Naval Information Warfare Center



TECHNICAL DOCUMENT 3393 October 2019

# **Pulsed Exposure Toxicity Testing:**

Method Development and Initial Evaluation for Stormwater Compliance

> Gunther Rosen Molly Colvin Chuck Katz NIWC Pacific

Jacob Munson-Decker Nicholas Hayman San Diego State University Research Foundation

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NIWC Pacific San Diego, CA 92152-5001 M. K. Yokoyama, CAPT, USN Commanding Officer W. R. Bonwit Executive Director

# ADMINISTRATIVE INFORMATION

The work described in this report was performed for the Commander, Navy Region Southwest, San Diego, CA, by the Energy and Environmental Sustainability Branch (71760) of the Advanced Systems and Applied Sciences Division (71700), Naval Information Warfare Center Pacific (NIWC Pacific), San Diego, CA. Support was provided by San Diego State University Research Foundation.

Released by Robert George, Head Environmental Sustainability Branch Under authority of Ayax D. Ramirez, Head Advanced Systems and Applied Sciences Division

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# EXECUTIVE SUMMARY

This report describes a preliminary research effort to modify whole effluent toxicity (WET) testing protocols designed for continuous flow discharges for application to episodic and/or ephemeral discharges such as those associated with storm water runoff. The effort was undertaken in response to a Naval Base San Diego industrial stormwater National Pollutant Discharge Elimination System (NPDES) permit (R9-2013-0064) condition that allows the Navy to assess and propose alternative testing parameters. This report's research (at the time it was conducted) was done for Naval Base San Diego by environmental toxicologists at the Navy's Space and Naval Warfare Systems Center Pacific (SSC Pacific).

The technical approach taken was to modify the WET testing method to simulate a range of exposure conditions found at the end-of-pipe. The test conditions matrix included: acute and chronic endpoints with commonly used test organisms; copper, zinc, and a combination of the two toxicants at various concentrations found to cause toxicity under standard WET testing; and short-term exposure conditions representing the 50<sup>th</sup>, 75<sup>th</sup>, and 95<sup>th</sup> percentile historical rainfall durations observed in San Diego over the past 55 years. The initial testing culminated in its application to multiple stormwater samples collected from Naval Base San Diego outfalls during a single rain event in March 2016. All testing was conducted concurrently with standard test method durations for comparison.

Chronic toxicity tests with purple sea urchin (*Strongylocentrotus purpuratus*) embryos and acute toxicity tests with the mysid shrimp (*Americamysis bahia*) were performed using standard Environmental Protection Agency (EPA) 96-hr continuous exposures alongside pulsed exposures of 3, 6 and 12-hr toxicant exposures, followed by transfer to uncontaminated seawater for the remainder of the 96 hr. Copper, zinc and a combination of the two were tested at concentrations ranging from 5.8 to 3,200 µg/L and 20 to 20,880 µg/L for copper and zinc, respectively. Copper and zinc were selected as these are commonly elevated constituents and often the cause of toxicity in stormwater at San Diego Naval Bases (Katz et al. 2006) and other Non-Navy stormwater discharges (Kayhanian et al. 2008). Additionally, stormwater samples collected from Naval Base San Diego were tested in a similar manner using the standard and modified EPA methods.

Toxicity tests with single and mixed metals, and stormwater samples, resulted in progressively lower toxicity with reduced contact time to the sample when compared to standard static 96-hr exposures. The effect was more pronounced for zinc than copper for both test species. Median effective concentrations (EC50) ranged from a factor of 2 to 186 higher (less toxic) under the pulsed conditions relative to the standard 96-hr exposure. Stormwater samples collected from NBSD consisted of a wide range of copper and zinc concentrations. As with the copper and zinc tests, the stormwater results also showed a consistent progressively lower toxicity with reduced contact time to the sample.

The results of this study showed that modifying standard WET test methods is a feasible approach to accurately access short-term exposure conditions. The tests, which were conducted over a range of realistic conditions for both a chronic and acute endpoint presented consistent results lending confidence in their application. All the tests displayed a significant progressive reduction in toxicity with decreasing exposure time. The toxicity determined with standard 96-hr static tests overestimated that of short-term exposures over a wide range (<1 to 2 orders of magnitude) depending on the exposure duration, toxicant, and endpoint evaluated. The implication is that exposure duration is as critical a testing condition as the exposure concentration when evaluating toxicity. Although the test procedures focused on exposure conditions likely to occur at the end-of-pipe, those conditions are

still conservative in comparison to actual exposures that occur once the stormwater is discharged to, and mixes with, receiving waters. Though these initial results are highly promising, additional testing and evaluation is required prior to implementation of a pulse-based methodology for compliance testing.

# ACRONYMS

BMP	Best Management Practices
CETIS	Comprehensive Environmental Toxicity Information System
Cu	Copper
DO	Dissolved Oxygen
$EC_{50}$	Median Effective Concentration
ELAP	Environmental Laboratory Accreditation Program
EMA	EnviroMatrix Analytical, Inc.
FSW	Filtered Seawater
HDPE	High Density Polyethylene
HSB	Hypersaline brine
ICP-AES	Inductively Coupled Plasma Atomic Emission Spectroscopy
ICP-MS	Inductively Coupled Plasma Mass Spectrometry
$LC_{50}$	Median Lethal Concentration
LCL	Lower Confidence Limit
NBSD	Naval Base San Diego
ND	Non-Detect
NIWC Pacific	Naval Information Warfare Center Pacific
NPDES	National Pollutant Discharge Elimination System
SPAWAR	Space and Naval Warfare
SSC Pacific	SPAWAR Systems Center Pacific
TST	Test for Significant Toxicity
TU	Toxic Unit
UCL	Upper Confidence Limit
USEPA	Environmental Protection Agency
Weck	Weck Laboratories
WET	Whole Effluent Toxicity
Zn	Zinc

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# 1. INTRODUCTION

This report describes a preliminary research effort to modify Whole Effluent Toxicity (WET) testing protocols designed for continuous flow discharges for application to episodic and/or ephemeral discharges such as those associated with storm water runoff. The research for this report was conducted in response to a Naval Base San Diego (NBSD) industrial National Pollutant Discharge Elimination System (NPDES) permit (Permit R9-2013-0064) condition that allows the Navy to assess an alternative approach to evaluating stormwater discharges and propose alternative toxicity testing parameters. Current compliance requirements for San Diego Navy installations apply standard acute (lethal) WET testing to first-flush stormwater collected directly from the end-of-pipe. The Navy's permits indicate that there may be a potential transition to the use of chronic (sub-lethal) WET testing in future permits. These requirements are in contrast to the State's toxicity draft guidance document (SWRCB, 2012) that applies WET testing to effluents once they are fully mixed in receiving waters. While the Navy supports that approach and has considerable scientific data that warrant setting the point-of-compliance in receiving waters, the Regional Water Quality Control Board (RWQCB), San Diego has mandated end-of-pipe testing with no consideration for mixing. Thus, this research effort focused on developing methods that could be applied to end-of-pipe samples while addressing more realistic exposure conditions generated by these types of episodic short-lived discharges.

The underlying rationale for addressing a modification to the standard WET protocol is that standard WET testing protocols expose test organisms for substantially longer periods of time (48 hours to 7 days) than the discharges themselves are present at the end-of-pipe (almost always less than 24 hours). The hypothesis is that this approach significantly overestimates the potential toxic impact. If applied properly, a modification to generate more realistic exposure conditions will still provide an appropriate level of protection, particularly given that the exposure at the end-of-pipe will be further reduced once it mixes in the receiving environment.

This research was conducted in 2015-2016 by environmental toxicologists at the Naval Information Warfare Center Pacific (NIWC Pacific). The report describes the background and rationale for the research, results of laboratory and stormwater testing, and a discussion of, and recommendations for, additional method development to ensure the efficacy of these methods in future compliance monitoring.

#### 1.1 BACKGROUND

Toxicity testing for compliance monitoring of industrial storm water discharges was first introduced by the RWQCB, San Diego in 1997 and applied to Navy permits in 2002. At that time stormwater monitoring required that first-flush (first hour of flow) end-of-pipe samples meet a 90% survival 50% of the time, and 70% survival 90% of the time, requirement. As part of the permit conditions, the Navy undertook an extensive assessment of stormwater runoff chemistry and toxicity from its facilities discharging to San Diego Bay starting in 2002. Results of the Navy's study (Katz et al., 2006) showed that while stormwater was acutely toxic in ~30% of samples, caused primarily by copper and zinc, receiving waters were found to be non-toxic for acute and chronic tests 100 and 98% of the time, respectively. The Navy concluded that toxicity testing at the end-of-pipe overestimated the toxic impacts found in receiving waters because the testing did not take into account the exposure conditions found there. The Navy recommended that future testing be conducted in receiving waters or by adjusting end of pipe tests for mixing or shorter toxicity testing durations to provide a more accurate prediction of the toxic effect. The RWQCB, San Diego did not agree with this approach, stating that they were required to monitor the discharge.

Several iterations of the toxicity requirements were promulgated in the ensuing years in other industrial NPDES permits. The California State Water Resources Control Board developed a draft toxicity guidance that applied chronic WET testing to samples fully mixed in receiving waters (SWRCB, 2012). However, the guidance provided a caveat that allowed regional boards to apply the exact same testing on 100% effluent samples. The outcome is that Navy NPDES permits since 2013 require acute WET tests on end-of-pipe samples with the potential for eventually applying chronic tests in the same way. The permits also allowed the Navy to re-evaluate alternative approaches to testing including addressing the role of mixing in receiving waters.

## **1.2 TECHNICAL APPROACH**

The technical approach taken in this study was to modify the WET testing method to simulate a range of exposure conditions found at the end-of-pipe. The range of conditions was derived from historical rain duration data, industrial stormwater runoff data associated with San Diego Naval Facilities, and toxicological test results evaluated for various organisms and endpoints. The test conditions matrix included: an acute and chronic endpoint for sensitive species typically used for toxicity evaluations; copper, zinc, and a combination of the two toxicants at various concentrations found to cause toxicity under standard WET testing; and short-term pulsed exposure conditions representing the 50<sup>th</sup>, 75<sup>th</sup>, and 95<sup>th</sup> percentile historical rainfall durations observed in San Diego over the past 55 years. The initial testing culminated in its application to multiple stormwater samples collected from Naval Base San Diego outfalls during a single rain event in March 2016. All testing was conducted concurrently with standard test method durations for comparison.

# 2. MATERIALS AND METHODS

## 2.1 SELECTION OF PULSED EXPOSURE DURATIONS

Experimental pulsed exposure times were derived from a National Oceanic and Atmospheric Administration database of San Diego International Airport rainfall recorded over the 55-year period between 1951 and 2006. The dataset included 2,284 days of precipitation values  $\geq 0.1$  inch measured on an hourly basis. The total number of hours measured each day were tabulated and assessed for their cumulative probabilities. These results are shown in Figure 2-1. The 50th, 75th, and 95th percentile rainfall durations of 3, 6 and 12 hours, respectively were chosen to span the range of reasonable testing conditions. Runoff durations are observed to be virtually the same as rainfall durations at Navy facilities because the drainages there are relatively small with a high percentage of impervious surfaces. An example of this rainfall-runoff relationship is shown in Figure 2-2 for a recent storm event at NBSD.

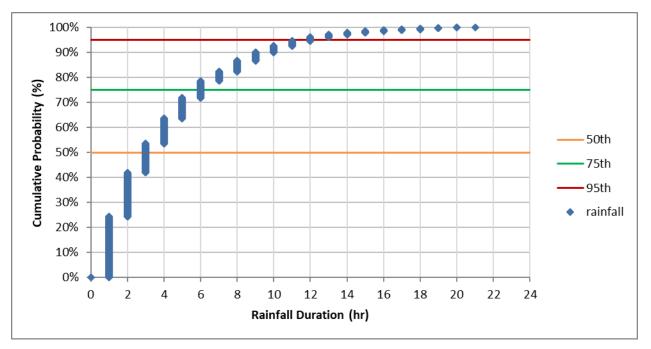


Figure 2-1. Cumulative frequency of rainfall duration over 24 hr periods when rain >0.1" was recorded between 1951 and 2006 (N= 2,284). The  $50^{th}$ ,  $75^{th}$  and  $95^{th}$  percentiles were used to derive the pulsed exposure regimes for this study.

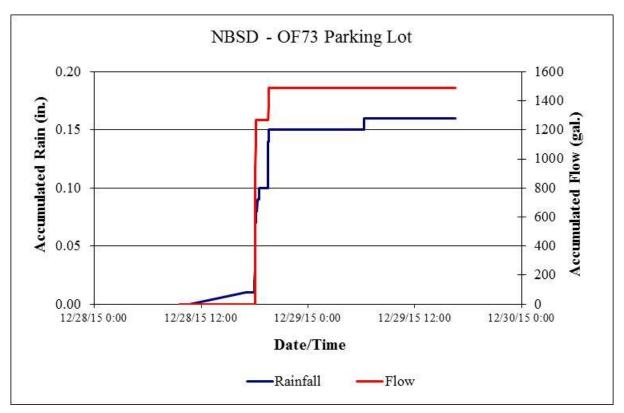


Figure 2-2. Example of rainfall and runoff during a storm event measured at NBSD Outfall 73 (parking area) showing runoff and rainfall durations are virtually the same.

The pulsed exposure experimental design was modified from standard USEPA methods (USEPA 1995, 2002a) and is shown graphically in Figure 2-3. Standard testing with reference toxicant materials or effluent samples typically requires the exposure of the test population to the undiluted sample under a static or static-renewal (replacement of test solution at one or more time points with the same stored test solution) conditions for the duration of the experiment. Modifications to this testing regime were made so that the organism exposures to either the reference toxicants (in this case copper or zinc, or both) or the effluent samples (stormwater) were made at the beginning of the exposure period followed by transfer to NIWC Pacific laboratory dilution water (uncontaminated 0.45  $\mu$ m filtered seawater (FSW) collected near the mouth of San Diego Bay) for the remainder of the test. This exposure design ensured that all testing was conducted for the full 96-hr duration of the standard WET test.

3 Hour Exposure		93 Hour 0.45µm Filtered Seawater Exposure			
6 Hour Exposure		90	Hour 0.45µm Filtered Seawater Exposure		
12 Hour Exposure		84 Hour 0.45µm Filtered Seawater Exposure			
96 Hour Exposure					

Figure 2-3. Pulsed exposure experimental design.

# 2.2 SELECTION OF TEST ORGANISMS

The toxicity testing species for this study were selected because they are permit-relevant species representing both acute and chronic endpoints (USEPA 1995, 2002a). The test species included opossum (mysid) shrimp (*Americamysis bahia*) and purple sea urchins (*Strongylocentrotus purpuratus*). The test endpoints included 96-hr survival and 96-hr embryo-larval development for mysids and sea urchins, respectively.

# 2.3 TEST MATERIAL

## 2.3.1 Selection of Stock Solutions

All test dilutions were made using NIWC Pacific laboratory filtered seawater (0.45 µm FSW collected from the mouth of San Diego Bay, CA). Test concentrations were prepared by volumetric addition of reagent grade copper and/or zinc stocks directly into FSW. All stock solutions and test concentrations were sub-sampled for verification and were analyzed by State of California Environmental Laboratory Accreditation Program (ELAP) certified laboratories, including either EnviroMatrix Analytical, Inc. (EMA) in San Diego, CA or Weck Laboratories (Weck), in the City of Industry, CA using USEPA method 6010 or by USEPA method 1640, respectively (USEPA 2007, 1996).

Analytical methods, method detection limits and reporting limits for copper and zinc are provided in Table 2-1.

Study Type	Analyte	Test Method	MDL* (µg/L)	RL* (µg/L)	Laboratory
Stormwater	Stormwater Copper		0.007	0.02	NIWC Pacific
Stormwater	Zinc	ICP-MS; EPA 1640	0.23	0.77	NIWC Pacific
Mixed Metal	Copper	ICP-MS; EPA 1640	0.004	0.01	Weck
Single & Mixed Metal	Zinc	ICP-MS; EPA 1640	0.04	0.20	Weck
Single Metal	Copper and Zinc	ICP-AES; EPA 6010	2	100	EMA

Table 2-1. Analytical Methods, Detection and Reporting Limits for Copper and Zinc.

MDL – Method detection limit

RL - Reporting limit

\* Note that the MDL and RL can change based on the dilution made for a given sample. See Appendix A through C for analytical reports from the laboratories.

Table 2-2 summarizes the experimental design and copper (Cu) and zinc (Zn) test concentrations that were tested for each species and pulse duration in single metal pulsed toxicity exposures. These concentrations were selected based on results from preliminary "range-finding" experiments using similar test methods, values found in peer-reviewed literature and historical laboratory results generated at NIWC Pacific. Concentrations were established in order to elicit a dose response in the species tested over the short exposure periods. Laboratory controls (uncontaminated 0.45 µm FSW from the mouth of San Diego Bay) were conducted concurrently for all experiments.

The mixed metal (copper and zinc) portion of this study was conducted only for the mysid acute survival test. It was assumed that Cu and Zn would contribute equally to the total toxicity due to similar mechanism of toxicity (Bellas et al. 2008). Using the Philips et al. (2003) Toxic Unit (TU) method (TU= concentration divided by  $LC_{50}$ ) single metal TU were considered a baseline, yielding TUs of 1. Using data generated from the single metal pulsed and static exposures, exposure concentrations for the mixed metal exposure were determined. Half of a TU for both Cu and Zn as determined from the single metal exposures we used as the basis concentration for the mixed metal exposure. Assuming equal contribution from Cu and Zn, 0.5 TU<sub>Cu</sub> + 0.5 TU<sub>Zn</sub> should elicit the same toxic response as each metal did individually at one TU each. To ensure that a dose response was observed, additional concentrations above and below the combined 0.5 TU<sub>Cu</sub> + 0.5 TU<sub>Zn</sub> were included.

For the stormwater samples, the highest concentration tested for the echinoderm embryo-larval development test was 64%, due to the addition of hypersaline brine (HSB) to bring the final salinity to 34 parts-per-thousand (ppt) (USEPA 1995). For the mysid survival test, stormwater sample salinity was increased to  $34 \pm 2$  ppt by the addition of synthetic sea salts (Crystal Sea Marine Mix®) (USEPA 2002a), resulting in an undiluted stormwater sample. Concurrent brine and salt controls were tested for the embryo-larval development and mysid survival test, respectively.

Table 2-2. Experimental Design, Test Concentrations and Testing Dates for Static and Pulsed Exposures.

Test	Test Initiation Date	Test Species	Exposure Duration (hr)	Nominal Test Concentrations
	15 Nov	Spurpuratua	96 (Static)	0, 5.8, 8.4, 12, 17.2, 24, 31.3 μg/L
Copper	2015	S. purpuratus	3, 6, & 12	0, 31.3, 62.5, 125, 250, 500 μg/L
Exposures	28 Oct 2015	1 habia	96 (Static)	0, 50, 100, 200, 400, 800 µg/L
	28 Oct 2015	A. bahia	3, 6, & 12	0, 200, 400, 800, 1600, 3200 µg/L
	25 Mar 2016	C. purpuratua	96 (Static)	0, 20, 40, 80, 160, 320 μg/L
Zinc	25 Mar 2016	S. purpuratus	3, 6, & 12	0, 1280, 2560, 5120, 10240, 20480 µg/L
Exposures	10 Dec 2015	A. bahia	96 (Static)	0, 125, 250, 500, 1000, 2000 μg/L
			3, 6, & 12	0, 500, 1000, 2000, 4000, 8000, 16000 μg/L
	29 Apr 2016	A. bahia	96 (Static)	Cu: 16.9, 33.8, 67.6, 135, 270 µg/L Zn: 63.8, 128, 255, 510, 1020 µg/L
Mixed Metals			3	Cu: 184,369,738, 1475, 2950 µg/L Zn: 1305, 2610, 5220, 10440, 20880 µg/L
Exposures			6	Cu: 99.4, 199, 398, 795, 1590 μg/L Zn: 489, 979, 1957, 3914, 7828 μg/L
			12	Cu: 30.0, 59.9, 120, 240.6, 479 μg/L Zn: 258, 515, 1030, 2060, 4120 μg/L
		S. purpuratus	96 (Static)	64%*
Stormwater	8 Mar 2016		3, 6, & 12	64%*
Exposures	0 IVIAI 2010		96 (Static)	100%
		A. bahia	3, 6, & 12	100%

\* Highest concentration tested due to the addition of hypersaline brine to adjust salinity to 34 ppt.

### 2.3.2 Stormwater Sample Collection

Stormwater samples consisted of runoff grab samples collected from industrial areas in Naval Base San Diego (NBSD) on March 7th, 2016 by NIWC Pacific personnel. Precipitation prior to and during the collection period was approximately an hour. Samples were collected in 1 L HDPE cubitainers and hand carried in insulated coolers with blue ice to the NIWC Pacific Bioassay Laboratory. Sample collection and receipt times are summarized in Table 2-3. Copies of chain of custody forms are provided in Appendix C. Water quality parameters including pH, dissolved oxygen (DO), salinity and temperature were measured immediately upon receipt at the Bioassay Lab and prior to testing. Additionally, total and dissolved copper and zinc were analyzed in the stormwater samples in-house by NIWC Pacific (ICP-MS; USEPA 1996; Table 2-1).

Station ID	Matrix	Туре	Sample Collection Date/Time	Sample Receipt Date/Time
Outfall 73	Stormwater	Grab	3/7/2016 1045	3/7/2016 1130
Pier 10 Influent	Stormwater	Grab	3/7/2016 0935	3/7/2016 1130
Pier 10 Effluent	Stormwater	Grab	3/7/2016 0943	3/7/2016 1130
Pier 13 Base	Stormwater	Grab	3/7/2016 0853	3/7/2016 1130
Pier 13 Mid	Stormwater	Grab	3/7/2016 0902	3/7/2016 1130
Pier 13 End	Stormwater	Grab	3/7/2016 0916	3/7/2016 1130

Table 2-3. Collection and Receipt Times of Stormwater Samples from NBSD

## 2.4 CHRONIC TOXICITY TEST METHODS

As determined by the rainfall history observed (Figure 2-1), chronic testing was conducted using modified standard USEPA methods (USEPA 1995; Table 2-4) to conservatively estimate stormwater scenarios that are likely to be observed at the end-of-pipe. The purple sea urchin embryo-larval development tests were conducted in 25 µm Nitex screen polycarbonate tubes placed in 400 mL high density polyethylene (HPDE) tri-corner beakers at  $15 \pm 1$  °C. Following the pulsed exposure duration, screen tubes (Figure 2-4 and Figure 2-5) were removed from metal or stormwater containing solutions, gently rinsed with FSW, and placed into clean tri-corner beakers containing FSW for the remainder of the 96-hr test period. As a quality control measure to ensure that the transfer methods did not negatively impact the embryos, a set of lab controls underwent transfers as well. At the end of the exposure period, the contents of the screen tubes were gently rinsed with FSW into 30 mL scintillation vials and preserved with 1 mL of 10% buffered formalin in seawater. The tests were then evaluated for normal larval development on an inverted microscope at 100x magnification. Statistical analyses to calculate median effective concentrations and confidence intervals were conducted with the statistical software Comprehensive Environmental Toxicity Information System (CETIS) v1.8.7.16 (Tidepool 2012). Stormwater data was analyzed using the Test of Significant Toxicity (TST) procedure to determine if there were significant differences relative to the controls. TST methods examine whether the results of a given sample relative to its respective control differs by an a priori prescribed amount rather than whether they are the same, as in traditional hypothesis testing (USEPA 2010). For the sea urchin test, the a priori critical percent difference is set at 25%.



Figure 2-4. Test set up for sea urchin embryo exposures.

Standard water quality measurements (DO, temperature, salinity and pH) were monitored daily. Concurrent reference toxicant tests using either Cu or Zn, as appropriate, were conducted as a quality control measure to assess the health of the organisms and technical performance of the method. Test specifications can be found in Table 2-4.

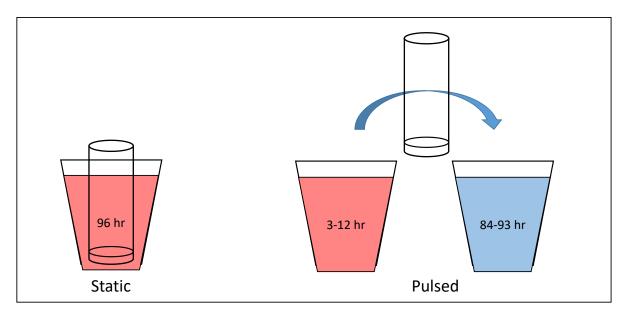


Figure 2-5. Generalized diagram comparing static 96-hr exposure and pulsed exposures during which test organisms were transferred from test solution (red) to uncontaminated seawater (blue) at designated time.

Test organism	Strongylocentrotus purpuratus (purple sea urchin)				
Test organism source	Field collected off of Point Loma, San Diego, CA				
Test endpoints	96 hr Embryo-Larval Development Success (Proportion Normal)				
Test solution renewal	None				
Feeding	None				
Test Chamber size/type	Pulsed Exposures: 400 mL polyethylene (HDPE) tri-corner containers with polycarbonate screen tubes with 25 µm mesh Static Exposures: 30 mL scintillation vial				
Test solution volume	Pulsed Exposures: 250 mL Static Exposures: 10 mL				
Test temperature	15 ± 1 °C				
Test salinity	34 ± 2 ppt				
Light quality	Ambient laboratory illumination				
Light intensity	10-20 µE/m <sup>2</sup> /s (Ambient laboratory levels)				
Photoperiod	16 hr light/ 8 hr dark				
Aeration	None.				
No. of organisms per chamber	250 eggs, appropriate sperm density to provide > 90% fertilization success (determined in a pre-test trial).				
No. of replicates	4 or 5				
Dilution water	Filtered (0.45 µm) natural seawater collected from near the mouth of San Diego Bay at NIWC Pacific Laboratory				
Test durationExposure for 3, 6, or 12 hr followed by exposure to clean 0.45 µm fil seawater for the remainder of the 96 hr test period					
Test acceptability criteria	≥ 80% normal development in surviving controls; < 25% Minimum Significant Difference (MSD)				
Reference toxicant	Copper sulfate Zinc Sulfate				
Test protocol	EPA 600/R-95/136 (USEPA 1995), ASTM E1563-98 (2012)				

Table 2-4. Purple Sea Urchin Embryo-Larval Development Toxicity Test Specifications

# 2.5 ACUTE TOXICITY TEST METHODS

Similar to the chronic tests, acute testing was conducted using modified standard USEPA methods (USEPA 2002a; Table 2-5) to conservatively estimate stormwater scenarios that are likely to be observed at the end-of-pipe based on the historical rainfall data (Figure 2-1). Mysid exposures were conducted in 500 mL disposable plastic cups at  $20 \pm 1$  °C. Following pulsed exposures, mysids were carefully poured onto an 80-µm Nitex screen and thoroughly rinsed with FSW. Mysids were then rinsed gently into new clean plastic cups containing FSW for the remainder of the exposure period. As a quality control measure to ensure that the transfer methods did not negatively impact the mysids, a set of lab controls underwent transfers as well. Statistical analyses to calculate median lethal concentrations and confidence intervals were conducted with the statistical software CETIS (Tidepool 2012). Stormwater data was analyzed using the TST procedure to determine if there were significant differences relative to the controls with the acute a priori critical percent difference set at 10% (USEPA 2010).

Daily survival counts in each replicate were conducted and standard water quality measurements (DO, temperature, salinity and pH) were monitored daily. Concurrent reference toxicant tests using either copper or zinc when appropriate were conducted as a quality control measure to assess the health of the organisms. Test specifications can be found in Table 2-5.

Test organism	Americamysis bahia (mysid shrimp)
Test organism source	Aquatic Research Organisms, Hampton, NH
Test endpoints	Survival
Test solution renewal	None
Feeding	Feed 40 newly hatched Artemia nauplii per larvae twice daily, morning and evening
Test Chamber size/type	500 mL Plastic Cups
Test solution volume	50 – 250 mL (dependent on exposure chamber volume)
Test temperature	20 ± 1 °C
Test salinity	34 ± 2 ppt
Light quality	Ambient laboratory illumination
Light intensity	10-20 µE/m <sup>2</sup> /s (Ambient laboratory levels)
Photoperiod	16 hr light/ 8 hr dark
Aeration	None, unless DO concentrations fall below 4.0 mg/L, then aerate all chambers.
No. of organisms per chamber	5
Age of test organism	5 days; 24 hr range in size
No. of replicates	4
Dilution water	Filtered (0.45 $\mu$ m) natural seawater (FSW) collected from near the mouth of San Diego Bay at NIWC Pacific Laboratory
Test durationExposure for 3, 6, & 12 hr followed by transfer to clean 0.45 µ seawater (FSW) for remainder of the 96 hr test period	
Test acceptability criteria	≥ 90% survival in controls
Reference toxicant	Copper sulfate Zinc Sulfate
Test protocol	EPA 821/R-02/012 (USEPA 2002)

Table 2-5. Mysid Survival Toxicity Test Specifications

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# 3. RESULTS

Test results for all lab controls met all test acceptability criteria of  $\geq$  80% normal larval development or  $\geq$  90% survival for the sea urchin and mysid tests, respectively. All water quality parameters measured were within the recommended ranges for the duration of the tests. Raw test data and bench water quality sheets are provided in Appendix A through C.

All data presented were deemed acceptable for reporting purposes. A few QA/QC deviations from EPA and internal protocols occurred and were noted on raw data sheets. A thorough review of the data and test procedures for the sea urchin embryo-larval development tests and the mysid survival tests did not identify any likely impacts on test results of these deviations. Explanations are provided below, and a glossary of the qualifier codes used on the test datasheets is provided in Appendix D.

## 3.1 QA/QC

#### 3.1.1 Single Metal Exposures

The 96-hr static reference toxicant test for sea urchin embryo-larval development that was run concurrently with the Cu single-metal pulsed study did not result in a median effective concentration (EC<sub>50</sub>). The mean Cu EC<sub>50</sub> value of 14.8  $\mu$ g/L from three peer reviewed studies was used for comparisons to pulsed exposures (literature based EC<sub>50</sub> values: 14.8  $\mu$ g/L: Arnold et al. 2010, 15.3  $\mu$ g/L: Phillips et al. 1995, 14.3  $\mu$ g/L: Rosen et al. 2008; mean EC<sub>50</sub> = 14.8  $\mu$ g/L).

Table 3-1 and Table 3-2 summarize the nominal and verified copper and zinc concentrations that were used in both the purple sea-urchin embryo-larval development and the mysid survival tests, respectively.

Test Species	Exposure Duration (hr)	Nominal Copper Concentration (µg/L)	Verified Copper Concentration <sup>a</sup> (µg/L)
	3, 6, & 12	0	ND
	3, 6, & 12	31.3	15.0
	3, 6, & 12	62.5	36.0
S. purpuratus	3, 6, & 12	125	81.0
	3, 6, & 12	250	179
	3, 6, & 12	500	367
	3, 6, & 12 96 (Static)	0	ND
	96 (Static)	50	44.4
	3, 6, & 12 96 (Static)	100	88.8
A. bahia	3, 6, & 12 96 (Static)	200	178
A. Dania	3, 6, & 12 96 (Static)	400	355
	3, 6, & 12 96 (Static)	800	693
	3, 6, & 12	1600	1390
	3, 6, & 12	3200	2970

Table 3-1. Summary of Nominal and Verified Copper Concentrations from Static and Pulsed Exposures.

<sup>a</sup> USEPA method 6010 (EMA); ND=below method detection limit.

Table 3-2. Summary of Nominal and Verified Zinc Concentrations from Static and Pulsed	
Exposures.	

Test Species	Exposure Duration (hr)	Nominal Zinc Concentration (µg/L)	Verified Zinc Concentration (µg/L) <sup>a</sup>
	3, 6, & 12 96 (Static)	0	6.1
	96 (Static)	20	37
	96 (Static)	40	63
	96 (Static)	80	120
	96 (Static)	160	220
S. purpuratus	96 (Static)	320	480
	3, 6, & 12	1280	1900
	3, 6, & 12	2560	3900
	3, 6, & 12	5120	7700
	3, 6, & 12	10240	15000
	3, 6, & 12	20180	31000
	3, 6, & 12 96 (Static)	0	13
	96 (Static)	125	100
	96 (Static)	250	180
	3, 6, & 12 96 (Static)	500	398
A. bahia	3, 6, & 12 96 (Static)	1000	753
	3, 6, & 12 96 (Static)	2000	1520
	3, 6, & 12	4000	3280
	3, 6, & 12	8000	5430
	3, 6, & 12	16000	16700

<sup>a</sup> USEPA method 1640 (Weck) for S. purpuratus, USEPA method 6010 (EMA) for A. bahia.

### 3.1.2 Mixed Metal Exposures

For the mysid survival test, concurrently conducted single metal (Cu & Zn) static exposures met test acceptability criteria of 90% survival in the controls and the  $LC_{50}$  values generated for Cu and Zn both were within acceptable historical and/or literature ranges (Table 3-6).

Table 3-3 summarizes the nominal and verified concentrations of Cu and Zn in the mixed metal exposures for each of the pulsed time exposures, as each pulsed exposure had unique concentrations.

Table 3-3. Summary of Nominal and Verified Copper and Zinc Concentrations for Mysid survival
mixed metal static and pulsed exposures.

Pulse Duration (hr)	Cu-Nominal Concentration (µg/L)	Cu-Verified Concentration <sup>a</sup> (µg/L)	Zn- Nominal Concentration (µg/L)	Zn- Verified Concentration <sup>a</sup> (µg/L)
Laboratory Control	0	1.6	0	6.4
	184	190	1305	1800
	369	350	2610	3900
3	738	880	5220	7400
	1475	1500	10440	15000
	2950	3100	20880	30000
	99.4	99.0	489	850
	199	200	979	1500
6	398	440	1957	2500
	795	770	3914	5200
	1590	1600	7828	11000
	30	34	258	360
	59.9	72.0	515	910
12	120	120	1030	1500
	240	340	2060	3100
	479	570	4120	5900
	16.9	21.0	63.8	81.0
96 (Static)	33.8	34.0	128	150
	67.6	71.0	255	320
	135	140	510	860
	270	280	1020	1600

<sup>a</sup> USEPA 1640 method (Weck)

#### 3.1.3 Stormwater Exposures

All tests were conducted within the required 36-hour holding time. Samples were received within 3 hrs of collection and the temperatures of the samples were outside of the EPA recommended range of 0-6 °C upon receipt at the NIWC Pacific Laboratory; however, samples were in a state of cooling during transit, meeting ELAP requirements. Samples were stored at 4 °C in a refrigerator until test initiation.

Water quality parameters upon receipt of stormwater samples at NIWC Pacific are summarized in Table 3-4 and Appendix C. Sample temperatures reflect that that the samples were brought to the lab very quickly after collection. Total and Dissolved Cu and Zn concentrations for the stormwater samples are shown in Table 3-5, along with the calculated difference based on highest concentration tested (64%) for sea urchin embryo-larval development tests due to the addition of hypersaline brine.

Station/Sample ID	Temp (°C)	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)
Outfall 73	14.2	8.0	7.77	0.0
Pier 10 Influent	14.2	8.1	6.72	0.0
Pier 10 Effluent	14.2	8.2	7.27	0.1
Pier 13 Base	14.2	8.1	7.01	0.1
Pier 13 Mid	14.2	8.2	7.09	0.1
Pier 13 End	14.2	8.0	7.01	0.0

Table 3-4. Water Quality Parameters Measured Upon Receipt at NIWC Pacific from NBSD Stormwater Samples Collected on March 7, 2016.

Table 3-5. Total and Dissolved Cu and Zn Concentrations in NBSD Stormwater Samples Collected on March 7, 2016.

Station/Sample ID	Cu – Total (µg/L) ª	Cu - Dissolved (µg/L) ª	64% Cu - Dissolved (μg/L) <sup>ь</sup>	Zn - Total (µg/L) ª	Zn - Dissolved (µg/L) ª	64% Zn - Dissolved (μg/L) <sup>ь</sup>
Outfall 73	56.7	48.9	31.3	384	343	219.5
Pier 10 Influent	24.2	17.2	11.0	220	162	103.7
Pier 10 Effluent	25.1	15.0	9.6	230	145	92.8
Pier 13 Base	21.0	0.23	0.1	350	34	21.8
Pier 13 Mid	83.6	51.4	32.9	994	600	384.0
Pier 13 End	75.4	55.9	35.8	2361	2137	1367.7

<sup>a</sup> USEPA method 1640 (NIWC Pacific); <sup>b</sup> Calculated concentration based on highest concentration tested (64%) for sea urchin embryo-larval development tests due to the addition of hypersaline brine.

For the stormwater pulsed exposure study, the 3 hr and 6 hr pulsed exposure data for the sea urchin embryo-larval development test are not presented here. The data did not meet necessary requirements for TST analysis due to several outliers that reduced required replication. A single statistical outlier was observed in the 12-hr data for one of the replicates of the Pier 13 Mid sample (11% normal development) using Grubb's test with a significance level set at 0.01. This replicate was removed from analysis.

Standard reference toxicant tests with copper that were conducted concurrently with the stormwater evaluations for both species had median effective concentration ( $EC_{50}$ ) value or median lethal concentration ( $LC_{50}$ ) within two standard deviations of the internal historical mean, indicating sensitivity to copper was consistent with that historically observed for these organisms (Table 3-6).

Table 3-6. Results Summary for the Copper Reference Toxicant Tests Concurrently Conducted with the NBSD Stormwater Samples Collected on March 7, 2016.

Species & Endpoint	LC <sub>50</sub> or EC <sub>50</sub> (µg/L copper) ª	Historical mean ± 2 SD (µg/L copper) ª
Sea Urchin Embryo-Larval Development	18.0	18.6 ± 9.4
Mysid Shrimp Survival	253	259 ± 146

<sup>a</sup> Reported values are based on nominal (unmeasured) concentrations.

## 3.2 COPPER EXPOSURES

For the chronic sea urchin embryo-larval development tests, all of the pulsed exposures with copper showed a reduction in toxicity relative to the static exposure. The  $EC_{50}$  values and the 95% lower and upper confidence intervals for copper for the static and each pulsed exposure were calculated based on verified concentrations and are shown in Figure 3-1. $EC_{50}$  values for the pulsed exposures were 8-20 times greater than that of the published static exposure  $EC_{50}$  value reported for this species (Figure 3-1).

For the acute mysid survival tests, a similar trend was observed in that the pulsed exposures with copper showed a reduction in toxicity relative to the static exposure with  $LC_{50}$  values all greater than that observed (ranging from factor of 2 to 11) in the static exposure (Figure 3-2). The  $LC_{50}$  values and the 95% lower and upper confidence intervals for copper for the static and each pulsed exposure were calculated based on verified concentrations and are shown in Figure 3-2.

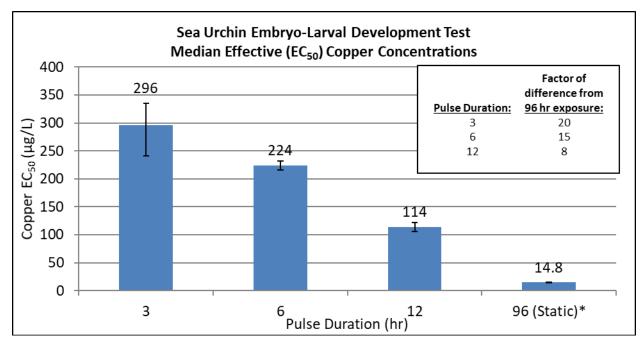
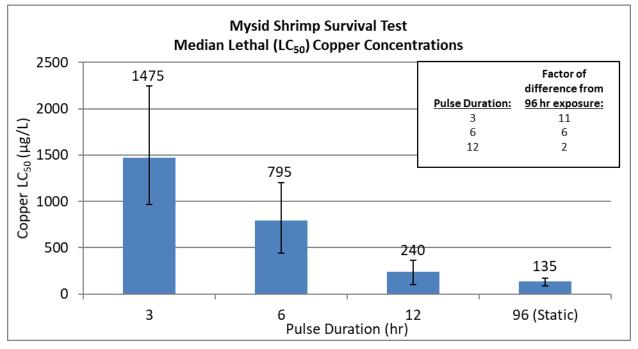
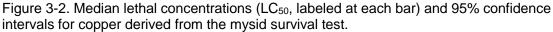


Figure 3-1. Median effective concentrations (EC<sub>50</sub>, labeled at each bar) and 95% confidence intervals for copper derived from the purple sea urchin embryo-larval development test. \*96-hr static data are from the mean Cu EC<sub>50</sub> value of 14.8  $\mu$ g/L from three peer-reviewed studies (see section 3.1).





## 3.3 ZINC EXPOSURES

The EC<sub>50</sub> values and the 95% lower and upper confidence intervals for zinc for the static and each pulsed exposure were calculated based on verified concentrations and are shown in Figure 3-3. For the chronic sea urchin embryo-larval development tests, the pulsed exposures with zinc showed a reduction in toxicity relative to the static exposures. EC<sub>50</sub> values for the pulsed exposures were 112-186 times greater than that of the static exposure (Figure 3-3).

The LC<sub>50</sub> values and the 95% lower and upper confidence intervals for zinc for the static and each pulsed exposure were calculated based on verified concentrations and are shown in Figure 3-4. For the acute mysid survival tests, a similar trend was observed in that the pulsed exposures with zinc showed a reduction in toxicity relative to the static exposures with LC<sub>50</sub> values all greater than that observed from the 96-hr static exposure (Figure 3-4).

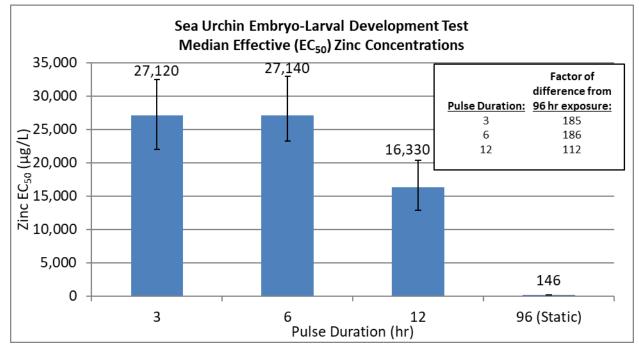


Figure 3-3. Median effective concentrations (EC<sub>50</sub>, labeled at each bar) and 95% confidence intervals for zinc derived from the purple sea urchin embryo-larval development test.

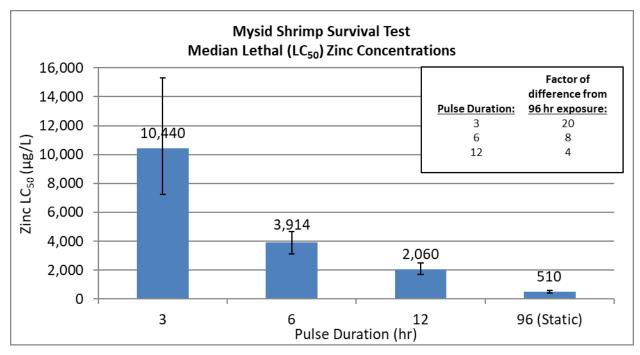


Figure 3-4. Median lethal concentrations ( $LC_{50}$ , labeled at each bar) and 95% confidence intervals for zinc derived from the mysid survival test.

## 3.4 MIXED METALS EXPOSURES

The  $LC_{50}$  values and the 95% lower and upper confidence intervals for the single metal static exposures of copper and zinc were calculated and are shown in Table 3-7.

For the mixed metal exposures, the  $LC_{50}$  values and associated 95% lower and upper confidence intervals were calculated based on verified concentrations for each metal individually for the static and each pulsed exposure and are shown in Figure 3-5. The mixed metals study shows consistent reduction in toxicity for both copper and zinc with shorter exposure periods as was seen with the single metal exposures.

Figure 3-6 summarizes the result of the Toxic Unit (TU) calculations. To calculate the Toxic Unit (TU), the  $LC_{50}$  values determined for each metal in the mixture were divided by its  $LC_{50}$  value determined during the single metal tests. The resulting TUs for each metal were then summed to generate a combined TU for the mixture. Since it was assumed that Cu and Zn would contribute equally to the total observed toxicity, a TU value greater than one indicates that a greater amount of Cu and Zn, in combination, was needed to elicit a toxic effect relative to their equivalent single metal exposures (Figure 3-6). The lower TUs observed for copper suggest that it was the primary toxicant in these tests.

Table 3-7. Summary of Median Lethal (LC<sub>50</sub>) Copper and Zinc Concentrations for the Single Metal Mysid Survival Test with Corresponding 95% Upper (UCL) and Lower Confidence Limits (LCL).

Exposure Duration (hr)	Metal	LC₅₀ (µg/L)	95 % LCL (μg/L)	95% UCL (µg/L)
OG (Statia)	Cu	223	182	288
96 (Static)	Zn	689	575	825

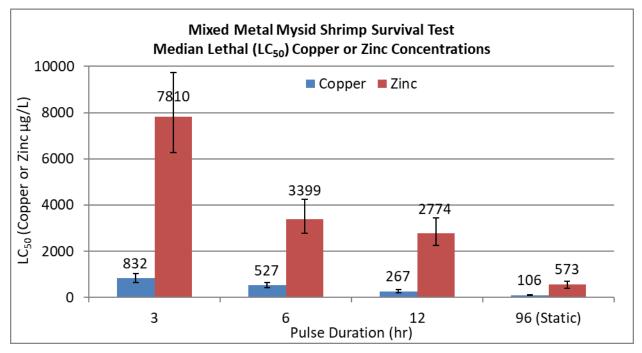


Figure 3-5. Median lethal concentrations ( $LC_{50}$ , labeled at each bar) and 95% confidence intervals for copper and zinc derived from the mysid survival test with mixed metals.

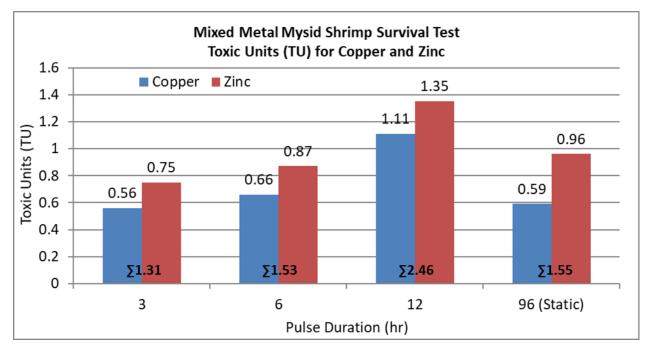


Figure 3-6. Toxic Units (TU) for copper and zinc derived from the mysid survival test with mixed metals.

#### 3.5 STORMWATER EXPOSURES

Statistical analyses for the sea urchin embryo-larval development tests were performed against the brine control, as brine was added to increase the salinity of all of the samples. Statistical analyses were conducted using the TST method.

Table 3-8 and Figure 3-7 summarize the mean percent normal embryo-larval development for the 12 hr pulsed exposure and the 96 hr static exposure for the stormwater samples collected on March 7, 2016. Development values ranged from 0 to 91% of control in the 96 hr static tests and from 94 to 97% in the 12 hr pulsed exposure tests. Five of the six samples were identified as toxic in the 96 hr static exposure test, whereas no samples were identified as toxic in the 12 hr pulsed exposure test.

Table 3-8. Results Summary for Chronic Purple Sea Urchin Embryo-Larval Development Test on
NBSD Stormwater Samples Collected on March 7, 2016 for the 12 hr Pulsed Exposure and the 96
hr Static Exposure.

Pulse Duration (hr)	Station/Sample ID	Mean % Normal (± SD)	% Difference from Brine Control	TST Procedure Toxicity Decision
-	Lab Control	100 (0.0)	-	-
-	Brine Control	99 (1.0)	-	-
	Outfall 73	94 (2.5)	5.5	Non-Toxic
	Pier 10 Influent	97 (1.9)	2.5	Non-Toxic
40	Pier 10 Effluent	97 (3.0)	2.0	Non-Toxic
12	Pier 13 Base	96 (3.0)	3.0	Non-Toxic
	Pier 13 Mid	94 (1.7)	5.3	Non-Toxic
	Pier 13 End	95 (2.5)	4.5	Non-Toxic
	Outfall 73	0 (0.0)	100	Toxic
	Pier 10 Influent	9.3 (6.1)	89.4	Toxic
	Pier 10 Effluent	11 (3.8)	90.7	Toxic
96 (Static)	Pier 13 Base	91 (3.0)	8.6	Non-Toxic
	Pier 13 Mid	0 (0.0)	100	Toxic
	Pier 13 End	0 (0.0)	100	Toxic

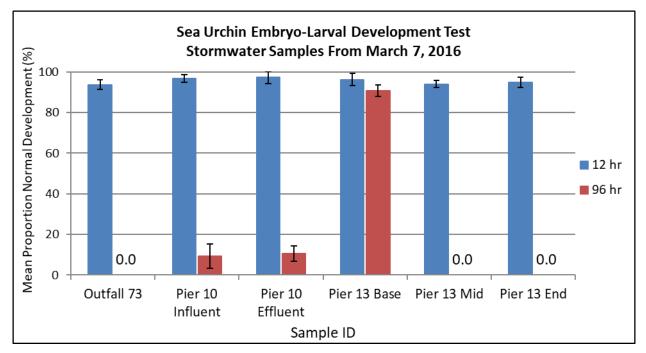


Figure 3-7. Mean percent normal (±SD) for chronic sea urchin embryo-larval development test on stormwater samples collected from NBSD on March 7, 2016 for the 12 hr pulsed exposure and the 96 hr static exposure.

For the acute mysid survival test, statistical analyses were performed against the salt control, as artificial sea salts were added to increase the salinity of all of the samples. Statistical analyses were conducted using the USEPA TST Calculator Tool (USEPA 2010). Table 3-9 summarizes and Figure 3-8 graphically shows the mean percent survival for the 3, 6, and 12 hr pulsed exposures and the 96 hr static exposure for the stormwater samples collected on March 7, 2016. For the 96 hr static exposure, the samples Pier 13 Mid and Pier 13 End resulted in a toxic response compared to the salt control. All other samples were non-toxic. Under the 12 hr pulsed exposure method, the Pier 13 Mid and Pier 13 End samples continue to exhibit a toxic response compared to the salt control, while all other samples were non-toxic. For the 6 hr pulsed method, only the Pier 13 End sample continued to have a toxic response. For the 3 hr pulsed method, all samples were non-toxic relative to the salt control. Figure 3-9 shows the survival results for Pier 13 Mid and Pier 13 End with decreasing toxicity with decreased exposure time.

Pulse Duration (hr)	Station/Sample ID	Mean % Survival (± SD)	% Difference from Salt Control	TST Procedure Toxicity Decision	
-	Lab Control	100 (0.0)	-	-	
-	Salt Control	95 (10.0)	-	-	
	Outfall 73	95 (10.0)	0.0	Non-Toxic	
	Pier 10 Influent	90 (11.5)	5.3	Non-Toxic	
2	Pier 10 Effluent	100 (0.0)	-5.3	Non-Toxic	
3	Pier 13 Base	95 (10.0)	0.0	Non-Toxic	
	Pier 13 Mid	95 (10.0)	0.0	Non-Toxic	
	Pier 13 End	90 (11.5)	5.3	Non-Toxic	
	Outfall 73	95 (10.0)	0.0	Non-Toxic	
	Pier 10 Influent	100 (0.0)	-5.3	Non-Toxic	
c	Pier 10 Effluent	95 (10.0)	0.0	Non-Toxic	
6	Pier 13 Base	100 (0.0)	-5.3	Non-Toxic	
	Pier 13 Mid	90 (11.5)	5.3	Non-Toxic	
	Pier 13 End	65 (19.1)	31.6	Toxic	
	Outfall 73	100 (0.0)	-5.3	Non-Toxic	
	Pier 10 Influent	90 (11.5)	5.3	Non-Toxic	
12	Pier 10 Effluent	90 (11.5)	5.3	Non-Toxic	
12	Pier 13 Base	100 (0.0)	-5.3	Non-Toxic	
	Pier 13 Mid	75 (10.0)	21.1	Toxic	
	Pier 13 End	55 (25.2)	42.1	Toxic	
	Outfall 73	90 (11.5)	5.3	Non-Toxic	
	Pier 10 Influent	90 (10.0)	5.3	Non-Toxic	
OF (Statia)	Pier 10 Effluent	95 (10.0)	0.0	Non-Toxic	
96 (Static)	Pier 13 Base	100 (0.0)	-5.3	Non-Toxic	
	Pier 13 Mid	75 (10.0)	21.1	Toxic	
	Pier 13 End	25 (25.2)	73.7	Toxic	

Table 3-9. Results Summary for Acute Mysid Survival Test on NBSD Stormwater Samples Collected on March 7, 2016 for the 3, 6, and 12 hr Pulsed Exposures, and the 96 hr Static Exposure.

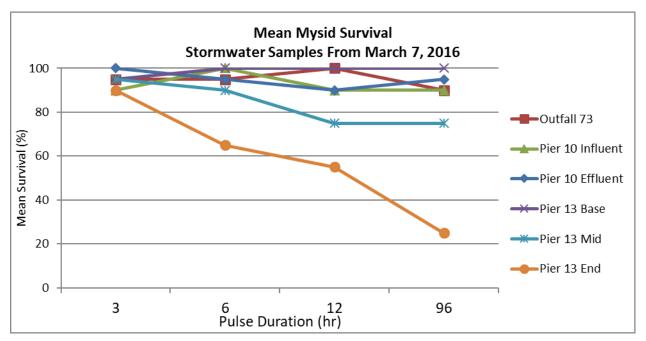


Figure 3-8. Mean percent survival for acute mysid test on stormwater samples collected from NBSD on March 7, 2016 for the 3, 6, and 12 hr pulsed exposures and the 96 hr static exposure.

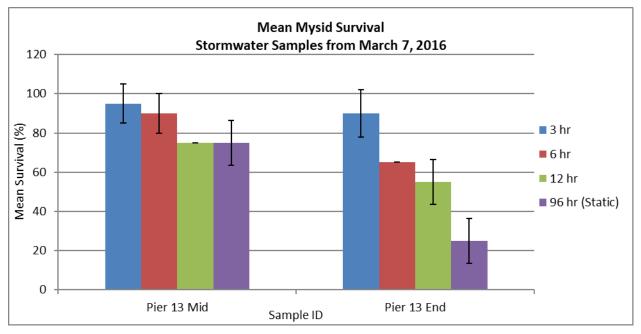


Figure 3-9. Mean percent survival for acute mysid test on stormwater samples Pier 13 Mid and Pier 13 End collected from NBSD on March 7, 2016 for the 3, 6, and 12 hr pulsed exposures and the 96 hr static exposure.

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## 4. DISCUSSION AND CONCLUSIONS

The results of this study showed that modifying standard WET test methods is a feasible approach to accurately assess short-term exposure conditions. The tests, which were conducted over a range of realistic conditions for both chronic and acute toxicity endpoints, presented consistent results lending confidence in their application. All the tests displayed a significant progressive reduction in toxicity with decreasing exposure time. The toxicity determined with standard 96 hr static tests overestimated the toxicity of short-term exposures by a factor of between 2 and 186, depending on the exposure duration, toxicant, and endpoint evaluated.

The higher effects concentrations from the short-term pulsed testing showed that the test organisms are relatively protected over shorter exposure intervals. This enhanced level of protection was observed in the sea urchin embryo-larval development test results, whereby even exceptionally high levels of zinc did not cause toxic effects in short term exposures. This outcome is consistent with other studies that found that the fertilization membrane may provide a level of protection during the earliest developmental life stages of the organism (Buznikov et al. 2007; AMEC, 2015). The implication is that exposure duration is as critical a testing condition as the exposure concentration when evaluating toxicity. It also suggests that further testing at various developmental life stages is important in evaluating the efficacy of the pulsed exposure method.

The laboratory pulsed testing procedures were conducted under conditions that reflected realistic stormwater conditions found at the end-of-pipe at San Diego Navy facilities. It included a range in the stormwater runoff durations expected as well as the type and magnitude of the toxicant concentrations. The observed level of toxicity in both laboratory and stormwater samples were consistent and repeatable with comparable results to other pulsed exposure studies with different toxicants and pulse durations (Dupuis and Kreutzberger 2003, Butcher et al. 2006, Diamond et al. 2006, Hoang et al 2007a, Hoang et al. 2007b, Hoang 2007c, AMEC, 2015). The simple modification of the standard WET procedure provides a reasonable logistical change that could easily be implemented in future testing.

Although the test procedures focused on exposure conditions likely to occur at the end-of-pipe, those conditions are still conservative in comparison to actual exposures that occur once the stormwater is discharged to, and mixes with, receiving waters. This is corroborated by repeated testing that consistently showed no adverse effects to similar toxicity test endpoints and near background chemical concentrations when samples were collected from the receiving environment immediately adjacent to stormwater outfalls (Katz et al. 2006).

Though these initial result are highly promising, additional testing and evaluation are recommended prior to implementation of a pulsed methodology for compliance testing, In particular, additional testing should include:

- Examining timing of the onset of the pulse during laboratory exposure
- Consideration of the effects of repeated pulses
- Evaluation of the most sensitive, not just earliest life stages of test organisms
- Potential for latent effects following the standard exposure duration
- Receiving water testing
- Inter-laboratory comparisons
- Comparison of costs of pulsed testing vs. static testing

We believe that this methodology can and should be implemented into stormwater testing compliance monitoring once the above testing is completed and there is a sufficient level of repetition to provide a statistical assessment.

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## APPENDIX A TEST DATA AND STATISTICAL SUMMARIES

# SINGLE METAL EXPOSURES

## OVERVIEW

Items included are included in Appendix A:

Copper Exposures – Purple Urchin	A-2
Zinc Exposures – Purple Urchin	
Zinc Exposures – Mysid Shrimp	A-100
Zinc Exposures – Analytical Chemistry Reports	
	Zinc Exposures – Mysid Shrimp

## A.1. COPPER EXPOSURES – PURPLE URCHIN:

CE IIS Sull	nmary Repo	r L						Report Date Test Code:		739	912D09   19	8 (p 1 of 1 -3889-408
Echinoid Emb	oryo-Larval Deve	elopmen	ıt Test							SPA	VAR Syste	ms Cente
Batch ID: Start Date: Ending Date: Duration:	07-7568-4302 05 Nov-15 08:5 09 Nov-15 08:4 96h	0 F 5 S	Fest Type: Protocol: Species: Source:	Development- EPA/600/R-95 Strongylocentr Field Collected	/136 (1995) otus purpura	tus		Analyst: Diluent: Brine: Age:	Labo	b Munson-l pratory Seav Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:	01-8242-6934 05 Nov-15 10:0 NA	0 N S	Code: Aaterial: Source: Station:	ADF9D36 Copper sulfate Pulsed Expose 3 Hour				Client: Project:		WAR ed Exposur	e	
Comparison S	Summary											
Analysis ID	Endpoint		NOEL	LOEL	TOEL	PMSD	τu	Meth	od			
02-9521-1706	Proportion Norr	nal	179	367	256.3	21.3%		Steel	Man	y-One Rank	Sum Test	
Point Estimate	e Summary											
Analysis ID	Endpoint		Level	μg/L	95% LCL	95% UCL	τυ	Meth	od			
06-1064-8139	Proportion Norr	nal	EC50	295.9	241.3	334.7		Linea	ır Reg	gression (M	LE)	
Proportion No	ormal Summary											
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std E	Frr	Std Dev	CV%	% Effect
0	Lab Control	4	0.937	5 0.8774	0.9976	0.9	0.99	0.018	387	0.03775	4.03%	0.0%
15		4	0.922	5 0.8807	0.9643	0.9	0.96	0.013	315	0.0263	2.85%	1.6%
36		4	0.965		0.9926	0.94	0.98	0.008		0.01732	1.8%	-2.93%
81		4	0.917		0.9528	0.89	0.94	0.011		0.02217	2.42%	2.13%
179 367		4 4	0.892 0.22	5 0.8245 0	0.9605 0.6893	0.83 0	0.92			0.04272 0.295	4.79% 134.1%	4.8% 76.53%
Proportion No	ormal Detail					-			-			
•	Control Type	Rep 1	Rep 2	Rep 3	Rep 4							
	Lab Control	0.93	0.99	0.9	0.93							
15		0.96	0.91	0.92	0.9							
36		0.97	0.97	0.98	0.94							
81		0.89	0.91	0.94	0.93							
179		0.92	0.83	0.9	0.92							
367		0	0.01	0.63	0.24							
Proportion No	ormal Binomials											
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4							
0	Lab Control	93/100	99/10	0 90/100	93/100							
15		96/100	91/10	0 92/100	90/100							
36		97/100			94/100							
81		89/100	91/10	0 94/100	93/100							
179 367		92/100 0/100		0 90/100	92/100 24/100							

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CETIS Ana	alytical Repo	ort						-	ort Date: Code:			)8 (p 1 of 2 9-3889-408
Echinoid Em	bryo-Larval Dev	elopmen	t Test							SPA	WAR Syste	ems Cente
Analysis ID: Analyzed:	02-9521-1706 03 Feb-15 13:5		Indpoint: Analysis:	Proportion No Nonparametri		vs T	reatments		S Versior		.8.7	
Batch ID: Start Date: Ending Date: Duration:	07-7568-4302 05 Nov-15 08:5 09 Nov-15 08:4 96h	i0 P 15 S	Test Type: Protocol: Species: Source:	Development- EPA/600/R-95 Strongylocent Field Collecte	6/136 (19 rotus pur	,	tus	Anal Dilue Brin Age:	ent: La e: No	cob Munson-I boratory Sea ot Applicable		
Sample ID: Sample Date: Receive Date Sample Age:		00 NV S	Code: Aaterial: Source: Station:	ADF9D36 Copper sulfate Pulsed Expos 3 Hour				Clier Proje		PAWAR Ised Exposur	e	
Data Transfo	rm	Zeta	Alt H	yp Trials	Seed			PMSD	NOEL	LOEL	TOEL	TU
Angular (Corre	ected)	NA	C > T	NA	NA			21.3%	179	367	256.3	
Steel Many-O	ne Rank Sum T	est										
Control	vs C-µg/L		Test	Stat Critical	Ties	DF	P-Value	P-Type	Decisio	n(α:5%)		
Lab Control	15		15.5	10	1	6	0.5438	Asymp	Non-Sig	nificant Effect		
	36		22	10	0	6	0.9908	Asymp	-	nificant Effect		
	81		16	10	1 1	6	0.6105	Asymp	-	nificant Effect		
	179		12.5 10			6	0.1834	Asymp	Non-Significant Effect			
	367*		10	10	0	6	0.0417	Asymp	Significa	nt Effect		
Auxiliary Tes	ts											
Attribute	Test			Test Sta	Critic	al	P-Value	Decision(				
Extreme Value	e Grubbs E	Extreme ∖	/alue	3.37	2.802		0.0019	Outlier De	tected			
ANOVA Table	9											
Source	Sum Squ	ares	Mean	Square	DF		F Stat	P-Value	Decisio	n(α:5%)		
Between	2.818988		0.563		5		18.38	<0.0001	Significa			
Error	0.5520169	Э	0.030	6676	18							
Total	3.371005				23		-					
Distributiona	l Tests											
Attribute	Test			Test Sta	Critic	al	P-Value	Decision	α:1%)			
Variances	Bartlett E	quality of	f Variance	25.34	15.09		0.0001	Unequal \	/ariances			
Distribution	Shapiro-	Nilk W N	ormality	0.8123	0.884		0.0005	Non-norm	al Distribu	tion		
Proportion N	ormal Summary											
C-µg/L	Control Type	Count	Mean	95% LCI	. 95% (	JCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Control	4	0.937	5 0.8774	0.997	6	0.93	0.9	0.99	0.01887	4.03%	0.0%
15		4	0.922	5 0.8807	0.964	3	0.915	0.9	0.96	0.01315	2.85%	1.6%
36		4	0.965	0.9374	0.992	6	0.97	0.94	0.98	0.00866	1.8%	-2.93%
81		4	0.917		0.952		0.92	0.89	0.94	0.01109	2.42%	2.13%
179		4	0.892		0.960		0.91	0.83	0.92	0.02136	4.79%	4.8%
367		4	0.22	0	0.689	3	0.125	0	0.63	0.1475	134.1%	76.53%
	rected) Transfor	med Sur	nmary									
Angular (Cori				95% LCI	. 95% l	JCL	Median	Min	Max	Std Err	CV%	%Effect
C-µg/L	Control Type	Count	Mean	00 /0 201			1 0 0 0	4.040				
<b>С-µg/L</b> 0		4	1.331	1.178	1.485		1.303	1.249	1.471	0.04811	7.23%	0.0%
<b>С-µg/L</b> 0 15	Control Type	4 4	1.331 1.292	1.178 1.207	1.377		1.275	1.249	1.369	0.02673	4.14%	2.95%
<b>С-µg/L</b> 0 15 36	Control Type	4 4 4	1.331 1.292 1.386	1.178 1.207 1.315	1.377 1.458		1.275 1.397	1.249 1.323	1.369 1.429	0.02673 0.02236	4.14% 3.23%	2.95% -4.13%
С-µg/L 0 15 36 81	Control Type	4 4 4 4	1.331 1.292 1.386 1.281	1.178 1.207 1.315 1.217	1.377 1.458 1.345		1.275 1.397 1.285	1.249 1.323 1.233	1.369 1.429 1.323	0.02673 0.02236 0.02006	4.14% 3.23% 3.13%	2.95% -4.13% 3.77%
<b>С-µg/L</b> 0 15 36	Control Type	4 4 4	1.331 1.292 1.386	1.178 1.207 1.315 1.217 1.137	1.377 1.458		1.275 1.397	1.249 1.323	1.369 1.429	0.02673 0.02236	4.14% 3.23%	2.95% -4.13%

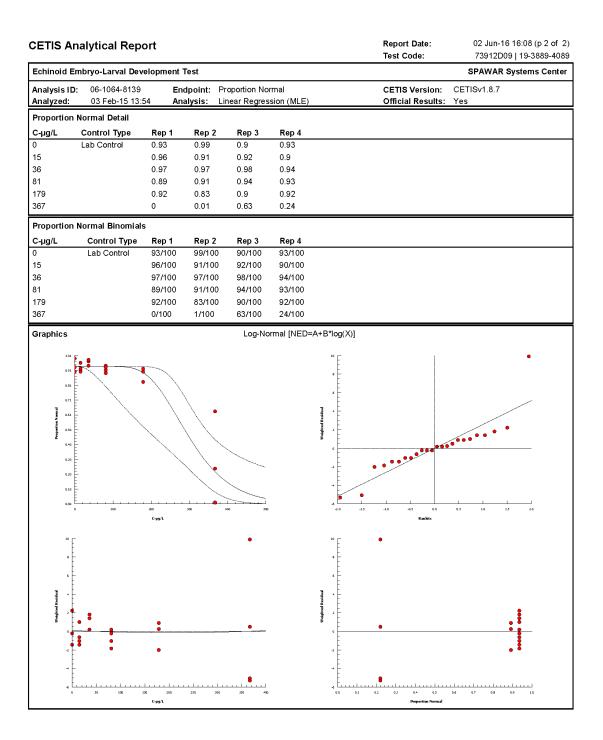
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CETIS Ana	alytical Repo	ort					Report Date: Test Code:	02 Jun-16 16:08 (p 2 of 2) 73912D09   19-3889-4089
Echinoid Em	bryo-Larval Dev	elopment	Test					SPAWAR Systems Center
Analysis ID: Analyzed:	02-9521-1706 03 Feb-15 13:5		•	roportion Nor onparametric		Treatments	CETIS Version: Official Results:	CETISv1.8.7 Yes
Proportion N	ormal Detail							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
0	Lab Control	0.93	0.99	0.9	0.93			
15		0.96	0.91	0.92	0.9			
36		0.97	0.97	0.98	0.94			
81		0.89	0.91	0.94	0.93			
179		0.92	0.83	0.9	0.92			
367		0	0.01	0.63	0.24			
Angular (Cor	rected) Transfor	med Detai	I					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
0	Lab Control	1.303	1.471	1.249	1.303			
15		1.369	1.266	1.284	1.249			
36		1.397	1.397	1.429	1.323			
81		1.233	1.266	1.323	1.303			
179		1.284	1.146	1.249	1.284			
367		0.05002	0.1002	0.9169	0.512			
Proportion N	ormal Binomials	;						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
0	Lab Control	93/100	99/100	90/100	93/100			
15		96/100	91/100	92/100	90/100			
36		97/100	97/100	98/100	94/100			
81		89/100	91/100	94/100	93/100			
179		92/100	83/100	90/100	92/100			
367		0/100	1/100	63/100	24/100			
Graphics								
	<b>.</b>		• 7	_		0.6		
			<b>Z</b>			0.5		
0.8						0.4		
T 0.7					-	a 0.3		/
Proposition Normal					a ter	- Jungle		
					5	0.1		••
						Ē		
0.4						0.0		·
0.3						-0.1	••	
0.2						-0.2		
0.1				4		-0.3		
Ē								
0.0	OLC IS	36	81 17	n 367		-0.4 -2.0 -1.5	-1.0 -0.5 0.0	05 10 15 20
		C-µg/L					Rankits	

CETIS™ v1.8.7.16

CETIS An	alytical Repo	ort						ort Date: Code:			08 (p 1 of 2 9-3889-408
Echinoid Er	nbryo-Larval Deve	lopment	Test						SPA	WAR Syst	ems Center
Analysis ID: Analyzed:	06-1064-8139 03 Feb-15 13:5		-	Proportion Norr Linear Regress				S Version: al Results	CETISv1 : Yes	.8.7	
Batch ID: Start Date: Ending Date Duration:	07-7568-4302 05 Nov-15 08:5 99 Nov-15 08:4 96h	0 Pro 5 Spo	tocol: ecies:	Development-S EPA/600/R-95/ Strongylocentro Field Collected	136 (1995) otus purpura	tus	Anal Dilue Brine Age:	ent: Lab e: Not	ob Munson- oratory Sea Applicable		
Sample ID: Sample Dat Receive Dat Sample Age		So	terial: urce:	ADF9D36 Copper sulfate Pulsed Exposu 3 Hour	re		Clier Proj		WAR sed Exposur	e	
•	ession Options										
Model Func Log-Normal	[NED=A+B*log(X)]			old Option	0.0625	Optimized Yes	No	Het Corr Yes	Weighted Yes	1	
Regression											
Iters LL	AICc	BIC 1468	Mu 2.471	<b>Sigma</b> 0.1296	Adj R2	F Stat 0.3041	Critical 3.16	P-Value 0.8220	Decision	(α:5%) ificant Lack	of Fit
		1100	2	0.1200	0.0120	0.0011	0.10	0.0220	Hon orgin	Liouni Euoi	l of the
Point Estim	L 95% LCL	95% UCL									
EC50 295		334.7									
Regression	Parameters										
Parameter	Estimate	Std Erro			t Stat	P-Value	Decision	, ,			
Threshold Slope	0.06437 7.715	0.01803 1.839	0.0268 3.89	7 0.1019 11.54	3.569 4.195	0.0018 0.0004	-	t Parameter			
Intercept	-19.07	4.635	-28.7	-9.426	4.195 -4.113	0.0004	-	t Parameter t Parameter			
ANOVA Tab	le										
Source	Sum Squa	ares Me	an Squar	e DF	F Stat	P-Value	Decision	(α:5%)			
Model	1083.259		3.259	1	125.4	< 0.0001	Significan				
Lack of Fit	8.749746		16582	3	0.3041	0.8220	Non-Signi				
Pure Error	172.6161	9.5	89781	18							
Residual	181.3658	8.6	36467	21							
Residual Ar	alysis										
Attribute	Method			Test Stat	Critical	P-Value	Decision	, ,			
Goodness-o				181.4	32.67	<0.0001	-	t Heterogen	-		
Extreme Val	Likelihood ue Grubbs Ex			200.5 3.525	32.67 2.802	<0.0001 0.0006		t Heterogen	ity		
Variances	Mod Lever				2.802	0.0323	Outlier De Unequal \				
Distribution	Shapiro-W			0.8215	0.9169	0.0007		al Distributi	on		
Biotinbucion	Anderson-		-		2.492	0.0002		al Distributi			
Proportion	Normal Summary				Calcu	ated Variat	e(A/B)				
C-µg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	в
0	Lab Control	4	0.9375	0.9	0.99	0.01887	0.03775	4.03%	0.0%	375	400
15		4	0.9225	0.9	0.96	0.01315	0.0263	2.85%	1.6%	369	400
36		4	0.965	0.94	0.98	0.00866	0.01732	1.8%	-2.93%	386	400
81		4	0.9175		0.94	0.01109	0.02217	2.42%	2.13%	367	400
179		4	0.8925	0.83	0.92	0.02136	0.04272	4.79%	4.8%	357	400
367		4	0.22	0	0.63	0.1475	0.295	134.1%	76.53%	88	400

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CETIS Sum	nmary Repo	rt						Report Date Test Code:	e:			07 (p 1 of 1) 1-2856-2468
Echinoid Emb	oryo-Larval Deve	lopme	nt Test							SPA	WAR Syste	ems Center
Batch ID: Start Date: Ending Date: Duration:	07-7568-4302 05 Nov-15 08:5 09 Nov-15 08:4 96h	0 5	Test Type: Protocol: Species: Source:	Development EPA/600/R-9 Strongylocen Field Collecte	5/136 (1995) trotus purpura	tus		Analyst: Diluent: Brine: Age:	Labo	b Munson-I ratory Seav Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:	11-1577-5855 05 Nov-15 08:5 NA	0	Code: Material: Source: Station:	4281636F Copper sulfat Pulsed Expos 6 Hour				Client: Project:	SPA\ Pulse	WAR ed Exposur	e	
Comparison S	Summary											
Analysis ID	Endpoint		NOEL		TOEL	PMSD	τu	Meth				
14-9395-5559	Proportion Norn	nal	36	81	54	6.96%		Dunn	ett Mu	ultiple Com	parison Te	st
Point Estimat	e Summary											
Analysis ID	Endpoint		Level	µg/L	95% LCL	95% UCL	тυ	Meth	od			
20-9663-9070	Proportion Norn	nal	EC50	223.8	215.5	232.4		Trimr	ned S	ipearman-k	lärber	
Proportion No	ormal Summary											
C-µg/L	Control Type	Coun	t Mean	95% LC	L 95% UCL	Min	Max	Std E	Frr	Std Dev	CV%	% Effect
0	Lab Control	4	0.937		0.9976	0.9	0.99			0.03775	4.03%	0.0%
15		4	0.897		0.9351	0.88	0.93			0.02363	2.63%	4.27%
36		4	0.91	0.865	0.955	0.89	0.95			0.02828	3.11%	2.93%
81		4	0.847		0.958	0.75	0.91			0.06946	8.2%	9.6%
179 367		4 4	0.822 0	5 0.7294 0	0.9156 0	0.76 0	0.89 0	0.029	920	0.05852 0	7.12%	12.27% 100.0%
Proportion No	ormal Detail											
C-μg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4							
0	Lab Control	0.93	0.99	0.9	0.93							
15		0.88	0.9	0.93	0.88							
36		0.91	0.89	0.95	0.89							
81		0.85	0.75	0.91	0.88							
179		0.79	0.85	0.76	0.89							
367		0	0	0	0							
Proportion No	ormal Binomials											
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4							
0	Lab Control	93/10	0 99/10	0 90/100	93/100							
15		88/10	0 90/10	0 93/100	88/100							
36		91/10			89/100							
81		85/10			88/100							
179		79/10			89/100							
367		0/43	0/60	0/70	0/74							

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							Repo Test	Code:			-2856-246
Echinoid Err	nbryo-Larval Dev	elopment	Test						SPAV	VAR Syste	ms Cente
Analysis ID: Analyzed:	14-9395-5559 03 Feb-15 13:5		•	Proportion Norr Parametric-Cor		iments		S Version: al Results	CETISv1. : Yes	.8.7	
Batch ID: Start Date: Ending Date Duration:	07-7568-4302 05 Nov-15 08:5 09 Nov-15 08:4 96h	50 Pr 15 Sp	otocol: pecies:	Development-S EPA/600/R-95/ Strongylocentro Field Collected	136 (1995)	tus	Anal Dilue Brin Age:	ent: Lab e: Not	ob Munson-E oratory Seav Applicable		
Sample ID: Sample Date Receive Date Sample Age:		50 Mi So	aterial: ource:	4281636F Copper sulfate Pulsed Exposu 6 Hour	re		Clier Proje		WAR sed Exposure	e	
Data Transfo	orm	Zeta	Alt Hy	•	Seed		PMSD	NOEL	LOEL	TOEL	TU
Angular (Corr	rected)	NA	C > T	NA	NA		6.96%	36	81	54	
Dunnett Mul	tiple Comparisor	n Test									
Control	vs C-µg/L		Test S	tat Critical	MSD DF	P-Value	P-Type	Decision	(α:5%)		
Lab Control	15 36 81* 179*		1.586 1.163 2.907 3.58	2.356 2.356 2.356 2.356	0.126 6 0.126 6 0.126 6 0.126 6	0.1797 0.3177 0.0177 0.0047	CDF CDF CDF CDF	-			
0ili			0.00	2.000	0.120 0	0.0011	001	orginitouri	C Enrost		
Auxiliary Tes											
Attribute Extreme Valu	Test	Extreme Va	-	2.07	Critical 2.708	P-Value 0.5866	Decision(	a:5%) s Detected			
			alue	2.07	2.700	0.5666		s Delecteu			
ANOVA Tabl	le										
Source	Sum Squ										
				Square	DF	F Stat	P-Value	Decision	. ,		
Between	0.0924973	33	0.0231	2433	4	F Stat 4.038	<b>P-Value</b> 0.0204	Decision Significan	. ,		
Error	0.0924973	33 93		2433	4 15				. ,		
Error Total	0.092497 0.085903 0.178401	33 93	0.0231	2433	4				. ,		
Error Total Distributiona	0.092497 0.085903 0.178401 al Tests	33 93	0.0231	2433 26929	4 15 19	4.038 -	0.0204	Significan	. ,		
Error Total Distributiona Attribute	0.092497 0.085903 0.178401 al Tests Test	33 93 3	0.0231 0.0057	2433 26929 Test Stat	4 15 19 Critical	4.038 	0.0204 Decision	Significan	. ,		
Error Total Distributiona Attribute Variances	0.0924973 0.0859033 0.1784013 al Tests Test Bartlett E	33 93 3 Equality of	0.0231 0.0057 Variance	2433 26929 Test Stat 2.597	4 15 19 <b>Critical</b> 13.28	4.038 	0.0204 Decision Equal Var	Significan (a:1%) iances	. ,		
Error Total <b>Distributiona</b> <b>Attribute</b> Variances Distribution	0.092497 0.0859033 0.178401 al Tests Test Bartlett E Shapiro-1	33 93 3 Equality of Wilk W No	0.0231 0.0057 Variance	2433 26929 Test Stat	4 15 19 Critical	4.038 	0.0204 Decision	Significan (a:1%) iances	. ,		
Error Total Distributiona Attribute Variances Distribution Proportion N	0.092497 0.085903 0.178401 al Tests Test Bartlett E Shapiro-1	33 93 3 Equality of Wilk W No	0.0231 0.0057 Variance rmality	2433 26929 <b>Test Stat</b> 2.597 0.9679	4 15 19 <b>Critical</b> 13.28 0.866	4.038 	0.0204 Decision Equal Var Normal Di	Significan (α:1%) iances stribution	t Effect	0)///	N/ Effect4
Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L	0.092497 0.085903 0.178401 al Tests Test Bartlett E Shapiro-1 Normal Summary Control Type	33 93 3 Guality of Wilk W No Count	0.0231 0.0057 Variance ormality Mean	2433 26929 Test Stat 2.597 0.9679 95% LCL	4 15 19 Critical 13.28 0.866 95% UCL	4.038 <b>P-Value</b> 0.6274 0.7103 Median	0.0204 Decision Equal Var Normal Di Min	Significan (a:1%) iances istribution Max	t Effect	CV%	%Effect
Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0	0.092497 0.085903 0.178401 al Tests Test Bartlett E Shapiro-1	33 93 3 Guality of Wilk W No Count 4	0.0231 0.0057 Variance ormality Mean 0.9375	2433 26929 Test Stat 2.597 0.9679 95% LCL 0.8774	4 15 19 <b>Critical</b> 13.28 0.866 <b>95% UCL</b> 0.9976	4.038 <b>P-Value</b> 0.6274 0.7103 <b>Median</b> 0.93	0.0204 Decision( Equal Var Normal Di Min 0.9	Significan	t Effect <u>Std Err</u> 0.01887	4.03%	0.0%
Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0 15	0.092497 0.085903 0.178401 al Tests Test Bartlett E Shapiro-1 Normal Summary Control Type	33 93 3 Guality of Wilk W No Count	0.0231 0.0057 Variance ormality Mean	2433 26929 Test Stat 2.597 0.9679 95% LCL 0.8774 0.8599	4 15 19 <b>Critical</b> 13.28 0.866 <b>95% UCL</b> 0.9976 0.9351	4.038 	0.0204 Decision Equal Var Normal Di Min	Significan (a:1%) iances istribution Max	Std Err           0.01887           0.01181	4.03% 2.63%	
Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0 15 36	0.092497 0.085903 0.178401 al Tests Test Bartlett E Shapiro-1 Normal Summary Control Type	33 33 3 Guuality of Wilk W No Count 4	0.0231 0.0057 Variance prmality <u>Mean</u> 0.9375 0.8975	2433 26929 Test Stat 2.597 0.9679 95% LCL 0.8774 0.8599 0.865	4 15 19 <b>Critical</b> 13.28 0.866 <b>95% UCL</b> 0.9976	4.038 <b>P-Value</b> 0.6274 0.7103 <b>Median</b> 0.93	0.0204 Decision( Equal Var Normal Di Min 0.9 0.88	Significan	t Effect <u>Std Err</u> 0.01887	4.03%	0.0% 4.27%
Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0 15 36 81	0.092497 0.085903 0.178401 al Tests Test Bartlett E Shapiro-1 Normal Summary Control Type	33 33 33 Equality of Wilk W No Count 4 4 4	0.0231 0.0057 Variance mraility Mean 0.9375 0.8975 0.91	2433 26929 Test Stat 2.597 0.9679 95% LCL 0.8774 0.8599 0.865 0.737	4 15 19 <b>Critical</b> 13.28 0.866 <b>95% UCL</b> 0.9976 0.9351 0.955	4.038 	0.0204 Decision( Equal Var Normal Di Min 0.9 0.88 0.89	Significan (a:1%) iances istribution Max 0.99 0.93 0.95	Std Err           0.01887           0.01181           0.01414	4.03% 2.63% 3.11%	0.0% 4.27% 2.93% 9.6%
Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0 15 36 81 179	0.092497 0.085903 0.178401 al Tests Test Bartlett E Shapiro-1 Normal Summary Control Type	33 33 3 Guality of Wilk W No Count 4 4 4 4	0.0231 0.0057 Variance xmality Mean 0.9375 0.8975 0.91 0.8475	2433 26929 Test Stat 2.597 0.9679 95% LCL 0.8774 0.8599 0.865 0.737	4 15 19 <b>Critical</b> 13.28 0.866 <b>95% UCL</b> 0.9976 0.9351 0.955 0.958	4.038 	0.0204  Decision( Equal Var Normal Di  0.9  0.88  0.89  0.75	Significan (a:1%) iances istribution Max 0.99 0.93 0.95 0.91	Std Err           0.01887           0.01181           0.01414           0.03473	4.03% 2.63% 3.11% 8.2%	0.0% 4.27% 2.93%
Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0 15 36 81 179 367	0.092497 0.085903 0.178401 al Tests Test Bartlett E Shapiro-1 Normal Summary Control Type	33 33 33 Aviik W Not Aviik W Not Count 4 4 4 4 4 4 4 4 4	0.0231 0.0057 Variance mality Mean 0.9375 0.8975 0.91 0.8475 0.8225 0	2433 26929 <b>Test Stat</b> 2.597 0.9679 <b>95% LCL</b> 0.8774 0.8599 0.865 0.737 0.7294	4 15 19 <b>Critical</b> 13.28 0.866 <b>95% UCL</b> 0.9976 0.9351 0.955 0.958 0.9156	4.038 	0.0204 Decision( Equal Var Normal Di 0.9 0.88 0.89 0.75 0.76	Significan (a:1%) iances stribution 0.99 0.93 0.95 0.91 0.89	Std Err           0.01887           0.0181           0.01414           0.03473           0.02926	4.03% 2.63% 3.11% 8.2%	0.0% 4.27% 2.93% 9.6% 12.27%
Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0 15 36 81 179 367 Angular (Cor	0.092497: 0.0859033 0.178401: al Tests Bartlett E Shapiro-1 Normal Summary Control Type Lab Control	33 33 33 Count 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	0.0231 0.0057 Variance mality Mean 0.9375 0.8975 0.91 0.8475 0.8225 0	2433 26929 <b>Test Stat</b> 2.597 0.9679 <b>95% LCL</b> 0.8774 0.8599 0.865 0.737 0.7294	4 15 19 <b>Critical</b> 13.28 0.866 <b>95% UCL</b> 0.9976 0.9351 0.955 0.958 0.9156	4.038 	0.0204 Decision( Equal Var Normal Di 0.9 0.88 0.89 0.75 0.76	Significan (a:1%) iances stribution 0.99 0.93 0.95 0.91 0.89	Std Err           0.01887           0.0181           0.01414           0.03473           0.02926	4.03% 2.63% 3.11% 8.2%	0.0% 4.27% 2.93% 9.6% 12.27%
Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0 15 36 81 179 367 Angular (Cor C-µg/L	0.092497 0.085903 0.178401 al Tests Test Bartlett E Shapiro-1 Normal Summary Control Type Lab Control	33 33 33 Aviik W Not Aviik W Not Count 4 4 4 4 4 4 4 4 4	0.0231 0.0057 Variance rmality Mean 0.9375 0.8975 0.91 0.8475 0.8225 0 mary	2433 26929 Test Stat 2.597 0.9679 95% LCL 0.8774 0.8599 0.865 0.737 0.7294 0	4 15 19 <b>Critical</b> 13.28 0.866 <b>95% UCL</b> 0.9976 0.9351 0.955 0.958 0.9156 0	4.038 	0.0204 Decision Equal Var Normal Di 0.9 0.88 0.89 0.75 0.76 0	Significan (a:1%) iances istribution Max 0.99 0.93 0.95 0.91 0.89 0	Std Err           0.01887           0.01181           0.01414           0.03473           0.02926           0	4.03% 2.63% 3.11% 8.2% 7.12%	0.0% 4.27% 2.93% 9.6% 12.27% 100.0%
Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0 15 36 81 179 367 Angular (Cor C-µg/L	0.092497 0.085903 0.178401 al Tests Bartlett E Shapiro-1 Normal Summary Control Type Lab Control rrected) Transfor Control Type	33 33 33 Count 4 4 4 4 4 4 4 4 4 4 4 4 4	0.0231 0.0057 Variance mality <u>Mean</u> 0.9375 0.8975 0.91 0.8475 0.8225 0 mary Mean	2433 26929 Test Stat 2.597 0.9679 95% LCL 0.8774 0.8799 0.865 0.737 0.7294 0 95% LCL	4 15 19 <b>Critical</b> 13.28 0.866 <b>95% UCL</b> 0.9976 0.9351 0.955 0.958 0.9156 0 95% UCL	4.038 	0.0204 Decision( Equal Var Normal Di 0.9 0.88 0.89 0.75 0.76 0 Min	Significan (a:1%) iances istribution 0.99 0.93 0.95 0.91 0.89 0 Max	Std Err           0.01887           0.01181           0.01414           0.03473           0.02926           0           Std Err	4.03% 2.63% 3.11% 8.2% 7.12%	0.0% 4.27% 2.93% 9.6% 12.27% 100.0%
Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0 15 36 81 179 367 Angular (Cor C-µg/L 0 15	0.092497 0.085903 0.178401 al Tests Bartlett E Shapiro-1 Normal Summary Control Type Lab Control rrected) Transfor Control Type	33 33 33 Count 4 4 4 4 4 4 4 4 4 4 4 4 4	0.0231 0.0057 Variance mality Mean 0.9375 0.89750 0.89750 0.89750 0.89750 0.99750000000000000	2433 26929 Test Stat 2.597 0.9679 95% LCL 0.8774 0.8599 0.865 0.737 0.7294 0 95% LCL 1.178	4 15 19 Critical 13.28 0.866 95% UCL 0.9976 0.9351 0.955 0.958 0.9156 0 95% UCL 1.485	4.038 	0.0204 Decision( Equal Var Normal Di 0.9 0.88 0.89 0.75 0.76 0 Min 1.249	Significan (a:1%) iances istribution Max 0.99 0.93 0.93 0.95 0.91 0.89 0 Max 1.471	Std Err           0.01887           0.01414           0.03473           0.02926           0           Std Err           0.04811	4.03% 2.63% 3.11% 8.2% 7.12% CV% 7.23%	0.0% 4.27% 2.93% 9.6% 12.27% 100.0%
Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0 15 36 81 179 367 Angular (Cor C-µg/L 0	0.092497 0.085903 0.178401 al Tests Bartlett E Shapiro-1 Normal Summary Control Type Lab Control rrected) Transfor Control Type	33 33 33 4 4 4 4 4 4 4 4 4 4 4 4 4	0.0231 0.0057 Variance xmality 0.9375 0.9375 0.9375 0.9375 0.9375 0.9375 0.925 0.91 0.8475 0.8225 0 mary Mean 1.331 1.247	2433 26929 Test Stat 2.597 0.9679 95% LCL 0.8774 0.8599 0.865 0.737 0.7294 0 95% LCL 1.178 1.182	4 15 19 Critical 13.28 0.866 95% UCL 0.9976 0.9351 0.955 0.958 0.9156 0 95% UCL 1.485 1.311	4.038 	0.0204 Decision( Equal Var Normal Di 0.9 0.88 0.75 0.76 0 Min 1.249 1.217	Significan (a:1%) iances istribution Max 0.99 0.93 0.95 0.91 0.95 0.91 0.95 0.91 0.95 0.91 1.471 1.303	Std Err           0.01887           0.01414           0.03473           0.02926           0           Std Err           0.04811           0.02028	4.03% 2.63% 3.11% 8.2% 7.12% <b>CV%</b> 7.23% 3.25%	0.0% 4.27% 2.93% 9.6% 12.27% 100.0% <b>%Effect</b> 0.0% 6.38%
Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0 15 36 81 179 367 Angular (Cor C-µg/L 0 15 36	0.092497 0.085903 0.178401 al Tests Bartlett E Shapiro-1 Normal Summary Control Type Lab Control rrected) Transfor Control Type	33 33 33 44 4 4 4 4 4 4 4 4 4 4 4 4	0.0231 0.0057 Variance rmality <u>Mean</u> 0.9375 0.8975 0.8975 0.8975 0.8255 0 mary <u>Mean</u> 1.331 1.247 1.269	2433 26929 <b>Test Stat</b> 2.597 0.9679 <b>95% LCL</b> 0.8774 0.8599 0.865 0.737 0.7294 0 <b>95% LCL</b> 1.178 1.182 1.185	4 15 19 Critical 13.28 0.866 95% UCL 0.9976 0.9351 0.955 0.958 0.9156 0 95% UCL 1.485 1.311 1.354	4.038 	0.0204 Decision( Equal Var Normal Di 0.9 0.88 0.89 0.75 0.76 0 Min 1.249 1.217 1.233	Significan (a:1%) iances stribution Max 0.99 0.93 0.95 0.91 0.95 0.91 0.89 0 Max 1.471 1.303 1.345	Std Err           0.01887           0.0181           0.01414           0.03473           0.02926           0           Std Err           0.04811           0.02028           0.02655	4.03% 2.63% 3.11% 8.2% 7.12% <b>CV%</b> 7.23% 3.25% 4.18%	0.0% 4.27% 2.93% 9.6% 12.27% 100.0% <b>%Effect</b> 0.0% 6.38% 4.67%

CETIS™ v1.8.7.16

CETIS Ana	alytical Repo	ort				Report Date: Test Code:	02 Jun-16 16:07 (p 2 of 2 43447F24   11-2856-2468
Echinoid Em	bryo-Larval Deve	elopmen	t Test				SPAWAR Systems Center
Analysis ID: Analyzed:	14-9395-5559 03 Feb-15 13:5		•	oportion Nori rametric-Cor	mal htrol ∨s Treatments	CETIS Version: Official Results:	CETISv1.8.7 Yes
Proportion N	ormal Detail						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
0	Lab Control	0.93	0.99	0.9	0.93		
15		0.88	0.9	0.93	0.88		
36		0.91	0.89	0.95	0.89		
81		0.85	0.75	0.91	0.88		
179		0.79	0.85	0.76	0.89		
367		0	0	0	0		
Angular (Cor	rected) Transfor	med Det	ail				
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
0	Lab Control	1.303	1.471	1.249	1.303		
15		1.217	1.249	1.303	1.217		
36		1.266	1.233	1.345	1.233		
81		1.173	1.047	1.266	1.217		
179		1.095	1.173	1.059	1.233		
367		0.0763	2 0.06459	0.0598	0.05816		
Proportion N	ormal Binomials						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
0	Lab Control	93/100	99/100	90/100	93/100		
15		88/100	90/100	93/100	88/100		
36		91/100	89/100	95/100	89/100		
81		85/100	75/100	91/100	88/100		
179		79/100	85/100	76/100	89/100		
367		0/43	0/60	0/70	0/74		
Graphics							
<sup>10</sup> E	<b>.</b>	-			0.16		•
				Reject Null	- 0.12		/
0.8					0.10		•_•
1 07					E		
Permon Northound					1 000 Constered		
Prepor					F		•
• 0.5 -					0.00	<b>64</b> 000	
0.4					-0.04	. • • • • • • •	
0.3					-0.06		
0.2					-0.08	•/•	
E					0.10		
0.1					-0.14		
0.0 E	olc is	36	81 179	387		-1.5 -1.0 -0.5 0.0	05 1.0 1.5 2.0

CETIS™ v1.8.7.16

CETIS A	nalytical Rep	ort						ort Date: Code:			:07 (p 1 of 2) I 1-2856-2468
Echinoid E	mbryo-Larval Dev	/elopment T	est						SPA	WAR Syst	ems Center
Analysis ID Analyzed:	D: 20-9663-9070 03 Feb-15 13:		•	Proportion Norn rimmed Spear		er		S Version: ial Results:	CETISv1 Yes	.8.7	
Batch ID: Start Date: Ending Dat Duration:	07-7568-4302 05 Nov-15 08: <b>te:</b> 09 Nov-15 08: 96h	50 <b>Pro</b> 45 <b>Sp</b> e	tocol: E ecies: S	Development-S PA/600/R-95/ Strongylocentro ield Collected	136 (1995)	atus	Anal Dilue Brine Age:	ent: Labo e: Not	ob Munson-Decker ooratory Seawater Applicable		
Sample ID: Sample Da Receive Da Sample Ag	ate: 05 Nov-15 08: ate:	Sou	erial: C urce: F	281636F Copper sulfate Pulsed Exposur Hour	re		Clier Proje		WAR ed Exposur	e	
Trimmed S Threshold Control Thr		Estimates Threshold	<b>Trim</b> 3.60%	Mu 2.35	<b>Sigma</b> 0.008201		EC50	95% LCL	95% UCL		
Residual A			0.0070	2.00	0.000201		220.0	210.0	101.7		
Attribute	Method			Test Stat	Critical	P-Value	Decision(	a:5%)			
Extreme Va		Extreme Valu	e	2.275	2.802	0.3939		s Detected			
Proportion	Normal Summary	/			Calc	ulated Varia	te(A/B)				
C-µg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	в
0	Lab Control	4	0.9375	0.9	0.99	0.01887	0.03775	4.03%	0.0%	375	400
15		4	0.8975	0.88	0.93	0.01181	0.02363	2.63%	4.27%	359	400
36 81		4 4	0.91 0.8475	0.89 0.75	0.95 0.91	0.01414 0.03473	0.02828 0.06946	3.11% 8.2%	2.93% 9.6%	364 339	400 400
179		4	0.8475	0.75	0.89	0.03473	0.05852	0.2% 7.12%	9.6% 12.27%	329	400
367		4	0	0.70	0	0	0	7.1270	100.0%	0	247
Proportion	Normal Detail										
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4						
0	Lab Control	0.93	0.99	0.9	0.93						
15		0.88	0.9	0.93	0.88						
36		0.91	0.89	0.95	0.89						
81		0.85	0.75	0.91	0.88						
179		0.79	0.85	0.76	0.89						
367		0	0	0	0						
Proportion	Normal Binomial	s									
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4						
0	Lab Control	93/100	99/100	90/100	93/100						
15		88/100	90/100	93/100	88/100						
36		91/100	89/100	95/100	89/100						
81		85/100	75/100	91/100	88/100						
179		79/100	85/100	76/100	89/100						
367		0/43	0/60	0/70	0/74						

CETIS™ v1.8.7.16

CETIS Ana	ETIS Analytical Report			Report Date: Test Code:	02 Jun-16 16:07 (p 2 of 2) 43447F24   11-2856-2468
Echinoid Em	Embryo-Larval Development Test SPAWAR Systems Center				
Analysis ID: Analyzed:	20-9663-9070 03 Feb-15 13:55	Endpoint: Analysis:	Proportion Normal Trimmed Spearman-Kärber	CETIS Version: Official Results:	CETISv1.8.7 Yes
Graphics					
00 LLI 0	50 100 150 C-pg	200 250	⊥ ↓ ↓ ↓ 300 330 400		

CETIS™ v1.8.7.16

CETIS Sum	nmary Repo	rt						Report Da Test Code				6 (p 1 of 1) -3575-5539
Echinoid Emb	oryo-Larval Deve	elopme	ent Test							SPA	WAR Syste	ms Center
Batch ID: Start Date: Ending Date: Duration:	07-7568-4302 05 Nov-15 08:5 09 Nov-15 08:4 96h		Test Type: Protocol: Species: Source:	EPA/600/R	e-95/136 (1995) entrotus purpu	,		Analyst: Diluent: Brine: Age:	Lab	bb Munson-I pratory Seav Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:	07-9168-0289 05 Nov-15 08:5 NA	0	Code: Material: Source: Station:	2F301521 Copper sul Pulsed Exp 12 Hour				Client: Project:		WAR ed Exposur	e	
Comparison S	Summary											
Analysis ID	Endpoint		NOEL			PMSD	τu		hod			
08-0336-4843	Proportion Norn	nal	81	179	120.4	4.65%		Dur	nett N	lultiple Com	parison Tes	t
Point Estimat	e Summary											
Analysis ID	Endpoint		Level	μg/L	95% LC	L 95% UCL	τu	Met	hod			
17-5820-2474	Proportion Norm	nal	EC50	114.3	106.4	122		Line	ear Re	gression (M	LE)	
Proportion No	ormal Summary											
C-µg/L	Control Type	Coun	nt Mean	95% I	LCL 95% UC	L Min	Max	std	Err	Std Dev	CV%	%Effect
0	Lab Control	4	0.937			0.9	0.99		1887	0.03775	4.03%	0.0%
15		4	0.935			0.91	0.96			0.0238	2.55%	0.27%
36		4	0.935			0.92	0.95		)6455	0.01291	1.38%	0.27%
81 179		4 4	0.912 0.005		3 0.9397 0.02091	0.89 0	0.93		08539	0.01708 0.01	1.87% 200.0%	2.67% 99.47%
367		4	0.005	0	0.02091	0	0.02	0.00	5	0	200.0%	100.0%
Proportion No	ormal Detail											
C-µg/L	Control Type	Rep 1	I Rep 2	Rep 3	Rep 4							
0	Lab Control	0.93	0.99	0.9	0.93							
15		0.95	0.96	0.91	0.92							
36		0.93	0.95	0.94	0.92							
81		0.93	0.92	0.91	0.89							
179		0	0.02	0	0							
367		0	0	0	0							
Proportion No	ormal Binomials											
C-µg/L	Control Type	Rep 1	-	Rep 3	Rep 4							
0	Lab Control	93/10	0 99/10	0 90/10	0 93/100							
15		95/10										
36		93/10										
81		93/10										
179		0/100										
367		0/100	0/100	0/100	0/100							

