Appendix H: Whole Effluent Toxicity (WET) Laboratory Reports

BIOASSAY REPORT
CHRONIC
BIOASSAYS CONDUCTED
July 17 through 24, 2012

Prepared for

SUMITOMO METAL MINING-POGO MINE
DELTA JUNCTION, ALASKA

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INTRODUCTION

CH2M HILL conducted chronic bioassays from July 17 through 24, 2012, 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	12.5	> 100	< 1

Note: acronyms are as defined below.

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 July 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 HILL'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 July 16, 18, and 20, 2012 The samples were accepted as scheduled by CH2M HILL's Corvallis Aquatic Toxicology Laboratory.

The three samples were received in the 0 to 6 °C range. Following receipt at the laboratory, the samples were stored in the dark at 0 to 6 °C until test solutions were prepared and tested.

The tests were initiated within 36 hours of sample collection. The samples were stored in the dark at 0 to 6°C until daily test solutions were prepared. Chain of custody forms documenting sample collection and handling are 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 (= 100 / IC_{25}) values of 2 or higher indicate the need for additional testing.

RESULTS AND DISCUSSION

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	24.7
12.5	100	25.1
25	90	24.9
50	100	27.3
75	100	26.9
100	100	26.2

The *C. dubia* test results indicated no statistically significant reduction in survival or reproduction 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 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	100	0.817
12.5	90.0	0.717
25	87.5	0.616 [a]
50	87.5	0.627 [a]
75	90.0	0.697
100	95.0	0.722

The *P. promelas* test results no statistically significant reduction in survival at any sample concentration tested and a statistically significant reduction in growth only at the 25 and 50 percent sample concentrations when compared to the control. By EPA definition, the NOEC and the LOEC were 100 and 12.5 percent sample, respectively.

EPA 821-B-00-004, page 4-13, identifies this data set as similar to one described as an interrupted concentration response with a non-significant effect bracketed by significant effects. Additionally, EPA-821-R-02-013, states that tests that show an interrupted dose response "should be used with extreme caution". EPA-821-R-02-013 also recommends the use of point estimation statistical techniques for calculating endpoints in the NPDES Permit program. Considering the uncertainty surrounding the hypothesis testing and the NPDES permit's guidance of using the IC_{25} in the calculation of the TU_c value, a point estimate likely provides a better measure of the toxicity of the effluent.

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.

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 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 conducted using sodium chloride indicate that the test organisms were within their respective cusum chart range based on EPA guidelines.

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

The data sheets for the reference toxicant tests are provided in Appendix B.

Table 3 summarizes the reference toxicant test results and Cusum chart limits.

Table 3
Chronic Reference Toxicant Tests (g/L)

Species	IC_{25}	Cusum Chart Limits
C. dubia (survival)	1.58	0.71 to 2.14
C. dubia (reproduction)	0.65	0.37 to 0.85
P. promelas (survival)	3.1	1.9 to 4.8
P. promelas (growth)	2.3	1.8 to 3.4

APPENDIX A

RAW DATA SHEETS

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

Client: Sumitomo Metal Mining - Pogo
Contact: Stacy Staley or Luke Walker 1.907.895.2761
SDG # B 2780
Test Initiation: Date 7-17-12
Test Termination: Date 7-24-12

Sample ID Number	Field ID	Collected Date (mm/dd/yy)	Collected Time (Pacific Zone)	Date Received	Temp (°C) as Rc'vd	Total Residual Chlorine (mg/l) ☐ Dechlorination allowed as Rc'vd / after Dechlor.	Ammonia NH_3-N mg/l as Rc'vd	Hardness mg/l as $CaCO_3$ as Rc'vd	Alkalinity mg/l as $CaCO_3$ as Rc'vd	DO (mg/L) as Rc'vd	pH as Rc'vd	Cond. (uS) as Rc'vd	60 um filtered prior to use?
B2780 -01	Outfall 001 #1	07/16/12	06:30	07/17/12	5.4	0.03 / -	1.18	71	-	-	-	-	☑
-02	Outfall 001 #2	07/18/12	07:10	07/19/12	6.8	0.02 / -	1.53	74	-	-	-	-	☑
-03	Outfall 001 #3	07/20/12	09:20	07/21/12	5.5	0.02 / -	1.76	81	-	-	-	-	☑
						/							
						/							
						/							
						/							
						/							
						/							
						/							
						/							
						/							
			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)	3701	90	64
↓	3705	84	62

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 # 4 Conductivity # 2

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

Client Sumitomo Metal Mining - Pogo Sample Designation (SDG): B 2780

Test Species Information	Cd # 2737 *Ceriodaphnia dubia* Chronic	FHM # 1660 *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	[illegible]			
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

Client: Sumitomo Metal Mining - Pogo

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

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 2780 - 01	☐ Temp adj, ☐ Aerated	ID # 3701	# 954	# 953	7/17/2012	13:40	[illegible]
Control	0.00	→	200	1	B 2780 - 01	☐ Temp adj, ☐ Aerated	ID # 3701	# 954	# 953	7/18/12	07:45	MS
12.5	25.0	→	200	2	B " - 02	☐ Temp adj, ☐ Aerated	ID # 3703	# 954	# 953	7/19/"	15:00	[illegible]
25	50.0	→	200	3	B " - 02	☐ Temp adj, ☐ Aerated	ID # "	# "	# 956	7/20/"	08:40	[illegible]
50	100	→	200	4	B " - 03	☐ Temp adj, ☐ Aerated	ID # "	# "	# "	7/21/"	11:10	[illegible]
75	150	→	200	5	B " - 03	☐ Temp adj, ☐ Aerated	ID # 3705	# "	# "	7/22/"	07:20	[illegible]
100	200	→	200	6	B " - 03	☐ Temp adj, ☐ Aerated	ID # 3705	# 954	# 956	7/23/12	10:10	DW
Total Sample volume needed per day =			525 mls	7	B -	☐ Temp adj, ☐ Aerated	ID #	#	#	/ /"	:	

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 2780 - 01	☐ Temp adj, ☐ Aerated	ID # 3701	7/17/2012	13:40	[illegible]
Control	0.00	→	2000	1	B 2780 - 01	☐ Temp adj, ☐ Aerated	ID # 3701	7/18/"	07:48	MS
12.5	250	→	2000	2	B " - 02	☐ Temp adj, ☐ Aerated	ID # 3703	7/19/"	15:00	[illegible]
25	500	→	2000	3	B " - 02	☐ Temp adj, ☐ Aerated	ID # "	7/20/"	08:40	[illegible]
50	1,000	→	2000	4	B " - 03	☐ Temp adj, ☐ Aerated	ID # "	7/21/"	11:10	[illegible]
75	1,500	→	2000	5	B " - 03	☐ Temp adj, ☐ Aerated	ID # 3705	7/22/"	07:20	[illegible]
100	2,000	→	2000	6	B ↓ - 03	☐ Temp adj, ☐ Aerated	ID # 3705	7/23/12	10:10	DW

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: 7-17-12

Sample Description: Outfall 001

Initial Sample ID#: B 2780

Data summarized by: D.W.

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	25	30	23	24	23	24	22	24	28	24	10	247
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
12.5 %	27	27	27	24	26	27	26	27	14	26	10	251
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
25 %	26	32	27	27	29	29	25	0	28	26	9	249
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD? ✓	AD?	AD?		
50 %	28	28	24	29	23	30	30	27	28	26	10	273
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
75 %	29	28	28	26	26	27	28	27	26	24	10	269
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
100 %	24	27	29	24	25	27	28	26	26	26	10	262
	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 #:	18	16	15	14	12	10	9	8	7	5

Incubator Used: # 6

Random Template Used: 6 conc # 23

Client: Sumitomo Metal Mining - Pogo

Test Initiation: Date: 7/17/2012 Time: 15:20

Sample Description: Outfall 001

Initial Sample ID #: B2780 -

Termination: Date: 7/23/2012 Time: 13:10

Technician: Day 0 MS Day 1 Bm Day 2 Bm Day 3 Bm Day 4 Bm Day 5 Bm Day 6 DW Day 7 ____ Day 8 ____

Time: Day 0 1520 Day 1 1645 Day 2 1645 Day 3 1435 Day 4 1235 Day 5 1020 Day 6 1310 Day 7 ____ Day 8 ____

JM 7/19/12

Cerio ID: Cd 2737

Percent	Day	A	B	C	D	E	F	G	H	I	J	No. Live Adults	Daily Total Live Young
		Daily Number of Live Young for each Replicate											
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	6	6	4	5	5	3	5	4	0	5	10	43
	4	0	0	0	0	0	0	0	0	5	0	10	5
	5	12	13	9	9	9	10	7	9	11	10	10	99
	6	7	11	10	10	9	11	10	11	12	9	10	100
	7												
	8												
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	6	5	5	4	5	0	5	5	0	5	10	40
	4	0	0	0	0	0	4	0	0	4	0	10	8
	5	11	10	11	10	9	12	10	10	10	10	10	103
	6	10	12	11	10	12	11	11	12	0	11	10	100
	7												
	8												
25 %	1	0	0	0	0	0	0	0	0 AD	0	0	9	0
	2	0	0	0	0	0	0	0		0	0	9	0
	3	4	5	4	4	4	5	4		4	0	9	34
	4	0	0	0	0	0	0	0		0	4	9	4
	5	10	12	11	9	10	10	10		10	10	9	92
	6	12	15	12	14	15	14	11		14	12	9	119
	7												
	8												
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	5	4	3	5	4	5	6	5	3	5	10	45
	4	0	0	0	0	0	0	0	0	0	0	10	0
	5	10	12	9	9	8	12	11	10	12	10	10	103
	6	13	12	12	15	11	13	13	12	13	11	10	125
	7												
	8												
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	4	4	5	5	4	5	5	3	5	5	10	45
	4	0	0	0	7	0	0	0	0	0	0	10	7
	5	12	12	11	3/0	8	11	10	10	10	9	10	96
	6	13	12	12	11	14	11	13	14	11	10	10	121
	7												
	8												
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	5	5	5	4	5	5	5	0	3	10	37
	4	6	0	0	0	0	0	0	0	3	0	10	9
	5	9	10	11	9	9	10	9	9	12	10	10	98
	6	9	12	13	10	12	12	14	12	11	13	10	118
	7												
	8												

"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: 7/17/2012 Time: 15:20
Initial Sample ID #: B 2780 -01
Adults Isolated Date: 7/16/2012 Time: 16:45
Neo's Collected Date: 7/16/20 Time: 22:55

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
Tech:	MS	MS	Bm	Bm	Bm	Bm	DW		
Time	15:20	10:50	10:50	14:45	13:00	10:55	13:10	:	:
Therm. #	187	187	186	188	188	187	187	#	#

%	Dissolved Oxygen (mg/l) Day 0	1	2	3	4	5	6	7	8
Control	7.8	8.1 / 8.3	7.9 / 8.2	7.9 / 7.9	8.0 / 7.8	8.0 / 8.0	7.5 / —		
12.5 %	8.1	8.1 / 8.3	8.0 / 8.2	8.0 / 8.0	8.0 / 8.1	8.0 / 8.2	7.5 / —		
25 %	8.2	8.0 / 8.4	8.0 / 8.3	8.0 / 8.0	8.0 / 8.1	8.0 / 8.2	7.5 / —		
50 %	8.3	7.9 / 8.5	8.0 / 8.4	8.0 / 8.1	8.0 / 8.2	8.1 / 8.2	7.5 / —		
75 %	8.4	7.9 / 8.5	8.0 / 8.3	8.0 / 8.2	8.0 / 8.2	8.1 / 8.2	7.4 / —		
100 %	8.4	7.9 / 8.4	8.0 / 8.3	8.0 / 8.2	8.0 / 8.2	8.1 / 8.0	7.4 / —		

%	pH Day 0	1	2	3	4	5	6	7	8
Control	8.2	7.7 / 7.9	8.3 / 8.1	7.9 / 7.8	7.9 / 7.8	8.0 / 7.9	7.8 / —		
12.5 %	8.0	7.7 / 7.7	8.3 / 7.9	7.9 / 7.7	7.8 / 7.6	8.0 / 7.7	7.8 / —		
25 %	7.9	7.7 / 7.6	8.2 / 7.7	7.9 / 7.6	7.8 / 7.5	7.9 / 7.5	7.8 / —		
50 %	7.7	7.6 / 7.4	8.1 / 7.4	7.8 / 7.4	7.7 / 7.2	7.9 / 7.3	7.7 / —		
75 %	7.5	7.5 / 7.2	7.9 / 7.2	7.7 / 7.2	7.6 / 7.0	7.7 / 7.1	7.6 / —		
100 %	7.3	7.5 / 7.0	7.2 / ~~7.3~~ 7.0	7.6 / 7.2	7.5 / 7.0	7.6 / 7.0	7.5 / —		

%	Temperature (°C) / Conductivity (µS) (1st use of each sample only) Day 0	1	2	3	4	5	6	7	8
Control	24.1 / 292	24.6	24.9 / 296	24.8	24.5 / 303	24.7	24.2		
12.5 %	24.3 / 285	24.1 / -	24.9 / -	24.8 / -	24.3 / -	25.0 / -	24.9 / -		
25 %	24.4 / -	24.2 / -	25.0 / -	24.2 / -	24.7 / -	24.6 / -	25.0 / -		
50 %	24.3 / -		24.5 / -	24.6 / -	24.8 / -	24.5 / -	24.6 / -		
75 %	24.2 / -		25.0 / -	24.7 / -	24.0 / -	24.1 / -	24.9 / -		
100 %	24.2 / 206		24.6 / 223	24.6 /	24.2 / 233	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: 07 Aug-12 11:36 (p 1 of 2)
Test Code: B278001cdc | 06-4500-0468

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

Batch ID:	19-9587-1098	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	17 Jul-12 15:20	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	
Ending Date:	23 Jul-12 13:10	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	5d 22h	**Source:**	In-House Culture	**Age:**	<24h

Sample ID:	05-8634-1909	**Code:**	B2780-01	**Client:**	
Sample Date:	16 Jul-12 06:30	**Material:**	Unknown	**Project:**	
Receive Date:	17 Jul-12	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	33h (5.4 °C)	**Station:**			

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
09-0876-3803	6d Survival Rate	100	>100	N/A	N/A	1	Fisher Exact/Bonferroni-Holm Test
04-2889-7505	Reproduction	100	>100	N/A	18.0%	1	Steel Many-One Rank Test

Point Estimate Summary

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
00-0542-9483	Reproduction	IC25	>100	N/A	N/A	<1	Linear Interpolation (ICPIN)

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
00-0542-9483	Reproduction	Control Resp	24.7	15 - NL	Yes	Passes Acceptability Criteria
04-2889-7505	Reproduction	Control Resp	24.7	15 - NL	Yes	Passes Acceptability Criteria
04-2889-7505	Reproduction	PMSD	0.1798	0.13 - 0.47	Yes	Passes Acceptability Criteria

6d 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	1	1	1	1	1	0	0	0.0%	0.0%
25		10	0.9	0.7819	1	0	1	0.1	0.3162	35.14%	10.0%
50		10	1	1	1	1	1	0	0	0.0%	0.0%
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	24.7	23.78	25.62	22	30	0.7753	2.452	9.93%	0.0%
12.5		10	25.1	23.6	26.6	14	27	1.269	4.012	15.99%	-1.62%
25		10	24.9	21.55	28.25	0	32	2.838	8.975	36.04%	-0.81%
50		10	27.3	26.42	28.18	23	30	0.7461	2.359	8.64%	-10.53%
75		10	26.9	26.36	27.44	24	29	0.4583	1.449	5.39%	-8.91%
100		10	26.2	25.6	26.8	24	29	0.5121	1.619	6.18%	-6.07%

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

6d 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	1	1	1	1
25		1	1	1	1	1	1	1	0	1	1
50		1	1	1	1	1	1	1	1	1	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	25	30	23	24	23	24	22	24	28	24
12.5		27	27	27	24	26	27	26	27	14	26
25		26	32	27	27	29	29	25	0	28	26
50		28	28	24	29	23	30	30	27	28	26
75		29	28	28	26	26	27	28	27	26	24
100		24	27	29	24	25	27	28	26	26	26

CETIS Analytical Report

Report Date: 07 Aug-12 11:36 (p 1 of 1)
Test Code: B278001cdc | 06-4500-0468

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

Analysis ID:	09-0876-3803	**Endpoint:**	6d Survival Rate	**CETIS Version:**	CETISv1.8.1
Analyzed:	07 Aug-12 11:36	**Analysis:**	STP 2x2 Contingency Tables	**Official Results:**	Yes

Batch ID:	19-9587-1098	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	17 Jul-12 15:20	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	
Ending Date:	23 Jul-12 13:10	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	5d 22h	**Source:**	In-House Culture	**Age:**	<24h

Sample ID:	05-8634-1909	**Code:**	B2780-01	**Client:**	
Sample Date:	16 Jul-12 06:30	**Material:**	Unknown	**Project:**	
Receive Date:	17 Jul-12	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	33h (5.4 °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	1	1.0000	Non-Significant Effect
		25	0.5	1.0000	Non-Significant Effect
		50	1	1.0000	Non-Significant Effect
		75	1	1.0000	Non-Significant Effect
		100	1	1.0000	Non-Significant Effect

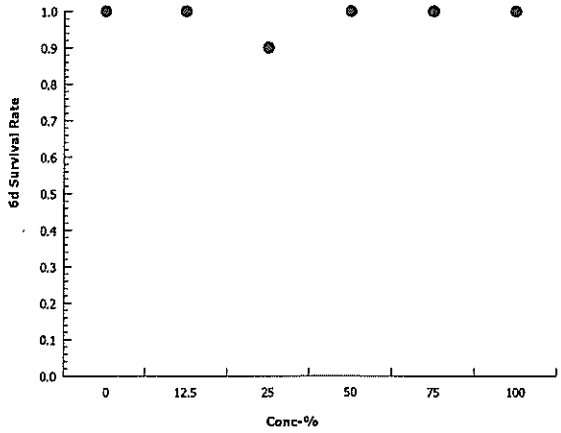
Data Summary

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

6d 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	1	1	1	1
25		1	1	1	1	1	1	1	0	1	1
50		1	1	1	1	1	1	1	1	1	1
75		1	1	1	1	1	1	1	1	1	1
100		1	1	1	1	1	1	1	1	1	1

Graphics



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

Analysis ID:	04-2889-7505	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.1
Analyzed:	07 Aug-12 11:36	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

Batch ID:	19-9587-1098	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	17 Jul-12 15:20	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	
Ending Date:	23 Jul-12 13:10	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	5d 22h	**Source:**	In-House Culture	**Age:**	<24h

