

Sanitary Sewer Overflow Monthly Report

Facility Name: Sheridan Water and Sewer Works Permit Number: AR0034347 Reporting Period (Month/Year): June 2013

No Sanitary Sewer Overflows This Monitoring Period

Summary Report Code Descriptions

Cause(s) of SSO		SSO Impact	Action(s) Taken	Ultimate Discharge Location
CO-Construction	D-Debris	NEAH-No Evidence of Adverse Health or Environmental Impact	WO-Work Order	CR-Creek/Stream/River (please specify)
E-Equipment Failure	G-Grease	OBHC-Observed or Evidence of Human Contact	EC-Environmental Cleanup	DI-Ditch
HC-Hydro Clean	LF-Line Failure/Break	EFK-Evidence of Fish Kill	HC-Hydro Cleaned	DR-Drop Inlet
R-Rainfall	RG-Roots & Grease		HR-Hand Rodded	GR-Ground Surface
RO-Roots	V-Vandalism		EN-Referred to Engineering	PA-Paved Area
			PN-Public Notification	CB-Contained in Building

Location	Manhole #	Start Date of SSO	End Date of SSO	Estimated Volume (in gallons)	Cause of SSO	Environmental Impact	Action (s) Taken to Address SSO	Ultimate Discharge Location

Signature of Cognizant or Ranking Official

Date 7-12-13

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Arkansas Analytical, Inc.

Toxicity Test Results

CITY of SHERIDAN
NPDES PERMIT NUMBER: AR0034347
Second Quarter 2013
AFIN # 27-00022

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

Ceriodaphnia dubia, Survival and Reproduction Test
Test 1002.0

Prepared for: **Mr. David Fitzgerald**
City of Sheridan
P.O.Box 486
Sheridan, Arkansas 72150

Prepared by: Arkansas Analytical, Inc.
11701 I-30, Bldg 1, Suite 115
Little Rock, Arkansas 72209
Lab Number K1304003

April 25, 2013

Introduction

This report contains test results for toxicity testing for the City of Sheridan, NPDES permit number AR0034347. The plant is located in the Southeast ¼ of the Northwest ¼ of Section 11, Township 5 South, Range 13 West, in Grant County, Arkansas. The discharge is to receiving waters named Big Creek to Hurricane Creek, then to the Saline River in Segment 2C of the Ouachita River Basin.

The permit requires chronic biomonitoring testing quarterly for *Ceriodaphnia dubia* and *Pimephales promelas*. The test results in this report represent the testing of the second quarter of 2013.

Plant Operations

To be provided by permittee.

Source of Effluent and Dilution Water

Effluent sample was a composite and collected as follows:

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	04-11-13, 1145	04-12-13, 1045
Sample #2	04-14-13, 0800	04-15-13, 0700
Sample #3	04-15-13, 1343	04-16-13, 1243

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

Sample Receiving Information:	Date, Time Sample(s) Received	Temperature Upon Receipt (°C)
Sample #1:	04-12-13, 1140	13 (on ice)
Sample #2	04-15-13, 1446	22 (on ice)
Sample #3	04-16-13, 1530	21 (on ice)

Chain of custody documentation is located in Appendix A.

The permit designates the receiving water to be used as dilution water for the toxicity tests. Synthetic dilution water was substituted because of either zero flow conditions or due to an earlier characterization of the receiving water as being toxic.

The dilution water used in the toxicity tests was synthetic moderately hard. 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 6%, 8%, 11%, 14%, and 19%. The low-flow effluent concentration (**critical dilution**) was defined as **14% effluent**.

Test Methods

EPA Method 1000.0, Fathead Minnow, *Pimephales promelas*, Larval Survival and Growth Test, was used in this bioassay. Larvae are exposed in a static renewal system for seven days and the results are based on the survival and growth (increase in weight) of the larvae. The alternate method suggested in the method (11.3.4.5) for combating pathogen interference was run in place of the original fathead minnow test. The test chambers were 30 ml plastic cups with 20 ml of test solution. Each chamber contained 2 organisms. The total number of fish was 40 per test solution. The fish were then combined to perform growth analysis. The test temperature was 25 degrees Centigrade. Raw data and statistics are provided in Appendix C.

EPA Method 1002.0, Cladoceran, *Ceriodaphnia dubia*, Survival and Reproduction Test, was also used. Neonates are exposed in a static renewal system until at least 60% of the control organisms have produced a third brood. Results are based on the survival and reproduction of the organisms. One neonate was placed in each of ten replicate chambers using a randomizing template. Test chambers were 30 ml plastic cups filled with 15 ml of test solution. The test temperature was 25 degrees Centigrade. Raw data and statistics are provided in Appendix D.

Test Organisms

The organisms used in Test 1000.0 were < 48 hour old Fathead Minnows, *Pimephales promelas*, which were purchased from Aquatox; a copy of the organism history is provided in Appendix D.

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 *Pimephales promelas*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	100%	X	
The percent coefficient of variation between replicates must be 40% or less for survival	0.00%	X	
Minimum of 0.25 mg average dry weight of surviving controls	0.647	X	
The percent coefficient of variation between replicates must be 40% or less for growth	6.13%	X	

TEST ACCEPTANCE CRITERIA for *Ceriodaphnia dubia*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	100%	X	
Average of 15 or more young per surviving female	17.5	X	
At least 60% of surviving females should have produced 3 broods	100%	X	
The percent coefficient of variation between replicates must be 40% or less for the young of surviving females	20.7%	X	

Reference Toxicant

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

REFERENCE TOXICANT

<i>Ceriodaphnia dubia</i> 4/2/13-4/9/13		<i>Pimephales promelas</i> 4/2/13-4/9/13	
NOEC Survival:	500 ppm KCl	NOEC Survival:	250 ppm KCl
LOEC Survival:	1000 ppm KCl	LOEC Survival:	500 ppm KCl
NOEC Reproduction:	250 ppm KCl	NOEC Growth:	250 ppm KCl
LOEC Reproduction:	500 ppm KCl	LOEC Growth:	500 ppm KCl

Quality Assurance charts are provided in Appendix E.

Summary of Results

<i>Pimephales promelas</i>	
NOEC / LOEC survival	19% / NA
NOEC / LOEC growth	19% / NA
%CV survival (critical dilution)	0.00%
Mean dry weight (critical dilution) in milligrams	0.639
%CV growth (critical dilution)	15.70%
PMSD Growth	18.8%
<i>Ceriodaphnia dubia</i>	
NOEC / LOEC survival	19% /N/A
NOEC / LOEC reproduction	19% /N/A
Mean number of neonates (critical dilution)	19.2
%CV Reproduction (critical dilution)	16.1%
PMSD Reproduction	22.4%

Conclusion

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

The permit issued to the City of Sheridan, AR0034347, specifies that the **critical dilution is 14% effluent**. The effluent samples **did not** exhibit lethal or sublethal effects at the critical dilution, and, as such, **passed** the test.

Chronic static renewal survival and reproduction test using *Ceriodaphnia dubia*, (Method 1002.0)

The permit issued to the City of Sheridan, AR0034347, specifies that the **critical dilution is 14% effluent**. The effluent samples **did not** exhibit lethal or sublethal effects at the critical dilution, and, as such, **passed** the test.

