Arkansas Analytical, Inc.

Toxicity Test Results

MAGCOBAR MINE SITE
NPDES PERMIT NUMBER: AR0049794
January, 2011
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 K1101004

Monday, January 31, 2011

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 January of 2011.

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:	1-12-11, 0905	1-13-11, 0905
Sample #2:	1-13-11, 1030	1-14-11, 1030
Sample #3:	1-17-11, 0840	1-18-11, 0840

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:	1-13-11, 1441	3
Sample #2:	1-14-11, 1507	4
Sample #3:	1-18-11, 1318	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	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	80%	X	
The percent coefficient of variation between replicates must be 40% or less for the young of surviving females	18.6%	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	0.322	X	
The percent coefficient of variation between replicates must be 40% or less for growth	8.56%	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

Ceriodaphnia dubia 12/16-23/10		*Pimephales promelas* 12/16-23/10	
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

Ceriodaphnia dubia		*Pimephales promelas*	
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)	17.3	%CV survival (critical dilution)	0.00 %
%CV Reproduction (critical dilution)	25.4%	Mean dry weight (critical dilution) in milligrams	0.518
		%CV growth (critical dilution)	6.20%
PMSD Reproduction	30.3	PMSD Growth	21.5

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 or sublethal effects at the critical dilution, and, as such, **passed** both the portions of the test.

Biomonitoring Analysts:

Ken Pigue

Allen Parker

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:	1-12-11, 0905	1-13-11, 0905
Sample #2:	1-13-11, 1030	1-14-11, 1030
Sample #3:	1-17-11, 0840	1-18-11, 0840

Test initiated (date, time): 1-14-11, 1110 Test terminated (date, time): 1-21-11, 0830

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	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

SUMMARY

Effluent Conc %	A	B	C	D	E		Mean Dry Weight	CV%
0%	0.309	0.293	0.367	0.319	0.325		0.323	8.56
32%	0.414	0.422	0.452	0.459	0.484		0.446	
42%	0.420	0.429	0.438	0.502	0.566		0.471	
56%	0.400	0.439	0.539	0.563	0.409		0.470	
75%	0.446	0.446	0.439	0.469	0.577		0.475	
100%	0.466	0.537	0.509	0.536	0.544		0.518	6.20

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)= _____**8.56**_____%

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:	1-12-11, 0905	1-13-11, 0905
Sample #2:	1-13-11, 1030	1-14-11, 1030
Sample #3:	1-17-11, 0840	1-18-11, 0840

Test initiated (date, time): 1-14-11, 1045 Test terminated (date, time): 1-21-11, 0815

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	19	20	18	17	27	23
B	16	14	24	9	21	20
C	20	19	23	19	18	23
D	10	14	22	23	17	19
E	16	17	16	14	16	13
F	19	20	20	19	11	9
G	15	23	16	21	x0	16
H	16	10	10	21	22	16
I	17	14	14	13	17	15
J	13	19	20	14	17	19
Mean	16.1	17.0	18.3	17.0	16.6	17.3
Mean/surviving female	16.1	17.0	18.3	17.0	18.4	17.3
CV%*	18.6					25.4

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	100	100	100	90	100
48 HOURS	100	100	100	100	90	100
Test termination	100	100	100	100	90	100

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)= _____**25.4**_____%

APPENDIX A

Chain of Custody Forms

Arkansas Analytical Inc.

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

CHAIN OF CUSTODY R

CLIENT INFORMATION		Project Description	Turnaround Time	Preservation Cod
EEMA O & M Services Group	EEMA O & M Services Group	Magcobar Mine Site	24 Hour	1. Cool, 4 Degrees Centigrade — 4. Th
Magcobar Mine Site	P.O. Box 732	Biomonitoring Sample	48 Hour	2. Sulfuric Acid (H_2SO_4), pH < 2 — 5. Hy
P.O. Box 699	Kulpsville, PA 19443	Reporting Information	72 Hour	3. Nitric Acid (HNO_3), pH < 2 — 6. Sod
Malvern, AR 72104		Telephone: 501-467-8355	Routine (5 Day)	
Attn: Bill McAlister	Attn: Amber Rich	Fax: 501-467-8687	Preservative Code:	TEST PARAMETERS
		Email: dave.friedman@eema-inc.com; bmcalister@eema-inc.com; bhorton@eema-inc.com	Bottle Type:	

Sampler(s) Signature: Bill McAlister

Sampler(s) Printed: Bill McAlister

Field Number	SAMPLE COLLECTION Date/s	Time/s	Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	Chronic Biomonitoring						
FD-1 Comp.	1/13/2011	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 / SA
Bill McAlister	1-13-11		1. CUSTODY SEALS: ✓ Yes ___ No	
			2. CONTAINERS CORRECT: ✓ Yes ___ No	
			3. COC/LABELS AGREE: ✓ Yes ___ No	
3. Relinquished by: (Signature)	Date/Time	4. Received by lab: (Signature)	4. PRESERVATION CONFIRMED: ✓ Yes ___ No	
		Amanda Forbus 1441 1/13/11	5. RECEIVED ON ICE: ✓ Yes ___ No	
			6. TEMPERATURE ON RECEIPT: 3°C	
			FOR COMPLETION BY LAB ONLY	

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

CHAIN OF CUSTODY R

CLIENT INFORMATION		Project Description	Turnaround Time	Preservation Cod
EEMA O & M Services Group	EEMA O & M Services Group	Magcobar Mine Site	24 Hour	1. Cool, 4 Degrees Centigrade
Magcobar Mine Site	P.O. Box 732	Biomonitoring Sample	48 Hour	2. Sulfuric Acid (H_2SO_4), pH < 2
P.O. Box 699	Kulpsville, PA 19443	Reporting Information	72 Hour	3. Nitric Acid (HNO_3), pH < 2
Malvern, AR 72104		Telephone: 501-467-8355	Routine (5 Day)	
Attn: Bill McAlister	Attn: Amber Rich	Fax: 501-467-8687	Preservative Code:	1
		Email: dave.friedman@eema-inc.com; bmcalister@eema-inc.com; bhorton@eema-inc.com	Bottle Type:	P

