

ATTACHMENT 2:

**Results of the Site Specific Streamlined
Water Effects Ratio for Copper**

Intended for
Town of Danville
Wastewater Treatment Plant
1000 East Broadway
Danville, Indiana

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RESULTS OF SITE-SPECIFIC STREAMLINED WATER EFFECT RATIO FOR COPPER



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1. EXECUTIVE SUMMARY

The Town of Danville executed the August 2017 Study Plan for a Site-Specific Streamlined Water Effect Ratio for Copper which was developed in accordance with the Streamlined Water-Effect Ratio Procedure for Discharges of Copper (USEPA, 2001). Following an initial range-finder event, two rounds of sampling for WER assessment were performed using 100% Outfall 001 effluent. A final site-specific WER of 4.7 was determined for total copper. The site-specific WER of 4.7 will be used as the basis of a request for a site-specific modification to both the chronic and acute aquatic life criteria for copper and associated Town of Danville NPDES Permit limits for total copper.

2. INTRODUCTION AND STUDY OBJECTIVE

The Town of Danville owns and operates the Town of Danville Wastewater Treatment Plant (WWTP) which is a major municipal wastewater treatment plant in Danville, Indiana. Outfall 001 is authorized to discharge to West Fork White Lick Creek via NPDES Permit IN0020079. The Permit was renewed with an effective date of February 1, 2017. In developing the discharge limits for the renewed NPDES Permit, IDEM found that the WWTP effluent levels of total copper had a reasonable potential to exceed (RPE) the in-stream aquatic life criteria. Hence, the renewed Permit contains final water quality-based effluent limits (WQBELs) for total copper with a 3-year compliance schedule. Upon review of the IDEM approach to developing the WQBELs, options to adjust the criteria or the implementation of the criteria to incorporate site-specific (WWTP and West Fork White Lick Creek) conditions were identified.

The USEPA water-effect ratio (WER) procedure was initially published in 1984 and revised in 1994. The WER Interim Guidance (USEPA, 1994) outlines a methodology by which laboratory toxicity tests in site water and laboratory water are conducted with a primary and secondary test species. In 2001, the Streamlined WER procedure for copper was published. The Streamlined WER procedure for copper was developed in response to the need to improve the efficiency of applying the WER approach for the common situation where copper concentrations exceed criteria due to continuous discharges but there is no actual toxicity due to the elevated copper concentrations¹. "The most common such situation involves municipal effluents, which past experience and current knowledge have generally shown to yield low risks for copper toxicity, due to the sequestering of copper by organic matter" (USEPA 2001). USEPA 2001 goes on to say that "Because this is a relatively common regulatory situation, a great deal of experience is available to guide the development of a more efficient procedure," and "EPA developed a more streamlined approach, simpler to perform, simpler to review, but fully protective" (USEPA 2001). In short, while still fully protective, the Streamlined WER approach is more efficient, requiring only two sampling events with one test species, utilizing the design low-flow

¹ The situation described is precisely the case for the Town of Danville. While the data show an RPE for copper, neither acute toxicity (>1.0 TUa) nor chronic toxicity (>1.0 TUc) have been demonstrated in annual WET testing with two organisms (*C. dubia* and *P. promelas*) at 100% effluent.

dilution ratio, and allows for the use of the laboratory water test results or the results of a published toxicity database (Species Mean Acute Value or SMAV), whichever is greater, in the calculation of the WER.

Although the permitted endpoint for the WWTP biomonitoring is chronic, according to the Streamlined WER document, acute testing is applicable to both acute and chronic criteria. Both the Streamlined WER procedure (2001) and the October 2000 document "Response to Peer Review Comments on Streamlined Water-Effect Ratio Procedure for Discharges of Copper" (Delos et. al, 2000) confirm the appropriateness of this approach².

This report summarizes the results of the development of a site-specific Water Effect Ratio (WER) for copper using the USEPA Streamlined WER Procedure for Discharges of Copper (USEPA, 2001) (Streamlined WER). The Study Plan for the Site-specific Streamlined Water Effect Ratio for Copper (Study Plan) was submitted to and accepted by the Indiana Department of Environmental Management (IDEM) in August 2017.

3. GENERAL STUDY DESIGN

3.1 SAMPLE COLLECTION

According to the Streamlined WER and accepted Study Plan, samples for the Streamlined WER were to be collected a minimum of 30 days apart. The first sample for WER assessment, was collected September 25, 2017. The second sample for WER assessment, was collected October 31, 2017. Prior to the two WER studies, a sample of effluent was collected for rangefinder testing. The purpose of the rangefinder testing was to ascertain the approximate concentrations of copper necessary to perform the Streamlined WER tests. The results of the rangefinding test are not presented herein. As feasible, the sampling for the Streamlined WER tests also overlapped the routine Outfall 001 NPDES Permit monitoring for total copper, total lead, CBOD5, TSS, Ammonia-N, and pH. These data are presented in Table 1.

² From the Streamlined WER procedure: "In accord with the 1994 Interim Guidance and with common practice, the WER derived from acute tests is applied to both acute and chronic criteria. Because the involvement of strong binding agents causes the WER to increase as the effect concentration decreases, the WER derived from acute tests is expected to be protective of chronic effects." From Delos et. al, 2000 (in question and response form): "It was unclear if the WER derived from the streamlined procedure would apply only to acute criteria. Since this WER is essentially derived from acute data, wouldn't it potentially underestimate toxicity at a chronic level? The document has been clarified to indicate that the acute WER does apply to chronic criteria, per conventional practice. Although the chronic criterion is less than the acute criterion, this does not mean that the chronic WER is less than the acute WER. Rather the opposite is true. Because strong binders with limited capacity are involved, the "water-effect difference" (as opposed to ratio) tends to be similar across various effect concentrations. As a result the ratio tends to increase the sensitive the endpoint considered." (note that it is believed this last sentence includes a typo and that the phrase "sensitive the endpoint" was meant to read "sensitivity of the endpoint").

Table 1. Summary of Overlapping Outfall 001 Data

Associated Testing	Date	pH (s.u.)	CBOD5 (mg/L)	TSS (mg/L)	Ammonia (mg/L)	Copper (ug/L)	Lead (ug/L)
WER Event 1	09/25/17	8.1	2 to 4 ^(A)	3.3	0.1 ^(B)	86.5 ^(C)	0.069 ^(D)
WER Event 2	10/31/17	7.5	2	2.6	0.1	90.3	0.148

Notes:
 (A) CBOD5 results in the week prior to and following sampling for the WER study ranged from 2 to 4 mg/L
 (B) Ammonia results in the week prior to and following sampling for the WER study were all 0.1 mg/L
 (C) Total Copper results for 9/28/17 were 86.5 ug/L
 (D) Total Lead results for 9/28/17 were 0.069 ug/L

The Streamlined WER indicates that the site water used for testing is effluent and upstream receiving water “combined at the dilution corresponding to the design low flow condition that the permitting authority uses in permit limit calculations.” For the West Fork of White Lick Creek, a 7Q10 flow of zero was utilized in the development of the Town of Danville’s Permit limits³. As such, it is appropriate⁴ that the WER determinations were performed using 100% effluent. Therefore, the 24-hour composite effluent samples for the Streamlined WER were only collected at the existing Outfall 001 monitoring location.

3.2 TOXICITY TESTING

- USEPA Streamlined WER Procedure for Discharges of Copper (USEPA, 2001) was followed. The method requires a minimum of two WER determinations, approximately one month apart. Therefore, testing for WER determination was conducted September 26, 2017, and November 1, 2017.
- Test species was *Ceriodaphnia dubia* (*C. dubia*). The organisms were obtained from in-house moderately hard water cultures⁵.
- Tests were initiated within 36-hours of sample collection.
- *C. dubia* were less than 24-hours old at test initiation per USEPA (2002). Test organisms were not fed during the test, but were fed prior to testing as outlined by the USEPA test procedures.
- Borosilicate glass beakers were utilized as the test vessels. Four replicates of five organisms per vessel were established. Test solution volumes (copper and control exposures) were a minimum of 15 mL (USEPA, 2002). Test vessels were covered with clear plastic sheet during testing in such a manner as to allow light penetration and gas exchange.
- Acute, definitive (minimum of five copper exposures), 48-hour toxicity tests were conducted

³ For example, application of a zero flow 7Q10 is observed in not only in the final copper limitations, but also in the WET limitations (benchmark of 1.0 TUC).

⁴ By deferring to the design low flow conditions in permit limit calculations, the Streamlined WER recognizes that the appropriate “critical” condition for protection can vary and will already be identified by the permitting authority. It is not uncommon for the “critical” condition to be no dilution (100% effluent, with compliance for both acute and chronic criteria applied at the end-of-pipe) and the Streamlined WER document does not include a prohibition on the range of dilution (including no dilution) allowed. Further supporting the appropriateness of using the Streamlined WER with 100% effluent (for 7Q10=0 receiving waters) are comments made by EPA Region 6 (AR0040967, 2014) on a draft plan proposed by an Arkansas NPDES Permitted facility. In the comments, the EPA instructed the facility that for the Streamlined WER procedure (for copper), they are to use 100% effluent: “...under the copper streamlined procedure, the simulated downstream water constitutes effluent and upstream water mixed at the design low flow dilution ratio (in the case of Van Buren’s discharge, this means 100% effluent).”

⁵ Ramboll maintains their own cultures of *Ceriodaphnia dubia* and conducts monthly reference toxicity tests for assessment of organism health.

following USEPA (2002) methodologies. Mortality (lack of movement upon gentle prodding) was the test endpoint. Test concentrations were determined by the results of the rangefinder test.

- Key test conditions for *C. dubia* are summarized in Table 2. The test temperatures were 25 +/- 1 °C with a light:dark photoperiod of 16h:8h. Ramboll maintains written Standard Operating Procedures (SOPs) adhering to USEPA (2002) methodologies for *C. dubia* (SOPs available upon request).

