

HOPE, CITY OF  
PERMIT NO: AR0038466  
CHRONIC BIOMONITORING

METHOD 1000.0 - PIMEPHALES PROMELAS  
METHOD 1002.0 - CERIODAPHNIA DUBIA

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Report Prepared by:  
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January 20, 2014

Laboratory Number: 16543.0001, 0002, 0003

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## INTRODUCTION AND SUMMARY

Chronic biomonitoring tests:

7 day ceriodaphnia dubia survival and reproduction (method 1002.0) was performed by Sorrells Research Associates for Hope 24 hour composite samples of plant effluent for dates 11/17-18/13, 11/19-20/13, 11/21-22/13.

The samples were delivered to Sorrells lab in ice chest, cooled to 4 degrees c.

These samples were logged in as 16543.0001, 0002, 0003. Chain of custody included in report.

Moderately hard 20% deionized mineral water was used as dilution water.

Testing was initiated 11/19/13 at 1620 hours and continued through 11/27/13 at 1620 hours.

The results of these tests are as follows:

### **TEST 1000.0 FATHEAD MINNOW**

SURVIVAL - NOEL 100% Effluent

GROWTH - NOWL 100% Effluent

### **TEST 1002.0 CERIODAPHNIA DUBIA**

SURVIVAL - 100% Effluent

REPRODUCTION - 100% Effluent

Fishers Exact Test statistics are included in this report for these observations. No other adjustments were made.

TEST ACCEPTANCE CRITERIA  
FOR CONTROL

TEST METHOD	ORGANISM	CRITERIA	RESULTS	PASS/FAIL
1000	Pimephales promelas	Control surv. >or= 80 %	100%	PASS
1002	Ceriodaphnia dubia	Control surv. >or= 80 %	100%	PASS
1000	Pimephales promelas	Control wt. .25 mg or> per larvae.	.320	PASS
1002	Ceriodaphnia dubia	Control repro. 15 or> neonates per surviving female.	19.2	PASS
1000	Pimephales promelas	Control CV 40 % or <	<b>3.6</b>	PASS
1002	Ceriodaphnia Dubia	Control CV 40 % or <	<b>12.47</b>	PASS

NOTE: The test acceptance criteria is based upon the synthetic laboratory control. Laboratory control is moderately hard 20% deionized mineral water, as directed by EPA/600/4-91/002.

OUTLINED REPORT

PERMIT NO: AR0038466  
PERMIT REQUIREMENTS:  
PLANT LOCATION:  
RECEIVING WATER BODY:

CLIENT: Hope, City of  
ADDRESS: P.O. Box 667  
PHONE NO: Hope, AR 71801

PLANT OPERATIONS

PRODUCT (S): n/a  
RAW MATERIALS: n/a  
OPERATING SCHEDULE:  
SCHEMATIC OF WASTE TREATMENT:

RETENTION TIME:

VOLUME OF WASTE FLOW (MGD, CFS, GPM)



(Cont.)

PHYSICAL AND CHEMICAL DATA:

	DATE	DATE	DATE
100 % EFFLUENT	11/19/13	11/21/13	11/23/13
DO (mg/l)	8.51	8.26	8.10
pH (S.U.)	7.41	7.40	7.38
Conductivity (umhos)	891	921	872
Alkalinity (mg/l)	210	226	186
Hardness (mg/l)	168	170	164
Res. Chlorine (mg/l)	0	0	0
Temperature .c	25	25	25

DILUTION WATER SAMPLES -

SOURCE: 20% DMW

COLLECTION DATE: N/A

TIME: N/A

PRETREATMENT: AERATED

Hardness is to be reported as mg/l CaCO3  
D.O. Dissolved Oxygen mg/l  
Temperature degrees centigrade  
pH standard units  
Conductivity = us/cm  
Chlorine Residual = mg/l





DATA ANALYSIS

ACCORDING TO EPA/600/4-91/002.

STATISTICAL ANALYSES

TOXSTAT VERSION 3.3

**Percent minimum significant difference (PMSD) calculated for sub-lethal endpoints.**

This information for *C. dubia* reproduction is found in the inserted tables after page 8. We will highlight these values in Dunnetts Table 2, for all sub-lethal endpoints.

