


**NORTH LITTLE ROCK WASTEWATER UTILITY
FAULKNER LAKE PLANT
OUTFALL 001**

Chronic Biomonitoring Report
Permit Number NPDES AR0020303
AFIN 60-00274

Ceriodaphnia dubia
Pimephales promelas

February 1, 2022

Reviewed by:



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TOXICITY TEST REPORT - CHRONIC

Client	North Little Rock Wastewater Utility	Sample	Outfall 001
Facility	Faulkner Lake Plant	Laboratory I.D.	33590
Permit No.	NPDES AR0020303	Begin Date	February 1, 2022

Results: **Pass** *Ceriodaphnia dubia* survival and reproduction and *Pimephales promelas* survival and growth at the critical low flow concentration (8% effluent).

SAMPLE COLLECTION

Composite effluent samples from North Little Rock Wastewater Utility, Faulkner Lake Plant were delivered by Greyhound Package Express courier to Huther & Associates on February 1 and February 7, 2022. 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). *Note: Due to snow/ice storm only two samples could be shipped to the lab. There was enough sample to conduct daily renewals.

The effluent samples were analyzed for total residual chlorine (Standard Methods, 23rd Edition, 4500-C1 D) and contained <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 1545 hours, February 1, 2022. Five concentrations were prepared (3%, 5%, 6%, 8%, and 11% effluent) utilizing distilled, deionized laboratory water reconstituted to match the hardness, alkalinity and pH of the receiving stream (Arkansas 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.

Huthner and Associates

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

CLIENT	North Little Rock, Faulkner Lake Plant	SAMPLE TYPE	24 Hour Composite
NPDES #	AR0020303	DATE COLLECTED	01/31/22 02/04/22
LAB ID #	33590	DATE RECEIVED	02/01/22 02/07/22
TEST TYPE	7 Day Chronic	BEGIN DATE/TIME	02/01/22 1545
TEST ORGANISM	<i>Ceriodaphnia dubia</i>	END DATE/TIME	02/08/22 1545
ORGANISM AGE	< 24-Hours	TEST TEMPERATURE (°C)	25 ± 1
ORGANISM SOURCE	In House	PHOTO PERIOD	16-hr. Light 8-hr. Dark
RECEIVING WATER	Arkansas River	LIGHT INTENSITY	50-100 ft. cndl.
DILUTION WATER	Laboratory	TECHNICIAN	M. Homer

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
02/02/22	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
02/03/22	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
02/04/22	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
02/05/22	5	2	5	3	4	3	3	4	2	4
	5	2	5	3	4	3	3	4	2	4
02/06/22	A	A	A	A	A	A	A	A	A	A
	5	2	5	3	4	3	3	4	2	4
02/07/22	7	6	8	7	10	8	7	8	9	6
	12	8	13	10	14	11	10	12	11	10
02/08/22	14	13	12	12	12	13	12	14	13	13
	26	21	25	22	26	24	22	26	24	23
x# Young 23.9 C.V. 7.75% x%Survival 100% C.V. 0.00%										

3%Effluent

Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
02/02/22	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
02/03/22	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
02/04/22	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
02/05/22	2	2	3	2	5	3	4	3	2	5
	2	2	3	2	5	3	4	3	2	5
02/06/22	A	A	A	A	A	A	A	A	A	A
	2	2	3	2	5	3	4	3	2	5
02/07/22	10	6	11	10	9	8	10	6	7	8
	12	8	14	12	14	11	14	9	9	13
02/08/22	12	13	12	12	13	13	12	14	13	14
	24	21	26	24	27	24	26	23	22	27
x# Young 24.4 C.V. 8.47% x%Survival 100% C.V. 0.00%										

5%Effluent

Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
02/02/22	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
02/03/22	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
02/04/22	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
02/05/22	3	2	4	4	3	5	3	4	5	2
	3	2	4	4	3	5	3	4	5	2
02/06/22	A	A	A	A	A	A	A	A	A	A
	3	2	4	4	3	5	3	4	5	2
02/07/22	6	7	9	8	6	7	6	11	11	10
	9	9	13	12	9	12	9	15	16	12
02/08/22	13	13	13	13	12	14	12	14	13	12
	22	22	26	25	21	26	21	29	29	24
x# Young 24.5 C.V. 12.36% x%Survival 100% C.V. 0.00%										

6%Effluent

Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
02/02/22	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
02/03/22	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
02/04/22	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
02/05/22	4	2	4	3	4	5	5	3	3	2
	4	2	4	3	4	5	5	3	3	2
02/06/22	A	A	A	A	A	A	A	A	A	A
	4	2	4	3	4	5	5	3	3	2
02/07/22	11	8	10	7	10	8	9	8	9	8
	15	10	14	10	14	13	14	11	12	10
02/08/22	12	14	12	13	13	14	12	14	12	13
	27	24	26	23	27	27	26	25	24	23
x# Young 25.2 C.V. 6.43% 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

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

NRL, Faulkner

Lab ID# 33590

Test Date: February 1, 2022

8%Effluent										
Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
02/02/22	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
02/03/22	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
02/04/22	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
02/05/22	3	2	3	4	3	5	5	5	3	2
	3	2	3	4	3	5	5	5	3	2
02/06/22	A	A	A	A	A	A	A	A	A	A
	3	2	3	4	3	5	5	5	3	2
02/07/22	8	11	6	8	10	9	11	6	10	10
	11	13	9	12	13	14	16	11	13	12
02/08/22	12	14	13	14	12	13	13	13	13	12
	23	27	22	26	25	27	29	24	26	24
x # Young 25.3 C.V. 8.34% x%Survival 100% C.V. 0.00%										

