

# Sanitary Sewer Overflow (SSO) Monthly Report

Facility Name: Hot Springs Wastewater NPDES Permit No.: AR0033880 Monitoring Period (Month/Year) December / 2015

No Sanitary Sewer Overflows This Monitoring Period

### Summary Report Code Descriptions

Cause(s) of SSO	SSO Impact	Action(s) Taken	Ultimate Discharge Location
<b>CO</b> -Construction	<b>D</b> -Debris	<b>NEAH</b> -No Evidence Adverse Health/Environmental Impact	<b>CR</b> -Creek/Stream/River (specify)
<b>E</b> -Equipment Failure	<b>G</b> -Grease	<b>OEHC</b> -Observed or Evidence of Human Contact	<b>DI</b> -Ditch
<b>HC</b> -Hydro Clean	<b>LF</b> -Line Failure	<b>EFK</b> -Evidence of Fish Kill	<b>DR</b> -Drop Inlet
<b>R</b> -Rainfall	<b>RG</b> -Roots/Grease	<b>HR</b> -Hand Rodded	<b>GR</b> -Ground Surface
<b>RO</b> -Roots	<b>V</b> -Vandalism	<b>EN</b> -Referred to Engineering	<b>PA</b> -Paved Area
		<b>PN</b> -Public Notification	<b>CB</b> -Contained in Building

Location	Manhole #	Start Date of SSO	End Date of SSO	Estimated Volume (in gallons)	Cause of SSO	Environmental Impact	Action(s) Taken to Address SSO	Discharge Location
3047 Malvern Ave	MH# 1747	12/13/2015		Still Overflowing	R	NEAH		CR--Gulpha
104 Forest View Ct.	MH# 1864	12/13/2015		Still Overflowing	R	NEAH		CR--Hot Springs
857 Carpenter Dam Rd.	MH# 5259	12/13/2015		Still Overflowing	R	NEAH		CR--Unknown
360 Fontana Rd.	MH# 1866	12/13/2015	13/14/2015	10000	R	NEAH	EC	CR--Hot Springs
403 McLeod St.	MH# 991	12/13/2015	13/14/2015	5000	R	NEAH	EC	CR--Stokes
519 McLeod St.	MH# 995	12/13/2015	12/14/2015	5000	R	NEAH	EC	CR--Stokes
615 McLeod St.	MH# 998	12/13/2015	12/14/2015	5000	R	NEAH	EC	CR--Stokes
3047 Malvern Ave	MH# 1747	12/13/2015	12/14/2015	35000	R	NEAH	EC	CR--Gulpha
857 Carpenter Dam Rd.	MH# 5259	12/13/2015	12/14/2015	20000	R	NEAH	EC	CR--Unknown
104 Forest View Ct.	MH# 1864	12/13/2015	12/16/2015	50000	R	NEAH	EC	CR--Hot Springs
126 Foxwood St.	MH# 8001	12/17/2015	12/17/2015	10,000	E	NEAH	EC	DI--Ditch

Signature of Cognizant or Ranking Official

Date 1-19-2016

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment of knowing violations.

*8X146,000*

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<b>RO</b> -Roots	<b>V</b> -Vandalism		<b>PA</b> -Paved Area
		<b>EN</b> -Referred to Engineering	
		<b>PN</b> -Public Notification	<b>CB</b> -Contained in Building

Location	Manhole #	Start Date of SSO	End Date of SSO	Estimated Volume (in gallons)	Cause of SSO	Environmental Impact	Action(s) Taken to Address SSO	Discharge Location
1539 Spring St.	MH# 4117	12/26/2015		Still Overflowing	R	NEAH		CR--Gulpha
1539 Spring St.	MH# 4118	12/26/2015		Still Overflowing	R	NEAH		CR--Gulpha
615 McLeod St.	MH# 998	12/26/2015		Still Overflowing	R	NEAH		CR--Stokes
519 McLeod St.	MH# 995	12/26/2015		Still Overflowing	R	NEAH		CR--Stokes
403 McLeod St.	MH# 991	12/26/2015		Still Overflowing	R	NEAH		CR--Stokes
857 Carpenter Dam Rd.	MH# 5259	12/26/2015		Still Overflowing	R	NEAH		CR--Unknown
816 Carpenter Dam Rd.	MH# 5260	12/26/2015		Still Overflowing	R	NEAH		CR--Unknown
3047 Malvern Ave	MH# 1747	12/26/2015		Still Overflowing	R	NEAH		CR--Gulpha
106 Forest View Ct.	MH# 12242	12/26/2015		Still Overflowing	R	NEAH		CR--Hot Springs
104 Forest View Ct.	MH# 1864	12/26/2015		Still Overflowing	R	NEAH		CR--Hot Springs
352 Fontana Rd.	MH# 1866	12/27/2015		Still Overflowing	R	NEAH		CR--Hot Springs

  
 Signature of Cognizant or Ranking Official

1-19-2016  
 Date

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## Sanitary Sewer Overflow (SSO) Monthly Report

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		<b>PN</b> -Public Notification	<b>CB</b> -Contained in Building

Location	Manhole #	Start Date of SSO	End Date of SSO	Estimated Volume (in gallons)	Cause of SSO	Environmental Impact	Action(s) Taken to Address SSO	Discharge Location
362 Fontana Rd.	MH# 1865	12/27/2015		Still Overflowing	R	NEAH		CR—Hot Springs
400 East Grand Ave	MH# 3116	12/28/2015		Still Overflowing	R	NEAH		DR—Drop Inlet
400 East Grand Ave	MH# 3116	12/28/2015	12/28/2015	300	RO	NEAH	HC	DR—Drop Inlet
352 Fontana Rd.	MH# 1866	12/27/2015	12/28/2015	45000	R	NEAH	EC	CR—Hot Springs
362 Fontana Rd.	MH# 1865	12/27/2015	12/28/2015	50000	R	NEAH	EC	CR—Hot Springs
106 Forest View Ct.	MH# 12242	12/26/2015	12/28/2015	70000	R	NEAH	EC	CR—Hot Springs
1539 Spring St.	MH# 4117	12/26/2015	12/28/2015	20000	R	NEAH	EC	CR—Gulpha
1539 Spring St.	MH# 4118	12/26/2015	12/28/2015	20000	R	NEAH	EC	CR—Gulpha
403 McLeod St.	MH# 991	12/26/2015	12/28/2015	50000	R	NEAH	EC	CR—Stokes
519 McLeod St.	MH# 995	12/26/2015	12/28/2015	50000	R	NEAH	EC	CR—Stokes
615 McLeod St.	MH# 998	12/26/2015	12/28/2015	60000	R	NEAH	EC	CR—Stokes

