



# Acute Toxicity Test Results from the Carlsbad Desalination Plant

❖ Sample ID: M-001  
Sample Collection Dates: 8/29/18, 9/6/18, and  
9/18/18

**Prepared for:** Poseidon Water, LLC  
5780 Fleet Street, Suite 140  
Carlsbad, CA 92008

**Prepared by:** Nautilus Environmental

**Submitted:** October 10, 2018

**Data Quality Assurance:**

- Nautilus Environmental is accredited in accordance with NELAP by the State of Oregon Environmental Laboratory Accreditation Program (Certificate No. 4053). It is also certified by the State of California Department of Health Services Environmental Laboratory Accreditation Program (Certificate No. 1802) and the State of Washington Department of Ecology (Lab ID C552).
- All data have been reviewed and verified.
- All test results have met minimum test acceptability criteria under their respective EPA protocols, unless otherwise noted in this report.
- All test results have met internal Quality Assurance Program requirements.

**Results verified by:** Adrienne Gibor

# **EXECUTIVE SUMMARY**

## **ACUTE TOXICITY TESTING**

### **CARLSBAD DESALINATION PLANT BRINE EFFLUENT**

#### **CDP M-001 Brine Effluent**

#### **Pacific Topsmelt 96-hour Acute Survival Results Summary:**

<b>Sample Date</b>	<b>Acute Toxic Unit (TU<sub>a</sub>)</b>
<b>8/29/18</b>	<b>1.28</b>
<b>9/6/18</b>	<b>1.14</b>
<b>9/18/18</b>	<b>1.25</b>

## INTRODUCTION

24-hour composite discharge samples were collected in August and September 2018 from the Carlsbad Desalination Plant (CDP) for acute toxicity testing purposes. At the request Santa Ana Regional Water Quality Control Board (SARWQCB), Poseidon Water, LLC (Poseidon) contracted with Nautilus Environmental (Nautilus) to conduct three acute toxicity tests on CDP brine effluent samples collected at least one week apart from each other and representative of normal plant brine production. Bioassay testing was conducted at the Nautilus laboratory in San Diego, California using the Pacific topsmelt (*Atherinops affinis*) 96-hour acute survival test.

## MATERIALS AND METHODS

Sample collection was performed by Poseidon or plant operator (IDE) personnel, and the samples were hand delivered to Nautilus on the same day as collection. Following arrival at Nautilus, an aliquot of each water sample was poured off and the following water quality parameters were measured: pH, dissolved oxygen (DO), temperature, salinity, alkalinity, and total chlorine. The sample was stored at 4° C in the dark until used for testing. A summary of the sample collection and receipt information is provided in Table 1, and water quality parameters measured upon receipt at Nautilus are presented in Table 2. Testing was conducted in accordance with the protocols described in USEPA 2002, and the methods are summarized in Table 3.

**Table 1. Sample Information**

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Client/Project:	Poseidon Water, LLC/ Carlsbad Desalination Plant
Sample ID/Material:	M-001/desalination plant brine effluent
Testing Period:	August/September 2018
Sample Collection Dates, Times:	1. 8/29/18, 08:30; 2. 9/6/18, 08:00; 3. 9/18/18, 09:30
Sample Receipt Dates, Times:	1. 8/29/18, 12:30; 2. 9/6/18, 12:45; 3. 9/18/18, 12:07
Sampling Method:	24-hr Composite

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**Table 2. M-001 Water Quality Measurements upon Sample Receipt**

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Sample Date	pH	DO (mg/L)	Temp (°C)	Salinity (ppt)	Alkalinity (mg/L as CaCO <sub>3</sub> )	Total Chlorine (mg/L)
8/29/18	7.74	6.1	2.5	67.0	215	0.02
9/6/18	8.00	7.5	5.6	64.8	212	<0.02
9/18/18	7.34	6.0	3.3	67.4	233	0.02

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**Table 3. Pacific Topsmelt 96-hour Acute Survival Bioassay Specifications**

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Test Period:	1. 8/29/18, 16:20 to 9/2/18, 14:45 2. 9/6/18, 15:45 to 9/10/18, 14:15 3. 9/19/18, 13:00 to 9/23/18, 11:30
Test Organism, age:	<i>Atherinops affinis</i> (Pacific topsmelt), 9-12 days
Test Organism Source:	Aquatic Biosystems, Inc. (Fort Collins, CO)
Lab Control/Dilution Water:	Natural seawater (source: Scripps Institution of Oceanography inlet); 20- $\mu$ m filtered
Sample Manipulation:	None
Test Concentrations:	6.25, 12.5, 25, 50, and 100 percent effluent; lab control
Number of Replicates/ Organisms per Replicate:	6 replicates of 5 organisms each
Protocol Used:	EPA/821/R-02/012, 2002 Acute Manual
Test Type:	96-hour acute survival; 80% water renewal at 48 hours (static-renewal)
Acceptability Criteria:	Mean survival in the lab control must be $\geq$ 90%
Statistical Analysis Software:	CETIS™, version 1.8.7.20

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**RESULTS**

A statistically significant decrease in Pacific topsmelt survival was observed in the 100 percent effluent sample for each test date, but there were no statistically significant effects in the 6.25, 12.5, 25, or 50 percent concentrations for any of the three samples tested, resulting in a NOEC of 50 percent effluent for each test. Median lethal effect concentrations (LC<sub>50</sub>) ranged from 78.3 to 88.0 percent. The acute toxic unit (TU<sub>a</sub>) is calculated as 100/LC<sub>50</sub>, and resulting TU<sub>a</sub> values ranged from 1.14 to 1.28 (Table 4). The responses in the undiluted brine effluent are likely due to elevated salinity based on salinity studies performed by Nautilus and other laboratories (Weston 2007 and Phillips et al. 2012). Statistical results are summarized in Table 4, and detailed test results are summarized in Table 5. Raw test data and full statistical analyses can be found in Appendix A. Sample receipt information and a copy of the chain-of-custody form are in Appendices B and C, respectively.

**Table 4. Statistical Results for Pacific Topsmelt 96-hour Acute Survival Testing**

Test Date	NOEC (% sample)	LOEC (% sample)	LC <sub>50</sub> (% sample)	TU <sub>a</sub> value (toxic units)
8/29/18	50	100	78.3	1.28
9/6/18	50	100	88.0	1.14
9/19/18	50	100	79.8	1.25

NOEC = The highest Concentration that results in No Observed Effect

LOEC = Lowest Observed Effect Concentration

LC<sub>50</sub> = Concentration expected to cause a lethal response in 50% of the test organisms

TU<sub>a</sub> = Acute Toxic Units: 100/LC<sub>50</sub> for samples exhibiting < 50% survival in 100% sample, where the LC<sub>50</sub> = concentration of the sample estimated to cause mortality to 50% of the test organisms. For samples exhibiting >50% survival in 100% sample, the TU<sub>a</sub> is calculated as: (log (100 - % survival in 100% sample))/1.7. If survival is >99% in the sample, the TU<sub>a</sub> = 0.0

**Table 5. Detailed Results of Pacific Topsmelt Acute Bioassay Testing**

Test Concentration (% Effluent)	Mean 96-hr Survival (%)		
	8/29/18 Test	9/6/18 Test	9/19/18 Test
Lab Control	100	96.7	93.3
6.25	93.3	93.3	96.7
12.5	100	100	100
25	96.7	96.7	93.3
50	93.3	100	96.7
100	16.7*	33.3*	16.7*

\*An asterisk indicates a statistically significant decrease in survival compared to the lab control.

## QUALITY ASSURANCE

The samples were received on the same day as collection, and all three tests were initiated within the 36-hour holding time. The laboratory control met the minimum acceptability criteria as set by USEPA, as well as all internal QA Program requirements. Therefore, all test results were deemed valid. Additionally, based on the dose response observed during testing, the calculated effect concentration is deemed reliable.

Results for the monthly reference toxicant tests used to monitor laboratory performance and test organism sensitivity met all test acceptability criteria, and are summarized in Table 6 and presented in full in Appendix D. A glossary of qualifier codes used on bench datasheets is available in Appendix E.

**Table 6. Pacific Topsmelt 96-hr Acute Survival Reference Toxicant Test Results**

<b>Test Date</b>	<b>EC<sub>50</sub> (µg/L Copper)</b>	<b>Historical Mean EC<sub>50</sub> ± 2 SD (µg/L Copper)</b>	<b>CV (%)</b>
8/14/18	196	124 ± 136	54.7
9/12/18	106	131 ± 136	52.0

EC<sub>50</sub> = Concentration expected to cause an adverse effect to 50 percent of the test organisms  
Historical Mean EC<sub>50</sub> ± 2 SD = Mean of historical test results plus or minus two standard deviations  
CV = Coefficient of Variation

## **REFERENCES**

- Phillips, B.M., B.S. Anderson, K. Siegler, J.P. Voorhees, S. Katz, L. Jennings and R.S. Tjeerdema. 2012. Hyper-Saline Toxicity Thresholds for Nine California Ocean Plan Toxicity Test Protocols. Final Report. University of California, Davis, Department of Environmental Toxicology at Granite Canyon.
- Tidepool Scientific Software. 2000-2013. CETIS™ Comprehensive Environmental Toxicity Information System Software, Version 1.8.7.20
- USEPA. 2002. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms. EPA/821/R-02/012.
- Weston Solutions. 2007. Analytical Report submitted to Poseidon Resources. Desal Pilot Topsmelt Toxicity Study. January 17, 2007.

## **Appendix A**

### **Test Data and Statistical Analyses**

**August 29, 2018 Acute Topsmelt Test**

# CETIS Summary Report

Report Date: 19 Sep-18 09:47 (p 1 of 1)  
 Test Code: 1808-S220 | 19-4968-3509

**Pacific Topsmelt 96-h Acute Survival Test** **Nautilus Environmental (CA)**

<b>Batch ID:</b> 08-3748-2464	<b>Test Type:</b> Survival (96h)	<b>Analyst:</b>
<b>Start Date:</b> 29 Aug-18 16:20	<b>Protocol:</b> EPA/821/R-02-012 (2002)	<b>Diluent:</b> Natural Seawater
<b>Ending Date:</b> 02 Sep-18 14:45	<b>Species:</b> Atherinops affinis	<b>Brine:</b> Not Applicable
<b>Duration:</b> 94h	<b>Source:</b> Aquatic Biosystems, CO	<b>Age:</b> 12d

<b>Sample ID:</b> 04-6476-3609	<b>Code:</b> 18-0927	<b>Client:</b> Poseidon
<b>Sample Date:</b> 29 Aug-18 08:30	<b>Material:</b> Facility Effluent	<b>Project:</b>
<b>Receive Date:</b> 29 Aug-18 12:30	<b>Source:</b> Poseidon	
<b>Sample Age:</b> 8h (2.5 °C)	<b>Station:</b> M-001 (CDP)	

Comparison Summary							
Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU <sub>α</sub>	Method
17-5302-7315	96h Survival Rate	50	100	70.71	14.6%	Ⓟ 2 / 1.28	Steel Many-One Rank Sum Test

Point Estimate Summary							
Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
20-8538-6807	96h Survival Rate	EC25	61.96	55.97	66.53	1.614	Linear Interpolation (ICPIN)
		EC50	78.26	71.31	86.21	1.278	

96h Survival Rate Summary											
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Control	6	1	1	1	1	1	0	0	0.0%	0.0%
6.25		6	0.9333	0.8249	1	0.8	1	0.04216	0.1033	11.07%	6.67%
12.5		6	1	1	1	1	1	0	0	0.0%	0.0%
25		6	0.9667	0.881	1	0.8	1	0.03333	0.08165	8.45%	3.33%
50		6	0.9333	0.8249	1	0.8	1	0.04216	0.1033	11.07%	6.67%
100		6	0.1667	0	0.373	0	0.4	0.08028	0.1966	118.0%	83.33%

96h Survival Rate Detail							
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
0	Lab Control	1	1	1	1	1	1
6.25		1	1	0.8	0.8	1	1
12.5		1	1	1	1	1	1
25		0.8	1	1	1	1	1
50		1	1	0.8	1	0.8	1
100		0.4	0	0	0	0.4	0.2

Ⓟ EG Q18 9/19/18

**CETIS Analytical Report**

Report Date: 19 Sep-18 09:46 (p 1 of 2)  
 Test Code: 1808-S220 | 19-4968-3509

Pacific Topsmelt 96-h Acute Survival Test						Nautilus Environmental (CA)					
Analysis ID: 17-5302-7315		Endpoint: 96h Survival Rate				CETIS Version: CETISv1.8.7					
Analyzed: 19 Sep-18 9:46		Analysis: Nonparametric-Control vs Treatments				Official Results: Yes					
Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU		
Angular (Corrected)	NA	C > T	NA	NA	14.6%	50	100	70.71	2		
Steel Many-One Rank Sum Test											
Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)		
Lab Control		6.25	33	25	1	10	0.4320	Asymp	Non-Significant Effect		
		12.5	39	25	1	10	0.8333	Asymp	Non-Significant Effect		
		25	36	25	1	10	0.6538	Asymp	Non-Significant Effect		
		50	33	25	1	10	0.4320	Asymp	Non-Significant Effect		
		100*	21	25	0	10	0.0087	Asymp	Significant Effect		
ANOVA Table											
Source	Sum Squares		Mean Square		DF	F Stat	P-Value	Decision(α:5%)			
Between	3.974514		0.7949029		5	52.53	<0.0001	Significant Effect			
Error	0.4539925		0.01513308		30						
Total	4.428507				35						
Distributional Tests											
Attribute	Test		Test Stat	Critical	P-Value	Decision(α:1%)					
Variances	Mod Levene Equality of Variance		3.527	3.699	0.0126	Equal Variances					
Variances	Levene Equality of Variance		13.82	3.699	<0.0001	Unequal Variances					
Distribution	Shapiro-Wilk W Normality		0.866	0.9166	0.0005	Non-normal Distribution					
96h Survival Rate Summary											
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Control	6	1	1	1	1	1	1	0	0.0%	0.0%
6.25		6	0.9333	0.8249	1	1	0.8	1	0.04216	11.07%	6.67%
12.5		6	1	1	1	1	1	1	0	0.0%	0.0%
25		6	0.9667	0.881	1	1	0.8	1	0.03333	8.45%	3.33%
50		6	0.9333	0.8249	1	1	0.8	1	0.04216	11.07%	6.67%
100		6	0.1667	0	0.373	0.1	0	0.4	0.08028	118.0%	83.33%
Angular (Corrected) Transformed Summary											
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Control	6	1.345	1.345	1.345	1.345	1.345	1.345	0	0.0%	0.0%
6.25		6	1.266	1.137	1.395	1.345	1.107	1.345	0.0502	9.71%	5.9%
12.5		6	1.345	1.345	1.345	1.345	1.345	1.345	0	0.0%	0.0%
25		6	1.306	1.204	1.408	1.345	1.107	1.345	0.03969	7.45%	2.95%
50		6	1.266	1.137	1.395	1.345	1.107	1.345	0.0502	9.71%	5.9%
100		6	0.4183	0.181	0.6555	0.3446	0.2255	0.6847	0.09229	54.05%	68.91%

