

**TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC.**

HEADQUARTERS: P.O. BOX 33695 DENVER, COLORADO 80233-0695 303-452-6111

March 31, 2017

Mr. Eric Mink
Water Quality Control Division
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

RE: Notification of Chronic WET Results for Outfall 013 and
Accelerated WET Testing Notification
New Horizon Mine, CDPS Permit #CO-0000213

Dear Mr. Mink:

On March 29, 2017, the third party laboratory, The Seacrest Group, provided the enclosed analytical report to Tri-State Generation and Transmission Association (Tri-State) containing the first quarter Whole Effluent Toxicity (WET) testing results for Outfall 013 at the Elk Ridge Mining and Reclamation, LLC (Elk Ridge) New Horizon Mine (CDPS Permit #CO-0000213). Tri-State is the parent of Elk Ridge. Therefore, we are providing the required notification of WET results, in accordance with Part I.D.1b of the permit.

Outfall	Species	Reproduction Results		IWC
		NOEC*	IC25**	
013	<i>Ceriodaphnia dubia</i>	40%	28.1%	100%

*NOEC means "no observed effect concentration" at which concentration there are no observable adverse effects on the organisms.

**IC25 means inhibition concentration causing a 25% reduction in the biological measurement.

As noted in the recent permit modification, fourth and first quarter WET testing is "report only" at Outfall 013 until September 30, 2020 (delayed effective date). While the NOEC and IC25 are reported, results below the instream waste concentration (IWC) are not a permit violation.

In accordance with the permit, the facility is commencing accelerated WET testing within two weeks for the sensitive species for this outfall location to determine if there is a pattern of toxicity. We will report these results to the Division when available. We will also be submitting the initial WET test summary and chains of custody with the March 2017 Discharge Monitoring Report (DMR) by April 28, 2017.

AN EQUAL OPPORTUNITY / AFFIRMATIVE ACTION EMPLOYER

A Touchstone Energy Cooperative



CRAIG STATION
P.O. BOX 1307
CRAIG, CO 81626-1307
970-824-4411

ESCALANTE STATION
P.O. BOX 577
PREWITT, NM 87045
505-972-5200

NUCLA STATION
P.O. BOX 698
NUCLA, CO 81424-0698
970-864-7316



Mr. Eric Mink
March 31, 2017
Page 2

If you have any questions on this notification, please contact Chantell Johnson at 303-254-3185 (cjohnson@tristategt.org) or Darlene Crosby at 303.254.3055 (dcrosby@tristategt.org).

Sincerely,

Barbara A. Walz
Senior Vice President
Policy and Compliance
Chief Compliance Officer

BAW:CJ:db

Enclosures

cc: Brock Bowles, DRMS (via email)
Darlene Crosby (via email)
Chantell Johnson (via email)

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bcc: Dan Casiraro (via email)
Frank Ferris (via email)
Tom Fry (via email)
Chris Gilbreath (via email)
Tony Tennyson (via email)
File G474-11.3(10)a-5

AN EQUAL OPPORTUNITY / AFFIRMATIVE ACTION EMPLOYER

A Touchstone Energy* Cooperative 



March 28, 2017

Mr. Thomas Fry
Elk Ridge Mining and Reclamation
27646 W 5th Ave.
Nucla, CO 81424

Dear Mr. Fry:

Enclosed is the report for chronic biomonitoring tests performed for Elk Ridge Mining and Reclamation on effluent from the New Horizon Mine NPDES 013 discharge. There were statistically significant toxicity effects to the *Ceriodaphnia dubia* species resulting in a reproduction No Observable Effect Concentration (NOEC) of 40% and an IC₂₅ of 28.1%.

Per permit no. CO0000213, during the first and fourth quarters of the year Elk Ridge Mining and Reclamation is responsible for implementing the automatic compliance response provision when both the NOEC and IC₂₅ are below the IWC of 100%. Since the current effluent meets these criteria they will be moving into accelerated testing using the single species found to be more sensitive, *C. dubia*.

If you have any questions or concerns, please do not hesitate to contact me at (303) 661-9324.

Best regards,

Kyra Brisson
Laboratory Manager
Enclosure(s): Invoice
Report



500 S Arthur Ave. Suite 450
Louisville, CO 80027-3065
(303) 661-9324 Phone
(303) 661-9325 Fax

Invoice
Invoice Number:
317186.B
Invoice Date:
March 28, 2017

BILL TO:

Elk Ridge Mining and Rec.
27646 W. 5th Ave.
Nucla, CO 81424

Customer Contact	Customer PO#	Terms	Customer ID
Mr. Thomas Fry	NHM 013	Payable Upon Receipt	Western Fuels

QTY	Description	Unit Price	Extended Price
1	Chronic biomonitoring tests conducted on effluent from the New Horizon Mine 013 discharge using <i>Ceriodaphnia dubia</i>	\$1,733.00	\$1,733.00

Total: \$1,733.00

*All invoices are due and payable upon receipt.
Outstanding balances over 30-days are subject to a finance charge of 1.5% per month.*

THANK YOU FOR YOUR BUSINESS!

**REVISED RESULTS OF CHRONIC BIOMONITORING TESTS
CONDUCTED FOR ELK RIDGE MINING AND RECLAMATION
ON THE
NEW HORIZON MINE OUTFALL 013 SITE**

Prepared for:

Mr. Thomas Fry
Elk Ridge Mining and Reclamation
P.O. Box 628
Nucla, CO 801424

Prepared by:

SeaCrest Group
500 S Arthur Ave. Suite 450
Louisville, Colorado 80027-3065
(303) 661-9324

March 28, 2017

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Chronic Toxicity Test Summary

Test:

- 7-day static renewal using *Ceriodaphnia dubia*.
- 7-day static renewal using Fathead minnow (*Pimephales Promelas*).

Client: Elk Ridge Mining and Reclamation

Test Procedure Followed:

- *Ceriodaphnia dubia*: EPA/821/R-02-013. Method 1002.0 (2002)
- Fathead minnow: EPA/821/R-02-013. Method 1000.0 (2002)

Sample Number: 317186.B

Sample	Time of Collection	Date of Collection	Time of Receipt	Date of Receipt
Effluent 1	1050	03-13-2017	1005	03-14-2017
Effluent 2	1025	03-15-2017	1008	03-16-2017
Effluent 3	1100	03-17-2017	1015	03-18-2017

	<i>Ceriodaphnia dubia</i>	Fathead minnow
Test Initiation Time	1120	1240
Test Initiation Date	03-14-2017	03-14-2017
Test Completion Time	1200	1210
Test Completion Date	03-20-2017	03-21-2017

Dilution Water:

- Moderately hard laboratory reconstituted water

Test Organism Source:

- *Ceriodaphnia dubia*
SeaCrest Group
- Fathead minnow
Aquatic Biosystems, Inc.

Reference Toxicant:

- Sodium Chloride/ Potassium Chloride

Abstract of Results

Test Concentrations:	Control (0%), 20%, 40%, 60%, 80%, 100%
Number of Organisms/Concentration:	10 for <i>Ceriodaphnia dubia</i> 40 for Fathead minnow
Replicates at each Concentration:	10 for <i>Ceriodaphnia dubia</i> 4 for Fathead minnow

	<i>Ceriodaphnia dubia</i>	Fathead minnow
Test vessel size	30ml	500ml
Exposure volume	16ml	250ml
Pass/Fail Status	FAIL	PASS
Temperature Range (°C)	24.1 – 25.3	24.1 – 25.9
Dissolved Oxygen Range (mg/L)	6.2 – 7.6	4.1 – 7.9
pH Range	6.6 – 8.1	6.5 – 8.1
	CONTROL (<i>Cerio</i>/FHM)	100%
Alkalinity (mg/L as CaCO ₃)	64/64	532/448/400
Hardness (mg/L as CaCO ₃)	100/92	2220/2740/2290
Total residual chlorine (mg/L)	<0.01	<0.01
Total ammonia (mg/L as NH ₃)	<0.03	2.75/2.74/1.06

INTRODUCTION

Biomonitoring provides an effective means by which the toxicity of discharges from municipal, industrial and mining operations can be tested. Among the advantages of biomonitoring is the ability to test complex effluents containing a broad range of contaminants. Biomonitoring, when used in conjunction with chemical analyses, can generate data capable of identifying a much wider range of contaminants.

The Colorado Water Quality Control Division requires certain NPDES permittees to perform acute and/or chronic biomonitoring tests. The chronic test measures significant differences in lethality and in reproduction (*Ceriodaphnia dubia*) or growth (Fathead minnow – *Pimephales promelas*) between control and exposed organisms.

The present report discusses the results of chronic biomonitoring tests conducted on effluent from Elk Ridge Mining and Reclamation New Horizon Mine 013 discharge. These tests were conducted in March 2017.