TITLE: HOPE 16543 CERIO REPS  
 FILE: 16543HCR  
 TRANSFORM: NO TRANSFORM

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	23.0000	23.0000
1	CONTROL	2	18.0000	18.0000
1	CONTROL	3	22.0000	22.0000
1	CONTROL	4	17.0000	17.0000
1	CONTROL	5	18.0000	18.0000
1	CONTROL	6	20.0000	20.0000
1	CONTROL	7	21.0000	21.0000
1	CONTROL	8	19.0000	19.0000
1	CONTROL	9	19.0000	19.0000
1	CONTROL	10	15.0000	15.0000
2	31.60	1	18.0000	18.0000
2	31.60	2	20.0000	20.0000
2	31.60	3	19.0000	19.0000
2	31.60	4	22.0000	22.0000
2	31.60	5	18.0000	18.0000
2	31.60	6	20.0000	20.0000
2	31.60	7	21.0000	21.0000
2	31.60	8	21.0000	21.0000
2	31.60	9	18.0000	18.0000
2	31.60	10	20.0000	20.0000
3	42.20	1	20.0000	20.0000
3	42.20	2	18.0000	18.0000
3	42.20	3	22.0000	22.0000
3	42.20	4	20.0000	20.0000
3	42.20	5	20.0000	20.0000
3	42.20	6	19.0000	19.0000
3	42.20	7	19.0000	19.0000
3	42.20	8	19.0000	19.0000
3	42.20	9	20.0000	20.0000
3	42.20	10	18.0000	18.0000
4	56.30	1	16.0000	16.0000
4	56.30	2	21.0000	21.0000
4	56.30	3	18.0000	18.0000
4	56.30	4	20.0000	20.0000
4	56.30	5	17.0000	17.0000
4	56.30	6	19.0000	19.0000
4	56.30	7	19.0000	19.0000
4	56.30	8	21.0000	21.0000
4	56.30	9	18.0000	18.0000
4	56.30	10	20.0000	20.0000
5	75.00	1	20.0000	20.0000
5	75.00	2	23.0000	23.0000
5	75.00	3	22.0000	22.0000
5	75.00	4	19.0000	19.0000
5	75.00	5	17.0000	17.0000
5	75.00	6	20.0000	20.0000
5	75.00	7	23.0000	23.0000
5	75.00	8	20.0000	20.0000
5	75.00	9	23.0000	23.0000
5	75.00	10	21.0000	21.0000

6	100.00	1	19.0000	19.0000
6	100.00	2	19.0000	19.0000
6	100.00	3	18.0000	18.0000
6	100.00	4	21.0000	21.0000
6	100.00	5	20.0000	20.0000
6	100.00	6	22.0000	22.0000
6	100.00	7	21.0000	21.0000
6	100.00	8	19.0000	19.0000
6	100.00	9	19.0000	19.0000
6	100.00	10	20.0000	20.0000

HOPE 16543 CERIO REPS

File: 16543HCR

Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	10	15.000	23.000	19.200
2	31.60	10	18.000	22.000	19.700
3	42.20	10	18.000	22.000	19.500
4	56.30	10	16.000	21.000	18.900
5	75.00	10	17.000	23.000	20.800
6	100.00	10	18.000	22.000	19.800

HOPE 16543 CERIO REPS

File: 16543HCR

Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM
1	CONTROL	5.733	2.394	0.757
2	31.60	2.011	1.418	0.448
3	42.20	1.389	1.179	0.373
4	56.30	2.767	1.663	0.526
5	75.00	3.956	1.989	0.629
6	100.00	1.511	1.229	0.389

HOPE 16543 CERIO REPS

File: 16543HCR

Transform: NO TRANSFORM

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	21.350	4.270	1.475
Within (Error)	54	156.300	2.894	

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Total                    59                    177.650  
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Critical F value = 2.45 (0.05,5,40)  
Since F < Critical F FAIL TO REJECT Ho:All groups equal

HOPE 16543 CERIO REPS  
File: 16543HCR                    Transform: NO TRANSFORM

DUNNETTS TEST       -       TABLE 1 OF 2                    Ho:Control<Treatment  
-----

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	19.200	19.200		
2	31.60	19.700	19.700	-0.657	
3	42.20	19.500	19.500	-0.394	
4	56.30	18.900	18.900	0.394	
5	75.00	20.800	20.800	-2.103	
6	100.00	19.800	19.800	-0.789	

-----  
Dunnnett table value = 2.31                    (1 Tailed Value, P=0.05, df=40,5)

HOPE 16543 CERIO REPS  
File: 16543HCR                    Transform: NO TRANSFORM

DUNNETTS TEST       -       TABLE 2 OF 2                    Ho:Control<Treatment  
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GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	10			
2	31.60	10	1.758	9.2	-0.500
3	42.20	10	1.758	9.2	-0.300
4	56.30	10	1.758	9.2	0.300
5	75.00	10	1.758	9.2	-1.600
6	100.00	10	1.758	9.2	-0.600

HOPE 16543 CERIO REPS  
File: 16543HCR                    Transform: NO TRANSFORM

WILLIAMS TEST (Isotonic regression model)       TABLE 1 OF 2  
-----

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	CONTROL	10	19.200	19.200	19.200
2	31.60	10	19.700	19.700	19.367
3	42.20	10	19.500	19.500	19.367
4	56.30	10	18.900	18.900	19.367
5	75.00	10	20.800	20.800	20.300
6	100.00	10	19.800	19.800	20.300

HOPE 16543 CERIO REPS

File: 16543HCR

Transform: NO TRANSFORM

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
CONTROL	19.200				
31.60	19.367	0.219		1.68	k= 1, v=54
42.20	19.367	0.219		1.76	k= 2, v=54
56.30	19.367	0.219		1.79	k= 3, v=54
75.00	20.300	1.446		1.80	k= 4, v=54
100.00	20.300	1.446		1.80	k= 5, v=54

s = 1.701

Note: df used for table values are approximate when v > 20.

