

**Upper Animas River
Surface Water Toxicity Testing Report
April 2013 Surface Water Collection
Final**

Prepared for:



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List of Acronyms

BERA	Baseline Ecological Risk Assessment
°C	Degrees Celsius
CDPHE	Colorado Department of Public Health and Environment
CETIS	Comprehensive Environmental Toxicity Information System
EPA	United States Environmental Protection Agency
ESAT	Environmental Services Assistance Team
LC50	50% Lethal Concentration
LCL	Lower Confidence Limit
mg/L	Milligrams per liter
MHRW	Moderately Hard Reconstituted Water
mL	Milliliter
ms/cm	Millisiemens/centimeter
QA	Quality assurance
QAPP	Quality Assurance Project Plan
SI	Site Inspection
UCL	Upper Confidence Limit
ug/L	Micrograms per liter

1.0 INTRODUCTION

Acute (96-hour), static-renewal toxicity tests were performed in April of 2013 at the United States Environmental Protection Agency (EPA) Region 8 Laboratory using juvenile rainbow trout (*Oncorhynchus mykiss*) exposed to undiluted and serially-diluted surface water samples from the Animas River, Cement Creek, and Mineral Creek collected at and downstream of the town of Silverton, CO. Three tests were performed during 2012 and 2013 to better understand the chemistry and potential acute aquatic toxicity of metal contamination in these streams associated with historical mining activities and to provide data in support of a future Baseline Ecological Risk Assessment (BERA) as part of an on-going Remedial Investigation (RI).

As a Quality Assurance (QA) measure, a simultaneous reference toxicity test with a separate batch of juvenile rainbow trout was performed using Hard Reconstituted Water (HRW) spiked with different concentrations of zinc sulfate heptahydrate (include formula). Survival was the endpoint evaluated in all tests. This report includes a brief background of the Upper Animas River area in the vicinity of Silverton, materials and methods, test results, a discussion of those results, and supporting references.

1.1 Background

The following background information was obtained from the *Baseline Sampling and Analysis Plan for Upper Cement Creek Water Quality Characterization* (EPA, 2009). The discovery of gold and silver brought miners to the Silverton area and Animas Mining District in the early 1870's. The discovery of silver in the base-metal ores was the major factor in establishing Silverton as a permanent settlement. Between 1870 and 1890, the richer ore deposits were discovered and mined to the extent possible. Not until 1890 was any serious attempt made to mine and concentrate the larger low-grade ore bodies in the area. Twelve concentration mills in the valley were sending their products to the Kendrick and Gelder Smelter near the mouth of Cement Creek by 1900. Mining and milling operations slowed down around 1905. At that point in time, the remaining mines were consolidated into fewer and larger operations with the facilities for milling large volumes of ore. Mining and milling activities continued throughout the basin after 1907, but only when prices were relatively favorable.

Gladstone, located about eight miles upstream of Silverton on Cement Creek, is the site of an historic mining town which developed in the 1880s with the onset of mining in the surrounding area. The town was the central location and railroad terminus for milling and shipping mine ores from the surrounding valley. The town declined in the 1920's and no remnants of it remain today. Only one, year-round, producing mine (Sunnyside Mine) remained in the county by the 1970's. This mine ceased production in 1991, and has since undergone extensive reclamation efforts. The Gold King Mine's permit with the Division of Reclamation, Mining and Safety (DRMS) is currently in inactive status; however, landowners hope to rehabilitate the mine.

Both the Sunnyside and Gold King properties were partially accessed through the American Tunnel which has its portal in Gladstone. Previously, this feature drained as much as 1,600 gallons per minute (gpm) of water from the mines. A lime feed and settling pond-type treatment facility was constructed in Gladstone in 1979 by Standard Metals Corporation. Water discharging from the American Tunnel was treated as required by the water discharge permit. The facility operations and mine ownership was later transferred to the Sunnyside Gold Corporation (SGC). SGC installed several bulkheads within the Sunnyside Mine under jurisdiction of a court consent decree to terminate their discharge permit. This action greatly reduced the volume of discharge from the American Tunnel. However, the tunnel currently continues to discharge 70 to 100 gpm, presumably from near-surface groundwater. SGC met all terms of the consent decree in 2002.

Numerous historic and now abandoned mines exist within a two-mile radius of Gladstone. They include: the Upper Gold King 7 Level, American Tunnel, Grand Mogul, Mogul, and Red and Bonita, Evelyne, Henrietta, Joe and John, and Lark mines. Some of these mines have acid mine drainage that flows between 30 and 300 gpm directly or indirectly into Cement Creek and eventually into the Animas River.

1.2 Objective

The objectives of the toxicity tests were to: (a) characterize the effects of mine waste-impacted surface water samples on juvenile rainbow trout under acute exposure conditions, (b) refine the understanding of the extent of toxicity in Mineral Creek, Cement Creek, and the Animas River with and without dilution, and (c) generate data to support the future BERA and RI.

2.0 MATERIALS AND METHODS

This section outlines the materials and methods used in the test, including surface water collection procedures, water preparation and delivery, test organisms, food preparation, and test conditions. The general test methods and testing criteria followed EPA protocol (EPA, 2002) and are summarized in **Table 2.5-1**.

2.1 Surface water collection

Surface water samples were collected on April 16, 2013 from the Animas River, Cement Creek, and Mineral Creek. These samples were intended to represent low-flow conditions (i.e., before the May-June snowmelt period). The weather before and during the sampling event was sunny, windy, and cool with ambient temperature in the morning around 35°C and afternoon temperature of approximately 50°C.

The surface water samples used in the toxicity tests were obtained from the following locations (see **Figure 2.1-1**):

- A68: sample collected from the Animas River about 0.5 mile upstream of the confluence with Cement Creek in Silverton; this sample represents the regional conditions in the Animas River above Silverton.

- *M34*: sample collected from Mineral Creek about 0.29 miles above the confluence with the Animas River in Silverton.
- *A72*: sample collected from the Animas River about 0.71 miles downstream of the confluence with Mineral Creek below Silverton.
- *A73*: sample collected from the Animas River just above the confluence with Elk Creek, located about 5 miles downstream from *A72*.
- *A73B*: Sample collected from the Animas River below the confluence with Elk Creek, located about 5.1 miles downstream from *A72*.
- *A75B*: sample collected from the Animas River below the confluence with Cascade Creek, located about 12.80 miles downstream from *A73B*.
- *CC48/M34*: a mixed sample collected from Cement Creek at location *CC48* and Mineral Creek at location *M34* (note: *CC48* is located about 0.80 miles above the confluence with the Animas River in Silverton).

Surface water samples *A68*, *M34*, *A72*, *A73*, *A73B*, and *A75B* represent composite samples collected in the mid-water column across the width of the Animas River and Mineral Creek.

Mixed surface water sample *CC48/M34* was collected using a discharge-weighted approach based on the total discharge of the two creeks. As a result, this sample represented roughly two parts Mineral Creek for every one part Cement Creek.

All the surface water samples were immediately stored on ice in coolers in the field and transported to the Region 8 laboratory until use for testing. Once at the laboratory, they were placed in a cooler at 4°C until the test started, which took place within 36 hours after the last sample was collected.

2.2 Water preparation and renewal

The water samples collected from *A68*, *M34*, *A72*, *A73*, *A73B*, and *A75B* were tested undiluted (full strength) for acute toxicity. The water sample obtained from location *A72* in the Animas River was also serially diluted with HRW (laboratory control water) before these dilutions were tested for acute toxicity. Mixed water sample *CC48/M34* was serially diluted twice, using the water sample obtained from location *A68* and using HRW, before these two dilution series were tested separately for acute toxicity.

The HRW was prepared according to Smith *et al.* (1997) by adding 95 grams of calcium sulfate, 246 grams of magnesium sulfate heptahydrate, 192 grams of sodium bicarbonate, and 8 grams of potassium chloride to the laboratory stainless steel batch tank containing 1,000 liters of deionized water. Once the HRW was prepared, the batch tank was continuously aerated during the toxicity test. The water quality of the HRW was measured to verify that key parameters had been met, as follows: hardness between 160-180 milligrams per liter (mg/L), alkalinity between 110-120 mg/L, and pH between 7.6 and 8.0 (EPA, 2002). Actual results for HRW batch water are as follows: hardness of 176 mg/L, alkalinity of 120 mg/L, conductivity of 634 ms/cm and pH of 7.4

The exposure water in each of the test chambers was replaced daily. The renewal was achieved when >90% of the water in each vessel was replaced (measured volumetrically). Site water used for renewal was first warmed to 12 degrees Celsius (°C) prior to use. The water temperature was held constant during the 96-hour exposure period by placing all the test chambers in a temperature-controlled water bath.

2.3 Test organisms

Juvenile (15-30 days post yolk-sac absorption) rainbow trout (*O. mykiss*) were obtained from Trout Lodge, Inc. (Sumner, Washington) for use in the toxicity tests. An importation license was obtained from the Colorado Division of Wildlife before the *O. mykiss* were shipped by the supplier. The trout were of uniform size and had an average wet weight of 0.38 grams.

The fish in the shipping bag were placed in a 20-gallon holding tank at 12°C to equilibrate the temperature after they arrived at the Region 8 laboratory. Afterwards, the shipping bag was carefully opened to allow a small amount of HRW water to enter the bag. This procedure was repeated several times throughout the day until laboratory HRW and shipping water were well mixed. The fish were then released from the shipping bag into the holding tank where they were held for five days until used for testing.

2.4 Feeding procedure

The fish were fed starter trout chow obtained from Nelson's Silver Cup, Inc. in accordance with EPA methods (EPA, 2002). The fish were fed twice each day before the test started and once daily thereafter. They were not fed for 24 hours before the start of the test to reduce waste accumulation.

2.5 Toxicity test procedures

The following subsections summarize the procedures used for the acute toxicity tests and the reference toxicity test.

All test chambers consisted of 1-L glass beakers placed in a water bath to maintain a temperature of 12° C during the 96-hour exposure period. Four replicates were tested for each water sample, including the laboratory control. The test followed the criteria specified in EPA (2002) (see also **Table 2.5-1**).

A laboratory control consisting of HRW was also tested to verify the health of the test organisms and to serve as a reference sample. Note that sample A68 was not used as a reference because it was impacted by mining-related activities or natural discharges in the watershed upstream of Silverton.

Ten fish were added to each test chamber at the start of the test using a small dip net and an 8-ounce cup, in which the count was quickly verified. Four replicate test chambers were used for each of the site and reference water samples.

Dissolved Oxygen (DO), pH, conductivity, and temperature were measured directly from each replicate. Water samples were also collected on Day 0 and Day 4 from each test chamber for the following analyses: total and dissolved metals (EPA Method 200.7/200.80), anions (EPA Method 300.0), ammonia (EPA Method 350.1), and alkalinity (EPA Method 310.1). Fish mortality was observed daily and recorded. All dead organisms were removed and discarded.

2.5.1 Profile testing of the Animas River and Mineral Creek surface water samples

The composite surface water samples collected from the Animas River (A68, A72, A73, A73B, and A75B) and Mineral Creek (M34) were tested undiluted (i.e., 100% strength).

Appendix A provides the survival and daily water chemistry data for this test. **Table 2.5-2** provides the initial and final results for total recoverable metals, whereas **Table 2.5-3** provides the initial and final results for dissolved metals. **Table 2.5-4** summarizes the initial and final wet chemistry results, whereas **Table 2.5-5** shows initial and final ammonia levels, as well as the calculated pH-adjusted acute ammonia surface water criteria for comparison.

2.5.2 Serial Dilution Toxicity Testing

2.5.2.1 Animas River water (A72) diluted by HRW

The surface water sample collected from location A72 in the Animas River was serially diluted with HRW to determine what dilutions of site water would cause acute toxicity to juvenile rainbow trout. The serial dilutions resulted in Animas River A72 surface water samples of 88%, 75%, 50%, 35%, 25%, and 12% strength.

Appendix B provides the survival and daily water chemistry data for this dilution series. **Table 2.5-2** provides the initial and final results for total recoverable metals, whereas **Table 2.5-3** provides the initial and final results for dissolved metals. **Table 2.5-4** summarizes the initial and final wet chemistry results, whereas **Table 2.5-5** shows initial and final ammonia levels, as well as the calculated pH-adjusted acute ammonia surface water criteria for comparison.

2.5.2.2 Combined Mineral Creek and Cement Creek water (M34/CC48) diluted by A68 and HRW

The stream discharge-weighted mixed surface water sample M34/CC48 was serially diluted either with HRW or with Animas River water collected upstream of Silverton (i.e., A68) to determine what dilutions would cause acute toxicity to juvenile rainbow trout. The serial dilutions resulted in M34/CC48 surface water samples of 100%, 95%, 90%, 80%, 75%, 50%, and 25% strength.

Appendices C and D provide the survival and daily water chemistry data for the A68 diluent series and HRW diluent series, respectively. **Table 2.5-2** provides the initial and final results for total recoverable metals, whereas **Table 2.5-3** provides the initial and

final results for dissolved metals. **Table 2.5-4** summarizes the initial and final wet chemistry results, whereas **Table 2.5-5** shows initial and final ammonia levels, as well as the calculated pH-adjusted acute ammonia surface water criteria for comparison.

2.5.3 Reference Toxicity Testing

For QA purposes, a reference toxicity test using juvenile rainbow trout was performed simultaneously with the site water toxicity tests. HRW was spiked with different concentrations of a zinc sulfate heptahydrate. Zinc concentrations were reduced by 50% starting with the highest target concentration until the lowest dilution of 6.25% was reached.

The following values present the dilutions and average dissolved zinc levels (obtained by averaging the initial and final dissolved zinc results) used for this reference test: 100% concentration (1075 µg/L Zn), 50% concentration (525 µg/L Zn), 25% concentration (305 µg/L), 12.5% concentration (155 µg/L Zn), and 6.25% concentration (87.7 µg/L). The zinc levels were verified in the analytical laboratory using EPA Method 200.7/200.8.

Appendix E provides the survival and daily water chemistry data for the reference toxicity test. **Table 2.5-2** provides the initial and final results for total recoverable metals, whereas **Table 2.5-3** provides the initial and final results for dissolved metals. **Table 2.5-4** summarizes the initial and final wet chemistry results, whereas **Table 2.5-5** shows initial and final ammonia levels, as well as the calculated pH-adjusted acute ammonia surface water criteria for comparison.

3.0 RESULTS

This section presents the results of the various toxicity tests performed on the surface water samples collected from the Animas River, Cement Creek, and Mineral Creek, plus the reference toxicity test.

The juvenile rainbow trout exposed to the laboratory control water (HRW) showed 100% survival after 96 hours of exposure, which exceeded the minimum performance criterion of 90% survival. As a result, all the tests discussed below are considered valid.

The Comprehensive Environmental Toxicity Information System (CETIS) statistical software package (version 1.8.0.13) was used to analyze the significance of the results discussed below.

CETIS was used to perform Analyses of Variance (ANOVAs) to identify the presence of statistically significant differences in survival measured in the profile test and serial dilution tests when compared to those measured in the laboratory control sample.

In addition, CETIS was used to calculate EC₅₀ values based on the survival data from all the serial dilution tests and the reference toxicity test.

3.1 The Animas River and Mineral Creek profile test

The water quality parameters were consistent throughout this toxicity test (see **Appendix A** and **Table 2.5-5**). All DO readings remained above 6.0 mg/L, and the average test chamber temperatures fell within +/- 2°C of the target (12°C), which met the performance criteria for these two parameters. The ammonia measured on day 0 and day 4 remained well below the pH-adjusted and sample-specific acute ammonia criteria, indicating that ammonia levels were not a concern in this test.

The results showed 67.5% survival at A68, 15% at M34, 0% survival at A72, 97.5% survival at A73, 97.5% survival at 73B, and 100% survival at A75B (see **Appendix A** and **Figure 3.1**). The ANOVA and Steel Many-One Rank Test found no statistically significant differences when survival in A73, 73B, and A75B was compared to that measured in the control. Survival was significantly lower in A68, M34, and A72 when compared to that measured in the control (see **Attachment 1**).

3.2 A72 diluted by HRW

The water quality parameters were consistent throughout the toxicity test (see **Appendix B** and **Table 2.5-5**). All DO readings remained above 6.0 mg/L, and the average test chamber temperatures fell within +/- 2°C of the target (12°C), which met the performance criteria for these two parameters. The ammonia measured on day 0 and day 4 remained well below the pH-adjusted and sample-specific acute ammonia criteria, indicating that ammonia levels were not a concern in this test.

The results showed that 100% of the juvenile rainbow trout survived at all the dilutions except the 88% dilution which had a survival of 97.5% (see **Appendix B** and **Figure 3.1**).

These data were statistically analyzed using CETIS, which provided the following results:

- The ANOVA and Steel Many-One Rank Test found that survival in all the dilutions did not differ significantly from that measured in the HRW sample (see **Attachment 2**).
- CETIS selected a Linear Interpolation to calculate an EC₅₀ of >88% based on the dose-response data (see **Attachment 2**).

3.3 M34/CC48 diluted by A68 and HRW

3.3.1 A68 as a diluent

The water quality parameters were consistent throughout the toxicity test (see **Appendix C** and **Table 2.5-5**). All DO readings remained above 6.0 mg/L, and the average test chamber temperatures fell within +/- 2°C of the target (12°C), which met the performance

criteria for these two parameters. The ammonia measured on day 0 and day 4 remained well below the pH-adjusted and sample-specific acute ammonia criteria, indicating that ammonia levels were not a concern in this test or a source of toxicity.

Survival in juvenile rainbow trout exposed for 96 hours to the CC48/M34 sample diluted with A68 surface water was as follows: 100% CC48/M34 = 0% survival; 95% CC48/M34 = 0% survival; 90% CC48/M34 = 0% survival; 80% CC48/M34 = 0% survival; 75% CC48/M34 = 0% survival; 50% CC48/M34 = 90% survival; and 25% CC48/M34 = 100% survival (see **Appendix C** and **Figure 3.2**).

These data were statistically analyzed using CETIS, which provided the following results:

- The ANOVA and Steel Many-One Rank Sum Test found that survival in the 100%, 95%, 90%, 80%, and 75% CC48/M34 samples was significantly lower than that measured in the HRW sample. Survival in the 50% and 25% CC48/M34 samples did not differ significantly from that measured in the HRW sample (see **Attachment 3**).
- CETIS selected the Spearman-Kärber method to calculate an EC₅₀ of 58% based on the dose-response data. This value indicated that half of the juvenile rainbow trout can be expected to die after 96 hours of exposure to a mixture consisting of 58% of CC48/M34 surface water and 42% of A68 surface water. The EC₅₀ had a 95% Lower Confidence Limit (95% LCL) of 55.0% and a 95% Upper Confidence Limit (95% UCL) of 61.1% (see **Attachment 3**).

3.3.2 HRW as a diluent

The water quality parameters were consistent throughout the toxicity test (see **Appendix D** and **Table 2.5-5**). All DO readings remained above 6.0 mg/L, and the average test chamber temperatures fell within +/- 2°C of the target (12°C), which met the performance criteria for these two parameters. The ammonia measured on day 0 and day 4 remained well below the pH-adjusted and sample-specific acute ammonia criteria, indicating that ammonia levels were not a concern in this test.

Survival in juvenile rainbow trout exposed for 96 hours to the CC48/M34 sample diluted with HRW was as follows: 95% CC48/M34 = 0% survival; 90% CC48/M34 = 0% survival; 75% CC48/M34 = 100% survival; 50% CC48/M34 = 100% survival; and 25% CC48/M34 = 100% survival (see **Appendix D** and **Figure 3.2**).

These data were statistically analyzed using CETIS, which provided the following results:

- The ANOVA and Steel Many-One Rank Test found that survival in the 95% and 90% CC48/M34 samples were significantly lower than that measured in the HRW

sample. Survival in the 75%, 50% and 25% CC48/M34 samples did not differ significantly from that measured in the HRW sample (see **Attachment 4**).

- CETIS selected the Binomial/Graphical Estimates method to calculate an EC₅₀ of 82.2% based on the dose-response data (see **Attachment 4**). This value indicated that half of juvenile rainbow trout can be expected to die after 96 hours of exposure to a mixture consisting of 82.2% of CC48/M34 surface water and 17.8% of HRW. The EC₅₀ had a 95% LCL of 79.8% and a 95% UCL of 84.6% (**Attachment 4**).

3.4 Reference Toxicity Test

A reference toxicity test was conducted simultaneously with the other toxicity tests to check for the quality of the juvenile rainbow trout. The water quality parameters were consistent throughout this test (see **Appendix E** and **Table 2.5-5**). All DO readings remained above 6.0 mg/L, and the average test chamber temperatures fell within +/- 2°C of the target (12°C), which met the performance criteria for these two parameters. The ammonia measured on day 0 and day 4 remained well below the pH-adjusted and sample-specific acute ammonia criteria, indicating that ammonia levels were not a concern in this test.

The zinc concentrations used in the reference toxicity test increased sequentially as follows (the % survival at the end of the 96-hour exposure period is included in parentheses): 6.25% strength = 88 µg/L (97.5% survival); 12.5% strength = 155 µg/L (85% survival); 25% strength = 305 µg/L (15% survival); 50% strength = 525 µg/L (0% survival); and 100% strength (i.e., no dilution) = 1075 µg/L (0% survival) (see **Appendix E** and **Figure 3.3**).

CETIS selected the Trimmed Spearman-Kärber method to calculate an EC₅₀ of 215.8 µg/L based on the dose-response data (see **Attachment 5**). This value indicated that half of juvenile rainbow trout can be expected to die after 96 hours of exposure to surface water that contains 215.8 µg/L of zinc. The EC₅₀ had a LCL of 194.5 µg/L and an UCL of 239.4 µg/L (see **Attachment 5**). This value is comparable to previous reference toxicity tests performed from 2005 through 2011. **Figure 3.4** provides the zinc LC₅₀ control chart which shows historical LC₅₀ data obtained at the Region 8 Laboratory.

4.0 DISCUSSION

The results of the profile test showed that surface water collected from the Animas River above the confluence of Cement Creek (A68) indicated toxic effects in juvenile rainbow trout (67.5 % survival). This suggests that natural or mining-related sources of contamination further upstream in the watershed.

100% mortality was observed just below the confluence with Mineral and Cement Creeks at location A72. One contributing factor is the input of highly-toxic water from Mineral

Creek (M34 = 15% survival). In addition, and although not included in the April 2013 investigation, previous analyses of surface water samples collected from Cement Creek showed that the contaminant levels in this stream would be lethal to aquatic organisms.

The high toxicity observed at A72 was not observed in the water sample collected from A73 (95% survival), which is located about 5 miles further downstream. The most likely reason is the continuous input of water from the numerous creeks and streams that discharge to this stretch of the mainstem, thereby diluting the high metal levels observed at A72. This trend continued further downstream approximately 17 miles to A75B where 100% survival was observed. It was therefore concluded that the stretch of the Animas River which is acutely toxic to juvenile rainbow trout extends for less than 5 miles below Silverton.

Results of the A72 serial dilution test support this conclusion. Even though the undiluted water sample collected at A72 was acutely toxic to juvenile rainbow trout, no mortality was observed when this sample was diluted with only 12% HRW.

The acute toxicity to juvenile rainbow trout associated with the undiluted mixed CC48/M34 sample was severe (0% survival). Note that the effect of dilution with A68 water was contradictory, as follows: undiluted (full-strength) A68 water resulted in 67.5% survival, whereas diluting the highly toxic CC48/M34 sample by half using A68 water resulted in 90% survival. It is not known what may have caused this discrepancy.

The reference toxicity test generated a 96-hour EC₅₀ for the juvenile rainbow trout equal to 215.8 µg/L zinc.

5.0 REFERENCES

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Tables

**Table 2.5-1: April 2013 Upper Animas River Surface Water Toxicity Test
Summary of the Test Conditions**

Test Parameter	Criterion
Test type	static renewal
Test duration	96 hour
Temperature range	12°C +/- 2°C
Light quality	ambient laboratory illumination
Light intensity	50-100 ft-c
Photo period	16 hours light, 8 hours dark
Test chamber size	1 liter
Test solution volume	900 mL
Renewal of test solutions	daily
Age of test organisms	RBT (15-30 days post yolk-sac absorption)
No. of replicate chambers per sample	4
No. of fish per chamber	10
No. of fish per sample	40
Feeding regime	once daily
Test chamber cleaning	cleaning not required
Test solution aeration	not to exceed 100 bubbles per minute
Dissolved oxygen concentration	≥6.0 mg/L
Dilution water used	hard reconstituted water
End point evaluated	mortality
Sample holding time	36 hours after collecting the last surface water sample in the field
Test acceptability	90% or greater survival in controls

Table 2.5-2 April 2013 Upper Animas River Surface Water Toxicity Testing

Total Recoverable Metals Initial Analytical Results (ug/L)