Biomonitoring Analysts:

Ryan Hudgin (RH)
Ryan Hudgin

Chris Turney (CT)
Chris Turney

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

PERMITTEE: City of Sheridan

NPDES #: AR0034347

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	04-11-13, 1145	04-12-13, 1045
Sample #2	04-14-13, 0800	04-15-13, 0700
Sample #3	04-15-13, 1343	04-16-13, 1243

Test initiated (date, time): 4-12-13 , 1215 Test terminated (date, time): 4-19-13 , 1215

Dilution water used: Moderately Hard 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	100	100		100	100	100	0.0%
6.0%	87.5	100	100	100	100		100	100	97.5	
8.0%	100	100	100	100	100		100	100	100	
11.0%	100	100	100	100	100		100	100	100	
14.0%	100	100	100	100	100		100	100	100	0.0%
19.0%	100	100	87.5	100	100		100	100	97.5	

DATA TABLE FOR GROWTH OF FATHEAD MINNOWS

Average Dry Weight in milligrams in replicate chambers

Effluent Conc %	A	B	C	D	E		Mean Dry Weight	CV%
0%	0.683	0.688	0.630	0.591	0.645		0.647	6.13%
6.0%	0.574	0.661	0.588	0.662	0.815		0.660	
8.0%	0.626	0.589	0.588	0.643	0.804		0.650	
11.0%	0.698	0.552	0.559	0.616	0.761		0.637	
14.0%	0.680	0.530	0.701	0.536	0.750		0.639	15.70%
19.0%	0.621	0.629	0.552	0.664	0.688		0.631	

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, (14.0%) 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, (14.0%) 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)= _____ 19 _____ % effluent
b) NOEC growth (parameter TPP6C)= _____ 19 _____ % effluent
c) Coefficient of variation (parameter TQP6C)= _____ 15.70 _____ %

SUMMARY REPORTING FORMS FOR CHRONIC BIOMONITORING
Ceriodaphnia dubia SURVIVAL AND REPRODUCTION

Permittee: City of Sheridan

NPDES #: AR0034347

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	04-11-13, 1145	04-12-13, 1045
Sample #2	04-14-13, 0800	04-15-13, 0700
Sample #3	04-15-13, 1343	04-16-13, 1243

Test initiated (date, time): 4-12-13 , 1200 Test terminated (date, time): 4-19-13 , 1000

Dilution water used: Moderately Hard Synthetic

Ceriodaphnia dubia SURVIVAL AND REPRODUCTION

NUMBER OF YOUNG PRODUCED PER FEMALE @ TEST TERMINATION

PERCENT EFFLUENT

Replicate	0%	6%	8%	11%	14%	19%
A	18	18	13	14	21	14
B	13	15	21	21	22	16
C	20	21	13	25	20	19
D	16	23	18	21	15	23
E	22	20	15	23	24	17
F	17	15	27	21	17	18
G	15	21	21	28	18	18
H	24	16	22	15	18	25
I	17	23	16	15	15	15
J	13	18	20	22	22	23
Mean	17.5	19.0	18.6	20.5	19.2	18.8
Mean/surviving female	17.5	19.0	18.6	20.5	19.2	18.8
CV%*	20.7				16.1	

X= Dead Adult; M= Male (Not considered in statistics)

*Coefficient of Variation = standard deviation/ mean * 100; CV% calculation based on young per surviving female

SUMMARY REPORTING FORMS FOR CHRONIC BIOMONITORING
Ceriodaphnia dubia SURVIVAL AND REPRODUCTION

Permittee: City of Sheridan

NPDES #: AR0034347

PERCENT SURVIVAL

PERCENT EFFLUENT	0%	6%	8%	11%	14%	19%
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, (36.3%): 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, (36.3%): 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)= 19 % effluent

b) NOEC reproduction (parameter TPP3B)= 19 % effluent

c) Coefficient of variation (parameter TQP3B)= 20.7 %





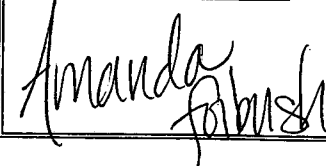
APPENDIX A

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:										
Sheridan Waterworks		Sheridan Waterworks		Chronic Toxicity		24 Hour		1. Cool, 4 Degrees Centigrade				4. Thiosulfate for Dechlorination						
104 W High St.		P.O. Box 486				48 Hour		2. Sulfuric Acid (H ₂ SO ₄), pH < 2				5. Hydrochloric Acid(HCl)						
Sheridan, AR 72150		Sheridan, AR 72150		Reporting Information		72 Hour		3. Nitric Acid (HNO ₃), pH < 2				6. Sodium Hydroxide (NaOH), pH > 12						
Attn: David Fitzgerald				Telephone: 870-942-2722		Routine		TEST PARAMETERS								Bottle Type Code		
				Fax: 870-942-1937		Preservative Code: 1										G = Glass; P = Plastic		
				Email: sheridanwater@windstream.net		Bottle Type: P										V = Septum; A = Amber		
 Sampler(s) Signature				Allen Parker Sampler(s) Printed				Chronic Biomonitoring										Arkansas Analytical Work Order Number:
Field Number	SAMPLE COLLECTION		Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION											
	Date/s	Time/s																
	4/11/12/13	1145-1045		X	24	Water	Final Discharge											
1. Relinquished by: (Signature)		Date/Time		2. Received by: (Signature)		SAMPLE CONDITION UPON RECEIPT IN LAB				REMARKS / SAMPLE COMMENTS								
		1140 4-12-13				1. CUSTODY SEALS: <input checked="" type="checkbox"/> Yes ___ No												
						2. CONTAINERS CORRECT: ___ Yes ___ No												
						3. COC/LABELS AGREE: ___ Yes ___ No												
						4. PRESERVATION CONFIRMED: ___ Yes ___ No												
						5. RECEIVED ON ICE: <input checked="" type="checkbox"/> Yes ___ No												
						6. TEMPERATURE ON RECEIPT: 13°C												
3. Relinquished by: (Signature)		Date/Time		4. Received by lab: (Signature)		FOR COMPLETION BY LAB ONLY												
																		

Revision 1
12/1/10



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:								
Sheridan Waterworks		Sheridan Waterworks		Chronic Toxicity		24 Hour		1. Cool, 4 Degrees Centigrade				4. Thiosulfate for Dechlorination				
104 W High St.		P.O. Box 486				48 Hour		2. Sulfuric Acid (H ₂ SO ₄), pH < 2				5. Hydrochloric Acid(HCl)				
Sheridan, AR 72150		Sheridan, AR 72150		Reporting Information		72 Hour		3. Nitric Acid (HNO ₃), pH < 2				6. Sodium Hydroxide (NaOH), pH > 12				
Attn: David Fitzgerald				Telephone: 870-942-2722		Routine		TEST - PARAMETERS								
				Fax: 870-942-1937		Preservative Code: 1		Bottle Type Code								
				Email: sheridanwater@windstream.net		Bottle Type: P		G = Glass; P = Plastic V = Septum; A = Amber								
Allen Parker				Allen Parker				Chronic Biomonitoring								
Sampler(s) Signature				Sampler(s) Printed												
Field Number	SAMPLE COLLECTION		Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION		Arkansas Analytical Work Order Number:							
	Date/s	Time/s							K13040033							
	4/14-15/13	0800-0700		X	24	Water	Final Discharge									
1. Relinquished by: (Signature)		Date/Time		2. Received by: (Signature)		SAMPLE CONDITION UPON RECEIPT IN LAB				REMARKS / SAMPLE COMMENTS						
Allen Parker		4/15-13		/		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. PRESERVATION CONFIRMED: <input type="checkbox"/> Yes ___ No										
						5. RECEIVED ON ICE: <input checked="" type="checkbox"/> Yes ___ No										
						6. TEMPERATURE ON RECEIPT: 22°C										
3. Relinquished by: (Signature)		Date/Time		4. Received by lab: (Signature)		FOR COMPLETION BY LAB ONLY										
/		/		Sydney James												



