

#### Results of Toxicity Tests on Cruise Ship Wastewater Effluent 2003

Southcentral Alaska

**Prepared for** 

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#### Signature Page

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#### INTRODUCTION

The State of Alaska Department of Environmental Conservation (ADEC) is investigating emissions and wastewater from commercial passenger vessels in Alaska. As part of this investigation, wastewater samples of graywater (a combination of laundry, galley and accommodation water) and blackwater (wastewater discharged from the sanitation system), or mixed grey and black water were collected from six commercial cruise ships which discharge into marine waters of Southcentral Alaska. These samples were evaluated for acute and chronic toxicity using whole effluent toxicity tests with representative marine organisms. The results of these tests are presented in this report.

#### **METHODS**

#### Sample Collection and Transport

Seven samples of effluent were collected from six commercial passenger vessels. Six of the samples were collected between June 9 and 20, 2003, and the remaining sample was collected on September 12, 2003. Graywater and black water samples were collected from the Spirit of Columbia and mixed effluent samples were collected from the Spirit of Oceanus, Sun Princess, Norwegian Wind, Ryndam and Carnival Spirit. Detailed sample information including water quality parameters measured upon receipt of the samples is provided in Table 1.

Samples were collected in 20-L polyethylene collapsible cubitainers. Once collected, samples were placed in an ice bath and cooled to 2 to 4°C. Samples were then packed in coolers containing icepacks, which were sealed and delivered to the Juneau Airport for transport to the laboratory. All samples were shipped by air express (Alaska Airlines "Goldstreak") and collected by AMEC personnel from the Seattle Tacoma International Airport. Appropriate chain-of-custody procedures were employed during collection and transport. Chain-of-custody documentation is provided in Appendix D.

#### Sample Receipt

Upon arrival at AMEC, the coolers were opened, samples were inspected and the contents compared with the chain-of-custody forms. Receipt temperature was measured in a temperature blank contained in each cooler and recorded on the chain-of-custody form. Standard water quality parameters were measured in a subsample collected from each effluent sample and recorded in a bound logbook. Receipt temperatures and initial

water quality measurements are provided in Table 1. Samples were held in a 4°C cold room until used for testing.

	Spirit of	Spirit of	Spirit of	Sun	Norwegian	Ryndam	Carnival
	Columbia	Columbia	Oceanus	Princess	wind	-	Spirit
Sample Type	Black water	Gray water	Mixed effluent	Mixed effluent	Mixed effluent	Mixed effluent	Mixed effluent
Collection Date	06/09/03	06/09/03	06/12/03	06/16/03	06/18/03	06/20/03	09/12/03
Collection Time	09:35	11:15	09:15	13:15	09:30	12:10	14:15
Receipt Date	06/10/03	06/10/03	06/13/03	06/17/03	06/19/03	06/21/03	09/13/03
Receipt Time	08:45	09:00	09:00	17:00 <sup>1</sup>	11:30 <sup>1</sup>	08:15	10:00
Receipt Temp. (°C)	1.0	2.1	1.6	0 2	4.1	2.0	2.0
Dissolved Oxygen (mg/L)	12.4	2.4	0.7	5.6	10.6	6.4	11.1
рН	8.04	6.47	7.05	7.40	6.41	7.57	6.88
Conductivity (μS/cm)	25400	140	1281	2010	747	495	98
Salinity (ppt)	22.1	-	1.0	1.4	0.4	-	-
Hardness (mg/L CaCO₃)	> 400	120	112	148	64	32	32
Alkalinity (mg/L CaCO₃)	80	20	256	496	44	320	20
Chlorine (mg/L)	< 0.03	0.17	< 0.03	< 0.03	0.05	< 0.03	0.03
Ammonia (mg/L)	0.1	4.4	64.2	142.8	35.8	9.5	3.8

#### Table 1. Sample Receipt Information

<sup>1</sup> Samples received 2 - 4 h after the targeted 24-h shipping time had elapsed; however, toxicity tests were initiated within the 36-h holding time recommended by USEPA.

<sup>2</sup> A small amount of ice was observed in this sample upon receipt. Additional details are provided in the QA/QC section.

#### Test Organisms

Mysids (*Mysidopsis bahia*) and larval topsmelt (*Atherinops affinis*) were obtained from Aquatic Biosystems (Fort Collins, Colorado). Bivalve tests used blue mussels, *Mytilus galloprovincialis*, which were obtained from Carlsbad Aquafarms (Carlsbad, California), or Pacific oysters (*Crassostrea gigas*), which were obtained from M-REP (Carlsbad, California). Purple sea urchins (*Strongylocentrotus purpuratus*), were collected by AMEC personnel off the Mission Bay Jetty in San Diego, California, for use in the echinoderm tests. The organisms were transported to AMEC in insulated coolers and shipped by overnight delivery service. Upon arrival at AMEC, organism receipt information, including physical parameters and observations of organism health, was recorded. Mysids and topsmelt were acclimated to test conditions and held until test initiation and bivalves and echinoderms were spawned on the day of receipt or held overnight in a room maintained at 12°C and used the next day.

#### Sample Preparation and Handling

The salinity of each sample was adjusted to 30±2 parts per thousand (ppt) prior to preparing dilutions. The salinity of samples in the acute toxicity tests was adjusted by addition of artificial seasalts (40 Fathoms Crystal Sea Marinemix) and mixing the sample on a stir plate for a minimum of 1 hour (h). Hypersaline brine was used to adjust the salinity of samples for the bivalve and echinoderm tests. Hypersaline brine was made by freezing natural seawater to obtain concentrated brine with a final salinity of 60 to 100 ppt.

#### **Test Procedures**

Acute toxicity tests were conducted using mysids (*M. bahia*) and topsmelt (*A. affinis*) according to procedures presented by USEPA (1993) and summarized in Tables 2 and 3, respectively. The mysid test involved an exposure of 3- to 5-day old organisms for 48 h and the topsmelt test involved an exposure of 9- to 14-day old larvae for 96 h. An 80 percent solution renewal was conducted at the mid-point of the tests and test organisms were fed during the exposure by addition of brine shrimp nauplii to the test chambers approximately two hours prior to solution renewal. Water quality parameters (temperature, dissolved oxygen, pH, and salinity) and survival were monitored and recorded daily.

Test Organism:	Mysidopsis bahia
Test Organism Source:	Aquatic Biosystems; Fort Collins, Colorado
Test Organism Age:	3-5 days post hatch
Test Duration:	48 hours with solution renewal at 24 hours
Feeding:	Artemia nauplii during holding time and 2 hours prior to solution renewal
Test Chamber:	1-L polypropylene beaker
Test Solution Volume:	500 mL
Dilution Water:	40 Fathoms Artificial seawater
Test Temperature:	25 ± 1°C
Salinity:	30 ± 2 ppt
Test Concentrations (% sample):	50, 25, 12.5, 6.25, 3.12, 1.55, control
Number of Organisms/Chamber:	5
Number of Replicates/Concentration:	4
Illumination:	16 hours light/ 8 hours dark
Aeration:	Spirit of Oceanus, Spirit of Columbia (graywater), Ryndam and Sun Princess samples required aeration prior to exposure. Spirit of Oceanus and Spirit of Columbia (graywater) samples required aeration during exposure
Test Protocol:	EPA/600/4-90/027F
Test Acceptability:	≥ 90% control survival
Reference Toxicant:	Copper chloride

#### Table 2. Mysidopsis bahia 48-hour Acute Toxicity Test Procedure

#### Table 3. Atherinops affinis 96-hour Acute Toxicity Test Procedure

Test Organism:	Atherinops affinis
Test Organism Source:	Aquatic Biosystems (Fort Collins, Colorado)
Test Organism Age:	7-14 days post hatch
Test Duration:	96 hours with solution renewal at 48 hours
Feeding:	Artemia nauplii during holding and 2 hours prior to solution renewal
Test Chamber:	1-L polypropylene beaker
Test Solution Volume:	500 mL
Dilution Water:	40 Fathoms Artificial seawater
Test Temperature:	20 ± 1°C
Salinity:	30 ± 2 ppt
Test Concentrations (% sample):	50, 25, 12.5, 6.25, 3.12, 1.55, control
Number of Organisms/Chamber:	5
Number of Replicates/Concentration:	4
Illumination:	16 hours light/ 8 hours dark
Aeration:	Spirit of Oceanus, Spirit of Columbia (graywater), Ryndam and Sun Princess samples required aeration prior to exposure. Spirit of Oceanus and Spirit of Columbia (graywater) samples required aeration during exposure
Test Protocol:	EPA/600/4-90/027F
Test Acceptability:	$\geq$ 90% control survival
Reference Toxicant:	Copper chloride

Chronic toxicity tests using bivalve larvae and echinoderm gametes were conducted according to USEPA (1995) and these procedures are summarized in Tables 4 and 5, respectively. The bivalve larval development tests involved a 48-h exposure of blue mussel or oyster larvae that were less than 4 hours post-fertilization at test initiation. The larvae were preserved at test termination and evaluated microscopically for survival and normal development. The percentage of larvae that survived and the percentage of surviving embryos that developed normally were calculated. Water quality parameters were monitored daily in surrogate test chambers. The echinoderm fertilization test involved exposure of sperm cells to the test solutions for 20 minutes, at which point eggs were added and the solutions left for an additional 20 minutes for fertilization to occur. The embryos were then preserved and examined microscopically to assess the percentage of eggs that were successfully fertilized. Water quality parameters were measured at test initiation.

Test Organism:	Mytilus galloprovincialis; Crassostrea gigas
Test Organism Source:	Carlsbad Aquafarms (Carlsbad, CA); M-REP (Carlsbad, CA)
Test Organism Age:	<4 hours post-fertilization
Test Duration:	48 hours
Test Chamber:	30-mL glass vials
Test Solution Volume:	10 mL
Test Temperature:	15 ± 1°C
Dilution Water:	Seawater collected off Dash Point, Washington and filtered through a 0.5- $\mu m$ screen
Salinity:	30 ± 2 ppt
Source of Salinity:	Hypersaline brine made by freezing dilution water to a salinity of 60-100 ppt
Test Concentrations (% sample):	50, 25, 12.5, 6.25, 3.12, 1.56, plus laboratory and brine controls
Number of Organisms/Chamber:	150-300
Number of Replicates/Concentration:	5
Illumination:	16 hours light/ 8 hours dark
Aeration:	Spirit of Oceanus, Spirit of Columbia (graywater), Ryndam and Sun Princess samples required aeration prior to exposure.
Test Protocol:	EPA/600/R-95/136
Test Acceptability:	≥ 70% normal development in control
Reference Toxicant:	Copper chloride

#### Table 4. Bivalve Larval Development Test Procedure

Test Organism:	Strongylocentrotus purpuratus
Test Organism Source:	Mission Bay Jetty, San Diego, California
Test Organism Age:	<4 hours post gamete collection
Test Duration:	40 minute total (20 min. sperm exposure; 20 min. fertilization)
Test Chamber:	30-mL glass vials
Test Solution Volume:	10 mL
Test Temperature:	12 <u>+</u> 1°C
Dilution Water:	Seawater collected off Dash Point, Washington and filtered through a 0.5-µm screen
Salinity:	30 ppt
Source of Salinity:	Hypersaline brine made by freezing dilution water to a salinity of 60-80 ppt
Test Concentrations (% sample):	50, 25, 12.5, 6.25, 3.12, 1.56, plus laboratory and brine controls
Number of organisms/chamber:	1500-2000 eggs
Sperm:Egg Ratio:	200:1
Number of Replicates/Concentration:	5
Aeration:	Spirit of Oceanus, Spirit of Columbia (graywater), Ryndam and Sun Princess samples required aeration prior to exposure
Test Protocol:	EPA/600/R-95/136
Test Acceptability:	$\geq$ 70% control fertilization
Reference Toxicant:	Copper chloride

#### Table 5. Echinoderm Fertilization Test Procedure

Reference toxicant tests were conducted in conjunction with this study to assess the health and sensitivity of the test organisms. Bivalve and echinoderm reference toxicant tests were conducted concurrently with each sample. Mysid and topsmelt acute reference toxicant tests were conducted within one week of tests with the samples.

#### **RESULTS**

Results of toxicity tests with samples collected from the commercial cruise ships are summarized in Tables 6 through 9. Summaries of data are also provided in Appendix A. Raw data from the tests and printouts of statistical analyses are provided in Appendix B.

Table 6. Acute Toxicity Test Results Using Mysidopsis bahia. Data are presented
as percent effluent with 95% confidence limits, where applicable.

	Spirit of Columbia blackwater	Spirit of Columbia graywater	Spirit of Oceanus	Sun Princess	Norwegian Wind	Ryndam	Carnival Spirit
LC50	> 50	16.3 (13.5-19.4)	26.7 (20.5-33.9)	21.0	> 50	> 50	> 50
NOEC	50	12.5	25	12.5	50	50	50
LOEC	> 50	25	50	25	> 50	> 50	> 50

# Table 7. Acute Toxicity Test Results Using *Atherinops affinis*. Data are presented as percent effluent with 95% confidence limits, where applicable.

	Spirit of Columbia blackwater	Spirit of Columbia graywater	Spirit of Oceanus	Sun Princess	Norwegian Wind	Ryndam	Carnival Spirit
LC50	> 50	24.0 (19.2-29.9)	14.2 (9.8-18.6)	11.0	25.5 (16.5-34.2)	> 50	> 50
NOEC	50	25	12.5	12.5	12.5	50	50
LOEC	> 50	50	25	25	25	> 50	> 50

	Spirit of Columbia blackwater	Spirit of Columbia graywater	Spirit of Oceanus	Sun Princess	Norwegian Wind	Ryndam	Carnival Spirit
Species	Mussel	Mussel	Oyster	Sea urchin	Oyster	Oyster	Mussel
Normality							
EC50	> 50	8.7 (8.6-8.8)	< 1.56	1.8 (1.8-1.9)	12.4 (12.1-12.7)	21 (18.4-23.2)	31.7 (31.1-32.3)
NOEC	50	6.25	< 1.56	1.56	6.25	12.5	25
LOEC	> 50	12.5	1.56	3.12	12.5	25	50
Survival							
EC50	> 50	> 50	28.7 (NC)	> 50	> 50	> 50	> 50
NOEC	50	25	12.5	50	50	50	50
LOEC	> 50	50	25	> 50	> 50	> 50	> 50
NC No	ot calculable						

# Table 8. Toxicity Test Results for the Bivalve Larval Development Test. Data are presented as percent effluent with 95% confidence limits, where applicable. Data presented for the Sun Princess are for an echinoderm larval development test.

 Table 9. Toxicity Test Results for the Echinoderm Fertilization Test. Data are presented as percent effluent with 95% confidence limits, where applicable.

	Spirit of Columbia blackwater	Spirit of Columbia greywater	Spirit of Oceanus	Sun Princess	Norwegian Wind	Ryndam	Carnival Spirit
EC50	> 50	1.5	5.0 (NC)	< 1.56	40.0 (38.7-41.4)	> 50	NT
NOEC	25	<1.5	< 1.56	< 1.56	25	50	NT
LOEC	50	1.5	1.56	1.56	50	> 50	NT
NC I NT I	Not calculable Not tested						

#### **QUALITY ASSURANCE**

All test containers were received in good condition in sealed coolers with appropriate chain-of-custody documentation consistent with the identification on the sample containers themselves. Samples were received within 24 h of collection, with the exception of the samples from the Sun Princess and Norwegian Wind, which were received approximately 28 and 26 h after collection, respectively. The temperature of the samples upon receipt ranged from 0 to 4.1°C, which is within the range of 0 to 6°C recommended by the USEPA (1994, 1995). A small amount of ice was observed in the sample from the Sun Princess, which was received with a temperature of 0°C. Tests were conducted with this sample following discussions with ADEC and technical advisors from Shannon and Wilson.

All toxicity tests were initiated within the recommended holding time of 36 h. There were no deviations from testing protocols and all water quality parameters remained within ranges specified in the corresponding protocols.

The bivalves obtained for the test with the Sun Princess sample did not spawn. Consequently, the bivalve larval development test with this species was replaced with an echinoderm larval development test using *S. purpuratus* gametes. Although this is not a bivalve, the larval development test with this species would be expected to exhibit a similar degree of toxicity to the bivalve larvae. For example, the mean and standard deviation of reference toxicant tests conducted by this laboratory for larval development tests with *M. galloprovincialis* and *S. purpuratus* are  $13.4 \pm 2.2$  and  $29.2 \pm 15.3 \mu g/L$  copper, respectively.

The *S. purpuratus* and *Dendraster excentricus* (an alternative echinoderm species used in toxicity evaluations) that were received for the echinoderm fertilization tests with the sample from the Carnival Spirit would not spawn. Consequently, there are no data for this toxicity test for the Carnival Spirit sample.

Results for reference toxicant tests conducted as part of this testing program were within acceptable ranges of test performance (mean  $\pm$  two standard deviations for historical tests conducted in this laboratory). Data from these tests are provided in Appendix C.

#### **REFERENCES**

- EPA. 1995. Short-Term Method for Estimating the Chronic Toxicity of Effluents and Receiving Waters to the West Coast Marine and Estuarine Organisms. EPA/600/R-95/136, February 1995.
- EPA. 1994. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Marine and Estuarine Organisms. Second Edition. EPA/600/4-91/003, July 1994.
- EPA. 1993. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms. C.I. Weber. EPA/600/4-90/027F, August 1993.
- Tidepool Scientific Software. 1992-1994. TOXCALC Comprehensive Toxicity Data Analysis and Database Software, Version 5.0.

