

Arkansas Analytical, Inc.

Toxicity Test Results

Conway Corporation: Tupelo Bayou
NPDES Permit Number: AR0051951
Fourth quarter 2014
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 K1412003

Thursday, December 18, 2014

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 fourth quarter of 2014.

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:	12-7-14, 0700	12-8-14, 0700
Sample #2:	12-9-14, 0700	12-10-14, 0700
Sample #3:	12-11-14, 0700	12-12-14, 0700

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:	12-8-14, 1112	1
Sample #2:	12-10-14, 0948	3
Sample #3:	12-12-14, 1404	2

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	32.2%	X	

TEST ACCEPTANCE CRITERIA for *Pimephales promelas*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	96%	X	
The percent coefficient of variation between replicates must be 40% or less for survival	9.32%	X	
Minimum of 0.25 mg average dry weight of surviving controls	0.618	X	
The percent coefficient of variation between replicates must be 40% or less for growth	4.40%	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> 11/5/14 – 11/12/14		<i>Pimephales promelas</i> 11/5/14 – 11/12/14	
NOEC Survival:	500 ppm KCl	NOEC Survival:	500 ppm KCl
LOEC Survival:	1000 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)	16.5	%CV survival (critical dilution)	0%
%CV Reproduction (critical dilution)	26.2%	Mean dry weight (critical dilution) in milligrams	0.771
		%CV growth (critical dilution)	6.68%
PMSD Reproduction	30.1%	PMSD Growth	12.8%

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 / Christopher Turney / Hallie Freyaldenhoven

Reviewed 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:	12-7-14, 0700	12-8-14, 0700
Sample #2:	12-9-14, 0700	12-10-14, 0700
Sample #3:	12-11-14, 0700	12-12-14, 0700

Test initiated (date, time): 12-9-14, 1405 Test terminated (date, time): 12-16-14, 1330

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	80	100		100	100	96	9.32
5%	100	100	100	100	100		100	100	100	
7%	80	100	90	100	100		100	94	94	
9%	100	100	100	100	100		100	100	100	
12%	100	100	100	100	100		100	100	100	0.00
16%	100	90	100	100	100		100	98	98	

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%	0.594	0.650	0.614	0.589	0.641		0.618	4.40%
5%	0.575	0.622	0.695	0.591	0.533		0.603	
7%	0.530	0.488	0.525	0.667	0.565		0.555	
9%	0.619	0.623	0.710	0.663	0.654		0.654	
12%	0.775	0.731	0.756	0.734	0.857		0.771	6.68%
16%	0.762	0.645	0.617	0.661	0.608		0.659	

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)= 6.68 %

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:	12-7-14, 0700	12-8-14, 0700
Sample #2:	12-9-14, 0700	12-10-14, 0700
Sample #3:	12-11-14, 0700	12-12-14, 0700

Test initiated (date, time): 12-9-14, 1020 Test terminated (date, time): 12-16-14, 1030

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	9	17	17	14	15	14
B	16	16	14	15	19	19
C	10	13	15	12	19	12
D	14	11	17	10	18	18
E	21	15	14	17	12	14
F	22	16	24	X1	17	10
G	18	19	12	24	24	18
H	16	14	9	11	19	20
I	9	16	21	12	9	18
J	21	12	12	19	13	8
Mean	15.6	14.9	15.5	13.5	16.5	15.1
Mean/surviving female	15.6	14.9	15.5	14.9	16.5	15.1
CV%*	32.2				26.2	

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	90	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)= 32.2 %

6. Enter Whole Effluent Toxicity: 16 %


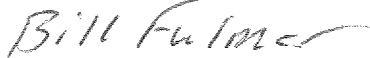

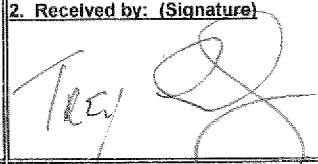


APPENDIX A

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 ₂ SO ₄), pH < 2				5. Hydrochloric Acid(HCl)							
Conway, AR 72032		Conway, AR 72032		Reporting Information		3 Day (25%)		3. Nitric Acid (HNO ₃), pH < 2				6. Sodium Hydroxide (NaOH), pH > 12							
				Telephone: 501-733-4495		Routine		TEST PARAMETERS								Bottle Type Code			
Attn: Bill Fulmer				Email: Bill.Fulmer@conwaycorp.com		Preservative Code: 1										G = Glass; P = Plastic			
				Email: trey.lieblong@conwaycorp.com		Bottle Type: P										V = Septum; A = Amber			
 Sampler(s) Signature				 Sampler(s) Printed				Chronic Toxicity										Arkansas Analytical Work Order Number: 14412-003A	
Field Number	SAMPLE COLLECTION		Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION		Chronic Toxicity										
	Date/s	Time/s																	
	12-7-8 14	7AM-7AM		X	1	Water	Tupelo Bayou Effluent		X										
1. Relinquished by: (Signature)		Date/Time		2. Received by: (Signature)		SAMPLE CONDITION UPON RECEIPT IN LAB						REMARKS / SAMPLE COMMENTS							
						1. CUSTODY SEALS: <input checked="" type="checkbox"/> Yes ___ No 2. CONTAINERS CORRECT: <input 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)		FOR COMPLETION BY LAB ONLY													
		12/8/14																	



