

Huther and Associates, Inc.

CITY OF FORREST CITY
OUTFALL 001

Chronic Biomonitoring Report
Permit Number NPDES AR0020087
AFIN Number 62-00070

Ceriodaphnia dubia
Pimephales promelas

May 22, 2012

Reviewed by:



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TOXICITY TEST REPORT - CHRONIC

Client City of Forrest City Laboratory I.D. 19656
 Permit No. NPDES AR0020087 Begin Date May 22, 2012
 Sample Outfall 001

Results: Pass *Ceriodaphnia dubia* survival and reproduction and *Pimephales promelas* survival and growth at the critical low flow concentration (100% effluent).

SAMPLE COLLECTION

Composite effluent samples from City of Forrest City were delivered by Greyhound Package Express courier to Huther & Associates on May 22, May 24, and May 26, 2012. Effluent samples were collected and composited from Outfall 001 using an automatic sampler by facility personnel. Two toxicity tests were requested: a seven-day *Ceriodaphnia dubia* survival and reproduction test (EPA Method 1002.0), and a seven-day *Pimephales promelas* larval survival and growth test (EPA Method 1000.0). Test organisms, procedures and quality assurance requirements were in accordance with the EPA manual, "Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition" (EPA-821-R-02-013).

The effluent samples were analyzed for total residual chlorine (Standard Methods, 20th Edition, 4500-Cl D) and contained <0.01 mg/L, <0.01 mg/L, and <0.01 mg/L, respectively. Effluent and laboratory dilution water hardness, alkalinity, conductivity, pH, and dissolved oxygen data were collected and recorded.

TEST SETUP
Ceriodaphnia dubia



The seven-day *Ceriodaphnia dubia* survival and reproduction test was initiated at 1530 hours, May 22, 2012. Five concentrations were prepared (32%, 45%, 54%, 75% and 100% effluent) utilizing distilled, deionized laboratory water reconstituted to match the hardness, alkalinity and pH of the receiving stream (unnamed tributary of L'Anguille River). The test was conducted in 25 mL distilled water rinsed plastic beakers containing 15 mL of solution (one organism per beaker, ten beakers per concentration). *C. dubia* neonates were less than 24 hours old and within eight hours of the same age at test initiation. Neonates were placed in beakers following a randomized block test design. Fresh solutions were prepared and renewed daily. Daily feeding consisted of 0.5 mL *Selenastrum capricornutum* and cerophyll per test chamber. The test proceeded for seven days during which survival, reproduction and water quality data were collected daily.

A control of 10 replicate beakers containing one neonate each in distilled, deionized, reconstituted water (same as diluent) was conducted concurrently with the test. There was 100% survival in the control. The test ended at 1530 hours, May 29, 2012. Survival and reproduction data were statistically analyzed ($p = 0.05$) according to EPA procedures to determine the Lowest Observable Effect Concentration (LOEC) and the No Observable Effect Concentration (NOEC).

SURVIVAL
Ceriodaphnia dubia

There was 100% survival to *C. dubia* in all of the effluent concentrations tested. Therefore, statistical analyses were not required to determine a no effect concentration.

LOEC: Not Applicable
NOEC: 100% Effluent

REPRODUCTION
Ceriodaphnia dubia

C. dubia reproduction data were normally distributed at the 0.01 alpha level (13.277) using Chi-Square test for normality. Reproduction data were homogeneous using Bartlett's test at the 0.01 alpha level (15.09) without data transformations. Therefore, a parametric test was performed on the homogeneous data. Dunnett's test on *C. dubia* reproduction data demonstrated that there were no statistically significant differences between the control and any of the effluent concentrations.

LOEC: Not Applicable
NOEC: 100% Effluent

PMSD: 10.0%

TEST SETUP
Pimephales promelas



The seven-day *Pimephales promelas* larval survival and growth test was initiated at 1610 hours, May 22, 2012. Five concentrations were prepared (32%, 45%, 54%, 75% and 100% effluent) utilizing distilled, deionized laboratory water reconstituted to match the hardness, alkalinity and pH of the receiving stream (unnamed tributary of L'Anguille River). The test was conducted in 300 mL distilled water rinsed plastic beakers containing 250 mL of solution (eight larvae per beaker, five beakers per concentration). *P. promelas* larvae were less than 24-hours old at test initiation and originated from a minimum of three in-house spawnings. Fresh solutions were prepared and renewed daily. Larvae in each test chamber were fed <24-hour-old *Artemia* (brine shrimp) three times per day. The test proceeded for seven days during which survival and water quality data were collected daily.

A control of five replicate chambers containing eight larvae each in distilled, deionized, reconstituted water (same as diluent) was conducted concurrently with the test. There was 100% survival in the control. The test ended at 1610 hours, May 29, 2012. At test termination, all larvae were sacrificed, dried for 24-hours, and weighed. Survival and growth (weight) data were statistically analyzed ($p = 0.05$) according to EPA procedures to determine the Lowest Observable Effect Concentration (LOEC) and the No Observable Effect Concentration (NOEC).

SURVIVAL
Pimephales promelas

There was 100% survival to *P. promelas* in all of the effluent concentrations tested. Therefore, statistical analyses were not required to determine a no effect concentration.

LOEC: Not Applicable
NOEC: 100% Effluent

GROWTH
Pimephales promelas

P. promelas growth data were normally distributed at the 0.01 alpha level (0.900) using Shapiro Wilk's test for normality. Growth data were homogeneous using Bartlett's test at the 0.01 alpha level (15.09) without data transformations. Therefore, a parametric test was performed on the homogeneous data. Dunnett's test on *P. promelas* growth data demonstrated that there were no statistically significant differences between the control and any of the effluent concentrations.

LOEC: Not Applicable **PMSD: 12.0%**
NOEC: 100% Effluent

SUMMARY

There were no statistically significant differences between the control and the critical low flow concentration (100% effluent) for *C. dubia* survival and reproduction and *P. promelas* survival and growth. Based on biomonitoring requirements for Outfall 001 contained in NPDES Permit Number AR0020087 for City of Forrest City, Outfall 001 **passed** for this testing period.

Huthur and Associates

7-Day/3 Brood *Ceriodaphnia dubia* Survival and Reproduction Chronic Toxicity Test

CLIENT City of Forrest City SAMPLE TYPE 24 Hour Composite
 NPDES # AR0020087 DATE COLLECTED 05/21/12 05/23/12 05/25/12
 LAB ID # 19656 DATE RECEIVED 05/22/12 05/24/12 05/26/12
 TEST TYPE 7 Day Chronic BEGIN DATE/TIME 05/22/12 1530
 TEST ORGANISM *Ceriodaphnia dubia* END DATE/TIME 05/29/12 1530
 ORGANISM AGE < 24 Hours TEST TEMPERATURE (°C) 25 ± 1
 ORGANISM SOURCE In House PHOTO PERIOD 16-hr. Light 8-hr. Dark
 RECEIVING WATER unnamed tributary of L'Anguille River LIGHT INTENSITY 50-100 ft. cndl.
 DILUTION WATER Laboratory Adjusted TECHNICIAN J. Gnau

SURVIVAL & REPRODUCTION SUMMARY

Control

Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
05/23/12	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
05/24/12	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
05/25/12	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
05/26/12	A	2	2	2	A	A	A	3	A	A
	0	2	2	2	0	0	0	3	0	0
05/27/12	4	A	A	A	4	3	3	A	3	4
	4	2	2	2	4	3	3	3	3	4
05/28/12	7	6	8	8	9	7	7	6	7	6
	11	8	10	10	13	10	10	9	10	10
05/29/12	10	11	11	12	10	9	14	12	10	11
	21	19	21	22	23	19	24	21	20	21
x # Young 21.1 C.V. 7.56% x% Survival 100% C.V. 0.00%										

32% Effluent

Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
05/23/12	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
05/24/12	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
05/25/12	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
05/26/12	4	A	A	A	A	A	A	4	4	4
	4	0	0	0	0	0	0	0	4	4
05/27/12	A	3	4	4	5	4	3	4	4	A
	4	3	4	4	5	4	3	4	4	4
05/28/12	6	8	7	9	8	10	7	9	9	7
	10	11	11	13	13	14	10	13	13	11
05/29/12	9	11	14	12	10	14	14	13	12	13
	19	22	25	25	23	28	24	26	25	24
x # Young 24.1 C.V. 10.06% x% Survival 100% C.V. 0.00%										

45% Effluent

Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
05/23/12	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
05/24/12	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
05/25/12	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
05/26/12	A	A	4	A	2	3	4	4	A	A
	0	0	4	0	2	3	4	4	0	0
05/27/12	5	3	A	3	A	A	A	A	5	5
	5	3	4	3	2	3	4	4	5	5
05/28/12	7	6	6	9	6	8	10	7	6	9
	12	9	10	12	8	11	14	11	11	14
05/29/12	12	14	11	12	14	13	13	14	11	12
	24	23	21	24	22	24	27	25	22	26
x # Young 23.8 C.V. 7.87% x% Survival 100% C.V. 0.00%										