CETIS™ v1.8.7.16

CETIS An							Test	Coue.		3C6013   10	-3373-355
Echinoid Err	nbryo-Larval Dev	elopment	t Test							VAR Syste	
Analysis ID: Analyzed:	08-0336-4843 03 Feb-15 13:5		ndpoint: nalysis:	Proportion Nor Parametric-Co		tments		IS Version: cial Results		.8.7	
Batch ID: Start Date: Ending Date Duration:	07-7568-4302 05 Nov-15 08:5 9: 09 Nov-15 08:4 96h	50 P 15 S	est Type: rotocol: pecies: ource:	Development-S EPA/600/R-95/ Strongylocentro Field Collected	136 (1995) otus purpura	tus	Anal Dilu Brin Age:	ent: Lab e: Not	ob Munson-E poratory Seav Applicable		
Sample ID: Sample Date Receive Date Sample Age:		50 M S	ode: laterial: ource: tation:	2F301521 Copper sulfate Pulsed Exposu 12 Hour	re		Clier Proj		AWAR sed Exposure	e	
Data Transfo	orm	Zeta	Alt H		Seed		PMSD	NOEL	LOEL	TOEL	τu
Angular (Corr	rected)	NA	C > T	NA	NA		4.65%	81	179	120.4	
Dunnett Mul	ltiple Comparisor	n Test									
Control Lab Control	vs C-µg/L 15 36 81 179*		Test \$ 0.3882 0.4468 1.53 32.1	2 2.356	MSD         DF           0.092         6           0.092         6           0.092         6           0.092         6           0.092         6	<b>P-Value</b> 0.6529 0.6277 0.1952 <0.0001	P-Type CDF CDF CDF CDF CDF	Non-Sign	ificant Effect ificant Effect ificant Effect		
Auxiliary Tes	sts										
Attribute	Test			Test Stat	Critical	P-Value	Decision	(a:5%)			
Extreme Valu		- xtreme V	/oluo					()••)			
			alue	2.826	2.708	0.0275	Outlier De	etected			
	le		alue	2.826	2.708	0.0275	Outlier De	tected			
ANOVA Tabl									(a:5%)		
Source	Sum Squ		Mean	Square	DF	F Stat	P-Value	Decision	. ,		
Source Between	Sum Squ 4.890816	ares	<b>Mean</b> 1.222	Square	DF 4				. ,		
Source	Sum Squ	ares	<b>Mean</b> 1.222	Square	DF	F Stat	P-Value	Decision	. ,		
Source Between Error	Sum Squ 4.890816 0.0460983 4.936914	ares	<b>Mean</b> 1.222	Square	<b>DF</b> 4 15	F Stat	P-Value	Decision	. ,		
Source Between Error Total Distributiona	Sum Squ 4.890816 0.0460983 4.936914	ares	<b>Mean</b> 1.222	<b>Square</b> 704 073234	<b>DF</b> 4 15 19	<b>F Stat</b> 397.9	<b>P-Value</b> <0.0001	Decision Significar	. ,		
Source Between Error Total Distributiona Attribute	Sum Squ 4.890816 0.0460983 4.936914 al Tests Test	ares 51	<b>Mean</b> 1.222	Square	<b>DF</b> 4 15	F Stat	P-Value	Decision Significar (α:1%)	. ,		
Source Between Error Total Distributiona Attribute	Sum Squ 4.890816 0.046098 4.936914 al Tests Test Bartlett E	ares 51	Mean 1.222 0.003 Variance	Square 704 073234 Test Stat	DF 4 15 19 Critical	F Stat 397.9  P-Value	P-Value <0.0001 Decision	Decision Significar (α:1%) iances	. ,		
Source Between Error Total Distributiona Attribute Variances Distribution	Sum Squ 4.890816 0.046098 4.936914 al Tests Test Bartlett E	ares 51 Equality of Wilk W No	Mean 1.222 0.003 Variance	Square 704 073234 Test Stat 5.925	DF 4 15 19 Critical 13.28	<b>F Stat</b> 397.9 	P-Value <0.0001 Decision Equal Var	Decision Significar (α:1%) iances	. ,		
Source Between Error Total Distribution Attribute Variances Distribution Proportion N	Sum Squ 4.890816 0.046098 4.936914 al Tests Test Bartlett E Shapiro-1	ares 51 Equality of Wilk W No	Mean 1.222 0.003 Variance	Square 704 073234 Test Stat 5.925	DF 4 15 19 Critical 13.28 0.866	<b>F Stat</b> 397.9 	P-Value <0.0001 Decision Equal Var	Decision Significar (α:1%) iances	. ,	CV%	%Effect
Source Between Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L	Sum Squ           4.890816           0.046098           4.936914           al Tests           Test           Bartlett E           Shapiro-N	ares 51 quality of Wilk W No	Mean 1.222 0.0030	Square 704 073234 Test Stat 5.925 0.9148 95% LCL	DF 4 15 19 Critical 13.28 0.866	<b>F Stat</b> 397.9 	P-Value <0.0001 Decision Equal Var Normal D	Decision Significar (α:1%) iances istribution	nt Effect	<b>CV%</b> 4.03%	%Effect 0.0%
Source Between Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0	Sum Squ 4.890816 0.046098 4.936914 al Tests Test Bartlett E Shapiro-Y Normal Summary Control Type	ares 51 Equality of Wilk W No Count	Mean 1.222 0.0030	Square 704 073234 Test Stat 5.925 0.9148 95% LCL	DF 4 15 19 Critical 13.28 0.866 95% UCL	F Stat 397.9 - - - - - - - - - - - - - - - - - - -	P-Value <0.0001 Decisioni Equal Var Normal D Min	Decision Significar (a:1%) iances istribution Max	t Effect		
Source Between Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0 15	Sum Squ 4.890816 0.046098 4.936914 al Tests Test Bartlett E Shapiro-Y Normal Summary Control Type	ares 51 Guality of Wilk W No Count 4	Mean 1.222 0.003 Variance ormality Mean 0.937	Square 704 073234 Test Stat 5.925 0.9148 95% LCL 5 0.8774	DF 4 15 19 Critical 13.28 0.866 95% UCL 0.9976	F Stat 397.9 	P-Value <0.0001 Decision Equal Var Normal D Min 0.9	Decision Significar (a:1%) iances istribution <u>Max</u> 0.99	Std Err 0.01887	4.03%	0.0%
Source Between Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0 15 36	Sum Squ 4.890816 0.046098 4.936914 al Tests Test Bartlett E Shapiro-Y Normal Summary Control Type	ares 51 Gquality of Wilk W No Count 4	Mean 1.222 0.003 Variance ormality Mean 0.937 0.935	Square 704 073234 Test Stat 5.925 0.9148 95% LCL 5 0.8774 0.8971 0.9145	DF 4 15 19 Critical 13.28 0.866 95% UCL 0.9976 0.9729	F Stat 397.9 	P-Value <0.0001 Decision Equal Var Normal D Min 0.9 0.91	Decision Significar (a:1%) iances istribution Max 0.99 0.96	Std Err 0.01887 0.0119	4.03% 2.55%	0.0% 0.27%
Source Between Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0 15 36	Sum Squ 4.890816 0.046098 4.936914 al Tests Test Bartlett E Shapiro-Y Normal Summary Control Type	ares 51 Equality of Wilk W No Count 4 4 4	Mean 1.222 0.003 Variance ormality Mean 0.937 0.935 0.935	Square 704 073234 Test Stat 5.925 0.9148 95% LCL 5 0.8774 0.8971 0.9145	DF 4 15 19 Critical 13.28 0.866 95% UCL 0.9976 0.9729 0.9555	F Stat 397.9 - - 0.2048 0.2048 0.0788 Median 0.93 0.935 0.935	P-Value           <0.0001	Decision Significar (a:1%) iances istribution Max 0.99 0.96 0.95	Std Err           0.01887           0.0119           0.006455	4.03% 2.55% 1.38%	0.27% 0.27%
Source Between Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0 15 36 81 179	Sum Squ 4.890816 0.046098 4.936914 al Tests Test Bartlett E Shapiro-Y Normal Summary Control Type	ares 51 Guality of Wilk W No Count 4 4 4 4	Mean 1.222 0.003 Variance ormality Mean 0.937 0.935 0.935 0.935 0.912	Square 704 703234 Test Stat 5.925 0.9148 95% LCL 5 0.8774 0.8971 0.9145 5 0.8853	DF 4 15 19 Critical 13.28 0.866 95% UCL 0.9976 0.9729 0.9555 0.9397	F Stat 397.9 - - 0.2048 0.2048 0.0788 Median 0.93 0.935 0.935 0.935 0.915	P-Value <0.0001 Decision Equal Var Normal D Min 0.9 0.91 0.92 0.89		Std Err           0.01887           0.01455           0.008539	4.03% 2.55% 1.38% 1.87%	0.0% 0.27% 0.27% 2.67%
Source Between Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0 15 36 81 179 367	Sum Squ 4.890816 0.046098 4.936914 al Tests Test Bartlett E Shapiro-Y Normal Summary Control Type	ares 51 Guality of Wilk W No Count 4 4 4 4 4 4 4 4 4	Mean 1.222 0.003 Variance ormality Mean 0.937 0.935 0.935 0.912 0.005 0	Square 704 703234 Test Stat 5.925 0.9148 95% LCL 5 0.8774 0.8971 0.9145 5 0.8853 0	DF 4 15 19 Critical 13.28 0.866 95% UCL 0.9976 0.9729 0.9555 0.9397 0.02091	F Stat 397.9 	P-Value <0.0001 Equal Var Normal D Min 0.9 0.91 0.92 0.89 0	Decision           Significar           (α:1%)           iances           istribution           Max           0.99           0.99           0.95           0.95           0.93           0.92	Std Err           0.01887           0.0119           0.008539           0.005	4.03% 2.55% 1.38% 1.87%	0.0% 0.27% 0.27% 2.67% 99.47%
Source Between Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0 15 36 81 179 367	Sum Squ 4.890816 0.0460983 4.936914 al Tests Test Bartlett E Shapiro-1 Normal Summary Control Type Lab Control	ares 51 Guality of Wilk W No Count 4 4 4 4 4 4 4 4 4	Mean 1.222 0.003 Variance ormality Mean 0.937 0.935 0.935 0.912 0.005 0	Square 704 703234 Test Stat 5.925 0.9148 95% LCL 5 0.8774 0.8971 0.9145 5 0.8853 0	DF 4 15 19 Critical 13.28 0.866 95% UCL 0.9976 0.9729 0.9555 0.9397 0.02091	F Stat 397.9 	P-Value <0.0001 Equal Var Normal D Min 0.9 0.91 0.92 0.89 0	Decision           Significar           (α:1%)           iances           istribution           Max           0.99           0.99           0.95           0.95           0.93           0.92	Std Err           0.01887           0.0119           0.008539           0.005	4.03% 2.55% 1.38% 1.87%	0.0% 0.27% 0.27% 2.67% 99.47% 100.0%
Source Between Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0 15 36 81 179 367 Angular (Con C-µg/L	Sum Squ 4.890816 0.046098 4.936914 al Tests Test Bartlett E Shapiro-1 Normal Summary Control Type Lab Control	ares 51 Guality of Wilk W No Count 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Mean 1.222 0.003( Variance ormality Mean 0.935 0.935 0.935 0.912 0.005 0 nmary	Square 704 073234 Test Stat 5.925 0.9148 95% LCL 5 0.8774 0.8971 0.9145 5 0.8853 0 0	DF 4 15 19 Critical 13.28 0.866 95% UCL 0.9976 0.9729 0.9555 0.9397 0.02091 0	F Stat 397.9 	P-Value <0.0001 Decision Equal Var Normal D 0.9 0.91 0.92 0.89 0 0	Decision           Significar           (a:1%)           iances           istribution           0.99           0.96           0.95           0.93           0.02           0	Std Err           0.01887           0.0119           0.006455           0.008539           0.005           0	4.03% 2.55% 1.38% 1.87% 200.0%	0.0% 0.27% 0.27% 2.67% 99.47%
Source Between Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0 15 367 Angular (Con C-µg/L 0 15	Sum Squ 4.890816 0.0460983 4.936914 al Tests Test Bartlett E Shapiro-1 Normal Summary Control Type Lab Control	ares 51 51 Wilk W No Count 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Mean 1.222 0.003( <sup>7</sup> Variance ormality Mean 0.937 0.935	Square 704 703234 Test Stat 5.925 0.9148 95% LCL 5 0.8873 0.9145 5 0.8863 0 0 95% LCL 1.178 1.238	DF 4 15 19 Critical 13.28 0.866 95% UCL 0.9976 0.9729 0.9555 0.9397 0.02091 0 95% UCL 1.485 1.394	F Stat 397.9 	P-Value <0.0001 Equal Var Normal D 0.9 0.91 0.92 0.89 0 0 0 0 0 0 0 0 0 0 0	Decision Significar (α:1%) iances istribution Max 0.99 0.96 0.93 0.95 0.93 0.92 0.93 0.02 0 0 .93 0.72 0.93 0.72 0.93	Std Err           0.01887           0.01887           0.006455           0.008539           0.005           0           Std Err           0.04811           0.02454	4.03% 2.55% 1.38% 1.87% 200.0% CV% 7.23% 3.73%	0.0% 0.27% 0.27% 2.67% 99.47% 100.0% <b>%Effect</b> 0.0% 1.14%
Source Between Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0 15 36 81 179 367 Angular (Con C-µg/L 0	Sum Squ 4.890816 0.0460983 4.936914 al Tests Test Bartlett E Shapiro-1 Normal Summary Control Type Lab Control	ares 51 51 Count 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Mean 1.222 0.003 Variance ormality Mean 0.937 0.935 0.935 0.935 0.912 0.005 0 nmary Mean 1.331	Square 704 703234 Test Stat 5.925 0.9148 95% LCL 5 0.8873 0 0 0 95% LCL 1.178	DF 4 15 19 Critical 13.28 0.866 95% UCL 0.9976 0.9729 0.9555 0.9397 0.02091 0 95% UCL 1.485	F Stat 397.9 	P-Value <0.0001 Decision Equal Var Normal D Min 0.9 0.91 0.92 0.89 0 0 0 0 0 0 0 0 0	Decision           Significar           significar           (α:1%)           iances           istribution           Max           0.99           0.96           0.93           0.02           0           1.471           1.369           1.345	Std Err           0.01887           0.006455           0.008539           0.005           0           Std Err           0.04811	4.03% 2.55% 1.38% 1.87% 200.0%	0.0% 0.27% 0.27% 2.67% 99.47% 100.0%
Source Between Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0 15 36 81 179 367 Angular (Con C-µg/L 0 15 36 81 179 367 81 179 367 81 81 81 81 81 81 81 81 81 81 81 81 81	Sum Squ 4.890816 0.0460983 4.936914 al Tests Test Bartlett E Shapiro-1 Normal Summary Control Type Lab Control	ares 51 51 Count 4 4 4 4 4 4 4 4 4 4 4 4 4	Mean 1.222 0.003( <sup>7</sup> Variance ormality Mean 0.937 0.935	Square 704 073234 Test Stat 5.925 0.9148 95% LCL 5.0.8774 0.8971 0.9145 5.0.8853 0 0 95% LCL 1.178 1.238 1.272 1.224	DF 4 15 19 Critical 13.28 0.866 95% UCL 0.9976 0.9729 0.9555 0.9397 0.02091 0 95% UCL 1.485 1.394	F Stat 397.9 	P-Value <0.0001 Equal Var Normal D 0.9 0.91 0.92 0.89 0 0 0 0 Min 1.249 1.266 1.284 1.233	Decision           Significar           significar           (α:1%)           iances           istribution           Max           0.99           0.96           0.93           0.02           0           1.471           1.369           1.345	Std Err           0.01887           0.0119           0.006455           0.008539           0.005           0           Std Err           0.04811           0.02454           0.01318           0.01495	4.03% 2.55% 1.38% 1.87% 200.0% CV% 7.23% 3.73% 2.01% 2.35%	0.0% 0.27% 0.27% 2.67% 99.47% 100.0% <b>%Effect</b> 0.0% 1.14%
Source Between Error Total Distributiona Attribute Variances Distribution Proportion N C-µg/L 0 15 36 81 179 367 Angular (Con C-µg/L 0 15 36	Sum Squ 4.890816 0.0460983 4.936914 al Tests Test Bartlett E Shapiro-1 Normal Summary Control Type Lab Control	ares 51 51 Count 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Mean 1.222 0.003( Variance ormality Mean 0.937 0.935 0.935 0.912 0.005 0 0 mmary Mean 1.331	Square 704 703234 Test Stat 5.925 0.9148 95% LCL 5 0.8774 0.8971 0.9145 5 0.8853 0 0 95% LCL 1.178 1.228 1.272 1.224 99 -0.00011	DF 4 15 19 Critical 13.28 0.866 95% UCL 0.9976 0.9729 0.9555 0.9397 0.02091 0 0.2091 0 95% UCL 1.485 1.394 1.356	F Stat 397.9 	P-Value <0.0001 Equal Var Normal D 0.9 0.91 0.92 0.89 0 0 0 0 Min 1.249 1.266 1.284	Decision           Significar           significar           (α:1%)           iances           istribution           Max           0.99           0.96           0.93           0.02           0           1.471           1.369           1.345	Std Err           0.01887           0.0119           0.006455           0.005           0           Std Err           0.04811           0.02454           0.01318	4.03% 2.55% 1.38% 1.87% 200.0% CV% 7.23% 3.73% 2.01%	0.0% 0.27% 0.27% 2.67% 99.47% 100.0% <b>%Effect</b> 0.0% 1.14% 1.32%

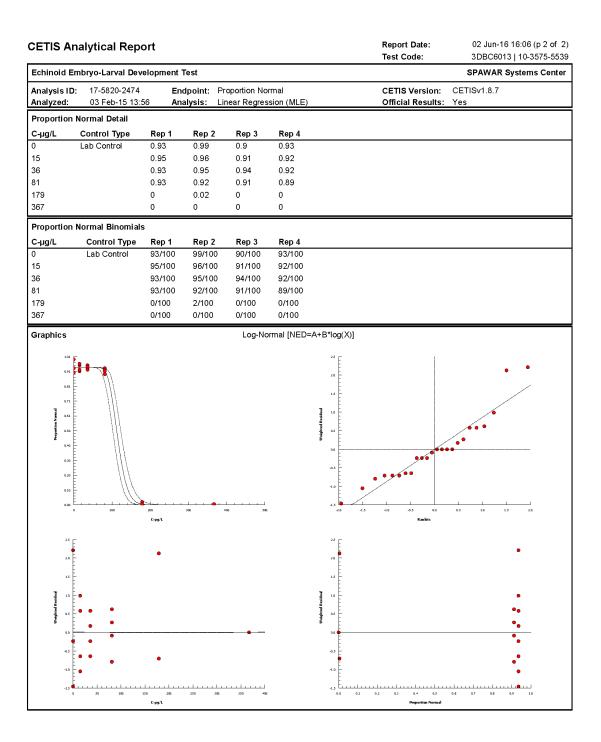
CETIS™ v1.8.7.16

CETIS Ana	alytical Repo	ort					Report Date: Test Code:	02 Jun-16 16:06 (p 2 of 2) 3DBC6013   10-3575-5539
Echinoid Em	bryo-Larval Deve	elopment T	est					SPAWAR Systems Center
Analysis ID: Analyzed:	08-0336-4843 03 Feb-15 13:5		•	portion Norr rametric-Cor	mal htrol vs Treatn	nents	CETIS Version: Official Results:	CETISv1.8.7 Yes
Proportion N	ormal Detail							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
0	Lab Control	0.93	0.99	0.9	0.93			
15		0.95	0.96	0.91	0.92			
36		0.93	0.95	0.94	0.92			
81		0.93	0.92	0.91	0.89			
179		0	0.02	0	0			
367		0	0	0	0			
Angular (Cor	rected) Transfor	med Detail						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
0	Lab Control	1.303	1.471	1.249	1.303			
15		1.345	1.369	1.266	1.284			
36		1.303	1.345	1.323	1.284			
81		1.303	1.284	1.266	1.233			
179		0.05002	0.1419	0.05002	0.05002			
367		0.05002	0.05002	0.05002	0.05002			
Proportion N	ormal Binomials							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
0	Lab Control	93/100	99/100	90/100	93/100			
15		95/100	96/100	91/100	92/100			
36		93/100	95/100	94/100	92/100			
81		93/100	92/100	91/100	89/100			
179		0/100	2/100	0/100	0/100			
367		0/100	0/100	0/100	0/100			
Graphics								
10 10 10 10 10 10 10 10 10 10		3	P1 12	Reported 20	– – Contrad Contrad			
		C-pg/L					Rankits	

CETIS™ v1.8.7.16

CETIS A	nalytical Re	oort					-	ort Date: Code:			)6 (p 1 of 2) )-3575-5539
Echinoid I	Embryo-Larval De	velopmen	nt Test						SPA	WAR Syste	ems Center
Analysis I Analyzed:	D: 17-5820-247 03 Feb-15 13		•	Proportion Nor Linear Regress				S Version: ial Results:	CETISv1 : Yes	.8.7	
Batch ID: Start Date Ending Da Duration:		3:50 F 3:45 S	Protocol: Species:	Development-5 EPA/600/R-95, Strongylocentr Field Collected	/136 (1995) otus purpurat	tus	Anal Dilue Brine Age:	nt: Lab	ob Munson- oratory Sea Applicable		
Sample ID Sample Da Receive D Sample Ag	ate: 05 Nov-15 08 ate:	3:50 N S	Aaterial: Source:	2F301521 Copper sulfate Pulsed Exposu 12 Hour			Clier Proje		WAR sed Exposur	e	
Model Fur				hold Option		Optimized		Het Corr	Weighted	I	
Log-Norma	al [NED=A+B*log()	0]	Contro	l Threshold	0.0625	Yes	No	No	Yes		
Iters L		BIC 844	Mu 2.058	Sigma 0.07629	Adj R2	F Stat	Critical	P-Value	Decision		
10 -2	17.2 841.6	844	2.058	0.07629	0.9899	-0.03479	3.16		Lack of FI	t Not Teste	
	mates g/L 95% LC 14.3 106.4	L 95% U	CL								
		122									
-	n Parameters										
Parameter			ror 95% L			P-Value	Decision(	,			
Threshold	0.06417				9.071	<0.0001	-	Parameter			
Slope Intercept	13.11 -26.98	1.097 2.299	10.96 -31.48	15.26 -22.47	11.95 -11.73	<0.0001 <0.0001	-	: Parameter : Parameter			
	ble						-				
Source	Sum Sc	waree N	/lean Squa	re DF	F Stat	P-Value	Desision	a.5%)			
Model	1935.07		935.078	1	2265	<0.0001	Decision( Significant				
Lack of Fit			0.03487	3	-0.03479	~0.0001	olginican	•			
Pure Error	18.0419		.002331	18	0.00 11 0						
Residual	17.9373	3 0	.854159	21							
Residual /	Analysis										
Attribute	Method			Test Stat	Critical	P-Value	Decision(	α:5%)			
Goodness-	of-Fit Pearsor	n Chi-Sq G	OF	17.94	32.67	0.6530	Non-Signi	ficant Heter	ogenity		
		od Ratio G	OF	19.73	32.67	0.5386	Non-Signi	ficant Heter	ogenity		
Extreme V		Extreme V		2.503	2.802	0.1753		s Detected			
Variances			lity of Variar		2.773	0.5952	Equal Var				
Distribution		-Wilk W No on-Darling A	ormality A2 Normalit	0.9097 v 0.8486	0.9169 2.492	0.0347 0.0289		al Distributio al Distributio			
Description		-		,							
	n Normal Summa	ry Count	Moon	Min	Max	ated Variat Std Err	e(A/B) Std Dev	CV%	%Effect	Δ	в
С-µg/L 0	Control Type Lab Control	4	Mean 0.9375		0.99	0.01887	0.03775	4.03%	0.0%	A 375	400
		4	0.935	0.91	0.95	0.0110	0.0238	4.03 % 2.55%	0.0%	373	400
			0.935	0.92	0.95	0.006455	0.01291	1.38%	0.27%	374	400
15 36		4	0.000								
15		4 4	0.9125		0.93	0.008539	0.01708	1.87%	2.67%	365	400
15 36					0.93 0.02	0.008539 0.005	0.01708 0.01	1.87% 200.0%	2.67% 99.47%	365 2	400 400

CETIS™ v1.8.7.16



CETIS™ v1.8.7.16

#### Embryo Larval Bioassay

#### 96-Hour Development

Project: Definitive Cu Pulse Exposure Tost Sample ID:

Test Species: S. purpuratus

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Test No.:

Start Date: Nov 9, 2019 0845

End Date: Nov 7, 2015 8:45Am

Sample ID	Number Counted	Number Normal	Technician Initials
36	100	63	Jm
37	100	94	JA
38	100	97	ANE
39	, ioo	98	JM
40	100	24	JW.
41	100	}	TAA .
42	100	96	Jrg
43	/00	97	Jul .
44	. 190	90	ME
45	100	99	ME
46	. \00	92	MI
47	\36	91	21
48	100	93 -	JM
49	100		J-X-T
50	100	JU 94 89	Jer
51	100	92	JM
52	100	90	ME
53	100	83	NE '
54	100	Ø	MC '
55	Jul 55 100	93	ME
56	100	91	JM
57	100	13	JM
59	100	92	ME
59	160	94	ANE
60	. 100	76	P-J.
C!	100	93	Jan
67.	100	88	JM
63	100	85	Juy
64	160	79	し し し し し し し し し し し し し し し し し し し
65	70	0	Fin
6C	100	25	TH
67	100	89	Jm
63	74	0	TEM
69	60	0	JA
70	100	75	Sm

### Embryo Larval Bioassay

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#### 96-Hour Development

Project:	DeRustive Cu Pulse Exposure Tash	Test Species:	S. purpuratus	
\_ample ID:_		Start Date:	Nov 5, 201	5 BILLSAM
Test No.:		End Date:	Nav 9, 2	ois 8:45 Ån

Random #	Number Counted	Number Nor <b>mal</b>	Technician Initials
71	2m 104- 100		- Th
72	100	88	Im
73	100	86	IM
74 .	100	89	Ju
75	100	79	. STAN
76	100	\$5	. JA
77	43	0	JAN
78	100	91	Jm
79	100	90	- ANT
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QC Check: <u>Im 6/1//6</u> Einal Deview: <u>UC 6/2/16</u> SPAWAR Systems Center Pacific Bioassay Lab, 53435 Circulte Rd, BCay 111 Rm 116, San Diego, CA 92152

### Embryo Larval Bioassay

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### 96-Hour Development

Project: <u>R</u>	11sed Experiment	Definitive Test Spesies:	S. purpuratus
	2 hour pulse		11/5/2015 0845
Test No.:	for the second se	End Date:	11/9/2015 0845

Random #	Number Counted	Number Namal Tumber Normal JQ	Technician Initials
80	100	Q	140
81	ΪΛΟ	0	126
82	100	91	NK
93	100	91	Arr
84	VÃO	92	MU
85	100	2	inter
86	100	96	NHA
81	- 10D	89	a.Htt
48	100	93	AG .
<u>\$</u> 9	100	10	NHÀ
90	100	81 93 0 0	Ktt
91	100	93	19-64
92	100	Ö	H.
93	10.6		1717
au	100	95 94	16FB
15	100	<u>م</u>	N. XLA
96	100	0 95	Kitt
97	1 60	92	1xtr
98	T TO	97	ATH.
90	100	92	- ARL
		···· ·································	
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	· · ·	and the second	
<del></del> .		· · · · · · · · · · · · · · · · · · ·	
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<u></u>			Particular and the second s

SPAWAR Systems Center Pacific Bioassay Lan, 101 Character and 111 Rm 116, San Diego, CA 92152

## 96 Mt **48-Hour Development**

NHUE Pulse Study roject: ℓ Sample ID: USO READX Test No.:

**Embryo Larval Bioassay** 

KH& S\_ purpuratos Test Species: <u>M. galloprovincialis</u>

Start Date: 11 /5/ 2015 0845

End Date: 11/9/2015 DR145

Random #	Number Counted	Number Normal	Technician Initials
1	100	93	Nott
2	100	91	17. K
3	100	NH# 82 97	NAT
4	100	82	NFA
5	100		NHA
6	100	89	hart
7	100	80	. M.
8	100	94	NACH
9	100	90	NA
10	100	92	NH
11	100	89	MA
12	100	90	NYH
13	100	93 94 NH 93	NA
14	100		NYA
15	100	94	NAHA
16	100	97	NAA
17	100	91	NACK
18	100	68	NH
19	100	70	NHA
20	100	91	NAM-
21	100	89	Nith
22	100	93	NH4
23	-106	84	NH
24	100	89	17,44
25	100	96 95	NAL
26	100	95	NE
27	100	77	NOF
28	100	68	NH
29	100	87	NAM
30	100	90	NB
31	100	96	1Ar
32	(00	96	NET
33	100	92	MA
34	100	94	North
35	(00	91	NA

#### SPAWAR Pulsed Exposure Definitive Study Echinoderm Development Tests Test Initiation Date: 10/28/2015 3 /t-hour exposure

Copper Concentration (µg/L)	Rand#
	48
h -h O - tral	45
Lab Control	52
	55
	54
15- 500	41 .
-15.5 500 Notet	36
patot	40
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	42
04.0	56
31.3	46
	. 49
	38
99 F	43
62.5	39
	37
	. 50
405	47
125	59
	57
· ·	58
050	53
250	44
	51

#### SPAWAR Pulsed Exposure Definitive Study Echinoderm Development Tests Test Initiation Date: 1<del>0/28/2015</del> MHH 11/5/2015 6-hour exposure

Copper Concentration (µg/L)	Rand#
- <u>16.6</u> htt 500	77 69
	65
500 -	68
	62
31.3	79
31,5	61
	· 73 ·
	71
62.5	64
02.0	66
	. 67
	76
125	70
125	78
in the second	. 72
1 <sup>2</sup>	75
250	63
	60
	74

#### SPAWAR Pulsed Exposure Definitive Study Echinoderm Development Tests K 5 Test Initiation Date: <del>10/28/2015</del> 1)/<del>15</del>/2015 12-hour exposure

Copper Concentration (µg/L)	Rand#	
1111-	81	
-15:5 500	95	• .
mo.o 300	80	
	92	
	93	
21.2	86	
31:3	. 82	
	84	
	88	10000
60 F	96	
62.5	94	
	97	
	91	
105	98	
125	83	
	87	
	90	
050	85	
250	89	
	99	

QC Check:

### SPAWAR Pulsed Exposure Definitive Study Echinoderm Development Tests Test Initiation Date: 10/28/2015

Copper Concentration (µg/L)	Rand#
	5
	30
Lab Control	25
	2
	35
	11
	22
5.8	14
,	31
	21
	8
8.4	1
0.4	13
	32 9
	26
	28 10
	6
12	15
	12
	3
	· 17
17.2	20
	29
	33
	. 7
	16
24	24
· · ·	23
	34
	19
	18
35	27
	4
	28
ac charly 11A	
QC Check:	

Water Quality Measurements 34 799 3.00 8.51 7.99 7.96 7.92 8:00 8:07 8.61 799 8.05 7. TL 5.00 22.4 203 65.4 7.62 9.8 8 72 7.99 2.93 8.00 7.98 799 8.00 pH (pH units) 48 085 120 8.10 794 193 8.10 7.93 8.10 7.94 8.10 7.94 24 \$-{D Start Date/Time: <u>…/{/~</u>/2*\_0*/~ Test Species: S. purpuratus (2015 NH AO Final Review: 0.1 <del>م</del>.0 9.0 ہ ج 1.0 9 End Date/Time:  $\frac{1}{\sqrt{\pi}}$ 8 Dissolved Oxygen M \$.5 2 8. B 8.6 8.8 9.0 л Ю 22 8.8 8.7 (mg/L) 60 00 60 8.7 8.8 8.6 8.8 60 48 24 9 8.6 8.6 5 8.9 8.7 8.9 14.9 8.9 б. 8 9.9 8.9 8. 0. ø <del>ر</del> ک 14.9 15.8 15.0 149 15-6 15.0 149 15.6 15.0 50 3 149 154 150 8 15.0 14.9 15.2 14.9 IS.H 72 149 6:7 0 Temperature **8** ŝ 96 Nautilus Environmen 14.8 2 341 32.2 34.4 15.4 14.8 32.2 34.4 15.4 49 14.8 15.4 14.8 34.) 32.8 34.2 15.4 14.8 22 12 it Б.4 15.4 o 32.9 34.2 33.7 33.7 34.2 34.4 33.2 34.2 96 24 Exposure Ohn 72 WQ Readings: MC Dilutions made by: MC 0 Salinity (ppt) 48 34.) 7 1 2 34 24 **33.8** 339 3.7 33.8 338 33.8 **33.7** 33.8 **33.**71 33 .€ **33.8** 33.8 338 33.9 Sample ID: 3. 6. Project: Pulaed Animal Source/Date Received: 72 hrs<del>.</del> Marine Chronic Bioassay 0 hrs: \_ 24 hrs: 48 hrs: o いとう Test No.: QC Check: Lab Control -500 500 Technician Initials: 500 Concentration me kung 3 3 3 Comments: 315 12hc lehr 12hr 3ý lohr

Part Led Expositue Shick for the formula       Temperature (pr)         Part Led Expositue Shick for the formula       Temperature (pr)         Part Led Expositue Shick for the formula       Temperature (pr)         Part Led Expositue Shick for the formula       Temperature (pr)         Part Led Expositue Shick for the formula       Temperature (pr)         Part Led Expositue Shick formula       Temperature (pr)         Part Part Part Part Part Part Part Part	Water Quality Measurements Test Species: <u>S. purpuratus</u> Start Date/Time: <u>ル/s / 20/5</u> ひるらら End Date/Time: <del>287 15 いの</del> ひをらう	Dissolved Oxygen	15.1     8.9     8.1     7.0     8.4     9.26     7.99     7       15.4     8.9     8.7     9.6     8.03     7.9     7       15.4     8.9     8.7     8.6     9.1     9.4     8.05     7       15.4     8.9     8.7     8.6     9.1     9.4     8.05     7       15.4     8.9     8.7     8.5     9.1     9.4     8.05     7       15.4     8.9     8.7     8.5     9.4     8.05     7       15.4     9.0     8.7     7.6     8.05     7	4 15.8 8.9 8.7 8.59.1 9.2 8.10 7.8	Final Review: <u></u>	
	Exposure Shiding	Salinity (ppt) 48 72 96 0 24	24.0 52.7 33.1 15.4 15.0 4.8 24.1 33.3 33.8 15.415.1 14.8 24.1 34.65.0 15.4 15.0 14.8 24.1 33.3 35.1 15.4 15.0 14.8 24.1 23.4 33.8 15.415.1 14.8 24.1 33.4 33.9 15.415.0 14.8	34.1 13.533.8 aadings: <u>w.c. W.c.</u> nade by: <u>w.cm W.c.</u> <i>Nauch ILus</i> 2	(V22 CZ2 WC	

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Embryo-Larval Development Test – SPAWNING CHECKLIST & CALCULATIONS

Batch ID: 11051550 Analyst: \_\_\_\_\_

Spawn/Test Date: <u>11/5/2015</u> Test Species: <u>Spurfuratus</u>

Task	Time
Spawning Inducement Initiated	0600
Spawning Begins	0601
Females/Males Isolated in Incubator	3 \$ 2 3
Fertilization Initiated	0615
Fertilzation Terminated/eggs rinsed	0635
Embryo Counts	0815
Embryo addition to vials	NLA830845

#### Embryo Counts:

 $\frac{1}{18} = \frac{1}{100} \frac{1}{10} \frac{1}{100} \frac{1}{10} \frac{1}{100} \frac{1}{10} \frac{1}{100} \frac{1}{10} \frac{1}{$ 

Adjust selected embryo stock to 2000 embryos/ml. Confirm density:

B Selected Stock : 51, 58, 54 Mean = 54 /20 uL \* 1000 uL/mL = 2710 cells/mL

Add 100  $\mu l$  of 2000 embryo/ml stock to obtain 20 embryos/ml in test vials.

Notes: stocks#1 good; # 2 - Some irregular shaped / low density. look Egg Sperm stocks estilization, decklod @ 0625: 41. ~80.90/. 2- 01. 3- 90% + @ 0630- 100 feitilized + " 063-100% a @ 2 cell 100% stage @ initiation Stock 1B division selected -Jooul

SPAWAR Systems Center Pacific Bioassay Lab, 53475 Strothe Rd, Bldg 111 Rm 116, San Diego, CA 92152

# A.2. COPPER EXPOSURES – MYSID SHRIMP:

CETIS Sum	nmary Repo	rt						Report Dat Test Code:				)4 (p 1 of 1) )-2405-4246
Americamysis	96-h Acute Sur	vival 1	est							SPAV	VAR Syste	ms Center
Batch ID: Start Date: Ending Date: Duration:	00-4319-0877 28 Oct-15 09:45 01 Nov-15 08:30 95h		Test Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-02- Americamysis Aquatic Resea	bahia	ns, NH		Analyst: Diluent: Brine: Age:	Lab	ob Munson-I oratory Seav Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:			Code: Material: Source: Station:	486F9CD1 Copper sulfate Pulsed Exposu 3 Hour	re			Client: SPAWAR Project: Pulsed Exposure				
Comparison S	Summary											
Analysis ID	Endpoint		NOEL		TOEL	PMSD	τu	Met				
17-9286-0157	96h Survival Ra	te	693	1390	981.5	50.0%		Dun	nett N	/lultiple Com	parison Tes	st
Point Estimate Analysis ID	e Summary Endpoint 96h Survival Ra	t	Level	μg/L 1475	95% LCL 967.6	95% UCL	TU	Met		Spearman-K		
		le	LCSU	1475	967.6	2240		1 mm	meu	Spearman-K	arber	
	Rate Summary											
С-µg/L 0	Control Type	Cour 4	nt Mean 0.9		95% UCL	Min	Max 1			0.1155	CV%	% Effect
177.5	Lab Control	4 4	0.9	0.7163 0.3453	1 0.9547	0.8 0.4	0.8	0.05		0.1155	12.83% 29.46%	0.0% 27.78%
355.1		4	0.05	0.4453	1	0.6	1	0.00		0.1915	25.53%	16.67%
693		4	0.75	0.3496	1	0.4	1	0.00		0.2517	33.55%	16.67%
1390		4	0.45	0	1	0	0.8	0.20	62	0.4123	91.62%	50.0%
2970		4	0.25	0	0.7274	0	0.6	0.15		0.3	120.0%	72.22%
96h Survival F	Rate Detail											
C-µg/L	Control Type	Rep '	I Rep 2	Rep 3	Rep 4							
0	Lab Control	0.8	1	1	0.8							
177.5		0.4	0.8	0.6	0.8							
355.1		0.6	1	0.6	0.8							
693		0.8	0.4	1	0.8							
1390		0.8	0	0.2	0.8							
2970		0	0	0.4	0.6							
96h Survival F	Rate Binomials											
C-µg/L	Control Type	Rep '			Rep 4							
0	Lab Control	4/5	5/5	5/5	4/5							
177.5		2/5	4/5	3/5	4/5							
355.1		3/5	5/5	3/5	4/5							
693		4/5	2/5	5/5	4/5							
1390		4/5	0/5	1/5	4/5							
2970		0/5	0/5	2/5	3/5							

000-010-187-1

CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_\_

- in a chai	ytical Repo								-	ort Date: Code:		6F09E6   00	4 (p 1 of 2 )-2405-424
Americamysis	96-h Acute Sur	vival To	est								SPA	WAR Syste	ms Cente
Analysis ID: Analyzed:	17-9286-0157 05 May-16 11:4		Endpoint: Analysis:		rvival Rate etric-Contr		reat	ments		S Versior ial Result		.8.7	
Start Date: Ending Date:	00-4319-0877 28 Oct-15 09:4 01 Nov-15 08:3 95h	5 0	Test Type: Protocol: Species: Source:	EPA/82 Americ	l (96h) 1/R-02-01 amysis ba Research	ahia		ıs, NH	Anal Dilue Brine Age:	ent: La e: No	cob Munson- boratory Sea ot Applicable		
Sample Date: Receive Date:	12-1527-4193 28 Oct-15 10h		Code: Material: Source: Station:	486F90 Copper Pulsed 3 Hour		1			Clier Proje		PAWAR Ilsed Exposur	re	
Data Transforn	n	Zeta	Alt H	yp Tr	ials	Seed			PMSD	NOEL	LOEL	TOEL	τυ
Angular (Correc	ted)	NA	C > T	NA	4	NA			50.0%	693	1390	981.5	
Dunnett Multip	le Comparison	Test											
Control	vs C-µg/L		Test	Stat Cr	itical	MSD	DF	P-Value	P-Type	Decisio	n(α:5%)		
Lab Control	177.5 355.1		1.374 0.834				6 6	0.2708 0.4964	CDF CDF	-	nificant Effect nificant Effect		
	693		0.810				6	0.5075	CDF	-	nificant Effect	t	
	1390* 2970*		2.455 3.537			0.491 0.491	6 6	0.0456 0.0050	CDF CDF	-	ant Effect ant Effect		
ANOVA Table	2010						-						
Source	Sum Squ	ares	Mean	Square		DF		F Stat	P-Value	Decisio	n(a:5%)		
Between	1.369727		0.273			5		3.299	0.0274		int Effect		
Error	1.494823		0.083	04574		18				0			
Total	2.86455					23							
Distributional	Tests												
Attribute	Test			Те	st Stat	Critica	1	P-Value	Decision(	α:1%)			
Variances	Bartlett E	quality of	of Variance	4.:	34	15.09		0.5016	Equal Vari	iances			
Distribution	Shapiro-V	Vilk W I	Vormality	0.5	9573	0.884		0.3861	Normal Di	stribution			
	ata Summaru												
96h Survival R	ale Summary												
	Control Type	Count	t Mean	95	% LCL	95% U	CL	Median	Min	Max	Std Err	CV%	%Effect
C-µg/L (	-	Count 4	t Mean 0.9			<b>95% U</b>	CL	Median 0.9	<b>Min</b> 0.8	Max 1	<b>Std Err</b> 0.05774	<b>CV%</b> 12.83%	%Effect 0.0%
C-µg/L (	Control Type			0.	7163		CL						
С-µg/L ( 0 I 177.5 355.1	Control Type	4 4 4	0.9 0.65 0.75	0. 0. 0.	7163 3453 4453	1 0.9547 1	CL	0.9 0.7 0.7	0.8 0.4 0.6	1 0.8 1	0.05774 0.09574 0.09574	12.83% 29.46% 25.53%	0.0% 27.78% 16.67%
С-µg/L ( 0 L 177.5 355.1 693	Control Type	4 4 4 4	0.9 0.65 0.75 0.75	0. 0. 0. 0.	7163 3453 4453 3496	1 0.9547 1 1	CL	0.9 0.7 0.7 0.8	0.8 0.4 0.6 0.4	1 0.8 1 1	0.05774 0.09574 0.09574 0.1258	12.83% 29.46% 25.53% 33.55%	0.0% 27.78% 16.67% 16.67%
С-µg/L ( 0 L 177.5 355.1 693 1390	Control Type	4 4 4 4 4	0.9 0.65 0.75 0.75 0.45	0. 0. 0. 0. 0.	7163 3453 4453 3496	1 0.9547 1 1 1	CL	0.9 0.7 0.7 0.8 0.5	0.8 0.4 0.6 0.4 0	1 0.8 1 1 0.8	0.05774 0.09574 0.09574 0.1258 0.2062	12.83% 29.46% 25.53% 33.55% 91.62%	0.0% 27.78% 16.67% 16.67% 50.0%
C-µg/L ( 0 L 177.5 355.1 693 1390 2970	Control Type	4 4 4 4 4 4	0.9 0.65 0.75 0.75 0.45 0.25	0. 0. 0. 0.	7163 3453 4453 3496	1 0.9547 1 1	CL	0.9 0.7 0.7 0.8	0.8 0.4 0.6 0.4	1 0.8 1 1	0.05774 0.09574 0.09574 0.1258	12.83% 29.46% 25.53% 33.55%	0.0% 27.78% 16.67% 16.67%
С-µg/L ( 0 L 177.5 355.1 693 1390 2970 Аngular (Согге	Control Type Lab Control	4 4 4 4 4 4 med Su	0.9 0.65 0.75 0.75 0.45 0.25	0. 0. 0. 0. 0	7163 3453 4453 3496	1 0.9547 1 1 1 0.7274		0.9 0.7 0.7 0.8 0.5 0.2	0.8 0.4 0.6 0.4 0 0	1 0.8 1 1 0.8 0.6	0.05774 0.09574 0.09574 0.1258 0.2062 0.15	12.83% 29.46% 25.53% 33.55% 91.62% 120.0%	0.0% 27.78% 16.67% 16.67% 50.0% 72.22%
С-µg/L ( 0 L 177.5 355.1 693 1390 2970 Angular (Corre С-µg/L (	Control Type Lab Control ected) Transfor Control Type	4 4 4 4 4 med Su	0.9 0.65 0.75 0.75 0.45 0.25 Immary t Mean	0. 0. 0. 0. 0 0 95	7163 3453 4453 3496 % LCL	1 0.9547 1 1 0.7274 <b>95% U</b> (		0.9 0.7 0.7 0.8 0.5 0.2 Median	0.8 0.4 0.6 0.4 0 0 Min	1 0.8 1 0.8 0.6 Max	0.05774 0.09574 0.09574 0.1258 0.2062 0.15 Std Err	12.83% 29.46% 25.53% 33.55% 91.62% 120.0%	0.0% 27.78% 16.67% 16.67% 50.0% 72.22%
С-µg/L ( 0 L 177.5 355.1 693 1390 2970 Angular (Согге С-µg/L ( 0 L	Control Type Lab Control	4 4 4 4 4 4 4 med Su Count 4	0.9 0.65 0.75 0.45 0.25 mmary t Mean 1.226	0. 0. 0. 0. 0. 0 0 0	7163 3453 4453 3496 % LCL	1 0.9547 1 1 0.7274 <b>95% U</b>		0.9 0.7 0.7 0.8 0.5 0.2 Median 1.226	0.8 0.4 0.6 0.4 0 0 0 <b>Min</b> 1.107	1 0.8 1 0.8 0.6 Max 1.345	0.05774 0.09574 0.1258 0.2062 0.15 <b>Std Err</b> 0.06874	12.83% 29.46% 25.53% 33.55% 91.62% 120.0% <b>CV%</b> 11.21%	0.0% 27.78% 16.67% 50.0% 72.22% %Effect 0.0%
С-µg/L ( 0 L 177.5 355.1 693 1390 2970 Angular (Согге С-µg/L ( 0 L 177.5	Control Type Lab Control ected) Transfor Control Type	4 4 4 4 4 4 med Su Count 4 4	0.9 0.65 0.75 0.45 0.25 mmary t Mean 1.226 0.946	0. 0 0 0. 0. 0 0 0 1. 3 0.	7163 3453 4453 3496 % LCL	1 0.9547 1 1 0.7274 95% U( 1.445 1.27		0.9 0.7 0.7 0.8 0.5 0.2 <b>Median</b> 1.226 0.9966	0.8 0.4 0.6 0.4 0 0 <b>Min</b> 1.107 0.6847	1 0.8 1 1 0.8 0.6 <b>Max</b> 1.345 1.107	0.05774 0.09574 0.1258 0.2062 0.15 <b>Std Err</b> 0.06874 0.1016	12.83% 29.46% 25.53% 33.55% 91.62% 120.0% <b>CV%</b> 11.21% 21.47%	0.0% 27.78% 16.67% 50.0% 72.22% %Effect 0.0% 22.83%
С-µg/L ( 0 [ 177.5 355.1 693 1390 2970 Алдиlar (Согге С-µg/L ( 0 [ 177.5 355.1	Control Type Lab Control ected) Transfor Control Type	4 4 4 4 4 4 <b>med Su</b> 4 4 4	0.9 0.65 0.75 0.45 0.25 <b>Immary</b> t Mean 1.226 0.946 1.056	0. 0. 0. 0. 0. 0. 0. 0. 3. 3. 3. 0. 0. 3. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	7163 3453 4453 3496 % LCL 2007 323 7075	1 0.9547 1 1 0.7274 95% U( 1.445 1.27 1.405		0.9 0.7 0.7 0.8 0.5 0.2 <b>Median</b> 1.226 0.9966 0.9966	0.8 0.4 0.6 0.4 0 0 0 <b>Min</b> 1.107 0.6847 0.8861	1 0.8 1 0.8 0.6 <b>Max</b> 1.345 1.107 1.345	0.05774 0.09574 0.1258 0.2062 0.15 <b>Std Err</b> 0.06874 0.1016 0.1096	12.83% 29.46% 25.53% 33.55% 91.62% 120.0% <b>CV%</b> 11.21% 21.47% 20.75%	0.0% 27.78% 16.67% 50.0% 72.22% %Effect 0.0% 22.83% 13.87%
С-µg/L ( 0 [ 177.5] 355.1 693 1390 2970 Алдиlar (Согге С-µg/L ( 0 [ 177.5]	Control Type Lab Control ected) Transfor Control Type	4 4 4 4 4 4 med Su Count 4 4	0.9 0.65 0.75 0.45 0.25 mmary t Mean 1.226 0.946	0. 0. 0. 0. 0. 0. 0. 0. 3. 0. 0. 0. 0. 0.	7163 3453 4453 3496 % LCL 007 523 7075 5237	1 0.9547 1 1 0.7274 95% U( 1.445 1.27		0.9 0.7 0.7 0.8 0.5 0.2 <b>Median</b> 1.226 0.9966	0.8 0.4 0.6 0.4 0 0 <b>Min</b> 1.107 0.6847	1 0.8 1 1 0.8 0.6 <b>Max</b> 1.345 1.107	0.05774 0.09574 0.1258 0.2062 0.15 <b>Std Err</b> 0.06874 0.1016	12.83% 29.46% 25.53% 33.55% 91.62% 120.0% <b>CV%</b> 11.21% 21.47%	0.0% 27.78% 16.67% 50.0% 72.22% %Effect 0.0% 22.83%

Analyst:\_\_\_\_\_ QA:\_\_\_\_

\_\_\_\_

CETIS Ana	alytical Repo	ort				Report Date: Test Code:	02 Jun-16 16:04 (p 2 of 2) 16F09E6   00-2405-4246
Americamysi	is 96-h Acute Sur	vival Te	st				SPAWAR Systems Center
Analysis ID: Analyzed:	17-9286-0157 05 May-16 11:4		Endpoint: 96 Analysis: Pa		ate ntrol vs Treatments	CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Survival							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
0 0	Lab Control	0.8	1	1	0.8		
177.5		0.4	0.8	0.6	0.8		
355.1		0.6	1	0.6	0.8		
693		0.8	0.4	1	0.8		
1390		0.8	0	0.2	0.8		
2970		0	0	0.4	0.6		
Angular (Cor	rected) Transforr	ned Def	ail				
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
0	Lab Control	1.107	1.345	1.345	1.107		
177.5		0.6847		0.8861	1.107		
355.1		0.8861		0.8861	1.107		
693		1.107	0.6847	1.345	1.107		
1390		1.107	0.2255	0.4636	1.107		
2970		0.2255	0.2255	0.6847	0.8861		
96h Survival	Rate Binomials						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
0	Lab Control	4/5	5/5	5/5	4/5		
177.5		2/5	4/5	3/5	4/5		
355.1		3/5	5/5	3/5	4/5		
693		4/5	2/5	5/5	4/5		
1390		4/5	0/5	1/5	4/5		
2970		0/5	0/5	2/5	3/5		
Graphics							
10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	•	22		Sign (M	4.4 4.1 4.1 4.1 4.4 4.4 4.4 4.4		••••••••••••••••••••••••••••••••••••••
00 E	0LC 177.5	355.1	693 1390	2970		-1.5 -1.0 -0.5 0.0	05 10 15 20
		C-µg/L				Rankits	

CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS A	nalytical Rep			ort Date: Code:	02 Jun-16 16:04 (p 1 of 2 16F09E6   00-2405-424							
Americam	ysis 96-h Acute Su	urvival Test							SPA	WAR Sys	tems Center	
Analysis I Analyzed:	D: 05-2018-4188 05 May-16 11		•	6h Survival F rimmed Spea		er	CETIS Version: CETISv1.8.7 Official Results: Yes					
Batch ID:	00-4319-0877	Tes	st Type: S	Survival (96h)			Analyst: Jacob Munson-Decker					
Start Date				PA/821/R-02		)	Dilue		oratory Sea	water		
	ate: 01 Nov-15 08:			mericamysis			Brine		Applicable			
Duration:	95h	50	urce: A	quatic Resea	arch Organis	sms, NH	Age:	5				
Sample ID				86F9CD1			Clier		WAR			
-	ate: 28 Oct-15			Copper sulfate			Proje	ect: Puls	ed Exposu	re		
Receive D Sample Ac				ulsed Expos	ure							
	-											
	Spearman-Kärber											
Threshold Control Th		Threshold 0.1	Trim 27.78%	Mu 3.169	Sigma		LC50 1475	95% LCL 967.6	95% UCL 2248			
Control In	resnold	0.1	21.10%	3.169	0.09154		1475	967.6	2240			
96h Surviv	val Rate Summary				Calc	ulated Varia	te(A/B)			-		
C-µg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	В	
0 177.5	Lab Control	4 4	0.9 0.65	0.8 0.4	1 0.8	0.05774 0.09574	0.1155 0.1915	12.83% 29.46%	0.0% 27.78%	18 13	20 20	
355.1		4	0.85	0.4	0.8 1	0.09574	0.1915	25.53%	27.78% 16.67%	15	20	
693		4	0.75	0.4	1	0.1258	0.2517	33.55%	16.67%	15	20	
1390		4	0.45	0	0.8	0.2062	0.4123	91.62%	50.0%	9	20	
2970		4	0.25	0	0.6	0.15	0.3	120.0%	72.22%	5	20	
96h Surviv	val Rate Detail											
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4							
0	Lab Control	0.8	1	1	0.8							
177.5		0.4	0.8	0.6	0.8							
355.1		0.6	1	0.6	0.8							
693		0.8	0.4	1	0.8							
1390		0.8	0	0.2	0.8							
2970		0	0	0.4	0.6							
96h Surviv	val Rate Binomials	;										
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4							
0	Lab Control	4/5	5/5	5/5	4/5							
177.5		2/5	4/5	3/5	4/5							
355.1		3/5	5/5	3/5	4/5							
693 1390		4/5 4/5	2/5 0/5	5/5 1/5	4/5 4/5							
2970		4/5 0/5	0/5	2/5	4/5 3/5							
2010		0/3	0/0	21 J	515							

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ana	alytical Report			Report Date: Test Code:	02 Jun-16 16:04 (p 2 of 2) 16F09E6   00-2405-4246
Americamysi	s 96-h Acute Surviva	l Test			SPAWAR Systems Center
Analysis ID: Analyzed:	05-2018-4188 05 May-16 11:48	Endpoint: Analysis:	96h Survival Rate Trimmed Spearman-Kärber	CETIS Version: Official Results:	CETISv1.8.7 Yes
Graphics	50 200 Crp/	1.500 2000	220 200		

CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_\_

CETIS Sum	nmary Repo	ort						Report Dat Test Code:				)4 (p 1 of 1) 3-6810-4609
Americamysis	s 96-h Acute Su	rvival 1	lest 🛛							SPA	WAR Syste	ms Center
Batch ID: Start Date: Ending Date: Duration:	00-4319-0877 28 Oct-15 09:4 01 Nov-15 08:3 95h		Test Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-02 Americamysis Aquatic Resea	bahia	ns, NH		Analyst: Diluent: Brine: Age:	Lab	ob Munson-l oratory Seav Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:	01-3892-7066 28 Oct-15 09:3 10m	5	Code: Material: Source: Station:	847DBDA Copper sulfate Pulsed Exposu 6 Hour				Client: SPAWAR Project: Pulsed Exposure				
Comparison S	Summary											
Analysis ID	Endpoint		NOEL	LOEL	TOEL	PMSD	τu	Meth	hod			
17-1319-0763	96h Survival Ra	ate	355.1	693	496.1	31.4%		Dunr	nett N	/lultiple Com	parison Tes	st
Point Estimat	e Summary											
Analysis ID	Endpoint		Level	µg/L	95% LCL	95% UCL	τυ	Meth	hod			
04-7838-3697	96h Survival Ra	ate	LC50	795.2	437.5	1202		Linea	ar Re	gression (M	LE)	
96h Survival F	Rate Summary											
C-µg/L	Control Type	Cour	nt Mean	95% LCL	95% UCL	Min	Max	Std	Err	Std Dev	CV%	%Effect
0	Lab Control	4	0.9	0.7163	1	0.8	1	0.05	774	0.1155	12.83%	0.0%
177.5		4	0.85	0.6909	1	0.8	1	0.05		0.1	11.76%	5.56%
355.1		4	0.65	0.2496	1	0.4	1	0.12		0.2517	38.72%	27.78%
693		4	0.55	0.1496	0.9504	0.2	0.8	0.12	58	0.2517	45.76%	38.89%
1390		4	0.25	0.09088	0.4091	0.2	0.4	0.05		0.1	40.0%	72.22%
2970		4	0.1	0	0.2837	0	0.2	0.05	774	0.1155	115.5%	88.89%
96h Survival F	Rate Detail											
C-µg/L	Control Type	Rep	1 Rep 2	2 Rep 3	Rep 4							
0	Lab Control	0.8	1	1	0.8							
177.5		0.8	1	0.8	0.8							
355.1		0.6	0.4	0.6	1							
693		0.6	0.8	0.6	0.2							
1390		0.2	0.2	0.4	0.2							
2970		0	0	0.2	0.2							
96h Survival I	Rate Binomials											
C-µg/L	Control Type	Rep	1 Rep 2	Rep 3	Rep 4							
0	Lab Control	4/5	5/5	5/5	4/5							
177.5		4/5	5/5	4/5	4/5							
355.1		3/5	2/5	3/5	5/5							
693		3/5	4/5	3/5	1/5							
1390		1/5	1/5	2/5	1/5							

Analyst:\_\_\_\_\_ QA:\_\_\_\_\_

CETIS Analytical Report									Report Date:         02 Jun-16 16:03           Test Code:         33BE39A1   08-6				
Americamysis	s 96-h Acute Su	rvival T	est							SPA	WAR Syste	ems Cente	
Analysis ID: Analyzed:	17-1319-0763 05 May-16 11:4		Endpoint: Analysis:		ival Rate ic-Control ve	; Trea	tments		IS Version		.8.7		
Batch ID: Start Date: Ending Date: Duration:	00-4319-0877 28 Oct-15 09:4 01 Nov-15 08:3 95h	5 60	Test Type: Protocol: Species: Source:	EPA/821 Americar	96h) /R-02-012 (2 nysis bahia Research Or		ns, NH	Anal Dilu Brin Age:	ent: Lat e: No	cob Munson- poratory Sea t Applicable			
Sample ID: Sample Date: Receive Date: Sample Age:	01-3892-7066 28 Oct-15 09:3 10m	5	Code: Material: Source: Station:	847DBD/ Copper s Pulsed E 6 Hour	ulfate			Clier Proj		AWAR Ised Exposur	re		
Data Transfor		Zeta NA	Alt H C>T	yp Tria NA	Is See NA	ł		PMSD	NOEL	<b>LOEL</b> 693	<b>TOEL</b> 496.1	TU	
Angular (Corre	,		621	NA	NA			31.4%	355.1	693	496.1		
Dunnett Multij	ple Comparisor	i Test											
Control	vs C-µg/L		Test				P-Value	P-Type	Decision	. ,			
Lab Control	177.5		0.444				0.6712	CDF	-	ificant Effect			
	355.1 2.06 693* 2.918		2.40			0.0940	CDF	-	ificant Effect	t			
							0.0182	CDF	Significa				
	1390* 2970*		5.286 6.589				0.0001 <0.0001	CDF CDF	Significa Significa				
	2970		0.508	2.40	0.32	2 0	<0.0001	CDF	Significal				
ANOVA Table				-				<b>_</b>					
Source	Sum Squ	ares		Square	DF		F Stat	P-Value	Decision				
Between Error	2.466622 0.6445779		0.493	3∠45 80988	5 18		13.78	<0.0001	Significa	nt Ellect			
Total	3.1112	<i>,</i>	0.000	00500	23		-						
					20								
Distributional				_									
Attribute	Test				t Stat Criti		P-Value	Decision					
Variances Distribution	Bartlett E Shapiro-\		of Variance	4.76 0.95		-	0.4453 0.2832	Equal Var Normal D					
			Normality	0.90	0.00	4	0.2032	Normai D	ISTIDUTION				
96h Survival F	-	_											
	Control Type	Coun				UCL	Median	Min	Max	Std Err	CV%	%Effect	
0 177.5	Lab Control	4 4	0.9 0.85	0.71 0.69			0.9 0.8	0.8 0.8	1 1	0.05774 0.05	12.83% 11.76%	0.0% 5.56%	
355.1		4	0.65	0.8			0.6	0.8	1	0.05	38.72%	27.78%	
693		4	0.05	0.2-		04	0.6	0.4	0.8	0.1258	45.76%	38.89%	
1390		4	0.25	0.09			0.2	0.2	0.4	0.05	40.0%	72.22%	
2970		4	0.1	0	0.28		0.1	0	0.2	0.05774	115.5%	88.89%	
Angular (Corr	ected) Transfor	med Su	ımmary										
C-µg/L	Control Type	Coun	t Mean	95%	LCL 95%	UCL	Median	Min	Max	Std Err	CV%	%Effect	
0	Lab Control	4	1.226	1.00	7 1.44	5	1.226	1.107	1.345	0.06874	11.21%	0.0%	
		4	1.167		72 1.35		1.107	1.107	1.345	0.05953	10.21%	4.86%	
177.5													
355.1		4	0.950				0.8861	0.6847	1.345	0.1399	29.43%		
355.1 693		4	0.835	7 0.40	76 1.26	4	0.8861	0.4636	1.107	0.1345	32.19%	22.48% 31.84%	
				7 0.40 9 0.34	76 1.26 3 0.69	4 48							

Analyst:\_\_\_\_\_ QA:\_\_\_\_

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CETIS Ana	alytical Repo	ort					Report Date: Test Code:	02 Jun-16 16:03 (p 2 of 2) 33BE39A1   08-6810-4609
Americamysi	is 96-h Acute Su	rvival Te	st					SPAWAR Systems Center
Analysis ID: Analyzed:	17-1319-0763 05 May-16 11:4		ndpoint: 96 nalysis: Pa		ate ontrol∨s Treat	iments	CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Survival	Rate Detail							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
0	Lab Control	0.8	1	1	0.8			
177.5		0.8	1	0.8	0.8			
355.1		0.6	0.4	0.6	1			
693		0.6	0.8	0.6	0.2			
1390		0.2	0.2	0.4	0.2			
2970		0	0	0.2	0.2			
Angular (Cor	rected) Transfor	med Det	ail					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
0	Lab Control	1.107	1.345	1.345	1.107			
177.5		1.107	1.345	1.107	1.107			
355.1		0.8861	0.6847	0.8861	1.345			
693		0.8861	1.107	0.8861	0.4636			
1390		0.4636	0.4636	0.6847	0.4636			
2970		0.2255	0.2255	0.4636	0.4636			
96h Survival	Rate Binomials							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
0	Lab Control	4/5	5/5	5/5	4/5			
177.5		4/5	5/5	4/5	4/5			
355.1		3/5	2/5	3/5	5/5			
693		3/5	4/5	3/5	1/5			
1390		1/5	1/5	2/5	1/5			
2970		0/5	0/5	1/5	1/5			
Graphics								
10 13 14 15 16 16 16 16 17 16 16 16 16 16 16 16 16	• • • • • • • • • • • • • • • • • • •	25.1 Cr9/L	60 120			0.0	• • • • • • • • • • • • • • • • • • •	

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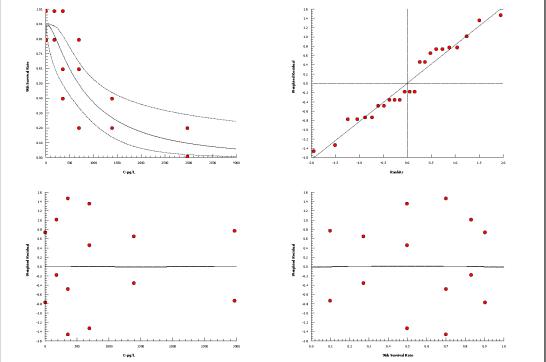
CETIS Ana	lytical Repo	ort						ort Date: t Code:		Jun-16 16:0 3E39A1   08	
Americamysis	96-h Acute Sur	vival Test							SPA	WAR Syste	ms Center
Analysis ID: Analyzed:	04-7838-3697 05 May-16 11:4			h Survival Ra lear Regress				FIS Version: cial Results:	CETISv1 Yes	.8.7	
Batch ID: Start Date: Ending Date: Duration:	00-4319-0877 28 Oct-15 09:45 01 Nov-15 08:30 95h	5 Prot	ocol: EP cies: Am	rvival (96h) PA/821/R-02- nericamysis l uatic Resear	bahia	ns, NH		ient: Labo ne: Not	b Munson- oratory Sea Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:	01-3892-7066 28 Oct-15 09:35 10m	Code Mate Sou Stati	erial: Co rce: Pu	7DBDA pper sulfate Ised Exposu Iour	re		Clie Pro		WAR ed Exposu	e	
Linear Regres	•		Threshol	d Option	Threshold	Optimized	Pooled	Het Corr	Weighted	1	
	ED=A+B*log(X)]		Control T		0.1	Yes	No	No	Yes		
Regression S	ummary										
Iters LL 6 -59.6	AICc 9 126.6	BIC 128.9	<b>Mu</b> 2.9	<b>Sigma</b> 0.4634	Adj R2 0.6797	F Stat 0.3356	Critical 3.16	<b>P-Value</b> 0.7998	Decision Non-Sign	(α:5%) ificant Lack	of Fit
Point Estimat	es										
Level μg/L LC50 795.2	95% LCL	95% UCL 1202									
Regression P	arameters										
Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decisior	n(α:5%)			
Threshold	0.09733	0.06288	-0.02592	0.2206	1.548	0.1366	Non-Sigr	nificant Param	neter		
Slope	2.158	0.5219	1.135	3.181	4.135	0.0005	-	nt Parameter			
Intercept	-6.259	1.547	-9.291	-3.228	-4.047	0.0006	Significa	nt Parameter			
ANOVA Table											
Source	Sum Squa		n Square	DF	F Stat	P-Value	Decision				
Model Lack of Fit	36.8787 0.807386	36.8 0.26		1 3	50.81 0.3356	<0.0001 0.7998	Significa Non-Sigr				
Pure Error	14.43512	0.80		18	0.0000	0.7000	Non eigi	mount			
Residual	15.24251	0.72	5834	21							
Residual Anal	ysis										
Attribute	Method			Test Stat	Critical	P-Value	Decisior	n(α:5%)			
Goodness-of-F				15.24	32.67	0.8106	-	ificant Heter			
Variances	Likelihood Bartlett Eq	Ratio GOF uality of Var	iance	18.95 2.92	32.67 11.07	0.5881 0.7124	Non-Sigr Equal Va	nificant Hetero riances	ogenity		
		ne Equality of			2.773	0.6974	Equal Va				
Distribution		ilk W Norm	-	0.9506	0.9169	0.2790		Distribution			
		Darling A2 N	vormality	0.6136	2.492	0.1114		Distribution			
	Rate Summary					ated Variat					_
	control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0 L 177.5	ab Control	4 4	0.9 0.85	0.8 0.8	1 1	0.05774 0.05	0.1155 0.1	12.83% 11.76%	0.0% 5.56%	18 17	20 20
355.1		4	0.65	0.4	1	0.03	0.2517	38.72%	27.78%	13	20
693		4	0.55	0.2	0.8	0.1258	0.2517	45.76%	38.89%	11	20
1390		4	0.25	0.2	0.4	0.05	0.1	40.0%	72.22%	5	20
2970		4	0.1	0	0.2	0.05774	0.1155	115.5%	88.89%	2	20

CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

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CETIS AI	nalytical Rep	ort				Report Date: Test Code:	02 Jun-16 16:04 (p 2 of 2) 33BE39A1   08-6810-4609
Americamy	sis 96-h Acute Su	ırvival Tes	t				SPAWAR Systems Center
Analysis ID Analyzed:	: 04-7838-3697 05 May-16 11:		idpoint: 96 ialysis: Li	6h Survival F near Regres		CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Surviv	al Rate Detail						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
0	Lab Control	0.8	1	1	0.8		
177.5		0.8	1	0.8	0.8		
355.1		0.6	0.4	0.6	1		
693		0.6	0.8	0.6	0.2		
1390		0.2	0.2	0.4	0.2		
2970		0	0	0.2	0.2		
96h Surviv	al Rate Binomials						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
0	Lab Control	4/5	5/5	5/5	4/5		
177.5		4/5	5/5	4/5	4/5		
355.1		3/5	2/5	3/5	5/5		
693		3/5	4/5	3/5	1/5		
1390		1/5	1/5	2/5	1/5		
2970		0/5	0/5	1/5	1/5		
Graphics				Log-No	ormal [NED=A+B*log	(X)]	
1.01					16 1	- I	



CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Sum	nmary Repo	rt						Report Date: Test Code:		Jun-16 16:0 54A57A   19	
Americamysis	s 96-h Acute Sur	vival T	est						SPA	WAR Syste	ms Center
Batch ID: Start Date: Ending Date: Duration:	00-4319-0877 28 Oct-15 09:4 01 Nov-15 08:3 95h		Test Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-0 Americamysis Aquatic Rese	2-012 (2002) s bahia	ns, NH		Diluent: Brine:	Jacob Munson Laboratory Sea Not Applicable 5		
Sample ID: Sample Date: Receive Date: Sample Age:	20-6715-8179 28 Oct-15 09:3 10m	5	Code: Material: Source: Station:	7B3654A3 Copper sulfat Pulsed Expos 12 Hour					SPAWAR Pulsed Exposu	re	
Comparison S	Summary										
Analysis ID	Endpoint		NOEL		TOEL	PMSD	ΤU	Metho			
11-7286-9114	96h Survival Ra	ate	<177.	5 177.5	NA	24.5%		Dunne	tt Multiple Con	nparison Tes	st
Point Estimat	e Summary										
Analysis ID	Endpoint		Level	µg/L	95% LCL	95% UCL	ΤU	Metho	d		
13-0468-2566	96h Survival Ra	ate	LC50	239.6	103.9	367.4		Linear	Regression (M	1LE)	
96h Survival I	Rate Summary										
C-µg/L	Control Type	Coun	it Mean	95% LC	L 95% UCL	Min	Max	Std Er	r Std Dev	CV%	%Effect
0	Lab Control	4	0.9	0.7163	1	0.8	1	0.0577	74 0.1155	12.83%	0.0%
177.5		4	0.65	0.4909	0.8091	0.6	0.8	0.05	0.1	15.38%	27.78%
355.1		4	0.2	0	0.4598	0	0.4	0.0816		81.65%	77.78%
693		4	0.2	0	0.4598	0	0.4	0.0816		81.65%	77.78%
1390		4	0	0	0	0	0	0	0		100.0%
2970		4	0.05	0	0.2091	0	0.2	0.05	0.1	200.0%	94.44%
96h Survival I	Rate Detail										
C-µg/L	Control Type	Rep 1			Rep 4						
0	Lab Control	0.8	1	1	0.8						
177.5		0.8	0.6	0.6	0.6						
355.1		0.4	0	0.2	0.2						
693		0	0.2	0.4	0.2						
1390		0	0	0	0						
2970		0	0	0.2	0						
96h Survival F	Rate Binomials										
C-µg/L	Control Type	Rep 1			Rep 4						
0	Lab Control	4/5	5/5	5/5	4/5						
177.5		4/5	3/5	3/5	3/5						
355.1		2/5	0/5	1/5	1/5						
693		0/5	1/5	2/5	1/5						
1390		0/5	0/5	0/5	0/5						
1550			0,0	0.5	0/5						

Analyst:\_\_\_\_\_ QA:\_\_\_\_\_

CE IIS ANA	lytical Repo	ort					-	ort Date: Code:			3 (p 1 of 2) ⊩5170-4442
Americamysi	s 96-h Acute Su	rvival Te	est						SPA	WAR Syste	ms Center
Analysis ID: Analyzed:	11-7286-9114 05 May-16 11:4		Endpoint: Analysis:	96h Survival Ra Parametric-Cor		tments		IS Version: ial Results	CETISv1 : Yes	.8.7	
Batch ID: Start Date: Ending Date: Duration:	00-4319-0877 28 Oct-15 09:4 01 Nov-15 08:3 95h	5 I 80 8	Test Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-02- Americamysis Aquatic Resea	bahia	ns, NH	Anal Dilu Brin Age:	ent: Lab e: Not	ob Munson-l oratory Seav Applicable		
Sample ID: Sample Date: Receive Date Sample Age:	20-6715-8179 28 Oct-15 09:3 : 10m	5 I	Code: Material: Source: Station:	7B3654A3 Copper sulfate Pulsed Exposu 12 Hour	re		Clier Proj		WAR sed Exposur	e	
Data Transfor Angular (Corre		Zeta NA	Alt H C > T	yp Trials NA	Seed NA		PMSD 24.5%	NOEL <177.5	LOEL 177.5	TOEL NA	TU
					10.		21.070				
Control	ple Comparisor vs C-µg/L	1 lest	Test \$	Stat Critical	MSD DF	P-Value	P-Type	Decision	(α:5%)		
Lab Control	177.5* 355.1* 693*		2.53 6.809 6.809	2.287 2.287 2.287	0.258 6 0.258 6 0.258 6	0.0328 <0.0001 <0.0001	CDF CDF CDF	Significar Significar Significar	t Effect		
ANOVA Table											
Source	Sum Squ	ares	Mean	Square	DF	F Stat	P-Value	Decision	(α:5%)		
Between	1.721797		0.573	9322	3	22.63	<0.0001	Significar	t Effect		
Error	0.3043779	Ð	0.025	36483	12	_					
Total	2.026175				15						
Distributional	Tests										
Attribute	Test			Test Stat	Critical	P-Value	Decision				
Variances			of Variance	0.977	11.34	0.8068	Equal Var				
Distribution	Shapiro-\ Rate Summary		ormanty	0.944	0.8408	0.4009	Normal D	stribution			
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0			0.0			0.9	0.8	1	0.05774		0.0%
	Lab Control	4	0.9	0.7163	1	0.0				12.83%	0.070
0 177.5	Lab Control	4 4	0.9 0.65	0.7163 0.4909	1 0.8091	0.6	0.6	0.8	0.05	12.83% 15.38%	0.0% 27.78%
-	Lab Control							0.8 0.4	0.05 0.08165		
177.5 355.1 693	Lab Control	4 4 4	0.65 0.2 0.2	0.4909 0 0	0.8091 0.4598 0.4598	0.6 0.2 0.2	0.6 0 0	0.4 0.4	0.08165 0.08165	15.38%	27.78% 77.78% 77.78%
177.5 355.1 693 1390	Lab Control	4 4 4 4	0.65 0.2 0.2 0	0.4909 0 0 0	0.8091 0.4598 0.4598 0	0.6 0.2 0.2 0	0.6 0 0 0	0.4 0.4 0	0.08165 0.08165 0	15.38% 81.65% 81.65%	27.78% 77.78% 77.78% 100.0%
177.5 355.1 693 1390 2970		4 4 4 4 4	0.65 0.2 0.2 0 0.05	0.4909 0 0	0.8091 0.4598 0.4598	0.6 0.2 0.2	0.6 0 0	0.4 0.4	0.08165 0.08165	15.38% 81.65%	27.78% 77.78% 77.78%
177.5 355.1 693 1390 2970 Angular (Corr	ected) Transfor	4 4 4 4 4 med Su	0.65 0.2 0.2 0 0.05	0.4909 0 0 0 0	0.8091 0.4598 0.4598 0 0.2091	0.6 0.2 0.2 0 0	0.6 0 0 0	0.4 0.4 0.2	0.08165 0.08165 0 0.05	15.38% 81.65% 81.65% 200.0%	27.78% 77.78% 77.78% 100.0% 94.44%
177.5 355.1 693 1390 2970 Аngular (Corr С-µg/L	rected) Transfor Control Type	4 4 4 4 med Su Count	0.65 0.2 0.2 0 0.05 mmary Mean	0.4909 0 0 0 0 95% LCL	0.8091 0.4598 0.4598 0 0.2091 95% UCL	0.6 0.2 0.2 0 0 0 Median	0.6 0 0 0 0	0.4 0.4 0.2 Max	0.08165 0.08165 0 0.05 Std Err	15.38% 81.65% 81.65% 200.0%	27.78% 77.78% 77.78% 100.0% 94.44%
177.5 355.1 693 1390 2970 Аngular (Corr С-µg/L 0	ected) Transfor	4 4 4 4 med Su Count	0.65 0.2 0.05 mmary <u>Mean</u> 1.226	0.4909 0 0 0 0 95% LCL 1.007	0.8091 0.4598 0.4598 0 0.2091 <b>95% UCL</b> 1.445	0.6 0.2 0.2 0 0 0 <b>Median</b> 1.226	0.6 0 0 0 0 0 <b>Min</b> 1.107	0.4 0.4 0.2 Max 1.345	0.08165 0.08165 0 0.05 <b>Std Err</b> 0.06874	15.38% 81.65% 81.65% 200.0% CV% 11.21%	27.78% 77.78% 77.78% 100.0% 94.44% %Effect 0.0%
177.5 355.1 693 1390 2970 Аngular (Согг С-µg/L 0 177.5	rected) Transfor Control Type	4 4 4 4 med Su Count 4 4	0.65 0.2 0 0.05 mmary <u>Mean</u> 1.226 0.941	0.4909 0 0 0 0 95% LCL 1.007 3 0.7655	0.8091 0.4598 0.4598 0 0.2091 <b>95% UCL</b> 1.445 1.117	0.6 0.2 0.2 0 0 0 <b>Median</b> 1.226 0.8861	0.6 0 0 0 0 <b>Min</b> 1.107 0.8861	0.4 0.4 0.2 <b>Max</b> 1.345 1.107	0.08165 0.08165 0 0.05 <b>Std Err</b> 0.06874 0.05527	15.38% 81.65% 81.65% 200.0% CV% 11.21% 11.74%	27.78% 77.78% 77.78% 100.0% 94.44% %Effect 0.0% 23.23%
177.5 355.1 693 1390 2970 Аngular (Corr С-µg/L 0	rected) Transfor Control Type	4 4 4 4 med Su Count	0.65 0.2 0.05 mmary <u>Mean</u> 1.226	0.4909 0 0 0 95% LCL 1.007 3 0.7655 4 0.161	0.8091 0.4598 0.4598 0 0.2091 <b>95% UCL</b> 1.445	0.6 0.2 0.2 0 0 0 <b>Median</b> 1.226	0.6 0 0 0 0 0 <b>Min</b> 1.107	0.4 0.4 0.2 Max 1.345	0.08165 0.08165 0 0.05 <b>Std Err</b> 0.06874	15.38% 81.65% 81.65% 200.0% CV% 11.21%	27.78% 77.78% 77.78% 100.0% 94.44% %Effect 0.0%
177.5 355.1 693 1390 2970 Апдиlar (Согг С-µg/L 0 177.5 355.1	rected) Transfor Control Type	4 4 4 4 med Su Count 4 4 4	0.65 0.2 0.2 0.05 mmary <u>Mean</u> 1.226 0.941: 0.459	0.4909 0 0 0 95% LCL 1.007 3 0.7655 4 0.161 4 0.161	0.8091 0.4598 0.4598 0 0.2091 <b>95% UCL</b> 1.445 1.117 0.7578	0.6 0.2 0.2 0 0 0 <b>Median</b> 1.226 0.8861 0.4636	0.6 0 0 0 0 <b>Min</b> 1.107 0.8861 0.2255	0.4 0.2 Max 1.345 1.107 0.6847	0.08165 0.08165 0 0.05 <b>Std Err</b> 0.06874 0.05527 0.09377	15.38% 81.65% 81.65% 200.0% <b>CV%</b> 11.21% 11.74% 40.82%	27.78% 77.78% 77.78% 100.0% 94.44% %Effect 0.0% 23.23% 62.54%
177.5 355.1 693 1390 2970 <b>Angular (Corr C-µg/L</b> 0 177.5 355.1 693	rected) Transfor Control Type	4 4 4 4 med Su Count 4 4 4 4	0.65 0.2 0.05 mmary <u>Mean</u> 1.226 0.941: 0.459 0.459	0.4909 0 0 0 95% LCL 1.007 3 0.7655 4 0.161 4 0.161	0.8091 0.4598 0.4598 0 0.2091 <b>95% UCL</b> 1.445 1.117 0.7578 0.7578	0.6 0.2 0.2 0 0 0 <b>Median</b> 1.226 0.8861 0.4636 0.4636	0.6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.4 0.4 0.2 <b>Max</b> 1.345 1.107 0.6847 0.6847	0.08165 0.08165 0 0.05 <b>Std Err</b> 0.06874 0.05527 0.09377 0.09377	15.38% 81.65% 81.65% 200.0% <b>CV%</b> 11.21% 11.74% 40.82% 40.82%	27.78% 77.78% 77.78% 100.0% 94.44% %Effect 0.0% 23.23% 62.54% 62.54%
177.5 355.1 693 1390 2970 <b>Angular (Corr C-µg/L</b> 0 177.5 355.1 693 1390 2970 <b>96h Survival</b>	ected) Transfor Control Type Lab Control Rate Detail	4 4 4 4 <u>Count</u> 4 4 4 4 4	0.65 0.2 0.2 0 0.05 <b>mmary</b> Mean 1.226 0.941 0.459 0.459 0.225 0.285	0.4909 0 0 0 0 0 0 0 0 0 0 0 0 0	0.8091 0.4598 0.4598 0 0.2091 <b>95% UCL</b> 1.445 1.117 0.7578 0.2256 0.4745	0.6 0.2 0.2 0 0 <b>Median</b> 1.226 0.8861 0.4636 0.4636 0.2255	0.6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.4 0.4 0.2 Max 1.345 1.107 0.6847 0.2255	0.08165 0.08165 0 0.05 <b>Std Err</b> 0.06874 0.05527 0.09377 0.09377 0	15.38% 81.65% 81.65% 200.0% <b>CV%</b> 11.21% 11.74% 40.82% 40.82% 0.0%	27.78% 77.78% 77.78% 100.0% 94.44% %Effect 0.0% 23.23% 62.54% 62.54% 81.61%
177.5 355.1 693 1390 2970 <b>Angular (Corr C-µg/L</b> 0 177.5 355.1 693 1390 2970 <b>96h Survival</b> <b>C-µg/L</b>	ected) Transfor Control Type Lab Control Rate Detail Control Type	4 4 4 4 <b>med Su</b> Count 4 4 4 4 4 4 4 4 8 7 8 9 1	0.65 0.2 0.2 0 0.05 mmary Mean 1.226 0.941 0.459 0.225 0.285 Rep 2	0.4909 0 0 0 0 <b>95% LCL</b> 1.007 3 0.7655 4 0.161 4 0.161 5 0.2255 0.09558	0.8091 0.4598 0.4598 0 0.2091 <b>95% UCL</b> 1.445 1.117 0.7578 0.7578 0.2256 0.4745 <b>Rep 4</b>	0.6 0.2 0.2 0 0 <b>Median</b> 1.226 0.8861 0.4636 0.4636 0.2255	0.6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.4 0.4 0.2 Max 1.345 1.107 0.6847 0.2255	0.08165 0.08165 0 0.05 <b>Std Err</b> 0.06874 0.05527 0.09377 0.09377 0	15.38% 81.65% 81.65% 200.0% <b>CV%</b> 11.21% 11.74% 40.82% 40.82% 0.0%	27.78% 77.78% 77.78% 100.0% 94.44% %Effect 0.0% 23.23% 62.54% 62.54% 81.61%
177.5 355.1 693 1390 2970 Апдиlаr (Согг С-µg/L 0 177.5 355.1 693 1390 2970 96h Survival С-µg/L 0	ected) Transfor Control Type Lab Control Rate Detail	4 4 4 4 4 <b>med Su</b> <b>Count</b> 4 4 4 4 4 4 4 <b>Rep 1</b> 0.8	0.65 0.2 0.2 0 0.05 mmary Mean 1.226 0.941: 0.459 0.225: 0.285 Rep 2 1	0.4909 0 0 0 0 0 0 0 0 0 0 0 0 0	0.8091 0.4598 0.4598 0 0.2091 <b>95% UCL</b> 1.445 1.117 0.7578 0.256 0.4745 <b>Rep 4</b> 0.8	0.6 0.2 0.2 0 0 <b>Median</b> 1.226 0.8861 0.4636 0.4636 0.2255	0.6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.4 0.4 0.2 Max 1.345 1.107 0.6847 0.2255	0.08165 0.08165 0 0.05 <b>Std Err</b> 0.06874 0.05527 0.09377 0.09377 0	15.38% 81.65% 81.65% 200.0% <b>CV%</b> 11.21% 11.74% 40.82% 40.82% 0.0%	27.78% 77.78% 77.78% 100.0% 94.44% %Effect 0.0% 23.23% 62.54% 62.54% 81.61%
177.5 355.1 693 1390 2970 Апдиlar (Согг С-µg/L 0 177.5 355.1 693 1390 2970 96h Survival С-µg/L 0 177.5	ected) Transfor Control Type Lab Control Rate Detail Control Type	4 4 4 4 <b>med Su</b> <b>Count</b> 4 4 4 4 4 4 4 4 <b></b>	0.65 0.2 0.2 0 0.05 <b>mmary</b> Mean 1.226 0.459 0.459 0.225 0.285 <b>Rep 2</b> 1 0.6	0.4909 0 0 0 0 0 0 0 0 0 0 0 0 0	0.8091 0.4598 0.4598 0 0.2091 <b>95% UCL</b> 1.445 1.117 0.7578 0.7578 0.2256 0.4745 <b>Rep 4</b> 0.8 0.6	0.6 0.2 0.2 0 0 <b>Median</b> 1.226 0.8861 0.4636 0.4636 0.2255	0.6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.4 0.4 0.2 Max 1.345 1.107 0.6847 0.2255	0.08165 0.08165 0 0.05 <b>Std Err</b> 0.06874 0.05527 0.09377 0.09377 0	15.38% 81.65% 81.65% 200.0% <b>CV%</b> 11.21% 11.74% 40.82% 40.82% 0.0%	27.78% 77.78% 77.78% 100.0% 94.44% %Effect 0.0% 23.23% 62.54% 62.54% 81.61%
177.5 355.1 693 1390 2970 <b>Angular (Corr C-µg/L</b> 0 177.5 355.1 693 1390 2970 <b>96h Survival</b> <b>C-µg/L</b> 0 177.5 355.1	ected) Transfor Control Type Lab Control Rate Detail Control Type	4 4 4 <b>med Su</b> Count 4 4 4 4 4 4 4 4 4 0.8 0.8 0.4	0.65 0.2 0.05 mmary Mean 1.226 0.941: 0.459 0.459 0.225 0.285 Rep 2 1 0.6 0	0.4909 0 0 0 0 0 0 0 0 0 0 0 0 0	0.8091 0.4598 0.4598 0 0.2091 <b>95% UCL</b> 1.445 1.117 0.7578 0.7578 0.2256 0.4745 <b>Rep 4</b> 0.8 0.6 0.2	0.6 0.2 0.2 0 0 <b>Median</b> 1.226 0.8861 0.4636 0.4636 0.2255	0.6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.4 0.4 0.2 Max 1.345 1.107 0.6847 0.2255	0.08165 0.08165 0 0.05 <b>Std Err</b> 0.06874 0.05527 0.09377 0.09377 0	15.38% 81.65% 81.65% 200.0% <b>CV%</b> 11.21% 11.74% 40.82% 40.82% 0.0%	27.78% 77.78% 77.78% 100.0% 94.44% %Effect 0.0% 23.23% 62.54% 62.54% 81.61%
177.5 355.1 693 1390 2970 Angular (Corr C-µg/L 0 177.5 355.1 693 1390 2970 96h Survival C-µg/L 0 177.5 355.1 693	ected) Transfor Control Type Lab Control Rate Detail Control Type	4 4 4 <b>med Su</b> <b>Count</b> 4 4 4 4 4 4 4 4 4 0.8 0.8 0.8 0.4 0	0.65 0.2 0.2 0 0.05 mmary Mean 1.226 0.941: 0.459 0.459 0.459 0.225 0.285 Rep 2 1 0.6 0 0.2	0.4909 0 0 0 0 0 0 0 0 0 0 0 0 0	0.8091 0.4598 0.4598 0 0.2091 <b>95% UCL</b> 1.445 1.117 0.7578 0.2256 0.4745 <b>Rep 4</b> 0.8 0.6 0.2 0.2	0.6 0.2 0.2 0 0 <b>Median</b> 1.226 0.8861 0.4636 0.4636 0.2255	0.6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.4 0.4 0.2 Max 1.345 1.107 0.6847 0.2255	0.08165 0.08165 0 0.05 <b>Std Err</b> 0.06874 0.05527 0.09377 0.09377 0	15.38% 81.65% 81.65% 200.0% <b>CV%</b> 11.21% 11.74% 40.82% 40.82% 0.0%	27.78% 77.78% 77.78% 100.0% 94.44% %Effect 0.0% 23.23% 62.54% 62.54% 81.61%
177.5 355.1 693 1390 2970 <b>Angular (Corr C-19/L</b> 0 177.5 355.1 693 1390 2970 <b>96h Survival C C-19/L</b> 0 177.5 355.1	ected) Transfor Control Type Lab Control Rate Detail Control Type	4 4 4 <b>med Su</b> Count 4 4 4 4 4 4 4 4 4 0.8 0.8 0.4	0.65 0.2 0.05 mmary Mean 1.226 0.941: 0.459 0.459 0.225 0.285 Rep 2 1 0.6 0	0.4909 0 0 0 0 0 0 0 0 0 0 0 0 0	0.8091 0.4598 0.4598 0 0.2091 <b>95% UCL</b> 1.445 1.117 0.7578 0.7578 0.2256 0.4745 <b>Rep 4</b> 0.8 0.6 0.2	0.6 0.2 0.2 0 0 <b>Median</b> 1.226 0.8861 0.4636 0.4636 0.2255	0.6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.4 0.4 0.2 Max 1.345 1.107 0.6847 0.2255	0.08165 0.08165 0 0.05 <b>Std Err</b> 0.06874 0.05527 0.09377 0.09377 0	15.38% 81.65% 81.65% 200.0% <b>CV%</b> 11.21% 11.74% 40.82% 40.82% 0.0%	27.78% 77.78% 77.78% 100.0% 94.44% %Effect 0.0% 23.23% 62.54% 62.54% 81.61%

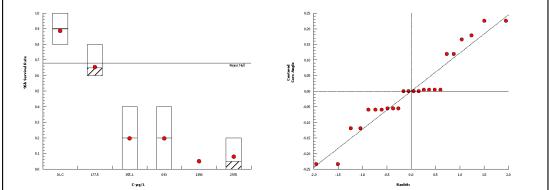
CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

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CETIS Ana	alytical Repo	ort				Report Date: Test Code:	02 Jun-16 16:03 (p 2 of 2) 7454A57A   19-5170-4442
Americamys	is 96-h Acute Su	rvival Test					SPAWAR Systems Center
Analysis ID: Analyzed:	11-7286-9114 05 May-16 11:		<b>-</b> -	ih Survival F arametric-Co	tate ≥ntrol vs Treatments	CETIS Version: Official Results:	CETISv1.8.7 Yes
Angular (Cor	rected) Transfor	med Detai	l				
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
0	Lab Control	1.107	1.345	1.345	1.107		
177.5		1.107	0.8861	0.8861	0.8861		
355.1		0.6847	0.2255	0.4636	0.4636		
693		0.2255	0.4636	0.6847	0.4636		
1390		0.2255	0.2255	0.2255	0.2255		
2970		0.2255	0.2255	0.4636	0.2255		
96h Survival	Rate Binomials						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
0	Lab Control	4/5	5/5	5/5	4/5		
177.5		4/5	3/5	3/5	3/5		
355.1		2/5	0/5	1/5	1/5		
693		0/5	1/5	2/5	1/5		
1390		0/5	0/5	0/5	0/5		
2970		0/5	0/5	1/5	0/5		





000-010-187-1

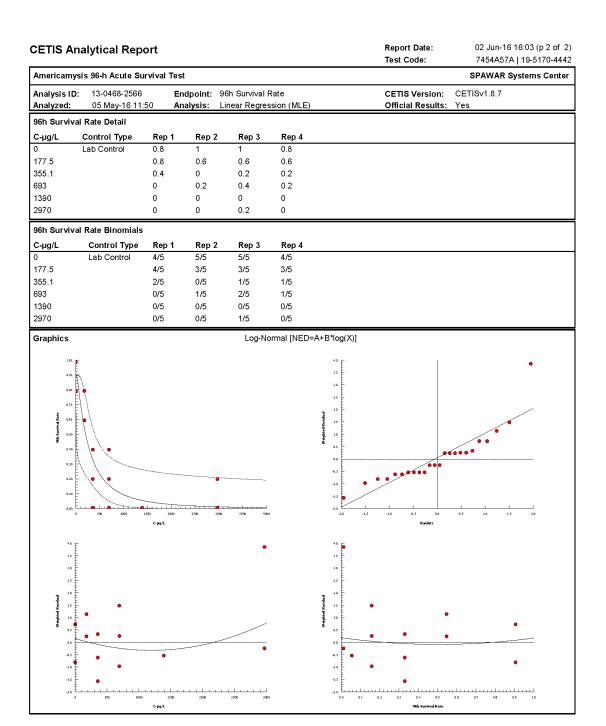
Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS An	alytical Repo	ort					-	ort Date: t Code:			03 (p 1 of 2) 9-5170-4442
Americamy	is 96-h Acute Sur	vival Test							SPA	WAR Syste	ems Center
Analysis ID: Analyzed:	13-0468-2566 05 May-16 11:5			h Survival Ra iear Regress				'IS Version: cial Results	CETISv1 : Yes	.8.7	
Batch ID: Start Date: Ending Date Duration:	00-4319-0877 28 Oct-15 09:4 01 Nov-15 08:3 95h	5 Prot	ocol: EF cies: An	rvival (96h) PA/821/R-02- nericamysis t juatic Resear	pahia	ns, NH		ient: Lab ne: Not	ob Munson- oratory Sea Applicable		
Sample ID: Sample Dat Receive Dat Sample Age		Cod 5 Mate Sou Stati	erial: Co rce: Pu	3654A3 opper sulfate Ised Exposu Hour	re		Clie Pro		WAR sed Exposu	re	
Linear Regr	ession Options										
Model Func			Threshol Control T		Threshold 0.1	Optimized Yes		Het Corr	Weightee Yes	ł	
-	NED=A+B*log(X)]		Control	nresnola	0.1	res	No	No	res		
Regression Iters LL	Summary AICc	BIC	Mu	Sigma	Adj R2	F Stat	Critical	P-Value	Decision	(a:5%)	
8 -46		102.8	2.38	0.4933	0.547	8.432	3.16	0.0010		t Lack of F	it
Point Estim Level µg/ LC50 239 Regression	L 95% LCL .6 103.9	95% UCL 367.4									
Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision	ı(α:5%)			
Threshold	0.09418	0.06521	-0.03363	0.222	1.444	0.1634		ificant Paran			
Slope Intercept	2.027 -4.824	0.4955 1.328	1.056 -7.427	2.999 -2.221	4.091 -3.632	0.0005 0.0016		nt Parameter nt Parameter			
ANOVA Tab	e										
Source Model Lack of Fit	Sum Squa 37.64648 15.51407	37.6 5.17	n Square 4648 1355	<b>DF</b> 1 3	<b>F Stat</b> 29.77 8.432	<b>P-Value</b> <0.0001 0.0010	Decision Significar Significar	nt			
Pure Error Residual	11.03946 26.55352		3303 4454	18 21							
Residual Ar											
Attribute	Method			Test Stat	Critical	P-Value	Decision	(a:5%)			
Goodness-o Variances	-Fit Pearson C Likelihood	hi-Sq GOF Ratio GOF ne Equality o	of Variance	26.55 19.61	32.67 32.67 2.773	0.1861 0.5463 0.6791	Non-Sign	ificant Heter ificant Heter			
Distribution		ilk W Norm	-	0.832	0.9169	0.0010		nal Distributi			
		Darling A2 I	vormality	1.269	2.492	0.0023		nal Distributio	on		
	Rate Summary	<b>.</b> .				ated Variat			A/ <b>-</b>		
С-µg/L 0	Control Type Lab Control	Count 4	Mean 0.9	Min 0.8	Max 1	Std Err 0.05774	Std Dev 0.1155	CV% 12.83%	%Effect 0.0%	A 18	<b>B</b> 20
177.5	200 001110	4	0.65	0.6	0.8	0.05	0.1	15.38%	27.78%	13	20
355.1		4	0.2	0	0.4	0.08165	0.1633	81.65%	77.78%	4	20
693		4 4	0.2	0 0	0.4 0	0.08165 0	0.1633 0	81.65%	77.78%	4 0	20
1390 2970		4 4	0 0.05	0	0 0.2	0 0.05	0 0.1	200.0%	100.0% 94.44%	0 1	20 20
		-		-						-	

CETIS™ v1.8.7.16

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CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Sum	nmary Repo	ort						Report Date Test Code:		2 Jun-16 16:0 A8835AB   0	
Americamysis	96-h Acute Su	rvival <sup>-</sup>	Test 🛛						SF	AWAR Syste	ms Center
Batch ID: Start Date: Ending Date: Duration:	00-4319-0877 28 Oct-15 09:4 01 Nov-15 08:3 95h		Test Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-02 Americamysis Aquatic Resea	bahia	ns, NH		Analyst: Diluent: Brine: Age:	Jacob Munso Laboratory S Not Applicabl 5	eawater	
Sample ID: Sample Date: Receive Date: Sample Age:			Code: Material: Source: Station:	148FE74B Copper sulfate Reference Tox Reference Tox	icant			Client: Project:	SPAWAR Pulsed Expos	sure	
Comparison S	Summary										
Analysis ID	Endpoint		NOEL	. LOEL	TOEL	PMSD	τu	Meth	od		
08-8701-5964	96h Survival R	ate	88.8	177.5	125.5	31.4%		Dunn	ett Multiple C	omparison Te	st
Point Estimate	e Summary										
Analysis ID	Endpoint		Level	μg/L	95% LCL	95% UCL	τυ	Meth	od		
04-8850-7955	96h Survival R	ate	LC50	135.2	91.32	172.3		Linea	r Regression	(MLE)	
96h Survival F	Rate Summary										
	Control Type	Cour	nt Mean	95% LCL	95% UCL	Min	Max	Std E	rr Std De	v CV%	% Effect
	Lab Control	4	0.95	0.7909	1	0.8	1	0.05	0.1	10.53%	0.0%
44.4		4	0.8	0.5402	1	0.6	1	0.081	65 0.1633	20.41%	15.79%
88.8		4	0.7	0.2891	1	0.4	1	0.129	0.2582	36.89%	26.32%
177.5		4	0.3	0	0.6182	0	0.4	0.1	0.2	66.67%	68.42%
355.1		4	0	0	0	0	0	0	0		100.0%
693		4	0	0	0	0	0	0	0		100.0%
96h Survival F	Rate Detail										
C-µg/L	Control Type	Rep	1 Rep 2	Rep 3	Rep 4						
0	Lab Control	1	1	0.8	1						
44.4		0.8	1	0.6	0.8						
88.8		1	0.4	0.6	0.8						
177.5		0.4	0	0.4	0.4						
355.1		0	0	0	0						
693		0	0	0	0						
96h Survival F	Rate Binomials										
C-µg/L	Control Type	Rep	1 Rep 2	Rep 3	Rep 4						
0	Lab Control	5/5	5/5	4/5	5/5						
44.4		4/5	5/5	3/5	4/5						
88.8		5/5	2/5	3/5	4/5						
177.5		2/5	0/5	2/5	2/5						
355.1		0/5	0/5	0/5	0/5						
693		0/5	0/5	0/5	0/5						

Analyst:\_\_\_\_\_ QA:\_\_\_\_\_

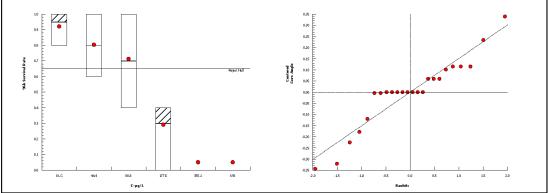
CETIS Ana	lytical Repo	ort						-	ort Date: Code:			2 (p 1 of 2) 7-1356-9707
Americamysis	s 96-h Acute Sur	vival T	est							SPA	WAR Syste	ms Center
Analysis ID: Analyzed:	08-8701-5964 05 May-16 11:5	50	Endpoint: Analysis:		Survival Ra metric-Con	te trol vs Treat	tments		IS Version al Results		.8.7	
Batch ID: Start Date: Ending Date: Duration:	00-4319-0877 28 Oct-15 09:4 01 Nov-15 08:3 95h		Test Type: Protocol: Species: Source:	EPA/ Amer	821/R-02-( icamysis b	012 (2002) bahia ch Organisn	ns, NH	Anal Dilu Brin Age:	ent: Lat e: No	cob Munson-l poratory Seav t Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:			Code: Material: Source: Station:	Refer	E74B er sulfate rence Toxic rence Toxic			Clier Proj		AWAR Ised Exposur	e	
Data Transfor Angular (Corre		Zeta NA	Alt H C > T		Trials NA	Seed NA		<b>PMSD</b> 31.4%	NOEL 88.8	LOEL 177.5	TOEL 125.5	TU
Control	ple Comparison vs C-µg/L	Test	Test	Stat	Critical	MSD DF	P-Value	P-Type	Decisior	n(α:5%)		
Lab Control	44.4 88.8 177.5*		1.153 1.851 4.732	:	2.287 2.287 2.287	0.346 6 0.346 6 0.346 6	0.2790 0.1030 0.0007	CDF CDF CDF		nificant Effect nificant Effect nt Effect		
ANOVA Table												
Source	Sum Squ	ares	Mean	Squa	re	DF	F Stat	P-Value	Decision	n(α:5%)		
Between	1.115546		0.371	8488		3	8.126	0.0032	Significa	nt Effect		
Error	0.5491378	}	0.045	76148		12	_					
Total	1.664684					15						
Distributional	Tests											
Attribute	Test				Test Stat	Critical	P-Value	Decision	(α:1%)			
Variances	Bartlett E	quality	of Variance		1.904	11.34	0.5926	Equal Var	iances			
Distribution	Shapiro-\	Vilk W	Normality	(	0.9424	0.8408	0.3800	Normal D	istribution			
96h Survival F	Rate Summary											
C-µg/L	Control Type	Coun	t Mean		95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Control	4	0.95	(	0.7909	1	1	0.8	1	0.05	10.53%	0.0%
44.4		4	0.8		0.5402	1	0.8	0.6	1	0.08165	20.41%	15.79%
88.8		4	0.7		0.2891	1	0.7	0.4	1	0.1291	36.89%	26.32%
177.5		4	0.3		0	0.6182	0.4	0	0.4	0.1	66.67%	68.42%
355.1 693		4 4	0 0		0 0	0 0	0 0	0 0	0 0	0 0		100.0% 100.0%
					•	·	•	•	•	•		100.070
	ected) Transfor		-									
С-µg/L 0	Control Type	Coun			95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
	Lab Control	4	1.286		1.096	1.475	1.345	1.107	1.345	0.05953 0.09377	9.26% 16.87%	0.0%
				,	0 012	1 / 1		0.9964				13.56%
44.4		4	1.111		0.813	1.41 1.459	1.107	0.8861	1.345			21 7704
44.4 88.8		4 4	1.006	(	0.553	1.459	0.9966	0.6847	1.345	0.1423	28.29%	21.77% 55.67%
44.4 88.8 177.5		4 4 4	1.006 0.569	( 9 (	0.553 0.2046	1.459 0.9353	0.9966 0.6847	0.6847 0.2255	1.345 0.6847	0.1423 0.1148	28.29% 40.29%	55.67%
44.4 88.8		4 4	1.006	9 ( 5 (	0.553	1.459	0.9966	0.6847	1.345	0.1423	28.29%	
44.4 88.8 177.5 355.1		4 4 4 4	1.006 0.569 0.225	9 ( 5 (	0.553 0.2046 0.2255	1.459 0.9353 0.2256	0.9966 0.6847 0.2255	0.6847 0.2255 0.2255	1.345 0.6847 0.2255	0.1423 0.1148 0	28.29% 40.29% 0.0%	55.67% 82.46%
44.4 88.8 177.5 355.1 693		4 4 4 4	1.006 0.569 0.225 0.225	9 ( 5 ( 5 (	0.553 0.2046 0.2255	1.459 0.9353 0.2256	0.9966 0.6847 0.2255	0.6847 0.2255 0.2255	1.345 0.6847 0.2255	0.1423 0.1148 0	28.29% 40.29% 0.0%	55.67% 82.46%
44.4 88.8 177.5 355.1 693 <b>96h Survival F</b>	Rate Detail	4 4 4 4	1.006 0.569 0.225 0.225	9 ( 5 ( 5 ( 2	0.553 0.2046 0.2255 0.2255	1.459 0.9353 0.2256 0.2256	0.9966 0.6847 0.2255	0.6847 0.2255 0.2255	1.345 0.6847 0.2255	0.1423 0.1148 0	28.29% 40.29% 0.0%	55.67% 82.46%
44.4 88.8 177.5 355.1 693 96h Survival F С-µg/L	Rate Detail Control Type	4 4 4 4 8 Rep 1	1.006 0.569 0.225 0.225	9 ( 5 ( 5 ( <u>2  </u>	0.553 0.2046 0.2255 0.2255 Rep 3	1.459 0.9353 0.2256 0.2256 <b>Rep 4</b>	0.9966 0.6847 0.2255	0.6847 0.2255 0.2255	1.345 0.6847 0.2255	0.1423 0.1148 0	28.29% 40.29% 0.0%	55.67% 82.46%
44.4 88.8 177.5 355.1 693 <b>96h Survival F</b> С-µg/L 0	Rate Detail Control Type	4 4 4 4 <b>Rep</b> 1 1	1.006 0.569 0.225 0.225 0.225	( 9 ( 5 ( 5 ( <u>2  </u> (	0.553 0.2046 0.2255 0.2255 <b>Rep 3</b> 0.8	1.459 0.9353 0.2256 0.2256 <b>Rep 4</b> 1	0.9966 0.6847 0.2255	0.6847 0.2255 0.2255	1.345 0.6847 0.2255	0.1423 0.1148 0	28.29% 40.29% 0.0%	55.67% 82.46%
44.4 88.8 177.5 355.1 693 96h Survival F С-µg/L 0 44.4	Rate Detail Control Type	4 4 4 4 8 <b>Rep</b> 1 1 0.8	1.006 0.569 0.225 0.225 0.225 1 <b>Rep 2</b> 1 1	( 9 ( 5 ( 5 ( 2   ( ( ( (	0.553 0.2046 0.2255 0.2255 <b>Rep 3</b> 0.8 0.6	1.459 0.9353 0.2256 0.2256 <b>Rep 4</b> 1 0.8	0.9966 0.6847 0.2255	0.6847 0.2255 0.2255	1.345 0.6847 0.2255	0.1423 0.1148 0	28.29% 40.29% 0.0%	55.67% 82.46%
44.4 88.8 177.5 355.1 693 <b>96h Survival F</b> С-µg/L 0 44.4 88.8	Rate Detail Control Type	4 4 4 4 <b>Rep</b> 1 1 0.8 1	1.006 0.569 0.225 0.225 <b>Rep 2</b> 1 1 1 0.4	2 1 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.553 0.2046 0.2255 0.2255 <b>Rep 3</b> 0.8 0.6 0.6	1.459 0.9353 0.2256 0.2256 <b>Rep 4</b> 1 0.8 0.8	0.9966 0.6847 0.2255	0.6847 0.2255 0.2255	1.345 0.6847 0.2255	0.1423 0.1148 0	28.29% 40.29% 0.0%	55.67% 82.46%
44.4 88.8 177.5 355.1 693 96h Survival F C-µg/L 0 44.4 88.8 177.5	Rate Detail Control Type	4 4 4 4 <b>Rep</b> 1 1 0.8 1 0.4	1.006 0.569 0.225 0.225 1 1 1 0.4 0	() 9 () 5 () 5 () 7 () () () () () () () () () () () () () (	0.553 0.2046 0.2255 0.2255 <b>Rep 3</b> 0.8 0.6 0.6 0.4	1.459 0.9353 0.2256 0.2256 <b>Rep 4</b> 1 0.8 0.8 0.8 0.4	0.9966 0.6847 0.2255	0.6847 0.2255 0.2255	1.345 0.6847 0.2255	0.1423 0.1148 0	28.29% 40.29% 0.0%	55.67% 82.46%

CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_\_

CETIS Ana	alytical Repo	ort				Report Date: Test Code:	02 Jun-16 16:02 (p 2 of 2) 2A8835AB   07-1356-9707
Americamysi	s 96-h Acute Su	rvival Test					SPAWAR Systems Center
Analysis ID: Analyzed:	08-8701-5964 05 May-16 11:			ih Survival F trametric-Co	Rate ontrol vs Treatments	CETIS Version: Official Results:	CETISv1.8.7 Yes
Angular (Cor	rected) Transfor	med Detai	I				
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
0	Lab Control	1.345	1.345	1.107	1.345		
44.4		1.107	1.345	0.8861	1.107		
88.8		1.345	0.6847	0.8861	1.107		
177.5		0.6847	0.2255	0.6847	0.6847		
355.1		0.2255	0.2255	0.2255	0.2255		
693		0.2255	0.2255	0.2255	0.2255		
96h Survival	Rate Binomials						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
0	Lab Control	5/5	5/5	4/5	5/5		
44.4		4/5	5/5	3/5	4/5		
88.8		5/5	2/5	3/5	4/5		
177.5		2/5	0/5	2/5	2/5		
355.1		0/5	0/5	0/5	0/5		
693		0/5	0/5	0/5	0/5		

## Graphics



CETIS™ v1.8.7.16

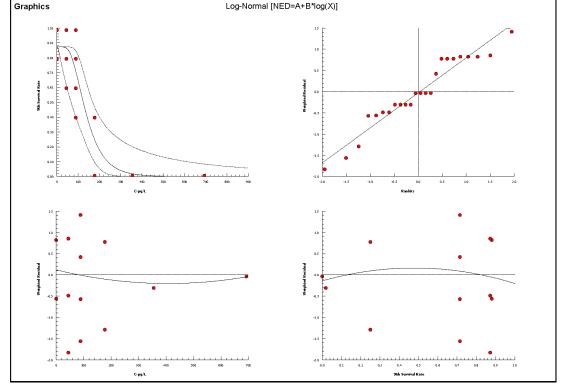
Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ana	alytical Repo	ort					-	ort Date: Code:			:02 (p 1 of 2) )7-1356-9707
Americamysi	s 96-h Acute Sur	vival Test							SPA	WAR Syst	terns Center
Analysis ID: Analyzed:	04-8850-7955 05 May-16 11:5			6h Survival Ra inear Regress				S Version: ial Results	CETISv1 : Yes	.8.7	
Batch ID: Start Date: Ending Date: Duration:	00-4319-0877 28 Oct-15 09:45 01 Nov-15 08:3 95h	5 Prot 0 Spe	tocol: E cies: A	urvival (96h) PA/821/R-02- mericamysis l quatic Resear	pahia	ns, NH	Anal Dilue Brine Age:	ent: Lab e: Not	ob Munson- oratory Sea Applicable		
Sample ID: Sample Date Receive Date Sample Age:	:	Sou	erial: C ırce: R	48FE74B opper sulfate eference Toxi eference Toxi			Clier Proje		WAR sed Exposur	e	
Linear Regre	ssion Options										
Model Functi	on NED=A+B*log(X)]			old Option Threshold	Threshold 0.05	Optimized Yes	Pooled No	Het Corr No	Weighted Yes	1	
Regression S	••• /•		Control	meshoid	0.00	103		110	103		
Iters LL	AICc	BIC 89.36	<b>Mu</b> 2.131	<b>Sigma</b> 0.2066	Adj R2	F Stat	Critical 3.16	P-Value 0.3804	Decision Non-Signi		k of Fit
Point Estima		00.00	2.151	0.2000	0.7001	1.000	5.10	0.0004	Non-Olgin		K OFFIC
Level µg/L	. 95% LCL	95% UCL									
Regression F	arameters										
Parameter	Estimate	Std Error	95% LC	L 95% UCL	t Stat	P-Value	Decision(	α:5%)			
Threshold	0.1187	0.05509	0.01076		2.155	0.0429	-	t Parameter			
Slope Intercept	4.84 -10.31	1.282 2.819	2.328 -15.84	7.352 -4.789	3.777 -3.659	0.0011 0.0015	-	t Parameter t Parameter			
ANOVA Table	9						-				
Source Model	Sum Squa 62.43002		in Square	<b>DF</b>	F Stat 83.62	P-Value <0.0001	Decision( Significan	. ,			
Lack of Fit Pure Error Residual	2.402125 13.27694 15.67907	0.73	0708 7608 6622	3 18 21	1.086	0.3804	Non-Signi	ficant			
Residual Ana	lysis										
Attribute	Method			Test Stat	Critical	P-Value	Decision(	α:5%)			
Goodness-of- Variances Distribution	Likelihood Mod Lever Shapiro-W	chi-Sq GOF Ratio GOF ne Equality (ilk W Norm Darling A2	ality	15.68 19.43 e 1.469 0.9361 0.7484	32.67 32.67 2.773 0.9169 2.492	0.7874 0.5576 0.2485 0.1334 0.0511	-	stribution			
96h Survival	Rate Summary				Calcu	ated Variat	e(A/B)				
	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	в
	Lab Control	4	0.95	0.8	1	0.05	0.1	10.53%	0.0%	19	20
44.4 88.8		4 4	0.8 0.7	0.6 0.4	1 1	0.08165 0.1291	0.1633 0.2582	20.41% 36.89%	15.79% 26.32%	16 14	20 20
00.0		4	0.7	0.4 0	0.4	0.1291	0.2582	36.89% 66.67%	26.32% 68.42%	14 6	20
177.5											
177.5 355.1		4	0.5	0	0	0	0	00.01 /0	100.0%	0	20

Analyst:\_\_\_\_\_ QA:\_\_\_\_

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CETIS Ar	nalytical Rep	ort				Report Date: Test Code:	02 Jun-16 16:02 (p 2 of 2) 2A8835AB   07-1356-9707
Americamy	sis 96-h Acute S	urvival Tes	t				SPAWAR Systems Center
Analysis ID Analyzed:	: 04-8850-7955 05 May-16 11			ih Survival F near Regres		CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Surviva	al Rate Detail						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
0	Lab Control	1	1	0.8	1		
44.4		0.8	1	0.6	0.8		
88.8		1	0.4	0.6	0.8		
177.5		0.4	0	0.4	0.4		
355.1		0	0	0	0		
693		0	0	0	0		
96h Surviva	al Rate Binomials	5					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
0	Lab Control	5/5	5/5	4/5	5/5		
44.4		4/5	5/5	3/5	4/5		
88.8		5/5	2/5	3/5	4/5		
177.5		2/5	0/5	2/5	2/5		
355.1		0/5	0/5	0/5	0/5		
693		0/5	0/5	0/5	0/5		
Graphics				Log No	ormal [NED=A+B*log		



CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

## Water Quality Measurements & Test Organism Survival

Ĉ	Project: D	finitive Pulsed G	pper Experime Test Sp	ecies: A. bahia		•	<u> </u>	Teo	ch Initi	als	
-	-Sample ID: <u>3</u>	-have pulse	Start Date	Time: 10/28/15	0935		0	24	-48	72	96
·	Test No.:		End Date	Time: <u>11/1/15</u>	0830	Counts:	ың	NH	<b>Р</b> Щ	мн	JM
						Readings:	NH	NH	ЪĤ	μн	JM
					Dilutio	ons made by:	MС		-		~
		· · · · · · · · · · · · · · · · · · ·									-
	, I	Number of Live	Salinity	Temperature	Discoluted	)vovan					

Concentration	Rép	A		nber rgani	of Liv Isms	e	10000		Salini (ppt		v uterioù		Te	mpera (°C)			3	Disso	olved ( (mg/i		en			pH (units	5)	
-3/2		0	24		72	10 10 10 10 10 10 10 10 10 10 10 10 10 1	Contracting of the	AND INCOMES	NOT PROPAGANE	or another for	and the second	ong 1264/52022	91 - 140-26-449	48		96	O	24	48	72	96	0	24	48	72	90
	A	5	5	4	4	4	39	8 34.	1 34.2	338	\$ 33.5	20.	\$ 19. 7	19.7	18.7	19.6	8.7	8.2	8.4	7.8	8.1	7.8	7.8	1.80	7.77	7.
	В	5	5	5	5	5			[					۲ _					f				1	f		Γ
Lab Control	C	5	5	5	5	5																			-	
	D	5	S	5	4	4																		1		f
	E	-		-		-																		f		
	A	5	5	3	3	2	33.9	34.	2 34.0	<i>34.2</i>	34.1	20,1	18.8	19.9	18.9	19.8	8.9	8.7	8.6	8.1	8.1	7.91	799	793	781	7
200	В	5	5	4	4	4			f _					f _					1 -					f.		
200	С	5	4	4	3	3																				
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D     5     5     7     7       D     5     5     4     4																										
	E																					alve se Vetices Differen				
	Α	5	4	4	4	4	34.0	34-1	34.1	34.C	34.7	20.0	19.8	19.7	18.3	18.8	9.1	8.7	8.3	8.9	8.3	2.90	297	702	790	'7 '7
800	в	5	5	2	2	2			f					۲ <sub></sub>					1					f 13	1.16	/
	C	5	5	5	5	5																			-	
[	D	5	4	4	4	4																		-		
	Е					~										-	<u> </u>									
1600	A	5	5	4	4	4	34.0	34.4	24.4	34.5	34.3	20.3	127	19.9	19.8	17.9	8.7	29	P 9	2.7	9. C	700	201	200	7:32	1~~
1600	в	5	4	2	0	-			f _				f					1				1-87	$\frac{GH}{1}$	1.02	<u>, c, p</u>	.0 /
Γ	С	5	4	2	2	1																				
Γ	D	5	4	4	4	4			U.																	
	E					-												-								
20	A	5	2	0	-		3.9	34.1	33.8 3	34.Z 🔅	34.1	20.41	19.7	RAD	0.11	9.9	2.9 9	20 1	181	२.५ ।	2 4 0	7819	2001	7 80 7		
3200 +	B	S I	3	i	0	) t		1	1000				f					f					f		.02	- 18
	C	5 4	5 6	1	2.	2				·		-														_
· [	D	5	4	3	3 :	3																		-		
	E																									-
Initial Counts QC'd by:_/	٩c													<u></u>		200000	92024624 <b>1</b> 19	<u>alatan 100</u>	22225424	00000	<u> 2012</u> 20					1
imal Source/Date F	Receive	ed:	1	ARC	0	10	127	1/20	215	A	lge at	Initiat	ion:	_50	) c	5					-		Feedi	ng Tim	es	
																					F	0	24	48	72	96
mments:									final re			t chan	nber pr	ior to i	renew	al					АМ: 0	8000	730 je	229 0	8300	800
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#### Water Quality Measurements & Test Organism Survival

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#### Water Quality Measurements & Test Organism Survival

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Project: PUISEd exposure definitive sample ID: 12 hour puise Test Species: <u>A. balia</u> Start Date/Time: <u>10/28/150735</u> Tech Initials End Date/Time: 11112015 0530 Test No.: Dilutions made by:

	-Sampte ID	Rep	A		ber o ganis	f Live ms	÷		5	Salinit (ppt)				Ter	npera (°C)	ture		B	Disso N	lved C (mg/L	) )	n –			pH units	)	
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Water Quality Measurements & Test Organism Survival

Project: Pulse CU Exposure depuistive Test Species: A. bachina Tech Initials Sample ID: Co Reference Test (CUSQ) Start Date/Time: 10/28/15 0945 24 48 72 0 96 Test No.: End Date/Time: 11/1/15 0830 Counts: NH/GR NH NH JH 9 Lehr Static μщ Readings: NH NH NH NH Dilutions made by: NC

Number of Live Cu Salinity Temperature Dissolved Oxygen pH (units) Organisms Concentration Rep (ppt) . (°C) (mg/L) A mg/2 0 24 48 72 96 0 24 48 72 96 0 24 48 72 96 0 24 48 72 96 0 24 48 72 96 5 5 5 5 5 5 5 5 33.7 34.1 33.9 340 34.1 19.7 19.8 19.8 20.219.7 9.1 8.8 8.7 8.4 7.9 7.90 7.87 7.91 7.88 Α в 5. 5555 5554 55555 Lab Control С 5 D 5. Е 4 340 34.1 34.1 34.2 34.2 196 198 19:3 202 19.7 9.1 87 8.4 87 8.9 805 7.97 7.95 7.89 7.92 А 55 4 ч в 5 5 55 5 50 5543 С З D 5555 4 E -340 341 341 342 343 186 188 148 203 187 81 88 86 86 87 807 7.94 287 7.93 7.94 Α 555 5 5 В 5422 2... 100 С 553 3 3 D 5544 4 E Α 34.0 34.1 34.3 34.1 34.1 19.6 19.8 19.8 20.2 19.7 9.2 8.8 8.6 8.6 8.5 8.57 8.01 7.99 7.95 7.96 5532 2 200 в 530 ----С 54222 D 55322 Е A 53 ł 0 34.1 34.2 34.2 34.1 - 9.7 19.7 19.7 20.0 19-9.2 8.9 8.7 8.7 ----- 8.01 8.01 7.99 7.99 ~ 540-400 в С 540 ~ -D 540 --Е 34.1 34.2 34.1 34.2 34.3 19.7 18.7 18.7 20.1 18.7 9.2 9.0 8.6 8.6 8.8 807 803 7.99 7.95 7.96 Α 5 5 1 0 2 800 в \_ 540 -----С 53 1 \_ 0 D 5 31 0 E 3 Initial Counts QC'd by: MC AND, 10/27/15 5 days Animal Source/Date Received: Age at initiation: Feeding Times 24 48 72 0 96

i = initial reading in fresh test solution, f = final reading in test chamber prior to renewal Comments: AM: 0800/30 1000 0830 0800 Organisms fed prior to initiation, circle one  $(\sqrt{y} / n)$ PM: 1400 1630 1400 1100 Tests aerated? Circle one ( y / (1) if yes, sample ID(s): Duration: NH 11/2/15 Aration Source: Nove @=QZZ Final Review: 11/15/15 QC Check:

A-51

# A.3. COPPER EXPOSURES – ANALYTICAL CHEMISTRY REPORTS:



29 December 2015

Nautilus Environmental, LLC Attn: Kellyn Lupfer 4340 Vandever Avenue San Diego, CA 92120 EMA Log#: 15L0514

## Project Name: SPAWAR-Pulsed

Enclosed are the results of analyses for samples received by the laboratory on 12/15/15 10:30. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that this data is in compliance both technically and for completeness.