Pacific Topsmelt 96-h Acute Survival Test

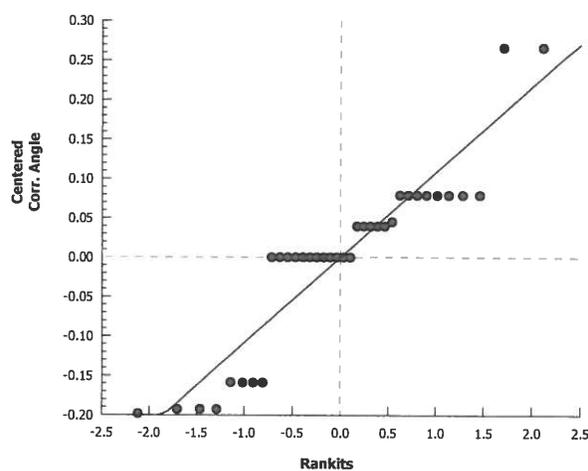
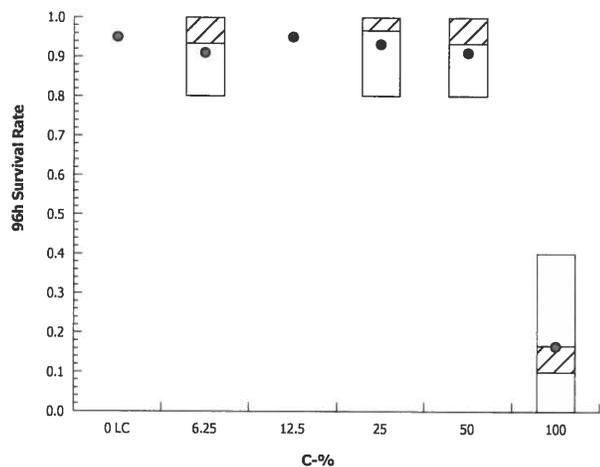
Nautilus Environmental (CA)

Analysis ID: 17-5302-7315  
Analyzed: 19 Sep-18 9:46

Endpoint: 96h Survival Rate  
Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



# CETIS Analytical Report

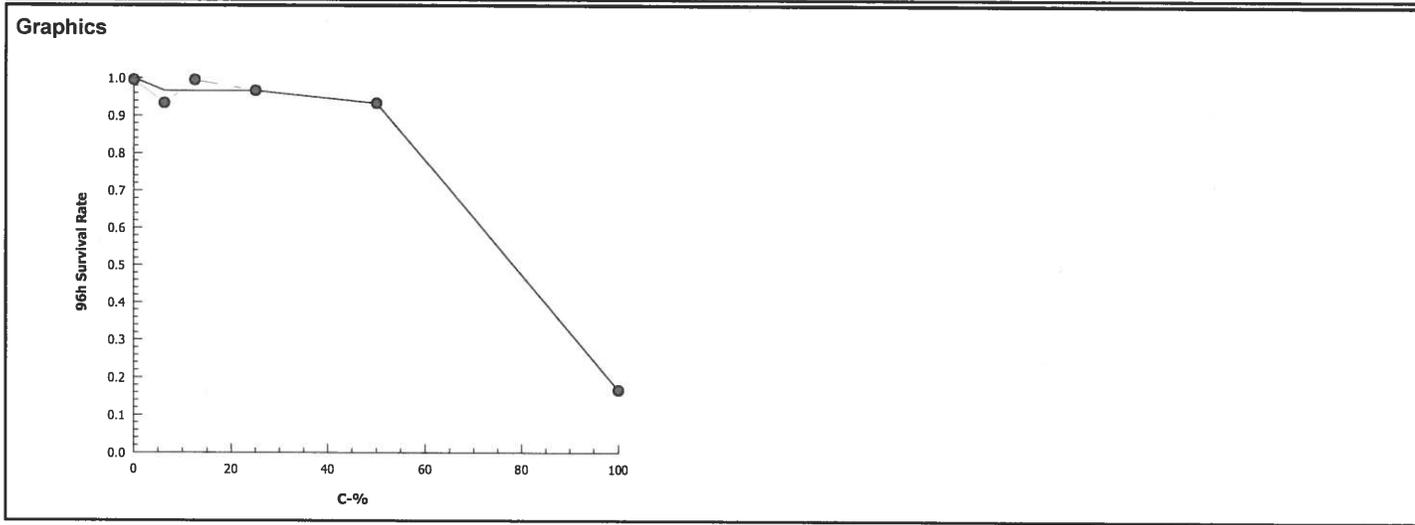
Report Date: 19 Sep-18 09:47 (p 1 of 1)  
 Test Code: 1808-S220 | 19-4968-3509

Pacific Topsmelt 96-h Acute Survival Test			Nautilus Environmental (CA)		
Analysis ID: 20-8538-6807	Endpoint: 96h Survival Rate	CETIS Version: CETISv1.8.7			
Analyzed: 19 Sep-18 9:46	Analysis: Linear Interpolation (ICPIN)	Official Results: Yes			

Linear Interpolation Options					
X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	1579214	1000	Yes	Two-Point Interpolation

Point Estimates						
Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
EC25	61.96	55.97	66.53	1.614	1.503	1.787
EC50	78.26	71.31	86.21	1.278	1.16	1.402

96h Survival Rate Summary			Calculated Variate(A/B)								
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Lab Control	6	1	1	1	0	0	0.0%	0.0%	30	30
6.25		6	0.9333	0.8	1	0.04216	0.1033	11.07%	6.67%	28	30
12.5		6	1	1	1	0	0	0.0%	0.0%	30	30
25		6	0.9667	0.8	1	0.03333	0.08165	8.45%	3.33%	29	30
50		6	0.9333	0.8	1	0.04216	0.1033	11.07%	6.67%	28	30
100		6	0.1667	0	0.4	0.08028	0.1966	118.0%	83.33%	5	30



**Marine Acute Bioassay  
Static-Renewal Conditions**

**Water Quality Measurements  
& Test Organism Survival**

Client: Poseidon  
 Sample ID: M-001 (LOP)  
 Sample Log-in No.: 18-0927  
 Test No.: 1808-S220

Test Species: A. affinis  
 Start Date/Time: 8/29/2018 1410  
 End Date/Time: 9/2/2018 1445

Tech Initials				
0	24	48	72	96
Counts:	WT	WT	BOAB	#1
Readings:	BO	DM	Rt	RT
Dilutions made by:	AB		BO	

Concentration %	Rep	Number of Live Organisms					Salinity (ppt)					Temperature (°C) Qi					Dissolved Oxygen (mg/L)					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	A	5	5	5	5	5	34.2	34.3	34.4	34.3	34.5	20.4	20.1	20.2	19.9	20.8	7.4	6.0	6.7	6.5	6.4	8.08	7.93	8.05	7.84	7.80	
	B	5	5	5	5	5		34.1					20.1					5.5					7.77				
	C	5	5	5	5	5																					
	D	5	5	5	5	5																					
	E	5	5	5	5	5																					
	F	5	5	5	5	5																					
6.25	A	5	5	5	5	5	36.5	36.3	36.5	36.5	36.5	20.6	20.2	20.1	19.8	20.8	7.3	5.6	6.8	6.6	6.3	8.01	7.94	8.03	7.86	7.80	
	B	5	5	5	5	5		36.3					20.1					5.5					7.79				
	C	5	5	5	5	4																					
	D	5	5	5	5	4																					
	E	5	5	5	5	5																					
	F	5	5	5	5	5																					
12.5	A	5	5	5	5	5	38.3	38.2	38.4	38.5	38.5	20.7	20.2	20.3	19.8	20.7	7.5	5.5	6.8	6.6	6.2	8.01	7.94	8.02	7.90	7.82	
	B	5	5	5	5	5		38.3					20.0					5.4					7.80				
	C	5	5	5	5	5																					
	D	5	5	5	5	5																					
	E	5	5	5	5	5																					
	F	5	5	5	5	5																					
25	A	5	5	5	5	4	43.0	42.9	42.0	42.2	42.0	21.0	20.2	20.5	19.6	20.6	7.6	5.5	6.8	6.4	6.2	7.98	7.93	7.98	7.91	7.82	
	B	5	5	5	5	5		42.0					20.0					5.2					7.92				
	C	5	5	5	5	5																					
	D	5	5	5	5	5																					
	E	5	5	5	5	5																					
	F	5	5	5	5	5																					
50	A	5	5	5	5	5	50.8	50.8	50.4	50.4	50.6	21.4	20.4	20.0	19.4	20.5	7.3	5.4	7.2	6.7	6.2	7.93	7.96	7.91	7.93	7.88	
	B	5	5	5	5	5		50.8		*			20.1					5.5					7.86				
	C	5	5	5	4	4																					
	D	5	5	5	5	5																					
	E	5	5	5	4	4																					
	F	5	5	5	5	5																					

Initial Counts QC'd by: DM  
 Initiated by: TW

Animal Source/Date Received: ABS 8/29/18 Age at Initiation: 12d  
 Animal Acclimation Qualifiers (circle all that apply): Q22 / Q23 / Q24 / none

Feeding Times				
0	24	48	72	96
AM:	0920	0945	0945	0850
PM:	1650	1700	✓	✓

Comments: i = initial reading in fresh test solution, f = final reading in test chamber prior to renewal  
 Organisms fed prior to initiation, circle one (y n) \* Salinity measured using 50% dilution with DI water

QC Check: EG 9/4/18 @ Q15 RT 8/30/18 Final Review: AC 10/1/18

**Marine Acute Bioassay  
Static-Renewal Conditions**

**Water Quality Measurements  
& Test Organism Survival**

Client: Poseidon  
 Sample ID: M-001 (CDP)  
 Sample Log-in No.: 18-0927  
 Test No.: 1808-S220

Test Species: A. affinis  
 Start Date/Time: 8/29/2018 1620  
 End Date/Time: 9/2/2018 1445

Tech Initials				
0	24	48	72	96
TN	TN	BOAB	ES	
BO	OMRT	RT	RH	
AB		BO		

Counts:

Readings:

Dilutions made by:

Concentration %	Rep	Number of Live Organisms					Salinity (ppt)					Temperature (°C)					Dissolved Oxygen (mg/L)					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	
100	A	5	3	2	2	2	66.6	66.6	66.6	66.6	66.8	21.4	20.1	20.7	19.7	20.7	7.6	5.5	7.6	6.7	6.3	7.7	7.90	7.80	7.95	7.93	
	B	5	0	-	-	-	66.6	66.6	66.6	66.6	20.1						5.4						7.83				
	C	5	0	-	-	-																					
	D	5	0	-	-	-																					
	E	5	2	2	2	2																					
	F	5	1	1	1	1																					
	A																										
	B																										
	C																										
	D																										
	E																										
	F																										

Initial Counts QC'd by: DM  
 Initiated by: TN

Animal Source/Date Received: ABS 8/25/18 Age at Initiation: 12d

Animal Acclimation Qualifiers (circle all that apply): Q22 Q23 / Q24 / none

Comments: i = initial reading in fresh test solution, f = final reading in test chamber prior to renewal Q18 ACS 8/26/18  
 Organisms fed prior to initiation, circle one (y/n) Q18 BO 8/29/18 Q18 RT 8/30/18 Salinity measured using 50% dilution with DI water

QC Check: EA 9/4/18

Feeding Times				
0	24	48	72	96
AM:	0920	0910	0945	0850
PM:	1650	1410	✓	✓

Final Review: AC 10/1/18

**September 6, 2018 Acute Topsmelt Test**

# CETIS Summary Report

Report Date: 19 Sep-18 09:47 (p 1 of 1)  
 Test Code: 1809-S105 | 07-5901-2478

Pacific Topsmelt 96-h Acute Survival Test							Nautilus Environmental (CA)				
Batch ID:	17-6863-9406	Test Type:	Survival (96h)	Analyst:							
Start Date:	06 Sep-18 15:45	Protocol:	EPA/821/R-02-012 (2002)	Diluent:	Natural Seawater						
Ending Date:	10 Sep-18 14:15	Species:	Atherinops affinis	Brine:	Not Applicable						
Duration:	94h	Source:	Aquatic Biosystems, CO	Age:	9d						
Sample ID:	13-9537-6444	Code:	18-0951	Client:	Poseidon						
Sample Date:	06 Sep-18 08:00	Material:	Facility Effluent	Project:							
Receive Date:	06 Sep-18 12:45	Source:	Poseidon								
Sample Age:	8h (5.6 °C)	Station:	M-001 (CDP)								
Comparison Summary											
Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU <sub>a</sub>	Method				
13-4856-0653	96h Survival Rate	50	100	70.71	15.5%	21.14	Steel Many-One Rank Sum Test				
Point Estimate Summary											
Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method				
03-9122-0099	96h Survival Rate	EC25	69.01	62.67	77.41	1.449	Linear Interpolation (ICPIN)				
		EC50	88.02	76.51	N/A	1.136					
96h Survival Rate Summary											
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Control	6	0.9667	0.881	1	0.8	1	0.03333	0.08165	8.45%	0.0%
6.25		6	0.9333	0.8249	1	0.8	1	0.04216	0.1033	11.07%	3.45%
12.5		6	1	1	1	1	1	0	0	0.0%	-3.45%
25		6	0.9667	0.881	1	0.8	1	0.03333	0.08165	8.45%	0.0%
50		6	1	1	1	1	1	0	0	0.0%	-3.45%
100		6	0.3333	0.07915	0.5875	0	0.6	0.09888	0.2422	72.66%	65.52%
96h Survival Rate Detail											
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6				
0	Lab Control	1	1	1	0.8	1	1				
6.25		1	1	0.8	0.8	1	1				
12.5		1	1	1	1	1	1				
25		1	1	1	1	0.8	1				
50		1	1	1	1	1	1				
100		0.6	0.4	0.2	0.2	0	0.6				

Ⓐ EG Q18 9/19/18

**CETIS Analytical Report**

Report Date: 11 Sep-18 09:03 (p 3 of 4)  
 Test Code: 1809-S105 | 07-5901-2478

Pacific Topsmelt 96-h Acute Survival Test							Nautilus Environmental (CA)				
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Analysis ID: 13-4856-0653	Endpoint: 96h Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 11 Sep-18 9:02	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Angular (Corrected)	NA	C > T	NA	NA	15.5%	50	100	70.71	2

Steel Many-One Rank Sum Test									
Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Lab Control		6.25	36	25	2	10	0.6538	Asymp	Non-Significant Effect
		12.5	42	25	1	10	0.9387	Asymp	Non-Significant Effect
		25	39	25	2	10	0.8333	Asymp	Non-Significant Effect
		50	42	25	1	10	0.9387	Asymp	Non-Significant Effect
		100*	21	25	0	10	0.0087	Asymp	Significant Effect

