Arkansas Analytical, Inc.

Toxicity Test Results

MAGCOBAR MINE SITE
NPDES PERMIT NUMBER: AR0049794
April, 2010
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.
11701 I-30, Bldg 1, Suite 115
Little Rock, Arkansas 72209
Lab Number K1004002

Monday, May 03, 2010

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 April of 2010.

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:	4-14-10, 0818	4-15-10, 0818
Sample #2:	4-15-10, 0905	4-16-10, 0905
Sample #3:	4-19-10, 0835	4-20-10, 0835

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:	4-15-10, 1521	4
Sample #2:	4-16-10, 1421	4
Sample #3:	4-20-10, 1455	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	100%	X	
Average of 15 or more young per surviving female	17.7	X	
At least 60% of surviving females should have produced 3 broods	70%	X	
The percent coefficient of variation between replicates must be 40% or less for the young of surviving females	32.0%	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	0.396	X	
The percent coefficient of variation between replicates must be 40% or less for growth	11.2%	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 3/31/10-4/7/10		*Pimephales promelas* 3/31/10-4/7/10	
NOEC Survival:	250 ppm KCl	NOEC Survival:	250 ppm KCl
LOEC Survival:	500 ppm KCl	LOEC Survival:	500 ppm KCl
NOEC Reproduction:	250 ppm KCl	NOEC Growth:	250 ppm KCl
LOEC Reproduction:	500 ppm KCl	LOEC Growth:	500 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)	18.5	%CV survival (critical dilution)	7.21 %
%CV Reproduction (critical dilution)	27.7%	Mean dry weight (critical dilution) in milligrams	0.519
		%CV growth (critical dilution)	15.9%
PMSD Reproduction	34.6	PMSD Growth	30.7

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

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:	4-14-10, 0818	4-15-10, 0818
Sample #2:	4-15-10, 0905	4-16-10, 0905
Sample #3:	4-19-10, 0835	4-20-10, 0835

Test initiated (date, time): 4-16-10, 1040 Test terminated (date, time): 4-23-10, 1340

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%	87.5	100	100	87.5	100		100	100	95	7.21
32%	87.5	75	75	100	100		100	100	87.5	
42%	75	87.5	87.5	100	100		100	90	90	
56%	87.5	100	100	100	100		100	97.5	97.5	
75%	100	100	100	75	100		100	100	95	
100%	87.5	87.5	100	100	100		100	100	95	7.21

SUMMARY

Effluent Conc %	A	B	C	D	E		Mean Dry Weight	CV%
0%	0.405	0.323	0.391	0.435	0.425		0.396	11.2
32%	0.360	0.331	0.325	0.536	0.528		0.416	
42%	0.425	0.399	0.276	0.548	0.550		0.440	
56%	0.512	0.539	0.455	0.479	0.651		0.527	
75%	0.504	0.564	0.392	0.507	0.545		0.502	
100%	0.427	0.541	0.439	0.574	0.612		0.519	15.9

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)= _____**15.9**_____%

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:	4-14-10, 0818	4-15-10, 0818
Sample #2:	4-15-10, 0905	4-16-10, 0905
Sample #3:	4-19-10, 0835	4-20-10, 0835

Test initiated (date, time): 4-16-10, 1045 Test terminated (date, time): 4-23-10, 0830

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	15	20	17	x3	x7	7
B	18	13	13	16	9	20
C	12	8	27	23	15	15
D	15	21	22	24	6	18
E	27	18	26	16	16	21
F	26	17	20	9	7	15
G	18	20	17	14	18	21
H	13	22	19	19	12	20
I	11	15	13	20	25	23
J	22	31	17	23	24	25
Mean	17.7	18.5	19.1	16.7	13.9	18.5
Mean/surviving female	17.7	18.5	19.1	18.2	14.7	18.5
CV%*	32.0					27.7

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	100	100	100	90	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)= _____**32.0**_____%

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 RECORD

CLIENT INFORMATION	
EEMA O & M Services Group	EEMA O & M Services Group
Magcobar Mine Site	P.O. Box 732
P.O. Box 699	Kulpsville, PA 19443
Malvern, AR 72104	
Attn: Bill McAlister	Attn: Amber Rich

Project Description
Magcobar Mine Site
Biomonitoring Sample

Reporting Information
Telephone: 501-467-8355
Fax: 501-467-8687
Email: dave.friedman@eema-inc.com; bmcalister@eema-inc.com; bhorton@eema-inc.com

Turnaround Time
24 Hour
48 Hour
72 Hour
Routine (5 Day)
Preservative Code
Bottle Type

Preservation Codes:
1. Cool, 4 Degrees Centigrade
2. Sulfuric Acid (H_2SO_4), pH < 2
3. Nitric Acid (HNO_3), pH < 2
4. Thiosulfate for Dechlorination
5. Hydrochloric Acid(HCl)
6. Sodium Hydroxide (NaOH), pH > 12

Bottle Type Code: G = Glass; P = Plastic; V = Septum; A = Amber

Bill McAlister
Sampler(s) Signature

Bill McAlister
Sampler(s) Printed

Field Number	SAMPLE COLLECTION Date/s	Time/s	Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	TEST PARAMETERS: Chronic Biomonitoring	1	P	Arkansas Analytical Work Order Number:
FD-1 Comp.	4/15/2010	8:18 AM		X	4	W	Facility Discharge	X			K1004002 A

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)
Bill McAlister	4-15-10 1521	
3. Relinquished by: (Signature)	Date/Time	4. Received by lab: (Signature)
		Sydney James

