

Sanitary Sewer Overflow Monthly Report

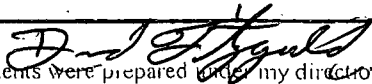
Facility Name: Sheridan Water and Sewer Works Permit Number: AR0034347 Reporting Period (Month/Year): June 2014

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	EPK-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 7-21-14

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 2014
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 K1405002

Friday, May 23, 2014

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 $\frac{1}{4}$ of the Northwest $\frac{1}{4}$ 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 2014.

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:	5-13-14, 1015	5-14-14, 0915
Sample #2	5-14-14, 1029	5-15-14, 0929
Sample #3	5-15-14, 1418	5-16-14, 1318

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:	5-14-14, 1144	10 (on ice)
Sample #2	5-15-14, 1600	2
Sample #3	5-16-14, 1459	4

Chain of custody documentation is located in Appendix A.

The permit designates the receiving water to be used as dilution water for the toxicity tests. Synthetic dilution water was substituted 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	0.642	X	
The percent coefficient of variation between replicates must be 40% or less for growth	15.40%	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	15.5	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	20.5%	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> 4/22/14 – 4/29/14		<i>Pimephales promelas</i> 4/22/14 – 4/29/14	
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 E.

Summary of Results

<i>Ceriodaphnia dubia</i>		<i>Pimephales promelas</i>	
NOEC / LOEC Survival	19% / NA	NOEC / LOEC survival	19% / NA
NOEC / LOEC Reproduction	19% / NA	NOEC / LOEC growth	19% / NA
Mean number of neonates (critical dilution)	15.5	%CV survival (critical dilution)	5.73%
%CV Reproduction (critical dilution)	18.6%	Mean dry weight (critical dilution) in milligrams	0.673
		%CV growth (critical dilution)	9.67%
PMSD Reproduction	24.3%	PMSD Growth	16.4%

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.

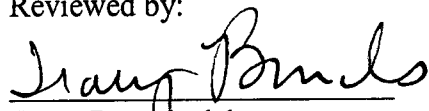
Chronic static renewal survival and reproduction test using *Ceriodaphnia dubia*, (Method 1002.0)

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

Reviewed by:


Tracy Bounds, lab manager

**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:	5-13-14, 1015	5-14-14, 0915
Sample #2	5-14-14, 1029	5-15-14, 0929
Sample #3	5-15-14, 1418	5-16-14, 1318

Test initiated (date, time): 5-14-14, 1400 Test terminated (date, time): 5-21-14, 1400

Dilution water used: Moderately Hard Synthetic

DATA TABLE FOR FATHEAD MINNOW SURVIVAL

Effluent Conc %	Percent Survival in Replicate Chambers						Mean Percent Survival			
	A	B	C	D	E		24 hours	48 hours	7 days	CV %
0%	100	100	100	100	100		100	100	100	0.00%
6.0%	87.5	87.5	100	100	100		100	100	95.0	
8.0%	100	100	87.5	100	100		97.5	97.5	97.5	
11.0%	100	87.5	87.5	100	100		95.0	95.0	95.0	
14.0%	100	87.5	100	100	100		97.5	97.5	97.5	5.73%
19.0%	87.5	87.5	100	100	100		97.5	97.5	95.0	

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%	0.559	0.530	0.651	0.770	0.698		0.642	15.4%
6.0%	0.502	0.555	0.636	0.670	0.634		0.599	
8.0%	0.596	0.661	0.607	0.704	0.624		0.638	
11.0%	0.674	0.627	0.616	0.635	0.767		0.664	
14.0%	0.750	0.586	0.631	0.688	0.712		0.673	9.67%
19.0%	0.648	0.567	0.656	0.590	0.757		0.644	

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)= 15.4 %

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:	5-13-14, 1015	5-14-14, 0915
Sample #2	5-14-14, 1029	5-15-14, 0929
Sample #3	5-15-14, 1418	5-16-14, 1318

Test initiated (date, time): 5-14-14, 1500 Test terminated (date, time): 5-21-14, 0945

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	20	15	11	19	13	19
B	13	9	12	21	14	17
C	16	18	8	19	12	20
D	13	18	14	16	19	7
E	18	15	15	19	12	15
F	18	7	18	15	17	20
G	16	13	16	14	15	12
H	9	9	16	6	20	19
I	15	13	15	14	15	11
J	17	14	18	14	18	15
Mean	15.5	13.1	14.3	15.7	15.5	15.5
Mean/surviving female	15.5	13.1	14.3	15.7	15.5	15.5
CV%*	20.5				18.6	

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:

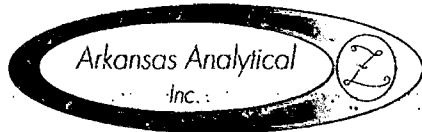
a) NOEC survival (parameter TOP3B)= 19 % effluent

