

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

Southcentral Alaska

Prepared for

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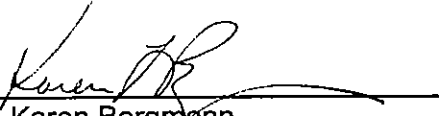
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INTRODUCTION

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.

Table 1. Sample Receipt Information

	Spirit of Columbia	Spirit of Columbia	Spirit of Oceanus	Sun Princess	Norwegian Wind	Ryndam	Carnival 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 ¹	11:30 ¹	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
pH	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

¹ 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.

² 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.

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

Test Organism:	<i>Mysidopsis bahia</i>
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:	<i>Artemia</i> 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 3. *Atherinops affinis* 96-hour Acute Toxicity Test Procedure

Test Organism:	<i>Atherinops affinis</i>
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:	<i>Artemia</i> 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:	≥ 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.

Table 4. Bivalve Larval Development Test Procedure

Test Organism:	<i>Mytilus galloprovincialis</i> ; <i>Crassostrea gigas</i>
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-µm 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 5. Echinoderm Fertilization Test Procedure

Test Organism:	<i>Strongylocentrotus purpuratus</i>
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±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:	≥ 70% control fertilization
Reference Toxicant:	Copper chloride

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

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.

	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	Not calculable						

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	Not calculable						
NT	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 ± 2.2 and 29.2 ± 15.3 µg/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

		<i>Mysidopsis bahia</i>				<i>Atherinops affinis</i>			
Survival		Survival				Survival			
Concentration				Mean %	LC ₅₀			Mean %	LC ₅₀
%	Replicate	# Survivors	% Survival	Survival	(% effluent)	# Survivors	% Survival	Survival	(% effluent)
Control	1	5	100	100	>50	4	80	90	>50
	2	5	100			5	100		
	3	5	100			5	100		
	4	5	100			4	80		
1.5	1	5	100	100		5	100	90	
	2	5	100			4	80		
	3	5	100			4	80		
	4	5	100			5	100		
3.125	1	5	100	95		5	100	85	
	2	5	100			4	80		
	3	5	100			4	80		
	4	4	80			4	80		
6.25	1	5	100	100		5	100	85	
	2	5	100			5	100		
	3	5	100			5	100		
	4	5	100			2	40		
12.5	1	5	100	100		5	100	95	
	2	5	100			5	100		
	3	5	100			5	100		
	4	5	100			4	80		
25	1	5	100	95		2	40	60	
	2	4	80			3	60		
	3	5	100			4	80		
	4	5	100			3	60		
50	1	5	100	100		4	80	80	
	2	5	100			4	80		
	3	5	100			4	80		
	4	5	100			4	80		

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

Concentration		Bivalve			Echinoderm		
		Larval Development			Sperm Cell Fertilization		
		Mean	EC ₅₀		Mean	EC ₅₀	
%	Replicate	% Normal	% Normal	(% effluent)	% Fertilized	% Fertilized	(% effluent)
Control	1	99	97	>50	85	82	>50
	2	95			87		
	3	98			81		
	4	95			77		
	5	97			80		
Brine Control	1	99	97		82	81	
	2	92			79		
	3	97			80		
	4	98			78		
	5	97			86		
1.5	1	96	96		85	81	
	2	96			75		
	3	97			75		
	4	93			80		
	5	99			88		
3.125	1	100	98		83	82	
	2	96			83		
	3	97			90		
	4	98			76		
	5	97			78		
6.25	1	96	97	73	79		
	2	98		81			
	3	96		82			
	4	98		80			
	5	97		80			
12.5	1	92	95	84	84		
	2	97		84			
	3	97		84			
	4	96		84			
	5	94		82			
25	1	98	97	76	79		
	2	95		73			
	3	96		83			
	4	98		80			
	5	99		82			
50	1	96	97	66	71		
	2	98		78			
	3	96		68			
	4	96		73			
	5	98		68			

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

		<i>Mysidopsis bahia</i>				<i>Atherinops affinis</i>			
Survival		Survival				Survival			
Concentration				Mean %	LC ₅₀			Mean %	LC ₅₀
%	Replicate	# Survivors	% Survival	Survival	(% effluent)	# Survivors	% Survival	Survival	(% effluent)
Control	1	4	80	95	39.2	5	100	90	27.4
	2	5	100			5	100		
	3	5	100			4	80		
	4	5	100			4	80		
1.5	1	5	100			4	80	80	
	2	5	100			5	100		
	3	5	100			4	80		
	4	5	100			3	60		
3.125	1	5	100			4	80	75	
	2	5	100			5	100		
	3	5	100			4	80		
	4	5	100			2	40		
6.25	1	3	60			5	100	90	
	2	5	100			5	100		
	3	5	100			4	80		
	4	4	80			4	80		
12.5	1	5	100			4	80	80	
	2	4	80			4	80		
	3	3	60			3	60		
	4	4	80			5	100		
25	1	4	80			2	40	45	
	2	4	80			4	80		
	3	3	60			3	60		
	4	4	80			3	60		
50	1	3	60			0	0	0	
	2	1	20			0	0		
	3	0	0			0	0		
	4	3	60			0	0		

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

Concentration		Bivalve			Echinoderm		
		Larval Development		EC ₅₀	Sperm Cell Fertilization		EC ₅₀
		Mean	Mean		Mean	Mean	
%	Replicate	% Normal	% Normal	(% effluent)	% Fertilized	% Fertilized	(% effluent)
Control	1	95	96	8.7	80	78	<1.5
	2	97			78		
	3	95			78		
	4	98			75		
	5	94			79		
Brine Control	1	95	95		74	78	
	2	96			86		
	3	98			78		
	4	91			71		
	5	93			81		
1.5	1	92	94		0	0	
	2	94			0		
	3	98			0		
	4	93			0		
	5	92			0		
3.125	1	92	93		0	0	
	2	97			0		
	3	90			0		
	4	95			0		
	5	90			0		
6.25	1	95	93	0	0		
	2	98		0			
	3	89		0			
	4	95		0			
	5	90		0			
12.5	1	0	0	0	0		
	2	0		0			
	3	0		0			
	4	0		0			
	5	0		0			
25	1	0	0	0	0		
	2	0		0			
	3	0		0			
	4	0		0			
	5	0		0			
50	1	0	0	0	0		
	2	0		0			
	3	0		0			
	4	0		0			
	5	0		0			

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

		<i>Mysidopsis bahia</i>				<i>Atherinops affinis</i>			
Survival		Survival				Survival			
Concentration				Mean %	LC ₅₀			Mean %	LC ₅₀
%	Replicate	# Survivors	% Survival	Survival	(% effluent)	# Survivors	% Survival	Survival	(% effluent)
Control	1	4	80	95	26.7	3	60	90	14.2
	2	5	100			5	100		
	3	5	100			5	100		
	4	5	100			5	100		
1.5	1	5	100	100		5	100	95	
	2	5	100			4	80		
	3	5	100			5	100		
	4	5	100			5	100		
3.125	1	5	100	95		5	100	95	
	2	4	80			5	100		
	3	5	100			5	100		
	4	5	100			4	80		
6.25	1	5	100	100		3	60	70	
	2	5	100			4	80		
	3	5	100			3	60		
	4	5	100			4	80		
12.5	1	5	100	80		5	100	65	
	2	1	20			2	40		
	3	5	100			3	60		
	4	5	100			3	60		
25	1	5	100	70		1	20	20	
	2	5	100			1	20		
	3	3	60			1	20		
	4	1	20			1	20		
50	1	0	0	5		0	0	0	
	2	1	20			0	0		
	3	0	0			0	0		
	4	0	0			0	0		

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

		Bivalve			Echinoderm		
Concentration		Larval Development			Sperm Cell Fertilization		
%	Replicate	% Normal	Mean % Normal	EC ₅₀ (% effluent)	% Fertilized	Mean % Fertilized	EC ₅₀ (% effluent)
Control	1	90	91	<1.5	99	98	5.0
	2	89			98		
	3	94			99		
	4	91			95		
	5	93			97		
Brine Control	1	89	90		100	93	
	2	94			91		
	3	84			92		
	4	93			91		
	5	90			91		
1.5	1	20	23		82	79	
	2	28			71		
	3	19			72		
	4	17			88		
	5	34			82		
3.125	1	0	0.0		81	81	
	2	0			70		
	3	0			82		
	4	0			87		
	5	0			85		
6.25	1	0	0.0	29	23		
	2	0		9			
	3	0		28			
	4	0		22			
	5	0		29			
12.5	1	0	0.0	2	1.6		
	2	0		1			
	3	0		0			
	4	0		3			
	5	0		2			
25	1	0	0.0	0	0.0		
	2	0		0			
	3	0		0			
	4	0		0			
	5	0		0			
50	1	0	0.0	0	0.2		
	2	0		1			
	3	0		0			
	4	0		0			
	5	0		0			

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

		<i>Mysidopsis bahia</i>				<i>Atherinops affinis</i>				
Survival		Survival				Survival				
Concentration				Mean %	LC ₅₀			Mean %	LC ₅₀	
%	Replicate	# Survivors	% Survival	Survival	(% effluent)	# Survivors	% Survival	Survival	(% effluent)	
Control	1	5	100	100	21.0	5	100	90	11.0	
	2	5	100			5	100			
	3	5	100			5	100			
	4	5	100			3	60			
1.5	1	5	100			5	100	100		
	2	5	100			5	100			
	3	5	100			5	100			
	4	5	100			5	100			
3.125	1	5	100			4	80	75		
	2	5	100			3	60			
	3	5	100			4	80			
	4	5	100			4	80			
6.25	1	5	100			4	80	75		
	2	5	100			4	80			
	3	5	100			3	60			
	4	5	100			4	80			
12.5	1	5	100			3	60	40		
	2	5	100			1	20			
	3	5	100			2	40			
	4	5	100			2	40			
25	1	2	40			0	0	0		
	2	1	20			0	0			
	3	1	20			0	0			
	4	1	20			0	0			
50	1	0	0			0	0	0		
	2	0	0			0	0			
	3	0	0			0	0			
	4	0	0			0	0			

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

		Bivalve			Echinoderm		
		Larval Development			Sperm Cell Fertilization		
Concentration		Mean	EC ₅₀		Mean	EC ₅₀	
%	Replicate	% Normal	% Normal	(% effluent)	% Fertilized	% Fertilized	(% effluent)
Control	1	93	92	1.8	100	100	1.1
	2	93			100		
	3	90			100		
	4	90			100		
	5	93			100		
Brine Control	1	90	90		98	92	
	2	91			91		
	3	84			85		
	4	93			90		
	5	92			96		
1.5	1	71	75		39	31	
	2	98			26		
	3	53			34		
	4	77			19		
	5	78			37		
3.125	1	2.6	1.2		8	2.6	
	2	1.8			1		
	3	1.2			3		
	4	0.6			1		
	5	0			0		
6.25	1	0	0.0		0	0.2	
	2	0			0		
	3	0			0		
	4	0			1		
	5	0			0		
12.5	1	0	0.0		0	0.0	
	2	0			0		
	3	0			0		
	4	0			0		
	5	0			0		
25	1	0	0.0		0	0.0	
	2	0			0		
	3	0			0		
	4	0			0		
	5	0			0		
50	1	0	0.0		0	0.0	
	2	0			0		
	3	0			0		
	4	0			0		
	5	0			0		

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

		<i>Mysidopsis bahia</i>				<i>Atherinops affinis</i>				
Survival		Survival				Survival				
Concentration				Mean %	LC ₅₀			Mean %	LC ₅₀	
%	Replicate	# Survivors	% Survival	Survival	(% effluent)	# Survivors	% Survival	Survival	(% effluent)	
Control	1	5	100	100	>50	5	100	90	25.5	
	2	5	100			5	100			
	3	5	100			3	60			
	4	5	100			5	100			
1.5	1	5	100			5	100	90		
	2	5	100			4	80			
	3	5	100			4	80			
	4	5	100			5	100			
3.125	1	5	100			5	100	75		
	2	5	100			3	60			
	3	5	100			4	80			
	4	5	100			3	60			
6.25	1	5	100			5	100	95		
	2	5	100			5	100			
	3	5	100			4	80			
	4	5	100			5	100			
12.5	1	4	80			4	80	70		
	2	5	100			5	100			
	3	5	100			3	60			
	4	5	100			2	40			
25	1	5	100			3	60	50		
	2	5	100			2	40			
	3	5	100			3	60			
	4	5	100			2	40			
50	1	4	80			1	20	10		
	2	4	80			0	0			
	3	3	60			0	0			
	4	5	100			1	20			

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

Concentration		Bivalve			Echinoderm		
		Larval Development			Sperm Cell Fertilization		
%	Replicate	% Normal	Mean % Normal	EC ₅₀ (% effluent)	% Fertilized	Mean % Fertilized	EC ₅₀ (% effluent)
Control	1	91	91	12	90	83	40
	2	93			83		
	3	93			81		
	4	95			82		
	5	82			80		
Brine Control	1	96	94		77	77	
	2	94			86		
	3	96			78		
	4	89			77		
	5	96			67		
1.5	1	87	84		80	75	
	2	88			65		
	3	90			86		
	4	62			66		
	5	93			79		
3.125	1	90	91		75	75	
	2	92			75		
	3	91			76		
	4	92			81		
	5	90			69		
6.25	1	92	92	66	75		
	2	87		79			
	3	95		75			
	4	92		77			
	5	92		76			
12.5	1	31	45	81	76		
	2	43		75			
	3	21		76			
	4	61		76			
	5	70		70			
25	1	0	0.0	86	77		
	2	0		78			
	3	0		87			
	4	0		74			
	5	0		61			
50	1	0	0.0	20	26		
	2	0		22			
	3	0		21			
	4	0		38			
	5	0		27			

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

		<i>Mysidopsis bahia</i>				<i>Atherinops affinis</i>			
Concentration		Survival				Survival			
%	Replicate	# Survivors	% Survival	Mean % Survival	LC ₅₀ (% effluent)	# Survivors	% Survival	Mean % Survival	LC ₅₀ (% effluent)
Control	1	5	100	100	>50	5	100	95	>50
	2	5	100			5	100		
	3	5	100			4	80		
	4	5	100			5	100		
1.5	1	5	100	100		4	80	90	
	2	5	100			4	80		
	3	5	100			5	100		
	4	5	100			5	100		
3.125	1	5	100	100		5	100	100	
	2	5	100			5	100		
	3	5	100			5	100		
	4	5	100			5	100		
6.25	1	5	100	95		5	100	100	
	2	5	100			5	100		
	3	4	80			5	100		
	4	5	100			5	100		
12.5	1	5	100	95		5	100	100	
	2	4	80			5	100		
	3	5	100			5	100		
	4	5	100			5	100		
25	1	5	100	90		5	100	90	
	2	3	60			5	100		
	3	5	100			5	100		
	4	5	100			3	60		
50	1	5	100	100		5	100	95	
	2	5	100			5	100		
	3	5	100			4	80		
	4	5	100			5	100		

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

Concentration		Bivalve			Echinoderm		
%	Replicate	Larval Development		EC ₅₀ (% effluent)	Sperm Cell Fertilization		EC ₅₀ (% effluent)
		% Normal	Mean % Normal		% Fertilized	Mean % Fertilized	
Control	1	97	91	21	97	94	>50
	2	88			93		
	3	79			98		
	4	92			94		
	5	97			90		
Brine Control	1	98	91		87	91	
	2	92			93		
	3	75			94		
	4	97			88		
	5	95			91		
1.5	1	94	91		94	93	
	2	96			95		
	3	90			89		
	4	78			96		
	5	95			92		
3.125	1	83	91		94	92	
	2	98			93		
	3	97			90		
	4	96			88		
	5	81			94		
6.25	1	85	90	93	93		
	2	96		97			
	3	87		94			
	4	89		91			
	5	91		92			
12.5	1	79	79	93	94		
	2	83		96			
	3	72		97			
	4	84		93			
	5	78		90			
25	1	36	34	94	92		
	2	25		89			
	3	51		89			
	4	13		94			
	5	46		93			
50	1	0	0.0	94	94		
	2	0		93			
	3	0		92			
	4	0		96			
	5	0		93			

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

		<i>Mysidopsis bahia</i>				<i>Atherinops affinis</i>			
Concentration		Survival				Survival			
%	Replicate	# Survivors	% Survival	Mean % Survival	LC ₅₀ (% effluent)	# Survivors	% Survival	Mean % Survival	LC ₅₀ (% effluent)
Control	1	5	100	95	>50	5	100	95	>50
	2	5	100			5	100		
	3	4	80			4	80		
	4	5	100			5	100		
1.5	1	5	100	100		5	100	90	
	2	5	100			3	60		
	3	5	100			5	100		
	4	5	100			5	100		
3.125	1	5	100	100		5	100	90	
	2	5	100			5	100		
	3	5	100			3	60		
	4	5	100			5	100		
6.25	1	5	100	95		5	100	95	
	2	4	80			4	80		
	3	5	100			5	100		
	4	5	100			5	100		
12.5	1	5	100	100		4	80	90	
	2	5	100			4	80		
	3	5	100			5	100		
	4	5	100			5	100		
25	1	5	100	100		5	100	95	
	2	5	100			4	80		
	3	5	100			5	100		
	4	5	100			5	100		
50	1	5	100	95		5	100	95	
	2	4	80			5	100		
	3	5	100			5	100		
	4	5	100			4	80		

