

**CITY OF ROGERS**  
OUTFALL 001

Chronic Biomonitoring Report  
Permit Number NPDES AR0043397  
AFIN 04-00155

*Ceriodaphnia dubia*  
*Pimephales promelas*

October 15, 2019

Reviewed by:



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TOXICITY TEST REPORT - CHRONIC

Client ..... City of Rogers Laboratory I.D. .... 30719
Permit No. .... NPDES AR0043397 Begin Date ..... October 15, 2019
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 Huther & Associates on October 15, October 17, and October 19, 2019. 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-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, October 15, 2019. 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.





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	10/14/19 10/16/19 10/18/19
LAB ID #	30719	DATE RECEIVED	10/15/19 10/17/19 10/19/19
TEST TYPE	7 Day Chronic	BEGIN DATE/TIME	10/15/19 1530
TEST ORGANISM	<i>Ceriodaphnia dubia</i>	END DATE/TIME	10/22/19 1530
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
10/16/19	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
10/17/19	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
10/18/19	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
10/19/19	2	5	3	4	3	4	3	2	4	3
	2	5	3	4	3	4	3	2	4	3
10/20/19	8	7	6	7	9	9	11	8	10	7
	10	12	9	11	12	13	14	10	14	10
10/21/19	A	A	A	A	A	A	A	A	A	A
	10	12	9	11	12	13	14	10	14	10
10/22/19	12	13	12	12	14	14	13	13	13	14
	22	25	21	23	26	27	27	23	27	24
x# Young 24.5					C.V. 9.08%					
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
10/16/19	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
10/17/19	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
10/18/19	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
10/19/19	5	3	4	3	2	5	4	3	3	2
	5	3	4	3	2	5	4	3	3	2
10/20/19	6	10	9	9	8	11	7	6	6	9
	11	13	13	12	10	16	11	9	9	11
10/21/19	A	A	A	A	A	A	A	A	A	A
	11	13	13	12	10	16	11	9	9	11
10/22/19	14	13	12	13	12	13	13	13	14	13
	25	26	25	25	22	29	24	22	23	24
x# Young 24.5					C.V. 8.44%					
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
10/16/19	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
10/17/19	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
10/18/19	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
10/19/19	3	5	4	2	5	4	3	2	3	2
	3	5	4	2	5	4	3	2	3	2
10/20/19	10	9	9	7	6	8	10	11	6	8
	13	14	13	9	11	12	13	13	9	10
10/21/19	A	A	A	A	A	A	A	A	A	A
	13	14	13	9	11	12	13	13	9	10
10/22/19	13	14	12	13	12	13	12	13	14	12
	26	28	25	22	23	25	25	26	23	22
x# Young 24.5					C.V. 7.99%					
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
10/16/19	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
10/17/19	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
10/18/19	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
10/19/19	2	5	5	5	4	2	3	5	4	3
	2	5	5	5	4	2	3	5	4	3
10/20/19	6	6	7	9	10	11	8	8	7	6
	8	11	12	14	14	13	11	13	11	9
10/21/19	A	A	A	A	A	A	A	A	A	A
	8	11	12	14	14	13	11	13	11	9
10/22/19	12	13	14	14	14	13	14	12	14	13
	20	24	26	28	28	26	25	25	25	22
x# Young 24.9					C.V. 9.92%					
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# 30719

Test Date: October 15, 2019

62%Effluent										
Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
10/16/19	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
10/17/19	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
10/18/19	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
	3	3	2	5	4	3	2	3	5	3
10/19/19	3	3	2	5	4	3	2	3	5	3
	7	11	7	9	10	6	8	8	10	7
10/20/19	10	14	9	14	14	9	10	11	15	10
	A	A	A	A	A	A	A	A	A	A
10/21/19	10	14	9	14	14	9	10	11	15	10
	14	14	14	14	13	13	12	14	13	14
10/22/19	24	28	23	28	27	22	22	25	28	24
<p>x # Young 25.1                      C.V. 9.84%</p> <p>x%Survival 100%                      C.V. 0.00%</p>										

82%Effluent										
Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
10/16/19	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
10/17/19	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
10/18/19	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
	2	5	4	3	2	4	5	3	2	3
10/19/19	2	5	4	3	2	4	5	3	2	3
	9	6	8	8	6	10	9	11	7	10
10/20/19	11	11	12	11	8	14	14	14	9	13
	A	A	A	A	A	A	A	A	A	A
10/21/19	11	11	12	11	8	14	14	14	9	13
	13	14	13	12	12	14	13	13	12	14
10/22/19	24	25	25	23	20	28	27	27	21	27
<p>x # Young 24.7                      C.V. 10.97%</p> <p>x%Survival 100%                      C.V. 0.00%</p>										

