ECOANALYSTS, INC.

TOXICOLOGY TESTING RESULTS

PORT GAMBLE BAY RESTORATION MONITORING 2018

PORT GAMBLE, WASHINGTON

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All testing reported herein was performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and EcoAnalysts is not responsible for use of less than the complete report. The test results summarized in this report apply only to the sample(s) evaluated.

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TABLES

APPENDICES

ACRONYMS AND ABBREVIATIONS

AFDW:	Ash-free dry weight
cm:	Centimeter
CSL:	Cleanup Screening Level
°C:	Degrees Celsius
EC_{50}:	Effective Concentration that results in a 50% reduction in a sub-lethal endpoint
g:	Grams
LC_{50}:	Lethal Concentration that results in a 50% reduction in survival
L:	Liter
µm:	Micrometer
mg:	Milligram
mg/L:	Milligrams per liter
mL:	Milliliter
mm:	Millimeter
NELAP:	National Environmental Laboratory Accreditation Program
NOEC:	No Observed Effect Concentration
OR:	Oregon
ppt:	parts per thousand
PSEP:	Puget Sound Estuary Protocols (PSEP 1995)
SCO:	Sediment Cleanup Objective
SCUM II:	Sediment Cleanup User's Manual II
SMS:	Sediment Management Standards
SOP:	Standard operation procedure
SMARM:	Sediment Management Annual Review Meeting
UIA:	Un-ionized ammonia
USACE:	United States Army Corps of Engineers
USEPA:	United States Environmental Protection Agency
WA:	Washington State
WAC:	Washington Administrative Code
WDOE:	Washington (State) Department of Ecology

1. INTRODUCTION

EcoAnalysts conducted biological toxicity testing with sediment samples collected by Anchor QEA, LLC. (Anchor) as part of the restoration monitoring activities being performed at the Port Gamble Bay Cleanup Site in Port Gamble, Washington. Sediments were evaluated for biological effects following guidance provided by the Washington State Department of Ecology (WDOE) Sediment Management Standards (SMS) under the Washington Administrative Code (WAC) 173-204-315. This report presents the results of the toxicity testing portion of the Port Gamble Bay sediment investigation.

2. METHODS

This section summarizes the test methods followed for this biological characterization. Test methods followed guidance provided by the Puget Sound Estuary Program (PSEP 1995), the Sediment Cleanup User's Manual II (SCUM II; WDOE 2017), and the various updates presented during the Sediment Management Annual Review Meeting (SMARM). Sediment toxicity was evaluated using three standard PSEP bioassays; the 10-day amphipod test, the 20-day juvenile polychaete survival and growth test, and the 48-hour benthic larval development test.

2.1 Sample Collection and Organism Receipt

Nineteen test sediments were collected between September 6 and 19, 2018 and were received at EcoAnalysts on same day as collection. Reference sediments from Carr Inlet, WA were collected by EcoAnalysts on September 28, 2018 and received on the same day. Sediment samples were stored in a walk-in cold room at 4 ± 2°C in the dark. The test sediment was not sieved prior to testing. All tests were conducted within the eight-week holding time.

Amphipods (*Eohaustorius estuarius*) were supplied by Northwest Amphipod in Newport, Oregon. Animals were held in native sediment at 15°C prior to test initiation. Juvenile polychaete worms (*Neanthes arenaceodentata*) were obtained from Aquatic Toxicology Support in Bremerton, Washington. Juvenile polychaetes were held in seawater at 20°C (Neanthes were cultured in water-only and were not held in sediment prior to testing). *Mytilus galloprovincialis* (mussel) broodstock were provided by Taylor Shellfish in Shelton, WA. Broodstock were held in unfiltered seawater at 14 – 16°C prior to spawning.

Native *Eohaustorius* sediment from Yaquina Bay, Oregon was also provided by Northwest Amphipod for use as control sediment treatments for the amphipod and juvenile polychaete tests.

2.2 Sample Testing Plan

Based on instruction from Anchor representatives, 12 of the 19 samples collected from the site were selected for bioassay testing. Five samples were identified to be evaluated with the full bioassay suite (three species testing) while seven samples were to be evaluated with the larval benthic test only. Sample locations and their corresponding bioassays are outlined in Table 2-1.

Table 2-1. Bioassay Sample Assignments

Sample ID	Benthic Larval Development Test	Juvenile Polychaete Survival and Growth Test	Amphipod Survival Test
SMA1B-IT2-0-10-180907	X	X	X
SMA1B-IT3-0-10-180919	X	X	X
SMA2C-IT3-0-10-180907	X	X	X
SMA2C-IT6-0-10-180907	X	X	X
SMA2C-IT9-0-10-180906	X	X	X
SMA1-ST-0-10-COMP-180917	X		
SMA1A-IT-0-10-COMP-180917	X		
SMA2A-IT-0-10-COMP-180919	X		
SMA2A-ST-0-10-COMP-180918	X		
SMA2B-IT-0-10-COMP-180918	X		
SMA2B-ST-0-10-COMP-180918	X		
BW-15-0-10-180917	X		
SMA2C-IT2-0-10-180906	Sample not analyzed for sediment toxicity		
SMA2C-IT5-0-10-180906			
SMA2C-IT8-0-10-180906			
SMA2C-IT4-0-10-180906			
SMA2C-IT1-0-10-180906			
SMA2C-IT7-0-10-180906			
SMA1B-IT1-0-10-180907			

X = Indicates test to be conducted with associated samples

2.3 Sample Grain Size and Reference Comparison

Sediment grain size is one of the characteristics used in selecting the appropriate reference sediment(s) to compare the chemical and biological responses of project sediments. The percent fines value is defined as the amount of sediment that passes through a 62.5-µm sieve, expressed as a percentage of the total sample analyzed. This is also the sum of the silt and clay fraction of sediment. Wet-sieve grain size results for the reference samples was conducted in the field (at the time of collection) and after receipt at the EcoAnalysts laboratory. The percent-fines determination of the project sediments is summarized in Table 2-2.

Table 2-2. Sample and Reference Grain Size Comparison

Treatment	Sample Abbreviation	Percent Fines[1]	Treatment Compared To:
CARR-20 (Reference)		40%	
CR-21 (Reference)		14%	
SMA1B-IT2-0-10-180907	SMA-1B-IT2	2%	CR-21
SMA1B-IT3-0-10-180919	SMA-1B-IT3	4%	CR-21
SMA2C-IT3-0-10-180907	SMA-2C-IT3	10%	CR-21
SMA2C-IT6-0-10-180907	SMA-2C-IT6	8%	CR-21
SMA2C-IT9-0-10-180906	SMA-2C-IT9	4%	CR-21
SMA1-ST-0-10-COMP-180917	SMA-1-ST	14%	CR-21
SMA1A-IT-0-10-COMP-180917	SMA-1A-IT	6%	CR-21
SMA2A-IT-0-10-COMP-180919	SMA-2A-IT	0%	CR-21
SMA2A-ST-0-10-COMP-180918	SMA-2A-ST	6%	CR-21
SMA2B-IT-0-10-COMP-180918	SMA-2B-IT	0%	CR-21
SMA2B-ST-0-10-COMP-180918	SMA-2B-ST	0%	CR-21
BW-15-0-10-180917	BW-15	36%	CARR-20

[1] Wet sieve results

Project sample BW-15-0-10-180917 was compared to the Carr Inlet reference CARR-20 for the purposes of evaluating the sediment under the sediment management standards. All other project samples were compared to reference station CR-21.

Station coordinates for the reference samples are summarize in Table 2-3.

Table 2-3. Reference Station Coordinates

Station	Latitude	Longitude
CARR-20	47.33298	-122.66981
CR-21	47.33111	-122.67889

2.4 10-day Amphipod Bioassay

The 10-day amphipod acute toxicity test was conducted with *Eohaustorius estuarius*. Test organisms were supplied by Northwestern Aquatic Sciences in Newport, OR and held in native sediment at 15°C prior to test initiation. Organisms were fed during the holding period a diet of ground TetraMarin® ad libitum. Native sediment from Yaquina Bay, OR was provided by the organism supplier for use as the control treatment sediment in the test. This matrix has been used successfully in prior tests with this species and is known to support positive organism health and survival.

The amphipod bioassay was conducted as 10-day static exposures with five replicates for each test treatment, reference treatment, and control. Two centimeters of sediment (approximately 175 mL) were placed into each 1-L glass chamber with 775 mL of overlying water. Trickle-flow aeration was provided through glass pipettes, and care was taken to avoid disturbing the sediment surface. Test chambers were placed into randomly assigned positions and allowed to equilibrate to test conditions overnight.

Prior to the test initiation, water quality measurements were taken in all replicates for each test treatment and included dissolved oxygen, temperature, salinity, and pH. Ammonia and sulfide concentrations were measured in both interstitial (pore water) and overlying water at initiation and termination. These measurements were made from a sacrificial surrogate chamber for each test treatment. Sediment pore water was extracted via centrifugation. During the test, water quality was monitored daily in one surrogate replicate per treatment. All water quality instruments were calibrated daily or on their recommended schedule. Records of instrument calibration were retained in the laboratory logs.

To initiate the test, organisms were randomly allocated to each of the test chambers. Initial stocking densities were 20 organisms per test chamber. Amphipods that did not bury within approximately one hour were replaced with healthy amphipods. No food was provided during the 10-day exposure for the amphipod test.

At test termination, sediment from each test chamber was sieved through a 0.5-mm screen to recover all organisms. The number of surviving and dead amphipods was then enumerated.

2.5 20-day Juvenile Polychaete Bioassay

The 20-day polychaete survival and growth test was conducted with juvenile polychaete worms (*Neanthes arenaceodentata*). Test organisms were obtained from Aquatic Toxicology Support in Bremerton, WA and held in seawater at 20°C (Neanthes were cultured in water-only and were not held in sediment prior to testing). Organisms were fed during the holding period a diet of ground TetraMarin® ad libitum. Native sediment of the amphipod Eohaustorius estuarius from Yaquina Bay, OR was provided by Northwestern Aquatic Sciences for use as the control treatment sediment for the test. This coarse sand control sediment has been routinely tested in conjunction with this species at this laboratory and results from historical testing have demonstrated acceptable organism health and sediment quality.

The polychaete bioassay was conducted as a 20-day static-renewal test, with overlying exchanges of 300 mL of water occurring every third day. Each test treatment, reference treatment, and control consisted of five replicates of 1-L glass chambers, which were filled with two centimeters of sediment (approximately 175 mL) and 775 mL of overlying water. Trickle-flow aeration was provided through glass pipettes, and care was taken to avoid disturbing the sediment surface. Test chambers were then randomly assigned positions and allowed to equilibrate to test conditions overnight.

Prior to the test initiation, water quality measurements were taken in a surrogate chamber for each test treatment and included dissolved oxygen, temperature, salinity, and pH. Ammonia and sulfide concentrations were measured in both interstitial (pore water) and overlying water at initiation and termination. These measurements were made from a sacrificial surrogate chamber for each test treatment. Sediment pore water was extracted via centrifugation. During the test, water quality was monitored daily in one surrogate replicate per treatment. All water quality instruments were calibrated daily or on their recommended schedule. Records of instrument calibration were retained in the laboratory logs.

To initiate the test, organisms were randomly allocated to each of the test chambers. Initial stocking densities were five worms per test chamber. During the test, organisms were fed a diet of 40-mg of TetraMarin® slurry every other day (approximately 8-mg dry weight per worm). Pre-test initial biomass was determined by taking dry weight and ash-free dry weight (AFDW) measurements of three replicates of five worms each on Day 0.

At test termination, sediment from each test chamber was sieved through a 0.5-mm screen. All worms were recovered, enumerated, rinsed in deionized water (to remove salt), and transferred to pre-weighed aluminum foil weigh boats. After drying in an oven at 60°C for approximately 24 hours, each weigh-boat was removed, cooled in a desiccator and weighed to obtain dry weight measurements. They were then heated to 550°C for 2 hours to determine the ashed weight. Ash-free dry weights (AFDW) were calculated to correct for the influence of sediment grain size differences between treatments:

AFDW=Dry weight-Ashed weight

Both dry weight and AFDW were used to determine individual worm weight and growth rates.

2.6 Larval Developmental Bioassay

The bivalve larval development test was conducted with the mussel, *Mytilus galloprovincialis*. Adult organisms were obtained from Taylor Shellfish in Shelton, WA and were held under flowing natural seawater at 12°C prior to spawning induction. Adult mussels were fed during the holding period a marine algal suspension ad libitum. The control treatment for this assay employed a clean seawater treatment (no sediment).

The larval development bioassay was conducted as a static exposure with five replicates for each test treatment, reference treatment, and control. Approximately 18 g (±1 g) of sediment was placed into each 1-L glass chamber with 900 mL of overlying water. Trickle-flow aeration was provided through glass pipettes, and care was taken to avoid disturbing the sediment surface. Test chambers were then shaken for 10 seconds and placed into randomly assigned positions. The larval test was performed without aeration unless dissolved oxygen levels fell below threshold levels for action.

Prior to the test initiation, water quality measurements were taken in the surrogate chamber for each test treatment and included dissolved oxygen, temperature, salinity, and pH. Ammonia and sulfide concentrations were measured in the overlying water at initiation and termination. These measurements were made from a sacrificial surrogate chamber for each test treatment. During the test, water quality was monitored daily in one surrogate replicate per treatment. All water quality instruments were calibrated daily or on their recommended schedule. Records of instrument calibration were retained in the laboratory logs.

To initiate the test, mussels were placed in clean seawater and acclimated at 16°C for approximately 20 minutes. The water bath temperature was then increased over a period of 15 minutes to 20°C. Mussels were held at 20°C and monitored for spawning individuals. Spawning females and males were removed

from the water bath and placed in individual containers with seawater. These individuals were allowed to spawn until sufficient gametes were available to initiate the test. After the spawning period, eggs were transferred to fresh seawater and filtered through a 0.5 mm Nitex® mesh screen to remove large debris, feces, and excess gonadal matter. A composite was made of the sperm and diluted with fresh seawater. The fertilization process was initiated by adding sperm to the isolated egg containers. Egg-sperm solutions were periodically homogenized with a perforated plunger during the fertilization process and sub-samples observed under the microscope for egg and sperm viability. Approximately one to one and a half hours after fertilization, embryo solutions were checked for fertilization rate. Only those embryo stocks with >90% fertilization were used to initiate the tests. Embryo solutions were rinsed free of excess sperm and then combined to create one embryo stock solution. Density of the embryo stock solution was determined by counting the number of embryos in a subsample of homogenized stock solution. This was used to determine the volume of embryo stock solution to deliver approximately 27,000 embryos to each test chamber.

The protocol calls for test termination when 95% of the embryos in the control have reached the prodissoconch I stage (approximately 48-60 hours). At termination, the overlying seawater was decanted into a clean 1-L jar and mixed with a perforated plunger. From this container, a 10 mL subsample was transferred to a scintillation vial and preserved in 5% buffered formalin. Larvae were subsequently stained with a dilute solution of Rose Bengal in 70% alcohol to help visualization of larvae. The number of normal and abnormal larvae was enumerated on an inverted microscope. Normal larvae included all D-shaped prodissoconch I stage larvae. Abnormal larvae included abnormally shaped prodissoconch I larvae and all early stage larvae.

2.7 Data Analysis and QA/QC

All water quality and endpoint data were entered into Excel spreadsheets. Water quality parameters were summarized by calculating the mean, minimum, and maximum values for each test treatment. Endpoint data were calculated for each replicate and the mean values and standard deviations were determined for each test treatment.

All hand-entered data was reviewed for data entry errors, which were corrected prior to summary calculations. A minimum of 10% of all calculations and data sorting were reviewed for errors. Review counts were conducted on any apparent outliers.

For the larval test, the normalized combined mortality and abnormality endpoint was used to evaluate the test sediment. This was based on the number of normal larvae in each treatment and reference sample divided by the mean number of normal larvae in the control replicates, as defined in the SCUM II guidance document (Ecology 2015).

For SMS and CSL suitability determinations, comparisons were made according to DMMP User Manual (DMMP, 2016) and Fox et al. (1998), using BioStat software. Data reported as percent mortality or survival were transformed using an arcsine square root transformation prior to statistical analysis. All data were tested for normality using the Wilk-Shapiro test and equality of variance using Levene's test. Determinations of statistical significance were based on one-tailed Student's t-tests with an alpha of 0.05. A comparison of the larval endpoint relative to the reference was made using an alpha level of 0.10. For samples failing to meet assumptions of normality, a Mann-Whitney test was conducted to determine significance. For those samples failing to meet the assumptions of normality and equality of variance, a t-test on rankits was used.

To evaluate the relative sensitivity of the organisms, reference toxicity tests were performed using standard reference toxicants (Lee 1980). A water-only reference-toxicant test was conducted concurrently with the sediment tests using ammonium chloride. The ammonium chloride reference-toxicant test was used to ensure animals used in the test were healthy and of similar sensitivity to prior tests. This test also provided information on the sensitivity to ammonia concentrations that would possibly be present in the sediments.

Statistical analyses of all dose-response tests were performed using CETIS Comprehensive Toxicity Data Analysis and Database Software version 1.9.2.6. Comparisons between the lab control and each test concentration were performed following recommended USEPA decision matrices (USEPA 2002).

3. RESULTS

The results of the sediment testing, including a summary of test results and water quality observations are presented in this section. Data for each of the replicates, as well as laboratory bench sheets are provided Appendix A and statistical analyses are provided in Appendix B.

3.1 10-day Amphipod Bioassay

The bioassay test with *E. estuarius* was validated with 4% mortality in the native sediment control, which met the performance criterion of ≤10% mortality for SMS evaluations. This result indicates that the test conditions were suitable for adequate amphipod survival. Mean mortality in the reference treatments CARR-20 and CR-21 was 4% and 2%, respectively, which met the performance criteria (≤25% mortality) and indicated that the reference sediments were acceptable for suitability determination. Mean mortality in the five project samples ranged from 1 – 15%. All endpoint results are summarized in Table 3-1. Summaries of water quality measurements, ammonia and sulfide concentrations, and test conditions are presented in Table 3-2, Table 3-3, and Table 3-4.

Water quality parameters were within the acceptable limits throughout the duration of the test.

A reference-toxicant test (positive control) was performed on the batch of test organisms utilized for this study. The LC_{50} value was within ±2 standard deviations from the laboratory historical mean. This result indicates that the test organisms used in this study were of similar sensitivity to those previously tested at EcoAnalysts.

Ammonia concentrations observed in the *E. estuarius* test were below the No Observed Effect Concentration (NOEC) value derived from the concurrent ammonia reference-toxicant test (Table 3-3; compare to NOEC of 134 mg/L). Values were also below the published threshold concentration of 15 mg/L total ammonia (Barton 2002). Therefore, ammonia concentrations within the sediment samples should not have been a contributor to any adverse biological effects observed in the test treatments. Initial sulfide concentrations in interstitial water were unable to be measured due to an insufficient volume of porewater collected from the coarse-grained sediments.

Table 3-1. Test Results for *Eohaustorius estuarius*

Treatment	Replicate	Number Initiated	Number Surviving	Number Missing or Dead	Percentage Mortality	Mean Percentage Mortality	SD
Control	1	20	19	1	5	4	4.2
	2	20	19	1	0		
	3	20	20	0	5		
	4	20	18	2	0		
	5	20	20	0	0		
CARR-20	1	20	18	2	5	4	4.2
	2	20	20	0	25		
	3	20	19	1	5		
	4	20	20	0	5		
	5	20	19	1	0		
CR-21	1	20	20	0	0	2	2.7
	2	20	19	1	20		
	3	20	20	0	20		
	4	20	20	0	20		
	5	20	19	1	5		
SMA-1B-IT2	1	20	15	5	10	7	10.4
	2	20	19	1	10		
	3	20	19	1	15		
	4	20	20	0	15		
	5	20	20	0	0		
SMA-1B-IT3	1	20	16	4	10	15	7.1
	2	20	16	4	0		
	3	20	16	4	0		
	4	20	19	1	0		
	5	20	18	2	0		
SMA-2C-IT3	1	20	18	2	5	10	6.1
	2	20	17	3	15		
	3	20	17	3	0		
	4	20	20	0	5		
	5	20	18	2	0		
SMA-2C-IT6	1	20	20	0	0	1	2.2
	2	20	20	0	5		
	3	20	20	0	0		
	4	20	20	0	5		
	5	20	19	1	0		
SMA-2C-IT9	1	20	17	3	0	4	6.5
	2	20	20	0	5		
	3	20	19	1	25		
	4	20	20	0	5		
	5	20	20	0	5		

Table 3-2. Water Quality Summary for *Eohaustorius estuarius*

Treatment	Dissolved Oxygen (mg/L) ≥5.1 mg/L			Temperature (°C) 15 ± 1°C			Salinity (ppt) 28 ± 2 ppt			pH 7 - 9 units		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Control	8.3	8.1	8.5	15.3	15.1	15.7	27	27	28	8.0	7.8	8.0
CARR-20	8.3	8.0	8.6	15.4	15.1	15.8	27	27	28	8.0	7.8	8.2
CR-21	8.3	8.1	8.4	15.3	15.1	15.5	28	27	28	8.1	7.6	8.4
SMA-1B-IT2	8.3	7.2	8.5	15.4	15.2	15.7	27	27	28	8.0	7.8	8.1
SMA-1B-IT3	8.3	8.1	8.5	15.3	15.1	15.6	28	27	28	8.1	7.9	8.3
SMA-2C-IT3	8.3	8.2	8.5	15.3	15.1	15.5	27	27	28	8.0	7.9	8.2
SMA-2C-IT6	8.4	8.2	8.6	15.3	15.1	15.5	27	27	28	8.0	7.8	8.1
SMA-2C-IT9	8.2	8.0	8.4	15.3	15.1	15.6	28	28	29	8.0	7.8	8.1

Table 3-3. Ammonia and Sulfide Summary for *Eohaustorius estuarius*

Treatment	Overlying Ammonia (mg/L Total) [1]NOEC = 134 mg/L		Interstitial Ammonia (mg/L Total) [1]NOEC = 134 mg/L		Overlying Sulfides (mg/L Total) [2]Trigger Value = 1.9 mg/L		Interstitial Sulfides (mg/L Total) [2]Trigger Value = 1.9 mg/L	
	Day 0	Day 10	Day 0	Day 10	Day 0	Day 10	Day 0	Day 10
Control	0.00	0.00	0.00	NM	ND	0.000	NM	NM
CARR-20	0.969	1.31	8.42	3.94	0.001	0.004	NM	0.140
CR-21	0.695	4.01	NM	6.60	ND	ND	NM	NM
SMA-1B-IT2	0.152	0.00	NM	NM	ND	ND	NM	NM
SMA-1B-IT3	0.279	0.00	NM	NM	ND	0.000	NM	NM
SMA-2C-IT3	0.299	0.00	NM	NM	0.012	ND	NM	NM
SMA-2C-IT6	0.00	0.00	NM	NM	ND	ND	NM	NM
SMA-2C-IT9	0.00	8.89	1.53	NM	ND	ND	NM	NM

[1]NOEC (concurrent reference-toxicant test derived) = 134 mg/L total ammonia

[2]Inouye 2015: Total sulfide value 1.9 mg/L derived from hydrogen sulfide dissociation (0.122 mg/L H_2S @ 15°C, 28 ppt, and 8.1 pH)

ND = not detected; measurement below detection limit

NM = not measured; insufficient porewater recovered for analysis

Table 3-4.Test Condition Summary for *Eohaustorius estuarius*

Test Conditions: PSEP *E. estuarius*		
Date sampled	September 6 – 19, 2018	
Date received	September 6 – 19, 2018	
Test dates	October 9 – 19, 2018	
Sample storage conditions	4°C, dark	
Days of holding Recommended: ≤8 weeks (56 days)	20 – 33 Days	
Source of control sediment	Yaquina Bay, OR	
Test Species	*Eohaustorius estuarius*	
Supplier	Northwest Amphipod, Newport, OR	
Date acquired	October 4, 2018	
Age class	Mature adult, 3-5 mm	
Test Procedures	PSEP 1995 with SMARM revisions, SCUM II (2017) SOP No. SED002.09	
Test location	EcoAnalysts Port Gamble Laboratory	
Test type/duration	10-Day static	
Control water	North Hood Canal seawater, 0.45µm filtered	
Test dissolved oxygen	Recommended: > 5.1 mg/L	Observed: 7.2 – 8.6 mg/L
Test temperature	Recommended: 15 ± 1 °C	Observed: 15.1 – 15.8°C
Test Salinity	Recommended: 28 ± 2 ppt	Observed: 27 – 29 ppt
Test pH	Recommended: 7 - 9	Observed: 7.6 – 8.4
Control Performance Standard SMS	Recommended: Control ≤ 10% mortality	Observed: 4% mortality; Pass
Reference Performance Standard SMS	Recommended: Reference ≤ 25% mortality	Observed mortality: 2%, 4%; Pass
Reference Toxicant LC50 (total ammonia)	LC_{50} = 189.1 mg/L	
Mean; Acceptable Range (total ammonia)	148.0; 77.4 – 282.7 mg/L	
NOEC (total ammonia)	134 mg/L	
NOEC (unionized ammonia)	0.74 mg /L	
Test Lighting	50 – 100 foot candles (ambient and constant)	
Test chamber	1-Liter Glass Chamber	
Replicates/treatment	5 + 2 surrogates (one used for WQ measurements throughout the test)	
Organisms/replicate	20	
Exposure volume	175 mL sediment/ 775 mL water	
Feeding	None	
Water renewal	None	
Deviations from Test Protocol	None	

3.2 20-day Juvenile Polychaete Bioassay

No mortality was observed in the *N. arenaceodentata* control sediment and mean individual growth (MIG) in the control was 0.808 mg/ind/day (dry weight) and 0.455 mg/ind/day (AFDW). These values fall within the test acceptability criteria of <10% mean mortality and ≥0.38 mg/ind/day dry weight (Kendall 1996), indicating that the test conditions were suitable for adequate polychaete survival and growth. A summary of the test results for all samples is shown in Table 3-5. Summaries of water quality measurements, ammonia and sulfide concentrations, and test conditions are presented in Table 3-6, Table 3-7, Table 3-8, and Table 3-9.

Mean mortality in the reference treatments ranged from 0 – 8%, meeting the reference performance standard of ≤10% (WDOE 2017; USACE 2015). Mean individual growth for the reference treatments ranged from 0.735 to 0.840 mg/ind/day (dry weight) and 0.473 to 0.475 mg/ind/day (AFDW). When compared to the control, MIG expressed as AFDW ranged from 1.039 to 1.044, which met the reference performance standard of ≥0.80 (WDOE 2017).

Mortality in the project sediments ranged from 0% to 4%. Mean individual growth (as dry weight) in the test treatments ranged from 0.695 to 0.860 mg/ind/day. Mean individual growth in the AFDW assessment, which removes variability caused by gut contents, ranged from 0.429 to 0.529 mg/ind/day as AFDW.

All water quality parameters were within the acceptable limits throughout the duration of the test. Initial mean individual biomass (pretest) of the test organisms met the recommended criterion of 0.25 – 1.0 mg/individual at 0.859 mg/ind dry weight and 0.760 mg/ind AFDW.

A reference-toxicant test (positive control) was performed on the batch of test organisms utilized for this study. The LC_{50} value was within control chart limits (±2 standard deviations from the laboratory historical mean). This result indicates that the test organisms used in this study were of similar sensitivity to those previously tested at EcoAnalysts.

Ammonia concentrations observed in the *N. arenaceodentata* test were below the No Observed Effect Concentration (NOEC) value derived from the concurrent ammonia reference-toxicant test (Table 3-7; compare to NOEC of 173 mg/L). Initial sulfide concentrations in the interstitial water were below the NOEC of 3.4 mg/L total sulfides (Kendall and Barton 2004) for all samples.

Table 3-5. Test Results for *Neanthes arenaceodentata*

Treatment	Rep	Number Initiated	Survivors	Mean Mortality (%)	Individual Growth (mg/ind/day)					
					Dry Weight	Mean	Std Dev	AFDW	Mean	Std Dev
Control	1	5	5	0	0.773	0.808	0.142	0.456	0.455	0.060
	2	5	5		0.909			0.487		
	3	5	5		0.736			0.423		
	4	5	5		0.633			0.375		
	5	5	5		0.990			0.534		
CARR-20	1	5	5	0	1.092	0.840	0.264	0.611	0.475	0.114
	2	5	5		0.478			0.317		
	3	5	5		1.094			0.552		
	4	5	5		0.703			0.423		
	5	5	5		0.833			0.473		
CR-21	1	5	5	8	0.775	0.735	0.147	0.461	0.473	0.099
	2	5	5		0.496			0.335		
	3	5	5		0.802			0.530		
	4	5	3		0.886			0.599		
	5	5	5		0.717			0.440		
SMA-1B-IT2	1	5	5	4	0.888	0.860	0.150	0.535	0.527	0.059
	2	5	5		0.802			0.535		
	3	5	5		1.066			0.590		
	4	5	5		0.654			0.429		
	5	5	4		0.890			0.546		
SMA-1B-IT3	1	5	5	0	0.926	0.748	0.140	0.569	0.499	0.066
	2	5	5		0.695			0.480		
	3	5	5		0.741			0.496		
	4	5	5		0.826			0.551		
	5	5	5		0.554			0.401		
SMA-2C-IT3	1	5	5	0	0.788	0.746	0.032	0.499	0.514	0.033
	2	5	5		0.704			0.477		
	3	5	5		0.729			0.565		
	4	5	5		0.761			0.513		
	5	5	5		0.746			0.515		
SMA-2C-IT6	1	5	5	4	0.608	0.782	0.099	0.362	0.466	0.067
	2	5	5		0.801			0.506		
	3	5	5		0.839			0.438		
	4	5	5		0.831			0.530		
	5	5	4		0.832			0.493		
SMA-2C-IT9	1	5	5	0	0.574	0.695	0.098	0.375	0.429	0.040
	2	5	5		0.844			0.482		
	3	5	5		0.678			0.429		
	4	5	5		0.708			0.449		
	5	5	5		0.670			0.412		

Table 3-6. Water Quality Summary for *Neanthes arenaceodentata*

Treatment	Dissolved Oxygen (mg/L) ≥4.6 mg/L			Temperature (°C) 20 ± 1°C			Salinity (ppt) 28 ± 2 ppt			pH 7 - 9 units		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Control	7.4	6.6	7.8	19.7	19.3	20.4	28	27	29	7.8	7.7	8.0
CARR-20	7.2	6.6	7.7	19.9	19.6	20.6	28	28	29	7.8	7.6	8.0
CR-21	6.6	5.5	7.4	19.8	19.4	20.5	28	27	29	7.7	7.4	7.9
SMA-1B-IT2	7.5	7.1	7.7	20.0	19.7	20.6	28	28	29	8.0	7.8	8.1
SMA-1B-IT3	7.4	7.0	7.7	19.9	19.5	20.4	28	27	29	8.0	7.8	8.1
SMA-2C-IT3	7.5	7.2	7.7	19.6	19.3	20.1	28	27	28	7.9	7.8	8.0
SMA-2C-IT6	7.3	6.6	7.7	19.9	19.5	20.5	28	27	28	7.8	7.6	7.9
SMA-2C-IT9	7.4	7.1	7.7	20.0	19.7	20.6	28	28	29	7.8	7.7	8.0

Table 3-7. Ammonia Summary for *Neanthes arenaceodentata*

Treatment	Overlying Ammonia (mg/L Total) [1]NOEC = 173 mg/L		Interstitial Ammonia (mg/L Total) [1]NOEC = 173 mg/L	
	Day 0	Day 20	Day 0	Day 20
Control	0.00	1.17	0.00	1.79
CARR-20	0.410	1.36	3.21	NM
CR-21	0.304	7.50	NM	NM
SMA-1B-IT2	0.585	0.420	8.75	NM
SMA-1B-IT3	0.622	0.326	NM	NM
SMA-2C-IT3	0.282	1.84	NM	NM
SMA-2C-IT6	0.00	2.77	0.096	NM
SMA-2C-IT9	0.00	1.44	0.296	1.81

[1]NOEC (concurrent reference-toxicant test derived) = 173 mg/L total ammonia
NM = not measured; insufficient porewater recovered for analysis

Table 3-8. Sulfide Summary for *Neanthes arenaceodentata*

Treatment	Overlying Sulfides (mg/L Total) [1]Trigger Value = 3.4 mg/L		Interstitial Sulfides (mg/L Total) [1]Trigger Value = 3.4 mg/L	
	Day 0	Day 20	Day 0	Day 20
Control	0.008	0.001	ND	0.020
CARR-20	0.014	0.000	0.012	ND
CR-21	0.017	0.003	ND	0.070
SMA-1B-IT2	0.007	0.000	0.240	NM
SMA-1B-IT3	0.011	0.000	NM	NM
SMA-2C-IT3	0.009	0.001	0.110	NM
SMA-2C-IT6	0.008	0.003	0.130	ND
SMA-2C-IT9	0.004	0.001	0.310	0.000

[1]Kendall and Barton 2004

ND = not detected; measurement below detection limit

NM = not measured; insufficient porewater recovered for analysis

Table 3-9. Test Condition Summary for *Neanthes arenaceodentata*

Test Conditions: PSEP *N. arenaceodentata*		
Date sampled	September 6 – 19, 2018	
Date received	September 6 – 19, 2018	
Test dates	October 3 – 23, 2018	
Sample storage conditions	4°C, dark	
Days of holding Recommended: ≤8 weeks (56 days)	14 – 27 days	
Source of control sediment	Yaquina Bay, OR	
Test Species	*Neanthes arenaceodentata*	
Supplier	Aquatic Toxicology Support	
Date acquired	September 28, 2018	
Age class	Juvenile; 23 - 28 Days post emergence	
Test Procedures	PSEP 1995 with SMARM revisions, SCUM II (2017) SOP No. SED009.08	
Test location	EcoAnalysts Port Gamble Laboratory	
Test type/duration	20-Day static renewal	
Control water	North Hood Canal seawater, 0.45µm filtered	
Test dissolved oxygen	Recommended: > 4.6 mg/L	Observed: 5.5 – 7.8 mg/L
Test temperature	Recommended: 20 ± 1 °C	Observed: 19.3 – 20.6 °C
Test Salinity	Recommended: 28 ± 2 ppt	Observed: 27 – 29 ppt
Test pH	Recommended: 7 - 9	Observed: 7.4 – 8.1
Initial biomass	Recommended: 0.5 - 1.0 mg Minimum: 0.25 mg	0.859 mg (dry weight) 0.760 mg (AFDW)
Control Performance Standard	Recommended: Control < 10% mortality	Observed: 0% Pass
	Recommended: ≥ 0.72 mg/ind/day Minimum: ≥ 0.38 mg/ind/day (as Dry Weight)	Observed: 0.808 mg/ind/day; Pass
Reference performance standard (SMS)	Recommended: Mortality ≤20% $MIG_{Reference}/MIG_{Control} \geq 0.80$	0 – 8%; Pass 1.039 – 1.044; Pass
Reference Toxicant LC_{50} (total ammonia)	LC_{50} = 197.3 mg/L	
Mean; Acceptable Range (total ammonia)	174.9; 122.5 – 249.6 mg/L	
NOEC (total ammonia)	173 mg/L	
NOEC (unionized ammonia)	2.059 mg /L	
Test Lighting	50 – 100 foot candles	
Test chamber	1-Liter Glass Chamber	
Replicates/treatment	5 + 2 surrogates (one used for WQ measurements throughout the test)	
Organisms/replicate	5	
Exposure volume	175 mL sediment/ 775 mL water	
Feeding	40 mg/jar every other day (8 mg/ind every other day)	
Water renewal	Water renewed every third day (1/3 volume of exposure chamber)	
Deviations from Test Protocol	None	

3.3 Larval Development Bioassay

The larval development test with *M. galloprovincialis* was validated by 0.977 proportion normal survivorship, defined as the mean number of normal larvae within the control divided by the stocking density. This value was within both the SMS acceptability criteria of ≥0.70. A summary of the test results for all samples is shown in Table 3-10. Summaries of water quality measurements, ammonia and sulfide concentrations, and test conditions are presented in, Table 3-11, Table 3-12, and Table 3-13.

Mean normal survival of the reference sediments were between 0.894 and 0.920 of the control response, which met the SMS reference acceptability criteria (N_R/N_C) of ≥0.65. This is defined as the number of normal larvae in the reference sample(s) divided by the number of normal larvae in the control. The test mean chamber stocking density (measured at test initiation) was 33.6 embryos/mL and was within the test objective of 20 – 40 embryos/mL.

Water quality parameters were within acceptable limits throughout the duration of the test.

A reference-toxicant test (positive control) was performed on the batch of test organisms utilized for this study. The LC_{50} value was within control chart limits (±2 standard deviations from the laboratory historical mean). This result indicates that the test organisms used in this study were of similar sensitivity to those previously tested at EcoAnalysts.

Ammonia concentrations observed in the *M. galloprovincialis* test were below the No Observed Effect Concentration (NOEC) value derived from the concurrent ammonia reference-toxicant test (Table 3-12; compare to NOEC 6.0 mg/L total ammonia). Initial sulfide concentrations were below the trigger value of 0.009 mg/L total sulfides, derived from hydrogen sulfide dissociation (0.0025 mg/L H_2S) and mean water quality data (Inouye 2015). This indicates that ammonia and sulfide concentrations within the sediment samples should not have contributed to any adverse biological effects observed in the test treatments.