54% Effluent

Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
05/23/12	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
05/24/12	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
05/25/12	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
05/26/12	A	4	A	A	2	3	A	4	3	3
	0	4	0	0	2	3	0	4	3	3
05/27/12	2	A	6	2	A	A	4	A	A	6
	2	4	6	2	2	3	4	4	3	9
05/28/12	6	8	11	9	9	10	10	11	7	A
	8	12	11	11	11	13	14	15	10	9
05/29/12	13	14	12	14	14	11	11	14	13	12
	21	26	29	25	25	24	25	29	23	21
x # Young 24.8 C.V. 11.21% x% Survival 100% C.V. 0.00%										

where: A = Alive
 5 = Alive, 5 young
 D = Dead
 D5 = 5 Young, Female died

ex 1:

A	alive today
4	total young to date

ex 2:

5	alive, 5 young today
12	total young to date

Huthner and Associates
7-Day/3 Brood *Ceriodaphnia dubia* Survival and Reproduction Chronic Toxicity Test

City of Forrest City

Lab ID# 19656

Test Date: May 22, 2012

75% Effluent																							
Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10													
05/23/12	A	A	A	A	A	A	A	A	A	A	A												
	0	0	0	0	0	0	0	0	0	0	0												
05/24/12	A	A	A	A	A	A	A	A	A	A	A												
	0	0	0	0	0	0	0	0	0	0	0												
05/25/12	A	A	A	A	A	A	A	A	A	A	A												
	0	0	0	0	0	0	0	0	0	0	0												
05/26/12	2	2	3	A	4	A	A	2	2	4													
	2	2	3	0	4	0	0	2	2	4													
05/27/12	A	A	A	2	A	4	4	A	A	A													
	2	2	3	2	4	4	4	2	2	4													
05/28/12	7	8	6	9	9	7	9	11	6	7													
	9	10	9	11	13	11	13	13	8	11													
05/29/12	13	13	14	12	14	14	11	13	14	14													
	22	23	23	23	27	25	24	26	22	25													
<table style="width: 100%; border: none;"> <tr> <td style="width: 15%;"></td> <td style="width: 15%;">x# Young</td> <td style="width: 15%;">24.0</td> <td style="width: 15%;"></td> <td style="width: 15%;">C.V.</td> <td style="width: 15%;">7.08%</td> </tr> <tr> <td></td> <td>x% Survival</td> <td>100%</td> <td></td> <td>C.V.</td> <td>0.00%</td> </tr> </table>													x# Young	24.0		C.V.	7.08%		x% Survival	100%		C.V.	0.00%
	x# Young	24.0		C.V.	7.08%																		
	x% Survival	100%		C.V.	0.00%																		

100% Effluent																							
Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10													
05/23/12	A	A	A	A	A	A	A	A	A	A	A												
	0	0	0	0	0	0	0	0	0	0	0												
05/24/12	A	A	A	A	A	A	A	A	A	A	A												
	0	0	0	0	0	0	0	0	0	0	0												
05/25/12	A	A	A	A	A	A	A	A	A	A	A												
	0	0	0	0	0	0	0	0	0	0	0												
05/26/12	4	3	2	3	5	A	4	A	4	A													
	4	3	2	3	5	0	4	0	4	0													
05/27/12	A	A	A	A	A	4	A	5	A	4													
	4	3	2	3	5	4	4	5	4	4													
05/28/12	8	6	9	10	10	7	8	8	7	10													
	12	9	11	13	15	11	12	13	11	14													
05/29/12	12	14	14	13	12	12	12	12	14	14													
	24	23	25	26	27	23	24	25	25	28													
<table style="width: 100%; border: none;"> <tr> <td style="width: 15%;"></td> <td style="width: 15%;">x# Young</td> <td style="width: 15%;">25.0</td> <td style="width: 15%;"></td> <td style="width: 15%;">C.V.</td> <td style="width: 15%;">6.53%</td> </tr> <tr> <td></td> <td>x% Survival</td> <td>100%</td> <td></td> <td>C.V.</td> <td>0.00%</td> </tr> </table>													x# Young	25.0		C.V.	6.53%		x% Survival	100%		C.V.	0.00%
	x# Young	25.0		C.V.	6.53%																		
	x% Survival	100%		C.V.	0.00%																		

where: A = Alive
 5 = Alive, 5 young
 D = Dead
 D5 = 5 Young, Female died

ex 1:

A
4

 alive today
 total young to date

ex 2:

5
12

 alive, 5 young today
 total young to date

Huthner and Associates
7-Day/3 Brood *Ceriodaphnia dubia* Survival and Reproduction Chronic Toxicity Test

City of Forrest City

Lab ID# 19656

Test Date: May 22, 2012

WET CHEMISTRY MEASUREMENTS

Date	Time	Temp	Samp. No.	pH of Solution						Analyst
				CON	32%	45%	54%	75%	100%	
05/22/12	Start	25.0	1	8.01	8.05	8.11	8.13	8.12	7.97	AK
05/23/12	24 Hr.	25.3	1	8.24	8.10	8.20	8.28	8.35	8.43	MJ
05/23/12	Renew	25.9	1	8.22	8.24	8.17	8.19	8.20	8.19	MJ
05/24/12	48 Hr.	24.6	1	8.16	8.17	8.35	8.45	8.49	8.58	AK
05/24/12	Renew	25.0	2	7.88	7.89	8.00	8.04	8.03	7.81	AK
05/25/12	72 Hr.	24.9	2	8.00	8.17	8.28	8.34	8.48	8.51	TB
05/25/12	Renew	25.2	2	7.93	8.07	8.11	8.10	8.17	8.15	TB
05/26/12	96 Hr.	25.1	2	8.23	8.20	8.25	8.33	8.39	8.50	SK
05/26/12	Renew	25.0	3	8.13	8.07	8.08	8.09	8.07	8.06	SK
05/27/12	120 Hr.	25.3	3	8.15	8.28	8.36	8.46	8.61	8.64	SK
05/27/12	Renew	25.1	3	8.23	8.20	8.26	8.30	8.35	8.39	SK
05/28/12	144 Hr.	24.9	3	8.02	8.21	8.30	8.36	8.45	8.54	TB
05/28/12	Renew	25.5	3	8.12	8.06	8.08	8.05	8.03	8.03	TB
05/29/12	168 Hr.	24.7	3	8.15	8.09	8.08	8.01	8.00	7.99	AK

Date	Time	Temp	Samp. No.	DO (mg/L) of Solution						Analyst
				CON	32%	45%	54%	75%	100%	
05/22/12	Start	25.0	1	7.39	7.31	7.39	7.36	7.34	8.62	AK
05/23/12	24 Hr.	25.3	1	8.42	8.49	8.32	8.22	8.22	8.16	MJ
05/23/12	Renew	25.9	1	8.54	8.80	8.74	8.68	8.64	8.58	MJ
05/24/12	48 Hr.	24.6	1	7.53	7.48	7.44	7.44	7.48	7.45	AK
05/24/12	Renew	25.0	2	7.47	7.43	7.50	7.54	7.45	8.71	AK
05/25/12	72 Hr.	24.9	2	8.43	8.36	8.28	8.21	8.04	8.06	TB
05/25/12	Renew	25.2	2	8.71	8.67	8.68	8.65	8.36	8.27	TB
05/26/12	96 Hr.	25.1	2	8.75	8.69	8.62	8.57	8.39	8.40	SK
05/26/12	Renew	25.0	3	8.51	8.60	8.55	8.58	8.57	8.80	SK
05/27/12	120 Hr.	25.3	3	8.07	8.07	8.06	8.09	8.06	7.97	SK
05/27/12	Renew	25.1	3	8.69	8.43	8.43	8.49	8.52	8.55	SK
05/28/12	144 Hr.	24.9	3	8.18	8.10	8.04	8.01	7.93	7.87	TB
05/28/12	Renew	25.5	3	8.33	8.26	8.17	8.13	8.05	7.96	TB
05/29/12	168 Hr.	24.7	3	8.34	8.31	8.11	8.05	8.11	8.13	AK

Huther and Associates
7-Day/3 Brood *Ceriodaphnia dubia* Survival and Reproduction Chronic Toxicity Test

City of Forrest City

Lab ID# 19656

Test Date: May 22, 2012

INITIAL CHEMISTRY MEASUREMENTS @ 100% EFFLUENT

Date	Samp. No.	pH	DO	Hardness mg/L CaCO ₃ ¹	Alkalinity mg/L CaCO ₃ ¹	Conduct. umhos/cm ¹	Resid. Cl ₂ mg/L ¹	Dechlor(mL) Na ₂ S ₂ O ₃ mg/L ¹	Analyst
05/22/12	1	7.97	8.62	284	250	970	<0.01	N/A	TN
05/24/12	2	7.81	8.71	284	260	971	<0.01	N/A	TN
05/26/12	3	8.06	8.80	288	254	966	<0.01	N/A	TN
05/22/12	Con	8.01	7.39	88	60	313	-	-	TN

¹ Measurements taken in 100% solution.