11%Effluent										
Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
02/02/22	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
02/03/22	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
02/04/22	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
02/05/22	5	2	2	3	2	4	3	4	3	3
	5	2	2	3	2	4	3	4	3	3
02/06/22	A	A	A	A	A	A	A	A	A	A
	5	2	2	3	2	4	3	4	3	3
02/07/22	6	10	10	9	10	9	9	7	8	10
	11	12	12	12	12	13	12	11	11	13
02/08/22	13	14	13	14	14	12	13	12	12	12
	24	26	25	26	26	25	25	23	23	25
x # Young 24.8 C.V. 4.58% 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

NLR, Faulkner

Lab ID# 33590

Test Date: February 1, 2022

WET CHEMISTRY MEASUREMENTS

Date	Time	Temp	Samp. No.	pH of Solution						Analyst
				CON	3%	5%	6%	8%	11%	
02/01/22	Start	25.0	1	8.30	8.22	8.16	8.15	8.08	8.09	DN
02/02/22	24 Hr.	23.0	1	8.26	8.14	8.13	8.10	7.96	8.02	DN
02/02/22	Renew	25.0	1	8.29	8.18	8.15	8.10	7.96	8.02	DN
02/03/22	48 Hr.	25.1	1	8.22	8.10	8.06	8.02	7.91	7.86	BH
02/03/22	Renew	24.9	1	8.29	8.24	8.20	8.19	8.12	8.10	BH
02/04/22	72 Hr.	23.8	1	8.24	8.21	8.16	8.12	8.07	8.01	BH
02/04/22	Renew	24.8	1	8.33	8.25	8.20	8.18	8.01	8.00	BH
02/05/22	96 Hr.	23.1	1	8.07	8.05	7.76	7.59	7.40	7.40	AM
02/05/22	Renew	23.7	1	8.28	8.17	7.87	7.63	7.39	7.40	AM
02/06/22	120 Hr.	23.1	1	8.12	8.08	7.93	7.69	7.49	7.54	AM
02/06/22	Renew	23.7	1	8.36	8.12	7.97	7.74	7.51	7.51	AM
02/07/22	144 Hr.	23.7	1	8.43	8.28	8.20	7.97	7.83	7.84	ID
02/07/22	Renew	25.0	2	8.01	8.03	8.00	7.78	7.59	7.66	ID
02/08/22	168 Hr.	23.4	2	8.45	8.41	8.36	8.33	8.28	8.28	TA

Date	Time	Temp	Samp. No.	DO (mg/L) of Solution						Analyst
				CON	3%	5%	6%	8%	11%	
02/01/22	Start	25.0	1	8.25	8.14	8.19	7.88	8.06	8.10	DN
02/02/22	24 Hr.	23.0	1	8.54	7.37	8.46	8.55	7.06	7.74	DN
02/02/22	Renew	25.0	1	7.84	7.75	8.16	7.63	7.32	8.54	DN
02/03/22	48 Hr.	25.1	1	7.82	7.69	8.05	7.56	7.22	7.20	BH
02/03/22	Renew	24.9	1	8.29	8.24	8.20	8.19	8.12	8.10	BH
02/04/22	72 Hr.	23.8	1	8.22	8.20	8.16	8.14	8.05	8.02	BH
02/04/22	Renew	24.8	1	8.33	8.25	8.20	8.18	8.01	8.00	BH
02/05/22	96 Hr.	23.1	1	7.75	7.75	7.68	7.72	7.49	7.69	AM
02/05/22	Renew	23.7	1	7.97	7.92	7.88	7.88	7.82	7.85	AM
02/06/22	120 Hr.	23.1	1	8.25	8.60	7.95	8.58	8.55	8.52	AM
02/06/22	Renew	23.7	1	8.47	8.52	8.42	8.44	8.45	8.45	AM
02/07/22	144 Hr.	23.7	1	7.64	7.19	8.37	7.22	7.33	7.30	ID
02/07/22	Renew	25.0	2	8.43	7.95	7.86	7.80	7.02	7.21	ID
02/08/22	168 Hr.	23.4	2	8.52	8.51	8.57	7.33	8.50	7.42	TA

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

NLR, Faulkner

Lab ID# 33590

Test Date: February 1, 2022

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
02/01/22	1	7.23	7.64	40	90	452	<0.01	N/A	DN
02/07/22	2	7.31	7.84	48	94	551	<0.01	N/A	ID
02/01/22	Con	8.30	8.25	100	64	360	-	N/A	DN

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	21.000	26.000	23.900
2	3% Effluent	10	21.000	27.000	24.400
3	5% Effluent	10	21.000	29.000	24.500
4	6% Effluent	10	23.000	27.000	25.200
5	8% Effluent	10	22.000	29.000	25.300
6	11% Effluent	10	23.000	26.000	24.800

Summary Statistics on Transformed Data Table 2 of 2

Grp	Identification	Variance	Sd	Sem	C.V.%
1	Control	3.433	1.853	0.586	7.75
2	3% Effluent	4.267	2.066	0.653	8.47
3	5% Effluent	9.167	3.028	0.957	12.36
4	6% Effluent	2.622	1.619	0.512	6.43
5	8% Effluent	4.456	2.111	0.667	8.34
6	11% Effluent	1.289	1.135	0.359	4.58