STATION_ID	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Nickel	Potassium	Selenium	Silver	Sodium	Strontium	Thallium	Vanadium	Zinc
Profile test of the Animas River and Mineral Creek surface water samples																							
A68	317	<2.50U	<2.50U	<25.0U	<2.00U	2.98D	65700	7.09JD	1.42D	14.4D	213J	3.46BD	3940	3920	2.76JD	767J	<2.50U	<2.50U	2750	702	<2.50U	<10.0U	962
M34	3290	<2.50U	<2.50U	27.2JD	<2.00U	1.20D	76400	<5.00U	6.44D	7.60D	4720	11.7D	5890	433	<2.50U	809J	<2.50U	<2.50U	5680	796	<2.50U	<10.0U	317
A72	2690	<2.50U	<2.50U	<25.0U	<2.00U	2.54D	86900	<5.00U	6.51D	17.7D	4680	8.79BD	5790	2340	2.82JD	1020	<2.50U	<2.50U	4250	972	<2.50U	<10.0U	935
A73	2220	<2.50U	<2.50U	<25.0U	<2.00U	2.28D	79400	6.10JD	6.00D	15.4D	3620	7.70BD	5590	1950	2.56JD	975J	<2.50U	<2.50U	4090	874	<2.50U	<10.0U	835
A73B	1930	<2.50U	<2.50U	25.6JD	<2.00U	2.05D	75200	<5.00U	4.94D	13.0D	3220	6.81BD	5430	1860	2.86JD	960J	<2.50U	<2.50U	3950	827	<2.50U	<10.0U	798
A75B	1230	<2.50U	<2.50U	25.0JD	<2.00U	1.39D	60100	7.09JD	3.45D	7.56D	1290	4.09BD	4780	1260	<2.50U	976J	<2.50U	<2.50U	3330	640	<2.50U	<10.0U	563
Animas River surface water sample A72 serially diluted by hard reconstituted water (HRW)																							
HRW Control	<20.0U	<2.50U	<2.50U	<25.0U	<2.00U	<0.500U	23800	5.50JD	<0.500U	<2.50U	<100U	<0.500U	27100	<2.00U	<2.50U	4940	<2.50U	<2.50U	58700	158	<2.50U	<10.0U	<10.0U
HRW(A72)-88%	2440	<2.50U	<2.50U	<25.0U	<2.00U	2.21D	80500	<5.00U	6.68D	17.1D	4160	7.33D	8420	2080	3.02JD	1480	<2.50U	<2.50U	10900	877	<2.50U	<10.0U	840
HRW(A72)-75%	2120	<2.50U	<2.50U	<25.0U	<2.00U	1.82D	72200	<5.00U	5.29D	14.7D	3670	6.46D	11300	1770	2.92JD	2020	<2.50U	<2.50U	18200	773	<2.50U	<10.0U	699
HRW(A72)-50%	1190	<2.50U	<2.50U	<25.0U	<2.00U	1.30D	55600	6.38JD	3.49D	8.97D	2100	3.70D	16700	1180	<2.50U	3010	<2.50U	<2.50U	32000	570	<2.50U	<10.0U	451
HRW(A72)-35%	914	<2.50U	<2.50U	<25.0U	<2.00U	0.770JD	46100	7.08JD	2.33D	6.05D	1560	2.69BD	19700	864	<2.50U	3550	<2.50U	<2.50U	39900	502	<2.50U	<10.0U	345
HRW(A72)-25%	684	<2.50U	<2.50U	<25.0U	<2.00U	<0.500U	39300	6.94JD	1.56D	4.93JD	1170	2.24JBD	21800	582	<2.50U	3950	<2.50U	<2.50U	45300	361	<2.50U	<10.0U	225
HRW(A72)-12%	320	<2.50U	<2.50U	<25.0U	<2.00U	<0.500U	31300	5.62JD	0.550JD	<2.50U	547	1.01JBD	24600	273	<2.50U	4450	<2.50U	<2.50U	52100	255	<2.50U	<10.0U	110
Combined sample CC48/M34 serially diluted by Animas River surface water sample A68																							
A68(CC48/M34) Control	<20.0U	<2.50U	<2.50U	<25.0U	<2.00U	<0.500U	24100	7.44JD	<0.500U	<2.50U	<100U	<0.500U	27300	<2.00U	<2.50U	4910	<2.50U	<2.50U	58400	159	<2.50U	<10.0U	<10.0U
A68(CC48/M34)-100%	4330	<2.50U	<2.50U	<25.0U	<2.00U	2.46D	99800	<5.00U	12.5D	24.1D	7160	12.1BD	6870	1700	5.72D	1130	<2.50U	<2.50U	5020	1110	<2.50U	<10.0U	921
A68(CC48/M34)-95%	4210	<2.50U	<2.50U	<25.0U	<2.00U	2.50D	98100	5.23JD	10.6D	23.3D	6910	12.0BD	6770	1840	4.79JD	1120	<2.50U	<2.50U	4960	1120	<2.50U	<10.0U	940
A68(CC48/M34)-90%	3860	<2.50U	<2.50U	<25.0U	<2.00U	2.67D	96900	<5.00U	9.88D	21.7D	6430	11.2BD	6630	1900	4.57JD	1100	<2.50U	<2.50U	4840	1080	<2.50U	<10.0U	923
A68(CC48/M34)-80%	3570	<2.50U	<2.50U	<25.0U	<2.00U	2.37D	92200	5.63JD	9.44D	23.1D	5810	10.7BD	6270	2110	4.84JD	1050	<2.50U	<2.50U	4570	1040	<2.50U	<10.0U	931
A68(CC48/M34)-75%	3510	<2.50U	<2.50U	<25.0U	<2.00U	2.53D	92500	5.24JD	9.23D	22.8D	5650	11.1BD	6210	2340	4.11JD	1060	<2.50U	<2.50U	4410	1030	<2.50U	<10.0U	966
A68(CC48/M34)-50%	2300	<2.50U	<2.50U	<25.0U	<2.00U	2.57D	81400	5.23JD	6.17D	16.4D	3740	7.65BD	5320	2740	4.08JD	922J	<2.50U	<2.50U	3820	902	<2.50U	<10.0U	914
A68(CC48/M34)-25%	1350	<2.50U	<2.50U	<25.0U	<2.00U	2.83D	74000	7.10JD	4.03D	15.6D	1960	5.81BD	4710	3340	2.70JD	851J	<2.50U	<2.50U	3360	801	<2.50U	<10.0U	956
Combined sample CC48/M34 serially diluted by hard reconstituted water (HRW)																							
HRW(CC48/M34)-95%	4190	<2.50U	<2.50U	<25.0U	<2.00U	2.17D	96600	<5.00U	9.90D	20.3D	6870	11.6D	7990	1610	4.78JD	1320	<2.50U	<2.50U	7880	1070	<2.50U	<10.0U	870
HRW(CC48/M34)-90%	4050	<2.50U	<2.50U	<25.0U	<2.00U	2.07D	95400	<5.00U	9.79D	21.0D	6680	11.7D	9080	1560	4.63JD	1520	<2.50U	<2.50U	10500	1060	<2.50U	<10.0U	849
HRW(CC48/M34)-75%	3260	<2.50U	<2.50U	<25.0U	<2.00U	1.59D	80800	5.55JD	7.89D	17.1D	5190	9.18D	12000	1280	3.32JD	2090	<2.50U	<2.50U	18700	879	<2.50U	<10.0U	688
HRW(CC48/M34)-50%	2190	<2.50U	<2.50U	<25.0U	<2.00U	1.08D	62300	7.42JD	5.54D	11.6D	3560	6.16D	17200	849	2.75JD	3050	<2.50U	<2.50U	32400	644	<2.50U	<10.0U	441
HRW(CC48/M34)-25%	1190	<2.50U	<2.50U	<25.0U	<2.00U	<0.500U	42900	6.12JD	2.75D	5.83D	1850	3.41D	22500	421	<2.50U	4040	<2.50U	<2.50U	46400	399	<2.50U	<10.0U	224
Reference toxicity test																							
Ref. Control	<20.0U	<2.50U	<2.50U	<25.0U	<2.00U	<0.500U	11600	8.46JD	<0.500U	<2.50U	<100U	<0.500U	13100	<2.00U	<2.50U	1990	<2.50U	<2.50U	24100	71.6	<2.50U	<10.0U	<10.0U
Ref. 100%	<20.0U	<2.50U	<2.50U	<25.0U	<2.00U	<0.500U	11700	5.64JD	<0.500U	<2.50U	<100U	<0.500U	13300	<2.00U	<2.50U	2010	<2.50U	<2.50U	24300	72.8	<2.50U	<10.0U	974
Ref. 50%	<20.0U	<2.50U	<2.50U	<25.0U	<2.00U	<0.500U	11900	7.20JD	<0.500U	<2.50U	<100U	<0.500U	13600	<2.00U	<2.50U	2070	<2.50U	<2.50U	24900	72.2	<2.50U	<10.0U	480
Ref. 25%	<20.0U	<2.50U	<2.50U	<25.0U	<2.00U	<0.500U	11700	5.92JD	<0.500U	<2.50U	<100U	<0.500U	13200	<2.00U	<2.50U	2000	<2.50U	<2.50U	24100	72.7	<2.50U	<10.0U	219
Ref. 12.5%	<20.0U	<2.50U	<2.50U	<25.0U	<2.00U	<0.500U	12000	<5.00U	<0.500U	<2.50U	<100U	<0.500U	13500	<2.00U	<2.50U	2050	<2.50U	<2.50U	24700	74.9	<2.50U	<10.0U	115
Ref. 6.25%	<20.0U	<2.50U	<2.50U	<25.0U	<2.00U	<0.500U	11600	9.88JD	<0.500U	<2.50U	<100U	<0.500U	13100	<2.00U	<2.50U	2000	<2.50U	<2.50U	24100	72.6	<2.50U	<10.0U	80.3

Table 2.5-2 (cont'd) April 2013 Upper Animas River Surface Water Toxicity Testing

Total Recoverable Metals Final Analytical Results (ug/L)

STATION ID	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Nickel	Potassium	Selenium	Silver	Sodium	Strontium	Thallium	Vanadium	Zinc
Profile test of the Animas River and Mineral Creek surface water samples																							
A68	150	<2.50U	<2.50U	<25.0U	<2.00U	2.85D	70800	<5.00U	1.49D	7.41D	<100U	1.47D	4200	4090	<2.50U	1070	<2.50U	<2.50U	2840	696	<2.50U	<10.0U	982
M34	2250	<2.50U	<2.50U	26.8JD	<2.00U	1.45D	81400	<5.00U	6.16D	7.36D	4010	8.70D	6180	457	5.89D	1380	<2.50U	<2.50U	6220	824	<2.50U	<10.0U	349
A72	710	<2.50U	<2.50U	<25.0U	<2.00U	2.94D	95200	5.69JD	7.28D	11.8D	2040	1.12D	6270	2450	4.15JD	2090	<2.50U	<2.50U	5010	985	<2.50U	<10.0U	985
A73	1030	<2.50U	<2.50U	<25.0U	<2.00U	2.42D	87200	6.11JD	6.23D	8.44D	1720	3.30D	6070	2070	3.75JD	1370	<2.50U	<2.50U	4280	888	<2.50U	<10.0U	875
A73B	1050	<2.50U	<2.50U	25.1JD	<2.00U	2.13D	81400	<5.00U	5.53D	8.44D	1750	3.61D	5780	1950	3.16JD	1330	<2.50U	<2.50U	4030	831	<2.50U	<10.0U	836
A75B	1230	<2.50U	<2.50U	25.1JD	<2.00U	1.50D	65300	5.01JD	3.69D	8.17D	1450	4.31D	5120	1310	2.89JD	1370	<2.50U	<2.50U	3490	642	<2.50U	<10.0U	591
Animas River surface water sample A72 serially diluted by hard reconstituted water (HRW)																							
HRW Control	20.3J	<2.50U	<2.50U	<25.0U	<2.00U	<0.500U	23400	5.08JD	<2.50U	<2.50U	<100U	<0.500U	29600	<2.00U	<2.50U	5620	<2.50U	<2.50U	62900	173	<2.50U	<10.0U	<10.0U
HRW(A72)-88%	1550	<2.50U	<2.50U	<25.0U	<2.00U	2.20D	87200	<5.00U	5.82D	9.89D	2770	4.61D	9070	2210	3.75JD	1880	<2.50U	<2.50U	11600	915	<2.50U	<10.0U	817
HRW(A72)-75%	1300	<2.50U	<2.50U	<25.0U	<2.00U	2.08D	77200	<5.00U	5.61D	9.48D	2310	4.01D	12000	1870	4.05JD	2400	<2.50U	<2.50U	19000	812	<2.50U	<10.0U	626
HRW(A72)-50%	871	<2.50U	<2.50U	<25.0U	<2.00U	1.21D	58200	<5.00U	3.49D	6.44D	1580	2.74D	17700	1220	<2.50U	3400	<2.50U	<2.50U	33100	583	<2.50U	<10.0U	377
HRW(A72)-35%	752	<2.50U	<2.50U	<25.0U	<2.00U	0.908JD	47400	<5.00U	2.52D	6.23D	1300	2.37D	21000	848	<2.50U	3990	<2.50U	<2.50U	41400	456	<2.50U	<10.0U	274
HRW(A72)-25%	366	<2.50U	<2.50U	<25.0U	<2.00U	<0.500U	39900	7.19JD	1.58D	<2.50U	504	0.928JD	23100	593	<2.50U	4410	<2.50U	<2.50U	47100	370	<2.50U	<10.0U	141
HRW(A72)-12%	206	<2.50U	<2.50U	<25.0U	<2.00U	<0.500U	31300	7.74JD	0.638JD	<2.50U	146J	<0.500U	26500	289	<2.50U	5000	<2.50U	<2.50U	55300	267	<2.50U	<10.0U	60.7
Combined sample CC48/M34 serially diluted by Animas River surface water sample A68																							
A68(CC48/M34)-Control	<20.0U	<2.50U	<2.50U	<25.0U	<2.00U	<0.500U	23000	5.99JD	<0.500U	<2.50U	<100U	<0.500U	28700	<2.00U	<2.50U	5340	<2.50U	<2.50U	60300	167	<2.50U	<10.0U	<10.0U
A68(CC48/M34)-100%	4010	<2.50U	<2.50U	<25.0U	<2.00U	2.55D	110000	<5.00U	13.0D	22.7D	1770	6.77D	7480	1820	6.19D	2260	<2.50U	<2.50U	7820	1160	<2.50U	<10.0U	1020
A68(CC48/M34)-95%	3750	<2.50U	<2.50U	<25.0U	<2.00U	2.52D	110000	5.18JD	11.8D	21.4D	1700	6.66D	7480	1970	6.04D	2190	<2.50U	<2.50U	7770	1150	<2.50U	<10.0U	1040
A68(CC48/M34)-90%	3190	<2.50U	<2.50U	<25.0U	<2.00U	2.67D	108000	5.05JD	11.0D	17.9D	1710	5.77D	7240	2040	5.53D	2320	<2.50U	<2.50U	7680	1100	<2.50U	<10.0U	1010
A68(CC48/M34)-80%	2140	<2.50U	<2.50U	<25.0U	<2.00U	2.39D	99400	5.06JD	9.64D	17.2D	1660	4.26D	6650	2200	4.46JD	1930	<2.50U	<2.50U	7000	1040	<2.50U	<10.0U	1010
A68(CC48/M34)-75%	1710	<2.50U	<2.50U	<25.0U	<2.00U	2.55D	99400	5.03JD	9.16D	16.3D	1860	3.96D	6640	2350	4.90JD	2090	<2.50U	<2.50U	7030	1030	<2.50U	<10.0U	1010
A68(CC48/M34)-50%	1080	<2.50U	<2.50U	<25.0U	<2.00U	2.47D	87800	5.89JD	6.34D	10.1D	1840	3.69D	5710	2900	3.00JD	1360	<2.50U	<2.50U	4210	913	<2.50U	<10.0U	960
A68(CC48/M34)-25%	384	<2.50U	<2.50U	<25.0U	<2.00U	2.70D	78700	5.89JD	4.07D	6.39D	498	1.73D	4980	3480	2.71JD	1200	<2.50U	<2.50U	3560	803	<2.50U	<10.0U	815
Combined sample CC48/M34 serially diluted by hard reconstituted water (HRW)																							
HRW(CC48/M34)-95%	2680	<2.50U	<2.50U	<25.0U	<2.00U	2.25D	106000	<5.00U	11.0D	17.7D	2680	5.33D	8570	1760	5.15D	2550	<2.50U	<2.50U	10800	1150	<2.50U	<10.0U	988
HRW(CC48/M34)-90%	1490	<2.50U	<2.50U	<25.0U	<2.00U	1.98D	102000	<5.00U	9.37D	14.2D	2780	3.92D	9610	1630	5.02D	2850	<2.50U	<2.50U	13400	1080	<2.50U	<10.0U	908
HRW(CC48/M34)-75%	2260	<2.50U	<2.50U	<25.0U	<2.00U	1.70D	87200	<5.00U	7.97D	12.0D	3980	6.52D	12900	1360	4.70JD	2470	<2.50U	<2.50U	19700	931	<2.50U	<10.0U	670
HRW(CC48/M34)-50%	2220	<2.50U	<2.50U	<25.0U	<2.00U	1.04D	66200	<5.00U	5.12D	10.1D	3830	6.37D	18700	900	2.91JD	3530	<2.50U	<2.50U	34400	669	<2.50U	<10.0U	456
HRW(CC48/M34)-25%	865	<2.50U	<2.50U	<25.0U	<2.00U	<0.500U	43600	<5.00U	2.61D	5.66D	1480	2.46D	24100	440	<2.50U	4590	<2.50U	<2.50U	48900	423	<2.50U	<10.0U	195
Reference toxicity test																							
Ref. 100%	<20.0U	<2.50U	<2.50U	<25.0U	<2.00U	<0.500U	11200	5.46JD	<0.500U	<2.50U	<100U	<0.500U	12500	<2.00U	<2.50U	1930	<2.50U	<2.50U	22400	67.3	<2.50U	<10.0U	1120
Ref. 50%	<20.0U	<2.50U	<2.50U	<25.0U	<2.00U	<0.500U	11200	5.82JD	<0.500U	<2.50U	<100U	<0.500U	12600	<2.00U	<2.50U	1920	<2.50U	<2.50U	22700	68.1	<2.50U	<10.0U	623
Ref. 25%	<20.0U	<2.50U	<2.50U	<25.0U	<2.00U	<0.500U	11100	<5.00U	<0.500U	<2.50U	<100U	<0.500U	12500	<2.00U	<2.50U	1930	<2.50U	<2.50U	22500	68.0	<2.50U	<10.0U	299
Ref. 12.5%	<20.0U	<2.50U	<2.50U	<25.0U	<2.00U	<0.500U	10900	<5.00U	<0.500U	<2.50U	<100U	<0.500U	12600	<2.00U	<2.50U	2210	<2.50U	<2.50U	22700	67.6	<2.50U	<10.0U	182
Ref. 6.25%	<20.0U	<2.50U	<2.50U	<25.0U	<2.00U	<0.500U	10800	6.66JD	<0.500U	<2.50U	<100U	<0.500U	12600	<2.00U	<2.50U	2180	<2.50U	<2.50U	22700	67.0	<2.50U	<10.0U	89.8
Ref. Control	<20.0U	<2.50U	<2.50U	<25.0U	<2.00U	<0.500U	10900	7.11JD	<0.500U	<2.50U	<100U	<0.500U	12700	<2.00U	<2.50U	2240	<2.50U	<2.50U	22900	69.0	<2.50U	<10.0U	<10.0U

**Table 2.5-3 April 2013 Upper Animas River Surface Water Toxicity Testing
 Dissolved Metals Initial Analytical Results (ug/L)**

STATION_ID	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Hardness (mg/L)	Iron	Lead	Magnesium	Manganese	Nickel	Potassium	Selenium	Silver	Sodium	Strontium	Thallium	Vanadium	Zinc
Profile test of the Animas River and Mineral Creek surface water samples																								
A68	38.5J	<0.500U	<0.500U	23.7	<2.00U	3.11	70600	1.68J	1.44	3.70	194	<100U	0.134J	4260	3960	1.49	765J	<0.500U	<0.500U	2910	695	<0.500U	<2.00U	994
M34	887	<0.500U	<0.500U	25.7	<2.00U	1.20	80700	<1.00U	6.10	7.35	227	3170	5.16	6210	444	2.04	829J	<0.500U	<0.500U	5830	809	<0.500U	<2.00U	335
A72	694	<0.500U	<0.500U	22.4	<2.00U	2.74	91900	<1.00U	7.39	13.4	255	2720	1.27	6160	2380	3.63	1010	0.705J	<0.500U	4440	974	<0.500U	<2.00U	979
A73	187	<0.500U	<0.500U	23.6	<2.00U	2.32	85000	<1.00U	5.82	6.06	237	1310	<0.100U	5980	2000	3.54	998J	<0.500U	<0.500U	4300	876	<0.500U	<2.00U	892
A73B	145	<0.500U	<0.500U	24.6	<2.00U	2.25	80800	<1.00U	5.73	5.60	226	1150	0.704	5860	1870	3.86	999J	0.609J	<0.500U	4180	827	<0.500U	<2.00U	825
A75B	24.3J	<0.500U	<0.500U	25.3	<2.00U	1.58	65100	<1.00U	3.64	1.16	184	<100U	1.02	5190	1270	2.84	998J	0.654J	<0.500U	3540	641	<0.500U	<2.00U	566
Animas River surface water sample A72 serially diluted by hard reconstituted water (HRW)																								
HRW Control	<20.0U	<0.500U	<0.500U	<5.00U	<2.00U	<0.100U	24200	6.30	<0.100U	<0.500U	176	<100U	<0.100U	28100	<2.00U	<0.500U	4860	<0.500U	<0.500U	59900	154	<0.500U	<2.00U	<10.0U
HRW(A72)-88%	67.1	<0.500U	<0.500U	19.2	<2.00U	2.38	85700	<1.00U	5.61	6.36	251	2010	0.212	8900	2120	3.02	1520	<0.500U	<0.500U	11200	878	<0.500U	<2.00U	859
HRW (A72)-75%	69.1	<0.500U	<0.500U	16.1	<2.00U	1.92	77800	1.24J	5.06	4.31	244	1800	0.106J	12100	1820	3.12	2080	<0.500U	<0.500U	19000	781	<0.500U	<2.00U	725
HRW(A72)-50%	68.2	<0.500U	<0.500U	10.7	<2.00U	1.13	59700	2.50	3.38	0.933J	223	653	<0.100U	17800	1210	1.70	3110	<0.500U	<0.500U	33000	569	<0.500U	<2.00U	399
HRW(A72)-35%	84.2	<0.500U	<0.500U	7.65J	<2.00U	0.667	49700	4.27	2.29	<0.500U	211	141J	<0.100U	21100	846	1.29	3690	<0.500U	<0.500U	41200	446	<0.500U	<2.00U	216
HRW(A72)-25%	123	<0.500U	0.596J	5.81J	<2.00U	0.359	41900	4.82	1.67	1.06	200	<100U	<0.100U	23200	590	1.39	4060	<0.500U	<0.500U	47100	361	<0.500U	<2.00U	111
HRW(A72)-12%	80.6	<0.500U	<0.500U	<5.00U	<2.00U	0.178J	32800	6.33	0.733	1.70	190	218J	<0.100U	26300	270	0.832J	4590	<0.500U	<0.500U	54900	249	<0.500U	<2.00U	93.6
Combined sample CC48/M34 serially diluted by Animas River surface water sample A68																								
A68(CC48/M34) Control	<20.0U	<0.500U	<0.500U	<5.00U	<2.00U	<0.100U	25300	6.77	<0.100U	<0.500U	183	<100U	0.230	29000	<2.00U	<0.500U	5000	<0.500U	<0.500U	60600	159	<0.500U	<2.00U	<10.0U
A68(CC48/M34)-100%	2910	<0.500U	<0.500U	21.2	<2.00U	2.51	106000	<1.00U	10.1	20.1	294	3900	8.64	7280	1760	4.46	1130	0.813J	<0.500U	5210	1140	<0.500U	<2.00U	1020
A68(CC48/M34)-95%	2800	<0.500U	<0.500U	21.6	<2.00U	2.48	105000	<1.00U	11.2	21.2	293	3780	8.26	7250	1880	4.76	1120	<0.500U	<0.500U	5180	1120	<0.500U	<2.00U	1010
A68(CC48/M34)-90%	2680	<0.500U	<0.500U	21.2	<2.00U	2.57	104000	<1.00U	9.85	19.7	291	3460	7.67	7200	1960	4.27	1130	<0.500U	<0.500U	5160	1090	<0.500U	<2.00U	994
A68(CC48/M34)-80%	2290	<0.500U	<0.500U	21.8	<2.00U	2.68	99000	<1.00U	9.22	18.7	275	2480	5.93	6740	2150	3.80	1060	<0.500U	<0.500U	4840	1030	<0.500U	<2.00U	977
A68(CC48/M34)-75%	2110	<0.500U	<0.500U	21.8	<2.00U	2.82	98600	<1.00U	8.15	16.5	274	2230	5.08	6680	2400	3.67	1070	<0.500U	<0.500U	4690	1050	<0.500U	<2.00U	1030
A68(CC48/M34)-50%	553	<0.500U	<0.500U	22.6	<2.00U	2.76	88300	<1.00U	6.30	9.84	244	1610	1.67	5800	2860	3.26	939J	<0.500U	<0.500U	4100	919	<0.500U	<2.00U	1010
A68(CC48/M34)-25%	102	<0.500U	<0.500U	23.0	<2.00U	2.93	77500	<1.00U	3.70	3.97	214	787	0.365	4940	3390	2.39	851J	<0.500U	<0.500U	3470	806	<0.500U	<2.00U	972
Combined sample CC48/M34 serially diluted by hard reconstituted water (HRW)																								
HRW(CC48/M34)-95%	2770	<0.500U	<0.500U	20.2	<2.00U	2.30	103000	<1.00U	10.2	19.4	293	3320	6.67	8510	1670	4.61	1390	<0.500U	<0.500U	8210	1100	<0.500U	<2.00U	944
HRW(CC48/M34)-90%	1980	<0.500U	<0.500U	18.7	<2.00U	2.09	97700	<1.00U	9.36	18.0	283	3110	4.91	9400	1580	4.41	1540	<0.500U	<0.500U	10800	1050	<0.500U	<2.00U	902
HRW(CC48/M34)-75%	248	<0.500U	<0.500U	15.7	<2.00U	1.73	86100	1.22J	8.30	7.68	267	2380	0.465	12700	1300	4.79	2160	<0.500U	<0.500U	19300	887	<0.500U	<2.00U	710
HRW(CC48/M34)-50%	39.2J	<0.500U	<0.500U	10.9	<2.00U	1.16	66600	2.68	5.29	1.81	242	1520	0.113J	18300	864	3.00	3170	<0.500U	<0.500U	33700	647	<0.500U	<2.00U	427
HRW(CC48/M34)-25%	126	<0.500U	<0.500U	5.61J	<2.00U	0.351	44900	3.74	2.32	0.987J	210	305	0.120J	23800	433	1.39	4090	<0.500U	<0.500U	47900	402	<0.500U	<2.00U	154
Reference toxicity test																								
Ref. 100%	<20.0U	<0.500U	<0.500U	<5.00U	<2.00U	<0.100U	12700	2.67	<0.100U	<0.500U	90	<100U	<0.100U	14200	<2.00U	<0.500U	2110	<0.500U	<0.500U	25100	73.1	<0.500U	<2.00U	1050
Ref. 50%	<20.0U	<0.500U	<0.500U	<5.00U	<2.00U	<0.100U	12600	3.19	<0.100U	<0.500U	89	<100U	<0.100U	14100	<2.00U	<0.500U	2090	<0.500U	<0.500U	25100	73.6	<0.500U	<2.00U	478
Ref. 25%	<20.0U	<0.500U	<0.500U	<5.00U	<2.00U	<0.100U	12600	2.47	<0.100U	<0.500U	90	<100U	<0.100U	14100	<2.00U	<0.500U	2100	<0.500U	<0.500U	25100	73.0	<0.500U	<2.00U	314
Ref. 12.5%	<20.0U	<0.500U	<0.500U	<5.00U	<2.00U	<0.100U	12400	2.85	<0.100U	<0.500U	88	<100U	<0.100U	13800	<2.00U	<0.500U	2050	<0.500U	<0.500U	24400	74.2	<0.500U	<2.00U	128
Ref. 6.25%	<20.0U	<0.500U	<0.500U	<5.00U	<2.00U	<0.100U	12700	2.88	<0.100U	<0.500U	90	<100U	<0.100U	14200	<2.00U	<0.500U	2120	<0.500U	<0.500U	25300	73.2	<0.500U	<2.00U	85.6
Ref. Control	<20.0U	<0.500U	<0.500U	<5.00U	<2.00U	<0.100U	12500	3.02	<0.100U	<0.500U	89	<100U	0.360	14000	<2.00U	<0.500U	2090	<0.500U	<0.500U	25000	73.6	<0.500U	<2.00U	<10.0U

**Table 2.5-3 (cont'd) April 2013 Upper Animas River Surface Water Toxicity Testing
 Dissolved Metals Final Analytical Results (ug/L)**