ANOVA Table						
Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2.5606	0.51212	5	29.64	<0.0001	Significant Effect
Error	0.5183898	0.01727966	30			
Total	3.07899		35			

Distributional Tests						
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)	
Variances	Mod Levene Equality of Variance	4.978	3.699	0.0019	Unequal Variances	
Variances	Levene Equality of Variance	10.19	3.699	<0.0001	Unequal Variances	
Distribution	Shapiro-Wilk W Normality	0.8489	0.9166	0.0002	Non-normal Distribution	

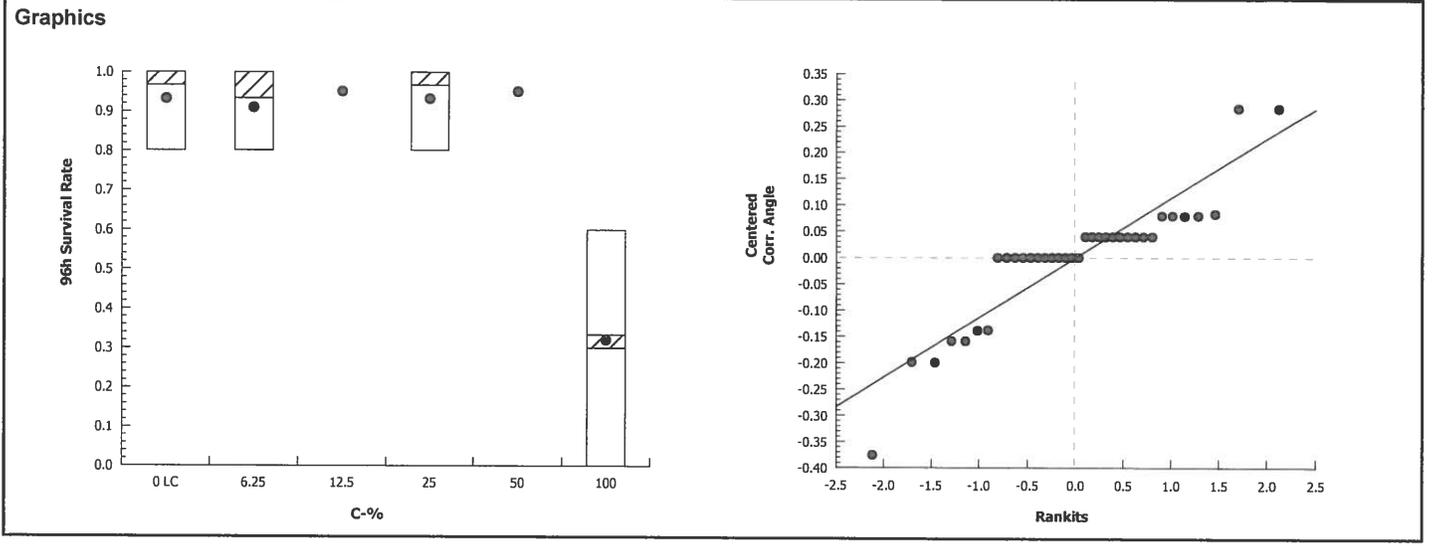
96h Survival Rate Summary											
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Control	6	0.9667	0.881	1	1	0.8	1	0.03333	8.45%	0.0%
6.25		6	0.9333	0.8249	1	1	0.8	1	0.04216	11.07%	3.45%
12.5		6	1	1	1	1	1	1	0	0.0%	-3.45%
25		6	0.9667	0.881	1	1	0.8	1	0.03333	8.45%	0.0%
50		6	1	1	1	1	1	1	0	0.0%	-3.45%
100		6	0.3333	0.07915	0.5875	0.3	0	0.6	0.09888	72.66%	65.52%

Angular (Corrected) Transformed Summary											
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Control	6	1.306	1.204	1.408	1.345	1.107	1.345	0.03969	7.45%	0.0%
6.25		6	1.266	1.137	1.395	1.345	1.107	1.345	0.0502	9.71%	3.04%
12.5		6	1.345	1.345	1.345	1.345	1.345	1.345	0	0.0%	-3.04%
25		6	1.306	1.204	1.408	1.345	1.107	1.345	0.03969	7.45%	0.0%
50		6	1.345	1.345	1.345	1.345	1.345	1.345	0	0.0%	-3.04%
100		6	0.6016	0.3246	0.8786	0.5742	0.2255	0.8861	0.1077	43.87%	53.92%

# CETIS Analytical Report

Report Date: 11 Sep-18 09:03 (p 4 of 4)  
Test Code: 1809-S105 | 07-5901-2478

Pacific Topsmelt 96-h Acute Survival Test		Nautilus Environmental (CA)	
Analysis ID: 13-4856-0653	Endpoint: 96h Survival Rate	CETIS Version: CETISv1.8.7	
Analyzed: 11 Sep-18 9:02	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes	



# CETIS Analytical Report

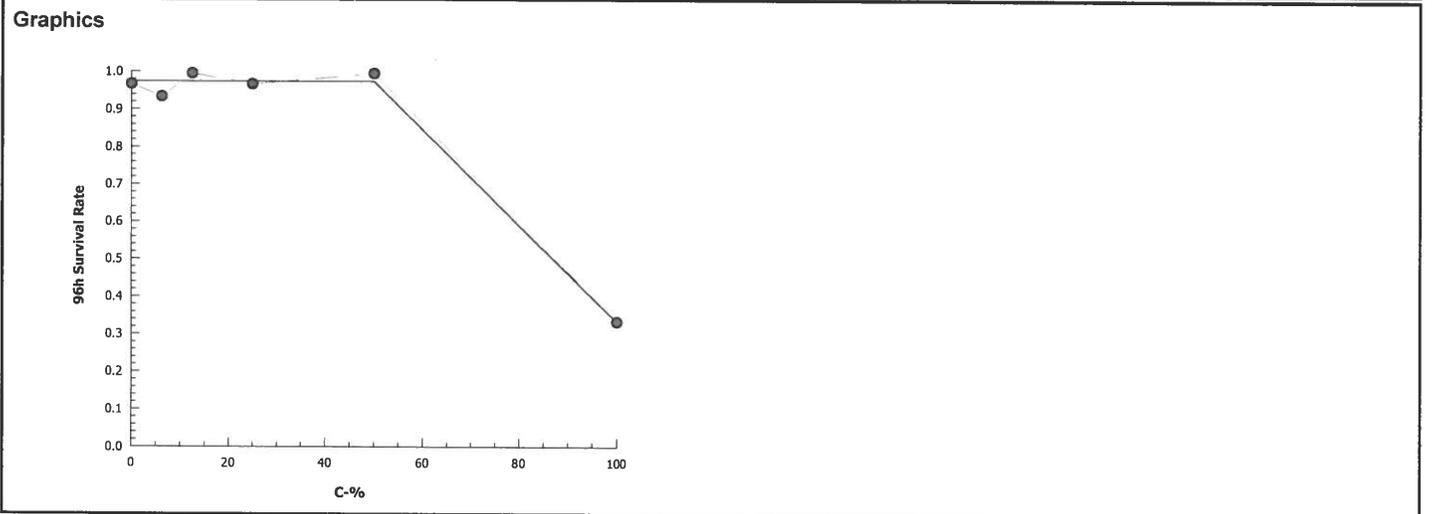
Report Date: 11 Sep-18 09:03 (p 1 of 1)  
 Test Code: 1809-S105 | 07-5901-2478

Pacific Topsmelt 96-h Acute Survival Test			Nautilus Environmental (CA)		
Analysis ID: 03-9122-0099	Endpoint: 96h Survival Rate	CETIS Version: CETISv1.8.7			
Analyzed: 11 Sep-18 9:02	Analysis: Linear Interpolation (ICPIN)	Official Results: Yes			

Linear Interpolation Options					
X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	1472737	1000	Yes	Two-Point Interpolation

Point Estimates						
Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
EC25	69.01	62.67	77.41	1.449	1.292	1.596
EC50	88.02	76.51	N/A	1.136	NA	1.307

96h Survival Rate Summary			Calculated Variate(A/B)								
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Lab Control	6	0.9667	0.8	1	0.03333	0.08165	8.45%	0.0%	29	30
6.25		6	0.9333	0.8	1	0.04216	0.1033	11.07%	3.45%	28	30
12.5		6	1	1	1	0	0	0.0%	-3.45%	30	30
25		6	0.9667	0.8	1	0.03333	0.08165	8.45%	0.0%	29	30
50		6	1	1	1	0	0	0.0%	-3.45%	30	30
100		6	0.3333	0	0.6	0.09888	0.2422	72.66%	65.52%	10	30



**Marine Acute Bioassay  
Static-Renewal Conditions**

**Water Quality Measurements  
& Test Organism Survival**

Client: Poseidon  
 Sample ID: M-001 (CDP)  
 Sample Log-in No.: 18-0951  
 Test No.: 1809-S105

Test Species: A. affinis  
 Start Date/Time: 9/6/2018 1545  
 End Date/Time: 9/10/2018 1415

Tech Initials				
0	24	48	72	96
BO	BO	TJ	TJ	TJ
BO	BO	BO	TJ	DM
BO		RT		

Counts: BO BO TJ TJ TJ  
 Readings: BO BO BO TJ DM

Dilutions made by: BO RT

Concentration %	Rep	Number of Live Organisms					Salinity (ppt)					Temperature (°C)					Dissolved Oxygen (mg/L)					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	A	5	5	5	5	5	34.3	34.2	34.2	34.6	34.4	20.4	20.7	20.7	20.6	20.7	7.5	6.2	7.5	6.3	6.2	8.1	7.7	8.0	7.8	7.9
	B	5	5	5	5	5			34.3					20.7					6.0					7.7	7.9	
	C	5	5	5	5	5																				
	D	5	4	4	4	4																				
	E	5	5	5	5	5																				
	F	5	5	5	5	5																				
6.25	A	5	5	5	5	5	36.8	36.4	36.4	36.4	36.4	20.4	20.7	20.8	20.7	20.7	7.6	5.9	7.6	5.9	5.7	8.1	7.9	8.1	7.7	7.8
	B	5	5	5	5	5			36.4					20.7					5.7					7.8	8.3	
	C	5	4	4	4	4																				
	D	5	5	5	4	4																				
	E	5	5	5	5	5																				
	F	5	5	5	5	5																				
12.5	A	5	5	5	5	5	38.6	38.4	38.3	38.5	38.5	20.4	20.6	20.7	20.8	20.6	7.6	5.9	7.6	6.1	5.9	8.0	7.9	8.0	7.9	7.9
	B	5	5	5	5	5			38.5					20.7					5.9					7.8	8.4	
	C	5	5	5	5	5																				
	D	5	5	5	5	5																				
	E	5	5	5	5	5																				
	F	5	5	5	5	5																				
25	A	5	5	5	5	5	43.0	42.8	42.9	42.9	43.6	20.5	20.6	20.4	20.5	20.5	7.6	5.8	7.6	6.1	6.0	8.0	7.9	8.0	7.9	7.9
	B	5	5	5	5	5			42.8					20.6					6.0					7.8	8.7	
	C	5	5	5	5	5																				
	D	5	5	5	5	5																				
	E	5	4	4	4	4																				
	F	5	5	5	5	5																				
50	A	5	5	5	5	5	51.6	51.3	50.2	51.0	51.6	20.7	20.8	20.3	20.5	20.2	7.6	5.8	7.6	6.2	6.0	7.9	7.9	7.9	7.9	7.9
	B	5	5	5	5	5			51.3					20.8					5.9					7.8	8.8	
	C	5	5	5	5	5																				
	D	5	5	5	5	5																				
	E	5	5	5	5	5																				
	F	5	5	5	5	5																				

Initial Counts QC'd by: TJ  
 Initiated by: BO

Animal Source/Date Received: ABS / 9/5/18 Age at Initiation: 9 days  
 Animal Acclimation Qualifiers (circle all that apply): Q22 / Q23 / Q24 / none

Feeding Times				
0	24	48	72	96
	0830	0930	0830	0910
AM:				
PM:	0830			

Comments: i = initial reading in fresh test solution, f = final reading in test chamber prior to renewal with DI  
 Organisms fed prior to initiation, circle one (y / n) y \*diluted 50% to get reading;  
ABS BO 9/8/18 Salinity meter max = 42 ppt.

QC Check: AL 9/10/18 Final Review: EL 9/19/18

**Marine Acute Bioassay  
Static-Renewal Conditions**

**Water Quality Measurements  
& Test Organism Survival**

Client: Poseidon  
 Sample ID: M-001 (CDP)  
 Sample Log-in No.: 18-0951  
 Test No.: 1809-S105

Test Species: A. affinis  
 Start Date/Time: 9/6/2018 1545  
 End Date/Time: 9/10/2018 1415

Tech Initials				
0	24	48	72	96
BO	BO	TN	TN	TN
BO	BO	BO	TN	DM
BO		RT		

Counts:

Readings:

Dilutions made by:

Concentration %	Rep	Number of Live Organisms					Salinity (ppt)					Temperature (°C)					Dissolved Oxygen (mg/L)					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
100	A	5	3	3	3	3	65.4	65.1	66.6	66.6	66.0	21.2	20.6	20.4	20.6	20.5	7.6	5.7	8.2	6.1	6.0	7.8	7.8	7.8	7.9	7.9
	B	5	3	2	2	3																				
	C	5	1	1	1	1																				
	D	5	1	1	1	1																				
	E	5	0	-	-	-																				
	F	5	3	3	3	3																				
	A	5																								
	B	5																								
	C	5																								
	D	5																								
	E	5																								
	F	5																								
	A	5																								
	B	5																								
	C	5																								
	D	5																								
	E	5																								
	F	5																								

Initial Counts QC'd by: TN  
 Initiated by: BO

Animal Source/Date Received: ABS 19/5/18 Age at Initiation: 9 days

Animal Acclimation Qualifiers (circle all that apply): Q22 / Q23 / Q24 / none

Feeding Times				
0	24	48	72	96
	0850	0930	0830	0910
AM:				
PM:	1645	-	-	-

Comments: i = initial reading in fresh test solution, f = final reading in test chamber prior to renewal Ⓟ R19 At 5/9/19  
 Organisms fed prior to initiation, circle one (y/n) \*diluted 50% to get reading with DI

QC Check: AC 9/10/18

Final Review: EG 9/19/18

**September 19, 2018 Acute Topsmelt Test**

**CETIS Summary Report**

Report Date: 01 Oct-18 16:45 (p 1 of 1)  
 Test Code: 1809-S141 | 08-5045-8647

**Pacific Topsmelt 96-h Acute Survival Test** **Nautilus Environmental (CA)**

<b>Batch ID:</b> 07-0183-1077	<b>Test Type:</b> Survival (96h)	<b>Analyst:</b>
<b>Start Date:</b> 19 Sep-18 13:00	<b>Protocol:</b> EPA/821/R-02-012 (2002)	<b>Diluent:</b> Natural Seawater
<b>Ending Date:</b> 23 Sep-18 11:30	<b>Species:</b> Atherinops affinis	<b>Brine:</b> Not Applicable
<b>Duration:</b> 94h	<b>Source:</b> Aquatic Biosystems, CO	<b>Age:</b> 9d