Appendix A

Summary Tables of Toxicity Test Results

#### Appendix Table A-1. Acute Toxicity Tests Spirit of Columbia Blackwater June 2003

			Mysidops	sis bahia		Atherinops affinis			
			Surv	vival			Surv	ival	
Concentration				Mean %	LC <sub>50</sub>			Mean %	LC <sub>50</sub>
%	Replicate	# Survivors	% Survival	Survival	(% effluent)	# Survivors	% Survival	Survival	(% effluent)
	1	5	100	100		4	80		
Control	2	5	100	100	<b>&gt;50</b>	5	100	90	<b>⊳</b> 50
Control	3	5	100		>50	5	100	90	>50
	4	5	100			4	80		
	1	5	100	100		5	100		
15	2	5	100	100		4	80	90	
1.5	3	5	100			4	80	30	
	4	5	100			5	100		
	1	5	100	95		5	100		
3 1 2 5	2	5	100	30		4	80	85	
5.125	3	5	100			4	80	00	
	4	4	80			4	80		
	1	5	100	100		5	100		
6 25	2	5	100	100		5	100	85	
0.25	3	5	100			5	100	00	
	4	5	100			2	40		
	1	5	100	100		5	100		
12.5	2	5	100	100		5	100	95	
12.5	3	5	100			5	100	55	
	4	5	100			4	80		
	1	5	100	95		2	40		
25	2	4	80	55		3	60	60	
25	3	5	100			4	80	00	
	4	5	100			3	60		
	1	5	100	100		4	80		
50	2	5	100	100		4	80	80	
50	3	5	100			4	80	00	
	4	5	100			4	80		

#### Appendix Table A-2. Chronic Toxicity Tests Spirit of Columbia Blackwater June 2003

		Bivalve			Echinoderm			
		Larv	al Develop	nent	Sperm	Cell Fertili	zation	
Concentration			Mean	EC <sub>50</sub>	-	Mean	EC <sub>50</sub>	
%	Replicate	% Normal	% Normal	(% effluent)	% Fertilized	% Fertilized	(% effluent)	
	1	99			85			
	2	95			87			
Control	3	98	97	>50	81	82	>50	
	4	95			77			
	5	97			80			
	1	99			82			
	2	92			79			
Brine Control	3	97	97		80	81		
	4	98			78			
	5	97			86			
	1	96			85			
	2	96			75			
1.5	3	97	96		75	81		
	4	93			80			
	5	99			88			
	1	100			83			
	2	96			83			
3.125	3	97	98		90	82		
	4	98			76			
	5	97			78			
	1	96			73			
	2	98			81			
6.25	3	96	97		82	79		
	4	98			80			
	5	97			80			
	1	92			84			
	2	97	0.5		84			
12.5	3	97	95		84	84		
	4	96			84			
	5	94			82			
	1	98			76			
05	2	95	07		73	70		
25	3	96	97		83	79		
	4	98			80			
	5	99			82			
	1	96			66			
E 0	2	98	07		/ X	74		
50	3	96	97		68	71		
	4 E	96			13			
	5	98			68			

#### Appendix Table A-3. Acute Toxicity Tests Spirit of Columbia Graywater June 2003

			Mysidopsis bahia				Atherinops affinis			
			Surv	vival			Surv	ival		
Concentration				Mean %	LC <sub>50</sub>			Mean %	LC <sub>50</sub>	
%	Replicate	# Survivors	% Survival	Survival	(% effluent)	# Survivors	% Survival	Survival	(% effluent)	
	1	4	80	05		5	100			
Control	2	5	100	90	30.2	5	100	90	27.4	
Control	3	5	100		59.Z	4	80	90	27.4	
	4	5	100			4	80			
	1	5	100	100		4	80			
15	2	5	100	100		5	100	80		
1.5	3	5	100			4	80	80		
	4	5	100			3	60			
	1	5	100	100		4	80			
2 1 2 5	2	5	100	100		5	100	75		
3.125	3	5	100			4	80	75		
	4	5	100			2	40			
	1	3	60	95		5	100			
6.05	2	5	100	65		5	100	00		
0.25	3	5	100			4	80	90		
	4	4	80			4	80			
	1	5	100	80		4	80			
105	2	4	80	00		4	80	80		
12.5	3	3	60			3	60	00		
	4	4	80			5	100			
	1	4	80	5		2	40			
25	2	4	80	5		4	80	45		
25	3	3	60			3	60	45		
	4	4	80			3	60			
	1	3	60	0		0	0			
50	2	1	20	0		0	0	0		
50	3	0	0			0	0	U		
	4	3	60			0	0			

#### Appendix Table A-4. Chronic Toxicity Tests Spirit of Columbia Graywater June 2003

		Bivalve			Echinoderm			
		Larv	al Develop	nent	Sperm	Cell Fertili	zation	
Concentration			Mean	EC <sub>50</sub>	-	Mean	EC <sub>50</sub>	
%	Replicate	% Normal	% Normal	(% effluent)	% Fertilized	% Fertilized	(% effluent)	
	1	95			80			
	2	97			78			
Control	3	95	96	8.7	78	78	<1.5	
	4	98			75			
	5	94			79			
	1	95			74			
	2	96			86			
Brine Control	3	98	95		78	78		
	4	91			71			
	5	93			81			
	1	92			0			
	2	94			0	-		
1.5	3	98	94		0	0		
	4	93			0			
	5	92			0			
	1	92			0			
	2	97			0	0		
3.125	3	90	93		0	0		
	4	95			0			
	5	90			0			
	1	95			0			
0.05	2	98			0	0		
6.25	3	89	93		0	0		
	4	95			0			
	5	90			0			
	1	0			0			
12.5	2	0	0		0	0		
12.5	3	0	0		0	0		
	4	0			0			
	1	0			0			
	2	0			0			
25	2	0	0		0	0		
20	۵ ۸	0	0		0	Ū		
	5	0			0			
	1	0			0			
	2	Õ			0			
50	3	Ő	0		0	0		
	4	0	0		0	5		
	5	õ			õ			

#### Appendix Table A-5. Acute Toxicity Tests Spirit of Oceanus - Combined June 2003

			Mysidops	sis bahia		Atherinops affinis			
			Surv	vival			Surv	ival	
Concentration				Mean %	LC <sub>50</sub>			Mean %	LC <sub>50</sub>
%	Replicate	# Survivors	% Survival	Survival	(% effluent)	# Survivors	% Survival	Survival	(% effluent)
	1	4	80	95		3	60		
Control	2	5	100	30	26.7	5	100	90	1/1 2
Control	3	5	100		20.7	5	100	30	14.2
	4	5	100			5	100		
	1	5	100	100		5	100		
15	2	5	100	100		4	80	95	
1.5	3	5	100			5	100	30	
	4	5	100			5	100		
	1	5	100	95		5	100		
3 1 2 5	2	4	80	90		5	100	05	
5.125	3	5	100			5	100	30	
	4	5	100			4	80		
	1	5	100	100		3	60		
6 25	2	5	100	100		4	80	70	
0.25	3	5	100			3	60	70	
	4	5	100			4	80		
	1	5	100	80		5	100		
12.5	2	1	20	00		2	40	65	
12.5	3	5	100			3	60	00	
	4	5	100			3	60		
	1	5	100	70		1	20		
25	2	5	100	70		1	20	20	
25	3	3	60			1	20	20	
	4	1	20			1	20		
	1	0	0	5		0	0		
50	2	1	20	5		0	0	0	
50	3	0	0			0	0	U	
	4	0	0			0	0		

#### Appendix Table A-6. Chronic Toxicity Tests Spirit of Oceanus - Combined June 2003

		Bivalve			Echinoderm			
		Larv	al Develop	ment	Sperm	Cell Fertili	zation	
Concentration			Mean	EC <sub>50</sub>	-	Mean	EC <sub>50</sub>	
%	Replicate	% Normal	% Normal	(% effluent)	% Fertilized	% Fertilized	(% effluent)	
	1	90			99			
	2	89			98			
Control	3	94	91	<1.5	99	98	5.0	
	4	91			95			
	5	93		-	97			
	1	89			100			
	2	94			91			
Brine Control	3	84	90		92	93		
	4	93			91			
	5	90			91			
	1	20			82			
1 5	2	28	22		71	70		
1.5	3	19	23		12	79		
	4	17			00			
	1	0			02 81			
	1 2	0			70			
3 1 2 5	2	0	0.0		70	81		
5.125	3	0	0.0		87	01		
	4 5	0			85			
	1	0			29			
	2	0			9			
6.25	3	0	0.0		28	23		
	4	0	••••		22			
	5	0			29			
	1	0			2			
	2	0			1			
12.5	3	0	0.0		0	1.6		
	4	0			3			
	5	0			2			
	1	0			0			
	2	0			0			
25	3	0	0.0		0	0.0		
	4	0			0			
	5	0			0			
	1	0			0			
	2	0			1			
50	3	0	0.0		0	0.2		
	4	0			0			
	5	0			0			

#### Appendix Table A-7. Acute Toxicity Tests Sun Princess - Combined June 2003

			Mysidopsis bahia				Atherinops affinis			
			Surv	vival			Surv	ival		
Concentration				Mean %	LC <sub>50</sub>			Mean %	LC <sub>50</sub>	
%	Replicate	# Survivors	% Survival	Survival	(% effluent)	# Survivors	% Survival	Survival	(% effluent)	
	1	5	100	100		5	100			
Control	2	5	100	100	21.0	5	100	90	11.0	
Control	3	5	100		21.0	5	100	30	11.0	
	4	5	100			3	60			
	1	5	100	100		5	100			
15	2	5	100	100		5	100	100		
1.5	3	5	100			5	100	100		
	4	5	100			5	100			
	1	5	100	100		4	80			
2 1 2 5	2	5	100	100		3	60	75		
5.125	3	5	100			4	80	75		
	4	5	100			4	80			
	1	5	100	100		4	80			
6 25	2	5	100	100		4	80	75		
0.25	3	5	100			3	60	75		
	4	5	100			4	80			
	1	5	100	100		3	60			
12.5	2	5	100	100		1	20	40		
12.5	3	5	100			2	40	40		
	4	5	100			2	40			
	1	2	40	25		0	0			
25	2	1	20	25		0	0	0		
25	3	1	20			0	0	0		
	4	1	20			0	0			
	1	0	0	0		0	0			
50	2	0	0	0		0	0	0		
50	3	0	0			0	0	U		
	4	0	0			0	0			

#### Appendix Table A-8. Chronic Toxicity Tests Sun Princess - combined June 2003

		Bivalve			Echinoderm			
		Larv	al Develop	ment	Sperm	Cell Fertili	zation	
Concentration			Mean	EC <sub>50</sub>	-	Mean	EC <sub>50</sub>	
%	Replicate	% Normal	% Normal	(% effluent)	% Fertilized	% Fertilized	(% effluent)	
	1	93			100			
	2	93			100			
Control	3	90	92	1.8	100	100	1.1	
	4	90			100			
	5	93			100			
	1	90			98			
	2	91			91			
Brine Control	3	84	90		85	92		
	4	93			90			
	5	92			96			
	1	71			39			
4.5	2	98	75		26	24		
1.5	3	53	75		34	31		
	4	71			19			
	5 1	18		-	37			
	1	2.0			0			
2 1 2 5	2	1.8	1 2			2.6		
5.125	3	1.2	1.2		3	2.0		
	4	0.0			0			
		0			0			
	2	0			0			
6.25	3	0	0.0		0	0.2		
0.20	4	0	0.0		1	0.2		
	5	0			0			
	1	0			0			
	2	0			0			
12.5	3	0	0.0		0	0.0		
	4	0			0			
	5	0			0			
	1	0			0			
	2	0			0			
25	3	0	0.0		0	0.0		
	4	0			0			
	5	0			0			
	1	0			0			
	2	0	_		0	_		
50	3	0	0.0		0	0.0		
	4	0			0			
	5	0			0			

#### Appendix Table A-9. Acute Toxicity Tests Norwegian Wind - Combined June 2003

			Mysidopsis bahia				Atherinops affinis			
			Surv	vival			Surv	ival		
Concentration				Mean %	LC <sub>50</sub>			Mean %	LC <sub>50</sub>	
%	Replicate	# Survivors	% Survival	Survival	(% effluent)	# Survivors	% Survival	Survival	(% effluent)	
	1	5	100	100		5	100			
Control	2	5	100	100	<b>&gt;50</b>	5	100	90	25.5	
Control	3	5	100		>50	3	60	90	20.0	
	4	5	100			5	100			
	1	5	100	100		5	100			
15	2	5	100	100		4	80	90		
1.5	3	5	100			4	80	90		
	4	5	100			5	100			
	1	5	100	100		5	100			
2 1 2 5	2	5	100	100		3	60	75		
5.125	3	5	100			4	80	75		
	4	5	100			3	60			
	1	5	100	100		5	100			
6.25	2	5	100	100		5	100	05		
0.25	3	5	100			4	80	90		
	4	5	100			5	100			
	1	4	80	05		4	80			
12.5	2	5	100	35		5	100	70		
12.5	3	5	100			3	60	70		
	4	5	100			2	40			
	1	5	100	100		3	60			
25	2	5	100	100		2	40	50		
25	3	5	100			3	60	50		
	4	5	100			2	40			
	1	4	80	80		1	20			
50	2	4	80	00		0	0	10		
50	3	3	60			0	0	10		
	4	5	100			1	20			

#### Appendix Table A-10. Chronic Toxicity Tests Norwegian Wind - Combined June 2003

		Bivalve			Echinoderm			
		Larv	al Develop	nent	Sperm	Cell Fertili	zation	
Concentration			Mean	EC <sub>50</sub>	-	Mean	EC <sub>50</sub>	
%	Replicate	% Normal	% Normal	(% effluent)	% Fertilized	% Fertilized	(% effluent)	
	1	91			90			
	2	93			83			
Control	3	93	91	12	81	83	40	
	4	95			82			
	5	82			80			
	1	96			77			
	2	94			86			
Brine Control	3	96	94		78	//		
	4	89			77			
	5	96		-	67			
	1	87			80			
4 5	2	88	0.4		65	75		
1.5	3	90	64		80	75		
	4	02			00 70			
	5 1	93		-	79			
	1	90			75			
2 1 2 5	2	92	01		75	75		
5.125	3	91	51		70	75		
	4	92			60			
	J 1	90			66			
	2	92 87			79			
6 25	2	95	92		75	75		
0.20	4	92	02		70	70		
	5	92			76			
	1	31			81			
	2	43			75			
12.5	3	21	45		76	76		
	4	61			76			
	5	70			70			
	1	0			86			
	2	0			78			
25	3	0	0.0		87	77		
	4	0			74			
	5	0			61			
	1	0			20			
	2	0			22			
50	3	0	0.0		21	26		
	4	0			38			
	5	0			27			

#### Appendix Table A-11. Acute Toxicity Tests Ryndam - Combined June 2003

			Mysidopsis bahia				Atherinops affinis			
			Surv	vival			Surv	vival		
Concentration				Mean %	LC <sub>50</sub>			Mean %	LC <sub>50</sub>	
%	Replicate	# Survivors	% Survival	Survival	(% effluent)	# Survivors	% Survival	Survival	(% effluent)	
	1	5	100	100		5	100			
Control	2	5	100	100	<u>⊳50</u>	5	100	05	>50	
Control	3	5	100		>50	4	80	90	>50	
	4	5	100			5	100			
	1	5	100	100		4	80			
15	2	5	100	100		4	80	00		
1.5	3	5	100			5	100	90		
	4	5	100			5	100			
	1	5	100	100		5	100			
2 1 25	2	5	100	100		5	100	100		
5.125	3	5	100			5	100	100		
	4	5	100			5	100			
	1	5	100	05		5	100			
6.25	2	5	100	95		5	100	100		
0.25	3	4	80			5	100	100		
	4	5	100			5	100			
	1	5	100	95		5	100			
12.5	2	4	80	30		5	100	100		
12.5	3	5	100			5	100	100		
	4	5	100			5	100			
	1	5	100	90		5	100			
25	2	3	60	30		5	100	90		
25	3	5	100			5	100	90		
	4	5	100			3	60			
	1	5	100	100		5	100			
50	2	5	100	100		5	100	05		
50	3	5	100			4	80	90		
	4	5	100			5	100			

#### Appendix Table A-12. Chronic Toxicity Tests Ryndam - Combined June 2003

			Bivalve		E	chinoderm	1
		Larv	al Develop	ment	Sperm	Cell Fertili	zation
Concentration			Mean	EC <sub>50</sub>	•	Mean	EC <sub>50</sub>
%	Replicate	% Normal	% Normal	(% effluent)	% Fertilized	% Fertilized	(% effluent)
	1	97			97		
	2	88			93		
Control	3	79	91	21	98	94	>50
	4	92			94		
	5	97			90		
	1	98			87		
	2	92			93		
Brine Control	3	75	91		94	91	
	4	97			88		
	5	95			91		
	1	94			94		
	2	96			95		
1.5	3	90	91		89	93	
	4	78			96		
	5	95			92		
	1	83			94		
	2	98			93		
3.125	3	97	91		90	92	
	4	96			88		
	5	81		-	94		
	1	85			93		
0.05	2	96			97		
6.25	3	87	90		94	93	
	4	89			91		
	5	91		-	92		
	1	79			93		
10.5	2	83	70		96	04	
12.5	3	12	19		97	94	
	4	04 70			93		
		70			90		
	1	25			94 80		
25	2	51	34		80	92	
25	J	13	54		03	52	
	+ 5	15			03		
	1	 		1	94		
	2	Õ			93		
50	3	Ő	0.0		92	94	
	4	0	0.0		96	<b>U</b> T	
	5	Ő			93		

#### Appendix Table A-13. Acute Toxicity Tests Carnival Spirit - Combined September 2003

			Mysidops	sis bahia		Atherinops affinis				
			Surv	vival			Surv	ival		
Concentration				Mean %	LC <sub>50</sub>		Mean %		LC <sub>50</sub>	
%	Replicate	# Survivors	% Survival	Survival	(% effluent)	# Survivors	% Survival	Survival	(% effluent)	
	1	5	100	05		5	100			
Control	2	5	100	90	> 50	5	100	05	>50	
Control	3	4	80		>00	4	80	95	>00	
	4	5	100			5	100			
	1	5	100	100		5	100			
15	2	5	100	100		3	60	00		
1.5	3	5	100			5	100	90		
	4	5	100			5	100			
	1	5	100	100		5	100			
3 1 2 5	2	5	100	100		5	100	90		
5.125	3	5	100			3	60	90		
	4	5	100			5	100			
	1	5	100	95		5	100			
6 25	2	4	80	90		4	80	95		
0.25	3	5	100			5	100	30		
	4	5	100			5	100			
	1	5	100	100		4	80			
12.5	2	5	100	100		4	80	90		
12.5	3	5	100			5	100	30		
	4	5	100			5	100			
	1	5	100	100		5	100			
25	2	5	100	100		4	80	95		
25	3	5	100			5	100	30		
	4	5	100			5	100			
	1	5	100	95		5	100			
50	2	4	80	30		5	100	95		
	3	5	100			5	100	95		
	4	5	100			4	80			

#### Appendix Table A-14. Chronic Toxicity Tests Carnival Spirit - combined September 2003

			Bivalve		E	chinoderm	n		
		Larv	al Develop	nent	Sperm	Cell Fertili	zation		
Concentration			Mean	EC <sub>50</sub>	-	Mean	EC <sub>50</sub>		
%	Replicate	% Normal	% Normal	(% effluent)	% Fertilized	% Fertilized	(% effluent)		
	1	75							
	2	76							
Control	3	85	78	1.8			*		
	4	70							
	5	83							
	1	86							
	2	86							
Brine Control	3	81	82						
	4	83							
	5	75							
	1	74							
15	2	84	02						
1.5	3	84 94	03						
	4	04 00							
		00 88		-					
	1	00							
3 1 2 5	2	01 91	82						
0.120	3 4	80	02						
	5	79							
	1	88							
	2	79							
6.25	3	80	82						
	4	81							
	5	84							
	1	77							
	2	75							
12.5	3	86	82						
	4	83							
	5	90							
	1	80							
	2	74							
25	3	74	75						
	4	86							
	5	62							
	1	0							
	2	0							
50	3	0	0.0						
	4	0							
	5	0							

Appendix B

**Statistical Summaries and Raw Bench Sheets** 

Atherinops affinis 96 h Survival

·				Acute Fish	h Test-96 Hr	Survival		
Start Date:	6/10/03		Test ID:	0306-16NW	S	ample ID:	Spirit of Columbia	
End Date:	6/14/03		Lab ID:	WAAEE-AMEC NV	N BioassayS	ample Type;	BW-Black Water	
Sample Date:	6/9/03		Protocol:	EPA 02-EPA Acute	e T	est Species:	AA-Atherinops affinis	
Comments:						•	· · · · · · · · · · · · · · · · · · ·	
Conc-%	1	2	3	4		-		
D-Control	0.8000	1.0000	1.0000	0.8000				
1.5	1.0000	0.8000	0.8000	1.0000				
3.125	1.0000	0.8000	0.8000	0.8000				
6.25	1.0000	1.0000	1.0000	0.4000				
12.5	1.0000	1.0000	1.0000	0.8000				
25	0.4000	0.6000	0.8000	0.6000				
50	0.8000	0.8000	0.8000	0.8000				

		_	Tra	ansform:	Arcsin Sc	uare Roo	t	Rank	1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	
D-Control	0.9000	1.0000	1.2262	1.1071	1.3453	11.212	4			
1.5	0.9000	1.0000	1.2262	1.1071	1.3453	11.212	4	18.00	10.00	
3.125	0.8500	0.9444	1.1667	1.1071	1.3453	10.206	4	16.00	10.00	
6.25	0.8500	0.9444	1.1801	0.6847	1.3453	27.987	4	19.00	10.00	
12.5	0.9500	1.0556	1.2857	1.1071	1.3453	9.261	4	20.00	10.00	
25	0.6000	0.6667	0.8910	0.6847	1.1071	19.366	4	11.00	10.00	
50	0.8000	0.8889	1.1071	1.1071	1.1071	0.000	4	14.00	10.00	

Auxiliary Tests			-		Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates nor	mal distribu	ution (p > 0	.01)		0.90956	0.896	-1.2386	2.89322
Equality of variance cannot be co								
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU				
Steel's Many-One Rank Test	50	>50		2				