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:	4°C	

FOR COMPLETION BY LAB ONLY

REMARKS / SAMPLE COMMENTS

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 RECORD

CLIENT INFORMATION		Project Description	Turnaround Time
EEMA O & M Services Group	EEMA O & M Services Group	Magcobar Mine Site	24 Hour
Magcobar Mine Site	P.O. Box 732	Biomonitoring Sample	48 Hour
P.O. Box 699	Kulpsville, PA 19443	**Reporting Information**	72 Hour
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

Preservation Codes:
1. Cool, 4 Degrees Centigrade
2. Sulfuric Acid (H_2SO_4), pH < 2
3. Nitric Acid (HNO_3), pH < 2
4. Thiosulfate for Dechlorination
5. Hydrochloric Acid(HCl)
6. Sodium Hydroxide (NaOH), pH > 12

Bottle Type Code: G = Glass; P = Plastic; V = Septum; A = Amber

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	Arkansas Analytical Work Order Number:
FD-2 Comp.	4/16/2010	9:05 AM		X	3	W	Facility Discharge	X	1K1004002 B

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)
Bill McAlister	4-16-10 1421	
3. Relinquished by: (Signature)	Date/Time	4. Received by lab: (Signature)
		Sarah E. Ronol

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:	4°C	

FOR COMPLETION BY LAB ONLY

REMARKS / SAMPLE COMMENTS

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 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_2SO_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)		
Attn: Bill McAlister	Attn: Amber Rich	Fax: 501-467-8687	Preservative Code:		
		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	TEST PARAMETERS	Bottle Type Code	Arkansas Analytical Work Order Number:
								1		G = Glass, P = Plastic	
								P		V = Septum: A = Amber	
FD-1 Comp.	4/20/2010	8:35 AM		X	4	W	Facility Discharge	X			K1004002 C

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)	SAMPLE CONDITION UPON RECEIPT IN LAB	REMARKS / SAMPLE COMMENTS
Bill McAlister	4-20-10 1455		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: 4°C	
3. Relinquished by: (Signature)	Date/Time	4. Received by lab: (Signature)	FOR COMPLETION BY LAB ONLY	
		Sarah E Ronse		

APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING — Fathead Minnow

Lab # / Sample ID 1C1004002 — Test Start (Date/Time) 4/16/10

Client Weston — Test End (Date/Time) 4/23/10

		Day of Test							
		1	2	3	4	5	6	7	notes/remarks
Control	0	4/16/10	4/17	4/18	4/19	4/20	4/21	4/22	
D.O. (mg/L)	INITIAL	84	8.48	8.40	85	84	86	85	
	FINAL	7.53	7.74	77	76	81	83	77	
pH (s.u.)	INITIAL	78	6.9	7.2	72	73	73	74	
	FINAL	6.94	6.99	74	70	78	76	77	
temp (C)	INITIAL	20.8	20.9	20.3	210	218	219	223	
	FINAL	25.0	25.0	250	250	250	250	250	
ALKALINITY (mg/L)		22						↓	
HARDNESS (mg/L)		88						↓	
CONDUCTIVITY (umhos/cm)		153						↓	
CHLORINE (mg/L)		<0.05						↓	
CONC:	32								
D.O. (mg/L)	INITIAL	85	8.54	8.77	87	85	85	86	
	FINAL	7.58	7.71	76	77	78	82	76	
pH (s.u)	INITIAL	77	6.9	6.89	69	67	67	70	
	FINAL	6.61	6.90	72	70	74	77	77	
temp (C)	INITIAL	20.8	21.4	21.8	211	214	224	225	
	FINAL	25.0	25.0	250	250	250	250	250	
CONC:	42								
D.O. (mg/L)	INITIAL	86	9.12	8.78	87	87	86	86	
	FINAL	7.64	7.65	76	77	78	80	77	
pH (mg/L)	INITIAL	77	6.8	7.01	70	67	68	70	
	FINAL	6.65	6.82	72	70	73	77	76	
temp (C)	INITIAL	20.7	21.8	22.5	212	214	224	226	
	FINAL	25.0	25.0	250	250	250	250	250	
CONC:	56								
D.O. (mg/L)	INITIAL	88	9.27	8.82	86	88	87	87	
	FINAL	7.75	7.65	77	78	78	81	78	
pH (s.u.)	INITIAL	76	6.6	6.99	70	66	69	70	
	FINAL	6.72	6.91	72	78	73	74	75	
temp (C)	INITIAL	20.9	22.2	23.1	212	213	226	225	
	FINAL	250	25.0	250	250	250	250	250	
CONC:	75								
D.O. (mg/L)	INITIAL	89	9.43	8.91	86	89	87	87	
	FINAL	7.77	7.70	77	78	77	81	78	
pH (s.u.)	INITIAL	75	6.7	7.11	70	66	69	69	
	FINAL	6.63	6.85	72	69	72	74	75	
temp (C)	INITIAL	210	22.7	23.8	212	214	228	226	
	FINAL	25.0	25.0	250	250	250	250	250	
CONC:	100								
D.O. (mg/L)	INITIAL	89	9.6	9.12	87	89	87	88	
	FINAL	7.76	8.42	81	76	78	81	78	
pH (s.u.)	INITIAL	73	6.5	7.05	68	66	68	69	
	FINAL	6.42	6.44	7.0	69	71	72	74	
temp (C)	INITIAL	213	23.0	23.8	214	216	227	227	
	FINAL	25.0	25.0	250	250	250	250	250	
CONC:	100%	A	A	A	B	B	C	C	
ALKALINITY (mg/L)		4	↓	↓	6	↓	4	↓	
HARDNESS (mg/L)		>600	↓	↓	>600	↓	>600	↓	
CONDUCTIVITY (umhos/cm)		20300	↓	↓	20500	↓	20500	↓	
CHLORINE (mg/L)		<0.05	↓	↓	<0.05	↓	<0.05	↓	