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 ₂ SO ₄), pH < 2				5. Hydrochloric Acid(HCl)							
Conway, AR 72032		Conway, AR 72032		Reporting information		3 Day (25%)		3. Nitric Acid (HNO ₃), pH < 2				6. Sodium Hydroxide (NaOH), pH > 12							
				Telephone: 501-733-4495		Routine		TEST PARAMETERS								Bottle Type Code			
Attn: Bill Fulmer				Email: Bill.Fulmer@conwaycorp.com		Preservative Code: 1										G = Glass, P = Plastic			
				Email: trey.lleblong@conwaycorp.com		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: K1412-003B	
Field Number	SAMPLE COLLECTION		Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION												
	Date/s	Time/s																	
	12-9-10-14	7AM-7AM		X	1	Water	Tupelo Bayou Effluent		X										
1. Relinquished by: (Signature)		Date/Time		2. Received by: (Signature)		SAMPLE CONDITION UPON RECEIPT IN LAB						REMARKS / SAMPLE COMMENTS							
<i>Bill Fulmer</i>		12-10-14 948 AM		<i>[Signature]</i>		1. CUSTODY SEALS: <input checked="" type="checkbox"/> Yes ___ No 2. CONTAINERS CORRECT: <input checked="" type="checkbox"/> Yes ___ No 3. COC/LABELS AGREE: <input checked="" type="checkbox"/> Yes ___ No 4. RECEIVED ON ICE: <input type="checkbox"/> Yes ___ No 5. TEMPERATURE ON RECEIPT: 3°C 6. TEMPERATURE GUN ID: HHT#2													
3. Relinquished by: (Signature)		Date/Time		4. Received by lab: (Signature)		P.P. COMPLETION BY LAB ONLY													
<i>[Signature]</i>				<i>Sydney James</i>															



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 ₂ SO ₄), pH < 2				5. Hydrochloric Acid(HCl)					
Conway, AR 72032		Conway, AR 72032		Reporting Information		3 Day (25%)		3. Nitric Acid (HNO ₃), pH < 2				6. Sodium Hydroxide (NaOH), pH > 12					
				Telephone: 501-733-4495		Routine		TEST PARAMETERS								Bottle Type Code	
Attn: Bill Fulmer				Email: Bill.Fulmer@conwaycorp.com		Preservative Code: 1		1								G = Glass; P = Plastic	
				Email: trey.lieblong@conwaycorp.com		Bottle Type: P		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: K1412-003C	
Field Number	SAMPLE COLLECTION		Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION		Chronic Toxicity								
	12-11-12-14	7Am-7Am		X	1	Water	Tupelo bayou Effluent		X								
1. Relinquished by: (Signature)		Date/Time		2. Received by: (Signature)		SAMPLE CONDITION UPON RECEIPT IN LAB						REMARKS / SAMPLE COMMENTS					
<i>Bill Fulmer</i>		12-12-14 2:04 PM		<i>Sydney James</i>		1. CUSTODY SEALS: <input checked="" type="checkbox"/> Yes ___ No 2. CONTAINERS CORRECT: <input checked="" type="checkbox"/> Yes ___ No 3. COC/LABELS AGREE: <input checked="" type="checkbox"/> Yes ___ No 4. RECEIVED ON ICE: <input checked="" type="checkbox"/> Yes ___ No 5. TEMPERATURE ON RECEIPT: 2°C 6. TEMPERATURE GUN ID: H111#2											
3. Relinquished by: (Signature)		Date/Time		4. Received by lab: (Signature)		FOR COMPLETION BY LAB ONLY											
				<i>Sydney James</i>													

APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Fathead Minnow

Lab # / Sample ID K1412003

Test Start (Date/Time)

12-9-14

1405

Client: Tupelo Bayou

Test End (Date/Time)