Table 3-10. Test Results for *Mytilus galloprovincialis*

Treatment	Rep	Number Normal	Number Abnormal	Mean # Normal (N)	Std. Dev.	Control Normal Survival N_C/I	Reference Normal Survival Relative to Control N_R/N_C	Performance Standard
Control	1	345	14	333.2	15.6	0.977		≥0.70; Meets Criterion
	2	343	11					
	3	344	11					
	4	310	7					
	5	324	12					
CARR-20	1	250	8	297.8	33.7		0.894	≥0.65; Meets Criterion
	2	332	5					
	3	294	6					
	4	285	14					
	5	328	9					
CR-21	1	264	11	310.4	32.6		0.920	≥0.65; Meets Criterion
	2	352	7					
	3	298	7					
	4	325	6					
	5	313	12					
SMA-1B-IT2	1	337	6	302.2	25.2	See Section 4.3 for Larval Test Suitability Determination		
	2	274	5					
	3	316	6					
	4	300	3					
	5	284	5					
SMA-1B-IT3	1	318	6	320.4	13.6			
	2	299	8					
	3	336	10					
	4	324	11					
	5	325	4					
SMA-2C-IT3	1	305	10	313.8	21.0			
	2	342	13					
	3	305	8					
	4	289	4					
	5	328	10					
SMA-2C-IT6	1	286	8	303.6	21.0			
	2	318	10					
	3	286	5					
	4	333	5					
	5	295	11					
SMA-2C-IT9	1	287	11	293.2	9.0			
	2	291	14					
	3	283	7					
	4	304	9					
	5	301	9					
SMA-1-ST	1	266	9	277.8	18.1			
	2	289	11					
	3	304	2					
	4	269	13					
	5	261	7					

Treatment	Rep	Number Normal	Number Abnormal	Mean # Normal (N)	Std. Dev.	Control Normal Survival N_C/I	Reference Normal Survival Relative to Control N_R/N_C	Performance Standard
SMA-1A-IT	1	328	4	307.6	18.7			
	2	292	13					
	3	328	10					
	4	297	10					
	5	293	11					
SMA-2A-IT	1	323	6	317.6	18.9			
	2	287	5					
	3	313	7					
	4	333	4					
	5	332	10					
SMA-2A-ST	1	275	14	304.2	25.3			
	2	336	11					
	3	285	6					
	4	303	8					
	5	322	6					
SMA-2B-IT	1	280	7	298.0	20.3			
	2	297	10					
	3	318	4					
	4	276	10					
	5	319	10					
SMA-2B-ST	1	320	8	301.2	16.1			
	2	302	12					
	3	277	7					
	4	310	5					
	5	297	2					
BW-15	1	268	10	294.4	29.3			
	2	287	30					
	3	340	21					
	4	305	16					
	5	272	19					

I = Mean Initial count (Stocking density); 336

N_C = Mean Control Normal

N_R = Mean Reference Normal

Table 3-11. Water Quality Summary for *Mytilus galloprovincialis*

Treatment	Dissolved Oxygen (mg/L) ≥5.0 mg/L			Temperature (°C) 16± 1°C			Salinity (ppt) 28 ± 1 ppt			pH 7 - 9 units		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Control	7.6	7.5	7.7	16.7	16.5	16.9	28	28	28	7.8	7.7	7.8
CARR-20	6.8	6.2	7.5	16.6	16.5	16.8	28	28	28	7.7	7.6	7.7
CR-21	6.7	6.5	7.0	16.6	16.4	16.8	28	28	28	7.7	7.6	7.7
SMA-1B-IT2	7.1	6.9	7.3	16.7	16.5	16.8	28	28	28	7.7	7.7	7.7
SMA-1B-IT3	7.2	7.0	7.7	16.8	16.5	17.0	28	28	28	7.7	7.7	7.7
SMA-2C-IT3	7.2	7.1	7.5	16.6	16.4	16.9	28	28	28	7.7	7.7	7.7
SMA-2C-IT6	7.4	7.2	7.6	16.8	16.4	17.0	28	27	28	7.7	7.7	7.8
SMA-2C-IT9	7.6	7.4	7.7	16.6	16.5	16.7	28	28	28	7.8	7.7	7.8
SMA-1-ST	6.3	5.7	6.9	16.8	16.6	16.9	28	28	28	7.7	7.6	7.7
SMA-1A-IT	6.1	5.7	6.7	16.8	16.7	17.0	28	28	28	7.7	7.7	7.7
SMA-2A-IT	6.8	6.4	7.4	16.9	16.7	17.0	28	28	28	7.7	7.7	7.7
SMA-2A-ST	6.7	6.4	7.4	16.7	16.3	17.0	28	28	28	7.7	7.6	7.7
SMA-2B-IT	6.0	5.7	6.5	16.7	16.4	16.8	28	28	28	7.7	7.6	7.7
SMA-2B-ST	7.1	6.9	7.4	16.7	16.5	16.9	28	28	28	7.7	7.7	7.7
BW-15	6.6	6.1	7.4	16.6	16.3	16.8	28	28	28	7.7	7.6	7.7

Table 3-12. Ammonia and Sulfide Summary for *Mytilus galloprovincialis*

Treatment	Overlying Ammonia (mg/L Total) [1]NOEC = 6.0 mg/L		Overlying Sulfides (mg/L Total) [2]Trigger Value = 0.009 mg/L	
	Day 0	Final (Day 2)	Day 0	Final (Day 2)
Control	0.00	0.00	ND	0.002
CARR-20	0.00	0.00	0.008	0.005
CR-21	0.00	0.00	0.004	0.002
SMA-1B-IT2	0.00	0.00	ND	0.007
SMA-1B-IT3	0.00	0.00	0.002	0.003
SMA-2C-IT3	0.00	0.00	0.001	ND
SMA-2C-IT6	0.00	0.00	ND	0.003
SMA-2C-IT9	0.00	0.00	0.000	ND
SMA-1-ST	0.00	0.00	0.005	0.003
SMA-1A-IT	0.00	0.00	ND	0.001
SMA-2A-IT	0.00	0.00	ND	0.002
SMA-2A-ST	0.00	0.00	ND	0.001
SMA-2B-IT	0.00	0.00	0.004	0.006
SMA-2B-ST	0.00	0.00	0.007	ND
BW-15	0.00	0.00	0.005	0.004

[1]NOEC (concurrent reference-toxicant test derived) = 6.0 mg/L total ammonia

[2]Inouye 2015: Total sulfide value 0.009 mg/L derived from hydrogen sulfide dissociation (0.0025 mg/L H_2S @ 16°C, 28 ppt, and 7.7 pH)

ND = Non-detect

Table 3-13. Test Condition Summary for *Mytilus galloprovincialis*

Test Conditions: PSEP *M. galloprovincialis*		
Date sampled	September 6 – 19, 2018	
Date received	September 6 – 19, 2018	
Test dates	October 3 – 5, 2018	
Sample storage conditions	4°C, dark	
Holding time Recommended: < 8 weeks (56 days)	14 – 27 Days	
Test Species	*Mytilus galloprovincialis*	
Supplier	Taylor Shellfish, Shelton, Wa	
Date acquired	October 2, 2018	
Age class	<4-h old embryos	
Test Procedures	PSEP 1995 with SMARM revisions, SCUM II (2017) SOP No. SED005.06	
Test location	EcoAnalysts Port Gamble Laboratory	
Test type/duration	48-60 Hour static test (Actual: 48.5 hours)	
Control water	North Hood Canal sea water, 0.45µm filtered	
Test dissolved oxygen	Recommended: >5.0 mg/L	Observed: 5.7 – 7.7 mg/L
Test temperature	Recommended: 16 ± 1 °C	Observed: 16.3 – 17.0 °C
Test Salinity	Recommended: 28 ± 1 ppt	Observed: 27 – 28 ppt
Test pH	Recommended: 7 - 9	Observed: 7.6 – 7.8
Stocking Density	Recommended: 20 – 40 embryos/mL	Observed: 33.6 embryos/mL
Control performance standard (SMS)	Recommended: Control normal survival ≥ 0.70	Observed: 0.977 Pass
Reference performance standard (SMS)	Recommended: Reference normal survival relative to control ≥ 0.65	Observed: 0.894 – 0.920; Pass
Reference Toxicant	Total Ammonia	Unionized Ammonia
Reference Toxicant EC_{50} (total ammonia)	EC_{50} = 8.20 mg/L	EC_{50} = 0.106 mg/L
Mean; Acceptable Range (total ammonia)	6.81; 3.38 – 13.71 mg/L	0.111; 0.049 – 0.252 mg/L
NOEC Combined proportion normal (total ammonia)	6.0 mg/L	0.086 mg /L
Test Lighting	50 – 100 foot candles	
Test chamber	1-Liter Glass Chamber	
Replicates/treatment	5 + 1 surrogate (used for WQ measurements throughout the test)	
Exposure volume	18 g sediment/ 900 mL water	
Feeding	None	
Water renewal	None	
Deviations from Test Protocol	None	

4. DISCUSSION

Sediments were evaluated based on Sediment Management Standards (SMS) criteria. The biological criteria are based on both statistical significance (a statistical comparison) and the degree of biological response (a numerical comparison). The SMS criteria are derived from the Washington Department of Ecology's Sediment Cleanup User's Manual II (SCUM II; WDOE 2017). Comparisons were made for each treatment against the reference sample. Two numerical comparisons were made under SMS, the Sediment Cleanup Objective (SCO) and the Cleanup Screening Level (CSL).

4.1 Amphipod Test Suitability Determination

Under the SMS program, a treatment will fail SCO if mean mortality in the test sediment relative to the reference sediment is >25% and the difference between mean mortality in the treatment compared to mean mortality in the reference is statistically significant ($p < 0.05$). Treatments fail the CSL if mean mortality in the test treatment >30% relative to the reference sediment and the difference is statistically significant.

Project sediments from the Port Gamble Bay restoration site do not fail the SCO and CSL criteria for the amphipod test as shown in Table 4-1.

Table 4-1. SMS Comparison for *Eohaustorius estuarius*

Treatment	Mean Mortality (%)	Compared To:	Statistically Different than Reference? (P=0.05)	Mortality Comparison to Reference M_T-M_R (%)	Fails SCO?[1] > 25 %	Fails CSL?[2] > 30 %
Control	4					
CARR-20	4					
CR-21	2					
SMA-1B-IT2	7					
SMA-1B-IT3	15	CR-21	No	13	No	No
SMA-2C-IT3	10	CR-21	No	8	No	No
SMA-2C-IT6	1	CR-21	No	1	No	No
SMA-2C-IT9	4	CR-21	No	2	No	No

[1]SCO: Statistical Significance and M_T >25%
[2]CSL: Statistical Significance and M_T-M_R >30%
M_T = Treatment Mortality
M_R = Reference Mortality

4.2 Juvenile Polychaete Test Suitability Determination

Suitability determinations for the juvenile polychaete test were based on mean individual growth (MIG). A test treatment fails SCO criteria if MIG is statistically lower in the test treatment, relative to the reference, and the ratio of the MIG in the test treatment is <0.70 that of the reference. The treatments will fail CSL criteria if the MIG is significantly lower than the reference treatment and the ratio between the MIG of the treatment and the MIG of the reference is <0.50.

All Port Gamble Bay project sediments pass the SCO and CSL criteria when evaluated on a dry weight and AFDW basis (Table 4-2).

Table 4-2. SMS Comparison for *Neanthes arenaceodentata*

Treatment	MIG (mg/ind/day)	Comparison To:	Statistically Less than Reference? (p=0.05)	MIG Relative to Reference MIG_T/MIG_R	Fails SCO?[1] < 0.70	Fails CSL?[2] < 0.50
Dry Weight						
Control	0.808					
CARR-20	0.840					
CR-21	0.735					
SMA-1B-IT2	0.860	CR-21	No	1.17	No	No
SMA-1B-IT3	0.748	CR-21	No	1.02	No	No
SMA-2C-IT3	0.746	CR-21	No	1.01	No	No
SMA-2C-IT6	0.782	CR-21	No	1.06	No	No
SMA-2C-IT9	0.695	CR-21	No	0.95	No	No
Ash-Free Dry Weight						
Control	0.455					
CARR-20	0.475					
CR-21	0.473					
SMA-1B-IT2	0.527	CR-21	No	1.11	No	No
SMA-1B-IT3	0.499	CR-21	No	1.06	No	No
SMA-2C-IT3	0.514	CR-21	No	1.09	No	No
SMA-2C-IT6	0.466	CR-21	No	0.98	No	No
SMA-2C-IT9	0.429	CR-21	No	0.91	No	No

[1]SCO: Statistical Significance and MIG_T/MIG_R <0.70
[2]CSL: Statistical Significance and MIG_T/MIG_R <0.50
MIG_T = Treatment Mean Individual Growth
MIG_R = Reference Mean Individual Growth

4.3 Larval Test Suitability Determination

Larval test treatments fail SCO criteria if the number of normal larvae in the test treatment is significantly lower ($p < 0.10$) than that of the reference and if the ratio between the normal larval development in the test treatment is less than 0.85 of the normal development in the reference. Treatments fail CSL criteria if the number of normal larvae in the test treatment is significantly lower ($p < 0.10$) than that of the reference and if the ratio between the normal larval development in the test treatment is less than 0.70 of the normal development in the reference.

All Port Gamble Bay project sediments pass both the SCO and CSL criteria for larval bivalve development evaluation (Table 4-3).

Table 4-3. SMS Comparison for *Mytilus galloprovincialis*

Treatment	Mean Normal Survival (%)[1]	Mean Number Normal	Compared To:	Statistically Less than Reference? (p=0.10)	Normal Survival to Reference N_T/N_R	Fails SCO?[2] <0.85	Fails CSL?[3] <0.70
Control	97.7	333.2					
CARR-20	89.4	297.8					
CR-21	92.0	310.4					
SMA-1B-IT2	90.5	302.2	CR-21	No	0.97	No	No
SMA-1B-IT3	96.0	320.4	CR-21	No	1.03	No	No
SMA-2C-IT3	93.6	313.8	CR-21	No	1.01	No	No
SMA-2C-IT6	91.1	303.6	CR-21	No	0.98	No	No
SMA-2C-IT9	88.0	293.2	CR-21	No	0.94	No	No
SMA-1-ST	83.4	277.8	CR-21	Yes	0.89	No	No
SMA-1A-IT	92.3	307.6	CR-21	No	0.99	No	No
SMA-2A-IT	95.3	317.6	CR-21	No	1.02	No	No
SMA-2A-ST	91.1	304.2	CR-21	No	0.98	No	No
SMA-2B-IT	89.4	298.0	CR-21	No	0.96	No	No
SMA-2B-ST	90.4	301.2	CR-21	No	0.97	No	No
BW-15	87.9	294.4	CARR-20	No	0.99	No	No

[1] Control data is normalized to the stocking density; reference and project treatments are normalized to the control

[2] SCO: Statistical Significance and (N_T/N_R) <0.85

[3] CSL: Statistical Significance and (N_T/N_R) <0.70

N_T =Treatment Mean Number Normal

N_R =Reference Mean Number Normal

N_C =Control Mean Number Normal

5. SUMMARY

A summary of the biological tests conducted on the Port Gamble Bay restoration site sediments evaluated under the SMS sediment quality criteria (Table 5-1) are provided below.

All project sediments pass the SCO and CSL performance criteria for all tests performed on the Port Gamble Bay restoration site sediments.

Table 5-1. Summary of SMS Evaluation

Treatment	Sediment Cleanup Objectives			Cleanup Screening Levels		
	Amphipod	Polychaete	Larval	Amphipod	Polychaete	Larval
SMA-1B-IT2	Pass	Pass	Pass	Pass	Pass	Pass
SMA-1B-IT3	Pass	Pass	Pass	Pass	Pass	Pass
SMA-2C-IT3	Pass	Pass	Pass	Pass	Pass	Pass
SMA-2C-IT6	Pass	Pass	Pass	Pass	Pass	Pass
SMA-2C-IT9	Pass	Pass	Pass	Pass	Pass	Pass
SMA-1-ST			Pass			Pass
SMA-1A-IT			Pass			Pass
SMA-2A-IT			Pass			Pass
SMA-2A-ST			Pass			Pass
SMA-2B-IT			Pass			Pass
SMA-2B-ST			Pass			Pass
BW-15			Pass			Pass

*Shaded cells represent tests not conducted as part of the test design

6. REFERENCES

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APPENDIX A. TEST AND REFERENCE TOXICANT TEST RESULTS

1. *Eohaustorius estuarius* 10-Day Test

ECO ANALYSTS

10 DAY SOLID PHASE TEST DATA

CLIENT	PROJECT	JOB N0.	PROJECT MAN.	LABORATORY	PROTOCOL	SPECIES
Anchor QEA	Port Gamble Monitoring	PG1123	Brian Hester	Port Gamble /	PSEP 1995	*Eohaustorius estuarius*

ENDPOINT DATA & OBSERVATIONS

#S= Number on the Surface
#M= Number of Mortality
L=Anoxic Surface
F=Fungal Patches
D=No Air Flow (DO?)
U=Excess food
N=Normal
B=No Burrows

INITIAL # OF ORGANISMS: 20

Sample ID	REP	JAR #	INITIAL #	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10	NUMBER REMAINING
				DATE 10/10/18	DATE 10/11	DATE 10/12	DATE 10/13	DATE 10/14	DATE 10/15	DATE 10/16	DATE 10/17	DATE 10/18	DATE 10/19	
				TECHNICIAN LD	TECHNICIAN SW	TECHNICIAN RG	TECHNICIAN MK	TECHNICIAN MK	TECHNICIAN SW	TECHNICIAN SW	TECHNICIAN SW	TECHNICIAN MK	TECHNICIAN SW	
				OBSERVNS.	OBSERVNS.	OBSERVNS.	OBSERVNS.	OBSERVNS.	OBSERVNS.	OBSERVNS.	OBSERVNS.	OBSERVNS.	OBSERVNS.	
Control /	1			N	N	N	N	N	N	N	N	N	N	19
	2			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	19
	3			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	20
	4			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	18
	5			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	20
CARR-20 /	1			N	N	N			N	N	N		N	18
	2			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	20
	3			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	19
	4			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	20
	5			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	19
CR-21 /	1			5S	4S	N			N	N	N		N	20
	2			N	N	↓	↓	↓	↓	↓	↓	↓	↓	19
	3			↓	N	↓	↓	↓	↓	↓	↓	↓	↓	20
	4			↓	2S	↓	↓	↓	↓	↓	↓	↓	↓	20
	5			↓	N	↓	↓	↓	↓	↓	↓	↓	↓	19
SMA-1B-IT2 /	1			N	N	N			N	N	N		N	15
	2			↓	↓	1S	↓	↓	↓	↓	↓	↓	↓	19
	3			↓	↓	N	↓	↓	↓	↓	↓	↓	↓	19
	4			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	20
	5			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	20

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10 DAY SOLID PHASE TEST DATA

CLIENT	PROJECT	JOB N0.	PROJECT MAN.	LABORATORY	PROTOCOL	SPECIES
Anchor QEA	Port Gamble Monitoring	PG1123	Brian Hester	Port Gamble /	PSEP 1995	*Eohaustorius estuarius*

ENDPOINT DATA & OBSERVATIONS

#S= Number on the Surface
#M= Number of Mortality
L=Anoxic Surface
F=Fungal Patches
D=No Air Flow (DO?)
U=Excess food
N=Normal
B=No Burrows

INITIAL # OF ORGANISMS: 20

Sample ID	REP	JAR #	INITIAL #	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10	NUMBER REMAINING
				DATE 10/10/18	DATE 10/11	DATE 10/12	DATE 10/13	DATE 10/14	DATE 10/15	DATE 10/16	DATE 10/17	DATE 10/18	DATE 10/19	
				TECHNICIAN VB	TECHNICIAN SW	TECHNICIAN RE	TECHNICIAN MK	TECHNICIAN MK	TECHNICIAN SW	TECHNICIAN SW	TECHNICIAN SW	TECHNICIAN MK	TECHNICIAN SW	
				OBSERVNS.	OBSERVNS.	OBSERVNS.	OBSERVNS.	OBSERVNS.	OBSERVNS.	OBSERVNS.	OBSERVNS.	OBSERVNS.	OBSERVNS.	
SMA-1B-IT3 /	1			N	2 S	N	N	N	N	N	N	N	N	16, 1M
	2			↓	2	↓	1S	↓	1S	2	↓	↓	↓	16 2m
	3			↓	↓	↓	2	↓	2	1S	↓	↓	↓	16 1m
	4			↓	↓	↓	↓	↓	↓	2	↓	↓	↓	19
	5			↓	↓	↓	↓	↓	↓	2	1S	↓	↓	18 1m
SMA-2C-IT3 /	1			1S	2	2	↓	↓	2	2	2	↓	2	18 1m
	2			2	2	↓	↓	1S	↓	↓	2	↓	↓	17
	3			↓	1S	↓	↓	2	↓	↓	1S	↓	↓	17 1m
	4			↓	2	↓	↓	↓	↓	↓	2	↓	↓	20
	5			↓	2	↓	↓	↓	↓	↓	2	↓	↓	18, 1M
SMA-2C-IT6 /	1			2	2	2	↓	↓	2	2	2	↓	2	20
	2			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	20
	3			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	20
	4			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	20
	5			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	19
SMA-2C-IT9 /	1			2	2	2	↓	↓	2	2	2	↓	2	17
	2			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	20
	3			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	19
	4			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	20
	5			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	20

ECO ANALYSTS

10 DAY SOLID PHASE TEST DATA

CLIENT	PROJECT	SPECIES	TEST START DATE	TEST START DATE	TEST END DATE
Anchor QEA	Port Gamble Monitoring	*Eohaustorius estuarius*	Port Gamble	09Oct18	19Oct18
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**DILUTION WATER BATCH**	**PROTOCOL**	
PG1123	Brian Hester	Port Gamble /	FSW100518.01	PSEP 1995	

WATER QUALITY DATA

TEST CONDITIONS			D.O. (mg/L) >5.1		TEMP (°C) 15 ± 1		SALINITY (ppt) 28 ± 2		pH (pH units) 7 - 9		TECH.	Date
SAMPLE ID	DAY	REP	D.O.		TEMP		SALINITY		pH			
			meter	mg/L	meter	°C	meter	ppt	meter	unit		
Control /	0	1	8	8.3	8	15.3	8	27	8	8.0	MK	10/9/18
Control /	0	2	↓	8.4	↓	15.2	↓	27	↓	8.0	↓	↓
Control /	0	3		8.3		15.7		27		8.0		
Control /	0	4		8.4		15.2		27		8.0		
Control /	0	5	↓	8.3	↓	15.3	↓	27	↓	8.0	↓	↓
Control /	1	Surr	8	8.3	8	15.3	8	28	8	7.8	MS	10/10
Control /	2	Surr	8	8.2	8	15.4	8	28	8	7.9	MASEN	10/11
Control /	3	Surr	8	8.1	8	15.5	8	28	8	7.9	RE	10/12
Control /	4	Surr	8	① ~~8.0~~ 8.5	8	15.1	8	28	8	8.0	MK	10/13
Control /	5	Surr	8	8.4	8	15.3	8	28	8	8.0	MK	10/14
Control /	6	Surr	8	8.4	8	15.2	8	27	8	7.9	SW	10/15
Control /	7	Surr	8	8.4	8	15.2	8	27	8	8.0	SW	10/16
Control /	8	Surr	8	8.4	8	15.2	8	27	8	7.9	SW	10/17
Control /	9	Surr	8	8.5	8	15.1	8	28	8	7.9	JL	10/18
Control /	10	1	8	8.3	8	15.4	8	27	8	8.0	MK	10/19
Control /	10	2	↓	8.3	↓	15.2	↓	28	↓	8.0	↓	↓
Control /	10	3		8.3		15.5		28		8.0		
Control /	10	4		8.3		15.4		28		8.0		
Control /	10	5	↓	8.3	↓	15.3	↓	27	↓	8.0	↓	↓

① WC. MK 10/13.

ECO ANALYSTS

10 DAY SOLID PHASE TEST DATA

CLIENT	PROJECT	SPECIES	TEST START DATE	TEST START DATE	TEST END DATE
Anchor QEA	Port Gamble Monitoring	*Eohaustorius estuarius*	Port Gamble	09Oct18	19Oct18
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**DILUTION WATER BATCH**	**PROTOCOL**	
PG1123	Brian Hester	Port Gamble /	FSW100518.01	PSEP 1995	

WATER QUALITY DATA

TEST CONDITIONS			D.O. (mg/L) >5.1		TEMP (°C) 15 ± 1		SALINITY (ppt) 28 ± 2		pH (pH units) 7 - 9		TECH.	Date
SAMPLE ID	DAY	REP	D.O.		TEMP		SALINITY		pH			
			meter	mg/L	meter	°C	meter	ppt	meter	unit		
CARR-20 /	0	1	8	8.4	8	15.1	8	27	8	8.0	MK	① 08/ 10/9/18
CARR-20 /	0	2		8.4		15.2		27		8.0		
CARR-20 /	0	3		8.2		15.4		27		8.0		
CARR-20 /	0	4		8.3		15.4		27		8.0		
CARR-20 /	0	5	↓	8.3	↓	15.4	↓	27	↓	8.0	↓	↓
CARR-20 /	1	Surr	8	8.3	8	15.5	8	28	8	7.8	WS	10/10
CARR-20 /	2	Surr	8	8.6	8	15.8	8	28	8	7.9	MARK	10/11
CARR-20 /	3	Surr	8	8.2	8	15.6	8	28	8	7.9	RE	10/12
CARR-20 /	4	Surr	8	8.5	8	15.2	8	28	8	8.0	MK	10/13
CARR-20 /	5	Surr	8	8.3	8	15.4	8	28	8	8.0	MK	10/14
CARR-20 /	6	Surr	8	8.3	8	15.4	8	27	8	8.0	SW	10/15
CARR-20 /	7	Surr	8	8.2	8	15.4	8	27	8	8.0	SW	10/16
CARR-20 /	8	Surr	8	8.3	8	15.3	8	27	8	8.0	SW	10/17
CARR-20 /	9	Surr	8	8.3	8	15.2	8	27	8	8.0	JL	10/18
CARR-20 /	10	1	8	8.0	8	15.6	8	27	8	8.2	JL	10/19
CARR-20 /	10	2		8.3		15.4		28		8.2		
CARR-20 /	10	3		8.2		15.5		27		8.2		
CARR-20 /	10	4		8.3		15.5		27		8.1		
CARR-20 /	10	5	↓	8.3	↓	15.4	↓	28	↓	8.2	↓	↓

① WC. MK 10/9.

ECO ANALYSTS

10 DAY SOLID PHASE TEST DATA

CLIENT	PROJECT	SPECIES	TEST START DATE	TEST START DATE	TEST END DATE
Anchor QEA	Port Gamble Monitoring	*Eohaustorius estuarius*	Port Gamble	09Oct18	19Oct18
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**DILUTION WATER BATCH**	**PROTOCOL**	
PG1123	Brian Hester	Port Gamble /	FSW100518.01	PSEP 1995	

WATER QUALITY DATA

TEST CONDITIONS			D.O. (mg/L) >5.1		TEMP (°C) 15 ± 1		SALINITY (ppt) 28 ± 2		pH (pH units) 7 - 9		TECH.	Date
SAMPLE ID	DAY	REP	D.O.		TEMP		SALINITY		pH			
			meter	mg/L	meter	°C	meter	ppt	meter	unit		
CR-21 /	0	1	8	8.3	8	15.3	8	27	8	8.0	MK	10/9/18
CR-21 /	0	2		8.1		15.2		27		7.6		
CR-21 /	0	3		8.3		15.5		27		7.9		
CR-21 /	0	4		8.2		15.2		27		7.8		
CR-21 /	0	5		8.3		15.3		27		8.0		
CR-21 /	1	Surr	8	8.4	8	15.1	8	28	8	7.9	WS	10/10
CR-21 /	2	Surr	8	8.3	8	15.4	8	28	8	8.0	MARK	10/11
CR-21 /	3	Surr	8	8.2	8	15.4	8	28	8	7.9	RE	10/12
CR-21 /	4	Surr	8	8.4	8	15.1	8	28	8	8.1	MK	10/13
CR-21 /	5	Surr	8	8.1	8	15.3	8	28	8	8.2	MK	10/14
CR-21 /	6	Surr	8	8.3	8	15.3	8	28	8	8.2	SW	10/15
CR-21 /	7	Surr	8	8.3	8	15.3	8	28	8	8.3	SW	10/16
CR-21 /	8	Surr	8	8.2	8	15.2	8	28	8	8.3	SW	10/17
CR-21 /	9	Surr	8	8.3	8	15.1	8	28	8	8.3	JL	10/18
CR-21 /	10	1	8	8.3	8	15.5	8	27	8	8.3	KL	10/19
CR-21 /	10	2		8.3		15.4		28		8.4		
CR-21 /	10	3		8.2		15.2		28		8.4		
CR-21 /	10	4		8.3		15.3		28		8.3		
CR-21 /	10	5		8.3		15.4		28		8.3		

ECO ANALYSTS

10 DAY SOLID PHASE TEST DATA

CLIENT	PROJECT	SPECIES	TEST START DATE	TEST START DATE	TEST END DATE
Anchor QEA	Port Gamble Monitoring	*Eohaustorius estuarius*	Port Gamble	09Oct18	19Oct18
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**DILUTION WATER BATCH**	**PROTOCOL**	
PG1123	Brian Hester	Port Gamble /	FSW100518.01	PSEP 1995	

WATER QUALITY DATA

TEST CONDITIONS			D.O. (mg/L) >5.1		TEMP (°C) 15 ± 1		SALINITY (ppt) 28 ± 2		pH (pH units) 7 - 9		TECH.	Date
SAMPLE ID	DAY	REP	D.O.		TEMP		SALINITY		pH			
			meter	mg/L	meter	°C	meter	ppt	meter	unit		
SMA-1B-IT2 /	0	1	B	7.8	B	15.4	B	27	B	7.9	MK	10/9/18
SMA-1B-IT2 /	0	2	↓	8.3	↓	15.4	↓	27	↓	8.0	↓	↓
SMA-1B-IT2 /	0	3		8.4		15.3		27		8.0		
SMA-1B-IT2 /	0	4		8.4		15.2		27		8.0		
SMA-1B-IT2 /	0	5	↓	8.1	↓	15.4	↓	27	↓	8.0	↓	↓
SMA-1B-IT2 /	1	Surr	8	8.4	8	15.4	8	27	8	7.8	WB	10/10
SMA-1B-IT2 /	2	Surr	8	8.3	8	15.6	8	28	8	8.0	MAH	10/11
SMA-1B-IT2 /	3	Surr	8	8.4	8	15.4	8	28	8	7.9	RE	10/12
SMA-1B-IT2 /	4	Surr	B	8.5	B	15.2	B	28	B	8.0	MK	10/13
SMA-1B-IT2 /	5	Surr	8	8.5	8	15.3	8	28	8	8.0	MK	10/14
SMA-1B-IT2 /	6	Surr	8	8.4	8	15.3	8	27	8	8.0	SW	10/15
SMA-1B-IT2 /	7	Surr	8	8.3	8	15.3	8	27	8	8.0	SW	10/16
SMA-1B-IT2 /	8	Surr	8	8.5	8	15.3	8	27	8	8.0	SW	10/17
SMA-1B-IT2 /	9	Surr	8	8.5	8	15.3	8	27	8	8.0	JL	10/18
SMA-1B-IT2 /	10	1	8	7.2	8	15.7	8	27	8	8.1	JL	10/19
SMA-1B-IT2 /	10	2	↓	8.3	↓	15.6	↓	27	↓	8.0	↓	↓
SMA-1B-IT2 /	10	3		8.3		15.3		28		8.1		
SMA-1B-IT2 /	10	4		8.3		15.4		27		8.0		
SMA-1B-IT2 /	10	5	↓	8.2	↓	15.3	↓	28	↓	8.1	↓	↓

EcoAnalysts

10 DAY SOLID PHASE TEST DATA

CLIENT	PROJECT	SPECIES	TEST START DATE	TEST START DATE	TEST END DATE
Anchor QEA	Port Gamble Monitoring	*Eohaustorius estuarius*	Port Gamble	09Oct18	19Oct18
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**DILUTION WATER BATCH**	**PROTOCOL**	
PG1123	Brian Hester	Port Gamble /	FSW100518.01	PSEP 1995	

WATER QUALITY DATA

TEST CONDITIONS			D.O. (mg/L) >5.1		TEMP (°C) 15 ± 1		SALINITY (ppt) 28 ± 2		pH (pH units) 7 - 9		TECH.	Date
SAMPLE ID	DAY	REP	D.O.		TEMP		SALINITY		pH			
			meter	mg/L	meter	°C	meter	ppt	meter	unit		
SMA-1B-IT3 /	0	1	8	8.3	8	15.2	8	27	8	8.0	MK	10/9/18
SMA-1B-IT3 /	0	2		8.4		15.2		27		8.0		
SMA-1B-IT3 /	0	3		8.4		15.3		27		8.0		
SMA-1B-IT3 /	0	4		8.3		15.2		27		8.0		
SMA-1B-IT3 /	0	5		8.2		15.4		27		8.0		
SMA-1B-IT3 /	1	Surr	8	8.4	8	15.2	8	28	8	7.9	UB	10/10
SMA-1B-IT3 /	2	Surr	8	8.4	8	15.4	8	28	8	8.0	MARH	10/11
SMA-1B-IT3 /	3	Surr	8	8.2	8	15.5	8	28	8	7.9	RE	10/12
SMA-1B-IT3 /	4	Surr	8	8.5	8	15.2	8	28	8	8.1	MK	10/13
SMA-1B-IT3 /	5	Surr	8	8.5	8	15.2	8	28	8	8.1	MK	10/14
SMA-1B-IT3 /	6	Surr	8	8.4	8	15.2	8	27	8	8.1	SW	10/15
SMA-1B-IT3 /	7	Surr	8	8.2	8	15.3	8	27	8	8.1	SW	10/16
SMA-1B-IT3 /	8	Surr	8	8.4	8	15.2	8	28	8	8.1	SW	10/17
SMA-1B-IT3 /	9	Surr	8	8.5	8	15.1	8	28	8	8.1	JL	10/18
SMA-1B-IT3 /	10	1	8	8.2	8	15.4	8	28	8	8.2	JL	10/19
SMA-1B-IT3 /	10	2		8.3		15.2		27		8.2		
SMA-1B-IT3 /	10	3		8.4		15.2		28		8.3		
SMA-1B-IT3 /	10	4		8.1		15.2		28		8.2		
SMA-1B-IT3 /	10	5		8.3		15.6		27		8.1		

EcoAnalysts

10 DAY SOLID PHASE TEST DATA

CLIENT	PROJECT	SPECIES	TEST START DATE	TEST START DATE	TEST END DATE
Anchor QEA	Port Gamble Monitoring	*Eohaustorius estuarius*	Port Gamble	09Oct18	19Oct18
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**DILUTION WATER BATCH**	**PROTOCOL**	
PG1123	Brian Hester	Port Gamble /	FSW100518.01	PSEP 1995	

WATER QUALITY DATA

TEST CONDITIONS			D.O. (mg/L) >5.1		TEMP (°C) 15 ± 1		SALINITY (ppt) 28 ± 2		pH (pH units) 7 - 9		TECH.	Date
SAMPLE ID	DAY	REP	D.O.		TEMP		SALINITY		pH			
			meter	mg/L	meter	°C	meter	ppt	meter	unit		
SMA-2C-IT3 /	0	1	8	8.3	8	15.3	8	27	8	8.0	MK	10/9/18
SMA-2C-IT3 /	0	2	↓	8.3	↓	15.3	↓	27	↓	8.0	↓	↓
SMA-2C-IT3 /	0	3		8.2		15.4		27		8.0		
SMA-2C-IT3 /	0	4		8.3		15.3		27		8.0		
SMA-2C-IT3 /	0	5		8.3		15.4		27		8.0		
SMA-2C-IT3 /	1	Surr	8	8.3	8	15.3	8	27	8	7.9	WB	10/10
SMA-2C-IT3 /	2	Surr	8	8.4	8	15.4	8	28	8	8.0	MARK	10/11
SMA-2C-IT3 /	3	Surr	8	8.2	8	15.5	8	28	8	7.9	RE	10/12
SMA-2C-IT3 /	4	Surr	8	8.5	8	15.1	8	28	8	8.1	MK	10/13
SMA-2C-IT3 /	5	Surr	8	8.3	8	15.3	8	28	8	8.1	MK	10/14
SMA-2C-IT3 /	6	Surr	8	8.4	8	15.3	8	27	8	8.0	SW	10/15
SMA-2C-IT3 /	7	Surr	8	8.3	8	15.3	8	27	8	8.1	SW	10/16
SMA-2C-IT3 /	8	Surr	8	8.4	8	15.2	8	27	8	8.0	SW	10/17
SMA-2C-IT3 /	9	Surr	8	8.4	8	15.3	8	27	8	7.9	JL	10/18
SMA-2C-IT3 /	10	1	8	8.3	8	15.3	8	27	8	8.2	JL	10/19
SMA-2C-IT3 /	10	2	↓	8.3	↓	15.3	↓	28	↓	8.1	↓	↓
SMA-2C-IT3 /	10	3		8.4		15.3		27		8.2		
SMA-2C-IT3 /	10	4		8.3		15.3		27		8.1		
SMA-2C-IT3 /	10	5		8.2		15.4		27		8.1		

EcoAnalysts

10 DAY SOLID PHASE TEST DATA

CLIENT	PROJECT	SPECIES	TEST START DATE	TEST START DATE	TEST END DATE
Anchor QEA	Port Gamble Monitoring	*Eohaustorius estuarius*	Port Gamble	09Oct18	19Oct18
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**DILUTION WATER BATCH**	**PROTOCOL**	
PG1123	Brian Hester	Port Gamble /	FSW100518.01	PSEP 1995	

WATER QUALITY DATA

TEST CONDITIONS			D.O. (mg/L) >5.1		TEMP (°C) 15 ± 1		SALINITY (ppt) 28 ± 2		pH (pH units) 7 - 9		TECH.	Date
SAMPLE ID	DAY	REP	D.O.		TEMP		SALINITY		pH			
			meter	mg/L	meter	°C	meter	ppt	meter	unit		
SMA-2C-IT6 /	0	1	8	8.3	8	15.3	8	27	8	8.0	MK	10/9/18
SMA-2C-IT6 /	0	2		8.3		15.4		27		8.0		
SMA-2C-IT6 /	0	3		8.3		15.2		27		8.0		
SMA-2C-IT6 /	0	4		8.3		15.4		27		8.0		
SMA-2C-IT6 /	0	5		8.3		15.3		27		8.0		
SMA-2C-IT6 /	1	Surr	8	8.4	8	15.3	8	27	8	7.8	VB	10/10
SMA-2C-IT6 /	2	Surr	8	8.4	8	15.4	8	28	8	7.9	MARU	10/11
SMA-2C-IT6 /	3	Surr	8	8.4	8	15.3	8	28	8	7.9	RE	10/12
SMA-2C-IT6 /	4	Surr	8	8.5	8	15.3	8	28	8	8.0	MK	10/13
SMA-2C-IT6 /	5	Surr	8	8.5	8	15.2	8	28	8	8.0	MK	10/14
SMA-2C-IT6 /	6	Surr	8	8.5	8	15.2	8	27	8	8.0	SW	10/15
SMA-2C-IT6 /	7	Surr	8	8.4	8	15.2	8	27	8	8.0	SW	10/16
SMA-2C-IT6 /	8	Surr	8	8.6	8	15.2	8	27	8	8.0	SW	10/17
SMA-2C-IT6 /	9	Surr	8	8.6	8	15.1	8	27	8	8.0	JL	10/18
SMA-2C-IT6 /	10	1	8	8.3	8	15.3	8	27	8	8.1	✓	10/19
SMA-2C-IT6 /	10	2		8.3		15.3		27		8.1		
SMA-2C-IT6 /	10	3		8.3		15.4		28		8.1		
SMA-2C-IT6 /	10	4		8.2		15.5		27		8.1		
SMA-2C-IT6 /	10	5		8.3		15.2		28		8.1		

EcoAnalysts

10 DAY SOLID PHASE TEST DATA

CLIENT	PROJECT	SPECIES	TEST START DATE	TEST START DATE	TEST END DATE
Anchor QEA	Port Gamble Monitoring	*Eohaustorius estuarius*	Port Gamble	09Oct18	19Oct18
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**DILUTION WATER BATCH**	**PROTOCOL**	
PG1123	Brian Hester	Port Gamble /	FSW100518.01	PSEP 1995	

WATER QUALITY DATA

TEST CONDITIONS			D.O. (mg/L) >5.1		TEMP (°C) 15 ± 1		SALINITY (ppt) 28 ± 2		pH (pH units) 7 - 9		TECH.	Date
SAMPLE ID	DAY	REP	D.O.		TEMP		SALINITY		pH			
			meter	mg/L	meter	°C	meter	ppt	meter	unit		
SMA-2C-IT9 /	0	1	8	8.4	8	15.2	8	28	8	8.0	MK	10/9/18
SMA-2C-IT9 /	0	2	↓	8.4	↓	15.1	↓	28	↓	8.0	↓	↓
SMA-2C-IT9 /	0	3	↓	8.2	↓	15.3	↓	28	↓	8.0	↓	↓
SMA-2C-IT9 /	0	4	↓	8.3	↓	15.3	↓	28	↓	8.0	↓	↓
SMA-2C-IT9 /	0	5	↓	8.4	↓	15.3	↓	28	↓	8.0	↓	↓
SMA-2C-IT9 /	1	Surr	8	8.3	8	15.2	8	28	8	7.8	MB	10/10
SMA-2C-IT9 /	2	Surr	8	8.2	8	15.4	8	29	8	8.0	MARK	10/11
SMA-2C-IT9 /	3	Surr	8	8.0	8	15.5	8	29	8	7.8	RE	10/12
SMA-2C-IT9 /	4	Surr	8	8.1	8	15.1	8	29	8	7.9	MK	10/13
SMA-2C-IT9 /	5	Surr	8	8.4	8	15.2	8	29	8	8.0	MK	10/14
SMA-2C-IT9 /	6	Surr	8	8.0	8	15.3	8	28	8	①8 7.9	SW	10/15
SMA-2C-IT9 /	7	Surr	8	8.1	8	15.3	8	28	8	8.0	SW	10/16
SMA-2C-IT9 /	8	Surr	8	8.1	8	15.2	8	28	8	7.9	SW	10/17
SMA-2C-IT9 /	9	Surr	8	8.1	8	15.1	8	28	8	8.0	JL	10/18
SMA-2C-IT9 /	10	1	8	8.3	8	15.4	8	28	8	8.0	✓	10/19
SMA-2C-IT9 /	10	2	↓	8.3	↓	15.4	↓	28	↓	8.1	↓	↓
SMA-2C-IT9 /	10	3	↓	8.3	↓	15.2	↓	28	↓	8.1	↓	↓
SMA-2C-IT9 /	10	4	↓	8.4	↓	15.6	↓	28	↓	8.1	↓	↓
SMA-2C-IT9 /	10	5	↓	8.3	↓	15.3	↓	28	↓	8.0	↓	↓

①IE 10-15-18 SW

Ammonia and Sulfide Analysis Record

Client/Project: Anchor / Port Gamble	Organism: Eoh	Test Duration (days): 10

PRETEST / (INITIAL) / FINAL / OTHER (circle one) DAY of TEST: 0

(OVERLYING (OV)) / (POREWATER (PW)) (circle one) / Comments: _____

Calibration Standards Temperature		Sample temperature should be within ±1°C of standards temperature at time and date of analysis.
Date:	Temperature:	
10/9/18	21.6°C	

	Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Meter #/ Temp (°C)		Date of Reading and Initials	Sample Preserved (Y/N)	pH	Sal (ppt)	Sample Volume (mL)	Measured Sulf. (mg/L)	Multi-plier	Calc-ulated Sulf. (mg/L)
OV	Ø	surr	10/9/18 CR	0.00	10	22.2	10/9/18 MK	N			10	ND	1	ND
	CRRP-20			0.969								0.001		0.001
	CR-21			0.695								ND		ND
	SMA 1B-1T2			0.152										
	1B-1T3			0.279										
	2C-1T3			0.299								0.012		0.012
	2C-1T6			0.00								ND		ND
	2C-1T9			0.00								ND		
										2②				
PW	Ø	surr	10/9/18 CR	0.00					7.9	28	①			
	CRRP-20			8.42					7.8	29	①			
	CR-21			①										
	SMA 1B-1T2			①										
	1B-1T3			①										
	2C-1T3			①										
	2C-1T6			①										
	2C-1T9			1.53					7.9	28	①			

① Insufficient pw for analysis. MK 10/9. ② MK. JL 10/09.

