

Arkansas Analytical, Inc.

Toxicity Test Results

MAGCOBAR MINE SITE
NPDES PERMIT NUMBER: AR0049794
October, 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**
EEMA O&M Services Group
P.O. Box 232
Kulpsville, PA 19443

Prepared by: Arkansas Analytical, Inc.
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Little Rock, Arkansas 72209
Lab Number K910002

Thursday, November 12, 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 October 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:	10-14-09, 0905	10-15-09, 0905
Sample #2:	10-15-09, 0815	10-16-09, 0815
Sample #3:	10-19-09, 0912	10-20-09, 0912

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:	10-15-09, 1327	3
Sample #2:	10-16-09, 1240	4
Sample #3:	10-20-09, 1342	3

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	90%	X	
Average of 15 or more young per surviving female	16.3	X	
At least 60% of surviving females should have produced 3 broods	77.8%	X	
The percent coefficient of variation between replicates must be 40% or less for the young of surviving females	22.3%	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	0.00%	X	
Minimum of 0.25 mg average dry weight of surviving controls	0.366	X	
The percent coefficient of variation between replicates must be 40% or less for growth	11.8%	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> 8/20-27/09		<i>Pimephales promelas</i> 8/20-27/09	
NOEC Survival:	250 ppm KCl	NOEC Survival:	500 ppm KCl
LOEC Survival:	500 ppm KCl	LOEC Survival:	1000 ppm KCl
NOEC Reproduction:	250 ppm KCl	NOEC Growth:	500 ppm KCl
LOEC Reproduction:	500 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)	12.4	%CV survival (critical dilution)	87.5%
%CV Reproduction (critical dilution)	33.6%	Mean dry weight (critical dilution) in milligrams	0.535
		%CV growth (critical dilution)	13.1%
PMSD Reproduction	34.6	PMSD Growth	22.3

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

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:	10-14-09, 0905	10-15-09, 0905
Sample #2:	10-15-09, 0815	10-16-09, 0815
Sample #3:	10-19-09, 0912	10-20-09, 0912

Test initiated (date, time): 10-15-09, 1430 Test terminated (date, time): 10-22-09, 0955

Dilution water used: Soft Synthetic

DATA TABLE FOR FATHEAD MINNOW SURVIVAL

Percent Survival in Replicate Chambers

Mean Percent Survival

DATA TABLE FOR GROWTH OF FATHEAD MINNOWS

Effluent Conc %	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	87.5	100	100		100	100	97.5	
42%	100	87.5	100	100	100		100	100	97.5	
56%	100	87.5	87.5	100	100		100	100	95	
75%	100	100	100	87.5	75		100	100	92.5	
100%	75	87.5	100	100	75		95	95	87.5	14.29

SUMMARY

Effluent Conc %	A	B	C	D	E		Mean Dry Weight	CV%
0%	0.385	0.311	0.375	0.422	0.336		0.366	11.8
32%	0.558	0.526	0.468	0.380	0.559		0.498	
42%	0.576	0.585	0.566	0.524	0.425		0.535	
56%	0.634	0.560	0.520	0.526	0.531		0.554	
75%	0.545	0.520	0.503	0.546	0.469		0.517	
100%	0.441	0.554	0.625	0.494	0.563		0.535	13.1

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)= 13.1 %

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:	10-14-09, 0905	10-15-09, 0905
Sample #2:	10-15-09, 0815	10-16-09, 0815
Sample #3:	10-19-09, 0912	10-20-09, 0912

Test initiated (date, time): 10-15-09, 1400 Test terminated (date, time): 10-22-09, 0915

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	22	10	15	20	9	6
B	14	20	11	5	10	12
C	12	16	16	11	2	x0
D	x10	19	15	x0	22	8
E	12	22	5	12	10	11
F	19	18	11	17	16	11
G	21	17	17	14	7	16
H	15	4	8	15	14	14
I	16	11	19	3	x7	14
J	16	16	13	13	12	20
Mean	15.7	15.3	13.0	11.0	10.9	11.2
Mean/surviving female	16.3	15.3	13.0	12.2	11.3	12.4
CV%*	22.3					33.6