12-16-14

1330

Day of Test

		1	2	3	4	5	6	7	notes
Control	SS	12-9	12-10	12-11	12-12	12-13	12-14	12-15	
D.O. (mg/L)	INITIAL	8.7	8.4	8.7	8.2	8.5	8.6	8.8	
	FINAL	7.6	7.3	7.1	8.1	8.7	7.2	7.9	
pH (s.u.)	INITIAL	7.8	8.0	7.7	7.5	7.8	7.7	7.8	
	FINAL	7.4	7.6	7.4	7.8	7.5	8.0	7.4	
temp (C)	INITIAL	23	22	23	23	23	23	22	
	FINAL	25	25	25	25	25	25	25	
ALKALINITY (mg/L)		80				34			
HARDNESS (mg/L)		48				42			
CONDUCTIVITY (umhc)		810				297			
CHLORINE (mg/L)		20.05							
CONC:	5								
D.O. (mg/L)	INITIAL	8.5	7.9	8.6	8.6	8.6	8.6	8.8	
	FINAL	7.5	7.2	7.2	7.8	8.6	7.3	8.1	
pH (s.u.)	INITIAL	7.8	8.0	7.8	7.5	7.8	7.8	7.9	
	FINAL	7.3	7.4	7.4	7.7	7.6	7.8	7.5	
temp (C)	INITIAL	23	23	23	23	23	23	22	
	FINAL	25	25	25	25	25	25	25	
CONC:	7								
D.O. (mg/L)	INITIAL	8.2	8.0	8.6	8.5	8.6	8.7	8.7	
	FINAL	7.5	7.2	7.4	7.8	8.6	7.1	7.7	
pH (mg/L)	INITIAL	7.7	8.0	7.7	7.5	7.8	7.8	7.8	
	FINAL	7.4	7.4	7.4	7.8	7.6	7.6	7.4	
temp (C)	INITIAL	23	23	22	23	23	23	21	
	FINAL	25	25	25	25	25	25	25	
CONC:	9								
D.O. (mg/L)	INITIAL	8.7	8.2	8.7	8.9	8.6	8.7	8.8	
	FINAL	7.7	7.2	7.4	7.8	8.4	7.2	7.9	
pH (s.u.)	INITIAL	7.6	7.8	7.8	7.6	7.8	7.8	7.8	
	FINAL	7.4	7.3		7.8	7.7	7.6	7.4	
temp (C)	INITIAL	22	23	22	23	23	23	21	
	FINAL	25	25	25	25	25	25	25	
CONC:	12								
D.O. (mg/L)	INITIAL	8.7	8.1	8.6	8.7	8.6	8.7	8.7	
	FINAL	7.7	7.3	7.4	7.8	8.4	7.0	7.8	
pH (s.u.)	INITIAL	7.6	7.8	7.7	7.6	7.8	7.8	7.9	
	FINAL	7.4	7.3	7.5	7.8	7.7	7.6	7.4	
temp (C)	INITIAL	23	23	23	23	23	23	21	
	FINAL	25	25	25	25	25	25	25	
CONC:	16								
D.O. (mg/L)	INITIAL	8.7	8.2	8.6	9.0	8.6	8.7	8.7	
	FINAL	7.6	7.2	7.4	7.8	8.6	7.1	7.9	
pH (s.u.)	INITIAL	7.6	7.7	7.7	7.6	7.7	7.8	7.7	
	FINAL	7.4	7.3	7.5	7.9	7.7	7.5	7.4	
temp (C)	INITIAL	23	23	22	23	23	23	21	
	FINAL	25	25	25	25	25	25	25	
CONC:	100 %	A	A	A	B	B	C	C	
ALKALINITY (mg/L)		80			120		106		
HARDNESS (mg/L)		38			64		56		
CONDUCTIVITY (umhc)		547			582		576		
CHLORINE (mg/L)		20.05							

