

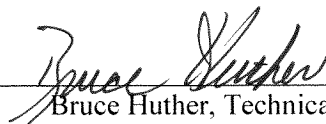
CITY OF ROGERS
OUTFALL 001

Chronic Biomonitoring Report
Permit Number NPDES AR0043397
AFIN 04-00155

Ceriodaphnia dubia
Pimephales promelas

December 14, 2021

Reviewed by:



Bruce Huther, Technical Director
Huther & Associates, Inc.
1156 North Bonnie Brae
Denton, Texas 76201
(940) 387-1025, Fax: (940) 387-1036

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TOXICITY TEST REPORT - CHRONIC

Client	City of Rogers	Laboratory I.D.	33403
Permit No.	NPDES AR0043397	Begin Date	December 14, 2021
Sample.....	Outfall 001		

Results: **Pass** *Ceriodaphnia dubia* survival and reproduction and *Pimephales promelas* survival and growth at the critical concentration (82% effluent).

SAMPLE COLLECTION

Composite effluent samples from City of Rogers were delivered by Federal Express courier to Huthier & Associates on December 14, December 16, and December 18, 2021. 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, 23rd Edition, 4500-C1 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 1615 hours, December 14, 2021. Five concentrations were prepared (26%, 35%, 46%, 62% and 82% effluent) utilizing distilled, deionized laboratory water reconstituted to match the hardness, alkalinity and pH of the receiving stream (Osage Creek). 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 ten 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 1615 hours, December 21, 2021. 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: 82% 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 **PMSD: 7.9%**
NOEC: 82% Effluent

TEST SETUP
Pimephales promelas



The seven-day *Pimephales promelas* larval survival and growth test was initiated at 1610 hours, December 14, 2021. Five concentrations were prepared (26%, 35%, 46%, 62% and 82% effluent) utilizing distilled, deionized laboratory water reconstituted to match the hardness, alkalinity and pH of the receiving stream (Osage Creek). The test was conducted in 300 mL distilled water rinsed plastic beakers containing 250 mL of solution (eight organisms 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 beakers 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, December 21, 2021. 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).

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

CLIENT City of Rogers	SAMPLE TYPE 24 Hour Composite
NPDES # AR0043397	DATE COLLECTED 12/13/21 12/15/21 12/17/21
LAB ID # 33403	DATE RECEIVED 12/14/21 12/16/21 12/18/21
TEST TYPE 7 Day Chronic	BEGIN DATE/TIME 12/14/21 1615
TEST ORGANISM <i>Ceriodaphnia dubia</i>	END DATE/TIME 12/21/21 1615
ORGANISM AGE < 24-Hours	TEST TEMPERATURE (°C) 25 ± 1
ORGANISM SOURCE In House	PHOTO PERIOD 16-hr. Light 8-hr. Dark
RECEIVING WATER Osage Creek	LIGHT INTENSITY 50-100 ft. cndl.
DILUTION WATER Laboratory	TECHNICIAN M. Horner

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		
12/15/21	A	A	A	A	A	A	A	A	A	A	A	
	0	0	0	0	0	0	0	0	0	0	0	
12/16/21	A	A	A	A	A	A	A	A	A	A	A	
	0	0	0	0	0	0	0	0	0	0	0	
12/17/21	A	A	A	A	A	A	A	A	A	A	A	
	0	0	0	0	0	0	0	0	0	0	0	
12/18/21	3	5	3	4	4	2	5	3	2	2		
	3	5	3	4	4	2	5	3	2	2		
12/19/21	A	A	A	A	A	A	A	A	A	A	A	
	3	5	3	4	4	2	5	3	2	2		
12/20/21	8	8	7	9	7	6	9	6	9	10		
	11	13	10	13	11	8	14	9	11	12		
12/21/21	14	13	12	12	14	12	13	13	13	12		
	25	26	22	25	25	20	27	22	24	24		
x# Young 24.0						C.V. 8.78%						
x%Survival 100%						C.V. 0.00%						

26%Effluent												
Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10		
12/15/21	A	A	A	A	A	A	A	A	A	A	A	
	0	0	0	0	0	0	0	0	0	0	0	
12/16/21	A	A	A	A	A	A	A	A	A	A	A	
	0	0	0	0	0	0	0	0	0	0	0	
12/17/21	A	A	A	A	A	A	A	A	A	A	A	
	0	0	0	0	0	0	0	0	0	0	0	
12/18/21	4	3	2	3	5	3	2	5	3	4		
	4	3	2	3	5	3	2	5	3	4		
12/19/21	A	A	A	A	A	A	A	A	A	A	A	
	4	3	2	3	5	3	2	5	3	4		
12/20/21	8	6	9	6	8	6	8	7	8	8		
	12	9	11	9	13	9	10	12	11	12		
12/21/21	12	14	14	14	13	13	14	13	14	13		
	24	23	25	23	26	22	24	25	25	25		
x# Young 24.2						C.V. 5.08%						
x%Survival 100%						C.V. 0.00%						

35%Effluent												
Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10		
12/15/21	A	A	A	A	A	A	A	A	A	A	A	
	0	0	0	0	0	0	0	0	0	0	0	
12/16/21	A	A	A	A	A	A	A	A	A	A	A	
	0	0	0	0	0	0	0	0	0	0	0	
12/17/21	A	A	A	A	A	A	A	A	A	A	A	
	0	0	0	0	0	0	0	0	0	0	0	
12/18/21	4	3	5	2	5	3	3	5	2	2		
	4	3	5	2	5	3	3	5	2	2		
12/19/21	A	A	A	A	A	A	A	A	A	A	A	
	4	3	5	2	5	3	3	5	2	2		
12/20/21	10	6	6	7	7	6	9	9	8	6		
	14	9	11	9	12	9	12	14	10	8		
12/21/21	14	12	13	13	13	14	13	14	14	14		
	28	21	24	22	25	23	25	28	24	22		
x# Young 24.2						C.V. 9.89%						
x%Survival 100%						C.V. 0.00%						