## AMEC Earth Environmental

Northwest Bioassay Lab 5009 Pacific Hwy. E. Suite 2-0

Fife, WA 98424

Client: Shannon + Wilson

Sample ID: Spirit of Columbia #1

Contact:

Test#: 0306 -16 NW

					_		n	H				
			D.	0		(mg/l.)						
Sample			(m	<u>1/L)</u>								Fin.
Conc. or (%)	Init.		Fin.	Init.		Fin.	<u> </u>	- 24	18	48	72	96
	0	24	48	48	72	96		24	20	8.30	821	8.06
CON	68	7.1	6.1	6.9	6,1	6-1	8.48	<u>All</u>	9 00	0.7	19.72	8.06
	69	69	6.0	6.8	6.6	6.5	8.48	8.15	0107	8.7	0.0.0	818
0.00	60	7	1.1	6.1	6.3	65	8.49	8.14	8.10	8.30	2.00	0 NV
2.12.5	<u><u><u>w</u>.</u></u>	70	1 2	6.9	6,3	6.8	8.48	8.14	8.11	8.2	0.4~	0.00
<u>. (e.15</u>		70	1. 3	10	<u>L</u> S	10.7	8.48	8,14	8.12	8.7	8.2.5	8.00
12.5		1.0		1.0	दिप	6.5	6.46	8.12	8:08	8.34	18.19	201
1 25	11.4		I PA									

BW

					Test Temporature							
	r	Sali	nity	7	Test Temperature							
	┞_────			210	(°C)							
Sample_	·	P	<u>01 M</u>	<u>- 2: Y</u>	<u> </u>	1		-/		Fin.		
Conc or	Init	Fin.	Init.	Fin.	Init.	L	<u></u>	40		06		
		48	48	96.	0	24	48	48	12	90		
		40			10 0	202	19 2	14.5	1991	1 19.8		
CON	29.9	1344	297		<u>14.e</u>	0.3		146	िंच वे	140		
	201	204	1798	1313	19.0	20.3	19.0	17.7	남동문			
	<u></u>		1000	200	lian	212	19.1	119,5	17.1	119.8		
3.125	30.	1305	116	20,71	1.00	1965	172	1107	199	114 4		
1. 1.	201	308	179.7	130.8	14.0	ang	170	<u> </u>	1.6°	┞┟┊╬		
<u>l. 19</u>	00.1	동품	160-4	20 0	19 0	202	(9,0	19,5	17.8	119.8		
12.5	50.1	1-20/T	1/1-1	1 20. 1	1.55	t	1:4 0	10 4	197	119.8		
25	20.1	130.4	29.8	132	14.0	01.5	117.	1.1		يتحصينها		
ν <u>ν</u>		<del>النبية ال</del>		a subscription of the local division of the								

Alkalinity         Constrained           Conc.         *(mg/L as CaCo3)         (mg/L)         (mg/L)           control         5 (o		Alkolipitut	Chlorine Resid.	Ammonia
Conc.         (nig/L as caces)           control         5 (6           bichost conc         80		Alkalinity	(mg/L)	(mg/L)
biobact conc 80 2.03	Conc.	-(mg/L as caodo)		
	bigbest conc	80	2.03	·

\_\_\_\_\_

Sample Description:

Comments:

Analysts: <u>Gom, et M</u>

# 96 Hour Toxicity Test Data Sheet

Saltwater 96-hr Acute with Renewal

Start Date & Time: 6 10 03 1345 End Date & Time: 6 4 D3 1330

Test Organism: Athenhops affinis

Test Protocol:

			Number of							
Comple	Ren	Cont		Live	Organi	sms				
	#	#	0	24	48	72	96			
CONC. OUR	1	22	5	5	5	-	4			
<u>    (.o.n.                              </u>		10	5	5	5	5	5			
		2	5	5	5	5	5			
				4	4	4	4			
	4				5	5	5			
1.5	$\begin{bmatrix} 1 \\ - \end{bmatrix}$	1-2-1		12-	5	5	4			
	$\frac{2}{2}$		5	1-2-	4	4	4			
	$\frac{3}{3}$				15	15	5			
	4	13			12-	5	5			
3.125	$\frac{1}{1}$			<u>+</u> €-	17-	14	4			
	$\frac{1}{2}$	14	$\frac{3}{5}$	$+\tilde{t}$	$\frac{1}{4}$	4	14			
	3	<u>4</u> -	5	┼╌┶╴	15	14	4			
L	+ 4	16	5	5	5	5	5			
10.25	+ +	19	$\frac{1}{5}$	15	15	5	5			
	$\frac{2}{3}$	Ha	5	15	5	S	5			
		15	$\frac{1}{5}$	13	743	* Q	2			
	$+\frac{\pi}{4}$	72	5	5	17	5	15			
12.5	+	127	5	15	17	15	5			
	- 2	11	5	15	17	5	5			
<b> </b>	$+\frac{3}{4}$	12	5	14	4	T4	4			
	+ 7	10	5	12	12	à	2			
25	┼╶╴	-H¥	5	Ĵ	3	3	13			
<b> </b>	$+\frac{2}{3}$	128	5	5	5	5	4			
<b> </b>	+ 4	123	5	13	3	3	$\frac{1}{1}$			
Tech.	Initia	s	SM	٩ł	m	<u>, </u>	INC			

Animal Source:	AP	<u>5</u>	
Date Received:	6	10	03
Date of Hatch:	5	30	03

#### AMEC Earth Environmental Northwest Bioassay Lab 5009 Pacific Hwy. E. Suite 2-0

Fife, WA 98424

# Client: <u>Shannon + Wilson</u> Sample ID: <u>Spirit of Columbia #1</u> Contact:

Test#: 0306-16NN

						7			0	Ч		
			<u>D.</u>	<u>0.</u>			(mg/L)					
Sample	(mg/L)						Lipit Fin L Init.				Fin.	
Conc. or(%)	Init.		Fin.	Init.			n II.C.	24	48	48	72	96
	0	24	48	48	72	96		44		9.24	11 8	18.05
	%.D	[7.]	6.3	69	IGS.	10.7	8.4D	808	8:01	0.5		<u> 10.00</u>
		<u>†</u>		<b></b>	Ţ	T	I )	l	L	L	<b></b>	<b></b>
	<b>}</b>	<b></b>	<b>+</b>	┼───	1	†	Γ				L	L
	<b></b>	<b></b>	<b></b>	<b></b>	+	+	<u>+</u>	t	<b></b>	<u> </u>		
		L	L	<b></b>	<b></b>	╆────	╂───	╂	<u>+</u>	t		T
		<u> </u>	L	L	<b></b>		<b>}</b>	╂───	╂━━━	+	+	+
	1	T				<u></u>		<u></u>	<u></u>	<u> </u>	┷━━	<u></u>

						Tee	t Tem	nerati	ure		
		Sali	<u>nity</u>		(0)						
Sample		וס	ot	_ 1		1	Ein				
Copo or %	Init	Fin	Init	Fin.	Init.		Fin.	Init.	L		
Conc. or %	$\frac{1110}{0}$	10	48	96	0	24	48	48	72	96	
		40				10 2	19.0	19.5	19.8		
50	30.9	30.7	1 219	20.1	14.0	av.s	<u>u</u>	1 · · · ·	<u> </u>	<u> </u>	
		Į –				<b></b>	<b> </b>	┝╼╼╴	<b> </b>	╂───	
	t	1				i	L	<b></b>	┣	╀───	
	╂	┢────	┢───	<u>+−−−</u>		Τ	Ţ	1	1	L	
	<b></b>	┢	┣───	┟───	╂───	╈	t	<u>†                                    </u>			
	l		<u> </u>	<b></b>	┣───	╂	╂────	+	┼───	1	
	T			Į	I	L	L	┟────	┶┷╼╼	┶╍╍	

ſ	Alkalinity*	Chlorine Resid.	Ammonia
Conc.	*(mg/L as CaCo3)	(mg/L)	(mg/L)
control		<u> </u>	
highest conc.		<u> </u>	

Sample Description:

Comments:

96 Hour Toxicity Test Data Sheet

Saltwater 96-hr Acute with Renewal

Start Date & Time: <u>6/18/83</u> 1395 End Date & Time: <u>6/19/03</u> 1330 Test Organism: <u>Attainages affing</u> 1

Test Protocol:

	<u>-</u>	T		N	umber	of	
Sample	Rep	Cont		Live	Organi	isms	
Conc. of %	#	#	0	24	48	72	96
	1	3	5	<u> </u>	4	<u> </u>	4
	2	6	5	<u>۲</u>	4	<u> </u>	4
<b> </b>		9	5	4	4_	<u>  4</u>	4
	4	20	5	5	4	4	4
<b> </b>		╞╧╼╼┛	5		1 .		
<b></b>	┼╌	╏───┤	5		1		
<b>↓</b>	1 2	┟────	5	<u> </u>	1		
L		╂	5	┼───	1		
	+	╂╾╼╸	5	<b> </b>			Ţ
	+	┼───	5				
<b> </b>	$\frac{2}{3}$	┼───	5				
	4	┼──	5				
	+ +	+	5				
}	$\frac{1}{2}$	+	5		<u> </u>		+
	3	+	5		1	_ <b>_</b>	
	4		5				
	1		5				
<b></b>	2		5				╺┼╌╌╼
	3		5			_ <b>_</b>	
	4		5				
	1		5				
	2		5			_{	
	3		5			-+	_╂
	4		5	╧	_ <del></del>	-01	NE
Tech	. Initial	s	5m	100	-ru	<u></u>	

Animal Source: \_\_\_\_\_\_ Date Received: \_\_\_\_\_\_ Date of Hatch:

Analysts:

Start Date:	6/10/03		Test ID:	Acute Fish	Test-96 Hr Survival		<del></del>
End Date: Sample Date: Comments:	6/14/03 6/9/03		Lab ID: Protocol:	WAAEE-AMEC NW EPA 02-EPA Acute	Sample ID: BioassaySample Type: Test Species:	Spirit of Columbia GW-Gray Water AA-Atherinops affinis	
Conc-%	1	2	3				
D-Control	1.0000	1.0000	0.8000	0.8000			
1.5	0.8000	1.0000	0.8000	0.6000		_	
3.125	0.8000	1.0000	0.8000	0.4000			
6.25	1.0000	1.0000	0.8000	0.8000			
12.5	0.8000	0.8000	0.6000	1.0000			
25	0.4000	0.8000	0.4000	0.2000			
50	0.0000	0.0000	0.0000	0.0000			

	• •		-	<u> </u>	ansform:	Arcsin Sc	uare Root	t	Rank		Also and a second	<b>T</b>
_	<u>Conc-%</u>	<u>Mean</u>	N-Mean	Mean	Min	Max	CV%		- Sum	Critical	reamber	lotal
	D-Control	0.9000	1.0000	1.2262	1.1071	1 3453	11 212	4		<u>onucar</u>	Resp	Number
	1.5	0.8000	0.8889	1.1114	0.8861	1 3/53	16.974	4	45.00	40.0-	2	20
	3.125	0.7500	0.8333	1.0611	0.6847	1 2462	25.005	4	15.00	10.00	4	20
	6 25	0 9000	1 0000	1 2262	1 1071	1.3455	20.905	4	15.00	10.00	5	20
	12.5	0.0000	0.0000	1.2202	1.1071	1.5453	11.212	4	18.00	10.00	2	20
	12.0	0.0000	0.0009	1.1114	0.8861	1.3453	16.874	4	15.00	10.00	4	20
	23	0.4500	0.5000	0.7351	0.4636	1.1071	36.604	4	11.00	10.00	11	20
	*50	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	4	10.00	10.00	11	20
								•	10.00	10.00	20	- 20

Auxiliary Tests					Statistic			
Shapiro-Wilk's Test indicates por	mal distribu	tion (+ )	0.04)		Statistic	Critical	<u> </u>	Kurt
Equality of variance cannot be co	nfirmed	luon (p >	0.01)		0.97228	0.896	0.03166	0.28984
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU				
Steel's Many-One Rank Test	25	50	35.3553	4	•			

Trim Level EC50	95% CL	Tillined Spearman-Karber	
0.0%			<u> </u>
5.0% 10.0% 23.96	3 19 204 20 0		
20.0% 24.26	3 18.917 31.1		
Auto-9.3% 23.83	<u>2 18.961 29.9</u>	0.9	







#### **AMEC Earth Environmental** Northwest Bioassay Lab

5009 Pacific Hwy. E. Suite 2-0 Fife, WA 98424

Client: <u>Shannon + Wilson</u> Sample ID: <u>Spirit of (olumbia #2-6W</u>

Contact:

Test #: 0306-17NW

			_	_					_	1		
			D.	<b>O</b> .			рн					
Comple	(mg/l)						(mg/L)					
Sample		<b></b>		9/ <u>-</u> )		Fin	Init		Fin.	Init.		Fin.
Conc. or %	init.		Fin.	mint.		L	<u> </u>				70	00
	0	24	48	48	72	96	0	24	48	48	12	90
	10	<u> </u>	-71	10	CC		5448	815	8 00	\$ 37	8,22	8.07
(oN	6.8	6.4	$\left( L \right)$	0,0	0.0	1.1	0.70	013	0.00	0.00	0 10	0.01
15	68	5.9	7	6.8	6.8	6.9	8.51	8,13	8,01	8,36	0.18	0.00
		- iu	60	~ 0	69	69	261	<u> </u>	799	835	8.11	8.0X
3.125	16.9	<u>15, T</u>	0.0	6.0	0, [				-7017	200	0.00	R 12
1025	68	43	6,9	16.6	6,7	66	8.48	1.91	191	0.5T	8.00	0.02
	10	<u>5 a</u>	CC	67	69	107	RUS	7.83	793	830	7.92	ان.لا
2.5	Q.D.	لتعيا	10.0	ド			600	400		\$ 22	770	793
25	7.0	F8	5.8	6.6	68	15.5	8.92	1.68	615	7,24	1,10	

		Sali	nity		Test Temperature						
Sample					(°C)						
	Init	Fin	Init	Fin.	Init.	[]	Fin.	Init.		Fin.	
	0	48	48	96	0	24	48	48	72	96	
CON	299	307	29.5	30.9	19.8	19.9	19.9	19.8	19.9	19.6	
1,5	29.7	30.6	29,1	29.8	19.7	909	19.9	19,9	199	19.6	
2.175	m.D	30.9	29.6	30.7	19.5	<u> 20, I</u>	19.9	900	19.8	195	
10.75	30.0	30.5	29.7	31.0	19.6	20.2	20.0	19.9	<u>19,1</u>	19.6	
12.5	200	30.3	29.8	31.0	19.3	19,8	30.0	199	19.8	19.6	
25	30.0	30.5	29.9	31.5	19.0	90.0	19,9	19,5	[9,9]	146	

				_
I	Alkalinity*	Chlorine Resid.	Ammonia	
Conc	*(mo/L as CaCo3)	(mg/L)	(mg/L)	_
Confrol	56			
highest conc.	2.0	.17	4.4	

Sample Description:

prior to test initiation Comments: Sanfle agraded Analysts:

## 96 Hour Toxicity Test Data Sheet

Saltwater 96-hr Acute with Renewal

Start Date & Time: 6 10 03 1415

End Date & Time: 6 14 03 1400 Test Organism: Atherinops affinis\_ Test Protocol:

				Ň	umber	of	
Sample	Rep	Cont		Live	Organi	sms	
Conc. or %	#	#	0	24	48	72	96
CON	1	13	5	5	5	5	5
	2	2	5	5	5	.5	5
	3	18	5	S	4	4	4
	4	6	5	5	5	4	4
1.5	1	21	5	5	5	<u>4</u>	4
┠╼─────────	2	23	5	S	5	5	9
	3	27	5	4	4	4	4
	4	14	5	3	3	3	3
3.125	1	11	5	<u>.</u>	5	5	۲.
	2	10	5	S	5	5	5
	3	1	5	<u>4</u>	4	4	4
	4	12	5	2	2	a a	2
10.25	1	9	5	5	5	<u>s</u>	13
	2	15	5	5	5	5	15
	3	24	5	<u> </u>		5	<u>  4</u>
	4	16	5	5	5	3-	<u> </u>
12.5	1	25	5_	17	<u> 4</u> _	ļŢ.	<u>  4</u>
	2	26	5	4	+	4	<u>4</u>
	3	1	5	3	<u> -ў</u>	15	12
	4	8	5	5	5	2	+ <u>}</u> −
25-	1	5	5	<u> </u>	13-	<u>a</u>	12
	2	28	5	17	╞╤╴	<u>↓</u> <u>₩</u>	17
L	3	13	5	<u>d</u>	+ <del>4</del>	<u>`d</u>	$\frac{4}{1}$
L	4	117-	5			61	
Tech. I	nitials		SM		<u>1 5 r</u>	<u> </u>	I MY

Animal	Source:	<u>A</u>	B	5_	
				_	-

Date Received:	61	10/03		 		
Date of Hatch:	6	300	3	 	<u></u>	

page lof 2
Northwest Bioassay Lab 5009 Pacific Hwy. E., Suite 2 Fife, WA 98424

Client:	Shannon	+ Wi Kun		
Sample ID:	Spirit of	Calembia	- #1_	Gw
Contact:				
Test #:	03-010-17 N	J		

D.O. pН Sample (mg/L)(ma/L) Conc. or (%) Fin. Init. Fin. Init. Init. Fin. Init. Fin. 48 96 0 24 48 0 24 72 96 48 48 72 0.5 50 7.2 8.09 7.51 ----\_\_\_\_

		Sali	inity	'		Test Temperature					
Sample		ppt					(°	<u>C)</u>			
Conc. or(%)	Init.	Fin.	Init.	Fin.	Init.		Fin.	Init.		Fin.	
-	0	48	48	96	0	24	48	48	72	96	
50	30.D	30.7		<u>F_'</u>	19.0	a0.0	[]	<u> </u>			
		<u> </u>		$\Box$ '	$\Box$	<u> </u>	$\Box$	$\Box$	$\Box$		
	<u> </u>		$\Box$	$\Box$	$\Box$		$\Box$		$\Box$		
	$\Box$				$\Box$ '	$\Box$	<u> </u>		$\Box$		
	['			$\square$	$\Box'$	$\Box$					
	[]	$\int \int \int$		[ ]		$\Box$		,	$\square$		

	Alkalinity*	Chlorine Resid.	Ammonia
Conc.	*(mg/L as CaCo3)	(mg/L)	(mg/L)
control			· · · · ·
highest conc.			