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	90	100	100
Test termination	90	100	100	90	90	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)= 33.6 %

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 732	Biomonitoring Sample		48 Hour	2. Sulfuric Acid (H ₂ SO ₄), pH < 2				5. Hydrochloric Acid(HCl)					
P.O. Box 699	Kulpsville, PA 19443	Reporting Information		72 Hour	3. Nitric Acid (HNO ₃), pH < 2				6. Sodium Hydroxide (NaOH), pH > 12					
Malvern, AR 72104		Telephone: 501-467-8355		Routine (5 Day)	TEST PARAMETERS								Bottle Type Code	
Attn: Bill McAlister	Attn: Amber Rich	Fax: 501-467-8687		Preservative Code:	1									G = Glass; P = Plastic
		Email: dave.friedman@eema-inc.com; bmcallister@eema-inc.com; bhorton@eema-inc.com		Bottle Type:	P									V = Septum; A = Amber

<i>Bill McAlister</i>			<i>Bill McAlister</i>				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											
FD-1 Comp.	10/15/2009	9:05 AM		X	4	W	Facility Discharge	X										

1. Relinquished by: (Signature)		Date/Time	2. Received by: (Signature)		SAMPLE CONDITION UPON RECEIPT IN LAB			REMARKS / SAMPLE COMMENTS	
<i>Bill McAlister</i>		10-15-09	<i>[Signature]</i>		1. CUSTODY SEALS: <input checked="" type="checkbox"/> Yes ___ No				
		1327			2. CONTAINERS CORRECT: <input type="checkbox"/> Yes ___ No				
3. Relinquished by: (Signature)		Date/Time	4. Received by lab: (Signature)		3. COC/LABELS AGREE: <input type="checkbox"/> Yes ___ No				
<i>[Signature]</i>		10-15-09	<i>[Signature]</i>		4. PRESERVATION CONFIRMED: <input type="checkbox"/> Yes ___ No				
		1327			5. RECEIVED ON ICE: <input type="checkbox"/> Yes ___ No				
					6. TEMPERATURE ON RECEIPT: 3°C				
					FOR COMPLETION BY LAB ONLY				



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:			
CEMA O & M Services Group	CEMA O & M Services Group	Magcohar Mine Site	24 Hour	1. Cool, 4 Degrees Centigrade		4. Thiosulfate for Dechlorination	
Magcohar Mine Site	P.O. Box 732	Biomonitoring Sample	48 Hour	2. Sulfuric Acid (H ₂ SO ₄), pH < 2		5. Hydrochloric Acid(HCl)	
P.O. Box 699	Kulpsville, PA 19443	Reporting Information	72 Hour	3. Nitric Acid (HNO ₃), pH < 2		6. Sodium Hydroxide (NaOH), pH > 12	
Malvern, AR 72104	Attn: Amber Rich	Telephone: 501-467-8355	Routine (5 Day)	TEST PARAMETERS			
Attn: Bill McAlister	Attn: Amber Rich	Fax: 501-467-8687	Reservative Code: 1				
<small>Email: bmcaldin@cesma-inc.com; bmcaldin@cesma-inc.com; bhorton@cesma-inc.com</small>			Bottle Type: P	G = Glass; P = Plastic			
				V = Septum; A = Amber			

<i>Bill McAlister</i>		<i>Bill McAlister</i>																Arkansas Analytical Work Order Number:		
Sampler(s) Signature		Sampler(s) Printed																K910002		
Field Number	SAMPLE COLLECTION		Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION		Chronic Biomonitoring											
FD-1 Comp.	10/20/2009	9:12 AM		X	3	W	Facility Discharge-1	X												

1. Relinquished by: (Signature) <i>Bill McAlister</i>	Date/Time 10-20-09 1342	2. Received by: (Signature)	SAMPLE CONDITION UPON RECEIPT IN LAB		REMARKS / SAMPLE COMMENTS
			1. CUSTODY SEALS: <input checked="" type="checkbox"/> Yes ___ No		
			2. CONTAINERS CORRECT: <input checked="" type="checkbox"/> Yes ___ No		
3. Relinquished by: (Signature)	Date/Time	4. Received by lab: (Signature) <i>Sydney James</i>	3. COC/LABELS AGREE: <input type="checkbox"/> Yes ___ No		
			4. PRESERVATION CONFIRMED: <input type="checkbox"/> Yes ___ No		
			5. RECEIVED ON ICE: <input type="checkbox"/> Yes ___ No		
			6. TEMPERATURE ON RECEIPT: 3°C		
			FOR COMPLETION BY LAB ONLY		

APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Fathead Minnow

Lab # / Sample ID K⁹10002

Test Start (Date/Time) 10/15/09

Client Weston

Test End (Date/Time) 10/22/09

		Day of Test							notes/remarks
		1	2	3	4	5	6	7	
Control	SS	10/15	10/16	10/17	10/18	10/19	10/20	10/21	
D.O. (mg/L)	INITIAL	7.4	7.4	8.5	8.5	8.3	8.2	8.3	
	FINAL	6.3	8.1	8.2	7.9	7.7	8.0	8.2	
pH (s.u.)	INITIAL	7.2	7.2	7.3	7.6	7.9	7.8	7.7	
	FINAL	7.5	7.4	7.5	7.4	7.6	7.7	7.5	
temp (C)	INITIAL	22.3	22.0	21.3	22.0	21.7	22.2	22.0	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
ALKALINITY (mg/L)		32							↑
HARDNESS (mg/L)		56							↑
CONDUCTIVITY (umhos/cm)		174							↑
CHLORINE (mg/L)		<0.05							↑
CONC: 32									
D.O. (mg/L)	INITIAL	8.1	7.9	8.4	8.7	8.4	8.2	8.3	
	FINAL	6.4	7.7	7.9	7.7	7.7	8.0	8.2	
pH (s.u.)	INITIAL	6.6	7.0	6.8	7.1	7.3	7.4	7.3	
	FINAL	7.0	6.9	7.4	7.2	7.3	7.3	7.2	
temp (C)	INITIAL	23.1	22.5	21.0	22.4	21.5	22.6	22.2	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC: 42									
D.O. (mg/L)	INITIAL	8.2	8.0	8.8	8.8	8.5	8.3	8.4	
	FINAL	7.2	7.5	7.8	7.7	7.6	8.0	8.2	
pH (mg/L)	INITIAL	6.6	6.7	6.9	7.2	7.3	7.4	7.3	
	FINAL	7.1	6.9	7.2	6.9	7.2	7.3	7.1	
temp (C)	INITIAL	23.2	23.0	20.8	22.5	21.5	23.0	22.4	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC: 56									
D.O. (mg/L)	INITIAL	8.4	8.2	8.9	9.0	8.7	8.5	8.5	
	FINAL	7.2	7.1	7.6	7.6	7.6	7.9	8.1	
pH (s.u.)	INITIAL	6.6	6.6	6.9	7.2	7.3	7.4	7.4	
	FINAL	7.1	6.9	7.1	6.9	7.2	7.3	7.2	
temp (C)	INITIAL	24.0	23.6	20.5	22.7	21.5	23.3	22.5	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC: 75									
D.O. (mg/L)	INITIAL	8.6	8.4	8.8	9.2	8.7	8.5	8.4	
	FINAL	6.8	7.1	7.9	7.5	7.5	7.9	8.1	
pH (s.u.)	INITIAL	6.6	6.5	6.9	7.1	7.2	7.3	7.4	
	FINAL	7.0	6.9	7.1	6.9	7.0	7.3	7.2	
temp (C)	INITIAL	24.5	23.9	20.4	22.9	21.6	23.2	22.6	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC: 100									
D.O. (mg/L)	INITIAL	9.0	8.7	9.0	9.5	8.9	8.6	8.4	
	FINAL	7.1	7.4	8.0	7.5	7.5	7.8	8.0	
pH (s.u.)	INITIAL	6.5	6.5	6.9	7.1	7.7	7.5	7.3	
	FINAL	7.0	7.0	7.1	6.9	7.0	7.2	7.2	
temp (C)	INITIAL	25.2	24.1	20.2	23.1	21.9	23.4	22.8	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC: 100%		A	A	A	B	B	C	C	
ALKALINITY (mg/L)		14			8	7	12	11	
HARDNESS (mg/L)		2600			2600	1	2600	1	
CONDUCTIVITY (umhos/cm)		1889			1910	1	1977	1	
CHLORINE (mg/L)		<0.05			<0.05	1	<0.05	1	

