SCOTT J. BUNDY
Utilities Director

July 20, 2015
Arkansas Department of Environmental Quality
Mary Barnett
Ecologist Coordinator

Re City of Hot Springs WWTP
NPDES Permit # AR0033880
Bio Monitoring Second Quarter 2015

Dear Mrs. Barnett we have completed the second quarter chronic 7-Day Renewal Bio monitoring testing and did perform the recommended side by side UV Treated Both did pass, but there was an enough difference in results that we would like to request permission to continue using the UV treatment during the laboratory wet testing.

On the DMR for this Quarter I will be submitting the results from the regular testing until I here from ADEQ.

If there is anything else I need to do please let me know.

Thank you

James B Sorrells
Operations Manager
Hot Springs WWTP
501 262 1125

June 18, 2015

Test Results of
Second Quarter
Chronic 7-Day Renewal
Biomonitoring Testing
for
UV Treated Outfall 001
City of Hot Springs

Control No. 191256-1

Prepared for:

Mr. James Sorrells
City of Hot Springs
320 Davidson Drive
Hot Springs, AR 71901

Prepared by:

AMERICAN INTERPLEX CORPORATION
8600 Kanis Road
Little Rock, AR 72204-2322

AMERICAN INTERPLEX CORPORATION
LABORATORIES

City of Hot Springs
ATTN: Mr. James Sorrells
320 Davidson Drive
Hot Springs, AR 71901

Re: Chronic 7-Day Renewal utilizing *Pimephales promelas* (Fathead minnow)
UV Treated Outfall 001 - City of Hot Springs
NPDES Permit No. AR0033880 AFIN#26-00145

Dear Mr. James Sorrells:

This report is the analytical results and supporting information for the samples submitted to American Interplex Corporation (AIC). The following results are applicable only to the sample identified by the control number referenced above. Accurate assessment of the data requires access to the entire document. Each section of the report has been reviewed and approved by the laboratory director or qualified designee.

Testing procedures and Quality Assurance were in accordance with "Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms" EPA-821-R-02-013, Fourth Edition, October 2002. Test results are summarized below:

Method 1000.0 Chronic *Pimephales promelas* (Fathead minnow) Survival and Growth Test: The No Observable Effects Concentration (NOEC) for survival occurred at 87 % effluent, which is above the critical dilution of 65 %. The NOEC for growth occurred at 87 % effluent, which is above the critical dilution of 65 %. **The sample, therefore, PASSED both lethal and sub-lethal effects for the Fathead minnow test.**

AMERICAN INTERPLEX CORPORATION

John Overbey
Laboratory Director

PDF cc: City of Hot Springs
ATTN: Ms. Jessica Burks
jburks@cityhs.net

City of Hot Springs
ATTN: Mr. Dennis Brunson
dbrunson@cityhs.net

City of Hot Springs
ATTN: Mr. James Sorrells
jsorrells@cityhs.net

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I. Control Acceptance Criteria

Pimephales promelas (Fathead minnow) Method 1000.0

CRITERIA	RESULTS	PASS/FAIL
Control Survival > or = 80%	100	PASS
Control Growth > or = 0.25 mg per Surviving minnow	0.280	PASS
Control Growth CV < or = 40%	12.8	PASS
Growth Minimum Significant Difference 12 to 30%	17.9	PASS
Critical Dilution CV < or = 40%	10.8	PASS

II. Outlined Report

A. Introduction

1. Permit Number: AR0033880 AFIN#26-00145
2. Test Requirements: Chronic Biomonitoring, Quarterly
   Test Method 1000.0
3. Receiving Stream: Lake Catherine

B. Source of Effluent/Dilution Water

1. Effluent Samples:
   a. Sampling Point: UV Treated Outfall 001
   b. Chemical Data:

Analysis	Sample 1	Sample 2	Sample 3
Dissolved oxygen (mg/l)	8.1	6.8	7.9
pH (standard units)	7.2	7.6	7.6
Alkalinity (mg/l as CaCO3)	48	67	74
Hardness (mg/l as CaCO3)	63	71	78
Conductivity (umhos/cm)	220	280	310
Residual Chlorine (mg/l)	0.050	0.050	0.050
Ammonia as N (mg/l)	0.29	1.7	0.53

2. Dilution Water Samples: Synthetic Soft Water #4222
   a. Dates Prepared: June 1 through June 15, 2015
   b. Chemical Data:

Analysis	Sample 1	Sample 2	Sample 3
Dissolved oxygen (mg/l)	7.6	7.4	7.8
pH (standard units)	7.6	7.5	7.6
Alkalinity (mg/l as CaCO3)	30	30	30
Hardness (mg/l as CaCO3)	43	43	43
Conductivity (umhos/cm)	120	140	140
Residual Chlorine (mg/l)	<0.05	<0.05	<0.05

C. Test Methods
1. Test methods used:
Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, EPA-821-R-02-013; test Method 1000.0, Fathead Minnow Survival and Growth.
2. Endpoint: No Observable Effects Concentration (NOEC)
3. Test Conditions:

Pimephales promelas (Fathead minnow) Survival and Growth Method 1000.0

Date & Time Test Initiated:	June 9, 2015 at 1130
Date & Time Test Terminated:	June 16, 2015 at 0955
Type & Volume of Test Chamber:	500 ml disposable beaker
Volume of Sample:	250 ml
Number of Organisms per replicate:	8
Number of Replicates per dilution:	5

4. Acclimation of test organisms: Obtained from in-house cultures
5. Test Temperature: 25 +/- 1 degree Celsius

D. Test Organisms
1. Scientific Name
a. Test 1000.0 *Pimephales promelas*

III. Data Analysis

The data was analyzed using American Interplex Corporation's Laboratory Information Management Software based on Toxstat.

Pimephales promelas (Fathead minnow) survival data was transformed using the Arc Sine transformation. Normality and homogeneity of variance were checked using Shapiro-Wilk's. The survival data was then analyzed using Steel's Many-One Rank Test to determine the No Observable Effects Concentration (NOEC).

Fathead minnow growth data was analyzed for normality and homogeneity of variance using Shapiro-Wilk's and Bartlett's test. Dunnett's Test was used to determine the No Observable Effects Concentration (NOEC) for growth.

IV. Standard Reference Toxicants

American Interplex Corporation has an ongoing test organism culturing program. The sensitivity of the offspring is determined by performing a standard reference toxicant test with each effluent test. Sodium chloride in synthetic moderately hard water is used as prescribed in EPA-821-R-02-013.

Pimephales promelas (Fathead minnow)

Chronic reference tests are performed monthly.
A chronic reference test was performed on May 26, 2015 at 1450 to June 2, 2015 at 1315
The results were as follows: (Control No. 190396-1.)

Survival LC-50: 1884 mg/l
Growth IC-25: 2236 mg/l
Growth PMSD: 17.9

V. Chemical Analysis/Quality Control

Parameter	Method	% Recovery	Relative % Difference
Alkalinity	SM 2320 B	NA	0.00
Hardness	EPA 200.7	95.5	1.43
pH	SM 4500-H+ B	101	0.00
Conductivity	EPA 120.1	100	0.678

VI. Organism History

Pimephales promelas (Fathead minnow)

Date: June 9, 2015
Age: <24 hours
Source: In-house culture
Water Chemistry Record:

Alkalinity: 57-64 mg/l
Hardness: 80-100 mg/l
Temperature: 25 deg.C

VII. Results Summary *Pimephales promelas*, Fathead minnow Larval Survival and Growth Test -- Method 1000.0

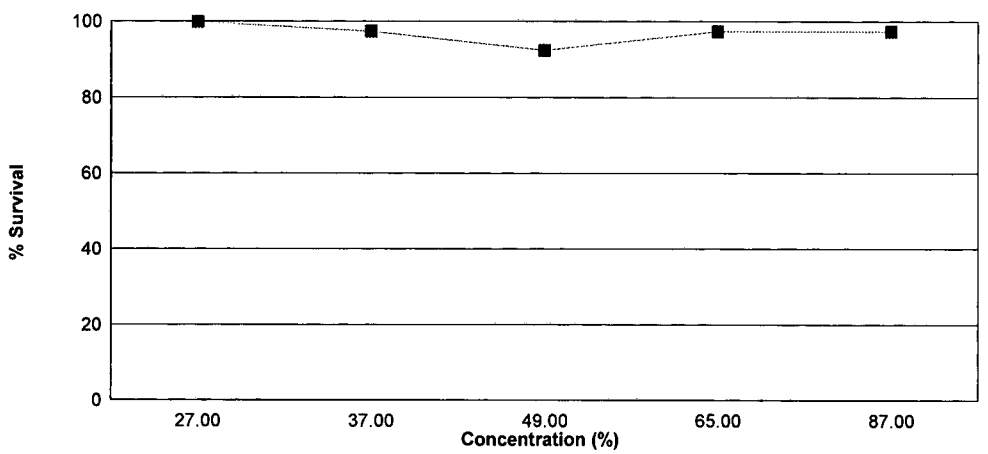
Larvae are exposed in a static renewal system for seven days to different concentrations of effluent with dilution water. Test results are based on the survival and growth (increase in weight) of the larvae.

Effluent dilutions for this test were 27 %, 37 %, 49 %, 65 %, 87 % in accordance with the NPDES permit.

The low flow or 'critical' dilution is specified in the NPDES permit as 65 % effluent.

The test was initiated on June 9, 2015 at 1130 and continued through June 16, 2015 at 0955. Statistical analyses were performed on the observed data and the no observable effects concentrations (NOECs) were as follows:

a.) NOEC survival = 87 % effluent
b.) NOEC growth = 87 % effluent



Summary of the 7-day Fathead Minnow Survival and Growth		
Concentration	Percent Survival	Mean Growth (mg)
Control	100	0.280
27 %	100	0.265
37 %	97.5	0.292
49 %	92.5	0.271
65 %	97.5	0.285
87 %	97.5	0.284

Appendix A1: Test 1000.0

Pimephales promelas (Fathead Minnow) 7-Day Survival

Date and Time Test Initiated: June 9, 2015 at 1130
Date and Time Test Terminated: June 16, 2015 at 0955

Concentration	Replicate	Number of Survivors						
		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	A	8	8	8	8	8	8	8
	B	8	8	8	8	8	8	8
	C	8	8	8	8	8	8	8
	D	8	8	8	8	8	8	8
	E	8	8	8	8	8	8	8
27 %	A	8	8	8	8	8	8	8
	B	8	8	8	8	8	8	8
	C	8	8	8	8	8	8	8
	D	8	8	8	8	8	8	8
	E	8	8	8	8	8	8	8
37 %	A	8	8	8	8	8	8	8
	B	8	8	8	8	8	8	7
	C	8	8	8	8	8	8	8
	D	8	8	8	8	8	8	8
	E	8	8	8	8	8	8	8
49 %	A	8	8	8	8	8	8	8
	B	7	7	7	7	7	7	6
	C	8	8	8	8	8	8	8
	D	8	8	8	8	8	8	8
	E	8	8	8	8	8	8	7
65 %	A	8	8	8	8	8	8	8
	B	8	8	8	8	8	8	8
	C	8	8	8	8	8	8	8
	D	8	8	8	8	8	8	7
	E	8	8	8	8	8	8	8
87 %	A	8	8	8	8	8	8	8
	B	8	8	8	8	8	8	7
	C	8	8	8	8	8	8	8
	D	8	8	8	8	8	8	8
	E	8	8	8	8	8	8	8

Appendix A1: Test 1000.0

Pimephales promelas (Fathead Minnow) 7-Day Growth

Test Initiated: June 9, 2015 at 1130
Test Terminated: June 16, 2015 at 0955

Drying Started: June 15, 2015 at 1120
Drying Ended: June 17, 2015 at 1400

Concentration	Replicate	Weight of pan	Weight of pan + fish	Total weight of fish (g)	Original # of fish	Mean dry weight (mg)
Control	A	.94391	.94577	0.00186	8	0.232
	B	.94292	.94504	0.00212	8	0.265
	C	.93870	.94108	0.00238	8	0.298
	D	.93752	.94014	0.00262	8	0.328
	E	.93688	.93911	0.00223	8	0.279
27 %	A	.93315	.93507	0.00192	8	0.240
	B	.93553	.93792	0.00239	8	0.299
	C	.93512	.93738	0.00226	8	0.282
	D	.93710	.93940	0.00230	8	0.288
	E	.94018	.94192	0.00174	8	0.218
37 %	A	.93794	.94007	0.00213	8	0.266
	B	.93523	.93760	0.00237	8	0.296
	C	.93673	.93936	0.00263	8	0.329
	D	.93578	.93805	0.00227	8	0.284
	E	.93626	.93855	0.00229	8	0.286
49 %	A	.94014	.94212	0.00198	8	0.248
	B	.94271	.94450	0.00179	8	0.224
	C	.94432	.94662	0.00230	8	0.288
	D	.94568	.94812	0.00244	8	0.305
	E	.94233	.94463	0.00230	8	0.288
65 %	A	.93754	.93970	0.00216	8	0.270
	B	.93883	.94135	0.00252	8	0.315
	C	.93619	.93877	0.00258	8	0.322
	D	.93594	.93805	0.00211	8	0.264
	E	.93745	.93950	0.00205	8	0.256
87 %	A	.93878	.94109	0.00231	8	0.289
	B	.93832	.94061	0.00229	8	0.286
	C	.93855	.94028	0.00173	8	0.216
	D	.93540	.93797	0.00257	8	0.321
	E	.93377	.93624	0.00247	8	0.309