CERIODAPHNIA DUBIA STATISTICAL ANALYSES
 Reproduction

Summary Statistics on Transformed Data Table 1 of 2

Grp	Identification	N	Min	Max	Mean
1	Control	10	19.000	24.000	21.100
2	32% Effluent	10	19.000	28.000	24.100
3	45% Effluent	10	21.000	27.000	23.800
4	54% Effluent	10	21.000	29.000	24.800
5	75% Effluent	10	22.000	27.000	24.000
6	100% Effluent	10	23.000	28.000	25.000

Summary Statistics on Transformed Data Table 2 of 2

Grp	Identification	Variance	Sd	Sem	C.V.%
1	Control	2.544	1.595	0.504	7.56
2	32% Effluent	5.878	2.424	0.767	10.06
3	45% Effluent	3.511	1.874	0.593	7.87
4	54% Effluent	7.733	2.781	0.879	11.21
5	75% Effluent	2.889	1.700	0.537	7.08
6	100% Effluent	2.667	1.633	0.516	6.53

Chi-Square Test For Normality: Actual And Expected Frequencies

Interval	< -1.5	-1.5 to -0.5	-0.5 to 0.5	> 0.5 to 1.5	> 1.5
Expected	4.020	14.520	22.920	14.520	4.020
Observed	1	19	23	10	7

Calculated Chi-Square goodness of fit test statistic = 7.2674
 Table Chi-Square value (alpha = 0.01) = 13.277

Data Pass normality test. Continue analysis.

Bartlett's Test For Homogeneity of Variance

Calculated B1 statistic = 4.90

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.

ANOVA Table

SOURCE	DF	SS	MS	F
Between	5	98.600	19.720	4.691
Within (Error)	54	227.000	4.204	
Total	59	325.600		

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

Dunnett's Test - Table 1 of 2 Ho:Control < Treatment

Grp	Identification	Mean		T Stat	Sig
		Transformed Mean	Calculated In Original Units		
1	Control	21.100	21.100		
2	32% Effluent	24.100	24.100	-3.272	
3	45% Effluent	23.800	23.800	-2.945	
4	54% Effluent	24.800	24.800	-4.035	
5	75% Effluent	24.000	24.000	-3.163	
6	100% Effluent	25.000	25.000	-4.253	

Dunnett table value = 2.31 (1 Tailed Value, P=0.05, DF=40,5)
 No statistically significant difference

Dunnett's Test - Table 1 of 2 Ho:Control < Treatment

Grp	Identification	Num of Reps	Minimum Sig Diff (In Orig. Units)	% of Control	Difference from Control
1	Control	10			
2	32% Effluent	10	2.118	10.0	-3.000
3	45% Effluent	10	2.118	10.0	-2.700
4	54% Effluent	10	2.118	10.0	-3.700
5	75% Effluent	10	2.118	10.0	-2.900
6	100% Effluent	10	2.118	10.0	-3.900

Huthur and Associates
7-Day *Pimephales promelas* Survival and Growth Chronic Toxicity Test

CLIENT	City of Forrest City	SAMPLE TYPE	24 Hour Composite
NPDES #	AR0020087	DATE COLLECTED	05/21/12 05/23/12 05/25/12
LAB ID #	19656	DATE RECEIVED	05/22/12 05/24/12 05/26/12
TEST TYPE	7 Day Chronic	BEGIN DATE/TIME	05/22/12 1610
TEST ORGANISM	<i>Pimephales promelas</i>	END DATE/TIME	05/29/12 1610
ORGANISM AGE	< 24 Hours	TEST TEMPERATURE (°C)	25 ± 1
ORGANISM SOURCE	In House	PHOTO PERIOD	16-hr. Light 8-hr. Dark
RECEIVING WATER	unnamed tributary of the L'Anguille River	LIGHT INTENSITY	50-100 ft. cndl.
DILUTION WATER	Laboratory Adjusted	TECHNICIAN	T. Nesbitt

SURVIVAL SUMMARY

Conc.	05/23/12					05/24/12					05/25/12					05/26/12					05/27/12				
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
Con	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	6	8	8	8	8	6	8	8	8	8
32%	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
45%	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
54%	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
75%	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
100%	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8

Conc.	05/28/12					05/29/12					x % Survival	C.V. %
	A	B	C	D	E	A	B	C	D	E		
Con	8	8	8	8	8	8	8	8	8	8	100.0	0.00
32%	8	8	8	8	8	8	8	8	8	8	100.0	0.00
45%	8	8	8	8	8	8	8	8	8	8	100.0	0.00
54%	8	8	8	8	8	8	8	8	8	8	100.0	0.00
75%	8	8	8	8	8	8	8	8	8	8	100.0	0.00
100%	8	8	8	8	8	8	8	8	8	8	100.0	0.00

MEAN DRY WEIGHT PER REP

% Effluent	Rep A	Rep B	Rep C	Rep D	Rep E	x	C.V.%
Con	0.4190	0.4060	0.4830	0.4920	0.4270	0.4454	8.82
32%	0.4650	0.5020	0.4200	0.4750	0.4910	0.4706	6.73
45%	0.4860	0.5020	0.4170	0.4930	0.5020	0.4800	7.47
54%	0.4610	0.4720	0.5050	0.4250	0.4810	0.4688	6.26
75%	0.4760	0.4950	0.4230	0.5010	0.5000	0.4790	6.87
100%	0.4260	0.4070	0.5020	0.4960	0.4910	0.4644	9.56

Huthner and Associates
7-Day *Pimephales promelas* Survival and Growth Chronic Toxicity Test

City of Forrest City

Lab ID# 19656

Test Date: May 22, 2012

WET CHEMISTRY MEASUREMENTS

Date	Time	Temp	Samp. No.	pH of Solution						Analyst
				CON	32%	45%	54%	75%	100%	
05/22/12	Start	25.0	1	8.01	8.05	8.11	8.13	8.12	7.97	AK
05/23/12	24 Hr.	25.8	1	8.25	8.17	8.25	8.35	8.41	8.48	MJ
05/23/12	Renew	25.9	1	8.22	8.24	8.17	8.19	8.20	8.19	MJ
05/24/12	48 Hr.	25.7	1	8.07	8.03	8.22	8.24	8.29	8.41	AK
05/24/12	Renew	25.0	2	7.88	7.89	8.00	8.04	8.03	7.81	AK
05/25/12	72 Hr.	25.7	2	8.08	8.23	8.35	8.38	8.49	8.53	TB
05/25/12	Renew	25.2	2	7.93	8.07	8.11	8.10	8.17	8.15	TB
05/26/12	96 Hr.	25.8	2	7.95	8.06	8.16	8.25	8.44	8.44	SK
05/26/12	Renew	25.0	3	8.13	8.07	8.08	8.09	8.07	8.06	SK
05/27/12	120 Hr.	25.7	3	7.87	8.06	8.16	8.25	8.40	8.43	SK
05/27/12	Renew	25.1	3	8.23	8.20	8.26	8.30	8.35	8.39	SK
05/28/12	144 Hr.	25.8	3	7.92	8.12	8.22	8.25	8.36	8.43	TB
05/28/12	Renew	25.5	3	8.12	8.06	8.08	8.05	8.03	8.03	TB
05/29/12	168 Hr.	25.8	3	8.19	8.18	8.09	8.07	8.01	7.99	AK

Date	Time	Temp	Samp. No.	DO (mg/L) of Solution						Analyst
				CON	32%	45%	54%	75%	100%	
05/22/12	Start	25.0	1	7.39	7.31	7.39	7.36	7.34	8.62	AK
05/23/12	24 Hr.	25.8	1	7.79	7.68	7.67	7.57	7.62	7.57	MJ
05/23/12	Renew	25.9	1	8.54	8.80	8.74	8.68	8.64	8.58	MJ
05/24/12	48 Hr.	25.7	1	7.42	7.39	7.47	7.44	7.47	7.53	AK
05/24/12	Renew	25.0	2	7.47	7.43	7.50	7.54	7.45	8.71	AK
05/25/12	72 Hr.	25.7	2	8.06	8.04	8.11	8.04	7.98	7.99	TB
05/25/12	Renew	25.2	2	8.71	8.67	8.68	8.65	8.36	8.27	TB
05/26/12	96 Hr.	25.8	2	8.35	8.38	8.39	8.32	8.21	8.22	SK
05/26/12	Renew	25.0	3	8.51	8.60	8.55	8.58	8.57	8.80	SK
05/27/12	120 Hr.	25.7	3	8.46	8.49	8.52	8.49	8.61	8.49	SK
05/27/12	Renew	25.1	3	8.69	8.43	8.43	8.49	8.52	8.55	SK
05/28/12	144 Hr.	25.8	3	8.06	8.23	8.44	8.33	8.24	8.16	TB
05/28/12	Renew	25.5	3	8.33	8.26	8.17	8.13	8.05	7.96	TB
05/29/12	168 Hr.	25.8	3	8.41	8.44	8.36	8.31	8.30	8.12	AK

Huther and Associates
7-Day *Pimephales promelas* Survival and Growth Chronic Toxicity Test

City of Forrest City

Lab ID# 19656

Test Date: May 22, 2012

INITIAL CHEMISTRY MEASUREMENTS @ 100% EFFLUENT

Date	Samp. No.	pH	DO	Hardness mg/L CaCO ₃ ¹	Alkalinity mg/L CaCO ₃ ¹	Conduct. umhos/cm ¹	Resid. Cl ₂ mg/L ¹	Dechlor(mL) Na ₂ S ₂ O ₃ mg/L ¹	Analyst
05/22/12	1	7.97	8.62	284	250	970	<0.01	N/A	TN
05/24/12	2	7.81	8.71	284	260	971	<0.01	N/A	TN
05/26/12	3	8.06	8.80	288	254	966	<0.01	N/A	TN
05/22/12	Con	8.01	7.39	88	60	313	-	-	TN

¹ Measurements taken in 100% solution.