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING — Cerodaphnia Dubia

Lab # / Sample ID: K1004002 — Test Start (Date/Time): 4/16/10

Client: Weston — Test End (Date/Time): 4/23/10

		Day of Test 1	2	3	4	5	6	7	notes/remarks
Control	0	4/16/10	4/17	4/18	4/19	4/20	4/21	4/22	
D.O. (mg/L)	INITIAL	84	8.48	8.40	85	84	86	85	
	FINAL	8.21	7.85	79	76	75	78		
pH (s.u.)	INITIAL	78	6.9	7.2	72	73	73	74	
	FINAL	6.7	7.12	74	69	77	73		
temp (C)	INITIAL	20.8	20.9	20.3	210	218	219	223	
	FINAL	25.0	25.0	250	250	250	250		
ALKALINITY (mg/L)		22							
HARDNESS (mg/L)		238							
CONDUCTIVITY (umhos/cm)		153							
CHLORINE (mg/L)		<0.05							
CONC:	32								
D.O. (mg/L)	INITIAL	85	8.54	8.77	87	85	85	86	
	FINAL	8.20	7.97	8.79	75	77	78		
pH (s.u)	INITIAL	77	6.9	6.89	69	67	67	70	
	FINAL	6.6	6.82	70	66	6.78	68		
temp (C)	INITIAL	20.8	21.4	21.8	211	214	224	225	
	FINAL	25.0	25.0	250	250	250	250		
CONC:	42								
D.O. (mg/L)	INITIAL	86	9.12	8.78	87	87	86	86	
	FINAL	8.19	6.78	78	75	76	77		
pH (mg/L)	INITIAL	77	6.8	7.01	70	69	68	70	
	FINAL	6.7	6.79	68	66	76	69		
temp (C)	INITIAL	20.7	21.8	22.5	212	214	224	226	
	FINAL	25.0	25.0	250	250	250	250		
CONC:	56								
D.O. (mg/L)	INITIAL	88	9.27	8.82	86	88	87	87	
	FINAL	8.22	7.98	78	76	78	77		
pH (s.u.)	INITIAL	76	6.6	6.99	70	66	69	70	
	FINAL	6.5	6.85	68	6.6	78	69		
temp (C)	INITIAL	20.9	22.2	23.1	212	213	226	225	
	FINAL	25.0	25.0	250	250	250	250		
CONC:	75								
D.O. (mg/L)	INITIAL	89	9.43	8.91	86	89	87	87	
	FINAL	8.24	8.01	77	75	78	73		
pH (s.u.)	INITIAL	75	6.7	7.11	70	66	69	69	
	FINAL	6.6	6.79	67	66	78	70		
temp (C)	INITIAL	210	22.7	23.8	212	214	228	226	
	FINAL	25.0	25.0	250	250	250	250		
CONC:	100								
D.O. (mg/L)	INITIAL	89	9.60	9.12	87	89	87	88	
	FINAL	8.26	8.11	79	75	77	74		
pH (s.u.)	INITIAL	73	6.5	7.05	68	6.6	68	69	
	FINAL	6.42	7.08	69	6.6	74	72		
temp (C)	INITIAL	213	23.0	23.8	214	216	227	227	
	FINAL	25.0	25.0	250	250	250	250		
CONC:	100%	A	A	A	B	B	C	C	
ALKALINITY (mg/L)		4			6		4		
HARDNESS (mg/L)		>600			>600		>600		
CONDUCTIVITY (umhos/cm)		20800			20500		20500		
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 14004002 TEST START DATE 4/16/10 TIME 1040

CLIENT Weston Summary TEST END DATE 4/23/10 TIME 1340

AGE AND SOURCE OF MINNOWS

D A Y (NUMBER SURVIVING) SURVIVAL

	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	8	8	8	7	7	7	7	7		95	7.21
	B				8	8	8	8	8			
	C				8	8	8	8	8			
	D				7	7	7	7	7			
	E				8	8	8	8	8			
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	8	8	8	7	7	7	7	7		87.5	
	B				6	6	6	6	6			
	C				6	6	6	6	6			
	D				8	8	8	8	8			
	E				8	8	8	8	8			
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	8	8	6	6	6	6	6	6		90	
	B			7	7	7	7	7	7			
	C			7	7	7	7	7	7			
	D			8	8	8	8	8	8			
	E			8	8	8	8	8	8			
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	8	8	7	7	7	7	7	7		97.5	
	B			8	8	8	8	8	8			
	C								8			
	D								8			
	E								8			
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	8	8	8	8	8	8	8	8		95	
	B				8	8	8	8	8			
	C				8	8	8	8	8			
	D				6	6	6	6	6			
	E				8	8	8	8	8			
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	8	8	8	7	7	7	7	7		93	7.21
	B				8	7	7	7	7			
	C				8	8	8	8	8			
	D				8	8	8	8	8			
	E				8	8	8	8	8			
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 K100H002 TEST START DATE 4/16/10 TIME 1040

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
CONC: 0	A	2	2	2	2	2	2	2	2			
	B	2	2	2	2	2	2	2	2			
	C	2	2	2	2	2	1	2	2			
	D	2	2	2	2	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 32	A	2	2	2	2	2	2	2	2			
	B	2	2	2	2	2	1	2	1			
	C	2	2	2	2	2	2	2	2			
	D	2	2	2	2	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 42	A	2	2	2	2	2	2	2	2			
	B	2	2	2	1	1	1	1	1			
	C	2	2	2	2	2	2	2	2			
	D	2	2	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 56	A	2	2	1	1	1	1	1	1			
	B	2	2	2	2	2	2	2	2			
	C	2	2	2	2	2	2	2	2			
	D	2	2	2	2	2	2	2	2			
	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	2	2	2	2	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 100	A	2	2	2	2	2	2	2	2			
	B				2	2	2	2	2			
	C				2	2	2	2	2			
	D	2	2	2	2	1	1	1	1			
	E											
ANALYST		KP	~~KP~~	TT	KP	KP	KP	KP	KP			
DATE:		4/16/10	4/17	4/18	4/19	4/20	4/21	4/22	4/23			
TIME:		1040	1115	1210	1115	1320	1510	1620	1340			