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
Anchor / Port Gamble	Eoh	10

PRETEST / INITIAL / **FINAL** / OTHER (circle one)

DAY of TEST: 10

OVERLYING (OV) / **POREWATER (PW)** (circle one) / Comments: _____

Calibration Standards Temperature		
Date:	Temperature:	Sample temperature should be within ±1°C of standards temperature at time and date of analysis.
10/19/18	21.3 °C	

Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Meter # / Temp (°C)		Date of Reading and Initials	Sample Preserved (Y/N)	pH	Sal (ppt)	Sample Volume (mL)	Measured Sulf. (mg/L)	Multi-plier	Calc-ulated Sulf. (mg/L)
OV													
Ø	Surr	10/19 RE	0.0	T1	20.3	10/19 RE	N			10	0	1	0
CARR-20			1.31		20.3						0.004		0.004
CR-21			4.01		20.4						ND		ND
SMA 1B-1T2			0.0		20.3						ND		ND
1B-1T3			0.0		20.3						0		0
2C-1T3			0.0		20.4						ND		ND
2C-1T6			0.0		20.4						ND		ND
2C-1T9			8.89		20.4						ND		ND
Ø	②												
PW													
CARR-20	Surr	10/19 RE	3.94	T1	21.4	10/19 RE	N	7.07	28	2	0.028	5	0.14
CR-21			6.60		20.3			7.11	29	②			
SMA 1B 1T2	②												
1B 1T3	②												
2C-1T3	②												
2C-1T6	②												
2C-1T9	②												

① IE 10/19 RE 20.3

② Insufficient Volume

ORGANISM RECEIPT LOG

Date:	Time:	Batch No.
10/04/18	1230	NWA100418

Organism: Eohs

Source / Supplier: Northwest Amphipod

No. Ordered:	No. Received:	Source Batch: Collection date, hatch date, etc.):
1910	1910 + 10.1	Collected 10/02/18

Condition of Organisms:	Approximate Size or Age: (Days from hatch, life stage, size class, etc.):
Good	3-5mm
Shipper: Fed Ex	**B of L (Tracking No.)** 0215 8112 7869 9210
Condition of Container: Good	**Received By:** JL

Container	D.O. (mg/L)	Temp. (°C)	Cond. or Sal. (Include Units)	pH (Units)	# Dead	% Dead*	Tech. (Initials)
1	*	7.8	*	→		→	JL

*if >10% contact lab manager

Notes: * Rcvd Dry.

Northwest Amphipod
3814 Yaquina Bay Rd., P.O. Box 542, Newport, OR 97365
Tel: 541-867-7225, nwamphipod@gmail.com

SUBJECT: Animal Collection Data Sheet (shipping)

SOLD TO: EcoAnalysts
4770 NE View Dr.
P.O. Box 216
Port Gamble WA 98364

FedEx# 1817-5747-7

Brian Hester/Collin Ray/Hillary Eicholer
360.297.6040
Julia Baum
360.509.4141

P.O. # PGL

DATE OF SHIPMENT: 10-3-18

ANIMAL HISTORY

Species	Age/Size	Number Shipped
Eohaustorius estuarius	3-5mm	1910 + 10%

WATER QUALITY AT TIME OF SHIPMENT

Temperature (°C): 14.7	pH: 8.0	Salinity (ppt): 35.0	D.O. (mg/L): 8.0
Other:			

PACKAGED BY: GB **DATE:** 10-3-18

FIELD COLLECTION/CULTURE NOTES

Collected 10-2-18 from Yaquina Bay, OR.
Interstitial WQ: Temp: 11.0°C, Salinity 34.5 ppt; salinity adjusted ~5 ppt up or down as needed.
Held at 15°C in aerated water.

ADDITIONAL COMMENTS

4-liters of 0.5 mm sieved home sediment included.

PLEASE RETURN ALL SHIPPING MATERIALS

If you have any questions, Please call Gary Buhler or Gerald Irissarri at (541) 265-7225. Thank You.

MAINTENANCE LOG FOR CULTURES

ORGANISM: Eohs

LOCATION: Bath 5

Batch Number: NWA100418	Date Received: 10/04/18	Initial # of Organisms: 1910

Date	Feed AM	Feed PM	Tub No.	D.O.	Temp (°C)	Cond/ Sal (ppt)	pH	H_2O Change	Organisms appear healthy (Y/N)	# Mort	% Mort*	Init.	Comments
10/05	—	—	1	7.7	16.5	31	7.9	N	Y	45		JL	
↓	—	—	2	7.9	16.6	32	7.9	↓	↓	9		↓	
10/6	—	—	1	7.4	16.9	32	8.0	Y	Y	41		CR	
↓	—	—	2	7.8	17.0	32	8.0	Y	Y	4		↓	
10.7	-	X	1	7.7	16.1	32	7.9	Y	Y	11		BH	
↓		X	2	7.9	16.1	32	8.0	Y	Y	3		↓	
10/8	—	—	1	7.5	16.3	30	7.9	N	Y	11		SW	
↓	—	—	2	7.9	16.2	30	8.0	N	Y	4		SW	
10/09	—	—	1	8.0	15.6	30	7.9	N	Y	—	—	JL	
↓	—	—	2	8.1	15.5	30	8.0	↓	↓	—	—	↓	

FT = Flow-through

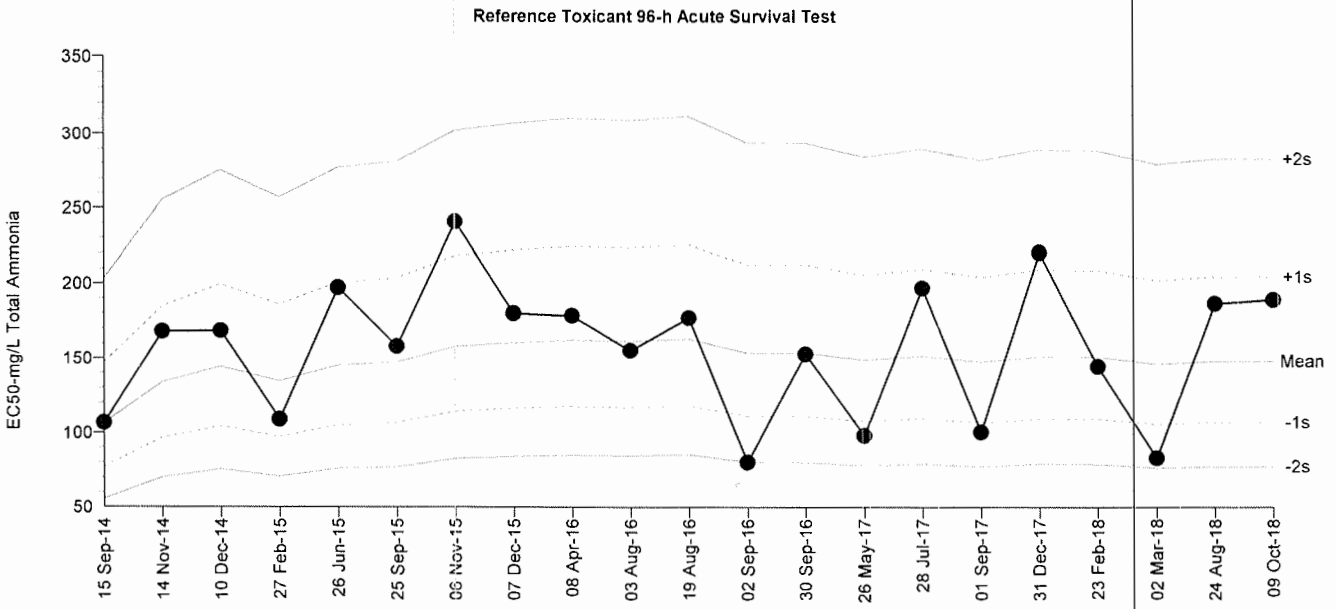
**if >10% notify lab manager*

CETIS QC Plot

Report Date: 22 Oct-18 16:14 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **All Matching Labs**

Test Type: Survival | **Organism:** Eohaustorius estuarius (Amphipod) | **Material:** Total Ammonia
Protocol: EPA/600/R-94/025 (1994) | **Endpoint:** Proportion Survived | **Source:** Reference Toxicant-REF



Mean:	148	**Count:**	20	**-1s Warning Limit:**	107	**-2s Action Limit:**	77.42
Sigma:	n/a	**CV:**	33.20%	**+1s Warning Limit:**	204.5	**+2s Action Limit:**	282.7

Quality Control Data

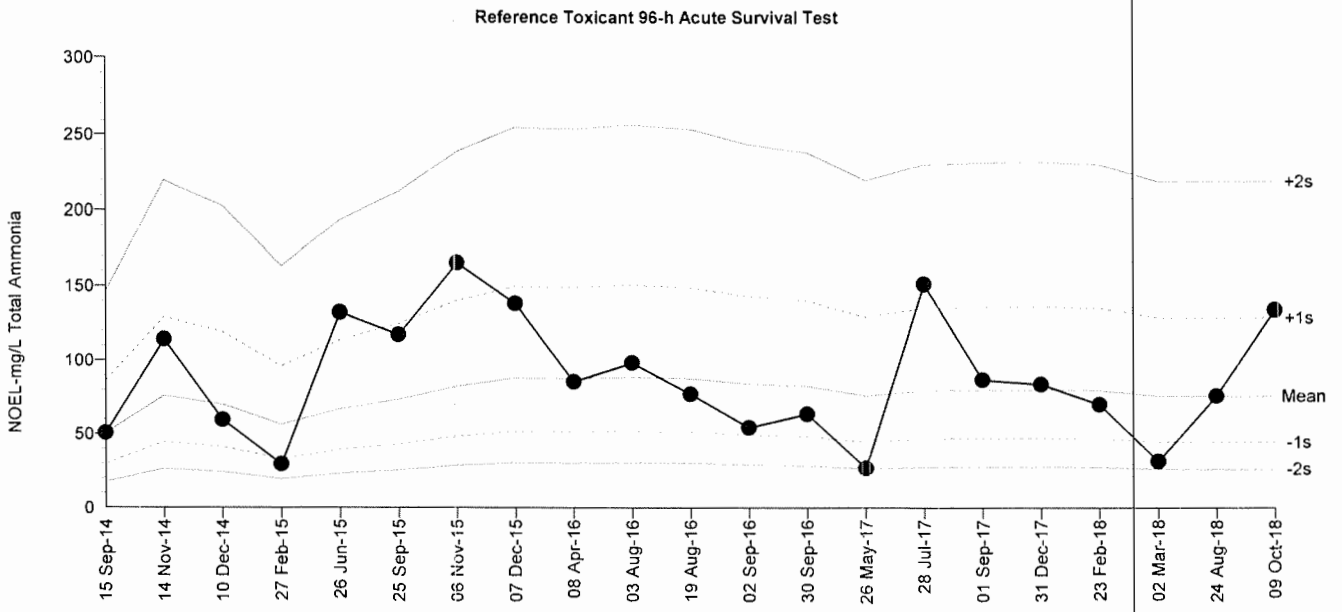
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2014	Sep	15	15:10	106.3	-41.62	-1.02	(-)		07-1282-2061	01-5984-9612	ENVIRON
2		Nov	14	14:25	168	20.03	0.392			09-0717-5355	19-7840-9499	ENVIRON
3		Dec	10	15:50	168.3	20.34	0.3977			19-3485-9112	05-9978-3434	ENVIRON
4	2015	Feb	27	12:35	108.8	-39.17	-0.9496			19-3876-5860	21-0291-4043	ENVIRON
5		Jun	26	13:20	197.1	49.12	0.8853			00-5720-1886	11-7391-9309	ENVIRON
6		Sep	25	17:30	157.8	9.849	0.199			05-7835-3625	14-8488-2762	ENVIRON
7		Nov	6	15:30	240.8	92.85	1.504	(+)		07-0462-4762	05-5994-4603	ENVIRON
8		Dec	7	15:58	180.1	32.11	0.6066			18-5380-2632	01-5604-1684	ENVIRON
9	2016	Apr	8	14:40	178.3	30.36	0.5764			20-3339-4511	20-5786-8614	ENVIRON
10		Aug	3	16:55	155	7.067	0.1441			15-5854-7986	14-0317-8212	ENVIRON
11			19	14:25	177	28.99	0.5526			10-0746-9736	13-2092-5186	ENVIRON
12		Sep	2	16:25	80.2	-67.76	-1.891	(-)		06-2389-4542	16-8119-8926	ENVIRON
13			30	15:00	152.6	4.68	0.09616			16-2341-4864	11-2277-7148	ENVIRON
14	2017	May	26	13:00	97.99	-49.98	-1.273	(-)		06-2743-8362	04-6967-6524	EcoAnalysts
15		Jul	28	14:20	196.9	48.89	0.8816			14-8451-4586	00-9100-0373	EcoAnalysts
16		Sep	1	15:45	100.5	-47.5	-1.196	(-)		02-8963-0820	06-1020-6763	EcoAnalysts
17		Dec	31	15:47	220.3	72.34	1.229	(+)		09-7306-1854	08-4856-6308	EcoAnalysts
18	2018	Feb	23	13:35	144.3	-3.65	-0.07714			21-0530-3984	12-8139-0101	EcoAnalysts
19		Mar	2	11:45	83.01	-64.95	-1.785	(-)		11-4485-4691	17-1248-6929	EcoAnalysts
20		Aug	24	15:55	186.5	38.58	0.7155			16-5739-3244	17-2559-2384	EcoAnalysts
21		Oct	9	15:00	189.1	41.18	0.7582			20-4720-6933	11-3401-1593	EcoAnalysts

CETIS QC Plot

Report Date: 22 Oct-18 16:15 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **All Matching Labs**

Test Type: Survival | **Organism:** Eohaustorius estuarius (Amphipod) | **Material:** Total Ammonia
Protocol: EPA/600/R-94/025 (1994) | **Endpoint:** Proportion Survived | **Source:** Reference Toxicant-REF



Mean:	75.57	**Count:**	20	**-1s Warning Limit:**	44.4	**-2s Action Limit:**	26.08
Sigma:	n/a	**CV:**	57.20%	**+1s Warning Limit:**	128.6	**+2s Action Limit:**	219

Quality Control Data

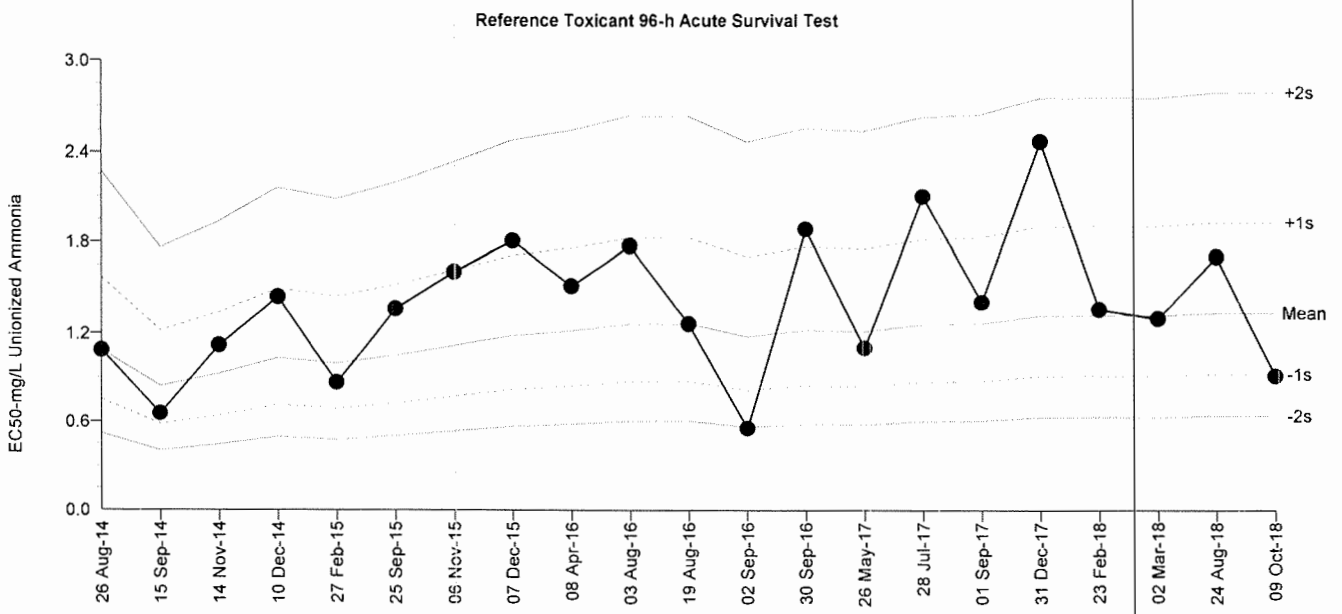
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2014	Sep	15	15:10	50.5	-25.07	-0.7577			07-1282-2061	16-3885-0935	ENVIRON
2		Nov	14	14:25	114	38.43	0.7731			09-0717-5355	07-0500-8008	ENVIRON
3		Dec	10	15:50	59.4	-16.17	-0.4525			19-3485-9112	07-0579-1018	ENVIRON
4	2015	Feb	27	12:35	29.3	-46.27	-1.781	(-)		19-3876-5860	19-7961-3594	ENVIRON
5		Jun	26	13:20	132	56.43	1.049	(+)		00-5720-1886	15-3704-4199	ENVIRON
6		Sep	25	17:30	117	41.43	0.8219			05-7835-3625	21-0939-3919	ENVIRON
7		Nov	6	15:30	165	89.43	1.468	(+)		07-0462-4762	19-7906-3673	ENVIRON
8		Dec	7	15:58	138	62.43	1.132	(+)		18-5380-2632	00-7335-5231	ENVIRON
9	2016	Apr	8	14:40	85.2	9.634	0.2256			20-3339-4511	16-7438-0764	ENVIRON
10		Aug	3	16:55	98	22.43	0.4888			15-5854-7986	05-8855-9934	ENVIRON
11			19	14:25	76.9	1.334	0.03291			10-0746-9736	12-8850-4495	ENVIRON
12		Sep	2	16:25	54.1	-21.47	-0.6282			06-2389-4542	18-8647-7799	ENVIRON
13			30	15:00	63.2	-12.37	-0.336			16-2341-4864	17-9345-6065	ENVIRON
14	2017	May	26	13:00	26.6	-48.97	-1.963	(-)		06-2743-8362	12-3565-7845	EcoAnalysts
15		Jul	28	14:20	151	75.43	1.302	(+)		14-8451-4586	09-8418-8824	EcoAnalysts
16		Sep	1	15:45	86.5	10.93	0.2541			02-8963-0820	17-0422-4621	EcoAnalysts
17		Dec	31	15:47	83.6	8.034	0.19			09-7306-1854	06-1883-5465	EcoAnalysts
18	2018	Feb	23	13:35	69.7	-5.866	-0.1519			21-0530-3984	16-8514-1800	EcoAnalysts
19		Mar	2	11:45	31.2	-44.37	-1.663	(-)		11-4485-4691	15-7110-1336	EcoAnalysts
20		Aug	24	15:55	75.6	0.03449	0.0008578			16-5739-3244	15-9917-9528	EcoAnalysts
21		Oct	9	15:00	134	58.43	1.077	(+)		20-4720-6933	14-7074-1873	EcoAnalysts

CETIS QC Plot

Report Date: 22 Oct-18 16:20 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **All Matching Labs**

Test Type: Survival | **Organism:** Eohaustorius estuarius (Amphipod) | **Material:** Unionized Ammonia
Protocol: EPA/600/R-94/025 (1994) | **Endpoint:** Proportion Survived | **Source:** Reference Toxicant-REF



Mean:	1.338	**Count:**	20	**-1s Warning Limit:**	0.9263	**-2s Action Limit:**	0.6412
Sigma:	n/a	**CV:**	38.10%	**+1s Warning Limit:**	1.933	**+2s Action Limit:**	2.792

Quality Control Data

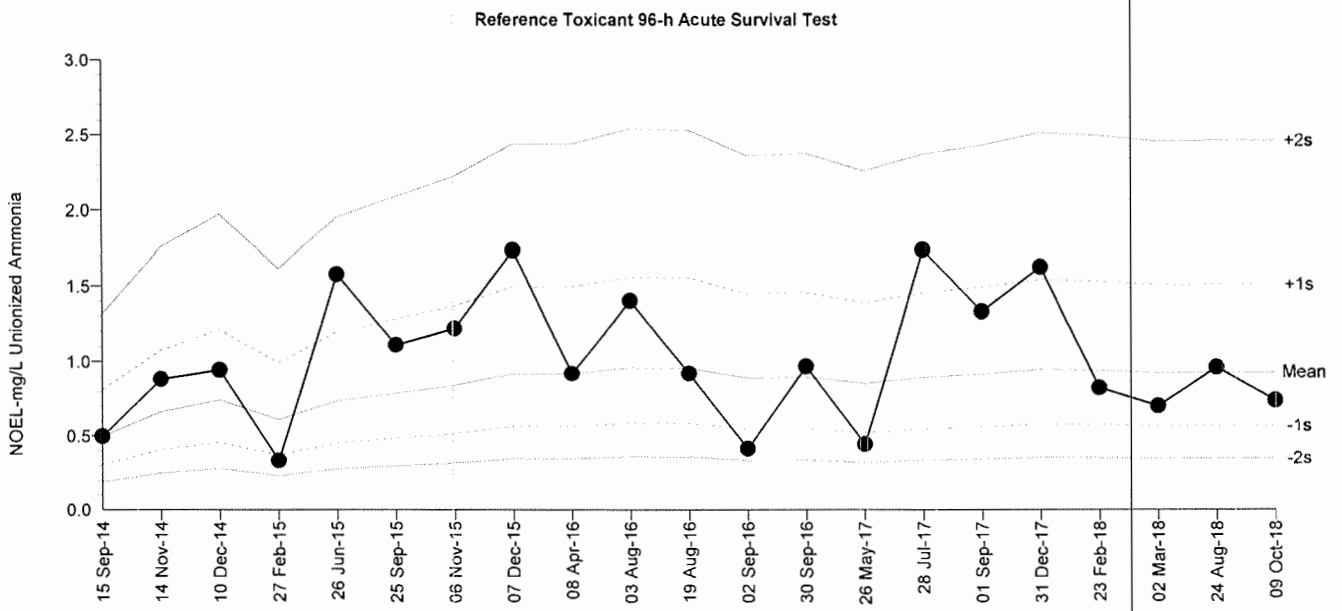
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2014	Aug	26	15:45	1.087	-0.251	-0.5648			16-9917-4183	13-7453-5343	ENVIRON
2		Sep	15	15:10	0.6543	-0.6837	-1.945	(-)		04-2286-3837	03-1229-8693	ENVIRON
3		Nov	14	14:25	1.119	-0.2189	-0.4857			07-5753-6828	00-1415-6148	ENVIRON
4		Dec	10	15:50	1.441	0.1025	0.2008			04-0714-3304	08-0742-5225	ENVIRON
5	2015	Feb	27	12:35	0.8668	-0.4712	-1.18	(-)		10-1977-7129	06-3048-0232	ENVIRON
6		Sep	25	17:30	1.361	0.02276	0.04586			00-7510-8480	16-9779-9851	ENVIRON
7		Nov	6	15:30	1.605	0.2673	0.4952			14-1974-2437	14-7486-0204	ENVIRON
8		Dec	7	15:58	1.807	0.4686	0.8163			12-1918-7694	00-1085-2209	ENVIRON
9	2016	Apr	8	14:40	1.512	0.1736	0.3318			17-7738-6530	02-5159-2977	ENVIRON
10		Aug	3	16:55	1.775	0.4365	0.7677			15-5470-2613	20-0153-1348	ENVIRON
11			19	14:25	1.264	-0.07434	-0.1554			11-7594-3529	18-2266-1841	ENVIRON
12		Sep	2	16:25	0.5558	-0.7822	-2.389	(-)	(-)	20-2236-1025	01-7459-0032	ENVIRON
13			30	15:00	1.885	0.5468	0.9316			12-0597-8760	12-1436-9613	ENVIRON
14	2017	May	26	13:00	1.101	-0.2374	-0.5312			15-8049-8093	00-1911-6893	EcoAnalysts
15		Jul	28	14:20	2.103	0.7648	1.229	(+)		11-4327-6237	03-7130-7368	EcoAnalysts
16		Sep	1	15:45	1.407	0.06921	0.1371			18-6405-8290	07-0280-8863	EcoAnalysts
17		Dec	31	15:47	2.466	1.128	1.662	(+)		16-6781-4604	13-3844-2137	EcoAnalysts
18	2018	Feb	23	13:35	1.361	0.0228	0.04594			00-2027-3508	17-9124-7622	EcoAnalysts
19		Mar	2	11:45	1.301	-0.03713	-0.07651			02-5827-5523	13-4470-6509	EcoAnalysts
20		Aug	24	15:55	1.708	0.3702	0.664			17-5739-4878	03-7944-2577	EcoAnalysts
21		Oct	9	15:00	0.9139	-0.4241	-1.036	(-)		17-3069-9320	16-8151-1630	EcoAnalysts

CETIS QC Plot

Report Date: 22 Oct-18 16:20 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **All Matching Labs**

Test Type: Survival | **Organism:** Eohaustorius estuarius (Amphipod) | **Material:** Unionized Ammonia
Protocol: EPA/600/R-94/025 (1994) | **Endpoint:** Proportion Survived | **Source:** Reference Toxicant-REF



Mean:	0.9286	**Count:**	20	**-1s Warning Limit:**	0.5705	**-2s Action Limit:**	0.3505
Sigma:	n/a	**CV:**	51.80%	**+1s Warning Limit:**	1.512	**+2s Action Limit:**	2.46

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2014	Sep	15	15:10	0.497	-0.4316	-1.283	(-)		04-2286-3837	01-4675-9354	ENVIRON
2		Nov	14	14:25	0.881	-0.04763	-0.1081			07-5753-6828	01-5478-5022	ENVIRON
3		Dec	10	15:50	0.943	0.01437	0.03153			04-0714-3304	12-5251-7122	ENVIRON
4	2015	Feb	27	12:35	0.334	-0.5946	-2.099	(-)	(-)	10-1977-7129	04-0485-4050	ENVIRON
5		Jun	26	13:20	1.578	0.6494	1.088	(+)		13-7504-6588	11-4090-1553	ENVIRON
6		Sep	25	17:30	1.111	0.1824	0.368			00-7510-8480	05-3466-1859	ENVIRON
7		Nov	6	15:30	1.22	0.2914	0.5601			14-1974-2437	10-4251-0205	ENVIRON
8		Dec	7	15:58	1.733	0.8044	1.281	(+)		12-1918-7694	05-5204-9536	ENVIRON
9	2016	Apr	8	14:40	0.918	-0.01063	-0.02362			17-7738-6530	07-6987-7357	ENVIRON
10		Aug	3	16:55	1.404	0.4754	0.8485			15-5470-2613	11-2111-0216	ENVIRON
11			19	14:25	0.919	-0.009625	-0.02139			11-7594-3529	06-9525-3086	ENVIRON
12		Sep	2	16:25	0.415	-0.5136	-1.653	(-)		20-2236-1025	20-1525-6837	ENVIRON
13			30	15:00	0.967	0.03837	0.08311			12-0597-8760	06-8089-0740	ENVIRON
14	2017	May	26	13:00	0.445	-0.4836	-1.51	(-)		15-8049-8093	18-0229-5291	EcoAnalysts
15		Jul	28	14:20	1.738	0.8094	1.287	(+)		11-4327-6237	11-4496-1419	EcoAnalysts
16		Sep	1	15:45	1.334	0.4054	0.7435			18-6405-8290	16-4129-3608	EcoAnalysts
17		Dec	31	15:47	1.626	0.6974	1.15	(+)		16-6781-4604	02-2467-9837	EcoAnalysts
18	2018	Feb	23	13:35	0.825	-0.1036	-0.2429			00-2027-3508	11-7925-6381	EcoAnalysts
19		Mar	2	11:45	0.703	-0.2256	-0.5713			02-5827-5523	14-9941-7186	EcoAnalysts
20		Aug	24	15:55	0.962	0.03337	0.07247			17-5739-4878	10-4999-0518	EcoAnalysts
21		Oct	9	15:00	0.74	-0.1886	-0.466			17-3069-9320	05-9114-6332	EcoAnalysts

CETIS Summary Report

Reference Toxicant 96-h Acute Survival Test — **EcoAnalysts**

Batch ID:	16-5970-2885	**Test Type:**	Survival	**Analyst:**	
Start Date:	09 Oct-18 15:00	**Protocol:**	EPA/600/R-94/025 (1994)	**Diluent:**	Laboratory Seawater
Ending Date:	13 Oct-18 13:50	**Species:**	Eohaustorius estuarius	**Brine:**	Not Applicable
Test Length:	95h	**Taxon:**	Malacostraca	**Source:**	Northwestern Aquatic Scien **Age:**
Sample ID:	11-5195-8884	**Code:**	44A97F64	**Project:**	Reference Toxicant
Sample Date:	15 May-17	**Material:**	Total Ammonia	**Source:**	Reference Toxicant
Receipt Date:	15 May-17	**CAS (PC):**		**Station:**	p170515.110
Sample Age:	512d 15h	**Client:**	Internal Lab		

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓	NOEL	LOEL	TOEL	TU	PMSD	S
14-7074-1873	Proportion Survived	Steel Many-One Rank Sum Test		134	276	192.3		24.6%	1

Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓	Level	mg/L	95% LCL	95% UCL	TU	S
11-3401-1593	Proportion Survived	Spearman-Kärber		EC50	189.1	166.3	215.1		1

Proportion Survived Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	D	4	0.9000	0.5818	1.0000	0.6000	1.0000	0.1000	0.2000	22.22%	0.00%
17.1		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-11.11%
34.8		4	0.8500	0.4712	1.0000	0.5000	1.0000	0.1190	0.2380	28.01%	5.56%
69		4	0.9500	0.7909	1.0000	0.8000	1.0000	0.0500	0.1000	10.53%	-5.56%
134		4	0.8500	0.7581	0.9419	0.8000	0.9000	0.0289	0.0577	6.79%	5.56%
276		4	0.1750	0.0227	0.3273	0.1000	0.3000	0.0479	0.0957	54.71%	80.56%
541		4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		100.00%

Proportion Survived Detail

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	1.0000	1.0000	0.6000	1.0000
17.1		1.0000	1.0000	1.0000	1.0000
34.8		1.0000	0.5000	1.0000	0.9000
69		0.8000	1.0000	1.0000	1.0000
134		0.8000	0.8000	0.9000	0.9000
276		0.3000	0.1000	0.1000	0.2000
541		0.0000	0.0000	0.0000	0.0000

Proportion Survived Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	10/10	10/10	6/10	10/10
17.1		10/10	10/10	10/10	10/10
34.8		10/10	5/10	10/10	9/10
69		8/10	10/10	10/10	10/10
134		8/10	8/10	9/10	9/10
276		3/10	1/10	1/10	2/10
541		0/10	0/10	0/10	0/10

CETIS Test Data Worksheet

Reference Toxicant 96-h Acute Survival Test — **EcoAnalysts**

Start Date: 09 Oct-18 15:00 **Species:** Eohaustorius estuarius **Sample Code:** 44A97F64
End Date: 13 Oct-18 13:50 **Protocol:** EPA/600/R-94/025 (1994) **Sample Source:** Reference Toxicant
Sample Date: 15 May-17 **Material:** Total Ammonia **Sample Station:** p170515.110

Conc-mg/L	Code	Rep	Pos	# Exposed	# Survived	Notes
0	D	1	1	10	10	
0	D	2	12	10	10	
0	D	3	21	10	6	
0	D	4	27	10	10	
17.1		1	14	10	10	
17.1		2	20	10	10	
17.1		3	11	10	10	
17.1		4	25	10	10	
34.8		1	15	10	10	
34.8		2	3	10	5	
34.8		3	17	10	10	
34.8		4	10	10	9	
69		1	4	10	8	
69		2	18	10	10	
69		3	8	10	10	
69		4	26	10	10	
134		1	7	10	8	
134		2	9	10	8	
134		3	24	10	9	
134		4	28	10	9	
276		1	19	10	3	
276		2	22	10	1	
276		3	2	10	1	
276		4	23	10	2	

CETIS Test Data Worksheet

Conc-mg/L	Code	Rep	Pos	# Exposed	# Survived	Notes
541		1	6	10	0	
541		2	13	10	0	
541		3	16	10	0	
541		4	5	10	0	

CETIS Summary Report

Reference Toxicant 96-h Acute Survival Test — **EcoAnalysts**

Batch ID:	02-7500-5202	**Test Type:**	Survival	**Analyst:**	
Start Date:	09 Oct-18 15:00	**Protocol:**	EPA/600/R-94/025 (1994)	**Diluent:**	Laboratory Seawater
Ending Date:	13 Oct-18 13:50	**Species:**	Eohaustorius estuarius	**Brine:**	Not Applicable
Test Length:	95h	**Taxon:**	Malacostraca	**Source:**	Northwestern Aquatic Scien **Age:**
Sample ID:	10-5025-6844	**Code:**	3E99A5CC	**Project:**	Reference Toxicant
Sample Date:	15 May-17	**Material:**	Unionized Ammonia	**Source:**	Reference Toxicant
Receipt Date:	15 May-17	**CAS (PC):**		**Station:**	p170515.110
Sample Age:	512d 15h	**Client:**	Internal Lab		

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓	NOEL	LOEL	TOEL	TU	PMSD	S
05-9114-6332	Proportion Survived	Steel Many-One Rank Sum Test		0.74	1.221	0.9505		24.6%	1

Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓	Level	mg/L	95% LCL	95% UCL	TU	S
16-8151-1630	Proportion Survived	Spearman-Kärber		EC50	0.9139	0.8403	0.994		1

Proportion Survived Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	D	4	0.9000	0.5818	1.0000	0.6000	1.0000	0.1000	0.2000	22.22%	0.00%
0.141		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-11.11%
0.288		4	0.8500	0.4712	1.0000	0.5000	1.0000	0.1190	0.2380	28.01%	5.56%
0.475		4	0.9500	0.7909	1.0000	0.8000	1.0000	0.0500	0.1000	10.53%	-5.56%
0.74		4	0.8500	0.7581	0.9419	0.8000	0.9000	0.0289	0.0577	6.79%	5.56%
1.221		4	0.1750	0.0227	0.3273	0.1000	0.3000	0.0479	0.0957	54.71%	80.56%
1.535		4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		100.00%

Proportion Survived Detail

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	1.0000	1.0000	0.6000	1.0000
0.141		1.0000	1.0000	1.0000	1.0000
0.288		1.0000	0.5000	1.0000	0.9000
0.475		0.8000	1.0000	1.0000	1.0000
0.74		0.8000	0.8000	0.9000	0.9000
1.221		0.3000	0.1000	0.1000	0.2000
1.535		0.0000	0.0000	0.0000	0.0000

Proportion Survived Binomials

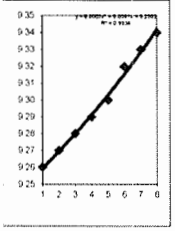
Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	10/10	10/10	6/10	10/10
0.141		10/10	10/10	10/10	10/10
0.288		10/10	5/10	10/10	9/10
0.475		8/10	10/10	10/10	10/10
0.74		8/10	8/10	9/10	9/10
1.221		3/10	1/10	1/10	2/10
1.535		0/10	0/10	0/10	0/10

Un-ionized Ammonia Calculator

CLIENT:	Various	Date of Test:	October 9, 2018
PROJECT:	PG1123, PG1214	Test Type:	*Eohaustorius estuarius*
COMMENTS:			

To convert Total Ammonia (mg/L) to Free (un-ionized) Ammonia (mg/L) enter the corresponding total ammonia, salinity, temperature, and pH.

