

# Arkansas Analytical, Inc.

## Toxicity Test Results

**Conway Corporation: Tupelo Bayou**  
**NPDES Permit Number: AR0051951**  
**Second quarter 2015**  
AFIN # 23-01095

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

*Ceriodaphnia dubia*, Survival and Reproduction Test  
Test 1002.0

Prepared for: **Mr. Bill Fulmer**  
**Conway Corporation**  
**P.O. Box 99**  
**Conway, Arkansas 72032**

Prepared by: Arkansas Analytical, Inc.  
11701 I-30, Bldg 1 Suite 115  
Little Rock, Arkansas 72209  
**Lab Number K1504008**

Monday, May 11, 2015

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## Introduction

This report contains test results for toxicity testing for Conway Corporation. The NPDES permit number is AR0051951. The facility is located as follows: from the intersection of Dave Ward Drive (Hwy. 60) and Lollie Road, drive approximately 1.3 miles south on Lollie Road, and the proposed facility location will be on the right (to the west) in Faulkner County, Arkansas. Latitude: 35° 03' 05" North & Longitude: 92° 32' 09" West.

The permit requires chronic biomonitoring testing quarterly for *Pimephales promelas* and *Ceriodaphnia dubia*. The test results in this report represent the testing for the second quarter of 2015.

## 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:	4-26-15, 0800	4-27-15, 0800
Sample #2:	4-28-15, 0800	4-29-15, 0800
Sample #3:	4-30-15, 0800	5-1-15, 0800

Samples were composites collected at the final discharge of Outfall 001, Tupelo Bayou effluent.

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

Sample Receiving Information:	Date, Time Sample(s) Received	Temperature (°C) upon receipt
Sample #1:	4-27-15, 0913	1
Sample #2:	4-29-15, 0909	2
Sample #3:	5-1-15, 0917	1

Chain of custody documentation is located in Appendix A.

The dilution water used in the toxicity tests was synthetic soft. It was prepared using Elga Maxima ultra pure water according to EPA specifications. Each batch 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 5%, 7%, 9%, 12%, and 16%. The low-flow effluent concentration (**critical dilution**) was defined as **12% effluent**.

## Test Methods

EPA Method 1000.0, Fathead Minnow, *Pimephales promelas*, Larval Survival and Growth Test, was used in this bioassay. Larvae are exposed in a static renewal system for seven days and the results are based on the survival and growth (increase in weight) of the larvae. There were no deviations from the reference method. The test chambers were 500 ml plastic cups, and each chamber contained ten organisms in a test solution volume of 250 mls. 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 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 mls 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	15.6	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	26.6%	X	

#### TEST ACCEPTANCE CRITERIA for *Pimephales promelas*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	98%	X	
The percent coefficient of variation between replicates must be 40% or less for survival	4.56%	X	
Minimum of 0.25 mg average dry weight of surviving controls	0.669	X	
The percent coefficient of variation between replicates must be 40% or less for growth	8.41%	X	

### Reference Toxicant

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

#### REFERENCE TOXICANT

<i>Ceriodaphnia dubia</i> 4/22/15 – 4/29/15		<i>Pimephales promelas</i> 4/22/15 – 4/29/15	
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**  
**Conway Corporation – Tupelo Bayou**

<i>Ceriodaphnia dubia</i>		<i>Pimephales promelas</i>	
NOEC / LOEC Survival	16% / NA	NOEC / LOEC survival	16% / NA
NOEC / LOEC Reproduction	16% / NA	NOEC / LOEC growth	16% / NA
Mean number of neonates (critical dilution)	15.8	%CV survival (critical dilution)	0.00%
%CV Reproduction (critical dilution)	30.8%	Mean dry weight (critical dilution) in milligrams	0.691
		%CV growth (critical dilution)	4.01%
PMSD Reproduction	29.7%	PMSD Growth	13.5%

**Conclusion**

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

The permit issued to Conway Corporation – Tupelo Bayou, specifies that the **critical dilution is 12% effluent**. The effluent samples **did not** exhibit lethal 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 Conway Corporation – Tupelo Bayou, specifies that the **critical dilution is 12% effluent**. The effluent samples **did not** exhibit lethal or sublethal effects at the critical dilution, and, as such, **passed** both portions of the test.

Biomonitoring Analysts:

Ryan Hudgin / Hallie Freyaldenhoven

Reviewed by:

Tracy Bounds by   
 Tracy Bounds, lab manager

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

**PERMITTEE: Conway Corporation –Tupelo Bayou**

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	4-26-15, 0800	4-27-15, 0800
Sample #2:	4-28-15, 0800	4-29-15, 0800
Sample #3:	4-30-15, 0800	5-1-15, 0800

Test initiated (date, time): 4-28-15, 1340    Test terminated (date, time): 5-5-15, 1115

Dilution water used:    Soft Synthetic

**DATA TABLE FOR FATHEAD MINNOW SURVIVAL**

Effluent Conc %	Percent Survival in Replicate Chambers						Mean Percent Survival			CV %
	A	B	C	D	E		24 hours	48 hours	7 days	
0%	100	100	100	90	100		100	100	98	4.56
5%	100	100	100	100	100		100	100	100	
7%	100	100	100	100	100		100	100	100	
9%	100	100	90	100	90		98	98	96	
12%	100	100	100	100	100		100	100	100	0.00
16%	100	100	90	80	100		100	98	94	

**DATA TABLE FOR GROWTH OF FATHEAD MINNOWS**

Average Dry Weight in milligrams in replicate chambers  
chambers

Effluent Conc %	A	B	C	D	E		Mean Dry Weight	CV%
0%	0.591	0.738	0.702	0.674	0.642		0.669	8.41%
5%	0.625	0.739	0.706	0.716	0.706		0.698	
7%	0.611	0.667	0.643	0.733	0.778		0.686	
9%	0.708	0.800	0.589	0.698	0.652		0.689	
12%	0.699	0.660	0.721	0.710	0.663		0.691	4.01%
16%	0.668	0.689	0.599	0.616	0.786		0.672	

Coefficient of Variation = standard deviation / mean \* 100

SUMMARY REPORTING FORMS FOR CHRONIC BIOMONITORING  
FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL  
*Pimephales promelas*

1. Dunnett's procedure or Steel's Many-One Rank Test as appropriate:  
Is the mean survival at 7 days significantly different ( $p=0.05$ ) than the control survival for:  
a) LOW FLOW OR CRITICAL DILUTION, (100%)    YES \_\_\_\_\_    NO   X
  