Table 2. Overview of Streamlined WER Determination	
Summary of Test Conditions for a <i>C. dubia</i> Acute WER Determination	
Type Testing	48-hr Acute
Test Species	<i>Ceriodaphnia dubia</i> (<i>C. dubia</i>)
Organism Age	< 24 hrs old at test initiation
Number of Test Concentrations	Minimum of five plus a control
Number of Replicates	Four
Number of Organisms per Replicate	Five
Feeding During Test	None
Temperature	25±1°C
Photoperiod	Light:Dark 16h:8h
Copper source	Concentrated stock solution of reagent-grade copper sulfate (will not dilute waters by more than 10%)
Endpoint	Mortality

3.3 TEST WATERS

- Site water consisted of undiluted Outfall 001 effluent.
- Site water was collected during normal operating conditions, as 24-hour composite samples, under refrigeration (either refrigerated compositor or ice surrounded sample container)
- Filtration of site water through a plankton net to remove any indigenous organisms prior to toxicity testing was not necessary.
- Effluent samples were received at the testing laboratory at less than 6 °C and within 36-hours of sample collection.
- The laboratory test waters were reconstituted waters prepared according to USEPA (2002).
 - The laboratory test waters were reconstituted water with a total hardness similar to that of the effluent. Since the 7Q10 of the receiving stream is zero, no upstream receiving water will be used in the tests.
- A "laboratory control" of moderately hard water was established in parallel with each site water test and laboratory test to confirm the suitability of test organisms.
- The test compound used for spiking samples was reagent-grade copper sulfate. This reagent serves as a comparison of toxicity test results to those published in the Streamlined WER Appendix B and USEPA (1984 and 2007).
 - Copper sulfate was added to distilled water to prepare the stock solution for addition to test waters. The stock solution was of sufficient copper concentration that its addition to test waters (i.e., laboratory water or site water) did not dilute the test water by greater than 10%. Given the high solubility of copper sulfate, stirring of test solutions occurred for a minimum of 15 minutes. In keeping with Appendix A, Section E.15 of the USEPA Streamlined WER Procedure, the mixture was allowed to stand for 2 to 24 hours prior to use.
- Following rangefinder tests in site water, the WER test concentrations were established using a dilution factor of 0.7. Table 3 shows the nominal copper test concentrations in site water and laboratory water.

Site Water Nominal Copper Concentration Added	Very Hard Laboratory Water Nominal Copper Concentration Added
0 - baseline	0 - baseline
84	5
120	7.2
171.5	10.3
245	14.7
350	21
500	30

3.4 ANALYTICAL ANALYSIS

- Ramboll documented water quality parameters in test waters (site test exposures and laboratory tests) as follows using standard methods:
 - At test initiation in test waters (effluent and reconstituted waters) prior to copper addition: total residual chlorine, total ammonia, total hardness, total alkalinity, pH, dissolved oxygen, specific conductance, DOC, TSS, and temperature (chemistry methods listed in Table 3).
 - At test initiation, after 24 hours, and at test termination in control and all copper exposures: pH, dissolved oxygen, specific conductance, and temperature.
 - Refer to Table 4 below for a summary of chemical analysis timeline.
- Total Copper analyses were conducted at test initiation and termination in all control and copper exposures. The average of these concentrations was used in all calculations.
 - Samples for total copper analysis were collected by Ramboll upon test solution preparation and at test termination. Aliquots of the samples were immediately collected in appropriate sample vessels with preservative. These aliquots were sent to a local contract laboratory for total copper analysis⁶. Copper analysis was by USEPA Method 200.8.

Parameter	Method	Test Schedule
Total Copper	EPA 200.8	test initiation; test termination
DOC	SM 5310	test initiation before copper addition
TSS	EPA 160.2	test initiation before copper addition
Total Residual Chlorine (TRC)	SM 4500-CI G	test initiation before copper addition
Total Ammonia	SM 4500-NH3 D	test initiation before copper addition
Total Hardness	SM 2340 C	test initiation before copper addition
Total Alkalinity	SM 2320 B	test initiation before copper addition
pH	SM 4500-H+ B	test initiation; after 24 hrs; test termination
Dissolved Oxygen	SM 4500-OG	test initiation; after 24 hrs; test termination
Specific Conductance	SM 2510 B	test initiation; after 24 hrs; test termination
Temperature	SM 2550 B	test initiation; after 24 hrs; test termination

⁶ TestAmerica Laboratories, Inc. TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204

4. CALCULATIONS, RESULTS, AND DISCUSSION

4.1 LC50 AND WER CALCULATIONS

- Toxicity test data were reported as Lethal Concentration to 50% of the exposed organisms (LC50).
 - All LC50 values were determined based on the average measured copper concentrations in test solutions.
 - LC50 values were calculated using commercial software approved by USEPA (CETIS, version 1.8.4.22).
- All tests initiated were valid and used in WER calculations.
- The laboratory water *C. dubia* copper LC50 values were compared to literature *C. dubia* copper LC50 values published by USEPA (1984 and 2007) in similar hardness waters to confirm that the sensitivity of Ramboll test organisms was similar to those listed in the USEPA criteria database.
- Laboratory water LC50 values, site water LC50 values, and SMAV LC50 values were normalized to the same hardness using the formula in Streamlined WER Appendix A.
- The normalized laboratory LC50 value, averaging both the lab water test results, were compared to the SMAV LC50 value. According to the Streamlined WER procedure, the larger of the two values is used in the WER calculation. Therefore, the SMAV (Streamlined WER Appendix B) was used in the final site WER (fWER) calculation.
- The final site WER (fWER) was determined as the geometric mean of the *C. dubia* WER values, for the two determinations using SMAV LC50 results.

4.2 RESULTS AND DISCUSSION

4.2.1 WATER QUALITY AND TEST ACCEPTABILITY

Water quality parameters monitored in control exposures (0 – baseline concentration) measured at test initiation, 24-hr exposure, and at test termination indicated conditions acceptable for toxicity testing (attached Table 5). The dissolved oxygen concentrations ranged from 7.7 mg/L to 8.6 mg/L in the site water and laboratory water tests. The pH in the site water tests ranged from 7.58 to 8.65 s.u. The pH in the laboratory test controls were slightly less, ranging from 7.95 to 8.18 s.u. The increase in pH in the site waters is not uncommon given the higher alkalinity concentrations (site water total alkalinity values were 255 and 270 mg/L CaCO₃). Alkalinity is a measure of the buffering capacity of the carbonate/bicarbonate ions, and to some extent, the hydroxide ions of water. When the three ions react with hydrogen ions an increasing pH is observed. The target hardness of the laboratory water was consistent with that of the site water hardness (i.e. approximately 250 mg/L CaCO₃). The conductivity values of the site water ranged from 1,607 to 2,120 µmhos/cm while the laboratory water conductivity values ranged from 566 to 649 µmhos/cm. In the site waters, TRC and total ammonia values were less than 0.05 mg/L and 0.30 mg/L, respectively. TRC and total ammonia were non-detect in the laboratory waters. No test organism mortality was observed in the site water and laboratory water controls. There was 10 percent organism mortality observed in one of the laboratory water secondary control of moderately hard water. Test organism mortality of 10 percent or

less is required by the test method (USEPA 2002) to be considered an acceptable test.

In summary:

- Water quality parameters were suitable for determination of copper toxicity;
- Site water had a higher hardness and conductivity values than those observed in the laboratory water;
- USEPA test acceptability criteria were met for all toxicity tests (i.e., control organism mortality of 10 percent or less)

4.2.2 COPPER TOXICITY TO *C. DUBIA*

The nominal and measured copper concentrations along with corresponding mortality for each test are presented on attached Table 6. A copper toxicity dose response-relationship was observed in all site water and laboratory water tests. The copper concentrations in site water that caused a dose response-relationship were significantly higher than the concentrations in the laboratory water. The measured copper concentrations in the control (i.e., baseline concentrations in the site water) tests were 100 and 97 µg/L copper, respectively. These values are also consistent with historical Outfall 001 total copper concentrations.⁷ The measured copper concentrations were consistent in both the site water tests. This consistency indicated good precision with a relative percent difference of less than 20 percent for the initial and final measured copper concentrations. The targeted nominal copper concentrations were also within 20 percent of the measured copper concentrations (after accounting for the average copper baseline concentrations of 100 and 97 µg/L copper). Measured baseline copper concentrations in the laboratory water tests were consistently less than 3 µg/L.

An LC50 value was obtained from each of the site water tests with at least one concentration resulting in no mortality, at least one concentration resulting in partial mortality and at least one concentration resulting in complete mortality. There was no mortality observed in the baseline concentration or the secondary control of moderately hard water.

The LC50 values for laboratory waters were relatively constant. The LC50 values in the effluent were slightly more variable, however this could be due to a difference in water chemistry values. The LC50 values of the site and laboratory waters are presented in Table 7-A. For comparison of the LC50 values, the data were normalized to a hardness value of 275 mg/L per the Streamlined WER procedure. This normalization resulted in site water LC50 values of 361.8 and 277.7 µg/L copper, respectively for the first and second determinations. The laboratory water normalized LC50 values were 14.3 and 10.8 µg/L copper, respectively for the first and second determination of copper in laboratory water. The two laboratory LC50 values were averaged to yield one value for the WER calculation (12.6 µg/L copper).

⁷ Total copper in the current permit cycle (23 results from Feb 2017 through mid Feb 2018) ranges 15.2 - 110 ug/L with an average value of 74 ug/L. For the months near and including collection of samples for the WER study (8 results from Aug - Nov 2017) the total copper ranged 72 - 110 ug/L, with an average of 93 ug/L.

4.2.3 FINAL WER (FWER)

The Streamlined WER allows for the use of the laboratory water test results or the results of a published toxicity database (SMAV), whichever is greater, in the calculation of the WER. Therefore, the normalized laboratory water LC50 value was compared to the normalized SMAV LC50 value from Appendix B of the Streamlined WER. As stated above, the normalized laboratory water LC50 value was 12.6 µg/L copper, while the normalized SMAV LC50 value was 62.3 µg/L copper. Given the normalized LC50 values, the WER was calculated by dividing the normalized site-water LC50 by the normalized SMAV value (Table 7-B). However, because the WER value from the first test was greater than five (5), a value of five (5) was used in the calculation of the fWER, so that the fWER will be five (5) or less. The geometric mean of the two test WERs (5.8 set equal to 5.0 for test 1 and 4.5 for test 2) was then calculated to determine the fWER of 4.7 for total copper.

