



August 29, 2012
Control No. 160328-1
Page 1 of 31

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Test Results of
Third Quarter
Chronic 7-Day Renewal
Biomonitoring Testing
for
Malvern Wastewater

Control No. 160328-1

Prepared for:

Mr. John Davis
Malvern Water Works
506 Overman
Malvern, AR 72104

Prepared by:

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

Malvern Water Works
ATTN: Mr. John Davis
506 Overman
Malvern, AR 72104

Re: Chronic 7-Day Renewal utilizing *Pimephales promelas* (Fathead minnow) and *Ceriodaphnia dubia*
Malvern Wastewater
NPDES Permit No. AR0034126 AFIN 30-00040

Dear Mr. John Davis:

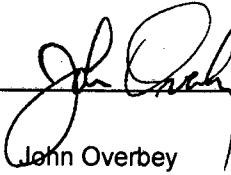
This report is the analytical results and supporting information for the samples submitted to American Interplex Corporation (AIC). The following results are applicable only to the sample identified by the control number referenced above. Accurate assessment of the data requires access to the entire 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 8.5 % effluent, which is above the critical dilution of 6.5 %. The NOEC for growth occurred at 8.5 % effluent, which is above the critical dilution of 6.5 %. **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 8.5 % effluent, which is above the critical dilution of 6.5 %. The NOEC for reproduction occurred at 8.5 % effluent, which is above the critical dilution of 6.5 %. **The sample, therefore, PASSED both lethal and sub-lethal effects for the *Ceriodaphnia dubia* test.**

AMERICAN INTERPLEX CORPORATION



John Overbey
Laboratory Director

PDF cc: Malvern Water Works
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Malvern Water Works
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Table of Contents

I. Control Acceptance Criteria

II. Outlined Report

III. Data Analysis

IV. Standard Reference Toxicants

V. Chemical Analysis/Quality Control

VI. Organism History

VII. Results Summary

Pimephales promelas (Fathead minnow)

Ceriodaphnia dubia

Appendix A: Raw Data

A1: Test 1000.0

Pimephales promelas (Fathead minnow) Survival and Growth

Test 1002.0

Ceriodaphnia dubia Survival and Reproduction

A2: Statistics

A3: Water Chemistry

A4: Reference Toxicant

Appendix B: Chains of Custody

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	0.374	PASS
Control Growth CV < or = 40%	6.35	PASS
Growth Minimum Significant Difference 12 to 30%	23.8	PASS
Critical Dilution CV < or = 40%	9.48	PASS

Ceriodaphnia dubia Method 1002.0

CRITERIA	RESULTS	PASS/FAIL
Control Survival > or = 80%	80.0	PASS
Control Reproduction > or = 15 per Surviving Female	19.0	PASS
Control CV < or = 40% per Surviving Female	20.1	PASS
Reproduction Minimum Significant Difference 13 to 47%	21.0	PASS
Critical Dilution CV < or = 40%	20.7	PASS

II. Outlined Report

A. Introduction

1. Permit Number: AR0034126 AFIN 30-00040
2. Test Requirements: Test Methods 1000.0 and 1002.0
3. Receiving Stream: Ouachita River Basin

B. Source of Effluent/Dilution Water

1. Effluent Samples:
 - a. Sampling Point: Malvern Wastewater
 - b. Chemical Data:

Analysis	Sample 1	Sample 2	Sample 3
Dissolved oxygen (mg/l)	7.2	7.3	8.4
pH (standard units)	7.8	7.5	7.7
Alkalinity (mg/l as CaCO ₃)	36	34	32
Hardness (mg/l as CaCO ₃)	31	29	28
Conductivity (umhos/cm)	270	270	270
Residual Chlorine (mg/l)	<0.05	<0.05	<0.05
Ammonia as N (mg/l)	0.76	0.72	0.71

2. Dilution Water Samples: Synthetic Soft Water #3899
 - a. Dates Prepared: August 7 through August 21, 2012
 - b. Chemical Data:

Analysis	Sample 1	Sample 2	Sample 3
Dissolved oxygen (mg/l)	8.3	8.4	8.0
pH (standard units)	7.9	7.9	8.0
Alkalinity (mg/l as CaCO ₃)	30	30	30
Hardness (mg/l as CaCO ₃)	46	40	41
Conductivity (umhos/cm)	170	160	170
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: August 21, 2012 at 1440
Date & Time Test Terminated: August 28, 2012 at 1255
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: August 21, 2012 at 1415
Date & Time Test Terminated: August 28, 2012 at 1350
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 August 9, 2012 at 1440 to August 16, 2012 at 1450

The results were as follows: (Control No. 160011-2.)

Survival LC-50: 5808 mg/l

Growth IC-25: 5283 mg/l

Growth PMSD: 15.3

Ceriodaphnia dubia

Chronic reference tests are performed monthly.

A chronic reference test was performed on August 9, 2012 at 1200 to August 15, 2012 at 1320

The results were as follows: (Control No. 160011-1.)

Survival LC-50: 2469 mg/l

Growth IC-25: 1245 mg/l

Growth PMSD: 11.4

V. Chemical Analysis/Quality Control

Parameter	Method	% Recovery	Relative % Difference
Alkalinity	SM 2320 B	NA	0.00
Hardness	EPA 200.7	98.7	2.27
pH	SM 4500-H+ B	101	0.134
Conductivity	EPA 120.1	103	1.32

VI. Organism History

Pimephales promelas (Fathead minnow)

Date: August 21, 2012

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: August 21, 2012

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

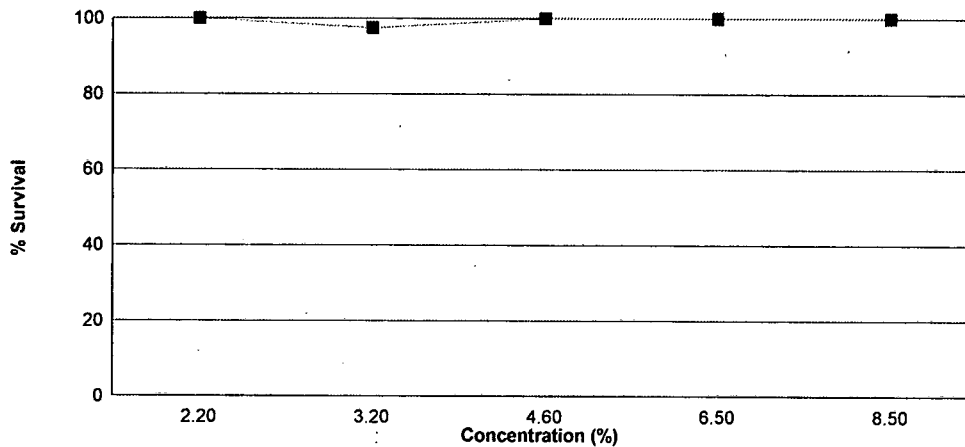
Larvae are exposed in a static renewal system for seven days to different concentrations of effluent with dilution water. Test results are based on the survival and growth (increase in weight) of the larvae.