Sample ID:	05-8634-1909	**Code:**	B2780-01	**Client:**	
Sample Date:	16 Jul-12 06:30	**Material:**	Unknown	**Project:**	
Receive Date:	17 Jul-12	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	33h (5.4 °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	18.0%

Steel Many-One Rank Test

Control	vs	Conc-%	Test Stat	Critical	DF	Ties	P-Value	Decision(α:5%)
Dilution Water		12.5	124	75	18	1	0.9965	Non-Significant Effect
		25	131	75	18	2	0.9996	Non-Significant Effect
		50	131.5	75	18	4	0.9996	Non-Significant Effect
		75	134.5	75	18	2	0.9999	Non-Significant Effect
		100	130	75	18	3	0.9994	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	15	3	1.96	0.8523	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	61.15	12.23	5	0.6497	0.6629	Non-Significant Effect
Error	1016.5	18.82407	54			
Total	1077.65	31.05407	59			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	45.09	15.09	<0.0001	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.6439	0.9459	<0.0001	Non-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	24.7	23.77	25.63	22	30	0.7753	2.452	9.93%	0.0%
12.5		10	25.1	23.57	26.63	14	27	1.269	4.012	15.99%	-1.62%
25		10	24.9	21.49	28.31	0	32	2.838	8.975	36.04%	-0.81%
50		10	27.3	26.4	28.2	23	30	0.7461	2.359	8.64%	-10.53%
75		10	26.9	26.35	27.45	24	29	0.4583	1.449	5.39%	-8.91%
100		10	26.2	25.58	26.82	24	29	0.5121	1.619	6.18%	-6.07%

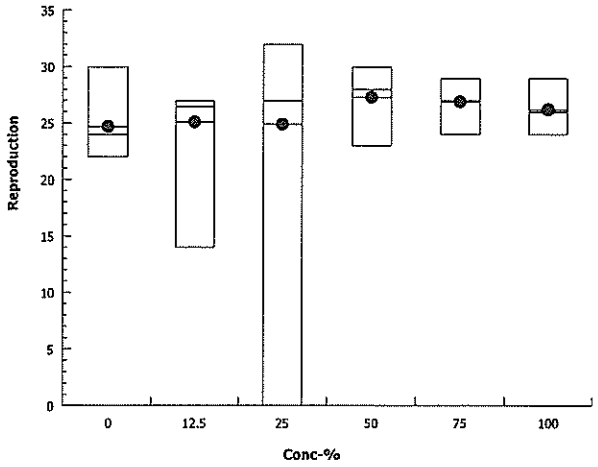
Ceriodaphnia 7-d Survival and Reproduction Test — **CH2M HILL - ASL**

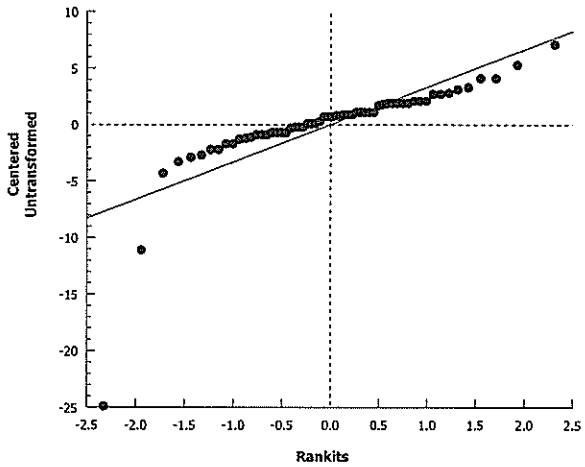
Analysis ID:	04-2889-7505	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.1
Analyzed:	07 Aug-12 11:36	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

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	25	30	23	24	23	24	22	24	28	24
12.5		27	27	27	24	26	27	26	27	14	26
25		26	32	27	27	29	29	25	0	28	26
50		28	28	24	29	23	30	30	27	28	26
75		29	28	28	26	26	27	28	27	26	24
100		24	27	29	24	25	27	28	26	26	26

Graphics





CETIS Analytical Report

Report Date: 07 Aug-12 11:36 (p 1 of 2)
Test Code: B278001cdc | 06-4500-0468

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

Analysis ID:	00-0542-9483	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.1
Analyzed:	07 Aug-12 11:36	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Batch ID:	19-9587-1098	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	17 Jul-12 15:20	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	
Ending Date:	23 Jul-12 13:10	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	5d 22h	**Source:**	In-House Culture	**Age:**	<24h

Sample ID:	05-8634-1909	**Code:**	B2780-01	**Client:**	
Sample Date:	16 Jul-12 06:30	**Material:**	Unknown	**Project:**	
Receive Date:	17 Jul-12	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	33h (5.4 °C)	**Station:**			

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	647483396	200	Yes	Two-Point Interpolation

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend	3	1.96	0.8523	Non-significant Trend in Controls

Point Estimates

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

Reproduction Summary

			Calculated Variate						
Conc-%	**Control Type**	**Count**	**Mean**	**Min**	**Max**	**Std Err**	**Std Dev**	**CV%**	**%Effect**
0	Dilution Water	10	24.7	22	30	0.7753	2.452	9.93%	0.0%
12.5		10	25.1	14	27	1.269	4.012	15.99%	-1.62%
25		10	24.9	0	32	2.838	8.975	36.04%	-0.81%
50		10	27.3	23	30	0.7461	2.359	8.64%	-10.53%
75		10	26.9	24	29	0.4583	1.449	5.39%	-8.91%
100		10	26.2	24	29	0.5121	1.619	6.18%	-6.07%

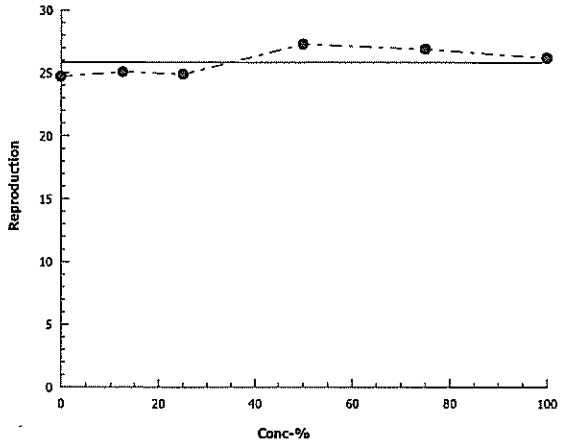
Reproduction Detail

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	25	30	23	24	23	24	22	24	28	24
12.5		27	27	27	24	26	27	26	27	14	26
25		26	32	27	27	29	29	25	0	28	26
50		28	28	24	29	23	30	30	27	28	26
75		29	28	28	26	26	27	28	27	26	24
100		24	27	29	24	25	27	28	26	26	26

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

Analysis ID:	00-0542-9483	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.1
Analyzed:	07 Aug-12 11:36	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Graphics



CH2M HILL

FATHEAD MINNOW 7-DAY SURVIVAL AND WATER QUALITY DATA

Random Template Used: 6 conc. x 4 reps. # 10 | Waterbath/incubator Used: # 7 | Date Initiated 7/12/2012 Time 16:30

Initial sample ID B 2780 - 01 | Date Terminated 7/24/2012 Time 11:00

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

Tech: Day 0 [illegible] Day 1 BM Day 2 [illegible]/BM Day 3 [illegible] Day 4 [illegible] Day 5 BM Day 6 BM Day 7 BM

Time: Day 0 16:30 Day 1 1510 Day 2 [illegible] Day 3 1630 Day 4 1410 Day 5 1045 Day 6 1330 Day 7 1100

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✓	10	10	10		8.4		8.4	Post: 24.6	176	44 35
	1	10	10	10	10	7.3	8.2	7.8	8.1	24.8	176	
	2	10	10	10	10	6.5	8.1	7.3	8.1	24.5	186	300
	3	10	10	10	10	7.3	8.0	7.3	7.0	24.7	185	
	4	9M	10	10	10	7.1	8.0	7.2	8.1	24.1	185	310
	5	9	10	10	10	6.9	8.1	7.9	8.3	24.8	176	
	6	9	10	10	10	6.5	7.6	7.5	8.0	24.4	186	
	7	9	10	10	10	6.7		8.2		24.7	186	
12.5 %	0	10	10	10	10		8.4		8.3	Post: 24.6		
	1	10	10	10	10	7.4	8.3	7.8	8.0	24.7		
	2	10	9	10	9	6.6	8.1	7.3	8.0	24.4		
	3	10	8F	9F	9	7.1	8.2	7.2	7.7	24.6		
	4	10	8	9	9	6.9	8.4	7.2	8.0	24.7		
	5	10	8	9	9	7.0	8.1	7.8	8.1	24.9		
	6	10	8	9	9	6.5	7.7	7.4	7.9	24.5		
	7	10	8	9	9	7.0		8.1		24.6		
25 %	0	10	10	10	10		8.3		8.0	Post: 24.5		
	1	10	10	10	10	7.4	8.3	7.7	7.8	24.7		
	2	10	10	10	9	6.6	8.2	7.3	7.7	24.5		
	3	9F	10	9F	8F	7.1	8.2	7.3	7.6	24.7		
	4	9	10	9	8	6.8	8.4	7.2	7.7	24.6		
	5	9	10	9	8	7.0	8.2	7.7	7.9	24.9		
	6	9	10	9	7	6.5	7.9	7.3	7.6	24.6		
	7	9	10	9	7	7.0		8.1		24.7		
50 %	0	10	10	10	10		8.4		7.6	Post: 24.6		
	1	10	10	10	10	7.2	8.4	7.6	7.5	24.8		
	2	10	10	10	7	6.5	8.2	7.2	7.3	Post: 24.7		
	3	9	9F	10	7	6.9	8.2	7.2	7.3	24.7		
	4	9	9	10	7	6.7	8.4	7.0	7.2	24.8		
	5	9	9	10	7	7.0	8.5	7.6	7.7	24.9		
	6	9	9	10	7	6.3	8.0	7.2	7.3	24.5		
	7	9	9	10	7	7.0		8.0		24.7		
75 %	0	10	10	10	10		8.4		7.4	Post: 24.4		
	1	10	10	10	10	7.2	8.3	7.5	7.3	24.8		
	2	10✓	10	10	10	6.4	8.2	7.1	7.0	Post: 24.7		
	3	8F	9F	9F	10	6.8	8.4	6.7	7.0	24.8		
	4	8	9	9	10	6.6	8.4	6.8	6.9	24.9		
	5	8	9	9	10	6.8	8.6	7.4	7.4	25.1		
	6	8	9	9	10	6.2	8.2	7.1	7.1	24.5		
	7	8	9	9	10	7.0		7.9		24.7		
100 %	0	10	10	10	10		8.4		7.2	Post: 24.3		370
	1	10	10	10	10	7.3	8.6	7.4	7.0	24.7		
	2	10	10	9	9	6.3	8.3	7.1	6.9	Post: 24.8		217
	3	10	10	9	9	6.8	8.1	6.9	6.8	24.7		
	4	10	10	9	9	6.3	8.4	6.7	6.7	24.8		233
	5	10	10	9	9	6.6	8.6	7.1	7.0	25.0		
	6	10	10	9	9	6.1	8.2	7.0	6.9	24.5		
	7	10	10	9	9	6.8		7.7		24.7		

✓ 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.

☐ 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 Tins Labeled As: SUMIT

Lab ID: B2780-01 Start Date: 7/17/2012

Sample Description:

Technician:	KJ	KJ
Date:	7/31/2012	7/16/2012
Balance Serial #:	50309851	50309851

Percent	Replicate	Total Weight (mg)	Tare Weight (mg)	No. of Fish
Control	A	806.14	799.13	9
	B	787.93	779.28	10
	C	789.72	781.97	10
	D	791.25	782.78	10
12.5 %	A	799.52	791.97	10
	B	789.48	782.96	8
	C	801.39	795.09	9
	D	806.88	798.56	9
25 %	A	790.58	784.71	9
	B	792.92	786.17	10
	C	797.98	790.61	9
	D	802.18	797.53	7
50 %	A	791.64	785.76	9
	B	799.80	793.01	9
	C	795.35	787.56	10
	D	789.97	785.35	7
75 %	A	797.64	791.06	8
	B	778.39	772.38	9
	C	810.18	802.27	9
	D	762.85	755.48	10
100 %	A	810.51	803.21	10
	B	798.89	791.21	10
	C	801.51	793.67	9
	D	802.97	796.93	9

weigh to 0.01 mg

FATHEAD MINNOW 7-DAY GROWTH DATA

Client: Sumitomo Metal Mining | Tins Labeled As: SUMIT

Lab ID: 32780-01 | Start Date: 7/17/2012

Sample Description:

Technician:		KJ
Date:		7/16/2012
Balance Serial #:	50309851	50309851

Percent	Replicate	Total Weight (mg)	Tare Weight (mg)	No. of Fish
Control	A		799.13	9
	B		779.28	10
	C		781.97	10
	D		782.78	10
12.5 %	A		791.97	10
	B		782.96	9
	C		795.09	9
	D		798.56	9
25 %	A		784.71	9
	B		786.17	10
	C		790.61	9
	D		797.53	7
50 %	A		785.76	9
	B		793.01	9
	C		787.56	10
	D		785.35	7
75 %	A		791.06	9
	B		772.38	9
	C		802.27	9
	D		755.48	10
100 %	A		803.21	10
	B		791.21	10
	C		793.67	9
	D		796.93	9

weigh to 0.01 mg

CETIS Summary Report

Report Date: 07 Aug-12 11:41 (p 1 of 2)
Test Code: B278001ppc | 19-5406-9368

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

Batch ID:	18-9805-0435	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	17 Jul-12 16:30	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	
Ending Date:	24 Jul-12 11:00	**Species:**	Pimephales promelas	**Brine:**	
Duration:	6d 19h	**Source:**	Aquatox, AR	**Age:**	<48h

Sample ID:	05-8634-1909	**Code:**	B2780-01	**Client:**	
Sample Date:	16 Jul-12 06:30	**Material:**	Unknown	**Project:**	
Receive Date:	17 Jul-12	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	34h (5.4 °C)	**Station:**			

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
06-3498-3424	7d Survival Rate	100	>100	N/A	13.8%	1	Steel Many-One Rank Test
05-4876-1125	Mean Dry Biomass-mg	100	~~>100~~ 25	N/A	20.3%	1	Dunnett Multiple Comparison Test

Point Estimate Summary

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
06-1365-2725	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
06-3498-3424	7d Survival Rate	Control Resp	1	0.8 - NL	Yes	Passes Acceptability Criteria
05-4876-1125	Mean Dry Biomass-mg	Control Resp	0.8165	0.25 - NL	Yes	Passes Acceptability Criteria
06-1365-2725	Mean Dry Biomass-mg	Control Resp	0.8165	0.25 - NL	Yes	Passes Acceptability Criteria
05-4876-1125	Mean Dry Biomass-mg	PMSD	0.2028	0.12 - 0.3	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	4	1	1	1	1	1	0	0	0.0%	0.0%
12.5		4	0.9	0.8695	0.9305	0.8	1	0.04082	0.08165	9.07%	10.0%
25		4	0.875	0.828	0.922	0.7	1	0.06292	0.1258	14.38%	12.5%
50		4	0.875	0.828	0.922	0.7	1	0.06292	0.1258	14.38%	12.5%
75		4	0.9	0.8695	0.9305	0.8	1	0.04082	0.08165	9.07%	10.0%
100		4	0.95	0.9284	0.9716	0.9	1	0.02887	0.05774	6.08%	5.0%

Mean Dry Biomass-mg Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.8165	0.7992	0.8337	0.775	0.865	0.02313	0.04626	5.67%	0.0%
12.5		4	0.7173	0.6822	0.7523	0.63	0.832	0.04696	0.09392	13.09%	12.15%
25		4	0.616	0.5719	0.6601	0.465	0.737	0.059	0.118	19.15%	24.55%
50		4	0.627	0.5766	0.6774	0.462	0.779	0.06742	0.1348	21.51%	23.21%
75		4	0.6967	0.6654	0.7281	0.601	0.791	0.042	0.08401	12.06%	14.66%
100		4	0.7215	0.6911	0.7519	0.604	0.784	0.04077	0.08154	11.3%	11.63%

7d Survival Rate Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1	1	1	1
12.5		1	0.8	0.9	0.9
25		0.9	1	0.9	0.7
50		0.9	0.9	1	0.7
75		0.8	0.9	0.9	1
100		1	1	0.9	0.9

Mean Dry Biomass-mg Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.7789	0.865	0.775	0.847
12.5		0.755	0.652	0.63	0.832
25		0.587	0.675	0.737	0.465
50		0.588	0.679	0.779	0.462
75		0.658	0.601	0.791	0.737
100		0.73	0.768	0.784	0.604

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

Analysis ID:	06-3498-3424	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.1
Analyzed:	07 Aug-12 11:41	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

Batch ID:	18-9805-0435	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	17 Jul-12 16:30	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	
Ending Date:	24 Jul-12 11:00	**Species:**	Pimephales promelas	**Brine:**	
Duration:	6d 19h	**Source:**	Aquatox, AR	**Age:**	<48h

Sample ID:	05-8634-1909	**Code:**	B2780-01	**Client:**	
Sample Date:	16 Jul-12 06:30	**Material:**	Unknown	**Project:**	
Receive Date:	17 Jul-12	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	34h (5.4 °C)	**Station:**			

Data Transform	Zeta	Alt Hyp	MC Trials	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	0	C > T	Not Run	100	>100	N/A	1	13.8%

Steel Many-One Rank Test

Control	vs	Conc-%	Test Stat	Critical	DF	Ties	P-Value	Decision(α:5%)
Dilution Water		12.5	12	10	6	1	0.1424	Non-Significant Effect
		25	12	10	6	1	0.1424	Non-Significant Effect
		50	12	10	6	1	0.1424	Non-Significant Effect
		75	12	10	6	1	0.1424	Non-Significant Effect
		100	14	10	6	1	0.3451	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	15	6		1.0000	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.1066003	0.02132007	5	1.273	0.3181	Non-Significant Effect
Error	0.3014094	0.01674497	18			
Total	0.4080097	0.03806503	23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	16.99	15.09	0.0045	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9246	0.884	0.0738	Normal Distribution

7d Survival Rate Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	1	1	1	1	1	0	0	0.0%	0.0%
12.5		4	0.9	0.8689	0.9311	0.8	1	0.04082	0.08165	9.07%	10.0%
25		4	0.875	0.8271	0.9229	0.7	1	0.06292	0.1258	14.38%	12.5%
50		4	0.875	0.8271	0.9229	0.7	1	0.06292	0.1258	14.38%	12.5%
75		4	0.9	0.8689	0.9311	0.8	1	0.04082	0.08165	9.07%	10.0%
100		4	0.95	0.928	0.972	0.9	1	0.02887	0.05773	6.08%	5.0%