STATION ID	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Hardness (mg/l)	Iron	Lead	Magnesium	Manganese	Nickel	Potassium	Selenium	Silver	Sodium	Strontium	Thallium	Vanadium	Zinc
Profile test of the Animas River and Mineral Creek surface water samples																								
A68	41.3J	<0.500U	<0.500U	22.8	<2.00U	2.79	69400	1.52J	1.25	3.48	191	<100U	<0.100U	4180	3920	1.34	1050	0.538J	<0.500U	2840	689	<0.500U	<2.00U	905
M34	761	<0.500U	<0.500U	25.2	<2.00U	1.19	79500	<1.00U	7.13	7.09	224	2530	3.75	6140	438	2.72	1400	<0.500U	<0.500U	6210	791	<0.500U	<2.00U	337
A72	562	<0.500U	<0.500U	22.7	<2.00U	2.60	95900	<1.00U	7.24	13.2	265	1850	0.907	6280	2460	3.16	1950	0.875J	<0.500U	4940	1010	<0.500U	<2.00U	1010
A73	35.1J	<0.500U	<0.500U	23.8	<2.00U	2.17	85600	<1.00U	5.93	3.26	238	<100U	<0.100U	5940	2000	3.27	1360	0.581J	<0.500U	4190	855	<0.500U	<2.00U	857
A73B	26.2J	<0.500U	<0.500U	24.5	<2.00U	1.95	80900	<1.00U	5.43	2.71	226	<100U	<0.100U	5740	1880	3.54	1290	0.792J	<0.500U	3990	816	<0.500U	<2.00U	796
A75B	20.0J	<0.500U	<0.500U	25.1	<2.00U	1.40	67000	<1.00U	3.60	2.37	189	<100U	<0.100U	5300	1290	3.15	1380	0.932J	<0.500U	3620	647	<0.500U	<2.00U	525
Animas River surface water sample A72 serially diluted by hard reconstituted water (HRW)																								
HRW Control	<20.0U	<0.500U	<0.500U	<5.00U	<2.00U	<0.100U	23500	6.03	<0.100U	0.712J	181	<100U	<0.100U	29700	<2.00U	<0.500U	5630	<0.500U	<0.500U	62300	169	<0.500U	<2.00U	<10.0U
HRW(A72)-88%	24.2J	<0.500U	<0.500U	18.4	<2.00U	1.97	82300	<1.00U	5.78	1.29	241	<100U	<0.100U	8680	2040	3.19	1830	0.557J	<0.500U	11100	865	<0.500U	<2.00U	679
HRW(A72)-75%	31.6J	<0.500U	<0.500U	15.7	<2.00U	1.49	75300	<1.00U	5.13	1.11	237	<100U	<0.100U	11900	1780	2.19	2380	<0.500U	<0.500U	18800	768	<0.500U	<2.00U	453
HRW(A72)-50%	48.1J	<0.500U	<0.500U	10.6	<2.00U	0.854	57900	2.10	3.35	1.44	218	<100U	<0.100U	17800	1060	2.03	3500	<0.500U	<0.500U	33300	522	<0.500U	<2.00U	200
HRW(A72)-35%	79.1	<0.500U	<0.500U	7.55J	<2.00U	0.465	46400	2.94	2.16	1.26	201	<100U	0.113J	20800	808	0.930J	3980	<0.500U	<0.500U	41600	446	<0.500U	<2.00U	108
HRW(A72)-25%	91.3	<0.500U	<0.500U	5.31J	<2.00U	0.259	37000	4.99	1.44	1.35	182	<100U	<0.100U	21700	538	1.44	4140	0.717J	<0.500U	44900	340	<0.500U	<2.00U	68.9
HRW(A72)-12%	136	<0.500U	<0.500U	<5.00U	<2.00U	<0.100U	30400	5.66	0.611	1.59	182	<100U	<0.100U	25800	271	1.01	4820	0.727J	<0.500U	53500	256	<0.500U	<2.00U	37.2
Combined sample CC48/M34 serially diluted by Animas River surface water sample A68																								
A68(CC48/M34)-Control	<20.0U	<0.500U	<0.500U	<5.00U	<2.00U	<0.100U	23400	6.52	<0.100U	<0.500U	179	<100U	<0.100U	29300	<2.00U	<0.500U	5430	0.736J	<0.500U	61400	169	<0.500U	<2.00U	<10.0U
A68(CC48/M34)-100%	4040	<0.500U	<0.500U	21.2	<2.00U	2.42	109000	<1.00U	10.5	19.8	304	1650	6.43	7480	1760	4.79	2260	0.765J	<0.500U	7780	1130	<0.500U	<2.00U	998
A68(CC48/M34)-95%	3540	<0.500U	<0.500U	21.1	<2.00U	2.41	104000	<1.00U	9.79	19.4	289	1520	5.75	7050	1830	5.14	2020	0.773J	<0.500U	7320	1100	<0.500U	<2.00U	948
A68(CC48/M34)-90%	3040	<0.500U	<0.500U	22.3	<2.00U	2.46	102000	<1.00U	9.47	17.3	285	1510	5.18	6960	1930	4.16	2240	0.781J	<0.500U	7460	1070	<0.500U	<2.00U	965
A68(CC48/M34)-80%	1970	<0.500U	<0.500U	21.7	<2.00U	2.48	97700	<1.00U	8.48	16.2	271	1170	3.52	6590	2110	4.19	1920	1.02J	<0.500U	6980	1010	<0.500U	<2.00U	959
A68(CC48/M34)-75%	1470	<0.500U	<0.500U	22.5	<2.00U	2.53	100000	<1.00U	7.79	13.9	278	1340	2.99	6760	2290	3.94	2100	1.13J	<0.500U	7150	1030	<0.500U	<2.00U	982
A68(CC48/M34)-50%	32.9J	<0.500U	<0.500U	21.9	<2.00U	2.48	87700	<1.00U	5.56	1.92	242	220J	<0.100U	5690	2820	2.70	1320	<0.500U	<0.500U	4170	894	<0.500U	<2.00U	915
A68(CC48/M34)-25%	37.2J	<0.500U	<0.500U	22.9	<2.00U	2.59	80000	<1.00U	3.64	1.95	221	<100U	<0.100U	5070	3640	2.52	1220	1.08J	<0.500U	3610	853	<0.500U	<2.00U	798
Combined sample CC48/M34 serially diluted by hard reconstituted water (HRW)																								
HRW(CC48/M34)-95%	2560	<0.500U	<0.500U	20.2	<2.00U	2.32	103000	<1.00U	10.1	16.0	292	2140	4.52	8480	1650	3.95	2580	<0.500U	<0.500U	10800	1090	<0.500U	<2.00U	909
HRW(CC48/M34)-90%	1110	<0.500U	<0.500U	18.8	<2.00U	2.10	96600	<1.00U	9.89	13.1	280	1970	2.71	9360	1540	4.48	2890	<0.500U	<0.500U	13200	1030	<0.500U	<2.00U	854
HRW(CC48/M34)-75%	30.1J	<0.500U	<0.500U	15.5	<2.00U	1.51	84800	<1.00U	8.03	1.50	265	<100U	<0.100U	12800	1290	3.45	2500	<0.500U	<0.500U	19700	895	<0.500U	<2.00U	523
HRW(CC48/M34)-50%	63.2	<0.500U	<0.500U	10.4	<2.00U	0.655	64200	1.51J	4.89	1.42	235	<100U	<0.100U	18200	842	2.14	3470	<0.500U	<0.500U	33600	643	<0.500U	<2.00U	120
HRW(CC48/M34)-25%	123	<0.500U	<0.500U	5.33J	<2.00U	0.196J	42700	3.24	2.26	1.43	204	<100U	<0.100U	23600	402	1.20	4510	<0.500U	<0.500U	48300	398	<0.500U	<2.00U	43.6
Reference toxicity test																								
Ref. 100%	<20.0U	<0.500U	<0.500U	<5.00U	<2.00U	<0.100U	10800	1.80J	<0.100U	0.668J	77	<100U	<0.100U	12100	<2.00U	<0.500U	1880	0.537J	<0.500U	21700	64.3	<0.500U	<2.00U	1100
Ref. 50%	<20.0U	<0.500U	<0.500U	<5.00U	<2.00U	<0.100U	10700	2.07	<0.100U	0.562J	76	<100U	<0.100U	12000	<2.00U	<0.500U	1860	<0.500U	<0.500U	21600	63.4	<0.500U	<2.00U	571
Ref. 25%	<20.0U	<0.500U	<0.500U	<5.00U	<2.00U	<0.100U	11100	1.93J	<0.100U	<0.500U	79	<100U	<0.100U	12500	<2.00U	<0.500U	1930	<0.500U	<0.500U	22300	64.9	<0.500U	<2.00U	295
Ref. 12.5%	<20.0U	<0.500U	<0.500U	<5.00U	<2.00U	<0.100U	10800	2.32	<0.100U	0.527J	78	<100U	<0.100U	12400	<2.00U	<0.500U	2180	<0.500U	<0.500U	22300	65.4	<0.500U	<2.00U	182
Ref. 6.25%	<20.0U	<0.500U	<0.500U	<5.00U	<2.00U	<0.100U	10900	2.48	<0.100U	0.502J	79	<100U	<0.100U	12500	<2.00U	<0.500U	2190	<0.500U	<0.500U	22400	65.5	<0.500U	<2.00U	89.8
Ref. Control	<20.0U	<0.500U	<0.500U	<5.00U	<2.00U	<0.100U	11000	2.99	<0.100U	0.566J	79	<100U	<0.100U	12600	<2.00U	<0.500U	2240	<0.500U	<0.500U	22500	65.5	<0.500U	<2.00U	<10.0U

**Table 2.5-4 April 2013 Upper Animas River Surface Water Toxicity Testing
 Initial Wet Chemistry Results (mg/L)**

STATION_ID	Chloride	Dissolved Organic Carbon	Fluoride	Nitrate/Nitrite as N	Sulfate as SO4	Total Alkalinity (mg CaCO3 / L)
Profile test of the Animas River and Mineral Creek surface water samples						
A68	2.8	1.1	0.8	0.2J	178	34.1
M34	11.4JD	1.3	<1.0U	<2.0U	237D	<5.00U
A72	<10.0U	1.2	<1.0U	<2.0U	264D	<5.00U
A73	<10.0U	1.2	<1.0U	<2.0U	237D	<5.00U
A73B	3.6	1.1	0.5	<0.2U	244	<5.00U
A75B	3.0	1.2	0.5	0.2J	193	11.6
Animas River surface water sample A72 serially diluted by hard reconstituted water (HRW)						
HRW Control	4.8	1.0	<0.1U	<0.2U	206	123
HRW(A72)-88%	10.2JD	1.2	<1.0U	<2.0U	253D	9.14
HRW(A72)-75%	10.7JD	1.1	<1.0U	249D	249D	26.6
HRW(A72)-50%	4.1	1.1	0.5	<0.2U	247	55.4
HRW(A72)-35%	4.3	1.2	0.4	<0.2U	235	76.1
HRW(A72)-25%	4.5	1.0	0.2	<0.2U	227	87.5
HRW(A72)-12%	4.6	1.0	0.2	<0.2U	217	106
Combined sample CC48/M34 serially diluted by Animas River surface water sample A68						
A68(CC48/M34) Control	4.7	1.1	<0.1U	<0.2U	204	120
A68(CC48/M34)-100%	<10.0U	1.3	<1.0U	<2.0U	319D	<5.00U
A68(CC48/M34)-95%	<10.0U	1.2	1.0JD	<2.0U	314D	<5.00U
A68(CC48/M34)-90%	<10.0U	1.2	<1.0U	<2.0U	303D	<5.00U
A68(CC48/M34)-80%	<10.0U	1.2	1.0JD	<2.0U	287D	<5.00U
A68(CC48/M34)-75%	<10.0U	1.2	<1.0U	<2.0U	284D	<5.00U
A68(CC48/M34)-50%	13.6JD	1.1	1.1JD	9.0D	249D	5.36
A68(CC48/M34)-25%	3.0	1.1	0.7	0.3J	221	16.6
Combined sample CC48/M34 serially diluted by hard reconstituted water (HRW)						
HRW(CC48/M34)-95%	10.2JD	1.3	1.0JD	<2.0U	319D	<5.00U
HRW(CC48/M34)-90%	10.2JD	1.3	1.0JD	<2.0U	310D	<5.00U
HRW(CC48/M34)-75%	10.4JD	1.2	<1.0U	<2.0U	293D	12.6
HRW(CC48/M34)-50%	11.0JD	1.1	<1.0U	<2.0U	260D	47.9
HRW(CC48/M34)-25%	11.0JD	1.1	<1.0U	<2.0U	224D	83.5
Reference toxicity test						
Ref. Control	2.4	<1.0U	<0.1U	<0.2U	93.8	56.2
Ref. 100%	2.3	<1.0U	<0.1U	<0.2U	94.6	56.8
Ref. 50%	2.3	<1.0U	<0.1U	<0.2U	94.0	56.9
Ref. 25%	2.3	1.0	<0.1U	<0.2U	93.4	60.4
Ref. 12.5%	2.3	<1.0U	<0.1U	<0.2U	93.4	53.7
Ref. 6.25%	2.4	<1.0U	<0.1U	<0.2U	93.6	55.4

**Table 2.5-4 (cont'd) April 2013 Upper Animas River Surface Water Toxicity Testing
 Final Wet Chemistry Results (mg/L)**

STATION_ID	Chloride	Dissolved Organic Carbon	Fluoride	Nitrate as N	Nitrate/Nitrite as N	Nitrite as N	Sulfate as SO4	Total Alkalinity (mg CaCO3 / L)
Profile test of the Animas River and Mineral Creek surface water samples								
A68	2.7	1.5	0.7	0.2J	0.2J	<0.2U	172	38.0
M34	12.5JD	2.5	<1.0U	<2.0U	<2.0U	<2.0U	237D	<5.00U
A72	11.1JD	3.6	<1.0U	<2.0U	<2.0U	<2.0U	265D	<5.00U
A73	10.1JD	1.6	<1.0U	<2.0U	<2.0U	<2.0U	242D	9.98
A73B	3.6	1.6	0.5	0.3J	0.3J	<0.2U	244	8.16
A75B	3.1	1.5	0.5	0.2J	0.2J	<0.2U	195	17.9
Animas River surface water sample A72 serially diluted by hard reconstituted water (HRW)								
HRW Control	4.9	1.2	<0.1U	<0.2U	<0.2U	<0.2U	210	125
HRW(A72)-88%	10.4JD	1.2	<1.0U	<2.0U	<2.0U	<2.0U	262D	12.0
HRW(A72)-75%	10.4JD	1.3	<1.0U	<2.0U	<2.0U	<2.0U	250D	28.8
HRW(A72)-50%	4.3	1.5	0.4	<0.2U	0.2J	<0.2U	248	57.0
HRW(A72)-35%	4.4	1.3	0.3	<0.2U	<0.2U	<0.2U	236	77.9
HRW(A72)-25%	4.6	1.2	0.2	<0.2U	<0.2U	<0.2U	229	90.4
HRW(A72)-12%	4.7	1.4	0.1J	<0.2U	<0.2U	<0.2U	218	104
Combined sample CC48/M34 serially diluted by Animas River surface water sample A68								
A68(CC48/M34)-Control	4.8	1.3	<0.1U	<0.2U	<0.2U	<0.2U	202	122
A68(CC48/M34)-100%	12.5JD	2.4	<1.0U	<2.0U	<2.0U	<2.0U	315D	<5.00U
A68(CC48/M34)-95%	12.8JD	2.3	<1.0U	<2.0U	<2.0U	<2.0U	309D	<5.00U
A68(CC48/M34)-90%	13.4JD	2.6	1.0JD	<2.0U	<2.0U	<2.0U	305D	<5.00U
A68(CC48/M34)-80%	12.9JD	2.1	<1.0U	<2.0U	<2.0U	<2.0U	286D	<5.00U
A68(CC48/M34)-75%	12.9JD	2.3	<1.0U	<2.0U	<2.0U	<2.0U	279D	<5.00U
A68(CC48/M34)-50%	10.9JD	1.6	<1.0U	<2.0U	<2.0U	<2.0U	242D	7.01
A68(CC48/M34)-25%	3.1	1.4	0.8	0.2J	0.2J	<0.2U	220	22.8
Combined sample CC48/M34 serially diluted by hard reconstituted water (HRW)								
HRW(CC48/M34)-95%	13.1JD	2.7	<1.0U	<2.0U	<2.0U	<2.0U	318D	<5.00U
HRW(CC48/M34)-90%	13.6JD	3.1	<1.0U	<2.0U	<2.0U	<2.0U	312D	<5.00U
HRW(CC48/M34)-75%	10.3JD	1.4	<1.0U	<2.0U	<2.0U	<2.0U	298D	13.5
HRW(CC48/M34)-50%	10.6JD	1.2	<1.0U	<2.0U	<2.0U	<2.0U	266D	50.1
HRW(CC48/M34)-25%	11.0JD	1.3	<1.0U	<2.0U	<2.0U	<2.0U	226D	85.0
Reference toxicity test								
Ref. 100%	2.2	1.1	<0.1U	<0.2U	<0.2U	<0.2U	83.6	52.6
Ref. 50%	2.2	1.0	<0.1U	<0.2U	<0.2U	<0.2U	83.3	50.4
Ref. 25%	2.1	1.0	<0.1U	<0.2U	<0.2U	<0.2U	84.2	55.1
Ref. 12.5%	2.2	1.0	<0.1U	<0.2U	<0.2U	<0.2U	84.3	53.1
Ref. 6.25%	2.3	1.3	<0.1U	<0.2U	<0.2U	<0.2U	84.4	55.4
Ref. Control	2.2	1.2	<0.1U	<0.2U	<0.2U	<0.2U	84.6	55.6

**Table 2.5-5 April 2013 Upper Animas River Surface Water Toxicity Testing
 Initial and Final Ammonia Concentrations**

Site ID	Day 0 Measured Ammonia Conc. (mg N/L)	Day 0 Measured pH	Day 0 Average Measured Ammonia Conc. (mg N/L)	Day 0 Average Measured pH	Day 0 Ammonia Criterion (mg N/L)	Day 4 Measured Ammonia Conc. (mg N/L) ^a	Day 4 Measured pH ^a	Day 4 Average Measured Ammonia Conc. (mg N/L)	Day 4 Average Measured pH	Day 4 Ammonia Criterion (mg N/L)
PROFILE TEST										
A68	0.04941	7.69	0.0511	7.73	9.20	1.279	6.72	1.1385	6.83	27.54
	0.05017	7.80				0.7289	6.82			
	0.05237	7.71				1.456	6.85			
	0.0524	7.71				1.09	6.92			
M34	0.0354	4.82	0.0357	4.98	38.77	0.479	5.30	0.4880	5.22	38.60
	0.03068	4.92				0.5033	5.19			
	0.03706	5.11				0.4492	5.21			
	0.03953	5.05				0.5204	5.19			
A72	0.08822	5.73	0.0880	5.73	37.74	0.5133	5.85	0.6968	5.67	37.89
	0.08951	5.75				0.396	5.59			
	0.0889	5.73				0.5868	5.62			
	0.08529	5.72				1.291	5.63			
A73	0.08014	7.19	0.0804	7.11	21.72	1.668	6.52	1.6413	6.47	32.97
	0.08095	7.15				1.696	6.47			
	0.0802	7.17				1.636	6.45			
	0.08044	6.93				1.565	6.44			
A73B	0.08696	7.50	0.0893	7.52	12.94	1.767	6.56	1.5815	6.52	32.42
	0.0889	7.86				1.615	6.54			
	0.08929	7.40				1.255	6.45			
	0.09208	7.31				1.689	6.51			
A75B	0.07997	7.76	0.0804	7.76	8.66	1.261	6.50	1.4880	6.55	31.97
	0.07763	7.74				1.491	6.54			
	0.08376	7.75				1.754	6.56			
	0.08015	7.80				1.446	6.60			
SERIAL DILUTION OF SAMPLE A72 WITH HRW AS THE DILUENT										
HRW Control	0.03003	7.74	0.0280	7.96	6.03	1.997	7.68	1.7413	7.83	7.72
	0.03007	7.87				1.783	7.77			
	0.02451	8.08				1.545	7.89			
	0.02743	8.16				1.64	7.97			
HRW(A72)-88%	0.0807	6.96	0.0807	6.86	26.93	1.286	7.28	1.4338	7.28	18.00
	0.08067	6.90				1.479	7.26			
	0.0812	6.81				1.46	7.28			
	0.08004	6.77				1.51	7.29			
HRW(A72)-75%	0.07393	7.27	0.0730	7.15	20.78	1.4	7.42	1.4233	7.36	16.20
	0.07544	7.20				1.368	7.32			
	0.07246	7.12				1.424	7.34			
	0.07019	7.02				1.501	7.36			
HRW(A72)-50%	0.06039	7.68	0.0609	7.52	12.84	1.487	7.70	1.4498	7.58	11.70
	0.06181	7.53				1.454	7.56			
	0.0592	7.44				1.458	7.53			
	0.06233	7.44				1.4	7.54			
HRW(A72)-35%	0.0543	7.38	0.0408	7.73	9.12	1.338	7.76	1.4703	7.70	9.69
	0.03561	7.78				1.477	7.72			
	0.03527	8.02				1.539	7.63			
	0.03813	7.75				1.527	7.68			
HRW(A72)-25%	0.1166	7.18	0.1123	7.27	18.28	1.38	7.78	1.5178	7.80	8.14
	0.1113	7.25				1.609	7.88			
	0.1167	7.24				1.653	7.84			
	0.1046	7.39				1.429	7.69			
HRW(A72)-12%	0.08114	7.49	0.0843	7.47	13.94	1.274	7.56	1.4080	7.63	10.84
	0.08043	7.48				1.19	7.60			
	0.08642	7.47				1.609	7.63			
	0.08918	7.43				1.559	7.73			

^avalues shown are either the measurements made at the end of the test (day 4) or earlier if all test organisms died before the 4-day exposure period was completed

**Table 2.5-5 (cont'd) April 2013 Upper Animas River Surface Water Toxicity Testing
 Initial and Final Ammonia Concentrations**

Site ID	Day 0 Measured Ammonia Conc. (mg N/L)	Day 0 Measured pH	Day 0 Average Measured Ammonia Conc. (mg N/L)	Day 0 Average Measured pH	Day 0 Ammonia Criterion (mg N/L)	Day 4 Measured Ammonia Conc. (mg N/L) ^a	Day 4 Measured pH ^a	Day 4 Average Measured Ammonia Conc. (mg N/L)	Day 4 Average Measured pH	Day 4 Ammonia Criterion (mg N/L)
SERIAL DILUTION OF SAMPLE CC48/M34 WITH A68 AS THE DILUENT										
A68(CC48/M34)-100%	0.0367	4.36	0.0335	4.32	38.95	1.026	4.65	0.9995	4.62	38.90
	0.03023	4.29				1.019	4.65			
	0.03478	4.32				0.9901	4.61			
	0.03231	4.30				0.9628	4.57			
A68(CC48/M34)-95%	0.03432	4.58	0.0325	4.54	38.92	0.8675	4.73	0.8658	4.69	38.88
	0.03149	4.53				0.884	4.67			
	0.03123	4.53				0.819	4.69			
	0.03305	4.52				0.8928	4.66			
A68(CC48/M34)-90%	0.03248	4.65	0.0316	4.64	38.89	0.8809	4.75	0.8549	4.78	38.86
	0.03164	4.63				0.7872	4.85			
	0.03085	4.66				0.8561	4.76			
	0.03152	4.63				0.8954	4.74			
A68(CC48/M34)-80%	0.03313	4.69	0.0330	4.70	38.88	0.944	4.90	0.8448	4.83	38.84
	0.03339	4.74				0.7689	4.84			
	0.03163	4.69				0.849	4.81			
	0.03392	4.67				0.8174	4.78			
A68(CC48/M34)-75%	0.03329	4.95	0.0336	4.89	38.81	0.8131	5.22	0.6163	5.20	38.62
	0.03333	4.93				0.9102	5.43			
	0.03367	4.85				0	5.10			
	0.03429	4.84				0.7418	5.06			
A68(CC48/M34)-50%	0.05944	6.34	0.0612	6.15	35.89	1.366	7.01	1.2235	6.94	25.45
	0.06078	6.22				1.201	6.98			
	0.06331	6.04				1.124	6.92			
	0.06128	5.98				1.203	6.83			
A68(CC48/M34)-25%	0.07063	6.97	0.0756	6.88	26.54	1.45	7.25	1.4978	7.24	18.84
	0.07417	6.89				1.431	7.23			
	0.07907	6.84				1.65	7.24			
	0.07862	6.82				1.46	7.24			
SERIAL DILUTION OF SAMPLE CC48/M34 WITH HRW AS THE DILUENT										
HRW(CC48/M34)-Control	0.06793	7.16	0.0691	7.37	16.04	1.251	7.55	1.3228	7.82	7.79
	0.07062	7.22				1.382	7.84			
	0.06924	7.39				1.298	8.01			
	0.06872	7.70				1.36	7.89			
HRW(CC48/M34)-95%	0.03252	5.15	0.0338	4.69	38.88	0.8979	5.00	0.9327	4.99	38.77
	0.03306	4.58				0.9816	4.95			
	0.03355	4.53				0.8745	5.02			
	0.03617	4.48				0.9767	4.98			
HRW(CC48/M34)-90%	0.03385	5.32	0.0361	5.23	38.60	0.9163	6.36	0.9288	5.79	37.55
	0.03668	5.26				0.9138	5.61			
	0.03605	5.15				0.8061	5.40			
	0.03775	5.17				1.079	5.80			
HRW(CC48/M34)-75%	0.03048	6.69	0.0299	6.53	32.23	1.416	7.50	1.3988	7.40	15.29
	0.03321	6.61				1.468	7.34			
	0.03204	6.38				1.372	7.36			
	0.0237	6.44				1.339	7.41			
HRW(CC48/M34)-50%	0.02571	7.23	0.0277	7.14	21.12	1.539	7.71	1.4723	7.67	10.19
	0.02689	7.16				1.524	7.62			
	0.02764	7.10				1.496	7.61			
	0.03052	7.06				1.33	7.73			
HRW(CC48/M34)-25%	0.03247	7.74	0.0312	7.66	10.27	1.481	7.84	1.6005	7.84	7.58
	0.03215	7.76				1.702	7.76			
	0.02816	7.60				1.554	7.88			
	0.03218	7.55				1.665	7.87			

^avalues shown are either the measurements made at the end of the test (day 4) or earlier if all test organisms died before the 4-day exposure period was completed

**Table 2.5-5 (cont'd) April 2013 Upper Animas River Surface Water Toxicity Testing
 Initial and Final Ammonia Concentrations**

Site ID	Day 0 Measured Ammonia Conc. (mg N/L)	Day 0 Measured pH	Day 0 Average Measured Ammonia Conc. (mg N/L)	Day 0 Average Measured pH	Day 0 Ammonia Criterion (mg N/L)	Day 4 Measured Ammonia Conc. (mg N/L) ^a	Day 4 Measured pH ^a	Day 4 Average Measured Ammonia Conc. (mg N/L)	Day 4 Average Measured pH	Day 4 Ammonia Criterion (mg N/L)
REFERENCE TOXICITY TEST										
Laboratory Control	0.09254	7.84	0.0814	7.89	6.92	1.653	7.45	1.5710	7.47	13.84
	0.07788	7.88				1.593	7.37			
	0.07861	7.89				1.583	7.50			
	0.0764	7.94				1.455	7.57			
100%	0.05802	7.84	0.0561	7.80	8.11	0.08906	7.28	0.5487	7.42	14.87
	0.05522	7.79				1.006	7.55			
	0.05446	7.79				0.9963	7.54			
	0.05655	7.78				0.1034	7.32			
50%	0.06034	7.92	0.0619	7.91	6.67	1.31	7.63	0.7637	7.52	12.84
	0.06287	7.88				0.6263	7.32			
	0.06745	7.87				1.076	7.54			
	0.05683	7.96				0.04236	7.60			
25%	0.06223	8.07	0.0649	8.02	5.38	0.1619	7.74	0.3588	7.72	9.32
	0.06625	8.06				0.505	7.61			
	0.0678	7.99				0.5246	7.75			
	0.06319	7.97				0.2438	7.78			
12.50%	0.07566	8.00	0.0728	7.99	5.75	1.686	7.60	1.5048	7.64	10.62
	0.06907	7.98				1.031	7.68			
	0.06867	7.99				1.399	7.65			
	0.07793	7.98				1.903	7.64			
6.25%	0.08101	8.05	0.0780	8.02	5.38	1.429	7.58	1.4925	7.62	11.06
	0.07508	8.02				1.481	7.62			
	0.07711	8.03				1.434	7.65			
	0.07886	7.99				1.626	7.62			

^aValues shown are either the measurements made at the end of the test (day 4) or earlier if all test organisms died before the 4-day exposure period was completed

Figures

TechLaw, Inc.
Environmental Services Assistance Team
Contract No. EP-W-06-033

Upper Animas River Surface Water Toxicity Testing Report
Final
August 2013

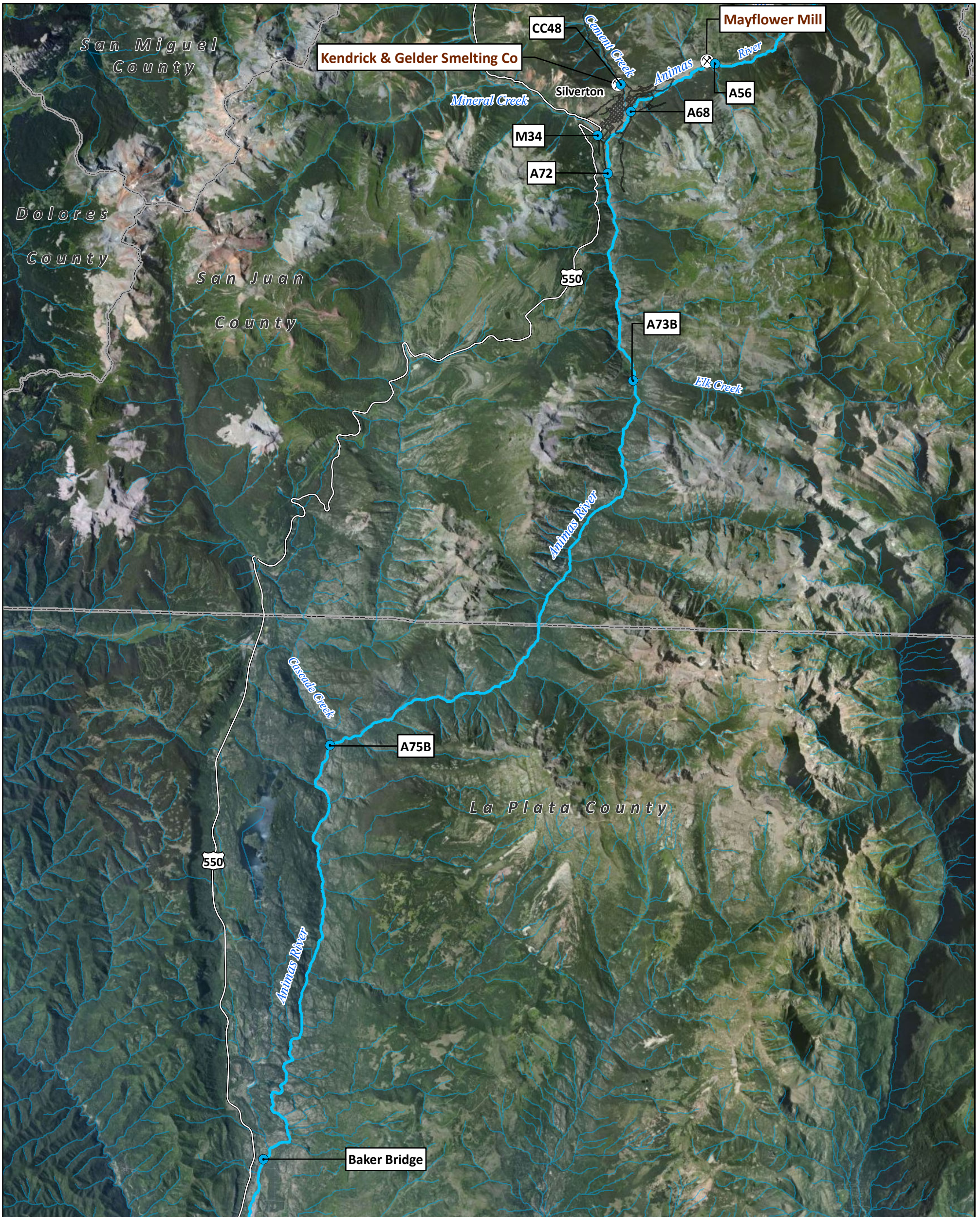







Figure 2.1-1
Upper Animas Mining District
2012 Surface Water Toxicity Test



-  Sample Locations
-  Mine Locations
-  Rivers and Streams
-  Roads
-  County Boundaries

Date: July 15, 2013

Data Sources:

Sample Locations: U.S. EPA Region 8 and UOS (2013)
 Mine Locations: U.S. EPA and ESAT (2012)
 Roads: Navteq (2011)
 Rivers and Streams: CDOW 1:24k (2004)
 County Boundaries: U.S. Census Bureau (2011)
 Image: Bing (2013)

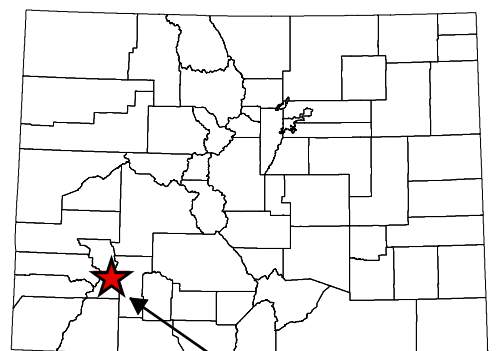
Coordinate System/Projection:
 UTM Zone 13 North, NAD 83, Meters