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Cerodaphnia Dubia

Lab # / Sample ID 1C910002

Test Start (Date/Time) 10-15-09 / 1400

Client Weston

Test End (Date/Time) 10/22/09

		Day of Test							notes/remarks
		1	2	3	4	5	6	7	
Control	<u>SS 211</u>	<u>10/14</u>	<u>10/16</u>	<u>10/17</u>	<u>10/18</u>	<u>10/19</u>	<u>10/20</u>	<u>10/21</u>	
D.O. (mg/L)	INITIAL	7.4	7.4	8.2 8.5	8.5	8.3	8.2	8.3	
	FINAL	8.0	8.3	7.6	7.5	7.4	7.3		
pH (s.u.)	INITIAL	7.2	7.2	7.6 7.3	7.6	7.9	7.8	7.7	
	FINAL	7.4	7.5	7.8	7.7	8.1	7.3		
temp (C)	INITIAL	22.3	22.0	21.5 21.3	22.0	21.7	22.2	22.0	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0		
ALKALINITY (mg/L)		32							
HARDNESS (mg/L)		56							
CONDUCTIVITY (umhos/cm)		174							
CHLORINE (mg/L)		0.05							
CONC:	<u>32</u>								
D.O. (mg/L)	INITIAL	8.1	7.9	8.1 8.4	8.9	8.4	8.2	8.3	
	FINAL	8.3	8.0	7.9	7.5	7.8	7.3		
pH (s.u.)	INITIAL	6.6	7.0	7.5 6.8	7.1	7.3	7.4	7.3	
	FINAL	7.1	7.2	7.2	7.3	7.3	7.4		
temp (C)	INITIAL	23.1	22.5	21.0 21.0	22.4	21.5	22.6	22.2	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0		
CONC:	<u>42</u>								
D.O. (mg/L)	INITIAL	8.2	8.0	8.1 8.8	8.8	8.5	8.3	8.4	
	FINAL	8.4	7.9	7.9	7.5	7.7	7.3		
pH (mg/L)	INITIAL	6.6	6.7	7.5 6.9	7.2	7.3	7.4	7.3	
	FINAL	7.1	7.2	7.3	7.3	7.3	7.4		
temp (C)	INITIAL	23.2	23.0	21.8 21.8	22.5	21.5	23.0	22.4	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0		
CONC:	<u>56</u>								
D.O. (mg/L)	INITIAL	8.4	8.2	7.7 8.9	9.0	8.7	8.5	8.5	
	FINAL	8.4	7.9	7.9	7.6	7.6	7.5		
pH (s.u.)	INITIAL	6.6	6.6	6.9	7.2	7.3	7.4	7.4	
	FINAL	7.0	7.2	7.2	7.2	7.3	7.2		
temp (C)	INITIAL	24.0	23.0	20.5	22.7	21.5	23.3	22.5	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0		
CONC:	<u>75</u>								
D.O. (mg/L)	INITIAL	8.6	8.4	8.8	9.2	8.7	8.5	8.4	
	FINAL	8.2	7.9	7.3	7.7	8.7	7.5		
pH (s.u.)	INITIAL	6.6	6.5	6.9	7.1	7.2	7.3	7.4	
	FINAL	7.0	7.1	7.2	7.2	7.2	7.2		
temp (C)	INITIAL	24.5	23.9	20.4	22.9	21.6	23.2	22.6	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0		
CONC:	<u>100</u>								
D.O. (mg/L)	INITIAL	9.0	8.7	9.0	9.5	8.9	8.6	8.4	
	FINAL	8.1	7.9	7.6	7.7	7.6	7.4		
pH (s.u.)	INITIAL	6.5	6.5	6.9	7.1	7.2	7.3	7.3	
	FINAL	7.0	7.1	7.2	7.2	7.2	7.0		
temp (C)	INITIAL	25.2	24.1	20.2	23.1	21.9	23.4	22.8	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0		
CONC:	<u>100%</u>	A	A	A	B	B	C	C	
ALKALINITY (mg/L)		14			8		12		
HARDNESS (mg/L)		2600			2600		2600		
CONDUCTIVITY (umhos/cm)		1889			1910		1977		
CHLORINE (mg/L)		0.05			0.05		0.05		