PIMEPHALES PROMELAS STATISTICAL ANALYSES
 Growth

Summary Statistics on Transformed Data Table 1 of 2

Grp	Identification	N	Min	Max	Mean
1	Control	5	0.406	0.492	0.445
2	32% Effluent	5	0.420	0.502	0.471
3	45% Effluent	5	0.417	0.502	0.480
4	54% Effluent	5	0.425	0.505	0.469
5	75% Effluent	5	0.423	0.501	0.479
6	100% Effluent	5	0.407	0.502	0.464

Summary Statistics on Transformed Data Table 2 of 2

Grp	Identification	Variance	Sd	Sem	C.V.%
1	Control	0.002	0.039	0.018	8.82
2	32% Effluent	0.001	0.032	0.014	6.73
3	45% Effluent	0.001	0.036	0.016	7.47
4	54% Effluent	0.001	0.029	0.013	6.26
5	75% Effluent	0.001	0.033	0.015	6.87
6	100% Effluent	0.002	0.044	0.020	9.56

Shapiro - Wilk's Test For Normality

D = 0.031

W = 0.909

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.

Bartlett's Test For Homogeneity of Variance

Calculated B1 statistic = 0.86

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.

ANOVA Table

SOURCE	DF	SS	MS	F
Between	5	0.004	0.001	0.616
Within (Error)	24	0.031	0.001	
Total	29	0.035		

Critical F value = 2.62 (0.05,5,24)

Since F < Critical F Fail to Reject Ho: All equal

Dunnett's Test - Table 1 of 2 Ho:Control < Treatment

Grp	Identification	Transformed Mean	Mean		T Stat	Sig
			Original Units	Calculated In		
1	Control	0.445	0.445			
2	32% Effluent	0.471	0.471		-1.109	
3	45% Effluent	0.480	0.480		-1.522	
4	54% Effluent	0.469	0.469		-1.030	
5	75% Effluent	0.479	0.479		-1.478	
6	100% Effluent	0.464	0.464		-0.836	

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

No statistically significant difference

Dunnett's Test - Table 1 of 2 Ho:Control < Treatment

Grp	Identification	Num of Reps	Minimum Sig Diff (In Orig. Units)	% of Control	Difference from Control
1	Control	5			
2	32% Effluent	5	0.054	12.0	-0.025
3	45% Effluent	5	0.054	12.0	-0.035
4	54% Effluent	5	0.054	12.0	-0.023
5	75% Effluent	5	0.054	12.0	-0.034
6	100% Effluent	5	0.054	12.0	-0.019

**APPENDIX A
RAW DATA**

7-DAY CERIODAPHNA DUBIA SURVIVAL & REPRODUCTION

DAILY RAW DATA TABLE

CLIENT Forrest City

START DATE/TIME 5-22-12 Jh 1530

OUTFALL 001

END DATE/TIME 5/29/12 BH 1530

LAB ID # 19656

CON

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
5/23	A	A	A	A	A	A	A	A	A	A	UD	1530
5/24	A	A	A	A	A	A	A	A	A	A	UD	1445
5/25	A	A	A	A	A	A	A	A	A	A	TN	1230
5/26	A	2	2	2	A	A	A	3	A	A	Jh	1305
5/27	4	A	A	A	4	3	3	A	3	4	Jh	0920
5/28	7	6	8	8	9	7	7	6	7	6	TN	1345
5/29	10	11	11	12	10	9	14	12	10	11	BH	1530
	21	19	21	22	23	19	24	21	20	21		

\bar{x} # Young w/o Dead = 21.1 CV% = 7.56

\bar{x} # Young w/Dead = CV% =

\bar{x} % Survival = 100.0 CV% = 0.00

32

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
5/23	A	A	A	A	A	A	A	A	A	A	UD	1530
5/24	A	A	A	A	A	A	A	A	A	A	UD	1445
5/25	A	A	A	A	A	A	A	A	A	A	TN	1230
5/26	4	A	A	A	A	A	A	A	4	4	Jh	1305
5/27	A	3	4	4	5	4	3	4	A	A	Jh	0920
5/28	6	8	7	9	8	10	7	9	9	7	TN	1345
5/29	9	11	14	12	10	14	14	13	12	13	BH	1530
	19	22	25	25	23	28	24	26	25	24		

\bar{x} # Young w/o Dead = 24.1 CV% = 10.06

\bar{x} # Young w/Dead = CV% =

\bar{x} % Survival = 100.0 CV% = 0.00

45

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
5/23	A	A	A	A	A	A	A	A	A	A	UD	1530
5/24	A	A	A	A	A	A	A	A	A	A	UD	1445
5/25	A	A	A	A	A	A	A	A	A	A	TN	1230
5/26	A	A	4	A	2	3	4	4	A	A	Jh	1305
5/27	5	3	A	3	A	A	A	A	5	5	Jh	0920
5/28	7	6	6	9	6	8	10	7	6	9	TN	1345
5/29	12	14	11	12	14	13	13	14	11	12	BH	1530
	24	23	21	24	22	24	27	25	22	26		

\bar{x} # Young w/o Dead = 23.8 CV% = 7.87

\bar{x} # Young w/Dead = CV% =

\bar{x} % Survival = 100.0 CV% = 0.00

54

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
5/23	A	A	A	A	A	A	A	A	A	A	UD	1530
5/24	A	A	A	A	A	A	A	A	A	A	UD	1445
5/25	A	A	A	A	A	A	A	A	A	A	TN	1230
5/26	A	4	A	A	2	3	A	4	3	3	Jh	1305
5/27	2	A	6	2	A	A	4	A	A	6	Jh	0920
5/28	6	8	11	9	9	10	10	11	7	A	TN	1345
5/29	13	14	12	14	14	11	11	14	13	12	BH	1530
	21	26	29	25	25	24	25	29	23	21		

\bar{x} # Young w/o Dead = 24.8 CV% = 11.21

\bar{x} # Young w/Dead = CV% =

\bar{x} % Survival = 100.0 CV% = 0.00

7-DAY CERIODAPHnia DUBIA SURVIVAL & REPRODUCTION
DAILY RAW DATA TABLE
PAGE 2 OF 2

CLIENT Forrest City
OUTFALL 001
LAB ID # 19656
75

START DATE/TIME 5-22-12 Jh 1530
END DATE/TIME 5/29/12 BH 1530

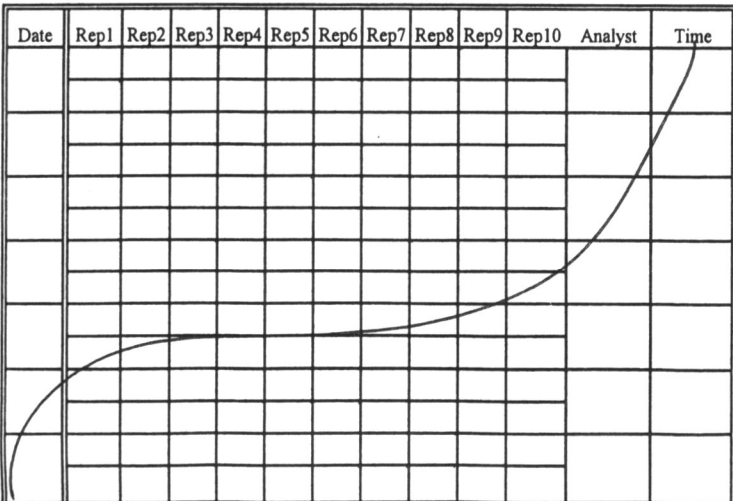
Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
5/23	A	A	A	A	A	A	A	A	A	A	KD	1530
5/24	A	A	A	A	A	A	A	A	A	A	KD	1445
5/25	A	A	A	A	A	A	A	A	A	A	TN	1230
5/26	2	2	3	A	4	A	A	2	2	4	Jh	0920 ¹³⁰⁵
5/27	A	A	A	2	A	4	4	A	A	A	Jh	0920
5/28	7	8	6	9	9	7	9	11	6	7	TN	1345
5/29	13	13	14	12	14	14	11	13	14	14	BH	1530
	22	23	23	23	27	25	24	26	22	25		

\bar{x} # Young w/o Dead = 24.0 CV% = 7.08
 \bar{x} # Young w/Dead = CV% =
 \bar{x} % Survival = 100.0 CV% = 0.00