0 1 2 Miles

0 1 2 Kilometers

Colorado



Area of Interest

Figure 3.1
Survival in juvenile rainbow trout exposed for 96 hours to undiluted Animas River and Mineral Creek surface water (profile test) and A72 surface water serially diluted with HRW

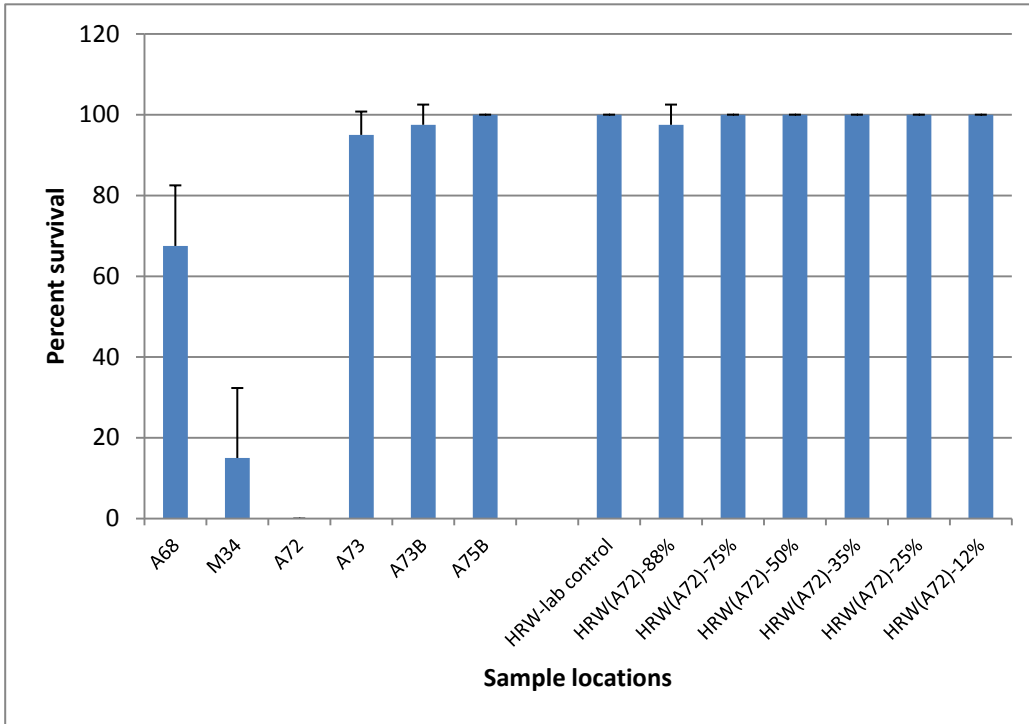


Figure 3.2
Survival in juvenile rainbow trout exposed for 96 hours to mixed CC48/M34 surface water serially diluted with A68 surface water and HRW

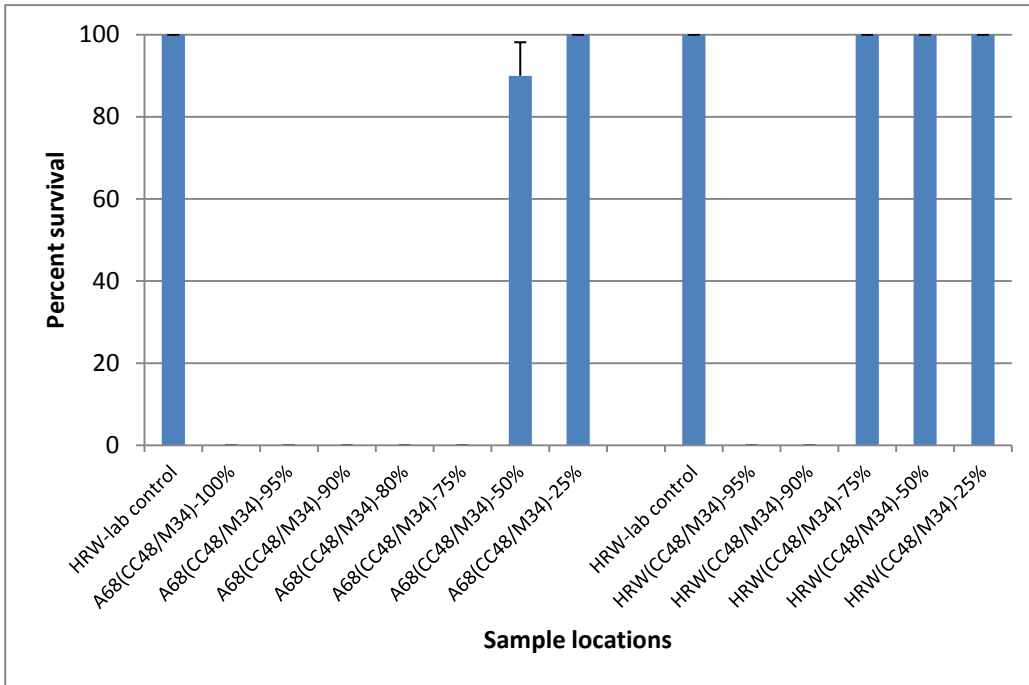


Figure 3.3
Survival in juvenile rainbow trout exposed for 96 hours to a reference toxicant (zinc sulfate heptahydrate)

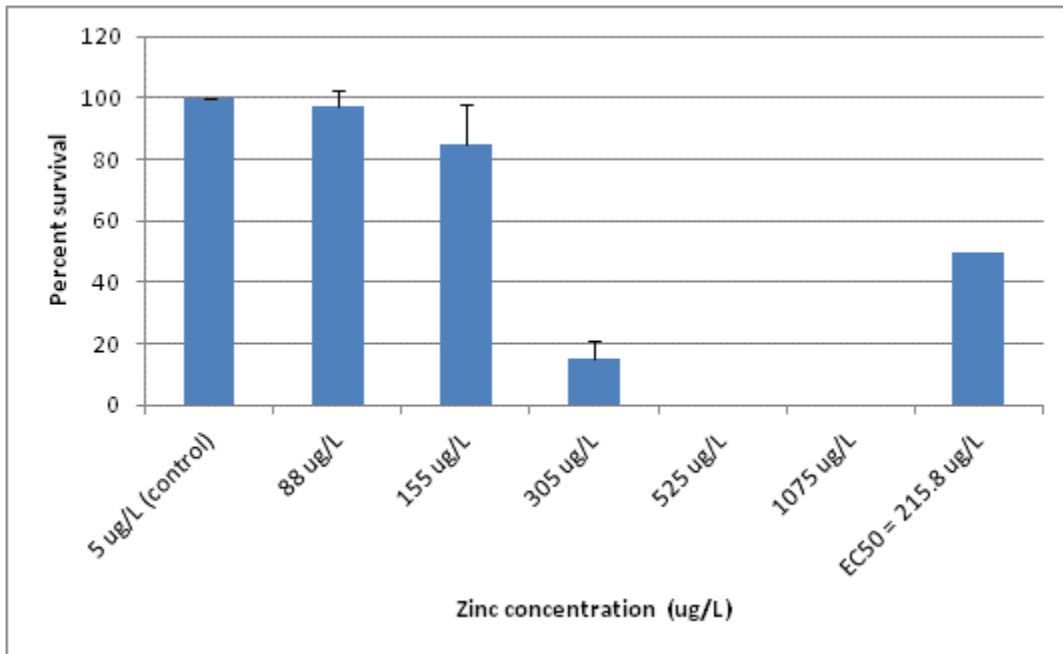
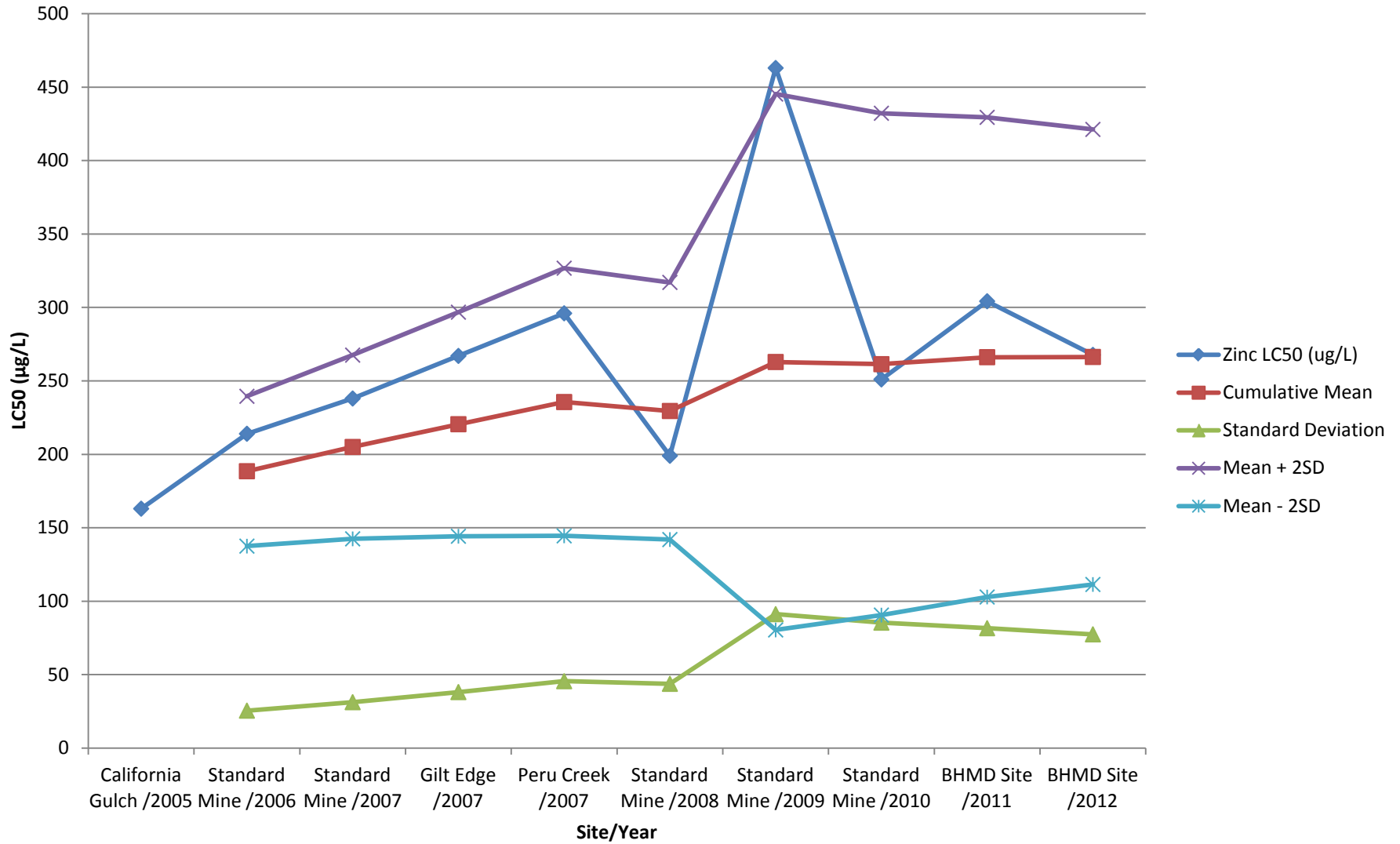


Figure 3.4
Acute reference toxicant control chart for juvenile rainbow trout
exposed to zinc at the EPA Region 8 Laboratory



Appendices

APPENDIX A: Test data sheets for the profile test

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/18/13
End Date	04/22/13
Organism	RBT (0.38 gram)

No. Organisms	10
No. of Replicates	4
Analysts	SA,BW,LC, NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68-01	No. Alive	10	10	9	8	8
A68-01	pH	7.69	7.37	6.76	6.64	6.72
A68-01	Temp (C)	12.22	11.88	11.8	11.79	12.05
A68-01	D.O. (mg/L)	8.62	8.36	8.38	8.46	8.34
A68-01	Conductivity (us/cm)	426	433	441.6	434.9	435
A68-01	Alkalinity	34.1				38.0
A68-01	Hardness	194				191

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68-02	No. Alive	10	10	6	5	5
A68-02	pH	7.8	7.35	6.82	6.79	6.82
A68-02	Temp (C)	12.09	11.83	11.79	11.78	12.06
A68-02	D.O. (mg/L)	8.68	7.72	8.38	8.48	8.37
A68-02	Conductivity (us/cm)	426.4	433.7	438.3	431.6	432.5
A68-02	Alkalinity	34.1				38.0
A68-02	Hardness	194				191

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68-03	No. Alive	10	10	8	8	8
A68-03	pH	7.71	7.42	6.87	6.78	6.85
A68-03	Temp (C)	12	11.81	11.79	11.76	12.07
A68-03	D.O. (mg/L)	8.72	8.03	8.35	8.43	8.4
A68-03	Conductivity (us/cm)	427.2	434.7	438.9	436.5	436.9
A68-03	Alkalinity	34.1				38
A68-03	Hardness	194				191

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68-04	No. Alive	10	10	9	6	6
A68-04	pH	7.71	7.42	6.92	6.89	6.92
A68-04	Temp (C)	11.98	11.82	11.79	11.77	12.07
A68-04	D.O. (mg/L)	8.73	8.12	8.3	8.35	8.33
A68-04	Conductivity (us/cm)	427.3	433.1	440.1	436.6	434.8
A68-04	Alkalinity	34.1				38
A68-04	Hardness	194				191

APPENDIX A: Test data sheets for the profile test

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/18/13
End Date	04/22/13
Organism	RBT (0.38 gram)

No. Organisms	10
No. of Replicates	4
Analysts	SA,BW,LC, NM

Site I.D. ^a	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
M34-01	No. Alive	10	10	4	3	0
M34-01	pH	4.82	6.02	6.69	6.44	5.3
M34-01	Temp (C)	12.67	11.85	11.83	12.1	12.26
M34-01	D.O. (mg/L)	8.6	8.2	8.53	8.49	8.73
M34-01	Conductivity (us/cm)	521.7	534.6	554.6	543.2	528.2
M34-01	Alkalinity	<5.00U				<5.00U
M34-01	Hardness	227				224

Site I.D. ^a	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
M34-02	No. Alive	10	10	5	4	3
M34-02	pH	4.92	6.03	6.68	6.37	5.19
M34-02	Temp (C)	12.51	11.79	11.85	12.09	12.14
M34-02	D.O. (mg/L)	8.73	8.25	8.54	8.5	8.69
M34-02	Conductivity (us/cm)	523.4	536.5	556.5	543.2	526.8
M34-02	Alkalinity	<5.00U				<5.00U
M34-02	Hardness	227				224

Site I.D. ^a	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
M34-03	No. Alive	10	10	6	4	3
M34-03	pH	5.11	6.05	6.65	6.36	5.21
M34-03	Temp (C)	12.42	11.74	11.82	12.07	12.06
M34-03	D.O. (mg/L)	8.81	8.31	8.53	8.48	8.61
M34-03	Conductivity (us/cm)	522.2	537.3	555.9	544.7	526.7
M34-03	Alkalinity	<5.00U				<5.00U
M34-03	Hardness	227				224

Site I.D. ^a	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
M34-04	No. Alive	10	10	7	5	0
M34-04	pH	5.05	6.04	6.66	6.37	5.19
M34-04	Temp (C)	12.35	11.73	11.83	12.05	12.04
M34-04	D.O. (mg/L)	8.89	8.35	8.5	8.47	8.64
M34-04	Conductivity (us/cm)	524	534.3	551.5	544.6	529.2
M34-04	Alkalinity	<5.00U				<5.00U
M34-04	Hardness	227				224

APPENDIX A: Test data sheets for the profile test

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/18/13
End Date	04/22/13
Organism	RBT (0.38 gram)

No. Organisms	10
No. of Replicates	4
Analysts	SA,BW,LC, NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A72-01	No. Alive	10	10	3	0	-
A72-01	pH	5.73	6.06	6.3	5.85	-
A72-01	Temp (C)	11.84	11.93	11.89	11.8	-
A72-01	D.O. (mg/L)	8.76	8.29	8.33	8.48	-
A72-01	Conductivity (us/cm)	573.4	581.3	587.7	578.7	-
A72-01	Alkalinity	<5.00U			<5.00U	
A72-01	Hardness	255			265	

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A72-02	No. Alive	10	10	3	0	-
A72-02	pH	5.75	6.21	6.22	5.59	-
A72-02	Temp (C)	11.82	11.87	11.87	11.8	-
A72-02	D.O. (mg/L)	8.76	8.35	8.39	8.53	-
A72-02	Conductivity (us/cm)	575.2	585.7	592.3	576	-
A72-02	Alkalinity	<5.00U			<5.00U	
A72-02	Hardness	255			265	

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A72-03	No. Alive	10	10	4	0	-
A72-03	pH	5.73	6.16	6.25	5.62	-
A72-03	Temp (C)	11.78	11.8	11.85	11.8	-
A72-03	D.O. (mg/L)	8.78	8.4	8.44	8.59	-
A72-03	Conductivity (us/cm)	574.6	583.8	590.1	579.5	-
A72-03	Alkalinity	<5.00U			<5.00U	
A72-03	Hardness	255			265	

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A72-04	No. Alive	10	9	6	0	-
A72-04	pH	5.72	6.2	6.26	5.63	-
A72-04	Temp (C)	11.76	11.82	11.82	11.79	-
A72-04	D.O. (mg/L)	8.77	8.42	8.46	8.63	-
A72-04	Conductivity (us/cm)	574.8	585.2	590.1	583	-
A72-04	Alkalinity	<5.00U			<5.00U	
A72-04	Hardness	255			265	

APPENDIX A: Test data sheets for the profile test

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/18/13
End Date	04/22/13
Organism	RBT (0.38 gram)

No. Organisms	10
No. of Replicates	4
Analysts	SA,BW,LC, NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A73-01	No. Alive	10	10	9	9	9
A73-01	pH	7.19	6.56	6.42	6.31	6.52
A73-01	Temp (C)	11.81	12.07	11.89	11.8	12.07
A73-01	D.O. (mg/L)	8.77	8.2	8.27	8.27	8.19
A73-01	Conductivity (us/cm)	531.6	539.6	541.8	537.7	539.2
A73-01	Alkalinity	<5.00U				9.98
A73-01	Hardness	237				238

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A73-02	No. Alive	10	10	10	10	10
A73-02	pH	7.15	6.53	6.46	6.31	6.47
A73-02	Temp (C)	11.82	12.02	11.88	11.79	12.07
A73-02	D.O. (mg/L)	8.76	8.3	8.29	8.26	8.15
A73-02	Conductivity (us/cm)	531.8	538.3	540.1	537.8	540.2
A73-02	Alkalinity	<5.00U				9.98
A73-02	Hardness	237				238

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A73-03	No. Alive	10	10	10	10	10
A73-03	pH	7.17	6.53	6.5	6.32	6.45
A73-03	Temp (C)	11.8	12	11.89	11.76	12.06
A73-03	D.O. (mg/L)	8.76	8.34	8.25	8.24	8.14
A73-03	Conductivity (us/cm)	531.8	537.5	539.1	538.2	539.2
A73-03	Alkalinity	<5.00U				9.98
A73-03	Hardness	237				238

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A73-04	No. Alive	10	10	10	9 ^b	9
A73-04	pH	6.93	6.52	6.43	6.3	6.44
A73-04	Temp (C)	11.8	11.99	11.89	11.76	12.07
A73-04	D.O. (mg/L)	8.77	8.28	8.07	8.2	8.15
A73-04	Conductivity (us/cm)	531.8	537.7	539.6	539.1	538.7
A73-04	Alkalinity	<5.00U				9.98
A73-04	Hardness	237				238

APPENDIX A: Test data sheets for the profile test

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/18/13
End Date	04/22/13
Organism	RBT (0.38 gram)

No. Organisms	10
No. of Replicates	4
Analysts	SA,BW,LC, NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A73B-01	No. Alive	10	10	10	10	10
A73B-01	pH	7.5	6.74	6.48	6.36	6.56
A73B-01	Temp (C)	11.86	12.14	11.98	11.82	12.05
A73B-01	D.O. (mg/L)	8.77	8.03	8.23	8.29	8
A73B-01	Conductivity (us/cm)	503.6	507.9	510.8	509.7	513.1
A73B-01	Alkalinity	<5.00U				8.16
A73B-01	Hardness	226				226

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A73B-02	No. Alive	10	10	10	10	10
A73B-02	pH	7.86	6.67	6.57	6.37	6.54
A73B-02	Temp (C)	11.85	12.04	11.97	11.8	12.05
A73B-02	D.O. (mg/L)	8.75	8.03	8.17	8.25	8.04
A73B-02	Conductivity (us/cm)	503.9	507.8	512.3	511.3	511.6
A73B-02	Alkalinity	<5.00U				8.16
A73B-02	Hardness	226				226

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A73B-03	No. Alive	10	10	10	9	9
A73B-03	pH	7.4	6.65	6.51	6.35	6.45
A73B-03	Temp (C)	11.83	12.03	11.94	11.8	12.04
A73B-03	D.O. (mg/L)	8.77	8.15	8.21	8.26	8.07
A73B-03	Conductivity (us/cm)	504.1	507.5	512	510.1	509.2
A73B-03	Alkalinity	<5.00U				8.16
A73B-03	Hardness	226				226

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A73B-04	No. Alive	10	10	10	10	10
A73B-04	pH	7.31	6.61	6.49	6.35	6.51
A73B-04	Temp (C)	11.83	12.06	11.91	11.79	12.05
A73B-04	D.O. (mg/L)	8.76	8.09	8.22	8.25	8.11
A73B-04	Conductivity (us/cm)	503.8	509.1	511.9	510.6	512.2
A73B-04	Alkalinity	<5.00U				8.16
A73B-04	Hardness	226				226

APPENDIX A: Test data sheets for the profile test

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/18/13
End Date	04/22/13
Organism	RBT (0.38 gram)

No. Organisms	10
No. of Replicates	4
Analysts	SA,BW,LC, NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A75B-01	No. Alive	10	10	10	10	10
A75B-01	pH	7.76	7	6.37	6.4	6.5
A75B-01	Temp (C)	11.91	12.21	12.2	12.09	12.36
A75B-01	D.O. (mg/L)	8.73	7.98	8.16	8.14	7.3
A75B-01	Conductivity (us/cm)	416	422.7	427	426.2	428.6
A75B-01	Alkalinity	11.6				17.9
A75B-01	Hardness	184				189

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A75B-02	No. Alive	10	10	10	10	10
A75B-02	pH	7.74	6.91	6.44	6.28	6.54
A75B-02	Temp (C)	11.91	11.93	12.07	12.03	12.15
A75B-02	D.O. (mg/L)	8.75	8.17	8.18	8.17	7.7
A75B-02	Conductivity (us/cm)	416.5	422.9	426.4	425.8	428.1
A75B-02	Alkalinity	11.6				17.9
A75B-02	Hardness	184				189

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A75B-03	No. Alive	10	10	10	10	10
A75B-03	pH	7.75	6.9	6.5	6.32	6.56
A75B-03	Temp (C)	11.87	11.91	12.02	11.83	12.06
A75B-03	D.O. (mg/L)	8.76	7.84	8.3	8.23	7.95
A75B-03	Conductivity (us/cm)	416.8	421.4	428.2	428.8	430.6
A75B-03	Alkalinity	11.6				17.9
A75B-03	Hardness	184				189

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A75B-04	No. Alive	10	10	10	10	10
A75B-04	pH	7.8	6.87	6.56	6.37	6.6
A75B-04	Temp (C)	11.88	11.9	12.01	11.81	12.06
A75B-04	D.O. (mg/L)	8.78	7.57	8.25	8.24	8.05
A75B-04	Conductivity (us/cm)	417.1	421.8	426.9	425.2	427.3
A75B-04	Alkalinity	11.6				17.9
A75B-04	Hardness	184				189

^a Surface water sample M34 was tested starting 4/19/13

^b one juvenile rainbow trout jumped out of the test vessel

APPENDIX B: Test data sheet for the serial dilution of A72 with HRW

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/19/13	No. Organisms 10
End Date	04/23/13	No. of Replicates 4
Organism	RBT (0.38 gram)	Analysts SA,BW,LC,NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-88%-Rep1	No. Alive	10	10	10	10	10
HRW(A72)-88%-Rep1	pH	6.96	7.23	7.27	7.31	7.28
HRW(A72)-88%-Rep1	Temp (C)	12.65	11.74	12.04	11.75	11.75
HRW(A72)-88%-Rep1	D.O. (mg/L)	8.56	8.13	8.21	8.12	8.29
HRW(A72)-88%-Rep1	Conductivity (us/cm)	578.4	580.9	581.5	583.5	582.3
HRW(A72)-88%-Rep1	Alkalinity	9.14				12.0
HRW(A72)-88%-Rep1	Hardness	251				241

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-88%-Rep2	No. Alive	10	10	10	10	10
HRW(A72)-88%-Rep2	pH	6.9	7.13	7.22	7.28	7.26
HRW(A72)-88%-Rep2	Temp (C)	12.62	11.74	12.04	11.72	11.74
HRW(A72)-88%-Rep2	D.O. (mg/L)	8.63	8.22	8.29	8.18	8.39
HRW(A72)-88%-Rep2	Conductivity (us/cm)	577.1	580.6	581.1	583	583.3
HRW(A72)-88%-Rep2	Alkalinity	9.14				12.0
HRW(A72)-88%-Rep2	Hardness	251				241

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A73)-88%-Rep3	No. Alive	10	10	9	9	9
HRW(A73)-88%-Rep3	pH	6.81	7.17	7.27	7.26	7.28
HRW(A73)-88%-Rep3	Temp (C)	12.59	11.73	12.02	11.7	11.73
HRW(A73)-88%-Rep3	D.O. (mg/L)	8.6	8.26	8.33	8.28	8.43
HRW(A73)-88%-Rep3	Conductivity (us/cm)	578	583.4	583.2	583.2	583.3
HRW(A73)-88%-Rep3	Alkalinity	9.14				12.0
HRW(A73)-88%-Rep3	Hardness	251				241

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-88%-Rep4	No. Alive	10	10	10	10	10
HRW(A72)-88%-Rep4	pH	6.77	7.17	7.24	7.23	7.29
HRW(A72)-88%-Rep4	Temp (C)	12.59	11.72	12.03	11.7	11.72
HRW(A72)-88%-Rep4	D.O. (mg/L)	8.62	8.33	8.33	8.33	8.44
HRW(A72)-88%-Rep4	Conductivity (us/cm)	580.2	581.9	581.5	583.5	583.9
HRW(A72)-88%-Rep4	Alkalinity	9.14				12.0
HRW(A72)-88%-Rep4	Hardness	251				241

APPENDIX B: Test data sheet for the serial dilution of A72 with HRW

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/19/13	No. Organisms 10
End Date	04/23/13	No. of Replicates 4
Organism	RBT (0.38 gram)	Analysts SA,BW,LC,NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-75%-Rep1	No. Alive	10	10	10	10	10
HRW(A72)-75%-Rep1	pH	7.27	7.43	7.43	7.53	7.42
HRW(A72)-75%-Rep1	Temp (C)	12.88	11.72	12	11.74	11.73
HRW(A72)-75%-Rep1	D.O. (mg/L)	8.44	7.89	7.91	7.87	8.1
HRW(A72)-75%-Rep1	Conductivity (us/cm)	584.5	590.7	589.4	591.5	591.2
HRW(A72)-75%-Rep1	Alkalinity	26.6				28.8
HRW(A72)-75%-Rep1	Hardness	244				237

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-75%-Rep2	No. Alive	10	10	10	10	10
HRW(A72)-75%-Rep2	pH	7.2	7.39	7.37	7.47	7.32
HRW(A72)-75%-Rep2	Temp (C)	12.94	11.75	12	11.73	11.74
HRW(A72)-75%-Rep2	D.O. (mg/L)	8.45	7.9	7.88	7.87	8.12
HRW(A72)-75%-Rep2	Conductivity (us/cm)	584	588.4	588.7	590.5	590.3
HRW(A72)-75%-Rep2	Alkalinity	26.6				28.8
HRW(A72)-75%-Rep2	Hardness	244				237

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-75%-Rep3	No. Alive	10	10	10	10	10
HRW(A72)-75%-Rep3	pH	7.12	7.34	7.35	7.43	7.34
HRW(A72)-75%-Rep3	Temp (C)	12.74	11.74	11.99	11.72	11.77
HRW(A72)-75%-Rep3	D.O. (mg/L)	8.52	7.97	7.92	7.9	8.21
HRW(A72)-75%-Rep3	Conductivity (us/cm)	585.9	589.1	588.3	590	590.4
HRW(A72)-75%-Rep3	Alkalinity	26.6				28.8
HRW(A72)-75%-Rep3	Hardness	244				237

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-75%-Rep4	No. Alive	10	10	10	10	10
HRW(A72)-75%-Rep4	pH	7.02	7.32	7.34	7.41	7.36
HRW(A72)-75%-Rep4	Temp (C)	12.68	11.75	11.99	11.71	11.74
HRW(A72)-75%-Rep4	D.O. (mg/L)	8.54	7.91	7.97	8.05	8.26
HRW(A72)-75%-Rep4	Conductivity (us/cm)	582.7	589	589.3	591.4	590.8
HRW(A72)-75%-Rep4	Alkalinity	26.6				28.8
HRW(A72)-75%-Rep4	Hardness	244				237