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	5	16	20	18	1

Calculated Chi-Square goodness of fit test statistic = 3.8646
 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 = 8.68

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	13.883	2.777	0.660
Within (Error)	54	227.100	4.206	
Total	59	240.983		

Critical F value = 2.45 (0.05,5,40)
 Since F < Critical F Fail to Reject Ho: All equal

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

Grp	Identification	Mean		T Stat	Sig
		Transformed Mean	Calculated In Original Units		
1	Control	23.900	23.900		
2	3% Effluent	24.400	24.400	-0.545	
3	5% Effluent	24.500	24.500	-0.654	
4	6% Effluent	25.200	25.200	-1.417	
5	8% Effluent	25.300	25.300	-1.527	
6	11% Effluent	24.800	24.800	-0.981	

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

Dunnnett'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	3% Effluent	10	2.119	8.9	-0.500
3	5% Effluent	10	2.119	8.9	-0.600
4	6% Effluent	10	2.119	8.9	-1.300
5	8% Effluent	10	2.119	8.9	-1.400
6	11% Effluent	10	2.119	8.9	-0.900

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

CLIENT	North Little Rock, Faulkner Lake Plant	SAMPLE TYPE	24 Hour Composite
NPDES #	AR0020303	DATE COLLECTED	01/31/22 02/04/22
LAB ID #	33590	DATE RECEIVED	02/01/22 02/07/22
TEST TYPE	7 Day Chronic	BEGIN DATE/TIME	02/01/22 1350
TEST ORGANISM	<i>Pimephales promelas</i>	END DATE/TIME	02/08/22 1350
ORGANISM AGE	< 24-Hours	TEST TEMPERATURE (°C)	25 ± 1
ORGANISM SOURCE	In House	PHOTO PERIOD	16-hr. Light 8-hr. Dark
RECEIVING WATER	Arkansas River	LIGHT INTENSITY	50-100 ft. cndl.
DILUTION WATER	Laboratory	TECHNICIAN	T. Annis

SURVIVAL SUMMARY

Conc.	02/02/22					02/03/22					02/04/22					02/05/22					02/06/22				
	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
3%	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
5%	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
6%	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	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
11%	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.	02/07/22					02/08/22					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
3%	8	8	8	8	8	8	8	8	8	8	100.0	0.00
5%	8	8	8	8	8	8	8	8	8	8	100.0	0.00
6%	8	8	8	8	8	8	8	8	8	8	100.0	0.00
8%	8	8	8	8	8	8	8	8	8	8	100.0	0.00
11%	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	0.4620	0.4270	0.4550	0.4210	0.4780	0.4486	5.36
3%	0.4560	0.4810	0.4210	0.4450	0.4670	0.4540	5.01
5%	0.4800	0.4190	0.4630	0.4720	0.4700	0.4608	5.24
6%	0.4570	0.4590	0.4860	0.4200	0.4370	0.4518	5.51
8%	0.4900	0.4560	0.4870	0.4190	0.4630	0.4630	6.19
11%	0.4440	0.4820	0.4630	0.4790	0.4820	0.4700	3.52

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

NLR, Faulkner

Lab ID# 33590

Test Date: February 1, 2022

WET CHEMISTRY MEASUREMENTS

Date	Time	Temp	Samp. No.	pH of Solution						Analyst
				CON	3%	5%	6%	8%	11%	
02/01/22	Start	25.0	1	8.30	8.22	8.16	8.15	8.08	8.09	DN
02/02/22	24 Hr.	23.3	1	7.67	7.70	7.80	7.75	7.72	7.72	DN
02/02/22	Renew	25.0	1	8.29	8.18	8.15	8.10	7.96	8.02	DN
02/03/22	48 Hr.	24.9	1	8.22	8.09	8.04	8.02	7.88	7.86	DN
02/03/22	Renew	24.9	1	8.29	8.24	8.20	8.19	8.12	8.10	DN
02/04/22	72 Hr.	23.8	1	8.20	8.16	8.12	8.09	8.03	7.89	DN
02/04/22	Renew	24.8	1	8.33	8.25	8.20	8.18	8.01	8.00	DN
02/05/22	96 Hr.	23.5	1	8.56	8.08	7.98	7.95	7.79	7.73	AM
02/05/22	Renew	23.7	1	8.28	8.17	7.87	7.63	7.39	7.40	AM
02/06/22	120 Hr.	23.3	1	8.20	8.20	8.19	8.18	8.07	8.02	AM
02/06/22	Renew	22.8	1	8.36	8.12	7.97	7.74	7.51	7.51	AM
02/07/22	144 Hr.	23.8	1	8.63	8.38	8.25	8.15	8.03	8.05	ID
02/07/22	Renew	25.0	2	8.01	8.03	8.00	7.78	7.59	7.66	ID
02/08/22	168 Hr.	24.0	2	7.58	7.67	7.74	7.76	7.68	7.80	TA