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							
K916002		10/15/09		1							
CLIENT		TEST END DATE		TIME							
Weston Summary		10/22/09		1							
AGE AND SOURCE OF MINNOWS											
DAY (NUMBER SURVIVING)										SURVIVAL	
REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 0	A	8	8	8	8	8	8	8	100	95	H.P 0.00
	B	↓	↓	↓	↓	↓	↓	↓	100		
	C	↓	↓	↓	↓	↓	↓	↓	100		
	D	↓	↓	↓	↓	↓	↓	↓	100		
	E	↓	8	8	8	8	8	8	75/100		
CONC: 32	A	8	8	8	8	8	8	8	100	95	
	B	↓	↓	↓	↓	↓	↓	↓	100		
	C	↓	↓	↓	↓	↓	↓	↓	87.5		
	D	↓	↓	↓	↓	↓	↓	↓	100		
	E	↓	↓	↓	↓	↓	↓	↓	100/87.5		
CONC: 42	A	8	8	8	8	8	8	8	100	95	
	B	↓	↓	↓	↓	↓	↓	↓	87.5		
	C	↓	↓	↓	↓	↓	↓	↓	100		
	D	↓	↓	↓	↓	↓	↓	↓	87.5/100		
	E	↓	↓	↓	↓	↓	↓	↓	100		
CONC: 56	A	8	8	8	8	8	8	8	100	97.5	
	B	↓	↓	↓	↓	↓	↓	↓	100/87.5		
	C	↓	↓	↓	↓	↓	↓	↓	100/87.5		
	D	↓	↓	↓	↓	↓	↓	↓	87.5/100		
	E	↓	↓	↓	↓	↓	↓	↓	100		
CONC: 75	A	8	8	8	8	8	8	8	100	92.5	
	B	↓	↓	↓	↓	↓	↓	↓	100		
	C	↓	↓	↓	↓	↓	↓	↓	100		
	D	↓	↓	↓	↓	↓	↓	↓	87.5		
	E	↓	↓	↓	↓	↓	↓	↓	75		
CONC: 100	A	8	6	6	6	6	6	6	75	87.5	14.3
	B	↓	↓	↓	↓	↓	↓	↓	87.5		
	C	↓	↓	↓	↓	↓	↓	↓	100		
	D	↓	↓	↓	↓	↓	↓	↓	100		
	E	↓	↓	↓	↓	↓	↓	↓	75		
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		TEST START DATE		10/15/09		TIME		1430			
CLIENT		WESTON A		TEST END DATE		10/22/09		TIME 0955			
AGE AND SOURCE OF MINNOWS											
DAY (NUMBER SURVIVING)											
	REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
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
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
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
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
CONC:	A	2	0	0	0	0	0	0	0		
	B	↓	2	2	2	2	2	2	2		
	C	↓	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓	↓		
ANALYST		KP	KP	KP	KP	KP	KP	KP	KP		
DATE:		10/15/09	10/16	10/17	10/18	10/19	10/20	10/21	10/22		
TIME:		1430	1330	1400	1320	1115	1310	1410	1500 0955		

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										
DAY (NUMBER SURVIVING)										
REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
CONC:	A	2	2	2	2	2	2	2		
	B	2	2	2	2	2	2	2		
	C	1	1	1	1	1	1	1		
	D	1	1	1	1	1	1	1		
	E	1	1	1	1	1	1	1		
CONC:	A	2	2	2	2	2	2	2		
	B	2	2	2	2	2	2	2		
	C	1	1	1	1	1	1	1		
	D	1	1	1	1	1	1	1		
	E	1	1	1	1	1	1	1		
CONC:	A	2	2	2	2	2	2	2		
	B	2	2	2	2	2	2	2		
	C	1	1	1	1	1	1	1		
	D	1	1	1	1	1	1	1		
	E	1	1	1	1	1	1	1		
CONC:	A	2	2	2	2	2	2	2		
	B	2	2	2	2	2	2	2		
	C	1	1	1	1	1	1	1		
	D	1	1	1	1	1	1	1		
	E	1	1	1	1	1	1	1		
CONC:	A	2	2	2	2	2	2	2		
	B	2	2	2	2	2	2	2		
	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										
DATE:										
TIME:										