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# 30719

Test Date: October 15, 2019

**WET CHEMISTRY MEASUREMENTS**

Date	Time	Temp	Samp. No.	pH of Solution						Analyst
				CON	26%	35%	46%	62%	82%	
10/15/19	Start	25.0	1	8.01	7.88	7.80	7.72	7.66	7.62	SD
10/16/19	24 Hr.	25.3	1	7.76	7.78	7.77	7.81	7.89	7.87	GS
10/16/19	Renew	24.9	1	8.23	8.24	8.18	8.06	7.96	7.85	JS
10/17/19	48 Hr.	24.7	1	7.86	7.83	7.82	7.78	7.76	7.64	SD
10/17/19	Renew	25.0	2	7.96	8.09	8.09	7.97	7.88	7.81	SD
10/18/19	72 Hr.	24.8	2	8.00	7.96	7.92	7.86	7.81	7.79	LM
10/18/19	Renew	24.5	2	8.22	8.24	8.20	8.02	8.21	7.79	LM
10/19/19	96 Hr.	25.2	2	8.25	8.17	8.17	8.04	8.03	8.01	GS
10/19/19	Renew	25.0	3	7.96	7.88	7.81	7.73	7.66	7.62	SD
10/20/19	120 Hr.	25.2	3	8.03	7.97	7.98	7.87	7.87	7.68	GS
10/20/19	Renew	25.0	3	7.68	8.08	8.01	7.84	7.85	7.61	GS
10/21/19	144 Hr.	25.2	3	8.10	8.07	8.07	8.00	7.98	7.94	LM
10/21/19	Renew	24.9	3	8.13	8.49	8.48	8.26	8.30	7.91	LM
10/22/19	168 Hr.	24.8	3	8.10	8.09	8.05	8.06	8.04	8.06	SD

Date	Time	Temp	Samp. No.	DO (mg/L) of Solution						Analyst
				CON	26%	35%	46%	62%	82%	
10/15/19	Start	25.0	1	7.37	7.79	8.38	8.38	8.30	8.37	SD
10/16/19	24 Hr.	25.3	1	7.92	7.35	7.09	7.10	7.24	7.00	GS
10/16/19	Renew	24.9	1	8.18	8.23	8.16	8.18	8.19	8.18	JS
10/17/19	48 Hr.	24.7	1	7.73	6.97	7.76	7.49	7.56	7.60	SD
10/17/19	Renew	25.0	2	7.49	7.77	7.74	7.80	7.67	7.80	SD
10/18/19	72 Hr.	24.8	2	7.70	7.70	7.71	7.73	7.73	7.67	LM
10/18/19	Renew	24.5	2	7.84	7.77	7.76	7.77	7.78	7.75	LM
10/19/19	96 Hr.	25.2	2	7.73	7.71	7.66	7.20	7.62	7.44	GS
10/19/19	Renew	25.0	3	7.84	7.86	7.81	7.69	7.67	7.71	SD
10/20/19	120 Hr.	25.2	3	7.79	7.82	7.83	7.58	7.53	7.45	GS
10/20/19	Renew	25.0	3	7.21	7.92	7.87	7.83	8.00	7.81	GS
10/21/19	144 Hr.	25.2	3	8.01	7.97	7.96	7.87	7.87	7.82	LM
10/21/19	Renew	24.9	3	7.78	7.80	7.80	7.62	7.76	7.74	LM
10/22/19	168 Hr.	24.8	3	8.18	7.88	7.52	7.55	7.79	7.80	SD

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

Rogers

Lab ID# 30719

Test Date: October 15, 2019

**INITIAL CHEMISTRY MEASUREMENTS @ 100% EFFLUENT**

Date	Samp. No.	pH <sup>1</sup>	DO <sup>1</sup>	Hardness mg/L CaCO <sub>3</sub> <sup>1</sup>	Alkalinity mg/L CaCO <sub>3</sub> <sup>1</sup>	Conduct. μS/cm <sup>1</sup>	Resid.Cl <sub>2</sub> mg/L <sup>1</sup>	Dechlor(mL) Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> mg/L <sup>1</sup>	Analyst
10/15/19	1	7.60	6.90	108	100	575	<0.01	N/A	SD
10/17/19	2	8.10	8.06	128	102	626	<0.01	N/A	SD
10/19/19	3	7.52	8.08	116	106	743	<0.01	N/A	SD
10/15/19	CON	8.01	7.37	128	70	427	-	-	SD

<sup>1</sup> 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	21.000	27.000	24.500
2	26% Effluent	10	22.000	29.000	24.500
3	35% Effluent	10	22.000	28.000	24.500
4	46% Effluent	10	20.000	28.000	24.900
5	62% Effluent	10	22.000	28.000	25.100
6	82% Effluent	10	20.000	28.000	24.700

Summary Statistics on Transformed Data Table 2 of 2

Grp	Identification	Variance	Sd	Sem	C.V.%
1	Control	4.944	2.224	0.703	9.08
2	26% Effluent	4.278	2.068	0.654	8.44
3	35% Effluent	3.833	1.958	0.619	7.99
4	46% Effluent	6.100	2.470	0.781	9.92
5	62% Effluent	6.100	2.470	0.781	9.84
6	82% Effluent	7.344	2.710	0.857	10.97

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	16	22	17	2

Calculated Chi-Square goodness of fit test statistic = 1.8852  
 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 = 1.29

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	3.200	0.640	0.118
Within (Error)	54	293.400	5.433	
Total	59	296.600		

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		T Stat	Sig
			Original Units	Calculated In		
1	Control	24.500	24.500			
2	26% Effluent	24.500	24.500		0.000	
3	35% Effluent	24.500	24.500		0.000	
4	46% Effluent	24.900	24.900		-0.384	
5	62% Effluent	25.100	25.100		-0.576	
6	82% Effluent	24.700	24.700		-0.192	

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	Sig	Difference from Control
			Diff (In Orig. Units)	% of Control	
1	Control	10			
2	26% Effluent	10	2.408	9.8	0.000
3	35% Effluent	10	2.408	9.8	0.000
4	46% Effluent	10	2.408	9.8	-0.400
5	62% Effluent	10	2.408	9.8	-0.600
6	82% Effluent	10	2.408	9.8	-0.200

