SORRELLS RESEARCH
LABORATORY AND FIELD SERVICES

CHEMISTS
ECOLOGISTS
CONSULTANTS
PLANNERS

8100 National Drive
Little Rock, Arkansas 72209

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

LABORATORY ANALYSIS

Date of Report: January 13, 2015
Date Received : December 8, 2014

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 12/07-08/14 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 12/08/14 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
P.O. BOX 130
STUTTGART, AR 72160-

DANNY WILSON
STUTTGART WATER WORKS
612 SOUTH COLLEGE
STUTTGART, AR 72160-

Laboratory Number: 17701.0001B TKR Reviewed By: K. E. Sorrells, M.S. [ ]

2012 Water/Wastewater Survey

2012 Water/Wastewater Survey

Executive Summary

In an attempt to obtain accurate information regarding municipalities' water/wastewater services, the following survey was conducted in early 2012.

The survey was mailed to all Arkansas municipalities. Survey respondents were asked a series of questions (see Attachment). As requested by the survey, respondents did define the "Other" category. Where respondents did not submit answers to questions, NAS (No Answer Submitted) was used.

Arkansas has 500 municipalities. Two hundred seventy five (275) completed the survey, which translated into a response rate of fifty five percent (55%). The response rate broken down by classification was:

- Cities of the First Class (population 2,500 or more): 31 percent
- Cities of the Second Class (population 500-2,499): 43 percent
- Incorporated Towns (population 499 or less): 26 percent

Results of this survey are based exclusively on 275 acceptable responses we received. Due to some of the survey responses being difficult to interpret the AML staff has attempted to document the respondent's answers to the best of our ability.

We thank all those city officials who provided the information contained in this survey. We hope that the information contained herein will be useful.

For additional copies of the survey, contact the Arkansas Municipal League at 501-374-3484.

Don A. Zimmerman
Executive Director
daz@arml.org
501-374-3484, ext. 100

Ken Wasson
Assistant Director
kwasson@arml.org
501-374-3484, ext. 211

Tricia Zello
Administrative Assistant
tzello@arml.org
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Table of Contents

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QUALITY ASSURANCE

December 8, 2014
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	12/09/15	1045	12/16/15	930	0.00	0.0	1
Bioassay, Fathead minnow,	AA	12/09/15	1430	12/16/15	1400	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: 17701.0001B TKR

Arkansas Analytical, Inc.

Toxicity Test Results

CITY of STUTTGART
NPDES PERMIT NUMBER: AR0034380
Fourth Quarter 2014
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 K1412005

Thursday, December 18, 2014

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 fourth quarter of 2014.

Plant Operations

To be provided by permittee.

Source of Effluent and Dilution Water

Effluent samples were collected as follows:

Sample Collection:	Date Started	Date, Time Ended
Sample #1:	12-7-14, 0900	12-8-14, 0900
Sample #2:	12-9-14, 0900	12-10-14, 0900
Sample #3:	12-11-14, 0900	12-12-14, 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:	12-8-14, 1700	7 (on ice)
Sample #2:	12-10-14, 1645	5
Sample #3:	12-12-14, 1513	5

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 < 24 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	16.4	X	
At least 60% of surviving females should have produced 3 broods	90%	X	
The percent coefficient of variation between replicates must be 40% or less for the young of surviving females	17.5%	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	0.518	X	
The percent coefficient of variation between replicates must be 40% or less for growth	6.57%	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

Ceriodaphnia dubia 11/5/14 – 11/12/14		*Pimephales promelas* 11/5/14 – 11/12/14	
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 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

Ceriodaphnia dubia		*Pimephales promelas*	
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)	14.4	%CV survival (critical dilution)	5.71%
%CV Reproduction (critical dilution)	28.4%	Mean dry weight (critical dilution) in milligrams	0.494
		%CV growth (critical dilution)	14.2%
PMSD Reproduction	27.7	PMSD Growth	19.0

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 / Christopher Turney / Hallie Freyaldenhoven

Reviewed by:

Tracy Bounds (TB)
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:	12-7-14, 0900	12-8-14, 0900
Sample #2:	12-9-14, 0900	12-10-14, 0900
Sample #3:	12-11-14, 0900	12-12-14, 0900

Test initiated (date, time): 12-9-14, 1430 Test terminated (date, time): 12-16-14, 1400

Dilution water used: Moderately Hard Synthetic

DATA TABLE FOR FATHEAD MINNOW SURVIVAL

	Percent Survival in Replicate Chambers						Mean Percent Survival			
Effluent Conc %	A	B	C	D	E		24 hours	48 hours	7 days	CV %
0%	100	100	100	100	90		98	98	98	4.56
32%	100	100	100	100	90		100	98	98	
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	90	100	90		100	98	96	5.71

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%	0.561	0.488	0.548	0.498	0.494		0.518	6.57
32%	0.405	0.398	0.439	0.479	0.413		0.427	
42%	0.348	0.437	0.411	0.397	0.562		0.431	
56%	0.492	0.671	0.544	0.700	0.600		0.601	
75%	0.623	0.536	0.585	0.675	0.716		0.627	
100%	0.453	0.450	0.443	0.518	0.608		0.494	14.2

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)= _____**14.2**_____%

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:	12-7-14, 0900	12-8-14, 0900
Sample #2:	12-9-14, 0900	12-10-14, 0900
Sample #3:	12-11-14, 0900	12-12-14, 0900

Test initiated (date, time): 12-9-14, 1045 Test terminated (date, time): 12-16-14, 0930

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	14	13	14	17	23	11
B	13	18	20	X0	13	18
C	17	17	16	11	17	12
D	13	19	13	9	20	12
E	20	18	20	15	15	19
F	14	9	16	18	20	12
G	16	13	12	15	12	21
H	17	10	10	19	11	16
I	20	10	11	11	6	8
J	20	21	8	13	15	15
Mean	16.4	14.8	14.0	12.8	15.2	14.4
Mean/surviving female	16.4	14.8	14.0	14.2	15.2	14.4
CV%*	17.5					28.4