Appendix A2: Statistics

Pimephales promelas (Fathead minnow) Survival

		Transformation of Data		Transform: Arc Sin(Square Root(Y))
Group	Identification	Rep	Value	Transformed
1	Control	1	1.00000	1.39310
1	Control	2	1.00000	1.39310
1	Control	3	1.00000	1.39310
1	Control	4	1.00000	1.39310
1	Control	5	1.00000	1.39310
2	27 %	1	1.00000	1.39310
2	27 %	2	1.00000	1.39310
2	27 %	3	1.00000	1.39310
2	27 %	4	1.00000	1.39310
2	27 %	5	1.00000	1.39310
3	37 %	1	1.00000	1.39310
3	37 %	2	0.87500	1.20940
3	37 %	3	1.00000	1.39310
3	37 %	4	1.00000	1.39310
3	37 %	5	1.00000	1.39310
4	49 %	1	1.00000	1.39310
4	49 %	2	0.75000	1.04720
4	49 %	3	1.00000	1.39310
4	49 %	4	1.00000	1.39310
4	49 %	5	0.87500	1.20940
5	65 %	1	1.00000	1.39310
5	65 %	2	1.00000	1.39310
5	65 %	3	1.00000	1.39310
5	65 %	4	0.87500	1.20940
5	65 %	5	1.00000	1.39310
6	87 %	1	1.00000	1.39310
6	87 %	2	0.87500	1.20940
6	87 %	3	1.00000	1.39310
6	87 %	4	1.00000	1.39310
6	87 %	5	1.00000	1.39310

Appendix A2: Statistics

Pimephales promelas (Fathead minnow) Survival

Shapiro - Wilk's Test for Normality		Transform: Arc Sin(Square Root(Y))
D = 0.1783		
W = 0.7889		
Critical W = 0.9	(alpha = 0.01, N = 30)	
Critical W = 0.927	(alpha = 0.05, N = 30)	
Data FAIL normality test (alpha = 0.01).		

Steel's Many-One Rank Test				Transform: Arc Sin(Square Root(Y))	
Ho:Control<Treatment					
Group	Identification	Rank Sum	Critical Value	DF	Sig 0.05
1	Control				
2	27 %	27.50	16.00	5.00	
3	37 %	25.00	16.00	5.00	
4	49 %	22.50	16.00	5.00	
5	65 %	25.00	16.00	5.00	
6	87 %	25.00	16.00	5.00	
Critical values are 1 tailed (k=5)					

Appendix A2: Statistics

Pimephales promelas (Fathead minnow) Growth

Shapiro - Wilk's Test for Normality		No Transformation
D = 0.02702		
W = 0.9532		
Critical W = 0.9	(alpha = 0.01, N = 30)	
Critical W = 0.927	(alpha = 0.05, N = 30)	
Data PASS normality test (alpha = 0.01).		

Bartlett's Test for Homogeneity of Variance		No Transformation
Calculated B1 statistic = 1.193		
Critical B = 15.086	(alpha = 0.01, df = 5)	
Data PASS B1 homogeneity test at 0.01 level.		

Appendix A2: Statistics

Pimephales promelas (Fathead minnow) Growth

ANOVA Table				No Transformation
SOURCE	DF	SS	MS	F
Between	5	0.002484	0.0004968	0.4412
Within (Error)	24	0.02702	0.001126	
Total	29	0.0295		

Critical F = 3.9 (alpha = 0.01, df = 5,24)
2.62 (alpha = 0.05, df = 5,24)

Since F < Critical F FAIL TO REJECT Ho: All equal (alpha = 0.05)

Dunnett's Test - Table 1 of 2					No Transformation
Ho:Control<Treatment					
Group	Identification	Transformed Mean	Mean In Original Units	T Stat	Sig 0.05
1	Control	0.2804	0.2804		
2	27 %	0.2654	0.2654	0.7068	
3	37 %	0.2922	0.2922	-0.556	
4	49 %	0.2706	0.2706	0.4618	
5	65 %	0.2854	0.2854	-0.2356	
6	87 %	0.2842	0.2842	-0.1791	

Dunnett's critical value = 2.36 (1 Tailed, alpha = 0.05, df = 5,24)

Dunnett's Test - Table 2 of 2					No Transformation
Ho:Control<Treatment					
Group	Identification	Num of Reps	Min Sig Diff (In Orig. Units)	% of Control	Difference From Control
1	Control	5			
2	27 %	5	0.05009	17.9	0.015
3	37 %	5	0.05009	17.9	-0.0118
4	49 %	5	0.05009	17.9	0.0098
5	65 %	5	0.05009	17.9	-0.005
6	87 %	5	0.05009	17.9	-0.0038

Appendix A3: Water Chemistry

Routine Chemical and Physical Data

Date and Time Test Initiated: June 9, 2015 at 0901
Date and Time Test Terminated: June 16, 2015 at 0955

Effluent Conc.: Control		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	7.6	7.7	7.4	7.7	7.8	7.6	7.7
	Final	7.2	6.8	7.0	7.1	7.2	7.1	6.7
pH, units	Initial	7.6	7.5	7.5	7.5	7.6	7.7	7.5
	Final	7.5	7.5	7.6	7.9	7.8	7.6	7.4
Alkalinity, mg CaCO3/l		30	NA	30	NA	30	NA	NA
Hardness, mg CaCO3/l		43	NA	43	NA	43	NA	NA
Conductivity, umhos/cm		120	130	140	130	140	150	140
Res. Chlorine, mg/l		<0.05	NA	<0.05	NA	<0.05	NA	NA

Effluent Conc.: 27 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	7.7	7.6	7.2	7.1	7.5	7.3	7.8
	Final	6.8	6.4	7.0	6.8	7.4	7.2	5.9
pH, units	Initial	7.5	7.5	7.6	7.4	7.6	7.8	7.5
	Final	7.5	7.4	7.6	7.8	7.9	7.6	7.4

Effluent Conc.: 37 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	7.8	7.5	7.6	7.1	7.8	7.2	7.5
	Final	7.0	6.2	7.1	7.4	7.6	7.2	6.3
pH, units	Initial	7.4	7.5	7.6	7.5	7.5	7.8	7.5
	Final	7.6	7.4	7.6	7.8	7.9	7.6	7.5

Appendix A3: Water Chemistry

Routine Chemical and Physical Data

Date and Time Test Initiated: June 9, 2015 at 0901
Date and Time Test Terminated: June 16, 2015 at 0955

Effluent Conc.: 49 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	8.0	7.5	7.3	7.2	7.8	7.5	7.7
	Final	7.2	6.7	7.1	6.8	7.3	7.2	6.2
pH, units	Initial	7.4	7.5	7.6	7.5	7.5	7.9	7.6
	Final	7.6	7.4	7.7	7.8	8.0	7.6	7.5

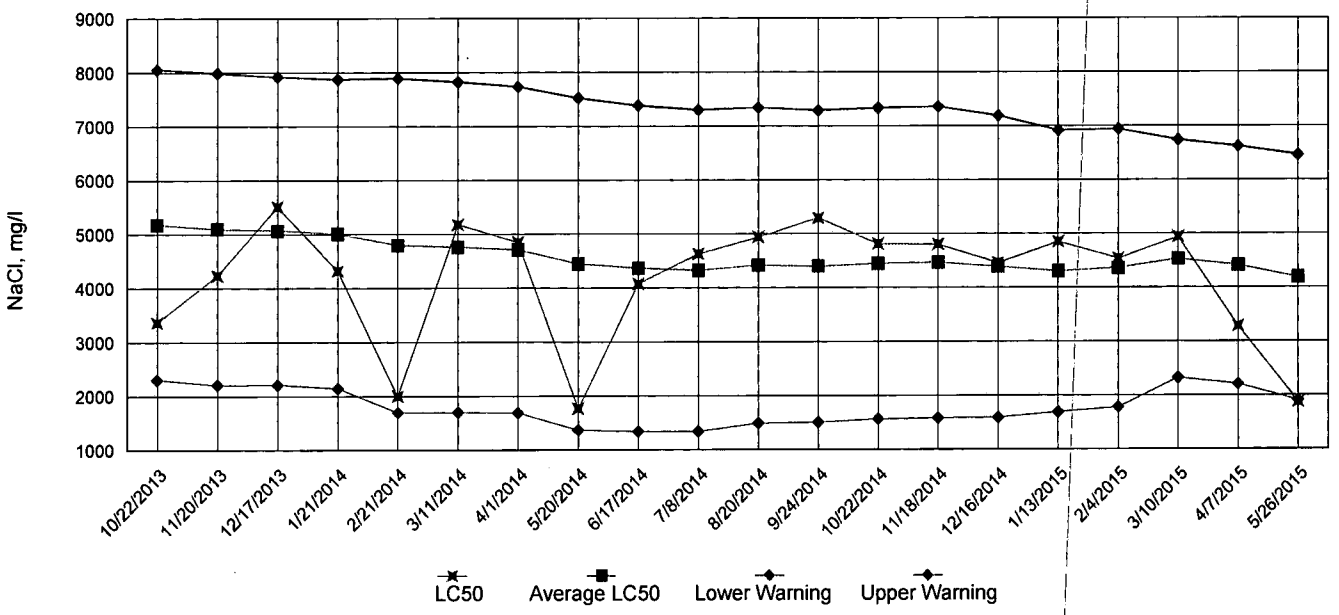
Effluent Conc.: 65 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	7.8	7.5	7.5	7.3	7.5	7.5	7.7
	Final	7.3	6.7	7.2	6.9	7.2	7.4	8.1
pH, units	Initial	7.4	7.6	7.6	7.6	7.6	7.9	7.6
	Final	7.6	7.4	7.7	7.8	8.0	7.7	7.5
Alkalinity, mg CaCO3/l		44	NA	52	NA	59	NA	NA
Hardness, mg CaCO3/l		57	NA	59	NA	66	NA	NA
Conductivity, umhos/cm		180	200	230	220	250	260	250
Res. Chlorine, mg/l		<0.05	NA	<0.05	NA	<0.05	NA	NA

Effluent Conc.: 87 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	8.0	7.4	7.1	7.0	7.5	7.3	7.4
	Final	7.1	6.4	7.0	7.0	7.4	7.2	7.8
pH, units	Initial	7.3	7.6	7.6	7.5	7.6	8.0	7.6
	Final	7.6	7.5	7.7	7.9	8.1	7.7	7.6

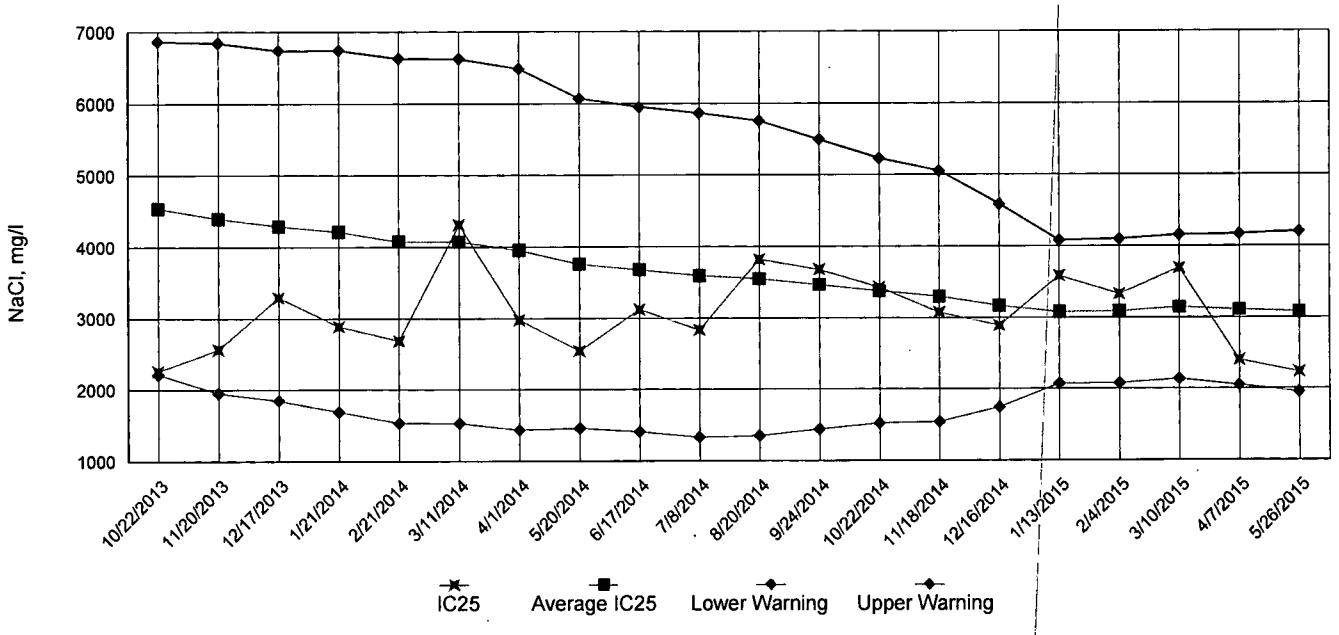
Appendix A4: Test 1000.0

Chronic Reference Toxicant, *Pimephales promelas* (Fathead Minnow)