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

c) Coefficient of variation (parameter TQP3B)= 20.5 %

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





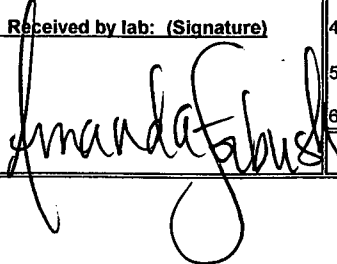
CHAIN OF CUSTODY RECORD

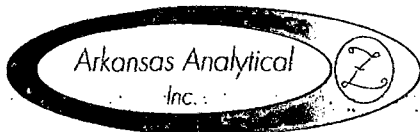
CLIENT INFORMATION		BILLING INFORMATION		Project Description		Turnaround Time		Preservation Codes:											
Sheridan Waterworks		Sheridan Waterworks		Chronic Toxicity		1 Day (100%)		1. Cool, 4 Degrees Centigrade				4. Thiosulfate for Dechlorination							
104 W High St.		P.O. Box 486				2 Day (50%)		2. Sulfuric Acid (H ₂ SO ₄), pH < 2				5. Hydrochloric Acid(HCl)							
Sheridan, AR 72150		Sheridan, AR 72150		Reporting Information		3 Day (25%)		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			
<i>Will Lindsey</i> <i>Allen Parker</i> Sampler(s) Signature				<i>Will Linosey</i> <i>Allen Parker</i> Sampler(s) Printed				Chronic Toxicity										Arkansas Analytical Work Order Number: K1405-002A	
Field Number	SAMPLE COLLECTION		Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION												
	5	13-14-14		X	24	Water	Final Discharge												
1. Relinquished by: (Signature)		Date/Time		2. Received by: (Signature)		SAMPLE CONDITION UPON RECEIPT IN LAB				REMARKS / SAMPLE COMMENTS									
<i>Allen Parker</i>		1144 5-14-14				1. CUSTODY SEALS: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No 2. CONTAINERS CORRECT: <input type="checkbox"/> Yes <input type="checkbox"/> No 3. COC/LABELS AGREE: <input type="checkbox"/> Yes <input type="checkbox"/> No 4. RECEIVED ON ICE: <input type="checkbox"/> Yes <input type="checkbox"/> No 5. TEMPERATURE ON RECEIPT: 10°C 6. TEMPERATURE GUN ID: HHT #2													
3. Relinquished by: (Signature)		Date/Time		4. Received by lab: (Signature)		FOR COMPLETION BY LAB ONLY													
				<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:														
Sheridan Waterworks		Sheridan Waterworks		Chronic Toxicity		1 Day (100%)		1. Cool, 4 Degrees Centigrade				4. Thiosulfate for Dechlorination										
104 W High St.		P.O. Box 486				2 Day (50%)		2. Sulfuric Acid (H ₂ SO ₄), pH < 2				5. Hydrochloric Acid(HCl)										
Sheridan, AR 72150		Sheridan, AR 72150		Reporting Information		3 Day (25%)		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				 Sampler(s) Printed				Chronic Toxicity												Arkansas Analytical Work Order Number:		
Field Number	SAMPLE COLLECTION		Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION					Chronic Toxicity										
	5/14-15/14	1029-0929	X			Water	Final Discharge					X										
1. Relinquished by: (Signature)			Date/Time		2. Received by: (Signature)			SAMPLE CONDITION UPON RECEIPT IN LAB					REMARKS / SAMPLE COMMENTS									
			1600 5-15-14					1. CUSTODY SEALS: <input checked="" type="checkbox"/> Yes ___ No														
								2. CONTAINERS CORRECT: <input checked="" type="checkbox"/> Yes ___ No														
								3. COC/LABELS AGREE: ___ Yes ___ No														
								4. RECEIVED ON ICE: <input checked="" type="checkbox"/> Yes ___ No														
								5. TEMPERATURE ON RECEIPT:														
					 4. Received by lab: (Signature)			6. TEMPERATURE GUN ID: 2°C HHT#2														
FOR COMPLETION BY LAB ONLY																						



11701 Interstate 30, Bldg. 1, Ste. 115
 Little Rock, AR 72209
 PHONE: 501-455-3233
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CHAIN OF CUSTODY RECORD

CLIENT INFORMATION		BILLING INFORMATION		Project Description		Turnaround Time		Preservation Codes:													
Sheridan Waterworks		Sheridan Waterworks		Chronic Toxicity		1 Day (100%)		1. Cool, 4 Degrees Centigrade				4. Thiosulfate for Dechlorination									
104 W High St.		P.O. Box 486				2 Day (50%)		2. Sulfuric Acid (H ₂ SO ₄), pH < 2				5. Hydrochloric Acid(HCl)									
Sheridan, AR 72150		Sheridan, AR 72150		Reporting Information		3 Day (25%)		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				 Sampler(s) Printed				Chronic Toxicity												Arkansas Analytical Work Order Number:	
Field Number	SAMPLE COLLECTION		Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION														
	5/15-16/14	1418-1318		X	24	Water	Final Discharge												K14250020		
1. Relinquished by: (Signature)		Date/Time		2. Received by: (Signature)		SAMPLE CONDITION UPON RECEIPT IN LAB				REMARKS / SAMPLE COMMENTS											
		1459 5-16-14				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: 4°C 6. TEMPERATURE GUN ID: HHT #2															
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 K1405008