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

Concentration		Bivalve			Echinoderm		
		Larval Development		EC ₅₀	Sperm Cell Fertilization		EC ₅₀
		Mean	Mean		Mean	Mean	
%	Replicate	% Normal	% Normal	(% effluent)	% Fertilized	% Fertilized	(% effluent)
Control	1	75	78	1.8		*	
	2	76					
	3	85					
	4	70					
	5	83					
Brine Control	1	86	82				
	2	86					
	3	81					
	4	83					
	5	75					
1.5	1	74	83				
	2	84					
	3	84					
	4	84					
	5	88					
3.125	1	88	82				
	2	81					
	3	81					
	4	80					
	5	79					
6.25	1	88	82				
	2	79					
	3	80					
	4	81					
	5	84					
12.5	1	77	82				
	2	75					
	3	86					
	4	83					
	5	90					
25	1	80	75				
	2	74					
	3	74					
	4	86					
	5	62					
50	1	0	0.0				
	2	0					
	3	0					
	4	0					
	5	0					

Appendix B

Statistical Summaries and Raw Bench Sheets

***Atherinops affinis* 96 h Survival**

Acute Fish Test-96 Hr Survival

Start Date: 6/10/03	Test ID: 0306-16NW	Sample ID: Spirit of Columbia
End Date: 6/14/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type: BW-Black Water
Sample Date: 6/9/03	Protocol: EPA 02-EPA Acute	Test Species: AA-Atherinops affinis

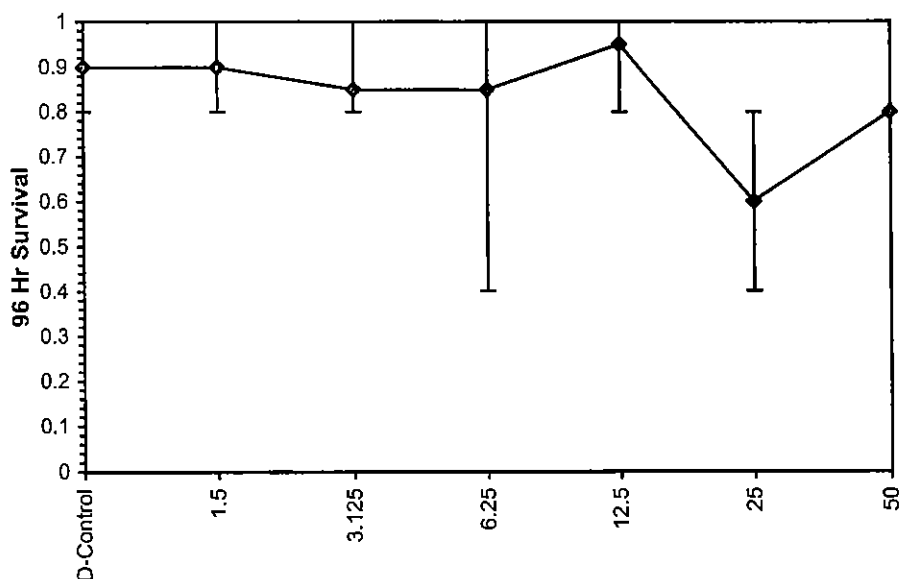
Comments:

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

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%	N		
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 normal distribution (p > 0.01)	0.90956	0.896	-1.2386	2.89322
Equality of variance cannot be confirmed				
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	50	>50		2

Dose-Response Plot



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 BW
 Contact: _____
 Test #: 0306-16NW

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

Start Date & Time: 6/10/03 1345
 End Date & Time: 6/14/03 1330
 Test Organism: Atherhops affinis
 Test Protocol: _____

Sample Conc. or (%)	D.O. (mg/L)						pH (mg/L)					
	Init.			Fin.			Init.			Fin.		
	0	24	48	48	72	96	0	24	48	48	72	96
CON	6.8	7.1	6.1	6.9	6.7	6.7	8.48	8.11	8.12	8.34	8.21	8.06
1.5	6.9	6.9	6.0	6.8	6.6	6.5	8.48	8.15	8.09	8.37	8.23	8.06
3.125	6.9	7.1	6.1	6.7	6.3	6.5	8.49	8.14	8.10	8.38	8.22	8.08
6.25	7.0	7.0	6.2	6.9	6.3	6.8	8.48	8.14	8.11	8.37	8.23	8.06
12.5	7.1	7.0	6.0	7.0	6.5	6.7	8.48	8.14	8.12	8.37	8.23	8.06
25	7.4	7.1	6.2	7.0	6.4	6.5	8.46	8.12	8.08	8.34	8.19	8.01

Sample Conc. or (%)	Salinity ppt				Test Temperature (°C)					
	Init.		Fin.		Init.		Fin.		Init.	
	0	48	48	96	0	24	48	48	72	96
CON	29.9	29.4	29.7	29.8	19.0	20.3	19.3	19.5	19.9	19.8
1.5	30.1	30.4	29.8	31.3	19.0	20.3	19.0	19.5	19.9	19.8
3.125	30.1	30.5	29.6	30.9	19.0	20.2	19.1	19.5	19.9	19.8
6.25	30.1	30.8	29.7	30.8	19.0	20.2	19.0	19.5	19.8	19.8
12.5	30.1	30.4	29.7	30.9	19.0	20.3	19.0	19.5	19.8	19.8
25	30.1	30.4	29.8	31.2	19.0	20.3	19.0	19.5	19.7	19.8

Conc.	Alkalinity* (mg/L as CaCO3)	Chlorine Resid. (mg/L)	Ammonia (mg/L)
control	56	—	—
highest conc.	80	2.03	1

Sample Description: _____

Comments: _____

Analysts: SM, ET, NC

Sample Conc. or (%)	Rep #	Cont #	Number of Live Organisms				
			0	24	48	72	96
CON	1	22	5	5	5	4	4
	2	10	5	5	5	5	5
	3	2	5	5	5	5	5
	4	21	5	4	4	4	4
1.5	1	5	5	5	5	5	5
	2	11	5	5	5	5	4
	3	1	5	4	4	4	4
	4	13	5	5	5	5	5
3.125	1	7	5	5	5	5	5
	2	24	5	5	5	4	4
	3	4	5	4	4	4	4
	4	16	5	5	5	4	4
6.25	1	26	5	5	5	5	5
	2	17	5	5	5	5	5
	3	19	5	5	5	5	5
	4	15	5	3	2 ³	2	2
12.5	1	23	5	5	5	5	5
	2	27	5	5	5	5	5
	3	14	5	5	5	5	5
	4	12	5	4	4	4	4
25	1	18	5	3	2	2	2
	2	8	5	3	3	3	3
	3	28	5	5	5	5	4
	4	25	5	3	3	3	3
Tech. Initials			SM	ET	NC	ET	NC

Animal Source: ABS
 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: Shannon + Wilson
 Sample ID: Spirit of Columbia #1
 Contact: _____
 Test #: 0306-16NW

Sample Conc. or %	D.O. (mg/L)						pH (mg/L)					
	Init.			Fin.			Init.			Fin.		
	0	24	48	48	72	96	0	24	48	48	72	96
50	8.0	7.1	6.3	6.9	6.5	6.7	8.40	8.08	8.04	8.34	8.11	8.05

Sample Conc. or %	Salinity ppt				Test Temperature (°C)					
	Init.		Fin.		Init.		Fin.		Init.	
	0	48	48	96	0	24	48	48	72	96
50	30.3	30.7	29.8	30.9	19.0	20.3	19.0	19.5	19.8	

Conc.	Alkalinity* (mg/L as CaCO ₃)	Chlorine Resid. (mg/L)	Ammonia (mg/L)
control			
highest conc.			

Sample Description: _____

Comments: _____

Analysts: _____

96 Hour Toxicity Test Data Sheet

Saltwater 96-hr Acute with Renewal

Start Date & Time: 6/10/03 1345
 End Date & Time: 6/14/03 1330
 Test Organism: Atherinops affinis
 Test Protocol: _____

Sample Conc. or %	Rep #	Cont #	Number of Live Organisms				
			0	24	48	72	96
50	1	3	5	4	4	4	4
	2	6	5	4	4	4	4
	3	9	5	4	4	4	4
	4	20	5	5	4	4	4
	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				
Tech. Initials			SM				

Animal Source: _____

Date Received: _____

Date of Hatch: _____

Acute Fish Test-96 Hr Survival

Start Date: 6/10/03 Test ID: 0306-17NW Sample ID: Spirit of Columbia
 End Date: 6/14/03 Lab ID: WAAEE-AMEC NW Bioassay Sample Type: GW-Gray Water
 Sample Date: 6/9/03 Protocol: EPA 02-EPA Acute Test Species: AA-Atherinops affinis
 Comments:

Conc.-%	1	2	3	4
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

Conc.-%	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical	Number Resp	Total Number
			Mean	Min	Max	CV%	N				
D-Control	0.9000	1.0000	1.2262	1.1071	1.3453	11.212	4			2	20
1.5	0.8000	0.8889	1.1114	0.8861	1.3453	16.874	4	15.00	10.00	4	20
3.125	0.7500	0.8333	1.0611	0.6847	1.3453	25.905	4	15.00	10.00	5	20
6.25	0.9000	1.0000	1.2262	1.1071	1.3453	11.212	4	18.00	10.00	2	20
12.5	0.8000	0.8889	1.1114	0.8861	1.3453	16.874	4	15.00	10.00	4	20
25	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	20	20

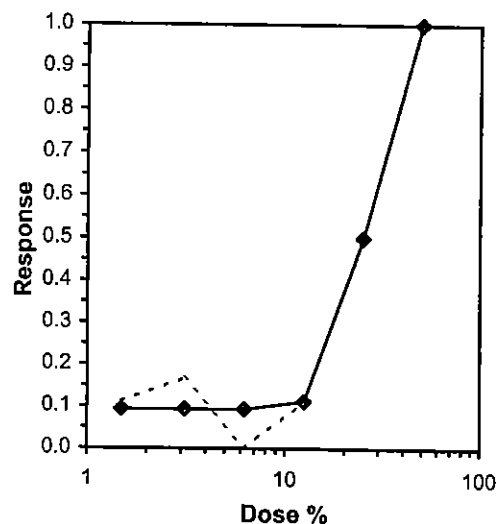
Auxiliary Tests

Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$) Statistic 0.97228 Critical 0.896 Skew 0.03166 Kurt 0.28984
 Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	25	50	35.3553	4

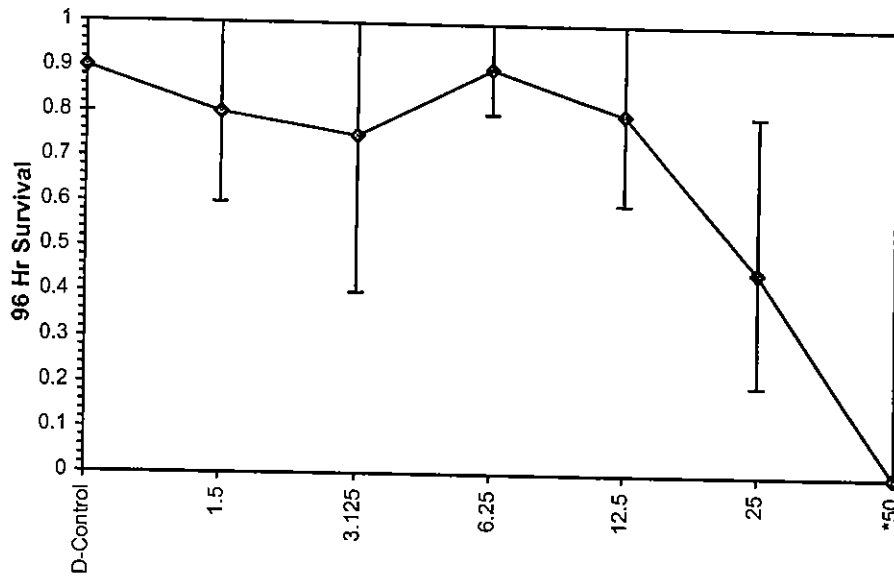
Trim Level	EC50	95% CL	
0.0%			
5.0%			
10.0%	23.963	19.204	29.901
20.0%	24.268	18.917	31.134
Auto-9.3%	23.832	18.961	29.955

Trimmed Spearman-Kärber



Acute Fish Test-96 Hr Survival			
Start Date: 6/10/03	Test ID: 0306-17NW	Sample ID:	Spirit of Columbia
End Date: 6/14/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type:	GW-Gray Water
Sample Date: 6/9/03	Protocol: EPA 02-EPA Acute	Test Species:	AA-Atherinops affinis
Comments:			

Dose-Response Plot



AMEC Earth Environmental
Northwest Bioassay Lab
 5009 Pacific Hwy. E. Suite 2-0
 Fife, WA 98424

Client: Shannon + Wilson
 Sample ID: Spirit of Columbia #2 GW
 Contact: _____
 Test #: 0306-17 NW

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: _____

Sample Conc. or %	D.O. (mg/L)						pH (mg/L)					
	Init.		Fin.	Init.		Fin.	Init.		Fin.	Init.		Fin.
	0	24	48	48	72	96	0	24	48	72	96	
CON	6.8	5.4	7.1	6.8	6.6	7.1	8.48	8.15	8.00	8.37	8.22	8.07
1.5	6.8	5.9	7.1	6.8	6.8	6.9	8.51	8.13	8.01	8.36	8.18	8.06
3.125	6.8	5.4	6.8	6.8	6.9	6.9	8.51	8.08	7.99	8.35	8.11	8.08
6.25	6.8	4.3	6.9	6.6	6.7	8.6	8.48	7.97	7.97	8.34	8.06	8.02
12.5	6.8	3.9	6.6	6.7	6.9	12.2	8.43	7.83	7.93	8.30	7.92	8.01
25	7.0	4.8	5.8	6.6	6.8	5.5	8.32	7.68	7.73	8.22	7.70	7.93

Sample Conc. or %	Salinity ppt				Test Temperature (°C)					
	Init.	Fin.	Init.	Fin.	Init.		Fin.	Init.		Fin.
	0	48	48	96	0	24	48	48	72	96
CON	29.9	30.7	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	20.2	19.9	19.9	19.9	19.6
3.125	30.0	30.9	29.6	30.7	19.5	20.1	19.9	20.0	19.8	19.5
6.25	30.0	30.5	29.7	31.0	19.6	20.2	20.0	19.9	19.9	19.6
12.5	30.0	30.3	29.8	31.0	19.3	19.8	20.0	19.9	19.8	19.6
25	30.0	30.5	29.9	31.5	19.0	20.0	19.9	19.5	19.9	19.6

Conc.	Alkalinity* (mg/L as CaCO ₃)	Chlorine Resid. (mg/L)	Ammonia (mg/L)
control	56	—	—
highest conc.	20	.17	4.4

Sample Description: _____

Comments: Sample aerated prior to test initiation
Air started at 24H

Analysts: _____

Sample Conc. or %	Rep #	Cont #	Number of Live Organisms				
			0	24	48	72	96
CON	1	13	5	5	5	5	5
	2	2	5	5	5	5	5
	3	18	5	5	4	4	4
	4	6	5	5	5	4	4
1.5	1	21	5	5	5	4	4
	2	23	5	5	5	5	5
	3	27	5	4	4	4	4
	4	14	5	3	3	3	3
3.125	1	11	5	5	5	5	4
	2	10	5	5	5	5	5
	3	7	5	4	4	4	4
	4	12	5	2	2	2	2
6.25	1	9	5	5	5	5	5
	2	15	5	5	5	5	5
	3	24	5	5	5	5	4
	4	16	5	5	5	5	4
12.5	1	25	5	4	4	4	4
	2	26	5	4	4	4	4
	3	1	5	3	3	3	3
	4	8	5	5	5	5	5
25	1	5	5	2	2	2	2
	2	28	5	4	4	4	4
	3	3	5	2	2	2	2
	4	17	5	1	1	1	1
Tech. Initials			SM	ET	ET	ET	MF

Animal Source: ABS
 Date Received: 6/10/03
 Date of Hatch: 6/30/03

AMEC Earth & Environmental

Northwest Bioassay Lab

5009 Pacific Hwy. E., Suite 2

Fife, WA 98424

96 Hour Toxicity Test Data Sheet

Saltwater 96-hr Acute with Renewal

Client: Shannon + W. Kun
 Sample ID: Spirit of Columbia #2 GW
 Contact: _____
 Test #: 03-06-17 NW

Start Date & Time: 6/10/03 1415
 End Date & Time: 6/14/03 1400
 Test Organism: Atherinops ethini's
 Test Protocol: _____

Sample Conc. or (%)	D.O. (mg/L)						pH (mg/L)					
	Init.		Fin.	Init.		Fin.	Init.		Fin.	Init.		Fin.
	0	24	48	48	72	96	0	24	48	48	72	96
50	7.2	0.5	—	—	—	—	8.01	7.51	—	—	—	—
		4.5										

Sample Conc. or (%)	Salinity ppt				Test Temperature (°C)					
	Init.	Fin.	Init.	Fin.	Init.		Fin.	Init.		Fin.
	0	48	48	96	0	24	48	48	72	96
50	30.0	30.7	—	—	19.0	20.0	—	—	—	—

Conc.	Alkalinity* (mg/L as CaCO ₃)	Chlorine Resid. (mg/L)	Ammonia (mg/L)
control			
highest conc.			