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID K100402 TEST START DATE 4/16/10 TIME

CLIENT Weston TEST END DATE TIME

AGE AND SOURCE OF MINNOWS

D A Y (NUMBER SURVIVING)

	REP #	start	1	2	3	4	5	6	7	SURVIVAL %	MEAN %	CV
CONC: 0	A	2	2	2	2	2	2	2	2			
	B	2	2	2	2	2	2	2	2			
	C	2	2	2	2	2	2	2	2			
	D	2	2	2	2	2	2	2	2			
	E											
CONC: 32	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A	2	2	2	0	0	0	0	0			
	B	2	2	2	2	2	2	2	2			
	C	2	2	2	2	2	2	2	2			
	D	2	2	2	2	2	2	2	2			
	E											
CONC: 42	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A	2	2	1	1	1	1	1	1			
	B			2	2	2	2	2	2			
	C			2	2	2	2	2	2			
	D			2	2	2	2	2	2			
	E											
CONC: 56	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A	2	2	2	2	2	2	2	2			
	B						2					
	C						2					
	D						2					
	E											
CONC: 75	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A	2	2	2	2	2	2	2	2			
	B								2			
	C								2			
	D								2			
	E											
CONC: 100	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A	2	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	1	1	1	1			
	E											
ANALYST		KP										
DATE:		4/16/10										
TIME:												

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID K1004002 TEST START DATE 4/16/10 TIME

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
CONC: 0	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: 32	A	2	2	2	1	1	1	1	1			
	B				1	1	1	1	1			
	C				2	2	2	2	2			
	D				2	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 42	A	2	2	2	2	2	2	2	2			
	B		2	2	2	2	2	2	2			
	C		2	2	2	1	1	1	1			
	D		2	2	2	2	2	2	2			
	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											
	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											
	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											
	E											
ANALYST		KP										
DATE:		4/16/10										
TIME:												

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID K100402 TEST START DATE 4/16/10 TIME

CLIENT Weston TEST END DATE TIME

AGE AND SOURCE OF MINNOWS

		DAY (NUMBER SURVIVING)								SURVIVAL		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 0	A	2	2	2	2	2	2	2	2			
	B	2	2	2	2	1	2	2	1			
	C	2	2	2	2	2	2	2	2			
	D	2	1	1	2	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 32	A	2	2	2	2	2	2	2	2			
	B	2	2	2	2	2	2	2	2			
	C	2	2	2	2	2	2	2	2			
	D	2	1	1	1	1	2	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	2	2	2	2	2	2	2	2			
	C	2	2	2	2	2	2	2	2			
	D	2	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	2	2	2	2	2	2	2	2			
	C	2	2	2	2	2	2	2	2			
	D	2	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	2	2	2	2	2	2	2	2			
	C	2	2	2	1	2	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	2	2	2	2	2	2	2	2			
	C	2	2	2	2	2	2	2	2			
	D	2	2	2	2	2	2	2	2			
	E											
ANALYST		KP										
DATE:		4/16/10										
TIME:												

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID K1004002 TEST START DATE 4/16/10 TIME

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
CONC: 0	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: 32	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: 42	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: 56	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: 75	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: 100	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D											
	E											
ANALYST		KP										
DATE:		4/16/10										
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:	K1004002	TEST DATES (BEGIN / END):	4/16-23/10
CLIENT:	EEMA	WEIGHING DATE / TIME:	4/27/10, 1410
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	0.99205	0.98881	0.00324	8	0.405	AVG DRY WEIGHT (mg) 0.396
	B	1.01537	1.01279	0.00258	8	0.323	
	C	1.01670	1.01357	0.00313	8	0.391	
	D	1.01149	1.00801	0.00348	8	0.435	CV 11.2
	E	0.99817	0.99477	0.00340	8	0.425	
CONC: 32%	A	0.99168	0.98880	0.00288	8	0.360	AVG DRY WEIGHT (mg) 0.416
	B	0.99791	0.99526	0.00265	8	0.331	
	C	1.03698	1.03438	0.00260	8	0.325	
	D	0.99209	0.98780	0.00429	8	0.536	CV
	E	1.01469	1.01047	0.00422	8	0.528	
CONC: 42%	A	0.98464	0.98124	0.00340	8	0.425	AVG DRY WEIGHT (mg) 0.440
	B	1.02026	1.01707	0.00319	8	0.399	
	C	1.01301	1.01080	0.00221	8	0.276	
	D	0.99370	0.98932	0.00438	8	0.548	CV
	E	0.99683	0.99243	0.00440	8	0.550	
CONC: 56%	A	0.97411	0.97001	0.00410	8	0.512	AVG DRY WEIGHT (mg) 0.527
	B	1.02641	1.02210	0.00431	8	0.539	
	C	0.97255	0.96891	0.00364	8	0.455	
	D	1.01088	1.00705	0.00383	8	0.479	CV
	E	1.01721	1.01200	0.00521	8	0.651	
CONC: 75%	A	1.00958	1.00555	0.00403	8	0.504	AVG DRY WEIGHT (mg) 0.502
	B	1.01564	1.01113	0.00451	8	0.564	
	C	1.00901	1.00587	0.00314	8	0.392	
	D	1.00457	1.00051	0.00406	8	0.507	CV
	E	1.00436	1.00000	0.00436	8	0.545	
CONC: 100%	A	0.99815	0.99473	0.00342	8	0.427	AVG DRY WEIGHT (mg) 0.519
	B	1.00291	0.99858	0.00433	8	0.541	
	C	1.00515	1.00164	0.00351	8	0.439	
	D	1.01294	1.00835	0.00459	8	0.574	CV 15.9
	E	1.01355	1.00865	0.00490	8	0.612	