Effluent dilutions for this test were 2.2 %, 3.2 %, 4.6 %, 6.5 %, 8.5 % in accordance with the NPDES permit.

The low flow or 'critical' dilution is specified in the NPDES permit as 6.5 % effluent.

The test was initiated on August 21, 2012 at 1440 and continued through August 28, 2012 at 1255. Statistical analyses were performed on the observed data and the no observable effects concentrations (NOECs) were as follows:

- a.) NOEC survival = 8.5 % effluent
- b.) NOEC growth = 8.5 % effluent



Summary of the 7-day Fathead Minnow Survival and Growth		
Concentration	Percent Survival	Mean Growth (mg)
Control	100	0.374
2.2 %	100	0.390
3.2 %	97.5	0.401
4.6 %	100	0.363
6.5 %	100	0.420
8.5 %	100	0.405

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

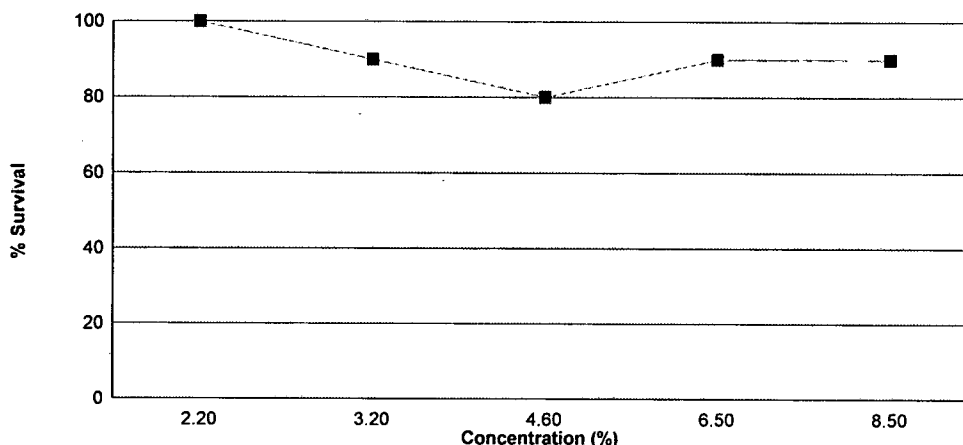
Neonates are exposed in a static renewal system to different concentrations of effluent with dilution water until 60% of surviving control organisms have three broods of offspring with an average of at least 15 young per female.

Effluent dilutions for this test were 2.2 %, 3.2 %, 4.6 %, 6.5 %, 8.5 % in accordance with the NPDES permit.

The low flow or 'critical' dilution is specified in the NPDES permit as 6.5 % effluent.

The test was initiated on August 21, 2012 at 1415 and continued through August 28, 2012 at 1350. Statistical analyses were performed on the observed data and the no observable effects concentrations (NOECs) were as follows:

- a.) NOEC survival = 8.5 % effluent
- b.) NOEC reproduction = 8.5 % effluent



Concentration	Percent Survival	Mean Reproduction
Control	80.0	15.2
2.2 %	100	15.9
3.2 %	90.0	15.8
4.6 %	80.0	13.6
6.5 %	90.0	17.4
8.5 %	90.0	13.6

Appendix A1: Test 1000.0

Pimephales promelas (Fathead Minnow) 7-Day Survival

Date and Time Test Initiated: August 21, 2012 at 1440

Date and Time Test Terminated: August 28, 2012 at 1255

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
2.2 %	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
3.2 %	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	7	7	7	7	7	7	7
4.6 %	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
6.5 %	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
8.5 %	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

Appendix A1: Test 1000.0

Pimephales promelas (Fathead Minnow) 7-Day Growth

Test Initiated: August 21, 2012 at 1440
Test Terminated: August 28, 2012 at 1255

Drying Started: August 27, 2012 at 1150
Drying Ended: August 29, 2012 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	.93442	.93739	0.00297	8	0.371
	B	.93315	.93622	0.00307	8	0.384
	C	.93180	.93447	0.00267	8	0.334
	D	.93131	.93438	0.00307	8	0.384
	E	.93107	.93423	0.00316	8	0.395
2.2 %	A	.93189	.93463	0.00274	8	0.342
	B	.93233	.93468	0.00235	8	0.294
	C	.93227	.93598	0.00371	8	0.464
	D	.93798	.94125	0.00327	8	0.409
	E	.93862	.94213	0.00351	8	0.439
3.2 %	A	.93911	.94209	0.00298	8	0.372
	B	.93871	.94152	0.00281	8	0.351
	C	.93791	.94204	0.00413	8	0.516
	D	.93746	.94129	0.00383	8	0.479
	E	.93632	.93861	0.00229	8	0.286
4.6 %	A	.93422	.93664	0.00242	8	0.302
	B	.93349	.93582	0.00233	8	0.291
	C	.93296	.93605	0.00309	8	0.386
	D	.93286	.93645	0.00359	8	0.449
	E	.93064	.93374	0.00310	8	0.388
6.5 %	A	.92970	.93338	0.00368	8	0.460
	B	.92918	.93238	0.00320	8	0.400
	C	.93001	.93374	0.00373	8	0.466
	D	.93067	.93383	0.00316	8	0.395
	E	.93983	.94287	0.00304	8	0.380
8.5 %	A	.93997	.94319	0.00322	8	0.402
	B	.93880	.94167	0.00287	8	0.359
	C	.93923	.94269	0.00346	8	0.432
	D	.93943	.94278	0.00335	8	0.419
	E	.93941	.94273	0.00332	8	0.415