Sample Description: _____

Comments: _____

Analysts: _____

Sample Conc. or (%)	Rep #	Cont #	Number of Live Organisms				
			0	24	48	72	96
50	1	19	5	0	—	—	—
	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				
	1		5				
	2		5				
	3		5				
	4		5				
Tech. Initials		SM					NR

Animal Source: _____

Date Received: _____

Date of Hatch: _____

Acute Fish Test-96 Hr Survival

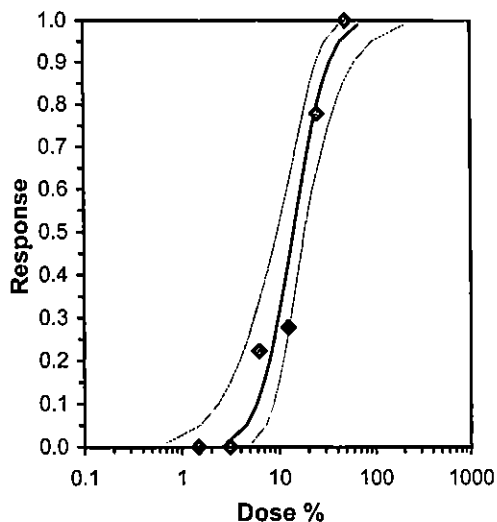
Start Date: 6/13/03	Test ID: 0306-21NW	Sample ID:	Spirit of Oceanus
End Date: 6/17/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type:	BW/GW-Combined gray & black water
Sample Date: 6/12/03	Protocol: EPA 02-EPA Acute	Test Species:	AA-Atherinops affinis
Comments:			

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

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical	Number Resp	Total Number
			Mean	Min	Max	CV%	N				
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 normal distribution (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

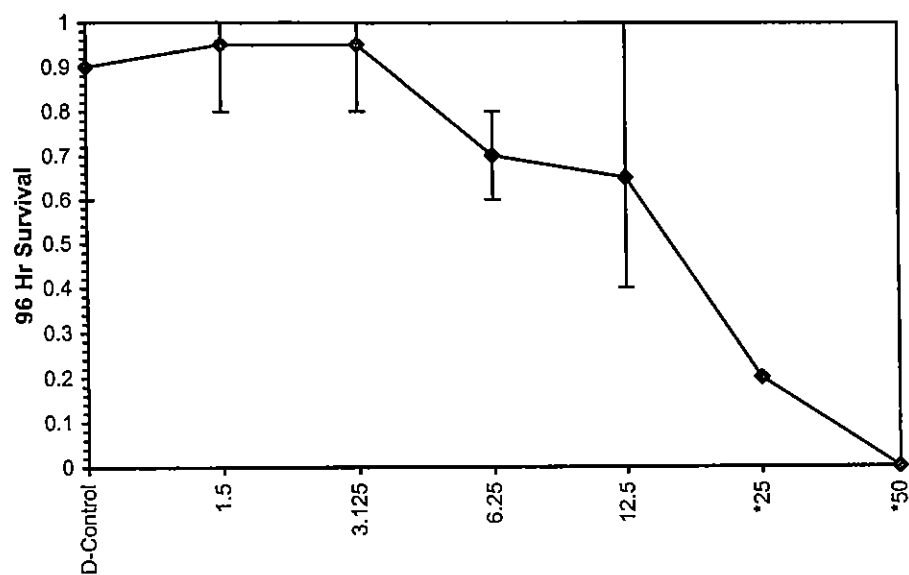
Maximum Likelihood-Probit											
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	3.38509	0.74637	1.92221	4.84797	0.1	4.23275	9.48773	0.38	1.1512	0.29541	5
Intercept	1.10308	0.92644	-0.7127	2.91891							
TSCR	0.07468	0.03667	0.00281	0.14654							
Point	Probits	%	95% Fiducial Limits								
EC01	2.674	2.91049	0.70651	5.24714							
EC05	3.355	4.62689	1.57453	7.36208							
EC10	3.718	5.92397	2.40288	8.8585							
EC15	3.964	6.99881	3.1861	10.0673							
EC20	4.158	7.9905	3.97644	11.1741							
EC25	4.326	8.95256	4.79656	12.2517							
EC40	4.747	11.9222	7.56372	15.7165							
EC50	5.000	14.1645	9.75811	18.6116							
EC60	5.253	16.8284	12.3091	22.5414							
EC75	5.674	22.4106	17.0688	32.8827							
EC80	5.842	25.1088	19.0866	38.8924							
EC85	6.036	28.6666	21.5427	47.7337							
EC90	6.282	33.8678	24.8376	62.3873							
EC95	6.645	43.3622	30.278	93.9766							
EC99	7.326	68.9341	42.9876	206.973							



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 Bioassay	Sample Type: BW/GW-Combined gray & black water
Sample Date: 6/12/03	Protocol: EPA 02-EPA Acute	Test Species: AA-Atherinops affinis
Comments:		

Dose-Response Plot



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Client: Shannon & Wilson
 Sample ID: Spirit of Oceanus
 Contact: _____
 Test #: 0306-21NW

96 Hour Toxicity Test Data Sheet

Saltwater 96-hr Acute with Renewal

Start Date & Time: 6/13/03 1450
 End Date & Time: 6/17/03 1415
 Test Organism: Atheinops affinis
 Test Protocol: _____

Sample Conc. or (%)	D.O. (mg/L)						pH (mg/L)					
	Init.		Fin.	Init.	6.5 hr	Fin.	Init.		Fin.	Init.		Fin.
	0	24	48	48	72	96	0	24	48	48	72	96
CON	6.8	6.7	6.72	5.8	7.2	7.1	8.24	8.06	8.02	8.32	8.16	7.97
1.5	6.8	6.5	7.5	6.5	6.5	7.2	8.24	8.00	8.06	8.32	8.12	8.02
3.125	6.8	5.8	7.5	6.5	6.1	7.3	8.23	7.93	8.07	8.31	8.02	8.02
6.25	6.8	4.8	7.3	6.9	5.7	7.0	8.20	7.80	8.08	8.28	7.86	8.03
12.5	6.7	6.8	7.2	6.5	5.7	7.0	8.09	7.67	8.06	8.23	7.73	8.03
25	6.3	7.0	7.0	6.5	5.9	7.2	8.09	7.67	8.05	8.15	7.70	8.06

Sample Conc. or (%)	Salinity ppt				Test Temperature (°C)					
	Init.	Fin.	Init.	Fin.	Init.		Fin.	Init.		Fin.
	0	48	48	96	0	24	48	48	72	96
CON	29.3	30.1	29.5	30.5	20.5	20.5	20.0	20.9	20.2	19.8
1.5	29.6	30.0	29.5	30.5	20.1	20.5	19.8	20.4	20.0	19.8
3.125	29.5	30.0	29.5	30.6	20.4	20.5	19.2	20.6	20.0	20.0
6.25	29.4	30.1	29.5	30.8	20.7	20.5	19.0	20.7	19.9	19.8
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	20.5	19.2	19.2	19.8	20.0

19.9

	Alkalinity*	Chlorine Resid.	Ammonia
Conc.	*(mg/L as CaCO ₃)	(mg/L)	(mg/L)
control	56	—	—
highest conc.	256	< 0.3	0.42

Sample Description: _____

Comments: testacrated day 0Analysts: SM, MF

Sample Conc. or (%)	Rep #	Cont #	Number of Live Organisms				
			0	24	48	72	96
CON	1	23	5	3	3	3	3
	2	25	5	5	5	5	5
	3	20	5	5	5	5	5
	4	6	5	5	5	5	5
1.5	1	26	5	5	5	5	5
	2	9	5	5	4	4	4
	3	24	5	5	5	5	5
	4	13	5	5	5	5	5
3.125	1	4	5	5	5	5	5
	2	7	5	5	5	5	5
	3	18	5	5	5	5	5
	4	11	5	5	5	5	4
6.25	1	28	5	5	5	5	3
	2	3	5	5	5	5	4
	3	21	5	4	4	4	3
	4	1	5	5	5	5	4
12.5	1	16	5	5	5	5	5
	2	12	5	5	4	3	2
	3	5	5	4	4	4	3
	4	14	5	5	3	3	3
25	1	8	5	2	2	2	1
	2	27	5	2	1	1	1
	3	2	5	3	3	1	1
	4	19	5	3	2	1	1
Tech. Initials			SM	MF	MF	MF	MF

Animal Source: ABS
 Date Received: 6/13/03
 Date of Hatch: 6/2/03

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

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

page 2 of 2

Client: Shannon & Wilson
 Sample ID: Spirit of Oceanus
 Contact: _____
 Test #: 0306-21NW

Start Date & Time: 6/13/03 1450
 End Date & Time: 6/17/03 1415
 Test Organism: A. affinis
 Test Protocol: _____

Sample Conc. or (%)	D.O. (mg/L)						pH (mg/L)					
	Init.		Fin.	Init.		Fin.	Init.		Fin.	Init.		Fin.
	0	24	48	48	72	96	0	24	48	48	72	96
50	6.4	7.0					7.97	7.73				

Sample Conc. or (%)	Salinity ppt				Test Temperature (°C)					
	Init.	Fin.	Init.	Fin.	Init.		Fin.	Init.		Fin.
	0	48	48	96	0	24	48	48	72	96
50	29.0	29.5			20.5	20.5				

	Alkalinity*	Chlorine Resid.	Ammonia
Conc.	*(mg/L as CaCO ₃)	(mg/L)	(mg/L)
control			
highest conc.			

Sample Description: _____

Comments: _____

Analysts: _____

Sample Conc. or (%)	Rep #	Cont #	Number of Live Organisms				
			0	24	48	72	96
50	1	15	5	0			
	2	10	5	0			
	3	17	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				
	1		5				
	2		5				
	3		5				
	4		5				
Tech. Initials			SM	NP			

Animal Source: _____

Date Received: _____

Date of Hatch: _____

Acute Fish Test-96 Hr Survival

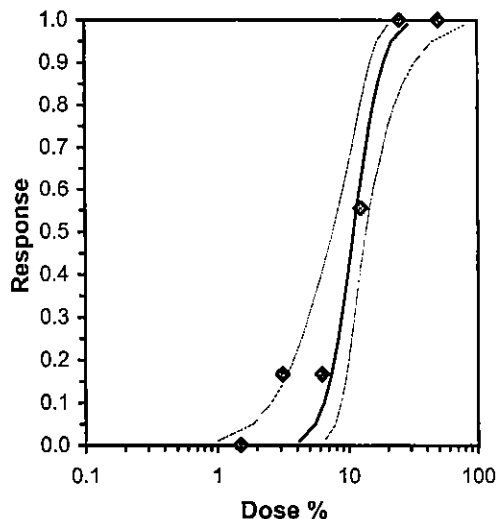
Start Date: 6/17/03	Test ID: 0306-25NW	Sample ID: Sun Princess
End Date: 6/21/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type: BW/GW-Combined gray & black water
Sample Date: 6/16/03	Protocol: EPA 02-EPA Acute	Test Species: AA-Atherinops affinis
Comments:		

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
50	0.0000	0.0000	0.0000	0.0000

Conc-%	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical	Number Resp	Total Number
	Mean	N-Mean	Mean	Min	Max	CV%	N				
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

Auxiliary Tests					Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.01$)					0.81529	0.896	-1.4086	3.24065
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

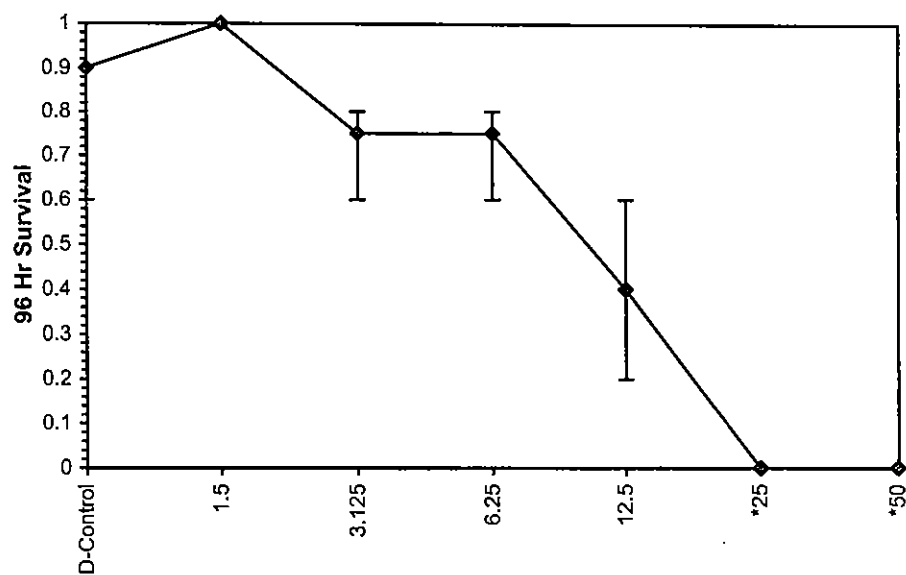
Maximum Likelihood-Probit											
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	5.53004	1.55597	2.48033	8.57975	0.1	6.87647	9.48773	0.14	1.04179	0.18083	23
Intercept	-0.7611	1.73038	-4.1527	2.63041							
TSCR	0.12316	0.04216	0.04052	0.2058							
Point	Probits	%	95% Fiducial Limits								
EC01	2.674	4.17939	0.99724	6.49864							
EC05	3.355	5.5507	1.85507	7.8968							
EC10	3.718	6.4572	2.57361	8.79194							
EC15	3.964	7.15103	3.20217	9.47497							
EC20	4.158	7.75527	3.80181	10.0758							
EC25	4.326	8.31418	4.39624	10.6427							
EC40	4.747	9.90774	6.25676	12.3783							
EC50	5.000	11.01	7.61942	13.7645							
EC60	5.253	12.2349	9.10461	15.5988							
EC75	5.674	14.5799	11.5855	20.2917							
EC80	5.842	15.6307	12.5193	22.9359							
EC85	6.036	16.9514	13.5723	26.7109							
EC90	6.282	18.7729	14.8684	32.6944							
EC95	6.645	21.8387	16.7971	44.7012							
EC99	7.326	29.0043	20.6781	82.0794							



Acute Fish Test-96 Hr Survival

Start Date: 6/17/03	Test ID: 0306-25NW	Sample ID: Sun Princess
End Date: 6/21/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type: BW/GW-Combined gray & black water
Sample Date: 6/16/03	Protocol: EPA 02-EPA Acute	Test Species: AA-Atherinops affinis
Comments:		

Dose-Response Plot



AMEC Earth & Environmental

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 1900
 End Date & Time: 6/21/03 19:30
 Test Organism: Athelopsis affinis
 Test Protocol: _____

Sample Conc. or (%)	D.O. (mg/L)						pH (mg/L)					
	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	8.06	8.37	8.15	8.09
1.5	6.7	7.1	6.6	6.7	6.8	6.4	8.16	8.10	8.05	8.32	8.18	8.09
3.125	6.8	7.4	6.7	6.8	7.0	6.2	8.15	8.10	8.07	8.33	8.15	8.12
6.25	6.6	7.2	6.8	6.8	5.6	6.4	8.12	8.09	8.07	8.20	8.14	8.11
12.5	6.8	7.1	6.7	6.8	6.6	6.5	8.06	8.07	8.06	8.27	8.11	8.06
25	7.2	6.4	6.5	7.0	6.7	—	7.96	8.04	8.06	8.17	8.08	—

8.32

Sample Conc. or (%)	Salinity ppt				Test Temperature (°C)					
	Init.		Fin.		Init.		Fin.		Init.	
	0	48	48	96	0	24	48	48	72	96
CON	29.5	29.4	29.7	29.8	21.0	19.8	19.8	21.0	19.9	19.8
1.5	29.5	29.0	29.7	30.5	21.0	19.6	20.0	21.0	19.6	19.8
3.125	29.5	29.0	29.7	30.1	21.0	19.5	19.9	21.0	20.2	19.8
6.25	29.4	29.1	29.6	30.3	21.0	19.5	19.7	20.8	20.2	19.7
12.5	29.4	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	—	20.0	19.5	20.0	20.5	19.8	—