2. Dunnett's Procedure  
Is the mean dry weight (growth) at 7 days significantly different ( $p=0.05$ ) than the control's dry weight (growth) for:  
a) LOW FLOW OR CRITICAL DILUTION, (100%)    YES \_\_\_\_\_    NO   X
  
3. If NO was answered to 1.a) enter [0] otherwise enter [1] (parameter TLP6C):   0
  
4. If NO was answered to 2.a) enter [0] otherwise enter [1] (parameter TGP6C):   0
  
5. Enter percentage corresponding to each parameter below:  
a) NOEC survival (parameter TOP6C)=   16   % effluent  
b) NOEC growth (parameter TPP6C)=   16   % effluent  
c) Coefficient of variation (parameter TQP6C)=   8.41   %
  
6. Enter Whole Effluent Toxicity:   16   %



SUMMARY REPORTING FORMS FOR CHRONIC BIOMONITORING  
*Ceriodaphnia dubia* SURVIVAL AND REPRODUCTION

**PERMITTEE: Conway Corporation –Tupelo Bayou**

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	4-26-15, 0800	4-27-15, 0800
Sample #2:	4-28-15, 0800	4-29-15, 0800
Sample #3:	4-30-15, 0800	5-1-15, 0800

Test initiated (date, time): 4-28-15, 0945      Test terminated (date, time): 5-5-15, 1000

Dilution water used:      Soft Synthetic

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

PERCENT EFFLUENT

Replicate	0%	5%	7%	9%	12%	16%
A	16	13	18	20	9	17
B	13	13	11	15	18	9
C	22	14	5	10	18	16
D	19	19	17	18	19	15
E	17	21	19	20	10	17
F	15	18	12	11	17	22
G	14	12	12	11	17	13
H	8	17	6	11	25	22
I	12	9	16	8	14	18
J	20	18	9	20	11	10
Mean	15.6	15.4	12.5	14.4	15.8	15.9
Mean/surviving female	15.6	15.4	12.5	14.4	15.8	15.9
CV%*	26.6				30.8	

SUMMARY REPORTING FORMS FOR CHRONIC BIOMONITORING  
*Ceriodaphnia dubia* SURVIVAL AND REPRODUCTION

**Permittee: Conway Corporation**

PERCENT SURVIVAL

PERCENT EFFLUENT	0%	5%	7%	9%	12%	16%
Time of Reading: 24 HOURS	100	100	100	100	100	100
48 HOURS	100	100	100	100	100	100
Test termination	100	100	100	100	100	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)= 16 % effluent

b) NOEC reproduction (parameter TPP3B)= 16 % effluent

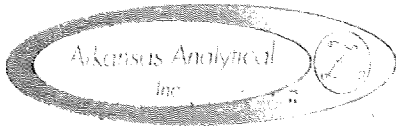
c) Coefficient of variation (parameter TQP3B)= 30.8 %

6. Enter Whole Effluent Toxicity: 16 %

APPENDIX A

Chain of Custody Forms

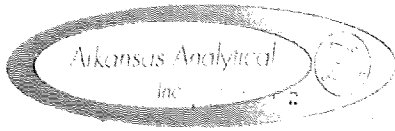




11701 Interstate 30, Bldg. 1, Ste. 115  
 Little Rock, AR 72209  
 PHONE: 501-455-3233  
 FAX: 501-455-6118

# CHAIN OF CUSTODY RECORD

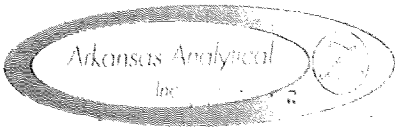
CLIENT INFORMATION		BILLING INFORMATION		Project Description		Turnaround Time		Preservation Codes:											
Conway Corporation		Conway Corporation		Chronic Toxicity		1 Day (100%)		1. Cool, 4 Degrees Centigrade				4. Thiosulfate for Dechlorination							
800 South Harkrider		P.O. Box 99				2 Day (50%)		2. Sulfuric Acid (H <sub>2</sub> SO <sub>4</sub> ), pH < 2				5. Hydrochloric Acid (HCl)							
Conway, AR 72032		Conway, AR 72032		Reporting Information		3 Day (25%)		3. Nitric Acid (HNO <sub>3</sub> ), pH < 2				6. Sodium Hydroxide (NaOH), pH > 12							
Attn: Bill Fulmer				Telephone: 501-733-4495		Email: Bill.Fulmer@conwaycorp.com		TEST PARAMETERS								Bottle Type Code			
				Email: trey.liebtong@conwaycorp.com		Preservative Code: 1										G = Glass, P = Plastic			
						Bottle Type: P										V = Septum, A = Amber			
<i>Bill Fulmer</i> Sampler(s) Signature				<i>Bill Fulmer</i> Sampler(s) Printed				Chronic Toxicity										Arkansas Analytical Work Order Number:  K1504-008A	
Field Number	SAMPLE COLLECTION		Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION												
	4-26-2015	8AM-9AM		X	2	Water	Tupelo Bayou Effluent		X										
1. Relinquished by: (Signature)		Date/Time		2. Received by: (Signature)		SAMPLE COMPLIANCE CHECKLIST						REMARKS / SAMPLE COMMENTS							
<i>Bill Fulmer</i>		4-27-15 9:30AM				1. CUSTODY SEALS: <input checked="" type="checkbox"/> Yes ___ No 2. CONTAINERS CORRECT: <input type="checkbox"/> Yes ___ No 3. COC/LABELS AGREE: <input type="checkbox"/> Yes ___ No 4. RECEIVED ON ICE: <input type="checkbox"/> Yes ___ No 5. TEMPERATURE ON RECEIPT: 1°C 6. TEMPERATURE GUN ID: HHT #2													
3. Relinquished by: (Signature)		Date/Time		4. Received by lab: (Signature)															
				<i>Sydney James</i>															