Appendix A1: Test 1002.0

Ceriodaphnia dubia Survival and Reproduction

Date and Time Test Initiated: August 21, 2012 at 1415

Date and Time Test Terminated: August 28, 2012 at 1350

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	X	0	0	0	0	0	X	0	0	0	8	0.00
3	0	0	X	0	0	0	0	0	X	0	0	0	8	0.00
4	2	2	X	1	2	2	3	2	X	3	17	8	2.12	
5	0	7	X	3	5	5	4	2	X	0	26	8	3.25	
6	9	0	X	9	9	0	9	8	X	9	53	8	6.62	
7	9	12	X	11	0	13	1	0	X	10	56	8	7.00	
8														
TOTAL	20	21	0	24	16	20	17	12	0	22	152	10	15.2	

Concentration: 2.2 %														
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	0	0	0	0	0	0	0	0	0	10	0.00	
4	2	2	0	0	3	4	2	2	3	0	18	10	1.80	
5	2	4	4	3	4	4	4	2	2	2	31	10	3.10	
6	9	0	0	9	8	0	11	8	0	11	56	10	5.60	
7	0	10	10	11	0	12	0	11E	11	0	54	10	5.40	
8														
TOTAL	13	16	14	23	15	20	17	12	16	13	159	10	15.9	

E = Excluded fourth brood neonates

Concentration: 3.2 %														
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	0	0	0	0	0	0	0	0	0	10	0.00	
4	3	2	2	3	2	0	2	0	2	2	18	10	1.80	
5	4	2	3	4	4	2	2	0	0	0	21	10	2.10	
6	1	0	9	8	8	0	8	9	7	7	57	10	5.70	
7	11	10	0	0	0	X	10	10	12	9	62	9	6.89	
8														
TOTAL	19	14	14	15	14	2	22	19	21	18	158	10	15.8	

Appendix A1: Test 1002.0

Ceriodaphnia dubia Survival and Reproduction

Date and Time Test Initiated: August 21, 2012 at 1415

Date and Time Test Terminated: August 28, 2012 at 1350

Concentration: 4.6 %														
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	X	0	0	X	0	0	0	0	0	0	8	0.00
3	0	0	X	0	0	X	0	0	0	0	0	0	8	0.00
4	2	2	X	0	0	X	2	3	0	2	11	8	1.38	
5	4	3	X	4	3	X	4	3	0	4	25	8	3.12	
6	8	0	X	11	8	X	10	1	7	9	54	8	6.75	
7	0	12	X	0	12	X	0	10	11	1	46	8	5.75	
8														
TOTAL	14	17	0	15	23	0	16	17	18	16	136	10	13.6	

Concentration: 6.5 %														
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	X	0	0	0	0	0	0	9	0.00	
2	0	0	0	0	X	0	0	0	0	0	0	9	0.00	
3	0	0	0	0	X	0	0	0	0	0	0	9	0.00	
4	4	0	2	3	X	2	0	0	2	4	17	9	1.89	
5	0	3	0	0	X	4	0	0	2	4	13	9	1.44	
6	9	0	10	10	X	0	10	11	1	0	51	9	5.67	
7	8	11	11	11	X	11	8	14	11	8	93	9	10.3	
8														
TOTAL	21	14	23	24	0	17	18	25	16	16	174	10	17.4	

Concentration: 8.5 %														
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	X	0	9	0.00	
2	0	0	0	0	0	0	0	0	0	X	0	9	0.00	
3	0	0	0	0	0	0	0	0	0	X	0	9	0.00	
4	4	2	0	2	2	3	0	2	2	X	17	9	1.89	
5	0	2	0	0	2	2	5	2	2	X	15	9	1.67	
6	7	1	11	6	6	0	0	1	8	X	40	9	4.44	
7	6	12	10	10	10E	9	8	9	10E	X	64	9	7.11	
8														
TOTAL	17	17	21	18	10	14	13	14	12	0	136	10	13.6	

E = Excluded fourth brood neonates

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	2.2 %	1	1.00000	1.39310
2	2.2 %	2	1.00000	1.39310
2	2.2 %	3	1.00000	1.39310
2	2.2 %	4	1.00000	1.39310
2	2.2 %	5	1.00000	1.39310
3	3.2 %	1	1.00000	1.39310
3	3.2 %	2	1.00000	1.39310
3	3.2 %	3	1.00000	1.39310
3	3.2 %	4	1.00000	1.39310
3	3.2 %	5	0.87500	1.20940
4	4.6 %	1	1.00000	1.39310
4	4.6 %	2	1.00000	1.39310
4	4.6 %	3	1.00000	1.39310
4	4.6 %	4	1.00000	1.39310
4	4.6 %	5	1.00000	1.39310
5	6.5 %	1	1.00000	1.39310
5	6.5 %	2	1.00000	1.39310
5	6.5 %	3	1.00000	1.39310
5	6.5 %	4	1.00000	1.39310
5	6.5 %	5	1.00000	1.39310
6	8.5 %	1	1.00000	1.39310
6	8.5 %	2	1.00000	1.39310
6	8.5 %	3	1.00000	1.39310
6	8.5 %	4	1.00000	1.39310
6	8.5 %	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))
<p>D = 0.027 W = 0.4161 Critical W = 0.9 (alpha = 0.01, N = 30) Critical W = 0.927 (alpha = 0.05, N = 30)</p> <p>Data FAIL normality test (alpha = 0.01).</p>		

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	2.2 %	27.50	16.00	5.00	
3	3.2 %	25.00	16.00	5.00	
4	4.6 %	27.50	16.00	5.00	
5	6.5 %	27.50	16.00	5.00	
6	8.5 %	27.50	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
<p>D = 0.08483 W = 0.9869 Critical W = 0.9 (alpha = 0.01, N = 30) Critical W = 0.927 (alpha = 0.05, N = 30)</p> <p>Data PASS normality test (alpha = 0.01).</p>	

Bartlett's Test for Homogeneity of Variance	No Transformation
<p>Calculated B1 statistic = 9.716 Critical B = 15.086 (alpha = 0.01, df = 5)</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	5	0.01113	0.002226	0.6297	
Within (Error)	24	0.08483	0.003535		
Total	29	0.09596			
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	0.3736	0.3736			
2	2.2 %	0.3896	0.3896	-0.4255		
3	3.2 %	0.4008	0.4008	-0.7233		
4	4.6 %	0.3632	0.3632	0.2766		
5	6.5 %	0.4202	0.4202	-1.239		
6	8.5 %	0.4054	0.4054	-0.8457		
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	2.2 %	5	0.08874	23.8	-0.016	
3	3.2 %	5	0.08874	23.8	-0.0272	
4	4.6 %	5	0.08874	23.8	0.0104	
5	6.5 %	5	0.08874	23.8	-0.0466	
6	8.5 %	5	0.08874	23.8	-0.0318	

Appendix A2: Statistics

Ceriodaphnia dubia Survival

Fisher's Exact Test			
Identification	Dead	Alive	Total Animals
Control	2	8	10
2.2 %	0	10	10
Total	2	18	20

Critical Fisher's value (10,10,2) (alpha=0.05) is negative. b value is 0. NO SIGNIFICANT DIFFERENCE.