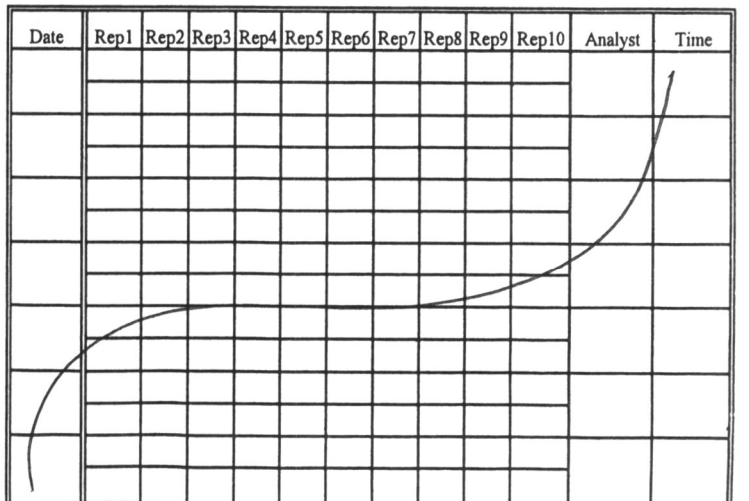
100

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
5/23	A	A	A	A	A	A	A	A	A	A	KD	1530
5/24	A	A	A	A	A	A	A	A	A	A	KD	1445
5/25	A	A	A	A	A	A	A	A	A	A	TN	1235
5/26	4	3	2	3	5	A	4	A	4	A	Jh	0920 ¹³⁰⁵
5/27	A	A	A	A	A	4	A	5	A	4	Jh	0920
5/28	8	6	9	10	10	7	8	8	7	10	TN	1345
5/29	12	14	14	13	12	12	12	12	14	14	BH	1530
	24	23	25	26	27	23	24	25	25	28		

\bar{x} # Young w/o Dead = 25.0 CV% = 6.53
 \bar{x} # Young w/Dead = CV% =
 \bar{x} % Survival = 100.0 CV% = 0.00



\bar{x} # Young w/o Dead = CV% =
 \bar{x} # Young w/Dead = CV% =
 \bar{x} % Survival = CV% =



\bar{x} # Young w/o Dead = CV% =
 \bar{x} # Young w/Dead = CV% =
 \bar{x} % Survival = CV% =

Chronic Toxicity Summary Form

Permittee: Forrest City
 Or fall: 601
 ID No.: 19656
 In Time/Date: 5-22-12 1530 End Date/Time: 5-29-12 1530

Ceriodaphnia dubia
 Chemical Parameters Chart

Date	Time	Temp.	Samp. No.	pH of Solution						Analyst
				CON	32	45	54	75	100	
5/22	Start	25.0	1	8.01	8.05	8.11	8.13	8.12	7.97	AK
5/23	24 Hr.	25.3	1	8.24	8.10	8.20	8.28	8.35	8.43	J
5/23	Renew	25.9	1	8.22	8.24	8.17	8.19	8.20	8.19	J
5/24	48 Hr.	24.6	1	8.16	8.17	8.35	8.45	8.49	8.58	AK
5/24	Renew	25.0	2	7.88	7.89	8.00	8.04	8.03	7.81	AK
5/25	72 Hr.	24.9	2	8.00	8.17	8.28	8.34	8.48	8.51	TB
5/25	Renew	25.2	2	7.93	8.07	8.11	8.10	8.17	8.15	TB
5/26	96 Hr.	25.1	2	8.23	8.20	8.25	8.33	8.39	8.50	SK
5/26	Renew	25.0	3	8.13	8.07	8.08	8.09	8.09	8.06	SK
5/27	120 Hr.	25.3	3	8.15	8.28	8.36	8.46	8.61	8.64	SK
5/27	Renew	25.1	3	8.23	8.20	8.26	8.30	8.35	8.39	SK
5/28	144 Hr.	24.9	3	8.02	8.21	8.30	8.36	8.45	8.54	TB
5/28	Renew	25.5	3	8.12	8.06	8.08	8.05	8.03	8.03	TB
5/29	168 Hr.	24.7	3	8.15	8.09	8.08	8.01	8.00	7.99	AK

Date	Time	Temp.	Samp. No.	DO(mg/L) of Solution						Analyst
				CON	32	45	54	75	100	
5/22	Start	25.0	1	7.39	7.31	7.39	7.36	7.34	8.62	AK
5/23	24 Hr.	25.3	1	8.42	8.49	8.32	8.22	8.22	8.16	J
5/23	Renew	25.9	1	8.54	8.80	8.74	8.68	8.64	8.58	J
5/24	48 Hr.	24.6	1	7.53	7.48	7.44	7.44	7.48	7.45	AK
5/24	Renew	25.0	2	7.47	7.43	7.50	7.54	7.45	8.71	AK
5/25	72 Hr.	24.9	2	8.43	8.30	8.28	8.21	8.04	8.00	TB
5/25	Renew	25.2	2	8.71	8.67	8.68	8.65	8.36	8.27	TB
5/26	96 Hr.	25.1	2	8.75	8.69	8.62	8.57	8.39	8.40	SK
5/26	Renew	25.0	3	8.51	8.60	8.55	8.58	8.57	8.80	SK
5/27	120 Hr.	25.3	3	8.07	8.07	8.06	8.09	8.06	7.97	SK
5/27	Renew	25.1	3	8.69	8.43	8.43	8.49	8.52	8.55	SK
5/28	144 Hr.	24.9	3	8.18	8.10	8.04	8.01	7.93	7.87	TB
5/28	Renew	25.5	3	8.33	8.26	8.17	8.13	8.05	7.96	TB
5/29	168 Hr.	24.7	3	8.34	8.51	8.11	8.05	8.11	8.13	AK

7-DAY CHRONIC TOXICITY TEST
PIMEPHALES PROMELAS (fathead minnow) SURVIVAL

CLIENT/FACILITY Forrest City
 OUTFALL # 001 PROJECT # 19656
 ORGANISM ID# PP0-12-142

DATE/TIME STARTED 5-22-12 TN 1610
 DATE/TIME ENDED 5-29-12 NC 1610

Conc.	A					B					C					D					E				
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
CON	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
32	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
45	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
54	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
75	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
100	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Initials Date/Time	5-23-12 NC 1610					5-24-12 NC 0840					5-25-12 SK 0910					5-26-12 KD 1205					5-27-12 KD 1320				

Conc.	A	B	C	D	E	A	B	C	D	E	Mean Survival	C.V. %
CON	8	8	8	8	8	8	8	8	8	8	100.0	0.00
32	8	8	8	8	8	8	8	8	8	8	100.0	0.00
45	8	8	8	8	8	8	8	8	8	8	100.0	0.00
54	8	8	8	8	8	8	8	8	8	8	100.0	0.00
75	8	8	8	8	8	8	8	8	8	8	100.0	0.00
100	8	8	8	8	8	8	8	8	8	8	100.0	0.00
Initials Date/Time	5-28-12 KD 1355					5-29-12 NC . 10						

Chronic Toxicity Summary Form

Permitee: Forrest Crty
 Outfall: 001
 ID No.: 19656
 Begin Time/Date: 5-22-12 11010 End Date/Time: 5-29-12 11010

Pimephales promelas
 Chemical Parameters Chart

Date	Time	Temp.	Samp. No.	32 pH of Solution						Analyst
				CON	34	45	54	75	100	
5/22	Start	25.0	1	8.01	8.05	8.11	8.13	8.12	7.97	AK
5/23	24 Hr.	25.8	1	8.25	8.17	8.25	8.35	8.41	8.48	J
5/23	Renew	25.9	1	8.22	8.24	8.17	8.19	8.20	8.19	J
5/24	48 Hr.	25.7	1	8.07	8.03	8.22	8.24	8.29	8.41	JAK
5/24	Renew	25.0	2	7.88	7.89	8.00	8.04	8.03	7.81	AK
5/25	72 Hr.	25.7	2	8.08	8.23	8.35	8.38	8.49	8.53	TB
5/25	Renew	25.2	2	7.93	8.07	8.11	8.10	8.17	8.15	TB
5/26	96 Hr.	25.8	2	7.95	8.06	8.16	8.25	8.44	8.44	SK
5/26	Renew	25.0	3	8.13	8.07	8.08	8.09	8.07	8.06	SK
5/27	120 Hr.	25.7	3	7.87	8.06	8.16	8.25	8.40	8.43	SK
5/27	Renew	25.1	3	8.23	8.20	8.26	8.30	8.35	8.39	SK
5/28	144 Hr.	25.8	3	7.92	8.12	8.22	8.25	8.36	8.43	TB
5/28	Renew	25.5	3	8.12	8.06	8.08	8.05	8.03	8.03	TB
5/29	168 Hr.	25.8	3	8.19	8.18	8.09	8.07	8.01	7.99	AK