Conc.	Alkalinity* (mg/L as CaCO ₃)	Chlorine Resid. (mg/L)	Ammonia (mg/L)
control	56	—	—
highest conc.	496	<.03	142.8

Sample Description: _____

Comments: _____

Analysts: KB

Sample Conc. or (%)	Rep #	Cont #	Number of Live Organisms				
			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	5	3	3	3
1.5	1	10	5	5	5	5	5
	2	4	5	5	5	5	5
	3	8	5	5	5	5	5
	4	9	5	5	5	5	5
3.125	1	11	5	5	4	4	4
	2	26	5	3	3	3	3
	3	5	5	4	4	4	4
	4	17	5	5	5	4	4
6.25	1	23	5	5	5	4	4
	2	20	5	5	5	4	4
	3	7	5	5	5	3	3
	4	25	5	5	4	4	4
12.5	1	18	5	5	3	3	3
	2	12	5	3	1	1	1
	3	15	5	5	2	2	2
	4	28	5	5	2	2	2
25	1	13	5	3	0	—	—
	2	24	5	5	0	—	—
	3	2	5	3	0	—	—
	4	1	5	2	0	—	—
Tech. Initials			KB	et	SM	et	et

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

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

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

Sample Conc. or (%)	D.O. (mg/L)						pH (mg/L)					
	Init.			Fin.			Init.			Fin.		
	0	24	48	48	72	96	0	24	48	48	72	96
50	7.9	5.1	—	—	—	—	7.84	8.01	—	—	—	—

Sample Conc. or (%)	Salinity ppt				Test Temperature (°C)					
	Init.		Fin.		Init.		Fin.		Init.	
	0	48	48	96	0	24	48	48	72	96
50	29.3	—	—	—	19.0	19.4	—	—	—	—

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

Sample Description: _____

Comments: _____

Analysts: _____

page 2 of 2

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

Start Date & Time: 6/17/03 1900
End Date & Time: 6/21/03 1830
Test Organism: Atherinops affinis
Test Protocol: _____

Sample Conc. or (%)	Rep #	Cont #	Number of Live Organisms				
			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				
	4		5				
	1		5				
	2		5				
	3		5				
	4		5				
Tech. Initials							

Animal Source: _____
Date Received: _____
Date of Hatch: _____

Acute Fish Test-96 Hr Survival

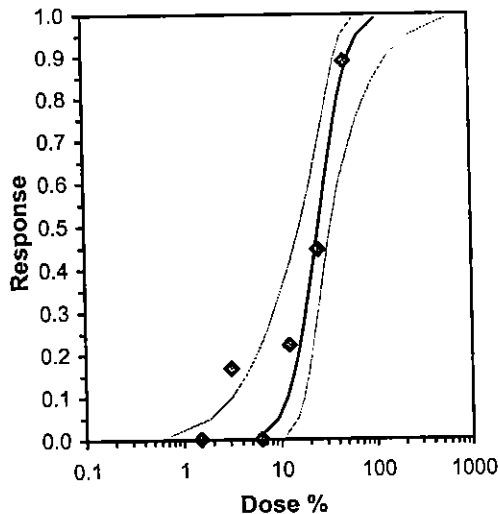
Start Date: 6/19/03	Test ID: 0306-57NW	Sample ID:	Norwegian Wind
End Date: 6/23/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type:	BW/GW-Combined gray & black water
Sample Date: 6/18/03	Protocol: EPA 02-EPA Acute	Test Species:	AA-Atherinops affinis
Comments:			

Conc-%	1	2	3	4
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

Conc-%	Transform: Arcsin Square Root							t-Stat	1-Tailed Critical	MSD	Number Resp	Total Number
	Mean	N-Mean	Mean	Min	Max	CV%	N					
D-Control	0.9000	1.0000	1.2305	0.8861	1.3453	18.660	4				2	20
1.5	0.9000	1.0000	1.2262	1.1071	1.3453	11.212	4	0.032	2.451	0.3258	2	20
3.125	0.7500	0.8333	1.0561	0.8861	1.3453	20.748	4	1.312	2.451	0.3258	5	20
6.25	0.9500	1.0556	1.2857	1.1071	1.3453	9.261	4	-0.416	2.451	0.3258	1	20
12.5	0.7000	0.7778	1.0058	0.6847	1.3453	28.293	4	1.691	2.451	0.3258	6	20
*25	0.5000	0.5556	0.7854	0.6847	0.8861	14.802	4	3.349	2.451	0.3258	10	20
*50	0.1000	0.1111	0.3446	0.2255	0.4636	39.900	4	6.667	2.451	0.3258	18	20

Auxiliary Tests					Statistic	Critical	Skew	Kurt						
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.92256	0.896	-0.189	-0.2645						
Bartlett's Test indicates equal variances (p = 0.65)					4.22095	16.8119								
Hypothesis 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

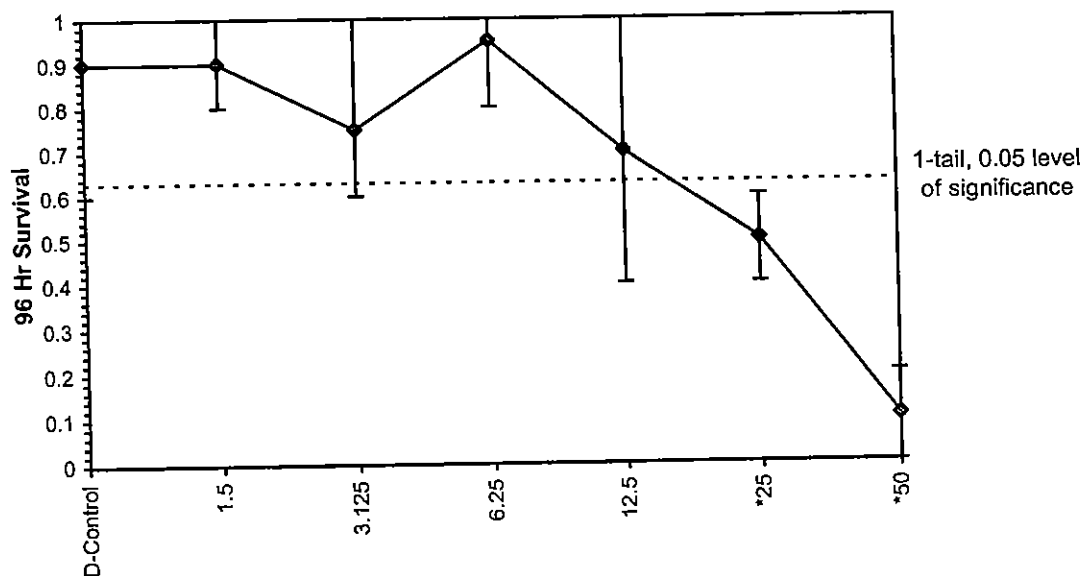
Maximum Likelihood-Probit											
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	3.78838	1.10377	1.62499	5.95177	0.1	4.75751	9.48773	0.31	1.40644	0.26397	8
Intercept	-0.3281	1.61479	-3.4931	2.83684							
TSCR	0.13048	0.03929	0.05348	0.20748							
Point	Probits	%	95% Fiducial Limits								
EC01	2.674	6.19967	0.74364	11.4171							
EC05	3.355	9.38122	1.92426	15.0849							
EC10	3.718	11.6993	3.17866	17.5863							
EC15	3.964	13.5788	4.44396	19.5737							
EC20	4.158	15.2857	5.78141	21.381							
EC25	4.326	16.92	7.22126	23.1409							
EC40	4.747	21.8559	12.3418	28.9426							
EC50	5.000	25.4943	16.5109	34.168							
EC60	5.253	29.7384	21.2053	42.0166							
EC75	5.674	38.4136	29.0093	65.6526							
EC80	5.842	42.5208	31.9956	80.4693							
EC85	6.036	47.8658	35.4723	103.145							
EC90	6.282	55.5556	39.9535	142.498							
EC95	6.645	69.2831	47.0525	233.02							
EC99	7.326	104.838	62.7123	597.736							



Acute Fish Test-96 Hr Survival

Start Date: 6/19/03	Test ID: 0306-57NW	Sample ID: Norwegian Wind
End Date: 6/23/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type: BW/GW-Combined gray & black water
Sample Date: 6/18/03	Protocol: EPA 02-EPA Acute	Test Species: AA-Atherinops affinis
Comments:		

Dose-Response Plot



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

Client: Shannon & Wilson
 Sample ID: Norwegian Wind
 Contact: _____
 Test #: 0306-57NW

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: Atherinops affinis
 Test Protocol: _____

Sample Conc. or (%)	D.O. (mg/L)						pH (mg/L)					
	Init.		Fin.	Init.		Fin.	Init.		Fin.	Init.		Fin.
	0	24	48	48	72	96	0	24	48	48	72	96
CON	6.8	7.2	6.5	7.3	7.1	6.9	8.36	8.28	8.18	8.27	8.27	8.21
1.5	6.8	7.3	6.7	7.2	7.1	6.9	8.35	8.27	8.19	8.29	8.28	8.22
3.125	6.8	7.3	6.6	7.4	7.3	6.8	8.35	8.24	8.11	8.23	8.25	8.21
6.25	6.7	7.3	6.6	7.1	7.0	6.9	8.33	8.19	8.17	8.20	8.18	8.20
12.5	6.7	7.2	6.7	7.0	6.9	6.9	8.31	8.21	8.15	8.21	8.19	8.18
25	6.8	7.2	6.5	7.1	6.8	6.8	8.25	8.14	8.09	8.17	8.15	8.14

Sample Conc. or (%)	Salinity ppt				Test Temperature (°C)					
	Init.	Fin.	Init.	Fin.	Init.		Fin.	Init.		Fin.
	0	48	48	96	0	24	48	48	72	96
CON	29.4	30.1	29.7	29.6	20.0	19.8	20.1	19.9	20.1	20.2
1.5	29.6	30.2	29.6	29.5	20.0	19.9	19.9	19.8	20.1	20.2
3.125	29.6	30.3	29.6	29.7	20.0	20.1	19.9	20.0	20.1	20.2
6.25	29.6	30.2	29.6	29.7	20.0	20.0	19.9	20.0	20.0	20.2
12.5	29.5	30.2	29.7	29.8	20.0	20.0	19.8	19.8	20.1	20.2
25	29.6	30.4	29.7	29.9	20.0	19.9	19.8	19.8	20.1	20.2

Conc.	Alkalinity* (mg/L as CaCO ₃)	Chlorine Resid. (mg/L)	Ammonia (mg/L)
control	60	8.4	—
highest conc.	44	.05	35.8

Sample Description: _____

Comments: _____

Analysts: et m

Sample Conc. or (%)	Rep #	Cont #	Number of Live Organisms				
			0	24	48	72	96
CON	1	26	5	5	5	5	5
	2	6	5	5	5	5	5
	3	5	5	5	5	4	3
	4	15	5	5	5	5	5
1.5	1	4	5	5	5	5	5
	2	18	5	5	5	5	4
	3	19	5	5	5	5	4
	4	25	5	5	5	5	5
3.125	1	10	5	5	5	5	5
	2	3	5	5	5	5	3
	3	1	5	5	5	5	4
	4	28	5	5	5	4	3
6.25	1	7	5	5	5	5	5
	2	22	5	5	5	5	5
	3	27	5	5	4	4	4
	4	23	5	5	5	5	5
12.5	1	12	5	5	4	4	4
	2	11	5	5	5	5	5
	3	2	5	5	5	4	3
	4	13	5	5	4	4	2
25	1	21	5	5	4	4	3
	2	17	5	5	4	3	2
	3	20	5	5	3	3	3
	4	14	5	5	3	3	2
Tech. Initials				et	et	et	m

Animal Source: ABS

Date Received: 6/17/03

Date of Hatch: 6/7/03

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

Client: Shannon & Wilson
 Sample ID: Norwegian Wind
 Contact: _____
 Test #: 0306-57NW

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: Atherinops affinis
 Test Protocol: _____

Sample Conc. or (%)	D.O. (mg/L)						pH (mg/L)					
	Init.	24	48	48	72	96	Init.	24	48	48	72	96
50	8.11	6.9	6.6	7.1		6.5	29.7	7.99	8.03	8.05		8.06

Sample Conc. or (%)	Salinity ppt				Test Temperature (°C)					
	Init.	Fin.	Init.	Fin.	Init.	24	48	48	72	96
50	6.9	30.2	29.9	30.5	20.0	19.9	19.7	19.8	20.1	20.2

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

Sample Description: _____

Comments: _____

Analysts: _____

Sample Conc. or (%)	Rep #	Cont #	Number of Live Organisms				
			0	24	48	72	96
50	1	16	5	4	3	3	1
	2	9	5	4	1	1	0
	3	8	5	1	0		
	4	24	5	5	4	3	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				
Tech. Initials				et	et	et	

Animal Source: _____

Date Received: _____

Date of Hatch: _____

Acute Fish Test-96 Hr Survival

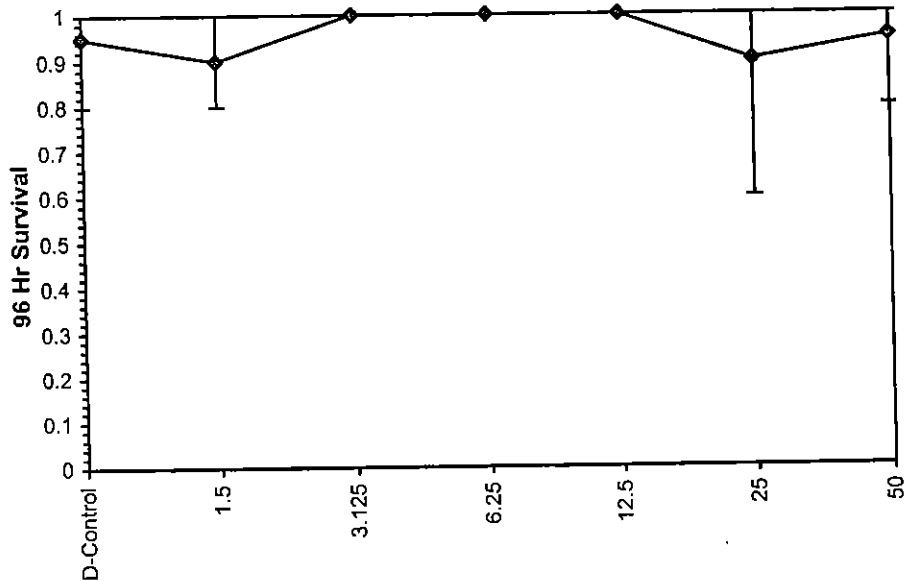
Start Date: 6/21/03	Test ID: 0306-60NW	Sample ID: Ryndam
End Date: 6/25/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type: BW/GW-Combined gray & black water
Sample Date: 6/20/03	Protocol: EPA 02-EPA Acute	Test Species: AA-Atherinops affinis
Comments:		

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

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%	N		
D-Control	0.9500	1.0000	1.2857	1.1071	1.3453	9.261	4		
1.5	0.9000	0.9474	1.2262	1.1071	1.3453	11.212	4	16.00	10.00
3.125	1.0000	1.0526	1.3453	1.3453	1.3453	0.000	4	20.00	10.00
6.25	1.0000	1.0526	1.3453	1.3453	1.3453	0.000	4	20.00	10.00
12.5	1.0000	1.0526	1.3453	1.3453	1.3453	0.000	4	20.00	10.00
25	0.9000	0.9474	1.2305	0.8861	1.3453	18.660	4	17.50	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-normal distribution (p <= 0.01)	0.81889	0.896	-1.5822	3.19903
Equality of variance cannot be confirmed				
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	50	>50		2

Dose-Response Plot



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

Client: Shannon + Wilson
 Sample ID: Random
 Contact: _____
 Test #: 0306-60NW

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

Start Date & Time: 6/21/03 2000
 End Date & Time: 6/25/03 1930
 Test Organism: Atherinops affinis
 Test Protocol: _____

Sample Conc. or %	D.O. (mg/L)						pH (mg/L) 8.25					
	Init.			Fin.			Init.			Fin.		
	0	24	48	48	72	96	0	24	48	48	72	96
CON	6.9	6.4	6.5	6.8	6.5	7.0	8.26	8.19	8.22	8.31	8.21	8.17
1.5	7.0	6.6	6.7	6.8	6.5	7.0	8.26	8.20	8.23	8.31	8.20	8.21
3.125	7.1	6.4	6.4	6.8	6.7	7.0	8.29	8.17	8.18	8.31	8.18	8.20
6.25	6.9	6.2	6.6	6.9	6.6	7.0	8.24	8.18	8.17	8.31	8.18	8.21
12.5	6.9	6.1	6.6	7.1	6.2	7.0	8.24	8.19	8.21	8.29	8.20	8.24
25	6.8	6.5	6.7	7.1	6.4	7.0	8.23	8.19	8.24	8.27	8.20	8.26