Angular (Corrected) Transformed Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	1.41	1.408	1.412	1.403	1.412	0.002171	0.004341	0.31%	0.0%
12.5		4	1.254	1.207	1.302	1.107	1.412	0.06231	0.1246	9.94%	11.03%
25		4	1.225	1.159	1.291	0.9912	1.412	0.08699	0.174	14.2%	13.09%
50		4	1.225	1.159	1.291	0.9912	1.412	0.08699	0.174	14.2%	13.09%
75		4	1.254	1.207	1.302	1.107	1.412	0.06231	0.1246	9.94%	11.03%
100		4	1.331	1.295	1.366	1.249	1.412	0.04705	0.09409	7.07%	5.63%

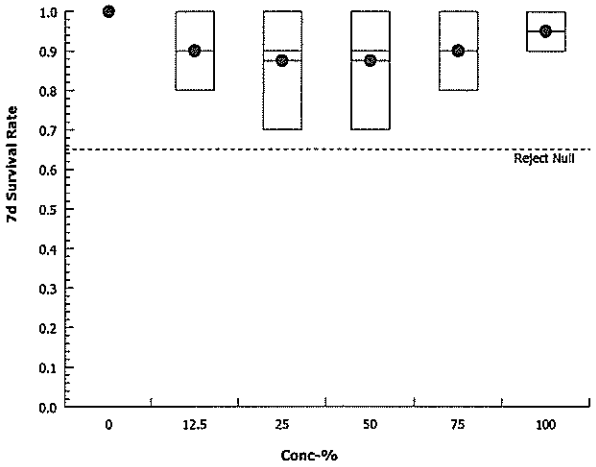
Fathead Minnow 7-d Larval Survival and Growth Test — **CH2M HILL - ASL**

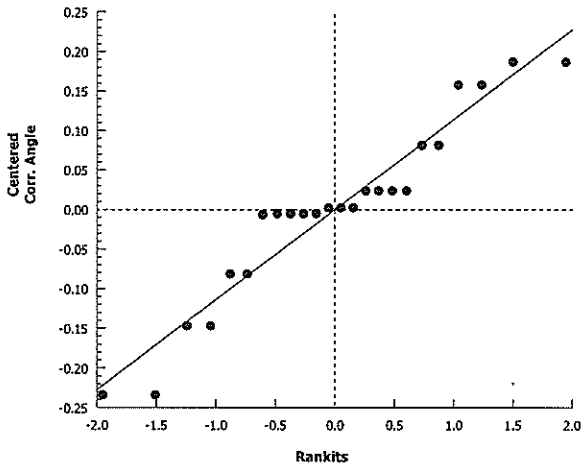
Analysis ID:	06-3498-3424	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.1
Analyzed:	07 Aug-12 11:41	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

7d Survival Rate Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1	1	1	1
12.5		1	0.8	0.9	0.9
25		0.9	1	0.9	0.7
50		0.9	0.9	1	0.7
75		0.8	0.9	0.9	1
100		1	1	0.9	0.9

Graphics





CETIS Analytical Report

Report Date: 07 Aug-12 11:41 (p 1 of 4)
Test Code: B278001ppc | 19-5406-9368

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

Analysis ID:	05-4876-1125	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.1
Analyzed:	07 Aug-12 11:41	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Batch ID:	18-9805-0435	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	17 Jul-12 16:30	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	
Ending Date:	24 Jul-12 11:00	**Species:**	Pimephales promelas	**Brine:**	
Duration:	6d 19h	**Source:**	Aquatox, AR	**Age:**	<48h

Sample ID:	05-8634-1909	**Code:**	B2780-01	**Client:**	
Sample Date:	16 Jul-12 06:30	**Material:**	Unknown	**Project:**	
Receive Date:	17 Jul-12	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	34h (5.4 °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	20.3%

Dunnett Multiple Comparison Test

Control	vs	Conc-%	Test Stat	Critical	DF	MSD	P-Value	Decision(α:5%)
Dilution Water		12.5	1.443	2.407	6	0.1656	0.2469	Non-Significant Effect
		25*	2.915	2.407	6	0.1656	0.0184	Significant Effect
		50*	2.755	2.407	6	0.1656	0.0254	Significant Effect
		75	1.741	2.407	6	0.1656	0.1594	Non-Significant Effect
		100	1.381	2.407	6	0.1656	0.2684	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	15	0		1.0000	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.1068678	0.02137356	5	2.259	0.0926	Non-Significant Effect
Error	0.1703206	0.009462259	18			
Total	0.2771885	0.03083582	23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	3.09	15.09	0.6861	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9689	0.884	0.6394	Normal Distribution

Mean Dry Biomass-mg Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.8165	0.7989	0.8341	0.775	0.865	0.02313	0.04626	5.67%	0.0%
12.5		4	0.7173	0.6815	0.753	0.63	0.832	0.04696	0.09392	13.09%	12.15%
25		4	0.616	0.5711	0.6609	0.465	0.737	0.059	0.118	19.15%	24.55%
50		4	0.627	0.5757	0.6783	0.462	0.779	0.06742	0.1348	21.51%	23.21%
75		4	0.6967	0.6648	0.7287	0.601	0.791	0.042	0.08401	12.06%	14.66%
100		4	0.7215	0.6905	0.7525	0.604	0.784	0.04077	0.08154	11.3%	11.63%

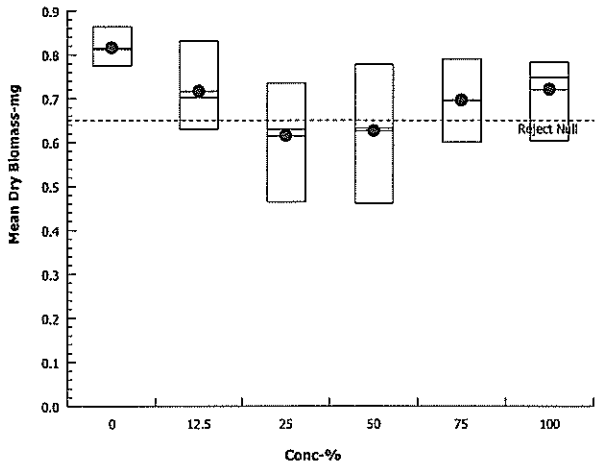
Fathead Minnow 7-d Larval Survival and Growth Test — **CH2M HILL - ASL**

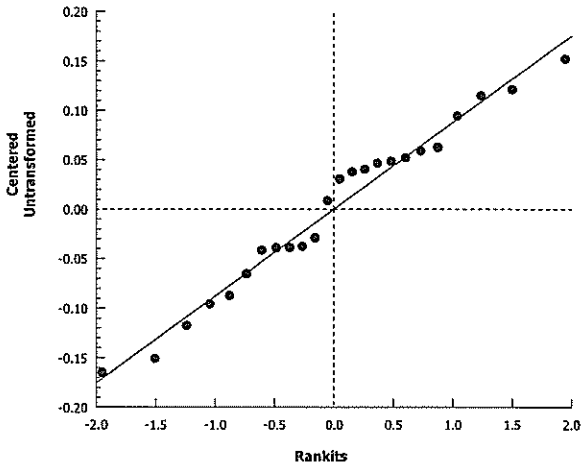
Analysis ID:	05-4876-1125	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.1
Analyzed:	07 Aug-12 11:41	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Mean Dry Biomass-mg Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.7789	0.865	0.775	0.847
12.5		0.755	0.652	0.63	0.832
25		0.587	0.675	0.737	0.465
50		0.588	0.679	0.779	0.462
75		0.658	0.601	0.791	0.737
100		0.73	0.768	0.784	0.604

Graphics





CETIS Analytical Report

Report Date:	07 Aug-12 11:41 (p 1 of 2)
Test Code:	B278001ppc | 19-5406-9368

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

Analysis ID:	06-1365-2725	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.1
Analyzed:	07 Aug-12 11:41	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Batch ID:	18-9805-0435	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	17 Jul-12 16:30	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	
Ending Date:	24 Jul-12 11:00	**Species:**	Pimephales promelas	**Brine:**	
Duration:	6d 19h	**Source:**	Aquatox, AR	**Age:**	<48h

Sample ID:	05-8634-1909	**Code:**	B2780-01	**Client:**	
Sample Date:	16 Jul-12 06:30	**Material:**	Unknown	**Project:**	
Receive Date:	17 Jul-12	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	34h (5.4 °C)	**Station:**			

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	1.729E+09	200	Yes	Two-Point Interpolation

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend	0		1.0000	Non-significant Trend in Controls

Point Estimates

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

Mean Dry Biomass-mg Summary

			Calculated Variate						
Conc-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.8165	0.775	0.865	0.02313	0.04626	5.67%	0.0%
12.5		4	0.7173	0.63	0.832	0.04696	0.09392	13.09%	12.15%
25		4	0.616	0.465	0.737	0.059	0.118	19.15%	24.55%
50		4	0.627	0.462	0.779	0.06742	0.1348	21.51%	23.21%
75		4	0.6967	0.601	0.791	0.042	0.08401	12.06%	14.66%
100		4	0.7215	0.604	0.784	0.04077	0.08154	11.3%	11.63%

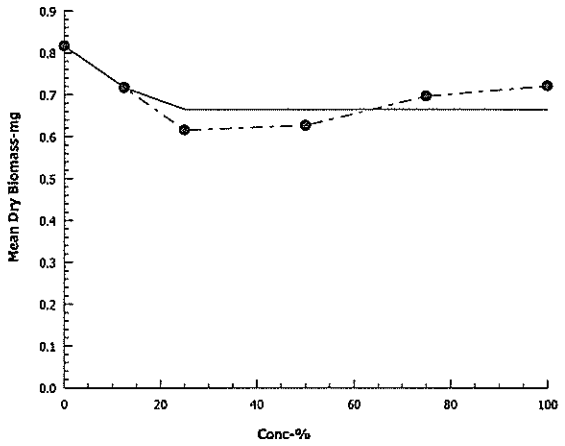
Mean Dry Biomass-mg Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.7789	0.865	0.775	0.847
12.5		0.755	0.652	0.63	0.832
25		0.587	0.675	0.737	0.465
50		0.588	0.679	0.779	0.462
75		0.658	0.601	0.791	0.737
100		0.73	0.768	0.784	0.604

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

Analysis ID:	06-1365-2725	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.1
Analyzed:	07 Aug-12 11:41	**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: 7-6-2012

Sample Description: NaCl (50 g/L stock)

Reagent ID#: 2B031-07

Ceriodaphnia Lot#: Cd 2736

Statistician: D.W.

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	34	33	34	33	33	32	29	32	31	36	10	327
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
0.25 g/L	35	36	32	33	29	32	33	28	32	32	10	322
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
0.50 g/L	28	25	28	30	28	30	27	26	28	31	10	281
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
1.0 g/L	15	15	18	15	18	21	10	18	22	20	9	172
	AD?	AD?	AD?	AD?	AD?	AD?	AD? ✓	AD?	AD?	AD?		
1.5 g/L	5	0	2	3	6	6	4	3	8	7	9	44
	AD?	AD? ✓	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
2.0 g/L	0	0	0	0	0	0	0	0	0	0	0	0
	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓		
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? ✓		

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 (for WDOE only, = Number of test organisms alive at Day 7)

Total Live Young = Total neonates produced in first 3 broods

Footnote: As per EPA-821-R-02-013 (13.10.9.1), *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."

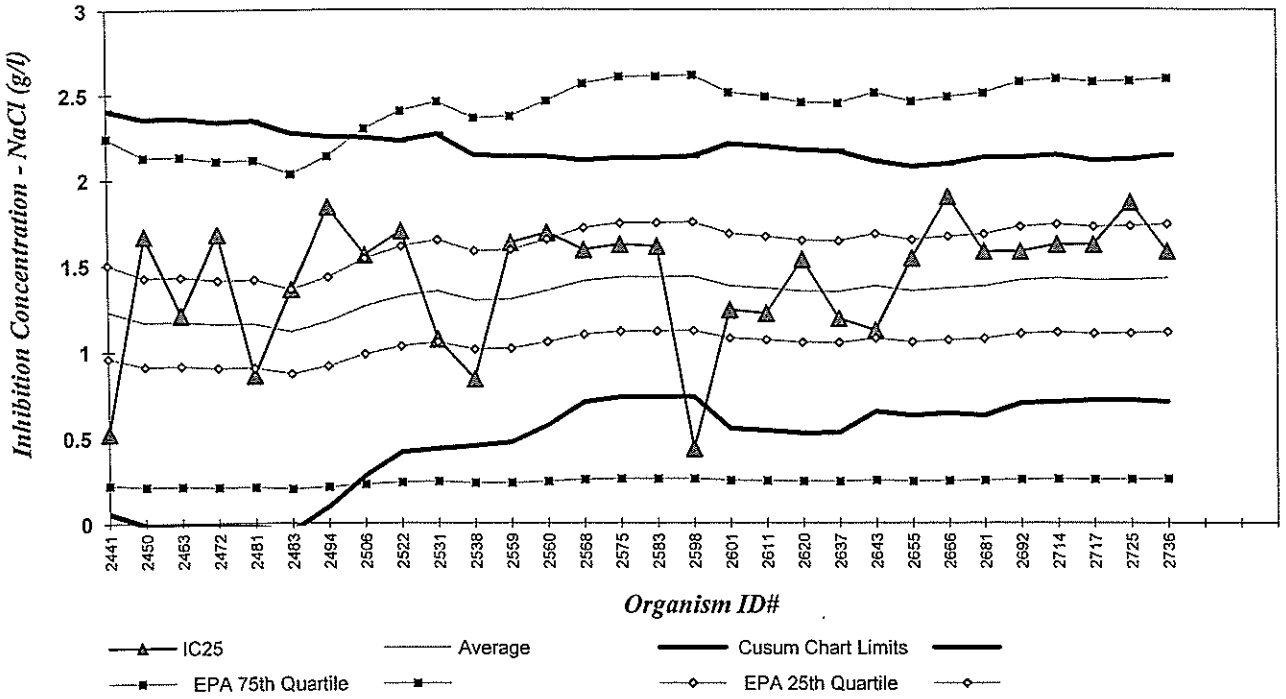
Endpoint	IC25	Cusum Chart Limits
Survival	1.58	0.71 to 2.14
Reproduction	0.65	0.37 to 0.85

Task Manager: [signature]

Project Manager: Doug Nunn

QA Officer: Ginger Collins

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:

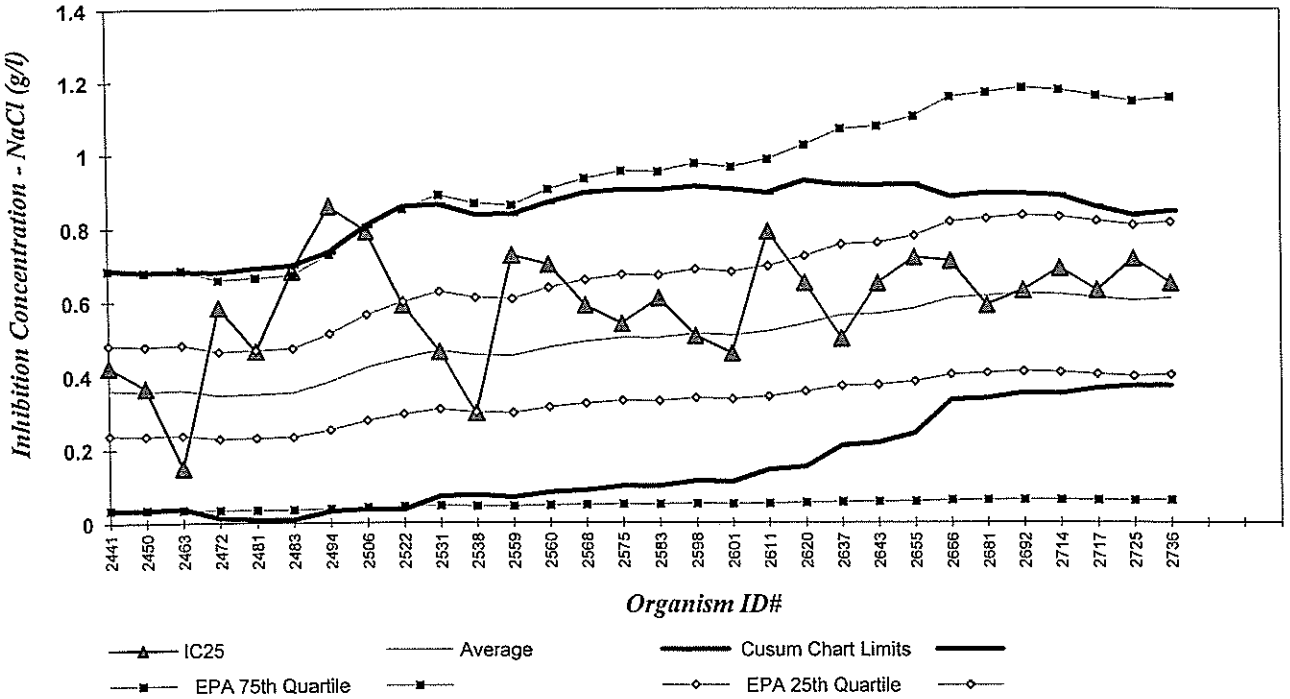
10th Quartile CV (*control limit*) =	0.07
25th Quartile CV (*warning limit*) =	0.11
75th Quartile CV (warning *limit*) =	0.41
90th Quartile CV (*control limit*) =	0.81

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
242	2643	11/01/11	1.12	1.38	0.36	**0.65**	**2.11**	0.27
243	2655	12/06/11	1.54	1.35	0.36	**0.63**	**2.07**	0.27
244	2666	01/04/12	1.90	1.37	0.36	**0.64**	**2.09**	0.27
245	2681	02/07/12	1.58	1.38	0.38	**0.63**	**2.13**	0.25
246	2692	02/29/12	1.58	1.41	0.36	**0.70**	**2.13**	0.25
247	2714	04/17/12	1.62	1.42	0.36	**0.71**	**2.14**	0.25
248	2717	05/01/12	1.62	1.41	0.35	**0.71**	**2.11**	0.25
249	2725	05/31/12	1.87	1.42	0.35	**0.71**	**2.12**	0.25
250	2736	07/06/12	1.58	1.42	0.36	**0.71**	**2.14**	0.24
251								
252								
253								
254								