MATERIALS AND METHODS

Sample Collection

Two gallons of effluent were collected on three separate dates. Samples were delivered chilled to the SeaCrest lab where they were held at 0-6°C. Chain of custody forms showing sample collection and lab arrival times are included in Appendix 1.

Dilution Water

Laboratory reconstituted water was used as both the dilution water source and the control for the tests. Reconstituted water for the *Ceriodaphnia dubia* test was produced by adding sodium bicarbonate, calcium sulfate, magnesium sulfate, potassium chloride, and sodium selenate to deionized water. Reconstituted water for the Fathead minnow test was produced by adding sodium bicarbonate, calcium sulfate, magnesium sulfate and potassium chloride to deionized water.

Test Organisms

The biomonitoring tests were conducted with *Ceriodaphnia dubia* and Fathead minnow. *Ceriodaphnia dubia* is cultured in the SeaCrest laboratory. Stock cultures are maintained in 5-gallon aquaria. Brood females are cultured in individual plastic beakers on brood boards for a period of up to 14-days. Neonates less than 24-hours old released from third or subsequent broods of eight or more within an 8-hour period are removed from the brood chambers and used in tests. Brood and stock organisms are fed daily with a mixture of Yeast, Cereal Leaves and Trout Chow (YCT). This is supplemented with an equal volume of green algae (*Selenastrum capricornutum*).

Less than one-day-old Fathead minnow, cultured in Aquatic BioSystems, Inc., were also used in the test. The larval fish are fed newly hatched Brine shrimp (*Artemia* sp.) at least twice per day.

Test Procedures

Upon receipt at the lab, samples are analyzed for alkalinity, hardness, conductivity, dissolved oxygen, ammonia, chlorine and pH. Alkalinity and hardness are determined titrimetrically according to methods described in Hach Chemical Company¹. Ammonia is measured by a Thermo Orion ion-selective electrode according to the procedures in APHA/AWWA/WEF². Conductivity, dissolved oxygen and pH probes were used to take these measurements.

The test followed the procedures in EPA³ and CDPHE⁴ guidelines. Exposure concentrations included control (0%), 20%, 40%, 60%, 80% and 100% mixtures, diluted with moderately hard laboratory reconstituted water.

Individual *Ceriodaphnia dubia* were placed in 30ml plastic containers containing approximately 15ml of exposure medium. Ten replicates at each concentration were used. The animals were fed daily with the YCT mixture and an equal volume of the green algae (*Selenastrum capricornutum*). The exposure medium was changed daily in each container and the number of young released overnight were counted and recorded. Young were removed from the containers daily and discarded. Routine measurements were made each day of temperature, dissolved oxygen and pH before and after the water changes.

Fathead minnow were exposed in 500ml plastic cups to which 250ml of media was added and replaced daily. Four replicates were used at each concentration. Ten fish, less than 24-hours old, were placed in each cup. The fish were monitored daily for survival and fed live Brine shrimp at least twice per day. After seven days, the fish were removed from the cups, euthanized, and then placed in aluminum pans and dried in an oven for a minimum of six hours at 100°C. The pans were then weighed on a five-place analytical balance to determine the average dry weight of the fish from each replicate.

Data Analysis

Data from the test(s) were analyzed on a personal computer using the TOXCALC package developed by Tidepool Scientific Software. Statistical tests used in the analyses are shown in Table 1. Test acceptability was determined using control survival and performance criteria, concentration-response relationships and percent minimum significant differences (USEPA^{5,6}).

Table 1. Statistics methods used in testing for significant differences in test parameters.

Species	Normality		Homogeneity	
<i>Ceriodaphnia dubia</i>	Kolmogorov Test		Bartlett's Test	
Fathead minnow	Shapiro – Wilk's Test		Bartlett's Test	
Statistical Difference				
	Survival	Growth	Reproduction	IC ₂₅
<i>Ceriodaphnia dubia</i>	Fisher's Exact Test	N/A	Steel's Many-One Rank Test	IC _p
Fathead minnow	Steel's Many-One Rank Test	Dunnett's Test	N/A	IC _p

RESULTS

Ceriodaphnia dubia Test Results

Test results for the *Ceriodaphnia dubia* are summarized in Table 2 and provided on the data sheets located in Appendix 2. Survival was 70% in the 100% effluent concentration and ranged from 70% - 100% in the remaining effluent concentrations. Control survival was 100%. Statistically significant mortality was measured in the 100% effluent concentration when compared to the control. The No Observable Effect Concentration (NOEC) for lethality was 100%. The IC₂₅ for lethality was 75%.

Table 2. Summary of *Ceriodaphnia dubia* test results. Ten animals were exposed at each concentration. An asterisk (*) denotes a statistically significant difference from the control.

Concentration	No. Surviving	Mean Births	Min.	Max.	Significant Difference	
					Lethality	Reprod.
Control (0%)	10	23.2	9	30		
20%	10	18.5	10	29		
40%	10	15.8	0	28		
60%	9	14.5	1	24		*
80%	7	2.4	0	10		*
100%	7	2.1	0	10		*

Average numbers of neonates was 2.1 in the 100% effluent concentration and ranged from 2.4 - 18.5 in the remaining effluent concentrations. Average number of neonates in the control was 23.2 for statistical analyses and test acceptability criteria. A statistically significant difference in the number of neonates was found between the control and the 60%, 80% and 100% effluent concentration. The NOEC for reproduction was 40%. The IC₂₅ for reproduction was 28.1%.

Fathead minnow Test Results

Fathead minnow results are summarized in Table 3 and are provided on data sheets in Appendix 3. Survival was 75% in the 100% effluent concentration and ranged from 85% - 98% in the remaining effluent concentrations. Control survival was 100%. No statistically significant mortality was measured in any effluent concentration when compared to the control. The NOEC for lethality was 100%. The IC₂₅ for lethality was >100%.

Table 3. Summary of Fathead minnow test results. Forty fish were exposed at each concentration. An asterisk (*) denotes a statistically significant difference from the control.

Concentration	No. Alive	Avg. Wt. (mg)	Min.	Max.	Significant Difference	
					Lethality	Growth
Control (0%)	40	0.502	0.389	0.605		
20%	39	0.655	0.541	0.765		
40%	39	0.567	0.542	0.633		
60%	39	0.656	0.576	0.728		
80%	34	0.502	0.437	0.594		
100%	30	0.362	0.269	0.453		

Average weight in the 100% effluent concentration was 0.362mg per individual and ranged from 0.502mg - 0.656mg per individual in the remaining effluent concentrations. Average weight for the control fish was 0.502mg for statistical analyses and for test acceptability criteria. No statistically significant differences were measured for growth in any effluent concentration when compared to the control. The NOEC for growth was 100%. The IC₂₅ for growth was 87.9%.

Test Acceptability

Acceptable control survival was achieved in both tests. Similarly, *Ceriodaphnia dubia* reproduction and Fathead minnow growth in control organisms met required levels. PMSD was within the required limits for an acceptable test (Table 4).

Table 4. PMSD for chronic test parameters.

PMSD (% Minimum significant difference)	Survival		Growth		Reproduction		Result
	<i>Ceriodaphnia dubia</i>	Fathead Minnow	Lower bound	Upper bound	Lower bound	Upper bound	Test parameters deemed to be acceptable if numbers fall within limits for the test.
			12	30	13	47	
	N/A	N/A	28.7		28.6		

DISCUSSION

A test is a violation of a permit limitation for this discharge when both the NOEC and the IC₂₅ are at any effluent concentration less than the IWC. A test is a failure when one of the two statistical endpoints, either the NOEC or the IC₂₅, is at any effluent concentration less than the IWC. Per permit no. CO0000213, during the first and fourth quarters of the year this discharge is responsible for implementing the automatic compliance response provision when both the NOEC and IC₂₅ are below the IWC. During the second and third quarter of the year this discharge is responsible for implementing automatic compliance response provision when either the NOEC or the IC₂₅ are below the IWC or when two consecutive reporting periods have resulted in failure of one of the two statistical endpoints, either NOEC or IC₂₅. The IWC for this permit has been determined to be 100%.

There were statistically significant lethality toxicity effects to the *Ceriodaphnia dubia* species in the 40%, 60%, 80% and 100% effluent concentration resulting in an IC₂₅ of 75.0%. There was also statistically significant reproduction toxicity resulting in a reproduction NOEC of 40% and an IC₂₅ 28.1%. Since the current effluent meets the criteria for automatic compliance response, they will be moving into accelerated testing using the single species found to be more sensitive, *C. dubia*.

