Arkansas Analytical, Inc.

Toxicity Test Results

Conway Corporation: Tupelo Bayou
NPDES Permit Number: AR0051951
Second quarter 2016
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.
8100 National Drive
Little Rock, Arkansas 72209
Lab Number K1605005

Monday, June 13, 2016

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 2016.

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:	5-15-16, 0800	5-16-16, 0800
Sample #2:	5-17-16, 0800	5-18-16, 0800
Sample #3:	5-19-16, 0800	5-20-16, 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:	5-16-16, 0848	2
Sample #2:	5-18-16, 0957	1
Sample #3:	5-20-16, 0859	0

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	28.2	X	
At least 60% of surviving females should have produced 3 broods	90%	X	
The percent coefficient of variation between replicates must be 40% or less for the young of surviving females	36.5%	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	5.71%	X	
Minimum of 0.25 mg average dry weight of surviving controls	0.614	X	
The percent coefficient of variation between replicates must be 40% or less for growth	7.13%	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 4/19/16-4/25/16		*Pimephales promelas* 4/19/16-4/2616	
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

Ceriodaphnia dubia		*Pimephales promelas*	
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)	29.3	%CV survival (critical dilution)	9.52%
%CV Reproduction (critical dilution)	36.1%	Mean dry weight (critical dilution) in milligrams	0.564
		%CV growth (critical dilution)	8.53%
PMSD Reproduction	12.7%	PMSD Growth	11.2% *

* Refer to *Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the NPDES Program*, EPA 833-R-00-003, June 2000, Section 6.4.2. See Statistics for RPD.

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:

Tracy Bounds, Melissa Bird, Teresa Coins, Shelby Chappell

Reviewed by:

Tracy Bounds

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:	5-15-16, 0800	5-16-16, 0800
Sample #2:	5-17-16, 0800	5-18-16, 0800
Sample #3:	5-19-16, 0800	5-20-16, 0800

Test initiated (date, time): 5-17-16, 1430 Test terminated (date, time): 5-24-16, 1105

Dilution water used: Soft Synthetic

DATA TABLE FOR FATHEAD MINNOW SURVIVAL

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

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	0.598	0.665	0.563	0.655		0.614	7.13%
5%	0.586	0.529	0.583	0.572	0.556		0.565	
7%	0.603	0.628	0.573	0.618	0.503		0.585	
9%	0.561	0.666	0.603	0.518	0.544		0.578	
12%	0.558	0.612	0.611	0.501	0.537		0.564	8.53%
16%	0.529	0.551	0.518	0.532	0.632		0.552	

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)= _____**8.53**_____%

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:	5-15-16, 0800	5-16-16, 0800
Sample #2:	5-17-16, 0800	5-18-16, 0800
Sample #3:	5-19-16, 0800	5-20-16, 0800

Test initiated (date, time): 5-17-16, 1010 Test terminated (date, time): 5-23-16, 0940

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	28	33	29	31	31	30
B	34	31	27	27	32	28
C	36	29	30	27	33	35
D	29	25	31	27	30	26
E	33	33	25	32	28	37
F	27	38	33	36	34	40
G	31	36	29	38	36	36
H	32	32	30	30	34	34
I	0	5	3	x0	0	x0
J	32	35	36	18	35	39
Mean	28.2	29.7	27.3	28.0	29.3	30.5
Mean/surviving female	28.2	29.7	27.3	31.1	29.3	33.9
CV%*	36.5				36.1	

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	90

1. Fisher's Exact Test:
   Is the mean survival at test termination significantly different (p=0.05) than the control survival for:

   a) LOW FLOW OR CRITICAL DILUTION, (100%): YES_____ NO____**X**____

2. Dunnett's Procedure or Steel's Many One Rank Test:
   Is the mean number of young produced per female significantly different (p=0.05) than the controls number of young per female for:

   a) LOW FLOW OR CRITICAL DILUTION, (100%): YES_____ NO____**X**_____

3. If NO was answered to 1.a) enter [0] otherwise enter [1] (parameter TLP3B):_____**0**_____

4. If NO was answered to 2.a) enter [0] otherwise enter [1] (parameter TGP3B):_____**0**_____

5. Enter percentage corresponding to each parameter below:

   a) NOEC survival (parameter TOP3B)= _____**16**___ % effluent

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

   c) Coefficient of variation (parameter TQP3B)= _____**36.5**_____%

6. Enter Whole Effluent Toxicity: _____**16**_____%

APPENDIX A

Chain of Custody Forms

Arkansas Analytical Inc.

8100 National Dr.
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	Tupelo Bayou	2 Day (50%)	2. Sulfuric Acid (H_2SO_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
Attn: Bill Fulmer		Email: Bill.Fulmer@conwaycorp.com	Preservative Code:	1
		Email: trey.lieblong@conwaycorp.com	Bottle Type:	P

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

Sampler(s) Signature: Bill Fulmer

Sampler(s) Printed: Bill Fulmer

Arkansas Analytical Work Order Number: K1605005

Field Number	SAMPLE COLLECTION Date/s	Time/s	Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	Chronic Toxicity	Bottle Type Code
	5-15-16-16	8AM-8AM		X	1	Water	Outfall 001	X	A

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)	SAMPLE CONDITION UPON RECEIPT IN LAB	REMARKS / SAMPLE COMMENTS
Bill Fulmer	5-16-16 848Am		1. CUSTODY SEALS: ✓ Yes ___ No	
			2. CONTAINERS CORRECT: ✓ Yes ___ No	
3. Relinquished by: (Signature)	Date/Time	4. Received by lab: (Signature)	3. COC/LABELS AGREE: ✓ Yes ___ No	
		Amanda Forbush 5-16-16 0848	4. RECEIVED ON ICE: ✓ Yes ___ No	
			5. TEMPERATURE ON RECEIPT: 2 °C	
			6. TEMPERATURE GUN ID: HHT# 2	
			FOR COMPLETION BY LAB ONLY	

Arkansas Analytical Inc.

