



Arkansas Analytical, Inc.

Toxicity Test Results

MAGCOBAR MINE SITE
NPDES PERMIT NUMBER: AR0049794
December 2005

Fathead Minnow, *Pimephales promelas*, Larval Survival and Growth Test
Test 1000.0

Ceriodaphnia dubia, Survival and Reproduction Test
Test 1002.0

Prepared for: **Mr. David Friedman**
EEMA O&M Services Group
P.O. Box 232
Kulpsville, PA 19443

Prepared by: Arkansas Analytical, Inc.
11701 I-30, Bldg 1, Suite 115
Little Rock, Arkansas 72209
Lab Number K512323

Monday, January 16, 2006



Introduction

This report contains test results for toxicity testing for the Magcobar Mine Site. The NPDES permit number is AR0049794. The facility is located one mile northeast of Magnet Cove in Sections 10, 11, 14, & 15, Township 3 South, Range 17 West in Hot Springs County, Arkansas. The facility discharges into Chamberlain Creek, thence to Cove Creek, thence to Ouachita River in Segment 2F of the Ouachita River Basin.

The permit requires chronic biomonitoring testing bi-monthly for both *Ceriodaphnia dubia* and *Pimephales promelas*. The test results in this report represent the testing for December of 2005.

Plant Operations

To be provided by permittee.



Source of Effluent and Dilution Water

Effluent samples were collected as follows:

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	12-12-05, 0930	12-13-05, 0930
Sample #2:	12-13-05, 0930	12-14-05, 0930
Sample #3:	12-19-05, 0900	12-20-05, 0900

The sample was a composite collected at the final discharge from the Magcobar mine site.

The following information was collected upon immediate receipt of the samples at the laboratory:

Sample Receiving Information:	Date, Time Sample(s) Received	Storage Temperature (°C)
Sample #1:	12-13-05, 1125	4
Sample #2:	12-14-05, 1150	4
Sample #3:	12-20-05, 0915	4

Chain of custody documentation is located in Appendix A.

The permit designates the receiving water to be used as dilution water for the toxicity tests. Synthetic dilution water was substituted either because zero flow conditions existed or due to an earlier characterization of the receiving water as being toxic.

Each sample was analyzed for pH, hardness, total alkalinity, and conductivity. Results are provided in Appendix B.

Dilution Series

Five dilutions in addition to a control (0% effluent) were used in the toxicity tests. The dilutions, which were made with synthetic water, were 32%, 42%, 56%, 75%, and 100%. The low-flow effluent concentration (**critical dilution**) was defined as **100% effluent**.

Test Methods

EPA Method 1000.0, Fathead Minnow, *Pimephales promelas*, Larval Survival and Growth Test, was used in this bioassay. Larvae are exposed in a static renewal system for seven days and the results are based on the survival and growth (increase in weight) of the larvae. There were no deviations from the reference method. The test chambers were 500 ml plastic cups, and each chamber contained eight organisms in a test solution volume of 250 mls. The alternate method suggested in the method (11.3.4.5) for combating pathogen interference, was also run parallel to the original fathead minnow test. The test chambers were 30 ml plastic cups with 20 ml of test solution. Each chamber contained 2 organisms. The total number of fish remained the same (40 per test solution). The fish were then combined to perform growth analysis. The test temperature was 25 degrees Centigrade. Raw data and statistics are provided in Appendix C.

EPA Method 1002.0, Cladoceran, *Ceriodaphnia dubia*, Survival and Reproduction Test, was also used. Neonates are exposed in a static renewal system until at least 60% of the control organisms have produced a third brood. Results are based on the survival and reproduction of the organisms. One neonate was placed in each of ten replicate chambers using a randomizing template. Test chambers were 30 ml plastic cups filled with 15 ml of test solution. The test temperature was 25 degrees Centigrade. Raw data and statistics are provided in Appendix D.

Test Organisms

The organisms used in Test 1000.0 were < 24 hour old Fathead Minnows, *Pimephales promelas*, which were purchased from Aquatox; a copy of the organism history is provided in Appendix E.

The organisms used in Test 1002.0 were < 24 hour old *Ceriodaphnia dubia* neonates, (all born within the same eight hours), obtained from an in-house culture. An organism history is provided in Appendix E.

Quality Assurance

Test Acceptability

TEST ACCEPTANCE CRITERIA for *Ceriodaphnia dubia*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	100%	X	
Average of 15 or more young per surviving female	16.1	X	
At least 60% of surviving females should have produced 3 broods	70%	X	
The percent coefficient of variation between replicates must be 40% or less for the young of surviving females	20.8%	X	

TEST ACCEPTANCE CRITERIA for *Pimephales promelas*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	100%	X	
The percent coefficient of variation between replicates must be 40% or less for survival	0%	X	
Minimum of 0.25 mg average dry weight of surviving controls	0.448	X	
The percent coefficient of variation between replicates must be 40% or less for growth	8.20%	X	

Reference Toxicant

The reference toxicant used was Potassium Chloride prepared in-house. The tests were performed using moderately hard synthetic as dilution water. The results of the reference toxicant were:

REFERENCE TOXICANT

<i>Ceriodaphnia dubia</i>		<i>Pimephales promelas</i>	
NOEC Survival:	250 ppm KCl	NOEC Survival:	500 ppm KCl
LOEC Survival:	500 ppm KCl	LOEC Survival:	1000 ppm KCl
NOEC Reproduction:	125 ppm KCl	NOEC Growth:	500 ppm KCl
LOEC Reproduction:	250 ppm KCl	LOEC Growth:	1000 ppm KCl

Quality Assurance charts are provided in Appendix F.

**Summary of Results
Magcobar Mine Site**

<i>Ceriodaphnia dubia</i>		<i>Pimephales promelas</i>	
NOEC / LOEC Survival	100% / NA	NOEC / LOEC survival	100% / NA
NOEC / LOEC Reproduction	100% / NA	NOEC / LOEC growth	100% / NA
Mean number of neonates (critical dilution)	16.2	%CV survival (critical dilution)	0%
%CV Reproduction (critical dilution)	18.4%	Mean dry weight (critical dilution) in milligrams	0.770
		%CV growth (critical dilution)	10.0%

Conclusion

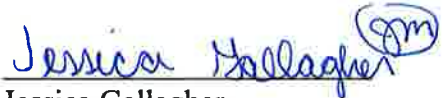
Chronic static renewal larval survival and growth test using fathead minnow, *Pimephales promelas*, (Method 1000.0).

The permit issued to the Magcobar Mine Site, AR0049794, specifies that the **critical dilution is 100% effluent**. The effluent samples did not exhibit lethal effects or sublethal effects at the critical dilution, and, as such, **passed** both portions of the test.

Chronic static renewal survival and reproduction test using *Ceriodaphnia dubia*, (Method 1002.0).

The permit issued to the Magcobar, AR0049794, specifies that the **critical dilution is 100% effluent**. The effluent samples did not exhibit lethal effects or sublethal effects at the critical dilution, and, as such, **passed** both portions of the test.

Biomonitoring Analysts:


Jessica Gallagher


Lynn Beaulieu


Jennifer Morales


Tracy Bounds


Melissa Green



**SUMMARY REPORTING FORMS FOR CHRONIC BIOMONITORING
FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL
*PIMEPHALES PROMELAS***

PERMITTEE: Magcobar Mine Site

NPDES #: AR0049794

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	12-12-05, 0930	12-13-05, 0930
Sample #2:	12-13-05, 0930	12-14-05, 0930
Sample #3:	12-19-05, 0900	12-20-05, 0900

Test initiated (date, time): 12-14-05, 1620 Test terminated (date, time): 12-21-05, 1000

Dilution water used: Soft Synthetic

DATA TABLE FOR FATHEAD MINNOW SURVIVAL

Effluent Conc %	Percent Survival in Replicate Chambers					Mean Percent Survival			
	A	B	C	D	E	24 hours	48 hours	7 days	CV %
0%	100	100	100	100	100	100	100	100	0.00
32%	100	100	100	100	100	100	100	100	
42%	100	100	100	100	100	100	100	100	
56%	100	100	100	100	100	100	100	100	
75%	100	100	100	100	100	100	100	100	
100%	100	100	100	100	100	100	100	100	0.00

DATA TABLE FOR GROWTH OF FATHEAD MINNOWS

Effluent Conc %	Average Dry Weight in milligrams in replicate chambers					Mean Dry Weight	CV%
	A	B	C	D	E		
0%	0.526	0.407	0.394	0.446	0.431	0.441	11.7
32%	0.417	0.403	0.291	0.306	0.368	0.357	
42%	0.372	0.356	0.326	0.348	0.313	0.343	
56%	0.353	0.384	0.244	0.386	0.525	0.378	
75%	0.408	0.428	0.364	0.396	0.396	0.398	
100%	0.312	0.475	0.337	0.372	0.559	0.411	25.2

Coefficient of Variation = standard deviation / mean * 1



**SUMMARY REPORTING FORMS FOR CHRONIC BIOMONITORING
FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL
*PIMEPHALES PROMELAS***

PERMITTEE: Magcobar Mine Site

NPDES #: AR0049794

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	12-12-05, 0930	12-13-05, 0930
Sample #2:	12-13-05, 0930	12-14-05, 0930
Sample #3:	12-19-05, 0900	12-20-05, 0900

Test initiated (date, time): 12-14-05, 1650 Test terminated (date, time): 12-21-05, 1430
 Dilution water used: Soft Synthetic

**DATA TABLE FOR FATHEAD MINNOW SURVIVAL
ALTERNATE METHOD (SUMMARY)**

Effluent Conc %	Percent Survival in Replicate Chambers					Mean Percent Survival				CV %
	A	B	C	D	E	24 hours	48 hours	7 days		
0%	100	100	100	100	100	100	100	100	0.00	
32%	75	100	100	100	87.5	97.5	97.5	92.5		
42%	100	100	100	87.5	100	100	100	97.5		
56%	100	100	100	100	100	100	100	100		
75%	100	100	100	100	100	100	100	100		
100%	87.5	100	100	100	100	100	100	97.5	5.73	

**DATA TABLE FOR GROWTH OF FATHEAD MINNOWS
ALTERNATE METHOD**

Effluent Conc %	Average Dry Weight in milligrams in replicate chambers					Mean Dry Weight	CV%
	A	B	C	D	E		
0%	0.526	0.407	0.394	0.446	0.431	0.441	11.7
32%	0.417	0.403	0.291	0.306	0.368	0.357	
42%	0.372	0.356	0.326	0.348	0.313	0.343	
56%	0.353	0.384	0.244	0.386	0.525	0.378	
75%	0.408	0.428	0.364	0.396	0.396	0.398	
100%	0.312	0.475	0.337	0.372	0.559	0.411	25.2