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	100	100	90	100	100

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

   a) LOW FLOW OR CRITICAL DILUTION, (100%): YES_____ NO___**X**___

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

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

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

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

5. Enter percentage corresponding to each parameter below:

   a) NOEC survival (parameter TOP3B)= _____**100**____ % effluent

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

   c) Coefficient of variation (parameter TQP3B)= _____**28.4**_____%

6. Enter Whole Effluent Toxicity: _____**100**_____%

APPENDIX A

Chain of Custody Forms

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 # 17701.0001B
CLIENT # _____
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

E OF COMPANY, CITY, OR PROJECT: City of Stuttgart
PROJECT NO:
SAMPLER(S) NAME: (PRINT)

PLE	SAMPLE ID AND/ OR COLLECTION LOCATION	START DATE/TIME	END DATE/TIME	COMP GRAB	FIELD ANALYSIS pH	TEMP	FLOW	CL2	D,O (W) D.O(P)	CONTAINER TYPE PRESERVATIVE	ANALYSIS REQUIRED
	Eff Outfall001	900 12-7-14	900 12-8-14	C						6½ Gallons	K1412005 - BIO-MON A

Samples Received at Arkansas Analytical –
Relinquished By: Cecil Sorrells
Date/Time: 12-8-14 1710
Received By: Sydney James

	Yes	No
Custody Seals:	✓	
Containers Correct:		
COC/Labels Agree:		
Received on Ice:		
Temperature on Receipt:	7°C	
Temperature Gun ID: HHT # 2		

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

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

FIELD CALIBRATION RECORD

pH 7				
pH 4				
pH 10				
D.O				

NOTES/COMMENTS/OBSERVATIONS
Temp Lab 7.5°

FIELD ANALYSIS CONDUCTED BY: (CIRCLE) (SRA) CLIENT

RELINQUISHED BY: _____ DATE/TIME: _____ RECEIVED BY: _____ DATE/TIME: 1055 12-8-14

RELINQUISHED BY: _____ DATE/TIME: _____ RECEIVED BY(LAB): _____ DATE/TIME: 1440 12-8-14

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 # 17701.0002-B
CLIENT # _____
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

E OF COMPANY, CITY, OR PROJECT | PROJECT NO: | SAMPLER(S) NAME: (PRINT) 110913k2

CITY OF STUTTGART

PLE	SAMPLE ID AND/ OR COLLECTION LOCATION	START DATE/TIME	END DATE/TIME	COMP GRAB	FIELD ANALYSIS pH	TEMP	FLOW	CL2	D,O (W) D.O(P)	CONTAINER TYPE PRESERVATIVE	ANALYSIS REQUIRED
	EFF OUT FALL 001	900 12-9-14	900 12-10-14	C						6½ Gal Cy	K14 2005 - BIO-MON B

Samples Received at Arkansas Analytical
Relinquished By: E. Sorrells
Date/Time: 12-10-14.1645
Received By: Sydney James

	Yes	No
Custody Seals:		
Containers Correct:	✓	
COC/Labels Agree:	✓	
Received on Ice:	✓	
Temperature on Receipt:	5°C	
Temperature Gun ID:	HHT # 2	

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

FIELD CALIBRATION RECORD

pH 7			
pH 4			
pH 10			
D.O			

Temp @ Lab 7°

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: 1135 12-10-14

RELINQUISHED BY: _____ DATE/TIME: _____ RECEIVED BY(LAB): _____ DATE/TIME: 1550 12-10-14

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 # 17701-0003 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

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

AMPLE NO:	SAMPLE ID AND/ OR COLLECTION LOCATION	START DATE/TIME	END DATE/TIME	COMP GRAB	FIELD ANALYSIS pH	TEMP	FLOW	CL2	D,O (W) D.O(P)	CONTAINER TYPE PRESERVATIVE	ANALYSIS REQUIRED
	EFF OUTFALL 001	900 12-11-14	900 12-12-14	C						6½ GALLON	BIO-MON/C

K1412005

Samples Received at Arkansas Analytical
Relinquished By: E Sorrells
Date/Time: 12-12-14, 1513
Received By: Sydney James

	Yes	No
Custody Seals:	✓	
Containers Correct:		
COC/Labels Agree:		
Received on Ice:		
Temperature on Receipt:	5°C	
Temperature Gun ID:	HHT # 2	