8100 National Dr.
Little Rock, AR 72209
PHONE: 501-455-3233
FAX: 501-455-6118

CHAIN OF CUSTODY RECORD

CLIENT INFORMATION	BILLING INFORMATION	Project Description	Turnaround Time
Conway Corporation	Conway Corporation	Chronic Toxicity	1 Day (100%)
800 South Harkrider	P.O. Box 99	Tupelo Bayou	2 Day (50%)
Conway, AR 72032	Conway, AR 72032	**Reporting Information**	3 Day (25%)
		Telephone: 501-733-4495	Routine
Attn: Bill Fulmer		Email: Bill.Fulmer@conwaycorp.com	Preservative Code: 1
		Email: trey.lieblong@conwaycorp.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 Fulmer

Sampler(s) Printed: Bill Fulmer

Field Number	SAMPLE COLLECTION Date/s	Time/s	Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	TEST PARAMETERS: Chronic Toxicity	Arkansas Analytical Work Order Number:
	5-17-16	8 AM-8 AM		X	1	Water	Outfall 001	X	K1605-005B

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)
Bill Fulmer	5-18-16 957 AM	
3. Relinquished by: (Signature)	**Date/Time**	**4. Received by lab: (Signature)**
	5-18-16, 0957	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. RECEIVED ON ICE:	___ Yes	___ No
5. TEMPERATURE ON RECEIPT:	1 °C	
6. TEMPERATURE GUN ID:	HHT# 2	

FOR COMPLETION BY LAB ONLY

REMARKS / SAMPLE COMMENTS

Arkansas Analytical Inc.

8100 National Dr.
Little Rock, AR 72209
PHONE: 501-455-3233
FAX: 501-455-6118

CHAIN OF CUSTODY RECORD

CLIENT INFORMATION	BILLING INFORMATION
Conway Corporation	Conway Corporation
800 South Harkrider	P.O. Box 99
Conway, AR 72032	Conway, AR 72032
Attn: Bill Fulmer	

Project Description: Chronic Toxicity; Tupelo Bayou

Reporting Information
Telephone: 501-733-4495
Email: Bill.Fulmer@conwaycorp.com
Email: trey.lieblong@conwaycorp.com

Turnaround Time: 1 Day (100%); 2 Day (50%); 3 Day (25%); Routine

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

Preservative Code: 1
Bottle Type: P

Sampler(s) Signature: Bill Fulmer
Sampler(s) Printed: Bill Fulmer

Field Number	SAMPLE COLLECTION Date/s	Time/s	Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	Chronic Toxicity	Bottle Type Code
	5-19-2016	8 AM-8 AM		X	2	Water	Outfall 001	X	C

TEST PARAMETERS

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

Arkansas Analytical Work Order Number: K1605005

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)
Bill Fulmer	5-20-16 8:59 AM	
3. Relinquished by: (Signature)	Date/Time	4. Received by lab: (Signature)
	5/20/16 8:59	Danny Riddle

SAMPLE CONDITION UPON RECEIPT IN LAB

1. CUSTODY SEALS:	✓ Yes	No
2. CONTAINERS CORRECT:	Yes	No
3. COC/LABELS AGREE:	Yes	No
4. RECEIVED ON ICE:	Yes	No
5. TEMPERATURE ON RECEIPT:	0 °C	
6. TEMPERATURE GUN ID:	HHT# 2	