Integer:	I-factor
1	9.26
2	9.27
3	9.28
4	9.29
5	9.30
6	9.32
7	9.33
8	9.34



	Sample	Mod	NH3T (mg/L)	salinity (ppt)	pH	temp (C)	temp (K)	i-factor	Mod	NH3U (mg/L)
	Target / Sample Name		Actual	22.9	8.0	24.1	297.26	9.3053		#VALUE!
	Example 3.5		2.000	10.0	7.5	5.0	278.16	9.2750		0.008
1										
2	0		0	31	7.6	13.7	286.86	9.3270		
3	15.6		17.1	31	7.6	13.9	287.06	9.3270		0.141
4	31.2		34.8	31	7.6	14.0	287.16	9.3270		0.288
5	62.5		69	31	7.5	14.6	287.76	9.3270		0.475
6	125		134	31	7.4	14.7	287.86	9.3270		0.740
7	250		276	31	7.3	14.8	287.96	9.3270		1.221
8	500		541	31	7.1	15.0	288.16	9.3270		1.535
9										
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CETIS Test Data Worksheet

Reference Toxicant 96-h Acute Survival Test — EcoAnalysts

Start Date:	09 Oct-18 15:00	**Species:**	Eohaustorius estuarius	**Sample Code:**	3E99A5CC
End Date:	13 Oct-18 13:50	**Protocol:**	EPA/600/R-94/025 (1994)	**Sample Source:**	Reference Toxicant
Sample Date:	15 May-17	**Material:**	Unionized Ammonia	**Sample Station:**	p170515.110

Conc-mg/L	Code	Rep	Pos	# Exposed	# Survived	Notes
0	D	1	7	10	10	
0	D	2	4	10	10	
0	D	3	25	10	6	
0	D	4	20	10	10	
0.141		1	2	10	10	
0.141		2	23	10	10	
0.141		3	14	10	10	
0.141		4	19	10	10	
0.288		1	16	10	10	
0.288		2	28	10	5	
0.288		3	17	10	10	
0.288		4	9	10	9	
0.475		1	22	10	8	
0.475		2	10	10	10	
0.475		3	5	10	10	
0.475		4	18	10	10	
0.74		1	24	10	8	
0.74		2	6	10	8	
0.74		3	8	10	9	
0.74		4	26	10	9	
1.221		1	1	10	3	
1.221		2	27	10	1	
1.221		3	13	10	1	
1.221		4	11	10	2	

CETIS Test Data Worksheet

Conc-mg/L	Code	Rep	Pos	# Exposed	# Survived	Notes
1.535		1	21	10	0	
1.535		2	3	10	0	
1.535		3	12	10	0	
1.535		4	15	10	0	

Ammonia Reference Toxicant
Spiking Worksheet

Reference Toxicant ID: PT0515.110
Date Prepared: 10/9/18
Technician Initials: CR

Amp/Eoh NH_3 RT

Assumptions in Model
Stock ammonia concentration is 10,000 mg/L = 10 mg/mL

Date: 10/2/2018
Measurement: 9,833

Test Solutions			Volume of stock to reach desired concentration	
Measured Concentration	**Desired Concentration**	**Volume**		
mg/L	mg/L	mL	mL stock to increase	
			[redacted]	SALT WATER
541	**500**	3200		**244.076**
276	**250**	3200		**122.038**
134	**125**	3200		**61.019**
69.0	**62.5**	3200		**30.510**
34.8	**31.2**	3200		**15.230**
17.1	**15.6**	3200		**7.615**
0.06	**0**			

Ammonia Reference Toxicant Test Water Quality Data Sheet

EcoAnalysts

CLIENT	PROJECT		LABORATORY	PROTOCOL
[redacted]	[redacted]	*Eohaustorius estuarius*	Port Gamble	USEPA 1994 / ASTM 2006

TEST ID	LOT #:	DILUTION PREP INITIALS:
P170515.110	Z986C510	CR

CHAMBER SIZE/TYPE	EXPOSURE VOLUME	TEST START DATE	INITIALS	TIME	TEST END DATE	TIME
1L Plastic	800mL	09Oct18	MK, CR	1500	13Oct18	1350

WATER QUALITY DATA

TEST CONDITIONS					DO (mg/L)		TEMP(C)		SAL (ppt)		pH		TECHNICIAN	AMMONIA				
					> 8.0		15 ± 2		32 ± 2		7.7 - 8.3							
SAMPLE ID	CONCENTRATION value	CONCENTRATION units	DAY	REP	D.O. meter	D.O. mg/L	TEMP. meter	TEMP. °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WQ TECH/ DATE	AMMONIA METER	AMMONIA mg/L	Tech		
Ref.Tox.-ammonia	0	mg/L	0	Stock	8	7.0	8	13.7	8	31	8	7.6	JL 10/09	10	0.00	SW		
			2	1	8	6.9	8	16.6	8	31	8	7.8	MARH 10/11					
			4	2	8	7.5	8	15.1	8	31	8	7.8	MK 10/13	10	0.414	JL		
Ref.Tox.-ammonia	15.6	mg/L	0	Stock	8	6.9	8	13.9	8	31	8	7.6	JL 10/09	10	17.1	SW		
			2	1	8	7.2	8	16.6	8	31	8	7.7	MARH 10/11					
			4	2	8	7.4	8	15.0	8	31	8	7.8	MK 10/13	10	17.8	JL		
Ref.Tox.-ammonia	31.2	mg/L	0	Stock	8	7.0	8	14.0	8	31	8	7.6	JL 10/09	10	34.8	SW		
			2	1	8	7.2	8	16.4	8	31	8	7.7	MARH 10/11					
			4	2	8	7.2	8	15.3	8	31	8	7.8	MK 10/13	10	36.5	JL		
Ref.Tox.-ammonia	62.5	mg/L	0	Stock	8	7.3	8	14.6	8	31	8	7.5	JL 10/09	10	69.0	SW		
			2	1	8	7.1	8	16.7	8	31	8	7.7	MARH 10/11					
			4	2	8	7.3	8	15.1	8	31	8	7.7	MK 10/13	10	69.7	JL		
Ref.Tox.-ammonia	125	mg/L	0	Stock	8	7.1	8	14.7	8	31	8	7.4	JL 10/09	10	0/104.134	SW		
			2	1	8	7.5	8	16.8	8	31	8	7.7	MARH 10/11					
			4	2	8	7.6	8	15.3	8	31	8	7.7	MK 10/13	10	130	JL		
Ref.Tox.-ammonia	250	mg/L	0	Stock	8	7.3	8	14.8	8	31	8	7.3	JL 10/09	10	0/135/276	SW		
			2	1	8	7.1	8	16.6	8	31	8	7.5	MARH 10/11					
			4	2	8	7.4	8	15.1	8	31	8	7.6	MK 10/13	10	269	JL		

Ammonia Reference Toxicant Test Water Quality Data Sheet

EcoAnalysts

CLIENT	PROJECT		LABORATORY	PROTOCOL
[redacted]	[redacted]	*Eohaustorius estuarius*	Port Gamble	USEPA 1994 / ASTM 2006

TEST ID	LOT #:	DILUTION PREP INITIALS:
P170515.110	29866510	

CHAMBER SIZE/TYPE	EXPOSURE VOLUME	TEST START DATE	INITIALS	TIME	TEST END DATE	TIME
1L Plastic	800mL	09Oct18	MK, CR	1500	13Oct18	1350

WATER QUALITY DATA

TEST CONDITIONS				DO (mg/L) > 8.0		TEMP(C) 15 ± 2		SAL (ppt) 32 ± 2		pH 7.7 - 8.3		TECHNICIAN	AMMONIA					
Ref.Tox.-ammonia	500 mg/L	0	Stock	B	7.2	B	15.0	B	31	B	7.1	10/09 JL	10	541	SW			
		2	1	(1)														
		4	2	(1)														

(1) No surviving animals. JL 10/22/18.

EcoAnalysts Ammonia Reference Toxicant Test Water Quality Data Sheet

SPECIES	
	Eohaustorius estuarius

CLIENT	PROJECT	PROJECT MANAGER	LABORATORY	PROTOCOL
[redacted]	[redacted]	B. Hester	Port Gamble	USEPA 1994 / ASTM 2006

SURVIVAL & BEHAVIOR DATA

OBSERVATION KEY
N = Normal
LOE = Loss of equilibium
Q = Quinscent
DC = Discoloration
NB = No body
F = Floating on surface

INITIAL # OF ORGANISMS: 10

				DAY 1			DAY 2			DAY 3			DAY 4		
				DATE: 10/10/18			DATE: 10/11/18			DATE: 10/12/18			DATE: 10/13/18		
				TECHNICIAN: WS			TECHNICIAN: MARH			TECHNICIAN: RE			TECHNICIAN: ME		
SAMPLE ID	CONC. value	CONC. units	REP	INITIAL NUMBER	#ALIVE	#DEAD	OBS	#ALIVE	#DEAD	OBS	#ALIVE	#DEAD	OBS	#ALIVE	#DEAD	OBS
Ref.Tox.- Ammonia	0	mg/L	1	10	10	0	N	10	0	N	10	0	1F	10	0	1F
			2		10	0		10	0		10	0	3F	10	0	N
			3		10	0		10	0		10	0	1F	6	2	2NB
			4		10	0		10	0		10	0	3F	10	0	N
Ref.Tox.- Ammonia	15.6	mg/L	1		10	0	N	10	0	N	10	0	2F	10	0	3F
			2		10	0	2F	10	0		10	0	N	10	0	N
			3		10	0	1F	10	0		10	0	N	10	0	
			4		10	0	N	10	0		10	0	N	10	0	
Ref.Tox.- Ammonia	31.2	mg/L	1		10	0	1F	10	0	N	10	0	1F	10	0	N
			2		10	0	2F	10	0	2F	10	0	3F	5	1	4F, 4NB
			3		10	0	2F	10	0	2F	10	0	N	10	0	N
			4		10	0	3F	10	0	N	10	0	1F	9	0	1F, 1NB
Ref.Tox.- Ammonia	62.5	mg/L	1		10	0	N	10	0	1Q	10	0	1Q ①	8	1	1F, 1NB
			2		10	0		10	0	N	10	0	1Q	10	0	N
			3		10	0	2F	10	0	N	10	0	N	10	0	
			4		10	0	N	10	0	1F	10	0	3F	10	0	1F
Ref.Tox.- Ammonia	125	mg/L	1		10	0	1F	10	0	1Q	10	0	2F 1Q	8	2	1F
			2		10	0	2F	9	1	2F	9	0	2Q	8	1	1F
			3		10	0	2F	10	0	N	10	0	1F 2Q	9	1	2F
			4		10	0	2F	9	1	N	9	0	1Q	9	0	1F
Ref.Tox.- Ammonia	250	mg/L	1		9	1	1F Q	9	0	Q	5	4	Q	3	2	Q
			2		7	3	Q	5	2	Q	4	1	Q	1	3	
			3		9	1	Q	7	2	Q	4	3	Q	1	3	
			4		8	2	Q	7	1	Q	3	4	Q	2	1	

① WC. ME 10/13

① IE - RE 10/12

ECO ANALYSTS **Ammoni[illegible] Reference Toxicant Test Water Q[illegible]lity Data Sheet**

SPECIES	
	Eohaustorius estuarius

CLIENT	PROJECT	PROJECT MANAGER	LABORATORY	PROTOCOL
[redacted]	[redacted]	B. Hester	Port Gamble	USEPA 1994 / ASTM 2006

SURVIVAL & BEHAVIOR DATA

OBSERVATION KEY
N = Normal
LOE = Loss of equilibium
Q = Quinscent
DC = Discoloration
NB = No body
F = Floating on surface

INITIAL # OF ORGANISMS: 10

	DAY 1	DAY 2	DAY 3	DAY 4
DATE	10/10/18	10/11/18		
TECHNICIAN	VS	MARH		

SAMPLE ID	CONC. value	CONC. units	REP	INITIAL NUMBER	DAY 1 #ALIVE	DAY 1 #DEAD	DAY 1 OBS	DAY 2 #ALIVE	DAY 2 #DEAD	DAY 2 OBS	DAY 3 #ALIVE	DAY 3 #DEAD	DAY 3 OBS	DAY 4 #ALIVE	DAY 4 #DEAD	DAY 4 OBS
Ref.Tox.- Ammonia	500	mg/L	1	10	0	10	–									
			2	↓	1	9	Q	0	1	–						
			3		3	17	Q	0	3	–						
			4		1	9	Q	0	1	–						

2. *Neanthes arenaceodentata* 20-Day Test

EcoAnalysts

CLIENT	PROJECT	JOB NO.	PROJECT MANAGER	LABORATORY	PROTOCOL	SPECIES
Anchor QEA	Port Gamble Monitoring	PG1123	B. Hester	Port Gamble	PSEP 1995	*Neanthes arenaceodentata*

ENDPOINT DATA & OBSERVATIONS

N = Normal OW = other worm
#E = Emergence
#M = Mortality
G = Growth
(fungal, bacterial, or algal)
O = No Air Flow (DO?)
F = Floating on Surface
TC = Too Cloudy
U=Excess food

INITIAL # OF ORGANISMS: 5

CLIENT/ENVIRON ID	REP	JAR	INITIAL # (if differs)	Date and Initials	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	NUMBER REMAINING	TARE WEIGHT (mg)	TOTAL WEIGHT (mg)	ASHED WEIGHT (mg)
				10/4 SW	10/5 SW	10/6 CR	10/7 CR	10/8 WS	10/9 MK	10/10 WS	10/11 SW	10/12 RE	10/13 MK	10/14 MK	10/15 SW	10/16 SW	10/17 SW	10/18 SW	10/19 MK	10/20 SW	10/21 SW	10/22 SW	10/23 WS			
Control /	1			N	N	N	N	N	N	N	G	G	G	U	G	G	G	IE	G	G	G	N	N	5	1 209.99	291.59	242.15
	2			↓	↓	↓	↓	↓	↓	↓	G	G	↓	↓	G	IE	G	G	↓	N	N	N	N	5	2 200.35	295.52	243.07
	3			↓	↓	↓	↓	↓	U	U	N	IE	↓	↓	N	N	N	IE	↓	IE	IE	N	N	5	3 181.29	259.22	213.13
	4			↓	↓	↓	↓	↓	N	N	N	N	↓	↓	G	G	G	G	↓	N	N	IE	DN	5	4 214.16	281.74	240.40
	5			↓	↓	↓	↓	↓	U	U	G	IE	↓	↓	IE	G	G	G	↓	G	G	G	N	5	5 208.23	311.51	254.32
CARR-20 /	1			N	N	N	G	G	G	G	G	G	G	G	G	G	G	IE	G	G	G	G	G	5	6 195.34	308.85	243.96
	2			N	↓	↓	G	G	↓	↓	G	↓	↓	↓	↓	↓	↓	U	↓	U	↓	↓	↓	5	7 224.77	276.84	241.38
	3	13		10W	↓	↓	N	N	U	N	G	↓	↓	↓	↓	↓	↓	G	↓	G	↓	↓	↓	5	8 231.35	345.08	286.08
	4			N	↓	↓	↓	↓	N	G	G	↓	↓	↓	↓	↓	↓	G	↓	↓	↓	↓	↓	5	9 216.30	290.85	244.80
	5			N	↓	↓	↓	↓	↓	N	G	↓	↓	↓	↓	↓	↓	G	↓	↓	↓	↓	↓	5	10 233.01	320.63	269.58

Initial Biomass	Rep	Number	Tare Weight (mg)	Dry Weight (mg)	Ashed Weight (mg)	Comments:
	1	5	46.72	50.94	47.12	Boat #
	2	5	46.73	50.76	47.20	101
	3	5	47.38	52.02	48.00	102
						103

58 222.47
60 220.28
65 312.02

DWC 10/24/18 SW

ECO ANALYSTS

CLIENT	PROJECT	JOB NO.	PROJECT MANAGER	LABORATORY	PROTOCOL	SPECIES
Anchor QEA	Port Gamble Monitoring	PG1123	B. Hester	Port Gamble	PSEP 1995	*Neanthes arenaceodentata*

ENDPOINT DATA & OBSERVATIONS

N = Normal OW = other worm
#E = Emergence
#M = Mortality
G = Growth
(fungal, bacterial, or algal)
D = No Air Flow (DO?)
F = Floating on Surface
TC = Too Cloudy
U=Excess food

INITIAL # OF ORGANISMS: 5

CLIENT/ ENVIRON ID	REP	JAR	INITIAL # (if differs)	Date and initials	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	NUMBER REMAINING	TARE WEIGHT (mg)	TOTAL WEIGHT (mg)	ASHED WEIGHT (mg)
CR-21 /	1			10/4 SW	N	N	N	N	N	N	N	G	G	G	G	G	U	G	G	G	G	G	G	G	5	11 195.51	277.26	227.33
	2			10/5 SW	↓	↓	↓	↓	↓	↓	G	G	↓	↓	↓	↓	U	↓	G	↓	U	↓	G	↓	5	12 193.88	247.77	210.52
	3			10/6 CR	↓	↓	↓	↓	G	G	G	G	↓	↓	↓	↓	U	↓	U	↓	U	↓	G	↓	5	13 212.04	296.53	239.77
	4			10/7 CR	↓	↓	↓	↓	N	N	N	G	↓	↓	↓	↓	U	↓	U	↓	U	↓	U	↓	3	14 212.26	268.01	229.77
	5	7		10/8 MS	16 10W	↓	↓	G	G	G	G	G	↓	↓	↓	↓	U	↓	U	↓	U	↓	G	↓	5	15 239.45	315.40	267.64
SMA-1B-IT2 /	1			10/9 MK	N	N	N	N	N	U	G	G	G			G	G	G	G	G	G	G	G	G	5	16 195.97	289.07	231.81
	2			10/10 MS	↓	↓	↓	↓	↓	↓	G	G	↓			↓	↓	↓	↓	↓	↓	↓	↓	↓	5	17 204.38	288.89	231.59
	3			10/11 SW	↓	↓	↓	↓	↓	U	G	G	↓			↓	↓	↓	↓	↓	↓	↓	↓	↓	5	18 197.34	308.25	245.46
	4			10/12 RE	↓	↓	↓	↓	↓	U	N	N	↓			↓	↓	↓	↓	↓	↓	↓	↓	↓	5	19 198.68	268.33	221.63
	5			10/13 MK	↓	↓	↓	↓	↓	U	↓	G	↓			↓	↓	↓	↓	↓	↓	↓	↓	↓	4	20 199.45	274.12	227.39
SMA-1B-IT3 /	1			10/14 MK	N	N	N	N	N	N	N	N	N			G	G	G	G	G	G	G	G	G	5	21 197.86	294.76	234.07
	2			10/15 SW	↓	↓	↓	↓	↓	↓	↓	G	G			↓	↓	↓	↓	↓	↓	↓	G	↓	5	22 186.58	260.36	208.57
	3			10/16 SW	↓	↓	↓	↓	↓	↓	↓	G	↓			↓	↓	↓	↓	↓	↓	↓	IE	↓	5	23 185.54	263.98	210.57
	4			10/17 SW	↓	↓	↓	↓	↓	↓	↓	G	↓			↓	↓	↓	↓	↓	↓	↓	G	↓	5	24 181.27	268.21	209.34
	5			10/18 SW	↓	↓	↓	↓	↓	↓	↓	G	↓			↓	↓	↓	↓	↓	U	↓	G	↓	5	25 176.05	235.71	191.84

ECO ANALYSTS

CLIENT	PROJECT	JOB NO.	PROJECT MANAGER	LABORATORY	PROTOCOL	SPECIES
Anchor QEA	Port Gamble Monitoring	PG1123	B. Hester	Port Gamble	PSEP 1995	*Neanthes arenaceodentata*

ENDPOINT DATA & OBSERVATIONS

N = Normal OW = other worm
#E = Emergence
#M = Mortality
G = Growth (fungal, bacterial, or algal)
D = No Air Flow (DO?)
F = Floating on Surface
TC = Too Cloudy
U=Excess food
INITIAL # OF ORGANISMS: 5

CLIENT/ ENVIRON ID	REP	JAR	Date and Initials	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	NUMBER REMAINING	TARE WEIGHT (mg)	TOTAL WEIGHT (mg)	ASHED WEIGHT (mg)
			INITIAL # (if differs)	10/4 RW	10/5 RW	10/6 CR	10/7 CR	10/8 CM	10/9 MK	10/10 CM	10/11 RW	10/13 RE	10/13 MK	10/14 MK	10/15 RW	10/16 RW	10/17 RW	10/18 RW	10/19 MK	10/20 RW	10/21 RW	10/22 RW	10/23 CB				
SMA-2C-IT3 /	1			N	N	N	N	N	N	G	G	G	G	G	G	G	G	G	G	G	G	G	G	5	26 197.13	280.26	226.55
	2			↓	↓	↓	↓	↓	↓	N	G	↓	↓	↓	↓	↓	↓	IE	↓	↓	↓	↓	↓	5	27 189.34	264.02	212.53
	3			↓	↓	↓	↓	↓	G	G	G	↓	↓	↓	↓	↓	↓	G	↓	↓	↓	↓	↓	5	28 203.36	280.55	220.22
	4			↓	↓	↓	↓	↓	N	N	G	↓	↓	↓	↓	↓	↓	G	↓	↓	↓	IE	↓	5	29 209.06	289.45	234.33
	5			↓	↓	↓	G	G	G	G	G	↓	↓	↓	↓	↓	↓	G	↓	↓	↓	G	↓	5	30 193.34	272.20	216.92
SMA-2C-IT6 /	1			N	N	N	N	N	N	G	G	G			G	G	G	G	G	G	G	G	G	5	31 196.24	261.29	221.32
	2			↓	↓	↓	↓	↓	↓	G	G	↓			↓	↓	↓	IE	↓	↓	↓	↓	↓	5	32 174.21	258.62	204.26
	3			↓	↓	↓	↓	↓	↓	G	G	↓			↓	↓	↓	G	↓	↓	↓	↓	↓	5	33 196.85	285.03	237.48
	4			↓	↓	↓	↓	↓	↓	G	G	↓			↓	↓	↓	G	↓	↓	↓	↓	↓	5	34 225.30	312.66	255.91
	5			↓	↓	↓	↓	↓	↓	N	G	N			↓	↓	↓	IE	↓	↓	↓	↓	↓	4	35 218.91	288.89	246.38
SMA-2C-IT9 /	1			N	N	N	N	N	U	N	G	G			G	G	G	G	G	G	G	G	G	5	36 194.27	255.92	214.58
	2			↓	↓	↓	↓	↓	N	↓	N	N			↓	↓	↓	G	↓	↓	↓	IE	↓	5	37 255.88	344.62	292.65
	3			↓	↓	↓	↓	↓	↓	↓	G	G			↓	↓	↓	G	↓	↓	↓	G	↓	5	38 236.02	308.13	261.47
	4			↓	↓	↓	↓	↓	↓	↓	G	↓			↓	↓	↓	IE	↓	↓	↓	↓	↓	5	39 294.25	369.39	320.73
	5			↓	↓	↓	↓	↓	↓	↓	G	↓			↓	↓	↓	U	↓	↓	↓	↓	↓	5	40 182.64	253.91	208.96

ECO ANALYSTS

CLIENT	PROJECT	START TIME/ END TIME	DILUTION WATER BATCH	PROTOCOL	TEST START DATE
Anchor QEA	Port Gamble Monitoring	1100 / 0960	FSW100218.01	PSEP 1995	3-Oct-2018
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
PG1123	B. Hester	Port Gamble		*Neanthes arenaceodentata*	23-Oct-2018

WATER QUALITY DATA

Test Location:	Dilution Water Batch:
Test Acceptability:	Supplier:
> 80% Survival in Control	Organism Batch: Age:
	Test Chamber Size:

TEST CONDITIONS				DO (mg/L) > 4.6		TEMP (C) 20 ± 1		SALINITY (ppt) 28 ± 2		pH 8.0±1.0				
CLIENT/ENVIRON ID	DAY	REP	JAR	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WATER RENEWAL	Feeding	TECH/DATE
Control /	0	Surr	8	8	7.5	8	20.1	8	29	8	8.0		SW	MK 10/3
Control /	1	Surr		8	7.4	8	20.2	8	29	8	7.7			SW 10/4
Control /	2	Surr		8	7.3	8	20.2	8	29	8	7.8		JL	SW 10/5
Control /	3	Surr		8	7.4	8	20.4	8	29	8	7.8	CR		CR 10/6
Control /	4	Surr		8	6.6	8	19.9	8	28	8	7.8		CR	CR 10/7
Control /	5	Surr		8	7.0	8	19.9	8	27	8	7.8			UB 10/8
Control /	6	Surr		8	7.4	8	19.9	8	28	8	7.9	JL	JL	MK 10/9
Control /	7	Surr		8	7.1	8	19.6	8	28	8	7.7			UB 10/10
Control /	8	Surr		8	7.6	8	19.6	8	28	8	7.9		JL	SW 10/11
Control /	9	Surr		8	7.3	8	19.6	8	28	8	7.7	SW		RE 10/12
Control /	10	Surr		8	7.7	8	19.5	8	28	8	7.9		MK	MK 10/13
Control /	11	Surr	8	8	7.5	8	19.6	8	28	8	7.9			MK 10/14
Control /	12	Surr		8	7.4	8	19.6	8	28	8	7.9	SW	MK	SW 10/15
Control /	13	Surr		8	7.7	8	19.4	8	28	8	7.9			SW 10/16
Control /	14	Surr		8	7.8	8	19.4	8	28	8	7.8		SW	SW 10/17
Control /	15	Surr		8	7.3	8	19.4	8	28	8	7.8	SW		SW 10/18
Control /	16	Surr		8	7.4	8	19.5	8	28	8	7.9		SW	MK 10/19
Control /	17	Surr		8	7.2	8	19.5	8	28	8	7.8			SW 10/20
Control /	18	Surr		8	7.2	8	19.5	8	28	8	7.8	SW	SW	SW 10/21
Control /	19	Surr		8	7.3	8	19.4	8	28	8	7.8			SW 10/22
Control /	20	Surr		8	7.3	8	19.3	8	28	8	7.9			SW 10/23

EcoAnalysts

CLIENT	PROJECT	START TIME/ END TIME	DILUTION WATER BATCH	PROTOCOL	TEST START DATE
Anchor QEA	Port Gamble Monitoring		FSW100218.01	PSEP 1995	3-Oct-2018
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
PG1123	B. Hester	Port Gamble		*Neanthes arenaceodentata*	23-Oct-2018

WATER QUALITY DATA

Test Location:	Dilution Water Batch:
Test Acceptability:	Supplier:
90% Survival in Control	Organism Batch: Age:
	Test Chamber Size:

TEST CONDITIONS				DO (mg/L) > 4.6		TEMP (C) 20 ± 1		SALINITY (ppt) 28 ± 2		pH 8.0±1.0				
CLIENT/ENVIRON ID	DAY	REP	JAR	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WATER RENEWAL	Feeding	TECH/DATE
CARR-20 /	0	Surr	16	8	7.5	8	20.2	8	29	8	7.9		SW	MK 10/3
CARR-20 /	1	Surr	|	8	7.0	8	20.4	8	29	8	7.6			SW 10/4
CARR-20 /	2	Surr	|	8	7.2	8	20.3	8	29	8	7.7		JL	SW 10/5
CARR-20 /	3	Surr	|	8	6.6	8	20.6	8	29	8	7.7	CR		CR 10/6
CARR-20 /	4	Surr	|	8	7.4	8	19.8	8	28	8	7.8		CR	CR 10/7
CARR-20 /	5	Surr	|	8	6.9	8	20.1	8	28	8	7.7			MB 10/8
CARR-20 /	6	Surr	|	8	7.4	8	20.1	8	28	8	7.8	JL	JL	MK 10/9
CARR-20 /	7	Surr	|	8	7.2	8	19.7	8	28	8	7.6			MB 10/10
CARR-20 /	8	Surr	|	8	7.4	8	19.8	8	28	8	7.9		JL	SW 10/11
CARR-20 /	9	Surr	|	8	7.0	8	19.9	8	28	8	7.7	SW		RE 10/12
CARR-20 /	10	Surr	⊥	8	7.7	8	19.6	8	28	8	8.0		MK	MK 10/13
CARR-20 /	11	Surr	16	8	7.5	8	19.9	8	28	8	7.9			MK 10/14
CARR-20 /	12	Surr	|	8	7.5	8	19.8	8	28	8	8.0	SW	MK	SW 10/15
CARR-20 /	13	Surr	|	8	7.3	8	19.6	8	28	8	7.9			SW 10/16
CARR-20 /	14	Surr	|	8	7.7	8	19.6	8	28	8	7.9		SW	SW 10/17
CARR-20 /	15	Surr	|	8	7.1	8	19.6	8	28	8	7.8	SW		SW 10/18
CARR-20 /	16	Surr	|	8	7.4	8	19.7	8	28	8	7.9		SW	MK 10/19
CARR-20 /	17	Surr	|	8	7.1	8	19.7	8	28	8	7.9			SW 10/20
CARR-20 /	18	Surr	|	8	6.9	8	19.9	8	28	8	7.8	SW	SW	SW 10/21
CARR-20 /	19	Surr	|	8	7.1	8	19.6	8	28	8	7.8			SW 10/22
CARR-20 /	20	Surr	⊥	8	7.0	8	19.6	8	28	8	7.9			SW 10/23

ECO ANALYSTS

CLIENT	PROJECT	START TIME/ END TIME	DILUTION WATER BATCH	PROTOCOL	TEST START DATE
Anchor QEA	Port Gamble Monitoring		FSW100218.01	PSEP 1995	3-Oct-2018
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
PG1123	B. Hester	Port Gamble		*Neanthes arenaceodentata*	23-Oct-2018

WATER QUALITY DATA

Test Location:	Dilution Water Batch:
Test Acceptablility:	Supplier:
___ > 90% Survival in Control	Organism Batch: Age:
	Test Chamber Size:

TEST CONDITIONS				DO (mg/L) > 4.6		TEMP (C) 20 ± 1		SALINITY (ppt) 28 ± 2		pH 8.0±1.0				
CLIENT/ENVIRON ID	DAY	REP	JAR	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WATER RENEWAL	Feeding	TECH/DATE
CR-21 /	0	Surr	4	8	7.3	8	20.1	8	29	8	7.9		SW	MK 10/3
CR-21 /	1	Surr	|	8	6.7	8	20.3	8	29	8	7.5			SW 10/4
CR-21 /	2	Surr	|	8	6.3	8	20.2	8	29	8	7.7		JL	SW 10/5
CR-21 /	3	Surr	|	8	6.3	8	20.5	8	29	8	7.7	CR		CR 10/6
CR-21 /	4	Surr	|	8	6.6	8	19.8	8	28	8	7.6		CR	CR 10/7
CR-21 /	5	Surr	|	8	5.5	8	20.1	8	28	8	7.5			UB 10/8
CR-21 /	6	Surr	|	8	6.1	8	19.9	8	28	8	7.7	JL	JL	MK 10/9
CR-21 /	7	Surr	|	8	5.6	8	19.8	8	28	8	7.4			UB 10/10
CR-21 /	8	Surr	|	8	6.9	8	19.8	8	28	8	7.8		JL	SW 10/11
CR-21 /	9	Surr	|	8	6.1	8	19.8	8	28	8	7.5	SW		RE 10/12
CR-21 /	10	Surr	|	8	7.0	8	19.6	8	28	8	7.8		MK	MK 10/13
CR-21 /	11	Surr	4	8	6.7	8	19.8	8	28	8	7.8			MK 10/14
CR-21 /	12	Surr	|	8	7.3	8	19.6	8	28	8	7.8	SW	MK	SW 10/15
CR-21 /	13	Surr	|	8	6.8	8	19.6	8	27	8	7.7			SW 10/16
CR-21 /	14	Surr	|	8	7.4	8	19.5	8	27	8	7.8		SW	SW 10/17
CR-21 /	15	Surr	|	8	6.1	8	19.5	8	27	8	7.7	SW		SW 10/18
CR-21 /	16	Surr	|	8	6.7	8	19.7	8	27	8	7.8		SW	MK 10/19
CR-21 /	17	Surr	|	8	6.8	8	19.5	8	28	8	7.7			SW 10/20
CR-21 /	18	Surr	|	8	6.6	8	19.6	8	27	8	7.8	SW	SW	SW 10/21
CR-21 /	19	Surr	|	8	6.6	8	19.5	8	28	8	7.7			SW 10/22
CR-21 /	20	Surr	|	8	6.5	8	19.4	8	28	8	7.9			SW 10/23

EcoAnalysts

CLIENT	PROJECT	START TIME/ END TIME	DILUTION WATER BATCH	PROTOCOL	TEST START DATE
Anchor QEA	Port Gamble Monitoring	/	FSW100218.01	PSEP 1995	3-Oct-2018
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
PG1123	B. Hester	Port Gamble		*Neanthes arenaceodentata*	23-Oct-2018

WATER QUALITY DATA

~~Test Location:~~	Dilution Water Batch:
Test Acceptablility:	Supplier:
__ > 90% Survival in Control	Organism Batch: Age:
	Test Chamber Size:

TEST CONDITIONS				DO (mg/L) > 4.6		TEMP (C) 20 ± 1		SALINITY (ppt) 28 ± 2		pH 8.0±1.0				
CLIENT/ENVIRON ID	DAY	REP	JAR	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WATER RENEWAL	Feeding	TECH/DATE
SMA-1B-IT2 /	0	Surr	17	8	7.6	8	20.1	8	29	8	8.0		SW	MK 10/3
SMA-1B-IT2 /	1	Surr		8	7.2	8	20.5	8	29	8	7.8			SW 10/4
SMA-1B-IT2 /	2	Surr		8	7.3	8	20.3	8	29	8	7.9		JL	SW 10/5
SMA-1B-IT2 /	3	Surr		8	7.3	8	20.6	8	29	8	7.9	CR		CR 10/6
SMA-1B-IT2 /	4	Surr		8	7.4	8	19.8	8	28	8	7.9		CR	CR 10/7
SMA-1B-IT2 /	5	Surr		8	7.1	8	20.2	8	28	8	7.9			MB 10/8
SMA-1B-IT2 /	6	Surr		8	7.5	8	20.2	8	28	8	8.0	JL	JL	MK 10/9
SMA-1B-IT2 /	7	Surr		8	7.2	8	19.8	8	28	8	7.8			MB 10/10
SMA-1B-IT2 /	8	Surr		8	7.5	8	20.0	8	28	8	8.0		JL	SW 10/11
SMA-1B-IT2 /	9	Surr		8	7.4	8	20.0	8	28	8	7.9	SW		RE 10/12
SMA-1B-IT2 /	10	Surr		8	7.7	8	19.8	8	28	8	8.1		MK	MK 10/13
SMA-1B-IT2 /	11	Surr	17	8	7.6	8	20.0	8	28	8	8.1			MK 10/14
SMA-1B-IT2 /	12	Surr		8	7.7	8	19.9	8	28	8	8.1	SW	MK	SW 10/15
SMA-1B-IT2 /	13	Surr		8	7.7	8	19.7	8	28	8	8.1			SW 10/16
SMA-1B-IT2 /	14	Surr		8	7.7	8	19.8	8	28	8	8.1		SW	SW 10/17
SMA-1B-IT2 /	15	Surr		8	7.4	8	19.7	8	28	8	8.0	SW		SW 10/18
SMA-1B-IT2 /	16	Surr		8	7.6	8	19.7	8	28	8	8.1		SW	MK 10/19
SMA-1B-IT2 /	17	Surr		8	7.4	8	19.9	8	28	8	8.1			SW 10/20
SMA-1B-IT2 /	18	Surr		8	7.5	8	19.9	8	28	8	8.0	SW	SW	SW 10/21
SMA-1B-IT2 /	19	Surr		8	7.5	8	19.7	8	28	8	8.0			SW 10/22
SMA-1B-IT2 /	20	Surr		8	7.5	8	19.7	8	28	8	8.1			SW 10/23

