

Arkansas Analytical, Inc.

Toxicity Test Results

MAGCOBAR MINE SITE
NPDES PERMIT NUMBER: AR0049794
June 2009
AFIN# 00-00348

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**
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Wednesday, July 08, 2009

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 June of 2009.

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:	6-3-09, 0905	6-4-09, 0905
Sample #2:	6-4-09, 0837	6-5-09, 0837
Sample #3:	6-8-09, 0730	6-9-09, 0730

The samples were composites 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	Temperature Upon Receipt (°C)
Sample #1:	6-4-09, 1344	4
Sample #2:	6-5-09, 1256	4
Sample #3:	6-9-09, 1329	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. The alternate method suggested in the method (11.3.4.5) for combating pathogen interference, was run in place of 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 was 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	80%	X	
Average of 15 or more young per surviving female	16.6	X	
At least 60% of surviving females should have produced 3 broods	100%	X	
The percent coefficient of variation between replicates must be 40% or less for the young of surviving females	11.1%	X	

TEST ACCEPTANCE CRITERIA for *Pimephales promelas*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	95%	X	
The percent coefficient of variation between replicates must be 40% or less for survival	7.21%	X	
Minimum of 0.25 mg average dry weight of surviving controls	0.555	X	
The percent coefficient of variation between replicates must be 40% or less for growth	25.8%	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> 5/28/09, 6/4/09		<i>Pimephales promelas</i> 5/28/09, 6/4/09	
NOEC Survival:	125 ppm KCl	NOEC Survival:	500 ppm KCl
LOEC Survival:	250 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)	16.9	%CV survival (critical dilution)	5.73%
%CV Reproduction (critical dilution)	16.1%	Mean dry weight (critical dilution) in milligrams	0.670
		%CV growth (critical dilution)	12.4%
PMSD Reproduction	46.4	PMSD Growth	30.6

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 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.

Biomonitoring Analysts:


Ken Pigue


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:	6-3-09, 0905	6-4-09, 0905
Sample #2:	6-4-09, 0837	6-5-09, 0837
Sample #3:	6-8-09, 0730	6-9-09, 0730

Test initiated (date, time): 6-5-09, 1215 Test terminated (date, time): 6-12-09, 1420

Dilution water used: Soft Synthetic

DATA TABLE FOR FATHEAD MINNOW SURVIVAL

Effluent Conc %	Percent Survival in Replicate Chambers					Mean Percent Survival				CV %
	A	B	C	D	E	24 hours	48 hours	7 days		
0%	87.5	87.5	100	100	100	100	97.5	95	7.21	
32%	100	87.5	100	100	100	100	100	97.5		
42%	100	100	100	100	100	100	100	100		
56%	100	100	87.5	100	100	100	100	97.5		
75%	100	100	87.5	100	100	100	100	97.5		
100%	100	87.5	100	100	100	100	100	97.5	5.73	

DATA TABLE FOR GROWTH OF FATHEAD MINNOWS

SUMMARY

Effluent Conc %	A	B	C	D	E	Mean Dry Weight	CV%
0%	0.765	0.449	0.425	0.500	0.636	0.555	25.8
32%	0.384	0.430	0.564	0.442	0.629	0.490	
42%	0.723	0.458	0.598	0.541	0.512	0.566	
56%	0.510	0.600	0.438	0.694	0.653	0.579	
75%	0.815	0.581	0.600	0.607	0.534	0.627	
100%	0.661	0.560	0.624	0.750	0.754	0.670	12.4

Coefficient of Variation = standard deviation / mean * 100

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)= _____ 25.8 %

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:	6-3-09, 0905	6-4-09, 0905
Sample #2:	6-4-09, 0837	6-5-09, 0837
Sample #3:	6-8-09, 0730	6-9-09, 0730

Test initiated (date, time): 6-5-09, 1205 Test terminated (date, time): 6-12-09, 1345

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	14	17	19	x0	18	15
B	15	16	20	11	13	19
C	17	11	x13	7	21	x7
D	15	20	17	20	27	21
E	19	21	23	16	26	16
F	17	x5	9	26	x0	12
G	19	19	18	16	19	18
H	x10	x0	x3	19	13	17
I	x10	18	17	21	x0	15
J	17	17	26	x1	16	19
Mean	15.3	14.4	16.5	13.7	15.3	15.9
Mean/surviving female	16.6	17.4	18.6	17.0	19.1	16.9
CV%*	11.1					16.1

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	100	100	100	100	100
48 HOURS	100	100	100	100	100	100
Test termination	80	80	80	80	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)= 16.1 %







