



**SORRELLS RESEARCH
LABORATORY AND FIELD SERVICES**

WEF



8100 National Drive
Little Rock, Arkansas 72209

CHEMISTS
ECOLOGISTS
CONSULTANTS
PLANNERS

Phone 501-562-8139
Fax 501-562-7025
Toll Free 1-800-331-8139

LABORATORY ANALYSIS

Date of Report: March 26, 2015
Date Received : March 9, 2015

For: STUTTGART MUNICIPAL WATER WORKS
P.O. BOX 130
516 SOUTH MAIN
STUTTGART, AR 72160-

Job: NPDES MONITORING PERMIT NO: AR0034380 1/QTR

Sample From: EFF. COMP 03/08-09/15 0900-0900 BIO-MONITORING

ANALYTE		RESULT	UNITS	METHOD
Bioassay, Ceriodaphnia dubia, chronic	=	100.000	Rp_NOEC, %	1002.0
Bioassay, Fathead minnow, chronic	=	100.000	Gr_NOEC, %	1000.0
Bioassay, Ceriodaphnia dubia- chronic	=	100.000	Sv_NOEC, %	1002.0
Bioassay, Fathead minnow, chronic	=	100.000	Sv_NOEC, %	1000.0

STANDARD METHODS, 20TH ED.; EPA METHODS, 3RD ED.

Collected by:

MAHDI HADDADI on 03/09/15 at 9:00

Analysis by :

SEE ATTACHED QUALITY ASSURANCE PAGE.

Sample preservation and Laboratory Analysis conducted according to EPA 40 CFR Part 136. Test/Analyst/Time/Coeff./Var./ QA plan filed with ADPC&E. Includes 10 % replication and 10 % recovery studies by random selection. Instruments maintained and calibrated and records kept. See Attached.

Copies to:

MR. TOMMY LAWSON

DANNY WILSON

STUTTGART WATER WORKS

P.O. BOX 130

612 SOUTH COLLEGE

STUTTGART, AR 72160-

STUTTGART, AR 72160-

Laboratory Number: 17945.0001B TKR Reviewed By: K. E. Sorrells, M.S. []



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QUALITY ASSURANCE

March 9, 2015

The following QA represents SRA's Quality Assurance values for this report.

ANALYTE	ANALYST	BEG. DATE	BEG. TIME	FIN. DATE	FIN. TIME	S.D. %	SPK. REC.	#IN BAT
Bioassay, Ceriodaphnia du AA	AA	03/10/15	1030	03/17/15	1000	0.00	0.0	1
Bioassay, Fathead minnow, AA	AA	03/10/15	1340	03/17/15	1345	0.00	0.0	1

Field PH/TEMP/D.O. Sampler or Courier/ at time of sampling or pick up
Sample preservation and laboratory analysis conducted according to EPA
40 CFR Part 136 TEST/ANALYST/TIME/COEF. VAR.* QA PLAN filed with
ADPC&E. Include replication.

KES = K. E. Sorrells
JBS = James B. Sorrells
CAS = Cecil A. Sorrells
MKM = Mark Kyle McKenzie

KESII = K. E. Sorrells, II
TJS = Todd J. Sanders
JHD = J. Henry Dodson

Laboratory Number: 17945.0001B TKR

8100 NAT. JAL DRIVE, LITTLE ROCK, AR 72209
 501-562-8139 800-331-8139
 FAX 501-562-7025

CHAIN OF CUSTODY RECORD

TURN AROUND TIME
 RUSH 24HR. 48 HR.
 5 DAY REG
 OTHER _____

FOR LAB/OFFICE USE ONLY

LAB # 17945.000/B
 CLIENT # 37021
 P.O.# _____

STANDARD METHODS PRESERVATION PER EPA 40 CFR
 C4= COOL TO 4.C
 S<2= SULFURIC ACID TO pH<2
 N<2= NITRIC ACID TO pH<2
 T= THIOSULFATE FOR DECHLORINATION
 W= WINKLER AZIDE MODIFICATION
 P= MEMBRANE ELECTRODE
 NaOH= pH >12

110913K2

NAME OF COMPANY, CITY, OR PROJECT

PROJECT NO:

SAMPLER(S) NAME: (PRINT)

CITY OF STAGGART

SAMPLE NO:	SAMPLE ID AND/OR COLLECTION LOCATION	START	END	COMP	FIELD ANALYSIS				D.O (W)	CONTAINER TYPE	ANALYSIS REQUIRED
		DATE/TIME	DATE/TIME	GRAB	pH	TEMP	FLOW	CL2	D.O(P)	PRESERVATIVE	
	<u>EFF OUT FAIL 001</u>	<u>3-8-15</u> ⁹⁰⁰	<u>3-9-15</u> ⁹⁰⁰	<u>C</u>						<u>6 1/2 GAL</u>	<u>BIO-MON</u>
METHOD OF SHIPMENT (CIRCLE)		FIELD CALIBRATION RECORD			NOTES/COMMENTS/OBSERVATIONS						
FED EX WALK IN <u>SRA</u> UPS OTHER		pH 7			<u>Tampa Lab 5.5</u>						
		pH 4									
		pH 10									
		D.O									
TYPE OF SAMPLE(S) (CIRCLE)					FIELD ANALYSIS CONDUCTED BY: (CIRCLE) <u>SRA</u> CLIENT						
WATER SOIL <u>W/W</u> SLUDGE OTHER											

RELINQUISHED BY:

DATE/TIME:

RECEIVED BY:

DATE/TIME: 3-9-15¹³⁵⁰

RELINQUISHED BY:

DATE/TIME:

RECEIVED BY (LAB):

DATE/TIME: 3-9-15¹⁵⁰⁰

8100 NA1. .NAL DRIVE, LITTLE ROCK, AR 72209

501-562-8139 800-331-8139

FAX 501-562-7025

CHAIN OF CUSTODY RECORD

TURN AROUND TIME
RUSH 24HR. 48 HR.
5 DAY REG
OTHER _____

FOR LAB/OFFICE USE ONLY

LAB # 17945.0002-B

CLIENT # 37021

P.O.# _____

STANDARD METHODS PRESERVATION PER EPA 40 CFR

C 4= COOL TO 4.C

S<2= SULFURIC ACID TO pH<2

N<2= NITRIC ACID TO pH<2

T= THIOSULFATE FOR DECHLORINATION

W= WINKLER AZIDE MODIFICATION

P= MEMBRANE ELECTRODE

NaOH= pH >12

110913K2

NAME OF COMPANY, CITY, OR PROJECT

PROJECT NO:

SAMPLER(S) NAME: (PRINT)

CITY OF STUTTGART

[Signature]

SAMPLE NO:	SAMPLE ID AND/OR COLLECTION LOCATION	START	END	COMP	FIELD ANALYSIS				D.O (W)	CONTAINER TYPE	ANALYSIS REQUIRED
		DATE/TIME	DATE/TIME	GRAB	pH	TEMP	FLOW	CL2	D.O(P)	PRESERVATIVE	
	<u>Eff-OUT Fall 001</u>	<u>9:00 3-10-15</u>	<u>9:10 3-11-15</u>	<u>C</u>						<u>6 1/2 Galcy</u>	<u>BIO-MON</u>

METHOD OF SHIPMENT (CIRCLE)
FED EX WALK IN SRA UPS OTHER

FIELD CALIBRATION RECORD
pH 7
pH 4
pH 10
D.O

NOTES/COMMENTS/OBSERVATIONS
Temp Lab 5°

TYPE OF SAMPLE(S): (CIRCLE)
WATER SOIL W/W SLUDGE OTHER

FIELD ANALYSIS CONDUCTED BY: (CIRCLE) SRA CLIENT

RELINQUISHED BY:

DATE/TIME:

RECEIVED BY:

DATE/TIME: 3-11-15

RELINQUISHED BY:

DATE/TIME:

RECEIVED BY (LAB):

DATE/TIME: 3-11-15

1115
1550

8100 NATI AL DRIVE, LITTLE ROCK, AR 72209
 501-562-8139 800-331-8139
 FAX 501-562-7025

CHAIN OF CUSTODY RECORD

TURN AROUND TIME
 RUSH 24HR. 48 HR.
 5 DAY REG
 OTHER _____

FOR LAB/OFFICE USE ONLY

LAB # 17945.0003
 CLIENT # _____
 P.O.# _____

STANDARD METHODS PRESERVATION PER EPA 40 CFR
 C4= COOL TO 4.C
 S<2= SULFURIC ACID TO pH<2
 N<2= NITRIC ACID TO pH<2
 T= THIOSULFATE FOR DECHLORINATION
 W= WINKLER AZIDE MODIFICATION
 P= MEMBRANE ELECTRODE
 NaOH= pH >12