Sampler(s) Signature	Sampler(s) Printed
Bill McAlister	Bill McAlister

Field Number	SAMPLE COLLECTION Date/s	Time/s	Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	Chronic Biomonitoring	TEST PARAMETERS
FD-2 Comp.	1/14/2011	10:30 AM		X	3	W	Facility Discharge	X	

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)	SAMPLE CONDITION UPON RECEIPT IN LAB	REMARKS / SA
Bill McAlister	1-14-11		1. CUSTODY SEALS: ✓ Yes ___ No	
			2. CONTAINERS CORRECT: ✓ Yes ___ No	
			3. COC/LABELS AGREE: ✓ Yes ___ No	
3. Relinquished by: (Signature)	Date/Time	4. Received by lab: (Signature)	4. PRESERVATION CONFIRMED: ✓ Yes ___ No	
		Amanda 1507 for Lush	5. RECEIVED ON ICE: ✓ Yes ___ No	
			6. TEMPERATURE ON RECEIPT: 4°C	
			FOR COMPLETION BY LAB ONLY	

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

CHAIN OF CUSTODY R

CLIENT INFORMATION		Project Description	Turnaround Time	Preservation Cod
EEMA O & M Services Group	EEMA O & M Services Group	Magcobar Mine Site	24 Hour	1. Cool, 4 Degrees Centigrade
Magcobar Mine Site	P.O. Box 732	Biomonitoring Sample	48 Hour	2. Sulfuric Acid (H_2SO_4), pH < 2
P.O. Box 699	Kulpsville, PA 19443	Reporting Information	72 Hour	3. Nitric Acid (HNO_3), pH < 2
Malvern, AR 72104		Telephone: 501-467-8355	Routine (5 Day)	
Attn: Bill McAlister	Attn: Amber Rich	Fax: 501-467-8687	Preservative Code:	1
		Email: dave.friedman@eema-inc.com; bmcalister@eema-inc.com; bhorton@eema-inc.com	Bottle Type:	P

Sampler(s) Signature: Larry Curtis

Sampler(s) Printed: LARRY CURTIS

Field Number	SAMPLE COLLECTION Date/s	Time/s	Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	Chronic Biomonitoring	TEST PARAMETERS
FD-1 Comp.	1/18/2011	8:40 AM		X	3	W	Facility Discharge	X	

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)
3. Relinquished by: (Signature)	Date/Time	4. Received by lab: (Signature)
Larry Curtis	1-18-11 13:10	Amanda Jabalski

SAMPLE CONDITION UPON RECEIPT IN LAB		
1. CUSTODY SEALS:	✓ Yes	___ No
2. CONTAINERS CORRECT:	✓ Yes	___ No
3. COC/LABELS AGREE:	✓ Yes	___ No
4. PRESERVATION CONFIRMED:	✓ Yes	___ No
5. RECEIVED ON ICE:	✓ Yes	___ No
6. TEMPERATURE ON RECEIPT:	3°C	
FOR COMPLETION BY LAB ONLY		

REMARKS / SA

APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING — Fathead Minnow

Lab # / Sample ID: K11D1004 — Test Start (Date/Time): 1/14/11

Client: Weston — Test End (Date/Time): 1/21/11

		Day of Test							
		1	2	3	4	5	6	7	notes/remarks
Control	MHS551	1/14	1/15	1/16	1/17	1/18	1/19	1/20	
D.O. (mg/L)	INITIAL	7.8	8.8	8.6	8.2	87	86	85	
	FINAL	8.2	8.1	75	76	76	76	83	
pH (s.u.)	INITIAL	79	8.0	7.9	79	80	79	77	
	FINAL	7.6	7.5	74	78	77	76	77	
temp (C)	INITIAL	20.8	21.4	20.5	21.6	22.4	22.5	22.4	
	FINAL	25.0	25.0	250	250	250	250	250	
ALKALINITY (mg/L)		36							
HARDNESS (mg/L)		44							
CONDUCTIVITY (umhos/cm)		173							
CHLORINE (mg/L)		<0.05							
CONC:									
D.O. (mg/L)	INITIAL	79	8.7	8.9	86	86	86	85	
	FINAL	7.9	7.6	75	77	75	74	83	
pH (s.u)	INITIAL	75	7.6	7.7	75	78	77	73	
	FINAL 7.3	8.0	7.4	75	76	75	74	77	
temp (C)	INITIAL	20.4	22.4	20.8	21.9	23.1	23.2	22.8	
	FINAL	25.0	25.0	250	250	250	250	250	
CONC:									
D.O. (mg/L)	INITIAL	80	8.6	8.9	88	87	87	85	
	FINAL	8.0	7.7	75	76	75	77	83	
pH (mg/L)	INITIAL	75	7.7	7.7	75	76	77	74	
	FINAL	7.3	7.4	72	76	75	74	74	
temp (C)	INITIAL	20.2	23.2	21.1	22.1	23.2	23.3	22.8	
	FINAL	25.0	25.0	250	250	250	250	250	
CONC:									
D.O. (mg/L)	INITIAL	80	8.6	8.9	88	86	87	86	
	FINAL	7.9	7.7	75	76	75	77	83	
pH (s.u.)	INITIAL	75	7.7	7.7	75	76	77	74	
	FINAL	7.5	7.4	72	76	73	75	77	
temp (C)	INITIAL	20.5	23.8	21.5	21.3	23.4	23.6	23.3	
	FINAL	25.0	25.0	250	250	250	250	250	
CONC:									
D.O. (mg/L)	INITIAL	82	8.5	8.9	88	82	88	88	
	FINAL	8.1	7.7	76	76	75	76	87	
pH (s.u.)	INITIAL	76	7.7	7.7	75	75	76	74	
	FINAL	7.6	7.4	72	73	72	72	76	
temp (C)	INITIAL	20.4	24.5	21.6	22.3	23.7	23.9	23.6	
	FINAL	25.0	25.0	250	250	250	250	250	
CONC:									
D.O. (mg/L)	INITIAL	8.6	8.7	8.9	88	86	88	89	
	FINAL	8.0	7.6	75	76	74	76	84	
pH (s.u.)	INITIAL	7.6	7.7	7.7	75	75	76	7.3	
	FINAL	7.6	7.3	71	75	72	70	75	
temp (C)	INITIAL	20.2	25.4	22.0	22.7	24.1	24.4	23.9	
	FINAL	25.0	25.0	250	250	250	250	250	
CONC:	100%	A	A	A	A	B	C	C	
ALKALINITY (mg/L)		190 + 18	4		20	4	20	4	
HARDNESS (mg/L)		58 + >600	4		>600	4	>600	4	
CONDUCTIVITY (umhos/cm)		589 + 2100	4		2120	4	2120	4	
CHLORINE (mg/L)		+ <0.05	4		<0.05	4	<0.05	4	