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# CHAIN OF CUSTODY RECORD

CLIENT INFORMATION		BILLING INFORMATION		Project Description		Turnaround Time		Preservation Codes:															
Conway Corporation		Conway Corporation		Chronic Toxicity		1 Day (100%)		1. Cool, 4 Degrees Centigrade				4. Thiosulfate for Dechlorination											
800 South Harkrider		P.O. Box 99				2 Day (50%)		2. Sulfuric Acid (H <sub>2</sub> SO <sub>4</sub> ), pH < 2				5. Hydrochloric Acid(HCl)											
Conway, AR 72032		Conway, AR 72032		Reporting Information		3 Day (25%)		3. Nitric Acid (HNO <sub>3</sub> ), pH < 2				6. Sodium Hydroxide (NaOH), pH > 12											
Attn: Bill Fulmer				Telephone: 501-733-4495		Email: Bill.Fulmer@conwaycorp.com		Preservative Code: 1		TEST PARAMETERS								Bottle Type Code:					
				Email: trey.lieblong@conwaycorp.com		Bottle Type: P												G = Glass; P = Plastic V = Septum; A = Amber					
<i>Bill Fulmer</i> Sampler(s) Signature				<i>Bill Fulmer</i> Sampler(s) Printed								Chronic Toxicity										Arkansas Analytical Work Order Number:	
Field Number	SAMPLE COLLECTION		Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION		Chronic Toxicity									Arkansas Analytical Work Order Number:					
	Date/s	Time/s																					
	4-29-15	8AM-8AM		X	1	Water	Tupper Boyer 5-PHASE		X									K1504-008B					
1. Relinquished by: (Signature)			Date/Time		2. Received by: (Signature)			SAFETY CONDITIONS ON RECEIPT				REMARKS / SAMPLE COMMENTS											
<i>Bill Fulmer</i>			4-29-15 9:09AM					1. CUSTODY SEALS: <input checked="" type="checkbox"/> Yes ___ No															
3. Relinquished by: (Signature)			Date/Time		4. Received by lab: (Signature)			2. CONTAINERS CORRECT: <input checked="" type="checkbox"/> Yes ___ No															
					<i>Amanda Fabrik</i>			3. COC/LABELS AGREE: <input checked="" type="checkbox"/> Yes ___ No															
								4. RECEIVED ON ICE: ___ Yes ___ No															
								5. TEMPERATURE ON RECEIPT: 2°C															
								6. TEMPERATURE GUN ID: HHT #2															



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# CHAIN OF CUSTODY RECORD

CLIENT INFORMATION		BILLING INFORMATION		Project Description		Turnaround Time		Preservation Codes:											
Conway Corporation		Conway Corporation		Chronic Toxicity		1 Day (100%)		1. Cool, 4 Degrees Centigrade				4. Thiosulfate for Dechlorination							
800 South Harkrider		P.O. Box 99				2 Day (50%)		2. Sulfuric Acid (H <sub>2</sub> SO <sub>4</sub> ), pH < 2				5. Hydrochloric Acid (HCl)							
Conway, AR 72032		Conway, AR 72032		Reporting Information		3 Day (25%)		3. Nitric Acid (HNO <sub>3</sub> ), pH < 2				6. Sodium Hydroxide (NaOH), pH > 12							
Attn: Bill Fulmer		Telephone: 501-733-4495		Email: Bill.Fulmer@conwaycorp.com		Preservative Code: 1		TEST PARAMETERS								Bottle Type Code			
		Email: trey.ileblong@conwaycorp.com				Bottle Type: P										G = Glass; P = Plastic V = Septum; A = Amber			
 Sampler(s) Signature				 Sampler(s) Printed				Chronic Toxicity										Arkansas Analytical Work Order Number: K1504-008C	
Field Number	SAMPLE COLLECTION		Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION		Chronic Toxicity										
	4-30-5-1-15	8 AM-8 AM		X	1	Water	Tupalo Bay on Effluent		X										
1. Relinquished by: (Signature)		Date/Time		2. Received by: (Signature)		SAMPLE CONDITION ON RECEIPT (SEE LAB)		REMARKS / SAMPLE COMMENTS											
		5-1-15 9:17 AM				1. CUSTODY SEALS: <input checked="" type="checkbox"/> Yes ___ No													
3. Relinquished by: (Signature)		Date/Time		4. Received by lab: (Signature)		2. CONTAINERS CORRECT: <input type="checkbox"/> Yes ___ No													
						3. COC/LABELS AGREE: <input type="checkbox"/> Yes ___ No													
						4. RECEIVED ON ICE: <input type="checkbox"/> Yes ___ No													
						5. TEMPERATURE ON RECEIPT: PC													
						6. TEMPERATURE GUN ID: HHT #2													

APPENDIX B

Effluent and Dilution Water Data



**Biomonitoring Quality Control Benchsheet**

Analyst	RH	RH	RH		RP		RH	RH
Date	4-27-15	4-23-15	4-24-15		4-23-15		4-27-15	4-28-15
pH Meter ID	AR60							
LIN pH 4 Buffer	140167							
LIN pH 7 Buffer	140173							
LIN pH 10 Buffer	140168							
Slope (>90%)	94.7%	94.5%	92.3%		104			90.3%

Dissolved O <sub>2</sub> Meter	0.01305							
Meter Reading	8.33	8.45	8.43		8.46			8.56
Temp.	24	23	23		23			23
Chart Value at Temp.	8.418	8.578	8.578		8.578			8.578
Difference	0.088	0.128	0.148		0.14			0.018
Acceptance Criteria	<0.2mg/L	<0.2mg/L	<0.2mg/L	<0.2mg/L	<0.2mg/L	<0.2mg/L	<0.2mg/L	<0.2mg/L

Temp. Meter ID	AR60							
Meter Reading	23	23	23		23			23
Thermometer Reading	23	22	22		23			22
Thermometer ID	PB							
Acceptance Criteria	±1°C	±1°C	±1°C	±1°C	±1°C	±1°C	±1°C	±1°C

Alkalinity								
Blank (<5mg/L)		0					0	
STD Result		98					104	
T.V. / %REC		100/98%					100/104%	
Acceptance Criteria		93.5-108.5% Recovery						

Hardness								
Blank (<2mg/L)		0					0	
STD. Result		92					98	
T.V. / %REC		100/92%					100/98%	
Acceptance Criteria		90.0-105.5% Recovery						

Conductivity Meter ID	Com 02							
Blank (<1)		0					0	
STD Result		1440					1444	
T.V. / %REC		1412/102%					1412/1444 RH	
Acceptance Criteria		99.2-104.0% Recovery						

Chlorine Meter ID	DR 820							
Blank (<0.05mg/L)		0					0	
STD Result		0.21					0.21	
T.V. / % REC		0.20/105%					0.20/105%	
Acceptance Criteria		100.0-120% Recovery						