APPENDIX A

Chain of Custody Forms



11701 Interstate 30, Bldg. 1, Ste. 115
 Little Rock, AR 72209
 PHONE: 501-455-3233
 FAX: 501-455-6118

CHAIN OF CUSTODY RECORD

CLIENT INFORMATION				Project Description				Turnaround Time		Preservation Codes:																			
EEMA O & M Services Group		EEMA O & M Services Group		Magcobar Mine Site				24 Hour		1. Cool, 4 Degrees Centigrade					4. Thiosulfate for Dechlorination														
Magcobar Mine Site		P.O. Box 699		Reporting Information				48 Hour		2. Sulfuric Acid (H ₂ SO ₄), pH < 2					5. Hydrochloric Acid(HCl)														
2000 Darby Lane		Malvern, AR 72104		Telephone: 501-467-8355				72 Hour		3. Nitric Acid (HNO ₃), pH < 2					6. Sodium Hydroxide (NaOH), pH > 12														
Malvern, AR 72104				FAX: 501-467-8687				Routine (5 Day)		TEST PARAMETERS										Bottle Type Code									
Attn: Bill Mc Alister				Bill to/P.O. #:				Preservative Code		1	2	3	4	5	6	7	8	9	10	11	12	G = Glass; P = Plastic V = Septum; A = Amber							
Bottle Type								P		Chronic Biomonitoring													Arkansas Analytical Work Order Number:						
 Sampler(s) Signature				 Sampler(s) Printed																									
Field Number	SAMPLE COLLECTION		Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION					Chronic Biomonitoring																	
FD2Comp	6/5/2009	8:37 AM		X	3	W	Facility Discharge FD-2					X																	
1. Relinquished by: (Signature)													Date/Time		2. Received by: (Signature)					SAMPLE CONDITION UPON RECEIPT IN LAB					REMARKS / SAMPLE COMMENTS				
													6-5-09							1. CUSTODY SEALS: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No 2. CONTAINERS CORRECT: <input type="checkbox"/> Yes <input type="checkbox"/> No 3. COC/LABELS AGREE: <input type="checkbox"/> Yes <input type="checkbox"/> No 4. PRESERVATION CONFIRMED: <input type="checkbox"/> Yes <input type="checkbox"/> No 5. RECEIVED ON ICE: <input type="checkbox"/> Yes <input type="checkbox"/> No 6. TEMPERATURE ON RECEIPT: <input checked="" type="checkbox"/> 4.0C									
3. Relinquished by: (Signature)													Date/Time		4. Received by lab: (Signature)					FOR COMPLETION BY LAB ONLY									
																													

APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Fathead Minnow

Lab # / Sample ID 1906066

Test Start (Date/Time) 6/5/09

Client Weston

Test End (Date/Time) 6/12/09

Day of Test

		1	2	3	4	5	6	7	notes/remarks
Control	SS 207	6/5	6/6	6/7	6/8	6/9	6/10	6/11	
D.O. (mg/L)	INITIAL	7.1	7.9	7.8	7.6	7.4	7.5	7.8	
	FINAL	8.2	7.8	7.2	7.3	7.3	7.6	7.5	
pH (s.u.)	INITIAL	7.9	7.0	7.5	7.1	7.7	7.7	7.3	
	FINAL	7.2	7.5	7.7	7.0	7.4	7.3	7.3	
temp (C)	INITIAL	22.6	24.0	22.9	22.8	22.2	22.3	21.5	
	FINAL	24.1	25.0	25.0	25.0	25.0	25.0	25.0	
ALKALINITY (mg/L)		3.6							
HARDNESS (mg/L)		48							
CONDUCTIVITY (umhos/cm)		180							
CHLORINE (mg/L)		<0.05							
CONC: 32									
D.O. (mg/L)	INITIAL	7.2	8.1	7.9	7.7	7.1	6.9	7.8	
	FINAL	8.1	7.5	7.2	7.1	7.2	7.6	7.5	
pH (s.u.)	INITIAL	7.7	7.2	7.4	7.1	7.4	7.4	7.0	
	FINAL	7.1	7.1	7.3	6.8	6.9	7.6	7.3	
temp (C)	INITIAL	22.8	22.9	23.0	23.5	22.0	22.4	21.5	
	FINAL	23.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC: 42									
D.O. (mg/L)	INITIAL	7.4	8.3	8.1	7.8	7.5	7.1	7.8	
	FINAL	7.9	7.6	7.2	7.1	7.2	7.3	7.4	
pH (mg/L)	INITIAL	8.2	7.2	7.5	7.1	7.4	7.1	6.9	
	FINAL	7.2	7.1	7.3	6.9	7.0	6.7	7.0	
temp (C)	INITIAL	22.8	22.6	23.2	25.8	22.0	22.5	21.4	
	FINAL	22.4	25.0	25.0	25.0	25.0	25.0	25.0	
CONC: 56									
D.O. (mg/L)	INITIAL	7.6	8.3	8.3	7.9	7.4	7.4	7.8	
	FINAL	8.1	7.6	7.2	7.2	7.2	7.3	7.4	
pH (s.u.)	INITIAL	8.0	7.2	7.4	7.5	7.4	7.1	6.9	
	FINAL	7.3	7.1	7.3	6.8	6.9	6.7	7.0	
temp (C)	INITIAL	22.8	22.3	23.2	24.1	22.1	22.4	21.2	
	FINAL	22.8	25.0	25.0	25.0	25.0	25.0	25.0	
CONC: 75									
D.O. (mg/L)	INITIAL	7.6	8.5	8.3	7.9	7.5	7.5	8.1	
	FINAL	8.0	7.7	7.3	7.5	7.2	7.3	7.4	
pH (s.u.)	INITIAL	7.9	7.2	7.4	7.1	7.4	7.0	6.9	
	FINAL	7.2	7.1	7.2	6.9	6.9	6.7	6.7	
temp (C)	INITIAL	22.8	22.4	23.3	24.4	22.1	22.4	21.3	
	FINAL	22.3	25.0	25.0	25.0	25.0	25.0	25.0	
CONC: 100									
D.O. (mg/L)	INITIAL	7.8	8.5	8.9	8.1	7.5	7.7	8.3	
	FINAL	7.8	7.6	7.3	7.3	7.1	7.1	7.2	
pH (s.u.)	INITIAL	8.0	7.2	7.3	7.6	7.3	7.0	6.8	
	FINAL	7.2	7.0	7.2	6.9	6.9	6.6	6.8	
temp (C)	INITIAL	23.0	22.3	23.4	24.6	21.9	22.2	21.5	
	FINAL	22.6	25.0	25.0	25.0	25.0	25.0	25.0	
CONC: 100%		A	A	A	B	B	C	C	
ALKALINITY (mg/L)		18			22		26		
HARDNESS (mg/L)		1040			2600		2600		
CONDUCTIVITY (umhos/cm)		1925			1916		1940		
CHLORINE (mg/L)		<0.05			<0.05		<0.05		