HOPE 16543 CERIO REPS

File: 16543HCR

Transform: NO TRANSFORM

STEELS MANY-ONE RANK TEST - Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	19.200				
2	31.60	19.700	112.00	75.00	10.00	
3	42.20	19.500	110.50	75.00	10.00	
4	56.30	18.900	101.50	75.00	10.00	
5	75.00	20.800	125.50	75.00	10.00	
6	100.00	19.800	114.50	75.00	10.00	

Critical values use k = 5, are 1 tailed, and alpha = 0.05

TITLE: HOPE 16543 MINNOW WEIGHTS

FILE: 16543HMW

TRANSFORM: NO TRANSFORM

NUMBER OF GROUPS: 6

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GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.3130	0.3130
1	CONTROL	2	0.3090	0.3090
1	CONTROL	3	0.3260	0.3260
1	CONTROL	4	0.3080	0.3080
2	31.60	1	0.3250	0.3250
2	31.60	2	0.3160	0.3160
2	31.60	3	0.3280	0.3280
2	31.60	4	0.3090	0.3090
3	42.20	1	0.3330	0.3330
3	42.20	2	0.2550	0.2550
3	42.20	3	0.3120	0.3120
3	42.20	4	0.3010	0.3010
4	56.30	1	0.3290	0.3290
4	56.30	2	0.3250	0.3250
4	56.30	3	0.3040	0.3040
4	56.30	4	0.3150	0.3150
5	75.00	1	0.3300	0.3300
5	75.00	2	0.3060	0.3060
5	75.00	3	0.3170	0.3170
5	75.00	4	0.3090	0.3090
6	100.00	1	0.3340	0.3340
6	100.00	2	0.3210	0.3210
6	100.00	3	0.3060	0.3060
6	100.00	4	0.3180	0.3180

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HOPE 16543 MINNOW WEIGHTS

File: 16543HMW

Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

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GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	4	0.308	0.326	0.314
2	31.60	4	0.309	0.328	0.320
3	42.20	4	0.255	0.333	0.300
4	56.30	4	0.304	0.329	0.318
5	75.00	4	0.306	0.330	0.316
6	100.00	4	0.306	0.334	0.320

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HOPE 16543 MINNOW WEIGHTS

File: 16543HMW

Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

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GRP	IDENTIFICATION	VARIANCE	SD	SEM
1	CONTROL	0.000	0.008	0.004
2	31.60	0.000	0.009	0.004
3	42.20	0.001	0.033	0.016
4	56.30	0.000	0.011	0.006
5	75.00	0.000	0.011	0.005
6	100.00	0.000	0.011	0.006

HOPE 16543 MINNOW WEIGHTS  
 File: 16543HMW Transform: NO TRANSFORM

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.001	0.000	0.812
Within (Error)	18	0.005	0.000	
Total	23	0.006		

Critical F value = 2.77 (0.05, 5, 18)  
 Since  $F < \text{Critical } F$  FAIL TO REJECT  $H_0$ : All groups equal

HOPE 16543 MINNOW WEIGHTS  
 File: 16543HMW Transform: NO TRANSFORM

DUNNETTS TEST - TABLE 1 OF 2 Ho: Control < Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	0.314	0.314		
2	31.60	0.320	0.320	-0.476	
3	42.20	0.300	0.300	1.190	
4	56.30	0.318	0.318	-0.368	
5	75.00	0.316	0.316	-0.130	
6	100.00	0.320	0.320	-0.498	

Dunnnett table value = 2.41 (1 Tailed Value,  $P=0.05$ ,  $df=18,5$ )

HOPE 16543 MINNOW WEIGHTS  
 File: 16543HMW Transform: NO TRANSFORM

DUNNETTS TEST - TABLE 2 OF 2 Ho: Control < Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
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1	CONTROL	4			
2	31.60	4	0.028	8.9	-0.005
3	42.20	4	0.028	8.9	0.014
4	56.30	4	0.028	8.9	-0.004
5	75.00	4	0.028	8.9	-0.001
6	100.00	4	0.028	8.9	-0.006

HOPE 16543 MINNOW WEIGHTS  
 File: 16543HMW Transform: NO TRANSFORM

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	CONTROL	4	0.314	0.314	0.311
2	31.60	4	0.320	0.320	0.311
3	42.20	4	0.300	0.300	0.311
4	56.30	4	0.318	0.318	0.317
5	75.00	4	0.316	0.316	0.317
6	100.00	4	0.320	0.320	0.320

HOPE 16543 MINNOW WEIGHTS  
 File: 16543HMW Transform: NO TRANSFORM

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
CONTROL	0.311				
31.60	0.311	0.237		1.73	k= 1, v=18
42.20	0.311	0.237		1.82	k= 2, v=18
56.30	0.317	0.247		1.85	k= 3, v=18
75.00	0.317	0.247		1.86	k= 4, v=18
100.00	0.320	0.495		1.87	k= 5, v=18

s = 0.016

Note: df used for table values are approximate when v > 20.

HOPE 16543 MINNOW WEIGHTS  
 File: 16543HMW Transform: NO TRANSFORM

STEELS MANY-ONE RANK TEST Ho: Control < Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	0.314				
2	31.60	0.320	21.50	10.00	4.00	
3	42.20	0.300	16.00	10.00	4.00	



4	56.30	0.318	20.00	10.00	4.00
5	75.00	0.316	18.50	10.00	4.00
6	100.00	0.320	20.00	10.00	4.00

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Critical values use  $k = 5$ , are 1 tailed, and  $\alpha = 0.05$

TEST METHOD  
1000.0

TEST METHOD USED: 1000.0  
END POINT(S) OF TEST: NOEL 100 %  
DEVIATIONS FROM REFERENCE METHOD: None

DATE AND TIME TEST STARTED: 11/19/13 1620  
DATE AND TIME TEST TERMINATED: 11/26/13 1620

TYPE OF TEST CHAMBERS: 500 ml  
VOLUME OF SOLUTIONS USED/CHAMBER: 400 ml  
NUMBER OF ORGANISMS/TEST CHAMBER: 10  
NUMBER OF REPLICATE TEST CHAMBERS/TREATMENT: 4