Temp @ Lab 6.8°

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

FIELD CALIBRATION RECORD

pH 7				
pH 4				
pH 10				
D.O				

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: 1340 12-12-14

RELINQUISHED BY: _____ DATE/TIME: _____ RECEIVED BY(LAB): _____ DATE/TIME: 1445 12-12-14

APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING									Fathead Minnow
Lab # / Sample ID		K1412005			Test Start (Date/Time)		12-9-14	1430	
Client:		Stuttgart			Test End (Date/Time)		12-16-14	1400	
		Day of Test							
		1	2	3	4	5	6	7	notes
Control	mHS	12-9	12-10	12-11	12-12	12-13	12-14	12-15	
D.O. (mg/L)	INITIAL	8.6	8.4	8.6	8.4	8.5	8.6	8.8	
	FINAL	7.6	7.5	7.3	8.2	8.3	7.7	7.8	
pH (s.u.)	INITIAL	7.7	7.7	7.6	7.7	7.9	7.8	7.9	
	FINAL	7.5	7.5	7.7	7.3	7.8	7.4	7.5	
temp (C)	INITIAL	24	22	22	23	23	23	22	
	FINAL	25	25	25	25	25	25	25	
ALKALINITY (mg/L)		64	—	64	—	—	—	—	
HARDNESS (mg/L)		98	—	90	—	—	—	—	
CONDUCTIVITY (umhc		457	—	404	—	—	—	—	
CHLORINE (mg/L)		<0.05	—	—	—	—	—	—	
CONC:	3.2								
D.O. (mg/L)	INITIAL	8.6	8.2	8.4	8.4	8.7	8.5	9.0	
	FINAL	7.7	7.4	7.5	7.9	8.3	7.7	7.8	
pH (s.u)	INITIAL	7.4	7.7	7.5	7.7	7.9	8.2	7.9	
	FINAL	7.5	7.6	7.7	7.9	7.8	7.5	7.6	
temp (C)	INITIAL	25	23	22	23	23	23	22	
	FINAL	25	25	25	25	25	25	25	
CONC:	4.2								
D.O. (mg/L)	INITIAL	8.5	8.1	8.6	8.7	8.7	8.6	9.0	
	FINAL	7.6	6.9	7.4	8.0	8.4	7.5	7.7	
pH (mg/L)	INITIAL	7.5	7.6	7.6	7.6	7.9	8.0	7.8	
	FINAL	7.6	7.6	7.7	8.0	8.0	7.7	7.8	
temp (C)	INITIAL	25	25	23	24	23	23	21	
	FINAL	25	25	25	25	25	25	25	
CONC:	5.6								
D.O. (mg/L)	INITIAL	8.7	8.2	8.7	8.9	8.6	8.5	9.1	
	FINAL	7.6	7.2	7.4	8.0	8.3	7.6	7.8	
pH (s.u.)	INITIAL	7.5	7.6	7.6	7.6	7.8	8.0	7.8	
	FINAL	7.6	7.6	7.8	8.1	8.1	7.8	7.9	
temp (C)	INITIAL	26	26	23	24	23.0	23	21	
	FINAL	25	25	25	25	25	25	25	
CONC:	7.5								
D.O. (mg/L)	INITIAL	8.8	8.8	9.1	9.2	8.6	8.3	9.1	
	FINAL	7.7	7.3	7.5	7.9	8.3	7.5	7.8	
pH (s.u.)	INITIAL	7.4	7.5	7.6	7.6	7.8	8.0	7.8	
	FINAL	7.8	7.7	7.8	8.2	8.2	8.0	8.0	
temp (C)	INITIAL	26	27	23	24	24	23	20	
	FINAL	25	25	25	25	25	25	25	
CONC:	10.0								
D.O. (mg/L)	INITIAL	8.9	9.1	9.3	9.4	8.6	8.3	9.2	
	FINAL	7.6	7.3	7.5	7.9	8.3	7.7	7.9	
pH (s.u.)	INITIAL	7.4	7.6	7.4	7.5	7.8	7.9	7.7	
	FINAL	7.9	7.8	7.9	8.4	8.3	8.1	8.2	
temp (C)	INITIAL	26	28	23	25	24	23	20	
	FINAL	25	25	25	25	25	25	25	
CONC: 100 %		A	A	A	B	B	C	C	
ALKALINITY (mg/L)		168	—	—	174	—	228	—	
HARDNESS (mg/L)		160	—	—	158	—	160	—	
CONDUCTIVITY (umhc		1053	—	—	1078	—	1200	—	
CHLORINE (mg/L)		<0.05	—	—	—	—	—	—	

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING									Ceriodaphnia Dubia
Lab # / Sample ID		K1412005			Test Start (Date/Time)		12-9-14	1045	
Client:		Stuttgart			Test End (Date/Time)		12-16-14	0930	
		Day of Test							
		1	2	3	4	5	6	7	notes
Control	n/t 5	12-9	12-10	12-11	12-12	12-13	12-14	12-15	
D.O. (mg/L)	INITIAL	8.6	8.4	8.6	8.4	8.5	8.6	8.8	
	FINAL	8.3 ~~7.8~~ RH	7.8	8.2	8.4	8.8	8.3	8.3	
pH (s.u.)	INITIAL	7.7	7.7	7.6	7.7	7.9	7.8	7.9	
	FINAL	7.5	7.6	7.4	7.7	7.8	8.1	8.4	
temp (C)	INITIAL	24	22	22	23	23	23	22	
	FINAL	25	25	25	25	25	25	25	
ALKALINITY (mg/L)		64	—	64	—	—	—	—	
HARDNESS (mg/L)		98	—	90	—	—	—	—	
CONDUCTIVITY (umhc		457	—	404	—	—	—	—	
CHLORINE (mg/L)		<0.05	—	—	—	—	—	—	
CONC:	32								
D.O. (mg/L)	INITIAL	8.6	8.2	8.4	8.4	8.7	8.5	9.0	
	FINAL	7.8	7.9	8.2	8.3	8.9	8.5	8.4	
pH (s.u)	INITIAL	7.4	7.7	7.5	7.7	7.9	8.2	7.9	
	FINAL	7.8 ~~8.3~~ RH	7.8	7.5	7.4	7.5	7.4 ~~8.5~~	8.3	
temp (C)	INITIAL	25	23	22	23	23	RH 23	22	
	FINAL	25	25	25	25	25	25	25	
CONC:	42								
D.O. (mg/L)	INITIAL	8.5	8.1	8.6	8.7	8.7	8.6	9.0	
	FINAL	8.4	8.1	8.4	8.4	8.7	8.5	9.0	
pH (mg/L)	INITIAL	7.5	8.6	7.6	7.6	7.9	8.0	7.8	
	FINAL	7.9	7.9	7.6	8.1	7.9	8.1	8.3	
temp (C)	INITIAL	25	27	23	24	23	23	21	
	FINAL	25	25	25	25	25	25	25	
CONC:	56								
D.O. (mg/L)	INITIAL	8.7	8.2	8.7	8.9	8.6	8.5	9.1	
	FINAL	8.4	8.2	8.4	8.4	8.6	8.5	8.9	
pH (s.u.)	INITIAL	7.5	7.6	7.6	7.6	7.8	8.0	7.8	
	FINAL	7.9	7.9	7.7	8.2	7.9	8.3	8.5	
temp (C)	INITIAL	26	26	23	24	23	23	21	
	FINAL	25	25	25	25	25	25	25	
CONC:	75								
D.O. (mg/L)	INITIAL	8.8	8.8	9.1	9.2	8.6	8.3	9.1	
	FINAL	8.4	8.1	8.4	8.4	8.7	8.5	8.6	
pH (s.u.)	INITIAL	7.4	7.5	7.6	7.6	7.8	8.0	7.8	
	FINAL	8.0	8.0	7.9	8.3	8.1	8.3	8.5	
temp (C)	INITIAL	26	27	23	24	24	23	20	
	FINAL	25	25	25	25	25	25	25	
CONC:	100								
D.O. (mg/L)	INITIAL	8.9	9.1	9.3	9.4	8.6	8.3	9.2	
	FINAL	8.4	8.2	8.5	8.4	8.8	8.5	8.8	
pH (s.u.)	INITIAL	7.4	7.6	7.4	7.5	7.8	7.9	7.7	
	FINAL	8.1	8.1	8.0	8.4	8.2	8.4	8.5	
temp (C)	INITIAL	26	28	23	25	24	23	20	
	FINAL	25	25	25	25	25	25	25	
CONC:	**100 %**	A	A	A	B	B	C	C	
ALKALINITY (mg/L)		168	—	—	174	—	228	—	
HARDNESS (mg/L)		160	—	—	158	—	160	—	
CONDUCTIVITY (umhc		1053	—	—	1078	—	1200	—	
CHLORINE (mg/L)		<0.05	—	—	—	—	—	—	