Date	Time	Temp	Samp. No.	DO (mg/L) of Solution						Analyst
				CON	3%	5%	6%	8%	11%	
02/01/22	Start	25.0	1	8.25	8.14	8.19	7.88	8.06	8.10	DN
02/02/22	24 Hr.	23.3	1	7.30	8.24	7.66	7.30	7.83	8.01	DN
02/02/22	Renew	25.0	1	7.84	7.75	8.16	7.63	7.32	8.54	DN
02/03/22	48 Hr.	25.1	1	7.40	7.36	7.32	7.30	7.19	7.16	DN
02/03/22	Renew	24.9	1	8.29	8.24	8.20	8.19	8.12	8.10	DN
02/04/22	72 Hr.	23.8	1	8.09	7.89	7.69	7.55	7.48	7.26	DN
02/04/22	Renew	24.8	1	8.33	8.25	8.20	8.18	8.01	8.00	DN
02/05/22	96 Hr.	23.5	1	8.44	8.45	7.75	8.39	8.38	8.32	AM
02/05/22	Renew	23.7	1	7.97	7.92	7.88	7.88	7.82	7.85	AM
02/06/22	120 Hr.	23.3	1	7.70	7.78	7.80	7.79	8.43	7.70	AM
02/06/22	Renew	22.8	1	8.47	8.52	8.42	8.44	8.45	8.45	AM
02/07/22	144 Hr.	23.8	1	7.71	7.51	8.13	7.48	7.71	7.80	ID
02/07/22	Renew	25.0	2	8.43	7.95	7.86	7.80	7.02	7.21	ID
02/08/22	168 Hr.	24.0	2	7.82	7.81	7.81	7.81	7.81	7.81	TA

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

NLR, Faulkner

Lab ID# 33590

Test Date: February 1, 2022

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
02/01/22	1	7.23	7.64	40	90	452	<0.01	N/A	DN
02/07/22	2	7.31	7.84	48	94	551	<0.01	N/A	ID
02/01/22	Con	8.30	8.25	100	64	360	-	N/A	DN

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	0.421	0.478	0.449
2	3% Effluent	5	0.421	0.481	0.454
3	5% Effluent	5	0.419	0.480	0.461
4	6% Effluent	5	0.420	0.486	0.452
5	8% Effluent	5	0.419	0.490	0.463
6	11% Effluent	5	0.444	0.482	0.470

Summary Statistics on Transformed Data Table 2 of 2

Grp	Identification	Variance	Sd	Sem	C.V.%
1	Control	0.001	0.024	0.011	5.36
2	3% Effluent	0.001	0.023	0.010	5.01
3	5% Effluent	0.001	0.024	0.011	5.24
4	6% Effluent	0.001	0.025	0.011	5.51
5	8% Effluent	0.001	0.029	0.013	6.19
6	11% Effluent	0.000	0.017	0.007	3.52

Shapiro - Wilk's Test For Normality

D = 0.014

W = 0.942

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 = 1.09

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	0.002	0.000	0.565
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
			Original Units	Calculated In		
1	Control	0.449	0.449			
2	3% Effluent	0.454	0.454		-0.359	
3	5% Effluent	0.461	0.461		-0.811	
4	6% Effluent	0.452	0.452		-0.213	
5	8% Effluent	0.463	0.463		-0.957	
6	11% Effluent	0.470	0.470		-1.423	

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	3% Effluent	5	0.036	7.9	-0.005
3	5% Effluent	5	0.036	7.9	-0.012
4	6% Effluent	5	0.036	7.9	-0.003
5	8% Effluent	5	0.036	7.9	-0.014
6	11% Effluent	5	0.036	7.9	-0.021

**APPENDIX A
RAW DATA**

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

CLIENT NLR-Faulkner

START DATE/TIME 2-1-22 MH 1545

OUTFALL 001

END DATE/TIME 2-8-22 MH 1545

LAB ID # 33590

Con

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
2/2	A	A	A	A	A	A	A	A	A	A	MH	1545
2/3	A	A	A	A	A	A	A	A	A	A		
2/4	A	A	A	A	A	A	A	A	A	A	MH	1045
2/5	5	2	5	3	4	3	3	4	2	4		
2/6	A	A	A	A	A	A	A	A	A	A	TG	1400
2/7	7	6	8	7	10	8	7	8	9	6		
2/8	14	13	12	12	12	13	12	14	13	13	MH	1545
	26	21	25	22	26	24	22	26	24	23		

\bar{x} # Young w/o Dead = 23.9 CV% = 7.75
 \bar{x} # Young w/Dead = CV% =
 \bar{x} % Survival = 100 CV% = 0.00

3

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
2/2	A	A	A	A	A	A	A	A	A	A	MH	1545
2/3	A	A	A	A	A	A	A	A	A	A		
2/4	A	A	A	A	A	A	A	A	A	A	MH	1045
2/5	2	2	3	2	5	3	4	3	2	5		
2/6	A	A	A	A	A	A	A	A	A	A	TG	1400
2/7	10	6	11	10	9	8	10	6	7	8		
2/8	12	13	12	12	13	13	12	14	13	14	MH	1545
	24	21	26	24	27	24	26	23	22	27		

\bar{x} # Young w/o Dead = 24.4 CV% = 8.47
 \bar{x} # Young w/Dead = CV% =
 \bar{x} % Survival = 100 CV% = 0.00

5

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
2/2	A	A	A	A	A	A	A	A	A	A	MH	1545
2/3	A	A	A	A	A	A	A	A	A	A		
2/4	A	A	A	A	A	A	A	A	A	A	MH	1045
2/5	3	2	4	4	3	5	3	4	5	2		
2/6	A	A	A	A	A	A	A	A	A	A	TG	1400
2/7	6	7	9	8	6	7	6	11	11	10		
2/8	13	13	13	13	12	14	12	14	13	12	MH	1545
	22	22	26	25	21	26	21	29	29	24		