Signature of Cognizant or Ranking Official

Date

*1-19-2016*

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*9x 365,300*

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<b>E</b> -Equipment Failure	<b>G</b> -Grease	<b>OEHC</b> -Observed or Evidence of Human Contact	<b>EC</b> -Environmental Cleanup	<b>DI</b> -Ditch
<b>HC</b> -Hydro Clean	<b>LF</b> -Line Failure	<b>EFK</b> -Evidence of Fish Kill	<b>HC</b> -Hydro Cleaned	<b>DR</b> -Drop Inlet
<b>R</b> -Rainfall	<b>RG</b> -Roots/Grease		<b>HR</b> -Hand Rodded	<b>GR</b> -Ground Surface
<b>RO</b> -Roots	<b>V</b> -Vandalism		<b>EN</b> -Referred to Engineering	<b>PA</b> -Paved Area
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Location	Manhole #	Start Date of SSO	End Date of SSO	Estimated Volume (in gallons)	Cause of SSO	Environmental Impact	Action(s) Taken to Address SSO	Discharge Location
104 Forest View Ct.	MH# 1864	12/26/2015	12/28/2015	70000	R	NEAH	EC	CR—Hot Springs
816 Carpenter Dam Rd.	MH# 5260	12/26/2015	12/29/2015	50000	R	NEAH	EC	CR--Unknown
857 Carpenter Dam Rd.	MH# 5259	12/26/2015	12/29/2015	60000	R	NEAH	EC	CR--Unknown
3047 Malvern Ave	MH# 1747	12/26/2015	12/29/2015	75000	R	NEAH	EC	CR--Gulpha

*[Handwritten Signature]*  
 Signature of Cognizant or Ranking Official

*1-19-2016*  
 Date

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment of knowing violations.

*4x 255,000*



November 25, 2015

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

Control No. 196278-1

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



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 Chief Operating Officer 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 65 % effluent, which is equal to 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  
Chief Operating Officer

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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*Pimephales promelas* (Fathead minnow) Survival and Growth

Test 1002.0

*Ceriodaphnia dubia* Survival and Reproduction

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Appendix B: Chains of Custody

I. Control Acceptance Criteria

*Pimephales promelas* (Fathead minnow) Method 1000.0

CRITERIA	RESULTS	PASS/FAIL
Control Survival > or = 80%	97.5	PASS
Control Growth > or = 0.25 mg per Surviving minnow	0.335	PASS
Control Growth CV < or = 40%	12.8	PASS
Growth Minimum Significant Difference 12 to 30%	15.0	PASS
Critical Dilution CV < or = 40%	13.9	PASS

*Ceriodaphnia dubia* Method 1002.0

CRITERIA	RESULTS	PASS/FAIL
Control Survival > or = 80%	100	PASS
Control Reproduction > or = 15 per Surviving Female	19.6	PASS
Control CV < or = 40% per Surviving Female	26.6	PASS
Reproduction Minimum Significant Difference 13 to 47%	23.6	PASS
Critical Dilution CV < or = 40%	24.1	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)	6.9	8.3	8.5
pH (standard units)	8.0	7.1	7.2
Alkalinity (mg/l as CaCO <sub>3</sub> )	130	45	32
Hardness (mg/l as CaCO <sub>3</sub> )	96	64	63
Conductivity (umhos/cm)	270	300	230
Residual Chlorine (mg/l)	<0.05	<0.05	<0.05
Ammonia as N (mg/l)	<0.1	0.59	<0.1

2. Dilution Water Samples: Synthetic Soft Water # 4275

- a. Dates Prepared: November 13 through 27, 2015
- b. Chemical Data:

Analysis	Sample 1	Sample 2	Sample 3
Dissolved oxygen (mg/l)	7.6	7.8	8.2
pH (standard units)	6.9	6.8	7.6
Alkalinity (mg/l as CaCO <sub>3</sub> )	32	32	32
Hardness (mg/l as CaCO <sub>3</sub> )	46	46	46
Conductivity (umhos/cm)	170	170	180
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: November 17, 2015 at 1035  
Date & Time Test Terminated: November 24, 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

*Ceriodaphnia dubia* Survival and Growth Method 1002.0

Date & Time Test Initiated: November 17, 2015 at 1040  
Date & Time Test Terminated: November 23, 2015 at 0850  
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 and Bartlett's test. The survival data was then analyzed using Dunnett's 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 Bartlett's test and analyzed with Dunnett's Test to determine the No Observable Effects Concentration (NOEC) for Reproduction.

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 October 21, 2015 at 1600 to October 28, 2015 at 1530

The results were as follows: (Control No. 195350-1.)

Survival LC-50: 4872 mg/l

Growth IC-25: 3595 mg/l

Growth PMSD: 13

*Ceriodaphnia dubia*

Chronic reference tests are performed monthly.

A chronic reference test was performed on October 21, 2015 at 1400 to October 27, 2015 at 1550

The results were as follows: (Control No. 195350-2.)

Survival LC-50: 1732 mg/l

Growth IC-25: 879.2 mg/l

Growth PMSD: 20.2

V. Chemical Analysis/Quality Control

Parameter	Method	% Recovery	Relative % Difference
Alkalinity	SM 2320 B	NA	0.00
Hardness	EPA 200.7	103	0.292
pH	SM 4500-H+ B	100	0.135
Conductivity	EPA 120.1	95.2	0.717

VI. Organism History

*Pimephales promelas* (Fathead minnow)

Date: November 17, 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: November 17, 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

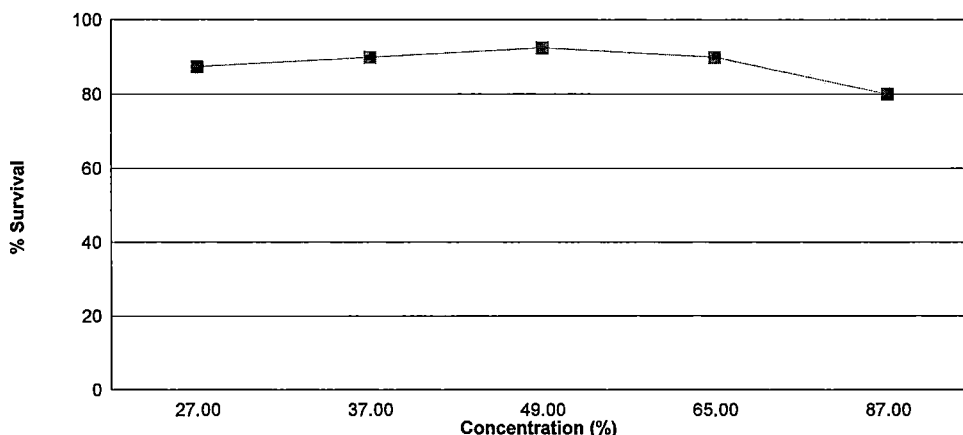
Larvae are exposed in a static renewal system for seven days to different concentrations of effluent with dilution water. Test results are based on the survival and growth (increase in weight) of the larvae.