ECO ANALYSTS

CLIENT	PROJECT	START TIME/ END TIME	DILUTION WATER BATCH	PROTOCOL	TEST START DATE
Anchor QEA	Port Gamble Monitoring		FSW100218.01	PSEP 1995	3-Oct-2018
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
PG1123	B. Hester	Port Gamble		*Neanthes arenaceodentata*	23-Oct-2018

WATER QUALITY DATA

Test Location:	Dilution Water Batch:
Test Acceptability:	Supplier:
> 90% Survival in Control	Organism Batch: Age:
	Test Chamber Size:

TEST CONDITIONS				DO (mg/L) > 4.6		TEMP (C) 20 ± 1		SALINITY (ppt) 28 ± 2		pH 8.0±1.0				
CLIENT/ENVIRON ID	DAY	REP	JAR	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WATER RENEWAL	Feeding	TECH/DATE
SMA-1B-IT3 /	0	Surr	34	8	7.6	8	19.9	8	28	8	7.9		SW	MK 10/3
SMA-1B-IT3 /	1	Surr		8	7.2	8	20.2	8	28	8	7.8			SW 10/4
SMA-1B-IT3 /	2	Surr		8	7.3	8	20.1	8	29	8	7.9		JL	SW 10/5
SMA-1B-IT3 /	3	Surr		8	7.3	8	20.4	8	29	8	7.9	CR		CR 10/6
SMA-1B-IT3 /	4	Surr		8	7.4	8	19.7	8	28	8	7.9		CR	CR 10/7
SMA-1B-IT3 /	5	Surr		8	7.0	8	20.1	8	28	8	7.9			UB 10/8
SMA-1B-IT3 /	6	Surr		8	7.4	8	20.1	8	28	8	8.1	JL	JL	MK 10/9
SMA-1B-IT3 /	7	Surr		8	7.0	8	19.8	8	28	8	7.8			UB 10/10
SMA-1B-IT3 /	8	Surr		8	7.3	8	20.0	8	28	8	8.1		JL	SW 10/11
SMA-1B-IT3 /	9	Surr		8	7.3	8	20.0	8	28	8	7.9	SW		RE 10/12
SMA-1B-IT3 /	10	Surr		8	7.7	8	19.7	8	28	8	8.0		MK	MK 10/13
SMA-1B-IT3 /	11	Surr	34	8	7.6	8	20.0	8	28	8	8.0			MK 10/14
SMA-1B-IT3 /	12	Surr		8	7.7	8	19.8	8	28	8	8.0	SW	MK	SW 10/15
SMA-1B-IT3 /	13	Surr		8	7.5	8	19.6	8	27	8	8.0			SW 10/16
SMA-1B-IT3 /	14	Surr		8	7.5	8	19.6	8	28	8	8.0		SW	SW 10/17
SMA-1B-IT3 /	15	Surr		8	7.4	8	19.5	8	28	8	7.9	SW		SW 10/18
SMA-1B-IT3 /	16	Surr		8	7.6	8	19.6	8	28	8	8.0		SW	MK 10/19
SMA-1B-IT3 /	17	Surr		8	7.3	8	19.8	8	28	8	8.0			SW 10/20
SMA-1B-IT3 /	18	Surr		8	7.3	8	19.7	8	28	8	8.0	SW	SW	SW 10/21
SMA-1B-IT3 /	19	Surr		8	7.3	8	19.6	8	28	8	7.9			SW 10/22
SMA-1B-IT3 /	20	Surr		8	7.4	8	0 ~~28~~ 19.7	8	28	8	8.1			SW 10/23

0 WC 10/23/18 SW

EcoAnalysts

CLIENT	PROJECT	START TIME/ END TIME	DILUTION WATER BATCH	PROTOCOL	TEST START DATE
Anchor QEA	Port Gamble Monitoring	/	FSW100218.01	PSEP 1995	3-Oct-2018
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
PG1123	B. Hester	Port Gamble		*Neanthes arenaceodentata*	23-Oct-2018

WATER QUALITY DATA

Test Location:	Dilution Water Batch:
Test Acceptability:	Supplier:
~~>~~ 90% Survival in Control	Organism Batch: Age:
	Test Chamber Size:

TEST CONDITIONS				DO (mg/L) > 4.6		TEMP (C) 20 ± 1		SALINITY (ppt) 28 ± 2		pH 8.0±1.0				
CLIENT/ENVIRON ID	DAY	REP	JAR	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WATER RENEWAL	Feeding	TECH/DATE
SMA-2C-IT3 /	0	Surr	44	8	7.6	8	19.5	8	28	8	8.0		SW	MK 10/3
SMA-2C-IT3 /	1	Surr	|	8	7.4	8	19.6	8	28	8	7.9			SW 10/4
SMA-2C-IT3 /	2	Surr	|	8	7.4	8	19.7	8	28	8	8.0		JL	SW 10/5
SMA-2C-IT3 /	3	Surr	|	8	7.4	8	20.1	8	28	8	8.0	CR		CR 10/6
SMA-2C-IT3 /	4	Surr	|	8	7.5	8	19.5	8	28	8	8.0		CR	CR 10/7
SMA-2C-IT3 /	5	Surr	|	8	7.2	8	19.8	8	27	8	7.9			WB 10/8
SMA-2C-IT3 /	6	Surr	|	8	7.6	8	19.6	8	27	8	8.0	JL	JL	MK 10/9
SMA-2C-IT3 /	7	Surr	|	8	7.4	8	19.5	8	28	8	7.8			WB 10/10
SMA-2C-IT3 /	8	Surr	|	8	7.4	8	19.6	8	28	8	8.0		JL	SW 10/11
SMA-2C-IT3 /	9	Surr	|	8	7.5	8	19.7	8	28	8	7.8	SW		RE 10/12
SMA-2C-IT3 /	10	Surr	|	8	7.7	8	19.5	8	28	8	8.0		MK	MK 10/13
SMA-2C-IT3 /	11	Surr	44	8	7.6	8	19.6	8	28	8	7.9			MK 10/14
SMA-2C-IT3 /	12	Surr	|	8	7.7	8	19.5	8	28	8	8.0	SW	MK	SW 10/15
SMA-2C-IT3 /	13	Surr	|	8	7.5	8	19.4	8	27	8	7.9			SW 10/16
SMA-2C-IT3 /	14	Surr	|	8	7.6	8	19.4	8	28	8	7.9		SW	SW 10/17
SMA-2C-IT3 /	15	Surr	|	8	7.5	8	19.3	8	28	8	7.9	SW		SW 10/18
SMA-2C-IT3 /	16	Surr	|	8	7.5	8	19.5	8	28	8	8.0		SW	MK 10/19
SMA-2C-IT3 /	17	Surr	|	8	7.4	8	19.5	8	28	8	7.9			SW 10/20
SMA-2C-IT3 /	18	Surr	|	8	7.4	8	19.6	8	28	8	7.8	SW	SW	SW 10/21
SMA-2C-IT3 /	19	Surr	|	8	7.4	8	19.5	8	28	8	7.8			SW 10/22
SMA-2C-IT3 /	20	Surr	|	8	7.3	8	19.4	8	28	8	7.9			SW 10/23

EcoAnalysts

CLIENT	PROJECT	START TIME/ END TIME	DILUTION WATER BATCH	PROTOCOL	TEST START DATE
Anchor QEA	Port Gamble Monitoring		FSW100218.01	PSEP 1995	3-Oct-2018
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
PG1123	B. Hester	Port Gamble		*Neanthes arenaceodentata*	23-Oct-2018

WATER QUALITY DATA

Test Location:	Dilution Water Batch:
Test Acceptability:	Supplier:
> 90% Survival in Control	Organism Batch: Age:
	Test Chamber Size:

TEST CONDITIONS				DO (mg/L) > 4.6		TEMP (C) 20 ± 1		SALINITY (ppt) 28 ± 2		pH 8.0±1.0				
CLIENT/ENVIRON ID	DAY	REP	JAR	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WATER RENEWAL	Feeding	TECH/DATE
SMA-2C-IT6 /	0	Surr	37	8	7.6	8	20.0	8	28	8	7.9		SW	MK 10/3
SMA-2C-IT6 /	1	Surr	|	8	6.6	8	20.3	8	28	8	7.6			SW 10/4
SMA-2C-IT6 /	2	Surr	|	8	7.0	8	20.2	8	28	8	7.7		JV	SW 10/5
SMA-2C-IT6 /	3	Surr	|	8	7.0	8	20.5	8	28	8	7.8	CR		CR 10/6
SMA-2C-IT6 /	4	Surr	|	8	7.4	8	19.8	8	28	8	7.8		CR	CR 10/7
SMA-2C-IT6 /	5	Surr	|	8	7.0	8	20.1	8	27	8	7.7			UB 10/8
SMA-2C-IT6 /	6	Surr	|	8	7.4	8	20.1	8	28	8	7.9	JV	JV	MK 10/9
SMA-2C-IT6 /	7	Surr	|	8	7.2	8	19.7	8	28	8	7.7			UB 10/10
SMA-2C-IT6 /	8	Surr	|	8	7.4	8	19.9	8	28	8	7.9		JV	SW 10/11
SMA-2C-IT6 /	9	Surr	|	8	7.2	8	20.0	8	28	8	7.7	SW		RE 10/12
SMA-2C-IT6 /	10	Surr	|	8	7.7	8	19.7	8	28	8	7.9		MK	MK 10/13
SMA-2C-IT6 /	11	Surr	37	8	7.5	8	19.9	8	28	8	7.8			MK 10/14
SMA-2C-IT6 /	12	Surr	|	8	7.5	8	19.8	8	28	8	7.8	SW	MK	SW 10/15
SMA-2C-IT6 /	13	Surr	|	8	7.4	8	19.6	8	27	8	7.8			SW 10/16
SMA-2C-IT6 /	14	Surr	|	8	7.5	8	19.6	8	28	8	7.8		SW	SW 10/17
SMA-2C-IT6 /	15	Surr	|	8	7.2	8	19.5	8	28	8	7.7	SW		SW 10/18
SMA-2C-IT6 /	16	Surr	|	8	7.6	8	19.6	8	28	8	7.8		SW	MK 10/19
SMA-2C-IT6 /	17	Surr	|	8	7.1	8	19.7	8	27	8	7.8			SW 10/20
SMA-2C-IT6 /	18	Surr	|	8	7.2	8	19.7	8	28	8	7.7	SW	SW	SW 10/21
SMA-2C-IT6 /	19	Surr	|	8	7.2	8	19.7	8	28	8	7.7			SW 10/22
SMA-2C-IT6 /	20	Surr	|	8	7.3	8	19.6	8	28	8	7.8			SW 10/23

ECO ANALYSTS

CLIENT	PROJECT	START TIME/ END TIME	DILUTION WATER BATCH	PROTOCOL	TEST START DATE
Anchor QEA	Port Gamble Monitoring		FSW100218.01	PSEP 1995	3-Oct-2018
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
PG1123	B. Hester	Port Gamble		*Neanthes arenaceodentata*	23-Oct-2018

WATER QUALITY DATA

Test Location:	Dilution Water Batch:
Test Acceptability:	Supplier:
> 90% Survival in Control	Organism Batch: Age:
	Test Chamber Size:

TEST CONDITIONS				DO (mg/L) > 4.6		TEMP (C) 20 ± 1		SALINITY (ppt) 28 ± 2		pH 8.0±1.0				
CLIENT/ENVIRON ID	DAY	REP	JAR	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WATER RENEWAL	Feeding	TECH/DATE
SMA-2C-IT9 /	0	Surr	9	8	7.5	8	20.3	8	28	8	8.0		SW	MK 10/3
SMA-2C-IT9 /	1	Surr	|	8	7.1	8	20.5	8	28	8	7.7			SW 10/4
SMA-2C-IT9 /	2	Surr	|	8	7.4	8	20.3	8	28	8	7.8		JV	SW 10/5
SMA-2C-IT9 /	3	Surr	|	8	7.1	8	20.6	8	29	8	7.8	CR		CR 10/6
SMA-2C-IT9 /	4	Surr	|	8	7.1	8	19.9	8	28	8	7.8		CR	CR 10/7
SMA-2C-IT9 /	5	Surr	|	8	7.2	8	20.2	8	28	8	7.8			MB 10/8
SMA-2C-IT9 /	6	Surr	|	8	7.5	8	20.2	8	28	8	7.9	JV	JV	MK 10/9
SMA-2C-IT9 /	7	Surr	|	8	7.3	8	19.9	8	28	8	7.7			MB 10/10
SMA-2C-IT9 /	8	Surr	|	8	7.5	8	20.1	8	28	8	7.9		JV	SW 10/11
SMA-2C-IT9 /	9	Surr	|	8	7.5	8	20.0	8	28	8	7.7	SW		RE 10/12
SMA-2C-IT9 /	10	Surr	|	8	7.7	8	19.8	8	28	8	7.9		MK	MK 10/13
SMA-2C-IT9 /	11	Surr	9	8	7.6	8	20.1	8	28	8	7.9			MK 10/14
SMA-2C-IT9 /	12	Surr	|	8	7.5	8	19.9	8	28	8	7.8	SW	MK	SW 10/15
SMA-2C-IT9 /	13	Surr	|	8	7.5	8	19.8	8	28	8	7.8			SW 10/16
SMA-2C-IT9 /	14	Surr	|	8	7.6	8	19.8	8	28	8	7.8		SW	SW 10/17
SMA-2C-IT9 /	15	Surr	|	8	7.3	8	19.7	8	28	8	7.8	SW		SW 10/18
SMA-2C-IT9 /	16	Surr	|	8	7.4	8	19.9	8	28	8	7.8		SW	MK 10/19
SMA-2C-IT9 /	17	Surr	|	8	7.2	8	19.9	8	28	8	7.8			SW 10/20
SMA-2C-IT9 /	18	Surr	|	8	7.2	8	19.9	8	28	8	7.7	SW	SW	SW 10/21
SMA-2C-IT9 /	19	Surr	|	8	7.2	8	19.8	8	28	8	7.7			SW 10/22
SMA-2C-IT9 /	20	Surr	|	8	7.4	8	19.7	8	28	8	7.8			SW 10/23

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
ANCHOR / Port Gamble	Neanthes	20

PRETEST / INITIAL / ~~FINAL~~ / OTHER (circle one)

OVERLYING (OV) / ~~POREWATER (PW)~~ (circle one) / Comments: _____

DAY of TEST: 0

Calibration Standards Temperature		
Date: 10/03/18	Temperature: 22.0°C	Sample temperature should be within ±1°C of standards temperature at time and date of analysis.

Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Meter # / Temp (°C)		Date of Reading and Initials	Sample Preserved (Y/N)	pH	Sal (ppt)	Sample Volume (mL)	Measured Sulf. (mg/L)	Multi-plier	Calc-ulated Sulf. (mg/L)
OV Ø	Surr.	10/03/18 JL	0.00	T1	21.0	10/03/18 JL	N			10	0.008		
CARR 20			0.410								0.014		
CR. 21			0.304								0.017		
1B IT2			0.585								0.007		
↓ IT3			0.622								0.011		
2C IT3			0.282								0.009		
↓ IT6			0.00								0.008		
↓ IT9			0.00								0.004		
PW Ø	Surr		0.00	T1	21.0	10/03 RE		7.2	29	5	ND	2	ND
CARR 20			3.21	T1	21.0			7.3	29	5	0.006	2	0.012
CR 21			①							2	ND	5	ND
1B-IT2			8.75	T1	21.0			7.4	26	2	0.048	5	~~0.090~~ 0.240 ②
IT3			①										
2C IT3			①	T1			7	7.5	24	1	0.011	10	0.110
IT6			0.096		21.0			7.2	26	1	0.013	10	0.130
IT9			0.296		21.0			7.3	27	1	0.031	10	0.310

① Insufficient volume. RE 10/03. ② JL 10/03.

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
Anchor / Port Gamble	Neanthes	20

PRETEST / INITIAL / FINAL / OTHER (circle one)

OVERLYING (OV) / POREWATER (PW) (circle one) / Comments: _____

DAY of TEST: 20

Calibration Standards Temperature		
Date: 10/23/18	Temperature: 22.2°C	Sample temperature should be within ±1°C of standards temperature at time and date of analysis.

Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Meter # / Temp (°C)		Date of Reading and Initials	Sample Preserved (Y/N)	pH	Sal (ppt)	Sample Volume (mL)	Measured Sulf. (mg/L)	Multi-plier	Calc-ulated Sulf. (mg/L)
OV ⊖	Surr.	10/23/18 JL	1.17	T1	21.4	10/23 JL	N			10			0.001
CARR 20			1.36										0.000
CR 21			7.50										0.003
1B 1T2			0.420										0.000
1B 1T3			0.326										0.000
2C 1T3			1.84										0.001
2C 1T6			2.77										0.003
2C 1T9			1.44										0.001
PW ⊖			1.79	T1	21.2			7.5	27	2	0.004	5	0.020
CARR 20			①					7.0	27	5	ND	2	ND
CR 21			①					7.9	27	1	0.007	10	0.070
1B 1T2			①										
1B 1T3			①										
2C 1T3			①										
2C 1T6			①					7.6	27	2	② ND	5	ND
2C 1T9			1.81					7.5	27	2	0.00	5	0.00

① Insufficient volume for analysis. JL 10/23

② IE. JL 10/23.

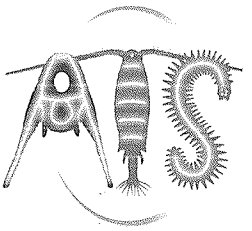
ORGANISM RECEIPT LOG

Date: 9-28-18	Time: 1020	Batch No. ATS092818
Organism: Neanthes arenaceodentata		
Source / Supplier: Aquatic Toxicology Support		
No. Ordered: 840	**No. Received:** 924	**Source Batch:** Collection date, hatch date, etc.): Emerge Date 09-5-10-2018
Condition of Organisms: Good	**Approximate Size or Age:** (Days from hatch, life stage, size class, etc.): 23-28 days old	
Shipper: Courier	**B of L (Tracking No.)** NA	
Condition of Container: Good	**Received By:** BH, SW	

Container	D.O. (mg/L)	Temp. (°C)	Cond. or Sal. (Include Units) ppt	pH (Units)	# Dead	% Dead*	Tech. (Initials)
Comp	14.0	19.1	31	7.3	—	—	SW, BH

*if >10% contact lab manager

Notes:



Aquatic Toxicology Support
1849 Charleston Beach Road West
Bremerton, Washington 98312
(360) 813-1202

Order Summary

Species: *Neanthes arenaceodentata**	Emerge Date: Sept 5-10 '18
Number Ordered: 840	Number Shipped: 840 + 10%
Date Shipped: Sept 28 '18	Salinity (ppt): 31

*Smith 1964. CSU Long Beach strain. Feed upon arrival.

MAINTENANCE LOG FOR CULTURES

ORGANISM: Neanthes

LOCATION: Bath 2

Batch Number: ATS092818	Date Received: 9/28/18	Initial # of Organisms:

Date 2019	Feed AM/PM	Tub No.	D.O.	Temp (°C)	Cond/ (Sal) ppt	pH	H_2O Change	Organisms appear healthy (Y/N)	# Mort	% Mort*	Init.	Comments
9/29	—	10-d 1	6.9	19.7	32	7.8	N	Y	—	—	UL	
↓	—	2	6.9	19.9	32	7.8	↓	↓	—	—	↓	
↓	—	20-d	6.2	19.9	32	7.5	↓	↓	—	—	↓	
9/30	↓	10-d 1	6.9	19.9	32	7.8	Y	Y	—	—	↓	
↓	↓	2	6.9	20.0	32	7.8	↓	↓	—	—	↓	
↓	↓	20-d	6.5	19.8	31	7.6	↓	↓	—	—	↓	
10/01	—	10-d 1	7.0	20.0	32	7.9	N	Y	—	—	JL	
↓	—	2	6.8	20.1	32	7.8	↓	↓	—	—	↓	
↓	—	20-d	6.3	19.7	32	7.7	↓	↓	—	—	↓	
10/2	—	10-d 1	7.0	19.5	32	7.9	N	Y	—	—	MK	
↓	—	2	7.1	19.5	32	7.8	↓	↓	—	—	↓	
↓	—	20-d 1	6.7	19.4	32	7.7	↓	↓	—	—	↓	
10.3	—	20-d 1	7.1	19.1	32	7.8	N	Y	—	—	BH	

FT = Flow-through

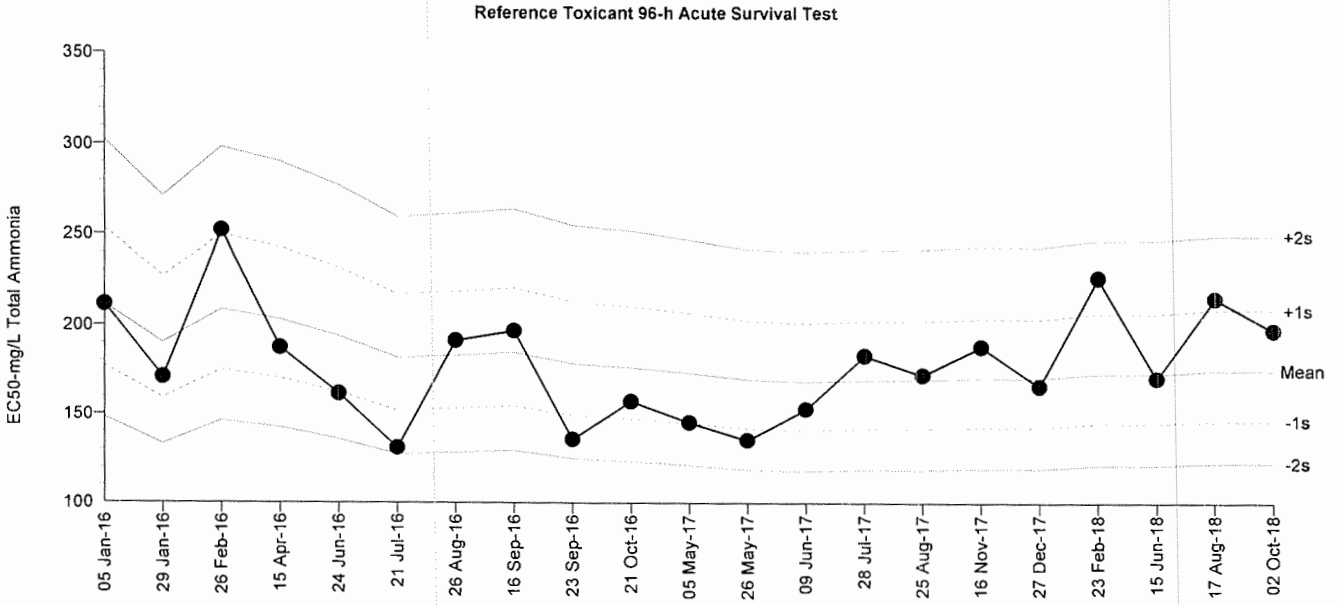
**if >10% notify lab manager*

CETIS QC Plot

Report Date: 22 Oct-18 16:37 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **All Matching Labs**

Test Type: Survival | **Organism:** Neanthes arenaceodentata (Polycha | **Material:** Total Ammonia
Protocol: PSEP (1995) | **Endpoint:** Proportion Survived | **Source:** Reference Toxicant-REF



Mean:	174.9	**Count:**	20	**-1s Warning Limit:**	146.4	**-2s Action Limit:**	122.5
Sigma:	n/a	**CV:**	17.90%	**+1s Warning Limit:**	208.9	**+2s Action Limit:**	249.6

Quality Control Data

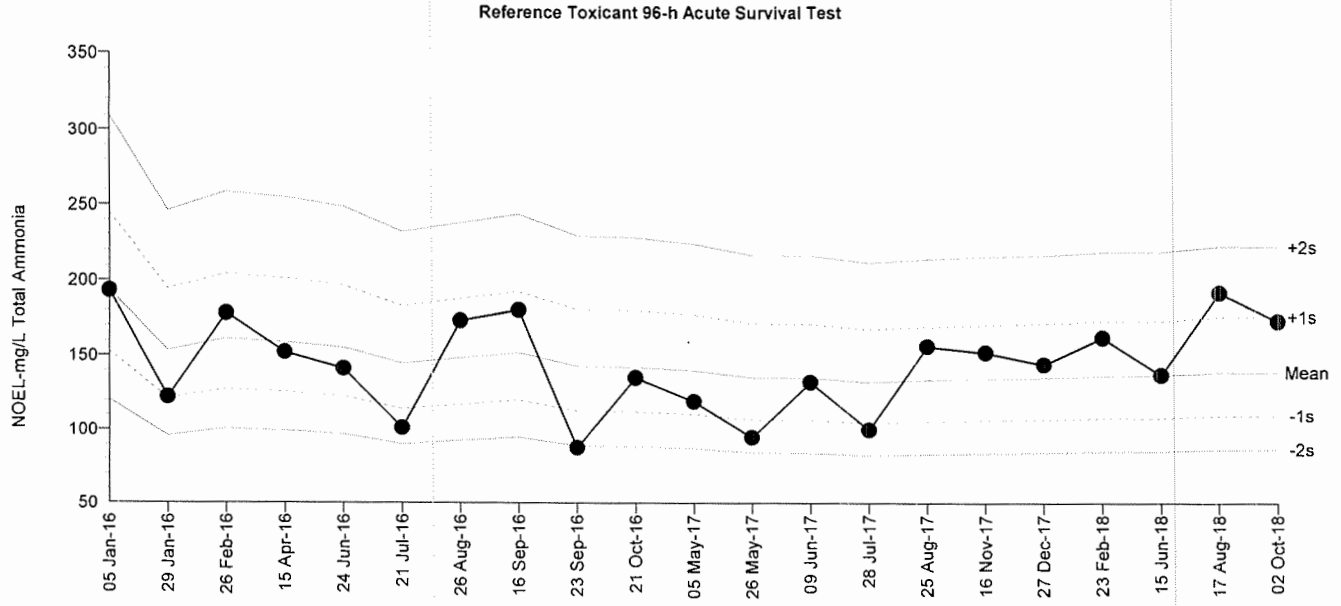
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2016	Jan	5	15:40	211.6	36.74	1.072	(+)		08-2089-5605	19-0377-2050	ENVIRON
2			29	10:55	170.9	-3.953	-0.1285			17-5198-4435	10-4316-4458	ENVIRON
3		Feb	26	13:05	251.9	77.04	2.052	(+)	(+)	12-4659-9912	05-2938-3515	ENVIRON
4		Apr	15	11:20	187.5	12.62	0.3917			14-5662-2397	01-2817-7421	ENVIRON
5		Jun	24	14:10	161.5	-13.35	-0.4466			18-4503-3329	10-8210-8087	ENVIRON
6		Jul	21	14:00	130.8	-44.03	-1.63	(-)		03-2252-3368	14-5043-4569	ENVIRON
7		Aug	26	17:00	191.5	16.65	0.5112			03-0001-3671	08-4097-9552	ENVIRON
8		Sep	16	13:45	196.9	21.99	0.6659			15-1361-3636	10-0806-2573	ENVIRON
9			23	14:00	135.9	-39	-1.418	(-)		11-8849-2684	05-6423-6975	ENVIRON
10		Oct	21	12:20	157.3	-17.52	-0.5936			07-3517-7142	10-6382-3344	ENVIRON
11	2017	May	5	11:10	145.4	-29.42	-1.036	(-)		19-9695-8635	12-9907-4132	EcoAnalysts
12			26	11:20	135.4	-39.44	-1.437	(-)		02-4398-8901	19-3251-4383	EcoAnalysts
13		Jun	9	13:12	152.9	-21.94	-0.7537			06-5936-3810	21-1385-6147	EcoAnalysts
14		Jul	28	10:45	183.1	8.221	0.2582			04-6413-3650	06-5419-2075	EcoAnalysts
15		Aug	25	10:40	172.2	-2.631	-0.0852			03-6651-4426	03-4165-4995	EcoAnalysts
16		Nov	16	13:40	188.2	13.35	0.4136			03-0415-6136	04-9955-5124	EcoAnalysts
17		Dec	27	15:35	165.8	-9.019	-0.2977			01-8821-8905	08-9204-3617	EcoAnalysts
18	2018	Feb	23	16:20	226.4	51.55	1.452	(+)		13-7905-8989	13-7098-6720	EcoAnalysts
19		Jun	15	14:35	170.5	-4.41	-0.1436			04-1274-1602	03-0642-1993	EcoAnalysts
20		Aug	17	14:15	215.3	40.39	1.168	(+)		07-8700-6256	13-3406-4651	EcoAnalysts
21		Oct	2	14:10	197.3	22.41	0.678			21-2226-7904	00-1709-8680	EcoAnalysts

CETIS QC Plot

Report Date: 22 Oct-18 16:37 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **All Matching Labs**

Test Type: Survival | **Organism:** Neanthes arenaceodentata (Polycha | **Material:** Total Ammonia
Protocol: PSEP (1995) | **Endpoint:** Proportion Survived | **Source:** Reference Toxicant-REF



Mean:	138.9	**Count:**	20	**-1s Warning Limit:**	109.8	**-2s Action Limit:**	86.69
Sigma:	n/a	**CV:**	23.90%	**+1s Warning Limit:**	176	**+2s Action Limit:**	222.8

Quality Control Data

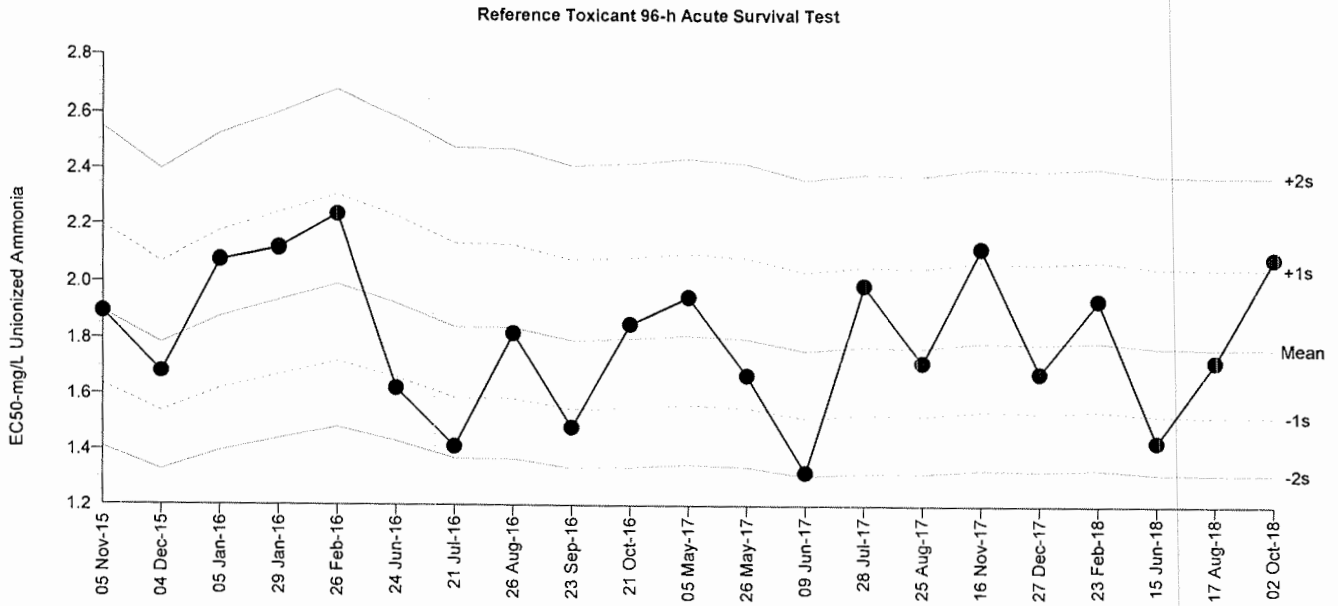
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2016	Jan	5	15:40	193	54.07	1.393	(+)		08-2089-5605	14-5672-8302	ENVIRON
2			29	10:55	122	-16.93	-0.5508			17-5198-4435	20-2746-8183	ENVIRON
3		Feb	26	13:05	178	39.07	1.05	(+)		12-4659-9912	04-9112-4627	ENVIRON
4		Apr	15	11:20	152	13.07	0.3808			14-5662-2397	08-8399-3634	ENVIRON
5		Jun	24	14:10	141	2.066	0.06254			18-4503-3329	05-9137-4303	ENVIRON
6		Jul	21	14:00	101	-37.93	-1.351	(-)		03-2252-3368	05-6001-6512	ENVIRON
7		Aug	26	17:00	173	34.07	0.9292			03-0001-3671	13-0809-8319	ENVIRON
8		Sep	16	13:45	180	41.07	1.097	(+)		15-1361-3636	20-6898-0370	ENVIRON
9			23	14:00	87.6	-51.33	-1.954	(-)		11-8849-2684	14-0354-7159	ENVIRON
10		Oct	21	12:20	135	-3.934	-0.1217			07-3517-7142	04-1673-2094	ENVIRON
11	2017	May	5	11:10	119	-19.93	-0.6563			19-9695-8635	08-7557-3106	EcoAnalysts
12			26	11:20	94.7	-44.23	-1.624	(-)		02-4398-8901	20-6641-5688	EcoAnalysts
13		Jun	9	13:12	132	-6.934	-0.2169			06-5936-3810	02-9842-7509	EcoAnalysts
14		Jul	28	10:45	99.9	-39.03	-1.398	(-)		04-6413-3650	18-1225-7941	EcoAnalysts
15		Aug	25	10:40	156	17.07	0.4909			03-6651-4426	09-2206-9228	EcoAnalysts
16		Nov	16	13:40	152	13.07	0.3808			03-0415-6136	18-4343-4696	EcoAnalysts
17		Dec	27	15:35	144	5.066	0.1518			01-8821-8905	01-3003-6293	EcoAnalysts
18	2018	Feb	23	16:20	162	23.07	0.6508			13-7905-8989	16-4206-5191	EcoAnalysts
19		Jun	15	14:35	137	-1.934	-0.0594			04-1274-1602	00-8204-0817	EcoAnalysts
20		Aug	17	14:15	192	53.07	1.371	(+)		07-8700-6256	00-3442-0298	EcoAnalysts
21		Oct	2	14:10	173	34.07	0.9292			21-2226-7904	05-0269-1791	EcoAnalysts

CETIS QC Plot

Report Date: 26 Oct-18 09:27 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **All Matching Labs**

Test Type: Survival | **Organism:** Neanthes arenaceodentata (Polycha | **Material:** Unionized Ammonia
Protocol: PSEP (1995) | **Endpoint:** Proportion Survived | **Source:** Reference Toxicant-REF



Mean: 1.768 | **Count:** 20 | **-1s Warning Limit:** 1.525 | **-2s Action Limit:** 1.315
Sigma: n/a | **CV:** 14.90% | **+1s Warning Limit:** 2.049 | **+2s Action Limit:** 2.376

Quality Control Data

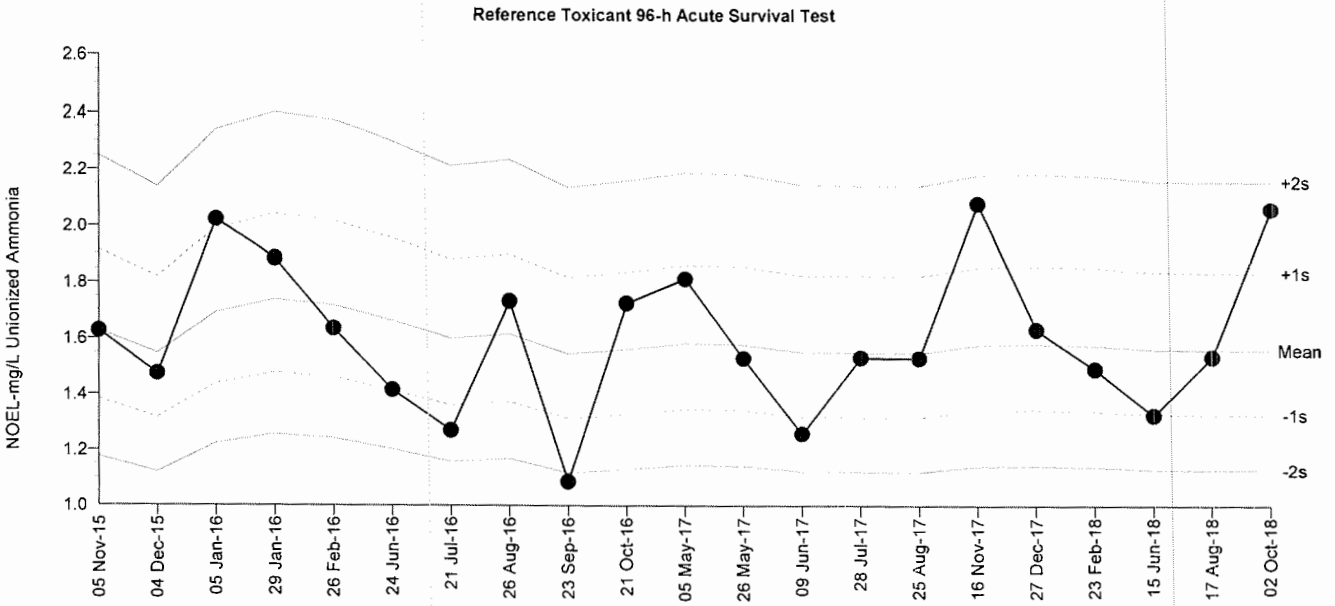
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2015	Nov	5	16:00	1.894	0.126	0.4658			13-9158-6969	12-9319-1772	ENVIRON
2		Dec	4	15:55	1.68	-0.0881	-0.3459			05-0232-3049	00-1680-9936	ENVIRON
3	2016	Jan	5	15:40	2.076	0.3081	1.087	(+)		16-5879-5239	14-7332-7904	ENVIRON
4			29	10:55	2.116	0.3487	1.218	(+)		02-3774-6836	17-0304-9971	ENVIRON
5		Feb	26	13:05	2.236	0.468	1.589	(+)		18-2733-1978	16-1252-1654	ENVIRON
6		Jun	24	14:10	1.621	-0.1467	-0.5863			14-5937-9292	12-2632-5647	ENVIRON
7		Jul	21	14:00	1.412	-0.3557	-1.52	(-)		13-0851-4355	08-2460-4906	ENVIRON
8		Aug	26	17:00	1.818	0.05013	0.1892			18-0730-6378	20-7585-3701	ENVIRON
9		Sep	23	14:00	1.482	-0.2861	-1.195	(-)		16-0277-5330	13-3150-6775	ENVIRON
10		Oct	21	12:20	1.851	0.08363	0.3128			15-4953-5653	13-6771-5656	ENVIRON
11	2017	May	5	11:10	1.947	0.1794	0.654			06-1983-2716	10-6060-2702	EcoAnalysts
12			26	11:20	1.668	-0.09972	-0.3929			11-9977-1019	12-2648-7955	EcoAnalysts
13		Jun	9	13:12	1.32	-0.4474	-1.974	(-)		20-5746-1828	16-2628-9369	EcoAnalysts
14		Jul	28	10:45	1.989	0.2214	0.7983			11-9488-2902	14-7043-7154	EcoAnalysts
15		Aug	25	10:40	1.716	-0.05214	-0.2026			04-3451-1040	00-3615-6317	EcoAnalysts
16		Nov	16	13:40	2.122	0.3543	1.236	(+)		21-2485-6236	15-8866-6943	EcoAnalysts
17		Dec	27	15:35	1.678	-0.08985	-0.353			14-3251-3795	10-3688-8341	EcoAnalysts
18	2018	Feb	23	16:20	1.939	0.1708	0.6241			08-4313-9079	15-8743-9749	EcoAnalysts
19		Jun	15	14:35	1.432	-0.3357	-1.425	(-)		13-9420-2469	11-6483-4489	EcoAnalysts
20		Aug	17	14:15	1.721	-0.0467	-0.1811			16-0114-0602	19-8752-3439	EcoAnalysts
21		Oct	2	14:10	2.087	0.3195	1.124	(+)		02-7017-5318	01-2654-4798	EcoAnalysts