Test Start (Date/Time) 5-14-14

1400

Client: Sheridan

Test End (Date/Time) 5-21-14

1400

Day of Test

		1	2	3	4	5	6	7	notes
Control	MHS	5-14	5-15	5-16	5-17	5-18	5-19	5-20	
D.O. (mg/L)	INITIAL	8.8	8.6	8.6	9.0	8.7	8.7	8.6	
	FINAL	6.8	7.7	7.5	7.2	6.8	7.6	7.3	
pH (s.u.)	INITIAL	8.2	7.7	7.8	7.8	7.9	8.1	8.0	
	FINAL	7.6	7.6	7.7	7.9	7.8	8.1	8.1	
temp (C)	INITIAL	22	23	22	22	22	22	23	
	FINAL	25	25	25	25	25	25	25	
ALKALINITY (mg/L)		60				62			
HARDNESS (mg/L)		86				92			
CONDUCTIVITY (umhd)		305				328			
CHLORINE (mg/L)		<0.05							
CONC:	6								
D.O. (mg/L)	INITIAL	8.7	8.6	8.7	8.9	9.0	8.8	8.7	
	FINAL	7.0	7.8	7.4	7.3	6.8	7.8	7.2	
pH (s.u.)	INITIAL	8.4	8.4	8.1	7.7	7.6	8.1	7.9	
	FINAL	7.5	7.7	8.0	7.7	7.9	8.0	8.0	
temp (C)	INITIAL	22	22	22	22	22	22	23	
	FINAL	25	25	25	25	25	25	25	
CONC:	8								
D.O. (mg/L)	INITIAL	8.7	8.6	8.7	8.8	9.0	8.8	8.9	
	FINAL	7.0	7.8	7.6	7.4	7.0	7.9	7.5	
pH (mg/L)	INITIAL	8.4	8.1	8.3	7.9	7.8	8.1	8.2	
	FINAL	7.5	7.8	8.0	8.2	7.7	8.2	8.2	
temp (C)	INITIAL	23	22	22	23	22	22	23	
	FINAL	25	25	25	25	25	25	25	
CONC:	11								
D.O. (mg/L)	INITIAL	8.7	8.5	8.6	8.7	8.9	8.7	8.8	
	FINAL	6.9	7.8	7.4	7.0	6.9	7.5	7.3	
pH (s.u.)	INITIAL	8.1	8.2	8.4	7.8	7.9	8.0	8.3	
	FINAL	7.5	7.7	8.3	8.1	7.8	8.1	8.1	
temp (C)	INITIAL	23	23	22	22	22	23	24	
	FINAL	25	25	25	25	25	25	25	
CONC:	14								
D.O. (mg/L)	INITIAL	8.7	8.5	8.6	8.9	8.7	8.8	8.7	
	FINAL	7.0	7.8	7.6	7.2	7.0	7.2	7.5	
pH (s.u.)	INITIAL	8.4	8.0	8.3	7.9	8.0	8.3	8.3	
	FINAL	7.2	7.8	8.5	8.0	8.0	8.4	8.0	
temp (C)	INITIAL	23	23	22	23	23	24	24	
	FINAL	25	25	25	25	25	25	25	
CONC:	19								
D.O. (mg/L)	INITIAL	8.8	8.6	8.5	8.8	8.9	8.8	8.8	
	FINAL	6.8	7.8	7.4	7.0	6.8	7.5	7.4	
pH (s.u.)	INITIAL	8.5	8.3	8.4	7.8	8.0	8.3	8.2	
	FINAL	7.2	7.7	8.5	8.3	8.3	8.2	8.3	
temp (C)	INITIAL	23	23	23	23	22	24	24	
	FINAL	25	25	25	25	25	25	25	
CONC:	100 %	A	A	A	B	B	C	C	
ALKALINITY (mg/L)		50			48		48		
HARDNESS (mg/L)		50			56		42		
CONDUCTIVITY (umhd)		267			262		267		
CHLORINE (mg/L)		<0.05			<0.05		<0.05		

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Ceriodaphnia Dubia

Lab # / Sample ID K1405002

Test Start (Date/Time)

5-14-14 1500

Client: Sheridan

Test End (Date/Time)

