APPENDIX E –

WHOLE EFFLUNET TOXICITY TESTING (WET)

LABORATORY REPORTS

TRE Environmental Strategies, LLC
100 Racquette Drive, Unit A Fort Collins, CO 80524
T 970.416.0916 F 970.490.2963

July 7, 2015

Ms. Stacy Staley
Sumitomo Metal Mining Pogo, LLC
Pogo Mine Joint Venture
P.O. Box 145
Delta Junction, Alaska 99737

RE: Results of WET tests – June 2015

Dear Ms. Staley,

Attached are copies of the reports for the *Ceriodaphnia dubia* (water flea) and *Pimephales promelas* (fathead minnow) toxicity tests conducted in June 2015 with effluent from your facility.

TRE Environmental Strategies, LLC greatly appreciates this opportunity to provide our services to Sumitomo Metal Mining Pogo. Please do not hesitate to call if you have any questions.

Sincerely,

Whitney Naddy
Data Analyst
naddywm.tre@gmail.com

Rami B. Naddy, Ph.D.
Manager / Environmental Toxicologist
naddyrb.tre@gmail.com

Attachments:

14001-412-021
14001-412-022

TRE

Report of Short-Term Chronic Toxicity Testing using the Water Flea (Ceriodaphnia dubia)

Project ID: 14001-412-021
June 2015

Sponsor and Laboratory Information

Sponsor	Sumitomo Metal Mining Pogo LLC Pogo Mine Joint Venture P.O. Box 145 Delta Junction, AK 99737
Project Officer	Stacy Staley (907) 895-2761
Testing Facility	TRE Environmental Strategies, LLC 100 Racquette Dr., Unit A Fort Collins, CO 80524 Fax: (970) 490-2963 State of Florida NELAP Laboratory ID: E87972
Study Director	Rami B. Naddy, Ph.D. (970) 416-0916 email: naddyrb.tre@gmail.com
Report Author	Whitney Naddy (970) 416-0916 email: naddywm.tre@gmail.com

Test Information

Test	Short-Term Chronic under Static-Renewal Conditions
Basis	USEPA (2002), method 1002.0
Test Dates and Time	June 23, 2015 @ 1430 to June 29, 2015 @ 1620
Test Length	6 days
Species	*Ceriodaphnia dubia*
Test Material	Effluent
Outfall	Outfall 001
Permit Number	AK-005334-1
Receiving Stream	N/A
Dilution Water	Moderately hard reconstituted water
Concurrent Control Water	None
Test Concentrations	0 (control), 12.5, 25, 50, 75, and 100% effluent
Permit Compliance	_X_ **Pass** ____Fail

- *Results described in this report apply only to the samples submitted to the laboratory and analyzed, as listed in the report*
- *Test results comply with NELAC standards. Reports are intended to be considered in their entirety; TRE is not responsible for consequences arising from use of a partial report*
- *This report contains 5 pages plus 2 appendices*

Effluent Collection and Receipt

Sample No.	Field No.	Collection Date & Time	TRE No.	Date of Receipt	Temp. at Arrival (°C)
1	N/A	06/22/15 @ 0925	28817	06/23/15	2.1
2	N/A	06/24/15 @ 0810	28823	06/25/15	3.0
3	N/A	06/26/15 @ 0745	28834	06/27/15	5.0

Note: See Appendix A for chain of custody records

Effluent Characterization

Sample No.	pH	Hard. (mg/L)[a]	Alk. (mg/L)[a]	Spec. Cond. (µS/cm)	TRC (mg/L)[b]	NH_3-N (mg/L)
1	7.6	80	41	276	<0.02	1.6
2	7.4	80	39	289	<0.02	1.7
3	7.3	80	41	282	0.02	1.7

[a] As $CaCO_3$
[b] Total residual chlorine

Initial Dilution/Control Water Characterization

Batch No.	pH	Hard. (mg/L)[a]	Alk. (mg/L)[a]	Spec. Cond. (µS/cm)	TRC (mg/L)[b]	NH_3-N (mg/L)[c]
11682	8.2	92	62	328	0.02	<1.0

[a] As $CaCO_3$
[b] Total residual chlorine
[c] Measured on source water

Test Conditions

Type	Static-Renewal Short-term Chronic			
Test Endpoints	Survival and Reproduction			
Test Chambers	30-ml plastic cups			
Test Solution Volume	15 ml			
Replicates per Treatment	10			
Organisms per Replicate	1			
Test Temperature	25 ± 1°C (≤ 3°C differential)			
Lighting	Fluorescent, 16 hours light:8 hours dark			
Chamber Placement	Random block according to computer-generated chart			
Aeration?	X	No		Yes
Test Solution Renewal	Daily			

Test Organism

Species	*Ceriodaphnia dubia*
Age	<24 hours (all within 8 hours of the same age)
Source	TRE in-house culture, batch 062215
Acclimation	Test temperature
Feeding	0.2 ml YTC/Algae mixed per test chamber daily during the test
Reference Toxicant Testing	Initiated June 2, 2015 using sodium chloride (NaCl)

TEST RESULTS

Biological Data

Treatment (% Effluent)	Percent Survival of *Ceriodaphnia dubia*							Mean Young per Female[a]	Significant Reduction Relative to Control?	
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7		Surv.	Repr.
0 (Control)	100	100	100	100	100	100	NA	27.6	N/A	N/A
12.5	100	100	100	90	90	90	NA	26.3	No	No
25	100	100	100	100	100	100	NA	27.2	No	No
50	100	100	100	100	100	100	NA	26.7	No	No
75	100	100	100	90	90	90	NA	28.5	No	No
100	100	100	90	80	80	80	NA	26.3	No	No
Percent Minimum Significant Difference (Reproduction)								42.7	Acceptable	

[a] Mean young per original female. If any 4th broods or higher were produced, they were excluded from calculation of mean young per female and statistical analysis of reproduction.
Note: See Appendix B for copies of laboratory data sheets

Data Analysis and Test Endpoints

Biological Endpoint	Statistical Endpoint	Value
Survival	NOEC	100% Effluent
	LOEC	>100% Effluent
	IC_{25}	>100% Effluent
Reproduction	NOEC	100% Effluent
	LOEC	>100% Effluent
	ChV	>100% Effluent
	IC_{25}	>100% Effluent
	TU_c ($100/IC_{25}$)	<1.0

NOEC = No Observed Effect Concentration
LOEC = Lowest Observed Effect Concentration
ChV = Chronic Value
IC_{25} = 25% Inhibition Concentration
TU_c = Chronic Toxic Units
Note: Analyses completed using, where appropriate, CETIS version 1.8.7 (2014).

Physical and Chemical Data

Treatment (% Effluent)	pH		Dissolved Oxygen (mg/L)		Conductivity (µS/cm)		Temperature (°C)	
	Low	High	Low	High	Low	High	Low	High
0 (Control)	8.0	8.3	6.3	6.9	311	332	24	25
100	7.3	8.1	6.3	7.1	275	293	24	25
All Treatments	7.3	8.3	≥6.3		NA		24[a]	25[a]
							25[b]	27[b]

[a] Temperature in test solutions
[b] Continuous wet temperature in the environmental chamber

Reference Toxicant Test Results for *C. dubia*

IC_{25}	TRE Historical 95% Control Limits	
	Low	High
267	133	702

Note: Values are expressed as mg/L of chloride.

References

CETIS. 2014. Comprehensive Environmental Toxicity Information System. User Guide (version 1.8.7). Tidepool Scientific, LLC. McKinleyville, CA.

USEPA. 2002. Short-term methods for estimating the chronic toxicity of effluents and receiving waters to freshwater organisms. Fourth Edition. EPA-821-R-02-013.

Statement of Quality Assurance

The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol (if applicable) and standard operating procedures, and that the resulting data and report meet the requirements of the NELAC standards. This report is an accurate reflection of the raw data.

Anita Rehner — July 1, 2015
Quality Assurance Unit — Date

Whitney Mhaddy — July 2, 2015
Data Analyst — Date

APPENDIX A

Chain of Custody Records

TRE Environmental Strategies, LLC

100 Racquette Drive, Unit A Fort Collins, CO 80524 Phone: (970) 416-0916 Fax: (970) 490-2963

Client/Project Name: Sumitomo Metal Mining Pogo
Project #: 14001-412(021,022)
Sampler (Print/Affiliation): _____ Signature: _____
Chain of Custody Tape #: 454406 Intact? (circle): Yes No

Client / Sample ID	Sample Collection Beginning Date	Beginning Time	Ending Date	Ending Time	Sample Type Grab	Comp.	Volume	Preservation (i.e.: 0-6°C)	Matrix (Liq., Soil, Sediment, etc.)	Test Requested: FC, CC							Sample Temp. Upon Arrival (Therm. #1-18)	Lab Sample ID
Effluent #2 ①	6/22/2015	9:25	6/22/2015	9:29	X		2.5 Gal	0-6°C	L	✓							2.1	28817
Effluent #1 ①	6/22/2015	9:26	6/22/2015	9:27	X		1 Gal	0-6°C	L	✓								

Sample Relinquished By: (Print Name/Affiliation)	Date	Received By: (Print Name/Affiliation)	Date
Jim Ward, Pogo Env.	6/22/2015	Ashley Romero TRE	6/23/15
Signature:	Time: 1430	Signature:	Time: 1300
Sample Relinquished By: (Print Name/Affiliation)	Date:	Received By: (Print Name/Affiliation)	Date:
Signature:	Time:	Signature:	Time:
Sample Relinquished By: (Print Name/Affiliation)	Date:	Received By: (Print Name/Affiliation)	Date:
Signature:	Time:	Signature:	Time:

Laboratory (Destination): Received on ice
TRE Environmental Strategies, LLC
100 Racquette Drive, Unit A
Fort Collins, CO 80524
(970) 416-0916
(970) 490-2963 (FAX)

Sample Shipped Via (circle): FedEx Other UPS Courier
Temp Blank? Yes No

Comments:

① NBN 6/30/15 CF

Serial No. 00731

TRE Environmental Strategies, LLC

100 Racquette Drive, Unit A Fort Collins, CO 80524 Phone: (970) 416-0916 Fax: (970) 490-2963

Client/Project Name: Sumitomo Metal Mining Pogo

Project #: 14001-412-(021,022)

Sampler (Print/Affiliation): _____ Signature: _____

Chain of Custody Tape #: 454167 Intact? (circle): Yes No

Client / Sample ID	Sample Collection Beginning Date	Beginning Time	Ending Date	Ending Time	Sample Type Grab	Comp.	Volume	Preservation (i.e.: 0-6°C)	Matrix (Liq., Soil, Sediment, etc.)	Test Requested: Fe, CC						Sample Temp. Upon Arrival (Therm. # 63)	Lab Sample ID
Effluent #3	6-24-15	0810	6-24-15	0820			2.5 Gal	0-6°C	L	✓						~~1.5~~	288203
Effluent #23	6-24-15	0810	6-24-15	0820			1 Gal	0-6°C	L	✓						3.0	

Sample Relinquished By: (Print Name/Affiliation)	Date	Received By: (Print Name/Affiliation)	Date	Laboratory (Destination):
Stacy Staley Pogo Signature: Stacy Staley	Time: 11:40 AM	Michelle Urban, Pogo Buyer Signature: Michelle Urban	Time: 11:40 AM	TRE Environmental Strategies, LLC 100 Racquette Drive, Unit A Fort Collins, CO 80524 (970) 416-0916 (970) 490-2963 (FAX)
Sample Relinquished By: Michelle Urban, Pogo Buyer Signature: Michelle Urban	Date: 6-24-15 Time: 3:47pm	Received By: Amanda Bidlack/TRE Signature: Amanda Bidlack	Date: 6/25/15 Time: 1310	
Sample Relinquished By: (Print Name/Affiliation) Signature:	Date: Time:	Received By: (Print Name/Affiliation) Signature:	Date: Time:	Sample Shipped Via (circle): FedEx Other UPS Courier Temp Blank? Yes No

Comments: Received on ice

① AB 6/25/15 E

② 7/1/15 CF

Serial No. 00732

TRE Environmental Strategies, LLC

100 Racquette Drive, Unit A Fort Collins, CO 80524 Phone: (970) 416-0916 Fax: (970) 490-2963

Client/Project Name: Sumitomo Metal Mining Pogo
Project #: 14001-412-(021,022)
Sampler (Print/Affiliation): Leonard Z Hanson Signature: Leonard Z Hanson
Chain of Custody Tape #: 45465 Intact?(circle): Yes No

Client / Sample ID	Sample Collection Beginning Date	Beginning Time	Ending Date	Ending Time	Sample Type Grab	Comp.	Volume	Preservation (i.e.: 0-6°C)	Matrix (Liq., Soil, Sediment, etc.)	Test Requested: FC, CC						Sample Temp. Upon Arrival (Therm. #5)	Lab Sample ID
Effluent #1	6/26/15	0745	—	—			2.5 Gal	0-6°C	L	✓						5.0	28834
Effluent #2	6/26/15	" "	—	—			1 Gal	0-6°C	L	✓							
Effluent #3	6/26/15	" "	—	—			1 gal	0-6°C	L	✓							

Sample Relinquished By: (Print Name/Affiliation)	Date	Received By: (Print Name/Affiliation)	Date
Leonard Z Hanson	6/26/15	Justin Boucher	6/26/15
Signature: Leonard Z Hanson	Time: 0745	Signature: Justin Boucher	Time: 1045
Sample Relinquished By: Justin Boucher / POGO	Date: 6/26/15	Received By: Amanda Bidlack / TRE	Date: 6/27/15
Signature: Justin Boucher	Time: 13:50 pm	Signature: Amanda Bidlack	Time: 1305
Sample Relinquished By:	Date:	Received By:	Date:
Signature:	Time:	Signature:	Time:

Laboratory (Destination):
TRE Environmental Strategies, LLC
100 Racquette Drive, Unit A
Fort Collins, CO 80524
(970) 416-0916
(970) 490-2963 (FAX)

Sample Shipped Via (circle): FedEx Other UPS Courier
Temp Blank? Yes No

Comments:
extra 1 gallon collected in a clean 1 gallon jug. Received on ice
OAB 6/27/15 E

Serial No. 00730

APPENDIX B

Test Data

TOXICITY DATA PACKAGE COVER SHEET

QA: AR 6/30/15

Test Type: Chronic

Project Number: 14001-412-021

Test Substance: Effluent-(Outfall 001)

Species: *Ceriodaphnia dubia*

Dilution Water Type: Mod Hard

Organism Lot or Batch Number: 062215

Concurrent Control Water Type: NA

Age: <24hrs (< 24 hr) Supplier: TRE

Date and Time Test Began: 6/23/15 @ 1430

Date and Time Test Ended: 6/29/15 @ 1620

Protocol Number: USEPA 2002, Method 1002.0

Investigator(s): ZR/AW/MW/AB

Background Information

pH control?: Yes No

If yes, give % CO_2: N/A

Type of Test: Static-Renewal

Test Temperature: 25 ± 1 °C

Env. Chmbr/Bath #: 25 Test Chmbrs: 30-ml cups

Test Solution Vol.: 15 ml

Number of Replicates per Treatment: 10

Length of Test: 3 broods

Number of Organisms per Replicate: 1

Photoperiod: 16 h light : 8 h dark

Light Intensity: 50 to 100 ft.-c.

Type of Food and Quantity per Chamber: 0.2 ml YTC/ALG

Feeding Frequency: 1 x Daily

Test Substance Characterization Parameters and Frequency:

Hardness: Sx Receipt Alkalinity: Sx Receipt NH_3: Sx. Receipt TRC: Sx Receipt

pH: Daily Conductivity: Daily and Test Termination*

Test Concentrations (Volume:Volume): 0 (MH), 12.5, 25, 50, 75, and 100% effluent

Agency Summary Sheet(s)?: ① ~~Y~~

Reference Toxicant Data: Test Dates: 06/02/15 to 06/08/15 IC_{25}: 267 mg Cl⁻/L

Hist. 95% Control Limits: 133 to 702 Method for Determining Ref. Tox. Value: Lin Interp.

Special Procedures and Considerations:

*Conductivity measured in dilution water and 100% effluent at test termination

D.O. maintained ≥ 4.0 mg/L

Study Director Initials: NJN Date: 6/23/15

① AR 6/30/15 MP

QA Form No. 014
Revision 1
Effective 02/14

TEST SUBSTANCE USAGE LOG

Project Number: 14001-412-021

QA: AR 6/30/15

	Sample 1	Sample 2	Sample 3	Sample 4
Test Substance Number	28817	28823	28834	
Test Substance Collection Date and Time	From: 6/22/15 @ 0925 To: 6/22/15 @ 0929	From: 6/24/15 @ 0810 To: 6/24/15 @ 0820	From: 6/26/15 @ 0745 To: NA @	From: @ To: @
Sample Type (Grab or Comp)	Grab	Grab	Grab	
Date Test Substance Received	6/23/15	6/25/15	6/27/15	
Dilution Water Number RW# or TRE#, circle one	11682	11701	11701	
Concurrent Control Water RW#	NA	NA	NA	
Date(s) Used	6/23/15 6/24/15	6/25/15 6/26/15	6/27/15 6/28/15	

Preparation of Test Solutions

Test Substance % Conc.	Test Substance Volume (ml)	Dilution Water Volume (ml)	Total Volume (ml)	Test Substance Volume (ml)	Dilution Water Volume (ml)	Total Volume (ml)	Test Substance Volume (ml)	Dilution Water Volume (ml)	Total Volume (ml)
0 (MH)	0	1200	1200	0	200	200			
12.5%	150	1050	1200	25	175	200			
25%	300	900	1200	50	150	200			
50%	600	600	1200	100	100	200			
75%	900	300	1200	150	50	200			
100%	1200	0	1200	200	0	200			
Total	3150	4050	7200	525	675	1200			
Initials / Date				6/23/15 RR	mixed cc				
Initials / Date				6/24/15 MW	"				
Initials / Date				AB 6/25/15	"	"			
Initials / Date				RR 6/26/15	"	"			
Initials / Date				AB 6/27/15	"	"			
Initials / Date				MW 6/28/15	"	"			
Initials / Date									
Initials / Date									

CERIODAPHNIA DUBIA
CHRONIC BIOLOGICAL DATA

wmw 06/29/15

QA: AR 6/30/15

Project Number: 14001-412-021

Number of Neonates Produced and Survival of Original Organisms — % Survival

Conc.	Day	A	B	C	D	E	F	G	H	I	J	Total	Mean	Remarks
0 (MH)	1	0	0	0	0	0	0	0	0	0	0			100%
	2	0	0	0	0	0	0	0	0	0	0			
	3	0	0	6/1	0	0	0	0	6/1	6/1	6/1	24		
	4	6/1	6/1	0	4/1	6/1	4/1	4/1	0	0	0	30		
	5	14/2	12/2	14/2	12/2	11/2	8/2	11/2	13/2	13/2	13/2	121		
	6	17/3	13/3	20/3	0	0	0	0	17/3	17/3	17/3	101		
	7													
	8													
Total		37	31	40	16	17	12	15	36	36	36	276	27.6	
12.5%	1	0	0	0	0	0	0	0	0	0	0			90%
	2	0	0	0	0	0	0	0	0	0	0			
	3	0	0	6/1	0	0	0	0	3/1	6/1	7/1	22		
	4	6/1	5/1	0	0 X	4/1	2/1	6/1	4/1 △	0	0	27		△ large neo
	5	12/2	9/2	12/2		11/2	11/2	12/2	8/2	10/2	14/2	99		
	6	16/3	10/3	18/3		0	0	17/3	16/3	19/3	19/3	115		
	7													
	8													
Total		34	24	36	0 X F	15	13	35	31	35	40	263	26.3	
25%	1	0	0	0	0	0	0	0	0	0	0			100%
	2	0	0	0	0	0	0	0	0	0	0			
	3	0	0	5/1	0	0	0	0	5/1	4/1	7/1	21		
	4	6/1	6/1	0	5/1	6/1	4/1	5/1	0	4/1 △	0	33		△ large neo
	5	14/2	10/2	12/2	10/2	9/2	8/2	14/2	3/2	12/2	11/2	103		
	6	17/3	16/3	17/3	0	0	0	17/3	13/3	14/3	21/3	115		* small neos
	7													
	8													
Total		37	32	34	15	15	12	36	21	31	39	272	27.2	

Day:	1	2	3	4	5	6	7	8
Date:	6/21/15	6/22/15	6/24/15	6/25/15	6/26/15	6/29/15		
Time:	1140	1550	1350	1615	1100	1620		
Initials:	MW	AB	RR	RR	MW	RR		

Key to symbols:
X = Original organism died.
M = Male

QA Form No. 057
Revision 2
Effective 02/14

WMW 06/29/15

QA: AR 6/30/15

CERIODAPHNIA DUBIA
CHRONIC BIOLOGICAL DATA

Project Number: 14001-412-021

Number of Neonates Produced and Survival of Original Organisms

Conc.	Day	A	B	C	D	E	F	G	H	I	J	Total	Mean	Remarks
50%	1	0	0	0	0	0	0	0	0	0	0			100%
	2	0	0	0	0	0	0	0	0	0	0			
	3	0	0	4/1	0	0	0	0	6/1	6/1	6/1	22		
	4	6/1	4/1	0	4/1	6/1	6/1	6/1	0	0	0	32		
	5	10/2	14/2	11/2	11/2	8/2	8/2	12/2	11/2	12/2	11/2	104		
	6	12/3	12/3	18/3	0	1/2 Δ	0	14/3	18/3	16/3	18/3	109		Δ organ
	7													
	8													
Total		28	26	33	15	15	14	32	35	34	35	267	26.7	
75%	1	0	0	0	0	0	0	0	0	0	0			95%
	2	0	0	0	0	0	0	0	0	0	0			
	3	0	0	4/1	0	0	0	0	6/1	5/1	6/1	21		
	4	6/1	5/1	0X	5/1	5/1	5/1	6/1	0	0	1/1 Δ	33		Δ organ
	5	12/2	10/2		11/2	12/2	10/2	14/2	9/2	12/2	12/2	102		
	6	16/3	17/3		7/3	0	6/3	21/3	20/3	21/3	21/3	129		
	7													
	8													
Total		34	32	4X	23	17	21	41	35	38	40	285	28.5	
100%	1	0	0	0	0	0	0	0	0	0	0			80%
	2	0	0	0	0	0	0	0	0	0	0			
	3	0X	0	5/1	0	0	0	0	5/1	0	7/1	17		
	4		5/1	2/2X	6/1	5/1	2/1	5/1	0	4/1	0	29		
	5		11/2		12/2	12/2	11/2	15/2	10/2	10/2	14/2	95		
	6		16/3		0	16/3	21/3	16/3	20/3	17/3	16/3	122		
	7													
	8													
Total		0X	32	7X	18	33	34	36	35	31	37	263	26.3	

Day:	1	2	3	4	5	6	7	8		Key to symbols:
Date:	6/24/15	6/25/15	6/26/15	6/27/15	6/28/15	6/29/15				X = Original organism died.
Time:	1140	1550	1350	1615	1100	1620				M = Male
Initials:	MW	AB	RR	AD	MW	RM				

WMW 6/29/15, CF

CHRONIC CHEMICAL DATA (INITIAL)

QA: AR 7/1/15

Project Number: 14001-412-021

Test Species: ***Ceriodaphnia dubia***

%	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Meter #	Remarks
Conc.: 0 (MH)									All Conc.	
pH	8.2	8.3	8.2	8.2	8.2	8.2			FM24	
D.O. (mg/L)	6.7	6.7	6.8	6.5	6.7	6.8			5	
Temp. (°C)	25	25	25	25	25	25			L18	
Cond. (µS/cm)	328	318	322	314	311	318			15	
Hard. (mg/L)	92		92		90				Titr.	
Alk. (mg/L)	62		60		59				Titr.	
TRC (mg/L)	0.02		<0.02						22	
NH_3 (mg/L)	<1.0		<1.0						HA#1	
Conc.: 12.5%										
pH	8.2	8.2	8.1	8.2	8.2	8.1				
D.O. (mg/L)	6.7	6.7	6.8	6.6	6.8	6.7				
Temp. (°C)	*	*	*	*	*	*				
Cond. (µS/cm)	322	317	322	308	315	319				
Hard. (mg/L)										
Alk. (mg/L)										
TRC (mg/L)										
NH_3 (mg/L)										
Conc.: 25%										
pH	8.1	8.1	8.0	8.1	8.0	8.0				
D.O. (mg/L)	6.7	6.7	6.8	6.6	6.8	6.7				
Temp. (°C)	*	*	*	*	*	*				
Cond. (µS/cm)	316	313	306	302	310	319				
Conc.: 50%										
pH	7.9	7.9	7.8	7.9	7.8	7.8				
D.O. (mg/L)	6.7	6.8	6.9	6.7	7.0	6.8				
Temp. (°C)	*	*	*	*	*	*				
Cond. (µS/cm)	301	302	301	292	302	306				
Date:	6/23/15	6/24/15	6/25/15	6/26/15	6/27/15	6/28/15				
Time:	1410	1125	1530	1320	1535	1015				
Initials:	RR	MM	AS	RR	AS	MM				

Note: Hardness, alkalinity, TRC, and NH3 data appearing on this page have been transcribed from the wet chemistry log QA Form No. 084.

*Dilution/control water and effluent were brought to 25°C prior to making the dilution series. The temperature of resulting effluent dilution is assumed to also be 25°C.

① ~~** Measured in source water~~ ① MM 6/23/15 E

QA: AR 7/1/15

CHRONIC CHEMICAL DATA (INITIAL)

Project Number: 14001-412-021

Test Species: ***Ceriodaphnia dubia***

%	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Meter #	Remarks
Conc.: 75%									All Conc.	
pH	7.8	7.8	7.6	7.7	7.6	7.6				
D.O. (mg/L)	6.8	6.8	6.9	6.7	7.1	6.7				
Temp. (°C)	*	*	*	*	*	*				
Cond. (µS/cm)	290	290	298	281	292	299				
Conc.:										
pH										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.:										
pH										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.:										
pH										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.: 100%										
pH	7.6	7.6	7.4	7.5	7.3	7.4				
D.O. (mg/L)	6.8	6.8	6.9	6.8	7.1	6.8				
Temp. (°C)	25	25	25	25	25	25				
Cond. (µS/cm)	276	280	289	275	282	291				
Hard. (mg/L)	80		80		80					
Alk. (mg/L)	~~[illegible]~~ 41		39		41					
TRC (mg/L)	<0.02		<0.02		0.02					
NH_3 (mg/L)	1.59 ▲		1.69 ▲		1.68 ▲				AN#1	
Date:	6/23/15	6/24/15	6/25/15	6/26/15	6/27/15	6/28/15				
Time:	1410	1175	1570	1320	1535	1005				
Initials:	RR	MW	AB	RR	AB	MW				

Note: Hardness, alkalinity, TRC, and NH3 data appearing on this page have been transcribed from the wet chemistry log QA Form No. 084.