<b>Sample ID:</b> 19-2864-6376	<b>Code:</b> 18-1005	<b>Client:</b> Poseidon
<b>Sample Date:</b> 18 Sep-18 09:30	<b>Material:</b> Facility Effluent	<b>Project:</b>
<b>Receive Date:</b> 18 Sep-18 12:07	<b>Source:</b> Poseidon	
<b>Sample Age:</b> 27h (3.3 °C)	<b>Station:</b> M-001	

Comparison Summary							
Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU <sub>Q</sub>	Method
19-8466-1494	96h Survival Rate	50	100	70.71	12.1%	@ 1.25	Steel Many-One Rank Sum Test

Point Estimate Summary							
Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
01-3627-8116	96h Survival Rate	EC25	64.36	59.73	66.26	1.554	Linear Interpolation (ICPIN)
		EC50	79.79	75.3	82.19	1.253	

96h Survival Rate Summary											
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Control	6	0.9333	0.8249	1	0.8	1	0.04216	0.1033	11.07%	0.0%
6.25		6	0.9667	0.881	1	0.8	1	0.03333	0.08165	8.45%	-3.57%
12.5		6	1	1	1	1	1	0	0	0.0%	-7.14%
25		6	0.9333	0.8249	1	0.8	1	0.04216	0.1033	11.07%	0.0%
50		6	0.9667	0.881	1	0.8	1	0.03333	0.08165	8.45%	-3.57%
100		6	0.1667	0.08098	0.2524	0	0.2	0.03333	0.08165	48.99%	82.14%

96h Survival Rate Detail							
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6
0	Lab Control	1	0.8	0.8	1	1	1
6.25		1	0.8	1	1	1	1
12.5		1	1	1	1	1	1
25		1	0.8	0.8	1	1	1
50		1	1	1	0.8	1	1
100		0.2	0	0.2	0.2	0.2	0.2

@Q18 AC 10/1/18

# CETIS Analytical Report

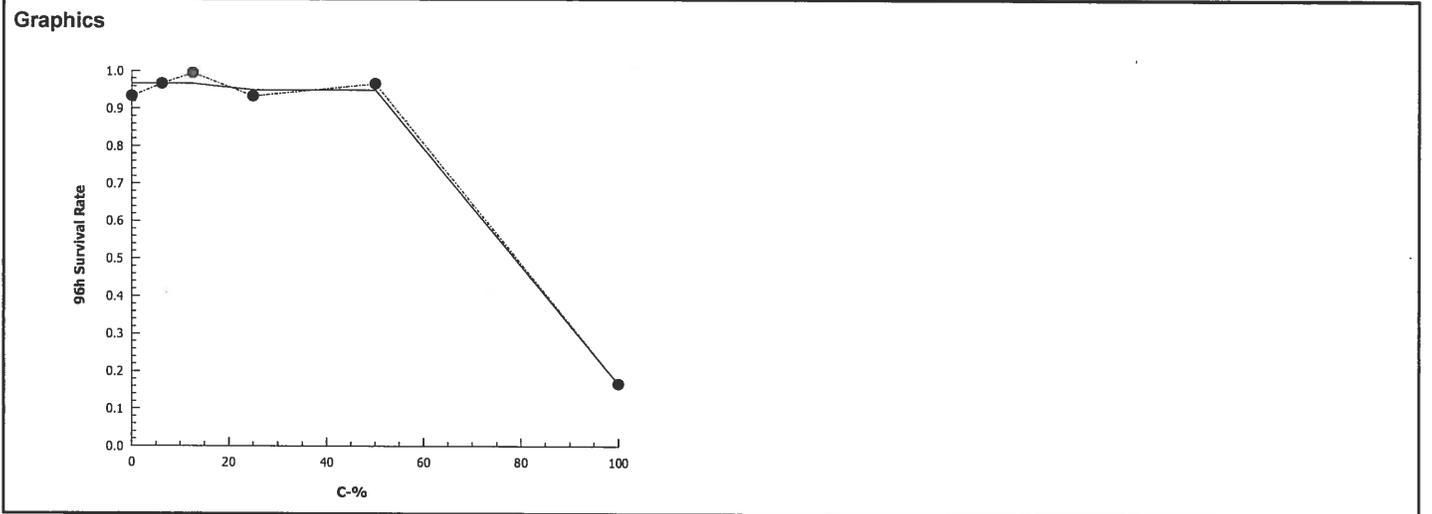
Report Date: 25 Sep-18 11:38 (p 1 of 1)  
 Test Code: 1809-S141 | 08-5045-8647

Pacific Topsmelt 96-h Acute Survival Test			Nautilus Environmental (CA)		
Analysis ID: 01-3627-8116	Endpoint: 96h Survival Rate	CETIS Version: CETISv1.8.7			
Analyzed: 25 Sep-18 11:30	Analysis: Linear Interpolation (ICPIN)	Official Results: Yes			

Linear Interpolation Options					
X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	1233844	1000	Yes	Two-Point Interpolation

Point Estimates						
Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
EC25	64.36	59.73	66.26	1.554	1.509	1.674
EC50	79.79	75.3	82.19	1.253	1.217	1.328

96h Survival Rate Summary			Calculated Variate(A/B)									
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B	
0	Lab Control	6	0.9333	0.8	1	0.04216	0.1033	11.07%	0.0%	28	30	
6.25		6	0.9667	0.8	1	0.03333	0.08165	8.45%	-3.57%	29	30	
12.5		6	1	1	1	0	0	0.0%	-7.14%	30	30	
25		6	0.9333	0.8	1	0.04216	0.1033	11.07%	0.0%	28	30	
50		6	0.9667	0.8	1	0.03333	0.08165	8.45%	-3.57%	29	30	
100		6	0.1667	0	0.2	0.03333	0.08165	48.99%	82.14%	5	30	



**CETIS Analytical Report**

Report Date: 25 Sep-18 11:38 (p 1 of 4)  
 Test Code: 1809-S141 | 08-5045-8647

Pacific Topsmelt 96-h Acute Survival Test						Nautilus Environmental (CA)					
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Analysis ID: 19-8466-1494	Endpoint: 96h Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 25 Sep-18 11:30	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Angular (Corrected)	NA	C > T	NA	NA	12.1%	50	100	70.71	2

Steel Many-One Rank Sum Test									
Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Lab Control		6.25	42	25	2	10	0.9387	Asymp	Non-Significant Effect
		12.5	45	25	1	10	0.9832	Asymp	Non-Significant Effect
		25	39	25	2	10	0.8333	Asymp	Non-Significant Effect
		50	42	25	2	10	0.9387	Asymp	Non-Significant Effect
		100*	21	25	0	10	0.0087	Asymp	Significant Effect

ANOVA Table						
Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	3.8432	0.76864	5	78.7	<0.0001	Significant Effect
Error	0.2929908	0.009766361	30			
Total	4.136191		35			

Distributional Tests					
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	0.5484	3.699	0.7382	Equal Variances
Variances	Levene Equality of Variance	3.382	3.699	0.0153	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.7209	0.9166	<0.0001	Non-normal Distribution

96h Survival Rate Summary											
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Control	6	0.9333	0.8249	1	1	0.8	1	0.04216	11.07%	0.0%
6.25		6	0.9667	0.881	1	1	0.8	1	0.03333	8.45%	-3.57%
12.5		6	1	1	1	1	1	1	0	0.0%	-7.14%
25		6	0.9333	0.8249	1	1	0.8	1	0.04216	11.07%	0.0%
50		6	0.9667	0.881	1	1	0.8	1	0.03333	8.45%	-3.57%
100		6	0.1667	0.08098	0.2524	0.2	0	0.2	0.03333	48.99%	82.14%

Angular (Corrected) Transformed Summary											
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Control	6	1.266	1.137	1.395	1.345	1.107	1.345	0.0502	9.71%	0.0%
6.25		6	1.306	1.204	1.408	1.345	1.107	1.345	0.03969	7.45%	-3.14%
12.5		6	1.345	1.345	1.345	1.345	1.345	1.345	0	0.0%	-6.27%
25		6	1.266	1.137	1.395	1.345	1.107	1.345	0.0502	9.71%	0.0%
50		6	1.306	1.204	1.408	1.345	1.107	1.345	0.03969	7.45%	-3.14%
100		6	0.424	0.3219	0.526	0.4636	0.2255	0.4636	0.03969	22.93%	66.51%

Pacific Topsmelt 96-h Acute Survival Test

Nautilus Environmental (CA)

Analysis ID: 19-8466-1494

Endpoint: 96h Survival Rate

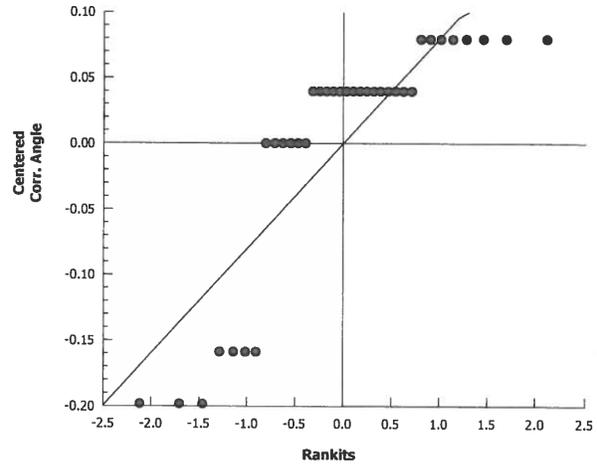
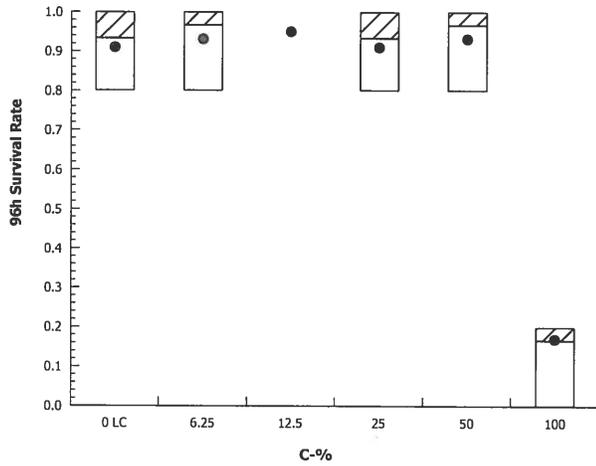
CETIS Version: CETISv1.8.7

Analyzed: 25 Sep-18 11:30

Analysis: Nonparametric-Control vs Treatments

Official Results: Yes

Graphics



**Marine Acute Bioassay  
Static-Renewal Conditions**

**Water Quality Measurements  
& Test Organism Survival**

Client: Poseidon  
 Sample ID: M-001  
 Sample Log-in No.: 18-1005  
 Test No.: 1809-S141

Test Species: *A. affinis*  
 Start Date/Time: 9/19/2018 1300  
 End Date/Time: 9/23/2018 1130

Tech Initials				
0	24	48	72	96
Counts: AB	RT	RT	DM	AS
Readings: BORT	DM	RT	AS	
Dilutions made by: AB	RT			

Concentration %	Rep	Number of Live Organisms					Salinity (ppt)					Temperature (°C)					Dissolved Oxygen (mg/L)					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	A	5	5	5	5	5	34.0	34.2	34.3	34.0	33.9	20.2	20.3	20.5	20.5	20.7	7.2	6.8	6.3	6.5	6.3	8.02	7.91	8.07	7.99	7.85
	B	5	5	5	5	4			32.9					20.5					5.0					7.85		
	C	5	5	5	4	4																				
	D	5	5	5	5	5																				
	E	5	5	5	5	5																				
	F	5	5	5	5	5																				
6.25	A	5	5	5	5	5	36.4	36.2	36.1	36.1	36.0	20.5	20.4	20.4	20.5	20.7	7.2	6.6	6.3	6.6	6.1	8.02	7.91	8.06	7.96	7.90
	B	5	5	5	5	4			35.9					20.5					5.1					7.86		
	C	5	5	5	5	5																				
	D	5	5	5	5	5																				
	E	5	5	5	5	5																				
	F	5	5	5	5	5																				
12.5	A	5	5	5	5	5	38.0	38.0	38.2	38.1	38.1	20.8	20.5	20.5	20.6	20.7	7.2	6.3	6.3	6.3	6.1	7.98	7.92	8.05	7.96	7.90
	B	5	5	5	5	5			37.9					20.5					4.9					7.90		
	C	5	5	5	5	5																				
	D	5	5	5	5	5																				
	E	5	5	5	5	5																				
	F	5	5	5	5	5																				
25	A	5	5	5	5	5	43.4	43.4	43.6	43.0	43.2	20.9	20.5	20.5	20.4	20.8	7.2	6.7	6.3	6.4	5.9	7.90	7.90	8.01	7.95	7.93
	B	5	5	5	5	4			41.7					20.5					4.8					7.90		
	C	5	5	5	5	4																				
	D	5	5	5	5	5																				
	E	5	5	5	5	5																				
	F	5	5	5	5	5																				
50	A	5	5	5	5	5	51.4	51.5	52.0	52.2	52.2	21.6	20.3	20.5	20.4	20.6	7.3	6.7	6.6	6.5	6.3	7.77	7.96	7.93	7.94	7.94
	B	5	5	5	5	5			50.4					20.4					5.3					7.94		
	C	5	5	5	5	5																				
	D	5	5	5	4	4																				
	E	5	5	5	5	5																				
	F	5	5	5	5	5																				

Initial Counts QC'd by: RC/DM/TN  
 Initiated by: AB

Animal Source/Date Received: ABS 9/18/18 Age at Initiation: 9d  
 Animal Acclimation Qualifiers (circle all that apply): Q22 / Q23 / Q24 / none (A)

Feeding Times				
0	24	48	72	96
AM:	0900	0824	0830	0155
PM:	1600	-	-	-

Comments: i = initial reading in fresh test solution, f = final reading in test chamber prior to renewal  
 Organisms fed prior to initiation, circle one (y) / n ) \* 50% dilution for rearing  
 (A) Q22 AB 9/19/18

QC Check: EG 9/25/18

Final Review: ACK 10/1/18

**Marine Acute Bioassay  
Static-Renewal Conditions**

**Water Quality Measurements  
& Test Organism Survival**

Client: Poseidon  
 Sample ID: M-001  
 Sample Log-in No.: 18-1005  
 Test No.: 1809-S141

Test Species: *A. affinis*  
 Start Date/Time: 9/19/2018 1300  
 End Date/Time: 9/23/2018 130

Tech Initials				
0	24	48	72	96
Counts:	AB	RT	DM	AS
Readings:	BO	RT	DM	RT
Dilutions made by:	AB	RT		