46%Effluent												
Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10		
12/15/21	A	A	A	A	A	A	A	A	A	A	A	
	0	0	0	0	0	0	0	0	0	0	0	
12/16/21	A	A	A	A	A	A	A	A	A	A	A	
	0	0	0	0	0	0	0	0	0	0	0	
12/17/21	A	A	A	A	A	A	A	A	A	A	A	
	0	0	0	0	0	0	0	0	0	0	0	
12/18/21	5	2	3	4	3	2	3	3	5	4		
	5	2	3	4	3	2	3	3	5	4		
12/19/21	A	A	A	A	A	A	A	A	A	A	A	
	5	2	3	4	3	2	3	3	5	4		
12/20/21	8	8	6	7	7	9	7	6	7	9		
	13	10	9	11	10	11	10	9	12	13		
12/21/21	14	14	12	14	12	12	13	14	13	14		
	27	24	21	25	22	23	23	23	25	27		
x# Young 24.0						C.V. 8.33%						
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

Rogers

Lab ID# 33403

Test Date: December 14, 2021

62%Effluent										
Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12/15/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
12/16/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
12/17/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
12/18/21	3	4	5	2	2	5	3	3	3	2
	3	4	5	2	2	5	3	3	3	2
12/19/21	A	A	A	A	A	A	A	A	A	A
	3	4	5	2	2	5	3	3	3	2
12/20/21	7	10	6	8	7	7	10	6	8	8
	10	14	11	10	9	12	13	9	11	10
12/21/21	12	12	14	14	14	12	13	14	12	14
	22	26	25	24	23	24	26	23	23	24
x# Young 24.0 C.V. 5.56% x%Survival 100% C.V. 0.00%										

82%Effluent										
Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
12/15/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
12/16/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
12/17/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
12/18/21	2	5	3	2	4	4	3	5	3	2
	2	5	3	2	4	4	3	5	3	2
12/19/21	A	A	A	A	A	A	A	A	A	A
	2	5	3	2	4	4	3	5	3	2
12/20/21	7	6	10	6	7	8	7	8	8	10
	9	11	13	8	11	12	10	13	11	12
12/21/21	14	12	12	13	14	12	12	13	14	14
	23	23	25	21	25	24	22	26	25	26
x# Young 24.0 C.V. 7.08% 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

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

Rogers

Lab ID# 33403

Test Date: December 14, 2021

WET CHEMISTRY MEASUREMENTS

Date	Time	Temp	Samp. No.	pH of Solution						Analyst
				CON	26%	35%	46%	62%	82%	
12/14/21	Start	25.0	1	8.28	8.20	8.19	8.14	8.05	8.02	ID
12/15/21	24 Hr.	24.0	1	8.29	8.21	8.15	8.12	8.10	8.04	AM
12/15/21	Renew	24.0	1	8.51	8.30	8.28	8.21	8.20	8.16	AM
12/16/21	48 Hr.	24.3	1	8.51	8.54	8.51	8.49	8.48	8.45	ID
12/16/21	Renew	25.0	2	8.59	8.50	8.40	8.29	8.22	8.15	ID
12/17/21	72 Hr.	23.2	2	8.79	8.51	8.33	8.21	8.15	8.07	ID
12/17/21	Renew	25.0	2	7.80	8.44	8.38	8.30	8.22	8.17	ID
12/18/21	96 Hr.	23.3	2	8.32	8.11	7.95	7.93	7.88	7.77	ID
12/18/21	Renew	25.0	3	8.54	8.38	8.25	8.13	8.04	7.98	ID
12/19/21	120 Hr.	22.6	3	8.24	8.26	8.22	8.14	8.07	8.04	AM
12/19/21	Renew	22.4	3	8.52	8.32	8.22	8.17	8.06	8.02	AM
12/20/21	144 Hr.	22.4	3	7.97	8.53	8.30	8.23	8.14	8.07	AM
12/20/21	Renew	22.5	3	8.55	8.25	8.15	8.05	8.07	7.97	AM
12/21/21	168 Hr.	22.4	3	8.50	8.45	8.37	8.35	8.30	8.32	ID

Date	Time	Temp	Samp. No.	DO (mg/L) of Solution						Analyst
				CON	26%	35%	46%	62%	82%	
12/14/21	Start	25.0	1	8.21	7.97	7.94	8.28	8.39	8.21	ID
12/15/21	24 Hr.	24.0	1	7.67	8.37	7.70	7.98	8.37	8.48	AM
12/15/21	Renew	24.0	1	7.85	7.80	7.93	7.69	8.41	7.91	AM
12/16/21	48 Hr.	24.3	1	7.93	7.85	7.03	7.33	7.85	8.05	ID
12/16/21	Renew	25.0	2	7.14	7.79	8.27	8.27	8.58	8.29	ID
12/17/21	72 Hr.	23.2	2	8.33	7.91	7.79	7.61	8.30	7.00	ID
12/17/21	Renew	25.0	2	7.99	8.39	8.26	7.98	7.42	7.84	ID
12/18/21	96 Hr.	23.3	2	8.25	7.72	7.52	7.88	7.83	8.21	ID
12/18/21	Renew	25.0	3	7.71	7.62	7.50	7.68	7.90	8.07	ID
12/19/21	120 Hr.	22.6	3	8.24	8.24	8.36	8.37	8.64	8.04	AM
12/19/21	Renew	22.4	3	8.22	8.24	7.88	8.06	7.86	8.16	AM
12/20/21	144 Hr.	22.4	3	7.67	7.69	7.83	8.14	8.00	7.44	AM
12/20/21	Renew	22.5	3	7.97	7.72	7.85	7.94	7.94	7.69	AM
12/21/21	168 Hr.	22.4	3	8.45	8.01	7.36	7.26	7.48	7.84	ID