*Dilution/control water and effluent were brought to 25°C prior to making the dilution series. The temperature of resulting effluent dilution is assumed to also be 25°C.

MW for AB 6/25/15 E

QA Form No. 059
Revision 3
Effective 02/14

CHRONIC CHEMICAL DATA (FINAL)

Project Number: 14001-412-021 QA: AR 7/1/15
Test Species: *Ceriodaphnia dubia*

%	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Meter #	Remarks
Conc.: 0 (MH)						332			All Conc.	* conductivity (#15)
pH	8.1	8.2	8.1	8.0	8.0	8.0			FUZY	
D.O. (mg/L)	6.5	6.9	6.3	6.5	6.4	6.5			5	
Temp (°C)	24	24	24	24	24	24			L-18	
Conc.: 12.5%										
pH	8.0	8.3	8.0	8.1	7.9	8.1				
D.O. (mg/L)	6.5	6.8	6.3	6.6	6.4	6.6				
Temp (°C)	24	24	24	24	24	24				
Conc.: 25%										
pH	8.0	8.2	8.0	7.9	7.9	8.1				
D.O. (mg/L)	6.4	6.4	6.3	6.4	6.3	6.6				
Temp (°C)	24	24	24	24	24	24				
Conc.: 50%										
pH	8.0	8.1	8.0	8.0	7.9	8.1				
D.O. (mg/L)	6.5	6.7	6.3	6.6	6.4	6.5				
Temp (°C)	24	24	24	24	25	24				
Conc.: 75%										
pH	7.9	8.1	8.0	8.1	7.8	8.0				
D.O. (mg/L)	6.5	6.8	6.4	6.8	6.3	6.5				
Temp (°C)	24	24	24	24	24	24				
Conc.: 100%						393				* conductivity (#15)
pH	7.9	8.0	7.9	8.1	7.8	8.0				
D.O. (mg/L)	6.5	6.8	6.4	6.9	6.3	6.6				
Temp (°C)	24	24	24	24	24	24				
Conc.:										
pH										
D.O. (mg/L)										
Temp (°C)										
Date:	6/24/15	6/25/15	6/26/15	6/27/15	6/28/15	6/29/15				
Time:	1335	1600	1355	1610	1055	1625				
Initials:	MW	AB	RR	AB	MW	AM				

DAILY TOXICITY TEST LOG

Project Number:	14001-412-021	QA: AR 6/30/15
Test Species:	***Ceriodaphnia dubia***	

General Comments	Neonates obtained from 060615 Perrier Bio monoculture board (green marked cups) Random Chart: Nova Min/Max Therm. #: M-14	Feeding 0.2 ml YTC/ALG Daily	Initials/Date
Test Day 0	Test Solution Mixed at: 1405 Test Organisms Added at: 14~~15~~30 ①	Fed @ 1415	RR/A 6/23/15
Test Day 1	Real Time Temp= 26 °C Range = 25-27 °C	Fed @ 1130	MW 6/24/15
Test Day 2	Real Time Temp= 25 °C Range = 25-27 °C	Fed @ 1540	AS 6/25/15
Test Day 3	Real Time Temp= 26 °C Range = 25-26 °C	Fed @ 1325	RR 6/26/15
Test Day 4	Real Time Temp= 25 °C Range = 25-26 °C	Fed @ 1545	AS 6/27/15
Test Day 5	Real Time Temp= 25 °C Range = 25-26 °C	Fed @ 1000	MW 6/28/15
Test Day 6	Real Time Temp= 25 °C Range = 25-26 °C	Fed @ None	AS 6/29/15
Test Day 7	Real Time Temp= °C Range = °C	Fed @	
Test Day 8	Real Time Temp= °C Range = °C	NONE	

DRR 6/23/15

CETIS Analytical Report

Report Date: 30 Jun-15 11:12 (p 1 of 2)
Test Code: 412-021 | 01-3467-5170

Ceriodaphnia 7-d Survival and Reproduction Test — **TRE Environmental Strategies**

Analysis ID:	08-7439-1205	**Endpoint:**	6d Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	30 Jun-15 11:00	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

Batch ID:	15-5515-6854	**Test Type:**	Reproduction-Survival (6-8d)	**Analyst:**	Lab Tech
Start Date:	23 Jun-15 14:30	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	29 Jun-15 16:20	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	6d 2h	**Source:**	In-House Culture	**Age:**	<24

Sample ID:	16-3467-0643	**Code:**	616F1833	**Client:**	Sumitomo Mining (Pogo)
Sample Date:	22 Jun-15 09:29	**Material:**	Ambient Sample	**Project:**	WET Annual Compliance Test
Receive Date:	23 Jun-15 13:00	**Source:**	Discharge Monitoring Report		
Sample Age:	29h	**Station:**	Outfall 001		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	42.7%	100	>100	NA	1

Steel Many-One Rank Sum Test

Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		12.5	97	75	4	18	0.5980	Asymp	Non-Significant Effect
		25	101	75	5	18	0.7280	Asymp	Non-Significant Effect
		50	92	75	1	18	0.4218	Asymp	Non-Significant Effect
		75	110	75	2	18	0.9223	Asymp	Non-Significant Effect
		100	98.5	75	3	18	0.6489	Asymp	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	36.6	7.32	5	0.05529	0.9979	Non-Significant Effect
Error	7148.8	132.3852	54			
Total	7185.4		59			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	1.917	15.1	0.8605	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.8664	0.946	<0.0001	Non-normal Distribution

6d Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	10	27.6	19.64	35.56	33.5	12	40	3.519	40.3%	0.0%
12.5		10	26.3	17.02	35.58	32.5	0	40	4.104	49.3%	4.71%
25		10	27.2	19.8	34.6	31.5	12	39	3.272	38.0%	1.45%
50		10	26.7	20.41	32.99	30	14	35	2.781	32.9%	3.26%
75		10	28.5	19.96	37.04	33	4	41	3.775	41.9%	-3.26%
100		10	26.3	16.83	35.77	32.5	0	37	4.185	50.3%	4.71%

6d Reproduction Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	37	31	40	16	17	12	15	36	36	36
12.5		34	24	36	0	15	13	35	31	35	40
25		37	32	34	15	15	12	36	21	31	39
50		28	26	33	15	15	14	32	35	34	35
75		34	32	4	23	17	21	41	35	38	40
100		0	32	7	18	33	34	36	35	31	37

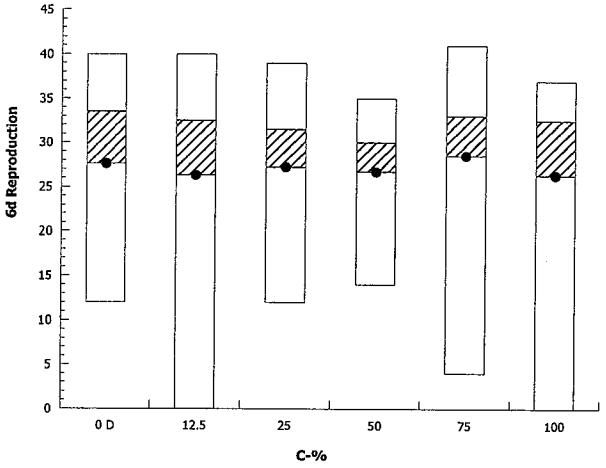
CETIS Analytical Report

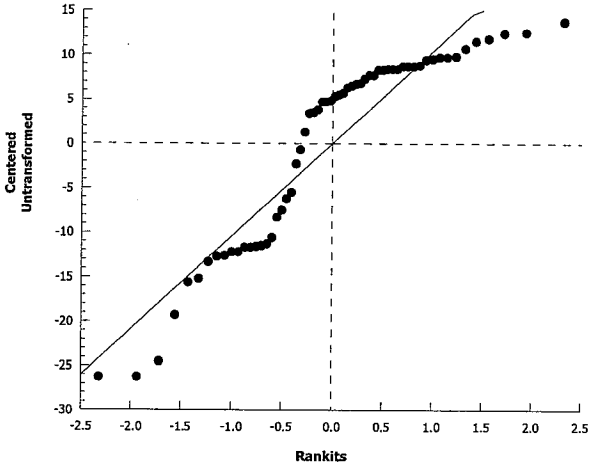
Report Date: 30 Jun-15 11:12 (p 2 of 2)
Test Code: 412-021 | 01-3467-5170

Ceriodaphnia 7-d Survival and Reproduction Test — **TRE Environmental Strategies**

Analysis ID:	08-7439-1205	**Endpoint:**	6d Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	30 Jun-15 11:00	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

Graphics





TRE

Report of Short-Term Chronic Toxicity Testing using the Fathead Minnow (Pimephales promelas)

Project ID: 14001-412-022
June 2015

Sponsor and Laboratory Information

Sponsor	Sumitomo Metal Mining Pogo LLC Pogo Mine Joint Venture P.O. Box 145 Delta Junction, AK 99737
Project Officer	Stacy Staley (907) 895-2761
Testing Facility	TRE Environmental Strategies, LLC Fort Collins Environmental Toxicology Laboratory 100 Racquette Drive, Unit A Fort Collins, CO 80524 Fax: (970) 490-2963 State of Florida NELAP Laboratory ID: E87972
Study Director	Rami B. Naddy, Ph.D. (970) 416-0916 email: naddyrb.tre@gmail.com
Report Author	Whitney Naddy (970) 416-0916 email: naddywm.tre@gmail.com

Test Information

Test	Short-Term Chronic under Static-Renewal Conditions
Basis	USEPA (2002), method 1000.0
Test Dates and Time	June 23, 2015 @ 1425 to June 30, 2015 @ 1425
Test Length	7 days
Species	*Pimephales promelas*
Test Material	Effluent
Outfall	Outfall 001
Permit Number	AK-005334-1
Receiving Stream	N/A
Dilution Water	Moderately hard reconstituted water
Concurrent Control Water	None
Test Concentrations	0 (control), 12.5, 25, 50, 75, and 100% effluent
Permit Compliance	_X_ **Pass** ____ Fail

- *Results described in this report apply only to the samples submitted to the laboratory and analyzed, as listed in the report*
- *Test results comply with NELAC standards. Reports are intended to be considered in their entirety; TRE is not responsible for consequences arising from use of a partial report*
- *This report contains 5 pages plus 2 appendices*

Effluent Collection and Receipt

Sample No.	Field No.	Collection Date & Time	TRE No.	Date of Receipt	Temp. at Arrival (°C)
1	N/A	06/22/15 @ 0925	28817	06/23/15	2.1
2	N/A	06/24/15 @ 0810	28823	06/25/15	3.0
3	N/A	06/26/15 @ 0745	28834	06/27/15	5.0

Note: See Appendix A for chain of custody records

Effluent Characterization

Sample No.	pH	Hard. (mg/L)[a]	Alk. (mg/L)[a]	Spec. Cond. (µS/cm)	TRC (mg/L)[b]	NH_3-N (mg/L)
1	7.7	80	41	282	<0.02	1.6
2	7.6	80	39	289	<0.02	1.7
3	7.6	80	41	278	0.02	1.7

[a] As $CaCO_3$
[b] Total residual chlorine

Initial Dilution/Control Water Characterization

Batch No.	pH	Hard. (mg/L)[a]	Alk. (mg/L)[a]	Spec. Cond. (µS/cm)	TRC (mg/L)[b]	NH_3-N (mg/L)[c]
11699	8.3	94	61	329	<0.02	<1.0

[a] As $CaCO_3$
[b] Total residual chlorine
[c] Measured on source water

Test Conditions

Type	Static-Renewal Short-term Chronic			
Test Endpoints	Survival and Growth			
Test Chambers	500-ml plastic cups			
Test Solution Volume	250 ml			
Replicates per Treatment	4			
Organisms per Replicate	10			
Test Temperature	25 ± 1°C (≤ 3°C differential)			
Lighting	Fluorescent, 16 hours light:8 hours dark			
Chamber Placement	Random according to computer-generated chart			
Aeration?	X	No		Yes
Test Solution Renewal	Daily			

Test Organism

Species	*Pimephales promelas*
Age	<48 hours
Source	TRE in-house culture, batch 062215
Acclimation	Test temperature
Feeding	0.10 ml concentrated suspension of brine shrimp (*Artemia* sp.) nauplii per test chamber three times daily during the test.
Reference Toxicant Testing	Initiated June 1, 2015 using sodium chloride (NaCl)

TEST RESULTS

Biological Data

Treatment (% Effluent)	Percent Survival of *Pimephales promelas*								Significant Reduction Relative to Control?	
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Mean Dry Weight (mg)[a]	Surv.	Growth
0 (Control)	100	100	100	100	100	100	100	0.753	N/A	N/A
12.5	100	100	100	100	100	100	100	0.644	No	Yes[b]
25	100	100	100	100	100	100	100	0.734	No	No
50	100	100	100	97.5	97.5	97.5	97.5	0.656	No	Yes
75	100	100	100	100	100	100	100	0.652	No	Yes
100	100	100	100	100	100	100	100	0.654	No	Yes
Percent Minimum Significant Difference (Growth)								11.3	Low	

[a] Mean dry weight calculated based on the original number of organisms per replicate
[b] Because the PMSD was below the lower bound of 12 (USEPA 2002), the relative percent differences (RPDs) from the control for all flagged treatments were evaluated. While the RPDs were >12, the only statistical flag that could be disregarded was the 12.5% treatment; because it was thought to be a Type I Error.
Note: See Appendix B for copies of laboratory data sheets

Data Analysis and Test Endpoints

Biological Endpoint	Statistical Endpoint	Value
Survival	NOEC	100% Effluent
	LOEC	>100% Effluent
	IC_{25}	>100% Effluent
Chronic (Growth)	NOEC	25% Effluent
	LOEC	50% Effluent
	ChV	35.4% Effluent
	IC_{25}	>100% Effluent
	TU_c ($100/IC_{25}$)	<1.0

NOEC = No Observed Effect Concentration
LOEC = Lowest Observed Effect Concentration
ChV = Chronic Value
IC_{25} = 25% Inhibition Concentration
TU_c = Chronic Toxic Units
Note: Analyses completed using, where appropriate, CETIS version 1.8.7 (2014).

Physical and Chemical Data

Treatment (% Effluent)	pH		Dissolved Oxygen (mg/L)		Conductivity (µS/cm)		Temperature (°C)	
	Low	High	Low	High	Low	High	Low	High
0 (Control)	7.5	8.3	4.6	7.0	306	335	24	25
100	7.3	7.7	3.8	6.9	278	300	24	25
All Treatments	7.3	8.3	≥3.8		NA		24[a]	25[a]
							25[b]	27[b]

[a] Temperature in test solutions
[b] Continuous wet temperature in the environmental chamber
Note: The low dissolved oxygen was observed at test termination

Reference Toxicant Test Results for *Pimephales promelas*

IC_{25}	TRE Historical 95% Control Limits	
	Low	High
1,274	830	1,405

Note: Values are expressed as mg/L of chloride.

References

CETIS. 2014. Comprehensive Environmental Toxicity Information System. User Guide (version 1.8.7). Tidepool Scientific, LLC. McKinleyville, CA

USEPA. 2002. Short-term methods for estimating the chronic toxicity of effluents and receiving waters to freshwater organisms. Fourth Edition. EPA-821-R-02-013.

Statement of Quality Assurance

The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol (if applicable) and standard operating procedures, and that the resulting data and report meet the requirements of the NELAC standards. This report is an accurate reflection of the raw data.

Anita Reiner — July 7, 2015
Quality Assurance Unit — Date

Whitney Maddy — July 7, 2015
Data Analyst — Date

APPENDIX A

Chain of Custody Records

TRE Environmental Strategies, LLC

100 Racquette Drive, Unit A Fort Collins, CO 80524 Phone: (970) 416-0916 Fax: (970) 490-2963

Client/Project Name: Sumitomo Metal Mining Pogo
Project #: 14001-412(021,022)
Sampler (Print/Affiliation): _____ Signature: _____
Chain of Custody Tape #: 454406 Intact? (circle): Yes No

Client / Sample ID	Sample Collection Beginning Date	Beginning Time	Ending Date	Ending Time	Sample Type Grab	Comp.	Volume	Preservation (i.e.: 0-6°C)	Matrix (Liq., Soil, Sediment, etc.)	Test Requested: FC, CC						Sample Temp. Upon Arrival (Therm. #: 18)	Lab Sample ID
Effluent #2	6/22/2015	9:25	6/22/2015	9:29	X		2.5 Gal	0-6°C	L	✓						2.1	2.8817
Effluent #1	6/22/2015	9:26	6/22/2015	9:27	X		1 Gal	0-6°C	L	✓							

Sample Relinquished By: (Print Name/Affiliation)	Date / Time	Received By: (Print Name/Affiliation)	Date / Time
Jim Ward, Pogo Env. Signature:	Date: 6/22/2015 Time: 1430	Ashley Romero TTNE Signature:	Date: 6/23/15 Time: 1300
Sample Relinquished By: (Print Name/Affiliation) Signature:	Date: Time:	Received By: (Print Name/Affiliation) Signature:	Date: Time:
Sample Relinquished By: (Print Name/Affiliation) Signature:	Date: Time:	Received By: (Print Name/Affiliation) Signature:	Date: Time:

Laboratory (Destination): Received on ice
TRE Environmental Strategies, LLC
100 Racquette Drive, Unit A
Fort Collins, CO 80524
(970) 416-0916
(970) 490-2963 (FAX)

Sample Shipped Via (circle): FedEx UPS Other Courier
Temp Blank? Yes No

Comments:

① NBN 6/30/15 CF

Serial No. 00731

TRE Environmental Strategies, LLC

100 Racquette Drive, Unit A Fort Collins, CO 80524 Phone: (970) 416-0916 Fax: (970) 490-2963

Client/Project Name: Sumitomo Metal Mining Pogo

Project #: 14001-412-(021,022)

Sampler (Print/Affiliation): _____ Signature: _____

Chain of Custody Tape #: 454467 Intact?(circle): Yes No

Client / Sample ID	Sample Collection Beginning Date	Beginning Time	Ending Date	Ending Time	Sample Type Grab	Comp.	Volume	Preservation (i.e.: 0-6°C)	Matrix (Liq., Soil, Sediment, etc.)	Test Requested: Fe, CC						Sample Temp. Upon Arrival (Therm. # 63)	Lab Sample ID
Effluent #3 (2)	6-24-15	0810	6-24-15	0820			2.5 Gal	0-6°C	L	✓						~~1.60~~	288203
Effluent #3 (1)	6-24-15	0810	6-24-15	0820			1 Gal	0-6°C	L	✓						3.0	

Sample Relinquished By: (Print Name/Affiliation)	Date	Received By: (Print Name/Affiliation)	Date	Laboratory (Destination):
Stacy Staley Pogo Signature: Stacy Staley	Date: 6-24-15 Time: 11:40 am	Michelle Urban, Pogo Buyer Signature: Michelle Urban, Pogo Buyer	Date: 6-24-15 Time: 11:40AM	TRE Environmental Strategies, LLC 100 Racquette Drive, Unit A Fort Collins, CO 80524 (970) 416-0916 (970) 490-2963 (FAX)
Sample Relinquished By: (Print Name/Affiliation) Michelle Urban, Pogo Buyer Signature: Michelle Urban	Date: 6-24-15 Time: 3:47pm	Received By: (Print Name/Affiliation) Amanda Bidlack/TRE Signature: Amanda Bidlack	Date: 6/25/15 Time: 1310	
Sample Relinquished By: (Print Name/Affiliation) Signature:	Date: _____ Time: _____	Received By: (Print Name/Affiliation) Signature:	Date: _____ Time: _____	Sample Shipped Via (circle): FedEx Other UPS Courier Temp Blank? Yes No

Comments: Received on ice

① AB 6/25/15 E ② AB 7/1/15 CF

Serial No. 00732

TRE Environmental Strategies, LLC

100 Racquette Drive, Unit A Fort Collins, CO 80524 Phone: (970) 416-0916 Fax: (970) 490-2963

Client/Project Name: Sumitomo Metal Mining Pogo
Project #: 14001-412-(021,022)
Sampler (Print/Affiliation): Leonard Z Hanson Signature: Leonard Z Hanson
Chain of Custody Tape #: 454605 Intact? (circle): Yes No

Client / Sample ID	Sample Collection Beginning Date	Beginning Time	Ending Date	Ending Time	Sample Type Grab	Comp.	Volume	Preservation (i.e.: 0-6°C)	Matrix (Liq., Soil, Sediment, etc.)	Test Requested FC, CC							Sample Temp. Upon Arrival (Therm. #3)	Lab Sample ID
Effluent #1 X3	6/26/15	0745	—	—			2.5 Gal	0-6°C	L	✓							5.0	28834
Effluent #2 X3	6/26/15	" "	—	—			1 Gal	0-6°C	L	✓								
Effluent #3 X3	6/26/15	" "	—	—			1 gal	0-6°C	L	✓								

Sample Relinquished By: (Print Name/Affiliation)	Date	Received By: (Print Name/Affiliation)	Date
Leonard Z Hanson	6/26/15	Justin Boucher	6/26/15
Signature: Leonard Z Hanson	Time: 0745	Signature: Justin Boucher	Time: 1045
Sample Relinquished By: Justin Boucher / POGO	Date: 6/26/15	Received By: Amanda Bidlack / TRE	Date: 6/27/15
Signature: Justin Boucher	Time: 13:50 pm	Signature: Amanda Bidlack	Time: 1305
Sample Relinquished By:	Date:	Received By:	Date:
Signature:	Time:	Signature:	Time:

Laboratory (Destination):
TRE Environmental Strategies, LLC
100 Racquette Drive, Unit A
Fort Collins, CO 80524
(970) 416-0916
(970) 490-2963 (FAX)

Sample Shipped Via (circle): FedEx Other UPS Courier
Temp Blank? Yes No

Comments:
extra 1 gallon collected in a clean 1 gallon jug. Received on ice
OAB 6/27/15 E

Serial No. 00730

APPENDIX B

Test Data

QA Form No. 051
Revision 5
Effective 02/14

TOXICITY DATA PACKAGE COVER SHEET

QA: AR 7/7/15

Test Type: Chronic

Project Number: 14001-412-022

Test Substance: Effluent-(Outfall 001)

Species: *Pimephales promelas*

Dilution Water Type: Mod Hard

Organism Lot or Batch Number: 062215

Concurrent Control Water Type: NA

Age: L48hr (< 24 hr) Supplier: TRE

Date and Time Test Began: 6/23/15 @ 1425

Date and Time Test Ended: 6/30/15 @ 1425

Protocol Number: USEPA 2002, Method 1000.0

Investigator(s): MH/RR/MJ/KF/MW

Background Information

pH control?: Yes No

Type of Test: Static-Renewal

If yes, give % CO_2: N/A

Test Temperature: 25 ± 1 °C

Env. Chmbr/Bath #: 25

Test Chmbrs: 500-ml cups/beakers

Test Solution Vol.: 250 ml

Number of Replicates per Treatment: 4

Length of Test: 7 days

Number of Organisms per Replicate: 10

Photoperiod: 16 h light : 8 h dark

Light Intensity: 50 to 100 ft.-c.

Type of Food and Quantity per Chamber: 0.1 ml B.S.