LC50 Survival Data



IC25 Growth Data



Appendix B: Test 1000.0

SUMMARY REPORTING FORMS
CHRONIC BIOMONITORING
Pimephales promelas (Fathead Minnow)
SURVIVAL AND GROWTH

Permittee: City of Hot Springs

NPDES No.: AR0033880 AFIN#26-00145

Date and Time Test Initiated: June 9, 2015 at 1130
Date and Time Test Terminated: June 16, 2015 at 0955
Dilution water used: Synthetic Soft Water #4222

DATA TABLE FOR SURVIVAL

Effluent Conc. %	Percent Survival in replicate chambers A	B	C	D	E	Mean percent survival 24 hr	48 hr	7 days	CV%
Control	100	100	100	100	100	100	100	100	0.00
27 %	100	100	100	100	100	100	100	100	0.00
37 %	100	87.5	100	100	100	100	100	97.5	5.73
49 %	100	75.0	100	100	87.5	97.5	97.5	92.5	12.1
65 %	100	100	100	87.5	100	100	100	97.5	5.73
87 %	100	87.5	100	100	100	100	100	97.5	5.73

DATA TABLE FOR GROWTH

Effluent Conc. %	Average dry weight, mg replicate chambers A	B	C	D	E	Mean dry weight, mg	CV%
Control	0.232	0.265	0.298	0.328	0.279	0.28	12.8
27 %	0.240	0.299	0.282	0.288	0.218	0.265	13.1
37 %	0.266	0.296	0.329	0.284	0.286	0.292	7.95
49 %	0.248	0.224	0.288	0.305	0.288	0.271	12.4
65 %	0.270	0.315	0.322	0.264	0.256	0.285	10.8
87 %	0.289	0.286	0.216	0.321	0.309	0.284	14.3

CV = Coefficient of variation = standard deviation * 100 / mean

Appendix B: Test 1000.0

SUMMARY REPORTING FORMS
CHRONIC BIOMONITORING
Pimephales promelas (Fathead Minnow)
SURVIVAL AND GROWTH

1. Steel's Many-One Rank Test:

   Is the mean survival significantly different (p=0.05) than the control survival for the % effluent corresponding to (lethality):

a.) LOW FLOW OR CRITICAL DILUTION	(65 %)	YES	X NO
b.) 1/2 LOW FLOW DILUTION	(NA)	YES	NO

2. Dunnett's Test:

   Is the mean dry weight (growth) significantly different (p=0.05) than the control's dry weight (growth) for the % effluent corresponding to (significant non-lethal effects):

a.) LOW FLOW OR CRITICAL DILUTION	(65 %)	YES	X NO
b.) 1/2 LOW FLOW DILUTION	(NA)	YES	NO

3. If you answered NO to 1.a) enter [0] otherwise enter [1]: 0 (TLP6C)

4. If you answered NO to 2.a) enter [0] otherwise enter [1]: 0 (TGP6C)

5. NOEC Pimephales Lethality: 87 % (TOP6C)

6. LOEC Pimephales Lethality: 87 % (TXP6C)

7. NOEC Pimephales Sublethality: 87 % (TPP6C)

8. LOEC Pimephales Sublethality: 87 % (TYP6C)

9. Coefficient of variation for Pimephales growth: 12.8 (TQP6C)

AMERICAN INTERPLEX CORPORATION
LABORATORIES

Appendix B: Test 1000.0

CHRONIC TOXICITY SUMMARY FORM
Pimephales promelas (Fathead minnow)
CHEMICAL PARAMETERS CHART

PERMITTEE: City of Hot Springs 2400
NPDES NO.: AR0033880 AFIN#26-00145 2400
CONTACT: Mr. James Sorrells 2400
ANALYST: 280, 304, 310, 314

Test Initiated: DATE: June 9, 2015 TIME: 1130
Test Terminated: DATE: June 16, 2015 TIME: 0955

DILUTION Control	DAY 1	2	3	4	5	6	7
D.O. Initial	7.6	7.7	7.4	7.7	7.8	7.6	7.7
Final	7.2	6.8	7.0	7.1	7.2	7.1	6.7
pH Initial	7.6	7.5	7.5	7.5	7.6	7.7	7.5
Final	7.5	7.5	7.6	7.9	7.8	7.6	7.4
Alkalinity	30	NA	30	NA	30	NA	NA
Hardness	43	NA	43	NA	43	NA	NA
Conductivity	120	130	140	130	140	150	140
Chlorine	<0.05	NA	<0.05	NA	<0.05	NA	NA

DILUTION 27 %	DAY 1	2	3	4	5	6	7
D.O. Initial	7.7	7.6	7.2	7.1	7.5	7.3	7.8
Final	6.8	6.4	7.0	6.8	7.4	7.2	5.9
pH Initial	7.5	7.5	7.6	7.4	7.6	7.8	7.5
Final	7.5	7.4	7.6	7.8	7.9	7.6	7.4
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	150	160	170	170	180	190	180
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION 37 %	DAY 1	2	3	4	5	6	7
D.O. Initial	7.8	7.5	7.6	7.1	7.8	7.2	7.5
Final	7.0	6.2	7.1	7.4	7.6	7.2	6.3
pH Initial	7.4	7.5	7.6	7.5	7.5	7.8	7.5
Final	7.6	7.4	7.6	7.8	7.9	7.6	7.5
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	150	170	190	190	200	210	200
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION 49 %	DAY 1	2	3	4	5	6	7
D.O. Initial	8.0	7.5	7.3	7.2	7.8	7.5	7.7
Final	7.2	6.7	7.1	6.8	7.3	7.2	6.2
pH Initial	7.4	7.5	7.6	7.5	7.5	7.9	7.6
Final	7.6	7.4	7.7	7.8	8.0	7.6	7.5
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	170	180	200	190	220	230	220
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION 65 %	DAY 1	2	3	4	5	6	7
D.O. Initial	7.8	7.5	7.5	7.3	7.5	7.5	7.7
Final	7.3	6.7	7.2	6.9	7.2	7.4	8.1
pH Initial	7.4	7.6	7.6	7.6	7.6	7.9	7.6
Final	7.6	7.4	7.7	7.8	8.0	7.7	7.5
Alkalinity	44	NA	52	NA	59	NA	NA
Hardness	57	NA	59	NA	66	NA	NA
Conductivity	180	200	230	220	250	260	250
Chlorine	<0.05	NA	<0.05	NA	<0.05	NA	NA

DILUTION 87 %	DAY 1	2	3	4	5	6	7
D.O. Initial	8.0	7.4	7.1	7.0	7.5	7.3	7.4
Final	7.1	6.4	7.0	7.0	7.4	7.2	7.8
pH Initial	7.3	7.6	7.6	7.5	7.6	8.0	7.6
Final	7.6	7.5	7.7	7.9	8.1	7.7	7.6
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	200	220	260	260	290	300	290
Chlorine	NA	NA	NA	NA	NA	NA	NA

AMERICAN INTERPLEX CORPORATION
LABORATORIES

CHAIN OF CUSTODY / ANALYSIS REQUEST FORM

Client: City of Hot Springs
Project Reference: Plant Effluent
Project Manager: James Sorrells
Sampled By: H Mauldin

PO No. 15-2002

AIC CONTROL NO: 19256
AIC PROPOSAL NO:
Carrier: U.S. Delivery
Received Temperature C: 0.1

AIC No.	Sample Identification	Date/Time Collected	GRAB	COMP	MATRIX WATER	MATRIX SOIL	NO OF BOTTLES	ANALYSES REQUESTED: Chronic EH	Remarks
1	Plant Effluent	6/7/15 C0000-2400		X	X		3	X	
		Container Type							Field pH calibration
		Preservative							on _____ @ _____
									Buffer:

G = Glass P = Plastic V = VOA vials H = HCl to pH2 T = Sodium Thiosulfate
NO = none S = Sulfuric acid pH2 N = Nitric acid pH2 B = NaOH to pH12 Z = Zinc acetate A=$(NH_4)_2SO_4$. NH_4OH

Turnaround Time Requested: (Please circle)
NORMAL or EXPEDITED IN ____ DAYS
Expedited results requested by: _____
Who should AIC contact with questions:
Phone:_____ Fax:
Report Attention to:
Report Address to:
Email Address:

Relinquished By:	Date/Time	Received By:	Date/Time
H Mauldin	6/8/15 @ 0940	M. Mann	6-8-15 @ 9:40
M. Mann	6-8-15 @ 10:45	D. Brown	6-8-15 10:45

Comments: Pimephales promelas (Fathead Minnow)

9/2014 FORM 0060

AMERICAN INTERPLEX CORPORATION LABORATORIES

CHAIN OF CUSTODY / ANALYSIS REQUEST FORM

Client: City of Hot Springs
Project Reference: Plant Effluent
Project Manager: James Sorrells
Sampled By: H Mancom

PO No. 15-2002

AIC CONTROL NO: 191256
AIC PROPOSAL NO:
Carrier: Delivery Hot Springs
Received Temperature C: 0.1

AIC No.	Sample Identification	Date/Time Collected	GRAB	COMP	MATRIX WATER	MATRIX SOIL	NO OF BOTTLES	ANALYSES REQUESTED: Pimephales promelas (Fathead Minnow)	Remarks
2	Plant Effluent	10/9/15 @ 0000-2400		X	X		3	X	
		Container Type							
		Preservative							

Field pH calibration
on _____ @ _____
Buffer:

G = Glass P = Plastic V = VOA vials H = HCl to pH2 T = Sodium Thiosulfate
NO = none S = Sulfuric acid pH2 N = Nitric acid pH2 B = NaOH to pH12 Z = Zinc acetate A=$(NH_4)_2SO_4$, NH_4OH

Turnaround Time Requested: (Please circle)
NORMAL or EXPEDITED IN ____ DAYS
Expedited results requested by: _____
Who should AIC contact with questions:
Phone: _____ Fax:
Report Attention to:
Report Address to:
Email Address:

Relinquished By:	Date/Time	Received By:	Date/Time
Bill Mancom	6-10-2015 @ 1025 HRS	M. Mann	6-10-15 @ 10:25
M. Mann	6-10-15 @ 11:50	D. Brown	6-10-15 11:50

Comments:

9/2014 FORM 0060

AMERICAN INTERPLEX CORPORATION
LABORATORIES

CHAIN OF CUSTODY / ANALYSIS REQUEST FORM

Client: City of Hot Springs
Project Reference: Plant Effluent
Project Manager: James Sorrells
Sampled By: H Mauldin

PO No. 15-2002

AIC CONTROL NO: 191256
AIC PROPOSAL NO:
Carrier: HS Delivery
Received Temperature C: 0.1

AIC No.	Sample Identification	Date/Time Collected	GRAB	COMP	MATRIX WATER	MATRIX SOIL	NO OF BOTTLES	ANALYSES REQUESTED: Pimephales	ANALYSES REQUESTED: Fathead Minnow	Remarks
3	Plant Effluent	6/11/15 @0000-2400		X	X			X	X	
		Container Type						P		
		Preservative						NO		

Remarks

Field pH calibration
on _____ @ _____
Buffer:

G = Glass P = Plastic V = VOA vials H = HCl to pH2 T = Sodium Thiosulfate
NO = none S = Sulfuric acid pH2 N = Nitric acid pH2 B = NaOH to pH12 Z = Zinc acetate A=$(NH_4)_2SO_4$, NH_4OH

Turnaround Time Requested: (Please circle)
NORMAL or EXPEDITED IN ____ DAYS
Expedited results requested by: _____
Who should AIC contact with questions:
Phone: _____ Fax:
Report Attention to:
Report Address to:
Email Address:

Relinquished By:	Date/Time	Received By:	Date/Time
H Mauldin	6/12/15 @0955	[illegible]	6-12-15 @955
[illegible]	6-12-15 1251	P. Brown	6-12-15 12:00

Comments:

9/2014

FORM 0060

July 4th weekend plant over flow into digesters

Electrical transformers- 2 starters - aux contacts

(2) Motors for the boiler water pumps

(2) Motors for the methane compressors

(1) Motor for cornell sludge pump

(2) Motors for digester recirculation pumps

(2) flow meters /transmeters 2,500.00

AMERICAN INTERPLEX CORPORATION
LABORATORIES

June 18, 2015

Test Results of
Second Quarter
Chronic 7-Day Renewal
Biomonitoring Testing
for
Outfall 001
City of Hot Springs

Control No. 191255-1

Prepared for:

Mr. James Sorrells
City of Hot Springs
320 Davidson Drive
Hot Springs, AR 71901

Prepared by:

AMERICAN INTERPLEX CORPORATION
8600 Kanis Road
Little Rock, AR 72204-2322

AMERICAN INTERPLEX CORPORATION
LABORATORIES

City of Hot Springs
ATTN: Mr. James Sorrells
320 Davidson Drive
Hot Springs, AR 71901

Re: Chronic 7-Day Renewal utilizing *Pimephales promelas* (Fathead minnow) and *Ceriodaphnia dubia*
Outfall 001 - City of Hot Springs
NPDES Permit No. AR0033880 AFIN#26-00145

Dear Mr. James Sorrells:

This report is the analytical results and supporting information for the samples submitted to American Interplex Corporation (AIC). The following results are applicable only to the sample identified by the control number referenced above. Accurate assessment of the data requires access to the entire document. Each section of the report has been reviewed and approved by the laboratory director or qualified designee.