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:							
Sheridan Waterworks		Sheridan Waterworks		Chronic Toxicity		24 Hour		1. Cool, 4 Degrees Centigrade				4. Thiosulfate for Dechlorination			
104 W High St.		P.O. Box 486				48 Hour		2. Sulfuric Acid (H ₂ SO ₄), pH < 2				5. Hydrochloric Acid(HCl)			
Sheridan, AR 72150		Sheridan, AR 72150		Reporting Information		72 Hour		3. Nitric Acid (HNO ₃), pH < 2				6. Sodium Hydroxide (NaOH), pH > 12			
Attn: David Fitzgerald				Telephone: 870-942-2722		Routine		TEST PARAMETERS Bottle Type Code G = Glass; P = Plastic V = Septum; A = Amber							
				Fax: 870-942-1937		Preservative Code: 1									
				Email: sheridanwater@windstream.net		Bottle Type: P									

Allen Parker
 Sample(s) Signature
 Allen Parker
 Sampler(s) Printed
 TRIP TENNIS

Field Number	SAMPLE COLLECTION		Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	Chronic Biomonitoring	TEST PARAMETERS								Arkansas Analytical Work Order Number:	
	Date/s	Time/s																
	4/15-16/13	1343-1243		X	24	Water	Final Discharge	X										

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)	SAMPLE CONDITION UPON RECEIPT IN LAB 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. PRESERVATION CONFIRMED: <input type="checkbox"/> Yes ___ No 5. RECEIVED ON ICE: <input type="checkbox"/> Yes ___ No 6. TEMPERATURE ON RECEIPT: 21°	REMARKS / SAMPLE COMMENTS
	4/14/13 1530			
3. Relinquished by: (Signature)	Date/Time	4. Received by lab: (Signature)	FOR COMPLETION BY LAB ONLY	

APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Fathead Minnow

Lab # / Sample ID K1304003

Test Start (Date/Time) 4-12-13 1215

Client: Sheriden

Test End (Date/Time) 4-19-13 1215

		Day of Test							notes/remarks
		1	2	3	4	5	6	7	
Control	MHS551	4-12	4-13	4-14	4-15	4-16	4-17	4-18	
D.O. (mg/L)	INITIAL	8.6	8.4	8.4	8.2	8.4	8.5	8.5	
	FINAL	8.3	7.9	7.6	7.6	7.9	7.8	7.9	
pH (s.u.)	INITIAL	8.1	8.0	7.6	8.3	8.4	8.0	8.0	
	FINAL	8.0	8.0	7.8	8.0	7.9	7.9	7.9	
temp (C)	INITIAL	22.0	22.7	22.1	23	23	22	22	
	FINAL	25	25	25	25	25	25	25	
ALKALINITY (mg/L)		74				71	72		
HARDNESS (mg/L)		84				71	80		
CONDUCTIVITY (umhos/cm)		349				71	321		
CHLORINE (mg/L)		<0.05				71	<0.05		
CONC:									
D.O. (mg/L)	INITIAL	8.6	8.4	8.5	8.2	8.4	8.5	8.5	
	FINAL	8.2	8.0	7.7	7.9	8.0	7.8	8.0	
pH (s.u.)	INITIAL	8.1	8.0	8.0	8.1	8.4	8.5	8.4	
	FINAL	8.0	7.9	7.8	8.0	7.9	7.9	7.8	
temp (C)	INITIAL	21.9	22.9	23.0	23	23	22	22	
	FINAL	25	25	25	25	25	25	25	
CONC:									
D.O. (mg/L)	INITIAL	8.6	8.5	8.5	8.2	8.5	8.5	8.5	
	FINAL	8.1	8.0	7.7	8.0	8.0	7.8	8.1	
pH (mg/L)	INITIAL	8.1	8.0	8.1	8.3	8.4	8.5	8.4	
	FINAL	8.1	8.0	7.8	8.0	7.8	7.9	7.9	
temp (C)	INITIAL	21.9	23.1	23.2	23	23	23	23	
	FINAL	25	25	25	25	25	25	25	
CONC:									
D.O. (mg/L)	INITIAL	8.6	8.5	8.5	8.2	8.4	8.6	8.5	
	FINAL	8.1	8.1	7.6	7.7	8.0	7.7	8.0	
pH (s.u.)	INITIAL	8.1	8.1	8.1	8.5	8.4	8.5	8.4	
	FINAL	8.1	8.0	7.9	8.0	7.9	7.9	7.9	
temp (C)	INITIAL	21.9	23.3	23.5	23	23	23	22	
	FINAL	25	25	25	25	25	25	25	
CONC:									
D.O. (mg/L)	INITIAL	8.6	8.5	8.5	8.2	8.4	8.6	8.5	
	FINAL	8.2	8.1	7.7	7.9	7.9	7.7	7.9	
pH (s.u.)	INITIAL	8.1	8.1	8.1	8.5	8.4	8.7	8.5	
	FINAL	8.1	8.0	7.9	8.0	7.9	7.9	7.9	
temp (C)	INITIAL	21.9	23.6	23.8	22	23	23	22	
	FINAL	25	25	25	25	25	25	25	
CONC:									
D.O. (mg/L)	INITIAL	8.7	8.4	8.4	8.2	8.4	8.4	8.3	
	FINAL	8.2	8.1	7.7	8.0	8.0	7.8	7.9	
pH (s.u.)	INITIAL	8.1	8.1	8.0	8.5	8.5	8.7	8.5	
	FINAL	8.1	8.0	7.9	8.0	7.9	7.9	7.9	
temp (C)	INITIAL	21.9	24.2	24.8	23	23	23	22	
	FINAL	25	25	25	25	25	25	25	
CONC: 100%									
ALKALINITY (mg/L)		64			76		88		
HARDNESS (mg/L)		48			70		64		
CONDUCTIVITY (umhos/cm)		424			417		385		
CHLORINE (mg/L)		0.09			0.06		<0.05		