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

Pimephales promelas **FATHEAD MINNOW** TEST 1000.0

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s: KI604002
CLIENT: Weston
ANALYSTS: KP
SAMPLE ID:

TEST DATES (BEGIN / END): 4/16-23/10
WEIGHING DATE / TIME: 4/27/10, 1410
DRYING TEMP (DEGREES C): 60
DRYING TIME (HOURS): 24

	REP#	FINAL DRY WEIGHT TIN+LARVAE 0.992(g)DS	INTIAL WEIGHT TIN (g)	TOTAL DRY WEIGHT OF LARVAE (g)	NUMBER OF LARVAE	DRY WEIGHT OF LARVAE (mg)	
CONTROL	A 1	~~0.98281~~	0.98881				AVG DRY WEIGHT (mg)
	B 2	1.01537	1.01279				
	C 3	1.01670	1.01357				
	D 4	1.01149	1.00801				CV
	E 5	0.99817	0.99477				
CONC: 32	A 6	0.99168	0.98880				AVG DRY WEIGHT (mg)
	B 7	0.99791	0.99526				
	C 8	1.03698	1.03438				
	D 9	0.99209	0.98780				CV
	E 10	1.01469	1.01647				
CONC: 42	A 11	0.98464	0.98124				AVG DRY WEIGHT (mg)
	B 12	1.02026	1.01767				
	C 13	1.01361	1.01080				
	D 14	0.99370	0.98932				CV
	E 15	0.99683	0.99243				
CONC: 56	A 16	0.97411	0.97001				AVG DRY WEIGHT (mg)
	B 17	1.02641	1.02210				
	C 18	0.97255	0.96891				
	D 19	1.01089	1.00705				CV
	E 20	1.01721	1.01206				
CONC: 75	A 21	1.00958	1.00555				AVG DRY WEIGHT (mg)
	B 22	1.01561	1.01113				
	C 23	1.00901	1.00587				
	D 24	1.00457	1.00051				CV
	E 25	1.00436	1.00000				
CONC: 100	A 26	0.99815	0.99473				AVG DRY WEIGHT (mg)
	B 27	1.00291	0.99858				
	C 28	1.00515	1.00164				
	D 29	1.01294	1.00935				CV
	E 30	1.01365	1.00865				

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

AA# K1004002, FATHEAD MINNOW SURVIVAL, CHRONIC, 4-16-10
File: Z:\TOXSTAT\MONTE\FHSURV. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.409

W = 0.914

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# K1004002, FATHEAD MINNOW SURVIVAL, CHRONIC, 4-16-10
File: Z:\TOXSTAT\MONTE\FHSURV. Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 3.05

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# K1004002, FATHEAD MINNOW SURVIVAL, CHRONIC, 4-16-10
FILE: Z:\TOXSTAT\MONTE\FHSURV.
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	1.0000	1.3931
1	CONTROL	3	1.0000	1.3931
1	CONTROL	4	0.8750	1.2094
1	CONTROL	5	1.0000	1.3931
2	32 % EFFLUENT	1	0.8750	1.2094
2	32 % EFFLUENT	2	0.7500	1.0472
2	32 % EFFLUENT	3	0.7500	1.0472
2	32 % EFFLUENT	4	1.0000	1.3931
2	32 % EFFLUENT	5	1.0000	1.3931
3	42 % EFFLUENT	1	0.7500	1.0472
3	42 % EFFLUENT	2	0.8750	1.2094
3	42 % EFFLUENT	3	0.8750	1.2094
3	42 % EFFLUENT	4	1.0000	1.3931
3	42 % EFFLUENT	5	1.0000	1.3931
4	56 % EFFLUENT	1	0.8750	1.2094

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	0.7500	1.0472
5	75 % EFFLUENT	5	1.0000	1.3931
6	100 % EFFLUENT	1	0.8750	1.2094
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	1.0000	1.3931

AA# K1004002, FATHEAD MINNOW SURVIVAL, CHRONIC, 4-16-10
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	1.320				
2	32 % EFFLUENT	1.218	23.00	16.00	5.00	
3	42 % EFFLUENT	1.250	24.00	16.00	5.00	
4	56 % EFFLUENT	1.356	30.00	16.00	5.00	
5	75 % EFFLUENT	1.324	29.00	16.00	5.00	
6	100 % EFFLUENT	1.320	27.50	16.00	5.00	

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

AA# K1004002, FATHEAD MINNOW GROWTH CHRONIC, 4-16-10
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.180

W = 0.962

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# K1004002, FATHEAD MINNOW GROWTH CHRONIC, 4-16-10
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 3.82

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# K1004002, FATHEAD MINNOW GROWTH CHRONIC, 4-16-10
FILE: Z:\TOXSTAT\MONTE\FHGR.
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.4050	0.6898
1	CONTROL	2	0.3230	0.6045
1	CONTROL	3	0.3910	0.6755
1	CONTROL	4	0.4350	0.7202
1	CONTROL	5	0.4250	0.7101
2	32 % EFFLUENT	1	0.3600	0.6435
2	32 % EFFLUENT	2	0.3310	0.6130
2	32 % EFFLUENT	3	0.3250	0.6066
2	32 % EFFLUENT	4	0.5360	0.8214
2	32 % EFFLUENT	5	0.5280	0.8134
3	42 % EFFLUENT	1	0.4250	0.7101
3	42 % EFFLUENT	2	0.3990	0.6837
3	42 % EFFLUENT	3	0.2760	0.5531
3	42 % EFFLUENT	4	0.5480	0.8335
3	42 % EFFLUENT	5	0.5500	0.8355
4	56 % EFFLUENT	1	0.5120	0.7974