Coefficient of Variation = standard deviation / mean * 100
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SUMMARY REPORTING FORMS FOR CHRONIC BIOMONITORING
FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL
Pimephales promelas

1. Dunnett's procedure or Steel's Many-One Rank Test as appropriate:
Is the mean survival at 7 days significantly different ($p=0.05$) than the control survival for:

a) LOW FLOW OR CRITICAL DILUTION, (100%) YES _____ NO X

2. Dunnett's Procedure
Is the mean dry weight (growth) at 7 days significantly different ($p=0.05$) than the control's dry weight (growth) for:

a) LOW FLOW OR CRITICAL DILUTION, (100%) YES _____ NO X

3. If NO was answered to 1.a) enter [0] otherwise enter [1] (parameter TLP6C): 0

4. If NO was answered to 2.a) enter [0] otherwise enter [1] (parameter TGP6C): 0

5. Enter percentage corresponding to each parameter below:

a) NOEC survival (parameter TOP6C)= 100 % effluent
b) NOEC growth (parameter TPP6C)= 100 % effluent
c) Coefficient of variation (parameter TQP6C)= 0 %



SUMMARY REPORTING FORMS FOR CHRONIC BIOMONITORING
Ceriodaphnia dubia SURVIVAL AND REPRODUCTION

Permittee: Magcobar Mine Site

NPDES #: AR0049794

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	12-12-05, 0930	12-13-05, 0930
Sample #2:	12-13-05, 0930	12-14-05, 0930
Sample #3:	12-19-05, 0900	12-20-05, 0900

Test initiated (date, time): 12-14-05, 1100 Test terminated (date, time): 12-21-05, 0910

Dilution water used: Soft Synthetic

Ceriodaphnia dubia SURVIVAL AND REPRODUCTION
 NUMBER OF YOUNG PRODUCED PER FEMALE @ TEST TERMINATION
 PERCENT EFFLUENT

Replicate	0%	32%	42%	56%	75%	100%
A	16	18	X0	16	16	16
B	19	14	18	15	15	20
C	16	13	X0	X0	15	16
D	23	13	13	21	X9	15
E	14	18	13	16	14	13
F	18	13	13	17	10	22
G	16	11	14	14	18	16
H	11	11	X0	11	X0	X0
I	15	X0	17	16	17	15
J	13	X0	14	20	19	13
Mean	16.1	11.1	10.2	14.6	13.3	14.6
Mean/surviving female	16.1	13.9	14.6	16.2	15.5	16.2
CV%*	20.8					18.4

X= Dead Adult; M= Male (Not considered in statistics)

*Coefficient of Variation = standard deviation/ mean * 100; CV% calculation based on young per surviving female



SUMMARY REPORTING FORMS FOR CHRONIC BIOMONITORING
Ceriodaphnia dubia SURVIVAL AND REPRODUCTION

Permittee: Magcobar Mine Site

NPDES #: AR0049794

PERCENT SURVIVAL

PERCENT EFFLUENT	0%	32%	42%	56%	75%	100%
Time of Reading: 24 HOURS	100	90	100	100	100	100
48 HOURS	100	80	100	100	90	90
Test termination	100	80	70	90	80	90

1. Fisher's Exact Test:

Is the mean survival at test termination significantly different (p=0.05) than the control survival for:

a) LOW FLOW OR CRITICAL DILUTION, (100%): YES _____ NO X

2. Dunnett's Procedure or Steel's Many One Rank Test:

Is the mean number of young produced per female significantly different (p=0.05) than the controls number of young per female for:

a) LOW FLOW OR CRITICAL DILUTION, (100%): YES _____ NO X

3. If NO was answered to 1.a) enter [0] otherwise enter [1] (parameter TLP3B): 0

4. If NO was answered to 2.a) enter [0] otherwise enter [1] (parameter TGP3B): 0

5. Enter percentage corresponding to each parameter below:

a) NOEC survival (parameter TOP3B)= 100 % effluent

b) NOEC reproduction (parameter TPP3B)= 100 % effluent

c) Coefficient of variation (parameter TQP3B)= 20.8 %

APPENDIX A

Chain of Custody Forms

APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Fathead Minnow

Lab # / Sample ID		K512323							Test Start (Date/Time)	12-14-05/14:20
Client		Weston							Test End (Date/Time)	12-21-05/1000
		Day of Test								
		1	2	3	4	5	6	7	notes/remarks	
Control		12/14	12/15	12/16	12/17	12/18	12/19	12/20	55 139	
D.O (mg/L)	INITIAL	8.2	8.9	8.5	8.8	8.4	9.0	9.0		
	FINAL	8.5	8.2	8.9	9.3	8.1	8.9	8.8		
pH(mg/L)	INITIAL	7.7	7.9	8.2	8.0	8.0	7.8	7.7		
	FINAL	7.8	7.7	8.0	8.1	8.1	7.6	8.0		
temp(C)	INITIAL	23.7	22.2	22.0	21.2	22.6	22.7	22.3		
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0		
ALKALINITY(mg/L)		26						7		
HARDNESS(mg/L)		33						5		
CONDUCTIVITY(umhos/cm)		149						7		
CHLORINE(mg/L)		<0.05						7		
CONC:		32%	30%	32%	32%	32%	32%	32%		
D.O (mg/L)	INITIAL	8.1	8.7	8.8	9.1	8.9	8.8	9.9		
	FINAL	8.9	8.1	8.8	9.3	8.2	8.6	8.5		
pH(mg/L)	INITIAL	7.5	7.6	7.5	7.6	7.8	7.3	7.3		
	FINAL	7.7	7.4	7.6	7.8	7.8	7.4	7.7		
temp(C)	INITIAL	23.4	22.3	23.2	21.1	22.9	23.0	24.8		
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0		
CONC:		42%	42%	42%	42%	42%	42%	42%		
D.O (mg/L)	INITIAL	8.1	8.7	8.8	9.0	9.0	8.8	9.9		
	FINAL	8.4	8.1	8.7	9.1	8.5	8.6	8.4		
pH(mg/L)	INITIAL	7.5	7.5	7.5	7.5	7.7	7.4	7.4		
	FINAL	7.6	7.3	7.5	7.7	7.8	7.3	7.6		
temp(C)	INITIAL	24.0	22.3	22.3	21.2	23.0	22.9	24.8		
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0		
CONC:		56%	56%	56%	56%	56%	56%	56%		
D.O (mg/L)	INITIAL	8.1	8.7	8.8	9.1	9.2	9.1	9.9		
	FINAL	8.4	8.2	8.8	8.8	8.5	8.8	8.2		
pH(mg/L)	INITIAL	7.4	7.9	7.4	7.5	7.4	7.4	7.4		
	FINAL	7.6	7.2	7.5	7.6	7.7	7.2	7.4		
temp(C)	INITIAL	24.0	22.3	22.4	21.8	23.3	22.9	24.8		
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0		
CONC:		75%	75%	75%	75%	75%	75%	75%		
D.O (mg/L)	INITIAL	8.1	8.7	8.9	9.2	9.3	9.4	9.9		
	FINAL	8.2	8.2	8.6	7.8	8.6	8.9	8.3		
pH(mg/L)	INITIAL	7.3	7.4	7.6	7.4	7.6	7.3	7.3		
	FINAL	7.4	7.2	7.4	7.5	7.7	7.2	7.4		
temp(C)	INITIAL	24.2	22.4	22.5	22.0	23.9	23.0	24.8		
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0		
CONC:		100%	100%	100%	100%	100%	100%	100%		
D.O (mg/L)	INITIAL	8.3	8.9	9.0	9.4	9.6	9.4	9.9		
	FINAL	8.2	8.3	8.6	8.7	8.6	8.9	7.9		
pH(mg/L)	INITIAL	7.3	7.3	7.3	7.3	7.4	7.0	7.1		
	FINAL	7.4	7.1	7.3	7.4	7.6	7.0	7.0		
temp(C)	INITIAL	24.4	22.4	22.6	22.2	24.2	23.1	24.8		
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0		
CONC:	100%	A	A	B	B	A	B	C		
ALKALINITY(mg/L)		8	8	8	8	8	8	6		
HARDNESS(mg/L)		1300	1300	1320	1320	1300	1320	1450		
CONDUCTIVITY(umhos/cm)		2360	2360	2350	2350	2360	2350	2350		
CHLORINE(mg/L)		<0.05						3		

APPENDIX C

Fathead minnow raw data and statistics

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB #/ SAMPLE ID V512323 TEST START DATE 12-14 TIME 11020
 CLIENT Neston TEST END DATE 12-21 TIME 1000
 AGE AND SOURCE OF MINNOWS < 24 hrs, Aquatica

Control

CONC:	REP #	start	D A Y (NUMBER SURVIVING)							SURVIVAL			
			1	2	3	4	5	6	7	%	MEAN %	CV	
Control	A	8	8		8	8	8	8	8	8	100	100	0%
	B		8		8	8	8	8	8	8	100		
	C		8		8	8	8	8	8	8	100		
	D		8		8	8	8	8	8	8	100		
	E		8		8	8	8	8	8	8	100		
321	A	8	8		8	8	8	8	8	8	100	100	
	B		8		8	8	8	8	8	8	100		
	C		8		8	8	8	8	8	8	100		
	D		8		8	8	8	8	8	8	100		
	E		8		8	8	8	8	8	8	100		
421	A	8	8		8	8	8	8	8	8	100	100	
	B		8		8	8	8	8	8	8	100		
	C		8		8	8	8	8	8	8	100		
	D		8		8	8	8	8	8	8	100		
	E		8		8	8	8	8	8	8	100		
561	A	8	8		8	8	8	8	8	8	100	100	
	B		8		8	8	8	8	8	8	100		
	C		8		8	8	8	8	8	8	100		
	D		8		8	8	8	8	8	8	100		
	E		8		8	8	8	8	8	8	100		
751	A	8	8		8	8	8	8	8	8	100	100	
	B		8		8	8	8	8	8	8	100		
	C		8		8	8	8	8	8	8	100		
	D		8		8	8	8	8	8	8	100		
	E		8		8	8	8	8	8	8	100		
100%	A	8	8		8	8	8	8	8	8	100	100	0%
	B		8		8	8	8	8	8	8	100		
	C		8		8	8	8	8	8	8	100		
	D		8		8	8	8	8	8	8	100		
	E		8		8	8	8	8	8	8	100		
ANALYST:		mg	Jg	4g/1b	4g/1b	1b	Jg	Jg	Jg				
DATE:		12-14	12-15	12-16	12-17	12-18	12-19	12-20	12-21				
TIME:		11020	1040	1000	1055	1500	1930	1115	1000				