MHS

690

890

1190

1490

1990

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Cerodaphnia Dubia

Lab # / Sample ID K1304003

Test Start (Date/Time) 4-12-13 1200

Client: Sheridan

Test End (Date/Time) 4-19-13 1000

		Day of Test							notes/remarks
		1	2	3	4	5	6	7	
Control	MHS551	4-12	4-13	4-14	4-15	4-16	4-17	4-18	
D.O. (mg/L)	INITIAL	8.6	8.4	8.4	8.2	8.4	8.5	8.5	
	FINAL	8.1	7.9	8.2	8.2	8.3	8.5	8.2	
pH (s.u.)	INITIAL	8.1	8.0	7.6	8.3	8.4	8.0	8.0	
	FINAL	8.0	7.8	8.0	8.1	7.9	8.2	8.0	
temp (C)	INITIAL	22.0	22.7	22.1	23	23	22	22	
	FINAL	25	25	25	25	25	25	25	
ALKALINITY (mg/L)		74					72		
HARDNESS (mg/L)		84					80		
CONDUCTIVITY (umhos/cm)		349					321		
CHLORINE (mg/L)		<0.05					<0.05		
CONC:									
D.O. (mg/L)	INITIAL	8.6	8.4	8.5	8.2	8.4	8.5	8.5	
	FINAL	8.0	7.9	8.2	8.3	8.1	8.5	8.3	
pH (s.u.)	INITIAL	8.1	8.0	8.0	8.1	8.4	8.5	8.4	
	FINAL	8.0	7.9	8.2	8.1	8.1	8.2	8.0	
temp (C)	INITIAL	21.9	22.9	23.0	23	23	22	22	
	FINAL	25	25	25	25	25	25	25	
CONC:									
D.O. (mg/L)	INITIAL	8.6	8.5	8.5	8.2	8.5	8.5	8.5	
	FINAL	8.0	7.9	8.2	8.3	8.2	8.5	8.3	
pH (mg/L)	INITIAL	8.1	8.0	8.1	8.3	8.4	8.5	8.4	
	FINAL	8.0	8.0	8.1	8.0	8.0	8.4	8.0	
temp (C)	INITIAL	21.9	23.1	23.2	23	23	23	23	
	FINAL	25	25	25	25	25	25	25	
CONC:									
D.O. (mg/L)	INITIAL	8.6	8.5	8.5	8.2	8.4	8.6	8.5	
	FINAL	8.0	7.9	8.2	8.2	8.7	8.5	8.1	
pH (s.u.)	INITIAL	8.1	8.1	8.1	8.5	8.4	8.5	8.4	
	FINAL	8.0	8.0	8.2	8.1	8.0	8.5	8.1	
temp (C)	INITIAL	21.9	23.3	23.5	23	23	23	22	
	FINAL	25	25	25	25	25	25	25	
CONC:									
D.O. (mg/L)	INITIAL	8.6	8.5	8.5	8.2	8.4	8.6	8.5	
	FINAL	8.0	8.0	8.1	8.3	8.2	8.5	8.2	
pH (s.u.)	INITIAL	8.1	8.1	8.1	8.5	8.4	8.7	8.5	
	FINAL	8.1	8.0	8.3	8.1	8.1	8.3	8.2	
temp (C)	INITIAL	21.9	23.6	23.8	22	23	23	22	
	FINAL	25	25	25	25	25	25	25	
CONC:									
D.O. (mg/L)	INITIAL	8.7	8.4	8.4	8.2	8.4	8.4	8.3	
	FINAL	8.0	7.9	8.1	8.2	8.1	8.5	8.2	
pH (s.u.)	INITIAL	8.1	8.1	8.0	8.5	8.5	8.7	8.5	
	FINAL	8.1	8.1	8.3	8.1	7.9	8.3	8.5	
temp (C)	INITIAL	21.9	24.2	24.8	23	23	23	22	
	FINAL	25	25	25	25	25	25	25	
CONC:									
100%		A	A	A	B	B	C	C	
ALKALINITY (mg/L)		64			76		88		
HARDNESS (mg/L)		48			70		64		
CONDUCTIVITY (umhos/cm)		424			417		385		
CHLORINE (mg/L)		0.09			0.06		<0.05		

MHS

690

890

1190

1490

1990

APPENDIX C

Fathead minnow raw data and statistics

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB #/ SAMPLE ID K1304003 TEST START DATE 4-12-13 TIME 1215
 CLIENT Sheridan TEST END DATE 4-19-13 TIME 1215

AGE AND SOURCE OF MINNOWS

		DAY (NUMBER SURVIVING)							SURVIVAL		
CONC:	REP #	start	1	2	3	4	5	6	7%	MEAN %	CV
4HS	A	8	8	8	8	8	8	8	8	100%	0
	B	8	8	8	8	8	8	8	8		
	C	8	8	8	8	8	8	8	8		
	D	8	8	8	8	8	8	8	8		
	E	8	8	8	8	8	8	8	8		
6%	A	8	8	8	8	7	7	7	7	97.5%	
	B	8	8	8	8	8	8	8	8		
	C	8	8	8	8	8	8	8	8		
	D	8	8	8	8	8	8	8	8		
	E	8	8	8	8	8	8	8	8		
8%	A	8	8	8	8	8	8	8	8	100%	
	B	8	8	8	8	8	8	8	8		
	C	8	8	8	8	8	8	8	8		
	D	8	8	8	8	8	8	8	8		
	E	8	8	8	8	8	8	8	8		
11%	A	8	8	8	8	8	8	8	8	100%	
	B	8	8	8	8	8	8	8	8		
	C	8	8	8	8	8	8	8	8		
	D	8	8	8	8	8	8	8	8		
	E	8	8	8	8	8	8	8	8		
14%	A	8	8	8	8	8	8	8	8	100%	0
	B	8	8	8	8	8	8	8	8		
	C	8	8	8	8	8	8	8	8		
	D	8	8	8	8	8	8	8	8		
	E	8	8	8	8	8	8	8	8		
19%	A	8	8	8	8	8	8	8	8	97.5%	
	B	8	8	8	8	8	8	8	8		
	C	8	8	8	8	8	8	8	7		
	D	8	8	8	8	8	8	8	8		
	E	8	8	8	8	8	8	8	8		
ANALYST											
DATE:											
TIME:											

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID K1304003 TEST START DATE 4-12-13 TIME 12/5
 CLIENT Sheridan A TEST END DATE 4-19-13 TIME 12/5
 AGE AND SOURCE OF MINNOWS

		DAY (NUMBER SURVIVING)									SURVIVAL	
CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
mHS	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
6%	A	2	2	3	2	2	2	2	2			
	B	↓	↓	↓	↓	2	2	2	2			
	C	↓	↓	↓	↓	1	1	1	1			
	D	↓	↓	↓	↓	2	2	2	2			
	E											
8%	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
11%	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
14%	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
19%	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
ANALYST		RH	GH	GH	RH	KH	RH	RH	KH			
DATE:		4-12-13	4-13	4-14	4-15-13	4-16-13	4-17-13	4-18-13	4-19-13			
TIME:		12/5	1645	1420	1545	1430	1050	1100	1115			

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID K1304003 TEST START DATE 4-12-13 TIME 1215
 CLIENT Sheridan B TEST END DATE _____ TIME _____
 AGE AND SOURCE OF MINNOWS _____

		DAY (NUMBER SURVIVING)									SURVIVAL	
CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
mHS	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
6%	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
8%	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
11%	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
14%	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
19%	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
ANALYST		RH	cb	JK	RH	RH	RH	RH	RH			
DATE:		4-12-13	4-13	4-15	4-15-13	4-16-13	4-17-13	4-18-13	4-19-13			
TIME:		1225	1645	1420	1550	1435	1055	1105	1125			