APPENDIX C

Fathead minnow raw data and statistics

Pimephales promelas

FATHEAD MINNOW

SURVIVAL DATA FOR LARVAL SURVIVAL AND GROWTH TEST (CHRONIC)

LAB #: K1412005	TEST START	DATE 12/9/14	TIME 1430
CLIENT: Stuttgart	TEST END	DATE 12/16/14	TIME 1400
ANALYST: RH/HF/CT	AGE AND SOURCE OF MINNOWS	< 24 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	10	100%		
	B	10	10	10	10	10	10	10	10	100%		
	C	10	10	10	10	10	10	10	10	100%	*98.0%*	*4.56*
MHS	D	10	10	10	10	10	10	10	10	100%		
	E	10	9	9	9	9	9	9	9	90%		
	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	10	10	10	10	10	10	10	10	100%		
	B	10	10	10	10	10	10	10	10	100%		
	C	10	10	10	10	10	10	10	10	100%	*98.0%*	
32%	D	10	10	10	10	10	10	10	10	100%		
	E	10	10	9	9	9	9	9	9	90%		
	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	10	10	10	10	10	10	10	10	100%		
	B	10	10	10	10	10	10	10	10	100%		
	C	10	10	10	10	10	10	10	10	100%	*100.0%*	
42%	D	10	10	10	10	10	10	10	10	100%		
	E	10	10	10	10	10	10	10	10	100%		
	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	10	10	10	10	10	10	10	10	100%		
	B	10	10	10	10	10	10	10	10	100%		
	C	10	10	10	10	10	10	10	10	100%	*100.0%*	
56%	D	10	10	10	10	10	10	10	10	100%		
	E	10	10	10	10	10	10	10	10	100%		
	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	10	10	10	10	10	10	10	10	100%		
	B	10	10	10	10	10	10	10	10	100%		
	C	10	10	10	10	10	10	10	10	100%	*100.0%*	
75%	D	10	10	10	10	10	10	10	10	100%		
	E	10	10	10	10	10	10	10	10	100%		
	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	10	10	10	10	10	10	10	10	100%		
	B	10	10	10	10	10	10	10	10	100%		
	C	10	10	9	9	9	9	9	9	90%	*96.0%*	*5.71*
100%	D	10	10	10	10	10	10	10	10	100%		
	E	10	10	10	9	9	9	9	9	90%		
ANALYST:		RH	RH	RH	RH	CT	HF	RH	RH			
DATE:		12/9/14	12/10/14	12/11/14	12/12/14	12/13/14	12/15/14	12/16/14	9/16/14			
TIME:		1430	1540	1150	1330	1230	1300	1410	1400			

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

REMARKS:

AA# K1412005, FATHEAD MINNOW SURV.,CHRONIC,12-9-14
File: C:\COPYTO~1\TOXSTAT\FHSURV~1. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.074

W = 0.760

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# K1412005, FATHEAD MINNOW SURV.,CHRONIC,12-9-14
File: C:\COPYTO~1\TOXSTAT\FHSURV~1. Transform: ARC SINE(SQUARE ROOT(Y))

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

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

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

TITLE: AA# K1412005, FATHEAD MINNOW SURV.,CHRONIC,12-9-14
FILE: C:\COPYTO~1\TOXSTAT\FHSURV~1.
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

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

AA# K1412005, FATHEAD MINNOW SURV.,CHRONIC,12-9-14
File: C:\COPYTO~1\TOXSTAT\FHSURV~1. Transform: ARC SINE(SQUARE ROOT(Y))

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	1.379				
2	32 % EFFLUENT	1.379	27.50	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	1.347	25.00	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:	K1412005
CLIENT:	Stuttgart
ANALYSTS:	RH
SAMPLE ID:	