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

Rogers

Lab ID# 33403

Test Date: December 14, 2021

INITIAL CHEMISTRY MEASUREMENTS @ 100% EFFLUENT

Date	Samp. No.	pH ¹	DO ¹	Hardness mg/L CaCO ₃ ¹	Alkalinity mg/L CaCO ₃ ¹	Conduct. μS/cm ¹	Resid.Cl ₂ mg/L ¹	Dechlor(mL) Na ₂ S ₂ O ₃ mg/L ¹	Analyst
12/14/21	1	7.85	7.34	128	112	780	<0.01	N/A	ID
12/16/21	2	7.93	8.16	140	118	681	<0.01	N/A	ID
12/18/21	3	7.68	7.94	144	124	718	<0.01	N/A	ID
12/14/21	CON	8.28	8.21	160	110	520	-	-	MH

¹ Measurements taken in 100% solution.

Huther and Associates, Inc.
 Begin Date: December 14, 2021
 Lab I.D.# 33403

CERIODAPHNIA DUBIA STATISTICAL ANALYSES
 Reproduction

Summary Statistics on Transformed Data Table 1 of 2

Grp	Identification	N	Min	Max	Mean
1	Control	10	20.000	27.000	24.000
2	26% Effluent	10	22.000	26.000	24.200
3	35% Effluent	10	21.000	28.000	24.200
4	46% Effluent	10	21.000	27.000	24.000
5	62% Effluent	10	22.000	26.000	24.000
6	82% Effluent	10	21.000	26.000	24.000

Summary Statistics on Transformed Data Table 2 of 2

Grp	Identification	Variance	Sd	Sem	C.V.%
1	Control	4.444	2.108	0.667	8.78
2	26% Effluent	1.511	1.229	0.389	5.08
3	35% Effluent	5.733	2.394	0.757	9.89
4	46% Effluent	4.000	2.000	0.632	8.33
5	62% Effluent	1.778	1.333	0.422	5.56
6	82% Effluent	2.889	1.700	0.537	7.08

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	3	17	21	17	2

Calculated Chi-Square goodness of fit test statistic = 2.2818

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 = 5.66

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	0.533	0.107	0.031
Within (Error)	54	183.200	3.393	
Total	59	183.733		

Critical F value = 2.45 (0.05,5,40)

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 Calculated In Original Units	T Stat	Sig
1	Control	24.000	24.000		
2	26% Effluent	24.200	24.200	-0.243	
3	35% Effluent	24.200	24.200	-0.243	
4	46% Effluent	24.000	24.000	0.000	
5	62% Effluent	24.000	24.000	0.000	
6	82% Effluent	24.000	24.000	0.000	

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

No statistically significant difference

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

Grp	Identification	Num of Reps	Minimum Diff (In Orig. Units)	Sig % of Control	Difference from Control
1	Control	10			
2	26% Effluent	10	1.903	7.9	-0.200
3	35% Effluent	10	1.903	7.9	-0.200
4	46% Effluent	10	1.903	7.9	0.000
5	62% Effluent	10	1.903	7.9	0.000
6	82% Effluent	10	1.903	7.9	0.000

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

CLIENT	City of Rogers	SAMPLE TYPE	24 Hour Composite
NPDES #	AR0043397	DATE COLLECTED	12/13/21 12/15/21 12/17/21
LAB ID #	33403	DATE RECEIVED	12/14/21 12/16/21 12/18/21
TEST TYPE	7 Day Chronic	BEGIN DATE/TIME	12/14/21 1610
TEST ORGANISM	<i>Pimephales promelas</i>	END DATE/TIME	12/21/21 1610
ORGANISM AGE	< 24-Hours	TEST TEMPERATURE (°C)	25 ± 1
ORGANISM SOURCE	In House	PHOTO PERIOD	16-hr. Light 8-hr. Dark
RECEIVING WATER	Osage Creek	LIGHT INTENSITY	50-100 ft. endl.
DILUTION WATER	Laboratory	TECHNICIAN	J. Castillo

SURVIVAL SUMMARY

Conc.	12/15/21					12/16/21					12/17/21					12/18/21					12/19/21				
	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
26%	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
35%	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
46%	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
62%	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
82%	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.	12/20/21					12/21/21					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
26%	8	8	8	8	8	8	8	8	8	8	100.0	0.00
35%	8	8	8	8	8	8	8	8	8	8	100.0	0.00
46%	8	8	8	8	8	8	8	8	8	8	100.0	0.00
62%	8	8	8	8	8	8	8	8	8	8	100.0	0.00
82%	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	0.4560	0.4230	0.4450	0.4790	0.4230	0.4452	5.32
26%	0.4650	0.4680	0.4810	0.4210	0.4350	0.4540	5.50
35%	0.4290	0.4750	0.4560	0.4820	0.4630	0.4610	4.46
46%	0.4510	0.4800	0.4320	0.4680	0.4790	0.4620	4.42
62%	0.4830	0.4220	0.4670	0.4850	0.4470	0.4608	5.75
82%	0.4350	0.4670	0.4850	0.4880	0.4250	0.4600	6.25