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										
DAY (NUMBER SURVIVING)										
REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
CONC:	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		
CONC:	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		
CONC:	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		
CONC:	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		
CONC:	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										
DATE:										
TIME:										

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												
DAY (NUMBER SURVIVING)												
		start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	REP #	A	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 #	A	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 #	A	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 #	A	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 #	A	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			
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		TEST START	DATE	TIME						
CLIENT		TEST END	DATE	TIME						
AGE AND SOURCE OF MINNOWS										
DAY (NUMBER SURVIVING)										
REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
CONC:	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		
CONC:	A	2	2	3	2	3	2	3		
	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		
CONC:	A	2	2	3	2	2	3	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		
CONC:	A	2	2	3	2	3	2	3		
	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		
CONC:	A	2	2	3	3	3	2	1		
	B	1	1	1	1	1	1	2		
	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										
DATE:										
TIME:										

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

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s:		K910002		TEST DATES (BEGIN / END):		10/15-22/09	
CLIENT:		EEMA		WEIGHING DATE / TIME:		10/30/09, 1545	
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	0.99357	0.99049	0.00308	8	0.385	AVG DRY WEIGHT (mg)
	B	1.00009	0.99760	0.00249	8	0.311	
	C	0.98142	0.97842	0.00300	8	0.375	0.366
	D	0.98710	0.98372	0.00338	8	0.422	CV
	E	1.01431	1.01162	0.00269	8	0.336	
CONC:	A	0.97279	0.96833	0.00446	8	0.558	AVG DRY WEIGHT (mg)
	B	1.00980	1.00559	0.00421	8	0.526	
	C	1.00557	1.00183	0.00374	8	0.468	0.498
	D	1.00449	1.00145	0.00304	8	0.380	CV
	E	0.99549	0.99102	0.00447	8	0.559	
CONC:	A	0.99655	0.99194	0.00461	8	0.576	AVG DRY WEIGHT (mg)
	B	0.99281	0.98813	0.00468	8	0.585	
	C	1.00135	0.99682	0.00453	8	0.566	0.535
	D	1.00185	0.99766	0.00419	8	0.524	CV
	E	1.01262	1.00922	0.00340	8	0.425	
CONC:	A	0.98011	0.97504	0.00507	8	0.634	AVG DRY WEIGHT (mg)
	B	0.98838	0.98390	0.00448	8	0.560	
	C	1.01536	1.01120	0.00416	8	0.520	0.554
	D	1.00717	1.00296	0.00421	8	0.526	CV
	E	1.00914	1.00489	0.00425	8	0.531	
CONC:	A	1.00241	0.99805	0.00436	8	0.545	AVG DRY WEIGHT (mg)
	B	1.01072	1.00656	0.00416	8	0.520	
	C	1.00254	0.99852	0.00402	8	0.503	0.517
	D	0.99778	0.99341	0.00437	8	0.546	CV
	E	0.99916	0.99541	0.00375	8	0.469	
CONC:	A	0.96072	0.95719	0.00353	8	0.441	AVG DRY WEIGHT (mg)
	B	0.99916	0.99473	0.00443	8	0.554	
	C	1.00272	0.99772	0.00500	8	0.625	0.535
	D	1.00132	0.99737	0.00395	8	0.494	CV
	E	0.99129	0.98679	0.00450	8	0.563	