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID K1304003 TEST START DATE 4-12-13 TIME 1215
 CLIENT Sheridan TEST END DATE _____ TIME _____
 AGE AND SOURCE OF MINNOWS _____

		DAY (NUMBER SURVIVING)							SURVIVAL		
CONC:	REP #	start	1	2	3	4	5	6	7%	MEAN %	CV
mHS	A	2	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓	↓		
	E										
6%	A	2	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓	↓		
	E										
8%	A	2	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓	↓		
	E										
11%	A	2	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓	↓		
	E										
14%	A	2	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓	↓		
	E										
19%	A	2	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓	↓		
	E										
ANALYST		RH	CH	CH	RH	RH	RH	RH	RH		
DATE:		4-12-13	4-13-13	4-14-13	4-15-13	4-16-13	4-17-13	4-18-13	4-19-13		
TIME:		1220	1615	1420	1555	1440	1100	1110	1135		

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID **K1304003** TEST START DATE **4-12-13** TIME **1215**
 CLIENT **Sheridan D** TEST END DATE TIME
 AGE AND SOURCE OF MINNOWS

		DAY (NUMBER SURVIVING)							SURVIVAL			
CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
mHS	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
6%	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
8%	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
11%	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
14%	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
19%	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
ANALYST		RH	GA	GA	RH	RH	RH	KH	RH			
DATE:		4-12-13	4-13	4-14	4-15-13	4-16-13	4-17-13	4-18-13	4-19-13			
TIME:		1230	1645	1420	1600	1445	1110	1020	1140			

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID K1304003 TEST START DATE 4-12-13 TIME 1215
 CLIENT Sheridan E TEST END DATE _____ TIME _____
 AGE AND SOURCE OF MINNOWS _____

		DAY (NUMBER SURVIVING)								SURVIVAL		
CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
mHS	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
6%	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
8%	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
11%	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
14%	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
19%	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
ANALYST		KH	ck	ck	KH	RH	RH	KH	KH			
DATE:		4-12-13	4-13	4-14	4-15-13	4-16-13	4-17-13	4-18-13	4-19-13			
TIME:		1235	1645	1420	1605	1450	1115	1125	1150			

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

AA# K1304003 FATHEAD MINNOW, CHRONIC, 4-12-13
File: Z:\TOXSTAT\MONTE\FHSURV. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.054

W = 0.547

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# K1304003 FATHEAD MINNOW, CHRONIC, 4-12-13
File: Z:\TOXSTAT\MONTE\FHSURV. Transform: ARC SINE(SQUARE ROOT(Y))

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

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

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

TITLE: AA# K1304003 FATHEAD MINNOW, CHRONIC, 4-12-13
 FILE: Z:\TOXSTAT\MONTE\FHSURV.
 TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	1.0000	1.3931
1	CONTROL	2	1.0000	1.3931
1	CONTROL	3	1.0000	1.3931
1	CONTROL	4	1.0000	1.3931
1	CONTROL	5	1.0000	1.3931
2	6 % EFFLUENT	1	0.8750	1.2094
2	6 % EFFLUENT	2	1.0000	1.3931
2	6 % EFFLUENT	3	1.0000	1.3931
2	6 % EFFLUENT	4	1.0000	1.3931
2	6 % EFFLUENT	5	1.0000	1.3931
3	8 % EFFLUENT	1	1.0000	1.3931
3	8 % EFFLUENT	2	1.0000	1.3931
3	8 % EFFLUENT	3	1.0000	1.3931
3	8 % EFFLUENT	4	1.0000	1.3931
3	8 % EFFLUENT	5	1.0000	1.3931
4	11 % EFFLUENT	1	1.0000	1.3931
4	11 % EFFLUENT	2	1.0000	1.3931
4	11 % EFFLUENT	3	1.0000	1.3931
4	11 % EFFLUENT	4	1.0000	1.3931
4	11 % EFFLUENT	5	1.0000	1.3931
5	14 % EFFLUENT	1	1.0000	1.3931
5	14 % EFFLUENT	2	1.0000	1.3931
5	14 % EFFLUENT	3	1.0000	1.3931
5	14 % EFFLUENT	4	1.0000	1.3931
5	14 % EFFLUENT	5	1.0000	1.3931
6	19 % EFFLUENT	1	1.0000	1.3931
6	19 % EFFLUENT	2	1.0000	1.3931
6	19 % EFFLUENT	3	0.8750	1.2094
6	19 % EFFLUENT	4	1.0000	1.3931
6	19 % EFFLUENT	5	1.0000	1.3931

AA# K1304003 FATHEAD MINNOW, CHRONIC, 4-12-13
 File: Z:\TOXSTAT\MONTE\FHSURV. Transform: ARC SINE(SQUARE ROOT(Y))

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	1.393				
2	6 % EFFLUENT	1.356	25.00	16.00	5.00	
3	8 % EFFLUENT	1.393	27.50	16.00	5.00	
4	11 % EFFLUENT	1.393	27.50	16.00	5.00	
5	14 % EFFLUENT	1.393	27.50	16.00	5.00	
6	19 % EFFLUENT	1.356	25.00	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:		K1304003			TEST DATES (BEGIN / END):		4/12/13 - 4/19/13	
CLIENT:		Sheridan			WEIGHING DATE / TIME:		4/22/2013 1135	
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	0.96760	0.96214	0.00546	8	0.683	AVG DRY	
	B	0.99814	0.99264	0.00550	8	0.688	WEIGHT (mg)	
	C	0.98620	0.98116	0.00504	8	0.630	0.647	
	D	0.98043	0.97570	0.00473	8	0.591	CV	
	E	0.99057	0.98541	0.00516	8	0.645	6.13	
CONC:	A	0.97914	0.97455	0.00459	8	0.574	AVG DRY	
	B	1.00238	0.99709	0.00529	8	0.661	WEIGHT (mg)	
	C	0.98046	0.97576	0.00470	8	0.588	0.660	
	D	1.00836	1.00306	0.00530	8	0.662	CV	
	E	1.00798	1.00146	0.00652	8	0.815		
CONC:	A	0.98330	0.97829	0.00501	8	0.626	AVG DRY	
	B	0.99266	0.98795	0.00471	8	0.589	WEIGHT (mg)	
	C	0.97939	0.97469	0.00470	8	0.588	0.650	
	D	0.99666	0.99152	0.00514	8	0.643	CV	
	E	1.00650	1.00007	0.00643	8	0.804		
CONC:	A	0.98006	0.97448	0.00558	8	0.698	AVG DRY	
	B	0.99144	0.98702	0.00442	8	0.552	WEIGHT (mg)	
	C	0.98654	0.98207	0.00447	8	0.559	0.637	
	D	0.95701	0.95208	0.00493	8	0.616	CV	
	E	0.97992	0.97383	0.00609	8	0.761		
CONC:	A	0.96140	0.95596	0.00544	8	0.680	AVG DRY	
	B	0.96071	0.95647	0.00424	8	0.530	WEIGHT (mg)	
	C	0.97397	0.96836	0.00561	8	0.701	0.639	
	D	0.97452	0.97023	0.00429	8	0.536	CV	
	E	1.03241	1.02641	0.00600	8	0.750	15.70	
CONC:	A	0.99329	0.98832	0.00497	8	0.621	AVG DRY	
	B	1.01623	1.01120	0.00503	8	0.629	WEIGHT (mg)	
	C	0.99531	0.99089	0.00442	8	0.552	0.631	
	D	0.96555	0.96024	0.00531	8	0.664	CV	
	E	1.01823	1.01273	0.00550	8	0.688	8.0	