Sample Conc. or %	Salinity ppt				Test Temperature (°C)					
	Init.		Fin.		Init.		Fin.		Init.	
	0	48	48	96	0	24	48	48	72	96
CON	29.0	29.4	29.0	30.6	19.9	19.4	19.8	20.0	20.1	19.8
1.5	29.0	29.2	29.0	29.3	19.3	19.0	19.8	20.0	20.1	20.1
3.125	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	20.1	19.9
12.5	29.0	30.2	29.0	29.5	19.5	19.0	19.1	20.0	20.3	20.0
25	29.0	29.7	29.0	29.5	19.0	19.0	19.0	20.0	20.3	20.0

Conc.	Alkalinity* (mg/L as CaCO ₃)	Chlorine Resid. (mg/L)	Ammonia (mg/L)
control	600	—	—
highest conc.	320	<0.3	9.5

Sample Description: _____

Comments: _____

Analysts: AB

Sample Conc. or %	Rep #	Cont #	Number of Live Organisms				
			0	24	48	72	96
CON	1	3	5	5	5	5	5
	2	24	5	5	5	5	5
	3	10	5	5	5	5	4
	4	17	5	5	5	5	5
1.5	1	23	5	5	4	4	4
	2	13	5	5	5	5	4
	3	12	5	5	5	5	5
	4	26	5	5	5	5	5
3.125	1	14	5	5	5	5	5
	2	28	5	5	5	5	5
	3	25	5	5	5	5	5
	4	4	5	5	5	5	5
6.25	1	27	5	5	5	5	5
	2	1	5	5	5	5	5
	3	11	5	5	5	5	5
	4	5	5	5	5	5	5
12.5	1	16	5	5	5	5	5
	2	8	5	5	5	5	5
	3	18	5	5	5	5	5
	4	15	5	5	5	5	5
25	1	19	5	5	5	5	5
	2	20	5	5	5	5	5
	3	7	5	5	5	5	5
	4	22	5	5	4	4	3
Tech. Initials			me	mm	mm	et	sm

Animal Source: AB S
 Date Received: 6/20/03
 Date of Hatch: 6/9/03

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

Client: S+W
 Sample ID: Ryndam
 Contact: _____
 Test #: 0306-60NW

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

Start Date & Time: 6/24/03 2000
 End Date & Time: 6/25/03 1910
 Test Organism: Atherinops affinis
 Test Protocol: _____

Sample Conc. or %	D.O. (mg/L)						pH (mg/L)					
	Init.			Fin.			Init.			Fin.		
	0	24	48	48	72	96	0	24	48	48	72	96
50	6.4	5.9	6.2	29.1	6.0	6.8	8.20	8.19	8.21	8.22	8.18	8.28
				7.4								

Sample Conc. or %	Salinity ppt				Test Temperature (°C)					
	Init.		Fin.		Init.		Fin.		Init.	
	0	48	48	96	0	24	48	48	72	96
50	29.0	30.8	29.4	29.9	19.0	19.2	19.0	20.0	20.4	
			29.1							

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

Sample Description: _____

Comments: _____

Analysts: _____

Sample Conc. or %	Rep #	Cont #	Number of Live Organisms				
			0	24	48	72	96
50	1	21	5	5	5	5	5
	2	2	5	5	5	5	5
	3	9	5	5	5	5	4
	4	6	5	5	5	5	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				
	1		5				
	2		5				
	3		5				
	4		5				
Tech. Initials			he	m	m	et	sm

Animal Source: _____

Date Received: _____

Date of Hatch: _____

Acute Fish Test-96 Hr Survival

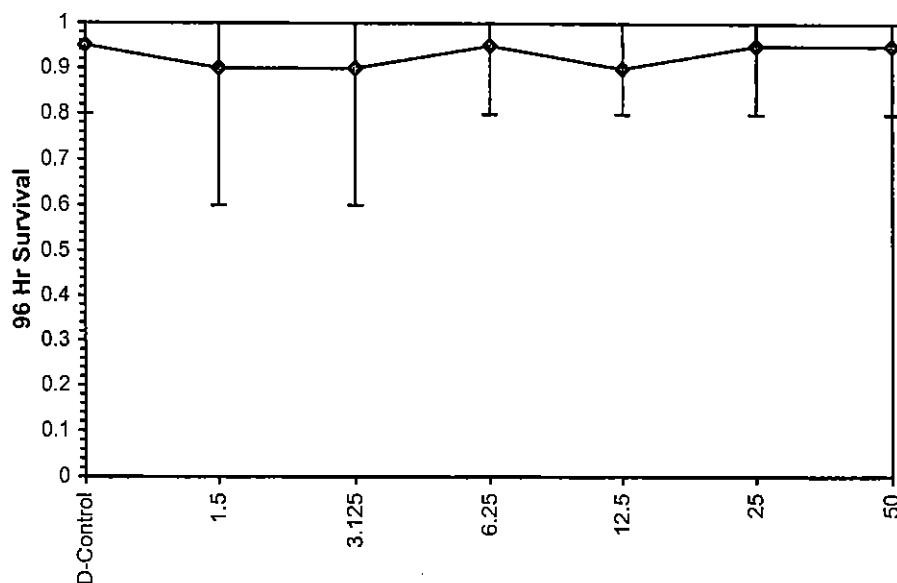
Start Date: 9/13/03	Test ID: 0309-03NW	Sample ID:	Carnival Spirit
End Date: 9/17/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type:	GW-Gray Water
Sample Date: 9/12/03	Protocol: EPA 02-EPA Acute	Test Species:	AA-Atherinops affinis
Comments:			

Conc-%	1	2	3	4
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

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%	N		
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-normal distribution ($p \leq 0.01$)	0.74647	0.896	-1.2985	0.54636
Bartlett's Test indicates equal variances ($p = 0.75$)	3.44511	16.8119		
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	50	>50		2

Dose-Response Plot



AMEC Earth & Environmental

Northwest Bioassay Lab

5009 Pacific Hwy. E., Suite 2

Fife, WA 98424

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

96 Hour Toxicity Test Data Sheet

Saltwater 96-hr Acute with Renewal

page 1

Start Date & Time: 9/13/03 1515
 End Date & Time: 9/17/03 1445
 Test Organism: Atherinops affinis
 Test Protocol: _____

Sample Conc. or %	D.O. (mg/L)						pH (mg/L)					
	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	6.7	8.35	8.25	8.11	8.41	8.26	8.13
1.5	6.8	6.2	6.1	6.8	7.0	6.8	8.36	8.25	8.11	8.41	8.25	8.13
3.125	6.7	6.4	6.1	6.7	7.0	6.7	8.37	8.25	8.10	8.41	8.26	8.14
6.25	7.0	6.3	6.1	6.6	6.7	6.8	8.37	8.23	8.09	8.40	8.24	8.14
12.5	7.1	6.1	6.0	6.9	6.8	6.6	8.35	8.20	8.11	8.40	8.23	8.13
25	7.3	5.7	6.1	7.1	6.7	6.5	8.33	8.13	8.10	8.37	8.17	8.10

Sample Conc. or %	Salinity ppt				Test Temperature (°C)					
	Init.		Fin.		Init.		Fin.		Init.	
	0	48	48	96	0	24	48	48	72	96
CON	29.3	30.3	29.6	30.5	21.0	20.2	20.5	20.6	20.0	21.0
1.5	29.3	30.6	29.8	30.5	21.0	20.2	20.6	20.7	21.9	20.1
3.125	29.4	30.2	29.8	30.3	21.0	20.2	20.7	20.7	19.8	20.8
6.25	29.3	30.2	29.7	30.4	21.0	20.2	20.8	20.7	19.9	21.0
12.5	29.3	30.6	29.8	30.4	21.0	20.2	20.7	20.8	19.9	21.0
25	29.1	30.6	29.6	29.9	21.0	20.2	20.7	20.9	19.9	21.0

Conc.	Alkalinity* (mg/L as CaCO3)	Chlorine Resid. (mg/L)	Ammonia (mg/L)
control	189	—	—
highest conc.	20	0.03	3.8

Sample Description: _____

Comments: _____

Analysts: SM NF EA we SO

Sample Conc. or %	Rep #	Cont #	Number of Live Organisms				
			0	24	48	72	96
CON	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	5
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	5
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	1	5	5	5	5	5
	2	18	5	4	4	4	4
	3	20	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	5	5	5
	4	28	5	5	5	5	5
25	1	21	5	5	5	5	5
	2	19	5	4	4	4	4
	3	27	5	5	5	5	5
	4	24	5	5	5	5	5
Tech. Initials			SM	NF	EA	we	SO

Animal Source: APS
 Date Received: 9/12/03
 Date of Hatch: 9/9/03

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

Client: Shannon & Wilson
 Sample ID: Carnival Spirit
 Contact: _____
 Test #: 0309-03NW

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

page 2

Start Date & Time: 9/13/03 1515
 End Date & Time: 9/17/03 1445
 Test Organism: Atherinops affinis
 Test Protocol: _____

Sample Conc. or %	D.O. (mg/L)						pH (mg/L)					
	Init.			Fin.			Init.			Fin.		
	0	24	48	48	72	96	0	24	48	48	72	96
<u>50</u>	<u>7.3</u>	<u>8.6</u>	<u>6.3</u>	<u>7.2</u>	<u>6.0</u>	<u>6.3</u>	<u>8.27</u>	<u>7.98</u>	<u>8.01</u>	<u>8.32</u>	<u>8.07</u>	<u>8.00</u>

Sample Conc. or %	Salinity ppt				Test Temperature (°C)					
	Init.		Fin.		Init.		Fin.		Init.	
	0	48	48	96	0	24	48	48	72	96
<u>50</u>	<u>29.1</u>	<u>30.4</u>	<u>29.3</u>	<u>29.9</u>	<u>21.6</u>	<u>20.5</u>	<u>20.5</u>	<u>20.5</u>	<u>20.6</u>	<u>20.8</u>

Conc.	Alkalinity* (mg/L as CaCO ₃)	Chlorine Resid. (mg/L)	Ammonia (mg/L)
control			
highest conc.			

Sample Description: _____

Comments: _____

Analysts: _____

Sample Conc. or %	Rep #	Cont #	Number of Live Organisms				
			0	24	48	72	96
<u>50</u>	<u>1</u>	<u>4</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>
	<u>2</u>	<u>16</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>
	<u>3</u>	<u>15</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>
	<u>4</u>	<u>3</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>4</u>	<u>4</u>
	<u>1</u>		<u>5</u>				
	<u>2</u>		<u>5</u>				
	<u>3</u>		<u>5</u>				
	<u>4</u>		<u>5</u>				
	<u>1</u>		<u>5</u>				
	<u>2</u>		<u>5</u>				
	<u>3</u>		<u>5</u>				
	<u>4</u>		<u>5</u>				
	<u>1</u>		<u>5</u>				
	<u>2</u>		<u>5</u>				
	<u>3</u>		<u>5</u>				
	<u>4</u>		<u>5</u>				
	<u>1</u>		<u>5</u>				
	<u>2</u>		<u>5</u>				
	<u>3</u>		<u>5</u>				
	<u>4</u>		<u>5</u>				
Tech. Initials							

Animal Source: _____

Date Received: _____

Date of Hatch: _____

***Mysidopsis bahia* 48 h Survival**

Start Date: 6/10/03 Test ID: 0306-14NW Sample ID: Spirit of Columbia #1
End Date: 6/12/03 Lab ID: WAAEE-AMEC NW Bioassay Sample Type: BW-Black Water
Sample Date: 6/9/03 Protocol: EPA 02-EPA Acute Test Species: MY-Mysidopsis bahia
Comments:

Mysid Acute-48 Hr Survival

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	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-%	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%	N		
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	0.9500	0.9500	1.2857	1.1071	1.3453	9.261	4	16.00	10.00
6.25	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	18.00	10.00
25	0.9500	0.9500	1.2857	1.1071	1.3453	9.261	4	16.00	10.00
50	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00

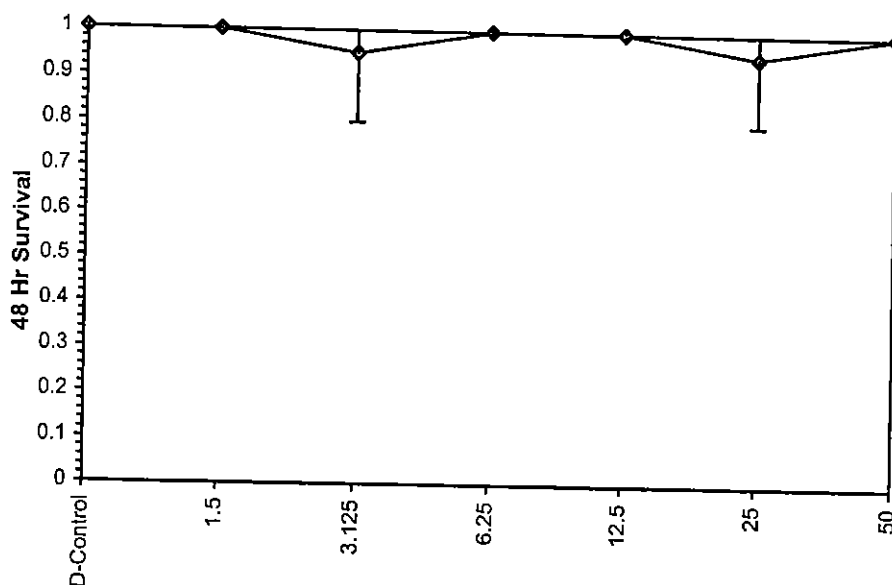
Auxiliary Tests

Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.01$) Statistic: 0.58279 Critical: 0.896 Skew: -2.2845 Kurt: 6.47308
Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05)

Steel's Many-One Rank Test NOEC: 50 LOEC: >50 ChV: TU: 2

Dose-Response Plot



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

Client: Shannon + Wilson
 Sample ID: Spartan Columbia #1 BW
 Contact: _____
 Test #: 0306-14NW

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

Conc. or %	Rep #	Cont. #	Number of Live Organisms			Dissolved Oxygen (mg/L)				pH (units)				Salinity (ppt)				Temperature (°C)				Mean Percent Survival
			0	24	48	0	Fin. 24	Init. 24	48	0	Fin. 24	Init. 24	48	0	Fin. 24	Init. 24	48	0	Fin. 24	Init. 24	48	
CON	1	14	5	5	5	6.8	5.4	6.5	5.9	8.48	8.22	8.28	8.14	29.9	30.6	30.3	30.6	25.5	25.0	25.0	25.2	
	2	7	5	5	5																	
	3	10	5	5	5																	
	4	11	5	5	5																	
1.5	1	23	5	5	5	6.9	5.6	6.5	5.7	8.48	8.22	8.29	8.14	30.1	30.7	30.1	30.8	25.4	25.0	25.0	25.5	
	2	2	5	5	5																	
	3	15	5	5	5																	
	4	9	5	5	5																	
3.125	1	6	5	5	5	6.9	5.6	6.5	5.7	8.49	8.20	8.30	8.12	30.1	30.0	30.1	30.7	25.6	25.0	25.4	25.5	
	2	25	5	5	5																	
	3	1	5	5	5																	
	4	24	5	4	4																	
6.25	1	8	5	5	5	7.0	5.6	6.6	5.9	8.48	8.22	8.30	8.13	30.1	30.8	30.1	30.4	25.3	25.0	25.5	25.3	
	2	19	5	5	5																	
	3	28	5	5	5																	
	4	17	5	5	5																	
12.5	1	4	5	5	5	7.1	5.7	6.9	6.0	8.48	8.20	8.30	8.13	30.1	31.0	30.0	30.9	25.6	25.0	25.4	25.5	
	2	3	5	5	5																	
	3	21	5	5	5																	
	4	12	5	5	5																	
25	1	26	5	5	5	7.4	5.5	7.1	5.6	8.46	8.17	8.29	8.10	30.1	31.1	29.7	30.9	25.4	25.0	25.2	25.3	
	2	27	5	4	4																	
	3	13	5	5	5																	
	4	18	5	5	5																	

Technician Initials

MF NF

Conc.	Alkalinity* (mg/L as CaCO3)	Chlorine (mg/L)	Ammonia (mg/L)
control	56	—	—
highest conc.	80	< 0.3	—

Sample Description: _____

Analyst Initials: MF NF

Comments: 0 hrs: Animal Source: ARS Date Rec'd: 6/10/03 DOH: 6/7/03
 24 hrs: Fed at 8:30
 48 hrs: _____

Reviewed: _____

QA check: _____

AMEC Northwest Bioassay Lab
 5009 Pacific Hwy. E. Suite 2
 Fife, WA 98424
 (253) 922-4296

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

Client: Shannon + Wilson
 Sample ID: SOC #1 Blackwater
 Contact: _____
 Test #: 0306-1A NW

Start Date & Time: 6/10/03 1545
 End Date & Time: 6/12/03 1600
 Test Organisms: M. balthica
 Test Protocol: _____

Conc. or %	Rep #	Cont. #	Number of Live Organisms			Dissolved Oxygen (mg/L)				pH (units)				Salinity (ppt)				Temperature (°C)				Mean Percent Survival
			0	24	48	0	Fin. 24	Init. 24	48	0	Fin. 24	Init. 24	48	0	Fin. 24	Init. 24	48	0	Fin. 24	Init. 24	48	
50	1	16	5	5	5	8.0	6.4	7.3	5.7	8.40	8.11	8.27	8.07	30.3	31.2	29.5	30.4	25.4	25.0	25.0	25.5	
	2	20	5	5	5																	
	3	22	5	5	5																	
	4	5	5	5	5																	
	1																					
	2																					
	3																					
	4																					
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	3																					
	4																					
	1																					
	2																					
	3																					
	4																					
Technician Initials			mw	NE	BT																	

Conc.	Alkalinity* (mg/L as CaCO ₃)	Chlorine (mg/L)	Ammonia (mg/L)
control			
highest conc.			