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

Rogers

Lab ID# 33403

Test Date: December 14, 2021

WET CHEMISTRY MEASUREMENTS

Date	Time	Temp	Samp. No.	pH of Solution						Analyst
				CON	26%	35%	46%	62%	82%	
12/14/21	Start	25.0	1	8.28	8.20	8.19	8.14	8.05	8.02	ID
12/15/21	24 Hr.	24.6	1	8.14	8.17	8.24	8.22	8.20	8.17	AM
12/15/21	Renew	24.0	1	8.51	8.30	8.28	8.21	8.20	8.16	AM
12/16/21	48 Hr.	25.0	1	8.31	8.14	8.10	8.03	8.12	8.14	ID
12/16/21	Renew	25.0	2	8.59	8.50	8.40	8.29	8.22	8.15	ID
12/17/21	72 Hr.	23.8	2	8.17	7.95	7.85	7.87	7.83	7.87	ID
12/17/21	Renew	23.2	2	7.80	8.44	8.38	8.30	8.22	8.17	ID
12/18/21	96 Hr.	23.7	2	8.10	8.10	8.07	7.99	8.05	7.99	ID
12/18/21	Renew	25.0	3	8.54	8.38	8.25	8.13	8.04	7.98	ID
12/19/21	120 Hr.	22.6	3	8.22	7.87	8.03	8.08	7.84	7.91	AM
12/19/21	Renew	22.4	3	8.52	8.32	8.22	8.17	8.06	8.02	AM
12/20/21	144 Hr.	22.6	3	8.03	7.86	7.98	8.09	7.87	7.89	AM
12/20/21	Renew	22.5	3	8.55	8.25	8.15	8.05	8.07	7.97	AM
12/21/21	168 Hr.	22.5	3	8.12	7.77	7.80	7.74	7.78	7.70	ID

Date	Time	Temp	Samp. No.	DO (mg/L) of Solution						Analyst
				CON	26%	35%	46%	62%	82%	
12/14/21	Start	25.0	1	8.21	7.97	7.94	8.28	8.39	8.21	ID
12/15/21	24 Hr.	24.6	1	7.94	7.96	7.91	7.85	7.99	7.82	AM
12/15/21	Renew	24.0	1	7.85	7.80	7.93	7.69	8.41	7.91	AM
12/16/21	48 Hr.	25.0	1	8.61	7.60	7.77	7.88	7.20	7.91	ID
12/16/21	Renew	25.0	2	7.14	7.79	8.27	8.27	8.58	8.29	ID
12/17/21	72 Hr.	23.8	2	8.15	8.45	8.50	7.66	8.18	7.59	ID
12/17/21	Renew	23.2	2	7.99	8.39	8.26	7.98	7.42	7.84	ID
12/18/21	96 Hr.	23.7	2	7.84	7.44	7.86	7.66	8.12	7.78	ID
12/18/21	Renew	25.0	3	7.71	7.62	7.50	7.68	7.90	8.07	ID
12/19/21	120 Hr.	22.6	3	7.86	7.94	7.95	8.04	8.07	8.05	AM
12/19/21	Renew	22.4	3	8.22	8.24	7.88	8.06	7.86	8.16	AM
12/20/21	144 Hr.	22.6	3	8.13	8.11	8.09	7.89	7.81	8.00	AM
12/20/21	Renew	22.5	3	8.97	8.72	8.85	8.94	8.94	8.69	AM
12/21/21	168 Hr.	22.5	3	8.11	8.04	7.33	7.28	8.46	7.36	ID

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

Rogers

Lab ID# 33403

Test Date: December 14, 2021

INITIAL CHEMISTRY MEASUREMENTS @ 100% EFFLUENT

Date	Samp. No.	pH ¹	DO ¹	Hardness mg/L CaCO ₃ ¹	Alkalinity mg/L CaCO ₃ ¹	Conduct. μS/cm ¹	Resid.Cl ₂ mg/L ¹	Dechlor(mL) Na ₂ S ₂ O ₃ mg/L ¹	Analyst
12/14/21	1	7.85	7.34	128	112	780	<0.01	N/A	ID
12/16/21	2	7.93	8.16	140	118	681	<0.01	N/A	ID
12/18/21	3	7.68	7.94	144	124	718	<0.01	N/A	ID
12/14/21	CON	8.28	8.21	160	110	520	-	-	MH

¹ Measurements taken in 100% solution.

Huther and Associates, Inc.
 Begin Date: December 14, 2021
 Lab I.D.# 33403

PIMEPHALES PROMELAS STATISTICAL ANALYSES
 Growth

Summary Statistics on Transformed Data Table 1 of 2

Grp	Identification	N	Min	Max	Mean
1	Control	5	0.423	0.479	0.445
2	26% Effluent	5	0.421	0.481	0.454
3	35% Effluent	5	0.429	0.482	0.461
4	46% Effluent	5	0.432	0.480	0.462
5	62% Effluent	5	0.422	0.485	0.461
6	82% Effluent	5	0.425	0.488	0.460

Summary Statistics on Transformed Data Table 2 of 2

Grp	Identification	Variance	Sd	Sem	C.V.%
1	Control	0.001	0.024	0.011	5.32
2	26% Effluent	0.001	0.025	0.011	5.50
3	35% Effluent	0.000	0.021	0.009	4.46
4	46% Effluent	0.000	0.020	0.009	4.42
5	62% Effluent	0.001	0.027	0.012	5.75
6	82% Effluent	0.001	0.029	0.013	6.25

Shapiro - Wilk's Test For Normality

D = 0.014

W = 0.925

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 = 0.68

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	0.001	0.000	0.359
Within (Error)	24	0.014	0.001	
Total	29	0.015		

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
			Calculated In Original Units		
1	Control	0.445	0.445		
2	26% Effluent	0.454	0.454	-0.572	
3	35% Effluent	0.461	0.461	-1.026	
4	46% Effluent	0.462	0.462	-1.091	
5	62% Effluent	0.461	0.461	-1.013	
6	82% Effluent	0.460	0.460	-0.961	

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

No statistically significant difference

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

Grp	Identification	Num of Reps	Minimum Sig	% of	Difference
			Diff (In Orig. Units)	Control	from Control
1	Control	5			
2	26% Effluent	5	0.036	8.2	-0.009
3	35% Effluent	5	0.036	8.2	-0.016
4	46% Effluent	5	0.036	8.2	-0.017
5	62% Effluent	5	0.036	8.2	-0.016
6	82% Effluent	5	0.036	8.2	-0.015