Fisher's Exact Test			
Identification	Dead	Alive	Total Animals
Control	2	8	10
3.2 %	1	9	10
Total	3	17	20

Critical Fisher's value (10,10,2) (alpha=0.05) is negative. b value is 1. NO SIGNIFICANT DIFFERENCE.

Fisher's Exact Test			
Identification	Alive	Dead	Total Animals
Control	8	2	10
4.6 %	8	2	10
Total	16	4	20

Critical Fisher's value (10,10,8) (alpha=0.05) is 3. b value is 8. Since b is greater than 3 there is NO SIGNIFICANT DIFFERENCE between CONTROL and TREATMENT at the 0.05 level.

Fisher's Exact Test			
Identification	Dead	Alive	Total Animals
Control	2	8	10
6.5 %	1	9	10
Total	3	17	20

Critical Fisher's value (10,10,2) (alpha=0.05) is negative. b value is 1. NO SIGNIFICANT DIFFERENCE.

Appendix A2: Statistics

Ceriodaphnia dubia Survival

Fisher's Exact Test			
Identification	Dead	Alive	Total Animals
Control	2	8	10
8.5 %	1	9	10
Total	3	17	20

Critical Fisher's value (10,10,2) (alpha=0.05) is negative. b value is 1. NO SIGNIFICANT DIFFERENCE.

Summary of Fisher's Exact Test				
Group	Identification	Exposed	Dead	Sig 0.05
0	Control	10	2	
1	2.2 %	10	0	
2	3.2 %	10	1	
3	4.6 %	10	2	
4	6.5 %	10	1	
5	8.5 %	10	1	

Appendix A2: Statistics

Ceriodaphnia dubia Reproduction

Chi-Square Test for Normality	No Transformation
Chi-Square = 13.514 Critical Chi-Square = 13.28	(alpha = 0.01, df = 4)
Data FAIL normality test (alpha = 0.01).	

Kolmogorov Test for Normality	No Transformation
D = 0.1654 D* = 1.298 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	2.2 %	96.00	75.00	10.00	
3	3.2 %	100.00	75.00	10.00	
4	4.6 %	93.00	75.00	10.00	
5	6.5 %	111.50	75.00	10.00	
6	8.5 %	91.00	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	123.5	24.7	2.074	
Within (Error)	47	559.8	11.91		
Total	52	683.3			
Critical F = 3.43 (alpha = 0.01, df = 5,47)					
2.42 (alpha = 0.05, df = 5,47)					
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	19			
2	2.2 %	15.9	15.9	1.894		
3	3.2 %	17.333	17.333	0.9941		
4	4.6 %	17	17	1.159		
5	6.5 %	19.333	19.333	-0.1986		
6	8.5 %	15.111	15.111	2.319	*	
Dunnett's critical value = 2.31 (1 Tailed, alpha = 0.05, df [used] = 5,40) (Actual df = 5,47)						
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	8				
2	2.2 %	10	3.781	19.9	3.1	
3	3.2 %	9	3.874	20.4	1.667	
4	4.6 %	8	3.986	21	2	
5	6.5 %	9	3.874	20.4	-0.333	
6	8.5 %	9	3.874	20.4	3.889	

Appendix A3: Water Chemistry

Routine Chemical and Physical Data

Date and Time Test Initiated: August 21, 2012 at 1134

Date and Time Test Terminated: August 28, 2012 at 1350

Effluent Conc.: Control		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	8.3	8.0	8.4	8.2	8.0	8.0	8.2
	Final *1	7.9	8.0	7.2	7.4	7.5	7.1	7.1
	Final *2	8.5	8.4	8.4	8.6	8.3	8.0	7.5
pH, units	Initial	7.9	7.7	7.9	7.8	8.0	7.9	7.8
	Final *1	7.6	7.7	7.6	7.6	7.7	7.5	7.5
	Final *2	8.2	8.3	8.2	8.3	8.3	8.0	7.8
Alkalinity, mg CaCO ₃ /l		30	NA	30	NA	30	NA	NA
Hardness, mg CaCO ₃ /l		46	NA	40	NA	41	NA	NA
Conductivity, umhos/cm		170	NA	160	NA	170	NA	NA
Res. Chlorine, mg/l		<0.05	NA	<0.05	NA	<0.05	NA	NA

Effluent Conc.: 2.2 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	8.0	8.3	8.3	8.2	8.1	7.8	8.2
	Final *1	8.0	8.1	7.5	8.1	7.3	6.6	6.7
	Final *2	8.4	8.4	8.2	8.6	8.3	8.1	7.3
pH, units	Initial	7.9	7.7	7.9	7.8	8.0	7.8	7.8
	Final *1	7.7	7.8	7.6	7.8	7.6	7.4	7.4
	Final *2	8.1	8.2	8.2	8.2	8.1	8.0	7.7

Effluent Conc.: 3.2 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	8.1	8.2	8.2	8.1	8.2	8.1	8.2
	Final *1	7.9	7.9	7.0	7.2	7.2	6.8	6.8
	Final *2	8.5	8.5	8.4	8.6	8.3	8.1	7.4
pH, units	Initial	7.9	7.7	7.8	7.8	8.0	7.9	7.7
	Final *1	7.7	7.7	7.5	7.6	7.6	7.4	7.4
	Final *2	8.2	8.2	8.1	8.2	8.2	8.0	7.6

Appendix A3: Water Chemistry

Routine Chemical and Physical Data

Date and Time Test Initiated: August 21, 2012 at 1134

Date and Time Test Terminated: August 28, 2012 at 1350

Effluent Conc.: 4.6 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	7.9	8.2	8.2	8.2	8.2	8.2	8.2
	Final *1	8.0	8.1	7.8	8.0	7.7	7.4	7.1
	Final *2	8.6	8.4	8.3	8.5	8.2	7.9	7.0
pH, units	Initial	7.9	7.7	7.8	7.8	8.0	7.9	7.8
	Final *1	7.8	7.8	7.7	7.8	7.8	7.5	7.4
	Final *2	8.2	8.2	8.1	8.2	8.1	8.0	7.6