Concentration %	Rep	Number of Live Organisms					Salinity (ppt)					Temperature (°C)					Dissolved Oxygen (mg/L)					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
100	A	5	1	1	1	1	67.0	67.0	67.0	67.2	67.2	21.5	20.3	20.5	20.4	20.6	7.3	5.8	6.8	6.5	6.2	7.40	7.64	7.81	7.92	7.95
	B	5	1	1	0	-			65.2					20.4				5.3						7.87		
	C	5	1	1	1	1																				
	D	5	1	1	1	1																				
	E	5	2	1	1	1																				
	F	5	1	1	1	1																				
	A																									
	B																									
	C																									
	D																									
	E																									
	F																									
	A																									
	B																									
	C																									
	D																									
	E																									
	F																									

Initial Counts QC'd by: KLD/DM/TN  
 Initiated by: AB

Animal Source/Date Received: ABS 9/18/18 Age at Initiation: 9d

Animal Acclimation Qualifiers (circle all that apply): Q22 / Q23 / Q24 / none (A)

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

Organisms fed prior to initiation, circle one (i) / n) 50% dilution for reading

QC Check: EG 9/25/18 (A) Q18 AB 9/11/18

Feeding Times				
0	24	48	72	96
AM:	0900	0820	0830	0855
PM:	1600	-	-	-

Final Review: AC 10/1/18

## **Appendix B**

### **Sample Receipt Information**

Nautilus Environmental  
4340 Vandever Avenue  
San Diego, CA 92120

Client: Poseidon  
Sample ID: M-001 (CDP)  
Test ID No(s): 1808-S220

Sample Check-In Information

Sample Description:  
A - colorless, clear, odorless, no debris

Sample (A, B, C):	<u>A</u>			
Log-in No. (18-xxxx):	<u>0927</u>			
Sample Collection Date & Time:	<u>8/29/18 0830</u>			
Sample Receipt Date & Time:	<u>8/29/18 1230</u>			
Number of Containers & Container Type:	<u>1 4L cubi</u>			
Approx. Total Volume Received (L):	<u>3.9 L</u>			
Check-in Temperature (°C)	<u>2.5</u>			
Temperature OK? <sup>1</sup>	<u>(Y) N</u>	Y N	Y N	Y N
DO (mg/L)	<u>6.1</u>			
pH (units)	<u>7.74</u>			
Conductivity (µS/cm)	<u>—</u>			
Salinity (ppt)	<u>47.0 (B)</u>			
Alkalinity (mg/L) <sup>2</sup>	<u>215</u>			
Hardness (mg/L) <sup>2,3</sup>	<u>—</u>			
Total Chlorine (mg/L)	<u>0.02</u>			
Technician Initials	<u>KCM</u>			

COC Complete (Y/N)?  
A Y B — C —

Filtration? Y (N)  
Pore Size: \_\_\_\_\_  
Organisms \_\_\_\_\_ or \_\_\_\_\_ Debris

Salinity Adjustment? Y (N)  
Test: Acute Source: Seawater Target ppt: 34  
Test: Topsmelt Source: \_\_\_\_\_ Target ppt: \_\_\_\_\_  
Test: \_\_\_\_\_ Source: \_\_\_\_\_ Target ppt: \_\_\_\_\_

pH Adjustment? Y (N)

	A	B	C
Initial pH:			
Amount of HCl added:			
Final pH:			

Cl<sub>2</sub> Adjustment? Y (N)

	A	B	C
Initial Free Cl <sub>2</sub> :			
STS added:			
Final Free Cl <sub>2</sub> :			

Sample Aeration? Y (N)

	A	B	C
Initial D.O.			
Duration & Rate			
Final D.O.			

Subsamples for Additional Chemistry Required? Y (N)  
NH3 Other \_\_\_\_\_  
Tech Initials A \_\_\_\_\_ B \_\_\_\_\_ C \_\_\_\_\_

QC Check: EG 9/4/18  
Final Review: AC 9/11/18

Test Performed: Acute topsmelt Control/Dilution Water: 8:2 / Lab SW / Lab ART Other: \_\_\_\_\_  
Alkalinity: 116 Hardness or Salinity: 34 ppt  
Additional Control? Y (N) = \_\_\_\_\_ Alkalinity: \_\_\_\_\_ Hardness or Salinity: \_\_\_\_\_

Test Performed: \_\_\_\_\_ Control/Dilution Water: 8:2 / Lab SW / Lab ART Other: \_\_\_\_\_  
Alkalinity: \_\_\_\_\_ Hardness or Salinity: \_\_\_\_\_  
Additional Control? Y N = \_\_\_\_\_ Alkalinity: \_\_\_\_\_ Hardness or Salinity: \_\_\_\_\_

Test Performed: \_\_\_\_\_ Control/Dilution Water: 8:2 / Lab SW / Lab ART Other: \_\_\_\_\_  
Alkalinity: \_\_\_\_\_ Hardness or Salinity: \_\_\_\_\_  
Additional Control? Y N = \_\_\_\_\_ Alkalinity: \_\_\_\_\_ Hardness or Salinity: \_\_\_\_\_

Notes: <sup>1</sup> Temperature of sample should be 0-6°C, if received more than 24 hours past collection time.  
<sup>2</sup> mg/L as CaCO<sub>3</sub>, <sup>3</sup> Measured for freshwater samples only, NA = Not Applicable

Additional Comments: (A) Q18 AC 8/29/18 (B) Salinity measured by making a 1:1 dilution with DI water.  
(C) EG Q18 9/4/18

Nautilus Environmental  
 4340 Vandever Avenue  
 San Diego, CA 92120

Client: Poseidon  
 Sample ID: M-001 (COP)  
 Test ID No(s): 1809-5105

Sample Check-In Information

Sample Description:  
Colorless, clear, odor less, no debris

Sample (A, B, C):	A		
Log-in No. (18-xxxx):	18-0951		
Sample Collection Date & Time:	9/6/18 0800		
Sample Receipt Date & Time:	9/6/18 1245		
Number of Containers & Container Type:	2 4L cubes		
Approx. Total Volume Received (L):	~8 L		
Check-in Temperature (°C)	5.6		
Temperature OK? <sup>1</sup>	<input checked="" type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N
DO (mg/L)	7.5		
pH (units)	8.00		
Conductivity (µS/cm)	—		
Salinity (ppt)	64.8*		
Alkalinity (mg/L) <sup>2</sup>	212		
Hardness (mg/L) <sup>2,3</sup>	—		
Total Chlorine (mg/L)	40.02		
Technician Initials	AKS		

COC Complete (Y/N)?  
 A  Y B  C

Filtration? Y  N   
 Pore Size: \_\_\_\_\_  
 Organisms or Debris

Salinity Adjustment? Y  N   
 Test: Source: Target ppt:  
 Test: Source: Target ppt:  
 Test: Source: Target ppt:

pH Adjustment? Y  N   

	A	B	C
Initial pH:			
Amount of HCl added:			
Final pH:			

Cl<sub>2</sub> Adjustment? Y  N   

	A	B	C
Initial Free Cl <sub>2</sub> :			
STS added:			
Final Free Cl <sub>2</sub> :			

Sample Aeration? Y  N   

	A	B	C
Initial D.O.			
Duration & Rate			
Final D.O.			

Subsamples for Additional Chemistry Required? Y  N   
 NH<sub>3</sub> Other \_\_\_\_\_  
 Tech Initials A \_\_\_\_\_ B \_\_\_\_\_ C \_\_\_\_\_

QC Check: AK 9/10/18  
 Final Review: EA 9/19/18

Test Performed: Acute Topsmelt Control/Dilution Water: 8:2 / Lab SW / Lab ART Other: \_\_\_\_\_  
 Alkalinity: 119 Hardness or Salinity: 34 ppt  
 Additional Control? Y  N  = \_\_\_\_\_ Alkalinity: \_\_\_\_\_ Hardness or Salinity: \_\_\_\_\_

Test Performed: \_\_\_\_\_ Control/Dilution Water: 8:2 / Lab SW / Lab ART Other: \_\_\_\_\_  
 Alkalinity: \_\_\_\_\_ Hardness or Salinity: \_\_\_\_\_  
 Additional Control? Y  N  = \_\_\_\_\_ Alkalinity: \_\_\_\_\_ Hardness or Salinity: \_\_\_\_\_

Test Performed: \_\_\_\_\_ Control/Dilution Water: 8:2 / Lab SW / Lab ART Other: \_\_\_\_\_  
 Alkalinity: \_\_\_\_\_ Hardness or Salinity: \_\_\_\_\_  
 Additional Control? Y  N  = \_\_\_\_\_ Alkalinity: \_\_\_\_\_ Hardness or Salinity: \_\_\_\_\_

Notes: <sup>1</sup> Temperature of sample should be 0-6°C, if received more than 24 hours past collection time.

<sup>2</sup> mg/L as CaCO<sub>3</sub>, <sup>3</sup> Measured for freshwater samples only, NA = Not Applicable

Additional Comments: \* 50% dilution made to determine salinity with DI water

Nautilus Environmental  
4340 Vandever Avenue  
San Diego, CA 92120

Client: Poseidon  
Sample ID: M-001 (CDP)  
Test ID No(s): 1809-S141

Sample Check-In Information

Sample Description:

A - COLORLESS, CLEAR, MILD ODOR, NO DEBRIS

Sample (A, B, C):	<u>A</u>			
Log-in No. (18-xxxx):	<u>1005</u>			
Sample Collection Date & Time:	<u>9/18/18 0930</u>			
Sample Receipt Date & Time:	<u>9/18/18 1207</u>			
Number of Containers & Container Type:	<u>2 4L cubs</u>			
Approx. Total Volume Received (L):	<u>8L</u>			
Check-in Temperature (°C)	<u>3.3</u>			
Temperature OK? <sup>1</sup>	<u>(Y) N</u>	<u>Y N</u>	<u>Y N</u>	<u>Y N</u>
DO (mg/L)	<u>6.0</u>			
pH (units)	<u>7.34</u>			
Conductivity (µS/cm)	<u>—</u>			
Salinity (ppt)	<u>67.4 (A)</u>			
Alkalinity (mg/L) <sup>2</sup>	<u>233</u>			
Hardness (mg/L) <sup>2,3</sup>	<u>—</u>			
Total Chlorine (mg/L)	<u>0.02</u>			
Technician Initials	<u>VC</u>			

COC Complete (Y/N)?

A Y B — C —

Filtration? Y (N)

Pore Size: \_\_\_\_\_

Organisms or Debris

Salinity Adjustment? Y (N)

Test: Source: Target ppt:

Test: Source: Target ppt:

Test: Source: Target ppt:

pH Adjustment? Y (N)

	A	B	C
Initial pH:			
Amount of HCl added:			
Final pH:			

Cl<sub>2</sub> Adjustment? Y (N)

	A	B	C
Initial Free Cl <sub>2</sub> :			
STS added:			
Final Free Cl <sub>2</sub> :			

Sample Aeration? Y (N)

	A	B	C
Initial D.O.			
Duration & Rate			
Final D.O.			

Subsamples for Additional Chemistry Required? Y (N)

NH<sub>3</sub> Other \_\_\_\_\_

Tech Initials A \_\_\_\_\_ B \_\_\_\_\_ C \_\_\_\_\_

Test Performed: Topsome It Acute Control/Dilution Water: 8:2 / Lab SW / Lab ART Other: \_\_\_\_\_

Alkalinity: 139 Hardness or Salinity: 34 ppt

Additional Control? Y (N) = \_\_\_\_\_ Alkalinity: \_\_\_\_\_ Hardness or Salinity: \_\_\_\_\_

Test Performed: \_\_\_\_\_ Control/Dilution Water: 8:2 / Lab SW / Lab ART Other: \_\_\_\_\_

Alkalinity: \_\_\_\_\_ Hardness or Salinity: \_\_\_\_\_

Additional Control? Y N = \_\_\_\_\_ Alkalinity: \_\_\_\_\_ Hardness or Salinity: \_\_\_\_\_

Test Performed: \_\_\_\_\_ Control/Dilution Water: 8:2 / Lab SW / Lab ART Other: \_\_\_\_\_

Alkalinity: \_\_\_\_\_ Hardness or Salinity: \_\_\_\_\_

Additional Control? Y N = \_\_\_\_\_ Alkalinity: \_\_\_\_\_ Hardness or Salinity: \_\_\_\_\_

Notes: <sup>1</sup> Temperature of sample should be 0-6°C, if received more than 24 hours past collection time.

<sup>2</sup> mg/L as CaCO<sub>3</sub>, <sup>3</sup> Measured for freshwater samples only, NA = Not Applicable

Additional Comments: (A) Salinity measured by making a 1:1 dilution with DI.

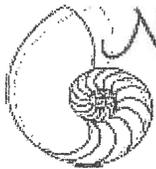
QC Check: EG 9/25/18

Final Review: AC 10/1/18

## **Appendix C**

### **Chain-of-Custody Forms**





# Nautilus Environmental

4340 Vandever Avenue  
San Diego, CA 92120  
Phone 858.587.7333  
Fax 858.587.3961

## Chain of Custody

Date 9/6/18 Page 1 of 1

Sample Collection By: <u>Michelle Parnelson</u>		<b>ANALYSES REQUIRED</b>	
<b>Report to:</b> Company: <u>Posidon Water</u> Address: <u>5780 Fleet St. Suite 140</u> City/State/Zip: <u>Carlsbad, CA 92008</u> Contact: <u>Michelle Parnelson</u> Phone: <u>(702) (006) - 8742</u> Email: <u>mparnelson@posidonwater.com</u>		<b>Invoice To:</b> Company: <u>Posidon Water</u> Address: <u>5780 Fleet St. Suite 140</u> City/State/Zip: <u>Carlsbad, CA 92008</u> Contact: <u>Michelle Parnelson</u> Phone: <u>(702) (006) - 8742</u> Email: <u>mparnelson@posidonwater.com</u>	

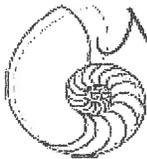
SAMPLE ID	DATE	TIME	MATRIX	CONTAINER TYPE	NO. OF CONTAINERS	COMMENTS	Acute Toxicity	Receipt Temperature (°C)
1 M-001	9/5-9/6	8 A.M.		4L Cubic	2	24 HR Composite	X	5.6
2								
3								
4								
5								
6								
7								
8								
9								
10								