TEST TEMPERATURE (MEAN): mean = 25

TEST ORGANISMS

SCIENTIFIC NAME: Pimephales promelas  
AGE: 24 hours  
LIFE STAGE: Embryos  
SOURCE: Aquatic BioSystems, Inc.  
DISEASES AND TREATMENT: None  
FEEDING REGIME: 2/day Brine Shrimp  
\*\*ORGANISM HISTORY SHEETS ARE ATTACHED\*\*

RESULTS SUMMARY

FATHEAD MINNOW, PIMEPHALES PROMELAS, LARVAL SURVIVAL AND GROWTH TEST  
METHOD 1000.0

Larvae are exposed in a static renewal system for seven days to different concentrations of effluent or to receiving water. Test results are based on the survival and growth (increase in weight) of the larvae. Effluent dilutions chosen for this test were 100 %, 75%, 56.3%, 42.2% and 31.6% in accordance with the NPDES permit. The low flow or "critical" dilution is specified in the NPDES Permit as 100% effluent.

NOEL(S) ARE AS FOLLOWS:

100% Survival	100%	effluent
NOEL Growth	100%	effluent

BIOMONITORING REPORT  
FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL

DATA TABLE FOR FATHEAD MINNOW SURVIVAL

Effluent Conc. %	Percent Survival In				Mean Percent			CV%*
	A	B	C	D	24h	48h	7d	
Dilution Water	100	100	100	100	100	100	100	0.0
31.6%	100	100	100	100	100	100	100	0.0
42.2%	100	100	90	100	100	100	97.5	5.1
56.3%	100	100	100	100	100	100	100	0.0
75%	100	100	100	100	100	100	100	0.0
100%	100	100	100	100	100	100	100	0.0

\*coefficient of variation = standard deviation x 100/mean

\*\*ph unadjusted 100% effluent

1. Dunnett's Procedure or Steel's Many-One Rank Test as appropriate:

Is the mean survival at 7xdays significantly different (XX0.5)

than the control survival for the % effluent corresponding to:

a.) LOW FLOW OR CRITICAL DILUTION (100%): YES [ ] NO [x]

b.) 1/2 LOW FLOW OR 2 X CRITICAL DILUTION (56.3 %): YES [ ] NO [x]

2. Dunnett's Procedure:

Is the mean dry weight (growth) at 7 days effluent 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 (100%): YES [ ] NO [x]

b.) 1/2 LOW FLOW OR 2 X CRITICAL DILUTION (56.3 %): YES [ ] NO [x]

3. If you answered NO to 1.a) and 2.a) enter [0]  
otherwise enter [1]: [0]

4. If you answered NO to 1.b) and 2.b) enter [0]  
otherwise enter [1]: [0]

5. Enter response to item 3 on DMR Form, parameter # TEP6C.

6. Enter response to item 4 on DMR Form, parameter # TFP6C.

7. Enter percent effluent corresponding to each NOEL below and circle lowest number:

a.) NOEL survival = 100% effluent

b.) NOEL growth = 100% effluent

FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL  
(Pimephales promelas)

Permittee: **CITY OF HOPE** NPDES NO. AR0038466

Dilution water used: Receiving [ ] Reconstituted [ x ]

DATA TABLE FOR GROWTH

EFFLUENT CONC. %	AVERAGE DRY WEIGHT IN MILLIGRAMS IN REPLICATE CHAMBERS				MEAN DRY WEIGHT (MG) 7 days	CV%*
	A	B	C	D		
CONTROL	.313	.309	.326	.308	.314	2.6
31.6 %	.325	.316	.328	.309	.320	2.7
42.2 %	.333	.255	.312	.301	.300	11.0
56.3 %	.329	.325	.304	.315	.318	3.5
75 %	.330	.306	.317	.309	.316	3.4
100%	.334	.321	.306	.318	.320	3.6

\*Coefficient of variation = standard deviation X 100/mean

(Coef Of Var Statre 7Day Chronic Pimephales TQP6C = 3.6)

TEST METHOD  
1002.0

TEST METHOD USED: 1002.0

DATE AND TIME TEST STARTED: 11/19/13 1620

DATE AND TIME TEST TERMINATED: 11/27/13 1620

TYPE OF TEST CHAMBERS: 30 ml

VOLUME OF SOLUTIONS USED/CHAMBER: 15 ml

NUMBER OF ORGANISMS/TEST CHAMBER: 1

NUMBER OF REPLICATE TEST CHAMBERS/TREATMENT: 10

TEST TEMPERATURE (MEAN AND RANGE): 25

TEST ORGANISMS

SCIENTIFIC NAME: Ceriodaphnia dubia

AGE: Less than 24 hours

LIFE STAGE: Neonates

SOURCE: Aquatic BioSystems, Inc.

DISEASES AND TREATMENT: None

FEEDING REGIME: Daily

\*\*ORGANISM HISTORY SHEETS ARE ATTACHED\*\*

RESULTS SUMMARY  
CLADOCERAN, CERIODAPHNIA DUBIA, SURVIVAL AND REPRODUCTION TEST  
METHOD 1002.0

Ceriodaphnia are exposed in a static renewal system to different concentrations of effluent, and to receiving water until 60% of surviving control organisms have three broods of offspring (15 neonates per surviving female). Effluent dilutions for this test were 100%, 75%, 56.3%, 42.2%, and 31.6% in accordance with the NPDES Permit. The "critical" dilution is specified as 100% effluent. Test results are based on survival and reproduction. If the test is conducted as described, the control organism should produce three broods of young during a seven-day period.