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

AA# K1304003, FATHEAD MINNOW GROWTH CHRONIC, 4-12-13

File: Z:/TOXSTAT/monte\FHGR. Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

D = 0.159

W = 0.942

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# K1304003, FATHEAD MINNOW GROWTH CHRONIC, 4-12-13

File: Z:/TOXSTAT/monte\FHGR. Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B1 statistic = 4.29

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# K1304003, FATHEAD MINNOW GROWTH CHRONIC, 4-12-13
 FILE: Z:/TOXSTAT/monte\FHGR.
 TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.6830	0.6830
1	CONTROL	2	0.6880	0.6880
1	CONTROL	3	0.6300	0.6300
1	CONTROL	4	0.5910	0.5910
1	CONTROL	5	0.6450	0.6450
2	6 % EFFLUENT	1	0.5740	0.5740
2	6 % EFFLUENT	2	0.6610	0.6610
2	6 % EFFLUENT	3	0.5880	0.5880
2	6 % EFFLUENT	4	0.6620	0.6620
2	6 % EFFLUENT	5	0.8150	0.8150
3	8 % EFFLUENT	1	0.6260	0.6260
3	8 % EFFLUENT	2	0.5890	0.5890
3	8 % EFFLUENT	3	0.5880	0.5880
3	8 % EFFLUENT	4	0.6430	0.6430
3	8 % EFFLUENT	5	0.8040	0.8040
4	11 % EFFLUENT	1	0.6980	0.6980
4	11 % EFFLUENT	2	0.5520	0.5520
4	11 % EFFLUENT	3	0.5590	0.5590
4	11 % EFFLUENT	4	0.6160	0.6160
4	11 % EFFLUENT	5	0.7610	0.7610
5	14 % EFFLUENT	1	0.6800	0.6800
5	14 % EFFLUENT	2	0.5300	0.5300
5	14 % EFFLUENT	3	0.7010	0.7010
5	14 % EFFLUENT	4	0.5360	0.5360
5	14 % EFFLUENT	5	0.7500	0.7500
6	19 % EFFLUENT	1	0.6210	0.6210
6	19 % EFFLUENT	2	0.6290	0.6290
6	19 % EFFLUENT	3	0.5520	0.5520
6	19 % EFFLUENT	4	0.6640	0.6640
6	19 % EFFLUENT	5	0.6880	0.6880

AA# K1304003, FATHEAD MINNOW GROWTH CHRONIC, 4-12-13
 File: Z:/TOXSTAT/monte\FHGR. Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.003	0.001	0.082
Within (Error)	24	0.159	0.007	
Total	29	0.162		

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

AA# K1304003, FATHEAD MINNOW GROWTH CHRONIC, 4-12-13

File: Z:/TOXSTAT/monte\FHGR.

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	0.647	0.647		
2	6 % EFFLUENT	0.660	0.660	-0.245	
3	8 % EFFLUENT	0.650	0.650	-0.051	
4	11 % EFFLUENT	0.637	0.637	0.198	
5	14 % EFFLUENT	0.639	0.639	0.156	
6	19 % EFFLUENT	0.631	0.631	0.323	

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

AA# K1304003, FATHEAD MINNOW GROWTH CHRONIC, 4-12-13

File: Z:/TOXSTAT/monte\FHGR.

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	6 % EFFLUENT	5	0.121	18.8	-0.013
3	8 % EFFLUENT	5	0.121	18.8	-0.003
4	11 % EFFLUENT	5	0.121	18.8	0.010
5	14 % EFFLUENT	5	0.121	18.8	0.008
6	19 % EFFLUENT	5	0.121	18.8	0.017

APPENDIX D

Ceriodaphnia dubia Raw Data and Statistics

Cerodaphnia dubia

SURVIVAL AND REPRODUCTION TEST

RH

Discharger: <u>Sheridan</u>	Lab Number/s
Location:	<u>K1504003</u>
Date Sample Collected:	<u>see Col</u>

Analyst:	
Test Start - Date/Time:	<u>4-12-13 1200</u>
Test Stop - Date/Time:	<u>4-19-13 1000</u>

41%

69%

89%

Conc 1	% Day	Replicate										No. of Young	No. of Adult	Young/Adult	Analyst	
		A	B	C	D	E	F	G	H	I	J					
1		0	0	0	0	0	0	0	0	0	0	0				
2		0	0	0	0	0	0	0	0	0	0	0				
3		1	0	0	2	3	0	3	4	2	0	15				
4		6	2	8	3	5	6	3	0	3	3	39				
5		3	5	1	8	11	3	3	8	9	0	51				
6		2	4	8	3	2	5	1	12	1	6	44				
7		6	2	3	0	1	3	5	0	2	4	26				
8													X	17.5		
Total		18	13	20	16	22	17	15	24	17	13	175	CV	20.7		

Conc 4	% Day	Replicate										No. of Young	No. of Adult	Young/Adult	Analyst	
		A	B	C	D	E	F	G	H	I	J					
1		0	0	0	0	0	0	0	0	0	0	0				
2		0	0	0	0	0	0	0	0	0	0	0				
3		0	0	4	2	3	0	4	0	0	3	16				
4		3	2	11	10	0	4	9	1	5	0	45				
5		5	8	1	0	11	7	0	7	0	9	48				
6		4	10	7	4	6	3	13	7	6	5	63				
7		2	1	2	5	3	8	3	0	4	5	33				
8															X	20.5
Total		14	21	25	21	23	21	28	15	15	22	205	CV	22.3		

Conc 5	% Day	Replicate										No. of Young	No. of Adult	Young/Adult	Analyst	
		A	B	C	D	E	F	G	H	I	J					
1		0	0	0	0	0	0	0	0	0	0	0				
2		0	0	0	0	0	0	0	0	0	0	0				
3		0	2	3	0	4	2	4	3	0	4	22				
4		4	6	1	4	1	5	2	7	3	4	37				
5		4	2	8	3	10	3	6	7	1	7	49				
6		10	11	8	3	6	3	6	4	5	5	60				
7		3	1	0	5	3	1	0	3	6	2	24				
8															X	19.2
Total		21	22	20	15	24	17	18	18	15	22	192	CV	16.1		

Conc 3	% Day	Replicate										No. of Young	No. of Adult	Young/Adult	Analyst	
		A	B	C	D	E	F	G	H	I	J					
1		0	0	0	0	0	0	0	0	0	0	0				
2		0	0	0	0	0	0	0	0	0	0	0				
3		0	1	0	2	3	4	7	2	4	3	23				
4		2	7	3	3	1	2	1	5	7	9	40				
5		1	2	5	6	5	11	8	2	0	1	41				
6		6	8	1	7	2	10	3	12	2	3	54				
7		4	3	4	0	4	0	5	1	3	4	28				
8															X	18.6
Total		13	21	13	18	15	21	21	22	16	20	186	CV	23.9		