Sample Description:

Comments:

Analysts: \_\_\_\_\_

## 96 Hour Toxicity Test Data Sheet

Saltwater 96-hr Acute with Renewal

Sample	Ren	Cont		N	lumber Organi	of sms	
Conc. or	#	#	0	24	48	72	96
50	1	19	5	<u></u>			
	2	20	5	0			
	3	4	5	0			
	4	22	5	0			
	1		5				
	2		5				
-	3		5				
	4		5				_
	1		5				
	2		5				
	3		5				
	4		_ 5				
	_ 1		5				
	2		5				
	3		5				
	4		5				
<u> </u>	1		5				
	2		5				
	3		5				
┣──── <b>─</b> ┥	4		5				
			5				
┣─────┤	-2		5				
<b> </b>			5				
Tech In	itials	<u> </u>	Sus		—— <u> </u>		

Animal Source: \_\_\_\_\_

Date Received:

Date of Hatch:

				Acute Fish	Test-96 Hr Survival	
Start Date:	6/13/03		Test ID:	0306-21NW	Sample ID;	Spirit of Oceanus
End Date:	6/17/03		Lab ID:	WAAEE-AMEC NW	Bioassa Sample Type:	BW/GW-Combined gray & black water
Sample Date:	6/12/03		Protocol:	EPA 02-EPA Acute	Test Species:	AA-Atherinons affinis
Comments:				-	·····	
Conc-%	1	2	3	4		
D-Control	0.6000	1.0000	1.0000	1.0000		
1.5	1.0000	0.8000	1.0000	1.0000		
3.125	1.0000	1.0000	1.0000	0.8000		
6.25	0.6000	0.8000	0.6000	0.8000		
12.5	1.0000	0.4000	0.6000	0.6000		
25	0.2000	0.2000	0.2000	0.2000		
50	0.0000	0.0000	0.0000	0.0000		

		_	Tra	ansform:	Arcsin Sc	uare Root	t	Rank	1-Tailed	Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	0.9000	1.0000	1.2305	0.8861	1.3453	18.660	4			2	20
1.5	0.9500	1.0556	1.2857	1.1071	1.3453	9.261	4	18.50	10.00	1	20
3.125	0.9500	1.0556	1.2857	1.1071	1.3453	9.261	4	18.50	10.00	1	20
6.25	0.7000	0.7778	0.9966	0.8861	1.1071	12.807	4	13.00	10.00	6	20
12.5	0.6500	0.7222	0.9505	0.6847	1.3453	29.432	4	13.50	10.00	7	20
*25	0.2000	0.2222	0.4636	0.4636	0.4636	0.000	4	10.00	10.00	16	20
*50	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	4	10.00	10.00	20	20

Auxiliary Tests					Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates norn	nal distribu	tion (p > (	0.01)		0.91642	0.896	-0.0622	2.2981
Equality of variance cannot be confirmed								
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU				
Steel's Many-One Rank Test	12.5	25	17.6777	8				

				Maxi	imum Likeliho	od-Probit	:				
Parameter	Value	SE	95% Fidu	cial Limits	Control	Chl-Sq	Critical	P-value	Mu	Sigma	lter
Slope	3.38509	0.74637	1.92221	4.84797	0.1	4.23275	9.48773	0.38	1.1512	0.29541	5
Intercept	1.10308	0.92644	-0.7127	2.91891							
TSCR	0.07468	0.03667	0.00281	0.14654		1.0 <del>T</del>		·	- <b>N</b>	<u> </u>	
Point	Probits	%	95% Fidu	cial Limits							
EC01	2.674	2.91049	0.70651	5.24714		0.3			/		
EC05	3.355	4.62689	1.57453	7.36208		0.8 -			<b>   </b>		
EC10	3.718	5.92397	2.40288	8.8585		0.7		/	1/		
EC15	3.964	6.99881	3.1861	10.0673					[]		
EC20	4.158	7.9905	3.97644	11.1741		<u>₩</u> 0.6]		/	1		
EC25	4.326	8.95256	4.79656	12.2517		<b>0</b> .5		/ <b> </b>			
EC40	4,747	11.9222	7.56372	15.7165		5 . I		/ <b> </b>			
EC50	5.000	14.1645	9.75811	18.6116		Ž <sup>0.4</sup> ]		- / <b> </b>			
EC60	5.253	16.8284	12.3091	22.5414		0.3 -					
EC75	5.674	22.4106	17.0688	32.8827		0.2		/ <b>*/</b> /			
EC80	5.842	25.1088	19.0866	38.8924				- / <b> </b>  -			
EC85	6.036	28.6666	21.5427	47.7337		0.1 -		$/ I_{-}$			
EC90	6.282	33.8678	24.8376	62.3873		0.0		<b></b>			
EC95	6.645	43.3622	30.278	93.9766		0.	.1 1	10	100	1000	
EC99	7.326	68.9341	42.9876	206.973		0.		Dose	%		



Northwest Bioassay Lab 5009 Pacific Hwy. E., Suite 2

Fife, WA 98424

### Client: <u>Shannon & Wilson</u> Sample ID: <u>Spirit of Octanus</u> Contact:

D.O.

Test #: 0306-21NW

### 96 Hour Toxicity Test Data Sheet

Saltwater 96-hr Acute with Renewal

Start Date & Time:	613	03	1450	
End Date & Time:	6/17/0	13	14:15	

Date of Hatch: 6/2/03

no Date & Time:	VIIID	4/12
Test Organism:	Atheninops	affinis
Test Protocol		

Sample	Ren	Cont	1	ր ենտ	Number	0t Vicmo	
	rtep			1 24			1 00
	#	#		24	40		90
CON	1	42		<u></u> _	15	23	23
	2	25	5	13	2	5_	5
	3	20	5	2_	5	5	5
	4	$\left( \phi \right)$	5	15	15	5	5
15	1	26	5	5	5	5	5
	2	9	5	5	4	4	4
	3	24	5	15	5	5	5
	4	13	5	15	Ś	5	5
3.125	1	4	5	2	1	5	5
	2	7	5	2	5	5	ĪS
	3	18	5	12	5	5	5
	4	11	5	14	5	5	4
6.25	1	28	5	12	ιζ.	5	3
	2	3	5	Ś	5	5	4
	3	21	5	<u>ú</u>	4	4	3
	4	1	5	5	5	Ś	4
12.5	1	16	5	15	Ś	5	5
	2	12	5	1 <del>2</del>	4	3	la -
	3	5	5	<u>ц</u>	4	4	2
	4	14	5	13	12	3	3
25	1	8	5	2	7	2	F
	2	21	5	2	1	-	<u>1</u>
	3	2	5	3	3		-{
	4	19	5	3	2	1	⊢}
Tech. In	itials		Sm	NE	NE	Ů-	4
		1		1-9		•	

Sample			(mg	g/L)			(mg/L)					
Conc. or (%)	Init.		Fin.	Init.	12.54	Fin.	Init.		Fin.	Init.		Fin.
	0	24	<u>4</u> 8	48 4	72	96	0	24	48	48	72	96
CON	6.8	67	6.7.2	<u>5</u> 8	7,2	7.	8.24	806°	8.02	8,32	8.16	7.97
1.5	6.8	65	7.5	65	6.5	72	8:24	8.0D	8.06	3.32	8,12	8.02
3.125	6.8	5.8	75	65	6,1	7.3	8.23	793	8.07	8.31	8.02	8.02
6.25	6.8	4.8	7.3	6.9	5.7	7.d	8:20	7.80	8.08	8.28	7.86	803
12.5	67	6.8	7.2	65	5.7	7,0	8-09	7.67	8.06	8.23	773	8,03
25	6.3	10	7.0	65	59	7.2	8.09	7.67	8.05	8.15	7,70	806
		~				Ś	28.17	r –				

рH

		Sal	inity		Test Temperature						
Sample		. р	pt		(°C)						
Conc. or %	Init.	Fin.	Init.	Fin.	Init.		Fin.	Init.		Fin.	
	0	48	48	96	0	24	48	48	72	96	
CON	29.3	30.1	295	30,5	205	205	20.0	20.9	90.7	198	
1.5	29.6	300	29.5	30,5	20.1	20.5	19.8	20.4	30,0	19.8	
3.125	19.5	30.0	1295	30.6	20.4	205	19.2	206	90.0	20,0	
6.25	29.4	30,1	295	30,8	20.7	20.5	19.0	20.T	19.9	<del>19.0</del> 2	
12.5	29.3	29.7	29.6	30,6	20.5	20.5	19.2	19.9	19.8	19,9	
25	29.2	29.8	29.7	31.0	19.8	205	19.2	19.2	19.8	200	
										19.0	

			1107
	Alkalinity*	Chlorine Resid.	Ammonia
Conc.	*(mg/L as CaCo3)	(mg/L)	(mg/L)
control	56		
highest conc.	256	<.03	64-2

Sample Description:

Comments: <u>Astacrated day o</u> Analysts: 3M. NF

Northwest Bioassay Lab 5009 Pacific Hwy. E., Suite 2 Fife, WA 98424

Client:	Shannon & Wilson	
Sample ID:	Spirit of Oceanis	
Contact:		
Test #:	0306 - 21 NUL	

**96 Hour Toxicity Test Data Sheet** Saltwater 96-hr Acute with Renewal

Start Date & Time:	6	13	03	1450
End Date & Time:	6	17	103.	1415
Test Organism:	1	A.	alle	his
Test Protocol:		•	~/	

				N	lumber	of	
Sample	Rep	Cont		Live	Organ	isms	
Conc. or(%/	#	#	0	24	48	72	96
50	1	15	5	$\cup$			
	2	10	5	Ø			
	3	17	5	0			<u> </u>
	4	22	5	0	4		1
	1		5				
	2		5				
	3		5				
	4		5				
	1		5				
	2		5				
	3		5				
	4		5				
	1		5				
_	2		5				
	3		5				
	4		5				_
	1		5				
	2		5				
	3		5			-	
	4		5				
			5				
	2		5				
	3		5				
ļ., <u>_</u> ., ,	4		5	-1.6			
Tech. Ir	nitials		SM.	MF			

\_\_\_\_\_

Animal Source:

Date F	Received	:
--------	----------	---

Date of Hatch:

			D.	0.					p	Н	H		
Sample			(mg	3/L)		(mg/L)							
Conc. or (%)	Init.		Fin.	Init.		Fin.	Init.		Fin.	Init.		Fin.	
)	0	24	48	48	72	96	0	24	48	48	72	96	
50	6.4	1.0					7.97	7.73					
- <b>- - - - - - - - - -</b>		. :											

		Sali	inity		Test Temperature					
Sample		р	pt				(°	C)		
Conc. or 🛞	Init.	Fin.	Init.	Fin.	Init.		Fin.	lnit.		Fin.
Ū	0	48	48	96	0	24	48	48	72	96
5D	29.0	295			20.5	205				

	Alkalinity*	Chlorine Resid.	Ammonia
Conc.	*(mg/L as CaCo3)	(mg/L)	(mg/L)
control			
highest conc.			

Sample Description:

Comments:

Analysts:

				Ac	ute Fish	Test-96	Hr Surviva	1	
Start Date:	6/17/03		Test ID:	0306-25NV	V		Sample ID	):	Sun Princess
End Date:	6/21/03		Lab ID:	WAAEE-AI	MEC NW	Bioassav	Sample Tv	/De:	BW/GW-Combined grav & black water
Sample Date:	6/16/03		Protocol:	EPA 02-EF	A Acute		Test Speci	ies'	AA-Atherinons affinis
Comments:									, e c ancinopa annia
Conc-%	1	2	3	4					
D-Control	1.0000	1.0000	1.0000	0.6000				-	
1.5	1.0000	1.0000	1.0000	1.0000					
3.125	0.8000	0.6000	0.8000	0.8000					
6.25	0.8000	0.8000	0.6000	0.8000					
12.5	0.6000	0.2000	0.4000	0.4000					
25	0.0000	0.0000	0.0000	0.0000					

			Tra	ansform:	Arcsin Sc	uare Roo	Rank	1-Tailed	Number	Total	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	- Sum	Critical	Resp	Number
D-Control	0.9000	1.0000	1.2305	0.8861	1.3453	18.660	4			2	20
1.5	1.0000	1.1111	1.3453	1.3453	1.3453	0.000	4	20.00	10.00	0	20
3.125	0.7500	0.8333	1.0519	0.8861	1.1071	10.508	4	13.50	10.00	5	20
6.25	0.7500	0.8333	1.0519	0.8861	1.1071	10.508	4	13.50	10.00	5	20
12.5	0.4000	0.4444	0.6798	0.4636	0.8861	25.383	4	10.50	10.00	12	20
*25	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	4	10.00	10.00	20	20
*50	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	4	10.00	10.00	20	20

50 0.0000 0.0000 0.0000 0.0000

Auxiliary Tests				Statistic	Critical	Skew	Kurt	
Shapiro-Wilk's Test indicates non-	-normal dis	tribution		0.81529	0.896	-1.4086	3.24065	
Equality of variance cannot be con	nfirmed							
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU				
Steel's Many-One Rank Test	12.5	25	17.6777	8				

				Max	imum Likeliho	od-Probit					
Parameter	Value	SE	95% Fldu	cial Limits	Control	Chi-Sq	Critical	P-value	Mu	Sigma	iter
Slope	5.53004	1.55597	2.48033	8.57975	0.1	6.87647	9.48773	0.14	1.04179	0.18083	23
Intercept	-0.7611	1.73038	-4.1527	2.63041							
TSCR	0.12316	0.04216	0.04052	0.2058		1.0 <del></del>				• •	
Point	Probits	%	95% Fidu	cial Limits		0.0			(1		
EC01	2.674	4.17939	0.99724	6.49864		0.9					
EC05	3.355	5.5507	1.85507	7.8968		0.8 -					
EC10	3.718	6.4572	2.57361	8.79194		07					
EC15	3.964	7.15103	3.20217	9.47497		-					
EC20	4.158	7.75527	3.80181	10.0758		9.0 -	1				
EC25	4.326	8.31418	4.39624	10.6427		<b>0</b> .5					
EC40	4.747	9.90774	6.25676	12.3783		dsi ,					
EC50	5.000	11.01	7.61942	13.7645		<sup>0.4</sup> ک			/ 1		
EC60	5.253	12.2349	9.10461	15.5988		0.3 -			/ H		
EC75	5.674	14.5799	11.5855	20.2917		0.2		1	/		
EC80	5.842	15.6307	12.5193	22.9359		0.2		ø	♦		
EC85	6.036	16.9514	13.5723	26.7109		0.1 -		1			
EC90	6.282	18.7729	14.8684	32.6944		0.0			//		
EC95	6.645	21.8387	16.7971	44.7012		0.0	1	1	10	100	
EC99	7.326	29.0043	20.6781	82.0794		0.		Dose	%	100	
								2030			





Northwest Bioassay Lab

5009 Pacific Hwy. E., Suite 2 Fife, WA 98424

> Client: Shannon and Wilson Sample ID: Sun Princess Contact:

Test #: 0306-25NW

**96 Hour Toxicity Test Data Sheet** Saltwater 96-hr Acute with Renewal

Start Date & Time:	6	17	03	1	900	
End Date & Time:	/۲	<u>ˈ</u> ]/	63	Ī	91.30	_
Test Organism:	Atl	wür	чрл	al.	Pines	_
Test Protocol:			1	90		

				1	lumber	of	
Sample	Rep	Cont		Live	e Organ	isms	
_Conc. or(%/	#	#	0	_ 24	48	72	96
CON	1	14	5	5	5	5	5
	2	3	5	5	5	[5	5
	3	21	5	5	5	5	5
	4	6	5	S	3	3	3
1.5	1	10	5	5	5	5	5
	2	4	5	5	5	5	5
	3	8	5	S	5	5	5
	4	9	5	5	5	5	Ŝ
3125	1	11	5	5	4	4 8	<b>14-</b> 4
	2	26	5	3	3	3	3
	3	5	5	4	4	4	4
	4	17	5	S	5	4	4
6.25	_1	23	5	5	5	4	4
	2	20	5	5	5	4	4
L	3	7	5	5	5	3	2
	4	25	5	5	4	4	4
12.5	1	18	5	5	3	3	3
	2	12	5	3	1		1
	_3	15	5	5	2	3	2
	4	28	5	S	2	3	à
_ 25_	1	13	5	3	0		
	2	24	5	5	<u>    0                                </u>		
┫───────┤	3	2	5	3	0		<u> </u>
ļ	4		5	3	0		
lech. In	itials		123	<u>'t</u>	OM	₹£	<u>t</u>

			D.	0.					р	H		
Sample		_	(m)	ng/L)			(mg/L)					
Conc. or (%)	Init.		Fin.	Înit.		Fin.	Init.		Fin.	Init.		Fin.
	0	24	48	48	72	96	0	24	48	48	72	96
CON	6.7	7.1	6.6	6.7	6.9	6,1	8.18	8.12	8.0b	8.37	8,15	8.09
1.5	67	7.1	6.6	2967	6.8	64	8.16	8,10	8.05	8.32	8,18	8,09
3.125	6.8	74	(0.7)	6.8	7,0	62	8.15	8.10	8.07	8.39	8.15	8.12
6.25	6.6	7,2	6.8	6.8	5.6	54	812	8.09	8.07	\$.£0	8.14	8.11
12.5	6.8	7.1	6.7	6.8	ଟ୍ଟ	<del>،</del> 5	8.06	8.07	8.06	8.27	8.11	8.06
25	12	6,4	6.5	7.0	6.7		796	804	8.06	8.17	8.08	
									4	8.32		

		Sal	inity		Test Temperature						
Sample		р	pt		(°C)						
Conc. or(%)	Init.	Fin.	Init.	Fin.	Init.		Fin.	Init.		Fin.	
	0	48	48	96	0	24	48	48	72	96	
CON	24.5	29.4	29.7	29,8	21.0	19.8	19.8	21.0	19,9	19,8	
1.5	29.5	29. O	29.7	305	21.0	19.6	20.0	21.0	19.8	19.8	
3.125	295	29.0	29.7	<b>70 I</b>	21.0	19,5	19.9	21.0	ana	19.9	
6.25	29.4	29.1	29.6	30,3	21.0	19.5	19.7	20.8	903	197	
12.5	294	29.0	29.5	30.9	21.0	19,5	20.0	20.8	20.0	19.5	
25	29.4	29.0	29.5	j	20.0	19.5	20.0	20.5	19.8		

	Alkalinity*	Chlorine Resid.	Ammonia
Conc.	*(mg/L as CaCo3)	(mg/L)	(mg/L)
control	50		 
highest conc.	496	4.03	142.8

Sample Description:

Comments:

Analysts:

### AMEC Earth & Environmental Northwest Bioassay Lab 5009 Pacific Hwy. E., Suite 2 Fife, WA 98424

Т

Client:	Shannon and Wilson
Sample ID:	Sun Princess
Contact:	
Test #:	0306-25NW

96	Hour	Toxicity	<b>Test</b>	Data	Sheet
Sa	Invoto	r 06 hr Ā	outo .		

Saltwater 96-hr Acute with Renewal

Start Date & Time: 40 1900 End Date & Time: 6/21 /0 3 1930 Test Organism: Athennops affinis Test Protocol:

Sample	Rep	Cont		Live	lumber Organ	of isms	
Conc. or %	#	#	0	24	48	72	96
50	1	19	5	0			
	_2	16	5	0			
	_3	27	5	0			
	4	22	5	0			
	1		5				
	2		5				
	3		5				
	4		5				
	_1		5				
	2		5				
	3		5				
	4		5				
	_1		5				
	2		5				
	3		5				
F	4		_5				
	-		_5				
	2						
┠────┼-	3		- 5				
┣━━━━┼	4	-+	<u> </u>				
┣━━━━━┼┉			5				<u> </u>
┠────┼╸	3		5	ł			
	4	-+	5	— <u> </u>	—- <u> </u> -		
Tech. Init	ials	╼╀	<u> </u>	——- <u>-</u> [-			

Animal Source:	
Date Received:	

Date of Hatch:

			<u></u> D.	<u>.O.                                   </u>					p	H _	-	
Sample			<u>(m</u>	<u>g/L)</u>					(m	g/L)		
Conc. or %)	Init.		Fin.	Init.		Fin.	Init.		Fin.	Í Init.		<b>Fin</b>
	0	24	48	48	72	96	0	24	48	48	72	96
<u> </u>	7.9	51					1.84	8.01				Ĕ
							1.21	0.01				
												<u> </u>
			<u> </u>									
					[							

_	Salinity					Te	st Ten	nperat	ure	
Sample		ppt			(°C)					
Conc. or %	Init.	Fin	<u>Init.</u>	Fin.	Init.		Fin.	Init.		Fin.
	0	48	_ 48	96	0	24	48	48	72	96
	<u>29.5</u>			<u> </u>	19.0	19.4	ļ			
			_				1	Í		_

<u> </u>	Alkalinity*	Chlorine Resid.	Ammonia
<u> </u>	*(mg/L as CaCo3)	(ma/L)	(ma/L)
control			(119/2)
highest conc.		┼───┼	

Sample Description:

Comments:

Analysts:

