A Toxicity Evaluation of Marine Sediment Samples Collected from Outer Cook Inlet and the Shelikof Strait

(Collected July 9-16, 1997)

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1. INTRODUCTION

Under contract to Applied Marine Sciences, Pacific Eco-Risk Laboratories performed sediment toxicity testing on 20 marine sediment samples, collected from the Outyer Cook Inlet and Shelikof Strait during the period of July 9-16, 1997. These sediment toxicity evaluations consisted of performing the U.S. EPA's 10-day estuarine amphipod survival test with the amphipod *Eohaustorius estuarius*.

This report describes the performance and results of these sediment tests.

2. SEDIMENT TOXICITY TESTING

The methods used in conducting these tests followed the guidelines established by the EPA manual "Methods for measuring the toxicity of sediment-associated contaminants with estuarine and marine amphipods" (EPA-600/R-94/025, U.S. EPA, Env. Research Laboratory, Narragansett, RI).

2.1 RECEIPT AND HANDLING OF THE SEDIMENT SAMPLES

During the period of July 9-16, 1997, grab samples of marine sediments of approximately 2 L volume were collected from each of 20 sites within the Outer Cook Inlet and Shelikov Strait; these samples were collected into 2 L high-density polyethylene bottles, and were then shipped, via overnight delivery, to the testing laboratory in Martinez, CA, where they were received on July 22, 1997. Upon receipt, the sediment samples were stored at 4°C until used to set-up the test replicates for the sediment toxicity tests on July 23, 1997.

2.2 TEST ORGANISMS

The *Eohaustorius estuarius* used in these tests were obtained from a commercial supplier (Northwestern Aquatic Sciences, Newport, OR). These organisms were acclimated to a salinity of 27 ppt prior to shipment to the testing lab; upon receipt, the test organisms were acclimated to the test salinity of 34 ppt.

2.3. SEDIMENT TOXICITY TESTING PROCEDURES

The sediment toxicity test replicates were established on July 23, 1997. There were 4 replicates for each site. Each replicate consisted of a 1 L glass beaker to which approximately 175 ml (approximately 2 cm depth) of sediment was added (each sediment sample was homogenized prior to loading of the test replicate containers). Test replicates were similarly established for the Control treatment, which consisted

of the same sediment from which the test organisms were originally collected; this sediment was a fine-grained sand-silt mixture very similar in grain size characteristics to the site sediments. The overlying water consisted of 0.45-um filtered seawater (collected from the U.C. Bodega Bay Marine Laboratory); approximately 800 mL of this water was carefully poured into each test replicates so as to minimize disturbance of the sediment. These test replicates were then placed in a temperature-controlled water bath at 15°C under continuous illumination from fluorescent lighting. Each test replicate was gently aerated.

The following day (July 24, 1997), routine water qualities (temperature, pH, dissolved oxygen (D.O.), and salinity) were determined for each test replicate. Then, the tests were initiated with the random allocation of 20 randomly-selected *Eohaustorius*, 3-5 mm in length, into each replicate container (aeration was shut off until the amphipods re-buried themselves, approximately 1 hr after their introduction). Each day, for the next 10 days, the temperature, pH, D.O., and salinity of the overlying water were measured in one test replicate for each treatment. On Days 2 and 8, a small sample of the overlying water was collected from each replicate for each treatment, composited, and analyzed to determine the total ammonia at that treatment.

After 10 days exposure, routine water qualities (temperature, pH, dissolved oxygen (D.O.), and salinity) were again determined for each test replicate. Then, the contents of each replicate beaker were sieved and examined, and the surviving amphipods were collected and counted. The resulting % survival data were statistically analyzed using the Tox-Calc statistical software (TidePool Scientific, McKinleyville, CA). Comparison of the survival data from each of the sites with the Control treatment was made using the Homoscedastic t-Test. The results of these tests are summarized in Section 3.

3. RESULTS

The results of the toxicity evaluation of these 20 sediments are summarized below in Table 1. Briefly, there was 96.25% survival of the amphipods in the Control sediment. Statistical comparison of amphipod survival at the site sediments with the Control were made using the Homoscedastic t-Test; these analyses indicated that amphipod survival in 15 of the site sediments were significanly less than the Control at $p < 0.05$.

Copies of summary of statistical analyses for each of the 20 tests are provided in Appendix A. Copies of the test data sheets are provided in Appendix B.

Table 1. Percent survival of *Eohaustorius estuarius* in the test sediments.

Sediment Site	% Survival in Test Replicates				Overall Mean % Survival
	Rep A	Rep B	Rep C	Rep D	
Control	95	100	90	100	96.25
Z0F1 *	65	75	65	75	70 *
Z0F2	95	90	100	90	93.75
Z0F4	95	85	100	85	91.25
Z0F5	100	90	85	85	90
Z0F6 *	90	70	70	70	75 *
Z0F8 *	85	85	80	75	81.25 *
Z0F13	95	85	100	90	92.5
Z0F14 *	85	95	90	85	88.75 *
Z1F1	100	90	90	95	93.75
Z1F2 *	75	75	85	85	80 *
Z1R07 *	80	90	90	90	87.5 *
Z1R13 *	90	75	85	80	82.5 *
Z2F1 *	75	70	80	85	77.5 *
Z2F2 *	60	70	50	75	63.75 *
Z2R01 *	75	85	80	75	78.75 *
Z2R13 *	80	80	70	90	80 *
Z3F1 *	80	70	70	75	73.75 *
Z3F2 *	65	70	80	70	71.25 *
Z3R11 *	70	40	60	55	56.25 *
Z3R14 *	55	60	70	55	60 *

* statistical analysis indicates that amphipod survival at this site was significantly less than the Control at $p < 0.05$.

Appendix A

Summary of Statistical Analyses
Toxicity Evaluation of 20 Sediment Samples Collected from the Outer Cook Inlet and Shelikof Strait

(samples collected July 9-16, 1997)

Ten Day Amphipod Survival Test-Survival

Start Date:	7/24/97 12:00	Test ID:	1337	Sample ID:	Z0F1
End Date:	8/3/97 12:30	Lab ID:	CAPER-Pacific Eco-Risk Lab	Sample Type:	MS-Marine Sediment
Sample Date:		Protocol:	EPAM 94-EPA Marine	Test Species:	EE-Eohaustorius estuarius
Comments:					

Conc-%	1	2	3	4
Control	0.9500	1.0000	0.9000	1.0000
100	0.6500	0.7500	0.6500	0.7500

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control	0.9625	1.0000	1.3780	1.2490	1.4588	7.346	4			
*100	0.7000	0.7273	0.9925	0.9377	1.0472	6.367	4	6.461	1.943	0.0069