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Ceriodaphnia Dubia

Lab # / Sample ID *K1412003* Test Start (Date/Time) *12-9-14 1020*

Client: *Fugelo Bayou* Test End (Date/Time) *12-16-14 1030*

Day of Test

		1	2	3	4	5	6	7	notes
Control	<i>55</i>	<i>12-9</i>	<i>12-10</i>	<i>12-11</i>	<i>12-12</i>	<i>12-13</i>	<i>12-14</i>	<i>12-15</i>	
D.O. (mg/L)	INITIAL	<i>8.7</i>	<i>8.4</i>	<i>8.7</i>	<i>8.2</i>	<i>8.5</i>	<i>8.1</i>	<i>8.8</i>	
	FINAL	<i>8.4</i>	<i>8.1</i>	<i>8.3</i>	<i>8.3</i>	<i>8.7</i>	<i>8.6</i>	<i>8.4</i>	
pH (s.u.)	INITIAL	<i>7.8</i>	<i>8.0</i>	<i>7.7</i>	<i>7.5</i>	<i>7.8</i>	<i>7.7</i>	<i>7.8</i>	
	FINAL	<i>8.1</i>	<i>7.9</i>	<i>7.6</i>	<i>7.6</i>	<i>8.0</i>	<i>7.7</i>	<i>8.1</i>	
temp (C)	INITIAL	<i>23</i>	<i>22</i>	<i>23</i>	<i>23</i>	<i>23</i>	<i>23</i>	<i>22</i>	
	FINAL	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	
ALKALINITY (mg/L)		<i>30</i>				<i>34</i>			
HARDNESS (mg/L)		<i>48</i>				<i>42</i>			
CONDUCTIVITY (umhd)		<i>810</i>				<i>297</i>			
CHLORINE (mg/L)		<i><0.05</i>							
CONC:	<i>5</i>								
D.O. (mg/L)	INITIAL	<i>8.5</i>	<i>7.8</i>	<i>8.6</i>	<i>8.0</i>	<i>8.6</i>	<i>8.1</i>	<i>8.8</i>	
	FINAL	<i>8.5</i>	<i>8.2</i>	<i>8.4</i>	<i>8.6</i>	<i>8.8</i>	<i>8.4</i>	<i>8.9</i>	
pH (s.u.)	INITIAL	<i>7.8</i>	<i>8.0</i>	<i>7.8</i>	<i>7.5</i>	<i>7.8</i>	<i>7.8</i>	<i>7.9</i>	
	FINAL	<i>8.0</i>	<i>7.7</i>	<i>7.6</i>	<i>7.6</i>	<i>7.9</i>	<i>7.8</i>	<i>8.1</i>	
temp (C)	INITIAL	<i>23</i>	<i>23</i>	<i>23</i>	<i>23</i>	<i>23</i>	<i>23</i>	<i>22</i>	
	FINAL	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	
CONC:	<i>7</i>								
D.O. (mg/L)	INITIAL	<i>8.2</i>	<i>8.0</i>	<i>8.6</i>	<i>8.5</i>	<i>8.6</i>	<i>8.7</i>	<i>8.7</i>	
	FINAL	<i>8.4</i>	<i>8.3</i>	<i>8.3</i>	<i>8.4</i>	<i>8.7</i>	<i>8.5</i>	<i>8.6</i>	
pH (mg/L)	INITIAL	<i>7.7</i>	<i>8.0</i>	<i>7.7</i>	<i>7.5</i>	<i>7.8</i>	<i>7.8</i>	<i>7.8</i>	
	FINAL	<i>7.9</i>	<i>7.7</i>	<i>7.6</i>	<i>7.8</i>	<i>7.9</i>	<i>7.7</i>	<i>8.0</i>	
temp (C)	INITIAL	<i>23</i>	<i>23</i>	<i>22</i>	<i>23</i>	<i>23</i>	<i>23</i>	<i>21</i>	
	FINAL	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	
CONC:	<i>9</i>								
D.O. (mg/L)	INITIAL	<i>8.7</i>	<i>8.2</i>	<i>8.7</i>	<i>8.7</i>	<i>8.6</i>	<i>8.7</i>	<i>8.8</i>	
	FINAL	<i>8.4</i>	<i>8.2</i>	<i>8.5</i>	<i>8.4</i>	<i>8.6</i>	<i>8.5</i>	<i>8.7</i>	
pH (s.u.)	INITIAL	<i>7.6</i>	<i>7.8</i>	<i>7.8</i>	<i>7.6</i>	<i>7.8</i>	<i>7.8</i>	<i>7.8</i>	
	FINAL	<i>7.8</i>	<i>7.7</i>	<i>7.7</i>	<i>7.8</i>	<i>7.8</i>	<i>7.8</i>	<i>8.0</i>	
temp (C)	INITIAL	<i>23</i>	<i>23</i>	<i>22</i>	<i>23</i>	<i>23</i>	<i>23</i>	<i>21</i>	
	FINAL	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	
CONC:	<i>12</i>								
D.O. (mg/L)	INITIAL	<i>8.7</i>	<i>8.1</i>	<i>8.6</i>	<i>8.9</i>	<i>8.6</i>	<i>8.7</i>	<i>8.7</i>	
	FINAL	<i>8.4</i>	<i>8.4</i>	<i>8.4</i>	<i>8.4</i>	<i>8.7</i>	<i>8.4</i>	<i>8.7</i>	
pH (s.u.)	INITIAL	<i>7.6</i>	<i>7.8</i>	<i>7.7</i>	<i>7.6</i>	<i>7.8</i>	<i>7.8</i>	<i>7.9</i>	
	FINAL	<i>7.7</i>	<i>7.7</i>	<i>7.7</i>	<i>7.9</i>	<i>7.9</i>	<i>7.8</i>	<i>8.0</i>	
temp (C)	INITIAL	<i>23</i>	<i>23</i>	<i>23</i>	<i>23</i>	<i>23</i>	<i>23</i>	<i>21</i>	
	FINAL	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	
CONC:	<i>11</i>								
D.O. (mg/L)	INITIAL	<i>8.7</i>	<i>8.2</i>	<i>8.6</i>	<i>9.0</i>	<i>8.6</i>	<i>8.7</i>	<i>8.7</i>	
	FINAL	<i>8.4</i>	<i>8.5</i>	<i>8.4</i>	<i>8.4</i>	<i>8.7</i>	<i>8.4</i>	<i>8.6</i>	
pH (s.u.)	INITIAL	<i>7.6</i>	<i>7.7</i>	<i>7.7</i>	<i>7.5</i>	<i>7.7</i>	<i>7.8</i>	<i>7.7</i>	
	FINAL	<i>7.8</i>	<i>7.7</i>	<i>7.8</i>	<i>7.9</i>	<i>8.0</i>	<i>7.9</i>	<i>8.0</i>	
temp (C)	INITIAL	<i>23</i>	<i>23</i>	<i>22</i>	<i>23</i>	<i>23</i>	<i>23</i>	<i>21</i>	
	FINAL	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	<i>25</i>	
CONC:	<i>100 %</i>								
ALKALINITY (mg/L)		<i>80</i>			<i>120</i>		<i>106</i>		
HARDNESS (mg/L)		<i>38</i>			<i>69</i>		<i>56</i>		
CONDUCTIVITY (umhd)		<i>547</i>			<i>582</i>		<i>576</i>		
CHLORINE (mg/L)		<i><0.05</i>							

APPENDIX C

Fathead minnow raw data and statistics

FATHEAD MINNOW

SURVIVAL DATA FOR LARVAL SURVIVAL AND GROWTH TEST (CHRONIC)

LAB #: K1412003		TEST START		DATE	12/9/14	TIME	1405					
CLIENT: Conway - Tupelo Bayou		TEST END		DATE	12/16/14	TIME	1330					
ANALYST: RH / CT / HF		AGE AND SOURCE OF MINNOWS										
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%	96.0%	9.32
	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	8	80%		
	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	8	8	8	8	8	8	80%	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	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%	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%	98.0%	
	B	10	10	9	9	9	9	9	9	90%		
	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%		
ANALYST:		RH	RH	RH	RH	CT	HF	RH	RH			
DATE:		12/9/14	12/10/14	12/11/14	12/12/14	12/13/14	12/14/14	12/15/14	12/16/14			
TIME:		1405	1530	1350	1005	1320	1100	1425	1330			

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

REMARKS:

AA# K1412003, FATHEAD MINNOW SURV.,CHRONIC,12-9-14
File: C:\COPYTO~1\TOXSTAT\FHSURV~1. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.171