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Cerodaphnia Dubia

Lab # / Sample ID *K90006*

Test Start (Date/Time) *6/5/09*

Client *Weston*

Test End (Date/Time) *6/12/09*

		Day of Test							notes/remarks
		1	2	3	4	5	6	7	
Control	<i>55207</i>	<i>6/5</i>	<i>6/6</i>	<i>6/7</i>	<i>6/8</i>	<i>6/9</i>	<i>6/10</i>	<i>6/11</i>	
D.O. (mg/L)	INITIAL	<i>7.1</i>	<i>7.9</i>	<i>7.8</i>	<i>7.6</i>	<i>7.4</i>	<i>7.5</i>	<i>7.8</i>	
	FINAL	<i>7.2</i>	<i>8.0</i>	<i>7.6</i>	<i>7.6</i>	<i>7.5</i>	<i>7.4</i>	<i>7.2</i>	
pH (s.u.)	INITIAL	<i>7.9</i>	<i>7.0</i>	<i>7.5</i>	<i>7.1</i>	<i>7.7</i>	<i>7.7</i>	<i>7.3</i>	
	FINAL	<i>7.2</i>	<i>7.4</i>	<i>7.6</i>	<i>7.5</i>	<i>7.4</i>	<i>7.5</i>	<i>7.6</i>	
temp (C)	INITIAL	<i>22.6</i>	<i>24.0</i>	<i>22.9</i>	<i>22.8</i>	<i>22.2</i>	<i>22.3</i>	<i>21.5</i>	
	FINAL	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	
ALKALINITY (mg/L)		<i>36</i>							
HARDNESS (mg/L)		<i>48</i>							
CONDUCTIVITY (umhos/cm)		<i>180</i>							
CHLORINE (mg/L)		<i><0.05</i>							
CONC:		<i>32</i>							
D.O. (mg/L)	INITIAL	<i>7.2</i>	<i>8.1</i>	<i>7.9</i>	<i>7.7</i>	<i>7.1</i>	<i>6.9</i>	<i>7.8</i>	
	FINAL	<i>7.3</i>	<i>7.6</i>	<i>7.7</i>	<i>7.6</i>	<i>7.3</i>	<i>7.2</i>	<i>7.2</i>	
pH (s.u.)	INITIAL	<i>7.9</i>	<i>7.2</i>	<i>7.4</i>	<i>7.1</i>	<i>7.4</i>	<i>7.1</i>	<i>7.0</i>	
	FINAL	<i>7.0</i>	<i>7.0</i>	<i>7.2</i>	<i>7.3</i>	<i>7.2</i>	<i>7.6</i>	<i>7.4</i>	
temp (C)	INITIAL	<i>22.8</i>	<i>22.9</i>	<i>23.0</i>	<i>23.5</i>	<i>22.0</i>	<i>22.4</i>	<i>21.5</i>	
	FINAL	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	
CONC:		<i>42</i>							
D.O. (mg/L)	INITIAL	<i>7.4</i>	<i>8.3</i>	<i>8.1</i>	<i>7.8</i>	<i>7.5</i>	<i>7.1</i>	<i>7.8</i>	
	FINAL	<i>7.2</i>	<i>7.3</i>	<i>7.7</i>	<i>7.6</i>	<i>7.5</i>	<i>7.3</i>	<i>7.3</i>	
pH (mg/L)	INITIAL	<i>8.2</i>	<i>7.2</i>	<i>7.5</i>	<i>7.1</i>	<i>7.4</i>	<i>7.1</i>	<i>6.9</i>	
	FINAL	<i>7.2</i>	<i>7.1</i>	<i>7.2</i>	<i>7.3</i>	<i>7.2</i>	<i>7.6</i>	<i>7.4</i>	
temp (C)	INITIAL	<i>22.8</i>	<i>22.6</i>	<i>23.2</i>	<i>23.8</i>	<i>23.0</i>	<i>22.5</i>	<i>21.4</i>	