**APPENDIX A
RAW DATA**

7-DAY CERIODAPHNIA DUBIA SURVIVAL & REPRODUCTION
DAILY RAW DATA TABLE
PAGE 1 OF 2

CLIENT Rogers
OUTFALL 001
LAB ID # 33403

START DATE/TIME 12-14-21 MH 1615
END DATE/TIME 12-21-21 MH 1615

Con

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
12/15	A	A	A	A	A	A	A	A	A	A	TG	1615
12/16	A	A	A	A	A	A	A	A	A	A	MH	1330
12/17	A	A	A	A	A	A	A	A	A	A	MH	1015
12/18	3	5	3	4	4	2	5	3	2	2	TG	1615
12/19	A	A	A	A	A	A	A	A	A	A	TG	1415
12/20	8	8	7	9	7	6	9	6	9	10	JS	1145
12/21	14	13	12	12	14	12	13	13	13	12	MH	1615
	25	26	22	25	25	20	27	22	24	24		

\bar{x} # Young w/o Dead = 24.0 CV% = 8.78
 \bar{x} # Young w/Dead = CV% =
 \bar{x} % Survival = 100 CV% = 0.00

26

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
12/15	A	A	A	A	A	A	A	A	A	A	TG	1615
12/16	A	A	A	A	A	A	A	A	A	A	MH	1330
12/17	A	A	A	A	A	A	A	A	A	A	MH	1015
12/18	4	3	2	3	5	3	2	5	3	4	TG	1615
12/19	A	A	A	A	A	A	A	A	A	A	TG	1415
12/20	8	6	9	6	8	6	8	7	8	8	JS	1145
12/21	12	14	14	14	13	13	14	13	14	13	MH	1615
	24	23	25	23	26	22	24	25	25	25		

\bar{x} # Young w/o Dead = 24.2 CV% = 5.08
 \bar{x} # Young w/Dead = CV% =
 \bar{x} % Survival = 100 CV% = 0.00

35

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
12/15	A	A	A	A	A	A	A	A	A	A	TG	1615
12/16	A	A	A	A	A	A	A	A	A	A	MH	1330
12/17	A	A	A	A	A	A	A	A	A	A	MH	1015
12/18	4	3	5	2	5	3	3	5	2	2	TG	1615
12/19	A	A	A	A	A	A	A	A	A	A	TG	1415
12/20	10	6	6	7	7	6	9	9	8	6	JS	1145
12/21	14	12	13	13	13	14	13	14	14	14	MH	1615
	28	21	24	22	25	23	26	28	24	22		

\bar{x} # Young w/o Dead = 24.2 CV% = 9.89
 \bar{x} # Young w/Dead = CV% =
 \bar{x} % Survival = 100 CV% = 0.00

46

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
12/15	A	A	A	A	A	A	A	A	A	A	TG	1615
12/16	A	A	A	A	A	A	A	A	A	A	MH	1330
12/17	A	A	A	A	A	A	A	A	A	A	MH	1015
12/18	5	2	3	4	3	2	3	3	5	4	TG	1615
12/19	A	A	A	A	A	A	A	A	A	A	TG	1415
12/20	8	8	6	7	7	9	7	6	7	9	JS	1145
12/21	14	14	12	14	12	12	13	14	13	14	MH	1615
	27	24	21	25	22	23	23	23	25	27		

\bar{x} # Young w/o Dead = 24.0 CV% = 8.33
 \bar{x} # Young w/Dead = CV% =
 \bar{x} % Survival = 100 CV% = 0.00

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

CLIENT/FACILITY: Rogers DATE/TIME STARTED: 12-14-21 JC 1610
 OUTFALL #: 001 PROJECT #: 33403 DATE/TIME ENDED: 12-21-21 JC 1610
 ORGANISM ID#: PP0-21-347

Conc.	12-15-21 JC 1610					12-16-21 JC 915					12-17-21 JS 1025					12-18-21 JC 1200					12-19-21 JC 1230									
	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	8	8	8	8	8
20	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	8	8	8	8	8
35	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	8	8	8	8	8
40	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	8	8	8	8	8
62	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	8	8	8	8	8
82	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	8	8	8	8	8

Conc.	12-20-21 JS 0915					12-21-21 JC 1610					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
20	8	8	8	8	8	8	8	8	8	8	100.0	0.00
35	8	8	8	8	8	8	8	8	8	8	100.0	0.00
40	8	8	8	8	8	8	8	8	8	8	100.0	0.00
62	8	8	8	8	8	8	8	8	8	8	100.0	0.00
82	8	8	8	8	8	8	8	8	8	8	100.0	0.00