NAME OF COMPANY, CITY, OR PROJECT PROJECT NO: SAMPLER(S) NAME: (PRINT) 11091382

City of Stuttgart

SAMPLE NO:	SAMPLE ID AND/OR COLLECTION LOCATION	START	END	COMP	FIELD ANALYSIS				D.O (W)	CONTAINER TYPE	ANALYSIS REQUIRED
		DATE/TIME	DATE/TIME	GRAB	pH	TEMP	FLOW	CL2	D.O(P)	PRESERVATIVE	
	<u>EFF OUT FAN 001</u>	<u>900 3-12-15</u>	<u>900 3-13-15</u>	<u>C</u>						<u>6 1/2 Gal cy</u>	<u>BIO-MON</u>

METHOD OF SHIPMENT (CIRCLE) <input type="checkbox"/> FED EX <input checked="" type="checkbox"/> WALK IN <input type="checkbox"/> SRA <input type="checkbox"/> UPS <input type="checkbox"/> OTHER	FIELD CALIBRATION RECORD pH 7 pH 4 pH 10 D.O	NOTES/COMMENTS/OBSERVATIONS <u>Test at Lab 7.8</u>
TYPE OF SAMPLE(S): (CIRCLE) <input type="checkbox"/> WATER <input checked="" type="checkbox"/> SOIL <input type="checkbox"/> W/W <input type="checkbox"/> SLUDGE <input type="checkbox"/> OTHER		FIELD ANALYSIS CONDUCTED BY: (CIRCLE) <input checked="" type="checkbox"/> SRA <input type="checkbox"/> CLIENT

RELINQUISHED BY: _____ DATE/TIME: _____ RECEIVED BY: [Signature] DATE/TIME: 3-13-15
 RELINQUISHED BY: _____ DATE/TIME: _____ RECEIVED BY(LAB): [Signature] DATE/TIME: 3-13-15

Arkansas Analytical, Inc.

Toxicity Test Results

CITY of STUTTGART
NPDES PERMIT NUMBER: AR0034380
First Quarter 2015
AFIN # 01-00041

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

Ceriodaphnia dubia, Survival and Reproduction Test
Test 1002.0

Prepared for: **Tommy Lawson**
Stuttgart Municipal Water Works
516 South Main
Stuttgart, AR 72160

Prepared by: Arkansas Analytical, Inc.
11701 I-30, Bldg 1 Suite 115
Little Rock, Arkansas 72209
Lab Number K1503004

Monday, March 23, 2015

Introduction

This report contains test results for the toxicity testing for the City of Stuttgart, NPDES permit number AR0034380, Outfall 001. The plant is located in Stuttgart, Arkansas, on West 10th Street west of the St. Louis Railroad on the west side of town in Section 29, Township 2 South, Range 5 West in Arkansas County, Arkansas. The discharge is to receiving waters named King Bayou, thence to Bayou Meto in Segment 3B of the Arkansas River Basin.

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

Plant Operations

To be provided by permittee.

Source of Effluent and Dilution Water

Effluent samples were collected as follows:

Sample Collection:	Date Started	Date, Time Ended
Sample #1:	3-8-15, 0900	3-9-15, 0900
Sample #2:	3-10-15, 0900	3-11-15, 0900
Sample #3:	3-12-15, 0900	3-13-15, 0900

Samples were three composites collected at the final discharge from the City of Stuttgart Wastewater Treatment Plant, Outfall 001

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:	3-9-15, 1618	10 (on ice)
Sample #2:	3-11-15, 1630	6
Sample #3:	3-13-15, 1545	8 (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. Due to either zero flow conditions or to its earlier characterization as toxic, synthetic dilution water was substituted.

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 32%, 42%, 56%, 75%, and 100%. The low-flow effluent concentration (**critical dilution**) was defined as **100% effluent**.

Test Methods

EPA Method 1000.0, Fathead Minnow, *Pimephales promelas*, Larval Survival and Growth Test, was used in this bioassay. Larvae are exposed in a static renewal system for seven days and the results are based on the survival and growth (increase in weight) of the larvae. There were no deviations from the reference method. The test chambers were 500 ml plastic cups, and each chamber contained ten organisms in a test solution volume of 250 mls. The test temperature was 25 degrees Centigrade. Raw data and statistics are provided in Appendix C.

EPA Method 1002.0, Cladoceran, *Ceriodaphnia dubia*, Survival and Reproduction Test, was 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 E.

The organism used in Test 1002.0 were < 24 hour old *Ceriodaphnia dubia* neonates, (all born within the same eight hours), obtained from an in-house culture. An organism history is provided in Appendix E.

Quality Assurance

Test Acceptability

TEST ACCEPTANCE CRITERIA for *Ceriodaphnia dubia*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	100%	X	
Average of 15 or more young per surviving female	16.3	X	
At least 60% of surviving females should have produced 3 broods	70%	X	
The percent coefficient of variation between replicates must be 40% or less for the young of surviving females	17.4%	X	

TEST ACCEPTANCE CRITERIA for *Pimephales promelas*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	98%	X	
The percent coefficient of variation between replicates must be 40% or less for survival	4.56 %	X	
Minimum of 0.25 mg average dry weight of surviving controls	0.678	X	
The percent coefficient of variation between replicates must be 40% or less for growth	9.26%	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> 2/11/15 – 2/18/15		<i>Pimephales promelas</i> 2/11/15 – 2/18/15	
NOEC Survival:	250 ppm KCl	NOEC Survival:	500 ppm KCl
LOEC Survival:	500 ppm KCl	LOEC Survival:	1000 ppm KCl
NOEC Reproduction:	250 ppm KCl	NOEC Reproduction:	500 ppm KCl
LOEC Reproduction:	500 ppm KCl	LOEC Reproduction:	1000 ppm KCl

Quality Assurance charts are provided in Appendix F.

Summary of Results City of Stuttgart

<i>Ceriodaphnia dubia</i>		<i>Pimephales promelas</i>	
NOEC / LOEC Survival	100% / NA	NOEC / LOEC survival	100% / NA
NOEC / LOEC Reproduction	100% / NA	NOEC / LOEC growth	100% / NA
Mean number of neonates (critical dilution)	15.6	%CV survival (critical dilution)	0.00%
%CV Reproduction (critical dilution)	27.2%	Mean dry weight (critical dilution) in milligrams	0.667
		%CV growth (critical dilution)	6.45%
PMSD Reproduction	29.5	PMSD Growth	14.3

Conclusion

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

The permit issued to the City of Stuttgart, AR0034380, specifies that the **critical dilution is 100% effluent**. The effluent samples **did not** exhibit either lethal or sublethal effects at the critical dilution, and, as such, the effluent samples **passed** both portions of the test.

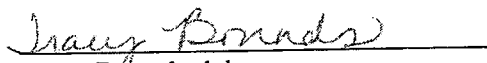
Chronic static renewal survival and reproduction test using *Ceriodaphnia dubia*, (Method 1002.0)

The permit issued to the City of Stuttgart, AR0034380, specifies that the **critical dilution is 100% effluent**. The effluent samples **did not** exhibit lethal or sublethal effects at the critical dilution, and, as such, the effluent samples **passed** both portions of the test.