				Acute F	ish Test-96 Hr S	urvival	
Start Date:	6/19/03		Test ID:	0306-57NW	San	nple ID:	Norwegian Wind
End Date:	6/23/03		Lab ID:	WAAEE-AMEC	NW BioassaySan	nple Type:	BW/GW-Combined gray & black water
Sample Date:	6/18/03		Protocol:	EPA 02-EPA Ad	ute Tes	t Species:	AA-Atherinops affinis
Comments:							
Conc-%	1	2	3	4			<u> </u>
D-Control	1.0000	1.0000	0.6000	1.0000			
1.5	1.0000	0.8000	0.8000	1.0000			
3.125	1.0000	0.6000	0.8000	0.6000			
6.25	1.0000	1.0000	0.8000	1.0000			
12.5	0.8000	1.0000	0.6000	0.4000			
25	0.6000	0.4000	0.6000	0.4000			
50	0.2000	0.0000	0.0000	0.2000			

			Tra	ansform: /	Arcsin Sc	uare Root	i	1-Tailed			Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD _	<u>Resp</u>	Number
D-Control	0.9000	1.0000	1.2305	0.8861	1.3453	18.660	4				2	20
1.5	0.0000	1 0000	1 2262	1.1071	1.3453	11.212	4	0.032	2.451	0.3258	2	20
3 125	0.0000	0.8333	1 0561	0.8861	1.3453	20.748	4	1.312	2.451	0.3258	5	20
J. 12J	0.7000	1 0556	1 2857	1 1071	1 3453	9.261	4	-0.416	2.451	0.3258	1	20
0.20	0.8000	0.7779	1.2007	0.6847	1 3453	28 293	4	1.691	2.451	0.3258	6	20
12.5	0.7000	0.7770	0.7954	0.0047	0.8861	14 802	4	3 349	2.451	0.3258	10	20
*25	0.5000	0.5555	0.7854	0.0047	0.0001	20.000	т А	6 667	2 451	0.3258	18	20
*50	0.1000	0.1111	0.3446	0.2255	0.4030	29.900	4	0.007	2.401	0.0200	10	20

A will an Tanka			· · ·	Statistic			Critical		Skew	Kurt
Auxiliary Tests	hapiro-Wilk's Test indicates normal distribution (p > 0.01)						0.896	·	-0.189	-0.2645
Snapiro-wilk's Test indicates for	ances (n =	0.65)	0.017		4.22095		16.8119			
Hymothesis Test (1-tail 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	12.5	25	17.6777	8	0.27039	0.30429	0.44277	0.03532	5.3E-06	6, 21

Maximum Likelihood-Probit											
Parameter	Value	SE	95% Fiduo	cial Limits	Control	Chi-Sq	Critical	P-value	Mu	Sigma	
Slope	3.78838	1.10377	1.62499	5.95177	0.1	4.75751	9.48773	0.31	1.40644	0.26397	8
Intercept	-0.3281	1.61479	-3.4931	2.83684							
TSCR	0.13048	0.03929	0.05348	0.20748		<sup>1.0</sup> T			11		
Point	Probits	%	95% Fidu	cial Limits		0.9			8 /		
EC01	2.674	6.19967	0.74364	11.4171					11 /		
EC05	3.355	9.38122	1.92426	15.0849		0.8					
EC10	3.718	11.6993	3.17866	17.5863		0.7 -					
EC15	3.964	13.5788	4,44396	19.5737		006			11/		
EC20	4.158	15.2857	5.78141	21.381		Su o.o.			///		
EC25	4,326	16.92	7.22126	23,1409		<u>8</u> 0.5 -			[]	1	
EC40	4.747	21.8559	12.3418	28.9426		<u>6</u> 04.	1	/	1		
EC50	5.000	25.4943	16.5109	34.168		<u>م</u> م	1	/	1		
EC60	5.253	29.7384	21.2053	42.0166		0.3 -			11		
EC75	5.674	38.4136	29.0093	65.6526		0.2	1				
EC80	5.842	42.5208	31.9956	80.4693			ł		[]		
EC85	6.036	47.8658	35.4723	103.145		0.1 -	1	//	]	4	
EC90	6.282	55.5556	39,9535	142.498		0.0	<u>↓</u>	• · · · • • • • • • • • • • • • • • • •			
EC95	6.645	69.2831	47.0525	233.02		C	).1 1	i 10	100	1000	
EC99	7.326	104.838	<u>62.7123</u>	597.736				Dose	e %		





### V 0 0...

### AMEC Earth & Environmental

Northwest Bioassay Lab 5009 Pacific Hwy. E., Suite 2 Fife, WA 98424

### Client: <u>Shannon & Wilson</u> Sample ID: <u>Norwcgian Wind</u> Contact: Test #: <u>0306-57 NW</u>

D.O.

96 Hour Toxicity Test Data Sheet Saltwater 96-hr Acute with Renewal

Start Date & Time: 6/19/03 1900 End Date & Time: 6/23/03 1800

Test Organism: <u>Atheuneps affinis</u> Test Protocol:

					N	umber	of	
	Sample	Rep	Cont		Live	Organ	isms	
l Fin	Conc. or	#	#	0	24	48	72	96
72 96	CON	1	26	5	5	5	5	5
27921		2	6	5	5	5	5	5
79 021		3	5	5	5	5	[4]	3
25 801		4	15	5	5	S	5	5
18 910	15	1	4	5	5	5	5	5
10 0.20		<u></u>	18	5	S	5	5	14
10.10		3	19	5	5	5	5	4
15 0.14		4	25	5	5	5	5	5
	3.125	1	In	5	5	5	5	5
		2	3	5	2	5	5	3
		3	1T	5	S	S	5	4
		4	28	5	5	5	14	3
	(0.25	1	17	5	S_	5	5	۴
		2	22	5	S	5	5	<
		3	27	5	<u> </u>	<u>  4</u>	4	4_
		4	23	5	5	<u>-s</u>	5	5
	2.5	1	12	5	S	4	<u>  4</u>	4
		2	1	5	5	5	5	
		3	2	5	5_	5	14-	3
		4	13	5	5	17	4	1.2
	25	1	21	5	5	<u>  4</u>	<u>  4</u>	<u> -</u>
		2	117	5	12	<u><u></u></u>	12	12
		3	1-20-	1-5-	12	12	5	1-7-
	L	4	114	<u> </u>	<del>  2</del> -	1 3	17-	
	Tech.	Initials		<u> </u>	<u>w</u>		<u> </u>	<u> </u>

Sample			(mo	a/L)			(mg/L)					
Conc. or	Init.		Fin.	Init.		Fin.	Init.		Fin.	Init.		Fin.
	0	24	48	48	72	96	0	24	48	48	72	96
	68	72	6.5	73	71	6.9	8.36	8.58	818	ዓ.አ7	8.27	8.21
	1.4	72	67	72	71	69	8.35	827	9.18	8.29	8,28	8.22
- 2 10	10.0 10.0	1-1-2	cc	74	72	6.8	8.35	8.24	811	823	8.25	8.21
<u></u>	<u>v. o</u>	4.2		77-	70	109	a22	\$ 19	8.17	820	8.18	8.20
(0.25	[0, 1]	12	0.0	70	69	1.0	82	921	SISP	6 9.1	8 19	8.18
12.5	(o.	7.4				1.0	0.11 4.15	214	<u> 7 69</u>	G17	815	8.14
25	(0.8)	17.d	16.5		0.0	0.0	$0.\Lambda$	0.11	0101	011	200	

pН

		Sali	inity	-	Test Temperature						
Sample	opt				(°C)						
	init.	Fin.	Init.	Fin.	Init.		Fin.	lnit.		Fin.	
	0	48	48	96	0	24	48	48	72	96	
CON	294	20	29.7	29.6	20.0	19.8	201	19,9	20,1	20.2	
15	201.	20.2	<u>-4</u> C	29.5	20.D	199	19.9	198	20,1	20.2	
2125	29 6	30.3	296	297	20.0	ac.T	199	20.0	20,1	20.2	
1.26	2910		296	29 1	20.0	20.0	199	20.0	20.0	20.2	
- 0.25	$\frac{1}{2}$	30.5	na 7	29 8	20.0	300	19.8	198	201	20.2	
12.2	29 10	30.4	297	29.9	10.0	19.9	19.8	19.8	201	20.2	

	Alkalinity*	Chlorine Resid.	Ammonia
Conc	*(mg/L as CaCo3)	(mg/L)	(mg/L)
control	100	-8.4	
bighest conc.	44	.05	35 8

\_\_\_\_\_

Sample Description:

Comments:

Analysts: <u>Ct M</u>

Animal Source:	ABS	
Date Received:	6/17/03	
Date of Hatch:	6/7/03	

puge a of a

Init.

0

8.11

Northwest Bioassay Lab 5009 Pacific Hwy. E., Suite 2 Fife, WA 98424

Sample

Conc. or (%)

50

# Client: <u>Shannon + Wilson</u> Sample ID: <u>Norwenan Wind</u> Contact: Test #: 0306-57NW

D.O.

(ma/L)

Fin. I Init.

48

6.6

24

6.9

48

11

96 Hour Toxicity Test Data Sheet Saltwater 96-hr Acute with Renewal

Start Date & Time: 6/19/03 /900 800 End Date & Time: 6/23/03 Test Organism: Attainaps offinis Test Protocol:

				N	umber	of	
Sample	Rep	Cont	_	Live	Organ	isms	
Conc. or (%)	#	#	0	24	48	72	96
50	1	16	5	. 4	N.	3	t
	2	9	5	- 4	1		N
	3	8	5		0		
	4	24	5	5	4	3	1
	1		5				
	2		5				
	3		5				
	4		5				<u> </u>
	1		5			<b></b>	
	2	[	5			l	<u> </u>
	3		5			L	
	4		5				
	1		5		ļ	<u> </u>	<u> </u>
	2		5	<u> </u>	<u> </u>	┣━━	
	3		5	1		<u> </u>	·
	4		5		<u> </u>		·
	1		5			<u> </u>	
	2		5	<u> </u>	<u> </u>	<u> </u>	<b> </b>
	3		5_		<u> </u>		┨
	4		5			<u> </u>	<u> </u>
	1		5	<u> </u>	<u> </u>	∔	<u> </u>
	2		5		<u> </u>	<u> </u>	<u> </u>
	3	<u> </u>	5	<u> </u>	┥───	<b></b>	
	4		5		+	51	
Tech. I	Initials		<u> </u>	<u>t</u>	<u>[</u> <u></u> tt_	12	<u>i</u>

						<u> </u>		 <u>}_</u>		
								 ļ	<u> </u>	
·			$\top$							
			1							
			+-	[						
· · · · · · · · · · · · · · · · · · ·				<u> </u>			-			
	Sa	inity	T	Te	st Ter	npera	ture			
Sample	p	pt			(	<u>°C)</u>		 Į		

Fin.

96

72

Init.

0

6.5 29.7

24

DH.

(ma/L)

Fin. Init.

48

799 8,03 8,05

48

Fin.

96

8.06

72

Sample		p	pt					<u> </u>		
Conc or	Init.	Fin.	Init.	Fin.	Init.		Fin.	Init.		Fin.
	0	48	48	96	0	24	48	48	72	96
50	69	20.2	299	30.5	20.0	19.9	19.7	198	20.1	20.2
	<u></u> -	<u>  30</u>					[			
		·						[		
┝╍────────		╀	├───	<u> </u>		<u> </u>	<b>—</b>			
	╂────			<u>+</u> −						
l		1				L				<u> </u>

ſ	Alkalinity*	Chlorine Resid	Ammonia
Conc.	*(mg/L as CaCo3)	(mg/L)	(mg/L)
control			
highest conc.			

Sample Description:

Comments: \_\_\_\_\_

Analysts: \_\_\_\_\_\_

Animal Source: 

Date of Hatch:

			•	Acute Fi	sh Test-96	Hr Survival	
Start Date:	6/21/03	-	Test ID:	0306-60NW		Sample ID:	Ryndam
End Date:	6/25/03		Lab ID:	WAAEE-AMEC N	IW Bioassa	y Sample Type:	BW/GW-Combined gray & black water
Sample Date:	6/20/03		Protocol:	EPA 02-EPA Acu	te	Test Species:	AA-Atherinops affinis
Comments:					<u> </u>		
Conc-%	1	2	3	4			
D-Control	1.0000	1.0000	0.8000	1.0000			
1.5	0.8000	0.8000	1.0000	1.0000			
3.125	1.0000	1.0000	1.0000	1.0000			
6.25	1.0000	1.0000	1.0000	1.0000			
12.5	1.0000	1.0000	1.0000	1.0000			
25	1.0000	1.0000	1.0000	0.6000			
50	1.0000	1.0000	0.8000	1.0000			

	<u> Root</u>	Arcsin <u>Sq</u> ı	insform: /	Tra			
Conc-% Mean N-Mean Mean Min Max CV% N Sum Critical	%	Max	Min	Mean	N-Mean	Mean	Conc-%
D-Control 0.9500 1.0000 1.2857 1.1071 1.3453 9.261 4	.261	1.3453	1,1071	1.2857	1.0000	0.9500	D-Control
1.5 0.9000 0.9474 1.2262 1.1071 1.3453 11.212 4 16.00 10.00	.212	1.3453	1.1071	1.2262	0.9474	0.9000	1.5
3 125 1 0000 1 0526 1 3453 1 3453 1 3453 0 000 4 20.00 10.00	.000	1.3453	1.3453	1.3453	1.0526	1.0000	3 125
6 25 1 0000 1.0526 1.3453 1.3453 1.3453 0.000 4 20.00 10.00	.000	1.3453	1.3453	1.3453	1.0526	1 0000	6 25
12.5 1.0000 1.0526 1.3453 1.3453 1.3453 0.000 4 20.00 10.00	.000	1.3453	1.3453	1.3453	1.0526	1 0000	12.5
25 0 9000 0 9474 1.2305 0.8861 1.3453 18.660 4 17.50 10.00	.660	1.3453	0.8861	1.2305	0 9474	0,000	25
50 0 5500 1 0000 1 2857 1 1071 1 3453 9 261 4 18.00 10.00	.261	1 3453	1 1071	1 2857	1 0000	0.0000	50

A	<u> </u>				Statistic	Critical	Skew	Kurt
Auxiliary lesis	-normal dis	tribution (	$n \le 0.01$		0,81889	0.896	-1.5822	3.19903
Equality of variance cannot be co	nfirmed		,,					
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU				
Steel's Many-One Rank Test	50	>50		2				



### Dose-Response Plot



Northwest Bioassay Lab 5009 Pacific Hwy. E., Suite 2 Fife, WA 98424

Client: Shannon + Wen Sample ID: Contact: Test #: 0306-60NW

D.O.

# 96 Hour Toxicity Test Data Sheet Saltwater 96-hr Acute with Renewal

Start Date & Time: End Date & Time: 625/03 Test Organism: Atherin Test Protocol:

2000 63 70

				N	umber	of	
Sample	Rep	Cont		Live	Organi	sms	
Conc. or %	#	#	0	24	48	72	96
CON	1	3	5	5	5	5	5
	2	24	5	5	5	5	5
··	3	10	5	٢	5	5	4
	4	17	5	5	<	5	5
15	1	23	5	5	4	4	4
	2	73	5	5	5	5	4
	3	12	5	۲	5	5	5
	4	26	5	5	5	5	5
3.125	1	14	5	5	5	5	5
	2	28	5	5	ج.	5	5
	3	25	5	5	5	<u> </u>	5
	4	4_	5	5	5	5	5
6,25	1	27	5	5	5	5	5.
	2	[]_	5	5	٣	5	15
	3		5	5	5	5	5
	4	5	5	5	5	2	5
12,5	1	16	5	5	5	5	5
	2	8	5	5	5	15_	2
	3	18	5	5	5	5	5
	4	15	5	5	5	15	15
3.5	1	19	5	5	5	15	12
	2	30	5	5	5	15	12-
	3	17_	5	5	<u> }_</u>	<u> </u>	2
	4	97	5	5	17	<u> _</u>	
Tech. I	nitials		I'me		<u>p</u> mc	<u>177</u>	1 JM

Sample -			(mo	⊒/L)					(mg	<u>g/L)_/</u>	8.25	
Conc or %	Init.		Fin.	Init.		Fin.	Init.		Fin.	Init.\		Fin.
	0	24	48	48	72	96	0	24	48	48	72	96
COLL	69	τ. (.	65	10.8	6.5	.7.0	8.2Þ	8,19	8.22	8-31	821	8.17
$-\frac{con}{c}$	70	6 6	107	68	65	10	8.24	6.20	823	831	8,20	8.21
1.5	$\overline{7}$	614	1. 1	16 K	7 7	70	8 25	817	818	8.31	8.18	8.20
		4.17		10.0	$\frac{0\cdot 1}{cc}$	70	8.24	818	817	831	414	8.21
<u> </u>	$\varphi, \eta$	4.1	10.6	10.1	0.0		074	8.19	\$ 11	8 29	Q )(	8.24
12.5	6.7	61	6.6	1.1	6.4	1.0	0.2-	2019	0.21	827-7	\$ 10	826
_م	6,8	6.7	<u>  V  </u>	<u>[</u> [.]	<u>6, T</u>	1.0	0.07		0,* 1	0.	0,00	0

pН

		Sal	inity		Test Temperature						
Sample.			ot		(°C)						
	Init.	Fin.	Init.	Fin.	Init.		Fin.	Init.		Fin.	
	0	48	48	96	0	24	48	48	72	96	
<u> </u>	29.0	29.4	29.0	30.6	19.9	17.4	19.8	20,0	20.1	19.8	
1.5	290	29.2	29.0	29.3	19.3	190	198	20.0	20.1	20.1	
3125	29.4	30.9	29.0	30.7	19,0	19.1	19.5	20.0	20.1	19.8	
6.25	29,0	31.0	29.0	31.0	19.2	19.3	19.8	20.0	<u>20. (</u>	19.9	
12.5	29.0	20.2	29.0	29.5	19.5	19.0	19.1	20.0	303	20.0	
3.5	29.0	29.7	29.0	29.5	9,0	19.0	19,0	20,0	<u> 20, 3</u>	<u>20</u> .0	

	Alkalinity*	Chlorine Resid.	Ammonia
Conc	*(mg/L as CaCo3)	(mg/L)	(mg/L)
control	(00)		······································
highest conc.	320	4.03	9.5

Sample Description:

Comments:

Analysts:

Animal Source:	ABS	 
Date Received:	6/20/03	 
Date of Hatch:	6/9/03	 
-		

Northwest Bioassay Lab

5009 Pacific Hwy. E., Suite 2 Fife, WA 98424

Sample-

Conc. or %

#### Client: C+W Ryndam Sample ID: Contact:

D.O.

(ma/L)

Fin. Init.

Test #: 0306-60NW

Init.

### 96 Hour Toxicity Test Data Sheet Saltwater 96-hr Ácute with Renewal

2000 6/2/03 Start Date & Time: 1910 End Date & Time: 6/15/03 Test Organism: Attering & affin. Test Protocol:

				N	umber	of	
Sample	Rep	Cont		<u>Live</u>	Organi	sms	
Conc. or %	#	#	0	24	48	72	96
50	1	21_	5	5	5	<u>_S</u>	5
	2	3	5	٢	5	5	5
	3	9	5	5	5	2	4_
	4	6	5	5	5	<u> </u>	5
	1		5				
	2		5		l	<u> </u>	
	3		5			_	
	4		5				
	1		5				<u> </u>
	2		5				
	3		5				
	4		5			<u> </u>	
	1		5				
	2		5		ļ	<u> </u>	<b></b> -
· ·	3		5		<u> </u>	<u> </u>	<u> </u>
	4		5	·		<u> </u>	<u> </u>
	1		5		<b></b>	ļ	ļ
	2		5		<u> </u>	<u> </u>	<u> </u>
	3		5	<u> </u>	<u> </u>		<u> </u>
	4		5				<u> </u>
	1		5	L	<u> </u>	<u> </u>	<u> </u>
	2		5		∔		
	3	<u> </u>	5			<u> </u>	
	4		5		<u> </u>		
Tech.	Initials		nu		m	<u>   Ľ,†-</u>	MET

48 0 24 96 72 48 48 24 0 8,20 8,19 8.21 8.22 8.18 8.28 6,0 6.8 (0.2 29.To 5.9 6.4 50 7.4 Test Temperature Oaliath

Init.