Huther 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	10/14/19 10/16/19 10/18/19
LAB ID #	30719	DATE RECEIVED	10/15/19 10/17/19 10/19/19
TEST TYPE	7 Day Chronic	BEGIN DATE/TIME	10/15/19 1550
TEST ORGANISM	<i>Pimephales promelas</i>	END DATE/TIME	10/22/19 1550
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	J. Castillo

**SURVIVAL SUMMARY**

Conc.	10/16/19					10/17/19					10/18/19					10/19/19					10/20/19				
	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.	10/21/19					10/22/19					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	0.4650	0.4220	0.4230	0.4510	0.4470	0.4416	4.23
26%	0.4310	0.4520	0.4670	0.4660	0.4580	0.4548	3.22
35%	0.4650	0.4290	0.4760	0.4770	0.4440	0.4582	4.59
46%	0.4820	0.4350	0.4610	0.4720	0.4410	0.4582	4.36
62%	0.4650	0.4810	0.4720	0.4310	0.4540	0.4606	4.18
82%	0.4810	0.4290	0.4630	0.4720	0.4600	0.4610	4.27

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

Rogers

Lab ID# 30719

Test Date: October 15, 2019

**WET CHEMISTRY MEASUREMENTS**

Date	Time	Temp	Samp. No.	pH of Solution						Analyst
				CON	26%	35%	46%	62%	82%	
10/15/19	Start	25.0	1	8.01	7.88	7.80	7.72	7.66	7.62	SD
10/16/19	24 Hr.	25.1	1	7.87	7.76	7.72	7.74	7.70	7.82	GS
10/16/19	Renew	24.9	1	8.23	8.24	8.18	8.06	7.96	7.85	JS
10/17/19	48 Hr.	24.6	1	7.89	7.84	7.81	7.82	7.80	7.81	SD
10/17/19	Renew	25.0	2	7.96	8.09	8.09	7.97	7.88	7.81	SD
10/18/19	72 Hr.	24.8	2	7.85	7.88	7.87	7.89	7.90	7.89	LM
10/18/19	Renew	24.5	2	8.22	8.24	8.20	8.02	8.21	7.79	LM
10/19/19	96 Hr.	25.2	2	8.05	7.92	7.88	7.86	7.86	7.84	SD
10/19/19	Renew	25.0	3	7.96	7.88	7.81	7.73	7.66	7.62	SD
10/20/19	120 Hr.	25.0	3	7.80	7.88	7.95	7.91	7.94	7.86	GS
10/20/19	Renew	25.0	3	7.68	8.08	8.01	7.84	7.85	7.61	GS
10/21/19	144 Hr.	25.1	3	7.89	7.89	7.82	7.84	7.81	7.75	LM
10/21/19	Renew	24.9	3	8.13	8.49	8.48	8.26	8.30	7.91	LM
10/22/19	168 Hr.	24.6	3	8.01	7.93	7.89	7.87	7.85	7.78	SD

Date	Time	Temp	Samp. No.	DO (mg/L) of Solution						Analyst
				CON	26%	35%	46%	62%	82%	
10/15/19	Start	25.0	1	7.37	7.79	8.38	8.38	8.30	8.37	SD
10/16/19	24 Hr.	25.1	1	8.45	7.71	8.37	7.96	8.33	8.33	GS
10/16/19	Renew	24.9	1	8.18	8.23	8.16	8.18	8.19	8.18	JS
10/17/19	48 Hr.	24.6	1	8.04	8.09	7.90	7.66	7.89	7.74	SD
10/17/19	Renew	25.0	2	7.49	7.77	7.74	7.80	7.67	7.80	SD
10/18/19	72 Hr.	24.8	2	7.86	7.87	7.89	7.92	7.95	7.97	LM
10/18/19	Renew	24.5	2	7.84	7.77	7.76	7.77	7.78	7.75	LM
10/19/19	96 Hr.	25.2	2	7.37	7.55	7.42	7.35	7.18	7.39	SD
10/19/19	Renew	25.0	3	7.84	7.86	7.81	7.69	7.67	7.71	SD
10/20/19	120 Hr.	25.0	3	7.88	7.61	7.90	7.80	7.70	7.84	GS
10/20/19	Renew	25.0	3	7.21	7.92	7.87	7.83	8.00	7.81	GS
10/21/19	144 Hr.	25.1	3	7.74	7.77	7.41	7.59	7.70	7.74	LM
10/21/19	Renew	24.9	3	7.78	7.80	7.80	7.62	7.76	7.74	LM
10/22/19	168 Hr.	24.6	3	7.98	7.86	7.91	7.12	7.56	7.62	SD

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

0

Rogers

Lab ID# 30719

Test Date: October 15, 2019

**INITIAL CHEMISTRY MEASUREMENTS @ 100% EFFLUENT**

Date	Samp. No.	pH <sup>1</sup>	DO <sup>1</sup>	Hardness mg/L CaCO <sub>3</sub> <sup>1</sup>	Alkalinity mg/L CaCO <sub>3</sub> <sup>1</sup>	Conduct. μS/cm <sup>1</sup>	Resid.Cl <sub>2</sub> mg/L <sup>1</sup>	Dechlor(mL) Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> mg/L <sup>1</sup>	Analyst
10/15/19	1	7.60	6.90	108	100	575	<0.01	N/A	SD
10/17/19	2	8.10	8.06	128	102	626	<0.01	N/A	SD
10/19/19	3	7.52	8.08	116	106	743	<0.01	N/A	SD
10/15/19	CON	8.01	7.37	128	70	427	-	-	SD