5. CONCLUSIONS

USEPA test acceptability criteria and data quality requirements were met for the toxicity tests used in the derivation of the site-specific streamlined WER values applicable to the Town of Danville discharge. The test data demonstrate that organisms exposed to the site water can tolerate a higher concentration of total copper than in laboratory water, even laboratory water that has increased hardness. The results of the data also indicate that hardness is not the only factor in copper toxicity. The site water has higher dissolved organic carbon, total alkalinity and pH compared to the laboratory water, signifying that these are also important drivers in copper toxicity.

Based on the USEPA Streamlined WER Guidance and results of the Study Plan, a site-specific WER of 4.7 for total copper is applicable to the discharge of the Town of Danville. Site-specific modifications to criteria are allowed pursuant to 327 IAC 2-1-8.9. A comparison of current Permit limits for copper (developed with the default WER = 1.0) and projected limits (developed with the determined site-specific WER=4.7) are shown below.

- Current Permit limits for Copper
 - Basis: WER = 1.0; Hardness = 250 mg/L
 - Monthly Average Limit: 21 µg/L
 - Daily Maximum Limit: 42 µg/L

- Projected Permit limits for Copper
 - Basis: WER = 4.7; Hardness = 250 mg/L
 - Monthly Average Limit: 100 µg/L
 - Daily Maximum Limit: 200 µg/L

This report summarizing the development of a site-specific WER (4.7) for total copper will be used as the basis of a request for a site-specific modification to both the chronic and acute aquatic life criteria for copper and associated Permit limits.

6. REFERENCES

Delos, C., Jiapizain, P., Dimond, W., and Roberts, C., 2000. *Response to Peer Reviewed Comments on Streamlined Water-Effect Ratio Procedure for Discharges of Copper*. EPA-823-B-94-001. USEPA Office of Water. Washington, DC. February 1994.

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TABLE 5. MEASURED ANALYTICAL DATA IN SITE AND LABORATORY TEST WATERS

Site Water Test 1 (100% Effluent)

Sample Date: 09/24/17 - 09/25/17

Test Date: 09/26/17 - 09/28/17

Parameter	Nominal Copper Concentration Added																		Mod Hard Control					
	0 - baseline			84 µg/L			120 µg/L			171.5 µg/L			245 µg/L			350 µg/L			500 µg/L			0 hrs 24 hrs 48 hrs		
	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs
Measured Copper (µg/L)	97.6	---	103	175	---	177	203	---	215	255	---	261	299	---	330	412	---	427	544	---	552	---	---	---
Dissolved Oxygen (mg/L)	8.0	7.7	7.8	7.9	7.6	7.7	7.8	7.7	7.7	7.9	7.6	7.7	8.0	7.6	7.6	7.9	7.7	7.7	7.9	7.6	7.7	7.8	7.8	7.6
pH ^(A) (s.u.)	7.78	8.40	8.51	7.86	8.41	8.54	7.86	8.42	8.54	7.86	8.39	8.53	7.85	8.38	8.51	7.85	8.38	8.52	7.82	8.33	8.50	7.54	7.56	7.63
Temperature (°C)	25.0	25.1	24.9	24.5	25.0	24.8	24.7	25.0	25.1	24.6	24.9	24.8	24.9	25.0	24.9	25.1	24.9	25.1	25.6	25.2	24.9	25.0	25.3	25.1
Conductivity (µmhos/cm)	1,608	1,566	2,120	1,901	1,807	2,120	2,000	1,974	2,140	2,080	2,070	2,200	2,110	2,110	2,200	2,110	2,120	2,200	2,090	2,130	2,160	205	223	254
Also measured for "0 - baseline"	Dissolved Organic Carbon			Total Suspended Solids			Total Residual Chlorine			Ammonia			Hardness (as CaCO ₃)			Alkalinity (as CaCO ₃)								
	13.1 mg/L			1.2 mg/L			0.03 mg/L			0.28 mg/L			273 mg/L			255 mg/L								

Notes:

(A) The observed increase in pH was due to the higher alkalinity concentration.

Site Water Test 2 (100% Effluent)

Sample Date: 10/30/17 - 10/31/17

Test Date: 11/01/17 - 11/03/17

Parameter	Nominal Copper Concentration Added																		Mod Hard Control					
	0 - baseline			84 µg/L			120 µg/L			171.5 µg/L			245 µg/L			350 µg/L			500 µg/L			0 hrs 24 hrs 48 hrs		
	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs
Measured Copper (µg/L)	99.3	---	93.9	158	---	172	193	---	204	238	---	254	301	---	349	393	---	425	554	---	544	---	---	---
Dissolved Oxygen (mg/L)	8.6	8.5	8.6	8.4	8.4	8.4	8.3	8.4	8.1	8.4	8.6	8.0	8.3	8.4	8.0	8.6	8.4	7.9	8.4	8.4	7.8	8.3	8.4	8.4
pH ^(A) (s.u.)	7.58	7.98	8.65	7.61	8.23	8.69	7.63	8.40	8.66	7.64	8.46	8.68	7.65	8.46	8.61	7.65	8.48	8.60	7.62	8.48	8.58	7.30	7.45	7.97
Temperature (°C)	24.4	24.7	24.7	24.6	25.0	25.3	24.6	25.1	25.4	24.7	25.2	25.3	24.7	25.1	24.5	24.8	25.1	24.6	24.7	25.0	24.8	24.7	25.2	24.9
Conductivity (µmhos/cm)	1,833	1,710	1,617	1,954	1,806	1,849	2,040	1,937	2,010	2,060	1,970	2,090	2,070	2,070	2,120	2,050	2,080	2,150	2,060	2,050	(B)	216	216	218
Also measured for "0 - baseline"	Dissolved Organic Carbon			Total Suspended Solids			Total Residual Chlorine			Ammonia			Hardness (as CaCO ₃)			Alkalinity (as CaCO ₃)								
	14.0 mg/L			3.25 mg/L			0.02 mg/L			0.22 mg/L			304 mg/L			270 mg/L								

Notes:

(A) The observed increase in pH was due to the higher alkalinity concentration.

(B) Parameters are often not measured when there are no longer living organisms in a concentration.

TABLE 5. MEASURED ANALYTICAL DATA IN SITE AND LABORATORY TEST WATERS

Lab Water Test 1 (Very Hard Water)

Stock Prep Date: 11/1/2017

Test Date: 11/01/17 - 11/03/17

Parameter	Nominal Copper Concentration Added																								Mod Hard Control		
	0 - baseline			5 µg/L			7.2 µg/L			10.3 µg/L			14.7 µg/L			21 µg/L			30 µg/L								
	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs
Measured Copper (µg/L)	<2.0	---	2.58	4.59	---	4.17	6.85	---	6.56	9.95	---	8.51	14.2	---	12.0	20.6	---	17.1	30.6	---	27.0	---	---	---	---	---	---
Dissolved Oxygen (mg/L)	8.6	8.3	8.5	8.7	8.4	8.2	8.7	8.4	8.2	8.6	8.6	8.2	8.6	8.4	8.1	8.6	8.2	8.1	8.6	8.2	8.1	8.3	8.4	8.4	8.3	8.4	8.4
pH (s.u.)	8.06	8.18	8.17	8.07	8.20	8.20	8.07	8.20	8.21	8.06	8.20	8.22	8.06	8.21	8.22	8.06	8.20	8.22	8.06	8.20	8.23	7.30	7.45	7.97	7.30	7.45	7.97
Temperature (°C)	24.0	24.9	25.1	24.0	25.0	25.3	24.1	25.1	24.9	24.1	25.0	25.3	24.3	25.0	25.1	24.4	25.1	25.6	24.3	25.0	25.4	24.7	25.2	24.9	24.7	25.2	24.9
Conductivity (µmhos/cm)	566	608	649	583	650	707	634	666	711	636	670	718	637	663	707	632	664	714	627	659	705	216	216	218	216	216	218
Also measured for "0 - baseline"	Dissolved Organic Carbon (A)			Total Suspended Solids (A)			Total Residual Chlorine < 0.02 mg/L			Ammonia < 0.1 mg/L			Hardness (as CaCO ₃) 244 mg/L			Alkalinity (as CaCO ₃) 61 mg/L											

Notes:

(A) Dissolved Organic Carbon in lab water has been historically less than 1.0 mg/L or non-detect. Due to the filtration system on the laboratory's dionized water system, Total Suspended Solids are non-detect.

Lab Water Test 1 (Very Hard Water)

Stock Prep Date: 12/20/2017

Test Date: 12/20/17 - 12/22/17

Parameter	Nominal Copper Concentration Added																								Mod Hard Control		
	0 - baseline			5 µg/L			7.2 µg/L			10.3 µg/L			14.7 µg/L			21 µg/L			30 µg/L								
	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs	0 hrs	24 hrs	48 hrs
Measured Copper (µg/L)	< 2 (A)	---	< 2 (A)	3.17	---	3.84	4.63	---	5.44	10.2	---	9.17	9.86	---	11.7	14.5	---	15.7	24.2	---	25.0	---	---	---	---	---	---
Dissolved Oxygen (mg/L)	8.4	8.3	8.4	8.6	8.2	8.4	8.5	8.4	8.3	8.2	8.3	8.3	8.3	8.2	8.0	8.2	8.2	8.1	8.3	8.0	8.0	8.7	8.7	8.5	8.7	8.7	8.5
pH (s.u.)	7.95	8.11	8.14	7.98	8.06	8.12	8.00	8.08	8.16	8.02	8.07	8.15	8.03	8.04	8.16	8.04	8.12	8.19	8.04	8.14	8.20	7.99	7.95	8.00	7.99	7.95	8.00
Temperature (°C)	24.2	24.6	24.5	24.4	24.5	24.4	24.6	24.7	24.6	24.5	24.6	24.2	24.6	24.5	24.5	24.4	24.8	24.4	24.6	24.8	24.3	24.4	24.2	24.9	24.4	24.2	24.9
Conductivity (µmhos/cm)	580	587	582	591	602	612	592	606	604	592	597	601	597	595	602	589	601	606	584	601	596	225	240	234	225	240	234
Also measured for "0 - baseline"	Dissolved Organic Carbon (B)			Total Suspended Solids (B)			Total Residual Chlorine < 0.02 mg/L			Ammonia < 0.1 mg/L			Hardness (as CaCO ₃) 268 mg/L			Alkalinity (as CaCO ₃) 93 mg/L											

Notes:

(A) Copper samples for baseline (no added copper) T0 hrs and T48 hrs were inadvertently not collected for analysis. Based on the baseline copper results for the first test with very hard water (11/01/17-11/03/17), the copper method reporting limit (2.0 µg/L) is listed and was used for any associated calculations.