CETIS QC Plot

Report Date: 26 Oct-18 09:27 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **All Matching Labs**

Test Type: Survival | **Organism:** Neanthes arenaceodentata (Polycha | **Material:** Unionized Ammonia
Protocol: PSEP (1995) | **Endpoint:** Proportion Survived | **Source:** Reference Toxicant-REF



Mean:	1.56	**Count:**	20	**-1s Warning Limit:**	1.327	**-2s Action Limit:**	1.129
Sigma:	n/a	**CV:**	16.30%	**+1s Warning Limit:**	1.835	**+2s Action Limit:**	2.157

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2015	Nov	5	16:00	1.627	0.06667	0.2584			13-9158-6969	18-5085-3785	ENVIRON
2		Dec	4	15:55	1.473	-0.08733	-0.3558			05-0232-3049	09-1115-6716	ENVIRON
3	2016	Jan	5	15:40	2.023	0.4627	1.604	(+)		16-5879-5239	13-0355-9173	ENVIRON
4			29	10:55	1.883	0.3227	1.161	(+)		02-3774-6836	16-2829-1192	ENVIRON
5		Feb	26	13:05	1.635	0.07467	0.2887			18-2733-1978	17-6331-1700	ENVIRON
6		Jun	24	14:10	1.415	-0.1453	-0.6039			14-5937-9292	10-8537-0051	ENVIRON
7		Jul	21	14:00	1.27	-0.2903	-1.272	(-)		13-0851-4355	06-2505-9350	ENVIRON
8		Aug	26	17:00	1.732	0.1717	0.6447			18-0730-6378	04-2606-0638	ENVIRON
9		Sep	23	14:00	1.085	-0.4753	-2.244	(-)	(-)	16-0277-5330	10-1484-1501	ENVIRON
10		Oct	21	12:20	1.725	0.1647	0.6197			15-4953-5653	10-3980-3312	ENVIRON
11	2017	May	5	11:10	1.812	0.2517	0.9236			06-1983-2716	14-3198-2813	EcoAnalysts
12			26	11:20	1.529	-0.03133	-0.1253			11-9977-1019	08-2373-9544	EcoAnalysts
13		Jun	9	13:12	1.258	-0.3023	-1.33	(-)		20-5746-1828	13-3286-2330	EcoAnalysts
14		Jul	28	10:45	1.532	-0.02833	-0.1132			11-9488-2902	00-8692-4177	EcoAnalysts
15		Aug	25	10:40	1.53	-0.03033	-0.1213			04-3451-1040	07-6966-4955	EcoAnalysts
16		Nov	16	13:40	2.079	0.5187	1.773	(+)		21-2485-6236	00-9775-4668	EcoAnalysts
17		Dec	27	15:35	1.633	0.07267	0.2812			14-3251-3795	04-4998-7500	EcoAnalysts
18	2018	Feb	23	16:20	1.491	-0.06933	-0.2807			08-4313-9079	12-5767-7210	EcoAnalysts
19		Jun	15	14:35	1.325	-0.2353	-1.01	(-)		13-9420-2469	12-4705-5925	EcoAnalysts
20		Aug	17	14:15	1.535	-0.02533	-0.1011			16-0114-0602	03-4717-2264	EcoAnalysts
21		Oct	2	14:10	2.059	0.4987	1.713	(+)		02-7017-5318	12-2051-3096	EcoAnalysts

CETIS Summary Report

Reference Toxicant 96-h Acute Survival Test — **EcoAnalysts**

Batch ID:	20-2661-2066	**Test Type:**	Survival	**Analyst:**	
Start Date:	02 Oct-18 14:10	**Protocol:**	PSEP (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	06 Oct-18 14:50	**Species:**	Neanthes arenaceodentata	**Brine:**	Not Applicable
Test Length:	4d 1h	**Taxon:**	Polychaeta	**Source:**	Aquatic Toxicology Support **Age:**

Sample ID:	17-6336-1456	**Code:**	691AC2B0	**Project:**	Reference Toxicant
Sample Date:	15 May-17	**Material:**	Total Ammonia	**Source:**	Reference Toxicant
Receipt Date:	15 May-17	**CAS (PC):**		**Station:**	P170515.103
Sample Age:	505d 14h	**Client:**	Internal Lab		

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓	NOEL	LOEL	TOEL	TU	PMSD	S
05-0269-1791	Proportion Survived	Fisher Exact Test		173	223	196.4		n/a	1

Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓	Level	mg/L	95% LCL	95% UCL	TU	S
00-1709-8680	Proportion Survived	Trimmed Spearman-Kärber		EC50	197.3	195.5	199		1

Proportion Survived Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	D	3	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
63.6		3	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
116		3	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
148		3	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
173		3	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
223		3	0.0333	0.0000	0.1768	0.0000	0.1000	0.0333	0.0577	173.21%	96.67%

Proportion Survived Detail

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3
0	D	1.0000	1.0000	1.0000
63.6		1.0000	1.0000	1.0000
116		1.0000	1.0000	1.0000
148		1.0000	1.0000	1.0000
173		1.0000	1.0000	1.0000
223		0.0000	0.1000	0.0000

Proportion Survived Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3
0	D	10/10	10/10	10/10
63.6		10/10	10/10	10/10
116		10/10	10/10	10/10
148		10/10	10/10	10/10
173		10/10	10/10	10/10
223		0/10	1/10	0/10

CETIS Test Data Worksheet

Reference Toxicant 96-h Acute Survival Test — EcoAnalysts

Start Date:	02 Oct-18 14:10	**Species:**	Neanthes arenaceodentata	**Sample Code:**	691AC2B0
End Date:	06 Oct-18 14:50	**Protocol:**	PSEP (1995)	**Sample Source:**	Reference Toxicant
Sample Date:	15 May-17	**Material:**	Total Ammonia	**Sample Station:**	P170515.103

Conc-mg/L	Code	Rep	Pos	# Exposed	# Survived	Notes
0	D	1	13	10	10	
0	D	2	10	10	10	
0	D	3	3	10	10	
63.6		1	8	10	10	
63.6		2	6	10	10	
63.6		3	7	10	10	
116		1	16	10	10	
116		2	15	10	10	
116		3	2	10	10	
148		1	14	10	10	
148		2	17	10	10	
148		3	9	10	10	
173		1	12	10	10	
173		2	11	10	10	
173		3	1	10	10	
223		1	18	10	0	
223		2	4	10	1	
223		3	5	10	0	

CETIS Summary Report

Reference Toxicant 96-h Acute Survival Test — **EcoAnalysts**

Batch ID:	16-8756-8795	**Test Type:**	Survival	**Analyst:**	
Start Date:	02 Oct-18 14:10	**Protocol:**	PSEP (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	06 Oct-18 14:50	**Species:**	Neanthes arenaceodentata	**Brine:**	Not Applicable
Test Length:	4d 1h	**Taxon:**	Polychaeta	**Source:**	Aquatic Toxicology Support **Age:**
Sample ID:	07-0788-5901	**Code:**	2A317B4D	**Project:**	Reference Toxicant
Sample Date:	15 May-17	**Material:**	Unionized Ammonia	**Source:**	Reference Toxicant
Receipt Date:	15 May-17	**CAS (PC):**		**Station:**	P170515.103
Sample Age:	505d 14h	**Client:**	Internal Lab		

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓	NOEL	LOEL	TOEL	TU	PMSD	S
12-2051-3096	Proportion Survived	Fisher Exact Test		2.059	2.114	2.086		n/a	1

Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓	Level	mg/L	95% LCL	95% UCL	TU	S
01-2654-4798	Proportion Survived	Trimmed Spearman-Kärber		EC50	2.087	2.085	2.089		1

Proportion Survived Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	D	3	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
1.192		3	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
1.733		3	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
1.974		3	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
2.059		3	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
2.114		3	0.0333	0.0000	0.1768	0.0000	0.1000	0.0333	0.0577	173.21%	96.67%

Proportion Survived Detail

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3
0	D	1.0000	1.0000	1.0000
1.192		1.0000	1.0000	1.0000
1.733		1.0000	1.0000	1.0000
1.974		1.0000	1.0000	1.0000
2.059		1.0000	1.0000	1.0000
2.114		0.0000	0.1000	0.0000

Proportion Survived Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3
0	D	10/10	10/10	10/10
1.192		10/10	10/10	10/10
1.733		10/10	10/10	10/10
1.974		10/10	10/10	10/10
2.059		10/10	10/10	10/10
2.114		0/10	1/10	0/10

CETIS Test Data Worksheet

Reference Toxicant 96-h Acute Survival Test — **EcoAnalysts**

Start Date:	02 Oct-18 14:10	**Species:**	Neanthes arenaceodentata	**Sample Code:**	2A317B4D
End Date:	06 Oct-18 14:50	**Protocol:**	PSEP (1995)	**Sample Source:**	Reference Toxicant
Sample Date:	15 May-17	**Material:**	Unionized Ammonia	**Sample Station:**	P170515.103

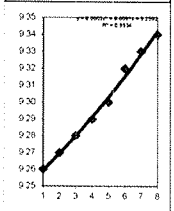
Conc-mg/L	Code	Rep	Pos	# Exposed	# Survived	Notes
0	D	1	8	10	10	
0	D	2	5	10	10	
0	D	3	1	10	10	
1.192		1	4	10	10	
1.192		2	2	10	10	
1.192		3	3	10	10	
1.733		1	11	10	10	
1.733		2	14	10	10	
1.733		3	17	10	10	
1.974		1	15	10	10	
1.974		2	12	10	10	
1.974		3	18	10	10	
2.059		1	10	10	10	
2.059		2	13	10	10	
2.059		3	16	10	10	
2.114		1	9	10	0	
2.114		2	7	10	1	
2.114		3	6	10	0	

Un-ionized Ammonia Calculator

CLIENT:	Various	Date of Test:	October 2, 2018
PROJECT:	PG1162, PG1123	Test Type:	*Neanthes arenaceodentata*
COMMENTS:			

To convert Total Ammonia (mg/L) to Free (un-ionized) Ammonia (mg/L) enter the corresponding total ammonia, salinity, temperature, and pH.

Integer:	I-factor
1	9.26
2	9.27
3	9.28
4	9.29
5	9.30
6	9.32
7	9.33
8	9.34



	Sample	Mod	NH3T (mg/L)	salinity (ppt)	pH	temp (C)	temp (K)	i-factor	Mod	NH3U (mg/L)
	Target / Sample Name		Actual	22.9	8.0	24.1	297.26	9.3053		#VALUE!
	Example 3.5		2.000	10.0	7.5	5.0	278.16	9.2750		0.008
1										
2	0		0	32	8.0	19.0	292.16	9.3298		
3	60		63.6	32	7.8	19.0	292.16	9.3298		1.192
4	100		116	32	7.7	19.0	292.16	9.3298		1.733
5	140		148	32	7.7	19.0	292.16	9.3298		1.974
6	180		173	32	7.6	19.0	292.16	9.3298		2.059
7	220		223	32	7.5	19.0	292.16	9.3298		2.114
8										
9										
10										
11										
12										
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Ammonia Reference Toxicant Test Survival Data Sheet

CLIENT	PROJECT	JOB NO.	SPECIES		
			Neanthes arenaceodentata		
ADH	Crescent City	PG1160	PROJECT MANAGER: B. Hester	LABORATORY: Port Gamble .	PROTOCOL: USACE 1991

SURVIVAL & BEHAVIOR DATA

OBSERVATION KEY
N = Normal
LOE = Loss of equilibium
Q = Quinscent
DC = Discoloration
NB = No body
F = Floating on surface

INITIAL # OF ORGANISMS: 10

CLIENT/ENVIRON ID	CONC. value	CONC. units	REP	INITIAL NUMBER	DAY 1 DATE: 10/3/18 TECHNICIAN: RE			DAY 2 DATE: 10/4/18 TECHNICIAN: MK			DAY 3 DATE: 10/5/18 TECHNICIAN: MK			DAY 4 DATE: 10/6/18 TECHNICIAN: CR		
					#ALIVE	#DEAD	OBS	#ALIVE	#DEAD	OBS	#ALIVE	#DEAD	OBS	#ALIVE	#DEAD	OBS
Ref.Tox.- Ammonia	0	mg/L	1		10	0	N	10	0	N	10	0	N	10	0	N
			2		10	0	N	10	0	↓	10	0	↓	10	0	↓
			3		10	0	N	10	0	↓	10	0	↓	10	0	↓
Ref.Tox.- Ammonia	60	mg/L	1		10	0	N	10	0	N	10	0	N	10	0	N
			2		10	0	N	10	0	↓	10	0	↓	10	0	↓
			3		10	0	N	10	0	↓	10	0	↓	10	0	↓
Ref.Tox.- Ammonia	100	mg/L	1		10	0	N	10	0	N	10	0	N	10	0	N
			2		10	0	N	10	0	↓	10	0	↓	10	0	↓
			3		10	0	N	10	0	↓	10	0	↓	10	0	↓
Ref.Tox.- Ammonia	140	mg/L	1		10	0	N	10	0	N	10	0	N	10	0	N
			2		10	0	N	10	0	↓	10	0	↓	10	0	↓
			3		10	0	N	10	0	↓	10	0	↓	10	0	↓
Ref.Tox.- Ammonia	180	mg/L	1		10	0	N	10	0	Q	10	0	Q	10	0	N
			2		10	0	N	10	0	↓	10	0	↓	10	0	↓
			3		10	0	N	10	0	↓	10	0	↓	10	0	↓
Ref.Tox.- Ammonia	220	mg/L	1		10	0	N	10	0	Q	10	0	Q	0	10	N
			2		10	0	N	10	0	↓	10	0	↓	1	9	↓
			3		10	0	N	10	0	↓	10	0	↓	0	10	↓

Ammonia Reference Toxicant Test Survival Data Sheet

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
ADH	Crescent City	*Neanthes arenaceodentata*	Port Gamble .	USACE 1991

TEST ID	LOT #:	TEST START DATE	TIME	4-DAY END DATE	TIME
P170515.103	2986C510	02Oct18	1410 MK	06Oct18	1450

CHAMBER SIZE/TYPE	EXPOSURE VOLUME
Glass pint jar	250 mL

WATER QUALITY DATA

TEST CONDITIONS					DO (mg/L)		TEMP(C)		SAL (ppt)		pH		TECHNICIAN	AMMONIA			SULFIDES		
					> 4.6		20 ± 1		30 ± 2		7.8 ± 0.5								
CLIENT/ENVIRON ID	CONCENTRATION value	CONCENTRATION units	DAY	REP	D.O. meter	D.O. mg/L	TEMP. meter	TEMP. °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WQ TECH/ DATE	AMMONIA METER	AMMONIA mg/L	Tech	SULFIDES meter	SULFIDES mg/L	Tech
Ref.Tox.-ammonia	0	mg/L	0	Stock	B	7.4	B	19.0	B	32	B	8.0	MK 10/2	10	0.00				
			4	1	8	7.3	8	20.0	8	32	8	8.0	CR 10/6						
Ref.Tox.-ammonia	60	mg/L	0	Stock	B	7.3	B	19.0	B	32	B	7.8	MK 10/2	10	63.6				
			4	1	8	7.1	8	20.1	8	33	8	7.9	CR 10/6						
Ref.Tox.-ammonia	100	mg/L	0	Stock	B	7.4	B	19.0	B	32	B	7.7	MK 10/2	10	116				
			4	1	8	7.0	8	20.1	8	33	8	7.8	CR 10/6						
Ref.Tox.-ammonia	140	mg/L	0	Stock	B	7.4	B	19.0	B	32	B	7.7	MK 10/2	10	148				
			4	1	8	7.0	8	20.1	8	33	8	7.8	CR 10/6						
Ref.Tox.-ammonia	180	mg/L	0	Stock	B	7.4	B	19.0	B	32	B	7.6	MK 10/2	10	173				
			4	1	8	7.1	8	20.1	8	33	8	7.8	CR 10/6						
Ref.Tox.-ammonia	220	mg/L	0	Stock	B	7.4	B	19.0	B	32	B	7.5	MK 10/2	10	223				
			4	1	8	6.7	8	20.1	8	33	8	7.8	CR 10/6						

Ammonia Reference Toxicant
Spiking Worksheet

Reference Toxicant ID: P170515.103
Date Prepared: 10/2/18
Technician Initials: ME

Neanthes NH_3 RT

Assumptions in Model
Stock ammonia concentration is 10,000 mg/L = 10 mg/mL

Date: 10/2/2018 ~~8/30/2018~~
Measurement: 9833

Test Solutions			Volume of stock to reach desired concentration	
Measured Concentration	**Desired Concentration**	**Volume**		
mg/L	mg/L	mL	mL stock to increase	
0			FRESH WATER (mL)	SALT WATER (mL)
63.6	**60**	750	[redacted]	6.86
116	**100**	750		11.44
148	**140**	750		16.02
173	**180**	750		20.59
223	**220**	750		25.17

3. *Mytilus galloprovincialis* Bivalve Larval Test

CLIENT	PROJECT	JOB NUMBER	PROJECT MANAGER	LABORATORY	PROTOCOL
Anchor QEA	Port Gamble Monitoring	0	Brian Hester	Port Gamble	PSEP (1995)

TEST ORGANISM SPAWNING DATA

SPECIES			TEST START DATE
Mytilus spp			3-Oct-18
SUPPLIER			ORGANISM BATCH
Taylor Shellfish			TS100218
SPAWNING METHOD		INITIAL SPAWNING TIME	FINAL SPAWNING TIME
heatshock		1225	1321
MALES	FEMALES	SPERM VIABILITY	EGG CONDITION
6	4	✓	Good
BEGIN FERTILIZATION		END FERTILIZATION	CONDITION OF EMBRYOS
1321		1600	>90% div

SAMPLE STORAGE
4 Degrees Celsius - dark
SEDIMENT TREATMENT
none
TEST CHAMBERS
1 L Mason Jars
EXPOSURE VOLUME
900mL seawater / 18g Sediment
TIME OF SHAKE
1000-1040
TIME OF INITIATION
1620

SPECIAL CONDITIONS

UV LIGHT EXPOSURE (YES/NO)	AERATION FROM TEST INITIATION (YES/NO)
N	N
SCREEN TUBE TEST (YES/NO)	**OTHER (EXPLAIN)**
N	Resuspension

EMBRYO DENSITY CALCULATIONS

85 x 100 = 8500 eggs/mL

Target $\frac{27{,}000 \text{ ~~eggs/mL~~}/\text{jar}}{8500}$

= 3.17

Deliv 3.2mL/jar

RT $\frac{2700}{8500} = 0.317$

x 70mL =

22mL egg stock

48mL Seawater

Deliv 0.100mL/vial

CLIENT	PROJECT	JOB NUMBER	SPECIES	PROJECT MANAGER	LAB / LOCATION	PROTOCOL
Anchor QEA	Port Gamble Monitoring	0	*Mytilus spp*	Brian Hester	Port Gamble /	PSEP (1995)

LARVAL OBSERVATION DATA

CLIENT/ ID	REP	NUMBER NORMAL	NUMBER	DATE	TECHNICIAN	COMMENTS
STOCKING DENSITY	1		~~345~~ 371	10/25/18	MB	
	2		338			
	3		326			
	4		322			
	5		323			
Control /	1	345	14	10/16/18	JW	
	2	343	11			
	3	344	11			
	4	310	7			312/4 DA
	5	324	12			
CARR-20 /	1	250	8			
	2	332	5			
	3	294	6			
	4	285	14			
	5	328	9			
CR-21 /	1	264	11			
	2	352	7			
	3	298	7			
	4	325	6			325/6 DA
	5	313	12			

① WC, MB 10/25

CLIENT	PROJECT	JOB NUMBER	SPECIES	PROJECT MANAGER	LAB / LOCATION	PROTOCOL
Anchor QEA	Port Gamble Monitoring	0	*Mytilus spp*	Brian Hester	Port Gamble /	PSEP (1995)

LARVAL OBSERVATION DATA

CLIENT/ ID	REP	NUMBER NORMAL	NUMBER	DATE	TECHNICIAN	COMMENTS
SMA-1B-IT2 /	1	337	6	10/16/18	JW	
	2	274	5			
	3	316	6			
	4	300	3			293/4 ~~0A~~
	5	284	5			
SMA-1B-IT3 /	1	318	6			
	2	299	8			
	3	336	10			
	4	324	11			
	5	325	4			
SMA-2C-IT3 /	1	305	10	10/17/18		
	2	342	13			341/12 ~~0A~~
	3	305	8			
	4	289	4			
	5	328	10			
SMA-2C-IT6 /	1	286	8			
	2	318	10			
	3	286	5			
	4	333	5			
	5	295	11			

SPECIES					
Mytilus spp					
CLIENT	**PROJECT**	**JOB NUMBER**	**PROJECT MANAGER**	**LAB / LOCATION**	**PROTOCOL**
Anchor QEA	Port Gamble Monitoring	0	Brian Hester	Port Gamble /	PSEP (1995)

LARVAL OBSERVATION DATA

CLIENT/ ID	REP	NUMBER NORMAL	NUMBER	DATE	TECHNICIAN	COMMENTS
SMA-2C-IT9 /	1	287	11	10/17/18	JW	
	2	291	14			
	3	283	7			
	4	304	9			
	5	301	9			286/12 OA
SMA-1-ST /	1	266	9			
	2	289	11			
	3	304	2			
	4	269	13			
	5	261	7			
SMA-1A-IT /	1	328	4			
	2	292	13			
	3	328	10			
	4	297	10			
	5	293	11			
SMA-2A-IT /	1	323	6			
	2	287	5			
	3	313	7			
	4	333	4			
	5	332	10			

SPECIES					
Mytilus spp					
CLIENT	**PROJECT**	**JOB NUMBER**	**PROJECT MANAGER**	**LAB / LOCATION**	**PROTOCOL**
Anchor QEA	Port Gamble Monitoring	0	Brian Hester	Port Gamble /	PSEP (1995)

LARVAL OBSERVATION DATA

CLIENT/ ID	REP	NUMBER NORMAL	NUMBER	DATE	TECHNICIAN	COMMENTS
SMA-2A-ST /	1	275	14	10/22/18	JW	
	2	336	11			
	3	285	6			
	4	303	8			
	5	322	6			
SMA-2B-IT /	1	280	7			
	2	297	10			
	3	318	4			
	4	276	10			
	5	319	10			
SMA-2B-ST /	1	320	8			
	2	302	12			
	3	277	7			
	4	310	5			
	5	297	2			281/2 04
BW-15 /	1	268	10			
	2	287	30			
	3	340	21			
	4	305	16			
	5	272	19			

ECOANALYSTS

CLIENT	PROJECT	SPECIES		LAB / LOCATION	PROTOCOL
Anchor QEA	Port Gamble Monitoring	*Mytilus spp*		Port Gamble /	PSEP (1995)
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE**	**TIME**	**TEST END DATE**	**TIME**
0	Brian Hester	03Oct18	1620	10.5.18	1650

* Day 3&4 observations needed only if development endpoint not met by day 2

WATER QUALITY DATA

TEST CONDITIONS				DO (mg/L) >5.0		Temp (°C) 16 ± 1		Sal (ppt) 28 ± 1		pH 7 - 9		Ammonia NA		Sulfide NA		TECH	DATE
				D.O.		TEMP.		SALINITY		pH		AMMONIA		SULFIDE			
SAMPLE ID	DAY	Random #	REP	meter	mg/L	meter	°C	meter	ppt	meter	unit	Techn.	mg/L (total)	Techn.	mg/L (Total		
Control /	0	37	WQ Surr	8	7.7	8	16.5	8	28	8	7.7	RE	0.00	MK	N.D	RE	10/3/18
Control /	1	↓	WQ Surr	8	7.5	8	16.7	8	28	8	7.8					MK	10/4
Control /	2	↓	WQ Surr	8	7.5	8	16.9	8	28	8	7.8	SW	0.00	JL	0.002	SW	10/5
Control /	3		WQ Surr														
Control /	4		WQ Surr														
CARR-20 /	0	45	WQ Surr	8	7.5	8	16.5	8	28	8	7.7	RE	0.00	MK	0.008	RE	10/3/18
CARR-20 /	1	↓	WQ Surr	8	6.6	8	16.6	8	28	8	7.7					MK	10/4
CARR-20 /	2	↓	WQ Surr	8	6.2	8	16.8	8	28	8	7.6	SW	0.00	JL	0.005	SW	10/5
CARR-20 /	3		WQ Surr														
CARR-20 /	4		WQ Surr														
CR-21 /	0	65	WQ Surr	8	7.0	8	16.4	8	28	8	7.7	RE	0.00	MK	0.004	RE	10/3/18
CR-21 /	1	↓	WQ Surr	8	6.5	8	16.5	8	28	8	7.7					MK	10/4
CR-21 /	2	↓	WQ Surr	8	6.5	8	16.8	8	28	8	7.6	SW	0.00	JL	0.002	SW	10/5
CR-21 /	3		WQ Surr														
CR-21 /	4		WQ Surr														

EcoAnalysts

CLIENT	PROJECT	SPECIES		LAB / LOCATION	PROTOCOL
Anchor QEA	Port Gamble Monitoring	*Mytilus spp*		Port Gamble /	PSEP (1995)
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE**	**TIME**	**TEST END DATE**	**TIME**
0	Brian Hester	03Oct18	1620	10.5.18	1650

* Day 3&4 observations needed only if development endpoint not met by day 2

WATER QUALITY DATA

TEST CONDITIONS				DO (mg/L) >5.0		Temp (°C) 16 ± 1		Sal (ppt) 28 ± 1		pH 7 - 9		Ammonia NA		Sulfide NA		TECH	DATE
SAMPLE ID	DAY	Random #	REP	D.O. meter	D.O. mg/L	TEMP. meter	TEMP. °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	AMMONIA Techn.	AMMONIA mg/L (total)	SULFIDE Techn.	SULFIDE mg/L (Total		
SMA-1B-IT2 /	0	78	WQ Surr	8	7.3	8	~~28~~ ①16.5	8	28	8	7.7	RE	0.00	MK	ND	RE	10/3/18
SMA-1B-IT2 /	1	↓	WQ Surr	8	7.1	8	16.8	8	28	8	7.7					MK	10/4
SMA-1B-IT2 /	2	↓	WQ Surr	8	6.9	8	16.7	8	28	8	7.7	SW	0.00	JL	0.007	SW	10/5
SMA-1B-IT2 /	3		WQ Surr														
SMA-1B-IT2 /	4		WQ Surr														
SMA-1B-IT3 /	0	32	WQ Surr	8	7.7	8	16.5	8	28	8	7.7	RE	0.00	MK	0.002 ~~ND~~ ②	RE	10/3/18
SMA-1B-IT3 /	1	↓	WQ Surr	8	7.0	8	17.0	8	28	8	7.7					MK	10/4
SMA-1B-IT3 /	2	↓	WQ Surr	8	7.0	8	16.8	8	28	8	7.7	SW	0.00	JL	0.003	SW	10/5
SMA-1B-IT3 /	3		WQ Surr														
SMA-1B-IT3 /	4		WQ Surr														
SMA-2C-IT3 /	0	76	WQ Surr	8	7.5	8	16.4	8	28	8	7.7	RE	0.00	MK	0.001	RE	10/3/18
SMA-2C-IT3 /	1	↓	WQ Surr	8	7.1	8	16.6	8	28	8	7.7					MK	10/4
SMA-2C-IT3 /	2	↓	WQ Surr	8	7.1	8	16.9	8	28	8	7.7	SW	0.00	JL	ND	SW	10/5
SMA-2C-IT3 /	3		WQ Surr														
SMA-2C-IT3 /	4		WQ Surr														
SMA-2C-IT6 /	0	6	WQ Surr	8	7.4	8	16.4	8	27	8	7.7	RE	0.00	MK	ND	RE	10/3/18
SMA-2C-IT6 /	1	↓	WQ Surr	8	7.2	8	17.0	8	28	8	7.7					MK	10/4
SMA-2C-IT6 /	2	↓	WQ Surr	8	~~7.3~~ ③7.6	8	17.0	8	28	8	7.8	SW	0.00	JL	0.003	SW	10/5
SMA-2C-IT6 /	3		WQ Surr														
SMA-2C-IT6 /	4		WQ Surr														

① WC - 10/3/18 RE ② WC. MK 10/3. ③ MR SW 10-5-18 DO = 7.6

ECO ANALYSTS

CLIENT	PROJECT	SPECIES		LAB / LOCATION	PROTOCOL
Anchor QEA	Port Gamble Monitoring	*Mytilus spp*		Port Gamble /	PSEP (1995)
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE**	**TIME**	**TEST END DATE**	**TIME**
0	Brian Hester	03Oct18	1620	10.5.18	1650

* Day 3&4 observations needed only if development endpoint not met by day 2

WATER QUALITY DATA

TEST CONDITIONS				DO (mg/L) >5.0		Temp (°C) 16 ± 1		Sal (ppt) 28 ± 1		pH 7 - 9		Ammonia NA		Sulfide NA		TECH	DATE
SAMPLE ID	DAY	Random #	REP	D.O.		TEMP.		SALINITY		pH		AMMONIA		SULFIDE			
				meter	mg/L	meter	°C	meter	ppt	meter	unit	Techn.	mg/L (total)	Techn.	mg/L (Total)		
SMA-2C-IT9 /	0	30	WQ Surr	8	7.7	8	16.5	8	28	8	7.7	RE	0.00	MK	0.00	RE	10/3/18
SMA-2C-IT9 /	1	↓	WQ Surr	8	7.4	8	16.7	8	28	8	7.8					MK	10/4
SMA-2C-IT9 /	2	↓	WQ Surr	8	7.6	8	16.6	8	28	8	7.8	SW	0.00	JL	ND	SW	10/5
SMA-2C-IT9 /	3		WQ Surr														
SMA-2C-IT9 /	4		WQ Surr														
SMA-1-ST /	0	82	WQ Surr	8	6.2	8	16.6	8	28	8	7.7	RE	0.00	MK	0.005	RE	10/3/18
SMA-1-ST /	1	↓	WQ Surr	8	6.9	8	16.8	8	28	8	7.7					MK	~~10/4~~ ② 10/4
SMA-1-ST /	2	↓	WQ Surr	8	5.7	8	16.9	8	28	8	7.6	SW	0.00	JL	0.003	SW	10/5
SMA-1-ST /	3		WQ Surr														
SMA-1-ST /	4		WQ Surr														
SMA-1A-IT /	0	88	WQ Surr	8	6.7	8	16.7	8	28	8	7.7	RE	0.00	MK	ND	RE	10/3/18
SMA-1A-IT /	1	↓	WQ Surr	8	~~6.8~~ ①	8	16.7	8	28	8	7.7					MK	10/4
SMA-1A-IT /	2	↓	WQ Surr	8	5.9	8	17.0	8	28	8	7.7	SW	0.00	JL	0.004	SW	10/5
SMA-1A-IT /	3		WQ Surr														
SMA-1A-IT /	4		WQ Surr														
SMA-2A-IT /	0	12	WQ Surr	8	7.4	8	16.7	8	28	8	7.7	RE	0.00	MK	ND	RE	10/3/18
SMA-2A-IT /	1	↓	WQ Surr	8	6.4	8	17.0	8	28	8	7.7					MK	10/4
SMA-2A-IT /	2	↓	WQ Surr	8	6.6	8	16.9	8	28	8	7.7	SW	0.00	JL	0.002	SW	10/5
SMA-2A-IT /	3		WQ Surr														
SMA-2A-IT /	4		WQ Surr														

① MK. Actual = 5.7 MK 10/4.

② IE. MK 10/4.