Biomonitoring Analysts:

Ryan Hudgin / William Lindsey

Reviewed by:


Tracy Bounds, lab manager

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

PERMITTEE: City of Stuttgart

NPDES #: AR0034380

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	3-8-15, 0900	3-9-15, 0900
Sample #2:	3-10-15, 0900	3-11-15, 0900
Sample #3:	3-12-15, 0900	3-13-15, 0900

Test initiated (date, time): 3-10-15, 1340 Test terminated (date, time): 3-17-15, 1345

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%	90	100	100	100	100		100	100	98	4.56
32%	100	100	100	100	100		100	100	100	
42%	100	100	100	100	100		100	100	100	
56%	100	100	100	100	100		100	100	100	
75%	100	100	100	100	100		100	100	100	
100%	100	100	100	100	100		100	100	100	0.00

DATA TABLE FOR GROWTH OF FATHEAD MINNOWS

Effluent Conc %	Average Dry Weight in milligrams in replicate chambers						Mean Dry Weight	CV%
	A	B	C	D	E			
0%	0.581	0.680	0.684	0.687	0.757		0.678	9.26
32%	0.571	0.627	0.711	0.693	0.676		0.656	
42%	0.629	0.652	0.636	0.686	0.626		0.646	
56%	0.592	0.705	0.677	0.621	0.692		0.657	
75%	0.606	0.683	0.779	0.477	0.564		0.622	
100%	0.653	0.707	0.687	0.688	0.598		0.667	6.45

Coefficient of Variation = standard deviation / mean * 100

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

1. Dunnett's procedure or Steel's Many-One Rank Test as appropriate:
Is the mean survival at 7 days significantly different ($p=0.05$) than the control survival for:
a) LOW FLOW OR CRITICAL DILUTION, (100%) YES _____ NO X

2. Dunnett's Procedure
Is the mean dry weight (growth) at 7 days significantly different ($p=0.05$) than the control's dry weight (growth) for:
a) LOW FLOW OR CRITICAL DILUTION, (100%) YES _____ NO X

3. If NO was answered to 1.a) enter [0] otherwise enter [1] (parameter TLP6C): _____ 0 _____

4. If NO was answered to 2.a) enter [0] otherwise enter [1] (parameter TGP6C): _____ 0 _____

5. Enter percentage corresponding to each parameter below:
a) NOEC survival (parameter TOP6C)= _____ 100 _____ % effluent
b) NOEC growth (parameter TPP6C)= _____ 100 _____ % effluent
c) Coefficient of variation (parameter TQP6C)= _____ 9.26 _____ %

6. Enter Whole Effluent Toxicity: _____ 100 _____ %

SUMMARY REPORTING FORMS FOR CHRONIC BIOMONITORING
Ceriodaphnia dubia SURVIVAL AND REPRODUCTION

Permittee: City of Stuttgart

NPDES #: AR0034380

Sample Collection:	Date Started	Date, Time Ended
Sample #1:	3-8-15, 0900	3-9-15, 0900
Sample #2:	3-10-15, 0900	3-11-15, 0900
Sample #3:	3-12-15, 0900	3-13-15, 0900

Test initiated (date, time): 3-10-15, 1030 Test terminated (date, time): 3-17-15, 1000

Dilution water used: Moderately Hard Synthetic

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

Replicate	0%	32%	42%	56%	75%	100%
A	19	17	12	X0	15	19
B	14	18	14	15	18	9
C	19	X1	21	21	13	20
D	17	23	8	13	10	11
E	18	10	7	18	14	17
F	14	10	14	18	20	15
G	11	15	12	10	10	11
H	18	20	13	16	11	22
I	14	8	15	12	14	15
J	19	18	10	15	15	17
Mean	16.3	14.0	12.6	13.8	14.0	15.6
Mean/surviving female	16.3	15.4	12.6	15.3	14.0	15.6
CV%*	17.4					27.2

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 Stuttgart

NPDES #: AR0034380

PERCENT SURVIVAL

PERCENT EFFLUENT	0%	32%	42%	56%	75%	100%
Time of Reading: 24 HOURS	100	100	100	100	100	100
48 HOURS	100	100	100	90	100	100
Test termination	100	90	100	90	100	100

1. Fisher's Exact Test:

Is the mean survival at test termination significantly different ($p=0.05$) than the control survival for:

a) LOW FLOW OR CRITICAL DILUTION, (100%): YES _____ NO X _____

2. Dunnett's Procedure or Steel's Many One Rank Test:

Is the mean number of young produced per female significantly different ($p=0.05$) than the controls number of young per female for:

a) LOW FLOW OR CRITICAL DILUTION, (100%): YES _____ NO X _____

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

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

5. Enter percentage corresponding to each parameter below:

a) NOEC survival (parameter TOP3B)= 100 % effluent

b) NOEC reproduction (parameter TPP3B)= 100 % effluent

c) Coefficient of variation (parameter TQP3B)= 27.2 %

6. Enter Whole Effluent Toxicity: 100 %

APPENDIX A

Chain of Custody Forms

SORRELLS RESEARCH ASSOCIATES, INC
 8100 NATIONAL DRIVE, LITTLE ROCK, AR 72209
 501-562-8139 800-331-8139
 FAX 501-562-7025

CHAIN OF CUSTODY RECORD

TURN AROUND TIME
 RUSH 24HR. 48 HR.
 5 DAY REG
 OTHER _____

FOR LAB/OFFICE USE ONLY

STANDARD METHODS PRESERVATION PER EPA 40 CFR

- C4= COOL TO 4.C
- S<2= SULFURIC ACID TO pH<2
- N<2= NITRIC ACID TO pH<2
- T= THIOSULFATE FOR DECHLORINATION
- W= WINKLER AZIDE MODIFICATION
- P= MEMBRANE ELECTRODE
- NaOH= pH >12

LAB # 17945.0001
 CLIENT # _____
 P.O.# _____

NAME OF COMPANY, CITY OR PROJECT PROJECT NO. SAMPLER(S) NAME: (PRINT)

CITY OF ST. JOURNAL		PROJECT NO.		SAMPLER(S) NAME: (PRINT)					
SAMPLE NO.	SAMPLE ID AND/OR COLLECTION LOCATION	START	END	COMP	FIELD ANALYSIS	D.O (W)	CONTAINER TYPE PRESERVATIVE	ANALYSIS REQUIRED	
		DATE/TIME	DATE/TIME	GRAB	pH TEMP FLOW CL2				
	EFF OUT FALL 001	9:00 3-8-15	9:00 3-9-15	C			6 1/2 Gallon	X1503004 A BIO-MON	
METHOD OF SHIPMENT (CIRCLE)		FIELD CALIBRATION RECORD			<p>Samples Received at Arkansas Analytical Relinquished By: Sorrells</p> <p>Date/Time: 3/9/15 1618</p> <p>Received By: <i>Armeda</i></p> <p>Temperature on Receipt: 10°C</p> <p>Temperature Gun ID: NHT # 2</p> <p>Custody Seals: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p> <p>Containers Correct: <input checked="" type="checkbox"/></p> <p>COC/Labels Agree: <input checked="" type="checkbox"/></p> <p>Received on Ice: <input type="checkbox"/></p> <p><i>Tampa Lab 5.5</i></p>				
FED EX WALK IN SRA UPS OTHER		pH 7							
		pH 4							
		pH 10							
TYPE OF SAMPLE(S) (CIRCLE)		D.O.							
WATER SOIL W/W SLUDGE OTHER					FIELD ANALYSIS CONDUCTED BY: (CIRCLE) (SRA) CLIENT				

RELINQUISHED BY:

DATE/TIME:

RECEIVED BY: *[Signature]*

DATE/TIME: 3-9-15

RELINQUISHED BY:

DATE/TIME:

RECEIVED BY: *[Signature]*

DATE/TIME: 1500

SORRELLS RESEARCH ASSOCIATES, INC

8100 NATIONAL DRIVE, LITTLE ROCK, AR 72209

501-562-8139 800-331-8139

FAX 501-562-7025

CHAIN OF CUSTODY RECORD

TURN AROUND TIME
 RUSH 24HR. 48 HR.
 5 DAY REG
 OTHER _____

FOR LAB/OFFICE USE ONLY

STANDARD METHODS PRESERVATION PER EPA 40 CFR
 C4= COOL TO 4.C
 S<2= SULFURIC ACID TO pH<2
 N<2= NITRIC ACID TO pH<2
 T= THIOSULFATE FOR DECHLORINATION
 W= WINKLER AZIDE MODIFICATION
 P= MEMBRANE ELECTRODE
 NaOH= pH >12

LAB # 17945-0002

CLIENT # 37021

P.O.# _____

NAME OF COMPANY, CITY, OR PROJECT: CITY OF STUTTGART PROJECT NO: _____ SAMPLER(S) NAME: (PRINT) See

SAMPLE NO.	SAMPLE ID AND/OR COLLECTION LOCATION	START	END	COMP	FIELD ANALYSIS				D.O(W)	CONTAINER TYPE	ANALYSIS REQUIRED
		DATE/TIME	DATE/TIME	GRAB	pH	TEMP	FLOW	CL2	D.O(P)	PRESERVATIVE	
	<u>EFF OUT FALL 001</u>	<u>900 3-10-15</u>	<u>900 3-11-15</u>	<u>C</u>						<u>6 1/2 GAL CY</u>	<u>K1503004-B BLD-MON</u>