(B) Dissolved Organic Carbon in lab water has been historically less than 1.0 mg/L or non-detect. Due to the filtration system on the laboratory's dionized water system, Total Suspended Solids are non-detect.

TABLE 6. NOMINAL AND MEASURED COPPER CONCENTRATIONS WITH PERCENT MORTALITY

Site Water Test 1 (100% Effluent)

Sample Date: 09/24/17 - 09/25/17

Test Date: 09/26/17 - 09/28/17

Nominal Copper Concentration Added	T0 hrs Measured Copper (ug/L)	T48 hrs Measured Copper (ug/L)	Absolute RPD (T0 vs T48 hrs)	Ave. Measured Copper (ug/L)	Absolute RPD (Ave measured minus baseline vs. Nominal)	Percent Mortality
0 - baseline	97.6	103	5%	100	na	0%
84	175	177	1%	176	10%	0%
120	203	215	6%	209	10%	0%
171.5	255	261	2%	258	8%	5%
245	299	330	10%	315	13%	20%
350	412	427	4%	420	9%	85%
500	544	552	1%	548	11%	100%

Site Water Test 2 (100% Effluent)

Sample Date: 10/30/17 - 10/31/17

Test Date: 11/01/17 - 11/03/17

Nominal Copper Concentration Added	T0 hrs Measured Copper (ug/L)	T48 hrs Measured Copper (ug/L)	Absolute RPD (T0 vs T48 hrs)	Ave. Measured Copper (ug/L)	Absolute RPD (Ave measured minus baseline vs. Nominal)	Percent Mortality
0 - baseline	99.3	93.9	6%	96.6	na	0%
84	158	172	8%	165	20%	0%
120	193	204	6%	199	16%	0%
171.5	238	254	7%	246	14%	0%
245	301	349	15%	325	7%	70%
350	393	425	8%	409	11%	100%
500	554	544	2%	549	10%	100%

Lab Water Test 1 (Very Hard Water)

Stock Prep Date: 11/1/2017

Test Date: 11/01/17 - 11/03/17

Nominal Copper Concentration Added	T0 hrs Measured Copper (ug/L)	T48 hrs Measured Copper (ug/L)	Absolute RPD (T0 vs T48 hrs)	Ave. Measured Copper (ug/L)	Absolute RPD (Ave measured vs. Nominal)	Percent Mortality
0 - baseline	< 2.0	2.58	25%	2.3	14% (A)	0%
5	4.59	4.17	10%	4.4	13%	0%
7.2	6.85	6.56	4%	6.7	7%	0%
10.3	9.95	8.51	16%	9.2	11%	10%
14.7	14.2	12.0	17%	13.1	12%	45%
21	20.6	17.1	19%	18.9	11%	100%
30	30.6	27.0	13%	28.8	4%	100%

(A) Detection limit (2.0 ug/L) used for nominal baseline concentration.

TABLE 6. NOMINAL AND MEASURED COPPER CONCENTRATIONS WITH PERCENT MORTALITY

Lab Water Test 2 (Very Hard Water)

Stock Prep Date: 12/20/2017

Test Date: 12/20/17 - 12/22/17

Nominal Copper Concentration Added	T0 hrs Measured Copper (ug/L)	T48 hrs Measured Copper (ug/L)	Absolute RPD (T0 vs T48 hrs)	Ave. Measured Copper (ug/L)	Absolute RPD (Ave measured vs. Nominal)	Percent Mortality
0 - baseline	< 2.0 (A)	< 2.0 (A)	0%	2.0	0% (B)	0%
5	3.17	3.84	19%	3.5	35%	0%
7.2	4.63	5.44	16%	5.0	35%	5%
10.3	10.2	9.17	11%	9.7	6%	30%
14.7	9.86	11.7	17%	10.8	31%	60%
21	14.5	15.7	8%	15.1	33%	80%
30	24.2	25	3%	24.6	20%	100%

(A) Copper samples for baseline (no added copper) T0 hrs and T48 hrs were inadvertently not collected for analysis. Based on the baseline copper results for the first test with very hard water (11/01/17-11/03/17), the copper method reporting limit (2.0 µg/L) is listed and was used for any associated calculations.

(B) Detection limit (2.0 ug/L) used for nominal baseline concentration in calculations

TABLES 7-A & 7-B. STREAMLINED WATER EFFECT RATIOS (WERs) FOR TOTAL COPPER

Table 7-A: *Ceriodaphnia dubia* LC50 and Species Mean Acute Values (SMAVs) Standardized to 275 mg/L (as CaCO₃) Hardness

Description	Test 1 with 100% Effluent	Test 2 with 100% Effluent	Lab Water Test 1	Lab Water Test 2	Lab Water Average	SMAV from the 2001 Streamlined WER Procedure ^(C)
Test Dates	09/26/17-09/28/17	11/01/17-11/03/17	11/01/17-11/03/17	12/20/17-12/22/17	11/2017 & 12/2017	na
Sample Hardness (as mg/L CaCO ₃)	276	304	244	268	na	100
LC50 (µg/L of total copper) at Measured Sample Hardness ^(A)	363.0	305.2	12.78	10.55	na	24.0
Normalized LC50 (µg/L of Cu) at 275 mg/L (as CaCO ₃) Hardness ^(B)	361.8	277.7	14.3	10.8	12.6	62.3

- Notes:
- (A). LC50 based on average measured copper concentrations. Nominal and measured concentrations are presented in both Table 3-1 and Table 3-2.
 - (B) Normalized LC50 for 275 mg/L (as CaCO₃) hardness calculated per the 2001 Streamlined WER Procedure for Discharges of Copper:
 $LC50 \text{ for specific hardness} = LC50 \text{ at sample hardness} * (\text{Specific Hardness}/\text{Sample Hardness}) ^ 0.9422$
 - (C) *C. dubia* SMAV for hardness 100 mg/L presented in the 2001 Streamlined WER Procedure for Discharges of Copper, Appendix B.

Table 7-B: Calculated WERs for Total Copper

Basis of Comparison	Calculated ^(A) Site WER for Test 1 with 100% Effluent	Calculated ^(A) Site WER for Test 2 with 100% Effluent	Calculated ^(B) Final WER (fWER)
Average Lab Water LC50	28.8	22.1	25.2
SMAV from the 2001 Streamlined WER Procedure	5.8 (value of 5.0 used in fWER calculation)	4.5	4.7

- Notes:
- (A): Site WERs calculated by dividing the normalized sample LC50 by the Lab Water LC50 or Reference SMAV
 - (B): fWER is the geometric mean of the Test 1 and Test 2 Site WERs. For any site WER > 5, a value of 5 will be used in calculation of the fWER.

APPENDIX
BENCH SHEETS & ANALYTICAL DATA
CONTROL CHARTS

Site Water Event 1 Documents

48-HR ACUTE TOXICITY TEST DATA SHEET
EPA-821-R-02-012 Method 2002.0

LOG: <u>19011</u>	TEST TYPE: <u>Static, Daily Renewal</u>	TEST VESSEL CAPACITY: <u>30 mL</u>
JOB NO: <u>38400876</u>	TEST ORGANISM: <u>Ceriodaphnia dubia</u>	TEST SOLUTION VOLUME: <u>15 - 20 mL</u>
CLIENT: <u>Town of Danville</u>	ORGANISM AGE (date): <u>9/25/17 (310-0710)</u>	NO. ORGANISMS/VESSEL: <u>5</u>
EFFLUENT: <u>Outfall 001</u>	ORGANISM SOURCE: <u>11906-11</u>	NO. REPLICATES: <u>4</u>
SAMPLE "B" NOS.: <u>2082</u>	PHOTOPERIOD: <u>16 hrs light/8 hrs dark</u>	DILUTION WATER: <u>Type: Eff No. 8082</u>
SAMPLE DATE: <u>9/24/17</u>	START DATE/TIME: <u>9/26/17 1416</u>	DILUTIONS MADE BY: <u>LM</u>
ORGANISM SOURCE TEMP: <u>24.3</u>	END DATE/TIME: <u>9/28/17 1330</u>	FED @ LEAST 2 HR. PRIOR TO TEST: <u>Time: 010 Intls: 1M</u>
FOOD BATCH: <u>6002.25</u>	RANDOMIZED BY: <u>LM</u>	48 hr. LC50 = <u>282.6 (Normal)</u> 95% CI = <u>257.7-309.9</u> <u>263 - measured</u>

Conc (ppb)	Vessel ID	Survival (#)				DO (mg/L)			pH (s.u.)			Temperature (°C)			Conductivity (umhos/cm)		
		0	24	48	DEAD	0	24	48	0	24	48	0	24	48	0	24	48
Baseline	A	5	5	5	0	8.0			7.54			23.0			11008		
Effluent	B	5	5	5	0		7.7	7.8	7.78	8.40	8.51		25.1	24.9		1416	2120
	C	5	5	5	0												
	D	5	5	5	0												
84	A	5	5	5	0	7.9			7.86			24.5			1901		
	B	5	5	5	0		7.6	7.7		8.41	8.54		25.0	24.8		1807	2120
	C	5	5	5	0												
	D	5	5	5	0												
120.1	A	5	5	5	0	7.8			7.86			24.7			2000		
	B	5	5	5	0		7.7	7.7		8.42	8.54		25.0	25.1		1979	2140
	C	5	5	5	0												
	D	5	5	5	0												
171.5	A	5	5	5	0	7.9			7.86			24.6			2085		
	B	5	5	5	0		7.6	7.7		8.39	8.53		24.6	24.8		2070	2210
	C	5	4	4	1												
	D	5	5	5	0												