Dan Verdon Laboratory Director

CA ELAP Certification #: 2564

4340 Viewridge Avenue, Suite A - San Diego, California 92123 - (858) 560-7717 - Fax (858) 560-7763 Analytical Chemistry Laboratory

## EMA Log #: 15L0514

## ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
1 Cu(TO-EP-0) B	15L0514-01	Seawater	11/05/15 00:00	12/15/15 10:30
2 Cu(TO-EP-31.3) B	15L0514-02	Seawater	11/05/15 00:00	12/15/15 10:30
3 Cu(TO-EP-62.5) B	15L0514-03	Seawater	11/05/15 00:00	12/15/15 10:30
4 Cu(TO-EP-125) B	15L0514-04	Seawater	11/05/15 00:00	12/15/15 10:30
5 Cu(TO-EP-250) B	15L0514-05	Seawater	11/05/15 00:00	12/15/15 10:30
6 Cu(TO-EP-500) B	15L0514-06	Seawater	11/05/15 00:00	12/15/15 10:30
7 Cu(TO-EC-0) B	15L0514-07	Seawater	11/05/15 00:00	12/15/15 10:30
8 Cu(TO-EC-5.8) B	15L0514-08	Seawater	11/05/15 00:00	12/15/15 10:30
9 Cu(TO-EC-8.4) B	15L0514-09	Seawater	11/05/15 00:00	12/15/15 10:30
11 Cu(TO-EC-17.2) B	15L0514-10	Seawater	11/05/15 00:00	12/15/15 10:30
12 Cu(TO-EC-24) B	15L0514-11	Seawater	11/05/15 00:00	12/15/15 10:30
13 Cu(TO-EC-31.3) B	15L0514-12	Seawater	11/05/15 00:00	12/15/15 10:30

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



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EMA Log #: 15L0514

# Total Metals by EPA 6000/7000 Series Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
1 Cu(TO-EP-0) B (15L0514	4-01) Seawater S	ampled: 1	1/05/15 00:00	Receive	ed: 12/15/1	5 10:30				
Copper	ND	0.002	0.100	mg/l	2	5122344	12/23/15	12/23/15	EPA 6010	
2 Cu(TO-EP-31.3) B (15L0	0514-02) Seawater	Sampleo	l: 11/05/15 00:	:00 Rece	eived: 12/1	5/15 10:3	0			
Copper	0.015	0.002	0.100	mg/l	2	5122344	12/23/15	12/23/15	EPA 6010	J
3 Cu(TO-EP-62.5) B (15L0	0514-03) Seawater	Sampleo	l: 11/05/15 00:	:00 Rece	eived: 12/1	5/15 10:3	0			
Copper	0.036	0.002	0.100	mg/l	2	5122344	12/23/15	12/23/15	EPA 6010	J
4 Cu(TO-EP-125) B (15L0	514-04) Seawater	Sampled	: 11/05/15 00:0	00 Rece	ived: 12/1:	5/15 10:30	)			
Copper	0.081	0.002	0.100	mg/l	2	5122344	12/23/15	12/23/15	EPA 6010	J
5 Cu(TO-EP-250) B (15L0	514-05) Seawater	Sampled	: 11/05/15 00:	00 Rece	ived: 12/1:	5/15 10:30	)			
Copper	0.179	0.002	0.100	mg/l	2	5122344	12/23/15	12/23/15	EPA 6010	
6 Cu(TO-EP-500) B (15L0:	514-06) Seawater	Sampled	: 11/05/15 00:0	00 Rece	ived: 12/1:	5/15 10:30	)			
Copper	0.367	0.002	0.100	mg/l	2	5122344	12/23/15	12/23/15	EPA 6010	
7 Cu(TO-EC-0) B (15L051	4-07) Seawater	Sampled: 1	1/05/15 00:00	Receiv	ed: 12/15/1	5 10:30				
Copper	ND	0.002	0.100	mg/l	2	5122344	12/23/15	12/23/15	EPA 6010	
8 Cu(TO-EC-5.8) B (15L05	514-08) Seawater	Sampled	: 11/05/15 00:0	00 Recei	ived: 12/15	15 10:30				
Copper	ND	0.002	0.100	mg/l	2	5122344	12/23/15	12/23/15	EPA 6010	
9 Cu(TO-EC-8.4) B (15L05	514-09) Seawater	Sampled	: 11/05/15 00:0	00 Recei	ived: 12/15	15 10:30	1			
Copper	ND	0.002	0.100	mg/l	2	5122344	12/23/15	12/23/15	EPA 6010	
c opp	112	0.002	0.200	8/-1	-	5.00511				

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

- EnviroMatrix EMA Analytical, Inc.

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EMA Log #: 15L0514

# Total Metals by EPA 6000/7000 Series Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
11 Cu(TO-EC-17.2) B (15L	.0514-10) Seawater	Sample	ed: 11/05/15 0	0:00 Re	ceived: 12/	15/15 10:	30			
Copper	0.006	0.002	0.100	mg/l	2	5122344	12/23/15	12/23/15	EPA 6010	J
12 Cu(TO-EC-24) B (15L0	514-11) Seawater	Sampled	: 11/05/15 00:	00 Rece	ived: 12/1	5/15 10:3	)			
Copper	0.010	0.002	0.100	mg/l	2	5122344	12/23/15	12/23/15	EPA 6010	J
13 Cu(TO-EC-31.3) B (15L	.0514-12) Seawater	Sample	ed: 11/05/15 0	0:00 Re	ceived: 12/	15/15 10:	30			
Copper	0.017	0.002	0.100	mg/l	2	5122344	12/23/15	12/23/15	EPA 6010	J

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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EMA Log #: 15L0514

# Total Metals by EPA 6000/7000 Series Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 5122344											
Blank (5122344-BLK1)					Prepared	& Analyz	ed: 12/23/	15			
Copper	ND	0.0009	0.050	mg/l							
LCS (5122344-BS1)					Prepared	& Analyz	ed: 12/23/	15			
Copper	1.03	0.0009	0.050	mg/l	1.00		103	75-125			
Duplicate (5122344-DUP1)		Sou	rce: 15L051	1-01	Prepared	& Analyz	ed: 12/23/	15			
Copper	0.730	0.090	5.00	mg/l		0.749			3	20	J

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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Page 5 of 6

# EMA Log #: 15L0514

#### Notes and Definitions

J	$\label{eq:constraint} Detected \ but \ below \ the \ Reporting \ Limit; \ therefore, \ result \ is \ an \ estimated \ concentration \ (CLP \ J-Fl ag).$
ND	Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified)
NR.	Not Reported
dry	Sample results reported on a dry weight basis (if indicated in units column)
RPD	Relative Percent Difference

MDL Method detection limit (indicated per client's request)

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

- EnviroMatrix MAnalytical, Inc.

Page 6 of 6

CHAIN-OF-CUSTODY RECORD EMALOG#: Client: Alove 105 Environmental 1	15LOSIY	510		– EnviroMatrix 4340 Viewridge Ave., Ste. A	<b>iro</b> ľ	Matr Ne. Si	κ.Υ.Υ.	San Diego, C	, CA92	EnviroMatrix (A) Analytical, Inc	<b>ü<i>CQ</i></b>	3) 560-	- <b>-</b>	Fax (8	58) 560-		Page (		2
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<sup>1</sup> Additional costs may apply. Please note there is a \$35 minimum charge for all cherry.	narge for all clients.																		
<sup>2</sup> EMA reserves the right to return any samples that do not match mir waste month	Turstle mofilio																	1	

"EMA reserves the right to return any samples that do not match our waste profits. NOTT: By relinquishing samples to EMA, line, client agrees to pay far the services requested on this COC form and any additional analysis performed on this propert. Payment for services in due within 30 days from due of invoice. Samples will be disposed of 7 days after report has been fluidreat miles offerwise noted. All work is subject to EMA is terms and conditions.

TODY RECORL	1520514	211	T	$-E_{t}$	– EnviroMatrix <sup>4340</sup> Viewridge Ave., Ste. A	Matı <sup>ge Ave., S</sup>	Ste. A - Su	San Diego,	А <i>т</i> ( СА 92123 Reque	Analytical, Inc. 2A 92123 - Phone (858) 560-771 Requested Analysis	<b>al, I</b> (858) 56 alvsis	<b>RC.</b> -	Ēax (85	EnviroMatrix (2) Analytical, Inc. (240 Viewidge Ave., Ste. A - San Diege, CA 92123 - Phone (858) 560-7763 Requested Analysis		Page 11 01	1
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ant Sample ID	Sample Sample Date Time		c Container # / Type	Dil & Grease	A) 0928/629 (Ha.L) \$108	1808 / 809 ) 0278 / \$79	8141 (Otga 908 / 8082	DET (Organo D∃ □ Hq D	D Nitrate D	C9 C4 C4 🕜 LCT5 (BCB5	a , <b>mio</b> lifo)	Colifert, T+E. Enterococcus,	aleterotrophic BOD a C			Xardiy	
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Matrix Codes: $A = Air$ , $DW = Drinking Water, GW = Groundwater, SW = Storm Water$	r. SW = Storm Water				REL	INOUIS	RELINOUISHED/BY			DATE/TIME					2	Ĕ.Z	
W = Wastewater, S = Soil, SED = Sediment, SD = Solid, T = Tissue, O = Oil, L = Liquid Science Dur C	ue, O = Oil, L = Liquid			Signature	1	IJ		×	2			Signature	P		Į	T	
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"EMA reserves the right to man any samples that do not match our waste profile. NOTE: By refinquishing anaples to EMA, frue, client agrees to pay for the services requested on this COC form and may subficient analyses performed on this project. Payment for services is due within 30 days from date of invoice. Sumples will be disposed of 7 days after report has been finalized unless otherwise noted. All work is subject to EMA's terms and conditions.



29 December 2015

EMA Log#: 15L0513

Nautilus Environmental, LLC Attn: Kellyn Lupfer 4340 Vandever Avenue San Diego, CA 92120

## Project Name: SPAWAR-Pulsed

Enclosed are the results of analyses for samples received by the laboratory on 12/15/15 10:30. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that this data is in compliance both technically and for completeness.

Dan Verdon Laboratory Director

CA ELAP Certification #: 2564

4340 Viewridge Avenue, Suite A - San Diego, California 92123 - (858) 560-7717 - Fax (858) 560-7763 Analytical Chemistry Laboratory

# EMA Log #: 15L0513

## ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
1 Cu(TO-MC-0)	15L0513-01	Seawater	10/28/15 00:00	12/15/15 10:30
2 Cu(TO-MC-50)	15L0513-02	Seawater	10/28/15 00:00	12/15/15 10:30
3 Cu(TO-MC-100)	15L0513-03	Seawater	10/28/15 00:00	12/15/15 10:30
4 Cu(TO-MC-200)	15L0513-04	Seawater	10/28/15 00:00	12/15/15 10:30
5 Cu(TO-MC-400)	15L0513-05	Seawater	10/28/15 00:00	12/15/15 10:30
6 Cu(TO-MC-800)	15L0513-06	Seawater	10/28/15 00:00	12/15/15 10:30
7 Cu(TO-MP-1600)	15L0513-07	Seawater	10/28/15 00:00	12/15/15 10:30
8 Cu(TO-MP-3200)	15L0513-08	Seawater	10/28/15 00:00	12/15/15 10:30
9 Cu(TO-EP-0)	15L0513-09	Seawater	10/28/15 00:00	12/15/15 10:30
10 Cu(TO-EP-15.6)	15L0513-10	Seawater	10/28/15 00:00	12/15/15 10:30
Cu 11(TO-EP-31.3)	15L0513-11	Seawater	10/28/15 00:00	12/15/15 10:30
Cu 12(TO-EP-62.5)	15L0513-12	Seawater	10/28/15 00:00	12/15/15 10:30
Cu 13(TO-EP-125)	15L0513-13	Seawater	10/28/15 00:00	12/15/15 10:30
Cu 14(TO-EP-250)	15L0513-14	Seawater	10/28/15 00:00	12/15/15 10:30
Cu 15(TO-EC-0)	15L0513-15	Seawater	10/28/15 00:00	12/15/15 10:30
Cu 16(TO-EC-5.8)	15L0513-16	Seawater	10/28/15 00:00	12/15/15 10:30
Cu 17(TO-EC-8.4)	15L0513-17	Seawater	10/28/15 00:00	12/15/15 10:30
Cu 18(TO-EC-12)	15L0513-18	Seawater	10/28/15 00:00	12/15/15 10:30
Cu 19(TO-EC-17.2)	15L0513-19	Seawater	10/28/15 00:00	12/15/15 10:30
Cu 20(TO-EC-24)	15L0513-20	Seawater	10/28/15 00:00	12/15/15 10:30
21 Cu (TO-EC-35)	15L0513-21	Seawater	10/28/15 00:00	12/15/15 10:30

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

– EnviroMatrix EMA Analytical, Inc.

Page 2 of 7

EMA Log #: 15L0513

# Total Metals by EPA 6000/7000 Series Methods

Analyte         Result         MDL         Reporting Limit         Units         Dilution         Batch         Prepared         Analyzed         Method           1 Cu(TO-MC-0) (15L0513-01) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         Image: Copper         ND         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           2 Cu(TO-MC-50) (15L0513-02) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         Image: Copper         0.039         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           3 Cu(TO-MC-100) (15L0513-03) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         Image: Copper         0.0072         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           4 Cu(TO-MC-200) (15L0513-04) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         Image: Copper         0.138         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           5 Cu(TO-MC-400) (15L0513-05) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         Image: Copper <th></th>											
ND         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           2 Cu(TO-MC-50) (15L0513-02) Seawater         Sampled:         10/28/15 00:00         Received:         12/15/15 10:30           Copper         0.039         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           3 Cu(TO-MC-100) (15L0513-03) Seawater         Sampled:         10/28/15 00:00         Received:         12/15/15 10:30           Copper         0.072         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           4 Cu(TO-MC-200) (15L0513-04) Seawater         Sampled:         10/28/15 00:00         Received:         12/15/15 10:30           Copper         0.138         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           5 Cu(TO-MC-400) (15L0513-05) Seawater         Sampled:         10/28/15 00:00         Received:         12/15/15 10:30         12/28/15         EPA 6010           6 Cu(TO-MC-800) (15L0513-06) Seawater         Sampled:         10/28/15 00:00         Received:         12/15/15 10:30         12/28/15         EPA 6010	Analyte	Result	MDL		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Curro-MC-50) (15L0513-02) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30         Copper       0.039       0.002       0.100       mg/l       2       5122347       12/23/15       12/28/15       EPA 6010         3 Cu(TO-MC-100) (15L0513-03) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30          EPA 6010         4 Cu(TO-MC-200) (15L0513-04) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30          EPA 6010         4 Cu(TO-MC-200) (15L0513-04) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30           EPA 6010         5 Cu(TO-MC-400) (15L0513-05) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30           EPA 6010         6 Cu(TO-MC-800) (15L0513-06) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30 <td< td=""><td>1 Cu(TO-MC-0) (15L051</td><td>3-01) Seawater Sa</td><td>mpled: 10</td><td>/28/15 00:00</td><td>Received</td><td>: 12/15/15</td><td>10:30</td><td></td><td></td><td></td><td></td></td<>	1 Cu(TO-MC-0) (15L051	3-01) Seawater Sa	mpled: 10	/28/15 00:00	Received	: 12/15/15	10:30				
Copper         0.039         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           3 Cu(TO-MC-100) (15L0513-03) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         Copper         0.072         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           4 Cu(TO-MC-200) (15L0513-04) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         Copper         0.138         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           4 Cu(TO-MC-200) (15L0513-04) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         Copper         0.333         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           5 Cu(TO-MC-400) (15L0513-05) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         Copper         0.693         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           6 Cu(TO-MC-800) (15L0513-07) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         Copper         1.39         0.002 </td <td>Copper</td> <td>ND</td> <td>0.002</td> <td>0.100</td> <td>mg/l</td> <td>2</td> <td>5122347</td> <td>12/23/15</td> <td>12/28/15</td> <td>EPA 6010</td> <td></td>	Copper	ND	0.002	0.100	mg/l	2	5122347	12/23/15	12/28/15	EPA 6010	
A       O       O         S Cu(TO-MC-100) (15L0513-03) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30         Copper       0.072       0.002       0.100       mg/l       2       5122347       12/23/15       12/28/15       EPA 6010         4 Cu(TO-MC-200) (15L0513-04) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30       EPA 6010         Copper       0.138       0.002       0.100       mg/l       2       5122347       12/23/15       12/28/15       EPA 6010         5 Cu(TO-MC-400) (15L0513-05) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30       EPA 6010         6 Cu(TO-MC-800) (15L0513-06) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30       EPA 6010         6 Cu(TO-MC-800) (15L0513-06) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30       EPA 6010         7 Cu(TO-MP-1600) (15L0513-07) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30       EPA 6010         8 Cu(TO-MP-1600) (15L0513-07) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30       EPA 6010         8 Cu(TO-MP-3200) (15L0513-07) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30       EPA 6010         9 Cu(TO-EP-0) (15L0513-09) Seawater       Sampled: 10/28/15 00:00       Rece	2 Cu(TO-MC-50) (15L05	13-02) Seawater S	ampled: 1	0/28/15 00:00	Receive	d: 12/15/1	5 10:30				
Copper         0.072         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           4 Cu(TO-MC-200) (15L0513-04) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         EPA 6010           Copper         0.138         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           5 Cu(TO-MC-400) (15L0513-05) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         EPA 6010           Copper         0.323         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           5 Cu(TO-MC-800) (15L0513-06) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         EPA 6010           6 Cu(TO-MP-1600) (15L0513-07) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         EPA 6010           7 Cu(TO-MP-1600) (15L0513-07) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         EPA 6010           8 Cu(TO-MP-3200) (15L0513-08) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         EPA 6010           9 Cu(TO-MP-3200) (15L0513-08) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         EPA 6010	Copper	0.039	0.002	0.100	mg/l	2	5122347	12/23/15	12/28/15	EPA 6010	J
A Cu(TO-MC-200) (15L0513-04) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30         Copper       0.138       0.002       0.100       mg/l       2       512:347       12/23/15       12/28/15       EPA 6010         5 Cu(TO-MC-400) (15L0513-05) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30       EPA 6010         6 Cu(TO-MC-800) (15L0513-06) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30       EPA 6010         6 Cu(TO-MC-800) (15L0513-06) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30       EPA 6010         7 Cu(TO-MC-800) (15L0513-07) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30       EPA 6010         7 Cu(TO-MP-1600) (15L0513-07) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30       EPA 6010         8 Cu(TO-MP-1600) (15L0513-07) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30       EPA 6010         8 Cu(TO-MP-3200) (15L0513-07) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30       EPA 6010         8 Cu(TO-MP-3200) (15L0513-07) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30       EPA 6010         9 Cu(TO-EP-0) (15L0513-09) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30       EPA 6010         9 Cu(TO-EP-0) (15L0513-09) Seawater	3 Cu(TO-MC-100) (15L0	513-03) Seawater	Sampled:	10/28/15 00:0	0 Receiv	ed: 12/15/	15 10:30				
Copper         0.138         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           S Cu(TO-MC-400) (15L0513-05) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         EPA 6010           Copper         0.323         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           6 Cu(TO-MC-800) (15L0513-06) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         EPA 6010           Copper         0.693         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           7 Cu(TO-MP-1600) (15L0513-07) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         EPA 6010           7 Cu(TO-MP-3200) (15L0513-08) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         EPA 6010           8 Cu(TO-MP-3200) (15L0513-08) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         EPA 6010           9 Cu(TO-SP-0) (15L0513-09) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         EPA 6010           9 Cu(TO-EP-0) (15L0513-09) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         EPA 6010 </td <td>Copper</td> <td>0.072</td> <td>0.002</td> <td>0.100</td> <td>mg/l</td> <td>2</td> <td>5122347</td> <td>12/23/15</td> <td>12/28/15</td> <td>EPA 6010</td> <td>J</td>	Copper	0.072	0.002	0.100	mg/l	2	5122347	12/23/15	12/28/15	EPA 6010	J
Sumplet:       10/28/15 00:00       Received:       12/15/15 10:30         Copper       0.323       0.002       0.100       mg/l       2       5122347       12/23/15       12/28/15       EPA 6010         6 Cu(TO-MC-800) (15L0513-06) Seawater       Sampled:       10/28/15 00:00       Received:       12/15/15 10:30         Copper       0.693       0.002       0.100       mg/l       2       5122347       12/23/15       12/28/15       EPA 6010         7 Cu(TO-MP-1600) (15L0513-07) Seawater       Sampled:       10/28/15 00:00       Received:       12/15/15 10:30       EVA 6010         7 Cu(TO-MP-1600) (15L0513-07) Seawater       Sampled:       10/28/15 00:00       Received:       12/15/15 10:30       EVA 6010         8 Cu(TO-MP-3200) (15L0513-08) Seawater       Sampled:       10/28/15 00:00       Received:       12/15/15 10:30       EVA 6010         8 Cu(TO-MP-3200) (15L0513-08) Seawater       Sampled:       10/28/15 00:00       Received:       12/15/15 10:30       EVA 6010         9 Cu(TO-EP-0) (15L0513-09) Seawater       Sampled:       10/28/15 00:00       Received:       12/15/15 10:30       EVA 6010         9 Cu(TO-EP-0) (15L0513-09) Seawater       Sampled:       10/28/15 00:00       Received:       12/15/15 10:30       EVA 6010	4 Cu(TO-MC-200) (15L0	513-04) Seawater	Sampled:	10/28/15 00:0	0 Receiv	ed: 12/15/	15 10:30				
Copper         0.323         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           6 Cu(TO-MC-800) (15L0513-06) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         EPA 6010           Copper         0.693         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           7 Cu(TO-MP-1600) (15L0513-07) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         EPA 6010           7 Cu(TO-MP-1600) (15L0513-07) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         EPA 6010           8 Cu(TO-MP-3200) (15L0513-08) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         EPA 6010           9 Cu(TO-EP-0) (15L0513-09) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         EPA 6010	Copper	0.138	0.002	0.100	mg/l	2	5122347	12/23/15	12/28/15	EPA 6010	
6 Cu(TO-MC-800) (15L0513-06) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30         Copper       0.693       0.002       0.100       mg/l       2       512347       12/23/15       12/28/15       EPA 6010         7 Cu(TO-MP-1600) (15L0513-07) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30       EPA 6010         Copper       1.39       0.002       0.100       mg/l       2       512347       12/23/15       12/28/15       EPA 6010         8 Cu(TO-MP-3200) (15L0513-08) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30       EPA 6010         8 Cu(TO-MP-3200) (15L0513-08) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30       EPA 6010         9 Cu(TO-EP-0) (15L0513-09) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30       EPA 6010	5 Cu(TO-MC-400) (15L0	513-05) Seawater	Sampled:	10/28/15 00:0	0 Receiv	ed: 12/15/	15 10:30				
Copper         0.693         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           7 Cu(TO-MP-1600) (15L0513-07) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         EPA 6010           Copper         1.39         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           S Cu(TO-MP-3200) (15L0513-08) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         EPA 6010           Copper         2.97         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           9 Cu(TO-EP-0) (15L0513-09) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30         EPA 6010	Copper	0.323	0.002	0.100	mg/l	2	5122347	12/23/15	12/28/15	EPA 6010	
7 Cu(TO-MP-1600) (15L0513-07) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30         Copper       1.39       0.002       0.100       mg/l       2       5122347       12/23/15       12/28/15       EPA 6010         8 Cu(TO-MP-3200) (15L0513-08) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30          EPA 6010         9 Cu(TO-EP-0) (15L0513-09) Seawater       Sampled: 10/28/15 00:00       Received: 12/15/15 10:30	6 Cu(TO-MC-800) (15L0	513-06) Seawater	Sampled:	10/28/15 00:0	0 Receiv	ed: 12/15/	15 10:30				
Copper         1.39         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           8 Cu(TO-MP-3200) (15L0513-08) Seawater         Sampled:         10/28/15         00:00         Received:         12/15/15         10:30           Copper         2.97         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           9 Cu(TO-EP-0) (15L0513-09) Seawater         Sampled:         10/28/15         00:00         Received:         12/15/15         10:28	Copper	0.693	0.002	0.100	mg/l	2	5122347	12/23/15	12/28/15	EPA 6010	
S Cu(TO-MP-3200) (15L0513-08) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30           Copper         2.97         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           9 Cu(TO-EP-0) (15L0513-09) Seawater         Sampled: 10/28/15 00:00         Received: 12/15/15 10:30	7 Cu(TO-MP-1600) (15L0	0513-07) Seawater	Sampled	: 10/28/15 00:	00 Recei	ved: 12/15	15 10:30	)			
Copper         2.97         0.002         0.100         mg/l         2         5122347         12/23/15         12/28/15         EPA 6010           9 Cu(TO-EP-0)         (15L0513-09)         Seawater         Sampled:         10/28/15         00:00         Received:         12/15/15         10:20	Copper	1.39	0.002	0.100	mg/l	2	5122347	12/23/15	12/28/15	EPA 6010	
9 Cu(TO-EP-0) (15L0513-09) Seawater Sampled: 10/28/15 00:00 Received: 12/15/15 10:30	8 Cu(TO-MP-3200) (15L0	0513-08) Seawater	Sampled	: 10/28/15 00:	00 Recei	ved: 12/15	15 10:30	)			
	Copper	2.97	0.002	0.100	mg/l	2	5122347	12/23/15	12/28/15	EPA 6010	
	9 Cu(TO-EP-0) (15L0513	-09) Seawater Sa	mpled: 10/	28/15 00:00	Received:	12/15/15	10:30				
	. , ,		-					12/23/15	12/28/15	EPA 6010	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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EMA Log #: 15L0513

### Total Metals by EPA 6000/7000 Series Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
10 Cu(TO-EP-15.6) (15L05	13-10) Seawater	Sampled	: 10/28/15 00:00	Recei	ived: 12/15	/15 10:30				
Copper	0.004	0.002	0.100	mg/l	2	5122347	12/23/15	12/28/15	EPA 6010	J
Cu 11(TO-EP-31.3) (15L05)	13-11) Seawater	Sampled	: 10/28/15 00:00	Recei	ived: 12/15	15 10:30				
Copper	0.012	0.002	0.100	mg/l	2	5122347	12/23/15	12/28/15	EPA 6010	J
Cu 12(TO-EP-62.5) (15L05)	13-12) Seawater	Sampled	: 10/28/15 00:00	Recei	ived: 12/15	15 10:30				
Copper	0.039	0.002	0.100	mg/l	2	5122347	12/23/15	12/28/15	EPA 6010	J
Cu 13(TO-EP-125) (15L051	l3-13) Seawater	Sampled:	10/28/15 00:00	Receiv	ved: 12/15/	15 10:30				
Copper	0.089	0.002	0.100	mg/l	2	5122347	12/23/15	12/28/15	EPA 6010	J
Cu 14(TO-EP-250) (15L051	3-14) Seawater	Sampled:	10/28/15 00:00	Receiv	ved: 12/15/	15 10:30				
Copper	0.225	0.002	0.100	mg/l	2	5122347	12/23/15	12/28/15	EPA 6010	
Cu 15(TO-EC-0) (15L0513-	15) Seawater S	ampled: 1	0/28/15 00:00 F	Receive	d: 12/15/15	5 10:30				
Copper	ND	0.002	0.100	mg/l	2	5122347	12/23/15	12/29/15	EPA 6010	
Cu 16(TO-EC-5.8) (15L051)	3-16) Seawater	Sampled:	10/28/15 00:00	Receiv	ved: 12/15/	15 10:30				
Copper	ND	0.002	0.100	mg/l	2	5122347	12/23/15	12/29/15	EPA 6010	
Cu 17(TO-EC-8.4) (15L051)	3-17) Seawater	Sampled:	10/28/15 00:00	Receiv	ved: 12/15/	15 10:30				
Copper	ND	0.002	0.100	mg/l	2	5122347	12/23/15	12/29/15	EPA 6010	
Cu 18(TO-EC-12) (15L0513	3-18) Seawater	Sampled:	10/28/15 00:00	Receiv	ed: 12/15/1	15 10:30				
Copper	0.003	0.002	0.100	mg/l	2	5122347	12/23/15	12/29/15	EPA 6010	J

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EMA Log #: 15L0513

### Total Metals by EPA 6000/7000 Series Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Cu 19(TO-EC-17.2) (15L0513-19)	Seawater	Sampled	: 10/28/15 00:00	Rece	ived: 12/15	/15 10:30	1			
Copper	0.008	0.002	0.100	mg/l	2	5122347	12/23/15	12/29/15	EPA 6010	J
Cu 20(TO-EC-24) (15L0513-20) S	eawater s	Sampled:	10/28/15 00:00	Receiv	ed: 12/15/1	5 10:30				
Copper	0.011	0.002	0.100	mg/l	2	5122347	12/23/15	12/29/15	EPA 6010	J
21 Cu (TO-EC-35) (15L0513-21) S	Seawater	Sampled:	10/28/15 00:00	Receiv	ved: 12/15/	15 10:30				
Copper	0.017	0.002	0.100	mg/l	2	5122344	12/23/15	12/23/15	EPA 6010	J

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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EMA Log #: 15L0513

### Total Metals by EPA 6000/7000 Series Methods - Quality Control

			Reporting		Spike	Source		%REC		RPD	
Analyte	Result	MDL	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes
Batch 5122344											
Blank (5122344-BLK1)					Prepared	& Analyz	ed: 12/23/	15			
Copper	ND	0.0009	0.050	mg/l							
LCS (5122344-BS1)					Prepared	& Analyz	ed: 12/23/	15			
Copper	1.03	0.0009	0.050	mg/l	1.00		103	75-125			-
Duplicate (5122344-DUP1)		Sour	ce: 15L05	11-01	Prepared	& Analyz	ed: 12/23/	15			
Copper	0.730	0.090	5.00	mg/l		0.749			3	20	J
Batch 5122347											
Blank (5122347-BLK1)					Prepared:	12/23/15	Analyzed	£ 12/28/15			
Copper	ND	0.0009	0.050	mg/l							
LCS (5122347-BS1)					Prepared:	12/23/15	Analyzed	£ 12/28/15			
Copper	1.06	0.0009	0.050	mg/l	1.00		106	75-125			
Duplicate (5122347-DUP1)		Sour	rce: 15L05	13-06	Prepared:	12/23/15	Analyzed	£ 12/28/15			
Copper	0.671	0.002	0.100	mg/l		0.693			3	20	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

- EnviroMatrix EMAnalytical, Inc.

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### EMA Log #: 15L0513

#### Notes and Definitions

J	$Detected \ but \ below \ the \ Reporting \ Limit; \ therefore, \ result \ is \ an \ estimated \ concentration \ (CLP \ J-Fl ag).$
ND	Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified)
NR.	Not Reported
dry	Sample results reported on a dry weight basis (if indicated in units column)
RPD	Relative Percent Difference

MDL Method detection limit (indicated per client's request)

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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<sup>2</sup>EMA reserves the right to return any samples that do not march four waste profile. NOTE: By relinquisting samples to EMA, Inc., client agrees to pay four its aervices requested on this COC form and any additional sunlyses performed on this project. Payment for services is due within 30 days from date of invoice. Samples will be disposed of 7 days after report has been discording to the project. Payment for services is due within 30 days from date of invoice. Samples will be

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	10/28/6	ſ	36		$\square$	$\vdash$		_		-			1	-		1	+	-	35	5 5		
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10 CUZE CT EC- 24)	10/28/15	1	200	2		╀	1	+		-		_	X			H			3			
Waterix Codes: A = Air, DW = Drinking Water, GW = Groundwater, SW = Storm Water WW = Watewater S = Soil SED = Softman SD = Softman SD = Softman	r, SW = Storm W	fer				8	RELINQUISHED BY	- ISHEI	BY, L	-		DATE/TIMF	Z#	_		1ª	Å	Ţ		726		
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<sup>1</sup> Turn-Around-Time: a Same Day a 1 day a 2 day a 1 day a 4 day a 5 day a 2 day a 2 day	f day in 5 day in	ATD CL A	1		Lini	ĩ	Maily Colun	Celu	e				Ş	1Ę		N	15	2 L C C E		Ţ		
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'Sample Disposal: A By Laboratory a Return to Client: P/U or Delivery a Archive	Delivery 🗆 Arch	ve			Print	2								Sigr	Signature					Π		
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Project/Sample Commente:	Sampled By-Charle EMA Autosampler	È.	A Autosar	apler	Company	DY:								ð	Company:							
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recommended uses may apply. Arease note there is a \$35 minimum charge for all citerits. <sup>2</sup> EMA reserves the right to return any samples that do not march our waste month.	arge för all clients weste nrofile																			7		

<sup>2</sup>EMA reserves the right to return any samples that do not match our wake profile. NOTE: By reliquiabing samples to EMA, Jun., client agress to pay for the services requested on this OCC form and may additional analyses performed on this project. Payment for services is due within 30 days from date of invoice. Samples will be disposed of 7 days after report has been finalized unless otherwise noted. All work is subject to EMA's terms and conditions.

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1333         24         25         20 <t< th=""><th>n merrya Luphen polens(s): Morry (Orracia)</th><th></th><th></th><th></th><th></th><th>deN</th><th></th><th></th><th></th><th>о Этц:</th><th>pov</th><th></th><th></th><th></th><th></th><th></th></t<>	n merrya Luphen polens(s): Morry (Orracia)					deN				о Этц:	pov					
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NOTE: By relinquishing samples to EMA, Inc., client agress to pay for the services requested on this COC form and any additional analyses performed on this project. Payment for services is due within 30 days from due of invoice. Samples will be disposed of 7 days after the services and the services is due within 30 days from due of invoice. Samples will be

## A.4. ZINC EXPOSURES – PURPLE URCHIN:

CETIS Sum		<u> </u>						Test Code:		14F	233C8   03	3 (p 1 of 3-5141-728
Echinoid Emb	oryo-Larval Dev	elopme	nt Test							SPAV	VAR Syste	ms Cente
Batch ID: Start Date: Ending Date:	18-8664-8575 25 Mar-16 09:3	30	Test Type: Protocol: Species:	Development EPA/600/R-95 Strongylocentr		tus		Analyst: Diluent: Brine:	Labo	ob Munson-I oratory Seav Applicable		
Duration:	NA		Source:	Field Collected	1 . 1			Age:				
Sample ID:	10-0881-9327		Code:	3C215C7F				Client:	SPA	WAR		
Sample Date:	25 Mar-16 09:3	30	Material:	Zinc sulfate				Project:	Puls	ed Exposure	Э	
Receive Date:			Source:	Pulsed Exposu	ire							
Sample Age:	NA		Station:	3 Hour								
Comparison S	Summary											
Analysis ID	Endpoint		NOEI	LOEL	TOEL	PMSD	τu	Meth	nod			
11-8378-1410	Proportion Nor	mal	31000	) >31000	NA	24.1%		Stee	l Man	y-One Rank	Sum Test	
Point Estimate	e Summary											
Analysis ID	Endpoint		Level	μg/L	95% LCL	95% UCL	τu	Meth	nod			
20-4223-0387	Proportion Nor	mal	EC50	27120	22060	32540		Line	ar Reș	gression (MI	.E)	
Test Acceptab	oility											
Analysis ID	Endpoint		Attrib	ute	Test Stat	TAC Limi	ts	Ove	rlap	Decision		
11-8378-1410	Proportion Nor	mal	Contr	ol Resp	0.9525	0.8 - NL		Yes		Passes Ad	ceptability	Criteria
20-4223-0387	Proportion Nor	mal	Contr	ol Resp	0.9525	0.8 - NL		Yes		Passes Ad	ceptability	Criteria
11-8378-1410	Proportion Nor	mal	PMSI	0	0.2408	NL - 0.25		No		Passes A	ceptability	Criteria
Proportion No	ormal Summary											
C-µg/L	Control Type	Count	: Mean	95% LCL	95% UCL	Min	Max	Std	Err	Std Dev	CV%	%Effec
6.1	Lab Control	4	0.952	5 0.8752	1	0.88	0.98	0.02	428	0.04856	5.1%	0.0%
1900		4	0.952	5 0.9445	0.9605	0.95	0.96	0.00	25	0.005	0.52%	0.0%
3900		4	0.962		0.9777	0.95	0.97		4787	0.009574	0.99%	-1.05%
7700		4	0.947		0.9803	0.92	0.97			0.02062	2.18%	0.52%
15000		4	0.905		0.9429	0.88	0.93			0.0238	2.63%	4.99%
31000		4	0.34	0	0.9769	0.02	0.91	0.20	01	0.4002	117.7%	64.3%
Proportion No	ormal Detail											
C-µg/L	Control Type	Rep 1	Rep 2		Rep 4							
6.1	Lab Control	0.98	0.97	0.88	0.98							
1900		0.95	0.95	0.95	0.96							
3900		0.97	0.97	0.96	0.95							
7700		0.95	0.95	0.97	0.92							
15000		0.88	0.93	0.92	0.89							
31000		0.02	0.32	0.11	0.91							
Proportion No	ormal Binomials	5										
C-µg/L	Control Type	Rep 1	Rep 2	-	Rep 4							
	Lab Control	98/10	97/10	0 88/100	98/100							
6.1		95/10	95/10	0 95/100	96/100							
6.1 1900												
		97/10	97/10	0 96/100	95/100							
					95/100 92/100							
1900 3900		97/10	95/10	0 97/100								

CETIS™ v1.8.7.16

CETIS An	alytical Repo	ort					-	oort Date: t Code:			13 (p 1 of 2 3-5141-728
Echinoid Em	ıbryo-Larval Dev	elopmer	nt Test						SPA	WAR Syste	ems Center
Analysis ID: Analyzed:	11-8378-1410 02 Jun-16 12:2		Endpoint: Analysis:	Proportion No Nonparametri		/s Treatment		TIS Versio cial Resul		.8.7	
Batch ID: Start Date: Ending Date Duration:	18-8664-8575 25 Mar-16 09:3 : NA	50 I	Test Type: Protocol: Species: Source:	Development EPA/600/R-9 Strongylocent Field Collecte	rotus purp			uent: La ne: No	acob Munson-I aboratory Seav ot Applicable		
Sample ID: Sample Date Receive Date Sample Age:		i0 I	Code: Material: Source: Station:	3C215C7F Zinc sulfate Pulsed Expos 3 Hour	ure		Clie Pro		PAWAR ulsed Exposur	e	
Data Transfo	rm	Zeta	Alt H	yp Trials	Seed		PMSD	NOEL	LOEL	TOEL	TU
Angular (Corr	rected)	NA	C > T	NA	NA		24.1%	31000	>31000	NA	
Steel Many-C	One Rank Sum T	est									
Control	vs C-µg/L		Test	Stat Critical	Ties	DF P-Value	P-Type	Decisio	n(α:5%)		
6.1	1900		14	10	0	6 0.3451	Asymp		nificant Effect		
6.1	3900		15	10	1	6 0.4761	Asymp	-	nificant Effect		
6.1	7700		14.5	10	1	6 0.4092	Asymp	-	nificant Effect		
6.1	15000		13.5	10	1	6 0.2853	Asymp	-	nificant Effect		
6.1	31000		11	10	0	6 0.0805	Asymp	Non-Sig	nificant Effect		
Test Accepta	bility Criteria										
Attribute	Test Stat	TAC L	imits	Overlap	Decisi	on					
Control Resp	0.9525	0.8 - N	IL	Yes	Passes	s Acceptabilit	y Criteria				
PMSD	0.2408	NL - 0.	.25	No	Passes	s Acceptabilit	y Criteria				
ANOVA Tabl	e										
Source	Sum Squ	ares	Mean	Square	DF	F Stat	P-Value	Decisio	n(α:5%)		
Between	1.924405		0.384		5	9.042	0.0002		ant Effect		
Error	0.766161	5	0.042	56453	18			-			
Total	2.690567				23						
Distributiona	al Tests										
Attribute	Test			Test Sta	t Critica	P-Value	Decisior	n(α:1%)			
Variances		auality o	of Variance	42.05	15.09	< 0.0001		Variances			
Distribution	Shapiro-			0.669	0.884	<0.0001		nal Distribu	ution		
Proportion N	lormal Summary										
C-µg/L	Control Type	Count	: Mean	95% LCI	L 95% U	CL Median	Min	Max	Std Err	CV%	%Effect
6.1	Lab Control	4	0.952		1	0.975	0.88	0.98	0.02428	5.1%	0.0%
1900		4	0.952		0.9605	0.95	0.95	0.96	0.0025	0.53%	0.0%
3900		4	0.962		0.9777	0.965	0.95	0.97	0.004787	0.99%	-1.05%
7700		4	0.947		0.9803	0.95	0.92	0.97	0.01031	2.18%	0.52%
15000		4	0.905	0.8671	0.9429	0.905	0.88	0.93	0.0119	2.63%	4.99%
31000		4	0.34	0	0.9769	0.215	0.02	0.91	0.2001	117.7%	64.3%
Angular (Cor	rected) Transfor	med Su	mmary								
C-µg/L	Control Type	Count	: Miean	95% LCI	95% U	CL Median	Min	Max	Std Err	cv%	%Effect
6.1	Lab Control	4	1.368		1.53	1.413	1.217	1.429	0.05085	7.44%	0.0%
1900		4	1.351		1.371	1.345	1.345	1.369	0.006038	0.89%	1.21%
		4	1.377		1.416	1.383	1.345	1.397	0.01238	1.8%	-0.67%
3900				4 000	1 446	1.345	1.284	1.397	0.02304	3.43%	1.83%
3900 7700		4	1.343	1.269	1.416	1.545	1.204		0.02001	0.4070	1.0070
		4 4 4	1.343 1.259 0.586	1.194	1.324 1.367	1.258 0.4697	1.217 0.1419	1.303 1.266	0.02044 0.2452	3.25% 83.57%	7.95% 57.1%

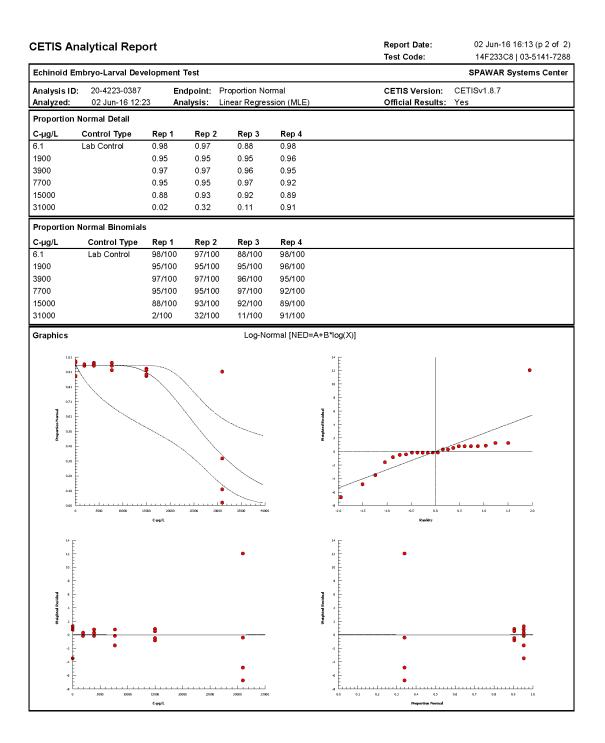
CETIS™ v1.8.7.16

CETIS Ana	alytical Repo	ort					Report Date: Test Code:	02 Jun-16 16:13 (p 2 of 2 14F233C8   03-5141-728
Echinoid Em	bryo-Larval Deve	elopme	nt Test					SPAWAR Systems Center
Analysis ID: Analyzed:	11-8378-1410 02 Jun-16 12:2		•	Proportion Nor Nonparametric		Treatments	CETIS Version: Official Results:	CETISv1.8.7 Yes
Proportion N	ormal Detail							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.1	Lab Control	0.98	0.97	0.88	0.98			
1900		0.95	0.95	0.95	0.96			
3900		0.97	0.97	0.96	0.95			
7700		0.95	0.95	0.97	0.92			
15000		0.88	0.93	0.92	0.89			
31000		0.02	0.32	0.11	0.91			
Angular (Cor	rected) Transfor	med De	tail					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.1	Lab Control	1.429	1.397	1.217	1.429			
1900		1.345	1.345	1.345	1.369			
3900		1.397	1.397	1.369	1.345			
7700		1.345	1.345	1.397	1.284			
15000		1.217	1.303	1.284	1.233			
31000		0.1419	9 0.6013	0.3381	1.266			
Proportion N	ormal Binomials	;						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.1	Lab Control	98/100	97/100	88/100	98/100			
1900		95/100	95/100	95/100	96/100			
3900		97/100	97/100	96/100	95/100			
7700		95/100	95/100	97/100	92/100			
15000		88/100	93/100	92/100	89/100			
31000		2/100	32/100	11/100	91/100			
Graphics								
10			E E			02 Converse 04 A	••••••••••••	
0.1	5.1 LC 1900	3100 C-µg/L	7700	15000 31000		-0.5 -0.6 -2.0 -1.5	1   -1.0 -0.5 0.0 Rankëts	

CETIS™ v1.8.7.16

CETIS Ana	lytical Repo	ort					-	rt Date: Code:			:13 (p 1 of 2 )3-5141-728
Echinoid Eml	oryo-Larval Deve	lopment Te	est								ems Cente
Analysis ID: Analyzed:	20-4223-0387 02 Jun-16 12:23			oportion Nori near Regress				S Version: ial Results		.8.7	
Batch ID: Start Date: Ending Date: Duration:	18-8664-8575 25 Mar-16 09:30 NA		ocol: EF cies: St	evelopment PA/600/R-95/ rongylocentro eld Collected	otus purpurat	us	Analy Dilue Brine Age:	nt: Lab	ob Munson- oratory Sea Applicable		
Sample ID: Sample Date: Receive Date Sample Age:		Code D Mate Sou Stati	erial: Zir rce: Pu	2215C7F nc sulfate Ilsed Exposu Hour	re		Clien Proje		AWAR sed Exposur	e	
Linear Regre	ssion Options										
Model Functi Log-Normal [N	on IED=A+B*log(X)]		Threshol Control T	l <b>d Option</b> hreshold	Threshold 0.0475	Optimized Yes	Pooled No	Het Corr Yes	Weighted Yes	1	
Regression S	ummary										
Iters LL 6 -681.	AICc 7 1371	BIC 1373	Mu 4.433	Sigma 0.1577	Adj R2 0.8001	F Stat 0.04186	Critical 3.16	P-Value 0.9882	Decision Non-Sian	(α:5%) ificant Lac	k of Fit
Point Estimat	es										
Level μg/L EC50 2712	95% LCL	95% UCL 32540									
Test Acceptal	oility Criteria										
Attribute	Test Stat	TAC Limit	s	Overlap	Decision						
Control Resp	0.9525	0.8 - NL		Yes	Passes Ac	ceptability C	Criteria				
Regression P											
Parameter Threshold	Estimate 0.04615	Std Error 0.0177	95% LCL 0.009339		t Stat 2.607	P-Value 0.0165	Decision(	α:5%) Parameter			
Slope	6.34	1.778	2.643	10.04	3.566	0.0018	-	Parameter			
Intercept	-28.11	7.891	-44.52	-11.7	-3.562	0.0018	Significant	Parameter	•		
ANOVA Table											
Source Model	Sum Squa 1061.223	ares Mea 1061	n Square	DF 1	F Stat 94.06	P-Value <0.0001	Decision( Significant				
Lack of Fit	1.641275		.223 7092	3	0.04186	0.9882	Non-Signif				
Pure Error	235.2768	13.0		18							
Residual	236.918	11.2	8181	21							
Residual Ana				<b>T</b> - 4 04 - 4	0	<b>D</b> Malana	<b>-</b> · · <i>i</i>				
Attribute Goodness-of-I	Method Fit Pearson C	hi-Sa GOF		Test Stat 236.9	Critical 32.67	P-Value <0.0001	Decision( Significant	Heterogen	ity		
Variances	Likelihood Mod Lever	Ratio GOF ne Equality o			32.67 2.773	<0.0001 0.0529	Significant Equal Vari	Heterogen ances	ity		
Distribution		ilk W Norma Darling A2 N	-	0.7006 3.056	0.9169 2.492	<0.0001 <0.0001		al Distributi al Distributi			
Proportion No	ormal Summary				Calcul	ated Variat	e(A/B)				
C-µg/L (	Control Type	Count	Mean	Min	Мах	Std Err	Std Dev	cv%	%Effect	A	в
	ab Control	4	0.9525	0.88	0.98	0.02428	0.04856	5.1%	0.0%	381	400
1900 3900		4 4	0.9525 0.9625	0.95 0.95	0.96 0.97	0.0025 0.004787	0.005 0.009574	0.53% 0.99%	0.0% -1.05%	381 385	400 400
		4	0.9625 0.9475	0.95	0.97 0.97	0.004787	0.009574	0.99% 2.18%	-1.05% 0.52%	365 379	400 400
7700											
7700 15000		4	0.905	0.88	0.93	0.0119	0.0238	2.63%	4.99%	362	400

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								Test Code:		350	DF03E3   09	-0380-797
Echinoid Emb	ryo-Larval Dev	elopmen	Test							SPA	WAR Syste	ms Cente
Batch ID: Start Date: Ending Date: Duration:	18-8664-8575 25 Mar-16 09:3 NA	50 P S	est Type: rotocol: pecies: ource:	Development EPA/600/R-95/ Strongylocentre Field Collected	otus purpura	tus		Diluent:	Labora	Munson-I tory Seav plicable		
Sample ID: Sample Date: Receive Date: Sample Age:	10-7952-1621 25 Mar-16 09:3 NA	60 M S	ode: aterial: ource: tation:	40583155 Zinc sulfate Pulsed Exposu 6 Hour	re				SPAW/ Pulsed	AR Exposur	e	
Comparison S	ummary											
Analysis ID	Endpoint		NOEI		TOEL	PMSD	τu	Metho				
18-8256-3241	Proportion Nor	mal	15000	) 31000	21560	13.0%		Steel	Many-C	One Rank	sum Test	
Point Estimate	e Summary											
Analysis ID	Endpoint		Level		95% LCL	95% UCL	TU	Metho				
17-0420-4437	Proportion Nor	mal	EC50	27140	23300	32980		Linear	r Regre	ssion (M	LE)	
Test Acceptab	ility											
Analysis ID	Endpoint		Attrib		Test Stat	TAC Limi	ts	Overl	·	ecision		
17-0420-4437	Proportion Nor			ol Resp	0.9525	0.8 - NL		Yes			cceptability	
18-8256-3241	Proportion Nor			ol Resp	0.9525	0.8 - NL		Yes			cceptability	
18-8256-3241	Proportion Nor	mal	PMSI	)	0.13	NL - 0.25		No	P	asses A	cceptability	Criteria
Proportion No	rmal Summary											
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std E	rr S	td Dev	CV%	%Effec
	Lab Control	4	0.952		1	0.88	0.98			.04856	5.1%	0.0%
1900		4	0.967		1	0.95	0.99	0.010		.02062	2.13%	-1.58%
3900		4	0.955		0.9755	0.94	0.97	0.006		.01291	1.35%	-0.26%
7700		4	0.93	0.9075	0.9525	0.92	0.95			.01414	1.52%	2.36%
15000 31000		4 4	0.835 0.38	0.6469 0.001436	1 0.7586	0.66 0.15	0.92 0.6	0.059 0.119		.1182 .2379	14.15% 62.61%	12.34% 60.1%
		-	0.00	0.001400	0.7000	0.10	0.0	0.110		.2070	02.0170	00.170
Proportion No		<b>B</b> 4		<b>.</b>	<b>B</b>							
	Control Type	Rep 1	Rep 2		Rep 4							
	Lab Control	0.98	0.97	0.88	0.98							
1900		0.99	0.98	0.95	0.95							
3900		0.95	0.94	0.96	0.97							
7700		0.93	0.95	0.92	0.92							
15000		0.66	0.88	0.92	0.88							
31000		0.57	0.6	0.15	0.2							
Proportion No	rmal Binomials	6										
	Control Type	Rep 1	Rep 2		Rep 4							
	Lab Control	98/100	97/10		98/100							
1900		99/100	98/10		95/100							
3900		95/100	94/10	0 96/100	97/100							
7700		93/100	95/10	0 92/100	92/100							
		66/100	88/10	0 92/100	88/100							
15000		66/100	00/10	0 52/100	00/100							

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		ort					-	ort Date: Code:		F03E3   09	5 (p 1 of 9-0380-79:
Echinoid Emb	oryo-Larval Deve	elopmei	nt Test						SPAV	VAR Syste	ems Cente
Analysis ID: Analyzed:	18-8256-3241 03 Jun-16 8:09		Endpoint: Analysis:	Proportion No Nonparametri		Treatments		IS Version		.8.7	
Batch ID: Start Date: Ending Date: Duration:	18-8664-8575 25 Mar-16 09:3 NA	0 I	Test Type: Protocol: Species: Source:	Development EPA/600/R-95 Strongylocent Field Collecter	rotus purpur		Anal Dilu Brin Age:	ent: Lat e: No	cob Munson-E poratory Seav t Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:		0 1	Code: Material: Source: Station:	40583155 Zinc sulfate Pulsed Expos 6 Hour	ure		Clier Proj	nt: SP	AWAR Ised Exposure	e	
Data Transfor	m	Zeta	Alt H	yp Trials	Seed		PMSD	NOEL	LOEL	TOEL	TU
Angular (Corre	cted)	NA	C > T	NA	NA		13.0%	15000	31000	21560	
Steel Many-Or	ne Rank Sum Te	est									
Control	vs C-µg/L		Test	Stat Critical	Ties D	F P-Value	P-Type	Decision	n(α:5%)		
6.1	1900		19	10	2 6	0.9055	Asymp		ificant Effect		
6.1	3900		14.5	10	1 6	0.4092	Asymp	Non-Sign	ificant Effect		
6.1	7700		14	10	06	0.3451	Asymp	Non-Sign	ificant Effect		
6.1	15000		12	10	1 6	0.1424	Asymp	Non-Sign	ificant Effect		
6.1	31000*		10	10	0 6	0.0417	Asymp	Significa	nt Effect		
Test Acceptab	oility Criteria										
Attribute	Test Stat	TAC L	imits	Overlap	Decision	ı					
Control Resp	0.9525	0.8 - N	IL	Yes	Passes	Acceptability	Criteria				
PMSD	0.13	NL - 0	.25	No	Passes /	Acceptability	Criteria				
ANOVA Table											
Source	Sum Squ	ares	Mean	Square	DF	F Stat	P-Value	Decision	(a.2%)		
Between	1.622611	1163	0.324	-	5	18.77	<0.0001	Significar			
Error	0.3112574	L		29208	18	10.77	-0.0001	orginnear	In Ellect		
Total	1.933868		0.011		23						
Distributional	Tests										
Attribute	Test			Test Sta	Critical	P-Value	Decision	(0:196)			
Variances		quality	of Variance	16.73	15.09	0.0050	Unequal				
Distribution	Shapiro-\			0.9391	0.884	0.1560	Normal D				
Droportion No											
	ormal Summary	Count	Maan			Madion	Min	Max	Otol Ear	C) (0/	0/ Effect
	Control Type Lab Control	Count 4	Mean 0.952		. 95% UC	. Median 0.975	Min 0.88	Max 0.98	0.02428	CV%	%Effect 0.0%
	Lab Control	4	0.932			0.975	0.88	0.98	0.02428	5.1% 2.13%	-1.58%
		4	A 967	5 () (47.17				0.00			
1900		4 4	0.967 0.955		1 0.9755			0.97			-0.26%
1900 3900		4	0.955	0.9345	0.9755	0.955	0.94	0.97 0.95	0.006455	1.35%	-0.26% 2.36%
1900 3900 7700		4 4	0.955 0.93	0.9345 0.9075	0.9755 0.9525	0.955 0.925	0.94 0.92	0.95	0.006455 0.007071	1.35% 1.52%	2.36%
1900 3900 7700 15000		4	0.955	0.9345	0.9755 0.9525 1	0.955	0.94		0.006455	1.35%	2.36%
1900 3900 7700 15000 31000	ected) Transfor	4 4 4 4	0.955 0.93 0.835 0.38	0.9345 0.9075 0.6469	0.9755 0.9525 1	0.955 0.925 0.88	0.94 0.92 0.66	0.95 0.92	0.006455 0.007071 0.05909	1.35% 1.52% 14.15%	2.36% 12.34%
1900 3900 7700 15000 31000 Angular (Corr	ected) Transfor	4 4 4 4 med Su	0.955 0.93 0.835 0.38 mmary	0.9345 0.9075 0.6469 0.001436	0.9755 0.9525 1 6 0.7586	0.955 0.925 0.88 0.385	0.94 0.92 0.66 0.15	0.95 0.92 0.6	0.006455 0.007071 0.05909 0.119	1.35% 1.52% 14.15% 62.61%	2.36% 12.34% 60.1%
1900 3900 7700 15000 31000 Angular (Corr C-µg/L	Control Type	4 4 4 med Su Count	0.955 0.93 0.835 0.38 mmary Mean	0.9345 0.9075 0.6469 0.001436 <b>95% LCL</b>	0.9755 0.9525 1 0.7586 . 95% UCI	0.955 0.925 0.88 0.385 Median	0.94 0.92 0.66 0.15 Min	0.95 0.92 0.6 Max	0.006455 0.007071 0.05909 0.119 Std Err	1.35% 1.52% 14.15% 62.61%	2.36% 12.34% 60.1% %Effect
1900 3900 7700 15000 31000 Angular (Corr C-µg/L 6.1		4 4 4 med Su Count	0.955 0.93 0.835 0.38 mmary Mean 1.368	0.9345 0.9075 0.6469 0.001436 <b>95% LCL</b> 1.206	0.9755 0.9525 1 0.7586 0.7586 <b>95% UCI</b> 1.53	0.955 0.925 0.88 0.385 <b>Median</b> 1.413	0.94 0.92 0.66 0.15 Min 1.217	0.95 0.92 0.6 Max 1.429	0.006455 0.007071 0.05909 0.119 Std Err 0.05085	1.35% 1.52% 14.15% 62.61% <b>CV%</b> 7.44%	2.36% 12.34% 60.1% %Effect 0.0%
1900 3900 7700 15000 31000 Angular (Corre C-µg/L 6.1 1900	Control Type	4 4 4 med Su Count 4 4	0.955 0.93 0.835 0.38 mmary Mean 1.368 1.398	0.9345 0.9075 0.6469 0.001436 95% LCL 1.206 1.298	0.9755 0.9525 1 0.7586 <b>95% UCI</b> 1.53 1.497	0.955 0.925 0.88 0.385 <b>Median</b> 1.413 1.387	0.94 0.92 0.66 0.15 <b>Min</b> 1.217 1.345	0.95 0.92 0.6 <b>Max</b> 1.429 1.471	0.006455 0.007071 0.05909 0.119 Std Err 0.05085 0.03134	1.35% 1.52% 14.15% 62.61% <b>CV%</b> 7.44% 4.49%	2.36% 12.34% 60.1% %Effect 0.0% -2.17%
1900 3900 7700 15000 31000 Angular (Corr C-µg/L 6.1 1900 3900	Control Type	4 4 4 med Su Count 4 4 4	0.955 0.93 0.835 0.38 mmary Mean 1.368 1.398 1.359	0.9345 0.9075 0.6469 0.001436 <b>95% LCL</b> 1.206 1.298 1.308	0.9755 0.9525 1 0.7586 <b>95% UCI</b> 1.53 1.497 1.409	0.955 0.925 0.88 0.385 <b>Median</b> 1.413 1.387 1.357	0.94 0.92 0.66 0.15 <b>Min</b> 1.217 1.345 1.323	0.95 0.92 0.6 <b>Max</b> 1.429 1.471 1.397	0.006455 0.007071 0.05909 0.119 Std Err 0.05085 0.03134 0.01579	1.35% 1.52% 14.15% 62.61% 7.44% 4.49% 2.32%	2.36% 12.34% 60.1% %Effect 0.0% -2.17% 0.67%
1900 3900 7700 15000 31000 Angular (Corre C-µg/L 6.1 1900	Control Type	4 4 4 med Su Count 4 4	0.955 0.93 0.835 0.38 mmary Mean 1.368 1.398	0.9345 0.9075 0.6469 0.001436 95% LCL 1.206 1.298	0.9755 0.9525 1 0.7586 <b>95% UCI</b> 1.53 1.497	0.955 0.925 0.88 0.385 <b>Median</b> 1.413 1.387	0.94 0.92 0.66 0.15 <b>Min</b> 1.217 1.345	0.95 0.92 0.6 <b>Max</b> 1.429 1.471	0.006455 0.007071 0.05909 0.119 Std Err 0.05085 0.03134	1.35% 1.52% 14.15% 62.61% <b>CV%</b> 7.44% 4.49%	2.36% 12.34% 60.1% %Effect 0.0% -2.17%

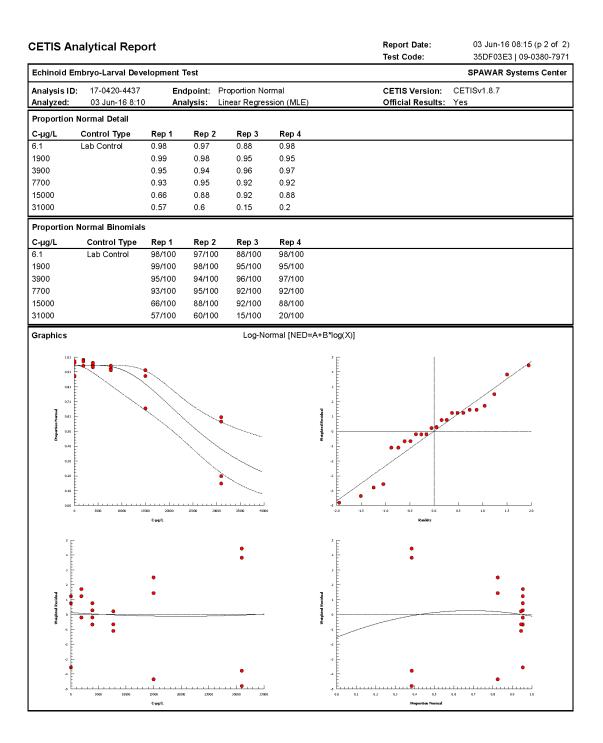
CETIS™ v1.8.7.16

CETIS Ana	alytical Repo	ort					Report Date: Test Code:	03 Jun-16 08:15 (p 2 of 2 35DF03E3   09-0380-797
Echinoid Em	bryo-Larval Deve	elopme	nt Test					SPAWAR Systems Center
Analysis ID: Analyzed:	18-8256-3241 03 Jun-16 8:09		•	Proportion No Nonparametric		Treatments	CETIS Version: Official Results:	CETISv1.8.7 Yes
Proportion N	ormal Detail							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.1	Lab Control	0.98	0.97	0.88	0.98			
1900		0.99	0.98	0.95	0.95			
3900		0.95	0.94	0.96	0.97			
7700		0.93	0.95	0.92	0.92			
15000		0.66	0.88	0.92	0.88			
31000		0.57	0.6	0.15	0.2			
Angular (Cori	rected) Transforr	ned De	ətail					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.1	Lab Control	1.429	1.397	1.217	1.429			
1900		1.471	1.429	1.345	1.345			
3900		1.345	1.323	1.369	1.397			
7700		1.303	1.345	1.284	1.284			
15000		0.948	3 1.217	1.284	1.217			
31000		0.855	6 0.8861	0.3977	0.4636			
Proportion N	ormal Binomials							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.1	Lab Control	98/10	0 97/100	88/100	98/100			
1900		99/10	0 98/100	95/100	95/100			
3900		95/10	0 94/100	96/100	97/100			
7700		93/10	0 95/100	92/100	92/100			
15000		66/10	0 88/100	92/100	88/100			
31000		57/10	0 60/100	15/100	20/100			
Graphics								
		-				0.25		•••
Proposition Normaal 90						Concentrated	••••••	
0.4				•		-0.05		
0.1			II			-0.20 -0.25		
6	.1LC 1900	3900 С-µg/L	7700	15000 31000		-2.0 -15	-1.0 -0.5 0.0 Rankits	05 1.0 1.5 2.0

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CETIS Ana	.,						Test	Code:	35[	DF03E3 0	19-0380-79
Echinoid Eml	oryo-Larval Deve	elopment	Test							· · ·	ems Cente
Analysis ID: Analyzed:	17-0420-4437 03 Jun-16 8:10		ndpoint: nalysis:	Proportion Nori Linear Regress				IS Version: ial Results		.8.7	
Batch ID: Start Date: Ending Date: Duration:	18-8664-8575 25 Mar-16 09:3 NA	0 Pr Sp		Development EPA/600/R-95/ Strongylocentro Field Collected	otus purpurat	tus	Anal Dilue Brin Age:	ent: Lab e: Not	ob Munson- oratory Sea Applicable		
Sample ID: Sample Date: Receive Date Sample Age:		0 Mi So	ode: aterial: ource: tation:	40583155 Zinc sulfate Pulsed Exposu 6 Hour	re		Clier Proj		AWAR sed Exposu	re	
-	ssion Options									-	
Model Functi	on IED=A+B*log(X)]			hold Option	Threshold 0.0475	Optimized Yes	Pooled No	Het Corr Yes	Weighted Yes	b	
			oonne		0.0110	100		100	100		
Regression S	-	RIC	<b>N</b> #++	Sigma	Adi P2	E Stat	Critical	P Volue	Declair	(0:59/)	
Iters LL 10 -755.	AICc 3 1518	BIC 1520	Mu 4.434	Sigma 0.2344	Adj R2 0.8511	F Stat 0.09269	Critical 3.16	P-Value 0.9631	Decision Non-Sign	(α:5%) ificant Lacl	k of Fit
		1020	4.464	0.2044	0.0011	0.00200	0.10	0.0001	Hon eigh	mount Euc	
Point Estimat	es										
Level µg/L	95% LCL	95% UC	Ľ								
EC50 2714	0 23300	32980									
Test Acceptal	oility Criteria										
Attribute	Test Stat	TAC Lin	nits	Overlap	Decision						
Attribute Control Resp	Test Stat 0.9525	<b>TAC Lin</b> 0.8 - NL		Overlap Yes	Decision Passes Ac	ceptability C	Criteria				
Control Resp	0.9525			-		ceptability C	Criteria				
	0.9525			-		ceptability C	Criteria				
Control Resp Regression P Parameter	0.9525 arameters Estimate	0.8 - NL Std Erro	or 95% L	Yes CL 95% UCL	Passes Ac	P-Value	Decision				
Control Resp Regression P Parameter Threshold	0.9525 arameters Estimate 0.04515	0.8 - NL Std Erro 0.01369	or <b>95% L</b> 0.0166	Yes CL 95% UCL 37 0.07362	Passes Ac t Stat 3.297	P-Value 0.0034	Decision Significan	t Parameter			
Control Resp Regression P Parameter Threshold Slope	0.9525 arameters Estimate 0.04515 4.267	0.8 - NL Std Erro 0.01369 0.8547	or 95% L 0.0166 2.489	Yes CL 95% UCL 57 0.07362 6.044	Passes Ac t Stat 3.297 4.992	P-Value 0.0034 <0.0001	Decision Significan Significan	t Parameter t Parameter			
Control Resp Regression P	0.9525 arameters Estimate 0.04515	0.8 - NL Std Erro 0.01369	or <b>95% L</b> 0.0166	Yes CL 95% UCL 37 0.07362	Passes Ac t Stat 3.297	P-Value 0.0034	Decision Significan Significan	t Parameter			
Control Resp Regression P Parameter Threshold Slope Intercept	0.9525 arameters Estimate 0.04515 4.267 -18.92	0.8 - NL Std Erro 0.01369 0.8547	or 95% L 0.0166 2.489	Yes CL 95% UCL 57 0.07362 6.044	Passes Ac t Stat 3.297 4.992	P-Value 0.0034 <0.0001	Decision Significan Significan	t Parameter t Parameter			
Control Resp Regression P Parameter Threshold Slope	0.9525 arameters Estimate 0.04515 4.267 -18.92	0.8 - NL <b>Std Erro</b> 0.01369 0.8547 3.743	or 95% L 0.0166 2.489	Yes CL 95% UCL 37 0.07362 6.044 -11.13	Passes Ac t Stat 3.297 4.992	P-Value 0.0034 <0.0001	Decision Significan Significan	t Parameter t Parameter t Parameter			
Control Resp Regression P Parameter Threshold Slope Intercept ANOVA Table Source	0.9525 arameters Estimate 0.04515 4.267 -18.92	0.8 - NL Std Erro 0.01369 0.8547 3.743 ares Mo	or 95% L 0.0166 2.489 -26.7	Yes CL 95% UCL 37 0.07362 6.044 -11.13	Passes Ac t Stat 3.297 4.992 -5.054	<b>P-Value</b> 0.0034 <0.0001 <0.0001	Decision Significan Significan Significan	t Parameter t Parameter t Parameter (α:5%)			
Control Resp Regression P Parameter Threshold Slope Intercept ANOVA Table Source Model Lack of Fit	0.9525 arameters Estimate 0.04515 4.267 -18.92 Sum Squ	0.8 - NL Std Erro 0.01369 0.8547 3.743 ares Ma 80	or 95% L 0 0.0166 2.489 -26.7 ean Squa	Yes CL 95% UCL 37 0.07362 6.044 -11.13 re DF	Passes Ac t Stat 3.297 4.992 -5.054 F Stat	P-Value 0.0034 <0.0001 <0.0001 P-Value	Decision Significan Significan Significan Decision	t Parameter t Parameter t Parameter (α:5%) t			
Control Resp Regression P Parameter Threshold Slope Intercept ANOVA Table Source Model Lack of Fit Pure Error	0.9525 arameters Estimate 0.04515 4.267 -18.92 Sum Squ. 801.944 1.919534 124.2607	0.8 - NL Std Erro 0.01369 0.8547 3.743 ares Ma 80 0.1 6.2	or 95% L 0.0166 2.489 -26.7 ean Squar 01.944 639845 903373	Yes CL 95% UCL 57 0.07362 6.044 -11.13 re DF 1 3 18	Passes Ac           t Stat           3.297           4.992           -5.054           F Stat           133.5	P-Value 0.0034 <0.0001 <0.0001 P-Value <0.0001	Decision Significan Significan Significan Decision	t Parameter t Parameter t Parameter (α:5%) t			
Control Resp Regression P Parameter Threshold Slope Intercept ANOVA Table Source Model Lack of Fit Pure Error	0.9525 arameters Estimate 0.04515 4.267 -18.92 Sum Squ 801.944 1.919534	0.8 - NL Std Erro 0.01369 0.8547 3.743 ares Ma 80 0.1 6.2	or 95% L 0.0166 2.489 -26.7 ean Squar 01.944 639845	Yes CL 95% UCL 57 0.07362 6.044 -11.13 re DF 1 3	Passes Ac           t Stat           3.297           4.992           -5.054           F Stat           133.5	P-Value 0.0034 <0.0001 <0.0001 P-Value <0.0001	Decision Significan Significan Significan Decision	t Parameter t Parameter t Parameter (α:5%) t			
Control Resp Regression P Parameter Threshold Slope Intercept ANOVA Table Source Model Lack of Fit Pure Error Residual	0.9525 arameters Estimate 0.04515 4.267 -18.92 Sum Squ 801.944 1.919534 124.2607 126.1803	0.8 - NL Std Erro 0.01369 0.8547 3.743 ares Ma 80 0.1 6.2	or 95% L 0.0166 2.489 -26.7 ean Squar 01.944 639845 903373	Yes CL 95% UCL 57 0.07362 6.044 -11.13 re DF 1 3 18	Passes Ac           t Stat           3.297           4.992           -5.054           F Stat           133.5	P-Value 0.0034 <0.0001 <0.0001 P-Value <0.0001	Decision Significan Significan Significan Decision	t Parameter t Parameter t Parameter (α:5%) t			
Control Resp Regression P Parameter Threshold Slope Intercept ANOVA Table Source Model Lack of Fit Pure Error Residual Residual Ana	0.9525 arameters Estimate 0.04515 4.267 -18.92 Sum Squ 801.944 1.919534 124.2607 126.1803	0.8 - NL Std Erro 0.01369 0.8547 3.743 ares Ma 80 0.1 6.2	or 95% L 0.0166 2.489 -26.7 ean Squar 01.944 639845 903373	Yes CL 95% UCL 57 0.07362 6.044 -11.13 re DF 1 3 18	Fasses Ac           t Stat           3.297           4.992           -5.054           F Stat           133.5           0.09269	P-Value 0.0034 <0.0001 <0.0001 P-Value <0.0001	Decision Significan Significan Significan Decision	t Parameter t Parameter t Parameter (α:5%) t ficant			
Control Resp Regression P Parameter Threshold Slope Intercept ANOVA Table Source Model Lack of Fit Pure Error Residual Residual Ana Attribute	0.9525 arameters Estimate 0.04515 4.267 -18.92 Sum Squ 801.944 1.919534 124.2607 126.1803 lysis Method	0.8 - NL Std Erro 0.01369 0.8547 3.743 ares Mo 80 0.1 6.3 6.1	or 95% L 0.0166 2.489 -26.7 ean Squar 01.944 639845 903373 008584	Yes CL 95% UCL 57 0.07362 6.044 -11.13 Te DF 1 3 18 21	Fasses Ac           t Stat           3.297           4.992           -5.054           F Stat           133.5           0.09269	P-Value 0.0034 <0.0001 <0.0001 P-Value <0.0001 0.9631	Decision Significan Significan Significan Decision Non-Signi Decision	t Parameter t Parameter t Parameter (α:5%) t ficant			
Control Resp Regression P Parameter Threshold Slope Intercept ANOVA Table Source Model Lack of Fit Pure Error Residual Residual Ana Attribute	0.9525 arameters Estimate 0.04515 4.267 -18.92 Sum Squ 801.944 1.919534 124.2607 126.1803 lysis Method	0.8 - NL Std Errr 0.01369 0.8547 3.743 ares Mi 80 0.1 6.: 6.: Chi-Sq GO	or 95% L 0.0166 2.489 -26.7 ean Squal 01.944 639845 903373 008584	Yes           CL         95% UCL           37         0.07362           6.044         -11.13           re         DF           1         3           18         21           Test Stat	Passes Ac t Stat 3.297 4.992 -5.054 F Stat 133.5 0.09269 Critical	P-Value 0.0034 <0.0001 <0.0001 P-Value <0.0001 0.9631 P-Value	Decision Significan Significan Significan Decision Non-Signi Significan Significan	t Parameter t Parameter t Parameter (α:5%) t ficant (α:5%)	ity		
Control Resp Regression P Parameter Threshold Slope Intercept ANOVA Table Source Model Lack of Fit Pure Error Residual Residual Ana Attribute Goodness-of-I	0.9525 arameters Estimate 0.04515 4.267 -18.92 Sum Squ. 801.944 1.919534 124.2607 126.1803 lysis Method Fit Pearson C	0.8 - NL Std Error 0.01369 0.8547 3.743 ares Mi 8.00 0.0 0.0 0.0 0.0 0.0 0.0 0.	or 95% L 0 0.0166 2.489 -26.7 ean Squal 01.944 639845 903373 008584 007 008584	Yes           CL         95% UCL           57         0.07362           6.044         -11.13           re         DF           1         3           18         21           Test Stat           126.2           126.6           16.67	Fasses Ac           t Stat           3.297           4.992           -5.054           F Stat           133.5           0.09269           Critical           32.67           32.67           32.67           11.07	P-Value 0.0034 <0.0001 <0.0001 P-Value <0.0001 0.9631 P-Value <0.0001 <0.0001 <0.0001 0.0052	Decision Significan Significan Significan Significan Non-Signi Decision Significan Significan Significan	t Parameter t Parameter t Parameter (α:5%) t ficant (α:5%) t Heterogen t Heterogen /ariances	ity		
Control Resp Regression P Parameter Threshold Slope Intercept ANOVA Table Source Model Lack of Fit Pure Error Residual Ana Attribute Goodness-of-I Variances	0.9525 arameters Estimate 0.04515 4.267 -18.92 Sum Squ 801.944 1.919534 1.949534 126.1803 Iysis Method Bartlett Ec Mod Leve	0.8 - NL Std Erro 0.01369 0.8547 3.743 ares Mi 80 0.1 6.1 6.1 Chi-Sq GO Ratio GC uality of V he Equalit	or 95% L 0.0166 2.489 -26.7 ean Squa 01.944 639845 903373 008584 008584	Yes           CL         95% UCL           67         0.07362           6.044         -11.13           re         DF           1         3           18         21           Test Stat           126.2         126.6           16.67         3.727	Fasses Ac           t Stat           3.297           4.992           -5.054           F Stat           133.5           0.09269           Critical           32.67           32.67           32.67           32.67           32.73	P-Value           0.0034           <0.0001	Decision Significan Significan Significan Significan Non-Signi Significan Significan Unequal \	t Parameter t Parameter t Parameter (α:5%) t ficant (α:5%) t Heterogen t Heterogen /ariances /ariances	ity		
Control Resp Regression P Parameter Threshold Slope Intercept ANOVA Table Source Model Lack of Fit Pure Error Residual Ana Attribute Goodness-of-I Variances	0.9525 arameters Estimate 0.04515 4.267 -18.92 Sum Squ 801.944 1.919534 1.919534 124.2607 126.1803 Iysis Method Bartlett Ec Mod Leve Shapiro-W	0.8 - NL Std Errr 0.01369 0.8547 3.743 ares M. 80 0.1 6.1 6.1 Chi-Sq GO Ratio GC quality of V ne Equalit /ilk W Nor	or 95% L 0.0166 2.489 -26.7 ean Squa 01.944 639845 903373 008584 008584	Yes           CL         95% UCL           6.044         -           -11.13         -           re         DF           1         3           18         21           Test Stat           126.2         126.6           16.67         3.727           0.9429         -	Passes Ac           t Stat           3.297           4.992           -5.054           F Stat           133.5           0.09269           Critical           32.67           32.67           11.07           2.773           0.9169	P-Value 0.0034 <0.0001 <0.0001 P-Value <0.0001 0.9631 P-Value <0.0001 <0.0001 0.0052 0.0172 0.1892	Decision Significan Significan Significan Significan Non-Signi Decision Significan Unequal V Unequal V Normal D	t Parameter t Parameter t Parameter (α:5%) t ficant (α:5%) t Heterogen /ariances /ariances /ariances	ity		
Control Resp Regression P Parameter Threshold Slope Intercept ANOVA Table Source Model Lack of Fit Pure Error Residual Ana Attribute Goodness-of-I Variances	0.9525 arameters Estimate 0.04515 4.267 -18.92 Sum Squ 801.944 1.919534 1.919534 124.2607 126.1803 Iysis Method Bartlett Ec Mod Leve Shapiro-W	0.8 - NL Std Errr 0.01369 0.8547 3.743 ares M. 80 0.1 6.1 6.1 Chi-Sq GO Ratio GO quality of V ne Equalit /ilk W Nor	or 95% L 0.0166 2.489 -26.7 ean Squa 01.944 639845 903373 008584 008584	Yes           CL         95% UCL           37         0.07362           6.044         -11.13           re         DF           1         3           18         21           Test Stat           126.2         126.6           16.67         3.727           0.9429         0.9429	Fasses Ac           t Stat           3.297           4.992           -5.054           F Stat           133.5           0.09269           Critical           32.67           32.67           32.67           32.67           32.73	P-Value           0.0034           <0.0001	Decision Significan Significan Significan Significan Non-Signi Significan Significan Unequal \	t Parameter t Parameter t Parameter (α:5%) t ficant (α:5%) t Heterogen /ariances /ariances /ariances	ity		
Control Resp Regression P Parameter Threshold Slope Intercept ANOVA Table Source Model Lack of Fit Pure Error Residual Ana Attribute Goodness-of-I Variances Distribution	0.9525 arameters Estimate 0.04515 4.267 -18.92 Sum Squ 801.944 1.919534 1.919534 124.2607 126.1803 Iysis Method Bartlett Ec Mod Leve Shapiro-W	0.8 - NL Std Errr 0.01369 0.8547 3.743 ares M. 80 0.1 6.1 6.1 Chi-Sq GO Ratio GO quality of V ne Equalit /ilk W Nor	or 95% L 0.0166 2.489 -26.7 ean Squa 01.944 639845 903373 008584 008584	Yes           CL         95% UCL           6.044         -           -11.13         -           re         DF           1         3           18         21           Test Stat           126.2         126.6           16.67         3.727           0.9429         -	Passes Ac           t Stat           3.297           4.992           -5.054           F Stat           133.5           0.09269           Critical           32.67           32.67           32.67           1.07           2.773           0.9169           2.492	P-Value 0.0034 <0.0001 <0.0001 P-Value <0.0001 0.9631 P-Value <0.0001 <0.0001 0.0052 0.0172 0.1892	Decision Significan Significan Significan Significan Non-Signi Decision Significan Significan Significan Unequal V Unequal V Normal D	t Parameter t Parameter t Parameter (α:5%) t ficant (α:5%) t Heterogen /ariances /ariances /ariances	ity		
Control Resp Regression P Parameter Threshold Slope Intercept ANOVA Table Source Wodel ack of Fit Pure Error Residual Ana Attribute Goodness-of-I Variances Distribution	0.9525 arameters Estimate 0.04515 4.267 -18.92 Sum Squ 801.944 1.919534 124.2607 126.1803 lysis Method Fit Pearson C Likelihood Bartlett Ec Mod Leve Shapiro-W Anderson-	0.8 - NL Std Errr 0.01369 0.8547 3.743 ares M. 80 0.1 6.1 6.1 Chi-Sq GO Ratio GO quality of V ne Equalit /ilk W Nor	or 95% L 0.0166 2.489 -26.7 ean Squa 01.944 639845 903373 008584 008584	Yes           CL         95% UCL           6.044         -           -11.13         -           re         DF           1         3           18         21           Test Stat           126.2         126.6           16.67         3.727           0.9429         -	Passes Ac           t Stat           3.297           4.992           -5.054           F Stat           133.5           0.09269           Critical           32.67           32.67           32.67           1.07           2.773           0.9169           2.492	P-Value           0.0034           <0.0001	Decision Significan Significan Significan Significan Non-Signi Decision Significan Significan Significan Unequal V Unequal V Normal D	t Parameter t Parameter t Parameter (α:5%) t ficant (α:5%) t Heterogen /ariances /ariances /ariances	ity		В
Control Resp Regression P Parameter Threshold Slope Intercept ANOVA Table Source Model Lack of Fit Pure Error Residual Ana Attribute Goodness-of-I Variances Distribution Proportion No C-µg/L ( 6.1 L	0.9525 arameters Estimate 0.04515 4.267 -18.92 Sum Squ 801.944 1.919534 124.2607 126.1803 Nysis Method Fit Pearson C Likelihood Bartlett Ec Mod Leve Shapiro-W Anderson- Dormal Summary	0.8 - NL Std Erro 0.01369 0.8547 3.743 ares Mi 80 0.1 6.1 Chi-Sq GO Ratio GC quality of N he Equalit filk W Nor Darling A Count 4	or 95% L 0.0166 2.489 -26.7 ean Squa 01.944 639845 639845 903373 008584 008584 007 F 5F /ariance ty of Variar maility 2 Normalit Mean 0.9525	Yes           CL         95% UCL           57         0.07362           6.044         -11.13           re         DF           1         3           18         21           Test Stat           126.2         126.6           16.67         3.727           0.9429         y           0.6923	Passes Ac           t Stat           3.297           4.992           -5.054           F Stat           133.5           0.09269           Critical           32.67           32.67           32.67           32.67           2.773           0.9169           2.492           Calcul           Max           0.98	P-Value           0.0034           <0.0001	Decision Significan Significan Significan Significan Non-Signi Significan Significan Unequal V Unequal V Normal D Normal D e(A/B) Std Dev 0.04856	t Parameter t Parameter t Parameter t Parameter (α:5%) t ficant (α:5%) t Heterogen /ariances	ity ity ity %Effect 0.0%	381	400
Control Resp Regression P Parameter Threshold Slope Intercept ANOVA Table Source Model Lack of Fit Pure Error Residual Residual Ana Attribute Goodness-of-I Variances Distribution Proportion Nic C-µg/L ( 6.1 L	0.9525 arameters Estimate 0.04515 4.267 -18.92 Sum Squ 801.944 1.919534 124.2607 126.1803 lysis Method Fit Pearson C Likelihood Bartlett Ec Mod Leve Shapiro-W Anderson- Dormal Summary Control Type	0.8 - NL Std Erro 0.01369 0.8547 3.743 ares M. 80 0.1 6.1 6.1 Chi-Sq GO Ratio GC uality of None Equalit filk W Nor Darling A Count 4	or 95% L 0.0166 2.489 -26.7 01.944 639845 90373 008584 008584 007 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	Yes           CL         95% UCL           6.043         6.044           -11.13         7           re         DF           1         3           18         21           Test Stat           126.2         126.6           16.67         16.67           10.9429         9.4293           Min         5         0.88           5         0.95	Passes Ac           t Stat           3.297           4.992           -5.054           F Stat           133.5           0.09269           Critical           32.67           32.67           11.07           2.773           0.9169           2.492           Calcul           Max           0.98           0.99	P-Value           0.0034           <0.0001	Decision Significan Significan Significan Significan Non-Signi Decision Significan Significan Unequal V Unequal V Normal D Normal D Normal D Std Dev 0.04856 0.02062	t Parameter t Parameter t Parameter (α:5%) t ficant (α:5%) t Heterogen t Heterogen /ariances istribution istribution <b>CV%</b> 5.1% 2.13%	ity ity <u>%Effect</u> 0.0% -1.58%	381 387	400 400
Control Resp Regression P Parameter Threshold Slope Intercept ANOVA Table Source Model Lack of Fit Pure Error Residual Attribute Goodness-of-I Variances Distribution Proportion Not C-µg/L ( 6.1 L 1900 3900	0.9525 arameters Estimate 0.04515 4.267 -18.92 Sum Squ 801.944 1.919534 124.2607 126.1803 lysis Method Fit Pearson C Likelihood Bartlett Ec Mod Leve Shapiro-W Anderson- Dormal Summary Control Type	0.8 - NL Std Errr 0.01369 0.8547 3.743 ares M. 80 0.1 6.1 6.1 Chi-Sq GO nuality of V ne Equalit filk W Nor Darling A Count 4 4	or 95% L 0.0166 2.489 -26.7 ean Squa 01.944 639845 903373 008584 008584 008584 008584 007 /ariance ty of Variar mality 2 Normality Mean 0.9525 0.9675 0.955	Yes           Yes           CL         95% UCL           6.044         -           -11.13         -           re         DF           1         3           18         21           Test Stat           126.2         126.6           16.67         0.9429           y         0.6923           Min         -           5         0.88           5         0.94	Passes Ac           t Stat           3.297           4.992           -5.054           F Stat           133.5           0.09269           Critical           32.67           32.67           11.07           2.773           0.9169           2.492           Calcul           Max           0.98           0.99           0.97	P-Value           0.0034           <0.0001	Decision Significan Significan Significan Significan Non-Signi Decision Significan Unequal N Unequal N Normal D Normal D Normal D Std Dev 0.04856 0.02062 0.01291	t Parameter t Parameter t Parameter (α:5%) t ficant (α:5%) t Heterogen /ariances	ity ity <u>%Effect</u> 0.0% -1.58% -0.26%	381 387 382	400 400 400
Control Resp Regression P Parameter Threshold Slope Intercept ANOVA Table Source Model Lack of Fit Pure Error Residual Residual Ana Attribute Goodness-of-I Variances Distribution Proportion Ne C-µg/L 00 3900 3700	0.9525 arameters Estimate 0.04515 4.267 -18.92 Sum Squ 801.944 1.919534 124.2607 126.1803 lysis Method Fit Pearson C Likelihood Bartlett Ec Mod Leve Shapiro-W Anderson- Dormal Summary Control Type	0.8 - NL Std Erro 0.01369 0.8547 3.743 ares Mi 8 0.0 0.0 0.0 0.0 0.0 0.0 0.0	or         95% L           0         0.0168           2.489         -26.7           ean         Squal           .26.7         -26.7           ean         Squal           01.944         639845           903373         008584           00         -26.7           //	Yes           Yes           CL         95% UCL           57         0.07362           6.044         -11.13           re         DF           1         3           18         21           Test Stat           126.2         126.6           16.67         0.9429           y         0.6923           Min         5         0.88           5         0.95           0.94         0.92	Critical           32.67           4.992           -5.054           F Stat           133.5           0.09269           Critical           32.67           32.67           32.67           2.492           Calcul           Max           0.98           0.97           0.95	P-Value           0.0034           <0.0001	Decision Significan Significan Significan Significan Non-Signi Significan Significan Significan Unequal V Unequal V Normal D Normal D Normal D Normal D Normal D Std Dev 0.04856 0.02062 0.01291 0.01414	t Parameter t Parameter t Parameter t Parameter (α:5%) t ficant (α:5%) t Heterogen /ariances	ity ity ity <u>%Effect</u> 0.0% -1.58% -0.26% 2.36%	381 387 382 372	400 400 400 400
Control Resp Regression P Parameter Threshold Slope Intercept ANOVA Table Source Model Lack of Fit Pure Error Residual Attribute Goodness-of-I Variances Distribution Proportion Not C-µg/L ( 6.1 L 1900 3900	0.9525 arameters Estimate 0.04515 4.267 -18.92 Sum Squ 801.944 1.919534 124.2607 126.1803 lysis Method Fit Pearson C Likelihood Bartlett Ec Mod Leve Shapiro-W Anderson- Dormal Summary Control Type	0.8 - NL Std Errr 0.01369 0.8547 3.743 ares M. 80 0.1 6.1 6.1 Chi-Sq GO nuality of V ne Equalit filk W Nor Darling A Count 4 4	or 95% L 0.0166 2.489 -26.7 ean Squa 01.944 639845 903373 008584 008584 008584 008584 007 /ariance ty of Variar mality 2 Normality Mean 0.9525 0.9675 0.955	Yes           Yes           CL         95% UCL           6.044         -           -11.13         -           re         DF           1         3           18         21           Test Stat           126.2         126.6           16.67         0.9429           y         0.6923           Min         -           5         0.88           5         0.94	Passes Ac           t Stat           3.297           4.992           -5.054           F Stat           133.5           0.09269           Critical           32.67           32.67           11.07           2.773           0.9169           2.492           Calcul           Max           0.98           0.99           0.97	P-Value           0.0034           <0.0001	Decision Significan Significan Significan Significan Non-Signi Decision Significan Unequal N Unequal N Normal D Normal D Normal D Std Dev 0.04856 0.02062 0.01291	t Parameter t Parameter t Parameter (α:5%) t ficant (α:5%) t Heterogen /ariances	ity ity <u>%Effect</u> 0.0% -1.58% -0.26%	381 387 382	400 400 400