REFERENCES

1. **Hach Chemical Company.** 2008. *Hach's Water Analysis Handbook*. Fifth Edition. Hach Chemical Company, Loveland, Colorado. Digital Medium.
2. **APHA/AWWA/WEF.** 1998. *Standard Methods for the Examination of Water and Wastewater*. 20th Edition. American Public Health Association, Washington, D.C.
3. **USEPA.** 2002. *Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*. EPA-821-R-02-013. 335 pp.
4. **CDPHE (Colorado Department of Public Health and Environment).** 1998. *Laboratory Guidelines for Conducting Whole Effluent Toxicity Tests*. Water Quality Control Division.
5. **USEPA.** 2000. *Method of Guidance and Recommendations for Whole Effluent Toxicity (WET) Testing* (40 CFR Part 136). EPA/821/B-00/004.
6. **USEPA.** 2000. *Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications under the National Pollutant Discharge Elimination System Program*. EPA/833/R-00/003.

Appendix 1 – Chain of Custody Form



CHAIN OF CUSTODY

500 S. Arthur Avenue, Unit 450 - Louisville, CO 80027
(303) 661.9324 - FAX (303) 661.9325

Client/Project Name: ELK RIDGE WILDLIFE AND RECREATION			
P.O./Project Number: NEW HORIZON ALPINE			
Contact: Tom Fry			
Address: 27646 W 50th Ave Nixa, MO 64294			
Phone # 970 864 1073		E-Mail: TFry@RESTATEGROUP.COM	
Fax # 970 864 2165		Sampler: TFry	
Report By: ☐ Mail ☒ PDF ☐ FAX			
Sample Location or ID	Date	Time	Grab/Comp
NPDES 013	3.13.17	1050	G
Lab ID (LAB Use Only): 3718-81			
WET: Acute (Indicate Below)			
WET: Chronic (Indicate Below)			
WET: Accelerated (Indicate Below)			
WET: PTI/TIE/TRE (Indicate Below)			
Metals (List Below)			
Solids (TS/TDS/TSS) (Circle)			
Anions (List Below)			
Chromium III/VI (Circle)			
Oil and Grease			
Coliform (Total/Fecal/E-Coli) (Circle)			
BOD/COD (Circle)			
Other Analysis (List Below)			
Number of Containers			
Total Volume			

Turnaround Requirements (Analytical Testing Only)		Test Species: ☒ Fathead Minnow ☐ Cerio daphnia ☐ Daphnia magna ☐ Daphnia pulex ☐ Other (List Below)	
Standard (10 days)	6-9 Day		
3-5 Day	1-2 Day		
Special Instructions/Comments:			
Requested Report Date:			
Relinquished By (1)		Received By (1)	
Signature: <i>[Signature]</i>	Date/Time: 3.13.17 1200	Signature: <i>[Signature]</i>	Date/Time: 03/14/17 1005

Sample Receipt Form

Form #: 42
Effective: December 2008

Project #: 317 185.13

Date: 03/11/17

Samples Were:

1. Shipped Hand Delivered Messengered

Notes:

Sample #: 1

Initials: ND

(circle one)

3. Chilled to Ship

Notes:

Ambient Chilled (circle one)

Wet Ice Blue Ice (circle one)

4. Cooler Received Broken or Leaking

Notes:

Y N NA

5. Sample Received Broken or Leaking

Notes:

Y N NA

6. Received Within Holding Times

Notes:

Y N

7. Aeration necessary

Notes:

Y N NA

8. Sample Received at Temperature between 0-6° C.

Notes:

Y N NA

9. Description of Sample (Color, Odor, and/or Presence of Particulate Matter):

eff: clear, some PM

rec'g

Temp	DO (mg/L)	DO (%Sat)	pH	Cond	Aeration			
					Time	DO (mg/L)	DO (%Sat)	pH
<u>3.9</u>	<u>6.2</u>	<u>83.4</u>	<u>6.6</u>	<u>3100</u>				
<u>4.3</u>								

Custody Seals:

1. Present on Outer Package

Y N

2. Unbroken on Outer Package

Y N NA

3. Present on Sample

Y N

4. Unbroken on Sample

Y N NA

Custody Documentation:

1. Present Upon Receipt of Sample

Y N



500 S. Arthur Avenue, Unit 450 - Louisville, CO 80027
(303) 661.9324 - FAX (303) 661.9325

[illegible]

Sample Receipt Form

Project #: 317 186.B
Date: 03/16/17

Sample #: 2
Initials: SB

Samples Were:

1. Shipped Hand Delivered Messengered (circle one)

Notes:

VPS

3. Chilled to Ship

Notes:

Ambient Chilled (circle one)

Wet Ice Blue Ice (circle one)

4. Cooler Received Broken or Leaking

Notes:

Y N NA

5. Sample Received Broken or Leaking

Notes:

Y N NA

6. Received Within Holding Times

Notes:

Y N

7. Aeration necessary

Notes:

Y N NA

8. Sample Received at Temperature between 0-6°C.

Notes:

5.9°C

Y N NA

9. Description of Sample (Color, Odor, and/or Presence of Particulate Matter):

eff:

Clear, No PM

rec'g

	Temp	DO (mg/L)	DO (%Sat)	pH	Cond	Time	Aeration		
							DO (mg/L)	DO (%Sat)	pH
	<u>5.9</u>	<u>6.4</u>	<u>90.5</u>	<u>6.8</u>	<u>3440</u>				

Custody Seals:

1. Present on Outer Package

Y N

2. Unbroken on Outer Package

Y N NA

3. Present on Sample

Y N

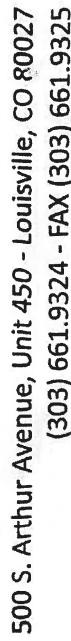
4. Unbroken on Sample

Y N NA

Custody Documentation:

1. Present Upon Receipt of Sample

Y N



Sample Receipt Form

Project #: 317 186.B

Date: 03/8/17

Sample #: 3

Initials: SIB

Samples Were:

1. Shipped Hand Delivered Messengered (circle one)

Notes:

UPS

3. Chilled to Ship

Notes:

Ambient Chilled (circle one)

Wet Ice Blue Ice (circle one)

4. Cooler Received Broken or Leaking

Notes:

Y N NA

5. Sample Received Broken or Leaking

Notes:

Y N NA

6. Received Within Holding Times

Notes:

Y N

7. Aeration necessary

Notes:

Y N NA

8. Sample Received at Temperature between 0-6° C.

Notes:

4.0°C

Y N NA

9. Description of Sample (Color, Odor, and/or Presence of Particulate Matter):

eff:

Clear, No PM

rec'g

	Temp	DO (mg/L)	DO (%Sat)	pH	Cond	Time	Aeration		
							DO (mg/L)	DO (%Sat)	pH
	<u>4.0</u>	<u>7.7</u>	<u>111.8</u>	<u>6.8</u>	<u>3100</u>				

Custody Seals:

1. Present on Outer Package

Y N

2. Unbroken on Outer Package

Y N NA

3. Present on Sample

Y N

4. Unbroken on Sample

Y N NA

Custody Documentation:

1. Present Upon Receipt of Sample

Y N

Appendix 2 – Data Sheets for the *Ceriodaphnia dubia* Test

WET TEST REPORT FORM – CHRONIC

Permittee: Elk Ridge Mining and Reclamation

Outfall: 013

Permit No.: CO-0000213

Test Type: Routine ☒ Accelerated ☐

Test Species: *Ceriodaphnia dubia*

IWC: 100%

Test Start Time	Test Start Date	Test End Time	Test End Date
1120	03-14-2017	1200	03-20-2017

Test Results	Lethality	Reproduction
NOEC	100%	40%
	PASS	FAIL
IC ₂₅	75%	28.1%
	FAIL	FAIL

Dilution(s) - % Effluent

Measurements	Control (0%)	20%	40%	60%	80%	100%
% Survival for day 1	100	100	100	100	100	100
% Survival for day 2	100	100	100	100	100	100
% Survival for day 3	100	100	100	100	80	80
% Survival for day 4	100	100	100	100	80	80
% Survival for day 5	100	100	100	100	80	80
% Survival for day 6	100	100	100	90	70	70
Mean 3 Brood Total	23.2	18.5	15.8	14.5	2.4	2.1

Hardness (mg/L) – Receiving Water: N/A Effluent: 2220/2740/2290 Recon Water: 100

Alkalinity (mg/L) – Receiving Water: N/A Effluent: 532/448/400 Recon Water: 64

Chlorine (mg/L) – Effluent: <0.01 pH (initial/final) – Control: 8.1/8.0 100%: 6.6/7.7

Total Ammonia as NH₃ (mg/L) - Effluent: 2.75/2.74/1.06

Were all Test Conditions in Conformance with Division Guidelines? YES ☒ NO ☐

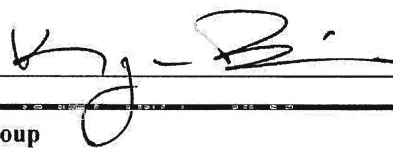
If **NO**, list deviations from test specifications:

Laboratory: SeaCrest Group

Comments:

Analyst's Name: Samuel Boisseau, Madison Reese, Kyra Brisson and Natalie Jones

Signature



Date

03-28-17

Permittee: Eik Ridge Lab #: 317 1812.B Site: NPDES 013
IWC %: 100 Template #: 5 Dilution Water: MH 1700W Sample Date: 031317
Age & Source: cerio 031417 4010 Test Start: 031417 1120 Test End: 1200 0302-0300 03017
Test Conditions:

	0	1	2	3	4	5	6	7	8	Total
(C) 0	0	0	0	0	0	0	0	0	0	25
	0	0	0	0	0	0	0	0	0	30
	0	0	0	0	0	0	0	0	0	22
	0	0	0	0	0	0	0	0	0	25
	0	0	0	0	0	0	0	0	0	25
	0	0	0	0	0	0	0	0	0	30
	0	0	0	0	0	0	0	0	0	27
	0	0	0	0	0	0	0	0	0	23
	0	0	0	0	0	0	0	0	0	16
	0	0	0	0	0	0	0	0	0	9
DO	7.1	6.9	6.9	6.7	7.1	7.1	7.0	6.8	7.0	6.2
Temp	24.1	24.4	24.2	24.1	24.3	24.1	24.2	24.3	24.1	25.1
pH	8.1	7.7	7.9	7.9	8.0	8.1	7.8	8.0	8.1	8.0
Cond	2210	302	311	313	315	311	311	311	311	311
(1) 20	0	0	0	0	0	0	0	0	0	11
	0	0	0	0	0	0	0	0	0	29
	0	0	0	0	0	0	0	0	0	23
	0	0	0	0	0	0	0	0	0	25
	0	0	0	0	0	0	0	0	0	13
	0	0	0	0	0	0	0	0	0	15
	0	0	0	0	0	0	0	0	0	16
	0	0	0	0	0	0	0	0	0	25
	0	0	0	0	0	0	0	0	0	15
	0	0	0	0	0	0	0	0	0	21
DO	7.0	6.8	6.9	6.7	7.1	7.1	7.0	6.8	7.1	6.4
Temp	24.2	24.3	24.2	24.1	24.3	24.2	24.2	24.3	24.1	25.1
pH	7.0	7.7	7.7	7.9	7.9	8.0	7.0	7.8	7.8	8.0
Cond	125	1015	111	10810	1039	922	922	922	922	922
(2) 40	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	28
	0	0	0	0	0	0	0	0	0	26
	0	0	0	0	0	0	0	0	0	16
	0	0	0	0	0	0	0	0	0	27
	0	0	0	0	0	0	0	0	0	215
	0	0	0	0	0	0	0	0	0	12
	0	0	0	0	0	0	0	0	0	10
	0	0	0	0	0	0	0	0	0	16
	0	0	0	0	0	0	0	0	0	9
DO	11.8	6.5	6.9	6.7	7.0	7.1	7.0	6.9	7.2	6.8
Temp	24.3	24.3	24.2	24.4	24.1	24.3	24.4	24.3	24.2	25.1
pH	11.8	7.7	7.4	7.9	7.9	7.9	7.0	7.8	7.8	7.9
Cond	1483	1668	1712	1705	1711	1711	1711	1711	1711	1711
(3) 110	0	0	0	0	0	0	0	0	0	16
	0	0	0	0	0	0	0	0	0	7
	0	0	0	0	0	0	0	0	0	17
	0	0	0	0	0	0	0	0	0	17
	0	0	0	0	0	0	0	0	0	24
	0	0	0	0	0	0	0	0	0	10
	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	24
	0	0	0	0	0	0	0	0	0	20
	0	0	0	0	0	0	0	0	0	9
DO	12.7	6.4	6.8	6.7	7.0	7.1	7.0	6.9	7.3	6.8
Temp	24.4	24.3	24.2	24.5	24.1	24.3	24.4	24.3	24.2	25.2
pH	11.7	7.7	7.7	7.9	7.7	7.9	7.7	7.9	7.3	7.9
Cond	14218	25200	2330	2440	2310	2310	2310	2310	2310	2310

EE

	0	1	2	3	4	5	6	7	8	Total
(4) 80	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	7
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	5	0	0	0	0	7
	0	0	0	0	0	7	3	0	0	10
DO	10.12	6.3	6.8	6.6	6.9	7.2	7.0	7.4	6.9	
Temp	24.18	24.2	24.2	24.6	24.1	24.3	24.3	24.3	25.2	2.4
pH	10.7	7.6	7.0	8.0	7.6	7.8	10.1	7.1	7.1	
Cond	2500	2890	2990	2040	2090	2220				
(5) 100	0	0	0	2	3	0	0	0	0	2
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
DO	10.12	6.2	6.7	6.6	6.8	7.2	7.0	7.4	6.9	
Temp	24.8	24.1	24.1	24.8	24.1	24.3	24.2	24.8	24.3	2.1
pH	10.12	7.6	6.7	8.0	7.4	7.8	10.1	7.1	7.1	
Cond	3000	3350	3460	3480	3520	3110				
Algae	APD/ABS	APD/ABS	APD/ABS	APD/ABS	APD/ABS	APD/ABS				
YCT	1702	1702	1702	1702	1702	1702				
H ₂ O	1	1	1	2	2	3				
Initials	MR	SR	SR	MR	MR	MR				
	Eff #1	Eff #2	Eff #3	Rec'g #1	Rec'g #2	Rec'g #3	Recon #1	Recon #2	Recon #3	
Hardness	2220	2740	2290				100			
Alkalinity	532	444	400				64			
Chlorine	20.01	20.01	20.01				20.01			
Ammonia	2.75	2.74	1.06				20.03			

1. Exposure Chamber

Total Capacity: 30 ml
Test Solution Surface Area: cm²

Test Solution Volume: 15 ml
Water Depth (constant): cm
(cyclic): to cm

2. Feeding Schedule

Not fed:
Fed Irregularly:

Fed Daily: X
Food Used: YCT, algae

3. Aeration

#1 None:
#2 None:
#3 None:

Before Use: (minutes @ ~100 bubbles/min)
Before Use: (minutes @ ~100 bubbles/min)
Before Use: (minutes @ ~100 bubbles/min)

4. Screened Animal Enclosures

Not Used: X Used: cm diameter

5. Condition/appearance of surviving organisms at end of test (i.e., alive but immobile; loss of orientation, erratic movement, etc.):

active and healthy

6. Comments:

x,y,z = board #:row.column									
1	2	3	4	5	6	7	8	9	10
C10	D3	D5	D0	D7	D8	D9	E9	E2	E4

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date: 3/14/2017	Test ID: 317186cd	Sample ID: EFFFIN-Effluent Final
End Date: 3/20/2017	Lab ID: SCG-Seacrest Group	Sample Type: EFF2-Industrial
Sample Date:	Protocol: EPAFW02-EPA/821/R-02-01	Test Species: CD-Ceriodaphnia dubia
Comments:		

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
20	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
40	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
60	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000
80	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
D-Control	1.0000	1.0000	0	10	10	10		
20	1.0000	1.0000	0	10	10	10	1.0000	0.0500
40	1.0000	1.0000	0	10	10	10	1.0000	0.0500
60	0.9000	0.9000	1	9	10	10	0.5000	0.0500
80	0.7000	0.7000	3	7	10	10	0.1053	0.0500
100	0.7000	0.7000	3	7	10	10	0.1053	0.0500

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	100	>100		1
Treatments vs D-Control				

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date: 3/14/2017	Test ID: 317186cd	Sample ID: EFFFIN-Effluent Final
End Date: 3/20/2017	Lab ID: SCG-Seacrest Group	Sample Type: EFF2-Industrial
Sample Date:	Protocol: EPAFW02-EPA/821/R-02-01	Test Species: CD-Ceriodaphnia dubia
Comments:		

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
20	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
40	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
60	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000
80	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					Isotonic	
			Mean	Min	Max	CV%	N	Mean	N-Mean
D-Control	1.0000	1.0000	1.0472	1.0472	1.0472	0.000	10	1.0000	1.0000
20	1.0000	1.0000	1.0472	1.0472	1.0472	0.000	10	1.0000	1.0000
40	1.0000	1.0000	1.0472	1.0472	1.0472	0.000	10	1.0000	1.0000
60	0.9000	0.9000	0.9948	0.5236	1.0472	16.644	10	0.9000	0.9000
80	0.7000	0.7000	0.8901	0.5236	1.0472	28.414	10	0.7000	0.7000
100	0.7000	0.7000	0.8901	0.5236	1.0472	28.414	10	0.7000	0.7000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.05)	3.00752	0.895	-1.6558	2.39357
Equality of variance cannot be confirmed				