Samples Received at Arkansas Analytical Relinquished By: Sorrells

Date/Time: 11030 3/11/15

Received By: Amanda [Signature]

	Yes	No
Custody Seals:	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Containers Correct:	<input checked="" type="checkbox"/>	<input type="checkbox"/>
COC/Labels Agree:	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Received on Ice:	<input type="checkbox"/>	<input type="checkbox"/>

Temperature on Receipt: 6°C

Temperature Gun ID: HHT # 2

METHOD OF SHIPMENT (CIRCLE)	FIELD CALIBRATION RECORD
FED EX <input checked="" type="checkbox"/> WALK IN <input type="checkbox"/> CRA <input type="checkbox"/> UPS <input type="checkbox"/> OTHER <input type="checkbox"/>	pH 7: _____
	pH 4: _____
	pH 10: _____
	D.O: _____

T. [Signature] Lab 5⁰

FIELD ANALYSIS CONDUCTED BY: (CIRCLE) SRA CLIENT

RELINQUISHED BY: _____ DATE/TIME: _____ RECEIVED BY: [Signature] DATE/TIME: 1115 3-11-15

DATE/TIME: _____ RECEIVED BY (LAB): [Signature] DATE/TIME: 1550 3-11-15

SORRELLS RESEARCH ASSOCIATES, INC
 8100 NATIONAL DRIVE, LITTLE ROCK, AR 72209
 501-562-8139 800-331-8139
 FAX 501-562-7025

CHAIN OF CUSTODY RECORD

TURN AROUND TIME
 RUSH 24HR 48 HR
 5 DAY REG
 OTHER _____

FOR LAB/OFFICE USE ONLY

LAB # 17945-0003
 CLIENT # _____
 P.O.# _____

STANDARD METHODS PRESERVATION PER EPA 40 CFR
 C4= COOL TO 4.C
 S<2= SULFURIC ACID TO pH<2
 N<2= NITRIC ACID TO pH<2
 T= THIOSULFATE FOR DECHLORINATION
 W= WINKLER AZIDE MODIFICATION
 P= MEMBRANE ELECTRODE
 NaOH= pH>12

11021312

NAME OF COMPANY, CITY, OR PROJECT: _____ PROJECT NO: _____ SAMPLER(S) NAME: (PRINT) _____

CITY OF STAGGART

SAMPLE NO.	SAMPLE ID AND/OR COLLECTION LOCATION	START	END	COMP	FIELD ANALYSIS				D.O (W)	CONTAINER TYPE	ANALYSIS REQUIRED
		DATE/TIME	DATE/TIME	GRAB	pH	TEMP	FLOW	CL2	D.O(P)	PRESERVATIVE	
	<i>EFF OUT EM 001</i>	<i>900 3-12-15</i>	<i>900 3-13-15</i>	<i>C</i>						<i>6 1/2 Galcy</i>	<i>K1503004C Bio-mon</i>

Samples Received at Arkansas Analytical
 Relinquished By: Sorrells
 Date/Time: *3-13-15 1545*
 Received By: *Amundson*

	Yes	No
Custody Seals:	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Containers Correct:	<input checked="" type="checkbox"/>	<input type="checkbox"/>
COC/Labels Agree:	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Received on Ice:	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Temperature on Receipt:	<i>0°C</i>	
Temperature Gun ID:	<i>HHT # 2</i>	

METHOD OF SHIPMENT (CIRCLE)	FIELD CALIBRATION RECORD	NOTES/COMMENTS/OBSERVATIONS
FED EX WALK IN <u>SRA</u> UPS OTHER	pH 7 pH 4 pH 10 D.O.	<i>Rel Lab 7.8</i>
TYPE OF SAMPLE(S) (CIRCLE)		
WATER SOIL <u>W</u> SLUDGE OTHER		FIELD ANALYSIS CONDUCTED BY: (CIRCLE) <u>SRA</u> CLIENT

RELINQUISHED BY: _____ DATE/TIME: _____ RECEIVED BY: *[Signature]* DATE/TIME: *1040 3-13-15*
 RECEIVED BY (LAB): *[Signature]* DATE/TIME: *1153 3-13-15*

APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Fathead Minnow

Lab # / Sample ID K1503004

Test Start (Date/Time) 3-10-15

1340

Client: *S. H. H. H. H.*

Test End (Date/Time) 3-17-15

1345

Day of Test

		1	2	3	4	5	6	7	notes
Control	<i>m 45</i>	3-10	3-11	3-12	3-13	3-14	3-15	3-16	
D.O. (mg/L)	INITIAL	8.5	8.6	8.9	8.9	8.7	9.0	8.5	
	FINAL	8.2	7.1	7.7	7.8	8.3	7.6	7.8	
pH (s.u.)	INITIAL	7.8	8.3	7.8	7.9	7.9	8.2	8.0	
	FINAL	7.9	7.4	7.8	7.7	7.9	7.6	7.6	
temp (C)	INITIAL	23	22	22	23	21	21	22	
	FINAL	25	25	25	25	25	25	25	
ALKALINITY (mg/L)		62				58			
HARDNESS (mg/L)		86				89			
CONDUCTIVITY (umhc)		914				458			
CHLORINE (mg/L)		<0.05							
CONC:	32								
D.O. (mg/L)	INITIAL	8.3	7.1	8.9	8.6	8.5	8.7	8.5	
	FINAL	8.2	7.3	7.8	7.8	8.0	7.4	6.7	
pH (s.u.)	INITIAL	7.8	7.7	7.8	7.5	7.7	7.6	8.0	
	FINAL	7.8	6.7	7.7	7.7	7.9	7.5	7.9	
temp (C)	INITIAL	23	21	22	23	22	22	22	
	FINAL	25	25	25	25	25	25	25	
CONC:	42								
D.O. (mg/L)	INITIAL	7.9	7.1	8.6	8.6	8.6	8.6	8.3	
	FINAL	8.2	7.0	7.9	7.9	7.9	7.6	7.6	
pH (mg/L)	INITIAL	7.6	7.7	7.3	7.6	7.7	7.6	7.9	
	FINAL	7.9	7.2	7.8	7.7	7.9	7.6	7.8	
temp (C)	INITIAL	23	21	22	23	22	24	22	
	FINAL	25	25	25	25	25	25	25	
CONC:	54								
D.O. (mg/L)	INITIAL	7.9	7.0	8.6	8.8	8.7	8.6	8.2	
	FINAL	8.2	6.9	7.9	7.8	8.0	7.7	7.6	
pH (s.u.)	INITIAL	7.5	7.7	7.5	7.4	7.6	7.6	7.9	
	FINAL	7.6	6.1	7.8	7.7	7.9	7.7	7.8	
temp (C)	INITIAL	23	21	22	23	22	24	22	
	FINAL	25	25	25	25	25	25	25	
CONC:	75								
D.O. (mg/L)	INITIAL	8.3	6.8	8.5	8.9	8.7	8.4	8.5	
	FINAL	8.4	7.0	7.8	7.9	7.9	7.7	7.6	
pH (s.u.)	INITIAL	7.3	7.6	7.7	7.9	7.6	7.5	7.8	
	FINAL	7.7	7.2	7.8	7.7	7.9	7.9	7.8	
temp (C)	INITIAL	23	22	21	23	22	25	23	
	FINAL	25	25	25	25	25	25	25	
CONC:	100								
D.O. (mg/L)	INITIAL	8.6	6.7	8.4	9.1	8.9	8.3	8.2	
	FINAL	8.4	7.5	7.9	7.9	7.9	7.7	7.6	
pH (s.u.)	INITIAL	7.2	7.7	7.4	7.2	7.3	7.3	7.5	
	FINAL	7.5	6.2	7.7	7.0	7.9	7.3	7.8	
temp (C)	INITIAL	24	22	21	23	22	26	23	
	FINAL	25	25	25	25	25	25	25	
CONC:	100 %	A	A	A	B	B	C	C	
ALKALINITY (mg/L)		102			76		114		
HARDNESS (mg/L)		810			110		154		
CONDUCTIVITY (umhc)		449			459		718		
CHLORINE (mg/L)		<0.05			0.07		0.11		