Feeding Frequency: 3 x Daily

Test Substance Characterization Parameters and Frequency:

Hardness: Sx Receipt Alkalinity: Sx Receipt NH_3: Sx Receipt TRC: Sx Receipt

pH: Daily Conductivity: Daily

Test Concentrations (Volume:Volume): 0 (MH), 12.5, 25, 50, 75, and 100%

Agency Summary Sheet(s)?: None

Reference Toxicant Data: Test Dates: 06/01/15 to 06/08/15 IC_{25}: 1274 mg Cl/L

Hist. 95% Control Limits: 830 to 1405 Method for Determining Ref. Tox. Value: ICPIN

Special Procedures and Considerations:

D.O. maintained ≥ 4.0 mg/L

*Conductivity measured in dilution water and 100% effluent at test termination

If survival in any test chamber falls below 50%, reduce feeding in that chamber to 0.05 ml of brine shrimp

Study Director Initials: MJN Date: 6/23/15

QA Form No. 014
Revision 1
Effective 02/14

TEST SUBSTANCE USAGE LOG

QA: AR 7/2/15

Project Number: 14001-412-022

	Sample 1	Sample 2	Sample 3	Sample 4
Test Substance Number	28817	28823	28834	
Test Substance Collection Date and Time	From: 6/22/15 @ 0525	From: 6/24/15 @ 0810	From: 6/26/15 @ 0745	From: @
	To: 6/22/15 @ 0529	To: 6/24/15 @ 0820	To: @ NA	To: @
Sample Type (Grab or Comp)	Grab	Grab	Grab	
Date Test Substance Received	6/23/15	6/25/15	6/27/15	
Dilution Water Number RW# or TRE#, circle one	11699* ~~11769~~ ①	11704	11704	
Concurrent Control Water RW#	NA	NA	NA	
Date(s) Used	6/23/15*	6/25/15	6/27/15	
	6/24/15*	6/26/15	6/28/15	
			6/29/15	

Preparation of Test Solutions

Test Substance Conc. (% Effluent)	Test Substance Volume (ml)	Dilution Water Volume (ml)	Total Volume (ml)	Test Substance Volume (ml)	Dilution Water Volume (ml)	Total Volume (ml)	Test Substance Volume (ml)	Dilution Water Volume (ml)	Total Volume (ml)
0 (MH)	0	1200	1200	0	1000	1000			
12.5%	150	1050	1200	125	875	1000			
25%	300	900	1200	250	750	1000			
50%	600	600	1200	500	500	1000			
75%	900	300	1200	750	250	1000			
100%	1200	0	1200	1000	0	1000			
Total	3150	4050	7200	2625	3375	6000			

Initials / Date		6/23/15 MH Mixed FC	
Initials / Date		MH 6/24/15 " "	
Initials / Date		MH 6/25/15 " "	
Initials / Date		KAM 6/26/15 " "	
Initials / Date		RR 6/27/15 " "	
Initials / Date		MH 6/28/15 " "	
Initials / Date		MW 6/29/15 " "	
Initials / Date			

① MH 6/25/15, E

FATHEAD MINNOW (*PIMEPHALES PROMELAS*)
CHRONIC BIOLOGICAL DATA

QA: AR 7/2/15

Project Number: 14001-412-022

% survival

%Conc.	Test Replicate	Number of Surviving Organisms								Remarks
		Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	
0 (MH)	A	10	10	10	10	10	10	10	10	100%
	B	10	10	10	10	10	10	10	10	
	C	10	10	10	10	10	10	10	10	
	D	10	10	10	10	10	10	10	10	
12.5%	A	10	10	10	10	10	10	10	10	100%
	B	10	10	10	10	10	10	10	10	
	C	10	10	10	10	10	10	10	10	
	D	10	10	10	10	10	10	10	10	
25%	A	10	10	10	10	10	10	10	10	100%
	B	10	10	10	10	10	10	10	10	
	C	10	10	10	10	10	10	10	10	
	D	10	10	10	10	10	10	10	10	
50%	A	10	10	10	10*	9	9	9	9	*1 weak org. 97.5%
	B	10	10	10	10	10	10	10	10	
	C	10	10	10	10	10	10	10	10	
	D	10	10	10	10	10	10	10	10	
75%	A	10	10	10	10	10	10	10	10	100%
	B	10	10	10	10	10	10	10	10	
	C	10	10	10	10	10	10	10	10	
	D	10	10	10	10	10	10	10	10	
100%	A	10	10	10	10	10	10	10	10	100%
	B	10	10	10	10	10	10	10	10	
	C	10	10	10	10	10	10	10	10	
	D	10	10	10	10	10	10	10	10	
	A									
	B									
	C									
	D									
Date:		6/23/15	6/24/15	6/25/15	6/26/15	6/27/15	6/28/15	6/29/15	6/30/15	
Time:		1425	1400	1430	1500	1535	1045	1140	1425	
Initials:		MH/RR	MH	MH	KFM	RR	MH	MW	MH	

QA: AR 7/7/15

CHRONIC CHEMICAL DATA (INITIAL)

Project Number: 14001-412-022

Test Species: ***Pimephales promelas***

%	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Meter #	Remarks
Conc.: 0 (MH)									All Conc.	
pH	8.3	8.3	8.3	8.3	8.3	8.3	8.2		Fm24	
D.O. (mg/L)	6.6	6.6	7.0	6.4	6.8	6.7	6.5		5	
Temp. (°C)	25	25	25	25	25	25	25		L-5	
Cond. (µS/cm)	329	326	319	316	328	306	310		15	
Hard. (mg/L)	94		90		90				Titr.	
Alk. (mg/L)	61		58		59				Titr.	
TRC (mg/L)	(6/19/15) <0.02		(6/24/15) <0.02						22	
NH_3 (mg/L) ① ~~*~~	<1.0		<1.0						HA4	
Conc.: 12.5%										
pH	8.3	8.3	8.3	8.2	8.2	8.2	8.2			
D.O. (mg/L)	6.6	6.6	7.0	6.5	6.8	6.7	6.5			
Temp. (°C)	*	*	*	*	*	*	*			
Cond. (µS/cm)	334	331	322	316	318	326	315			
Hard. (mg/L)										
Alk. (mg/L)										
TRC (mg/L)										
NH_3 (mg/L)										
Conc.: 25%										
pH	8.2	8.1	8.2	8.1	8.1	8.1	8.0			
D.O. (mg/L)	6.6	6.7	7.0	6.5	6.9	6.8	6.5			
Temp. (°C)	*	*	*	*	*	*	*			
Cond. (µS/cm)	328	323	318	312	312	318	317			
Conc.: 50%										
pH	8.0	8.0	8.0	8.0	7.9	7.9	7.9			
D.O. (mg/L)	6.6	6.7	7.0	6.5	6.9	6.8	6.4			
Temp. (°C)	*	*	*	*	*	*	*			
Cond. (µS/cm)	312	309	308	302	298	309	309			
Date:	6/23/15	6/24/15	6/25/15	6/26/15	6/27/15	6/28/15	6/29/15			
Time:	1415	1350	1420	1415	1510	1035	1125			
Initials:	MH	MH	MH	KF/RR	RR	MH	MW			

Note: Hardness, alkalinity, TRC, and NH3 data appearing on this page have been transcribed from the wet chemistry log QA Form No. 084.

*Dilution/control water and effluent were brought to 25°C prior to making the dilution series. The temperature of resulting effluent dilution is assumed to also be 25°C.

~~** Measured in source water~~

① WJN 6/23/15 E

CHRONIC CHEMICAL DATA (INITIAL)

Project Number: 14001-412-022 QA: AE 7/2/15

Test Species: ***Pimephales promelas***

%	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Meter #	Remarks
Conc.: 75%									All Conc.	
pH	7.9	7.8	7.8	7.8	7.8	7.7	7.7			
D.O. (mg/L)	6.6	6.7	6.5	6.6	6.9	6.8	6.5			
Temp. (°C)	*	*	*	*	*	*	*			
Cond. (µS/cm)	296	295	298	292	289	299	296			
Conc.:										
pH										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.:										
pH										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.:										
pH										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.: 100%										
pH	7.7	7.6	7.6	7.6	7.6	7.5	7.5			
D.O. (mg/L)	6.7	6.8	6.6	6.7	6.9	6.9	6.7			
Temp. (°C)	25	25	25	25	25	25	25			
Cond. (µS/cm)	282	280	289	283	278	287	287			
Hard. (mg/L)	80		80		80					
Alk. (mg/L)	41		39		41					
TRC (mg/L)	<0.02		<0.02		0.02					
NH_3 (mg/L)	1.59 Δ		1.69 Δ		1.68 Δ				ΔNS#1	
Date:	6/23/15	6/24/15	6/25/15	6/26/15	6/27/15	6/28/15	6/29/15			
Time:	1415	1350	1420	1415	1510	1035	1125			
Initials:	MH	MH	MH	KP/AS	RR	MH	MH			

Note: Hardness, alkalinity, TRC, and NH3 data appearing on this page have been transcribed from the wet chemistry log QA Form No. 084.

*Dilution/control water and effluent were brought to 25°C prior to making the dilution series. The temperature of resulting effluent dilution is assumed to also be 25°C.

QA Form No. 059
Revision 3
Effective 02/14

QA: AR 7/7/15

CHRONIC CHEMICAL DATA (FINAL)

Project Number:	14001-412-022
Test Species:	***Pimephales promelas***

%		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Meter #	Remarks
Conc.:	0 (MH)							335		All Conc.	* conductivity (15)
pH		7.5	7.6	7.6	7.5	7.6	7.7	7.6		RMZ4	
D.O. (mg/L)		4.6	4.7	6.2	5.1	5.0	4.8	4.9		5	
Temp (°C)		24	24	24	24	24	24	24		L-5	
Conc.:	12.5%										
pH		7.5	7.5	7.5	7.4	7.5	7.6	7.5			
D.O. (mg/L)		4.3	4.2	5.8	4.6	4.4	4.4	4.4			
Temp (°C)		25	24	24	24	25	24	24			
Conc.:	25%										
pH		7.5	7.5	7.5	7.4	7.5	7.6	7.5			
D.O. (mg/L)		4.1	4.4	5.4	4.7	4.5	4.2	4.7			
Temp (°C)		25	24	25	24	25	24	25			
Conc.:	50%										
pH		7.4	7.5	7.4	7.4	7.4	7.5	7.4			
D.O. (mg/L)		4.1	4.2	5.3	4.6	4.2	4.0	3.9			
Temp (°C)		25	25	25	25	25	24	25			
Conc.:	75%										
pH		7.4	7.4	7.4	7.3	7.4	7.5	7.4			
D.O. (mg/L)		4.0	4.3	5.2	4.6	4.2	4.1	3.9			
Temp (°C)		25	25	25	25	25	24	25			
Conc.:	100%							300			* conductivity (15)
pH		7.3	7.3	7.4	7.3	7.3	7.4	7.3			
D.O. (mg/L)		4.2	4.2	5.3	5.0	4.2	4.0	3.8			
Temp (°C)		25	25	25	25	25	24	25			
Conc.:											
pH											
D.O. (mg/L)											
Temp (°C)											
Date:		6/24/15	6/25/15	6/26/15	6/27/15	6/28/15	6/29/15	6/30/15			
Time:		1350	1420	1415	1510	1035	1120	1415			
Initials:		MH	MH	KP/MA	RF	MH	MW	MH			

QA Form No. 055
Revision 3
Effective 02/14

QA: AR 7/2/15

DAILY TOXICITY TEST LOG

Project Number:	14001-412-022
Test Species:	***Pimephales promelas***

General Comments	Random Chart: Kappa Min/Max Therm. #: M14	Feeding 0.1 ml B.S. 3 x Daily	Initials/Date
Test Day 0	Test Solution Mixed at: 1410 Test Organisms Added at: 1425	Fed @ 1725 RR	MH 6/23/15
Test Day 1	Real Time Temp= 26 °C Range = 25-27 °C	Fed @ 0815 MH 1220 AB 1810 MH	MH 6/24/15
Test Day 2	Real Time Temp= 25 °C Range = 25-27 °C	Fed @ 0815 MH 1200 MH 1760 MW	MH 6/25/15
Test Day 3	Real Time Temp= 26 °C Range = 25-26 °C	Fed @ ~~0815~~ JA 1205 AB KF 1725 KF/RR	KF/AB 6/26/15
Test Day 4	Real Time Temp= 25 °C Range = 25-26 °C	Fed @ 0820 RR 1150 AB 1650 RR	RR 6/27/15
Test Day 5	Real Time Temp= 25 °C Range = 25-26 °C	Fed @ 0815 MH 1200 MH 1605 MW	MH 6/28/15
Test Day 6	Real Time Temp= 25 °C Range = 25-26 °C	Fed @ 0825 KF/AB 1205 KF/AB 1630 KF/AB	MW 6/29/15
Test Day 7	Real Time Temp= 25 °C Range = 25-26 °C	NONE	MH 6/30/15
Test Day 8			

QA Form No.010
Revision 6
Effective 02/14

QA: AR 7/2/15

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project Number: 14001-412-022
Species: P. promelas
Date/Time of Tare Wt.: 6/30/15 @ 1450
Test Substance: Effluent
Analyst Tare: KP/AM Analyst Gross: KP/AM
Date/Time of Gross Wt.: 7/1/15 @ 1135
Comments:
Analytical Balance ID: SART #1
Dried in Oven # 2 from Date: 6/30/15 Time: 1430
to Date: 7/1/15 Time: 0915

Weight Type (Circle): Wet Blot Dry Dry (>100 C) AFDW (>500 C)
Lot or Batch Number: 062215

Boat No.	Treatment (%)	Rep.	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)[1]	No. of Orig. Organisms	Mean Wt. per Original Organism (mg)	Mean Wt. per Treatment (mg) (Original)	No. of Surv. Organisms	Mean Wt. per Surviving Organism (mg)	Mean Wt. per Treatment (mg) (Surviving)
	MH	A		0.93206	0.93948	0.00742					10		
		B		0.93761	0.94550	0.00789					10		
		C		0.93241	0.93962	0.00721					10*		
		D		0.93276	0.94007	0.00731					10		
	12.5	A		0.93060	0.93664	0.00604					10		
		B		0.92967	0.93598	0.00631					10		
		C		0.92584	0.93215	0.00631					10		
		D		0.92612	0.93295	0.00683					10		
	25	A		0.93265	0.94042	0.00777					10		
		B		0.92634	0.93300	0.00666					10		
		C		0.93389	0.94146	0.00757					10		
		D		0.93258	0.93965	0.00707					10		
Blank				0.93257	0.93250	-0.00007							
Range													
Mean													

Test Solution Volume:
Loading Rate:

[1] Add in weight loss of blank boat, if appropriate.

*found 10th org. on MHD pan

QA Form No.010
Revision 6
Effective 02/14

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project Number: 14001-412-022
Test Substance: Effluent
Comments: QA: AR 7/2/15
Species: P. promelas
Analyst Tare: KFI Analyst Gross: KFI
Analytical Balance ID: SART #1
Dried in Oven # 2 from Date: 6/30/15 Time: 1430 to Date: 7/1/15 Time: 0915
Date/Time of Tare Wt.: 6/30/15 @ 1450
Date/Time of Gross Wt.: 7/1/15 @ 1135

Weight Type (Circle): Wet Blot Dry Dry (>100 C) AFDW (>500 C)
Lot or Batch Number: 062215

Boat No.	Treatment (%)	Rep.	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)[1]	No. of Orig. Organisms	Mean Wt. per Original Organism (mg)	Mean Wt. per Treatment (mg) (Original)	No. of Surv. Organisms	Mean Wt. per Surviving Organism (mg)	Mean Wt. per Treatment (mg) (Surviving)
	50	A		0.93222	0.93844	0.00622					9		
		B		0.92879	0.93407	0.00528 *					10		
		C		0.93262	0.94002	0.00740					10		
		D		0.93335	0.94040	0.00705					10		
	75	A		0.93049	0.93684	0.00635					10		
		B		0.93254	0.93859	0.00605					10		
		C		0.93092	0.93770	0.00678					10		
		D		0.93670	0.94331	0.00661					10		
	100	A		0.93117	0.93737	0.00620					10		
		B		0.92957	0.93625	0.00668					10		
		C		0.93181	0.93849	0.00668					10		
		D		0.93487	0.94121	0.00634					10		
Blank													
Range													
Mean													

Test Solution Volume: * weight verified fish smaller
Loading Rate:

[1] Add in weight loss of blank boat, if appropriate.

QA Form No. 010a
Revision 1
Effective 02/14

BJ 7/2/15
QA: MR 7/2/15

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project Number: 14001-412-022 Species: Fathead minnow

Treatment	Rep	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)	No of Orig. Organisms	Mean Wt./ Original Organism (mg)	Mean Wt./ Treatment (mg) (Original)	Number of Surv. Organisms	Mean Wt./ Surviving Organism (mg)	Mean Wt./ Treatment (mg) (Surviving)
MH	A		0.93206	0.93948	0.00742	0.00749	10	0.749	0.7527	10	0.749	0.7527
	B		0.93761	0.94550	0.00789	0.00796	10	0.796		10	0.796	
	C		0.93241	0.93962	0.00721	0.00728	10	0.728		10	0.728	
	D		0.93276	0.94007	0.00731	0.00738	10	0.738		10	0.738	
12.5%	A		0.93060	0.93664	0.00604	0.00611	10	0.611	0.6443	10	0.611	0.6443
	B		0.92967	0.93598	0.00631	0.00638	10	0.638		10	0.638	
	C		0.92584	0.93215	0.00631	0.00638	10	0.638		10	0.638	
	D		0.92612	0.93295	0.00683	0.00690	10	0.690		10	0.690	
25%	A		0.93265	0.94042	0.00777	0.00784	10	0.784	0.7338	10	0.784	0.7338
	B		0.92634	0.93300	0.00666	0.00673	10	0.673		10	0.673	
	C		0.93389	0.94146	0.00757	0.00764	10	0.764		10	0.764	
	D		0.93258	0.93965	0.00707	0.00714	10	0.714		10	0.714	
50%	A		0.93222	0.93844	0.00622	0.00629	10	0.629	0.6557	9	0.699	0.6732
	B		0.92879	0.93407	0.00528	0.00535	10	0.535		10	0.535	
	C		0.93262	0.94002	0.00740	0.00747	10	0.747		10	0.747	
	D		0.93335	0.94040	0.00705	0.00712	10	0.712		10	0.712	
75%	A		0.93049	0.93684	0.00635	0.00642	10	0.642	0.6518	10	0.642	0.6518
	B		0.93254	0.93859	0.00605	0.00612	10	0.612		10	0.612	
	C		0.93092	0.93770	0.00678	0.00685	10	0.685		10	0.685	
	D		0.93670	0.94331	0.00661	0.00668	10	0.668		10	0.668	
100%	A		0.93117	0.93737	0.00620	0.00627	10	0.627	0.6545	10	0.627	0.6545
	B		0.92957	0.93625	0.00668	0.00675	10	0.675		10	0.675	
	C		0.93181	0.93849	0.00668	0.00675	10	0.675		10	0.675	
	D		0.93487	0.94121	0.00634	0.00641	10	0.641		10	0.641	
Blank			0.93257	0.93250	-0.00007							

KJN 7/2/15
QA: MC 7/2/15

Project Number: 14001-412-022 Species: Fathead minnow

Summary Statistics for Survival Data

Treatment	N	Min	Max	Mean	SD	C.V.
MH	4	1.0	1.0	1.0000	0.0000	0.000%
12.5%	4	1.0	1.0	1.0000	0.0000	0.000%
25%	4	1.0	1.0	1.0000	0.0000	0.000%
50%	4	0.9	1.0	0.9750	0.0500	5.128%
75%	4	1.0	1.0	1.0000	0.0000	0.000%
100%	4	1.0	1.0	1.0000	0.0000	0.000%

Summary Statistics for Growth Data (dry wt per original)

Treatment	N	Min	Max	Mean	SD	C.V.
MH	4	0.728	0.796	0.7527	0.0301	3.996%
12.5%	4	0.611	0.690	0.6443	0.0330	5.130%
25%	4	0.673	0.784	0.7338	0.0501	6.824%
50%	4	0.535	0.747	0.6557	0.0945	14.410%
75%	4	0.612	0.685	0.6518	0.0319	4.888%
100%	4	0.627	0.675	0.6545	0.0244	3.721%

Summary Statistics for Growth Data (dry wt per surviving organism)

Treatment	N	Min	Max	Mean	SD	C.V.
MH	4	0.728	0.796	0.7527	0.0301	3.996%
12.5%	4	0.611	0.690	0.6443	0.0330	5.130%
25%	4	0.673	0.784	0.7338	0.0501	6.824%
50%	4	0.535	0.747	0.6732	0.0944	14.016%
75%	4	0.612	0.685	0.6518	0.0319	4.888%
100%	4	0.627	0.675	0.6545	0.0244	3.721%

CETIS Analytical Report

Report Date: 02 Jul-15 12:34 (p 1 of 2)
Test Code: 412-022 | 02-7420-2954

Fathead Minnow 7-d Larval Survival and Growth Test — **TRE Environmental Strategies**

Analysis ID:	00-7802-8833	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.7
Analyzed:	02 Jul-15 12:33	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Batch ID:	14-2668-0796	**Test Type:**	Growth-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	23 Jun-15 14:25	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	30 Jun-15 14:25	**Species:**	Pimephales promelas	**Brine:**	Not Applicable
Duration:	7d 0h	**Source:**	In-House Culture	**Age:**	<24

Sample ID:	20-6620-1592	**Code:**	7B27BBF8	**Client:**	Sumitomo Mining (Pogo)
Sample Date:	22 Jun-15 09:29	**Material:**	Ambient Sample	**Project:**	WET Annual Compliance Test
Receive Date:	23 Jun-15 13:00	**Source:**	Discharge Monitoring Report		
Sample Age:	29h	**Station:**	Outfall 001		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	11.3%	25	50	35.36	4

Dunnett Multiple Comparison Test

$\alpha = 0.05$

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		12.5*	3.065	2.41	0.085	6	0.0135	CDF	Significant Effect
		25	0.5367	2.41	0.085	6	0.6315	CDF	Non-Significant Effect
		50*	2.74	2.41	0.085	6	0.0261	CDF	Significant Effect
		75*	2.853	2.41	0.085	6	0.0208	CDF	Significant Effect
		100*	2.775	2.41	0.085	6	0.0243	CDF	Significant Effect

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control Resp	0.7528	0.25 - NL	Yes	Passes Acceptability Criteria
PMSD	0.1132	0.12 - 0.3	Yes	Below Acceptability Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.04587588	0.009175177	5	3.66	0.0185	Significant Effect
Error	0.04512276	0.00250682	18			
Total	0.09099864		23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	7.768	15.1	0.1695	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9641	0.884	0.5262	Normal Distribution

Mean Dry Biomass-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	4	0.7528	0.7049	0.8006	0.7435	0.728	0.796	0.01504	4.0%	0.0%
12.5		4	0.6443	0.5917	0.6968	0.638	0.611	0.69	0.01652	5.13%	14.4%
25		4	0.7338	0.6541	0.8134	0.739	0.673	0.784	0.02503	6.82%	2.52%
50		4	0.6557	0.5054	0.8061	0.6705	0.535	0.747	0.04725	14.4%	12.9%
75		4	0.6517	0.6011	0.7024	0.655	0.612	0.685	0.01593	4.89%	13.4%
100		4	0.6545	0.6158	0.6932	0.658	0.627	0.675	0.01218	3.72%	13.1%

Mean Dry Biomass-mg Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.749	0.796	0.728	0.738
12.5		0.611	0.638	0.638	0.69
25		0.784	0.673	0.764	0.714
50		0.629	0.535	0.747	0.712
75		0.642	0.612	0.685	0.668
100		0.627	0.675	0.675	0.641

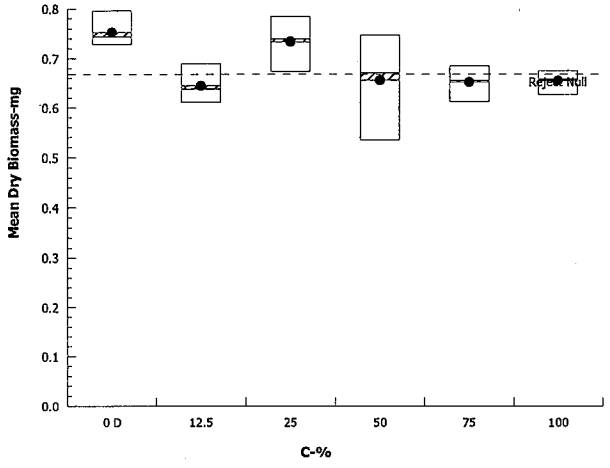
CETIS Analytical Report

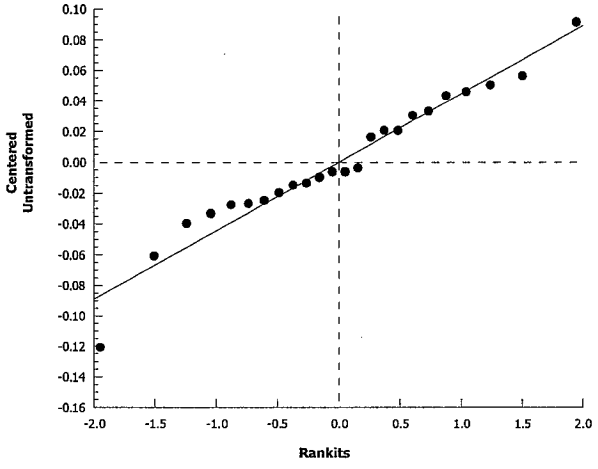
Report Date:	02 Jul-15 12:34 (p 2 of 2)
Test Code:	412-022 | 02-7420-2954

Fathead Minnow 7-d Larval Survival and Growth Test — **TRE Environmental Strategies**

Analysis ID:	00-7802-8833	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.7
Analyzed:	02 Jul-15 12:33	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Graphics





CETIS Analytical Report

Report Date: 02 Jul-15 12:34 (p 1 of 2)
Test Code: 412-022 | 02-7420-2954

Fathead Minnow 7-d Larval Survival and Growth Test — **TRE Environmental Strategies**

Analysis ID:	20-5290-3451	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.7
Analyzed:	02 Jul-15 12:34	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Batch ID:	14-2668-0796	**Test Type:**	Growth-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	23 Jun-15 14:25	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	30 Jun-15 14:25	**Species:**	Pimephales promelas	**Brine:**	Not Applicable
Duration:	7d 0h	**Source:**	In-House Culture	**Age:**	<24

Sample ID:	20-6620-1592	**Code:**	7B27BBF8	**Client:**	Sumitomo Mining (Pogo)
Sample Date:	22 Jun-15 09:29	**Material:**	Ambient Sample	**Project:**	WET Annual Compliance Test
Receive Date:	23 Jun-15 13:00	**Source:**	Discharge Monitoring Report		
Sample Age:	29h	**Station:**	Outfall 001		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	15.1%	100	>100	NA	1

Dunnett Multiple Comparison Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:1%)
Dilution Water		12.5	3.065	3.21	0.114	6	0.0135	CDF	Non-Significant Effect
		25	0.5367	3.21	0.114	6	0.6315	CDF	Non-Significant Effect
		50	2.74	3.21	0.114	6	0.0261	CDF	Non-Significant Effect
		75	2.853	3.21	0.114	6	0.0208	CDF	Non-Significant Effect
		100	2.775	3.21	0.114	6	0.0243	CDF	Non-Significant Effect

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control Resp	0.7528	0.25 - NL	Yes	Passes Acceptability Criteria
PMSD	0.1508	0.12 - 0.3	Yes	Passes Acceptability Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.04587588	0.009175177	5	3.66	0.0185	Significant Effect
Error	0.04512276	0.00250682	18			
Total	0.09099864		23			

Distributional Tests

α = 0.01

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	7.768	15.1	0.1695	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9641	0.884	0.5262	Normal Distribution

Mean Dry Biomass-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	4	0.7528	0.7049	0.8006	0.7435	0.728	0.796	0.01504	4.0%	0.0%
12.5		4	0.6443	0.5917	0.6968	0.638	0.611	0.69	0.01652	5.13%	14.4%
25		4	0.7338	0.6541	0.8134	0.739	0.673	0.784	0.02503	6.82%	2.52%
50		4	0.6557	0.5054	0.8061	0.6705	0.535	0.747	0.04725	14.4%	12.9%
75		4	0.6517	0.6011	0.7024	0.655	0.612	0.685	0.01593	4.89%	13.4%
100		4	0.6545	0.6158	0.6932	0.658	0.627	0.675	0.01218	3.72%	13.1%

Mean Dry Biomass-mg Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.749	0.796	0.728	0.738
12.5		0.611	0.638	0.638	0.69
25		0.784	0.673	0.764	0.714
50		0.629	0.535	0.747	0.712
75		0.642	0.612	0.685	0.668
100		0.627	0.675	0.675	0.641