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	Cusum Chart Limits AVG+2SD	Intralab CV
241	2637	10/4/2011	0.50	0.56	0.18	**0.21**	**0.92**	0.31
242	2643	11/1/2011	0.65	0.57	0.17	**0.22**	**0.92**	0.29
243	2655	12/6/2011	0.72	0.58	0.17	**0.24**	**0.92**	0.23
244	2666	1/4/2012	0.71	0.61	0.14	**0.33**	**0.88**	0.23
245	2681	2/7/2012	0.59	0.62	0.14	**0.34**	**0.89**	0.22
246	2692	2/29/2012	0.63	0.62	0.14	**0.35**	**0.89**	0.22
247	2714	4/17/2012	0.69	0.62	0.13	**0.35**	**0.89**	0.20
248	2717	5/1/2012	0.63	0.61	0.12	**0.36**	**0.86**	0.19
249	2725	5/31/2012	0.72	0.60	0.12	**0.37**	**0.83**	0.19
250	2736	7/6/2012	0.65	0.61	0.12	**0.37**	**0.85**	0.18
251								
252								
253								
254								

CH2M HILL

FATHEAD MINNOW 7-DAY SURVIVAL AND WATER QUALITY DATA

Random Template Used: 6 conc. x 4 reps. # 5 | Waterbath/incubator Used: | Date Initiated 06 / 12 / 2012 | Time 15:45

Stock Sol. ID ZB029-01 - | # 7 | Date Terminated 06 / 19 / 2012 | Time 09:30

nism ID: FHM #1657 | Test Container Size: 800 ml | Solution Volume / rep: 500 ml

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

Tech: Day 0 ~~DW~~/SB Day 1 SB Day 2 AB Day 3 AB Day 4 AB Day 5 DW/SB Day 6 SB Day 7 AB

Time Day 0 1545 Day 1 1000 Day 2 1650 Day 3 1450 Day 4 1015 Day 5 0910 Day 6 1130 Day 7 0930

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		8.3		8.1	Post: 24.7	159	405
	1	10	10	10	10	7.5	8.1	7.8	8.2	25.3	159	310
	2	10	10	10	10	7.4	8.0	7.7	8.2	24.3	149	341
	3	10	10	10	10	7.0	8.1	7.8	8.2	24.4	185	341
	4	10	10	10	10	7.3	8.1	7.9	8.1	24.6	159	342
	5	10	10	10	10	7.3	8.0	7.5	8.2	24.8	159	~~70~~ 352
	6	10	10	10	10	7.2	8.0	7.5	8.1	24.2	159	309
	7	10	10	10	10	7.1		7.2		24.2	149	
0.3 g/L	0	10	10	10	10		8.4		8.1	Post: 24.8		851
	1	10	10	10	10	7.4	8.2	7.7	8.3	25.3		863
	2	10	10	10	10	7.4	8.1	7.8	8.2	24.5		868
	3	10	10	10	10	7.1	8.2	7.8	8.2	24.6		897
	4	10	10	10	10	7.4	8.3	7.9	8.2	24.6		910
	5	10	10	10	10	7.4	8.2	7.6	8.1	24.9		849
	6	10	10	10	10	7.5	8.2	7.5	8.1	24.3		897
	7	10	10	10	10	7.2		7.3		24.4		
g/L	0	10	10	10	10		8.4		8.1	Post: 24.9		2090
	1	10	10	10	10	7.5	8.3	7.7	8.2	25.3		2150
	2	10	10	10	10	7.4	8.2	7.8	8.2	24.6		2300
	3	10	10	10	10	7.2	8.3	7.9	8.2	24.7		2140
	4	10	10	10	10	7.4	8.4	7.9	8.1	24.5		2140
	5	9	9	10	10	7.4	8.3	7.6	8.1	25.1		2010
	6	9	9	10	10	7.5	8.3	7.6	8.1	24.2		1975
	7	9	9	10	10	7.4		7.3		24.4		
2.0 g/L	0	10	10	10	10		8.4		8.0	Post: 24.8		3740
	1	10	10	10	10	7.4	8.3	7.7	8.1	25.4		3880
	2	10	10	10	10	7.4	8.2	7.7	8.2	24.4		3890
	3	10	10	10	10	7.4	8.3	7.8	8.1	24.5		3930
	4	10	10	10	10	7.5	8.4	7.8	8.1	24.7		3920
	5	10	10	10	10	7.4	8.3	7.6	8.1	24.6		3790
	6	10	10	10	9	7.8	8.3	7.6	8.0	24.4		3760
	7	10	10	10	9	7.4		7.4		24.2		
4.0 g/L	0	10	10	10	10		8.4		8.0	Post: 24.7		6990
	1	10	10	10	10	7.4	8.2	7.7	8.0	25.5		7230
	2	10	10	10	10	7.6	8.2	7.8	8.1	24.4		7180
	3	9	10	9	10	7.4	8.3	7.7	8.1	24.4		7180
	4	9	10	8	10	7.4	8.4	7.8	8.1	24.5		7180
	5	9	10	7	9	7.5	8.3	7.6	8.1	24.9		7060
	6	8	8	~~6~~ 7	9	7.6	8.3	7.6	8.0	24.3		6780
	7	7	6	4	8	7.7		7.4		24.3		
8.0 g/L	0	10	10	10	10		8.4		8.0	Post: 24.8		13040
	1	10	10	10	10	7.5	8.2	7.6	7.9	25.3		13570
	2	0	0	2	2	7.6	8.2	7.7	8.0	24.5		13560
	3			0	0	7.5	8.3	7.7	8.0	24.6		13470
	4											
	5											
	6											
	7											

icates 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

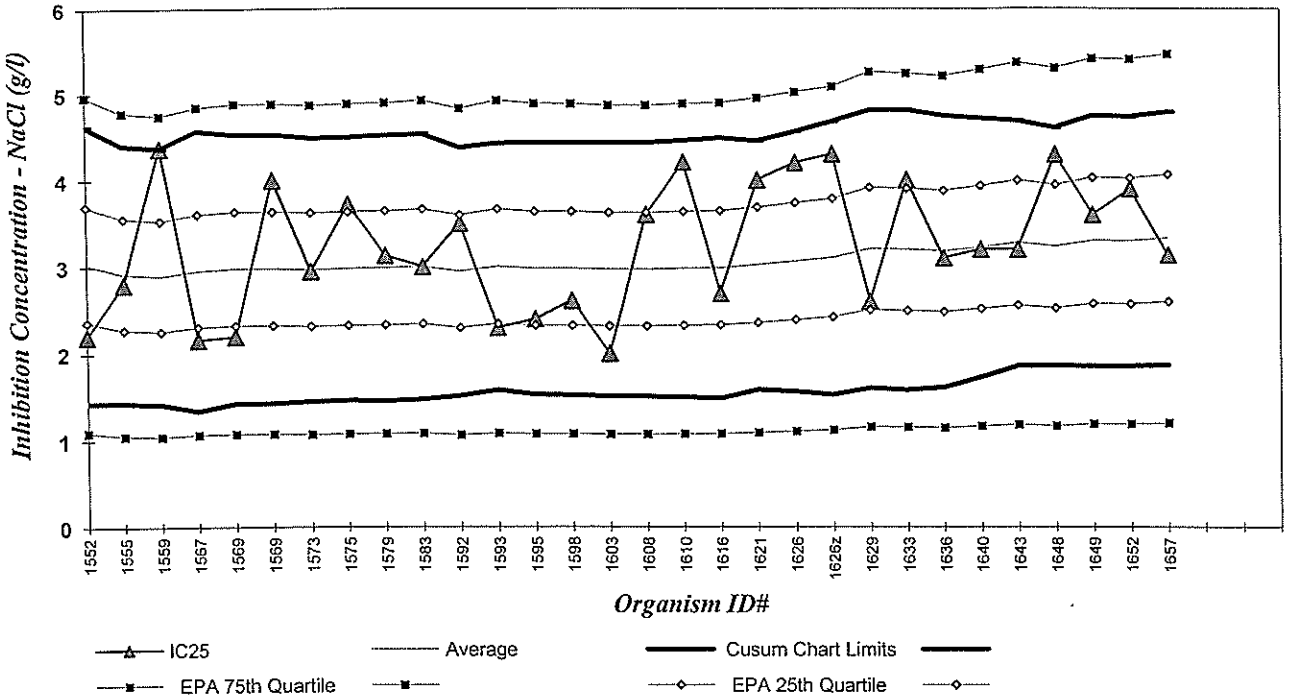
Endpoint	IC25	Cusum Chart Limits	
Survival	3.1	1.9 to	4.8
Growth	2.3	1.8 to	3.4

Task Manager

Project Manager

QA Officer

REFERENCE TOXICANT CUMLATIVE SUMMARY (CUSUM) CHART
Pimphales promelas Chronic Survival - IC25 Values



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

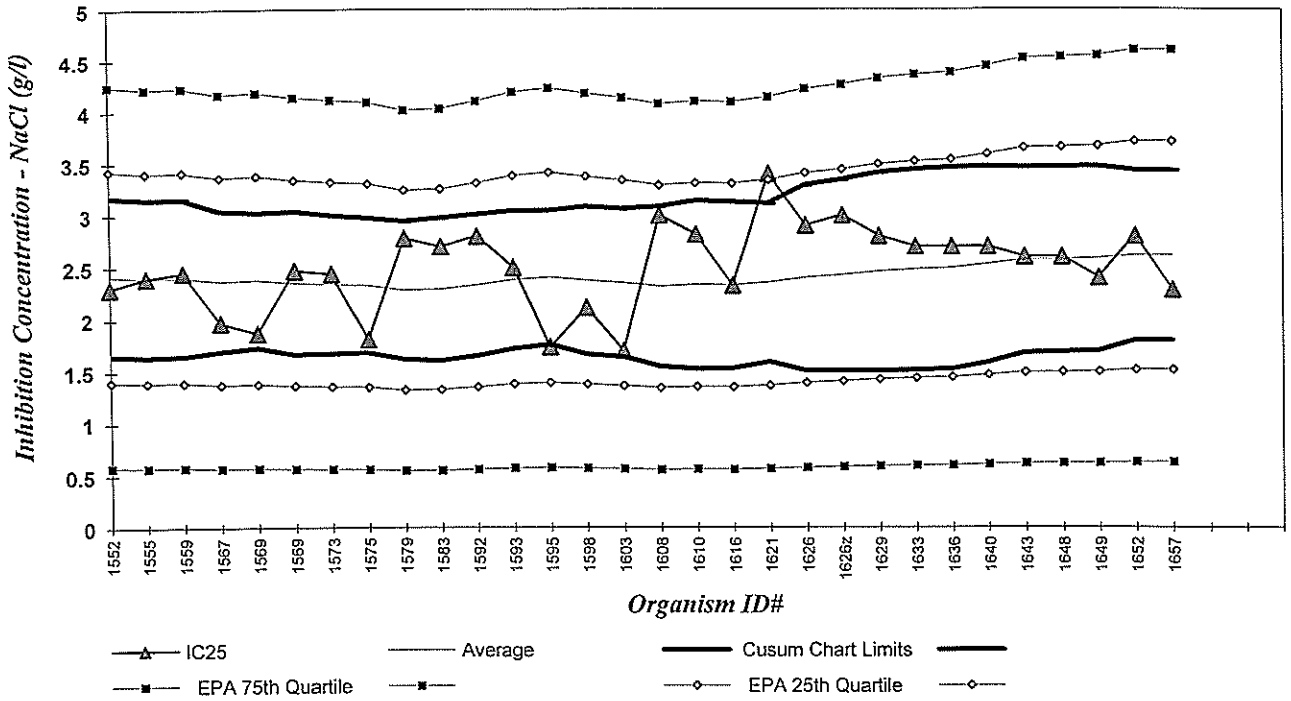
90th Quartile CV (*control limit*) = 0.52

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
270	1633	01/24/12	4.0	3.2	0.81	1.6	4.8	0.25
271	1636	02/07/12	3.1	3.2	0.78	1.6	4.7	0.23
272	1640	02/28/12	3.2	3.2	0.75	1.7	4.7	0.22
273	1643	03/13/12	3.2	3.3	0.71	1.9	4.7	0.21
274	1648	04/03/12	4.3	3.2	0.69	1.9	4.6	0.22
275	1649	04/10/12	3.6	3.3	0.72	1.9	4.7	0.22
276	1652	05/01/12	3.9	3.3	0.72	1.9	4.7	0.22
277	1657	06/12/12	3.1	3.3	0.73	1.9	4.8	0.22
278								
279								
280								
281								
282								

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
270	1633	1/24/2012	2.7	2.5	0.48	1.5	3.4	0.19
271	1636	2/7/2012	2.7	2.5	0.48	1.5	3.5	0.19
272	1640	2/28/2012	2.7	2.5	0.47	1.6	3.5	0.17
273	1643	3/13/2012	2.6	2.6	0.45	1.7	3.5	0.17
274	1648	4/3/2012	2.6	2.6	0.44	1.7	3.5	0.17
275	1649	4/10/2012	2.4	2.6	0.44	1.7	3.5	0.16
276	1652	5/1/2012	2.8	2.6	0.41	1.8	3.4	0.16
277	1657	6/12/2012	2.3	2.6	0.41	1.8	3.4	0.16
278								
279								
280								
281								
282								

APPENDIX C

CHAIN OF CUSTODY

CH2M HILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

Client Sumitomo Metal Mining Pogo LLC NPDES# _____

Address P.O. Box 145
Delta Junction, AK 99737

Contact Person: Stacy Staley
Phone: (907) 895-2761
E-mail: Stacy.Staley@smmPOGO.com

CH2M HILL Project # / Purchase Order # 153814406

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

5.2°C

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				B2780 Concentration and/or Comments
Out fall 001 #1	7/16/12	0630		X	1	B2780		X		X													-1

Sampled By & Title (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time
Stacy Staley Stacy Staley	7.16.12 0730		
Received By (Please sign and print name)	**Date/Time**	**Relinquished By (Please sign and print name)**	**Date/Time**
Janel McGeary Janel McGeary	7/17/12 1305		
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**		

CH2MHILL
Applied Sciences Laboratory (ASL)

Bioassay Sample Receipt Record

Batch Number: B2780 Date received: 7/17/12

Client/Project: Sumitomo Checked by: JM

VERIFICATION OF SAMPLE CONDITIONS (verify all items) * HD = Client Hand delivered Samples

Observation	NA	YES	NO
Were custody seals intact and on the outside of the cooler?		✓	
Type of packing material: Ice Blue Ice Bubble wrap		✓	
Was a Chain of Custody provided?		✓	
Was the Chain of Custody properly filled out? If not document in SRER below.		✓	
Were the sample containers in good condition (broken or leaking)?		✓	
Are all samples within 36 hours of collection? If not, contact LPM		✓	
Was there ice in the cooler? Enter temp. If >6°C contact client/SRER 5.4 °C		✓	

Sample Receipt Exception Report

The following exceptions were noted:		Comments (write number of exception description and the impacted sample numbers)
	1. No custody seal as required by project	
	2. No chain-of-custody provided	
	3. Analysis, description, date of collection not provided	
	4. Samples broken or leaking on receipt.	
	for analysis requested. (EPA recommends 0-6 °C for WET testing)	
	6. Container inappropriate for analysis requested	
	7. Inadequate sample volume.	
	8. Preservation inappropriate for analysis requested	
	9. Samples received out of holding time for analysis requested	
	10. Discrepancies between COC form and container labels.	
	11. Other.	

ACTION TAKEN (date/time):
Client notified on (date/time):
Originator:
Client Contact:

LYNDEN INTERNATIONAL

Lynden Air Freight, Inc.
P.O. BOX 84167
SEATTLE, WA 98124
www.laf.lynden.com

*NOTE: IF SERVICE DESCRIPTION IS NOT IDENTIFIED LYNDEN WILL AUTOMATICALLY SHIP AS SECOND BUSINESS DAY SERVICE.

AIRBILL NUMBER: WORLD COURIER 4854817 1051729

ORIGIN: PDX
DATE SHIPPED: 07/17/12

SERVICES DESCRIPTION: 1 NEXT BUSINESS DAY by 5PM [X] | SECOND BUSINESS DAY by 5PM [ ] | FIFTH BUSINESS DAY by 5PM [ ] | CUSTOMER SPECIFIED (MAY RESULT IN ADDITIONAL CHARGES) [ ]

SHIPPER'S LAF ACCOUNT NO.:
SHIPPER'S REFERENCE NO. OR P.O. NO.:

CONSIGNEE'S LAF ACCOUNT NO.:
CONSIGNEE'S REFERENCE NO. OR P.O. NO.:
TARIFF DEST.: PDX
TRANS. CITY:

2 FROM: SHIPPER (NAME AND STREET ADDRESS) RESIDENCE [ ]
SUMITOMO METAL MINING POGO
PO BOX 145
CITY: DELTA JUNCTION
STATE: AK
ZIP REQUIRED: 99737
SENT BY (NAME / DEPT.):
PHONE:

3 TO: CONSIGNEE (NAME AND STREET ADDRESS) RESIDENCE [ ]
CH2M HILL
1100 NE CIRCLE BLVD, STE 300 BIO
CITY: CORVALLIS
STATE: OR
ZIP REQUIRED: 97330
ATTENTION (NAME / DEPT.):
PHONE: 541-768-3160

4 BILL CHARGES TO: CHARGES ARE PREPAID UNLESS OTHERWISE INDICATED
PREPAID [ ] COLLECT [ ] 3RD PARTY [X]
DRIVER COLLECT FUNDS: AS CHECKED ABOVE [ ] COMAT [ ]

FREIGHT CHARGE: 0.00

3RD PARTY BILLING (IF OTHER THAN SHIPPER OR CONSIGNEE) PLEASE INCLUDE: CITY, STATE AND ZIP
SUMITOMO METAL MINING POGO
PO BOX 145
DELTA JUNCTION, AK 99737

DEL DEADLINE DATE: 07/18/12
TIME: 17:00
SCALE / ITEM: 77F
RATE:

PICKUP:
DELIVERY:

PIECES	DESCRIPTION OF COMMODITY	DIMENSIONS L×W×H = CUBIC IN.	WEIGHT	DIM. WEIGHT
1	SAMPLES	24.13.14	78	25
			CARRIER FUEL SURCHARGE 30.42, CARRIER SECURITY SURCHARGE 6.24	
1	◀ TOTAL ▶		CHARGEABLE WT. 78	

VALUE / INSURANCE:
ADVANCE ORIGIN:
ADVANCE DEST.:
C.O.D. FEE:

LIABILITY IS AGREED AND UNDERSTOOD TO BE $50.00 OR $.50 PER POUND PER PIECE WHICHEVER IS GREATER UNLESS A HIGHER VALUE IS DECLARED AND APPLICABLE CHARGES PAID. SEE REVERSE SIDE OF AIRBILL FOR DECLARED VALUE COVERAGE INFORMATION.