Revision 1
11/30/10

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING									Cerodaphnia Dubia
Lab # / Sample ID		1C110004			Test Start (Date/Time)		1/14/11		
Client:		Weston			Test End (Date/Time)		1/21/11		
		Day of Test							
		1	2	3	4	5	6	7	notes/remarks
Control	MHS551	1/14	1/15	1/16	1/17	1/18	1/19	1/20	
D.O. (mg/L)	INITIAL	78	8.8	8.6	82	8.7	8.6	8.5	
	FINAL	8.3	8.4	8.3	8.2	7.9	7.9	7.9	
pH (s.u.)	INITIAL	7.9	8.0	7.9	7.9	8.0	7.9	7.7	
	FINAL	7.7	7.8	7.8	7.9	8.0	7.9	7.8	
temp (C)	INITIAL	20.8	21.4	20.5	21.6	20.4	22.5	22.4	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
ALKALINITY (mg/L)		36	—	—	—	—	—	—	
HARDNESS (mg/L)		44	—	—	—	—	—	—	
CONDUCTIVITY (umhos/cm)		173	—	—	—	—	—	—	
CHLORINE (mg/L)		<0.05	—	—	—	—	—	—	
CONC:									
D.O. (mg/L)	INITIAL	7.9	8.7	8.9	8.6	8.6	8.6	8.5	
	FINAL	8.3	8.4	8.2	8.2	7.9	7.9	7.7	
pH (s.u)	INITIAL	7.5	7.6	7.7	7.5	7.8	7.7	7.3	
	FINAL	7.6	7.7	7.6	7.2	7.4	7.5	7.5	
temp (C)	INITIAL	20.4	22.4	20.8	21.9	23.1	23.2	22.8	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC:									
D.O. (mg/L)	INITIAL	8.0	8.6	8.9	8.8	8.7	8.7	8.5	
	FINAL	8.3	8.3	8.3	8.1	7.9	8.0	7.8	
pH (mg/L)	INITIAL	7.5	7.7	7.7	7.5	7.6	7.7	7.9	
	FINAL	7.6	7.7	7.7	7.4	7.4	7.5	7.5	
temp (C)	INITIAL	20.2	23.2	21.1	22.1	23.2	23.3	22.8	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC:									
D.O. (mg/L)	INITIAL	8.0	8.6	8.9	8.8	8.6	8.7	8.6	
	FINAL	8.3	8.3	8.2	8.0	8.1	8.0	7.7	
pH (s.u.)	INITIAL	7.5	7.7	7.7	7.5	7.6	7.7	7.4	
	FINAL	7.6	7.6	7.7	7.5	7.4	7.5	7.5	
temp (C)	INITIAL	20.3	23.8	21.5	21.3	23.4	23.6	23.3	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC:									
D.O. (mg/L)	INITIAL	8.2	8.5	8.9	8.8	8.2	8.8	8.8	
	FINAL	8.3	8.4	8.2	8.1	8.1	8.0	7.7	
pH (s.u.)	INITIAL	7.6	7.7	7.7	7.5	7.5	7.6	7.4	
	FINAL	7.6	7.6	7.6	7.5	7.5	7.6	7.5	
temp (C)	INITIAL	20.4	24.5	21.6	22.3	23.7	23.9	23.6	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.6	25.0	
CONC:									
D.O. (mg/L)	INITIAL	8.6	8.7	8.9	8.8	8.6	8.8	8.9	
	FINAL	8.3	8.4	8.2	8.1	8.1	8.0	7.8	
pH (s.u.)	INITIAL	7.6	7.7	7.7	7.5	7.5	7.6	7.3	
	FINAL	7.5	7.5	7.6	7.5	7.5	7.6	7.4	
temp (C)	INITIAL	20.2	25.4	22.0	22.7	24.1	24.4	23.9	
	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)		18	—	—	20	—	20	—	
HARDNESS (mg/L)		>600	—	—	>600	—	>600	—	
CONDUCTIVITY (umhos/cm)		2100	—	—	2120	—	2120	—	
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: K110104 TEST START DATE: 1/14/11 TIME: 1110
CLIENT: Weston TEST END DATE: 1/21/11 TIME: 0830
AGE AND SOURCE OF MINNOWS
Summary Page
DAY (NUMBER SURVIVING) SURVIVAL