Revision 0  
Effective Date 01APR15



Biomonitoring Quality Control Benchsheet

Analyst	RH	RH	RH	HF	HF	RH	RH	
Date	4-29-15	4-30-15	5-1-15	5-2-15	5-3-15	5-4-15	5-5-15	
pH Meter ID	AR60							
LIN pH 4 Buffer	14011.7							
LIN pH 7 Buffer	4011.73							
LIN pH 10 Buffer	14011.68							
Slope (>90%)	96.9%	100.3%	93.2%	95%	90.4%	91.1%	90.5%	

Dissolved O <sub>2</sub> Meter	D.O. 1305							
Meter Reading	8.33	8.19	8.28	8.20	8.38	8.68	8.95	
Temp.	24	25	25	24	24	22	24	
Chart Value at Temp.	8.418	8.263	8.263	8.263	8.263	8.743	8.918	
Difference	0.088	0.073	0.023	0.063	0.123	0.063	0.048	
Acceptance Criteria	<0.2mg/L	<0.2mg/L	<0.2mg/L	<0.2mg/L	<0.2mg/L	<0.2mg/L	<0.2mg/L	<0.2mg/L

Temp. Meter ID	AR60 24							
Meter Reading	24	24	25	25	24	23	24	
Thermometer Reading	23	24	24	24	24	22	23	
Thermometer ID	PB	PB	PB	PB	PB	PB	PB	
Acceptance Criteria	±1°C	±1°C	±1°C	±1°C	±1°C	±1°C	±1°C	±1°C

Alkalinity								
Blank (<5mg/L)							0	
STD Result							100	
T.V. / %REC							100/100%	
Acceptance Criteria	93.5-108.5% Recovery							

Hardness								
Blank (<2mg/L)							0	
STD. Result							99	
T.V. / %REC							100/99%	
Acceptance Criteria	90.0-105.5% Recovery							

Conductivity Meter ID	Con 02							
Blank (<1)								
STD Result							1421	
T.V. / %REC							142/142%	
Acceptance Criteria	99.2-104.0% Recovery							

Chlorine Meter ID	OR 820							
Blank (<0.05mg/L)							0	
STD Result							0.21	
T.V. / % REC							0.20/105%	
Acceptance Criteria	100.0-120% Recovery							

Revision 0  
Effective Date 01APR15





APPENDIX C

Fathead minnow raw data and statistics



*Pimephales promelas*

**FATHEAD MINNOW**

**SURVIVAL DATA FOR LARVAL SURVIVAL AND GROWTH TEST (CHRONIC)**

LAB #: K1504008			TEST START		DATE	4/28/15	TIME	1340				
CLIENT: Conway - Tupelo Bayou			TEST END		DATE	5/5/15	TIME	1115				
ANALYST: RH / HF			AGE AND SOURCE OF MINNOWS		< 24 hrs old, Aquatox							
DAY(NUMBER SURVIVING)												
SURVIVAL												
	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV
CONTROL	A	10	10	10	10	10	10	10	10	100%	98.0%	4.56
	B	10	10	10	10	10	10	10	10	100%		
	C	10	10	10	10	10	10	10	10	100%		
	D	10	10	10	10	9	9	9	9	90%		
	E	10	10	10	10	10	10	10	10	100%		
	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	10	10	10	10	10	10	10	10	100%	100.0%	
	B	10	10	10	10	10	10	10	10	100%		
	C	10	10	10	10	10	10	10	10	100%		
	D	10	10	10	10	10	10	10	10	100%		
	E	10	10	10	10	10	10	10	10	100%		
	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	10	10	10	10	10	10	10	10	100%	100.0%	
	B	10	10	10	10	10	10	10	10	100%		
	C	10	10	10	10	10	10	10	10	100%		
	D	10	10	10	10	10	10	10	10	100%		
	E	10	10	10	10	10	10	10	10	100%		
	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	10	10	10	10	10	10	10	10	100%	96.0%	
	B	10	10	10	10	10	10	10	10	100%		
	C	10	9	9	9	10	9	9	9	90%		
	D	10	10	10	10	10	10	10	10	100%		
	E	10	10	10	9	9	9	9	9	90%		
	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	10	10	10	10	10	10	10	10	100%	100.0%	0.00
	B	10	10	10	10	10	10	10	10	100%		
	C	10	10	10	10	10	10	10	10	100%		
	D	10	10	10	10	10	10	10	10	100%		
	E	10	10	10	10	10	10	10	10	100%		
	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	10	10	10	10	10	10	10	10	100%	94.0%	
	B	10	10	10	10	10	10	10	10	100%		
	C	10	10	9	9	9	9	9	9	90%		
	D	10	10	10	10	10	10	9	8	80%		
	E	10	10	10	10	10	10	10	10	100%		
ANALYST:		RH	RH	RH	RH	HF	HF	RH	RH			
DATE:		4/28/15	4/29/15	4/30/15	5/1/15	5/2/15	5/3/15	5/4/15	5/5/15			
TIME:		1340	1430	1330	1000	1715	1700	1330	1115			

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

REMARKS:

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AA# K1504008,FATHEAD MINNOW SURV.,CHRONIC, 4-28-15  
File: C:\COPYTO~1\TOXSTAT\FHSURV~1. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

-----  
D = 0.129

W = 0.839

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# K1504008,FATHEAD MINNOW SURV.,CHRONIC, 4-28-15  
File: C:\COPYTO~1\TOXSTAT\FHSURV~1. Transform: ARC SINE(SQUARE ROOT(Y))

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

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

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

TITLE: AA# K1504008, FATHEAD MINNOW SURV., CHRONIC, 4-28-15  
 FILE: C:\COPYTO~1\TOXSTAT\FHSURV~1.  
 TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	1.0000	1.4120
1	CONTROL	2	1.0000	1.4120
1	CONTROL	3	1.0000	1.4120
1	CONTROL	4	0.9000	1.2490
1	CONTROL	5	1.0000	1.4120
2	5 % EFFLUENT	1	1.0000	1.4120
2	5 % EFFLUENT	2	1.0000	1.4120
2	5 % EFFLUENT	3	1.0000	1.4120
2	5 % EFFLUENT	4	1.0000	1.4120
2	5 % EFFLUENT	5	1.0000	1.4120
3	7 % EFFLUENT	1	1.0000	1.4120
3	7 % EFFLUENT	2	1.0000	1.4120
3	7 % EFFLUENT	3	1.0000	1.4120
3	7 % EFFLUENT	4	1.0000	1.4120
3	7 % EFFLUENT	5	1.0000	1.4120
4	9 % EFFLUENT	1	1.0000	1.4120
4	9 % EFFLUENT	2	1.0000	1.4120
4	9 % EFFLUENT	3	0.9000	1.2490
4	9 % EFFLUENT	4	1.0000	1.4120
4	9 % EFFLUENT	5	0.9000	1.2490
5	12 % EFFLUENT	1	1.0000	1.4120
5	12 % EFFLUENT	2	1.0000	1.4120
5	12 % EFFLUENT	3	1.0000	1.4120
5	12 % EFFLUENT	4	1.0000	1.4120
5	12 % EFFLUENT	5	1.0000	1.4120
6	16 % EFFLUENT	1	1.0000	1.4120
6	16 % EFFLUENT	2	1.0000	1.4120
6	16 % EFFLUENT	3	0.9000	1.2490
6	16 % EFFLUENT	4	0.8000	1.1071
6	16 % EFFLUENT	5	1.0000	1.4120