Linear Interpolation (200 Resamples)					
Point	%	SD	95% CL	Skew	
IC05	50.000	8.579	43.333	70.000	0.8317
IC10	60.000				
IC15	65.000				
IC20	70.000				
IC25	75.000				
IC40	>100				
IC50	>100				

Ceriodaphnia Survival and Reproduction Test-Reproduction					
Start Date:	3/14/2017	Test ID:	317186cd	Sample ID:	EFFFIN-Effluent Final
End Date:	3/20/2017	Lab ID:	SCG-Seacrest Group	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	25.000	30.000	22.000	25.000	25.000	30.000	27.000	23.000	16.000	9.000
20	11.000	29.000	23.000	25.000	13.000	15.000	10.000	25.000	13.000	21.000
40	0.000	28.000	25.000	16.000	27.000	15.000	12.000	10.000	16.000	9.000
60	16.000	7.000	17.000	17.000	24.000	10.000	1.000	24.000	20.000	9.000
80	0.000	0.000	7.000	0.000	0.000	0.000	0.000	0.000	7.000	10.000
100	3.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	8.000	10.000

Conc-%	Mean	N-Mean	Transform: Untransformed					Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%	N		
D-Control	23.200	1.0000	23.200	9.000	30.000	27.697	10		
20	18.500	0.7974	18.500	10.000	29.000	37.036	10	84.50	75.00
40	15.800	0.6810	15.800	0.000	28.000	55.961	10	82.50	75.00
*60	14.500	0.6250	14.500	1.000	24.000	52.144	10	72.00	75.00
*80	2.400	0.1034	2.400	0.000	10.000	164.570	10	56.00	75.00
*100	2.100	0.0905	2.100	0.000	10.000	180.213	10	56.00	75.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution ($p \leq 0.05$)	0.90649	0.895	-0.1967	-0.0223
Bartlett's Test indicates equal variances ($p = 0.10$)	9.30038	15.0863		
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	40	60	48.9898	2.5
Treatments vs D-Control				

Ceriodaphnia Survival and Reproduction Test-Reproduction					
Start Date:	3/14/2017	Test ID:	317186cd	Sample ID:	EFFFIN-Effluent Final
End Date:	3/20/2017	Lab ID:	SCG-Seacrest Group	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	25.000	30.000	22.000	25.000	25.000	30.000	27.000	23.000	16.000	9.000
20	11.000	29.000	23.000	25.000	13.000	15.000	10.000	25.000	13.000	21.000
40	0.000	28.000	25.000	16.000	27.000	15.000	12.000	10.000	16.000	9.000
60	16.000	7.000	17.000	17.000	24.000	10.000	1.000	24.000	20.000	9.000
80	0.000	0.000	7.000	0.000	0.000	0.000	0.000	0.000	7.000	10.000
100	3.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	8.000	10.000

Conc-%	Mean	N-Mean	Transform: Untransformed					t-Stat	1-Tailed	
			Mean	Min	Max	CV%	N		Critical	MSD
D-Control	23.200	1.0000	23.200	9.000	30.000	27.697	10			
20	18.500	0.7974	18.500	10.000	29.000	37.036	10	1.617	2.287	6.647
*40	15.800	0.6810	15.800	0.000	28.000	55.961	10	2.546	2.287	6.647
*60	14.500	0.6250	14.500	1.000	24.000	52.144	10	2.993	2.287	6.647
*80	2.400	0.1034	2.400	0.000	10.000	164.570	10	7.155	2.287	6.647
*100	2.100	0.0905	2.100	0.000	10.000	180.213	10	7.259	2.287	6.647

Auxiliary Tests					Statistic		Critical		Skew	Kurt	
Kolmogorov D Test indicates non-normal distribution (p <= 0.05)					0.90649		0.895		-0.1967	-0.0223	
Bartlett's Test indicates equal variances (p = 0.10)					9.30038		15.0863				
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test		20	40	28.2843	5	6.64708	0.28651	750.35	42.25	2.3E-10	5, 54
Treatments vs D-Control											

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date: 3/14/2017	Test ID: 317186cd	Sample ID: EFFFIN-Effluent Final
End Date: 3/20/2017	Lab ID: SCG-Seacrest Group	Sample Type: EFF2-Industrial
Sample Date:	Protocol: EPAFW02-EPA/821/R-02-01	Test Species: CD-Ceriodaphnia dubia

Comments:

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	25.000	30.000	22.000	25.000	25.000	30.000	27.000	23.000	16.000	9.000
20	11.000	29.000	23.000	25.000	13.000	15.000	10.000	25.000	13.000	21.000
40	0.000	28.000	25.000	16.000	27.000	15.000	12.000	10.000	16.000	9.000
60	16.000	7.000	17.000	17.000	24.000	10.000	1.000	24.000	20.000	9.000
80	0.000	0.000	7.000	0.000	0.000	0.000	0.000	0.000	7.000	10.000
100	3.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	8.000	10.000

Conc-%	Transform: Untransformed							Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
D-Control	23.200	1.0000	23.200	9.000	30.000	27.697	10	23.200	1.0000
20	18.500	0.7974	18.500	10.000	29.000	37.036	10	18.500	0.7974
40	15.800	0.6810	15.800	0.000	28.000	55.961	10	15.800	0.6810
60	14.500	0.6250	14.500	1.000	24.000	52.144	10	14.500	0.6250
80	2.400	0.1034	2.400	0.000	10.000	164.570	10	2.400	0.1034
100	2.100	0.0905	2.100	0.000	10.000	180.213	10	2.100	0.0905

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.05)	0.90649	0.895	-0.1967	-0.0223
Bartlett's Test indicates equal variances (p = 0.10)	9.30038	15.0863		

Linear Interpolation (200 Resamples)					
Point	%	SD	95% CL		Skew
IC05*	4.936	8.336	2.810	29.770	3.3956
IC10*	9.872	10.177	5.620	46.314	2.3967
IC15*	14.809	10.912	8.430	50.768	1.8360
IC20*	19.745	12.876	11.240	60.453	1.1681
IC25	28.148	14.159	14.050	61.800	0.6999
IC40	60.959	11.564	28.938	66.303	-0.9572
IC50	64.793	6.258	39.105	69.346	-2.5579

* indicates IC estimate less than the lowest concentration

Appendix 3 – Data Sheets for Fathead minnow Test

WET TEST REPORT FORM - CHRONIC

Permittee: Elk Ridge Mining and Reclamation

Outfall: 013

Permit No.: CO-0000213

Test Type: Routine ☒ Accelerated ☐

Test Species: Fathead minnow

IWC: 100%

Test Start Time	Test Start Date	Test End Time	Test End Date
1240	03-14-2017	1210	03-21-2017

Test Results	Lethality	Growth
NOEC	100%	100%
	PASS	PASS
IC ₂₅	>100%	87.9%
	PASS	FAIL

Dilution(s) - % Effluent

Measurements	Control (0%)	20%	40%	60%	80%	100%
% Survival for day 1	100	100	100	100	100	98
% Survival for day 2	100	100	100	100	95	95
% Survival for day 3	100	100	100	100	93	93
% Survival for day 4	100	100	100	100	85	78
% Survival for day 5	100	98	100	100	85	75
% Survival for day 6	100	98	98	98	85	75
% Survival for day 7	100	98	98	98	85	75
Mean Dry Wt. (mg)	0.502	0.655	0.567	0.656	0.502	0.362

Hardness (mg/L) - Receiving Water: N/A Effluent: 2220/2740/2290 Recon Water: 92
Alkalinity (mg/L) - Receiving Water: N/A Effluent: 532/448/400 Recon Water: 64
Chlorine (mg/L) - Effluent: <0.01 pH (initial/final) - Control: 8.0/7.6 100%: 6.9/8.0
Total Ammonia as NH₃ (mg/L) - Effluent: 2.75/2.74/1.06

Were all Test Conditions in Conformance with Division Guidelines? YES ☒ NO ☐

If **NO**, list deviations from test specifications:

Laboratory: SeaCrest Group

Comments:

Analyst's Name: Madison Reese, Nicole Denkinger and Samuel Boisseau

Signature

Date 03-28-17

Fathead Minnow Chronic Benchsheet

Form # 103a
Effective: January 2009

Client: Elk Ridge Site: NPDES013 Lab #: 317 Species Info: ARS FHM Sample Date: 03/13 IWC: 100 Dilution H₂O: MH17-010