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Ceriodaphnia Dubia

Lab # / Sample ID K1503004

Test Start (Date/Time) 3-10-15 1030

Client: SL # gant

Test End (Date/Time) 3-17-15 1000

Day of Test

		1	2	3	4	5	6	7	notes
Control	m#5	3-10	3-11	3-12	3-13	3-14	3-15	3-16	
D.O. (mg/L)	INITIAL	8.5	8.6	8.9	8.4	8.7	9.0	8.5	
	FINAL	8.3	8.4	8.2	9.0	8.9	8.5	8.5	
pH (s.u.)	INITIAL	7.8	8.3	7.8	7.9	7.9	8.2	8.0	
	FINAL	7.5	7.9	8.0	8.2	7.6	8.3	8.0	
temp (C)	INITIAL	23	22	22	23	21	21	22	
	FINAL	25	25	25	25	25	25	25	
ALKALINITY (mg/L)		62				58			
HARDNESS (mg/L)		86				84			
CONDUCTIVITY (umho)		414				458			
CHLORINE (mg/L)		<0.05							
CONC:	32								
D.O. (mg/L)	INITIAL	8.3	7.1	8.9	8.6	8.5	8.7	8.5	
	FINAL	8.4	8.5	8.2	9.0	8.8	8.5	8.5	
pH (s.u.)	INITIAL	7.8	7.7	7.8	7.5	7.7	7.6	8.0	
	FINAL	7.7	7.5	8.0	8.1	7.6	8.0	8.1	
temp (C)	INITIAL	23	21	22	23	22	25	22	
	FINAL	25	25	25	25	25	25	25	
CONC:	42								
D.O. (mg/L)	INITIAL	7.9	7.1	8.6	8.6	8.6	8.1	8.3	
	FINAL	8.2	8.4	8.4	9.0	8.8	8.3	8.4	
pH (mg/L)	INITIAL	7.6	7.7	7.5	7.6	7.7	7.6	7.9	
	FINAL	7.7	7.5	7.8	8.1	7.8	8.0	8.0	
temp (C)	INITIAL	23	21	22	23	22	24	22	
	FINAL	25	25	25	25	25	25	25	
CONC:	56								
D.O. (mg/L)	INITIAL	7.9	7.0	8.1	8.8	8.7	8.6	8.2	
	FINAL	8.2	8.3	8.4	9.0	8.7	8.6	8.3	
pH (s.u.)	INITIAL	7.5	7.7	7.5	7.4	7.6	7.6	7.9	
	FINAL	7.8	7.7	7.7	8.1	7.9	8.0	7.8	
temp (C)	INITIAL	23	21	22	23	22	24	22	
	FINAL	25	25	25	25	25	25	25	
CONC:	75								
D.O. (mg/L)	INITIAL	8.3	6.8	8.5	8.9	8.7	8.4	8.5	
	FINAL	8.0	8.3	8.2	9.1	8.9	8.5	8.3	
pH (s.u.)	INITIAL	7.3	7.6	7.7	7.4	7.6	7.5	7.8	
	FINAL	7.5	7.7	7.7	7.3	7.6	7.7	7.7	
temp (C)	INITIAL	23	22	21	23	22	25	23	
	FINAL	25	25	25	25	25	25	25	
CONC:	100								
D.O. (mg/L)	INITIAL	8.6	6.7	8.4	9.1	8.9	8.3	8.2	
	FINAL	8.3	8.4	8.3	9.0	8.8	8.5	8.4	
pH (s.u.)	INITIAL	7.2	7.7	7.4	7.2	7.3	7.3	7.5	
	FINAL	7.3	7.6	7.5	7.1	7.7	7.5	7.6	
temp (C)	INITIAL	24	22	21	23	22	26	23	
	FINAL	25	25	25	25	25	25	25	
CONC:	100 %	A	A	A	B	B	C	C	
ALKALINITY (mg/L)		102			76		114		
HARDNESS (mg/L)		86			110		154		
CONDUCTIVITY (umho)		449			459		718		
CHLORINE (mg/L)		<0.05			0.07		0.11		

APPENDIX C

Fathead minnow raw data and statistics

Pimephales promelas

FATHEAD MINNOW

SURVIVAL DATA FOR LARVAL SURVIVAL AND GROWTH TEST (CHRONIC)

LAB #: K1503004		TEST START	DATE	3/10/15	TIME	1340							
CLIENT: Stuttgart		TEST END	DATE	03/17/15	TIME	1345							
ANALYST: RH/ WL		AGE AND SOURCE OF MINNOWS < 48 hrs old, Aquatox											
DAY(NUMBER SURVIVING)													
SURVIVAL													
	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV	
CONTROL	A	10	10	10	10	10	10	10	9	90%	98.0%	4.56	
	B	10	10	10	10	10	10	10	10	100%			
	C	10	10	10	10	10	10	10	10	100%			
	D	10	10	10	10	10	10	10	10	100%			
	E	10	10	10	10	10	10	10	10	100%			
MHS	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV	
	CONC:	A	10	10	10	10	10	10	10	100%	100.0%		
	32%	B	10	10	10	10	10	10	10	10			100%
		C	10	10	10	10	10	10	10	10			100%
		D	10	10	10	10	10	10	10	10			100%
E		10	10	10	10	10	10	10	10	100%			
CONC:	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV	
	42%	A	10	10	10	10	10	10	10	10	100%	100.0%	
		B	10	10	10	10	10	10	10	10	100%		
		C	10	10	10	10	10	10	10	10	100%		
		D	10	10	10	10	10	10	10	10	100%		
E	10	10	10	10	10	10	10	10	100%				
CONC:	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV	
	56%	A	10	10	10	10	10	10	10	10	100%	100.0%	
		B	10	10	10	10	10	10	10	10	100%		
		C	10	10	10	10	10	10	10	10	100%		
		D	10	10	10	10	10	10	10	10	100%		
E	10	10	10	10	10	10	10	10	100%				
CONC:	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV	
	75%	A	10	10	10	10	10	10	10	10	100%	100.0%	
		B	10	10	10	10	10	10	10	10	100%		
		C	10	10	10	10	10	10	10	10	100%		
		D	10	10	10	10	10	10	10	10	100%		
E	10	10	10	10	10	10	10	10	100%				
CONC:	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV	
	100%	A	10	10	10	10	10	10	10	10	100%	100.0%	0.00
		B	10	10	10	10	10	10	10	10	100%		
		C	10	10	10	10	10	10	10	10	100%		
		D	10	10	10	10	10	10	10	10	100%		
E	10	10	10	10	10	10	10	10	100%				
ANALYST:		RH	RH	RH	RH	WL	WL	RH	RH				
DATE:		3/10/15	3/11/15	3/12/15	3/13/15	3/14/15	3/15/15	3/16/15	3/17/15				
TIME:		1340	1645	1500	1400	930	1000	1615	1345				

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

REMARKS:

AA# K1503004, FATHEAD MINNOW SURV., CHRONIC, 3-10-15
File: C:\COPYTO~1\TOXSTAT\FHSURV~1. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.021

W = 0.416

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# K1503004, FATHEAD MINNOW SURV., CHRONIC, 3-10-15
File: C:\COPYTO~1\TOXSTAT\FHSURV~1. Transform: ARC SINE(SQUARE ROOT(Y))

Hartley's test for homogeneity of variance

Bartlett's test for homogeneity of variance

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

Data FAIL to meet homogeneity of variance assumption.

Additional transformations are useless.