PROJECT INFORMATION		SAMPLE RECEIPT		RELINQUISHED BY (CLIENT)		RELINQUISHED BY (COURIER)	
Client:		Total No. of Containers	2	Signature: <u>Michelle Parnelson</u>	(Time): <u>10:18 a.m.</u>	Signature: <u>[Signature]</u>	(Time): <u>12:45</u>
PO No.:		Received Good Condition?	Y	Printed Name: <u>Michelle Parnelson</u>	(Date): <u>9/6/18</u>	Printed Name: <u>Michael Oster</u>	(Date): <u>9/6/18</u>
Shipped Via:	<u>courier</u>	Matches Test Schedule?	Y	Company: <u>Posidon Water</u>		Company: <u>LME</u>	
SPECIAL INSTRUCTIONS/COMMENTS:				RECEIVED BY (COURIER)		RECEIVED BY (LABORATORY)	
				Signature: <u>[Signature]</u>	(Time): <u>10:18</u>	Signature: <u>[Signature]</u>	(Time): <u>12:45</u>
				Printed Name: <u>Michael Oster</u>	(Date): <u>9/6</u>	Printed Name: <u>Rachel Collins</u>	(Date): <u>9/6/18</u>
				Company: <u>LME</u>		Company: <u>Nautilus</u>	

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

DISTRIBUTION: WHITE - Nautilus Environmental, COLOR - Originator

10-18-0951



# Nautilus Environmental

4340 Vandever Avenue  
San Diego, CA 92120  
Phone 858.587.7333  
Fax 858.587.3961

## Chain of Custody

Date 9/18/18 Page 1 of 1

Sample Collection By: <u>Vanessa Hayes</u>							<b>ANALYSES REQUIRED</b>										Receipt Temperature (°C)	
Report to: Company: <u>Poseidon Water</u> Address: <u>5780 Fleet St. Suite 140</u> City/State/Zip: <u>Carlsbad, CA 92008</u> Contact: <u>Michelle Powellson</u> Phone: <u>(702) 606-8742</u> Email: <u>mpowellson@poseidonwater.com</u>				Invoice To: Company: <u>Poseidon Water</u> Address: <u>5780 Fleet St. Suite 140</u> City/State/Zip: <u>Carlsbad, CA 92008</u> Contact: <u>Michelle Powellson</u> Phone: <u>(702) 606-8742</u> Email: <u>mpowellson@poseidonwater.com</u>			Air/Ink Toxicity											
1	SAMPLE ID	DATE	TIME	MATRIX	CONTAINER TYPE	NO. OF CONTAINERS	COMMENTS											83
2	M-001	9/17-9/18	0930		4L Cube	2	24 hr. composite	X										
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
<b>PROJECT INFORMATION</b>		<b>SAMPLE RECEIPT</b>			<b>RELINQUISHED BY (CLIENT)</b>				<b>RELINQUISHED BY (COURIER)</b>									
Client:		Total No. of Containers:	2		Signature:	<i>Michelle Powellson</i>		Time:	10:17		Signature:	<i>[Signature]</i>			Time:	12:07		
PO No.:		Received Good Condition?:	Y		Printed Name:	Michelle Powellson		Date:	9/18/18		Printed Name:	MICHAEL OSTER			Date:	9/18/18		
Shipped Via:	courier		Matches Test Schedule?:	Y		Company:	Poseidon Water		Company:	LME								
SPECIAL INSTRUCTIONS/COMMENTS:					<b>RECEIVED BY (COURIER)</b>				<b>RECEIVED BY (LABORATORY)</b>									
					Signature:	<i>[Signature]</i>		Time:	10:17		Signature:	<i>[Signature]</i>			Time:	12:07		
					Printed Name:	MICHAEL OSTER		Date:	9/18/18		Printed Name:	Amanda Sage			Date:	9/18/18		
					Company:	LME		Company:	Nautilus ID: 18-1005									

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

DISTRIBUTION: WHITE - Nautilus Environmental, COLOR - Originator

## **Appendix D**

### **Reference Toxicant Test Data**

**CETIS Summary Report**

**Report Date:** 20 Aug-18 10:21 (p 1 of 1)  
**Test Code:** 180814aara | 15-6494-9229

Pacific Topsmelt 96-h Acute Survival Test							Nautilus Environmental (CA)					
<b>Batch ID:</b>	01-6263-2491	<b>Test Type:</b>	Survival (96h)				<b>Analyst:</b>					
<b>Start Date:</b>	14 Aug-18 16:00	<b>Protocol:</b>	EPA/821/R-02-012 (2002)				<b>Diluent:</b>	Diluted Natural Seawater				
<b>Ending Date:</b>	18 Aug-18 14:15	<b>Species:</b>	Atherinops affinis				<b>Brine:</b>	Not Applicable				
<b>Duration:</b>	94h	<b>Source:</b>	Aquatic Biosystems, CO				<b>Age:</b>	15d				
<b>Sample ID:</b>	05-8591-1541	<b>Code:</b>	180814aara				<b>Client:</b>	Internal				
<b>Sample Date:</b>	14 Aug-18	<b>Material:</b>	Copper chloride				<b>Project:</b>					
<b>Receive Date:</b>	14 Aug-18	<b>Source:</b>	Reference Toxicant									
<b>Sample Age:</b>	16h	<b>Station:</b>	Copper Chloride									
<b>Comparison Summary</b>												
<b>Analysis ID</b>	<b>Endpoint</b>	<b>NOEL</b>	<b>LOEL</b>	<b>TOEL</b>	<b>PMSD</b>	<b>TU</b>	<b>Method</b>					
20-9744-9467	96h Survival Rate	100	200	141.4	28.4%		Dunnett Multiple Comparison Test					
<b>Point Estimate Summary</b>												
<b>Analysis ID</b>	<b>Endpoint</b>	<b>Level</b>	<b>µg/L</b>	<b>95% LCL</b>	<b>95% UCL</b>	<b>TU</b>	<b>Method</b>					
17-8173-7294	96h Survival Rate	EC50	196.4	157.6	244.7		Spearman-Kärber					
<b>96h Survival Rate Summary</b>												
<b>C-µg/L</b>	<b>Control Type</b>	<b>Count</b>	<b>Mean</b>	<b>95% LCL</b>	<b>95% UCL</b>	<b>Min</b>	<b>Max</b>	<b>Std Err</b>	<b>Std Dev</b>	<b>CV%</b>	<b>%Effect</b>	
0	Lab Control	4	0.9	0.5818	1	0.6	1	0.1	0.2	22.22%	0.0%	
50		4	1	1	1	1	1	0	0	0.0%	-11.11%	
100		4	0.75	0.4453	1	0.6	1	0.09574	0.1915	25.53%	16.67%	
200		4	0.55	0.2453	0.8547	0.4	0.8	0.09574	0.1915	34.82%	38.89%	
400		4	0.1	0	0.2837	0	0.2	0.05774	0.1155	115.5%	88.89%	
800		4	0	0	0	0	0	0	0		100.0%	
<b>96h Survival Rate Detail</b>												
<b>C-µg/L</b>	<b>Control Type</b>	<b>Rep 1</b>	<b>Rep 2</b>	<b>Rep 3</b>	<b>Rep 4</b>							
0	Lab Control	1	0.6	1	1							
50		1	1	1	1							
100		0.8	0.6	0.6	1							
200		0.4	0.4	0.8	0.6							
400		0.2	0	0.2	0							
800		0	0	0	0							

**CETIS Analytical Report**

Report Date: 20 Aug-18 10:21 (p 1 of 2)  
 Test Code: 180814aara | 15-6494-9229

**Pacific Topsmelt 96-h Acute Survival Test** **Nautilus Environmental (CA)**

Analysis ID: 20-9744-9467	Endpoint: 96h Survival Rate	CETIS Version: CETISv1.8.7	
Analyzed: 20 Aug-18 10:21	Analysis: Parametric-Control vs Treatments	Official Results: Yes	

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Angular (Corrected)	NA	C > T	NA	NA	28.4%	100	200	141.4	

**Dunnett Multiple Comparison Test**

Control	vs C-µg/L	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Control	50	-0.907	2.356	0.298	6	0.9687	CDF	Non-Significant Effect
	100	1.377	2.356	0.298	6	0.2415	CDF	Non-Significant Effect
	200*	3.08	2.356	0.298	6	0.0126	CDF	Significant Effect
	400*	6.999	2.356	0.298	6	<0.0001	CDF	Significant Effect

**ANOVA Table**

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2.495081	0.6237702	4	19.47	<0.0001	Significant Effect
Error	0.4806227	0.03204151	15			
Total	2.975703		19			

**Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	1.132	4.893	0.3789	Equal Variances
Variances	Levene Equality of Variance	3.39	4.893	0.0364	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9557	0.866	0.4625	Normal Distribution

**96h Survival Rate Summary**

C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Control	4	0.9	0.5818	1	1	0.6	1	0.1	22.22%	0.0%
50		4	1	1	1	1	1	1	0	0.0%	-11.11%
100		4	0.75	0.4453	1	0.7	0.6	1	0.09574	25.53%	16.67%
200		4	0.55	0.2453	0.8547	0.5	0.4	0.8	0.09574	34.82%	38.89%
400		4	0.1	0	0.2837	0.1	0	0.2	0.05774	115.5%	88.89%
800		4	0	0	0	0	0	0	0		100.0%

**Angular (Corrected) Transformed Summary**

C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Control	4	1.23	0.8651	1.596	1.345	0.8861	1.345	0.1148	18.66%	0.0%
50		4	1.345	1.345	1.346	1.345	1.345	1.345	0	0.0%	-9.33%
100		4	1.056	0.7075	1.405	0.9966	0.8861	1.345	0.1096	20.75%	14.17%
200		4	0.8407	0.5202	1.161	0.7854	0.6847	1.107	0.1007	23.96%	31.68%
400		4	0.3446	0.1258	0.5634	0.3446	0.2255	0.4636	0.06874	39.9%	72.0%
800		4	0.2255	0.2255	0.2256	0.2255	0.2255	0.2255	0	0.0%	81.67%

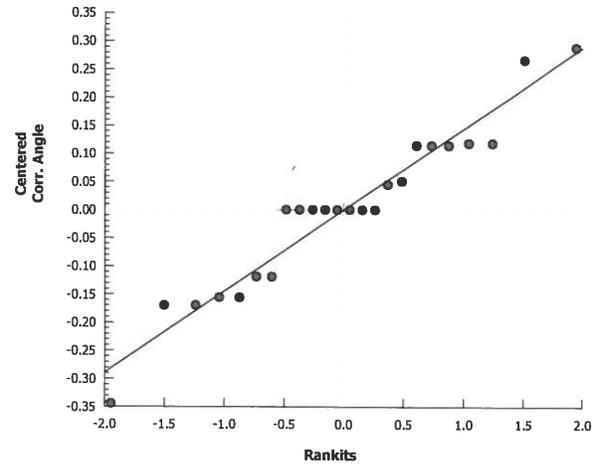
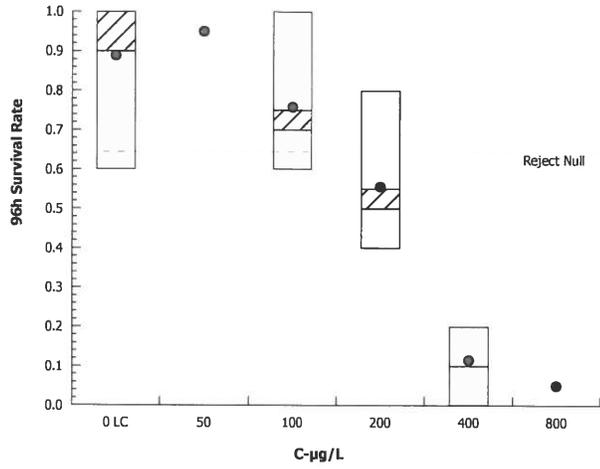
Pacific Topsmelt 96-h Acute Survival Test

Nautilus Environmental (CA)

Analysis ID: 20-9744-9467      Endpoint: 96h Survival Rate  
Analyzed: 20 Aug-18 10:21      Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.8.7  
Official Results: Yes

Graphics



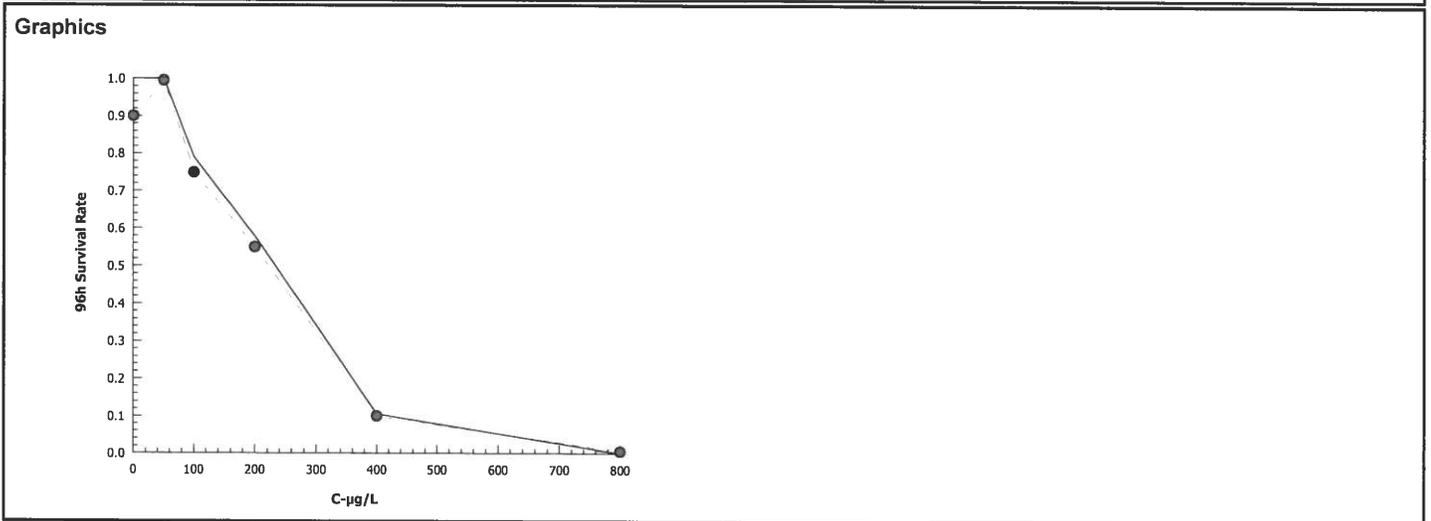
**CETIS Analytical Report**

Report Date: 20 Aug-18 10:21 (p 1 of 1)  
 Test Code: 180814aara | 15-6494-9229

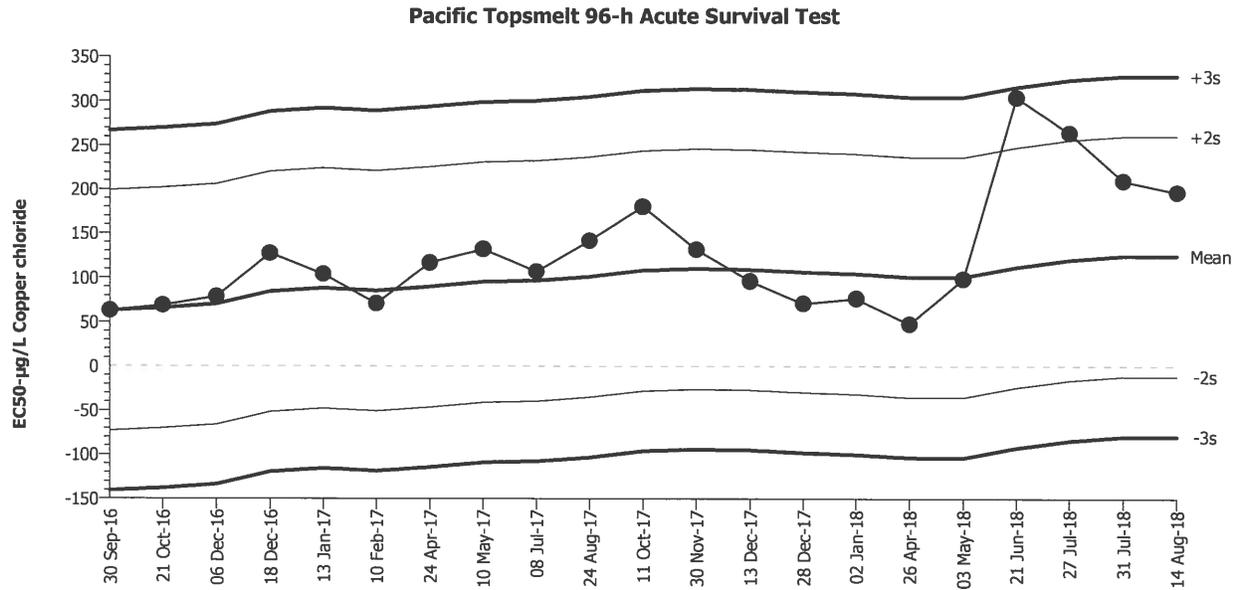
<b>Pacific Topsmelt 96-h Acute Survival Test</b>				<b>Nautilus Environmental (CA)</b>			
<b>Analysis ID:</b> 17-8173-7294	<b>Endpoint:</b> 96h Survival Rate			<b>CETIS Version:</b> CETISv1.8.7			
<b>Analyzed:</b> 20 Aug-18 10:21	<b>Analysis:</b> Untrimmed Spearman-Kärber			<b>Official Results:</b> Yes			