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.8789	0.749	-0.4484	-1.2326
F-Test indicates equal variances (p = 0.46)	2.5662	47.468		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

ToxCalc v5.0

Reviewed by:

Ten Day Amphipod Survival Test-Survival

Start Date:	7/24/97 12:00	Test ID:	1338	Sample ID:	Z0F2
End Date:	8/3/97 12:30	Lab ID:	CAPER-Pacific Eco-Risk Lab	Sample Type:	MS-Marine Sediment
Sample Date:		Protocol:	EPAM 94-EPA Marine	Test Species:	EE-Eohaustorius estuarius
Comments:					

Conc-%	1	2	3	4
Control	0.9500	1.0000	0.9000	1.0000
100	0.9500	0.9000	1.0000	0.9000

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control	0.9625	1.0000	1.3700	1.2490	1.4588	7.346	4			
100	0.9375	0.9740	1.3255	1.2490	1.4588	7.524	4	0.738	1.943	0.0098

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.941	0.749	0.084	-1.4844
F-Test indicates equal variances (p = 0.98)	1.0303	47.468		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates no significant differences

ToxCalc v5.0

Reviewed by:

Ten Day Amphipod Survival Test-Survival

Start Date:	7/24/97 12:00	Test ID:	1339	Sample ID:	Z0F4
End Date:	8/3/97 14:00	Lab ID:	CAPER-Pacific Eco-Risk Lab	Sample Type:	MS-Marine Sediment
Sample Date:		Protocol:	EPAM 94-EPA Marine	Test Species:	EE-Eohaustorius estuarius
Comments:					

Conc-%	1	2	3	4
Control	0.9500	1.0000	0.9000	1.0000
100	0.9500	0.8500	1.0000	0.8500

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control	0.9625	1.0000	1.3780	1.2490	1.4588	7.346	4			
100	0.9125	0.9481	1.2876	1.1731	1.4588	10.877	4	1.046	1.943	0.0145

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.8909	0.749	0.1432	-1.6011
F-Test indicates equal variances (p = 0.61)	1.914	47.468		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates no significant differences

ToxCalc v5.0

Reviewed by: RSB

Ten Day Amphipod Survival Test-Survival

Start Date:	7/24/97 12:00	Test ID:	1340	Sample ID:	Z0F5
End Date:	8/3/97 14:00	Lab ID:	CAPER-Pacific Eco-Risk Lab	Sample Type:	MS-Marine Sediment
Sample Date:		Protocol:	EPAM 94-EPA Marine	Test Species:	EE-Eohaustorius estuarius
Comments:					

Conc-%	1	2	3	4
Control	0.9500	1.0000	0.9000	1.0000
100	1.0000	0.9000	0.8500	0.8500

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control	0.9625	1.0000	1.3780	1.2490	1.4588	7.346	4			
100	0.9000	0.9351	1.2635	1.1731	1.4588	10.685	4	1.357	1.943	0.0138

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9258	0.749	0.684	-0.4111
F-Test indicates equal variances (p = 0.65)	1.7786	47.468		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates no significant differences

ToxCalc v5.0

Reviewed by: RSO

Ten Day Amphipod Survival Test-Survival

Start Date:	7/24/97 12:00	Test ID:	1323	Sample ID:	Z0F6
End Date:	8/3/97 15:05	Lab ID:	CAPER-Pacific Eco-Risk Lab	Sample Type:	MS-Marine Sediment
Sample Date:		Protocol:	EPAM 94-EPA Marine	Test Species:	EE-Eohaustorius estuarius
Comments:					

Conc-%	1	2	3	4
Control	0.9500	1.0000	0.9000	1.0000
100	0.9000	0.7000	0.7000	0.7000

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control	0.9625	1.0000	1.3780	1.2490	1.4588	7.346	4			
*100	0.7500	0.7792	1.0556	0.9912	1.2490	12.215	4	3.932	1.943	0.0131

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.8918	0.749	0.8181	-0.2118
F-Test indicates equal variances (p = 0.70)	1.6225	47.468		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

ToxCalc v5.0

Reviewed by:

Ten Day Amphipod Survival Test-Survival

Start Date:	7/24/97 12:00	Test ID:	1324	Sample ID:	Z0F8
End Date:	8/3/97 15:05	Lab ID:	CAPER-Pacific Eco-Risk Lab	Sample Type:	MS-Marine Sediment
Sample Date:		Protocol:	EPAM 94-EPA Marine	Test Species:	EE-Eohaustorius estuarius
Comments:					

Conc-%	1	2	3	4
Control	0.9500	1.0000	0.9000	1.0000
100	0.8500	0.8500	0.8000	0.7500

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control	0.9625	1.0000	1.3780	1.2490	1.4588	7.346	4			
*100	0.8125	0.8442	1.1251	1.0472	1.1731	5.381	4	4.287	1.943	0.0068

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.91	0.749	-0.5713	-0.9453
F-Test indicates equal variances (p = 0.42)	2.7953	47.468		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

ToxCalc v5.0

Reviewed by: RG

Ten Day Amphipod Survival Test-Survival

Start Date:	7/24/97 12:00	Test ID:	1341	Sample ID:	Z0F13
End Date:	8/3/97 14:15	Lab ID:	CAPER-Pacific Eco-Risk Lab	Sample Type:	MS-Marine Sediment
Sample Date:		Protocol:	EPAM 94-EPA Marine	Test Species:	EE-Eohaustorius estuarius
Comments:					

Conc-%	1	2	3	4
Control	0.9500	1.0000	0.9000	1.0000
100	0.9500	0.8500	1.0000	0.9000

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control	0.9625	1.0000	1.3780	1.2490	1.4588	7.346	4			
100	0.9250	0.9610	1.3065	1.1731	1.4588	9.455	4	0.894	1.943	0.0124

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.934	0.749	-0.0174	-1.3725
F-Test indicates equal variances (p = 0.75)	1.4892	47.468		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates no significant differences

ToxCalc v5.0

Reviewed by: RW

Ten Day Amphipod Survival Test-Survival

Start Date:	7/24/97 12:00	Test ID:	1342	Sample ID:	Z0F14
End Date:	8/3/97 14:15	Lab ID:	CAPER-Pacific Eco-Risk Lab:	Sample Type:	MS-Marine Sediment
Sample Date:		Protocol:	EPAM 94-EPA Marine	Test Species:	EE-Eohaustorius estuarius
Comments:					

Conc-%	1	2	3	4
Control	0.9500	1.0000	0.9000	1.0000
100	0.8500	0.9500	0.9000	0.8500

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control	0.9625	1.0000	1.3780	1.2490	1.4588	7.346	4			
*100	0.8875	0.9221	1.2351	1.1731	1.3453	6.614	4	2.196	1.943	0.0082