	FINAL	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	
CONC:		<i>56</i>							
D.O. (mg/L)	INITIAL	<i>7.6</i>	<i>8.3</i>	<i>8.3</i>	<i>7.9</i>	<i>7.4</i>	<i>7.4</i>	<i>5.8</i>	
	FINAL	<i>7.3</i>	<i>7.4</i>	<i>7.6</i>	<i>7.5</i>	<i>7.4</i>	<i>7.2</i>	<i>7.4</i>	
pH (s.u.)	INITIAL	<i>8.0</i>	<i>7.3</i>	<i>7.4</i>	<i>7.1</i>	<i>7.4</i>	<i>7.1</i>	<i>6.9</i>	
	FINAL	<i>7.1</i>	<i>7.2</i>	<i>7.2</i>	<i>7.1</i>	<i>7.1</i>	<i>7.5</i>	<i>7.2</i>	
temp (C)	INITIAL	<i>22.8</i>	<i>22.3</i>	<i>23.2</i>	<i>24.1</i>	<i>22.1</i>	<i>22.4</i>	<i>21.2</i>	
	FINAL	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	
CONC:		<i>75</i>							
D.O. (mg/L)	INITIAL	<i>7.6</i>	<i>8.5</i>	<i>8.3</i>	<i>7.9</i>	<i>7.5</i>	<i>7.5</i>	<i>8.1</i>	
	FINAL	<i>7.2</i>	<i>7.4</i>	<i>7.6</i>	<i>7.6</i>	<i>7.4</i>	<i>7.2</i>	<i>7.3</i>	
pH (s.u.)	INITIAL	<i>7.9</i>	<i>7.2</i>	<i>7.4</i>	<i>7.1</i>	<i>7.4</i>	<i>7.6</i>	<i>6.9</i>	
	FINAL	<i>7.1</i>	<i>7.1</i>	<i>7.2</i>	<i>7.1</i>	<i>7.2</i>	<i>7.7</i>	<i>7.1</i>	
temp (C)	INITIAL	<i>22.8</i>	<i>22.4</i>	<i>23.3</i>	<i>24.4</i>	<i>22.1</i>	<i>22.4</i>	<i>21.3</i>	
	FINAL	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	
CONC:		<i>100</i>							
D.O. (mg/L)	INITIAL	<i>7.8</i>	<i>8.5</i>	<i>8.9</i>	<i>8.1</i>	<i>7.5</i>	<i>7.7</i>	<i>8.3</i>	
	FINAL	<i>7.1</i>	<i>7.3</i>	<i>7.6</i>	<i>7.7</i>	<i>7.4</i>	<i>7.4</i>	<i>7.3</i>	
pH (s.u.)	INITIAL	<i>8.0</i>	<i>7.2</i>	<i>7.3</i>	<i>7.1</i>	<i>7.3</i>	<i>7.6</i>	<i>6.8</i>	
	FINAL	<i>7.1</i>	<i>7.1</i>	<i>7.1</i>	<i>7.1</i>	<i>7.2</i>	<i>7.7</i>	<i>7.2</i>	
temp (C)	INITIAL	<i>23.6</i>	<i>22.5</i>	<i>23.4</i>	<i>24.6</i>	<i>21.9</i>	<i>22.7</i>	<i>21.5</i>	
	FINAL	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	<i>25.0</i>	
CONC:		<i>100%</i>							
ALKALINITY (mg/L)		<i>18</i>			<i>22</i>		<i>16</i>		
HARDNESS (mg/L)		<i>1040</i>			<i>2600</i>		<i>2600</i>		
CONDUCTIVITY (umhos/cm)		<i>1925</i>			<i>1916</i>		<i>1940</i>		
CHLORINE (mg/L)		<i><0.05</i>			<i><0.05</i>		<i><0.05</i>		