W = 0.754

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# K1412003, FATHEAD MINNOW SURV.,CHRONIC,12-9-14
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# K1412003, FATHEAD MINNOW SURV., CHRONIC, 12-9-14
 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	0.8000	1.1071
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	0.8000	1.1071
3	7 % EFFLUENT	2	1.0000	1.4120
3	7 % EFFLUENT	3	0.9000	1.2490
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	1.0000	1.4120
4	9 % EFFLUENT	4	1.0000	1.4120
4	9 % EFFLUENT	5	1.0000	1.4120
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	0.9000	1.2490
6	16 % EFFLUENT	3	1.0000	1.4120
6	16 % EFFLUENT	4	1.0000	1.4120
6	16 % EFFLUENT	5	1.0000	1.4120

AA# K1412003, FATHEAD MINNOW SURV., CHRONIC, 12-9-14
 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	1.351				
2	5 % EFFLUENT	1.412	30.00	16.00	5.00	
3	7 % EFFLUENT	1.318	25.50	16.00	5.00	
4	9 % EFFLUENT	1.412	30.00	16.00	5.00	
5	12 % EFFLUENT	1.412	30.00	16.00	5.00	
6	16 % EFFLUENT	1.379	28.00	16.00	5.00	

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

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s:		K1412003		TEST DATES (BEGIN / END):		12/9/14 - 12/16/14	
CLIENT:		Conway- Tupelo Bayou		WEIGHING DATE / TIME:		12/17/2014 1600	
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	1.01746	1.01152	0.00594	10	0.594	AVG DRY WEIGHT (mg)
	B	1.06527	1.05877	0.00650	10	0.650	
	C	1.01812	1.01198	0.00614	10	0.614	CV
	D	1.02461	1.01872	0.00589	10	0.589	
	E	1.01941	1.01300	0.00641	10	0.641	
							0.618
							4.4
5%	A	1.01099	1.00524	0.00575	10	0.575	AVG DRY WEIGHT (mg)
	B	1.01987	1.01365	0.00622	10	0.622	
	C	1.04772	1.04077	0.00695	10	0.695	CV
	D	1.04426	1.03835	0.00591	10	0.591	
	E	1.02832	1.02299	0.00533	10	0.533	
							0.603
7%	A	0.99111	0.98581	0.00530	10	0.530	AVG DRY WEIGHT (mg)
	B	1.00963	1.00475	0.00488	10	0.488	
	C	1.00213	0.99688	0.00525	10	0.525	CV
	D	1.02162	1.01495	0.00867	10	0.667	
	E	1.00789	1.00224	0.00565	10	0.565	
							0.555
9%	A	0.96461	0.95842	0.00619	10	0.619	AVG DRY WEIGHT (mg)
	B	0.98090	0.97467	0.00623	10	0.623	
	C	0.97325	0.96615	0.00710	10	0.710	CV
	D	1.02332	1.01669	0.00663	10	0.663	
	E	0.97310	0.96656	0.00654	10	0.654	
							0.654
12%	A	0.97484	0.96709	0.00775	10	0.775	AVG DRY WEIGHT (mg)
	B	1.01173	1.00442	0.00731	10	0.731	
	C	1.04581	1.03825	0.00756	10	0.756	CV
	D	1.01046	1.00312	0.00734	10	0.734	
	E	0.97513	0.96656	0.00857	10	0.857	
							0.771
							6.68
16%	A	1.00524	0.99762	0.00762	10	0.762	AVG DRY WEIGHT (mg)
	B	1.01651	1.01006	0.00645	10	0.645	
	C	0.96412	0.95795	0.00617	10	0.617	CV
	D	1.01011	1.00350	0.00661	10	0.661	
	E	0.99676	0.99068	0.00608	10	0.608	
							0.659

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

AA# K1412003, FATHEAD MINNOW GROWTH CHRONIC, 12-9-14
File: C:\COPYTO~1\TOXSTAT\FHGROWTH. Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

D = 0.067

W = 0.899

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# K1412003, FATHEAD MINNOW GROWTH CHRONIC, 12-9-14
File: C:\COPYTO~1\TOXSTAT\FHGROWTH. Transform: NO TRANSFORMATION

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# K1412003, FATHEAD MINNOW GROWTH CHRONIC, 12-9-14
 FILE: C:\COPYTO~1\TOXSTAT\FHGROWTH.
 TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.5940	0.5940
1	CONTROL	2	0.6500	0.6500
1	CONTROL	3	0.6140	0.6140
1	CONTROL	4	0.5890	0.5890
1	CONTROL	5	0.6410	0.6410
2	5 % EFFLUENT	1	0.5750	0.5750
2	5 % EFFLUENT	2	0.6220	0.6220
2	5 % EFFLUENT	3	0.6950	0.6950
2	5 % EFFLUENT	4	0.5910	0.5910
2	5 % EFFLUENT	5	0.5330	0.5330
3	7 % EFFLUENT	1	0.5300	0.5300
3	7 % EFFLUENT	2	0.4880	0.4880
3	7 % EFFLUENT	3	0.5250	0.5250
3	7 % EFFLUENT	4	0.6670	0.6670
3	7 % EFFLUENT	5	0.5650	0.5650
4	9 % EFFLUENT	1	0.6190	0.6190
4	9 % EFFLUENT	2	0.6230	0.6230
4	9 % EFFLUENT	3	0.7100	0.7100
4	9 % EFFLUENT	4	0.6630	0.6630
4	9 % EFFLUENT	5	0.6540	0.6540
5	12 % EFFLUENT	1	0.7750	0.7750
5	12 % EFFLUENT	2	0.7310	0.7310
5	12 % EFFLUENT	3	0.7560	0.7560
5	12 % EFFLUENT	4	0.7340	0.7340
5	12 % EFFLUENT	5	0.8570	0.8570
6	16 % EFFLUENT	1	0.7620	0.7620
6	16 % EFFLUENT	2	0.6450	0.6450
6	16 % EFFLUENT	3	0.6170	0.6170
6	16 % EFFLUENT	4	0.6610	0.6610
6	16 % EFFLUENT	5	0.6080	0.6080