Params: <u>LM LM LM</u>	Control Primary: <u>256</u>	100% Effluent: <u>276</u>	Comments: <u>MH made: N/A 6/21/19</u>
Initials: <u>LM LM LM</u>	Hardness (mg/L): <u>256</u>	Alkalinity (mg/L): <u>256</u>	1st use: <u>9/24/17</u>
Time: <u>1416 1220 1330</u>	TRC (mg/L): <u>0.03</u>	Ammonia (mg/L): <u>0.28</u>	Light Level (fc): <u>64.7</u>
Date: <u>9/26 9/27 9/28</u>			

48-HR ACUTE TOXICITY TEST DATA SHEET
EPA-821-R-02-012 Method 2002.0

LOG: <u>19011</u>	TEST TYPE: <u>Static, Daily Renewal</u>	TEST VESSEL CAPACITY: <u>30 mL</u>	
JOB NO: <u>384087B</u>	TEST ORGANISM: <u>Ceriodaphnia dubia</u>	TEST SOLUTION VOLUME: <u>15 - 20 mL</u>	
CLIENT: <u>Town of Danville</u>	SAMPLE B #: <u>20829</u>	NO. ORGANISMS/VESSEL: <u>5</u>	
EFFLUENT: <u>Outfall 001</u>	TEST START DATE: <u>9/26/17</u>	NO. REPLICATES: <u>4</u>	

Conc (ppb)	Vessel ID	Survival (#)				DO (mg/L)			pH (s.u.)			Temperature (°C)			Conductivity (umhos/cm)		
		0	24	48	DEAD	0	24	48	0	24	48	0	24	48	0	24	48
245	A	5	5	5	0	8.0			7.85			24.9			2110		
	B	5	5	5	0		7.6	7.6		8.38	8.51		25.0	24.9		2110	2200
	C	5	4	3	2												
	D	5	4	3	2												
350	A	5	1	0	5	7.9			7.85			25.1			2110		
	B	5	2	1	4		7.7	7.7		8.38	8.52		24.9	25.1		2100	2200
	C	5	3	1	4												
	D	5	1	1	4												
500	A	5	0	0	5	7.9			7.82			25.0			2090		
	B	5	0	0	5		7.6	7.7		8.33	8.50		25.2	24.9		2130	2160
	C	5	0	0	5												
	D	5	0	0	5												
NH	A	5	5	5	0	7.8			7.54			25.0			205		
	B	5	5	5	0		7.8	7.6		7.56	7.63		25.7	25.1		223	254
	C	5	5	5	0												
	D	5	5	5	0												

Comments:

CETIS Analytical Report

Report Date: 09 Oct-17 15:49 (p 1 of 2)
 Test Code: 19011cd | 04-1389-8781

Ceriodaphnia 48-h Acute Survival Test

Ramboll Environ

Analysis ID: 00-4804-4987	Endpoint: 48h Survival Rate	CETIS Version: CETISv1.8.4
Analyzed: 09 Oct-17 15:48	Analysis: Untrimmed Spearman-Kärber	Official Results: Yes
Batch ID: 01-0911-8959	Test Type: Survival (48h)	Analyst:
Start Date: 26 Sep-17	Protocol: EPA/821/R-02-012 (2002)	Diluent: Effluent diluting toxicant
Ending Date: 28 Sep-17	Species: Ceriodaphnia dubia	Brine: Not Applicable
Duration: 48h	Source: In-House Culture	Age:
Sample ID: 00-7607-7111	Code: 488D837	Client: Town of Danville
Sample Date: 25 Sep-17	Material: POTW Effluent	Project: Special Studies
Receive Date: 26 Sep-17	Source: WER	
Sample Age: 24h	Station: Outfall 001	

Sample Note: 1st WER Event *Nominal*

Spearman-Kärber Estimates

Threshold Option	Threshold	Trim	Mu	Sigma	LC50	95% LCL	95% UCL
Control Threshold	0	0.00%	2.451	0.02005	282.6	257.7	309.9

Test Acceptability Criteria

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

48h Survival Rate Summary

Calculated Variate(A/B)

C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Dilution Water	4	1	1	1	0	0	0.0%	0.0%	20	20
84		4	1	1	1	0	0	0.0%	0.0%	20	20
120.1		4	1	1	1	0	0	0.0%	0.0%	20	20
171.5		4	0.95	0.8	1	0.05	0.1	10.53%	5.0%	19	20
245		4	0.8	0.6	1	0.1155	0.2309	28.87%	20.0%	16	20
350		4	0.15	0	0.2	0.05	0.1	66.67%	85.0%	3	20
500		4	0	0	0	0	0	100.0%	100.0%	0	20

48h Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1	1	1	1
84		1	1	1	1
120.1		1	1	1	1
171.5		1	1	0.8	1
245		1	1	0.6	0.6
350		0	0.2	0.2	0.2
500		0	0	0	0

48h Survival Rate Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	5/5	5/5	5/5	5/5
84		5/5	5/5	5/5	5/5
120.1		5/5	5/5	5/5	5/5
171.5		5/5	5/5	4/5	5/5
245		5/5	5/5	3/5	3/5
350		0/5	1/5	1/5	1/5
500		0/5	0/5	0/5	0/5

CETIS Analytical Report

Report Date: 09 Oct-17 15:49 (p 2 of 2)
Test Code: 19011cd | 04-1389-8781

Ceriodaphnia 48-h Acute Survival Test

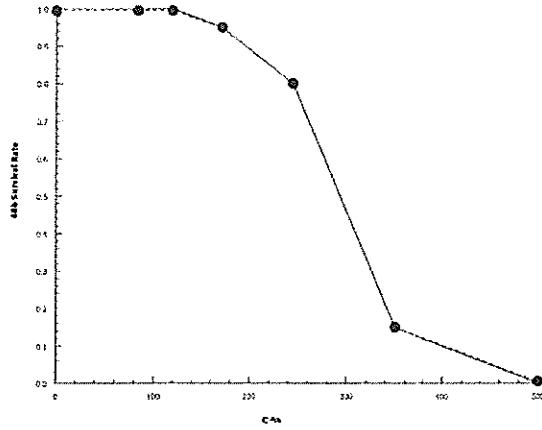
Ramboll Environ

Analysis ID: 00-4804-4987
Analyzed: 09 Oct-17 15:48

Endpoint: 48h Survival Rate
Analysis: Untrimmed Spearman-Kärber

CETIS Version: CETISv1.8.4
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 08 Dec-17 14:18 (p 1 of 2)
 Test Code: 19011 MEASURED | 00-2700-6027

Ceriodaphnia 48-h Acute Survival Test

Ramboll Environ

Analysis ID: 18-2660-2753	Endpoint: 48h Survival Rate	CETIS Version: CETISv1.8.4
Analyzed: 08 Dec-17 14:18	Analysis: Linear Interpolation (ICPIN)	Official Results: Yes
Batch ID: 02-2288-3734	Test Type: Survival (48h)	Analyst:
Start Date: 26 Sep-17	Protocol: EPA/821/R-02-012 (2002)	Diluent: Effluent diluting toxicant
Ending Date: 28 Sep-17	Species: Ceriodaphnia dubia	Brine: Not Applicable
Duration: 48h	Source: In-House Culture	Age:
Sample ID: 00-7607-7111	Code: 488D837	Client: Town of Danville
Sample Date: 25 Sep-17	Material: POTW Effluent	Project: Special Studies
Receive Date: 26 Sep-17	Source: WER	
Sample Age: 24h	Station: Outfall 001	

Sample Note: 1st WER Event - MEASURED T0 and T48 averaged

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	1948662	1000	Yes	Two-Point Interpolation

Test Acceptability Criteria

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

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
LC50	363	322.8	386.2	0.2755	0.2589	0.3098

48h Survival Rate Summary

Calculated Variate(A/B)

C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
100.3	Dilution Water	4	1	1	1	0	0	0.0%	0.0%	20	20
176		4	1	1	1	0	0	0.0%	0.0%	20	20
209		4	1	1	1	0	0	0.0%	0.0%	20	20
258		4	0.95	0.8	1	0.05	0.1	10.53%	5.0%	19	20
314.5		4	0.8	0.6	1	0.1155	0.2309	28.87%	20.0%	16	20
419.5		4	0.15	0	0.2	0.05	0.1	66.67%	85.0%	3	20
548		4	0	0	0	0	0	100.0%	100.0%	0	20

48h Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
100.3	Dilution Water	1	1	1	1
176		1	1	1	1
209		1	1	1	1
258		1	1	0.8	1
314.5		1	1	0.6	0.6
419.5		0	0.2	0.2	0.2
548		0	0	0	0

48h Survival Rate Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
100.3	Dilution Water	5/5	5/5	5/5	5/5
176		5/5	5/5	5/5	5/5
209		5/5	5/5	5/5	5/5
258		5/5	5/5	4/5	5/5
314.5		5/5	5/5	3/5	3/5
419.5		0/5	1/5	1/5	1/5
548		0/5	0/5	0/5	0/5