APPENDIX B: Test data sheet for the serial dilution of A72 with HRW

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/19/13	No. Organisms 10
End Date	04/23/13	No. of Replicates 4
Organism	RBT (0.38 gram)	Analysts SA,BW,LC,NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-50%-Rep1	No. Alive	10	10	10	10	10
HRW(A72)-50%-Rep1	pH	7.68	7.75	7.56	7.75	7.7
HRW(A72)-50%-Rep1	Temp (C)	13.14	11.76	12.02	11.76	11.76
HRW(A72)-50%-Rep1	D.O. (mg/L)	8.22	8.08	7.91	8.03	8.22
HRW(A72)-50%-Rep1	Conductivity (us/cm)	600.8	608.5	606.6	608.4	607.3
HRW(A72)-50%-Rep1	Alkalinity	55.4				57.0
HRW(A72)-50%-Rep1	Hardness	223				218

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-50%-Rep2	No. Alive	10	10	10	10	10
HRW(A72)-50%-Rep2	pH	7.53	7.67	7.54	7.66	7.56
HRW(A72)-50%-Rep2	Temp (C)	13.22	11.76	12.01	11.74	11.78
HRW(A72)-50%-Rep2	D.O. (mg/L)	8.26	8.05	7.89	8	8.09
HRW(A72)-50%-Rep2	Conductivity (us/cm)	602.6	606	603.4	605.8	606.8
HRW(A72)-50%-Rep2	Alkalinity	55.4				57.0
HRW(A72)-50%-Rep2	Hardness	223				218

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-50%-Rep3	No. Alive	10	10	10	10	10
HRW(A72)-50%-Rep3	pH	7.44	7.58	7.52	7.64	7.53
HRW(A72)-50%-Rep3	Temp (C)	13.12	11.74	11.99	11.72	11.81
HRW(A72)-50%-Rep3	D.O. (mg/L)	8.33	7.92	7.87	7.91	8.01
HRW(A72)-50%-Rep3	Conductivity (us/cm)	601.7	607.5	605.9	606.4	607.6
HRW(A72)-50%-Rep3	Alkalinity	55.4				57.0
HRW(A72)-50%-Rep3	Hardness	223				218

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-50%-Rep4	No. Alive	10	10	10	10	10
HRW(A72)-50%-Rep4	pH	7.44	7.52	7.51	7.61	7.54
HRW(A72)-50%-Rep4	Temp (C)	13.02	11.74	12	11.71	11.76
HRW(A72)-50%-Rep4	D.O. (mg/L)	8.32	7.85	7.82	7.87	7.99
HRW(A72)-50%-Rep4	Conductivity (us/cm)	602.2	607.7	605.3	606.4	606.4
HRW(A72)-50%-Rep4	Alkalinity	55.4				57.0
HRW(A72)-50%-Rep4	Hardness	223				218

APPENDIX B: Test data sheet for the serial dilution of A72 with HRW

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/19/13	No. Organisms 10
End Date	04/23/13	No. of Replicates 4
Organism	RBT (0.38 gram)	Analysts SA,BW,LC,NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-35%-Rep1	No. Alive	10	10	10	10	10
HRW(A72)-35%-Rep1	pH	7.38	7.67	7.69	7.82	7.76
HRW(A72)-35%-Rep1	Temp (C)	12.97	11.78	12.01	11.74	11.84
HRW(A72)-35%-Rep1	D.O. (mg/L)	8.34	7.96	8.25	8.21	8.29
HRW(A72)-35%-Rep1	Conductivity (us/cm)	605.2	624.8	616.5	617.6	615.5
HRW(A72)-35%-Rep1	Alkalinity	76.1				77.9
HRW(A72)-35%-Rep1	Hardness	211				201

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-35%-Rep2	No. Alive	10	10	10	10	10
HRW(A72)-35%-Rep2	pH	7.78	7.91	7.7	7.79	7.72
HRW(A72)-35%-Rep2	Temp (C)	13.32	11.77	12.02	11.78	11.81
HRW(A72)-35%-Rep2	D.O. (mg/L)	8.17	8.11	8.24	8.23	8.25
HRW(A72)-35%-Rep2	Conductivity (us/cm)	628.3	628.6	617.1	618.9	617.1
HRW(A72)-35%-Rep2	Alkalinity	76.1				77.9
HRW(A72)-35%-Rep2	Hardness	211				201

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-35%-Rep3	No. Alive	10	10	10	10	10
HRW(A72)-35%-Rep3	pH	8.02	7.92	7.67	7.78	7.63
HRW(A72)-35%-Rep3	Temp (C)	13.59	11.77	12.02	11.78	11.78
HRW(A72)-35%-Rep3	D.O. (mg/L)	8.2	8.15	8.19	8.19	8.27
HRW(A72)-35%-Rep3	Conductivity (us/cm)	627.2	633.9	617.8	618	617.3
HRW(A72)-35%-Rep3	Alkalinity	76.1				77.9
HRW(A72)-35%-Rep3	Hardness	211				201

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-35%-Rep4	No. Alive	10	10	10	10	10
HRW(A72)-35%-Rep4	pH	7.75	7.92	7.67	7.77	7.68
HRW(A72)-35%-Rep4	Temp (C)	13.03	11.76	12.01	11.76	11.7
HRW(A72)-35%-Rep4	D.O. (mg/L)	8.08	8.2	8.07	8.15	8.22
HRW(A72)-35%-Rep4	Conductivity (us/cm)	626.3	636.3	617.5	616.1	618.4
HRW(A72)-35%-Rep4	Alkalinity	76.1				77.9
HRW(A72)-35%-Rep4	Hardness	211				201

APPENDIX B: Test data sheet for the serial dilution of A72 with HRW

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/19/13	No. Organisms 10
End Date	04/23/13	No. of Replicates 4
Organism	RBT (0.38 gram)	Analysts SA,BW,LC,NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-25%-Rep1	No. Alive	10	10	10	10	10
HRW(A72)-25%-Rep1	pH	7.18	7.63	7.6	7.86	7.78
HRW(A72)-25%-Rep1	Temp (C)	12.4	11.76	11.98	11.68	11.83
HRW(A72)-25%-Rep1	D.O. (mg/L)	7.56	8.3	8.3	8.29	8.35
HRW(A72)-25%-Rep1	Conductivity (us/cm)	618.9	623.1	622.9	624.9	623.1
HRW(A72)-25%-Rep1	Alkalinity	87.5				90.4
HRW(A72)-25%-Rep1	Hardness	200				182

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-25%-Rep2	No. Alive	10	10	10	10	10
HRW(A72)-25%-Rep2	pH	7.25	7.66	7.62	7.88	7.88
HRW(A72)-25%-Rep2	Temp (C)	12.24	11.73	11.98	11.68	11.79
HRW(A72)-25%-Rep2	D.O. (mg/L)	7.86	8.31	8.35	8.31	8.43
HRW(A72)-25%-Rep2	Conductivity (us/cm)	618.4	624.6	624.2	627.4	624.9
HRW(A72)-25%-Rep2	Alkalinity	87.5				90.4
HRW(A72)-25%-Rep2	Hardness	200				182

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-25%-Rep3	No. Alive	10	10	10	10	10
HRW(A72)-25%-Rep3	pH	7.24	7.69	7.69	7.85	7.84
HRW(A72)-25%-Rep3	Temp (C)	12.21	11.73	11.95	11.67	11.79
HRW(A72)-25%-Rep3	D.O. (mg/L)	7.86	8.31	8.32	8.25	8.28
HRW(A72)-25%-Rep3	Conductivity (us/cm)	616.7	623.8	624.8	624.7	624.8
HRW(A72)-25%-Rep3	Alkalinity	87.5				90.4
HRW(A72)-25%-Rep3	Hardness	200				182

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-25%-Rep4	No. Alive	10	10	10	10	10
HRW(A72)-25%-Rep4	pH	7.39	7.69	7.67	7.8	7.69
HRW(A72)-25%-Rep4	Temp (C)	12.19	11.74	12	11.68	11.77
HRW(A72)-25%-Rep4	D.O. (mg/L)	7.99	8.21	8.07	8.02	8.22
HRW(A72)-25%-Rep4	Conductivity (us/cm)	617.1	620.7	624.7	623	622.6
HRW(A72)-25%-Rep4	Alkalinity	87.5				90.4
HRW(A72)-25%-Rep4	Hardness	200				182

APPENDIX B: Test data sheet for the serial dilution of A72 with HRW

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/19/13	No. Organisms 10
End Date	04/23/13	No. of Replicates 4
Organism	RBT (0.38 gram)	Analysts SA,BW,LC,NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-12%-Rep1	No. Alive	10	10	10	10	10
HRW(A72)-12%-Rep1	pH	7.49	7.59	7.28	7.53	7.56
HRW(A72)-12%-Rep1	Temp (C)	12.22	12.44	12.23	12.01	12.01
HRW(A72)-12%-Rep1	D.O. (mg/L)	7.77	7.95	8.11	7.91	8.12
HRW(A72)-12%-Rep1	Conductivity (us/cm)	626.2	627	626.3	628.1	630.3
HRW(A72)-12%-Rep1	Alkalinity	106				104
HRW(A72)-12%-Rep1	Hardness	190				182

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-12%-Rep2	No. Alive	10	10	10	10	10
HRW(A72)-12%-Rep2	pH	7.48	7.65	7.41	7.71	7.6
HRW(A72)-12%-Rep2	Temp (C)	12.23	11.91	12.14	11.88	11.9
HRW(A72)-12%-Rep2	D.O. (mg/L)	7.89	8.09	8.18	7.98	8.26
HRW(A72)-12%-Rep2	Conductivity (us/cm)	630	629.8	628.8	629.7	628.8
HRW(A72)-12%-Rep2	Alkalinity	106				104
HRW(A72)-12%-Rep2	Hardness	190				182

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-12%-Rep3	No. Alive	10	10	10	10	10
HRW(A72)-12%-Rep3	pH	7.47	7.38	7.55	7.87	7.63
HRW(A72)-12%-Rep3	Temp (C)	12.31	11.78	11.99	11.7	11.8
HRW(A72)-12%-Rep3	D.O. (mg/L)	7.9	8.2	8.24	8.2	8.37
HRW(A72)-12%-Rep3	Conductivity (us/cm)	633.6	633.1	630.6	634.6	633.4
HRW(A72)-12%-Rep3	Alkalinity	106				104
HRW(A72)-12%-Rep3	Hardness	190				182

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW(A72)-12%-Rep4	No. Alive	10	10	10	10	10
HRW(A72)-12%-Rep4	pH	7.43	7.5	7.64	7.91	7.73
HRW(A72)-12%-Rep4	Temp (C)	12.32	11.76	11.98	11.67	11.79
HRW(A72)-12%-Rep4	D.O. (mg/L)	8	8.21	8.27	8.29	8.44
HRW(A72)-12%-Rep4	Conductivity (us/cm)	629.9	633	633.7	634.6	632.4
HRW(A72)-12%-Rep4	Alkalinity	106				104
HRW(A72)-12%-Rep4	Hardness	190				182

APPENDIX C: Test data sheet for the serial dilution of CC48/M34 with A68

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/19/13
End Date	04/23/13
Organism	RBT (0.38 gram)

No. Organisms	10
No. of Replicates	4
Analysts	SA,BW,LC,NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-Control-Rep1	No. Alive	10	10	10	10	10
A68/(CC48/M34)-Control-Rep1	pH	7.16	7.15	7.42	7.6	7.55
A68/(CC48/M34)-Control-Rep1	Temp (C)	12.33	12.48	12.01	12.06	12.2
A68/(CC48/M34)-Control-Rep1	D.O. (mg/L)	7.48	7.41	7.76	7.92	7.93
A68/(CC48/M34)-Control-Rep1	Conductivity (us/cm)	631.6	635.6	636.7	638.4	637.7
A68/(CC48/M34)-Control-Rep1	Alkalinity	120				122
A68/(CC48/M34)-Control-Rep1	Hardness	183				179

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-Control-Rep2	No. Alive	10	10	10	10	10
A68/(CC48/M34)-Control-Rep2	pH	7.22	7.35	7.46	7.8	7.84
A68/(CC48/M34)-Control-Rep2	Temp (C)	12.38	12.22	11.94	11.93	12.11
A68/(CC48/M34)-Control-Rep2	D.O. (mg/L)	7.49	7.76	7.85	8.03	8.1
A68/(CC48/M34)-Control-Rep2	Conductivity (us/cm)	632.2	638.6	638.2	637.6	640.2
A68/(CC48/M34)-Control-Rep2	Alkalinity	120				122
A68/(CC48/M34)-Control-Rep2	Hardness	183				179

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-Control-Rep3	No. Alive	10	10	10	10	10
A68/(CC48/M34)-Control-Rep3	pH	7.39	7.61	7.67	7.85	8.01
A68/(CC48/M34)-Control-Rep3	Temp (C)	12.4	12.14	11.86	11.83	12.04
A68/(CC48/M34)-Control-Rep3	D.O. (mg/L)	7.49	7.91	8.06	8.07	8.16
A68/(CC48/M34)-Control-Rep3	Conductivity (us/cm)	630.5	636.4	637.5	636.6	638.3
A68/(CC48/M34)-Control-Rep3	Alkalinity	120				122
A68/(CC48/M34)-Control-Rep3	Hardness	183				179

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-Control-Rep4	No. Alive	10	10	10	10	10
A68/(CC48/M34)-Control-Rep4	pH	7.7	7.75	7.7	7.85	7.89
A68/(CC48/M34)-Control-Rep4	Temp (C)	12.4	12.13	11.83	11.83	12.04
A68/(CC48/M34)-Control-Rep4	D.O. (mg/L)	7.49	7.98	7.97	8.09	8.16
A68/(CC48/M34)-Control-Rep4	Conductivity (us/cm)	630.2	635.2	635.5	637.8	639.3
A68/(CC48/M34)-Control-Rep4	Alkalinity	120				122
A68/(CC48/M34)-Control-Rep4	Hardness	183				179

APPENDIX C: Test data sheet for the serial dilution of CC48/M34 with A68

Upper Animas 2013 Aquatic Toxicity Test

Start Date 04/19/13
 End Date 04/23/13
 Organism RBT (0.38 gram)

No. Organisms 10
 No. of Replicates 4
 Analysts SA,BW,LC,NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-100%-Rep1	No. Alive	10	0	-	-	-
A68/(CC48/M34)-100%-Rep1	pH	4.36	4.65	-	-	-
A68/(CC48/M34)-100%-Rep1	Temp (C)	12.68	11.79	-	-	-
A68/(CC48/M34)-100%-Rep1	D.O. (mg/L)	8.69	8.48	-	-	-
A68/(CC48/M34)-100%-Rep1	Conductivity (us/cm)	687.2	693.7	-	-	-
A68/(CC48/M34)-100%-Rep1	Alkalinity	<5.00U	<5.00U			
A68/(CC48/M34)-100%-Rep1	Hardness	294	304			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-100%-Rep2	No. Alive	10	0	-	-	-
A68/(CC48/M34)-100%-Rep2	pH	4.29	4.65	-	-	-
A68/(CC48/M34)-100%-Rep2	Temp (C)	12.77	11.77	-	-	-
A68/(CC48/M34)-100%-Rep2	D.O. (mg/L)	8.66	8.49	-	-	-
A68/(CC48/M34)-100%-Rep2	Conductivity (us/cm)	689.6	695	-	-	-
A68/(CC48/M34)-100%-Rep2	Alkalinity	<5.00U	<5.00U			
A68/(CC48/M34)-100%-Rep2	Hardness	294	304			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-100%-Rep3	No. Alive	10	0	-	-	-
A68/(CC48/M34)-100%-Rep3	pH	4.32	4.61	-	-	-
A68/(CC48/M34)-100%-Rep3	Temp (C)	12.73	11.78	-	-	-
A68/(CC48/M34)-100%-Rep3	D.O. (mg/L)	8.69	8.52	-	-	-
A68/(CC48/M34)-100%-Rep3	Conductivity (us/cm)	688.3	692.8	-	-	-
A68/(CC48/M34)-100%-Rep3	Alkalinity	<5.00U	<5.00U			
A68/(CC48/M34)-100%-Rep3	Hardness	294	304			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-100%-Rep4	No. Alive	10	0	-	-	-
A68/(CC48/M34)-100%-Rep4	pH	4.3	4.57	-	-	-
A68/(CC48/M34)-100%-Rep4	Temp (C)	12.76	11.79	-	-	-
A68/(CC48/M34)-100%-Rep4	D.O. (mg/L)	8.6	8.53	-	-	-
A68/(CC48/M34)-100%-Rep4	Conductivity (us/cm)	688.9	694.7	-	-	-
A68/(CC48/M34)-100%-Rep4	Alkalinity	<5.00U	<5.00U			
A68/(CC48/M34)-100%-Rep4	Hardness	294	304			

APPENDIX C: Test data sheet for the serial dilution of CC48/M34 with A68

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/19/13	No. Organisms 10
End Date	04/23/13	No. of Replicates 4
Organism	RBT (0.38 gram)	Analysts SA,BW,LC,NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-95%-Rep1	No. Alive	10	0	-	-	-
A68/(CC48/M34)-95%-Rep1	pH	4.58	4.73	-	-	-
A68/(CC48/M34)-95%-Rep1	Temp (C)	12.69	11.79	-	-	-
A68/(CC48/M34)-95%-Rep1	D.O. (mg/L)	8.72	8.56	-	-	-
A68/(CC48/M34)-95%-Rep1	Conductivity (us/cm)	670	679.7	-	-	-
A68/(CC48/M34)-95%-Rep1	Alkalinity	<5.00U	<5.00U			
A68/(CC48/M34)-95%-Rep1	Hardness	293	289			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-95%-Rep2	No. Alive	10	0	-	-	-
A68/(CC48/M34)-95%-Rep2	pH	4.53	4.67	-	-	-
A68/(CC48/M34)-95%-Rep2	Temp (C)	12.92	11.78	-	-	-
A68/(CC48/M34)-95%-Rep2	D.O. (mg/L)	8.63	8.55	-	-	-
A68/(CC48/M34)-95%-Rep2	Conductivity (us/cm)	668.5	677.9	-	-	-
A68/(CC48/M34)-95%-Rep2	Alkalinity	<5.00U	<5.00U			
A68/(CC48/M34)-95%-Rep2	Hardness	293	289			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-95%-Rep3	No. Alive	10	0	-	-	-
A68/(CC48/M34)-95%-Rep3	pH	4.53	4.69	-	-	-
A68/(CC48/M34)-95%-Rep3	Temp (C)	12.96	11.78	-	-	-
A68/(CC48/M34)-95%-Rep3	D.O. (mg/L)	8.61	8.54	-	-	-
A68/(CC48/M34)-95%-Rep3	Conductivity (us/cm)	668.1	679.4	-	-	-
A68/(CC48/M34)-95%-Rep3	Alkalinity	<5.00U	<5.00U			
A68/(CC48/M34)-95%-Rep3	Hardness	293	289			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-95%-Rep4	No. Alive	10	1	0	-	-
A68/(CC48/M34)-95%-Rep4	pH	4.52	4.66	4.66	-	-
A68/(CC48/M34)-95%-Rep4	Temp (C)	12.85	11.8	12.03	-	-
A68/(CC48/M34)-95%-Rep4	D.O. (mg/L)	8.66	8.52	8.71	-	-
A68/(CC48/M34)-95%-Rep4	Conductivity (us/cm)	668.7	679	672.1	-	-
A68/(CC48/M34)-95%-Rep4	Alkalinity	<5.00U	<5.00U			
A68/(CC48/M34)-95%-Rep4	Hardness	293	289			

APPENDIX C: Test data sheet for the serial dilution of CC48/M34 with A68

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/19/13
End Date	04/23/13
Organism	RBT (0.38 gram)

No. Organisms	10
No. of Replicates	4
Analysts	SA,BW,LC,NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-90%-Rep1	No. Alive	10	0	-	-	-
A68/(CC48/M34)-90%-Rep1	pH	4.65	4.75	-	-	-
A68/(CC48/M34)-90%-Rep1	Temp (C)	12.58	11.79	-	-	-
A68/(CC48/M34)-90%-Rep1	D.O. (mg/L)	8.75	8.57	-	-	-
A68/(CC48/M34)-90%-Rep1	Conductivity (us/cm)	651.8	669.1	-	-	-
A68/(CC48/M34)-90%-Rep1	Alkalinity	<5.00U	<5.00U			
A68/(CC48/M34)-90%-Rep1	Hardness	291	285			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-90%-Rep2	No. Alive	10	0	-	-	-
A68/(CC48/M34)-90%-Rep2	pH	4.63	4.85	-	-	-
A68/(CC48/M34)-90%-Rep2	Temp (C)	12.5	11.76	-	-	-
A68/(CC48/M34)-90%-Rep2	D.O. (mg/L)	8.7	8.59	-	-	-
A68/(CC48/M34)-90%-Rep2	Conductivity (us/cm)	651.5	667.5	-	-	-
A68/(CC48/M34)-90%-Rep2	Alkalinity	<5.00U	<5.00U			
A68/(CC48/M34)-90%-Rep2	Hardness	291	285			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-90%-Rep3	No. Alive	10	0	-	-	-
A68/(CC48/M34)-90%-Rep3	pH	4.66	4.76	-	-	-
A68/(CC48/M34)-90%-Rep3	Temp (C)	12.65	11.78	-	-	-
A68/(CC48/M34)-90%-Rep3	D.O. (mg/L)	8.79	8.59	-	-	-
A68/(CC48/M34)-90%-Rep3	Conductivity (us/cm)	650.6	668	-	-	-
A68/(CC48/M34)-90%-Rep3	Alkalinity	<5.00U	<5.00U			
A68/(CC48/M34)-90%-Rep3	Hardness	291	285			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-90%-Rep4	No. Alive	10	0	-	-	-
A68/(CC48/M34)-90%-Rep4	pH	4.63	4.74	-	-	-
A68/(CC48/M34)-90%-Rep4	Temp (C)	12.64	11.79	-	-	-
A68/(CC48/M34)-90%-Rep4	D.O. (mg/L)	8.78	8.57	-	-	-
A68/(CC48/M34)-90%-Rep4	Conductivity (us/cm)	653.3	666.9	-	-	-
A68/(CC48/M34)-90%-Rep4	Alkalinity	<5.00U	<5.00U			
A68/(CC48/M34)-90%-Rep4	Hardness	291	285			

APPENDIX C: Test data sheet for the serial dilution of CC48/M34 with A68

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/19/13
End Date	04/23/13
Organism	RBT (0.38 gram)

No. Organisms	10
No. of Replicates	4
Analysts	SA,BW,LC,NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-80%-Rep1	No. Alive	10	0	-	-	-
A68/(CC48/M34)-80%-Rep1	pH	4.69	4.9	-	-	-
A68/(CC48/M34)-80%-Rep1	Temp (C)	12.39	11.86	-	-	-
A68/(CC48/M34)-80%-Rep1	D.O. (mg/L)	8.66	8.48	-	-	-
A68/(CC48/M34)-80%-Rep1	Conductivity (us/cm)	622.5	636.5	-	-	-
A68/(CC48/M34)-80%-Rep1	Alkalinity	<5.00U	<5.00U			
A68/(CC48/M34)-80%-Rep1	Hardness	275	271			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-80%-Rep2	No. Alive	10	0	-	-	-
A68/(CC48/M34)-80%-Rep2	pH	4.74	4.84	-	-	-
A68/(CC48/M34)-80%-Rep2	Temp (C)	12.55	11.85	-	-	-
A68/(CC48/M34)-80%-Rep2	D.O. (mg/L)	8.68	8.5	-	-	-
A68/(CC48/M34)-80%-Rep2	Conductivity (us/cm)	625.6	636.7	-	-	-
A68/(CC48/M34)-80%-Rep2	Alkalinity	<5.00U	<5.00U			
A68/(CC48/M34)-80%-Rep2	Hardness	275	271			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-80%-Rep3	No. Alive	10	0	-	-	-
A68/(CC48/M34)-80%-Rep3	pH	4.69	4.81	-	-	-
A68/(CC48/M34)-80%-Rep3	Temp (C)	12.59	11.85	-	-	-
A68/(CC48/M34)-80%-Rep3	D.O. (mg/L)	8.73	8.48	-	-	-
A68/(CC48/M34)-80%-Rep3	Conductivity (us/cm)	623.8	636.6	-	-	-
A68/(CC48/M34)-80%-Rep3	Alkalinity	<5.00U	<5.00U			
A68/(CC48/M34)-80%-Rep3	Hardness	275	271			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-80%-Rep4	No. Alive	10	0	-	-	-
A68/(CC48/M34)-80%-Rep4	pH	4.67	4.78	-	-	-
A68/(CC48/M34)-80%-Rep4	Temp (C)	12.63	11.82	-	-	-
A68/(CC48/M34)-80%-Rep4	D.O. (mg/L)	8.72	8.46	-	-	-
A68/(CC48/M34)-80%-Rep4	Conductivity (us/cm)	625	637	-	-	-
A68/(CC48/M34)-80%-Rep4	Alkalinity	<5.00U	<5.00U			
A68/(CC48/M34)-80%-Rep4	Hardness	275	271			

APPENDIX C: Test data sheet for the serial dilution of CC48/M34 with A68

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/19/13
End Date	04/23/13
Organism	RBT (0.38 gram)

No. Organisms	10
No. of Replicates	4
Analysts	SA,BW,LC,NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-75%-Rep1	No. Alive	10	0	-	-	-
A68/(CC48/M34)-75%-Rep1	pH	4.95	5.22	-	-	-
A68/(CC48/M34)-75%-Rep1	Temp (C)	12.41	11.91	-	-	-
A68/(CC48/M34)-75%-Rep1	D.O. (mg/L)	8.59	8.47	-	-	-
A68/(CC48/M34)-75%-Rep1	Conductivity (us/cm)	608.2	624.7	-	-	-
A68/(CC48/M34)-75%-Rep1	Alkalinity	<5.00U	<5.00U			
A68/(CC48/M34)-75%-Rep1	Hardness	274	278			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-75%-Rep2	No. Alive	10	1	0	-	-
A68/(CC48/M34)-75%-Rep2	pH	4.93	5.09	5.43	-	-
A68/(CC48/M34)-75%-Rep2	Temp (C)	12.45	11.89	11.9	-	-
A68/(CC48/M34)-75%-Rep2	D.O. (mg/L)	8.58	8.45	8.61	-	-
A68/(CC48/M34)-75%-Rep2	Conductivity (us/cm)	604	619.8	623.2	-	-
A68/(CC48/M34)-75%-Rep2	Alkalinity	<5.00U		<5.00U		
A68/(CC48/M34)-75%-Rep2	Hardness	274		278		

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-75%-Rep3	No. Alive	10	2	0	-	-
A68/(CC48/M34)-75%-Rep3	pH	4.85	5.15	5.1	-	-
A68/(CC48/M34)-75%-Rep3	Temp (C)	12.42	11.88	11.91	-	-
A68/(CC48/M34)-75%-Rep3	D.O. (mg/L)	8.63	8.44	8.65	-	-
A68/(CC48/M34)-75%-Rep3	Conductivity (us/cm)	612.1	623.7	627.2	-	-
A68/(CC48/M34)-75%-Rep3	Alkalinity	<5.00U		<5.00U		
A68/(CC48/M34)-75%-Rep3	Hardness	274		278		

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-75%-Rep4	No. Alive	10	0	-	-	-
A68/(CC48/M34)-75%-Rep4	pH	4.84	5.06	-	-	-
A68/(CC48/M34)-75%-Rep4	Temp (C)	12.57	11.87	-	-	-
A68/(CC48/M34)-75%-Rep4	D.O. (mg/L)	8.71	8.48	-	-	-
A68/(CC48/M34)-75%-Rep4	Conductivity (us/cm)	609.7	626.1	-	-	-
A68/(CC48/M34)-75%-Rep4	Alkalinity	<5.00U	<5.00U			
A68/(CC48/M34)-75%-Rep4	Hardness	274	278			

APPENDIX C: Test data sheet for the serial dilution of CC48/M34 with A68

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/19/13
End Date	04/23/13
Organism	RBT (0.38 gram)

No. Organisms	10
No. of Replicates	4
Analysts	SA,BW,LC,NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-50%-Rep1	No. Alive	10	10	10	10	9
A68/(CC48/M34)-50%-Rep1	pH	6.34	6.95	6.96	7.02	7.01
A68/(CC48/M34)-50%-Rep1	Temp (C)	12.41	12.01	11.81	11.74	12.01
A68/(CC48/M34)-50%-Rep1	D.O. (mg/L)	8.79	8.28	8.29	8.21	8.32
A68/(CC48/M34)-50%-Rep1	Conductivity (us/cm)	542	549.5	550.1	549.2	550.4
A68/(CC48/M34)-50%-Rep1	Alkalinity	5.36				7.01
A68/(CC48/M34)-50%-Rep1	Hardness	244				242