<sup>1</sup> 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	0.422	0.465	0.442
2	26% Effluent	5	0.431	0.467	0.455
3	35% Effluent	5	0.429	0.477	0.458
4	46% Effluent	5	0.435	0.482	0.458
5	62% Effluent	5	0.431	0.481	0.461
6	82% Effluent	5	0.429	0.481	0.461

Summary Statistics on Transformed Data Table 2 of 2

Grp	Identification	Variance	Sd	Sem	C.V.%
1	Control	0.000	0.019	0.008	4.23
2	26% Effluent	0.000	0.015	0.007	3.22
3	35% Effluent	0.000	0.021	0.009	4.59
4	46% Effluent	0.000	0.020	0.009	4.36
5	62% Effluent	0.000	0.019	0.009	4.18
6	82% Effluent	0.000	0.020	0.009	4.27

Shapiro - Wilk's Test For Normality

D = 0.009

W = 0.918

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 = 0.53

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	0.732
Within (Error)	24	0.009	0.000	
Total	29	0.010		

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	Mean		T Stat	Sig
		Transformed Mean	Calculated In Original Units		
1	Control	0.442	0.442		
2	26% Effluent	0.455	0.455	-1.099	
3	35% Effluent	0.458	0.458	-1.382	
4	46% Effluent	0.458	0.458	-1.382	
5	62% Effluent	0.461	0.461	-1.582	
6	82% Effluent	0.461	0.461	-1.615	

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	Difference from Control
			Diff (In Orig. Units)	% of Control	
1	Control	5			
2	26% Effluent	5	0.028	6.4	-0.013
3	35% Effluent	5	0.028	6.4	-0.017
4	46% Effluent	5	0.028	6.4	-0.017
5	62% Effluent	5	0.028	6.4	-0.019
6	82% Effluent	5	0.028	6.4	-0.019

**APPENDIX A  
RAW DATA**

7-DAY CERIODAPHNIA DUBIA SURVIVAL & REPRODUCTION

DAILY RAW DATA TABLE

PAGE 1 OF 2

CLIENT Rogers

START DATE/TIME 10-15-19 MH 1530

OUTFALL 001

END DATE/TIME 10-22-19 MH 1530

LAB ID # 30719

CON

26

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
10/16	A	A	A	A	A	A	A	A	A	A	MH	1530
10/17	A	A	A	A	A	A	A	A	A	A	TG	1245
10/18	A	A	A	A	A	A	A	A	A	A	MH	1130
10/19	2	5	3	4	3	4	3	2	4	3	TG	1315
10/20	8	7	6	7	9	9	11	8	10	7	TG	1345
10/21	A	A	A	A	A	A	A	A	A	A	MH	1330
10/22	12	13	12	12	14	14	13	13	13	14	MH	1530
	22	25	21	23	26	27	27	23	27	24		

$\bar{x}$  # Young w/o Dead = 24.5 CV% = 9.08

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

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

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
10/16	A	A	A	A	A	A	A	A	A	A	MH	1530
10/17	A	A	A	A	A	A	A	A	A	A	TG	1245
10/18	A	A	A	A	A	A	A	A	A	A	MH	1130
10/19	5	3	4	3	2	5	4	3	3	2	TG	1315
10/20	6	10	9	9	8	11	7	6	6	9	TG	1345
10/21	A	A	A	A	A	A	A	A	A	A	MH	1330
10/22	14	13	12	13	12	13	13	13	14	13	MH	1530
	25	26	25	25	22	29	24	22	23	24		

$\bar{x}$  # Young w/o Dead = 24.5 CV% = 8.44

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

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

35

46

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
10/16	A	A	A	A	A	A	A	A	A	A	MH	1530
10/17	A	A	A	A	A	A	A	A	A	A	TG	1245
10/18	A	A	A	A	A	A	A	A	A	A	MH	1130
10/19	3	5	4	2	5	4	3	2	3	2	TG	1315
10/20	10	9	9	7	6	8	10	11	6	8	TG	1345
10/21	A	A	A	A	A	A	A	A	A	A	MH	1330
10/22	13	14	12	13	12	13	12	13	14	12	MH	1530
	26	28	25	22	23	25	25	26	23	22		

$\bar{x}$  # Young w/o Dead = 24.5 CV% = 7.99

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

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

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
10/16	A	A	A	A	A	A	A	A	A	A	MH	1530
10/17	A	A	A	A	A	A	A	A	A	A	TG	1245
10/18	A	A	A	A	A	A	A	A	A	A	MH	1130
10/19	2	5	5	5	4	2	3	5	4	3	TG	1315
10/20	6	6	7	9	10	11	8	8	7	6	TG	1345
10/21	A	A	A	A	A	A	A	A	A	A	MH	1330
10/22	12	13	14	14	14	13	14	12	14	13	MH	1530
	20	24	26	28	28	26	25	25	25	22		

$\bar{x}$  # Young w/o Dead = 24.9 CV% = 9.92

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

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

7-DAY CERIODAPHNIA DUBIA SURVIVAL & REPRODUCTION

DAILY RAW DATA TABLE

CLIENT Rogers  
 OUTFALL 001  
 LAB ID # 30719  
62

START DATE/TIME 10-15-19 MH 1530  
 END DATE/TIME 10-22-19 MH 1530

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
10/16	A	A	A	A	A	A	A	A	A	A	MH	1530
10/17	A	A	A	A	A	A	A	A	A	A	TG	1245
10/18	A	A	A	A	A	A	A	A	A	A	MH	1130
10/19	3	3	2	5	4	3	2	3	5	3	TG	1315
10/20	7	11	7	9	10	6	8	8	10	7	TG	1345
10/21	A	A	A	A	A	A	A	A	A	A	MH	1330
10/22	14	14	14	14	13	13	12	14	13	14	MH	1530
	24	28	23	28	27	22	22	25	28	24		