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9308	0.749	-0.0804	-1.3836
F-Test indicates equal variances (p = 0.73)	1.5354	47.468		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

Ten Day Amphipod Survival Test-Survival

Start Date:	7/24/97 12:00	Test ID:	1335	Sample ID:	Z1F1
End Date:	8/3/97 11:30	Lab ID:	CAPER-Pacific Eco-Risk Lab	Sample Type:	MS-Marine Sediment
Sample Date:		Protocol:	EPAM 94-EPA Marine	Test Species:	EE-Eohaustorius estuarius
Comments:					

Conc-%	1	2	3	4
Control	0.9500	1.0000	0.9000	1.0000
100	1.0000	0.9000	0.9000	0.9500

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control	0.9625	1.0000	1.3780	1.2490	1.4588	7.346	4			
100	0.9375	0.9740	1.3255	1.2490	1.4588	7.524	4	0.738	1.943	0.0098

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.941	0.749	0.084	-1.4844
F-Test indicates equal variances (p = 0.98)	1.0303	47.468		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates no significant differences

ToxCalc v5.0

Reviewed by: RJS

Ten Day Amphipod Survival Test-Survival

Start Date:	7/24/97 12:00	Test ID:	1336	Sample ID:	Z1F2
End Date:	8/3/97 11:30	Lab ID:	CAPER-Pacific Eco-Risk Lab	Sample Type:	MS-Marine Sediment
Sample Date:		Protocol:	EPAM 94-EPA Marine	Test Species:	EE-Eohaustorius estuarius
Comments:					

Conc-%	1	2	3	4
Control	0.9500	1.0000	0.9000	1.0000
100	0.7500	0.7500	0.8500	0.8500

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control	0.9625	1.0000	1.3780	1.2490	1.4588	7.346	4			
*100	0.8000	0.8312	1.1101	1.0472	1.1731	6.548	4	4.298	1.943	0.0075

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.856	0.749	-0.3937	-1.6082
F-Test indicates equal variances (p = 0.60)	1.9396	47.468		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

ToxCalc v5.0

Reviewed by: RSS

Ten Day Amphipod Survival Test-Survival

Start Date:	7/24/97 10:10	Test ID:	1333	Sample ID:	Z1R07
End Date:	8/3/97 12:45	Lab ID:	CAPER-Pacific Eco-Risk Lab	Sample Type:	MS-Marine Sediment
Sample Date:		Protocol:	EPAM 94-EPA Marine	Test Species:	EE-Eohaustorius estuarius
Comments:					

Conc-%	1	2	3	4
Control	0.9500	1.0000	0.9000	1.0000
100	0.8000	0.9000	0.9000	0.9000

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control	0.9625	1.0000	1.3780	1.2490	1.4588	7.346	4			
*100	0.8750	0.9091	1.2136	1.1071	1.2490	5.846	4	2.660	1.943	0.0074

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.8554	0.749	-0.7884	-0.9385
F-Test indicates equal variances (p = 0.57)	2.0358	47.468		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

ToxCalc v5.0

Reviewed by: RW

Ten Day Amphipod Survival Test-Survival

Start Date:	7/24/97 10:10	Test ID:	1334	Sample ID:	Z1R13
End Date:	8/3/97 12:45	Lab ID:	CAPER-Pacific Eco-Risk Lab	Sample Type:	MS-Marine Sediment
Sample Date:		Protocol:	EPAM 94-EPA Marine	Test Species:	EE-Eohaustorius estuarius
Comments:					

Conc-%	1	2	3	4
Control	0.9500	1.0000	0.9000	1.0000
100	0.9000	0.7500	0.8500	0.8000

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control	0.9625	1.0000	1.3780	1.2490	1.4588	7.346	4			
*100	0.8250	0.8571	1.1441	1.0472	1.2490	7.588	4	3.507	1.943	0.0086

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9215	0.749	-0.2588	-1.5088
F-Test indicates equal variances (p = 0.81)	1.3597	47.468		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

ToxCalc v5.0

Reviewed by: RO

Ten Day Amphipod Survival Test-Survival

Start Date:	7/24/97 10:10	Test ID:	1330	Sample ID:	Z2F1
End Date:	8/3/97 14:45	Lab ID:	CAPER-Pacific Eco-Risk Lab	Sample Type:	MS-Marine Sediment
Sample Date:		Protocol:	EPAM 94-EPA Marine	Test Species:	EE-Eohaustorius estuarius
Comments:					

Conc-%	1	2	3	4
Control	0.9500	1.0000	0.9000	1.0000
100	0.7500	0.7000	0.8000	0.8500

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control	0.9625	1.0000	1.3780	1.2490	1.4588	7.346	4			
*100	0.7750	0.8052	1.0796	0.9912	1.1731	7.248	4	4.663	1.943	0.0080

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9088	0.749	-0.3282	-1.4052
F-Test indicates equal variances (p = 0.68)	1.6733	47.468		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

ToxCalc v5.0

Reviewed by:

Ten Day Amphipod Survival Test-Survival

Start Date:	7/24/97 10:10	Test ID:	1331	Sample ID:	Z2F2
End Date:	8/3/97 14:00	Lab ID:	CAPER-Pacific Eco-Risk Lab	Sample Type:	MS-Marine Sediment
Sample Date:		Protocol:	EPAM 94-EPA Marine	Test Species:	EE-Eohaustorius estuarius
Comments:					

Conc-%	1	2	3	4
Control	0.9500	1.0000	0.9000	1.0000
100	0.6000	0.7000	0.5000	0.7500

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control	0.9625	1.0000	1.3780	1.2490	1.4588	7.346	4			
*100	0.6375	0.6623	0.9275	0.7854	1.0472	12.495	4	5.855	1.943	0.0115

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.8905	0.749	-0.3885	-1.5876
F-Test indicates equal variances (p = 0.83)	1.3105	47.468		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

ToxCalc v5.0

Reviewed by: RJS

Ten Day Amphipod Survival Test-Survival

Start Date:	7/24/97 10:10	Test ID:	1332	Sample ID:	Z2R01
End Date:	8/3/97 14:00	Lab ID:	CAPER-Pacific Eco-Risk Lab	Sample Type:	MS-Marine Sediment
Sample Date:		Protocol:	EPAM 94-EPA Marine	Test Species:	EE-Eohaustorius estuarius
Comments:					

Conc-%	1	2	3	4
Control	0.9500	1.0000	0.9000	1.0000
100	0.7500	0.8500	0.8000	0.7500

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control	0.9625	1.0000	1.3780	1.2490	1.4588	7.346	4			
*100	0.7875	0.8182	1.0937	1.0472	1.1731	5.489	4	4.831	1.943	0.0067