	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	8	8	8	8	8	8	8	8	100	100	0.00
	B									100		
	C									100		
	D									100		
	E									100		
CONC: 32	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A	8	8	8	8	8	8	8	8	100	100	
	B									100		
	C									100		
	D									100		
	E									100		
CONC: 42	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A	8	8	8	8	8	8	8	8	100	100	
	B									100		
	C									100		
	D									100		
	E									100		
CONC: 56	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A	8	8	8	8	8	8	8	8	100	100	
	B									100		
	C									100		
	D									100		
	E									100		
CONC: 75	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A	8	8	8	8	8	8	8	8	100	100	
	B									100		
	C									100		
	D									100		
	E									100		
CONC: 100	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A	8	8	8	8	8	8	8	8	100	100	0.00
	B									100		
	C									100		
	D									100		
	E									100		
ANALYST		KP										
DATE:												
TIME:												

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID	K11010064	TEST START DATE	1/14/11 TIME 1110
CLIENT	Weston	TEST END DATE	1/21/11 TIME 0830
	A	AGE AND SOURCE OF MINNOWS	

		DAY (NUMBER SURVIVING)								SURVIVAL		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 0	A	7	7	7	7	7	7	7	7			
	B											
	C											
	D	7	7	7	7	7	7	7	7			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 32	A	7	7	7	7	7	7	7	7			
	B											
	C											
	D	7	7	7	7	7	7	7	7			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 42	A	7	7	7	7	7	7	7	7			
	B											
	C											
	D	7	7	7	7	7	7	7	7			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 56	A	7	7	7	7	7	7	7	7			
	B											
	C											
	D	7	7	7	7	7	7	7	7			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 75	A	7	7	7	7	7	7	7	7			
	B											
	C											
	D	7	7	7	7	7	7	7	7			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 100	A	7	7	7	7	7	7	7	7			
	B											
	C											
	D	7	7	7	7	7	7	7	7			
	E											
ANALYST		KP	AP	AP	KP	KP	KP	KP	KP			
DATE:		1/14/11	1/15/11	1/16/11	1/17/11	1/18/11	1/19/11	1/20/11	1/21/11			
TIME:		1110	1000	1030	1040	1145	1130	0920	0830			

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 B			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
CONC:	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D	1	1	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 32	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D	1	1	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 42	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D	1	1	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 56	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D	1	1	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 75	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D	1	1	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 100	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D	1	1	1	1	1	1	1	1			
	E											
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		
	D A Y (NUMBER SURVIVING)		SURVIVAL

	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	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			
	E	1										
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 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											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 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											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 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											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 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											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 100	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											
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	
		D A Y (NUMBER SURVIVING)	SURVIVAL

	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	10	10	10	10	10	10	10	10			
	B											
	C											
	D		9	9	10	10	10	10	10			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 32	A	10	10	10	10	10	10	10	10			
	B											
	C											
	D		9	9	9	9	9	10	9			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 40	A	10	10	10	10	10	10	10	10			
	B											
	C											
	D		9	9	10	9	9	10	10			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 56	A	10	10	10	10	10	10	10	10			
	B											
	C											
	D		9	10	10	9	10	10	10			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 75	A	10	10	10	10	10	10	10	10			
	B											
	C											
	D		9	9	10	9	10	10	10			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 100	A	10	10	10	10	10	10	10	10			
	B											
	C											
	D		9	9	10	9	10	10	10			
	E											
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										
			D A Y (NUMBER SURVIVING)								SURVIVAL		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	7	7	7	7	7	7	7	7			
	B											
	C											
	D	7	7	7	7	7	7	7	7			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 32	A	7	7	7	7	7	7	7	7			
	B											
	C											
	D	7	7	7	7	7	7	7	7			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 42	A	7	7	7	7	7	7	7	7			
	B											
	C											
	D	7	7	7	7	7	7	7	7			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 56	A	7	7	7	7	7	7	7	7			
	B											
	C											
	D	7	7	7	7	7	7	7	7			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 75	A	7	7	7	7	7	7	7	7			
	B											
	C											
	D	7	7	7	7	7	7	7	7			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 100	A	7	7	7	7	7	7	7	7			
	B											
	C											
	D	7	7	7	7	7	7	7	7			
	E											
ANALYST												
DATE:												
TIME:												

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:	K1006012				TEST DATES (BEGIN / END):		6/17-24/10	
CLIENT:	EEMA				WEIGHING DATE / TIME:		6/25/10, 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	1.02880	1.02633	0.00247	8	0.309	AVG DRY	
	B	1.03898	1.03664	0.00234	8	0.293	WEIGHT (mg)	
	C	1.00948	1.00654	0.00294	8	0.367		0.322
	D	1.01715	1.01460	0.00255	8	0.319	CV	
	E	1.02657	1.02397	0.00260	8	0.325		8.56
CONC:	A	1.01820	1.01489	0.00331	8	0.414	AVG DRY	
	B	0.99886	0.99548	0.00338	8	0.422	WEIGHT (mg)	
32%	C	1.02298	1.01936	0.00362	8	0.452		0.446
	D	1.00772	1.00405	0.00367	8	0.459	CV	
	E	1.00944	1.00557	0.00387	8	0.484		
CONC:	A	1.02615	1.02279	0.00336	8	0.420	AVG DRY	
	B	1.02908	1.02565	0.00343	8	0.429	WEIGHT (mg)	
42%	C	1.02138	1.01788	0.00350	8	0.438		0.471
	D	1.04937	1.04535	0.00402	8	0.502	CV	
	E	1.00452	0.99999	0.00453	8	0.566		
CONC:	A	1.01740	1.01420	0.00320	8	0.400	AVG DRY	
	B	1.01022	1.00671	0.00351	8	0.439	WEIGHT (mg)	
56%	C	1.02974	1.02543	0.00431	8	0.539		0.470
	D	1.01086	1.00636	0.00450	8	0.563	CV	
	E	1.00359	1.00032	0.00327	8	0.409		
CONC:	A	1.01229	1.00872	0.00357	8	0.446	AVG DRY	
	B	1.00879	1.00522	0.00357	8	0.446	WEIGHT (mg)	
75%	C	0.99848	0.99497	0.00351	8	0.439		0.475
	D	1.00067	0.99692	0.00375	8	0.469	CV	
	E	1.03514	1.03052	0.00462	8	0.577		
CONC:	A	0.99165	0.98792	0.00373	8	0.466	AVG DRY	
	B	1.02293	1.01863	0.00430	8	0.537	WEIGHT (mg)	
100%	C	1.02981	1.02574	0.00407	8	0.509		0.518
	D	0.99385	0.98956	0.00429	8	0.536	CV	
	E	0.99813	0.99378	0.00435	8	0.544		6.20