BIOMONITORING REPORT  
CERIODAPHNIA DUBIA SURVIVAL AND REPRODUCTION

PERCENT SURVIVAL

Time of Reading	0 %	31.6%	42.2 %	56.3 %	75 %	100 %
24h	100	100	100	100	100	100
48h	100	100	100	100	100	100
7 day	100	100	100	100	100	100

1. Fisher's Exact Test:

Is the mean **survival** at 7 days significantly different ( $p=0.05$ ) than the control survival for the % effluent corresponding to (lethality):

a.) LOW FLOW OR CRITICAL DILUTION ( 100 %): YES [ ] NO [X]  
b.) 1/2 LOW FLOW OR 2 X

CRITICAL DILUTION ( 56.3 %): YES [ ] NO [X]

2. Dunnett's Procedure or Steel's Many-One Rank Test as appropriate:

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 (100 %): YES [ ] NO [ X ]  
b.) 1/2 LOW FLOW OR 2 X

CRITICAL DILUTION (56.3 %): YES [ ] NO [ X ]

3. If you answered NO to 1.a) and 2.a) enter [ 0 ]  
otherwise enter [ 1 ]: [ 0 ]

4. If you answered NO to 1.b) and 2.b) enter [ 0 ]  
otherwise enter [ 1 ]: [ 0 ]

5. Enter response to item 3 on DMR Form, parameter #TEP3B.

6. Enter response to item 4 on DMR Form, parameter #TFP3B.

7. Enter percent effluent corresponding to each NOEL below and circle lowest number:

a.) NOEL survival = 100 % effluent

b.) NOEL reproduction = 100 % effluent



BIOMONITORING REPORT  
CERIODAPHNIA DUBIA SURVIVAL AND REPRODUCTION

Permittee: CITY OF HOPE                      NPDES NO. AR0038466  
Dilution water used:                      Receiving [    ]      Reconstituted [X]

NUMBER OF YOUNG PRODUCED PER FEMALE @ 7 DAYS

PERCENT EFFLUENT (%)

REP	0 %	31.6%	42.2%	56.3%	75 %	100 %
A	23	18	20	16	20	19
B	18	20	18	21	23	19
C	22	19	22	18	22	18
D	17	22	20	20	19	21
E	18	18	20	17	17	20
F	20	20	19	19	20	22
G	21	21	19	19	23	21
H	19	21	19	21	20	19
I	19	18	20	18	23	19
J	15	20	18	20	21	20
CV%	<b>12.47</b>	7.20	6.04	8.80	9.56	6.21

MEAN                      19.2      19.7      19.50      18.9      20.8      19.8

\*coefficient of variation = standard deviation x 100/mean

(Coef Of Var Statre 7Day Chronic Ceriodaphnia TQP3B = **12.47**)

STANDARD REFERENCE TOXICANTS

STANDARD TOXICANT USED AND SOURCE: SODIUM CHLORIDE  
DATE AND TIME OF MOST RECENT TEST: 12/11/13  
DILUTION WATER USED IN TEST: 20% DMW  
RESULTS(LC50 OR, NOEC AND/OR ECL): LC50 = 1629 FATHEAD MINNOW  
RESULTS(LC50 OR, NOEC AND/OR ECL): LC50 = 734.3 CERIODAPHNIA  
ACCEPTABLE PERFORMANCE, STUDY 31= 100%  
PHYSICAL AND CHEMICAL METHODS USED:

SPECIFIC CONDUCTANCE METHOD 2510 B  
OXYGEN, DISSOLVED METHOD 4500- O G  
CHLORINE, TOTAL RESIDUAL METHOD 4500- C I F  
ALKALINITY, CACO3 METHOD 2320 B

SUMMARY OF REFERENCE TOXICANT (S) ARE AS FOLLOWS:

FATHEAD MINNOW

Standard Recovery FATHEAD MINNOW 101.1%

CERIODAPHNIA

Standard Recovery CERIODAPHNIA 94.4%

APPENDIX 1A  
TEST 1000.0

Permittee Hope 16543									
Effluent	Percent Survival In Rep. Chambers				Mean Percent Survival			CV%*	
	Conc.	A	B	C	D	24h	48h	7 days	*
CONTROL	100	100	100	100	100	100	100	100	0.0
31.60%	100	100	100	100	100	100	100	100	0.0
42.20%	100	100	90	100	100	100	100	97.5	5.1
56.30%	100	100	100	100	100	100	100	100	0.0
75.00%	100	100	100	100	100	100	100	100	0.0
100.00%	100	100	100	100	100	100	100	100	0.0
Permittee Hope 16543									
Effluent	Average Dry Weight (mg)				Mean Dry Weight (mg)				
	Conc.	A	B	C	D	7 days	CV%*		
CONTROL	0.313	0.309	0.326	0.308	0.314	2.6			
31.6	0.325	0.316	0.328	0.309	0.320	2.7			
42.2	0.333	0.255	0.312	0.301	0.300	11.0			
56.3	0.329	0.325	0.304	0.315	0.318	3.5			
75	0.330	0.306	0.317	0.309	0.316	3.4			
100	0.334	0.321	0.306	0.318	0.320	3.6			