<b>Spearman-Kärber Estimates</b>							
Threshold Option	Threshold	Trim	Mu	Sigma	EC50	95% LCL	95% UCL
Control Threshold	0.1	0.00%	2.293	0.04779	196.4	157.6	244.7

<b>96h Survival Rate Summary</b>			<b>Calculated Variate(A/B)</b>									
C-µg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B	
0	Lab Control	4	0.9	0.6	1	0.1	0.2	22.22%	0.0%	18	20	
50		4	1	1	1	0	0	0.0%	-11.11%	20	20	
100		4	0.75	0.6	1	0.09574	0.1915	25.53%	16.67%	15	20	
200		4	0.55	0.4	0.8	0.09574	0.1915	34.82%	38.89%	11	20	
400		4	0.1	0	0.2	0.05774	0.1155	115.5%	88.89%	2	20	
800		4	0	0	0	0	0		100.0%	0	20	



Pacific Topsmelt 96-h Acute Survival Test		Nautilus Environmental (CA)	
Test Type: Survival (96h)	Organism: Atherinops affinis (Topsmelt)	Material: Copper chloride	
Protocol: EPA/821/R-02-012 (2002)	Endpoint: 96h Survival Rate	Source: Reference Toxicant-REF	



Mean: 124.3      Count: 20      -2s Warning Limit: -11.62      -3s Action Limit: -79.59  
 Sigma: 67.97      CV: 54.70%      +2s Warning Limit: 260.3      +3s Action Limit: 328.2

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2016	Sep	30	15:30	63	-61.3	-0.9019			15-5016-1485	00-5251-2482
2		Oct	21	15:05	68.85	-55.45	-0.8158			12-5359-1342	08-1980-0032
3		Dec	6	14:00	78.46	-45.84	-0.6744			11-0191-2089	11-9997-9668
4			18	14:30	127.1	2.789	0.04103			07-4756-7914	09-8348-7658
5	2017	Jan	13	16:05	103.9	-20.37	-0.2998			06-1491-3172	18-6378-7266
6		Feb	10	14:50	70.71	-53.59	-0.7884			15-5537-9211	16-0070-6651
7		Apr	24	13:15	116.7	-7.617	-0.1121			04-2593-1548	15-9565-1968
8		May	10	15:25	132	7.651	0.1126			18-0705-1608	09-7991-9714
9		Jul	8	11:00	106.5	-17.84	-0.2625			02-7767-0662	04-3078-9331
10		Aug	24	14:45	141.4	17.12	0.2519			04-3270-4077	21-0546-3622
11		Oct	11	15:15	180.3	55.95	0.8232			09-8131-0051	08-6143-6647
12		Nov	30	12:15	131.5	7.17	0.1055			06-5828-7628	11-9084-4410
13		Dec	13	15:35	95.76	-28.54	-0.4199			20-5100-4727	07-8527-1377
14			28	13:00	70.71	-53.59	-0.7884			16-4874-9266	20-1729-5429
15	2018	Jan	2	15:00	76.37	-47.93	-0.7051			07-8786-9002	01-0853-3714
16		Apr	26	16:00	47.5	-76.8	-1.13			13-5076-1359	11-6152-1189
17		May	3	11:30	98.19	-26.11	-0.3841			10-2125-8586	19-5652-0046
18		Jun	21	17:15	304.1	179.8	2.645	(+)		01-0576-9762	09-0246-7639
19		Jul	27	15:45	263.9	139.6	2.054	(+)		14-8822-7369	11-4350-5971
20			31	16:30	209.6	85.29	1.255			19-5107-0005	20-6864-5330
21		Aug	14	16:00	196.4	72.08	1.061			15-6494-9229	17-8173-7294

Marine Acute Bioassay  
Static-Renewal Conditions

Water Quality Measurements  
& Test Organism Survival

Client: Internal  
Sample ID: CuCl<sub>2</sub>  
Test No.: 180814aara

Test Species: A. affinis  
Start Date/Time: 8/14/2018 1600  
End Date/Time: 8/18/2018 1415

Tech Initials				
0	24	48	72	96
TN	TN	RH	TN	RT
RH	TN	TN	TN	BO
RH	-	RH	-	-
800	-	400	-	-
16.0	-	8.0	-	-
2000	-	2000	-	-

Cu stock concentration (µg/L): 100,000

Concentration (µg/L)	Rand #	Number of Live Organisms					Salinity (ppt)					Temperature (°C)					Dissolved Oxygen (mg/L)					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	22	5	5	3	5	5	29.6	29.6	30.1	30.2	30.0	20.6	20.0	20.5	21.1	21.7	7.2	6.5	7.3	6.3	6.3	8.15	7.78	8.10	7.82	7.84
	2	5	5	5	5	3		29.4						20.6				6.0					7.74			
	10	5	5	5	5	5																				
	15	5	5	5	5	5																				
50	24	5	5	6	5	5	29.4	29.7	30.2	30.2	30.1	20.5	20.9	20.5	21.0	21.1	7.1	6.6	7.2	6.2	6.2	8.14	7.71	8.10	7.83	7.82
	8	5	5	5	5	5		29.7						20.6				6.0					7.71			
	17	5	5	5	5	5																				
	11	5	5	5	5	5																				
100	12	5	5	4	4	4	29.4	29.6	30.2	30.1	30.1	20.6	20.1	20.5	21.1	21.1	7.1	6.1	7.2	5.6	5.7	8.12	7.73	8.10	7.77	7.75
	4	5	5	4	4	3		29.7						20.6				5.5					7.65			
	1	5	5	5	4	3																				
	19	5	5	5	5	5																				
200	23	5	5	4	3	2	29.4	29.7	30.3	30.1	30.3	20.6	20.9	20.6	21.0	21.1	7.1	6.6	7.2	6.1	6.0	8.15	7.75	8.10	7.83	7.85
	13	5	5	5	4	2		29.7						20.6				5.8					7.72			
	14	5	5	5	5	4																				
	18	5	5	4	4	3																				
400	9	5	1	1	1	1	29.3	29.5	30.1	30.1	30.1	20.7	20.1	20.6	21.1	21.1	7.0	6.5	7.2	6.5	6.4	8.14	7.81	8.10	7.95	7.94
	16	5	1	1	0	-		29.5						20.6				6.1					7.76			
	7	5	1	1	1	1																				
	5	5	0	-	-	-																				
800	3	5	0				29.3	29.4	-	-	-	20.6	20.0	-	-	-	7.1	6.7	-	-	-	8.12	7.81	-	-	-
	21	5	0	ALL																						
	6	5	0																							
	20	5	0																							

Rand # QC: RH  
Initial Counts QC'd by: KRP  
Initiated by: VTP

Animal Source/Date Received: ABS 8/10/18 Age at Initiation: 15d  
Animal Acclimation Qualifiers (circle all that apply): Q22 / Q23 / Q24 / none

Comments: i = initial reading in fresh test solution, f = final reading in test chamber prior to renewal  
Organisms fed prior to initiation, circle one (y) n )

QC Check: AC 8/20/18

Final Review: EL 8/21/18

Feeding Times				
0	24	48	72	96
AM: -	0940	0900	0845	0900
PM: 1645	-	-	-	-

**CETIS Summary Report**

Report Date: 20 Sep-18 13:53 (p 1 of 1)  
 Test Code: 180912aara | 16-1211-7168

**Pacific Topsmelt 96-h Acute Survival Test** **Nautilus Environmental (CA)**

<b>Batch ID:</b> 19-8177-2482	<b>Test Type:</b> Survival (96h)	<b>Analyst:</b>
<b>Start Date:</b> 12 Sep-18 14:00	<b>Protocol:</b> EPA/821/R-02-012 (2002)	<b>Diluent:</b> Diluted Natural Seawater
<b>Ending Date:</b> 16 Sep-18 14:00	<b>Species:</b> Atherinops affinis	<b>Brine:</b> Not Applicable
<b>Duration:</b> 96h	<b>Source:</b> Aquatic Biosystems, CO	<b>Age:</b> 10d

<b>Sample ID:</b> 08-2725-4240	<b>Code:</b> 180912aara	<b>Client:</b> Internal
<b>Sample Date:</b> 12 Sep-18	<b>Material:</b> Copper chloride	<b>Project:</b>
<b>Receive Date:</b> 12 Sep-18	<b>Source:</b> Reference Toxicant	
<b>Sample Age:</b> 14h	<b>Station:</b> Copper Chloride	

**Comparison Summary**

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
07-3015-8069	96h Survival Rate	50	100	70.71	27.5%		Dunnett Multiple Comparison Test

**Point Estimate Summary**

Analysis ID	Endpoint	Level	µg/L	95% LCL	95% UCL	TU	Method
05-2683-6884	96h Survival Rate	EC50	105.6	87.32	127.8		Spearman-Kärber

**96h Survival Rate Summary**

C-µg/L	Control Type	Count	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	0.05774	0.1155	12.83%	0.0%
50		4	1	1	1	1	1	0	0	0.0%	-11.11%
100		4	0.4	0	0.8501	0.2	0.8	0.1414	0.2828	70.71%	55.56%
200		4	0.15	0	0.3091	0	0.2	0.05	0.1	66.67%	83.33%
400		4	0	0	0	0	0	0	0		100.0%
800		4	0	0	0	0	0	0	0		100.0%

**96h Survival Rate Detail**

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Lab Control	0.8	1	0.8	1
50		1	1	1	1
100		0.4	0.8	0.2	0.2
200		0.2	0.2	0.2	0
400		0	0	0	0
800		0	0	0	0

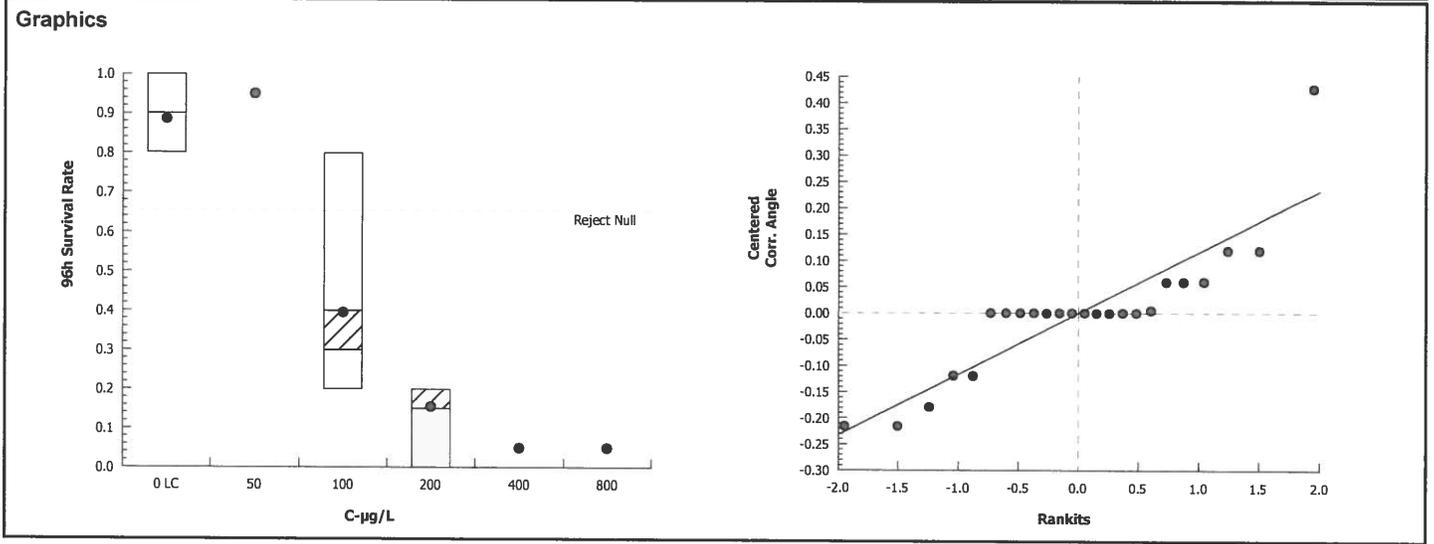
**CETIS Analytical Report**

Report Date: 20 Sep-18 13:53 (p 1 of 2)  
 Test Code: 180912aara | 16-1211-7168

Pacific Topsmelt 96-h Acute Survival Test										Nautilus Environmental (CA)	
Analysis ID: 07-3015-8069		Endpoint: 96h Survival Rate			CETIS Version: CETISv1.8.7						
Analyzed: 20 Sep-18 13:52		Analysis: Parametric-Control vs Treatments			Official Results: Yes						
Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU		
Angular (Corrected)	NA	C > T	NA	NA	27.5%	50	100	70.71			
Dunnett Multiple Comparison Test											
Control	vs	C-µg/L	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)		
Lab Control		50	-0.9521	2.287	0.286	6	0.9562	CDF	Non-Significant Effect		
		100*	4.369	2.287	0.286	6	0.0012	CDF	Significant Effect		
		200*	6.574	2.287	0.286	6	<0.0001	CDF	Significant Effect		
ANOVA Table											
Source	Sum Squares		Mean Square		DF	F Stat	P-Value	Decision(α:5%)			
Between	2.393285		0.7977616		3	25.51	<0.0001	Significant Effect			
Error	0.3753337		0.03127781		12						
Total	2.768619				15						
Distributional Tests											
Attribute	Test		Test Stat	Critical	P-Value	Decision(α:1%)					
Variances	Mod Levene Equality of Variance		2.312	5.953	0.1280	Equal Variances					
Variances	Levene Equality of Variance		3.816	5.953	0.0394	Equal Variances					
Distribution	Shapiro-Wilk W Normality		0.8883	0.8408	0.0523	Normal Distribution					
96h Survival Rate Summary											
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Control	4	0.9	0.7163	1	0.9	0.8	1	0.05774	12.83%	0.0%
50		4	1	1	1	1	1	1	0	0.0%	-11.11%
100		4	0.4	0	0.8501	0.3	0.2	0.8	0.1414	70.71%	55.56%
200		4	0.15	0	0.3091	0.2	0	0.2	0.05	66.67%	83.33%
400		4	0	0	0	0	0	0	0		100.0%
800		4	0	0	0	0	0	0	0		100.0%
Angular (Corrected) Transformed Summary											
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Control	4	1.226	1.007	1.445	1.226	1.107	1.345	0.06874	11.21%	0.0%
50		4	1.345	1.345	1.346	1.345	1.345	1.345	0	0.0%	-9.71%
100		4	0.6798	0.1971	1.163	0.5742	0.4636	1.107	0.1517	44.63%	44.56%
200		4	0.4041	0.2147	0.5936	0.4636	0.2255	0.4636	0.05953	29.46%	67.04%
400		4	0.2255	0.2255	0.2256	0.2255	0.2255	0.2255	0	0.0%	81.61%
800		4	0.2255	0.2255	0.2256	0.2255	0.2255	0.2255	0	0.0%	81.61%