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 November 17, 2015 at 1035 and continued through November 24, 2015 at 0955. Statistical analyses were performed on the observed data and the no observable effects concentrations (NOECs) were as follows:

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



Summary of the 7-day Fathead Minnow Survival and Growth		
Concentration	Percent Survival	Mean Growth (mg)
Control	97.5	0.327
27 %	87.5	0.326
37 %	90.0	0.290
49 %	92.5	0.312
65 %	90.0	0.315
87 %	80.0 *	--

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

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

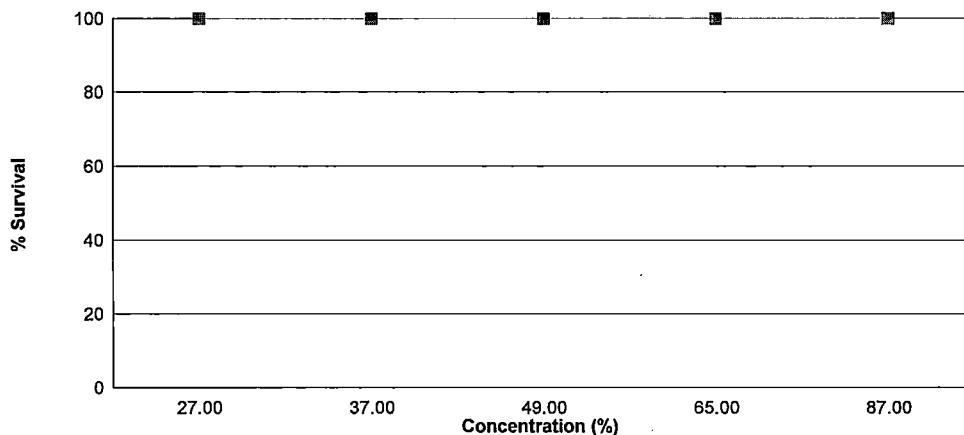
Neonates are exposed in a static renewal system to different concentrations of effluent with dilution water until 60% of surviving control organisms have three broods of offspring with an average of at least 15 young per female.

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 November 17, 2015 at 1040 and continued through November 23, 2015 at 0850. 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 <i>Ceriodaphnia dubia</i> Survival and Reproduction Data		
Concentration	Percent Survival	Mean Reproduction
Control	100	19.6
27 %	100	22.0
37 %	100	20.3
49 %	100	21.3
65 %	100	19.9
87 %	100	21.8

## Appendix A1: Test 1000.0

*Pimephales promelas* (Fathead Minnow) 7-Day Survival

 Date and Time Test Initiated: November 17, 2015 at 1035  
 Date and Time Test Terminated: November 24, 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	7
27 %	A	8	8	8	8	8	7	7
	B	8	8	8	8	8	8	7
	C	8	8	8	8	8	8	8
	D	8	8	8	8	8	7	6
	E	8	8	8	8	8	7	7
37 %	A	8	8	8	8	8	7	7
	B	8	8	8	8	8	7	7
	C	8	8	8	8	8	8	8
	D	8	8	8	8	8	7	7
	E	8	8	8	8	7	7	7
49 %	A	8	8	8	8	8	7	6
	B	8	8	8	8	8	8	8
	C	8	8	8	8	7	7	7
	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	7
	C	8	8	8	8	8	7	7
	D	8	8	8	8	8	7	7
	E	8	8	8	8	8	7	7
87 %	A	8	8	8	8	8	8	7
	B	8	8	8	6	5	5	5
	C	8	8	8	8	8	7	7
	D	8	8	8	8	8	8	7
	E	8	8	8	7	7	7	6

Appendix A1: Test 1000.0

*Pimephales promelas* (Fathead Minnow) 7-Day Growth

Test Initiated: November 17, 2015 at 1035  
Test Terminated: November 24, 2015 at 0955

Drying Started: November 23, 2015 at 1508  
Drying Ended: November 25, 2015 at 1050

Concentration	Replicate	Weight of pan	Weight of pan + fish	Total weight of fish (g)	Original # of fish	Mean dry weight (mg)
Control	A	.94956	.95220	0.00264	8	0.330
	B	.94040	.94301	0.00261	8	0.326
	C	.94383	.94674	0.00291	8	0.364
	D	.94336	.94621	0.00285	8	0.356
	E	.94347	.94553	0.00206	8	0.258
27 %	A	.93678	.93932	0.00254	8	0.318
	B	.94122	.94373	0.00251	8	0.314
	C	.93832	.94126	0.00294	8	0.368
	D	.94642	.94887	0.00245	8	0.306
	E	.93865	.94123	0.00258	8	0.322
37 %	A	.94290	.94502	0.00212	8	0.265
	B	.93843	.94070	0.00227	8	0.284
	C	.94055	.94338	0.00283	8	0.354
	D	.94051	.94261	0.00210	8	0.262
	E	.94809	.95038	0.00229	8	0.286
49 %	A	.94264	.94509	0.00245	8	0.306
	B	.94479	.94728	0.00249	8	0.311
	C	.94090	.94337	0.00247	8	0.309
	D	.94491	.94749	0.00258	8	0.322
	E	.94342	.94591	0.00249	8	0.311
65 %	A	.94497	.94780	0.00283	8	0.354
	B	.93767	.94031	0.00264	8	0.330
	C	.94066	.94322	0.00256	8	0.320
	D	.94117	.94383	0.00266	8	0.332
	E	.94333	.94525	0.00192	8	0.240
87 %	A	.94197	.94495	0.00298	8	0.372
	B	.95016	.95295	0.00279	8	0.349
	C	.94583	.94835	0.00252	8	0.315
	D	.94523	.94761	0.00238	8	0.298
	E	.94028	.94293	0.00265	8	0.331

Appendix A1: Test 1002.0

*Ceriodaphnia dubia* Survival and Reproduction

Date and Time Test Initiated: November 17, 2015 at 1040  
Date and Time Test Terminated: November 23, 2015 at 0850

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	0	10	0.00
2	0	0	0	0	0	0	0	0	0	0	0	0	10	0.00
3	0	3	4	0	4	3	2	0	0	4	20	10	2.00	
4	4	0	0	4	4	0	9	5	0	0	26	10	2.60	
5	5	10	8	10	0	7	1	9	7	9	66	10	6.60	
6	2	10	11	0	11	10	15	0	13	12	84	10	8.40	
7														
8														
TOTAL	11	23	23	14	19	20	27	14	20	25	196	10	19.6	

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	0	3	0	4	4	3	4	4	0	22	10	2.20	
4	7	0	0	3	0	0	6	3	5	5	29	10	2.90	
5	10	9	10	7	8	7	0	1	2	8	62	10	6.20	
6	0	13	11	13	10	9	15	13	13	10	107	10	10.7	
7														
8														
TOTAL	17	22	24	23	22	20	24	21	24	23	220	10	22.0	

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	3	0	3	4	0	0	4	0	18	10	1.80	
4	6	0	0	5	6	0	5	4	0	4	30	10	3.00	
5	10	9	11	10	1	9	9	10	7	6	82	10	8.20	
6	0	10	15	0	9	10	10	0	12	7	73	10	7.30	
7														
8														
TOTAL	16	23	29	15	19	23	24	14	23	17	203	10	20.3	

Appendix A1: Test 1002.0

*Ceriodaphnia dubia* Survival and Reproduction

Date and Time Test Initiated: November 17, 2015 at 1040

Date and Time Test Terminated: November 23, 2015 at 0850

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	0	10	0.00
2	0	0	0	0	0	0	0	0	0	0	0	0	10	0.00
3	0	3	4	0	4	4	5	0	4	0	24	10	2.40	
4	4	0	0	5	7	0	6	5	0	7	34	10	3.40	
5	5	7	7	7	1	9	1	11	11	9	68	10	6.80	
6	9	12	12	0	11	12	14	0	13	4	87	10	8.70	
7														
8														
TOTAL	18	22	23	12	23	25	26	16	28	20	213	10	21.3	