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

Pimephales promelas **FATHEAD MINNOW** TEST 1000.0

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s: K1101004						TEST DATES (BEGIN / END):	
CLIENT: Weston						WEIGHING DATE / TIME:	
ANALYSTS: KP						DRYING TEMP (DEGREES C):	
SAMPLE ID:						DRYING TIME (HOURS):	
	REP#	FINAL DRY WEIGHT TIN+LARVAE (g)	INTIAL WEIGHT TIN (g)	TOTAL DRY WEIGHT OF LARVAE (g)	NUMBER OF LARVAE	DRY WEIGHT OF LARVAE (mg)	
CONTROL	A 1	1.02880	1.02633				AVG DRY WEIGHT (mg)
	B 2	1.03898	1.03664				
	C 3	1.00948	1.00654				
	D 4	1.01715	1.01460				CV
	E 5	1.02657	1.02397				
CONC:	A 6	1.01820	1.01489				AVG DRY WEIGHT (mg)
	B 7	0.99886	0.99548				
	C 8	1.02298	1.01936				
	D 9	1.00772	1.00405				CV
	E 10	1.00944	1.00557				
CONC:	A 11	1.02615	1.02279				AVG DRY WEIGHT (mg)
	B 12	1.02908	1.02565				
	C 13	1.02138	1.01788				
	D 14	1.04937	1.04535				CV
	E 15	1.00452	0.99999				
CONC:	A 16	1.01740	1.01420				AVG DRY WEIGHT (mg)
	B 17	1.01022	1.00671				
	C 18	1.02974	1.02543				
	D 19	1.01086	1.00636				CV
	E 20	1.00359	1.00032				
CONC:	A 21	1.01229	1.00872				AVG DRY WEIGHT (mg)
	B 22	1.00879	1.00522				
	C 23	0.99848	0.99497				
	D 24	1.00067	0.99692				CV
	E 25	1.03514	1.03052				
CONC:	A 26	0.99165	0.98792				AVG DRY WEIGHT (mg)
	B 27	1.02293	1.01863				
	C 28	1.02981	1.02574				
	D 29	0.99385	0.98956				CV
	E 30	0.99813	0.99378				

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

AA# K1101004, FATHEAD MINNOW SURVIVAL, CHRONIC, 1-14-11
File: Z:\TOXSTAT\MONTE\FHSURV. 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# K1101004, FATHEAD MINNOW SURVIVAL, CHRONIC, 1-14-11
File: Z:\TOXSTAT\MONTE\FHSURV. 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# K1101004, FATHEAD MINNOW SURVIVAL, CHRONIC, 1-14-11
FILE: Z:\TOXSTAT\MONTE\FHSURV.
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# K1101004, FATHEAD MINNOW SURVIVAL, CHRONIC, 1-14-11
File: Z:\TOXSTAT\MONTE\FHSURV. 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

AA# K1101004, FATHEAD MINNOW GROWTH CHRONIC, 1-14-11
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.063

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# K1101004, FATHEAD MINNOW GROWTH CHRONIC, 1-14-11
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 6.48

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# K1101004, FATHEAD MINNOW GROWTH CHRONIC, 1-14-11
FILE: Z:\TOXSTAT\MONTE\FHGR.
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.3090	0.5894
1	CONTROL	2	0.2930	0.5720
1	CONTROL	3	0.3670	0.6508
1	CONTROL	4	0.3190	0.6002
1	CONTROL	5	0.3250	0.6066
2	32 % EFFLUENT	1	0.4140	0.6990
2	32 % EFFLUENT	2	0.4220	0.7071
2	32 % EFFLUENT	3	0.4520	0.7373
2	32 % EFFLUENT	4	0.4590	0.7444
2	32 % EFFLUENT	5	0.4840	0.7694
3	42 % EFFLUENT	1	0.4200	0.7051
3	42 % EFFLUENT	2	0.4290	0.7142
3	42 % EFFLUENT	3	0.4380	0.7232
3	42 % EFFLUENT	4	0.5020	0.7874
3	42 % EFFLUENT	5	0.5660	0.8516
4	56 % EFFLUENT	1	0.4000	0.6847

4	56 % EFFLUENT	2	0.4390	0.7242
4	56 % EFFLUENT	3	0.5390	0.8244
4	56 % EFFLUENT	4	0.5630	0.8486
4	56 % EFFLUENT	5	0.4090	0.6939
5	75 % EFFLUENT	1	0.4460	0.7313
5	75 % EFFLUENT	2	0.4460	0.7313
5	75 % EFFLUENT	3	0.4390	0.7242
5	75 % EFFLUENT	4	0.4690	0.7544
5	75 % EFFLUENT	5	0.5770	0.8627
6	100 % EFFLUENT	1	0.4660	0.7514
6	100 % EFFLUENT	2	0.5370	0.8224
6	100 % EFFLUENT	3	0.5090	0.7944
6	100 % EFFLUENT	4	0.5360	0.8214
6	100 % EFFLUENT	5	0.5440	0.8295

AA# K1101004, FATHEAD MINNOW GROWTH CHRONIC, 1-14-11
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.117	0.023	8.929
Within (Error)	24	0.063	0.003	
Total	29	0.181		