SHIPPER'S COD — UNLESS OTHERWISE SPECIFIED BY SHIPPER COLLECT CASH OR CERTIFIED FUNDS [ ] COMPANY CHECK OK

DOLLARS CENTS

LAF AIR BEYOND:

TYPE OF PACKAGING
INTERNAL:
EXTERNAL:

DECLARED VALUE COVERAGE:
CUBIC FT.: 2.5
DENSITY: 30.9

OTHER (DESCRIBE): 36.66

SPECIAL SERVICES
[ ] COUNTER TO COUNTER [ ] SPECIAL DELIVERY [ ] PROOF OF DELIVERY [ ] HAZARDOUS MATERIAL
[ ] SPECIAL PICKUP [ ] HOLD AND NOTIFY [ ] OTHER

5 SHIPPER'S SIGNATURE: X

TOTAL CHARGES $ U.S. 36.66

FORWARDER'S SIGNATURE: X
DATE RECV'D:
TIME RECV'D:
LOCATION: SHIPPER'S DOOR [ ] TERMINAL [ ]
NO. OF SHIPMENTS TENDERED:

RECEIVED IN ORDER EXCEPT AS NOTED: (SIGNATURE) X
PRINT NAME: Heather Unknown
DATE: 7/17/12
TIME: 1025

NON-NEGOTIABLE AIRBILL SUBJECT TO CONDITIONS OF CONTRACT ON REVERSE SIDE AND LYNDEN TARIFFS AT WWW.LAF.LYNDEN.COM.

CONSIGNEE COPY

WORLDWIDE COMMUNICATIONS CENTER-SEATTLE, WA
1 (800) 926-5703

621006

IMAGE PRESSWORKS (503) 231-5659

WORLD COURIER GROUND
A SERVICE NO ONE ELSE CAN DELIVER

Bill of Lading

Order Tracking Number 810 271712

Your Internal Billing Reference

RECIPIENT COPY

1 - From: Date 07/7/12 Sender's WCG Account Number

Sender's Name Phone ( )

Company Jet Delivery

Address 6225 NE 112th

City Portl State OR Zip 97220

2 - Shipper's Signature ★

3 - To: Recipient's Name Phone ( )

Company CH2M Hill

Address 1000 NE circle Blvd

10650

City corvallis State OR Zip 97330

Delivery Signature ★ Deliv. Time 12:25

Driver #: 2445 Pickup Time 1010

Name: Paul

Roundtrip Signature ★ Deliv. Time

Visit our Web Site: http://www.wcground.com

4 - Services:

Vehicle		Bike	
Direct ☐	(Non-Stop)	Super Rush ☐	(30 Min)
Rush ☑	(90 Min)	Rush ☐	(60 Min)
Route ☐	(3 Hours)	Route ☐	(3 Hours)

☐ *This shipment contains dangerous materials.*

5 - Special Instructions:

6 - Bill To: ☐ Sender ☐ Recipient ☐ Cash/Check ☐ Credit Card

Credit Card No.

Exp. Date

6a - Total Charges:

Total Packages 1 Total Weight 78 Total Declared Value $

Our liability is limited to $150 unless you declare a higher value. See back for details.

7 - Release Signature: *Sign to authorize delivery without obtaining signature.*

By signing you authorize us to deliver this shipment without obtaining a signature and agree to indemnify and hold us harmless from any resulting claims.

ATLANTA 800-487-9669	BOSTON 800-521-2211	CHICAGO 800-420-5717	MIAMI 800-611-0980
PORTLAND 800-254-3334	SAN FRANCISCO 800-345-8702	SANTA ROSA 888-882-7500	SEATTLE 1-866-959-9924

CH2M HILL

CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

Client: Sumitomo
Address:

Contact Person:
Phone:
E-mail:

CH2M HILL Project # / Purchase Order #

NPDES#

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 #2	7-18-12	0710		X	1	62750-02		X		X													

Sampled By & Title: Stacy Staley	(Please sign and print name): Stacy Staley	Date/Time: 7-18-12 1100	Relinquished By: Leonard G. Harris	(Please sign and print name): Leonard G. Harris	Date/Time: 7/18/12 11:02
Received By: [signature]	(Please sign and print name): Jeff A. Hiller	Date/Time: 7/18/12 1100	Relinquished By: [signature]	(Please sign and print name): Jeff A. Hiller	Date/Time: 7/18/12 1430
Received By: [signature]	(Please sign and print name): Sean McKeay	Date/Time: 7/19/12 1500	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 X		Shipping #
Work Authorized By	(Please sign and print name)	Remarks			

CH2MHILL
Applied Sciences Laboratory (ASL)

Bioassay Sample Receipt Record

Batch Number: 32780 B

Date received: 7/19/12

Client/Project: Sumitomo

Checked by: B

VERIFICATION OF SAMPLE CONDITIONS (verify all items) * HD = Client Hand delivered Samples

Observation	NA	YES	NO
Were custody seals intact and on the outside of the cooler?		✓	
Type of packing material: Ice Blue Ice Bubble wrap		✓	
Was a Chain of Custody provided?		✓	
Was the Chain of Custody properly filled out? If not document in SRER below.			✓
Were the sample containers in good condition (broken or leaking)?		✓	
Are all samples within 36 hours of collection? If not, contact LPM		✓	
Was there ice in the cooler? Enter temp. If >6°C contact client/SRER 5.2 °C			

Sample Receipt Exception Report

The following exceptions were noted:		Comments (write number of exception description and the impacted sample numbers)
	1. No custody seal as required by project	
	2. No chain-of-custody provided	
	3. Analysis, description, date of collection not provided	→ no client listed, shipping from referenced Alaska Air
	4. Samples broken or leaking on receipt.	
	for analysis requested. (EPA recommends 0-6 °C for WET testing)	
	6. Container inappropriate for analysis requested	
	7. Inadequate sample volume.	
	8. Preservation inappropriate for analysis requested	
	9. Samples received out of holding time for analysis requested	
	10. Discrepancies between COC form and container labels.	
	11. Other.	

ACTION TAKEN (date/time):
Client notified on (date/time):
Originator:
Client Contact:

PDX

AS	122	SEA	1650
AS	2175	PDX	2300

027 FAI 8629 6453

Date 18 JUL 12	SHIPPER PHONE # 9078952841
Pieces 1	CONSIGNEE PHONE # 503 2570365
Total Weight 62	
Piece Weight	
Box Number 1	

Goldstreak

Goldstreak

Alaska Air Cargo

www.alaskaair.com

CH2M HILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

Client: Smm Pogo llc
Address: Po Box 195
Delta Junction AK 99737

NPDES#: AK0053341

Contact Person: Luke Walker
Phone: 907-895-2860
E-mail: Lucas.walker@smmpogo.com

CH2M HILL Project # / Purchase Order #

Composite Sample Information:
Initiated: Date [redacted] Time
Ended: Date Time
Chilled During Collection ? Yes X No
Dechlorinated prior to shipping ? Yes No X

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	7.20.12	0920		X	1	B27900 03		X		X													

Sampled By & Title (Please sign and print name): L. Walker	Date/Time: 7.20.12/0920	Relinquished By (Please sign and print name): L. Walker	Date/Time: 7.20.12/1030
Received By (Please sign and print name): Jeff A. Hiller	Date/Time: 7/20/12 1030	Relinquished By (Please sign and print name): Jeff A. Hiller	Date/Time: 7/20/12 1400
Received By (Please sign and print name): Aaron Spotswood	Date/Time: 7/21/12 1100	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)

Bioassay Sample Receipt Record

Batch Number: B2780-

Date received: 7/21/12

Client/Project: Sumitomo

Checked by: [illegible]

VERIFICATION OF SAMPLE CONDITIONS (verify all items) * HD = Client Hand delivered Samples

Observation	NA	YES	NO
Were custody seals intact and on the outside of the cooler?		X	
Type of packing material: Ice Blue Ice Bubble wrap		X	
Was a Chain of Custody provided?		X	
Was the Chain of Custody properly filled out? If not document in SRER below.		X	
Were the sample containers in good condition (broken or leaking)?		X	
Are all samples within 36 hours of collection? If not, contact LPM		X	
Was there ice in the cooler? Enter temp. If >6°C contact client/SRER 5-5 °C		X	

Sample Receipt Exception Report

The following exceptions were noted:		Comments (write number of exception description and the impacted sample numbers)
	1. No custody seal as required by project	
	2. No chain-of-custody provided	
	3. Analysis, description, date of collection not provided	
	4. Samples broken or leaking on receipt.	
	for analysis requested. (EPA recommends 0-6 °C for WET testing)	
	6. Container inappropriate for analysis requested	
	7. Inadequate sample volume.	
	8. Preservation inappropriate for analysis requested	
	9. Samples received out of holding time for analysis requested	
	10. Discrepancies between COC form and container labels.	
	11. Other.	

ACTION TAKEN (date/time):
Client notified on (date/time):
Originator:
Client Contact:

621006

IMAGE PRESSWORKS (503) 231-5659

WORLD COURIER GROUND
A SERVICE NO ONE ELSE CAN DELIVER

Bill of Lading

Order Tracking Number 1932 072012

1 - From: Date 7-26-12 Sender's WCG Account Number

Sender's Name Phone ( )

Company AG

Address

City State Zip

2 - Shipper's Signature ★

3 - To: Recipient's Name Phone ( )

Company CH2M Hill

Address 1000 NE Circle Blvd 10650

City Corvallis State Zip

Delivery Signature ★ Deliv. Time

Roundtrip Signature ★ Deliv. Time

Driver #: 1938 Pickup Time 0715

Name: Bill

Visit our Web Site: http://www.wcground.com

Your Internal Billing Reference 4857169

RECIPIENT COPY

4 - Services:

Vehicle: Direct ☐ (Non-Stop) Rush ☒ (90 Min) Route ☐ (3 Hours)

Bike: Super Rush ☐ (30 Min) Rush ☐ (60 Min) Route ☐ (3 Hours)

☐ *This shipment contains dangerous materials.*

5 - Special Instructions: 24 x 12 x 14

8629 7610

6 - Bill To: ☐ Sender ☐ Recipient ☐ Cash/Check ☐ Credit Card

Credit Card No.

Exp. Date

6a - Total Charges:

Total Packages 1 Total Weight 76 Total Declared Value $

Our liability is limited to $150 unless you declare a higher value. See back for details.

7 - Release Signature: *Sign to authorize delivery without obtaining signature.*

By signing you authorize us to deliver this shipment without obtaining a signature and agree to indemnify and hold us harmless from any resulting claims.

ATLANTA 800-487-9669	BOSTON 800-521-2211	CHICAGO 800-420-5717	MIAMI 800-611-0980
PORTLAND 800-254-3334	SAN FRANCISCO 800-345-8702	SANTA ROSA 888-882-7500	SEATTLE 1-866-959-9924

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

Project ID: 60225262-412-016
July 2012

Sponsor and Laboratory Information

Sponsor	Sumitomo Metal Mining Pogo LLC Pogo Mine Joint Venture P.O. Box 145 Delta Junction, AK 99737
Project Officer	Lucas Walker (907) 895-2860
Testing Facility	AECOM Environment Fort Collins Environmental Toxicology Laboratory 4303 West LaPorte Ave. Fort Collins, CO 80521 Fax: (970) 490-2963 State of Florida NELAP Laboratory ID: E87972
Study Director	Rami B. Naddy, Ph.D. (970) 416-0916 email: rami.naddy@aecom.com
Report Author	Jessica Chiaradia (970) 416-0916 email: jessica.chiaradia@aecom.com

Test Information

Test	Short-Term Chronic under Static-Renewal Conditions
Basis	USEPA (2002), method 1000.0
Test Dates and Time	July 17, 2012 @ 1410 to July 24, 2012 @ 1350
Test Length	7 days
Species	*Pimephales promelas*
Test Material	Effluent (Grab)
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; AECOM 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	AECOM No.	Date of Receipt	Temp. at Arrival (°C)
1	N/A	07/16/12 @ 0620	25923	07/17/12	2.0
2	N/A	07/18/12 @ 0720	25931	07/19/12	3.0, 3.6
3	N/A	07/20/12 @ 0920	25950	07/21/12	4.1

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	66	32	215	<0.02	1.6
2	7.5	70	36	224	<0.02	2.2
3	7.5	72	37	246	<0.02	2.4

[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]
10391	8.4	88	57	297	<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	<24 hours
Source	FCETL in-house culture, batch 071712
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 July 2, 2012 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)	97.5	97.5	97.5	95	95	92.5	90	0.454	N/A	N/A
12.5	100	100	100	100	100	97.5	97.5	0.508	No	No
25	97.5	92.5	92.5	90	90	90	90	0.488	No	No
50	100	97.5	95	95	95	95	95	0.536	No	No
75	100	97.5	97.5	97.5	97.5	97.5	97.5	0.536	No	No
100	100	95	95	95	95	95	95	0.495	No	No
Percent Minimum Significant Difference (Growth)								20.2	Acceptable	

[a] Mean dry weight calculated based on the original number of organisms per replicate (mean dry weight per surviving organism in the control treatment was 0.506 mg)
Note: See Appendix B for copies of laboratory data sheets

Data Analysis and Test Endpoints

Biological Endpoint	Statistical Endpoint	Value (% Effluent)
Survival	NOEC	100%
	LOEC	>100%
	IC_{25}	>100%
Chronic (Growth)	NOEC	100%
	LOEC	>100%
	ChV	>100%
	IC_{25}	>100%
	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, USEPA Linear Interpolation Method v 2.0 (Norberg-King 1993) and Toxstat v 3.5 (WEST, Inc. and Gulley 1996)

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)	7.6	8.4	4.6	6.9	295	314	24	25
100	7.2	7.6	4.2	7.0	209	247	24	25
All Treatments	7.2	8.4	≥4.2		NA		24[a]	26[a]
							24.2[b]	25.6[b]

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

Reference Toxicant Test Results for *Pimephales promelas*

IC_{25}	AECOM/FCETL Historical 95% Control Limits	
	Low	High
1,172	956	1,428

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

References

Norberg-King, T. J.. 1993. A linear interpolation method for sublethal toxicity: the inhibition concentration (ICp) approach (version 2.0). National Effluent Toxicity Assessment Center Technical Report 03-93, U.S. Environmental Protection Agency, Environmental Research Laboratory, Duluth, MN.

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.

WEST, Inc. and D.D. Gulley. 1996. Toxstat Version 3.5. Western EcoSystems Technology, Inc., Cheyenne, WY.

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.

Christina Needham — August 7, 2012
Quality Assurance Unit — Date

Jennifer Miranda — August 6, 2012
Data Analyst — Date

APPENDIX A

Chain of Custody Records

AECOM

CHAIN OF CUSTODY RECORD

6.19.2012

Page 1 of 1

05-126

Client/Project Name: Sumitomo Metal Mining Pogo	Project Location: FCEIL
Project Number: 60225262-412	Field Logbook No.:
Sampler (Print Name)/(Affiliation):	Chain of Custody Tape Nos.: 42699 (intact)
Signature:	Send Results/Report to: TAT:

Analysis Requested: CC, FC

Container Type: P – Plastic; A – Amber Glass; G – Clear Glass; V – VOA Vial; O – Other; E – Encore

Preservation: 1 – HCl, 4°; 2 – H2SO4, 4°; 3 – HNO3, 4°; 4 – NaOH, 4°; 5 – NaOH/ZnAc, 4°; 6 – Na2S2O3, 4°; 7 – 4°

Matrix Codes: DW – Drinking Water; WW – Wastewater; GW – Groundwater; SW – Surface Water; ST – Storm Water; W – Water; S – Soil; SL – Sludge; SD – Sediment; SO – Solid; A – Air; L – Liquid; P – Product

Field Sample No./Identification	Date	Time	COMP	GRAB	Sample Container (Size/Mat'l)	Matrix	Preserv.	Field Filtered	CC, FC									Lab I.D.	Remarks
Effl #1	7-16-12	0620		X	25g	L	ICE		X									25923	
" "	"	"		X	1 g	"	"		X										

Relinquished by: (Print Name)/(Affiliation)	Date	Received by: (Print Name)/(Affiliation)	Date
Stacy Staley - Sumitomo Signature: Stacy Staley	7.16.12 Time: 7:30	Christina Needham (AECOM) Signature: Christina Needham	07/17/12 Time: 1235
Relinquished by: (Print Name)/(Affiliation) Signature:	Date: Time:	Received by: (Print Name)/(Affiliation) Signature:	Date: Time:
Relinquished by: (Print Name)/(Affiliation) Signature:	Date: Time:	Received by: (Print Name)/(Affiliation) Signature:	Date: Time:

Analytical Laboratory (Destination): Received effl. on ice @ 2.0°C (D69)

AECOM Toxicology Lab
4303 W. Laporte Avenue
Fort Collins, CO 80521
(970) 416-0916
(970) 490-2963 (FAX)

Sample Shipped Via: UPS FedEx Courier Other

Temp blank: Yes No

Serial No. № 52359

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AECOM

015-016

CHAIN OF CUSTODY RECORD

6·19·2012

Page 1 of 1

Client/Project Name: Sumitomo Metal Mine Pogo

Project Location: FCER

Project Number: 60225262-412

Field Logbook No.:

Sampler (Print Name)/(Affiliation):

Chain of Custody Tape Nos.: 42569 * intact *

Signature:

Send Results/Report to:

TAT:

Analysis Requested: 8C, 4

Container Type: P – Plastic; A – Amber Glass; G – Clear Glass; V – VOA Vial; O – Other; E – Encore

Preservation: 1 – HCl, 4°; 2 – H2SO4, 4°; 3 – HNO3, 4°; 4 – NaOH, 4°; 5 – NaOH/ZnAc, 4°; 6 – Na2S2O3, 4°; 7 – 4°

Matrix Codes: DW – Drinking Water; WW – Wastewater; GW – Groundwater; SW – Surface Water; ST – Storm Water; W – Water; S – Soil; SL – Sludge; SD – Sediment; SO – Solid; A – Air; L – Liquid; P – Product

Field Sample No./Identification	Date	Time	COMP	GRAB	Sample Container (Size/Mat'l)	Matrix	Preserv.	Field Filtered	8C, 4								Lab I.D.	Remarks
Eff # 2	7-18-12	0720		X	2.5g	L	ICE		X								25931	
" "	7-18-12	0720		X	1 g	"	"		X									

(D69)

Relinquished by: (Print Name)/(Affiliation)	Date	Received by: (Print Name)/(Affiliation)	Date	Analytical Laboratory (Destination):
Stacy Stacy Pogo Signature: Stacy Stacy	07/18/12 Time: 1100	Jeff A. Hiller Pogo Signature:	7/18/12 Time: 1100	rec. on ice via Fast-track @ 3.6°C (2.5g) & 3.0°C (1g) AECOM Toxicology Lab 4303 W. Laporte Avenue Fort Collins, CO 80521 (970) 416-0916 (970) 490-2963 (FAX)
Relinquished by: (Print Name)/(Affiliation) Jeff A. Hiller Pogo Signature:	7/18/12 Time: 1430	Received by: (Print Name)/(Affiliation) Amber Potts / AECOM Signature: Amber Potts	7/19/12 Time: 1334	
Relinquished by: (Print Name)/(Affiliation) Signature:	Date: Time:	Received by: (Print Name)/(Affiliation) Signature:	Date: Time:	Sample Shipped Via: UPS FedEx (Courier) Other Temp blank: Yes No