Test Start: <u>03/17/17-1240</u>		Test End: <u>03/21/17-1210</u>		Conc		Test Conditions										Fish & Tare		Fish Wt mg		Ave Wt	
0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	#	Tare	Fish Wt mg	STAT		
DO	7.5	10.2	7.4	5.8	7.5	4.8	7.4	5.3	7.1	5.4	10	10	10	10	10	#1	116.486	0.588	0.605		
Temp	24.1	25.0	24.1	24.1	24.1	25.2	24.1	25.1	24.1	25.2	10	10	10	10	10	#2	114.484	0.587	0.502		
pH	8.0	7.0	7.9	7.4	8.0	7.4	8.0	7.5	8.0	7.6	10	10	10	10	10	#3	115.854	0.541	0.441		
Cond	320	318	320	322	319	319	319	319	319	319	10	10	10	10	10	#4	114.859	0.573	0.573		
DO	7.3	10.2	7.3	5.5	7.5	4.7	7.5	5.1	7.3	5.2	10	10	10	10	10	#5	114.343	0.578	0.605		
Temp	24.1	25.0	24.1	24.1	24.1	25.2	24.1	25.2	24.1	25.2	10	10	10	10	10	#6	116.008	0.573	0.575		
pH	7.7	7.0	7.7	7.4	7.8	7.4	7.8	7.5	7.9	7.7	10	10	10	10	10	#7	115.953	0.573	0.573		
Cond	1133	1073	1137	1100	990	1022	1022	1022	1022	1022	10	10	10	10	10	#8	116.565	0.541	0.541		
DO	7.1	10.1	7.3	5.2	7.6	4.6	7.6	4.9	7.4	5.0	10	10	10	10	10	#9	114.125	0.542	0.542		
Temp	24.1	25.0	24.1	24.1	24.1	25.2	24.1	25.2	24.1	25.2	10	10	10	10	10	#10	116.197	0.543	0.543		
pH	7.4	7.0	7.3	7.3	7.3	7.5	7.5	7.6	7.8	7.8	10	10	10	10	10	#11	116.832	0.543	0.543		
Cond	1338	1103	1752	1630	1518	1561	1561	1561	1561	1561	10	10	10	10	10	#12	115.753	0.543	0.543		
DO	6.9	10.1	7.2	5.0	7.6	4.6	7.6	4.6	7.6	4.7	10	10	10	10	10	#13	115.075	0.543	0.543		
Temp	24.1	25.0	24.1	24.1	24.1	25.2	24.1	25.2	24.1	25.2	10	10	10	10	10	#14	116.076	0.543	0.543		
pH	7.2	7.0	7.3	7.3	7.3	7.5	7.5	7.6	7.8	7.8	10	10	10	10	10	#15	115.188	0.543	0.543		
Cond	2328	2280	2390	2250	1960	1993	1993	1993	1993	1993	10	10	10	10	10	#16	115.648	0.543	0.543		
DO	6.7	10.0	7.1	4.4	7.7	4.3	7.7	4.3	7.7	4.4	10	10	10	10	10	#17	115.558	0.543	0.543		
Temp	24.2	25.0	24.1	24.1	24.1	25.2	24.1	25.2	24.1	25.2	10	10	10	10	10	#18	115.907	0.543	0.543		
pH	7.0	7.0	7.2	7.2	7.2	7.5	7.5	7.6	7.8	7.8	10	10	10	10	10	#19	114.725	0.543	0.543		
Cond	2400	2400	2410	2410	2440	2580	2580	2580	2580	2580	10	10	10	10	10	#20	115.362	0.543	0.543		
DO	6.4	10.0	7.1	4.1	7.8	4.1	7.8	4.1	7.8	4.1	10	10	10	10	10	#21	114.660	0.543	0.543		
Temp	24.3	25.0	24.8	24.8	24.8	25.2	24.1	25.2	24.1	25.2	10	10	10	10	10	#22	117.060	0.543	0.543		
pH	6.9	7.0	7.1	7.1	7.1	7.5	7.5	7.6	7.8	7.8	10	10	10	10	10	#23	116.433	0.543	0.543		
Cond	3410	3410	3430	3400	2860	2940	2940	2940	2940	2940	10	10	10	10	10	#24	114.281	0.543	0.543		
DO											10										
Temp											10										
pH											10										
Cond											10										
Initials	SB	MP	ND	MP	ND	ND	ND	ND	ND	ND	SA										
Water #	1	1	2	2	3	3	3	3	3	3											
CO ₂																					
Eff 1	Eff 2	Eff 3	Rcv 1	Rcv 2	Rcv 3	Recon	Recon														
Hard	2220	2240	2290			72	72														
Alk	532	448	400			64	64														
Chlor	2.0	2.0	2.0			2.0	2.0														
NH ₃	7.67	7.96	1.10			40.85	40.85														
NH ₄	2.51	2.52	1.02																		
Condition/appearance of surviving organisms and Comments																					
pretest #25 116.161 116.174																					
Surviving FHM netting mobile																					
NO loss of orientation																					
Feeding Schedule																					
Not Fed: 2x/day																					
Fed Daily: ()																					
Fed Irregularly: ()																					
Food Used: ()																					
Aeration: ()																					
None: ()																					
Before Use #1: ()																					
Before Use #2: ()																					
Before Use #3: ()																					

Larval Fish Growth and Survival Test-7 Day Survival

Start Date: 3/14/2017	Test ID: 317186fhm	Sample ID: EFFFFIN-Effluent Final	
End Date: 3/21/2017	Lab ID: SCG-Seacrest Group	Sample Type: EFF2-Industrial	
Sample Date:	Protocol: EPAFW02-EPA/821/R-02-01	Test Species: PP-Pimephales promelas	
Comments:			

Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
20	1.0000	0.9000	1.0000	1.0000
40	1.0000	1.0000	0.9000	1.0000
60	1.0000	1.0000	0.9000	1.0000
80	1.0000	0.6000	0.9000	0.9000
100	1.0000	0.7000	0.6000	0.7000

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%	N		
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4		
20	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00
40	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00
60	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00
80	0.8500	0.8500	1.1990	0.8861	1.4120	18.543	4	12.00	10.00
100	0.7500	0.7500	1.0701	0.8861	1.4120	21.798	4	12.00	10.00

Auxiliary Tests		Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)		0.87898	0.916	0.16512	2.46897
Equality of variance cannot be confirmed					
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test		100	>100		1
Treatments vs D-Control					

Larval Fish Growth and Survival Test-7 Day Survival

Start Date: 3/14/2017	Test ID: 317186fhm	Sample ID: EFFFIN-Effluent Final
End Date: 3/21/2017	Lab ID: SCG-Seacrest Group	Sample Type: EFF2-Industrial
Sample Date:	Protocol: EPAFW02-EPA/821/R-02-01	Test Species: PP-Pimephales promelas

Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
20	1.0000	0.9000	1.0000	1.0000
40	1.0000	1.0000	0.9000	1.0000
60	1.0000	1.0000	0.9000	1.0000
80	1.0000	0.6000	0.9000	0.9000
100	1.0000	0.7000	0.6000	0.7000

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root						Isotonic	
			Mean	Min	Max	CV%	N	Mean	N-Mean	
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	1.0000	1.0000	
20	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	0.9750	0.9750	
40	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	0.9750	0.9750	
60	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	0.9750	0.9750	
80	0.8500	0.8500	1.1990	0.8861	1.4120	18.543	4	0.8500	0.8500	
100	0.7500	0.7500	1.0701	0.8861	1.4120	21.798	4	0.7500	0.7500	

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.87898	0.916	0.16512	2.46897
Equality of variance cannot be confirmed				

Linear Interpolation (200 Resamples)				
Point	%	SD	95% CL(Exp)	Skew
IC05	64.000			
IC10	72.000			
IC15	80.000			
IC20	90.000			
IC25	>100			
IC40	>100			
IC50	>100			

Larval Fish Growth and Survival Test-7 Day Growth					
Start Date:	3/14/2017	Test ID:	317186fhm	Sample ID:	EFFFIN-Effluent Final
End Date:	3/21/2017	Lab ID:	SCG-Seacrest Group	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	0.6050	0.3890	0.4410	0.5730
20	0.7650	0.5750	0.7370	0.5410
40	0.5420	0.5430	0.6330	0.5510
60	0.6060	0.5760	0.7140	0.7280
80	0.5940	0.4370	0.4380	0.5380
100	0.4530	0.2690	0.3560	0.3680

Conc-%	Mean	N-Mean	Transform: Untransformed					t-Stat	1-Tailed Critical	MSD
			Mean	Min	Max	CV%	N			
D-Control	0.5020	1.0000	0.5020	0.3890	0.6050	20.619	4			
20	0.6545	1.3038	0.6545	0.5410	0.7650	17.245	4	-2.551	2.410	0.1441
40	0.5673	1.1300	0.5673	0.5420	0.6330	7.760	4	-1.091	2.410	0.1441
60	0.6560	1.3068	0.6560	0.5760	0.7280	11.625	4	-2.576	2.410	0.1441
80	0.5017	0.9995	0.5017	0.4370	0.5940	15.472	4	0.004	2.410	0.1441
100	0.3615	0.7201	0.3615	0.2690	0.4530	20.824	4	2.350	2.410	0.1441