Date	Time	Temp.	Samp. No.	DO(mg/L) of Solution						Analyst
				CON	32	45	54	75	100	
5/22	Start	25.0	1	7.39	7.31	7.39	7.36	7.34	8.62	AK
5/23	24 Hr.	25.8	1	7.79	7.68	7.67	7.57	7.62	7.57	J
5/23	Renew	25.9	1	8.54	8.80	8.74	8.68	8.64	8.58	J
5/24	48 Hr.	25.7	1	7.42	7.39	7.47	7.44	7.47	7.53	JAK
5/24	Renew	25.0	2	7.47	7.43	7.50	7.54	7.45	8.71	AK
5/25	72 Hr.	25.7	2	8.06	8.04	8.11	8.04	7.98	7.99	TB
5/25	Renew	25.2	2	8.71	8.67	8.68	8.65	8.36	8.27	TB
5/26	96 Hr.	25.8	2	8.35	8.38	8.39	8.32	8.21	8.22	SK
5/26	Renew	25.0	3	8.51	8.60	8.55	8.58	8.57	8.80	SK
5/27	120 Hr.	25.7	3	8.46	8.49	8.52	8.49	8.61	8.49	SK
5/27	Renew	25.1	3	8.69	8.43	8.43	8.49	8.52	8.55	SK
5/28	144 Hr.	25.8	3	8.06	8.23	8.44	8.33	8.24	8.16	TB
5/28	Renew	25.5	3	8.33	8.26	8.17	8.13	8.05	7.96	TB
5/29	168 Hr.	25.8	3	8.41	8.44	8.36	8.31	8.30	8.12	AK

Client / Facility Forrest City
 Lab ID Number 19656
 Outfall Number 001
 Test Date 5-22-12

INITIAL CHEMISTRY MEASUREMENTS @ 100% EFFLUENT

Date	Samp. No.	pH	DO	Hardness mg/L CaCO ₃ ¹	Alkalinity mg/L CaCO ₃ ¹	Conduct. umhos/cm ¹	Resid. Cl ₂ mg/L ¹	Dechlor(mL) Na ₂ S ₂ O ₃ mg/L ¹	Analyst
5/22	1	7.97	8.62	284	250	970	10.01	Na	TN
5/24	2	7.81	8.71	284	260	971	~	~	~
5/26	3	8.06	8.80	288	254	966	~	~	~
5/22	Con	8.01	7.39	88	60	313	-	-	~

INITIAL CHEMISTRY MEASUREMENTS @ RECEIVING WATER

Date	Samp. No.	pH	DO	Hardness mg/L CaCO ₃ ¹	Alkalinity mg/L CaCO ₃ ¹	Conduct. umhos/cm ¹	Resid. Cl ₂ mg/L ¹	Dechlor(mL) Na ₂ S ₂ O ₃ mg/L ¹	Analyst

Notes:

**APPENDIX B
REFERENCE TOXICANTS**



CHRONIC REFERENCE TOXICANT TEST RESULTS

SPECIES: *Ceriodaphnia dubia*

CHEMICAL: Sodium Chloride

DURATION: 7-Days

TEST NUMBER: 5

TEST DATE/TIME: 05/03/12 - 05/10/12
1135 Hrs - 1135 Hrs

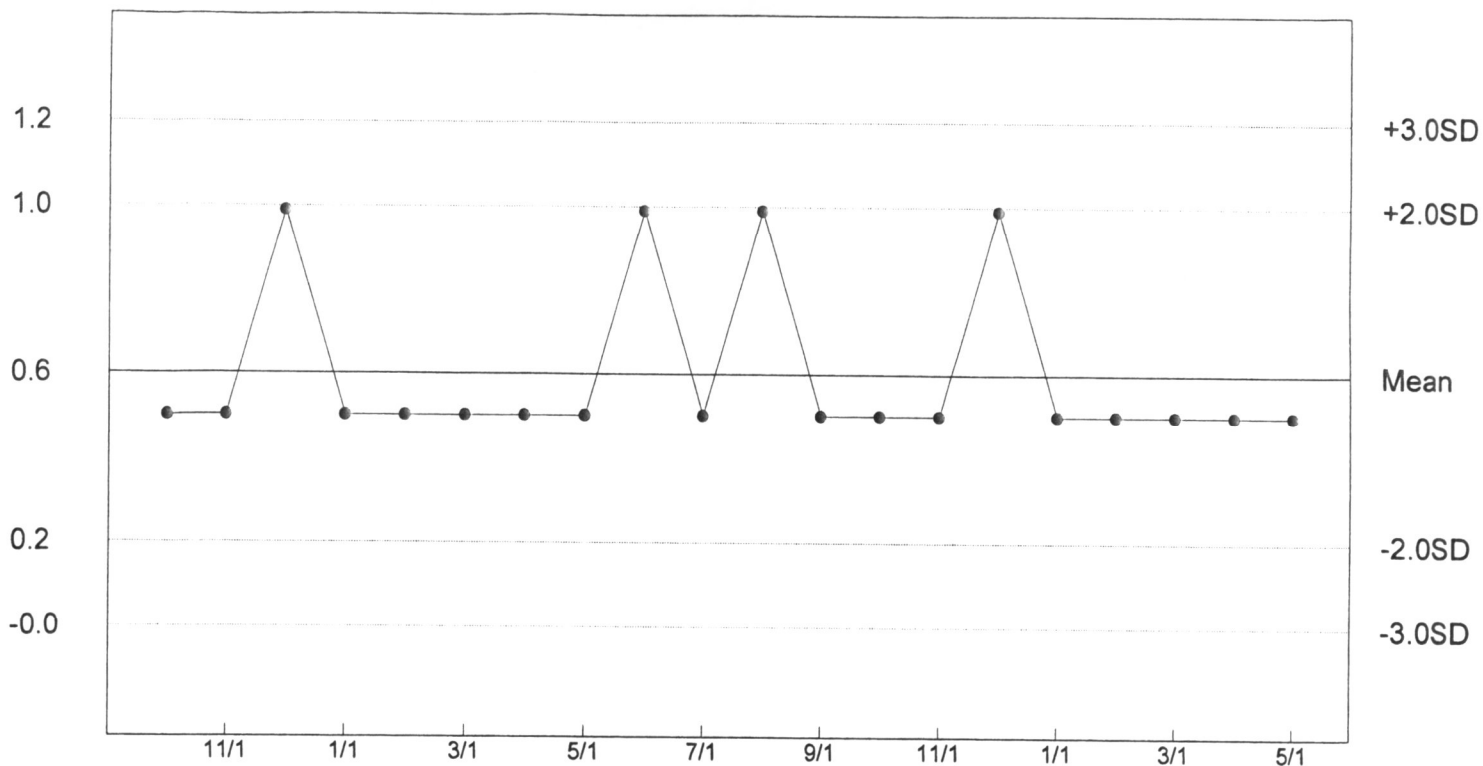
STATISTICAL METHOD: Fishers,Dunnetts/Steels