4	56 % EFFLUENT	2	0.5390	0.8244
4	56 % EFFLUENT	3	0.4550	0.7403
4	56 % EFFLUENT	4	0.4790	0.7644
4	56 % EFFLUENT	5	0.6510	0.9388
5	75 % EFFLUENT	1	0.5040	0.7894
5	75 % EFFLUENT	2	0.5640	0.8496
5	75 % EFFLUENT	3	0.3920	0.6765
5	75 % EFFLUENT	4	0.5070	0.7924
5	75 % EFFLUENT	5	0.5450	0.8305
6	100 % EFFLUENT	1	0.4270	0.7121
6	100 % EFFLUENT	2	0.5410	0.8264
6	100 % EFFLUENT	3	0.4390	0.7242
6	100 % EFFLUENT	4	0.5740	0.8597
6	100 % EFFLUENT	5	0.6120	0.8984

AA# K1004002, FATHEAD MINNOW GROWTH CHRONIC, 4-16-10
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.082	0.016	2.197
Within (Error)	24	0.180	0.008	
Total	29	0.262		

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

AA# K1004002, FATHEAD MINNOW GROWTH CHRONIC, 4-16-10
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	0.680	0.396		
2	32 % EFFLUENT	0.700	0.416	-0.357	
3	42 % EFFLUENT	0.723	0.440	-0.788	
4	56 % EFFLUENT	0.813	0.527	-2.429	
5	75 % EFFLUENT	0.788	0.502	-1.965	
6	100 % EFFLUENT	0.804	0.519	-2.266	

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

AA# K1004002, FATHEAD MINNOW GROWTH CHRONIC, 4-16-10
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	0.122	30.7	-0.020
3	42 % EFFLUENT	5	0.122	30.7	-0.044
4	56 % EFFLUENT	5	0.122	30.7	-0.131
5	75 % EFFLUENT	5	0.122	30.7	-0.107
6	100 % EFFLUENT	5	0.122	30.7	-0.123

AA# K1004002, FATHEAD MINNOW GROWTH CHRONIC, 4-16-10
File: Z:\TOXSTAT\MONTE\FHGR. 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	0.680				
2	32 % EFFLUENT	0.700	28.00	16.00	5.00	
3	42 % EFFLUENT	0.723	30.50	16.00	5.00	
4	56 % EFFLUENT	0.813	40.00	16.00	5.00	
5	75 % EFFLUENT	0.788	37.00	16.00	5.00	
6	100 % EFFLUENT	0.804	39.00	16.00	5.00	

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

APPENDIX D

Ceriodaphnia dubia Raw Data and Statistics

SURVIVAL AND REPRODUCTION TEST

Cerodaphnia dubia
Discharger: Weston
Location:
Date Sample Collected:
Lab Number/s: K1004002

Analyst: KP
Test Start - Date/ Time: 4/16/10, 1045
Test Stop - Date/Time: 4/23/10, 0830

Conc 1 — 0%

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	2	2	10	0.2	KP
3	0	0	0	0	0	0	0	0	0	3	3	10	0.3	KP
4	2	5	0	0	5	5	2	3	3	3	28	10	2.8	KP
5	10	6	4	6	8	8	7	5	4	9	67	10	6.7	KP
6	7	7	8	9	14	13	9	5	4	8	80	10	8.0	
7														
8													X=	17.7
Total	15	18	12	15	27	26	18	13	11	22	177		CV=	32.0

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	0	2	1	2	1	0	0	4	3	2	15	10	1.5	
4	2	3	0	4	4	2	5	3	2	6	31	10	3.1	
5	7	2	2	8	9	7	6	10	4	9	64	10	6.4	
6	11	6	5	7	4	8	9	5	6	14	75	10	7.5	
7														
8														
Total	20	13	8	21	18	17	20	22	15	31	185			

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	0	0	4	1	0	0	0	0	0	4	5	10	0.5	
4	3	1	4	6	6	3	4	3	3	4	37	10	3.7	
5	9	3	7	7	8	8	5	8	10	7	72	10	7.2	
6	5	9	12	8	12	9	8	8	0	6	77	10	7.7	
7														
8														
Total	17	13	27	22	26	20	17	19	13	17	191			

X= DEAD; Y= MALE

Conc 4 — 56%

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	3X	0	1	0	0	0	0	0	0	0	4	9	0.4	
4	—	7	5	3	2	2	1	3	5	3	31	9	3.4	
5	—	0	7	9	8	5	5	6	8	8	56	9	6.2	
6	—	9	10	12	6	2	8	10	7	12	76	9	8.4	
7														
8														
Total	3	16	23	24	16	9	14	19	20	23	167			

Conc 5 — 75%

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	1X	0	0	0	0	0	1	0	0	0	1	9	0.1	
4	—	2	3	2	6	2	3	2	4	4	28	9	3.1	
5	—	6	6	4	3	0	6	5	9	8	47	9	5.2	
6	—	9	6	0	7	5	8	5	12	10	54	9	6.0	
7														
8														
Total	7	9	15	6	16	7	18	12	25	24	139			