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	3	0	0	4	4	4	0	0	3	4	22	10	2.20	
4	0	6	4	0	7	0	0	4	7	3	31	10	3.10	
5	9	8	10	9	0	10	11	9	0	0	66	10	6.60	
6	10	0	0	13	13	10	10	0	13	11	80	10	8.00	
7														
8														
TOTAL	22	14	14	26	24	24	21	13	23	18	199	10	19.9	

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	4	0	4	4	4	0	3	4	27	10	2.70	
4	7	0	6	2	1	1	7	6	0	0	30	10	3.00	
5	10	10	0	7	0	9	0	7	10	10	63	10	6.30	
6	0	12	15	9	13	10	13	2	13	11	98	10	9.80	
7														
8														
TOTAL	17	26	25	18	18	24	24	15	26	25	218	10	21.8	



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	0.87500	1.20940	
2	27 %	1	0.87500	1.20940	
2	27 %	2	0.87500	1.20940	
2	27 %	3	1.00000	1.39310	
2	27 %	4	0.75000	1.04720	
2	27 %	5	0.87500	1.20940	
3	37 %	1	0.87500	1.20940	
3	37 %	2	0.87500	1.20940	
3	37 %	3	1.00000	1.39310	
3	37 %	4	0.87500	1.20940	
3	37 %	5	0.87500	1.20940	
4	49 %	1	0.75000	1.04720	
4	49 %	2	1.00000	1.39310	
4	49 %	3	0.87500	1.20940	
4	49 %	4	1.00000	1.39310	
4	49 %	5	1.00000	1.39310	
5	65 %	1	1.00000	1.39310	
5	65 %	2	0.87500	1.20940	
5	65 %	3	0.87500	1.20940	
5	65 %	4	0.87500	1.20940	
5	65 %	5	0.87500	1.20940	
6	87 %	1	0.87500	1.20940	
6	87 %	2	0.62500	0.91174	
6	87 %	3	0.87500	1.20940	
6	87 %	4	0.87500	1.20940	
6	87 %	5	0.75000	1.04720	

Appendix A2: Statistics

*Pimephales promelas* (Fathead minnow) Survival

Shapiro - Wilk's Test for Normality	Transform: Arc Sin(Square Root(Y))
D = 0.3109 W = 0.9511 Critical W = 0.9 Critical W = 0.927	(alpha = 0.01, N = 30) (alpha = 0.05, N = 30)
Data PASS normality test (alpha = 0.01).	

Bartlett's Test for Homogeneity of Variance	Transform: Arc Sin(Square Root(Y))
Calculated B1 statistic = 3.069 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) Survival

ANOVA Table			Transform: Arc Sin(Square Root(Y))	
SOURCE	DF	SS	MS	F
Between	5	0.1572	0.03144	2.428
Within (Error)	24	0.3108	0.01295	
Total	29	0.468		
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				Transform: Arc Sin(Square Root(Y))	
Ho:Control<Treatment					
Group	Identification	Transformed Mean	Mean In Original Units	T Stat	Sig 0.05
1	Control	1.3564	0.975		
2	27 %	1.2137	0.875	1.983	
3	37 %	1.2461	0.9	1.533	
4	49 %	1.2872	0.925	0.9615	
5	65 %	1.2461	0.9	1.533	
6	87 %	1.1174	0.8	3.321	*
Dunnett's critical value = 2.36 (1 Tailed, alpha = 0.05, df = 5,24)					

Dunnett's Test - Table 2 of 2				Transform: Arc Sin(Square Root(Y))	
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	0.09529	9.98	0.1
3	37 %	5	0.09529	9.98	0.075
4	49 %	5	0.09529	9.98	0.05
5	65 %	5	0.09529	9.98	0.075
6	87 %	5	0.09529	9.98	0.175

Appendix A2: Statistics

*Pimephales promelas* (Fathead minnow) Growth

Shapiro - Wilk's Test for Normality	No Transformation
<p>D = 0.02276 W = 0.9335 Critical W = 0.888 (alpha = 0.01, N = 25) Critical W = 0.918 (alpha = 0.05, N = 25)</p> <p>Data PASS normality test (alpha = 0.01).</p>	

Bartlett's Test for Homogeneity of Variance	No Transformation
<p>Calculated B1 statistic = 10.65 Critical B = 13.277 (alpha = 0.01, df = 4)</p> <p>Data PASS B1 homogeneity test at 0.01 level.</p>	

Appendix A2: Statistics

*Pimephales promelas* (Fathead minnow) Growth

ANOVA Table				No Transformation	
SOURCE	DF	SS	MS	F	
Between	4	0.004355	0.001089	0.9569	
Within (Error)	20	0.02276	0.001138		
Total	24	0.02711			
Critical F = 4.43 (alpha = 0.01, df = 4,20)					
2.87 (alpha = 0.05, df = 4,20)					
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	0.3268	0.3268			
2	27 %	0.3256	0.3256	0.05624		
3	37 %	0.2902	0.2902	1.715		
4	49 %	0.3118	0.3118	0.7031		
5	65 %	0.3152	0.3152	0.5437		
Dunnett's critical value = 2.3 (1 Tailed, alpha = 0.05, df = 4,20) (Actual df = 4,20)						

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	0.04907	15	0.0012	
3	37 %	5	0.04907	15	0.0366	
4	49 %	5	0.04907	15	0.015	
5	65 %	5	0.04907	15	0.0116	

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 %	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.

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	0	

Appendix A2: Statistics

*Ceriodaphnia dubia* Reproduction

Kolmogorov Test for Normality	No Transformation
<p>D = 0.1221 D* = 0.958 Critical D* = 1.035 (alpha = 0.01, N = 60)</p> <p>Data PASS normality test (alpha = 0.01).</p>	

Bartlett's Test for Homogeneity of Variance	No Transformation
<p>Calculated B1 statistic = 6.455 Critical B = 15.086 (alpha = 0.01, df = 5)</p> <p>Data PASS B1 homogeneity test at 0.01 level.</p>	



Appendix A2: Statistics

*Ceriodaphnia dubia* Reproduction

ANOVA Table				No Transformation	
SOURCE	DF	SS	MS	F	
Between	5	51.88	10.38	0.5174	
Within (Error)	54	1083	20.06		
Total	59	1135			
Critical F = 3.38 (alpha = 0.01, df = 5,54)					
2.38 (alpha = 0.05, df = 5,54)					
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	19.6	19.6			
2	27 %	22	22	-1.198		
3	37 %	20.3	20.3	-0.3495		
4	49 %	21.3	21.3	-0.8487		
5	65 %	19.9	19.9	-0.1498		
6	87 %	21.8	21.8	-1.098		
Dunnett's critical value = 2.31 (1 Tailed, alpha = 0.05, df [used] = 5,40) (Actual df = 5,54)						

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	4.627	23.6	-2.4		
3	37 %	10	4.627	23.6	-0.7		
4	49 %	10	4.627	23.6	-1.7		
5	65 %	10	4.627	23.6	-0.3		
6	87 %	10	4.627	23.6	-2.2		