FOR COMPLETION BY LAB ONLY

REMARKS / SAMPLE COMMENTS

APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING									Fathead Minnow
Lab # / Sample ID K1605005					Test Start (Date/Time) 5-17-16 / 1430				
Client: Conway - Tupelo					Test End (Date/Time) 5-24-16 / 1105				
		Day of Test							
		1	2	3	4	5	6	7	notes
Control	SS 321		5/18	5/19	5/20	5/21*	5/22	5/23	*SS 322
D.O. (mg/L)	INITIAL	8.4	8.3	8.2	8.4	8.5	8.4	8.2	
	FINAL	8.0	7.7	7.6	7.6	6.9	7.1	7.5	
pH (s.u.)	INITIAL	7.5	7.5	7.2	7.2	7.8	7.4	7.3	
	FINAL	7.4	7.3	7.3	7.2	7.5	7.0	7.1	
temp (C)	INITIAL	23	23.5	23	23	22	22	23	
	FINAL	20	25	25	25	25	25	25	
ALKALINITY (mg/L)		22	→	→	→	22	→	→	
HARDNESS (mg/L)		48	→	→	→	44	→	→	
CONDUCTIVITY (umhc		170	→	→	→	164	→	→	
CHLORINE (mg/L)		<0.05	→	→	→	<0.05	→	→	
CONC:	5%								
D.O. (mg/L)	INITIAL	8.4	8.4	8.5	8.4	8.2	8.5	8.4	
	FINAL	8.0	7.6	7.7	7.8	6.9	7.3	6.9	
pH (s.u)	INITIAL	7.5	7.5	7.4	7.4	7.8	7.5	7.4	
	FINAL	7.4	7.3	7.4	7.4	7.4	7.2	7.0	
temp (C)	INITIAL	24	24	23	24	22	22	23	
	FINAL	20	25	25	25	25	25	25	
CONC:	7%								
D.O. (mg/L)	INITIAL	8.4	8.3	8.5	8.4	8.2	8.5	8.4	
	FINAL	8.0	7.7	7.8	7.8	6.9	7.2	6.8	
pH (mg/L)	INITIAL	7.5	7.5	7.4	7.4	7.8	7.5	7.5	
	FINAL	7.4	7.5	7.5	7.4	7.5	7.2	7.0	
temp (C)	INITIAL	24	24	23	23.5	22	22	23	
	FINAL	19.5	25	25	25	25	25	25	
CONC:	9%								
D.O. (mg/L)	INITIAL	8.3	8.4	8.6	8.4	8.2	8.5	8.4	
	FINAL	7.7	7.7	7.0	7.4	6.9	7.3	6.4	
pH (s.u.)	INITIAL	7.5	7.5	7.4	7.4	7.8	7.5	sc 7.5 4	
	FINAL	7.3	7.4	7.3	7.4	7.4	7.2	6.9	
temp (C)	INITIAL	24.5	24	23	24	22	22	23	
	FINAL	19.5	25	25	25	25	25	25	
CONC:	12%								
D.O. (mg/L)	INITIAL	8.3	8.3	8.6	8.4	8.2	8.5	8.5	
	FINAL	7.5	7.7	sc ~~7.6~~ 6.6	7.6	6.9	7.2	6.4	
pH (s.u.)	INITIAL	7.5	7.5	7.4	7.4	7.8	7.5	7.5	
	FINAL	7.4	7.5	sc ~~7.5~~ 7.2	7.3	7.5	7.2	6.9	
temp (C)	INITIAL	25	24.5	23	24	22	22	23	
	FINAL	20	25	25	25	25	25	25	
CONC:	16%								
D.O. (mg/L)	INITIAL	8.3	8.3	8.6	8.4	8.1	8.5	8.4	
	FINAL	7.7	7.6	7.2	7.1	6.9	7.2	5.9	
pH (s.u.)	INITIAL	7.5	7.5	7.4	7.5	7.8	7.5	7.5	
	FINAL	7.4	7.5	7.4	7.3	7.4	7.2	6.8	
temp (C)	INITIAL	25	24.5	23	24	23	22	23	
	FINAL	20	25	25	25	25	25	25	
CONC:	100 %	A	A	B	B	C	C	C	
ALKALINITY (mg/L)		104	→	120	→	106	→	→	
HARDNESS (mg/L)		78	→	46	→	28	→	→	
CONDUCTIVITY (umhc		592	→	599	→	622	→	→	
CHLORINE (mg/L)		<0.05	→	<0.05	→	<0.05	→	→	

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING									Ceriodaphnia Dubia
Lab # / Sample ID K1605005					Test Start (Date/Time) 5-17-16 / 1010				
Client: Conway - Tupelo					Test End (Date/Time) 5-23-16 / 0940				
		Day of Test							
		1	2	3	4	5	6	7	notes
Control	SS 321	5/17	5/18	5/19	5/20	5/21*	5/22	5/23	*SS322
D.O. (mg/L)	INITIAL	8.4	8.3	8.2	8.4	8.4	8.4	8.2	
	FINAL	8.5	8.6	9.0	8.3	8.4	8.4	na	
pH (s.u.)	INITIAL	7.5	7.5	7.2	7.2	7.3	7.4	7.3	
	FINAL	7.6	8.0	8.0	7.6	7.5	7.3	na	
temp (C)	INITIAL	23	23.5	23	23	22	22	23	
	FINAL	25	25	25	25	25	25	na	
ALKALINITY (mg/L)		22	—	—	—	22	—	—	
HARDNESS (mg/L)		48	—	—	—	44	—	—	
CONDUCTIVITY (umhc		170	—	—	—	164	—	—	
CHLORINE (mg/L)		<0.05	—	—	—	<0.05	—	—	
CONC:	5%								
D.O. (mg/L)	INITIAL	8.4	8.4	8.5	8.4	8.5	8.5	8.4	
	FINAL	8.6	8.6	9.1	8.4	8.5	8.5	na	
pH (s.u)	INITIAL	7.5	7.5	7.4	7.4	7.4	7.5	7.4	
	FINAL	7.9	8.0	8.0	7.7	7.5	7.4	na	
temp (C)	INITIAL	24	24	23	24	22	22	23	
	FINAL	25	25	25	25	25	25	na	
CONC:	7%								
D.O. (mg/L)	INITIAL	8.4	8.3	8.5	8.4	8.5	8.5	8.4	
	FINAL	8.7	8.6	9.1	8.3	8.4	8.5	na	
pH (mg/L)	INITIAL	7.5	7.5	7.4	7.4	7.4	7.5	7.5	
	FINAL	8.0	8.0	8.0	7.7	7.6	7.4	na	
temp (C)	INITIAL	24	24	23	23.5	22	22	23	
	FINAL	25	25	25	25	25	25	na	
CONC:	9%								
D.O. (mg/L)	INITIAL	8.3	8.4	8.6	8.4	8.5	8.5	8.4	
	FINAL	8.6	8.6	9.2	8.3	8.5	8.6	na	
pH (s.u.)	INITIAL	7.5	7.5	7.4	7.4	7.4	7.5	7.4	
	FINAL	7.9	8.0	8.1	7.7	7.6	7.4	na	
temp (C)	INITIAL	24.5	24	23	24	22	22	23	
	FINAL	25	25	25	25	25	25	na	
CONC:	12%								
D.O. (mg/L)	INITIAL	8.3	8.3	8.6	8.4	8.5	8.5	8.5	
	FINAL	8.7	8.7	9.2	8.2	8.4	8.6	na	
pH (s.u.)	INITIAL	7.5	7.5	7.4	7.4	7.4	7.5	7.5	
	FINAL	7.9	8.0	8.0	7.7	7.6	7.5	na	
temp (C)	INITIAL	25	24.5	23	24	22	22	23	
	FINAL	25	25	25	25	25	25	na	
CONC:	16%								
D.O. (mg/L)	INITIAL	8.3	8.3	8.6	8.4	8.5	8.5	8.4	
	FINAL	8.7	8.6	*~~9.2~~ 9.0	8.3	8.5	8.6	na	
pH (s.u.)	INITIAL	7.5	7.5	7.4	7.5	7.4	7.5	7.5	
	FINAL	7.9	7.9	7.9	7.6	7.6	7.5	na	
temp (C)	INITIAL	25	24.5	23	24	22	22	23	
	FINAL	25	25	25	25	25	25	na	
CONC:	100 %	A	A	B	B	C	C	C	
ALKALINITY (mg/L)		104	→	120	→	106	→	→	
HARDNESS (mg/L)		78	→	46	→	28	→	→	
CONDUCTIVITY (umhc		592	→	599	→	622	→	→	
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 K1605005 TEST START DATE 5-17-16 TIME 1430