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.8845	0.749	-0.3412	-0.8938
F-Test indicates equal variances (p = 0.41)	2.8441	47.468		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

ToxCalc v5.0

Reviewed by:

Ten Day Amphipod Survival Test-Survival

Start Date:	7/24/97 10:10	Test ID:	1329	Sample ID:	Z2R13
End Date:	8/3/97 14:45	Lab ID:	CAPER-Pacific Eco-Risk Lab	Sample Type:	MS-Marine Sediment
Sample Date:		Protocol:	EPAM 94-EPA Marine	Test Species:	EE-Eohaustorius estuarius
Comments:					

Conc-%	1	2	3	4
Control	0.9500	1.0000	0.9000	1.0000
100	0.8000	0.8000	0.7000	0.9000

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control	0.9625	1.0000	1.3780	1.2490	1.4588	7.346	4			
*100	0.8000	0.8312	1.1136	0.9912	1.2490	9.478	4	3.615	1.943	0.0104

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9284	0.740	0.1034	1.1302
F-Test indicates equal variances (p = 0.95)	1.0871	47.468		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

ToxCalc v5.0

Reviewed by: RLO

Ten Day Amphipod Survival Test-Survival

Start Date:	7/24/97 10:10	Test ID:	1327	Sample ID:	Z3F1
End Date:	8/3/97 15:30	Lab ID:	CAPER-Pacific Eco-Risk Lab	Sample Type:	MS-Marine Sediment
Sample Date:		Protocol:	EPAM 94-EPA Marine	Test Species:	EE-Eohaustorius estuarius
Comments:					

Conc-%	1	2	3	4
Control	0.9500	1.0000	0.0000	1.0000
100	0.8000	0.7000	0.7000	0.7500

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control	0.9625	1.0000	1.3780	1.2490	1.4588	7.346	4			
*100	0.7375	0.7662	1.0342	0.9912	1.1071	5.354	4	5.959	1.943	0.0065

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.8932	0.749	-0.3936	-0.7102
F-Test indicates equal variances (p = 0.35)	3.3432	47.468		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

ToxCalc v5.0

Reviewed by:

Ten Day Amphipod Survival Test-Survival

Start Date:	7/24/97 10:10	Test ID:	1328	Sample ID:	Z3F2
End Date:	8/3/97 15:30	Lab ID:	CAPER-Pacific Eco-Risk Lab	Sample Type:	MS-Marine Sediment
Sample Date:		Protocol:	EPAM 94-EPA Marine	Test Species:	EE-Eohaustorius estuarius
Comments:					

Conc-%	1	2	3	4
Control	0.9500	1.0000	0.9000	1.0000
100	0.6500	0.7000	0.8000	0.7000

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control	0.9625	1.0000	1.3780	1.2490	1.4588	7.346	4			
*100	0.7125	0.7403	1.0068	0.9377	1.1071	7.100	4	5.990	1.943	0.0075

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9206	0.749	-0.1602	-1.0468
F-Test indicates equal variances (p = 0.58)	2.0057	47.468		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

ToxCalc v5.0

Reviewed by: RJO

Ten Day Amphipod Survival Test-Survival

Start Date:	7/24/97 10:10	Test ID:	1325	Sample ID:	Z3R11
End Date:	8/3/97 16:00	Lab ID:	CAPER-Pacific Eco-Risk Lab	Sample Type:	MS-Marine Sediment
Sample Date:		Protocol:	EPAM 94-EPA Marine	Test Species:	EE-Eohaustorius estuarius
Comments:					

Conc-%	1	2	3	4
Control	0.9500	1.0000	0.9000	1.0000
100	0.7000	0.4000	0.6000	0.5500

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control	0.9625	1.0000	1.3780	1.2490	1.4588	7.346	4			
*100	0.5625	0.5844	0.8494	0.6847	0.9912	15.009	4	6.494	1.943	0.0129

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9473	0.740	0.4220	0.0034
F-Test indicates equal variances (p = 0.71)	1.5858	47.468		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

ToxCalc v5.0

Reviewed by: RDS

Ten Day Amphipod Survival Test-Survival

Start Date:	7/24/97 10:10	Test ID:	1326	Sample ID:	Z3R14
End Date:	8/3/97 16:00	Lab ID:	CAPER-Pacific Eco-Risk Lab	Sample Type:	MS-Marine Sediment
Sample Date:		Protocol:	EPAM 94-EPA Marine	Test Species:	EE-Eohaustorius estuarius
Comments:					

Conc-%	1	2	3	4
Control	0.9500	1.0000	0.9000	1.0000
100	0.5500	0.6000	0.7000	0.5500

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control	0.9625	1.0000	1.3780	1.2490	1.4588	7.346	4			
*100	0.6000	0.6234	0.8870	0.8355	0.9912	8.273	4	7.852	1.943	0.0076

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9203	0.749	-0.0932	-1.1257
F-Test indicates equal variances (p = 0.61)	1.9027	47.468		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

Appendix B

Test Data Sheets for the Toxicity Evaluation of 20 Sediment Samples Collected from the Outer Cook Inlet and Shelikof Strait

(samples collected July 9-16, 1997)

10 Day Marine/Estuarine Sediment Toxicity Test Data

Date (Day 0) 7-24-97 Client Applied Marine Sciences Project Outer Cook Inlet / Shelikof Strait
Species Eohaustorius estuarius Organism Age/Size 3-5 mm Project # —

Date	Treatment Replicate	Sample I.D.: HOME CONTROL				Sample I.D.:				Sign-Off (Initials)
		pH	D.O.	Salinity	Temp.	pH	D.O.	Salinity	Temp.	
Day 0	Rep A	8.14	7.1	33.3	16.2					
	Rep B	8.14	7.2	33.2	16.0					RBO
	Rep C	8.14	7.2	33.2	15.9					7-24-97
	Rep D	8.14	7.2	33.0	15.9					Time: 1200pm
Day 1	Rep A	8.14	9.5	33.2	16.0					7/25/97
Day 2	Rep B	8.20	7.5	33.4	15.9					7/26/97
Day 3	Rep C	8.18	7.3	33.6	15.8					7-27-97
Day 4	Rep D	8.17	7.6	33.3	15.8					7-28-97
Day 5	Rep A	8.18	7.7	33.3	15.9					7/29/97
Day 6	Rep B	8.12	7.2	33.6	15.9					7/30/97
Day 7	Rep C	8.10	7.8	33.6	15.1					
Day 8	Rep D	7.94	6.6	33.5	15.7					7/31/97
Day 9	Rep A	8.13	6.7	34.2	15.7					8-2-97
Day 10	Rep A	8.20	7.1	34.5	16.0					
	Rep B	8.20	7.1	34.6	16.0					RBO
	Rep C	8.20	7.1	34.7	16.0					8-3-97
	Rep D	8.20	7.2	34.2	16.0					Time:
# of live organisms at end of test (Day 10)		Rep A 19	Rep B 20	Rep C 18	Rep D 20	Rep A	Rep B	Rep C	Rep D	12:30