Auxiliary Tests					Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)					0.91713	0.916	0.02093	-1.5008		
Bartlett's Test indicates equal variances (p = 0.78)					2.47936	15.0863				
Hypothesis Test (1-tail, 0.05)					MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	NOEC	LOEC	ChV	TU	0.1441	0.28705	0.04966	0.00715	9.0E-04	5, 18
Treatments vs D-Control										

Larval Fish Growth and Survival Test-7 Day Growth

Start Date: 3/14/2017	Test ID: 317186fhm	Sample ID: EFFFIN-Effluent Final
End Date: 3/21/2017	Lab ID: SCG-Seacrest Group	Sample Type: EFF2-Industrial
Sample Date:	Protocol: EPAFW02-EPA/821/R-02-01	Test Species: PP-Pimephales promelas
Comments:		

Conc-%	1	2	3	4
D-Control	0.6050	0.3890	0.4410	0.5730
20	0.7650	0.5750	0.7370	0.5410
40	0.5420	0.5430	0.6330	0.5510
60	0.6060	0.5760	0.7140	0.7280
80	0.5940	0.4370	0.4380	0.5380
100	0.4530	0.2690	0.3560	0.3680

Conc-%	Transform: Untransformed							Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
D-Control	0.5020	1.0000	0.5020	0.3890	0.6050	20.619	4	0.5949	1.0000
20	0.6545	1.3038	0.6545	0.5410	0.7650	17.245	4	0.5949	1.0000
40	0.5673	1.1300	0.5673	0.5420	0.6330	7.760	4	0.5949	1.0000
60	0.6560	1.3068	0.6560	0.5760	0.7280	11.625	4	0.5949	1.0000
80	0.5017	0.9995	0.5017	0.4370	0.5940	15.472	4	0.5017	0.8434
100	0.3615	0.7201	0.3615	0.2690	0.4530	20.824	4	0.3615	0.6076

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ($p > 0.05$)	0.91713	0.916	0.02093	-1.5008
Bartlett's Test indicates equal variances ($p = 0.78$)	2.47936	15.0863		

Linear Interpolation (200 Resamples)					
Point	%	SD	95% CL(Exp)		Skew
IC05	66.384	8.070	19.699	89.956	-2.0360
IC10	72.769	5.310	60.797	90.827	0.4714
IC15	79.153	4.974	64.831	91.441	-0.0582
IC20	83.679	4.659	68.475	95.379	-0.1733
IC25	87.921				
IC40	>100				
IC50	>100				

Appendix 4 – QA/QC and Reference Toxicant Test Chart

Quality Assurance Check List – Chronic Whole Effluent Toxicity Test

Client: Elk Ridge Mining and Reclamation

SeaCrest Sample No.: 317186.B

Species Tested: *Ceriodaphnia dubia* and Fathead minnow

Start Date of Test (<i>Ceriodaphnia dubia</i>)	Start Date of Test (Fathead minnow)
03-14-2017	03-14-2017

Sample received in lab properly preserved (0-6°C)?	Y
Sample delivered on ice or equivalent?	Y
Test initiated within 36-hours of collection?	Y
Test protocol conforms to CDPHE guidelines (<i>Ceriodaphnia dubia</i>)?	Y
Test protocol conforms to CDPHE guidelines (Fathead minnow)?	Y
Average test temp. $\pm 1^{\circ}\text{C}$ (<i>Ceriodaphnia dubia</i>)?	Y
Average test temp. $\pm 1^{\circ}\text{C}$ (Fathead minnow)?	Y
DO level $\geq 4.0\text{mg/L}$; no super-saturation (<i>Ceriodaphnia dubia</i>)?	Y
DO level $\geq 4.0\text{mg/L}$; no super-saturation (Fathead minnow)?	Y
Survival in control $\geq 90\%$, $\geq 80\%$ for chronic (<i>Ceriodaphnia dubia</i>)?	Y
Survival in control $\geq 90\%$, $\geq 80\%$ for chronic (Fathead minnow)?	Y
<i>Ceriodaphnia dubia</i> neonates <24-hours old?	Y
Fathead minnow larvae <24-hours old?	Y
Appropriate reference toxicity test conducted?	Y
Lab. Ref. Tox. test results within the confidence limits for the lab?	Y

Signature

Position: Laboratory Manager

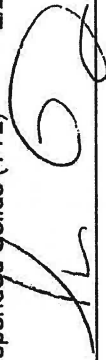
Date 03-28-17

Method	Analyte	Date	LCS (rec)	%REC	%RPD	QC LIMITS
2320 B	Alkalinity - Total	2/4/2017	100.80%	4.02%	-0.95%	± 5.00%
2320 B	Alkalinity - Total	2/11/2017	100.80%	6.21%	4.76%	± 5.00%
2320 B	Alkalinity - Total	2/19/2017	99.20%	7.81%	3.23%	± 5.00%
2320 B	Alkalinity - Total	2/26/2017	99.20%	10.10%	-2.01%	± 5.00%
4500 NH ₃ D	Ammonia	2/8/2017	100.00%	102.83%	0.90%	± 10.00%
4500 NH ₃ D	Ammonia	2/14/2017	103.86%	101.50%	3.14%	± 10.00%
4500 NH ₃ D	Ammonia	2/21/2017	103.86%	101.50%	3.14%	± 10.00%
4500 NH ₃ D	Ammonia	2/26/2017	99.04%	102.90%	-2.01%	± 10.00%
4500 Cl D	Chlorine	2/27/2017	103.23%	90.63%	0.00%	± 5.00, ± 20.00%
2340 B	Hardness - Total	2/8/2017	103.51%	102.11%	-2.22%	± 5.00%
2340 B	Hardness - Total	2/12/2017	103.51%	100.72%	0.99%	± 5.00%
2340 B	Hardness - Total	2/20/2017	103.51%	103.50%	-3.92%	± 5.00%
2340 B	Hardness - Total	2/28/2017	101.75%	95.68%	-4.69%	± 5.00%

Method	Analyte	Date	LCS (rec)	%REC M1	%REC M2	QC Limits
4500 O	DO - Winkler	2/5/2017	N/A	98.66%	NA	± 5.00%
4500 O	DO - Winkler	2/12/2017	N/A	102.74%	102.74%	± 5.00%
4500 O	DO - Winkler	2/19/2017	N/A	102.74%	98.63%	± 5.00%
4500 O	DO - Winkler	2/26/2017	N/A	96.05%	101.39%	± 5.00%

*Probe under maintenance

Method	Analyte	Date	Blank	%RPD	%REC MRS	QC Limits
2540 C	Dissolved Solids (TTL)	2/22/2017	100.0036%	3.39%	113.50%	±20%, ± 15%
2540 D	Suspended Solids (TTL)	2/22/2017	100.00990%	0.00%	96.60%	±20%, ± 15%

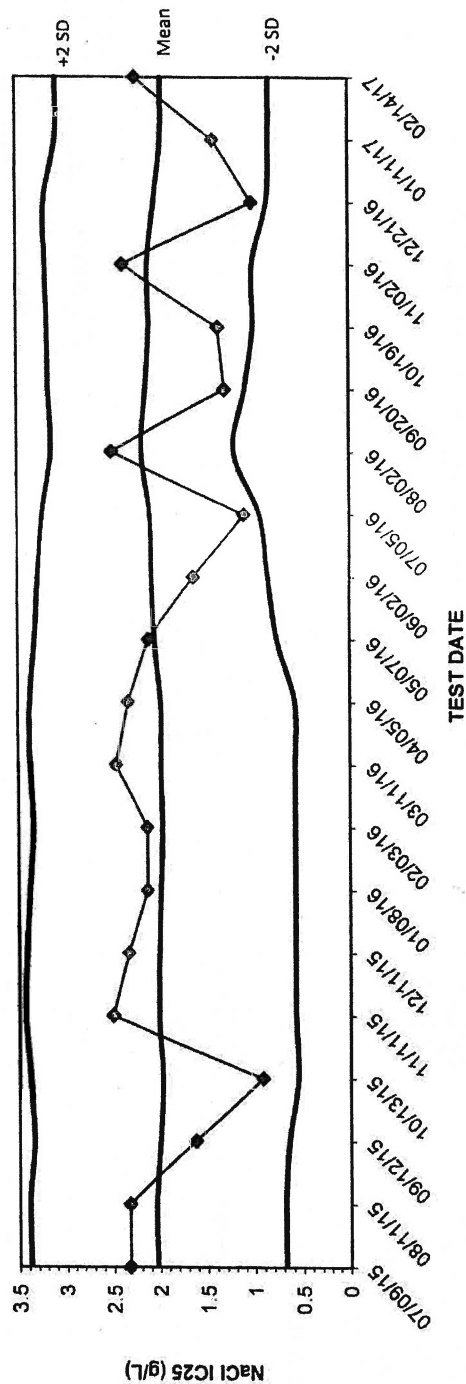
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Signature: 