Fin.

pН

(ma/L)

Fin. Init.

48

Fin

96

72

		Sai	inity	1							
Sample		D	pt		(°C)						
Conc. or %	Init	Fin	Init	Fin.	Init.		Fin.	Init.		Fin.	
	<u> </u>	48	48	96	0	24	48	48	72	96	
	290	76 4	1.	29.9	140	19.2	140	20.0	20.4		
50	<u>~1.</u> ~	20.0	1.14		110	┟╙┷┷╼	$\mu_{\pi}$	1 <del>7</del>			
			29.	┣	<b> </b>	┣╌──		├	<u> </u>		
<u> </u>		l	<u> </u>			<b></b>	<u> </u>	<b> </b>	┣—		
				1		l			ļ	<u> </u>	
	t							1			
· ·	┨────		┣	<u>+</u>	<b> </b>	<u> </u>	$\vdash$		1		
										<u> </u>	

Γ	Alkalinity*	Chlorine Resid.	Ammonia
Conc.	*(mg/L as CaCo3)	(mg/L)	(mg/L)
control			
highest conc.		<u> </u>	

Sample Description:

Comments:

Analysts:

Animal Source:

Date of Hatch:

				Āc	ute Fish 1	Test-96	Hr Survival		
Start Date: End Date: Sample Date: Comments:	9/13/03 9/17/03 9/12/03		Test ID: Lab ID: Protocol:	0309-03NV WAAEE-AI EPA 02-EF	V MEC NW I PA Acute	Bioassay	Sample ID: Sample Type: Test Species:	Carnival Spirit GW-Gray Water AA-Atherinops affinis	
Conc-%	1	2	3	4				······································	<u> </u>
D-Control	1.0000	1.0000	0.8000	1.0000					
1.5	1.0000	0.6000	1.0000	1.0000					
3.125	1.0000	1.0000	0.6000	1.0000					
6.25	1.0000	0.8000	1.0000	1.0000					
12.5	0.8000	0.8000	1.0000	1.0000					
25	1.0000	0.8000	1.0000	1.0000					
50	1.0000	1.0000	1.0000	0.8000					

			Tra	ansform:	Arcsin Sc	uare Root	t	Rank	1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	
D-Control	0.9500	1.0000	1.2857	1.1071	1.3453	9.261	4			
1.5	0.9000	0.9474	1.2305	0.8861	1.3453	18.660	4	17.50	10.00	
3.125	0.9000	0.9474	1.2305	0.8861	1.3453	18.660	4	17.50	10.00	
6.25	0.9500	1.0000	1.2857	1.1071	1.3453	9.261	4	18.00	10.00	
12.5	0.9000	0.9474	1.2262	1.1071	1.3453	11.212	4	16.00	10.00	
25	0.9500	1.0000	1.2857	1.1071	1.3453	9.261	4	18.00	10.00	
50	0.9500	1.0000	1.2857	1.1071	1.3453	9.261	4	18.00	10.00	

Auxiliary Tests	-	Statistic	Critical	Skew	Kurt			
Shapiro-Wilk's Test indicates non	n-normal dis	stribution (	p <= 0.01)		0.74647	0.896	-1.2985	0.54636
Bartlett's Test indicates equal variances (p = 0.75)					3.44511	16.8119		0.01000
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU				
Steel's Many-One Rank Test	50	>50		2				







### **AMEC Earth & Environmental** Northwest Bioassay Lab 5009 Pacific Hwy. E., Suite 2 Fife, WA 98424

ス 7,

Client:	Shannon + Wilson	
Sample ID:	Cornival Spirit	
Contact:		
Test #:	0309-03NW	

6

					<u></u>			•				
	D.O.						pH					
Sample			(m	g/L)					(m	g/L)		
Conc. or%)	Init.		Fin.	Init.	_	Fin.	Init.		Fin.	Init.	-	Fin.
	0	24	48	48	72	96	0	24	48	48	72	96
Con	6.8	6.3	6.1	6.7	6.7	67	835	825	8.11	841	8.26	8.13
1.5	6.8	6.2	6.1	6.8	7.0	6.8	836	8.25	8.11	841	8.25	81
3.125	6.7	64	61	1.7	70	K67.	9.37	8.2.1	80	841	8.21	811

9

8

8.7

Salinity Test Temperature Sample ppt (°C) Conc. or My Fin. Init. Init. Fin. Init. Fin. Init. Fin. 0 48 48 96 24 0 48 48 72 96 £9.7 29.6 CON 34.5 3 71 n 20.2 20.5 17 ZDI 10-0 21.6 1.5 193 79.8 30 21+ 27 20.7 20.6 Zb 7 3.125 29.8 30.3 -29.¥ 20 20 2 7.1. h 707 29.3 6,25 30 3/1 20 26, 4 29.3306 12.5 10 20.2 8 30 7.1 N 74.7 74 29.1 25 306 74 15

	Alkalinity*	Chlorine Resid.	Ammonia
Conc.	*(mg/L as CaCo3)	(mg/L)	(mg/L)
control	189		
highest conc.	20	0.03	3.8

Sample Description:

Comments:

6.25 12.5

25

Analysts: SM NE Et we n

### 96 Hour Toxicity Test Data Sheet Saltwater 96-hr Acute with Renewal

pafel

Start Date & Time: 1515 End Date & Time: Test Organism: ATLOUINIPS 4 ins Test Protocol;

			Number of									
Sample	Rep	Cont	Live Organisms									
Conc. or %	#	#	0	24	_ 48	72	96					
Can	1	8	_ 5	5	5	5	5					
	2	6	5	5	5	5	5					
	3	10	5	4	4	4	4					
	4	14	5	5	5	5	1 F					
1.5	_1	17	5	5	5	5	5					
	2	13	5	3	3	3	3					
	3	5	5	5	5	5	5					
	4	23	5	5	5	5	1 C					
3.125	1	9	5	5	5	5	5					
	2	25	5	5	5	5	5					
	3	11	5	4	.3	3	3					
	4	26	5	5	_5	5	5					
6.25	_1	)	5	5	5	3	5					
	2	18	5	4	4	4	4					
	3	24	5	5	5	5	5					
	4	12	5	5	5	5	5					
12.5	1	7	5	5	5	5	4					
	2	22	5	5	5	_ 4	4					
	3	2	5	5	<u> </u>	5	5					
	4	28	5	_5_	5	5	5					
25	_1	21	5	5	5	5	5					
┣	2	<u>19</u>	5	4	4	. 4	4					
┠	3	<u> </u>	5	5	_5	<u> </u>	5					
<u> </u>	4	24	5	5	50.	5	5					
lech. Ini	tials	1	8m	NF 1	KQ	RS	K3 T					

Animal Source:	ABS			
Date Received:	9/12/03			
Date of Hatch:	9/4/03	 	-	

### AMEC Earth & Environmental Northwest Bioassay Lab 5009 Pacific Hwy. E., Suite 2 Fife, WA 98424

Client:	Shannon & Wilson	
Sample ID:	Carnial Spirit	
Contact:		
Test #:	0309-03NUS	

			D	.0.			рН					
Sample			(m	g/L)			(mg/L)					
Conc. or 🌀	Init.		Fin.	Init.		Fin.	Init.		Fin.	Init.		Fin.
	0	24	48	48	72	96	0	24	48	48	72	96
EANT SU	7.3	88	6.7	7.2	6.0	6-3	8.27	7.98	8-01	8:32	8.07	8.00
											-	
· · · · · · · · · · · · · · · · · · ·												
								i				··

			_					_		
	L	Sal	inity		Test Temperature					
Sample	ppt				(°C)					
Conc. or 🍇	Init.	Fin.	Init.	Fin.	Init.		Fin.	Init.		Fin.
	0	48	48	96	0	24	48	48	72	96
50	29.	31.4	24.3	29.9	21.6	205	205	20.5	20.6	268
			*	a a sa a						

	Alkalinity*	Chlorine Resid.	Ammonia
Conc.	*(mg/L as CaCo3)	(mg/L)	(mg/L)
control			
highest conc.	· · · · · · · · · · · · · · · · · · ·		

Sample Description:

Comments:

Analysts:

### **96 Hour Toxicity Test Data Sheet** Saltwater 96-hr Acute with Renewal

1515

Start Date & Time: 9/13/03 1 End Date & Time: 9/17/03 1 Test Organism: Attocative ps Test Protocol:

	T		-	<u> </u>			
Comola				N	lumber	of	
Sample	Rep	Cont			Organ	isms	
Conc. or	1 #	#	0	24	_ 48	72	96
50	1	4	5	5	5	5	5
	2	16	5	5	5	$\overline{\varsigma}$	5
	3	15	5	5	5	5	5
	4	3	5	5	5	4	4
	1		5				
	2		5				
	3		5				
	4	_	5				
	1		5				
	2		5				
	3		5				
	4		5				
	1		5				
	2		5				
	3	_	<u>_</u> 5				
	4		5		1		
	1		5				
	2/		5				
	/3		5				
/	4		5				
	1		5				
	2		5				
	3		5				
	4		5				
Tech. in	itials						

Animal Source:

Date Received:

Date of Hatch:

page 2

Mysidopsis bahia 48 h Survival

Start Date:	6/10/03	·	Test ID:	Mysid Act	ute-48 Hr	Survival		<u> </u>
End Date: Sample Date: Comments:	6/12/03 6/9/03		Lab ID: Protocol:	WAAEE-AMEC NW EPA 02-EPA Acute	Bioassay	Sample ID: Sample Type: Test Species:	Spirit of Columbia #1 BW-Black Water MY-Mysidopsis bahia	
Сопс-%	1	2	3	4				
D-Control	1.0000	1.0000	1.0000	1 0000				
1.5	1.0000	1.0000	1.0000	1.0000				
3.125	1.0000	1.0000	1.0000	0.8000				
6.25	1.0000	1.0000	1.0000	1.0000				
12.5	1.0000	1.0000	1.0000	1.0000				
25	1.0000	0.8000	1.0000	1.0000				
50	1.0000	1.0000	1.0000	1.0000				

Conc_%	Manu		ir	ansform:	Arcsin Sc	uare Root	t	Rank	1-Tailod
	wean	<u>N-Mean</u>	Mean	Min	Max	CV%	 N	- Cum	
D-Control	1.0000	1.0000	1.3453	1.3453	1 3453	0.000		oum	Critical
1.5	1.0000	1.0000	1 3453	1 3/52	1.0400	0.000	4		
3,125	0.9500	0.9500	1 2057	1.0400	1.3453	0.000	4	18.00	10.00
6.25	1 0000	1.0000	1.2007	1.1071	1.3453	9.261	4	16.00	10.00
10.20	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18 00	10.00
12.5	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	19.00	10.00
25	0.9500	0.9500	1.2857	1.1071	1 3453	0.261	4	10.00	10.00
50	1.0000	1.0000	1 3453	1 3/53	1.0400	9.201	4	16.00	10.00
			1.0400	1.5455	1.3453	0.000	4	18.00	10.00

Auxiliary Tests				
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.04)	Statistic	Critical	Skew	Kurt
Equality of variance cannot be confirmed	0.58279	0.896	-2.2845 6	5.47308
Hypothesis Test (1-tail, 0.05) NOEC LOEC Chy	TII			
Steel's Many-One Rank Test 50 >50	2			
	4			



page 1 of 2

Saltwater Acute 48 Hour Toxicity Test Data Sheet AMEC Earth & Environmental - NW Bioassay Lab

Client:	Shannon + Wilson		
Sample ID:	Spritof Columbia #1	BW	
Contact:	- 1		
Test #:	0306-14WW		

Start Date & Time:	6/10/03	1545	
End Date & Time:	6/12/03	16:00	
Test Organisms:	Mysidopsis	sbahia	
Test Protocol:	j		

Conc.			1	Number	of	D D	issolve	d Oxyg	ел	割 pH 割					Salinity (not)				Temperature			
or			Live	e Orgar	nisms		(m	<u>g/L)</u>	1		<u>(ur</u>	hits)		1444	(	<u>ppt)</u>	1	140 C	(	<u>(C)</u>	<u>.                                    </u>	Percent
	кер	Cont.	<u> </u>	1 04	1 40		Fin.	Init.	40				40				40		Fin.		40	Survival
	#	#		24	48		24	24	48		24	24	48		24	24	48		24	24	48	
		14	12	12	<u> -&gt;</u>	6.8	24	0.5	1-2.1	<u>37.47</u>	D.CL	0.20	2.17	<u>2212</u>	1/20.4	20.9	-30.6	45.3	250	15.0	- <del>-</del>	
	<u></u>		5_	15	-2-	17.45 		ļ .			ļ	ļ		<b>3</b>	+	<u> </u>			+			
	3	10	5	12	12			<b> </b>		<b>.</b>								<u> </u>				
	4	12	5	12	12	1 <u>3</u> 18/- 0	50	la E	67	NA VA	8.22	879	Q:14	<u>新たつ</u> 」	20-7	201	200	国 し し し	2-0	250	000	
1.5	2	27	12	12	12		0.0	2.5	3,1	<u>립어.먹이</u>	0.20	0 1	<i>P</i> .J T.		20.1	20.1	5.50	<u>27.4</u>	750	21.0	<u>as, 7</u>	
[	2	15	2	15	12-										-			1 1 1				
	4	a	2	12	2				<u> </u>							<u></u>						
3125		10		5		allo G	510	105	5-7	দ্বিদ্বাৰ	220	8 30	8 3	120 I	ann	301	20.7	B B C C C	250	154	255	
1.50	2	$\frac{1}{2}$	12	6	12		10.0		<u> </u>		p.20	0. 10	0:10		$\frac{1}{1}$	1-20-1	<u>-~~ · ·</u>		2,0	1.7.4	as	
	3	p	E	5	5	S. S	1		·	2014 1				10. TO								
·	4	14	5	4	14												<u> </u>	19	1			
1025	1	8	Ĕ	5	5	170	510	10 10	5.9	8848	822	830	8.3	副ろ0.1	30.8	30.1	30.4	25.3	25.0	255	253	
	2	19	5	5	5						0.00		51.7	100								
	3	28	5	5	5	100				1111				1	1							
	4	17	5	5	5	1 North												a a				
12.5	1	4	5	5	5	37.	5.7	69	6.0	\$8.48	8.20	830	8,13	到30.1	3.0	30.0	30,9	25.6	25.0	25.4	255	
	2	3	5	5	5	1												1				
	3	2	5	5	5	1000			·	C. Mark				422								
	4	12	5	5	2	1000 C								<u> </u>				1414				
25	1	26	5	5	5	1.4	55	71	56	88.46	18.17	8.29	8.10	割ろ0.1	311	29.7	30.9	25.4	25.0	25.2	923	
	2	27	G	4	4								_					3 / ·	I			
	3	13/	5	б	5	NAMA.								2 2				1997 1997				
	4	18	5	5	5	596								4.43/1		1						
Technicia	n Initia	s	m	<u>INF</u>	<u></u>																	
		Alka	alinity*		ſ	Chlo	rine			Ammonia												
Conc.	<u>*(n</u>	ng/L a	is CaC	03)	I	(៣ថ្ង	j/L)			(mg/L)		Sam	ple Des	criptior	): 							
control		_ <u>5</u>	$\underline{0}$			<u></u>								. 1	4-	r P	1					
highest conc.		<u> </u>	0			۷.۱	03			-		Anal	yst Initia	als:V		<u>v- 1</u>	<u>*</u>		_			
Commontes			۸.	1.6			0	<i>(</i> )	1		-	1.11	·2.M	-								
Comments:	Unrs:	1	mina	1 DOLO	<u>e Alo</u>	is pare	<u>Kac'a</u>	610	<u>[05 i</u>	<u> 2014 : 645</u>	205	$\varphi_{\Gamma}$	, ,		_				Nodbu		00001/1	ah
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	101115	•													-			Fife M		y. ⊑. 24		
Reviewed:								QA ch	eck:									(253) 9	922-429	 96		

page 20fZ

Client:	Shannon + Willim	
Sample ID:	SOC #1 Blackwater	
Contact:		
Test #:	0306-11 NW	

Start Date & Time:	0 10/03	1545	
End Date & Time:	6/12/03	1600	
Test Organisms:	M. bak	1'h	
Test Protocol:			

Conc.			1	Number	of	D D	issolve	d Oxyg	jen	pH B				E S	Salinity				Temperature			
or		I.	Live	e Orgar	nisms		(m	g/L)		2442	(ม	nits)		ja la	ſ	(tot			/°			Boroopt
	Rep	Cont.	·	<b></b>			Fin.	Init.		1314	Fin.	init.	<u> </u>		Fin.	Init.	í	<u></u>	Ein	Unit	<u> </u>	Suprival
1	#	#	<u> </u>	24	48	0	24	24	48	<b>8</b> 0	24	24	48		24	24	48		24	24	19	Survival
50	1	16	5	5	5	<u>113.0</u>	154	1.3	5,7	18 9.4C	8.11	877	8.07	203	212	1795	20 4	and the second sec	1/2	450	40 200	
	2	20	5	5	5	847 X 4						0.01			<u></u>			<u>間上シエ</u>	250	10.0	42.2	
	3	N	15	6	5	CAN.												₿	<u> </u>			
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<u> </u>	2	<u> </u>		1														5				
	- 3-	I		I						-192												
	4	<u> </u>		┝		1	<u> </u>			1.41								8 5				———
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	4									<u></u>				29				22 <b>4</b> E				
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	in Initial		m	NE	$\underline{\alpha}$						_						P	<u> </u>		l	I	
Cono	*/-	Alka	linity"			Chlor	ine	1		Ammonia	- 1											
<u>control</u>	<del>{ "</del>	ng/L as	scace	<u>J3)</u>		(mg/	<u>'L)</u>			(mg/L)		Samp	le Des	cription:	_							
highest conc	<u></u>			ł																		
<u></u>	1			[		<b>-</b>		L				Analy	st Initia	ils:								
Comments:	0 hrs:																					
	24 hrs	-								<u> </u>												
	48 hrs					· .												AMECN	Northwe	st Bioa	ssay La	ab
		-																5009 Pa	ICITIC HV	vy. E. S	iuite 2	
Reviewed:							(	QA che	ck:									(252) 02	1 96424 12 4200	4		
								-										(200) 92	~~+290			

	Mysid Acute-48 Hr Survival												
Start Date: 6/1 End Date: 6/2 Sample Date: 6/2	10/03 12/03 9/03	T L F	est ID: 0 .ab ID: V Protocol: E	306-15NW VAAEE-AMEC PA 02-EPA A	NW Bioassa	Sample ID: Sample Type: Test Species:	Spirit of Columbia #2 GW-Gray Water MY-Mysidopsis bahia						
Conc-%	1	2	3	4									
D-Control 1.5 3.125 6.25 12.5 25 50	0.8000 1.0000 1.0000 0.6000 1.0000 0.0000 0.0000 0.0000	1.0000 1.0000 1.0000 1.0000 0.8000 0.0000 0.0000	1.0000 1.0000 1.0000 1.0000 0.6000 0.0000 0.0000	1.0000 1.0000 1.0000 0.8000 0.8000 0.2000 0.2000 0.0000									

-				Tra	Rank	1-Tailed	Number	Total				
	Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	<u>N</u>	<u>Sum</u>	Critical	Resp	Number
-	D-Control	0.9500	1.0000	1.2857	1.1071	1.3453	9.261	4			1	20
	1.5	1 0000	1 0526	1.3453	1.3453	1.3453	0.000	4	20.00	10.00	0	20
	2 125	1 0000	1.0526	1.3453	1.3453	1.3453	0.000	4	20.00	10.00	0	20
	3,123	0.9500	0.8947	1 1709	0.8861	1.3453	18.840	4	15.50	10.00	3	20
	0.25	0.0000	0.0341	1 1114	0.8861	1.3453	16.874	4	13.50	10.00	4	20
	12.5	0.8000	0.0421	0.2950	0.0001	0.4636	41,771	4	10.00	10.00	19	20
	*25	0.0500	0.0520	0.2000	0.2255	0.2055	0.000	4	10.00	10.00	20	20
	*50	0.0000	0.0000	0,2255	0.2200	0.2200	0.000	•				