AA# K1412003, FATHEAD MINNOW GROWTH CHRONIC, 12-9-14
 File: C:\COPYTO~1\TOXSTAT\FHGROWTH. Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.133	0.027	9.466
Within (Error)	24	0.067	0.003	
Total	29	0.201		

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

AA# K1412003, FATHEAD MINNOW GROWTH CHRONIC, 12-9-14
 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	0.618	0.618		
2	5 % EFFLUENT	0.603	0.603	0.429	
3	7 % EFFLUENT	0.555	0.555	1.867	
4	9 % EFFLUENT	0.654	0.654	-1.079	
5	12 % EFFLUENT	0.771	0.771	-4.562	
6	16 % EFFLUENT	0.659	0.659	-1.223	

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

AA# K1412003, FATHEAD MINNOW GROWTH CHRONIC, 12-9-14
 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	0.079	12.8	0.014
3	7 % EFFLUENT	5	0.079	12.8	0.063
4	9 % EFFLUENT	5	0.079	12.8	-0.036
5	12 % EFFLUENT	5	0.079	12.8	-0.153
6	16 % EFFLUENT	5	0.079	12.8	-0.041

APPENDIX D

Ceriodaphnia dubia Raw Data and Statistics

SURVIVAL AND REPRODUCTION TEST

Ceriodaphnia dubia

Discharger: Conway - Tupelo Bayou												Lab Number/s			
Location: Outfall 001												K1412003			
Date Sample Collected: 12 - 8/10/12 - 14															
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	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	4	0	3	6	4	5	2	7	6	1	5	39	10	3.9	RH
	5	4	8	0	5	1	8	3	5	4	2	40	10	4.0	RH
	6	0	5	4	0	8	4	8	3	2	10	44	10	4.4	RH
	7	5	0	0	5	7	8	0	2	2	4	33	10	3.3	RH
	8														
Total		9	16	10	14	21	22	18	16	9	21	156		Avg. = 15.6	
														C.V. = 32.2	
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	0	0	0	1	0	0	1	10	0.1	RH
	4	1	1	6	4	3	2	2	4	0	5	28	10	2.8	RH
	5	4	5	0	3	2	4	0	6	7	5	36	10	3.6	RH
	6	6	7	0	4	1	6	12	3	8	2	49	10	4.9	RH
	7	6	3	7	0	9	4	5	0	1	0	35	10	3.5	RH
	8														
Total		17	16	13	11	15	16	19	14	16	12	149		Avg. = 14.9	
														C.V. = 16.3	
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	0	0	0	0	0	0	0	10	0.0	RH
	4	6	0	5	4	1	2	4	7	4	5	38	10	3.8	RH
	5	6	1	5	7	5	7	0	2	8	5	46	10	4.6	RH
	6	5	6	5	6	5	9	8	0	5	2	51	10	5.1	RH
	7	0	7	0	0	3	6	0	0	4	0	20	10	2.0	RH
	8														
Total		17	14	15	17	14	24	12	9	21	12	155		Avg. = 15.5	
														C.V. = 28.7	

Analyst: RH															
Test Start - Date/Time: 12-9-14, 1020															
Test Stop - Date/Time: 12-16-14, 1030															
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	0	0	0	10	0.0	RH
	4	0	0	6	4	3	0	2	4	7	6	32	10	3.2	RH
	5	2	5	5	4	8	1	8	0	5	1	39	10	3.9	RH
	6	7	1	0	2	4	X	9	4	0	7	34	10	3.4	RH
	7	5	9	1	0	2		5	3	0	5	30	10	3.0	RH
	8														
Total		14	15	12	10	17	1	24	11	12	19	135		Avg. = 14.9	
														C.V. = 30.1	
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	0	0	0	0	0	0	0	0	10	0.0	RH
	4	6	4	7	2	5	9	6	7	0	1	47	10	4.7	RH
	5	4	9	5	0	7	0	8	8	3	5	49	10	4.9	RH
	6	0	4	6	11	0	8	8	0	1	6	44	10	4.4	RH
	7	5	2	1	5	0	0	2	4	5	1	25	10	2.5	RH
	8														
Total		15	19	19	18	12	17	24	19	9	13	165		Avg. = 16.5	
														C.V. = 26.2	
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	0	0	0	0	10	0.0	RH
	4	0	7	1	6	4	5	8	7	5	4	47	10	4.7	RH
	5	8	7	3	0	8	4	2	5	6	0	43	10	4.3	RH
	6	6	4	5	8	1	0	6	5	0	4	39	10	3.9	RH
	7	0	1	3	4	1	1	2	3	7	0	22	10	2.2	RH
	8														
Total		14	19	12	18	14	10	18	20	18	8	151		Avg. = 15.1	
														C.V. = 27.3	