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Serial No. № 52360

AECOM

CHAIN OF CUSTODY RECORD

015-016

6.19.2012

Page 1 of 1

Client/Project Name: Sumitomo Metal Mine Pogo

Project Location: FCEC

Project Number: 60225262-412

Field Logbook No.:

Sampler (Print Name)/(Affiliation):

Chain of Custody Tape Nos.: 42568 intact

Signature:

Send Results/Report to:

TAT:

Analysis Requested: CC, FC

Container Type: P – Plastic; A – Amber Glass; G – Clear Glass; V – VOA Vial; O – Other; E – Encore

Preservation: 1 – HCl, 4°; 2 – H2SO4, 4°; 3 – HNO3, 4°; 4 – NaOH, 4°; 5 – NaOH/ZnAc, 4°; 6 – Na2S2O3, 4°; 7 – 4°

Matrix Codes: DW – Drinking Water; WW – Wastewater; GW – Groundwater; SW – Surface Water; ST – Storm Water; W – Water; S – Soil; SL – Sludge; SD – Sediment; SO – Solid; A – Air; L – Liquid; P – Product

Field Sample No./Identification	Date	Time	COMP	GRAB	Sample Container (Size/Mat'l)	Matrix	Preserv.	Field Filtered	CC, FC									Lab I.D.	Remarks
Effl #3	07/20/12	0920		X	2.5g	L	ICE		X									25950	
" " "	7.20.12	0920		X	1g	"	"		X										

Relinquished by: (Print Name)/(Affiliation)	Date	Received by: (Print Name)/(Affiliation)	Date
L. Walker Signature:	7.20.12 Time: 1030	Jeff A. Hiller Pogo Signature:	7/20/12 Time: 1030
Relinquished by: (Print Name)/(Affiliation) Jeff A. Hiller Pogo Signature:	7/20/12 Time: 1400	Received by: (Print Name)/(Affiliation) Jessica Contreras AECOM Signature:	7/21/12 Time: 1425
Relinquished by: (Print Name)/(Affiliation) Signature:	Date: Time:	Received by: (Print Name)/(Affiliation) Signature:	Date: Time:

Analytical Laboratory (Destination): Received on ice @ 4.1°C (DG9)

AECOM Toxicology Lab
4303 W. Laporte Avenue
Fort Collins, CO 80521
(970) 416-0916
(970) 490-2963 (FAX)

Sample Shipped Via: UPS FedEx Courier Other

Temp blank: Yes No

Serial No. № 52361

Q:\GRAPHICS\FORMS\Chain of Custody (COC)\Chain-of-Custody_Ft. Collins_10_07.doc

APPENDIX B

Test Data

FCETL QA Form No. 051
Revision 4
Effective 1/96

TOXICITY DATA PACKAGE COVER SHEET

ON: cw 08/02/12
7/25/12
08/01/12

Test Type: Chronic

Project Number: 60225262-412-016

Test Substance: Effluent-(Outfall 001)

Species: *Pimephales promelas*

Dilution Water Type: Mod Hard

Organism Lot or Batch Number: 071712

Concurrent Control Water Type: NA

Age: <24hr (< 24 hr) Supplier: FCETL

Date and Time Test Began: 7/17/12 @ 1410

Date and Time Test Ended: 7/24/12 @ 1350

Protocol Number: USEPA 2002

Investigator(s): [illegible]/AB/[illegible]/AP/[illegible]/mt/AD/ cw for TK/cw for DM

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 #: 21

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: 7/2/12 to ~~7/6/12~~ 7/9/12 IC_{25}: 1172 mg/L Cl^-

Hist. 95% Control Limits: 956 to 1428 Method for Determining Ref. Tox. Value: Linear Interpolation

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: KAW Date: ~~7/17~~ 7/17/12

KAW 7/17/12 E
cw for (?) 08/02/12 E

FCETL QA Form No. 041
Revision 4
Effective 1/96

TEST SUBSTANCE USAGE LOG

QA: CW 08/02/12
08/01/12

Project Number: 60225262-412-016

	Sample 1	Sample 2	Sample 3	Sample 4
Test Substance Number	25923	25931	25950	
Test Substance Collection Date and Time	From: 7/16/12 @ 0620 To: N/A @	From: 7/18/12 @ 0720 To: N/A @	From: 7/20/12 @ 0920 To: N/A @	From: @ To: @
Sample Type (Grab or Comp)	Grab	Grab	Grab	
Date Test Substance Received	7/17/12	7/19/12	7/21/12	
Dilution Water Number RW# or FCETL#, circle one	10391	10395	10395	
Concurrent Control Water RW#	NA	NA	NA	
Date(s) Used	7/17/12 7/18/12	7/19/12 7/20/12	7/21/12 7/22/12 7/23/12	

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						
12.5%	150	1050	1200						
25%	300	900	1200						
50%	600	600	1200						
75%	900	300	1200						
100%	1200	0	1200						
Total	3150	4050	7200						

Initials / Date	AB 7/12/12 mixed FC+CC		
Initials / Date	AB 7/18/12 A "		
Initials / Date	DM 7/19/12 " "		
Initials / Date	[illegible] 7/20/12 " "		
Initials / Date	BP 7/21/12 "		
Initials / Date	BP 7/22/12 "		
Initials / Date	MK 7/23/12 mixed FC		
Initials / Date			

A cylinder mismarked for 12.5% at test initiation (was mixed at 12%). corrected to correct concentration on Day 1. (per A. Rehner)

FCETL QA Form No. 060
Revision 2
Effective 1/96

FATHEAD MINNOW (*PIMEPHALES PROMELAS*)
CHRONIC BIOLOGICAL DATA

Project Number: 60225262-412-016

7/25/12
QA:cy 07/26/12
08/01/12

%Conc.	Test Replicate	Number of Surviving Organisms Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	% survival / Remarks
0 (MH)	A	10	9	9	9	9	9	9	9	90%
	B	10	10	10	10	9	9	8	①~~6~~ 7	
	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	97.5%
	B	10	10	10	10	10	10	10	10	
	C	10	10	10	10	10	10	9	9	
	D	10	10	10	10	10	10	10*	10	* 1 siphoned
25%	A	10	9	7	7	7	7	7	7	90%
	B	10	10	10	10	10	10	10	10	
	C	10	10	10	10	10	10	10	10	
	D	10	10	10	10	9	9	9	9	
50%	A	10	10	10	10	10	10	10	10	95%
	B	10	10	9	9	9	9	9	9	
	C	10	10	10	10	10	10	10	10	
	D	10	10	10	9	9	9	9	9	
75%	A	10	10	10	10	10	10	10	10	97.5%
	B	10	10	10	10	10	10	10	10	
	C	10	10	9	9	9	9	9	9	
	D	10	10	10	10	10	10	10	10	
100%	A	10	10	10	10	10	10	10	10	95%
	B	10	10	10	10	10	10	10	10	
	C	10	10	9	9	9	9	9	9	
	D	10	10	9	9	9	9	9	9	
	A									
	B									
	C									
	D									
Date:		7/17/12	7/18/12	7/19/12	7/20/12	7/21/12	7/22/12	7/23/12	7/24/12	
Time:		1410	1115	1530	1430	1510	1040	1340	1350	
Initials:		AG	KB	AG		BP	BP	MK	KB	

①KB 7/24/12 E

FCETL QA Form No. 058
Revision 3
Effective 3/98

CHRONIC CHEMICAL DATA (INITIAL)

08/01/12
@ 08:00 08/02/12

Project Number: 60225262-412-016

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	8.4	8.2	8.2	8.4	8.2	8.2	8.3		Fm21	
D.O. (mg/L)	6.7	6.6	6.5	6.9	6.9	6.7	6.3		5	
Temp. (°C)	25	25	25	25	25	25	25		D62	
Cond. (µS/cm)	297	295	297	314	308	308	301		15	
Hard. (mg/L)	88		90		84				Titr.	
Alk. (mg/L)	57		61		60				Titr.	
TRC (mg/L)	(7/13/12) <0.02		(7/18/12) <0.02						#21	
NH_3 (mg/L) **	<1.0		<1.0						HA#1	
Conc.: 12.5%										
pH	8.3	8.1	8.1	8.3	8.3	8.2	8.3			
D.O. (mg/L)	6.7	6.7	6.5	6.9	6.9	6.7	6.3			
Temp. (°C)	*	*	*	*	*	*	*			
Cond. (µS/cm)	297	289	294	303	307	304	302			
Hard. (mg/L)										
Alk. (mg/L)										
TRC (mg/L)										
NH_3 (mg/L)										
Conc.: 25%										
pH	8.2	8.0	8.0	8.2	8.1	8.1	8.2			
D.O. (mg/L)	6.7	6.7	6.5	7.0	6.8	6.7	6.3			
Temp. (°C)	*	*	*	*	*	*	*			
Cond. (µS/cm)	281	278	285	295	296	296	294			
Conc.: 50%										
pH	8.0	7.8	7.8	8.0	8.0	7.9	7.9			
D.O. (mg/L)	6.7	6.7	6.5	7.0	6.8	6.9	6.3			
Temp. (°C)	*	*	*	*	*	*	*			
Cond. (µS/cm)	259	257	265	275	278	279	280			
Date:	7/17/12	7/18/12	7/19/12	7/20/12	7/21/12	7/22/12	7/23/12			
Time:	1340	1025	1510	1410	1450	1020	1330			
Initials:		AS	AS	AS	AS	AS	MT			

Note: Hardness, alkalinity, TRC, and NH3 data appearing on this page have been transcribed from the wet chemistry log FCETL 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.

0 AS 7/18/12 E

** Measured in source water

FCETL QA Form No. 058
Revision 3
Effective 3/98

CHRONIC CHEMICAL DATA (INITIAL)

7/25/12
08/01/12
@0:00 08/02/12

Project Number: 60225262-412-016

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	7.8	7.6	7.6	7.7	7.8	7.7	7.7		FM21	
D.O. (mg/L)	6.7	6.6	6.6	7.0	6.9	6.9	6.4		5	
Temp. (°C)	*	*	*	*	*	*	*		DL62	
Cond. (µS/cm)	238	234	244	254	263	264	264		15	
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	7.4	7.5	7.5	7.5	7.5	7.5			
D.O. (mg/L)	6.8	6.7	6.7	7.0	7.0	7.0	6.4			
Temp. (°C)	25	25	25	25	25	25	25			
Cond. (µS/cm)	215	209	224	233	246	245	247			
Hard. (mg/L)	66		70		72					
Alk. (mg/L)	32		36		37					
TRC (mg/L)	<0.02		<0.02		<0.02					(on a preserved sample)
NH_3 (mg/L)	1.6 Δ		2.2 Δ		2.4 Δ					Δ measured 7/24/12 using meter #3.
Date:	7/17/12	7/18/12	7/19/12	7/20/12	7/21/12	7/22/12	7/23/12			
Time:	1340	1025	1510	1410	1450	1020	1330			
Initials:		AS	AB	AB	BP	AB	MA			

Note: Hardness, alkalinity, TRC, and NH3 data appearing on this page have been transcribed from the wet chemistry log FCETL 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.

FCETL QA Form No. 059
Revision 2
Effective 1/96

CHRONIC CHEMICAL DATA (FINAL)

7/25/12
08/01/12
QA: CU 08/02/12

Project Number:	60225262-412-016
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)							312		All Conc.	* conductivity (15)
pH	8.0	7.6	7.7	7.7	7.8	7.6	7.7		FM21	
D.O. (mg/L)	5.3	4.6	4.8	5.0	5.2	5.0	5.5		5	
Temp (°C)	25	25	25	25	24	24	25		D70	
Conc.: 12.5%										
pH	7.8	7.6	7.7	7.6	7.7	7.5	7.6			
D.O. (mg/L)	5.6	4.5	4.6	4.9	4.6	4.2	5.9			
Temp (°C)	~~24~~ 24	24	25	26	24	25	25			
Conc.: 25%										
pH	7.8	7.5	7.6	7.6	7.6	7.4	7.5			
D.O. (mg/L)	5.1	4.6	4.7	4.6	4.8	4.2	5.9			
Temp (°C)	25	25	25	25	24	25	25			
Conc.: 50%										
pH	7.7	7.5	7.6	7.6	7.5	7.4	7.4			
D.O. (mg/L)	5.3	4.2	4.7	4.6	4.2	4.2	4.5			
Temp (°C)	25	25	25	25	24	25	25			
Conc.: 75%										
pH	7.7	7.4	7.5	7.5	7.5	7.3	7.4			
D.O. (mg/L)	5.3	4.2	4.6	4.4	4.5	5.4	4.4			
Temp (°C)	25	25	25	25	24	25	25			
Conc.: 100%							240			* conductivity (15)
pH	7.6	7.4	7.4	7.4	7.4	7.2	7.3			
D.O. (mg/L)	5.2	4.4	4.2	4.6	4.3	4.4	4.8			
Temp (°C)	25	25	25	25	24	24	25			
Conc.:										
pH										
D.O. (mg/L)										
Temp (°C)										
Date:	7/18/12	7/19/12	7/20/12	7/21/12	7/22/12	7/23/12	7/24/12			
Time:	1005	1510	1400	1450	1015	1330	1340			
Initials:	KB	AG	AR	BP	AG	MJ	KB			

① KB 7/18/12 E ② KB 7/24/12 E

FCETL QA Form No. 055
Revision 2
Effective 1/94

DAILY TOXICITY TEST LOG

7/25/12
08/01/12
08/02/12

Project Number:	60225262-412-016
Test Species:	***Pimephales promelas***

General Comments	Random Chart: Zeta		Feeding 0.1 ml B.S. 3 x Daily	Initials/Date
Test Day 0	Test Solution Mixed at: 1335 Test Organisms Added at: 1410		Fed @ 1700	AB 7/17/12
Test Day 1	CT= 25.0 °C	Range = 24.6 - 25.6 °C	Fed @ 0825MT 1200 AR 1655 AP	KB 7/18/12
Test Day 2	CT= 25.0 °C	Range = 24.6-25.2 °C	Fed @ 0915 AP 1155 PM 1655 AB	AB 7/19/12
Test Day 3	CT= 24.8 °C	Range = 24.2-25.2 °C	Fed @ 0825 AP 1205 AP 1655 AB	7/20/12
Test Day 4	CT= 24.8 °C	Range = 24.6 - 25.2 °C	Fed @ 0820 AB 1150 AB 1545	BP 7/21/12
Test Day 5	CT= 24.8 °C	Range = 24.6 - 25.2 °C	Fed @ 0815 1140 BP 1530 BP	BP 7/22/12
Test Day 6	CT= 25.0 °C	Range = 24.2 - 25.0 °C	Fed @ 0830 MT 1150 DM 1645 TR	MT 7/23/12
Test Day 7	CT= 24.8 °C	Range = 24.6 - 25.6 °C	NONE	KB 7/24/12
Test Day 8				

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

7/25/12
OR:CW 07/26/12

Project Number: 60225262-412-016
Test Substance: Effluent (outfall 001)
Species: P. promelas
Analyst Tare: NLT Analyst Gross: DM
Date/Time of Tare Wt.: 7/24/12 @ 1010
Date/Time of Gross Wt.: 7/25/12 @ 030
Comments:
Analytical Balance ID: Sart #1
Dried in Oven # 2 from Date: 7/24/12 Time: 1445
to Date: 7/25/12 Time: 0835

Weight Type (Circle): Wet Blot Dry Dry (>100°C) AFDW (>500°C)
Lot or Batch Number: 071712

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		0.93572	0.94034	0.00462		10			9		
		B		0.93070	0.93441	0.00371		10			7		
		C		0.92696	0.93214	0.00518		10			10		
		D		0.93586	0.94049	0.00463		10			10		
	12.5%	A		0.93640	0.94203	0.00563		10			10		
		B		0.93765	0.94231	0.00466		10			10		
		C		0.91659	0.92128	0.00469		10			①~~10~~ 9		
		D		0.91599	0.92131	0.00532		10			10		
	25%	A		0.91608	0.91991	0.00383 ~~382~~ ①		10			7		
		B		0.92414	0.92992	0.00578		10			10		
		C		0.93525	0.94017	0.00492		10			10		
		D		0.91919	0.92420	0.00501		10			①~~10~~ 9		
Blank				0.92566	0.92568	0.00002							
Range													
Mean													

Test Solution Volume:
Loading Rate:

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

① DM 7/25/12 E

FCETL QA Form No. 010
Revision 5
Effective 08/99

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

dl 7/25/12
QA: ao 07/26/12

Project Number: 60225262-412-016
Test Substance: Effluent (outfall001)
Species: P. promelas
Analyst Tare: NLT Analyst Gross: DM
Date/Time of Tare Wt.: 7/24/12 @ 1010
Date/Time of Gross Wt.: 7/25/12 @ 1030
Comments:
Analytical Balance ID: Sart #1
Dried in Oven # 2 from Date: 7/24/12 Time: 1445
to Date: 7/25/12 Time: 0835

Weight Type (Circle): Wet Blot Dry Dry (>100°C) AFDW (>500°C)
Lot or Batch Number: 071712

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		0.92305	0.92869	0.00564		10			10		
		B		0.92034	0.92538	0.00504		10			9		
		C		0.91906	0.92464	0.00558		10			10		
		D		0.91813	0.92333	0.00520		10			9		
	75%	A		0.93493	0.94043	0.00550		10			10		
		B		0.93431	0.94005	0.00574		10			10		
		C		0.92201	0.92667	0.00466		10			9		
		D		0.92927	0.93481	0.00554		10			10		
	100%	A		0.91515	0.92026	0.00511		10			10		
		B		0.91221	0.91759	0.00538		10			10		
		C		0.93314	0.93806	0.00492		10			9		
		D		0.91646	0.92086	0.00440		10			9		
Blank													
Range													
Mean													

Test Solution Volume:
Loading Rate:

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

FCETL QA Form No. 010a
Revision 0
Effective 10/06

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project Number: 60225262-412-016 Species: Fathead minnow