**APPENDIX B
REFERENCE TOXICANTS**

CHRONIC REFERENCE TOXICANT TEST RESULTS

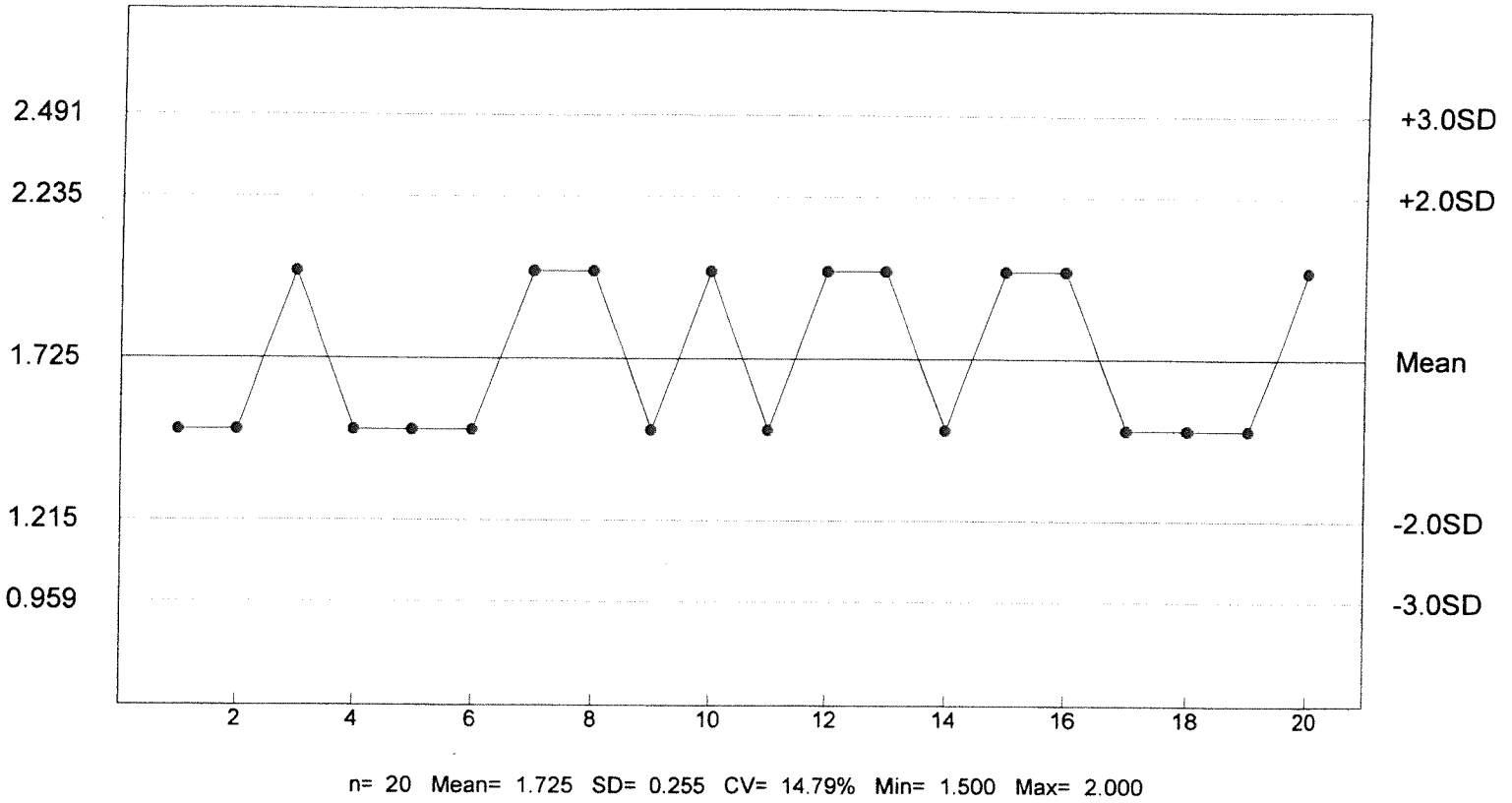
SPECIES: *Ceriodaphnia dubia*
 CHEMICAL: Sodium Chloride
 DURATION: 7-Days
 TEST NUMBER: 12
 TEST DATE: 12/01/21 - 12/08/21
 1630 Hrs - 1630 Hrs
 STATISTICAL METHOD: Dunnetts/Steels