TEST DATES (BEGIN / END):	12/9/14 - 12/16/14
WEIGHING DATE / TIME:	12/17/2014 1545
DRYING TEMP (DEGREES C):	60
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	1.01311	1.00750	0.00561	10	0.561	AVG DRY
	B	0.99956	0.99468	0.00488	10	0.488	WEIGHT (mg)
MHS	C	0.99830	0.99282	0.00548	10	0.548	0.518
	D	1.01024	1.00526	0.00498	10	0.498	CV
	E	0.99949	0.99455	0.00494	10	0.494	6.57
CONC:	A	1.02353	1.01948	0.00405	10	0.405	AVG DRY
	B	1.01248	1.00850	0.00398	10	0.398	WEIGHT (mg)
32%	C	1.03760	1.03321	0.00439	10	0.439	0.427
	D	0.99788	0.99309	0.00479	10	0.479	CV
	E	1.02329	1.01916	0.00413	10	0.413	
CONC:	A	1.02906	1.02558	0.00348	10	0.348	AVG DRY
	B	1.05238	1.04801	0.00437	10	0.437	WEIGHT (mg)
42%	C	1.04531	1.04120	0.00411	10	0.411	0.431
	D	1.03136	1.02739	0.00397	10	0.397	CV
	E	1.00201	0.99639	0.00562	10	0.562	
CONC:	A	1.03451	1.02959	0.00492	10	0.492	AVG DRY
	B	1.01279	1.00608	0.00671	10	0.671	WEIGHT (mg)
56%	C	1.02506	1.01962	0.00544	10	0.544	0.601
	D	1.00325	0.99625	0.00700	10	0.700	CV
	E	1.00293	0.99693	0.00600	10	0.600	
CONC:	A	0.99007	0.98384	0.00623	10	0.623	AVG DRY
	B	1.02709	1.02173	0.00536	10	0.536	WEIGHT (mg)
75%	C	1.03751	1.03166	0.00585	10	0.585	0.627
	D	1.01058	1.00383	0.00675	10	0.675	CV
	E	1.04141	1.03425	0.00716	10	0.716	
CONC:	A	1.04736	1.04283	0.00453	10	0.453	AVG DRY
	B	1.02703	1.02253	0.00450	10	0.450	WEIGHT (mg)
100%	C	1.00855	1.00412	0.00443	10	0.443	0.494
	D	1.02547	1.02029	0.00518	10	0.518	CV
	E	1.04025	1.03417	0.00608	10	0.608	14.2

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

AA# K1412005, FATHEAD MINNOW GROWTH CHRONIC, 12-9-14
File: C:\COPYTO~1\TOXSTAT\FHGROWTH. Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

D = 0.105

W = 0.964

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# K1412005, FATHEAD MINNOW GROWTH CHRONIC, 12-9-14
File: C:\COPYTO~1\TOXSTAT\FHGROWTH. Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 5.49

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# K1412005, FATHEAD MINNOW GROWTH CHRONIC, 12-9-14
FILE: C:\COPYTO~1\TOXSTAT\FHGROWTH.
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.5610	0.5610
1	CONTROL	2	0.4880	0.4880
1	CONTROL	3	0.5480	0.5480
1	CONTROL	4	0.4980	0.4980
1	CONTROL	5	0.4940	0.4940
2	32 % EFFLUENT	1	0.4050	0.4050
2	32 % EFFLUENT	2	0.3980	0.3980
2	32 % EFFLUENT	3	0.4390	0.4390
2	32 % EFFLUENT	4	0.4790	0.4790
2	32 % EFFLUENT	5	0.4130	0.4130
3	42 % EFFLUENT	1	0.3480	0.3480
3	42 % EFFLUENT	2	0.4370	0.4370
3	42 % EFFLUENT	3	0.4110	0.4110
3	42 % EFFLUENT	4	0.3970	0.3970
3	42 % EFFLUENT	5	0.5620	0.5620
4	56 % EFFLUENT	1	0.4920	0.4920
4	56 % EFFLUENT	2	0.6710	0.6710
4	56 % EFFLUENT	3	0.5440	0.5440
4	56 % EFFLUENT	4	0.7000	0.7000
4	56 % EFFLUENT	5	0.6000	0.6000
5	75 % EFFLUENT	1	0.6230	0.6230
5	75 % EFFLUENT	2	0.5360	0.5360
5	75 % EFFLUENT	3	0.5850	0.5850
5	75 % EFFLUENT	4	0.6750	0.6750
5	75 % EFFLUENT	5	0.7160	0.7160
6	100 % EFFLUENT	1	0.4530	0.4530
6	100 % EFFLUENT	2	0.4500	0.4500
6	100 % EFFLUENT	3	0.4430	0.4430
6	100 % EFFLUENT	4	0.5180	0.5180
6	100 % EFFLUENT	5	0.6080	0.6080

AA# K1412005, FATHEAD MINNOW GROWTH CHRONIC, 12-9-14
File: C:\COPYTO~1\TOXSTAT\FHGROWTH. Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.176	0.035	8.096
Within (Error)	24	0.105	0.004	
Total	29	0.281		

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

AA# K1412005, FATHEAD MINNOW GROWTH CHRONIC, 12-9-14
File: C:\COPYTO~1\TOXSTAT\FHGROWTH. Transform: NO TRANSFORMATION

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	0.518	0.518		
2	32 % EFFLUENT	0.427	0.427	2.180	
3	42 % EFFLUENT	0.431	0.431	2.079	
4	56 % EFFLUENT	0.601	0.601	-2.003	
5	75 % EFFLUENT	0.627	0.627	-2.616	
6	100 % EFFLUENT	0.494	0.494	0.561	

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

AA# K1412005, FATHEAD MINNOW GROWTH CHRONIC, 12-9-14
File: C:\COPYTO~1\TOXSTAT\FHGROWTH. Transform: NO TRANSFORMATION

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

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	5			
2	32 % EFFLUENT	5	0.099	19.0	0.091
3	42 % EFFLUENT	5	0.099	19.0	0.087
4	56 % EFFLUENT	5	0.099	19.0	-0.084
5	75 % EFFLUENT	5	0.099	19.0	-0.109
6	100 % EFFLUENT	5	0.099	19.0	0.023