CLIENT Conway - Tupelo TEST END DATE 5-24-16 TIME 1105

AGE AND SOURCE OF MINNOWS <24 HRS, Aquatox

			DAY (NUMBER SURVIVING)							SURVIVAL		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	10	10	10	10	10	10	10	10	100		
	B		10	10	9	9	9	9	9	90		
	C		10	10	10	10	10	10	10	100		
Control	D		10	10	9	9	9	9	9	90	96.0	5.71
	E		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		
	B		10	10	10	10	10	10	10	100		
	C		10	10	10	10	10	10	10	100		
5%	D		10	10	10	10	10	10	10	100	98.0	4.6
	E		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		
	B		10	10	10	10	10	10	10	100		
	C		10	9	9	9	9	9	9	90		
7%	D		10	10	10	10	10	10	10	100	94.0	9.5
	E		9	9	8	8	8	8	8	80		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	10	10	10	10	10	10	10	10	100		
	B		10	10	10	10	10	10	10	100		
	C		10	10	10	10	10	10	10	100		
9%	D		10	10	10	10	10	10	10	100	100.0	0
	E		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		
	B		10	10	10	10	10	10	10	100		
	C		10	10	10	10	10	10	10	100		
12%	D		10	10	10	9	9	8	8	80	94.0	9.52
	E		9	9	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		
	B		10	10	10	10	10	10	10	100		
	C		10	10	10	10	10	9	9	90		
16%	D		10	10	10	10	10	10	10	100	96.0	5.71
	E		10	10	10	10	10	10	9	90		
ANALYST		SC	SC	SC	SC	SC	SC	SC	SC			
DATE:		5-17-16	5-18-16	5-19-16	5-20-16	5-21-16	5-22-16	5-23-16	5-24-16			
TIME:		1430	1040	1015	1040	1615	1715	1020	1105			

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: WI16050005
CLIENT: Conway- Tupelo
ANALYSTS: Th SE
SAMPLE ID: Outfall

TEST DATES (BEGIN / END): 5-17-16 / 5-24-16
WEIGHING DATE / TIME: 5-25-16 / 1615
DRYING TEMP (DEGREES C): ~~24 HRS~~ Th 60°C
DRYING TIME (HOURS): 24 HRS