	Statistic	Critical	Skew	Kurt
Auxiliary Tests Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.87794	0.896	-0.3276	1.43785
Equality of variance cannot be confirmed				
Hypothesis Test (1-tail, 0.05)         NOEC         LOEC         One           Steel's Many-One Rank Test         12.5         25         17.6777	8			_

·				Ma	ximum Likeliho	od-Probit				Ciama a	ltor
Parameter	Value	SE	95% Fiduc	ial Limits	<u>Control</u>	Chi-Sq	Critical	P-value	<u>Mu</u>	<u>Sigma</u>	9
Slope	8.67095	2.05283	4.64739	12.6945	0.05	6.31689	9.48773	0.18	1.21109	0.11000	0
Intercept	-5.5065	2.5179	-10.442	-0.5714						<b>^</b>	
TSCR	0.04979	0.02435	0.00206	0.09752		<sup>1.0</sup> ]			6		
Point	Probits	%	95% Fidu	cial Limits		0.9 -					
EC01	2.674	8.77807	4.84541	11.1963		0.8					
EC05	3.355	10.5195	6.69941	12.8438		0.0			-HI		
EC10	3.718	11.5849	7.93043	13.8748		0.7 -	•				
EC15	3.964	12.3641	8.86307	14.6551		<b>e</b> 0.6 -	]		111		
EC20	4.158	13.0205	9.6614	15.3391		ŰŐ.	1				
EC25	4.326	13.6114	10.3832	15.9822		<u>6</u> 0.5	]			ļ	
EC40	4.747	15.2221	12.3148	17.9199		<b>0</b> .4 ·	4				
EC50	5.000	16.2814	13.5123	19.3866		03	1				
EC60	5.253	17.4144	14.699	21.1551		0.0	-	/	П		
EC75	5.674	19.4751	16.6041	24.9047		0.2	1	/	4		
EC80	5.842	20.3589	17.3378	26.7074		0.1	]		II		
EC85	6.036	21.439	3 18.1836	29.0543				//	/		
EC90	6.282	22.881	3 19.2431	32.4091		0.0	+	11 11	ο	100	
EC95	6.645	5 25.199	3 20.8278	38.2900			1	D a a	- 0/		
EC99	7.326	30.198	4 23.9394	52.8381				Dos	e 70		





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### Saltwater Acute 48 Hour Toxicity Test Data Sheet AMEC Earth & Environmental - NW Bioassay Lab

							A		arun ex	LINIO					, 			. 1	1-2		163	б	
Client	She		1 W	ls cin											Start I	Date &	Time:	610	02				
Client: _	<u>0110</u>	INNOF L	<u>. † 101</u> 1 NU 10	NOVA	<u>+-</u> 2	61	N								Endi	Date &	Time:	$\frac{012}{112}$	100				
Contact:	-2pic			<u>r(1)</u> 10 \$											les T	t Orgai	nisms. Mocol:	<u>116 1111</u>	20021	5 1200	1101		
Test #:	030	(0 - ) =	5 111	<del>」</del>											1	estru	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,						
		<u> </u>								a				췬		Sal	inity		2	Temp	erature		Mean
Conc.			N	umber	of	Di	ssolved	l Oxyge	en [	19 72 24	H Aur	nite)		現実に		(ŋ	pt)			(°	C)		Percent
or			Live	Organi	sms		(mg	]/L)		<u>.                                    </u>	Fin	Init.				Fin.	Init.			Fin.	Init.		Survival
$\bigcap$	Rep	Cont.			- 10		- FIN. - 24	24	48	0	24	24	48	2	0	24	24	48	0	24	24	48	007
	_#_	#	0	24	48		24	10 8	103	848	821	8.21	8.11		99	30.8	30.2	31.0	12.2	25.0	27.0	10.0	45%
<u> </u>	1	13_	5	4	- 5		68	0.0				- × -		2474						<u> </u>	<b>├</b> ───	┟╴═╴┦	<b> </b>
	2	4	-2-	5	E E					12				5						┨───	┼───	<b>├────</b> ┩	
	3	10	05	12	-5					154.0				202			<u> </u>	<u> </u>	8	1000	122 0	255	100%
	- 4	10	-2-	5	Ĕ	168	5.2	6.8	6.2	8.51	8.15	8.21	8.09		29.7	<u>30.C</u>	305	<u> //. 0</u>	<u> 27 11</u>	15:4	21.0	43.5	
<u></u>	2	13	5	5	5					1.00	<u> </u>		╡───	j.							<u>+</u>		
	3	10	5	5	15	ALC: NO.								1976						1			
	4	74	5	115	5		<u> </u>					0.00	0 27	1년 - 신	100	23 7	203	30	N 7<2	25.3	21.0	76.0	1007.
3175	1	16	5	5	5	6.8	4.4	6.8	6.2	8.51	8.0-	8:22	10.01	3	<u>50,0</u>	20.1		<u>21.9</u> .					
	2	12	5	15	5	2						+							1				
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	4	23	5	12	15-		10	0	100	<u>国</u> <u>国 </u> 公 山 S	192	819	904	252	30.D	31.0	30.4	3.0	25.2	25,0	27.0	25.4	70%
6.25	1	14	5	13	12	B(0. O	4.0	0.0	10.1	<u>80.70</u>			101	CLUB A	<u>, , , , ,</u>						<b>↓</b>	<u> </u> '	85/2
	2	20	5	12	12-			┼──	┦╼──	- <u>1</u>										<u> </u>		╉━━━┙	┝──┤
	$\frac{3}{4}$	21	12-	12	11	<u>   </u>		<u>+</u>	<u>├</u> –	- <u></u>				Ж.R							000	ar r	727
	+ +	12	2	105	17	1/2	1.1	6.8	6.0	88.4	377	18.12	- 7.95	4125	30.D	30.8	30.5	<u>  / 0</u>	<u>   25.</u>	[ 45. [	<u>-1.0</u>	29.5	10
- 12-2-	1 - 2	h <del>2</del>	1- <u>2</u> -	14	† Ýr		1×									<u> </u>	┼───	<u> </u>	-ă	+	+	+	<u>⊢~~~</u> _
	$\frac{2}{3}$	17	5	+5	15								<u> </u>	100				<u> </u>		+		+	<u> </u>
	4	28	5	14	14				1	×.				193	<u> </u>	120 8	22 10	210	11121	1250	2220	25.7	.5%
7-5	1 1	17	5	0	<b>—</b>	1.0	1.5	6.8	5.0	8.7	47.6	1144	11.84	2個	$\underline{0.0}$	10.0	120.0	1200		+		1	
	2		5	0	-	<u></u>		<u> </u>	╀──		+				_	┼───			- <u>A</u>		+		
[	3	22	5				<u> </u>			-16				1 Sector									
4951										¥			_1	1		<u> </u>		<u> </u>					
Technicia	an Initi	ials	Im	<u>-1811</u>	1,2m		larino		<del>_</del> _	Ammor		Г											
		Alk	calinity'	-		Cn (m				(ma/L	.)	Sa	mple De	esc	riptior	1:							
Conc.	<sup>*</sup>	(mg/L	as Ca	<u>(U3)</u>	+		<u></u>				~	7											
control			<u>-0</u>				<u> </u>			44		] An	alyst,inj	iția	ls: <u>//</u>	<u>~_}¥</u>	<u>M</u>						
Inignest conc	· <u> </u>				_1							-	6/1/	63		1. A.	ال مار .						
Comments:	0 hr	s:	Anin	nal So	10/10/1	o <u>3 Date</u>	Hate	<u>ned (</u>	0 200	3.	<u></u>	ple úti	una		AMF	C Nort	hwest E	lioassav	/ Lab				
÷0,	24 I	nrs.	Fed	at 8	.30 l	erand	<u>n add</u>	ed.								-			5009	) Pacific	: Hwy. I	E. Suite	2
	48 t	nrs.														-			Fife,	WA 9	8424		
	- A	I						<b>0</b> • •	bock:	$\mathcal{O}$									(253	) 922-4	296		
Reviewed:	eviewed: 46 QA check: 40																						

page	21	of	2
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Client:	Shannon	+ Wilson	
Sample ID:	SOC#2	Gray water	
Contact:	_/		

Start Date & Time:  $\frac{b/10/03}{150}$   $\frac{1630}{1545}$ End Date & Time:  $\frac{b/12/03}{1545}$   $\frac{545}{155}$ Test Organisms: <u>Mysidcpsis bahia</u> Test Protocol:

Test #: 0306-15WN

1 Col #.			<u></u>											8	Sa	linity			Temp	erature		Mean
Conc.			N	umber	of	<u>د</u> [	issolve	d Oxyg	en		p ///	nH Nite\			(r	nnt)		10.00	(°	C)		Percent
or			Live	Organ	isms		(m	<u>g/L)</u>				uits)			Fin.	Init.			Fin.	Init.		Survival
$\cap$	Rep	Cont.					Fin.	<u>  Init.</u>	40		<u> </u>	24	48	<u> </u>	24	24	48	0	24	_24	48	
(%)	#	#	0	24	48		24	24	48		24	153		200	31.0	30.7		25.5	25.1	210		_0
- 50	1	5	5	0		TL	19.2	6.8		<u>an</u> .0-	1 1.91	1.00		<u>, ~</u>	1							
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	3	8	Ъ	0	<u> </u>	1012	ļ	Į	<u> </u>					*****								
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Technicia	an Init	ials	w~	Sm	Sm	ň.			·-		<u> </u>	-1										
		All	kalinity'	+		С	nlorine				กเอ	1 601	nnia Dr	escriptio	<u>л</u> .							
Conc.	1	'(mg/L	as Ca	CO3)		(	<u>mg/L)</u>			<u>(mg/</u>	<u></u>	- "	inple D	000110110								
control													alvst Ini	itials:								
highest conc					_1				<u> </u>				arysen									
Comments:	iments: 0 hrs:																	AME	C Nort	hwest B	ioassa	y Lab
	24 ł	nrs.																5009	Pacifi	c Hwy. I	E. Suite	2
	48 hrs.														Fife,	WA 9	8424					
																(253	) 922-4	296				
Reviewed:								GUA (	JICON.													

- <u> </u>	Mysid Acute-48 Hr Survival													
Start Date: End Date: Sample Date: Comments:	6/13/03 6/15/03 6/12/03	7 L F	Test ID: 0 ab ID: N Protocol: E	)306-20NV WAAEE-AI EPA 02-EP	V MEC NW Bioassa PA Acute	Sample ID: Sample Type: Test Species:	Spirit of Oceanus BW/GW-Combined gray and black wate MY-Mysidopsis bahia							
Conc-%	1	2	3	4										
D-Control	0.8000	1.0000	1.0000	1.0000										
1.5	1.0000	1.0000	1.0000	1.0000										
3.125	1.0000	0.8000	1.0000	1.0000										
6.25	1,0000	1.0000	1.0000	1.0000										
12 5	1.0000	0.2000	1.0000	1.0000										
25	5 1 0000	1.0000	0.6000	0.2000										
50	0.0000	0.2000	0.0000	0.0000										

			Rank	1-Tailed	Number	Total					
Conc-%	Mean	N-Mean	Mean	Min	Max	<u> </u>	<u>N</u>	Sum	Critical		20
D-Control 1.5 3.125	0.9500 1.0000 0.9500	1.0000 1.0526 1.0000	1.2857 1.3453 1.2857	1.1071 1.3453 1.1071	1.3453 1.3453 1.3453	9.261 0.000 9.261	4 4 4	20.00 18.00	10.00 10.00 10.00	1 0 1 0	20 20 20 20
6.25 12.5 25 *50	1.0000 0.8000 0.7000 0.0500	1.0526 0.8421 0.7368 0.0526	1.3453 1.1249 1.0101 0.2850	1.3453 0.4636 0.4636 0.2255	1.3453 1.3453 1.3453 0.4636	0.000 39.188 41.952 41.771	4 4 4 4	20.00 17.50 15.00 10.00	10.00 10.00 10.00 10.00	4 6 19	20 20 20

		Statistic	Critical	Skew	Kurt
Auxiliary Tests	(n < -0.01)	0.8488	0.896	-1.4098	3.46608
Shapiro-Wilk's Test indicates non-normal distribution	i (p <= 0.01)	0.0100			
Equality of variance cannot be confirmed	ChV				
Hypothesis Test (1-tail, 0.05) NOEC LOEC	25 2552				
Steel's Many-One Rank Test 25 50	30.3000	7			

					0.	ltor					
Darameter	Value	SE	95% Fiduo	cial Limits	Control	Chi-Sq	Critical	P-value	Mu 1 42653	0.23118	5
Slopo	4 32567	1.01564	2.33502	6.31632	0.05	6.61989	9.48773	0.10	1.42.000	0,20110	U
Slope	1 1707	1 47416	-4.06	1.71868							
Intercept	-1.1707	0.0105	-0.0085	0.0679		т <sup>1.0</sup> т			$\overline{I}$		
<u>TSCR</u>	0.02909	0.0135	95% Fidu	cial Limits		]		/	9 /		
Point	Probits	70	2 49465	12 0812		0.9			/	1	
EC01	2.674	7.73971	2.46400	12.0012		0.8 -			[ ]	ł	
EC05	3.355	11.1243	4.79556	15.7141				/	/	1	
EC10	3.718	13.4977	6.77542	18.1676		0.7 -		/	/	4	
FC15	3.964	15.3789	8.5243	20.1074		<b>9</b> 0.6 -	1	/L	/	ļ	
EC20	4.158	17.0593	3 10.1984	21.8654		Ë.	1	11		4	
EC25	4.326	18.6465	5 11.8559	23.5716		<b>0</b> .5	1	/]/		l l	
E020	4,747	23.3323	3 16.9545	29.1121		<b>0.4</b>	]	///		4	
	5 000	26,700	20.5309	33.85			{			1	
ECOU	5 253	30 555	8 24.2735	40.3129		0.3	4	/  •		1	
EC60	5.200	38 234	2 30.5545	56.5635		0.2	]			1	
EC75	5.074	A1 701	6 33 0861	65.4639			4	/ •/		1	
EC80	0.042	41.131	1 26 1120	78 0294		0.1	1	$\langle     \rangle$		1	
EC85	6.036	) 40.000	0 40 0052	07 8611		0.0		a	<del></del>	_, , , , , , , , , , , , , , , , , , ,	
EC90	6.282	2 52,819	2 40.0932	427 872		0.0	1	10	100	1000	
EC95	6.645	5 64.088	4 40.4872	005 419			•	Doe	0 %		
EC99	7.326	<u>92.11</u>	4 60.6221	205.410				005	C /0		



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			4.5													Start I	Date &	Time:	<u>(c)</u>	302	<u>&gt;_</u>	600	<u></u>		
Client:	Sha	nnor	<u>1                                    </u>	<u>V1150</u>	<u></u>	_										End [	Date &	Time:	611	<u>570</u>	3_1	<u>500</u>	<u> </u>		
Sample ID:	Spi	nti	of <u>0</u> 9	lan	25											Tes	t Orgai	nisms:	my	<u>piciop</u>	<u>sho _</u>	Ville	لاتم		
Contact:																т	est Pro	otocol:							
Test #:_	030	<u>-90</u>	201	<u> </u>																15	Tom	norat		T	Меал
				umber	of	a D	issolve	Oxyg	en	5		pl	H		122		Sal	inity		110	rem	recar (°C)	uie		Percent
Conc.			NI Livo		vieme		(mo	⊒/L)		3. V		(un	its)		22		<u>-</u> (p	<u>pt)</u>		<u>الا</u>	Ein		út.		Survival
ог	Dan	Cant	LIVE	, Olgai	13113		Fin.	Init.				Fin.	Init.				Fin.		40		- 24		4	48	
	Rep #	4 Unit.		24	48	0	24	24	48		0	24	_24	48	1	$\frac{0}{20}$	24	24	207	25	2 2 2	0 79	0	76.0	95%
		<u>,</u>	Ē	8	HI-	6.8	6.1	7.0	6.5	8	24	8.10	8.9	1812	- 6-	<u> </u>	<u>े। ।</u>	$\frac{20}{20}$	<u>- 70, 1</u>		0 2.20				
		26	Ē	a	15										-3					<b>b</b>					
	2	G	Ē	tă-	15-	2441								<u> </u>	- 1							-1-			
										29 29			A. A.A.	<u> </u>	10	<u> </u>	010	10 2	2010	12/01	7 25	075	.0	760	100%
	F 1 11 5 6 5 168 0								10.5	18	24	8.17	<u>8.35</u>		-1	<u>24.6</u>	310	<u>1. fr</u>	<u> 20.0</u>	11-0-		<u>v. c.</u>	_		
_ 1.2		178	-2-	12-	14	1							ļ	+						-∰					
	-2-	178	E	12-	15			Τ		8								╞───		-5					
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1-25	$\frac{1}{1}$	15	tĔ	15	5	6.8	5.5	17.2	361	482	3.20	8.11	18.5	40.0	<u>-</u> [	27.4	72.0	<u>12.2</u>			<u>* =</u> r				
0.45	1 2	157	15	5	5				·	-8-			┼──	+					+		- 1			[	
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125		トカ	15	P	15 _	86.7	4.1	1.0	0.2	4월2	6.16	7.97	Ц <u>8.6</u>	42.0	'계	121.2	101-2	190.2						L	
- 12. 2	12	6	15	11	1				<u> </u>	- 12 -		<b> </b>	+			<u> </u>									
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<b>├</b> ────────	4	22	5	5	5	1				8	<u> </u>					202	207	20-	1 79.9	125	925	52	56	26.0	25/4
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		Ā	kalinity	/*		Ch	lorine		1	A	mmoni mo/L	a	S	amole l	Des	scriptio	n:								
Conc.		*(mg/L	as Ca	iCO3)		(1	<u>mg/L)</u>		_{	- 7	<u>myrc,</u>		$\dashv$ $\sim$												
control		5	6				<u> </u>			Ta	<u>7</u>			nalvst I	nitia	als: 🖻	<u>m_^</u>	<u>F</u>							
highest conc		2	56_		<u>_</u>	,	03			100	<u>~T· 4</u>			, - · ·					-						
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Comments:	0 hi	rs:	<u>D0H</u>	1.01	4 03	Keu	CIVED	<u> </u>	$v_1 v_1$	<u> </u>	$\sqrt{\sqrt{2}}$								0	AN	AEC NO	ortnwe	estB		y Lau
	24	hrs.																		50	U9 Pac		wy.⊏ ⊳⊿	:. Suite	. 2
	48	hrs.																		FI	e, WA	9044 1 1 2 0 1	. <del>4</del> 3		
	(l	ר						AO	check:	γl	) }									(2	53) 922	-429	,		
Reviewed: _	17	<u> </u>				-		5	0,10010	על-															

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Client:	Shannon + Wilson
Sample ID:	Spiritut Oceanus
Contact:	
Test #:	0306-20NW

Start Date & Time:	# 6/13/03	1.600	
End Date & Time:	6/15/03	1500	
Test Organisms:	Mibahia		
Test Protocol:	• •		