CV = PERCENT COEFFICIENT OF VARIATION: STANDARD DEVIATION/MEAN * 100

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB #/ SAMPLE ID KS12323 TEST START DATE 12-14 TIME 1650
 CLIENT Weston TEST END DATE 12-21 TIME 1430
 AGE AND SOURCE OF MINNOWS 24 hrs; Aquatox

Alternate - Summary

Control

CONC:	REP #	start	DAY (NUMBER SURVIVING)							SURVIVAL			
			1	2	3	4	5	6	7	%	MEAN %	CV	
<i>Control</i>	A	8	8	8	8	8	8	8	8	8	100	100	0%
	B	↓	8	8	8	8	8	8	8	8	100		
	C	↓	8	8	8	8	8	8	8	8	100		
	D	↓	8	8	8	8	8	8	8	8	100		
	E	↓	8	8	8	8	8	8	8	8	100		
<i>32%</i>	A	8	7	7	6	6	6	6	6	75	92.5		
	B	↓	8	8	8	8	8	8	8	100			
	C	↓	8	8	8	8	8	8	8	100			
	D	↓	8	8	8	8	8	8	8	100			
	E	↓	8	8	8	8	8	8	8	87.5			
<i>42%</i>	A	8	8	8	8	8	8	8	8	100	97.5		
	B	↓	8	8	8	8	8	8	8	100			
	C	↓	8	8	8	8	8	8	8	100			
	D	↓	8	8	8	7	7	7	7	87.5			
	E	↓	8	8	8	8	8	8	8	100			
<i>50%</i>	A	8	8	8	8	8	8	8	8	100	100		
	B	↓	8	8	8	8	8	8	8	100			
	C	↓	8	8	8	8	8	8	8	100			
	D	↓	8	8	8	8	8	8	8	100			
	E	↓	8	8	8	8	8	8	8	100			
<i>75%</i>	A	8	8	8	8	8	8	8	8	100	100		
	B	↓	8	8	8	8	8	8	8	100			
	C	↓	8	8	8	8	8	8	8	100			
	D	↓	8	8	8	8	8	8	8	100			
	E	↓	8	8	8	8	8	8	8	100			
<i>100%</i>	A	8	8	8	8	8	8	7	7	87.5	97.5	5.73%	
	B	↓	8	8	8	8	8	8	8	100			
	C	↓	8	8	8	8	8	8	8	100			
	D	↓	8	8	8	8	8	8	8	100			
	E	↓	8	8	8	8	8	8	8	100			
ANALYST:		AF, JG	JG	JG	Hb, lb	Hb, lb	JG	JG	JG				
DATE:		12-14	12-15	12-16	12-17	12-18	12-19	12-20	12-21				
TIME:		1650	1600	1340	1200	1650	1530	1400	1430				

CV = PERCENT COEFFICIENT OF VARIATION: STANDARD DEVIATION/MEAN * 100

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # SAMPLE ID K512323 TEST START DATE 12-14 TIME 1650

CLIENT Neston - Alternate TEST END DATE 12-21 TIME 1430

AGE AND SOURCE OF MINNOWS

CONC:	REP #	DAY (NUMBER SURVIVING)								SURVIVAL		
		start	1	2	3	4	5	6	7	%	MEAN %	CV
Control A	1	2	2	2	2	2	2	2	2	100	100	0
	2	1	1	1	1	2	2	2	2	100		
	3	1	1	1	1	2	2	2	2	100		
	4	1	1	1	1	2	2	2	2	100		
	5											
Control B	1	2	2	2	2	2	2	2	2	100	100	0
	2	1	1	1	1	2	2	2	2	100		
	3	1	1	1	1	2	2	2	2	100		
	4	1	1	1	1	2	2	2	2	100		
	5											
Control C	1	2	2	2	2	2	2	2	2	100	100	0
	2	1	1	1	1	2	2	2	2	100		
	3	1	1	1	1	2	2	2	2	100		
	4	1	1	1	1	2	2	2	2	100		
	5											
Control D	1	2	2	2	2	2	2	2	2	100	100	0
	2	1	1	1	1	2	2	2	2	100		
	3	1	1	1	1	2	2	2	2	100		
	4	1	1	1	1	2	2	2	2	100		
	5											
Control E	1	2	2	2	2	2	2	2	2	100	100	0
	2	1	1	1	1	2	2	2	2	100		
	3	1	1	1	1	2	2	2	2	100		
	4	1	1	1	1	2	2	2	2	100		
	5											
CONC:												
ANALYST:		JG	JG	JG	1b	10/1b	1g	1g	Jb			
DATE:		12-14	12-15	12-16	12-17	12-18	12-19	12-20	12-21			
TIME:		1650	1100	1410	1210	1145	1530	1400	1430			

CV = PERCENT COEFFICIENT OF VARIATION: STANDARD DEVIATION/MEAN * 100

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # SAMPLE ID TEST START DATE 12-14 TIME 1650

CLIENT EEMA Weston TEST END DATE 12-21 TIME 1430

AGE AND SOURCE OF MINNOWS

CONC:	REP #	start	DAY (NUMBER SURVIVING)							SURVIVAL			
			1	2	3	4	5	6	7	%	MEAN %	CV	
321. A	1	2	2	2	2	2	2	2	2	2	100	75?	
	2	2	2	2	2	2	2	2	2	2	100		
	3	2	2	1	1	1	1	1	1	50			
	4	2	1	1	1	1	1	1	1	50			
321. B	1	2	2	2	2	2	2	2	2	2	100	100	0
	2	2	2	2	2	2	2	2	2	2	100		
	3	2	2	2	2	2	2	2	2	2	100		
	4	2	2	2	2	2	2	2	2	2	100		
321. C	1	2	2	2	2	2	2	2	2	2	100	100	0
	2	2	2	2	2	2	2	2	2	2	100		
	3	2	2	2	2	2	2	2	2	2	100		
	4	2	2	2	2	2	2	2	2	2	100		
321. D	1	2	2	2	2	2	2	2	2	2	100	100	0
	2	2	2	2	2	2	2	2	2	2	100		
	3	2	2	2	2	2	2	2	2	2	100		
	4	2	2	2	2	2	2	2	2	2	100		
321. E	1	2	2	2	2	2	2	2	2	2	100	87.5	
	2	2	2	2	2	2	2	1	1	50			
	3	2	2	2	2	2	2	2	2	100			
	4	2	2	2	2	2	2	2	2	100			
CONC:													
ANALYST:		JG	JG	JG	ib	11/16	JG	JG	JG				
DATE:		12-14	12-15	12-16	12-17	12-18	12-19	12-20	12-21				
TIME:		1650	1300	1530	1220	1700	1530	1400	1430				

CV = PERCENT COEFFICIENT OF VARIATION: STANDARD DEVIATION/MEAN * 100

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB #/ SAMPLE ID TEST START DATE 12-14 TIME 1650

CLIENT ECMA-Weston TEST END DATE 12-21 TIME 1430

AGE AND SOURCE OF MINNOWS

CONC:	REP #	DAY (NUMBER SURVIVING)								SURVIVAL		
		start	1	2	3	4	5	6	7	%	MEAN %	CV
421. A	1	2	2	2	2	2	2	2	2	100	100	0
	2	2	2	2	2	2	2	2	100			
	3	2	2	2	2	2	2	2	100			
	4	2	2	2	2	2	2	2	100			
421. B	1	2	2	2	2	2	2	2	2	100	100	0
	2	2	2	2	2	2	2	2	100			
	3	2	2	2	2	2	2	2	100			
	4	2	2	2	2	2	2	2	100			
421. C	1	2	2	2	2	2	2	2	2	100	100	0
	2	2	2	2	2	2	2	2	100			
	3	2	2	2	2	2	2	2	100			
	4	2	2	2	2	2	2	2	100			
421. D	1	2	2	2	2	2	2	2	2	100	87.5	
	2	2	2	2	2	2	2	2	100			
	3	2	2	2	2	2	2	2	100			
	4	2	2	2	1	1	1	1	50			
421. E	1	2	2	2	2	2	2	2	2	100	100	
	2	2	2	2	2	2	2	2	100			
	3	2	2	2	2	2	2	2	100			
	4	2	2	2	2	2	2	2	100			
CONC:												
ANALYST:		JG	JG	JG	lb	JG/14	JG	JG	JG			
DATE:		12-14	12-15	12-16	12-17	12-18	12-19	12-20	12-21			
TIME:		1650	1500	1515	1230	1700	1530	1400	1430			

CV = PERCENT COEFFICIENT OF VARIATION: STANDARD DEVIATION/MEAN * 100

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB #/ SAMPLE ID TEST START DATE 12-14 TIME 1030

CLIENT EMA-Weston TEST END DATE 12-21 TIME 1430

AGE AND SOURCE OF MINNOWS

		D A Y (NUMBER SURVIVING)								SURVIVAL		
CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
50% A	1	2	2	2	2	2	2	2	2	100	100	0
	2	I	2	2	2	2	2	2	2	100		
	3	I	2	2	2	2	2	2	2	100		
	4	I	2	2	2	2	2	2	2	100		
	E	2										
50% B	1	2	2	2	2	2	2	2	2	100	100	0
	2	I	2	2	2	2	2	2	2	100		
	3	I	2	2	2	2	2	2	2	100		
	4	I	2	2	2	2	2	2	2	100		
50% C	1	2	2	2	2	2	2	2	2	100	100	0
	2	I	2	2	2	2	2	2	2	100		
	3	I	2	2	2	2	2	2	2	100		
	4	I	2	2	2	2	2	2	2	100		
50% D	1	2	2	2	2	2	2	2	2	100	100	0
	2	I	2	2	2	2	2	2	2	100		
	3	I	2	2	2	2	2	2	2	100		
	4	I	2	2	2	2	2	2	2	100		
50% E	1	2	2	2	2	2	2	2	2	100	100	0
	2	I	2	2	2	2	2	2	2	100		
	3	I	2	2	2	2	2	2	2	100		
	4	I	2	2	2	2	2	2	2	100		
CONC:												
ANALYST:		JG	JG	JG	tb/16	tb/16	ty	JG	JG			
DATE:		12-14	12-15	12-16	12-17	12-18	12-19	12-20	12-21			
TIME:		1030	1600	1340	1200	1650	1530	1400	1430			

CV = PERCENT COEFFICIENT OF VARIATION: STANDARD DEVIATION/MEAN * 100

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB #/ SAMPLE ID TEST START DATE 12-14 TIME 1050