*7/25/12
QA:CW 07/26/12

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		0.93572	0.94034	0.00462	0.00462	10	0.462	0.4535	9	0.513	0.5061
	B		0.93070	0.93441	0.00371	0.00371	10	0.371		7	0.530	
	C		0.92696	0.93214	0.00518	0.00518	10	0.518		10	0.518	
	D		0.93586	0.94049	0.00463	0.00463	10	0.463		10	0.463	
12.5%	A		0.93640	0.94203	0.00563	0.00563	10	0.563	0.5075	10	0.563	0.5205
	B		0.93765	0.94231	0.00466	0.00466	10	0.466		10	0.466	
	C		0.91659	0.92128	0.00469	0.00469	10	0.469		9	0.521	
	D		0.91599	0.92131	0.00532	0.00532	10	0.532		10	0.532	
25%	A		0.91608	0.91991	0.00383	0.00383	10	0.383	0.4885	7	0.547	0.5435
	B		0.92414	0.92992	0.00578	0.00578	10	0.578		10	0.578	
	C		0.93525	0.94017	0.00492	0.00492	10	0.492		10	0.492	
	D		0.91919	0.92420	0.00501	0.00501	10	0.501		9	0.557	
50%	A		0.92305	0.92869	0.00564	0.00564	10	0.564	0.5365	10	0.564	0.5649
	B		0.92034	0.92538	0.00504	0.00504	10	0.504		9	0.560	
	C		0.91906	0.92464	0.00558	0.00558	10	0.558		10	0.558	
	D		0.91813	0.92333	0.00520	0.00520	10	0.520		9	0.578	
75%	A		0.93493	0.94043	0.00550	0.00550	10	0.550	0.5360	10	0.550	0.5489
	B		0.93431	0.94005	0.00574	0.00574	10	0.574		10	0.574	
	C		0.92201	0.92667	0.00466	0.00466	10	0.466		9	0.518	
	D		0.92927	0.93481	0.00554	0.00554	10	0.554		10	0.554	
100%	A		0.91515	0.92026	0.00511	0.00511	10	0.511	0.4953	10	0.511	0.5211
	B		0.91221	0.91759	0.00538	0.00538	10	0.538		10	0.538	
	C		0.93314	0.93806	0.00492	0.00492	10	0.492		9	0.547	
	D		0.91646	0.92086	0.00440	0.00440	10	0.440		9	0.489	
Blank			0.92566	0.92568	0.00002							

Project Number: 60225262-412-016 Species: Fathead minnow

7/25/12
QA: CW 07/26/12

Summary Statistics for Survival Data

Treatment	N	Min	Max	Mean	SD	C.V.
MH	4	0.7	1.0	0.9000	0.1414	15.713%
12.5%	4	0.9	1.0	0.9750	0.0500	5.128%
25%	4	0.7	1.0	0.9000	0.1414	15.713%
50%	4	0.9	1.0	0.9500	0.0577	6.077%
75%	4	0.9	1.0	0.9750	0.0500	5.128%
100%	4	0.9	1.0	0.9500	0.0577	6.077%

Summary Statistics for Growth Data (dry wt per original)

Treatment	N	Min	Max	Mean	SD	C.V.
MH	4	0.371	0.518	0.4535	0.0609	13.430%
12.5%	4	0.466	0.563	0.5075	0.0479	9.440%
25%	4	0.383	0.578	0.4885	0.0802	16.423%
50%	4	0.504	0.564	0.5365	0.0291	5.431%
75%	4	0.466	0.574	0.5360	0.0478	8.924%
100%	4	0.440	0.538	0.4953	0.0414	8.357%

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

Treatment	N	Min	Max	Mean	SD	C.V.
MH	4	0.463	0.530	0.5061	0.0296	5.842%
12.5%	4	0.466	0.563	0.5205	0.0405	7.771%
25%	4	0.492	0.578	0.5435	0.0366	6.743%
50%	4	0.558	0.578	0.5649	0.0089	1.577%
75%	4	0.518	0.574	0.5489	0.0233	4.241%
100%	4	0.489	0.547	0.5211	0.0263	5.051%

Toxstat Version 3.5
Study # 60225262-412-016
Sumitomo Metal Mining Pogo
Pimephales promelas
Summary Statistics for Growth per Original

7/25/12
QA:CW 07/26/12

Title: 60225262-412-016
File: 412016fg.dat Transform: NO TRANSFORMATION

Summary Statistics on Data TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	Control	4	0.3710	0.5180	0.4535
2	12.5	4	0.4660	0.5630	0.5075
3	25	4	0.3830	0.5780	0.4885
4	50	4	0.5040	0.5640	0.5365
5	75	4	0.4660	0.5740	0.5360
6	100	4	0.4400	0.5380	0.4953

Title: 60225262-412-016
File: 412016fg.dat Transform: NO TRANSFORMATION

Summary Statistics on Data TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	Control	0.0037	0.0609	0.0305	13.4304
2	12.5	0.0023	0.0479	0.0240	9.4396
3	25	0.0064	0.0802	0.0401	16.4231
4	50	0.0008	0.0291	0.0146	5.4311
5	75	0.0023	0.0478	0.0239	8.9241
6	100	0.0017	0.0414	0.0207	8.3569

Toxstat Version 3.5
Study # 60225262-412-016
Sumitomo Metal Mining Pogo
Pimephales promelas
Determination of ~~NOEC, LOEC and~~ ① PMSD for Growth per Original

*7/25/12
an:cw 07/26/12

Title: 60225262-412-016
File: 412016fg.dat Transform: NO TRANSFORMATION

ANOVA Table

SOURCE	DF	SS	MS	F
Between	5	0.0198	0.0040	1.3747
Within (Error)	18	0.0519	0.0029	
Total	23	0.0717		

(p-value = 0.2800)

Critical F = 4.2479 (alpha = 0.01, df = 5,18)
= 2.7729 (alpha = 0.05, df = 5,18)

Since F < Critical F FAIL TO REJECT Ho: All equal (alpha = 0.05)

Title: 60225262-412-016
File: 412016fg.dat Transform: NO TRANSFORMATION

Dunnett's Test - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG 0.05
1	Control	0.4535	0.4535		
2	12.5	0.5075	0.5075	-1.4226	
3	25	0.4885	0.4885	-0.9220	
4	50	0.5365	0.5365	-2.1866	
5	75	0.5360	0.5360	-2.1734	
6	100	0.4953	0.4953	-1.0999	

Dunnett critical value = 2.4100 (1 Tailed, alpha = 0.05, df = 5,18)

Title: 60225262-412-016
File: 412016fg.dat Transform: NO TRANSFORMATION

Dunnett's Test - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	MIN SIG DIFF (IN ORIG. UNITS)	% OF CONTROL	DIFFERENCE FROM CONTROL
1	Control	4			
2	12.5	4	0.0915	20.2	-0.0540
3	25	4	0.0915	20.2	-0.0350
4	50	4	0.0915	20.2	-0.0830
5	75	4	0.0915	20.2	-0.0825
6	100	4	0.0915	20.2	-0.0418

① cw for ANP 07/26/12 NA

AECOM Environment
4303 West LaPorte Avenue, Fort Collins, Colorado, 80521-2154
T 970.416.0916 F 970.490.2963 www.aecom.com

August 7, 2012

Mr. Lucas Walker
Sumitomo Metal Mining Pogo, LLC
Pogo Mine Joint Venture
P.O. Box 145
Delta Junction, Alaska 99737

RE: Results of WET tests – July 2012

Dear Mr. Walker,

Attached are copies of the reports for the *Ceriodaphnia dubia* (water flea) and *Pimephales promelas* (fathead minnow) toxicity tests conducted in July 2012 with effluent from your facility.

AECOM Environment 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,

Jessica Chiaradia
Data Analyst
jessica.chiaradia@aecom.com

Rami B. Naddy, Ph.D.
Senior Toxicologist / Study Director
rami.naddy@aecom.com

Attachments:

60225262-412-015
60225262-412-016

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

Project ID: 60225262-412-015
July 2012

Sponsor and Laboratory Information

Sponsor	Sumitomo Metal Mining Pogo LLC Pogo Mine Joint Venture P.O. Box 145 Delta Junction, AK 99737
Project Officer	Lucas Walker (907) 895-2860
Testing Facility	AECOM Environment Fort Collins Environmental Toxicology Laboratory 4303 West LaPorte Ave. Fort Collins, CO 80521 Fax: (970) 490-2963 State of Florida NELAP Laboratory ID: E87972
Study Director	Rami B. Naddy, Ph.D. (970) 416-0916 email: rami.naddy@aecom.com
Report Author	Jessica Chiaradia (970) 416-0916 email: jessica.chiaradia@aecom.com

Test Information

Test	Short-Term Chronic under Static-Renewal Conditions
Basis	USEPA (2002), method 1002.0
Test Dates and Time	July 17, 2012 @ 1410 to July 23, 2012 @ 1615
Test Length	6 days
Species	*Ceriodaphnia dubia*
Test Material	Effluent (Grab)
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; AECOM 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	AECOM No.	Date of Receipt	Temp. at Arrival (°C)
1	N/A	07/16/12 @ 0620	25923	07/17/12	2.0
2	N/A	07/18/12 @ 0720	25931	07/19/12	3.0, 3.6
3	N/A	07/20/12 @ 0920	25950	07/21/12	4.1

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	66	32	215	<0.02	1.6
2	7.5	70	36	224	<0.02	2.2
3	7.5	72	37	246	<0.02	2.4

[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]
10391	8.4	88	57	297	<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	FCETL in-house culture, batch 071612
Acclimation	Test temperature
Feeding	0.2 ml YTC/Algae mixed per test chamber daily during the test
Reference Toxicant Testing	Initiated July 2, 2012 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	N/A	27.2	N/A	N/A
12.5	100	100	100	100	100	100	N/A	25.2	No	No
25	100	100	100	100	100	100	N/A	28.3	No	No
50	100	100	100	100	100	100	N/A	32.7	No	No
75	100	100	100	100	100	100	N/A	32.0	No	No
100	100	100	100	100	100	100	N/A	30.1	No	No
Percent Minimum Significant Difference (Reproduction)								32.3	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 (% Effluent)
Survival	NOEC	100%
	LOEC	>100%
	IC_{25}	>100%
Reproduction	NOEC	100%
	LOEC	>100%
	ChV	>100%
	IC_{25}	>100%
	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, USEPA Linear Interpolation Method v 2.0 (Norberg-King 1993) and Toxstat v 3.5 (WEST, Inc. and Gulley 1996)

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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)	8.1	8.4	6.3	6.9	295	334	24	25
100	7.4	8.0	6.3	7.0	209	262	24	25
All Treatments	7.4	8.4	≥6.2		NA		24[a]	25[a]
							24.2[b]	25.6[b]

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

Reference Toxicant Test Results for *C. dubia*

IC_{25}	AECOM/FCETL Historical 95% Control Limits	
	Low	High
275	192	722

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

References

Norberg-King, T. J.. 1993. A linear interpolation method for sublethal toxicity: the inhibition concentration (ICp) approach (version 2.0). National Effluent Toxicity Assessment Center Technical Report 03-93, U.S. Environmental Protection Agency, Environmental Research Laboratory, Duluth, MN.

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.

WEST, Inc. and D.D. Gulley. 1996. Toxstat Version 3.5. Western EcoSystems Technology, Inc., Cheyenne, WY.

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.

Christina Needham — August 7, 2012
Quality Assurance Unit — Date

Jill Hunter — August 6, 2012
Data Analyst — Date

APPENDIX A

Chain of Custody Records

AECOM

CHAIN OF CUSTODY RECORD

6.19.2012

Page 1 of 1

05-126

Client/Project Name: Sumitomo Metal Mining Pogo	Project Location: FCETC
Project Number: 60225262-412	Field Logbook No.:
Sampler (Print Name)/(Affiliation):	Chain of Custody Tape Nos.: 42699 (intact)
Signature:	Send Results/Report to: TAT:

Analysis Requested: CC, FC

Container Type: P – Plastic; A – Amber Glass; G – Clear Glass; V – VOA Vial; O – Other; E – Encore

Preservation: 1 – HCl, 4°; 2 – H2SO4, 4°; 3 – HNO3, 4°; 4 – NaOH, 4°; 5 – NaOH/ZnAc, 4°; 6 – Na2S2O3, 4°; 7 – 4°

Matrix Codes: DW – Drinking Water; WW – Wastewater; GW – Groundwater; SW – Surface Water; ST – Storm Water; W – Water; S – Soil; SL – Sludge; SD – Sediment; SO – Solid; A – Air; L – Liquid; P – Product

Field Sample No./Identification	Date	Time	COMP	GRAB	Sample Container (Size/Mat'l)	Matrix	Preserv.	Field Filtered	CC, FC	Lab I.D.	Remarks
Effl #1	7-16-12	0620		X	25g	L	ICE		X	25923	
" "	"	"		X	1 g	"	"		X		

Relinquished by: (Print Name)/(Affiliation)	Date/Time	Received by: (Print Name)/(Affiliation)	Date/Time
Stacy Staley - SMM Pogo Signature: Stacy Staley	Date: 7.16.12 Time: 7:30	Christina Needham (AECOM) Signature: Christina Needham	Date: 07/17/12 Time: 1235
Relinquished by: (Print Name)/(Affiliation) Signature:	Date: Time:	Received by: (Print Name)/(Affiliation) Signature:	Date: Time:
Relinquished by: (Print Name)/(Affiliation) Signature:	Date: Time:	Received by: (Print Name)/(Affiliation) Signature:	Date: Time:

Analytical Laboratory (Destination): Received eff. on ice @ 2.0°C (D69)

AECOM Toxicology Lab
4303 W. Laporte Avenue
Fort Collins, CO 80521
(970) 416-0916
(970) 490-2963 (FAX)

Sample Shipped Via: UPS FedEx Courier Other

Temp blank: Yes No

Q:\GRAPHICS\FORMS\Chain of Custody (COC)\Chain-of-Custody_Ft. Collins_10_07.doc

Serial No. № 52359

AECOM

015-016

CHAIN OF CUSTODY RECORD

6·19·2012

Page 1 of 1

Client/Project Name: Sumitomo Metal Mine Pogo

Project Location: FCER

Project Number: 60225262-412

Field Logbook No.:

Sampler (Print Name)/(Affiliation):

Chain of Custody Tape Nos.: 42569 * intact *

Signature:

Send Results/Report to:

TAT:

Analysis Requested: CL, Fl

Container Type: P – Plastic; A – Amber Glass; G – Clear Glass; V – VOA Vial; O – Other; E – Encore

Preservation: 1 – HCl, 4°; 2 – H2SO4, 4°; 3 – HNO3, 4°; 4 – NaOH, 4°; 5 – NaOH/ZnAc, 4°; 6 – Na2S2O3, 4°; 7 – 4°

Matrix Codes: DW – Drinking Water; WW – Wastewater; GW – Groundwater; SW – Surface Water; ST – Storm Water; W – Water; S – Soil; SL – Sludge; SD – Sediment; SO – Solid; A – Air; L – Liquid; P – Product

Field Sample No./Identification	Date	Time	COMP	GRAB	Sample Container (Size/Mat'l)	Matrix	Preserv.	Field Filtered	CL, Fl	Lab I.D.	Remarks
Eff # 2	7-18-12	0720		X	2.5g	L	ICE		X	25931	
" "	7-18-12	0720		X	1 g	"	"		X		

(D69)

Relinquished by: (Print Name)/(Affiliation)	Date	Received by: (Print Name)/(Affiliation)	Date
Stacy Stacy Pogo Signature: Stacy Stacy	07/18/12 Time: 1100	Jeff A. Hiller Pogo Signature:	7/18/12 Time: 1100
Relinquished by: (Print Name)/(Affiliation) Jeff A. Hiller Pogo Signature:	7/18/12 Time: 1430	Received by: (Print Name)/(Affiliation) Amber Potts / AECOM Signature: Amber Potts	7/19/12 Time: 1334
Relinquished by: (Print Name)/(Affiliation) Signature:	Date: Time:	Received by: (Print Name)/(Affiliation) Signature:	Date: Time:

Analytical Laboratory (Destination): rec. on ice via Fast-track @ 3.6°C (12.5) & 3.0°C (19)

AECOM Toxicology Lab
4303 W. Laporte Avenue
Fort Collins, CO 80521
(970) 416-0916
(970) 490-2963 (FAX)

Sample Shipped Via: UPS FedEx Courier Other

Temp blank: Yes No

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Serial No. № 52360

AECOM

015-016

CHAIN OF CUSTODY RECORD

6.19.2012

Page 1 of 1

Client/Project Name: Sumitomo Metal Mine Pogo

Project Location: FCEC

Project Number: 60225262-412

Field Logbook No.:

Sampler (Print Name)/(Affiliation):

Chain of Custody Tape Nos.: 42568 intact

Signature:

Send Results/Report to:

TAT:

Analysis Requested: CC, FC

Container Type: P – Plastic, A – Amber Glass, G – Clear Glass, V – VOA Vial, O – Other, E – Encore

Preservation: 1 – HCl, 4°; 2 – H2SO4, 4°; 3 – HNO3, 4°; 4 – NaOH, 4°; 5 – NaOH/ZnAc, 4°; 6 – Na2S2O3, 4°; 7 – 4°

Matrix Codes: DW – Drinking Water, WW – Wastewater, GW – Groundwater, SW – Surface Water, ST – Storm Water, W – Water, S – Soil, SL – Sludge, SD – Sediment, SO – Solid, A – Air, L – Liquid, P – Product

Field Sample No./Identification	Date	Time	COMP	GRAB	Sample Container (Size/Mat'l)	Matrix	Preserv.	Field Filtered	CC, FC	Lab I.D.	Remarks
Effl #3	07/20/12	0920		X	2.5g	L	ICE		X	25950	
" " "	7.20.12	0920		X	1g	"	"		X		

Relinquished by: (Print Name)/(Affiliation)	Date	Received by: (Print Name)/(Affiliation)	Date
L. Walker Signature:	7.20.12 Time: 1030	Jeff A. Hiller Pogo Signature:	7/20/12 Time: 1030
Jeff A. Hiller Pogo Signature:	7/20/12 Time: 2400	Jessica Contreras AECOM Signature:	7/21/12 Time: 1425
Signature:	Time:	Signature:	Time:

Analytical Laboratory (Destination): Received on ice @ 4.1°C (DG9)

AECOM Toxicology Lab
4303 W. Laporte Avenue
Fort Collins, CO 80521
(970) 416-0916
(970) 490-2963 (FAX)

Sample Shipped Via: UPS FedEx Courier Other

Temp blank: Yes No

Serial No. № 52361

Q:\GRAPHICS\FORMS\Chain of Custody (COC)\Chain-of-Custody_Ft. Collins_10_07.doc

APPENDIX B

Test Data

FCETL QA Form No. 051
Revision 4
Effective 1/96

QA: cw 08/02/12

TOXICITY DATA PACKAGE COVER SHEET

7/24/12
8/1/12

Test Type: Chronic

Project Number: 60225262-412-015

Test Substance: Effluent-(Outfall 001)