Sample Description: _____

Analyst Initials: _____

Comments: 0 hrs: _____
 24 hrs. _____
 48 hrs. _____

Reviewed: _____

QA check: _____

AMEC Northwest Bioassay Lab
 5009 Pacific Hwy. E. Suite 2
 Fife, WA 98424
 (253) 922-4296

Mysid Acute-48 Hr Survival

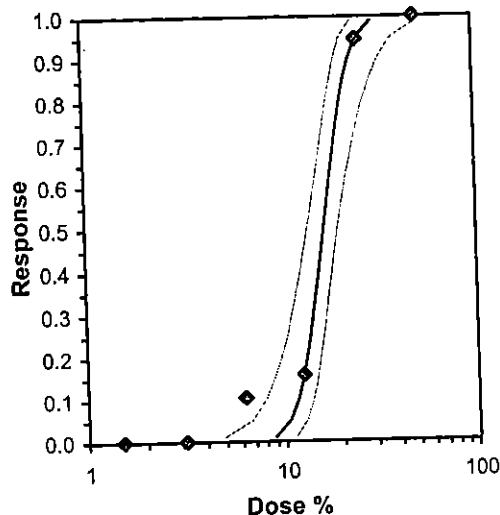
Start Date: 6/10/03	Test ID: 0306-15NW	Sample ID: Spirit of Columbia #2
End Date: 6/12/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type: GW-Gray Water
Sample Date: 6/9/03	Protocol: EPA 02-EPA Acute	Test Species: MY-Mysidopsis bahia
Comments:		

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	1.0000	1.0000	1.0000
6.25	0.6000	1.0000	1.0000	0.8000
12.5	1.0000	0.8000	0.6000	0.8000
25	0.0000	0.0000	0.0000	0.2000
50	0.0000	0.0000	0.0000	0.0000

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root				N	Rank Sum	1-Tailed Critical	Number Resp	Total Number
			Mean	Min	Max	CV%					
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
3.125	1.0000	1.0526	1.3453	1.3453	1.3453	0.000	4	20.00	10.00	0	20
6.25	0.8500	0.8947	1.1709	0.8861	1.3453	18.840	4	15.50	10.00	3	20
12.5	0.8000	0.8421	1.1114	0.8861	1.3453	16.874	4	13.50	10.00	4	20
*25	0.0500	0.0526	0.2850	0.2255	0.4636	41.771	4	10.00	10.00	19	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 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	ChV	TU
Steel's Many-One Rank Test	12.5	25	17.6777	8

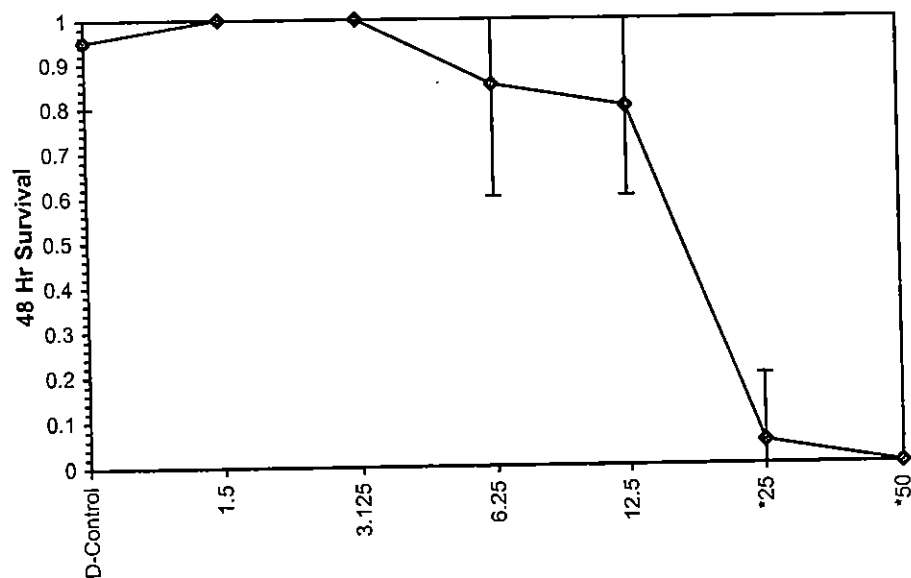
Parameter	Value	SE	95% Fiducial Limits		Maximum Likelihood-Probit					Mu	Sigma	Iter
					Control	Chi-Sq	Critical	P-value				
Slope	8.67095	2.05283	4.64739	12.6945	0.05	6.31689	9.48773	0.18		1.21169	0.11533	9
Intercept	-5.5065	2.5179	-10.442	-0.5714								
TSCR	0.04979	0.02435	0.00206	0.09752								
Point	Probits	%	95% Fiducial Limits									
EC01	2.674	8.77807	4.84541	11.1963								
EC05	3.355	10.5195	6.69941	12.8438								
EC10	3.718	11.5849	7.93043	13.8748								
EC15	3.964	12.3641	8.86307	14.6551								
EC20	4.158	13.0205	9.6614	15.3391								
EC25	4.326	13.6114	10.3832	15.9822								
EC40	4.747	15.2221	12.3148	17.9199								
EC50	5.000	16.2814	13.5123	19.3866								
EC60	5.253	17.4144	14.699	21.1551								
EC75	5.674	19.4751	16.6041	24.9047								
EC80	5.842	20.3589	17.3378	26.7074								
EC85	6.036	21.4398	18.1836	29.0543								
EC90	6.282	22.8818	19.2431	32.4091								
EC95	6.645	25.1993	20.8278	38.2906								
EC99	7.326	30.1984	23.9394	52.8381								



Mysid Acute-48 Hr Survival

Start Date: 6/10/03	Test ID: 0306-15NW	Sample ID: Spirit of Columbia #2
End Date: 6/12/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type: GW-Gray Water
Sample Date: 6/9/03	Protocol: EPA 02-EPA Acute	Test Species: MY-Mysidopsis bahia
Comments:		

Dose-Response Plot



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

Client: Shannon + Wilson
 Sample ID: Spirit of Columbia #2 GW
 Contact: _____
 Test #: 0306-15 NW

Start Date & Time: 6/10/03 1630
 End Date & Time: 6/12/03 1545
 Test Organisms: Mysidopsis bahia
 Test Protocol: _____

Conc. or %	Rep #	Cont. #	Number of Live Organisms			Dissolved Oxygen (mg/L)				pH (units)				Salinity (ppt)				Temperature (°C)				Mean Percent Survival	
			0	24	48	0	Fin. 24	Init. 24		48	0	Fin. 24	Init. 24		48	0	Fin. 24	Init. 24		48	0		Fin. 24
CON	1	13	5	4	4	6.8	6.5	6.8	6.3	8.48	8.21	8.21	8.11	29.9	30.8	30.2	31.0	25.2	25.0	27.0	26.0	95%	
	2	4	5	5	5		5.8																
	3	26	5	5	5																		
	4	27	5	5	5																		
1.5	1	18	5	5	5	6.8	5.2	6.8	6.2	8.51	8.15	8.21	8.09	29.7	30.8	30.5	31.0	25.1	25.2	27.0	25.5	100%	
	2	15	5	5	5																		
	3	6	5	5	5																		
	4	24	5	5	5																		
3.125	1	16	5	5	5	6.8	4.4	6.8	6.2	8.51	8.05	8.22	8.07	30.0	30.7	30.3	31.0	25.3	25.3	27.0	26.0	100%	
	2	12	5	5	5																		
	3	2	5	5	5																		
	4	23	5	5	5																		
6.25	1	14	5	3	3	6.8	4.0	6.8	6.2	8.48	7.93	8.19	8.04	30.0	31.0	30.4	31.0	25.2	25.0	27.0	25.4	70% 85%	
	2	20	5	5	5																		
	3	1	5	5	5																		
	4	21	5	4	4																		
12.5	1	3	5	5	5	6.8	2.1	6.8	6.0	8.43	7.77	8.12	7.95	30.0	30.8	30.3	31.0	25.1	25.1	27.0	25.5	25% 80	
	2	16	5	4	4																		
	3	7	5	3	3																		
	4	28	5	4	4																		
25	1	17	5	0	-	7.0	3.5	6.8	5.6	8.32	7.61	7.94	7.86	30.0	30.8	30.6	31.0	25.4	25.0	27.0	25.7	5%	
	2	11	5	0	-																		
	3	22	5	0	-																		
	4	9	5	1	1																		

Technician Initials: mm sm sm

Conc.	Alkalinity* (mg/L as CaCO3)	Chlorine (mg/L)	Ammonia (mg/L)
control	56		
highest conc.	20	17	44

Sample Description: _____

Analyst Initials: mm, sm

Comments: 0 hrs:
24 hrs:
48 hrs:

Animal Source: ABS Date Rec'd: 6/10/03 Date Hatched: 6/12/03 Sample aerated
Feed at 8:30. Aeration added.

Reviewed: mm

QA check: mm

AMEC Northwest Bioassay Lab
 5009 Pacific Hwy. E. Suite 2
 Fife, WA 98424
 (253) 922-4296

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

Client: Shannon + Wilson
Sample ID: 50C#2 Gray water
Contact: _____
Test #: 0306-15WN

Start Date & Time: 6/10/03 1630
End Date & Time: 6/12/03 1545
Test Organisms: Mysidopsis bahia
Test Protocol: _____

Conc. or (%)	Rep #	Cont. #	Number of Live Organisms			Dissolved Oxygen (mg/L)				pH (units)				Salinity (ppt)				Temperature (°C)				Mean Percent Survival
			0	24	48	0	Fin.	Init.	48	0	24	Init.	48	0	Fin.	Init.	48	0	24	Init.	48	
50	1	5	5	0	—	7.2	3.3	6.8	—	8.09	7.41	7.53	—	30.0	31.0	30.7	—	25.5	25.1	27.0	—	0
	2	25	5	0	—																	
	3	8	5	0	—																	
	4	19	5	0	—																	
	1																					
	2																					
	3																					
	4																					
	1																					
	2																					
	3																					
	4																					
	1																					
	2																					
	3																					
	4																					
	1																					
	2																					
	3																					
	4																					
	1																					
	2																					
	3																					
	4																					

Technician Initials: Wm Sm Sm

Conc.	Alkalinity* (mg/L as CaCO ₃)	Chlorine (mg/L)	Ammonia (mg/L)
control			
highest conc.			

Sample Description: _____

Analyst Initials: _____

Comments: 0 hrs: _____
24 hrs: _____
48 hrs: _____

Reviewed: _____

QA check: _____

AMEC Northwest Bioassay Lab
5009 Pacific Hwy. E. Suite 2
Fife, WA 98424
(253) 922-4296

Mysid Acute-48 Hr Survival

Start Date: 6/13/03	Test ID: 0306-20NW	Sample ID: Spirit of Oceanus
End Date: 6/15/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type: BW/GW-Combined gray and black water
Sample Date: 6/12/03	Protocol: EPA 02-EPA Acute	Test Species: MY-Mysidopsis bahia

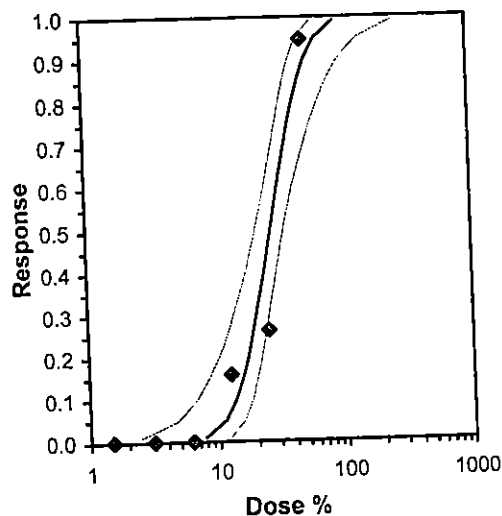
Comments:

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	1.0000	1.0000	0.6000	0.2000
50	0.0000	0.2000	0.0000	0.0000

Conc-%	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical	Number Resp	Total Number
	Mean	N-Mean	Mean	Min	Max	CV%	N				
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
3.125	0.9500	1.0000	1.2857	1.1071	1.3453	9.261	4	18.00	10.00	1	20
6.25	1.0000	1.0526	1.3453	1.3453	1.3453	0.000	4	20.00	10.00	0	20
12.5	0.8000	0.8421	1.1249	0.4636	1.3453	39.188	4	17.50	10.00	4	20
25	0.7000	0.7368	1.0101	0.4636	1.3453	41.952	4	15.00	10.00	6	20
*50	0.0500	0.0526	0.2850	0.2255	0.4636	41.771	4	10.00	10.00	19	20

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.01$)	0.8488	0.896	-1.4098	3.46608
Equality of variance cannot be confirmed				
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	25	50	35.3553	4

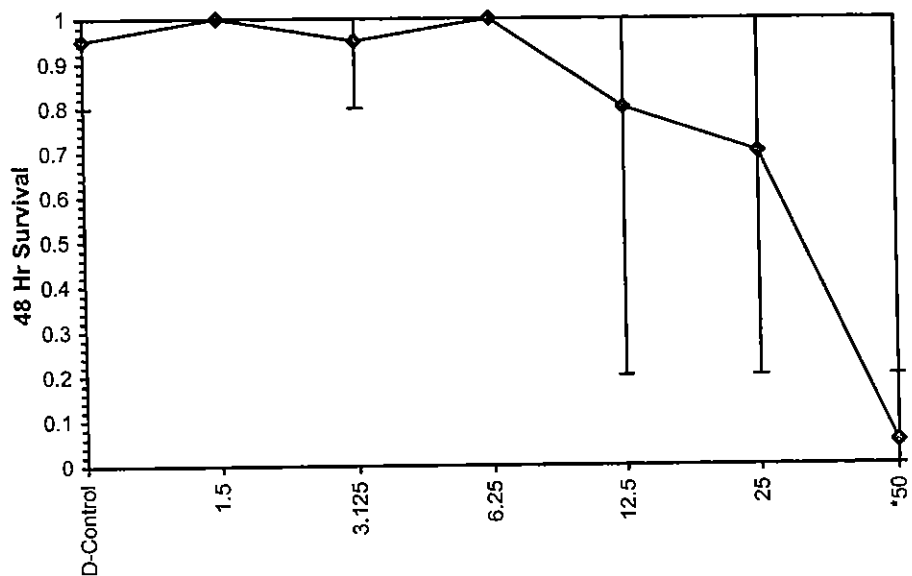
Maximum Likelihood-Probit											
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	4.32567	1.01564	2.33502	6.31632	0.05	6.61989	9.48773	0.16	1.42653	0.23118	5
Intercept	-1.1707	1.47416	-4.06	1.71868							
TSCR	0.02969	0.0195	-0.0085	0.0679							
Point	Probits	%	95% Fiducial Limits								
EC01	2.674	7.73971	2.48465	12.0812							
EC05	3.355	11.1243	4.79556	15.7141							
EC10	3.718	13.4977	6.77542	18.1676							
EC15	3.964	15.3789	8.5243	20.1074							
EC20	4.158	17.0593	10.1984	21.8654							
EC25	4.326	18.6465	11.8559	23.5716							
EC40	4.747	23.3323	16.9545	29.1121							
EC50	5.000	26.7009	20.5309	33.85							
EC60	5.253	30.5558	24.2735	40.3129							
EC75	5.674	38.2342	30.5545	56.5635							
EC80	5.842	41.7916	33.0861	65.4639							
EC85	6.036	46.3581	36.1129	78.0294							
EC90	6.282	52.8192	40.0952	97.8611							
EC95	6.645	64.0884	46.4872	137.872							
EC99	7.326	92.114	60.6221	265.418							



Mysid Acute-48 Hr Survival

Start Date: 6/13/03	Test ID: 0306-20NW	Sample ID: Spirit of Oceanus
End Date: 6/15/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type: BW/GW-Combined gray and black water
Sample Date: 6/12/03	Protocol: EPA 02-EPA Acute	Test Species: MY-Mysidopsis bahia
Comments:		