CETIS™ v1.8.7.16



CETIS™ v1.8.7.16

								Test Cod				-6674-729
Echinoid Emb	oryo-Larval Dev	elopmen	t Test							SPA	WAR Syste	ms Cente
Batch ID: Start Date: Ending Date:	18-8664-8575 25 Mar-16 09:3	30 P	est Type: rotocol: pecies:	Development EPA/600/R-95/ Strongylocentro		hus		Analyst: Diluent: Brine:	Labo	b Munson- pratory Sea Applicable		
Duration:	NA		ource:	Field Collected				Age:	11017	pheable		
Sample ID:	04-6883-2591		ode:	1BF1D14F				Client:		WAR		
•	25 Mar-16 09:3		laterial:	Zinc sulfate				Project:	Puls	ed Exposur	re	
Receive Date:			ource:	Pulsed Exposu	re							
Sample Age:	NA	s	tation:	12 Hour								
Comparison S	Summary											
Analysis ID	Endpoint		NOEL	. LOEL	TOEL	PMSD	ΤU	Me	thod			
08-6446-2391	Proportion Nor	mal	3900	7700	5480	16.7%		Du	nnett M	ultiple Com	parison Tes	t
Point Estimate	e Summary											
Analysis ID	Endpoint		Level	μg/L	95% LCL	95% UCL	τu	Me	thod			
06-1384-7340	Proportion Nor	mal	EC50	16330	12890	20420		Lin	ear Reg	gression (M	ILE)	
Test Acceptab	oility											
Analysis ID	Endpoint		Attrib	ute	Test Stat	TAC Limi	ts	Ov	erlap	Decision		
06-1384-7340	Proportion Nor	mal	Contr	ol Resp	0.9525	0.8 - NL		Ye	5	Passes A	cceptability	Criteria
08-6446-2391	Proportion Nor	mal	Contr	ol Resp	0.9525	0.8 - NL		Ye	5	Passes A	cceptability	Criteria
08-6446-2391	Proportion Nor	mal	PMS	)	0.1672	NL - 0.25		No		Passes A	cceptability	Criteria
Proportion No	ormal Summary	r										
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Ste	l Err	Std Dev	CV%	% Effect
					33% UCL	141111		010				
	Lab Control	4	0.952		1	0.88	0.98		2428	0.04856	5.1%	0.0%
1900	Lab Control	4 4	0.952 0.94				0.98 0.96	0.0			5.1% 1.94%	0.0% 1.31%
1900 3900	Lab Control			5 0.8752 0.9109	1	0.88		0.0 0.0	2428	0.04856		
3900 7700	Lab Control	4 4 4	0.94 0.917 0.735	5 0.8752 0.9109 5 0.8666 0.56	1 0.9691 0.9684 0.91	0.88 0.92 0.89 0.57	0.96 0.95 0.79	0.0 0.0 0.0 0.0	2428 09129 1601 55	0.04856 0.01826 0.03202 0.11	1.94% 3.49% 14.97%	1.31% 3.68% 22.83%
3900 7700 15000	Lab Control	4 4 4 4	0.94 0.917 0.735 0.617	5 0.8752 0.9109 5 0.8666 0.56 5 0.3029	1 0.9691 0.9684 0.91 0.9321	0.88 0.92 0.89 0.57 0.34	0.96 0.95 0.79 0.8	0.0 0.0 0.0 0.0 0.0	2428 09129 1601 55 9886	0.04856 0.01826 0.03202 0.11 0.1977	1.94% 3.49% 14.97% 32.02%	1.31% 3.68% 22.83% 35.17%
3900 7700	Lab Control	4 4 4	0.94 0.917 0.735	5 0.8752 0.9109 5 0.8666 0.56 5 0.3029	1 0.9691 0.9684 0.91	0.88 0.92 0.89 0.57	0.96 0.95 0.79	0.0 0.0 0.0 0.0 0.0	2428 09129 1601 55	0.04856 0.01826 0.03202 0.11	1.94% 3.49% 14.97%	1.31% 3.68% 22.83%
3900 7700 15000 31000		4 4 4 4	0.94 0.917 0.735 0.617	5 0.8752 0.9109 5 0.8666 0.56 5 0.3029	1 0.9691 0.9684 0.91 0.9321	0.88 0.92 0.89 0.57 0.34	0.96 0.95 0.79 0.8	0.0 0.0 0.0 0.0 0.0	2428 09129 1601 55 9886	0.04856 0.01826 0.03202 0.11 0.1977	1.94% 3.49% 14.97% 32.02%	1.31% 3.68% 22.83% 35.17%
3900 7700 15000 31000 <b>Proportion No</b> <b>C-µg/L</b>	rrmal Detail Control Type	4 4 4 4 4 Rep 1	0.94 0.917 0.735 0.617 0.145 <b>Rep 2</b>	5 0.8752 0.9109 5 0.8666 0.56 5 0.3029 0 <b>Rep 3</b>	1 0.9691 0.9684 0.91 0.9321 0.4345 <b>Rep 4</b>	0.88 0.92 0.89 0.57 0.34	0.96 0.95 0.79 0.8	0.0 0.0 0.0 0.0 0.0	2428 09129 1601 55 9886	0.04856 0.01826 0.03202 0.11 0.1977	1.94% 3.49% 14.97% 32.02%	1.31% 3.68% 22.83% 35.17%
3900 7700 15000 31000 Proportion No C-µg/L	ormal Detail	4 4 4 4 4	0.94 0.917 0.735 0.617 0.145	5 0.8752 0.9109 5 0.8666 0.56 5 0.3029 0	1 0.9691 0.9684 0.91 0.9321 0.4345	0.88 0.92 0.89 0.57 0.34	0.96 0.95 0.79 0.8	0.0 0.0 0.0 0.0 0.0	2428 09129 1601 55 9886	0.04856 0.01826 0.03202 0.11 0.1977	1.94% 3.49% 14.97% 32.02%	1.31% 3.68% 22.83% 35.17%
3900 7700 15000 31000 Proportion No C-µg/L 6.1	rrmal Detail Control Type	4 4 4 4 4 Rep 1	0.94 0.917 0.735 0.617 0.145 <b>Rep 2</b>	5 0.8752 0.9109 5 0.8666 0.56 5 0.3029 0 <b>Rep 3</b>	1 0.9691 0.9684 0.91 0.9321 0.4345 <b>Rep 4</b>	0.88 0.92 0.89 0.57 0.34	0.96 0.95 0.79 0.8	0.0 0.0 0.0 0.0 0.0	2428 09129 1601 55 9886	0.04856 0.01826 0.03202 0.11 0.1977	1.94% 3.49% 14.97% 32.02%	1.31% 3.68% 22.83% 35.17%
3900 7700 15000 31000 Proportion No C-µg/L 6.1 1900	rrmal Detail Control Type	4 4 4 4 4 <b>Rep 1</b> 0.98	0.94 0.917 0.735 0.617 0.145 <b>Rep 2</b> 0.97	5 0.8752 0.9109 5 0.8666 0.56 5 0.3029 0 • • <b>Rep 3</b> 0.88	1 0.9691 0.9684 0.91 0.9321 0.4345 <b>Rep 4</b> 0.98	0.88 0.92 0.89 0.57 0.34	0.96 0.95 0.79 0.8	0.0 0.0 0.0 0.0 0.0	2428 09129 1601 55 9886	0.04856 0.01826 0.03202 0.11 0.1977	1.94% 3.49% 14.97% 32.02%	1.31% 3.68% 22.83% 35.17%
3900 7700 15000 31000 <b>Ргорогtion No</b> <b>С-µg/L</b> 6.1 1900 3900	rrmal Detail Control Type	4 4 4 4 4 <b>Rep 1</b> 0.98 0.96	0.94 0.917 0.735 0.617 0.145 <b>Rep 2</b> 0.97 0.93	5 0.8752 0.9109 5 0.8666 0.56 5 0.3029 0 <b></b>	1 0.9691 0.9684 0.91 0.9321 0.4345 <b>Rep 4</b> 0.98 0.92	0.88 0.92 0.89 0.57 0.34	0.96 0.95 0.79 0.8	0.0 0.0 0.0 0.0 0.0	2428 09129 1601 55 9886	0.04856 0.01826 0.03202 0.11 0.1977	1.94% 3.49% 14.97% 32.02%	1.31% 3.68% 22.83% 35.17%
3900 7700 15000 31000 Proportion No C-µg/L	rrmal Detail Control Type	4 4 4 4 4 <b>Rep 1</b> 0.98 0.96 0.95	0.94 0.917 0.735 0.617 0.145 <b>Rep 2</b> 0.97 0.93 0.94	5 0.8752 0.9109 5 0.8666 0.56 5 0.3029 0 <b></b>	1 0.9691 0.9684 0.91 0.9321 0.4345 <b>Rep 4</b> 0.98 0.92 0.89	0.88 0.92 0.89 0.57 0.34	0.96 0.95 0.79 0.8	0.0 0.0 0.0 0.0 0.0	2428 09129 1601 55 9886	0.04856 0.01826 0.03202 0.11 0.1977	1.94% 3.49% 14.97% 32.02%	1.31% 3.68% 22.83% 35.17%
3900 7700 15000 31000 <b>Proportion No</b> <b>C-µg/L</b> 6.1 1900 3900 7700	rrmal Detail Control Type	4 4 4 4 4 <b>Rep 1</b> 0.98 0.96 0.95 0.79	0.94 0.917 0.735 0.617 0.145 <b>Rep 2</b> 0.97 0.93 0.94 0.57	5 0.8752 0.9109 5 0.8666 0.56 5 0.3029 0 <b>Rep 3</b> 0.88 0.95 0.89 0.79	1 0.9691 0.9684 0.91 0.9321 0.4345 <b>Rep 4</b> 0.98 0.92 0.89 0.79	0.88 0.92 0.89 0.57 0.34	0.96 0.95 0.79 0.8	0.0 0.0 0.0 0.0 0.0	2428 09129 1601 55 9886	0.04856 0.01826 0.03202 0.11 0.1977	1.94% 3.49% 14.97% 32.02%	1.31% 3.68% 22.83% 35.17%
3900 7700 15000 31000 <b>Proportion No</b> <b>C-µg/L</b> 6.1 1900 3900 7700 15000 31000	rrmal Detail Control Type	4 4 4 4 4 <b>Rep 1</b> 0.98 0.96 0.95 0.79 0.8 0.15	0.94 0.917 0.735 0.617 0.145 0.97 0.93 0.94 0.57 0.34	5 0.8752 0.9109 5 0.8666 0.56 5 0.3029 0 <b>Rep 3</b> 0.88 0.95 0.89 0.79 0.63	1 0.9691 0.9684 0.91 0.9321 0.4345 <b>Rep 4</b> 0.98 0.92 0.89 0.79 0.7	0.88 0.92 0.89 0.57 0.34	0.96 0.95 0.79 0.8	0.0 0.0 0.0 0.0 0.0	2428 09129 1601 55 9886	0.04856 0.01826 0.03202 0.11 0.1977	1.94% 3.49% 14.97% 32.02%	1.31% 3.68% 22.83% 35.17%
3900 7700 15000 31000 <b>Proportion No</b> <b>C-µg/L</b> 6.1 1900 3900 7700 15000 31000 <b>Proportion No</b>	rrmal Detail Control Type Lab Control	4 4 4 4 4 <b>Rep 1</b> 0.98 0.96 0.95 0.79 0.8 0.15	0.94 0.917 0.735 0.617 0.145 0.97 0.93 0.94 0.57 0.34	5 0.8752 0.9109 5 0.8666 0.56 5 0.3029 0 <b>Rep 3</b> 0.88 0.95 0.89 0.79 0.63 0.4	1 0.9691 0.9684 0.91 0.9321 0.4345 <b>Rep 4</b> 0.98 0.92 0.89 0.79 0.7	0.88 0.92 0.89 0.57 0.34	0.96 0.95 0.79 0.8	0.0 0.0 0.0 0.0 0.0	2428 09129 1601 55 9886	0.04856 0.01826 0.03202 0.11 0.1977	1.94% 3.49% 14.97% 32.02%	1.31% 3.68% 22.83% 35.17%
3900 7700 15000 31000 <b>Proportion No</b> <b>C-µg/L</b> 6.1 1900 3900 7700 15000 31000 <b>Proportion No</b> <b>C-µg/L</b>	rrmal Detail Control Type Lab Control	4 4 4 4 4 0.98 0.96 0.95 0.79 0.8 0.15	0.94 0.917 0.735 0.617 0.145 <b>Rep 2</b> 0.97 0.93 0.94 0.57 0.34 0	5 0.8752 0.9109 5 0.8666 0.56 5 0.3029 0 2 <b>Rep 3</b> 0.88 0.95 0.89 0.79 0.63 0.4 2 <b>Rep 3</b>	1 0.9691 0.9684 0.91 0.4345 <b>Rep 4</b> 0.98 0.92 0.89 0.79 0.7 0.03	0.88 0.92 0.89 0.57 0.34	0.96 0.95 0.79 0.8	0.0 0.0 0.0 0.0 0.0	2428 09129 1601 55 9886	0.04856 0.01826 0.03202 0.11 0.1977	1.94% 3.49% 14.97% 32.02%	1.31% 3.68% 22.83% 35.17%
3900 7700 15000 31000 <b>Proportion No</b> <b>C-µg/L</b> 6.1 1900 3900 7700 15000 31000 <b>Proportion No</b> <b>C-µg/L</b> 6.1	rrmal Detail Control Type Lab Control rrmal Binomials Control Type	4 4 4 4 4 7 8 98 0.98 0.96 0.95 0.79 0.8 0.15 8 8 8 8 8 90 1	0.94 0.917 0.735 0.617 0.145 <b>Rep 2</b> 0.97 0.93 0.94 0.57 0.34 0 <b>Rep 2</b>	5 0.8752 0.9109 5 0.8666 0.56 5 0.3029 0 2 <b>Rep 3</b> 0.88 0.95 0.89 0.79 0.63 0.4 2 <b>Rep 3</b> 0 88/100	1 0.9691 0.9684 0.91 0.9321 0.4345 <b>Rep 4</b> 0.98 0.92 0.79 0.7 0.7 0.03 <b>Rep 4</b>	0.88 0.92 0.89 0.57 0.34	0.96 0.95 0.79 0.8	0.0 0.0 0.0 0.0 0.0	2428 09129 1601 55 9886	0.04856 0.01826 0.03202 0.11 0.1977	1.94% 3.49% 14.97% 32.02%	1.31% 3.68% 22.83% 35.17%
3900 7700 15000 31000 <b>Proportion No</b> <b>C-µg/L</b> 6.1 1900 3900 7700 15000 31000 <b>Proportion No</b> <b>C-µg/L</b>	rrmal Detail Control Type Lab Control rrmal Binomials Control Type	4 4 4 4 4 0.98 0.96 0.95 0.79 0.8 0.15 s Rep 1 98/100	0.94 0.917 0.735 0.617 0.145 <b>Rep 2</b> 0.97 0.93 0.94 0.57 0.34 0 <b>Rep 2</b> 97/10	5 0.8752 0.9109 5 0.8666 0.56 5 0.3029 0 2 <b>Rep 3</b> 0.88 0.95 0.89 0.79 0.63 0.4 2 <b>Rep 3</b> 0 88/100 0 95/100	1 0.9691 0.9684 0.91 0.9321 0.4345 <b>Rep 4</b> 0.98 0.92 0.89 0.79 0.7 0.03 <b>Rep 4</b> 98/100	0.88 0.92 0.89 0.57 0.34	0.96 0.95 0.79 0.8	0.0 0.0 0.0 0.0 0.0	2428 09129 1601 55 9886	0.04856 0.01826 0.03202 0.11 0.1977	1.94% 3.49% 14.97% 32.02%	1.31% 3.68% 22.83% 35.17%
3900 7700 15000 31000 <b>Proportion No</b> <b>C-µg/L</b> 6.1 1900 3900 7700 15000 31000 <b>Proportion No</b> <b>C-µg/L</b> 6.1 1900 3900	rrmal Detail Control Type Lab Control rrmal Binomials Control Type	4 4 4 4 4 0.98 0.96 0.95 0.79 0.8 0.15 5 <b>Rep 1</b> 98/100 96/100 95/100	0.94 0.917 0.735 0.617 0.145 <b>Rep 2</b> 0.97 0.93 0.94 0.57 0.34 0 <b>Rep 2</b> 97/10 93/10 94/10	5 0.8752 0.9109 5 0.8666 0.56 5 0.3029 0 2 <b>Rep 3</b> 0.88 0.95 0.89 0.79 0.63 0.4 2 <b>Rep 3</b> 0 88/100 0 95/100 0 89/100	1 0.9691 0.9684 0.91 0.9321 0.4345 <b>Rep 4</b> 0.98 0.92 0.89 0.79 0.7 0.03 <b>Rep 4</b> 98/100 92/100 89/100	0.88 0.92 0.89 0.57 0.34	0.96 0.95 0.79 0.8	0.0 0.0 0.0 0.0 0.0	2428 09129 1601 55 9886	0.04856 0.01826 0.03202 0.11 0.1977	1.94% 3.49% 14.97% 32.02%	1.31% 3.68% 22.83% 35.17%
3900 7700 15000 31000 <b>Proportion No</b> <b>C-µg/L</b> 6.1 1900 3900 7700 15000 31000 <b>Proportion No</b> <b>C-µg/L</b> 6.1 1900	rrmal Detail Control Type Lab Control rrmal Binomials Control Type	4 4 4 4 4 0.98 0.96 0.95 0.79 0.8 0.15 <b>Rep 1</b> 98/100 96/100	0.94 0.917 0.735 0.617 0.145 <b>Rep 2</b> 0.97 0.93 0.94 0.57 0.34 0 <b>Rep 2</b> 97/10 93/10	5 0.8752 0.9109 5 0.8666 0.56 5 0.3029 0 2 <b>Rep 3</b> 0.88 0.95 0.89 0.79 0.63 0.4 2 <b>Rep 3</b> 0 88/100 0 95/100 0 89/100	1 0.9691 0.9684 0.91 0.9321 0.4345 <b>Rep 4</b> 0.98 0.92 0.89 0.79 0.7 0.03 <b>Rep 4</b> 98/100 92/100	0.88 0.92 0.89 0.57 0.34	0.96 0.95 0.79 0.8	0.0 0.0 0.0 0.0 0.0	2428 09129 1601 55 9886	0.04856 0.01826 0.03202 0.11 0.1977	1.94% 3.49% 14.97% 32.02%	1.31% 3.68% 22.83% 35.17%

CETIS™ v1.8.7.16

CETIS An	alytical Repo	ort					-	ort Date: Code:			21 (p 1 of 2 3-6674-729
Echinoid Err	nbryo-Larval Deve	elopmen	t Test						SPAV	VAR Syste	ems Center
Analysis ID: Analyzed:	08-6446-2391 03 Jun-16 8:20		indpoint: .nalysis:	Proportion Nor Parametric-Co		tments		IS Version cial Results		.8.7	
Batch ID: Start Date: Ending Date Duration:	18-8664-8575 25 Mar-16 09:3 :: NA	0 P S	est Type: rotocol: pecies: ource:	Development EPA/600/R-95, Strongylocentr Field Collected	otus purpura	tus	Anal Dilu Brin Age:	ent: Lat e: No	ob Munson-E poratory Seav t Applicable		
Sample ID: Sample Date Receive Date Sample Age:		0 N S	code: laterial: cource: ctation:	1BF1D14F Zinc sulfate Pulsed Exposu 12 Hour	Ire		Clier Proj		AWAR sed Exposure	e	
Data Transfo	orm	Zeta	Alt H	yp Trials	Seed		PMSD	NOEL	LOEL	TOEL	τυ
Angular (Corr	rected)	NA	C > T	NA	NA		16.7%	3900	7700	5480	
Dunnett Mul	tiple Comparison	Test									
Control	vs C-µg/L		Test	Stat Critical	MSD DF	P-Value	P-Type	Decision	ı(α:5%)		
6.1	1900		0.379		0.269 6	0.6985	CDF		ificant Effect		
6.1	3900		0.754	5 2.407	0.269 6	0.5331	CDF	Non-Sigr	ificant Effect		
6.1	7700*		2.977	2.407	0.269 6	0.0162	CDF	Significa	nt Effect		
6.1	15000*		4.1	2.407	0.269 6	0.0015	CDF	Significa	nt Effect		
6.1	31000*		9.311	2.407	0.269 6	<0.0001	CDF	Significa	nt Effect		
Test Accepta	ability Criteria										
Attribute	Test Stat	TAC LI	mits	Overlap	Decision						
Control Resp		0.8 - NI	L	Yes		cceptability	Criteria				
PMSD	0.1672	NL - 0.2	25	No	Passes A	cceptability	Criteria				
ANOVA Tabl	e										
Source		arac	Moon	Square	DF	F Stat	P-Value	Desision	(0.5%)		
Between	Sum Squ 3.09701	ales	0.619	-	5	24.76	<0.0001	Decision Significat			
Error	0.4502186	3		01214	18	24.70	-0.0001	olginica	It Elleve		
Total	3.547229		0.020	01211	23	_					
Distributiona	al Tests										
Attribute	Test			Teat Stat	Critical	P-Value	Desision	(~10/)			
Variances		au olity of	f Variance	Test Stat 12.05	Critical 15.09	0.0341	Decision Equal Var				
Distribution	Shapiro-\			0.9124	0.884	0.0341	Normal D				
			onnancy	0.0121	0.001	0.0001	Horman B	ion button			
	Normal Summary										
C-µg/L	Control Type	Count	Mean			Median	Min	Max	Std Err	CV%	%Effect
6.1	Lab Control	4	0.952		1	0.975	0.88	0.98	0.02428	5.1%	0.0%
1900		4	0.94	0.9109	0.9691	0.94	0.92	0.96	0.009129	1.94%	1.31%
3900 7700		4 4	0.917		0.9684	0.915	0.89 0.57	0.95	0.01601	3.49% 14.97%	3.68%
15000		4	0.735 0.617		0.91 0.9321	0.79 0.665	0.57	0.79 0.8	0.055 0.09886	14.97% 32.02%	22.83% 35.17%
31000		4	0.145		0.4345	0.000	0.54	0.4	0.09097	125.5%	84.78%
	reated) Transfer	mad O									
5 (	rrected) Transfor		-	0594 1 61	050/ 1101	NA	D.0.1	N4 - c -	044	C) (%)	
C-µg/L	Control Type	Count	Mean			Median	Min	Max	Std Err	CV%	%Effect
6.1	Lab Control	4	1.368		1.53	1.413	1.217	1.429	0.05085	7.44%	0.0%
1900		4	1.325		1.387	1.324	1.284	1.369	0.01946	2.94%	3.1%
		4	1.284	1.189	1.378	1.278	1.233	1.345	0.02966	4.62%	6.17%
3900				0 0447	4 335	1 005	0.0550	1 005	0.05070	44 650/	74 2401
3900 7700		4	1.035		1.225	1.095	0.8556	1.095	0.05978	11.55%	24.34%
3900				4 0.5806	1.225 1.238 0.7701	1.095 0.954 0.2859	0.8556 0.6225 0.05002	1.095 1.107 0.6847	0.05978 0.1033 0.1394	11.55% 22.73% 85.33%	24.34% 33.52% 76.12%

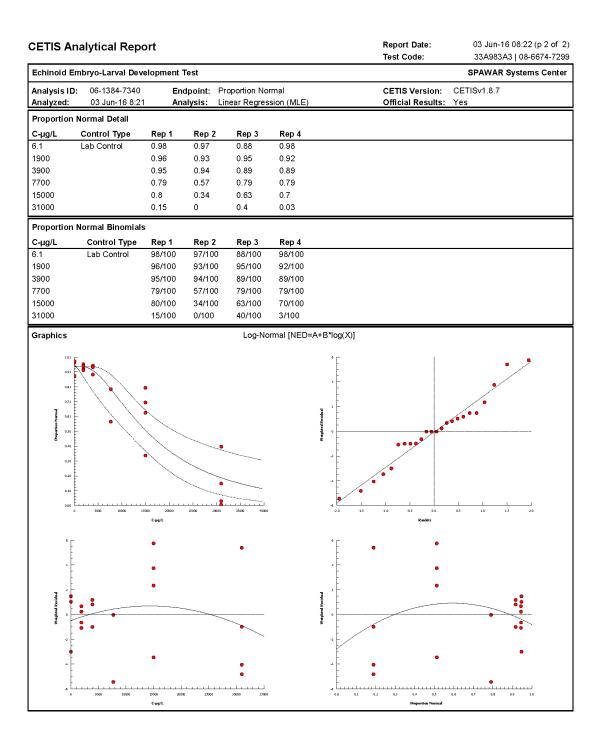
CETIS™ v1.8.7.16

CETIS Ana	alytical Repo	ort					Report Date: Test Code:	03 Jun-16 08:21 (p 2 of 2 33A983A3   08-6674-7299
Echinoid Em	bryo-Larval Deve	lopment	Test					SPAWAR Systems Center
Analysis ID: Analyzed:	08-6446-2391 03 Jun-16 8:20		•	portion Nor ametric-Co	mal ntrol vs Treat	ments	CETIS Version: Official Results:	CETISv1.8.7 Yes
Proportion N	ormal Detail							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.1	Lab Control	0.98	0.97	0.88	0.98			
1900		0.96	0.93	0.95	0.92			
3900		0.95	0.94	0.89	0.89			
7700		0.79	0.57	0.79	0.79			
15000		0.8	0.34	0.63	0.7			
31000		0.15	0	0.4	0.03			
Angular (Cor	rected) Transform	ned Detai	I					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.1	Lab Control	1.429	1.397	1.217	1.429			
1900		1.369	1.303	1.345	1.284			
3900		1.345	1.323	1.233	1.233			
7700		1.095	0.8556	1.095	1.095			
15000		1.107	0.6225	0.9169	0.9912			
31000		0.3977	0.05002	0.6847	0.1741			
Proportion N	ormal Binomials							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.1	Lab Control	98/100	97/100	88/100	98/100			
1900		96/100	93/100	95/100	92/100			
3900		95/100	94/100	89/100	89/100			
7700		79/100	57/100	79/100	79/100			
15000		80/100	34/100	63/100	70/100			
31000		15/100	0/100	40/100	3/100			
Graphics								
In the second se		•	ZZ	Reject Hull	— Cakeed	0.46 0.35 0.36 0.36 0.25 0.25 0.25 0.25 0.25 0.25 0.25 0.25	••••••	•
	1 1 5.1LC 1980	ा अण C-µg/L	1 7700 15000	33000		-0.20 -0.25 -0.30	1 1 1 LS -1.0 -0.5 0.0 Ranbits	05 1.0 1.5 2.0

CETIS™ v1.8.7.16

	,							Test	Code:	33.	A983A3   (	)8-6674-729
Echinoid E	Embryo-La	ırval Devel	opment	Test							· · ·	ems Cente
Analysis IE Analyzed:		84-7340 n-16 8:21		•	Proportion Nori Linear Regress				IS Version		1.8.7	
Batch ID: Start Date: Ending Dai Duration:	: 25 Ma	64-8575 ar-16 09:30	Pr Sp	otocol: vecies:	Development EPA/600/R-95/ Strongylocentro Field Collected	otus purpurat	tus	Anal Dilu Brin Age:	ent: Lab e: No	ob Munson- ooratory Sea t Applicable		
Sample ID: Sample Da Receive Da Sample Ag	ate: 25 Ma ate:	83-2591 ar-16 09:30	Ma So	aterial: ource:	1BF1D14F Zinc sulfate Pulsed Exposu 12 Hour	re		Cliei Proj		AWAR ised Exposu	re	
Linear Reg	gression O	ptions										
Model Fun Log-Norma		-B*log(X)]			nold Option	Threshold 0.0475	Optimized Yes	Pooled No	Het Corr Yes	Weighter Yes	d	
-	-			Contro	. mosilolu	0.0770	103		103	103		
Regression				64	Cl		E Ohrt	0-141 1	D V-I-	<b>D</b>	(	
Iters LL 8 -9		AICc 1926	BIC 1928	Mu 4.213	Sigma 0.329	Adj R2 0.8141	F Stat 0.4986	Critical 3.16	P-Value 0.6879	Decision	i(α:5%) ificant Lac	k of Fit
5 -5	55.4	1920	1920	4.215	0.329	0.0141	0.4500	5.10	0.0073	Non-Sign		K OI FIL
Point Estin	nates											
Level µg	g/L 9	95% LCL	95% UC	L								
EC50 16	5330 1	12890	20420									
Test Accep	otability Cr	riteria										
Attributo	-	Tact Stat	TACLIM	aite	Overlap	Decision						
Attribute			TAC Lin	nits	Overlap Yes	Decision Passes Ac	ceptability (	Criteria				
Attribute Control Res			<b>TAC Lin</b> 0.8 - NL	nits	Overlap Yes		ceptability C	Criteria				
	sp (	).9525		nits	-		ceptability C	Criteria				
Control Res Regression	sp ( n Paramet	0.9525 ers	0.8 - NL	nits or 95% L	Yes	Passes Ac	cceptability C P-Value	Criteria Decision	(α:5%)			
Control Res	sp ( n Paramet E	0.9525 ers Estimate	0.8 - NL		Yes CL 95% UCL	Passes Ac		Decision	(α:5%) t Paramete	r		
Control Res Regression Parameter Threshold	sp () n Paramet E ()	0.9525 ers Estimate 0.05568	0.8 - NL Std Erro	or 95% L	Yes CL 95% UCL	Passes Ac	P-Value	Decision Significan				
Control Res Regression Parameter Threshold Slope	sp C n Paramet E C 3	0.9525 ers Estimate 0.05568	0.8 - NL Std Erro 0.0235	or 95% L 0.0068	Yes CL 95% UCL 02 0.1046	Passes Ac t Stat 2.369	<b>P-Value</b> 0.0275	Decision Significan Significan	t Paramete	r		
Control Res Regression Parameter Threshold Slope Intercept	sp C n Paramet C 3 -	0.9525 ers Estimate 0.05568 3.04	0.8 - NL Std Erro 0.0235 0.5398	or 95% L 0.0068 1.917	Yes CL 95% UCL 02 0.1046 4.162	Passes Ac t Stat 2.369 5.631	P-Value 0.0275 <0.0001	Decision Significan Significan	t Paramete t Paramete	r		
Control Res Regression Parameter Threshold Slope Intercept ANOVA Tal	sp () n Paramet () 3 - ble	0.9525 ers Estimate 0.05568 3.04 12.81	0.8 - NL <b>Std Erro</b> 0.0235 0.5398 2.266	or 95% L 0.0068 1.917 -17.52	Yes CL 95% UCL 02 0.1046 4.162 -8.095	Passes Ac t Stat 2.369 5.631 -5.652	<b>P-Value</b> 0.0275 <0.0001 <0.0001	Decision Significan Significan Significan	t Paramete t Paramete t Paramete	r		
Control Res Regression Parameter Threshold Slope Intercept ANOVA Tal Source	sp C n Paramet C 3 - ble	0.9525 ers Estimate 0.05568 3.04 12.81 Sum Squar	0.8 - NL <b>Std Erro</b> 0.0235 0.5398 2.266 res Me	or 95% L 0.0068 1.917 -17.52 ean Squar	Yes CL 95% UCL 02 0.1046 4.162 -8.095 e DF	Passes Ac t Stat 2.369 5.631 -5.652 F Stat	P-Value 0.0275 <0.0001 <0.0001 P-Value	Decision Significan Significan Significan Decision	t Paramete t Paramete t Paramete (α:5%)	r		
Control Res Regression Parameter Threshold Slope Intercept ANOVA Tai Source Model	sp C n Paramet C 3 - 5 ble \$ 5	0.9525 ers Estimate 0.05568 3.04 12.81 Sum Squar 900.0076	0.8 - NL Std Erro 0.0235 0.5398 2.266 res Me 90	or 95% L 0.0068 1.917 -17.52 ean Squar 0.0076	Yes CL 95% UCL 02 0.1046 4.162 -8.095 e DF 1	Passes Ac           t Stat           2.369           5.631           -5.652           F Stat           102.7	P-Value 0.0275 <0.0001 <0.0001 P-Value <0.0001	Decision Significan Significan Significan Decision Significan	t Paramete t Paramete t Paramete (α:5%) t	r		
Control Res Regression Parameter Threshold Slope Intercept ANOVA Tal Source Model Lack of Fit	sp C n Paramet C 3 - 5 ble \$ 5 1	0.9525 ers Estimate 0.05568 3.04 12.81 Sum Squar	0.8 - NL Std Erro 0.0235 0.5398 2.266 res Me 90 4.7	or 95% L 0.0068 1.917 -17.52 ean Squar	Yes CL 95% UCL 02 0.1046 4.162 -8.095 e DF	Passes Ac t Stat 2.369 5.631 -5.652 F Stat	P-Value 0.0275 <0.0001 <0.0001 P-Value	Decision Significan Significan Significan Decision	t Paramete t Paramete t Paramete (α:5%) t	r		
Control Res Regression Parameter Threshold Slope Intercept ANOVA Tal Source Model Lack of Fit Pure Error	sp C n Paramet C 3 - ble \$ 5 1 1	0.9525 ers Estimate 0.05568 3.04 12.81 Sum Squar 900.0076 14.11501	0.8 - NL Std Erro 0.0235 0.5398 2.266 res Me 90 4.7 9.4	or 95% L 0.0068 1.917 -17.52 ean Squar 0.0076 705004	Yes CL 95% UCL 02 0.1046 4.162 -8.095 e DF 1 3	Passes Ac           t Stat           2.369           5.631           -5.652           F Stat           102.7	P-Value 0.0275 <0.0001 <0.0001 P-Value <0.0001	Decision Significan Significan Significan Decision Significan	t Paramete t Paramete t Paramete (α:5%) t	r		
Control Res Regression Parameter Threshold Slope Intercept ANOVA Tal Source Model Lack of Fit Pure Error Residual	sp C n Paramet C C 3 3 - - - - - - - - - 1 1 1 1	0.9525 ers 5.05568 3.04 12.81 5.00.0076 14.11501 169.8587	0.8 - NL Std Erro 0.0235 0.5398 2.266 res Me 90 4.7 9.4	or 95% L 0.0068 1.917 -17.52 ean Squar 0.0076 705004 436595	Yes           Yes           CL         95% UCL           02         0.1046           4.162         -8.095           e         DF           1         3           18         18	Passes Ac           t Stat           2.369           5.631           -5.652           F Stat           102.7	P-Value 0.0275 <0.0001 <0.0001 P-Value <0.0001	Decision Significan Significan Significan Decision Significan	t Paramete t Paramete t Paramete (α:5%) t	r		
Control Res Regression Parameter Threshold Slope Intercept ANOVA Tal Source Model Lack of Fit Pure Error Residual Residual A	sp C n Paramet C C C C C C C C C C C C C C C C C C C	0.9525 ers Estimate 0.05568 3.04 12.81 Sum Squat 900.0076 14.11501 169.8587 183.9737	0.8 - NL Std Erro 0.0235 0.5398 2.266 res Me 90 4.7 9.4	or 95% L 0.0068 1.917 -17.52 ean Squar 0.0076 705004 436595	Yes           CL         95% UCL           02         0.1046           4.162           -8.095             e         DF           1           3           18           21	Passes Ac t Stat 2.369 5.631 -5.652 F Stat 102.7 0.4986	P-Value 0.0275 <0.0001 <0.0001 P-Value <0.0001 0.6879	Decision Significan Significan Significan Decision Significan Non-Signi	t Paramete t Paramete t Paramete (α:5%) t t fficant	r		
Control Res Regression Parameter Threshold Slope Intercept ANOVA Tal Source Model Lack of Fit Pure Error Residual Residual A Attribute	sp C n Paramet C C C C C C C C C C C C C C C C C C C	0.9525 ers Estimate 0.05568 8.04 12.81 Sum Squar 000.0076 14.11501 169.8587 183.9737 Wethod	0.8 - NL Std Errc 0.0235 0.5398 2.266 res Me 90 4.7 9.4 8.7	or 95% L 0.0068 1.917 -17.52 20076 705004 436595 760653	Yes           CL         95% UCL           02         0.1046           4.162         -8.095           e         DF           1         3           18         21           Test Stat	Passes Ac t Stat 2.369 5.631 -5.652 F Stat 102.7 0.4986 Critical	P-Value 0.0275 <0.0001 <0.0001 P-Value <0.0001 0.6879 P-Value	Decision Significan Significan Significan Decision Non-Signi Decision	t Paramete t Paramete t Paramete (α:5%) t fficant (α:5%)	r r		
Control Res Regression Parameter Threshold Slope Intercept ANOVA Tal Source Model Lack of Fit Pure Error Residual Residual A Attribute	sp C n Paramet C C C C C C C C C C C C C C C C C C C	0.9525 ers Estimate 0.05568 3.04 12.81 Sum Squat 900.0076 14.11501 169.8587 183.9737	0.8 - NL Std Errc 0.0235 0.5398 2.266 90 4.7 9.4 8.7 ni-Sq GO	or 95% L 0.0068 1.917 -17.52 0.0076 705004 436595 760653	Yes           CL         95% UCL           02         0.1046           4.162         -8.095           e         DF           1         3           18         21           Test Stat           184	Fasses Ac           t Stat           2.369           5.631           -5.652           F Stat           102.7           0.4986           Critical           32.67	P-Value           0.0275           <0.0001	Decision Significan Significan Significan Decision Non-Signi Decision Significan	t Paramete t Paramete t Paramete t Paramete (α:5%) t t Heterogen t Heterogen	r r		
Control Res Regression Parameter Threshold Slope Intercept ANOVA Tal Source Lack of Fit Pure Error Residual Residual A Attribute Goodness-r	sp C n Paramet C S ble S S S S S S S S S S S S S S S S S S S	0.9525 <b>ers</b> <b>estimate</b> 0.05568 8.04 12.81 <b>Sum Squal</b> 900.0076 14.11501 169.8587 183.9737 <b>Method</b> Pearson Ch	0.8 - NL Std Errc 0.0235 0.5398 2.266 res Mc 4.7 9.4 8.7 ni-Sq GO Ratio GO	or 95% L 0.0068 1.917 -17.52 ean Squar 0.0076 705004 436595 760653 F	Yes           CL         95% UCL           02         0.1046           4.162         -8.095           e         DF           1         3           18         21           Test Stat	Passes Ac t Stat 2.369 5.631 -5.652 F Stat 102.7 0.4986 Critical	P-Value 0.0275 <0.0001 <0.0001 P-Value <0.0001 0.6879 P-Value	Decision Significan Significan Significan Decision Non-Signi Decision Significan	t Paramete t Paramete t Paramete (a:5%) t (a:5%) t Heterogei t Heterogei	r r		
Control Res Regression Parameter Threshold Slope Intercept ANOVA Tal Source Model Lack of Fit Pure Error Residual Residual A Attribute Goodness-r	sp C n Paramet C 3 5 5 5 5 5 5 5 7 7 7 7 7 7 7 7 7 7 7 7	0.9525 ers Estimate 0.05568 3.04 12.81 Sum Squat 900.0076 14.11501 169.8587 183.9737 Wethod Pearson Ch- i.kelihood F	0.8 - NL Std Errc 0.0235 0.5398 2.266 res Me 9.0 4.7 9.4 8.7 ni-Sq GO Ratio GO Iality of V	or 95% L 0.0068 1.917 -17.52 ean Squar 0.0076 705004 436595 760653 F F F Yariance	Yes           2         95% UCL           02         0.1046           4.162         -8.095           e         DF           1         3           18         21           Test Stat           184         202.4           9.908         9.08	Fasses Ac           t Stat           2.369           5.631           -5.652           F Stat           102.7           0.4986           Critical           32.67           32.67	P-Value           0.0275           <0.0001	Decision Significan Significan Significan Significan Non-Signi Decision Significan Significan	t Paramete t Paramete t Paramete (α:5%) t (α:5%) t Heteroger t Heteroger iances	r r		
Control Res Regression Parameter Threshold Slope Intercept ANOVA Tal Source Model Lack of Fit Pure Error Residual A Attribute Goodness- Variances	sp C n Paramet C C C C C C C C C C C C C C C C C C C	0.9525 ers Estimate 0.05568 3.04 12.81 Sum Squar 900.0076 14.11501 169.8587 183.9737 Vethod Pearson Ch- ikelihood F Bartlett Equ Mod Levenn Shapiro-Wil	0.8 - NL Std Errc 0.0235 0.5398 2.266 90 4.7 9.4 8.7 ni-Sq GO Ratio GO Ratio GO Ratio y V e Equality Ik W Nor	pr 95% L 0.0068 1.917 -17.52 9an Squar 0.0076 705004 436595 760653 F F fariance y of Variar mality	Yes           2         0.1046           4.162         -8.095           e         DF           1         3           18         21           Test Stat         184           202.4         9.908           ice         0.9376           0.9631         1	Passes Ac t Stat 2.369 5.631 -5.652 F Stat 102.7 0.4986 Critical 32.67 32.67 11.07	P-Value 0.0275 <0.0001 <0.0001 P-Value <0.0001 0.6879 P-Value <0.0001 <0.0001 0.0779	Decision Significan Significan Significan Non-Signi Decision Significan Significan Significan	t Paramete t Paramete t Paramete (α:5%) t t (α:5%) t Heterogen t Heterogen t Heterogen t Heterogen t Heterogen iances	r r		
Control Res Regression Parameter Threshold Slope Intercept ANOVA Tal Source Model Lack of Fit Pure Error Residual A Attribute Goodness- Variances	sp C n Paramet C C C C C C C C C C C C C C C C C C C	0.9525 ers Estimate 0.05568 3.04 12.81 Sum Squar 900.0076 14.11501 169.8587 183.9737 Vethod Pearson Ch .ikelihood Fq Mod Levend Mod Levend	0.8 - NL Std Errc 0.0235 0.5398 2.266 90 4.7 9.4 8.7 ni-Sq GO Ratio GO Ratio GO Ratio y V e Equality Ik W Nor	pr 95% L 0.0068 1.917 -17.52 9an Squar 0.0076 705004 436595 760653 F F fariance y of Variar mality	Yes           2         0.1046           4.162         -8.095           e         DF           1         3           18         21           Test Stat         184           202.4         9.908           ice         0.9376           0.9631         1	Fasses Ac           t Stat           2.369           5.631           -5.652           F Stat           102.7           0.4986           Critical           32.67           32.67           11.07           2.773	P-Value           0.0275           <0.0001	Decision Significan Significan Significan Significan Non-Signi Significan Significan Significan Equal Var Equal Var	t Paramete t Paramete t Paramete t Paramete (α:5%) t t (α:5%) t Heterogen iances iances iances	r r		
Control Res Regression Parameter Threshold Slope Intercept ANOVA Tai Source Model Lack of Fit Pure Error Residual Attribute Goodness-r Variances Distribution	sp C n Paramet C 3 5 5 5 5 5 5 5 7 1 1 1 1 1 1 1 1 1 1 5 5 5 5	0.9525 ers Estimate 0.05568 3.04 12.81 Sum Squar 000.0076 14.11501 169.8587 183.9737 Wethod Pearson Ch Likelihood F Bartlett Equ Wod Levent Shapiro-Wil Anderson-C	0.8 - NL Std Errc 0.0235 0.5398 2.266 90 4.7 9.4 8.7 ni-Sq GO Ratio GO Ratio GO Ratio y V e Equality Ik W Nor	pr 95% L 0.0068 1.917 -17.52 9an Squar 0.0076 705004 436595 760653 F F fariance y of Variar mality	Yes           2         0.1046           4.162         -8.095           e         DF           1         3           18         21           Test Stat         184           202.4         9.908           0.9376         0.9631	Passes Ac           t Stat           2.369           5.631           -5.652           F Stat           102.7           0.4986           Critical           32.67           32.67           1.07           2.773           0.9169           2.492	P-Value           0.0275           <0.0001	Decision Significan Significan Significan Significan Non-Signi Decision Significan Significan Significan Significan Significan Significan Normal D	t Paramete t Paramete t Paramete t Paramete (α:5%) t t (α:5%) t Heterogen iances iances iances	r r		
Control Res Regression Parameter Threshold Slope Intercept ANOVA Tal Source Model Lack of Fit Pure Error Residual Attribute Goodness- Variances Distribution Proportion	sp C n Paramet C S ble S S S S S S S S S S S S S S S S S S S	0.9525 ers Estimate 0.05568 3.04 12.81 Sum Squar 900.0076 14.11501 169.8587 183.9737 Wethod Pearson Ch .ikelihood F Bartlett Equ Wod Levens Shapiro-Wil Anderson-E Summary	0.8 - NL Std Errc 0.0235 0.5398 2.266 res Me 9.0 4.7 9.4 8.7 ni-Sq GO Ratio GO	or 95% L 0.0068 1.917 -17.52 ean Squar 0.0076 705004 436595 760653 F F 74riance y of Variar mality 2 Normalit	Yes           Yes           CL         95% UCL           02         0.1046           4.162         -8.095           e         DF           1         3           18         21           Test Stat           184         202.4           9.908         0.9376           0.9631         y           0.448	Passes Ac           t Stat           2.369           5.631           -5.652           F Stat           102.7           0.4986           Critical           32.67           32.67           32.67           2.773           0.9169           2.492           Calcul	P-Value           0.0275           <0.0001	Decision Significan Significan Significan Significan Non-Signi Decision Significan Significan Significan Significan Equal Var Normal D Normal D	t Paramete t Paramete t Paramete t Paramete (a:5%) t fifcant (a:5%) t Heterogen iances iances istribution istribution	r r		
Control Res Regression Parameter Threshold Slope Intercept ANOVA Tal Source Model Lack of Fit Pure Error Residual Attribute Goodness Variances Distribution Proportion C-µg/L	sp C n Paramet C 3 5 5 5 5 5 5 5 7 1 1 1 1 1 1 1 1 1 1 5 5 5 5	0.9525 ers Estimate 0.05568 3.04 12.81 Sum Squar 00.0076 14.11501 169.8587 183.9737 Wethod Pearson Ch i.kelihood F Bartlett Equ Wod Levens Shapiro-Wil Anderson-E Summary Type	0.8 - NL Std Errc 0.0235 0.5398 2.266 90 4.7 9.4 8.7 ni-Sq GO Ratio GO Ratio GO Ratio y V e Equality Ik W Nor	pr 95% L 0.0068 1.917 -17.52 9an Squar 0.0076 705004 436595 760653 F F fariance y of Variar mality	Yes           Yes           Q2         0.1046           4.162         -8.095           e         DF           1         3           18         21           Test Stat           184         202.4           9.098         0.9376           0.9631         y           y         0.448	Passes Ac           t Stat           2.369           5.631           -5.652           F Stat           102.7           0.4986           Critical           32.67           32.67           1.07           2.773           0.9169           2.492	P-Value           0.0275           <0.0001	Decision Significan Significan Significan Significan Non-Signi Decision Significan Significan Significan Significan Significan Significan Normal D	t Paramete t Paramete t Paramete t Paramete (α:5%) t t (α:5%) t Heterogen iances iances iances	r r nity nity	- <b>A</b> 381	
Control Res Regression Parameter Threshold Slope Intercept ANOVA Tal Source Model Lack of Fit Pure Error Residual A Attribute Goodness Variances Distribution Proportion C-µg/L 6.1	sp C n Paramet E C C C S S S S S S S S S S S S S S S S	0.9525 ers Estimate 0.05568 3.04 12.81 Sum Squar 00.0076 14.11501 169.8587 183.9737 Wethod Pearson Ch i.kelihood F Bartlett Equ Wod Levens Shapiro-Wil Anderson-E Summary Type	0.8 - NL Std Errc 0.0235 0.5398 2.266 res Me 90 4.7 9.4 8.7 ni-Sq GO Ratio GO vality of V e Equality Ik W Nor Darling A2 Count	or 95% L 0.0068 1.917 -17.52 ean Squar 0.0076 705004 436595 760653 F F F F Yariance y of Variar mality 2 Normalit Mean	Yes           Yes           Q2         0.1046           4.162         -8.095           e         DF           1         3           18         21           Test Stat           184         202.4           9.098         0.9376           0.9631         y           y         0.448	Passes Ac           t Stat           2.369           5.631           -5.652           F Stat           102.7           0.4986           Critical           32.67           32.67           11.07           2.773           0.9169           2.492           Calcul           Max	P-Value           0.0275           <0.0001	Decision Significan Significan Significan Significan Non-Signi Decision Significan Significan Significan Equal Var Normal D Normal D Normal D Std Dev	t Paramete t Paramete t Paramete t Paramete (a:5%) t fficant (a:5%) t Heteroger iances iances istribution istribution	r r nity nity %Effect		
Control Res Regression Parameter Threshold Slope Intercept ANOVA Tal Source Model Lack of Fit Pure Error Pure Error Pure Error Pure Error Pure Error Residual Attribute Goodness- Variances Distribution Proportion C-jug/L 6.1 1900	sp C n Paramet E C C C S S S S S S S S S S S S S S S S	0.9525 ers Estimate 0.05568 3.04 12.81 Sum Squar 00.0076 14.11501 169.8587 183.9737 Wethod Pearson Ch i.kelihood F Bartlett Equ Wod Levens Shapiro-Wil Anderson-E Summary Type	0.8 - NL Std Errc 0.0235 0.5398 2.266 90 4.7 9.4 8.7 ni-Sq GO Ratio GO result w Nor Darling A2 Count 4	or 95% L 0.0068 1.917 -17.52 ean Squar 0.0076 705004 36595 760653 F F F Yariance y of Variar mality 2 Normalit 2 Normalit 0.9525	Yes           202         95% UCL           002         0.1046           4.162         -8.095           e         DF           1         3           18         21           Test Stat           184         202.4           9.908         0.9631           y         0.448           Min           0.88         0.92	Passes Ac           t Stat           2.369           5.631           -5.652           F Stat           102.7           0.4986           Critical           32.67           32.67           32.67           2.773           0.9169           2.492           Calcul           Max           0.98	P-Value           0.0275           <0.0001	Decision Significan Significan Significan Significan Non-Signi Significan Significan Equal Var Equal Var Equal Var Equal Var Burmal D Normal D Normal D	t Paramete t Paramete t Paramete t Paramete (a:5%) t fifcant (a:5%) t Heteroger iances iances iances istribution <u>CV%</u> 5.1%	r r nity nity <u>%Effect</u> 0.0%	381	400
Control Res Regression Parameter	sp C n Paramet E C C C S S S S S S S S S S S S S S S S	0.9525 ers Estimate 0.05568 3.04 12.81 Sum Squar 00.0076 14.11501 169.8587 183.9737 Wethod Pearson Ch i.kelihood F Bartlett Equ Wod Levens Shapiro-Wil Anderson-E Summary Type	0.8 - NL Std Errc 0.0235 0.5398 2.266 90 4.7 9.4 8.7 ni-Sq GO Ratio GO resulty of V e Equality k W Norr Darling A2 Count 4 4	pr 95% L 0.0068 1.917 -17.52 9an Squar 0.0076 705004 936595 760653 F F F fariance y of Variar mality 2 Normality 2 Normality Mean 0.9525 0.94	Yes           202         95% UCL           002         0.1046           4.162         -8.095           e         DF           1         3           18         21           Test Stat           184         202.4           9.908         0.9631           y         0.448           Min           0.88         0.92	Passes Ac           t Stat           2.369           5.631           -5.652           F Stat           102.7           0.4986           Critical           32.67           32.67           11.07           2.773           0.9169           2.492           Calcul           Max           0.98           0.96	P-Value           0.0275           <0.0001	Decision Significan Significan Significan Significan Non-Signi Decision Significan Significan Significan Equal Var Normal D Normal D Normal D e(A/B) Std Dev 0.04856 0.01826	t Paramete t Paramete t Paramete t Paramete (α:5%) t fificant (α:5%) t Heteroger iances istribution istribution <b>CV%</b> 5.1% 1.94%	r r nity nity <u>%Effect</u> 0.0% 1.31%	381 376	400 400
Control Res Regression Parameter Threshold Slope Intercept ANOVA Tal Source Model Lack of Fit Pure Error Residual Attribute Goodness-r Variances Distribution Proportion C-µg/L 6.1 1900 3900	sp C n Paramet E C C C S S S S S S S S S S S S S S S S	0.9525 ers Estimate 0.05568 3.04 12.81 Sum Squar 00.0076 14.11501 169.8587 183.9737 Wethod Pearson Ch i.kelihood F Bartlett Equ Wod Levens Shapiro-Wil Anderson-E Summary Type	0.8 - NL Std Errc 0.0235 0.5398 2.266 90 4.7 9.4 8.7 9.4 8.7 9.4 8.7 9.4 9.4 9.7 9.4 8.7 9.4 9.4 9.4 9.4 8.7 0.2 8.7 9.4 9.4 9.4 9.4 9.4 9.4 9.4 9.4	or 95% L 0.0068 1.917 -17.52 9an Squar 0.0076 705004 436595 760653 F F fariance y of Variar mality 2 Normality 2 Normality 2 Normality 0.9525 0.94 0.9175	Yes           Yes           02         0.1046           4.162         -8.095           e         DF           1         3           18         21           Test Stat           184         202.4           9.908         0.9631           y         0.448           Min           0.88         0.92           0.89         0.57	Passes Ac           t Stat           2.369           5.631           -5.652           F Stat           102.7           0.4986           Critical           32.67           32.67           11.07           2.773           0.9169           2.492           Calcul           Max           0.98           0.96           0.95	P-Value           0.0275           <0.0001	Decision Significan Significan Significan Significan Non-Signi Decision Significan Equal Var Equal Var Equal Var Equal Var Normal D Normal D Normal D Normal D e(A/B) Std Dev 0.04856 0.01826 0.03202	t Paramete t Paramete t Paramete t Paramete (a:5%) t fficant t Heteroger iances istribution istribution <b>CV%</b> 5.1% 1.94% 3.49%	r r nity nity %Effect 0.0% 1.31% 3.68%	381 376 367	400 400 400

CETIS™ v1.8.7.16



CETIS™ v1.8.7.16

	mary Repo							Report Date Test Code:		BC5008   19	4 (p 1 of -0816-666
Echinoid Emb	ryo-Larval Dev	elopmer	nt Test						SPA	WAR Syste	ms Cente
Batch ID: Start Date: Ending Date: Duration:	18-8664-8575 25 Mar-16 09:3 NA	50 F	Test Type: Protocol: Species: Source:	Development EPA/600/R-95, Strongylocentr Field Collected	otus purpura	tus		Diluent:	Jacob Munson Laboratory Sea Not Applicable	awater	
Sample ID: Sample Date: Receive Date: Sample Age:	16-8655-8329 25 Mar-16 10h	N S	Code: Aaterial: Source: Station:	6486D679 Zinc sulfate Pulsed Exposu Static	ire				SPAWAR Pulsed Exposu	Ire	
Comparison S	ummary										
Analysis ID 11-1562-4001	Endpoint Proportion Nor	mal	<b>NOEL</b> 63	. LOEL 120	TOEL 86.95	PM SD 6.66%	τu	Metho	od ett Multiple Cor	nparison Tes	it
Point Estimate	Summary										
Analysis ID 12-1121-3761	Endpoint Proportion Nor	mal	Level EC50	<b>µg/L</b> 146.2	95% LCL 134.4	95% UCL 158.1	τu	Metho Linear	od Regression (N	ALE)	
Test Acceptab	ility										
Analysis ID	Endpoint		Attrib		Test Stat	TAC Limi	ts	Overla			
11-1562-4001	Proportion Nor			ol Resp	0.9825	0.8 - NL		Yes		Acceptability	
12-1121-3761 11-1562-4001	Proportion Nor Proportion Nor		PMS	ol Resp )	0.9825 0.06662	0.8 - NL NL - 0.25		Yes No		Acceptability Acceptability	
Proportion No	rmal Summary										
•	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std E	rr Std Dev	CV%	%Effec
6.1	Lab Control	4	0.982	5 0.9586	1	0.96	0.99	0.007	5 0.015	1.53%	0.0%
37		4	0.972		1	0.95	1	0.0110		2.28%	1.02%
63		4	0.98	0.9456	1	0.95	1	0.0108		2.2%	0.25%
120		4	0.637		0.8406	0.47	0.78			20.02%	35.11%
220 480		4 4	0.177 0	5 0.01297 0	0.342 0	0.08 0	0.32 0	0.051 0	7 0.1034 0	58.25%	81.93% 100.0%
		4	0	0	0	0	0	0	0		100.070
Proportion No C-µg/L	rmal Detail Control Type	Ban 1	Ban	Ban 2	Rep 4						
	Lab Control	Rep 1 0.96	Rep 2 0.99	2 Rep 3	0.99						
37	Lab Control	0.96	0.99	0.99	0.99						
63		0.99	0.98	0.95	1						
120		0.78	0.64	0.47	0.66						
220		0.18	0.13	0.08	0.32						
480		0	0	0	0						
Proportion No	rmal Binomials	6									
19	Control Type	Rep 1	Rep 2		Rep 4						
	Lab Control	96/100	99/10		99/100						
37		96/100	100/1	00 98/100	95/100						
63		99/100	98/10	0 95/100	100/100						
120		78/100	64/10	0 47/100	66/100						
		40/400	13/10	0 8/100	32/100						
220		18/100	13/10	0 8/100	32/100						

CETIS™ v1.8.7.16

CETIS Ana	lytical Repo	ort					-	ort Date: Code:		Jun-16 08:2 3C5008   19	
Echinoid Emb	ryo-Larval Dev	elopmei	nt Test						SPA	WAR Syste	ms Cente
Analysis ID: Analyzed:	11-1562-4001 03 Jun-16 8:24		Endpoint: Analysis:	Proportion Nor Parametric-Co		tments		IS Version		.8.7	
Batch ID: Start Date: Ending Date: Duration:	18-8664-8575 25 Mar-16 09:3 NA	0 1	Test Type: Protocol: Species: Source:	Development EPA/600/R-95, Strongylocentr Field Collected	otus purpura	tus	Anal Dilue Brin Age:	ent: Lab e: Noi	ob Munson- ooratory Sea Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:	16-8655-8329 25 Mar-16 10h	1	Code: Material: Source: Station:	6486D679 Zinc sulfate Pulsed Exposu Static	ire		Clier Proj		AWAR sed Exposur	e	
Data Transfor	m	Zeta	Alt H	yp Trials	Seed		PMSD	NOEL	LOEL	TOEL	TU
Angular (Corre	cted)	NA	C > T	NA	NA		6.66%	63	120	86.95	
	ple Comparisor	n Test	Test	Stat Critical		B Value	P Turpo	Desision	(a:5%)		
Control 6.1 6.1 6.1	vs C-µg/L 37 63 120*		0.413 0.055 7.307	2 2.356 52 2.356 2.356	0.167 6 0.167 6 0.167 6	P-Value 0.6422 0.7815 <0.0001	P-Type CDF CDF CDF	Non-Sign Significar	ificant Effect ificant Effect nt Effect		
6.1	220*		14.44	2.356	0.167 6	<0.0001	CDF	Significa	IL Ellect		
Test Acceptab											
Attribute Control Resp	Test Stat 0.9825	0.8 - N		Overlap Yes	Decision	ceptability	Critorio				
PMSD	0.9625	0.0 - N NL - 0		No		ceptability					
ANOVA Table											
Source	Sum Squ	ares	Mean	Square	DF	F Stat	P-Value	Decision	(α:5%)		
Between	3.270706		0.817		4	81.69	<0.0001	Significa			
Error	0.1501473	3	0.010	00982	15	_					
Total	3.420853				19						
Distributional	Tests										
Attribute	Test			Test Stat		P-Value	Decision				
Variances Distribution	Bartlett E Shapiro-\		of Variance	3.409 0.9708	13.28 0.866	0.4919 0.7710	Equal Var Normal Di				
	ormal Summary		tormancy	0.0100	0.000	0.1110	Homa B	Scribution			
C-µg/L	Control Type	Count	t Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
с-µу/с 6.1	Lab Control	4	0.982		1	0.99	0.96	0.99	0.0075	1.53%	0.0%
37		4	0.972		1	0.97	0.95	1	0.01109	2.28%	1.02%
63		4	0.98	0.9456	1	0.985	0.95	1	0.0108	2.2%	0.25%
120		4	0.637	5 0.4344	0.8406	0.65	0.47	0.78	0.06382	20.02%	35.11%
220		4	0.177		0.342	0.155	0.08	0.32	0.0517	58.25%	81.93%
480		4	0	0	0	0	0	0	0		100.0%
	ected) Transfor		-								
C-µg/L	Control Type	Count		95% LCL			Min	Max	Std Err	CV%	%Effect
6.1	Lab Control	4	1.445	1.365	1.526	1.471	1.369	1.471	0.0253	3.5%	0.0%
37		4	1.416	1.292	1.54	1.399	1.345	1.521	0.03907	5.52%	2.02%
63		4	1.441	1.323	1.56	1.45	1.345	1.521	0.03714	5.15%	0.27%
100				0 71/17	1 1 4 7	0.9378	0.7554	1.083	0.06715	14 4706	35.77%
120		4	0.928		1.142					14.47%	
120 220 480		4 4 4	0.928	3 0.2113	0.6362 0.05003	0.4035 0.05002	0.2868 0.05002	0.6013	0.06677 0	31.51% 0.0%	70.68% 96.54%

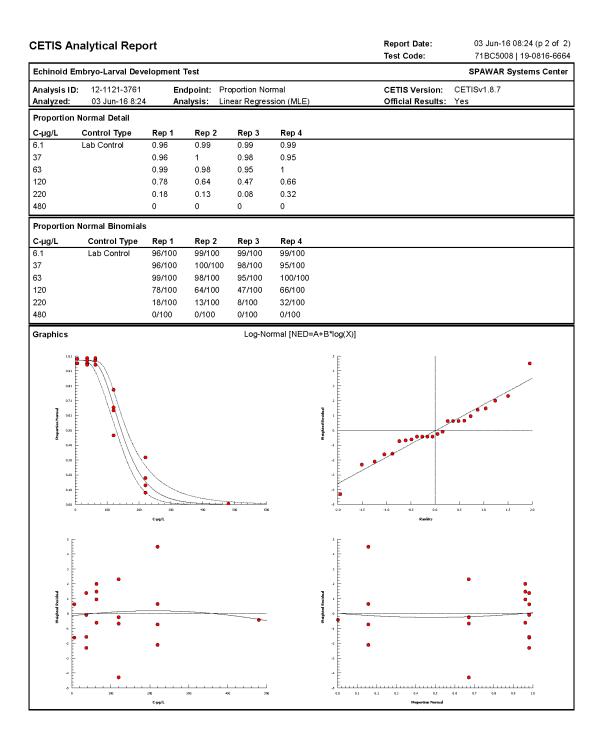
CETIS™ v1.8.7.16

CETIS Ana	alytical Repo	ort					Report Date: Test Code:	03 Jun-16 08:24 (p 2 of 2 71BC5008   19-0816-666
Echinoid Em	bryo-Larval Deve	lopment T	est					SPAWAR Systems Center
Analysis ID: Analyzed:	11-1562-4001 03 Jun-16 8:24		•	portion Nori rametric-Cor	mal htrol vs Treatn	nents	CETIS Version: Official Results:	CETISv1.8.7 Yes
Proportion N	ormal Detail							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.1	Lab Control	0.96	0.99	0.99	0.99			
37		0.96	1	0.98	0.95			
63		0.99	0.98	0.95	1			
120		0.78	0.64	0.47	0.66			
220		0.18	0.13	0.08	0.32			
480		0	0	0	0			
Angular (Cor	rected) Transforr	ned Detail						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.1	Lab Control	1.369	1.471	1.471	1.471			
37		1.369	1.521	1.429	1.345			
63		1.471	1.429	1.345	1.521			
120		1.083	0.9273	0.7554	0.9483			
220		0.4381	0.3689	0.2868	0.6013			
480		0.05002	0.05002	0.05002	0.05002			
Proportion N	ormal Binomials							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.1	Lab Control	96/100	99/100	99/100	99/100			
37		96/100	100/100	98/100	95/100			
63		99/100	98/100	95/100	100/100			
120		78/100	64/100	47/100	66/100			
220		18/100	13/100	8/100	32/100			
480		0/100	0/100	0/100	0/100			
Graphics								
۳Ee	•					°20 F	1	
0.9				Reject Null	-	0.15		
0.8						uis –		
Ē		Γ				0.10		•
Proportion Norma			<b>.</b>		말 문	Ē		
- a -			-		Contered Contered	0.05		
a os						0.00		
0.4		_				E	•	
Ē						-0.05		
0.3 E						-0.10	•	
0.2				-		1		
0.1						-0.15	•	
"Ē				_	_	-0.20		
	6.1LC 37		120 220	480			.5 -1.0 -0.5 0.0	05 1.0 15 2.0
		C-µg/L					Rankits	

CETIS™ v1.8.7.16

CETIS A	nalytic	al Repo	rt					-	ort Date: Code:			24 (p 1 of 2 9-0816-666
Echinoid E	Embryo-L	arval Deve.	lopment T	est						SPA	WAR Syst	ems Cente
Analysis II Analyzed:		121-3761 lun-16 8:24			oportion Nori near Regress				S Version: al Results		.8.7	
Batch ID:		664-8575			evelopment			Anal	•	ob Munson-		
Start Date:		/lar-16 09:30			PA/600/R-95/			Dilue		oratory Sea	water	
Ending Da Duration:	te: NA		Spe Sou		rongylocentro eld Collected		us	Brine Age:		Applicable		
Sample ID	· 16-8	655-8329	Cod	e: 64	186D679			Clier	nt: SP4	AWAR		
Sample Da					nc sulfate			Proje		sed Exposur	е	
Receive Da	ate:		Sou	rce: P	ulsed Exposu	re		-				
Sample Ag	je: 10h		Stat	ion: Si	atic							
Linear Reg	ression	Options										
Model Fun					Id Option	Threshold	-		Het Corr	Weighted		
Log-Norma	I [NED=A	+B*log(X)]		Control -	Threshold	0.0175	Yes	No	Yes	Yes		
Regressio							-					
10 -5	 79.2	AICc 1166	BIC 1168	Mu 2.165	Sigma 0.1783	Adj R2 0.9536	F Stat 1.17	Critical 3.16	P-Value 0.3488	Decision Non-Signi		k of Fit
Point Estir				2.100	0.1100	0.0000		0.10	0.0100	iten eigin	nount Euo	
	j/L	95% LCL	95% UCL									
	16.2	134.4	158.1									
Test Accep	otability (	Criteria										
Attribute		Test Stat	TAC Limit	s	Overlap	Decision						
Control Res	sp	0.9825	0.8 - NL		Yes	Passes Ac	ceptability C	Criteria				
Regressio	n Param	eters										
Parameter		Estimate	Std Error				P-Value	Decision(				
Threshold		0.01854	0.008458	0.00095		2.193	0.0397	-	t Parameter			
Slope Intercept		5.61 -12.14	0.5503 1.203	4.465 -14.65	6.754 -9.643	10.19 -10.09	<0.0001 <0.0001	-	t Parameter t Parameter			
	ble							-				
Source		Sum Squa	res Mea	n Square	DF	F Stat	P-Value	Decision(	α:5%)			
Model		1612.709	1612	2.709	1	474.7	<0.0001	Significant	t			
Lack of Fit		11.64034		0115	3	1.17	0.3488	Non-Signi	ficant			
Pure Error Residual		59.70355 71.34389		6864 7328	18 21							
Residual A	nalvsis											
Attribute		Method			Test Stat	Critical	P-Value	Decision(	(α:5%)			
Goodness-	of-Fit	Pearson Cl	ni-Sq GOF		71.34	32.67	<0.0001		t Heterogen	iity		
		Likelihood			72.48	32.67	< 0.0001	-	t Heterogen	ity		
Variances Distribution		Mod Leven				2.773	0.2278	Equal Var				
Distribution		Shapiro-Wi Anderson-[		-	0.9656 0.4532	0.9169 2.492	0.5602 0.2755	Normal Di Normal Di				
Proportion	Normal	Summary				Calcul	ated Variat	e(A/B)				
C-µg/L	Contro	ol Type	Count	Mean	Min	Max	Std Err	Std Dev	cv%	%Effect	A	в
6.1	Lab Co	ontrol	4	0.9825	0.96	0.99	0.0075	0.015	1.53%	0.0%	393	400
37			4	0.9725	0.95	1	0.01109	0.02217	2.28%	1.02%	389	400
62			4	0.98	0.95	1	0.0108	0.0216	2.2%	0.25%	392	400
					0.47	0.78	0.06383	0 1276	20.0204	35 1104	255	400
63 120 220			4 4	0.6375 0.1775	0.47 0.08	0.78 0.32	0.06382 0.0517	0.1276 0.1034	20.02% 58.25%	35.11% 81.93%	255 71	400 400

CETIS™ v1.8.7.16



CETIS™ v1.8.7.16

## Embryo Larval Bioassay

# 96-Hour Development

Project: Zn Urehm Pulse Test

Test Species: S. purpuratus

Sample ID:

Test No.:

Start Date: March 25, 2016 0930

End Date: Marsh 21, 2016 0930

Random #	Number Counted	Number Normal	Technician Initials
1	190	18	I J.u.
ζ.		2.	6
3		19	
ц		94	· ·
5		0	
6		42	
7		99	
8.		0	
9		99	
10		0	
11		96	
12			
13		0	
14		6	
15		93	
16		73	
17		0	
18		18	
19		54	
29		2.	
21	· .	76	
22		95	
23		97	
24		51	
2.5		92	
26		97	
27		15	
28		15	
29		70	
30		73	
51		3.5	
3.2.	-	95	· · · · · · · · · · · · · · · · · · ·
13 .		23	
5	· · · •	2	10

QC Check: NH 4/4/2016

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Final Review: <u>Lel 516</u>11e

## Embryo Larval Bioassay

## 96-Hour Development

Project: Zn wrahin Pulse Test

Test Species: S. purpuratus

Sample ID: \_\_\_\_\_

Start Date: <u>Harch 25, 2016 0930</u>

Test No.: \_\_\_\_\_

End Date: <u>March 29,2016</u> Ct 30

Random #	Number Counted	Number Normal	Technician Initials
36	100	m 68-91	gut
37 .		66	
38		95	
38		3	
42		63 .	
41		77	
42		96	
<u>43</u>		57	
44		60	
45		40	
46		79	
47		75	
. 48		0	
44	· ·	63	
50		15	
51		74	
52.		96	
53		89	
54	· ·	99	
55	·····	v= 22.32	
56	· · ·	88	
57		2.0	
58		15	
59		96	
60		92	
61		48	
62.		- 75	
63		93	
64		84	
65		95	
66		- 75	
67	-	92	
68 . `		92	
61	·	97	*

QC Check: <u>NH 4/4/2016</u>

÷.,

Final Review: 10 5/6/16

## Embryo Larval Bioassay

### 96-Hour Development

Project: Zn Urann Rulse Test

Sample ID: \_\_\_\_\_

Test Species: S. purpuratus

Start Date: Maren 29, 2016 0930 End Date: Maren 29, 2016 0930

Test No.:\_\_\_\_\_

Random #	Number Counted	Number Normal	Technician Initials
71	100	88	JUD
72	1	97	
73		95	
74		89	
.75		88	
:7 <i>6</i>		7 Z.	
77		92	
78		79	
74		96	
80		34	
81		98	
87.		98	
83		11	
84		57	
85	•	97	
86		25	
87	4	<u>₹</u> \$	1.
さす	100	79	5~0
		87.1 J	
	,		
-m.			
		, , <u>al-i-ari</u>	

SPAWAR Systems Center Pacific Bioassay Lab, 53475 Strothe Rd, Bldg 111 Rm 116, San Diego, CA 92152

Reference Test			Random #
LC	A	0.8748	7
	В	0.6869	21
	С	0.3910	18
	D	0.4382	1
20	A	0.0037	9
	В	0.5837	22
	С	0.0441	11
	D	0.8849	3
40	A	0.7292	16
	В	0.9292	15
	С	0.5733	4
	D '	0.0445	23
80	A	0.6876	24
	В	0.8564	6
	С	0.7220	12
	D	0.6714	19
160	A	0.1709	20
	В	0.3706	13
	С	0.3369	14
	D	0.1066	2
320	А	0.9091	17
	В	0.2122	8
	С	0.2670	5
	D	0.8133	10

Randonit's En Pulsed Exposition 3/25/2-010

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			Random #	
Lab Control	A	0.5845	61	
	В	0.6507	69	
	C	0.4249	71	
	D	0.9299	82	
1280 (3)	A	0.8379		
	В	0.0162	32	
	С	0.7760	86	
	D	0.1132	59	
1280 (6)	A	0.8304	81	
	В	0.7995	54	
	С	0.0726	50	
	D	0.7270	47	
1280 (12)	A	0.2938	52	
	В	0.4319	63	
	С	0.8490	38	- 76
	D	0.6585	68	
2560 (3)	A	0.3413	26	
	В	0.0507	72	
	С	0.3755	79	
	D	0.1115	87	
2560 (6)	A	0.3180	58	
	В	0.1302	64	
	C,	0.4550	42	
	D	0.5330	41	
2560 (12)	A	0.8517	31	
	B	0.2851	51	
	C	0.8529	70	
	D	0.0780	74	
5120 (3)	A	0.6611	66	
	B	0.8533	62	
	C	0.2712	85	
	D	0.9482	25	
5120 (6)	A	0.4405	33	
	B	0.2024	73	
	C	0.6027	67	
	D	0.4736		
5120 (12)	A .	0.8423	78	
5120 (12)	B	0.9545	43	
	C	0.4812	45	
	D	0.6995	88	ockel
1	U	0.0995	00	1/1/

. 4

A-94

Random #'s Zr Pulsed Exposure 3/25/2016

10240 (3)	A	0.4941	75 - 81
	В	0.9326	30 - 86
	С	0.6437	77 -92
	D	0.1938	53 -90
10240 (6)	A	0.8836	37
	В	0.3714	56
	C	0.4978	60
	D .	0.6438	40
10240 (12)	A	0.8103	35 - 8
	В	0.8089	80
	C	0.4931	49 87
	D	0.2327	29-64
20480 (3)	A	0.6762	34 - 51
	В	0.9751	55 🛩 70
	C	0.9596	36 - 94
	D	0.1544	83
20480 (6)	A	0.6905	84 72
	В	0.4058	44 ~ 46
	С	0.0901	27 - 10
	D	0.9705	57 63
20480 (12)	A	0.2912	28 - 8'
	В	0.5643	48 -21
	C	0.3675	45
	D	0.2211	39 -4

QA/QC Ill

Marine Chronic Bioassay

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Project: Zin PUISE Sample ID: Ref tox + 3 hr pulse

Test No.:

Water Quality Measurements

0830 0630 Test Species: <u>S. purpuratus</u> Start Date/Time: <u>3/25/16</u> End Date/Time: <u>3/29/16</u>

Jugle         0         24           (16)         33.5         351           33.5         331         333           33.5         333         333           23.3         333         333	Uppu         72         96           48         72         95           55 4         33.2         53.5           35.6         33.4         33.4           35.4         23.5         33.4	L		(Ce)					Dissolved Uxygen	ygen			5	рп (nH unite)		
(b) 33.5 331 33.5 334 33.4 35.37 33.4 35.37 33.4 35.37	14 332 56 336	96	0	24 48	72	96	0	24	48	72	96	0	24	48	72	96
33.5 33.4 33.4 33.3. 33.3 33.1	6 33.6	33.3	12:0	14.7 15.2 15:0 15.2	2 15.0		7.9	5.2	1-3	0.8	3.3	7,92	8.00	8.00 T.es 7.68		294
<b>33.4</b> 333. <b>33.3</b> 33.1	4 235	33.4	15-2 14.3	3 14.7	14.7 14.7 15.2	15.2	8.2 8.4		8.3	8.[	S, D	7.96	8-0-8	7.96 8.04 7.91 8273		2.84
			15:0 14.4	4 14.8	U-1/	6.2	2.8	F. 3	8.3	8.(	õ. (	7.96	7.96 8.06	7.85 7	7,78	7.71
t	33,3 33,6 34,1 15.0 144 14.6 N.4 152	- Ž	15.0 14	14.6	7 7		3.2	5-4	8.3	8.3 8.2 7.9	7.9	7.97	7.97 \$ 060	7.07 \$	8.02	7.31
\6O 33.0 32.9 33.	33.0 33.3 33.7	33.7	15.0	15.0 14.7 14.6 15.Z	٩.٢		8.1	8.4	8.3	8.3	8.1	7.99	7.99 8.00	\$ \$	5.06	20.8
320 325 324 3	32.6 33.0 33.5		8 H L'H L'H 0-51	1-1-1	1 14.8	15: 2	8.2	84	8.7	8.3	5.2	1.97	7.97 8.04 8-01	8-01 8	S.06	1.57
Le 33.5 33.3 33	33.3 33.3	33.4	15.0 15.5 15-2 15.7 15.0	2-51 ST	15.7	15.0	5.2	7.9	7.8	8.2		7.92	7.91	7.85 7.70	- 1	7.93
33.3 33.3	33.3 33.3	33.7	(Sa 15-	15-5 15.3 15-7	3 15-7	15.0	7.8	%,O	7.8		14 0	7.98	7.96	7.98 7.96 7.95 7.70		7.54
33.3 253	33.3 33.3	1.86	15.0 15	F15-51 -5-59	15.7	15:50	6.7	92	2.8	56	8.0	NS 12	7.85 P. 85	7.85 2	032	7.84
33.1 33.3	32.3 33.3 34.1		15.0 15	155 15.4	153	15.0	7.9	5,2	8,2 8,0 8.1	<u>ي</u> (	0. 0	7.88	7.76	7.96	\$.00	3.0
10240 32.8 33.3 34.1	1 33.7	7.4.1	15.0 (5	15.5 15.4	15 8	15.2	7,9	8.1		56. 1	0 00	7.84	7.91	2.91 7.96 820		8.07)
33.1	33.133.7 33.8		15-0 15-5 15-8	55) 5-	15.8	15.0	8-1	0, 8	0-	8.0	7.9	7.13	7.13 7.80	7-82 8-00		7.71

えた WQ Readings: NH NH NH UH

2.066 Animal Source/Date Received:

SPAWAR Systems Center Pacific Bioassay Lab, 53475 Strothe Rd, Bldg 111 Rm 116, San Diego, CA 92152

Test No::     End Date/Time: 3, and Date/Time: 3, an	3/22/16 0830
Salinity         Temperature         Dissolved Oxy           0         24         48         72         96         0         24         48           75.5         53.2         37.3         37.3         55.5         57.3         57.3         57.3         57.4         48           75.5         53.2         37.3         37.3         57.5         57.5         57.7         50         2.4         48           33.3         53.3         37.3         37.3         57.5         57.5         57.5         57.7         50         7.4         7.8         50         7.8         57         57         52         53.3         57.3         57.7         50         7.4         7.8         50         7.8         50         7.8         50         7.8         50         7.8         50         7.8         50         7.8         50         7.8         50         7.8         50         7.8         50         7.8         50         7.8         50         7.8         50         7.8         50         7.8         50         7.8         50         7.8         50         7.9         50         7.9         50         7.9         50         50 </th <th></th>	
0     24     48     72     96     0     24     48     72     96     0     24     48     72     96     0     24     48     73     74     75 <th7< th=""><th>Hd</th></th7<>	Hd
37.5     37.2     37.3     37.3     37.4     15.0     15.5     15.7     15.7     15.0     7.4     7.4     7.8     3.0     7.8     8.0     7.8     8.0     7.8     8.0     7.8     8.0     7.8     8.0     7.8     8.0     7.8     8.0     7.8     8.0     7.8     8.0     7.8     8.0     7.8     8.0     7.9     8.1     8.0     7.9     8.0     7.9     8.0     7.9     8.0     7.9     8.1	0 24 01 72 96 00 01 24 01 01 00 00
33.3 75.3 73.3 73.5 73.5 15.2 15.5 15.7 15.0 7.8 8.0 7.8 33.3 73.3 73.3 73.5 73.7 15.2 15.5 15.7 15.0 7.6 8.6 7.8 33.1 73.3 73.4 73.5 73.4 15.5 15.5 15.4 15.4 15.4 15.4 15.7 15.8 7.9 8.0 8.0 7.3 32.4 73.1 73.1 73.7 73.4 15.5 15.4 15.7 15.0 7.9 8.1 8.1 8.1 7 7.2.4 73.1 73.1 73.7 73.4 15.5 15.4 15.7 15.8 15.0 8.1 8.1 8.1 8.1 8.1 8.1 8.1 8.1 8.1 8.1	7.62 7.81 7.85 7.90 7
33.3 33.3 33.3 33.3 33.7 15.2 15.5 15.3 15.7 15.0 7.4 8.6 7.8 33.1 33.5 33.4 33.5 34.1 15.2 15.5 15.4 15.4 15.4 15.4 15.4 15.4 15.4	7.96 7.25
33.1 33.3 33.4 33.5 34.1 15.0 15.5 15.4 15.6 15.0 7.9 8.0 8.6 8.7 32.8 33.3 33.4 33.2 34.1 15.2 15.5 15.4 15.7 15.2 7.9 8.1 8.1 15.1 33.2.4 33.1 33.1 33.1 33.1 33.1 33.1 33.1 33	7.84 7.96 7.90 7.90
32.5 33.3 34.1 33.7 34.1 15.2 15.5 15.4 15.9 7.9 8:1 8.1 32.4 33.1 33.1 33.7 34.1 15.2 15.5 15.4 15.8 15.0 8:1 8:0 7.9 5 13.1 33.1 33.1 33.7 33.8 15.0 15.5 15.4 15.8 15.0 8:1 8:0 7.9 7.4 10.4 10.4 10.4 10.4 15.4 15.5 15.4 15.8 15.0 8:1 8:0 7.9 10 24 48 72 96 10 24 48 72 96	2 7.20 7.61 2.00
32.4 33.1 33.1 33.1 33.7 33.3 15.0 15.5 15.4 15.8 15.0 8.6 7.9 15.1 15.1 15.1 15.2 15.2 15.4 15.8 15.0 8.6 7.9 15.1 15.1 15.1 15.1 15.1 15.1 15.1 15.1	254 7.91 7.96 8.00
0     24     48     72     96       T/M     MH     MH     GA	7.73 7.80 7.82 8.00
0 24 24 24 24 24 24 24 24 24 24	
0 24 48 72 MH NH MH NH	
0 24 48 72 MH MH MH MH MH	
0 24 48 72 WH NH NH NH	
0 24 48 72 <u>WH</u> <del>WH</del> <del>WH</del> <del>WH</del> <del>WH</del>	
0 24 48 72 <u>NH</u> <del>NH</del> <del>NH</del> <del>NH</del>	
Animal Source/Date Received: المالية المراجع ال	
Comments: 0 hrs:	
24 hrs:	
48 hrs:	
72 hrs:	
OC Check: The R/1/2016	Final Review: D& C ( )

Marine Chronic Bioassay

Project: Zn Rlad Test Sample ID: (24, 0,02

Test No.:

Water Quality Measurements

0830 0630 Test Species: <u>S. purpuratus</u> Start Date/Time:  $\frac{3/2 \ 5/1 \ c}{2}$ End Date/Time: 3/24//2

(ppt)         (°C)         (°C)         (mq/L)         (pH units)           4         48         72         96         0         24         48         72         96         0         24         48         72         96         0         24         48         72         96         0         24         48         72         96         0         24         48         72         96         0         24         96         0         24         96         0         24         96         0         24         96         0         24         96         0         24         48         72         96         0         24         48         72         96         0         24         48         72         96         0         24         48         72         96         0         24         48         72         96         0         24         48         72         96         0         24         48         72         96         0         10         10         10         10         10         10         10         10         10         10         10         10         10         10         10         10 </th <th>(pH units)         (pH units)         96           0         24         48         72         96           7.82         7.81         7.85         7.82         7.85</th> <th>2 7 7 25 7 26 7</th> <th>「四でえる</th>	(pH units)         (pH units)         96           0         24         48         72         96           7.82         7.81         7.85         7.82         7.85	2 7 7 25 7 26 7	「四でえる
96	3334	<u>, 17</u>	0 7.72 7.74 7.74
Sec. 1		<b>96</b> 30. 1 800	96 20 20 20 20 20 20 20 20 20 20 20 20 20
12 72	<b>18 72</b> 0 82	<b>48 72</b> 96 <b>6</b> 0 82 8.1 80 8.2 80	8 72 0 8 72 0 8 7
24 4	<b>24 4</b> 7.9 8.	24 48 72 96 0 24 48 72 96 79 80 82 8.1 7.72 7.91 7.83 7.80 7.93 80 80 8.1 80 7.98 7.95 7.80 7.94	24         48         72         96         0         24         48         72         96         72         96         72         96         72         71         73         72         71         73 <th73< th="">         73         73         73</th73<>
0	4 48 72 96 0 24 48 72 96 0 24 28 72 75 96 0 24 24 73 73 33,4 15,5 15,2 15,7 15,0 7.9 7.9	7.8	0 7.9 7.9 7.7
96	96 15.0	<b>96</b>	<b>36</b>
12	15.7	15.7 15.7	<b>2</b> 7.21 7.21 15.7
	5 15.2	5 15.2 75.3	5 15.3 15.3 15.3
	2 2		
	3,4 15	1 1 1 2	3 7 2
	2.9 33	17.9 33.7	7.19 73.4 7.15 73.4 7.16 4.162
2 P. 1	12 8.86	39.9 24 39.9 24	33,3 29 33,3 39 33,3 39
	64	a a	
	23,2.		2 3 63
	535 23,2	33	73.5 23 79.3 70 79.3 79

レート・ 12:20 12:20 33.3 33.3 37. 25:132 37.1 37 5:132 37.1 37 5:132 37.1 37 5:132 37 5:132 37 5:132 37 5:132 37 5 10 10 10 10 10 10 10 10 10 10 10 10 10	73.5     73.5     73.7       73.7     73.7     73.3       73.1     73.3     73.3       72.5     73.3     73.3       72.5     73.3     73.3       72.4     37.1     73.3       72.4     37.1     73.3       72.4     37.1     73.3       72.4     37.1     73.3       72.4     37.1     74.3       71.4     0     24       71.4     0     24       71.4     0     14.4       11.4     17.4     0       12.4     11.4     14.4       24 hrs:     0     14.5	3.2. 733 3.3. 733 3.3. 3.4.1 3.1. 3.4.1 3.1. 3.7.1 3.1. 3.7.1.1 3.1. 3.7.1 3.1. 3.7.1 3.1.1.1 3.1.1.1.1.1.1.1.1.1.1.1.1.1.1	77.7 23.4 33.4 33.7 33.4 33.7 37.7 34.4 33.7 34.4 33.7 33.8 33.7 33.8 33.7 33.8 26 72 36 72 36 72 36 72 36 72 36 72 54 cc 1 c	23.4 33.7 33.7 33.1 33.1 33.1 33.1 33.1 33.7 33.7	2 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	15.2 15.3 15.4 15.4 15.4	7.7	1.1 7.9 7.9 7.9 7.9 8.1 8.1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	111, 111, 111, 111, 111, 111, 111, 111	7.12 (11 7.3) 7.13 7.46 7.15 7.14 7.16 7.15 7.15 7.20 7.86 7.17 7.80 7.86 7.17 7.80 7.82	11 7.3 7.2 7.2 7.2 7.2 7.2 7.2 7.2 7.2 7.2 7.2	7.12 7.17 7.12 7.12 7.12 7.12 7.12 7.12	12:20 12:20 12:20 12:20 12:20 12:20 12:20	
	48 hrs: 72 hrs:																
														-			

SPAWAR Systems Center Pacific Bioassay Lab, 53475 Strothe Rd, Bidg 111 Rm 116, San Diego, CA 92152

600 KG

01

QC Check:

allela gr

Final Review:

#### Embryo-Larval Development Test - SPAWNING CHECKLIST & CALCULATIONS

Jun Batch ID: <u>234545</u> 0125165P Analyst: Ju

Spawn/Test Date: <u>3/zs/16</u> Test Species: <u>5. purpuratus</u>

Task	Time
Spawning Inducement Initiated	0630
Spawning Begins	0640
Females/Males Isolated in Incubator	3/3
Fertilization Initiated	0700
Fertilzation Terminated/eggs rinsed	0740
Embryo Counts	0800
Embryo addition to vials	0930

#### Embryo Counts:

Embryo Stock #1: 463134Mean = 3720uL \* 1000 uL/mL = 1850cells/mLEmbryo Stock #2: 413634Mean = 3720uL \* 1000 uL/mL = 1850cells/mLEmbryo Stock #3: 302825Mean = 3020uL \* 1000 uL/mL = 1533cells/mL

Adjust selected embryo stock to 2000 embryos/ml. Confirm density:

Selected Stock : 38 , 31 , 34 Mean = 34 / 20 uL \* 1000 uL/mL = /7/6 cells/mL

Add 100 µl of 2000 embryo/ml stock to obtain 20 embryos/ml in test vials.

#### Notes:

Stark#1 100% fortilization Story #2 & 90% fortilization

Stock # 3 >90% Got 112 al 101

Selected Stock # 1

1716 (.150 ml) = 257 Embryos / Tost

A Majority of Embryos at two cell stage when added to kiels rangely 10% were as the four cell stage.

SPAWAR Systems Center Pacific Bioassay Lab, 53475 Strothe Rd, Bldg 111 Rm 116, San Diego, CA 92152

# A.5. ZINC EXPOSURES – MYSID SHRIMP:

CETIS Sum	nmary Repo	ort						Report Dat Test Code:			Jun-16 16:1 362F78   09	
Americamysis	96-h Acute Su	rvival T	est							SPA	NAR Syste	ms Cente
Batch ID: Start Date: Ending Date: Duration:	13-0299-9056 10 Dec-15 10:0 14 Dec-15 08:3 94h	00 50	Test Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-02- Americamysis Aquatic Resea	bahia	ns, NH		Analyst: Diluent: Brine: Age:	Lab	ienne A Col oratory Sea Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:			Code: Material: Source: Station:	7334C9DA Zinc sulfate Pulsed Exposu 3 Hour	re			Client: Project:		WAR sed Exposur	e	
Comparison S	Summary											
Analysis ID	Endpoint		NOEL	LOEL	TOEL	PMSD	τυ	Meth	nod			
15-2693-9165	96h Survival R	ate	3280	5430	4220	24.5%		Duni	nett N	/lultiple Com	parison Tes	st
Point Estimate	e Summary											
Analysis ID	Endpoint		Level	μg/L	95% LCL	95% UCL	τυ	Meth	nod			
06-7575-6139	96h Survival R	ate	LC50	10440	7262	15300		Line	ar Re	gression (M	LE)	
96h Survival F	Rate Summary											
C-µg/L	Control Type	Coun	t Mean	95% LCL	95% UCL	Min	Max	Std	Err	Std Dev	CV%	%Effec
13	Lab Control	4	0.95	0.7909	1	0.8	1	0.05		0.1	10.53%	0.0%
398		4	1	1	1	1	1	0		0	0.0%	-5.26%
753		4	0.85	0.5453	1	0.6	1	0.09	574	0.1915	22.53%	10.53%
1520		4	0.95	0.7909	1	0.8	1	0.05		0.1	10.53%	0.0%
3280		4	1	1	1	1	1	0		0	0.0%	-5.26%
5430		4	0.7	0.3818	1	0.6	1	0.1		0.2	28.57%	26.32%
16700		4	0.25	0	0.5547	0	0.4	0.09	574	0.1915	76.59%	73.68%
96h Survival F	Rate Detail											
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4							
13	Lab Control	1	1	1	0.8							
398		1	1	1	1							
753		1	0.6	1	0.8							
1520		1	1	0.8	1							
3280		1	1	1	1							
5430		1	0.6	0.6	0.6							
16700		0	0.4	0.4	0.2							
96h Survival F	Rate Binomials											
	Control Type	Rep 1	Rep 2	Rep 3	Rep 4							
	Lab Control	5/5	5/5	5/5	4/5							
398		5/5	5/5	5/5	5/5							
753		5/5	3/5	5/5	4/5							
1520		5/5	5/5	4/5	5/5							
3280		5/5	5/5	5/5	5/5							
			3/5	3/5								
5430		5/5	3/5	3/3	3/5							

000-010-187-1

CETIS™ v1.8.7.16

CETIS Ana	lytical Repo	ort					-	ort Date: Code:		Jun-16 16:1 362F78   09	
Americamysis	96-h Acute Su	vival Tes	t						SPA	WAR Syste	ms Center
Analysis ID: Analyzed:	15-2693-9165 05 May-16 11:4		•	Survival Ra ametric-Cor	ate htrolivs Treat	tments		IS Version al Results		.8.7	
Batch ID: Start Date: Ending Date: Duration:	13-0299-9056 10 Dec-15 10:0 14 Dec-15 08:3 94h	10 Pr 10 Sp	ecies: Am	4/821/R-02- ericamysis I		ns, NH	Anal Diluc Brin Age:	ent: Lab e: Noi	rienne A Col poratory Sea t Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:		Ma So	aterial: Zin	4C9DA c sulfate sed Exposu our	re		Clier Proj		AWAR sed Exposur	e	
Data Transfor	m	Zeta	Alt Hyp	Trials	Seed		PMSD	NOEL	LOEL	TOEL	τυ
Angular (Corre	cted)	NA	C > T	NA	NA		24.5%	3280	5430	4220	
Dunnett Multip	ple Comparisor	Test									
Control	vs C-µg/L		Test Stat	Critical	MSD DF	P-Value	P-Type	Decision	ı(α:5%)		
13 13 13 13 13 13	398 753 1520 3280 5430*		-0.5283 1.019 0 -0.5283 2.528	2.448 2.448 2.448 2.448 2.448	0.276 6 0.276 6 0.276 6 0.276 6 0.276 6	0.9549 0.4453 0.8571 0.9549 0.0427	CDF CDF CDF CDF CDF	Non-Sign Non-Sign	ificant Effect ificant Effect ificant Effect ificant Effect nt Effect	:	
13	16700*		6.843	2.448	0.276 6	<0.0001	CDF	Significar	nt Effect		
ANOVA Table											
Source	Sum Squ	ares	Mean Squ	iare	DF	F Stat	P-Value	Decision	ı(α:5%)		
Between Error Total	2.152008 0.5332697 2.685277	7	0.3586679 0.0253938		6 21 27	14.12 -	<0.0001	Significa	nt Effect		
Distributional											
	Test			Teat Stat	Critical		Desision	(aud 0/ )			
Attribute Variances		ene Fruali	ty of Variance	Test Stat 1.381	Critical 3.812	P-Value 0.2678	Decision Equal Var				
Variances		quality of	-	4.421	3.812	0.0048	Unequal \				
Distribution	Shapiro-\	Wilk W No	rmality	0.9533	0.8975	0.2393	Normal D	istribution			
96h Survival F	Rate Summary										
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
398 753 1520 3280	Lab Control	4 4 4 4	0.95 1 0.85 0.95 1	0.7909 1 0.5453 0.7909 1	1 1 1 1	1 1 0.9 1 1	0.8 1 0.6 0.8 1	1 1 1 1	0.05 0 0.09574 0.05 0	10.53% 0.0% 22.53% 10.53% 0.0%	0.0% -5.26% 10.53% 0.0% -5.26%
5430		4	0.7	0.3818	1	0.6	0.6	1	0.1	28.57%	26.32%
16700		4	0.25	0	0.5547	0.3	0	0.4	0.09574	76.59%	73.68%
	ected) Transfor	med Sum	mary								
	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
13 398 753 1520	Lab Control	4 4 4 4	1.286 1.345 1.171 1.286	1.096 1.345 0.8199 1.096	1.475 1.346 1.522 1.475	1.345 1.345 1.226 1.345	1.107 1.345 0.8861 1.107	1.345 1.345 1.345 1.345	0.05953 0 0.1103 0.05953	9.26% 0.0% 18.84% 9.26%	0.0% -4.63% 8.93% 0.0%
3280 5430 16700		4 4 4	1.345 1.001 0.5146	1.345 0.6355 0.166	1.346 1.366 0.8633	1.345 0.8861 0.5742	1.345 0.8861 0.2255	1.345 1.345 0.6847	0 0.1148 0.1096	0.0% 22.94% 42.58%	-4.63% 22.16% 59.97%

CETIS™ v1.8.7.16

CETIS Ana	alytical Repo	r u					Report Date: Test Code:	02 Jun-16 16:10 (p 2 of 2 36B62F78   09-1790-936
Americamysi	s 96-h Acute Surv	/ival Tes	t					SPAWAR Systems Center
Analysis ID: Analyzed:	15-2693-9165 05 May-16 11:4		•	Sh Survival R arametric-Co	ate ntrol vs Treat	ments	CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Survival								
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
13	Lab Control	1	1	1	0.8			
398		1	1	1	1			
753		1	0.6	1	0.8			
520		1	1	0.8	1			
3280		1	1	1	1			
5430		1	0.6	0.6	0.6			
16700		0	0.4	0.4	0.2			
Angular (Cor	rected) Transforn	ned Deta	il					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
13	Lab Control	1.345	1.345	1.345	1.107			
398		1.345	1.345	1.345	1.345			
753		1.345	0.8861	1.345	1.107			
1520		1.345	1.345	1.107	1.345			
3280		1.345	1.345	1.345	1.345			
5430		1.345	0.8861	0.8861	0.8861			
16700		0.2255	0.6847	0.6847	0.4636			
96h Survival	Rate Binomials							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
13	Lab Control	5/5	5/5	5/5	4/5			
398		5/5	5/5	5/5	5/5			
753		5/5	3/5	5/5	4/5			
1520		5/5	5/5	4/5	5/5			
3280		5/5	5/5	5/5	5/5			
5430 16700		5/5 0/5	3/5 2/5	3/5 2/5	3/5 1/5			
Graphics			2/3	2/5				
		•	•	Segect Ma		0.35		
92 Provide a la constante de l		]		7	L Considered	0.00 4.05 4.15 4.20 4.25 4.25		
1	3 LC 398 753	1520 С-µg/L	3280	54B0 16700		-2.5 -2.0	-1.5 -1.0 -0.5 0.0 Rankits	0.5 1.0 1.5 2.0 2.5

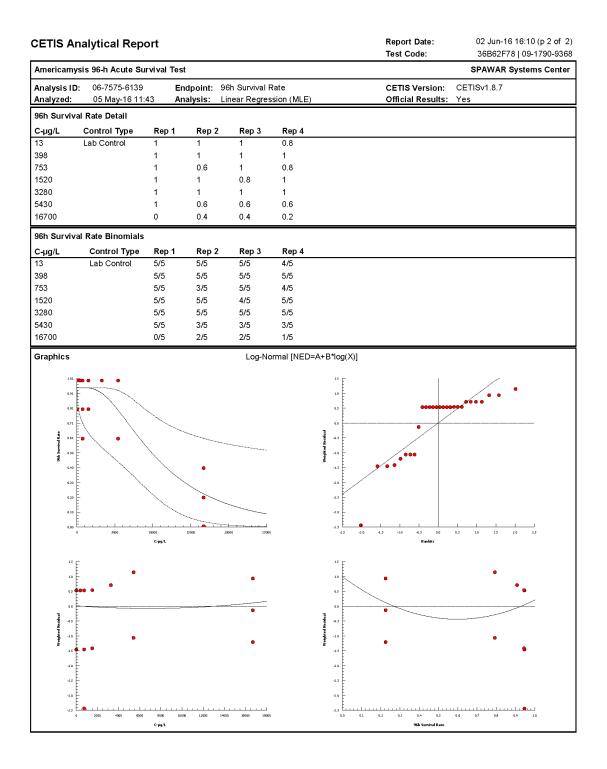
CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ar	nalytical Rep	ort					-	ort Date: t Code:			:10 (p 1 of 2) )9-1790-9368
Americamy	sis 96-h Acute S	urvival Test							SPA	WAR Syst	erns Center
Analysis ID Analyzed:	: 06-7575-6139 05 May-16 11		•	n Survival Ra ear Regress				TIS Version: cial Results:	CETISv1 : Yes	.8.7	
Batch ID:	13-0299-9056	Tes	t Type: Su	vival (96h)			Ana	<b>lyst:</b> Mari	ienne A Col	vin	
Start Date:	10 Dec-15 10			A/821/R-02-	012 (2002)				oratory Sea	water	
Ending Dat		-		ericamysis			Brir		Applicable		
Duration:	94h	SOL	irce: Aqi	uatic Resear	rch Organisn	ns, NH	Age	: 5			
Sample ID:	19-3283-9386			4C9DA			Clie		WAR		
-	e: 10 Dec-15			c sulfate			Pro	ject: Puls	ed Exposur	re	
Receive Dat Sample Age	te: 10 Dec-15 a: 10h			sed Exposu Iour	re						
		Jia	<b>IIII.</b> 5 F	loui							
_	ression Options										
Model Fund		,	Threshold			Optimized		Het Corr	Weighted	1	
Log-Normal	[NED=A+B*log(X	l]	Control Th	reshold	0.05	Yes	No	No	Yes		
Regression	Summary										
lters LL	AICc	BIC	Mu	Sigma	Adj R2	F Stat	Critical	P-Value	Decision		
21 -44	.67 96.33	99.33	4.019	0.2874	0.5272	4.72	2.84	0.0071	Significan	it Lack of F	it
Point Estim	ates										
Level µg	/L 95% LCI	. 95% UCL									
LC50 104	440 7262	15300									
Regression	Parameters										
Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decisior	ı(α:5%)			
Threshold	0.0542	0.02539	0.004426	0.104	2.134	0.0428	Significa	nt Parameter			
Slope	3.48	0.9119	1.692	5.267	3.816	0.0008	-	nt Parameter			
Intercept	-13.98	3.639	-21.12	-6.85	-3.842	0.0007	Significa	nt Parameter			
ANOVA Tab	le										
Source	Sum Sq		an Square	DF	F Stat	P-Value	Decisior	· ·			
Model	40.04662		4662	1	32.11	<0.0001	Significa				
Lack of Fit Pure Error	14.76146 16.41999		0365	4 21	4.72	0.0071	Significa	ht			
Residual	31.18145		31904 7258	25							
		1.2-									
Residual Ar Attribute	naiysis Method			To at Stat	Critical	P-Value	Desister	( E0/)			
Goodness-o		Chi-Sq GOF		Test Stat 31.18	Critical 37.65	0.1831	Decision	ificant Heter	ogenity		
000011033-0		d Ratio GOF		28.93	37.65	0.2667	-	ificant Heter			
Variances		ene Equality	of Variance	1.635	2.573	0.1869	Equal Va		- 3,		
Distribution	Shapiro-	Wilk W Norm	ality	0.7589	0.9264	<0.0001		nal Distributio			
	Anderso	n-Darling A2	Normality	3.296	2.492	<0.0001	Non-norr	nal Distributio	on		
96h Surviva	al Rate Summary				Calcu	lated Variat	e(A/B)			_	
C-µg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	А	в
13	Lab Control	4	0.95	0.8	1	0.05	0.1	10.53%	0.0%	19	20
398		4	1	1	1	0	0	0.0%	-5.26%	20	20
753		4	0.85	0.6	1	0.09574	0.1915	22.53%	10.53%	17	20
1520		4	0.95	0.8	1	0.05	0.1	10.53%	0.0%	19 20	20
3280 5430		4 4	1 0.7	1 0.6	1 1	0 0.1	0 0.2	0.0% 28.57%	-5.26% 26.32%	20 14	20 20
5430 16700		4 4	0.7	0.6 0	0.4	0.1	0.2 0.1915	28.57% 76.59%	26.32% 73.68%	14 5	20 20
10100		-	0.20	v	0.4	0.000/4	0.1010	10.3570	10.00 %	5	20

CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_



CETIS™ v1.8.7.16

CETIS Sun	nmary Repo	ort						Report Date Test Code:			0 (p 1 of 1) )-3490-5296
Americamysis	s 96-h Acute Sur	vival T	est						SPA	WAR Syste	ms Center
Batch ID: Start Date: Ending Date: Duration:	13-0299-9056 10 Dec-15 10:0 NA	0	Test Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-02- Americamysis I Aquatic Resear	pahia	ns, NH		Analyst: Diluent: Brine: Age:	Jacob Munson- Laboratory Sea Not Applicable 5		
Sample ID: Sample Date: Receive Date: Sample Age:			Code: Material: Source: Station:	57C09455 Zinc sulfate Pulsed Exposu 6 Hour	re			Client: Project:	SPAWAR Pulsed Exposu	re	
Comparison S	Summary										
Analysis ID 06-3505-2453	Endpoint 96h Survival Ra	ate	NOEL 1520	LOEL 3280	<b>TOEL</b> 2233	PM SD 20.5%	TU	Meth Stee	<mark>iod</mark> I Many-One Ran	k Sum Test	
Point Estimat	e Summary										
Analysis ID 02-9090-2398	Endpoint 96h Survival Ra	ate	Level	μ <b>g/L</b> 3914	95% LCL 3114	95% UCL 4674	τu	Meth Linea	nod ar Regression (N	1LE)	
96h Survival I	Rate Summary										
C-µg/L	Control Type	Coun	t Mean	95% LCL	95% UCL	Min	Max	Std I	Err Std Dev	CV%	% Effect
13 398 753 1520 3280 5430 16700	Lab Control	4 4 4 4 4 4	1 0.95 1 0.65 0.2 0	1 0.7909 1 1 0.4909 0 0	1 1 1 0.8091 0.6501 0	1 0.8 1 0.6 0 0	1 1 1 0.8 0.6 0	0 0.05 0 0.05 0.14' 0	0 0.1 0 0.1 14 0.2828 0	0.0% 10.53% 0.0% 0.0% 15.38% 141.4%	0.0% 5.0% 0.0% 35.0% 80.0% 100.0%
96h Survival I	Rate Detail										
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4						
13 398 753 1520 3280 5430 16700	Lab Control	1 1 1 0.8 0 0	1 0.8 1 0.6 0.6 0	1 1 1 0.6 0.2 0	1 1 1 0.6 0 0						
96h Survival I	Rate Binomials										
С-µg/L 13 398 753 1520 3280 5430 16700	Control Type Lab Control	Rep 1 5/5 5/5 5/5 5/5 4/5 0/5 0/5	Rep 2 5/5 4/5 5/5 5/5 3/5 3/5 0/5	Rep 3 5/5 5/5 5/5 5/5 3/5 1/5 0/5	Rep 4           5/5           5/5           5/5           3/5           0/5           0/5						