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

AA# K1101004, FATHEAD MINNOW GROWTH CHRONIC, 1-14-11
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	0.604	0.323		
2	32 % EFFLUENT	0.731	0.446	-3.935	
3	42 % EFFLUENT	0.756	0.471	-4.701	
4	56 % EFFLUENT	0.755	0.470	-4.667	
5	75 % EFFLUENT	0.761	0.475	-4.840	
6	100 % EFFLUENT	0.804	0.518	-6.166	

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

AA# K1101004, FATHEAD MINNOW GROWTH CHRONIC, 1-14-11
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

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	0.069	21.5	-0.124
3	42 % EFFLUENT	5	0.069	21.5	-0.148
4	56 % EFFLUENT	5	0.069	21.5	-0.147
5	75 % EFFLUENT	5	0.069	21.5	-0.153
6	100 % EFFLUENT	5	0.069	21.5	-0.196

APPENDIX D

Ceriodaphnia dubia Raw Data and Statistics

Ceriodaphnia dubia

SURVIVAL AND REPRODUCTION TEST

Discharger: Weston

Location:

Date Sample Collected:

Lab Number/s: K1110004

Analyst: KP

Test Start - Date/ Time: 1/14/11, 1045

Test Stop - Date/Time: 1/21/11, 0815

Conc 1 — %: 10

Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/ Adult	Analyst
1	0	0	0	0	0	0	0	0	0	0	0	10	0	KP
2	0	0	0	0	0	0	0	0	0	0	0	10	0	KP
3	0	0	0	0	0	2	2	0	0	0	4	10	0.4	KP
4	2	3	4	2	5	0	1	2	3	3	25	10	2.5	KP
5	3	1	0	0	1	3	3	0	0	0	11	10	1.1	KP
6	8	5	7	3	1	6	4	7	5	0	46	10	4.6	KP
7	6	7	9	5	4	8	5	7	9	10	75	10	7.5	KP
8														
Total	19	16	20	10	16	19	15	16	17	13	161	X=	16.1	
												SD=	18.6	

Conc 2 — %: 32

Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/ Adult	Analyst
1	0	0	0	0	0	0	0	0	0	0	0	10	0	
2	0	0	0	0	0	0	0	0	0	0	0	10	0	
3	2	3	3	2	2	2	0	0	2	1	13	10	1.3	
4	3	2	2	2	0	6	5	0	0	3	22	10	2.2	
5	3	3	3	2	1	0	5	0	4	0	21	10	2.1	
6	7	7	5	3	6	6	4	3	5	6	51	10	5.1	
7	7	0	6	8	7	6	9	7	5	8	63	10	6.3	
8														
Total	20	14	19	14	17	20	23	10	14	19	170			

Conc 3 — %: 42

Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/ Adult	Analyst
1	0	0	0	0	0	0	0	0	0	0	0	10	0	
2	0	0	0	0	0	0	0	0	0	0	0	10	0	
3	1	0	2	0	2	0	3	0	0	0	8	10	0.8	
4	6	5	2	5	3	5	0	0	0	6	36	10	3.6	
5	6	5	3	6	0	6	3	1	2	5	31	10	3.1	
6	2	5	5	5	3	1	5	0	7	4	43	10	4.3	
7	9	7	7	6	8	6	5	7	5	5	65	10	6.5	
8														
Total	18	29	23	22	16	20	16	10	14	20	183			

A = DEAD; Y = MALE

Conc 4 — %: 56

Day	A	B	C	D	E	F	G	H	I
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	2	0	2	3	3	1	2	2	0
4	1	1	3	0	0	2	2	5	
5	5	0	3	2	3	4	3	3	2
6	6	6	5	7	4	7	6	7	5
7	8	7	6	11	5	10	8	6	4
8									
Total	17	9	19	23	14	19	21	21	11

Conc 5 — %: 75

Day	A	B	C	D	E	F	G	H	I
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	—	0	0
3	1	0	2	0	3	0	—	0	0
4	2	5	2	2	0	4	—	3	5
5	4	3	3	4	1	1	—	4	0
6	2	2	5	4	4	3	—	8	5
7	2	5	6	7	8	3	—	7	5
8									
Total	27	21	18	17	16	11	X0	22	15

Conc 6 — %: 100

Day	A	B	C	D	E	F	G	H	I
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	2	0	0	0	0
4	2	5	5	3	1	0	0	3	2
5	6	5	0	5	0	4	0	3	2
6	7	4	7	6	6	5	6	5	4
7	8	6	11	5	4	6	6	5	4
8									
Total	23	20	23	19	13	9	16	16	14

Revision 1
11/30/10

AA # K1101004 C. DUBIA CHRONIC, REPRODUCION, 1-14-11
File: Z:/toxstat/monte\CD. 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 # K1101004 C. DUBIA CHRONIC, REPRODUCION, 1-14-11
File: Z:/toxstat/monte\CD. Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 7.64

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.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
32%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
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%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
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%	10	0	10

TOTAL	20	0	20

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

FISHER'S EXACT TEST

	NUMBER OF		
IDENTIFICATION	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
75%	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.

FISHER'S EXACT TEST

	NUMBER OF		
IDENTIFICATION	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
100%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
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