\bar{x} # Young w/o Dead = 24.5 CV% = 12.36
 \bar{x} # Young w/Dead = CV% =
 \bar{x} % Survival = 100 CV% = 0.00

6

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
2/2	A	A	A	A	A	A	A	A	A	A	MH	1545
2/3	A	A	A	A	A	A	A	A	A	A		
2/4	A	A	A	A	A	A	A	A	A	A	MH	1045
2/5	4	2	4	3	4	5	5	3	3	2		
2/6	A	A	A	A	A	A	A	A	A	A	TG	1400
2/7	11	8	10	7	10	8	9	8	9	8		
2/8	12	14	12	13	13	14	12	14	12	13	MH	1545
	27	24	26	23	27	27	26	25	24	23		

\bar{x} # Young w/o Dead = 25.2 CV% = 6.43
 \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 NLR - Faulkner DATE/TIME STARTED 2/1/22 TA 1350
 OUTFALL # 001 PROJECT # 33579 DATE/TIME ENDED 2-8-22 JC 1350
 ORGANISM ID# PP0-22-031

Conc.	2/1/22 TA 1350					2-2-22 MH 0900					2-4-22 MH 1350					2-5-22 JC 1400					2-6-22 JC 1030									
	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
3	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
5	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
6	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
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	8
11	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.	2-7-22 DN 0820					2-8-22 JC 1350					C.V.'s									
	A	B	C	D	E	A	B	C	D	E	Mean Survival					C.V.'s				
Con	8	8	8	8	8	8	8	8	8	8	100.0	100.0	100.0	100.0	100.0	0.00	0.00	0.00	0.00	0.00
3	8	8	8	8	8	8	8	8	8	8	100.0	100.0	100.0	100.0	100.0	0.00	0.00	0.00	0.00	0.00
5	8	8	8	8	8	8	8	8	8	8	100.0	100.0	100.0	100.0	100.0	0.00	0.00	0.00	0.00	0.00
6	8	8	8	8	8	8	8	8	8	8	100.0	100.0	100.0	100.0	100.0	0.00	0.00	0.00	0.00	0.00
8	8	8	8	8	8	8	8	8	8	8	100.0	100.0	100.0	100.0	100.0	0.00	0.00	0.00	0.00	0.00
11	8	8	8	8	8	8	8	8	8	8	100.0	100.0	100.0	100.0	100.0	0.00	0.00	0.00	0.00	0.00