10 Day Marine/Estuarine Sediment Toxicity Test Data

Date (Day 0) 7/~~23~~ 24/97 Client Applied Marine Science Project Outer Cook Inlet/Shelikof Strait
Species Eohaustorius estuarius Organism Age/Size 3-5 mm Project # 1337/1338

Date	Treatment Replicate	Sample I.D.: ZOF1				Sample I.D.: ZOF2				Sign-Off (Initials)
		pH	D.O.	Salinity	Temp.	pH	D.O.	Salinity	Temp.	
Day 0	Rep A	8.02	7.4	34.4	16.1	8.12	7.3	34.4	16.0	
	Rep B	8.10	7.2	34.4	16.0	8.12	7.3	34.4	16.0	
	Rep C	8.10	7.3	34.4	16.0	8.10	7.3	34.4	16.0	7-24-97
	Rep D	8.10	7.3	34.4	16.0	8.12	7.3	34.5	16.0	Time: 12:00p
Day 1	Rep A	8.04	9.5	34.1	16.0	8.14	9.5	34.1	16.0	7/25/97
Day 2	Rep B	8.11	7.4	34.2	16.0	8.19	7.4	34.4	16.1	7/26/97
Day 3	Rep C	8.16	7.4	34.5	15.9	8.14	7.3	34.6	15.9	7-27-97
Day 4	Rep D	8.12	7.2	34.4	16.0	8.18	7.2	34.6	16.0	7-27-97
Day 5	Rep A	8.09	7.7	34.2	16.1	8.21	7.7	34.3	16.0	7/29/97
Day 6	Rep B	8.08	7.3	34.2	16.1	8.18	7.2	34.4	16.1	7/30/97
Day 7	Rep C	8.06	8.2	34.4	15.2	8.09	8.1	34.5	15.2	7-31-97
Day 8	Rep D	7.95	6.8	34.5	16.0	8.02	6.7	34.7	16.1	8/1/97
Day 9	Rep A	8.14	7.3	35.1	16.0	8.18	7.1	34.8	16.0	8/2/97
Day 10	Rep A	8.16	7.9	35.0	16.2	8.22	7.6	35.2	16.3	
	Rep B	8.20	7.9	35.1	16.2	8.23	7.5	35.3	16.3	
	Rep C	8.20	7.9	35.0	16.2	8.20	7.5	35.2	16.2	
	Rep D	8.20	7.7	35.2	16.3	8.25	7.5	35.1	16.2	8-3-97 Time: 12:30
# of live organisms at end of test (Day 10)		Rep A 13	Rep B 15	Rep C 13	Rep D 15	Rep A 19	Rep B 18	Rep C 20	Rep D 18	

10 Day Marine/Estuarine Sediment Toxicity Test Data

Date (Day 0) 7-24-97 Client Applied Marine Sciences Project Outer Cook Inlet/Shelikof Strait
Species Eohaustorius estuarius Organism Age/Size 3-5 mm Project # 1339/1340

Date	Treatment Replicate	Sample I.D.: ZOF4				Sample I.D.: ZOF5				Sign-Off (Initials)
		pH	D.O.	Salinity	Temp.	pH	D.O.	Salinity	Temp.	
Day 0	Rep A	8.12	7.2	34.4	16.1	8.06	7.2	34.3	16.3	[illegible]
	Rep B	8.12	7.3	34.4	16.2	8.08	7.2	34.4	16.2	RJO
	Rep C	8.12	7.3	34.4	16.0	8.09	7.2	34.4	16.1	7-24-97
	Rep D	8.10	7.1	34.4	16.0	8.08	7.1	34.4	16.0	Time: 12:00 pm
Day 1	Rep A	8.09	9.3	34.1	16.0	8.09	9.3	34.1	16.1	mm 7/25/97
Day 2	Rep B	8.16	7.3	34.4	16.0	8.13	7.3	34.2	16.1	mm 7/26/97
Day 3	Rep C	8.16	7.3	34.6	15.9	8.16	7.2	34.2	15.9	[illegible] 7-27-97
Day 4	Rep D	8.17	7.6	34.2	16.0	8.18	7.3	34.6	16.0	[illegible] 7-28-97
Day 5	Rep A	8.17	7.7	34.2	16.0	8.16	7.6	34.0	16.0	mm 7/29/97
Day 6	Rep B	8.12	7.1	34.4	16.2	8.11	7.1	34.2	16.2	mm 7/30/97
Day 7	Rep C	8.11	8.2	34.5	15.2	8.12	7.9	34.3	15.2	mm 7/31/97
Day 8	Rep D	7.96	6.7	34.9	15.9	7.99	6.7	34.5	16.0	mm 8/1/97
Day 9	Rep A	8.14	7.4	34.8	16.0	8.14	6.9	34.8	16.0	mm 8/2/97
Day 10	Rep A	8.21	7.4	35.1	16.2	8.20	7.3	35.0	16.2	[illegible]
	Rep B	8.20	7.3	35.1	16.2	8.21	7.3	35.0	16.2	RJO
	Rep C	8.21	7.3	35.2	16.3	8.21	7.2	35.0	16.2	8-3-97
	Rep D	8.21	7.3	35.3	16.2	8.22	7.3	35.1	16.2	Time:
# of live organisms at end of test (Day 10)		Rep A 19	Rep B 17	Rep C 20	Rep D 17	Rep A 20	Rep B 18	Rep C 17	Rep D 17	2:00

10 Day Marine/Estuarine Sediment Toxicity Test Data

Date (Day 0) 7-24-97 Client Applied Marine Science Project Outer Cook Inlet / Shelikof Strait
Species Eohaustorius estuarius Organism Age/Size 3-5 mm Project # 1323/1324