① AR 7/2/15 E

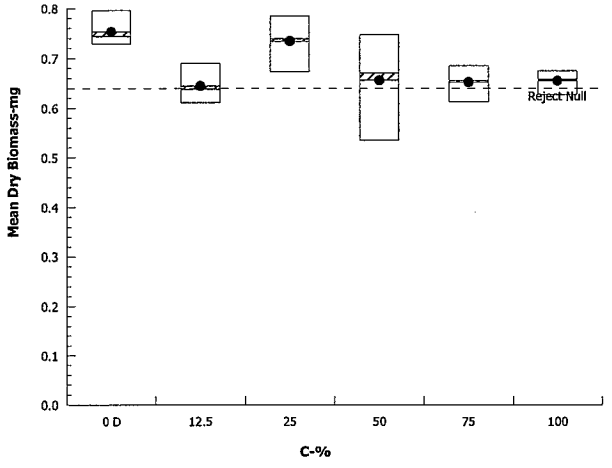
CETIS Analytical Report

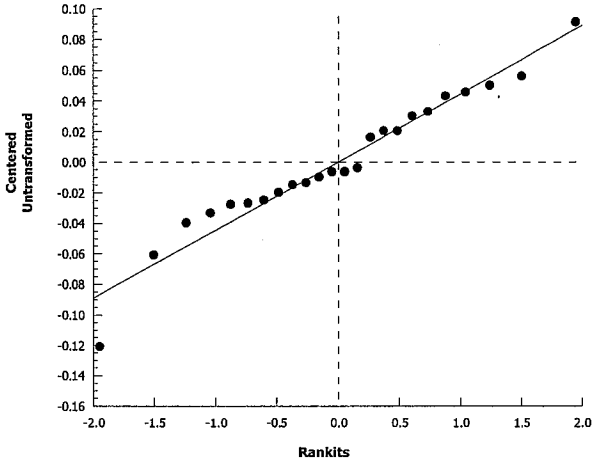
Report Date: 02 Jul-15 12:34 (p 2 of 2)
Test Code: 412-022 | 02-7420-2954

Fathead Minnow 7-d Larval Survival and Growth Test — **TRE Environmental Strategies**

Analysis ID:	20-5290-3451	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.7
Analyzed:	02 Jul-15 12:34	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Graphics





CETIS Analytical Report

Report Date: 02 Jul-15 12:34 (p 1 of 2)
Test Code: 412-022 | 02-7420-2954

Fathead Minnow 7-d Larval Survival and Growth Test — **TRE Environmental Strategies**

Analysis ID:	03-8801-9554	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.7
Analyzed:	02 Jul-15 12:34	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Batch ID:	14-2668-0796	**Test Type:**	Growth-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	23 Jun-15 14:25	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	30 Jun-15 14:25	**Species:**	Pimephales promelas	**Brine:**	Not Applicable
Duration:	7d 0h	**Source:**	In-House Culture	**Age:**	<24

Sample ID:	20-6620-1592	**Code:**	7B27BBF8	**Client:**	Sumitomo Mining (Pogo)
Sample Date:	22 Jun-15 09:29	**Material:**	Ambient Sample	**Project:**	WET Annual Compliance Test
Receive Date:	23 Jun-15 13:00	**Source:**	Discharge Monitoring Report		
Sample Age:	29h	**Station:**	Outfall 001		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	314944	200	Yes	Two-Point Interpolation

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control Resp	0.7528	0.25 - NL	Yes	Passes Acceptability Criteria

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	3.649	0.6122	78.04	27.41	1.281	163.3
IC10	31.84	N/A	106.3	3.141	0.9405	NA
IC15	>100	N/A	N/A	<1	NA	NA
IC20	>100	N/A	N/A	<1	NA	NA
IC25	>100	N/A	N/A	<1	NA	NA
IC40	>100	N/A	N/A	<1	NA	NA
IC50	>100	N/A	N/A	<1	NA	NA

Mean Dry Biomass-mg Summary

			Calculated Variate						
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.7528	0.728	0.796	0.01504	0.03008	4.0%	0.0%
12.5		4	0.6443	0.611	0.69	0.01652	0.03305	5.13%	14.4%
25		4	0.7338	0.673	0.784	0.02503	0.05007	6.82%	2.52%
50		4	0.6557	0.535	0.747	0.04725	0.09449	14.4%	12.9%
75		4	0.6517	0.612	0.685	0.01593	0.03186	4.89%	13.4%
100		4	0.6545	0.627	0.675	0.01218	0.02435	3.72%	13.1%

Mean Dry Biomass-mg Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.749	0.796	0.728	0.738
12.5		0.611	0.638	0.638	0.69
25		0.784	0.673	0.764	0.714
50		0.629	0.535	0.747	0.712
75		0.642	0.612	0.685	0.668
100		0.627	0.675	0.675	0.641

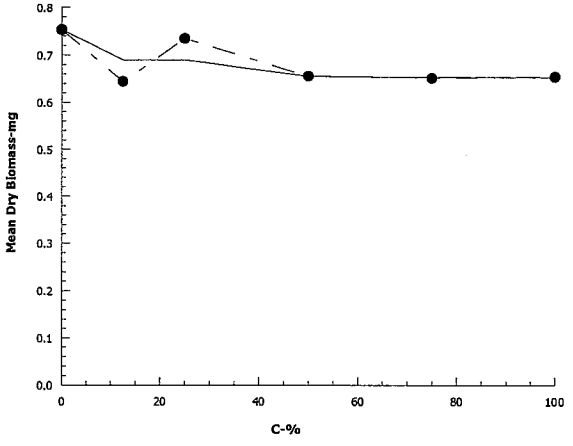
CETIS Analytical Report

Report Date: 02 Jul-15 12:34 (p 2 of 2)
Test Code: 412-022 | 02-7420-2954

Fathead Minnow 7-d Larval Survival and Growth Test — **TRE Environmental Strategies**

Analysis ID:	03-8801-9554	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.7
Analyzed:	02 Jul-15 12:34	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Graphics



BIOASSAY REPORT
CHRONIC
BIOASSAYS CONDUCTED
June 23 through July 1, 2015

Prepared for

SUMITOMO METAL MINING-POGO MINE
DELTA JUNCTION, ALASKA

Prepared by

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Report Issued: July 15, 2015
Lab I.D. No. B3342

CONTENTS

Section	Page
INTRODUCTION	1
SUMMARY OF TEST RESULTS	1
ACRONYM DEFINITIONS	1
METHODS AND MATERIALS	2
TEST METHODS	2
DEVIATIONS FROM PROTOCOL	2
TEST ORGANISMS	2
DILUTION WATER	2
TEST CONCENTRATIONS	2
SAMPLE COLLECTION	3
SAMPLE PREPARATION	3
MONITORING OF BIOASSAYS	3
DATA ANALYSIS	4
DATA INTERPRETATION	4
RESULTS AND DISCUSSION	5
CHRONIC RESULTS	5
REFERENCE TOXICANT TESTS	8
APPENDIX A. RAW DATA SHEETS	
APPENDIX B. REFERENCE TOXICANT DATA SHEETS	
APPENDIX C. CHAIN OF CUSTODY	

INTRODUCTION

CH2M HILL conducted chronic bioassays from June 23 through July 1, 2015, on samples provided by Sumitomo Metal Mining – Pogo Mine, Delta Junction, Alaska. The tests were conducted using the water flea (*Ceriodaphnia dubia*) and the fathead minnow (*Pimephales promelas*).

SUMMARY OF TEST RESULTS

Exhibit 1 provides a summary of the final test results.

EXHIBIT 1
Summary of Chronic Test Results

Species	NOEC (%)	LOEC (%)	IC_{25} (%)	TUc
C. dubia	100	> 100	> 100	< 1
P. promelas	100 [a]	> 100 [a]	> 100 [a]	< 1 [a]

Note: acronyms are as defined below.
[a] Indicates that these test results were confounded by the presence of a pathogenic effect. See discussion presented with Tables 2 and 3 for details.

Chronic Toxicity: Toxicity is shown if the TUc value (= 100% / IC_{25}) is equal to or greater than 2.

More detailed information is provided in the Chronic Results and Data Interpretation sections.

ACRONYM DEFINITIONS (from EPA guidance):

NOEC = No Observed Effect Concentration: The highest test concentration that causes no observable adverse effects on the test organisms (i.e. no statistically significant reduction from the control).
LOEC = Low Observed Effect Concentration: The lowest test concentration that does cause an observable adverse effect on the test organisms (i.e. is statistically significant reduction from the control).
IC_{25} = Inhibition Concentration (25%): A point estimate of the test concentration that would cause a 25 percent reduction of a non-quantal biological measurement (i.e. growth, reproduction, etc.) for the test population.
TUc = Toxic Units (Chronic): Calculated as 100% sample divided by the chronic IC_{25} value.

METHODS AND MATERIALS

TEST METHODS

The chronic test methods were performed according to: *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Fourth Edition, (EPA 2002), EPA-821-R-02-013.

Additional guidance was provided by:

- *Method Guidance and Recommendations for Whole Effluent Toxicity (WET) Testing* (40 CFR Part 136), (EPA September 2000), EPA 821-B-00-004.

DEVIATIONS FROM PROTOCOLS

Deviations from required procedures in the test methods:

- None noted.

Deviations from recommended procedures in the test methods:

- None noted.

TEST ORGANISMS

The *C. dubia* were obtained from CH2M's in-house cultures and were less than 24 hours old for the acute test and less than 24 hours old and within an 8-hour age range for the chronic test. The *P. promelas* were obtained from Aquatox Inc., Hot Springs, Arkansas, and were less than 48 hours old and within a 24-hour age range at test initiation. All organisms tested were fed and maintained during culturing, acclimation, and testing as prescribed by the EPA (2002). The test organisms appeared vigorous and in good condition prior to testing.

DILUTION WATER

The dilution water used was reconstituted, moderately hard water with a total hardness of 80 to 100 mg/L as $CaCO_3$ and an alkalinity of 60 to 70 mg/L as $CaCO_3$.

TEST CONCENTRATIONS

The concentrations for the chronic tests were 12.5, 25, 50, 75, and 100 percent sample with dilution water for the control. For the chronic *C. dubia* test, 10 organisms per concentration were used with 10 test vessels per concentration and one organism per vessel. For the *P. promelas* chronic test, 10 organisms per chamber, with four chambers per concentration for a total of 40 organisms per concentration were used.

SAMPLE COLLECTION

Samples were collected by Sumitomo - Pogo personnel on June 22, 24, and 26, 2015. The samples were accepted as scheduled by CH2M's Corvallis Aquatic Toxicology Laboratory. All samples were received within the EPA recommended 0 to 6 °C range.

All samples were initially used for test initiation or test solution renewal within the EPA recommended maximum holding time of 36 hours of sample collection. All subsequent uses of a sample occurred within the EPA recommended maximum holding time of 72 hours past the time of initial use of that sample.

Following receipt, the samples were stored in the dark at 0 to 6°C until test solutions were prepared and tested. Chain of Custody for sample collection is provided in Appendix C.

SAMPLE PREPARATION

Samples used during these tests were filtered through a 60 µm net upon arrival and temperature was adjusted prior to test initiation and each daily renewal.

MONITORING OF BIOASSAYS

Samples were monitored on arrival for hardness, total residual chlorine, ammonia, and temperature.

For the *P. promelas* and *C. dubia* chronic tests, pre- and post-renewal solutions were monitored for dissolved oxygen and pH daily in all the concentrations. Conductivity was measured in each new sample (100 percent sample) and in the control. *C. dubia* survival and neonate production was measured daily in the chronic tests. According to EPA, *C. dubia* tests should be terminated when 60 percent or more of the surviving female *C. dubia* in the controls have produced their third brood and at least 15 neonates per adult are produced. *P. promelas* mortality was measured daily and fish growth was measured by dry weight analysis at the conclusion of the *P. promelas* chronic test. Temperature was monitored in pre-renewal solutions daily.

DATA ANALYSIS

The effects measured during the *C. dubia* chronic test included survival and reproduction over the exposure period. The effects measured during the *P. promelas* chronic test included survival and growth over the exposure period. The statistical analyses performed were those outlined in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Fourth Edition, (EPA 2002), EPA-821-R-02-013, using CETIS. The chronic NOEC and LOEC values were established by hypothesis testing as follows: Dunnett's Procedure or Bonferroni's T-Test was used to compare the survival, fecundity, or growth data between the control and each sample concentration. When the assumptions of normality or homogeneity of variance necessary for Dunnett's Procedure or T-test with Bonferroni Adjustment could not be met, Steel's Many-One Rank Test or Wilcoxon Rank Sum with Bonferroni Adjustment was used to analyze the data. The chronic point estimate values (IC_{25} values) were calculated for growth, reproduction, and/or fecundity effects by use of the Linear Interpolation method.

DATA INTERPRETATION

The NPDES discharge permit issued to Sumitomo Metal Mining-Pogo Mine Site (AK0053341) specifies the use of the chronic toxic unit (TUc) as the Toxicity Trigger. TUc values of 2 or higher indicate the need for additional testing.

RESULTS AND DISCUSSION

The raw data sheets for all tests are presented in Appendix A.

CHRONIC BIOASSAYS

Table 1 summarizes the survival and reproduction data for the *C. dubia* chronic test.

Table 1
Summary of Chronic Results
C. dubia

Concentration (%)	Percent Survival	Ave. No. Young Per Adult
Control	100	18.0
12.5	90	23.3
25	100	23.7
50	80	19.2
75	100	25.3
100	100	24.7

The *C. dubia* test results indicated no statistically significant reduction in survival or reproduction at any sample concentrations tested when compared to the control. By EPA definition, the NOEC and the LOEC were 100 and greater than 100 percent sample, respectively.

The IC_{25} value calculated on *C. dubia* reproduction was greater than 100 percent sample.

The chronic toxic unit ($TU_c = 100/IC_{25}$) was less than 1.

From the NPDES permit: "A target level for chronic toxicity of 2 TUc shall apply for purposes of determining compliance ...". (i.e. a TUc value of greater than 2 shall indicate the need for additional testing.)

The dissolved oxygen levels in the chronic tests remained above 4.0 mg/L. Test temperatures remained at 25±1°C.

The test meets Test Acceptability Criteria (TAC) for a minimum 80 percent control survival and a minimum 15 young produced per surviving control adult. Unless referenced above, the tests proceeded without any noted deviations or interruptions that could have affected test results. The testing should be considered "valid".

Table 2 summarizes the survival and growth data for the *P. promelas* chronic test.

Table 2 **Summary of Chronic Results** ***P. promelas***		
Sample Concentration (%)	**Percent Survival**	**Mean Dry Weight Per Fish (mg)**
Control	91.9	0.546
12.5	90.0	0.518
25	92.5	0.481
50	90.2	0.523
75	55.0	0.323
100	92.5	0.528

The *P. promelas* test results indicate no statistically significant reduction in survival or growth at any sample concentration tested when compared to the control. By EPA definition, the NOEC and the LOEC were 100 and greater than 100 percent sample, respectively. The IC_{25} value on *P. promelas* growth was calculated as greater than 100 percent sample. The chronic toxic unit ($TU_c = 100/IC_{25}$) was less than 1.0. However, it must be noted that the Percent Minimum Significant Difference (PMSD) calculated for the growth endpoint was 30.12. This is above the PMSD limits of 12 to 30 listed in the EPA guidance and indicates an unacceptably insensitive test.

As per EPA 821-R-02-012, Appendix A, Section 3 "An outlier is an inconsistent or questionable data point that appears unrepresentative of the general trend exhibited by the majority of the data. Outliers may be detected by tabulation of the data, plotting, and by an analysis of the residuals. An explanation should be sought for any questionable data points. Without an explanation, data points should be discarded only with extreme caution. If there is no explanation, the analysis should be reported both with and without the outlier, and the results of both analyses should be reported."

Following tabulation of the data, the following replicates appeared to be statistical outliers:

- 75% rep B (20% survival)
- 75% rep C (10% survival).

All other replicate test chambers had survival rates of 70% or more. Note that survival rates also significantly impact the growth endpoint calculation.

An explanation was sought for these replicates and it was found that a pathogenic effect (e.g. fungus) was noted in the replicates listed above as statistical outliers. The same pathogenic effect was also noted in the 25% rep A (70% survival), 50% rep B (70% survival), and 100% rep C (90% survival) test chambers. As the pathogenic effect observed is known to impact

the *P. promelas* chronic test, all of the effected test chambers are suspected of being compromised by the fungus.

Taking advantage of the EPA guidance quoted inferring the acceptable practice of excluding outliers when an explanation is found, all five test chambers where the pathogenic effect was noted were removed from the data set.

Table 3 summarizes the survival and growth data for the *P. promelas* chronic test with the five replicates (25% A, 50% B, 75% B, 75% C, and 100% C) removed.

Table 3
Summary of Chronic Results (with removed replicates)
P. promelas

Sample Concentration (%)	Percent Survival	Mean Dry Weight Per Fish (mg)
Control	91.9	0.546
12.5	90.0	0.518
25	100	0.496
50	97.0	0.527
75	95.0	0.510
100	93.3	0.541

With the five replicates removed, the *P. promelas* test results PMSD calculated for the growth endpoint was 15.55. This is within the PMSD limits of 12 to 30 listed in the EPA guidance and indicates an acceptably sensitive test.

With the five replicates removed, the test indicate no statistically significant reduction in survival or growth at any sample concentration tested when compared to the control. By EPA definition, the NOEC and the LOEC were 100 and greater than 100 percent sample, respectively. The IC_{25} value on *P. promelas* growth was calculated as greater than 100 percent sample. The chronic toxic unit ($TU_c = 100/IC_{25}$) was less than 1.0.

From the NPDES permit: "A target level for chronic toxicity of 2 TUc shall apply for purposes of determining compliance ...". (i.e. a TUc value of greater than 2 shall indicate the need for additional testing.)

The dissolved oxygen levels in the chronic tests remained above 4.0 mg/L. Test temperatures remained at 25±1°C.

The test meets Test Acceptability Criteria (TAC) for a minimum 80 percent control survival and a minimum weight of 0.250 mg per surviving control organism. Unless referenced above, the tests proceeded without any noted deviations or interruptions that could have affected test results. The testing, as shown in Table 3, should be considered "valid".

REFERENCE TOXICANT TESTS

Reference toxicant (reftox) testing is performed to document both initial and ongoing laboratory performance of the test method(s). While the health of the test organisms is primarily evaluated by the performance of the laboratory control, reftox test results also may be used to assess the health and sensitivity of the test organisms. Reftox test results within their respective cumulative summary (Cusum) chart limits are indicative of consistent laboratory performance and normal test organism sensitivity.

The results of the reftox tests indicate that the test organisms were within their respective cusum chart limits based on EPA guidelines. This demonstrates ongoing laboratory proficiency of the test methods and suggests normal test organism sensitivity in the associated client testing.

The *C. dubia* and *P. promelas* reftox tests were conducted using sodium chloride. The data sheets for the reference toxicant tests are provided in Appendix B.

Note: in accordance with the NPDES permit, the *P. promelas* reftox was conducted concurrently with the client testing.

Table 4 summarizes the reference toxicant test results and Cusum chart limits.

Table 4
Chronic Reference Toxicant Tests (g/L)

Species	IC_{25}	Cusum Chart Limits
C. dubia (survival)	1.86	0.96 to 2.01
C. dubia (reproduction)	0.80	0.09 to 1.15
P. promelas (survival)	2.5	1.6 to 3.9
P. promelas (growth)	2.5	1.9 to 2.9

APPENDIX A

RAW DATA SHEETS

CH2M HILL **FRESHWATER TOXICITY TEST: SAMPLE AND DILUTION WATER DATA**

Client: Sumitomo Metal Mining - Pogo
Contact: Stacy Staley 1.907.895.2761
SDG # B 3342
Test Initiation: Date 6-23-2015
Test Termination: Date ~~6-30~~ 7-1 2015 DW QC 7-2-15

Sample ID Number	Field ID	Collected Date (mm/dd/yy)	Collected Time (Pacific Zone)	Date Received	Temp (°C) as Re'vd	Total Residual Chlorine (mg/l) ☐ Dechlorination allowed as Re'vd / after Dechlor.	Ammonia NH_3-N mg/l as Re'vd	Hardness mg/l as $CaCO_3$ as Re'vd	Alkalinity mg/l as $CaCO_3$ as Re'vd	DO (mg/L) as Re'vd	pH as Re'vd	Cond. (uS) as Re'vd	60 um filtered prior to use?
33342 -01	Outfall 001	06/22/15	09:20	06/23/15	2.9	0.03 / -	1.79	77	-	-	-	-	☑
-02	Outfall 001	6/24/15	08:10	6/25/15	4.3	0.02 / -	1.91	79	-	-	-	-	☑
-03	Outfall 001	6/26/15	07:30	6/27/15	2.6	0.02 / -	2.06	79	-	-	-	-	☑
						/							
						/							
						/							
						/							
						/							
						/							
						/							
						/							
						/							
			Reporting Limits:		na	0.02 mg/L	0.10 mg/L	4 mg/L	4 mg/L	na	na	na	na

Note: "-" Indicates data collection or dechlorination not needed. Any other adjustments to samples prior to use are documented in Comments below or on Dilutions page.

Dilution Water	ID#	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$
Recon MH (FHM)	4229	92	64
↓	4232	94	66

Comments: ☑ Indicates the action was taken, (☐= action not taken): " - " = sample not dechlorinated, or analyte not collected/needed.

Water Quality Meters Used/ID#: Dissolved Oxygen # 3 pH # 11 Conductivity # 2

CH2M HILL **FRESHWATER TOXICITY TEST: TEST ORGANISM INFORMATION**

Client Sumitomo Metal Mining - Pogo Sample Designation (SDG): B 3342

Test Species Information	Cd # 30811 *Ceriodaphnia dubia* Chronic	FHM # 1825 *Pimephales promelas* Chronic			
Organism Age at Initiation	<24 hrs, all within an 8 hr window	<48 hrs, all within a 24 hour window			
Test Container Size	30 ml	800 ml			
Test Volume	15 ml	500 ml			
Feeding: Type and Amount	0.10 ml Algae and 0.10 ml YCT daily	0.15 ml *Artemia*, 2 x Daily			
Aeration: In Test Chambers via Slow Bubble :	☒ None ☐ Prior to use	☑ None ☐ Prior to use ☐ @ _____ hrs			
Acclimation Period	<24 hrs	<24 hrs			
Organism Source	In-House	Aquatox			
Size	-	-			
Loading Rate	-	-			

Dissolved Oxygen aeration justifications (in test chambers):

Test(s): ☐ All ☐ _____

Date:

Comments:

Test Solution Preparation and Dilution Record

Note: ☐ Indicates task not done, ☑ Indicates task was done. Temp adj. = Temperature adjusted to ambient or test temp

Ditto marks ('') indicate that the same SDG, batch of dilution water, or food as the previous day's entry was used.

Client: Sumitomo Metal Mining - Pogo

Ceriodaphnia dubia - Chronic

Test Concentration (%)	Sample Volume (mls)		Final Volume (mls)	Test Day	Sample ID Used	Daily Sample Preparation (prior to dilution)	Dilution Water Used	YCT ID Used	Algae ID Used	Date	Time	Initials
				0 (Initiation)	B 3342-01	☐ Temp adj, ☐ Aerated	ID # 4229	# 1054	# 1053	6/23/2015	11:35	Bm
Control	0.00	→	200	1	B 3342 01	☐ Temp adj, ☐ Aerated	ID # 4229	# 1054	# 1053	6/24/15	08:35	e
12.5	25.0	→	200	2	B 3342 02	☐ Temp adj, ☐ Aerated	ID # 4232	# 1054	# 1053	6/25/15	09:30	e
25	50.0	→	200	3	B -02	☐ Temp adj, ☐ Aerated	ID # 4232	# 1054	#1053	6/26/15	07:10	DW
50	100	→	200	4	B -03	☐ Temp adj, ☐ Aerated	ID # 4232	# 1054	#1053	6/27/15	09:50	e
75	150	→	200	5	B -03	☐ Temp adj, ☐ Aerated	ID # 4232	# 1054	# 1053	6/28/15	13:10	jw
100	200	→	200	6	B -03	☐ Temp adj, ☐ Aerated	ID # 4232	# 1054	#1060	6/29/15	09:30	MC
Total Sample volume needed per day =			525 mls	7	B -03	☐ Temp adj, ☐ Aerated	ID # 4232	# 1054	# 1060	6/30/15	07:45	DW

Fathead minnow - Chronic

Test Concentration (%)	Sample Volume (mls)		Final Volume (mls)	Test Day	Sample ID Used	Daily Sample Preparation (prior to dilution)	Dilution Water Used	Date	Time	Initials
				0 (Initiation)	B 3342-01	☐ Temp adj, ☐ Aerated	ID # 4229	6/23/2015	11:35	Bm
Control	0.00	→	2000	1	B 3342-01	☐ Temp adj, ☐ Aerated	ID # 4229	6/24/15	08:35	e
12.5	250	→	2000	2	B 3342 02	☐ Temp adj, ☐ Aerated	ID # 4232	6/25/15	09:30	e
25	500	→	2000	3	B -02	☐ Temp adj, ☐ Aerated	ID # 4232	6/26/15	07:10	DW
50	1,000	→	2000	4	B 03	☐ Temp adj, ☐ Aerated	ID # 4232	6/27/15	09:50	e
75	1,500	→	2000	5	B -03	☐ Temp adj, ☐ Aerated	ID # 4232	6/28/15	13:10	jw
100	2,000	→	2000	6	B -03	☐ Temp adj, ☐ Aerated	ID # 4232	6/29/15	09:35	MC

Total Sample volume needed per day = 5250 mls

CH2M HILL

Ceriodaphnia dubia
Survival and Reproduction
Test Data Summary

Client: Sumitomo Metal Mining - Pogo

Test Start Date: 6/~~22~~ 23/2015 DW Q06 7-2-15

Sample Description: Outfall 001

Initial Sample ID#: B3342-01

Data summarized by: Stanaway

Percent or Concentration	Total Live Young Produced in First 3 Broods per Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
Control	16	16	10	5	23	22	17	21	23	27	10	180
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
12.5 %	15	30	16	24	33	18	0	31	33	33	9	233
	AD?	AD?	AD?	AD?	AD?	AD?	AD? X	AD?	AD?	AD?		
25 %	25	30	30	21	20	19	12	25	21	34	10	237
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
50 %	21	23	20	3	14	15	31	18	19	28	8	192
	AD?	AD?	AD?	AD? X	AD?	AD?	AD?	AD?	AD? X	AD?		
75 %	28	21	28	23	26	31	21	18	30	27	10	253
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
100 %	29	26	24	21	25	29	14	26	27	26	10	247
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		

Test Organism Mortality (Adult dead) = AD? ✓

Test Organism identified as Male = AD? M

Test Organism Injured during test = AD? I

# of Alive Adults = Number of test organism alive at termination

Total Live Young = Total neonates produced in first 3 broods

Footnote: As per EPA-600-4-91-002 and EPA-821-R-02-013, *Ceriodaphnia dubia* test should be terminated when 60% of the surviving control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

Also as per EPA-821-R-02-013 (13.10.9.1), "In this three-brood test, offspring from fourth or higher broods should not be counted and should not be included in the total number of neonates produced during the test."