	NUMBER	NUMBER	SIG

GROUP	IDENTIFICATION	EXPOSED	DEAD	(P=.05)
	CONTROL	10	0	
1	32%	10	0	
2	42%	10	0	
3	56%	10	0	
4	75%	10	1	
5	100%	10	0	

TITLE: AA # K1101004 C. DUBIA CHRONIC, REPRODUCION, 1-14-11
FILE: Z:/toxstat/monte\CD.
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	19.0000	19.0000
1	CONTROL	2	16.0000	16.0000
1	CONTROL	3	20.0000	20.0000
1	CONTROL	4	10.0000	10.0000
1	CONTROL	5	16.0000	16.0000
1	CONTROL	6	19.0000	19.0000
1	CONTROL	7	15.0000	15.0000
1	CONTROL	8	16.0000	16.0000
1	CONTROL	9	17.0000	17.0000
1	CONTROL	10	13.0000	13.0000
2	32 % EFFLUENT	1	20.0000	20.0000
2	32 % EFFLUENT	2	14.0000	14.0000
2	32 % EFFLUENT	3	19.0000	19.0000
2	32 % EFFLUENT	4	14.0000	14.0000
2	32 % EFFLUENT	5	17.0000	17.0000
2	32 % EFFLUENT	6	20.0000	20.0000
2	32 % EFFLUENT	7	23.0000	23.0000
2	32 % EFFLUENT	8	10.0000	10.0000
2	32 % EFFLUENT	9	14.0000	14.0000
2	32 % EFFLUENT	10	19.0000	19.0000
3	42 % EFFLUENT	1	18.0000	18.0000
3	42 % EFFLUENT	2	24.0000	24.0000
3	42 % EFFLUENT	3	23.0000	23.0000
3	42 % EFFLUENT	4	22.0000	22.0000
3	42 % EFFLUENT	5	16.0000	16.0000
3	42 % EFFLUENT	6	20.0000	20.0000
3	42 % EFFLUENT	7	16.0000	16.0000
3	42 % EFFLUENT	8	10.0000	10.0000
3	42 % EFFLUENT	9	14.0000	14.0000
3	42 % EFFLUENT	10	20.0000	20.0000
4	56 % EFFLUENT	1	17.0000	17.0000
4	56 % EFFLUENT	2	9.0000	9.0000
4	56 % EFFLUENT	3	19.0000	19.0000
4	56 % EFFLUENT	4	23.0000	23.0000
4	56 % EFFLUENT	5	14.0000	14.0000
4	56 % EFFLUENT	6	19.0000	19.0000
4	56 % EFFLUENT	7	21.0000	21.0000
4	56 % EFFLUENT	8	21.0000	21.0000

4	56 % EFFLUENT	9	13.0000	13.0000
4	56 % EFFLUENT	10	14.0000	14.0000
5	75 % EFFLUENT	1	27.0000	27.0000
5	75 % EFFLUENT	2	21.0000	21.0000
5	75 % EFFLUENT	3	18.0000	18.0000
5	75 % EFFLUENT	4	17.0000	17.0000
5	75 % EFFLUENT	5	16.0000	16.0000
5	75 % EFFLUENT	6	11.0000	11.0000
5	75 % EFFLUENT	7	0.0000	0.0000
5	75 % EFFLUENT	8	22.0000	22.0000
5	75 % EFFLUENT	9	17.0000	17.0000
5	75 % EFFLUENT	10	17.0000	17.0000
6	100 % EFFLUENT	1	23.0000	23.0000
6	100 % EFFLUENT	2	20.0000	20.0000
6	100 % EFFLUENT	3	23.0000	23.0000
6	100 % EFFLUENT	4	19.0000	19.0000
6	100 % EFFLUENT	5	13.0000	13.0000
6	100 % EFFLUENT	6	9.0000	9.0000
6	100 % EFFLUENT	7	16.0000	16.0000
6	100 % EFFLUENT	8	16.0000	16.0000
6	100 % EFFLUENT	9	15.0000	15.0000
6	100 % EFFLUENT	10	19.0000	19.0000

AA # K1101004 C. DUBIA CHRONIC, REPRODUCION, 1-14-11
File: Z:/toxstat/monte\CD. Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	27.350	5.470	0.245
Within (Error)	54	1205.500	22.324	
Total	59	1232.850		

Critical F value = 2.45 (0.05,5,40)
Since F < Critical F FAIL TO REJECT Ho: All equal

AA # K1101004 C. DUBIA CHRONIC, REPRODUCION, 1-14-11
File: Z:/toxstat/monte\CD. 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	16.100	16.100		
2	32 % EFFLUENT	17.000	17.000	-0.426	
3	42 % EFFLUENT	18.300	18.300	-1.041	
4	56 % EFFLUENT	17.000	17.000	-0.426	
5	75 % EFFLUENT	16.600	16.600	-0.237	
6	100 % EFFLUENT	17.300	17.300	-0.568	

Dunnett table value = 2.31 (1 Tailed Value, P=0.05, df=40,5)

AA # K1101004 C. DUBIA CHRONIC, REPRODUCION, 1-14-11
File: Z:/toxstat/monte\CD. 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	10			
2	32 % EFFLUENT	10	4.881	30.3	-0.900
3	42 % EFFLUENT	10	4.881	30.3	-2.200
4	56 % EFFLUENT	10	4.881	30.3	-0.900
5	75 % EFFLUENT	10	4.881	30.3	-0.500
6	100 % EFFLUENT	10	4.881	30.3	-1.200

AA # K1101004 C. DUBIA CHRONIC, REPRODUCION, 1-14-11
File: Z:/toxstat/monte\CD. 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	17.000	113.00	75.00	10.00	
3	42 % EFFLUENT	18.300	122.50	75.00	10.00	
4	56 % EFFLUENT	17.000	113.00	75.00	10.00	
5	75 % EFFLUENT	16.600	117.00	75.00	10.00	
6	100 % EFFLUENT	17.300	113.50	75.00	10.00	

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

APPENDIX E

Organism History

AQUATOX, INC.