CONCENTRATION (g/L)	NUMBER EXPOSED	NUMBER DEAD
0.5	10	0
1.0	10	0
1.5	10	0
2.0	10	1
2.5	10	10
3.0	10	10
4.0	10	10

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

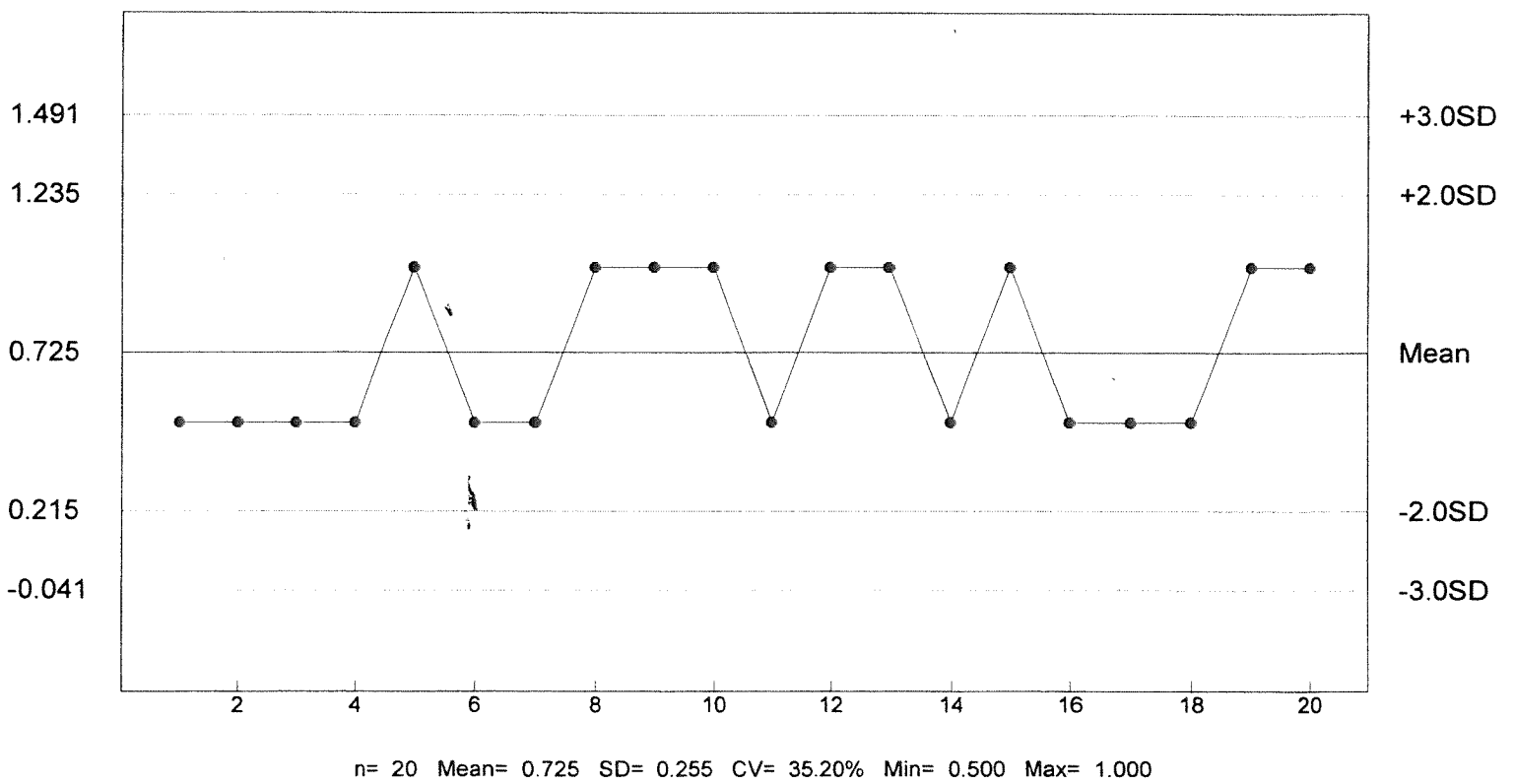
Reference Tox Sodium Chloride g/L

C. dubia Survival - NOEC



Reference Tox Sodium Chloride g/L

C. dubia Reproduction - NOEC



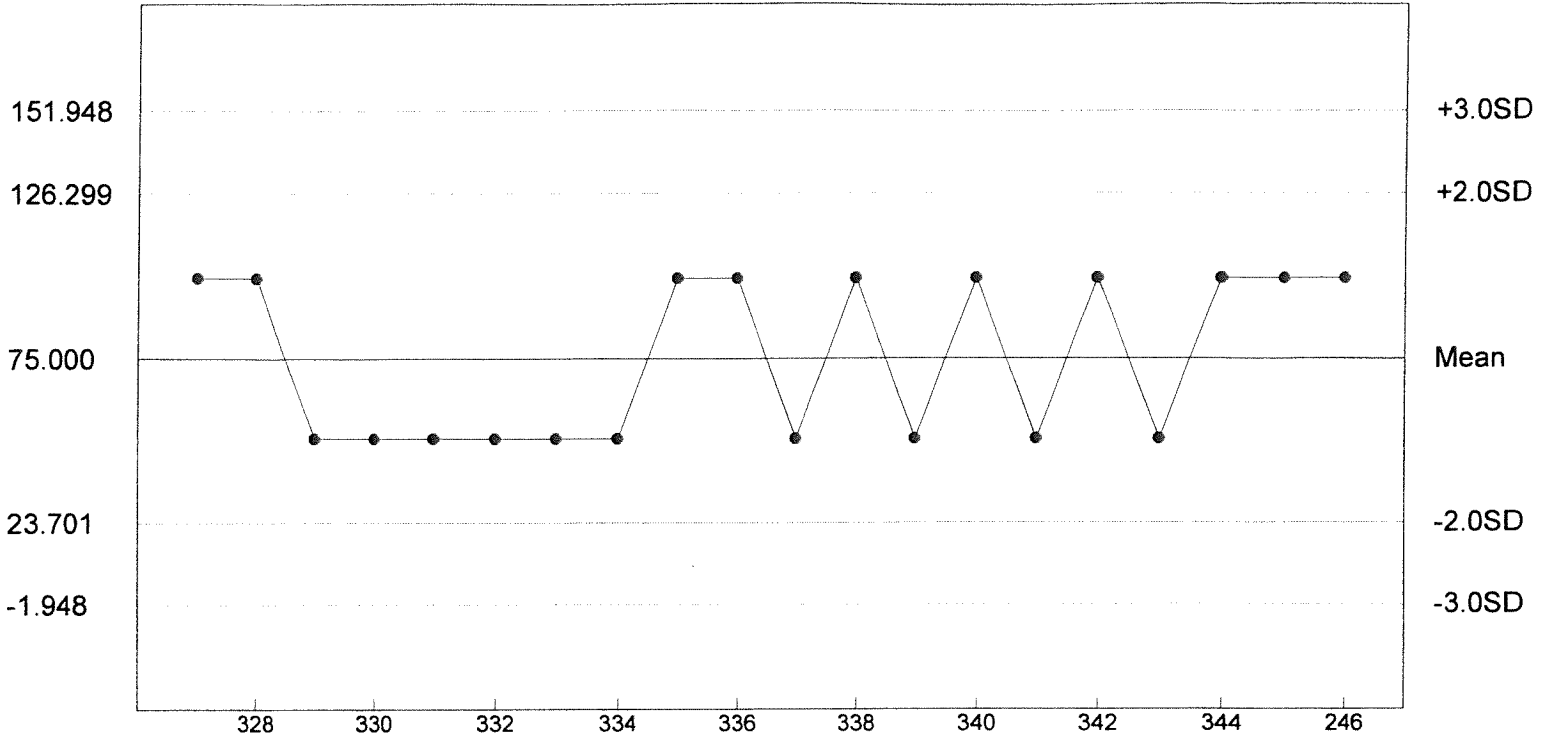
CHRONIC REFERENCE TOXICANT TEST RESULTS

SPECIES: *Pimephales promelas*
 CHEMICAL: Copper Nitrate
 DURATION: 7-Days
 TEST NUMBER: 12
 TEST DATE: 12/01/21 - 12/08/21
 1550 Hrs -1550 Hrs
 STATISTICAL METHOD: Dunnetts/Steels