Date	Treatment Replicate	Sample I.D.: ZOF6				Sample I.D.: ZOF8				Sign-Off (Initials)
		pH	D.O.	Salinity	Temp.	pH	D.O.	Salinity	Temp.	
Day 0	Rep A	8.09	7.2	34.4	16.1	8.06	7.0	34.3	16.0	
	Rep B	8.02	6.9	34.4	16.1	8.06	7.0	34.3	16.0	
	Rep C	8.12	7.1	34.4	16.0	8.06	7.1	34.4	16.0	7-24-97
	Rep D	8.10	7.1	34.4	16.0	8.08	7.1	34.4	16.0	Time: 12:00pm
Day 1	Rep A	8.14	9.4	34.1	16.0	8.10	9.3	34.1	16.1	7-25-97
Day 2	Rep B	8.17	7.4	34.1	16.0	8.13	7.3	34.1	16.1	7-26-97
Day 3	Rep C	8.14	7.3	34.5	15.9	8.14	7.2	34.3	15.9	7-27-97
Day 4	Rep D	8.19	7.2	34.5	16.0	8.18	7.3	34.7	16.0	7-28-97
Day 5	Rep A	8.16	7.6	34.2	16.0	8.17	7.6	34.0	16.1	7/29/97
Day 6	Rep B	8.13	7.1	34.2	16.1	8.11	7.0	34.2	16.1	7/30/97
Day 7	Rep C	8.13	7.9	34.4	15.2	8.14	7.7	34.4	15.2	7-31-97
Day 8	Rep D	7.99	6.7	34.6	15.9	7.81	4.9	34.9	15.8	8/1/97
Day 9	Rep A	8.13	6.8	34.7	16.0	8.14	6.7	34.7	16.0	8/2/97
Day 10	Rep A	8.22	7.2	35.0	16.2	22	7.1	35.0	16.2	
	Rep B	8.22	7.2	34.9	16.2	20	7.2	34.8	16.2	
	Rep C	8.21	7.2	35.0	16.2	21	7.1	35.1	16.2	8-3-97
	Rep D	8.22	7.2	34.9	16.2	22	7.2	35.4	16.2	Time: 3:08
# of live organisms at end of test (Day 10)		Rep A 18	Rep B 14	Rep C 14	Rep D 14	Rep A 17	Rep B 17	Rep C 16	Rep D 15	

10 Day Marine/Estuarine Sediment Toxicity Test Data

Date (Day 0) 7/~~23~~ 24/97 Client Applied Marine Science Project Outer Cook Inlet/Sholikof Strait

Species Eohaustorius estuarius Organism Age/Size 3-5 mm Project # 1341/1342

Date	Treatment Replicate	Sample I.D.: ZOF13				Sample I.D.: ZOF14				Sign-Off (Initials)
		pH	D.O.	Salinity	Temp.	pH	D.O.	Salinity	Temp.	
Day 0	Rep A	8.10	7.1	34.4	16.0	8.10	6.9	34.4	15.9	
	Rep B	8.12	7.1	34.4	16.0	8.10	7.0	34.4	15.9	
	Rep C	8.12	7.1	34.4	16.0	8.10	7.0	34.4	15.9	7-24-97
	Rep D	8.14	7.1	34.4	15.9	8.10	7.0	34.4	15.9	Time: 12:00pm
Day 1	Rep A	8.15	9.5	34.4	16.0	8.12	9.4	34.1	16.0	7/25/97
Day 2	Rep B	8.12	7.3	34.4	16.0	8.14	7.4	34.5	16.0	7/26/97
Day 3	Rep C	8.12	7.3	34.4	16.0	8.14	7.4	34.5	16.0	7/27/97
Day 4	Rep D	8.18	7.3	34.6	16.0	8.14	7.3	34.5	15.9	7-28-97
Day 5	Rep A	8.18	7.7	34.3	15.9	8.14	7.7	34.4	15.9	7/29/97
Day 6	Rep B	8.12	7.1	34.4	16.1	8.09	7.1	34.5	16.0	7/30/97
Day 7	Rep C	8.13	7.7	34.4	15.1	8.04	7.7	34.4	15.2	8/31/97
Day 8	Rep D	7.97	6.6	34.6	15.9	7.94	6.6	34.5	15.8	8/1/97
Day 9	Rep A	8.15	6.7	35.0	15.9	8.13	6.7	35.1	15.8	8/2/97
Day 10	Rep A	8.21	7.2	35.1	16.1	8.20	7.2	35.5	16.0	
	Rep B	8.20	7.2	35.0	16.2	8.20	7.2	35.4	16.0	
	Rep C	8.21	7.2	35.1	16.2	8.15	7.2	35.1	16.2	8-3-97
	Rep D	8.21	7.2	35.0	16.2	8.19	7.1	34.9	16.2	Time: 2:15
# of live organisms at end of test (Day 10)		Rep A 19	Rep B 17	Rep C 20	Rep D 18	Rep A 17	Rep B 19	Rep C 18	Rep D 17	

10 Day Marine/Estuarine Sediment Toxicity Test Data

Date (Day 0) 7-24-97 Client Applied Marine Science Project # 1335
Species Eohaustorius estuarius Organism Age/Size 3-5 mm Project # 1336

Date	Treatment Replicate	Sample I.D.: Z1F1				Sample I.D.: Z1F2				Sign-Off (Initials)
		pH	D.O.	Salinity	Temp.	pH	D.O.	Salinity	Temp.	
Day 0	Rep A	8.13	7.0	34.4	16.5	8.09	7.0	34.4	16.1	
	Rep B	8.12	7.1	34.4	16.1	8.10	7.1	34.4	16.0	
	Rep C	8.12	7.1	34.4	16.0	8.13	7.1	34.4	16.0	7-24-96
	Rep D	8.10	7.1	34.4	16.0	8.14	7.1	34.4	16.0	Time: 12:00pm
Day 1	Rep A	8.11	9.4	34.4	16.1	8.11	9.4	34.1	16.0	7/25/97
Day 2	Rep B	8.10	7.6	34.1	16.0	8.17	7.5	34.5	16.0	7/26/97
Day 3	Rep C	8.07	7.2	34.5	15.9	8.05	7.2	34.6	15.9	7-27-97
Day 4	Rep D	8.06	7.4	34.7	16.0	8.14	7.3	34.7	16.1	7-28-97
Day 5	Rep A	8.13	7.9	34.3	16.0	8.17	7.8	34.2	16.0	7/29/97
Day 6	Rep B	8.10	7.1	34.3	16.1	8.13	7.1	34.4	16.1	7/30/97
Day 7	Rep C	8.13	6.9	34.4	15.2	8.14	6.9	34.5	15.2	7/31/97
Day 8	Rep D	7.94	7.0	34.5	16.0	7.94	6.8	34.7	16.0	8/1/97
Day 9	Rep A	8.10	7.9	34.6	16.0	8.12	7.9	34.8	16.0	8/2/97
Day 10	Rep A	8.19	7.1	34.9	16.0	8.15	7.1	34.9	16.0	
	Rep B	8.18	7.1	34.9	16.0	8.16	7.1	35.1	16.0	
	Rep C	8.18	7.1	34.9	16.0	8.17	7.1	35.1	16.0	8-3-97
	Rep D	8.19	7.1	35.2	16.0	8.17	7.1	35.0	16.0	Time: 11:30a
# of live organisms at end of test (Day 10)		Rep A 20	Rep B 18	Rep C 18	Rep D 19	Rep A 15	Rep B 15	Rep C 17	Rep D 17	