Conc 6	% Day	Replicate										No. of Young	No. of Adult	Young/Adult	Analyst	
		A	B	C	D	E	F	G	H	I	J					
1		0	0	0	0	0	0	0	0	0	0	0				
2		0	0	0	0	0	0	0	0	0	0	0				
3		0	1	0	3	3	3	0	3	4	0	16				
4		3	5	5	0	8	6	5	8	0	9	44				
5		5	2	10	8	1	1	5	1	5	8	46				
6		2	8	1	10	8	2	11	4	2	5	54				
7		4	0	3	2	0	0	6	5	2	9	28				
8															X	18.8
Total		14	16	19	23	17	18	18	25	15	24	188	CV	19.7		

23

X= DEAD; Y= MALE

AA # K1304003, C. DUBIA CHRONIC REPRODUCCION, 4-12-13
File: Z:/TOXSTAT/monte\CD. Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	4.020	14.520	22.920	14.520	4.020
OBSERVED	0	19	20	16	5

Calculated Chi-Square goodness of fit test statistic = 6.1640
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

AA # K1304003, C. DUBIA CHRONIC REPRODUCCION, 4-12-13
File: Z:/TOXSTAT/monte\CD. Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 2.58

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
6	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
8	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
11	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
14	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
19	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	6	10	0	
2	8	10	0	
3	11	10	0	
4	14	10	0	
5	19	10	0	

TITLE: AA # K1304003, C. DUBIA CHRONIC REPRODUCTION, 4-12-13
FILE: Z:/TOXSTAT/monte\CD.
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	18.0000	18.0000
1	CONTROL	2	13.0000	13.0000
1	CONTROL	3	20.0000	20.0000
1	CONTROL	4	16.0000	16.0000
1	CONTROL	5	22.0000	22.0000
1	CONTROL	6	17.0000	17.0000
1	CONTROL	7	15.0000	15.0000
1	CONTROL	8	24.0000	24.0000
1	CONTROL	9	17.0000	17.0000
1	CONTROL	10	13.0000	13.0000
2	6 % EFFLUENT	1	18.0000	18.0000
2	6 % EFFLUENT	2	15.0000	15.0000
2	6 % EFFLUENT	3	21.0000	21.0000
2	6 % EFFLUENT	4	23.0000	23.0000
2	6 % EFFLUENT	5	20.0000	20.0000
2	6 % EFFLUENT	6	15.0000	15.0000
2	6 % EFFLUENT	7	21.0000	21.0000
2	6 % EFFLUENT	8	16.0000	16.0000
2	6 % EFFLUENT	9	23.0000	23.0000
2	6 % EFFLUENT	10	18.0000	18.0000
3	8 % EFFLUENT	1	13.0000	13.0000
3	8 % EFFLUENT	2	21.0000	21.0000
3	8 % EFFLUENT	3	13.0000	13.0000
3	8 % EFFLUENT	4	18.0000	18.0000
3	8 % EFFLUENT	5	15.0000	15.0000
3	8 % EFFLUENT	6	27.0000	27.0000
3	8 % EFFLUENT	7	21.0000	21.0000
3	8 % EFFLUENT	8	22.0000	22.0000
3	8 % EFFLUENT	9	16.0000	16.0000
3	8 % EFFLUENT	10	20.0000	20.0000
4	11 % EFFLUENT	1	14.0000	14.0000
4	11 % EFFLUENT	2	21.0000	21.0000
4	11 % EFFLUENT	3	25.0000	25.0000
4	11 % EFFLUENT	4	21.0000	21.0000
4	11 % EFFLUENT	5	23.0000	23.0000
4	11 % EFFLUENT	6	21.0000	21.0000
4	11 % EFFLUENT	7	28.0000	28.0000
4	11 % EFFLUENT	8	15.0000	15.0000

4	11	% EFFLUENT	9	15.0000	15.0000
4	11	% EFFLUENT	10	22.0000	22.0000
5	14	% EFFLUENT	1	21.0000	21.0000
5	14	% EFFLUENT	2	22.0000	22.0000
5	14	% EFFLUENT	3	20.0000	20.0000
5	14	% EFFLUENT	4	15.0000	15.0000
5	14	% EFFLUENT	5	24.0000	24.0000
5	14	% EFFLUENT	6	17.0000	17.0000
5	14	% EFFLUENT	7	18.0000	18.0000
5	14	% EFFLUENT	8	18.0000	18.0000
5	14	% EFFLUENT	9	15.0000	15.0000
5	14	% EFFLUENT	10	22.0000	22.0000
6	19	% EFFLUENT	1	14.0000	14.0000
6	19	% EFFLUENT	2	16.0000	16.0000
6	19	% EFFLUENT	3	19.0000	19.0000
6	19	% EFFLUENT	4	23.0000	23.0000
6	19	% EFFLUENT	5	17.0000	17.0000
6	19	% EFFLUENT	6	18.0000	18.0000
6	19	% EFFLUENT	7	18.0000	18.0000
6	19	% EFFLUENT	8	25.0000	25.0000
6	19	% EFFLUENT	9	15.0000	15.0000
6	19	% EFFLUENT	10	23.0000	23.0000

AA # K1304003, C. DUBIA CHRONIC REPRODUCCION, 4-12-13
 File: Z:/TOXSTAT/monte\CD. Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	47.133	9.427	0.654
Within (Error)	54	778.600	14.419	
Total	59	825.733		

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

AA # K1304003, C. DUBIA CHRONIC REPRODUCCION, 4-12-13
 File: Z:/TOXSTAT/monte\CD. Transform: NO TRANSFORMATION

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	17.500	17.500		
2	6 % EFFLUENT	19.000	19.000	-0.883	
3	8 % EFFLUENT	18.600	18.600	-0.648	
4	11 % EFFLUENT	20.500	20.500	-1.767	
5	14 % EFFLUENT	19.200	19.200	-1.001	
6	19 % EFFLUENT	18.800	18.800	-0.766	

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

AA # K1304003, C. DUBIA CHRONIC REPRODUCTION, 4-12-13

File: Z:/TOXSTAT/monte\CD.

Transform: NO TRANSFORMATION

DUNNETT'S TEST

TABLE 2 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	10			
2	6 % EFFLUENT	10	3.923	22.4	-1.500
3	8 % EFFLUENT	10	3.923	22.4	-1.100
4	11 % EFFLUENT	10	3.923	22.4	-3.000
5	14 % EFFLUENT	10	3.923	22.4	-1.700
6	19 % EFFLUENT	10	3.923	22.4	-1.300

APPENDIX E

Organism History

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

TEST ORGANISM HISTORY

DATE SHIPPED 4/10/13 CLIENT AR Analytical

Purchase Order #: _____ Rogers

SPECIES: Pimephales promelas

Quantity Shipped: 300 L24

Age: hatched 4/10/13 1500 CST

Brood Stock Source: Anderson Farms, AR

Culture Water: Groundwater 160

Hardness (Mg/l CaCO₃): 8.2

Dissolved Oxygen (Mg/l): 25.10C

Temperature (°C): 25.10C

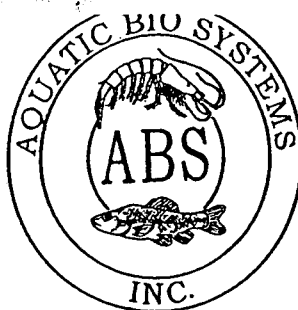
Feeding: Artemia

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: 6/22/09

SPECIES: Ceriodaphnia dubia

AGE: Variable

LIFE STAGE: Adult

HATCH DATE: Variable

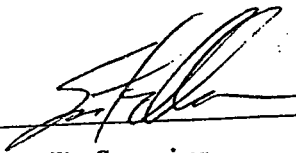
BEGAN FEEDING: Immediately

FOOD: YTC, Selenastrum sp.