CETIS™ v1.8.7.16

CETIS Ana	lytical Repo	ort					-	ort Date: Code:			0 (p 1 of 2) )-3490-5296
Americamysis	s 96-h Acute Su	vival Tes	t						SPA	WAR Syste	ms Center
Analysis ID: Analyzed:	06-3505-2453 05 May-16 11:4		•	ih Survival Ra onparametric		Freatments		IS Version		.8.7	
Batch ID: Start Date: Ending Date: Duration:	13-0299-9056 10 Dec-15 10:0 NA	0 Pr Sp	oecies: Ar	ırvival (96h) PA/821/R-02- nericamysis l quatic Reseal	bahia	ns, NH	Ana Dilu Brin Age	ent: Lab ne: Not	cob Munson- poratory Sea t Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:		M: Sc	aterial: Zin ource: Pu	'C09455 nc sulfate Ilsed Exposu Hour	re		Clie Proj		AWAR Ised Exposur	re	
Data Transfor Angular (Corre		Zeta NA	Alt Hyp C > T	Trials NA	Seed NA		<b>PMSD</b> 20.5%	<b>NOEL</b> 1520	LOEL 3280	<b>TOEL</b> 2233	TU
Steel Many-O	ne Rank Sum Te	est									
Control 13 13 13 13 13 13	vs C-µg/L 398 753 1520 3280* 5430*		Test Sta 16 18 18 10 10	t Critical 10 10 10 10 10 10	Ties         DF           1         6           1         6           0         6           0         6           0         6	<b>P-Value</b> 0.6105 0.8333 0.8333 0.0417 0.0417	P-Type Asymp Asymp Asymp Asymp Asymp	Non-Sign	nificant Effect nificant Effect nificant Effect nt Effect	t	
ANOVA Table											
Source Between Error Total	Sum Squ 2.641152 0.3703232 3.011475		Mean So 0.528230 0.020573	)4	<b>DF</b> 5 18 23	<b>F Stat</b> 25.68	P-Value <0.0001	Decision Significar	<u> </u>		
Distributional	Tests										
Attribute Variances Variances Distribution	Test Mod Leve Levene E	ene Equali iquality of Wilk W No		<b>Test Stat</b> e 2.56 5.161 0.7709	<b>Critical</b> 4.248 4.248 0.884	P-Value 0.0643 0.0041 0.0001	•		ion		
96h Survival	Rate Summary										
С-µg/L 13 398 753 1520 3280 5430 16700	Control Type Lab Control	Count 4 4 4 4 4 4 4 4 4 4	Mean 1 0.95 1 1 0.65 0.2 0	<b>95% LCL</b> 1 0.7909 1 1 0.4909 0 0	<b>95% UCL</b> 1 1 1 0.8091 0.6501 0	Median 1 1 1 0.6 0.1 0	Min 1 0.8 1 1 0.6 0 0	Max 1 1 1 0.8 0.6 0	Std Err           0           0.05           0           0.05           0.105           0.1414           0	CV% 0.0% 10.53% 0.0% 0.0% 15.38% 141.4%	%Effect           0.0%           5.0%           0.0%           35.0%           80.0%           100.0%
Angular (Corr	ected) Transfor		mary								
С-µg/L 13 398 753 1520 3280 5430 16700	Control Type Lab Control	Count 4 4 4 4 4 4 4 4 4	Mean 1.345 1.286 1.345 1.345 0.9413 0.4502 0.2255	95% LCL 1.345 1.096 1.345 1.345 0.7655 -0.04551 0.2255	95% UCL 1.346 1.475 1.346 1.346 1.117 0.9459 0.2256	Median 1.345 1.345 1.345 1.345 0.8861 0.3446 0.2255	Min 1.345 1.107 1.345 1.345 0.8861 0.2255 0.2255	Max 1.345 1.345 1.345 1.345 1.107 0.8861 0.2255	Std Err           0           0.05953           0           0.05527           0.1558           0	CV% 0.0% 9.26% 0.0% 11.74% 69.2% 0.0%	%Effect 0.0% 4.43% 0.0% 0.0% 30.03% 66.54% 83.24%

CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ana	alytical Repo	rt					Report Date: Test Code:	02 Jun-16 16:10 (p 2 of 2 794A30D0   20-3490-529
Americamysi	s 96-h Acute Sur	vival T	est					SPAWAR Systems Center
Analysis ID: Analyzed:	06-3505-2453 05 May-16 11:4		•	h Survival F	Rate c-Control vs	Treatments	CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Survival		7	Analysis. No	npurumetri		riournents	enitia results.	105
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
13	Lab Control	1	1	1	1			
398		1	0.8	1	1			
753		1	1	1	1			
1520		1	1	1	1			
3280		0.8	0.6	0.6	0.6			
5430		0	0.6	0.2	0			
16700		0	0	0	0			
Angular (Cor	rected) Transforr	ned De	etail					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
13	Lab Control	1.345	1.345	1.345	1.345			
398		1.345	1.107	1.345	1.345			
753		1.345	1.345	1.345	1.345			
1520		1.345	1.345	1.345	1.345			
3280		1.107	0.8861	0.8861	0.8861			
5430		0.225	5 0.8861	0.4636	0.2255			
16700		0.225	5 0.2255	0.2255	0.2255			
96h Survival	Rate Binomials							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
13	Lab Control	5/5	5/5	5/5	5/5			
398		5/5	4/5	5/5	5/5			
753		5/5	5/5	5/5	5/5			
1520		5/5	5/5	5/5	5/5			
3280		4/5	3/5	3/5	3/5			
5430		0/5	3/5	1/5	0/5			
16700		0/5	0/5	0/5	0/5			
Graphics								
0.9	•	•	•			0.46		٠
966 Survival Rate			2		Centered	0.25 0.25 0.15		•••
0.3	1 1			2		4.05 4.10 4.15 4.20 4.25	•	
	3 LC 398 753	Σ C•µg/L	20 3280	5480 16700		-2.5 -2.0	-1.5 -1.0 -0.5 0.0 Rankits	0.5 1.0 1.5 2.0 2.5
		0-µg/L					is antifalts	

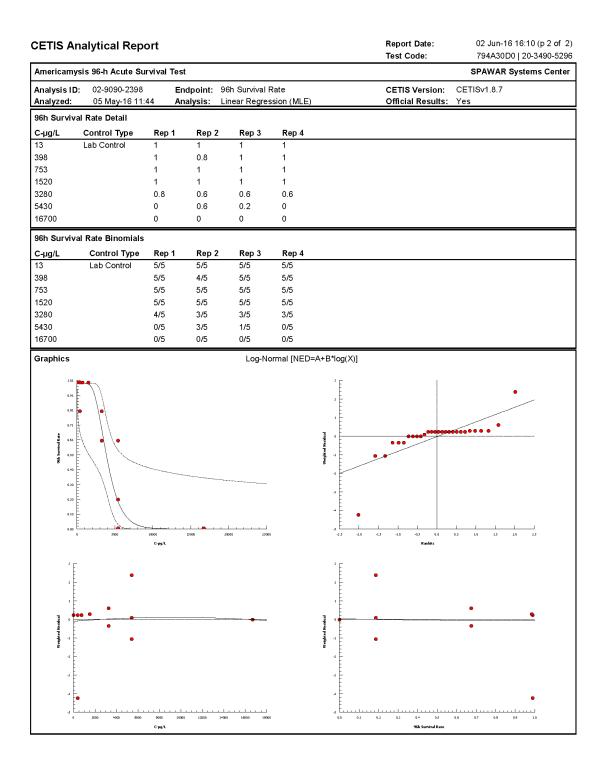
CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ar	nalytical Repo	ort					-	ort Date: Code:			I0 (p 1 of 2) D-3490-5296
Americamy	sis 96-h Acute Su	vival Test							SPA	WAR Syste	ems Center
Analysis ID Analyzed:	: 02-9090-2398 05 May-16 11:4			n Survival Ra ear Regress				IS Version: cial Results:	CETISv1 : Yes	.8.7	
Batch ID: Start Date: Ending Dat Duration:	13-0299-9056 10 Dec-15 10:0 e: NA	0 Prot	cies: Am	A/821/R-02- ericamysis I	. ,	ns, NH	Ana Dilu Brin Age	ent: Labo e: Not	ob Munson- oratory Sea Applicable		
Sample ID: Sample Dat Receive Da Sample Age		Cod Mate Sou Stat	erial: Zin rce: Pul	C09455 c sulfate sed Exposu lour	re		Clie Proj		WAR ed Exposu	re	
Linear Regi Model Fund	ession Options		Threshold	d Option	Threshold	Optimized	l Pooled	Het Corr	Weighted	ł	
Log-Normal	[NED=A+B*log(X)]		Control Th	reshold	1E-07	Yes	No	No	Yes		
Regression	Summary										
<b>Iters LL</b> 24 -28	AICc	BIC 66.96	Mu 3.593	<b>Sigma</b> 0.161	Adj R2 0.7593	<b>F Stat</b> 5.773	Critical 2.84	P-Value 0.0027	Decision Significan	(α:5%) It Lack of Fi	it
Point Estim	ates										
Level µg	/L 95% LCL	95% UCL 4674									
Regression	Parameters										
Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision	(a:5%)			
Threshold	0.01269	0.01335	-0.01348	0.03885	0.9504	0.3510		ificant Paran	neter		
Slope	6.212	1.867	2.553	9.871	3.328	0.0027	-	it Parameter			
Intercept	-22.32	6.743	-35.54	-9.101	-3.31	0.0028	Significar	t Parameter			
ANOVA Tab	le										
Source	Sum Squ	ares Mea	n Square	DF	F Stat	P-Value	Decision	(α:5%)			
Model	82.83003		3003	1	87.15	<0.0001	Significar				
Lack of Fit Pure Error	12.44364	3.11		4 21	5.773	0.0027	Significar	it			
Residual	11.31723 23.76087		8916 0435	21							
Residual Ar											
Attribute	nalysis Method			Test Stat	Critical	P-Value	Decision	(a:5%)			
Goodness-c		hi-Sq GOF		23.76	37.65	0.5332		(d:5%) ificant Heter	oaenit∨		
		Ratio GOF		15.03	37.65	0.9407	-	ificant Heter			
Variances	Mod Leve	ne Equality	of Variance	1.315	2.573	0.2939	Equal Va	riances	-		
Distribution	•	/ilk W Norm	-	0.6597	0.9264	<0.0001		nal Distributio			
	Anderson-	Darling A2 I	vormality	4.149	2.492	<0.0001	Non-norn	nal Distributio	on		
96h Surviva	al Rate Summary				Calcu	lated Variat	e(A/B)			-	
C-µg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	Α	В
13	Lab Control	4	1	1	1	0	0	0.0%	0.0%	20	20
398		4	0.95	0.8	1	0.05	0.1	10.53%	5.0%	19	20
753		4	1	1	1	0	0	0.0%	0.0%	20	20
1520 3280		4	1 0.65	1 0.6	1	0 0.05	0	0.0%	0.0%	20 13	20 20
3280 5430		4 4	0.65	0.6 0	0.8 0.6	0.05	0.1 0.2828	15.38% 141.4%	35.0% 80.0%	13 4	20 20
16700		4	0.2	0	0.0	0.1414	0.2020	(41.470	100.0%	4	20
			~	~	~	5	2		100.070	÷	20

CETIS™ v1.8.7.16

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CETIS™ v1.8.7.16

CETIS Sum	nmary Repo	rt						Report Date Test Code:			9 (p 1 of 1) 5-3308-6298
Americamysis	96-h Acute Sur	vival T	est						SPA	WAR Syste	ms Center
Batch ID: Start Date: Ending Date: Duration:	13-0299-9056 10 Dec-15 10:0 NA	0	Test Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-02- Americamysis t Aquatic Resear	pahia	ns, NH		Analyst: Diluent: Brine: Age:	Jacob Munson- Laboratory Sea Not Applicable 5		
Sample ID: Sample Date: Receive Date: Sample Age:			Code: Material: Source: Station:	53D84E08 Zinc sulfate Pulsed Exposur 12 Hour	re				SPAWAR Pulsed Exposu	re	
Comparison S	Summary										
Analysis ID 14-4521-2713	Endpoint 96h Survival Ra	ite	<b>NOEL</b> 753	LOEL 1520	<b>TOEL</b> 1070	PM SD 21.0%	τu	Meth	od Many-One Ran	k Sum Test	
Point Estimat	e Summary										
Analysis ID 09-4567-2331	Endpoint 96h Survival Ra	ite	Level	<b>μg/L</b> 2060	95% LCL 1685	95% UCL 2492	τu	Meth Linea	od r Regression (N	1LE)	
96h Survival F	Rate Summary										
C-µg/L	Control Type	Coun	t Mean	95% LCL	95% UCL	Min	Max	Std E	rr Std Dev	CV%	% Effect
13 398 753 1520 3280 5430 16700	Lab Control	4 4 4 4 4 4	1 1 0.7 0.2 0 0	1 1 0.5163 0 0 0	1 1 0.8837 0.6501 0 0	1 1 0.6 0 0 0	1 1 0.8 0.6 0 0	0 0 0.057 0.141 0 0		0.0% 0.0% 0.0% 16.5% 141.4%	0.0% 0.0% 30.0% 80.0% 100.0% 100.0%
96h Survival I	Rate Detail										
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4						
13 398 753 1520 3280 5430 16700	Lab Control	1 1 0.8 0 0 0	1 1 0.6 0.2 0 0	1 1 0.8 0.6 0 0	1 1 0.6 0 0						
96h Survival I	Rate Binomials										
С-µg/L 13 398 753 1520 3280 5430 16700	Control Type Lab Control	Rep 1 5/5 5/5 4/5 0/5 0/5 0/5	Rep 2 5/5 5/5 5/5 3/5 1/5 0/5 0/5	Rep 3           5/5           5/5           5/5           4/5           3/5           0/5           0/5	Rep 4 5/5 5/5 5/5 3/5 0/5 0/5 0/5 0/5						

CETIS™ v1.8.7.16

CETIS Anal	lytical Repo	ort					-	ort Date: Code:			)9 (p 1 of 2) 5-3308-6298
Americamysis	96-h Acute Sur	vival Tes	st						SPA	WAR Syste	ems Center
Analysis ID: Analyzed:	14-4521-2713 05 May-16 11:4			6h Survi∨al Ra onparametric		Treatments		IS Version		.8.7	
Batch ID: Start Date: Ending Date: Duration:	13-0299-9056 10 Dec-15 10:0 NA	0 P S	rotocol: E pecies: A	urvival (96h) PA/821/R-02- mericamysis l quatic Reseal	bahia		Ana Dilu Brin Age	ent: Lal ne: No	cob Munson- boratory Sea t Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:		M S	aterial: Z ource: P	3D84E08 inc sulfate ulsed Exposu 2 Hour	re		Clie Proj		PAWAR Ised Exposur	e	
Data Transform		Zeta NA	Alt Hyp C>T	Trials NA	Seed NA		PMSD 21.0%	<b>NOEL</b> 753	LOEL 1520	<b>TOEL</b> 1070	TU
	ne Rank Sum Te	st									
Control	vs C-µg/L	.51	Test Sta	at Critical	Ties [	DF P-Value	P-Type	Decision	n(α:5%)		
13 13 13 13	398 753 1520* 3280*		18 18 10 10	10 10 10 10	1 6 1 6 0 6	6 0.8000 6 0.0350	Asymp Asymp Asymp Asymp	Non-Sigr	nificant Effect nificant Effect nt Effect		
ANOVA Table								-			
Source	Sum Squ	ares	Mean S	quare	DF	F Stat	P-Value	Decisior	n(α:5%)		
Between Error Total	2.453502 0.3400105 2.793513	6	0.61337 0.02266		4 15 19	27.06	<0.0001	Significa	nt Effect		
Distributional											
Attribute	Test			Test Stat	Critical	P-Value	Decision	(α:1%)			
Variances			ity of Varian		4.893	0.0137	Equal Va				
Variances Distribution	Levene E Shapiro-V			6.762 0.7438	4.893 0.866	0.0026 0.0001	•	Variances nal Distribut	tion		
96h Survival F	Rate Summarv										
	Control Type	Count	Mean	95% LCL	95% UC	L Median	Min	Max	Std Err	CV%	%Effect
13 398 753 1520 3280 5430 16700	Lab Control	4 4 4 4 4 4 4	1 1 0.7 0.2 0 0	1 1 0.5163 0 0 0	1 1 0.8837 0.6501 0 0	1 1 0.7 0.1 0	1 1 0.6 0 0 0	1 1 0.8 0.6 0 0	0 0 0.05774 0.1414 0 0	0.0% 0.0% 0.0% 16.5% 141.4%	0.0% 0.0% 30.0% 80.0% 100.0% 100.0%
Angular (Corre	ected) Transfor	med Sun	nmary								
	Control Type	Count	Mean	95% LCL	95% UC		Min	Max	Std Err	CV%	%Effect
398 753 1520	Lab Control	4 4 4 4	1.345 1.345 1.345 0.9966	1.345 1.345 1.345 0.7935	1.346 1.346 1.346 1.2	1.345 1.345 1.345 0.9966	1.345 1.345 1.345 0.8861	1.345 1.345 1.345 1.107	0 0 0 0.06382	0.0% 0.0% 0.0% 12.81%	0.0% 0.0% 0.0% 25.92%
3280 5430 16700		4 4 4	0.4502 0.2255 0.2255	-0.04551 0.2255 0.2255	0.9459 0.2256 0.2256	0.3446 0.2255 0.2255	0.2255 0.2255 0.2255	0.8861 0.2255 0.2255	0.1558 0 0	69.2% 0.0% 0.0%	66.54% 83.24% 83.24%

CETIS™ v1.8.7.16

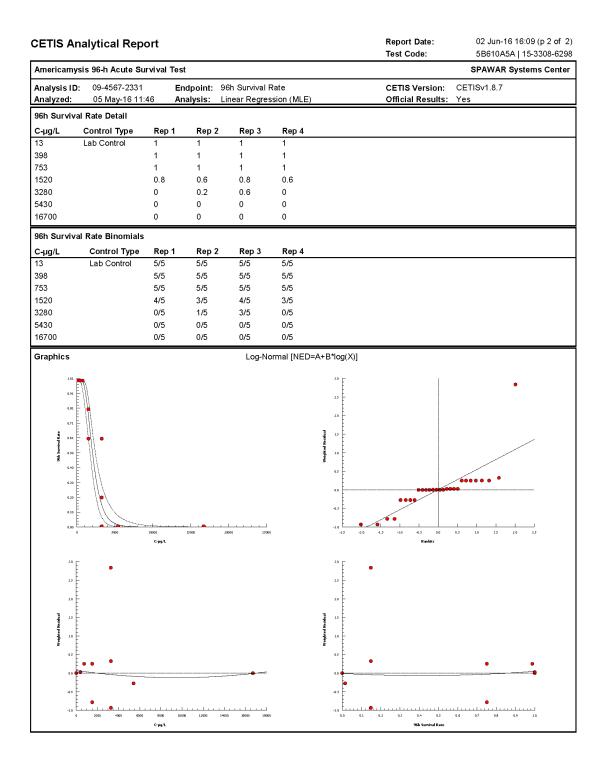
CETIS Ana	alytical Repo	ort					Report Date: Test Code:	02 Jun-16 16:09 (p 2 of 2 5B610A5A   15-3308-629
Americamysi	is 96-h Acute Sur	vival Tes	st					SPAWAR Systems Cente
Analysis ID: Analyzed:	14-4521-2713 05 May-16 11:4		•	5h Survival F onparametri	Rate c-Control vs Treatr	ments	CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Survival	Rate Detail							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
13	Lab Control	1	1	1	1			
398		1	1	1	1			
753		1	1	1	1			
1520		0.8	0.6	0.8	0.6			
3280		0	0.2	0.6	0			
5430		0	0	0	0			
16700		0	0	0	0			
Angular (Cor	rected) Transfor	ned Deta	ail					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
13	Lab Control	1.345	1.345	1.345	1.345			
398		1.345	1.345	1.345	1.345			
753		1.345	1.345	1.345	1.345			
1520		1.107	0.8861	1.107	0.8861			
3280		0.2255	0.4636	0.8861	0.2255			
5430		0.2255	0.2255	0.2255	0.2255			
16700		0.2255	0.2255	0.2255	0.2255			
96h Survival	Rate Binomials							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
13	Lab Control	5/5	5/5	5/5	5/5			
398		5/5	5/5	5/5	5/5			
753		5/5	5/5	5/5	5/5			
1520		4/5	3/5	4/5	3/5			
3280		0/5	1/5	3/5	0/5			
5430		0/5	0/5	0/5	0/5			
16700		0/5	0/5	0/5	0/5			
Graphics								
10 F					0.45	Ē	1	•
0.9 E	• • •				0.40	Ē		
0.8					0.35	Ē		
Ē					0.25	ΓE .		
		-			· · · · · · · · · · · · · · · · · · ·	Ē		/
96h Survival Rate					Centered Angle Contered Contered	Ē		
\$ os [					0.10	E		
0.4					0.05	E		•
-					-0.05	E		
0.3 E					-0.10	Ē	••	
0.2 E			<b>*</b>		-0.15	1		
0.1			4		-0.20	F •	•	
E	. I. I.			• •	-0.25	E		
	3LC 398 753	1520	3280	5480 16700		-2.5 -2.0	-1.5 -1.0 -0.5 0.0	0.5 1.0 1.5 2.0 2.5
		C•µg/L					Rankits	

CETIS™ v1.8.7.16

CETIS A	nalytical Rep	ort					•	ort Date: Code:			:09 (p 1 of 2) 15-3308-6298
Americam	ysis 96-h Acute Su	rvival Tes	t						SPA	WAR Sys	terns Center
Analysis II Analyzed:	09-4567-2331 05 May-16 11:		•	96h Survival Ra ₋inear Regress				S Version: ial Results		.8.7	
Batch ID: Start Date: Ending Da	te:	00 Pr Sp	otocol: E becies: /	Survival (96h) EPA/821/R-02- Americamysis I	bahia		Anal Dilue Brine	ent: Lab e: Not	ob Munson- oratory Sea Applicable		
Duration:	NA	So	ource: A	Aquatic Resear	rch Organisn	ns, NH	Age:	5			
•	ate: 10 Dec-15 ate: 10 Dec-15	Ma So	aterial: Z ource: F	53D84E08 Zinc sulfate Pulsed Exposu I2 Hour	re		Clier Proje		WAR sed Exposu	re	
Linear Reg	ression Options										
Model Fun				old Option		Optimized		Het Corr	Weighted	1	
Log-Norma	I [NED=A+B*log(X)		Control	Threshold	1E-07	No	No	No	Yes		
	n Summary										
Iters L 8 -2	AICc 3.1 50.68	BIC 52.87	Mu 3.314	<b>Sigma</b> 0.194	Adj R2 0.8941	F Stat 1.663	Critical 2.685	P-Value 0.1874	Decision	(α:5%) ificant Lac	k of Eit
		52.07	5.514	0.194	0.8941	1.003	2.005	0.1074	NUL-SIGH	Incant Lac	K UI FIL
Point Estin Level μ	nates g/L 95% LCL	95% UC	L								
LC50 20	060 1685	2492									
Regressio	n Parameters										
Parameter	Estimate	Std Erro	or 95% LC	CL 95% UCL	t Stat	P-Value	Decision(	α:5%)			
Slope	5.153	0.9096	3.371	6.936	5.666	<0.0001	-	t Parameter			
Intercept	-17.08	3.036	-23.03	-11.13	-5.625	<0.0001	Significant	Parameter			
ANOVA Ta	ble										
Source	Sum Squ	iares Me	ean Square	ə DF	F Stat	P-Value	Decision(	α:5%)			
Model	103.8834		3.8834	1	228.9	<0.0001	Significant				
Lack of Fit Pure Error	3.346611 8.452381		369322 402494	5 21	1.663	0.1874	Non-Signi	ficant			
Residual	11.79899		453807	26							
Residual A											
Attribute	Method			Test Stat	Critical	P-Value	Decision(	a:5%)			
Goodness-	of-Fit Pearson	Chi-Sq GO		11.8	38.89	0.9922	Non-Signi	ficant Heter			
		d Ratio GO		11	38.89	0.9955	-	ficant Heter	ogenity		
Variances		ne Equality Vilk W Nor	y of Varian molity	ce 4.129 0.6633	2.573 0.9264	0.0068 <0.0001	Unequal V	ariances al Distributi			
Distribution			2 Normality		2.492	<0.0001		al Distributi al Distributi			
Distribution	Anderson		_ · · ·								
					Calcul	lated Variat	o(A(R)				
96h Surviv	al Rate Summary	Count	Mean	Min		lated Variat		CV%	%Effect	Δ	в
		Count 4	Mean 1	Min 1	Calcul Max 1	lated Variat Std Err 0	e(A/B) Std Dev 0	<b>CV%</b>	%Effect	A 20	<b>B</b> 20
96h Surviv C-µg/L	al Rate Summary Control Type				Max	Std Err	Std Dev				
<b>96h Surviv</b> C-µg/L 13	al Rate Summary Control Type	4	1	1	Max 1	Std Err 0	Std Dev 0	0.0%	0.0%	20	20
<b>96h Surviv</b> С-µg/L 13 398 753	al Rate Summary Control Type	4 4	1 1	1 1	<b>Max</b> 1 1	Std Err 0 0	<b>Std Dev</b> 0 0 0	0.0% 0.0% 0.0%	0.0% 0.0% 0.0%	20 20	20 20
<b>96h Surviv</b> С-µg/L 13 398	al Rate Summary Control Type	4 4 4	1 1 1	1 1 1	Max 1 1 1	<b>Std Err</b> 0 0 0	Std Dev 0 0	0.0% 0.0%	0.0% 0.0%	20 20 20	20 20 20
<b>96h Surviv</b> С-µg/L 13 398 753 1520	al Rate Summary Control Type	4 4 4 4	1 1 1 0.7	1 1 1 0.6	Max 1 1 1 0.8	<b>Std Err</b> 0 0 0 0.05774	<b>Std Dev</b> 0 0 0 0.1155	0.0% 0.0% 0.0% 16.5%	0.0% 0.0% 0.0% 30.0%	20 20 20 14	20 20 20 20

CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_



CETIS™ v1.8.7.16

CETIS Sum	nmary Repo	ort						Report Dat Test Code:				9 (p 1 of 1) -2167-2095
Americamysis	s 96-h Acute Sur	vival 1	Test							SPA	VAR Syste	ms Center
Batch ID: Start Date: Ending Date: Duration:	13-0299-9056 10 Dec-15 10:0 14 Dec-15 08:3 94h		Test Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-02 Americamysis Aquatic Resea	bahia	ns, NH		Analyst: Diluent: Brine: Age:	Labo	bb Munson-l pratory Seav Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:			Code: Material: Source: Station:	424E4180 Zinc sulfate Reference Tox Reference Tox				Client: Project:		WAR ed Exposur	e	
Comparison S	Summary											
Analysis ID	Endpoint		NOEL		TOEL	PMSD	τu	Meth				
16-2240-7981	96h Survival Ra	ate	398	753	547.4	26.8%		Dunr	nett M	ultiple Com	parison Tes	it
Point Estimate Analysis ID 04-3492-6438	e Summary Endpoint 96h Survival Ra	ate	Level	μ <b>g/L</b> 510.1	95% LCL 415.1	95% UCL	TU	Meth		gression (M	LE)	
	Rate Summary										,	
C-µg/L	Control Type	Cour	nt Mean	95% LCL	. 95% UCL	Min	Max	Std	Frr	Std Dev	CV%	%Effect
13 100 180 398 753 1520	Lab Control	4 4 4 4 4 4 4	0.95 1 0.9 0.75 0.1 0	0.7909 1 0.7163 0.3496 0 0	1 1 1 1 0.4182 0	0.8 1 0.8 0.4 0	1 1 1 1 0.4 0	0.05 0 0.05 0.12 0.1 0	774	0.1 0 0.1155 0.2517 0.2 0	10.53% 0.0% 12.83% 33.55% 200.0%	0.0% -5.26% 5.26% 21.05% 89.47% 100.0%
96h Survival F	Pate Detail			-	-	-	-	-		-		
96h Survival I C-µg/L	Control Type	Rep	1 Rep 2	Rep 3	Rep 4							
13 100 180 398 753 1520	Lab Control	1 1 0.8 0.4 0	1 1 0.8 1 0 0	1 1 0.8 0.4 0 0	0.8 1 1 0.8 0 0							
96h Survival F	Rate Binomials											
C-µg/L	Control Type	Rep			Rep 4							
13 100 180 398 753	Lab Control	5/5 5/5 5/5 4/5 2/5	5/5 5/5 4/5 5/5 0/5	5/5 5/5 4/5 2/5 0/5	4/5 5/5 5/5 4/5 0/5							
1520		0/5	0/5	0/5	0/5							

CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ana	lytical Repo	ort					ort Date: Code:		Jun-16 16:0 F9B89F   08						
Americamysis	96-h Acute Su	rvival T	est						SPA	WAR Syste	ms Cente				
Analysis ID: Analyzed:	16-2240-7981 05 May-16 11:4	46	Endpoint: Analysis:	96h Survival R Parametric-Co		tments		IS Version cial Result		.8.7					
Batch ID: Start Date: Ending Date: Duration:	13-0299-9056 10 Dec-15 10:0 14 Dec-15 08:3 94h		Protocol: Species:	Survival (96h) EPA/821/R-02 Americamysis Aquatic Resea	bahia	ms, NH	Anal Dilu Brin Age:	ent: Lai e: No	cob Munson- boratory Sea ht Applicable						
Sample ID: Sample Date: Receive Date: Sample Age:	11-1242-4832 10 Dec-15 10h		Material:	424E4180 Zinc sulfate Reference To» Reference To»			Clier Proj		PAWAR Ised Exposu	re					
Data Transfor Angular (Corre		Zeta NA	Alt Hy C>T	/p Trials NA	Seed NA		PMSD 26.8%	NOEL 398	<b>LOEL</b> 753	<b>TOEL</b> 547.4	TU				
5 .	,		071	NA .	NA .		20.070	550	155	547.4					
Dunnett Multij Control	ple Comparisor vs C-µg/L	n Test	Test S	tat Critical	MSD DI	P-Value	P-Type	Decisior	ı(α:5%)						
13 13 13 13	100 180 398 753*		-0.468 0.4687 1.769 7.443		0.299 6 0.299 6 0.299 6 0.299 6	0.9159 0.6182 0.1360 <0.0001	CDF CDF CDF CDF	Non-Sigr	nificant Effect nificant Effect nificant Effect						
ANOVA Table				2.000	0.200 0			olgilliou							
Source	Sum Squ	ares	Mean	Square	DF	F Stat	P-Value	Decisior	a(a:5%)						
Between Error Total	2.71033 0.484054 3.194385		0.6775	5825	4 15 19	21	<0.0001	Significa	, ,						
Distributional	Tests														
Attribute	Test			Test Stat	Critical	P-Value	Decision	(α:1%)							
Variances Variances Distribution	Levene E	Equality	ality of Varia of Variance Normality	nce 0.74 2.499 0.9446	4.893 4.893 0.866	0.5793 0.0868 0.2923	Equal Var Equal Var Normal D	iances							
96h Survival F	Rate Summary														
	Control Type	Coun		95% LCL			Min	Max	Std Err	CV%	%Effect				
13 100 180 398 753 1520	Lab Control	4 4 4 4 4	0.95 1 0.9 0.75 0.1 0	0.7909 1 0.7163 0.3496 0 0	1 1 1 0.4182 0	1 1 0.9 0.8 0 0	0.8 1 0.8 0.4 0 0	1 1 1 0.4 0	0.05 0 0.05774 0.1258 0.1 0	10.53% 0.0% 12.83% 33.55% 200.0%	0.0% -5.26% 5.26% 21.05% 89.47% 100.0%				
Angular (Corr	ected) Transfor	med Su	ummary												
C-µg/L	Control Type	Coun	t Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect				
13 100 180 398 753 1520	Lab Control	4 4 4 4 4 4	1.286 1.345 1.226 1.061 0.3403 0.2255		1.475 1.346 1.445 1.498 0.7057 0.2256	1.345 1.345 1.226 1.107 0.2255 0.2255	1.107 1.345 1.107 0.6847 0.2255 0.2255	1.345 1.345 1.345 1.345 0.6847 0.2255	0.05953 0 0.06874 0.1374 0.1148 0	9.26% 0.0% 11.21% 25.91% 67.47% 0.0%	0.0% -4.63% 4.63% 17.47% 73.53% 82.46%				

CETIS™ v1.8.7.16

CETIS Ana	alytical Repo	ort					Report Date: Test Code:	02 Jun-16 16:09 (p 2 of 2) 30F9B89F   08-2167-2095
Americamysi	s 96-h Acute Sur	vival Te	est					SPAWAR Systems Center
Analysis ID: Analyzed:	16-2240-7981 05 May-16 11:4		Endpoint: 96 Analysis: Pa		ate ntrol vs Trea	tments	CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Survival	Rate Detail							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
13	Lab Control	1	1	1	0.8			
100		1	1	1	1			
180		1	0.8	0.8	1			
398		0.8	1	0.4	0.8			
753		0.4	0	0	0			
1520		0	0	0	0			
Angular (Cor	rected) Transform	ned De	tail					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
13	Lab Control	1.345	1.345	1.345	1.107			
100		1.345	1.345	1.345	1.345			
180		1.345	1.107	1.107	1.345			
398		1.107	1.345	0.6847	1.107			
753		0.6847	0.2255	0.2255	0.2255			
1520		0.2255	0.2255	0.2255	0.2255			
96h Survival	Rate Binomials							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
13	Lab Control	5/5	5/5	5/5	4/5			
100		5/5	5/5	5/5	5/5			
180		5/5	4/5	4/5	5/5			
398		4/5	5/5	2/5	4/5			
753		2/5	0/5	0/5	0/5			
1520		0/5	0/5	0/5	0/5			
Graphics								
10 0.9 0.9 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	•	•	22	Reject Mul		0.35 0.30 0.20 0.15 0.10 0.10 0.10 0.10		•
	1 L DLC 300	ію С-µg/L	390 75	1520		0.00 0.05 0.10 0.15 0.00 0.15 0.00	15 -10 -05 -00 Eablt	- I I J 95 10 15 20

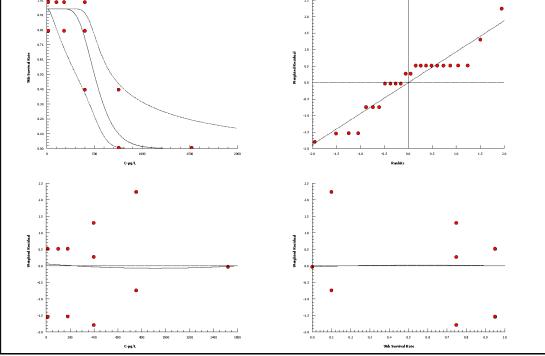
CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ana	lytical Repo	ort					-	ort Date: Code:			09 (p 1 of 2) 8-2167-2095
Americamysis	s 96-h Acute Sur	vival Test							SPA	WAR Syst	ems Center
Analysis ID: Analyzed:	04-3492-6438 05 May-16 11:4			n Survival Ra ear Regress				S Version:	CETISv1 : Yes	.8.7	
Batch ID: Start Date: Ending Date: Duration:	13-0299-9056 10 Dec-15 10:0 14 Dec-15 08:3 94h	0 Prot	ocol: EP cies: Am	rvival (96h) A/821/R-02- nericamysis I uatic Resear	bahia	ns, NH	Anal Dilue Brine Age:	ent: Lab e: Not	ob Munson- oratory Sea Applicable		
Sample ID: Sample Date: Receive Date Sample Age:		Cod Mate Sou Stati	erial: Zin rce: Re	4E4180 ic sulfate ference Toxi ference Toxi			Clier Proj		WAR ed Exposu	re	
Linear Regree	ssion Options										
Model Function	on IED=A+B*log(X)]		Threshol Control Th		Threshold 0.05	Optimized Yes	Pooled No	Het Corr No	Weighted Yes	ł	
• •	•••		Control II	nesnoù	0.05	165	NO	NO	165		
Regression S Iters LL	AICc	BIC	Mu	Sigma	Adj R2	F Stat	Critical	P-Value	Decision		
11 -29.6		68.85	2.708	0.1351	0.7502	1.431	3.16	0.2666	Non-Sign	ificant Lack	t of Fit
Point Estimat Level µg/L LC50 510. <sup>-</sup>	95% LCL	95% UCL 605.9									
Regression P	arameters										
Parameter	Estimate	Std Error	95% LCL			P-Value	Decision				
Threshold Slope	0.04964 7.401	0.02815 1.865	-0.00554 3.746	0.1048 11.06	1.763 3.968	0.0924 0.0007	-	ficant Paran t Parameter	neter		
Intercept	-20.04	5.093	-30.02	-10.06	-3.935	0.0008	-	t Parameter			
ANOVA Table	1										
Source	Sum Squa		n Square	DF	F Stat	P-Value	Decision				
Model Lack of Fit	71.73054 4.081984		3054 0661	1 3	71.07 1.431	<0.0001 0.2666	Significan Non-Signi				
Pure Error	17.11345		0747	3 18	1.451	0.2000	Non-Sign	ncan			
Residual	21.19543	1.00	9306	21							
Residual Ana	lysis										
Residual Ana Attribute	lysis Method			Test Stat	Critical	P-Value	Decision	(α:5%)			
	Method Fit Pearson C	hi-Sq GOF		21.2	32.67	0.4471	Non-Signi	ficant Heter			
Attribute Goodness-of-F	Fit Pearson C Likelihood	Ratio GOF	6 \ /i	21.2 20.83	32.67 32.67	0.4471 0.4693	Non-Signi Non-Signi	ficant Heter ficant Heter			
Attribute Goodness-of-F Variances	Fit Pearson C Likelihood Mod Lever	Ratio GOF ne Equality o		21.2 20.83 1.027	32.67 32.67 2.773	0.4471 0.4693 0.4311	Non-Signi Non-Signi Equal Var	ficant Heter ficant Heter iances	ogenity		
Attribute Goodness-of-F	Method Fit Pearson C Likelihood Mod Lever Shapiro-W	Ratio GOF	ality	21.2 20.83	32.67 32.67	0.4471 0.4693	Non-Signi Non-Signi Equal Var Non-norm	ficant Heter ficant Heter	ogenity		
Attribute Goodness-of-F Variances Distribution	Method Fit Pearson C Likelihood Mod Lever Shapiro-W	Ratio GOF ne Equality o ilk W Norm	ality	21.2 20.83 1.027 0.902	32.67 32.67 2.773 0.9169 2.492	0.4471 0.4693 0.4311 0.0238	Non-Signi Non-Signi Equal Var Non-norm Non-norm	ficant Heter ficant Heter iances al Distributio	ogenity		
Attribute Goodness-of-F Variances Distribution 96h Survival	Method Fit Pearson C Likelihood Mod Lever Shapiro-W Anderson-	Ratio GOF ne Equality o ilk W Norm	ality Normality Mean	21.2 20.83 1.027 0.902 1.298 Min	32.67 32.67 2.773 0.9169 2.492	0.4471 0.4693 0.4311 0.0238 0.0019 ated Variat	Non-Signi Non-Signi Equal Var Non-norm Non-norm	ficant Heter ficant Heter iances al Distributio	ogenity	A	в
Attribute Goodness-of-f Variances Distribution 96h Survival C-µg/L C 13 L	Method Fit Pearson C Likelihood Mod Lever Shapiro-W Anderson- Rate Summary	Ratio GOF ne Equality of ilk W Norm Darling A2 I Count 4	ality Normality Mean 0.95	21.2 20.83 1.027 0.902 1.298 Min 0.8	32.67 32.67 2.773 0.9169 2.492 Calcul Max 1	0.4471 0.4693 0.4311 0.0238 0.0019 ated Variat Std Err 0.05	Non-Signi Non-Signi Equal Var Non-norm Non-norm e(A/B) Std Dev 0.1	ficant Heter ficant Heter iances al Distributio al Distributio CV% 10.53%	ogenity on on %Effect 0.0%	19	20
Attribute Goodness-of-f Variances Distribution 96h Survival C-µg/L C 13 L	Method Fit Pearson C Likelihood Mod Lever Shapiro-W Anderson- Rate Summary Control Type	Ratio GOF ne Equality of ilk W Norm Darling A2 1 Count 4 4	Ality Normality Mean 0.95 1	21.2 20.83 1.027 0.902 1.298 Min 0.8 1	32.67 32.67 2.773 0.9169 2.492 Calcul Max 1 1	0.4471 0.4693 0.4311 0.0238 0.0019 ated Variat Std Err 0.05 0	Non-Signi Equal Var Non-norm Non-norm <b>e(A/B)</b> Std Dev 0.1 0	ficant Heter ficant Heter iances al Distributio al Distributio <b>CV%</b> 10.53% 0.0%	00genity 0n 00 <b>%Effect</b> 0.0% -5.26%	19 20	20 20
Attribute Goodness-of-f Variances Distribution 96h Survival C-µg/L 13 100 180	Method Fit Pearson C Likelihood Mod Lever Shapiro-W Anderson- Rate Summary Control Type	Ratio GOF ne Equality of ilk W Norm Darling A2 1 Count 4 4 4	Ality Normality Mean 0.95 1 0.9	21.2 20.83 1.027 0.902 1.298 Min 0.8 1 0.8	32.67 32.67 2.773 0.9169 2.492 Calcul Max 1 1 1	0.4471 0.4693 0.4311 0.0238 0.0019 ated Variat Std Err 0.05 0 0.05774	Non-Signi Non-Signi Equal Var Non-norm Non-norm e(A/B) Std Dev 0.1 0 0.1155	ficant Heter ficant Heter al Distributio al Distributio Distributio CV% 10.53% 0.0% 12.83%	0.0% 5.26% 5.26%	19 20 18	20 20 20
Attribute Goodness-of-f Variances Distribution 96h Survival C-µg/L C 13 L	Method Fit Pearson C Likelihood Mod Lever Shapiro-W Anderson- Rate Summary Control Type	Ratio GOF ne Equality of ilk W Norm Darling A2 1 Count 4 4	Ality Normality Mean 0.95 1	21.2 20.83 1.027 0.902 1.298 Min 0.8 1	32.67 32.67 2.773 0.9169 2.492 Calcul Max 1 1	0.4471 0.4693 0.4311 0.0238 0.0019 ated Variat Std Err 0.05 0	Non-Signi Equal Var Non-norm Non-norm <b>e(A/B)</b> Std Dev 0.1 0	ficant Heter ficant Heter iances al Distributio al Distributio <b>CV%</b> 10.53% 0.0%	00genity 0n 00 <b>%Effect</b> 0.0% -5.26%	19 20	20 20

CETIS™ v1.8.7.16

CETIS An	alytical Rep	ort				Report Date: Test Code:	02 Jun-16 16:09 (p 2 of 2) 30F9B89F   08-2167-2095
Americamy	sis 96-h Acute Su	urvival Test	t				SPAWAR Systems Center
Analysis ID: Analyzed:	04-3492-6438 05 May-16 11		•	Sh Survival F near Regres		CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Surviva	l Rate Detail						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
13	Lab Control	1	1	1	0.8		
100		1	1	1	1		
180		1	0.8	0.8	1		
398		0.8	1	0.4	0.8		
753		0.4	0	0	0		
1520		0	0	0	0		
96h Surviva	l Rate Binomials	;					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
13	Lab Control	5/5	5/5	5/5	4/5		
100		5/5	5/5	5/5	5/5		
180		5/5	4/5	4/5	5/5		
398		4/5	5/5	2/5	4/5		
753		2/5	0/5	0/5	0/5		
1520		0/5	0/5	0/5	0/5		
Graphics				Log-No	ormal [NED=A+B*log(X)]		
1.01	•••				2.5		•



CETIS™ v1.8.7.16

# Water Quality Measurements & Test Organism Survival

Project	Defin	itive Pulsed Exposure	Test Sp	ecles: <u>A. bahia</u>			Te	ech Init	ials	
Sample ID:		hr Exposure	Start Date	Time: 12/10/2015 1000		0	24	48	72	96
Test No.:	·		End Date	Time: <u>12/14/2015 0830</u>	Counts	3.4	NU	JM	JH	JU
					Readings	N.C	NA	211	3A	ЗM
					Dilutions made by:	J.M				
· · · · ·	<u>г</u> т	· · · · · · · · · · · · · · · · · · ·	1	r					_	
centration	Rep	Number of Live Organisms	Salinity (ppt)	Temperature (°C)	Dissolved Oxygen (mg化)			pH (units	)	

Concentration µg/L	Rep			nber rgani	of Live sms	)			Salini (ppt				Те	mpera (°C)	iture		A	Disso	lved ( (mg/l		en			pH (units	5)	
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
Lab Control	Α	5	5	5	\$	5	340	37.9	34.2	34,1	34.4	18,6	17.9	19.5	19.6	18.7	2.3	8.7	9.2	8.1	8.1	7.6	1		1	1
34 ppt	В	5	5	5	5	5								-									6.5	-	S	
	С	Ŝ	Ś	5	15	3																				
	D	S	5	4	4	4.																				
500µg/L	Α	5	5	5	2	5	B.U	34.1	34.4	343	24.4	18.8	20,1	19.8	178	12.7	7.3	87	89	8.3	80	7.53	7.84	7.98	8.14	7.95
Zinc	В	5	5	5	5	5								·						strain Shiste				1		
	С	5	5	5	5	5																				
	D	5	5	5	5	5																				
1000µg/L	Α	5	5	5	5	5	34.1	34.Z.	32.2	34,3	34.3	197	20.1	19.9	19.9	18.8	9.4	90	9.1	8.2	8,0	7.64	7.86	2.85	8.21	8.00
Zinc	В	5	5	64	3	3			,nte					~										2		
	С	5	5	5	5	5																				
	D	5	5	4	4	4																				
2000µg/L	Α	5	5	5	5	5	33.9	34.Z	34,3	44	34,6	184	20.1	19.9	18.9	18.8	2.3	8.6	8.7	84	85	7.55	7.88	386	8-72	8.07
Zinc	В	5	5	5	5	5			~										1					~		
	С	5	5	4	4	4																				
	D	5	5	5	5	5																				
4000µg/L	Α	6	5	5	5	5	332	34.1	34.5	34.3	34.3	18,4	200	19.9	19.7	198	9.2	83.	8.7	8.4	8.4	7.52	287	7.96	8,23	809
Zinc	В	3 5 5 5 5 -									~					~					~					
	C	5	5	5	5	5																				
	D	5	5	5	5	5																				
8000µg/L	A	5	5	5	5	5	33.2	34.1	34.3	34.Z	34.4	'9. Z. j	20.7	19.9	11.8	19.9	9.2	3.5	8:3	8.4	8.)	7.51	7,97	7.94	8. K.	8-01
Zinc	в	5	5	4	3	3								-st-					~					~		
	С	5	3	3	3	3																				
	D	S	5	3	$\rightarrow$	3																				
16000µg/L	A	5.	200	0			72.2	34.2	34.3	34.1	33.9	19.2	22.1	18.3	19.1	48	9,1	85 8	38	3.2	8.3	7.SI	7.80	7.99	8.23	8.Œ
Zinc	В		253 <sup>34</sup> 2 7 1	B		32																		-		
	c		$\leq$	32		3																				
Initial Counts	D	5	9	3	3 1	3(							3333											Construction of the second sec		
QC'd by:	5~/	NЦ.																								
- Animal Source/Date										_											ſ					
Animal Source/Date	Rece	ivea:	-		,	ARO -	2/8/2	015		P	lge at	Initia	tion:			5 days								ing Tir		
Comments:		= init	ial red	adina	in from	h too	t antu	tion f.	- 6												ŀ	0	24	48	72	96
								tion, f ircle o		· .		SLCA	ampe	prior	o ren	ewal	· · ·				İ	0720	~~			1892
								) if yes	-t	1											PM:	500	300	300 1	80	
			on so		101010	10 (	, 1(1)	ju yes			(s): * G	1 2 3	~		ration	к <u> </u>	•									
QC Check:		5/	1 2	2010	~				-		L.	÷~6							<b>F</b> 1.		•	l	00		1 Ju	1
2	-16	- (	1 4	~113	<u> </u>														Fina	u Kev	iew:	_X.	XX-	6	211	Le -

SPAWAR Systems Center Pacific Bioassay Lab, 53475 Strothe Rd, Bidg 111 Rm 116, San Diego, CA 92152

# Water Quality Measurements & Test Organism Survival

96 34 Int

Project: Definitive Pulsed Ex	Dosure Test Species: A. bahia			Te	ch Initi	ials
Sample ID: 6 hr Exposure	Start Date/Time: 12/10/2015 1000		0	24	48	72
Test No.:	End Date/Time: 12/14/2015 0830	Counts:	3.1	MЦ	J.4	I.4
		Dendinger	TX	$N_{\rm H}^{\rm h}$	C.A.	T.u

0/2015 1000		0
4/2015 0830	Counts:	šл
	Readings:	E٨
	Dilutions made by:	ſЛ

Concentration µg/L	Rep			iber o ganis		e		:	Salini (ppt)				Ter	npera (°C)	iture			Disso	ived ( (mg/l		n			pH (units	)	
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	$\checkmark$	24	48	72	96	0	24	48	72	96
Lab Control	A	5	5	\$	Ş	5	340	33.9	34.2	34.1	34.4	13.C	18.9	19.5	19.6	19:7	93	8.9	9,2	$\mathcal{B}_{d}$	8.1	7,60	274	2.76	287	7.85
34 ppt	В	5	5	Ş	5	5													-							
	С	5	5	5	5	5																				
	D	S	5	4	4	4															10,000 10,000					
500µg/L	A	5	5	5	5	5	33.2	34.1	34.2	34.2	34.3	188	20.1	18.9	18.8	20,1	7.3	8.7	8.C	8.9	80	753	7.94	7.78	7.14	7.97
Zinc	В	5	53	194	4	4			~					~					1							
	C	5	5	5	5	5																				
	D	5	S	5'	S	5																				
1000µg/L	A	5	5	5	5	5	33.9	34.2	34.1	34.1	34.2	18,4	20,1	19,9	193	201	8.2	90	8.6	8.6	8.1	7.66	7.X.	7.99	8.19	826
Zinc	в	5	5	5	5	S								-					-					-		
	C	5	5	5	5	5																				
	D	5	5	5	5	5																				
2000µg/L	A	5	5	5	5	5	33.9	34.Z	34.2	94. (	343	18.4	20.1	188	19:58	185	8.2	8.4	3.7	8,6	83	7.69	7.83	7.98	823	8.57
Zinc	в	5	5	5	5	5			-mod					~					~							
	С	5	S	5	5	5																				
	D	5	5	5	5	S																				
4000µg/L	A	5	5	4	7	4	34.1	34.2	34.3	33,9	34.3	18,4	200	20,1	198	18.9	2./	8.3	8.4	85	8.4	7.65	787	7.96	823	C07
Zinc	В	5	4	3	3	3								*					~~							
	С	4	4	3	3	3																				
	D	4	3	3	3	3																				
8000µg/L	Α	4	3	0	0	0	398	34.1	34.1	33,9	342.	19,1	la, t	20.	18.8	30.1	7.0	8.5	8.4	8.2.	85	261	7.2.7	7.9 <i>6</i>	8.)5	8.11
Zinc	В	5	4	4	4	3			~					2					~							
	С	5	5	}	ł	t.																				
	D	5	3	1	Ð	0																				
16000µg/L	A	5	3	0		_	33,2	34.1	34.1	~	~	18.4	20.2	19.9		- 44.94	7.1	9.6	8.7	~	-	7.47	7.89	7.98	"	_
Zinc	в	4	3	0					-										-"					~~		
	С	4	2	0	~	~																91995 2019				
	D	2	1	0	~																	1200013 1200015	333) 333)			
Initial Counts QC'd by:	JA/	/NH																								
Animal Source/Da	imal Source/Date Received:							2015			Age a	t Initi:	ation:			5 day	's							ding Ti		
Comments:	omments: <u>i = initial reading in fresh test</u>								f = fina	al read	ling in	test c	hambe	er prio	r to rei	newal					AM:	0 0730	24 1/ <i>00</i>	<b>48</b> ((30	72 //00	<b>96</b> 0830
		Orga	nisms	s fed p	prior t	o initia	ation,	circle	onę (	<u>y)</u>	n )										PM:	1500	1300	13-00	1500	-
		Tests	aera	ted?	Circle	one		1.	1000	nple I	D(s):			1	Duratio	on:										
			tion so	6			A	) = 1	Q e	2.7.												,		0	, 1	. 1.1
QC Check:	J.n	6	1	120	1.C.														Fir	nal Re	view:	J	X	Ľ	61-	2/10

QC Check:

SPAWAR Systems Center Pacific Bioassay Lab, 53475 Strothe Rd, Bldg 111 Rm 116, San Diego, CA 92152

## Water Quality Measurements & Test Organism Survival

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Project: Definitive Pulsed Exposure	Test Species: A. bahia			Тө	ch Init	ials	
Sample ID: 12 hr Exposure	Start Date/Time: 12/10/2015 1000		0	24	48	72	96
Test No.:	End Date/Time: 12/14/2015 0830	Counts:	Jui	Nk	5M	Ju i	IU
		Readings:	รัน	UH.	Ju	5.4.	July

Dilutions made by: J.a Number of Live Salinity Dissolved Oxygen Temperature pH (units) Concentration Organisms (ppt) (°C) (mg/L) Rep µg/L 0 24 48 72 96 0 24 48 72 96 0 24 48 72 48 72 96 24 48 72 96 0 24 0 96 Α < 5 Ş 33.9 19.5 19.6 Lab Control 34 5 34 z 34. ( 34.4 184 81 18.2 19-2 8.9 ĩz. 8: 7.6e 7.74 7.76 28.9 7.8 в 5 4 34 ppt < С  $\leq$ 5 < 34 -14 D 55 The second S Α 185 20,1 199 500µg/L 5 5 19.8 4. 34.2 20 87 5% 5  $\mathcal{D}$ 2-1 в 5 5 5 5 Zinc  $\langle$ C \$ 2 < 5 5 D 5  $\leq$ 5 Α 9.9 1000µg/L 5 5 198 9.0 87 2. в 5 Zínc 5 c 5 5 Ç 1 D 5 Α 920 2000µg/L 5 4 U 199 7.17 8,00 25 i1: 18.9 99 *24* 81 17 Zinc в 5 4 2 3 3 С 5 5 4  $\zeta$ D 3 3 3 2, 4000µg/L Α Ы 34.1 19/ 34 34. 98 80 23 8.1 < в 2 Z Zinc З, С 3 3 2 2 D 2 Ċ 8000µg/L А Z 19.6 20 8.8 33. S 34 8 121 2 34 в  $\mathcal{O}$ Zinc С Ч  $\circ$ 5 D 3 Α 16000µg/L 34.1 332 18.9 ~ в Zinc С D Initial Counts QC'd by: 34 / NH Feeding Times Animal Source/Date Received: ARO 12/8/2015 Age at Initiation: 5 days

			0	24	48	72	96	
Comments:	i = initial reading in fresh test solution, f = final reading in test chamber prior to renewal	AM:	FOC	1100	1190	1200	08%	
	Organisms fed prior to initiation, circle one ( $\widehat{\gamma}$ n )	PM:	1500	13:00	1900	1500		
	Tests aerated? Circle one ( y ( n) if yes, sample ID(s): Duration:	·						
	Aeration source: (A)=Q22_	<u> </u>				,		
QC Check:	Jm e/1/2010	Final Review:	l	Ul	)	6/2	<u>, 110</u>	Q

SPAWAR Systems Center Pacific Bioassay Lab, 53476 Strothe Rd, Bldg 111 Rm 116, San Diego, CA 92152

# Water Quality Measurements & Test Organism Survival

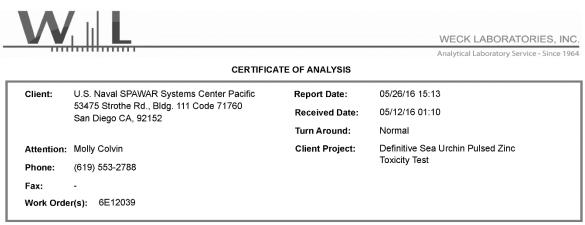
Project: Delinitive Plsed Zinc Experim Test Species: A. balia Sample 10: - Restor - 91010 Static Start DaterTime: 12/10/2015 10:00 air Test No.: End DaterTime: 12/14/2015 8:30 am Tech Initials 24 48 72 0 96 Counts: JA NH JM JM JM Readings: Ju NH Ju Ju Ju

Dilutions made by: Ju

٠

	Zu Concentration	Rép			nber o rgani	of Live sms	e		Salinity (ppt)				Temperature N Diss (°C)							Dissolved Oxygen (mg/L)				pH (units)				
	(mg/2)	<u> </u>	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
	-	A	5	5	5	5	5	33 8	34.0	34.2	34.1	2 34.	z 19.0	70.0	19.9	19.8	20.1	8.8	8.7	8.8	85	82	7.69	7.89	7.95	8,22	8.03	
		В	5	5	5	5	5			T					f					ł					f			
	Lab Control	C	5	5	5	5	5					<u> </u>						1000										
		DE	5	4	4	4	4							<u>.</u>			_								'			
		A		-					-	L	200				i.								S.S.					
		B	5	5	5	5	5	33.8	53.8	33.9	33.7	33.9	190	20.0	19.9	19.9	200	9.C	8.6	8.3	8.4	8.3	7.74	7.87	7.97	8,21	8,03	
		C	5	5	5	5	5					-	<u> </u> -												п <u>.</u>			
	125	D	5	5		5	, 5	1.20						-						689363				<u> </u>				
		E	-	_	Ľ																			-				
ŀ		A	5.	5	5	\$	5	71 9	Q2 ¢	<u>μ</u>	20.1	341	lic .	20.	100	20.0	16 0	0	a.	1.0.0		er .						
Í	250	В	5	5	4	4	- Ľ	79.0		24.1 f	74.1	201	14.1	20.0	17;9 1	20.0	17.9	9.0	0.6	8.5 f	82	0.3	7.76	7.89	7.95	8.19	8.02	
	-	С	5	5	4	4	4				245															_		
1		D	5	5	5	5	5																					
		Е																										
		Α	5	5	5	5	4	33. T	33.8	34.1	34.1	34.1	19:4	200	20.1	12.9	19.9	20	8.7	85	8.5	83	7.72	7977	7000	250	8	
	500	в	5	5	5	5	5			f					†					f				1.01	1.16	2.18	0,02	
	0-	С	5	5	4	4	2													San sa					-+	-	· · ·	
		D	5	5	5	5	4																					
Ļ		Е																										
	ļ	A		5	4		2	33.9	338	34.0	40	34.3	19.6	200	201	20,0	19.9	8.9	87	8.5	8.4	8.3	7.75	7.59	7.94	301	7.69	
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$\vdash$			5	3	2	0			1				10-			<u>.</u>										_		
	-	в		-		2	1	3.8	33.7 : f	13.8 º	5.8 2	54.3	(17.8 [17.8	20.1	9.g /	29 1	<u>89</u>	3.9	8.6	3-6	8.5	8,3	7.74	1.87 1	- <u>74</u> 8,	29 7	.99	
	2000.				·	0																		[				
	· F		~			0				-															_	-	_	
	-	E																						-+				
-	Initial Counts							10199990	-1999-1997 - 1999-1999-1999-1999-1999-19	erente an		(51304) <b>(</b>									1000	1993						
	QC'd by: 1	C/H/J	m																									
Ar	imal Source/Date F	Receiv	ed:		AR	0	12	18	/15		А	ge at	Initia	tion:		5)	my !	ŝ				Γ		Feedin	ng Tim	os ·		
																	,						0	24	48	12	96	
្លុំ	mments:												st chai	nber p	rlor to	renew	al					АМ:	130 1	100 11	30 12	ocd	83C	
(	Organisms fed prior to initiation, circle one (y) n)																											
`	Tests aerated? Circle one ( y 1 arbit yes, sample ID(s)(3)-(222 Duration:																											
QC	QC Check: In 12/2/2015 Concerne Final Review: Ul 4/2/16																											

# A.6. ZINC EXPOSURES – ANALYTICAL CHEMISTRY REPORTS:



#### NELAC #4047-002 ORELAP ELAP#1132 NEVADA #CA211 HAWAII LACSD #10143

The results in this report apply to the samples analyzed in accordance with the Chain of Custody document. Weck Laboratories, Inc. certifies that the test results meet all NELAC requirements unless noted in the case narrative. This analytical report is confidential and is only intended for the use of Weck Laboratories, Inc. and its client. This report contains the Chain of Custody document, which is an integral part of it, and can only be reproduced in full with the authorization of Weck Laboratories, Inc.

Dear Molly Colvin :

Enclosed are the results of analyses for samples received 05/12/16 01:10 with the Chain of Custody document. The samples were received in good condition, at 18.8 °C. All analysis met the method criteria except as noted below or in the report with data qualifiers.

Case Narrative:

Reviewed by:

to Chris Samatmanakit

Chris Samatmanak Project Manager



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Analytical Laboratory Service - Since 1964

Date Received:05/12/16 01:10Date Reported:05/26/16 15:13

U.S. Naval SPAWAR Systems Center Pacific
53475 Strothe Rd., Bldg. 111 Code 71760
San Diego CA, 92152

ANALYTICAL REPORT FOR SAMPLES									
Sample ID	Sampled by:	Lab ID	Matrix	Date Sampled					
TO-EPC-0	Molly, Gunther Rosen, Ja	c 6E12039-01	Water	03/25/16 08:30					
TO-EPC-20	Molly, Gunther Rosen, Ja	c 6E12039-02	Water	03/25/16 08:30					
TO-EPC-40	Molly, Gunther Rosen, Ja	c 6E12039-03	Water	03/25/16 08:30					
TO-EPC-80	Molly, Gunther Rosen, Ja	c 6E12039-04	Water	03/25/16 08:30					
TO-EPC-160	Molly, Gunther Rosen, Ja	c 6E12039-05	Water	03/25/16 08:30					
TO-EPC-320	Molly, Gunther Rosen, Ja	c 6E12039-06	Water	03/25/16 08:30					
TO-EPC-1280	Molly, Gunther Rosen, Ja	c 6E12039-07	Water	03/25/16 08:30					
TO-EPC-2560	Molly, Gunther Rosen, Ja	c 6E12039-08	Water	03/25/16 08:30					
TO-EPC-5120	Molly, Gunther Rosen, Ja	c 6E12039-09	Water	03/25/16 08:30					
TO-EPC-10240	Molly, Gunther Rosen, Ja	c 6E12039-10	Water	03/25/16 08:30					
TO-EPC-20180	Molly, Gunther Rosen, Ja	c 6E12039-11	Water	03/25/16 08:30					
	ANALYSES								

Metals - Low Level by 1600 Series Methods

Page 2 of 16

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San Diego CA, 92152

53475 Strothe Rd., Bldg. 111 Code 71760

WECK LABORATORIES, INC.

Analytical Laboratory Service - Since 1964

U.S. Naval SPAWAR Systems Center Pacific Date Received: Date Reported:

05/12/16 01:10 05/26/16 15:13

Sampled: 03/25/16 08:30	6E1203 Sampled By:	9-01 TO-EPC-0 Molly, Gunther Rosen, Jac	cob Munson			Matrix: Water
	Metals - Low Le	evel by 1600 Series Met	hods			
Method: EPA 1640	Batch: W6E0823	Prepared: 05/16/16 0	9:13			Analyst: gza
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Zinc, Total	6.1	0.20	ug/l	1	05/17/16 21:53	

Page 3 of 16

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U.S. Naval SPAWAR Systems Center Pacific Date Received: 05/12/16 01:10 53475 Strothe Rd., Bldg. 111 Code 71760 Date Reported: 05/26/16 15:13 San Diego CA, 92152 6E12039-02 TO-EPC-20 Sampled: 03/25/16 08:30 Sampled By: Molly, Gunther Rosen, Jacob Munson Matrix: Water Metals - Low Level by 1600 Series Methods Method: EPA 1640 Batch: W6E0823 Prepared: 05/16/16 09:13 Analyst: gza MRL Analyte Result Qualifier Units Dil Analyzed Zinc, Total 37 1.0 ug/l 5 05/17/16 22:48

Page 4 of 16

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Zinc, Total

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U.S. Naval SPAWAR Systems Center Pacific Date Received: 05/12/16 01:10 53475 Strothe Rd., Bldg. 111 Code 71760 Date Reported: 05/26/16 15:13 San Diego CA, 92152 6E12039-03 TO-EPC-40 Sampled: 03/25/16 08:30 Sampled By: Molly, Gunther Rosen, Jacob Munson Matrix: Water Metals - Low Level by 1600 Series Methods Method: EPA 1640 Batch: W6E0823 Prepared: 05/16/16 09:13 Analyst: gza MRL Analyte Result Qualifier Units Dil Analyzed

1.0

ug/l

5

05/17/16 23:02

63

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10 05/17/16 23:15

U.S. Naval SPAWAR Systems Center Pacific Date Received: 05/12/16 01:10 53475 Strothe Rd., Bldg. 111 Code 71760 Date Reported: 05/26/16 15:13 San Diego CA, 92152 6E12039-04 TO-EPC-80 Sampled: 03/25/16 08:30 Sampled By: Molly, Gunther Rosen, Jacob Munson Matrix: Water Metals - Low Level by 1600 Series Methods Method: EPA 1640 Batch: W6E0823 Prepared: 05/16/16 09:13 Analyst: gza MRL Analyte Result Qualifier Units Dil Analyzed

2.0

ug/l

120

Zinc, Total

Page 6 of 16

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Zinc, Total

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20 05/17/16 23:29

U.S. Naval SPAWAR Systems Center Pacific Date Received: 05/12/16 01:10 53475 Strothe Rd., Bldg. 111 Code 71760 Date Reported: 05/26/16 15:13 San Diego CA, 92152 6E12039-05 TO-EPC-160 Sampled: 03/25/16 08:30 Sampled By: Molly, Gunther Rosen, Jacob Munson Matrix: Water Metals - Low Level by 1600 Series Methods Method: EPA 1640 Batch: W6E0823 Prepared: 05/16/16 09:13 Analyst: gza MRL Analyte Result Qualifier Units Dil Analyzed

4.0

ug/l

220

Page 7 of 16

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Zinc, Total

WECK LABORATORIES, INC.

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50 05/17/16 23:43

U.S. Naval SPAWAR Systems Center Pacific Date Received: 05/12/16 01:10 53475 Strothe Rd., Bldg. 111 Code 71760 Date Reported: 05/26/16 15:13 San Diego CA, 92152 6E12039-06 TO-EPC-320 Sampled: 03/25/16 08:30 Sampled By: Molly, Gunther Rosen, Jacob Munson Matrix: Water Metals - Low Level by 1600 Series Methods Method: EPA 1640 Batch: W6E0823 Prepared: 05/16/16 09:13 Analyst: gza MRL Analyte Qualifier Result Units Dil Analyzed

10

ug/l

480

Page 8 of 16

Weck Laboratories, Inc 14859 East Clark Avenue, City of Industry, California 91745-1396 (626) 336-2139 FAX (626) 336-2634 The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety www.wecklabs.com



Analytical Laboratory Service - Since 1964

1000 05/17/16 23:56

U.S. Naval SPAWAR Systems Center Pacific Date Received: 05/12/16 01:10 53475 Strothe Rd., Bldg. 111 Code 71760 Date Reported: 05/26/16 15:13 San Diego CA, 92152 6E12039-07 TO-EPC-1280 Sampled: 03/25/16 08:30 Sampled By: Molly, Gunther Rosen, Jacob Munson Matrix: Water Metals - Low Level by 1600 Series Methods Method: EPA 1640 Batch: W6E0823 Prepared: 05/16/16 09:13 Analyst: gza MRL Analyte Qualifier Result Units Dil Analyzed

200

ug/l

1900

Zinc, Total

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Weck Laboratories, Inc 14859 East Clark Avenue, City of Industry, California 91745-1396 (626) 336-2139 FAX (626) 336-2634 The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety



Analytical Laboratory Service - Since 1964

1000 05/18/16 00:10

U.S. Naval SPAWAR Systems Center Pacific Date Received: 05/12/16 01:10 53475 Strothe Rd., Bldg. 111 Code 71760 Date Reported: 05/26/16 15:13 San Diego CA, 92152 6E12039-08 TO-EPC-2560 Sampled: 03/25/16 08:30 Sampled By: Molly, Gunther Rosen, Jacob Munson Matrix: Water Metals - Low Level by 1600 Series Methods Method: EPA 1640 Batch: W6E0823 Prepared: 05/16/16 09:13 Analyst: gza MRL Analyte Qualifier Result Units Dil Analyzed

200

ug/l

3900

Zinc, Total

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Analytical Laboratory Service - Since 1964

1000 05/18/16 00:24

U.S. Naval SPAWAR Systems Center Pacific Date Received: 05/12/16 01:10 53475 Strothe Rd., Bldg. 111 Code 71760 Date Reported: 05/26/16 15:13 San Diego CA, 92152 6E12039-09 TO-EPC-5120 Sampled: 03/25/16 08:30 Sampled By: Molly, Gunther Rosen, Jacob Munson Matrix: Water Metals - Low Level by 1600 Series Methods Method: EPA 1640 Batch: W6E0823 Prepared: 05/16/16 09:13 Analyst: gza MRL Analyte Result Qualifier Units Dil Analyzed

200

ug/l

7700

Zinc, Total

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Zinc, Total

WECK LABORATORIES, INC.

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U.S. Naval SPAWAR Systems Center Pacific Date Received: 05/12/16 01:10 53475 Strothe Rd., Bldg. 111 Code 71760 Date Reported: 05/26/16 15:13 San Diego CA, 92152 6E12039-10 TO-EPC-10240 Sampled: 03/25/16 08:30 Sampled By: Molly, Gunther Rosen, Jacob Munson Matrix: Water Metals - Low Level by 1600 Series Methods Method: EPA 1640 Batch: W6E0823 Prepared: 05/16/16 09:13 Analyst: gza MRL Analyte Qualifier Result Units Dil Analyzed

200

ug/l

1000 05/18/16 00:37

15000

Weck Laboratories, Inc 14859 East Clark Avenue, City of Industry, California 91745-1396 (626) 336-2139 FAX (626) 336-2634 The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety

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WECK LABORATORIES, INC.

Analytical Laboratory Service - Since 1964

U.S. Naval SPAWAR Systems Center Pacific 53475 Strothe Rd., Bldg. 111 Code 71760 San Diego CA, 92152

# Date Received:05/12/16 01:10Date Reported:05/26/16 15:13

Sampled: 03/25/16 08:30	6E12039-1 Sampled By:	1 TO-EPC-20180 Molly, Gunther Rosen, Jac				Matrix: Water
	Metals - Low Le	evel by 1600 Series Met	hods			
Method: EPA 1640	Batch: W6E0823	Prepared: 05/16/16 0	9:13			Analyst: gza
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Zinc, Total	31000	400	ug/l	2000	05/18/16 00:51	

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U.S. Naval SPAWAR Systems Center Pacific 53475 Strothe Rd., Bldg. 111 Code 71760 San Diego CA, 92152 WECK LABORATORIES, INC.

Analytical Laboratory Service - Since 1964

Date Received:05/12/16 01:10Date Reported:05/26/16 15:13

# QUALITY CONTROL SECTION

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Weck Laboratories, Inc 14859 East Clark Avenue, City of Industry, California 91745-1396 (626) 336-2139 FAX (626) 336-2634 The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety



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U.S. Naval SPAWAR Systems Center Pacific 53475 Strothe Rd., Bldg. 111 Code 71760 San Diego CA, 92152 Date Received:05/12/16 01:10Date Reported:05/26/16 15:13

#### Metals - Low Level by 1600 Series Methods - Quality Control

#### Batch W6E0823 - EPA 1640

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W6E0823-BLK1)				Analyzed: 0	5/17/16 19	:50				
Zinc, Total	ND	0.20	ug/l							
LCS (W6E0823-BS1)				Analyzed: C	5/17/16 20	:03				
Zinc, Total	10.0	0.20	ug/l	10.0		100	75-127			
Matrix Spike (W6E0823-MS1)	Source	e: 6E10043-01		Analyzed: 0	5/17/16 20	:17				
Zinc, Total	29.0	0.20	ug/l	10.0	20.2	89	68-132			
Matrix Spike (W6E0823-MS2)	Source	e: 6E12039-01		Analyzed: 0	5/17/16 20	:44				
Zinc, Total	16.4	0.20	ug/l	10.0	6.09	103	68-132			
Matrix Spike Dup (W6E0823-MSD1)	Source	e: 6E10043-01		Analyzed: 0	5/17/16 20	:31				
Zinc, Total	29.5	0.20	ug/l	10.0	20.2	94	68-132	2	30	
Matrix Spike Dup (W6E0823-MSD2)	Source	e: 6E12039-01		Analyzed: C	5/17/16 20	:58				
Zinc, Total	16.4	0.20	ug/l	10.0	6.09	103	68-132	0.09	30	

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Analytical Laboratory Service - Since 1964

U.S. Naval SPAWAR Systems Center Pacific 53475 Strothe Rd., Bldg. 111 Code 71760 San Diego CA, 92152 Date Received:05/12/16 01:10Date Reported:05/26/16 15:13

#### Notes and Definitions

ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then not detected at or above the MDL.
NR	Not Reportable
Dil	Dilution
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
% Rec	Percent Recovery
Sub	Subcontracted analysis, original report available upon request
MDL	Method Detection Limit
MDA	Minimum Detectable Activity
MRL	Method Reporting Limit

Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.

An Absence of Total Coliform meets the drinking water standards as established by the California Department of Health Services.

The Reporting Limit (RL) is referenced as the Laboratory's Practical Quantitation Limit (PQL) or the Detection Limit for Reporting Purposes (DLR).

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

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29 December 2015

EMA Log#: 15L0512

Nautilus Environmental, LLC Attn: Kellyn Lupfer 4340 Vandever Avenue San Diego, CA 92120

#### Project Name: SPAWAR-Pulsed

Enclosed are the results of analyses for samples received by the laboratory on 12/15/15 10:30. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that this data is in compliance both technically and for completeness.

Dan Verdon Laboratory Director

CA ELAP Certification #: 2564

4340 Viewridge Avenue, Suite A - San Diego, California 92123 - (858) 560-7717 - Fax (858) 560-7763 Analytical Chemistry Laboratory

## EMA Log #: 15L0512

#### ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
1-Zn (TO-MPC-0)	15L0512-01	Seawater	12/10/15 00:00	12/15/15 10:30
2-Zn (TO-MPC-125)	15L0512-02	Seawater	12/10/15 00:00	12/15/15 10:30
3-Zn (TO-MPC-250)	15L0512-03	Seawater	12/10/15 00:00	12/15/15 10:30
4-Zn (TO-MPC-500)	15L0512-04	Seawater	12/10/15 00:00	12/15/15 10:30
5-Zn (TO-MPC-1000)	15L0512-05	Seawater	12/10/15 00:00	12/15/15 10:30
6-Zn (TO-MPC-2000)	15L0512-06	Seawater	12/10/15 00:00	12/15/15 10:30
7-Zn (TO-MPC-4000)	15L0512-07	Seawater	12/10/15 00:00	12/15/15 10:30
8-Zn (TO-MPC-8000)	15L0512-08	Seawater	12/10/15 00:00	12/15/15 10:30
9-Zn (TO-MPC-16000)	15L0512-09	Seawater	12/10/15 00:00	12/15/15 10:30
10-Zn (TO-EPC-0)	15L0512-10	Seawater	12/10/15 00:00	12/15/15 10:30
11-Zn (TO-EC-20)	15L0512-11	Seawater	12/10/15 00:00	12/15/15 10:30
12-Zn (TO-EC-40)	15L0512-12	Seawater	12/10/15 00:00	12/15/15 10:30
13-Zn (TO-EC-80)	15L0512-13	Seawater	12/10/15 00:00	12/15/15 10:30
14-Zn (TO-EPC-160)	15L0512-14	Seawater	12/10/15 00:00	12/15/15 10:30
15-Zn (TO-EPC-320)	15L0512-15	Seawater	12/10/15 00:00	12/15/15 10:30
16-Zn (TO-EP-640)	15L0512-16	Seawater	12/10/15 00:00	12/15/15 10:30
17-Zn (TO-EP-1280)	15L0512-17	Seawater	12/10/15 00:00	12/15/15 10:30
18-Zn (TO-EP-2560)	15L0512-18	Seawater	12/10/15 00:00	12/15/15 10:30
19-Zn (TO-EP-5120)	15L0512-19	Seawater	12/10/15 00:00	12/15/15 10:30
20-Zn (T96-EP3-0)	15L0512-20	Seawater	12/14/15 00:00	12/15/15 10:30

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

– EnviroMatrix EMA Analytical, Inc.

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EMA Log #: 15L0512

## Total Metals by EPA 6000/7000 Series Methods

Analyte         Result         MDL         Reporting Limit         Units         Dilution         Batch         Prepared         Analyzed         Mether           1-Zn (TO-MPC-0) (15L0512-01) Seawater         Sampled:         12/10/15 00:00         Received:         12/15/15 10:30         Zinc         0.013         0.008         0.100         mg/l         2         5122346         12/23/15         12/28/15         EPA           2-Zn (TO-MPC-125) (15L0512-02) Seawater         Sampled:         12/10/15 00:00         Received:         12/15/15 10:30         Zinc         0.008         0.100         mg/l         2         5122346         12/23/15         12/28/15         EPA           3-Zn (TO-MPC-250) (15L0512-03) Seawater         Sampled:         12/10/15 00:00         Received:         12/15/15 10:30         Zinc         0.008         0.100         mg/l         2         5122346         12/23/15         12/28/15         EPA           3-Zn (TO-MPC-250) (15L0512-03) Seawater         Sampled:         12/10/15 00:00         Received:         12/15/15 10:30         Zinc         0.008         0.100         mg/l         2         5122346         12/23/15         12/28/15         EPA	6010 J
Zinc         0.013         0.008         0.100         mg/l         2         5122346         12/23/15         12/28/15         EPA           2-Zn (TO-MPC-125) (15L0512-02) Seawater         Sampled: 12/10/15 00:00         Received: 12/15/15 10:30         EPA           Zinc         0.100         0.008         0.100         mg/l         2         5122346         12/23/15         12/28/15         EPA           3-Zn (TO-MPC-250) (15L0512-03) Seawater         Sampled: 12/10/15 00:00         Received: 12/15/15 10:30         EPA	
2-Zn (TO-MPC-125) (15L0512-02) Seawater         Sampled: 12/10/15 00:00         Received: 12/15/15 10:30           Zinc         0.100         0.008         0.100         mg/l         2         5122346         12/23/15         12/28/15         EPA           3-Zn (TO-MPC-250) (15L0512-03) Seawater         Sampled: 12/10/15 00:00         Received: 12/15/15 10:30         EPA	
Zinc         0.100         0.008         0.100         mg/l         2         5122346         12/23/15         12/28/15         EPA           3-Zn (TO-MPC-250) (15L0512-03) Seawater         Sampled: 12/10/15 00:00         Received: 12/15/15 10:30	6010
3-Zn (TO-MPC-250) (15L0512-03) Seawater Sampled: 12/10/15 00:00 Received: 12/15/15 10:30	6010
7 inc 0.190 0.008 0.100 mel 2 5122244 12/20145 12/20145 EDA	
Zinc 0.180 0.008 0.100 mg/l 2 5122346 12/23/15 12/28/15 EPA	6010
4-Zn (TO-MPC-500) (15L0512-04) Seawater Sampled: 12/10/15 00:00 Received: 12/15/15 10:30	
Zinc 0.398 0.008 0.100 mg/l 2 5122346 12/23/15 12/28/15 EPA	6010
5-Zn (TO-MPC-1000) (15L0512-05) Seawater Sampled: 12/10/15 00:00 Received: 12/15/15 10:30	
Zinc 0.753 0.008 0.100 mg/l 2 5122346 12/23/15 12/28/15 EPA	6010
6-Zn (TO-MPC-2000) (15L0512-06) Seawater Sampled: 12/10/15 00:00 Received: 12/15/15 10:30	
Zinc 1.52 0.008 0.100 mg/l 2 5122346 12/23/15 12/28/15 EPA	6010
7-Zn (TO-MPC-4000) (15L0512-07) Seawater Sampled: 12/10/15 00:00 Received: 12/15/15 10:30	
Zinc 3.28 0.008 0.100 mg/l 2 5122346 12/23/15 12/28/15 EPA	6010
8-Zn (TO-MPC-8000) (15L0512-08) Seawater Sampled: 12/10/15 00:00 Received: 12/15/15 10:30	
Zinc 5.43 0.008 0.100 mg/l 2 5122346 12/23/15 12/28/15 EPA	6010
9-Zn (TO-MPC-16000) (15L0512-09) Seawater Sampled: 12/10/15 00:00 Received: 12/15/15 10:30	
Zinc 16.7 0.008 0.100 mg/l 2 5122346 12/23/15 12/28/15 EPA	6010

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– EnviroMatrix EMA Analytical, Inc.

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EMA Log #: 15L0512

## Total Metals by EPA 6000/7000 Series Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
10-Zn (TO-EPC-0) (15L051	2-10) Seawater	Sampled:	12/10/15 00:00	Receiv	ved: 12/15/	15 10:30				
Zinc	ND	0.008	0.100	mg/l	2	5122346	12/23/15	12/28/15	EPA 6010	
11-Zn (TO-EC-20) (15L051	2-11) Seawater	Sampled:	12/10/15 00:00	Receiv	ed: 12/15/	15 10:30				
Zinc	0.032	0.008	0.100	mg/l	2	5122346	12/23/15	12/28/15	EPA 6010	J
12-Zn (TO-EC-40) (15L051	2-12) Seawater	Sampled:	12/10/15 00:00	Receiv	ed: 12/15/	15 10:30				
Zinc	0.030	0.008	0.100	mg/l	2	5122346	12/23/15	12/28/15	EPA 6010	J
13-Zn (TO-EC-80) (15L051	2-13) Seawater	Sampled:	12/10/15 00:00	Receiv	ed: 12/15/	15 10:30				
Zinc	0.059	0.008	0.100	mg/l	2	5122346	12/23/15	12/28/15	EPA 6010	J
14-Zn (TO-EPC-160) (15L0	)512-14) Seawate	r Sample	ed: 12/10/15 00:0	0 Rec	eived: 12/3	15/15 10:3	30			
Zinc	0.116	0.008	0.100	mg/l	2	5122346	12/23/15	12/28/15	EPA 6010	
15-Zn (TO-EPC-320) (15L0	)512-15) Seawate	r Sample	d: 12/10/15 00:(	0 Rec	eived: 12/3	15/15 10:3	30			
Zinc	0.252	0.008	0.100	mg/l	2	5122346	12/23/15	12/28/15	EPA 6010	
16-Zn (TO-EP-640) (15L05	12-16) Seawater	Sampled	: 12/10/15 00:00	Recei	ved: 12/15	15 10:30				
Zinc	0.479	0.008	0.100	mg/l	2	5122346	12/23/15	12/28/15	EPA 6010	
17-Zn (TO-EP-1280) (15L0	512-17) Seawater	Sample	d: 12/10/15 00:0	0 Rec	eived: 12/1	5/15 10:3	0			
Zinc	0.932	0.008	0.100	mg/l	2	5122346	12/23/15	12/28/15	EPA 6010	
18-Zn (TO-EP-2560) (15L0	512-18) Seawater	Sample	d: 12/10/15 00:0	0 Rec	eived: 12/1	5/15 10:3	0			
Zinc	1.88	0.008	0.100	mg/l	2	5122346	12/23/15	12/28/15	EPA 6010	

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– EnviroMatrix EMA Analytical, Inc.

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EMA Log #: 15L0512

## Total Metals by EPA 6000/7000 Series Methods

Analyte 19-Zn (TO-EP-5120) (15L0512-19)	Result	MDL Sampled	Reporting Limit	Units	Dilution		Prepared	Analyzed	Method	Notes
Zinc	3.90	0.008	0.100	mg/l	2	5122346	12/23/15	12/28/15	EPA 6010	
20-Zn (T96-EP3-0) (15L0512-20) §	Seawater	Sampled:	12/14/15 00:00	0 Receiv	ed: 12/15/	15 10:30				
Zinc	ND	0.008	0.100	mg/l	2	5122346	12/23/15	12/28/15	EPA 6010	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

– EnviroMatrix EMAnalytical, Inc.

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EMA Log #: 15L0512

## Total Metals by EPA 6000/7000 Series Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 5122346											
Blank (5122346-BLK1)					Prepared:	12/23/15	Analyzed	: 12/28/15			
Zinc	ND	0.004	0.050	mg/l							
LCS (5122346-BS1)					Prepared:	12/23/15	Analyzed	: 12/28/15			
Zinc	1.04	0.004	0.050	mg/l	1.00		104	75-125			
Duplicate (5122346-DUP1)		Sou	rce: 15L051	2-06	Prepared:	12/23/15	Analyzed	: 12/28/15			
Zinc	1.69	0.008	0.100	mg/l		1.52			11	20	

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- EnviroMatrix MAnalytical, Inc.

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#### EMA Log #: 15L0512

#### Notes and Definitions

J	$Detected \ but \ below \ the \ Reporting \ Limit; \ therefore, \ result \ is \ an \ estimated \ concentration \ (CLP \ J-Fl ag).$
ND	Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified)
NR.	Not Reported
dry	Sample results reported on a dry weight basis (if indicated in units column)
RPD	Relative Percent Difference

MDL Method detection limit (indicated per client's request)

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

– EnviroMatrix MAnalytical, Inc.

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Дини         Полос.         Зул.         Полос.         Зул.         Полос.         Зул.         Полос.         Зул.         Полос.	CHAIN-OF-CUSTODY RECORD EMA LOG #: Client Nauthius Environmiento.1	/SPANJAR			۲ ۲	- EnviroMatrix   4340 Viewidge Ave., Ste. A -	<b>'O/W</b> (	<b>atrix</b> e., Ste. I	San D	San Diego, CA 92123 - Phone (858) 560-771 Requested Analysis	<b>Analyncal, 1</b> 2A 92123 - Phone (858) 56 Requested Analysis	<i>lytic</i> Phone ( ed An	<i>al, 1</i> 858) 56 alvsis	nc.	- Fax (8:	EnviroMatrix ( ) Analytical, Inc. — 4340 Viewridge Ave., Ste. A - San Diego, CA 92123 - Phone (858) 560-7717 - Fax (858) 560-7763 Requested Analysis		
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Note Wetter, SW = Scorn Water     RELINOUISIED py     DATE/TIME     K.C.C. B. J.       Sediments, CW = Groundwater, SW = Scorn Water     Segmane     1     1     2     1     1       Sediments, CW = Groundwater, SW = Scorn Water     Sigmane     1     1     2     1     1     1     2     1     1     2     2     2	10-3~(70-CPC-0)	1 31 AVS -	1	2	-			-		╞	-	<u>{</u> }		F	-		+	
Americal Sub-Static Lissae, Co-Oit, L-Lauid     Signature     7     17     15     16 <t< td=""><td>attix Coues: <math>A = Att, DW = Drinking Water, GW = Groundwater, <math>U = W_{0,0,0,0,0} = C = C = C</math></math></td><td>W = Storm Water</td><td></td><td></td><td></td><td>×</td><td>ELINQI</td><td>JISHED</td><td>BY</td><td></td><td>DAT</td><td>ETTIME</td><td>+</td><td>]</td><td>R</td><td></td><td>15</td><td>2</td></t<>	attix Coues: $A = Att, DW = Drinking Water, GW = Groundwater, U = W_{0,0,0,0,0} = C = C = C$	W = Storm Water				×	ELINQI	JISHED	BY		DAT	ETTIME	+	]	R		15	2
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<sup>1</sup> Additional costs muy apply. Please note there is a \$3.5 minimum charge for all clients. <sup>2</sup>EMA reserve, the right to return any samples that do not match our wase poofile. <sup>2</sup>EMA reserve, the right to return any samples to EMA, lice, client agrees to pay the services requested on this COC form and any additional analyses performed on this project. Payment for services is due within 30 days from date of invoice. Samples will be disposed of 7 days after report has been finalized unless cubrevie noted. All work is subject to EMA's items and conditions.

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Project Title/Project Number: Degnidive Sea	Urchin	Pulsod Znd To.	Toxicity Tes		Project Leader:		
Remarks/Air Bill:				Ŭ	Contact:		
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# APPENDIX B TEST DATA AND STATISTICAL SUMMARIES

# **MIXED METAL EXPOSURES**

## OVERVIEW

Items included are included in Appendix B:

1.	Mixed Metal Exposures – Mysid Shrimp	B-2
	Mixed Metal Exposures – Reference Toxicant Test Results	
3.	Mixed Metal Exposures – Analytical Chemistry Reports	B-59

## **B.1. MIXED METAL EXPOSURES – MYSID SHRIMP:**

CETIS Sum	nmary Repo	rt						Report Dat Test Code:				6 (p 1 of 1 -7232-0236
Americamysis	96-h Acute Sur	vival Te	est							SPA	VAR Syste	ms Center
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:00 03 May-16 09:00 96h	ו ו 0 ג	Test Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-02 Americamysis Aquatic Resea	bahia	ns, NH		Analyst: Diluent: Brine: Age:	Labo	enne A Colv ratory Seav Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:	29 Apr-16	ו נ	Code: Material: Source: Station:	610EBD40 Copper sulfate Pulsed Expose 3 Hour				Client: Project:	SPA\ Pulse	WAR ed Exposur	e	
Comparison S	Summary											
Analysis ID	Endpoint		NOEL		TOEL	PMSD	ΤU	Meth				
06-2690-6167	96h Survival Ra	te	350	880	555	22.1%		Stee	I Many	/-One Rank	Sum Test	
Point Estimate	e Summary											
Analysis ID	Endpoint		Level	μg/L	95% LCL	95% UCL	τu	Meth	nod			
05-4119-8838	96h Survival Ra	te	LC50	832.1	661.1	1029		Linea	ar Reg	ression (M	LE)	
96h Survival F	ate Summary											
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std I	Err	Std Dev	CV%	% Effect
	Lab Control	4	1	1	1	1	1	0		0	0.0%	0.0%
190		4	1	1	1	1	1	0		0	0.0%	0.0%
350		4	1	1	1	1	1	0		0	0.0%	0.0%
880		4	0.3	0	0.7109	0	0.6	0.12		0.2582	86.07%	70.0%
1500 3100		4 4	0.15 0.05	0 0	0.4547 0.2091	0 0	0.4 0.2	0.09 0.05	5/4	0.1915 0.1	127.7% 200.0%	85.0% 95.0%
96h Survival F	Poto Dotail		0.00	, , , , , , , , , , , , , , , , , , ,	0.2001		0.2	0.00		0.1	200.070	00.070
	Control Type	Rep 1	Rep 2	Rep 3	Rep 4							
	Lab Control	1	1	1	1							
190		1	1	1	1							
350		1	1	1	1							
880		0.6	0.2	0	0.4							
1500				0								
3100		0.4 0	0.2 0.2	0	0 0							
	oto Dinemial-			-								
	Rate Binomials Control Type	Rep 1	Rep 2	Rep 3	Rep 4							
	Lab Control	5/5	5/5	5/5	5/5							
190		5/5	5/5	5/5	5/5							
350		5/5	5/5	5/5	5/5							
		3/5	1/5	0/5	2/5							
880												
880 1500		2/5	1/5	0/5	2/5 0/5							

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CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_\_

CETIS Sum	nmary Repo	ort						Report Dat Test Code:		2 Jun-16 16:1 B7B3EC   1	
Americamysis	96-h Acute Su	rvival <sup>-</sup>	Fest						SP/	AWAR Syste	ms Center
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:0 03 May-16 09:0 96h		Test Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-02 Americamysis Aquatic Resea	bahia	ns, NH		Analyst: Diluent: Brine: Age:	Marienne A Co Laboratory Se Not Applicable 5	awater	
Sample ID: Sample Date: Receive Date: Sample Age:	29 Apr-16		Code: Material: Source: Station:	610EBD40 Copper sulfate Pulsed Exposu 3 Hour				Client: Project:	SPAWAR Pulsed Exposi	ıre	
Comparison S	Summary										
Analysis ID	Endpoint		NOEI	LOEL	TOEL	PMSD	τu	Meti	hod		
06-2690-6167	96h Survival R	ate	350	880	555	22.1%		Stee	l Many-One Rai	nk Sum Test	
Point Estimate	e Summary										
Analysis ID	Endpoint		Level	μg/L	95% LCL	95% UCL	τυ	Metl	nod		
05-4119-8838	96h Survival R	ate	LC50	832.1	661.1	1029		Line	ar Regression (I	MLE)	
96h Survival F	Rate Summary										
	Control Type	Cour	nt Mean	95% LCL	95% UCL	Min	Max	std	Err Std Dev	CV%	% Effect
	Lab Control	4	1	1	1	1	1	0	0	0.0%	0.0%
190		4	1	1	1	1	1	0	0	0.0%	0.0%
350		4	1	1	1	1	1	0	0	0.0%	0.0%
880		4	0.3	0	0.7109	0	0.6	0.12	91 0.2582	86.07%	70.0%
1500		4	0.15	0	0.4547	0	0.4	0.09	574 0.1915	127.7%	85.0%
3100		4	0.05	0	0.2091	0	0.2	0.05	0.1	200.0%	95.0%
96h Survival F	Rate Detail										
C-µg/L	Control Type	Rep	1 Rep 2	2 Rep 3	Rep 4						
1.6	Lab Control	1	1	1	1						
190		1	1	1	1						
350		1	1	1	1						
880		0.6	0.2	0	0.4						
1500		0.4	0.2	0	0						
3100		0	0.2	0	0						
96h Survival F	Rate Binomials										
	Control Type	Rep	1 Rep 2	2 Rep 3	Rep 4						
1.6	Lab Control	5/5	5/5	5/5	5/5						
190		5/5	5/5	5/5	5/5						
350		5/5	5/5	5/5	5/5						
880		3/5	1/5	0/5	2/5						
1500		2/5	1/5	0/5	0/5						
3100		0/5	1/5	0/5	0/5						
5100		0/0	1/5	0/5	0/5						

CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ana	lytical Repo	ort						-	ort Date: Code:			6 (p 1 of 2) 5-7232-0236
Americamysis	96-h Acute Su	rvival T	est							SPA	WAR Syste	ems Center
Analysis ID: Analyzed:	06-2690-6167 28 May-16 10:		Endpoint: Analysis:	96h Survival R Nonparametric		l vs 1	Freatments		IS Version ial Result	-	.8.7	
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:0 03 May-16 09:0 96h	0 00	Test Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-02 Americamysis Aquatic Resea	bahia		ns, NH	Anal Diluc Brin Age:	ent: Lai e: No	rienne A Col boratory Sea t Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:	•		Code: Material: Source: Station:	610EBD40 Copper sulfate Pulsed Expose 3 Hour				Clier Proj		PAWAR Ised Exposur	e	
Data Transfor		Zeta	Alt H		Seed			PMSD	NOEL	LOEL	TOEL	TU
Angular (Corre	cted)	NA	C > T	NA	NA			22.1%	350	880	555	
Steel Many-Or	ne Rank Sum T	est										
Control 1.6	<b>vs C-µg/L</b> 190		Test \$ 18	10	Ties 1	6	<b>P-Value</b> 0.8333	P-Type Asymp	-	nificant Effect		
1.6 1.6	350 880*		18 10	10 10	1 0	6 6	0.8333 0.0417	Asymp Asymp	Non-Sigr Significa	nificant Effect	t	
1.6	1500*		10	10	0	6	0.0417	Asymp	Significa			
1.6	3100*		10	10	0	6	0.0417	Asymp	Significa			
ANOVA Table												
Source	Sum Squ	ares	Mean	Square	DF		F Stat	P-Value	Decision	n(α:5%)		
Between	5.332822		1.066	•	5		44.49	<0.0001	Significa			
Error	0.431484	7	0.023	97137	18		_					
Total	5.764307				23							
Distributional	Tests											
Attribute	Test			Test Stat	Critic	al	P-Value	Decision	(α:1%)			
Variances			ality of Varia		4.248		0.0033	Unequal \				
Variances			of Variance	8.241	4.248		0.0003	Unequal \				
Distribution	Shapiro-		Normality	0.8778	0.884		0.0075	Non-norm	al Distribul	lon		
96h Survival F	Rate Summary											
	Control Type	Coun				UCL		Min	Max	Std Err	CV%	%Effect
	Lab Control	4	1	1	1		1	1	1	0	0.0%	0.0%
190		4 4	1	1	1 1		1	1	1	0 0	0.0%	0.0%
350 880		4 4	1 0.3	1 0	0.710	10	1 0.3	1 0	1 0.6	0.1291	0.0% 86.07%	0.0% 70.0%
1500		4	0.15	0	0.454		0.5	0	0.4	0.09574	127.7%	85.0%
3100		4	0.05	õ	0.209		0	õ	0.2	0.05	200.0%	95.0%
Angular (Corr	ected) Transfor	med Su	Immary									
	Control Type	Coun	-	95% LCL	. 95%	UCL	Median	Min	Max	Std Err	CV%	%Effect
	Lab Control	4	1.345	1.345	1.346		1.345	1.345	1.345	0	0.0%	0.0%
190		4	1.345	1.345	1.346	;	1.345	1.345	1.345	0	0.0%	0.0%
350		4	1.345	1.345	1.346		1.345	1.345	1.345	0	0.0%	0.0%
880		4	0.565	0.1122	1.018		0.5742	0.2255	0.8861	0.1423	50.37%	58.0%
1500		4	0.399		0.750		0.3446	0.2255	0.6847	0.1103	55.17%	70.28%
3100		4	0.285	0.09558	0.474	0	0.2255	0.2255	0.4636	0.05953	41.77%	78.81%

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ana	alytical Repo	ort					Report Date: Test Code:	02 Jun-16 16:16 (p 2 of 2 5DB7B3EC   15-7232-023
Americamysi	s 96-h Acute Su	rvival Te	est					SPAWAR Systems Cente
Analysis ID: Analyzed:	06-2690-6167 28 May-16 10:3		Endpoint: 96 Analysis: N			Treatments	CETIS Version: Official Results:	CETISv1.8.7 Yes
			niaiysis. N	Shparametric		meatments	Official Results.	103
96h Survival								
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
1.6	Lab Control	1	1	1	1			
190		1	1	1	1			
350		1	1	1	1			
880		0.6	0.2	0	0.4			
1500		0.4	0.2	0	0			
3100		0	0.2	0	0			
Angular (Cor	rected) Transfor	med De	tail					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
1.6	Lab Control	1.345	1.345	1.345	1.345			
190		1.345	1.345	1.345	1.345			
350		1.345	1.345	1.345	1.345			
880		0.8861		0.2255	0.6847			
1500		0.6847		0.2255	0.2255			
3100		0.2255	5 0.4636	0.2255	0.2255			
96h Survival	Rate Binomials							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
1.6	Lab Control	5/5	5/5	5/5	5/5			
190		5/5	5/5	5/5	5/5			
350		5/5	5/5	5/5	5/5			
880		3/5	1/5	0/5	2/5			
1500		2/5	1/5	0/5	0/5			
3100		0/5	1/5	0/5	0/5			
Graphics								
ω						0.35 F		
0.9	• •	٠				0.30		• •
Ē						0.25		
0.8 E						0.20		•
₹ 0.7						0.15		•
96h Survival Rate						Contered 01.0 Contract		•
\$ 0.5						0.00		
						-0.05		
0.4						-0.10	•	
0.3						-0.15		
0.2						0.20	~	
0.1						0.25		
-						-0.30		
0.0 E	1.6 LC 190	350	800 19	10 3100		-0.35	-10 -0.5 0.0	05 1.0 15 2.0

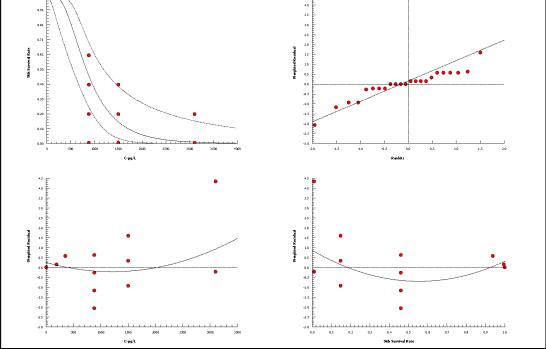
CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Analy	tical Repo	rt					-	ort Date: Code:			16 (p 1 of 2) 5-7232-0236
Americamysis 9	6-h Acute Sur	vival Test							SPA	WAR Syste	ems Center
	)5-4119-8838 28 May-16 10:3			6h Survival Ra inear Regress				1S Version: cial Results:	CETISv1 Yes	.8.7	
Start Date: 2 Ending Date: 0	18-0018-1674 29 Apr-16 09:00 03 May-16 09:00 96h	Prot	ocol: E cies: A	Survival (96h) EPA/821/R-02- Americamysis I Aquatic Resear	bahia	ns, NH	Ana Dilu Brir Age	ent: Labo ne: Not	enne A Col pratory Seav Applicable		
Sample Date: 2 Receive Date: 2		Cod Mate Sou Stati	erial: C rce: P	10EBD40 Copper sulfate Pulsed Exposu Hour	re		Clie Pro		WAR ed Exposur	e	
Linear Regressi	on Options										
Model Function				old Option Threshold	Threshold 1E-07	Optimized No	Pooled No	Het Corr No	Weighted Yes	1	
Regression Sun			Control	mosholu	, L-V/			110	103		
Iters LL 9 -27.93	AICc 60.43	BIC 62.22	<b>Mu</b> 2.92	<b>Sigma</b> 0.2444	Adj R2 0.6615	F Stat 6.851	Critical 2.928	<b>P-Value</b> 0.0016	Decision( Significan	(α:5%) t Lack of F	it
Point Estimates Level µg/L LC50 832.1	95% LCL 661.1	<b>95% UCL</b> 1029									
Regression Par	ameters										
Parameter	Estimate	Std Error				P-Value	Decision				
Slope Intercept	4.092 -11.95	0.7023 2.081	2.716 -16.03	5.469 -7.872	5.827 -5.744	<0.0001 <0.0001	-	nt Parameter nt Parameter			
ANOVA Table											
Source	Sum Squa	res Mea	n Square	DF	F Stat	P-Value	Decision	(α:5%)			
Model	64.45606	64.4	5606	1	45.95	<0.0001	Significar	nt			
Lack of Fit	18.6247		6175	4	6.851	0.0016	Significar	nt			
Pure Error Residual	12.23353 30.85822	0.67 1.40	9640 2647	18 22							
Residual Analys	sis										
Attribute	Method			Test Stat	Critical	P-Value	Decision	(α:5%)			
Goodness-of-Fit	Pearson C	hi-Sq GOF		30.86	33.92	0.0991		ificant Heter	ogenity		
	Likelihood			20.66	33.92	0.5420	-	ificant Heter			
Variances	Mod Leven				2.773	0.3313	Equal Va				
Distribution	Shapiro-W Anderson-I		-	0.7939 1.86	0.9169 2.492	0.0002 <0.0001		nal Distributio nal Distributio			
96h Survival Ra	te Summary				Calcul	ated Variat	e(A/B)				
	ntrol Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	в
	) Control	4	1	1	1	0	0	0.0%	0.0%	20	20
190		4	1	1	1	0	0	0.0%	0.0%	20	20
350		4	1	1	1	0	0	0.0%	0.0%	20	20
880		4	0.3	0	0.6	0.1291	0.2582	86.07%	70.0%	6	20
1500 3100		4 4	0.15 0.05	0	0.4 0.2	0.09574 0.05	0.1915 0.1	127.7% 200.0%	85.0% 95.0%	3 1	20 20
5100		-	0.00	v	0.2	0.00	U.1	200.070	33.0%	1	20

Analyst:\_\_\_\_\_ QA:\_\_\_\_\_

CETIS An	alytical Repo	ort				Report Date: Test Code:	02 Jun-16 16:16 (p 2 of 2) 5DB7B3EC   15-7232-0236
Americamy	sis 96-h Acute Su	rvival Test					SPAWAR Systems Center
Analysis ID: Analyzed:	05-4119-8838 28 May-16 10:			6h Survival F near Regres		CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Surviva	l Rate Detail						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
1.6	Lab Control	1	1	1	1		
190		1	1	1	1		
350		1	1	1	1		
880		0.6	0.2	0	0.4		
1500		0.4	0.2	0	0		
3100		0	0.2	0	0		
96h Surviva	l Rate Binomials						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
1.6	Lab Control	5/5	5/5	5/5	5/5		
190		5/5	5/5	5/5	5/5		
350		5/5	5/5	5/5	5/5		
880		3/5	1/5	0/5	2/5		
1500		2/5	1/5	0/5	0/5		
3100		0/5	1/5	0/5	0/5		
Graphics				Log-No	rmal [NED=A+B*log	(X)]	
101 0.011 0.011 0.011 0.011					43 43 33 34 14 14 14 14 14 14 14 14 14 14 14 14 14		•



CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Sum	nmary Repo	ort						Report Dat Test Code:		! Jun-16 16:1  FF6FB0   11	,
Americamysis	s 96-h Acute Sur	rvival 1	lest.						SP/	WAR Syste	ms Center
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:00 03 May-16 09:0 96h		Test Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-02- Americamysis Aquatic Resea	bahia	ns, NH		Analyst: Diluent: Brine: Age:	Marienne A Co Laboratory Se Not Applicable 5	awater	
Sample ID: Sample Date: Receive Date: Sample Age:			Code: Material: Source: Station:	2233AA81 Copper sulfate Pulsed Exposu 6 Hour	re			Client: Project:	SPAWAR Pulsed Exposi	Ire	
Comparison S	Summary										
Analysis ID	Endpoint		NOEL	. LOEL	TOEL	PMSD	τu	Meth	nod		
20-9830-3704	96h Survival Ra	ate	200	440	296.6	17.4%		Stee	l Many-One Rai	nk Sum Test	
Point Estimate	e Summary										
Analysis ID	Endpoint		Level	µg/L	95% LCL	95% UCL	τu	Meth	nod		
07-2199-8580	96h Survival Ra	ate	LC50	527.3	424.9	651.2		Line	ar Regression (I	MLE)	
96h Survival F	Rate Summary										
C-µg/L	Control Type	Cour	nt Mean	95% LCL	95% UCL	Min	Max	Std	Err Std Dev	CV%	% Effect
1.6	Lab Control	4	1	1	1	1	1	0	0	0.0%	0.0%
99		4	1	1	1	1	1	0	0	0.0%	0.0%
200		4	0.95	0.7909	1	0.8	1	0.05	0.1	10.53%	5.0%
440		4	0.7	0.3818	1	0.4	0.8	0.1	0.2	28.57%	30.0%
770		4	0.15	0	0.3091	0	0.2	0.05	0.1	66.67%	85.0%
1600		4	0.05	0	0.2091	0	0.2	0.05	0.1	200.0%	95.0%
96h Survival F	Rate Detail										
10	Control Type	Rep '			Rep 4						
	Lab Control	1	1	1	1						
99		1	1	1	1						
200		1	1	1	8.0						
440		0.8	0.4	0.8	0.8						
770		0.2	0.2	0	0.2						
1600		0	0.2	0	0						
96h Survival F	Rate Binomials										
C-µg/L	Control Type	Rep '			Rep 4						
	Lab Control	5/5	5/5	5/5	5/5						
99		5/5	5/5	5/5	5/5						
200		5/5	5/5	5/5	4/5						
440		4/5	2/5	4/5	4/5						
770		1/5	1/5	0/5	1/5						
1600		0/5	1/5	0/5	0/5						