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-50%-Rep2	No. Alive	10	10	10	9	8
A68/(CC48/M34)-50%-Rep2	pH	6.22	6.89	6.98	6.97	6.98
A68/(CC48/M34)-50%-Rep2	Temp (C)	12.32	11.99	11.84	11.72	11.99
A68/(CC48/M34)-50%-Rep2	D.O. (mg/L)	8.76	8.14	8.26	8.22	8.32
A68/(CC48/M34)-50%-Rep2	Conductivity (us/cm)	542.8	548.5	550.8	549.1	548.6
A68/(CC48/M34)-50%-Rep2	Alkalinity	5.36				7.01
A68/(CC48/M34)-50%-Rep2	Hardness	244				242

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-50%-Rep3	No. Alive	10	10	10	10	9
A68/(CC48/M34)-50%-Rep3	pH	6.04	6.84	6.94	6.96	6.92
A68/(CC48/M34)-50%-Rep3	Temp (C)	12.36	12	11.86	11.7	12.02
A68/(CC48/M34)-50%-Rep3	D.O. (mg/L)	8.72	8.13	8.28	8.29	8.28
A68/(CC48/M34)-50%-Rep3	Conductivity (us/cm)	541.7	548.5	548.1	549.5	548.3
A68/(CC48/M34)-50%-Rep3	Alkalinity	5.36				7.01
A68/(CC48/M34)-50%-Rep3	Hardness	244				242

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-50%-Rep4	No. Alive	10	10	10	10	10
A68/(CC48/M34)-50%-Rep4	pH	5.98	6.81	6.92	6.94	6.83
A68/(CC48/M34)-50%-Rep4	Temp (C)	12.43	11.99	11.85	11.72	12.01
A68/(CC48/M34)-50%-Rep4	D.O. (mg/L)	8.7	8.19	8.3	8.36	8.3
A68/(CC48/M34)-50%-Rep4	Conductivity (us/cm)	542.8	548.2	547.6	546.5	547.6
A68/(CC48/M34)-50%-Rep4	Alkalinity	5.36				7.01
A68/(CC48/M34)-50%-Rep4	Hardness	244				242

APPENDIX C: Test data sheet for the serial dilution of CC48/M34 with A68

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/19/13	No. Organisms 10
End Date	04/23/13	No. of Replicates 4
Organism	RBT (0.38 gram)	Analysts SA,BW,LC,NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-25%-Rep1	No. Alive	10	10	10	10	10
A68/(CC48/M34)-25%-Rep1	pH	6.97	7.14	7.22	7.27	7.25
A68/(CC48/M34)-25%-Rep1	Temp (C)	12.46	12.1	11.82	11.77	12.02
A68/(CC48/M34)-25%-Rep1	D.O. (mg/L)	8.42	8.14	8.43	8.23	8.41
A68/(CC48/M34)-25%-Rep1	Conductivity (us/cm)	483.8	491.4	493.5	495.4	498.1
A68/(CC48/M34)-25%-Rep1	Alkalinity	16.6				22.8
A68/(CC48/M34)-25%-Rep1	Hardness	214				221

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-25%-Rep2	No. Alive	10	10	10	10	10
A68/(CC48/M34)-25%-Rep2	pH	6.89	7.06	7.19	7.26	7.23
A68/(CC48/M34)-25%-Rep2	Temp (C)	12.6	12.05	11.81	11.75	12.01
A68/(CC48/M34)-25%-Rep2	D.O. (mg/L)	8.52	8.21	8.43	8.27	8.4
A68/(CC48/M34)-25%-Rep2	Conductivity (us/cm)	484.2	491.8	495.8	496.3	496.5
A68/(CC48/M34)-25%-Rep2	Alkalinity	16.6				22.8
A68/(CC48/M34)-25%-Rep2	Hardness	214				221

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-25%-Rep3	No. Alive	10	10	10	10	10
A68/(CC48/M34)-25%-Rep3	pH	6.84	7.04	7.16	7.33	7.24
A68/(CC48/M34)-25%-Rep3	Temp (C)	12.58	12.04	11.8	11.75	12.02
A68/(CC48/M34)-25%-Rep3	D.O. (mg/L)	8.65	8.17	8.35	8.23	8.4
A68/(CC48/M34)-25%-Rep3	Conductivity (us/cm)	485.3	490.6	493.4	497.3	495.3
A68/(CC48/M34)-25%-Rep3	Alkalinity	16.6				22.8
A68/(CC48/M34)-25%-Rep3	Hardness	214				221

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
A68/(CC48/M34)-25%-Rep4	No. Alive	10	10	10	10	10
A68/(CC48/M34)-25%-Rep4	pH	6.82	7.02	7.13	7.3	7.24
A68/(CC48/M34)-25%-Rep4	Temp (C)	12.6	12.04	11.81	11.76	12.03
A68/(CC48/M34)-25%-Rep4	D.O. (mg/L)	8.74	8.13	8.28	8.21	8.33
A68/(CC48/M34)-25%-Rep4	Conductivity (us/cm)	481.2	490.9	492.8	493.6	495
A68/(CC48/M34)-25%-Rep4	Alkalinity	16.6				22.8
A68/(CC48/M34)-25%-Rep4	Hardness	214				221

APPENDIX D: Test data sheet for the serial dilution of CC48/M34 with HRW

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/19/13	No. Organisms 10
End Date	04/23/13	No. of Replicates 4
Organism	RBT (0.38 gram)	Analysts SA,BW,LC,NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)Control-Rep1	No. Alive	10	10	10	10	10
HRW (CC48/M34)Control-Rep1	pH	7.74	7.65	7.67	7.77	7.68
HRW (CC48/M34)Control-Rep1	Temp (C)	13.25	12.05	12.21	11.93	11.92
HRW (CC48/M34)Control-Rep1	D.O. (mg/L)	8.03	8.02	7.55	7.72	7.89
HRW (CC48/M34)Control-Rep1	Conductivity (us/cm)	627.4	637.8	637.8	642.2	639.4
HRW (CC48/M34)Control-Rep1	Alkalinity	123				125
HRW (CC48/M34)Control-Rep1	Hardness	176				181

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)Control-Rep2	No. Alive	10	10	10	10	10
HRW (CC48/M34)Control-Rep2	pH	7.87	7.76	7.81	7.85	7.77
HRW (CC48/M34)Control-Rep2	Temp (C)	13.18	11.95	12.14	11.88	11.83
HRW (CC48/M34)Control-Rep2	D.O. (mg/L)	8.11	8.1	7.69	7.76	8.13
HRW (CC48/M34)Control-Rep2	Conductivity (us/cm)	634.8	636.5	635.5	638.9	640.1
HRW (CC48/M34)Control-Rep2	Alkalinity	123				125
HRW (CC48/M34)Control-Rep2	Hardness	176				181

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)Control-Rep3	No. Alive	10	10	10	10	10
HRW (CC48/M34)Control-Rep3	pH	8.08	7.85	7.97	7.93	7.89
HRW (CC48/M34)Control-Rep3	Temp (C)	13.12	11.9	12.03	11.79	11.8
HRW (CC48/M34)Control-Rep3	D.O. (mg/L)	8.07	8.24	8	8.03	8.28
HRW (CC48/M34)Control-Rep3	Conductivity (us/cm)	628.6	635.1	638.4	639.7	639
HRW (CC48/M34)Control-Rep3	Alkalinity	123				125
HRW (CC48/M34)Control-Rep3	Hardness	176				181

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)Control-Rep4	No. Alive	10	10	10	10	10
HRW (CC48/M34)Control-Rep4	pH	8.16	7.91	8.03	7.93	7.97
HRW (CC48/M34)Control-Rep4	Temp (C)	13.1	11.89	12.02	11.78	11.79
HRW (CC48/M34)Control-Rep4	D.O. (mg/L)	8.08	8.35	8.16	8.09	8.34
HRW (CC48/M34)Control-Rep4	Conductivity (us/cm)	631.4	644.8	636.9	639.6	642.1
HRW (CC48/M34)Control-Rep4	Alkalinity	123				125
HRW (CC48/M34)Control-Rep4	Hardness	176				181

APPENDIX D: Test data sheet for the serial dilution of CC48/M34 with HRW

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/19/13	No. Organisms 10
End Date	04/23/13	No. of Replicates 4
Organism	RBT (0.38 gram)	Analysts SA,BW,LC,NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)-95%-Rep1	No. Alive	10	0	-	-	-
HRW (CC48/M34)-95%-Rep1	pH	5.15	5	-	-	-
HRW (CC48/M34)-95%-Rep1	Temp (C)	12.13	11.96	-	-	-
HRW (CC48/M34)-95%-Rep1	D.O. (mg/L)	8.82	8.58	-	-	-
HRW (CC48/M34)-95%-Rep1	Conductivity (us/cm)	672.7	686	-	-	-
HRW (CC48/M34)-95%-Rep1	Alkalinity	<5.00U	<5.00U			
HRW (CC48/M34)-95%-Rep1	Hardness	293	292			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)-95%-Rep2	No. Alive	10	0	-	-	-
HRW (CC48/M34)-95%-Rep2	pH	4.58	4.95	-	-	-
HRW (CC48/M34)-95%-Rep2	Temp (C)	12.09	11.96	-	-	-
HRW (CC48/M34)-95%-Rep2	D.O. (mg/L)	8.91	8.5	-	-	-
HRW (CC48/M34)-95%-Rep2	Conductivity (us/cm)	675.1	686.6	-	-	-
HRW (CC48/M34)-95%-Rep2	Alkalinity	<5.00U	<5.00U			
HRW (CC48/M34)-95%-Rep2	Hardness	293	292			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)-95%-Rep3	No. Alive	10	0	-	-	-
HRW (CC48/M34)-95%-Rep3	pH	4.53	5.02	-	-	-
HRW (CC48/M34)-95%-Rep3	Temp (C)	12.05	11.96	-	-	-
HRW (CC48/M34)-95%-Rep3	D.O. (mg/L)	8.95	8.51	-	-	-
HRW (CC48/M34)-95%-Rep3	Conductivity (us/cm)	675.6	689.3	-	-	-
HRW (CC48/M34)-95%-Rep3	Alkalinity	<5.00U	<5.00U			
HRW (CC48/M34)-95%-Rep3	Hardness	293	292			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)-95%-Rep4	No. Alive	10	0	-	-	-
HRW (CC48/M34)-95%-Rep4	pH	4.48	4.98	-	-	-
HRW (CC48/M34)-95%-Rep4	Temp (C)	12	11.96	-	-	-
HRW (CC48/M34)-95%-Rep4	D.O. (mg/L)	9.01	8.55	-	-	-
HRW (CC48/M34)-95%-Rep4	Conductivity (us/cm)	674.2	688.8	-	-	-
HRW (CC48/M34)-95%-Rep4	Alkalinity	<5.00U	<5.00U			
HRW (CC48/M34)-95%-Rep4	Hardness	293	292			

APPENDIX D: Test data sheet for the serial dilution of CC48/M34 with HRW

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/19/13	No. Organisms 10
End Date	04/23/13	No. of Replicates 4
Organism	RBT (0.38 gram)	Analysts SA,BW,LC,NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)-90%-Rep1	No. Alive	10	0	-	-	-
HRW (CC48/M34)-90%-Rep1	pH	5.32	6.36	-	-	-
HRW (CC48/M34)-90%-Rep1	Temp (C)	12.23	11.93	-	-	-
HRW (CC48/M34)-90%-Rep1	D.O. (mg/L)	8.8	8.46	-	-	-
HRW (CC48/M34)-90%-Rep1	Conductivity (us/cm)	658.6	677.4	-	-	-
HRW (CC48/M34)-90%-Rep1	Alkalinity	<5.00U	<5.00U			
HRW (CC48/M34)-90%-Rep1	Hardness	283	280			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)-90%-Rep2	No. Alive	10	0	-	-	-
HRW (CC48/M34)-90%-Rep2	pH	5.26	5.61	-	-	-
HRW (CC48/M34)-90%-Rep2	Temp (C)	12.2	11.95	-	-	-
HRW (CC48/M34)-90%-Rep2	D.O. (mg/L)	8.91	8.5	-	-	-
HRW (CC48/M34)-90%-Rep2	Conductivity (us/cm)	657.7	672.6	-	-	-
HRW (CC48/M34)-90%-Rep2	Alkalinity	<5.00U	<5.00U			
HRW (CC48/M34)-90%-Rep2	Hardness	283	280			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)-90%-Rep3	No. Alive	10	0	-	-	-
HRW (CC48/M34)-90%-Rep3	pH	5.15	5.4	-	-	-
HRW (CC48/M34)-90%-Rep3	Temp (C)	12.15	11.96	-	-	-
HRW (CC48/M34)-90%-Rep3	D.O. (mg/L)	8.89	8.5	-	-	-
HRW (CC48/M34)-90%-Rep3	Conductivity (us/cm)	659.7	673.1	-	-	-
HRW (CC48/M34)-90%-Rep3	Alkalinity	<5.00U	<5.00U			
HRW (CC48/M34)-90%-Rep3	Hardness	283	280			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)-90%-Rep4	No. Alive	10	1	0	-	-
HRW (CC48/M34)-90%-Rep4	pH	5.17	5.36	5.8	-	-
HRW (CC48/M34)-90%-Rep4	Temp (C)	12.09	11.96	11.8	-	-
HRW (CC48/M34)-90%-Rep4	D.O. (mg/L)	8.94	8.54	8.58	-	-
HRW (CC48/M34)-90%-Rep4	Conductivity (us/cm)	657.9	675.7	682.1	-	-
HRW (CC48/M34)-90%-Rep4	Alkalinity	<5.00U		<5.00U		
HRW (CC48/M34)-90%-Rep4	Hardness	283		280		

APPENDIX D: Test data sheet for the serial dilution of CC48/M34 with HRW

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/19/13	No. Organisms 10
End Date	04/23/13	No. of Replicates 4
Organism	RBT (0.38 gram)	Analysts SA,BW,LC,NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)-75%-Rep1	No. Alive	10	10	10	10	10
HRW (CC48/M34)-75%-Rep1	pH	6.69	7.49	7.51	7.36	7.5
HRW (CC48/M34)-75%-Rep1	Temp (C)	12.44	11.94	11.87	11.77	11.78
HRW (CC48/M34)-75%-Rep1	D.O. (mg/L)	8.57	8.41	8.43	8.43	8.42
HRW (CC48/M34)-75%-Rep1	Conductivity (us/cm)	647	650.6	645.5	648.7	651.9
HRW (CC48/M34)-75%-Rep1	Alkalinity	12.6				13.5
HRW (CC48/M34)-75%-Rep1	Hardness	267				265

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)-75%-Rep2	No. Alive	10	10	10	10	10
HRW (CC48/M34)-75%-Rep2	pH	6.61	7.41	7.54	7.31	7.34
HRW (CC48/M34)-75%-Rep2	Temp (C)	12.52	11.94	11.87	11.79	11.78
HRW (CC48/M34)-75%-Rep2	D.O. (mg/L)	8.63	8.32	8.4	8.13	8.33
HRW (CC48/M34)-75%-Rep2	Conductivity (us/cm)	648.2	650.9	648.5	648.5	650.9
HRW (CC48/M34)-75%-Rep2	Alkalinity	12.6				13.5
HRW (CC48/M34)-75%-Rep2	Hardness	267				265

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)-75%-Rep3	No. Alive	10	10	10	10	10
HRW (CC48/M34)-75%-Rep3	pH	6.38	7.36	7.38	7.23	7.36
HRW (CC48/M34)-75%-Rep3	Temp (C)	12.32	11.93	11.87	11.8	11.75
HRW (CC48/M34)-75%-Rep3	D.O. (mg/L)	8.66	8.19	8.32	8.12	8.33
HRW (CC48/M34)-75%-Rep3	Conductivity (us/cm)	646.3	649.8	648.9	649.8	650.5
HRW (CC48/M34)-75%-Rep3	Alkalinity	12.6				13.5
HRW (CC48/M34)-75%-Rep3	Hardness	267				265

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)-75%-Rep4	No. Alive	10	10	10	10	10
HRW (CC48/M34)-75%-Rep4	pH	6.44	7.33	7.4	7.22	7.41
HRW (CC48/M34)-75%-Rep4	Temp (C)	12.37	11.94	11.85	11.78	11.76
HRW (CC48/M34)-75%-Rep4	D.O. (mg/L)	8.67	8.2	8.28	8.2	8.37
HRW (CC48/M34)-75%-Rep4	Conductivity (us/cm)	646.9	651.3	645	643.9	652
HRW (CC48/M34)-75%-Rep4	Alkalinity	12.6				13.5
HRW (CC48/M34)-75%-Rep4	Hardness	267				265

APPENDIX D: Test data sheet for the serial dilution of CC48/M34 with HRW

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/19/13	No. Organisms 10
End Date	04/23/13	No. of Replicates 4
Organism	RBT (0.38 gram)	Analysts SA,BW,LC,NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)-50%-Rep1	No. Alive	10	10	10	10	10
HRW (CC48/M34)-50%-Rep1	pH	7.23	7.76	7.8	7.76	7.71
HRW (CC48/M34)-50%-Rep1	Temp (C)	12.79	11.92	11.94	11.75	11.82
HRW (CC48/M34)-50%-Rep1	D.O. (mg/L)	8.34	8.43	8.34	8.31	8.39
HRW (CC48/M34)-50%-Rep1	Conductivity (us/cm)	642.3	645.6	644.1	647.8	648.7
HRW (CC48/M34)-50%-Rep1	Alkalinity	47.9				50.1
HRW (CC48/M34)-50%-Rep1	Hardness	242				235

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)-50%-Rep2	No. Alive	10	10	10	10	10
HRW (CC48/M34)-50%-Rep2	pH	7.16	7.75	7.8	7.76	7.62
HRW (CC48/M34)-50%-Rep2	Temp (C)	12.78	11.93	11.92	11.77	11.78
HRW (CC48/M34)-50%-Rep2	D.O. (mg/L)	8.35	8.43	8.26	8.3	8.37
HRW (CC48/M34)-50%-Rep2	Conductivity (us/cm)	640.8	644.2	645.2	646	649.2
HRW (CC48/M34)-50%-Rep2	Alkalinity	47.9				50.1
HRW (CC48/M34)-50%-Rep2	Hardness	242				235

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)-50%-Rep3	No. Alive	10	10	10	10	10
HRW (CC48/M34)-50%-Rep3	pH	7.1	7.69	7.79	7.71	7.61
HRW (CC48/M34)-50%-Rep3	Temp (C)	12.62	11.93	11.89	11.76	11.76
HRW (CC48/M34)-50%-Rep3	D.O. (mg/L)	8.34	8.41	8.28	8.24	8.39
HRW (CC48/M34)-50%-Rep3	Conductivity (us/cm)	642.8	646.5	647.2	646.8	648.1
HRW (CC48/M34)-50%-Rep3	Alkalinity	47.9				50.1
HRW (CC48/M34)-50%-Rep3	Hardness	242				235

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)-50%-Rep4	No. Alive	10	10	10	10	10
HRW (CC48/M34)-50%-Rep4	pH	7.06	7.66	7.74	7.72	7.73
HRW (CC48/M34)-50%-Rep4	Temp (C)	12.53	11.93	11.88	11.75	11.75
HRW (CC48/M34)-50%-Rep4	D.O. (mg/L)	8.43	8.36	8.3	8.28	8.4
HRW (CC48/M34)-50%-Rep4	Conductivity (us/cm)	639.2	642.2	643.6	642.4	647.1
HRW (CC48/M34)-50%-Rep4	Alkalinity	47.9				50.1
HRW (CC48/M34)-50%-Rep4	Hardness	242				235

APPENDIX D: Test data sheet for the serial dilution of CC48/M34 with HRW

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/19/13	No. Organisms 10
End Date	04/23/13	No. of Replicates 4
Organism	RBT (0.38 gram)	Analysts SA,BW,LC,NM

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)-25%-Rep1	No. Alive	10	10	10	10	10
HRW (CC48/M34)-25%-Rep1	pH	7.74	7.8	7.86	7.85	7.84
HRW (CC48/M34)-25%-Rep1	Temp (C)	13.09	11.92	12.1	11.8	11.79
HRW (CC48/M34)-25%-Rep1	D.O. (mg/L)	8.01	8.14	8.27	8.18	8.4
HRW (CC48/M34)-25%-Rep1	Conductivity (us/cm)	637.1	643.4	646.7	641.5	646.3
HRW (CC48/M34)-25%-Rep1	Alkalinity	83.5				85.0
HRW (CC48/M34)-25%-Rep1	Hardness	210				204

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)-25%-Rep2	No. Alive	10	10	10	10	10
HRW (CC48/M34)-25%-Rep2	pH	7.76	7.77	7.87	7.86	7.76
HRW (CC48/M34)-25%-Rep2	Temp (C)	13.22	11.92	12.02	11.78	11.78
HRW (CC48/M34)-25%-Rep2	D.O. (mg/L)	8.08	8.14	8.3	8.21	8.4
HRW (CC48/M34)-25%-Rep2	Conductivity (us/cm)	636.1	641.8	641.8	642.7	646.6
HRW (CC48/M34)-25%-Rep2	Alkalinity	83.5				85.0
HRW (CC48/M34)-25%-Rep2	Hardness	210				204

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)-25%-Rep3	No. Alive	10	10	10	10	10
HRW (CC48/M34)-25%-Rep3	pH	7.6	7.88	7.86	7.85	7.88
HRW (CC48/M34)-25%-Rep3	Temp (C)	13.42	11.92	11.96	11.76	11.78
HRW (CC48/M34)-25%-Rep3	D.O. (mg/L)	8.16	8.23	8.33	8.22	8.43
HRW (CC48/M34)-25%-Rep3	Conductivity (us/cm)	636.1	640.3	640.5	641.6	645.6
HRW (CC48/M34)-25%-Rep3	Alkalinity	83.5				85.0
HRW (CC48/M34)-25%-Rep3	Hardness	210				204

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
HRW (CC48/M34)-25%-Rep4	No. Alive	10	10	10	10	10
HRW (CC48/M34)-25%-Rep4	pH	7.55	7.83	7.86	7.85	7.87
HRW (CC48/M34)-25%-Rep4	Temp (C)	13.47	11.91	11.98	11.77	11.81
HRW (CC48/M34)-25%-Rep4	D.O. (mg/L)	8.07	8.28	8.32	8.24	8.46
HRW (CC48/M34)-25%-Rep4	Conductivity (us/cm)	636.8	640.3	642.1	640.3	646.1
HRW (CC48/M34)-25%-Rep4	Alkalinity	83.5				85.0
HRW (CC48/M34)-25%-Rep4	Hardness	210				204

APPENDIX E: Test data sheet for the reference toxicity test

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/18/13	No. Organisms	10
End Date	04/22/13	No. of Replicates	4
Organism	RBT (0.38 gram)	Analysts	SA, BW, NM, LC

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
Control-01	No. Alive	10	10	10	10	10
Control-01	pH	7.84	7.11	7.04	7.15	7.45
Control-01	Temp (C)	12.54	12.24	12.1	12.17	12.29
Control-01	D.O. (mg/L)	8.49	7.92	8.03	7.98	7.09
Control-01	Conductivity (us/cm)	307.9	318.3	279.6	286.4	290.5
Control-01	Alkalinity	56.2				55.6
Control-01	Hardness	89				79

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
Control-02	No. Alive	10	10	10	10	10
Control-02	pH	7.88	7.13	7.18	7.28	7.37
Control-02	Temp (C)	12.32	12.19	12.01	12.13	12.08
Control-02	D.O. (mg/L)	8.57	7.94	8.03	7.94	7.28
Control-02	Conductivity (us/cm)	306.3	313.9	279.6	283.5	288.8
Control-02	Alkalinity	56.2				55.6
Control-02	Hardness	89				79

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
Control-03	No. Alive	10	10	10	10	10
Control-03	pH	7.89	7.15	7.09	7.22	7.5
Control-03	Temp (C)	12.18	12.05	11.86	11.98	11.93
Control-03	D.O. (mg/L)	8.64	8.03	8.06	7.97	7.66
Control-03	Conductivity (us/cm)	306.5	314.5	278.4	283.4	288.2
Control-03	Alkalinity	56.2				55.6
Control-03	Hardness	89				79

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
Control-04	No. Alive	10	10	10	10	10
Control-04	pH	7.94	7.19	7.12	7.35	7.57
Control-04	Temp (C)	12.13	12.01	11.82	11.84	11.9
Control-04	D.O. (mg/L)	8.63	8.05	8.1	8.01	7.89
Control-04	Conductivity (us/cm)	306.6	314	278.7	283.7	287.4
Control-04	Alkalinity	56.2				55.6
Control-04	Hardness	89				79

APPENDIX E: Test data sheet for the reference toxicity test

Upper Animas 2013 Aquatic Toxicity Test

<u>Start Date</u>	<u>04/18/13</u>
<u>End Date</u>	<u>04/22/13</u>
<u>Organism</u>	<u>RBT (0.38 gram)</u>

<u>No. Organisms</u>	<u>10</u>
<u>No. of Replicates</u>	<u>4</u>
<u>Analysts</u>	<u>SA, BW, NM, LC</u>

APPENDIX E: Test data sheet for the reference toxicity test

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/18/13	No. Organisms	10
End Date	04/22/13	No. of Replicates	4
Organism	RBT (0.38 gram)	Analysts	SA, BW, NM, LC

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
6.25%-01	No. Alive	10	10	9	9	9
6.25%-01	pH	8.05	7.38	7.18	7.49	7.58
6.25%-01	Temp (C)	12.1	12.01	11.86	11.85	11.94
6.25%-01	D.O. (mg/L)	8.66	8.11	8.23	8.32	8.23
6.25%-01	Conductivity (us/cm)	306.6	317.7	280.5	284.6	288.1
6.25%-01	Alkalinity	55.4				55.4
6.25%-01	Hardness	90				79

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
6.25%-02	No. Alive	10	10	10	10	10
6.25%-02	pH	8.02	7.47	7.2	7.48	7.62
6.25%-02	Temp (C)	12.11	11.86	11.83	11.82	11.91
6.25%-02	D.O. (mg/L)	8.66	7.3	8.19	8.28	8.28
6.25%-02	Conductivity (us/cm)	306.8	316.2	278.5	284.3	288.5
6.25%-02	Alkalinity	55.4				55.4
6.25%-02	Hardness	90				79

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
6.25%-03	No. Alive	10	10	10	10	10
6.25%-03	pH	8.03	7.19	7.21	7.5	7.65
6.25%-03	Temp (C)	12.12	12.02	11.82	11.76	11.84
6.25%-03	D.O. (mg/L)	8.67	7.16	8.17	8.25	8.31
6.25%-03	Conductivity (us/cm)	306.5	314.5	277.5	282.6	286.2
6.25%-03	Alkalinity	55.4				55.4
6.25%-03	Hardness	90				79

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
6.25%-04	No. Alive	10	10	10	10	10
6.25%-04	pH	7.99	7.35	7.23	7.5	7.62
6.25%-04	Temp (C)	12.11	12.02	11.81	11.74	11.82
6.25%-04	D.O. (mg/L)	8.67	7.52	8.22	8.17	8.23
6.25%-04	Conductivity (us/cm)	306.4	315.6	279.1	284	287.3
6.25%-04	Alkalinity	55.4				55.4
6.25%-04	Hardness	90				79

APPENDIX E: Test data sheet for the reference toxicity test

Upper Animas 2013 Aquatic Toxicity Test

<u>Start Date</u>	<u>04/18/13</u>
<u>End Date</u>	<u>04/22/13</u>
<u>Organism</u>	<u>RBT (0.38 gram)</u>

<u>No. Organisms</u>	<u>10</u>
<u>No. of Replicates</u>	<u>4</u>
<u>Analysts</u>	<u>SA, BW, NM, LC</u>

APPENDIX E: Test data sheet for the reference toxicity test

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/18/13	No. Organisms	10
End Date	04/22/13	No. of Replicates	4
Organism	RBT (0.38 gram)	Analysts	SA, BW, NM, LC

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
12.5%-01	No. Alive	10	10	9	9	9
12.5%-01	pH	8	7.19	7.28	7.48	7.66
12.5%-01	Temp (C)	11.94	12.02	11.79	11.77	11.84
12.5%-01	D.O. (mg/L)	8.69	7.5	8.35	8.23	8.23
12.5%-01	Conductivity (us/cm)	307.3	328.3	281.3	286.8	290
12.5%-01	Alkalinity	53.7				53.1
12.5%-01	Hardness	88				78

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
12.5%-02	No. Alive	10	9	8	7	7
12.5%-02	pH	7.98	7.36	7.14	7.49	7.68
12.5%-02	Temp (C)	11.95	12.03	11.8	11.77	11.83
12.5%-02	D.O. (mg/L)	8.71	7.42	8.4	8.25	8.27
12.5%-02	Conductivity (us/cm)	307.2	316.2	278.4	283.1	284
12.5%-02	Alkalinity	53.7				53.1
12.5%-02	Hardness	88				78

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
12.5%-03	No. Alive	10	8	8	8	8
12.5%-03	pH	7.99	7.09	7.29	7.52	7.65
12.5%-03	Temp (C)	12.09	12.05	11.8	11.76	11.82
12.5%-03	D.O. (mg/L)	8.68	7.36	8.44	8.24	8.3
12.5%-03	Conductivity (us/cm)	306.5	316.3	279.2	283.2	286.2
12.5%-03	Alkalinity	53.7				53.1
12.5%-03	Hardness	88				78