AA # K1412003, C.DUBIA CHRONIC, REPRODUCCION, 12-9-14
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 # K1412003, C.DUBIA CHRONIC, REPRODUCCION, 12-9-14
File: C:\COPYTO~1\TOXSTAT\C.DUB Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 6.88

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

=====			
NUMBER OF			
IDENTIFICATION	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

=====			
NUMBER OF			
IDENTIFICATION	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

=====			
NUMBER OF			
IDENTIFICATION	ALIVE	DEAD	TOTAL ANIMALS

CONTROL	10	0	10
9	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

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

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

TITLE: AA # K1412003, C.DUBIA CHRONIC, REPRODUCTION, 12-9-14
FILE: C:\COPYTO~1\TOXSTAT\C.DUB
TRANSFORM: NO TRANSFORMATION

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	9.0000	9.0000
1	CONTROL	2	16.0000	16.0000
1	CONTROL	3	10.0000	10.0000
1	CONTROL	4	14.0000	14.0000
1	CONTROL	5	21.0000	21.0000
1	CONTROL	6	22.0000	22.0000
1	CONTROL	7	18.0000	18.0000
1	CONTROL	8	16.0000	16.0000
1	CONTROL	9	9.0000	9.0000
1	CONTROL	10	21.0000	21.0000
2	5 % EFFLUENT	1	17.0000	17.0000
2	5 % EFFLUENT	2	16.0000	16.0000
2	5 % EFFLUENT	3	13.0000	13.0000
2	5 % EFFLUENT	4	11.0000	11.0000
2	5 % EFFLUENT	5	15.0000	15.0000
2	5 % EFFLUENT	6	16.0000	16.0000
2	5 % EFFLUENT	7	19.0000	19.0000
2	5 % EFFLUENT	8	14.0000	14.0000
2	5 % EFFLUENT	9	16.0000	16.0000
2	5 % EFFLUENT	10	12.0000	12.0000
3	7 % EFFLUENT	1	17.0000	17.0000
3	7 % EFFLUENT	2	14.0000	14.0000
3	7 % EFFLUENT	3	15.0000	15.0000
3	7 % EFFLUENT	4	17.0000	17.0000
3	7 % EFFLUENT	5	14.0000	14.0000
3	7 % EFFLUENT	6	24.0000	24.0000
3	7 % EFFLUENT	7	12.0000	12.0000
3	7 % EFFLUENT	8	9.0000	9.0000
3	7 % EFFLUENT	9	21.0000	21.0000
3	7 % EFFLUENT	10	12.0000	12.0000
4	9 % EFFLUENT	1	14.0000	14.0000
4	9 % EFFLUENT	2	15.0000	15.0000
4	9 % EFFLUENT	3	12.0000	12.0000
4	9 % EFFLUENT	4	10.0000	10.0000
4	9 % EFFLUENT	5	17.0000	17.0000
4	9 % EFFLUENT	6	1.0000	1.0000
4	9 % EFFLUENT	7	24.0000	24.0000
4	9 % EFFLUENT	8	11.0000	11.0000

4	9	% EFFLUENT	9	12.0000	12.0000
4	9	% EFFLUENT	10	19.0000	19.0000
5	12	% EFFLUENT	1	15.0000	15.0000
5	12	% EFFLUENT	2	19.0000	19.0000
5	12	% EFFLUENT	3	19.0000	19.0000
5	12	% EFFLUENT	4	18.0000	18.0000
5	12	% EFFLUENT	5	12.0000	12.0000
5	12	% EFFLUENT	6	17.0000	17.0000
5	12	% EFFLUENT	7	24.0000	24.0000
5	12	% EFFLUENT	8	19.0000	19.0000
5	12	% EFFLUENT	9	9.0000	9.0000
5	12	% EFFLUENT	10	13.0000	13.0000
6	16	% EFFLUENT	1	14.0000	14.0000
6	16	% EFFLUENT	2	19.0000	19.0000
6	16	% EFFLUENT	3	12.0000	12.0000
6	16	% EFFLUENT	4	18.0000	18.0000
6	16	% EFFLUENT	5	14.0000	14.0000
6	16	% EFFLUENT	6	10.0000	10.0000
6	16	% EFFLUENT	7	18.0000	18.0000
6	16	% EFFLUENT	8	20.0000	20.0000
6	16	% EFFLUENT	9	18.0000	18.0000
6	16	% EFFLUENT	10	8.0000	8.0000

AA # K1412003, C.DUBIA CHRONIC, REPRODUCCION, 12-9-14
 File: C:\COPYTO~1\TOXSTAT\C.DUB Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	49.283	9.857	0.478
Within (Error)	54	1113.700	20.624	
Total	59	1162.983		

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

AA # K1412003, C.DUBIA CHRONIC, REPRODUCCION, 12-9-14
 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	14.900	14.900	0.345	
3	7 % EFFLUENT	15.500	15.500	0.049	
4	9 % EFFLUENT	13.500	13.500	1.034	
5	12 % EFFLUENT	16.500	16.500	-0.443	
6	16 % EFFLUENT	15.100	15.100	0.246	

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

AA # K1412003, C.DUBIA CHRONIC, REPRODUCTION, 12-9-14

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	4.692	30.1	0.700
3	7 % EFFLUENT	10	4.692	30.1	0.100
4	9 % EFFLUENT	10	4.692	30.1	2.100
5	12 % EFFLUENT	10	4.692	30.1	-0.900
6	16 % EFFLUENT	10	4.692	30.1	0.500