APPENDIX D

Ceriodaphnia dubia Raw Data and Statistics

SURVIVAL AND REPRODUCTION TEST

Ceriodaphnia dubia

Discharger: Stuttgart	Lab Number/s
Location: Outfall 001	*K1412005*
Date Sample Collected: 12 - 8/10/12 - 14	

Analyst: RH	
Test Start - Date/Time: 12-9-14, 1045	
Test Stop - Date/Time: 12-16-14, 0930	

Conc	1	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	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	4	2	4	6	1	0	6	3	5	0	2	29	10	2.9	RH
	5	2	5	4	8	7	0	6	5	6	0	43	10	4.3	RH
	6	5	3	0	1	3	0	5	1	10	8	36	10	3.6	RH
	7	5	1	7	3	10	8	2	6	4	10	56	10	5.6	RH
	8														
	Total	14	13	17	13	20	14	16	17	20	20	164		Avg. =	16.4
														C.V. =	17.5

Conc	2	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst
%	Day	A	B	C	D	E	F	G	H	I	J				
32.0%	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	5	4	3	1	4	3	4	0	5	5	34	10	3.4	RH
	5	0	3	5	4	8	4	4	2	5	9	44	10	4.4	RH
	6	5	0	3	7	2	0	4	2	0	5	28	10	2.8	RH
	7	3	11	6	7	4	2	1	6	0	2	42	10	4.2	RH
	8														
	Total	13	18	17	19	18	9	13	10	10	21	148		Avg. =	14.8
														C.V. =	29.2

Conc	3	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst
%	Day	A	B	C	D	E	F	G	H	I	J				
42.0%	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	2	0	0	0	0	0	0	0	2	10	0.2	RH
	4	5	3	4	3	4	5	5	2	3	3	37	10	3.7	RH
	5	1	7	3	5	8	9	0	0	5	2	40	10	4.0	RH
	6	3	9	6	5	2	0	3	8	0	3	39	10	3.9	RH
	7	5	1	1	0	6	2	4	0	3	0	22	10	2.2	RH
	8														
	Total	14	20	16	13	20	16	12	10	11	8	140		Avg. =	14.0
														C.V. =	28.8

Conc	4	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst
%	Day	A	B	C	D	E	F	G	H	I	J				
56.0%	1	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	2	0	X	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	5		3	6	4	4	5	3	1	0	31	10	3.1	RH
	5	4		5	0	3	9	6	10	7	6	50	10	5.0	RH
	6	6		0	3	5	0	4	0	0	2	20	10	2.0	RH
	7	2		3	0	3	5	0	6	3	5	27	10	2.7	RH
	8														
	Total	17	0	11	9	15	18	15	19	11	13	128		Avg. =	14.2
			X											C.V. =	24.3

Conc	5	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst
%	Day	A	B	C	D	E	F	G	H	I	J				
75.0%	1	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	2	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	3	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	4	6	2	2	4	5	6	1	5	3	2	36	10	3.6	RH
	5	7	5	0	6	6	8	6	1	0	4	43	10	4.3	RH
	6	10	6	8	8	0	3	5	0	3	1	44	10	4.4	RH
	7	0	0	7	2	4	3	0	5	0	8	29	10	2.9	RH
	8														
	Total	23	13	17	20	15	20	12	11	6	15	152		Avg. =	15.2
														C.V. =	33.1

Conc	6	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst
%	Day	A	B	C	D	E	F	G	H	I	J				
100.0%	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	3	0	4	6	6	3	6	0	5	2	35	10	3.5	RH
	5	4	6	0	1	8	3	10	5	3	2	42	10	4.2	RH
	6	4	5	8	0	4	0	2	7	0	7	37	10	3.7	RH
	7	0	7	0	5	1	6	3	4	0	4	30	10	3.0	RH
	8														
	Total	11	18	12	12	19	12	21	16	8	15	144		Avg. =	14.4
														C.V. =	28.4

AA # K1412005, C.DUBIA CHRONIC, REPRODUCION, 12-9-14
File: C:\COPYTO~1\TOXSTAT\C.DUB Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

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

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

Total number of replicates = 60

AA # K1412005, C.DUBIA CHRONIC, REPRODUCION, 12-9-14
File: C:\COPYTO~1\TOXSTAT\C.DUB Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 4.06

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
32	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
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

IDENTIFICATION	NUMBER OF 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	NUMBER OF 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	NUMBER OF 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	0	
2	42	10	0	
3	56	10	1	
4	75	10	0	
5	100	10	0	

TITLE: AA # K1412005, C.DUBIA CHRONIC, REPRODUCION, 12-9-14
FILE: C:\COPYTO~1\TOXSTAT\C.DUB
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	14.0000	14.0000
1	CONTROL	2	13.0000	13.0000
1	CONTROL	3	17.0000	17.0000
1	CONTROL	4	13.0000	13.0000
1	CONTROL	5	20.0000	20.0000
1	CONTROL	6	14.0000	14.0000
1	CONTROL	7	16.0000	16.0000
1	CONTROL	8	17.0000	17.0000
1	CONTROL	9	20.0000	20.0000
1	CONTROL	10	20.0000	20.0000
2	32 % EFFLUENT	1	13.0000	13.0000
2	32 % EFFLUENT	2	18.0000	18.0000
2	32 % EFFLUENT	3	17.0000	17.0000
2	32 % EFFLUENT	4	19.0000	19.0000
2	32 % EFFLUENT	5	18.0000	18.0000
2	32 % EFFLUENT	6	9.0000	9.0000
2	32 % EFFLUENT	7	13.0000	13.0000
2	32 % EFFLUENT	8	10.0000	10.0000
2	32 % EFFLUENT	9	10.0000	10.0000
2	32 % EFFLUENT	10	21.0000	21.0000
3	42 % EFFLUENT	1	14.0000	14.0000
3	42 % EFFLUENT	2	20.0000	20.0000
3	42 % EFFLUENT	3	16.0000	16.0000
3	42 % EFFLUENT	4	13.0000	13.0000
3	42 % EFFLUENT	5	20.0000	20.0000
3	42 % EFFLUENT	6	16.0000	16.0000
3	42 % EFFLUENT	7	12.0000	12.0000
3	42 % EFFLUENT	8	10.0000	10.0000
3	42 % EFFLUENT	9	11.0000	11.0000
3	42 % EFFLUENT	10	8.0000	8.0000
4	56 % EFFLUENT	1	17.0000	17.0000
4	56 % EFFLUENT	2	0.0000	0.0000
4	56 % EFFLUENT	3	11.0000	11.0000
4	56 % EFFLUENT	4	9.0000	9.0000
4	56 % EFFLUENT	5	15.0000	15.0000
4	56 % EFFLUENT	6	18.0000	18.0000
4	56 % EFFLUENT	7	15.0000	15.0000
4	56 % EFFLUENT	8	19.0000	19.0000