Species: *Ceriodaphnia dubia*

Dilution Water Type: Mod Hard

Organism Lot or Batch Number: 071612

Concurrent Control Water Type: NA

Age: <24hr (< 24 hr) Supplier: FCETL

Date and Time Test Began: 7/17/12 @ 1410

Date and Time Test Ended: 7/23/12 @ 1615

Protocol Number: USEPA 2002

Investigator(s): AB | AST | KB | DM | AK | BP

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 #: 21 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)?:

Reference Toxicant Data: Test Dates: 7/2/12 to 7/8/12 IC_{25}: 275 mg/L Cl⁻

Hist. 95% Control Limits: 192 to 722 Method for Determining Ref. Tox. Value: Linear Interpolation

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: MJ Date: 7/17/12

FCETL QA Form No. 041
Revision 4
Effective 1/96

TEST SUBSTANCE USAGE LOG

QA: CW 08/02/12

Project Number: 60225262-412-015

7/24/12
8/1/12

	Sample 1	Sample 2	Sample 3	Sample 4
Test Substance Number	25923	25931	25950	
Test Substance Collection Date and Time	From: 7/16/12 @ 0620	From: 7/18/12 @ 0720	From: 7/20/12 @ 0920	From: @
	To: N/A @	To: N/A @	To: N/A @	To: @
Sample Type (Grab or Comp)	Grab	Grab	Grab	
Date Test Substance Received	7/17/12	7/19/12	7/21/12	
Dilution Water Number (RW#) or FCETL#, circle one	10391	10395	10395	
Concurrent Control Water RW#	NA	NA	NA	
Date(s) Used	7/17/12	7/19/12	7/21/12	
	7/18/12	7/20/12	7/22/12	

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	AB 7/17/12 received cc+fc		
Initials / Date	AS 7/18/12▲ " "		
Initials / Date	DM 7/19/12 " "		
Initials / Date	7/20/12 " "		
Initials / Date	BP 7/21/12 "		
Initials / Date	BP 7/22/12 "		
Initials / Date			
Initials / Date			

▲ cylinder mismarked and 12.5% was really 12% at test initiation. corrected on Day 1 (per A. Rehner)

CERIODAPHNIA DUBIA
CHRONIC BIOLOGICAL DATA

Project Number: 60225262-412-015

7/24/12
QA: 07/26/12
08/01/12

Conc.	Day	A	B	C	D	E	F	G	H	I	J	Total	Mean	%survival Remarks
		Number of Neonates Produced and Survival of Original Organisms												
0 (MH)	1	0	0	0	0	0	0	0	0	0	0	0		100%
	2	0	0	0	0	0	0	0	0	0	0	0		
	3	0	4/1	0	5/1	6/1	0	0	0	5/1	0	20		
	4	0	0	5/1	1/1	0	5/1	6/1	7/1	0	6/1	30		A large neo
	5	10/1	7/2	6/2	11/2	11/2	9/2	9/2	8/2	4/2	15/2	90		
	6	14/~~32~~ ②	15/3	14/3	15/3	15/3	0	14/3	15/3	14/3	16/3	132		
	7													
	8													
Total		24	26	25	32	32	14	29	30	23	37	272	27.2	
12.5%	1	0	0	0	0	0	0	0	0	0	0	0		100%
	2	0	0	0	0	0	0	0	0	0	0	0		
	3	4/1	0	0	0	0	0	0	0	4/1	3/1	11		
	4	0	5/1	3/1	0	7/1	6/1	5/1	5/1	0	0	31		
	5	11/2	10/2	11/2	8/1	8/2	13/2	0	11/2	12/2	8/2	92		
	6	19/3	0	16/3	15/2	0	14/3	10/2	8/3	17/3	19/3	118		
	7													
	8													
Total		34	15	30	23	15	33	15	24	33	30	252	25.2	
25%	1	0	0	0	0	0	0	0	0	0	0	0		100%
	2	0	0	0	0	0	0	0	0	0	0	0		
	3	0	0	0	0	0	0	3/1	0	5/1	4/1	12		
	4	6/1	5/1	4/1	6/1	5/1	6/1	0	6/1	0	0	38		
	5	10/2	11/2	9/2	9/2	13/2	0	13/2	12/2	7/2	16/2	100		
	6	0	16/3	15/3	0	21/3	7/2	19/3	19/3	16/3	20/3	133		
	7													
	8													
Total		16	32	28	15	39	13	35	37	28	40	283	28.3	

Day:	1	2	3	4	5	6	7	8		Key to symbols:
Date:	7/18/12	7/19/12	7/20/12	7/21/12	7/22/12	7/23/12				X = Original organism died.
Time:	~~1020~~ 1040	1530	1430	1510	1000	1615				M = Male
Initials:	RS	DM	AR	[illegible]	AM	DM				

① 7/18/12 E
② Not sex? 7/23/12 E

FCETL QA Form No. 057
Revision 1
Effective 2/93

CERIODAPHNIA DUBIA
CHRONIC BIOLOGICAL DATA

7/24/12
QA: cw 07/26/12
08/01/12

Project Number: 60225262-412-015

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
50%	1	0	0	0	0	0	0	0	0	0	0	0		100%
	2	0	0	0	0	0	0	0	0	0	0	0		
	3	4/1	0	0	0	4/1	0	0	0	5/1	4/1	17		
	4	1/1 △	1/1	6/1	8/1	0	6/1	6/1	5/1	0	0	33		△ large neos
	5	2 1/2 *	8/2 ▽	8/2 ⊗	14 1/2	13 1/2	11 1/2	12 1/2	10 1/2	10 1/2	14 1/2	105		* under. neos n.c. ▽ small neos
	6	6/3 ⊗	18/3	16/3	18/3	19/3	20/3	18/3	23/3	17/3	17/3	172		⊗ dead neos n.c.
	7													
	8													
Total		13	27	33	40	36	37	36	38	32	35	327	32.7	
75%	1	0	0	0	0	0	0	0	0	0	0	0		100%
	2	0	0	0	0	0	0	0	0	0	0	0		
	3	0	0	0	5/1	4/1	0	0	0	4/1	0	13		
	4	5/1	5/1	6/1	0	0	5/1	6/1	5/1	0	6/1	38		
	5	12 1/2	12 1/2	14 1/2	13 1/2	10 1/2	9 1/2	13 1/2	12 1/2	16 1/2	12 1/2	123		
	6	16/3	19/3	17/3	22/3	~~19/3~~ 19/3 ⊗	20/3	0	17/3	16/3	0	146		
	7													
	8													
Total		⊗ 23	36	37	40	33	34	19	34	36	18	320	32.0	
100%	1	0	0	0	0	0	0	0	0	0	0	0		100%
	2	0	0	0	0	0	0	0	0	0	0	0		
	3	4/1	0	0	3/1	0	0	0	0	0	4/1	⊗ 8 11		
	4	0	4/1	3/1	0	5/1	6/1	5/1	6/1	6/1	1/1 △	36		△ large neos
	5	9 1/2	10 1/2	13 1/2	12 1/2	9 1/2	11 1/2	12 1/2	9 1/2	12 1/2	15 1/2	112		
	6	24/3	0	17/3	23/3	20/3	0	17/3	0	21/3	20/3	142		
	7													
	8													
Total		37	14	33	38	34	17	34	15	39	40	301	30.1	

Day:	1	2	3	4	5	6	7	8
Date:	7/18/12	7/19/12	7/20/12	7/21/12	7/22/12	7/23/12		
Time:	~~0920~~ 1010	1530	1430	1510	1000	1615		
Initials:	AG	DM	[illegible]	[illegible]	AG	DM		

Key to symbols:
X = Original organism died.
M = Male
N.C. = not counted

⊗ AG 7/18/12 E
⊗ AG 7/24/12 E
⊗ DM 7/23/12 C
⊗ 7/24/12, E

CHRONIC CHEMICAL DATA (INITIAL)

7/24/12
08/01/12
QA:CW 08/02/12

Project Number: 60225262-412-015

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	8.4	8.2	8.2	8.4	8.2	8.2			FM21	
D.O. (mg/L)	6.7	6.6	6.5	6.9	6.9	6.7			5	
Temp. (°C)	25	25	25	25	25	25			D62	
Cond. (µS/cm)	297	295	297	314	308	308			15	
Hard. (mg/L)	88		90		84				Titr.	
Alk. (mg/L)	57		61		60				Titr.	
TRC (mg/L)	(7/13/12) <0.02		(7/18/12) <0.02						#21	
NH_3 (mg/L) **	<1.0		<1.0						HA#1	
Conc.: 12.5%										
pH	8.3	8.1	8.1	8.3	8.3	8.2				
D.O. (mg/L)	6.7	6.7	6.5	6.9	6.9	6.7				
Temp. (°C)	*	*	*	*	*	*				
Cond. (µS/cm)	297	289	294	303	307	304				
Hard. (mg/L)										
Alk. (mg/L)										
TRC (mg/L)										
NH_3 (mg/L)										
Conc.: 25%										
pH	8.2	8.0	8.0	8.2	8.1	8.1				
D.O. (mg/L)	6.7	6.7	6.5	7.0	6.8	6.7				
Temp. (°C)	*	*	*	*	*	*				
Cond. (µS/cm)	281	278	285	295	296	296				
Conc.: 50%										
pH	8.0	7.8	7.8	8.0	8.0	7.9				
D.O. (mg/L)	6.7	6.7	6.5	7.0	6.8	6.9				
Temp. (°C)	*	*	*	*	*	*				
Cond. (µS/cm)	259	257	265	275	278	279				
Date:	7/17/12	7/18/12	7/19/12	7/20/12	7/21/12	7/22/12				
Time:	1840	1025	1510	1410	1450	1020				
Initials:		DB	AS	AR	BP	AS				

Note: Hardness, alkalinity, TRC, and NH3 data appearing on this page have been transcribed from the wet chemistry log FCETL 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 AS 7/19/12

FCETL QA Form No. 058
Revision 3
Effective 3/98

CHRONIC CHEMICAL DATA (INITIAL)

7/24/12
08/01/12
QA: 08/02/12

Project Number: 60225262-412-015

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	7.6	7.6	7.7	7.8	7.7			PM21	
D.O. (mg/L)	6.7	6.6	6.6	7.0	6.9	6.9			5	
Temp. (°C)	*	*	*	*	*	*			DO2	
Cond. (µS/cm)	238	234	244	254	263	264			15	
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	7.4	7.5	7.5	7.5	7.5				
D.O. (mg/L)	6.8	6.7	6.7	7.0	7.0	7.0				
Temp. (°C)	25	25	25	25	25	25				
Cond. (µS/cm)	215	209	224	233	246	245				
Hard. (mg/L)	66		70		72					
Alk. (mg/L)	32		36		37					
TRC (mg/L)	<0.02		<0.02		<0.02					(on a preserved sample)
NH_3 (mg/L)	1.6 Δ		2.2 Δ		2.4 Δ					Δ measured 7/26/12 with meter #3
Date:	7/17/12	7/18/12	7/19/12	7/20/12	7/21/12	7/22/12				
Time:	1340	1025	1510	1440	1450	1020				
Initials:		AG	AG		BP	AG				

Note: Hardness, alkalinity, TRC, and NH3 data appearing on this page have been transcribed from the wet chemistry log FCETL 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.

FCETL QA Form No. 059
Revision 2
Effective 1/96

CHRONIC CHEMICAL DATA (FINAL)

7/24/12
08/01/12
QA: CW 08/02/12

Project Number:	60225262-412-015
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)						334			All Conc. 15	* conductivity (15)
pH	8.1	8.1	8.1	8.1	8.1	8.3			Fm2	
D.O. (mg/L)	6.3	6.5	6.7	6.7	6.7	6.4			5	
Temp (°C)	25	25	24	24	24	25			D77	
Conc.: 12.5%						341				
pH	8.0	8.1	8.1	8.1	8.1	8.2				
D.O. (mg/L)	6.2	6.4	6.8	6.6	6.6	6.4				
Temp (°C)	25	24	25	24	24	25				
Conc.: 25%						351				
pH	8.0	8.1	8.1	8.1	8.1	8.2				
D.O. (mg/L)	6.4	6.4	6.8	6.7	6.7	6.4				
Temp (°C)	25	24	25	24	24	25				
Conc.: 50%						307				
pH	① 7.9	8.0	8.0	8.1	8.1	8.1				
D.O. (mg/L)	6.3	6.4	6.9	6.7	6.7	6.3				
Temp (°C)	25	24	24	25	25	25				
Conc.: 75%						281				
pH	7.9	7.9	8.0	8.0	8.0	8.1				
D.O. (mg/L)	6.4	6.3	6.8	6.7	6.7	6.3				
Temp (°C)	25	24	25	25	25	25				
Conc.: 100%						262				* conductivity (15)
pH	7.8	7.9	7.9	7.9	8.0	8.0				
D.O. (mg/L)	6.4	6.3	6.9	6.6	6.7	6.3				
Temp (°C)	25	24	25	24	24	24				
Conc.:										
pH										
D.O. (mg/L)										
Temp (°C)										
Date:	7/18/12	7/19/12	7/20/12	7/21/12	7/22/12	7/23/12				
Time:	1040	1525	1415	1515	1035	~~1400~~ 1600 ②				
Initials:	AS	DM	[illegible]	[illegible]	AS	DM				

① AS 7/18/12 ② DM 7/23/12

DAILY TOXICITY TEST LOG

A 7/24/12

Project Number:	60225262-412-015
Test Species:	***Ceriodaphnia dubia***

QA:cw 08/02/12

General Comments	Neonates obtained from 071012 HTB cerio monoculture board (green marked cups) Random Chart: Nova	Feeding 0.2 ml YTC/ALG Daily	Initials/Date
Test Day 0	Test Solution Mixed at: 1335 Test Organisms Added at: 1410	Fed @ 1345	IF 7/17/12
Test Day 1	CT= 25.0°C Range = 24.6-25.6 °C	Fed @ 1025	AS 7/18/12
Test Day 2	CT= 25.0 °C Range = 24.6 - 25.2 °C	Fed @ 1510	DM 7/19/12
Test Day 3	CT= 24.8 °C Range = 24.2-25.2 °C	Fed @ 1420	A 7/20/12
Test Day 4	CT= 24.8 °C Range = 24.6 - 25.2 °C	Fed @ 1450	7/21/12
Test Day 5	CT= 24.8 °C Range = 24.6-25.2 °C	Fed @ 1025	AS 7/22/12
Test Day 6	CT= 25.0 °C Range = 24.2-25.0 °C	Fed @ None	DM 7/23/12
Test Day 7	CT= °C Range = °C	Fed @	
Test Day 8	CT= °C Range = °C	NONE	

Toxstat Version 3.5
Study # 60225262-412-015
Sumitomo Metal Mining Pogo
Ceriodaphnia dubia
Summary Statistics for Reproduction per Original

QA:CW 07/26/12
7/24/12

Title: 60225262-412-015
File: 412015cr.dat Transform: NO TRANSFORMATION

Summary Statistics on Data TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	Control	10	14.0000	37.0000	27.2000
2	12.5	10	15.0000	34.0000	25.2000
3	25	10	13.0000	40.0000	28.3000
4	50	10	13.0000	40.0000	32.7000
5	75	10	18.0000	40.0000	32.0000
6	100	10	14.0000	40.0000	30.1000

Title: 60225262-412-015
File: 412015cr.dat Transform: NO TRANSFORMATION

Summary Statistics on Data TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	Control	40.1778	6.3386	2.0044	23.3037
2	12.5	62.6222	7.9134	2.5024	31.4025
3	25	105.3444	10.2637	3.2457	36.2676
4	50	60.9000	7.8038	2.4678	23.8650
5	75	55.1111	7.4237	2.3476	23.1990
6	100	109.4333	10.4610	3.3081	34.7543

Toxstat Version 3.5
Study # 60225262-412-015
Sumitomo Metal Mining Pogo
Ceriodaphnia dubia
Determination of NOEC and LOEC for Reproduction per Original

dk 7/24/12
QA:cw 07/26/12

Title: 60225262-412-015
File: 412015cr.dat Transform: NO TRANSFORMATION

Chi-Square Test for Normality

Actual and Expected Frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	4.0200	14.5200	22.9200	14.5200	4.0200
OBSERVED	5	11	21	22	1

Chi-Square = 7.3752 (p-value = 0.1173)

Critical Chi-Square = 13.277 (alpha = 0.01 , df = 4)
= 9.488 (alpha = 0.05 , df = 4)

Data PASS normality test (alpha = 0.01). Continue analysis.

Title: 60225262-412-015
File: 412015cr.dat Transform: NO TRANSFORMATION

Shapiro - Wilk's Test for Normality

******** Shapiro - Wilk's Test is aborted ********

This test can not be performed because total number of replicates is greater than 50.

Total number of replicates = 60

Title: 60225262-412-015
File: 412015cr.dat Transform: NO TRANSFORMATION

Bartlett's Test for Homogeneity of Variance

Calculated B1 statistic = 3.2823 (p-value = 0.6566)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

Critical B = 15.0863 (alpha = 0.01, df = 5)
= 11.0705 (alpha = 0.05, df = 5)

Toxstat Version 3.5
Study # 60225262-412-015
Sumitomo Metal Mining Pogo
Ceriodaphnia dubia
Determination of NOEC, LOEC and PMSD for Reproduction per Original

07/24/12
GA-ω 07/26/12

Title: 60225262-412-015
File: 412015cr.dat Transform: NO TRANSFORMATION

ANOVA Table

SOURCE	DF	SS	MS	F
Between	5	416.9500	83.3900	1.1540
Within (Error)	54	3902.3000	72.2648	
Total	59	4319.2500		

(p-value = 0.3438)

Critical F = 3.3769 (alpha = 0.01, df = 5,54)
= 2.3861 (alpha = 0.05, df = 5,54)

Since F < Critical F FAIL TO REJECT Ho: All equal (alpha = 0.05)

Title: 60225262-412-015
File: 412015cr.dat Transform: NO TRANSFORMATION

Dunnett's Test - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG 0.05
1	Control	27.2000	27.2000		
2	12.5	25.2000	25.2000	0.5261	
3	25	28.3000	28.3000	-0.2893	
4	50	32.7000	32.7000	-1.4467	
5	75	32.0000	32.0000	-1.2626	
6	100	30.1000	30.1000	-0.7628	

Dunnett critical value = 2.3100 (1 Tailed, alpha = 0.05, df [used] = 5,40)
(Actual df = 5,54)

Title: 60225262-412-015
File: 412015cr.dat Transform: NO TRANSFORMATION

Dunnett's Test - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	MIN SIG DIFF (IN ORIG. UNITS)	% OF CONTROL	DIFFERENCE FROM CONTROL
1	Control	10			
2	12.5	10	8.7819	32.3	2.0000
3	25	10	8.7819	32.3	-1.1000
4	50	10	8.7819	32.3	-5.5000
5	75	10	8.7819	32.3	-4.8000
6	100	10	8.7819	32.3	-2.9000