APPENDIX E

Organism History

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

TEST ORGANISM HISTORY

DATE SHIPPED 12-9-14 CLIENT Arkansas Analytical

Purchase Order #: _____

SPECIES: Pimephales promelas

Quantity Shipped: 840⁺

Age: hatched 12/8 15-1600 CST

Brood Stock Source: Anderson Farms, AR

Culture Water: Groundwater

Hardness (Mg/l CaCO₃): ~100

Dissolved Oxygen (Mg/l): 8.4

Temperature (°C): 25.4

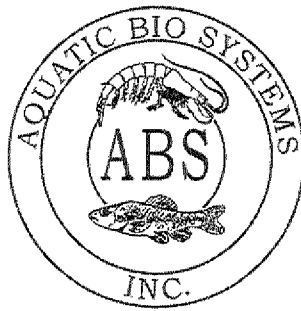
Feeding: ARTIFICIAL

Comments: _____

Shipped Via: Federal Express UPS Overnight Shuttle

Packaged By: CM

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 ₃):	<u>94 mg/l</u>	<u>76-130 mg/l</u>
TOTAL ALKALINITY (as CaCO ₃):	<u>65 mg/l</u>	<u>65-100 mg/l</u>
pH:	<u>7.98</u>	<u>7.50-8.20</u>

Comments:

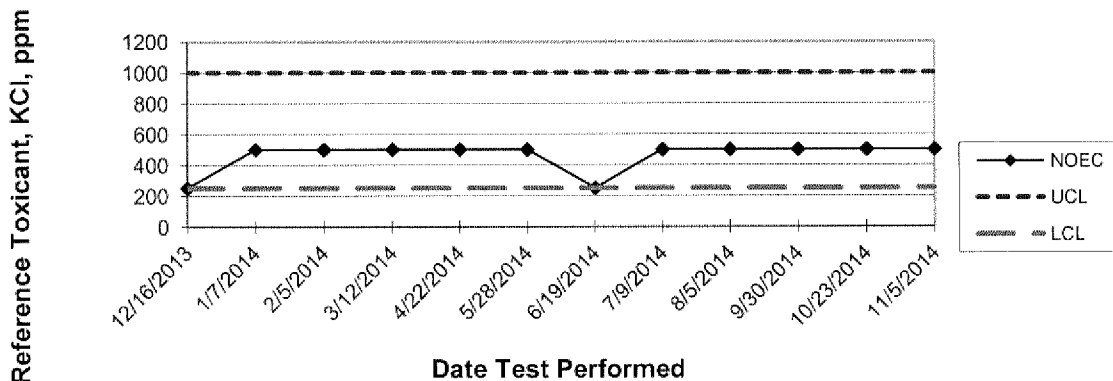


Facility Supervisor

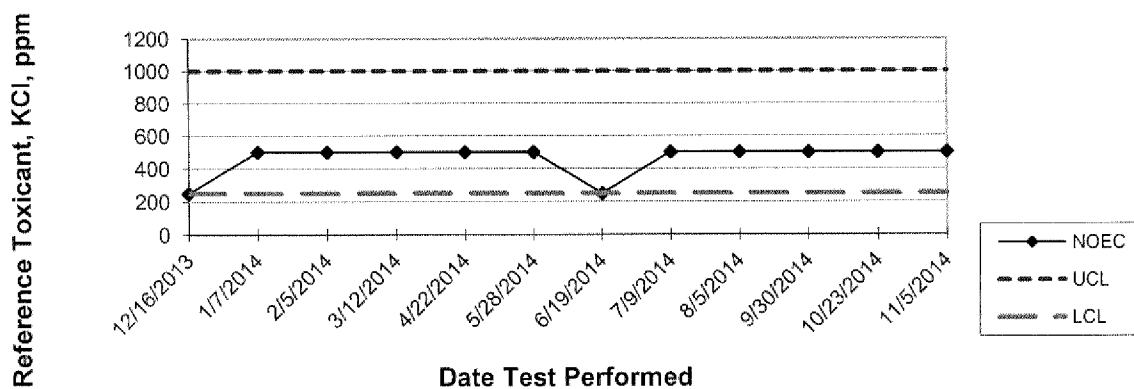
APPENDIX F

Quality Assurance Charts

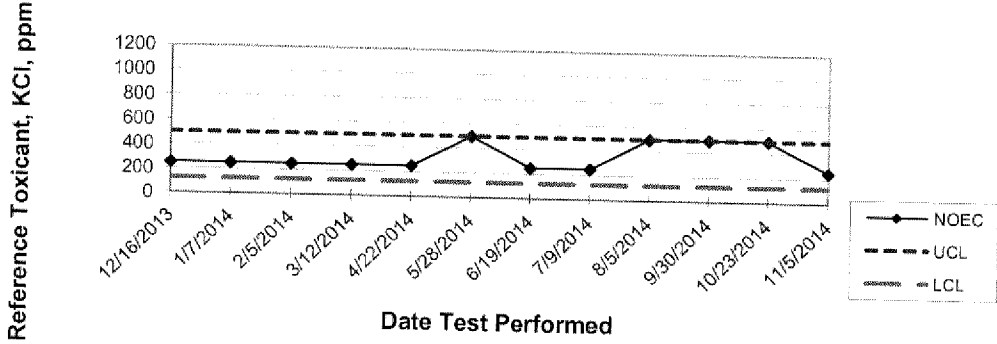
ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW SURVIVAL 7 Day
QUALITY ASSURANCE



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