Date: 3-1-17

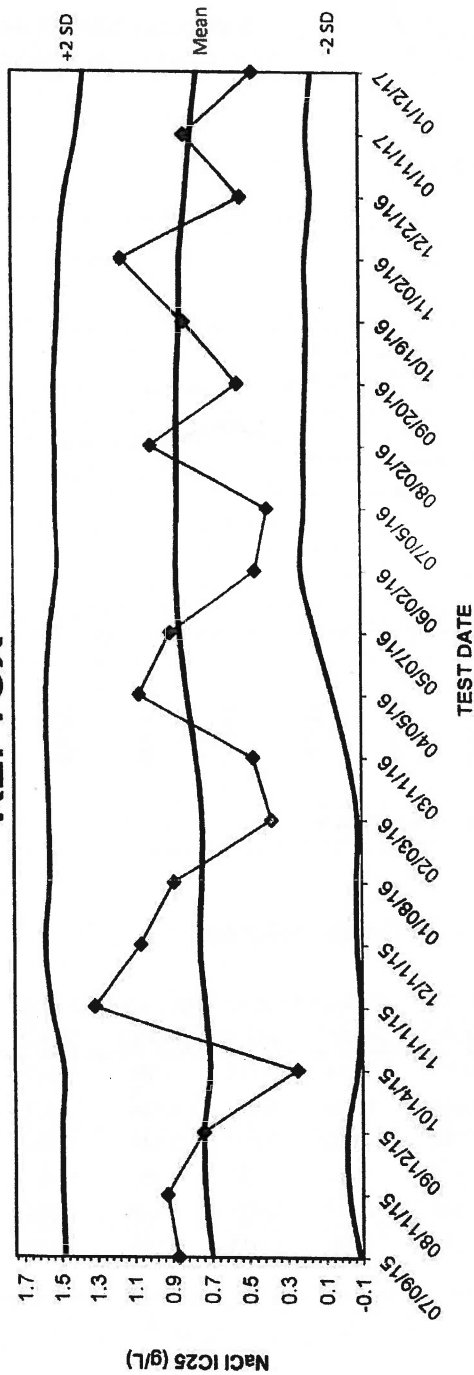
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CERIODAPHNIA SURVIVAL IC25 NaCl REFTOX



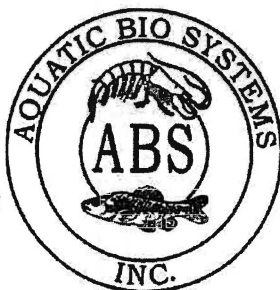
Date	IC25	Mean	-2 SD	+2 SD
07/09/15	2.3333	2.0286	0.6794	3.3778
08/11/15	2.3333	2.0385	0.6833	3.3938
09/12/15	1.6250	1.9969	0.6474	3.3463
10/13/15	0.9167	1.9691	0.5542	3.3839
11/11/15	2.5000	2.0048	0.5754	3.4342
12/11/15	2.3333	1.9969	0.5772	3.4165
01/08/16	2.1250	1.9790	0.5766	3.3814
02/03/16	2.1250	1.9611	0.5772	3.3451
03/11/16	2.4615	1.9772	0.5775	3.3768
04/05/16	2.3333	1.9772	0.5775	3.3768
05/07/16	2.1120	2.0420	0.7599	3.3241
06/02/16	1.6300	2.0691	0.8514	3.2868
07/05/16	1.1000	2.0857	0.9362	3.2353
08/02/16	2.5000	2.1720	1.2059	3.1382
09/20/16	1.3000	2.1275	1.0900	3.1650
10/19/16	1.3674	2.0869	0.9991	3.1748
11/02/16	2.3750	2.0989	1.0038	3.1939
12/21/16	1.0083	2.0278	0.8515	3.2041
01/11/17	1.4100	1.9548	0.8280	3.0815
02/14/17	2.2353	1.9524	0.8284	3.0763

CERIODAPHNIA REPRODUCTION IC25 NaCl REFTOX



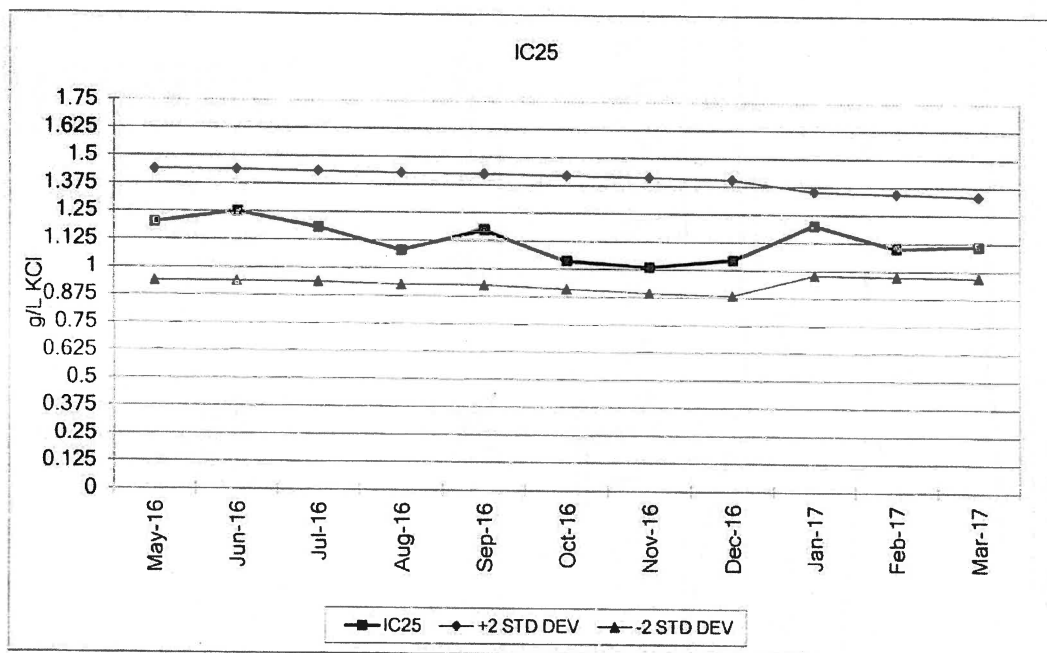
Date	IC25	Mean	-2 SD	+2 SD
07/09/15	0.8672	0.6982	-0.0846	1.4810
08/11/15	0.9257	0.7313	-0.0271	1.4896
09/12/15	0.7407	0.7378	-0.0183	1.4938
10/14/15	0.2484	0.7051	-0.0742	1.4844
11/11/15	1.3100	0.7284	-0.0935	1.5503
12/11/15	1.0637	0.7553	-0.0720	1.5626
01/08/16	0.8849	0.7450	-0.0694	1.5594
02/03/16	0.3771	0.7420	-0.0774	1.5615
03/11/16	0.4716	0.7721	-0.0261	1.5703
04/05/16	1.0664	0.8161	0.0576	1.5745
05/07/16	0.8992	0.8507	0.1484	1.5530
06/02/16	0.4580	0.8671	0.2224	1.5117
07/05/16	0.3951	0.8621	0.2040	1.5202
08/02/16	1.0000	0.8617	0.2039	1.5195
09/20/16	0.5481	0.8571	0.1917	1.5226
10/19/16	0.8250	0.8454	0.1867	1.5041
11/02/16	1.1541	0.8415	0.1916	1.4915
12/21/16	0.5270	0.8117	0.1615	1.4619
01/11/17	0.8196	0.7868	0.1816	1.3920
01/12/17	0.4621	0.7522	0.1564	1.3480

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Pimephales promelas



Chronic 7 Day Survival Test Data

Date	NOEC (g/L KCl)	LOEC (g/L KCl)
Oct-16	0.50	1.0
Nov-16	0.50	1.0
Dec-16	0.50	1.0
Jan-17	0.50	1.0
Feb-17	0.50	1.0
Mar-17	0.50	1.0

IC 25 for Growth Test

Date	IC25 g/L KCl	95% Confidence (upper)	(lower)	Avg. IC25 g/L KCl	+2 STD DEV	-2 STD DEV
Oct-16	1.036	1.234	0.174	1.166	1.419	0.912
Nov-16	1.010	1.115	-0.421	1.154	1.413	0.895
Dec-16	1.042	1.180	0.007	1.144	1.404	0.885
Jan-17	1.203	1.278	1.278	1.166	1.354	0.979
Feb-17	1.100	1.230	0.973	1.159	1.345	0.974
Mar-17	1.111	1.299	0.611	1.153	1.334	0.971

**Current Test Dates: 3/1-8/2017

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