$\bar{x}$  # Young w/o Dead = 25.1      CV% = 9.84  
 $\bar{x}$  # Young w/Dead =                      CV% =  
 $\bar{x}$  % Survival = 100.0                      CV% = 0.00

82

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
10/16	A	A	A	A	A	A	A	A	A	A	MH	1530
10/17	A	A	A	A	A	A	A	A	A	A	TG	1245
10/18	A	A	A	A	A	A	A	A	A	A	MH	1130
10/19	2	5	4	3	2	4	5	3	2	3	TG	1315
10/20	9	6	8	8	6	10	9	11	7	10	TG	1345
10/21	A	A	A	A	A	A	A	A	A	A	MH	1330
10/22	13	14	13	12	12	14	13	13	12	14	MH	1530
	24	25	25	23	26	28	27	27	21	27		

$\bar{x}$  # Young w/o Dead = 24.7      CV% = 10.97  
 $\bar{x}$  # Young w/Dead =                      CV% =  
 $\bar{x}$  % Survival = 100.0                      CV% = 0.00

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time

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

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time

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

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

CLIENT/FACILITY: Rogers DATE/TIME STARTED: 10-15-19 JC 1550  
 OUTFALL #: 001 PROJECT #: 30719 DATE/TIME ENDED: 10-22-19 JC 1550  
 ORGANISM ID#: FP0-19-287

Cont.	10-16-19 JC 1550					10-17-19 JC 1355					10-18-19 JH 0945					10-19-19 JC 935					10-20-19 JC 1110									
	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
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	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
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	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

Cont.	10-21-19 JH 1115					10-22-19 JC 1550					Mean 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



Client / Facility Rogers

Lab ID Number 30719

Outfall Number 001

Test Date 10-15-19

**INITIAL CHEMISTRY MEASUREMENTS @ 100% EFFLUENT**

Date	Samp. No.	pH	DO	Hardness mg/L CaCO <sub>3</sub>	Alkalinity mg/L CaCO <sub>3</sub>	Conduct. µmhos/cm	Resid. Cl <sub>2</sub> mg/L	Dechlor(mL) Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> mg/L	Analyst
10-15-19	1	7.60	6.90	108	100	575	2001	N/A	SD
10-17-19	2	8.10	8.06	128	102	626	20.01	N/A	SD
10-19-19	3	7.52	8.08	116	106	743	20.01	N/A	SD
10-15-19	CON	8.01	7.37	128	70	427	-	-	SD

**INITIAL CHEMISTRY MEASUREMENTS @ RECEIVING WATER**

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

Notes:

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**APPENDIX B  
REFERENCE TOXICANTS**