APPENDIX B
REFERENCE TOXICANTS



CHRONIC REFERENCE TOXICANT TEST RESULTS

SPECIES: *Ceriodaphnia dubia*

CHEMICAL: Sodium Chloride

DURATION: 7-Days

TEST NUMBER: 2

TEST DATE: 02/02/22 - 02/09/22
1500 Hrs - 1500 Hrs

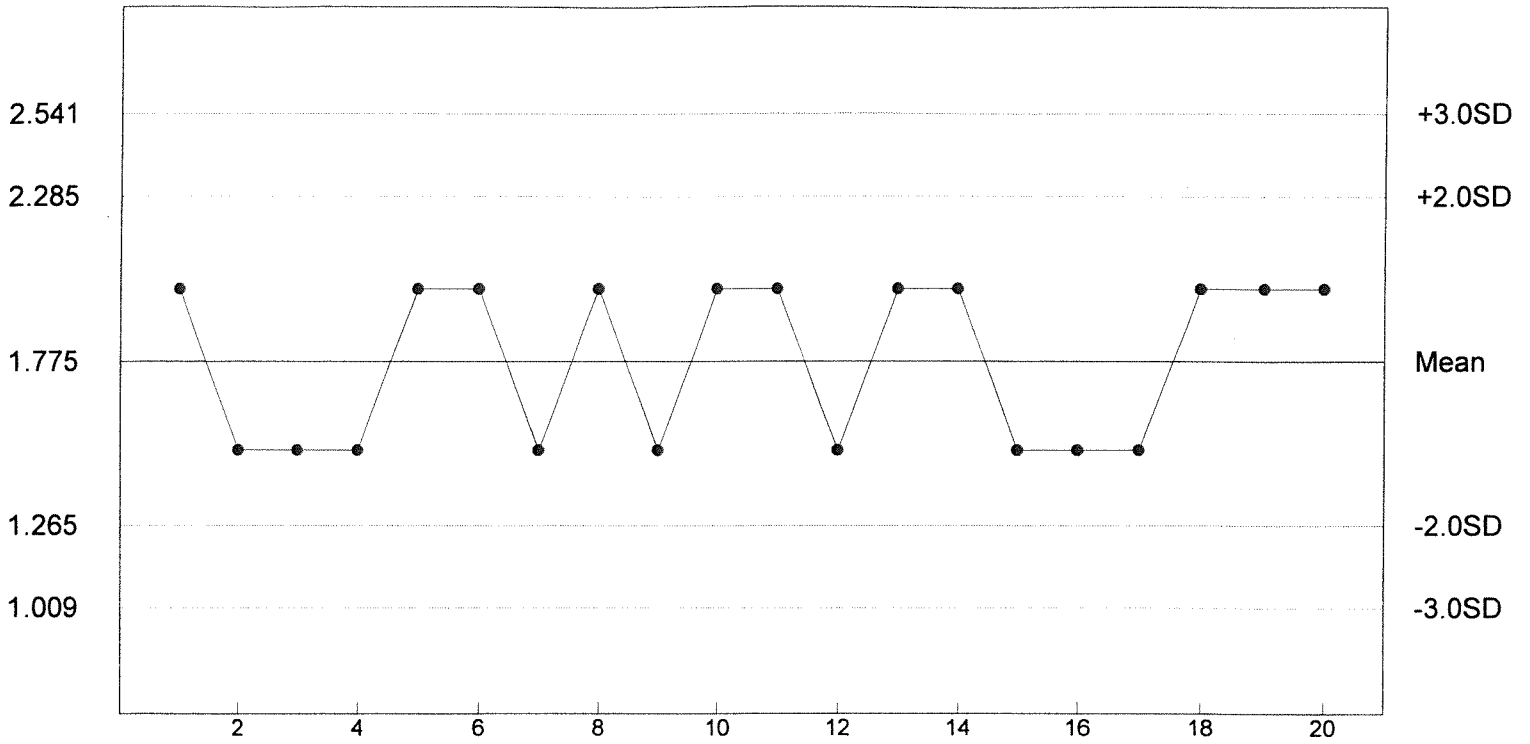
STATISTICAL METHOD: Dunnetts/Steels

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

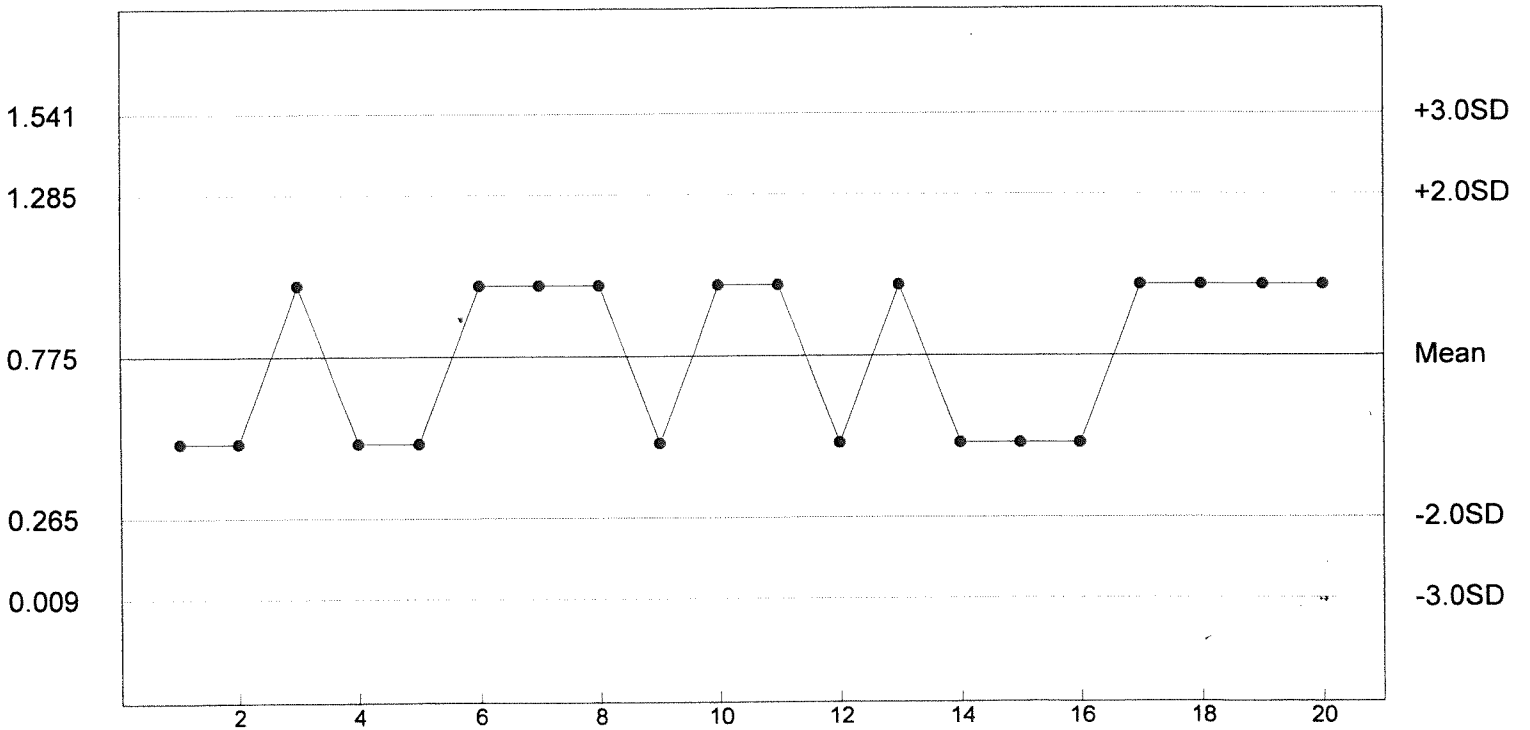
C. dubia Survival - NOEC