CH2M HILL

CERIODAPHNIA CHRONIC SURVIVAL AND REPRODUCTION DATA

Neo's obtained from	A	B	C	D	E	F	G	H	I	J
Culture Board ID:	N	N	N	N	N	N	N	N	N	N
Slot #:	8	11	12	16	23	25	31	38	41	53

Incubator Used: # 6

Random Template Used: 6 conc # 19

Client: Sumitomo Metal Mining - Pogo

Test Initiation: Date: 6 /25/2015 Time: 15 : 10

Sample Description: Outfall 001 Initial Sample ID # B 3542 - 01

Termination: Date: 7 / 1 /2015 Time: 10 : 40

Technician: Day 0 JW Day 1 C Day 2 C Day 3 DW Day 4 JW Day 5 JW Day 6 MC Day 7 JW Day 8 DW

Time: Day 0 1510 Day 1 1002 Day 2 1152 Day 3 0900 Day 4 1210 Day 5 1434 Day 6 1435 Day 7 1030 Day 8 1040

Cerio ID: Cd 3081

Percent	Day	A	B	C	D	E	F	G	H	I	J	No. Live Adults	Daily Total Live Young
Control	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	2	0	0	0	0	0	0	0	10	2
	4	0	0	0	0	0	0	0	0	0	0	10	0
	5	0	4	0	0	9	6	5	7	5	6	10	42
	6	7	2	OAY	2	3	6	0	3	0	0	10	23
	7	0	8	8	3	0	0	3	0	8	9	10	39
	8	9	2/0	0	0	11	10	9	11	10	12	10	74
12.5 %	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0/AD	0	0	0	9	0
	4	0	0	2	3	0	3		0	0	0	9	8
	5	0	9	7	8	9	8		8	7	8	9	64
	6	8	0	7	0	8	7		7	8	0	9	45
	7	7	9	0	0	0	0		0	0	10	9	26
	8	0	12	(11)	13	16	(17)		16	18	15	9	90
25 %	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	4	0	0	4	3	3	0	0	3	0	10	~~12~~ 14 MS
	5	10	9	8	6	6	7	0	8	7	8	10	69
	6	0	0	6	0	0	0	6	3	0	0	10	15
	7	11	7	0	4	8	7	6	0	11	10	10	~~12~~ 64 M
	8	0	14	16	7/0	3/0	2/0	0	14	0	16	10	72
50 %	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	3	3	3	1	3	4	0	0	5	3	10	25
	5	0	8	9	2/0 AD	7	6	7	7	8	9	9	63
	6	7	0	8		4	5	0	0	6	0	9	30
	7	9	12	0		0	0	7	0	0 AD	10	8	38
	8	2/0	0	(14)		(12)	(13)	17	11	5	6/0	8	36
75 %	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	4	3	5	2	3	0	4	2	6	6	10	35
	5	6	7	9	9	8	7	11	9	10	10	10	86
	6	0	0	14	0	0	8	6	7	14	11	10	60
	7	18	11	0	12	15	0	0	0	0	0	10	56
	8	0	(14)	(18)	(15)	(17)	16	(18)	(15)	(17)	(14)	10	16
100 %	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	5	5	4	4	4	4	3	4	4	3	10	40
	5	8	9	7	8	8	9	8	10	10	9	10	86
	6	0	12	13	9	13	15	3	12	13	0	10	90
	7	16	0	0	0	(11)	1/0	(9)	0	0	14	10	46
	8	(12)	(16)	(18)	(15)	0	(17)	(12)	(15)	(17)	(18)	10	0

"AD" = Adult Dead, "AY" = Aborted young, "M" = male organism, "F" = Female, "R" = Adult releasing young, " / " = split brood (carry-over brood / current day brood),
"Inj" = Adult Injured during test solution renewal, replicate removed from analysis. "AM" = Adult missing, remove from analysis. A circled neonate count = 4th brood

Footnote: As per EPA, C. dubia tests should be terminated when 60% of the surviving control organisms have produced their third brood, or at eight days, whichever occurs first.

CH2M HILL

CERIODAPHNIA WATER QUALITY DATA

Client: Sumitomo Metal Mining - Pogo
Sample Description: Outfall 001
Initiated Date: 6/23/2015 Time: 15:10
Initial Sample ID #: B 3342 - 01
Adults Isolated Date: 6/22/2015 Time: 16:55
Neo's Collected Date: 6/22/2015 Time: 23:00

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
Tech:	JW	e	e	DW	JW	JW	MC	JW	DW
Time	15:55	10:00	10:50	09:00	12:55	16:35	15:30	11:20	10:40
Therm.	# 214	# 177	# 241	# 214	# 214	# 214	# 214	# 214	# 214

%	Dissolved Oxygen (mg/l) Day 0	1	2	3	4	5	6	7	8
Control	6.4	7.4 / 7.1	7.0 / 7.0	7.2 / 7.5	7.1 / 6.9	7.2 / 7.7	7.5 / 7.5	7.2 / 7.1	7.4
12.5 %	6.7	7.3 / 7.2	7.0 / 7.0	7.3 / 7.5	7.5 / 7.1	7.2 / 7.7	7.9 / 7.5	7.5 / 7.3	7.4
25 %	6.9	7.3 / 7.2	7.1 / 7.0	7.3 / 7.5	7.6 / 7.2	7.5 / 7.8	7.6 / 7.6	7.7 / 7.5	7.4
50 %	7.0	7.4 / 7.3	7.0 / 7.1	7.3 / 7.5	7.6 / 7.3	7.7 / 7.8	7.8 / 7.6	7.6 / 7.7	7.3
75 %	7.1	7.3 / 7.3	7.0 / 7.2	7.3 / 7.6	7.7 / 7.4	7.9 / 7.8	8.0 / 7.6	7.6 / 7.8	7.4
100 %	7.2	7.4 / 7.5	7.2 / 7.4	7.4 / 7.7	7.5 / 7.5	7.9 / 7.8	8.1 / 7.7	7.6 / 7.9	7.5

%	pH Day 0	1	2	3	4	5	6	7	8
Control	8.0	8.0 / 7.9	8.0 / 8.0	8.0 / 7.9	8.1 / 8.1	8.0 / 7.9	7.9 / 7.9	7.7 / 7.8	7.8
12.5 %	7.9	8.0 / 7.8	8.0 / 7.9	8.0 / 7.9	8.1 / 8.0	8.1 / 7.9	7.8 / 7.8	7.7 / 7.8	7.8
25 %	7.8	8.0 / 7.8	8.0 / 7.8	8.0 / 7.9	8.1 / 7.9	8.1 / 7.8	7.8 / 7.8	7.7 / 7.8	7.8
50 %	7.6	8.0 / 7.6	8.0 / 7.7	7.9 / 7.7	8.0 / 7.8	8.0 / 7.7	7.8 / 7.7	7.7 / 7.7	7.7
75 %	7.4	7.9 / 7.5	7.9 / 7.5	7.9 / 7.6	7.9 / 7.7	8.0 / 7.7	7.8 / 7.6	7.7 / 7.5	7.7
100 %	7.5	7.9 / 7.5	7.9 / 7.5	7.7 / 7.6	7.9 / 7.7	7.9 / 7.7	7.7 / 7.6	7.6 / 7.5	7.7

%	Temperature (°C) / Conductivity (µS) (1st use of each sample only) Day 0	1	2	3	4	5	6	7	8
Control	24.5 / 294	24.2 / 324	24.5 / 316	25.1 /	24.8 / 309	24.5 / 320	25.1 /	25.4 /	25.1 /
12.5 %	24.5 / -	24.6 / -	24.9 / -	25.3 / -	24.9 / -	24.7 / -	25.2 / -	25.0 / -	24.8 / -
25 %	24.6 / -	24.4 / -	25.0 / -	24.5 / -	25.0 / -	24.9 / -	25.0 / -	25.2 / -	24.5 / -
50 %	24.6 / -	25.3 / -	24.9 / -	25.3 / -	25.3 / -	24.7 / -	25.1 / -	24.4 / -	25.4 / -
75 %	24.5 / -	25.4 / -	25.1 / -	25.6 / -	25.0 / -	25.0 / -	24.7 / -	24.6 / -	25.1 / -
100 %	24.5 / 267	25.1 / 279	24.6 / 272	24.8 /	25.0 / 275	25.1 / 272	24.6 /	24.2 /	24.9 /

COMMENTS: Temperatures taken just prior to test solution renewals. DO, pH, and Conductivity taken following organism transfer.

(23.8) = Temp out of recom. range

Note: All Day 0 data represents conditions at initiation. All other days: numerator represents pre-renewal conditions, denominator represents post-renewal conditions.

CETIS Summary Report

Report Date:	01 Jul-15 11:18 (p 1 of 1)
Test Code:	B334201cdc | 14-6477-2037

Ceriodaphnia 7-d Survival and Reproduction Test — **CH2M HILL - ASL**

Batch ID:	03-9323-2879	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	23 Jun-15 15:10	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Jul-15 10:40	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	7d 20h	**Source:**	In-House Culture	**Age:**	<24h

Sample ID:	02-2667-2142	**Code:**	B3342-01	**Client:**	
Sample Date:	22 Jun-15 09:20	**Material:**	Unknown	**Project:**	
Receive Date:	23 Jun-15 10:00	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	30h (2.9 °C)	**Station:**			

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
12-1225-7781	7d Survival Rate	100	>100	N/A	N/A	1	Fisher Exact/Bonferroni-Holm Test
16-7684-4592	Reproduction	100	>100	N/A	40.5%	1	Dunnett Multiple Comparison Test

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
12-1225-7781	7d Survival Rate	Control Resp	1	0.8 - NL	Yes	Passes Acceptability Criteria
16-7684-4592	Reproduction	Control Resp	18	15 - NL	Yes	Passes Acceptability Criteria
16-7684-4592	Reproduction	PMSD	0.4053	0.13 - 0.47	Yes	Passes Acceptability Criteria

7d Survival Rate Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	10	1	1	1	1	1	0	0	0.0%	0.0%
12.5		10	0.9	0.7819	1	0	1	0.1	0.3162	35.14%	10.0%
25		10	1	1	1	1	1	0	0	0.0%	0.0%
50		10	0.8	0.6426	0.9574	0	1	0.1333	0.4216	52.7%	20.0%
75		10	1	1	1	1	1	0	0	0.0%	0.0%
100		10	1	1	1	1	1	0	0	0.0%	0.0%

Reproduction Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	10	18	15.52	20.48	5	27	2.103	6.65	36.94%	0.0%
12.5		10	23.3	19.21	27.39	0	33	3.464	10.95	47.02%	-29.44%
25		10	23.7	21.29	26.11	12	34	2.044	6.464	27.28%	-31.67%
50		10	19.2	16.3	22.1	3	31	2.458	7.772	40.48%	-6.67%
75		10	25.3	23.69	26.91	18	31	1.367	4.322	17.08%	-40.56%
100		10	24.7	23.05	26.35	14	29	1.399	4.423	17.91%	-37.22%

7d Survival Rate Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	1	1	1	1	1	1	1	1	1	1
12.5		1	1	1	1	1	1	0	1	1	1
25		1	1	1	1	1	1	1	1	1	1
50		1	1	1	0	1	1	1	1	0	1
75		1	1	1	1	1	1	1	1	1	1
100		1	1	1	1	1	1	1	1	1	1

Reproduction Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	16	16	10	5	23	22	17	21	23	27
12.5		15	30	16	24	33	18	0	31	33	33
25		25	30	30	21	20	19	12	25	21	34
50		21	23	20	3	14	15	31	18	19	28
75		28	21	28	23	26	31	21	18	30	27
100		29	26	24	21	25	29	14	26	27	26

CETIS Summary Report

Report Date:	01 Jul-15 11:32 (p 1 of 1)
Test Code:	B334201cdc | 14-6477-2037

Ceriodaphnia 7-d Survival and Reproduction Test — **CH2M HILL - ASL**

Batch ID:	03-9323-2879	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	23 Jun-15 15:10	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Jul-15 10:40	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	7d 20h	**Source:**	In-House Culture	**Age:**	<24h

Sample ID:	02-2667-2142	**Code:**	B3342-01	**Client:**	
Sample Date:	22 Jun-15 09:20	**Material:**	Unknown	**Project:**	
Receive Date:	23 Jun-15 10:00	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	30h (2.9 °C)	**Station:**			

Point Estimate Summary

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
04-6889-5434	Reproduction	IC25	>100	N/A	N/A	<1	Linear Interpolation (ICPIN)

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
04-6889-5434	Reproduction	Control Resp	18	15 - NL	Yes	Passes Acceptability Criteria

Reproduction Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	10	18	15.52	20.48	5	27	2.103	6.65	36.94%	0.0%
12.5		10	23.3	19.21	27.39	0	33	3.464	10.95	47.02%	-29.44%
25		10	23.7	21.29	26.11	12	34	2.044	6.464	27.28%	-31.67%
50		10	19.2	16.3	22.1	3	31	2.458	7.772	40.48%	-6.67%
75		10	25.3	23.69	26.91	18	31	1.367	4.322	17.08%	-40.56%
100		10	24.7	23.05	26.35	14	29	1.399	4.423	17.91%	-37.22%

Reproduction Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	16	16	10	5	23	22	17	21	23	27
12.5		15	30	16	24	33	18	0	31	33	33
25		25	30	30	21	20	19	12	25	21	34
50		21	23	20	3	14	15	31	18	19	28
75		28	21	28	23	26	31	21	18	30	27
100		29	26	24	21	25	29	14	26	27	26

CETIS Analytical Report

Report Date: 01 Jul-15 11:18 (p 1 of 1)
Test Code: B334201cdc | 14-6477-2037

Ceriodaphnia 7-d Survival and Reproduction Test — **CH2M HILL - ASL**

Analysis ID:	12-1225-7781	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.1
Analyzed:	01 Jul-15 11:18	**Analysis:**	STP 2x2 Contingency Tables	**Official Results:**	Yes

Batch ID:	03-9323-2879	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	23 Jun-15 15:10	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Jul-15 10:40	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	7d 20h	**Source:**	In-House Culture	**Age:**	<24h

Sample ID:	02-2667-2142	**Code:**	B3342-01	**Client:**	
Sample Date:	22 Jun-15 09:20	**Material:**	Unknown	**Project:**	
Receive Date:	23 Jun-15 10:00	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	30h (2.9 °C)	**Station:**			

Data Transform	Zeta	Alt Hyp	MC Trials	NOEL	LOEL	TOEL	TU
Untransformed		C > T	Not Run	100	>100	N/A	1

Fisher Exact/Bonferroni-Holm Test

Control	vs	Conc-%	Test Stat	P-Value	Decision(0.05)
Dilution Water		12.5	0.5	1.0000	Non-Significant Effect
		25	1	1.0000	Non-Significant Effect
		50	0.2368	1.0000	Non-Significant Effect
		75	1	1.0000	Non-Significant Effect
		100	1	1.0000	Non-Significant Effect

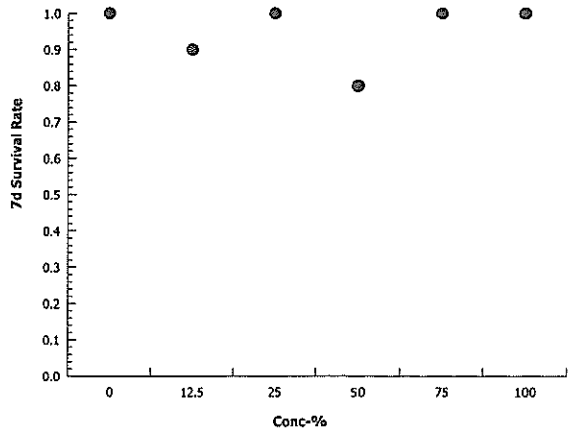
Data Summary

Conc-%	Control Type	No-Resp	Resp	Total
0	Dilution Water	10	0	10
12.5		9	1	10
25		10	0	10
50		8	2	10
75		10	0	10
100		10	0	10

7d Survival Rate Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	1	1	1	1	1	1	1	1	1	1
12.5		1	1	1	1	1	1	0	1	1	1
25		1	1	1	1	1	1	1	1	1	1
50		1	1	1	0	1	1	1	1	0	1
75		1	1	1	1	1	1	1	1	1	1
100		1	1	1	1	1	1	1	1	1	1

Graphics



CETIS Analytical Report

Report Date: 01 Jul-15 11:18 (p 1 of 2)
Test Code: B334201cdc | 14-6477-2037

Ceriodaphnia 7-d Survival and Reproduction Test — **CH2M HILL - ASL**

Analysis ID:	16-7684-4592	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.1
Analyzed:	01 Jul-15 11:18	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Batch ID:	03-9323-2879	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	23 Jun-15 15:10	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Jul-15 10:40	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	7d 20h	**Source:**	In-House Culture	**Age:**	<24h

Sample ID:	02-2667-2142	**Code:**	B3342-01	**Client:**	
Sample Date:	22 Jun-15 09:20	**Material:**	Unknown	**Project:**	
Receive Date:	23 Jun-15 10:00	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	30h (2.9 °C)	**Station:**			

Data Transform	Zeta	Alt Hyp	MC Trials	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	0	C > T	Not Run	100	>100	N/A	1	40.5%

Dunnett Multiple Comparison Test

Control	vs	Conc-%	Test Stat	Critical	DF	MSD	P-Value	Decision(α:5%)
Dilution Water		12.5	-1.663	2.289	18	7.295	0.9982	Non-Significant Effect
		25	-1.789	2.289	18	7.295	0.9991	Non-Significant Effect
		50	-0.3766	2.289	18	7.295	0.9215	Non-Significant Effect
		75	-2.291	2.289	18	7.295	0.9998	Non-Significant Effect
		100	-2.102	2.289	18	7.295	0.9997	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	457.9333	91.58667	5	1.804	0.1277	Non-Significant Effect
Error	2742	50.77778	54			
Total	3199.933	142.3644	59			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	10.81	15.09	0.0553	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9578	0.9459	0.0366	Normal Distribution

Reproduction Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	10	18	15.47	20.53	5	27	2.103	6.65	36.94%	0.0%
12.5		10	23.3	19.13	27.47	0	33	3.464	10.95	47.02%	-29.44%
25		10	23.7	21.24	26.16	12	34	2.044	6.464	27.28%	-31.67%
50		10	19.2	16.24	22.16	3	31	2.458	7.772	40.48%	-6.67%
75		10	25.3	23.66	26.94	18	31	1.367	4.322	17.08%	-40.56%
100		10	24.7	23.02	26.38	14	29	1.399	4.423	17.91%	-37.22%

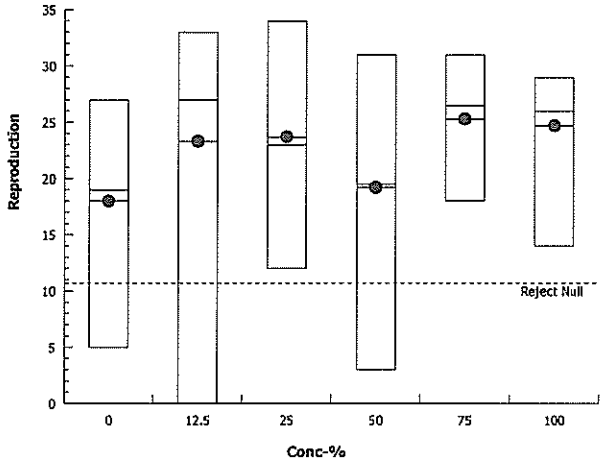
Ceriodaphnia 7-d Survival and Reproduction Test — **CH2M HILL - ASL**

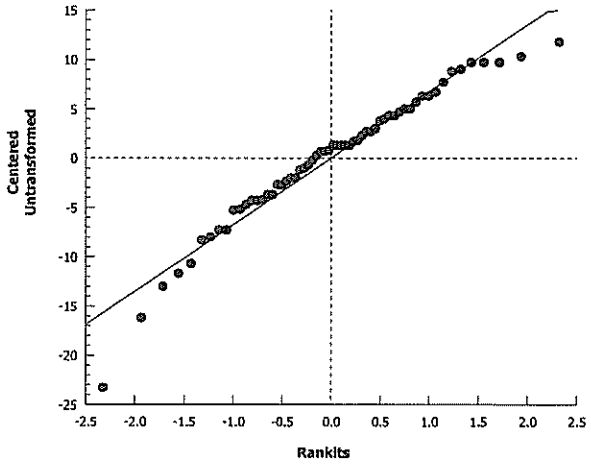
Analysis ID:	16-7684-4592	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.1
Analyzed:	01 Jul-15 11:18	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Reproduction Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	16	16	10	5	23	22	17	21	23	27
12.5		15	30	16	24	33	18	0	31	33	33
25		25	30	30	21	20	19	12	25	21	34
50		21	23	20	3	14	15	31	18	19	28
75		28	21	28	23	26	31	21	18	30	27
100		29	26	24	21	25	29	14	26	27	26

Graphics





CH2M HILL

FATHEAD MINNOW 7-DAY SURVIVAL AND WATER QUALITY DATA

Random Template Used: 6 conc. x 4 reps. # 3 | Waterbath/incubator Used: # 4 | Date Initiated 6/23/2015 Time 15:00

Initial sample ID B 33412 - 01 | Date Terminated 6/30/2015 Time 09:40

Client: Sumitomo Metal Mining - Pogo | Sample Description: Outfall 001

Tech: Day 0 e | Day 1 MC | Day 2 MC | Day 3 MC | Day 4 e | Day 5 JW | Day 6 MC | Day 7 e/JW

Time: Day 0 1500 | Day 1 1110 | Day 2 1045 | Day 3 1413 | Day 4 1140 | Day 5 1920 | Day 6 1150 | Day 7 0940

Conc. or Percent	Day	Number of Live Organisms A	B	C	D	Dissolved O_2 (mg/l) Pre	Post	pH Pre	Post	Temp. (°C) Pre	Therm. ID #	Conductivity (µS) Post (1st use)
Control	0	10	MC 10 9	10	10		7.1		7.9	Post: 24.5	159	300
	1	10	9 M	10	10	6.7	7.2	7.6	8.0	24.7	211	
	2	10	8	10	10	6.7	7.2	7.7	8.1	24.2	159	305
	3	10	7	10	10	7.0	7.3	7.7	8.1	24.8	211	
	4	10	7	9	10	6.8	7.6	7.6	8.2	24.5	159	311
	5	10	7	9	10	6.6	7.5	7.8	8.1	24.7	159	
	6	10	7	9	10	6.8	7.5	7.6	8.0	24.5	184	
	7	10	7	9	10	7.3		7.5		24.7	177	
12.5 %	0	10	10	10	10		7.2		7.8	Post: 24.5		
	1	10	9	10	10	6.7	7.3	7.6	7.9	24.8		
	2	10	8	10	9	6.6	7.2	7.6	8.0	24.2		
	3	10	8	9	9	6.9	7.5	7.7	8.0	24.8		
	4	10	8	9	9	6.9	7.8	7.7	8.0	24.7		
	5	10	8	9	9	6.8	7.6	7.8	7.9	24.7		
	6	10	8	9	9	6.9	7.7	7.6	7.9	24.6		
	7	10	8	9	9	7.4		7.4		25.0		
25 %	0	10	10	10	10		7.3		7.8	Post: 24.5		
	1	10 ✓	10	10	10	6.7	7.3	7.6	7.8	24.7		
	2	10	10	10	10	6.6	7.3	7.6	7.9	24.3		
	3	10	10	10	10	6.9	7.7	7.7	8.0	24.7		
	4	10	10	10	10	6.9	7.9	7.7	8.0	24.7		
	5	7 F	10	10	10	6.8	8.0	7.7	7.9	24.7		
	6	7	10	10	10	6.9	7.9	7.4	7.8	24.6		
	7	7	10	10	10	7.2		7.4		24.9		
50 %	0	10	10	Reje 10 11	10		7.3		7.6	Post: 24.4		
	1	10	10	11	10	6.7	7.4	7.6	7.5	24.8		
	2	10	10	10	10	6.5	7.4	7.7	7.7	24.4		
	3	10	10	10	10	6.8	7.7	7.6	7.8	24.7		
	4	10	9	10	10	6.9	8.1	7.7	7.7	24.6		
	5	10	8 F	10	10	6.8	8.0	7.7	7.7	24.7		
	6	10	7 F	10	10	6.9	8.0	7.4	7.7	24.5		
	7	10	7	10	10	7.1		7.2		24.8		
75 %	0	10	10	10	10		7.5		7.4	Post: 24.6		
	1	10	10	9	10	6.7	7.5	7.6	7.4	24.7		
	2	9	9	9	10	6.6	7.5	7.5	7.5	24.5		
	3	9	5 F	2 F	10	6.8	7.8	7.6	7.6	24.7		
	4	9	2 F	1 F	10	6.9	8.2	7.6	7.5	24.6		
	5	9	2	1	10	6.7	8.1	7.0	7.5	24.7		
	6	9	2	1	10	6.8	8.1	7.2	7.5	24.6		
	7	9	2	1	10	7.0		7.1		24.9		
100 %	0	10	10	10	10		7.7		7.3	Post: 24.6		263
	1	9	10	10	10	6.8	7.7	7.5	7.2	24.7		
	2	9	10	10	10	6.6	7.7	7.5	7.4	24.4		272
	3	9	10	10	10	6.8	8.0	7.6	7.4	24.7		
	4	9	10	10	10	6.9	8.2	7.5	7.4	24.7		272
	5	9	10	9 F	10	6.7	8.0	7.6	7.5	24.6		
	6	9	10	9	9	6.7	8.3	7.1	7.4	24.7		
	7	9	10	9	9	6.7		7.6		24.9		