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
12.5%-04	No. Alive	10	10	10	10	10
12.5%-04	pH	7.98	7.12	7.53	7.51	7.64
12.5%-04	Temp (C)	12.09	12.03	11.8	11.74	11.81
12.5%-04	D.O. (mg/L)	8.69	7.28	8.45	8.32	8.34
12.5%-04	Conductivity (us/cm)	306.5	320.8	283.2	288.9	288.8
12.5%-04	Alkalinity	53.7				53.1
12.5%-04	Hardness	88				78

APPENDIX E: Test data sheet for the reference toxicity test

Upper Animas 2013 Aquatic Toxicity Test

<u>Start Date</u>	<u>04/18/13</u>
<u>End Date</u>	<u>04/22/13</u>
<u>Organism</u>	<u>RBT (0.38 gram)</u>

<u>No. Organisms</u>	<u>10</u>
<u>No. of Replicates</u>	<u>4</u>
<u>Analysts</u>	<u>SA, BW, NM, LC</u>

APPENDIX E: Test data sheet for the reference toxicity test

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/18/13	No. Organisms	10
End Date	04/22/13	No. of Replicates	4
Organism	RBT (0.38 gram)	Analysts	SA, BW, NM, LC

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
25%-01	No. Alive	10	3	1	1	1
25%-01	pH	8.07	7.46	7.4	7.53	7.74
25%-01	Temp (C)	12.13	12.04	11.82	11.71	11.82
25%-01	D.O. (mg/L)	8.67	8.04	8.5	8.53	8.47
25%-01	Conductivity (us/cm)	306.3	317.4	275.8	276	282.4
25%-01	Alkalinity	60.4				55.1
25%-01	Hardness	90				79

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
25%-02	No. Alive	10	5	3	2	2
25%-02	pH	8.06	7.52	7.35	7.63	7.61
25%-02	Temp (C)	12.12	12.04	11.83	11.73	11.84
25%-02	D.O. (mg/L)	8.68	8.14	8.47	8.57	8.55
25%-02	Conductivity (us/cm)	305.8	320	277.6	278.9	281.3
25%-02	Alkalinity	60.4				55.1
25%-02	Hardness	90				79

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
25%-03	No. Alive	10	5	2	2	2
25%-03	pH	7.99	7.5	7.37	7.62	7.75
25%-03	Temp (C)	12.05	12.04	11.82	11.75	11.82
25%-03	D.O. (mg/L)	8.7	8.1	8.47	8.57	8.55
25%-03	Conductivity (us/cm)	305.9	320.1	277.8	277.7	280.1
25%-03	Alkalinity	60.4				55.1
25%-03	Hardness	90				79

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
25%-04	No. Alive	10	5	2	1	1
25%-04	pH	7.97	7.55	7.35	7.61	7.78
25%-04	Temp (C)	12.03	12.05	11.82	11.74	11.84
25%-04	D.O. (mg/L)	8.7	8.13	8.49	8.58	8.56
25%-04	Conductivity (us/cm)	306.6	318.5	278	277.2	276.7
25%-04	Alkalinity	60.4				55.1
25%-04	Hardness	90				79

APPENDIX E: Test data sheet for the reference toxicity test

Upper Animas 2013 Aquatic Toxicity Test

<u>Start Date</u>	<u>04/18/13</u>
<u>End Date</u>	<u>04/22/13</u>
<u>Organism</u>	<u>RBT (0.38 gram)</u>

<u>No. Organisms</u>	<u>10</u>
<u>No. of Replicates</u>	<u>4</u>
<u>Analysts</u>	<u>SA, BW, NM, LC</u>

APPENDIX E: Test data sheet for the reference toxicity test

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/18/13	No. Organisms	10
End Date	04/22/13	No. of Replicates	4
Organism	RBT (0.38 gram)	Analysts	SA, BW, NM, LC

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
50%-01	No. Alive	10	0	-	-	-
50%-01	pH	7.92	7.63	-	-	-
50%-01	Temp (C)	12.05	12.03	-	-	-
50%-01	D.O. (mg/L)	8.7	8.35	-	-	-
50%-01	Conductivity (us/cm)	306.6	322.1	-	-	-
50%-01	Alkalinity	56.9	50.4			
50%-01	Hardness	89	76			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
50%-02	No. Alive	10	2	0	-	-
50%-02	pH	7.88	7.76	7.32	-	-
50%-02	Temp (C)	12.01	12.04	11.84	-	-
50%-02	D.O. (mg/L)	8.74	8.43	8.6	-	-
50%-02	Conductivity (us/cm)	306.6	321	275.4	-	-
50%-02	Alkalinity	56.9		50.4		
50%-02	Hardness	89		76		

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
50%-03	No. Alive	10	0	-	-	-
50%-03	pH	7.87	7.54	-	-	-
50%-03	Temp (C)	11.98	12.03	-	-	-
50%-03	D.O. (mg/L)	8.73	8.47	-	-	-
50%-03	Conductivity (us/cm)	306.6	318.8	-	-	-
50%-03	Alkalinity	56.9	50.4			
50%-03	Hardness	89	76			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
50%-04	No. Alive	10	2	1	0	-
50%-04	pH	7.96	7.53	7.33	7.6	-
50%-04	Temp (C)	11.99	12.02	11.85	11.75	-
50%-04	D.O. (mg/L)	8.74	8.46	8.61	8.66	-
50%-04	Conductivity (us/cm)	306.6	319.1	276.7	275.2	-
50%-04	Alkalinity	56.9			50.4	
50%-04	Hardness	89			76	

APPENDIX E: Test data sheet for the reference toxicity test

Upper Animas 2013 Aquatic Toxicity Test

<u>Start Date</u>	<u>04/18/13</u>
<u>End Date</u>	<u>04/22/13</u>
<u>Organism</u>	<u>RBT (0.38 gram)</u>

<u>No. Organisms</u>	<u>10</u>
<u>No. of Replicates</u>	<u>4</u>
<u>Analysts</u>	<u>SA, BW, NM, LC</u>

APPENDIX E: Test data sheet for the reference toxicity test

Upper Animas 2013 Aquatic Toxicity Test

Start Date	04/18/13	No. Organisms	10
End Date	04/22/13	No. of Replicates	4
Organism	RBT (0.38 gram)	Analysts	SA, BW, NM, LC

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
100%-01	No. Alive	10	1	0	-	-
100%-01	pH	7.84	7.61	7.28	-	-
100%-01	Temp (C)	12.06	11.99	11.87	-	-
100%-01	D.O. (mg/L)	8.72	7.98	8.62	-	-
100%-01	Conductivity (us/cm)	306.8	322.6	274.9	-	-
100%-01	Alkalinity	56.8		52.6		
100%-01	Hardness	90		77		

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
100%-02	No. Alive	10	0	-	-	-
100%-02	pH	7.79	7.55	-	-	-
100%-02	Temp (C)	12.02	12.01	-	-	-
100%-02	D.O. (mg/L)	8.71	8.16	-	-	-
100%-02	Conductivity (us/cm)	306.6	319	-	-	-
100%-02	Alkalinity	56.8	52.6			
100%-02	Hardness	90	77			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
100%-03	No. Alive	10	0	-	-	-
100%-03	pH	7.79	7.54	-	-	-
100%-03	Temp (C)	12	12.02	-	-	-
100%-03	D.O. (mg/L)	8.73	8.26	-	-	-
100%-03	Conductivity (us/cm)	306.8	321	-	-	-
100%-03	Alkalinity	56.8	52.6			
100%-03	Hardness	90	77			

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
100%-04	No. Alive	10	1	0	-	-
100%-04	pH	7.78	7.5	7.32	-	-
100%-04	Temp (C)	11.99	12.02	11.87	-	-
100%-04	D.O. (mg/L)	8.72	8.29	8.63	-	-
100%-04	Conductivity (us/cm)	306.8	321.8	275	-	-
100%-04	Alkalinity	56.8		52.6		
100%-04	Hardness	90		77		

TechLaw, Inc.
Environmental Services Assistance Team
Contract No. EP-W-06-033

Upper Animas River Surface Water Toxicity Testing Report
Final
August 2013

Attachments

Attachment 1:

CETIS analyses of the acute toxicity data for the profile test

CETIS Test Data Worksheet

Report Date: 05 Jun-13 10:31 (p 1 of 1)
 Test Code: 20-4898-5532/7A2109BC

Fish 96-h Acute Survival Test			U.S. EPA Region 8 Lab		
Start Date: 18 Apr-13	Species: Oncorhynchus mykiss	Sample Code: HRW-Lab Control			
End Date: 22 Apr-13	Protocol: EPA/821/R-02-012 (2002)	Sample Source: Upper Animas River			
Sample Date: 18 Apr-13	Material: Lab Control	Sample Station: Control			

Batch Note: Region 8:Acute RBT toxicity test using SW from Upper Animas River (Test#1, no dilutions)

Sample Code	Rep	Pos	# Exposed	24h Survival	48h Survival	72h Survival	96h Survival	Notes
HRW-Lab Control	1	10	10	10	10	10	10	
HRW-Lab Control	2	11	10	10	10	10	10	
HRW-Lab Control	3	6	10	10	10	10	10	
HRW-Lab Control	4	20	10	10	10	10	10	
A75B	1	27	10	10	10	10	10	
A75B	2	1	10	10	10	10	10	
A75B	3	22	10	10	10	10	10	
A75B	4	5	10	10	10	10	10	
A73B	1	7	10	10	10	10	10	
A73B	2	2	10	10	10	10	10	
A73B	3	25	10	10	10	9	9	
A73B	4	8	10	10	10	10	10	
A73	1	16	10	10	9	9	9	
A73	2	28	10	10	10	10	10	
A73	3	17	10	10	10	10	10	
A73	4	18	9	9	9	9	9	
A72	1	15	10	10	3	0	0	
A72	2	9	10	10	3	0	0	
A72	3	13	10	10	4	0	0	
A72	4	24	10	9	6	0	0	
A68	1	12	10	10	9	8	8	
A68	2	21	10	10	6	5	5	
A68	3	4	10	10	8	8	8	
A68	4	19	10	10	9	6	6	
M34	1	26	10	10	4	3	0	
M34	2	3	10	10	5	4	3	
M34	3	14	10	10	6	4	3	
M34	4	23	10	10	7	5	0	

CETIS Analytical Report

Report Date: 19 Jun-13 15:41 (p 1 of 2)
 Test Code: 7A2109BC | 20-4898-5532

Fish 96-h Acute Survival Test

U.S. EPA Region 8 Lab

Analysis ID: 09-0066-7618 Endpoint: 96h Survival Rate CETIS Version: CETISv1.8.0
 Analyzed: 19 Jun-13 15:41 Analysis: Nonparametric-Control vs Treatments Official Results: Yes

Sample Code	Sample Comments
HRW-Lab Control	Region 8:Acute RBT toxicity test using SW from Upper Animas River (Test#1, no dilutions).
A75B	Region 8:Acute RBT toxicity test using SW from Upper Animas River (Test#1, no dilutions).
A73B	Region 8:Acute RBT toxicity test using SW from Upper Animas River (Test#1, no dilutions).
A73	Region 8:Acute RBT toxicity test using SW from Upper Animas River (Test#1, no dilutions).
A72	Region 8:Acute RBT toxicity test using SW from Upper Animas River (Test#1, no dilutions).
A68	Region 8:Acute RBT toxicity test using SW from Upper Animas River (Test#1, no dilutions).
M34	Region 8:Acute RBT toxicity test using SW from Upper Animas River (Test #1, no dilutions).

Data Transform	Zeta	Alt Hyp	MC Trials	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	0	C > T	Not Run					12.7%

Steel Many-One Rank Test

Sample Code	vs	Sample Code	Test Stat	Critical	DF	Ties	P-Value	Decision(α:5%)
HRW-Lab Control		A75B	18	10	6	1	0.8571	Non-Significant Effect
		A73B	16	10	6	1	0.6450	Non-Significant Effect
		A73	16	10	6	1	0.6450	Non-Significant Effect
		A72	10	10	6	0	0.0480	Significant Effect
		A68	10	10	6	0	0.0480	Significant Effect
		M34	10	10	6	0	0.0480	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	6.877513	1.146252	6	81.59	<0.0001	Significant Effect
Error	0.2950439	0.01404971	21			
Total	7.172557	1.160302	27			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	12.28	3.812	<0.0001	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.8904	0.8975	0.0069	Non-normal Distribution

96h Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
HRW-Lab Control	4	1	1	1	1	1	0	0	0.0%	0.0%
A75B	4	1	1	1	1	1	0	0	0.0%	0.0%
A73B	4	0.975	0.956	0.994	0.9	1	0.025	0.05	5.13%	2.5%
A73	4	0.975	0.956	0.994	0.9	1	0.025	0.05	5.13%	2.5%
A72	4	0	0	0	0	0	0	0		100.0%
A68	4	0.675	0.6179	0.7321	0.5	0.8	0.075	0.15	22.22%	32.5%
M34	4	0.15	0.08412	0.2159	0	0.3	0.0866	0.1732	115.5%	85.0%

Angular (Corrected) Transformed Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
HRW-Lab Control	4	1.412	1.412	1.412	1.412	1.412	0	0	0.0%	0.0%
A75B	4	1.412	1.412	1.412	1.412	1.412	0	0	0.0%	0.0%
A73B	4	1.371	1.34	1.402	1.249	1.412	0.04074	0.08149	5.94%	2.89%
A73	4	1.369	1.339	1.4	1.249	1.412	0.04007	0.08015	5.85%	3.04%
A72	4	0.1588	0.1588	0.1588	0.1588	0.1588	0	0	0.0%	88.76%
A68	4	0.9714	0.9098	1.033	0.7854	1.107	0.081	0.162	16.68%	31.2%
M34	4	0.3692	0.2768	0.4616	0.1588	0.5796	0.1215	0.243	65.81%	73.85%

CETIS Analytical Report

Report Date: 19 Jun-13 15:41 (p 2 of 2)
 Test Code: 7A2109BC | 20-4898-5532

Fish 96-h Acute Survival Test

U.S. EPA Region 8 Lab

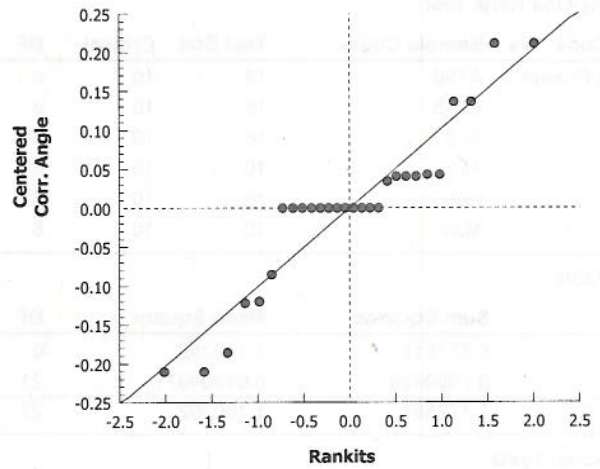
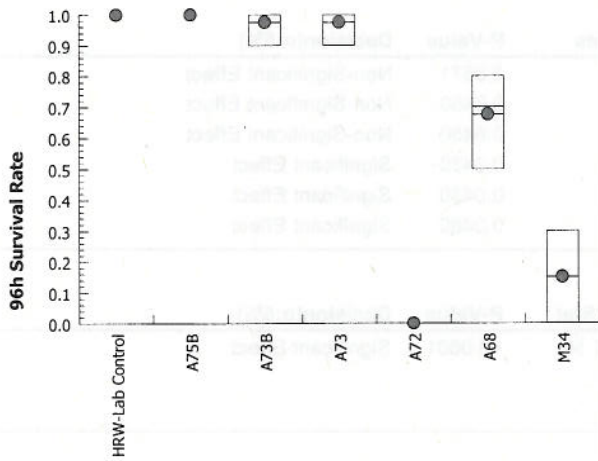
Analysis ID: 09-0066-7618 Endpoint: 96h Survival Rate
 Analyzed: 19 Jun-13 15:41 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.0
 Official Results: Yes

96h Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
HRW-Lab Control	1	1	1	1
A75B	1	1	1	1
A73B	1	1	0.9	1
A73	0.9	1	1	1
A72	0	0	0	0
A68	0.8	0.5	0.8	0.6
M34	0	0.3	0.3	0

Graphics



Attachment 2:

**CETIS analyses of the acute toxicity data for the A72 sample
diluted with HRW**

CETIS Test Data Worksheet

Report Date: 26 Jun-13 11:52 (p 1 of 1)
 Test Code: 08-2561-0991/3135D2EF

Fish 96-h Acute Survival Test

U.S. EPA Region 8 Lab

Start Date: 19 Apr-13 14:53 Species: Oncorhynchus mykiss Sample Code: 639A2779
 End Date: Protocol: EPA/821/R-02-012 (2002) Sample Source: Upper Animas River
 Sample Date: 19 Apr-13 14:51 Material: Mining Discharge/Runoff Sample Station: Control

Batch Note: Region 8: Acute RBT toxicity test using SW from Upper Animas River (Test#2, HRW/A72 dilutions)

Sample Note: Region 8: Acute RBT toxicity test using SW from Upper Animas River (Test#2, HRW/A72 dilutions)

Conc-%	Code	Rep	Pos	# Exposed	24h Survival	48h Survival	72h Survival	96h Survival	Notes
0	L	1	22	10	10	10	10	10	
0	L	2	1	10	10	10	10	10	
0	L	3	3	10	10	10	10	10	
0	L	4	7	10	10	10	10	10	
12		1	12	10	10	10	10	10	
12		2	16	10	10	10	10	10	
12		3	17	10	10	10	10	10	
12		4	26	10	10	10	10	10	
25		1	21	10	10	10	10	10	
25		2	8	10	10	10	10	10	
25		3	20	10	10	10	10	10	
25		4	13	10	10	10	10	10	
35		1	6	10	10	10	10	10	
35		2	24	10	10	10	10	10	
35		3	4	10	10	10	10	10	
35		4	19	10	10	10	10	10	
50		1	5	10	10	10	10	10	
50		2	28	10	10	10	10	10	
50		3	27	10	10	10	10	10	
50		4	2	10	10	10	10	10	
75		1	23	10	10	10	10	10	
75		2	11	10	10	10	10	10	
75		3	9	10	10	10	10	10	
75		4	15	10	10	10	10	10	
88		1	10	10	10	10	10	10	
88		2	25	10	10	10	10	10	
88		3	14	10	10	9	9	9	
88		4	18	10	10	10	10	10	

CETIS Analytical Report

Report Date: 26 Jun-13 11:50 (p 1 of 2)
 Test Code: 3135D2EF | 08-2561-0991

Fish 96-h Acute Survival Test

U.S. EPA Region 8 Lab

Analysis ID: 13-6496-9138 Endpoint: 96h Survival Rate CETIS Version: CETISv1.8.0
 Analyzed: 26 Jun-13 11:48 Analysis: Nonparametric-Control vs Treatments Official Results: Yes

Data Transform	Zeta	Alt Hyp	MC Trials	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	0	C > T	Not Run	88	>88	N/A	1.136	4.43%

Steel Many-One Rank Test

Control	vs	Conc-%	Test Stat	Critical	DF	Ties	P-Value	Decision(α:5%)
Lab Water		12	18	10	6	1	0.8571	Non-Significant Effect
		25	18	10	6	1	0.8571	Non-Significant Effect
		35	18	10	6	1	0.8571	Non-Significant Effect
		50	18	10	6	1	0.8571	Non-Significant Effect
		75	18	10	6	1	0.8571	Non-Significant Effect
		88	16	10	6	1	0.6450	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.005691285	0.0009485476	6	1	0.4512	Non-Significant Effect
Error	0.0199195	0.0009485476	21			
Total	0.02561078	0.001897095	27			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	1	3.812	0.4512	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.4261	0.8975	<0.0001	Non-normal Distribution

96h Survival Rate Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water	4	1	1	1	1	1	0	0	0.0%	0.0%
12		4	1	1	1	1	1	0	0	0.0%	0.0%
25		4	1	1	1	1	1	0	0	0.0%	0.0%
35		4	1	1	1	1	1	0	0	0.0%	0.0%
50		4	1	1	1	1	1	0	0	0.0%	0.0%
75		4	1	1	1	1	1	0	0	0.0%	0.0%
88		4	0.975	0.956	0.994	0.9	1	0.025	0.05	5.13%	2.5%

Angular (Corrected) Transformed Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water	4	1.412	1.412	1.412	1.412	1.412	0	0	0.0%	0.0%
12		4	1.412	1.412	1.412	1.412	1.412	0	0	0.0%	0.0%
25		4	1.412	1.412	1.412	1.412	1.412	0	0	0.0%	0.0%
35		4	1.412	1.412	1.412	1.412	1.412	0	0	0.0%	0.0%
50		4	1.412	1.412	1.412	1.412	1.412	0	0	0.0%	0.0%
75		4	1.412	1.412	1.412	1.412	1.412	0	0	0.0%	0.0%
88		4	1.371	1.34	1.402	1.249	1.412	0.04074	0.08149	5.94%	2.89%

CETIS Analytical Report

Report Date: 26 Jun-13 11:50 (p 2 of 2)
 Test Code: 3135D2EF | 08-2561-0991

Fish 96-h Acute Survival Test

U.S. EPA Region 8 Lab

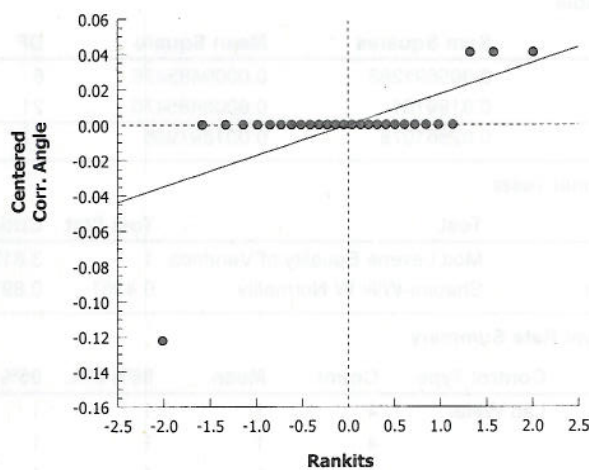
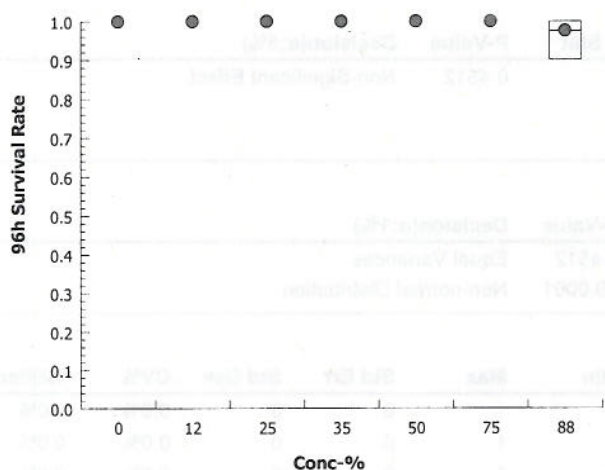
Analysis ID: 13-6496-9138 Endpoint: 96h Survival Rate
 Analyzed: 26 Jun-13 11:48 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.0
 Official Results: Yes

96h Survival Rate Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Lab Water	1	1	1	1
12		1	1	1	1
25		1	1	1	1
35		1	1	1	1
50		1	1	1	1
75		1	1	1	1
88		1	1	0.9	1

Graphics



CETIS Analytical Report

Report Date: 26 Jun-13 11:50 (p 1 of 1)
 Test Code: 3135D2EF | 08-2561-0991

Fish 96-h Acute Survival Test

U.S. EPA Region 8 Lab

Analysis ID: 03-5627-1896 Endpoint: 96h Survival Rate CETIS Version: CETISv1.8.0
 Analyzed: 26 Jun-13 11:49 Analysis: Linear Interpolation (ICPIN) Official Results: Yes

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	581076707	200	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
EC5	>88	N/A	N/A	<1.136	N/A	N/A
EC10	>88	N/A	N/A	<1.136	N/A	N/A
EC15	>88	N/A	N/A	<1.136	N/A	N/A
EC20	>88	N/A	N/A	<1.136	N/A	N/A
EC25	>88	N/A	N/A	<1.136	N/A	N/A
EC40	>88	N/A	N/A	<1.136	N/A	N/A
EC50	>88	N/A	N/A	<1.136	N/A	N/A

96h Survival Rate Summary

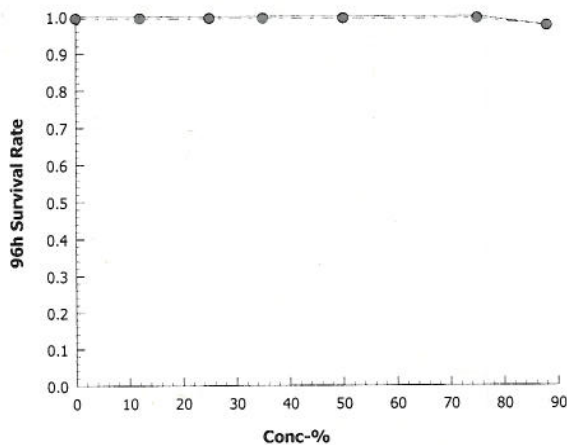
Calculated Variate(A/B)

Conc-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Lab Water	4	1	1	1	0	0	0.0%	0.0%	40	40
12		4	1	1	1	0	0	0.0%	0.0%	40	40
25		4	1	1	1	0	0	0.0%	0.0%	40	40
35		4	1	1	1	0	0	0.0%	0.0%	40	40
50		4	1	1	1	0	0	0.0%	0.0%	40	40
75		4	1	1	1	0	0	0.0%	0.0%	40	40
88		4	0.975	0.9	1	0.025	0.05	5.13%	2.5%	39	40

96h Survival Rate Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Lab Water	1	1	1	1
12		1	1	1	1
25		1	1	1	1
35		1	1	1	1
50		1	1	1	1
75		1	1	1	1
88		1	1	0.9	1

Graphics



Attachment 3:

**CETIS analyses of the acute toxicity data for the CC48/M34 sample
diluted with A68 sample**

CETIS Test Data Worksheet

Report Date: 02 Jul-13 09:15 (p 1 of 1)
 Test Code: 06-4976-2779/26BA97DB

Fish 96-h Acute Survival Test				U.S. EPA Region-8 Lab			
Start Date: 19 Apr-13 12:00	Species: Oncorhynchus mykiss	Sample Code: 6D974FF3					
End Date:	Protocol: EPA/821/R-02-012 (2002)	Sample Source: Upper Animas River					
Sample Date: 19 Apr-13 12:00	Material: Mining Discharge/Runoff	Sample Station: A68/(CC48/M34)					

Batch Note: Region 8:Acute RBT toxicity test using SW from Upper Animas River (Test#3, CC48/M34 diluted with A68)

Sample Note: Region 8:Acute RBT toxicity test using SW from Upper Animas River (Test#3, CC48/M34 diluted with A68)

C-NA	Code	Rep	Pos	# Exposed	24h Survival	48h Survival	72h Survival	96h Survival	Notes
0	L	1	18	10	10	10	10	10	
0	L	2	9	10	10	10	10	10	
0	L	3	25	10	10	10	10	10	
0	L	4	27	10	10	10	10	10	
25		1	16	10	10	10	10	10	
25		2	11	10	10	10	10	10	
25		3	1	10	10	10	10	10	
25		4	14	10	10	10	10	10	
50		1	31	10	10	10	10	9	
50		2	2	10	10	10	9	8	
50		3	7	10	10	10	10	9	
50		4	12	10	10	10	10	10	
75		1	28	10	10	0	0	0	
75		2	19	10	10	1	0	0	
75		3	17	10	10	2	0	0	
75		4	6	10	10	0	0	0	
80		1	30	10	10	0	0	0	
80		2	21	10	10	0	0	0	
80		3	22	10	10	0	0	0	
80		4	10	10	10	0	0	0	
90		1	13	10	10	0	0	0	
90		2	4	10	10	0	0	0	
90		3	26	10	10	0	0	0	
90		4	8	10	10	0	0	0	
95		1	23	10	10	0	0	0	
95		2	15	10	10	0	0	0	
95		3	29	10	10	0	0	0	
95		4	32	10	10	1	0	0	
100		1	20	10	10	0	0	0	
100		2	3	10	10	0	0	0	
100		3	24	10	10	0	0	0	
100		4	5	10	10	0	0	0	

CETIS Analytical Report

Report Date: 02 Jul-13 09:13 (p 1 of 2)
 Test Code: 26BA97DB | 06-4976-2779

Fish 96-h Acute Survival Test

U.S. EPA Region 8 Lab

Analysis ID: 17-8653-3292	Endpoint: 96h Survival Rate	CETIS Version: CETISv1.8.4
Analyzed: 02 Jul-13 9:13	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes
Batch ID: 19-1958-6405	Test Type: Survival (96h)	Analyst:
Start Date: 19 Apr-13 12:00	Protocol: EPA/821/R-02-012 (2002)	Diluent: Not Applicable
Ending Date:	Species: Oncorhynchus mykiss	Brine:
Duration: NA	Source: Trout Lodge Fish Farm	Age:

Data Transform	Zeta	Alt Hyp	Trials	Seed	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	NA	C > T	NA	NA	50	75	61.24		5.42%