AA# K1504008, FATHEAD MINNOW SURV., CHRONIC, 4-28-15  
 File: C:\COPYTO~1\TOXSTAT\FHSURV~1. Transform: ARC SINE(SQUARE ROOT(Y))

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	1.379				
2	5 % EFFLUENT	1.412	30.00	16.00	5.00	
3	7 % EFFLUENT	1.412	30.00	16.00	5.00	
4	9 % EFFLUENT	1.347	25.00	16.00	5.00	
5	12 % EFFLUENT	1.412	30.00	16.00	5.00	
6	16 % EFFLUENT	1.318	24.50	16.00	5.00	

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

*Pimephales promelas*

**FATHEAD MINNOW**

TEST 1000.0

**WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST**

LAB # / #s:		K1504008				TEST DATES (BEGIN / END):		4/28/15 - 5/5/15
CLIENT:		Conway- Tupelo Bayou				WEIGHING DATE / TIME:		5/6/2015 1000
ANALYSTS:		RH				DRYING TEMP (DEGREES C):		60
SAMPLE ID:						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	1.00699	1.00108	0.00591	10	0.591	AVG DRY	
SS	B	1.01755	1.01017	0.00738	10	0.738	WEIGHT (mg)	
	C	0.99617	0.98915	0.00702	10	0.702	0.669	
	D	1.00802	1.00128	0.00674	10	0.674	CV	
	E	0.98874	0.98232	0.00642	10	0.642	8.41	
CONC:	A	0.98612	0.97987	0.00625	10	0.625	AVG DRY	
5%	B	1.01923	1.01184	0.00739	10	0.739	WEIGHT (mg)	
	C	1.02045	1.01339	0.00706	10	0.706	0.698	
	D	1.00712	0.99996	0.00716	10	0.716	CV	
	E	1.01922	1.01216	0.00706	10	0.706		
CONC:	A	1.00494	0.99883	0.00611	10	0.611	AVG DRY	
7%	B	1.01685	1.01018	0.00667	10	0.667	WEIGHT (mg)	
	C	1.02285	1.01642	0.00643	10	0.643	0.686	
	D	1.03192	1.02459	0.00733	10	0.733	CV	
	E	1.02400	1.01622	0.00778	10	0.778		
CONC:	A	1.05641	1.04933	0.00708	10	0.708	AVG DRY	
9%	B	1.04700	1.03900	0.00800	10	0.800	WEIGHT (mg)	
	C	1.02877	1.02288	0.00589	10	0.589	0.689	
	D	1.00963	1.00265	0.00698	10	0.698	CV	
	E	1.00806	1.00154	0.00652	10	0.652		
CONC:	A	0.99570	0.98871	0.00699	10	0.699	AVG DRY	
12%	B	1.01401	1.00741	0.00660	10	0.660	WEIGHT (mg)	
	C	1.01822	1.01101	0.00721	10	0.721	0.691	
	D	0.99476	0.98766	0.00710	10	0.710	CV	
	E	1.02651	1.01988	0.00663	10	0.663	4.01	
CONC:	A	1.03184	1.02516	0.00668	10	0.668	AVG DRY	
16%	B	1.02453	1.01764	0.00689	10	0.689	WEIGHT (mg)	
	C	1.02333	1.01734	0.00599	10	0.599	0.672	
	D	1.02742	1.02126	0.00616	10	0.616	CV	
	E	1.01776	1.00990	0.00786	10	0.786		

CV = (STANDARD DEVIATION/MEAN)\*100

REMARKS:

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AA# K1504008, FATHEAD MINNOW GROWTH CHRONIC, 4-28-15  
File: C:\COPYTO~1\TOXSTAT\FHGROWTH. Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

-----  
D = 0.088

W = 0.966

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# K1504008, FATHEAD MINNOW GROWTH CHRONIC, 4-28-15  
File: C:\COPYTO~1\TOXSTAT\FHGROWTH. Transform: NO TRANSFORMATION

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

Calculated B1 statistic = 4.50

-----  
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# K1504008, FATHEAD MINNOW GROWTH CHRONIC, 4-28-15  
 FILE: C:\COPYTO~1\TOXSTAT\FHGROWTH.  
 TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.5910	0.5910
1	CONTROL	2	0.7380	0.7380
1	CONTROL	3	0.7020	0.7020
1	CONTROL	4	0.6740	0.6740
1	CONTROL	5	0.6420	0.6420
2	5 % EFFLUENT	1	0.6250	0.6250
2	5 % EFFLUENT	2	0.7390	0.7390
2	5 % EFFLUENT	3	0.7060	0.7060
2	5 % EFFLUENT	4	0.7160	0.7160
2	5 % EFFLUENT	5	0.7060	0.7060
3	7 % EFFLUENT	1	0.6110	0.6110
3	7 % EFFLUENT	2	0.6670	0.6670
3	7 % EFFLUENT	3	0.6430	0.6430
3	7 % EFFLUENT	4	0.7330	0.7330
3	7 % EFFLUENT	5	0.7780	0.7780
4	9 % EFFLUENT	1	0.7080	0.7080
4	9 % EFFLUENT	2	0.8000	0.8000
4	9 % EFFLUENT	3	0.5890	0.5890
4	9 % EFFLUENT	4	0.6980	0.6980
4	9 % EFFLUENT	5	0.6520	0.6520
5	12 % EFFLUENT	1	0.6990	0.6990
5	12 % EFFLUENT	2	0.6600	0.6600
5	12 % EFFLUENT	3	0.7210	0.7210
5	12 % EFFLUENT	4	0.7100	0.7100
5	12 % EFFLUENT	5	0.6630	0.6630
6	16 % EFFLUENT	1	0.6680	0.6680
6	16 % EFFLUENT	2	0.6890	0.6890
6	16 % EFFLUENT	3	0.5990	0.5990
6	16 % EFFLUENT	4	0.6160	0.6160
6	16 % EFFLUENT	5	0.7860	0.7860

AA# K1504008, FATHEAD MINNOW GROWTH CHRONIC, 4-28-15  
 File: C:\COPYTO~1\TOXSTAT\FHGROWTH. Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.003	0.001	0.179
Within (Error)	24	0.088	0.004	
Total	29	0.091		

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

AA# K1504008, FATHEAD MINNOW GROWTH CHRONIC, 4-28-15

File: C:\COPYTO~1\TOXSTAT\FHGROWTH.

Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 1 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	0.669	0.669		
2	5 % EFFLUENT	0.698	0.698	-0.759	
3	7 % EFFLUENT	0.686	0.686	-0.445	
4	9 % EFFLUENT	0.689	0.689	-0.523	
5	12 % EFFLUENT	0.691	0.691	-0.555	
6	16 % EFFLUENT	0.672	0.672	-0.058	

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

AA# K1504008, FATHEAD MINNOW GROWTH CHRONIC, 4-28-15

File: C:\COPYTO~1\TOXSTAT\FHGROWTH.

Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 2 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	5			
2	5 % EFFLUENT	5	0.090	13.5	-0.029
3	7 % EFFLUENT	5	0.090	13.5	-0.017
4	9 % EFFLUENT	5	0.090	13.5	-0.020
5	12 % EFFLUENT	5	0.090	13.5	-0.021
6	16 % EFFLUENT	5	0.090	13.5	-0.002

APPENDIX D

*Ceriodaphnia dubia* Raw Data and Statistics

**SURVIVAL AND REPRODUCTION TEST**

*Ceriodaphnia dubia*

Discharger: Conway - Tupelo Bayou											Lab Number/s				
Location: Outfall 001											K1504008				
Date Sample Collected: 4 - 27/29/, 5/1/15															
Conc	1	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst
%	Day	A	B	C	D	E	F	G	H	I	J				
SS	1	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	2	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	3	1	0	0	0	0	0	0	0	0	1	2	10	0.2	RH
	4	6	2	3	1	0	4	3	0	1	4	24	10	2.4	RH
	5	6	4	8	6	5	2	0	6	7	8	52	10	5.2	RH
	6	1	0	7	4	7	7	11	2	3	7	49	10	4.9	RH
	7	2	7	4	8	5	2	0	0	1	0	29	10	2.9	RH
	8											0			
Total		16	13	22	19	17	15	14	8	12	20	156		Avg. = 15.6	
														C.V. = 26.6	
Conc	2	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst
%	Day	A	B	C	D	E	F	G	H	I	J				
5%	1	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	2	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	3	0	0	0	0	2	0	0	0	0	0	2	10	0.2	RH
	4	1	5	4	0	6	2	3	1	0	7	29	10	2.9	RH
	5	4	2	8	3	0	0	2	9	8	7	43	10	4.3	RH
	6	3	5	2	9	7	8	7	4	0	0	45	10	4.5	RH
	7	5	1	0	7	6	8	0	3	1	4	35	10	3.5	RH
	8											0			
Total		13	13	14	19	21	18	12	17	9	18	154		Avg. = 15.4	
														C.V. = 24.3	
Conc	3	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst
%	Day	A	B	C	D	E	F	G	H	I	J				
7%	1	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	2	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	3	0	0	0	0	1	0	0	3	0	0	4	10	0.4	RH
	4	6	6	3	5	1	0	3	3	0	0	27	10	2.7	RH
	5	4	2	1	6	8	4	0	0	2	7	34	10	3.4	RH
	6	2	2	1	2	7	7	0	0	8	2	31	10	3.1	RH
	7	6	1	0	4	2	1	9	0	6	0	29	10	2.9	RH
	8											0			
Total		18	11	5	17	19	12	12	6	16	9	125		Avg. = 12.5	
														C.V. = 39.4	

Analyst: RH															
Test Start - Date/Time: 4-28-15, 0945															
Test Stop - Date/Time: 5-5-15, 1000															
Conc	4	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst
%	Day	A	B	C	D	E	F	G	H	I	J				
9%	1	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	2	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	3	0	0	0	0	0	0	0	0	1	0	1	10	0.1	RH
	4	4	0	5	1	0	0	0	6	3	4	23	10	2.3	RH
	5	4	1	2	3	3	4	6	2	2	0	27	10	2.7	RH
	6	8	6	0	8	10	3	0	0	2	9	46	10	4.6	RH
	7	4	8	3	6	7	4	5	3	0	7	47	10	4.7	RH
	8											0			
Total		20	15	10	18	20	11	11	11	8	20	144		Avg. = 14.4	
														C.V. = 32.9	
Conc	5	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst
%	Day	A	B	C	D	E	F	G	H	I	J				
12%	1	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	2	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	3	0	0	0	1	0	0	0	0	0	0	1	10	0.1	RH
	4	3	3	6	2	1	1	0	5	0	3	24	10	2.4	RH
	5	6	1	4	9	5	8	1	8	7	3	52	10	5.2	RH
	6	0	9	1	6	0	8	10	8	0	5	47	10	4.7	RH
	7	0	5	7	1	4	0	6	4	7	0	34	10	3.4	RH
	8											0			
Total		9	18	18	19	10	17	17	25	14	11	158		Avg. = 15.8	
														C.V. = 30.8	
Conc	6	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst
%	Day	A	B	C	D	E	F	G	H	I	J				
16%	1	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	2	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	3	0	0	0	0	0	0	0	1	1	0	2	10	0.2	RH
	4	4	1	1	0	0	2	0	0	5	3	16	10	1.6	RH
	5	6	3	8	5	6	8	5	8	0	7	56	10	5.6	RH
	6	7	0	7	2	4	6	5	9	0	0	40	10	4.0	RH
	7	0	5	0	8	7	6	3	4	12	0	45	10	4.5	RH
	8											0			
Total		17	9	16	15	17	22	13	22	18	10	159		Avg. = 15.9	
														C.V. = 27.6	

AA # K1504008, C.DUBIA CHRONIC, REPRODUCCION, 4-28-15  
File: C:\COPYTO~1\TOXSTAT\C.DUB 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 # K1504008, C.DUBIA CHRONIC, REPRODUCCION, 4-28-15  
File: C:\COPYTO~1\TOXSTAT\C.DUB Transform: NO TRANSFORMATION