CLIENT TEMA Weston TEST END DATE 12-21 TIME 1430

AGE AND SOURCE OF MINNOWS

CONC:	REP #	start	DAY (NUMBER SURVIVING)							SURVIVAL			
			1	2	3	4	5	6	7	%	MEAN %	CV	
75% A	1	2	2	2	2	2	2	2	2	2	100	100	
	2	2	2	2	2	2	2	2	2	2	100		
	3	2	2	2	2	2	2	2	2	2	100		
	4	2	2	2	2	2	2	2	2	2	100		
75% B	1	2	2	2	2	2	2	2	2	2	100	100	
	2	2	2	2	2	2	2	2	2	2	100		
	3	2	2	2	2	2	2	2	2	2	100		
	4	2	2	2	2	2	2	2	2	2	100		
75% C	1	2	2	2	2	2	2	2	2	2	100	100	
	2	2	2	2	2	2	2	2	2	2	100		
	3	2	2	2	2	2	2	2	2	2	100		
	4	2	2	2	2	2	2	2	2	2	100		
75% D	1	2	2	2	2	2	2	2	2	2	100	100	
	2	2	2	2	2	2	2	2	2	2	100		
	3	2	2	2	2	2	2	2	2	2	100		
	4	2	2	2	2	2	2	2	2	2	100		
75% E	1	2	2	2	2	2	2	2	2	2	100	100	
	2	2	2	2	2	2	2	2	2	2	100		
	3	2	2	2	2	2	2	2	2	2	100		
	4	2	2	2	2	2	2	2	2	2	100		
CONC:													
ANALYST:		JG	JG	JG	h/lb	h/lb	JG	JG	JG				
DATE:		12-14	12-15	12-16	12-17	12-18	12-19	12-20	12-21				
TIME:		1050	1030	1530	1200	1655	1530	1400	1420				

CV = PERCENT COEFFICIENT OF VARIATION: STANDARD DEVIATION/MEAN * 100

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB #/ SAMPLE ID TEST START DATE 12-14 TIME 1050

CLIENT EEMA - Weston TEST END DATE 12-21 TIME 1430

AGE AND SOURCE OF MINNOWS

CONC:	REP #	start	D A Y (NUMBER SURVIVING)							SURVIVAL			
			1	2	3	4	5	6	7	%	MEAN %	CV	
100% A	1	2	2	2	2	2	2	2	2	2	100	87.5	
	2	I	2	2	2	2	2	1	1	50			
	3	I	2	2	2	2	2	2	2	100			
	4	I	2	2	2	2	2	2	2	100			
100% B	1	2	2	2	2	2	2	2	2	100	100		
	2	I	2	2	2	2	2	2	2	100			
	3	I	2	2	2	2	2	2	2	100			
	4	I	2	2	2	2	2	2	2	100			
100% C	1	2	2	2	2	2	2	2	2	100	100		
	2	I	2	2	2	2	2	2	2	100			
	3	I	2	2	2	2	2	2	2	100			
	4	I	2	2	2	2	2	2	2	100			
100% D	1	2	2	2	2	2	2	2	2	100	100		
	2	I	2	2	2	2	2	2	2	100			
	3	I	2	2	2	2	2	2	2	100			
	4	I	2	2	2	2	2	2	2	100			
100% E	1	2	2	2	2	2	2	2	2	100	100		
	2	I	2	2	2	2	2	2	2	100			
	3	I	2	2	2	2	2	2	2	100			
	4	I	2	2	2	2	2	2	2	100			
CONC:													
ANALYST:		JG	JG	JG	tb/1b	tb/1b	JG	JG	JG				
DATE:		12-14	12-15	12-16	12-17	12-18	12-19	12-20	12-21				
TIME:		1050	1530	1615	1200	1659	1530	1400	1430				

CV = PERCENT COEFFICIENT OF VARIATION: STANDARD DEVIATION/MEAN * 100

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s:		K512323		TEST DATES (BEGIN / END):		12/14/05-12/21/05	
CLIENT:		EEMA-Weston		WEIGHING DATE / TIME:		12/27/05, 0915	
ANALYSTS:		MG,JG,TB,LB		DRYING TEMP (DEGREES C):		60	
SAMPLE ID:		SEE COC		DRYING TIME (HOURS):		24	
	REP #	FINAL DRY WEIGHT TIN+LARVAE (g)	INITIAL WEIGHT TIN (g)	TOTAL DRY WEIGHT OF LARVAE (g)	NUMBER OF LARVAE	DRY WEIGHT OF LARVAE (mg)	
CONTROL	A	1.24850	1.24523	0.00327	8	0.409	AVG DRY WEIGHT (mg)
	B	1.25360	1.25011	0.00349	8	0.436	
	C	1.24106	1.23770	0.00336	8	0.420	0.448
	D	1.23772	1.23382	0.00390	8	0.488	CV
	E	1.24275	1.23887	0.00388	8	0.485	
CONC: 32%	A	1.23950	1.23490	0.00460	8	0.575	AVG DRY WEIGHT (mg)
	B	1.24509	1.24031	0.00478	8	0.598	
	C	1.24086	1.23665	0.00421	8	0.526	0.578
	D	1.24481	1.23979	0.00502	8	0.628	CV
	E	1.27192	1.26739	0.00453	8	0.566	
CONC: 42%	A	1.25352	1.24902	0.00450	8	0.562	AVG DRY WEIGHT (mg)
	B	1.24524	1.24048	0.00476	8	0.595	
	C	1.24505	1.24130	0.00375	8	0.469	0.584
	D	1.25611	1.25080	0.00531	8	0.664	CV
	E	1.24438	1.23934	0.00504	8	0.630	
CONC: 56%	A	1.24405	1.23863	0.00542	8	0.678	AVG DRY WEIGHT (mg)
	B	1.25481	1.24930	0.00551	8	0.689	
	C	1.23708	1.23239	0.00469	8	0.586	0.675
	D	1.24144	1.23592	0.00552	8	0.690	CV
	E	1.23956	1.23372	0.00584	8	0.730	
CONC: 75%	A	1.24241	1.23731	0.00510	8	0.638	AVG DRY WEIGHT (mg)
	B	1.24656	1.24082	0.00574	8	0.717	
	C	1.26243	1.25693	0.00550	8	0.687	0.673
	D	1.24239	1.23722	0.00517	8	0.646	CV
	E	1.24460	1.23920	0.00540	8	0.675	
CONC: 100%	A	1.25608	1.25035	0.00573	8	0.716	AVG DRY WEIGHT (mg)
	B	1.25420	1.24768	0.00652	8	0.815	
	C	1.25341	1.24669	0.00672	8	0.840	0.770
	D	1.24539	1.24010	0.00529	8	0.661	CV
	E	1.24822	1.24170	0.00652	8	0.815	

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s:					TEST DATES (BEGIN / END):		
CLIENT:					WEIGHING DATE / TIME:		
ANALYSTS:					DRYING TEMP (DEGREES C):		
SAMPLE ID:					DRYING TIME (HOURS):		
	REP #	FINAL DRY WEIGHT TIN+LARVAE (g)	INITIAL WEIGHT TIN (g)	TOTAL DRY WEIGHT OF LARVAE (g)	NUMBER OF LARVAE	DRY WEIGHT OF LARVAE (mg)	
CONTROL (SS)	A 31	1.24850	1.24523		8		
	B 32	1.25360	1.25011			AVG DRY WEIGHT (mg)	
	C 33	1.24106	1.23770				
	D 34	1.23772	1.23382				
	E 35	1.24275	1.23887				CV
32%	A 36	1.23950	1.23490		8		
	B 37	1.24509	1.24031			AVG DRY WEIGHT (mg)	
	C 38	1.24086	1.23665				
	D 39	1.24481	1.23979				CV
	E 40	1.27192	1.26739				
42%	A 41	1.25352	1.24902		8		
	B 42	1.24524	1.24048			AVG DRY WEIGHT (mg)	
	C 43	1.24505	1.24130				
	D 44	1.25611	1.25080				CV
	E 45	1.24438	1.23934				
56%	A 46	1.24405	1.23863		8		
	B 47	1.25481	1.24930			AVG DRY WEIGHT (mg)	
	C 48	1.23708	1.23239				
	D 49	1.24144	1.23592				CV
	E 50	1.23956	1.23372				
75%	A 51	1.24241	1.23731		8		
	B 52	1.24656	1.24082			AVG DRY WEIGHT (mg)	
	C 53	1.26243	1.25693				
	D 54	1.24239	1.23722				CV
	E 55	1.24460	1.23928				
100%	A 56	1.25608	1.25035		8		
	B 57	1.25420	1.24768			AVG DRY WEIGHT (mg)	
	C 58	1.25341	1.24669				
	D 59	1.24539	1.24010				CV
	E 60	1.24822	1.24170				

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s:		K512323		TEST DATES (BEGIN / END):		12/14/05-12/21/05	
CLIENT:		EEMA-Weston ALTERNATE		WEIGHING DATE / TIME:		12/27/05, 0930	
ANALYSTS:		MG,JG,AF,LB,TB		DRYING TEMP (DEGREES C):		60	
SAMPLE ID:		SEE COC		DRYING TIME (HOURS):		24	
	REP #	FINAL DRY WEIGHT TIN+LARVAE (g)	INITIAL WEIGHT TIN (g)	TOTAL DRY WEIGHT OF LARVAE (g)	NUMBER OF LARVAE	DRY WEIGHT OF LARVAE (mg)	
CONTROL	A	1.24477	1.24244	0.00233	8	0.291	AVG DRY
	B	1.24393	1.24161	0.00232	8	0.290	WEIGHT (mg)
	C	1.23569	1.23291	0.00278	8	0.348	0.320
	D	1.25054	1.24777	0.00277	8	0.346	CV
	E	1.23179	1.22917	0.00262	8	0.327	8.9
CONC: 32%	A	1.25472	1.25220	0.00252	8	0.315	AVG DRY
	B	1.23259	1.22994	0.00265	8	0.331	WEIGHT (mg)
	C	1.24352	1.24126	0.00226	8	0.282	0.327
	D	1.24234	1.23977	0.00257	8	0.321	CV
	E	1.23847	1.23539	0.00308	8	0.385	
CONC: 42%	A	1.22887	1.22625	0.00262	8	0.327	AVG DRY
	B	1.25231	1.24830	0.00401	8	0.501	WEIGHT (mg)
	C	1.24950	1.24637	0.00313	8	0.391	0.414
	D	1.23471	1.23191	0.00280	8	0.350	CV
	E	1.24156	1.23756	0.00400	8	0.500	
CONC: 56%	A	1.24062	1.23638	0.00424	8	0.530	AVG DRY
	B	1.24371	1.23982	0.00389	8	0.486	WEIGHT (mg)
	C	1.23342	1.23003	0.00339	8	0.424	0.464
	D	1.24275	1.23900	0.00375	8	0.469	CV
	E	1.24286	1.23958	0.00328	8	0.410	
CONC: 75%	A	1.24621	1.24237	0.00384	8	0.480	AVG DRY
	B	1.24299	1.23943	0.00356	8	0.445	WEIGHT (mg)
	C	1.23426	1.23123	0.00303	8	0.379	0.416
	D	1.24180	1.23881	0.00299	8	0.374	CV
	E	1.24435	1.24114	0.00321	8	0.401	
CONC: 100%	A	1.24441	1.24109	0.00332	8	0.415	AVG DRY
	B	1.24279	1.24045	0.00234	8	0.293	WEIGHT (mg)
	C	1.24551	1.24059	0.00492	8	0.615	0.502
	D	1.24094	1.23622	0.00472	8	0.590	CV
	E	1.25445	1.24967	0.00478	8	0.598	28.4