Figure 2. Survival data for fathead minnow larval survival and growth to

Discharger: City of Hope Test Dates: 11-19-13 1620  
 Location: 16543 Analyst: ATED

Conc:	Rep. No.	No. Survivors							Remarks
		Day							
Control	1	10	10	10	10	10	10	10	
	2	10	10	10	10	10	10	10	
	3	10	10	10	10	10	10	10	
	4	10	10	10	10	10	10	10	
Conc:	5	10	10	10	10	10	10	10	
	6	10	10	10	10	10	10	10	
31.6	7	10	10	10	10	10	10	10	
	8	10	10	10	10	10	10	10	
Conc:	9	10	10	10	10	10	10	10	
	10	10	10	9	9	9	9	9	
	11	10	10	10	10	10	10	10	
42.2	12	10	10	10	10	10	10	10	
	13	10	10	10	10	10	10	10	
	14	10	10	10	10	10	10	10	
56.3	15	10	10	10	10	10	10	10	
	16	10	10	10	10	10	10	10	
	17	10	10	10	10	10	10	10	
75	18	10	10	10	10	10	10	10	
	19	10	10	10	10	10	10	10	
	20	10	11	10	10	10	10	10	
Conc:	21	10	10	10	10	10	10	10	
	22	10	10	10	10	10	10	10	
	23	10	10	10	10	10	10	10	
100	24	10	10	10	10	10	10	10	

Comments:

Discharge: City of Hope  
 Location: 16543  
 Analyst: JED

Test Date(s): 11-19-13  
 Weighing Date: 12-16-13

Drying Temperature (°C): 104  
 Drying Time (h): 2

Conc:	Rep. No.	A Wgt. of boat (mg)	B Dry wgt: foil and larvae (mg)	B-A Total dry wgt of larvae (mg)	C No. of larvae	(B-A)/C Mean dry wgt of larvae (mg)	Remarks
Control	1	123904	124217	313	10	.313	
	2	127442	127751	309	10	.309	
	3	126305	126631	326	10	.326	
	4	126220	126528	308	10	.308	
Conc:	5	122412	122737	325	10	.325	
	6	124570	124886	316	10	.316	
31.6	7	128773	129101	328	10	.328	
	8	124233	124542	309	10	.309	
46 Conc:	9	122506	122839	333	10	.333	
	10	125318	125601	283	9	.255	
	11	129304	129616	312	10	.312	
42.2 Conc:	12	122870	123171	301	10	.301	
	13	127613	127942	329	10	.329	
	14	125241	125566	325	10	.325	
56.3 Conc:	15	128315	128619	304	10	.304	
	16	130116	130431	315	10	.315	
	17	125088	125418	330	10	.330	
75 Conc:	18	127010	127316	306	10	.306	
	19	125062	125379	317	10	.317	
	20	123240	123549	309	10	.309	
100 Conc:	21	122500	122834	334	10	.334	
	22	123156	123477	321	10	.321	
	23	125290	125596	306	10	.306	
	24	128316	128634	318	10	.318	

<sup>1</sup>Adapted from Hughes, et al., 1987.