APPENDIX C

Fathead minnow raw data and statistics

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID		TEST START DATE		TIME							
K906006		6/15/09		1245							
CLIENT		TEST END DATE		TIME							
Weston		6/12/09		1420							
AGE AND SOURCE OF MINNOWS											
DAY (NUMBER SURVIVING)											
REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV	
CONC: Control	A	8	8	8	8	8	8	7	87.5	95	7.21
	B	8	8	8	8	8	8	7	87.5		
	C	8	8	8	8	8	8	100	100		
	D	8	8	8	8	8	8	100	100		
	E	8	8	8	8	8	8	100	100		
CONC: 32	A	8	8	8	8	8	8	100	97.5		
	B	8	8	8	8	8	8	87.5			
	C	8	8	8	8	8	8	100			100
	D	8	8	8	8	8	8	100			100
	E	8	8	8	8	8	8	100			100
CONC: 42	A	8	8	8	8	8	8	100	100		
	B	8	8	8	8	8	8	100			
	C	8	8	8	8	8	8	100			100
	D	8	8	8	8	8	8	100			100
	E	8	8	8	8	8	8	100			100
CONC: 56	A	8	8	8	8	8	8	100	97.5		
	B	8	8	8	8	8	8	100			
	C	8	8	8	8	8	8	87.5			100
	D	8	8	8	8	8	8	100			100
	E	8	8	8	8	8	8	100			100
CONC: 75	A	8	8	8	8	8	8	100	97.5		
	B	8	8	8	8	8	8	100			
	C	8	8	8	8	8	8	87.5			100
	D	8	8	8	8	8	8	100			100
	E	8	8	8	8	8	8	100			100
CONC: 100	A	8	8	8	8	8	8	100	97.5	5.73	
	B	8	8	8	8	8	8	87.5			
	C	8	8	8	8	8	8	100			100
	D	8	8	8	8	8	8	100			100
	E	8	8	8	8	8	8	100			100
ANALYST											
DATE:											
TIME:											

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID		K906006		TEST START DATE		6/15/09		TIME		1215					
CLIENT		Weston A		TEST END DATE		6/14/09		TIME		1420					
AGE AND SOURCE OF MINNOWS															
D A Y (NUMBER SURVIVING)															
SURVIVAL															
	REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV				
Control	CONC: A	2	2	2	2	2	2	2	1						
	B	↓	↓	↓	↓	↓	↓	↓	2						
	C	↓	↓	↓	↓	↓	↓	↓	2						
	D	↓	↓	↓	↓	↓	↓	↓	2						
	E														
	REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV				
32	CONC: A	2	2	2	2	2	2	2	2						
	B	↓	↓	↓	↓	↓	↓	↓	↓						
	C	↓	↓	↓	↓	↓	↓	↓	↓						
	D	↓	↓	↓	↓	↓	↓	↓	↓						
	E														
	REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV				
42	CONC: A	2	2	2	2	2	2	2	2						
	B	↓	↓	↓	↓	↓	↓	↓	↓						
	C	↓	↓	↓	↓	↓	↓	↓	↓						
	D	↓	↓	↓	↓	↓	↓	↓	↓						
	E														
	REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV				
56	CONC: A	2	2	2	2	2	2	2	2						
	B	↓	↓	↓	↓	↓	↓	↓	↓						
	C	↓	↓	↓	↓	↓	↓	↓	↓						
	D	↓	↓	↓	↓	↓	↓	↓	↓						
	E														
	REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV				
75	CONC: A	2	2	2	2	2	2	2	2						
	B	↓	↓	↓	↓	↓	↓	↓	↓						
	C	↓	↓	↓	↓	↓	↓	↓	↓						
	D	↓	↓	↓	↓	↓	↓	↓	↓						
	E														
	REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV				
100	CONC: A	2	2	2	2	2	2	2	2						
	B	↓	↓	↓	↓	↓	↓	↓	↓						
	C	↓	↓	↓	↓	↓	↓	↓	↓						
	D	↓	↓	↓	↓	↓	↓	↓	↓						
	E														
ANALYST		KP	ct	ct	KP	KP	KP	KP	KP						
DATE:		6/15/09	6/16/09	6/17/09	6/18/09	6/19/09	6/20/09	6/21/09	6/22/09						
TIME:		1215	1420	1400	1130	1310	1205	0720	1420						