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s: 2512323				TEST DATES (BEGIN / END):			
CLIENT: Weston (Alternate)				WEIGHING DATE / TIME: 12-27 / 0930			
ANALYSTS:				DRYING TEMP (DEGREES C):			
SAMPLE ID:				DRYING TIME (HOURS):			
	REP #	FINAL DRY WEIGHT TIN+LARVAE (g)	INITIAL WEIGHT TIN (g)	TOTAL DRY WEIGHT OF LARVAE (g)	NUMBER OF LARVAE	DRY WEIGHT OF LARVAE (mg)	
CONTROL (SS)	A 61	1.24477	1.24244				AVG DRY
	B 62	1.24393	1.24161				WEIGHT (mg)
	C 63	1.23969	1.23291				
	D 64	1.25054	1.24777				CV
	E 65	1.23179	1.22917				
32%	A 66	1.25472	1.25220				AVG DRY
	B 67	1.23259	1.22994				WEIGHT (mg)
	C 68	1.24352	1.24126				
	D 69	1.24234	1.23977				CV
	E 70	1.23847	1.23539				
42%	A 71	1.22887	1.22625				AVG DRY
	B 72	1.25231	1.24830				WEIGHT (mg)
	C 73	1.24950	1.24637				
	D 74	1.23471	1.23191				CV
	E 75	1.24156	1.23756				
56%	A 76	1.24062	1.23638				AVG DRY
	B 77	1.24371	1.23982				WEIGHT (mg)
	C 78	1.23342	1.23003				
	D 79	1.24275	1.23900				CV
	E 80	1.24286	1.23958				
75%	A 81	1.24621	1.24237				AVG DRY
	B 82	1.24299	1.23943				WEIGHT (mg)
	C 83	1.23426	1.23123				
	D 84	1.24180	1.23881				CV
	E 85	1.24435	1.24114				
100%	A 86	1.24441	1.24109				AVG DRY
	B 87	1.24279	1.24045				WEIGHT (mg)
	C 88	1.24551	1.24059				
	D 89	1.24094	1.23622				CV
	E 90	1.25445	1.24964				

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

MG1
AA# K512323, FATHEAD MINNOW SURVIVAL, 12-14-05
File: westonS Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.000

W = 0.000

Critical W (P = 0.05) (n = 30) = 0.927
Critical W (P = 0.01) (n = 30) = 0.900

Data FAIL normality test. Try another transformation.

Warning - The first three homogeneity tests are sensitive to non-normal data and should not be performed.

AA# K512323, FATHEAD MINNOW SURVIVAL, 12-14-05
File: westonS Transform: ARC SINE(SQUARE ROOT(Y))

Hartley's test for homogeneity of variance
Bartlett's test for homogeneity of variance

These two tests can not be performed because at least one group has zero variance.

Data FAIL to meet homogeneity of variance assumption.
Additional transformations are useless.

MG2

TITLE: AA# K512323, FATHEAD MINNOW SURVIVAL, 12-14-05
 FILE: westons
 TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	1.0000	1.3931
1	CONTROL	2	1.0000	1.3931
1	CONTROL	3	1.0000	1.3931
1	CONTROL	4	1.0000	1.3931
1	CONTROL	5	1.0000	1.3931
2	32 % EFFLUENT	1	1.0000	1.3931
2	32 % EFFLUENT	2	1.0000	1.3931
2	32 % EFFLUENT	3	1.0000	1.3931
2	32 % EFFLUENT	4	1.0000	1.3931
2	32 % EFFLUENT	5	1.0000	1.3931
3	42 % EFFLUENT	1	1.0000	1.3931
3	42 % EFFLUENT	2	1.0000	1.3931
3	42 % EFFLUENT	3	1.0000	1.3931
3	42 % EFFLUENT	4	1.0000	1.3931
3	42 % EFFLUENT	5	1.0000	1.3931
4	56 % EFFLUENT	1	1.0000	1.3931
4	56 % EFFLUENT	2	1.0000	1.3931
4	56 % EFFLUENT	3	1.0000	1.3931
4	56 % EFFLUENT	4	1.0000	1.3931
4	56 % EFFLUENT	5	1.0000	1.3931
5	75 % EFFLUENT	1	1.0000	1.3931
5	75 % EFFLUENT	2	1.0000	1.3931
5	75 % EFFLUENT	3	1.0000	1.3931
5	75 % EFFLUENT	4	1.0000	1.3931
5	75 % EFFLUENT	5	1.0000	1.3931
6	100 % EFFLUENT	1	1.0000	1.3931
6	100 % EFFLUENT	2	1.0000	1.3931
6	100 % EFFLUENT	3	1.0000	1.3931
6	100 % EFFLUENT	4	1.0000	1.3931
6	100 % EFFLUENT	5	1.0000	1.3931

AA# K512323, FATHEAD MINNOW SURVIVAL, 12-14-05
 File: westons Transform: ARC SINE(SQUARE ROOT(Y))

STEEL'S MANY-ONE RANK TEST - Ho: Control < Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	1.393				
2	32 % EFFLUENT	1.393	27.50	16.00	5.00	
3	42 % EFFLUENT	1.393	27.50	16.00	5.00	
4	56 % EFFLUENT	1.393	27.50	16.00	5.00	
5	75 % EFFLUENT	1.393	27.50	16.00	5.00	
6	100 % EFFLUENT	1.393	27.50	16.00	5.00	

critical values use k = 5, are 1 tailed, and alpha = 0.05

MG1

AA#K512323, FATHEAD SURVIVAL ALTERNATE METHOD, 12-14-05
File: c:\toxstat\WESTONS. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - wilk's test for normality

D = 0.151

W = 0.769

Critical W (P = 0.05) (n = 30) = 0.927

Critical W (P = 0.01) (n = 30) = 0.900

Data FAIL normality test. Try another transformation.

Warning - The first three homogeneity tests are sensitive to non-normal data and should not be performed.

AA#K512323, FATHEAD SURVIVAL ALTERNATE METHOD, 12-14-05
File: c:\toxstat\WESTONS. Transform: ARC SINE(SQUARE ROOT(Y))

Hartley's test for homogeneity of variance
Bartlett's test for homogeneity of variance

These two tests can not be performed because at least one group has zero variance.

Data FAIL to meet homogeneity of variance assumption.
Additional transformations are useless.

MG2

TITLE: AA#K512323, FATHEAD SURVIVAL ALTERNATE METHOD, 12-14-05
 FILE: c:\toxstat\WESTONS.
 TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	1.0000	1.3931
1	CONTROL	2	1.0000	1.3931
1	CONTROL	3	1.0000	1.3931
1	CONTROL	4	1.0000	1.3931
1	CONTROL	5	1.0000	1.3931
2	32 % EFFLUENT	1	0.7500	1.0472
2	32 % EFFLUENT	2	1.0000	1.3931
2	32 % EFFLUENT	3	1.0000	1.3931
2	32 % EFFLUENT	4	1.0000	1.3931
2	32 % EFFLUENT	5	0.8750	1.2094
3	42 % EFFLUENT	1	1.0000	1.3931
3	42 % EFFLUENT	2	1.0000	1.3931
3	42 % EFFLUENT	3	1.0000	1.3931
3	42 % EFFLUENT	4	0.8750	1.2094
3	42 % EFFLUENT	5	1.0000	1.3931
4	56 % EFFLUENT	1	1.0000	1.3931
4	56 % EFFLUENT	2	1.0000	1.3931
4	56 % EFFLUENT	3	1.0000	1.3931
4	56 % EFFLUENT	4	1.0000	1.3931
4	56 % EFFLUENT	5	1.0000	1.3931
5	75 % EFFLUENT	1	1.0000	1.3931
5	75 % EFFLUENT	2	1.0000	1.3931
5	75 % EFFLUENT	3	1.0000	1.3931
5	75 % EFFLUENT	4	1.0000	1.3931
5	75 % EFFLUENT	5	1.0000	1.3931
6	100 % EFFLUENT	1	0.8750	1.2094
6	100 % EFFLUENT	2	1.0000	1.3931
6	100 % EFFLUENT	3	1.0000	1.3931
6	100 % EFFLUENT	4	1.0000	1.3931
6	100 % EFFLUENT	5	1.0000	1.3931

AA#K512323, FATHEAD SURVIVAL ALTERNATE METHOD, 12-14-05
 File: c:\toxstat\WESTONS. Transform: ARC SINE(SQUARE ROOT(Y))

STEEL'S MANY-ONE RANK TEST - Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	1.393				
2	32 % EFFLUENT	1.287	22.50	16.00	5.00	
3	42 % EFFLUENT	1.356	25.00	16.00	5.00	
4	56 % EFFLUENT	1.393	27.50	16.00	5.00	
5	75 % EFFLUENT	1.393	27.50	16.00	5.00	
6	100 % EFFLUENT	1.356	25.00	16.00	5.00	

Critical values use k = 5, are 1 tailed, and alpha = 0.05

MG1
AA # K512323, FATHEAD MINNOW GROWTH, 12-14-05
File: westonG Transform: NO TRANSFORMATION

Shapiro - wilk's test for normality

D = 0.073

W = 0.948

Critical W (P = 0.05) (n = 30) = 0.927
Critical W (P = 0.01) (n = 30) = 0.900

Data PASS normality test at P=0.01 level. Continue analysis.