✓ Indicates one organism inadvertently poured off during solution renewal, replaced into container.
"M" = organism missing, start count reduced. "Inj" = organism injured, remove from stats.
"F" = fungus noted on dead organisms.
☐ Aeration in test chambers begun @ _____ (Note observations on Test Organism Info sheet)

Pre =Pre-renewal solutions. Post =Post-renewal solutions.
Day 0 Temperatures = Post-renewals
Therm ID# = Thermometer ID used for all measurements that day.
(23.8) = Temp. out of recommended range

FATHEAD MINNOW 7-DAY GROWTH DATA

Client: Sumitomo Metal Mining - Pogo Tins Labeled As: POGO

Lab ID: B3342 Start Date: 6/23/2015

Sample Description:

Technician:	KJ	KJ
Date:	7/1/2015	6/17/2015
Balance Serial #:	B328543647	B328543647

Percent	Replicate	Total Weight (mg)	Tare Weight (mg)	No. of Fish
Control	A	1158.59	1152.48	10
	B	1165.09	1159.77	7 of 9
	C	1166.03	1161.05	9
	D	1156.90	1152.06	10
12.5 %	A	1161.19	1155.56	10
	B	1159.76	1154.53	8
	C	1158.88	1154.21	9
	D	1153.38	1148.19	9
25 %	A	1151.68	1147.32	7
	B	1165.94	1161.01	10
	C	1165.68	1160.84	10
	D	1172.62	1167.51	10
50 %	A	1158.17	1152.76	10
	B	1163.95	1158.85	7
	C	1158.37	1152.72	10 of 11
	D	1148.92	1143.66	10
75 %	A	1161.55	1156.46	9
	B	1160.78	1159.24	2
	C	1155.26	1154.07	1
	D	1158.34	1153.23	10
100 %	A	1160.30	1155.08	9
	B	1165.27	1159.29	10
	C	1164.88	1160.00	9
	D	1158.33	1153.30	9

weigh to 0.01 mg

FATHEAD MINNOW 7-DAY GROWTH DATA

Client: Sumitomo Metal Mining - Pogo Tins Labeled As: POGO

Lab ID: Start Date: 6/23/2015

Sample Description:

Technician:		KJ
Date:		6/17/2015
Balance Serial #:	B328543647	B328543647

Percent	Replicate	Total Weight (mg)	Tare Weight (mg)	No. of Fish
Control	A		1152.48	10
	B		1159.77	7/9
	C		1161.05	9
	D		1152.06	10
12.5 %	A		1155.56	10
	B		1154.53	8
	C		1154.21	9
	D		1148.19	9
25 %	A		1147.32	7
	B		1161.01	10
	C		1160.84	10
	D		1167.51	10
50 %	A		1152.76	10
	B		1158.85	7
	C		1152.72	10/11
	D		1143.66	10
75 %	A		1156.46	9
	B		1159.24	2
	C		1154.07	1
	D		1153.23	10
100 %	A		1155.08	9
	B		1159.29	10
	C		1160.00	9
	D		1153.30	9

weigh to 0.01 mg

CETIS Summary Report

Report Date:	08 Jul-15 08:51 (p 1 of 2)
Test Code:	B334201ppc | 20-3218-2082

Fathead Minnow 7-d Larval Survival and Growth Test — **CH2M HILL - ASL**

Batch ID:	08-0195-5009	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	23 Jun-15 15:00	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	30 Jun-15 09:40	**Species:**	Pimephales promelas	**Brine:**	
Duration:	6d 19h	**Source:**	Aquatox, AR	**Age:**	<48h

Sample ID:	02-2667-2142	**Code:**	B3342-01	**Client:**	
Sample Date:	22 Jun-15 09:20	**Material:**	Unknown	**Project:**	
Receive Date:	23 Jun-15 10:00	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	30h (2.9 °C)	**Station:**			

Test Note: pathogenic effects (fungus) was noted in replicates 25%A, 50% B, 75% B, 75% C, and 100%C. Analysis including all replicates resulted in PMSD values of 30.12, just above the upper limit of 30. Analysis excluding those replicate chambers that showed pathogenic effects resulted in an acceptable PMSD value of 15.55.

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
12-3391-7531	7d Survival Rate	100	>100	NA	17.4%	1	Bonferroni Adj t Test ← pathog. removed
20-1471-3723	7d Survival Rate	100	>100	NA	40.6%	1	Dunnett Multiple Comparison Test } all data
13-8408-1272	Mean Dry Biomass-mg	100	>100	NA	30.1%	1	Steel Many-One Rank Sum Test } all data
02-1365-3074	Mean Dry Biomass-mg	100	>100	NA	15.5%	1	Bonferroni Adj t Test ← pathog. removed

Point Estimate Summary

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
02-2258-5156	Mean Dry Biomass-mg	IC25	>100	N/A	N/A	<1	Linear Interpolation (ICPIN)
19-0570-4895	Mean Dry Biomass-mg	IC25	>100	N/A	N/A	<1	Linear Interpolation (ICPIN)

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
12-3391-7531	7d Survival Rate	Control Resp	0.9194	0.8 - NL	Yes	Passes Acceptability Criteria
20-1471-3723	7d Survival Rate	Control Resp	0.9194	0.8 - NL	Yes	Passes Acceptability Criteria
02-1365-3074	Mean Dry Biomass-mg	Control Resp	0.546	0.25 - NL	Yes	Passes Acceptability Criteria
02-2258-5156	Mean Dry Biomass-mg	Control Resp	0.546	0.25 - NL	Yes	Passes Acceptability Criteria
13-8408-1272	Mean Dry Biomass-mg	Control Resp	0.546	0.25 - NL	Yes	Passes Acceptability Criteria
19-0570-4895	Mean Dry Biomass-mg	Control Resp	0.546	0.25 - NL	Yes	Passes Acceptability Criteria
02-1365-3074	Mean Dry Biomass-mg	PMSD	0.1555	0.12 - 0.3	Yes	Passes Acceptability Criteria
13-8408-1272	Mean Dry Biomass-mg	PMSD	0.3012	0.12 - 0.3	Yes	Above Acceptability Criteria ← Alt data

7d Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.9194	0.7515	1	0.7778	1	0.05278	0.1056	11.48%	0.0%
12.5		4	0.9	0.7701	1	0.8	1	0.04082	0.08165	9.07%	2.12%
25		4	0.925	0.6863	1	0.7	1	0.075	0.15	16.22%	-0.6%
50		4	0.9023	0.6771	1	0.7	1	0.07075	0.1415	15.68%	1.87%
75		4	0.55	0	1	0.1	1	0.2327	0.4655	84.63%	40.18%
100		4	0.925	0.8454	1	0.9	1	0.025	0.05	5.41%	-0.6%

Mean Dry Biomass-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.546	0.4437	0.6484	0.484	0.611	0.03216	0.06431	11.78%	0.0%
12.5		4	0.518	0.4553	0.5806	0.467	0.563	0.01969	0.03937	7.6%	5.13%
25		4	0.481	0.43	0.532	0.436	0.511	0.01601	0.03203	6.66%	11.91%
50		4	0.5227	0.5004	0.545	0.51	0.541	0.007008	0.01402	2.68%	4.28%
75		4	0.3233	-0.02063	0.6671	0.119	0.511	0.1081	0.2161	66.86%	40.8%
100		4	0.5277	0.45	0.6055	0.488	0.598	0.02443	0.04886	9.26%	3.35%

Fathead Minnow 7-d Larval Survival and Growth Test — **CH2M HILL - ASL**

7d Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1	0.7778	0.9	1
12.5		1	0.8	0.9	0.9
25		0.7	1	1	1
50		1	0.7	0.9091	1
75		0.9	0.2	0.1	1
100		0.9	1	0.9	0.9

Mean Dry Biomass-mg Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.611	0.5911	0.498	0.484
12.5		0.563	0.523	0.467	0.519
25		0.436	0.493	0.484	0.511
50		0.541	0.51	0.5136	0.526
75		0.509	0.154	0.119	0.511
100		0.522	0.598	0.488	0.503

7d Survival Rate Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	10/10	7/9	9/10	10/10
12.5		10/10	8/10	9/10	9/10
25		7/10	10/10	10/10	10/10
50		10/10	7/10	10/11	10/10
75		9/10	2/10	1/10	10/10
100		9/10	10/10	9/10	9/10

Fathead Minnow 7-d Larval Survival and Growth Test — **CH2M HILL - ASL**

Analysis ID:	20-1471-3723	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.1
Analyzed:	01 Jul-15 11:27	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Batch ID:	08-0195-5009	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	23 Jun-15 15:00	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	30 Jun-15 09:40	**Species:**	Pimephales promelas	**Brine:**	
Duration:	6d 19h	**Source:**	Aquatox, AR	**Age:**	<48h

Sample ID:	02-2667-2142	**Code:**	B3342-01	**Client:**	
Sample Date:	22 Jun-15 09:20	**Material:**	Unknown	**Project:**	
Receive Date:	23 Jun-15 10:00	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	30h (2.9 °C)	**Station:**			

Test Note: pathogenic effects (fungus) was noted in replicates 25%A, 50% B, 75% B, 75% C, and 100%C. Analysis including all replicates resulted in PMSD values of 30.12, just above the upper limit of 30. Analysis excluding those replicate chambers that showed pathogenic effects resulted in an acceptable PMSD value of 15.55.

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Angular (Corrected)	NA	C > T	NA	NA	40.6%	100	>100	NA	1

Dunnett Multiple Comparison Test

ALL DATA

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		12.5	0.1789	2.407	0.457	6	0.7753		Non-Significant Effect
		25	-0.09779	2.407	0.457	6	0.8605		Non-Significant Effect
		50	0.09656	2.407	0.457	6	0.8033		Non-Significant Effect
		75	2.249	2.407	0.457	6	0.0671		Non-Significant Effect
		100	-0.00812	2.407	0.457	6	0.8357		Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.5950696	0.1190139	5	1.653	0.1970	Non-Significant Effect
Error	1.295918	0.07199546	18			
Total	1.890988		23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	12.29	15.09	0.0311	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9475	0.884	0.2394	Normal Distribution

7d Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	4	0.9194	0.7515	1	0.95	0.7778	1	0.05278	11.48%	0.0%
12.5		4	0.9	0.7701	1	0.9	0.8	1	0.04082	9.07%	2.12%
25		4	0.925	0.6863	1	1	0.7	1	0.075	16.22%	-0.6%
50		4	0.9023	0.6771	1	0.9545	0.7	1	0.07075	15.68%	1.87%
75		4	0.55	0	1	0.55	0.1	1	0.2327	84.63%	40.18%
100		4	0.925	0.8454	1	0.9	0.9	1	0.025	5.41%	-0.6%

Angular (Corrected) Transformed Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	4	1.288	1.036	1.541	1.331	1.08	1.412	0.07936	12.32%	0.0%
12.5		4	1.254	1.056	1.453	1.249	1.107	1.412	0.06231	9.94%	2.63%
25		4	1.307	0.972	1.642	1.412	0.9912	1.412	0.1052	16.1%	-1.44%
50		4	1.27	0.9542	1.586	1.338	0.9912	1.412	0.09921	15.63%	1.42%
75		4	0.8616	-0.01133	1.735	0.8563	0.3218	1.412	0.2743	63.67%	33.12%
100		4	1.29	1.16	1.419	1.249	1.249	1.412	0.04074	6.32%	-0.12%

Fathead Minnow 7-d Larval Survival and Growth Test — **CH2M HILL - ASL**

Analysis ID:	20-1471-3723	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.1
Analyzed:	01 Jul-15 11:27	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

7d Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1	0.7778	0.9	1
12.5		1	0.8	0.9	0.9
25		0.7	1	1	1
50		1	0.7	0.9091	1
75		0.9	0.2	0.1	1
100		0.9	1	0.9	0.9

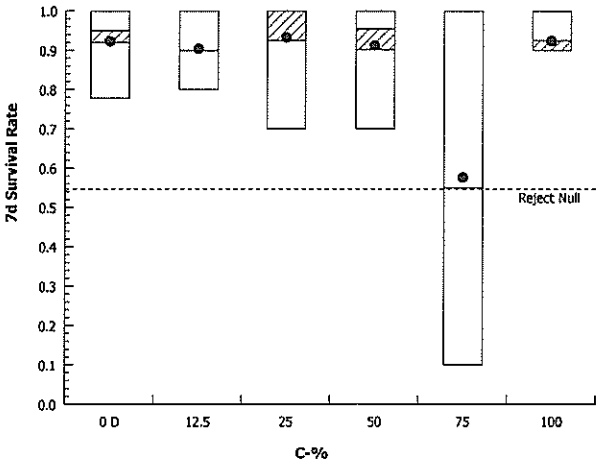
Angular (Corrected) Transformed Detail

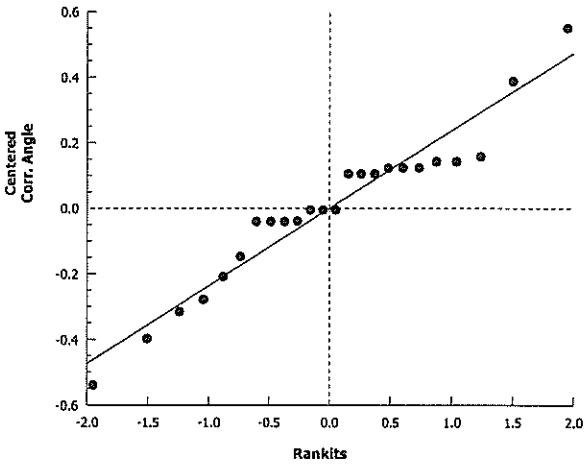
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1.412	1.08	1.249	1.412
12.5		1.412	1.107	1.249	1.249
25		0.9912	1.412	1.412	1.412
50		1.412	0.9912	1.265	1.412
75		1.249	0.4636	0.3218	1.412
100		1.249	1.412	1.249	1.249

7d Survival Rate Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	10/10	7/9	9/10	10/10
12.5		10/10	8/10	9/10	9/10
25		7/10	10/10	10/10	10/10
50		10/10	7/10	10/11	10/10
75		9/10	2/10	1/10	10/10
100		9/10	10/10	9/10	9/10

Graphics





Fathead Minnow 7-d Larval Survival and Growth Test — **CH2M HILL - ASL**

Analysis ID:	13-8408-1272	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.1
Analyzed:	01 Jul-15 11:27	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

Batch ID:	08-0195-5009	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	23 Jun-15 15:00	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	30 Jun-15 09:40	**Species:**	Pimephales promelas	**Brine:**	
Duration:	6d 19h	**Source:**	Aquatox, AR	**Age:**	<48h

Sample ID:	02-2667-2142	**Code:**	B3342-01	**Client:**	
Sample Date:	22 Jun-15 09:20	**Material:**	Unknown	**Project:**	
Receive Date:	23 Jun-15 10:00	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	30h (2.9 °C)	**Station:**			

Test Note: pathogenic effects (fungus) was noted in replicates 25%A, 50% B, 75% B, 75% C, and 100%C. Analysis including all replicates resulted in PMSD values of 30.12, just above the upper limit of 30. Analysis excluding those replicate chambers that showed pathogenic effects resulted in an acceptable PMSD value of 15.55.

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	30.1%	100	>100	NA	1

ALL DATA

Steel Many-One Rank Sum Test

Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		12.5	16	10	0	6	0.6105		Non-Significant Effect
		25	14	10	0	6	0.3451		Non-Significant Effect
		50	18	10	0	6	0.8333		Non-Significant Effect
		75	14	10	0	6	0.3451		Non-Significant Effect
		100	18	10	0	6	0.8333		Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.1368952	0.02737904	5	2.933	0.0415	Significant Effect
Error	0.1680009	0.009333384	18			
Total	0.3048961		23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	22.39	15.09	0.0004	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9122	0.884	0.0394	Normal Distribution

Mean Dry Biomass-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	4	0.546	0.4437	0.6484	0.5446	0.484	0.611	0.03216	11.78%	0.0%
12.5		4	0.518	0.4553	0.5806	0.521	0.467	0.563	0.01969	7.6%	5.13%
25		4	0.481	0.43	0.532	0.4885	0.436	0.511	0.01601	6.66%	11.91%
50		4	0.5227	0.5004	0.545	0.5198	0.51	0.541	0.007008	2.68%	4.28%
75		4	0.3233	-0.02063	0.6671	0.3315	0.119	0.511	0.1081	66.86%	40.8%
100		4	0.5277	0.45	0.6055	0.5125	0.488	0.598	0.02443	9.26%	3.35%

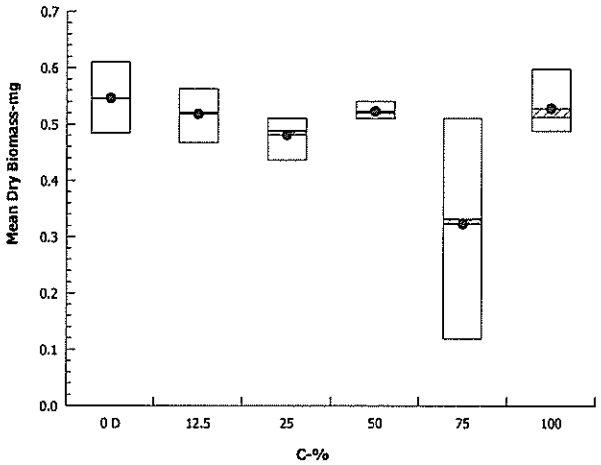
Mean Dry Biomass-mg Detail

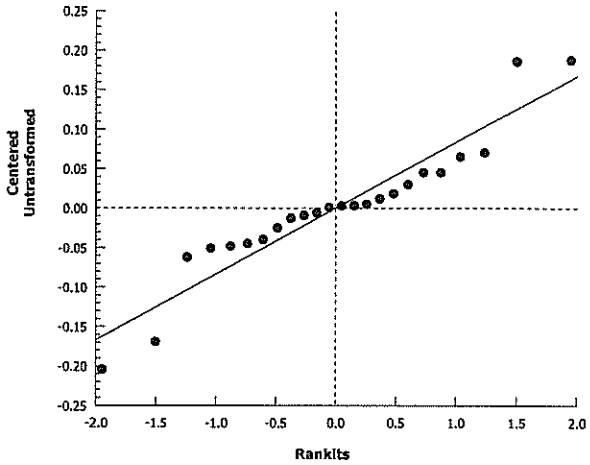
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.611	0.5911	0.498	0.484
12.5		0.563	0.523	0.467	0.519
25		0.436	0.493	0.484	0.511
50		0.541	0.51	0.5136	0.526
75		0.509	0.154	0.119	0.511
100		0.522	0.598	0.488	0.503

Fathead Minnow 7-d Larval Survival and Growth Test **CH2M HILL - ASL**

Analysis ID:	13-8408-1272	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.1
Analyzed:	01 Jul-15 11:27	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

Graphics





CETIS Analytical Report

Report Date:	08 Jul-15 08:54 (p 1 of 3)
Test Code:	B334201ppc | 20-3218-2082

Fathead Minnow 7-d Larval Survival and Growth Test — **CH2M HILL - ASL**

Analysis ID:	02-2258-5156	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.1
Analyzed:	01 Jul-15 11:27	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Batch ID:	08-0195-5009	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	23 Jun-15 15:00	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	30 Jun-15 09:40	**Species:**	Pimephales promelas	**Brine:**	
Duration:	6d 19h	**Source:**	Aquatox, AR	**Age:**	<48h

Sample ID:	02-2667-2142	**Code:**	B3342-01	**Client:**	
Sample Date:	22 Jun-15 09:20	**Material:**	Unknown	**Project:**	
Receive Date:	23 Jun-15 10:00	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	30h (2.9 °C)	**Station:**			

Test Note: pathogenic effects (fungus) was noted in replicates 25%A, 50% B, 75% B, 75% C, and 100%C. Analysis including all replicates resulted in PMSD values of 30.12, just above the upper limit of 30. Analysis excluding those replicate chambers that showed pathogenic effects resulted in an acceptable PMSD value of 15.55.

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	1.595E+09	200	Yes	Two-Point Interpolation

Point Estimates

ALL DATA

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC25	>100	N/A	N/A	<1	NA	NA

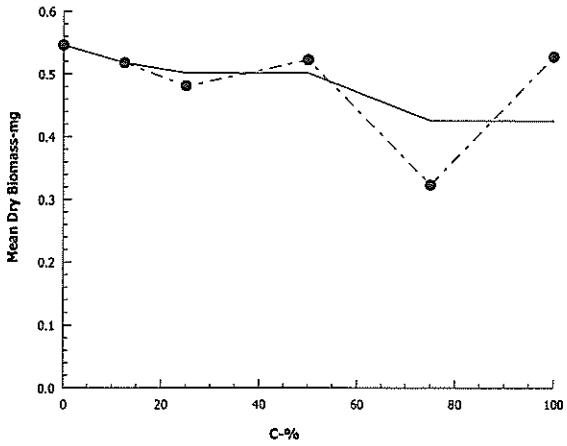
Mean Dry Biomass-mg Summary

			Calculated Variate						
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.546	0.484	0.611	0.03216	0.06431	11.78%	0.0%
12.5		4	0.518	0.467	0.563	0.01969	0.03937	7.6%	5.13%
25		4	0.481	0.436	0.511	0.01601	0.03203	6.66%	11.91%
50		4	0.5227	0.51	0.541	0.007008	0.01402	2.68%	4.28%
75		4	0.3233	0.119	0.511	0.1081	0.2161	66.86%	40.8%
100		4	0.5277	0.488	0.598	0.02443	0.04886	9.26%	3.35%

Mean Dry Biomass-mg Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.611	0.5911	0.498	0.484
12.5		0.563	0.523	0.467	0.519
25		0.436	0.493	0.484	0.511
50		0.541	0.51	0.5136	0.526
75		0.509	0.154	0.119	0.511
100		0.522	0.598	0.488	0.503

Graphics



Fathead Minnow 7-d Larval Survival and Growth Test — **CH2M HILL - ASL**

Analysis ID:	12-3391-7531	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.8
Analyzed:	08 Jul-15 8:47	**Analysis:**	Parametric-Multiple Comparison	**Official Results:**	Yes

Batch ID:	08-0195-5009	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	23 Jun-15 15:00	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	30 Jun-15 09:40	**Species:**	Pimephales promelas	**Brine:**	
Duration:	6d 19h	**Source:**	Aquatox, AR	**Age:**	<48h

Sample ID:	02-2667-2142	**Code:**	B3342-01	**Client:**	
Sample Date:	22 Jun-15 09:20	**Material:**	Unknown	**Project:**	
Receive Date:	23 Jun-15 10:00	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	30h (2.9 °C)	**Station:**			

Test Note: pathogenic effects (fungus) was noted in replicates 25%A, 50% B, 75% B, 75% C, and 100%C. Analysis including all replicates resulted in PMSD values of 30.12, just above the upper limit of 30. Analysis excluding those replicate chambers that showed pathogenic effects resulted in an acceptable PMSD value of 15.55.

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Angular (Corrected)	NA	C > T	NA	NA	17.4%	100	>100	NA	1

pathogenics removed

Bonferroni Adj t Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		12.5	0.4226	2.65	0.213	6	1.0000	CDF	Non-Significant Effect
		25	-1.427	2.65	0.23	5	1.0000	CDF	Non-Significant Effect
		50	-0.8601	2.65	0.23	5	1.0000	CDF	Non-Significant Effect
		75	-0.4299	2.65	0.261	4	1.0000	CDF	Non-Significant Effect
		100	-0.1743	2.65	0.23	5	1.0000	CDF	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value	2.159	2.681	0.4114	No Outliers Detected

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.05324196	0.01064839	5	0.8257	0.5533	Non-Significant Effect
Error	0.1676497	0.01289613	13			
Total	0.2208916		18			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	0.5966	5.636	0.7040	Equal Variances
Variances	Levene Equality of Variance	1.756	4.862	0.1913	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9722	0.8605	0.8187	Normal Distribution

7d Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	4	0.9194	0.7515	1	0.95	0.7778	1	0.05278	11.48%	0.0%
12.5		4	0.9	0.7701	1	0.9	0.8	1	0.04082	9.07%	2.12%
25		3	1	1	1	1	1	1	0	0.0%	-8.76%
50		3	0.9697	0.8393	1	1	0.9091	1	0.0303	5.41%	-5.47%
75		2	0.95	0.3147	1	0.95	0.9	1	0.05	7.44%	-3.32%
100		3	0.9333	0.7899	1	0.9	0.9	1	0.03333	6.19%	-1.51%

Fathead Minnow 7-d Larval Survival and Growth Test — **CH2M HILL - ASL**

Analysis ID:	12-3391-7531	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.8
Analyzed:	08 Jul-15 8:47	**Analysis:**	Parametric-Multiple Comparison	**Official Results:**	Yes

Angular (Corrected) Transformed Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	4	1.288	1.036	1.541	1.331	1.08	1.412	0.07936	12.32%	0.0%
12.5		4	1.254	1.056	1.453	1.249	1.107	1.412	0.06231	9.94%	2.63%
25		3	1.412	1.411	1.413	1.412	1.412	1.412	0	0.0%	-9.61%
50		3	1.363	1.151	1.574	1.412	1.265	1.412	0.04917	6.25%	-5.79%
75		2	1.331	0.2952	2.366	1.331	1.249	1.412	0.08149	8.66%	-3.28%
100		3	1.303	1.07	1.537	1.249	1.249	1.412	0.05432	7.22%	-1.17%

7d Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1	0.7778	0.9	1
12.5		1	0.8	0.9	0.9
25		1	1	1	
50		1	0.9091	1	
75		0.9	1		
100		0.9	1	0.9	

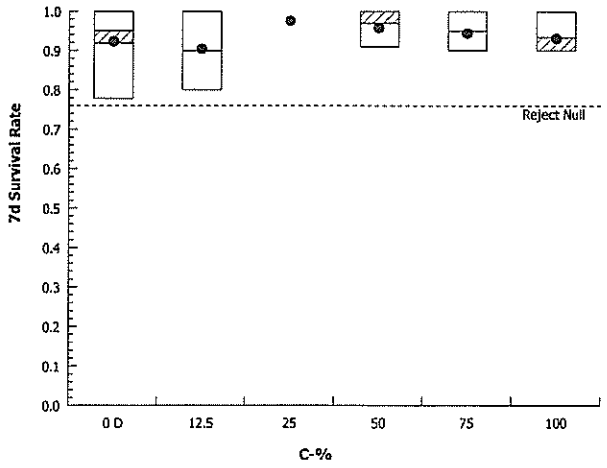
Angular (Corrected) Transformed Detail

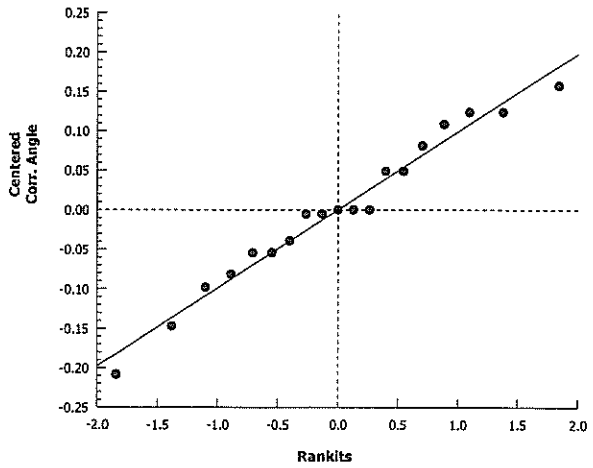
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1.412	1.08	1.249	1.412
12.5		1.412	1.107	1.249	1.249
25		1.412	1.412	1.412	
50		1.412	1.265	1.412	
75		1.249	1.412		
100		1.249	1.412	1.249	

7d Survival Rate Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	10/10	7/9	9/10	10/10
12.5		10/10	8/10	9/10	9/10
25		10/10	10/10	10/10	
50		10/10	10/11	10/10	
75		9/10	10/10		
100		9/10	10/10	9/10	

Graphics





Fathead Minnow 7-d Larval Survival and Growth Test — **CH2M HILL - ASL**

Analysis ID:	02-1365-3074	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	08 Jul-15 8:47	**Analysis:**	Parametric-Multiple Comparison	**Official Results:**	Yes

Batch ID:	08-0195-5009	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	23 Jun-15 15:00	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	30 Jun-15 09:40	**Species:**	Pimephales promelas	**Brine:**	
Duration:	6d 19h	**Source:**	Aquatox, AR	**Age:**	<48h

Sample ID:	02-2667-2142	**Code:**	B3342-01	**Client:**	
Sample Date:	22 Jun-15 09:20	**Material:**	Unknown	**Project:**	
Receive Date:	23 Jun-15 10:00	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	30h (2.9 °C)	**Station:**			

Test Note: pathogenic effects (fungus) was noted in replicates 25%A, 50% B, 75% B, 75% C, and 100%C. Analysis including all replicates resulted in PMSD values of 30.12, just above the upper limit of 30. Analysis excluding those replicate chambers that showed pathogenic effects resulted in an acceptable PMSD value of 15.55.