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID		K906006		TEST START DATE		6/5/09		TIME		1215		
CLIENT		Weston		TEST END DATE				TIME				
		B		AGE AND SOURCE OF MINNOWS				SURVIVAL				
				DAY (NUMBER SURVIVING)								
CONC:		REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
Control		A	12	2	1	2	2	2	2	2		
		B	1	1	1	1	1	1	1	1		
		C	1	1	1	1	1	1	1	1		
		D	1	1	1	1	1	1	1	1		
		E	1	1	1	1	1	1	1	1		
CONC:		REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
32		A	2	2	2	2	2	2	2	2		
		B	1	1	1	1	1	1	1	1		
		C	1	1	1	1	1	1	1	1		
		D	1	1	1	1	1	1	1	1		
		E	1	1	1	1	1	1	1	1		
CONC:		REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
42		A	2	2	2	2	2	2	2	2		
		B	1	1	1	1	1	1	1	1		
		C	1	1	1	1	1	1	1	1		
		D	1	1	1	1	1	1	1	1		
		E	1	1	1	1	1	1	1	1		
CONC:		REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
56		A	2	2	2	2	2	2	2	2		
		B	1	1	1	1	1	1	1	1		
		C	1	1	1	1	1	1	1	1		
		D	1	1	1	1	1	1	1	1		
		E	1	1	1	1	1	1	1	1		
CONC:		REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
75		A	2	2	2	2	2	2	2	2		
		B	1	1	1	1	1	1	1	1		
		C	1	1	1	1	1	1	1	1		
		D	1	1	1	1	1	1	1	1		
		E	1	1	1	1	1	1	1	1		
CONC:		REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
100		A	2	2	2	2	2	2	1	1		
		B	1	1	1	1	1	1	1	1		
		C	1	1	1	1	1	1	1	1		
		D	1	1	1	1	1	1	1	1		
		E	1	1	1	1	1	1	1	1		
ANALYST		KP		ct		ct						
DATE:		6/5/09		6/6/09		6/7/09						
TIME:		1215		1430		1400						

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID K906006 TEST START DATE 6/5/09 TIME 1215
 CLIENT Weston TEST END DATE _____ TIME _____
 AGE AND SOURCE OF MINNOWS _____

		D A Y (NUMBER SURVIVING)						SURVIVAL		
REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
Control	A	2	2	2	2	2	2	2		
	B	1	1	1	1	1	1	1		
	C	1	1	1	1	1	1	1		
	D	1	1	1	1	1	1	1		
	E	1	1	1	1	1	1	1		
32	A	2	2	2	2	2	2	2		
	B	1	1	1	1	1	1	1		
	C	1	1	1	1	1	1	1		
	D	1	1	1	1	1	1	1		
	E	1	1	1	1	1	1	1		
42	A	2	2	2	2	2	2	2		
	B	1	1	1	1	1	1	1		
	C	1	1	1	1	1	1	1		
	D	1	1	1	1	1	1	1		
	E	1	1	1	1	1	1	1		
56	A	2	2	2	2	2	2	2		
	B	1	1	1	1	1	1	1		
	C	1	1	1	1	1	1	1		
	D	1	1	1	1	1	1	1		
	E	1	1	1	1	1	1	1		
75	A	2	2	2	2	2	2	2		
	B	1	1	1	1	1	1	1		
	C	1	1	1	1	1	1	1		
	D	1	1	1	1	1	1	1		
	E	1	1	1	1	1	1	1		
100	A	2	2	2	2	2	2	2		
	B	1	1	1	1	1	1	1		
	C	1	1	1	1	1	1	1		
	D	1	1	1	1	1	1	1		
	E	1	1	1	1	1	1	1		
ANALYST	KP	ca	ct							
DATE:	6/5/09	6/6/09	6/7/09							
TIME:	1215	1430	1400							

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		TIME						
1906006		6/5/09		1215						
CLIENT		TEST END DATE		TIME						
Weston										
		AGE AND SOURCE OF MINNOWS						SURVIVAL		
		DAY (NUMBER SURVIVING)								
REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
Control	CONC: A	2	2	2	2	2	2	2		
	B	2	2	2	2	2	2	2		
	C	2	2	2	2	2	2	2		
	D	2	2	2	2	2	2	2		
	E	2	2	2	2	2	2	2		
32	CONC: A	2	2	2	2	2	2	2		
	B	2	2	2	2	2	2	2		
	C	2	2	2	2	2	2	2		
	D	2	2	2	2	2	2	2		
	E	2	2	2	2	2	2	2		
42	CONC: A	2	2	2	2	2	2	2		
	B	2	2	2	2	2	2	2		
	C	2	2	2	2	2	2	2		
	D	2	2	2	2	2	2	2		
	E	2	2	2	2	2	2	2		
56	CONC: A	2	2	2	2	2	2	2		
	B	2	2	2	2	2	2	2		
	C	2	2	2	2	2	2	2		
	D	2	2	2	2	2	2	2		
	E	2	2	2	2	2	2	2		
75	CONC: A	2	2	2	2	2	2	2		
	B	2	2	2	2	2	2	2		
	C	2	2	2	2	2	2	2		
	D	2	2	2	2	2	2	2		
	E	2	2	2	2	2	2	2		
100	CONC: A	2	2	2	2	2	2	2		
	B	2	2	2	2	2	2	2		
	C	2	2	2	2	2	2	2		
	D	2	2	2	2	2	2	2		
	E	2	2	2	2	2	2	2		
ANALYST	KP	ck	ct							
DATE:	6/5/09	6/6/09	6/7/09							
TIME:	1215	1430	1400							