Steel Many-One Rank Sum Test

Control	vs C-NA	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5.4%)
Lab Water	25	18	10	1	6	0.8750	Asymp	Non-Significant Effect
	50	12	10	1	6	0.1755	Asymp	Non-Significant Effect
	75*	10	10	0	6	0.0538	Asymp	Significant Effect
	80*	10	10	0	6	0.0538	Asymp	Significant Effect
	90*	10	10	0	6	0.0538	Asymp	Significant Effect
	95*	10	10	0	6	0.0538	Asymp	Significant Effect
	100*	10	10	0	6	0.0538	Asymp	Significant Effect

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control Resp	1	0.9 - NL	Yes	Passes Acceptability Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	10.87836	1.554051	7	800.7	<0.0001	Significant Effect
Error	0.04658309	0.001940962	24			
Total	10.92494		31			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	2.972	3.496	0.0216	Equal Variances
Variances	Levene Equality of Variance	3.436	3.496	0.0109	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.3476	0.9081	<0.0001	Non-normal Distribution

96h Survival Rate Summary

C-NA	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water	4	1	1	1	1	1	1	0	0.0%	0.0%
25		4	1	1	1	1	1	1	0	0.0%	0.0%
50		4	0.9	0.7701	1	0.9	0.8	1	0.04082	9.07%	10.0%
75		4	0	0	0	0	0	0	0	0.0%	100.0%
80		4	0	0	0	0	0	0	0	0.0%	100.0%
90		4	0	0	0	0	0	0	0	0.0%	100.0%
95		4	0	0	0	0	0	0	0	0.0%	100.0%
100		4	0	0	0	0	0	0	0	0.0%	100.0%

Angular (Corrected) Transformed Summary

C-NA	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water	4	1.412	1.412	1.412	1.412	1.412	1.412	0	0.0%	0.0%
25		4	1.412	1.412	1.412	1.412	1.412	1.412	0	0.0%	0.0%
50		4	1.254	1.056	1.453	1.249	1.107	1.412	0.06231	9.94%	11.17%
75		4	0.1588	0.1588	0.1588	0.1588	0.1588	0.1588	0	0.0%	88.76%
80		4	0.1588	0.1588	0.1588	0.1588	0.1588	0.1588	0	0.0%	88.76%
90		4	0.1588	0.1588	0.1588	0.1588	0.1588	0.1588	0	0.0%	88.76%
95		4	0.1588	0.1588	0.1588	0.1588	0.1588	0.1588	0	0.0%	88.76%
100		4	0.1588	0.1588	0.1588	0.1588	0.1588	0.1588	0	0.0%	88.76%

CETIS Analytical Report

Report Date: 02 Jul-13 09:13 (p 2 of 2)
 Test Code: 26BA97DB | 06-4976-2779

Fish 96-h Acute Survival Test

U.S. EPA Region 8 Lab

Analysis ID: 17-8653-3292 Endpoint: 96h Survival Rate CETIS Version: CETISv1.8.4
 Analyzed: 02 Jul-13 9:13 Analysis: Nonparametric-Control vs Treatments Official Results: Yes

96h Survival Rate Detail

C-NA	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Lab Water	1	1	1	1
25		1	1	1	1
50		0.9	0.8	0.9	1
75		0	0	0	0
80		0	0	0	0
90		0	0	0	0
95		0	0	0	0
100		0	0	0	0

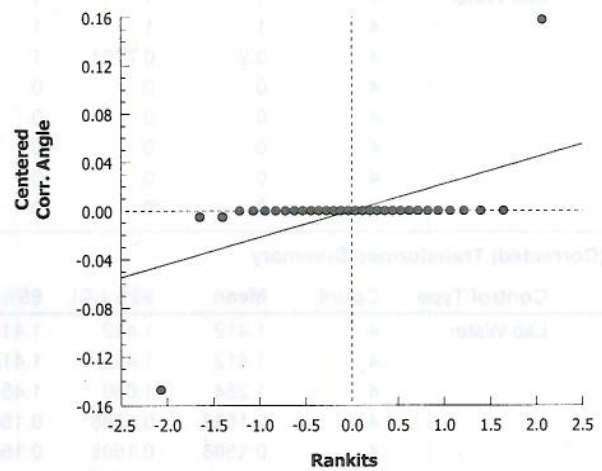
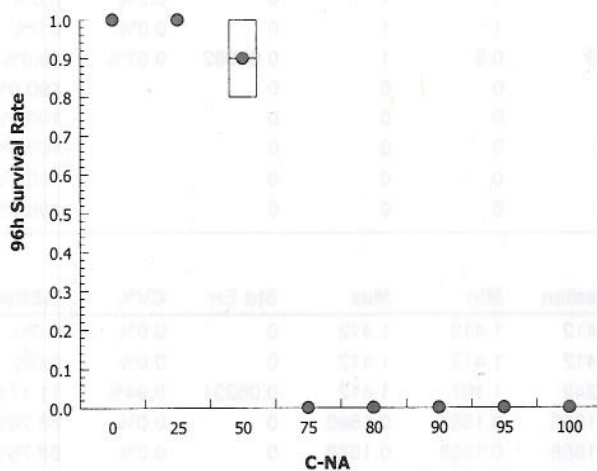
Angular (Corrected) Transformed Detail

C-NA	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Lab Water	1.412	1.412	1.412	1.412
25		1.412	1.412	1.412	1.412
50		1.249	1.107	1.249	1.412
75		0.1588	0.1588	0.1588	0.1588
80		0.1588	0.1588	0.1588	0.1588
90		0.1588	0.1588	0.1588	0.1588
95		0.1588	0.1588	0.1588	0.1588
100		0.1588	0.1588	0.1588	0.1588

96h Survival Rate Binomials

C-NA	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Lab Water	10/10	10/10	10/10	10/10
25		10/10	10/10	10/10	10/10
50		9/10	8/10	9/10	10/10
75		0/10	0/10	0/10	0/10
80		0/10	0/10	0/10	0/10
90		0/10	0/10	0/10	0/10
95		0/10	0/10	0/10	0/10
100		0/10	0/10	0/10	0/10

Graphics



CETIS Analytical Report

Report Date: 02 Jul-13 09:13 (p 1 of 2)
 Test Code: 26BA97DB | 06-4976-2779

Fish 96-h Acute Survival Test

U.S. EPA Region 8 Lab

Analysis ID: 03-4183-4286	Endpoint: 96h Survival Rate	CETIS Version: CETISv1.8.4
Analyzed: 02 Jul-13 9:13	Analysis: Untrimmed Spearman-Kärber	Official Results: Yes
Batch ID: 19-1958-6405	Test Type: Survival (96h)	Analyst:
Start Date: 19 Apr-13 12:00	Protocol: EPA/821/R-02-012 (2002)	Diluent: Not Applicable
Ending Date:	Species: Oncorhynchus mykiss	Brine:
Duration: NA	Source: Trout Lodge Fish Farm	Age:

Spearman-Kärber Estimates

Threshold Option	Threshold	Trim	Mu	Sigma	EC50	95% LCL	95% UCL
Control Threshold	0	0.00%	1.763	0.01132	57.96	55.02	61.06

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control Resp	1	0.9 - NL	Yes	Passes Acceptability Criteria

96h Survival Rate Summary

Calculated Variate(A/B)

C-NA	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Lab Water	4	1	1	1	0	0	0.0%	0.0%	40	40
25		4	1	1	1	0	0	0.0%	0.0%	40	40
50		4	0.9	0.8	1	0.04082	0.08165	9.07%	10.0%	36	40
75		4	0	0	0	0	0		100.0%	0	40
80		4	0	0	0	0	0		100.0%	0	40
90		4	0	0	0	0	0		100.0%	0	40
95		4	0	0	0	0	0		100.0%	0	40
100		4	0	0	0	0	0		100.0%	0	40

96h Survival Rate Detail

C-NA	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Lab Water	1	1	1	1
25		1	1	1	1
50		0.9	0.8	0.9	1
75		0	0	0	0
80		0	0	0	0
90		0	0	0	0
95		0	0	0	0
100		0	0	0	0

96h Survival Rate Binomials

C-NA	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Lab Water	10/10	10/10	10/10	10/10
25		10/10	10/10	10/10	10/10
50		9/10	8/10	9/10	10/10
75		0/10	0/10	0/10	0/10
80		0/10	0/10	0/10	0/10
90		0/10	0/10	0/10	0/10
95		0/10	0/10	0/10	0/10
100		0/10	0/10	0/10	0/10

CETIS Analytical Report

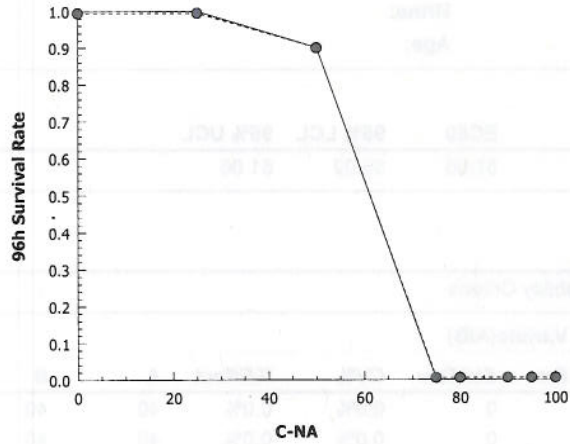
Report Date: 02 Jul-13 09:13 (p 2 of 2)
 Test Code: 26BA97DB | 06-4976-2779

Fish 96-h Acute Survival Test

U.S. EPA Region 8 Lab

Analysis ID: 03-4183-4286 Endpoint: 96h Survival Rate CETIS Version: CETISv1.8.4
 Analyzed: 02 Jul-13 9:13 Analysis: Untrimmed Spearman-Kärber Official Results: Yes

Graphics



C-NA	Count	Mean	Min	Max	Control Type
0	1	0	0	0	Lab Water
25	1	0	0	0	Lab Water
50	1	0.5	0	0.5	Lab Water
75	1	0	0	0	Lab Water
80	1	0	0	0	Lab Water
85	1	0	0	0	Lab Water
90	1	0	0	0	Lab Water
95	1	0	0	0	Lab Water
100	1	0	0	0	Lab Water

Attachment 4:

**CETIS analyses of the acute toxicity data for the CC48/M34 sample
diluted with HRW**

CETIS Test Data Worksheet

Report Date: 26 Jun-13 12:35 (p 1 of 1)
 Test Code: 09-8803-2988/3AE42FDC

Fish 96-h Acute Survival Test

U.S. EPA Region 8 Lab

Start Date: 19 Apr-13 12:00 Species: Oncorhynchus mykiss Sample Code: 6E1E3D49
 End Date: Protocol: EPA/821/R-02-012 (2002) Sample Source: Upper Animas River
 Sample Date: 19 Apr-13 12:00 Material: Mining Discharge/Runoff Sample Station: HRW/(CC48/M34)

Batch Note: Region 8:Acute RBT toxicity test using SW from Upper Animas River (Test#4, CC48/M34 diluted with HRW)

Sample Note: Region 8:Acute RBT toxicity test using SW from Upper Animas River (Test#4, CC48/M34 diluted with HRW)

Conc-NA	Code	Rep	Pos	# Exposed	24h Survival	48h Survival	72h Survival	96h Survival	Notes
0	L	1	8	10	10	10	10	10	
0	L	2	16	10	10	10	10	10	
0	L	3	20	10	10	10	10	10	
0	L	4	17	10	10	10	10	10	
25		1	22	10	10	10	10	10	
25		2	5	10	10	10	10	10	
25		3	24	10	10	10	10	10	
25		4	11	10	10	10	10	10	
50		1	15	10	10	10	10	10	
50		2	6	10	10	10	10	10	
50		3	13	10	10	10	10	10	
50		4	18	10	10	10	10	10	
75		1	23	10	10	10	10	10	
75		2	2	10	10	10	10	10	
75		3	7	10	10	10	10	10	
75		4	21	10	10	10	10	10	
90		1	4	10	0	0	0	0	
90		2	3	10	0	0	0	0	
90		3	1	10	0	0	0	0	
90		4	14	10	1	0	0	0	
95		1	12	10	0	0	0	0	
95		2	10	10	0	0	0	0	
95		3	19	10	0	0	0	0	
95		4	9	10	0	0	0	0	

CETIS Analytical Report

Report Date: 26 Jun-13 12:36 (p 1 of 2)
 Test Code: 3AE42FDC | 09-8803-2988

Fish 96-h Acute Survival Test

U.S. EPA Region 8 Lab

Analysis ID: 12-0007-8857 Endpoint: 96h Survival Rate CETIS Version: CETISv1.8.0
 Analyzed: 26 Jun-13 12:35 Analysis: Nonparametric-Control vs Treatments Official Results: Yes

Data Transform	Zeta	Alt Hyp	MC Trials	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	0	C > T	Not Run	75	90	82.16		2.5%

Steel Many-One Rank Test

Control	vs	Conc-NA	Test Stat	Critical	DF	Ties	P-Value	Decision(α:5%)
Lab Water		25	18	10	6	1	0.8333	Non-Significant Effect
		50	18	10	6	1	0.8333	Non-Significant Effect
		75	18	10	6	1	0.8333	Non-Significant Effect
		90*	10	10	6	0	0.0417	Significant Effect
		95*	10	10	6	0	0.0417	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	8.376534	1.675307	5	65540	<0.0001	Significant Effect
Error	0	0	18			
Total	8.376534	1.675307	23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	65540	4.248	<0.0001	Unequal Variances

96h Survival Rate Summary

Conc-NA	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water	4	1	1	1	1	1	0	0	0.0%	0.0%
25		4	1	1	1	1	1	0	0	0.0%	0.0%
50		4	1	1	1	1	1	0	0	0.0%	0.0%
75		4	1	1	1	1	1	0	0	0.0%	0.0%
90		4	0	0	0	0	0	0	0		100.0%
95		4	0	0	0	0	0	0	0		100.0%

Angular (Corrected) Transformed Summary

Conc-NA	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water	4	1.412	1.412	1.412	1.412	1.412	0	0	0.0%	0.0%
25		4	1.412	1.412	1.412	1.412	1.412	0	0	0.0%	0.0%
50		4	1.412	1.412	1.412	1.412	1.412	0	0	0.0%	0.0%
75		4	1.412	1.412	1.412	1.412	1.412	0	0	0.0%	0.0%
90		4	0.1588	0.1588	0.1588	0.1588	0.1588	0	0	0.0%	88.76%
95		4	0.1588	0.1588	0.1588	0.1588	0.1588	0	0	0.0%	88.76%

CETIS Analytical Report

Report Date: 26 Jun-13 12:36 (p 2 of 2)
 Test Code: 3AE42FDC | 09-8803-2988

Fish 96-h Acute Survival Test

U.S. EPA Region 8 Lab

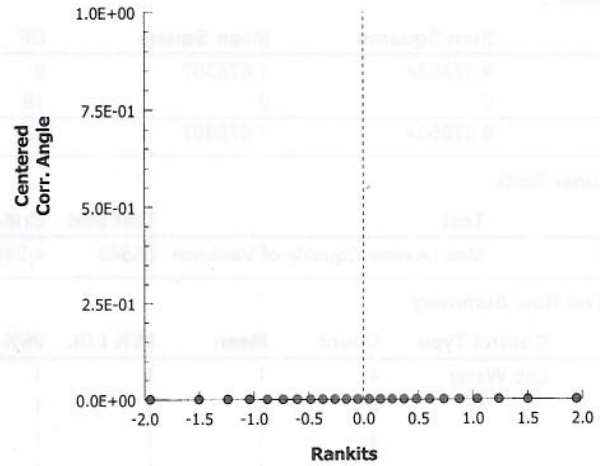
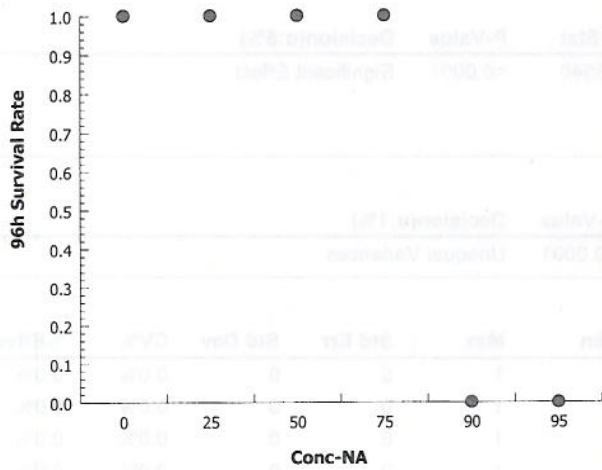
Analysis ID: 12-0007-8857 Endpoint: 96h Survival Rate
 Analyzed: 26 Jun-13 12:35 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.0
 Official Results: Yes

96h Survival Rate Detail

Conc-NA	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Lab Water	1	1	1	1
25		1	1	1	1
50		1	1	1	1
75		1	1	1	1
90		0	0	0	0
95		0	0	0	0

Graphics



Conc-NA	Control Type	Count	Mean	StDev	Min	Max	Q1	Q3
0	Lab Water	4	1.000	0.000	1.000	1.000	1.000	1.000
25		4	1.000	0.000	1.000	1.000	1.000	1.000
50		4	1.000	0.000	1.000	1.000	1.000	1.000
75		4	1.000	0.000	1.000	1.000	1.000	1.000
90		4	0.000	0.000	0.000	0.000	0.000	0.000
95		4	0.000	0.000	0.000	0.000	0.000	0.000

CETIS Analytical Report

Report Date: 26 Jun-13 12:36 (p 1 of 1)
 Test Code: 3AE42FDC | 09-8803-2988

Fish 96-h Acute Survival Test

U.S. EPA Region 8 Lab

Analysis ID: 00-1126-3273
 Analyzed: 26 Jun-13 12:36

Endpoint: 96h Survival Rate
 Analysis: Binomial Method

CETIS Version: CETISv1.8.0
 Official Results: Yes

Binomial/Graphical Estimates

Threshold Option	Threshold	Trim	Mu	Sigma	EC50	95% LCL	95% UCL
Control Threshold	0	0.00%	1.915	0	82.16	79.82	84.56

96h Survival Rate Summary

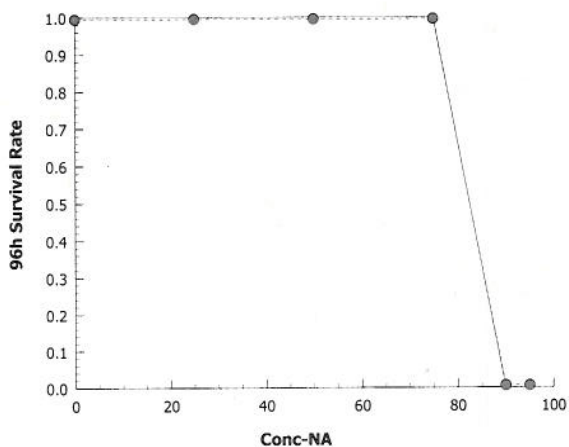
Calculated Variate(A/B)

Conc-NA	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Lab Water	4	1	1	1	0	0	0.0%	0.0%	40	40
25		4	1	1	1	0	0	0.0%	0.0%	40	40
50		4	1	1	1	0	0	0.0%	0.0%	40	40
75		4	1	1	1	0	0	0.0%	0.0%	40	40
90		4	0	0	0	0	0		100.0%	0	40
95		4	0	0	0	0	0		100.0%	0	40

96h Survival Rate Detail

Conc-NA	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Lab Water	1	1	1	1
25		1	1	1	1
50		1	1	1	1
75		1	1	1	1
90		0	0	0	0
95		0	0	0	0

Graphics



Spearman-Kärber

Attachment 5:

CETIS analyses of the acute toxicity data for the reference toxicity test

CETIS Test Data Worksheet

Report Date: 02 Jul-13 16:15 (p 1 of 1)
 Test Code: 04-7609-7282/1C60AB02

Fish 96-h Acute Survival Test

U.S. EPA Region I Lab

Start Date: 18 Apr-13 Species: Oncorhynchus mykiss Sample Code: 0413RBTARTT
 End Date: 22 Apr-13 Protocol: EPA/821/R-02-012 (2002) Sample Source: Reference Toxicant
 Sample Date: 18 Apr-13 Material: Zinc sulfate Sample Station:

Batch Note: Region 8: Concurrent RBT Reference Toxicity Test (Upper Animas River)

Sample Note: Region 8: Concurrent RBT Reference Toxicity Test (Upper Animas River)

Conc-µg/L	Code	Rep	Pos	# Exposed	24h Survival	48h Survival	72h Survival	96h Survival	Notes
5	L	1	7	10	10	10	10	10	
5	L	2	13	10	10	10	10	10	
5	L	3	6	10	10	10	10	10	
5	L	4	24	10	10	10	10	10	
88		1	11	10	10	9	9	9	
88		2	4	10	10	10	10	10	
88		3	16	10	10	10	10	10	
88		4	23	10	10	10	10	10	
155		1	20	10	10	9	9	9	
155		2	5	10	9	8	7	7	
155		3	12	10	8	8	8	8	
155		4	1	10	10	10	10	10	
305		1	18	10	3	1	1	1	
305		2	8	10	5	3	2	2	
305		3	2	10	5	2	2	2	
305		4	3	10	5	2	1	1	
525		1	10	10	0	0	0	0	
525		2	15	10	2	0	0	0	
525		3	19	10	0	0	0	0	
525		4	9	10	2	1	0	0	
1075		1	22	10	1	0	0	0	
1075		2	17	10	0	0	0	0	
1075		3	21	10	0	0	0	0	
1075		4	14	10	1	0	0	0	

CETIS Analytical Report

Report Date: 02 Jul-13 16:26 (p 1 of 2)
 Test Code: 1C60AB02 | 04-7609-7282

Fish 96-h Acute Survival Test

U.S. EPA Region I Lab

Analysis ID: 21-0193-1874	Endpoint: 96h Survival Rate	CETIS Version: CETISv1.8.0
Analyzed: 02 Jul-13 16:25	Analysis: Nonparametric-Control vs Treatments	Official Results: Yes
Batch ID: 00-9361-4536	Test Type: Survival (96h)	Analyst:
Start Date: 18 Apr-13	Protocol: EPA/821/R-02-012 (2002)	Diluent: Reconstituted Water
Ending Date: 22 Apr-13	Species: Oncorhynchus mykiss	Brine:
Duration: 96h	Source: Trout Lodge Fish Farm	Age:
Sample ID: 04-0243-6777	Code: 0413RBTARTT	Client: ESAT Region 8
Sample Date: 18 Apr-13	Material: Zinc sulfate	Project: Reference Toxicity Test
Receive Date:	Source: Reference Toxicant	
Sample Age: N/A	Station:	

Data Transform	Zeta	Alt Hyp	MC Trials	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	0	C > T	Not Run	155	305	217.4		9.22%

Steel Many-One Rank Test

Control	vs Conc-µg/L	Test Stat	Critical	DF	Ties	P-Value	Decision(α:5%)
5	88	16	10	6	1	0.6105	Non-Significant Effect
5	155	12	10	6	1	0.1424	Non-Significant Effect
5	305*	10	10	6	0	0.0417	Significant Effect
5	525*	10	10	6	0	0.0417	Significant Effect
5	1075*	10	10	6	0	0.0417	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	7.355389	1.471078	5	190.2	<0.0001	Significant Effect
Error	0.1392348	0.007735265	18			
Total	7.494623	1.478813	23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	5.646	4.248	0.0027	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.8662	0.884	0.0044	Non-normal Distribution

96h Survival Rate Summary

Conc-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
5	Lab Water	4	1	1	1	1	1	0	0	0.0%	0.0%
88		4	0.975	0.956	0.994	0.9	1	0.025	0.05	5.13%	2.5%
155		4	0.85	0.8009	0.8991	0.7	1	0.06455	0.1291	15.19%	15.0%
305		4	0.15	0.128	0.172	0.1	0.2	0.02887	0.05774	38.49%	85.0%
525		4	0	0	0	0	0	0	0		100.0%
1075		4	0	0	0	0	0	0	0		100.0%

Angular (Corrected) Transformed Summary

Conc-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
5	Lab Water	4	1.412	1.412	1.412	1.412	1.412	0	0	0.0%	0.0%
88		4	1.371	1.34	1.402	1.249	1.412	0.04074	0.08149	5.94%	2.89%
155		4	1.19	1.121	1.259	0.9912	1.412	0.09091	0.1818	15.28%	15.73%
305		4	0.3927	0.3615	0.4239	0.3218	0.4636	0.04096	0.08192	20.86%	72.19%
525		4	0.1588	0.1588	0.1588	0.1588	0.1588	0	0	0.0%	88.76%
1075		4	0.1588	0.1588	0.1588	0.1588	0.1588	0	0	0.0%	88.76%

CETIS Analytical Report

Report Date: 02 Jul-13 16:26 (p 2 of 2)
 Test Code: 1C60AB02 | 04-7609-7282

Fish 96-h Acute Survival Test

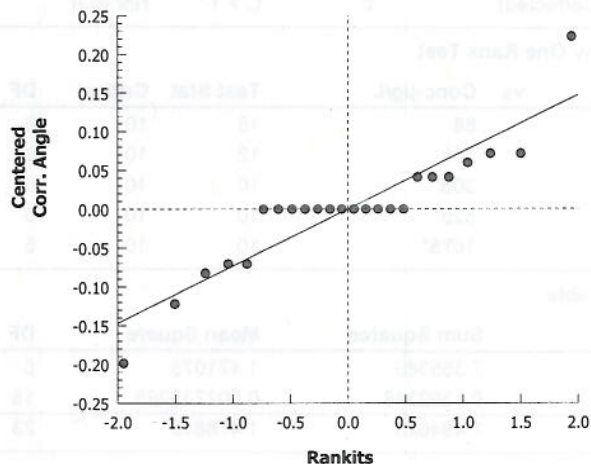
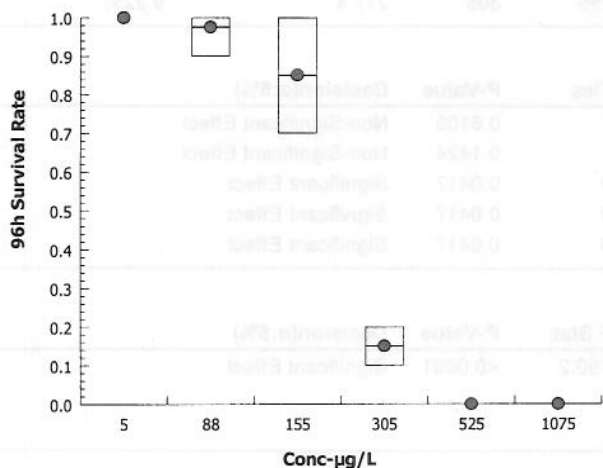
U.S. EPA Region I Lab

Analysis ID: 21-0193-1874 Endpoint: 96h Survival Rate CETIS Version: CETISv1.8.0
 Analyzed: 02 Jul-13 16:25 Analysis: Nonparametric-Control vs Treatments Official Results: Yes

96h Survival Rate Detail

Conc-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
5	Lab Water	1	1	1	1
88		0.9	1	1	1
155		0.9	0.7	0.8	1
305		0.1	0.2	0.2	0.1
525		0	0	0	0
1075		0	0	0	0

Graphics



CETIS Analytical Report

Report Date: 02 Jul-13 16:26 (p 1 of 1)
 Test Code: 1C60AB02 | 04-7609-7282

Fish 96-h Acute Survival Test

U.S. EPA Region I Lab

Analysis ID: 01-0250-5310	Endpoint: 96h Survival Rate	CETIS Version: CETISv1.8.0
Analyzed: 02 Jul-13 16:25	Analysis: Trimmed Spearman-Kärber	Official Results: Yes
Batch ID: 00-9361-4536	Test Type: Survival (96h)	Analyst:
Start Date: 18 Apr-13	Protocol: EPA/821/R-02-012 (2002)	Diluent: Reconstituted Water
Ending Date: 22 Apr-13	Species: Oncorhynchus mykiss	Brine:
Duration: 96h	Source: Trout Lodge Fish Farm	Age:
Sample ID: 04-0243-6777	Code: 0413RBTARTT	Client: ESAT Region 8
Sample Date: 18 Apr-13	Material: Zinc sulfate	Project: Reference Toxicity Test
Receive Date:	Source: Reference Toxicant	
Sample Age: N/A	Station:	

Trimmed Spearman-Kärber Estimates

Threshold Option	Threshold	Trim	Mu	Sigma	EC50	95% LCL	95% UCL
Control Threshold	0	2.50%	2.334	0.02257	215.8	194.5	239.4

96h Survival Rate Summary

Calculated Variate(A/B)

Conc-µg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
5	Lab Water	4	1	1	1	0	0	0.0%	0.0%	40	40
88		4	0.975	0.9	1	0.025	0.05	5.13%	2.5%	39	40
155		4	0.85	0.7	1	0.06455	0.1291	15.19%	15.0%	34	40
305		4	0.15	0.1	0.2	0.02887	0.05774	38.49%	85.0%	6	40
525		4	0	0	0	0	0		100.0%	0	40
1075		4	0	0	0	0	0		100.0%	0	40

96h Survival Rate Detail

Conc-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
5	Lab Water	1	1	1	1
88		0.9	1	1	1
155		0.9	0.7	0.8	1
305		0.1	0.2	0.2	0.1
525		0	0	0	0
1075		0	0	0	0

Graphics