Dose-Response Plot



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

Client: Shannon & Wilson
Sample ID: Spirit of Oceanus
Contact: _____
Test #: 0306-20NW

Start Date & Time: 6/13/03 1600
End Date & Time: 6/15/03 1500
Test Organisms: Mytilus trossulus
Test Protocol: _____

Test #: 0306-230W																						
Conc. or %	Rep #	Cont. #	Number of Live Organisms			Dissolved Oxygen (mg/L)				pH (units)				Salinity (ppt)				Temperature (°C)				Mean Percent Survival
						Fin.		Init.		Fin.		Init.		Fin.		Init.		Fin.		Init.		
			0	24	48	0	24	24	48	0	24	24	48	0	24	24	48	0	24	24	48	
CON	1	11	5	5	4	6.8	6.1	7.0	6.5	8.24	8.16	8.35	8.13	29.3	31.1	30.5	30.7	25.8	25.0	25.0	26.0	95%
	2	26	5	5	5																	
	3	9	5	5	5																	
	4	8	5	5	5																	
1.5	1	16	5	5	5	6.8	6.2	7.2	6.5	8.24	8.17	8.35	8.11	29.6	31.0	29.2	30.6	26.0	25.0	25.0	26.0	100%
	2	25	5	5	5																	
	3	28	5	5	5																	
	4	17	5	5	5																	
3.125	1	1	5	5	5	6.8	6.0	6.8	6.3	8.23	8.16	8.34	8.12	29.5	31.3	30.1	30.9	26.0	25.7	25.0	26.0	95%
	2	13	5	5	5																	
	3	19	5	5	5																	
	4	10	5	5	5																	
6.25	1	5	5	5	5	6.8	5.5	7.2	6.2	8.20	8.11	8.32	8.10	29.4	32.0	30.3	31.0	25.8	25.3	25.0	26.0	100%
	2	27	5	5	5																	
	3	7	5	5	5																	
	4	4	5	5	5																	
12.5	1	3	5	5	5	6.7	4.1	7.0	6.2	8.16	7.99	8.27	8.08	29.3	31.2	30.2	30.9	26.3	25.2	25.9	26.0	80%
	2	6	5	5	5																	
	3	14	5	5	5																	
	4	22	5	5	5																	
25	1	21	5	5	5	6.3	3.9	7.1	5.6	8.04	8.03	8.18	8.00	29.2	29.7	30.7	29.5	25.9	25.5	25.6	26.0	25%
	2	2	5	5	5																	
	3	20	5	5	5																	
	4	15	5	2	1																	

Technician Initials		SM	NF	NF
Conc.	Alkalinity* (mg/L as CaCO3)	Chlorine (mg/L)		Ammonia (mg/L)
control	56	—		—
highest conc.	256	<.03		64.2

Sample Description: _____

Analyst Initials: SM NF

Comments: 0 hrs: DOH: 6/14/03 Received: 6/10/03 source: ABS, test aerated Day 0
24 hrs: _____
48 hrs: _____

Reviewed: 145 QA check: 145

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

Client: Shannon + Wilson
Sample ID: Spirit of Oceanus
Contact: _____
Test #: 0306-20NW

Start Date & Time: 6/13/03 1600
End Date & Time: 6/15/03 1500
Test Organisms: M. balthica
Test Protocol: _____

Conc. or (%)	Rep #	Cont. #	Number of Live Organisms			Dissolved Oxygen (mg/L)				pH (units)				Salinity (ppt)				Temperature (°C)				Mean Percent Survival
			0	24	48	0	24	24	48	0	24	24	48	0	24	24	48	0	24	24	48	
50	1	12	5	0	-	6.4	2.6	6.6	5.9	7.97	8.09	8.11	8.09	29.0	30.3	30.5	29.4	25.3	25.3	25.9	29.4	40.5%
	2	24	5	2	1																	
	3	18	5	0	-																	
	4	23	5	1	0																	
	1																					
	2																					
	3																					
	4																					
	1																					
	2																					
	3																					
	4																					
	1																					
	2																					
	3																					
	4																					
	1																					
	2																					
	3																					
	4																					

Technician Initials: Tom NE

Conc.	Alkalinity* (mg/L as CaCO3)	Chlorine (mg/L)	Ammonia (mg/L)
control			
highest conc.			

Sample Description: _____

Analyst Initials: _____

Comments: 0 hrs: _____
24 hrs: _____
48 hrs: _____

Reviewed: _____

QA check: _____

AMEC Northwest Bioassay Lab
5009 Pacific Hwy. E. Suite 2
Fife, WA 98424
(253) 922-4296

Mysid Acute-48 Hr Survival

Start Date: 6/17/03	Test ID: 0306-24NW	Sample ID: Sun Princess
End Date: 6/19/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type: BW/GW-Combined gray & black water
Sample Date: 6/16/03	Protocol: EPA 02-EPA Acute	Test Species: MY-Mysidopsis bahia

Comments:

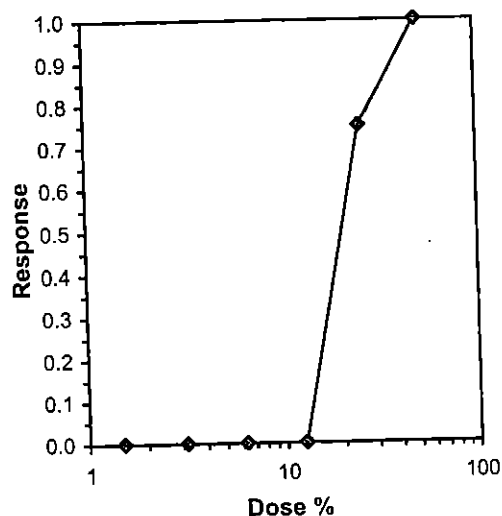
Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
1.5	1.0000	1.0000	1.0000	1.0000
3.125	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000
25	0.4000	0.2000	0.2000	0.2000
50	0.0000	0.0000	0.0000	0.0000

Conc-%	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical	Number Resp	Total Number
	Mean	N-Mean	Mean	Min	Max	CV%	N				
D-Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4			0	20
1.5	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
3.125	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
6.25	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
12.5	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
*25	0.2500	0.2500	0.5189	0.4636	0.6847	21.301	4	10.00	10.00	15	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 non-normal distribution (p <= 0.01)	0.43373	0.896	3.23077	16.3108
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

Trimmed Spearman-Kärber

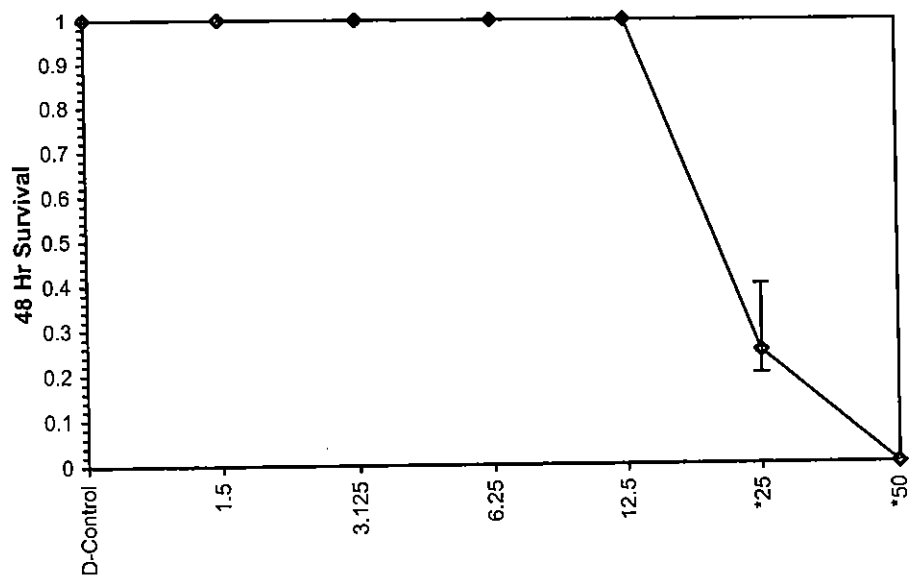
Trim Level	EC50	95% CL	
0.0%	21.022	18.382	24.042
5.0%	20.675	17.857	23.936
10.0%	20.365	17.426	23.800
20.0%	19.919	16.973	23.377
Auto-0.0%	21.022	18.382	24.042



Mysid Acute-48 Hr Survival

Start Date: 6/17/03	Test ID: 0306-24NW	Sample ID: Sun Princess
End Date: 6/19/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type: BW/GW-Combined gray & black water
Sample Date: 6/16/03	Protocol: EPA 02-EPA Acute	Test Species: MY-Mysidopsis bahia
Comments:		

Dose-Response Plot



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

Client: Shannon + Wilson
 Sample ID: Sun Princess
 Contact: _____
 Test #: 0306-24NW

Start Date & Time: 6/17/03 18:45
 End Date & Time: 6/19/03 18:00
 Test Organisms: Mysidopsis bahia
 Test Protocol: _____

Conc. or %	Rep #	Cont. #	Number of Live Organisms			Dissolved Oxygen (mg/L)				pH (units)				Salinity (ppt)				Temperature (°C)				Mean Percent Survival
						Fin.	Init.			Fin.	Init.			Fin.	Init.			Fin.	Init.			
			0	24	48	0	24	24	48	0	24	24	48	0	24	24	48	0	24	24	48	
CON	1	18	5	5	5	6.7	5.7	6.8	5.6	8.18	8.13	8.16	8.12	30.58	29.6	29.5	29.5	25.0	27.0	25.4	25.1	100%
	2	21	5	5	5									29.5								
	3	24	5	5	5																	
	4	25	5	5	5																	
1.5	1	4	5	5	5	6.7	5.8	6.8	5.7	8.16	8.11	8.16	8.10	29.5	29.6	29.6	29.9	25.0	27.0	25.0	25.2	100%
	2	6	5	5	5																	
	3	7	5	5	5																	
	4	22	5	5	5																	
3.125	1	12	5	5	5	6.8	5.6	6.8	5.7	8.15	8.10	8.14	8.12	29.5	29.5	29.5	30.2	25.0	26.9	26.0	25.3	100%
	2	17	5	5	5																	
	3	12	5	5	5																	
	4	23	5	5	5																	
6.25	1	2	5	5	5	6.6	5.4	6.8	5.3	8.12	8.09	8.12	8.12	29.7	29.4	29.5	30.0	25.0	26.6	27.0	25.2	100%
	2	9	5	5	5																	
	3	10	5	5	5																	
	4	28	5	5	5																	
12.5	1	14	5	5	5	6.8	5.1	6.8	5.0	8.06	8.05	8.07	8.05	29.4	29.4	29.6	29.9	25.0	26.8	27.0	25.2	100%
	2	3	5	5	5																	
	3	11	5	5	5																	
	4	15	5	5	5																	
25	1	27	5	2	2	7.2	5.0	7.0	4.7	7.96	8.01	7.98	8.03	29.4	29.6	29.5	30.5	25.0	26.5	27.0	25.2	25%
	2	5	5	2	1																	
	3	26	5	2	1																	
	4	19	5	4	1																	

Technician Initials

ET

SM

ET

Conc.	Alkalinity* (mg/L as CaCO ₃)	Chlorine (mg/L)	Ammonia (mg/L)
control	56		
highest conc.	496	<.03	142.8

Sample Description: _____

Analyst Initials: SM, ET

Comments: 0 hrs:
 24 hrs.
 48 hrs.

Animal Source: ABS DOH: 6/14/03 Date Received: 6/17/03

Reviewed: KSQA check: JP

AMEC Northwest Bioassay Lab
 5009 Pacific Hwy. E. Suite 2
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 (253) 922-4296

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

Client: SRW
 Sample ID: Sun Princess
 Contact: _____
 Test #: 0306-24NW

Start Date & Time: 6/17/03 1845
 End Date & Time: 6/19/03 1800
 Test Organisms: M. b. l. a.
 Test Protocol: _____

Conc. or %	Rep #	Cont. #	Number of Live Organisms			Dissolved Oxygen (mg/L)				pH (units)				Salinity (ppt)				Temperature (°C)				Mean Percent Survival
			0	24	48	0	24	24	48	0	24	24	48	0	24	24	48	0	24	24	48	
50	1	20	5	0	—	7.9	3.2	7.4		7.84	7.95	7.86		29.3	29.5	29.4		25.0	26.8	27.0		0%
	2	8	5	0	—																	
	3	1	5	0	—																	
	4	16	5	0	—																	
	1																					
	2																					
	3																					
	4																					
	1																					
	2																					
	3																					
	4																					
	1																					
	2																					
	3																					
	4																					
	1																					
	2																					
	3																					
	4																					
	1																					
	2																					
	3																					
	4																					

Technician Initials: _____

Conc.	Alkalinity* (mg/L as CaCO3)	Chlorine (mg/L)	Ammonia (mg/L)
control			
highest conc.			

Sample Description: _____

Analyst Initials: _____

Comments: 0 hrs: _____
 24 hrs. _____
 48 hrs. _____

Reviewed: _____

QA check: _____

AMEC Northwest Bioassay Lab
 5009 Pacific Hwy. E. Suite 2
 Fife, WA 98424
 (253) 922-4296

Mysid Acute-48 Hr Survival

Start Date: 6/19/03	Test ID: 0306-58NW	Sample ID: Norwegian Wind
End Date: 6/21/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type: BW/GW-Combined gray & black water
Sample Date: 6/18/03	Protocol: EPA 02-EPA Acute	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	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

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%	N		
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	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00
12.5	0.9500	0.9500	1.2857	1.1071	1.3453	9.261	4	16.00	10.00
25	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00
50	0.8000	0.8000	1.1114	0.8861	1.3453	16.874	4	12.00	10.00

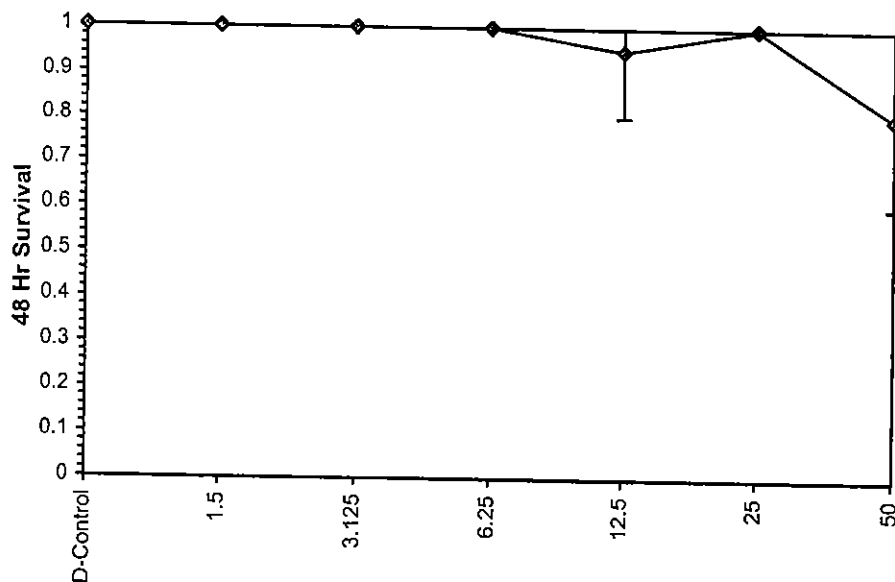
Auxiliary Tests

Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.01$)	Statistic: 0.60686	Critical: 0.896	Skew: -0.365	Kurt: 6.8316
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Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	50	>50		2

Dose-Response Plot



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

Client: Shannon + Wilson
Sample ID: Norwegian Wind
Contact: _____
Test #: 0306-58NW

Start Date & Time: 6/19/03 1820
End Date & Time: 6/21/03 1815
Test Organisms: Myxideprus bahia
Test Protocol: _____

Conc. or %	Rep #	Cont. #	Number of Live Organisms			Dissolved Oxygen (mg/L)				pH (units)				Salinity (ppt)				Temperature (°C)				Mean Percent Survival
			0	24	48	0	24	24	48	0	24	24	48	0	24	24	48	0	24	24	48	
CON	1	6	5	5	5	6.8	6.2	6.8	6.1	8.36	8.27	8.2	8.19	29.4	30.2	29.7	30.4	26.8	25.5	26.5	25.7	100%
	2	4	5	5	5																	
	3	5	5	5	5																	
	4	16	5	5	5																	
1.5	1	27	5	5	5	6.8	6.1	6.8	6.1	8.36	8.25	8.27	8.13	29.6	30.2	29.7	30.5	26.8	25.5	26.7	25.5	100%
	2	25	5	5	5																	
	3	17	5	5	5																	
	4	1	5	5	5																	
3.125	1	9	5	5	5	6.8	6.1	6.8	5.9	8.36	8.25	8.27	8.20	29.6	30.2	29.8	30.3	26.5	25.4	26.5	25.7	100%
	2	14	5	5	5																	
	3	19	5	5	5																	
	4	24	5	5	5																	
6.25	1	15	5	5	5	6.7	6.0	6.7	5.9	8.33	8.23	8.27	8.17	29.4	29.6	29.7	30.2	26.0	25.5	26.8	25.7	100%
	2	3	5	5	5																	
	3	18	5	5	5																	
	4	28	5	5	5																	
12.5	1	11	5	5	4	6.7	6.1	6.8	5.9	8.31	8.17	8.26	8.16	29.5	30.5	29.7	30.7	25.5	25.5	26.4	25.6	95%
	2	8	5	5	5																	
	3	21	5	5	5																	
	4	20	5	5	5																	
25	1	12	5	5	5	6.8	6.0	7.0	5.7	8.25	8.15	8.22	8.13	29.6	30.3	29.7	30.3	25.5	25.3	25.5	25.7	100%
	2	10	5	5	5																	
	3	2	5	5	5																	
	4	26	5	5	5																	