**CHRONIC REFERENCE TOXICANT TEST RESULTS**

SPECIES: *Ceriodaphnia dubia*

CHEMICAL: Sodium Chloride

DURATION: 7-Days

TEST NUMBER: 10

TEST DATE: 10/01/19 - 10/08/19  
1600 Hrs - 1600 Hrs

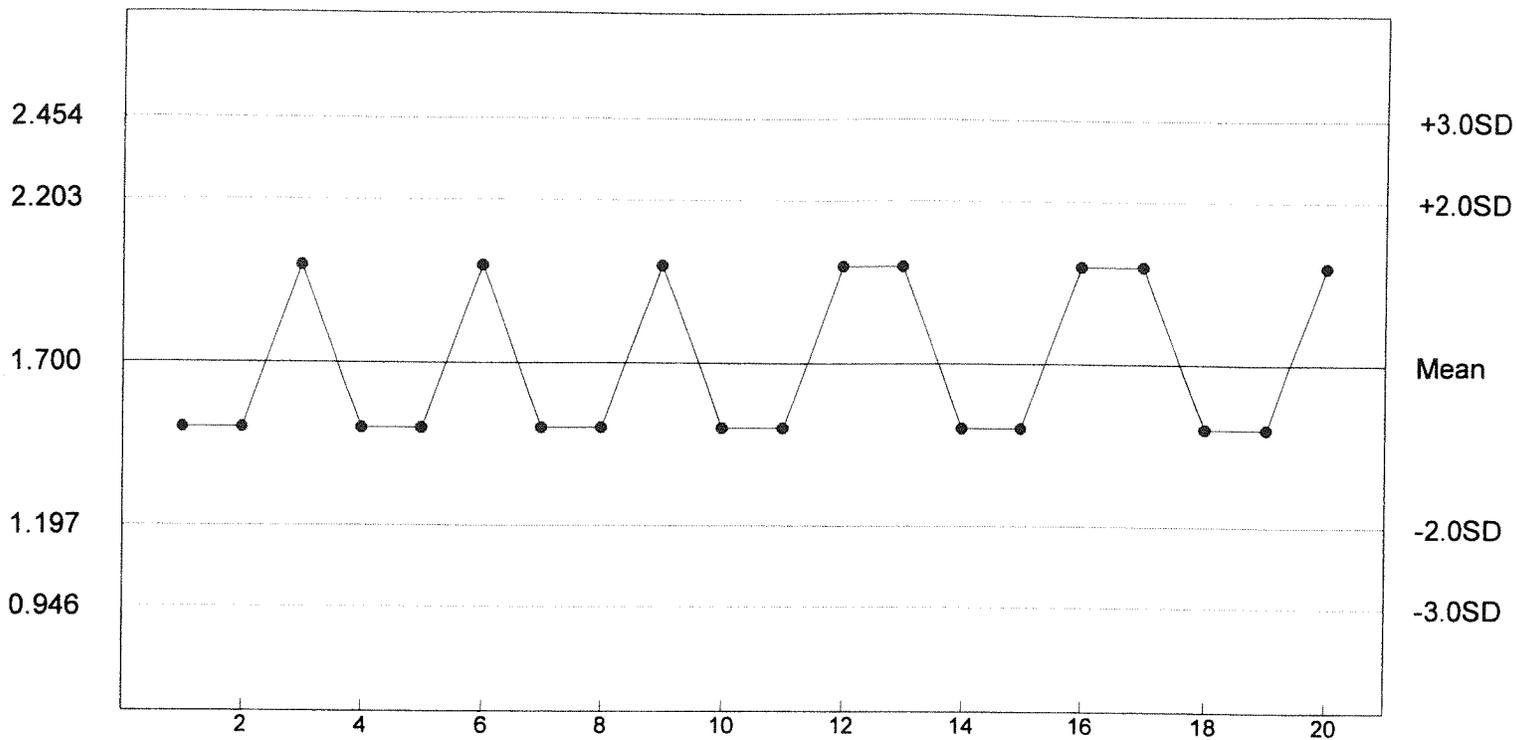
STATISTICAL METHOD: Dunnetts/Steels

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

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

Reference Tox Sodium Chloride g/L

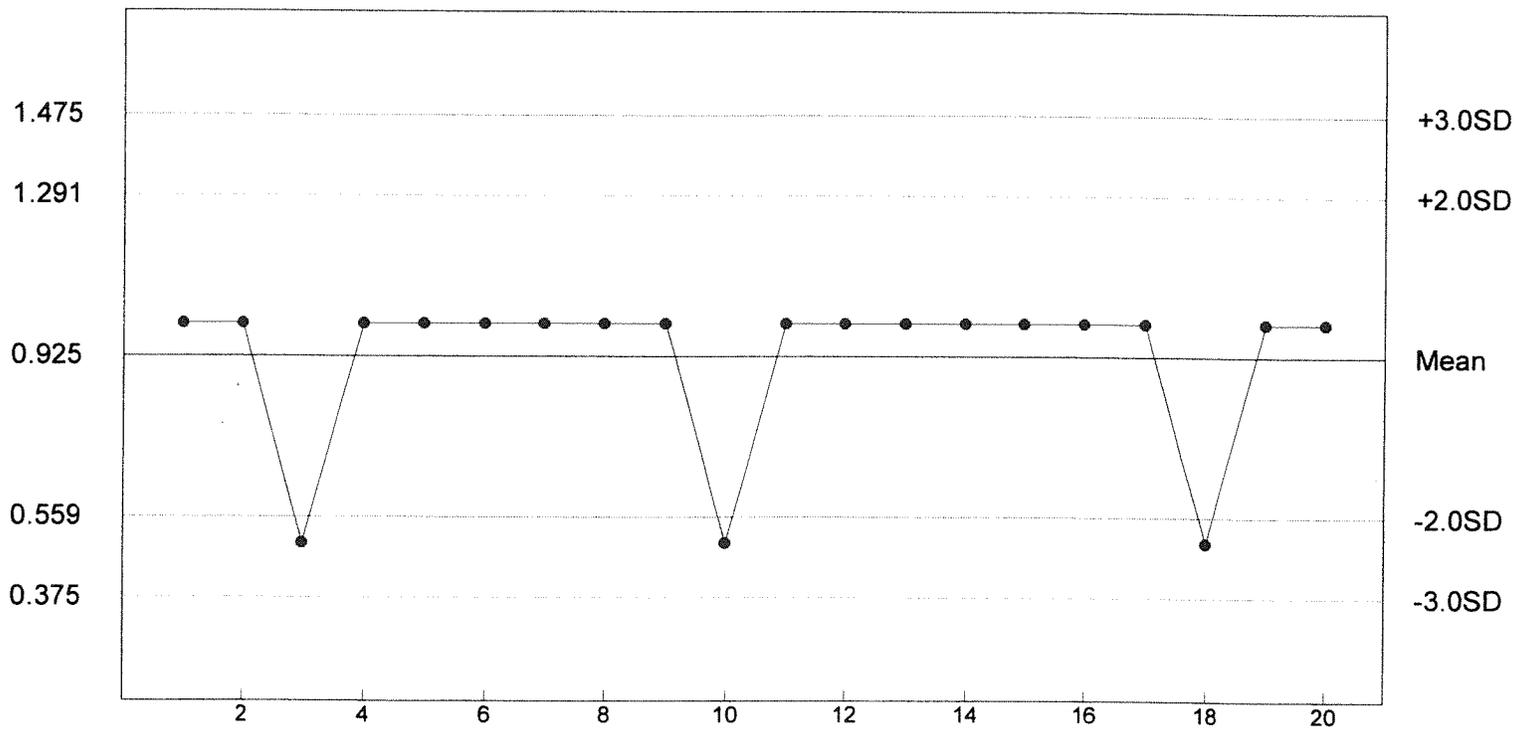