5-21-14 0945

Day of Test

		1	2	3	4	5	6	7	notes
Control	MHS	5-14	5-15	5-16	5-17	5-18	5-19	5-20	
D.O. (mg/L)	INITIAL	8.8	8.6	8.6	9.0	8.7	8.7	8.6	
	FINAL	8.3	8.0	7.9	8.0	7.6	7.7	8.3	
pH (s.u.)	INITIAL	8.2	7.7	7.8	7.8	7.9	8.1	8.0	
	FINAL	7.8	7.8	7.7	8.0	7.9	8.0	7.8	
temp (C)	INITIAL	22	23	22	22	22	22	23	
	FINAL	25	25	25	25	25	25	25	
ALKALINITY (mg/L)		60				62			
HARDNESS (mg/L)		86				92			
CONDUCTIVITY (umhc)		305				328			
CHLORINE (mg/L)		0.05							
CONC:	6								
D.O. (mg/L)	INITIAL	8.7	8.6	8.7	8.9	9.0	8.9	8.7	
	FINAL	8.2	8.1	8.2	8.3	7.5	7.9	8.2	
pH (s.u.)	INITIAL	8.4	8.4	8.1	7.7	7.6	8.1	7.9	
	FINAL	7.5	8.3	8.1	8.1	7.8	8.2	8.0	
temp (C)	INITIAL	22	22	22	22	22	22	23	
	FINAL	25	25	25	25	25	25	25	
CONC:	8								
D.O. (mg/L)	INITIAL	8.7	8.6	8.7	8.8	9.0	8.8	8.9	
	FINAL	8.1	8.0	8.1	8.4	7.4	7.7	8.2	
pH (mg/L)	INITIAL	8.4	8.1	8.3	7.9	7.8	8.1	8.2	
	FINAL	7.5	8.3	8.3	7.9	8.1	8.0	8.1	
temp (C)	INITIAL	23	22	22	23	22	22	23	
	FINAL	25	25	25	25	25	25	25	
CONC:	11								
D.O. (mg/L)	INITIAL	8.7	8.5	8.6	8.7	8.9	8.7	8.8	
	FINAL	8.4	7.7	8.0	8.1	7.5	7.8	8.0	
pH (s.u.)	INITIAL	8.1	8.2	8.4	7.8	7.9	8.0	8.3	
	FINAL	7.7	8.3	8.1	7.6	8.6	7.9	8.2	
temp (C)	INITIAL	23	23	22	22	22	23	24	
	FINAL	25	25	25	25	25	25	25	
CONC:	14								
D.O. (mg/L)	INITIAL	8.7	8.5	8.6	8.9	8.7	8.8	8.7	
	FINAL	8.3	7.6	7.8	8.2	7.4	7.9	8.3	
pH (s.u.)	INITIAL	8.4	8.0	8.3	7.9	8.0	8.3	8.3	
	FINAL	7.5	8.0	8.0	8.1	8.2	8.1	8.0	
temp (C)	INITIAL	23	23	22	23	23	24	24	
	FINAL	25	25	25	25	25	25	25	
CONC:	19								
D.O. (mg/L)	INITIAL	8.8	8.6	8.5	8.6	8.9	8.8	8.8	
	FINAL	8.3	7.8	7.8	7.9	7.6	7.8	8.2	
pH (s.u.)	INITIAL	8.5	8.3	8.4	7.8	8.0	8.3	8.2	
	FINAL	7.8	8.1	8.4	7.7	8.3	8.0	7.9	
temp (C)	INITIAL	23	23	23	23	22	24	24	
	FINAL	25	25	25	25	25	25	25	
CONC:	100 %	A	A	A	B	B	C	C	
ALKALINITY (mg/L)		50			48		48		
HARDNESS (mg/L)		50			56		42		
CONDUCTIVITY (umhc)		267			262		267		
CHLORINE (mg/L)		0.05							

APPENDIX C

Fathead minnow raw data and statistics

SURVIVAL DATA FOR LARVAL SURVIVAL AND GROWTH TEST (ALTERNATE)

LAB #: K1405002				TEST START		DATE	05/14/14	TIME	1400			
CLIENT: Sheridan				TEST END		DATE	05/21/14	TIME	1400			
ANALYST: RH				AGE AND SOURCE OF MINNOWS								
DAY(NUMBER SURVIVING)												
SURVIVAL												
	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV
CONTROL	A	8	8	8	8	8	8	8	8	100%	100.0%	0.00
	B	8	8	8	8	8	8	8	8	100%		
	C	8	8	8	8	8	8	8	8	100%		
	D	8	8	8	8	8	8	8	8	100%		
	E	8	8	8	8	8	8	8	8	100%		
	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 6%	A	8	8	8	7	7	7	7	7	87.5%	95.0%	
	B	8	8	8	8	8	8	8	7	87.5%		
	C	8	8	8	8	8	8	8	8	100%		
	D	8	8	8	8	8	8	8	8	100%		
	E	8	8	8	8	8	8	8	8	100%		
	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 8%	A	8	8	8	8	8	8	8	8	100%	97.5%	
	B	8	8	8	8	8	8	8	8	100%		
	C	8	7	7	7	7	7	7	7	87.5%		
	D	8	8	8	8	8	8	8	8	100%		
	E	8	8	8	8	8	8	8	8	100%		
	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 11%	A	8	8	8	8	8	8	8	8	100%	95.0%	
	B	8	7	7	7	7	7	7	7	87.5%		
	C	8	7	7	7	7	7	7	7	87.5%		
	D	8	8	8	8	8	8	8	8	100%		
	E	8	8	8	8	8	8	8	8	100%		
	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 14%	A	8	8	8	8	8	8	8	8	100%	97.5%	5.73
	B	8	7	7	7	7	7	7	7	87.5%		
	C	8	8	8	8	8	8	8	8	100%		
	D	8	8	8	8	8	8	8	8	100%		
	E	8	8	8	8	8	8	8	8	100%		
	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 19%	A	8	8	8	8	7	7	7	7	87.5%	95.0%	
	B	8	7	7	7	7	7	7	7	87.5%		
	C	8	8	8	8	8	8	8	8	100%		
	D	8	8	8	8	8	8	8	8	100%		
	E	8	8	8	8	8	8	8	8	100%		
ANALYST:												
DATE:												
TIME:												

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

REMARKS:

AA# K1405002, FATHEAD MINNOW SURVIVAL, CHRONIC, 5-14-14

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

Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.175

W = 0.794

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# K1405002, FATHEAD MINNOW SURVIVAL, CHRONIC, 5-14-14