4	56 % EFFLUENT	9	11.0000	11.0000
4	56 % EFFLUENT	10	13.0000	13.0000
5	75 % EFFLUENT	1	23.0000	23.0000
5	75 % EFFLUENT	2	13.0000	13.0000
5	75 % EFFLUENT	3	17.0000	17.0000
5	75 % EFFLUENT	4	20.0000	20.0000
5	75 % EFFLUENT	5	15.0000	15.0000
5	75 % EFFLUENT	6	20.0000	20.0000
5	75 % EFFLUENT	7	12.0000	12.0000
5	75 % EFFLUENT	8	11.0000	11.0000
5	75 % EFFLUENT	9	6.0000	6.0000
5	75 % EFFLUENT	10	15.0000	15.0000
6	100 % EFFLUENT	1	11.0000	11.0000
6	100 % EFFLUENT	2	18.0000	18.0000
6	100 % EFFLUENT	3	12.0000	12.0000
6	100 % EFFLUENT	4	12.0000	12.0000
6	100 % EFFLUENT	5	19.0000	19.0000
6	100 % EFFLUENT	6	12.0000	12.0000
6	100 % EFFLUENT	7	21.0000	21.0000
6	100 % EFFLUENT	8	16.0000	16.0000
6	100 % EFFLUENT	9	8.0000	8.0000
6	100 % EFFLUENT	10	15.0000	15.0000

AA # K1412005, C.DUBIA CHRONIC, REPRODUCION, 12-9-14
File: C:\COPYTO~1\TOXSTAT\C.DUB Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	72.800	14.560	0.753
Within (Error)	54	1043.600	19.326	
Total	59	1116.400		

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

AA # K1412005, C.DUBIA CHRONIC, REPRODUCION, 12-9-14
File: C:\COPYTO~1\TOXSTAT\C.DUB Transform: NO TRANSFORMATION

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	16.400	16.400		
2	32 % EFFLUENT	14.800	14.800	0.814	
3	42 % EFFLUENT	14.000	14.000	1.221	
4	56 % EFFLUENT	12.800	12.800	1.831	
5	75 % EFFLUENT	15.200	15.200	0.610	
6	100 % EFFLUENT	14.400	14.400	1.017	

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

AA # K1412005, C.DUBIA CHRONIC, REPRODUCION, 12-9-14
File: C:\COPYTO~1\TOXSTAT\C.DUB Transform: NO TRANSFORMATION

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

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	10			
2	32 % EFFLUENT	10	4.541	27.7	1.600
3	42 % EFFLUENT	10	4.541	27.7	2.400
4	56 % EFFLUENT	10	4.541	27.7	3.600
5	75 % EFFLUENT	10	4.541	27.7	1.200
6	100 % EFFLUENT	10	4.541	27.7	2.000

APPENDIX E

Organism History

AQUATOX, INC.

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

TEST ORGANISM HISTORY

DATE SHIPPED 12-9-14 CLIENT Arkansas Analytical

Purchase Order #: _____

SPECIES: Pimephales promelas

Quantity Shipped: ~240+

Age: Hatched 12/8 15-1600 CST

Brood Stock Source: Anderson Farms, AR

Culture Water: (Groundwater)

Hardness (Mg/l CaCO3): ~160

Dissolved Oxygen (Mg/1): 8.4

Temperature (°C): 25.4

Feeding: Artemia

Comments: _____

Shipped Via: Federal Express UPS Overnight (Shuttle)

Packaged By: CW

Bill Hall Printers 3171

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

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

ORGANISM HISTORY

DATE: 11/25/2013

SPECIES: *Ceriodaphnia dubia*

AGE: > 3 day

LIFE STAGE: Adult

HATCH DATE: Variable

BEGAN FEEDING: Immediately

FOOD: YTC, *Selenastrum* sp.