10 Day Marine/Estuarine Sediment Toxicity Test Data

Date (Day 0) 7-24-97 Client Applied Marine Science Project Outer Cook Inlet / Shelikof Strait
Species Eohaustorius estuarius Organism Age/Size 3-5 mm Project # 1333/1334

Date	Treatment Replicate	Sample I.D.: Z1R07				Sample I.D.: Z1R13				Sign-Off (Initials)
		pH	D.O.	Salinity	Temp.	pH	D.O.	Salinity	Temp.	
Day 0	Rep A	8.10	7.1	34.4	16.1	8.04	7.1	34.4	16.4	[illegible]
	Rep B	8.12	7.1	34.4	16.0	8.10	7.1	34.4	16.0	[illegible]
	Rep C	8.14	7.1	34.4	16.0	8.13	7.1	34.4	16.0	7-24-97
	Rep D	8.16	7.1	34.5	16.0	8.13	7.1	34.4	16.0	Time: 10:10 a
Day 1	RepA	8.15	9.3	34.1	16.0	8.15	9.4	34.1	16.0	[illegible] 7/25/97
Day 2	RepB	8.12	7.4	34.5	16.0	8.14	7.4	34.5	16.0	[illegible] 7/26/97
Day 3	RepC	8.10	7.1	34.6	16.2	8.09	7.2	34.6	16.1	[illegible] 7-27-97
Day 4	RepD	8.20	7.4	34.9	16.1	8.21	7.4	34.6	16.1	[illegible] 7-28-97
Day 5	RepA	8.17	7.8	34.2	16.0	8.10	7.8	34.1	16.0	[illegible] 7/29/97
Day 6	RepB	8.12	7.1	34.3	16.1	8.12	7.1	34.4	16.1	[illegible] 7/30/97
Day 7	RepC		6.9				6.9			[illegible] 7/31/97
Day 8	RepD	7.94	6.7	34.9	16.0	7.93	6.7	34.6	16.0	[illegible] 8/1/97
Day 9	RepA	8.13	7.2	34.5	15.9	8.09	7.1	34.6	15.9	[illegible] 8/2/97
Day 10	Rep A	8.20	7.1	34.8	16.0	8.18	7.1	34.6	16.0	[illegible]
	Rep B	8.21	7.1	34.8	16.0	8.18	7.1	35.0	16.0	
	Rep C	8.19	7.1	34.9	16.0	8.18	7.1	35.0	16.0	[illegible]
	Rep D	8.20	7.1	35.4	16.0	8.18	7.1	35.0	16.0	8-3-97 Time:
# of live organisms at end of test (Day 10)		Rep A 16	Rep B 18	Rep C 18	Rep D 18	Rep A 18	Rep B 15	Rep C 17	Rep D 16	12:45

10 Day Marine/Estuarine Sediment Toxicity Test Data

Date (Day 0) 7-24-97 Client Applied Marine Science Project Outer Cook Inlet/Shelikof Strait
Species Eohaustorius estuarius Organism Age/Size 3-5 mm Project # 1329/1330

Date	Treatment Replicate	Sample I.D.: Z2R13				Sample I.D.: Z2F1				Sign-Off (Initials)
		pH	D.O.	Salinity	Temp.	pH	D.O.	Salinity	Temp.	
Day 0	Rep A	8.10	7.1	34.4	16.0	8.13	7.1	34.4	16.0	
	Rep B	8.12	7.2	34.4	16.0	8.10	7.1	34.4	16.1	
	Rep C	8.13	7.1	34.4	16.0	8.08	7.1	34.4	16.0	7-24-97
	Rep D	8.08	7.1	34.4	16.0	8.08	7.1	34.4	16.0	Time: 10:00 am
Day 1	Rep A	8.15	9.2	34.4	16.0	8.16	9.3	34.5	16.1	7/25/97
Day 2	Rep B	8.12	7.3	34.2	16.0	8.14	7.3	34.4	16.0	7/26/97
Day 3	Rep C	8.11	7.3	34.6	16.1	8.06	7.3	34.6	16.0	7-27-97
Day 4	Rep D	8.26	7.4	34.6	16.0	8.23	7.4	34.6	16.1	7-28-97
Day 5	Rep A	8.19	7.7	34.2	16.0	8.15	7.8	34.2	16.0	7/29/97
Day 6	Rep B	8.11	7.0	34.3	16.1	8.10	7.0	34.3	16.1	7/30/97
Day 7	Rep C	8.13	6.9	34.5	15.1	8.09	7.8	34.5	15.1	7/31/97
Day 8	Rep D	7.96	6.8	34.6	15.9	7.93	6.7	34.6	16.0	8/1/97
Day 9	Rep A	8.14	6.9	34.6	16.0	8.09	6.8	34.7	15.9	8/2/97
Day 10	Rep A	8.22	7.0	34.8	16.0	8.18	7.0	35.0	16.0	
	Rep B	8.19	7.0	34.9	16.0	8.18	7.1	35.0	16.0	
	Rep C	8.20	7.0	35.0	16.0	8.17	7.0	35.1	16.0	8-3-97
	Rep D	8.21	7.0	35.0	15.9	8.18	7.0	35.4	16.0	Time: 2:45 pm
# of live organisms at end of test (Day 10)		Rep A 16	Rep B 16	Rep C 14	Rep D 18	Rep A 15	Rep B 14	Rep C 16	Rep D 17	

10 Day Marine/Estuarine Sediment Toxicity Test Data

Date (Day 0) 7-24-97 Client Applied Marine Science Project Outer Cook Inlet / Shelikof Strait
Species Eohaustorius estuarius Organism Age/Size 3-5 mm Project # 1331/1332