	REP#	FINAL DRY WEIGHT TIN+LARVAE (g)	INTIAL WEIGHT TIN (g)	TOTAL DRY WEIGHT OF LARVAE (g)	NUMBER OF LARVAE	DRY WEIGHT OF LARVAE (mg)	
CONTROL	A T1	0.98407	0.97816	0.00591	10	0.591	AVG DRY WEIGHT (mg) 0.6144
Control	B T2	0.98201	0.97603	0.00598	10	0.598	
	C T3	1.00277	0.99612	0.006665	10	0.6665	CV 7.13 %
	D T4	1.00139	0.99576	0.00563	10	0.8563	
	E T5	0.97155	0.96500	0.00655	10	0.655	
CONC:	A T6	1.01203	1.00617	0.00586	10	0.586	AVG DRY WEIGHT (mg) 0.565
5%	B T7	0.99948	0.99419	0.00529	10	0.529	
	C T8	0.99736	0.99153	0.00583	10	0.583	CV 4.1 %
	D T9	0.98834	0.98262	0.00572	10	0.572	
	E T10	1.03943	1.03387	0.00556	10	0.556	
CONC:	A T11	0.99965	0.99362	0.00603	10	0.603	AVG DRY WEIGHT (mg) 0.585
7%	B T12	0.98438	0.97810	0.00628	10	0.628	
	C T13	0.97319	0.96746	0.00573	10	0.573	CV 8.6 %
	D T14	1.01322	1.00704	0.00618	10	0.618	
	E T15	1.01457	1.00954	0.00503	10	0.503	
CONC:	A T26	1.02770	1.02209	0.00561	10	0.561	AVG DRY WEIGHT (mg) 0.578
9%	B T17	1.02002	1.01336	0.006666	10	0.6666	
	C T18	1.00358	0.99755	0.00603	10	0.603	CV 10.0 %
	D T19	1.02196	1.01678	0.00518	10	0.518	
	E T20	1.01725	1.01181	0.00544	10	0.544	
CONC:	A T21	1.00165	0.996607	0.00558	10	0.558	AVG DRY WEIGHT (mg) 0.564
12%	B T22	1.02869	1.02257	0.00612	10	0.612	
	C T23	1.00649	1.00038	0.00611	10	0.611	CV 8.53 %
	D T24	1.0835630	1.03062	0.00501	10	0.501	
	E T25	1.03581	1.03044	0.00537	10	0.537	
CONC:	A T16	1.01646	1.01117	0.00529	10	~~0.005~~ 0.529	AVG DRY WEIGHT (mg) 0.5524
16%	B T27	1.01919	1.01368	0.00551	10	0.551	
	C T28	1.02387	1.01869	0.00518	10	0.518	CV 8.34 %
	D T29	1.02020	1.01488	0.00532	10	0.532	
	E T30	1.03381	1.02749	0.00632	10	0.632	

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

AA # K1605005, P. PROMELAS 7 DAY CHRONIC, 5-17-16
File: CTBFH Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.236

W = 0.865

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 # K1605005, P. PROMELAS 7 DAY CHRONIC, 5-17-16
File: CTBFH 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 # K1605005, P. PROMELAS 7 DAY CHRONIC, 5-17-16
FILE: CTBFH
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	0.9000	1.2490
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	0.9000	1.2490
3	7% EFFLUENT	1	1.0000	1.4120
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	0.8000	1.1071
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	0.8000	1.1071
5	12% EFFLUENT	5	0.9000	1.2490
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	1.0000	1.4120
6	16% EFFLUENT	5	0.9000	1.2490

AA # K1605005, P. PROMELAS 7 DAY CHRONIC, 5-17-16
File: CTBFH 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	1.347				
2	5% EFFLUENT	1.379	30.00	16.00	5.00	
3	7% EFFLUENT	1.318	26.50	16.00	5.00	
4	9% EFFLUENT	1.412	32.50	16.00	5.00	
5	12% EFFLUENT	1.318	26.50	16.00	5.00	
6	16% EFFLUENT	1.347	27.50	16.00	5.00	

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

AA # K1605005, P. PROMELAS 7 DAY GROWTH, 5-17-16
File: ctbfg Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.053

W = 0.978

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 # K1605005, P. PROMELAS 7 DAY GROWTH, 5-17-16
File: ctbfg Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 2.83

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 # K1605005, P. PROMELAS 7 DAY GROWTH, 5-17-16
FILE: ctbfg
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.5910	0.8769
1	CONTROL	2	0.5980	0.8840
1	CONTROL	3	0.6650	0.9535
1	CONTROL	4	0.5630	0.8486
1	CONTROL	5	0.6550	0.9430
2	5% EFFLUENT	1	0.5860	0.8718
2	5% EFFLUENT	2	0.5290	0.8144
2	5% EFFLUENT	3	0.5830	0.8688
2	5% EFFLUENT	4	0.5720	0.8576
2	5% EFFLUENT	5	0.5560	0.8415
3	7% EFFLUENT	1	0.6030	0.8891
3	7% EFFLUENT	2	0.6280	0.9148
3	7% EFFLUENT	3	0.5730	0.8587
3	7% EFFLUENT	4	0.6180	0.9045
3	7% EFFLUENT	5	0.5030	0.7884
4	9% EFFLUENT	1	0.5610	0.8466
4	9% EFFLUENT	2	0.6660	0.9546
4	9% EFFLUENT	3	0.6030	0.8891
4	9% EFFLUENT	4	0.5180	0.8034
4	9% EFFLUENT	5	0.5440	0.8295
5	12% EFFLUENT	1	0.5580	0.8435
5	12% EFFLUENT	2	0.6120	0.8984
5	12% EFFLUENT	3	0.6110	0.8973
5	12% EFFLUENT	4	0.5010	0.7864
5	12% EFFLUENT	5	0.5370	0.8224
6	16% EFFLUENT	1	0.5290	0.8144
6	16% EFFLUENT	2	0.5510	0.8365
6	16% EFFLUENT	3	0.5180	0.8034
6	16% EFFLUENT	4	0.5320	0.8174
6	16% EFFLUENT	5	0.6320	0.9190

AA # K1605005, P. PROMELAS 7 DAY GROWTH, 5-17-16
File: ctbfg Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.012	0.002	1.122
Within (Error)	24	0.053	0.002	
Total	29	0.065		