ECOANALYSTS

CLIENT	PROJECT	SPECIES		LAB / LOCATION	PROTOCOL
Anchor QEA	Port Gamble Monitoring	*Mytilus spp*		Port Gamble /	PSEP (1995)
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE**	**TIME**	**TEST END DATE**	**TIME**
0	Brian Hester	03Oct18	1620	10.5.18	1650

* Day 3&4 observations needed only if development endpoint not met by day 2

WATER QUALITY DATA

TEST CONDITIONS				DO (mg/L) >5.0		Temp (°C) 16 ± 1		Sal (ppt) 28 ± 1		pH 7 - 9		Ammonia NA		Sulfide NA		TECH	DATE
SAMPLE ID	DAY	Random #	REP	D.O. meter	D.O. mg/L	TEMP. meter	TEMP. °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	AMMONIA Techn.	AMMONIA mg/L (total)	SULFIDE Techn.	SULFIDE mg/L (Total		
SMA-2A-ST /	0	18	WQ Surr	8	7.4	8	16.3	8	28	8	7.7	RE	0.00	MK	ND	RE	10/3/18
SMA-2A-ST /	1	↓	WQ Surr	8	6.4	8	17.0	8	28	8	7.7					MK	10/4
SMA-2A-ST /	2	↓	WQ Surr	8	6.4	8	16.8	8	28	8	7.6	SW	0.00	JL	0.001	SW	10/5
SMA-2A-ST /	3		WQ Surr														
SMA-2A-ST /	4		WQ Surr														
SMA-2B-IT /	0	59	WQ Surr	8	6.5	8	16.4	8	28	8	7.7	RE	0.00	MK	0.004	RE	10/3/18
SMA-2B-IT /	1	↓	WQ Surr	8	5.7	8	16.8	8	28	8	7.7					MK	10/4
SMA-2B-IT /	2	↓	WQ Surr	8	5.9	8	16.8	8	28	8	7.6	SW	0.00	JL	0.006	SW	10/5
SMA-2B-IT /	3		WQ Surr														
SMA-2B-IT /	4		WQ Surr														
SMA-2B-ST /	0	23	WQ Surr	8	7.4	8	16.5	8	28	8	7.7	RE	0.00	MK	0.007	RE	10/3/18
SMA-2B-ST /	1	↓	WQ Surr	8	6.9	8	16.9	8	28	8	7.7					MK	10/4
SMA-2B-ST /	2	↓	WQ Surr	8	6.9	8	16.8	8	28	8	7.7	SW	0.00	JL	ND	SW	10/5
SMA-2B-ST /	3		WQ Surr														
SMA-2B-ST /	4		WQ Surr														
BW-15 /	0	46	WQ Surr	8	7.4	8	16.3	8	28	8	7.7	RE	0.00	MK	0.005	RE	10/3/18
BW-15 /	1	↓	WQ Surr	8	6.3	8	16.8	8	28	8	7.7					MK	10/4
BW-15 /	2	↓	WQ Surr	8	6.1	8	16.7	8	28	8	7.6	SW	0.00	JL	0.004	SW	10/5
BW-15 /	3		WQ Surr														
BW-15 /	4		WQ Surr														

ORGANISM RECEIPT LOG

Date:	Time:	Batch No.
10.2.18	1015	TS100218

Organism: Mytilus gallo

Source / Supplier: Taylor Shellfish

No. Ordered:	No. Received:	Source Batch: Collection date, hatch date, etc.):
8 lbs	8 lbs	Collected 10.2.18 Totten Inlet

Condition of Organisms:	Approximate Size or Age: (Days from hatch, life stage, size class, etc.):
Good	Adult
Shipper: Courier	**B of L (Tracking No.)** N/A
Condition of Container: Good	**Received By:** MARit

Container	D.O. (mg/L)	Temp. (°C)	Cond. or Sal. (Include Units)	pH (Units)	# Dead	% Dead*	Tech. (Initials)
1	—	①	—	—	—	—	MARit

*if >10% contact lab manager

Notes: ① Shipped dry with icepacks MARit 10.2.18
Temp not recorded

MAINTENANCE LOG FOR CULTURES

ORGANISM: Myt. lus galloprovincialis
LOCATION: Bath 1

Batch Number: ~~TS100318~~ TS100218	Date Received: 10.2.18	Initial # of Organisms: 8lbs

Date	Feed AM	Feed PM	Tub No.	D.O.	Temp (°C)	Cond/ Sal	pH	H_2O Change	Organisms appear healthy (Y/N)	# Mort	% Mort*	Init.	Comments
10.3	X		1	5.6	13.7	31	7.4	FT	Y	0	—	BH	
↓	X		2	6.5	13.5	31	7.6	FT	Y	0	—	↓	
10/5	✓	~~X~~	1	5.4	13.5	31	7.4	FT	Y	0	—	SW	
↓	✓	~~X~~	2	7.4	13.1	32	7.7	FT	Y	0	—	↓	
10/8		✓	1	6.2	13.0	31	7.6	FT	Y	1	—	SW	
↓		✓	2	7.4	13.3	31	7.7	FT	Y	0	—	SW	
10/10	✓		1	6.5	12.8	31	7.4	FT	Y	0	—	SW	
↓	✓		2	7.5	12.8	31	7.6	↓	↓	0	—	SW	
10/12			1	6.4	13.0	31	7.4	FT	Y	0	—	RE	
↓			2	7.3	12.7	31	7.6	FT	Y	0	—	RE	
10/15		✓	1	6.6	13.3	30	7.5	FT	Y	0	—	WB	
↓		✓	2	6.8	12.9	31	7.7	↓	Y	0	—	↓	
10/17		✓	1	6.6	13.0	31	7.5	FT	Y	0	—	SW	
↓		✓	2	7.6	12.7	31	7.6	↓	↓	↓	—	↓	
10/19		✓	1	6.8	13.0	30	7.6	FT	Y	0	—	SW	
↓		✓	2	7.7	12.7	31	7.8	↓	Y	0	—	SW	
10/22	✓		1	7.0	12.7	31	7.6	FT	Y	0	—	SW	
↓	✓		2	7.8	12.6	31	7.8	FT	Y	0	—	SW	

FT = Flow-through
if >10% notify lab manager

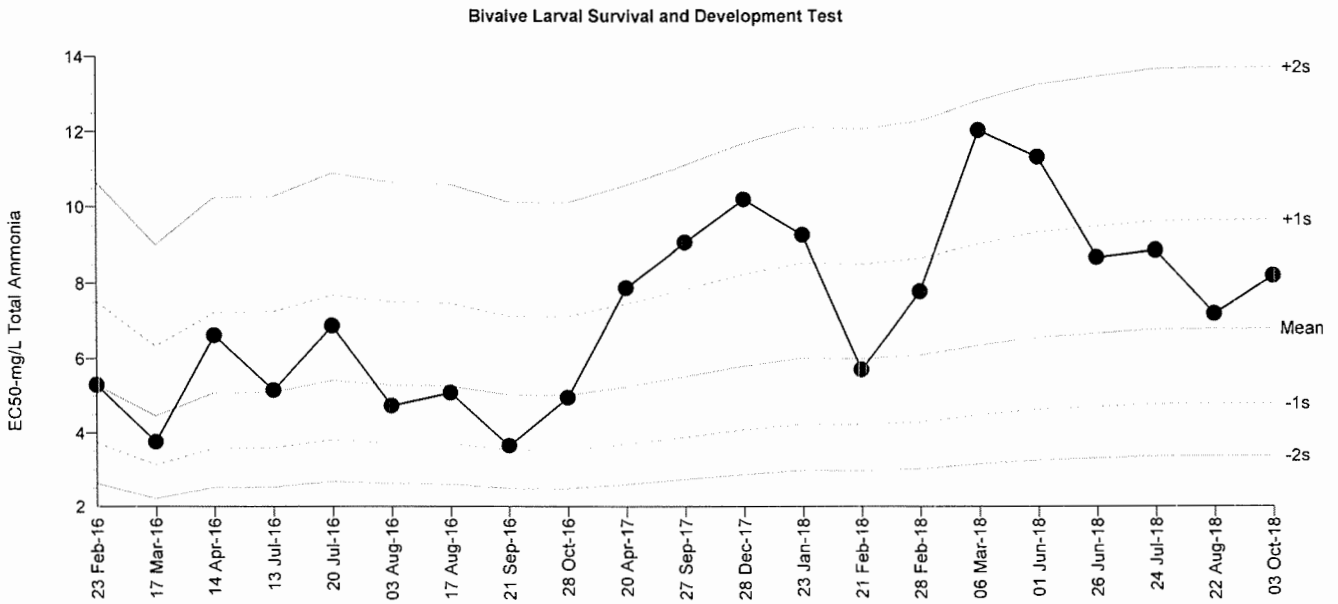
① IE 10.3.18 BH ② WC 10.5.18 AM Feed SW

CETIS QC Plot

Report Date: 26 Oct-18 10:31 (1 of 1)

Bivalve Larval Survival and Development Test — **All Matching Labs**

Test Type:	Development-Survival	**Organism:**	Mytilus galloprovincialis (Bay Mussel)	**Material:**	Total Ammonia
Protocol:	EPA/600/R-95/136 (1995)	**Endpoint:**	Combined Proportion Normal	**Source:**	Reference Toxicant-REF



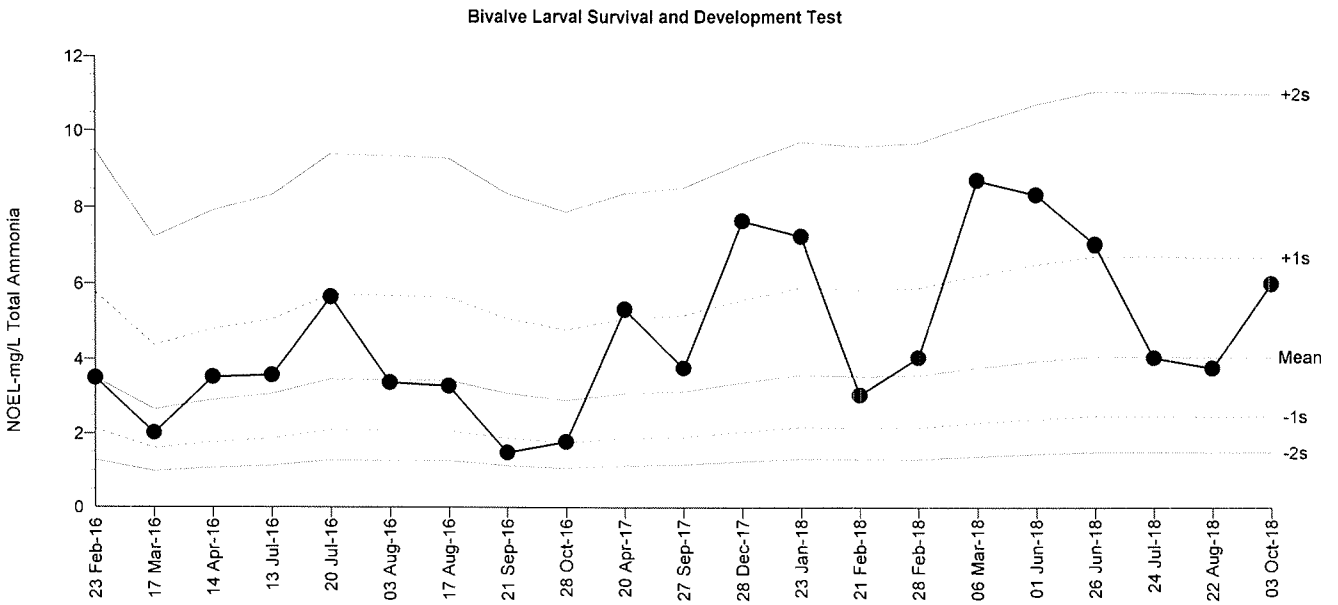
Mean:	6.807	**Count:**	20	**-1s Warning Limit:**	4.794	**-2s Action Limit:**	3.377
Sigma:	n/a	**CV:**	36.10%	**+1s Warning Limit:**	9.66	**+2s Action Limit:**	13.71

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2016	Feb	23	17:50	5.292	-1.516	-0.7189			18-1470-2153	19-1029-0373	ENVIRON
2		Mar	17	19:30	3.757	-3.05	-1.697	(-)		15-5000-9198	13-5264-4225	ENVIRON
3		Apr	14	17:15	6.621	-0.186	-0.07907			20-6935-4588	11-5576-6536	ENVIRON
4		Jul	13	19:55	5.147	-1.66	-0.7981			21-3594-7965	13-9208-2204	ENVIRON
5			20	19:37	6.871	0.0637	0.02659			15-8198-2198	11-4931-7833	ENVIRON
6		Aug	3	18:20	4.732	-2.075	-1.038	(-)		01-0657-3943	18-0523-9298	ENVIRON
7			17	17:05	5.081	-1.726	-0.8348			12-6418-6345	06-5970-9287	ENVIRON
8		Sep	21	17:05	3.644	-3.163	-1.784	(-)		12-2755-6335	12-7771-4113	ENVIRON
9		Oct	28	16:55	4.947	-1.86	-0.9112			11-5556-2644	13-8974-7601	ENVIRON
10	2017	Apr	20	17:20	7.867	1.06	0.4132			10-4553-7194	08-5173-1627	EcoAnalysts
11		Sep	27	17:50	9.055	2.248	0.8145			17-5033-2538	21-1690-3737	EcoAnalysts
12		Dec	28	15:06	10.19	3.381	1.151	(+)		14-5351-9068	16-2506-4728	EcoAnalysts
13	2018	Jan	23	15:10	9.255	2.448	0.8769			09-7170-7085	18-2220-1310	EcoAnalysts
14		Feb	21	16:50	5.699	-1.109	-0.5074			11-9789-0593	04-0007-2351	EcoAnalysts
15			28	15:50	7.78	0.9724	0.3812			07-6747-7949	18-9659-8443	EcoAnalysts
16		Mar	6	17:25	12.04	5.23	1.627	(+)		07-4370-2173	07-8492-0076	EcoAnalysts
17		Jun	1	18:20	11.33	4.525	1.455	(+)		12-7842-7476	20-1810-5029	EcoAnalysts
18			26	19:10	8.678	1.871	0.6931			17-9894-2551	06-4820-9232	EcoAnalysts
19		Jul	24	14:29	8.87	2.062	0.7554			03-7590-2196	04-9004-0822	EcoAnalysts
20		Aug	22	17:20	7.194	0.387	0.1579			16-3013-6338	06-6775-4461	EcoAnalysts
21		Oct	3	16:45	8.195	1.388	0.5296			12-1625-9203	05-0256-3584	EcoAnalysts

Bivalve Larval Survival and Development Test **All Matching Labs**

Test Type:	Development-Survival	**Organism:**	Mytilus galloprovincialis (Bay Mussel)	**Material:**	Total Ammonia
Protocol:	EPA/600/R-95/136 (1995)	**Endpoint:**	Combined Proportion Normal	**Source:**	Reference Toxicant-REF



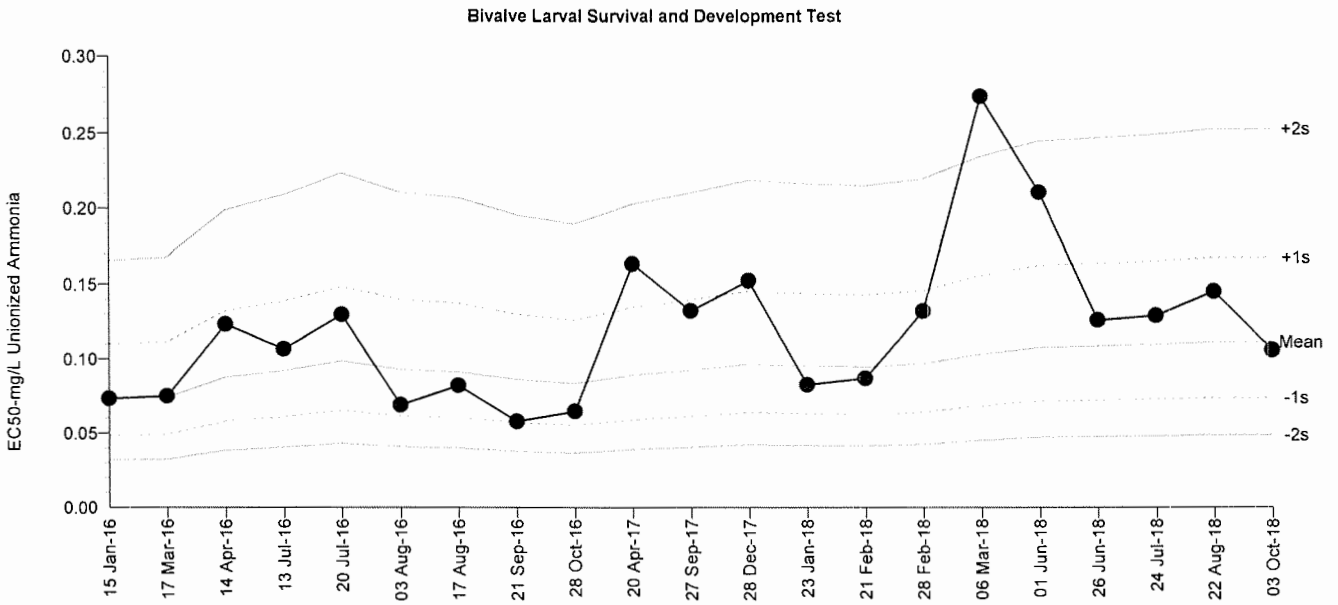
Mean:	4.071	**Count:**	20	**-1s Warning Limit:**	2.473	**-2s Action Limit:**	1.501
Sigma:	n/a	**CV:**	53.10%	**+1s Warning Limit:**	6.705	**+2s Action Limit:**	11.04

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2016	Feb	23	17:50	3.5	-0.5715	-0.3032			18-1470-2153	12-0892-9662	ENVIRON
2		Mar	17	19:30	2.02	-2.051	-1.405	(-)		15-5000-9198	10-0930-7275	ENVIRON
3		Apr	14	17:15	3.52	-0.5515	-0.2918			20-6935-4588	02-5801-5963	ENVIRON
4		Jul	13	19:55	3.57	-0.5015	-0.2635			21-3594-7965	00-8086-5441	ENVIRON
5			20	19:37	5.65	1.579	0.6569			15-8198-2198	15-7963-0031	ENVIRON
6		Aug	3	18:20	3.37	-0.7015	-0.3791			01-0657-3943	18-2881-4415	ENVIRON
7			17	17:05	3.28	-0.7915	-0.4334			12-6418-6345	16-7479-3581	ENVIRON
8		Sep	21	17:05	1.49	-2.581	-2.015	(-)	(-)	12-2755-6335	04-9221-3739	ENVIRON
9		Oct	28	16:55	1.78	-2.291	-1.659	(-)		11-5556-2644	02-1682-8136	ENVIRON
10	2017	Apr	20	17:20	5.33	1.259	0.54			10-4553-7194	12-0068-9010	EcoAnalysts
11		Sep	27	17:50	3.76	-0.3115	-0.1595			17-5033-2538	01-8974-4211	EcoAnalysts
12		Dec	28	15:06	7.64	3.569	1.262	(+)		14-5351-9068	19-5965-2391	EcoAnalysts
13	2018	Jan	23	15:10	7.23	3.159	1.151	(+)		09-7170-7085	00-5532-1927	EcoAnalysts
14		Feb	21	16:50	3.04	-1.031	-0.5857			11-9789-0593	12-8443-3147	EcoAnalysts
15			28	15:50	4.05	-0.02145	-0.01059			07-6747-7949	13-3889-9717	EcoAnalysts
16		Mar	6	17:25	8.72	4.649	1.527	(+)		07-4370-2173	08-6054-3126	EcoAnalysts
17		Jun	1	18:20	8.34	4.269	1.438	(+)		12-7842-7476	16-9291-1976	EcoAnalysts
18			26	19:10	7.04	2.969	1.098	(+)		17-9894-2551	00-8683-5940	EcoAnalysts
19		Jul	24	14:29	4.05	-0.02145	-0.01059			03-7590-2196	16-4897-6151	EcoAnalysts
20		Aug	22	17:20	3.77	-0.3015	-0.1542			16-3013-6338	05-9641-9153	EcoAnalysts
21		Oct	3	16:45	6.01	1.939	0.7807			12-1625-9203	13-5762-5882	EcoAnalysts

Bivalve Larval Survival and Development Test All Matching Labs

Test Type: Development-Survival **Organism:** Mytilus galloprovincialis (Bay Mussel) **Material:** Unionized Ammonia
Protocol: EPA/600/R-95/136 (1995) **Endpoint:** Combined Proportion Normal **Source:** Reference Toxicant-REF



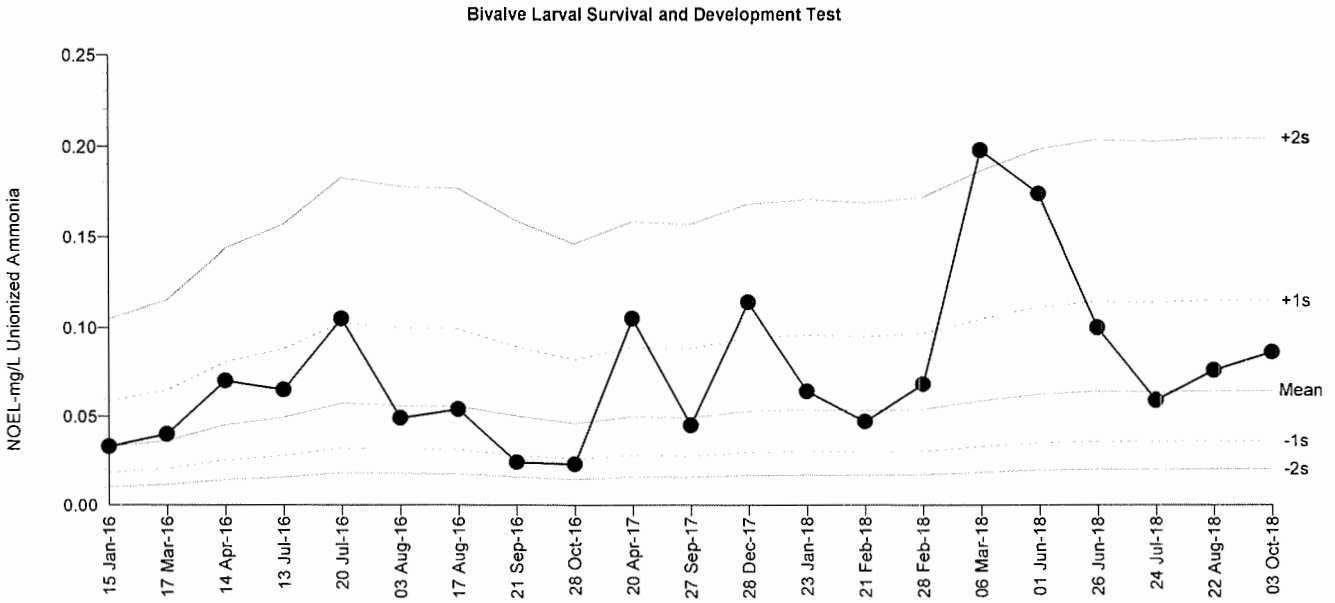
Mean: 0.111 **Count:** 20 **-1s Warning Limit:** 0.07368 **-2s Action Limit:** 0.0489
Sigma: n/a **CV:** 42.80% **+1s Warning Limit:** 0.1673 **+2s Action Limit:** 0.2522

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2016	Jan	15	18:45	0.07307	-0.03795	-1.02	(-)		14-3705-6085	19-2478-0688	ENVIRON
2		Mar	17	19:30	0.0747	-0.03632	-0.9661			04-9304-7933	11-8311-5806	ENVIRON
3		Apr	14	17:15	0.1231	0.01209	0.252			21-0694-5716	16-1625-7449	ENVIRON
4		Jul	13	19:55	0.1066	-0.004396	-0.09852			17-3624-8523	09-8766-4801	ENVIRON
5			20	19:37	0.1295	0.01852	0.3761			16-4492-6137	18-6316-6428	ENVIRON
6		Aug	3	18:20	0.0688	-0.04222	-1.167	(-)		09-2291-5121	03-3596-0456	ENVIRON
7			17	17:05	0.08185	-0.02917	-0.7433			07-3188-3147	05-9364-3209	ENVIRON
8		Sep	21	17:05	0.05781	-0.05321	-1.591	(-)		12-6262-3928	08-6003-5732	ENVIRON
9		Oct	28	16:55	0.06459	-0.04644	-1.321	(-)		05-5636-6924	16-1083-2604	ENVIRON
10	2017	Apr	20	17:20	0.1634	0.05235	0.9419			05-0815-7437	21-2956-9302	EcoAnalysts
11		Sep	27	17:50	0.1319	0.02091	0.4208			20-9743-5500	21-3701-9130	EcoAnalysts
12		Dec	28	15:06	0.1522	0.04115	0.7688			11-9837-6366	14-7670-9371	EcoAnalysts
13	2018	Jan	23	15:10	0.08248	-0.02854	-0.7247			14-9653-2794	09-5264-1795	EcoAnalysts
14		Feb	21	16:50	0.08676	-0.02426	-0.6012			15-2546-6673	13-8547-7245	EcoAnalysts
15			28	15:50	0.1317	0.02067	0.4162			15-8114-9389	20-6854-2996	EcoAnalysts
16		Mar	6	17:25	0.2738	0.1628	2.201	(+)	(+)	00-7847-6930	00-7321-8707	EcoAnalysts
17		Jun	1	18:20	0.2103	0.09926	1.557	(+)		05-1801-7066	04-7994-1641	EcoAnalysts
18			26	19:10	0.1255	0.01446	0.2985			06-7139-6937	06-3245-7683	EcoAnalysts
19		Jul	24	14:29	0.1286	0.01757	0.3582			16-0134-7952	19-7798-4523	EcoAnalysts
20		Aug	22	17:20	0.1449	0.03384	0.6487			07-1087-5324	12-5339-9193	EcoAnalysts
21		Oct	3	16:45	0.1056	-0.005424	-0.1221			01-0403-3220	16-2351-0172	EcoAnalysts

Bivalve Larval Survival and Development Test **All Matching Labs**

Test Type: Development-Survival **Organism:** Mytilus galloprovincialis (Bay Mussel) **Material:** Unionized Ammonia
Protocol: EPA/600/R-95/136 (1995) **Endpoint:** Combined Proportion Normal **Source:** Reference Toxicant-REF



Mean: 0.06451 **Count:** 20 **-1s Warning Limit:** 0.03622 **-2s Action Limit:** 0.02033
Sigma: n/a **CV:** 62.90% **+1s Warning Limit:** 0.115 **+2s Action Limit:** 0.2048

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2016	Jan	15	18:45	0.033	-0.03151	-1.161	(-)		14-3705-6085	10-1556-6538	ENVIRON
2		Mar	17	19:30	0.04	-0.02451	-0.8276			04-9304-7933	18-2075-7796	ENVIRON
3		Apr	14	17:15	0.07	0.005494	0.1416			21-0694-5716	12-4502-8479	ENVIRON
4		Jul	13	19:55	0.065	0.0004942	0.01322			17-3624-8523	04-6243-8640	ENVIRON
5			20	19:37	0.105	0.04049	0.8438			16-4492-6137	18-5505-5894	ENVIRON
6		Aug	3	18:20	0.049	-0.01551	-0.4762			09-2291-5121	05-1896-5100	ENVIRON
7			17	17:05	0.054	-0.01051	-0.3079			07-3188-3147	16-9734-3329	ENVIRON
8		Sep	21	17:05	0.024	-0.04051	-1.712	(-)		12-6262-3928	13-9034-6853	ENVIRON
9		Oct	28	16:55	0.023	-0.04151	-1.786	(-)		05-5636-6924	02-7414-4116	ENVIRON
10	2017	Apr	20	17:20	0.105	0.04049	0.8438			05-0815-7437	03-4135-8920	EcoAnalysts
11		Sep	27	17:50	0.045	-0.01951	-0.6236			20-9743-5500	07-1720-0800	EcoAnalysts
12		Dec	28	15:06	0.114	0.04949	0.9862			11-9837-6366	06-0841-7631	EcoAnalysts
13	2018	Jan	23	15:10	0.064	-0.000506	-0.01363			14-9653-2794	04-0773-5227	EcoAnalysts
14		Feb	21	16:50	0.047	-0.01751	-0.5483			15-2546-6673	21-3476-8661	EcoAnalysts
15			28	15:50	0.068	0.003494	0.09136			15-8114-9389	10-5284-4887	EcoAnalysts
16		Mar	6	17:25	0.198	0.1335	1.942	(+)		00-7847-6930	03-9693-3709	EcoAnalysts
17		Jun	1	18:20	0.174	0.1095	1.719	(+)		05-1801-7066	00-0472-0630	EcoAnalysts
18			26	19:10	0.1	0.03549	0.7593			06-7139-6937	00-3402-6456	EcoAnalysts
19		Jul	24	14:29	0.059	-0.005506	-0.1545			16-0134-7952	12-3548-9987	EcoAnalysts
20		Aug	22	17:20	0.076	0.01149	0.284			07-1087-5324	19-8244-5254	EcoAnalysts
21		Oct	3	16:45	0.086	0.02149	0.4981			01-0403-3220	16-6521-7341	EcoAnalysts

CETIS Summary Report

Bivalve Larval Survival and Development Test — **EcoAnalysts**

Batch ID:	15-3382-8184	**Test Type:**	Development-Survival	**Analyst:**			
Start Date:	03 Oct-18 16:45	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater		
Ending Date:	05 Oct-18 16:40	**Species:**	Mytilus galloprovincialis	**Brine:**	Crystal Sea Marine Mix		
Test Length:	48h	**Taxon:**		**Source:**	Taylor Shellfish	**Age:**	
Sample ID:	20-5272-5816	**Code:**	7A5A1C38	**Project:**	Reference Toxicant		
Sample Date:	15 May-17	**Material:**	Total Ammonia	**Source:**	Reference Toxicant		
Receipt Date:	15 May-17	**CAS (PC):**		**Station:**	P170515.105		
Sample Age:	506d 17h	**Client:**	Internal Lab				

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓	NOEL	LOEL	TOEL	TU	PMSD	S
13-5762-5882	Combined Proportion Norma	Dunnett Multiple Comparison Test		6.01	12	8.492		12.9%	1

Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓	Level	mg/L	95% LCL	95% UCL	TU	S
05-0256-3584	Combined Proportion Norma	Spearman-Kärber		EC50	8.195	8.095	8.297		1

Test Acceptability

				TAC Limits			
Analysis ID	Endpoint	Attribute	Test Stat	Lower	Upper	Overlap	Decision
13-5762-5882	Combined Proportion Norma	PMSD	0.1287	<<	0.25	No	Passes Criteria

Combined Proportion Normal Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	D	3	0.9666	0.8945	1.0000	0.9481	1.0000	0.0168	0.0290	3.00%	0.00%
0.867		3	0.9885	0.9388	1.0000	0.9654	1.0000	0.0115	0.0200	2.02%	-2.27%
1.46		3	0.9896	0.9450	1.0000	0.9689	1.0000	0.0104	0.0180	1.82%	-2.39%
3.18		3	0.9677	0.8287	1.0000	0.9031	1.0000	0.0323	0.0559	5.78%	-0.12%
6.01		3	0.9319	0.7643	1.0000	0.8651	1.0000	0.0390	0.0675	7.24%	3.58%
12		3	0.0127	0.0000	0.0306	0.0069	0.0208	0.0042	0.0072	56.77%	98.69%
20.7		3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		100.00%

Combined Proportion Normal Detail

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3
0	D	0.9481	1.0000	0.9516
0.867		0.9654	1.0000	1.0000
1.46		1.0000	0.9689	1.0000
3.18		1.0000	0.9031	1.0000
6.01		1.0000	0.8651	0.9308
12		0.0069	0.0104	0.0208
20.7		0.0000	0.0000	0.0000

Combined Proportion Normal Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3
0	D	274/289	292/292	275/289
0.867		279/289	295/295	298/298
1.46		320/320	280/289	302/302
3.18		293/293	261/289	295/295
6.01		289/289	250/289	269/289
12		2/289	3/289	6/289
20.7		0/289	0/289	0/289

CETIS Test Data Worksheet

Bivalve Larval Survival and Development Test — EcoAnalysts

Start Date:	03 Oct-18 16:45	**Species:**	Mytilus galloprovincialis	**Sample Code:**	7A5A1C38
End Date:	05 Oct-18 16:40	**Protocol:**	EPA/600/R-95/136 (1995)	**Sample Source:**	Reference Toxicant
Sample Date:	15 May-17	**Material:**	Total Ammonia	**Sample Station:**	P170515.105

Conc-mg/L	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes
0	D	1	11	289	277	277	274	QAd on ~~total~~ % UIA
0	D	2	1	289	294	294	292	
0	D	3	17	289	280	280	275	
0.867		1	6	289	284	284	279	
0.867		2	2	289	301	301	295	
0.867		3	8	289	303	303	298	
1.46		1	19	289	324	324	320	
1.46		2	12	289	285	285	280	
1.46		3	14	289	307	307	302	
3.18		1	4	289	301	301	293	
3.18		2	10	289	264	264	261	
3.18		3	9	289	306	306	295	
6.01		1	15	289	320	320	289	
6.01		2	13	289	279	279	250	
6.01		3	3	289	301	301	269	
12		1	16	289	225	225	2	
12		2	21	289	286	286	3	
12		3	5	289	323	323	6	
20.7		1	20	289	293	293	0	
20.7		2	7	289	305	305	0	
20.7		3	18	289	310	310	0	

CETIS Summary Report

Bivalve Larval Survival and Development Test — EcoAnalysts

Batch ID:	14-2069-0648	**Test Type:**	Development-Survival	**Analyst:**			
Start Date:	03 Oct-18 16:45	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater		
Ending Date:	05 Oct-18 16:40	**Species:**	Mytilus galloprovincialis	**Brine:**	Crystal Sea Marine Mix		
Test Length:	48h	**Taxon:**		**Source:**	Taylor Shellfish	**Age:**	
Sample ID:	09-8775-9708	**Code:**	3AE0045C	**Project:**	Reference Toxicant		
Sample Date:	15 May-17	**Material:**	Unionized Ammonia	**Source:**	Reference Toxicant		
Receipt Date:	15 May-17	**CAS (PC):**		**Station:**	P170515.105		
Sample Age:	506d 17h	**Client:**	Internal Lab				

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓	NOEL	LOEL	TOEL	TU	PMSD	S
16-6521-7341	Combined Proportion Norma	Dunnett Multiple Comparison Test		0.086	0.138	0.1089		12.9%	1

Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓	Level	mg/L	95% LCL	95% UCL	TU	S
16-2351-0172	Combined Proportion Norma	Spearman-Kärber		EC50	0.1056	0.1045	0.1067		1

Test Acceptability

				TAC Limits			
Analysis ID	Endpoint	Attribute	Test Stat	Lower	Upper	Overlap	Decision
16-6521-7341	Combined Proportion Norma	PMSD	0.1287	<<	0.25	No	Passes Criteria

Combined Proportion Normal Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	D	3	0.9666	0.8945	1.0000	0.9481	1.0000	0.0168	0.0290	3.00%	0.00%
0.013		3	0.9885	0.9388	1.0000	0.9654	1.0000	0.0115	0.0200	2.02%	-2.27%
0.021		3	0.9896	0.9450	1.0000	0.9689	1.0000	0.0104	0.0180	1.82%	-2.39%
0.046		3	0.9677	0.8287	1.0000	0.9031	1.0000	0.0323	0.0559	5.78%	-0.12%
0.086		3	0.9319	0.7643	1.0000	0.8651	1.0000	0.0390	0.0675	7.24%	3.58%
0.138		3	0.0127	0.0000	0.0306	0.0069	0.0208	0.0042	0.0072	56.77%	98.69%
0.24		3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		100.00%

Combined Proportion Normal Detail

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3
0	D	0.9481	1.0000	0.9516
0.013		0.9654	1.0000	1.0000
0.021		1.0000	0.9689	1.0000
0.046		1.0000	0.9031	1.0000
0.086		1.0000	0.8651	0.9308
0.138		0.0069	0.0104	0.0208
0.24		0.0000	0.0000	0.0000

Combined Proportion Normal Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3
0	D	274/289	292/292	275/289
0.013		279/289	295/295	298/298
0.021		320/320	280/289	302/302
0.046		293/293	261/289	295/295
0.086		289/289	250/289	269/289
0.138		2/289	3/289	6/289
0.24		0/289	0/289	0/289

CETIS Test Data Worksheet

Bivalve Larval Survival and Development Test — EcoAnalysts

Start Date:	03 Oct-18 16:45	**Species:**	Mytilus galloprovincialis	**Sample Code:**	3AE0045C
End Date:	05 Oct-18 16:40	**Protocol:**	EPA/600/R-95/136 (1995)	**Sample Source:**	Reference Toxicant
Sample Date:	15 May-17	**Material:**	Unionized Ammonia	**Sample Station:**	P170515.105

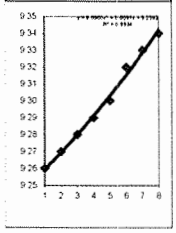
Conc-mg/L	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes
0	D	1	18	289	277	277	274	
0	D	2	11	289	294	294	292	
0	D	3	13	289	280	280	275	
0.013		1	12	289	284	284	279	
0.013		2	21	289	301	301	295	
0.013		3	3	289	303	303	298	
0.021		1	9	289	324	324	320	
0.021		2	15	289	285	285	280	
0.021		3	17	289	307	307	302	
0.046		1	16	289	301	301	293	
0.046		2	10	289	264	264	261	
0.046		3	2	289	306	306	295	
0.086		1	1	289	320	320	289	
0.086		2	6	289	279	279	250	
0.086		3	8	289	301	301	269	
0.138		1	20	289	225	225	2	
0.138		2	5	289	286	286	3	
0.138		3	14	289	323	323	6	
0.24		1	19	289	293	293	0	
0.24		2	4	289	305	305	0	
0.24		3	7	289	310	310	0	

Un-ionized Ammonia Calculator

CLIENT:	Various	Date of Test:	October 3, 2018
PROJECT:	PG1123, PG1162	Test Type:	*Mytilus gallo*
COMMENTS:			

To convert Total Ammonia (mg/L) to Free (un-ionized) Ammonia (mg/L) enter the corresponding total ammonia, salinity, temperature, and pH.