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# K1405002, FATHEAD MINNOW SURVIVAL, CHRONIC, 5-14-14
 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	1.3931
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	0.8750	1.2094
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	0.8750	1.2094
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	0.8750	1.2094
4	11 % EFFLUENT	3	0.8750	1.2094
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	0.8750	1.2094
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	0.8750	1.2094
6	19 % EFFLUENT	2	0.8750	1.2094
6	19 % EFFLUENT	3	1.0000	1.3931
6	19 % EFFLUENT	4	1.0000	1.3931
6	19 % EFFLUENT	5	1.0000	1.3931

AA# K1405002, FATHEAD MINNOW SURVIVAL, CHRONIC, 5-14-14
 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	1.393				
2	6 % EFFLUENT	1.320	22.50	16.00	5.00	
3	8 % EFFLUENT	1.356	25.00	16.00	5.00	
4	11 % EFFLUENT	1.320	22.50	16.00	5.00	
5	14 % EFFLUENT	1.356	25.00	16.00	5.00	
6	19 % EFFLUENT	1.320	22.50	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:		K1405002			TEST DATES (BEGIN / END):		5/14 - 21/14	
CLIENT:		Sheridan			WEIGHING DATE / TIME:		5/22/2014 1330	
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	1.02439	1.01992	0.00447	8	0.559	AVG DRY	
	B	1.01894	1.01470	0.00424	8	0.530	WEIGHT (mg)	
	C	1.00978	1.00457	0.00521	8	0.651	0.642	
	D	1.02603	1.01987	0.00616	8	0.770	CV	
	E	1.03445	1.02887	0.00558	8	0.698	15.40	
6%	A	1.00795	1.00393	0.00402	8	0.502	AVG DRY	
	B	0.99328	0.98884	0.00444	8	0.555	WEIGHT (mg)	
	C	1.00146	0.99637	0.00509	8	0.636	0.600	
	D	1.01008	1.00472	0.00536	8	0.670	CV	
	E	1.00425	0.99918	0.00507	8	0.634		
8%	A	1.02115	1.01638	0.00477	8	0.596	AVG DRY	
	B	1.02815	1.02286	0.00529	8	0.661	WEIGHT (mg)	
	C	0.98629	0.98143	0.00486	8	0.607	0.638	
	D	1.01047	1.00484	0.00563	8	0.704	CV	
	E	1.00038	0.99539	0.00499	8	0.624		
11%	A	1.02436	1.01897	0.00539	8	0.674	AVG DRY	
	B	1.02527	1.02025	0.00502	8	0.627	WEIGHT (mg)	
	C	1.02683	1.02190	0.00493	8	0.616	0.664	
	D	1.00164	0.99656	0.00508	8	0.635	CV	
	E	1.00473	0.99859	0.00614	8	0.767		
14%	A	0.99936	0.99336	0.00600	8	0.750	AVG DRY	
	B	0.99995	0.99526	0.00469	8	0.586	WEIGHT (mg)	
	C	1.03241	1.02736	0.00505	8	0.631	0.673	
	D	1.01494	1.00944	0.00550	8	0.688	CV	
	E	1.00508	0.99938	0.00570	8	0.712	9.67	
19%	A	1.00486	0.99968	0.00518	8	0.648	AVG DRY	
	B	1.02206	1.01752	0.00454	8	0.567	WEIGHT (mg)	
	C	1.01359	1.00834	0.00525	8	0.656	0.644	
	D	1.00364	0.99892	0.00472	8	0.590	CV	
	E	1.00105	0.99499	0.00606	8	0.757		

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

AA# K1405002, FATHEAD MINNOW GROWTH CHRONIC, 5-14-14

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

Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

D = 0.120

W = 0.971

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# K1405002, FATHEAD MINNOW GROWTH CHRONIC, 5-14-14

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

Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B1 statistic = 2.43

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# K1405002, FATHEAD MINNOW GROWTH CHRONIC, 5-14-14
 FILE: C:\COPYTO~1\TOXSTAT\FHGGROWTH.
 TRANSFORM: NO TRANSFORMATION

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.5590	0.5590
1	CONTROL	2	0.5300	0.5300
1	CONTROL	3	0.6510	0.6510
1	CONTROL	4	0.7700	0.7700
1	CONTROL	5	0.6980	0.6980
2	6 % EFFLUENT	1	0.5020	0.5020
2	6 % EFFLUENT	2	0.5550	0.5550
2	6 % EFFLUENT	3	0.6360	0.6360
2	6 % EFFLUENT	4	0.6700	0.6700
2	6 % EFFLUENT	5	0.6340	0.6340
3	8 % EFFLUENT	1	0.5960	0.5960
3	8 % EFFLUENT	2	0.6610	0.6610
3	8 % EFFLUENT	3	0.6070	0.6070
3	8 % EFFLUENT	4	0.7040	0.7040
3	8 % EFFLUENT	5	0.6240	0.6240
4	11 % EFFLUENT	1	0.6740	0.6740
4	11 % EFFLUENT	2	0.6270	0.6270
4	11 % EFFLUENT	3	0.6160	0.6160
4	11 % EFFLUENT	4	0.6350	0.6350
4	11 % EFFLUENT	5	0.7670	0.7670
5	14 % EFFLUENT	1	0.7500	0.7500
5	14 % EFFLUENT	2	0.5860	0.5860
5	14 % EFFLUENT	3	0.6310	0.6310
5	14 % EFFLUENT	4	0.6880	0.6880
5	14 % EFFLUENT	5	0.7120	0.7120
6	19 % EFFLUENT	1	0.6480	0.6480
6	19 % EFFLUENT	2	0.5670	0.5670
6	19 % EFFLUENT	3	0.6560	0.6560
6	19 % EFFLUENT	4	0.5900	0.5900
6	19 % EFFLUENT	5	0.7570	0.7570