TITLE: AA# K1503004, FATHEAD MINNOW SURV., CHRONIC, 3-10-15
 FILE: C:\COPYTO~1\TOXSTAT\FHSURV~1.
 TRANSFORM: ARC SINE (SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.9000	1.2490
1	CONTROL	2	1.0000	1.4120
1	CONTROL	3	1.0000	1.4120
1	CONTROL	4	1.0000	1.4120
1	CONTROL	5	1.0000	1.4120
2	32 % EFFLUENT	1	1.0000	1.4120
2	32 % EFFLUENT	2	1.0000	1.4120
2	32 % EFFLUENT	3	1.0000	1.4120
2	32 % EFFLUENT	4	1.0000	1.4120
2	32 % EFFLUENT	5	1.0000	1.4120
3	42 % EFFLUENT	1	1.0000	1.4120
3	42 % EFFLUENT	2	1.0000	1.4120
3	42 % EFFLUENT	3	1.0000	1.4120
3	42 % EFFLUENT	4	1.0000	1.4120
3	42 % EFFLUENT	5	1.0000	1.4120
4	56 % EFFLUENT	1	1.0000	1.4120
4	56 % EFFLUENT	2	1.0000	1.4120
4	56 % EFFLUENT	3	1.0000	1.4120
4	56 % EFFLUENT	4	1.0000	1.4120
4	56 % EFFLUENT	5	1.0000	1.4120
5	75 % EFFLUENT	1	1.0000	1.4120
5	75 % EFFLUENT	2	1.0000	1.4120
5	75 % EFFLUENT	3	1.0000	1.4120
5	75 % EFFLUENT	4	1.0000	1.4120
5	75 % EFFLUENT	5	1.0000	1.4120
6	100 % EFFLUENT	1	1.0000	1.4120
6	100 % EFFLUENT	2	1.0000	1.4120
6	100 % EFFLUENT	3	1.0000	1.4120
6	100 % EFFLUENT	4	1.0000	1.4120
6	100 % EFFLUENT	5	1.0000	1.4120

AA# K1503004, FATHEAD MINNOW SURV., CHRONIC, 3-10-15
 File: C:\COPYTO~1\TOXSTAT\FHSURV~1. Transform: ARC SINE (SQUARE ROOT(Y))

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	1.379				
2	32 % EFFLUENT	1.412	30.00	16.00	5.00	
3	42 % EFFLUENT	1.412	30.00	16.00	5.00	
4	56 % EFFLUENT	1.412	30.00	16.00	5.00	
5	75 % EFFLUENT	1.412	30.00	16.00	5.00	
6	100 % EFFLUENT	1.412	30.00	16.00	5.00	

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

Pimephales promelas

FATHEAD MINNOW

TEST 1000.0

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s:		K1503004		TEST DATES (BEGIN / END):		3/10/15 - 3/17/15	
CLIENT:		Stuttgart		WEIGHING DATE / TIME:		3/18/2015 1145	
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	0.99502	0.98921	0.00581	10	0.581	AVG DRY WEIGHT (mg)
	B	0.98566	0.97886	0.00680	10	0.680	
	C	0.99570	0.98886	0.00684	10	0.684	0.678
	D	1.00448	0.99761	0.00687	10	0.687	CV
	E	1.01752	1.00995	0.00757	10	0.757	
32%	A	0.97719	0.97148	0.00571	10	0.571	AVG DRY WEIGHT (mg)
	B	1.01536	1.00909	0.00627	10	0.627	
	C	0.99299	0.98588	0.00711	10	0.711	0.656
	D	1.00642	0.99949	0.00693	10	0.693	CV
	E	1.01214	1.00538	0.00676	10	0.676	
42%	A	1.01813	1.01184	0.00629	10	0.629	AVG DRY WEIGHT (mg)
	B	1.01044	1.00392	0.00652	10	0.652	
	C	0.99428	0.98792	0.00636	10	0.636	0.646
	D	1.00684	0.99998	0.00686	10	0.686	CV
	E	0.98650	0.98024	0.00626	10	0.626	
56%	A	0.98279	0.97687	0.00592	10	0.592	AVG DRY WEIGHT (mg)
	B	0.98672	0.97967	0.00705	10	0.705	
	C	0.97787	0.97110	0.00677	10	0.677	0.657
	D	1.00058	0.99437	0.00621	10	0.621	CV
	E	0.97667	0.96975	0.00692	10	0.692	
75%	A	1.01338	1.00732	0.00606	10	0.606	AVG DRY WEIGHT (mg)
	B	0.99803	0.99120	0.00683	10	0.683	
	C	1.02273	1.01494	0.00779	10	0.779	0.622
	D	1.01254	1.00777	0.00477	10	0.477	CV
	E	1.03514	1.02950	0.00564	10	0.564	
100%	A	1.02239	1.01586	0.00653	10	0.653	AVG DRY WEIGHT (mg)
	B	1.00000	0.99293	0.00707	10	0.707	
	C	1.00416	0.99729	0.00687	10	0.687	0.667
	D	0.98304	0.97616	0.00688	10	0.688	CV
	E	1.01721	1.01123	0.00598	10	0.598	

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

AA# K1503004, FATHEAD MINNOW GROWTH CHRONIC, 3-10-15
File: C:\COPYTO~1\TOXSTAT\FHGROWTH. Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

D = 0.101

W = 0.976

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# K1503004, FATHEAD MINNOW GROWTH CHRONIC, 3-10-15
File: C:\COPYTO~1\TOXSTAT\FHGROWTH. Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B1 statistic = 9.19

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# K1503004, FATHEAD MINNOW GROWTH CHRONIC, 3-10-15
 FILE: C:\COPYTO~1\TOXSTAT\FHGROWTH.
 TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.5810	0.5810
1	CONTROL	2	0.6800	0.6800
1	CONTROL	3	0.6840	0.6840
1	CONTROL	4	0.6870	0.6870
1	CONTROL	5	0.7570	0.7570
2	32 % EFFLUENT	1	0.5710	0.5710
2	32 % EFFLUENT	2	0.6270	0.6270
2	32 % EFFLUENT	3	0.7110	0.7110
2	32 % EFFLUENT	4	0.6930	0.6930
2	32 % EFFLUENT	5	0.6760	0.6760
3	42 % EFFLUENT	1	0.6290	0.6290
3	42 % EFFLUENT	2	0.6520	0.6520
3	42 % EFFLUENT	3	0.6360	0.6360
3	42 % EFFLUENT	4	0.6860	0.6860
3	42 % EFFLUENT	5	0.6260	0.6260
4	56 % EFFLUENT	1	0.5920	0.5920
4	56 % EFFLUENT	2	0.7050	0.7050
4	56 % EFFLUENT	3	0.6770	0.6770
4	56 % EFFLUENT	4	0.6210	0.6210
4	56 % EFFLUENT	5	0.6920	0.6920
5	75 % EFFLUENT	1	0.6060	0.6060
5	75 % EFFLUENT	2	0.6830	0.6830
5	75 % EFFLUENT	3	0.7790	0.7790
5	75 % EFFLUENT	4	0.4770	0.4770
5	75 % EFFLUENT	5	0.5640	0.5640
6	100 % EFFLUENT	1	0.6530	0.6530
6	100 % EFFLUENT	2	0.7070	0.7070
6	100 % EFFLUENT	3	0.6870	0.6870
6	100 % EFFLUENT	4	0.6880	0.6880
6	100 % EFFLUENT	5	0.5980	0.5980

AA# K1503004, FATHEAD MINNOW GROWTH CHRONIC, 3-10-15
 File: C:\COPYTO~1\TOXSTAT\FHGROWTH. Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.009	0.002	0.438
Within (Error)	24	0.101	0.004	
Total	29	0.110		

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

AA# K1503004, FATHEAD MINNOW GROWTH CHRONIC, 3-10-15

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

Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 1 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	0.678	0.678		
2	32 % EFFLUENT	0.656	0.656	0.541	
3	42 % EFFLUENT	0.646	0.646	0.780	
4	56 % EFFLUENT	0.657	0.657	0.497	
5	75 % EFFLUENT	0.622	0.622	1.365	
6	100 % EFFLUENT	0.667	0.667	0.273	

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

AA# K1503004, FATHEAD MINNOW GROWTH CHRONIC, 3-10-15

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

Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 2 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	5			
2	32 % EFFLUENT	5	0.097	14.3	0.022
3	42 % EFFLUENT	5	0.097	14.3	0.032
4	56 % EFFLUENT	5	0.097	14.3	0.020
5	75 % EFFLUENT	5	0.097	14.3	0.056
6	100 % EFFLUENT	5	0.097	14.3	0.011