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	15.5%	100	>100	NA	1

Bonferroni Adj t Test

pathogenics removed

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		12.5	0.945	2.65	0.079	6	0.9048	CDF	Non-Significant Effect
		25	1.562	2.65	0.085	5	0.3559	CDF	Non-Significant Effect
		50	0.5976	2.65	0.085	5	1.0000	CDF	Non-Significant Effect
		75	0.9917	2.65	0.096	4	0.8486	CDF	Non-Significant Effect
		100	0.1569	2.65	0.085	5	1.0000	CDF	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value	1.823	2.681	1.0000	No Outliers Detected

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.005712702	0.00114254	5	0.6495	0.6671	Non-Significant Effect
Error	0.02286786	0.001759066	13			
Total	0.02858056		18			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	10.63	15.09	0.0593	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9556	0.8605	0.4884	Normal Distribution

Mean Dry Biomass-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	4	0.546	0.4437	0.6484	0.5446	0.484	0.611	0.03216	11.78%	0.0%
12.5		4	0.518	0.4553	0.5806	0.521	0.467	0.563	0.01969	7.6%	5.13%
25		3	0.496	0.4619	0.5301	0.493	0.484	0.511	0.007935	2.77%	9.16%
50		3	0.5269	0.4928	0.5609	0.526	0.5136	0.541	0.007911	2.6%	3.51%
75		2	0.51	0.4974	0.5226	0.51	0.509	0.511	0.000993	0.28%	6.6%
100		3	0.541	0.4161	0.6659	0.522	0.503	0.598	0.02902	9.29%	0.92%

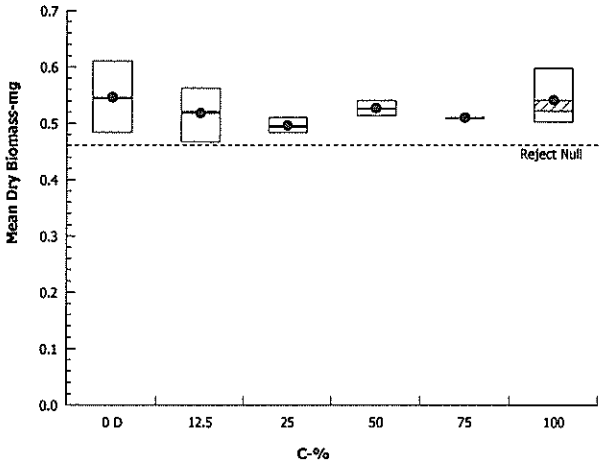
Mean Dry Biomass-mg Detail

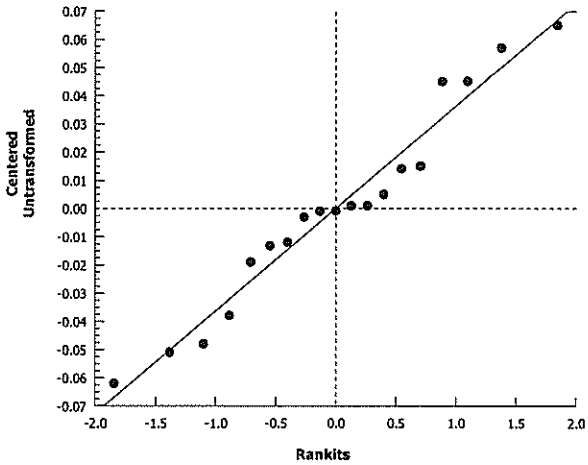
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.611	0.5911	0.498	0.484
12.5		0.563	0.523	0.467	0.519
25		0.493	0.484	0.511	
50		0.541	0.5136	0.526	
75		0.509	0.511		
100		0.522	0.598	0.503	

Fathead Minnow 7-d Larval Survival and Growth Test **CH2M HILL - ASL**

Analysis ID:	02-1365-3074	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	08 Jul-15 8:47	**Analysis:**	Parametric-Multiple Comparison	**Official Results:**	Yes

Graphics





Fathead Minnow 7-d Larval Survival and Growth Test — **CH2M HILL - ASL**

Analysis ID:	19-0570-4895	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	08 Jul-15 8:47	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Batch ID:	08-0195-5009	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	23 Jun-15 15:00	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	30 Jun-15 09:40	**Species:**	Pimephales promelas	**Brine:**	
Duration:	6d 19h	**Source:**	Aquatox, AR	**Age:**	<48h

Sample ID:	02-2667-2142	**Code:**	B3342-01	**Client:**	
Sample Date:	22 Jun-15 09:20	**Material:**	Unknown	**Project:**	
Receive Date:	23 Jun-15 10:00	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	30h (2.9 °C)	**Station:**			

Test Note: pathogenic effects (fungus) was noted in replicates 25%A, 50% B, 75% B, 75% C, and 100%C. Analysis including all replicates resulted in PMSD values of 30.12, just above the upper limit of 30. Analysis excluding those replicate chambers that showed pathogenic effects resulted in an acceptable PMSD value of 15.55.

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	117556	200	Yes	Two-Point Interpolation

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value	1.823	2.681	1.0000	No Outliers Detected

Point Estimates

pathogens removed

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC25	>100	N/A	N/A	<1	NA	NA

Mean Dry Biomass-mg Summary

			Calculated Variate						
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.546	0.484	0.611	0.03216	0.06431	11.78%	0.0%
12.5		4	0.518	0.467	0.563	0.01969	0.03937	7.6%	5.13%
25		3	0.496	0.484	0.511	0.007935	0.01374	2.77%	9.16%
50		3	0.5269	0.5136	0.541	0.007911	0.0137	2.6%	3.51%
75		2	0.51	0.509	0.511	0.000993	0.001405	0.28%	6.6%
100		3	0.541	0.503	0.598	0.02902	0.05027	9.29%	0.92%

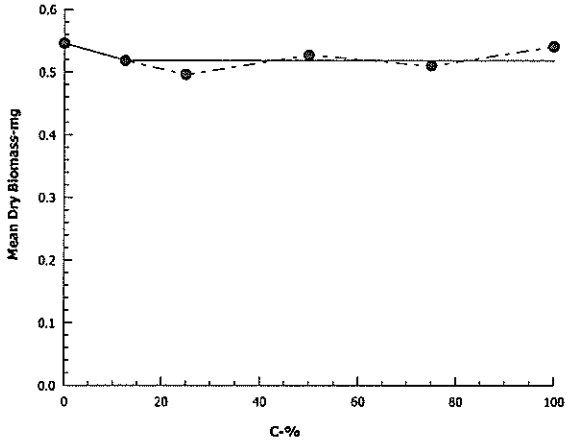
Mean Dry Biomass-mg Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.611	0.5911	0.498	0.484
12.5		0.563	0.523	0.467	0.519
25		0.493	0.484	0.511	
50		0.541	0.5136	0.526	
75		0.509	0.511		
100		0.522	0.598	0.503	

Fathead Minnow 7-d Larval Survival and Growth Test — **CH2M HILL - ASL**

Analysis ID:	19-0570-4895	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	08 Jul-15 8:47	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Graphics



APPENDIX B

REFERENCE TOXICANT DATA SHEETS

CH2M HILL

Ceriodaphnia dubia
Survival and Reproduction
Test Data Summary

Client: QA / QC

Test Start Date: 06-10-15

Sample Description: NaCl

Initial Sample ID#: 2B056-06

Data summarized by: [signature]

Percent or Concentration	Total Live Young Produced in First 3 Broods per Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
Control	0	17	14	17	21	23	17	25	10	23	9	167
	AD? ✓	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
0.25 g/L	10	13	16	14	14	27	23	3	17	23	9	160
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD? ✓	AD?	AD?		
0.50 g/L	13	14	23	24	I	0	13	20	18	I	7/8	125
	AD?	AD?	AD?	AD?	AD?	AD? ✓	AD?	AD?	AD?	AD?		
1.0 g/L	6	12	10	9	10	0	13	18	19	11	9	108
	AD?	AD?	AD?	AD?	AD?	AD? ✓	AD?	AD?	AD?	AD?		
1.5 g/L	2	4	8	13	9	0	6	4	1	4	9	51
	AD?	AD?	AD?	AD?	AD?	AD? ✓	AD?	AD?	AD?	AD?		
2.0 g/L	0	0	0	0	0	0	0	0	0	0	6	0
	AD? ✓	AD?	AD?	AD?	AD? ✓	AD? ✓	AD?	AD?	AD? ✓	AD?		
4.0 g/L	0	0	0	0	0	0	0	0	0	0	0	0
	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓		

Ave = 15.6

Test Organism Mortality (Adult dead) = AD? ✓

Test Organism identified as Male = AD? M

Test Organism Injured during test = AD? I

# of Alive Adults = Number of test organism alive at termination

Total Live Young = Total neonates produced in first 3 broods

Footnote: As per EPA-600-4-91-002 and EPA-821-R-02-013, *Ceriodaphnia dubia* test should be terminated when 60% of the surviving control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

Also as per EPA-821-R-02-013 (13.10.9.1), "In this three-brood test, offspring from fourth or higher broods should not be counted and should not be included in the total number of neonates produced during the test."

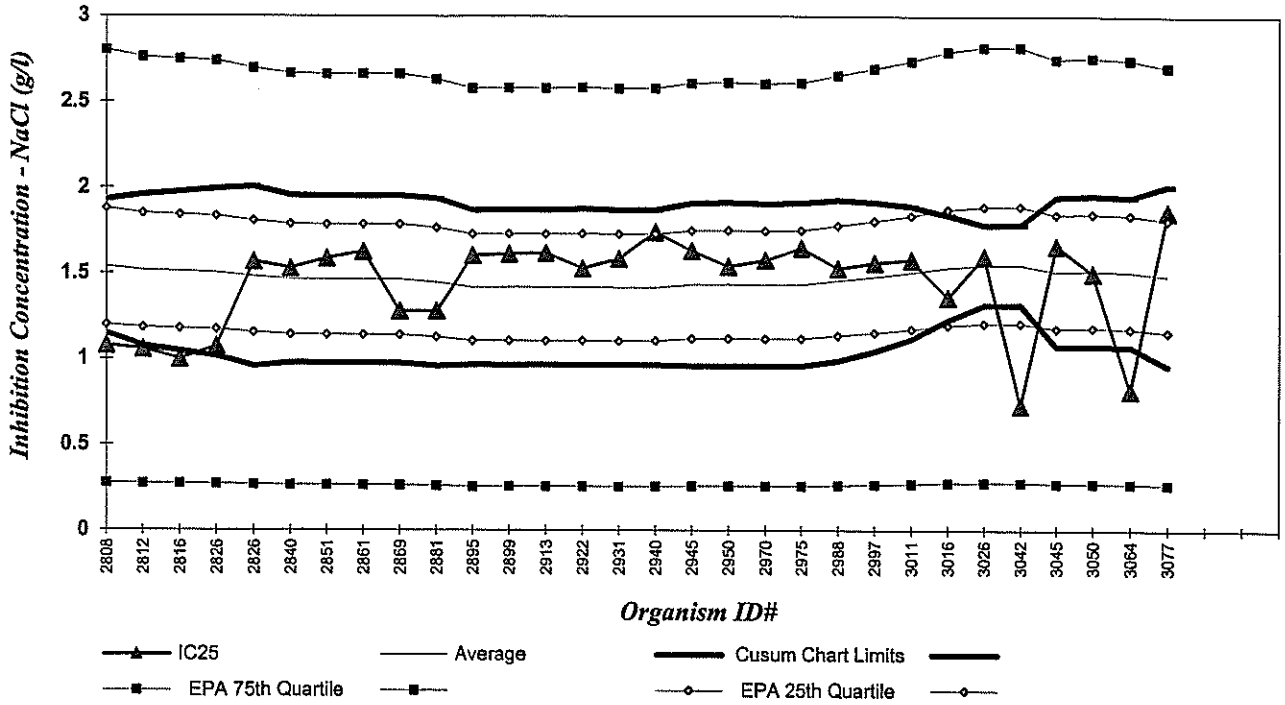
Endpoint	IC25	Cusum Chart Limits
Survival	1.86	0.96 to 2.01
Reproduction	0.80	0.09 to 1.15

Task Manager: [signature]

Project Manager: [signature]

QA Officer: [signature]

REFERENCE TOXICANT CUMLATIVE SUMMARY (CUSUM) CHART
Ceriodaphnia dubia Chronic Survival - IC25 Values



***Ceriodaphnia dubia* - Chronic (EPA Test Method 1002.0)**

SODIUM CHLORIDE (g/L)

Endpoint: Chronic Survival

Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

From EPA 833-R-00-003:

10th Quartile CV (*control limit*) = 0.07

25th Quartile CV (*warning limit*) = 0.11

75th Quartile CV (warning *limit*) = 0.41

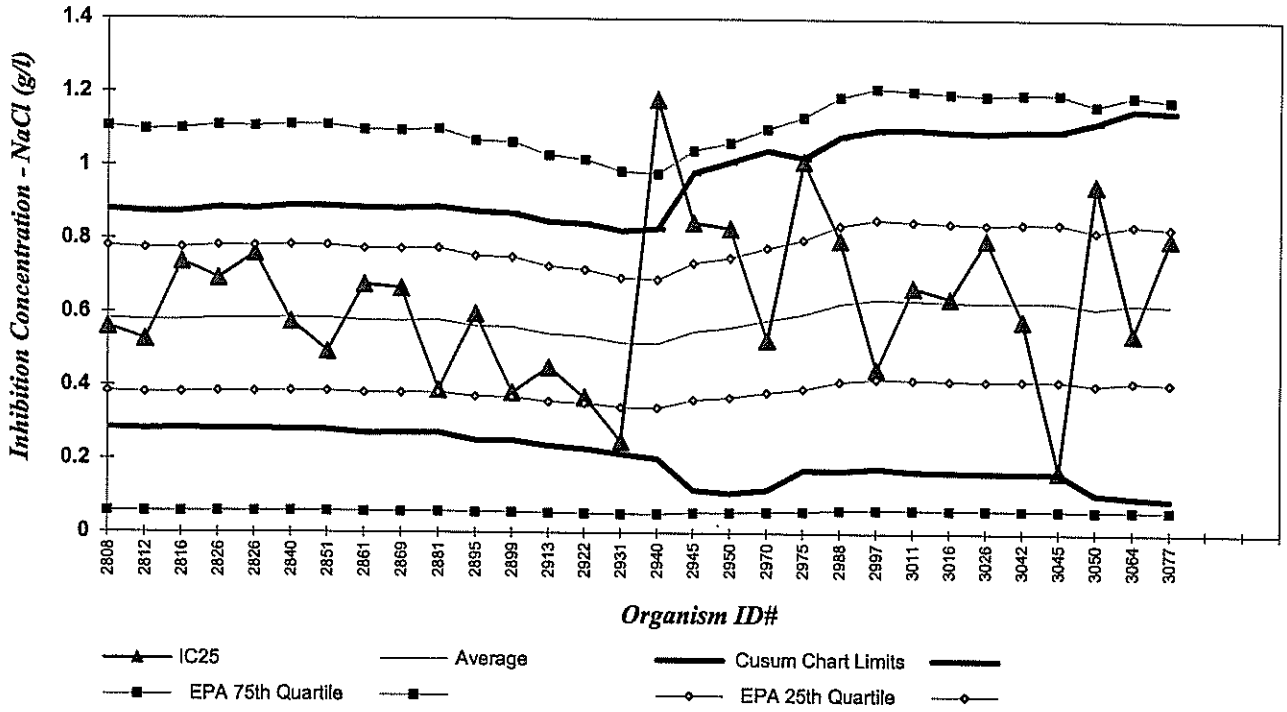
90th Quartile CV (*control limit*) = 0.81

*Intralab CV is compared to EPA **Warning limits** (25th and 75th CV's) and **Control limits** (10th and 90th CV's).*

If lab CV is outside EPA Control limits, the EPA Control limits are used to set Cusum chart limits.

Event #	Cerio ID #	Test Start Date	IC25	Running Average	Running SD	Cusum Chart Limits AVG-2SD	Cusum Chart Limits AVG+2SD	Intralab CV
279	2975	08/05/14	1.65	1.43	0.24	**0.96**	**1.91**	0.16
280	2988	09/16/14	1.53	1.46	0.23	**0.99**	**1.93**	0.15
281	2997	10/07/14	1.56	1.48	0.22	**1.05**	**1.91**	0.13
282	3011	11/04/14	1.58	1.51	0.19	**1.12**	**1.89**	0.10
283	3016	12/04/14	1.36	1.53	0.15	**1.23**	**1.84**	0.08
284	3026	01/06/15	1.60	1.55	0.12	**1.32**	**1.78**	0.08
285	3042	02/25/15	**0.73**	1.55	0.12	**1.32**	**1.78**	0.14
286	3045	03/10/15	1.66	1.51	0.22	**1.07**	**1.95**	0.15
287	3050	03/31/15	1.50	1.51	0.22	**1.07**	**1.95**	0.14
288	3064	05/12/15	**0.82**	1.51	0.22	**1.07**	**1.94**	0.18
289	3077	06/10/15	1.86	1.48	0.26	**0.96**	**2.01**	0.18
290								
291								
292								

REFERENCE TOXICANT CUMLATIVE SUMMARY (CUSUM) CHART
Ceriodaphnia dubia Chronic Reproduction - IC25 Values



***Ceriodaphnia dubia* - Chronic (EPA Test Method 1002.0)**

SODIUM CHLORIDE (g/L)

Endpoint: Chronic Reproduction

Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

From EPA 833-R-00-003:

10th Quartile CV (*control limit*) = 0.08

25th Quartile CV (*warning limit*) = 0.17

75th Quartile CV (warning *limit*) = 0.45

90th Quartile CV (*control limit*) = 0.62

*Intralab CV is compared to EPA **Warning limits** (25th and 75th CV's) and **Control limits** (10th and 90th CV's).*

If lab CV is outside EPA Control limits, the EPA Control limits are used to set Cusum chart limits.

Event #	Cerio ID #	Test Start Date	IC25	Running Average	Running SD	Cusum Chart Limits AVG-2SD	AVG+2SD	Intralab CV
279	2975	8/5/2014	1.01	0.60	0.21	**0.17**	**1.02**	0.36
280	2988	9/16/2014	0.80	0.63	0.23	**0.17**	**1.08**	0.36
281	2997	10/7/2014	0.45	0.64	0.23	**0.18**	**1.10**	0.37
282	3011	11/4/2014	0.67	0.63	0.23	**0.17**	**1.10**	0.37
283	3016	12/4/2014	0.64	0.63	0.23	**0.17**	**1.09**	0.37
284	3026	1/6/2015	0.80	0.63	0.23	**0.16**	**1.09**	0.37
285	3042	2/25/2015	0.58	0.63	0.23	**0.16**	**1.10**	0.37
286	3045	3/10/2015	0.17	0.63	0.23	**0.16**	**1.10**	0.41
287	3050	3/31/2015	0.95	0.61	0.25	**0.11**	**1.12**	0.42
288	3064	5/12/2015	0.55	0.63	0.26	**0.10**	**1.16**	0.43
289	3077	6/10/2015	0.80	0.62	0.26	**0.09**	**1.15**	0.41
290								
291								
292								

CH2M HILL

FATHEAD MINNOW 7-DAY SURVIVAL AND WATER QUALITY DATA

Random Template Used: 6 conc. x 4 reps. # 8 | Waterbath/incubator Used: # 7 | Date Initiated 6 / 23 / 2015 Time 11 :40

Stock Sol. ID 2B 052-06 - | Date Terminated 6 / 30 / 2015 Time 08 :40

Organism ID: FHM 1825 | Test Container Size: 800 ml | Solution Volume / rep: 500 ml

Client QA / QC - RefTox | Sample Description NaCl (50 g/L stock)

Tech: Day 0 e Day 1 e Day 2 e Day 3 MC Day 4 e Day 5 SW Day 6 MC Day 7 e

Time Day 0 1440 Day 1 1240 Day 2 0920 Day 3 1030 Day 4 1210 Day 5 1950 Day 6 1305 Day 7 0840

Conc. or Percent	Day	Number of Live Organisms A	B	C	D	Dissolved O_2 (mg/l) Pre	Post	pH Pre	Post	Temp. (°C) Pre	Therm. ID#	Conductivity (µS) Post (daily)
Control	0	10	10	10	10		7.3		8.0	Post: 25.0	177	308
	1	10	10	9	10	7.2	7.2	7.8	8.2	24.7	202	301
	2	8	10	9	10	6.8	7.1	7.5	8.2	24.7	202	311
	3	8	10	9	10	6.7	6.9	7.8	8.4	24.7	202	303
	4	8	10	9	10	7.1	7.3	7.7	8.2	24.4	159	316
	5	8	10	9	10	7.4	7.5	7.6	8.3	24.2	159	325
	6	8	10	9	10	~~7.6~~ 6.7	7.5	7.6	8.3	24.5	177	310
	7	8	10	9	10	7.2		7.6		24.5	177	
0.3 g/L	0	10	10	10	10		7.2		8.1	Post: 24.9		801
	1	10	10	9	10	7.2	7.3	7.8	8.2	24.7		874
	2	10	10	9	10	6.9	7.4	7.7	8.2	24.6		846
	3	10	10	8	10	6.7	7.2	7.8	8.3	24.3		871
	4	10	10	8	10	7.1	7.5	7.8	8.2	24.5		870
	5	10	10	8	9	7.3	7.6	7.8	8.3	24.2		880
	6	10	10	8	9	6.8	7.6	7.7	8.2	24.6		885
	7	10	10	8	9	7.3		7.7		24.7		
1.0 g/L	0	10	10	10	10		7.3		8.1	Post: 24.8		2050
	1	10	10	10	10	7.2	7.4	8.0	8.2	24.7		2080
	2	10	10	10	10	6.9	7.6	7.8	8.2	24.6		2160
	3	10	9	10	10	6.7	7.3	7.8	8.2	24.7		2100
	4	10	9	10	9	7.1	7.6	7.9	8.2	24.4		2190
	5	10	9	10	9	7.3	7.6	7.8	8.2	24.3		2060
	6	10	9	10	9	6.8	7.6	7.7	8.2	24.5		2060
	7	10	9	10	9	7.2		7.7		24.7		
2.0 g/L	0	10	10	10	10		7.3		8.1	Post: 24.8		3820
	1	10	10	10	10	7.2	7.5	7.9	8.1	24.7		3780
	2	10	10	9	10	6.9	7.7	7.8	8.1	24.7		3860
	3	10	10	9	9	6.7	7.3	7.9	8.2	24.2		3860
	4	10	10	9	8	7.2	7.6	7.9	8.2	24.3		3890
	5	9	9	9	8	7.4	7.6	7.8	8.1	24.2		3810
	6	9	9	9	8	6.8	7.7	7.8	8.2	24.6		3740
	7	9	9	9	7	7.3		7.7		24.6		
4.0 g/L	0	10	10	10	10		7.3		8.1	Post: 24.8		7110
	1	9	9	10	10	7.2	7.5	7.9	8.1	24.7		7090
	2	8	9	10	10	7.0	7.8	7.7	8.1	24.7		7160
	3	8	9	9	10	6.7	7.3	7.8	8.1	24.4		7120
	4	8	9	9	10	7.2	7.7	7.9	8.1	24.5		7220
	5	6	8	6	10	7.5	7.7	7.8	8.1	24.4		7000
	6	2	5	4	7	6.9	7.7	7.7	8.1	24.5		7020
	7	2	5	2	6	7.3		7.7		24.5		
8.0 g/L	0	10	10	10	10		7.3		8.0	Post: 24.7		13000
	1	1	10	7	7	7.2	7.5	7.9	8.0	24.7		12510
	2	0	2	1	4	7.1	7.9	7.7	8.1	24.7		12560
	3		2	1	2	6.8	7.3	7.8	8.1	24.3		13490
	4		0	1	0	7.2	7.7	7.8	8.1	24.3		13550
	5			0		7.3	7.7	7.9	8.0	24.4		13300
	6											
	7											

✓ Indicates one organism inadvertently poured off during solution renewal, replaced into container.