C. dubia Survival - NOEC



n= 20 Mean= 1.700 SD= 0.251 CV= 14.78% Min= 1.500 Max= 2.000

Reference Tox Sodium Chloride g/L

C. dubia Reproduction - NOEC



n= 20 Mean= 0.925 SD= 0.183 CV= 19.80% Min= 0.500 Max= 1.000

**CHRONIC REFERENCE TOXICANT TEST RESULTS**

SPECIES: *Pimephales promelas*

CHEMICAL: Copper Nitrate

DURATION: 7-Days

TEST NUMBER: 10

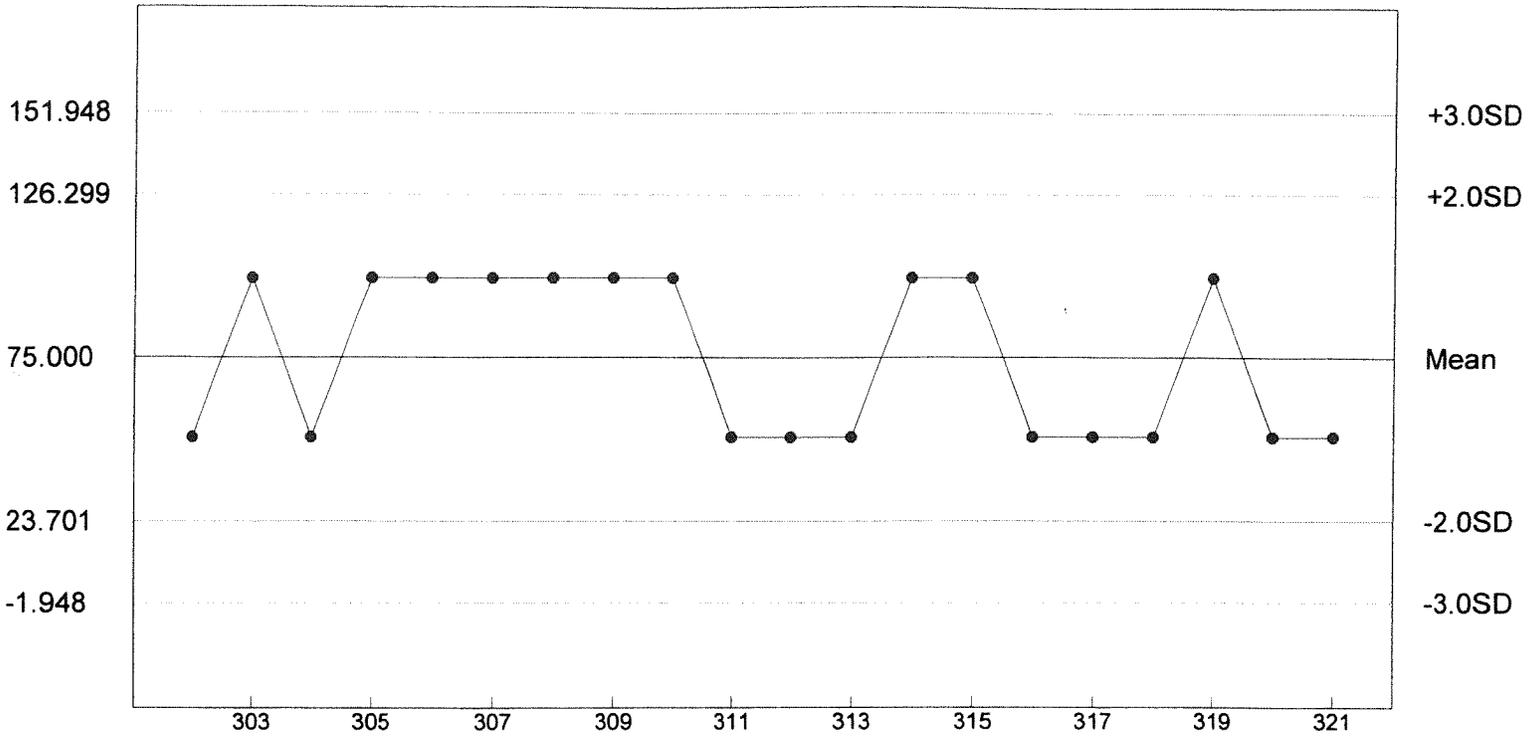
TEST DATE: 10/01/19 - 10/08/19  
1620 Hrs - 1620 Hrs