AA # K512323, FATHEAD MINNOW GROWTH, 12-14-05
File: westonG Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 5.16

Table Chi-square value = 15.09 (alpha = 0.01, df = 5)
Table Chi-square value = 11.07 (alpha = 0.05, df = 5)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

MG2

TITLE: AA # K512323, FATHEAD MINNOW GROWTH, 12-14-05
 FILE: westonG
 TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.4090	0.4090
1	CONTROL	2	0.4360	0.4360
1	CONTROL	3	0.4200	0.4200
1	CONTROL	4	0.4880	0.4880
1	CONTROL	5	0.4850	0.4850
2	32 % EFFLUENT	1	0.5750	0.5750
2	32 % EFFLUENT	2	0.5980	0.5980
2	32 % EFFLUENT	3	0.5260	0.5260
2	32 % EFFLUENT	4	0.6280	0.6280
2	32 % EFFLUENT	5	0.5660	0.5660
3	42 % EFFLUENT	1	0.5620	0.5620
3	42 % EFFLUENT	2	0.5950	0.5950
3	42 % EFFLUENT	3	0.4690	0.4690
3	42 % EFFLUENT	4	0.6640	0.6640
3	42 % EFFLUENT	5	0.6300	0.6300
4	56 % EFFLUENT	1	0.6780	0.6780
4	56 % EFFLUENT	2	0.6890	0.6890
4	56 % EFFLUENT	3	0.5860	0.5860
4	56 % EFFLUENT	4	0.6900	0.6900
4	56 % EFFLUENT	5	0.7300	0.7300
5	75 % EFFLUENT	1	0.6380	0.6380
5	75 % EFFLUENT	2	0.7170	0.7170
5	75 % EFFLUENT	3	0.6870	0.6870
5	75 % EFFLUENT	4	0.6460	0.6460
5	75 % EFFLUENT	5	0.6750	0.6750
6	100 % EFFLUENT	1	0.7160	0.7160
6	100 % EFFLUENT	2	0.8150	0.8150
6	100 % EFFLUENT	3	0.8400	0.8400
6	100 % EFFLUENT	4	0.6610	0.6610
6	100 % EFFLUENT	5	0.8150	0.8150

AA # K512323, FATHEAD MINNOW GROWTH, 12-14-05
 File: westonG Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.304	0.061	20.061
within (Error)	24	0.073	0.003	
Total	29	0.377		

critical F value = 2.62 (0.05,5,24)
 since F > Critical F REJECT Ho: All equal

MG2

File: westonG Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 1 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	0.448	0.448		
2	32 % EFFLUENT	0.579	0.579	-3.763	
3	42 % EFFLUENT	0.584	0.584	-3.918	
4	56 % EFFLUENT	0.675	0.675	-6.520	
5	75 % EFFLUENT	0.673	0.673	-6.463	
6	100 % EFFLUENT	0.769	0.769	-9.243	

Dunnnett table value = 2.36 (1 Tailed Value, P=0.05, df=24,5)

AA # K512323, FATHEAD MINNOW GROWTH, 12-14-05

File: westonG Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 2 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	5			
2	32 % EFFLUENT	5	0.082	18.4	-0.131
3	42 % EFFLUENT	5	0.082	18.4	-0.136
4	56 % EFFLUENT	5	0.082	18.4	-0.227
5	75 % EFFLUENT	5	0.082	18.4	-0.225
6	100 % EFFLUENT	5	0.082	18.4	-0.322

MG3

AA # K512323, FATHEAD GROWTH ATLERNATE METHOD, 12-14-05
File: westonG Transform: NO TRANSFORMATION

Shapiro - wilk's test for normality

D = 0.135

W = 0.948

Critical W (P = 0.05) (n = 30) = 0.927

Critical W (P = 0.01) (n = 30) = 0.900

Data PASS normality test at P=0.01 level. Continue analysis.

AA # K512323, FATHEAD GROWTH ATLERNATE METHOD, 12-14-05
File: westonG Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 13.55

Table Chi-square value = 15.09 (alpha = 0.01, df = 5)
Table Chi-square value = 11.07 (alpha = 0.05, df = 5)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

TITLE: AA # K512323, FATHEAD GROWTH ATLERNATE METHOD, 12-14-05
 FILE: westonG
 TRANSFORM: NO TRANSFORMATION

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.2910	
1	CONTROL	2	0.2900	0.2910
1	CONTROL	3	0.3480	0.2900
1	CONTROL	4	0.3460	0.3480
1	CONTROL	5	0.3270	0.3460
2	32 % EFFLUENT	1	0.3150	0.3270
2	32 % EFFLUENT	2	0.3310	0.3150
2	32 % EFFLUENT	3	0.2820	0.3310
2	32 % EFFLUENT	4	0.3210	0.2820
2	32 % EFFLUENT	5	0.3850	0.3210
3	42 % EFFLUENT	1	0.3270	0.3850
3	42 % EFFLUENT	2	0.5010	0.3270
3	42 % EFFLUENT	3	0.3910	0.5010
3	42 % EFFLUENT	4	0.3500	0.3910
3	42 % EFFLUENT	5	0.5000	0.3500
4	56 % EFFLUENT	1	0.5300	0.5000
4	56 % EFFLUENT	2	0.4860	0.5300
4	56 % EFFLUENT	3	0.4240	0.4860
4	56 % EFFLUENT	4	0.4690	0.4240
4	56 % EFFLUENT	5	0.4100	0.4690
5	75 % EFFLUENT	1	0.4800	0.4100
5	75 % EFFLUENT	2	0.4450	0.4800
5	75 % EFFLUENT	3	0.3790	0.4450
5	75 % EFFLUENT	4	0.3740	0.3790
5	75 % EFFLUENT	5	0.4010	0.3740
6	100 % EFFLUENT	1	0.4150	0.4010
6	100 % EFFLUENT	2	0.2930	0.4150
6	100 % EFFLUENT	3	0.6150	0.2930
6	100 % EFFLUENT	4	0.5900	0.6150
6	100 % EFFLUENT	5	0.5980	0.5900

AA # K512323, FATHEAD GROWTH ATLERNATE METHOD, 12-14-05
 File: westonG Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.132	0.026	4.696
Within (Error)	24	0.135	0.006	
Total	29	0.266		

Critical F value = 2.62 (0.05,5,24)
 Since F > Critical F REJECT Ho: All equal

MG4

File: westonG

Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 1 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	0.320	0.320		
2	32 % EFFLUENT	0.327	0.327	-0.135	
3	42 % EFFLUENT	0.414	0.414	-1.972	
4	56 % EFFLUENT	0.464	0.464	-3.027	
5	75 % EFFLUENT	0.416	0.416	-2.014	
6	100 % EFFLUENT	0.502	0.502	-3.838	

Dunnett table value = 2.36 (1 Tailed Value, P=0.05, df=24,5)

AA # K512323, FATHEAD GROWTH AT LERNATE METHOD, 12-14-05

File: westonG

Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 2 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	5			
2	32 % EFFLUENT	5	0.112	34.9	-0.006
3	42 % EFFLUENT	5	0.112	34.9	-0.093
4	56 % EFFLUENT	5	0.112	34.9	-0.143
5	75 % EFFLUENT	5	0.112	34.9	-0.095
6	100 % EFFLUENT	5	0.112	34.9	-0.182

APPENDIX D

***Ceriodaphnia dubia* Raw Data and Statistics**

MG3

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
32% effluent	8	2	10
TOTAL	18	2	20

CRITICAL FISHER'S VALUE (10,10,10) ($p=0.05$) IS 6. b VALUE IS 8.
 Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
42% effluent	7	3	10
TOTAL	17	3	20

CRITICAL FISHER'S VALUE (10,10,10) ($p=0.05$) IS 6. b VALUE IS 7.
 Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
56% effluent	9	1	10
TOTAL	19	1	20

MG3

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 9.
 Since b is greater than 6 there is no significant difference
 between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
75% effluent	8	2	10
TOTAL	18	2	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 8.
 Since b is greater than 6 there is no significant difference
 between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
100% effluent	9	1	10
TOTAL	19	1	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 9.
 Since b is greater than 6 there is no significant difference
 between CONTROL and TREATMENT at the 0.05 level.

SUMMARY OF FISHER'S EXACT TESTS

GROUP	IDENTIFICATION	NUMBER EXPOSED	NUMBER DEAD	SIG (P=.05)
	CONTROL	10	0	
1	32% effluent	10	2	
2	42% effluent	10	3	
3	56% effluent	10	1	
4	75% effluent	10	2	

5

100% effluent

MG3
10

1

MG1

AA # K512323, CERIODAPHNIA DUBIA REPRODUCTION, 12-14-05
File: westonC Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

***** Shapiro - Wilk's Test is aborted *****

This test can not be performed because total number of replicates
is greater than 50.

Total number of replicates = 60

AA # K512323, CERIODAPHNIA DUBIA REPRODUCTION, 12-14-05
File: westonC Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 4.87

Table Chi-square value = 15.09 (alpha = 0.01, df = 5)
Table Chi-square value = 11.07 (alpha = 0.05, df = 5)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

TITLE: AA # K512323, CERIODAPHNIA DUBIA REPRODUCTION, 12-14-05
 FILE: westonC
 TRANSFORM: NO TRANSFORMATION

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	16.0000	16.0000
1	CONTROL	2	19.0000	19.0000
1	CONTROL	3	16.0000	16.0000
1	CONTROL	4	23.0000	23.0000
1	CONTROL	5	14.0000	14.0000
1	CONTROL	6	18.0000	18.0000
1	CONTROL	7	16.0000	16.0000
1	CONTROL	8	11.0000	11.0000
1	CONTROL	9	15.0000	15.0000
1	CONTROL	10	13.0000	13.0000
2	32 % EFFLUENT	1	18.0000	18.0000
2	32 % EFFLUENT	2	14.0000	14.0000
2	32 % EFFLUENT	3	13.0000	13.0000
2	32 % EFFLUENT	4	13.0000	13.0000
2	32 % EFFLUENT	5	18.0000	18.0000
2	32 % EFFLUENT	6	13.0000	13.0000
2	32 % EFFLUENT	7	11.0000	11.0000
2	32 % EFFLUENT	8	11.0000	11.0000
2	32 % EFFLUENT	9	0.0000	0.0000
2	32 % EFFLUENT	10	0.0000	0.0000
3	42 % EFFLUENT	1	0.0000	0.0000
3	42 % EFFLUENT	2	18.0000	18.0000
3	42 % EFFLUENT	3	0.0000	0.0000
3	42 % EFFLUENT	4	13.0000	13.0000
3	42 % EFFLUENT	5	13.0000	13.0000
3	42 % EFFLUENT	6	13.0000	13.0000
3	42 % EFFLUENT	7	14.0000	14.0000
3	42 % EFFLUENT	8	0.0000	0.0000
3	42 % EFFLUENT	9	17.0000	17.0000
3	42 % EFFLUENT	10	14.0000	14.0000
4	56 % EFFLUENT	1	16.0000	16.0000
4	56 % EFFLUENT	2	15.0000	15.0000
4	56 % EFFLUENT	3	0.0000	0.0000
4	56 % EFFLUENT	4	21.0000	21.0000
4	56 % EFFLUENT	5	16.0000	16.0000
4	56 % EFFLUENT	6	17.0000	17.0000
4	56 % EFFLUENT	7	14.0000	14.0000
4	56 % EFFLUENT	8	11.0000	11.0000
4	56 % EFFLUENT	9	16.0000	16.0000
4	56 % EFFLUENT	10	20.0000	20.0000
5	75 % EFFLUENT	1	16.0000	16.0000
5	75 % EFFLUENT	2	15.0000	15.0000
5	75 % EFFLUENT	3	15.0000	15.0000
5	75 % EFFLUENT	4	9.0000	9.0000
5	75 % EFFLUENT	5	14.0000	14.0000
5	75 % EFFLUENT	6	10.0000	10.0000
5	75 % EFFLUENT	7	18.0000	18.0000
5	75 % EFFLUENT	8	0.0000	0.0000
5	75 % EFFLUENT	9	17.0000	17.0000
5	75 % EFFLUENT	10	19.0000	19.0000
6	100 % EFFLUENT	1	16.0000	16.0000
6	100 % EFFLUENT	2	20.0000	20.0000
6	100 % EFFLUENT	3	16.0000	16.0000
6	100 % EFFLUENT	4	15.0000	15.0000