Appendix A3: Water Chemistry

Routine Chemical and Physical Data

Date and Time Test Initiated: November 17, 2015 at 1002

Date and Time Test Terminated: November 25, 2015 at 1050

Effluent Conc.: Control		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	7.6	7.5	7.8	8.0	8.2	9.0	8.9
	Final *1	7.0	7.8	7.6	7.6	7.7	7.7	8.7
	Final *2	7.2	7.7	7.9	8.2	8.9	8.2	
pH, units	Initial	6.9	7.4	6.8	7.0	7.6	7.1	6.6
	Final *1	7.6	7.1	7.6	7.3	7.1	7.1	7.0
	Final *2	7.7	7.6	7.5	7.6	7.4	7.2	
Alkalinity, mg CaCO <sub>3</sub> /l		32	NA	32	NA	32	NA	NA
Hardness, mg CaCO <sub>3</sub> /l		46	NA	46	NA	46	NA	NA
Conductivity, umhos/cm		170	170	170	170	180	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	7.7	7.6	8.1	7.9	8.2	9.0	8.9
	Final *1	7.0	8.4	7.5	7.6	7.7	7.8	8.8
	Final *2	7.3	7.4	7.9	8.2	8.6	8.7	
pH, units	Initial	7.4	7.4	7.4	7.3	7.6	7.1	6.9
	Final *1	7.5	7.2	7.7	7.2	7.0	7.0	6.9
	Final *2	7.8	7.8	7.7	7.7	7.4	7.2	

Effluent Conc.: 37 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	7.6	7.7	7.8	8.0	8.2	9.1	8.9
	Final *1	7.1	7.3	7.7	7.7	8.1	8.1	8.6
	Final *2	7.5	7.7	7.9	8.4	9.0	8.6	
pH, units	Initial	7.4	7.5	7.4	7.3	7.5	7.2	6.9
	Final *1	7.5	7.0	7.7	7.2	7.1	7.0	6.9
	Final *2	7.8	7.8	7.7	7.7	7.4	7.1	

Appendix A3: Water Chemistry

Routine Chemical and Physical Data

Date and Time Test Initiated: November 17, 2015 at 1002

Date and Time Test Terminated: November 25, 2015 at 1050

Effluent Conc.: 49 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	7.5	7.7	7.8	8.0	8.1	9.1	9.0
	Final *1	7.2	8.5	7.6	7.8	8.2	7.9	7.0
	Final *2	7.5	7.9	7.8	8.6	9.0	8.3	
pH, units	Initial	7.4	7.5	7.5	7.4	7.4	7.2	6.9
	Final *1	7.4	7.2	7.8	7.2	7.0	7.0	6.8
	Final *2	7.8	7.8	7.7	7.7	7.4	7.1	

Effluent Conc.: 65 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	7.9	7.8	7.7	8.2	8.4	9.0	9.0
	Final *1	7.2	6.9	7.5	7.6	7.8	7.9	7.4
	Final *2	7.7	7.7	9.2	8.6	9.0	8.5	
pH, units	Initial	7.4	7.5	7.5	7.3	7.3	7.2	6.8
	Final *1	7.4	7.0	7.8	7.2	7.0	7.0	6.8
	Final *2	7.9	7.8	7.7	7.8	7.4	7.1	
Alkalinity, mg CaCO <sub>3</sub> /l	42	NA	38	NA	36	NA	NA	NA
Hardness, mg CaCO <sub>3</sub> /l	59	NA	62	NA	59	NA	NA	NA
Conductivity, umhos/cm	280	290	290	260	210	180	170	
Res. Chlorine, mg/l	<0.05	NA	<0.05	NA	<0.05	NA	NA	NA

Effluent Conc.: 87 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	7.4	7.9	7.8	8.1	8.6	9.0	8.8
	Final *1	7.3	7.2	7.4	7.6	8.0	8.0	6.9
	Final *2	7.6	7.7	9.2	8.9	8.6	8.7	
pH, units	Initial	7.5	7.6	7.6	7.2	7.3	7.1	6.7
	Final *1	7.6	7.1	7.8	7.3	7.1	7.0	6.8
	Final *2	7.9	7.8	7.7	7.8	7.4	7.1	

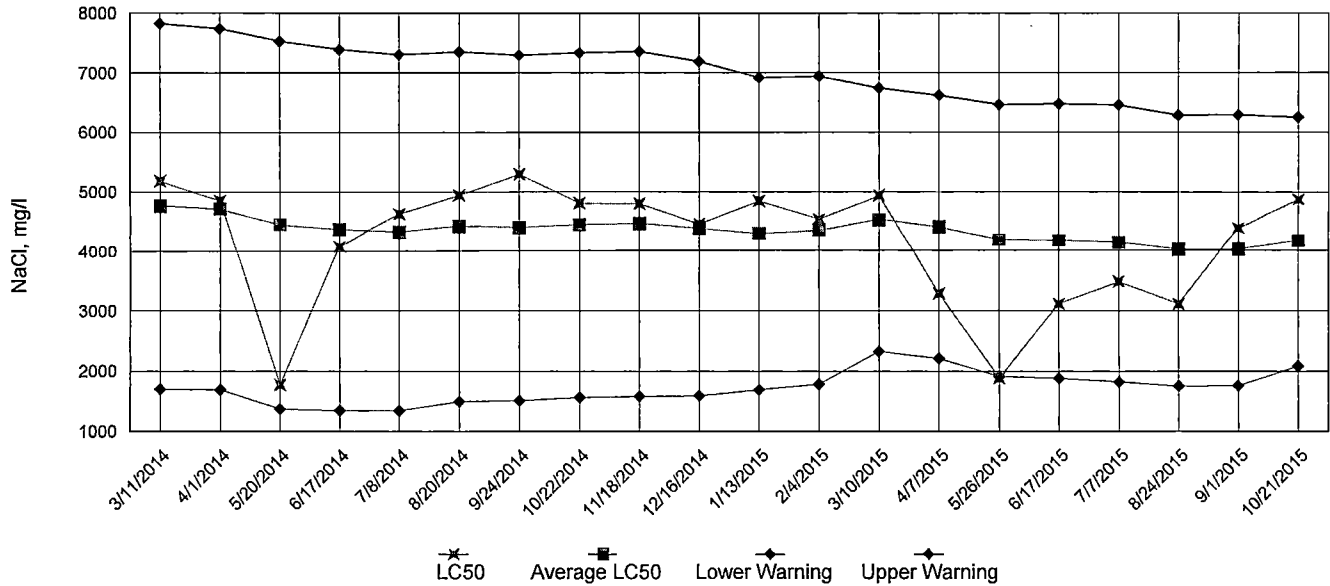
\*1 = data from the *Pimephales promelas* (Fathead Minnow) test