Testing procedures and Quality Assurance were in accordance with "Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms" EPA-821-R-02-013, Fourth Edition, October 2002. Test results are summarized below:

Method 1000.0 Chronic *Pimephales promelas* (Fathead minnow) Survival and Growth Test: The No Observable Effects Concentration (NOEC) for survival occurred at 87 % effluent, which is above the critical dilution of 65 %. The NOEC for growth occurred at 65 % effluent, which is equal to the critical dilution of 65 %. **The sample, therefore, PASSED both lethal and sub-lethal effects for the Fathead minnow test.**

Method 1002.0 Chronic *Ceriodaphnia dubia* Survival and Reproduction Test: The No Observable Effects Concentration (NOEC) for survival occurred at 87 % effluent, which is above the critical dilution of 65 %. The NOEC for reproduction occurred at 87 % effluent, which is above the critical dilution of 65 %. **The sample, therefore, PASSED both lethal and sub-lethal effects for the *Ceriodaphnia dubia* test.**

AMERICAN INTERPLEX CORPORATION

John Overbey
Laboratory Director

PDF cc: City of Hot Springs
ATTN: Ms. Jessica Burks
jburks@cityhs.net

City of Hot Springs
ATTN: Mr. Dennis Brunson
dbrunson@cityhs.net

City of Hot Springs
ATTN: Mr. James Sorrells
jsorrells@cityhs.net

Table of Contents

I. Control Acceptance Criteria

Pimephales promelas (Fathead minnow) Method 1000.0

CRITERIA	RESULTS	PASS/FAIL
Control Survival > or = 80%	100	PASS
Control Growth > or = 0.25 mg per Surviving minnow	0.317	PASS
Control Growth CV < or = 40%	12.2	PASS
Growth Minimum Significant Difference 12 to 30%	15.1	PASS
Critical Dilution CV < or = 40%	9.45	PASS

Ceriodaphnia dubia Method 1002.0

CRITERIA	RESULTS	PASS/FAIL
Control Survival > or = 80%	100	PASS
Control Reproduction > or = 15 per Surviving Female	23.0	PASS
Control CV < or = 40% per Surviving Female	10.5	PASS
Reproduction Minimum Significant Difference 13 to 47%	15.8	PASS
Critical Dilution CV < or = 40%	11.4	PASS

II. Outlined Report

A. Introduction

1. Permit Number: AR0033880 AFIN#26-00145
2. Test Requirements: Chronic Biomonitoring, Quarterly
   Test Methods 1000.0 and 1002.0
3. Receiving Stream: Lake Catherine

B. Source of Effluent/Dilution Water

1. Effluent Samples:
   a. Sampling Point: Outfall 001
   b. Chemical Data:

Analysis	Sample 1	Sample 2	Sample 3
Dissolved oxygen (mg/l)	7.8	7.5	8.0
pH (standard units)	7.3	7.5	7.4
Alkalinity (mg/l as CaCO3)	49	64	70
Hardness (mg/l as CaCO3)	64	69	82
Conductivity (umhos/cm)	220	280	320
Residual Chlorine (mg/l)	<0.05	<0.05	<0.05
Ammonia as N (mg/l)	0.33	1.8	0.28

2. Dilution Water Samples: Synthetic Soft Water #4222
   a. Dates Prepared: June 1 through June 15, 2015
   b. Chemical Data:

Analysis	Sample 1	Sample 2	Sample 3
Dissolved oxygen (mg/l)	7.8	7.0	7.8
pH (standard units)	7.5	7.5	7.4
Alkalinity (mg/l as CaCO3)	30	30	30
Hardness (mg/l as CaCO3)	43	43	43
Conductivity (umhos/cm)	120	140	140
Residual Chlorine (mg/l)	<0.05	<0.05	<0.05

C. Test Methods
1. Test methods used:
Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, EPA-821-R-02-013; test Methods 1000.0 and 1002.0, Fathead Minnow Survival and Growth and *Ceriodaphnia dubia* Survival and Reproduction.
2. Endpoint: No Observable Effects Concentration (NOEC)
3. Test Conditions:

Pimephales promelas (Fathead minnow) Survival and Growth Method 1000.0

Date & Time Test Initiated:	June 9, 2015 at 1130
Date & Time Test Terminated:	June 16, 2015 at 0945
Type & Volume of Test Chamber:	500 ml disposable beaker
Volume of Sample:	250 ml
Number of Organisms per replicate:	8
Number of Replicates per dilution:	5

Ceriodaphnia dubia Survival and Growth Method 1002.0

Date & Time Test Initiated:	June 9, 2015 at 1115
Date & Time Test Terminated:	June 15, 2015 at 1300
Type & Volume of Test Chamber:	30 ml disposable beaker
Volume of Sample:	15 ml
Number of Organisms per replicate:	1
Number of Replicates per dilution:	10

4. Acclimation of test organisms: Obtained from in-house cultures
5. Test Temperature: 25 +/- 1 degree Celsius

D. Test Organisms
1. Scientific Name
a. Test 1000.0 *Pimephales promelas*
b. Test 1002.0 *Ceriodaphnia dubia*

III. Data Analysis

The data was analyzed using American Interplex Corporation's Laboratory Information Management Software based on Toxstat.

Pimephales promelas (Fathead minnow) survival data was transformed using the Arc Sine transformation. Normality and homogeneity of variance were checked using Shapiro-Wilk's. The survival data was then analyzed using Steel's Many-One Rank Test to determine the No Observable Effects Concentration (NOEC).

Fathead minnow growth data was analyzed for normality and homogeneity of variance using Shapiro-Wilk's and Bartlett's test. Dunnett's Test was used to determine the No Observable Effects Concentration (NOEC) for growth.

Ceriodaphnia dubia survival data was analyzed with Fisher's Exact Test. Reproduction data was analyzed using Kolmogorov's Test for Normality and analyzed with Steel's Many-One Rank Test to determine the No Observable Effects Concentration (NOEC) for Reproduction. Dunnett's Test was used to calculate the PMSD.

IV. Standard Reference Toxicants

American Interplex Corporation has an ongoing test organism culturing program. The sensitivity of the offspring is determined by performing a standard reference toxicant test with each effluent test. Sodium chloride in synthetic moderately hard water is used as prescribed in EPA-821-R-02-013.

Pimephales promelas (Fathead minnow)

Chronic reference tests are performed monthly.
A chronic reference test was performed on May 26, 2015 at 1450 to June 2, 2015 at 1315
The results were as follows: (Control No. 190396-1.)
Survival LC-50: 1884 mg/l
Growth IC-25: 2236 mg/l
Growth PMSD: 17.9

Ceriodaphnia dubia

Chronic reference tests are performed monthly.
A chronic reference test was performed on May 13, 2015 at 1730 to May 19, 2015 at 1630
The results were as follows: (Control No. 190396-2.)
Survival LC-50: 1732 mg/l
Growth IC-25: 928.9 mg/l
Growth PMSD: 12

V. Chemical Analysis/Quality Control

Parameter	Method	% Recovery	Relative % Difference
Alkalinity	SM 2320 B	NA	0.00
Hardness	EPA 200.7	95.5	1.43
pH	SM 4500-H+ B	101	0.00
Conductivity	EPA 120.1	100	0.678

VI. Organism History

Pimephales promelas (Fathead minnow)

Date: June 9, 2015
Age: <24 hours
Source: In-house culture
Water Chemistry Record:
Alkalinity: 57-64 mg/l
Hardness: 80-100 mg/l
Temperature: 25 deg.C

Ceriodaphnia dubia

Date: June 9, 2015
Age: <24 hours
Source: In-house culture
Water Chemistry Record:
Alkalinity: 57-64 mg/l
Hardness: 80-100 mg/l
Temperature: 25 deg.C

VII. Results Summary *Pimephales promelas*, Fathead minnow Larval Survival and Growth Test -- Method 1000.0

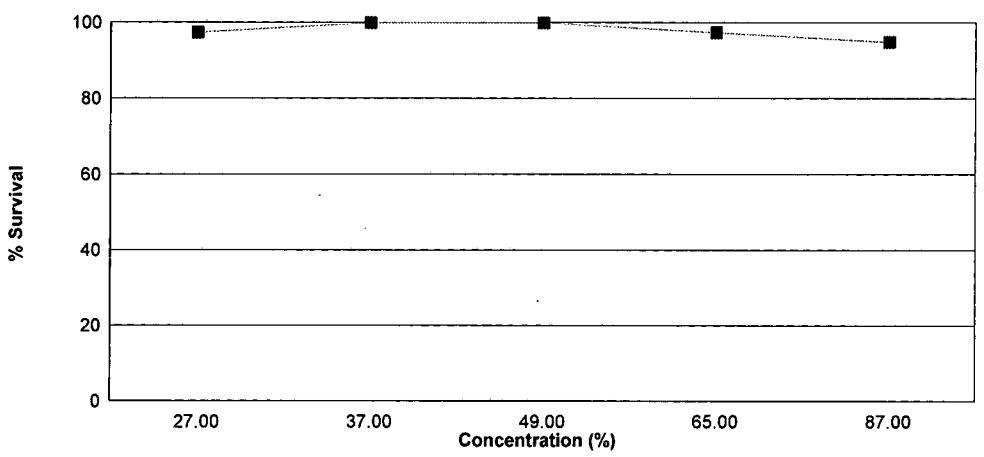
Larvae are exposed in a static renewal system for seven days to different concentrations of effluent with dilution water. Test results are based on the survival and growth (increase in weight) of the larvae.

Effluent dilutions for this test were 27 %, 37 %, 49 %, 65 %, 87 % in accordance with the NPDES permit.

The low flow or 'critical' dilution is specified in the NPDES permit as 65 % effluent.

The test was initiated on June 9, 2015 at 1130 and continued through June 16, 2015 at 0945. Statistical analyses were performed on the observed data and the no observable effects concentrations (NOECs) were as follows:

a.) NOEC survival = 87 % effluent
b.) NOEC growth = 65 % effluent



Summary of the 7-day Fathead Minnow Survival and Growth		
Concentration	Percent Survival	Mean Growth (mg)
Control	100	0.317
27 %	97.5	0.284
37 %	100	0.298
49 %	100	0.301
65 %	97.5	0.269
87 %	95.0	0.268 *

*Significant difference when compared to the control (p=0.05)

VII. Results Summary *Ceriodaphnia dubia*, Cladoceran Survival and Reproduction Test -- Method 1002.0

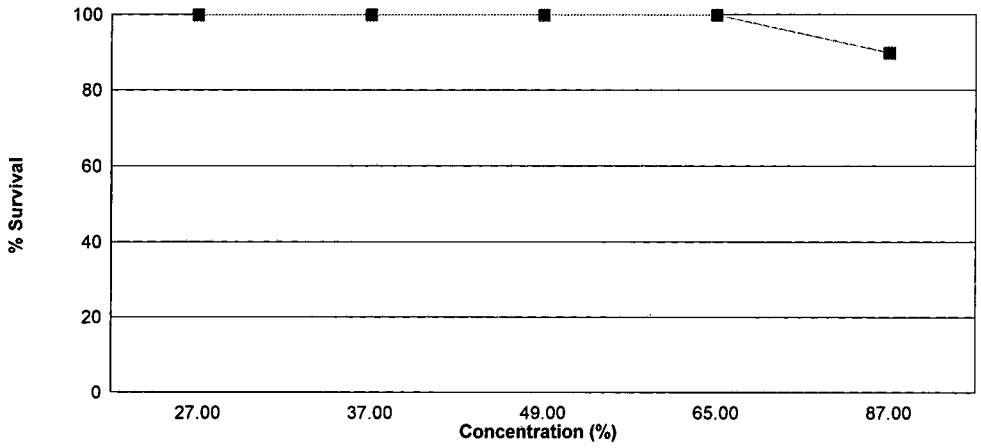
Neonates are exposed in a static renewal system to different concentrations of effluent with dilution water until 60% of surviving control organisms have three broods of offspring with an average of at least 15 young per female.