APPENDIX D

Ceriodaphnia dubia Raw Data and Statistics

SURVIVAL AND REPRODUCTION TEST

Ceriodaphnia dubia

Discharger: Stuttgart											Lab Number/s				Analyst: RH
Location: Outfall 001											K1503004				Test Start - Date/Time: 3-10-15, 1030
Date Sample Collected: 3 - 9/11/13 - 15															Test Stop - Date/Time: 3-17-15, 1000
Conc	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst	
%	Day	A	B	C	D	E	F	G	H	I	J				
MHS	1	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	2	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	3	1	0	0	0	0	0	1	0	0	0	2	10	0.2	RH
	4	4	0	1	3	0	2	0	2	2	1	15	10	1.5	RH
	5	2	0	4	6	7	4	10	8	0	5	46	10	4.6	RH
	6	7	12	6	3	0	8	0	1	6	10	53	10	5.3	RH
	7	5	2	8	5	11	0	0	7	6	3	47	10	4.7	RH
	8														
Total	19	14	19	17	18	14	11	18	14	19	163		Avg. = 16.3		
													C.V. = 17.4		
32%	1	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	2	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	3	0	0	0	1	0	0	0	0	0	0	1	10	0.1	RH
	4	2	1	1	0	2	2	0	1	0	1	10	10	1.0	RH
	5	5	6	X	5	3	0	0	5	8	5	37	10	3.7	RH
	6	0	8		8	0	6	10	7	0	8	47	10	4.7	RH
	7	10	3		9	5	2	5	7	0	4	45	10	4.5	RH
	8														
Total	17	18	1	23	10	10	15	20	8	18	140		Avg. = 15.4		
			X										C.V. = 33.0		
42%	1	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	2	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	3	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	4	1	1	0	1	0	2	0	2	1	1	9	10	0.9	RH
	5	4	5	8	0	8	5	6	0	1	9	44	10	4.4	RH
	6	7	6	8	2	0	7	0	7	11	0	48	10	4.8	RH
	7	0	2	5	5	1	0	6	4	2	0	25	10	2.5	RH
	8														
Total	12	14	21	8	7	14	12	13	15	10	126		Avg. = 12.6		
													C.V. = 31.3		
56%	1	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	2	X	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	10	0.0	RH
	4		3	1	3	0	4	2	1	1	2	17	10	1.7	RH
	5		6	5	1	6	2	3	0	6	7	36	10	3.6	RH
	6		2	10	1	7	12	5	7	5	4	53	10	5.3	RH
	7		4	5	8	5	0	0	8	0	2	32	10	3.2	RH
	8														
Total	0	15	21	13	18	18	10	16	12	15	138		Avg. = 15.3		
	X												C.V. = 22.1		
75%	1	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	2	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	3	0	1	1	0	0	0	0	0	0	0	2	10	0.2	RH
	4	2	1	1	2	0	3	0	3	2	1	15	10	1.5	RH
	5	0	0	7	5	6	3	8	0	0	4	33	10	3.3	RH
	6	5	10	2	0	0	9	1	0	5	10	42	10	4.2	RH
	7	8	6	2	3	8	5	1	8	7	0	48	10	4.8	RH
	8														
Total	15	18	13	10	14	20	10	11	14	15	140		Avg. = 14.0		
													C.V. = 23.3		
100%	1	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	2	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	3	0	0	0	0	0	0	0	0	1	0	1	10	0.1	RH
	4	3	1	0	0	2	4	0	0	1	1	12	10	1.2	RH
	5	9	0	4	3	8	5	1	7	5	8	50	10	5.0	RH
	6	0	5	12	6	0	1	4	10	0	1	39	10	3.9	RH
	7	7	3	4	2	7	5	6	5	8	7	54	10	5.4	RH
	8														
Total	19	9	20	11	17	15	11	22	15	17	156		Avg. = 15.6		
													C.V. = 27.2		

AA # K1503004, C.DUBIA CHRONIC, REPRODUCCION, 3-10-15
File: C:\COPYTO~1\TOXSTAT\C.DUB Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

***** Shapiro - Wilk's Test is aborted *****

This test can not be performed because total number of replicates
is greater than 50.

Total number of replicates = 60

AA # K1503004, C.DUBIA CHRONIC, REPRODUCCION, 3-10-15
File: C:\COPYTO~1\TOXSTAT\C.DUB Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B1 statistic = 9.20

Table Chi-square value = 15.09 (alpha = 0.01, df = 5)

Table Chi-square value = 11.07 (alpha = 0.05, df = 5)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

FISHER'S EXACT TEST

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

CONTROL	10	0	10
32	9	1	10

TOTAL	19	1	20
=====			

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 9.
 Since b is greater than 6 there is no significant difference
 between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

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

CONTROL	10	0	10
42	10	0	10

TOTAL	20	0	20
=====			

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
 Since b is greater than 6 there is no significant difference
 between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

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

CONTROL	10	0	10
56	9	1	10

TOTAL 19 1 20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 9.
 Since b is greater than 6 there is no significant difference
 between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
75	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
100	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	32	10	1	
2	42	10	0	
3	56	10	1	
4	75	10	0	
5	100	10	0	

TITLE: AA # K1503004, C.DUBIA CHRONIC, REPRODUCCION, 3-10-15
FILE: C:\COPYTO~1\TOXSTAT\C.DUB
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	19.0000	19.0000
1	CONTROL	2	14.0000	14.0000
1	CONTROL	3	19.0000	19.0000
1	CONTROL	4	17.0000	17.0000
1	CONTROL	5	18.0000	18.0000
1	CONTROL	6	14.0000	14.0000
1	CONTROL	7	11.0000	11.0000
1	CONTROL	8	18.0000	18.0000
1	CONTROL	9	14.0000	14.0000
1	CONTROL	10	19.0000	19.0000
2	32 % EFFLUENT	1	17.0000	17.0000
2	32 % EFFLUENT	2	18.0000	18.0000
2	32 % EFFLUENT	3	1.0000	1.0000
2	32 % EFFLUENT	4	23.0000	23.0000
2	32 % EFFLUENT	5	10.0000	10.0000
2	32 % EFFLUENT	6	10.0000	10.0000
2	32 % EFFLUENT	7	15.0000	15.0000
2	32 % EFFLUENT	8	20.0000	20.0000
2	32 % EFFLUENT	9	8.0000	8.0000
2	32 % EFFLUENT	10	18.0000	18.0000
3	42 % EFFLUENT	1	12.0000	12.0000
3	42 % EFFLUENT	2	14.0000	14.0000
3	42 % EFFLUENT	3	21.0000	21.0000
3	42 % EFFLUENT	4	8.0000	8.0000
3	42 % EFFLUENT	5	7.0000	7.0000
3	42 % EFFLUENT	6	14.0000	14.0000
3	42 % EFFLUENT	7	12.0000	12.0000
3	42 % EFFLUENT	8	13.0000	13.0000
3	42 % EFFLUENT	9	15.0000	15.0000
3	42 % EFFLUENT	10	10.0000	10.0000
4	56 % EFFLUENT	1	0.0000	0.0000
4	56 % EFFLUENT	2	15.0000	15.0000
4	56 % EFFLUENT	3	21.0000	21.0000
4	56 % EFFLUENT	4	13.0000	13.0000
4	56 % EFFLUENT	5	18.0000	18.0000
4	56 % EFFLUENT	6	18.0000	18.0000
4	56 % EFFLUENT	7	10.0000	10.0000
4	56 % EFFLUENT	8	16.0000	16.0000

4	56 %	EFFLUENT	9	12.0000	12.0000
4	56 %	EFFLUENT	10	15.0000	15.0000
5	75 %	EFFLUENT	1	15.0000	15.0000
5	75 %	EFFLUENT	2	18.0000	18.0000
5	75 %	EFFLUENT	3	13.0000	13.0000
5	75 %	EFFLUENT	4	10.0000	10.0000
5	75 %	EFFLUENT	5	14.0000	14.0000
5	75 %	EFFLUENT	6	20.0000	20.0000
5	75 %	EFFLUENT	7	10.0000	10.0000
5	75 %	EFFLUENT	8	11.0000	11.0000
5	75 %	EFFLUENT	9	14.0000	14.0000
5	75 %	EFFLUENT	10	15.0000	15.0000
6	100 %	EFFLUENT	1	19.0000	19.0000
6	100 %	EFFLUENT	2	9.0000	9.0000
6	100 %	EFFLUENT	3	20.0000	20.0000
6	100 %	EFFLUENT	4	11.0000	11.0000
6	100 %	EFFLUENT	5	17.0000	17.0000
6	100 %	EFFLUENT	6	15.0000	15.0000
6	100 %	EFFLUENT	7	11.0000	11.0000
6	100 %	EFFLUENT	8	22.0000	22.0000
6	100 %	EFFLUENT	9	15.0000	15.0000
6	100 %	EFFLUENT	10	17.0000	17.0000

AA # K1503004, C.DUBIA CHRONIC, REPRODUCCION, 3-10-15
 File: C:\COPYTO~1\TOXSTAT\C.DUB Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	89.683	17.937	0.827
Within (Error)	54	1170.500	21.676	
Total	59	1260.183		

Critical F value = 2.45 (0.05,5,40)
 Since $F < \text{Critical } F$ FAIL TO REJECT H_0 : All equal