Conc 6 — 100%

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	3	0	0	0	0	4	1	0	0	9	10	0.9	
4	1	4	1	7	3	2	2	0	5	2	27	10	2.7	
5	5	4	6	9	10	7	6	9	8	9	73	10	7.3	
6	0	9	8	7	8	6	9	10	10	9	76	10	7.6	
7														
8														
Total	7	20	15	23 18	21	15	21	20	23	25	185			

X= 18.5
CV= 27.7

2007

AA # K1004002 C. DUBIA CHRONIC, REPRODUCION, 4-16-10
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 # K1004002 C. DUBIA CHRONIC, REPRODUCION, 4-16-10
File: Z:/toxstat/monte\CD. Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 1.81

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%	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
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	1	
4	75%	10	1	
5	100%	10	0	

TITLE: AA # K1004002 C. DUBIA CHRONIC, REPRODUCION, 4-16-10
FILE: Z:/toxstat/monte\CD.
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	15.0000	15.0000
1	CONTROL	2	18.0000	18.0000
1	CONTROL	3	12.0000	12.0000
1	CONTROL	4	15.0000	15.0000
1	CONTROL	5	27.0000	27.0000
1	CONTROL	6	26.0000	26.0000
1	CONTROL	7	18.0000	18.0000
1	CONTROL	8	13.0000	13.0000
1	CONTROL	9	11.0000	11.0000
1	CONTROL	10	22.0000	22.0000
2	32 % EFFLUENT	1	20.0000	20.0000
2	32 % EFFLUENT	2	13.0000	13.0000
2	32 % EFFLUENT	3	8.0000	8.0000
2	32 % EFFLUENT	4	21.0000	21.0000
2	32 % EFFLUENT	5	18.0000	18.0000
2	32 % EFFLUENT	6	17.0000	17.0000
2	32 % EFFLUENT	7	20.0000	20.0000
2	32 % EFFLUENT	8	22.0000	22.0000
2	32 % EFFLUENT	9	15.0000	15.0000
2	32 % EFFLUENT	10	31.0000	31.0000
3	42 % EFFLUENT	1	17.0000	17.0000
3	42 % EFFLUENT	2	13.0000	13.0000
3	42 % EFFLUENT	3	27.0000	27.0000
3	42 % EFFLUENT	4	22.0000	22.0000
3	42 % EFFLUENT	5	26.0000	26.0000
3	42 % EFFLUENT	6	20.0000	20.0000
3	42 % EFFLUENT	7	17.0000	17.0000
3	42 % EFFLUENT	8	19.0000	19.0000
3	42 % EFFLUENT	9	13.0000	13.0000
3	42 % EFFLUENT	10	17.0000	17.0000
4	56 % EFFLUENT	1	3.0000	3.0000
4	56 % EFFLUENT	2	16.0000	16.0000
4	56 % EFFLUENT	3	23.0000	23.0000
4	56 % EFFLUENT	4	24.0000	24.0000
4	56 % EFFLUENT	5	16.0000	16.0000
4	56 % EFFLUENT	6	9.0000	9.0000
4	56 % EFFLUENT	7	14.0000	14.0000
4	56 % EFFLUENT	8	19.0000	19.0000

4	56 % EFFLUENT	9	20.0000	20.0000
4	56 % EFFLUENT	10	23.0000	23.0000
5	75 % EFFLUENT	1	7.0000	7.0000
5	75 % EFFLUENT	2	9.0000	9.0000
5	75 % EFFLUENT	3	15.0000	15.0000
5	75 % EFFLUENT	4	6.0000	6.0000
5	75 % EFFLUENT	5	16.0000	16.0000
5	75 % EFFLUENT	6	7.0000	7.0000
5	75 % EFFLUENT	7	18.0000	18.0000
5	75 % EFFLUENT	8	12.0000	12.0000
5	75 % EFFLUENT	9	25.0000	25.0000
5	75 % EFFLUENT	10	24.0000	24.0000
6	100 % EFFLUENT	1	7.0000	7.0000
6	100 % EFFLUENT	2	20.0000	20.0000
6	100 % EFFLUENT	3	15.0000	15.0000
6	100 % EFFLUENT	4	18.0000	18.0000
6	100 % EFFLUENT	5	21.0000	21.0000
6	100 % EFFLUENT	6	15.0000	15.0000
6	100 % EFFLUENT	7	21.0000	21.0000
6	100 % EFFLUENT	8	20.0000	20.0000
6	100 % EFFLUENT	9	23.0000	23.0000
6	100 % EFFLUENT	10	25.0000	25.0000

AA # K1004002 C. DUBIA CHRONIC, REPRODUCION, 4-16-10
File: Z:/toxstat/monte\CD. Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	181.400	36.280	1.029
Within (Error)	54	1903.000	35.241	
Total	59	2084.400		

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

AA # K1004002 C. DUBIA CHRONIC, REPRODUCION, 4-16-10
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	17.700	17.700		
2	32 % EFFLUENT	18.500	18.500	-0.301	
3	42 % EFFLUENT	19.100	19.100	-0.527	
4	56 % EFFLUENT	16.700	16.700	0.377	
5	75 % EFFLUENT	13.900	13.900	1.431	
6	100 % EFFLUENT	18.500	18.500	-0.301	

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

AA # K1004002 C. DUBIA CHRONIC, REPRODUCION, 4-16-10
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	6.133	34.6	-0.800
3	42 % EFFLUENT	10	6.133	34.6	-1.400
4	56 % EFFLUENT	10	6.133	34.6	1.000
5	75 % EFFLUENT	10	6.133	34.6	3.800
6	100 % EFFLUENT	10	6.133	34.6	-0.800