\*2 = data from the *Ceriodaphnia dubia* test

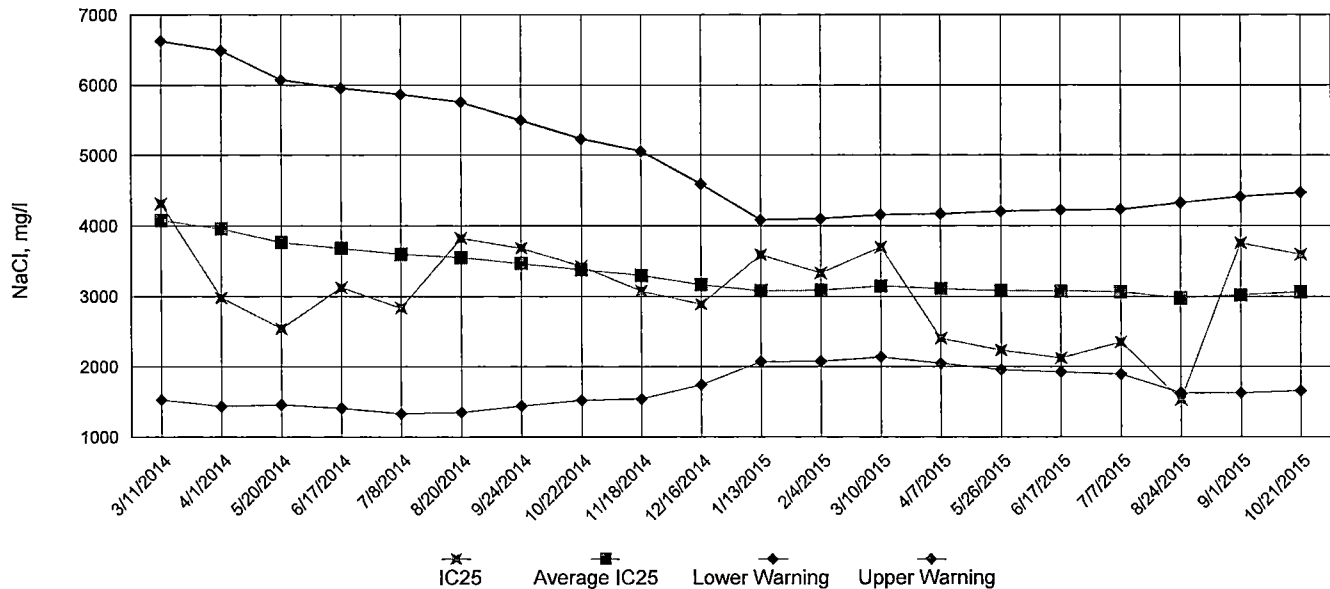
Appendix A4: Test 1000.0

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

LC50 Survival Data

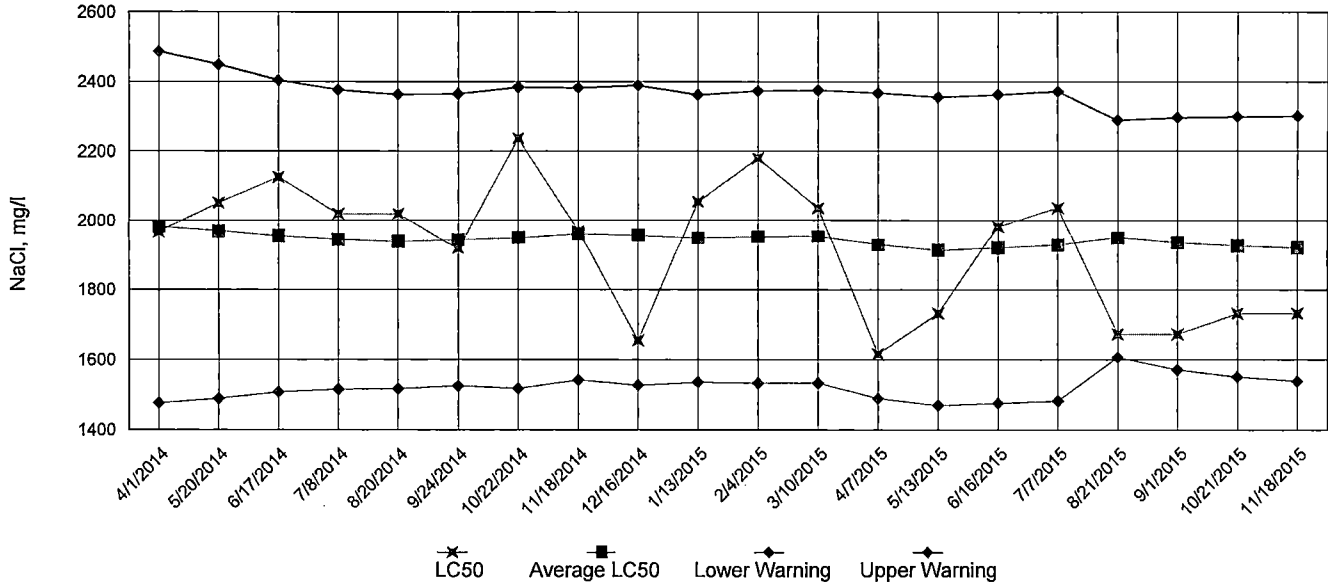


IC25 Growth Data

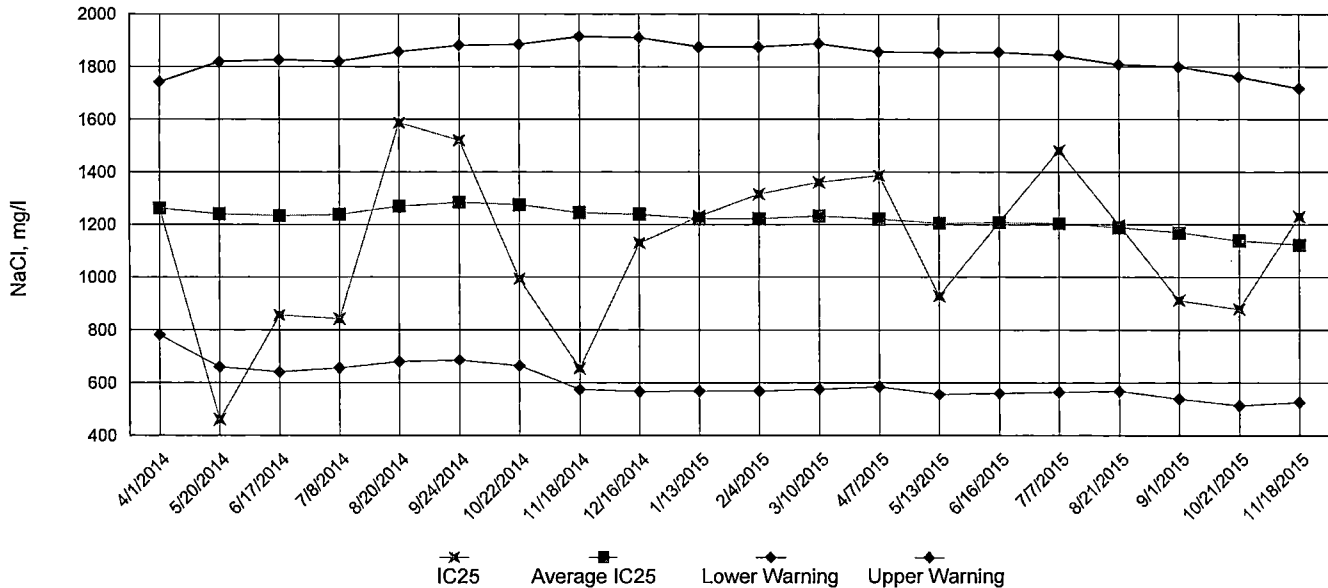


Appendix A4: Test 1002.0  
Chronic Reference Toxicant, *Ceriodaphnia dubia*

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: November 17, 2015 at 1035

Date and Time Test Terminated: November 24, 2015 at 0955

Dilution water used: Synthetic Soft Water # 4275

DATA TABLE FOR SURVIVAL

Effluent Conc. %	Percent Survival in replicate chambers					Mean percent survival			CV%
	A	B	C	D	E	24 hr	48 hr	7 days	
Control	100	100	100	100	87.5	100	100	97.5	5.73
27 %	87.5	87.5	100	75.0	87.5	100	100	87.5	10.1
37 %	87.5	87.5	100	87.5	87.5	100	100	90.0	6.21
49 %	75.0	100	87.5	100	100	100	100	92.5	12.1
65 %	100	87.5	87.5	87.5	87.5	100	100	90.0	6.21
87 %	87.5	62.5	87.5	87.5	75.0	100	100	80.0	14.0