Effluent dilutions for this test were 27 %, 37 %, 49 %, 65 %, 87 % in accordance with the NPDES permit.

The low flow or 'critical' dilution is specified in the NPDES permit as 65 % effluent.

The test was initiated on June 9, 2015 at 1115 and continued through June 15, 2015 at 1300. Statistical analyses were performed on the observed data and the no observable effects concentrations (NOECs) were as follows:

a.) NOEC survival = 87 % effluent
b.) NOEC reproduction = 87 % effluent



Summary of the 6-day *Ceriodaphnia dubia* Survival and Reproduction Data		
Concentration	Percent Survival	Mean Reproduction
Control	100	23.0
27 %	100	22.1
37 %	100	19.4
49 %	100	22.8
65 %	100	21.6
87 %	90.0	20.4

Appendix A1: Test 1000.0

Pimephales promelas (Fathead Minnow) 7-Day Survival

Date and Time Test Initiated: June 9, 2015 at 1130
Date and Time Test Terminated: June 16, 2015 at 0945

Concentration	Replicate	Number of Survivors						
		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	A	8	8	8	8	8	8	8
	B	8	8	8	8	8	8	8
	C	8	8	8	8	8	8	8
	D	8	8	8	8	8	8	8
	E	8	8	8	8	8	8	8
27 %	A	8	8	8	8	8	8	8
	B	8	8	8	8	8	8	7
	C	8	8	8	8	8	8	8
	D	8	8	8	8	8	8	8
	E	8	8	8	8	8	8	8
37 %	A	8	8	8	8	8	8	8
	B	8	8	8	8	8	8	8
	C	8	8	8	8	8	8	8
	D	8	8	8	8	8	8	8
	E	8	8	8	8	8	8	8
49 %	A	8	8	8	8	8	8	8
	B	8	8	8	8	8	8	8
	C	8	8	8	8	8	8	8
	D	8	8	8	8	8	8	8
	E	8	8	8	8	8	8	8
65 %	A	8	8	8	8	8	8	8
	B	8	8	8	8	8	8	8
	C	8	7	7	7	7	7	7
	D	8	8	8	8	8	8	8
	E	8	8	8	8	8	8	8
87 %	A	8	8	6	6	6	6	6
	B	8	8	8	8	8	8	8
	C	8	8	8	8	8	8	8
	D	8	8	8	8	8	8	8
	E	8	8	8	8	8	8	8

Appendix A1: Test 1000.0

Pimephales promelas (Fathead Minnow) 7-Day Growth

Test Initiated: June 9, 2015 at 1130
Test Terminated: June 16, 2015 at 0945

Drying Started: June 15, 2015 at 1440
Drying Ended: June 17, 2015 at 0920

Concentration	Replicate	Weight of pan	Weight of pan + fish	Total weight of fish (g)	Original # of fish	Mean dry weight (mg)
Control	A	.94096	.94312	0.00216	8	0.270
	B	.93686	.93947	0.00261	8	0.326
	C	.93569	.93866	0.00297	8	0.371
	D	.93705	.93967	0.00262	8	0.328
	E	.93836	.94069	0.00233	8	0.291
27 %	A	.93878	.94090	0.00212	8	0.265
	B	.93754	.93965	0.00211	8	0.264
	C	.93959	.94207	0.00248	8	0.310
	D	.93619	.93847	0.00228	8	0.285
	E	.93607	.93842	0.00235	8	0.294
37 %	A	.93551	.93737	0.00186	8	0.232
	B	.93224	.93496	0.00272	8	0.340
	C	.93594	.93835	0.00241	8	0.301
	D	.93930	.94186	0.00256	8	0.320
	E	.94155	.94392	0.00237	8	0.296
49 %	A	.93574	.93792	0.00218	8	0.272
	B	.93376	.93615	0.00239	8	0.299
	C	.93375	.93641	0.00266	8	0.332
	D	.93421	.93650	0.00229	8	0.286
	E	.94237	.94489	0.00252	8	0.315
65 %	A	.94346	.94553	0.00207	8	0.259
	B	.93238	.93451	0.00213	8	0.266
	C	.93507	.93696	0.00189	8	0.236
	D	.93701	.93927	0.00226	8	0.282
	E	.94127	.94370	0.00243	8	0.304
87 %	A	.93698	.93865	0.00167	8	0.209
	B	.93968	.94196	0.00228	8	0.285
	C	.93495	.93734	0.00239	8	0.299
	D	.93300	.93537	0.00237	8	0.296
	E	.93461	.93662	0.00201	8	0.251

Appendix A1: Test 1002.0

Ceriodaphnia dubia Survival and Reproduction

Date and Time Test Initiated: June 9, 2015 at 1115
Date and Time Test Terminated: June 15, 2015 at 1300

Concentration: Control													
Day	Replicate										No. of Young	No. of Adults	Young per Adult
	1	2	3	4	5	6	7	8	9	10			
1	0	0	0	0	0	0	0	0	0	0	0	10	0.00
2	0	0	0	0	0	0	0	0	0	0	0	10	0.00
3	4	4	3	4	4	4	4	5	4	0	36	10	3.60
4	0	0	0	0	0	0	0	0	0	3	3	10	0.300
5	8	7	7	8	9	8	9	10	8	5	79	10	7.90
6	13	12	12	11	12	10	11	10	12	9	112	10	11.2
7													
8													
TOTAL	25	23	22	23	25	22	24	25	24	17	230	10	23.0

Concentration: 27 %													
Day	Replicate										No. of Young	No. of Adults	Young per Adult
	1	2	3	4	5	6	7	8	9	10			
1	0	0	0	0	0	0	0	0	0	0	0	10	0.00
2	0	0	0	0	0	0	0	0	0	0	0	10	0.00
3	0	3	4	4	4	5	4	4	4	0	32	10	3.20
4	3	0	0	0	0	0	0	0	0	4	7	10	0.700
5	6	7	8	8	7	10	8	9	7	7	77	10	7.70
6	11	12	11	9	10	12	9	10	9	12	105	10	10.5
7													
8													
TOTAL	20	22	23	21	21	27	21	23	20	23	221	10	22.1

Concentration: 37 %													
Day	Replicate										No. of Young	No. of Adults	Young per Adult
	1	2	3	4	5	6	7	8	9	10			
1	0	0	0	0	0	0	0	0	0	0	0	10	0.00
2	0	0	0	0	0	0	0	0	0	0	0	10	0.00
3	0	4	4	4	4	4	4	0	4	0	28	10	2.80
4	4	0	0	0	0	0	0	4	0	3	11	10	1.10
5	10	8	7	7	8	9	8	6	8	7	78	10	7.80
6	0	10	10	12	11	13	10	0	10	1	77	10	7.70
7													
8													
TOTAL	14	22	21	23	23	26	22	10	22	11	194	10	19.4

Appendix A1: Test 1002.0

Ceriodaphnia dubia Survival and Reproduction

Date and Time Test Initiated: June 9, 2015 at 1115
Date and Time Test Terminated: June 15, 2015 at 1300

Concentration: 49 %													
Day	Replicate										No. of Young	No. of Adults	Young per Adult
	1	2	3	4	5	6	7	8	9	10			
1	0	0	0	0	0	0	0	0	0	0	0	10	0.00
2	0	0	0	0	0	0	0	0	0	0	0	10	0.00
3	4	4	4	4	5	4	4	4	4	0	37	10	3.70
4	0	0	0	0	0	0	0	0	0	4	4	10	0.400
5	8	9	8	7	8	9	8	8	8	6	79	10	7.90
6	11	12	12	9	10	13	11	10	9	11	108	10	10.8
7													
8													
TOTAL	23	25	24	20	23	26	23	22	21	21	228	10	22.8

Concentration: 65 %													
Day	Replicate										No. of Young	No. of Adults	Young per Adult
	1	2	3	4	5	6	7	8	9	10			
1	0	0	0	0	0	0	0	0	0	0	0	10	0.00
2	0	0	0	0	0	0	0	0	0	0	0	10	0.00
3	0	4	4	3	4	4	4	4	4	0	31	10	3.10
4	2	0	0	0	0	0	0	0	0	4	6	10	0.600
5	5	8	9	7	8	8	6	8	8	7	74	10	7.40
6	11	10	12	9	10	12	10	9	8	14	105	10	10.5
7													
8													
TOTAL	18	22	25	19	22	24	20	21	20	25	216	10	21.6

Concentration: 87 %													
Day	Replicate										No. of Young	No. of Adults	Young per Adult
	1	2	3	4	5	6	7	8	9	10			
1	0	0	0	0	0	0	0	0	0	0	0	10	0.00
2	0	0	0	0	0	0	0	0	0	0	0	10	0.00
3	0	4	5	4	4	X	4	4	4	0	29	9	3.22
4	4	0	0	0	0	X	0	0	0	4	8	9	0.889
5	8	9	10	8	8	X	7	8	6	8	72	9	8.00
6	11	15	11	10	13	X	12	10	13	0	95	9	10.6
7													
8													
TOTAL	23	28	26	22	25	0	23	22	23	12	204	10	20.4

Appendix A2: Statistics

Pimephales promelas (Fathead minnow) Survival

		Transformation of Data		Transform: Arc Sin(Square Root(Y))
Group	Identification	Rep	Value	Transformed
1	Control	1	1.00000	1.39310
1	Control	2	1.00000	1.39310
1	Control	3	1.00000	1.39310
1	Control	4	1.00000	1.39310
1	Control	5	1.00000	1.39310
2	27 %	1	1.00000	1.39310
2	27 %	2	0.87500	1.20940
2	27 %	3	1.00000	1.39310
2	27 %	4	1.00000	1.39310
2	27 %	5	1.00000	1.39310
3	37 %	1	1.00000	1.39310
3	37 %	2	1.00000	1.39310
3	37 %	3	1.00000	1.39310
3	37 %	4	1.00000	1.39310
3	37 %	5	1.00000	1.39310
4	49 %	1	1.00000	1.39310
4	49 %	2	1.00000	1.39310
4	49 %	3	1.00000	1.39310
4	49 %	4	1.00000	1.39310
4	49 %	5	1.00000	1.39310
5	65 %	1	1.00000	1.39310
5	65 %	2	1.00000	1.39310
5	65 %	3	0.87500	1.20940
5	65 %	4	1.00000	1.39310
5	65 %	5	1.00000	1.39310
6	87 %	1	0.75000	1.04720
6	87 %	2	1.00000	1.39310
6	87 %	3	1.00000	1.39310
6	87 %	4	1.00000	1.39310
6	87 %	5	1.00000	1.39310

Appendix A2: Statistics

Pimephales promelas (Fathead minnow) Survival

Shapiro - Wilk's Test for Normality		Transform: Arc Sin(Square Root(Y))
D = 0.1497		
W = 0.6562		
Critical W = 0.9	(alpha = 0.01, N = 30)	
Critical W = 0.927	(alpha = 0.05, N = 30)	

Data FAIL normality test (alpha = 0.01).

Steel's Many-One Rank Test — Transform: Arc Sin(Square Root(Y))

Ho:Control<Treatment

Group	Identification	Rank Sum	Critical Value	DF	Sig 0.05
1	Control				
2	27 %	25.00	16.00	5.00	
3	37 %	27.50	16.00	5.00	
4	49 %	27.50	16.00	5.00	
5	65 %	25.00	16.00	5.00	
6	87 %	25.00	16.00	5.00	

Critical values are 1 tailed (k=5)

Appendix A2: Statistics

Pimephales promelas (Fathead minnow) Growth

Shapiro - Wilk's Test for Normality		No Transformation
D = 0.02478		
W = 0.9758		
Critical W = 0.9	(alpha = 0.01, N = 30)	
Critical W = 0.927	(alpha = 0.05, N = 30)	
Data PASS normality test (alpha = 0.01).		

Bartlett's Test for Homogeneity of Variance		No Transformation
Calculated B1 statistic = 3.231		
Critical B = 15.086	(alpha = 0.01, df = 5)	
Data PASS B1 homogeneity test at 0.01 level.		