AA # K1004002 C. DUBIA CHRONIC, REPRODUCION, 4-16-10
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	17.700				
2	32 % EFFLUENT	18.500	111.00	75.00	10.00	
3	42 % EFFLUENT	19.100	114.50	75.00	10.00	
4	56 % EFFLUENT	16.700	106.00	75.00	10.00	
5	75 % EFFLUENT	13.900	87.50	75.00	10.00	
6	100 % EFFLUENT	18.500	113.00	75.00	10.00	

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

APPENDIX E

Organism History

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

TEST ORGANISM HISTORY

DATE SHIPPED 4-15-10 **CLIENT** Arkansas Analytical

Purchase Order #: Verbal / Kim

SPECIES:	(Pimephales promelas)	Mysidopsis bahia	Cyprinodon variegates
Quantity Shipped:	480+ - 180+ (1500)		
Age:	24hrs 4/15 & 1 Day old 4/15		
Brood Stock Source:	Arkansas Analytical		
Culture Water:	(Groundwater)	Artificial Salts	Artificial Salts
Hardness (Mg/l CaCO3)	160	**Salinity (ppt)**	
Dissolved Oxygen (Mg/1):	7.1		

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:

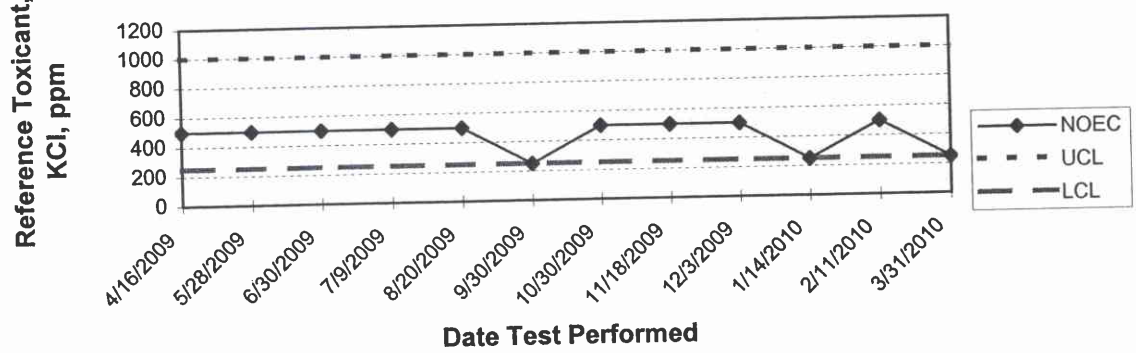
Facility Supervisor

APPENDIX F

Quality Assurance Charts

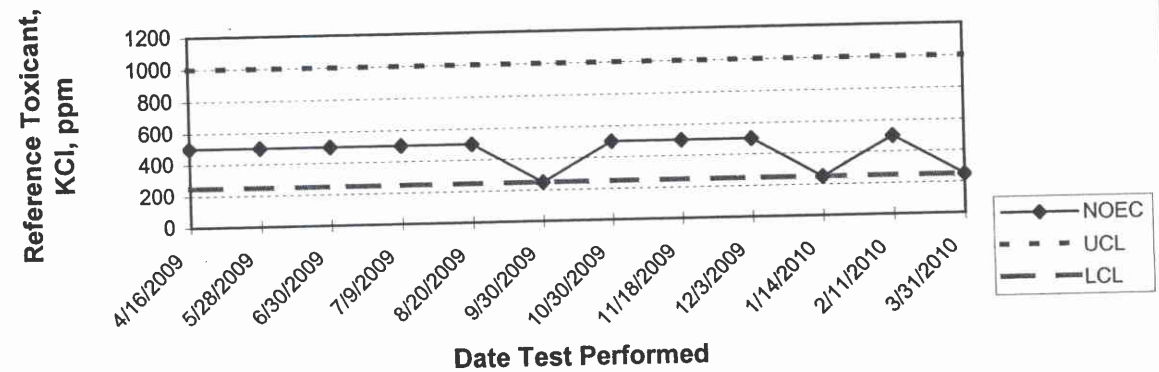
ARKANSAS ANALYTICAL, INC.

FATHEAD MINNOW SURVIVAL
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.

FATHEAD MINNOW GROWTH
QUALITY ASSURANCE



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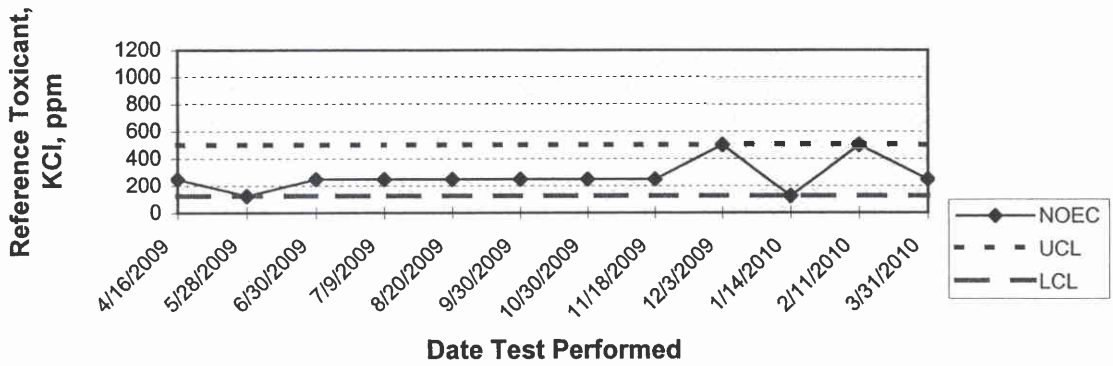
CERIODAPHNIA DUBIA SURVIVAL
QUALITY ASSURANCE



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CERIODAPHNIA DUBIA REPRODUCTION
QUALITY ASSURANCE