AA# K1405002, FATHEAD MINNOW GROWTH CHRONIC, 5-14-14
 File: C:\COPYTO~1\TOXSTAT\FHGGROWTH. Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.016	0.003	0.657
Within (Error)	24	0.120	0.005	
Total	29	0.136		

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

AA# K1405002, FATHEAD MINNOW GROWTH CHRONIC, 5-14-14

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	0.642	0.642		
2	6 % EFFLUENT	0.599	0.599	0.944	
3	8 % EFFLUENT	0.638	0.638	0.072	
4	11 % EFFLUENT	0.664	0.664	-0.497	
5	14 % EFFLUENT	0.673	0.673	-0.712	
6	19 % EFFLUENT	0.644	0.644	-0.045	

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

AA# K1405002, FATHEAD MINNOW GROWTH CHRONIC, 5-14-14

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	6 % EFFLUENT	5	0.105	16.4	0.042
3	8 % EFFLUENT	5	0.105	16.4	0.003
4	11 % EFFLUENT	5	0.105	16.4	-0.022
5	14 % EFFLUENT	5	0.105	16.4	-0.032
6	19 % EFFLUENT	5	0.105	16.4	-0.002

APPENDIX D

Ceriodaphnia dubia Raw Data and Statistics

SURVIVAL AND REPRODUCTION TEST

Ceriodaphnia dubia

Discharger: Sheridan AFIN # 27-00022
 Location: Outfall 001
 Date Sample Collected: 5-14/15/16-14

Lab Number/s
 K1405002

Analyst: RH
 Test Start - Date/Time: 5-14-14, 1500
 Test Stop - Date/Time: 5-21-14, 0945

Conc	1	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst	
		%	Day	A	B	C	D	E	F	G	H					I
MHS	1	0	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	0	10	0.0	RH
	3	0	0	0	0	1	2	0	0	0	0	0	3	10	0.3	RH
	4	6	0	5	0	0	4	6	0	3	7	31	10	3.1	RH	
	5	5	1	2	3	8	0	0	9	5	6	39	10	3.9	RH	
	6	6	6	5	0	4	9	8	0	1	0	39	10	3.9	RH	
	7	3	6	4	10	5	3	2	0	6	4	43	10	4.3	RH	
	8															
Total		20	13	16	13	18	18	16	9	15	17	155		Avg. = 15.5		
																C.V. = 20.5

Conc	4	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst	
		%	Day	A	B	C	D	E	F	G	H					I
11%	1	0	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	0	10	0.0	RH
	3	3	0	0	0	1	0	0	0	2	2	8	10	0.8	RH	
	4	6	1	5	1	0	0	0	4	6	2	25	10	2.5	RH	
	5	4	5	7	8	6	0	1	1	0	7	39	10	3.9	RH	
	6	6	11	5	7	9	8	8	1	1	0	56	10	5.6	RH	
	7	0	4	2	0	3	7	5	0	5	3	29	10	2.9	RH	
	8												10	0.0		
Total		19	21	19	16	19	15	14	6	14	14	157		Avg. = 15.7		
																C.V. = 27.2

Conc	2	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst	
		%	Day	A	B	C	D	E	F	G	H					I
6%	1	0	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	0	10	0.0	RH
	3	0	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	4	4	1	0	0	1	3	4	0	5	6	24	10	2.4	RH	
	5	2	3	6	7	0	0	0	7	3	2	30	10	3.0	RH	
	6	2	4	3	7	9	4	0	1	2	0	32	10	3.2	RH	
	7	7	1	9	4	5	0	9	1	3	6	45	10	4.5	RH	
	8															
Total		15	9	18	18	15	7	13	9	13	14	131		Avg. = 13.1		
																C.V. = 28.7

Conc	5	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst	
		%	Day	A	B	C	D	E	F	G	H					I
14%	1	0	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	0	10	0.0	RH
	3	1	0	0	2	0	0	0	1	1	2	7	10	0.7	RH	
	4	5	0	4	6	3	1	2	6	4	0	31	10	3.1	RH	
	5	3	6	4	7	0	7	0	0	8	4	39	10	3.9	RH	
	6	1	0	1	0	0	1	6	8	1	9	27	10	2.7	RH	
	7	3	8	3	4	9	8	7	5	1	3	51	10	5.1	RH	
	8												10	0.0	RH	
Total		13	14	12	19	12	17	15	20	15	18	155		Avg. = 15.5		
																C.V. = 18.6

Conc	3	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst	
		%	Day	A	B	C	D	E	F	G	H					I
8%	1	0	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	0	10	0.0	RH
	3	0	2	0	0	0	0	0	0	1	2	5	10	0.5	RH	
	4	4	0	5	3	2	2	2	6	0	0	24	10	2.4	RH	
	5	3	4	3	5	8	7	6	5	2	3	46	10	4.6	RH	
	6	4	1	0	4	5	0	1	5	8	6	34	10	3.4	RH	
	7	0	5	0	2	0	9	7	0	4	7	34	10	3.4	RH	
	8															
Total		11	12	8	14	15	18	16	16	15	18	143		Avg. = 14.3		
																C.V. = 22.1