Control: 127288 127288

APPENDIX 2A  
TEST 1002.0

conc.	Hope 16543	CERIO	REPLICATE CONTAINERS							s.d. =	2.39444	CV% =	12.471031	
control	DAY	1	2	3	4	5	6	7	8	9	10 #young	#adult		
temp:	1										0	10	0.00	
temp:	2										0	10	0.00	
temp:	3			1							1	10	0.10	
temp:	4	4	4	3	2	2	4	4	3		2	28	10	2.80
temp:	5	2		4			3		1	4		14	10	1.40
temp:	6	6	5	5	7	6	4	7	7	6		60	10	6.00
temp:	7	3	2			4			1			10	10	1.00
temp:	8	8	7	9	8	6	9	10	7	8	7	79	10	7.90
	TOTAL	23	18	22	17	18	20	21	19	19	15	192	10	19.20
conc	31.60 DAY	REPLICATE CONTAINERS							s.d. =	1.41814	CV% =	7.1986624		
temp:	1	1	2	3	4	5	6	7	8	9	10 no. young	no. adults		
temp:	1										0	10	0.00	
temp:	2										0	10	0.00	
temp:	3			1			2					3	10	0.30
temp:	4	1	4	3	5	2	2	4	3	1	4	29	10	2.90
temp:	5	2			1			1		3		7	10	0.70
temp:	6	6	7	7	7	7	7	6	8	7	5	67	10	6.70
temp:	7		1		2			4			3	10	10	1.00
temp:	8	9	8	8	7	9	9	6	10	7	8	81	10	8.10
	TOTAL	18	20	19	22	18	20	21	21	18	20	197	10	19.70
CONC.	42.20 DAY	REPLICATE CONTAINERS							s.d. =	1.17851	CV% =	6.0436477		
temp:	1	1	2	3	4	5	6	7	8	9	10 no. young	no. adults		
temp:	1										0	10	0.00	
temp:	2										0	10	0.00	
temp:	3	1				1			1		1	4	10	0.40
temp:	4	2	5	3	3	3	3	4	2	5	1	31	10	3.10
temp:	5	6	3	3	1			2	2		2	17	10	1.70
temp:	6			5	7	7	6	6	5	7	5	48	10	4.80
temp:	7		5	2			2				3	12	10	1.20
temp:	8	11	5	9	9	9	8	9	9	8	6	83	10	8.30
	TOTAL	20	18	22	20	20	19	19	19	20	18	195	10	19.50
CONC.	56.30 DAY	REPLICATE CONTAINERS							s.d. =	1.66333	CV% =	8.8006878		
temp:	1	1	2	3	4	5	6	7	8	9	10 no. young	no. adults		
temp:	1										0	10	0.00	
temp:	2										0	10	0.00	
temp:	3			2					1	1		4	10	0.40
temp:	4	3	3	2	4	2	2	2	4	3		25	10	2.50
temp:	5		1			2	1	2			4	10	1.00	
temp:	6	8	7	6	5	7	7	7	6	6	7	66	10	6.60
temp:	7				4			1	2			7	10	0.70
temp:	8	5	10	8	7	6	8	8	8	8	9	77	10	7.70
	TOTAL	16	21	18	20	17	19	19	21	18	20	189	10	18.90
CONC.	75.00 DAY	REPLICATE CONTAINERS							s.d. =	1.98886	CV% =	9.5618166		
temp:	1	1	2	3	4	5	6	7	8	9	10 no. young	no. adults		
temp:	1										0	10	0.00	
temp:	2										0	10	0.00	
temp:	3			2				3			1	6	10	0.60
temp:	4	5	1	3	3	3	4	2	4	2	3	30	10	3.00
temp:	5		6					1		3		10	10	1.00
temp:	6	3	7	7	6	6	8	7	5	7	6	62	10	6.20
temp:	7	5			3			1	4		2	15	10	1.50
temp:	8	7	9	10	7	8	8	9	7	11	9	85	10	8.50
	TOTAL	20	23	22	19	17	20	23	20	23	21	208	10	20.80
CONC.	100.00 DAY	REPLICATE CONTAINERS							s.d. =	1.22927	CV% =	6.2084474		
temp:	1	1	2	3	4	5	6	7	8	9	10 no. young	no. adults		
temp:	1										0	10	0.00	
temp:	2										0	10	0.00	
temp:	3	1	1				2			1		5	10	0.50
temp:	4	3	3	4	2	5	3	4	4	2	2	32	10	3.20
temp:	5		2		4		1			3	1	11	10	1.10
temp:	6	7	5	7	6	8	7	7	5	6	7	65	10	6.50
temp:	7		3		3				5		2	13	10	1.30
temp:	8	8	5	7	6	7	9	10	5	7	8	72	10	7.20
	TOTAL	19	19	18	21	20	22	21	19	19	20	198	10	19.80



16543 City of Hope Cerio 11-19-13 1620

CONC.	DAY	REPLICATE CONTAINERS										s.d.=	CVX =	#DIV/O!
control	1	2	3	4	5	6	7	8	9	10	no. youn	no. adults	young/adult	
temp:	1										0	10	#DIV/O!	
temp:	2										0	10	#DIV/O!	
temp:	3										0	10	#DIV/O!	
temp:	4	4	4	3	2	2	4	4	3		0	10	#DIV/O!	
temp:	5	2		4			3	7	1	4	2	0	10	#DIV/O!
temp:	6	6	5	5	7	6	4	7	7	4	6	0	10	#DIV/O!
temp:	7	3	2			4						0	10	#DIV/O!
temp:	8	8	7	9	8	6	9	10	7	8	7	0	10	#DIV/O!
* TOTAL		0	0	0	0	0	0	0	0	0	0	0	10	0.00

CONC.	DAY	REPLICATE CONTAINERS										s.d.=	CVX =	#DIV/O!
31.6	1	2	3	4	5	6	7	8	9	10	no. youn	no. adults	young/adult	
temp:	1										0	10	#DIV/O!	
temp:	2										0	10	#DIV/O!	
temp:	3			1			2				0	10	#DIV/O!	
temp:	4	1	4	3	5	2	2	4	3	1	4	0	10	#DIV/O!
temp:	5	2			1			1		3		0	10	#DIV/O!
temp:	6	6	7	7	7	7	7	6	8	7	5	0	10	#DIV/O!
temp:	7		1	8	2			4		3		0	10	#DIV/O!
temp:	8	9	8	8	7	9	9	6	10	7	8	0	10	#DIV/O!
* TOTAL		0	0	0	0	0	0	0	0	0	0	0	10	0.00

CONC.	DAY	REPLICATE CONTAINERS										s.d.=	CVX =	#DIV/O!
42.2	1	2	3	4	5	6	7	8	9	10	no. youn	no. adults	young/adult	
temp:	1										0	10	#DIV/O!	
temp:	2										0	10	#DIV/O!	
temp:	3			1			2				0	10	#DIV/O!	
temp:	4	2	5	3	3	3	3	4	2	5	1	0	10	#DIV/O!
temp:	5	6	3	3	1			2		2		0	10	#DIV/O!
temp:	6		5	7	7	6	6	5	7	5		0	10	#DIV/O!
temp:	7		5	2			2			3		0	10	#DIV/O!
temp:	8	11	5	9	9	9	8	9	9	8	6	0	10	#DIV/O!
* TOTAL		0	0	0	0	0	0	0	0	0	0	0	10	0.00