AA # K1503004, C.DUBIA CHRONIC, REPRODUCCION, 3-10-15
 File: C:\COPYTO~1\TOXSTAT\C.DUB Transform: NO TRANSFORMATION

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	16.300	16.300		
2	32 % EFFLUENT	14.000	14.000	1.105	
3	42 % EFFLUENT	12.600	12.600	1.777	
4	56 % EFFLUENT	13.800	13.800	1.201	
5	75 % EFFLUENT	14.000	14.000	1.105	
6	100 % EFFLUENT	15.600	15.600	0.336	

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

AA # K1503004, C.DUBIA CHRONIC, REPRODUCTION, 3-10-15

File: C:\COPYTO~1\TOXSTAT\C.DUB Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 2 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	10			
2	32 % EFFLUENT	10	4.810	29.5	2.300
3	42 % EFFLUENT	10	4.810	29.5	3.700
4	56 % EFFLUENT	10	4.810	29.5	2.500
5	75 % EFFLUENT	10	4.810	29.5	2.300
6	100 % EFFLUENT	10	4.810	29.5	0.700

APPENDIX E

Organism History

2062

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

TEST ORGANISM HISTORY

DATE SHIPPED 3/10/15 CLIENT Arkansas Analytical
Purchase Order #: _____

SPECIES: Pimephales promelas

Quantity Shipped: 300

Age: hatched 3/8/15 15-1600 CST

Brood Stock Source: Anderson Farms, AR

Culture Water: Groundwater 160

Hardness (Mg/l CaCO3): _____

Dissolved Oxygen (Mg/l): 8.5

Temperature (°C): 25.1°C

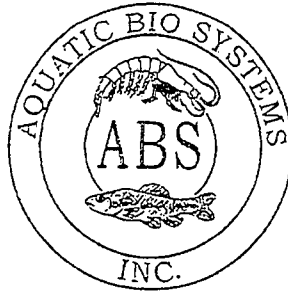
Feeding: Artemia

Comments: _____

Shipped Via: Federal Express UPS Overnight Shuttle

Packaged By: _____

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



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

ORGANISM HISTORY

DATE: 11/25/2013

SPECIES: Ceriodaphnia dubia

AGE: > 3 day

LIFE STAGE: Adult

HATCH DATE: Variable


BEGAN FEEDING: Immediately

FOOD: YTC, Selenastrum sp.

Water Chemistry Record:

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

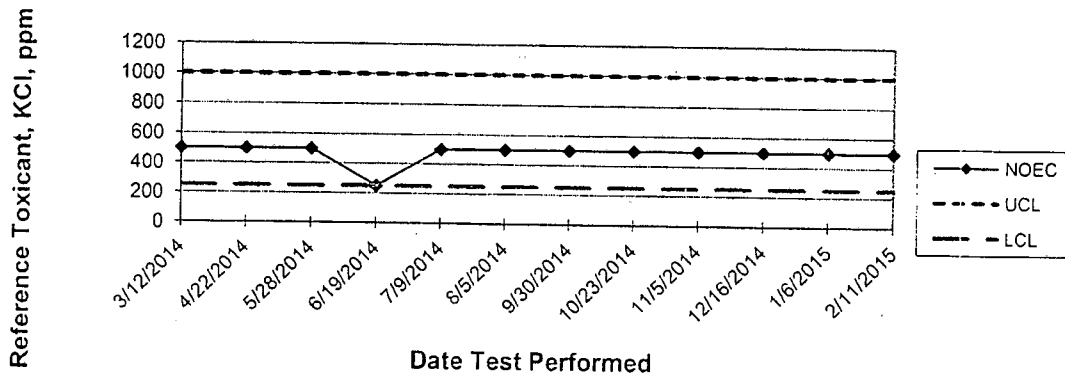


Facility Supervisor

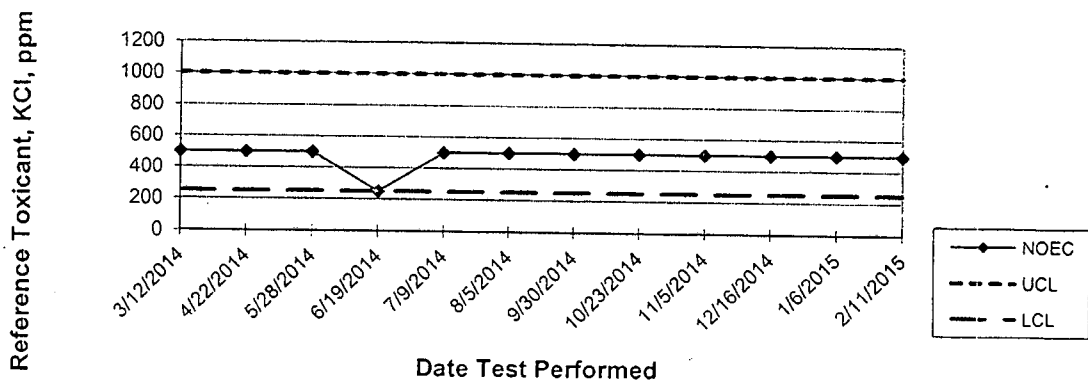
APPENDIX F

Quality Assurance Charts

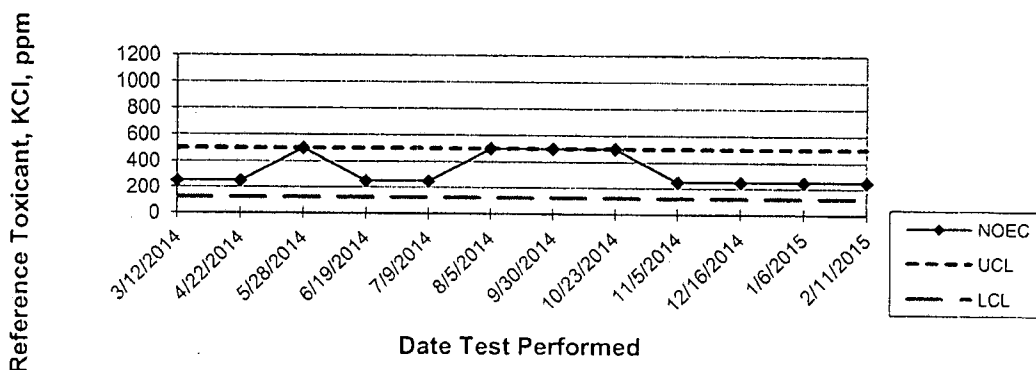
ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW SURVIVAL 7 Day
QUALITY ASSURANCE



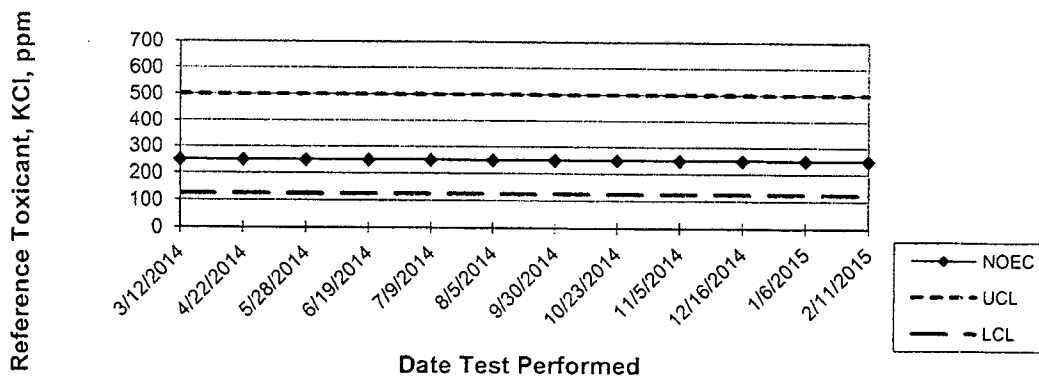
ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW GROWTH 7 Day
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.
CERIODAPHNIA DUBIA SURVIVAL
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.
CERIODAPHNIA DUBIA REPRODUCTION
QUALITY ASSURANCE



STUTT GART MUNICIPAL WATER WORKS
P.O. BOX 130
STUTT GART, AR 72160
PHONE: 870-673-3246

Hasler FIRST-CLASS MAIL
03/31/2015
US POSTAGE \$02.45⁰



ZIP 72160
011D10608725

ATTN: MARY BENNETT

Arkansas Dept. of Environmental Quality
Water Division
5301 Northshore Drive
North Little Rock AR 72118-5317