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ana	lytical Repo	ort						-	ort Date: Code:			5 (p 1 of 2 1-0725-9312
Americamysis	s 96-h Acute Su	rvival Te	st							SPA	WAR Syste	ems Center
Analysis ID: Analyzed:	20-9830-3704 28 May-16 10:		Endpoint: Analysis:	96h Survival F Nonparametric		l vs 1	Freatments		IS Version ial Result		.8.7	
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:0 03 May-16 09:0 96h	0 F	Fest Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-02 Americamysis Aquatic Resea	bahia		ns, NH	Anal Diluc Brin Age:	ent: Lai e: No	arienne A Col boratory Seas of Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:	29 Apr-16	n S	Code: Aaterial: Source: Station:	2233AA81 Copper sulfate Pulsed Exposi 6 Hour				Clier Proj		PAWAR Ised Exposur	e	
Data Transfor		Zeta	Alt H		Seed			PMSD	NOEL	LOEL	TOEL	TU
Angular (Corre	ected)	NA	C > T	NA	NA			17.4%	200	440	296.6	
Steel Many-Or	ne Rank Sum T	est										
Control 1.6	vs C-µg/L 99		Test \$ 18	Stat Critical	Ties 1	DF 6	<b>P-Value</b> 0.8333	P-Type Asymp	Decision Non-Sigr	n(α:5%) nificant Effect		
1.6	200		16	10	1	6	0.6105	Asymp	-	nificant Effect		
1.6	440*		10 10	10 10	0 0	6	0.0417	Asymp	Significa			
1.6 1.6	770* 1600*		10	10	0	6 6	0.0417 0.0417	Asymp Asymp	Significa Significa			
ANOVA Table	1											
Source	Sum Squ	ares	Mean	Square	DF		F Stat	P-Value	Decision	n(α:5%)		
Between	4.671416		0.934	•	5		64.33	<0.0001	Significa	<u> </u>		
Error	0.261427	8	0.014	52377	18		_					
Total	4.932844				23							
Distributional	Tests											
Attribute	Test			Test Stat	Critic	al	P-Value	Decision	(α:1%)			
Variances		•	ality of Varia		4.248		0.8018	Equal Var				
Variances Distribution	Levene E Shapiro-'		of Variance	4.126 0.8782	4.248 0.884		0.0113 0.0076	Equal Var	iances al Distribut	tion		
			loimailty	0.0782	0.004		0.0070	NOII-HUIH				
	Rate Summary											
С-µg/L 1.6	Control Type Lab Control	Count 4	Mean 1	95% LCL 1	. 95% 1	UCL	Median 1	Min 1	Max 1	Std Err 0	CV%	%Effect 0.0%
99	Lad Control	4	1	1	1		1	1	1	0	0.0%	0.0%
200		4	0.95	0.7909	1		1	0.8	1	0.05	0.0 <i>%</i> 10.53%	5.0%
440		4	0.7	0.3818	1		0.8	0.4	0.8	0.1	28.57%	30.0%
770		4	0.15	0	0.309	91	0.2	0	0.2	0.05	66.67%	85.0%
		4	0.05	0	0.209	91	0	0	0.2	0.05	200.0%	95.0%
1600		-	0.00									
1600	ected) Transfor											
1600 Angular (Corr С-µg/L	Control Type	med Sur Count	mmary Mean	95% LCL			Median	Min	Max	Std Err	CV%	%Effect
1600 Angular (Corr С-µg/L 1.6	-	med Sur Count 4	mmary Mean 1.345	1.345	1.346	i	1.345	1.345	1.345	0	0.0%	0.0%
1600 Angular (Corr C-µg/L 1.6 99	Control Type	rmed Sur Count 4 4	mmary Mean 1.345 1.345	1.345 1.345	1.346 1.346	i i	1.345 1.345	1.345 1.345	1.345 1.345	0 0	0.0%	0.0%
1600 Аngular (Corr С-µg/L 1.6 99 200	Control Type	rmed Sur Count 4 4 4	mmary Mean 1.345 1.345 1.286	1.345 1.345 1.096	1.346 1.346 1.475	; ; ;	1.345 1.345 1.345	1.345 1.345 1.107	1.345 1.345 1.345	0 0 0.05953	0.0% 0.0% 9.26%	0.0% 0.0% 4.43%
1600 Angular (Corr C-µg/L 1.6 99	Control Type	rmed Sur Count 4 4	mmary Mean 1.345 1.345	1.345 1.345 1.096 0.6655	1.346 1.346	; ; ;	1.345 1.345	1.345 1.345	1.345 1.345	0 0	0.0%	0.0%

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ana	alytical Repo	ort					Report Date: Test Code:	02 Jun-16 16:15 (p 2 of 2 41FF6FB0   11-0725-931:
Americamysi	s 96-h Acute Su	rvival Te	est					SPAWAR Systems Center
Analysis ID: Analyzed:	20-9830-3704 28 May-16 10:3			96h Survival R Nonparametric		Treatments	CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Survival	Rate Detail							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
1.6	Lab Control	1	1	1	1			
99		1	1	1	1			
200		1	1	1	0.8			
440		0.8	0.4	0.8	0.8			
770		0.2	0.2	0	0.2			
1600		0	0.2	0	0			
Angular (Cor	rected) Transfor	med De	tail					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
1.6	Lab Control	1.345	1.345	1.345	1.345			
99		1.345	1.345	1.345	1.345			
200		1.345	1.345	1.345	1.107			
440		1.107	0.6847	1.107	1.107			
770		0.4636	6 0.4636	0.2255	0.4636			
1600		0.2255	5 0.4636	0.2255	0.2255			
96h Survival	Rate Binomials							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
1.6	Lab Control	5/5	5/5	5/5	5/5			
99		5/5	5/5	5/5	5/5			
200		5/5	5/5	5/5	4/5			
440		4/5	2/5	4/5	4/5			
770		1/5	1/5	0/5	1/5			
1600		0/5	1/5	0/5	0/5			
Graphics								
10 F						0.25 F	1	
0.9	•	•				0.20		/•
0.8						0.15		
Ē						0.10		•••
966 Survival Rate						7 5 0.05 E		
10.6 E						Contered 000 000 000		
\$ 0.5 -						-0.05		
0.4						-0.10		
Ē						-0.15		
0.3 E						920	•	
0.2			F			4.25		
0.1						-		
Ē			.		1	-0.30		
0.0	1.6LC 99	200	440	770 1600		-0.35	-10 -0.5 0.0	05 1.0 1.5 2.0
		C·µg/L					Rankits	

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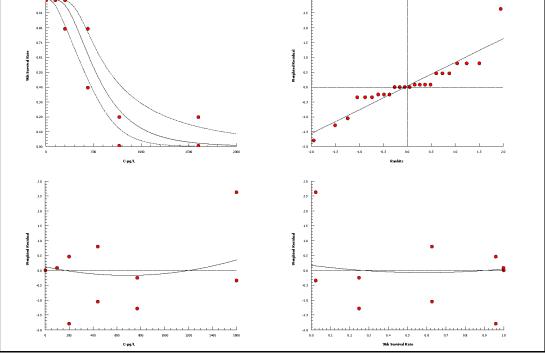
Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ana	lytical Repo	ort					-	ort Date: : Code:			15 (p 1 of 2) 1-0725-9312
Americamysis	s 96-h Acute Sur	vival Test							SPA	WAR Syste	ems Center
Analysis ID: Analyzed:	07-2199-8580 28 May-16 10:3			ih Survival Ra near Regress				1S Version: cial Results	CETISv1 : Yes	.8.7	
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:00 03 May-16 09:0 96h	) Prot	ocol: EF cies: Ar	ırvival (96h) PA/821/R-02- nericamysis l quatic Resear	bahia	ıs, NH	Ana Dilu Brin Age	ent: Lab ne: Not	ienne A Col oratory Sea Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:	•	Cod Mate Sou Stati	erial: Co rce: Pu	33AA81 opper sulfate ilsed Exposu Hour	re		Clie Proj		WAR sed Exposu	re	
Linear Regres	sion Options										
Model Functio	Dn ED=A+B*log(X)]		Thresho Control T	ld Option	Threshold 1E-07	Optimized Yes	Pooled No	Het Corr No	Weighted Yes	1	
Regression S											
Iters LL 80 -29.7	AICc	BIC 68.95	Mu 2.722	<b>Sigma</b> 0.242	Adj R2	F Stat 3.284	Critical 3.16	<b>P-Value</b> 0.0447	Decision Significar	(α:5%) It Lack of F	it
Point Estimat	95										
Level μg/L LC50 527.3	95% LCL	95% UCL									
Regression P	arameters										
Parameter	Estimate	Std Error	95% LCL	. 95% UCL	t Stat	P-Value	Decision	(a:5%)			
Threshold	5.35E-08	5.17E-05	-0.00010		0.001034	0.9992		ificant Paran			
Slope Intercept	4.133 -11.25	0.7391 2.025	2.684 -15.22	5.582 -7.28	5.592 -5.554	<0.0001 <0.0001	-	nt Parameter nt Parameter			
ANOVA Table											
Source Model Lack of Fit Pure Error Residual	Sum Squa 70.93179 5.66535 10.3494 16.01475	70.9 1.88	4967	DF 1 3 18 21	<b>F Stat</b> 93.01 3.284	<b>P-Value</b> <0.0001 0.0447	Decision Significar Significar	nt			
		0.78	2007	21							
Residual Anal Attribute	ysis Method			Test Stat	Critical	P-Value	Decision	(a.5%)			
Goodness-of-F Variances Distribution	it Pearson C Likelihood Mod Lever Shapiro-W	hi-Sq GOF Ratio GOF he Equality o 'ilk W Norma Darling A2 N	ality	16.01 12.66	32.67 32.67 2.773 0.9169 2.492	0.7688 0.9202 0.7828 0.0128 0.0054	Non-Sign Non-Sign Equal Va Non-norn	ificant Heter ificant Heter	ogenity		
96h Survival I	Rate Summary				Calcu	ated Variat	e(A/B)				
	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	В
1.6 L 99	ab Control	4 4	1 1	1 1	1 1	0 0	0 0	0.0% 0.0%	0.0% 0.0%	20 20	20 20
200		4	0.95	0.8	1	0.05	0.1	0.0% 10.53%	0.0% 5.0%	20 19	20
440		4	0.7	0.4	0.8	0.1	0.2	28.57%	30.0%	14	20
770		4	0.15	0	0.2	0.05	0.1	66.67%	85.0%	3	20
1600		4	0.05	0	0.2	0.05	0.1	200.0%	95.0%	1	20

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Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS An	alytical Rep	ort				Report Date: Test Code:	02 Jun-16 16:15 (p 2 of 2) 41FF6FB0   11-0725-9312
Americamy	sis 96-h Acute Su	rvival Test	t				SPAWAR Systems Center
Analysis ID: Analyzed:	07-2199-8580 28 May-16 10:			ih Survival F near Regres		CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Surviva	l Rate Detail						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
1.6	Lab Control	1	1	1	1		
99		1	1	1	1		
200		1	1	1	0.8		
440		0.8	0.4	0.8	0.8		
770		0.2	0.2	0	0.2		
1600		0	0.2	0	0		
96h Surviva	l Rate Binomials						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
1.6	Lab Control	5/5	5/5	5/5	5/5		
99		5/5	5/5	5/5	5/5		
200		5/5	5/5	5/5	4/5		
440		4/5	2/5	4/5	4/5		
770		1/5	1/5	0/5	1/5		
1600		0/5	1/5	0/5	0/5		
Graphics				Log-No	ormal [NED=A+B*log	(X)]	
0.91					30 25 20		•



CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Sum	nmary Repo	rt						Report Dat Test Code:				5 (p 1 of 1) 7-9508-8128
Americamysis	96-h Acute Sur	vival T	est							SPA	VAR Syste	ms Center
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:00 03 May-16 09:0 96h		Test Type:       Survival (96h)         Protocol:       EPA/821/R-02-012 (2002)         Species:       Americamysis bahia         Source:       Aquatic Research Organisms, NH					Analyst: Diluent: Brine: Age:	Labo	enne A Col pratory Seav Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:	: 29 Apr-16 Source: Pulsed Exposure							e				
Comparison S	Summary											
Analysis ID	Endpoint		NOEL	. LOEL	TOEL	PMSD	τu	Meth	hod			
15-9818-6438	96h Survival Ra	ate	120	340	202	17.5%		Duni	nett M	ultiple Com	parison Tes	st
Point Estimate	e Summary											
Analysis ID	Endpoint		Level	μg/L	95% LCL	95% UCL	τυ	Meth	hod			
19-3745-9491	96h Survival Ra	ate	LC50	266.6	209.2	340.5		Line	ar Reg	pression (M	LE)	
96h Survival R	Rate Summary											
C-µg/L	Control Type	Coun	it Mean	95% LCL	95% UCL	Min	Max	Std	Err	Std Dev	CV%	% Effect
1.6	Lab Control	4	1	1	1	1	1	0		0	0.0%	0.0%
34		4	1	1	1	1	1	0		0	0.0%	0.0%
72		4	0.95	0.7909	1	0.8	1	0.05		0.1	10.53%	5.0%
120		4	0.95	0.7909	1	0.8	1	0.05		0.1	10.53%	5.0%
340		4	0.35	0.0453	0.6547	0.2	0.6	0.09		0.1915	54.71%	65.0%
570		4	0.1	0	0.2837	0	0.2	0.05	774	0.1155	115.5%	90.0%
96h Survival R	Rate Detail											
C-µg/L	Control Type	Rep 1	I Rep 2	P. Rep 3	Rep 4							
1.6	Lab Control	1	1	1	1							
34		1	1	1	1							
72		1	1	0.8	1							
120		1	1	1	0.8							
340		0.2	0.4	0.6	0.2							
570		0	0.2	0.2	0							
96h Survival F	Rate Binomials											
C-µg/L	Control Type	Rep 1	I Rep 2	Rep 3	Rep 4							
1.6	Lab Control	5/5	5/5	5/5	5/5							
34		5/5	5/5	5/5	5/5							
72		5/5	5/5	4/5	5/5							
120		5/5	5/5	5/5	4/5							
340		1/5	2/5	3/5	1/5							

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ana	lytical Repo	ort					-	ort Date: Code:			5 (p 1 of 2) 7-9508-8128
Americamysis	s 96-h Acute Su	rvival Te	est						SPA	WAR Syste	ms Center
Analysis ID: Analyzed:	15-9818-6438 28 May-16 10:3		Endpoint: Analysis:	96h Survival R Parametric-Co		eatments		IS Version		.8.7	
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:0 03 May-16 09:0 96h	0 I	Test Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-02 Americamysis Aquatic Resea	bahia		Anal Dilu Brin Age:	ent: La e: No	arienne A Col boratory Sea ot Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:		Apr-16     Material:     Copper sulfate       Apr-16     Source:     Pulsed Exposure       Station:     12 Hour					Client: SPAWAR Project: Pulsed Exposure				
Data Transfor Angular (Corre		Zeta NA	Alt Hy C>T	/p Trials NA	Seed NA		PMSD 17.5%	<b>NOEL</b> 120	<b>LOEL</b> 340	<b>TOEL</b> 202	TU
			0.1					120	010	202	
Control	ple Comparisor vs C-µg/L	Trest	Test S	tat Critical	MSD D	)F P-Value	P-Type	Decisior	a(a:5%)		
1.6 1.6 1.6 1.6	34 72 120 340*		0 0.693 <sup>7</sup> 0.693 <sup>7</sup> 8.392	2.407 2.407	0.207 6 0.207 6 0.207 6 0.207 6	0.8333 0.5611 0.5611	CDF CDF CDF CDF CDF	Non-Sigr Non-Sigr	nificant Effect nificant Effect nificant Effect		
1.6	570*	11.65	2.407	0.207 6	<0.0001	CDF	Significa				
ANOVA Table											
Source	Sum Squ	ares	Mean	Square	DF	F Stat	P-Value	Decision	n(α:5%)		
Between	3.853589		0.7707		5	52.24	<0.0001	Significa	nt Effect		
Error	0.2655653	7	0.0147	75365	18 23						
Total	4.119155				23						
Distributional											
Attribute Variances Variances Distribution		Equality of	ality of Varia of Variance Jormality	Test Stat nce 2.57 7.267 0.9014	Critical 4.248 4.248 0.884	P-Value 0.0635 0.0007 0.0231	Decision(α:1%) Equal Variances Unequal Variances Normal Distribution				
96h Survival I	Rate Summary										
C-µg/L	Control Type	Count	Mean	95% LCL	95% UC	L Median	Min	Max	Std Err	CV%	%Effect
1.6 34 72 120	Lab Control	4 4 4 4	1 1 0.95 0.95	1 1 0.7909 0.7909	1 1 1	1 1 1 1	1 1 0.8 0.8	1 1 1	0 0 0.05 0.05	0.0% 0.0% 10.53% 10.53%	0.0% 0.0% 5.0% 5.0%
340		4	0.35	0.0453	0.6547	0.3	0.2	0.6	0.09574	54.71%	65.0%
570		4	0.1	0	0.2837	0.1	0	0.2	0.05774	115.5%	90.0%
Angular (Corr	ected) Transfor	med Su	mmary								
C-µg/L	Control Type	Count		95% LCL			Min	Max	Std Err	CV%	%Effect
	Lab Control	4	1.345	1.345	1.346	1.345	1.345	1.345	0	0.0%	0.0%
1.6					1.346	1.345	1.345	1.345	0	0.0%	0.0%
34		4	1.345	1.345			1 107	1 3/15	0.05953	9 26%	1 13%
34 72		4 4 4	1.286	1.096	1.475	1.345	1.107 1.107	1.345 1.345	0.05953 0.05953	9.26% 9.26%	4.43% 4.43%
34		4		1.096 1.096			1.107 1.107 0.4636	1.345 1.345 0.8861	0.05953 0.05953 0.1016	9.26% 9.26% 32.53%	4.43% 4.43% 53.58%

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ana	alytical Repo	ort					Report Date: Test Code:	02 Jun-16 16:15 (p 2 of 2 6AFEDF00   17-9508-8128
Americamysi	s 96-h Acute Sur	rvival To	est			SPAWAR Systems Center		
Analysis ID: Analyzed:	15-9818-6438 28 May-16 10:3		Endpoint: 9 Analysis: P		ate ntrol vs Treat	ments	CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Survival	Rate Detail							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
1.6	Lab Control	1	1	1	1			
34		1	1	1	1			
72		1	1	0.8	1			
120		1	1	1	0.8			
340		0.2	0.4	0.6	0.2			
570		0	0.2	0.2	0			
Angular (Cor	rected) Transfor	med De	tail					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
1.6	Lab Control	1.345	1.345	1.345	1.345			
34		1.345	1.345	1.345	1.345			
72		1.345	1.345	1.107	1.345			
120		1.345	1.345	1.345	1.107			
340		0.4636	6 0.6847	0.8861	0.4636			
570		0.225	5 0.4636	0.4636	0.2255			
96h Survival	Rate Binomials							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
1.6	Lab Control	5/5	5/5	5/5	5/5			
34		5/5	5/5	5/5	5/5			
72		5/5	5/5	4/5	5/5			
120		5/5	5/5	5/5	4/5			
340		1/5	2/5	3/5	1/5			
570		0/5	1/5	1/5	0/5			
Graphics								
ωĘ						°.30 E	i	
0.9		•	•			0.25		•
0.8				Reject Nul	_	0.20		/
F						0.15		
96h Survival Rate					1			
3.0 F			Г		Centered	0.10		
× 0.5						0.05		••••
0.4						0.00		
0.3 E				Z		-0.05		
						-		
0.2			L			-0.10	· · ·	
0.1						4.15	·	
Ē								
1	L&LC 34	72 Come/1	120 3	40 570		-2.0 -	15 -10 -0.5 0.0 Rankits	05 1.0 1.5 2.0
		C-µg/L					Kanists	

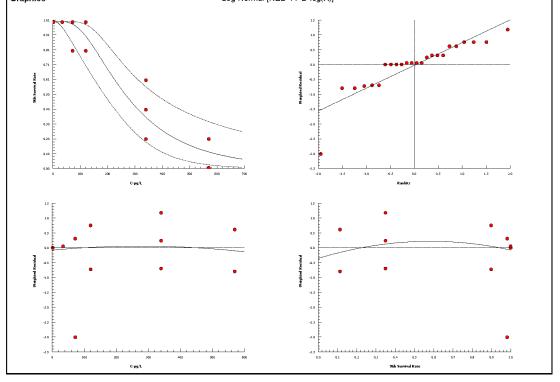
CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ana	lytical Repo	ort					-	ort Date: t Code:			15 (p 1 of 2) 7-9508-8128
Americamysis	s 96-h Acute Sur	vival Test							SPA	WAR Syste	ems Center
Analysis ID: Analyzed:	19-3745-9491 28 May-16 10:3			h Survival Ra lear Regress				FIS Version: cial Results:	CETISv1 : Yes	.8.7	
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:00 03 May-16 09:0 96h	) Prot	ocol: EP cies: Am	rvival (96h) PA/821/R-02- nericamysis t uatic Resear	pahia	ns, NH		ient: Labo ne: Not	ienne A Col oratory Sea Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:	•	Cod Mate Sou Stati	erial: Co rce: Pu	DAEB8E pper sulfate Ised Exposul Hour	re		Clie Pro		WAR ed Exposu	re	
Linear Regree	-		Threshol	d Option	Threshold	Optimized	Pooled	Het Corr	Weighted	4	
	ED=A+B*log(X)]		Control TI		1E-07	Yes	No	No	Yes		
Regression S	ummarv										
Iters LL	AICc	BIC 65.83	Mu 2.426	<b>Sigma</b> 0.2726	Adj R2	F Stat 2.779	Critical 3.16	P-Value 0.0709	Decision	(α:5%) ificant Lack	of Fit
		03.05	2.420	0.2720	0.1501	2.115	5.10	0.0703	Non-Sign		orni
Point Estimat Level µg/L LC50 266.6	95% LCL	95% UCL 340.5									
Regression P	arameters										
Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decisio	n(α:5%)			
Threshold	1.26E-07	7.93E-05	-0.00016	0.000156	0.001587	0.9987		nificant Param	neter		
Slope Intercept	3.668 -8.898	0.6203 1.514	2.452 -11.87	4.883 -5.93	5.913 -5.877	<0.0001 <0.0001		nt Parameter nt Parameter			
ANOVA Table											
Source	Sum Squa	ares Mea	n Square	DF	F Stat	P-Value	Decisio	n(α:5%)			
Model	67.8569	67.8	569	1	88.89	<0.0001	Significa	nt			
Lack of Fit	5.074647		1549	3	2.779	0.0709	Non-Sig	nificant			
Pure Error Residual	10.95559 16.03024	0.60 0.76	8644 3345	18 21							
Residual Ana	vsis										
Attribute	Method			Test Stat	Critical	P-Value	Decisio	n(α:5%)			
Goodness-of-F	it Pearson C Likelihood	-		16.03 12.81	32.67 32.67	0.7679 0.9152	Non-Sig	nificant Hetero nificant Hetero			
Variances	Mod Lever	ne Equality o	of Variance	0.9329	2.773	0.4831	Equal Va	riances			
Distribution	•	ilk W Norm Darling A2 N	-	0.8149 1.418	0.9169 2.492	0.0005 0.0006		nal Distributio nal Distributio			
96h Survival	Rate Summary					ated Variat					
	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	в
	ab Control	4	1	1	1	0	0	0.0%	0.0%	20	20
34		4	1	1	1	0	0	0.0%	0.0%	20	20
72		4	0.95	0.8	1	0.05	0.1	10.53%	5.0%	19	20
120		4	0.95	0.8	1	0.05	0.1	10.53%	5.0%	19	20
340		4	0.35	0.2	0.6	0.09574	0.1915	54.71%	65.0%	7	20
570		4	0.1	0	0.2	0.05774	0.1155	115.5%	90.0%	2	20

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS A	nalytical Rep	ort				Report Date: Test Code:	02 Jun-16 16:15 (p 2 of 2) 6AFEDF00   17-9508-8128
Americam	ysis 96-h Acute Su	urvival Tes	t		SPAWAR Systems Center		
Analysis I Analyzed:				ih Survival F near Regres		CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Survi	val Rate Detail						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
1.6	Lab Control	1	1	1	1		
34		1	1	1	1		
72		1	1	0.8	1		
120		1	1	1	0.8		
340		0.2	0.4	0.6	0.2		
570		0	0.2	0.2	0		
96h Survi	val Rate Binomials	;					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
1.6	Lab Control	5/5	5/5	5/5	5/5		
34		5/5	5/5	5/5	5/5		
72		5/5	5/5	4/5	5/5		
120		5/5	5/5	5/5	4/5		
340		1/5	2/5	3/5	1/5		
570		0/5	1/5	1/5	0/5		
Graphics				Log-No	ormal [NED=A+B*log(	X)]	



CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Sum	nmary Repo	rt						Report Date Test Code:	e:		Jun-16 16:1 )CBFA1   05	
Americamysis	96-h Acute Sur	vival T	est							SPA	WAR Syste	ms Center
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:00 03 May-16 09:0 96h		Test Type: Protocol: Species: Source:	cies: Americamysis bahia					Marienne Laborator Not Applie 5	y Sea		
Receive Date:	Date:     29 Apr-16     Material:     Copper sulfate     Project:     Pu       e Date:     29 Apr-16     Source:     Pulsed Exposure						SPAWAR Pulsed Ex		e			
Comparison S	Summary											
Analysis ID	Endpoint		NOEL	LOEL	TOEL	PMSD	τu	Meth	od			
01-9167-8084	96h Survival Ra	ite	71	140	99.7	14.3%		Stee	Many-One	e Ranl	< Sum Test	
Point Estimate	e Summary											
Analysis ID	Endpoint		Level	μg/L	95% LCL	95% UCL	τu	Meth	od			
19-3764-2302	96h Survival Ra	ite	LC50	105.9	84.58	122.5		Linea	ar Regressi	ion (M	LE)	
96h Survival R	Rate Summary											
C-µg/L	Control Type	Coun	it Mean	95% LCL	95% UCL	Min	Max	Std I	Err Std	Dev	CV%	%Effect
1.6	Lab Control	4	1	1	1	1	1	0	0		0.0%	0.0%
21		4	0.95	0.7909	1	0.8	1	0.05	0.1		10.53%	5.0%
34		4	1	1	1	1	1	0	0		0.0%	0.0%
71		4	0.95	0.7909	1	0.8	1	0.05	0.1		10.53%	5.0%
140		4	0.1	0	0.2837	0	0.2	0.05	774 0.11	155	115.5%	90.0%
280		4	0	0	0	0	0	0	0			100.0%
96h Survival R	Rate Detail											
C-µg/L	Control Type	Rep 1	I Rep 2	Rep 3	Rep 4							
1.6	Lab Control	1	1	1	1							
21		1	1	1	0.8							
34		1	1	1	1							
71		1	1	1	0.8							
140		0	0	0.2	0.2							
280		0	0	0	0							
96h Survival F	Rate Binomials											
C-µg/L	Control Type	Rep 1	I Rep 2	Rep 3	Rep 4							
1.6	Lab Control	5/5	5/5	5/5	5/5							
21		5/5	5/5	5/5	4/5							
34		5/5	5/5	5/5	5/5							
71		5/5	5/5	5/5	4/5							
140		0/5	0/5	1/5	1/5							
110												

CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

Analyzete:         28 May-16 10:30         Analysis:         Nonparametric-Control vs Treatments         Official Results:         Yes           Batch Dic:         18-0016-1674         Tost Type:         Survival (96h)         Analyst:         Manalyst:	CETIS Anal	lytical Rep	ort						ort Date: Code:		Jun-16 16:1 CBFA1   05		
Analyzet:         28 May-16 10:30         Analysis:         Nonparametric-Control vs Treatments         Official Results:         Yes           Batch 10:         18-0016-1674         Test Type:         Sunvial (98h)         Analysi:         Manalysi:	Americamysis	96-h Acute Su	rvival 1	Fest						SPA	WAR Syste	ems Cente	
Start Date:         29         Apr-16         09:00 Species:         Protocol:         EA/821/R-02-012 (2002)         Diluent:         Laboratory Seawater Brine:         Not Applicable           Ending Date:         03 May-16 09:00 Species:         Source:         Anguatic Research Organisms, NH         Age:         5           Sample Dat:         29 Apr-16         Material:         Coper sulfate         SPAU:         Project:         Pulsed Exposure           Sample Dat:         29 Apr-16         Material:         Coper sulfate         Spaulicaticaticaticaticaticaticaticaticaticat	Analysis ID: Analyzed:		30	•			Freatments						
Sample Date: 29 Apr-16         Material: Copper sulfate Exposure           Project: Pulsed Exposure           Sample Age: 9h         Station: Static           PMSD         NOEL         LOEL         TOE           Angular (Corrected)         NA         C > T         NA         NA         Project:         Pulsed Exposure           Station:         Station:         Station:         Station:         TOE           Data Transform         Zata         Att Hyp         Trials         Seed         PNJee         Decision(c:5%)           Static         Title         TO         TO         TO           Static         Title         TO         TO           Att NM         Total         Source:         Surface:         Source         Surface:         Source         Surface:         Source:         Surface:         Source         Surface: <th co<="" td=""><td>Batch ID: Start Date: Ending Date: Duration:</td><td>29 Apr-16 09:0 03 May-16 09:0</td><td></td><td>Protocol: Species:</td><td>EPA/821/R-02- Americamysis</td><td colspan="3">PA/821/R-02-012 (2002) mericamysis bahia</td><td>ent: La e: No</td><td>boratory Sea</td><td></td><td></td></th>	<td>Batch ID: Start Date: Ending Date: Duration:</td> <td>29 Apr-16 09:0 03 May-16 09:0</td> <td></td> <td>Protocol: Species:</td> <td>EPA/821/R-02- Americamysis</td> <td colspan="3">PA/821/R-02-012 (2002) mericamysis bahia</td> <td>ent: La e: No</td> <td>boratory Sea</td> <td></td> <td></td>	Batch ID: Start Date: Ending Date: Duration:	29 Apr-16 09:0 03 May-16 09:0		Protocol: Species:	EPA/821/R-02- Americamysis	PA/821/R-02-012 (2002) mericamysis bahia			ent: La e: No	boratory Sea		
Angular (Corrected)         NA         C > T         NA         NA         14.3%         71         140         99.7           Steel Many-One Rank Sum Test         Control         vs         C-yg/L         Test Stat         Critical         Ties         DF         P-Value         P-Type         Decision(a:5%)           1.6         21         16         10         1         6         0.5661         Asymp         Non-Significant Effect           1.6         71         16         10         1         6         0.5661         Asymp         Non-Significant Effect           1.6         140*         10         10         0         6         0.0350         Asymp         Non-Significant Effect           ANOVA Table         Source         Sum Squares         Mean Square         DF         F Stat         P-Value         Decision(a:5%)           Detributional Tests         Attribute         Test         Test Stat         Critical         P-Value         Decision(a:1%)           Variances         Mod Levene Equality of Variance         1.75         4.893         0.1915         Equal Variances           Distributional         Shapiro-Wilk W Normality         0.8561         0.0001         Non-normal Distribution <tr< td=""><td>-</td><td colspan="5">te:     29 Apr-16     Material:     Copper sulfate       te:     29 Apr-16     Source:     Pulsed Exposure</td><td></td><td></td><td></td><td>e</td><td></td></tr<>	-	te:     29 Apr-16     Material:     Copper sulfate       te:     29 Apr-16     Source:     Pulsed Exposure								e			
Steel Many-One Rank Sum Test         Test Stat         Critical         Ties         DF         P-Value         P-Type         Decision(c:5%)           1.6         21         16         10         1         6         0.5661         Asymp         Non-Significant Effect           1.6         34         18         10         1         6         0.5661         Asymp         Non-Significant Effect           1.6         71         16         10         0         6         0.0350         Asymp         Non-Significant Effect           1.6         140*         10         10         0         6         0.0350         Asymp         Non-Significant Effect           Source         Sum Squares         Mean Square         DF         F Stat         P-Value         Decision(c:5%)           Between         3.030666         0.7577171         4         80.17         <0.0001				-								TU	
control         vs         C-µg/L         Test Stat         Crítical         Tes         DF         P-Value         P-Type         Decision(α:5%)           1.6         21         16         10         1         6         0.5661         Asymp         Non-Significant Effect         1           1.6         71         16         10         1         6         0.5661         Asymp         Non-Significant Effect         1           1.6         140*         10         10         0         6         0.0350         Asymp         Non-Significant Effect           Source         Sum Squares         Mean Square         DF         F Stat         P-Value         Decision(α:5%)           Between         3.030868         0.7577171         4         80.17         <0.001	Angular (Corre	cted)	NA	C > T	NA	NA		14.3%	71	140	99.7		
1.6       21       16       10       1       6       0.5661       Asymp       Non-Significant Effect         1.6       34       18       10       1       6       0.5661       Asymp       Non-Significant Effect         1.6       140*       10       0       6       0.5661       Asymp       Non-Significant Effect         ANOVA Table         Source       Sum Squares       Mean Square       DF       F Stat       P-Value       Decision(α:5%)         Between       3.030868       0.7577171       4       80.17       <0.0001	Steel Many-Or	ie Rank Sum T	est										
1.6       34       18       10       1       6       0.8000       Asymp       Non-Significant Effect         1.6       140*       10       0       6       0.350       Asymp       Non-Significant Effect         1.6       140*       10       0       6       0.350       Asymp       Non-Significant Effect         ANOVA Table       Significant Effect       0.03868       0.7577171       4       80.17       <0001	Control									. ,			
1.6         71         16         10         1         6         0.5661         Asymp         Non-Significant Effect           ANOVA Table           Source         Sum Squares         Mean Square         DF         F Stat         P-Value         Decision(c:5%)           Between         3.03086         0.7577171         4         80.17         <0.001         Significant Effect           Error         0.1417698         0.009451317         15          0.0004         Significant Effect            Distributional Tests         Mod Levene Equality of Variance         8.75         4.893         0.0007         Unequal Variances         Variances           Distribution         Shajiro-Wilk V Normality         0.853         0.866         0.0007         Non-normal Distribution           Stafficant Equality of Variance         8.75         4.893         0.0007         Unequal Variances         Variances         Variances         Variances         Variances         Value         0.0007         Non-normal Distribution           Stafficant Effect         Control Type         Count         Mean         95% LCL         95% UCL         Median         Min         Max         Std Err         CV%         %Effect           1.6									-				
1.6         140°         10         0         6         0.0350         Asymp         Significant Effect           ANOVA Table           Source         Sum Squares         Mean Square         DF         F Stat         P-Value         Decision(α:5%)           Between         3.030868         0.7577171         4         80.17         <0.0001         Significant Effect           Error         0.1417698         0.009451317         15         0         Significant Effect         Significant Effect           Variances         Mod Levene Equality of Variance         1.75         4.893         0.1915         Equal Variances         Variances           Variances         Levene Equality of Variance         8.75         4.893         0.0007         Unequal Variances         Variances         Std Err         CV%         %Effect           Obstribution         Shapiro-Wilk W Normality         0.853         0.866         0.0061         Non-normal Distribution           Std Err         Cup/L         Control Type         Count         Mean         95% LCL         95% UCL         Median         Min         Max         Std Err         CV%         %Effect           1.6         Lab Control         4         1         1         1 <td>1.6</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>-</td> <td></td> <td></td> <td></td>	1.6								-				
Source         Sum Squares         Mean Square         DF         F Stat         P-Value         Decision(:::%)           Between         3.030868         0.7577171         4         80.17         <0.001	1.6												
Source         Sum Squares         Mean Square         DF         F Stat         P-Value         Decision(:::%)           Between         3.030868         0.7577171         4         80.17         <0.001	ANOVA Table												
Between         3.030868         0.7577171         4         80.17         <0.0001         Significant Effect           Error         0.1417698         0.009451317         15         -		Sum Sau	ares	Mean S	Square	DF	F Stat	P-Value	Decisio	n(a:5%)			
Error         0.1417698         0.009451317         15           Total         3.172638         19           Distributional Tests         Critical         P-Value         Decision(c:1%)           Attribute         Test         Test Stat         Critical         P-Value         Decision(c:1%)           Variances         Mod Levene Equality of Variance         8.75         4.893         0.0007         Unequal Variances           Distribution         Shapiro-Wilk W Normality         0.8533         0.866         0.0061         Non-normal Distribution           96h Survival Rate         C-ug/L         Control Type         Count         Mean         95% LCL         95% UCL         Median         Min         Max         Std Err         CV%         %Effec           1.6         Lab Control         4         1         1         1         0.05         10.53%         5.0%           21         4         0.95         0.7909         1         1         0.88         1         0.05         10.53%         5.0%           240         4         1         1         1         1         0.88         1         0.05         10.53%         5.0%           24         0.95         0.7909 </td <td>Between</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>1</td> <td></td> <td></td>	Between									1			
Distributional Tests         Test         Test Stat         Critical         P-Value         Decision(cr:1%)           Variances         Mod Levene Equality of Variance         1.75         4.893         0.1915         Equal Variances           Variances         Levene Equality of Variance         8.75         4.893         0.0007         Unequal Variances           Distribution         Shapiro-Wilk W Normality         0.8533         0.866         0.0061         Non-normal Distribution           Stribution         Shapiro-Wilk W Normality         0.8533         0.866         0.0061         Non-normal Distribution           Stdi Err         Count         Mean         95% LCL         95% UCL         Median         Min         Max         Std Err         CV%         %Effer           1.6         Lab Control         4         1         1         1         0.05         10.53%         5.0%           34         4         1         1         1         0.88         1         0.05         10.53%         5.0%           140         4         0.95         0.7909         1         1         0.05         10.53%         5.0%           280         4         0         0         0         0.2837	Error	0.141769	8			15							
Attribute         Test         Test Stat         Critical         P-Value         Decision(α:1%)           Variances         Mod Levene Equality of Variance         1.75         4.893         0.1915         Equal Variances           Variances         Levene Equality of Variance         8.75         4.893         0.0007         Unequal Variances           Distribution         Shapiro-Wilk W Normality         0.8533         0.866         0.0061         Non-normal Distribution           Shapiro-Wilk W Normality         0.8533         0.866         0.0061         Non-normal Distribution           Shapiro-Wilk W Normality         0.8533         0.866         0.0061         Non-normal Distribution           Shapiro-Wilk W Normality         0.8533         0.866         0.0061         Non-normal Distribution           Shapiro-Wilk W Normality         0.8533         0.866         0.0061         Non-normal Distribution           Std Err         CV@         Meffer         Std Err         CV%         %Effer           1.6         Lab Control         4         1         1         1         0.05         10.53%         5.0%           214         4         0.95         0.7909         1         1         0.02	Total	3.172638				19	_						
Variances         Mod Levene Equality of Variance         1.75         4.893         0.1915         Equal Variances           Variances         Levene Equality of Variance         8.75         4.893         0.0007         Unequal Variances           Distribution         Shapiro-Wilk W Normality         0.8533         0.866         0.0061         Unequal Variances           966         Survival Rate Summary         C-ug/L         Control Type         Count         Mean         95% LCL         95% UCL         Median         Min         Max         Std Err         CV%         %Effe           1.6         Lab Control         4         1         1         1         1         0.05         10.53%         5.0%           34         4         1         1         1         1         0         0.0%         0.0%           140         4         0.95         0.7909         1         1         0.8         1         0.05         10.53%         5.0%           280         4         0.1         0         0.2837         0.1         0         0.2         0.05774         115.5%         90.0%           280         4         0         0         0         0         0	Distributional	Tests											
Variances         Mod Levene Equality of Variance         1.75         4.893         0.1915         Equal Variances           Variances         Levene Equality of Variance         8.75         4.893         0.0007         Unequal Variances           Distribution         Shapiro-Wilk W Normality         0.8533         0.866         0.0061         Unequal Variances           966         Survival Rate Summary         C-ug/L         Control Type         Count         Mean         95% LCL         95% UCL         Median         Min         Max         Std Err         CV%         %Effe           1.6         Lab Control         4         1         1         1         1         0.05         10.53%         5.0%           34         4         1         1         1         1         0         0.0%         0.0%           140         4         0.95         0.7909         1         1         0.8         1         0.05         10.53%         5.0%           280         4         0.1         0         0.2837         0.1         0         0.2         0.05774         115.5%         90.0%           280         4         0         0         0         0         0	Attribute	Test			Test Stat	Critical	P-Value	Decision	(α:1%)				
Variances Distribution         Levene Equality of Variance Shapiro-Wilk W Normality         8.75 0.8533         4.893 0.866         0.0007 0.0061         Unequal Variances Non-normal Distribution           96h Survival Rate Surmary         Stopen Mike M Normality         95% LCL         95% UCL         Median         Min         Max         Std Err         CV%         %Effe           1.6         Lab Control         4         1         1         1         1         0.005         0.00%         0.0%         0.0%           21         4         0.95         0.7909         1         1         0.8         1         0.05         10.53%         5.0%           34         4         1         1         1         1         0.8         1         0.05         10.53%         5.0%           140         4         0.95         0.7909         1         1         0.2         0.05774         15.5%         90.0%           280         4         0.1         0         0.2837         0.1         0         0.2         0.05774         15.5%         90.0%           280         4         0.1         0         0.2837         0.1         0         0         0         0         0         10			ene Ea	uality of Varia					, ,				
96h Survival Rate Summary           C-µg/L         Count         Mean         95% LCL         95% UCL         Median         Min         Max         Std Err         CV%         %Effer           1.6         Lab Control         4         1         1         1         1         0         0.0%         0.0%           21         4         0.95         0.7909         1         1         0.8         1         0.05         10.53%         5.0%           34         4         1         1         1         1         0.8         1         0.05         10.53%         5.0%           71         4         0.95         0.7909         1         1         0.8         1         0.05         10.53%         5.0%           140         4         0.1         0         0.2837         0.1         0         0.2         0.05774         115.5%         90.0%           280         4         0         0         0         0         0         0         0         0         0         0         0.00         0         0         0         0.00         100.0            Control Type         <	Variances							-					
C-µg/L         Control Type         Count         Mean         95% LCL         95% UCL         Median         Min         Max         Std Err         CV%         %Effe           1.6         Lab Control         4         1         1         1         1         1         0         0.0%         0.0%           21         4         0.95         0.7909         1         1         0.8         1         0.05         10.53%         5.0%           34         4         1         1         1         1         0.8         1         0.05         10.53%         5.0%           71         4         0.95         0.7909         1         1         0.8         1         0.05         10.53%         5.0%           140         4         0.1         0         0.2837         0.1         0         0.2         0.05774         115.5%         90.0%           280         4         0.1         0         0.2837         0.1         0         0.2         0.05774         15.5%         90.0%           Angular (Corrected) Transformed Summers         Std Err         CV%         MEffe         1.345         1.346         1.345         1.345         0.0	Distribution	Shapiro-'	Wilk W	Normality	0.8533	0.866	0.0061	Non-norm	al Distribu	tion			
C-µg/L         Control Type         Count         Mean         95% LCL         95% UCL         Median         Min         Max         Std Err         CV%         %Effe           1.6         Lab Control         4         1         1         1         1         1         0         0.0%         0.0%           21         4         0.95         0.7909         1         1         0.8         1         0.05         10.53%         5.0%           34         4         1         1         1         1         0.8         1         0.05         10.53%         5.0%           71         4         0.95         0.7909         1         1         0.8         1         0.05         10.53%         5.0%           140         4         0.1         0         0.2837         0.1         0         0.2         0.05774         115.5%         90.0%           280         4         0.1         0         0.2837         0.1         0         0.2         0.05774         15.5%         90.0%           Angular (Corrected) Transformed Summers         Std Err         CV%         MEffe         1.345         1.346         1.345         1.345         0.0	96h Survival F	ate Summary											
21       4       0.95       0.7909       1       1       0.8       1       0.05       10.53%       5.0%         34       4       1       1       1       1       1       1       0       0.0%       0.0%         71       4       0.95       0.7909       1       1       0       0.05       10.53%       5.0%         140       4       0.1       0       0.2837       0.1       0       0.2       0.05774       115.5%       90.0%         280       4       0       0       0       0       0       0       0       0       100.0         Angular (Corrected) Transformet Summers         C-µg/L       Control Type       Count       Mean       95% LCL       95% UCL       Median       Min       Max       Std Err       CV%       %Effer         1.6       Lab Control       4       1.345       1.345       1.345       1.345       1.345       0       0.0%       0.0%         21       4       1.286       1.096       1.475       1.345       1.345       0       0.0%       0.0%         34       4       1.286       1.096       1.4	C-µg/L	Control Type	Cour	nt Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect	
34       4       1       1       1       1       1       1       0       0.0%       0.0%         71       4       0.95       0.7909       1       1       0       0.05       10.53%       5.0%         140       4       0.1       0       0.2837       0.1       0       0.2       0.05774       115.5%       90.0%         280       4       0       0       0       0       0       0       0       100.0         Angular (Corrected) Transformed Summerse       Std Err       CV%       %Effer       Mean       95% LCL       95% UCL       Median       Min       Max       Std Err       CV%       %Effer         1.6       Lab Control       4       1.345       1.345       1.345       1.345       1.345       0.05953       9.26%       4.43%         21       4       1.286       1.096       1.475       1.345       1.345       0       0.0%       0.0%         71       4       1.286       1.096       1.475       1.345       1.345       0       0.0%       0.0%         21       4       1.286       1.096       1.475       1.345       1.345       0.5953	1.6	Lab Control	4	1	1	1	1	1	1	0	0.0%	0.0%	
71       4       0.95       0.7909       1       1       0.8       1       0.05       10.53%       5.0%         140       4       0.1       0       0.2837       0.1       0       0.2       0.05774       115.5%       90.0%         280       4       0       0       0       0       0       0       0       0       0       0       0.05774       115.5%       90.0%         Agular (Corrected) Transformed Summers       Summers       State       State       Std Err       CV%       %Effer         1.6       Lab Control       4       1.345       1.345       1.346       1.345       1.345       1.345       0.05953       9.26%       4.43%         21       4       1.286       1.096       1.475       1.345       1.345       1.345       0.05953       9.26%       4.43%         34       4       1.286       1.096       1.475       1.345       1.107       1.345       0.05953       9.26%       4.43%         140       4       0.3446       0.1258       0.5634       0.3446       0.2255       0.4636       0.06874       39.9%       74.39	21		4	0.95	0.7909	1	1	0.8	1	0.05	10.53%	5.0%	
140       4       0.1       0       0.2837       0.1       0       0.2       0.05774       115.5%       90.0%         280       4       0       0       0       0       0       0       0       0.2       0.05774       115.5%       90.0%         Angular (Corrected) Transformed Summer         C-µg/L       Count       Mean       95% LCL       95% UCL       Median       Min       Max       Std Err       CV%       %Effer         1.6       Lab Control       4       1.345       1.345       1.345       1.345       1.345       0.05953       9.26%       4.43%         21       4       1.286       1.096       1.475       1.345       1.345       0       0.0%       0.0%         34       4       1.286       1.096       1.475       1.345       1.345       0       0.05953       9.26%       4.43%         71       4       1.286       1.096       1.475       1.345       1.107       1.345       0.05953       9.26%       4.43%         140       4       0.3446       0.1258       0.5634       0.3446       0.2255       0.4636       0.06874       39.9%	34									-			
Z80         4         0													
Angular (Corrected) Transformed Summary           C-µg/L         Count         Mean         95% LCL         95% UCL         Median         Min         Max         Std Err         CV%         %Effe           1.6         Lab Control         4         1.345         1.345         1.345         1.345         1.345         0         0.0%         0.0%           21         4         1.286         1.096         1.475         1.345         1.345         0.05953         9.26%         4.43%           34         4         1.345         1.346         1.345         1.345         1.345         0.05953         9.26%         4.43%           71         4         1.286         1.096         1.475         1.345         1.345         0.05953         9.26%         4.43%           140         4         0.3446         0.1258         0.5634         0.3446         0.2255         0.4636         0.06874         39.9%         74.39			-		-			-			115.5%		
C-µg/L         Count of Type         Count         Mean         95% LCL         95% UCL         Median         Min         Max         Std Err         CV%         % Effe           1.6         Lab Control         4         1.345         1.345         1.345         1.345         1.345         0         0.0%         0.0%           21         4         1.286         1.096         1.475         1.345         1.345         0.05953         9.26%         4.43%           34         4         1.345         1.345         1.345         1.345         1.345         0.00%         0.0%           71         4         1.286         1.096         1.475         1.345         1.107         1.345         0.05953         9.26%         4.43%           140         4         0.3446         0.1258         0.5634         0.3446         0.2255         0.4636         0.06874         39.9%         74.39	280		4	0	0	0	0	0	0	0		100.0%	
Lab Control         4         1.345         1.345         1.345         1.345         1.345         1.345         0         0.0%         0.0%           21         4         1.286         1.096         1.475         1.345         1.107         1.345         0.05953         9.26%         4.43%           34         4         1.345         1.345         1.345         1.345         1.345         0         0.0%         0.0%           71         4         1.286         1.096         1.475         1.345         1.107         1.345         0.05953         9.26%         4.43%           140         4         0.3446         0.1258         0.5634         0.3446         0.2255         0.4636         0.06874         39.9%         74.39	Angular (Corre	ected) Transfor	med S	ummary									
21         4         1.286         1.096         1.475         1.345         1.107         1.345         0.05953         9.26%         4.43%           34         1.345         1.345         1.346         1.345         1.345         0         0.0%         0.0%           71         4         1.286         1.096         1.475         1.345         1.107         1.345         0.05953         9.26%         4.43%           140         4         0.3446         0.1258         0.5634         0.3446         0.2255         0.4636         0.06874         39.9%         74.39												%Effect	
34         4         1.345         1.345         1.345         1.345         1.345         0         0.0%         0.0%           71         4         1.286         1.096         1.475         1.345         1.107         1.345         0.05953         9.26%         4.43%           140         4         0.3446         0.1258         0.5634         0.3446         0.2255         0.4636         0.06874         39.9%         74.39		Lab Control											
71         4         1.286         1.096         1.475         1.345         1.107         1.345         0.05953         9.26%         4.43%           140         4         0.3446         0.1258         0.5634         0.3446         0.2255         0.4636         0.06874         39.9%         74.39													
4 0.3446 0.1258 0.5634 0.3446 0.2255 0.4636 0.06874 39.9% 74.39										-			
+ 0.2255 0.2255 0.2255 0.2255 0.2255 0.2255 0.2255 0.2255 0.2255													
	280		4	0.2255	0.2255	0.2256	0.2255	0.2255	0.2255	0	0.0%	83.24	

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ana	alytical Repo	ort					Report Date: Test Code:	02 Jun-16 16:14 (p 2 of 2 1E0CBFA1   05-0415-196
Americamysi	s 96-h Acute Sur	rvival Te	est					SPAWAR Systems Center
Analysis ID: Analyzed:	01-9167-8084 28 May-16 10:3			96h Survival F Nonparametric		Treatments	CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Survival								
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
1.6	Lab Control	1	1	1	1			
21	Eub Control	1	1	1	0.8			
34		1	1	1	1			
71		1	1	1	0.8			
140		0	0	0.2	0.2			
280		0	0	0	0			
Angular (Cor	rected) Transfor	med Dei	tail					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
1.6	Lab Control	1.345	1.345	1.345	1.345			
21		1.345	1.345	1.345	1.107			
34		1.345	1.345	1.345	1.345			
71		1.345	1.345	1.345	1.107			
140		0.2255	0.2255	0.4636	0.4636			
280		0.2255	0.2255	0.2255	0.2255			
96h Survival	Rate Binomials							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
1.6	Lab Control	5/5	5/5	5/5	5/5			
21		5/5	5/5	5/5	4/5			
34		5/5	5/5	5/5	5/5			
71		5/5	5/5	5/5	4/5			
140		0/5	0/5	1/5	1/5			
280		0/5	0/5	0/5	0/5			
Graphics								
10	• ZZ	•				0.15		
0.9	-					0.10		· · ·
0.8						-		
\$ 0.7						0.05		
96h Survival Rate						- Createred	/	
586 5						3 5 0.00		••
0.5						-0.05		
0.4								
0.3						-0.10		
0.2			-			E	• •	
Ē						-0.15		
0.1			f	•		• •		
مه <del>لــــــــــــــــــــــــــــــــــــ</del>	1.61C 21	34	71	140 280		-0.20	-10 -0.5 0.0	05 1.0 1.5 2.0
				==>		. 10		

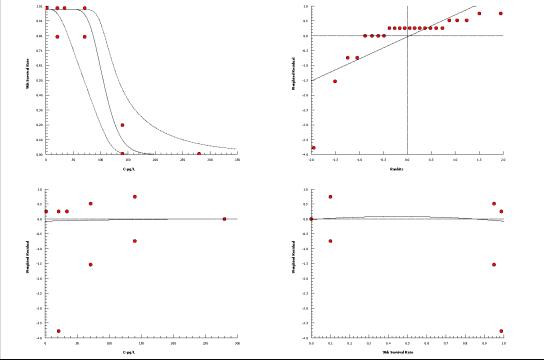
CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ana	lytical Repo	ort					-	ort Date: Code:			4 (p 1 of 2) -0415-1969
Americamysis	s 96-h Acute Sur	vival Test							SPA	WAR Syste	ms Center
Analysis ID: Analyzed:	19-3764-2302 28 May-16 10:3			h Survival Ra iear Regressi				S Version: ial Results:	CETISv1 Yes	.8.7	
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:00 03 May-16 09:0 96h	) Prot	ocol: EP cies: Am	rvival (96h) PA/821/R-02-f nericamysis t uatic Resear	pahia	ns, NH	Anal Dilue Brine Age:	ent: Labo e: Not	enne A Col pratory Sea Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:	•	Cod Mate Sou Stati	erial: Co rce: Pu	4EEC73 pper sulfate Ised Exposur atic	re		Clier Proj		WAR ed Exposur	e	
Linear Regres	-										
Model Function Log-Normal [N	on ED=A+B*log(X)]		Threshol Control TI		Threshold 1E-07	Optimized Yes	Pooled No	Het Corr No	Weighted Yes	1	
Regression S	ummarv										
Iters LL 11 -15.5	AICc	<b>BIC</b> 40.65	Mu 2.025	<b>Sigma</b> 0.09516	Adj R2	F Stat 5.642	Critical 3.16	P-Value 0.0066	Decision Significan	(α:5%) t Lack of Fit	t
Point Estimate Level µg/L LC50 105.9	95% LCL	<b>95% UCL</b> 122.5									
Regression P	arameters										
Parameter	Estimate	Std Error			t Stat	P-Value	Decision	. ,			
Threshold Slope	0.01667 10.51	0.01653 2.676	-0.01573 5.264	0.04906 15.75	1.008 3.927	0.3247 0.0008		ficant Param t Parameter	neter		
Intercept	-21.28	5.553	-32.16	-10.4	-3.832	0.0010	•	t Parameter			
ANOVA Table											
Source	Sum Squa	ares Mea	n Square	DF	F Stat	P-Value	Decision	α:5%)			
Model	89.03306	89.0		1	112.9						
Lack of Fit	8.028933	2.67		~		< 0.0001	Significan				
Hure Error	8 538012	0.47		3 18	5.642	<0.0001 0.0066					
Pure Error Residual	8.538012 16.56694	0.47 0.78		3 18 21			Significan				
	16.56694		4334	18			Significan				
Residual	16.56694		4334	18			Significan	t			
Residual Residual Anal Attribute Goodness-of-F	16.56694 ysis Method Tit Pearson C Likelihood	0.78 hi-Sq GOF Ratio GOF	4334 8902	18 21 <b>Test Stat</b> 16.57 11.1	5.642 Critical 32.67 32.67	0.0066 <b>P-Value</b> 0.7370 0.9608	Significan Significan Decision Non-Signi Non-Signi	t (α:5%) ficant Hetero ficant Hetero			
Residual Residual Anal Attribute Goodness-of-F Variances	16.56694 ysis Method it Pearson C Likelihood Mod Lever	0.78 hi-Sq GOF Ratio GOF ne Equality o	4334 8902 of Variance	18 21 <b>Test Stat</b> 16.57 11.1 0.964	5.642 Critical 32.67 32.67 2.773	0.0066 <b>P-Value</b> 0.7370 0.9608 0.4654	Significan Significan Decision Non-Signi Non-Signi Equal Var	t (α:5%) ficant Hetero ficant Hetero iances	ogenity		
Residual Residual Anal Attribute Goodness-of-F	16.56694 ysis Method it Pearson C Likelihood Mod Lever Shapiro-W	0.78 hi-Sq GOF Ratio GOF	4334 8902 of Variance ality	18 21 <b>Test Stat</b> 16.57 11.1	5.642 Critical 32.67 32.67	0.0066 <b>P-Value</b> 0.7370 0.9608	Significan Significan Decision Non-Signi Non-Signi Equal Var Non-norm	t (α:5%) ficant Hetero ficant Hetero	ogenity		
Residual Residual Anal Attribute Goodness-of-F Variances Distribution	16.56694 ysis Method it Pearson C Likelihood Mod Lever Shapiro-W	0.78 hi-Sq GOF Ratio GOF ne Equality c ilk W Norma	4334 8902 of Variance ality	18 21 <b>Test Stat</b> 16.57 11.1 0.964 0.6482	5.642 <b>Critical</b> 32.67 32.67 2.773 0.9169 2.492	0.0066 <b>P-Value</b> 0.7370 0.9608 0.4654 <0.0001	Significan Significan Non-Signi Non-Signi Equal Var Non-norm Non-norm	t (α:5%) ficant Hetero ficant Hetero iances al Distributic	ogenity		
Residual Anal Attribute Goodness-of-F Variances Distribution 96h Survival F C-µg/L C	16.56694 ysis Method Citelihood Mod Lever Shapiro-W Anderson- Rate Summary Control Type	0.78 hi-Sq GOF Ratio GOF ne Equality c ilk W Norma Darling A2 N Count	4334 8902 of Variance ality Jormality Mean	18 21 <b>Test Stat</b> 16.57 11.1 0.964 0.6482 3.533 <b>Min</b>	5.642 Critical 32.67 32.67 2.773 0.9169 2.492 Calcul Max	0.0066 P-Value 0.7370 0.9608 0.4654 <0.0001 <0.0001 ated Variate Std Err	Significan Significan Non-Signi Ron-Signi Equal Var Non-norm Non-norm e(A/B) Std Dev	t (α:5%) ficant Hetero iances al Distributic al Distributic CV%	orgenity on %Effect	A	В
Residual Anal Attribute Goodness-of-F Variances Distribution 96h Survival F C-µg/L C 1.6 L	16.56694 ysis Method Fit Pearson C Likelihood Mod Lever Shapiro-W Anderson-I Rate Summary	0.78 hi-Sq GOF Ratio GOF ne Equality of ilk W Norma Darling A2 N Count 4	4334 8902 of Variance ality Jormality <u>Mean</u> 1	18 21 <b>Test Stat</b> 16.57 11.1 0.964 0.6482 3.533 <b>Min</b> 1	5.642 Critical 32.67 32.67 2.773 0.9169 2.492 Calcul Max 1	0.0066 <b>P-Value</b> 0.7370 0.9608 0.4654 <0.0001 <0.0001 <b>ated Variato</b> <b>Std Err</b> 0	Significan Significan Non-Signi Non-Signi Equal Var Non-norm Non-norm e(A/B) Std Dev 0	t (a:5%) ficant Hetero ficant Hetero iances al Distributic al Distributic Distributic CV% 0.0%	ogenity on on <u>%Effect</u> 0.0%	20	20
Residual Residual Anal Attribute Goodness-of-F Variances Distribution 96h Survival F C-µg/L 1.6 21	16.56694 ysis Method Fit Pearson C Likelihood Mod Lever Shapiro-W Anderson- Rate Summary Control Type	0.78 hi-Sq GOF Ratio GOF te Equality of ilk W Norma Darling A2 N Count 4	4334 8902 of Variance ality Jormality Mean 1 0.95	18 21 <b>Test Stat</b> 16.57 11.1 0.964 0.6482 3.533 <b>Min</b> 1 0.8	5.642 Critical 32.67 32.67 2.773 0.9169 2.492 Calcul Max 1 1	0.0066 <b>P-Value</b> 0.7370 0.9608 0.4654 <0.0001 <0.0001 <b>ated Variat</b> <b>Std Err</b> 0 0.05	Significan Significan Non-Signi Non-Signi Equal Var Non-norm Non-norm e(A/B) Std Dev 0 0.1	t (a:5%) ficant Hetero iances al Distributic al Distributic CV% 0.0% 10.53%	weffect 0.0% 5.0%	20 19	20 20
Residual Anal Attribute Goodness-of-F Variances Distribution 96h Survival F C-µg/L C 1.6 L 21 34	16.56694 ysis Method Fit Pearson C Likelihood Mod Lever Shapiro-W Anderson- Rate Summary Control Type	0.78 hi-Sq GOF Ratio GOF te Equality of ilk W Norma Darling A2 N Count 4 4	of Variance ality Iormality Mean 1 0.95 1	18 21 <b>Test Stat</b> 16.57 11.1 0.964 0.6482 3.533 <b>Min</b> 1 0.8 1	5.642 Critical 32.67 32.67 2.773 0.9169 2.492 Calcul Max 1 1 1	0.0066 P-Value 0.7370 0.9608 0.4654 <0.0001 <0.0001 ated Variat Std Err 0 0.05 0	Significan Significan Non-Signi Non-Signi Equal Var Non-norm Non-norm e(A/B) Std Dev 0 0.1 0	t (a:5%) ficant Hetero iances al Distributic al Distributic CV% 0.0% 10.53% 0.0%	%Effect           0.0%           5.0%           0.0%	20 19 20	20 20 20
Residual Residual Anal Attribute Goodness-of-F Variances Distribution 96h Survival F C-µg/L 1.6 21	16.56694 ysis Method Fit Pearson C Likelihood Mod Lever Shapiro-W Anderson- Rate Summary Control Type	0.78 hi-Sq GOF Ratio GOF te Equality of ilk W Norma Darling A2 N Count 4	4334 8902 of Variance ality Jormality Mean 1 0.95	18 21 <b>Test Stat</b> 16.57 11.1 0.964 0.6482 3.533 <b>Min</b> 1 0.8	5.642 Critical 32.67 32.67 2.773 0.9169 2.492 Calcul Max 1 1	0.0066 <b>P-Value</b> 0.7370 0.9608 0.4654 <0.0001 <0.0001 <b>ated Variat</b> <b>Std Err</b> 0 0.05	Significan Significan Non-Signi Non-Signi Equal Var Non-norm Non-norm e(A/B) Std Dev 0 0.1	t (a:5%) ficant Hetero iances al Distributic al Distributic CV% 0.0% 10.53%	weffect 0.0% 5.0%	20 19	20 20

CETIS™ v1.8.7.16

CETIS Ar	alytical Rep	ort				Report Date: Test Code:	02 Jun-16 16:14 (p 2 of 2) 1E0CBFA1   05-0415-1969
Americamy	sis 96-h Acute Su	rvival Test	t				SPAWAR Systems Center
Analysis ID: Analyzed:	: 19-3764-2302 28 May-16 10:		•	Sh Survival F near Regres		CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Surviva	I Rate Detail						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
1.6	Lab Control	1	1	1	1		
21		1	1	1	0.8		
34		1	1	1	1		
71		1	1	1	0.8		
140		0	0	0.2	0.2		
280		0	0	0	0		
96h Surviva	l Rate Binomials						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
1.6	Lab Control	5/5	5/5	5/5	5/5		
21		5/5	5/5	5/5	4/5		
34		5/5	5/5	5/5	5/5		
71		5/5	5/5	5/5	4/5		
140		0/5	0/5	1/5	1/5		
280		0/5	0/5	0/5	0/5		
Graphics				Log-No	ormal [NED=A+B*log	(X)]	
1.01	•••				10		





CETIS Sum	nmary Repo	ort						Report Dat Test Code:				9 (p 1 of 1) 2-9641-1329
Americamysis	96-h Acute Su	rvival T	est							SPA	VAR Syste	ms Center
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:0 03 May-16 09:0 96h		Test Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-02- Americamysis Aquatic Resea	bahia	ns, NH		Analyst: Diluent: Brine: Age:	Labo	enne A Col <sup>y</sup> oratory Seav Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:	•		Code: Material: Source: Station:	5D308B46 Zinc sulfate Pulsed Exposu 3 Hour	re			Client: Project:		WAR ed Exposur	e	
Comparison S	Summary											
Analysis ID	Endpoint		NOEL	. LOEL	TOEL	PMSD	τu	Meth	nod			
03-8783-1724	96h Survival R	ate	3900	7400	5372	22.1%		Stee	I Many	y-One Rank	Sum Test	
Point Estimate	e Summary											
Analysis ID	Endpoint		Level	µg/L	95% LCL	95% UCL	τu	Meth	nod			
05-2303-6409	96h Survival R	ate	LC50	7810	6271	9733		Linea	ar Reg	pression (M	LE)	
96h Survival F	Rate Summary											
C-µg/L	Control Type	Coun	it Mean	95% LCL	95% UCL	Min	Max	Std	Err	Std Dev	CV%	% Effect
634	Lab Control	4	1	1	1	1	1	0		0	0.0%	0.0%
1800		4	1	1	1	1	1	0		0	0.0%	0.0%
3900		4	1	1	1	1	1	0		0	0.0%	0.0%
7400		4	0.3	0	0.7109	0	0.6	0.12		0.2582	86.07%	70.0%
15000		4	0.15	0	0.4547	0	0.4	0.09		0.1915	127.7%	85.0%
30000		4	0.05	0	0.2091	0	0.2	0.05		0.1	200.0%	95.0%
96h Survival F	Rate Detail											
C-µg/L	Control Type	Rep 1			Rep 4							
	Lab Control	1	1	1	1							
1800		1	1	1	1							
3900		1	1	1	1							
7400		0.6	0.2	0	0.4							
15000		0.4	0.2	0	0							
30000		0	0.2	0	0							
96h Survival F	Rate Binomials											
C-µg/L	Control Type	Rep 1	I Rep 2	Rep 3	Rep 4							
634	Lab Control	5/5	5/5	5/5	5/5							
1800		5/5	5/5	5/5	5/5							
3900		5/5	5/5	5/5	5/5							
7400		3/5	1/5	0/5	2/5							
15000		2/5	1/5	0/5	0/5							
		0/5	1/5	0/5	0/5							

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ana	lytical Repo	ort						-	ort Date: Code:			9 (p 1 of 2) 2-9641-1329
Americamysis	s 96-h Acute Su	vival To	est							SPA	WAR Syste	ms Center
Analysis ID: Analyzed:	03-8783-1724 28 May-16 10:4		Endpoint: Analysis:	96h Survival R Nonparametric		l vs 1	reatments		S Version		.8.7	
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:0 03 May-16 09:0 96h	0 00 -	Test Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-02 Americamysis Aquatic Resea	bahia	,	ns, NH	Anal Dilu Brin Age:	ent: Lat e: No	rienne A Col poratory Sea t Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:	•		Code: Material: Source: Station:	5D308B46 Zinc sulfate Pulsed Expose 3 Hour	ure			Clier Proj		AWAR Ised Exposur	re	
Data Transfor Angular (Corre		Zeta NA	Alt Hy C>T	yp Trials NA	Seed NA			PMSD 22.1%	<b>NOEL</b> 3900	LOEL 7400	<b>TOEL</b> 5372	ΤU
Steel Many-O	ne Rank Sum Te	est										
Control	vs C-µg/L		Test S		Ties		P-Value	P-Type	Decision			
634 634 634 634	1800 3900 7400* 15000*		18 18 10 10	10 10 10 10	1 1 0 0	6 6 6	0.8333 0.8333 0.0417 0.0417	Asymp Asymp Asymp Asymp	-			
634	30000*		10	10	0	6	0.0417	Asymp	Significa			
ANOVA Table												
Source Between Error	Sum Squ 5.332822 0.4314843		Mean 1.0665 0.0235		DF 5 18		F Stat 44.49	<b>P-Value</b> <0.0001	Decision Significat	<u> </u>		
Total	5.764307				23							
Distributional Attribute	Tests Test			Test Stat	t Critic	al	P-Value	Decision	(α:1%)			
Variances Variances Distribution	Mod Leve	quality	ality of Varia of Variance Normality		4.248 4.248 0.884	1	0.0033 0.0003 0.0075	Unequal \ Unequal \	/ariances	ion		
96h Survival I	Rate Summary											
<b>С-µg/L</b> 634	Control Type Lab Control	Count 4	t Mean 1	95% LCL 1	<b>. 95%</b> 1	UCL	Median 1	Min 1	Max 1	Std Err 0	<b>CV%</b>	%Effect 0.0%
1800 3900 7400		4 4 4	1 1 0.3	1 1 0	1 1 0.710		1 1 0.3	1 1 0	1 1 0.6	0 0 0.1291	0.0% 0.0% 86.07%	0.0% 0.0% 70.0%
15000 30000		4 4	0.15 0.05	0 0	0.454 0.209		0.1 0	0 0	0.4 0.2	0.09574 0.05	127.7% 200.0%	85.0% 95.0%
Angular (Corr	ected) Transfor	med Su	mmary									
C-µg/L	Control Type	Count	-	95% LCL	. 95%	UCL	Median	Min	Max	Std Err	CV%	%Effect
634 1800 3900 7400 15000 30000	Lab Control	4 4 4 4 4 4	1.345 1.345 1.345 0.565 0.3998 0.285	1.345 1.345 1.345 0.1122 3 0.04881 0.09558	1.346 1.346 1.346 1.018 0.750 0.474	; ; ; ;9	1.345 1.345 1.345 0.5742 0.3446 0.2255	1.345 1.345 1.345 0.2255 0.2255 0.2255	1.345 1.345 1.345 0.8861 0.6847 0.4636	0 0 0.1423 0.1103 0.05953	0.0% 0.0% 0.0% 50.37% 55.17% 41.77%	0.0% 0.0% 58.0% 70.28% 78.81%

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ana	alytical Repo	ort					Report Date: Test Code:	02 Jun-16 16:19 (p 2 of 2 11AAE0C1   02-9641-1329
Americamysi	s 96-h Acute Sur	vival Te	st					SPAWAR Systems Center
Analysis ID: Analyzed:	03-8783-1724 28 May-16 10:4		ndpoint: 96 nalysis: No		ate -Control vs 1	reatments	CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Survival	Rate Detail							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
634	Lab Control	1	1	1	1			
1800		1	1	1	1			
3900		1	1	1	1			
7400		0.6	0.2	0	0.4			
15000		0.4	0.2	ů O	0			
30000		0	0.2	õ	ů 0			
Angular (Cor	rected) Transforr	ned Det	ail					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
634	Lab Control	1.345	1.345	1.345	1.345			
1800		1.345	1.345	1.345	1.345			
3900		1.345	1.345	1.345	1.345			
7400		0.8861	0.4636	0.2255	0.6847			
15000		0.6847		0.2255	0.2255			
30000		0.2255		0.2255	0.2255			
		0.2255	0.4030	0.2255	0.2255			
	Rate Binomials							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
634	Lab Control	5/5	5/5	5/5	5/5			
1800		5/5	5/5	5/5	5/5			
3900		5/5	5/5	5/5	5/5			
7400		3/5	1/5	0/5	2/5			
15000		2/5	1/5	0/5	0/5			
30000		0/5	1/5	0/5	0/5			
Graphics								
<sup>10</sup> E						0.35 E		
0.9	•	•				0.30		•
0.8						0.25		
-						0.20		•
96h Survival Rate					3.	0.15		•
- 0.0 E					Centered	0.05		•
\$ <u>.</u>						0.00		~
Ē						-0.05		
0.4				7		-0.10	•	
0.3			┝┳┤			-0.15		
0.2						420	~	
-						425		
0.1				]		-0.30		
ω Ē	34LC 1800	3900	7400 15000	30000		-0.35	-10 -0.5 0.0	05 1.0 15 2.0

CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Analy	tical Repo	ort						ort Date: Code:			:19 (p 1 of 2) )2-9641-1329
Americamysis 9	5-h Acute Sur	vival Test							SPA	WAR Sys	tems Center
/	5-2303-6409 8 May-16 10:4			)6h Survival Ra .inear Regress				IS Version: cial Results	CETISv1 : Yes	.8.7	
Start Date: 2 Ending Date: 0	8-0018-1674 9 Apr-16 09:00 3 May-16 09:0 5h	) Pro 0 Spe	tocol: E ecies: A	Survival (96h) EPA/821/R-02- Americamysis I Aquatic Reseal	bahia	ns, NH	Ana Dilu Brin Age	ent: Lab e: Not	ienne A Col oratory Sea Applicable		
Sample ID:1:Sample Date:2:Receive Date:2:Sample Age:9:	9 Apr-16	Sou	terial: Z urce: F	5D308B46 Zinc sulfate Pulsed Exposu 3 Hour	re		Clie Proj		AWAR sed Exposur	re	
Linear Regressio	on Options										
Model Function	A - D# (301			old Option		Optimized		Het Corr	Weighted	ł	
Log-Normal [NED			Control	Threshold	1E-07	No	No	No	Yes		
Regression Sum Iters LL 16 -30.35	Mary AICc 65.27	BIC 67.06	Mu 3.893	<b>Sigma</b> 0.2547	Adj R2	<b>F Stat</b> 7.619	Critical	P-Value 0.0009	Decision Significan		<b>=</b> i+
	05.27	07.00	5.095	0.2347	0.0300	1.013	2.920	0.0003	Siginican	IL LACK OF	
Point Estimates Level µg/L LC50 7810	95% LCL 6271	95% UCL 9733									
Regression Para	meters										
Parameter	Estimate	Std Error	95% LC	CL 95% UCL	t Stat	P-Value	Decision	(α:5%)			
Slope Intercept	3.926 -15.28	0.6655 2.596	2.622 -20.37	5.231 -10.2	5.9 -5.887	<0.0001 <0.0001	-	t Parameter t Parameter			
ANOVA Table											
Source	Sum Squa	ares Me	an Square	DF	F Stat	P-Value	Decision	(α:5%)			
Model	62.36889	62.3	36889	1	41.65	<0.0001	Significar	t			
Lack of Fit	20.71187		77967	4	7.619	0.0009	Significar	t			
Pure Error Residual	12.23353 32.94539		79640 97518	18 22							
Residual Analysi	s										
Attribute	Method			Test Stat	Critical	P-Value	Decision	(α:5%)			
Goodness-of-Fit	Pearson C	hi-Sq GOF	:	32.95	33.92	0.0626		ificant Heter	ogenity		
	Likelihood			25.5	33.92	0.2738	-	ificant Heter			
Variances	Mod Lever				2.773	0.2972	Equal Va				
Distribution	Shapiro-W Anderson-		-	0.8677 1.295	0.9169 2.492	0.0047 0.0019		nal Distributio nal Distributio			
96h Survival Rat						ated Variat					
	trol Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	в
	Control	4	1	1	1	0	0	0.0%	0.0%	20	20
1800		4	1	1	1	0	0	0.0%	0.0%	20	20
3900		4	1	1	1	0	0	0.0%	0.0%	20	20
		4	0.3	0	0.6	0.1291	0.2582	86.07%	70.0%	6	20
7400											
		4	0.15 0.05	0	0.4 0.2	0.09574 0.05	0.1915 0.1	127.7% 200.0%	85.0% 95.0%	3 1	20 20

Analyst:\_\_\_\_\_ QA:\_\_\_\_

ETIS An	alytical Rep	ort				Report Date:         02 Jun-16 16:19 (           Test Code:         11AAE0C1   02-96	
Americamys	is 96-h Acute Su	urvival Tes	t			SPAWAR Systems	Center
Analysis ID: Analyzed:	05-2303-6409 28 May-16 10		•	ih Survival F near Regres		CETIS Version: CETISv1.8.7 Official Results: Yes	
96h Survival	Rate Detail						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
634	Lab Control	1	1	1	1		
1800		1	1	1	1		
3900		1	1	1	1		
7400		0.6	0.2	0	0.4		
15000		0.4	0.2	0	0		
30000		0	0.2	0	0		
96h Survival	Rate Binomials	;					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
634	Lab Control	5/5	5/5	5/5	5/5		
1800		5/5	5/5	5/5	5/5		
3900		5/5	5/5	5/5	5/5		
7400		3/5	1/5	0/5	2/5		
15000		2/5	1/5	0/5	0/5		
30000		0/5	1/5	0/5	0/5		
Graphics				Log-No	ormal [NED=	4+B*log(X)]	
121 031 031 031 031 031 031 031 03		•	200 ×000				

3.0

-0.5

-1.0 -1.5 -2.0

-2.5 -3.0

5000

10000

15000 С-µg/L

CETIS™ v1.8.7.16

3.0

0.0 -0.5

-1.0 -1.5

-2.0 -2.5 -3.0

0.1 0.2

Analyst:\_\_\_\_\_ QA:\_\_\_\_

0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 96h Survival Rate

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20000 25000

CETIS Sum	nmary Repo	ort						Report Dat Test Code:			Jun-16 16:1 FADE27   16	8 (p 1 of 1) 9416-2471
Americamysis	s 96-h Acute Su	rvival "	lest 🛛							SPA	WAR Syste	ms Center
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:0 03 May-16 09:0 96h		Test Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-02- Americamysis Aquatic Resea	bahia	ns, NH		Analyst: Diluent: Brine: Age:	Marienne Laborato Not Appl 5	ry Sea		
Sample ID: Sample Date: Receive Date: Sample Age:			Code: Material: Source: Station:	2D5FCE3B Zinc sulfate Pulsed Exposu 6 Hour	ire			Client: Project:	SPAWA Pulsed E		re	
Comparison S	Summary											
Analysis ID	Endpoint		NOEL	. LOEL	TOEL	PMSD	τu	Met				
19-0623-5659	96h Survival Ra	ate	1500	2500	1936	17.4%		Stee	l Many-Or	ie Ranl	k Sum Test	
Point Estimat	e Summary											
Analysis ID	Endpoint		Level	µg/L	95% LCL	95% UCL	τu	Met	hod			
18-7607-5786	96h Survival Ra	ate	LC50	3399	2782	4236		Line	ar Regres	sion (M	ILE)	
96h Survival F	Rate Summary											
C-µg/L	Control Type	Cour	nt Mean	95% LCL	95% UCL	Min	Max	std	Err Ste	d Dev	CV%	% Effect
6.4	Lab Control	4	1	1	1	1	1	0	0		0.0%	0.0%
850		4	1	1	1	1	1	0	0		0.0%	0.0%
1500		4	0.95	0.7909	1	0.8	1	0.05			10.53%	5.0%
2500		4	0.7	0.3818	1	0.4	0.8	0.1	0.2		28.57%	30.0%
5200 11000		4 4	0.15 0.05	0 0	0.3091 0.2091	0 0	0.2 0.2	0.05 0.05			66.67% 200.0%	85.0% 95.0%
		4	0.05	0	0.2091	0	0.2	0.05	0.		200.0%	93.0%
96h Survival F		_										
C-µg/L	Control Type	Rep	1 Rep 2 1	2 Rep 3	Rep 4							
6.4 850	Lab Control	1 1	1	1	1							
1500		1	1	1	0.8							
2500		۱ 0.8	0.4	0.8	0.8							
2300 5200		0.8	0.4	0.8	0.8							
11000		0.2	0.2	0	0.2							
		•		•	-							
96n Survival I C-µg/L	Rate Binomials Control Type	Rep	1 Rep 2	Rep 3	Rep 4							
C-μg/∟ 6.4	Lab Control	5/5	<u>кер</u> 5/5	5/5	5/5							
850		5/5	5/5	5/5	5/5							
1500		5/5	5/5	5/5	4/5							
2500		4/5	2/5	4/5	4/5							
5200		1/5	1/5	0/5	1/5							
11000		0/5	1/5	0/5	0/5							
11000		0/5	175	0/5	0/5							

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Anal	lytical Repo	ort						-	ort Date: Code:		Jun-16 16:1 ADE27   16	
Americamysis	96-h Acute Su	rvival To	est							SPA	WAR Syste	ms Center
Analysis ID: Analyzed:	19-0623-5659 28 May-16 10:4		Endpoint: Analysis:	96h Survival I Nonparametri		l vs 1	Freatments		IS Version	-	.8.7	
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:0 03 May-16 09:0 96h	0	Test Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-0 Americamysis Aquatic Rese	2-012 (20 s bahia	,	ns, NH	Anal Dilue Brin Age:	ent: Lal e: No	rienne A Col poratory Sea t Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:	29 Apr-16		Code: Material: Source: Station:	2D5FCE3B Zinc sulfate Pulsed Expos 6 Hour	ure			Clier Proj		AWAR Ised Exposur	e	
Data Transfori Angular (Corre		Zeta NA	Alt H C > T	yp Trials NA	Seed NA			<b>PMSD</b> 17.4%	<b>NOEL</b> 1500	LOEL 2500	<b>TOEL</b> 1936	TU
Steel Many-Or	ne Rank Sum To	est										
Control 6.4 6.4 6.4 6.4 6.4 6.4	vs C-μg/L 850 1500 2500* 5200* 11000*		Test \$ 18 16 10 10 10	Stat Critical 10 10 10 10 10 10	<b>Ties</b> 1 0 0 0	DF 6 6 6 6	<b>P-Value</b> 0.8333 0.6105 0.0417 0.0417 0.0417	P-Type Asymp Asymp Asymp Asymp Asymp	-	hificant Effect hificant Effect nt Effect nt Effect		
ANOVA Table					-	_			9			
<b>Source</b> Between Error	Sum Squ 4.671416 0.2614278		Mean 0.9342 0.0143		<b>DF</b> 5 18		F Stat 64.33	<b>P-Value</b> <0.0001	Decisior Significa			
Total	4.932844				23							
Distributional Attribute Variances Variances Distribution	Test Mod Leve	Equality	ality of Varia of Variance Normality	Test Sta ance 0.4585 4.126 0.8782	t Critic 4.248 4.248 0.884		<b>P-Value</b> 0.8018 0.0113 0.0076	<b>Decision</b> Equal Var Equal Var Non-norm	iances	ion		
96h Survival F	Rate Summary											
	Control Type Lab Control	Count 4 4 4 4 4 4 4	: Mean 1 0.95 0.7 0.15 0.05	95% LC 1 0.7909 0.3818 0 0	L 95% 1 1 1 1 0.309 0.209	1	Median 1 1 0.8 0.2 0	Min 1 0.8 0.4 0 0	Max 1 1 0.8 0.2 0.2	Std Err 0 0.05 0.1 0.05 0.05	CV% 0.0% 10.53% 28.57% 66.67% 200.0%	%Effect 0.0% 5.0% 30.0% 85.0% 95.0%
•	ected) Transfor											
	Control Type Lab Control	Count 4 4 4 4 4 4 4 4	: Mean 1.345 1.345 1.286 1.002 0.404 0.285	95% LCI 1.345 1.345 1.096 0.6655 1 0.2147 0.09558	L 95% 1 1.346 1.346 1.475 1.338 0.593 0.474	6	Median 1.345 1.345 1.345 1.107 0.4636 0.2255	Min 1.345 1.345 1.107 0.6847 0.2255 0.2255	Max 1.345 1.345 1.345 1.107 0.4636 0.4636	Std Err           0           0.05953           0.1056           0.05953           0.05953	CV% 0.0% 9.26% 21.09% 29.46% 41.77%	%Effect 0.0% 0.0% 4.43% 25.55% 69.96% 78.81%

Analyst:\_\_\_\_\_ QA:\_\_\_\_

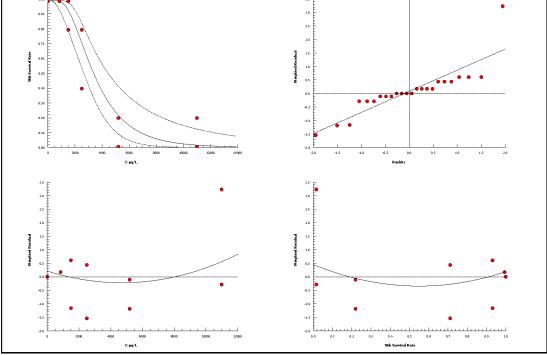
CETIS Ana	alytical Repo	ort					Report Date: Test Code:	02 Jun-16 16:18 (p 2 of 2 64FADE27   16-9416-247
Americamysi	s 96-h Acute Su	rvival Te	st					SPAWAR Systems Center
Analysis ID: Analyzed:	19-0623-5659 28 May-16 10:4		Endpoint: 96 Analysis: N	5h Survival R onparametric		Treatments	CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Survival	Rate Detail							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.4	Lab Control	1	1	1	1			
850		1	1	1	1			
1500		1	1	1	0.8			
2500		0.8	0.4	0.8	0.8			
5200		0.2	0.2	0	0.2			
11000		0	0.2	0	0			
Angular (Cor	rected) Transfor	med Det	ail					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.4	Lab Control	1.345	1.345	1.345	1.345			
850		1.345	1.345	1.345	1.345			
1500		1.345	1.345	1.345	1.107			
2500		1.107	0.6847	1.107	1.107			
5200		0.4636		0.2255	0.4636			
11000		0.2255		0.2255	0.2255			
96h Survival	Rate Binomials							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.4	Lab Control	5/5	5/5	5/5	5/5			
850		5/5	5/5	5/5	5/5			
1500		5/5	5/5	5/5	4/5			
2500		4/5	2/5	4/5	4/5			
5200		1/5	1/5	0/5	1/5			
11000		0/5	1/5	0/5	0/5			
Graphics								
۳E						0.25 E		
0.9	• •	•				0.20		
						0.15		•
0.8 F			$\square$			0.10		
966 Survival Rate			r <b>a</b>			<b>z 8</b> . 0.05		
0.6						Contered Contered Contered		
\$ .s						-0.05		
-						-0.10	•••	
0.4						-		
0.3						-0.15 E	•	
0.2			-			-0.20		
E			4	4		-0.25		
0.1				•		-0.30		
00 E	i.4LC 850	1500	2500 52	00 11000		-0.35 E	-10 -0.5 0.0	05 1.0 15 20

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Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Anal	ytical Repo	ort						oort Date: st Code:			18 (p 1 of 2) 6-9416-2471
Americamysis	96-h Acute Sur	vival Test							SPA	NAR Syst	ems Center
Analysis ID: Analyzed:	18-7607-5786 28 May-16 10:4		•	96h Survival Ra Linear Regress				TIS Version: icial Results:	CETISv1 : Yes	.8.7	
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:00 03 May-16 09:0 96h	) Pro 0 Spo	otocol: ecies:	Survival (96h) EPA/821/R-02- Americamysis I Aquatic Resear	bahia	ns, NH		uent: Labo ne: Not	ienne A Col oratory Sea Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:		So	terial: urce:	2D5FCE3B Zinc sulfate Pulsed Exposul 6 Hour	re				WAR sed Exposur	e	
Linear Regress	sion Options										
Model Functio				hold Option		Optimized		Het Corr	Weighted		
Log-Normal [NE			Contro	l Threshold	1E-07	No	No	No	Yes		
Regression Su Iters LL	AICc	BIC	Mu	Sigma	Adj R2	F Stat	Critical	P-Value	Decision		
19 -29.56		65.48	3.531	0.239	0.7879	3.172	2.928	0.0388	Significan	t Lack of F	It
Point Estimate Level µg/L LC50 3399	95% LCL 2782	95% UCL 4236	-								
Regression Pa	rameters										
Parameter	Estimate	Std Error	r 95% L	CL 95% UCL	t Stat	P-Value	Decisio	n(α:5%)			
Slope Intercept	4.185 -14.78	0.6923 2.427	2.828 -19.53	5.542 -10.02	6.045 -6.09	<0.0001 <0.0001	-	nt Parameter nt Parameter			
ANOVA Table											
Source	Sum Squa	ares Me	an Squa	re DF	F Stat	P-Value	Decisio	n(α:5%)			
Model	69.30309		30309	1	86.42	<0.0001	Significa				
Lack of Fit	7.294046		23512	4	3.172	0.0388	Significa	nt			
Pure Error Residual	10.3494 17.64345		74967 01975	18 22							
Residual Analy	rsis										
Attribute	Method			Test Stat	Critical	P-Value	Decisio	n(a:5%)			
Goodness-of-Fi		hi-Sg GOF		17.64	33.92	0.7269		nificant Heter	ogenity		
	Likelihood			12.36	33.92	0.9495	-	nificant Heter			
Variances	Mod Lever	ne Equality	of Variar	nce 0.5235	2.773	0.7554	Equal Va	ariances			
Distribution	Shapiro-W Anderson-		-	0.7878 y 1.871	0.9169 2.492	0.0002 <0.0001		mal Distributic mal Distributic			
96h Survival R				,		ated Variat					
	ontrol Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	в
	ab Control	4	1	1	1	0	0	0.0%	0.0%	20	20
850		4	1	1	1	0	0	0.0%	0.0%	20	20
1500		4	0.95	0.8	1	0.05	0.1	10.53%	5.0%	19	20
2500		4	0.7	0.4	0.8	0.1	0.2	28.57%	30.0%	14	20
5200		4	0.15	0	0.2	0.05	0.1	66.67%	85.0%	3	20
11000		4	0.05	0	0.2	0.05	0.1	200.0%	95.0%	1	20

CETIS An	alytical Rep	ort				Report Date: Test Code:	02 Jun-16 16:18 (p 2 of 2) 64FADE27   16-9416-2471
Americamy	sis 96-h Acute Su	urvival Test	t				SPAWAR Systems Center
Analysis ID: Analyzed:	18-7607-5786 28 May-16 10			ih Survival F near Regres		CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Surviva	l Rate Detail						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
6.4	Lab Control	1	1	1	1		
850		1	1	1	1		
1500		1	1	1	0.8		
2500		0.8	0.4	0.8	0.8		
5200		0.2	0.2	0	0.2		
11000		0	0.2	0	0		
96h Surviva	l Rate Binomials	;					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
6.4	Lab Control	5/5	5/5	5/5	5/5		
850		5/5	5/5	5/5	5/5		
1500		5/5	5/5	5/5	4/5		
2500		4/5	2/5	4/5	4/5		
5200		1/5	1/5	0/5	1/5		
11000		0/5	1/5	0/5	0/5		
Graphics				Log-No	ormal [NED=A+B*lo	g(X)]	
1.01					35 38		•



CETIS™ v1.8.7.16

CETIS Sun	nmary Repo	rt						Report Dat Test Code:				i6 (p 1 of 1) I-8335-2380
Americamysis	s 96-h Acute Sur	vival T	est							SPA	VAR Syste	ms Center
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:00 03 May-16 09:0 96h		Test Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-02- Americamysis Aquatic Resea	bahia	ns, NH		Analyst: Diluent: Brine: Age:	Labo	larienne A Colvin aboratory Seawater ot Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:	29 Apr-16		Code: Material: Source: Station:	351F5EE6 Zinc sulfate Pulsed Exposu 12 Hour	re			Client: Project:		WAR ed Exposur	e	
Comparison \$	Gummary											
Analysis ID	Endpoint		NOEL	. LOEL	TOEL	PMSD	τu	Meth	nod			
04-4300-7307	96h Survival Ra	ate	1500	3100	2156	17.5%		Dunr	nett M	lultiple Com	parison Tes	st
Point Estimat	e Summary											
Analysis ID	Endpoint		Level	μg/L	95% LCL	95% UCL	τυ	Meth	nod			
01-0152-0575	96h Survival Ra	ate	LC50	2774	2260	3456		Line	ar Reg	gression (M	LE)	
96h Survival I	Rate Summary											
C-µg/L	Control Type	Coun	it Mean	95% LCL	95% UCL	Min	Max	Std	Err	Std Dev	CV%	%Effect
6.4	Lab Control	4	1	1	1	1	1	0		0	0.0%	0.0%
360		4	1	1	1	1	1	0		0	0.0%	0.0%
910		4	0.95	0.7909	1	0.8	1	0.05		0.1	10.53%	5.0%
1500		4	0.95	0.7909	1	0.8	1	0.05		0.1	10.53%	5.0%
3100		4	0.35	0.0453	0.6547	0.2	0.6	0.09		0.1915	54.71%	65.0%
5900		4	0.1	0	0.2837	0	0.2	0.05	774	0.1155	115.5%	90.0%
96h Survival F	Rate Detail											
C-µg/L	Control Type	Rep 1	I Rep 2	Rep 3	Rep 4							
6.4	Lab Control	1	1	1	1							
360		1	1	1	1							
910		1	1	0.8	1							
1500		1	1	1	0.8							
3100		0.2	0.4	0.6	0.2							
5900		0	0.2	0.2	0							
96h Survival I	Rate Binomials											
C-µg/L	Control Type	Rep 1	I Rep 2	Rep 3	Rep 4							
6.4	Lab Control	5/5	5/5	5/5	5/5							
360		5/5	5/5	5/5	5/5							
910		5/5	5/5	4/5	5/5							
1500		5/5	5/5	5/5	4/5							
3100		1/5	2/5	3/5	1/5							

CETIS Anal	lytical Repo	ort					-	ort Date: Code:			7 (p 1 of 4) I-8335-2380
Americamysis	96-h Acute Sur	vival Tes	t						SPA	WAR Syste	ms Center
Analysis ID: Analyzed:	04-4300-7307 28 May-16 10:4			n Survival Ra rametric-Cor		tments		S Version: ial Results		.8.7	
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:00 03 May-16 09:0 96h	) Pr 0 Sp	ecies: Am	rvival (96h) A/821/R-02- nericamysis t uatic Resear	bahia	ns, NH	Anal Dilue Brine Age:	ent: Lab e: Not	rienne A Col poratory Sea Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:		Ma So	aterial: Zin ource: Pul	1F5EE6 ic sulfate Ised Exposul Hour	re		Clier Proje		AWAR sed Exposur	e	
Data Transform Angular (Corre		<b>Zeta</b> NA	Alt Hyp C > T	Trials NA	Seed NA		<b>PMSD</b> 17.5%	<b>NOEL</b> 1500	LOEL 3100	<b>TOEL</b> 2156	TU
Dunnett Multip	ole Comparison	Test									
Control 6.4 6.4 6.4 6.4 6.4 6.4	vs C-μg/L 360 910 1500 3100* 5900*		Test Stat 0 0.6931 0.6931 8.392 11.65	Critical 2.407 2.407 2.407 2.407 2.407	MSD         DF           0.207         6           0.207         6           0.207         6           0.207         6           0.207         6           0.207         6	P-Value 0.8333 0.5611 0.5611 <0.0001 <0.0001	P-Type CDF CDF CDF CDF CDF CDF	Non-Sign	ificant Effect ificant Effect ificant Effect nt Effect	t	
ANOVA Table											
Source Between Error Total	Sum Squares         Mean Square         DF           3.853589         0.7707179         5           0.2655657         0.01475365         18           4.119155         23				<b>F Stat</b> 52.24	<b>P-Value</b> <0.0001	Decision Significar	<u> </u>			
Distributional											
Attribute Variances Variances Distribution	Test	quality of		<b>Test Stat</b> 2.57 7.267 0.9014	<b>Critical</b> 4.248 4.248 0.884	<b>P-Value</b> 0.0635 0.0007 0.0231	<b>Decision(</b> Equal Var Unequal V Normal Di	iances /ariances			
96h Survival F	ate Summary										
	A Rate Summary         Count         Mean           Lab Control         4         1           4         1         4         0.95           4         0.95         4         0.35           4         0.1         0.1         0.1		<b>95% LCL</b> 1 0.7909 0.7909 0.0453 0	95% UCL 1 1 1 0.6547 0.2837	Median 1 1 1 0.3 0.1	Min 1 0.8 0.8 0.2 0	Max 1 1 1 1 0.6 0.2	Std Err           0           0.05           0.05           0.09574           0.05774	CV% 0.0% 10.53% 10.53% 54.71% 115.5%	%Effect 0.0% 0.0% 5.0% 5.0% 65.0% 90.0%	
Angular (Corre	ected) Transfor	ned Sum	mary								
	Control Type         Count         Mean         95% I           Lab Control         4         1.345         1.345           4         1.345         1.345           4         1.245         1.345           4         1.286         1.096			95% LCL 1.345 1.345 1.096 1.096	<b>95% UCL</b> 1.346 1.346 1.475 1.475	Median 1.345 1.345 1.345 1.345	Min 1.345 1.345 1.107 1.107	Max 1.345 1.345 1.345 1.345	<b>Std Err</b> 0 0 0.05953 0.05953	CV% 0.0% 9.26% 9.26%	% Effect 0.0% 0.0% 4.43% 4.43%
3100 5900	41.2861.09640.62450.301340.34460.1258				0.9478 0.5634	0.5742 0.3446	0.4636 0.2255	0.8861 0.4636	0.05955 0.1016 0.06874	9.26% 32.53% 39.9%	4.43% 53.58% 74.39%

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ana	alytical Repo	ort					Report Date: Test Code:	02 Jun-16 16:17 (p 2 of 4 AEDBC3C   01-8335-238(
Americamysi	s 96-h Acute Sur	vival To	est					SPAWAR Systems Center
Analysis ID: Analyzed:	04-4300-7307 28 May-16 10:4		Endpoint: 9 Analysis: P		ate ntrol vs Treat	ments	CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Survival	Rate Detail							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.4	Lab Control	1	1	1	1			
360		1	1	1	1			
910		1	1	0.8	1			
1500		1	1	1	0.8			
3100		0.2	0.4	0.6	0.2			
5900		0	0.2	0.2	0			
Angular (Cor	rected) Transfor	med De	tail					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.4	Lab Control	1.345	1.345	1.345	1.345			
360		1.345	1.345	1.345	1.345			
910		1.345	1.345	1.107	1.345			
1500		1.345	1.345	1.345	1.107			
3100		0.463		0.8861	0.4636			
5900		0.225		0.4636	0.2255			
96h Survival	Rate Binomials							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.4	Lab Control	5/5	5/5	5/5	5/5			
360		5/5	5/5	5/5	5/5			
910		5/5	5/5	4/5	5/5			
1500		5/5	5/5	5/5	4/5			
3100		1/5	2/5	3/5	1/5			
5900		0/5	1/5	1/5	0/5			
Graphics								
10 E	_					<sup>0.30</sup> E	I	
0.9	• •	•	•			0.25		•
0.8				Reject Null	_	0.20		/
Ē						Ē		
965 Survival R ate					2 8	0.15		
Name of the second			Г		Contered For Ande	0.10		· · ·
\$ 0.5					-	0.05		
0.4 E						0.00 E		/
				7				
0.3			Ľ	4		-0.05		
0.2			L			-0.10		
0.1						-0.15	<b>···</b>	
Ē						•		
0.0 [	i.4LC 360	910	1900 3	00 5900		-0.20	5 -10 -0.5 0.0	05 1.0 15 2.0
		C-µg/L					Rankits	

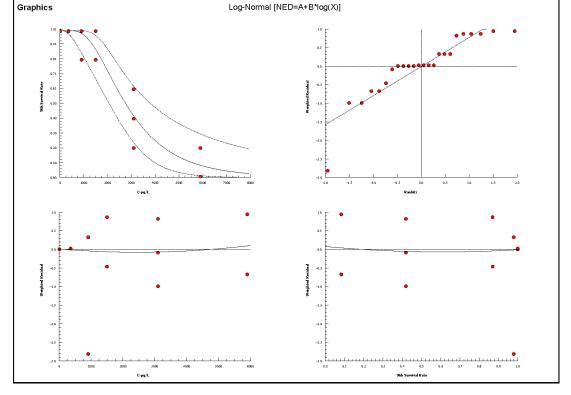
CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ana	lytical Repo	ort					-	ort Date: : Code:			17 (p 1 of 4) 1-8335-2380
Americamysis	s 96-h Acute Sur	vival Test							SPA	WAR Syste	ems Center
Analysis ID: Analyzed:	01-0152-0575 28 May-16 10:4			ih Survival Ra near Regress				1S Version: cial Results	CETISv1 : Yes	.8.7	
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:00 03 May-16 09:0 96h	) Prot	ocol: EF cies: Ar	urvival (96h) PA/821/R-02- nericamysis l quatic Resear	bahia	ıs, NH	Ana Dilu Brin Age	ent: Lab ie: Not	ienne A Col oratory Sea Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:	•	Cod Mate Sou Stati	erial: Zin rce: Pu	91F5EE6 nc sulfate Ilsed Exposu ? Hour	re		Clie Proj		WAR ed Exposu	e	
Linear Regres	-										
Model Functio	Dn ED=A+B*log(X)]			Id Option Threshold	Threshold 1E-07	Optimized Yes	Pooled No	Het Corr No	Weightee Yes	1	
			Control 1	mesnolu	12-01	163	110	110	163		
Regression S Iters LL	AICc	BIC	Mu	Sigma	Adj R2	F Stat	Critical	P-Value	Decision		
9 -28.6	5 64.51	66.84	3.443	0.2372	0.7903	2.796	3.16	0.0698	Non-Sign	ificant Lack	of Fit
Point Estimat Level µg/L LC50 2774	95% LCL 2260	95% UCL 3456									
Regression P	arameters										
Parameter	Estimate	Std Error	95% LCL			P-Value	Decision		4		
Threshold Slope	9.13E-08 4.215	6.75E-05 0.738	-0.00013 2.769	0.000133 5.662	0.001352 5.711	0.9989 <0.0001	-	ificant Paran 1t Parameter	heter		
Intercept	-14.51	2.53	-19.47	-9.554	-5.736	<0.0001	-	nt Parameter			
ANOVA Table											
Source	Sum Squa		n Square	DF	F Stat	P-Value	Decision	, ,			
Model Lack of Fit Pure Error Residual	67.82536 5.106187 10.95559 16.06178	1.70 0.60	2536 2062 8644 4847	1 3 18 21	88.68 2.796	<0.0001 0.0698	Significar Non-Sign				
Residual Anal	veie										
				Test Stat	Critical	P-Value	Decision	(a:5%)			
					32.67 32.67 2.773 0.9169	0.7662 0.8772 0.3968 0.0015	62 Non-Significant Heterogenity 72 Non-Significant Heterogenity 68 Equal Variances				
	Anderson-	Darling A2 I	Vormality	1.197	2.492	0.0039	Non-norn	nal Distributio	on		
	Rate Summary				ated Variat						
	ab Control	Count 4	Mean 1	Min 1	Max 1	Std Err 0	Std Dev	CV%	%Effect 0.0%	A 20	<b>B</b> 20
6.4 L 360		4	1	1	1	0	0	0.0%	0.0%	20 20	20 20
910		4	0.95	0.8	1	0.05	0.1	10.53%	5.0%	19	20
1500		4	0.95	0.8	1	0.05	0.1	10.53%	5.0%	19	20
3100		4	0.35	0.2	0.6	0.09574	0.1915	54.71%	65.0%	7	20
5900		4	0.1	0	0.2	0.05774	0.1155	115.5%	90.0%	2	20

CETIS™ v1.8.7.16

	alytical Rep	ort				Report Date: Test Code:	02 Jun-16 16:17 (p 2 of 4) AEDBC3C   01-8335-2380
Americamysi	is 96-h Acute Su	ırvival Test	:				SPAWAR Systems Center
Analysis ID: Analyzed:	01-0152-0575 28 May-16 10:			ih Survival F near Regres		CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Survival	l Rate Detail						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
6.4	Lab Control	1	1	1	1		
360		1	1	1	1		
910		1	1	0.8	1		
1500		1	1	1	0.8		
3100		0.2	0.4	0.6	0.2		
5900		0	0.2	0.2	0		
96h Survival	l Rate Binomials						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
6.4	Lab Control	5/5	5/5	5/5	5/5		
360		5/5	5/5	5/5	5/5		
910		5/5	5/5	4/5	5/5		
1500		5/5	5/5	5/5	4/5		
3100		1/5	2/5	3/5	1/5		
5900		0/5	1/5	1/5	0/5		



CETIS™ v1.8.7.16

Start Date: Ending Date:	18-0018-1674 29 Apr-16 09:00		'est Test Type:								
Start Date: Ending Date:	29 Apr-16 09:00 03 May-16 09:00	)	Test Type:						SPA	WAR Syste	ms Center
	0011	09:00 Species: Americamysis bahia Source: Aquatic Research Organisms, NH						Analyst: Diluent: Brine: Age:	Marienne A Col Laboratory Sea Not Applicable 5		
Sample Date: Receive Date:	•				re			Client: Project:	SPAWAR Pulsed Exposur	e	
Comparison Su	ummary										
Analysis ID	Endpoint		NOEL	. LOEL	TOEL	PMSD	τu	Meth	od		
13-8748-5682	96h Survival Ra	te	320	860	524.6	14.3%		Stee	Many-One Ran	k Sum Test	
Point Estimate	Summary										
Analysis ID	Endpoint		Level	μg/L	95% LCL	95% UCL	τυ	Meth	od		
07-3770-3886	96h Survival Ra	te	LC50	573	412	706.5		Linea	ar Regression (M	LE)	
96h Survival Ra	ate Summary										
C-µg/L C	Control Type	Coun	t Mean	95% LCL	95% UCL	Min	Max	Std I	Err Std Dev	CV%	% Effect
6.4 L	ab Control	4	1	1	1	1	1	0	0	0.0%	0.0%
81		4	0.95	0.7909	1	0.8	1	0.05	0.1	10.53%	5.0%
150		4	1	1	1	1	1	0	0	0.0%	0.0%
320		4	0.95	0.7909	1	0.8	1	0.05	0.1	10.53%	5.0%
860		4	0.1	0	0.2837	0	0.2	0.05		115.5%	90.0%
1600		4	0	0	0	0	0	0	0		100.0%
96h Survival Ra	ate Detail										
C-µg/L C	Control Type	Rep 1	l Rep 2	Rep 3	Rep 4						
6.4 L	ab Control	1	1	1	1						
81		1	1	1	0.8						
150		1	1	1	1						
320		1	1	1	0.8						
860		0	0	0.2	0.2						
1600		0	0	0	0						
96h Survival Ra	ate Binomials										
C-µg/L C	Control Type	Rep 1	l Rep 2	Rep 3	Rep 4						
6.4 L	ab Control	5/5	5/5	5/5	5/5						
81		5/5	5/5	5/5	4/5						
150		5/5	5/5	5/5	5/5						
320		5/5	5/5	5/5	4/5						
860		0/5	0/5	1/5	1/5						
1600		0/5	0/5	0/5	0/5						

CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Anal	lytical Repo	ort						ort Date: Code:		Jun-16 16:1 5A0788   08	
Americamysis	96-h Acute Su	rvival Te	st						SPA	WAR Syste	ems Cente
Analysis ID: Analyzed:	13-8748-5682 28 May-16 10:			96h Survival Ra Nonparametric		Treatments		IS Version		.8.7	
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:0 03 May-16 09:0 96h	0 F	Protocol:	Survival (96h) EPA/821/R-02- Americamysis I Aquatic Reseal	bahia	ms, NH	Anal Dilu Brin Age:	ent: Lai e: No	rienne A Col boratory Sea t Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:	•	N	flaterial: 2 Source: 1	73F9BDDB Zinc sulfate Pulsed Exposu Static	re		Clier Proj		PAWAR Ised Exposu	re	
Data Transforr		Zeta	Alt Hy		Seed		PMSD	NOEL	LOEL	TOEL	τu
Angular (Correc	cted)	NA	C > T	NA	NA		14.3%	320	860	524.6	
Steel Many-On	e Rank Sum T	est									
Control	vs C-µg/L		Test St	at Critical	Ties DF	P-Value	P-Type	Decision	n(α:5%)		
6.4	81		16	10	1 6	0.5661	Asymp	Non-Sigr	nificant Effec	t	
6.4	150		18	10	16	0.8000	Asymp	Non-Sigr	nificant Effect	t	
6.4	320		16	10	1 6	0.5661	Asymp	Non-Sigr	nificant Effect	t	
6.4	860*		10	10	0 6	0.0350	Asymp	Significa	nt Effect		
ANOVA Table											
Source	Sum Squ	ares	Mean \$	Square	DF	F Stat	P-Value	Decision	a(a:5%)		
Between	3.030868	ares	0.7577	•	4	80.17	<0.0001	Significa	, ,		
Error	0.141769	8	0.0094		15			orginited			
Total	3.172638				19	_					
Distributional	Tests										
				T1 01-1	Critical	D Value	Desision	(			
Attribute Variances	Test		ality of Varia	Test Stat	Critical 4.893	P-Value 0.1915	Decision Equal Va	, ,			
Variances			f Variance	8.75	4.893	0.0007					
Distribution	Shapiro-			0.8533	0.866	0.0061	•	al Distribul	tion		
96h Survival R	ate Summary		-								
	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	cv%	%Effect
	Lab Control	4	1	1	1	1	1	1	0	0.0%	0.0%
81		4	0.95	0.7909	1	1	0.8	1	0.05	10.53%	5.0%
150		4	1	1	1	1	1	1	0	0.0%	0.0%
320		4	0.95	0.7909	1	1	0.8	1	0.05	10.53%	5.0%
860		4	0.1	0	0.2837	0.1	0	0.2	0.05774	115.5%	90.0%
1600		4	0	0	0	0	0	0	0		100.0%
Angular (Corre	ected) Transfor	med Su	nmary								
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
6.4	Lab Control	4	1.345	1.345	1.346	1.345	1.345	1.345	0	0.0%	0.0%
81		4	1.286	1.096	1.475	1.345	1.107	1.345	0.05953	9.26%	4.43%
150		4	1.345	1.345	1.346	1.345	1.345	1.345	0	0.0%	0.0%
320		4	1.286	1.096	1.475	1.345	1.107	1.345	0.05953	9.26%	4.43%
	4 0.3446 0.1258			0.500.4	0 2 4 4 6	0.2255	0.4636	0.06974	20.00/	74.39%	
860 1600		4 4	0.3446	0.1256	0.5634 0.2256	0.3446 0.2255	0.2255	0.4030	0.06874 0	39.9% 0.0%	83.24%

CETIS Ana	alytical Repo	ort					Report Date: Test Code:	02 Jun-16 16:16 (p 2 of 2 355A0788   08-9509-2616
Americamysi	s 96-h Acute Sur	vival Te	st					SPAWAR Systems Center
Analysis ID: Analyzed:	13-8748-5682 28 May-16 10:3		indpoint: 9 malysis: N		ate c-Control vs T	reatments	CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Survival		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		onparametri		- datificanto	• molar resourcer	100
		<b>D</b> 4	<b>D</b> 0	<b>B</b> 0	<b>B</b>			
С-µg/L 6.4	Control Type Lab Control	Rep 1	Rep 2	Rep 3	Rep 4			
81	Lab Control	1	1	1	0.8			
150		1	1	1	1			
320		1	1	1	0.8			
860		0	0	0.2	0.2			
1600		0	0 0	0.2	0.2			
		-		0	0			
•	rected) Transfor	med Det	ail					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.4	Lab Control	1.345	1.345	1.345	1.345			
81		1.345	1.345	1.345	1.107			
150		1.345	1.345	1.345	1.345			
320		1.345	1.345	1.345	1.107			
860		0.2255		0.4636	0.4636			
1600		0.2255	0.2255	0.2255	0.2255			
96h Survival	Rate Binomials							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.4	Lab Control	5/5	5/5	5/5	5/5			
81		5/5	5/5	5/5	4/5			
150		5/5	5/5	5/5	5/5			
320		5/5	5/5	5/5	4/5			
860		0/5	0/5	1/5	1/5			
1600		0/5	0/5	0/5	0/5			
Graphics								
0.9	•	•	•			0.15		• •
0.8						0.10		
E						0.05		
96h Survival Rate					2 8			/
50 0.6					Contered Core Anolo	0.00		•••
\$ 0.5						Ē		
0.4						-0.05		
Ē						E		
0.3 E						-0.10		
0.2			Г	_			••	
0.1				•		-0.15		
Ē				•		-0.20		
	5.4LC 81	150	320 6	60 1600		-0.20 -15	-10 -05 0.0	05 1.0 1.5 2.0
		C-µg/L					Rankits	

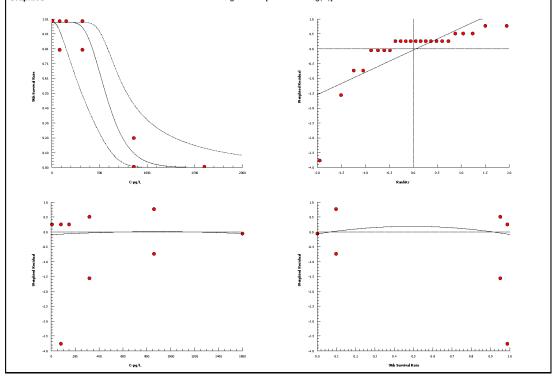
CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ana	lytical Repo	rt					-	ort Date: t Code:			16 (p 1 of 2) 8-9509-2616
Americamysis	96-h Acute Sur	vival Test							SPA	WAR Syste	ems Center
Analysis ID: Analyzed:	07-3770-3886 28 May-16 10:3			h Survival Ra iear Regress				FIS Version: cial Results	CETISv1 : Yes	.8.7	
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:00 03 May-16 09:0 96h	Prot	ocol: EF cies: An	rvival (96h) PA/821/R-02- nericamysis l uatic Resear	pahia	ns, NH		ient: Lab ne: Not	ienne A Col oratory Sea Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:	•	Cod Mate Sou Stati	erial: Zir ce: Pu	F9BDDB ic sulfate Ised Exposu atic	re		Clie Pro		WAR sed Exposu	re	
Linear Regres	sion Options										
Model Function	n ED=A+B*log(X)]		Threshol Control T		Threshold 1E-07	Optimized Yes	Pooled No	Het Corr No	Weightee Yes	d	
Regression Su	ummary										
Iters LL	AICc	BIC 40.67	Mu 2.758	<b>Sigma</b> 0.1375	Adj R2	F Stat 5.67	Critical 3.16	P-Value 0.0065	Decision Significar	(α:5%) It Lack of F	it
Point Estimate	25										
Level µg/L	95% LCL 412	95% UCL									
Regression Pa	arameters										
Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decisior	n(α:5%)			
Threshold	0.01676	0.01656	-0.0157	0.04922	1.012	0.3231		nificant Paran	neter		
Slope Intercept	7.271 -20.05	1.807 5.131	3.729 -30.11	10.81 -9.997	4.023 -3.908	0.0006 0.0008	-	nt Parameter nt Parameter			
ANOVA Table							-				
<b>Source</b> Model Lack of Fit Pure Error	<b>Sum Squa</b> 88.99298 8.069011 8.538012	88.9 2.68 0.47	4334	<b>DF</b> 1 3 18	<b>F Stat</b> 112.5 5.67	<b>P-Value</b> <0.0001 0.0065	Decision Significa Significa	nt			
Residual	16.60702	0.79	0811	21							
Residual Anal											
Attribute Goodness-of-F Variances Distribution	Likelihood Mod Lever Shapiro-W		ality	<b>Test Stat</b> 16.61 11.12 0.9677 0.6616 3.359	Critical 32.67 32.67 2.773 0.9169 2.492	P-Value 0.7346 0.9603 0.4634 <0.0001 <0.0001	Non-Sigr Equal Va Non-norr	nificant Heter nificant Heter	ogenity on		
96h Survival Rate Summary					Calcul	ated Variat	e(A/B)			-	
	ontrol Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	В
6.4 L 81 150 320	ab Control	4 4 4	1 0.95 1 0.95	1 0.8 1 0.8	1 1 1 1	0 0.05 0 0.05	0 0.1 0 0.1	0.0% 10.53% 0.0% 10.53%	0.0% 5.0% 0.0% 5.0%	20 19 20 19	20 20 20 20
320 860 1600		4 4 4	0.95 0.1 0	0.8 0 0	1 0.2 0	0.05 0.05774 0	0.1 0.1155 0	10.53% 115.5%	5.0% 90.0% 100.0%	19 2 0	20 20 20

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS A	Analytical Rep	ort				Report Date: Test Code:	02 Jun-16 16:16 (p 2 of 2) 355A0788   08-9509-2616
Americam	nysis 96-h Acute Su	ırvival Tes	t				SPAWAR Systems Center
Analysis I Analyzed:			•	ih Survival F near Regres		CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Survi	val Rate Detail						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
6.4	Lab Control	1	1	1	1		
81		1	1	1	0.8		
150		1	1	1	1		
320		1	1	1	0.8		
860		0	0	0.2	0.2		
1600		0	0	0	0		
96h Survi	val Rate Binomials						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
6.4	Lab Control	5/5	5/5	5/5	5/5		
81		5/5	5/5	5/5	4/5		
150		5/5	5/5	5/5	5/5		
320		5/5	5/5	5/5	4/5		
860		0/5	0/5	1/5	1/5		
1600		0/5	0/5	0/5	0/5		
Graphics				Log-No	ormal [NED=A+B*log	(X)]	



CETIS™ v1.8.7.16

# Water Quality Measurements & Test Organism Survival

Final Review: 11 2012/110

Project: Mixel Hetal Ruls Tech Initials Cu+Zn Test Species: 🔺 ballia Start Date/Time: 4/24/16 0900 Sample ID: \_\_\_\_\_\_  $C_{1}+Z_{1}$ 24 48 72 0 96 Counts: JA JA JA JA JA Readings: JA JM JM JM JM Test No.: End Date/Time: 5/3/16 0900 SYAC Dilutions made by: Number of Live Τ Salinify Т т.