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		TIME							
CLIENT		TEST END DATE		TIME							
		AGE AND SOURCE OF MINNOWS							SURVIVAL		
		DAY (NUMBER SURVIVING)									
CONC:	REP #	start	1	2	3	4	5	6	7%	MEAN %	CV
Control	A	3	3	3	3	3	3	3	3		
	B	3	3	3	3	3	3	3	3		
	C	3	3	3	3	3	3	3	3		
	D	3	3	3	3	3	3	3	3		
	E	3	3	3	3	3	3	3	3		
32	A	2	3	3	3	2	2	3	3		
	B	3	3	3	3	3	3	3	3		
	C	3	3	3	3	3	3	3	3		
	D	3	3	3	3	3	3	3	3		
	E	3	3	3	3	3	3	3	3		
42	A	3	3	3	3	3	3	3	3		
	B	3	3	3	3	3	3	3	3		
	C	3	3	3	3	3	3	3	3		
	D	3	3	3	3	3	3	3	3		
	E	3	3	3	3	3	3	3	3		
56	A	3	3	3	3	3	3	3	3		
	B	3	3	3	3	3	3	3	3		
	C	3	3	3	3	3	3	3	3		
	D	3	3	3	3	3	3	3	3		
	E	3	3	3	3	3	3	3	3		
75	A	3	3	3	3	3	3	3	3		
	B	3	3	3	3	3	3	3	3		
	C	3	3	3	3	3	3	3	3		
	D	3	3	3	3	3	3	3	3		
	E	3	3	3	3	3	3	3	3		
100	A	3	3	3	3	3	3	3	3		
	B	3	3	3	3	3	3	3	3		
	C	3	3	3	3	3	3	3	3		
	D	3	3	3	3	3	3	3	3		
	E	3	3	3	3	3	3	3	3		
ANALYST	KP	CA	ct								
DATE:	6/5/09	6/6/09	6/7/09								
TIME:	1215	1430	1400								

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

Pimephales promelas

FATHEAD MINNOW

TEST 1000.0

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s:		K906006		TEST DATES (BEGIN / END):		6/5-12/09	
CLIENT:		EEMA		WEIGHING DATE / TIME:		6/16/09, 1400	
ANALYSTS:		KP		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	0.99414	0.98802	0.00612	8	0.765	AVG DRY WEIGHT (mg)
	B	1.01321	1.00962	0.00359	8	0.449	
	C	0.98504	0.98164	0.00340	8	0.425	CV
	D	1.00733	1.00333	0.00400	8	0.500	
	E	0.97285	0.96776	0.00509	8	0.636	
						0.555	
						25.8	
CONC: 32%	A	0.97171	0.96864	0.00307	8	0.384	AVG DRY WEIGHT (mg)
	B	0.99828	0.99484	0.00344	8	0.430	
	C	0.99244	0.98793	0.00451	8	0.564	CV
	D	0.96343	0.95989	0.00354	8	0.442	
	E	0.99960	0.99457	0.00503	8	0.629	
						0.490	
CONC: 42%	A	0.94287	0.93709	0.00578	8	0.723	AVG DRY WEIGHT (mg)
	B	0.94655	0.94289	0.00366	8	0.458	
	C	0.98149	0.97671	0.00478	8	0.598	CV
	D	0.97074	0.96641	0.00433	8	0.541	
	E	0.98856	0.98446	0.00410	8	0.512	
						0.566	
CONC: 56%	A	1.01491	1.01083	0.00408	8	0.510	AVG DRY WEIGHT (mg)
	B	1.03875	1.03395	0.00480	8	0.600	
	C	0.98053	0.97703	0.00350	8	0.438	CV
	D	1.00305	0.99750	0.00555	8	0.694	
	E	1.02593	1.02071	0.00522	8	0.653	
						0.579	
CONC: 75%	A	0.98316	0.97664	0.00652	8	0.815	AVG DRY WEIGHT (mg)
	B	0.99472	0.99007	0.00465	8	0.581	
	C	1.01367	1.00887	0.00480	8	0.600	CV
	D	0.96975	0.96489	0.00486	8	0.607	
	E	0.97658	0.97231	0.00427	8	0.534	
						0.628	
CONC: 100%	A	0.94917	0.94388	0.00529	8	0.661	AVG DRY WEIGHT (mg)
	B	0.97311	0.96863	0.00448	8	0.560	
	C	1.01142	1.00643	0.00499	8	0.624	CV
	D	0.99889	0.99289	0.00600	8	0.750	
	E	0.97135	0.96532	0.00603	8	0.754	
						0.670	
						12.4	

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s: <u>1902-006</u>	TEST DATES (BEGIN / END): <u>6/15-12/09</u>
CLIENT: <u>Weston</u>	WEIGHING DATE / TIME: <u>6/16/09 1400</u>
ANALYSTS:	DRYING TEMP (DEGREES C): <u>60</u>
SAMPLE ID:	DRYING TIME (HOURS): <u>24</u>