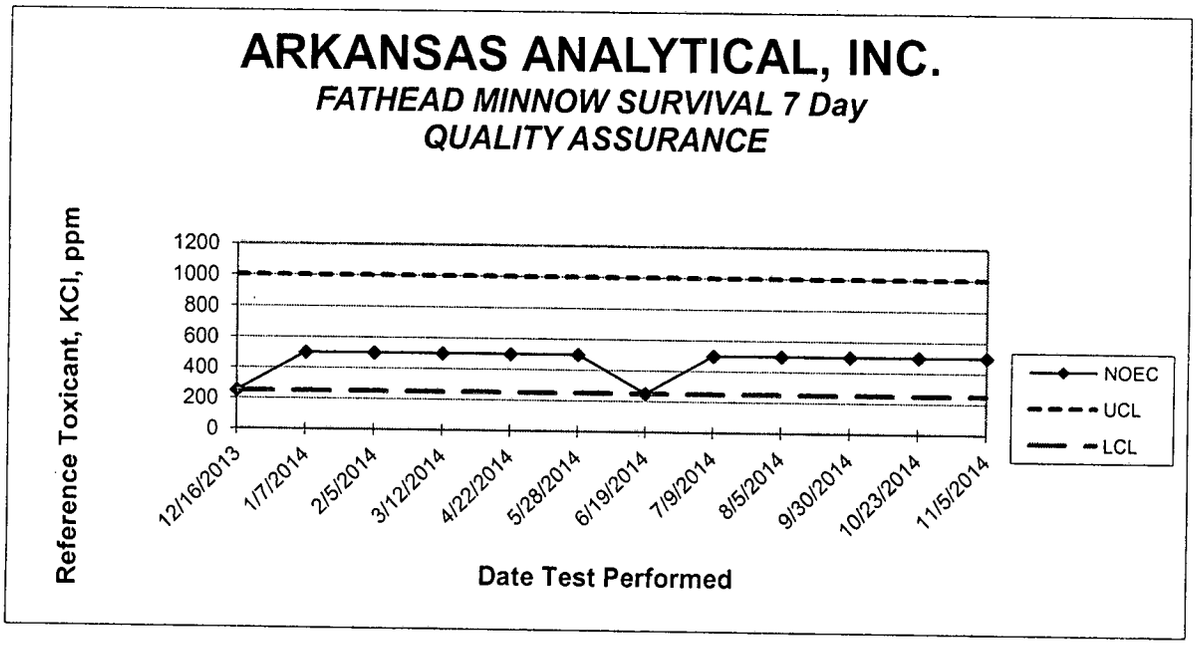
Water Chemistry Record:	Current	Range
TEMPERATURE:	22°C	22-26°C
SALINITY/CONDUCTIVITY:	--	--
TOTAL HARDNESS (as $CaCO_3$):	94 mg/l	76-130 mg/l
TOTAL ALKALINITY (as $CaCO_3$):	65 mg/l	65-100 mg/l
pH:	7.98	7.50-8.20

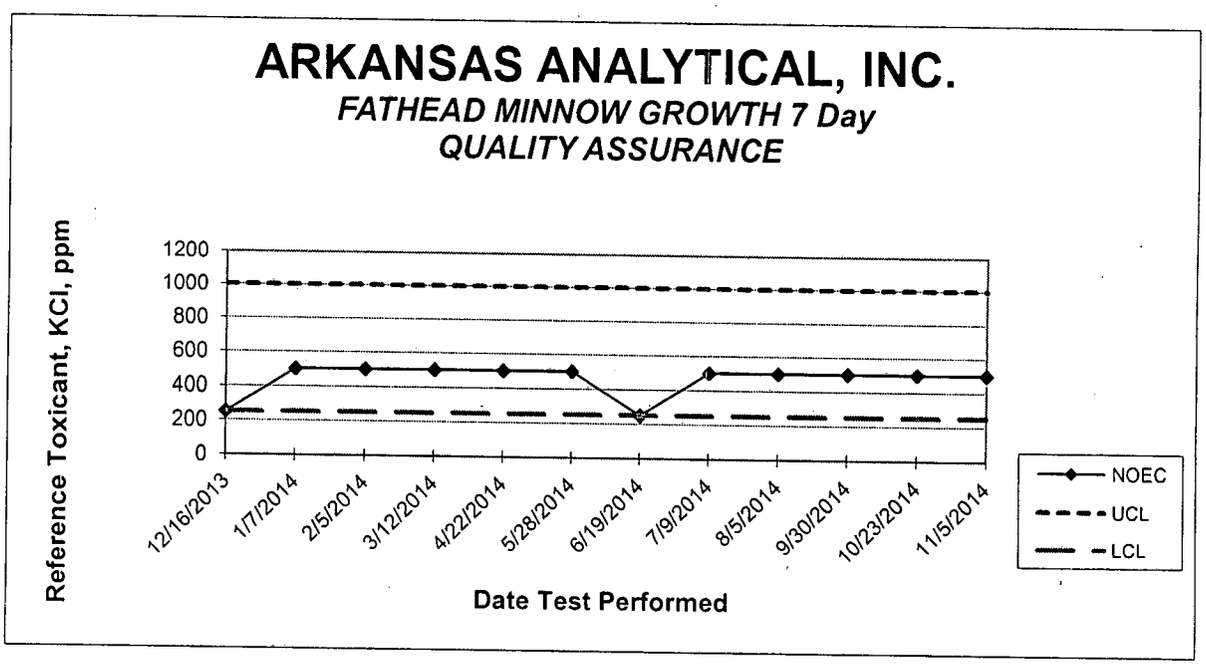
Comments:

Facility Supervisor

APPENDIX F

Quality Assurance Charts


ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW SURVIVAL 7 Day
QUALITY ASSURANCE
Reference Toxicant, KCl, ppm
1200
1000
800
600
400
200
0
12/16/2013
1/7/2014
2/5/2014
3/12/2014
4/22/2014
5/28/2014
6/19/2014
7/9/2014
8/5/2014
9/30/2014
10/23/2014
11/5/2014
NOEC
UCL
LCL
Date Test Performed


ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW GROWTH 7 Day
QUALITY ASSURANCE
Reference Toxicant, KCl, ppm
1200
1000
800
600
400
200
0
12/16/2013
1/7/2014
2/5/2014
3/12/2014
4/22/2014
5/28/2014
6/19/2014
7/9/2014
8/5/2014
9/30/2014
10/23/2014
11/5/2014
NOEC
UCL
LCL
Date Test Performed

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

Hasler
01/28/2015
USIPOSTAGE
FIRST-CLASS MAIL
$02.66⁰
ZIP 72160
011D10608725

ATTN: MARY BENNETT

ADEQ
5301 NORTHSHORE DRIVE
NORTH LITTLE ROCK AR 72118-5317