Appendix A2: Statistics

Pimephales promelas (Fathead minnow) Growth

ANOVA Table				No Transformation
SOURCE	DF	SS	MS	F
Between	5	0.009325	0.001865	1.807
Within (Error)	24	0.02478	0.001032	
Total	29	0.0341		

Critical F = 3.9 (alpha = 0.01, df = 5,24)
2.62 (alpha = 0.05, df = 5,24)

Since F < Critical F FAIL TO REJECT Ho: All equal (alpha = 0.05)

Dunnett's Test - Table 1 of 2					No Transformation
Ho:Control<Treatment					
Group	Identification	Transformed Mean	Mean In Original Units	T Stat	Sig 0.05
1	Control	0.3172	0.3172		
2	27 %	0.2836	0.2836	1.654	
3	37 %	0.2978	0.2978	0.9548	
4	49 %	0.3008	0.3008	0.8072	
5	65 %	0.2694	0.2694	2.353	
6	87 %	0.268	0.268	2.422	*

Dunnett's critical value = 2.36 (1 Tailed, alpha = 0.05, df = 5,24)

Dunnett's Test - Table 2 of 2					No Transformation
Ho:Control<Treatment					
Group	Identification	Num of Reps	Min Sig Diff (In Orig. Units)	% of Control	Difference From Control
1	Control	5			
2	27 %	5	0.04795	15.1	0.0336
3	37 %	5	0.04795	15.1	0.0194
4	49 %	5	0.04795	15.1	0.0164
5	65 %	5	0.04795	15.1	0.0478
6	87 %	5	0.04795	15.1	0.0492

Appendix A2: Statistics

Ceriodaphnia dubia Survival

Fisher's Exact Test			
Identification	Alive	Dead	Total Animals
Control	10	0	10
27 %	10	0	10
Total	20	0	20

Critical Fisher's value (10,10,10) (alpha=0.05) is 6. b value is 10. Since b is greater than 6 there is NO SIGNIFICANT DIFFERENCE between CONTROL and TREATMENT at the 0.05 level.

Fisher's Exact Test			
Identification	Alive	Dead	Total Animals
Control	10	0	10
37 %	10	0	10
Total	20	0	20

Critical Fisher's value (10,10,10) (alpha=0.05) is 6. b value is 10. Since b is greater than 6 there is NO SIGNIFICANT DIFFERENCE between CONTROL and TREATMENT at the 0.05 level.

Fisher's Exact Test			
Identification	Alive	Dead	Total Animals
Control	10	0	10
49 %	10	0	10
Total	20	0	20

Critical Fisher's value (10,10,10) (alpha=0.05) is 6. b value is 10. Since b is greater than 6 there is NO SIGNIFICANT DIFFERENCE between CONTROL and TREATMENT at the 0.05 level.

Fisher's Exact Test			
Identification	Alive	Dead	Total Animals
Control	10	0	10
65 %	10	0	10
Total	20	0	20

Critical Fisher's value (10,10,10) (alpha=0.05) is 6. b value is 10. Since b is greater than 6 there is NO SIGNIFICANT DIFFERENCE between CONTROL and TREATMENT at the 0.05 level.

Appendix A2: Statistics

Ceriodaphnia dubia Survival

Fisher's Exact Test			
Identification	Alive	Dead	Total Animals
Control	10	0	10
87 %	9	1	10
Total	19	1	20

Critical Fisher's value (10,10,10) (alpha=0.05) is 6. b value is 9. Since b is greater than 6 there is NO SIGNIFICANT DIFFERENCE between CONTROL and TREATMENT at the 0.05 level.

Summary of Fisher's Exact Test				
Group	Identification	Exposed	Dead	Sig 0.05
0	Control	10	0	
1	27 %	10	0	
2	37 %	10	0	
3	49 %	10	0	
4	65 %	10	0	
5	87 %	10	1	

Appendix A2: Statistics

Ceriodaphnia dubia Reproduction

Kolmogorov Test for Normality		No Transformation
D = 0.1621 D* = 1.272 Critical D* = 1.035	(alpha = 0.01, N = 60)	
Data FAIL normality test (alpha = 0.01).		

Steel's Many-One Rank Test					No Transformation
Ho:Control<Treatment					
Group	Identification	Rank Sum	Critical Value	DF	Sig 0.05
1	Control				
2	27 %	84.00	75.00	10.00	
3	37 %	80.00	75.00	10.00	
4	49 %	96.50	75.00	10.00	
5	65 %	87.00	75.00	10.00	
6	87 %	99.50	75.00	10.00	
Critical values are 1 tailed (k=5)					

Appendix A2: Statistics

Ceriodaphnia dubia Reproduction

Dunnett's Test for PMSD Calculation (excluding deaths if applicable)

ANOVA Table — No Transformation

SOURCE	DF	SS	MS	F
Between	5	89.28	17.86	1.533
Within (Error)	53	617.3	11.65	
Total	58	706.6		

Critical F = 3.39 (alpha = 0.01, df = 5,53)
2.39 (alpha = 0.05, df = 5,53)

Since F < Critical F FAIL TO REJECT Ho: All equal (alpha = 0.05)

Dunnett's Test - Table 1 of 2 — No Transformation

Ho:Control<Treatment

Group	Identification	Transformed Mean	Mean In Original Units	T Stat	Sig 0.05
1	Control	23	23		
2	27 %	22.1	22.1	0.5896	
3	37 %	19.4	19.4	2.358	*
4	49 %	22.8	22.8	0.131	
5	65 %	21.6	21.6	0.9172	
6	87 %	22.667	22.667	0.2123	

Dunnett's critical value = 2.31 (1 Tailed, alpha = 0.05, df [used] = 5,40) (Actual df = 5,53)
WARNING - Unequal replicate sizes. Critical values assuming equal replicate sizes have been used.

Dunnett's Test - Table 2 of 2 — No Transformation

Ho:Control<Treatment

Group	Identification	Num of Reps	Min Sig Diff (In Orig. Units)	% of Control	Difference From Control
1	Control	10			
2	27 %	10	3.526	15.3	0.9
3	37 %	10	3.526	15.3	3.6
4	49 %	10	3.526	15.3	0.2
5	65 %	10	3.526	15.3	1.4
6	87 %	9	3.623	15.8	0.333

Appendix A3: Water Chemistry

Routine Chemical and Physical Data

Date and Time Test Initiated: June 9, 2015 at 0900
Date and Time Test Terminated: June 16, 2015 at 0945

Effluent Conc.: Control		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	7.8	7.4	7.0	7.5	7.8	7.4	7.7
	Final *1	7.1	6.9	7.3	7.4	7.4	7.6	5.5
	Final *2	7.6	7.2	7.1	7.9	7.4	7.8	
pH, units	Initial	7.5	7.4	7.5	7.3	7.4	7.6	7.4
	Final *1	7.5	7.6	7.7	7.9	7.8	7.6	7.1
	Final *2	7.8	7.6	7.6	8.0	7.9	7.8	
Alkalinity, mg CaCO3/l		30	NA	30	NA	30	NA	NA
Hardness, mg CaCO3/l		43	NA	43	NA	43	NA	NA
Conductivity, umhos/cm		120	130	140	140	140	160	140
Res. Chlorine, mg/l		<0.05	NA	<0.05	NA	<0.05	NA	NA

Effluent Conc.: 27 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	7.8	7.5	7.1	7.3	7.7	7.7	7.5
	Final *1	7.1	6.1	6.9	7.0	7.4	7.5	5.7
	Final *2	7.2	7.1	7.1	8.0	7.7	7.8	
pH, units	Initial	7.5	7.4	7.4	7.2	7.3	7.7	7.3
	Final *1	7.5	7.4	7.6	7.8	7.9	7.6	7.2
	Final *2	7.8	7.6	7.7	8.1	8.0	7.9	

Effluent Conc.: 37 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	7.8	7.5	7.5	7.4	7.8	7.7	7.4
	Final *1	7.1	6.2	7.0	6.7	7.3	7.5	5.8
	Final *2	7.1	7.0	7.5	8.0	7.7	7.8	
pH, units	Initial	7.4	7.4	7.4	7.3	7.3	7.8	7.3
	Final *1	7.5	7.4	7.6	7.8	7.9	7.6	7.3
	Final *2	7.8	7.7	7.8	8.1	8.0	7.9	

Appendix A3: Water Chemistry

Routine Chemical and Physical Data

Date and Time Test Initiated: June 9, 2015 at 0900
Date and Time Test Terminated: June 16, 2015 at 0945

Effluent Conc.: 49 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	7.7	7.3	7.2	7.3	7.5	7.5	7.6
	Final *1	6.5	6.6	6.6	7.0	7.4	7.4	5.5
	Final *2	7.5	6.9	7.0	7.9	7.6	7.7	
pH, units	Initial	7.5	7.4	7.4	7.3	7.4	7.8	7.4
	Final *1	7.5	7.5	7.6	7.9	7.9	7.6	7.3
	Final *2	7.8	7.7	7.8	8.1	8.1	8.0	

Effluent Conc.: 65 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	7.6	7.3	7.5	7.1	7.7	7.3	7.4
	Final *1	6.7	6.3	6.7	7.3	7.5	7.6	5.2
	Final *2	7.5	7.1	7.2	7.8	7.4	7.8	
pH, units	Initial	7.4	7.4	7.5	7.3	7.4	7.9	7.4
	Final *1	7.6	7.4	7.6	7.8	8.0	7.7	7.3
	Final *2	7.8	7.7	7.9	8.1	8.2	8.0	
Alkalinity, mg CaCO3/l		44	NA	53	NA	60	NA	NA
Hardness, mg CaCO3/l		56	NA	65	NA	68	NA	NA
Conductivity, umhos/cm		180	200	230	220	250	260	250
Res. Chlorine, mg/l		<0.05	NA	<0.05	NA	<0.05	NA	NA

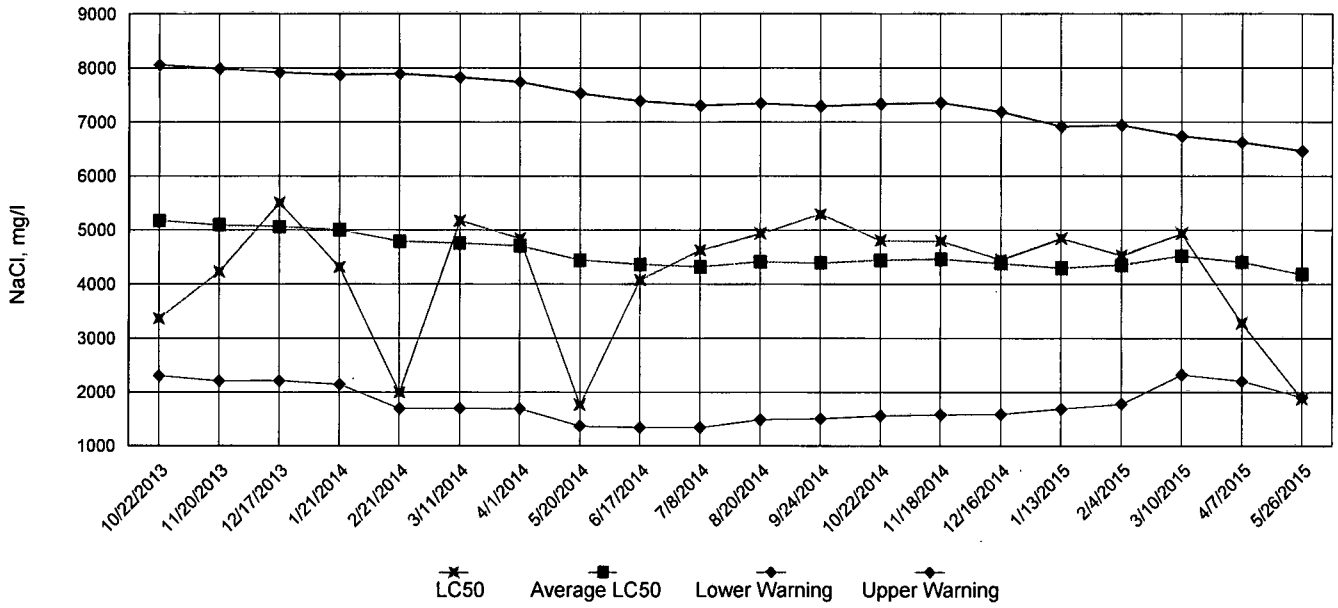
Effluent Conc.: 87 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	7.8	7.4	7.4	7.1	7.8	7.6	7.2
	Final *1	7.0	6.6	6.7	6.6	7.3	7.5	5.2
	Final *2	6.9	7.0	7.5	7.9	7.7	7.8	
pH, units	Initial	7.4	7.4	7.5	7.3	7.4	8.0	7.4
	Final *1	7.6	7.4	7.6	7.8	8.0	7.7	7.4
	Final *2	7.9	7.8	7.9	8.2	8.2	8.1	

*1 = data from the *Pimephales promelas* (Fathead Minnow) test *2 = data from the *Ceriodaphnia dubia* test