			MG2	
6	100 % EFFLUENT	5	13.0000	13.0000
6	100 % EFFLUENT	6	22.0000	22.0000
6	100 % EFFLUENT	7	16.0000	16.0000
6	100 % EFFLUENT	8	0.0000	0.0000
6	100 % EFFLUENT	9	15.0000	15.0000
6	100 % EFFLUENT	10	13.0000	13.0000

AA # K512323, CERIODAPHNIA DUBIA REPRODUCTION, 12-14-05
 File: westonC Transform: NO TRANSFORMATION

STEEL'S MANY-ONE RANK TEST - Ho:Control < Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	16.100				
2	32 % EFFLUENT	11.100	78.00	75.00	10.00	
3	42 % EFFLUENT	10.200	79.00	75.00	10.00	
4	56 % EFFLUENT	14.600	103.00	75.00	10.00	
5	75 % EFFLUENT	13.300	93.00	75.00	10.00	
6	100 % EFFLUENT	14.600	99.50	75.00	10.00	

Critical values use k = 5, are 1 tailed, and alpha = 0.05

APPENDIX E

Organism History

AQUATOX, INC.

100 Springwood Drive #15
Hot Springs, Arkansas 71913
(501) 767-9120

TEST ORGANISM HISTORY

DATE SHIPPED 12-14-05 Arkansas Analytical

SPECIES Pimephales promelas

QUANTITY SHIPPED 300+

AGE/LIFE STAGE 24 hrs 12/14 1500+

BROODSTOCK SOURCE Anderson Farms, AR

CULTURE WATER groundwater

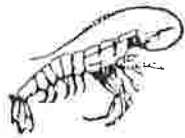
ALKALINITY (Mg/l as CaCO₃) = 180

HARDNESS (Mg/l as CaCO₃)/Salinity (ppt) = 160

FEEDING ARTIMIN

COMMENTS _____

PACKAGED BY DAL



Aquatic Research Organisms

DATA SHEET

I. Organism History

Species: Ceriodaphnia dubia

Source: Lab reared Hatchery reared Field collected

Hatch date 01/05 Receipt date _____

Lot number 02 07 05 CD Strain ARO

Brood Origination EPA OH

II. Water Quality

Temperature 24 °C Salinity — ppt DO SAT

pH 7.4 Hardness ~75 ppm

III. Culture Conditions

System: Fw static renewal

Diet: Flake Food Phytoplankton Trout Chow

Brine Shrimp Rotifers Other YCT

Prophylactic Treatments: _____

Comments: All gravid as of 2:00pm
EOT

IV. Shipping Information

Client: Arkansas Analytical # of Organisms: 1 culture

Carrier: Fed Ex Date Shipped: 2/7/05

Biologist: [Signature]