STATISTICAL METHOD: Dunnetts/Steels

CONCENTRATION (ug/L)	NUMBER EXPOSED	NUMBER DEAD
12.5	40	0
25	40	0
50	40	2
100	40	11
200	40	13
400	40	40
800	40	40

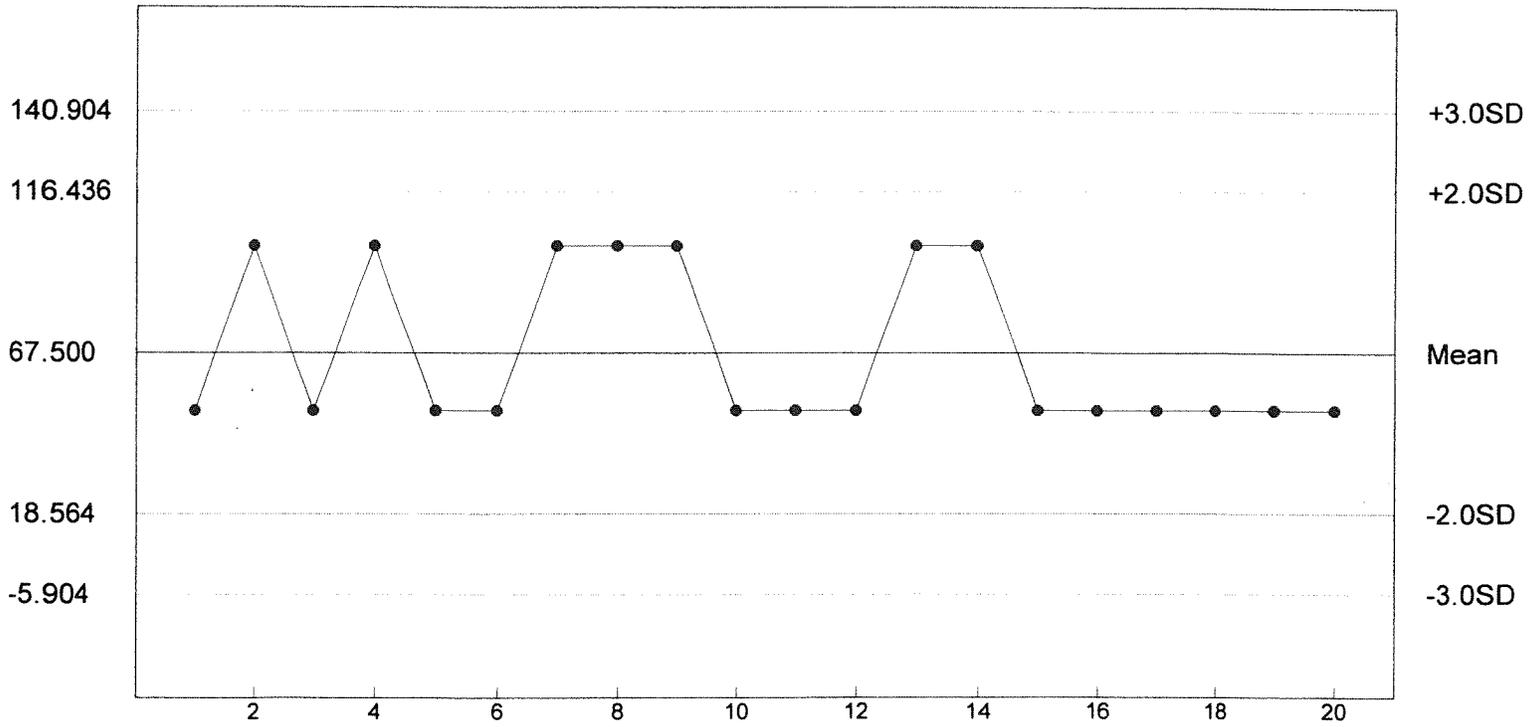
LOEC FOR SURVIVAL	NOEC FOR SURVIVAL	LOEC FOR GROWTH	NOEC FOR GROWTH
100 ug/L	50 ug/L	100 ug/L	50 ug/L

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

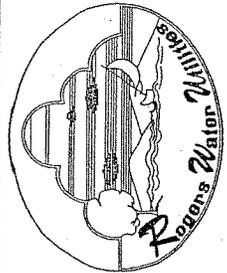


n= 20 Mean= 67.500 SD= 24.468 CV= 36.25% Min= 50.000 Max= 100.000

**APPENDIX C**  
**CHAIN OF CUSTODY SHEETS**



# 30 719



ROGERS POLLUTION CONTROL FACILITY  
CHAIN OF CUSTODY

SAMPLE DESCRIPTION	SAMPLE ID	COLLECTION		CONTAINER		TYPE C/G	METH A/M	TEMP °C	T S S	C B O D 3	N O 2 & N O 3	T N P 4	P O & C N L	M E T A L S	T T O
		DATE	TIME	L	G/P										
Effluent	190428	On: 10-15-19	0830	14.5	P	C	A	3.2	X	X	X	X			
Influent		Off: 10-16-19	0830						X	X	X	X			X
		On: 10-15-19	0836	9.0	P	C	A	2.8	X	X	X	X			
		Off: 10-16-19	0836												
		On: .....	.....												
		Off: .....	.....												
		On: .....	.....												
		Off: .....	.....												

Received by: *[Signature]* Date: *[Blank]*  
 Relinquished by: *[Signature]* Time: *[Blank]*  
 Received by: *[Signature]* Date: 10-17-19 0840  
 Relinquished by: *[Signature]* Time: *[Blank]*

COMMENTS: *EdEx IR: 0.8*  
 SAMPLER(S):  
 On: *[Signature]* Off: *[Signature]*

\* Metals: Ag, As, Be, Cd, Cr, Cu, Mo, Ni, Pb, Sb, Se, Tl, Zn (preserved with HNO<sub>3</sub>)  
 \* WET: Whole Effluent Toxicity (Biomonitoring)  
 \* T T O Scan: Table II - Organic Toxic Pollutants as defined by 40 CFR 122 appendix D. (Volatiles, Acid Compounds, Base / Neutral, Pesticides)  
 \* NH<sub>3</sub>-N, TN, TP and O&G preserved with H<sub>2</sub>SO<sub>4</sub> \* CN preserved with NaOH \* PHENOL preserved with CuSO<sub>4</sub> + Phos Acid



**CITY OF ROGERS  
 NPDES PERMIT NO. AR0043397  
 AFIN NUMBER: 04-00155  
 BIOMONITORING REPORTING  
 TEST DATE: 10/15/19**

**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.	10.97%

**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.	4.27%
22414 - 10	82%
22414 - PO	82%