CETIS Analytical Report

Report Date: 08 Dec-17 14:18 (p 2 of 2)
Test Code: 19011 MEASURED | 00-2700-6027

Ceriodaphnia 48-h Acute Survival Test

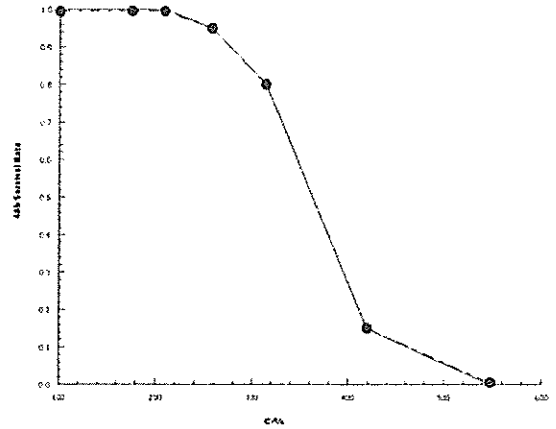
Ramboll Environ

Analysis ID: 18-2660-2753
Analyzed: 08 Dec-17 14:18

Endpoint: 48h Survival Rate
Analysis: Linear Interpolation (ICPIN)

CETIS Version: CETISv1.8.4
Official Results: Yes

Graphics



Client Sample Results

Client: Ramboll Environ US Corporation
 Project/Site: 3rd Quarter Water Quality

TestAmerica Job ID: 490-137433-1

Client Sample ID: Effluent Baseline T0 effluent

Lab Sample ID: 490-137433-1

Date Collected: 09/26/17 00:01

Matrix: Water

Date Received: 09/26/17 13:00

Method: 200.8 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.0976		0.00200		mg/L		09/27/17 09:07	09/27/17 18:25	1

General Chemistry									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids	1.20		1.20		mg/L			09/27/17 22:08	1

Client Sample ID: Effluent 84 T0

Lab Sample ID: 490-137433-2

Date Collected: 09/26/17 00:01

Matrix: Water

Date Received: 09/26/17 13:00

Method: 200.8 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.175		0.00200		mg/L		09/27/17 09:07	09/27/17 17:52	1

Client Sample ID: Effluent 120 T0

Lab Sample ID: 490-137433-3

Date Collected: 09/26/17 00:01

Matrix: Water

Date Received: 09/26/17 13:00

Method: 200.8 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.203		0.00200		mg/L		09/27/17 09:07	09/27/17 17:55	1

Client Sample ID: Effluent 171.5 T0

Lab Sample ID: 490-137433-4

Date Collected: 09/26/17 00:01

Matrix: Water

Date Received: 09/26/17 13:00

Method: 200.8 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.255		0.00200		mg/L		09/27/17 09:07	09/27/17 17:58	1

Client Sample ID: Effluent 245 T0

Lab Sample ID: 490-137433-5

Date Collected: 09/26/17 00:01

Matrix: Water

Date Received: 09/26/17 13:00

Method: 200.8 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.299		0.00200		mg/L		09/27/17 09:07	09/27/17 18:01	1

Client Sample ID: Effluent 350 T0

Lab Sample ID: 490-137433-6

Date Collected: 09/26/17 00:01

Matrix: Water

Date Received: 09/26/17 13:00

Method: 200.8 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.412		0.00200		mg/L		09/27/17 09:07	09/27/17 18:04	1

Client Sample Results

Client: Ramboll Environ US Corporation
Project/Site: 3rd Quarter Water Quality

TestAmerica Job ID: 490-137433-1

Client Sample ID: Effluent 500 T0

Date Collected: 09/26/17 00:01

Date Received: 09/26/17 13:00

Lab Sample ID: 490-137433-7

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.544		0.00200		mg/L		09/27/17 09:07	09/27/17 18:07	1

Client Sample Results

Client: Ramboll Environ US Corporation
Project/Site: Danville

TestAmerica Job ID: 490-137631-1

Client Sample ID: V.Hard T48

Date Collected: 09/28/17 13:30

Date Received: 09/28/17 14:48

Lab Sample ID: 490-137631-1

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.00456		0.00200		mg/L		09/29/17 09:40	10/02/17 15:41	1

Client Sample ID: Effluent Baseline T48

Date Collected: 09/28/17 13:30

Date Received: 09/28/17 14:48

Lab Sample ID: 490-137631-2

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.103		0.00200		mg/L		09/29/17 09:40	10/02/17 15:44	1

Client Sample ID: Effluent 84 T48

Date Collected: 09/28/17 13:30

Date Received: 09/28/17 14:48

Lab Sample ID: 490-137631-3

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.177		0.00200		mg/L		09/29/17 09:40	10/02/17 15:47	1

Client Sample ID: Effluent 120.1 T48

Date Collected: 09/28/17 13:30

Date Received: 09/28/17 14:48

Lab Sample ID: 490-137631-4

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.215		0.00200		mg/L		09/29/17 09:40	10/02/17 15:50	1

Client Sample ID: Effluent 171.5 T48

Date Collected: 09/28/17 13:30

Date Received: 09/28/17 14:48

Lab Sample ID: 490-137631-5

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.261		0.00200		mg/L		09/29/17 09:40	10/02/17 15:53	1

Client Sample ID: Effluent 245 T48

Date Collected: 09/28/17 13:30

Date Received: 09/28/17 14:48

Lab Sample ID: 490-137631-6

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.330		0.00200		mg/L		09/29/17 09:40	10/02/17 15:56	1

Client Sample ID: Effluent 350 T48

Date Collected: 09/28/17 13:30

Date Received: 09/28/17 14:48

Lab Sample ID: 490-137631-7

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.427		0.00200		mg/L		09/29/17 09:40	10/02/17 15:59	1

TestAmerica Nashville

Client Sample Results

Client: Ramboll Environ US Corporation
Project/Site: Danville

TestAmerica Job ID: 490-137631-1

Client Sample ID: Effluent 500 T48

Date Collected: 09/28/17 13:30

Date Received: 09/28/17 14:48

Lab Sample ID: 490-137631-8

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.552		0.00200		mg/L		09/29/17 09:40	10/04/17 17:57	1

Client Sample Results

Client: Ramboll Environ US Corporation
Project/Site: Danville

TestAmerica Job ID: 490-140080-1

Client Sample ID: Outfall 001 sd 9/26/17 (unfiltered)

Lab Sample ID: 490-140080-1

Date Collected: 11/03/17 00:01

Matrix: Water

Date Received: 11/03/17 09:50

General Chemistry - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dissolved Organic Carbon	13.1		1.00		mg/L			11/08/17 01:52	1

Site Water Event 2 Documents

48-HR ACUTE TOXICITY TEST DATA SHEET
EPA-821-R-02-012 Method 2002.0

LOG: <u>19060</u>	TEST TYPE: <u>Static, Daily Renewal</u>	TEST VESSEL CAPACITY: <u>30 mL</u>
JOB NO: <u>—</u>	TEST ORGANISM: <u>Ceriodaphnia dubia</u>	TEST SOLUTION VOLUME: <u>15 - 20 mL</u>
CLIENT: <u>Town of Danville</u>	ORGANISM AGE (date): <u>11/3/17 (1562-0313)</u>	NO. ORGANISMS/VESSEL: <u>5</u>
EFFLUENT: <u>Outfall 001</u>	ORGANISM SOURCE: <u>1944-50</u>	NO. REPLICATES: <u>4</u>
SAMPLE "B" NOS.: <u>20914</u>	PHOTOPERIOD: <u>16 hrs light/8 hrs dark</u>	DILUTION WATER: <u>Type: FF No. 20914</u>
SAMPLE DATE: <u>10/3/17</u>	START DATE/TIME: <u>11/1/17 1231</u>	DILUTIONS MADE BY: <u>LM</u>
ORGANISM SOURCE TEMP: <u>24.2</u>	END DATE/TIME: <u>11/3/17 1150</u>	FED @ LEAST 2 HR. PRIOR TO TEST: <u>Time: OXYS Intis: LM</u>
FOOD BATCH: <u>003356</u>	RANDOMIZED BY: <u>LM</u>	48 hr. LC50 = <u>232 nominal 95% CI = 205 measured</u>

Conc (ppb)	Vessel ID	Survival (#)				DO (mg/L)			pH (s.u.)			Temperature (°C)			Conductivity (umhos/cm)		
		0	24	48	DEAD	0	24	48	0	24	48	0	24	48	0	24	48
Baseline	A	5	5	5	0	8.1			7.58			24.4			1833		
Effluent	B	5	5	5	0		8.5	8.6		7.98	8.65		24.7	24.7		1710	1767
	C	5	5	5	0												
	D	5	5	5	0												
84	A	5	5	5	0	8.4			7.61			24.6			1954		
	B	5	5	5	0		8.4	8.4		8.24	8.61		25.0	25.3		1800	1849
	C	5	5	5	0												
	D	5	5	5	0												
120.1	A	5	5	5	0	8.3			7.63			24.6			2040		
	B	5	5	5	0		8.1	8.1		8.41	8.66		25.1	25.4		1937	2011
	C	5	5	5	0												
	D	5	5	5	0												
171.5	A	5	5	5	0	8.4			7.64			24.7			2060		
	B	5	5	5	0		8.0	8.0		8.40	8.68		25.0	25.3		1977	2047
	C	5	5	5	0												
	D	5	5	5	0												

Params:	LM	LM	LM		Control Primary	100% Effluent	Comments:
Initials:	LM	LM	LM		Hardness (mg/L)	304	MH made: WJA
Time:	1231	1624	1150		Alkalinity (mg/L)	270	1st use: WJA
Date:	11/1	11/2	11/3		TRC (mg/L)	0.02	Light Level (fc): 694
					Ammonia (mg/L)	0.22	

48-HR ACUTE TOXICITY TEST DATA SHEET
EPA-821-R-02-012 Method 2002.0

LOG: <u>19060</u>	TEST TYPE: <u>Static, Daily Renewal</u>	TEST VESSEL CAPACITY: <u>30 mL</u>	
JOB NO: <u>-</u>	TEST ORGANISM: <u>Ceriodaphnia dubia</u>	TEST SOLUTION VOLUME: <u>15 - 20 mL</u>	
CLIENT: <u>Town of Danville</u>	SAMPLE B #: <u>20914</u>	NO. ORGANISMS/VESSEL: <u>5</u>	
EFFLUENT: <u>not</u>	TEST START DATE: <u>11/1/17</u>	NO. REPLICATES: <u>4</u>	