n= 20 Mean= 1.775 SD= 0.255 CV= 14.38% Min= 1.500 Max= 2.000

Reference Tox Sodium Chloride g/L

C. dubia Reproduction - NOEC



n= 20 Mean= 0.775 SD= 0.255 CV= 32.93% Min= 0.500 Max= 1.000

CHRONIC REFERENCE TOXICANT TEST RESULTS

SPECIES: *Pimephales promelas*

CHEMICAL: Copper Nitrate

DURATION: 7-Days

TEST NUMBER: 2

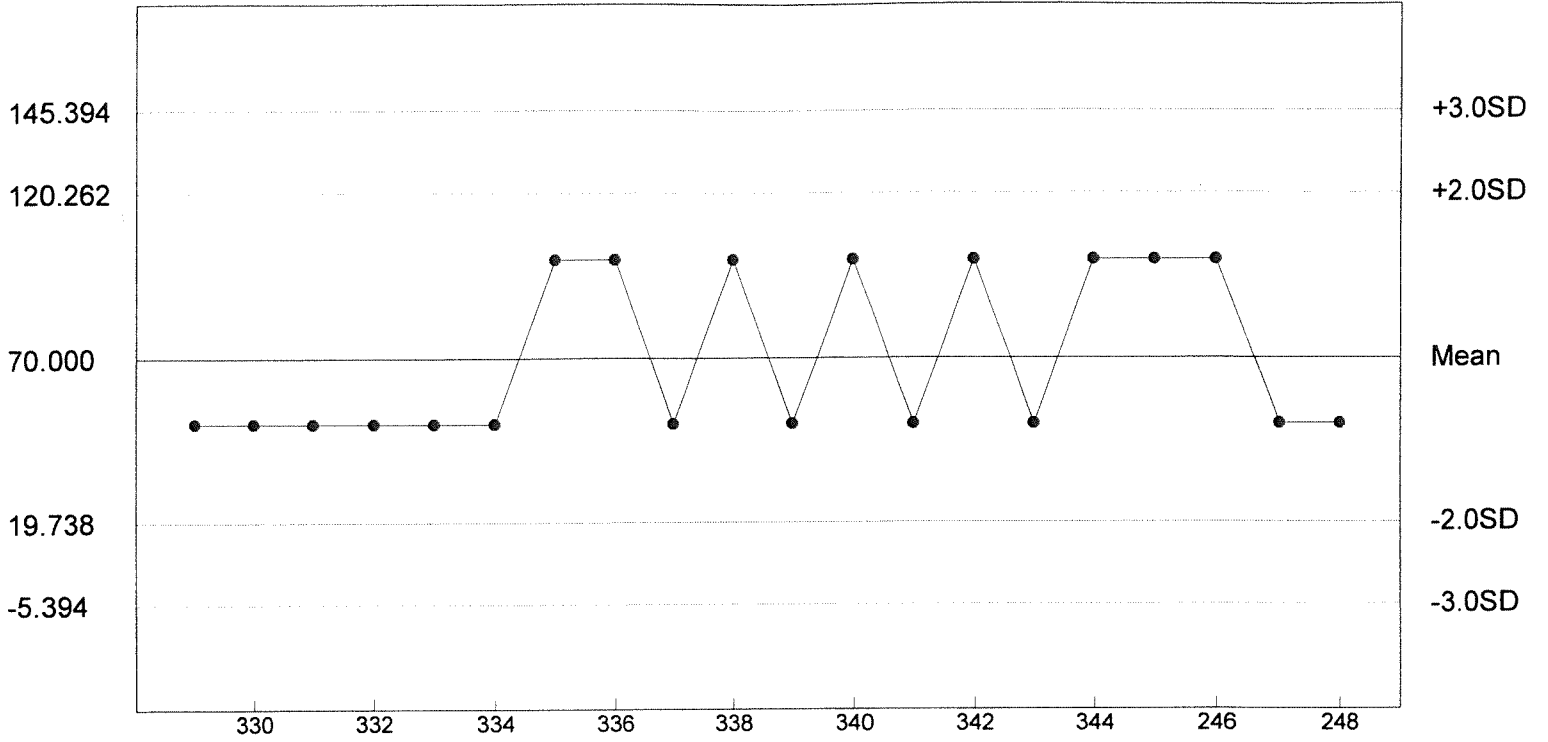
TEST DATE: 02/02/22 - 02/09/22
1330 Hrs -1330 Hrs