Effluent Conc.: 6.5 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	8.0	7.9	8.2	8.2	8.0	8.0	8.1
	Final *1	7.6	7.9	7.4	7.9	7.4	7.4	7.3
	Final *2	8.6	8.4	8.3	8.5	8.2	8.0	7.2
pH, units	Initial	7.9	7.7	7.8	7.8	7.9	7.9	7.7
	Final *1	7.6	7.7	7.6	7.8	7.7	7.6	7.5
	Final *2	8.1	8.1	8.1	8.1	8.1	8.0	7.6
Alkalinity, mg CaCO ₃ /l	48	NA	34	NA	46	NA	NA	NA
Hardness, mg CaCO ₃ /l	46	NA	41	NA	41	NA	NA	NA
Conductivity, umhos/cm	180	NA	180	NA	180	NA	NA	NA
Res. Chlorine, mg/l	<0.05	NA	<0.05	NA	<0.05	NA	NA	NA

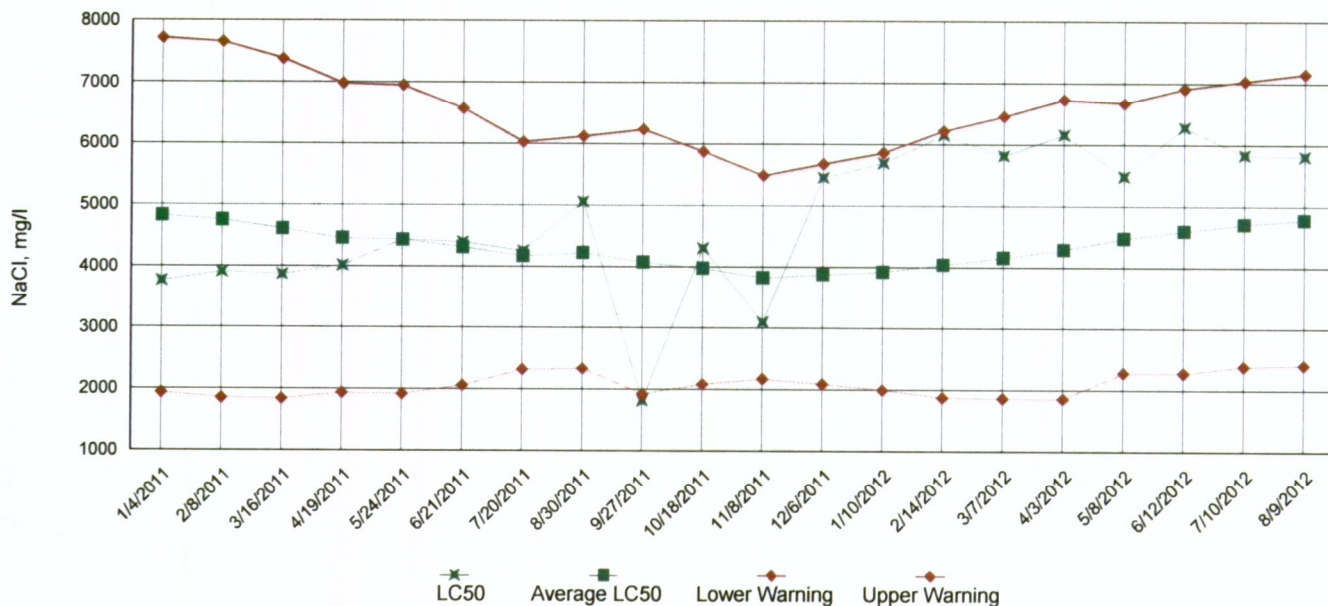
Effluent Conc.: 8.5 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	8.0	8.2	8.1	8.1	8.1	8.1	8.0
	Final *1	7.7	8.2	7.3	7.5	7.5	7.0	7.7
	Final *2	8.4	8.3	8.4	8.5	8.2	7.9	7.2
pH, units	Initial	7.9	7.7	7.8	7.8	8.0	7.9	7.7
	Final *1	7.7	7.8	7.6	7.7	7.6	7.5	7.6
	Final *2	8.1	8.3	8.2	8.1	8.1	8.0	7.6