Conc (ppb)	Vessel ID	Survival (#)				DO (mg/L)			pH (s.u.)			Temperature (°C)			Conductivity (umhos/cm)			
		0	24	48	DEAD	0	24	48	0	24	48	0	24	48	0	24	48	
245	A	5	4	3	2	8.3			7.65			24.7			2070			
	B	5	4	2	0		8.4	8.0		8.46	8.61		25.1	24.5		2070	2100	
	C	5	3	0	0													
	D	5	4	1	4													
350	A	5	1	0	5	8.6			7.65			24.8			2050			
	B	5	1	0	5		8.4	7.9		8.48	8.60		25.1	24.0		2070	2150	
	C	5	1	0	5													
	D	5	4	0	5													
500	A	5	1	0	5	8.4			7.30			24.7			2160			
	B	5	0	0	5		8.4	7.8		7.62	8.48	8.58		25.0	24.8		2060	2150
	C	5	0	0	5													
	D	5	0	0	5													
1411	A	5	5	5	0	8.3			7.30			24.7			2160			
	B	5	5	5	0		8.4	8.4		7.45	7.97		25.0	24.9		210	218	
	C	5	5	5	0													
	D	5	5	5	0													

Comments: OLM 12/1/17

CETIS Analytical Report

Report Date: 11 Dec-17 08:10 (p 1 of 2)
 Test Code: 19060 cd nomina | 02-3210-9532

Ceriodaphnia 48-h Acute Survival Test

Ramboll Environ

Analysis ID: 05-4084-6399	Endpoint: 48h Survival Rate	CETIS Version: CETISv1.8.4
Analyzed: 11 Dec-17 8:05	Analysis: Untrimmed Spearman-Kärber	Official Results: Yes
Batch ID: 00-2044-9023	Test Type: Survival (48h)	Analyst:
Start Date: 01 Nov-17	Protocol: EPA/821/R-02-012 (2002)	Diluent: Mod-Hard Synthetic Water
Ending Date: 03 Nov-17	Species: Ceriodaphnia dubia	Brine: Not Applicable
Duration: 48h	Source: In-House Culture	Age:
Sample ID: 03-3931-1541	Code: 14397BB5	Client: Town of Danville
Sample Date: 31 Oct-17	Material: POTW Effluent	Project: Special Studies
Receive Date: 01 Nov-17	Source: WER	<i>Nominal</i>
Sample Age: 24h	Station: Town of Danville	

Sample Note: 2nd WER - Effluent NOMINAL

Spearman-Kärber Estimates

Threshold Option	Threshold	Trim	Mu	Sigma	LC50	95% LCL	95% UCL
Control Threshold	0	0.00%	2.366	0.01652	232.2	215.2	250.6

Test Acceptability Criteria

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

48h Survival Rate Summary

Calculated Variate(A/B)

C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Dilution Water	4	1	1	1	0	0	0.0%	0.0%	20	20
84		4	1	1	1	0	0	0.0%	0.0%	20	20
120.1		4	1	1	1	0	0	0.0%	0.0%	20	20
171.5		4	1	1	1	0	0	0.0%	0.0%	20	20
245		4	0.35	0.2	0.6	0.09574	0.1915	54.71%	65.0%	7	20
350		4	0	0	0	0	0		100.0%	0	20
500		4	0	0	0	0	0		100.0%	0	20

48h Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1	1	1	1
84		1	1	1	1
120.1		1	1	1	1
171.5		1	1	1	1
245		0.6	0.4	0.2	0.2
350		0	0	0	0
500		0	0	0	0

48h Survival Rate Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	5/5	5/5	5/5	5/5
84		5/5	5/5	5/5	5/5
120.1		5/5	5/5	5/5	5/5
171.5		5/5	5/5	5/5	5/5
245		3/5	2/5	1/5	1/5
350		0/5	0/5	0/5	0/5
500		0/5	0/5	0/5	0/5

CETIS Analytical Report

Report Date: 11 Dec-17 08:10 (p 2 of 2)
Test Code: 19060 cd nomina | 02-3210-9532

Ceriodaphnia 48-h Acute Survival Test

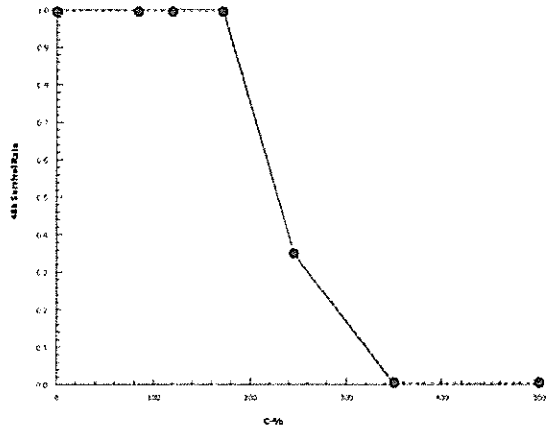
Ramboll Environ

Analysis ID: 05-4084-6399
Analyzed: 11 Dec-17 8:05

Endpoint: 48h Survival Rate
Analysis: Untrimmed Spearman-Kärber

CETIS Version: CETISv1.8.4
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 11 Dec-17 08:14 (p 1 of 2)
 Test Code: 19060 Measured | 18-8013-7474

Ceriodaphnia 48-h Acute Survival Test

Ramboll Environ

Analysis ID: 05-0073-4733	Endpoint: 48h Survival Rate	CETIS Version: CETISv1.8.4
Analyzed: 11 Dec-17 8:13	Analysis: Untrimmed Spearman-Kärber	Official Results: Yes
Batch ID: 01-5067-8853	Test Type: Survival (48h)	Analyst:
Start Date: 01 Nov-17	Protocol: EPA/821/R-02-012 (2002)	Diluent: Very Hard Synthetic Water
Ending Date: 03 Nov-17	Species: Ceriodaphnia dubia	Brine: Not Applicable
Duration: 48h	Source: In-House Culture	Age:
Sample ID: 03-3931-1541	Code: 14397BB5	Client: Town of Danville
Sample Date: 31 Oct-17	Material: POTW Effluent	Project: Special Studies
Receive Date: 01 Nov-17	Source: WER	
Sample Age: 24h	Station: Town of Danville	

Measured

Sample Note: 2nd WER - Effluent MEASURED

Spearman-Kärber Estimates

Threshold Option	Threshold	Trim	Mu	Sigma	LC50	95% LCL	95% UCL
Control Threshold	0	0.00%	2.485	0.01131	305.2	289.7	321.5

Test Acceptability Criteria

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

48h Survival Rate Summary

Calculated Variate(A/B)

C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
93.9	Dilution Water	4	1	1	1	0	0	0.0%	0.0%	20	20
165		4	1	1	1	0	0	0.0%	0.0%	20	20
198.5		4	1	1	1	0	0	0.0%	0.0%	20	20
246		3	1	1	1	0	0	0.0%	0.0%	15	15
325		4	0.3	0	0.6	0.1291	0.2582	86.07%	70.0%	6	20
409		4	0	0	0	0	0		100.0%	0	20
549		4	0	0	0	0	0		100.0%	0	20

48h Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
93.9	Dilution Water	1	1	1	1
165		1	1	1	1
198.5		1	1	1	1
246		1	1	1	
325		0.6	0.4	0.2	0
409		0	0	0	0
549		0	0	0	0

48h Survival Rate Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
93.9	Dilution Water	5/5	5/5	5/5	5/5
165		5/5	5/5	5/5	5/5
198.5		5/5	5/5	5/5	5/5
246		5/5	5/5	5/5	
325		3/5	2/5	1/5	0/5
409		0/5	0/5	0/5	0/5
549		0/5	0/5	0/5	0/5

CETIS Analytical Report

Report Date: 11 Dec-17 08:14 (p 2 of 2)
Test Code: 19060 Measured | 18-8013-7474

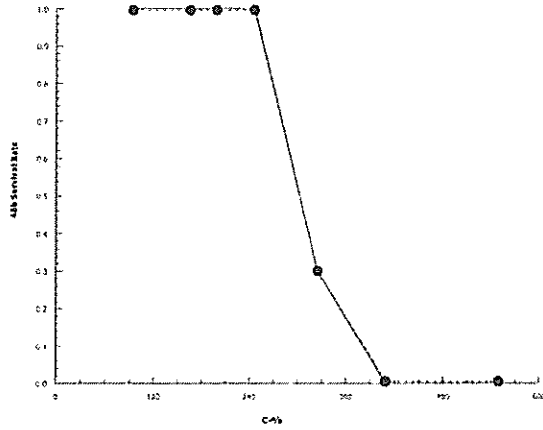
Ceriodaphnia 48-h Acute Survival Test

Ramboll Environ

Analysis ID: 05-0073-4733 Endpoint: 48h Survival Rate
Analyzed: 11 Dec-17 8:13 Analysis: Untrimmed Spearman-Kärber

CETIS Version: CETISv1.8.4
Official Results: Yes

Graphics



Client Sample Results

Client: Ramboll Environ US Corporation
Project/Site: Danville

TestAmerica Job ID: 490-142758-1

Client Sample ID: T0 Outfall 001

Lab Sample ID: 490-142758-1

Date Collected: 12/12/17 11:00

Matrix: Water

Date Received: 12/12/17 12:45

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.0993		0.00200		mg/L		12/14/17 15:08	12/15/17 12:25	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids	3.25		1.02		mg/L			12/16/17 21:50	1

Client Sample Results

Client: Ramboll Environ US Corporation
Project/Site: Danville

TestAmerica Job ID: 490-139873-1

Client Sample ID: Outfall To (sample is unfiltered for DOC)

Lab Sample ID: 490-139873-1

Date Collected: 11/01/17 10:00

Matrix: Water

Date Received: 11/01/17 13:30

General Chemistry - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dissolved Organic Carbon	14.0		1.00		mg/L			11/08/17 01:52	1

Client Sample ID: Outfall 84.0 T0

Lab Sample ID: 490-139873-2

Date Collected: 11/01/17 10:00

Matrix: Water

Date Received: 11/01/17 13:30

Method: 200.8 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.158		0.00200		mg/L		11/02/17 09:50	11/03/17 15:26	1