202	5555555 55555 55555	) 24 2 333 1 345	'33.S					1/4.1 f					<b>!</b>	72 7.&	96 7.1	0 7.97	24 85.01	48 i 5 f	72 8.17	96 7.1
4 5 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	( 345						ľ					<b>!</b>				85.01	18.00 f	8.17	7.1
20202020	555555	( 345						ľ					<b>!</b>				3	1		
20202000	5 34 5 5 5 5 5 5 5		: 34.5 [	94.S	<u> </u>	19.9	19,5	19.1	10 9	2. 0										
202020	5 34 5 5 5 5 4		: <u>3</u> 4.5 [	34.S	<b>7</b> 4.9	19,0	19,0	19.1	10 9	2. 6									1385	
2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	5 5 5 5 %		34.5 '	34.S	<u> 34.9</u>	19.0	19,0	19.1	10 9	2. 0		1		-						
2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	5 5 5 X		-			100.00		R 1 /	110.1	118.6	7.5	7.7	7.6	7.7	20	5.4	8.01	801	7.74	7.5
2 2 2 2	5 5 34			1,000,000	120000	30.04		f					f					1-		100
555	5 84																			
5	e																			
5	<b></b> 193	7 343	346	34.9	348	19.1	19.1	19.1	18.9	19.7	7.6*	7.7	7,4	7.7	2.1	2.77	7.79	17.28	7.94	7.7
	5		1-					f					F					ſ	1.1	
	5																			
	5																			
3	3 31	7 34.9	34.3	34.5	34.C	18.1	19,0	19.1	186	19.8	7.6	7.8	17.5	7.G	7.0	7.77	7.79	277	7.8%	7.79
1	1		f					f					- ۱					ſ		
2	-																			inge Solo
1	- Dev																			
2	2. 34.	34.5	345	34.7	34.8	81	19.0	19.1	18.7	19.9	7.7	7.8	7.5	7:7	7.3	7.8	7.38	7.86	7.84	7.86
1			f					' ~ '					·					- 1		
~	-			設定																1999
1	0													94999 24003					355 1	
-	- 34,	1 34.3	34.3	34.6		9.9	i\$,1	181	19.0	ĺ	7.9	7.9	7.7	9.6	1	2.87	801	2.85	7.99	
1	1		'					'					'					f		5.0
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			i					·					1					i		
			f					f					f					f	NACE A CE	
	1000 1000 1000 1000							Yes												
																			833	
	2 2 1 1 - 1	1 1 2 2 2 2 1 1 1 1  1 0 34, 1 1	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$										

QC Check:

SPAWAR Systems Center Pacific Bioassay Lab, 53475 Strothe Rd, Bidg 111 Rm 116, San Diego, CA 92152

ME

12015

5

# Water Quality Measurements & Test Organism Survival

Project: Mixed Medal Filsed Tod CuriEn	Test Species:	A. balua				Te	ch Init	ials	
Sample ID: <u>6 hr</u> Cut Zh	Start Date/Time:	4/2/16 0800			0	24	48	72	96
Test No.:	End Date/Time:	5/3/10 000	>	Counts:	M	34	34	- MC	JUA .
			· ·	Readings:	IM	Ju	JM	35	λĒ
				Dilutions made by:	Whe		-		300
					,				

	Sample ID	Rep			ber o ganis		•		:	Sallnii (ppt)				Ter	npera (°C)	ture			Disso	lved ( (mg/L		n			pH (units	)	
			0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
	LC	Α	5	5	5	5	5	34.S	34.3	33.9	24.9	34.8	14.0	19.1	19.1	188	14.4	7.7	7.9	19	7.8	7.1	7.98	7.17	17.55		
1	Sharadery 3h	в	5	5	5	5	5			ľ					f					1_					f		
		С	5	5	5	5	\$																				
		D	5	5	5	5	5												87980 8668						239) 239)		
	TU .125	Α	5	5	5	5	5	34.1	33.9	14.3	34:6	34.8	19.0	19.]	18.1	188	19.4	7.8	7.9	7.8	7.7	7.4	7.97	801	8.00	8.00	7.88
		В	5	5	9	5	5			f										f					f		
		С	5	5	5	S	5																				
		D	5	5	5	5	5																				
	TU-25	Α	5	5	5	5	5	345	34.6	jus.	34.7	34.7	14.2	19.0	19.1	K5.5	19.6	7.9	7.6	7.5	7.6	7.2	8.01	ŝ	8.00	7.96	7.93
		В	5	5	5	5	5			f					f					f)					f		
		С	5	5	5	5	5																				
		D	5	5		4	4																				
	TU.5	Α	5	4	4	4	4	34.7	34.5	1 34.C	34.9	34.6	180	19.0	1R./	18.B	19:7	7.6	7.5	1.6	7.7	7.2	7.97	7.79	1.97	7.Y	7,96
		В	5	4	3	2	2			f					-					f					f		
		С	5	5	5	4	ч																				
		D	5	4	4	4	Ц														2010				16049 28005		
	TUI	Α	5	Ż	Ì	1	۱	34.5	34.3	34.5	34.8	34.8	lî:o	18.1	19.1	18.8	19.6	7.5	27	7.6	7,8	りっこ	7.98	7.97	7.67	7,77	7.96
		в	5	2	1	1	1			ţ					f					ť					f		
		С	5	3	O	~	-															198646					
		D	5	2	1	1	1																				
	TUZ	Α	5	0	~	-	-	<u>37.9</u>	33,I	34.3	34.1	34.9	91	(î.]	17.1	18.8	19.6	7.7	7.6	7.7	7.7	7,2	7.%	7.80	7.90	7.91	797
		в	5	Z.		1	1			f					f					f					<sup>†</sup>		
			4	2	0	-	ļ																2899 NGS				
		D	5	2	0	-	-																1993				
		A													i			-		<u>ا</u>					i		
		в								r					f					f					f		
		С										333		- 223													
		D																									
	Initial Counts QC'd by:	7,1	ι																								
						A .F	20		/	/							1					ſ					
	Animal Source/Dat	e Rece	lved	: -		140		4/	28/	16		Age at	initia	tion:		50	/							· · · · · ·	ing Ti		
																							0	24	48	72	96
	Comments:	-									-	ing in t	est ch	ambe	r prìor	to ren	ewal						0700				1815
								ation, c														PM:	1900	Isas	1400	600	
				_		Arcle	one (	y (n	)) if ye	s, san	nple ID	D(s):			D	uratio	n:										
		-		ion so																			1	1	, ۱	. \	
	QC Check:	3 in	Ċ.	6	<u>, / 1</u>	12	<u>ei 6</u>													Fin	al Rev	iew:	$\mathcal{V}$	U	6	$\mathcal{F}II$	Q

SPAWAR Systems Center Pacific Bioassay Lab, 53475 Strothe Rd, Bidg 111 Rm 116, San Diego, CA 92152

### Water Quality Measurements & Test Organism Survival

Test Species: A bahia Start Date/Time: <u>4/14/16 0900</u> End Date/Time: <u>5/3/16 0900</u> Project: Mixed Metal Cut Zu Rilard Test Tech Initials 24 48 72 Sample ID: CutZn 12 hr Ð 96 JA JA JA JA Test No.: 5M Counts: an In Jun Jun Jun Readings: Dilutions made by:

Sample ID	Rep			ber o ganis	f Live sms	,			Salinii (ppt)				Tei	npera (°C)	ture			Disso	lved ( (mg/L		n			pH (units	i)	
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
LC	Α	5	5	5	5	5	34.1	34.1	33.9	31.9	34.8	19.0	19.1	19.1	18.8	19.4	7.5	7.6	7.7	7.%	7.2	7.89	7.98	17.78	8,1-	7.17
Shared uf 3h	в	5	5	5	5	5			f					۲ <u>-</u>					f					٢		
	С		5	5	5	5																				
	D	5	5	5	5	5																				
	Α					51-	×-	Participan D	i								<u> </u>	<u> </u>						<u> </u>		
	В								f					f					ſ					f		
	С						333																20090 20040			
	D		ļ																							
TU ,125	Α	5	5	5	5	5	34.2	339	34,1	34·5	345	14.0	19.1	18.1	18.8	19.2	7.7	7.8	7.4	29	7.5	7.71	7.78	7.67	8.0	7.13
	в	5	5	5	5	5			f					ſ _					- 1					f		
	С	5	5	5	5	5																				
	D	5	S	5	5	5							101495 George													
TU.25	A	5	5	5	5	5	34.5	34.7	347	34.7	34.9	19.9	18.1	19.1	18.8	19.2	7.6	7.7	7.6	7.9	7,3	2.99	7.89	8.01	7.17	7,96
	В	5	5	5	5	5			'					<u>'</u> ~					'					-		
	C	2	5	5	4	4												1999) S.S.S.S.								
	D	5	5	5	5	Ś																				
70:5	Α	5	5	5	S	5	34,6	34.7	34.6	34.8	34.)	19.9	18,1	18.1	18.8	19.2	7.5	7.6	7.5	1.8	7.Z	7.99	7.80	8.00	7.97	7.9Z
	в	5	5	5	5	5			[				23/22) 409-50	f					' <u> </u>					٢		
		5	5	5	5	5																				
	D			4	4	4																				
TU I .	Α	5	4	ł	1	1	345	34.7	34,2	<sup>2</sup> H.I	34.7	120	k.	19.1	188	19,2	7.4	7.6	7.6	7.7	7.6	7,94	7.57(	7.98	1.86	7.98
	в	4	2	2	2	2			<u>f</u>					'					'					f		
	С	5	~	3	3	3								- <u>88</u>												
	D		3	1	1	1						1975		33								2000				
TUZ		4	1	0	~	<u>~</u>	強7	<del>348</del>	348	34.9	34.8	18,0	19.1	19.1	18.8	19.2	7.9	7.9	7.8	7,8	7.6	7.92	7.87	7.8	7.97	7.96
	в	3		1	1	1			<u> </u>				355	<u>۲</u>					'					'		
		5	Ζ.	1		1											10000								-827	
	-	5	3	1	0							365														
Initial Counts- QC'd by:_	Juy															, .										
Animal Source/Dat	e Rece	eived	: .	1	ARC	2	4/	25/1	6		Age at	Initia	tion:		50	<u>ر</u>					[		Feed	ling <sub>.</sub> Ti	mes	
																		_				0	24	48	72	96
Comments:	j	l = inl	tial re	ading	in fre	sh te	st solu	ition, f	= fina	l read	ing in t	est ch	ambe	r prior	to ren	ewal					AM:	MD.	Nas	100	08%	9815
		Orga	nisms	fed p	rior to	initia	ation, d	circle o	one (	DI I	1)											Na		140		
		Tests	aera	ted? (	Circle	one (	v //n	) if ve	s, san	nole IC	D(s):			0	uratio	n:					-					

QC Check:

Aeration source: Glilzorg JUD.

Final Review: 11 6/2/16

SPAWAR Systems Center Pacific Bioassay Lah, 53475 Strothe Rd, Bldg 111 Rm 116, San Diego, CA 92152

### Water Quality Measurements & Test Organism Survival

Project: Mixed Metal Pulsed Test Cut Za	Test Species:	A, bahia			Te	ch laiti	ials	
Sample ID: 16 hr CU + Zh	Start Date/Time:	4/29/16 09:00	-	0	24	48	72	96
Test No.:	End Date/Time:	5/3/16 0900	Counts:	Ξ.	ЗM	J.H	Ň	JU
	_	·	Readings:	<b>(</b>	54	34	M	3M
			Dilutions made by:	IΜ		-		1000 1000

Sample ID	Rep			iber o ganis		)			Salini (ppt)				Те	npera (°C)				Disso	lved ( (mg/l		en			pH (units	;)	
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
LC	Α	5	5	Ś	5	5	34.2	34.1	1 93.73	34.1	34.8	190	19.0	181	18.8	19.4	7.8	7.7	7.9	7.8	7.2	7.99	80	3.0	8.17	7.17
shared with )	в	5	5	5	9	9			ſ					f					1					f		
	С	5	5	5	5	5																				
	D	5	5	5	ک	5																				
TW. 125	Α	5	5	5	5	5	33.9	33.9	H.1	345	34.9	18.0	RO	18.1	188	19.2.	28	7.9	7.7	7.7	7.1	7.98	8.00	\$.00	7.99	7.97
	в	5	5	5	5	5			1					f					f					f		
	С	5	5	5	5	5																				
	D	5	4	4	4	Ц																				
TU ,25	Α	5	5	5	5	5 5	33.8	34.1	j 34.7	Gi C	34.8	120	19:0	19.1	18.8	14.2.	7.8	8.0	120	7.9	7.2	7.99	801	17.99	7.86	7.98
	в	5	5	5	5	5			f,					f					f					f		
	С	5	5	5	5	5																				
	D	5	5	5	5	5																				
TU 0.5	Α	5	5	5	5	5	343	34.1	34.7	34.7	34.9	8.1	19.0	49,1	183	19.2	25	7.6	7.7	80	7.4	7.99	289	5 52	7.97	7.94
	в	5	5	5	5	5			1					f					1-		3333			f		
	С	5	5	5	5	5			/48094 07-07-01						lanada berber								ALC: N	00000 20000		
•	D	5	4	4	4	9																				
TUI	Α	5	3	1	0	1	34.2	34.1	34.8	34.8	34.5	19.1	1e, 1	18.1	18.8	19.1	27	7.8	24	26	1.9	7.91	7.91	2.70	7.9%	7.79
	в			ü	3	0			۲.,					f					f					f		
	С	5	4 5	4	2	1																				
	D	5	3	2	1	1																				200
TUZ	Α	5	2	0	+	^	341	34.Z	3/3	34.9	-	19.1	19.1	481	18.8	<	7.7	7.9	47.5	76	-	7.77	7.89	1	7.99	*-0mm
	в	5	4 =	žo	~	~			f			3555		f		3933 3933	550 C		f	1.0	1333			f	1993	1925
	С		4	0	~																					
	D	5	3	0	~	~																			1997	
	A	ţ.	~					<u></u>	1					l	10.000	2000			I			et et lieur		I		
	в								f	1833	833	333	133.2	f	13333	1933-55	33	3353	f	335	3352	iw.	395	f	22	1000
	С											1000														
	D													12404		1986 - 1986 1986 -								133.44 133343		
Initial Counts	-							100000	10.83131 1	70.001	0.000	.6.3.4	10000	1.1.272	20234	2014.2	No. in	1.00	10429	19995	324333	5.34	10.00	100	116	10000
Initial Counts QC'd by:	1 m														50	<b>`</b>										
nimal Source/Dat	e Reco	eived	:	ł	420	2	4/2	8/1	6		Ace a	t Initia	ation:		50	,		•					Feed	ding Ti	mes	
						÷		*/ (	<u></u>													0	24	48	72	96
Comments:		i = ini	tial re	ading	in fre	sh te	st solu	ition, f	= fina	l read	ing in	test cł	nambe	r prior	to rer	newal					AM:	Ta	1100	100	0730	mais
								circle o													PM:		Kæ			-
	-							))if ye						C	Duratic	n:						u,. 1				
				ource:			· ~ `	<u></u>	.,	1.01	<u>\-/</u>													,		
QC Check:	6/i					A													Fir	al Ro	view	Ŋ	l	- W	ali	10
-	- 1	i hi	いたて生		mad	<u> </u>																		~	~ .1	

SPAWAR Systems Center Pacific Bioassay Lab, 53475 Strothe Rd, Bldg 111 Rm 116, San Diego, CA 92152

# **B.2. MIXED METAL EXPOSURES – REFERENCE TOXICANT TEST RESULTS:**

CETIS Sum	nmary Repo	rt						Report Dat Test Code:		03 Jun-16 08: 3F986ECD   1	
Americamysis	96-h Acute Sur	vival T	est						5	SPAWAR Syste	ems Cente
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:00 03 May-16 09:0 96h		Test Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-02 Americamysis Aquatic Resea	bahia	ns, NH		Analyst: Diluent: Brine: Age:	Marienne A Laboratory Not Applica 5	Seawater	
Sample ID: Sample Date: Receive Date: Sample Age:	29 Apr-16		Code: Material: Source: Station:	55D1F426 Copper sulfate Reference Tox				Client: Project:	SPAWAR Pulsed Exp	osure	
Comparison S	ummary										
Analysis ID	Endpoint		NOEL		TOEL	PMSD	τu	Met	hod		
13-4499-6255	96h Survival Ra	te	100	210	144.9	10.0%		Stee	el Many-One F	Rank Sum Test	
Point Estimate	e Summary										
Analysis ID	Endpoint		Level	μg/L	95% LCL	95% UCL	τu	Met	hod		
09-7413-8532	96h Survival Ra	te	LC50	223.2	181.9	287.9		Line	ar Regression	n (MLE)	
96h Survival R	ate Summary										
C-µg/L	Control Type	Coun	t Mean	95% LCL	95% UCL	Min	Max	Std	Err Std D	ev CV%	% Effec
0	Lab Control	4	1	1	1	1	1	0	0	0.0%	0.0%
56		4	1	1	1	1	1	0	0	0.0%	0.0%
100		4	0.95	0.7909	1	0.8	1	0.05		10.53%	5.0%
210		4	0.6	0.6	0.6	0.6	0.6	0	0	0.0%	40.0%
620 850		4 4	0	0 0	0	0	0 0	0	0		100.0% 100.0%
96h Survival F	ota Datail	4	Ů	Ů	Ū	•	•		Ű		100.070
		Rep 1	Bon 3	Rep 3	Rep 4						
	Control Type Lab Control	1	I Rep 2 1	1 1	1 1						
56		1	1	1	1						
100		0.8	1	1	1						
210		0.6	0.6	0.6	0.6						
620		0.0	0.0	0.0	0.0						
850		0	0 0	õ	0						
96h Survival R	ate Binomials										
	Control Type	Rep 1	I Rep 2	Rep 3	Rep 4						
	Lab Control	5/5	5/5	5/5	5/5						
56		5/5	5/5	5/5	5/5						
100		4/5	5/5	5/5	5/5						
210		3/5	3/5	3/5	3/5						
620		0/5	0/5	0/5	0/5						
850		0/5	0/5	0/5	0/5						

CETIS™ v1.8.7.16

CETIS Anal	lytical Repo	ort					-	oort Date: t Code:			39 (p 1 of 2) D-6695-4445
Americamysis	96-h Acute Su	rvival T	est						SPA	WAR Syste	ems Center
Analysis ID: Analyzed:	13-4499-6255 28 May-16 10:	13		96h Survival R Nonparametric		s Treatment		TIS Version		.8.7	
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:0 03 May-16 09:0 96h		Protocol: Species:	Survival (96h) EPA/821/R-02- Americamysis Aquatic Resea	bahia	,		uent: La ne: No	rienne A Col boratory Sea t Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:			Material:	55D1F426 Copper sulfate Reference Tox	icant		Clie Pro		AWAR Ised Exposur	e	
Data Transform		Zeta	Alt Hy		Seed		PMSD	NOEL	LOEL	TOEL	TU
Angular (Corre	cted)	NA	C > T	NA	NA		10.0%	100	210	144.9	
Steel Many-Or	ne Rank Sum T	est									
Control	vs C-µg/L		Test S	tat Critical	Ties I	DF P-Value	P-Type	Decision	n(α:5%)		
Lab Control	56		18	10	1 6	6 0.7500	Asymp	Non-Sigr	nificant Effect	t	
	100		16	10		0.5065	Asymp	Non-Sigr	nificant Effect	t	
	210*		10	10	06	6 0.0276	Asymp	Significa	nt Effect		
ANOVA Table											
Source	Sum Squ	ares	Mean	Square	DF	F Stat	P-Value	Decision	n(α:5%)		
Between	0.588566	3	0.1961	888	3	55.35	<0.0001	Significa	nt Effect		
Error	0.042530	92	0.0035	44244	12						
Total	0.631097	2			15						
Distributional	Tests										
Attribute	Test			Test Stat	Critical	P-Value	Decisior	n(α:1%)			
Variances	Mod Lev	ene Equ	ality of Varia	nce 1	5.953	0.4262	Equal Va	. ,			
Variances	Levene E	Equality	of Variance	9	5.953	0.0021	Unequal	Variances			
Distribution	Shapiro-	Wilk W	Normality	0.5647	0.8408	<0.0001	Non-norr	mal Distribut	ion		
96h Survival R	ate Summary										
C-µg/L	Control Type	Coun	t Mean	95% LCL	95% UC	L Median	Min	Max	Std Err	CV%	%Effect
0	Lab Control	4	1	1	1	1	1	1	0	0.0%	0.0%
56		4	1	1	1	1	1	1	0	0.0%	0.0%
100		4	0.95	0.7909	1	1	0.8	1	0.05	10.53%	5.0%
210		4	0.6	0.5998	0.6002	0.6	0.6	0.6	0	0.0%	40.0%
620		4	0	0	0	0	0	0	0		100.0%
850		4	0	0	0	0	0	0	0		100.0%
Angular (Corre	ected) Transfor	med Su	ummary								
	Control Type	Coun		95% LCL			Min	Max	Std Err	CV%	%Effect
	Lab Control	4	1.345	1.345	1.346	1.345	1.345	1.345	0	0.0%	0.0%
56		4	1.345	1.345	1.346	1.345	1.345	1.345	0	0.0%	0.0%
100		4	1.286	1.096	1.475	1.345	1.107	1.345	0.05953	9.26%	4.43%
210		4	0.8861	0.8859	0.8862	0.8861	0.8861	0.8861	0	0.0%	34.13%
620		4	0.2255		0.2256	0.2255	0.2255	0.2255	0	0.0%	83.24%
850		4	0.2255	0.2255	0.2256	0.2255	0.2255	0.2255	0	0.0%	83.24%

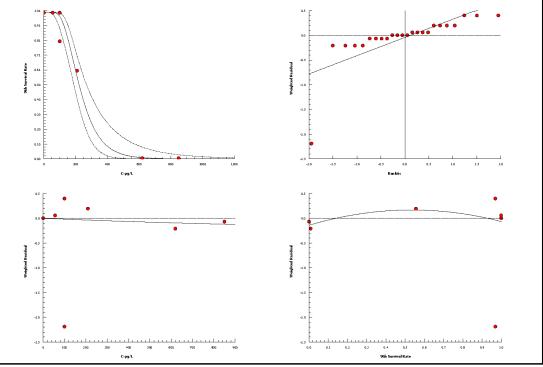
CETIS™ v1.8.7.16

CETIS Ana	alytical Repo	ort					Report Date: Test Code:	03 Jun-16 08:39 (p 2 of 2) 3F986ECD   10-6695-4445
Americamysi	s 96-h Acute Su	rvival To	est					SPAWAR Systems Center
Analysis ID: Analyzed:	13-4499-6255 28 May-16 10:1		Endpoint: 96 Analysis: N			s Treatments	CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Survival	Rate Detail							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
0	Lab Control	1	1	1	1			
56		1	1	1	1			
100		0.8	1	1	1			
210		0.6	0.6	0.6	0.6			
620		0	0	0	0			
850		0	0	0	0			
Angular (Cor	rected) Transfor	med De	tail					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
0	Lab Control	1.345	1.345	1.345	1.345			
56		1.345	1.345	1.345	1.345			
100		1.107	1.345	1.345	1.345			
210		0.886	1 0.8861	0.8861	0.8861			
620		0.225	5 0.2255	0.2255	0.2255			
850		0.225	5 0.2255	0.2255	0.2255			
96h Survival	Rate Binomials							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
0	Lab Control	5/5	5/5	5/5	5/5			
56		5/5	5/5	5/5	5/5			
100		4/5	5/5	5/5	5/5			
210		3/5	3/5	3/5	3/5			
620		0/5	0/5	0/5	0/5			
850		0/5	0/5	0/5	0/5			
Graphics								
۳Ē						0.10	1	
0.9	• •	•				-		
0.8						0.05		• • •
E						Ē		
96h Surrival Rate								
- 0.6			•			Contered Contered		
\$ 0.5						-0.05		
È.						F		
0.4						-0.10		
0.3						-0.20 E		
0.2						F		
0.1						-0.15		
Ē				•		•		
0.0 E	0LC 56	100	210 65	0 850		-0.20 -1.5	-1.0 -0.5 0.0	05 1.0 1.5 2.0
		C-µg/L					Rankits	

CETIS™ v1.8.7.16

CETIS Ar	nalytica	l Repor	t					-	ort Date: Code:			:39 (p 1 of 2) 10-6695-4445
Americamy	sis 96-h A	cute Survi	ival Test							SPA	WAR Syst	tems Center
Analysis ID: Analyzed:		13-8532 y-16 10:21			n Survival Ra ear Regress				S Version: al Results		.8.7	
Batch ID: Start Date: Ending Date Duration:	29 Apr	18-1674 -16 09:00 y-16 09:00		ocol: EP cies: Am	rvival (96h) A/821/R-02- nericamysis l uatic Resear		ns, NH	Anal Dilue Brine Age:	ent: Lab e: Not	ienne A Col oratory Sea Applicable		
Sample ID: Sample Dat Receive Dat Sample Age	e: 29 Apr te: 29 Apr		Code Mate Sou Stati	erial: Co ce: Re	D1F426 pper sulfate ference Toxi	cant		Clier Proje		AWAR sed Exposu	re	
Linear Regr	ression O	ptions										
Model Func Log-Normal		3*log(X)]		Control TI	-	Threshold 1E-07	Optimized Yes	Pooled No	Het Corr No	Weighted Yes	t	
Regression	Summary	,										
Iters LL 12 -17			BIC 45.17	Mu 2.349	<b>Sigma</b> 0.1866	Adj R2 0.9363	F Stat 4.701	Critical 3.16	<b>P-Value</b> 0.0136	Decision Significar	(α:5%) ht Lack of I	=it
Point Estim	ates											
Level µg/			95% UCL 287.9									
Regression	Paramete	ers										
Parameter	E	stimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision	(α:5%)			
Threshold			5.84E-05	-0.00011	0.000115	0.001169	0.9991	-	ficant Parar			
Slope Intercept			1.16 2.677	3.086 -17.84	7.632 -7.34	4.621 -4.701	0.0001 0.0001	-	t Parameter t Parameter			
ANOVA Tab	le							_				
Source		um Squar	es Mea	n Square	DF	F Stat	P-Value	Decision	α:5%)			
Model		1.18885	91.1		1	340	<0.0001	Significan				
Lack of Fit		.474179	0.82		3	4.701	0.0136	Significan	t			
Pure Error Residual		.157895 .632073	0.17 0.26		18 21							
Residual Ar	nalysis											
Attribute	N	lethod			Test Stat	Critical	P-Value	Decision	(α:5%)			
Goodness-o		earson Ch ikelihood R			5.632 3.712	32.67 32.67	0.9997 1.0000	-	ficant Heter ficant Heter			
Variances				of Variance		2.773	0.4457	Equal Var				
Distribution			k W Norma Parling A2 N	-	0.557 3.569	0.9169 2.492	<0.0001 <0.0001		al Distributi al Distributi			
96h Surviva			-	-		Calcul	ated Variat	e(A/B)				
C-µg/L	Control		Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	в
	Lab Cont		4	1	1	1	0	0	0.0%	0.0%	20	20
0			4	1	1	1	0	0	0.0%	0.0%	20	20
56			•									
56 100			4	0.95	0.8	1	0.05	0.1	10.53%	5.0%	19 12	20
56			•		0.8 0.6 0	1 0.6 0	0.05 0 0	0.1 0 0	10.53% 0.0%	5.0% 40.0% 100.0%	19 12 0	20 20 20

CETIS An	alytical Repo	ort				Report Date: Test Code:	03 Jun-16 08:39 (p 2 of 2) 3F986ECD   10-6695-4445
Americamys	sis 96-h Acute Su	rvival Tes	t				SPAWAR Systems Center
Analysis ID: Analyzed:	09-7413-8532 28 May-16 10::		dpoint: 96 alysis: Li	ih Survival F near Regres		CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Surviva	l Rate Detail						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
0	Lab Control	1	1	1	1		
56		1	1	1	1		
100		0.8	1	1	1		
210		0.6	0.6	0.6	0.6		
620		0	0	0	0		
850		0	0	0	0		
96h Surviva	l Rate Binomials						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4		
0	Lab Control	5/5	5/5	5/5	5/5		
56		5/5	5/5	5/5	5/5		
100		4/5	5/5	5/5	5/5		
210		3/5	3/5	3/5	3/5		
620		0/5	0/5	0/5	0/5		
850		0/5	0/5	0/5	0/5		
Graphics				Log-No	ormal [NED=A+B*log(	(X)]	



CETIS™ v1.8.7.16

CETIS Sun	nmary Repo	ort						Report Date Test Code:		2 Jun-16 16: 2F485A7   0	
Americamysis	s 96-h Acute Su	rvival 1	est						SF	AWAR Syste	ms Center
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:0 03 May-16 09:0 96h		Test Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-02- Americamysis Aquatic Resea	bahia	ns, NH		Analyst: Diluent: Brine: Age:	Marienne A C Laboratory Se Not Applicabl 5	eawater	
Sample ID: Sample Date: Receive Date: Sample Age:	29 Apr-16		Code: Material: Source: Station:	97E5E6A Zinc sulfate Reference Tox	icant			Client: Project:	SPAWAR Pulsed Expos	ure	
Comparison \$	Summary										
Analysis ID	Endpoint		NOEL	LOEL	TOEL	PMSD	τu	Meth	od		
00-9963-7171	96h Survival R	ate	320	540	415.7	15.5%		Dunn	ett Multiple Co	mparison Te	st
Point Estimat	e Summary										
Analysis ID	Endpoint		Level	µg/L	95% LCL	95% UCL	τυ	Meth	od		
05-7237-6669	96h Survival R	ate	LC50	688.9	575.2	824.9		Trimr	ned Spearmai	n-Kärber	
96h Survival I	Rate Summary										
C-µg/L	Control Type	Cour	nt Mean	95% LCL	95% UCL	Min	Max	Std E	Err Std De	/ CV%	%Effect
6.4	Lab Control	4	1	1	1	1	1	0	0	0.0%	0.0%
180		4	0.9	0.7163	1	0.8	1	0.057	74 0.1155	12.83%	10.0%
320		4	0.95	0.7909	1	0.8	1	0.05	0.1	10.53%	5.0%
540		4	0.7	0.5163	0.8837	0.6	0.8	0.057		16.5%	30.0%
1400		4	0	0	0	0	0	0	0		100.0%
2700		4	0	0	0	0	0	0	0		100.0%
96h Survival I	Rate Detail										
C-µg/L	Control Type	Rep '	l Rep 2		Rep 4						
6.4	Lab Control	1	1	1	1						
180		0.8	1	0.8	1						
320		1	1	1	0.8						
540		0.6	0.6	0.8	0.8						
1400		0	0	0	0						
2700		0	0	0	0						
96h Survival I	Rate Binomials										
C-µg/L	Control Type	Rep '	1 Rep 2	Rep 3	Rep 4						
6.4	Lab Control	5/5	5/5	5/5	5/5						
180		4/5	5/5	4/5	5/5						
320		5/5	5/5	5/5	4/5						
540		3/5	3/5	4/5	4/5						
1400		0/5	0/5	0/5	0/5						
		0/5	0/5	0/5							

CETIS Ana	lytical Repo	ort							ort Date: Code:			i6 (p 1 of 2) 5-8645-0343
Americamysis	s 96-h Acute Su	vival T	est							SPA	WAR Syste	ms Center
Analysis ID: Analyzed:	00-9963-7171 28 May-16 10:2		Endpoint: 96 Analysis: Pa	h Survival Ra rametric-Cor		reatr	nents		'IS Version: cial Results		.8.7	
Batch ID: Start Date: Ending Date: Duration:	18-0018-1674 29 Apr-16 09:0 03 May-16 09:0 96h	0 10	Species: An	rvival (96h) PA/821/R-02- nericamysis l juatic Resear	bahia	,	s, NH	Ana Dilu Brin Age	ent: Lab e: Not	rienne A Co poratory Sea : Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:	29 Apr-16		Material: Zir	E5E6A nc sulfate ference Toxi	cant			Clie Proj		AWAR sed Exposu	re	
Data Transfor Angular (Corre		Zeta NA	Alt Hyp C > T	Trials NA	Seed NA			<b>PMSD</b> 15.5%	<b>NOEL</b> 320	<b>LOEL</b> 540	<b>TOEL</b> 415.7	TU
Dunnett Multi	ple Comparisor	Test										
<b>Control</b> 6.4 6.4	vs C-µg/L 180 320		Test Stat 1.516 0.7578	<b>Critical</b> 2.287 2.287	MSD 0.18 0.18	6	<b>P-Value</b> 0.1712 0.4334	P-Type CDF CDF	-	(α:5%) ificant Effec ificant Effec		
6.4	540*		4.438	2.287	0.18	6	0.0011	CDF	Significar	nt Effect		
ANOVA Table												
Source Between Error Total	Sum Squa 0.2791536 0.1481115 0.4272651	; ;	Mean Sq 0.093051 0.012342	2	<b>DF</b> 3 12 15		F Stat 7.539	<b>P-Value</b> 0.0043	Decision Significar			
Distributional	Tests											
Attribute	Test			Test Stat	Critica	ı	P-Value	Decision	(α:1%)			
Variances Variances Distribution	Mod Leve	quality	ality of Varianc of Variance Normality		5.953 5.953 0.8408		0.0535 0.0004 0.0624	Equal Va Unequal '	riances			
96h Survival I	Rate Summary											
С-µg/L 6.4 180 320 540 1400 2700	Control Type Lab Control	Coun 4 4 4 4 4 4 4	t Mean 1 0.9 0.95 0.7 0 0	95% LCL 1 0.7163 0.7909 0.5163 0 0	95% U 1 1 0.8837 0 0		Median 1 0.9 1 0.7 0 0	Min 1 0.8 0.8 0.6 0 0	Max 1 1 0.8 0 0	<b>Std Err</b> 0 0.05774 0.05 0.05774 0 0	CV% 0.0% 12.83% 10.53% 16.5%	%Effect           0.0%           10.0%           5.0%           30.0%           100.0%
Angular (Corr	ected) Transfor	med Su	Immary									
С-µg/L 6.4 180 320 540 1400 2700	Control Type Lab Control	Coun 4 4 4 4 4 4 4	t Mean 1.345 1.226 1.286 0.9966 0.2255 0.2255	95% LCL 1.345 1.007 1.096 0.7935 0.2255 0.2255	95% U 1.346 1.445 1.475 1.2 0.2256 0.2256		Median 1.345 1.226 1.345 0.9966 0.2255 0.2255	Min 1.345 1.107 1.107 0.8861 0.2255 0.2255	Max 1.345 1.345 1.345 1.107 0.2255 0.2255	Std Err           0           0.06874           0.05953           0.06382           0           0	CV% 0.0% 11.21% 9.26% 12.81% 0.0% 0.0%	%Effect 0.0% 8.85% 4.43% 25.92% 83.24% 83.24%

CETIS Ana	alytical Repo	ort					Report Date: Test Code:	02 Jun-16 16:56 (p 2 of 2) 22F485A7   05-8645-0343
Americamysi	s 96-h Acute Su	rvival To	est					SPAWAR Systems Center
Analysis ID: Analyzed:	00-9963-7171 28 May-16 10::		•	5h Survival F arametric-Co	ate Introl vs Treat	ments	CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Survival	Rate Detail							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.4	Lab Control	1	1	1	1			
180		0.8	1	0.8	1			
320		1	1	1	0.8			
540		0.6	0.6	0.8	0.8			
1400		0	0	0	0			
2700		0	0	0	0			
Angular (Cor	rected) Transfor	med De	tail					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.4	Lab Control	1.345	1.345	1.345	1.345			
180		1.107	1.345	1.107	1.345			
320		1.345	1.345	1.345	1.107			
540		0.886	0.8861	1.107	1.107			
1400		0.225	5 0.2255	0.2255	0.2255			
2700		0.225	5 0.2255	0.2255	0.2255			
96h Survival	Rate Binomials							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
6.4	Lab Control	5/5	5/5	5/5	5/5			
180		4/5	5/5	4/5	5/5			
320		5/5	5/5	5/5	4/5			
540		3/5	3/5	4/5	4/5			
1400		0/5	0/5	0/5	0/5			
2700		0/5	0/5	0/5	0/5			
Graphics								
<sup>10</sup> F	•					0.15 F	1	_
0.9		•				F		• • • •
0.8				Reject Nul	—	0.10		
						0.05		•••
96h Surrival Rate					물물			
an and					Contered Corr. Angle	0.00 E		, • • •
8 os						E		
0.4						-0.05		
						F		
0.3						-0.10	/. <b>.</b> .	
0.2						Ē	• •	
0.1						-0.15		
E E	1			• •				
۰ ــــــــــــــــــــــــــــــــــــ	6.4LC 180	320	540 14	00 2700		-0.20 -2.0 -	1.5 -1.0 -0.5 0.0	05 1.0 1.5 2.0
		C-µg/L					Ranlóts	

CETIS™ v1.8.7.16

CETIS A	nalytical Rep	Report Date: Test Code:		02 Jun-16 16:56 (p 1 of 2) 22F485A7   05-8645-0343							
Americam	ysis 96-h Acute S	urvival Test							SPA	WAR Sys	tems Center
Analysis I Analyzed:				point: 96h Survival Rate Iysis: Trimmed Spearman-Kärber				CETIS Version: CETISv1.8.7 Official Results: Yes			
Batch ID:         18-0018-1674         Tes           Start Date:         29 Apr-16 09:00         Pro           Ending Date:         03 May-16 09:00         Specific		tocol: E ecies: /	es: Americamysis bahia			Analyst:     Marienne A Colvin       Diluent:     Laboratory Seawater       Brine:     Not Applicable       Age:     5					
Receive Date: 29 Apr-16 Sour			erial: 2	rial: Zinc sulfate ce: Reference Toxicant				Client: SPAWAR Project: Pulsed Exposure			
Trimmed Spearman-Kärber Estimates       Threshold Option     Threshold       Control Threshold     0		<b>Trim</b> 7.50%	<b>Mu</b> 2.838	<b>Sigma</b> 0.03915		LC50 688.9	95% LCL	95% UCL 824.9			
96h Surviv	al Rate Summary	1			Calc	ulated Varia	te(A/B)				
C-µg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	в
6.4 180 320 540 1400 2700	Lab Control	4 4 4 4 4 4	1 0.9 0.95 0.7 0 0	1 0.8 0.8 0.6 0 0	1 1 0.8 0 0	0 0.05774 0.05 0.05774 0 0	0 0.1155 0.1 0.1155 0 0	0.0% 12.83% 10.53% 16.5%	0.0% 10.0% 5.0% 30.0% 100.0% 100.0%	20 18 19 14 0 0	20 20 20 20 20 20 20
96h Surviv	/al Rate Detail										
С-µg/L 6.4 180 320 540 1400 2700	Control Type Lab Control	Rep 1 1 0.8 1 0.6 0 0	Rep 2 1 1 1 0.6 0 0	Rep 3 1 0.8 1 0.8 0 0	Rep 4 1 0.8 0.8 0 0						
96h Surviv	/al Rate Binomial	s									
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4						
6.4 180 320 540 1400	Lab Control	5/5 4/5 5/5 3/5 0/5	5/5 5/5 5/5 3/5 0/5	5/5 4/5 5/5 4/5 0/5	5/5 5/5 4/5 4/5 0/5						
2700		0/5	0/5	0/5	0/5						

CETIS™ v1.8.7.16

CETIS Ana	alytical Report		Report Date: Test Code:	02 Jun-16 16:56 (p 2 of 2) 22F485A7   05-8645-0343 SPAWAR Systems Center		
Americamysi	s 96-h Acute Surviva	l Test				
Analysis ID: Analyzed:	05-7237-6669 28 May-16 10:27	CETIS Version: Official Results:				
Graphics		1200 - 2000 12	250 500			

CETIS™ v1.8.7.16

### Marine Acute Bioassay Static-Renewal Conditions

#### Water Quality Measurements & Test Organism Survival

72 96 SM JM

Project:	Hismotola Co+ Zu Rulsand 70	H Test Species: A. bohia			Te	ch Initi	als
Sample ID:	96 hr CU Beterence Toot	Start Date/Time: 4/29/16 0700	. [	0	24	48	.7
Test No.:	· · · · · · · · · · · · · · · · · · ·	End Date/Time: 5/3/16 0900	Counts:	Ĵ٨	ЗM	JH	V
-			Readings:	J/I	W	J.M	Z

Dilutions made by:

	Sample ID	Rep			ber o ganis		)			Salini (ppt)				Tei	npera (°C)	ture	<b>-</b>		Disso	lved ( (mg/L		n			pH (units	)	
	(ugll)		0	24	48	72		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48		96
	LC	Α	5	5	5	5	5	34.5	34.4	34.3	347	949	190	190	19.1	(9.9	19.3	7.5	7.6	7.7	7.7	7.3	7.99	5.01	1 8.07	801	8.01
		в	5	5	5	5	5			1 -					- 1					ſ			<u> </u>		-		
		С	5	5	5	5	5								5555		1999										
		D	5	5	5	5	5																			102001 102002	
	50	A	5	5	5	5	5	34.1	34.1	341	34.6	34.5	19.1	19,2	19.1	19.2	14.3	7.5	7.5	7.5	7.6	7.5	831	8.0Ľ	8.0i	8.17	8.02
		В	5	5	5	5	5			'-					- 1					f <					-		
		С	5	5	5	5	5																				
		D	5	5	5	5	5																			- 335	
	100	Α	5	5	5	5	4	34.1	34:2	34.2	34.5	31.6	180	19.0	19.7	19.0	19.2	7.7	7.8	76	7.9	7.5	6.01	7.97	8.04	7.97	8.03
		в	5	5	5	5	5			- 1					- '					-			N.S.S.		<b>'</b>		
		С	5	5	5	5	5																				
		P	5	5	5	5	5																		3353	1993	10000
	2.00	A	5	5	4	3	3	<i>3</i> 9.8	34.1	34.3	34.5	346	19.0	182	18/	19,9	19.2	8.0	8.1	2.7	7.6	7.5	797	7.98	8.11	7.97	8.01
		В	5	4	4	4rs	43			- 1					r					[				1453445			
		С	5	5	4	9	3									2											
		D	5	5	21	4	3																				- 6848
	400	A	5	2	.0	ø		37.9	34.7	34.7	84.9	318	181	1.91	181	19,2	193	7.9	7.8	7.8	7.7	7.5	7.89	7.90	7.87	7.96	8.01
		В	5	4	0	-				ſ <del>~</del>					ſ					[ <u> </u>	1000				<u>ا</u> ــــــــــــــــــــــــــــــــــــ		
		С	5	2	4	1_	0																			- 2003 1.444	
		D	5	2	Parameter.	0											1333							639	7.99	233	13333
	800	A	5	3	0	~	u	34.3	34.4	3.8	34.9	33.9	19.0	19.1	19:1	19.0	19.3	7.4	7.6	27	7.8	7.4	7.31	7.99	2.92	7.88	8,02
		В	5	2	ł	1	Þ			1-															100		
		С	5	3	0	<i>v</i>	v																	19903			
		D	5	2	0	~	~			18650			236		1838		33323 333233			1332	1.55	1888	1993			<u> (</u>	1999
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L		С																									
		D							366					303) 3	1993			1033	342		1993			8333	200		
	Initial Counts QC'd by:	J.P	Ċ																								
	QUUNY.			-				,	1							É	1							Eas	ding T	imae	
An	imal Source/Da	te Rec	eive	d:	AR	0	-4,	/28	/16			Age a	it Initi	ation:		5	<u>C</u>			-			0	24	48	72	96
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											<u>)</u>										-	PM:	1100	(92)	19091	600	-
							e one	(y <i>I</i> (	n)ify	es, sa	mple I	D(s):				Durati	on:				-						
•		-5		ation s																	-		11	U	1.1	~	10
QC	C Check:	Ju		6/1	1 2.2	016		-												Fi	nai Re	eview:	_~	<u>v</u>	<u>\</u>	311	τ¢_

SPAWAR Systems Center Pacific Bioassay Lab, 53475 Strothe Rd, Bldg 111 Rm 116, San Diego, CA 92152

#### Marine Acute Bioassay Static-Renewal Conditions

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#### Water Quality Measurements & Test Organism Survival

7.4 7.3 7.94 8.01 7577.15 7.98

Project	l: <u>/4</u>	ixed	Mo	$\left a\right $	<u> </u>	1500	70.54	- Cu	<u> </u>	т	est Sp	pecies	: <u> </u>	. b	abia	۱			_				T	ech Init	ials	
Project Sample ID	$: \mathbb{Z}_{*}$	1	्रेश्व	erev	e e	Tes-	1 7	Shr	-	Star	t Date	/Time	: 4/	29/1	6	0900	)					0	24	48	72	96
Test No.	:				~				_	End	d Date	/Time	:	5/3/	IG	090.	0		-	Ċ	Counts	: JA	NM	JM	10	12
														,					-	Re	adings	Jun .	in	Jun	мĽ	J
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		<del></del>					_													•						
				ber (		re			Salini				Te	mpera				Disso	olved	Oxyge	ən	Τ		pН		
Sample ID	Rep	-	ত বজাহ	rgani	sms	d solar		a and a second	(ppt	)				(°C)					(mg/L)			(units)				
ug/L)		0	24			96				72		1 1 1 1	24	48				1 1 100		72	96	0	24	48	72	96
LC	A	5	5	5	5	5	31.2	32.3	34.1	346	34.7	19.0	0.91	19.1	19.7	19.2	7,9	3.0	80	7.7	7.11	7,88	8.01	800	7.11	7.99
	В	5	5	5	5	5			1-					ſ					f					f	200	
	C	5	5	5	5	5	800																			
	D	5	5	2	5	5																N				
125	A	5	5	S	5	4	31.2	34.1	i 33.9	34.7	34.9	19.1	19.1	19.1	19.7	19.3	1.8	8.1	17.4	7.6	21	7.78	7.99	i 7.76	7,49	39
	В	5	5	5	5	5			f					f					f					f		
	С	5	5	5	4	4																				
	D	5	5	5	5	5								alusta Strict												
250	A	5	5	5	5	5	34.1	33.9	34.2	34.8	34.9	19.0	18.9	18.1	19.7	194	7.7	8.0	7.5	7,5	7.4	7.67	7.71	7.86	7.77	8.0
	в	5	5	5	5	5			f					f					f					f		
	c	5	5	5	5	5																				
	D	5	5	5	5	4																				
500	Α	5	5	5	4	3	<u> 73.9</u>	34.1	337	348	34.7	19.1	190	Y8,7	19.7	19.4	7.9	8.1	17.6	7.7	7.3	7.71	1.89	7.96	7.81	8.0
	В	5	5	5	4	3			<u>ا</u> ي.					f					F					f		
	С	5	5	4	4	ц																				
	D	5		5	5	ù l																				
1000	Α	5	4	2	2	ò	34.1	34.1	1 <u>34.7</u>	34.9	'4.8	19.1	19.1	18.1	19.7	19.6	7.7	8.0	24	7.6	7.3	7.90	2.91	7.77	701	2.99
	_ n	~	- I	6			1000	1000-011	1	1.1.1.1.1.1	1372235	101103-022	10.07076		10000 1000	Sec. as	Arriver St.	12331-1414		11. 11. 14.					1.11	

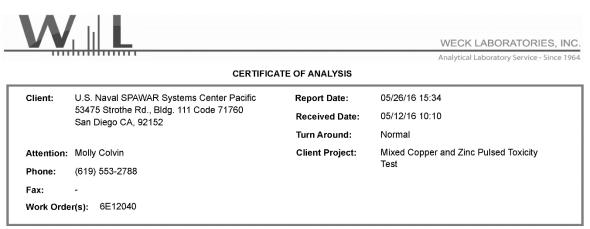
Initial Counts QC'd by: ゴハ Animal Source/Date Received: A 120 4/28/16 Age at Initiation: 52 Feeding Times 24 48 72 0 96 i = initial reading in fresh test solution, f = final reading in test chamber prior to renewal Comments: AM: 0700 1100 1101 0330 0315 PM: 1900 1500 1400 600 -Organisms fed prior to initiation, circle one ( n ) Tests aerated? Circle one ( y (i) if yes, sample ID(s): Duration: Aeration source: ul upplie c/1/2016 QC Check: 3-1 Final Review:

33.9 34.9 3× 34.8 34.7 19.0 18.0

19.1 19.7 19.67.9 8.1 7.6

SPAWAR Systems Center Pacific Bioassay Lab, 53475 Strothe Rd, Bldg 111 Rm 116, San Diego, CA 92152

## **B.3. MIXED METAL EXPOSURES – ANALYTICAL CHEMISTRY REPORTS:**



#### NELAC #4047-002 ORELAP ELAP#1132 NEVADA #CA211 HAWAII LACSD #10143

The results in this report apply to the samples analyzed in accordance with the Chain of Custody document. Weck Laboratories, Inc. certifies that the test results meet all NELAC requirements unless noted in the case narrative. This analytical report is confidential and is only intended for the use of Weck Laboratories, Inc. and its client. This report contains the Chain of Custody document, which is an integral part of *it*, and can only be reproduced in full with the authorization of Weck Laboratories, Inc.

Dear Molly Colvin :

Enclosed are the results of analyses for samples received 05/12/16 10:10 with the Chain of Custody document. The samples were received in good condition, at 18.8 °C. All analysis met the method criteria except as noted below or in the report with data qualifiers.

Case Narrative:

Samples were received at higher temperature than required for DOC analysis.

Reviewed by:

the Chris Samatmanakit

Project Manager



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Date Received:05/12/16 10:10Date Reported:05/26/16 15:34

U.S. Naval SPAWAR Systems Center Pacific 53475 Strothe Rd., Bldg. 111 Code 71760 San Diego CA, 92152

	ANALYTICAL REPORT FOR SAMPLES		
Sample ID	Sampled by: Lab ID	Matrix	Date Sampled
Static-LC-CU	Molly, Gunther Rosen, Jac 6E12040-01	Water	04/29/16 08:30
Static-CU-50	Molly, Gunther Rosen, Jac 6E12040-02	Water	04/29/16 08:30
Static-CU-100	Molly, Gunther Rosen, Jac 6E12040-03	Water	04/29/16 08:30
Static-CU-200	Molly, Gunther Rosen, Jac 6E12040-04	Water	04/29/16 08:30
Static-CU-400	Molly, Gunther Rosen, Jac 6E12040-05	Water	04/29/16 08:30
Static-CU-800	Molly, Gunther Rosen, Jac 6E12040-06	Water	04/29/16 08:30
Static-Zn-125	Molly, Gunther Rosen, Jac 6E12040-07	Water	04/29/16 08:30
Static-Zn-250	Molly, Gunther Rosen, Jac 6E12040-08	Water	04/29/16 08:30
Static-Zn-500	Molly, Gunther Rosen, Jac 6E12040-09	Water	04/29/16 08:30
Static-Zn-1000	Molly, Gunther Rosen, Jac 6E12040-10	Water	04/29/16 08:30
Static-Zn-2000	Molly, Gunther Rosen, Jac 6E12040-11	Water	04/29/16 08:30
96hr-TU-0.25	Molly, Gunther Rosen, Jac 6E12040-12	Water	04/29/16 08:30
96hr-TU-0.5	Molly, Gunther Rosen, Jac 6E12040-13	Water	04/29/16 08:30
96hr-TU-0.125	Molly, Gunther Rosen, Jac 6E12040-14	Water	04/29/16 08:30
96hr-TU-1	Molly, Gunther Rosen, Jac 6E12040-15	Water	04/29/16 08:30
96hr-TU-2	Molly, Gunther Rosen, Jac 6E12040-16	Water	04/29/16 08:30
3hr-TU-0.125	Molly, Gunther Rosen, Jac 6E12040-17	Water	04/29/16 08:30
3hr-TU-0.25	Molly, Gunther Rosen, Jac 6E12040-18	Water	04/29/16 08:30
3hr-TU-0.5	Molly, Gunther Rosen, Jac 6E12040-19	Water	04/29/16 08:30
3hr-TU-1	Molly, Gunther Rosen, Jac 6E12040-20	Water	04/29/16 08:30
3hr-TU-2	Molly, Gunther Rosen, Jac 6E12040-21	Water	04/29/16 08:30
6hr-TU-0.125	Molly, Gunther Rosen, Jac 6E12040-22	Water	04/29/16 08:30
6hr-TU-0.25	Molly, Gunther Rosen, Jac 6E12040-23	Water	04/29/16 08:30
6hr-TU-0.5	Molly, Gunther Rosen, Jac 6E12040-24	Water	04/29/16 08:30
6hr-TU-1	Molly, Gunther Rosen, Jac 6E12040-25	Water	04/29/16 08:30
6hr-TU-2	Molly, Gunther Rosen, Jac 6E12040-26	Water	04/29/16 08:30
12hr-TU-0.125	Molly, Gunther Rosen, Jac 6E12040-27	Water	04/29/16 08:30
12hr-TU-0.25	Molly, Gunther Rosen, Jac 6E12040-28	Water	04/29/16 08:30
12hr-TU-0.5	Molly, Gunther Rosen, Jac 6E12040-29	Water	04/29/16 08:30
12hr-TU-1	Molly, Gunther Rosen, Jac 6E12040-30	Water	04/29/16 08:30
12hr-TU-2	Molly, Gunther Rosen, Jac 6E12040-31	Water	04/29/16 08:30

AN ALYSES

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Metals - Low Level by 1600 Series Methods

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<b>.</b> .						
	6E12040-	01 Static-LC-CU				
Sampled: 04/29/16 08:30	Sampled By:	Molly, Gunther Rosen, Ja	cob Munson			Matrix: Water
	Conventional Chemistry/Physic	al Parameters by APH	A/EPA/AST	/ Metho	ods	
Method: SM 5310B	Batch: W6E1048	Prepared: 05/18/16	13:34			Analyst: jlp
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Dissolved Organic Carbon	1.0	0.10	mg/l	1	05/18/16 14:56	
	Metals - Low Le	vel by 1600 Series Me	thods			
Method: EPA 1640	Batch: W6E0823	Prepared: 05/16/16 (	09:13			Analyst: gza
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Copper, Total	1.6	0.010	ug/l	1	05/18/16 01:46	
Zinc, Total	6.4	0.20	ug/l	1	05/18/16 01:46	

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U.S. Naval SPAWAR Systems Center Pacific 53475 Strothe Rd., Bldg. 111 Code 71760 San Diego CA, 92152 Sampled: 04/29/16 08:30 Sampled By: Molly, Gunther Rosen, Jacob Munson Metals - Low Level by 1600 Series Methods Metals - Develop Develop Series Methods Metals - Low Level Data Series Methods

	Wetais - LOW Let	ver by 1000 Series wet	nous			
Method: EPA 1640	Batch: W6E0823	Prepared: 05/16/16 09	9:13			Analyst: gza
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Copper, Total	56	0.50	ug/l	50	05/18/16 02:00	

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U.S. Naval SPAWAR Systems Center Pacific Date Received: 05/12/16 10:10 53475 Strothe Rd., Bldg. 111 Code 71760 Date Reported: 05/26/16 15:34 San Diego CA, 92152 6E12040-03 Static-CU-100 Sampled: 04/29/16 08:30 Sampled By: Molly, Gunther Rosen, Jacob Munson Matrix: Water Metals - Low Level by 1600 Series Methods Method: EPA 1640 Batch: W6E0823 Prepared: 05/16/16 09:13 Analyst: gza MRL Analyte Qualifier Result Units Dil Analyzed Copper, Total 100 1.0 ug/l 100 05/18/16 02:14

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100 05/18/16 02:27

U.S. Naval SPAWAR Systems Center Pacific Date Received: 05/12/16 10:10 53475 Strothe Rd., Bldg. 111 Code 71760 Date Reported: 05/26/16 15:34 San Diego CA, 92152 6E12040-04 Static-CU-200 Sampled: 04/29/16 08:30 Sampled By: Molly, Gunther Rosen, Jacob Munson Matrix: Water Metals - Low Level by 1600 Series Methods Method: EPA 1640 Batch: W6E0823 Prepared: 05/16/16 09:13 Analyst: gza MRL Analyte Result Qualifier Units Dil Analyzed

1.0

ug/l

210

Copper, Total

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U.S. Naval SPAWAR Systems Center Pacific Date Received: 05/12/16 10:10 53475 Strothe Rd., Bldg. 111 Code 71760 Date Reported: 05/26/16 15:34 San Diego CA, 92152 6E12040-05 Static-CU-400 Sampled: 04/29/16 08:30 Sampled By: Molly, Gunther Rosen, Jacob Munson Matrix: Water Metals - Low Level by 1600 Series Methods Analyst: gza Method: EPA 1640 Batch: W6E0823 Prepared: 05/16/16 09:13 MRL Analyte Qualifier Result Units Dil Analyzed Copper, Total 620 10 ug/l 1000 05/18/16 02:41

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U.S. Naval SPAWAR Systems Center Pacific Date Received: 05/12/16 10:10 53475 Strothe Rd., Bldg. 111 Code 71760 Date Reported: 05/26/16 15:34 San Diego CA, 92152 6E12040-06 Static-CU-800 Sampled: 04/29/16 08:30 Sampled By: Molly, Gunther Rosen, Jacob Munson Matrix: Water Metals - Low Level by 1600 Series Methods Analyst: gza Method: EPA 1640 Batch: W6E0823 Prepared: 05/16/16 09:13 MRL Analyte Qualifier Result Units Dil Analyzed

10

ug/l

1000 05/18/16 02:55

850

Copper, Total

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Zinc, Total

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100 05/19/16 22:11

U.S. Naval SPAWAR Systems Center Pacific Date Received: 05/12/16 10:10 53475 Strothe Rd., Bldg. 111 Code 71760 Date Reported: 05/26/16 15:34 San Diego CA, 92152 6E12040-08 Static-Zn-250 Sampled: 04/29/16 08:30 Sampled By: Molly, Gunther Rosen, Jacob Munson Matrix: Water Metals - Low Level by 1600 Series Methods Analyst: gza Method: EPA 1640 Batch: W6E0896 Prepared: 05/19/16 09:10 MRL Analyte Qualifier Result Units Dil Analyzed

20

ug/l

320

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U.S. Naval SPAWAR Systems Center Pacific Date Received: 05/12/16 10:10 53475 Strothe Rd., Bldg. 111 Code 71760 Date Reported: 05/26/16 15:34 San Diego CA, 92152 6E12040-09 Static-Zn-500 Sampled: 04/29/16 08:30 Sampled By: Molly, Gunther Rosen, Jacob Munson Matrix: Water Metals - Low Level by 1600 Series Methods Analyst: gza Method: EPA 1640 Batch: W6E0896 Prepared: 05/19/16 09:10 MRL Analyte Qualifier Result Units Dil Analyzed Zinc, Total 540 20 ug/l 100 05/19/16 22:25

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200

ug/l

1000 05/19/16 23:34

2700

Zinc, Total

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Sampled: 04/29/16 08:30	6E12040 Sampled By:	-12 96hr-TU-0.25 Molly, Gunther Rosen, Jac	cob Munson			Matrix: Water
	Metals - Low Le	evel by 1600 Series Me	thods			
Method: EPA 1640	Batch: W6E0896	Prepared: 05/19/16 0	09:10			Analyst: gza
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Copper, Total	34	1.0	ug/l	100	05/19/16 23:47	
Zinc, Total	150	20	ug/l	100	05/19/16 23:47	

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<b>.</b> .						
	6E12040	-13 96hr-TU-0.5				
Sampled: 04/29/16 08:30	Sampled By:	Molly, Gunther Rosen, Jac	cob Munson			Matrix: Water
	Metals - Low Le	evel by 1600 Series Me	thods			
Method: EPA 1640	Batch: W6E0896	Prepared: 05/19/16 0	9:10			Analyst: gza
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Copper, Total	71	1.0	ug/l	100	05/20/16 00:01	
Zinc, Total	320	20	ug/l	100	05/20/16 00:01	

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Sampled: 04/29/16 08:30	6E12040- Sampled By:	14 96hr-TU-0.125 Molly, Gunther Rosen, Ja				Matrix: Water
	Metals - Low Le	evel by 1600 Series Me	thods			
Method: EPA 1640	Batch: W6E0896	Prepared: 05/19/16	09:10			Analyst: gza
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Copper, Total	21	1.0	ug/l	100	05/20/16 00:15	
Zinc, Total	81	20	ug/l	100	05/20/16 00:15	

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	6E1204	0-15 96hr-TU-1				
Sampled: 04/29/16 08:30	Sampled By:	Molly, Gunther Rosen, Ja	cob Munson			Matrix: Water
	Metals - Low Le	evel by 1600 Series Me	thods			
Method: EPA 1640	Batch: W6E0896	Prepared: 05/19/16 0	9:10			Analyst: gza
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Copper, Total	140	1.0	ug/l	100	05/20/16 00:29	
Zinc, Total	860	20	ug/l	100	05/20/16 00:29	

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<b>.</b> .						
	6E1204	0-16 96hr-TU-2				
Sampled: 04/29/16 08:30	Sampled By:	Molly, Gunther Rosen, Ja	cob Munson			Matrix: Water
	Metals - Low Le	evel by 1600 Series Me	thods			
Method: EPA 1640	Batch: W6E0896	Prepared: 05/19/16 (	09:10			Analyst: gza
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Copper, Total	280	1.0	ug/l	100	05/20/16 00:42	
Zinc, Total	1600	20	ug/l	100	05/20/16 00:42	

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Sampled: 04/29/16 08:30	6E12040 Sampled By:	<b>.17 3hr-TU-0.125</b> Molly, Gunther Rosen, Ja				Matrix: Water
	Metals - Low Le	evel by 1600 Series Me	thods			
Method: EPA 1640	Batch: W6E0896	Prepared: 05/19/16 (	09:10			Analyst: gza
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Copper, Total	190	1.0	ug/l	100	05/20/16 00:56	
Zinc, Total	1800	20	ug/l	100	05/20/16 00:56	

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	6E12040	-18 3hr-TU-0.25				
Sampled: 04/29/16 08:30		Molly, Gunther Rosen, Ja	cob Munson			Matrix: Water
	Metals - Low Le	evel by 1600 Series Me	thods			
Method: EPA 1640	Batch: W6E0896	Prepared: 05/19/16 (	09:10			Analyst: gza
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Copper, Total	350	10	ug/l	1000	05/20/16 01:10	
Zinc, Total	3900	200	ug/l	1000	05/20/16 01:10	

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<u> </u>									
	6E12040	0-19 3hr-TU-0.5							
Sampled: 04/29/16 08:30	Sampled By:	Matrix: Water							
Metals - Low Level by 1600 Series Methods									
Method: EPA 1640	Batch: W6E0896	Prepared: 05/19/16 (	09:10			Analyst: gza			
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier			
Copper, Total	880	10	ug/l	1000	05/20/16 01:23				
Zinc, Total	7400	200	ug/l	1000	05/20/16 01:23				

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<b>Ç</b> ,								
	6E1204	10-20 3hr-TU-1						
Sampled: 04/29/16 08:30	npled: 04/29/16 08:30 Sampled By: Molly, Gunther Rosen, Jacob Munson							
	Metals - Low Le	evel by 1600 Series Me	thods					
Method: EPA 1640	Batch: W6E0896	Prepared: 05/19/16 0	9:10			Analyst: gza		
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier		
Copper, Total	1500	10	ug/l	1000	05/20/16 01:37			
Zinc, Total	15000	200	ug/l	1000	05/20/16 01:37			

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Sampled: 04/29/16 08:30	6E1204 Somplad By:		ob Muncon			Matrix: Water	
Sampled: 04/29/18 08:30	: 04/29/16 08:30 Sampled By: Molly, Gunther Rosen, Jacob Munson						
	Metals - Low Le	evel by 1600 Series Me	thods				
Method: EPA 1640	Batch: W6E0896	Prepared: 05/19/16 0	9:10			Analyst: gza	
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier	
Copper, Total	3100	20	ug/l	2000	05/20/16 02:32		
Zinc, Total	30000	400	ug/l	2000	05/20/16 02:32		

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	6E12040-	22 6hr-TU-0.125							
Sampled: 04/29/16 08:30	Sampled By:	Matrix: Water							
Metals - Low Level by 1600 Series Methods									
Method: EPA 1640	Batch: W6E0896	Prepared: 05/19/16 0	9:10			Analyst: gza			
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier			
Copper, Total	99	1.0	ug/l	100	05/20/16 02:46				
Zinc, Total	850	20	ug/l	100	05/20/16 02:46				

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Sampled: 04/29/16 08:30	6E12040 Sampled By:	<b>-23 6hr-TU-0.25</b> Molly, Gunther Rosen, Ja	cob Munson			Matrix: Water
	Metals - Low Le	evel by 1600 Series Me	thods			
Method: EPA 1640	Batch: W6E0896	Prepared: 05/19/16 0	9:10			Analyst: gza
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Copper, Total	200	1.0	ug/l	100	05/20/16 02:59	
Zinc, Total	1500	20	ug/l	100	05/20/16 02:59	

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	6E1204	0-24 6hr-TU-0.5				
ampled: 04/29/16 08:30 Sampled By: Molly, Gunther Rosen, Jacob Munson						
	Metals - Low Le	evel by 1600 Series Me	thods			
Method: EPA 1640	Batch: W6E0896	Prepared: 05/19/16	09:10			Analyst: gza
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Copper, Total	440	10	ug/l	1000	05/20/16 03:13	
Zinc, Total	2500	200	ug/l	1000	05/20/16 03:13	

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<b>.</b> .							
	6E1204	10-25 6hr-TU-1					
Sampled: 04/29/16 08:30	04/29/16 08:30 Sampled By: Molly, Gunther Rosen, Jacob Munson						
	Metals - Low Le	evel by 1600 Series Me	thods				
Method: EPA 1640	Batch: W6E0896	Prepared: 05/19/16 0	09:10			Analyst: gza	
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier	
Copper, Total	770	10	ug/l	1000	05/20/16 03:27		
Zinc, Total	5200	200	ug/l	1000	05/20/16 03:27		

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<u> </u>							
	6E1204	40-26 6hr-TU-2					
Sampled: 04/29/16 08:30	Sampled By: Molly, Gunther Rosen, Jacob Munson						
	Metals - Low Le	evel by 1600 Series Me	thods				
Method: EPA 1640	Batch: W6E0896	Prepared: 05/19/16 0	09:10			Analyst: gza	
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier	
Copper, Total	1600	10	ug/l	1000	05/20/16 03:40		
Zinc, Total	11000	200	ug/l	1000	05/20/16 03:40		

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Sampled: 04/29/16 08:30	6E12040-/ Sampled By:	27 12hr-TU-0.12 Molly, Gunther Rosen, Ja	-			Matrix: Water
	Metals - Low Le	evel by 1600 Series Me	ethods			
Method: EPA 1640	Batch: W6E1121	Prepared: 05/19/16	16:12			Analyst: gza
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Copper, Total	34	1.0	ug/l	100	05/23/16 21:34	
Zinc, Total	360	20	ug/l	100	05/23/16 21:34	

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	6E12040-	-28 12hr-TU-0.25				
Sampled: 04/29/16 08:30		Molly, Gunther Rosen, Jac	cob Munson			Matrix: Water
	Metals - Low Le	evel by 1600 Series Met	thods			
Method: EPA 1640	Batch: W6E1121	Prepared: 05/19/16 1	6:12			Analyst: gza
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Copper, Total	72	1.0	ug/l	100	05/23/16 21:48	
Zinc, Total	910	20	ug/l	100	05/23/16 21:48	

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Sampled: 04/29/16 08:30	6E12040 Sampled By:	-29 12hr-TU-0.5 Molly, Gunther Rosen, Ja	cob Munson			Matrix: Water			
Metals - Low Level by 1600 Series Methods									
Method: EPA 1640	Batch: W6E1121	Prepared: 05/19/16	16:12			Analyst: gza			
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier			
Copper, Total	120	1.0	ug/l	100	05/23/16 22:01				
Zinc, Total	1500	20	ug/l	100	05/23/16 22:01				

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Sampled: 04/29/16 08:30	6E1204 Sampled By:	Matrix: Water				
	Metals - Low Le	evel by 1600 Series Met	hods			
Method: EPA 1640	Batch: W6E1121	Prepared: 05/19/16 16:12				Analyst: gza
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Copper, Total	340	10	ug/l	1000	05/23/16 22:56	
Zinc, Total	3100	200	ug/l	1000	05/23/16 22:56	

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<b>Ç</b> ,									
	6E12040	)-31 12hr-TU-2							
Sampled: 04/29/16 08:30	Sampled By:	Matrix: Water							
Metals - Low Level by 1600 Series Methods									
Method: EPA 1640	Batch: W6E1121	Prepared: 05/19/16 16:12				Analyst: gza			
Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier			
Copper, Total	570	10	ug/l	1000	05/23/16 23:10				
Zinc, Total	5900	200	ug/l	1000	05/23/16 23:10				

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U.S. Naval SPAWAR Systems Center Pacific 53475 Strothe Rd., Bldg. 111 Code 71760 San Diego CA, 92152 WECK LABORATORIES, INC.

Analytical Laboratory Service - Since 1964

Date Received:05/12/16 10:10Date Reported:05/26/16 15:34

# QUALITY CONTROL SECTION

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#### WECK LABORATORIES, INC.

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Date Received:	05/12/16 10:10
Date Reported:	05/26/16 15:34

#### Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods - Quality Control

#### Batch W6E1048 - SM 5310B

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W6E1048-BLK1)				Analyzed: (	05/18/16 14	:56				
Dissolved Organic Carbon	ND	0.10	mg/l							
LCS (W6E1048-BS1)				Analyzed: (	05/18/16 14	:56				
Dissolved Organic Carbon	1.07	0.10	mg/l	1.00		107	85-115			
Matrix Spike (W6E1048-MS1)	Source	: 6E12040-01		Analyzed: (	05/18/16 14	:56				
Dissolved Organic Carbon	5.94	0.10	mg/l	5.00	1.04	98	74-120			
Matrix Spike Dup (W6E1048-MSD1)	Source	: 6E12040-01		Analyzed: (	05/18/16 14	:56				
Dissolved Organic Carbon	5.62	0.10	mg/l	5.00	1.04	92	74-120	6	20	

Metals - Low Level by 1600 Series Methods - Quality Control

#### Batch W6E0823 - EPA 1640

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W6E0823-BLK1)				Analyzed:	05/17/16 19	:50				
Copper, Total	ND	0.010	ug/l							
Zinc, Total	ND	0.20	ug/l							
LCS (W6E0823-BS1)				Analyzed:	05/17/16 20	:03				
Copper, Total	1.93	0.010	ug/l	2.00		97	73-122			
Zinc, Total	10.0	0.20	ug/l	10.0		100	75-127			
Matrix Spike (W6E0823-MS1)	Sourc	e: 6E10043-01		Analyzed:	05/17/16 20	:17				
Copper, Total	5.85	0.010	ug/l	2.00	4.15	85	60-138			
Zinc, Total	29.0	0.20	ug/l	10.0	20.2	89	68-132			
Matrix Spike (W6E0823-MS2)	Sourc	e: 6E12039-01		Analyzed:	05/17/16 20	:44				
Copper, Total	3.39	0.010	ug/l	2.00	1.43	98	60-138			
Zinc, Total	16.4	0.20	ug/l	10.0	6.09	103	68-132			
Matrix Spike Dup (W6E0823-MSD1)	Sourc	e: 6E10043-01		Analyzed:	05/17/16 20	:31				
Copper, Total	5.96	0.010	ug/l	2.00	4.15	90	60-138	2	30	
Zinc, Total	29.5	0.20	ug/l	10.0	20.2	94	68-132	2	30	
Matrix Spike Dup (W6E0823-MSD2)	Sourc	e: 6E12039-01		Analyzed:	05/17/16 20	:58				
Copper, Total	3.40	0.010	ug/l	2.00	1.43	99	60-138	0.5	30	
Zinc, Total	16.4	0.20	ug/l	10.0	6.09	103	68-132	0.09	30	
Batch W6E0896 - EPA 1640										
Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W6E0896-BLK1)				Analyzed:	05/19/16 20	:36				
Copper, Total	ND	0.010	ug/l							
Zinc, Total	ND	0.20	ug/l							
LCS (W6E0896-BS1)				Analyzed:	05/19/16 20	:49				
Copper, Total	1.86	0.010	ug/l	2.00		93	73-122			
Zinc, Total	9.40	0.20	ug/l	10.0		94	75-127			
										Page 35 of 3

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Date Received:	05/12/16 10:10
Date Reported:	05/26/16 15:34

#### Metals - Low Level by 1600 Series Methods - Quality Control

#### Batch W6E0896 - EPA 1640

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Matrix Spike (W6E0896-MS1)	Sourc	e:6E12040-07		Analyzed: (	05/19/16 21	:03				
Copper, Total	4.36	0.050	ug/l	2.00	4.28	4	60-138			MS-02
Zinc, Total	175	1.0	ug/l	10.0	178	NR	68-132			MS-02
Matrix Spike (W6E0896-MS2)	Sourc	e:6E12040-12		Analyzed: (	05/19/16 21	:30				
Copper, Total	34.4	0.050	ug/l	2.00	33.5	44	60-138			MS-02
Zinc, Total	181	1.0	ug/l	10.0	153	277	68-132			MS-02
Matrix Spike Dup (W6E0896-MSD1)	Sourc	e:6E12040-07		Analyzed: (	05/19/16 21	:17				
Copper, Total	4.39	0.050	ug/l	2.00	4.28	5	60-138	0.6	30	MS-02
Zinc, Total	176	1.0	ug/l	10.0	178	NR	68-132	0.5	30	MS-02
Matrix Spike Dup (W6E0896-MSD2)	Sourc	e: 6E12040-12		Analyzed: (	05/19/16 21	:44				
Copper, Total	34.8	0.050	ug/l	2.00	33.5	63	60-138	1	30	
Zinc, Total	182	1.0	ug/l	10.0	153	290	68-132	0.8	30	MS-02
Batch W6E1121 - EPA 1640										
Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W6E1121-BLK1)				Analyzed: (	05/23/16 20	:39				
Copper, Total	ND	0.010	ug/l							
Zinc, Total	ND	0.20	ug/l							
LCS (W6E1121-BS1)				Analyzed: (	05/23/16 20	:53				
Copper, Total	1.91	0.010	ug/l	2.00		95	73-122			
Zinc, Total	9.98	0.20	ug/l	10.0		100	75-127			
Matrix Spike (W6E1121-MS1)	Sourc	e: 6E12065-01		Analyzed: (	05/23/16 21	:06				
Copper, Total	4.38	0.010	ug/l	2.00	2.56	91	60-138			
Zinc, Total	143	0.20	ug/l	10.0	138	58	68-132			MS-02
	Source	e: 6E12065-01		Analyzed: (	05/23/16 21	:20				
Matrix Spike Dup (W6E1121-MSD1)	oouro									
Matrix Spike Dup (W6E1121-MSD1) Copper, Total	4.41	0.010	ug/l	2.00	2.56	93	60-138	0.7	30	

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Date Received:05/12/16 10:10Date Reported:05/26/16 15:34

#### Notes and Definitions

MS-02	The RPD and/or percent recovery for this QC spike sample cannot be accurately calculated due to the high concentration of analyte inherent in the sample.
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then not detected at or above the MDL.
NR	Not Reportable
Dil	Dilution
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
% Rec	Percent Recovery
Sub	Subcontracted analysis, original report available upon request
MDL	Method Detection Limit
MDA	Minimum Detectable Activity
MRL	Method Reporting Limit

Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.

An Absence of Total Coliform meets the drinking water standards as established by the California Department of Health Services.

The Reporting Limit (RL) is referenced as the Laboratory's Practical Quantitation Limit (PQL) or the Detection Limit for Reporting Purposes (DLR).

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

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SPAWAR	Surface Confec	San Diego

ENVIRONMENTAL SCIENCES AND APPLIED SYSTEMS BRANCH, CODE 71760 53605 HULL STREET SAN DIEGO, CA 92152-5000

Chain of Custody Record  $\mathcal{EF1Cb40}$ 

Date: 5/4/2016 1 of 2 Page:

Project Title/Project Number: 4			0	1-1-1	2 D1-1 T. + + 7		Proie	Project Leader:	ar U.M. C.L. o	<u></u>		Γ
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Kemarks/Air Bill:							CONTRA		মূ	533-21	6	
Sampler(s): Holly Colvin	Gunther	er Rosen	~ ) Jacob	hosmy do	501		email:	N				
Tel: UP -553. 2788	Fax:		Email: M	olin 63	Email: NOOLIN @S DOW A (. MOUN WA	and mult	ľ		Requested Analyses	nalyses		
Special Instructions:				5	*	כ		e			7/Cm	%m '
							انون					ימכן
Sample D	Date	Time	Matrix	Container Type	# of Containers	Total Wet Weight (g)	n) essid	AZ SSIQ	000		Mer	
Static - CC - CU	4/29/16	0220	See when	HDPE	-		x	X X			0	Q
Static - Cu - 50	4/29/16	0830		HDPC	-		X				50	0
Staric - Cu - 100	4/29/16	0830	See wall	JJACH	+		X			-	Ś	0
Slatic - Cu - 200	4/29/16	0830		HDPE	-		X				230	0
Startic - Cu - 400	4/29/12	0830	250 mator	ALDAR	1		Х		-		400	0
Static - Cu - 800	4/29/16	0830	Space seter	NARE	-		y				\$	0
Static-Zn- 125		6830		ADPE	1			Х			0	125
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2hr - TU - 0.5	4/29/16	08-30	Seawayer	ADPE	-		X	×			E	737 5220
34-20-1	4/20/10	0830	Saust	ADPE	1		X	۲			1475	H75 10440
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Relinquished by: (Signature)		Received by: (Signature)	(Signature)	81	18.81			Date: ≤.12.16	5.16	Time: 10 [0	0	
2												

Chain of Custody Record	Date: 5/4/2010 Page: 2- of 2	Project Leader: Lolls Colling	contact: 6/9 533.278P	Ŀħ	Requested Abalyses		5 mm 2 mm	× ×	x x 393 1957	× × × 39/4	$\times \times$	$\times \times$	× × ×	× × ×	$\times \times$	479 H120			Date:	0001 0107/01/5	Date: 2.12.16 Time: 1.D/D
NTAL SCIENCES AND STEMS BRANCH, CODE 71750 STREET	Systems Center Systems Center San Diego	Project Title/Project Number: N.xea) Cooper and Zinc Pulsee) Toxicity test F		Sampler(s): (Signature) Mally Calvin, Burtier Rosan, Jacob Murson	Email: mcs/u/A	Field Sample * Date annue diation to collections * Annue diation for the collections * Annual diation for the collection is annue of the collection is an	4/24/16 0230 Source ADE	/DP/E	HDDE	40PE	- 2 4/29/16 DB30 Sermanar 4DB75	Abre	HDPE	HDPE	CE30 SAWAY	HDRE			Relinquished by: (Stituatule) Received by: (Signature)		Relinquished by: (Signature) (Signature) $i\delta^{kt}$

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## APPENDIX C TEST DATA AND STATISTICAL SUMMARIES

## **STORMWATER EXPOSURES**

## **C.1 OVERVIEW**

Items included are included in Appendix C:

1.	Stormwater Exposures – Purple Urchin	C-15
2.	Stormwater Exposures – Mysid Shrimp	C-15
3.	Stormwater Exposures – Analytical Chemistry Reports	C-15
4.	Stormwater Exposures – Reference Toxicant Test Results	C-15
5.	Stormwater Exposures – Sample Information and Chain of Custody	C-15

## C.1. COPPER EXPOSURES – PURPLE URCHIN:

## **TST Summary Sheet**

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Outfall 73_12hr	Test Species	S. purpuratus (echinoderm)
Test Date	3.25.2016	Test Type	Chronic
Test Duration	4 day	Endpoint	Larval Development
Critical Conc.	64		
Statistic		Control	Critical Concentration
Percent Mean of	Raw Data	0.99	0.94
	Icuation (transformed)	1.49	1.32
	Calcuation (transformed)	0.002	0.003
	on of Transformed Data	0.044	0.055
CV of Transforme		0.030	0.042
n		4	4
Mean % Effect a	t Critical Conc.		
5.54			
Calculated t-val	ue Degrees of Freedom	Table t-value	Percent Difference
		<b>Table t-value</b> 2.1318	Percent Difference
Calculated t-val	ue Degrees of Freedom		Percent Difference
Calculated t-val	ue Degrees of Freedom		Percent Difference
Calculated t-val 6.4828 Results	ue Degrees of Freedom 4		Percent Difference
Calculated t-val 6.4828 Results Pass Raw Data	ue Degrees of Freedom 4	2.1318	Percent Difference
Calculated t-valu 6.4828 Results Pass Raw Data Cont	ue Degrees of Freedom 4 Sample is Non-toxic	2.1318	
Calculated t-valu 6.4828 Results Pass Raw Data Cont No. of Organisma	ue Degrees of Freedom 4 Sample is Non-toxic rol Data s Response (Final	2.1318 Critical Conc No. of Organisms	e <b>ntration Data</b> Response (Final
Calculated t-valu 6.4828 Results Pass Raw Data Cont	ue Degrees of Freedom 4 Sample is Non-toxic rol Data s Response (Final Count, Weight,	2.1318 Critical Conc	e <b>ntration Data</b> Response (Final Count, Weight,
Calculated t-value 6.4828 Pass Raw Data No. of Organisme Exposed or	ue Degrees of Freedom 4 Sample is Non-toxic rol Data s Response (Final	2.1318 Critical Conc No. of Organisms Exposed or	e <b>ntration Data</b> Response (Final
Calculated t-value 6.4828 Pass Raw Data No. of Organism: Exposed or Counted	ue Degrees of Freedom 4 Sample is Non-toxic rol Data s Response (Final Count, Weight, Length, etc.)	2.1318 Critical Conc No. of Organisms Exposed or Counted	e <b>ntration Data</b> Response (Final Count, Weight, Length, etc.)
Calculated t-value 6.4828 Pass Raw Data No. of Organisms Exposed or Counted 100	ue Degrees of Freedom 4 Sample is Non-toxic rol Data s Response (Final Count, Weight, Length, etc.) 99	2.1318 Critical Conc No. of Organisms Exposed or Counted 100	e <b>entration Data</b> Response (Final Count, Weight, Length, etc.) 91
Calculated t-value 6.4828 Pass Raw Data No. of Organisms Exposed or Counted 100 100	ue Degrees of Freedom 4 Sample is Non-toxic rol Data s Response (Final Count, Weight, Length, etc.) 99 98	2.1318 Critical Conc No. of Organisms Exposed or Counted 100 100	e <b>entration Data</b> Response (Final Count, Weight, Length, etc.) 91 93

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000 D 15		
SSC - Pacific	Client Name	SSC - Pacific
SSC-2016-Outfall 73_96hr	Test Species	S. purpuratus (echinoderm)
3.25.2016	Test Type	Chronic
4 day	Endpoint	Larval Development
64		
	Control	Critical Concentration
Raw Data	0.99	0.00
lcuation (transformed)	1.49	0.05
	0.002	0.000
		0.000
ed Data		0.000
	4	4
t Critical Conc.		
no Dogroos of Frondom	Table t value	Porcent Difference
ue Degrees of Freedom	Table t-value	Percent Difference
ue Degrees of Freedom 3	<b>Table t-value</b> 2.3534	Percent Difference
		Percent Difference
		Percent Difference
3		Percent Difference
3		Percent Difference
3 Sample is Toxic	2.3534	
3 Sample is Toxic rol Data	2.3534 Critical Con	centration Data
3 Sample is Toxic <b>rol Data</b> s Response (Final	2.3534 Critical Con No. of Organisms	centration Data s Response (Final
3 Sample is Toxic <b>rol Data</b> s Response (Final Count, Weight,	2.3534 Critical Con	<b>centration Data</b> s Response (Final Count, Weight,
3 Sample is Toxic <b>rol Data</b> s Response (Final	2.3534 Critical Con No. of Organisms Exposed or	centration Data s Response (Final
3 Sample is Toxic rol Data s Response (Final Count, Weight, Length, etc.)	2.3534 Critical Con No. of Organisms Exposed or Counted	<b>centration Data</b> s Response (Final Count, Weight, Length, etc.)
3 Sample is Toxic <b>rol Data</b> s Response (Final Count, Weight, Length, etc.) 99	2.3534 Critical Con No. of Organisms Exposed or Counted 100	<b>centration Data</b> s Response (Final Count, Weight, Length, etc.) 0
3 Sample is Toxic rol Data s Response (Final Count, Weight, Length, etc.) 99 98	2.3534 Critical Con No. of Organisms Exposed or Counted 100 100	<b>centration Data</b> s Response (Final Count, Weight, Length, etc.) 0 0
	3.25.2016 4 day 64 Raw Data icuation (transformed) Calcuation (transformed) on of Transformed Data ed Data	3.25.2016 Test Type 4 day Endpoint 64 Control Raw Data 0.99 Icuation (transformed) 1.49 Calcuation (transformed) 0.002 on of Transformed Data 0.030 4

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Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 10 Influent_12hr	Test Species	S. purpuratus (echinoderm)
Test Date	3/25/2016	Test Type	Chronic
Test Duration	4 day	Endpoint	Larval Development
Critical Conc.	64		

Statistic	Control	Critical Concentration	
Percent Mean of Raw Data	0.99	0.97	
Mean used in Calcuation (transformed)	1.49	1.39	
Variance used in Calcuation (transformed)	0.002	0.002	
Standard Deviation of Transformed Data	0.044	0.050	
CV of Transformed Data	0.030	0.036	
n	4	4	

# Mean % Effect at Critical Conc. 2.52

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference	
9.3663	5	2.0150		
Results				
Pass	Sample is Non-toxic			

### Raw Data

Control Data		Critical Conce	entration Data
No. of Organisms	Response (Final	No. of Organisms	Response (Final
Exposed or	Count, Weight,	Exposed or	Count, Weight,
Counted	Length, etc.)	Counted	Length, etc.)
100	99	100	98
100	98	100	94
100	100	100	97
100	100	100	98

5/27/2016

Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 10 Influent_96hr	Test Species	S. purpuratus (echinoderm)
Test Date	3/25/2016	Test Type	Chronic
Test Duration	4 day	Endpoint	Larval Development
Critical Conc.	64		

Statistic	Control	Critical Concentration	
Percent Mean of Raw Data	0.99	0.09	
Mean used in Calcuation (transformed)	1.49	0.30	
Variance used in Calcuation (transformed)	0.002	0.013	
Standard Deviation of Transformed Data	0.044	0.112	
CV of Transformed Data	0.030	0.380	
n	4	4	

# Mean % Effect at Critical Conc. 90.68

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
-13.9810	3	2.3534	
Results			
Fail	Sample is Toxic		
Raw Data			

Control Data		Critical Concentration Data
No. of Organisms	Response (Final	No. of Organisms Response (Final
Exposed or	Count, Weight,	Exposed or Count, Weight,
Counted	Length, etc.)	Counted Length, etc.)
100	99	100 15
100	98	100 14
100	100	100 3
100	100	100 5

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Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 10 Effluent_12hr	Test Species	S. purpuratus (echinoderm)
Test Date	3/25/2016	Test Type	Chronic
Test Duration	4 day	Endpoint	Larval Development
Critical Conc.	64		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.99	0.97
Mean used in Calcuation (transformed)	1.49	1.42
Variance used in Calcuation (transformed)	0.002	0.008
Standard Deviation of Transformed Data	0.044	0.089
CV of Transformed Data	0.030	0.063
n	4	4

# Mean % Effect at Critical Conc. 2.02

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
6.4225	3	2.3534	
Results			
Pass	Sample is Non-toxic		

### Raw Data

Control Data		Critical Conce	entration Data
No. of Organisms	Response (Final	No. of Organisms	Response (Final
Exposed or	Count, Weight,	Exposed or	Count, Weight,
Counted	Length, etc.)	Counted	Length, etc.)
100	99	100	98
100	98	100	93
100	100	100	100
100	100	100	98

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Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 10 Effluent_96hr	Test Species	S. purpuratus (echinoderm)
Test Date	3/25/2016	Test Type	Chronic
Test Duration	4 day	Endpoint	Larval Development
Critical Conc.	64		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.99	0.11
Mean used in Calcuation (transformed)	1.49	0.33
Variance used in Calcuation (transformed)	0.002	0.003
Standard Deviation of Transformed Data	0.044	0.059
CV of Transformed Data	0.030	0.180
n	4	4

# Mean % Effect at Critical Conc. 89.42

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
-23.2693	4	2.1318	
Results			
Fail	Sample is Toxic		

Control Data		Critical Concentration Data
No. of Organisms	Response (Final	No. of Organisms Response (Final
Exposed or	Count, Weight,	Exposed or Count, Weight,
Counted	Length, etc.)	Counted Length, etc.)
100	99	100 8
100	98	100 10
100	100	100 16
100	100	100 8

Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 13 Base_12hr	Test Species	S. purpuratus (echinoderm)
Test Date	3/25/2016	Test Type	Chronic
Test Duration	4 day	Endpoint	Larval Development
Critical Conc.	64		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.99	0.96
Mean used in Calcuation (transformed)	1.49	1.39
Variance used in Calcuation (transformed)	0.002	0.006
Standard Deviation of Transformed Data	0.044	0.077
CV of Transformed Data	0.030	0.056
n	4	4

# Mean % Effect at Critical Conc. 3.02

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
6.5107	4	2.1318	
Results			
Pass	Sample is Non-toxic		

### Raw Data

Control Data		Critical Concentration Data
No. of Organisms	Response (Final	No. of Organisms Response (Final
Exposed or	Count, Weight,	Exposed or Count, Weight,
Counted	Length, etc.)	Counted Length, etc.)
100	99	100 99
100	98	100 92
100	100	100 97
100	100	100 97

5/27/2016

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Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 13 Base_96hr	Test Species	S. purpuratus (echinoderm)
Test Date	3/25/2016	Test Type	Chronic
Test Duration	4 day	Endpoint	Larval Development
Critical Conc.	64		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.99	0.91
Mean used in Calcuation (transformed)	1.49	1.26
Variance used in Calcuation (transformed)	0.002	0.003
Standard Deviation of Transformed Data	0.044	0.052
CV of Transformed Data	0.030	0.041
n	4	4

# Mean % Effect at Critical Conc. 8.56

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
4.9040	5	2.0150	
Results			
Pass	Sample is Non-toxic		

### Raw Data

Control Data		Critical Conce	ntration Data
No. of Organisms	Response (Final	No. of Organisms	Response (Final
Exposed or	Count, Weight,	Exposed or	Count, Weight,
Counted	Length, etc.)	Counted	Length, etc.)
100	99	100	90
100	98	100	87
100	100	100	94
100	100	100	92

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Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 13 Mid_12hr_Outlier F	R Test Species	S. purpuratus (echinoderm)
Test Date	3/25/2016	Test Type	Chronic
Test Duration	4 day	Endpoint	Larval Development
Critical Conc.	64		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.99	0.94
Mean used in Calcuation (transformed)	1.49	1.33
Variance used in Calcuation (transformed)	0.002	0.001
Standard Deviation of Transformed Data	0.044	0.038
CV of Transformed Data	0.030	0.029
n	4	3

# Mean % Effect at Critical Conc. 5.29

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
7.6258	4	2.1318	
Results			
Pass	Sample is Non-toxic		

### Raw Data

Control Data		Critical Conce	ntration Data
No. of Organisms	Response (Final	No. of Organisms	Response (Final
Exposed or	Count, Weight,	Exposed or	Count, Weight,
Counted	Length, etc.)	Counted	Length, etc.)
100	99	100	93
100	98	100	93
100	100	100	96
100	100		

Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 13 Mid_96hr	Test Species	S. purpuratus (echinoderm)
Test Date	3/25/2016	Test Type	Chronic
Test Duration	4 day	Endpoint	Larval Development
Critical Conc.	64		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.99	0.00
Mean used in Calcuation (transformed)	1.49	0.05
Variance used in Calcuation (transformed)	0.002	0.000
Standard Deviation of Transformed Data	0.044	0.000
CV of Transformed Data	0.030	0.000
n	4	4

# Mean % Effect at Critical Conc.

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
-63.9040	3	2.3534	
Results			
Fail	Sample is Toxic		
Raw Data			

Control Data		Critical Concentration Data
No. of Organisms	Response (Final	No. of Organisms Response (Final
Exposed or	Count, Weight,	Exposed or Count, Weight,
Counted	Length, etc.)	Counted Length, etc.)
100	99	100 0
100	98	100 0
100	100	100 0
100	100	100 0

Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 13 End_12hr	Test Species	S. purpuratus (echinoderm)
Test Date	3/25/2016	Test Type	Chronic
Test Duration	4 day	Endpoint	Larval Development
Critical Conc.	64		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.99	0.95
Mean used in Calcuation (transformed)	1.49	1.35
Variance used in Calcuation (transformed)	0.002	0.004
Standard Deviation of Transformed Data	0.044	0.061
CV of Transformed Data	0.030	0.045
n	4	4

# Mean % Effect at Critical Conc. 4.53

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
6.6463	4	2.1318	
Results			
Pass	Sample is Non-toxic		

## Raw Data

Control Data		Critical Concentration Data
No. of Organisms	Response (Final	No. of Organisms Response (Final
Exposed or	Count, Weight,	Exposed or Count, Weight,
Counted	Length, etc.)	Counted Length, etc.)
100	99	100 92
100	98	100 94
100	100	100 95
100	100	100 98

5/27/2016

Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 13 End_96hr	Test Species	S. purpuratus (echinoderm)
Test Date	3/25/2016	Test Type	Chronic
Test Duration	4 day	Endpoint	Larval Development
Critical Conc.	64		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.99	0.00
Mean used in Calcuation (transformed)	1.49	0.05
Variance used in Calcuation (transformed)	0.002	0.000
Standard Deviation of Transformed Data	0.044	0.000
CV of Transformed Data	0.030	0.000
n	4	4

# Mean % Effect at Critical Conc.

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
-63.9040	3	2.3534	
Results			
Fail	Sample is Toxic		
Raw Data			

Control Data		Critical Concentration Data
No. of Organisms	Response (Final	No. of Organisms Response (Final
Exposed or	Count, Weight,	Exposed or Count, Weight,
Counted	Length, etc.)	Counted Length, etc.)
100	99	100 0
100	98	100 0
100	100	100 0
100	100	100 0

Page 1 of 1

## 96-Hour Development

Project: NBSD Storm H2O - pulsed		Test Species: S.	purpuratus
Sample ID:	3hr Exposure - Brined Samples	Start Date:	3/8/2016 1000
Test No.:	т	End Date:	3/12/20110 1030

Random #	Number Counted	Number Normal	Technician Initials
36	100	Ø	MC.
37	100	100	MC
38	too	87	MC
39	00)	74	MC
40	100	Ø	μċ
41	106	Ø	NC
42	(00	72	MC
43	100	10	MC
44	100	23	μc
45	100	99	MC
46	100	160	MC
47	iuo	98	WC.
48	NC 185 79	76	nic
49		100	pic
50	i <i>0</i> 6	54	MC
51	160	24	MC
52	100	Ø	M2
<u> </u>	100	90	MC
54	100	99	MC
55	100	100	Me
5le ·	100	100	NC
57	100	91	MC
58	100	95	me
59	100	- Ø	me
00	160	Ø	me
61	100	95	me
62	100	106	wie
63	100	100	mc
64	100	90	MC
105	100	100	MC
66	100	97	WС
67	100	- 74	imc

### 96-Hour Development

Project: NBSD_	Storm H20 - pulsed	Test Species:	S, purpuratus	
Sample ID: Ghr Exp	posure - Bound Bamples	Start Date:	3/8/2010	1,000
Test No.:		End Date:	3112/2016	1030

Random #	Number Counted	Number Normal	Technician Initial
68	106	97	MC
69	100	100	vie
70	100	ø	mc
71	100	100	ma
72	100	70	ma
73	100	37	ma
14	100	99	me
15	100	97	Mic
76	100	99	me
77	100	ø	inc_
78	100	14	me
19	100	80	me
80	100	98	ma
81	106	- 100	line
82	100	99	me
83	100	92	ma
84	100	100	MC
85	100	98	uc
810	100	100	μα
\$1	100	100	MQ
88	100	94	MC
89	.100	100	Me
90	100	4	мс
91	100	99	MC
•I			
-			
			·

 QC Check:
 5/2c/16
 Final Review:
 UL
 ULL

 SPAWAR Systems Center Pacific Bioassay Lab, 53475 Strothe Rd, Bidg 111 Rm 116, San Diego, CA 92152

## 96-Hour Development

Project: <u></u>	UBGD Storm Hzo- pulsed	Test Species: S. purpuratus	
Sample ID:	12hr Exposite - Brined Samples	Start Date: 38 2016	1000
Test No.:		End Date: 3/12/2016	1020

Random #	Number Counted	Number Normal	Technician Initials
92	100	93	мс
93	100	91	MC
94	100	97	NC
95	00	94	MC
96	100	94	μc
97	100	99	ис
98	100	98	MC
99	100	98	MC
100	100	98	MC
101	100	92	MC
102	100	98	MC
103	100	97	ме
104	100		Me
105	tvo		me
1060	100	93	Inc.
107	100	93	me
108	106	93	MC.
109	100	92	NC
110	100	98	MC
111	- 100 -	100	THC
112	160	96	MC
113	100	97	MC
14	100	95	RIC .
115	100	94	мс
· · · · · · · · · · · · · · · · · · ·			
		····	
· · · · · · · · · · · · · · · · · · ·			

QC Check: TMD 5/2016 Final Review: UL U(2)14 SPAWAR Systems Center Pacific Bioassay Lab, 53475 Strothe Rd, Bidg 111 Rm 116, San Diego, CA 92152

## 96-Hour Development

Project: <sub>N</sub>	DSD Storm H20 - Pul	used Test Species:	S. purpuratus		
Sample ID: <u>A</u>	olur Static Exposure - Br	ned Smples Start Date:	3/8/2016	1000	
Test No.:	· · · · · · · · · · · · · · · · · · ·	End Date:	3/12/2010	1030	

Random #	Number Counted	Number Normal	Technician Initials
the me	مت <sub>الع</sub> رب		
116	100	ILe	we
117	100	Ø	NC
118	100	¢	mi .
PII	- 100	¢	w.c.
120	100	8	I. we
121	106	Ŕ	ne
122	100	90	me
173	106	Ø	w.c.
124	100	¢	me
1255	100	15	ILC.
126	100	8	Mic
127	100	3	uc
12.8	100	Ø	itic .
129	100	Ø	me
130	100	Ø	me.
181	100	92	MC
132	100	Ø	he
133	100	Ø	. ne
134	100	94	mc
125	100	81	me
136	100	Ø	me
137	100	14	me
138	100	5	mc
139	100	10	inc

 QC Check:
 Space and final Review:
 Space and final Review:

 SPAWAR Systems Center Pacific Bioassay Lab, 53475 Strothe Rd, Bidg 111 Rm 116, San Diego, CA 92152

#### SPAWAR Pulsed Exposure Definitive Study Echinoderm Development Tests Test Initiation Date: 3/8/2016 3-hour exposure

Copper Concentration (µg/L)	Rand#
	49
	62
Lab Control	55
	37
	45
	47
Brine Control	46
	56
	44
Storm water sample	48
#1	52
	41
	53
Storm water sample	51
#2	63
#Z	59
	42
Storm water sample	43
#3	40
#0	36
	66
Storm water sample	61
#4	65
<del>77*1</del>	60
	67
Storm water sample	39
#5	58
#0	57
	64
Storm water cample	38
Storm water sample #6	50
#0	54

QC Check: \_\_\_\_\_

#### SPAWAR Pulsed Exposure Definitive Study Echinoderm Development Tests Test Initiation Date: 3/8/2016 6-hour exposure

Copper Concentration (µg/L)	Rand#
	69
Storm water sample	82
#1	77
	70
	90
Storm water sample	76
#2	81
	68
	72
Storm water sample	71
#3	86
	88
	73
Storm water sample	91
#4	85
	87
	78
Storm water sample	80
#5	89
	83
	74
Storm water sample	75
#6	84
	79

### SPAWAR Pulsed Exposure Definitive Study Echinoderm Development Tests Test Initiation Date: 3/8/2016 12-hour exposure

Copper Concentration (µg/L)	Rand#
	93
Storm water sample	106
#1	95
	103
	100
Storm water sample	92
#2	111
	110
	98
Storm water sample	96
#3	113
	99
	97
Storm water sample	109
#4	105
	94
	104
Storm water sample	108
#5	107
	112
	101
Storm water sample	115
#6	114
	102

#### SPAWAR Pulsed Exposure Definitive Study Echinoderm Development Tests Test Initiation Date: 3/8/2016 Static

Copper Concentration (µg/L)	Rand#
	124
Storm water sample	129
#1	118
	132
	120
Storm water sample	139
#2	116 .
	126
	125
Storm water sample	137
#3	127
	138
	122
Storm water sample	135
#4	134
	131
	133
Storm water sample	123
#5	117
	121
	136
Storm water sample	128
#6	119
	130

33.7     15.2       342     44       344     14.3       54.7     14.8       54.8     14.8
chnician Initials: $\begin{array}{ c c c c c c c c c c c c c c c c c c c$

#### Embryo-Larval Development Test - SPAWNING CHECKLIST & CALCULATIONS

Batch ID: DIZBIG SD Spawn/Test Date: 3/8/16 Test Species S. Pur pureters Analyst: JAD\_\_\_\_\_

Task	Time
Spawning Inducement Initiated	0600
Spawning Begins	0605
Females/Males Isolated in Incubator	4/2
Fertilization Initiated	0620
Fertilzation Terminated/eggs rinsed	0645
Embryo Counts	0715
Embryo addition to vials	1000

Embryo Counts:

 $\begin{array}{l} \underline{\text{Embryo Counts}} \\ \underline{\text{Embryo Stock \#1}, \underline{\texttt{42}}, \underline{41}, \underline{40}} \\ \underline{\text{Embryo Stock \#2}; \underline{79}, \underline{36}, \underline{32}} \\ \underline{\text{Mean}} = \underline{\texttt{42}/20} \text{ uL } * 1000 \text{ uL/mL} = \underline{\texttt{2050}} \text{ cells/mL} \\ \underline{\text{Embryo Stock \#3}; \underline{23}, \underline{74}, \underline{20}} \\ \underline{\text{Mean}} = \underline{\texttt{32}/20} \text{ uL } * 1000 \text{ uL/mL} = \underline{\texttt{400}} \text{ cells/mL} \\ \underline{\text{Embryo Stock \#3}; \underline{23}, \underline{74}, \underline{20}} \\ \underline{\text{Mean}} = \underline{\texttt{32}/20} \text{ uL } * 1000 \text{ uL/mL} = \underline{\texttt{400}} \text{ cells/mL} \\ \underline{\text{mbryo Stock \#3}; \underline{23}, \underline{74}, \underline{20}} \\ \underline{\text{Mean}} = \underline{\texttt{32}/20} \text{ uL } * 1000 \text{ uL/mL} = \underline{\texttt{400}} \text{ cells/mL} \\ \underline{\text{mbryo Stock \#3}; \underline{23}, \underline{74}, \underline{20} \\ \underline{\text{mbryo Stock \#3}; \underline{73}, \underline{74}, \underline{70} \\ \underline{74}, \underline{74} \\ \underline{74} \\ \underline{74}, \underline{74} \\ \underline{74} \\ \underline{74}, \underline{74} \\ \underline$ 

Adjust selected embryo stock to 2000 embryos/ml. Confirm density:

Selected Stock :  $\frac{42}{1}$ ,  $\frac{41}{20}$  Mean =  $\frac{41}{20}$  uL \* 1000 uL/mL =  $\frac{2050}{100}$  cells/mL

Add 100 µl of 2000 embryo/ml stock to obtain 20 embryos/ml in test vials.