CONCENTRATION (g/L)	NUMBER EXPOSED	NUMBER DEAD
0.5	10	0
1.0	10	2
1.5	10	3
2.0	10	9
2.5	10	10
3.0	10	10
4.0	10	10

LOEC FOR SURVIVAL	NOEC FOR SURVIVAL	LOEC FOR REPRODUCTION	NOEC FOR REPRODUCTION
2.0 g/L	1.5 g/L	1.0 g/L	0.5 g/L

Ref. Toxicant Sodium chloride g/L

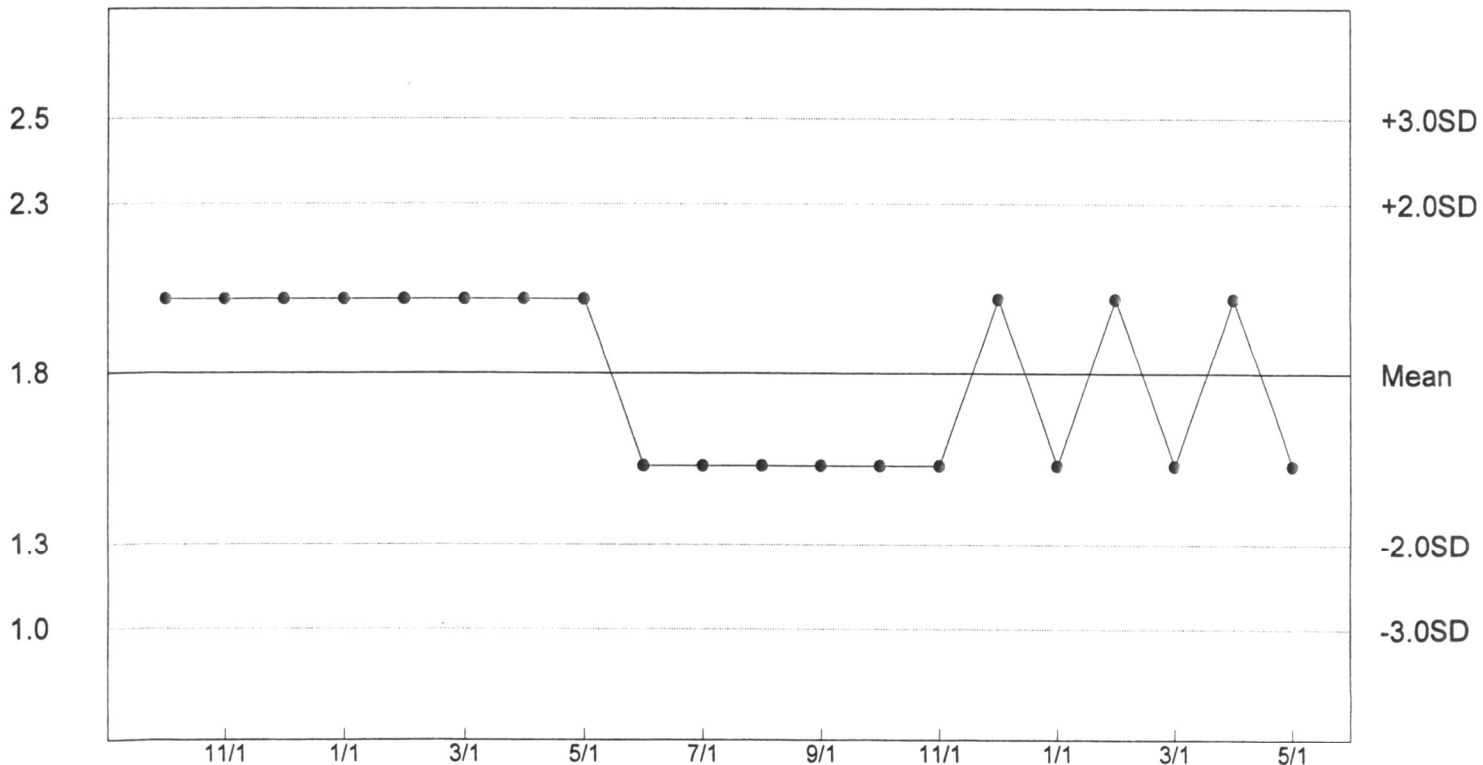
C. dubia Reproduction - NOEC



n= 20 Mean= 0.6 SD= 0.2 CV= 34.20% Min= 0.5 Max= 1.0

Ref. Toxicant Sodium chloride g/L

C. dubia Survival - NOEC



n= 20 Mean= 1.8 SD= 0.3 CV= 14.38% Min= 1.5 Max= 2.0

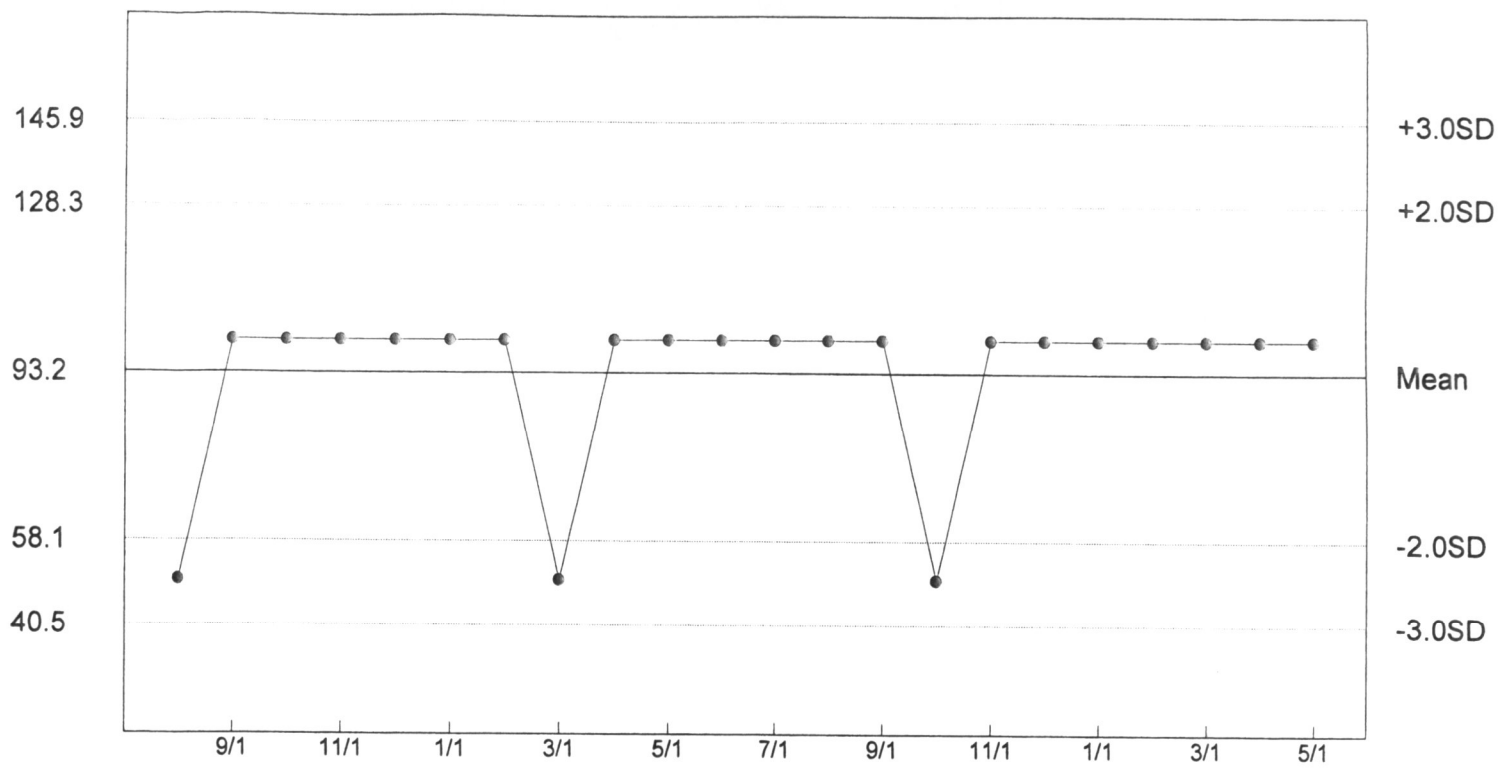
CHRONIC REFERENCE TOXICANT TEST RESULTS

SPECIES: *Pimephales promelas*
 CHEMICAL: Copper Nitrate
 DURATION: 7-Days
 TEST NUMBER: 5
 TEST DATE: 05/03/12 - 05/10/12
 1605 Hrs - 1605 Hrs
 STATISTICAL METHOD: Dunnetts/Steels

CONCENTRATION (ug/L)	NUMBER EXPOSED	NUMBER DEAD
12.5	40	0
25	40	0
50	40	1
100	40	1
200	40	29
400	40	40
800	40	40

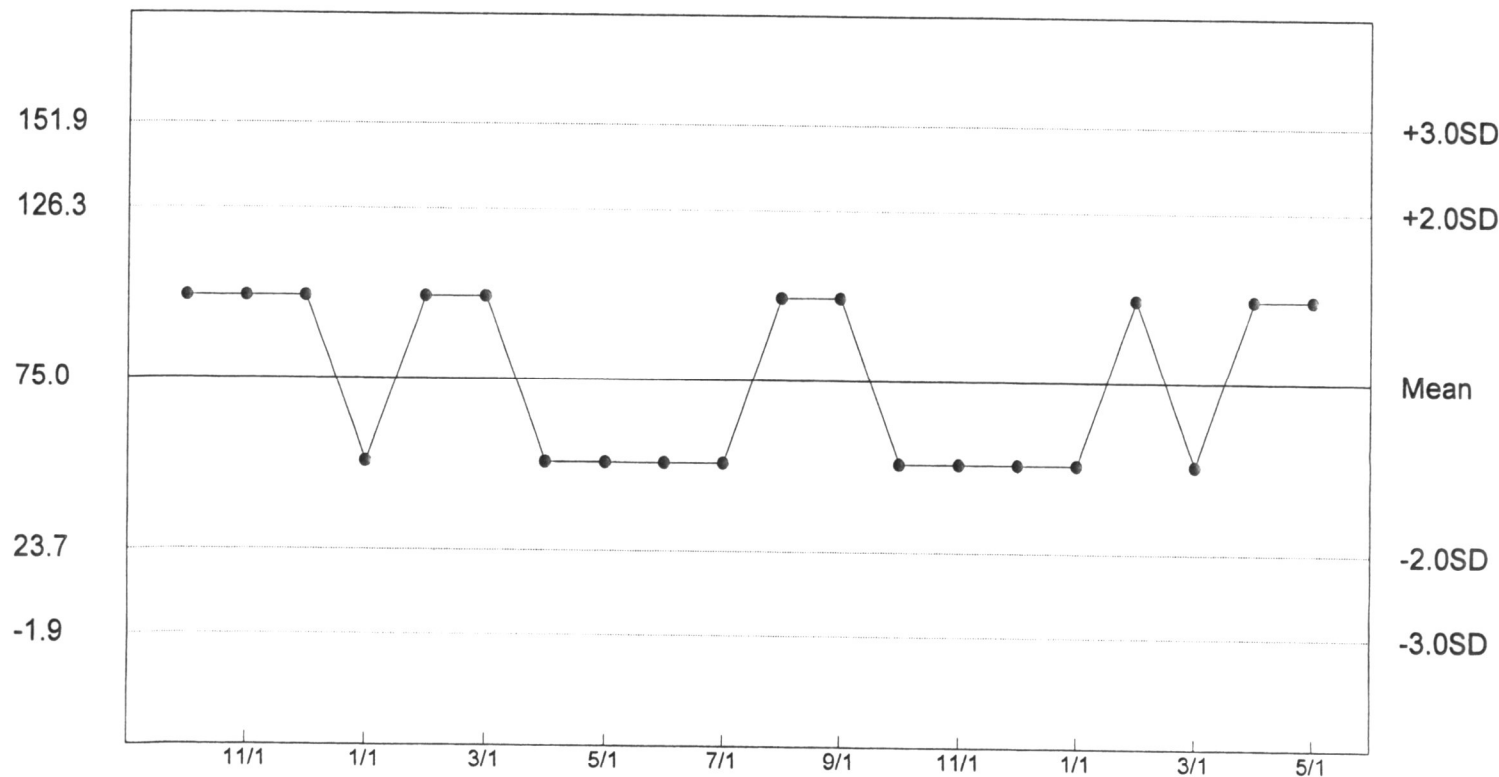
LOEC FOR SURVIVAL	NOEC FOR SURVIVAL	LOEC FOR GROWTH	NOEC FOR GROWTH
200 ug/L	100 ug/L	200 ug/L	100 ug/L