CONC.	DAY	REPLICATE CONTAINERS										s.d.=	CVX =	#DIV/O!
56.3	1	2	3	4	5	6	7	8	9	10	no. youn	no. adults	young/adult	
temp:	1										0	10	#DIV/O!	
temp:	2										0	10	#DIV/O!	
temp:	3			2				1	1		0	10	#DIV/O!	
temp:	4	3	3	2	4	2	2	2	4	3		0	10	#DIV/O!
temp:	5		1			2	1	2		4		0	10	#DIV/O!
temp:	6	8	7	6	5	7	7	7	6	6	7	0	10	#DIV/O!
temp:	7		5		4		1	2				0	10	#DIV/O!
temp:	8	5	10	8	7	6	8	8	8	8	9	0	10	#DIV/O!
* TOTAL		0	0	0	0	0	0	0	0	0	0	0	10	0.00

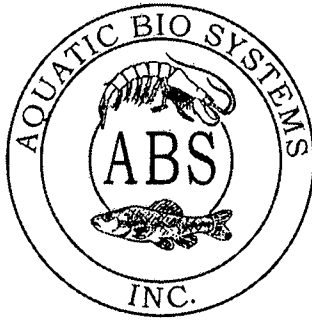
CONC.	DAY	REPLICATE CONTAINERS										s.d.=	CVX =	#DIV/O!
75	1	2	3	4	5	6	7	8	9	10	no. youn	no. adults	young/adult	
temp:	1										0	10	#DIV/O!	
temp:	2										0	10	#DIV/O!	
temp:	3			2				3		1		0	10	#DIV/O!
temp:	4	5	1	3	3	3	4	2	4	2	3	0	10	#DIV/O!
temp:	5		6					1		3		0	10	#DIV/O!
temp:	6	3	7	7	6	6	8	7	5	7	6	0	10	#DIV/O!
temp:	7	5			3			1	4		2	0	10	#DIV/O!
temp:	8	7	9	10	7	8	8	9	7	11	9	0	10	#DIV/O!
* TOTAL		0	0	0	0	0	0	0	0	0	0	0	10	0.00

CONC.	DAY	REPLICATE CONTAINERS										s.d.=	CVX =	#DIV/O!
100	1	2	3	4	5	6	7	8	9	10	no. youn	no. adults	young/adult	
temp:	1										0	10	#DIV/O!	
temp:	2										0	10	#DIV/O!	
temp:	3		1				2			1		0	10	#DIV/O!
temp:	4	3	3	4	2	5	3	4	4	2	2	0	10	#DIV/O!
temp:	5		2		4					3	1	0	10	#DIV/O!
temp:	6	7	5	7	6	8	7	7	5	6	7	0	10	#DIV/O!
temp:	7		3		3				5		2	0	10	#DIV/O!
temp:	8	8	5	7	6	7	9	10	5	7	8	0	10	#DIV/O!
* TOTAL		0	0	0	0	0	0	0	0	0	0	0	10	0.00

Fig. 2 - CERIO page 34

APPENDIX B  
ORGANISM HISTORY

1300 Blue Spruce Drive, Suite C  
Fort Collins, Colorado 80524



Toll Free: 800/331-5916  
Tel: 970/484-5091 Fax: 970/484-2514

### ORGANISM HISTORY

DATE: 11/18/2013

SPECIES: *Pimephales promelas*

AGE: N/A

LIFE STAGE: Embryo

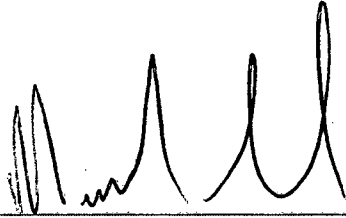
HATCH DATE: 11/18/2013

BEGAN FEEDING: N/A

FOOD: N/A

Water Chemistry Record:	Current	Range
TEMPERATURE:	<u>22°C</u>	<u>--</u>
SALINITY/CONDUCTIVITY:	<u>--</u>	<u>--</u>
TOTAL HARDNESS (as CaCO <sub>3</sub> ):	<u>128 mg/l</u>	<u>--</u>
TOTAL ALKALINITY (as CaCO <sub>3</sub> ):	<u>80 mg/l</u>	<u>--</u>
pH:	<u>7.98</u>	<u>--</u>

Comments:

  
\_\_\_\_\_  
*Facility Supervisor*

*Rec'd  
11-19-13*

APPENDIX C  
CHAINS OF CUSTODY





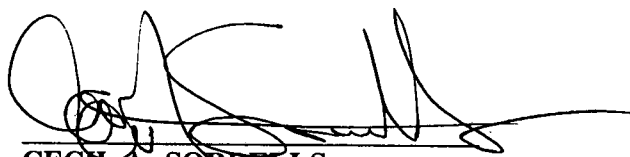


APPENDIX D  
LABORATORY CONTROL  
CERIO CULTURE RECORD

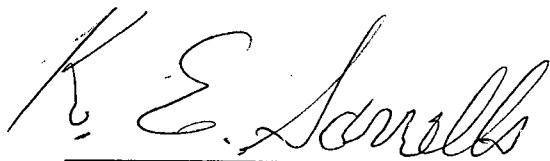


**BIOMONITORING ANALYSIS  
BY  
SORRELLS RESEARCH ASSOCIATES, INC**

**REVIEW**



**CECIL A. SORRELLS  
BIOMONITORING MANAGER/PRESIDENT**



**K.E. SORRELLS, M.S.  
QUALITY ASSURANCE/OFFICER**

City of Hope  
PO Box 6667  
Hope, AR  
71802-0667



ADEQ  
NPDES Enforcement Section  
5301 Northshore Drive  
North Little Rock, AR  
72218-5317