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

AA # K1605005, P. PROMELAS 7 DAY GROWTH, 5-17-16
File: ctbfg 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	0.901	0.614		
2	5% EFFLUENT	0.851	0.565	1.697	
3	7% EFFLUENT	0.871	0.585	1.014	
4	9% EFFLUENT	0.865	0.578	1.232	
5	12% EFFLUENT	0.850	0.564	1.738	
6	16% EFFLUENT	0.838	0.552	2.124	

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

AA # K1605005, P. PROMELAS 7 DAY GROWTH, 5-17-16
File: ctbfg 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	5% EFFLUENT	5	0.069	11.2	0.049
3	7% EFFLUENT	5	0.069	11.2	0.029
4	9% EFFLUENT	5	0.069	11.2	0.036
5	12% EFFLUENT	5	0.069	11.2	0.051
6	16% EFFLUENT	5	0.069	11.2	0.062

Lower PMSD bound for growth = 12

Concentration (% Effluent)	Growth ($\bar{x}$ of 5 reps)	Relative Difference from Control	Does Relative Difference Exceed 12?
Control	0.614	0	No
5%	0.565	8.0	No
7%	0.585	4.7	No
9%	0.578	5.9	No
12%	0.564	8.1	No
16%	0.552	10	No

No treatments exhibit a statistically significant difference from the control. NOEC = 16% + Bounds 6-16-2016

APPENDIX D

Ceriodaphnia dubia Raw Data and Statistics

SURVIVAL AND REPRODUCTION TEST

Ceriodaphnia dubia

Discharger: Conway
Location: Tupelo Bayou
Date Sample Collected: See COC

Lab Number/s: K1605005

Analyst: tb
Test Start - Date/Time: 5-17-16 / 1010
Test Stop - Date/Time: 5-23-16 / 0940

Conc % 1 (CONTROL)

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	tb
2	0	0	0	0	0	0	0	0	0	0	0	10	0	tb
3	4	4	6	5	5	5	4	6	0	4	43	10	4.3	tb
4	13	13	13	10	2	11	10	11	0	13	96	10	9.6	tb
5	11	17	0	14	12	11	2	0	0	0	67	10	6.7	tb
6	0	0	17	0	14	0	15	15	0	15	76	10	7.6	tb
7														
8														
Total	28	34	36	29	33	27	31	32	OM	32	282		CV%	36.5%
													$\bar{x}$ = 28.2	

Conc % 2 (5)

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	tb
2	0	0	0	0	0	0	0	0	0	0	0	10	0	tb
3	6	5	1	5	6	5	6	5	0	6	45	10	4.5	tb
4	9	11	10	10	13	16	0	9	2	12	92	10	9.2	tb
5	18	1	18	10	13	0	13	0	3	1	77	10	7.7	tb
6	0	14	0	0	1	17	17	18	⊙	16	83	10	8.3	tb
7														
8							60 3-11 36							
Total	33	31	29	25	33	38	32	32	SM	35	297			

Conc % 3 (1)

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	tb
2	0	0	0	0	0	0	0	0	0	0	0	10	0	tb
3	0	4	4	5	6	6	3	4	0	4	36	10	3.6	tb
4	11	9	10	10	7	10	10	11	2	11	91	10	9.1	tb
5	14	14	0	15	0	1	0	0	1	3	48	10	4.8	tb
6	4	0	16	1	12	16	16	15	0	18	98	10	9.8	tb
7														
8														
Total	29	27	30	31	25	33	29	30	SM	36	273			

Conc % 4 (9)

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	tb
2	0	0	0	0	0	0	0	0	0	0	0	10	0	tb
3	5	3	4	3	6	8	5	5	0	0	39	10	3.9	tb
4	11	10	10	10	13	13	13	11	0	14	105	10	10.5	tb
5	0	0	0	14	1	15	0	0	0	0	30	10	3.0	tb
6	15	14	13	0	12	0	20	14	X°	18	106	9	10.6	tb
7														
8														
Total	31	27	27	27	32	36	38	30	OM	32	280			

Conc % 5 (12)

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	tb
2	0	0	0	0	0	0	0	0	0	0	0	10	0	tb
3	0	5	4	4	4	6	3	5	0	6	37	10	3.7	tb
4	12	10	12	11	10	10	14	11	0	13	108	10	10.8	tb
5	0	16	17	14	3	15	16	0	0	0	81	10	8.1	tb
6	19	1	0	1	11	3	3	18	0	16	72	10	7.2	tb
7														
8														
Total	31	32	33	30	28	34	36	34	OM	35	293		CV% = 36.1%	
													$\bar{x}$ = 29.3	

Conc % 6 (16)

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	tb
2	0	0	0	0	0	0	0	0	0	0	0	10	0	tb
3	5	0	5	3	5	7	5	2	X	7	39	9	3.9	tb
4	11	12	12	8	2	15	14	11	–	14	99	9	9.9	tb
5	0	16	0	15	14	0	0	1	–	0	46	9	4.6	tb
6	14	0	18	0	16	18	17	20	–	18	121	9	12.1	tb
7														
8														
Total	30	28	35	26	37	40	36	34	OM	39	305		CV% = 38.2%	14.4%
													$\bar{x}$ = 30.5	tb

X = Dead

$\bar{x}$ per SA = 33.9

Revision 2
2/20/2014

7/14/2014 10:12 AM

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
5% effluent	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% effluent	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% effluent	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	NUMBER OF DEAD	TOTAL ANIMALS
CONTROL	10	0	10
12% effluent	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	NUMBER OF DEAD	TOTAL ANIMALS
CONTROL	10	0	10
16% effluent	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.