Date	Treatment Replicate	Sample I.D.: Z2F2				Sample I.D.: Z2R01				Sign-Off (Initials)
		pH	D.O.	Salinity	Temp.	pH	D.O.	Salinity	Temp.	
Day 0	Rep A	8.10	7.1	34.4	16.0	8.09	7.1	34.4	16.4	
	Rep B	8.09	7.2	34.4	16.2	8.10	7.1	34.4	16.0	
	Rep C	8.06	7.1	34.4	16.0	8.10	7.1	34.4	16.0	7-24-97
	Rep D	8.10	7.1	34.4	16.0	8.10	7.1	34.5	15.9	Time: 1010a
Day 1	Rep A	8.10	9.3	34.2	16.1	8.16	9.4	34.4	16.1	7/25
Day 2	Rep B	8.11	7.4	34.4	16.0	8.11	7.4	34.4	16.0	7/26
Day 3	Rep C	8.10	7.1	34.5	16.4	8.11	7.1	34.6	16.0	7/27/97
Day 4	Rep D	8.23	7.3	34.4	16.1	8.23	7.3	34.7	16.1	7-28-97
Day 5	Rep A	8.13	7.7	34.2	16.0	8.14	7.7	34.3	16.0	7/29
Day 6	Rep B	8.10	7.0	34.3	16.1	8.08	7.0	34.4	16.1	7/30
Day 7	Rep C	8.12	6.9	34.5	15.2	8.12	7.0	34.8	15.2	7/31
Day 8	Rep D	7.93	6.8	34.5	16.0	7.92	7.0	34.8	15.9	8/1/97
Day 9	Rep A	8.07	7.0	34.4	15.9	8.08	6.9	34.7	15.9	8/2/97
Day 10	Rep A	8.15	6.9	34.8	16.0	8.17	7.1	35.0	16.0	
	Rep B	8.17	7.0	34.9	16.0	8.16	7.1	34.8	16.0	
	Rep C	8.17	7.0	35.3	16.0	8.17	7.1	35.5	16.0	8-3-97
	Rep D	8.17	7.0	35.0	16.1	8.17	7.1	35.2	16.0	Time: 2:00 pm
# of live organisms at end of test (Day 10)		Rep A 12	Rep B 14	Rep C 10	Rep D 15	Rep A 15	Rep B 17	Rep C 16	Rep D 15	

10 Day Marine/Estuarine Sediment Toxicity Test Data

Date (Day 0) ~~7/23~~ 7/24/97 Client Applied Marine Sciences Project Outer Cook Inlet/Shelikof Strait

Species Eohaustorius estuarius Organism Age/Size 3-5 mm Project # 1327/1328

Date	Treatment Replicate	Sample I.D.: Z3F1				Sample I.D.: Z3F2				Sign-Off (Initials)
		pH	D.O.	Salinity	Temp.	pH	D.O.	Salinity	Temp.	
Day 0	Rep A	8.17	7.1	34.4	16.2	8.13	7.1	34.4	16.3	
	Rep B	8.13	7.1	34.4	16.0	8.09	7.0	34.4	16.2	
	Rep C	8.12	7.1	34.4	16.0	8.09	7.2	34.4	16.0	7-24-97
	Rep D	8.18	7.1	34.4	16.0	8.06	7.1	34.4	15.9	Time: 10:10a
Day 1	Rep A	8.10	9.3	34.1	16.0	8.16	9.3	34.4	16.1	7/25/97
Day 2	Rep B	8.15	7.4	34.4	16.0	8.13	7.4	34.5	16.0	7/26/97
Day 3	Rep C	8.10	7.2	34.6	16.1	8.08	7.3	34.6	16.2	7-27-97
Day 4	Rep D	8.25	7.5	34.7	15.8	8.26	7.4	34.8	16.0	7-28-97
Day 5	Rep A	8.14	7.7	34.3	16.0	8.17	7.7	34.4	16.0	7/29/97
Day 6	Rep B	8.12	7.1	34.3	16.0	8.13	7.0	34.3	16.1	7/30/97
Day 7	Rep C	8.11	7.9	34.4	15.1	8.13	7.8	34.4	15.2	7/31/97
Day 8	Rep D	7.93	6.7	34.9	15.8	7.93	6.7	35.0	15.9	8/1/97
Day 9	Rep A	8.09	6.8	34.6	16.0	8.12	6.8	34.6	16.0	8/2/97
Day 10	Rep A	8.16	7.0	35.0	15.9	8.19	6.9	35.1	16.0	
	Rep B	8.16	7.0	35.0	15.9	8.19	6.9	35.2	16.0	
	Rep C	8.18	6.9	35.1	15.8	8.18	7.0	35.0	15.9	8-3-97
	Rep D	8.18	6.9	35.4	15.8	8.20	7.0	35.0	15.9	Time:
# of live organisms at end of test (Day 10)		Rep A 16	Rep B 14	Rep C 14	Rep D 15	Rep A 13	Rep B 14	Rep C 16	Rep D 14	3:30 pm

10 Day Marine/Estuarine Sediment Toxicity Test Data

Date (Day 0) 7-24-97 Client Applied Marine Sciences Project Outer Cook Inlet/Shelikof Strait
Species Eohaustorius estuarius Organism Age/Size 3-5 mm Project # 1325/1326

Date	Treatment Replicate	Sample I.D.: Z3R11				Sample I.D.: Z3R14				Sign-Off (Initials)
		pH	D.O.	Salinity	Temp.	pH	D.O.	Salinity	Temp.	
Day 0	Rep A	8.05	6.8	34.4	16.2	8.05	7.1	34.4	16.0	[illegible]
	Rep B	8.06	7.1	34.5	16.1	8.06	7.1	34.4	16.2	[illegible]
	Rep C	8.12	7.1	34.5	16.0	8.14	7.1	34.5	16.1	7-24-97
	Rep D	8.09	7.1	34.5	16.0	8.12	7.2	34.5	16.1	Time: 10:10a
Day 1	Rep A	8.14	9.3	34.2	16.0	8.14	9.3	34.4	16.1	[illegible] 7/25/97
Day 2	Rep B	8.17	7.4	34.6	16.0	8.16	7.4	34.6	16.0	[illegible] 7/26/97
Day 3	Rep C	8.11	7.2	34.7	16.1	8.12	7.2	34.3	16.1	[illegible] 7-27-97
Day 4	Rep D	8.29	7.7	34.9	15.9	8.28	7.5	34.9	15.9	[illegible] 7-28-97
Day 5	Rep A	8.17	7.7	34.4	16.0	8.18	7.7	34.3	16.0	[illegible] 7/29/97
Day 6	Rep B	8.13	7.1	34.4	16.1	8.13	7.0	34.5	16.1	[illegible] 7/30/97
Day 7	Rep C	8.11	7.8	34.6	15.1	8.18	7.8	34.5	15.2	[illegible] 7/31/97
Day 8	Rep D	7.94	6.8	35.0	15.8	7.91	6.6	35.0	15.8	[illegible] 8-1/97
Day 9	Rep A	8.10	6.8	34.8	15.9	8.11	6.8	34.8	16.0	[illegible] 8-2-97
Day 10	Rep A	8.16	7.0	34.9	15.9	8.18	6.9	35.0	16.0	[illegible]
	Rep B	8.16	7.0	35.3	15.9	8.19	6.9	35.1	15.9	[illegible]
	Rep C	8.16	7.0	35.5	15.9	8.19	6.9	35.3	15.9	8-3-97
	Rep D	8.16	7.0	35.4	15.8	8.20	7.6	35.6	15.8	Time: 4:00p
# of live organisms at end of test (Day 10)		Rep A 14	Rep B 8	Rep C 12	Rep D 11	Rep A 11	Rep B 12	Rep C 14	Rep D 11	