Water Chemistry Record:

	Current	Range
TEMPERATURE:	<u>25°C</u>	<u>20-25°C</u>
SALINITY/CONDUCTIVITY:	<u>--</u>	<u>--</u>
TOTAL HARDNESS (as CaCO ₃):	<u>142 mg/l</u>	<u>86-124 mg/l</u>
TOTAL ALKALINITY (as CaCO ₃):	<u>100 mg/l</u>	<u>65-130 mg/l</u>
pH:	<u>7.92</u>	<u>7.56-8.35</u>

Comments:

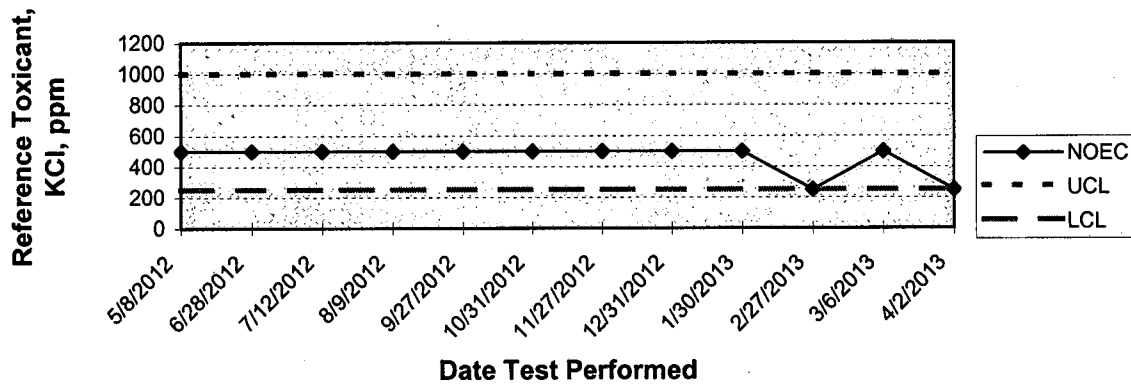


Facility Supervisor

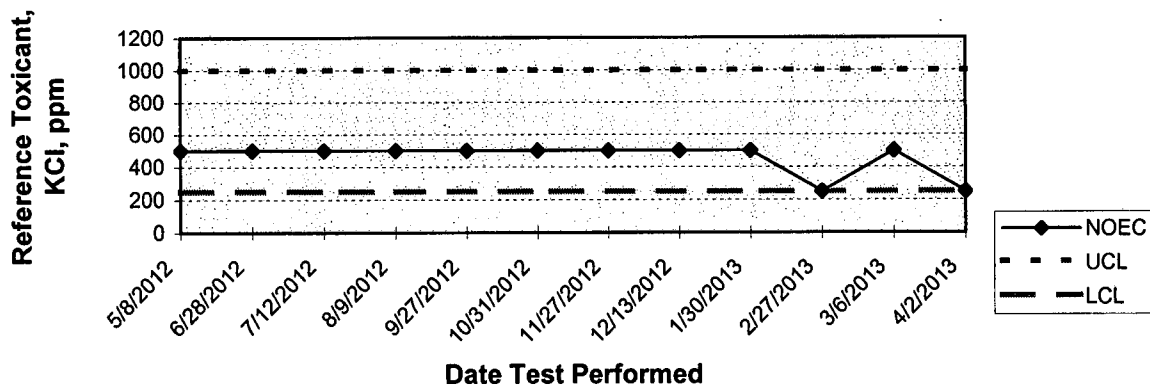
APPENDIX F

Quality Assurance Charts

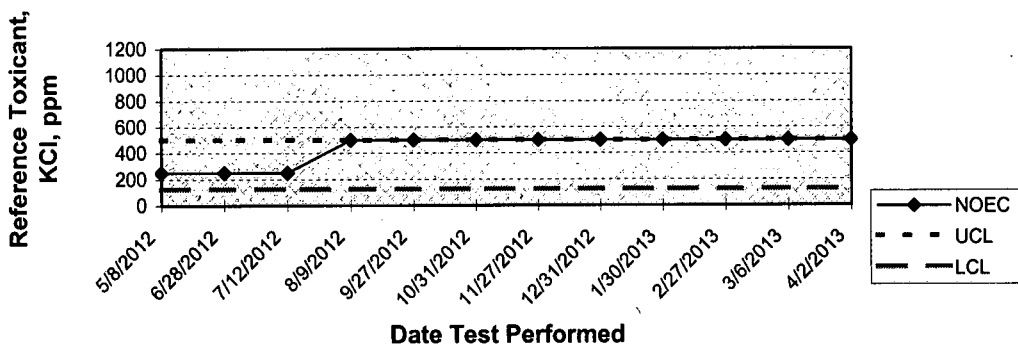
ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW SURVIVAL
QUALITY ASSURANCE



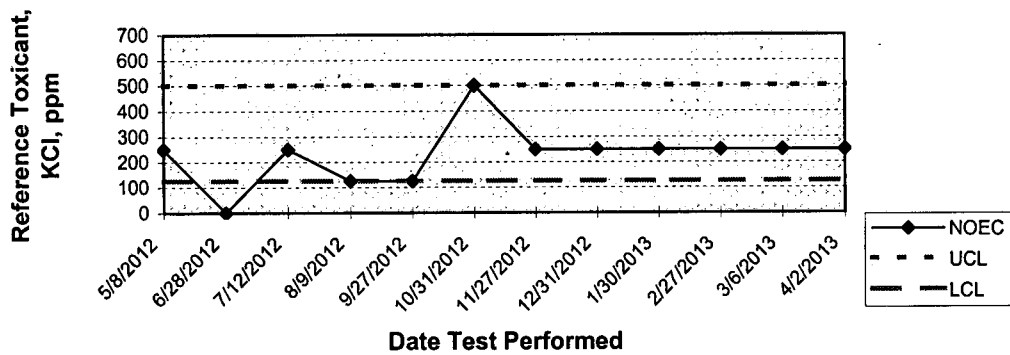
ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW GROWTH
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.
CERIODAPHNIA DUBIA SURVIVAL
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.
CERIODAPHNIA DUBIA REPRODUCTION
QUALITY ASSURANCE



PLACE STICKER AT TOP OF ENVELOPE TO THE RIGHT
OF THE RETURN ADDRESS, FOLD AT DOTTED LINE

REGISTERED MAIL™

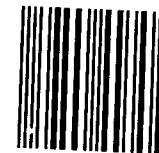
Sheridan
PO BOX 400
Sheridan, AR 72150-0486



7012 2920 0000 8592 3167



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REQUESTED**

ADEQ
NPDES Enforcement Branch
5301 Northshore Dr
No Little Rock, AR 72118-5317