-----  
Bartlett's test for homogeneity of variance  
Calculated B1 statistic = 0.95

-----  
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
5	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
7	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
9	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
12	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
16	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
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GROUP	IDENTIFICATION	EXPOSED	DEAD	(P=.05)
	CONTROL	10	0	
1	5	10	0	
2	7	10	0	
3	9	10	0	
4	12	10	0	
5	16	10	0	

TITLE: AA # K1504008, C.DUBIA CHRONIC, REPRODUCCION, 4-28-15  
FILE: C:\COPYTO~1\TOXSTAT\C.DUB  
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	16.0000	16.0000
1	CONTROL	2	13.0000	13.0000
1	CONTROL	3	22.0000	22.0000
1	CONTROL	4	19.0000	19.0000
1	CONTROL	5	17.0000	17.0000
1	CONTROL	6	15.0000	15.0000
1	CONTROL	7	14.0000	14.0000
1	CONTROL	8	8.0000	8.0000
1	CONTROL	9	12.0000	12.0000
1	CONTROL	10	20.0000	20.0000
2	5 % EFFLUENT	1	13.0000	13.0000
2	5 % EFFLUENT	2	13.0000	13.0000
2	5 % EFFLUENT	3	14.0000	14.0000
2	5 % EFFLUENT	4	19.0000	19.0000
2	5 % EFFLUENT	5	21.0000	21.0000
2	5 % EFFLUENT	6	18.0000	18.0000
2	5 % EFFLUENT	7	12.0000	12.0000
2	5 % EFFLUENT	8	17.0000	17.0000
2	5 % EFFLUENT	9	9.0000	9.0000
2	5 % EFFLUENT	10	18.0000	18.0000
3	7 % EFFLUENT	1	18.0000	18.0000
3	7 % EFFLUENT	2	11.0000	11.0000
3	7 % EFFLUENT	3	5.0000	5.0000
3	7 % EFFLUENT	4	17.0000	17.0000
3	7 % EFFLUENT	5	19.0000	19.0000
3	7 % EFFLUENT	6	12.0000	12.0000
3	7 % EFFLUENT	7	12.0000	12.0000
3	7 % EFFLUENT	8	6.0000	6.0000
3	7 % EFFLUENT	9	16.0000	16.0000
3	7 % EFFLUENT	10	9.0000	9.0000
4	9 % EFFLUENT	1	20.0000	20.0000
4	9 % EFFLUENT	2	15.0000	15.0000
4	9 % EFFLUENT	3	10.0000	10.0000
4	9 % EFFLUENT	4	18.0000	18.0000
4	9 % EFFLUENT	5	20.0000	20.0000
4	9 % EFFLUENT	6	11.0000	11.0000
4	9 % EFFLUENT	7	11.0000	11.0000
4	9 % EFFLUENT	8	11.0000	11.0000

4	9	% EFFLUENT	9	8.0000	8.0000
4	9	% EFFLUENT	10	20.0000	20.0000
5	12	% EFFLUENT	1	9.0000	9.0000
5	12	% EFFLUENT	2	18.0000	18.0000
5	12	% EFFLUENT	3	18.0000	18.0000
5	12	% EFFLUENT	4	19.0000	19.0000
5	12	% EFFLUENT	5	10.0000	10.0000
5	12	% EFFLUENT	6	17.0000	17.0000
5	12	% EFFLUENT	7	17.0000	17.0000
5	12	% EFFLUENT	8	25.0000	25.0000
5	12	% EFFLUENT	9	14.0000	14.0000
5	12	% EFFLUENT	10	11.0000	11.0000
6	16	% EFFLUENT	1	17.0000	17.0000
6	16	% EFFLUENT	2	9.0000	9.0000
6	16	% EFFLUENT	3	16.0000	16.0000
6	16	% EFFLUENT	4	15.0000	15.0000
6	16	% EFFLUENT	5	17.0000	17.0000
6	16	% EFFLUENT	6	22.0000	22.0000
6	16	% EFFLUENT	7	13.0000	13.0000
6	16	% EFFLUENT	8	22.0000	22.0000
6	16	% EFFLUENT	9	18.0000	18.0000
6	16	% EFFLUENT	10	10.0000	10.0000

AA # K1504008, C.DUBIA CHRONIC, REPRODUCCION, 4-28-15  
 File: C:\COPYTO~1\TOXSTAT\C.DUB Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	85.533	17.107	0.849
Within (Error)	54	1088.200	20.152	
Total	59	1173.733		

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

AA # K1504008, C.DUBIA CHRONIC, REPRODUCCION, 4-28-15  
 File: C:\COPYTO~1\TOXSTAT\C.DUB 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	15.600	15.600		
2	5 % EFFLUENT	15.400	15.400	0.100	
3	7 % EFFLUENT	12.500	12.500	1.544	
4	9 % EFFLUENT	14.400	14.400	0.598	
5	12 % EFFLUENT	15.800	15.800	-0.100	
6	16 % EFFLUENT	15.900	15.900	-0.149	

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

AA # K1504008, C.DUBIA CHRONIC, REPRODUCTION, 4-28-15

File: C:\COPYTO~1\TOXSTAT\C.DUB 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	5 % EFFLUENT	10	4.638	29.7	0.200
3	7 % EFFLUENT	10	4.638	29.7	3.100
4	9 % EFFLUENT	10	4.638	29.7	1.200
5	12 % EFFLUENT	10	4.638	29.7	-0.200
6	16 % EFFLUENT	10	4.638	29.7	-0.300

## APPENDIX E

### Organism History

Organism History

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**AQUATOX, INC.**  
416 TWIN POINTS ROAD  
HOT SPRINGS, ARKANSAS 71913  
501-520-0560

**TEST ORGANISM HISTORY**

DATE SHIPPED 4/28/15 CLIENT ARV ANALYTICAL

Purchase Order #: \_\_\_\_\_

SPECIES: Pimephales promelas

Quantity Shipped: 300<sup>+</sup> EST

Age: HATCHED 4/27/15 15-1600

Brood Stock Source: Anderson Farms, AR

Culture Water: Groundwater

Hardness (Mg/l CaCO<sub>3</sub>): 7160

Dissolved Oxygen (Mg/l): 8.5

Temperature (°C): 25.3<sup>0C</sup>

Feeding: ARTEMIA

Comments: \_\_\_\_\_

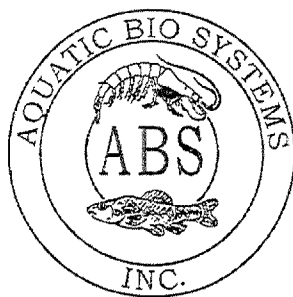
\_\_\_\_\_

\_\_\_\_\_

Shipped Via: Federal Express UPS Overnight Shuttle

Packaged By: \_\_\_\_\_

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: 11/25/2013

SPECIES: Ceriodaphnia dubia

AGE: > 3 day

LIFE STAGE: Adult

HATCH DATE: Variable

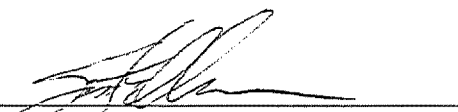
BEGAN FEEDING: Immediately

FOOD: YTC, Selenastrum sp.