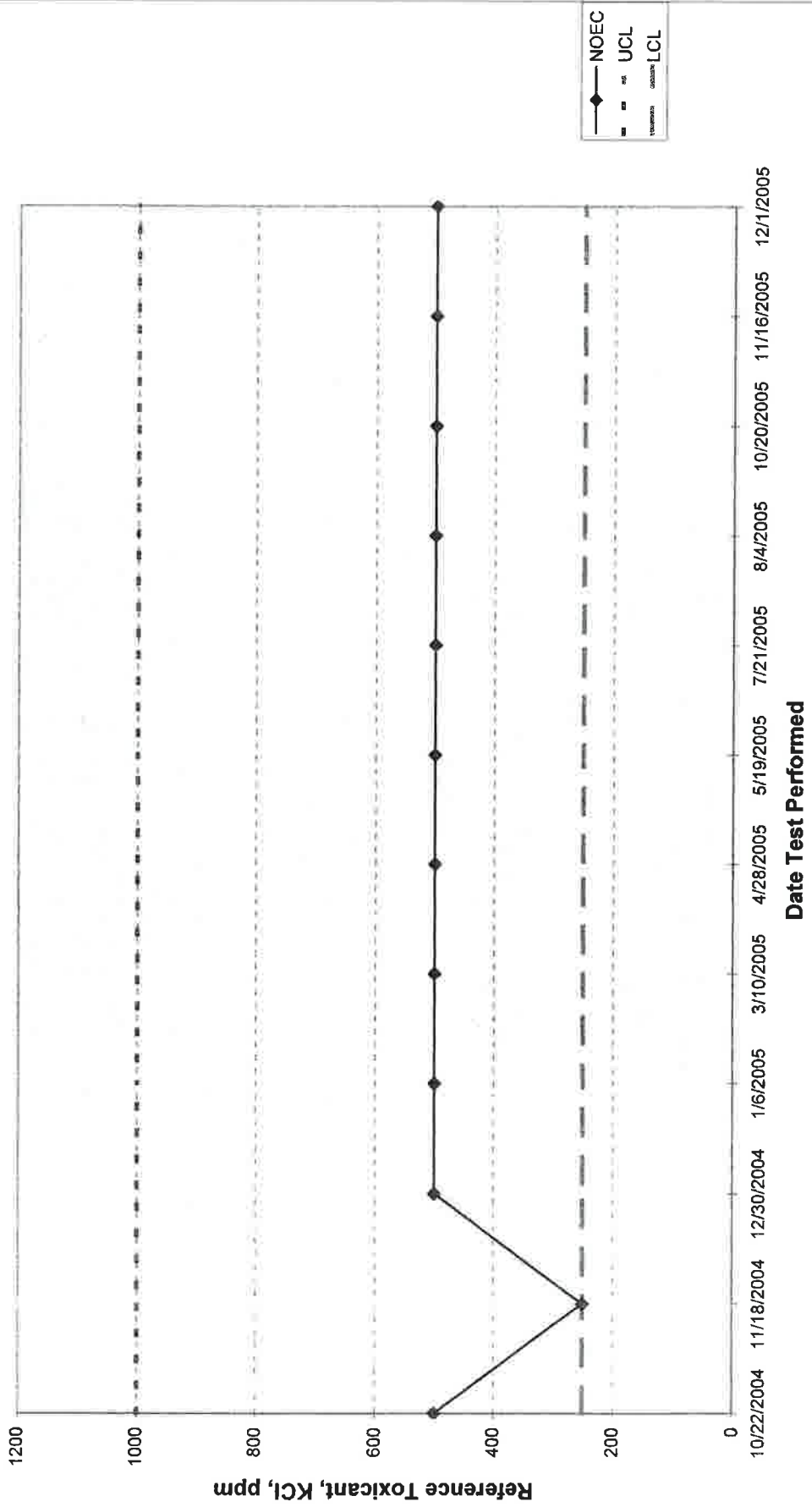
1 - 800 - 927 - 1650

PO Box 1271 • One Lafayette Road • Hampton, NH 03842 • (603) 926-1650

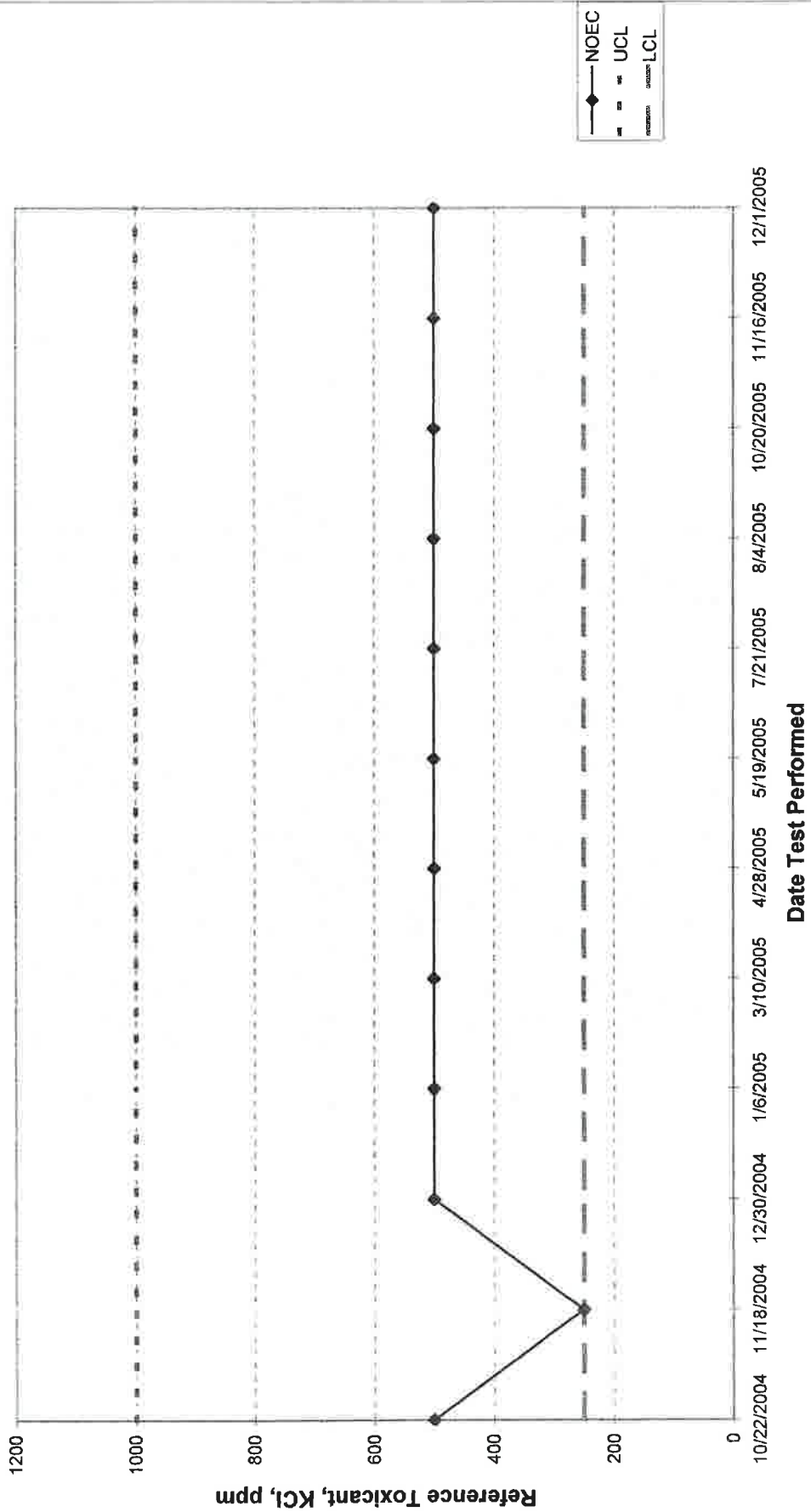
APPENDIX F

Quality Assurance Charts

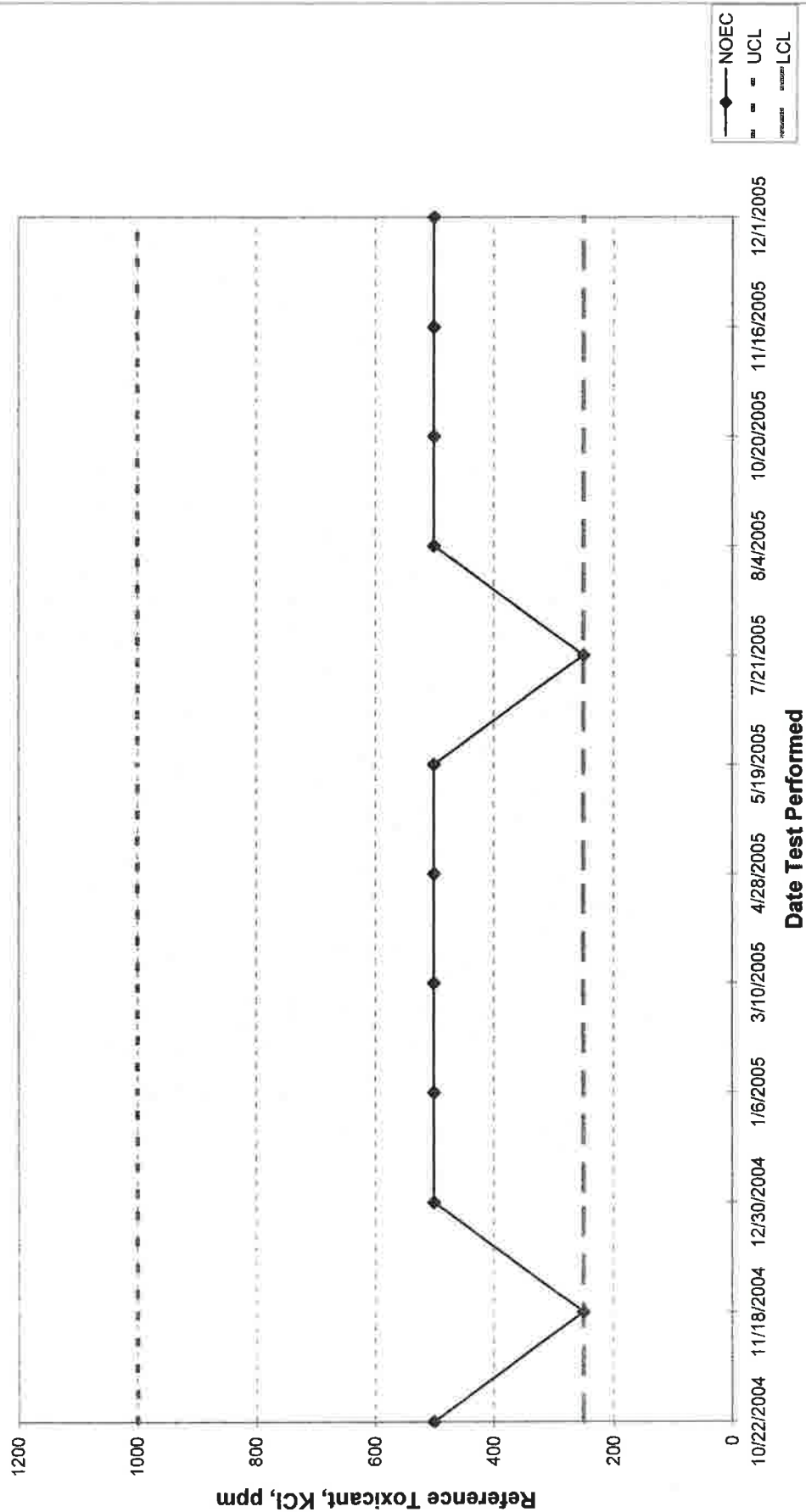
ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW SURVIVAL
QUALITY ASSURANCE



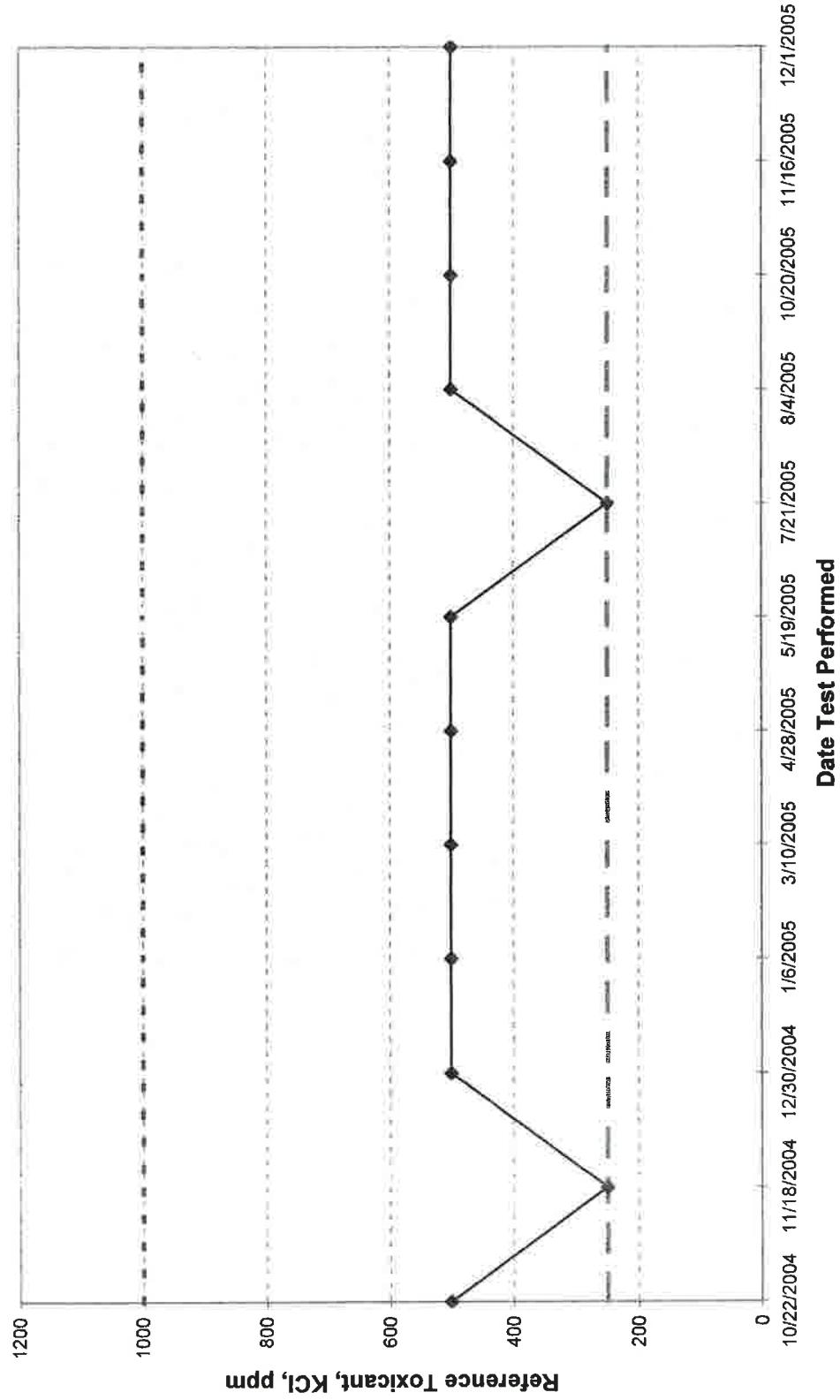
ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW SURVIVAL
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW GROWTH
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW GROWTH
QUALITY ASSURANCE



NOEC
 UCL
 LCL

APPENDIX G

Lab Certification



State of Arkansas
 Department of Environmental Quality
 Laboratory Certification Program
Arkansas Analytical, Inc.
 Little Rock, AR

has earned certification by law in accordance with Code Annotated §8-2-201 et seq., the State Environmental Laboratory Certification Program Act for the following parameters:

Alkalinity	Orthophosphate	Antimony	Mercury	Tin
Ammonia	Perchlorate	Arsenic	Molybdenum	Titanium
BOD	pH	Barium	Nickel	TPHC
Bromide	Phenol	Beryllium	Potassium	Vanadium
CBOD	Sulfate	Boron	Selenium	Volatile Organics
Chloride	Sulfide	Cadmium	Silver	Zinc
Chlorine	Surfactants	Calcium	Sodium	
COD	TDS	Chromium	Strontium	
Conductivity	TKN	Cobalt	Acute Toxicity	
Cyanide	TOC	Copper	Chronic Toxicity	
Fluoride	Total Phosphorus	Hex. Chromium	Fecal Coliform	
Hardness	Total Solids	Iron	Herbicides	
Nitrate	TSS	Lead	Pesticides & PCBs	
Nitrite	Turbidity	Magnesium	Semi-volatiles	
Oil & Grease	Aluminum	Manganese	Thallium	

Laboratory ID: **60-1754**

Certificate Number: **05-070-0**

Issued Date: **30 October 2005**

Expired Date: **30 October 2006**

J.A. Sembrski
 ADEQ Quality Assurance Officer
 Date *October 28, 2005*