"M" = organism missing, start count reduced. "Inj" = organism injured, remove from stats.

"F" = fungus noted on dead organisms.

Pre =Pre-renewal solutions. Post =Post-renewal solutions.

Day 0 Temperatures = Post-renewals

Therm ID# = Thermometer ID used for all measurements that day.

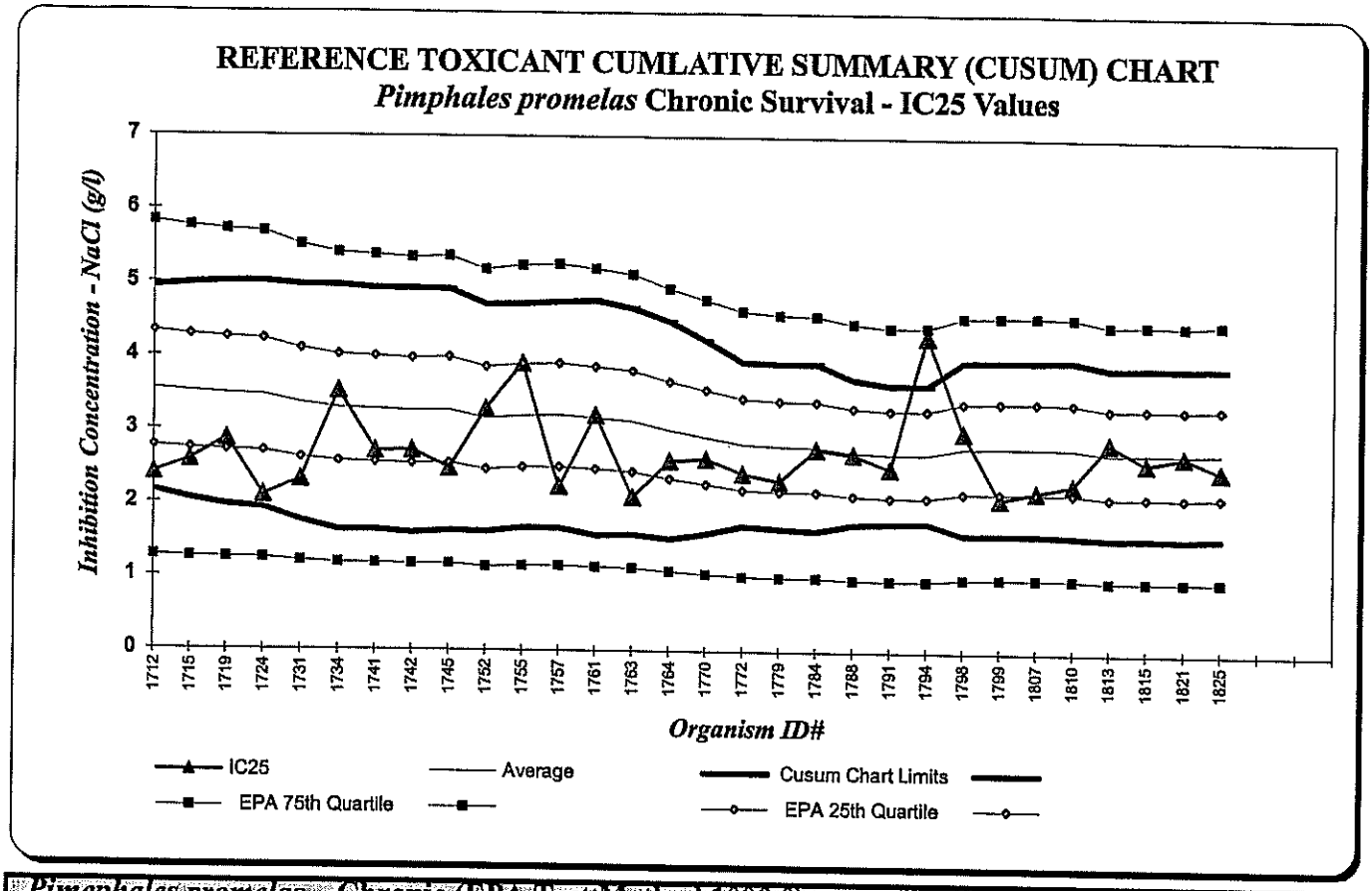
(23.8) = Temp. out of recommended range

Endpoint	IC25	Cusum Chart Limits
Survival	2.5	1.6 to 3.9
Growth	2.5	1.9 to 2.9

Task Manager [signature]

Project Manager Doug Winn

QA Officer Ginger Collins



***Pimephales promelas* - Chronic (EPA Test Method 1000.0)**

SODIUM CHLORIDE (g/L)

Endpoint: Chronic Survival

Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

From EPA 833-R-00-003:

10th Quartile CV (*control limit*) = 0.03

25th Quartile CV (*warning limit*) = 0.11

75th Quartile CV (*warning limit*) = 0.32

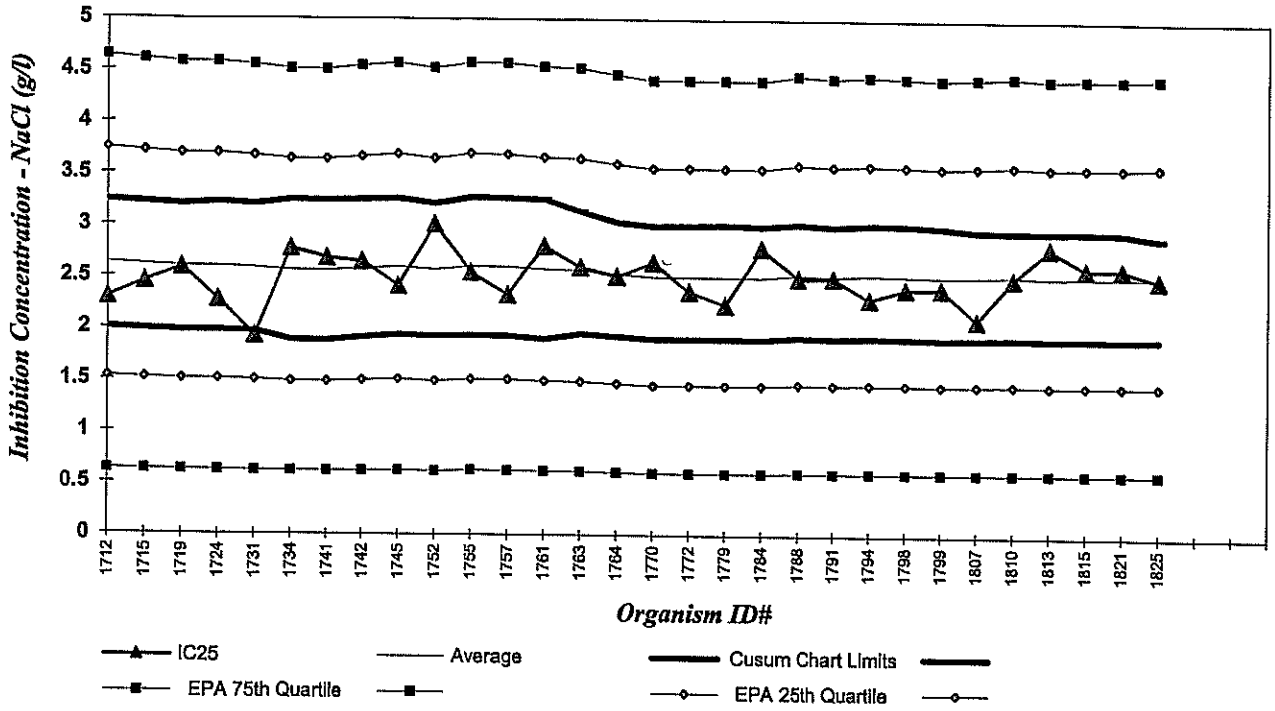
90th Quartile CV (*control limit*) = 0.52

*Intralab CV is compared to EPA **Warning limits** (25th and 75th CV's) and **Control limits** (10th and 90th CV's).*

If lab CV is outside EPA Control limits, the EPA Control limits are used to set Cusum chart limits.

Event #	FHM ID #	Test Start Date	IC25	Running Average	Running SD	Cusum Chart Limits AVG-2SD	AVG+2SD	Intralab CV
308	1779	08/26/14	2.3	2.8	0.56	1.7	3.9	0.20
309	1784	09/25/14	2.8	2.8	0.57	1.7	3.9	0.18
310	1788	10/21/14	2.7	2.7	0.49	1.7	3.7	0.18
311	1791	11/04/14	2.5	2.7	0.47	1.8	3.6	0.17
312	1794	12/02/14	4.3	2.7	0.47	1.8	3.6	0.21
313	1798	12/16/14	3.0	2.8	0.59	1.6	4.0	0.21
314	1799	01/06/15	2.1	2.8	0.59	1.6	4.0	0.21
315	1807	02/10/15	2.2	2.8	0.59	1.6	4.0	0.21
316	1810	03/10/15	2.3	2.8	0.60	1.6	4.0	0.21
317	1813	03/31/15	2.9	2.7	0.58	1.6	3.9	0.21
318	1815	04/07/15	2.6	2.7	0.58	1.6	3.9	0.21
319	1821	05/19/15	2.7	2.7	0.58	1.6	3.9	0.21
320	1825	06/23/15	2.5	2.7	0.58	1.6	3.9	0.21
321								

REFERENCE TOXICANT CUMLATIVE SUMMARY (CUSUM) CHART
Pimephales promelas Chronic Biomass - IC25 Values



***Pimephales promelas* - Chronic (EPA Test Method 1000.0)**

SODIUM CHLORIDE (g/L)

Endpoint: Chronic Growth (Biomass)

Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

From EPA 833-R-00-003:

10th Quartile CV (*control limit*) = 0.12

25th Quartile CV (*warning limit*) = 0.21

75th Quartile CV (*warning limit*) = 0.38

90th Quartile CV (*control limit*) = 0.45

*Intralab CV is compared to EPA **Warning limits** (25th and 75th CV's) and **Control limits** (10th and 90th CV's).*

If lab CV is outside EPA Control limits, the EPA Control limits are used to set Cusum chart limits.

Event #	FHM ID #	Test Start Date	IC25	Running Average	Running SD	Cusum Chart Limits AVG-2SD	AVG+2SD	Intralab CV
308	1779	8/26/2014	**2.2**	2.5	0.25	**1.9**	**3.0**	0.10
309	1784	9/25/2014	**2.8**	2.5	0.25	**1.9**	**3.0**	0.10
310	1788	10/21/2014	**2.5**	2.5	0.25	**1.9**	**3.0**	0.10
311	1791	11/4/2014	**2.5**	2.5	0.25	**1.9**	**3.0**	0.09
312	1794	12/2/2014	**2.3**	2.5	0.24	**1.9**	**3.0**	0.10
313	1798	12/16/2014	**2.4**	2.5	0.25	**1.9**	**3.0**	0.10
314	1799	1/6/2015	**2.4**	2.5	0.25	**1.9**	**3.0**	0.10
315	1807	2/10/2015	**2.1**	2.5	0.24	**1.9**	**3.0**	0.09
316	1810	3/10/2015	**2.5**	2.5	0.22	**1.9**	**3.0**	0.09
317	1813	3/31/2015	**2.8**	2.5	0.21	**1.9**	**3.0**	0.09
318	1815	4/7/2015	**2.6**	2.5	0.22	**1.9**	**3.0**	0.09
319	1821	5/19/2015	**2.6**	2.5	0.22	**1.9**	**3.0**	0.09
320	1825	6/23/2015	**2.5**	2.5	0.22	**1.9**	**2.9**	0.07

APPENDIX C

CHAIN OF CUSTODY

CH2MHILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

Client SMM Pogo LLC
Address 3204 International St.
Fairbanks, AK 99701

NPDES# AK0053341

Contact Person: Stacy Staley
Phone: (907)895-2761
E-mail: Pogo.environmental@smmpogo.com
CH2M HILL Project # / Purchase Order # 920872.0TC

Composite Sample Information:
Initiated: Date _____ Time _____
Ended: Date _____ Time _____
Chilled During Collection ? Yes ___ No ___
Dechlorinated prior to shipping ? Yes ___ No ___

Ship Samples to:
CH2M HILL - Applied Sciences Laboratory
Attention: Bioasssay Lab
1100 NE Circle Blvd. Suite 300
Corvallis, OR 97330
Lab Phone: (541) 768-3160
Customer Service: (541) 768-3120

2-9°C

B3342 "A"

Analysis Required / Comments

Sample ID	Date	Time	Sample Type: Comp.	Sample Type: Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Green Algae	Trout Acute	Sheepshead Acute	Sheepshead Chronic	Menidia Acute	Menidia Chronic	Mysid Acute	Mysid Chronic	Haz Waste				Concentration and/or Comments
Outfall 001	6/22/2015	920		X	2			X		X													

Sampled By & Title (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time
Jim Ward, Env. Specialist	6/22/2015 1430		
Received By (Please sign and print name)	**Date/Time**	**Relinquished By (Please sign and print name)**	**Date/Time**
	6/23/15 10:00		
Received By (Please sign and print name)	**Date/Time**	**Relinquished By (Please sign and print name)**	**Date/Time**
Received By (Please sign and print name)	**Date/Time**	**Shipped Via** UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	**Shipping #**
Work Authorized By (Please sign and print name)	**Remarks** B3342-01		

CH2MHILL
Applied Sciences Laboratory (ASL)

Sample Receipt Record

Batch Number: B 3342 "A"

Date Received: 6/23/15

Client/Project: SMM POGO LLC

Received By: RM

Were custody seals intact and on the outside of the cooler?	☒ Yes ☐ No ☐ N/A
Packing Material:	☐ Hand Delivered ☒ Ice ☐ Blue Ice ☐ Box
Temp OK? (<6C) Therm ID: TH173 Exp: 8/1/15 2.9 °C	☒ Yes ☐ No ☐ N/A
Was a Chain of Custody (CoC) Provided?	☒ Yes ☐ No ☐ N/A
Was the CoC correctly filled out (If No, document below)	☒ Yes ☐ No ☐ N/A
Were the sample containers in good condition (broken or leaking)?	☒ Yes ☐ No ☐ N/A
Was enough sample volume provided for analysis? (If No, document below)	☒ Yes ☐ No ☐ N/A
Are all samples within 36 hours of collection?	☒ Yes ☐ No ☐ N/A

Sample Exception Report (The following exceptions were noted)

Client was notified on: Client contact:

Resolution to Exception:

CH2MHILL **CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING**

Client: SMM Pogo LLC
Address: 3204 International St.
Fairbanks AK 99701

Contact Person: Stacy Staley
Phone: (907) 895-2761
E-mail: Pogo.environmental@smmpogo.com
CH2M HILL Project # / Purchase Order #: 920872.OTC.

NPDES#: AK 0053341

Composite Sample Information:
Initiated: Date _____ Time _____
Ended: Date _____ Time _____
Chilled During Collection ? Yes ___ No ___
Dechlorinated prior to shipping ? Yes ___ No ___

Ship Samples to:
CH2M HILL - Applied Sciences Laboratory
Attention: Bioasssay Lab
1100 NE Circle Blvd. Suite 300
Corvallis, OR 97330
Lab Phone: (541) 768-3160
Customer Service: (541) 768-3120

Analysis Required / Comments

Sample ID	Date	Time	Sample Type: Comp.	Sample Type: Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Green Algae	Trout Acute	Sheepshead Acute	Sheepshead Chronic	Menidia Acute	Menidia Chronic	Mysid Acute	Mysid Chronic	Haz Waste				Concentration and/or Comments
Outfall 001	6/24/2015	0810		X	2			X		X													

Sampled By & Title (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time
Jim Ward, Env. Specialist	6-24-15 11:40 am	Jim Ward, Env. Specialist	6/24/2015 1140 am
Received By (Please sign and print name)	**Date/Time**	**Relinquished By (Please sign and print name)**	**Date/Time**
Michelle Hoban, Buyer Michelle Hoban	6-24-15 11:40 am	Michelle Hoban Michelle Hoban	6/24/15 3:42 pm
Received By (Please sign and print name)	**Date/Time**	**Relinquished By (Please sign and print name)**	**Date/Time**
Received By (Please sign and print name)	**Date/Time**	**Shipped Via**	**Shipping #**
[illegible] 06/25/15 0900		UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	
Work Authorized By (Please sign and print name)	**Remarks**		
	FLE 4.3°C B3342-02		

CH2MHILL
Applied Sciences Laboratory (ASL)

Sample Receipt Record

Batch Number: B3342B

Client/Project: SMM Rgo

Date Received: 06/25/15 @ 0900

Received By: JVP

Were custody seals intact and on the outside of the cooler?	☑ Yes	☐ No	☐ N/A
Packing Material:	☐ Hand Delivered	☑ Ice	☐ Blue Ice ☐ Box
Temp OK? (<6C) Therm ID: TH173 Exp: 8/15 4.3°C	☑ Yes	☐ No	☐ N/A
Was a Chain of Custody (CoC) Provided?	☑ Yes	☐ No	☐ N/A
Was the CoC correctly filled out (If No, document below)	☑ Yes	☐ No	☐ N/A
Were the sample containers in good condition (broken or leaking)?	☑ Yes	☐ No	☐ N/A
Was enough sample volume provided for analysis? (If No, document below)	☑ Yes	☐ No	☐ N/A
Are all samples within 36 hours of collection?	☑ Yes	☐ No	☐ N/A

Sample Exception Report (The following exceptions were noted)

Client was notified on: Client contact:

Resolution to Exception:

27 FAI 1368 8080 027-1368 8080

Shipper's Name and Address	Shipper's Account Number	Not Negotiable
Sumitomo Metal Mining Po Mile 50 Pogo Mile Road Delta Junction, AK 99737 USA Tel: 9078952841	27442319143 Customer's ID Number 10659	**Air Waybill** Issued By Alaska Air Cargo ALASKA AIRLINES & HORIZON AIR P.O. BOX 68900 SEATTLE, WA 98168 800-225-2752 ALASKACARGO.COM

Consignee's Name and Address	Consignee's Account Number	Also notify
CH2M Hill C/O City Delivery System Corvallis, OR X USA Tel: 541-768-3120		Tel:

Issuing Carrier's Agent and City	Accounting Information
	10659 Sumitomo Metal Mining Pogo LLC Mile 50 Pogo Mile Road Delta Junction, AK 99737 USA
Agent's IATA Code / Account No.	
Airport of Departure (Addr. of First Carrier) and Requested Routing Fairbanks	GoldStreak

To	By First Carrier	To / By		To / By		Currency		WT/VAL		Other		Declared Value For Carriage	Declared Value For Customs
ANC	Alaska Airlines	PDX	AS	PDX	AS	USD	PX	X		X		NVD	NCV

Airport of Destination	Flight/Date	Flight/Date	Amount of Insurance
Portland	AS 2814/24	AS 2329/25	XXX

Handling Information

SCI

No of Pieces	Gross Weight	kg lb	Commodity Item No.	Chargeable Weight	Rate / Charge	Total	Nature and Quantity of Goods (Incl. Dimensions or Volume)
1	79.0	L		49.0		AS AGREED	CHILL WATER SAMPLES Dims: 13 x 14 x24 x 1
1	79.0					AS AGREED	GSX PER Volume: 2.528

Prepaid	Weight Charge	Collect	Other Charges
	AS AGREED		MYC 5.88 SCC 2.00 XBC 0.00
	Valuation Charge		
	Tax		
	Total Other Charges Due Agent		Shipper certifies that the particulars on the face hereof are correct and that insofar as any part of the consignment contains dangerous goods, such part is properly described by name and is in proper condition for carriage by air according to the applicable Dangerous Goods Regulations. I consent to the inspection of this cargo.
	Total Other Charges Due Carrier		For: Sumitomo Metal Mining Pogo LLC Signature of Shipper or his Agent
			[X] THIS SHIPMENT DOES NOT CONTAIN DANGEROUS GOODS [ ] THIS SHIPMENT DOES CONTAIN DANGEROUS GOODS
Total Prepaid	Total Collect		
AS AGREED			24 Jun 2015 15:55 Fairbanks Alaska Airlines
			Executed On (Date) at (Place) Signature of Issuing Carrier or its Agent

027-1368 8080

CH2MHILL **CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING**

Client: SMM Pogo LLC
Address: 3204 International St
Fairbanks AK 99701

NPDES#: AK0053341

Contact Person: Stacy Staley
Phone: (907) 895-2761
E-mail: Pogo-environmental@smmpogo.com
CH2M HILL Project # / Purchase Order #: 920872.DTC

Composite Sample Information:
Initiated: Date _____ Time _____
Ended: Date _____ Time _____
Chilled During Collection ? Yes ___ No ___
Dechlorinated prior to shipping ? Yes ___ No ___

Ship Samples to:
CH2M HILL - Applied Sciences Laboratory
Attention: Bioasssay Lab
1100 NE Circle Blvd. Suite 300
Corvallis, OR 97330
Lab Phone: (541) 768-3160
Customer Service: (541) 768-3120

Analysis Required / Comments

Sample ID	Date	Time	Sample Type: Comp.	Sample Type: Grab	# of Containers	Lab ID# 5342-23	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Green Algae	Trout Acute	Sheepshead Acute	Sheepshead Chronic	Menidia Acute	Menidia Chronic	Mysid Acute	Mysid Chronic	Haz Waste				Concentration and/or Comments
Outfall 001	6/26/2015	0730		X	2	~~3344-02~~		X		X													

Sampled By & Title (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time
Leonard Z Hanson Leonard Z Hanson Env. Tech.	6/26/15 0730	Leonard Z Hanson Leonard Hanson	6/26/15 10:45
Received By (Please sign and print name): Justin Boucher Justin Boucher	6/26/15 1045	Relinquished By (Please sign and print name): Justin Boucher Justin Boucher	6/26/15 1350 hrs
Received By (Please sign and print name): L. Otte	6-27-15 0910	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Shipped Via: UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name)	Remarks		

CH2MHILL
Applied Sciences Laboratory (ASL)

Sample Receipt Record

Batch Number: Sumitomo B3342-03

Date Received: 6-27-15

Client/Project: Sumitomo

Received By:

Were custody seals intact and on the outside of the cooler?		☒ Yes	☐ No	☐ N/A
Packing Material:	☐ Hand Delivered	☒ Ice	☐ Blue Ice	☐ Box
Temp OK? (<6C) Therm ID: TH173 Exp.	2.6 °C	☒ Yes	☐ No	☐ N/A
Was a Chain of Custody (CoC) Provided?		☒ Yes	☐ No	☐ N/A
Was the CoC correctly filled out (If No, document below)		☒ Yes	☐ No	☐ N/A
Were the sample containers in good condition (broken or leaking)?		☒ Yes	☐ No	☐ N/A
Was enough sample volume provided for analysis? (If No, document below)		☒ Yes	☐ No	☐ N/A
Are all samples within 36 hours of collection?		☒ Yes	☐ No	☐ N/A

Sample Exception Report (The following exceptions were noted)

Client was notified on: Client contact:

Resolution to Exception:

027 FAI 1368 8986 027-1368 8986

Shipper's Name and Address
Sumitomo Metal Mining Po
Mile 50 Pogo Mile Road
Delta Junction, AK 99737
USA
Tel: 9078952841

Shipper's Account Number: 27442319143
Customer's ID Number: 10659

Not Negotiable
Air Waybill
Issued By

Alaska Air Cargo
ALASKA AIRLINES & HORIZON AIR
P.O. BOX 68900 SEATTLE, WA 98168
800-225-2752 ALASKACARGO.COM

Consignee's Name and Address
CH2M Hill
1100 NE Circle Blvd Ste 300
Corvallis, OR 97330
USA
Tel: 5417524271

Consignee's Account Number: 27441014745

Also notify
Tel:

Issuing Carrier's Agent and City

Agent's IATA Code

Account No.

Accounting Information 10659
Sumitomo Metal Mining Pogo LLC
Mile 50 Pogo Mile Road
Delta Junction, AK 99737
USA

Airport of Departure (Addr. of First Carrier) and Requested Routing
Fairbanks

GoldStreak

To	By First Carrier	To / By		To / By	Currency		WT/VAL		Other		Declared Value For Carriage	Declared Value For Customs
SEA	Alaska Airlines	PDX	AS		USD	PX	X		X		NVD	NCV

Airport of Destination	Flight/Date	Flight/Date	Amount of Insurance
Portland	AS 124/26	AS 2329/27	XXX

Handling Information
PERISHABLE CARGO (NON - FOOD)

SCI

No of Pieces	Gross Weight	kg lb			Commodity Item No.	Chargeable Weight	Rate / Charge	Total	Nature and Quantity of Goods (Incl. Dimensions or Volume)
1	74.0	L		Q		74.0		AS AGREED	WATER SAMPLES Dims: 13 x 14 x24 x 1
1	74.0							AS AGREED	GSX PER Volume: 2.528

Prepaid — Weight Charge — Collect
AS AGREED

Valuation Charge

Tax

Total Other Charges Due Agent

Total Other Charges Due Carrier

Total Prepaid: AS AGREED

Total Collect

Other Charges
MYC 8.88
SCC 2.00
XBC 0.00

Shipper certifies that the particulars on the face hereof are correct and that insofar as any part of the consignment contains dangerous goods, such part is properly described by name and is in proper condition for carriage by air according to the applicable Dangerous Goods Regulations. I consent to the inspection of this cargo.

For: Sumitomo Metal Mining Pogo LLC

Signature of Shipper or his Agent

JPB THIS SHIPMENT DOES NOT CONTAIN DANGEROUS GOODS

THIS SHIPMENT DOES CONTAIN DANGEROUS GOODS

26 Jun 2015 14:19 — Executed On (Date)
Fairbanks — at (Place)
Alaska Airlines — Signature of Issuing Carrier or its Agent

027-1368 8986