Integer: I-factor	
1	9.26
2	9.27
3	9.28
4	9.29
5	9.30
6	9.32
7	9.33
8	9.34



	Sample	Mod	NH3T (mg/L)	salinity (ppt)	pH	temp (C)	temp (K)	i-factor	Mod	NH3U (mg/L)
	Target / Sample Name		Actual	22.9	8.0	24.1	297.26	9.3053		#VALUE!
	Example 3.5		2.000	10.0	7.5	5.0	278.16	9.2750		0.008
1										
2	0		0	28	7.8	15.5	288.66	9.3187		
3	0.75		0.867	28	7.8	15.2	288.36	9.3187		0.013
4	1.5		1.46	28	7.8	15.0	288.16	9.3187		0.021
5	3		3.18	28	7.8	15.1	288.26	9.3187		0.046
6	6		6.01	28	7.8	15.0	288.16	9.3187		0.086
7	12		12	28	7.7	15.1	288.26	9.3187		0.138
8	18		20.7	28	7.7	15.2	288.36	9.3187		0.240
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48 Hour Bivalve Development Reference Toxicant Test

Test ID: P170515;105	Replicates: 3	Study Director: B. Hester	Location: Inc. 1
Dilution Water Batch: FSW100318.02	Organism Batch: TS100218	Associated Test(s): PG1162, PG1123	Organism: Mytilus spp.
Chamber Size/Type: 30 ml shell vial	Exposure Volume: 10 ml		
Toxicant: Ammonium Chloride:	Lot #: 2986CS10	Date Prepared: 10/3/18	Initials: MK
Target Concentrations: **See spiking worksheet**		Quantity of Stock: Target: See spiking worksheet	Quantity of Diluent: Target: 200 mL
See spiking worksheet		Actual: See spiking worksheet	Actual: ↓

0 Hours Date: 10/3/18 WQ Time: MK Start Time: 1645 Initials: BH

STOCK

	Control	0.75	1.5	3	6	12	18
D.O. (%) (>5.0 mg/L)	7.6	7.8	7.9	8.0	8.0	8.0	8.1
Temperature (16 ± 1°C)	15.5	15.2	15.0	15.1	15.0	15.1	15.2
Salinity (28 ± 1 ppt)	28	28	28	28	28	28	28
pH (7.8 ± 0.5)	7.8	7.8	7.8	7.8	7.8	7.7	7.7

Day 1 Temperature (16 ± 1°C) 15.6°C 10/4 MK

Final Day Date: 10/05/18 WQ Time: 1490 End Time: 1640 Initials: JL

STOCK

	Control	0.75	1.5	3	6	12	18
D.O. (%) (>5.0 mg/L)	8.0	8.1	8.3	8.3	8.3	8.4	8.3
Temperature (16 ± 1°C)	15.3	15.2	14.6	15.2	14.5	15.3	15.2
Salinity (28 ± 1 ppt)	28	28	29	28	29	28	29
pH (7.8 ± 0.5)	7.8	7.8	7.8	7.8	7.8	7.8	7.8

Notes:

48 Hour Bivalve Development Reference Toxicant Test

Conc.	Rep	Number Normal	Number Abnormal	Date	Initials
Control	1	274	3	10.25.18	MARH
	2	292	2	↓	↓
	3	275	5		
0.75	1	279	5		
	2	295	6		
	3	298	5		
1.5	1	320	4		
	2	280	5		
	3	302	5		
3	1	293	8		
	2	261	3		
	3	295	11		
6	1	289	31		
	2	250	29		
	3	269	32		
12	1	2	223		
	2	3	283		
	3	6	317		
18	1	0	293		
	2	0	305		
	3	0	310	↓	↓

Stocking Density

Rep	Count	Init.
1	311	MARH
2	274 R4 315	↓
3	269 R5 275	↓
Mean:	289	↓

QA Count Checks:			
#1 conc/rep 0/3 # normal 274 # abnormal 6	#2 conc/rep 1.5/1 # normal 310 # abnormal 6	#3 conc/rep 12/2 # normal 5 # abnormal 280	#4 conc/rep 3/1 # normal 275 # abnormal 12
Tech. Init. MS	Tech. Init. MS	Tech. Init. MS	Tech. Init. MS
Calc. $\frac{274}{280}=97.9$ $\frac{275}{280}=98.2$	$\frac{310}{316}=98.1$ $\frac{320}{324}=98.8$	$\frac{5}{285}=1.8$ $\frac{3}{286}=1.0$	$\frac{275}{287}=95.8$ $\frac{293}{301}=97.3$

QA Check Acceptability: ☑ <5% difference in means of QA & orig. counts

Ammonia Reference Toxicant
Spiking Worksheet

Reference Toxicant ID: P170515.105
Date Prepared: 10/3/18
Technician Initials: MK

Biv / Echino NH_3 RT

Assumptions in Model
Stock ammonia concentration is 9,000 mg/L = 9 mg/mL

Date: 10/2/2018
Measurement: 9833

Test Solutions			Volume of stock to reach desired concentration	
Measured Concentration	**Desired Concentration**	**Volume**		
mg/L	mg/L	mL	mL stock to increase	
0	0		[redacted]	SALT WATER
0.867	**0.75**	200		**0.023**
1.46	**1.5**	200		**0.046**
3.18	**3**	200		**0.092**
6.01	**6**	200		**0.183**
12.0	**12**	200		**0.366**
20.7	**18**	200		**0.549**

APPENDIX B. STATISTICAL COMPARISONS

Statistical Results: *Eohaustorius estuarius* Test

Project Name: Anchor Port Gamble 2018 Eohs

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-1B-IT2	Ref ID:	CR-21
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	7	Mean:	2
SD:	10.368	SD:	2.739
Tr Mean:	11.168	Tr Mean:	5.168
Trans SD:	12.352	Trans SD:	7.077

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	6.532
SS:	810.58
K:	5
b:	27.334
Alpha Level:	0.05
Calculated Value:	0.9217
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	8.935
Test Residual SD:	7.265
Ref. Residual Mean:	6.202
Ref. Residual SD:	1.415
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.8256
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	ArcSin
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-0.9425
Critical Value:	>= 1.860
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	25	30	0	0	18.832	5.168			-11.168
2	5	12.921	5	12.921	1.753	7.753			-11.168
3	5	12.921	0	0	1.753	5.168			-5.168
4	0	0	0	0	11.168	5.168			-5.168
5	0	0	5	12.921	11.168	7.753			-5.168
6									1.753
7									1.753
8									7.753
9									7.753
10									18.832

Project Name: Anchor Port Gamble 2018 Eohs

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-1B-IT3	Ref ID:	CR-21
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	15	Mean:	2
SD:	7.071	SD:	2.739
Tr Mean:	22.21	Tr Mean:	5.168
Trans SD:	6.274	Trans SD:	7.077

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	4.339
SS:	357.778
K:	5
b:	17.562
Alpha Level:	0.05
Calculated Value:	0.862
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	5.226
Test Residual SD:	2.285
Ref. Residual Mean:	6.202
Ref. Residual SD:	1.415
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.8121
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	ArcSin
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-4.0292
Critical Value:	>= 1.860
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	20	26.565	0	0	4.355	5.168			-9.289
2	20	26.565	5	12.921	4.355	7.753			-5.168
3	20	26.565	0	0	4.355	5.168			-5.168
4	5	12.921	0	0	9.289	5.168			-5.168
5	10	18.435	5	12.921	3.775	7.753			-3.775
6									4.355
7									4.355
8									4.355
9									7.753
10									7.753

Project Name: Anchor Port Gamble 2018 Eohs

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-2C-IT3	Ref ID:	CR-21
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	10	Mean:	2
SD:	6.124	SD:	2.739
Tr Mean:	16.489	Tr Mean:	5.168
Trans SD:	9.471	Trans SD:	7.077

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	5.425
SS:	559.119
K:	5
b:	22.023
Alpha Level:	0.05
Calculated Value:	0.8674
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	6.595
Test Residual SD:	5.943
Ref. Residual Mean:	6.202
Ref. Residual SD:	1.415
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.144
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	ArcSin
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-2.141
Critical Value:	>= 1.860
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	10	18.435	0	0	1.946	5.168			-16.489
2	15	22.786	5	12.921	6.298	7.753			-5.168
3	15	22.786	0	0	6.298	5.168			-5.168
4	0	0	0	0	16.489	5.168			-5.168
5	10	18.435	5	12.921	1.946	7.753			1.946
6									1.946
7									6.298
8									6.298
9									7.753
10									7.753

Project Name: Anchor Port Gamble 2018 Eohs

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-2C-IT6	Ref ID:	CR-21
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	1	Mean:	2
SD:	2.236	SD:	2.739
Tr Mean:	N/A	Tr Mean:	N/A
Trans SD:	N/A	Trans SD:	N/A

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	4.192
SS:	333.903
K:	5
b:	15.917
Alpha Level:	0.05
Calculated Value:	0.7588
Critical Value:	<= 0.842
Normally Distributed:	No
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	4.135
Test Residual SD:	3.467
Ref. Residual Mean:	6.202
Ref. Residual SD:	1.415
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.2344
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Mann-Whitney
Balanced Design:	Yes
Transformation:	rank-order
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1:	5
Mann-Whitney N2:	5
Degrees of Freedom:	
Experimental Alpha Level:	0.05
Calculated Value:	15
Critical Value:	>= 21.000
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0	4	0	4	2.584	5.168	4		-5.168
2	0	4	5	9	2.584	7.753	4		-5.168
3	0	4	0	4	2.584	5.168	4		-5.168
4	0	4	0	4	2.584	5.168	4		-2.584
5	5	9	5	9	10.337	7.753	4		-2.584
6							4		-2.584
7							4		-2.584
8							9		7.753
9							9		7.753
10							9		10.337

Project Name: Anchor Port Gamble 2018 Eohs

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-2C-IT9	Ref ID:	CR-21
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	4	Mean:	2
SD:	6.519	SD:	2.739
Tr Mean:	N/A	Tr Mean:	N/A
Trans SD:	N/A	Trans SD:	N/A

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	5.765
SS:	631.513
K:	5
b:	22.508
Alpha Level:	0.05
Calculated Value:	0.8022
Critical Value:	<= 0.842
Normally Distributed:	No
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	8.57
Test Residual SD:	3.999
Ref. Residual Mean:	6.202
Ref. Residual SD:	1.415
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.2481
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Mann-Whitney
Balanced Design:	Yes
Transformation:	rank-order
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1:	5
Mann-Whitney N2:	5
Degrees of Freedom:	
Experimental Alpha Level:	0.05
Calculated Value:	11.5
Critical Value:	>= 21.000
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	15	10	0	3.5	15.645	5.168	3.5		-7.141
2	0	3.5	5	8	7.141	7.753	3.5		-7.141
3	5	8	0	3.5	5.779	5.168	3.5		-7.141
4	0	3.5	0	3.5	7.141	5.168	3.5		-5.168
5	0	3.5	5	8	7.141	7.753	3.5		-5.168
6							3.5		-5.168
7							8		5.779
8							8		7.753
9							8		7.753
10							10		15.645

Statistical Results: *Neanthes arenaceodentata* Test

Project Name: Anchor Port Gamble 2018 Neanthes Dry Weight

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-1B-IT2	Ref ID:	CR-21
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	0.86	Mean:	0.735
SD:	0.15	SD:	0.147
Tr Mean:	0.86	Tr Mean:	0.735
Trans SD:	0.15	Trans SD:	0.147

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.096
SS:	0.176
K:	5
b:	0.407
Alpha Level:	0.05
Calculated Value:	0.939
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.106
Test Residual SD:	0.092
Ref. Residual Mean:	0.103
Ref. Residual SD:	0.091
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.0454
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-1.3294
Critical Value:	>= 1.860
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.888	0.888	0.775	0.775	0.028	0.04			-0.239
2	0.802	0.802	0.496	0.496	0.058	0.239			-0.206
3	1.066	1.066	0.802	0.802	0.206	0.067			-0.058
4	0.654	0.654	0.886	0.886	0.206	0.151			-0.018
5	0.89	0.89	0.717	0.717	0.03	0.018			0.028
6									0.03
7									0.04
8									0.067
9									0.151
10									0.206

Project Name: Anchor Port Gamble 2018 Neanthes Dry Weight

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-1B-IT3	Ref ID:	CR-21
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	0.748	Mean:	0.735
SD:	0.14	SD:	0.147
Tr Mean:	0.748	Tr Mean:	0.735
Trans SD:	0.14	Trans SD:	0.147

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.093
SS:	0.165
K:	5
b:	0.393
Alpha Level:	0.05
Calculated Value:	0.939
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.102
Test Residual SD:	0.081
Ref. Residual Mean:	0.103
Ref. Residual SD:	0.091
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.0161
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-0.1455
Critical Value:	>= 1.860
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.926	0.926	0.775	0.775	0.178	0.04			-0.239
2	0.695	0.695	0.496	0.496	0.053	0.239			-0.194
3	0.741	0.741	0.802	0.802	0.007	0.067			-0.053
4	0.826	0.826	0.886	0.886	0.078	0.151			-0.018
5	0.554	0.554	0.717	0.717	0.194	0.018			-0.007
6									0.04
7									0.067
8									0.078
9									0.151
10									0.178

Project Name:	Anchor Port Gamble 2018 Neanthes Dry Weight				
Sample:	x1			Ref Samp:	x2
Samp ID:	SMA-2C-IT3			Ref ID:	CR-21
Alias:				Alias:	
Replicates:	5			Replicates:	5
Mean:	0.746			Mean:	0.735
SD:	0.032			SD:	0.147
Tr Mean:	0.746			Tr Mean:	0.735
Trans SD:	0.032			Trans SD:	0.147

Shapiro-Wilk Results:

Residual Mean:	0				
Residual SD:	0.069				
SS:	0.09				
K:	5				
b:	0.28				
Alpha Level:	0.05				
Calculated Value:	0.8673				
Critical Value:	<= 0.842				
Normally Distributed:	Yes				
Override Option:	N/A				

Levene's Results:

Test Residual Mean:	0.023				
Test Residual SD:	0.018				
Ref. Residual Mean:	0.103				
Ref. Residual SD:	0.091				
Deg. of Freedom:	8				
Alpha Level:	0.1				
Calculated Value:	1.914				
Critical Value:	>= 1.860				
Variances Homogeneous:	No				

Test Results:

Statistic:	Approximate t				
Balanced Design:	Yes				
Transformation:	No Transformation				
	Experimental Hypothesis				
Null:	x1 >= x2				
Alternate:	x1 < x2				
Degrees of Freedom:	4				
Experimental Alpha Level:	0.05				
Calculated Value:	-0.1547				
Critical Value:	>= 2.132				
Accept Null Hypothesis:	Yes				
Power:					
Min. Difference for Power:					

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.788	0.788	0.775	0.775	0.042	0.04			-0.239
2	0.704	0.704	0.496	0.496	0.042	0.239			-0.042
3	0.729	0.729	0.802	0.802	0.017	0.067			-0.018
4	0.761	0.761	0.886	0.886	0.015	0.151			-0.017
5	0.746	0.746	0.717	0.717	0	0.018			0
6									0.015
7									0.04
8									0.042
9									0.067
10									0.151

Project Name:	Anchor Port Gamble 2018 Neanthes Dry Weight				
Sample:	x1			Ref Samp:	x2
Samp ID:	SMA-2C-IT6			Ref ID:	CR-21
Alias:				Alias:	
Replicates:	5			Replicates:	5
Mean:	0.782			Mean:	0.735
SD:	0.098			SD:	0.147
Tr Mean:	N/A			Tr Mean:	N/A
Trans SD:	N/A			Trans SD:	N/A

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.081
SS:	0.125
K:	5
b:	0.323
Alpha Level:	0.05
Calculated Value:	0.8356
Critical Value:	<= 0.842
Normally Distributed:	No
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	0.07
Test Residual SD:	0.06
Ref. Residual Mean:	0.103
Ref. Residual SD:	0.091
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.6805
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Mann-Whitney
Balanced Design:	Yes
Transformation:	rank-order
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1:	5
Mann-Whitney N2:	5
Degrees of Freedom:	
Experimental Alpha Level:	0.05
Calculated Value:	9
Critical Value:	>= 21.000
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.608	2	0.775	4	0.174	0.04	1		-0.239
2	0.801	5	0.496	1	0.019	0.239	2		-0.174
3	0.839	9	0.802	6	0.057	0.067	3		-0.018
4	0.831	7	0.886	10	0.049	0.151	4		0.019
5	0.832	8	0.717	3	0.05	0.018	5		0.04
6							6		0.049
7							7		0.05
8							8		0.057
9							9		0.067
10							10		0.151

Project Name:	Anchor Port Gamble 2018 Neanthes Dry Weight				
Sample:	x1			Ref Samp:	x2
Samp ID:	SMA-2C-IT9			Ref ID:	CR-21
Alias:				Alias:	
Replicates:	5			Replicates:	5
Mean:	0.695			Mean:	0.735
SD:	0.097			SD:	0.147
Tr Mean:	0.695			Tr Mean:	0.735
Trans SD:	0.097			Trans SD:	0.147

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.081
SS:	0.124
K:	5
b:	0.341
Alpha Level:	0.05
Calculated Value:	0.9335
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.065
Test Residual SD:	0.065
Ref. Residual Mean:	0.103
Ref. Residual SD:	0.091
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.7588
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	0.5125
Critical Value:	>= 1.860
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.574	0.574	0.775	0.775	0.121	0.04			-0.239
2	0.844	0.844	0.496	0.496	0.149	0.239			-0.121
3	0.678	0.678	0.802	0.802	0.017	0.067			-0.025
4	0.708	0.708	0.886	0.886	0.013	0.151			-0.018
5	0.67	0.67	0.717	0.717	0.025	0.018			-0.017
6									0.013
7									0.04
8									0.067
9									0.149
10									0.151

Project Name: Anchor Port Gamble 2018 Neanthes AFDW

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-1B-IT2	Ref ID:	CR-21
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	0.527	Mean:	0.473
SD:	0.059	SD:	0.099
Tr Mean:	0.527	Tr Mean:	0.473
Trans SD:	0.059	Trans SD:	0.099

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.053
SS:	0.053
K:	5
b:	0.228
Alpha Level:	0.05
Calculated Value:	0.9686
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.039
Test Residual SD:	0.04
Ref. Residual Mean:	0.073
Ref. Residual SD:	0.056
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.1034
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-1.0444
Critical Value:	>= 1.860
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.535	0.535	0.461	0.461	0.008	0.012			-0.138
2	0.535	0.535	0.335	0.335	0.008	0.138			-0.098
3	0.59	0.59	0.53	0.53	0.063	0.057			-0.033
4	0.429	0.429	0.599	0.599	0.098	0.126			-0.012
5	0.546	0.546	0.44	0.44	0.019	0.033			0.008
6									0.008
7									0.019
8									0.057
9									0.063
10									0.126

Project Name:	Anchor Port Gamble 2018 Neanthes AFDW				
Sample:	x1			Ref Samp:	x2
Samp ID:	SMA-1B-IT3			Ref ID:	CR-21
Alias:				Alias:	
Replicates:	5			Replicates:	5
Mean:	0.499			Mean:	0.473
SD:	0.066			SD:	0.099
Tr Mean:	0.499			Tr Mean:	0.473
Trans SD:	0.066			Trans SD:	0.099

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.055
SS:	0.057
K:	5
b:	0.235
Alpha Level:	0.05
Calculated Value:	0.97
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.048
Test Residual SD:	0.038
Ref. Residual Mean:	0.073
Ref. Residual SD:	0.056
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.8142
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-0.4946
Critical Value:	>= 1.860
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.569	0.569	0.461	0.461	0.07	0.012			-0.138
2	0.48	0.48	0.335	0.335	0.019	0.138			-0.098
3	0.496	0.496	0.53	0.53	0.003	0.057			-0.033
4	0.551	0.551	0.599	0.599	0.052	0.126			-0.019
5	0.401	0.401	0.44	0.44	0.098	0.033			-0.012
6									-0.003
7									0.052
8									0.057
9									0.07
10									0.126

Project Name:	Anchor Port Gamble 2018 Neanthes AFDW				
Sample:	x1			Ref Samp:	x2
Samp ID:	SMA-2C-IT3			Ref ID:	CR-21
Alias:				Alias:	
Replicates:	5			Replicates:	5
Mean:	0.514			Mean:	0.473
SD:	0.032			SD:	0.099
Tr Mean:	0.514			Tr Mean:	0.473
Trans SD:	0.032			Trans SD:	0.099

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.048
SS:	0.044
K:	5
b:	0.203
Alpha Level:	0.05
Calculated Value:	0.9434
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.021
Test Residual SD:	0.022
Ref. Residual Mean:	0.073
Ref. Residual SD:	0.056
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.9328
Critical Value:	>= 1.860
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	5
Experimental Alpha Level:	0.05
Calculated Value:	-0.8739
Critical Value:	>= 2.015
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.499	0.499	0.461	0.461	0.015	0.012			-0.138
2	0.477	0.477	0.335	0.335	0.037	0.138			-0.037
3	0.565	0.565	0.53	0.53	0.051	0.057			-0.033
4	0.513	0.513	0.599	0.599	0.001	0.126			-0.015
5	0.515	0.515	0.44	0.44	0.001	0.033			-0.012
6									-0.001
7									0.001
8									0.051
9									0.057
10									0.126

Project Name:	Anchor Port Gamble 2018 Neanthes AFDW				
Sample:	x1			Ref Samp:	x2
Samp ID:	SMA-2C-IT6			Ref ID:	CR-21
Alias:				Alias:	
Replicates:	5			Replicates:	5
Mean:	0.466			Mean:	0.473
SD:	0.067			SD:	0.099
Tr Mean:	0.466			Tr Mean:	0.473
Trans SD:	0.067			Trans SD:	0.099

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.055
SS:	0.057
K:	5
b:	0.236
Alpha Level:	0.05
Calculated Value:	0.9695
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.053
Test Residual SD:	0.032
Ref. Residual Mean:	0.073
Ref. Residual SD:	0.056
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.7098
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	0.1344
Critical Value:	>= 1.860
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.362	0.362	0.461	0.461	0.104	0.012			-0.138
2	0.506	0.506	0.335	0.335	0.04	0.138			-0.104
3	0.438	0.438	0.53	0.53	0.028	0.057			-0.033
4	0.53	0.53	0.599	0.599	0.064	0.126			-0.028
5	0.493	0.493	0.44	0.44	0.027	0.033			-0.012
6									0.027
7									0.04
8									0.057
9									0.064
10									0.126

Project Name:	Anchor Port Gamble 2018 Neanthes AFDW

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-2C-IT9	Ref ID:	CR-21
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	0.429	Mean:	0.473
SD:	0.04	SD:	0.099
Tr Mean:	0.429	Tr Mean:	0.473
Trans SD:	0.04	Trans SD:	0.099

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.049
SS:	0.046
K:	5
b:	0.211
Alpha Level:	0.05
Calculated Value:	0.9763
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.029
Test Residual SD:	0.024
Ref. Residual Mean:	0.073
Ref. Residual SD:	0.056
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.6263
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	0.911
Critical Value:	>= 1.860
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.375	0.375	0.461	0.461	0.054	0.012			-0.138
2	0.482	0.482	0.335	0.335	0.053	0.138			-0.054
3	0.429	0.429	0.53	0.53	0	0.057			-0.033
4	0.449	0.449	0.599	0.599	0.02	0.126			-0.017
5	0.412	0.412	0.44	0.44	0.017	0.033			-0.012
6									0
7									0.02
8									0.053
9									0.057
10									0.126

Statistical Results: *Mytilus galloprovnicialis* Larval Test

Project Name:	Anchor Port Gamble 2018 Mytilus

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-2A-IT	Ref ID:	CR-21
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	317.6	Mean:	310.4
SD:	18.916	SD:	32.624
Tr Mean:	317.6	Tr Mean:	310.4
Trans SD:	18.916	Trans SD:	32.624

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	17.303
SS:	5688.4
K:	5
b:	73.86
Alpha Level:	0.05
Calculated Value:	0.959
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	14.08
Test Residual SD:	10.488
Ref. Residual Mean:	23.52
Ref. Residual SD:	19.308
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.9607
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	-0.4269
Critical Value:	>= 1.397
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	323	323	264	264	5.4	46.4			-46.4
2	287	287							
3	352	352	30.6	41.6		-30.6			
4	313	313							
5	298	298	4.6	12.4		-12.4			
6	333	333							
7	325	325	15.4	14.6		-4.6			
8	332	332							
9	313	313	14.4	2.6		2.6			
10									5.4
									14.4
									14.6
									15.4
									41.6

Project Name: Anchor Port Gamble 2018 Mytilus

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-2C-IT6	Ref ID:	CR-21
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	303.6	Mean:	310.4
SD:	21.007	SD:	32.624
Tr Mean:	303.6	Tr Mean:	310.4
Trans SD:	21.007	Trans SD:	32.624

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	17.804
SS:	6022.4
K:	5
b:	76.592
Alpha Level:	0.05
Calculated Value:	0.9741
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	17.52
Test Residual SD:	7.59
Ref. Residual Mean:	23.52
Ref. Residual SD:	19.308
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.6467
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	0.3919
Critical Value:	>= 1.397
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	286	286	264	264	17.6	46.4			-46.4
2									
3	318	318							
4	352	352	14.4	41.6		-17.6			
5	286	286							
6	298	298	17.6	12.4		-17.6			
7	333	333							
8	325	325	29.4	14.6		-12.4			
9	295	295							
10	313	313	8.6	2.6		-8.6			
									2.6
									14.4
									14.6
									29.4
									41.6

Project Name: Anchor Port Gamble 2018 Mytilus

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-2C-IT3	Ref ID:	CR-21
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	313.8	Mean:	310.4
SD:	21.017	SD:	32.624
Tr Mean:	313.8	Tr Mean:	310.4
Trans SD:	21.017	Trans SD:	32.624

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	17.806
SS:	6024
K:	5
b:	76.996
Alpha Level:	0.05
Calculated Value:	0.9841
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	16.96
Test Residual SD:	9.064
Ref. Residual Mean:	23.52
Ref. Residual SD:	19.308
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.6877
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	-0.1959
Critical Value:	>= 1.397
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	305	305	264	264	8.8	46.4			-46.4
2									
	342	342							
	352	352	28.2	41.6		-24.8			
3									
	305	305							
	298	298	8.8	12.4		-12.4			
4									
	289	289							
	325	325	24.8	14.6		-8.8			
5									
	328	328							
	313	313	14.2	2.6		-8.8			
6									2.6
7									14.2
8									14.6
9									28.2
10									41.6

Project Name: Anchor Port Gamble 2018 Mytilus

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-2B-ST	Ref ID:	CR-21
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	301.2	Mean:	310.4
SD:	16.084	SD:	32.624
Tr Mean:	301.2	Tr Mean:	310.4
Trans SD:	16.084	Trans SD:	32.624

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	16.689
SS:	5292
K:	5
b:	72.098
Alpha Level:	0.05
Calculated Value:	0.9823
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	11.36
Test Residual SD:	9.869
Ref. Residual Mean:	23.52
Ref. Residual SD:	19.308
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.2539
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	0.5656
Critical Value:	>= 1.397
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	320	320	264	264	18.8	46.4			-46.4
2									
302	302								
352	352	0.8	41.6			-24.2			
3									
277	277								
298	298	24.2	12.4			-12.4			
4									
310	310								
325	325	8.8	14.6			-4.2			
5									
297	297								
313	313	4.2	2.6			0.8			
6									2.6
7									8.8
8									14.6
9									18.8
10									41.6

Project Name:	Anchor Port Gamble 2018 Mytilus

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-2B-IT	Ref ID:	CR-21
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	298	Mean:	310.4
SD:	20.31	SD:	32.624
Tr Mean:	298	Tr Mean:	310.4
Trans SD:	20.31	Trans SD:	32.624

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	17.633
SS:	5907.2
K:	5
b:	76.239
Alpha Level:	0.05
Calculated Value:	0.9839
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	16.4
Test Residual SD:	8.735
Ref. Residual Mean:	23.52
Ref. Residual SD:	19.308
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.7513
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	0.7215
Critical Value:	>= 1.397
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	280	280	264	264	18	46.4			-46.4
2									
297	297								
352	352	1	41.6			-22			
3									
318	318								
298	298	20	12.4			-18			
4									
276	276								
325	325	22	14.6			-12.4			
5									
319	319								
313	313	21	2.6			-1			
6									2.6
7									14.6
8									20
9									21
10									41.6

Project Name: Anchor Port Gamble 2018 Mytilus

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-2A-ST	Ref ID:	CR-21
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	304.2	Mean:	310.4
SD:	25.253	SD:	32.624
Tr Mean:	304.2	Tr Mean:	310.4
Trans SD:	25.253	Trans SD:	32.624

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	18.929
SS:	6808
K:	5
b:	81.956
Alpha Level:	0.05
Calculated Value:	0.9866
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	19.84
Test Residual SD:	12.069
Ref. Residual Mean:	23.52
Ref. Residual SD:	19.308
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.3614
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	0.336
Critical Value:	>= 1.397
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	275	275	264	264	29.2	46.4			-46.4
2									
336	336								
352	352	31.8	41.6			-29.2			
3									
285	285								
298	298	19.2	12.4			-19.2			
4									
303	303								
325	325	1.2	14.6			-12.4			
5									
322	322								
313	313	17.8	2.6			-1.2			
6									2.6
7									14.6
8									17.8
9									31.8
10									41.6

Project Name: Anchor Port Gamble 2018 Mytilus

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-1-ST	Ref ID:	CR-21
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	277.8	Mean:	310.4
SD:	18.102	SD:	32.624
Tr Mean:	277.8	Tr Mean:	310.4
Trans SD:	18.102	Trans SD:	32.624

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	17.119
SS:	5568
K:	5
b:	73.705
Alpha Level:	0.05
Calculated Value:	0.9757
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	14.96
Test Residual SD:	6.924
Ref. Residual Mean:	23.52
Ref. Residual SD:	19.308
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.9331
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	1.9538
Critical Value:	>= 1.397
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	266	266	264	264	11.8	46.4			-46.4
2									
289	289								
352	352	11.2	41.6			-16.8			
3									
304	304								
298	298	26.2	12.4			-12.4			
4									
269	269								
325	325	8.8	14.6			-11.8			
5									
261	261								
313	313	16.8	2.6			-8.8			
6									2.6
7									11.2
8									14.6
9									26.2
10									41.6

Project Name:	Anchor Port Gamble 2018 Mytilus

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-1B-IT3	Ref ID:	CR-21
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	320.4	Mean:	310.4
SD:	13.612	SD:	32.624
Tr Mean:	320.4	Tr Mean:	310.4
Trans SD:	13.612	Trans SD:	32.624

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	16.22
SS:	4998.4
K:	5
b:	69.357
Alpha Level:	0.05
Calculated Value:	0.9624
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	9.52
Test Residual SD:	8.486
Ref. Residual Mean:	23.52
Ref. Residual SD:	19.308
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.4843
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	-0.6326
Critical Value:	>= 1.397
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	318	318	264	264	2.4	46.4			-46.4
2									
299	299								
352	352	21.4	41.6			-21.4			
3									
336	336								
298	298	15.6	12.4			-12.4			
4									
324	324								
325	325	3.6	14.6			-2.4			
5									
325	325								
313	313	4.6	2.6			2.6			
6									3.6
7									4.6
8									14.6
9									15.6
10									41.6

Project Name: Anchor Port Gamble 2018 Mytilus

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-1B-IT2	Ref ID:	CR-21
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	302.2	Mean:	310.4
SD:	25.163	SD:	32.624
Tr Mean:	302.2	Tr Mean:	310.4
Trans SD:	25.163	Trans SD:	32.624

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	18.904
SS:	6790
K:	5
b:	81.657
Alpha Level:	0.05
Calculated Value:	0.982
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	19.44
Test Residual SD:	12.681
Ref. Residual Mean:	23.52
Ref. Residual SD:	19.308
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.3949
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	0.445
Critical Value:	>= 1.397
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	337	337	264	264	34.8	46.4			-46.4
2									
274	274								
352	352	28.2	41.6			-28.2			
3									
316	316								
298	298	13.8	12.4			-18.2			
4									
300	300								
325	325	2.2	14.6			-12.4			
5									
284	284								
313	313	18.2	2.6			-2.2			
6									2.6
7									13.8
8									14.6
9									34.8
10									41.6

Project Name:	Anchor Port Gamble 2018 Mytilus

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-1A-IT	Ref ID:	CR-21
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	307.6	Mean:	310.4
SD:	18.716	SD:	32.624
Tr Mean:	307.6	Tr Mean:	310.4
Trans SD:	18.716	Trans SD:	32.624

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	17.257
SS:	5658.4
K:	5
b:	73.676
Alpha Level:	0.05
Calculated Value:	0.9593
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	16.32
Test Residual SD:	4.168
Ref. Residual Mean:	23.52
Ref. Residual SD:	19.308
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.815
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	0.1665
Critical Value:	>= 1.397
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	328	328	264	264	20.4	46.4			-46.4
2									
292	292								
352	352	15.6	41.6			-15.6			
3									
328	328								
298	298	20.4	12.4			-14.6			
4									
297	297								
325	325	10.6	14.6			-12.4			
5									
293	293								
313	313	14.6	2.6			-10.6			
6									2.6
7									14.6
8									20.4
9									20.4
10									41.6

Project Name: Anchor Port Gamble 2018 Mytilus

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-2C-IT9	Ref ID:	CR-21
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	293.2	Mean:	310.4
SD:	9.011	SD:	32.624
Tr Mean:	293.2	Tr Mean:	310.4
Trans SD:	9.011	Trans SD:	32.624

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	15.529
SS:	4582
K:	5
b:	65.79
Alpha Level:	0.05
Calculated Value:	0.9446
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	7.44
Test Residual SD:	3.465
Ref. Residual Mean:	23.52
Ref. Residual SD:	19.308
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.8329
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	1.1364
Critical Value:	>= 1.397
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	287	287	264	264	6.2	46.4			-46.4
2									
291	291								
352	352	2.2	41.6			-12.4			
3									
283	283								
298	298	10.2	12.4			-10.2			
4									
304	304								
325	325	10.8	14.6			-6.2			
5									
301	301								
313	313	7.8	2.6			-2.2			
6									2.6
7									7.8
8									10.8
9									14.6
10									41.6

Project Name: Anchor Port Gamble 2018 Mytilus

Sample:	x1	Ref Samp:	x2
Samp ID:	BW-15	Ref ID:	CARR-20
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	294.4	Mean:	297.8
SD:	29.348	SD:	33.708
Tr Mean:	294.4	Tr Mean:	297.8
Trans SD:	29.348	Trans SD:	33.708

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	20.507
SS:	7990
K:	5
b:	87.815
Alpha Level:	0.05
Calculated Value:	0.9651
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	22.48
Test Residual SD:	15.153
Ref. Residual Mean:	25.76
Ref. Residual SD:	17.514
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.3167
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	0.1701
Critical Value:	>= 1.397
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	268	268	250	250	26.4	47.8			-47.8
2									
287	287								
332	332	7.4	34.2			-26.4			
3									
340	340								
294	294	45.6	3.8			-22.4			
4									
305	305								
285	285	10.6	12.8			-12.8			
5									
272	272								
328	328	22.4	30.2			-7.4			
6									-3.8
7									10.6
8									30.2
9									34.2
10									45.6

APPENDIX C. CHAIN-OF-CUSTODY LOGS

Chain of Custody Record and Laboratory Analysis Request COC#

Date: 9/6/18
Laboratory: EcoAnalysts
Project Name: Port Gamble - OMMP LTM
Project Number: 180388-01.01
Project Contact: Cheronne Oreiro
Phone Number: 206.287.9130
Shipment Method: Delivery

ANCHOR QEA

Line	Field Sample ID	Collection Date/Time	Matrix	No. of Containers	Sediment and Field QC: Bioassay Archive	Comments
1	SMA2C-IT9-0-10-180906	9/6/18 0900	SE	1	X	
2	SMA2C-IT2-0-10-180906	0920	SE	1	X	
3	SMA2C-IT5-0-10-180906	0930	SE	1	X	
4	SMA2C-IT8-0-10-180906	0940	SE	1	X	
5	SMA2C-IT4-0-10-180906	0950	SE	1	X	
6	SMA2C-IT1-0-10-180906	1000	SE	1	X	
7	SMA2C-IT7-0-10-180906	1010	SE	1	X	
8			SE			
9			SE			
10			SE			
11			SE			
12			SE			
13			SE			
14			SE			

1 See project SAP/QAPP for analyte lists and test methods

2 Email sample confirmation report to labdata@anchorqea.com

Additional notes/comments:

Relinquished By:	Company:	Received By:	Company:
EVAN MALCZUK	Anchor QEA LLC.	Lauren Brandkamp	EcoAnalysts
Signature/Printed Name	9/6/18 1047 Date/Time	Signature/Printed Name	9/6/18 1045 Date/Time

Relinquished By:	Company:	Received By:	Company:
Signature/Printed Name	Date/Time	Signature/Printed Name	Date/Time

Distribution: A copy will be made for the laboratory and client. The Project file will retain the original.

Chain of Custody Record and Laboratory Analysis Request COC#

Date: 9/7/18
Laboratory : EcoAnalysts
Project Name: Port Gamble - OMMP LTM
Project Number: 180388-01.01
Project Contact: Cheronne Oreiro
Phone Number: 206.287.9130
Shipment Method: Delivery

ANCHOR QEA

Line	Field Sample ID	Collection Date/Time	Matrix	No. of Containers	Sediment and Field QC: Bioassay Archive	Comments
1	SMA1B-IT2-0-10-180907	9/7/18 0845	SE	1	X	
2	SMA1B-IT1-0-10-180907	9/7/18 0855	SE	1	X	
3	SMA2C-IT3-0-10-180907	9/7/18 0935	SE	1	X	
4	SMA2C-IT6-0-10-180907	9/7/18 0940	SE	1	X	
5			SE			
6			SE			
7			SE			
8			SE			
9			SE			
10			SE			
11			SE			
12			SE			
13			SE			
14			SE			

1 See project SAP/QAPP for analyte lists and test methods

2 Email sample confirmation report to labdata@anchorqea.com

Additional notes/comments:

Relinquished By:	Company:	Received By:	Company:
EVAN MALCZYC	Anchor QEA LLC.	Lauren Brandkamp	EcoAnalysts
Signature/Printed Name	Date/Time 9/7/18 1015	Signature/Printed Name	Date/Time 9/7/18 1015
Relinquished By:	Company:	Received By:	Company:
Signature/Printed Name	Date/Time	Signature/Printed Name	Date/Time

Distribution: A copy will be made for the laboratory and client. The Project file will retain the original.

Chain of Custody Record and Laboratory Analysis Request COC#

Date: 9/17/18
Laboratory : EcoAnalysts
Project Name: Port Gamble - OMMP LTM
Project Number: 180388-01.01
Project Contact: Jason Cornetta
Phone Number: 206.971.2680
Shipment Method: Delivery

ANCHOR QEA

Line	Field Sample ID	Collection Date/Time	Matrix	No. of Containers	Sediment and Field QC: Larval abnormality/mortality	Comments
1	SMA1-ST-0-10-Comp-180917	9/17/18 1205	SE	1	X	
2	SMA1A-IT-0-10-Comp-180917	9/17/18 1510	SE	1	X	
3	BW-15-1-10-180917	9/17/18 1546	SE	1	X	
4			SE			
5			SE			
6			SE			
7			SE			
8			SE			
9			SE			
10			SE			
11			SE			
12			SE			
13			SE			
14			SE			

1 See project SAP/QAPP for analyte lists and test methods

2 Email sample confirmation report to labdata@anchorqea.com

Additional notes/comments:

Relinquished By:	Company:	Received By:	Company:
Evan Malczyk	Anchor QEA LLC.	Julia Baum	~~Anchor QEA LLC~~ EcoA
Signature/Printed Name	9/17/18 1628 Date/Time	Signature/Printed Name	9/17/18 1628 Date/Time
Relinquished By:	Company:	Received By:	Company:
Signature/Printed Name	Date/Time	Signature/Printed Name	Date/Time

Distribution: A copy will be made for the laboratory and client. The Project file will retain the original.

Chain of Custody Record and Laboratory Analysis Request COC#

Date: 9/18/18
Laboratory : EcoAnalysts
Project Name: Port Gamble - OMMP LTM
Project Number: 180388-01.01
Project Contact: Jason Cornetta
Phone Number: 206.971.2680
Shipment Method: Delivery

ANCHOR QEA

Line	Field Sample ID	Collection Date/Time	Matrix	No. of Containers	Sediment and Field QC: Larval abnormality/mortality	Comments
1	SMA2A-ST-0-10-Comp-180918	9/18/18 1100	SE	1	X	
2	SMA2B-IT-0-10-Comp-180918	9/18/18 1510	SE	1	X	
3	SMA2B-ST-0-10-Comp-180918	9/18/18 1635	SE	1	X	
4			SE			
5			SE			
6			SE			
7			SE			
8			SE			
9			SE			
10			SE			
11			SE			
12			SE			
13			SE			
14			SE			

1 See project SAP/QAPP for analyte lists and test methods

2 Email sample confirmation report to labdata@anchorqea.com

Additional notes/comments:

Relinquished By:	Company:	Received By:	Company:
Evan Mekrzyk	Anchor QEA LLC.	Julia Baum	~~Anchor QEA LLC~~ EcoA
Signature/Printed Name	9/19/18 1700 Date/Time	Signature/Printed Name	9/18/18 1700 Date/Time
		JnBaum	
Relinquished By:	Company:	Received By:	Company:
Signature/Printed Name	Date/Time	Signature/Printed Name	Date/Time

Distribution: A copy will be made for the laboratory and client. The Project file will retain the original.

Chain of Custody Record and Laboratory Analysis Request COC#

ANCHOR QEA

Date:
Laboratory : **EcoAnalysts**
Project Name: **Port Gamble - OMMP LTM**
Project Number: **180388-01.01**
Project Contact: **Jason Cornetta**
Phone Number: **206.971.2680**
Shipment Method: **Delivery**

Line	Field Sample ID	Collection Date/Time	Matrix	No. of Containers	Sediment and Field QC: Larval abnormality/mortality	Sediment and Field QC: Biology archive	Comments
1	SMA2A-IT-0-10-comp-180919	9/19/18 1025	SE	1	X		
2	SMA1B-IT3-0-10-180919	9/19/18 1043	SE	1		X	
3			SE				
4			SE				
5			SE				
6			SE				
7			SE				
8			SE				
9			SE				
10			SE				
11			SE				
12			SE				
13			SE				
14			SE				

1 See project SAP/QAPP for analyte lists and test methods

2 Email sample confirmation report to labdata@anchorqea.com

Additional notes/comments:

Relinquished By:	Company:	Received By:	Company:
EVAN MALLETT	Anchor QEA LLC.	Regina Edwards	Anchor QEA LLC
Signature/Printed Name	Date/Time: 9/19/18 1110	Signature/Printed Name	Date/Time: EcoAnalysts

Relinquished By:	Company:	Received By:	Company:
Signature/Printed Name	Date/Time	Signature/Printed Name	Date/Time

Distribution: A copy will be made for the laboratory and client. The Project file will retain the original.