Pacific Topsmelt 96-h Acute Survival Test Nautilus Environmental (CA)

Analysis ID: 07-3015-8069      Endpoint: 96h Survival Rate      CETIS Version: CETISv1.8.7  
Analyzed: 20 Sep-18 13:52      Analysis: Parametric-Control vs Treatments      Official Results: Yes



**CETIS Analytical Report**

Report Date: 20 Sep-18 13:53 (p 1 of 1)  
 Test Code: 180912aara | 16-1211-7168

Pacific Topsmelt 96-h Acute Survival Test Nautilus Environmental (CA)

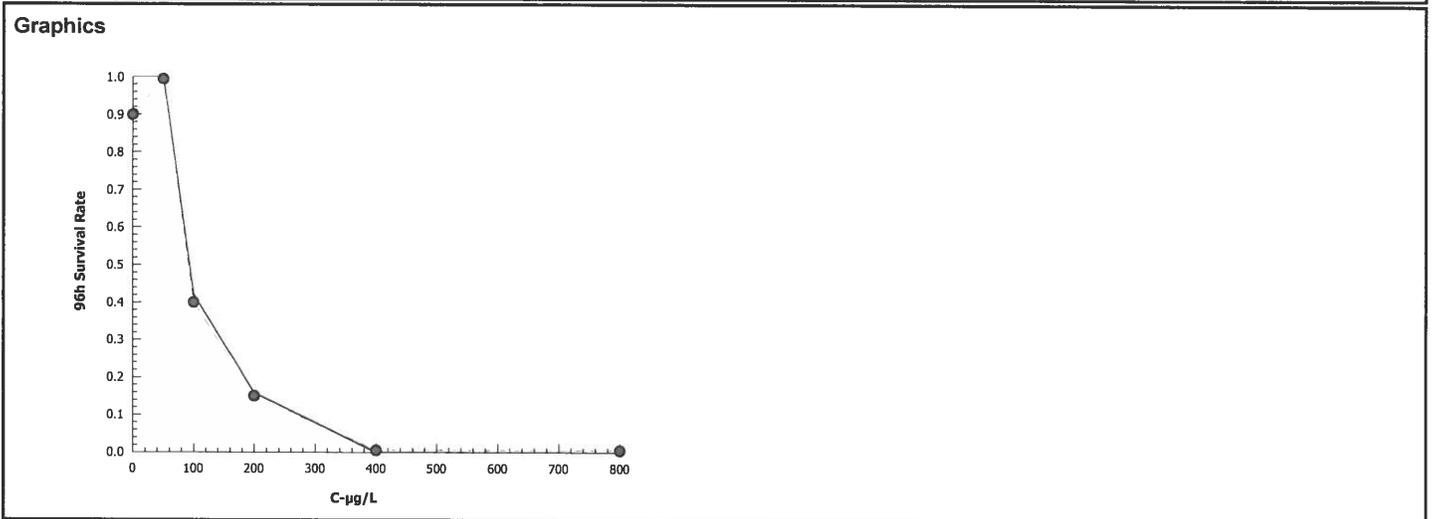
Analysis ID: 05-2683-6884      Endpoint: 96h Survival Rate      CETIS Version: CETISv1.8.7  
 Analyzed: 20 Sep-18 13:52      Analysis: Untrimmed Spearman-Kärber      Official Results: Yes

**Spearman-Kärber Estimates**

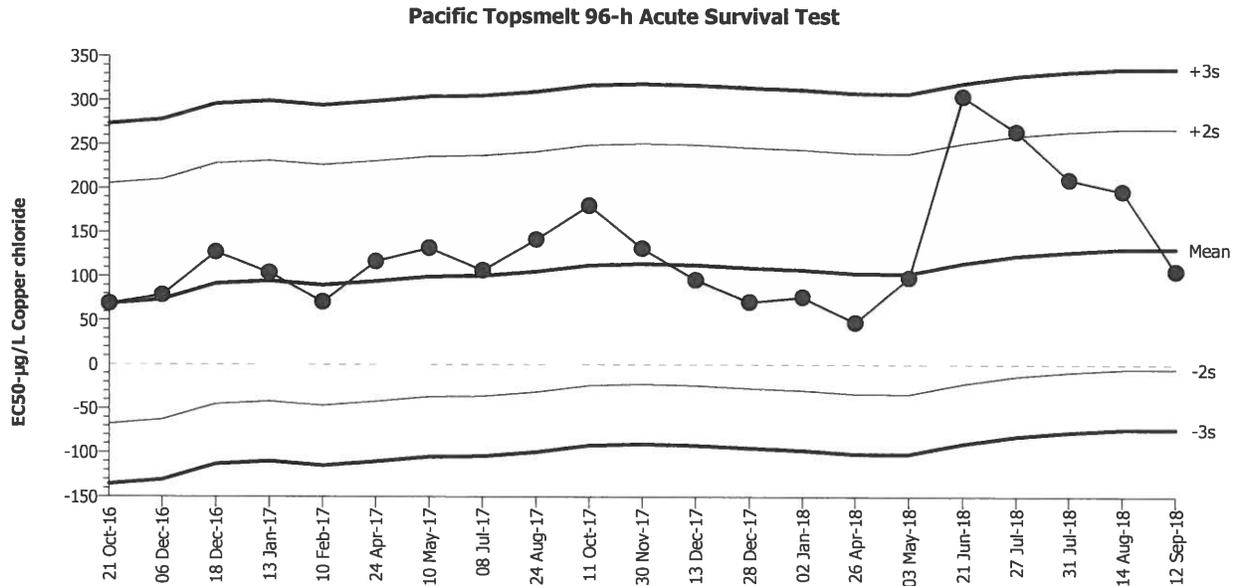
Threshold Option	Threshold	Trim	Mu	Sigma	EC50	95% LCL	95% UCL
Control Threshold	0.1	0.00%	2.024	0.04132	105.6	87.32	127.8

**96h Survival Rate Summary**

C-µg/L	Control Type	Count	Calculated Variate(A/B)								
			Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Lab Control	4	0.9	0.8	1	0.05774	0.1155	12.83%	0.0%	18	20
50		4	1	1	1	0	0	0.0%	-11.11%	20	20
100		4	0.4	0.2	0.8	0.1414	0.2828	70.71%	55.56%	8	20
200		4	0.15	0	0.2	0.05	0.1	66.67%	83.33%	3	20
400		4	0	0	0	0	0		100.0%	0	20
800		4	0	0	0	0	0		100.0%	0	20



Pacific Topsmelt 96-h Acute Survival Test		Nautilus Environmental (CA)	
Test Type: Survival (96h)	Organism: Atherinops affinis (Topsmelt)	Material: Copper chloride	
Protocol: EPA/821/R-02-012 (2002)	Endpoint: 96h Survival Rate	Source: Reference Toxicant-REF	



Mean: 131      Count: 20      -2s Warning Limit: -5.373      -3s Action Limit: -73.55  
 Sigma: 68.18      CV: 52.00%      +2s Warning Limit: 267.3      +3s Action Limit: 335.5

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2016	Oct	21	15:05	68.85	-62.15	-0.9116			12-5359-1342	08-1980-0032
2		Dec	6	14:00	78.46	-52.54	-0.7706			11-0191-2089	11-9997-9668
3			18	14:30	127.1	-3.912	-0.05737			07-4756-7914	09-8348-7658
4	2017	Jan	13	16:05	103.9	-27.07	-0.3971			06-1491-3172	18-6378-7266
5		Feb	10	14:50	70.71	-60.29	-0.8843			15-5537-9211	16-0070-6651
6		Apr	24	13:15	116.7	-14.32	-0.21			04-2593-1548	15-9565-1968
7		May	10	15:25	132	0.9508	0.01395			18-0705-1608	09-7991-9714
8		Jul	8	11:00	106.5	-24.54	-0.36			02-7767-0662	04-3078-9331
9		Aug	24	14:45	141.4	10.42	0.1529			04-3270-4077	21-0546-3622
10		Oct	11	15:15	180.3	49.25	0.7224			09-8131-0051	08-6143-6647
11		Nov	30	12:15	131.5	0.4703	0.006898			06-5828-7628	11-9084-4410
12		Dec	13	15:35	95.76	-35.24	-0.5169			20-5100-4727	07-8527-1377
13			28	13:00	70.71	-60.29	-0.8843			16-4874-9266	20-1729-5429
14	2018	Jan	2	15:00	76.37	-54.63	-0.8012			07-8786-9002	01-0853-3714
15		Apr	26	16:00	47.5	-83.5	-1.225			13-5076-1359	11-6152-1189
16		May	3	11:30	98.19	-32.81	-0.4812			10-2125-8586	19-5652-0046
17		Jun	21	17:15	304.1	173.1	2.538	(+)		01-0576-9762	09-0246-7639
18		Jul	27	15:45	263.9	132.9	1.949			14-8822-7369	11-4350-5971
19			31	16:30	209.6	78.59	1.153			19-5107-0005	20-6864-5330
20		Aug	14	16:00	196.4	65.38	0.959			15-6494-9229	17-8173-7294
21		Sep	12	14:00	105.6	-25.38	-0.3722			16-1211-7168	05-2683-6884

**Marine Acute Bioassay  
Static-Renewal Conditions**

**Water Quality Measurements  
& Test Organism Survival**

Client: Internal  
 Sample ID: CuCl<sub>2</sub>  
 Test No.: 180912aara

Test Species: A. affinis  
 Start Date/Time: 9/12/2018 1400  
 End Date/Time: 9/16/2018 1400

Tech Initials				
0	24	48	72	96
Counts: KC	DM	DM	BO	RH
Readings: BO	BO	DM	BO	RH
Dilutions made by: BO	-	ETP	-	-
High conc. made (µg/L):	800	-	400	-
Vol. Cu stock added (mL):	16.0	-	8.0	-
Final Volume (mL):	2000	-	2000	-

Cu stock concentration (µg/L): 100,000

Concentration (µg/L)	Rand #	Number of Live Organisms					Salinity (ppt)					Temperature (°C)					Dissolved Oxygen (mg/L)					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	22	5	5	5	4	4	29.5	30.2	29.7	29.8	30.0	20.8	20.3	21.5	21.0	20.8	6.9	6.3	6.7	6.0	6.1	7.99	7.72	8.08	7.79	7.75
	2	5	5	5	5	5			30.6					20.6					5.9					7.80		
	10	5	5	5	5	4																				
	15	5	5	5	5	5																				
50	24	5	5	5	5	5	29.6	29.9	29.6	29.9	29.9	20.8	20.2	21.5	21.0	20.9	6.9	6.3	6.7	6.0	6.2	7.96	7.75	8.08	7.78	7.79
	8	5	5	5	5	5			30.4					20.8					5.9					7.80		
	17	5	5	5	5	5																				
	11	5	5	5	5	5																				
100	12	5	5	4	3	2	29.7	30.1	29.8	29.9	30.0	20.8	20.4	21.5	20.9	20.9	6.9	6.4	6.7	6.4	6.4	7.98	7.76	8.08	7.82	7.82
	4	5	5	4	4	4			30.4					20.7					6.0					7.81		
	1	5	4	1	1	1																				
	19	5	5	1	1	1																				
200	23	5	5	2	1	1	29.6	29.9	29.9	29.9	30.0	20.8	20.3	21.5	20.9	20.9	6.9	6.4	6.7	6.6	6.2	7.98	7.79	8.08	7.85	7.85
	13	5	5	3	1	1			29.3					20.8					5.9					7.81		
	14	5	5	4	2	1																				
	18	5	4	1	1	0																				
400	9	5	1	1	0	-	29.7	30.1	29.7	29.9	-	20.8	20.5	21.5	20.9	-	6.9	6.4	6.6	6.5	-	7.98	7.79	8.08	7.89	-
	16	5	0	-	-	-			30.4					20.7					6.0					7.83		
	7	5	0	-	-	-																				
	5	5	0	-	-	-																				
800	3	5	0	-	-	-	29.3	29.8	-	-	-	20.9	20.7	-	-	-	6.9	6.9	-	-	-	7.97	7.81	-	-	
	21	5	0	-	-	-			-	-	-			-	-	-			-	-			-	-		
	6	5	0	-	-	-																				
	20	5	0	-	-	-																				

Rand # QC: BO  
 Initial Counts QC'd by: UP/TN  
 Initiated by: KC

Animal Source/Date Received: ABS / 9/11/18 Age at Initiation: 10 d  
 Animal Acclimation Qualifiers (circle all that apply): Q22 / Q23 / Q24 + none <sup>Q13 KC</sup> 9/13/18

Comments: i = initial reading in fresh test solution, f = final reading in test chamber prior to renewal  
Organisms fed prior to initiation, circle one (y) n )

QC Check: RH 9/19/18

Final Review: ETP 9/25/18

Feeding Times					
0	24	48	72	96	
AM:	--	0830	0815	0830	0845
PM:	1650	--	--	--	--

## **Appendix E**

### **Qualifier Codes**

### Glossary of Qualifier Codes:

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