SUMMARY OF FISHER'S EXACT TESTS

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

AA # K1605005, CERIODAPHNIA DUBIA REPRODUCTION, 5-17-16
File: ctbCD 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 = 54

AA # K1605005, CERIODAPHNIA DUBIA REPRODUCTION, 5-17-16
File: ctbCD Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 4.21

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 # K1605005, CERIODAPHNIA DUBIA REPRODUCTION, 5-17-16
FILE: ctbCD
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	28.0000	28.0000
1	CONTROL	2	34.0000	34.0000
1	CONTROL	3	36.0000	36.0000
1	CONTROL	4	29.0000	29.0000
1	CONTROL	5	33.0000	33.0000
1	CONTROL	6	27.0000	27.0000
1	CONTROL	7	31.0000	31.0000
1	CONTROL	8	32.0000	32.0000
1	CONTROL	9	32.0000	32.0000
2	5% EFFLUENT	1	33.0000	33.0000
2	5% EFFLUENT	2	31.0000	31.0000
2	5% EFFLUENT	3	29.0000	29.0000
2	5% EFFLUENT	4	25.0000	25.0000
2	5% EFFLUENT	5	33.0000	33.0000
2	5% EFFLUENT	6	38.0000	38.0000
2	5% EFFLUENT	7	36.0000	36.0000
2	5% EFFLUENT	8	32.0000	32.0000
2	5% EFFLUENT	9	35.0000	35.0000
3	7% EFFLUENT	1	29.0000	29.0000
3	7% EFFLUENT	2	27.0000	27.0000
3	7% EFFLUENT	3	30.0000	30.0000
3	7% EFFLUENT	4	31.0000	31.0000
3	7% EFFLUENT	5	25.0000	25.0000
3	7% EFFLUENT	6	33.0000	33.0000
3	7% EFFLUENT	7	29.0000	29.0000
3	7% EFFLUENT	8	30.0000	30.0000
3	7% EFFLUENT	9	36.0000	36.0000
4	9% EFFLUENT	1	31.0000	31.0000
4	9% EFFLUENT	2	27.0000	27.0000
4	9% EFFLUENT	3	27.0000	27.0000
4	9% EFFLUENT	4	27.0000	27.0000
4	9% EFFLUENT	5	32.0000	32.0000
4	9% EFFLUENT	6	36.0000	36.0000
4	9% EFFLUENT	7	38.0000	38.0000
4	9% EFFLUENT	8	30.0000	30.0000
4	9% EFFLUENT	9	32.0000	32.0000
5	12% EFFLUENT	1	31.0000	31.0000
5	12% EFFLUENT	2	32.0000	32.0000
5	12% EFFLUENT	3	33.0000	33.0000
5	12% EFFLUENT	4	30.0000	30.0000
5	12% EFFLUENT	5	28.0000	28.0000
5	12% EFFLUENT	6	34.0000	34.0000
5	12% EFFLUENT	7	36.0000	36.0000
5	12% EFFLUENT	8	34.0000	34.0000
5	12% EFFLUENT	9	35.0000	35.0000
6	16% EFFLUENT	1	30.0000	30.0000
6	16% EFFLUENT	2	28.0000	28.0000
6	16% EFFLUENT	3	35.0000	35.0000
6	16% EFFLUENT	4	26.0000	26.0000

6	16% EFFLUENT	5	37.0000	37.0000
6	16% EFFLUENT	6	40.0000	40.0000
6	16% EFFLUENT	7	36.0000	36.0000
6	16% EFFLUENT	8	34.0000	34.0000
6	16% EFFLUENT	9	39.0000	39.0000

AA # K1605005, CERIODAPHNIA DUBIA REPRODUCTION, 5-17-16
File: ctbCD Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	83.111	16.622	1.250
Within (Error)	48	638.222	13.296	
Total	53	721.333		

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

AA # K1605005, CERIODAPHNIA DUBIA REPRODUCTION, 5-17-16
File: ctbCD 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	31.333	31.333		
2	5% EFFLUENT	32.444	32.444	-0.646	
3	7% EFFLUENT	30.000	30.000	0.776	
4	9% EFFLUENT	31.111	31.111	0.129	
5	12% EFFLUENT	32.556	32.556	-0.711	
6	16% EFFLUENT	33.889	33.889	-1.487	

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

AA # K1605005, CERIODAPHNIA DUBIA REPRODUCTION, 5-17-16
File: ctbCD 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	9			
2	5% EFFLUENT	9	3.971	12.7	-1.111
3	7% EFFLUENT	9	3.971	12.7	1.333
4	9% EFFLUENT	9	3.971	12.7	0.222
5	12% EFFLUENT	9	3.971	12.7	-1.222
6	16% EFFLUENT	9	3.971	12.7	-2.556

AA # K1605005, CERIODAPHNIA DUBIA REPRODUCTION, 5-17-16
File: ctbCD Transform: NO TRANSFORMATION

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	31.333				
2	5% EFFLUENT	32.444	94.50	60.00	9.00	
3	7% EFFLUENT	30.000	75.00	60.00	9.00	
4	9% EFFLUENT	31.111	80.50	60.00	9.00	
5	12% EFFLUENT	32.556	96.00	60.00	9.00	
6	16% EFFLUENT	33.889	100.50	60.00	9.00	

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

APPENDIX E

Organism History

AQUATOX, INC.