#### Notes:

Embryo Stock # 1 790% ferlilization Empryo storic H 2 20% Sect. 1: 2010 Embryo Stock #3 690% Carl 120 - bion

Stuck #2 selected. 200, added - 1000 @ 2 cell stage @ initiation

## C.2. COPPER EXPOSURES – MYSID SHRIMP:

## **TST Summary Sheet**

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Outfall 73_3hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

#### Statistic

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.95	0.95
Mean used in Calcuation (transformed)	1.29	1.29
Variance used in Calcuation (transformed)	0.014	0.014
Standard Deviation of Transformed Data	0.119	0.119
CV of Transformed Data	0.093	0.093
n	4	4

#### Mean % Effect at Critical Conc.

0.00

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
3.3729	5	1.4759	
Results			

Pass

Sample is Non-toxic

#### Raw Data

Contro	ol Data	Critical Concent	ration Data
No. of Organisms	Response (Final	No. of Organisms R	esponse (Final
Exposed or	Count, Weight,	Exposed or C	Count, Weight,
Counted	Length, etc.)	Counted	Length, etc.)
5	5	5	5
5	4	5	4
5	5	5	5
5	5	5	5

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Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Outfall 73_6hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.95	0.95
Mean used in Calcuation (transformed)	1.29	1.29
Variance used in Calcuation (transformed)	0.014	0.014
Standard Deviation of Transformed Data	0.119	0.119
CV of Transformed Data	0.093	0.093
n	4	4

# Mean % Effect at Critical Conc.

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
3.3729	5	1.4759	
Results			

Pass

Sample is Non-toxic

## Raw Data

Contro	ol Data	Critical Conce	ntration Data
No. of Organisms	Response (Final	No. of Organisms	Response (Final
Exposed or	Count, Weight,	Exposed or	Count, Weight,
Counted	Length, etc.)	Counted	Length, etc.)
5	5	5	5
5	4	5	5
5	5	5	4
5	5	5	5

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Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Outfall 73_12hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.95	1.00
Mean used in Calcuation (transformed)	1.29	1.35
Variance used in Calcuation (transformed)	0.014	0.000
Standard Deviation of Transformed Data	0.119	0.000
CV of Transformed Data	0.093	0.000
n	4	4

#### Mean % Effect at Critical Conc.

-5.26

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
6.6493	3	1.6377	
Results			

Pass

Sample is Non-toxic

## Raw Data

Contro	ol Data	Critical Conce	ntration Data
No. of Organisms	Response (Final	No. of Organisms	Response (Final
Exposed or	Count, Weight,	Exposed or	Count, Weight,
Counted	Length, etc.)	Counted	Length, etc.)
5	5	5	5
5	4	5	5
5	5	5	5
5	5	5	5

Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Outfall 73_96hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.95	0.90
Mean used in Calcuation (transformed)	1.29	1.23
Variance used in Calcuation (transformed)	0.014	0.019
Standard Deviation of Transformed Data	0.119	0.137
CV of Transformed Data	0.093	0.112
n	4	4

### Mean % Effect at Critical Conc.

5.26

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
2.3630	5	1.4759	
Results			

Pass

Sample is Non-toxic

### Raw Data

Contro	ol Data	Critical Concentrati	ion Data
No. of Organisms	Response (Final	No. of Organisms Res	ponse (Final
Exposed or	Count, Weight,	Exposed or Cou	unt, Weight,
Counted	Length, etc.)	Counted Le	ength, etc.)
5	5	5	4
5	4	5	5
5	5	5	4
5	5	5	5

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Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 10 Influent_3hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration	
Percent Mean of Raw Data	0.95	0.90	
Mean used in Calcuation (transformed)	1.29	1.23	
Variance used in Calcuation (transformed)	0.014	0.019	
Standard Deviation of Transformed Data	0.119	0.137	
CV of Transformed Data	0.093	0.112	
n	4	4	

# Mean % Effect at Critical Conc. 5.26

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
2.3630	5	1.4759	
Results			
-			

Pass

Sample is Non-toxic

### Raw Data

Contro	ol Data	Critical Concent	tration Data
No. of Organisms	Response (Final	No. of Organisms	Response (Final
Exposed or	Count, Weight,	Exposed or	Count, Weight,
Counted	Length, etc.)	Counted	Length, etc.)
5	5	5	5
5	4	5	4
5	5	5	5
5	5	5	4

Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 10 Influent_6hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration	
Percent Mean of Raw Data	0.95	1.00	
Mean used in Calcuation (transformed)	1.29	1.35	
Variance used in Calcuation (transformed)	0.014	0.000	
Standard Deviation of Transformed Data	0.119	0.000	
CV of Transformed Data	0.093	0.000	
n	4	4	

#### Mean % Effect at Critical Conc.

-5.26

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
6.6493	3	1.6377	
Results			

Pass

Sample is Non-toxic

## Raw Data

Contro	ol Data	Critical Conce	ntration Data
No. of Organisms	Response (Final	No. of Organisms	Response (Final
Exposed or	Count, Weight,	Exposed or	Count, Weight,
Counted	Length, etc.)	Counted	Length, etc.)
5	5	5	5
5	4	5	5
5	5	5	5
5	5	5	5

Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 10 Influent_12hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration	
Percent Mean of Raw Data	0.95	0.90	
Mean used in Calcuation (transformed)	1.29	1.23	
Variance used in Calcuation (transformed)	0.014	0.019	
Standard Deviation of Transformed Data	0.119	0.137	
CV of Transformed Data	0.093	0.112	
n	4	4	

# Mean % Effect at Critical Conc. 5.26

Pass

Sample is Non-toxic

### Raw Data

Contro	ol Data	Critical Conce	entration Data
No. of Organisms	Response (Final	No. of Organisms	Response (Final
Exposed or	Count, Weight,	Exposed or	Count, Weight,
Counted	Length, etc.)	Counted	Length, etc.)
5	5	5	5
5	4	5	4
5	5	5	5
5	5	5	4

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Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 10 Influent_96hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.95	0.90
Mean used in Calcuation (transformed)	1.29	1.23
Variance used in Calcuation (transformed)	0.014	0.019
Standard Deviation of Transformed Data	0.119	0.137
CV of Transformed Data	0.093	0.112
n	4	4

# Mean % Effect at Critical Conc. 5.26

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
2.3630	5	1.4759	
Results			

Pass

Sample is Non-toxic

#### Raw Data

Control Data		Critical Concentration Data		
No. of Organisms	Response (Final	No. of Organisms	Response (Final	
Exposed or	Count, Weight,	Exposed or	Count, Weight,	
Counted	Length, etc.)	Counted	Length, etc.)	
5	5	5	5	
5	4	5	4	
5	5	5	4	
5	5	5	5	

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Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 10 Effluent_3hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.95	1.00
Mean used in Calcuation (transformed)	1.29	1.35
Variance used in Calcuation (transformed)	0.014	0.000
Standard Deviation of Transformed Data	0.119	0.000
CV of Transformed Data	0.093	0.000
n	4	4

#### Mean % Effect at Critical Conc.

-5.26

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
6.6493	3	1.6377	
Results			

Pass

Sample is Non-toxic

### Raw Data

Contro	ol Data	Critical Conce	ntration Data
No. of Organisms	Response (Final	No. of Organisms	Response (Final
Exposed or	Count, Weight,	Exposed or	Count, Weight,
Counted	Length, etc.)	Counted	Length, etc.)
5	5	5	5
5	4	5	5
5	5	5	5
5	5	5	5

5/27/2016

Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 10 Effluent_6hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.95	0.95
Mean used in Calcuation (transformed)	1.29	1.29
Variance used in Calcuation (transformed)	0.014	0.014
Standard Deviation of Transformed Data	0.119	0.119
CV of Transformed Data	0.093	0.093
n	4	4

# Mean % Effect at Critical Conc.

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
3.3729	5	1.4759	
Results			

Pass

Sample is Non-toxic

### Raw Data

Contro	ol Data	Critical Conce	entration Data
No. of Organisms	Response (Final	No. of Organisms	Response (Final
Exposed or	Count, Weight,	Exposed or	Count, Weight,
Counted	Length, etc.)	Counted	Length, etc.)
5	5	5	5
5	4	5	4
5	5	5	5
5	5	5	5

#### 5/27/2016

Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 10 Effluent_12hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration	
Percent Mean of Raw Data	0.95	0.90	
Mean used in Calcuation (transformed)	1.29	1.23	
Variance used in Calcuation (transformed)	0.014	0.019	
Standard Deviation of Transformed Data	0.119	0.137	
CV of Transformed Data	0.093	0.112	
n	4	4	

# Mean % Effect at Critical Conc. 5.26

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
2.3630	5	1.4759	
Results			

Pass

Sample is Non-toxic

#### Raw Data

Contro	ol Data	Critical Conce	entration Data
No. of Organisms	Response (Final	No. of Organisms	Response (Final
Exposed or	Count, Weight,	Exposed or	Count, Weight,
Counted	Length, etc.)	Counted	Length, etc.)
5	5	5	4
5	4	5	5
5	5	5	4
5	5	5	5

5/27/2016

Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 10 Effluent_96hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration	
Percent Mean of Raw Data	0.95	0.95	
Mean used in Calcuation (transformed)	1.29	1.29	
Variance used in Calcuation (transformed)	0.014	0.014	
Standard Deviation of Transformed Data	0.119	0.119	
CV of Transformed Data	0.093	0.093	
n	4	4	

# Mean % Effect at Critical Conc.

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
3.3729	5	1.4759	
Results			

Pass

Sample is Non-toxic

### Raw Data

Contro	ol Data	Critical Conce	ntration Data
No. of Organisms	Response (Final	No. of Organisms	Response (Final
Exposed or	Count, Weight,	Exposed or	Count, Weight,
Counted	Length, etc.)	Counted	Length, etc.)
5	5	5	4
5	4	5	5
5	5	5	5
5	5	5	5

5/27/2016

Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 13 Base_3hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.95	0.95
Mean used in Calcuation (transformed)	1.29	1.29
Variance used in Calcuation (transformed)	0.014	0.014
Standard Deviation of Transformed Data	0.119	0.119
CV of Transformed Data	0.093	0.093
n	4	4

#### Mean % Effect at Critical Conc.

0.00

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
3.3729	5	1.4759	
Results			

Pass

Sample is Non-toxic

### Raw Data

Contro	ol Data	Critical Concer	ntration Data
No. of Organisms	Response (Final	No. of Organisms	Response (Final
Exposed or	Count, Weight,	Exposed or	Count, Weight,
Counted	Length, etc.)	Counted	Length, etc.)
5	5	5	5
5	4	5	4
5	5	5	5
5	5	5	5

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Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 13 Base_6hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.95	1.00
Mean used in Calcuation (transformed)	1.29	1.35
Variance used in Calcuation (transformed)	0.014	0.000
Standard Deviation of Transformed Data	0.119	0.000
CV of Transformed Data	0.093	0.000
n	4	4

# Mean % Effect at Critical Conc. -5.26

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
6.6493	3	1.6377	
Results			

Pass

Sample is Non-toxic

### Raw Data

Contro	ol Data	Critical Conce	entration Data
No. of Organisms	Response (Final	No. of Organisms	Response (Final
Exposed or	Count, Weight,	Exposed or	Count, Weight,
Counted	Length, etc.)	Counted	Length, etc.)
5	5	5	5
5	4	5	5
5	5	5	5
5	5	5	5

Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 13 Base_12hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration	
Percent Mean of Raw Data	0.95	1.00	
Mean used in Calcuation (transformed)	1.29	1.35	
Variance used in Calcuation (transformed)	0.014	0.000	
Standard Deviation of Transformed Data	0.119	0.000	
CV of Transformed Data	0.093	0.000	
n	4	4	

#### Mean % Effect at Critical Conc.

-5.26

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
6.6493	3	1.6377	
Results			

Pass

Sample is Non-toxic

### Raw Data

Contro	ol Data	Critical Conce	ntration Data
No. of Organisms	Response (Final	No. of Organisms	Response (Final
Exposed or	Count, Weight,	Exposed or	Count, Weight,
Counted	Length, etc.)	Counted	Length, etc.)
5	5	5	5
5	4	5	5
5	5	5	5
5	5	5	5

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Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 13 Base_96hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.95	1.00
Mean used in Calcuation (transformed)	1.29	1.35
Variance used in Calcuation (transformed)	0.014	0.000
Standard Deviation of Transformed Data	0.119	0.000
CV of Transformed Data	0.093	0.000
n	4	4

#### Mean % Effect at Critical Conc.

-5.26

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
6.6493	3	1.6377	
Results			

Pass

Sample is Non-toxic

### Raw Data

Contro	ol Data	Critical Conce	ntration Data
No. of Organisms	Response (Final	No. of Organisms	Response (Final
Exposed or	Count, Weight,	Exposed or	Count, Weight,
Counted	Length, etc.)	Counted	Length, etc.)
5	5	5	5
5	4	5	5
5	5	5	5
5	5	5	5

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Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 13 Mid_3hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.95	0.95
Mean used in Calcuation (transformed)	1.29	1.29
Variance used in Calcuation (transformed)	0.014	0.014
Standard Deviation of Transformed Data	0.119	0.119
CV of Transformed Data	0.093	0.093
n	4	4

# Mean % Effect at Critical Conc.

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
3.3729	5	1.4759	
Results			

Pass

Sample is Non-toxic

### Raw Data

Contro	ol Data	Critical Concentration Data
No. of Organisms	Response (Final	No. of Organisms Response (Final
Exposed or	Count, Weight,	Exposed or Count, Weight,
Counted	Length, etc.)	Counted Length, etc.)
5	5	5 4
5	4	5 5
5	5	5 5
5	5	5 5

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Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 13 Mid_6hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.95	0.90
Mean used in Calcuation (transformed)	1.29	1.23
Variance used in Calcuation (transformed)	0.014	0.019
Standard Deviation of Transformed Data	0.119	0.137
CV of Transformed Data	0.093	0.112
n	4	4

# Mean % Effect at Critical Conc. 5.26

Pass

Sample is Non-toxic

#### Raw Data

Control Data		Critical Concentration Data		
No. of Organisms	Response (Final	No. of Organisms	Response (Final	
Exposed or	Count, Weight,	Exposed or	Count, Weight,	
Counted	Length, etc.)	Counted	Length, etc.)	
5	5	5	5	
5	4	5	4	
5	5	5	5	
5	5	5	4	

5/27/2016

Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 13 Mid_12hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.95	0.75
Mean used in Calcuation (transformed)	1.29	1.05
Variance used in Calcuation (transformed)	0.014	0.012
Standard Deviation of Transformed Data	0.119	0.111
CV of Transformed Data	0.093	0.105
n	4	4

# Mean % Effect at Critical Conc. 21.05

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
0.3191	5	1.4759	
Results			
Fail	Sample is Toxic		

#### Fail

Sample is Toxic

#### Raw Data

Control Data		Critical Conce	<b>Critical Concentration Data</b>		
No. of Organisms	Response (Final	No. of Organisms	Response (Final		
Exposed or	Count, Weight,	Exposed or	Count, Weight,		
Counted	Length, etc.)	Counted	Length, etc.)		
5	5	5	4		
5	4	5	4		
5	5	5	4		
5	5	5	3		

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Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 13 Mid_96hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.95	0.75
Mean used in Calcuation (transformed)	1.29	1.05
Variance used in Calcuation (transformed)	0.014	0.012
Standard Deviation of Transformed Data	0.119	0.111
CV of Transformed Data	0.093	0.105
n	4	4

# Mean % Effect at Critical Conc. 21.05

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
0.3191	5	1.4759	
Results			
Fail	Sample is Toxic		

#### Fail

Sample is Toxic

#### Raw Data

Control Data		Critical Conce	<b>Critical Concentration Data</b>		
No. of Organisms	Response (Final	No. of Organisms	Response (Final		
Exposed or	Count, Weight,	Exposed or	Count, Weight,		
Counted	Length, etc.)	Counted	Length, etc.)		
5	5	5	4		
5	4	5	4		
5	5	5	3		
5	5	5	4		

5/27/2016

Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 13 End_3hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.95	0.90
Mean used in Calcuation (transformed)	1.29	1.23
Variance used in Calcuation (transformed)	0.014	0.019
Standard Deviation of Transformed Data	0.119	0.137
CV of Transformed Data	0.093	0.112
n	4	4

# Mean % Effect at Critical Conc. 5.26

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
2.3630	5	1.4759	
Results			

Pass

Sample is Non-toxic

#### Raw Data

Contro	ol Data	Critical Conce	entration Data
No. of Organisms	Response (Final	No. of Organisms	Response (Final
Exposed or	Count, Weight,	Exposed or	Count, Weight,
Counted	Length, etc.)	Counted	Length, etc.)
5	5	5	4
5	4	5	5
5	5	5	5
5	5	5	4

5/27/2016

Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 13 End_6hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.95	0.65
Mean used in Calcuation (transformed)	1.29	0.95
Variance used in Calcuation (transformed)	0.014	0.041
Standard Deviation of Transformed Data	0.119	0.203
CV of Transformed Data	0.093	0.215
n	4	4

# Mean % Effect at Critical Conc. 31.58

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
-0.7339	4	1.5332	
Results			
Fail	Sample is Toxic		

#### Raw Data

Contro	ol Data	Critical Conce	ntration Data
No. of Organisms	Response (Final	No. of Organisms	Response (Final
Exposed or	Count, Weight,	Exposed or	Count, Weight,
Counted	Length, etc.)	Counted	Length, etc.)
5	5	5	2
5	4	5	3
5	5	5	4
5	5	5	4

5/27/2016

Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 13 End_12hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.95	0.55
Mean used in Calcuation (transformed)	1.29	0.84
Variance used in Calcuation (transformed)	0.014	0.072
Standard Deviation of Transformed Data	0.119	0.269
CV of Transformed Data	0.093	0.322
n	4	4

# Mean % Effect at Critical Conc. 42.11

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
-1.3514	3	1.6377	
Results			
Fail	Sample is Toxic		

#### Raw Data

Contro	ol Data	Critical Conce	entration Data
No. of Organisms	Response (Final	No. of Organisms	Response (Final
Exposed or	Count, Weight,	Exposed or	Count, Weight,
Counted	Length, etc.)	Counted	Length, etc.)
5	5	5	3
5	4	5	1
5	5	5	4
5	5	5	3

5/27/2016

Page 1 of 1

Lab Name	SSC - Pacific	Client Name	SSC - Pacific
Test ID	SSC-2016-Pier 13 End_96hr	Test Species	A. bahia (mysid shrimp)
Test Date	3/25/2016	Test Type	Acute
Test Duration	4 day	Endpoint	Survival
Critical Conc.	100		

Statistic	Control	Critical Concentration
Percent Mean of Raw Data	0.95	0.25
Mean used in Calcuation (transformed)	1.29	0.51
Variance used in Calcuation (transformed)	0.014	0.076
Standard Deviation of Transformed Data	0.119	0.275
CV of Transformed Data	0.093	0.539
n	4	4

# Mean % Effect at Critical Conc. 73.68

Calculated t-value	Degrees of Freedom	Table t-value	Percent Difference
-3.5673	3	1.6377	
Results			
Fail	Sample is Toxic		

Raw Data

Contro	ol Data	Critical Concentration Data								
No. of Organisms	Response (Final	No. of Organisms	Response (Final							
Exposed or	Count, Weight,	Exposed or	Count, Weight,							
Counted	Length, etc.)	Counted	Length, etc.)							
5	5	5	0							
5	4	5	1							
5	5	5	3							
5	5	5	1							

Page 1 of 1

#### Marine Acute Bioassay Static-Renewal Conditions

#### Water Quality Measurements & Test Organism Survival

Project: NBSD Stormwaker Pulsed.	Test Species: A. bahra	1		Te	ch Initi	ials	
	Start Date/Time: 3/8/2016 1030	-	0	24	48	72	96
Test No.:	End Date/Time: 3/12/2016 1000	Counts:	NA	MA	₽4	AC	MC
		Readings:	AC	NH	NH	MC	MC
		Dilutions made but	44		~	1936	

Sample ID	Rep			nber rgani	of Liv sms	e			Salin (ppi		ı		Те	mper (°C				Diss	olved (mg/	Oxyge L)	ən			pH (unif		
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	9
Lab Control	A	5		5	5	5	33,2	34.3	34,6	s 34.z	34.7	20.	20,	20	5 19.9	20	8.1	7.9	7.6	-	7.3		7.6	-		1
34ppt	В	5		5	5	5			ľ					1 _					1	- 2000				1		
	C	5		5		5																				
	D	S		S	15	5																				
Salt Gilcol	Α	5		5	5	5	330	34.	34.	\$ 34.2	34.z	20.1	25.2	19.9	Zak.	Z014	90	6.7	7.3	2.0	6.8	7.9	158	7.8	781	7.9
34904	В	5	S	5	5	E.			$\sim$					1-					1-					f		
	С	5	5	- 5	5	5																				
	D	5	5	5	5	S																				
Sample	Α	5	5	5	5	5	33.8	34.4	ц 34.(	343	34.3	202	20.5	20.6	201	20,1	8.4	7.5	70	7.3	7.0	83	79	287	7.91	25
77 (	В	5	5	5	S	5			' پ					1-					f					1	1888	
100%	С	5	S	S	5	4													393							
	D	5	5	5	5	5																				
Sample	Α	5	5	5	5	5	33.2	33.4	332	33,4	33,6	20,1	202	20.7	18.8	202	85	7.5	7.2	7.3	6.3	24	7.7 <	7.60	2.7	27
#2	В	5	5	5	s	5			f					1_					1					1	1983	
1004/2	C	5	5	5	5	5.																			102060	
	D	5	5	S	5	5																				
Sample	Α	5	5	5	-5	5	739	34.7	349	34.7	34.2	Z0,1	20.2	210	19.9	20.3	8.C	7.6	y	7.4	68	847	7.95	7.70	7.72	7.70
#3	В	5	4	4	4	- 24			"					f					1_	1000				1 -	3683	
100%	С	5	5	S	5	5																				
	D	5	4	Ŀj	4	4																				
Sample.	Α	5	5	5.	5	5	34.3	35.5	35.6	35.6	35.4	20.1	20,2	210	19.8	Z0,4	85	8.0	7.4	7.4	67	8.91	7.77	3.75	7.81	7.7
# 4	в	5	5	9	4	4			1					1					1				1996	f		-
	c	5	5	5	5	S																		1999		
100%	D	S	5	5	5	5																				
Bample	Α	5	5	5	5	4	53,6	348	348	34.6	4.0	20.(	20.6	20.9	198	20.3	8.4	83	68	7.0	6.8	393	192	500	7.74	7.70
45	в	5	5	5	5	5			۲					f					r					f	2533	
100%	С	5		5	5	5																				
	D	5	5	5	5	5																				
Sanpla	Α	5	5	5		4	4.73	50	35,6	3:1	348	201	206	27.8	198	20.4	8,5	7.6	21	6.8	7.1	894	7.8z	70	255	7.7
#6	в	5	5	5	5	5		- I	~					-					1					1		
100 %	С	5	5	5	5	S																		383		
	D	5	5	5	4	4																	90015 91616	enaki Shirik		

ARO 3/s/zol6 Age at Initiation: 6 Jay Animal Source/Date Received: 5 Feeding Times 24 48 0 Comments: i = initial reading in fresh test solution, f = final reading in test chamber prior to renewal o R  $l \alpha$ АМ Organisms fed prior to initiation, circle one (  $\mathfrak{G} \mathfrak{H} n$  ) PM: 53 Tests aerated? Circle one ( y /n) ifyes, sample ID(s):

C-48

72 96

Final Review:

<u>l 6/2/10</u>

QC Check:

Aeration source:

C Check: <u>Jacobs C / 1 / 201 C</u> SPAWAR Systems Center Pacific Bioassay Lab, 53476 Strothe Rd, Bidg 111 Rm 116, San Diego, CA 82152

Duration:

Marine Acute Bioassay Static-Renewal Conditions

#### Water Quality Measurements & Test Organism Survival

96

МĊ.

Project: N	IBSD Storm water Pulsed Exposure	Test Species: A. bahia
Sample ID: _	Lehr	Start Date/Time: 3/8/2016
Test No.:		End Date/Time: 3/12/201

Tech Initials 24 48 72 1030 0 Counts: NH NH NH AL ΜÇ 1000 6 Readings: Lic 냈 NH МC Dilutions made by: JND

Concentration %	Rep			iber o ganis		9		1	Salinii (ppt)		•		Ter	npera (°C)	ture		Γ		lved C (mg/L	Dxyge .)	n	pH (units)					
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
Lab Control	Α	5	5	5	5	\$	33.2	34.3	34.6	342	34.2	22.1	20.i	20.5	18.9	20-3	8.7	7.9	7.6	7.4	7.3	7.97	2.63	7.73	7.87	7.80	
30ppt	В	5	5	5	5	5			f _					「ノ					f					f			
(shared w)	С	5	5	5	5	5												121.13									
Static)	D	5	5	5	5	5																					
Salt Control	Α	5	5	5	5	5	33.7	34.3	34.5	<i>34.2</i>	34.2	220.6	20.7	22.6	12.2	20,4	7.0	67	7.3	7.0	6.8	7.90	7.5¥	5.81	7.81	7.90	
30ppt	в	<	5	5	5	4			17					fン					1 -					17			
(shared w)	С	5	5	5	5	5						30350 30333															
static)	D	5	5	5	5	5	1000																				
Sample #1	Α	5	5	5	5	5	33.3	34.7	34,9	34,8	34-8	20.2	20,0	20.4	19.9	18.8	8.4	7.z	7.5	7.2	7.0	8.78	7.58	765	2.71	7.92	
100%	В	5	5	5	5	5			1 🖉					1/					1 /					1			
Salted	C	5	5	4	4	4																					
	D	5	Ś	5	5	5																					
Sample #2	Α	S	5	5	5	5	33.Z	39,4	33.2	37.4	3,6	22.1	20.2	18.9	20.7	20.2	8.5	7.5	1. Z.	7.3	6.7	856	7.75	17.67	7.74	7.79	
100%	в	\$	4	4	4	4			′ /					f					f					۲.,			
Salted	С	5	5	5	5	5																		Strain Misaid			
	D	5	5	5	5	5																					
Sample #3	Α	5	5	5	5	5	33.8	34.7	1. 34. 1	34.7	34.5	22,1	20.2	21.0	18,9	20.3	8.5	7.6	7.3	7,4	5.8	8.92	7.95	7.70	7.72	7.76	
100%	в	5	4	5	5	5			' >					1/										f _			
Salted	С	5	()	5	5	5																				140415	
	D	5	5	5	5	5																	Data:				
Sample #4	A	\$	¥	5	5	5	34.3	34.5	346	34.6	3H.5	20.1	202	210	18.3	20.4	8.5	8,0	7.7	7.4	6.7	8.91	7.72	17.93	781	7.76	
100%	в	\$	5	Ŷ	5	5			1.2					f					12				ALSAND DOGOD	t >			
Salted	С	5	5	5	5	5																					
	D	5	5	5	5	5																					
Sample #5	Α	5	5	5	5	5	33.6	34.8	1 343	34.6	34.4	20,1	20.4	07	19.8	20:3	8.4	8:3	K3	7.0	6.8	8.93	7.92	7.67	7.74	7.70	
100%	в	ŝ	4	4	4	4			f		Sheri		300	1					<u>ب</u>					f			
Salted	С	5	5	5	5	5																					
	D	5	5	4	4	4																					
Sample #6	A	~	3	3	2	2	34.7	24.9	348	34.9	34 8	201	20,6	20.8	18.8	70.4	8.5	2.1	7.1	7.1	63	B.H	782	759	7.Q	2/1	
100%	в	-	4	3	3	3		1001 1100	レ					1					- /					5	identiti metrologi		
Salted	С	5	4	4	4	4													yositmliyi Galapital								
	D	5	ч	4	4	4				anus.					SSANC											Maria Multaria	
initial Counts QC'd by:	<u>UM</u>	D	<del>-</del>		1								unnutià <b>f</b>					<u></u>							1		

Animal Source/Date Received: ARO 3/5/2016 Feeding Times Age at Initiation: 6 days 24 0 48 72 96 Comments: 10 % i = initial reading in fresh test solution, f = final reading in test chamber prior to renewal 50 030 ice 90 AN Organisms fed prior to initiation, circle one () / n ) Se PM: Tests aerated? Circle one ( y / n) if yes, sample ID(s): Duration: 51 QC. Cheff AWAR Systems Center Pacific Bioassay Lab, 53475 Strothe Rd, Bidg 111 Rm 116, San Diego, CA 92152 Final Review: UL 6/2/16

6/1/2016 JMD QC Check

Marine Acute Bioassay

# Water Quality Measurements

Sample ID:				ator	i ula		xpos	uie		ie	st sp	ecles:	A. ba	ama					_					ch init		
	<u> </u>	2 h	5							Start	Date/	Time:	3/8/2	2016		103	6		_			0	24	48	72	96
Test No.:			annine,							End	Date/	Time:	3/12	/2016	i i	$\infty$	2		_	с	ounts:	NH	MĆ	NH	MC	NC
									-											Rea	dings:	mc	UH	N4	N.C	M.(
																			Dilutic	ons ma	de by:	mc/				
Concentration		<b></b>			f Live	•			Salinit				Ter	npera	ture	,			lved C			54 <u>1</u> 		рН		
%	Rep	0		ganis	10000	96	0	24	(ppt)	72	96	0	24	(°C)	72	96	0	24	(mg/L 48	.) 72	96	0	24	(units 48	) 72	96
Lab Control	A	5	<b>24</b>	48 5	72	S ap	33.Z		48 1.346		34.2	201	201	48	17	20.7	8.9	7.9	1 7.6	7.4	7.3	2.17	100 C 10	48 1, 2,7.3	A 6 19 19	7.8
30ppt	В	5	5	5	5	5	11.4-		f /					1/				/. { 	1 -			in the second		1 2	A COLUMN	
shared w	c	9	7	5	5	7	DUNKS Konalasi Konalasi	Classical Continued						<u>ARNS</u>												
Static)	D	5	2	S	5	5		Contraction Contraction Contraction																		
Salt Control	Ā	5	5	2 5	5	5	33.7	24,3	34.5	34.Z	34.2	20.1	20.7	20.0	18.9	27,4	7.0	6.7	7.3	7.0	6.8-	7.90	758	1. 79.7	7.81	7.7
30ppt	в	5	5	5	5	6]			f			NOR.		f					1					1/		
shared w	С	5	5	5	5	5																				
static)	D	5	5	5	5	Ś			(Classifier																	
Sample #1	Α	5	5	5	5	5	33.8	34.7	34.9	34.9	34.8	20.2	20.0	20.4	19.9	14.8	8.4	7. z	7.5	7.2.	7.0	8.8	7.5%	765	7.71	7.8
100%	В	5	5	5	5	5			Í /					f ,					1					1-	1250	
Salted	Ċ	5	5	5	5	5																				
	D	5	5	5	5	5																				
Sample #2	Α	S	4	4	4	4	33.Z	72.4	33.Z	33.4	33.6	20.1	20.2	1/8.9	20.7	20.2	8.5	7.5	7.2	7.3	6.9	8%	7.75	26.9	7.74	7.7
100%	в	5	5	5	5	5			- ۱					1-					1 /					f /		
Salted	С	5	4	4	4	4																				
	D	5	5	15	5	5																				
Sample #3	Α	5	5	Ś	5	5	33.8	34.7	34.9	34.7	34.5	20,1	202	210	19.9	20.S	<u>8</u> .5	7.6	2.3	7.4	6.8	872	2.85	2.70	7.72	$7.7_{\ell}$
100%	В	5	4	4	4	4			٢					12					f _					1 _		
Salted	С	5	5	5	5	5																				
	D	5	5	5	4	4						GANG GANG														Sales -
Sample #4	Α	5	5	5	5	5	34.3	34.5	34.6	34.6	34.5	201	D.Z.	210	19.E.	20.4	8.5	8.5	7.9	7.U	6.7	8.71	7.72	293	7.81	7.76
100%	В	5	5	5	5	5			f /					f					<b>1</b>					-		
Salted	С	5	5	5	5	5		AND YES																		
	D	5	5	5	5	5					凝散									- 19						
Sample #5	Α	5	4	4	4	4	33,6	34.3	34.8	34.6	74.4	20.1	20.G	20.7	19.8	20.3	8.4	83 10000	68	7.0	<u>68</u>	873	7.9 Z.	767	7.74	7.7
100%	В	5	5	ei	4	4			" ~ 0.5044					• ~ 94549.024					<b>سر :</b> درویونونو					- 1952-114		
Salted	С	S.	5	4	4	4			-100350 801355 04-1020	Coluina Coluina																
	D	5	3	3	3	3											iksitti Potta									353) URB
Sample #6	A	5	4	4	3	3	34. 7 13400	349	34.8	341.9 1990	34.G 38200	304. 19985	20, 6 19.988	2.8 f	/8.8 ang n	307.44 20060	8.5 kasas	7,1	7.1	21	5.3	8:4	7.32	7.59 1	7.62	?. ( See
						. /	Q2.011833	10.000	1 2	1.0200032		104 923201	1.00000000	T _,	1.12.0.02	1.6556.926	1.0.21	Lightly been	r 2	199763365	1.00000000	200 mile 10 int	12.5222.022	· /	SHOP	10000
100% Salted	B C	5	3	2	   4	1 4	ander Sieter	486765	igitiss:	1993223 3243339	igerest renéer	ALCON Mater	523322 11933074		SECON CANADA	2023) 1911-19	in an	10020	10,4500	Second Marcali	in the second	salenn Seobh		de la fa	enieku Rekusu	128197 725397

Initial Counts QC'd by:

Animal Source/Date	e Received: ARO 3/5/2016 Age at Initiation: 6 days	[	1	Feeding 1	imes	
		-	0	24 48	72	96
Comments:	i = initial reading in fresh test solution, f = final reading in test chamber prior to renewal			00,030		
	Organisms fed prior to initiation, circle one 🅢 / п)	PM:	150015	00 1530	1500	~
	Tests aerated? Circle one ( y / (i)) if yes, sample ID(s): Duration:					
C Checksowar Sys	st <u>ems Center Pacific Bioassay Lab, 5347</u> 5 Strothe Rd, Bidg 111 Rm 116, San Diego, CA 92152	Final Review:	λ	Ula	121	16
	4 × 2					

QC Cheer JAD G/1/2016

Marine Acute Bioassay Static-Renewal Conditions

#### Water Quality Measurements & Test Organism Survival

Project: NBSD Stormwater Pulsed Exposure Sample ID: Static Exposure Test No.:

Test Species:	A. bahia
Start Date/Time:	3/8/2016 1030
End Date/Time:	3/12/2016 1000

		Te	ch Init	lais	
	0	24	48	72	96
Counts:	NH	NH	NH	нс	МС
Readings:	ИC	PЦ	NH	мĊ.	жE.
Dilutions made by:	<u>44</u>	Ú.	-	(U)	4.4

Concentration _	Rep			iber o gani:	of Live sms	ê		:	Salini (ppt)				Tei	npera (°C)					lved ( (mg/L	Oxyge .)	n			pH (units		
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
Lab Control	Α	5	5	5	5	5	33.2	343	34.6	34.z	34.2	20,1	20.1	122.5	19.9	20.3	8.1	7.9	17.6	7.4	7.3.	7.97	2.65	7.73	1.89	7.8
	в	5	5	5	5	5			f					f _					f >					1		
	С	5	5	5	5	5																				
	D	5	5	5	5	5																				
Salt Control	A	5	5	5	5	5	33.7	34.3	i 345	34.Z	34.2	20,1	20.7	20.6	19.9	20.4	7.0	6.7	7.3	7.0	6.8	7.90	7.98	787	7.81	7.7
34pp+	В	5	5	5	5	4			f _					f					f ~′					1-		
	С	5	5,	S	5	5																				
	D	5	5	S	5	5												5								
Sample # 1	Α	5	5	5	5	4	33.8	34.2	34.9	34.97	348	ZØ.2	200	20.4	19.9	19.8	84	7, 2	2.5	7.2	7.0	8.78	7.58	7.63	7.71	7.32
100%	в	5	5	5	5	5			1/					1 <u></u> -					f					2		
Salted	С	5	5	5	5	4																				
	D	5	5	5	5	5																				
Sample # 2	Α	5	5	5	5	4	53.Z.	33.4	33.2	3.4	37.6	27.1	20,2	19.9	20.7	20.2	8.5	7.5	<sup>1</sup> 7. Z	7.3	6. 9	856	7.75	169	7.74	7.7
100%	в	5	S	5	5	5			/ //					• /										ſ		
Salted	C	5	-5	5	5	5																				
	D	5	S	5	5	5																				
Sample # 3	Α	5	5	5	5	5	33.7	34.7	34.9	34.7	34.5	20.1	202	210	19.9	20.3	8.5	U	7.3	7.4	6-8	8.72	7.95	7.70	7,72	7.76
100%	В	5	5	5	5	4			E00630400															f		
Salted	С	5	0.	<u> </u>	5	5			<u>.</u>																	
	D	5	0	5-	5	5			1																	
Sample # 4	Α	5	5	5	5	5	34.3	345	34.6	H.C	34.S	20.1	20.2	21.0	(9.3	20.14	8.5 www.ww	8.0	7.9	7.4	6.'7	2.71	7.72	7.93	7.87	7.7 :
100%	в	5	5	5	5	5																				
Salted	С	5	5	5	5	5																				
	D	5	5	5	5	5																				
Sample # 5	A	5	5	55	5	4	3.6		<u>43</u> 1_/	34.6°	34.4	20.1	20,6	f	19.8	D.3	8.4	83	68	7.0	63	8.?3	7.\$Z	767	7.74	270
100%		5	5		5	4			· / ·					• 100000					· /							
Salted	C D	5		5 5		-																				
Dame In the	A	5	5		5	4								1. L.	10 in											<u>)</u>
Sample # 6	B	5	5	5	5	0	34.7	34.2	343	34.7	34.S	201	22.6	22/8 f	(9.8 1111	70 4 1	8.5	7.1	7.1	7.1	6.7	8,3,4	282	7.59	762	7.11
100%	в С	2 5	-	5	5	3								0000												
Salted		5	5	5	5	2																				
initial Counts QC'd by	ł		77		1	I																				
nimal Source/Date	Rece	eived	: _	Aqua	tic Bic	osyste	ms 3/5	5/2016			Age a	t Initia	tion:	6 days									Feed	ling Ti	nes	
			-										-	Ċ								0	24	48	72	96

Organisms fed prior to initiation, circle one f(y) / n) Tests aerated? Circle one ( y / n) if yes, sample ID(s): JMD 6/1/2016

AM PM: 1500 1500 1530 1500 6/2/110

QC Check:

Comments:

Final Review: \_\_\_\_\_\_

Duration:

i = initial reading in fresh test solution, f = final reading in test chamber prior to renewal

#### Marine Chronic Bioassay

#### **Brine Dilution Worksheet**

Project:	NBSD Storm Water Pulsed Exposure

Sample ID:

Date of Brine used:	3/5/2016
Salinity of Brine:	95
Target Salinity:	34
Test Dilution Volume:	160

Analyst: MC

Test Date: 3/8/2016

Test Type: Sp-dev

Salinity Adjustment Factor:

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

TS = target salinity SB = salinity of brine SE = salinity of effluent

ł

Sample ID	Salinity of Sample	Salinity Adjustment Factor	Concentration %	Effluent Volume (ml)	Brine Volume (ml)	Dilute to: (ml)
Control			Control	NA	NA	200
OF73	0.0	0.56	64.2	112.4	62.6	175
Pier 10 Eff	0.1	0.56	64.3	112.5	62.5	175
Pier 10 In	0.0	0.56	64.2	112.4	62.6	175
Pier 13 Base	0.1	0.56	64.3	112.5	62.5	175
Pier 13 Mid	0.1	0.56	64.3	112.5	62.5	175
Pier 13 End	0.0	0.56	64.2	112.4	62.6	175
			DI Volume			
		Brine Control #2	112.4	0.56	62.6	175

Total Brine Volume Required (ml): 438.1

QC Check: M.C.

Final Review:

SPAWAR Systems Center Pacific Bioassay Lab, 53475 Strothe Rd, Bldg 111 Rm 116, San Diego, CA 92152

### C.3. COPPER EXPOSURES – ANALYTICAL CHEMISTRY REPORTS:

13 April 2016

Metal concentrations in samples from Stormwater Runoff at Naval Base San Diego

	Сор	per	Zir	IC	Lea	ad
Sample ID	Average (µg/L)	Std Dev (µg/L)	Average (µg/L)	Std Dev (µg/L)	Average (µg/L)	Std Dev (µg/L)
Pier 13 0853 NBSD Filt	0.23		34		0.24	
Pier 13 MID 0902 NBSD Filt	51.4		600		1.48	
Pier 13 END 0916 NBSD Filt	55.9		2137		0.30	
Pier 10 IN 0935 NBSD Filt Duplicate	17.2	0.13	162	1.36	0.62	0.091
Pier 10 EFF 0943 NBSD Filt	15.0		145		0.48	
OF73 1045 NBSD Filt	48.9		343		0.39	
Pier 13 0853 NBSD Total	21.0		350		5.87	
Pier 13 MID 0902 NBSD Total	83.6		944		14.0	
Pier 13 END 0916 NBSD Total	75.4		2361		2.19	
Pier 10 IN 0935 NBSD Total	24.2		220		2.54	
Pier 10 EFF 0943 NBSD Total	25.1		230		2.80	
OF73 1045 NBSD Total	56.7		384		1.72	
Blanks						
Limit Of Detection (3*SD)	0.0069		0.23		0.0084	
Limit Of Reporting (10*SD)	0.023		0.77		0.028	
Recovery SRM 1643e (%)						
Average	118		116		109	
Standard deviation	12		6		6	
Number of SRMs	4		4		4	
Spike						
Recovery (%)	90		174		93	

### C.4. COPPER EXPOSURES – REFERENCE TOXICANT TEST RESULTS:

CETIS Sun	nmary Repo	ort						Report Date: Test Code:				6 (p 1 of 1) -8182-3876
Echinoid Emb	oryo-Larval Dev	elopm	ent Test							SPAV	VAR Syste	ms Center
Batch ID: Start Date: Ending Date: Duration:	20-3527-1111 08 Mar-16 10:0 12 Mar-16 10:3 4d 1h		Test Type: Protocol: Species: Source:	Development-S EPA/600/R-95 Strongylocentr Field Collected	/136 (1995) otus purpura	tus		Diluent:	Labor	nne A Colv atory Seav pplicable		
Sample ID: Sample Date: Receive Date: Sample Age:			Code: Material: Source: Station:	96A288E Copper sulfate Reference Tox Reference Tox	icant				SPAV Pulse	VAR d Exposure	e	
Comparison \$	Summary											
Analysis ID 01-0920-6898	Endpoint Proportion Nor	mal	NOE 8.4	LOEL 12	<b>TOEL</b> 10.04	PM SD 3.27%	τu	Metho Dunne		ltiple Com	parison Tes	it
Point Estimat Analysis ID 02-4063-3610	e Summary Endpoint Proportion Nor	mal	Leve EC50		<b>95% LCL</b> 17.1	<b>95% UCL</b> 18.85	τu	Metho Linear		ression (MI	.E)	
Proportion No	ormal Summary											
C-µg/L	Control Type	Cou	nt Mear	95% LCL	95% UCL	Min	Max	Std Er	rr	Std Dev	CV%	% Effect
0 5.8 8.4 12 17.2 24 35	Lab Control	5 5 5 5 5 5 5 5	0.98 0.992 0.99 0.89 0.466 0.27 0	0.9812 0.8366	1 0.9988 0.9434 0.5964 0.3435 0	0.93 0.98 0.98 0.83 0.33 0.18 0	1 1 0.94 0.57 0.34 0	0.0469	742 162 24 97 46	0.02915 0.008367 0.007071 0.04301 0.105 0.05916 0	2.98% 0.84% 0.71% 4.83% 22.54% 21.91%	0.0% -1.22% -1.02% 9.18% 52.45% 72.45% 100.0%
Proportion No	ormal Detail											
C-µg/L	Control Type	Rep	1 Rep 2		Rep 4	Rep 5						
0 5.8 8.4 12 17.2 24 35	Lab Control	0.93 0.99 0.99 0.83 0.33 0.26 0	0.99 0.99 0.89 0.56 0.27 0	0.98 1 0.98 0.94 0.48 0.18 0	1 0.98 1 0.87 0.39 0.34 0	1 1 0.99 0.92 0.57 0.3 0						
Proportion No	ormal Binomials	;										
C-µg/L	Control Type	Rep	-		Rep 4	Rep 5						
0 5.8 8.4 12 17.2 24 35	Lab Control	93/10 99/10 99/10 83/10 33/10 26/10	00         99/10           00         99/10           00         99/10           00         89/10           00         56/10           00         27/10	0 100/100 0 98/100 0 94/100 0 48/100 0 18/100	100/100 98/100 100/100 87/100 39/100 34/100 0/100	100/100 100/100 99/100 92/100 57/100 30/100 0/100						

000-010-187-1

CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_\_

Batch ID:         20-3527-1111         Test Type:         Developming           Start Date:         08 Mar-16 10:00         Protocol:         EPA/600/F	-Control vs Tre ent-Survival -95/136 (1995) entrotus purpur cted fate Toxicant Toxicant NA al MSD D 0.108 8 0.108 8 0.108 8			ent: Lat e: Noi int: SP. ect: Pul ect: Pul 8.4 Decision Non-Sign Significan Significan Significan	: CETISV1 s: Yes irienne A Colv boratory Seav it Applicable PAWAR Ised Exposure Ised Exposure Ised Exposure ificant Effect nt Effect nt Effect nt Effect	.8.7 <i>v</i> in vater	TU
Analyzed:         06 May-16 10:30         Analysis:         Parametric           Batch ID:         20-3527-1111         Test Type:         Developmin           Start Date:         08 Mar-16 10:00         Protocol:         EPA/600/F           Ending Date:         12 Mar-16 10:30         Species:         Storn gyloc           Duration:         4d         1h         Source:         Field Colle           Sample Date:         08 Mar-16 10:30         Species:         Storn gyloc           Duration:         4d         1h         Source:         Field Colle           Sample Date:         08 Mar-16         Material:         Copper su           Receive Date:         Source:         Reference         Source:         Reference           Sample Age:         10h         Statlon:         Reference         NA         C> T         NA           Dunnett Multiple         C-yg/L         Test Stat         Critic         Lab Control         5.8         -0.7313         2.362           12*         4.609         2.362         17.2*         15.23         2.362           12*         4.609         2.362         17.2*         15.23         2.362           10*         2.4*         19.73         <	-Control vs Tre ent-Survival -95/136 (1995) entrotus purpur cted fate Toxicant Toxicant NA al MSD D 0.108 8 0.108 5 5	<b>F P-Value</b> 0.9658 0.9418 0.0003 <0.0001 <0.0001	Offic Anat Dilu Brin Age: Clier Proj 3.27% P-Type CDF CDF CDF CDF CDF CDF CDF CDF	clal Results yst: Ma ent: Lat e: Nol : nt: SP, ect: Pul ect: Pul 8.4 Decision Non-Sign Non-Sign Significan Significan Significan	s: Yes Irienne A Colv boratory Seav- t Applicable AWAR Ised Exposure Ised Exposure 12 n(a:5%) nificant Effect nt Effect nt Effect	vin vater e TOEL	TU
Start Date:         08         Mar-16         Protocol:         EPA/600/F           Ending Date:         12         Mar-16         10:30         Species:         Storn gyloc           Duration:         4d         1         Source:         Field Colle           Sample ID:         01-5795-2142         Code:         96A288E           Sample Date:         08         Mar-16         Material:         Copper su           Receive Date:         Source:         Reference         Source:         Reference           Sample Age:         10*         Zeta         Alt         Hyp         Trials           Angular (Correcter)         NA         C > T         NA         C         Source:         Critic           Lab Control         5.8         -0.7313         2.362         2.362         12.4         4.60         2.362           12.4         4.60         2.362         17.2*         15.23         2.362           ANOVA Table         Zeta         0.005251929         10.1260463         0.005251929         10.1260463         0.005251929         10.1260463         0.005251929         10.1260463         0.005251929         10.1260463         0.005251929         10.1260463         0.005251929         10.1260463 </td <td>-95/136 (1995) entrotus purpur cted Toxicant Toxicant NA al MSD D 0.108 8 0.108 8 0.108 8 0.108 8 0.108 8 0.108 8 0.108 8 0.108 8</td> <td>F P-Value 0.9658 0.9418 0.0003 &lt;0.0001 &lt;0.0001</td> <td>Dilu Brin Age: Clier Proj 3.27% P-Type CDF CDF CDF CDF CDF CDF CDF CDF</td> <td>ent: Lat e: Noi int: SP. ect: Pul ect: Pul 8.4 Decision Non-Sign Significan Significan Significan</td> <td>boratory Seav t Applicable AWAR Ised Exposure 12 h(α:5%) hificant Effect hificant Effect nt Effect nt Effect nt Effect</td> <td>vater e TOEL</td> <td>τυ</td>	-95/136 (1995) entrotus purpur cted Toxicant Toxicant NA al MSD D 0.108 8 0.108 8 0.108 8 0.108 8 0.108 8 0.108 8 0.108 8 0.108 8	F P-Value 0.9658 0.9418 0.0003 <0.0001 <0.0001	Dilu Brin Age: Clier Proj 3.27% P-Type CDF CDF CDF CDF CDF CDF CDF CDF	ent: Lat e: Noi int: SP. ect: Pul ect: Pul 8.4 Decision Non-Sign Significan Significan Significan	boratory Seav t Applicable AWAR Ised Exposure 12 h(α:5%) hificant Effect hificant Effect nt Effect nt Effect nt Effect	vater e TOEL	τυ
Sample Date:         08 Har-16:         Material:         Copper su Source:         Reference           Sample Age:         10H         Source:         Reference           Data Transform         Zeta         Alt         Hyp         Trials           Angular (Corrected)         NA         C > T         NA           Dunnett Multiple Corrected         NA         C > T         NA           Control         vs         C-µg/L         Test Stat         Critic           Lab Control         5.8         -0.7313         2.362           12*         4.609         2.362           17.2*         15.23         2.362           ANOVA Table         19.73         2.362           Error         0.1260463         0.005251929           Total         4.137028         0.8374056           Error         0.1260463         0.005251929           Total         4.313074         1           Distributional Tests         Test         Test           Attribute         Test         Test	Toxicant Toxicant NA al MSD D 0.108 8 0.108 8 0.108 8 0.108 8 0.108 8 0.108 8 0.108 8 0.108 8 0.108 8	0.9658 0.9418 0.0003 <0.0001 <0.0001	Proj PMSD 3.27% P-Type CDF CDF CDF CDF CDF CDF CDF	ect: Pul NOEL 8.4 Decision Non-Sign Non-Sign Significan Significan Significan	LOEL 12 n(α:5%) nificant Effect nt Effect nt Effect nt Effect nt Effect	TOEL	τυ
Angular (Corrected)         NA         C > T         NA           Dunnett Multiple Comparison Test         Control         vs         C-µg/L         Test Stat         Critic           Lab Control         5.8         -0.7313         2.362         2.362           12*         4.609         2.362         17.2*         15.23         2.362           17.2*         19.73         2.362         24*         19.73         2.362           ANOVA Table         Source         Sum Squares         Mean Squares         Error         0.1260463         0.005251929           Total         4.313074         Total         4.313074         Uariances         Bartlett Equality of Variance         6.703           Variances         Bartlett Equality of Variance         6.703         0.905         0.905	NA al MSD D 0.108 8 0.108 8 0.108 8 0.108 8 0.108 8 0.108 8 DF 5	0.9658 0.9418 0.0003 <0.0001 <0.0001	3.27% P-Type CDF CDF CDF CDF CDF CDF	8.4 Decision Non-Sign Non-Sign Significar Significar	12 n(α:5%) ifficant Effect nificant Effect nt Effect nt Effect nt Effect		τυ
Source         Sum Squares         Mean Squares           ANOVA Table         Sum Squares         Mean Squares           Between         4.187028         0.005251929           Total         4.313074         3.17.2*           Distributional Tests         Test         Test           Attribute         Test         Test           Surge         Surge         Mean Squares           Between         4.187028         0.005251929           Total         4.313074         Test           Variances         Bartlett Equality of Variance         6.703           Distributional Tests         Shapiro-Wilk W Normality         0.958	al MSD D 0.108 8 0.108 8 0.108 8 0.108 8 0.108 8 0.108 8 DF 5	0.9658 0.9418 0.0003 <0.0001 <0.0001	P-Type CDF CDF CDF CDF CDF CDF	Decision Non-Sign Non-Sign Significar Significar Significar	n(α:5%) hificant Effect hificant Effect nt Effect nt Effect nt Effect	10.04	
Control         vs         C-µg/L         Test Stat         Critic           Lab Control         5.8         -0.7313         2.362           8.4         -0.5125         2.362           12*         4.609         2.362           17.2*         15.23         2.362           24*         19.73         2.362           ANOVA Table         Mean Square           Between         4.187028         0.8374056           Error         0.1260463         0.005251929           Total         4.313074         Test           Distributional Tests         Test         Test           Attribute         Test         Test           Distribution         Shapiro-Wilk W Normality         0.958	0.108 8 0.108 8 0.108 8 0.108 8 0.108 8 0.108 8 <b>DF</b> 5	0.9658 0.9418 0.0003 <0.0001 <0.0001	CDF CDF CDF CDF CDF	Non-Sign Non-Sign Significar Significar Significar	nificant Effect nificant Effect nt Effect nt Effect nt Effect		
Lab Control         5.8         -0.7313         2.362           8.4         -0.5125         2.362           12*         4.609         2.362           17.2*         15.23         2.362           24*         19.73         2.362           Envore         Sum Squares         Mean Square           Between         4.187028         0.8374056           Error         0.1260463         0.005251929           Total         4.313074         Jointributional Tests           Attribute         Test         Test           Variances         Bartlett Equality of Variance         6.703           Distribution         Shapiro-Wilk W Normality         0.958	0.108 8 0.108 8 0.108 8 0.108 8 0.108 8 0.108 8 <b>DF</b> 5	0.9658 0.9418 0.0003 <0.0001 <0.0001	CDF CDF CDF CDF CDF	Non-Sign Non-Sign Significar Significar Significar	nificant Effect nificant Effect nt Effect nt Effect nt Effect		
Lab Control         5.8         -0.7313         2.362           8.4         -0.5125         2.362           12*         4.609         2.362           17.2*         15.23         2.362           24*         19.73         2.362           Envore         Sum Squares         Mean Square           Between         4.187028         0.8374056           Error         0.1260463         0.005251929           Total         4.313074         J           Distributional Tests         Test         Test           Attribute         Test         Test           Variances         Bartlett Equality of Variance         6.703           Distribution         Shapiro-Wilk W Normality         0.958	0.108 8 0.108 8 0.108 8 0.108 8 0.108 8 <b>DF</b> 5	0.9418 0.0003 <0.0001 <0.0001	CDF CDF CDF CDF CDF	Non-Sign Significar Significar Significar	nificant Effect nt Effect nt Effect nt Effect		
Source         Sum Squares         Mean Square           Between         4.187028         0.8374056           Error         0.1260463         0.005251929           Total         4.313074           Distributional Tests         Test           Attribute         Test         Test           Variances         Bartlett Equality of Variance         6.703           Distribution         Shapiro-Wilk W Normality         0.958	5	F Stat	D. Volue	Desision			
Between         4.187028         0.8374056           Error         0.1260463         0.005251929           Total         4.313074           Distributional Tests         Test           Attribute         Test         Test           Variances         Bartlett Equality of Variance         6.703           Distribution         Shapiro-Wilk W Normality         0.958	5	F Stat	D Value	Desision			
Between         4.187028         0.8374056           Error         0.1260463         0.005251929           Total         4.313074           Distributional Tests         Test           Attribute         Test         Test           Variances         Bartlett Equality of Variance         6.703           Distribution         Shapiro-Wilk W Normality         0.958	5		P-value		ı(α:5%)		
Total     4.313074       Distributional Tests     Test       Attribute     Test     Test       Variances     Bartlett Equality of Variance     6.703       Distribution     Shapiro-Wilk W Normality     0.958	24	159.4	<0.0001	Significar	. ,		
Distributional Tests         Test         Test           Attribute         Test         Test         6.703           Variances         Bartlett Equality of Variance         6.703           Distribution         Shapiro-Wilk W Normality         0.958		_					
Attribute         Test         Test           Variances         Bartlett Equality of Variance         6.703           Distribution         Shapiro-Wilk W Normality         0.958	29						
Variances         Bartlett Equality of Variance         6.703           Distribution         Shapiro-Wilk W Normality         0.958							
Distribution Shapiro-Wilk W Normality 0.958		P-Value	Decision				
		0.2437 0.2847	Equal Var Normal D				
Proportion Normal Summary	0.0001	0.2047		Istribution			
						-	
C-µg/L         Control Type         Count         Mean         95%           0         Lab Control         5         0.98         0.943		. Median 0.99	Min 0.93	Max 1	Std Err 0.01304	CV% 2.98%	%Effect
5.8 5 0.992 0.981		0.99	0.93	1	0.003742	2.98% 0.84%	-1.22%
8.4 5 0.99 0.981		0.99	0.98	1	0.003163	0.71%	-1.02%
12 5 0.89 0.836		0.89	0.83	0.94	0.01924	4.83%	9.18%
17.2 5 0.466 0.335		0.48	0.33	0.57	0.04697	22.54%	52.45%
24 5 0.27 0.196	5 0.3435	0.27	0.18	0.34	0.02646	21.91%	72.45%
35 5 0 0	0	0	0	0	0		100.0%
Angular (Corrected) Transformed Summary							
С-µg/L Control Type Count Mean 95%			Min	Max	Std Err	CV%	%Effect
0 Lab Control 5 1.449 1.337	1.561	1.471	1.303	1.521	0.0403	6.22%	0.0%
5.8 5 1.482 1.434		1.471	1.429	1.521	0.01744	2.63%	-2.31%
8.4 5 1.472 1.432		1.471	1.429	1.521	0.01456	2.21%	-1.62%
12 5 1.238 1.151	1.324	1.233	1.146	1.323	0.03101	5.6%	14.58%
17.250.75060.6182450.54440.459	5 0.8827	0.7654 0.5464	0.6119 0.4381	0.8556 0.6225	0.04758 0.0306	14.18% 12.57%	48.19% 62.43%
24         5         0.5444         0.459           35         5         0.05002         0.050		0.0404	0.4001	0.6225	0.0306	0.0%	62.43% 96.55%

CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

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CETIS Ana	alytical Repo	rt					Report Date: Test Code:	02 Jun-16 11:36 (p 2 of 2 SSC-2016-003   15-8182-3876
Echinoid Em	bryo-Larval Deve	lopment	Test					SPAWAR Systems Center
Analysis ID: Analyzed:	01-0920-6898 06 May-16 10:3		ndpoint: Pro nalysis: Pa	oportion Nor rametric-Co		atments	CETIS Version: Official Results:	CETISv1.8.7 Yes
Proportion N	ormal Detail							
C-μg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5		
0	Lab Control	0.93	0.99	0.98	1	1		
5.8		0.99	0.99	1	0.98	1		
8.4		0.99	0.99	0.98	1	0.99		
12		0.83	0.89	0.94	0.87	0.92		
17.2		0.33	0.56	0.48	0.39	0.57		
24		0.26	0.27	0.18	0.34	0.3		
35		0	0	0	0	0		
Angular (Cor	rected) Transforr	ned Deta	il					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5		
0	Lab Control	1.303	1.471	1.429	1.521	1.521		
5.8		1.471	1.471	1.521	1.429	1.521		
8.4		1.471	1.471	1.429	1.521	1.471		
12		1.146	1.233	1.323	1.202	1.284		
17.2		0.6119	0.8455	0.7654	0.6745	0.8556		
24		0.5351	0.5464	0.4381	0.6225	0.5796		
35		0.05002	0.05002	0.05002	0.05002	0.05002		
Proportion N	ormal Binomials							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5		
0	Lab Control	93/100	99/100	98/100	100/100	100/100		
5.8		99/100	99/100	100/100	98/100	100/100		
8.4		99/100	99/100	98/100	100/100	99/100		
12		83/100	89/100	94/100	87/100	92/100		
17.2		33/100	56/100	48/100	39/100	57/100		
24		26/100	27/100	18/100	34/100	30/100		
35		0/100	0/100	0/100	0/100	0/100		
Graphics								
₩E 🗖		3				0.12 F		
0.9				Reject Null		0.10		· · ·
0.8 E						0.08		•••
<b>1</b> 07						0.04		
ž.					1	- F		
and to the					i i i i i i i i i i i i i i i i i i i	50.0 Corr. Junit		
₹ os E						-0.02	••••	
0.4						-0.04		
Ē						-0.06	•	
0.3			-	•		-0.08	<b>^</b>	
0.2			L			-0.10	/•	
0.1						-0.12 E		
E						-0.14		
	LC 5.8 8.4	12	17.2	24 35		-0.16 -2.5 -2.0	-15 -10 -0.5 0.0	05 1.0 1.5 2.0 2.5
		C∙µg/L					Rankits	

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CETIS™ v1.8.7.16

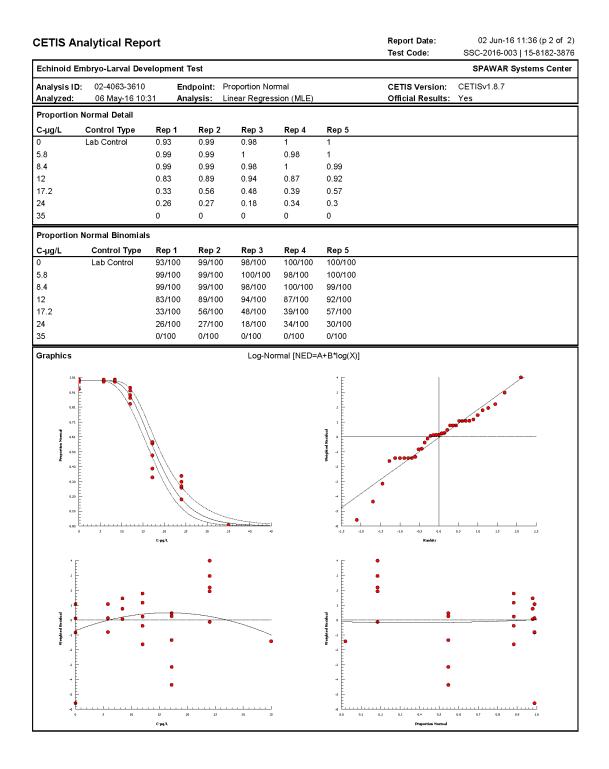
Analyst:\_\_\_\_\_ QA:\_\_\_\_\_

CETIS An	alytical R	eport						-	rt Date: Code:			6 (p 1 of 2) -8182-3876
Echinoid Er	nbryo-Larval	Developme	ent Te	st						SPA	WAR Syste	ms Center
Analysis ID: Analyzed:	02-4063-3 06 May-16		Endp Analy		portion Norr ear Regress				S Version: ial Results:	CETISv1 Yes	.8.7	
Batch ID: Start Date: Ending Date Duration:	20-3527-1 08 Mar-16 : 12 Mar-16 4d 1h	10:00	Test Proto Spec Sour	ocol: EF ies: Str	velopment-S A/600/R-95/ ongylocentro Id Collected	136 (1995) otus purpurai	tus	Analy Dilue Brine Age:	nt: Labo	enne A Colo oratory Seas Applicable		
Sample ID: Sample Date Receive Dat Sample Age		142	Code Mate Sour Statio	rial: Co ce: Re	A288E pper sulfate ference Toxi ference Toxi			Clien Proje		WAR ed Exposur	e	
Linear Regr Model Func	ession Optio	ns		Threshol	d Option	Threshold	Optimized	Pooled	Het Corr	Weighted	1	
	NED=A+B*lo	g(X)]		Control T		0.02	Yes	No	Yes	Yes	·	
Regression	Summary											
Iters LL 11 -94	AICc 1.9 1890	BIC 1894		<b>Mu</b> 1.254	<b>Sigma</b> 0.1414	Adj R2 0.9417	F Stat 8.6	Critical 2.714	P-Value 0.0001	Decision( Significan	(α:5%) t Lack of Fit	:
Point Estim	ates											
Level µg/ EC50 17.9	L 95%	LCL 95% 18.85										
Regression	Parameters											
Parameter	Estin	nate Std B	Error	95% LCL	95% UCL	t Stat	P-Value	Decision(	a:5%)			
Threshold	0.011			-0.00122	0.02358	1.836	0.0756		icant Param	eter		
Slope	7.072			6.016	8.129	13.64	<0.0001	-	Parameter			
Intercept	-8.87	2 0.659	93	-10.22	-7.529	-13.46	<0.0001	Significant	Parameter			
ANOVA Tab	le											
Source	Sum	Squares	Mear	n Square	DF	F Stat	P-Value	Decision(	α:5%)			
Model	2120		2120		1	550.8	<0.0001	Significant				
Lack of Fit	67.92		16.98		4	8.6	0.0001	Significant				
Pure Error Residual	55.28 123.2		1.974		28 32							
Residual An	-	. d			Te at Ot f	C-1411	D Value	De el 1				
Attribute Goodness-of	Meth	od son Chi-Sq	GOE		Test Stat 123.2	Critical 46.19	P-Value <0.0001	Decision(	a:5%) Heterogenit	N		
Goouness-o		hood Ratio			123.2	46.19 46.19	<0.0001	-	Heterogenit	-		
		Levene Equ		f Variance		2.573	0.0610	Equal Vari	-			
Variances	Mod		-						stribution			
Variances Distribution	Shap	iro-Wilk W I		-	0.948	0.9384	0.0984	Normal Di				
	Shap	iro-Wilk W I rson-Darling		-	0.948 0.7267	0.9384 2.492	0.0984 0.0579	Normal Di				
Distribution	Shap	rson-Darling		-		2.492		Normal Di				
Distribution Proportion I C-µg/L	Shap Ande Normal Sumn Control Type	rson-Darling nary e Cour	g A2 N	lormality Mean	0.7267 Min	2.492 Calcu Max	0.0579 ated Variat Std Err	Normal Dis e(A/B) Std Dev	stribution CV%	%Effect	A	в
Distribution Proportion I C-µg/L 0	Shap Ande Normal Sumr	rson-Darling n <b>ary</b> e Cour 5	g A2 N	Mean 0.98	0.7267 Min 0.93	2.492 Calcul Max 1	0.0579 ated Variate Std Err 0.01304	Normal Di: e(A/B) Std Dev 0.02915	cv% 2.98%	0.0%	490	500
Distribution Proportion I C-µg/L 0 5.8	Shap Ande Normal Sumn Control Type	rson-Darling nary æ Cour 5 5	g A2 N	Mean 0.98 0.992	0.7267 Min 0.93 0.98	2.492 Calcul Max 1 1	0.0579 ated Variate Std Err 0.01304 0.003742	Normal Dis e(A/B) Std Dev 0.02915 0.008367	<b>CV%</b> 2.98% 0.84%	0.0% -1.22%	490 496	500 500
Distribution Proportion I C-µg/L 0 5.8 8.4	Shap Ande Normal Sumn Control Type	rson-Darling nary e Cour 5 5 5 5	g A2 N	Mean 0.98 0.992 0.99	0.7267 Min 0.93 0.98 0.98	2.492 Calcul Max 1 1 1	0.0579 ated Variate Std Err 0.01304 0.003742 0.003163	Normal Dis e(A/B) Std Dev 0.02915 0.008367 0.007072	CV% 2.98% 0.84% 0.71%	0.0% -1.22% -1.02%	490 496 495	500 500 500
Distribution Proportion C-µg/L 0 5.8 8.4 12	Shap Ande Normal Sumn Control Type	rson-Darlin <u>ç</u> nary e Cour 5 5 5 5 5	g A2 N	Mean 0.98 0.992 0.99 0.89	0.7267 Min 0.93 0.98 0.98 0.98 0.83	2.492 Calcul Max 1 1 1 0.94	0.0579 ated Variato Std Err 0.01304 0.003742 0.003163 0.01924	Normal Di- e(A/B) Std Dev 0.02915 0.008367 0.007072 0.04301	<b>CV%</b> 2.98% 0.84% 0.71% 4.83%	0.0% -1.22% -1.02% 9.18%	490 496 495 445	500 500 500 500
Distribution Proportion I C-µg/L 0 5.8 8.4	Shap Ande Normal Sumn Control Type	rson-Darling nary e Cour 5 5 5 5	g A2 N	Mean 0.98 0.992 0.99	0.7267 Min 0.93 0.98 0.98	2.492 Calcul Max 1 1 1	0.0579 ated Variate Std Err 0.01304 0.003742 0.003163	Normal Dis e(A/B) Std Dev 0.02915 0.008367 0.007072	CV% 2.98% 0.84% 0.71%	0.0% -1.22% -1.02%	490 496 495	500 500 500

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Analyst:\_\_\_\_\_ QA:\_\_\_\_

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Analyst:\_\_\_\_\_ QA:\_\_\_\_

#### Embryo Larval Bioassay

### 96-Hour Development

Project: NBSD Storm HyD - Pulsed	Test Species: <u>S. purpuratus</u>
Sample ID: CUSCy Reference Toxicant Test	Start Date: 3/8/2016 1000
Test No.:	End Date: 3/12/2016 1030

Random #	Number Counted	Number Normal	Technician Initials
4 View	106	(00	MC
2	100	99	MC
3	100	87	uc-
4	100	99	me
5	100	Ø	MC
Le .	100	92	iuc.
7	100	33	щс
8	100	100	M.C.
9	100	18	MC
10	100	100	WC.
-	100	- 89	MC_
12	100	39	ric.
13	100	34	MC
14	106	98	MC
15	100	Ø	N.C.
IΨ	100	Ø	MC
17	100	160	MC
18	100	- Ø	MC
19	100	98	Mic
20	100	30	M.C.
21	100	94	N.L.
22	(66	100	ILC
23	106	99	MC
24	100	Ø	hic
15	100	56	MC.
26	100	48	MC
27	100	98	<i>Mc</i>
28	100	26	мÇ
24	100	27	MC
30	100	99	inc
31	100	83	NA.C.
32	001	99	INC
73	100	57	MC
34	106	99	MC
35	106	93	me

SPAWAR Systems Center Pacific Bioassay Lab, 53475 Strothe Rd, Bldg 111 Rm 116, San Diego, CA 92152

#### SPAWAR Pulsed Exposure Definitive Study Echinoderm Development Tests Test Initiation Date: 3/8/2016 Copper Reference Toxicant

Copper Concentration ( $\mu$ g/L)	Rand#
	35
	34
Lab Control	14
	1
	17
	23
	32
5.8	10 19
	8
	30
	4
8.4	27
0,7	22
	2
	31
	11
	21
	3
	6
	7
	25
17.2	26 12
	33
	28
	29
24	9
24	13
	20
· · · · · · · · · · · · · · · · · · ·	15
	5
35	24
	16
	18

SPAWAR Systems Center Pacific Bioassay Lab, 53475 Strothe Rd, Bldg 111 Rm 116, San Diego, CA 92152

Test Species: <u>S. purpuratus</u> Start Date/Time: <u>3/8/20/6 1000</u> End Date/Time: <u>3 12 20 6 1000</u>	Dissolved Oxygen pH	96 0 24 48 72 96 0 24 48 72 96	8.4 8.3 8.1 8.0 8.01 8.00 7.99 2.01 -	8-3 8.3 8.4 8.0 8.02 8.02 7.99 2.01	8-2 8, 3 8 4 8.1 8.0 8.02 8.02 8.07 P.01	8.2 8.4 8.1 79 8.03 8.28 00 8.01	8.2 8.5 8.4 8.1 7.9 8.03 828.02 201	8.2 8.5 8.4 8-1 8.0 8.03 8.02 8.02 8.01	8.2 8.5 8.1 8.0 8.03 8.02 8.01 8.01									FINAL REVIEW: JUL CAJULO		
Project: <u>NBSD Thom Had - Puelsed</u> Sample ID: <u>Cultor Represe Puescont</u> Test No.:	Salinity Ten (ppt)	<u> </u>	33.6 155 HLT	1	33.8 15.8 if 5 15.0 15.2	33.2 33.9 340 23.8 33.7 15.7	2 332 33.8 34.0 23.8 23.7 15.8		35 332 33.7 33.9 33.7 33.7 15.9 12.4 14.8 15.0 14.9			Technician Initials: 0 24 48 72 96 WQ Readings: <u>M-C N/A N<sup>+</sup> WC MC</u> Dilutions made by: <u>M-C MC</u>	Animal Source/Date Received: Freed contend of 1 /23/16	Comments: 0 hrs:	24 hrs:	48 hts: 72 hrs:	OC Check:	1 / m	SPAWAR Systems Center Pacific Bioassay Lab. 53475 Strothe Rd, Bidg 111 Rm 116, San Diego, CA 92152	

Water Quality Measurements

Marine Chronic Bioassay

C-61	

CETIS Sum	nmary Repo	ort						Report Dat Test Code:				;5 (p 1 of 1) I-4234-0175
Americamysis	s 96-h Acute Sur	rvival 1	lest 🛛							SPA	VAR Syste	ms Center
Batch ID: Start Date: Ending Date: Duration:	13-4930-5900 08 Mar-16 10:0 12 Mar-16 10:3 4d 1h		Test Type: Protocol: Species: Source:	Survival (96h) EPA/821/R-02- Americamysis Aquatic Resea	bahia	ns, NH		Analyst: Diluent: Brine: Age:	Labor	nne A Col <sup>y</sup> ratory Seav opplicable		
Sample ID: Sample Date: Receive Date: Sample Age:			Code: Material: Source: Station:	96A288E Copper sulfate Reference Tox Reference Tox				Client: Project:	SPAV Pulse	VAR ed Exposur	e	
Comparison S	Summary											
Analysis ID	Endpoint		NOEL		TOEL	PMSD	ΤU	Meth				
03-9723-9025	96h Survival Ra	ate	100	200	141.4	20.2%		Dunr	nett Mu	Iltiple Com	parison Tes	st
Point Estimate	e Summary											
Analysis ID	Endpoint		Level	µg/L	95% LCL	95% UCL	τu	Meth	nod			
10-6425-4746	96h Survival Ra	ate	LC50	253.1	195.4	313.2		Linea	ar Regi	ression (M	LE)	
96h Survival F	Rate Summary											
C-µg/L	Control Type	Cour	nt Mean	95% LCL	95% UCL	Min	Max	Std I	Err	Std Dev	CV%	% Effect
0	Lab Control	4	1	1	1	1	1	0		0	0.0%	0.0%
50		4	0.95	0.7909	1	0.8	1	0.05		0.1	10.53%	5.0%
100		4	0.95	0.7909	1	0.8	1	0.05		0.1	10.53%	5.0%
200		4	0.65	0.3453	0.9547	0.4	0.8	0.09		0.1915	29.46%	35.0%
400		4	0.2	0	0.4598	0	0.4	0.08	165	0.1633	81.65%	80.0%
800		4	0	0	0	0	0	0		0		100.0%
96h Survival F	Rate Detail											
C-µg/L	Control Type	Rep		<u> </u>	Rep 4							
0	Lab Control	1	1	1	1							
50		0.8	1	1	1							
100		1	0.8	1	1							
200		0.8	0.6	0.8	0.4							
400		0.4	0.2	0.2	0							
800		0	0	0	0							
96h Survival F	Rate Binomials											
C-µg/L	Control Type	Rep			Rep 4							
0	Lab Control	5/5	5/5	5/5	5/5							
50		4/5	5/5	5/5	5/5							
100		5/5	4/5	5/5	5/5							
200		4/5	3/5	4/5	2/5							
400		2/5	1/5	1/5	0/5							
800		0/5	0/5	0/5	0/5							

CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_\_

CETIS Ana	lytical Repo	ort						ort Date: Code:		Jun-16 08:3 016-004   04	
Americamysis	s 96-h Acute Su	rvival 1	lest 🛛						SPA	WAR Syste	ms Center
Analysis ID: Analyzed:	03-9723-9025 03 Jun-16 8:33	3	Endpoint: 9 Analysis: F	6h Survival R ?arametric-Co		tments		IS Version		.8.7	
Batch ID: Start Date: Ending Date: Duration:	13-4930-5900 08 Mar-16 10:0 12 Mar-16 10:3 4d 1h		Species: A	curvival (96h) PA/821/R-02- mericamysis quatic Resea	bahia	ns, NH	Anal Dilu Brin Age:	ent: Lal e: No	rienne A Col poratory Sea t Applicable		
Sample ID: Sample Date: Receive Date: Sample Age:			Material: C Source: R	6A288E Copper sulfate Reference Tox Reference Tox			Clier Proj		AWAR Ised Exposu	re	
Data Transfor	m	Zeta	Alt Hyp	Trials	Seed		PMSD	NOEL	LOEL	TOEL	τυ
Angular (Corre	cted)	NA	C > T	NA	NA		20.2%	100	200	141.4	
Dunnett Multi	ple Comparisor	n Test									
Control Lab Control	vs С-µg/L 50 100 200* 400*		Test Sta 0.5816 0.5816 3.898 8.654	at Critical 2.356 2.356 2.356 2.356 2.356	MSD         DF           0.241         6           0.241         6           0.241         6           0.241         6           0.241         6	<b>P-Value</b> 0.5682 0.5682 0.0025 <0.0001	P-Type CDF CDF CDF CDF		nificant Effec nificant Effec nt Effect		
ANOVA Table								_			
Source	Sum Squ	aree	Mean S	auare	DF	F Stat	P-Value	Decisior	(a:5%)		
Between Error Total	2.227548 0.314365 2.541914		0.55688	7	4 15 19	26.57	<0.0001	Significa	<b>X</b> ,		
Distributional	Tests										
Attribute	Test			Test Stat	Critical	P-Value	Decision	(a:1%)			
Variances		ene Equ	uality of Varian		4.893	0.3024	Equal Var	, ,			
Variances Distribution	Levene E	Equality	of Variance Normality	2.248 0.9099	4.893 0.866	0.1125 0.0635	Equal Var Normal D				
96h Survival F	Rate Summary										
C-µg/L	Control Type	Cour	nt Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0 50 100	Lab Control	4 4 4	1 0.95 0.95	1 0.7909 0.7909	1 1 1	1 1 1	1 0.8 0.8	1 1 1	0 0.05 0.05	0.0% 10.53% 10.53%	0.0% 5.0% 5.0%
200		4	0.65	0.3453	0.9547	0.7	0.4	0.8	0.09574	29.46%	35.0%
400 800		4 4	0.2 0	0 0	0.4598 0	0.2 0	0 0	0.4 0	0.08165 0	81.65%	80.0% 100.0%
	ected) Transfor	-									
C-µg/L	Control Type	Cour	-	95% LCL	95% UCL	Median	Min	Max	Std Err	cv%	%Effect
0	Lab Control	4	1.345	1.345	1.346	1.345	1.345	1.345	0	0.0%	0.0%
50		4	1.286	1.096	1.475	1.345	1.107	1.345	0.05953	9.26%	4.43%
100		4	1.286	1.096	1.475	1.345	1.107	1.345	0.05953	9.26%	4.43%
200		4	0.9463	0.623	1.27	0.9966	0.6847	1.107	0.1016	21.47%	29.66%
400		4	0.4594	0.161	0.7578	0.4636	0.2255	0.6847	0.09377	40.82%	65.85%
800		4	0.2255	0.2255	0.2256	0.2255	0.2255	0.2255	0	0.0%	83.24%

CETIS™ v1.8.7.16

Analyst:\_\_\_\_\_ QA:\_\_\_\_

CETIS Ana	alytical Repo	rt					Report Date: Test Code:	03 Jun-16 08:35 (p 2 of 2) SSC-2016-004   04-4234-0175
Americamysi	s 96-h Acute Sur	vival Tes	st					SPAWAR Systems Center
Analysis ID: Analyzed:	03-9723-9025 03 Jun-16 8:33		ndpoint: 96 nalysis: Pa		ate ntrol vs Trea	tments	CETIS Version: Official Results:	CETISv1.8.7 Yes
96h Survival	Rate Detail							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
0	Lab Control	1	1	1	1			
50		0.8	1	1	1			
100		1	0.8	1	1			
200		0.8	0.6	0.8	0.4			
400		0.4	0.2	0.2	0			
800		0	0	0	0			
Angular (Cor	rected) Transforr	ned Deta	ail					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
0	Lab Control	1.345	1.345	1.345	1.345			
50		1.107	1.345	1.345	1.345			
100		1.345	1.107	1.345	1.345			
200		1.107	0.8861	1.107	0.6847			
400		0.6847	0.4636	0.4636	0.2255			
800		0.2255	0.2255	0.2255	0.2255			
96h Survival	Rate Binomials							
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4			
0	Lab Control	5/5	5/5	5/5	5/5			
50		4/5	5/5	5/5	5/5			
100		5/5	4/5	5/5	5/5			
200		4/5	3/5	4/5	2/5			
400		2/5	1/5	1/5	0/5			
800		0/5	0/5	0/5	0/5			
Graphics								
<sup>10</sup> E						°ss E		•
0.9	•	•				0.20		
0.8				Reject Nul	_	0.15		
¥ 0.7					_	0.10 E		
96h Survival Rate					an teres	о.05 ст. <b>Уча</b>		
ŝ.						°	<b>••••••</b> •	•
						-0.05	•	
0.4						-0.10		
0.3						-0.15		
0.2						- F /	••	
Ē			<b>-</b>			0.20		
0.1				•		-0.25		
00 E	0LC 50	100	200 400	) 800		-0.30 E	5 -10 -05 0.0	05 1.0 15 2.0
	~	 С-µg/L	**					

000-010-187-1

CETIS™ v1.8.7.16

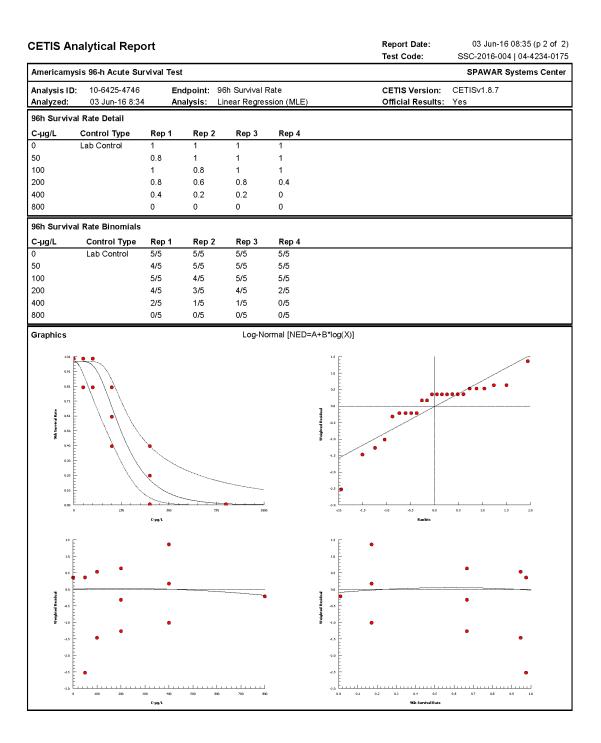
Analyst:\_\_\_\_\_ QA:\_\_\_\_\_

CETIS A	nalyti	cal Repo	ort					-	ort Date: Code:			35 (p 1 of 2) 4-4234-0175
Americam	ysis 96-l	n Acute Sur	vival Test							SPA	WAR Syst	ems Center
Analysis I Analyzed:		6425-4746 Jun-16 8:34			ih Survival Ra near Regress				IS Version: cial Results		.8.7	
Batch ID: Start Date Ending Da Duration:	. 08	4930-5900 Var-16 10:00 Var-16 10:30 1h	D Prot	tocol: El cies: Ar	urvival (96h) PA/821/R-02- nericamysis quatic Resea	bahia	ns, NH	Anal Dilu Brin Age:	ent: Lab e: Not	ienne A Col oratory Sea Applicable		
Sample ID Sample Da Receive D Sample Ag	ate: 08   ate:		Sou	erial: Co Irce: Re	A288E opper sulfate eference Toxi eference Toxi			Clier Proj		WAR sed Exposu	e	
Linear Reg	-	Options										
Model Fur		A+B*log(X)]		Thresho Control T	Id Option Threshold	Threshold 1E-07	Optimized Yes	Pooled No	Het Corr No	Weighted Yes	1	
Regressio	-			5611101								
lters L		AICc 70.9	BIC 73.24	Mu 2.403	Sigma 0.2133	Adj R2	F Stat 2.485	Critical	P-Value 0.0936	Decision	(α:5%) ificant Lacl	k of Fit
		10.5	13.24	2.403	0.2155	0.7955	2.403	5.10	0.0950	Non-Sign		KOTTI
	<b>nates</b> g/L 53.1	95% LCL 195.4	95% UCL 313.2									
Regressio	n Param	eters										
Parameter		Estimate	Std Error	95% LCI	. 95% UCL	t Stat	P-Value	Decision	(α:5%)			
Threshold		0.02421 4.687	0.02358 1.014	-0.02201 2.7	0.07042 6.675	1.027 4.622	0.3163 0.0001	-	ificant Parar t Parameter			
Slope Intercept		4.667 -11.27	2.476	-16.12	-6.412	4.622 -4.549	0.0001		t Parameter			
ANOVA Ta	ble											
Source Model Lack of Fit Pure Error Residual		Sum Squa 68.27331 4.653317 11.23337 15.88669	68.2 1.55 0.62	an Square 27331 51106 24076 56509	DF 1 3 18 21	<b>F Stat</b> 90.25 2.485	<b>P-Value</b> <0.0001 0.0936	Decision Significan Non-Signi	t			
		15.66669	0.75	16009	21							
Residual A	nalysis	Math			Tast Of t	Critit 1	D Value	Da -/ - / -	( 5.0/ )			
Attribute Goodness- Variances Distribution		Method Pearson C Likelihood Mod Lever Shapiro-W Anderson-	Ratio GOF ne Equality ilk W Norm	of Variance ality	Test Stat           15.89           13.49           0.719           0.8455           1.744	Critical 32.67 32.67 2.773 0.9169 2.492	P-Value           0.7760           0.8905           0.6176           0.0018           <0.0001	Non-Signi Equal Var Non-norm	ificant Heter ificant Heter	ogenity		
96h Surviv	al Rate	Summary				Calcu	lated Variat	e(A/B)				
C-µg/L		ol Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	в
0	Lab C	ontrol	4	1	1	1	0	0	0.0%	0.0%	20	20
50 100			4 4	0.95 0.95	0.8 0.8	1 1	0.05 0.05	0.1 0.1	10.53% 10.53%	5.0% 5.0%	19 19	20 20
200			4	0.95	0.8	0.8	0.05	0.1	10.53% 29.46%	5.0% 35.0%	19	20 20
400			4	0.2	0	0.4	0.08165	0.1633	81.65%	80.0%	4	20
800			4	0	0	0	0	0		100.0%	0	20

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Marine Acute Bioassay

Static-Renewal Conditions

#### Water Quality Measurements & Test Organism Survival

Project: NBSD Storm water Pulsed Exposure	Test Species: A. bahia				Te	ch Init	ials	
Sample ID: Reference Toxicant CuS04	Start Date/Time: 3/8/2016	1000		0	24	48	72	96
Test No.:	End Date/Time: 3/12/2016	1030	Counts:	NH	MC-	NH	HC.	uc
			Readings:	μĹ	NH	NH	MC	ac
			Dilutions made by:	μC		NH		

Concentration CuSO₄ (µg/L)	Rep			iber c rganis		0			Salini (ppt				Те	mpera (°C)				Disso	olved ( (mg/l		n			pH (units	5)	
	ļ	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
Lab Control	A	5	5	5	5	5	30.1	30.7	1209	30.0	50.7	m.1	20.1	206	19.4	19.7	7.8	7.5	44	7,9	7.8	26.8	7.8	7.78	1,95	7.96
	В	5	5	5	5	5			307	4				120	1				180					302		
	C	5	5	5	5	5																				
· · ·	D	5	5	5	5	5																				
50	A	5	5	5	4	4	30.1	30.7	1	30.0	30.5	<u> n. </u>	20.3	20.9	19.6	19.9	77	75	7.6	7.7	7.7	8.U	7.95	18:02	1.96	7.89
	B	5	5	5	5	5			209					20.9					1.1					1.84		
	C	5	5	5	5	5																				
	D	5	5	5	5	5								1												
100	A B	5	5	5	5	5	<b>'30</b> .0	306		30.6	30.4	192	al 6	209	19.7	18.8	7.8	7.4		7.5	7.6	8.06	7.74		7.94	7.85
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200	B		11/10	4	4 3	4	30.0	20.6		30.4	1.02	19.7	20.7	f	191.6	19.7	7.7	74	4.0	7.5	7.7	8.06	<u>774</u>	8.02	7.96	7.77
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	в	5	5	5	3	0		<b>y</b> .,	204	<u>,                                    </u>	<i>JU.</i> 1	<u>• 1-7</u>	Sev 3	f		11.1		1.	£			8.06	Columna .	2:33	1.72	7.72
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Initial Counts QC'd by:_	NH																	,		<u></u>						and Stations
Animal Source/Date	Receiv	ed:		ARO	3/5/20	016				ļ	Age at	Initia	tion:	6 days	6						. [		Feed	ing Tir	nes	
																					Ī	0	24	48	72	96

Comments:	i = initial reading in fresh test solution, f = final reading in test chamber prior to renewal	АМ: 091	8 1000	1590	tao	1010
	Organisms fed prior to initiation, circle one 🕜 / n)	PM: Sec	1500	1530	1500	
	Tests aerated? Circle one ( y n if yes, sample ID(s): Duration:			<u> </u>		
QC Check:	JAD 6/1/2016	Final Review:	u	6/2	AIL	e

SPAWAR Systems Center Pacific Bioassay Lab, 53475 Strothe Rd, Bldg 111 Rm 116, San Diego, CA 92152

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Project Sample D	Sample D#		Sampling		Receipt at Lab	at Lab	Matrix		Water Qual	Water Quality on Arrival		Received
		Date	Time Temp (°C)	Cemp (°C)	Date	Lime		pH (units)	D.O. (mg/L)	Temp. ('C)	pH (units) D.O. (ag/L) Temp. ('C) Salinity (ppt)	By
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Fui so Soundates Pror 10 Err		3/2/16	0943	14.2	3/7/16	1130	Stormants	7.27	2.2	14.2	<u>د</u> ا	1.H
RUISON STORM WORK PRO MED	37		2060	14.2	3/7/16	1130	Someth	7.09	8.2	14.2	0.	Ŕ
Russed Stanmator Pier 10 IN	38				3/2/12			6.72	-	14.2	ò	3
3.e.r	Ж				3/2/16	:	Society	7.01	-		0.0	15
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## C.5. COPPER EXPOSURES – SAMPLE INFORMATION AND CHAIN OF CUSTODY:

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### APPENDIX D GLOSSARY OF QUALIFIER CODES

### Glossary of Qualifier Codes:

- Q1 pH out of recommended range; refer to CAR
- Q2 Temperatures out of recommended range; corrective action taken and recorded in Test Temperature Correction Log
- Q3 Temperatures out of recommended range; no action taken, test terminated same day
- Q4 Sample aerated prior to initiation or renewal
- Q5 Salinity out of recommended range; refer to QA section of report
- Q6 Spilled test chamber/ Lost test animal
- Q7– Instrumentation Error/Failure; refer to CAR
- Q8 Inadequate sample volume, 50% renewal performed
- Q9 Inadequate sample volume, no renewal performed
- Q10 Sample out of holding time; refer to QA section of report
- Q11 Refer to QA section of report for explanation
- Q12 Supplemental information is footnoted
- Q13 Test initiated with an incorrect number of test organisms
- Q14 Replicate(s) not initiated
- Q15 Survival counts not recorded due to poor visibility or heavy debris
- Q16 Test aerated due to dissolved oxygen levels dropping below 4.0 mg/L
- Q17 Test initiated with aeration due to an anticipated drop in dissolved oxygen
- Q18 Airline obstructed or fell out of replicate and replaced, drop in dissolved oxygen occurred
- Q19 Animals out of appropriate age range at test initiation
- Q20 Readings not taken, tech error
- Q21 Organisms in replicate not counted, tech error
- Q22 Dissolved oxygen above recommended range, but remained within the 100% ±10% saturation requirement

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REPORT DOCUMENTATION PAGE	Form Approved OMB No. 0704-01-0188
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1. REPORT DATE (DD-MM-YYYY) 2. REPORT TYPE	3. DATES COVERED (From - To)
October 2019 Final	
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Pulsed Exposure Toxicity Testing:	5b. GRANT NUMBER
Method Development and Initial Evaluation	
for Stormwater Compliance	5c. PROGRAM ELEMENT NUMBER
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Gunther Rosen Jacob Munson-Decker	5e. TASK NUMBER
Molly Colvin Nicholas Hayman	
Chuck Katz San Diego State University	5f. WORK UNIT NUMBER
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937 N Harbor Drive	
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without restriction.	
14. ABSTRACT	
This report describes a preliminary research effort to modify whole effluent toxicity discharges for application to episodic and/or ephemeral discharges such as those as in response to a Naval Base San Diego industrial stormwater National Pollutant Discondition that allows the Navy to assess and propose alternative testing parameters. environmental toxicologists at the Navy's Information Warfare Center Pacific (NIW The technical approach taken was to modify the WET testing method to simulate a test conditions matrix included: acute and chronic endpoints with commonly used t toxicants at various concentrations found to cause toxicity under standard WET test 50th, 75th, and 95th percentile historical rainfall durations observed in San Diego capplication to multiple stormwater samples collected from Naval Base San Diego can was conducted concurrently with standard test method durations for comparison.	sociated with storm water runoff. The effort was undertaken scharge Elimination System (NPDES) permit (R9-2013-0064) The research was conducted for Naval Base San Diego by VC Pacific). range of exposure conditions found at the end-of-pipe. The est organisms; copper, zinc, and a combination of the two ting; and short-term exposure conditions representing the over the past 55 years. The initial testing culminated in its
15. SUBJECT TERMS	
Mixed metal exposures; stormwater exposures; zinc exposures; copper exp	osures; stormwater samples; pulsed exposure testing
16. SECURITY CLASSIFICATION OF: 17 LIMITATION OF 18. NUMB	ER 19a, NAME OF RESPONSIBLE PERSON

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