Conc.			N	lumber	of	1 D	issolve	d Oxyg	en	No.	Salinity				16423	Mean						
or			Live	e Orgar	nisms	2200	<u>(m</u>	g/L)		17.75 17.75	(ur	nits)		1	(1	opt)		600 A	(°	C)		Percent
$\square$	Rep	Cont.		<u></u>	<b>-</b>	200 Ch 1	Fin.	Init.		110	Fin.	Init.			Fin.	Init.			Fin.	Init.		Survival
%	#	#	0	24	48	<u>8</u> 0	24	24	48	0	24	24	48		24	24	48		24	24	48	10-1-1
50		12	5	10	<u> </u>	6.4	2.6	6.6	5.9	7.97	8.09	<u> 8-11</u>	8.00	129.0	<u>- 50, 7</u>	130.5	29.4	125.5	25:3	<u>rzs.7</u>	294	40 5/4
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Cana	+/-	Alka	alinity"	001	1	Chlo	rine			Ammonia		0	-la Dea	ariation								
Conc	<u> </u>	ng/L a	scau	03)	<u> </u>	(mg	/L)			(mg/L)		Sam	ipie Des	cription:								. <u></u> .
highest conc	-		-									Anal	vet Initia	aler								
ingricor cono.	l			·	1								younne	".ə					-			
Comments:	0 hrs:																					
	24 hrs	s		_														AMEC	Northw	est Bio	assayi	Lab
	48 hrs	5.											_					5009 F	Pacific H	łwy. E.	Suite 2	2
Reviewed:								QA ch	eck:									Fife, W (253) 9	/A 984 922-429	24 16		

			· · · · · · · ·	M	lysid Acute-48 Hi	Survival	
Start Date: End Date: Sample Date: Comments:	6/17/03 6/19/03 6/16/03		Test ID: ( .ab ID: N Protocol: I	0306-24NW WAAEE-AN EPA 02-EP	MEC NW Bioassa MEC NW Bioassa A Acute	Sample ID: Sample Type: Test Species:	Sun Princess BW/GW-Combined gray & black water MY-Mysidopsis bahia
Сопс-%	1	2	3	4			
D-Control	1.0000	1.0000	1.0000	1.0000			
1.5	1.0000	1.0000	1.0000	1.0000			
3.125	1.0000	1.0000	1.0000	1.0000			
6.25	1.0000	1.0000	1.0000	1.0000			
12.5	1.0000	1.0000	1.0000	1.0000			
25	0.4000	0.2000	0.2000	0.2000			
50	0.0000	0.0000	0.0000	0.0000			

	<u> </u>		Rank	1-Tailed	Number	l otai					
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	<u>N</u>	<u>Sum</u>	Critical	<u>Resp</u>	
	4 0000	1.0000	1 3453	1.3453	1.3453	0.000	4			U	20
D-Control	1.0000	1.0000	4 0 4 5 2	1 2462	1 3453	0.000	4	18.00	10.00	0	20
1.5	1.0000	1.0000	1.3455	1.3403	1,0400	0.000	Å	18.00	10.00	0	20
3,125	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	40.00	40.00	Ο	20
6 25	1 0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
0.20	4 0000	1 0000	1 3453	1 3453	1.3453	0.000	4	18.00	10.00	U	20
12.5	1.0000	1.0000	0.5400	0.4636	0.6847	21 301	4	10.00	10.00	15	. 20
*25	0.2500	0.2500	0.5189	0.4030	0.0047	21.001		10.00	10.00	20	20
*50	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	4	10.00	10.00		

					Statistic	Critical	Skew	Kurt
Auxiliary Tests					0 40070	0.896	3 23077	16.3108
Shapiro-Wilk's Test indicates non-	-normal dis	stribution	(p <= 0.01)		0.43373	0.030	0.2001 1	
Equality of variance cannot be con	nfirmed							
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	<u></u>				
Steel's Many-One Bank Test	12.5	25	17.6777	8				
Sleeps Many-One Raine root								

			Trimmed Spearman-Karber
EC50	95%	CL	
21.022	18.382	24.042	
20.675	17.857	23.936	4.5
20.365	17.426	23.800	1.0
19.919	16.973	23.377	0.9 -
21.022	18.382	24.042	
	EC50 21.022 20.675 20.365 19.919 21.022	EC5095%21.02218.38220.67517.85720.36517.42619.91916.97321.02218.382	EC5095% CL21.02218.38224.04220.67517.85723.93620.36517.42623.80019.91916.97323.37721.02218.38224.042







page 1 of 2

Client: Shannon + Wilson Sample ID: <u>Sin Princess</u> Contact: Test #: 0306-24.W

Start Date & Time: (	6/17/03 18:45
End Date & Time:	57/19/03 18:00
Test Organisms:	Musidopsis bahia
Test Protocol:	) /

					of	<u>я                                    </u>	issolver				p	H		Salinity					21025	Mean			
Conc.			N Line	Oraco	UI ieme		(m)	1/I)	511	(A) (5)	(ur	nits)		10.00		<u>(p</u>	pt)		165	(°	<u>C)</u>		Percent
or	Dan	Cont	Live	Organ			Fin	init.			Fin.	Init.				Fin.	Init.		ğ	Fin.	_Init	40	Survival
0/	кер	Conc.		24	48	0	24	24	48	0	24	24	48	nceo X	0	24	24	48		24	24	48	
<u>%</u>	<del>#</del>	10		5	$\frac{1}{\zeta}$	57	57	68	56	8.19	8.13	8.16	8.12		<del>30.5</del> 8	129.6	29.5	XI,S	<u>1.2.0</u>	21.0	<u>754</u>	05.7	100/0
<u>_ (DYL</u>		10	2	5	17		<u> </u>		<u> </u>					8	<u> 39.5</u>								
	2		10-	5	15-	100 A	<u> </u>			<u>ل</u> و											<u> </u>	· · · ·	
	3	24	2	5	12		<u> </u>																
	4	7		1 G	<u> </u> ~	167	58	68	57	88.6	8.11	8.16	8.10	in the second se	34,5	29.6	29.6	<u>29.9</u>	19250	21.0	<u>25.0</u>	<u> 27 7</u>	<u>/0/_/3</u>
1.5	<u> </u>		12		15			<u> </u>					Γ	2020				<u> </u>		ļ			
	$\frac{2}{3}$			12	5-			1						1					2 10	┣		<u> </u>	
		5	- 2-	1 E	5									200					<u>ă</u>	10.0	26.0	000	100%
210-		10	2	5	Le .	EC 9	56	68	57	88.15	8. D	8.14	8,12	2	<u>29,5</u>	29.5	29.5	30.2	<u> 1972'0 -</u>	126.9	26.0	<u>2525</u>	
-2122-	1-7	14	5	1 E	13-					10 <sup>-2</sup> 07			<u> </u>	1		<b></b>		<b></b> _	<u>8</u> ———		<u> </u>		
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6.75		2	5	6	5	6.6	5.4	6.8	53	<u> 38.13</u>	8.09	8.12	18,12		<u>27.7</u>	29.4	21.5	30,0	<u>間よう.0</u>	126.6	Pr I.Q.	-3/04	10070
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25	1	12	5	2	2	JT.a	5.0	7.0	4.7	<u>3790</u>	8.0	7.98	12.0.3	Ц	417	1270	29.3	130.0				$\frac{1}{1}$	
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Conc.	*	(mg/L	as <u>Ca</u>	CO3)		(r	ng <u>/L)</u>		<u> </u>	(mg/1	.)	-  <sup>5a</sup>	TIPIE D	esi	unpuor	i.							
control														le Si	M (t	-							
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	48 h	IS.																	Fife,	WA 98	424		
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Reviewed: _	14	)						QAU	nçur.	}••													

page	204	А

Client: Sample ID: Contact: Test #:	Sr Su	W Pr- 306	11.Ces	s NW										Star Enc Te	t Date & I Date & est Orga Test Pr	k Time: k Time: anisms: otocol:	/#/ /	<u>о Го</u> 1910 м. Бе	3 3 6 1 12	1845	<u></u>	
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· · · · · · · · · · · · · · · · · · ·	· · · · ·	Alka	alinity*	· · · · ·		Chl	orine	-	1	Amm	onia											
Conc.	*(	mg/L a	as CaC	O3)		(m	g/L)			(mg	/L)	_ San	nple De	scriptio	n:							
control																						
highest conc.												Ana	lyst Init	ials:			-		_			
Comments:	0 hrs 24 hi 48 hi	: 'S. 'S.																AMEC 5009 Fife, V	C North Pacific NA 984	west Bio Hwy. E. 124	bassay Suite :	Lab 2
Reviewed:					-			QA ch	neck:									(253)	922-42	96		

Start Date:	6/19/03	— <u>—</u>	Test ID:	Mysid Ac	ute-48 H	r Survival	
End Date: Sample Date: Comments:	6/21/03 6/18/03		Lab ID: Protocol:	WAAEE-AMEC NW EPA 02-EPA Acute	Bioassa	Sample ID: Sample Type: Test Species:	Norwegian Wind BW/GW-Combined gray & black water MY-Mysidopsis bahia
Conc-%	1	2	3			<u> </u>	
D-Control	1.0000	1.0000	1.0000	1.0000			
1.5	1.0000	1.0000	1.0000	1.0000			
3.125	1.0000	1.0000	1.0000	1.0000			
6.25	1.0000	1.0000	1.0000	1.0000			
12.5	0.8000	1.0000	1.0000	1.0000			
25	1.0000	1.0000	1.0000	1.0000			
50	0.8000	0.8000	0.6000	1.0000			

Transform: Arcsin Square Root Rank 1-Tailed											
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical		
D-Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4			<u> </u>	
1.5	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00		
3.125	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	19.00	10.00		
6.25	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	7 1	19.00	10.00		
12.5	0.9500	0.9500	1.2857	1.1071	1 3453	0.000	4	10.00	10.00		
25	1.0000	1.0000	1.3453	1 3453	1 3/53	0.000	4	16.00	10.00		
50	0.8000	0.8000	1 1114	0.8861	1 2452	10.000	4	18.00	10.00		
		2.3000		0.0001	1.3453	10.874	4	12.00	10.00		

Auxiliary Tests				_	01-4:- //			
Shapiro-Wilk's Test indicator nor		<u></u>		Statistic	Critical	Skew	Kurt	
Equality of market indicates hop	i-normai dis	stribution (	0.60686	0.896	-0.365	6 9216		
Equality of variance cannot be co	nfirmed						-0.000	0.0310
Hypothesis Test (1-tail, 0.05)	NOEC	LOFC	ChV					
Steel's Many One Bank Test								
order's Many-One Rank Test	50	>50		2				



Dose-Response Plot


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## Saltwater Acute 48 Hour Toxicity Test Data Sheet AMEC Earth & Environmental - NW Bioassay Lab

Client:	Shannant Wilson
Sample ID:	Norwegian Wind
Contact:	
Test #:	0306-58NW

Start Date & Time: (01903 1820 End Date & Time: 6/21/03 18:15 Test Organisms: Myndcpsco bahia Test Protocol:

Conc. or			Liv	Numbe re Orga	r of nisms	a strategy	Dissolve	ed Oxyg	gen	1000		pH		Salinity					- <u>1</u>	Temperature				
	Rep	Con	t.	3-		5		l (nit	T	-殷		units)		-8-		(	ppt)	<b>_</b>	-15 A	(	°C)		Percent	
L (%)	#	#	0	24	48	l o	24	24	48	-8			·			Fin.	Init.	<u> </u>	<u> </u>	Fin.	Init.		Survival	
LCON	1	6	5	5	5	1.9	1.2	168			24	7 24	48	1	0	24	24	48	<u> </u>	24	24	48		
	2	4	13	1 5	15	_ <u>{</u>	10.0	<u> o</u>	10,1	<u>  ð.ż</u>	<u>0 0.0</u>	<u>1 0.2</u>	8.19	32	<u>9.</u> 4	20.2	29.7	130.4	26	8255	26.5	1221	11070	
	3	5	1 5	15	17			┿╌─	<u> </u>		-+			- Š		<u> </u>			Ň.					
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16	1	137	ह	+ <u></u> -	12-	E ( 0			+	<u></u> 图		-		N-CF					1945					
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	3	17-7	1 ž	12-	+7-		·	┞────	<u> </u>		-			199						1 2 2 3			<u>_ / 0,0,0</u>	
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	1-	12	<u> </u>	12	15	<u> 6 4 - (</u>	60	6.7	59	<u>883</u>	28.2	382	8.17	1 20	1.6	29.6	29.7	30.2	126.0	255	260	357	10.01	
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Conc	*/	Aika na/L a	iinity-			Chic	rine			Ammoni	a	]												
Control				<u>J3)</u>		(mg	<u>/L)</u>			<u>(mg/L)</u>	l	Sam	ple Des	cripti	ion:									
highest conc.		-63					-				•	]	-	•		_								
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page 2 of 2

Client: <u>Shannon + Wilson</u> Sample ID: <u>Norwegian Wind</u> Contact:

E.

Test #: 0306-58NW

Start Date & Time: _(	0/19	03	1820	
End Date & Time:	2/21	103	1815	
Test Organisms: 🔿	nc	ahia		<u> </u>
Test Protocol:				

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				Mysid A	cute-48 Hr	Survival	
Start Date:	6/21/03		Test ID:	0306-59NW		Sample ID:	Ryndam
End Date:	6/23/03		Lab ID:	WAAEE-AMEC N	W Bioassays	Sample Type:	BW/GW-Combined gray & black water
Sample Date:	6/20/03		Protocol:	EPA 02-EPA Acut	e -	Test Species:	MY-Mysidopsis bahia
Comments:							
Conc-%	1	2	3	4			
D-Control	1.0000	1.0000	1.0000	1.0000			
1.5	1.0000	1.0000	1.0000	1.0000			
3.125	1.0000	1.0000	1.0000	1.0000			
6.25	1.0000	1.0000	0.8000	1.0000			
12.5	1.0000	0.8000	1.0000	1.0000			
25	1.0000	0.6000	1.0000	1.0000			
50	1.0000	1.0000	1.0000	1.0000			

			Tra	ansform:	Arcsin So	uare Roof	Rank	1-Tailed		
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D-Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4			
1.5	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	
3.125	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	
6.25	0.9500	0.9500	1.2857	1.1071	1.3453	9.261	4	16.00	10.00	
12.5	0.9500	0.9500	1.2857	1.1071	1.3453	9.261	4	16.00	10.00	
25	0.9000	0.9000	1.2305	0.8861	1.3453	18.660	4	16.00	10.00	
50	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	

Auviliany Tasts					Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non	-normal dis	stribution (	p <= 0.01)		0.70606	0.896	-2.1666	6.15821
Equality of variance cannot be co	nfirmed	_				<del></del>		
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU				
Steel's Many-One Rank Test	50	>50		2				



Dose-Response Plot



Client:	Shannon + Wilson
Sample ID:	Rundan
Contact:	
Test #:	0306-59NW

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Start Date & Time:	6/2//03	20:45	_
End Date & Time:	6723/03	5 17:30	
Test Organisms:	Musida	ssir bahia	
Test Protocol:			

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6.25	1	25	5	5	5	<u>\$6.9</u>	5.8	7.0	6.1	<u>\$</u> 8.	24.	8,21	8,24	8.33	<u>829,0</u>	29.8	29.0	30,9	<u> </u>	225	250	225	95%	
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Client:	Shannon + Wilson
Sample ID:	Rundan
Contact:	
Test #:	0306-59NW

Start Date & Time:	\$ / 2 Vo 3	2045
End Date & Time:	6/23/03	1730
Test Organisms:	Musidupsis	bala
Test Protocol:	· / ·	
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Reviewed: 14	<b>↓</b>						eck:								(253) 922-4296								

				My	sid Acute-48	Ir Survival		
Start Date: End Date: Sample Date: Comments:	9/13/03 9/15/03 9/12/03	ר ן ן	fest ID: ( _ab ID: \ Protocol: I	)309-04NW WAAEE-AMI EPA 02-EPA	EC NW Bioass	Sample ID: a) Sample Type: Test Species:	Carnival Spirit GW-Gray Water MY-Mysidopsis bahia	
Conc-%	1	2	3	4				
D-Control	1.0000	1.0000	0.8000	1.0000				
1.5	1.0000	1.0000	1.0000	1.0000				
3.125	1,0000	1.0000	1.0000	1.0000				
6.25	1.0000	0.8000	1.0000	1.0000				
12.5	1.0000	1.0000	1.0000	1.0000				
25	1.0000	1.0000	1.0000	1.0000				
50	1.0000	0.8000	1.0000	1.0000				

			Tra	ansform:	Arcsin Sq	Rank	1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Max	<u>CV%</u>	<u>N</u>	Sum	Critical	-
D-Control	0.9500	1.0000	1.2857	1.1071	1.3453	9.261	4			
1.5	1 0000	1 0526	1.3453	1.3453	1.3453	0.000	4	20.00	10.00	
2 125	1.0000	1.0526	1 3453	1.3453	1,3453	0.000	4	20.00	10.00	
5.125	0.0500	1 0000	1 2857	1.1071	1.3453	9.261	4	18.00	10.00	
0.2J	4 0000	1.0526	1 3453	1 3453	1.3453	0.000	4	20.00	10.00	
12.0	1.0000	1.0526	1 3453	1 3453	1.3453	0.000	4	20.00	10.00	
25	1.0000	1.0020	1 2957	1 1071	1 3453	9 261	4	18.00	10.00	
50	0.9500	1.0000	1.2007	1.107.1	1.5400	0.201	•			

					Statistic	Critical	Skew	Kurt
Auxiliary Tests	normal dis	tribution (	$n \le 0.01$		0.65146	0.896	-1.8653	3.19385
Shapiro-Wilk's Test indicates non	nfirmed		p · 0.01,					
Equality of variance carrier be co	NOEC	LOEC	ChV	TŪ				
Steel's Many-One Rank Test	50	>50		2				



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Client: <u>Shannon + Wilson</u> Sample ID: <u>Carnival Spirit</u> Contact:

Test #: 0308-01NW 0309-04NW

Conc.		-1	Number	of	D	issolve	d Oxyg	en	2010 101	р	<u>н</u>		6.441.44	Sa	linity				Mean		
		Liv	e Organ	nisms	拍	(mg	g/L)		(å15)	(u <u>r</u>	its)			(E	pt)		5. 	r ··· ·	Suprival		
, (	Rep Co	nt.	0		5	Fin.	Init.			Fin.	Init.			Fin.	Init.			<u>Fin.</u>		49	Survivar
(%)	# #	ŧ 0	24	48	0	24	24	48	0	24	24	48		$\frac{24}{200.7}$	24	48		1/24	24	75	95%
CON	1 114	3 5	5	5	6.8	03	8.2	6.1	8.35	8.10	8.25	7.15	24.5	1312	101.6	2017	1210	12.6	1-2.1	23.1	
	2 13	3 5	5_	5	4 5							<b> </b>			<u> </u>			<u> </u>			
	3 2	15	4	4	1. No. 1		L	<b>_</b>			<b> </b>							<u> </u> -			
	4 8	; S	5	5	2 7			~ .	園		0 12	0.10	<u>র্জা রানি নে নি</u>	216	101.	201	12 8	1250	125 <b>र</b>	167	100%
1.5	1 6	5	5	5	6.8	6.2	7.4	6.1	<u> 8.70</u>	8.12	8.42	2.12	21.3	21.0	161.0	1-21.2	40.0	123.0	-1.0		
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	3 9	5	12	12-					-		<u> </u>	-	民 定				10/12/				
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	3 6		-15-	12	-8			<u> </u>		+							が				
	1 10				1 1 1 1 7 1	101	183	50	830	1804	8.40	8.13	图29.2	32.6	29.6	<u>30,7</u>	27.0	25.2	25.0	252	100%
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control		184_									4		ialar R	ha N	r, et						
highest conc.		20			D	03			<u>3.8</u>			nysemie	iais. <u>(</u> )		<u>r_0</u>						
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	in													FITE, VVA 90424							
Reviewed:	<u></u>		<u> </u>				QA cl	neck: _	<u>{</u> /					(253) 922-4296							

Client:	Stannon + Willow	
Sample ID:	Camival Spint	
Contact:		
Test #:	0309-04NW	

Start Date & Time:	9/4/03 9/13/03 1615
End Date & Time:	4/15/07 1700
Test Organisms:	M. bahia
Test Protocol:	

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or			Live	e Organ	isms		( <u>m</u> i ⊤ ⊑:∽	3/L) 	<b>r</b>	§		ուշյ ⊑լու⊢1		Fin. Init.		Init	<b></b>		Fin.	Init.		Survival			
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