Ref. Toxicant Copper Nitrate ug/L
P. promelas Chronic Survival - NOEC



n= 22 Mean= 93.2 SD= 17.6 CV= 18.85% Min= 50.0 Max= 100.0

Ref. Toxicant Copper Nitrate ug/L
P. promelas Chronic Growth - NOEC



n= 20 Mean= 75.0 SD= 25.6 CV= 34.20% Min= 50.0 Max= 100.0

APPENDIX C
CHAIN OF CUSTODY SHEETS

HUTHER & ASSOCIATES
 1156 NORTH BONNIE BRAE STREET
 DENTON, TX 76201
 (940) 387-1025 • FAX (940) 387-1036

CHAIN OF CUSTODY RECORD

PROJECT # 19656 PROJECT NAME Forest City PERMIT # NPDES ARO020087

OUTFALL SAMPLES

24-Hr Flow Weighted Composite Other _____

OUTFALL NUMBER	PERSON TAKING SAMPLE	START DATE/TIME	END DATE/TIME	# OF PORTIONS COMPOSITED	METHODS OF COLLECTION AND COMPOSITE			# OF CONTAINERS TO BE SHIPPED
					AUTO COLL. AUTO COMP.	MANUAL COLL. MANUAL COMP.	AUTO COLL. MANUAL COMP.	
001	Joel R. Thetford	5-20-12 10:00AM	5-21-12 10:00AM	243	X			1

RECEIVING WATER SAMPLES

SAMPLE IDENTIFICATION (FOR REC'NG) H ₂ O GRABS, GIVE NAME OF STREAM AND LOCATION	PERSON TAKING SAMPLE	DATE	TIME	# OF CONTAINERS TO BE SHIPPED

TYPE OF TEST 7 day C/F
 NAME OF RECEIVING WATER unnamed trib. of L'Anquille River
 DILUTION WATER USED FOR THIS TEST LAB

RELINQUISHED BY: Joel R. Thetford DATE: 5-21-12 TIME: 11:00AM RECEIVED BY AT THIS DATE/TIME _____
 RELINQUISHED BY: _____ DATE: _____ TIME: _____ RECEIVED BY AT THIS DATE/TIME _____
 RELINQUISHED BY: _____ DATE: _____ TIME: _____ RECEIVED BY AT THIS DATE/TIME _____
 METHOD OF SHIPMENT: Greyhound Pick Up _____ Client Delivered _____ Other _____
 RECEIVED: [Signature] DATE: 5-22-12 TIME: 1010 SAMPLE TEMP. @ RECEIPT. 5.9

HUTHER & ASSOCIATES
 1156 NORTH BONNIE BRAE STREET
 DENTON, TX 76201
 (940) 387-1025 • FAX (940) 387-1036

CHAIN OF CUSTODY RECORD

PROJECT # 19656 PROJECT NAME Forrest City PERMIT # NPDES AR0020087

OUTFALL SAMPLES

24-Hr Flow Weighted Composite Other _____

OUTFALL NUMBER	PERSON TAKING SAMPLE	START DATE/TIME	END DATE/TIME	# OF PORTIONS COMPOSITED	METHODS OF COLLECTION AND COMPOSITE			# OF CONTAINERS TO BE SHIPPED
					AUTO COLL. AUTO COMP.	MANUAL COLL. MANUAL COMP.	AUTO COLL. MANUAL COMP.	
001	Joel R. Thorford	10 Am 5-22-12	10 Am 5-23-12	233	X			1

RECEIVING WATER SAMPLES

SAMPLE IDENTIFICATION (FOR REC'NG) H ₂ O GRABS, GIVE NAME OF STREAM AND LOCATION	PERSON TAKING SAMPLE	DATE	TIME	# OF CONTAINERS TO BE SHIPPED

TYPE OF TEST Today C/E
 NAME OF RECEIVING WATER unnamed tri. of L'Anquille River
 DILUTION WATER USED FOR THIS TEST LAB

RELINQUISHED BY: Joel R Thorford DATE: 5-23-12 TIME: 11:15 AM RECEIVED BY AT THIS DATE/TIME _____

RELINQUISHED BY: _____ DATE: _____ TIME: _____ RECEIVED BY AT THIS DATE/TIME _____

RELINQUISHED BY: _____ DATE: _____ TIME: _____ RECEIVED BY AT THIS DATE/TIME _____

METHOD OF SHIPMENT: Greyhound Pick Up _____ Client Delivered _____ Other _____

RECEIVED: Rachael DATE: 5-24-12 TIME: 1030 SAMPLE TEMP. @ RECEIPT. 5.4

HUTHER & ASSOCIATES
 1156 NORTH BONNIE BRAE STREET
 DENTON, TX 76201
 (940) 387-1025 • FAX (940) 387-1036

CHAIN OF CUSTODY RECORD

PROJECT # 19656 PROJECT NAME Forrest City PERMIT # NPDES ARO020087

OUTFALL SAMPLES

24-Hr Flow Weighted Composite Other _____

OUTFALL NUMBER	PERSON TAKING SAMPLE	START DATE/TIME	END DATE/TIME	# OF PORTIONS COMPOSITED	METHODS OF COLLECTION AND COMPOSITE			# OF CONTAINERS TO BE SHIPPED
					AUTO COLL. AUTO COMP.	MANUAL COLL. MANUAL COMP.	AUTO COLL. MANUAL COMP.	
001	Wayne Hawk	10:00am 5-24-12	10:00am 5-25-12	229	<input checked="" type="checkbox"/>			1

RECEIVING WATER SAMPLES

SAMPLE IDENTIFICATION (FOR REC'NG) H ₂ O GRABS, GIVE NAME OF STREAM AND LOCATION	PERSON TAKING SAMPLE	DATE	TIME	# OF CONTAINERS TO BE SHIPPED

TYPE OF TEST 7 day C/F
 NAME OF RECEIVING WATER unnamed trib. of Anguille River
 DILUTION WATER USED FOR THIS TEST LAB

RELINQUISHED BY: Wayne Hawk DATE: 5-25-12 TIME: 10:10 Am RECEIVED BY AT THIS DATE/TIME _____
 RELINQUISHED BY: _____ DATE: _____ TIME: _____ RECEIVED BY AT THIS DATE/TIME _____
 RELINQUISHED BY: _____ DATE: _____ TIME: _____ RECEIVED BY AT THIS DATE/TIME _____
 METHOD OF SHIPMENT: Greyhound Pick Up _____ Client Delivered _____ Other _____

RECEIVED: [Signature] DATE: 5-26-12 TIME: 0900 SAMPLE TEMP. @ RECEIPT. 3.1°C

**CITY OF FORREST CITY
NPDES PERMIT NO. AR0020087
BIOMONITORING REPORTING
TEST DATE: 05/22/12**

I. *Ceriodaphnia dubia*

	Response
(A) If the NOEC for survival is less than the critical dilution, enter a "1"; otherwise, enter a "0". Parameter No. TLP3B.	0
(B) If the NOEC for reproduction is less than the critical dilution, enter a "1"; otherwise, enter a "0". Parameter No. TGP3B.	0
(C) Report the NOEC value for survival, Parameter No. TOP3B.	100%
(D) Report the NOEC value for reproduction, Parameter No. TPP3B.	100%
(E) Report the higher (critical dilution or control) Coefficient of Variation, Parameter No. TQP3B.	7.56%

II. *Pimephales promelas* (fathead minnow)

	Response
(A) If the No Observed Effect Concentration (NOEC) for survival is less than the critical dilution, enter a "1"; otherwise, enter a "0". Parameter No. TLP6C.	0
(B) If the No Observed Effect Concentration (NOEC) for growth is less than the critical dilution, enter a "1"; otherwise, enter a "0". Parameter No. TGP6C.	0
(C) Report the NOEC value for survival, Parameter No. TOP6C.	100%
(D) Report the NOEC value for growth, Parameter No. TPP6C.	100%
(E) Report the highest (critical dilution or control) Coefficient of Variation, Parameter No. TQP6C.	9.56%

22415 Retest Number 1	Leave Blank
22416 Retest Number 2	Leave Blank

Forrest City Water Utility

303 North Rosser St.

P.O. Box 816

Forrest City, AR 72335



ARK DEPT OF ENVIRONMENTAL QUALITY
NPDES Enforcement Section
5301 NORTHSORE DRIVE
NORTH LITTLE ROCK, AR 72218