Technician Initials

SM SM GT

Conc.	Alkalinity* (mg/L as CaCO ₃)	Chlorine (mg/L)	Ammonia (mg/L)
control	60		
highest conc.	44	.05	35.8

Sample Description: _____

Analyst Initials: _____

Comments: 0 hrs:
24 hrs:
48 hrs:

Animal Source: ARBS Date Rec'd: 6/17/03 DOH: 6/10/03 6/14/03

Reviewed: AB

QA check: AB

AMEC Northwest Bioassay Lab
5009 Pacific Hwy. E. Suite 2
Fife, WA 98424
(253) 922-4296

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

Client: Shannon + Wilson
 Sample ID: Norwegian Wind
 Contact: _____
 Test #: 0306-58NW

Start Date & Time: 6/19/03 1820
 End Date & Time: 6/21/03 1815
 Test Organisms: m. bahia
 Test Protocol: _____

Conc. or (%)	Rep #	Cont. #	Number of Live Organisms			Dissolved Oxygen (mg/L)				pH (units)				Salinity (ppt)				Temperature (°C)				Mean Percent Survival
			0	24	48	0	Fin.	Init.	48	0	Fin.	Init.	48	0	Fin.	Init.	48	0	Fin.	Init.	48	
50	1	13	5	5	4	6.9	5.9	7.4	5.7	8.11	8.11	8.13	8.03	29.6	30.2	29.7	30.6	25.5	25.2	26.5	25.7	80%
	2	23	5	4	4																	
	3	7	5	4	3																	
	4	22	5	5	5																	
	1																					
	2																					
	3																					
	4																					
	1																					
	2																					
	3																					
	4																					
	1																					
	2																					
	3																					
	4																					
	1																					
	2																					
	3																					
	4																					
	1																					
	2																					
	3																					
	4																					

Technician Initials: SM DM EL

Conc.	Alkalinity* (mg/L as CaCO3)	Chlorine (mg/L)	Ammonia (mg/L)
control			
highest conc.			

Sample Description: _____

Analyst Initials: _____

Comments: 0 hrs: _____
 24 hrs: _____
 48 hrs: _____

Reviewed: JB

QA check: JB

AMEC Northwest Bioassay Lab
 5009 Pacific Hwy. E. Suite 2
 Fife, WA 98424
 (253) 922-4296

Mysid Acute-48 Hr Survival

Start Date: 6/21/03	Test ID: 0306-59NW	Sample ID: Ryndam
End Date: 6/23/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type: BW/GW-Combined gray & black water
Sample Date: 6/20/03	Protocol: EPA 02-EPA Acute	Test Species: MY-Mysidopsis bahia

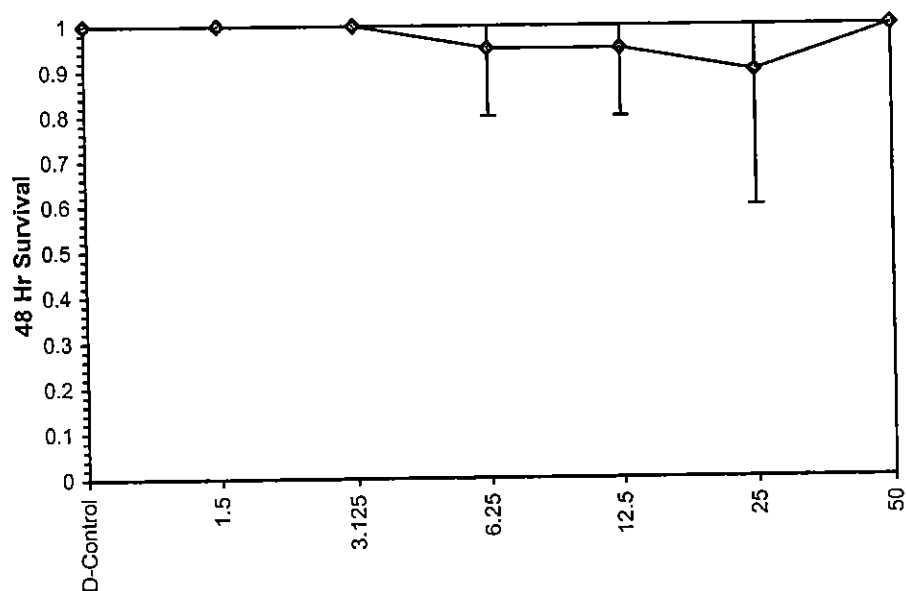
Comments:

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

Conc-%	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical
	Mean	N-Mean	Mean	Min	Max	CV%	N		
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

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.70606	0.896	-2.1666	6.15821
Equality of variance cannot be confirmed				
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	50	>50		2

Dose-Response Plot



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

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

Start Date & Time: 6/21/03 20:45
 End Date & Time: 6/23/03 17:30
 Test Organisms: Myxidopus bahia
 Test Protocol: _____

Conc. or (%)	Rep #	Cont. #	Number of Live Organisms			Dissolved Oxygen (mg/L)				pH (units)				Salinity (ppt)				Temperature (°C)				Mean Percent Survival
			0	24	48	0	Fin. 24	Init. 24	48	0	Fin. 24	Init. 24	48	0	Fin. 24	Init. 24	48	0	Fin. 24	Init. 24	48	
CON	1	23	5	5	5	6.9	6.0	7.0	6.1	8.26	8.19	8.23	8.22	29.0	29.4	29.0	29.2	25.5	25.6	25.0	25.5	100%
	2	17	5	5	5																	
	3	10	5	5	5																	
	4	27	5	5	5																	
1.5	1	13	5	5	5	7.0	5.6	7.1	5.9	8.25	8.19	8.24	8.23	29.0	29.7	29.0	29.2	25.5	25.4	25.0	25.4	100%
	2	12	5	5	5																	
	3	6	5	5	5																	
	4	4	5	5	5																	
3.125	1	11	5	5	5	7.1	6.1	7.1	5.9	8.25	8.18	8.23	8.24	29.4	29.2	29.0	29.1	25.5	25.5	25.0	25.7	100%
	2	20	5	5	5																	
	3	7	5	5	5																	
	4	19	5	5	5																	
6.25	1	25	5	5	5	6.9	5.8	7.0	6.1	8.24	8.21	8.24	8.23	29.0	29.8	29.0	30.9	25.5	25.5	25.0	25.5	95%
	2	16	5	5	5																	
	3	26	5	5	4																	
	4	3	5	5	5																	
12.5	1	14	5	5	5	6.9	5.7	6.9	6.2	8.24	8.20	8.25	8.24	29.0	30.1	29.0	30.9	25.5	25.6	25.0	25.5	95%
	2	1	5	4	4																	
	3	2	5	5	5																	
	4	8	5	5	5																	
25	1	9	5	5	5	6.8	6.0	7.1	6.2	8.23	8.21	8.23	8.26	29.0	30.1	29.0	30.9	25.5	25.7	25.0	25.5	90%
	2	15	5	3	3																	
	3	24	5	5	5																	
	4	21	5	5	5																	

Technician Initials: Et Et Et

Conc.	Alkalinity* (mg/L as CaCO3)	Chlorine (mg/L)	Ammonia (mg/L)
control	100		
highest conc.	320	<.03	9.5

Sample Description: _____

Analyst Initials: Et

Comments: 0 hrs: _____
 24 hrs: _____
 48 hrs: _____

Received: 6/20/03 DOH. to 6/17 Source: ABS

Reviewed: AS

QA check: AS

AMEC Northwest Bioassay Lab
 5009 Pacific Hwy. E. Suite 2
 Fife, WA 98424
 (253) 922-4296

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

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

Start Date & Time: 6/2/03 2045
 End Date & Time: 6/23/03 1770
 Test Organisms: Mysidopsis bahia
 Test Protocol: _____

Conc. or (%)	Rep #	Cont. #	Number of Live Organisms			Dissolved Oxygen (mg/L)				pH (units)				Salinity (ppt)				Temperature (°C)				Mean Percent Survival
			0	24	48	0	Fin. 24	Init. 24	48	0	Fin. 24	Init. 24	48	0	Fin. 24	Init. 24	48	0	Fin. 24	Init. 24	48	
50	1	22	5	5	5	6.8	5.6	7.0	5.6	8.23	8.22	8.24	8.32	29.0	29.7	29.0	30.0	25.5	25.7	25.0	25.5	100%
	2	18	5	5	5																	
	3	5	5	5	5																	
	4	28	5	5	5																	
	1																					
	2																					
	3																					
	4																					
	1																					
	2																					
	3																					
	4																					
	1																					
	2																					
	3																					
	4																					
	1																					
	2																					
	3																					
	4																					
	1																					
	2																					
	3																					
	4																					

Technician Initials: Ex Et Et

Conc.	Alkalinity* (mg/L as CaCO3)	Chlorine (mg/L)	Ammonia (mg/L)
control			
highest conc.			

Sample Description: _____

Analyst Initials: _____

Comments: 0 hrs: _____
 24 hrs: _____
 48 hrs: _____

Reviewed: JS

QA check: KS

AMEC Northwest Bioassay Lab
 5009 Pacific Hwy. E. Suite 2
 Fife, WA 98424
 (253) 922-4296

Mysid Acute-48 Hr Survival

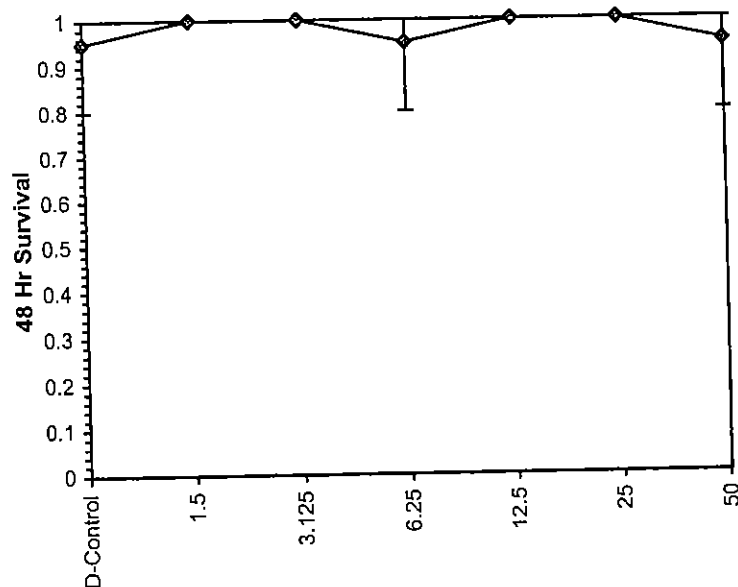
Start Date: 9/13/03	Test ID: 0309-04NW	Sample ID: Carnival Spirit
End Date: 9/15/03	Lab ID: WAAEE-AMEC NW Bioassay	Sample Type: GW-Gray Water
Sample Date: 9/12/03	Protocol: EPA 02-EPA Acute	Test Species: MY-Mysidopsis bahia
Comments:		

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

Conc-%	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical
	Mean	N-Mean	Mean	Min	Max	CV%	N		
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
3.125	1.0000	1.0526	1.3453	1.3453	1.3453	0.000	4	20.00	10.00
6.25	0.9500	1.0000	1.2857	1.1071	1.3453	9.261	4	18.00	10.00
12.5	1.0000	1.0526	1.3453	1.3453	1.3453	0.000	4	20.00	10.00
25	1.0000	1.0526	1.3453	1.3453	1.3453	0.000	4	20.00	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-normal distribution ($p \leq 0.01$)	0.65146	0.896	-1.8653	3.19385
Equality of variance cannot be confirmed				
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	50	>50		2

Dose-Response Plot



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

Client: Shannon + Wilson
 Sample ID: Carnival Spirit
 Contact: _____
 Test #: 0308-01NW 0309-04NW

Start Date & Time: 8/6/03 - 9/4/03 9/13/03 1615
 End Date & Time: 9/15/03 1700
 Test Organisms: Mysidopsis bahia
 Test Protocol: _____

Conc. or (%)	Rep #	Cont. #	Number of Live Organisms			Dissolved Oxygen (mg/L)				pH (units)				Salinity (ppt)				Temperature (°C)				Mean Percent Survival
						0	24	24	48	0	24	24	48	0	24	24	48	0	24	24	48	
CON	1	143	5	5	5	6.8	6.3	8.2	6.1	8.35	8.10	8.25	8.13	29.3	32.3	29.2	30.9	27.0	25.2	25.9	25.1	95%
	2	13	5	5	5																	
	3	27	5	4	4																	
	4	8	5	5	5																	
1.5	1	6	5	5	5	6.8	6.2	7.9	6.1	8.36	8.12	8.42	8.18	29.3	31.6	29.6	30.2	26.8	25.8	25.8	25.7	100%
	2	15	5	5	5																	
	3	3	5	5	5																	
	4	2	5	5	5																	
3.125	1	16	5	5	5	6.7	6.4	8.3	6.1	8.37	8.14	8.41	8.20	29.4	30.2	29.7	30.2	26.8	25.0	25.0	25.2	100%
	2	19	5	5	5																	
	3	9	5	5	5																	
	4	21	5	5	5																	
6.25	1	10	5	5	5	7.0	6.3	8.1	6.1	8.37	8.10	8.41	8.18	29.3	31.2	29.0	30.5	27.0	25.2	25.2	25.2	95%
	2	12	5	4	4																	
	3	25	5	5	5																	
	4	26	5	5	5																	
12.5	1	20	5	5	5	7.1	6.1	8.3	6.0	8.35	8.04	8.40	8.13	29.3	32.6	29.6	30.7	27.0	25.2	25.0	25.2	100%
	2	5	5	5	5																	
	3	28	5	5	5																	
	4	24	5	5	5																	
25	1	17	5	5	5	7.3	6.7	8.7	6.1	8.35	8.05	8.37	8.13	29.1	30.6	29.3	30.5	26.8	25.0	25.0	25.0	100%
	2	14	5	5	5																	
	3	4	5	5	5																	
	4	22	5	5	5																	

Technician Initials

SM ME NF

Conc.	Alkalinity* (mg/L as CaCO3)	Chlorine (mg/L)	Ammonia (mg/L)
control	184	-	-
highest conc.	20	0.03	3.8

Sample Description: _____

Analyst Initials: SM ME NF

Comments: 0 hrs: Animal Source: ABS Received: 9/12/03 Date Hatched: 9/9/03
 24 hrs: _____
 48 hrs: _____

Reviewed: JB

QA check: JP

AMEC Northwest Bioassay Lab
 5009 Pacific Hwy. E. Suite 2
 Fife, WA 98424
 (253) 922-4296

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

Client: Shannon + Wilson
 Sample ID: Carnival Spirit
 Contact: _____
 Test #: 0309-04 NW

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

Conc. or %	Rep #	Cont. #	Number of Live Organisms			Dissolved Oxygen (mg/L)				pH (units)				Salinity (ppt)				Temperature (°C)				Mean Percent Survival
			0	24	48	0	24	24	48	0	24	24	48	0	24	24	48	0	24	24	48	
50	1	18	5	5	5	7.3	5.5	4.5	5.9	8.27	7.89	8.32	8.02	29.1	31.2	29.4	30.8	26.5	25.0	29.4	25.2	95%
	2	1	5	4	4															25.0		
	3	7	5	5	5																	
	4	23	5	5	5																	
	1																					
	2																					
	3																					
	4																					
	1																					
	2																					
	3																					
	4																					
	1																					
	2																					
	3																					
	4																					
	1																					
	2																					
	3																					
	4																					

Technician Initials: SM MF ET

Conc.	Alkalinity* (mg/L as CaCO ₃)	Chlorine (mg/L)	Ammonia (mg/L)
control			
highest conc.			

Sample Description: _____

Analyst Initials: _____

Comments: 0 hrs: _____
 24 hrs: _____
 48 hrs: _____

Reviewed: RD

QA check: RD

AMEC Northwest Bioassay Lab
 5009 Pacific Hwy. E. Suite 2
 Fife, WA 98424
 (253) 922-4296