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

Pimephales promelas

FATHEAD MINNOW

TEST 1000.0

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s: <u>K910002</u>	TEST DATES (BEGIN / END): <u>10/15-22/09</u>
CLIENT: <u>P. Weston</u>	WEIGHING DATE / TIME: <u>10/30/09 1545</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	A31	0.99357	0.99049				AVG DRY WEIGHT (mg)
	B32	1.00009	0.99760				
	C33	0.98142	0.97842				
	D34	0.98710	0.98372				
	E35	1.01431	1.01162				
							CV
CONC:	A36	0.97279	0.96833				AVG DRY WEIGHT (mg)
	B37	1.00980	1.00559				
	C38	1.00557	1.00183				
	D39	1.00449	1.00145				
	E40	0.99549	0.99102				
							CV
CONC:	A41	0.99655	0.99184				AVG DRY WEIGHT (mg)
	B42	0.99281	0.98803				
	C43	1.00135	0.99682				
	D44	1.00185	0.99766				
	E45	1.01262	1.00922				
							CV
CONC:	A46	0.98011	0.97504				AVG DRY WEIGHT (mg)
	B47	0.98838	0.98390				
	C48	1.01536	1.01120				
	D49	1.00717	1.00296				
	E50	1.00914	1.00489				
							CV
CONC:	A51	1.00843	0.99805				AVG DRY WEIGHT (mg)
	B52	1.01072	1.00656				
	C53	1.00254	0.99852				
	D54	0.99778	0.99341				
	E55	0.99916	0.99541				
							CV
CONC:	A56	0.96072	0.95719				AVG DRY WEIGHT (mg)
	B57	0.99916	0.99473				
	C58	1.00272	0.99772				
	D59	1.00132	0.99787				
	E60	0.99129	0.98679				
							CV

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

51 - 1.00241

AA# K910002, FATHEAD MINNOW SURVIVAL, CHRONIC, 10-15-09
File: H:\TOXSTAT\MONTE\FHSURV~1. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.311

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# K910002, FATHEAD MINNOW SURVIVAL, CHRONIC, 10-15-09
File: H:\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.

TITLE: AA# K910002, FATHEAD MINNOW SURVIVAL, CHRONIC, 10-15-09
FILE: H:\TOXSTAT\MONTE\FHSURV~1.
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	0.8750	1.2094
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	0.8750	1.2094
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	0.8750	1.2094
4	56 %	EFFLUENT	3	0.8750	1.2094
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	0.8750	1.2094
5	75 %	EFFLUENT	5	0.7500	1.0472
6	100 %	EFFLUENT	1	0.7500	1.0472
6	100 %	EFFLUENT	2	0.8750	1.2094
6	100 %	EFFLUENT	3	1.0000	1.3931
6	100 %	EFFLUENT	4	1.0000	1.3931
6	100 %	EFFLUENT	5	0.7500	1.0472

AA# K910002, FATHEAD MINNOW SURVIVAL, CHRONIC, 10-15-09
 File: H:\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	1.393				
2	32 % EFFLUENT	1.356	25.00	16.00	5.00	
3	42 % EFFLUENT	1.356	25.00	16.00	5.00	
4	56 % EFFLUENT	1.320	22.50	16.00	5.00	
5	75 % EFFLUENT	1.287	22.50	16.00	5.00	
6	100 % EFFLUENT	1.218	20.00	16.00	5.00	

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

AA# K910002, FATHEAD MINNOW GROWTH CHRONIC, 10-15-09
File: w Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.082

W = 0.961

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# K910002, FATHEAD MINNOW GROWTH CHRONIC, 10-15-09
File: w Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance

Calculated B1 statistic = 3.53

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# K910002, FATHEAD MINNOW GROWTH CHRONIC, 10-15-09
FILE: w
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.3850	0.6694
1	CONTROL	2	0.3110	0.5916
1	CONTROL	3	0.3750	0.6591
1	CONTROL	4	0.4220	0.7071
1	CONTROL	5	0.3360	0.6183
2	32 % EFFLUENT	1	0.5580	0.8435
2	32 % EFFLUENT	2	0.5260	0.8114
2	32 % EFFLUENT	3	0.4680	0.7534
2	32 % EFFLUENT	4	0.3800	0.6642
2	32 % EFFLUENT	5	0.5590	0.8445
3	42 % EFFLUENT	1	0.5760	0.8617
3	42 % EFFLUENT	2	0.5850	0.8708
3	42 % EFFLUENT	3	0.5660	0.8516
3	42 % EFFLUENT	4	0.5240	0.8094
3	42 % EFFLUENT	5	0.4250	0.7101
4	56 % EFFLUENT	1	0.6340	0.9211