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

TEST ORGANISM HISTORY

DATE SHIPPED 5/17/16 **CLIENT** Ar Analytical Tracey

Purchase Order #: _____

SPECIES: **Pimephales promelas**

Quantity Shipped: 900

Age: hatched 5/16/17 @ 15-1600 CST

Brood Stock Source: Anderson Farms, AR

Culture Water: (Groundwater)

Hardness (Mg/l CaCO3): 160

Dissolved Oxygen (Mg/1): 8.2

Temperature (°C): 25.1°C

I ng: NFH

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: 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:	22°C	22-26°C
SALINITY/CONDUCTIVITY:	--	--
TOTAL HARDNESS (as $CaCO_3$):	94 mg/l	76-130 mg/l
TOTAL ALKALINITY (as $CaCO_3$):	65 mg/l	65-100 mg/l
pH:	7.98	7.50-8.20

Comments:

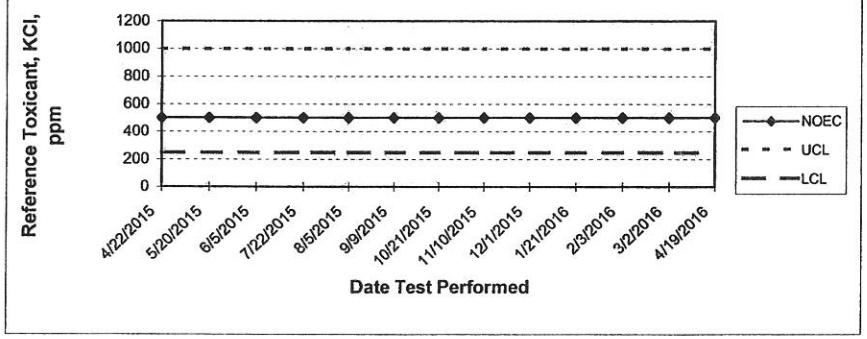
Facility Supervisor

APPENDIX F

Quality Assurance Charts

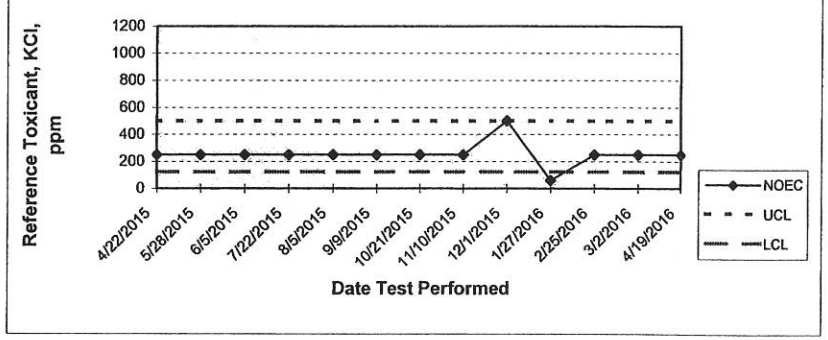
ARKANSAS ANALYTICAL, INC.

FATHEAD MINNOW SURVIVAL 7 Day
QUALITY ASSURANCE



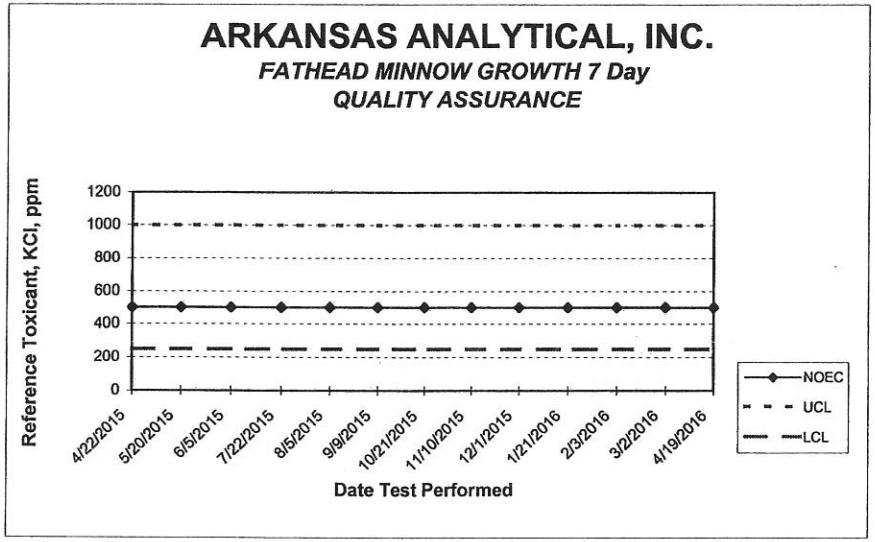
ARKANSAS ANALYTICAL, INC.

CERIODAPHNIA DUBIA SURVIVAL
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.

FATHEAD MINNOW GROWTH 7 Day
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.

CERIODAPHNIA DUBIA REPRODUCTION
QUALITY ASSURANCE