DATA TABLE FOR GROWTH

Effluent Conc. %	Average dry weight, mg replicate chambers					Mean dry weight, mg	CV%
	A	B	C	D	E		
Control	0.330	0.326	0.364	0.356	0.258	0.327	12.8
27 %	0.318	0.314	0.368	0.306	0.322	0.326	7.50
37 %	0.265	0.284	0.354	0.262	0.286	0.29	12.8
49 %	0.306	0.311	0.309	0.322	0.311	0.312	1.94
65 %	0.354	0.330	0.320	0.332	0.240	0.315	13.9
87 %	0.372	0.349	0.315	0.298	0.331	0.333	8.66

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. Dunnett's 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 %)	<u>          </u> YES	<u>  X  </u> NO
b.) 1/2 LOW FLOW DILUTION	(NA)	<u>          </u> YES	<u>          </u> 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 %)	<u>          </u> YES	<u>  X  </u> NO
b.) 1/2 LOW FLOW DILUTION	(NA)	<u>          </u> YES	<u>          </u> 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:   65 %   (TOP6C)
- 6. LOEC Pimephales Lethality:   87 %   (TXP6C)
- 7. NOEC Pimephales Sublethality:   65 %   (TPP6C)
- 8. LOEC Pimephales Sublethality:   65 %   (TYP6C)
- 9. Coefficient of variation for Pimephales growth:   13.9   (TQP6C)

Appendix B: Test 1000.0

CHRONIC TOXICITY SUMMARY FORM  
*Pimephales promelas* (Fathead minnow)  
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: November 17, 2015 TIME: 1035  
Test Terminated: DATE: November 24, 2015 TIME: 0955

DILUTION	DAY						
	1	2	3	4	5	6	7
Control							
D.O. Initial	7.6	7.5	7.8	8.0	8.2	9.0	8.9
Final	7.0	7.8	7.6	7.6	7.7	7.7	8.7
pH Initial	6.9	7.4	6.8	7.0	7.6	7.1	6.6
Final	7.6	7.1	7.6	7.3	7.1	7.1	7.0
Alkalinity	32	NA	32	NA	32	NA	NA
Hardness	46	NA	46	NA	46	NA	NA
Conductivity	170	170	170	170	180	160	140
Chlorine	<0.05	NA	<0.05	NA	<0.05	NA	NA

DILUTION	DAY						
	1	2	3	4	5	6	7
27 %							
D.O. Initial	7.7	7.6	8.1	7.9	8.2	9.0	8.9
Final	7.0	8.4	7.5	7.6	7.7	7.8	8.8
pH Initial	7.4	7.4	7.4	7.3	7.6	7.1	6.9
Final	7.5	7.2	7.7	7.2	7.0	7.0	6.9
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	220	220	220	210	190	160	150
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION	DAY						
	1	2	3	4	5	6	7
37 %							
D.O. Initial	7.6	7.7	7.8	8.0	8.2	9.1	8.9
Final	7.1	7.3	7.7	7.7	8.1	8.1	8.6
pH Initial	7.4	7.5	7.4	7.3	7.5	7.2	6.9
Final	7.5	7.0	7.7	7.2	7.1	7.0	6.9
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	240	240	230	220	200	170	160
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION	DAY						
	1	2	3	4	5	6	7
49 %							
D.O. Initial	7.5	7.7	7.8	8.0	8.1	9.1	9.0
Final	7.2	8.5	7.6	7.8	8.2	7.9	7.0
pH Initial	7.4	7.5	7.5	7.4	7.4	7.2	6.9
Final	7.4	7.2	7.8	7.2	7.0	7.0	6.8
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	260	260	260	240	200	180	160
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION	DAY						
	1	2	3	4	5	6	7
65 %							
D.O. Initial	7.9	7.8	7.7	8.2	8.4	9.0	9.0
Final	7.2	6.9	7.5	7.6	7.8	7.9	7.4
pH Initial	7.4	7.5	7.5	7.3	7.3	7.2	6.8
Final	7.4	7.0	7.8	7.2	7.0	7.0	6.8
Alkalinity	42	NA	38	NA	36	NA	NA
Hardness	59	NA	62	NA	59	NA	NA
Conductivity	280	290	290	260	210	180	170
Chlorine	<0.05	NA	<0.05	NA	<0.05	NA	NA

DILUTION	DAY						
	1	2	3	4	5	6	7
87 %							
D.O. Initial	7.4	7.9	7.8	8.1	8.6	9.0	8.8
Final	7.3	7.2	7.4	7.6	8.0	8.0	6.9
pH Initial	7.5	7.6	7.6	7.2	7.3	7.1	6.7
Final	7.6	7.1	7.8	7.3	7.1	7.0	6.8
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	310	320	310	280	220	190	180
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: November 17, 2015 at 1040

Date and Time Test Terminated: November 23, 2015 at 0850

Dilution water used: Synthetic Soft Water # 4275

PERCENT SURVIVAL

Time of Reading	Control	Percent Effluent				
		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	100

NUMBER OF YOUNG PRODUCED PER FEMALE @ 6 DAYS

Replicates	Control	Percent Effluent				
		27 %	37 %	49 %	65 %	87 %
A	11	17	16	18	22	17
B	23	22	23	22	14	26
C	23	24	29	23	14	25
D	14	23	15	12	26	18
E	19	22	19	23	24	18
F	20	20	23	25	24	24
G	27	24	24	26	21	24
H	14	21	14	16	13	15
I	20	24	23	28	23	26
J	25	23	17	20	18	25
Mean per Adult	19.6	22.0	20.3	21.3	19.9	21.8
Mean per Surviving Adult	19.6	22.0	20.3	21.3	19.9	21.8
CV %	26.6	10.1	23.8	22.9	24.1	19.6

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 %)	<u>      </u> YES	<u>  X  </u> NO
b.) 1/2 LOW FLOW DILUTION	(NA)	<u>      </u> YES	<u>      </u> NO

2. Dunnett's 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 %)	<u>      </u> YES	<u>  X  </u> NO
b.) 1/2 LOW FLOW DILUTION	(NA)	<u>      </u> YES	<u>      </u> 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:   26.6   (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: November 17, 2015 TIME: 1040  
Test Terminated: DATE: November 23, 2015 TIME: 0850