STATISTICAL METHOD: Dunnetts/Steels

CONCENTRATION (ug/L)	NUMBER EXPOSED	NUMBER DEAD
12.5	40	0
25	40	0
50	40	0
100	40	15
200	40	26
400	40	40
800	40	40

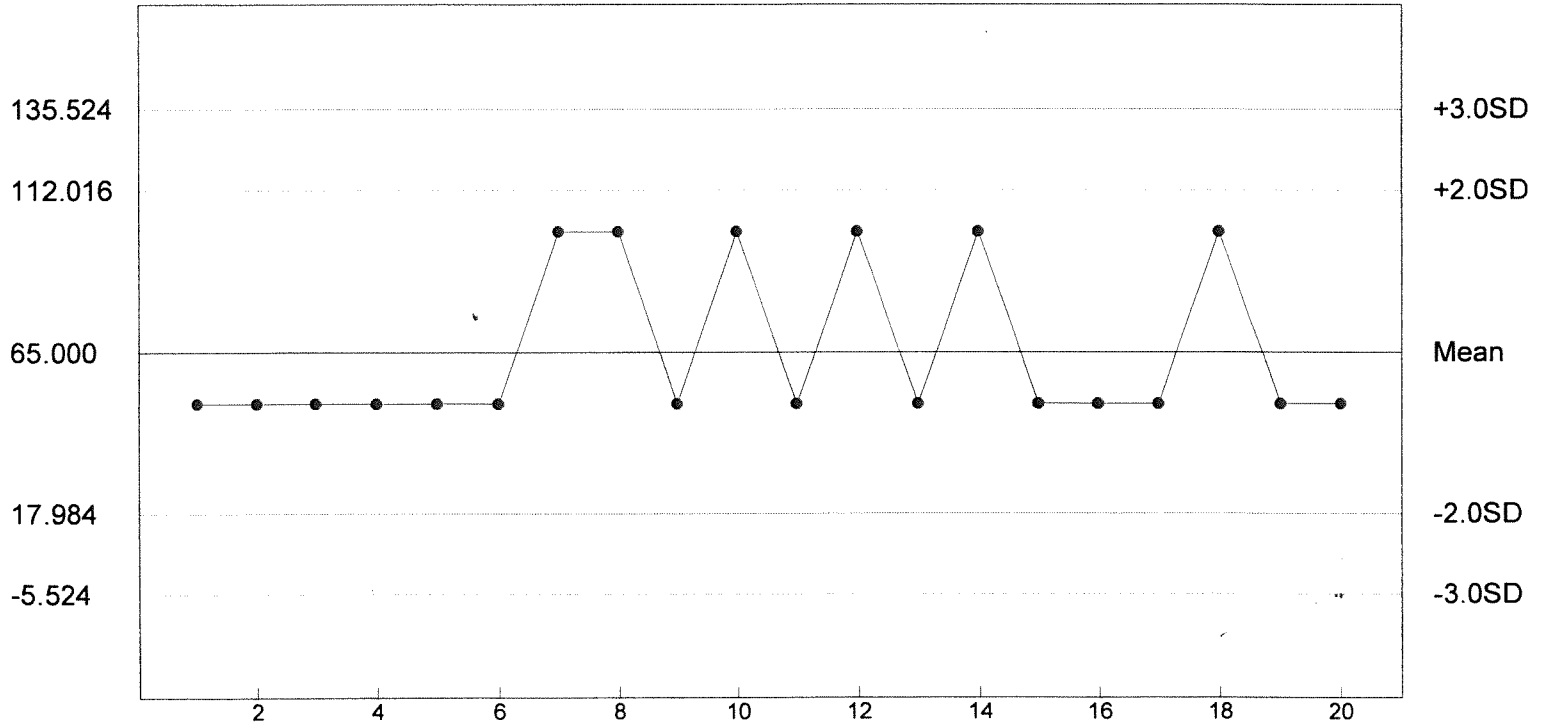
LOEC FOR SURVIVAL	NOEC FOR SURVIVAL	LOEC FOR GROWTH	NOEC FOR GROWTH
100 ug/L	50 ug/L	100 ug/L	50 ug/L

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



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

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



n= 20 Mean= 65.000 SD= 23.508 CV= 36.17% Min= 50.000 Max= 100.000

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 # 33590 PROJECT NAME NLR - Faulkner PERMIT# AR 020303

P.O. - 220180

24-Hr Flow Weighted Composite Other _____

OUTFALL SAMPLES

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.	
	B. Craft	1/30/22 / 6:25	1/31/22 / 0712	96	X			1

RECEIVING WATER SAMPLES

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

TYPE OF TEST 7 day ClF
 NAME OF RECEIVING WATER At Kansas River
 DILUTION WATER USED FOR THIS TEST Lab

RELINQUISHED BY: Bryan Craft DATE: _____ TIME: _____ 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: Matt Younger DATE: 2-1-22 TIME: 1000 SAMPLE TEMP. @ RECEIPT. 2.9

**NORTH LITTLE ROCK WASTEWATER UTILITY
 FAULKNER LAKE PLANT
 NPDES PERMIT NO. AR0020303
 AFIN NO. 60-00274
 OUTFALL 001 DMR REPORTING
 TEST DATE: 02/01/22**

I. *Ceriodaphnia dubia*

Response

(1) If the NOEC for survival is less than the critical dilution, enter a "1"; otherwise, enter a "0". Parameter No. TLP3B.	0
(2) Report the NOEC value for survival, Parameter No. TOP3B.	11%
(3) Report the NOEC value for reproduction, Parameter No. TPP3B.	11%
(4) If the NOEC for reproduction is less than the critical dilution, enter a "1"; otherwise, enter a "0". Parameter No. TGP3B.	0
(5) Report the higher (critical dilution or control) Coefficient of Variation Parameter No. TQP3B.	8.34%
(E) If retests are not required, Report NODI=9 (Conditional Monitoring – Not Required This Period) under Parameter Nos. 22415, 22416, 51443 (reported on quarterly DMR)	

II. *Pimephales promelas* (fathead minnow)

Response

(1) 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
(2) Report the NOEC value for survival, Parameter No. TOP6C.	11%
(3) Report the NOEC value for growth, Parameter No. TPP6C.	11%
(4) 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
(5) Report the highest (critical dilution or control) Coefficient of Variation, Parameter No. TQP6C.	6.19%
(E) If retests are not required, Report NODI=9 (Conditional Monitoring – Not Required This Period) under Parameter Nos. 22418, 22419, 51444 (reported on quarterly DMR)	