Conc	6	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst	
		%	Day	A	B	C	D	E	F	G	H					I
19%	1	0	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	0	10	0.0	RH
	3	3	0	0	0	0	0	1	1	1	0	6	10	0.6	RH	
	4	5	1	3	2	7	4	0	0	5	6	33	10	3.3	RH	
	5	4	8	5	0	0	9	3	7	6	5	47	10	4.7	RH	
	6	0	0	10	5	0	3	8	5	0	3	34	10	3.4	RH	
	7	7	8	2	0	8	3	0	6	0	1	35	10	3.5	RH	
	8												10	0.0	RH	
Total		19	17	20	7	15	20	12	19	11	15	155		Avg. = 15.5		
																C.V. = 28.2

AA # K1405002, C. DUBIA CHRONIC, REPRODUCCION, 5-14-14
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 # K1405002, C. DUBIA CHRONIC, REPRODUCCION, 5-14-14
File: C:\COPYTO~1\TOXSTAT\C.DUB Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 2.60

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	

AA # K1405002, C. DUBIA CHRONIC, REPRODUCCION, 5-14-14
 File: C:\COPYTO~1\TOXSTAT\C.DUB Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	53.133	10.627	0.799
Within (Error)	54	718.600	13.307	
Total	59	771.733		

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

AA # K1405002, C. DUBIA CHRONIC, REPRODUCCION, 5-14-14
 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	15.500	15.500		
2	6 % EFFLUENT	13.100	13.100	1.471	
3	8 % EFFLUENT	14.300	14.300	0.736	
4	11 % EFFLUENT	15.700	15.700	-0.123	
5	14 % EFFLUENT	15.500	15.500	0.000	
6	19 % EFFLUENT	15.500	15.500	0.000	

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

AA # K1405002, C. DUBIA CHRONIC, REPRODUCCION, 5-14-14
 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	6 %	EFFLUENT	10	3.769	24.3	2.400
3	8 %	EFFLUENT	10	3.769	24.3	1.200
4	11 %	EFFLUENT	10	3.769	24.3	-0.200
5	14 %	EFFLUENT	10	3.769	24.3	0.000
6	19 %	EFFLUENT	10	3.769	24.3	0.000

APPENDIX E

Organism History

AQUATOX, INC.

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

10/2

TEST ORGANISM HISTORY

DATE SHIPPED 5/13/14 CLIENT Ar Analytical
Regan

Purchase Order #: _____

SPECIES: Pimephales promelas

Quantity Shipped: 240

Age: hatched 5/12/14 15-1600
CST

Brood Stock Source: Anderson Farms, AR

Culture Water: Groundwater 160

Hardness (Mg/l CaCO3): _____

Dissolved Oxygen (Mg/l): 8.2

Temperature (°C): 25.1°C

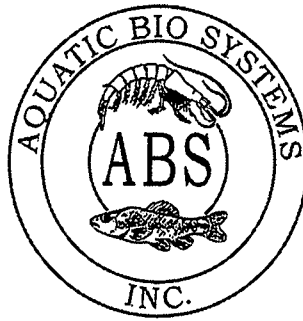
Feeding: Artificial

Comments: _____

Shipped Via: Federal Express UPS Overnight Shuttle

Packaged By: _____

1300 Blue Spruce Drive, Suite C
Fort Collins, Colorado 80524



Toll Free: 800/331-5916
Tel: 970/484-5091 Fax: 970/484-2514

ORGANISM HISTORY

DATE: 11/25/2013

SPECIES: Ceriodaphnia dubia

AGE: > 3 day

LIFE STAGE: Adult

HATCH DATE: Variable

BEGAN FEEDING: Immediately

FOOD: YTC, *Selenastrum* sp.

Water Chemistry Record:

	Current	Range
TEMPERATURE:	<u>22°C</u>	<u>22-26°C</u>
SALINITY/CONDUCTIVITY:	<u>--</u>	<u>--</u>
TOTAL HARDNESS (as CaCO 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:

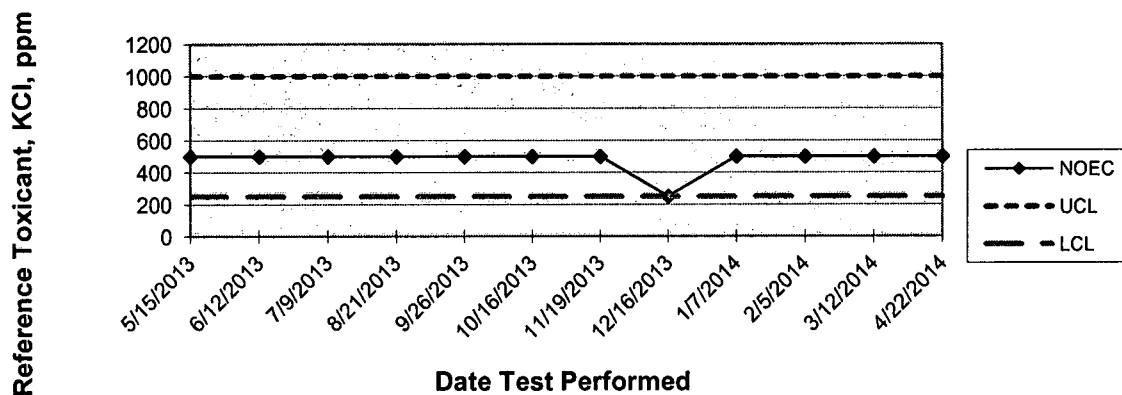


Facility Supervisor

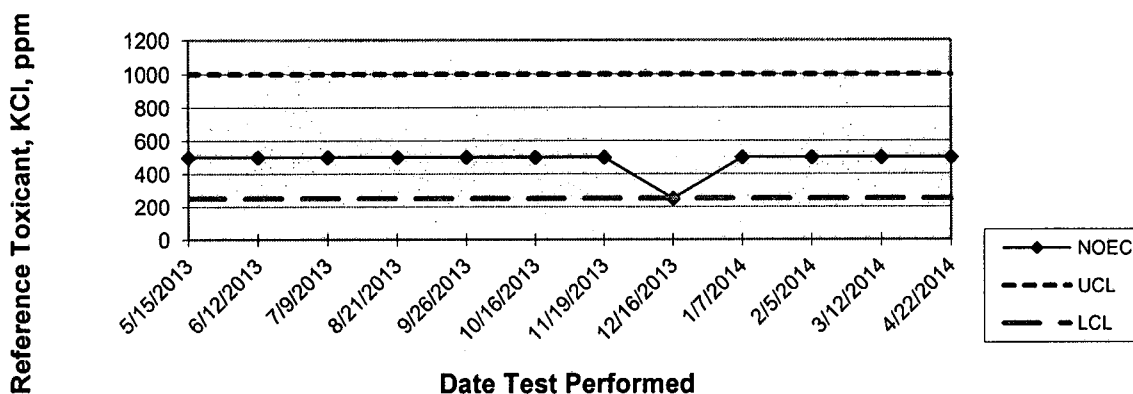
APPENDIX F

Quality Assurance Charts

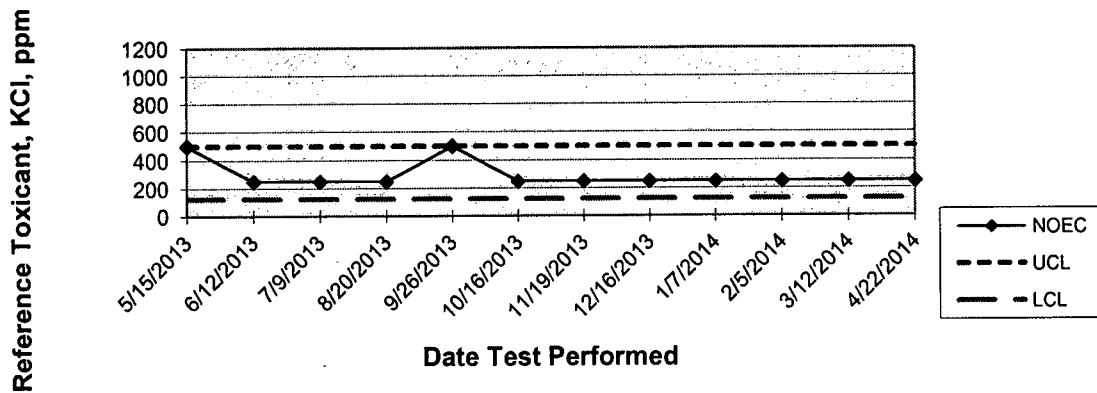
ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW SURVIVAL 7 Day
QUALITY ASSURANCE



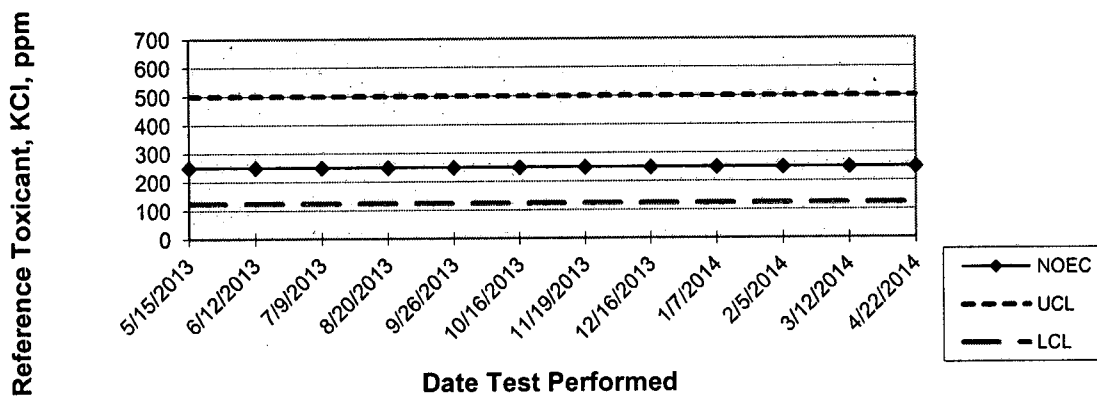
ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW GROWTH 7 Day
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.
CERIODAPHNIA DUBIA SURVIVAL
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.
CERIODAPHNIA DUBIA REPRODUCTION
QUALITY ASSURANCE

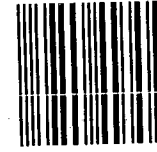


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PO Box 486
Sheridan, AR 72150

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