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

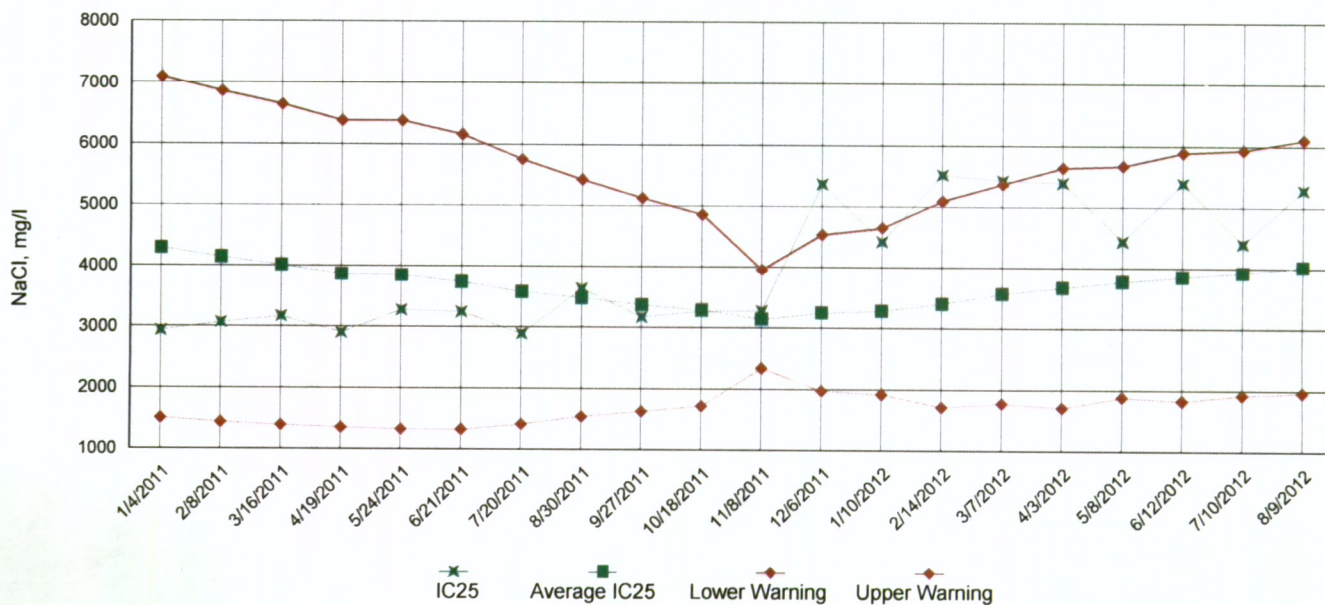
Appendix A4: Test 1000.0

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

LC50 Survival Data

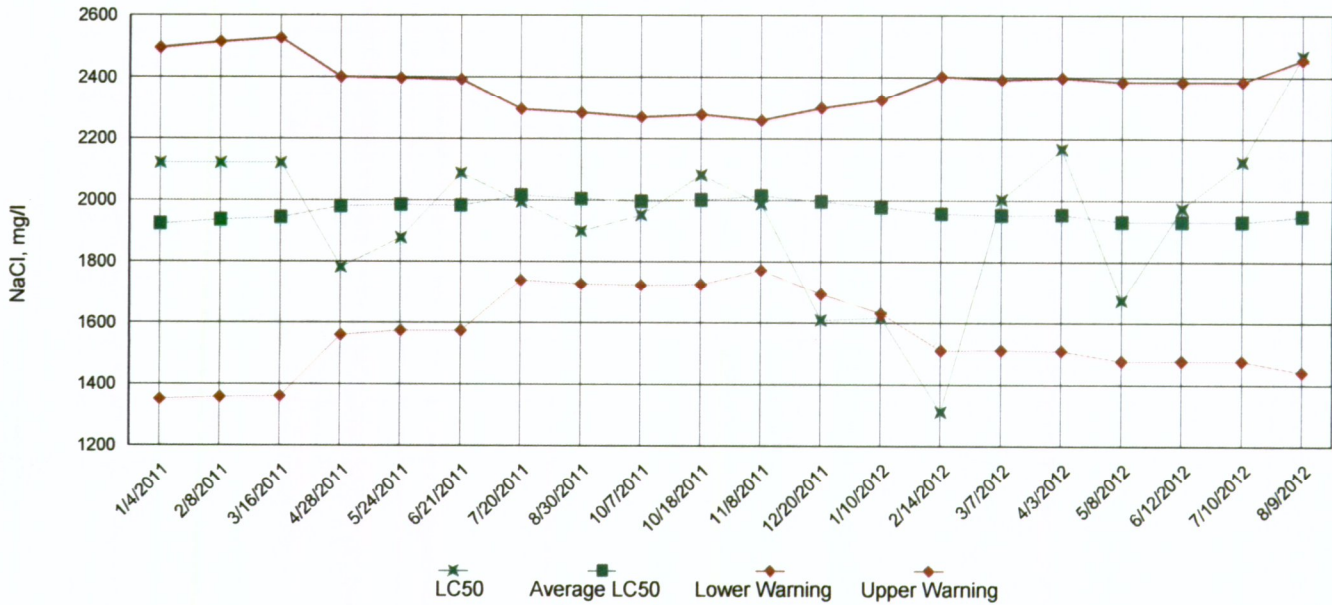


IC25 Growth Data

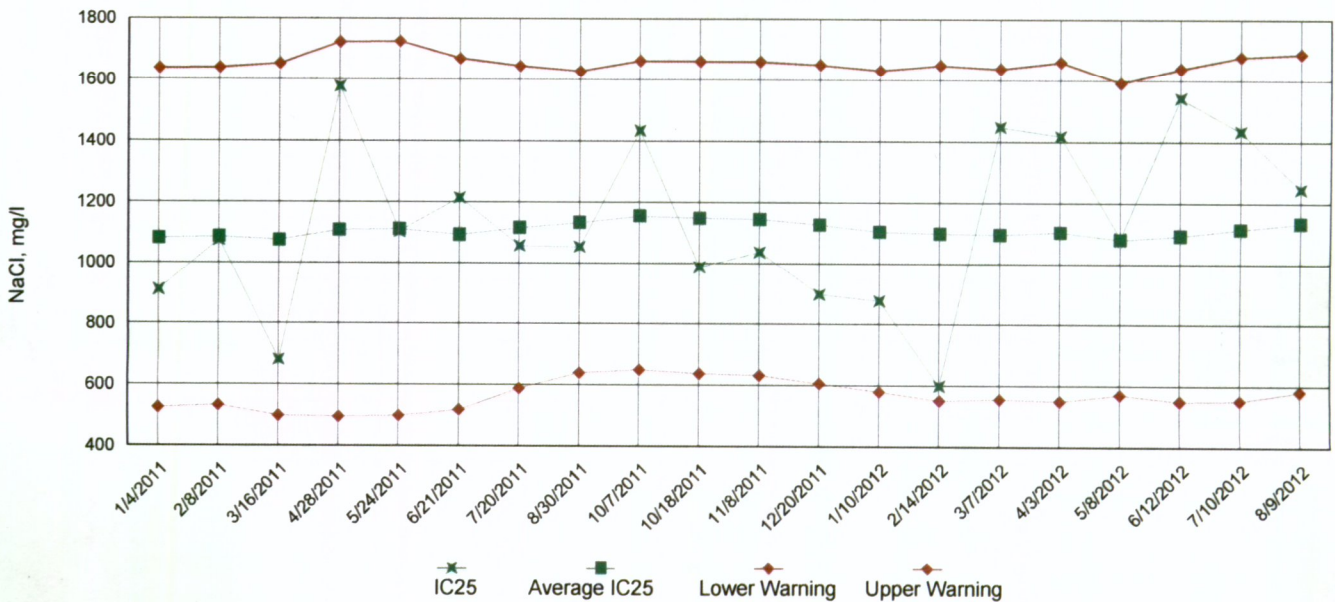


Appendix A4: Test 1002.0
Chronic Reference Toxicant, *Ceriodaphnia dubia*

LC50 Survival Data



IC25 Reproduction Data





CHAIN OF CUSTODY / ANALYSIS REQUEST FORM

PAGE OF

Client: <u>MAJERN WASTEWATER</u>			PO No.		NO OF BOTTLES 430 CD → 14	ANALYSES REQUESTED										AIC CONTROL NO: <u>160328</u>			
Project Reference:			SAMPLE MATRIX													AIC PROPOSAL NO:			
Project Manager:			WATER SOIL													Carrier:			
Sampled By: <u>JHD JAC</u>			G	C											Received Temperature C: <u>2</u>				
AIC No.	Sample Identification	Date/Time Collected	A	M											Remarks				
<u>2</u>	<u>WASTEWATER</u>	<u>8/22/12 9:20 L</u>		<u>X</u>															
Container Type																Field pH calibration on _____ @ _____			
Preservative																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																			
Turnaround Time Requested: (Please circle) <u>NORMAL</u> or EXPEDITED IN _____ DAYS					Relinquished By: <u>[Signature]</u>					Date/Time: <u>8/22/12 11:34 L</u>					Received By: _____				
Expedited results requested by: _____					Relinquished By: _____					Date/Time: _____					Received in Lab By: <u>[Signature]</u>				
Who should AIC contact with questions: _____					Comments: _____										Date/Time: <u>8-22-12 1134</u>				
Phone: _____ Fax: _____																			
Report Attention to: _____																			
Report Address to: _____																			

Appendix B: Test 1000.0
SUMMARY REPORTING FORMS
CHRONIC BIOMONITORING
Pimephales promelas (Fathead Minnow)
SURVIVAL AND GROWTH

Permittee: Malvern Water Works

NPDES No.: AR0034126 AFIN 30-00040

Date and Time Test Initiated: August 21, 2012 at 1440

Date and Time Test Terminated: August 28, 2012 at 1255

Dilution water used: Synthetic Soft Water #3899

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	100	100	100	100	0.00
2.2 %	100	100	100	100	100	100	100	100	0.00
3.2 %	100	100	100	100	87.5	97.5	97.5	97.5	5.73
4.6 %	100	100	100	100	100	100	100	100	0.00
6.5 %	100	100	100	100	100	100	100	100	0.00
8.5 %	100	100	100	100	100	100	100	100	0.00

DATA TABLE FOR GROWTH

Effluent Conc. %	Average dry weight, mg replicate chambers					Mean dry weight, mg	CV%
	A	B	C	D	E		
Control	0.371	0.384	0.334	0.384	0.395	0.374	6.35