416 TWIN POINTS ROAD
HOT SPRINGS, ARKANSAS 71913
501-520-0560

TEST ORGANISM HISTORY

DATE SHIPPED 1/13/11 **CLIENT** Arkansas Analytical

Purchase Order #: _____

SPECIES:	~~Pimephales promelas~~	Mysidopsis bahia	Cyprinodon variegates
Quantity Shipped:	300+		
Age:	24hrs 1/13 150ct+		
Brood Stock Source:	Arkansas, AR		
Culture Water:	~~Groundwater~~	Artificial Salts	Artificial Salts
Hardness (Mg/l CaCO3)	160	**Salinity (ppt)**	
Dissolved Oxygen (Mg/1):	8.1		

Feeding: Artemia

Comments: _____

Shipped Via: **Federal Express** **UPS Overnight** Shuttle

Packaged By: _____

Bill Hall Printers 3171

1300 Blue Spruce Drive, Suite C
Fort Collins, Colorado 80524

Toll Free: 800/331-5916
Tel:970/484-5091 Fax:970/484-2514

ORGANISM HISTORY

DATE: 6/22/09

SPECIES: *Ceriodaphnia dubia*

AGE: Variable

LIFE STAGE: Adult

HATCH DATE: Variable

BEGAN FEEDING: Immediately

FOOD: YTC, *Selenastrum* sp.

Water Chemistry Record:	**Current**	**Range**
TEMPERATURE:	25°C	20-25°C
SALINITY/CONDUCTIVITY:	--	--
TOTAL HARDNESS (as $CaCO_3$):	142 mg/l	86-124 mg/l
TOTAL ALKALINITY (as $CaCO_3$):	100 mg/l	65-130 mg/l
pH:	7.92	7.56-8.35

Comments:

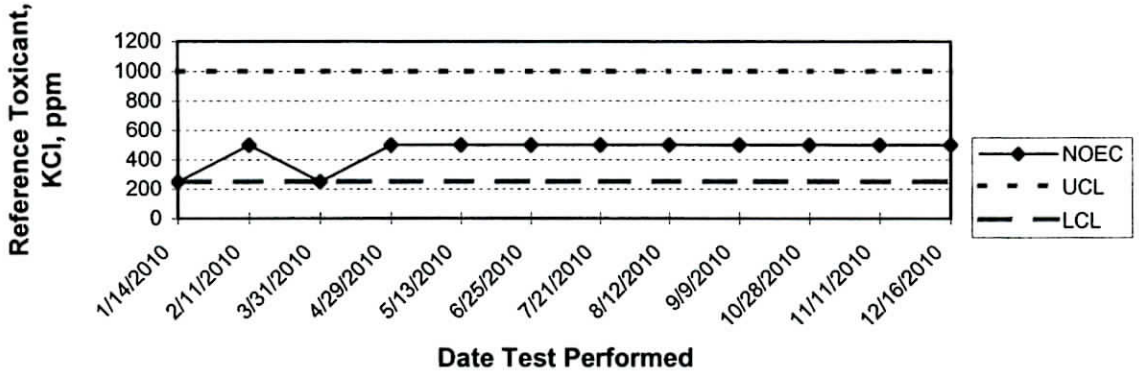
Facility Supervisor

APPENDIX F

Quality Assurance Charts

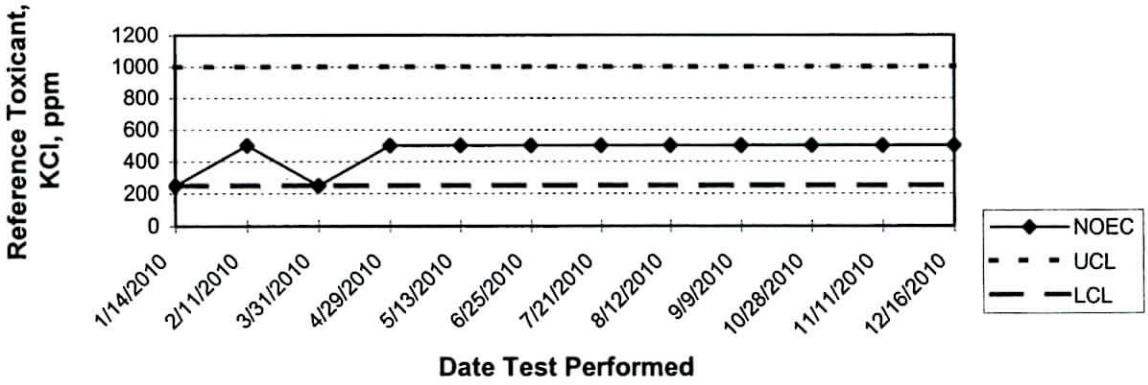
ARKANSAS ANALYTICAL, INC.

FATHEAD MINNOW SURVIVAL
QUALITY ASSURANCE



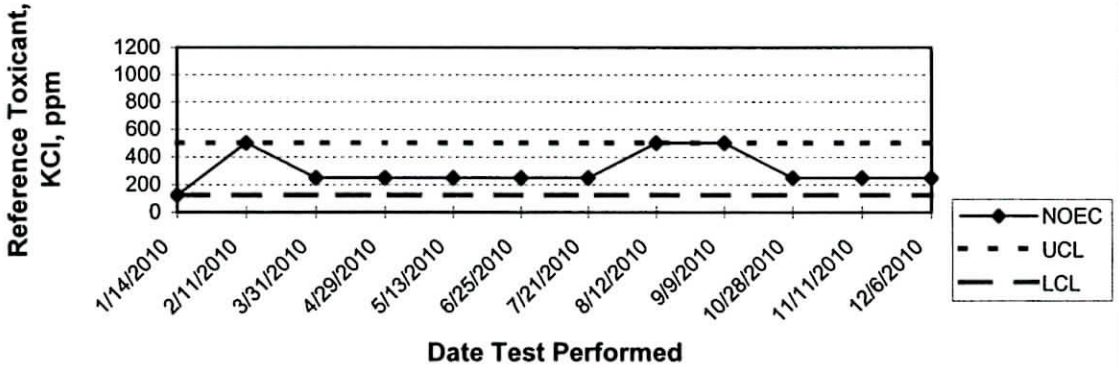
ARKANSAS ANALYTICAL, INC.

FATHEAD MINNOW GROWTH
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.

CERIODAPHNIA DUBIA SURVIVAL
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.

CERIODAPHNIA DUBIA REPRODUCTION
QUALITY ASSURANCE