CONCENTRATION (ug/L)	NUMBER EXPOSED	NUMBER DEAD
12.5	40	0
25	40	0
50	40	4
100	40	6
200	40	19
400	40	40
800	40	40

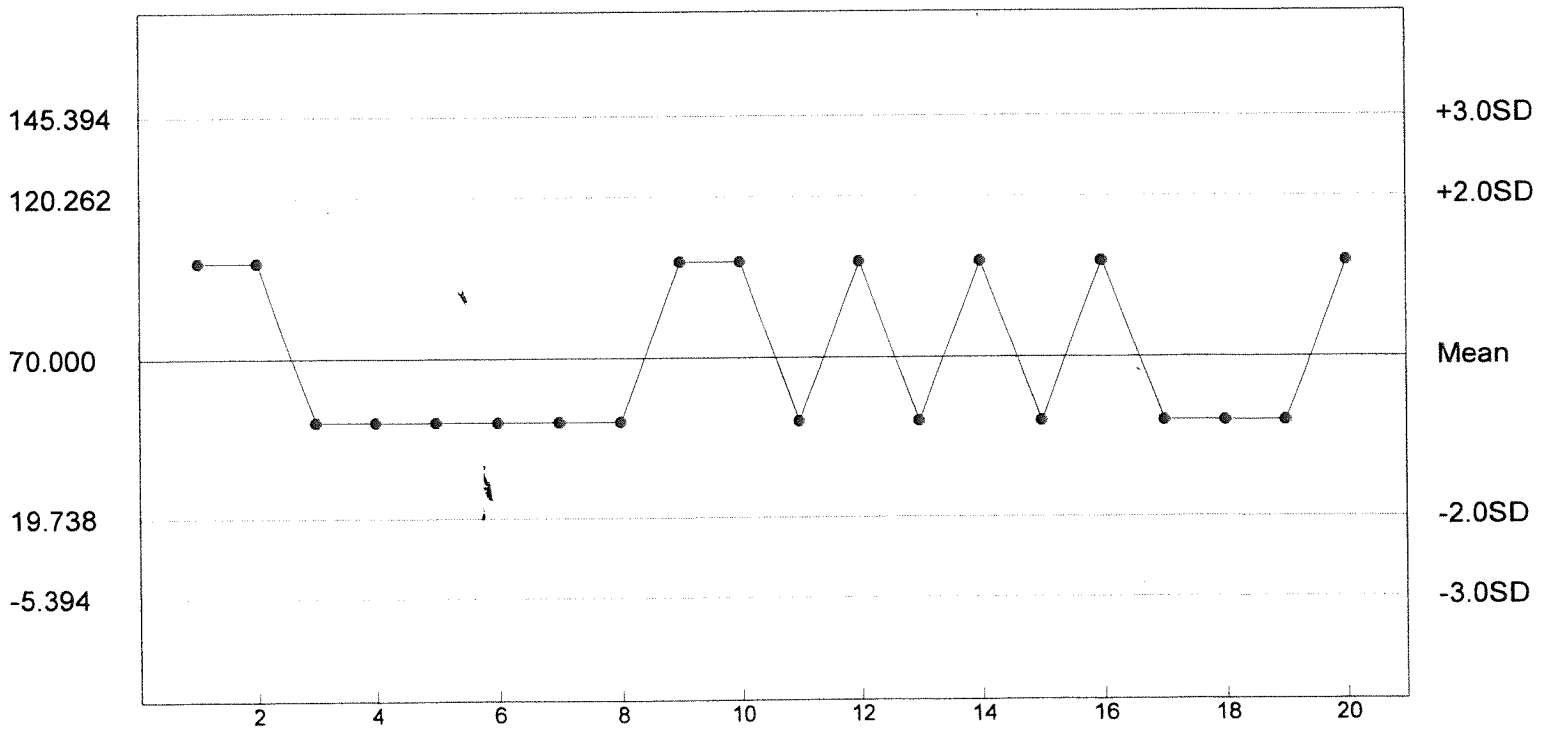
LOEC FOR SURVIVAL	NOEC FOR SURVIVAL	LOEC FOR GROWTH	NOEC FOR GROWTH
200 ug/L	100 ug/L	200 ug/L	100 ug/L

Reference Tox Copper Nitrate ug/L
P. promelas Chronic Survival - NOEC



n= 20 Mean= 75.000 SD= 25.649 CV= 34.20% Min= 50.000 Max= 100.000

Reference Tox Copper Nitrate ug/L
P. promelas Growth - NOEC



n= 20 Mean= 70.000 SD= 25.131 CV= 35.90% Min= 50.000 Max= 100.000

**APPENDIX C
CHAIN OF CUSTODY SHEETS**

**CITY OF ROGERS
 NPDES PERMIT NO. AR0043397
 AFIN NUMBER: 04-00155
 BIOMONITORING REPORTING
 TEST DATE: 12/14/21**

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) Report the NOEC value for survival, Parameter No. TOP3B.	82%
(C) Report the NOEC value for reproduction, Parameter No. TPP3B.	82%
(D) If the NOEC for reproduction is less than the critical dilution, enter a "1"; otherwise, enter a "0". Parameter No. TGP3B.	0
(E) Report the higher (critical dilution or control) Coefficient of Variation, Parameter No. TQP3B.	8.78%

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) Report the NOEC value for survival, Parameter No. TOP6C.	82%
(C) Report the NOEC value for growth, Parameter No. TPP6C.	82%
(D) 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
(E) Report the highest (critical dilution or control) Coefficient of Variation, Parameter No. TQP6C.	6.25%
22414 - 10	82%
22414 - PO	82%