2.2 %	0.342	0.294	0.464	0.409	0.439	0.39	18.0
3.2 %	0.372	0.351	0.516	0.479	0.286	0.401	23.6
4.6 %	0.302	0.291	0.386	0.449	0.388	0.363	18.2
6.5 %	0.460	0.400	0.466	0.395	0.380	0.42	9.48
8.5 %	0.402	0.359	0.432	0.419	0.415	0.405	6.92

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	(6.5 %)	<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	(6.5 %)	<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: 8.5 % (TOP6C)

6. LOEC Pimephales Lethality: 8.5 % (TXP6C)

7. NOEC Pimephales Sublethality: 8.5 % (TPP6C)

8. LOEC Pimephales Sublethality: 8.5 % (TYP6C)

9. Coefficient of variation for Pimephales growth: 9.48 (TQP6C)

Appendix B: Test 1000.0

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

PERMITTEE: Malvern Water Works
NPDES NO.: AR0034126 AFIN 30-00040
CONTACT: Mr. John Davis
ANALYST: 275, 280, 298, 304

1359
Test Initiated: DATE: August 21, 2012 TIME: 1440
Test Terminated: DATE: August 28, 2012 TIME: 1255

DILUTION	DAY						
	1	2	3	4	5	6	7
Control							
D.O. Initial	8.3	8.0	8.4	8.2	8.0	8.0	8.2
Final	7.9	8.0	7.2	7.4	7.5	7.1	7.1
pH Initial	7.9	7.7	7.9	7.8	8.0	7.9	7.8
Final	7.6	7.7	7.6	7.6	7.7	7.5	7.5
Alkalinity	30	NA	30	NA	30	NA	NA
Hardness	46	NA	40	NA	41	NA	NA
Conductivity	170	NA	160	NA	170	NA	NA
Chlorine	<0.05	NA	<0.05	NA	<0.05	NA	NA

DILUTION	DAY						
	1	2	3	4	5	6	7
2.2 %							
D.O. Initial	8.0	8.3	8.3	8.2	8.1	7.8	8.2
Final	8.0	8.1	7.5	8.1	7.3	6.6	6.7
pH Initial	7.9	7.7	7.9	7.8	8.0	7.8	7.8
Final	7.7	7.8	7.6	7.8	7.6	7.4	7.4
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	NA	NA	NA	NA	NA	NA	NA
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION	DAY						
	1	2	3	4	5	6	7
3.2 %							
D.O. Initial	8.1	8.2	8.2	8.1	8.2	8.1	8.2
Final	7.9	7.9	7.0	7.2	7.2	6.8	6.8
pH Initial	7.9	7.7	7.8	7.8	8.0	7.9	7.7
Final	7.7	7.7	7.5	7.6	7.6	7.4	7.4
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	NA	NA	NA	NA	NA	NA	NA
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION	DAY						
	1	2	3	4	5	6	7
4.6 %							
D.O. Initial	7.9	8.2	8.2	8.2	8.2	8.2	8.2
Final	8.0	8.1	7.8	8.0	7.7	7.4	7.1
pH Initial	7.9	7.7	7.8	7.8	8.0	7.9	7.8
Final	7.8	7.8	7.7	7.8	7.8	7.5	7.4
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	NA	NA	NA	NA	NA	NA	NA
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION	DAY						
	1	2	3	4	5	6	7
6.5 %							
D.O. Initial	8.0	7.9	8.2	8.2	8.0	8.0	8.1
Final	7.6	7.9	7.4	7.9	7.4	7.4	7.3
pH Initial	7.9	7.7	7.8	7.8	7.9	7.9	7.7
Final	7.6	7.7	7.6	7.8	7.7	7.6	7.5
Alkalinity	48	NA	34	NA	46	NA	NA
Hardness	46	NA	41	NA	41	NA	NA
Conductivity	180	NA	180	NA	180	NA	NA
Chlorine	<0.05	NA	<0.05	NA	<0.05	NA	NA