DILUTION	DAY						
	1	2	3	4	5	6	7
Control							
D.O. Initial	7.6	7.5	7.8	8.0	8.2	9.0	8.9
Final	7.2	7.7	7.9	8.2	8.9	8.2	--
pH Initial	6.9	7.4	6.8	7.0	7.6	7.1	6.6
Final	7.7	7.6	7.5	7.6	7.4	7.2	--
Alkalinity	32	NA	32	NA	32	NA	NA
Hardness	46	NA	46	NA	46	NA	NA
Conductivity	170	170	170	170	180	160	140
Chlorine	<0.05	NA	<0.05	NA	<0.05	NA	NA

DILUTION	DAY						
	1	2	3	4	5	6	7
27 %							
D.O. Initial	7.7	7.6	8.1	7.9	8.2	9.0	8.9
Final	7.3	7.4	7.9	8.2	8.6	8.7	--
pH Initial	7.4	7.4	7.4	7.3	7.6	7.1	6.9
Final	7.8	7.8	7.7	7.7	7.4	7.2	--
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	220	220	220	210	190	160	150
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION	DAY						
	1	2	3	4	5	6	7
37 %							
D.O. Initial	7.6	7.7	7.8	8.0	8.2	9.1	8.9
Final	7.5	7.7	7.9	8.4	9.0	8.6	--
pH Initial	7.4	7.5	7.4	7.3	7.5	7.2	6.9
Final	7.8	7.8	7.7	7.7	7.4	7.1	--
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	240	240	230	220	200	170	160
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION	DAY						
	1	2	3	4	5	6	7
49 %							
D.O. Initial	7.5	7.7	7.8	8.0	8.1	9.1	9.0
Final	7.5	7.9	7.8	8.6	9.0	8.3	--
pH Initial	7.4	7.5	7.5	7.4	7.4	7.2	6.9
Final	7.8	7.8	7.7	7.7	7.4	7.1	--
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	260	260	260	240	200	180	160
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION	DAY						
	1	2	3	4	5	6	7
65 %							
D.O. Initial	7.9	7.8	7.7	8.2	8.4	9.0	9.0
Final	7.7	7.7	9.2	8.6	9.0	8.5	--
pH Initial	7.4	7.5	7.5	7.3	7.3	7.2	6.8
Final	7.9	7.8	7.7	7.8	7.4	7.1	--
Alkalinity	42	NA	38	NA	36	NA	NA
Hardness	59	NA	62	NA	59	NA	NA
Conductivity	280	290	290	260	210	180	170
Chlorine	<0.05	NA	<0.05	NA	<0.05	NA	NA

DILUTION	DAY						
	1	2	3	4	5	6	7
87 %							
D.O. Initial	7.4	7.9	7.8	8.1	8.6	9.0	8.8
Final	7.6	7.7	9.2	8.9	8.6	8.7	--
pH Initial	7.5	7.6	7.6	7.2	7.3	7.1	6.7
Final	7.9	7.8	7.7	7.8	7.4	7.1	--
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	310	320	310	280	220	190	180
Chlorine	NA	NA	NA	NA	NA	NA	NA

CHAIN OF CUSTODY / ANALYSIS REQUEST FORM

Client: <i>Hot Springs Wastewater</i>			PO No. <i>15-3141</i>		NO OF BOTTLES	ANALYSES REQUESTED										AIC CONTROL NO: <i>196278</i>			
Project Reference: <i>PLANT EFFLUENT</i>			MATRIX			<i>Bio-Monitoring</i>										AIC PROPOSAL NO:			
Project Manager: <i>JIM SORRELLS</i>			WATER													SOIL		Remarks	
Sampled By: <i>H MAULDIN</i>			G R A P	C O M P	W A T E R	S O I L	3	<div style="text-align: center; font-size: 2em;">✓</div>										Carrier: <i>Hot Springs Delivery</i>	
AIC No.																		Date/Time Collected	
1			<i>11/15/15</i>		<i>0000-2400</i>		<i>X</i>		<i>X</i>				0.1						
Container Type			Preservative		P		NO		Field pH calibration on _____ @ _____ Buffer:										
G = Glass NO = none			P = Plastic S = Sulfuric acid pH2		V = VOA vials N = Nitric acid pH2		H = HCl to pH2 B = NaOH to pH12		T = Sodium Thiosulfate Z = Zinc acetate		A=(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> , NH <sub>4</sub> OH								
Turnaround Time Requested: (Please circle) NORMAL or EXPEDITED IN _____ DAYS					Relinquished By: <i>A. Thomason</i>		Date/Time <i>11-16-15 @ 0925</i>		Received By: <i>M. Mann</i>		Date/Time <i>11-16-15 @ 9:25</i>								
Expedited results requested by: _____					Relinquished By: <i>M. Mann</i>		Date/Time <i>11-16-15 @ 1200</i>		Received in Lab By: <i>[Signature]</i>		Date/Time <i>11-16-15 1200</i>								
Who should AIC contact with questions: Phone: _____ Fax: _____ Report Attention to: Report Address to:  Email Address: _____					Comments:														

**CHAIN OF CUSTODY / ANALYSIS REQUEST FORM**

Client: <u>City of Hot Springs</u>			PO No. <u>15-3141</u>		NO OF BOTTLES	ANALYSES REQUESTED										AIC CONTROL NO: <u>1a6278</u>		
Project Reference: <u>PLANT Effluent</u>						<div style="display: flex; justify-content: space-between;"> <span style="writing-mode: vertical-rl; transform: rotate(180deg);">Bio-Monitoring</span> <span style="writing-mode: vertical-rl; transform: rotate(180deg);">3</span> </div>										AIC PROPOSAL NO:		
Project Manager: <u>JIM SORRELLS</u>			MATRIX													Carrier:		
Sampled By: <u>H MAULDIN</u>			W	S												Received Temperature C <u>0.1</u>		
AIC No.	Sample Identification	Date/Time Collected	G R A B	C O M P	W A T E R	S O I L											Remarks	
2	<u>PLANT Effluent</u>	<u>11/17/15</u> <u>@ 0000-2400</u>	X	X														
																Field pH calibration on _____ @ _____		
			Container Type <u>P</u> Preservative <u>No</u>													Buffer:		
			G = Glass    P = Plastic NO = none    S = Sulfuric acid pH2			V = VOA vials N = Nitric acid pH2			H = HCl to pH2 B = NaOH to pH12			T = Sodium Thiosulfate Z = Zinc acetate			A=(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> , NH <sub>4</sub> OH			
Turnaround Time Requested: (Please circle) NORMAL or EXPEDITED IN _____ DAYS						Relinquished By: <u>Bill Mann</u>		Date/Time <u>11-18-2015</u> <u>@ 0930 hrs</u>		Received By: <u>M. Mann</u>		Date/Time <u>11-18-15</u> <u>@ 09:30 AM</u>						
Expedited results requested by: _____						Relinquished By: <u>M. Mann</u>		Date/Time <u>11-18-15</u> <u>@ 11:20</u>		Received in Lab By: <u>[Signature]</u>		Date/Time <u>11/18/15</u> <u>1120</u>						
Who should AIC contact with questions: Phone: _____ Fax: _____						Comments:												
Report Attention to: Report Address to:																		
Email Address:																		



City of Hot Springs Wastewater  
Treatment Plant  
320 Davidson Dr.  
Hot Springs, AR 71901

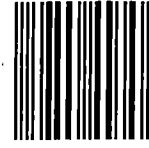
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