### Water Chemistry Record:

	Current	Range
TEMPERATURE:	<u>22°C</u>	<u>22-26°C</u>
SALINITY/CONDUCTIVITY:	<u>--</u>	<u>--</u>
TOTAL HARDNESS (as CaCO <sub>3</sub> ):	<u>94 mg/l</u>	<u>76-130 mg/l</u>
TOTAL ALKALINITY (as CaCO <sub>3</sub> ):	<u>65 mg/l</u>	<u>65-100 mg/l</u>
pH:	<u>7.98</u>	<u>7.50-8.20</u>

### Comments:

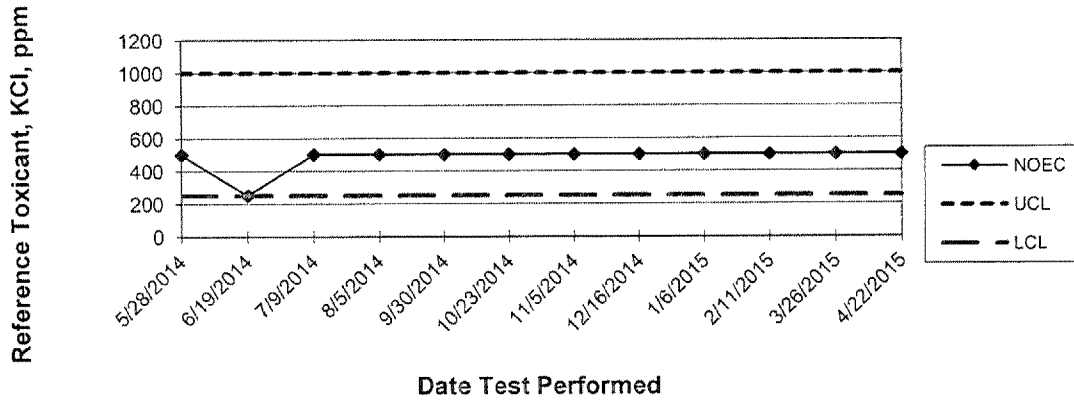
  
\_\_\_\_\_  
Facility Supervisor

APPENDIX F

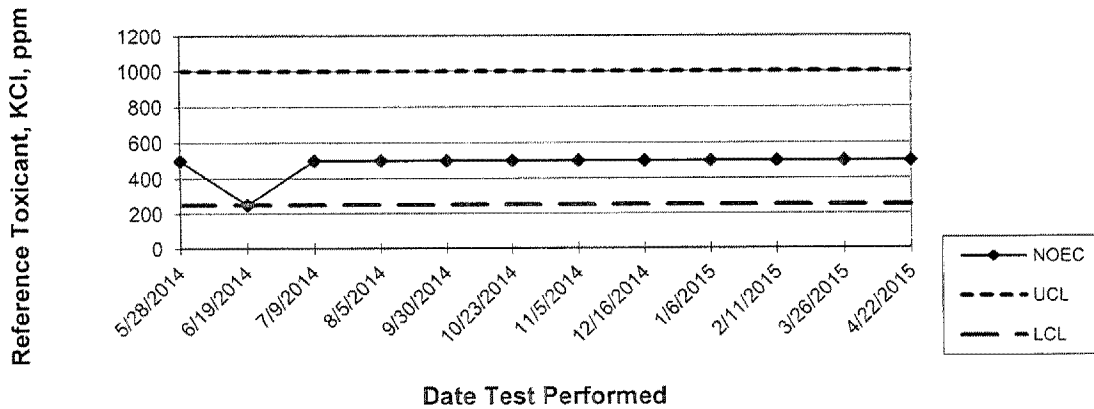
Quality Assurance Charts



**ARKANSAS ANALYTICAL, INC.**  
**FATHEAD MINNOW SURVIVAL 7 Day**  
**QUALITY ASSURANCE**

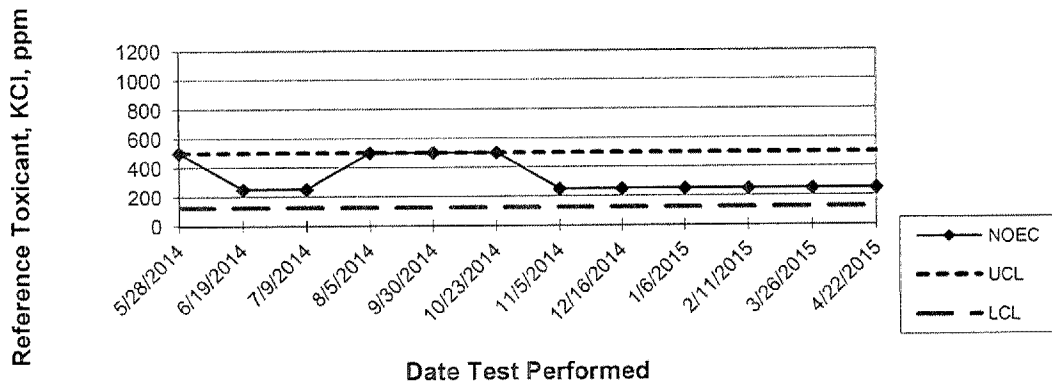


**ARKANSAS ANALYTICAL, INC.**  
**FATHEAD MINNOW GROWTH 7 Day**  
**QUALITY ASSURANCE**





**ARKANSAS ANALYTICAL, INC.**  
**CERIODAPHNIA DUBIA SURVIVAL**  
**QUALITY ASSURANCE**



**ARKANSAS ANALYTICAL, INC.**  
**CERIODAPHNIA DUBIA REPRODUCTION**  
**QUALITY ASSURANCE**