DILUTION	DAY						
	1	2	3	4	5	6	7
8.5 %							
D.O. Initial	8.0	8.2	8.1	8.1	8.1	8.1	8.0
Final	7.7	8.2	7.3	7.5	7.5	7.0	7.7
pH Initial	7.9	7.7	7.8	7.8	8.0	7.9	7.7
Final	7.7	7.8	7.6	7.7	7.6	7.5	7.6
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	NA	NA	NA	NA	NA	NA	NA
Chlorine	NA	NA	NA	NA	NA	NA	NA

Appendix B: Test 1002.0
SUMMARY REPORTING FORMS
CHRONIC BIOMONITORING
Ceriodaphnia dubia
SURVIVAL AND REPRODUCTION

Permittee: Malvern Water Works

NPDES No.: AR0034126 AFIN 30-00040

Date and Time Test Initiated: August 21, 2012 at 1415

Date and Time Test Terminated: August 28, 2012 at 1350

Dilution water used: Synthetic Soft Water #3899

PERCENT SURVIVAL

Time of Reading	Control	Percent Effluent				
		2.2 %	3.2 %	4.6 %	6.5 %	8.5 %
24 hour	100	100	100	100	90.0	90.0
48 hour	80.0	100	100	80.0	90.0	90.0
7 day	80.0	100	90.0	80.0	90.0	90.0

NUMBER OF YOUNG PRODUCED PER FEMALE @ 7 DAYS

Replicates	Control	Percent Effluent				
		2.2 %	3.2 %	4.6 %	6.5 %	8.5 %
A	20	13	19	14	21	17
B	21	16	14	17	14	17
C	0	14	14	0	23	21
D	24	23	15	15	24	18
E	16	15	14	23	0	10
F	20	20	2	0	17	14
G	17	17	22	16	18	13
H	12	12	19	17	25	14
I	0	16	21	18	16	12
J	22	13	18	16	16	0
Mean per Adult	15.2	15.9	15.8	13.6	17.4	13.6
Mean per Surviving Adult	19.0	15.9	17.3	17.0	19.3	15.1
CV %	20.1	21.5	18.2	16.0	20.7	22.5

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	(6.5 %)	<u> </u> YES	<u> X </u> NO
b.) 1/2 LOW FLOW DILUTION	(NA)	<u> </u> YES	<u> </u> 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	(6.5 %)	<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: 8.5 % (TOP3B)

6. LOEC Ceriodaphnia Lethality: 8.5 % (TXP3B)

7. NOEC Ceriodaphnia Sublethality: 8.5 % (TPP3B)

8. LOEC Ceriodaphnia Sublethality: 8.5 % (TYP3B)

9. Coefficient of variation for Ceriodaphnia Reproduction: 20.7 (TQP3B)

Appendix B: Test 1002.0
CHRONIC TOXICITY SUMMARY FORM
Ceriodaphnia dubia
CHEMICAL PARAMETERS CHART

PERMITTEE: Malvern Water Works
NPDES NO.: AR0034126 AFIN 30-00040
CONTACT: Mr. John Davis
ANALYST: 275, 280, 298, 304

Test Initiated: DATE: August 21, 2012 TIME: 1359
Test Terminated: DATE: August 28, 2012 TIME: 1415
TIME: 1350

DILUTION Control	DAY						
	1	2	3	4	5	6	7
D.O. Initial	8.3	8.0	8.4	8.2	8.0	8.0	8.2
Final	8.5	8.4	8.4	8.6	8.3	8.0	7.5
pH Initial	7.9	7.7	7.9	7.8	8.0	7.9	7.8
Final	8.2	8.3	8.2	8.3	8.3	8.0	7.8
Alkalinity	30	NA	30	NA	30	NA	NA
Hardness	46	NA	40	NA	41	NA	NA
Conductivity	170	NA	160	NA	170	NA	NA
Chlorine	<0.05	NA	<0.05	NA	<0.05	NA	NA

DILUTION 2.2 %	DAY						
	1	2	3	4	5	6	7
D.O. Initial	8.0	8.3	8.3	8.2	8.1	7.8	8.2
Final	8.4	8.4	8.2	8.6	8.3	8.1	7.3
pH Initial	7.9	7.7	7.9	7.8	8.0	7.8	7.8
Final	8.1	8.2	8.2	8.2	8.1	8.0	7.7
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	NA	NA	NA	NA	NA	NA	NA
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION 3.2 %	DAY						
	1	2	3	4	5	6	7
D.O. Initial	8.1	8.2	8.2	8.1	8.2	8.1	8.2
Final	8.5	8.5	8.4	8.6	8.3	8.1	7.4
pH Initial	7.9	7.7	7.8	7.8	8.0	7.9	7.7
Final	8.2	8.2	8.1	8.2	8.2	8.0	7.6
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	NA	NA	NA	NA	NA	NA	NA
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION 4.6 %	DAY						
	1	2	3	4	5	6	7
D.O. Initial	7.9	8.2	8.2	8.2	8.2	8.2	8.2
Final	8.6	8.4	8.3	8.5	8.2	7.9	7.0
pH Initial	7.9	7.7	7.8	7.8	8.0	7.9	7.8
Final	8.2	8.2	8.1	8.2	8.1	8.0	7.6
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	NA	NA	NA	NA	NA	NA	NA
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION 6.5 %	DAY						
	1	2	3	4	5	6	7
D.O. Initial	8.0	7.9	8.2	8.2	8.0	8.0	8.1
Final	8.6	8.4	8.3	8.5	8.2	8.0	7.2
pH Initial	7.9	7.7	7.8	7.8	7.9	7.9	7.7
Final	8.1	8.1	8.1	8.1	8.1	8.0	7.6
Alkalinity	48	NA	34	NA	46	NA	NA
Hardness	46	NA	41	NA	41	NA	NA
Conductivity	180	NA	180	NA	180	NA	NA
Chlorine	<0.05	NA	<0.05	NA	<0.05	NA	NA

DILUTION 8.5 %	DAY						
	1	2	3	4	5	6	7
D.O. Initial	8.0	8.2	8.1	8.1	8.1	8.1	8.0
Final	8.4	8.3	8.4	8.5	8.2	7.9	7.2
pH Initial	7.9	7.7	7.8	7.8	8.0	7.9	7.7
Final	8.1	8.3	8.2	8.1	8.1	8.0	7.6
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	NA	NA	NA	NA	NA	NA	NA
Chlorine	NA	NA	NA	NA	NA	NA	NA

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