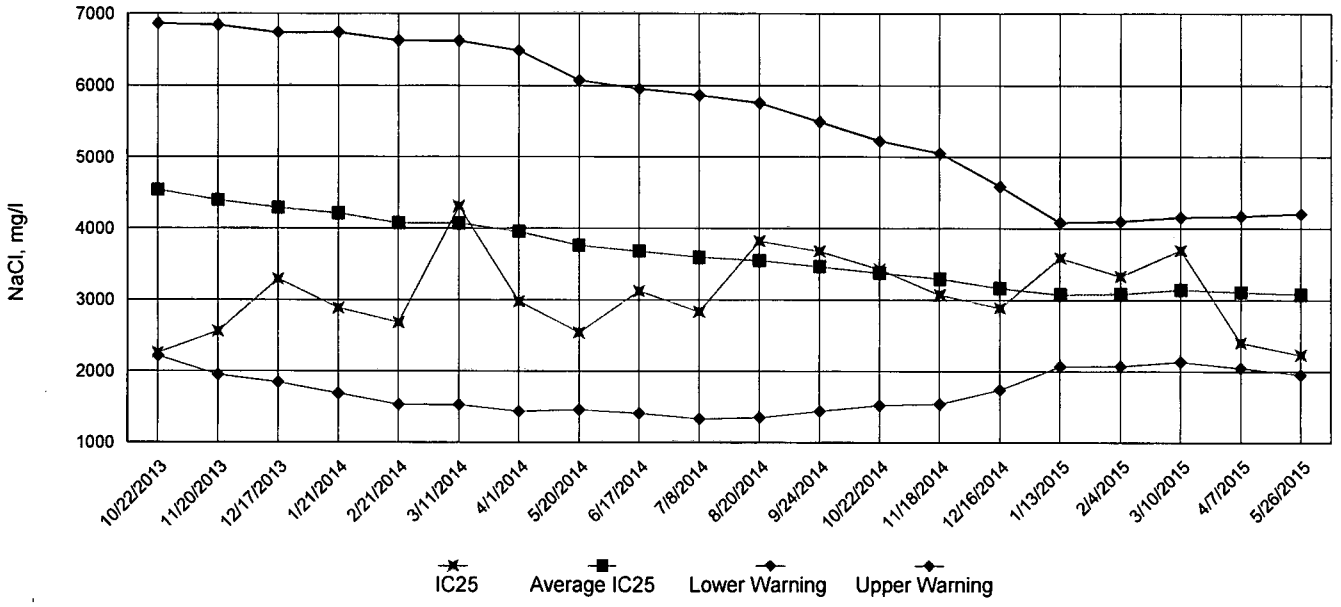
Appendix A4: Test 1000.0

Chronic Reference Toxicant, *Pimephales promelas* (Fathead Minnow)

LC50 Survival Data



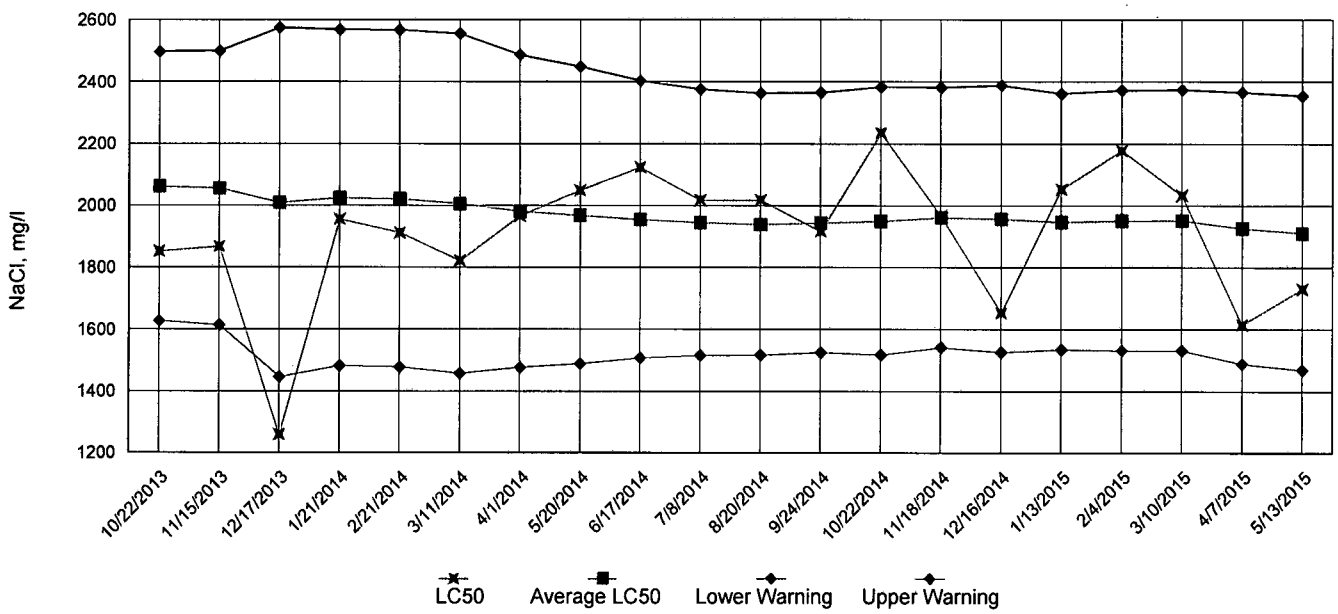
IC25 Growth Data



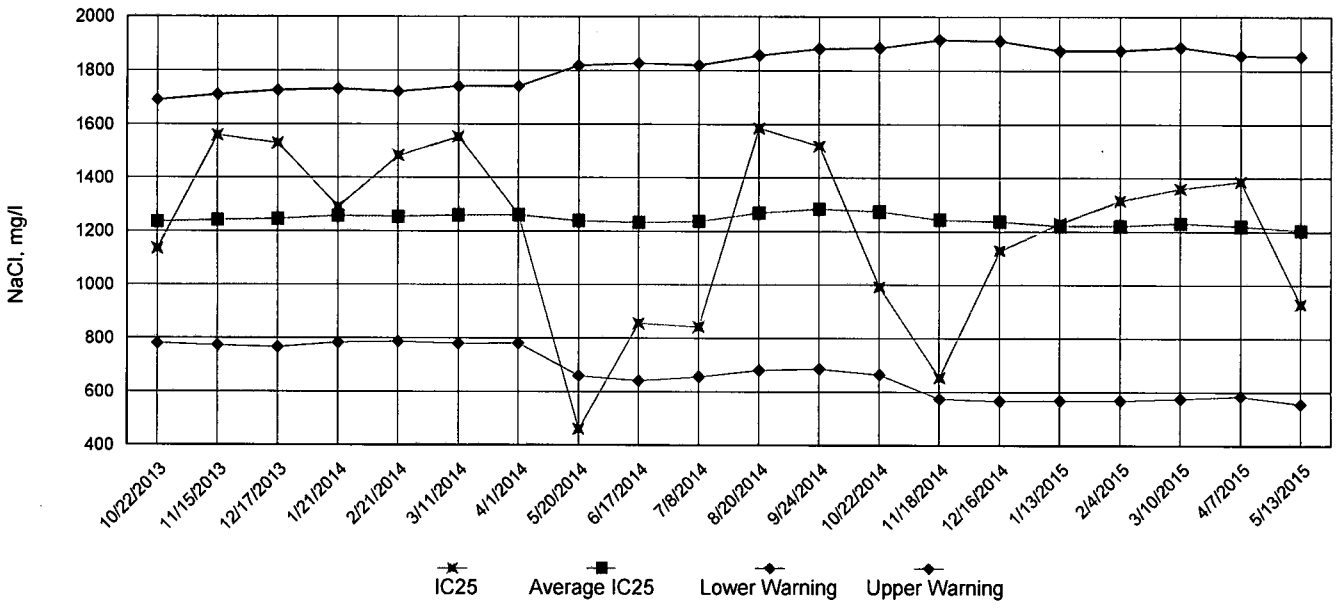
Appendix A4: Test 1002.0

Chronic Reference Toxicant, *Ceriodaphnia dubia*

LC50 Survival Data



IC25 Reproduction Data



Appendix B: Test 1000.0

SUMMARY REPORTING FORMS
CHRONIC BIOMONITORING
Pimephales promelas (Fathead Minnow)
SURVIVAL AND GROWTH

Permittee: City of Hot Springs

NPDES No.: AR0033880 AFIN#26-00145

Date and Time Test Initiated: June 9, 2015 at 1130
Date and Time Test Terminated: June 16, 2015 at 0945
Dilution water used: Synthetic Soft Water #4222

DATA TABLE FOR SURVIVAL

Effluent Conc. %	Percent Survival in replicate chambers A	B	C	D	E	Mean percent survival 24 hr	48 hr	7 days	CV%
Control	100	100	100	100	100	100	100	100	0.00
27 %	100	87.5	100	100	100	100	100	97.5	5.73
37 %	100	100	100	100	100	100	100	100	0.00
49 %	100	100	100	100	100	100	100	100	0.00
65 %	100	100	87.5	100	100	100	97.5	97.5	5.73
87 %	75.0	100	100	100	100	100	100	95.0	11.8

DATA TABLE FOR GROWTH

Effluent Conc. %	Average dry weight, mg replicate chambers A	B	C	D	E	Mean dry weight, mg	CV%
Control	0.270	0.326	0.371	0.328	0.291	0.317	12.2
27 %	0.265	0.264	0.310	0.285	0.294	0.284	6.91
37 %	0.232	0.340	0.301	0.320	0.296	0.298	13.7
49 %	0.272	0.299	0.332	0.286	0.315	0.301	7.84
65 %	0.259	0.266	0.236	0.282	0.304	0.269	9.45
87 %	0.209	0.285	0.299	0.296	0.251	0.268	14.2

CV = Coefficient of variation = standard deviation * 100 / mean

Appendix B: Test 1000.0

SUMMARY REPORTING FORMS
CHRONIC BIOMONITORING
Pimephales promelas (Fathead Minnow)
SURVIVAL AND GROWTH

1. Steel's Many-One Rank Test:

   Is the mean survival significantly different (p=0.05) than the control survival for the % effluent corresponding to (lethality):

a.) LOW FLOW OR CRITICAL DILUTION	(65 %)	_____YES	__X__ NO
b.) 1/2 LOW FLOW DILUTION	(NA)	_____YES	_____ NO

2. Dunnett's Test:

   Is the mean dry weight (growth) significantly different (p=0.05) than the control's dry weight (growth) for the % effluent corresponding to (significant non-lethal effects):

a.) LOW FLOW OR CRITICAL DILUTION	(65 %)	_____YES	__X__ NO
b.) 1/2 LOW FLOW DILUTION	(NA)	_____YES	_____ NO

3. If you answered NO to 1.a) enter [0] otherwise enter [1]: __0__ (TLP6C)

4. If you answered NO to 2.a) enter [0] otherwise enter [1]: __0__ (TGP6C)

5. NOEC Pimephales Lethality: __87 %__ (TOP6C)

6. LOEC Pimephales Lethality: __87 %__ (TXP6C)

7. NOEC Pimephales Sublethality: __65 %__ (TPP6C)

8. LOEC Pimephales Sublethality: __87 %__ (TYP6C)

9. Coefficient of variation for Pimephales growth: __12.2__ (TQP6C)

AMERICAN INTERPLEX CORPORATION
LABORATORIES

Appendix B: Test 1000.0

CHRONIC TOXICITY SUMMARY FORM
Pimephales promelas (Fathead minnow)
CHEMICAL PARAMETERS CHART

PERMITTEE: City of Hot Springs 2400
NPDES NO.: AR0033880 AFIN#26-00145 2400
CONTACT: Mr. James Sorrells 2400
ANALYST: 280, 304, 310, 314

Test Initiated: DATE: June 9, 2015 TIME: 1130
Test Terminated: DATE: June 16, 2015 TIME: 0945

DILUTION Control	DAY 1	2	3	4	5	6	7
D.O. Initial	7.8	7.4	7.0	7.5	7.8	7.4	7.7
Final	7.1	6.9	7.3	7.4	7.4	7.6	5.5
pH Initial	7.5	7.4	7.5	7.3	7.4	7.6	7.4
Final	7.5	7.6	7.7	7.9	7.8	7.6	7.1
Alkalinity	30	NA	30	NA	30	NA	NA
Hardness	43	NA	43	NA	43	NA	NA
Conductivity	120	130	140	140	140	160	140
Chlorine	<0.05	NA	<0.05	NA	<0.05	NA	NA

DILUTION 27 %	DAY 1	2	3	4	5	6	7
D.O. Initial	7.8	7.5	7.1	7.3	7.7	7.7	7.5
Final	7.1	6.1	6.9	7.0	7.4	7.5	5.7
pH Initial	7.5	7.4	7.4	7.2	7.3	7.7	7.3
Final	7.5	7.4	7.6	7.8	7.9	7.6	7.2
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	150	160	180	170	180	200	180
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION 37 %	DAY 1	2	3	4	5	6	7
D.O. Initial	7.8	7.5	7.5	7.4	7.8	7.7	7.4
Final	7.1	6.2	7.0	6.7	7.3	7.5	5.8
pH Initial	7.4	7.4	7.4	7.3	7.3	7.8	7.3
Final	7.5	7.4	7.6	7.8	7.9	7.6	7.3
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	160	170	190	180	200	210	200
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION 49 %	DAY 1	2	3	4	5	6	7
D.O. Initial	7.7	7.3	7.2	7.3	7.5	7.5	7.6
Final	6.5	6.6	6.6	7.0	7.4	7.4	5.5
pH Initial	7.5	7.4	7.4	7.3	7.4	7.8	7.4
Final	7.5	7.5	7.6	7.9	7.9	7.6	7.3
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	170	180	200	200	220	230	220
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION 65 %	DAY 1	2	3	4	5	6	7
D.O. Initial	7.6	7.3	7.5	7.1	7.7	7.3	7.4
Final	6.7	6.3	6.7	7.3	7.5	7.6	5.2
pH Initial	7.4	7.4	7.5	7.3	7.4	7.9	7.4
Final	7.6	7.4	7.6	7.8	8.0	7.7	7.3
Alkalinity	44	NA	53	NA	60	NA	NA
Hardness	56	NA	65	NA	68	NA	NA
Conductivity	180	200	230	220	250	260	250
Chlorine	<0.05	NA	<0.05	NA	<0.05	NA	NA