	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	0.99305	0.98802				AVG DRY WEIGHT (mg)
	B 2	1.01321	1.00962				
	C 3	0.98404	0.98164				
	D 4	1.00612	1.00333				
	E 5	0.97105	0.96776				
							CV
CONC: 0.97171	A 6	0.99077	0.96864				AVG DRY WEIGHT (mg)
	B 7	0.99828	0.99484				
	C 8	0.99244	0.982943				
	D 9	0.96343	0.95989				
	E 10	0.99960	0.99457				
							CV
CONC:	A 11	0.94287	0.93709				AVG DRY WEIGHT (mg)
	B 12	0.94655	0.94289				
	C 13	0.98149	0.97671				
	D 14	0.97074	0.96641				
	E 15	0.98856	0.98446				
							CV
CONC:	A 16	1.01491	1.01083				AVG DRY WEIGHT (mg)
	B 17	1.03875	1.03395				
	C 18	0.98053	0.97763				
	D 19	1.00305	0.99750				
	E 20	1.02593	1.02071				
							CV
CONC:	A 21	0.98316	0.97664				AVG DRY WEIGHT (mg)
	B 22	0.99472	0.99007				
	C 23	1.01567	1.00887				
	D 24	0.96975	0.96489				
	E 25	0.97658	0.97239				
							CV
CONC:	A 26	0.94917	0.94388				AVG DRY WEIGHT (mg)
	B 27	0.97311	0.96863				
	C 28	1.01142	1.00643				
	D 29	0.99829	0.99289				
	E 30	0.97155	0.96532				
							CV

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

AA# K906006, FATHEAD MINNOW SURVIVAL, CHRONIC 6-5-09
File: J:\TOXSTAT\MONTE\FHSURV~1. KP3 Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.181

W = 0.705

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# K906006, FATHEAD MINNOW SURVIVAL, CHRONIC 6-5-09
File: J:\TOXSTAT\MONTE\FHSURV~1. 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.

KP4

TITLE: AA# K906006, FATHEAD MINNOW SURVIVAL, CHRONIC 6-5-09
 FILE: J:\TOXSTAT\MONTE\FHSURV~1.
 TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.8750	1.2094
1	CONTROL	2	0.8750	1.2094
1	CONTROL	3	1.0000	1.4120
1	CONTROL	4	1.0000	1.4120
1	CONTROL	5	1.0000	1.4120
2	32 % EFFLUENT	1	1.0000	1.4120
2	32 % EFFLUENT	2	0.8750	1.2094
2	32 % EFFLUENT	3	1.0000	1.4120
2	32 % EFFLUENT	4	1.0000	1.4120
2	32 % EFFLUENT	5	1.0000	1.4120
3	42 % EFFLUENT	1	1.0000	1.4120
3	42 % EFFLUENT	2	1.0000	1.4120
3	42 % EFFLUENT	3	1.0000	1.4120
3	42 % EFFLUENT	4	1.0000	1.4120
3	42 % EFFLUENT	5	1.0000	1.4120
4	56 % EFFLUENT	1	1.0000	1.4120
4	56 % EFFLUENT	2	1.0000	1.4120
4	56 % EFFLUENT	3	0.8750	1.2094
4	56 % EFFLUENT	4	1.0000	1.4120
4	56 % EFFLUENT	5	1.0000	1.4120
5	75 % EFFLUENT	1	1.0000	1.4120
5	75 % EFFLUENT	2	1.0000	1.4120
5	75 % EFFLUENT	3	0.8750	1.2094
5	75 % EFFLUENT	4	1.0000	1.4120
5	75 % EFFLUENT	5	1.0000	1.4120
6	100 % EFFLUENT	1	1.0000	1.4120
6	100 % EFFLUENT	2	0.8750	1.2094
6	100 % EFFLUENT	3	1.0000	1.4120
6	100 % EFFLUENT	4	1.0000	1.4120
6	100 % EFFLUENT	5	1.0000	1.4120

AA# K906006, FATHEAD MINNOW SURVIVAL, CHRONIC 6-5-09
 File: J:\TOXSTAT\MONTE\FHSURV~1. 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	1.331				
2	32 % EFFLUENT	1.372	30.00	16.00	5.00	
3	42 % EFFLUENT	1.412	32.50	16.00	5.00	
4	56 % EFFLUENT	1.372	30.00	16.00	5.00	
5	75 % EFFLUENT	1.372	30.00	16.00	5.00	
6	100 % EFFLUENT	1.372	30.00	16.00	5.00	

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

AA# K906013, FATHEAD MINNOW GROWTH CHRONIC, 6-18-09
File: J:/toxstat/monte\FHGROWTH. KP1 Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - wilk's test for normality

D = 0.315

W = 0.929

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# K906013, FATHEAD MINNOW GROWTH CHRONIC, 6-18-09
File: J:/toxstat/monte\FHGROWTH. Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 1.11

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.