DILUTION 87 %	DAY 1	2	3	4	5	6	7
D.O. Initial	7.8	7.4	7.4	7.1	7.8	7.6	7.2
Final	7.0	6.6	6.7	6.6	7.3	7.5	5.2
pH Initial	7.4	7.4	7.5	7.3	7.4	8.0	7.4
Final	7.6	7.4	7.6	7.8	8.0	7.7	7.4
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	200	220	260	260	290	300	290
Chlorine	NA	NA	NA	NA	NA	NA	NA

Appendix B: Test 1002.0

SUMMARY REPORTING FORMS
CHRONIC BIOMONITORING
Ceriodaphnia dubia
SURVIVAL AND REPRODUCTION

Permittee: City of Hot Springs

NPDES No.: AR0033880 AFIN#26-00145

Date and Time Test Initiated: June 9, 2015 at 1115
Date and Time Test Terminated: June 15, 2015 at 1300
Dilution water used: Synthetic Soft Water #4222

PERCENT SURVIVAL

		Percent Effluent				
Time of Reading	Control	27 %	37 %	49 %	65 %	87 %
24 hour	100	100	100	100	100	100
48 hour	100	100	100	100	100	100
6 day	100	100	100	100	100	90.0

NUMBER OF YOUNG PRODUCED PER FEMALE @ 6 DAYS

		Percent Effluent				
Replicates	Control	27 %	37 %	49 %	65 %	87 %
A	25	20	14	23	18	23
B	23	22	22	25	22	28
C	22	23	21	24	25	26
D	23	21	23	20	19	22
E	25	21	23	23	22	25
F	22	27	26	26	24	0
G	24	21	22	23	20	23
H	25	23	10	22	21	22
I	24	20	22	21	20	23
J	17	23	11	21	25	12
Mean per Adult	23.0	22.1	19.4	22.8	21.6	20.4
Mean per Surviving Adult	23.0	22.1	19.4	22.8	21.6	22.7
CV %	10.5	9.41	28.8	8.22	11.4	19.7

CV = Coefficient of variation = standard deviation * 100 / mean
(calculated based on young produced by surviving females)

Appendix B: Test 1002.0

SUMMARY REPORTING FORMS
CHRONIC BIOMONITORING
Ceriodaphnia dubia
SURVIVAL AND REPRODUCTION

1. Fisher's Exact Test:

   Is the mean survival significantly different (p=0.05) than the control survival for the % effluent corresponding to (lethality):

a.) LOW FLOW OR CRITICAL DILUTION	(65 %)	____YES	X NO
b.) 1/2 LOW FLOW DILUTION	(NA)	____YES	____NO

2. Steel's Many-One Rank Test:

   Is the mean number of young produced per female significantly different (p=0.05) than the control's number of young per female for the % effluent corresponding to (significant non-lethal effects):

a.) LOW FLOW OR CRITICAL DILUTION	(65 %)	____YES	X NO
b.) 1/2 LOW FLOW DILUTION	(NA)	____YES	____NO

3. If you answered NO to 1.a) enter [0] otherwise enter [1]: 0 (TLP3B)

4. If you answered NO to 2.a) enter [0] otherwise enter [1]: 0 (TGP3B)

5. NOEC Ceriodaphnia Lethality: 87 % (TOP3B)

6. LOEC Ceriodaphnia Lethality: 87 % (TXP3B)

7. NOEC Ceriodaphnia Sublethality: 87 % (TPP3B)

8. LOEC Ceriodaphnia Sublethality: 87 % (TYP3B)

9. Coefficient of variation for Ceriodaphnia Reproduction: 11.4 (TQP3B)

Appendix B: Test 1002.0

CHRONIC TOXICITY SUMMARY FORM
Ceriodaphnia dubia
CHEMICAL PARAMETERS CHART

PERMITTEE: City of Hot Springs
NPDES NO.: AR0033880 AFIN#26-00145
CONTACT: Mr. James Sorrells
ANALYST: 280, 304, 310, 314

2400
2400
2400

Test Initiated: DATE: June 9, 2015 TIME: 1115
Test Terminated: DATE: June 15, 2015 TIME: 1300

DILUTION Control	DAY 1	2	3	4	5	6	7
D.O. Initial	7.8	7.4	7.0	7.5	7.8	7.4	7.7
Final	7.6	7.2	7.1	7.9	7.4	7.8	--
pH Initial	7.5	7.4	7.5	7.3	7.4	7.6	7.4
Final	7.8	7.6	7.6	8.0	7.9	7.8	--
Alkalinity	30	NA	30	NA	30	NA	NA
Hardness	43	NA	43	NA	43	NA	NA
Conductivity	120	130	140	140	140	160	140
Chlorine	<0.05	NA	<0.05	NA	<0.05	NA	NA

DILUTION 27 %	DAY 1	2	3	4	5	6	7
D.O. Initial	7.8	7.5	7.1	7.3	7.7	7.7	7.5
Final	7.2	7.1	7.1	8.0	7.7	7.8	--
pH Initial	7.5	7.4	7.4	7.2	7.3	7.7	7.3
Final	7.8	7.6	7.7	8.1	8.0	7.9	--
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	150	160	180	170	180	200	180
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION 37 %	DAY 1	2	3	4	5	6	7
D.O. Initial	7.8	7.5	7.5	7.4	7.8	7.7	7.4
Final	7.1	7.0	7.5	8.0	7.7	7.8	--
pH Initial	7.4	7.4	7.4	7.3	7.3	7.8	7.3
Final	7.8	7.7	7.8	8.1	8.0	7.9	--
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	160	170	190	180	200	210	200
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION 49 %	DAY 1	2	3	4	5	6	7
D.O. Initial	7.7	7.3	7.2	7.3	7.5	7.5	7.6
Final	7.5	6.9	7.0	7.9	7.6	7.7	--
pH Initial	7.5	7.4	7.4	7.3	7.4	7.8	7.4
Final	7.8	7.7	7.8	8.1	8.1	8.0	--
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	170	180	200	200	220	230	220
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION 65 %	DAY 1	2	3	4	5	6	7
D.O. Initial	7.6	7.3	7.5	7.1	7.7	7.3	7.4
Final	7.5	7.1	7.2	7.8	7.4	7.8	--
pH Initial	7.4	7.4	7.5	7.3	7.4	7.9	7.4
Final	7.8	7.7	7.9	8.1	8.2	8.0	--
Alkalinity	44	NA	53	NA	60	NA	NA
Hardness	56	NA	65	NA	68	NA	NA
Conductivity	180	200	230	220	250	260	250
Chlorine	<0.05	NA	<0.05	NA	<0.05	NA	NA

DILUTION 87 %	DAY 1	2	3	4	5	6	7
D.O. Initial	7.8	7.4	7.4	7.1	7.8	7.6	7.2
Final	6.9	7.0	7.5	7.9	7.7	7.8	--
pH Initial	7.4	7.4	7.5	7.3	7.4	8.0	7.4
Final	7.9	7.8	7.9	8.2	8.2	8.1	--
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	200	220	260	260	290	300	290
Chlorine	NA	NA	NA	NA	NA	NA	NA

AMERICAN INTERPLEX CORPORATION
LABORATORIES

CHAIN OF CUSTODY / ANALYSIS REQUEST FORM

Client: City of Hot Springs
Project Reference: Plant Effluent
Project Manager: James Sorrells
Sampled By: A Mauldin

PO No. 15-1637

AIC No.	Sample Identification	Date/Time Collected	GRAB	COMP	Sample Matrix: WATER	Sample Matrix: SOIL		No of BOTTLES	Analyses Requested: Chronic.CO, Chronic.FH
1	Plant Effluent	6/17/15 @0000-2400		X	X				X
		Container Type							P
		Preservative							NO

AIC Control No: 191255
AIC Proposal No: ~~0-1~~
Carrier: ~~0-1~~ TDZ85 FORNNIS
Received Temperature °C: 0.1
Remarks:
Field pH calibration on ____ @ ____
Buffer:

G = Glass P = Plastic V = VOA vials H = HCl to pH2 T = Sodium Thiosulfate
NO = none S = Sulfuric acid pH2 N = Nitric acid pH2 B = NaOH to pH12 Z = Zinc acetate A = $(NH_4)_2SO_4$

Turnaround Time Requested: (Please circle)
(NORMAL) or EXPEDITED IN ____ DAYS
~~Expedited~~ results requested by: _____
Who should AIC contact with questions: _____
Phone: _____ Fax: _____
Report Attention to: Mr. James Sorrells
Report Address to: 320 Davidson Road
Hot Springs, AR 71901

Relinquished By	Date/Time	Received By	Date/Time
A Mauldin	6/18/15 @ 0940	M. Mann	6-18-15 @ 9:40
M. Mann	6-18-15 @ 10:45	D. Brown	6-18-15 10:45

Comments:

AMERICAN INTERPLEX CORPORATION
LABORATORIES

CHAIN OF CUSTODY / ANALYSIS REQUEST FORM

Client: City of Hot Springs
Project Reference: Plant Effluent
Project Manager: James Sorrells
Sampled By: H MALCOLM

PO No. 15-1637

AIC Control No: 191255
AIC Proposal No:
Carrier: Delivery Hot Springs ~~Courier~~ BEH 17
Received Temperature °C: 0.1

AIC No.	Sample Identification	Date/Time Collected	GRAB	COMP	Sample Matrix: WATER	Sample Matrix: SOIL	No of BOTTLES	Analyses Requested: Chronic.CD, Chronic.FH	Remarks
2	PLANT Effluent	10/9/15 @ 0000-2400		X	X		3	X	
		Container Type						P	
		Preservative						NO	

Field pH calibration on _____ @ _____ Buffer:

G = Glass P = Plastic V = VOA vials H = HCl to pH2 T = Sodium Thiosulfate
NO = none S = Sulfuric acid pH2 N = Nitric acid pH2 B = NaOH to pH12 Z= Zinc acetate A = $(NH_4)_2SO_4$

Turnaround Time Requested: (Please circle)
NORMAL or EXPEDITED IN ____ DAYS
Expedited results requested by: _____
Who should AIC contact with questions: _____
Phone: _____ Fax: _____
Report Attention to: Mr. James Sorrells
Report Address to: 320 Davidson Road
Hot Springs, AR 71901

Relinquished By:	Date/Time	Received By:	Date/Time
Bill Daniel	6-10-2015 @ 1025 HRS	M. Mann	6-10-15 @ 10:25
M. Mann	6-10-15 @ 11:50	D. BROWN	6-10-15 11:50

Comments:

AMERICAN INTERPLEX CORPORATION
LABORATORIES

CHAIN OF CUSTODY / ANALYSIS REQUEST FORM

Client: City of Hot Springs
Project Reference: Plant Effluent
Project Manager: James Sorrells
Sampled By: H Malcolm

PO No. 15-1637

AIC Control No: 191255
AIC Proposal No:
Carrier: KS DELIVERY
Received Temperature °C: 0.1

AIC No.	Sample Identification	Date/Time Collected	GRAB	COMP	Sample Matrix: WATER	Sample Matrix: SOIL	No of BOTTLES	Analyses Requested: Chronic.CD, Chronic.FH	Remarks
3	Plant Effluent	6/11/15 @0000-2400		X	X			X	
		Container Type						P	
		Preservative						NO	

Field pH calibration on _____ @ _____ Buffer:

G = Glass P = Plastic V = VOA vials H = HCl to pH2 T = Sodium Thiosulfate
NO = none S = Sulfuric acid pH2 N = Nitric acid pH2 B = NaOH to pH12 Z= Zinc acetate A = $(NH_4)_2SO_4$

Turnaround Time Requested: (Please circle)
NORMAL or EXPEDITED IN ____ DAYS
Expedited results requested by: _____
Who should AIC contact with questions: _____
Phone: _____ Fax: _____
Report Attention to: Mr. James Sorrells
Report Address to: 320 Davidson Road
Hot Springs, AR 71901

Relinquished By	Date/Time	Received By	Date/Time
H Malcolm	6-12-15 0950	[illegible]	6-12-15 955
[illegible]	6-12-15 1250	D. Brown	6-12-15 12:00

Comments:

City of Hot Springs
Wastewater Treatment Plant
320 Davidson Drive
Hot Springs, Ar 71901

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