Client Sample ID: Outfall 120.1 T0

Lab Sample ID: 490-139873-3

Date Collected: 11/01/17 10:00

Matrix: Water

Date Received: 11/01/17 13:30

Method: 200.8 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.193		0.00200		mg/L		11/02/17 09:50	11/03/17 15:29	1

Client Sample ID: Outfall 171.5 T0

Lab Sample ID: 490-139873-4

Date Collected: 11/01/17 00:01

Matrix: Water

Date Received: 11/01/17 13:30

Method: 200.8 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.238		0.00200		mg/L		11/02/17 09:50	11/03/17 15:32	1

Client Sample ID: Outfall 245 T0

Lab Sample ID: 490-139873-5

Date Collected: 11/01/17 00:01

Matrix: Water

Date Received: 11/01/17 13:30

Method: 200.8 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.301		0.00200		mg/L		11/02/17 09:50	11/03/17 15:35	1

Client Sample ID: Outfall 350 T0

Lab Sample ID: 490-139873-6

Date Collected: 11/01/17 00:01

Matrix: Water

Date Received: 11/01/17 13:30

Method: 200.8 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.393		0.00200		mg/L		11/02/17 09:50	11/03/17 15:47	1

Client Sample ID: Outfall 500 T0

Lab Sample ID: 490-139873-7

Date Collected: 11/01/17 00:01

Matrix: Water

Date Received: 11/01/17 13:30

Method: 200.8 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.554		0.00200		mg/L		11/02/17 09:50	11/03/17 15:50	1

TestAmerica Nashville

Client Sample Results

Client: Ramboll Environ US Corporation
Project/Site: Danville

TestAmerica Job ID: 490-140081-1

Client Sample ID: Outfall T48

Date Collected: 11/03/17 00:01
Date Received: 11/03/17 09:50

Lab Sample ID: 490-140081-1

Matrix: Water

Method: 200.8 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.0939		0.00200		mg/L		11/08/17 09:44	11/09/17 12:01	1

Client Sample ID: Outfall 84.0 T48

Date Collected: 11/03/17 00:01
Date Received: 11/03/17 09:50

Lab Sample ID: 490-140081-2

Matrix: Water

Method: 200.8 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.172		0.00200		mg/L		11/08/17 09:44	11/09/17 12:04	1

Client Sample ID: Outfall 120.1 T48

Date Collected: 11/03/17 00:01
Date Received: 11/03/17 09:50

Lab Sample ID: 490-140081-3

Matrix: Water

Method: 200.8 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.204		0.00200		mg/L		11/08/17 09:44	11/09/17 12:07	1

Client Sample ID: Outfall 171.5 T48

Date Collected: 11/03/17 00:01
Date Received: 11/03/17 09:50

Lab Sample ID: 490-140081-4

Matrix: Water

Method: 200.8 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.254		0.00200		mg/L		11/08/17 09:44	11/09/17 12:10	1

Client Sample ID: Outfall 245 T48

Date Collected: 11/03/17 00:01
Date Received: 11/03/17 09:50

Lab Sample ID: 490-140081-5

Matrix: Water

Method: 200.8 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.349		0.00200		mg/L		11/08/17 09:44	11/09/17 12:13	1

Client Sample ID: Outfall 350 T48

Date Collected: 11/03/17 00:01
Date Received: 11/03/17 09:50

Lab Sample ID: 490-140081-6

Matrix: Water

Method: 200.8 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.425		0.00200		mg/L		11/08/17 09:44	11/09/17 12:16	1

Client Sample ID: Outfall 500 T48

Date Collected: 11/03/17 00:01
Date Received: 11/03/17 09:50

Lab Sample ID: 490-140081-7

Matrix: Water

Method: 200.8 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.544		0.00200		mg/L		11/08/17 09:44	11/09/17 12:19	1

TestAmerica Nashville

Lab Water Event 1 Documents

48-HR ACUTE TOXICITY TEST DATA SHEET
EPA-821-R-02-012 Method 2002.0

LOG: <u>19D6C-L</u>	TEST TYPE: <u>Static, Daily Renewal</u>	TEST VESSEL CAPACITY: <u>30 mL</u>	
JOB NO: <u> </u>	TEST ORGANISM: <u>Ceriodaphnia dubia</u>	TEST SOLUTION VOLUME: <u>15 - 20 mL</u>	
CLIENT: <u>Town of Danville</u>	ORGANISM AGE (date): <u>10/31-11/11/17 (35-43)</u>	NO. ORGANISMS/VESSEL: <u>5</u>	
EFFLUENT: <u>Very Hard</u>	ORGANISM SOURCE: <u>11944-50</u>	NO. REPLICATES: <u>4</u>	
SAMPLE "B" NOS.: <u> </u>	PHOTOPERIOD: <u>16 hrs light/8 hrs dark</u>	DILUTION WATER: <u>Type: Hard No. 6640</u>	
SAMPLE DATE: <u> </u>	START DATE/TIME: <u>11/11/17 1142</u>	DILUTIONS MADE BY: <u>LM</u>	
ORGANISM SOURCE TEMP: <u>24.1</u>	END DATE/TIME: <u>11/13/17 1034</u>	FED @ LEAST 2 HR. PRIOR TO TEST: <u>Time: Intis: LM</u>	
FOOD BATCH: <u>6628.56</u>	RANDOMIZED BY: <u>LM</u>	48 hr. LC50 = <u>14.3 - N=mg/L</u>	95% CI = <u>12.8 - 20.5 mg/L</u>

Conc (ppb)	Vessel ID	Survival (#)				DO (mg/L)			pH (s.u.)			Temperature (°C)			Conductivity (umhos/cm)		
		0	24	48	DEAD	0	24	48	0	24	48	0	24	48	0	24	48
Very Hard	A	5	5	5	0	8.6			8.06			24.0			566		
	B	5	5	5	0	8.3	8.5		8.18	8.17		24.9	25.1		603	649	
	C	5	5	5	0												
	D	5	5	5	0												
5	A	5	5	5	0	8.7			8.17			24.0			583		
	B	5	5	5	0	8.4	8.2		8.20	8.20		25.0	25.3		650	707	
	C	5	5	5	0												
	D	5	5	5	0												
7.2	A	5	5	5	0	8.7			8.07			24.1			634		
	B	5	5	5	0	8.4	8.2		8.20	8.21		25.1	24.9		666	711	
	C	5	5	5	0												
	D	5	5	5	0												
10.3	A	5	3	3	2	8.6			8.06			24.1			636		
	B	5	5	5	0	8.6	8.2		8.20	8.22		25.0	25.3		670	718	
	C	5	5	5	0												
	D	5	5	5	0												

Params: <u>LM LM LM</u>	Control Primary: <u>100% Effluent</u>	Comments: <u>MH made: 10/11/17</u>
Initials: <u>LM LM LM</u>	Hardness (mg/L): <u>244</u>	<u>1st use: 10/17/17</u>
Time: <u>1143 1112 1051</u>	Alkalinity (mg/L): <u>61</u>	<u>Light Level (fc): 75.4</u>
Date: <u>11/11 11/13 11/13</u>	TRC (mg/L): <u><0.02</u>	
	Ammonia (mg/L): <u> </u>	

48-HR ACUTE TOXICITY TEST DATA SHEET
EPA-821-R-02-012 Method 2002.0

LOG: 19060-L	TEST TYPE: Static, Daily Renewal	TEST VESSEL CAPACITY: 30 mL	
JOB NO: _____	TEST ORGANISM: <i>Ceriodaphnia dubia</i>	TEST SOLUTION VOLUME: 15 - 20 mL	
CLIENT: Town of Danville	SAMPLE B #: _____	NO. ORGANISMS/VESSEL: 5	
EFFLUENT: Very Hard	TEST START DATE: 11/1/7	NO. REPLICATES: 4	

Conc (ppb)	Vessel ID	Survival (#)				DO (mg/L)			pH (s.u.)			Temperature (°C)			Conductivity (umhos/cm)		
		0	24	48	DEAD	0	24	48	0	24	48	0	24	48	0	24	48
14.7	A	5	5	5	0	8.6			8.06			21.3			627		
	B	5	5	3	2		8.4	8		8.08	8.02		25.1	25.1	603	707	
	C	5	4	3	2												
	D	5	4	0	5												
21	A	5	0	0	5	8.6			8.06			24.4			636		
	B	5	0	0	5		8.2	8.1		8.00	8.00		25.6	25.6	604	714	
	C	5	0	0	5												
	D	5	1	0	5												
30	A	5	0	0	5	8.6			8.06			24.3			627		
	B	5	0	0	5		8.2	8.1		8.20	8.23		25.4	25.4	659	705	
	C	5	0	0	5												
	D	5	0	0	5												

Comments:

CETIS Analytical Report

Report Date: 08 Dec-17 15:53 (p 1 of 2)
 Test Code: 19060-L nominal | 09-5517-5535

Ceriodaphnia 48-h Acute Survival Test

Ramboll Environ

Analysis ID: 05-6888-4114	Endpoint: 48h Survival Rate	CETIS Version: CETISv1.8.4
Analyzed: 08 Dec-17 15:52	Analysis: Linear Regression (MLE)	Official Results: Yes
Batch ID: 01-5067-8853	Test Type: Survival (48h)	Analyst:
Start Date: 01 Nov-17	Protocol: EPA/821/R-02-012 (2002)	Diluent: Very Hard Synthetic Water
Ending Date: 03 Nov-17	Species: Ceriodaphnia dubia	Brine: Not Applicable
Duration: 48h	Source: In-House Culture	Age:
Sample ID: 18-5175-5370	Code: 6E5F8B6A	Client: Town of Danville
Sample Date: 01 Nov-17	Material: Copper sulfate	Project: Special Studies
Receive Date: 01 Nov-17	Source: WER	
Sample Age: NA	Station: Town of Danville	

Sample Note: 2nd WER Very Hard Water - NOMINAL

Linear Regression Options

Model Function	Threshold Option	Threshold	Optimized	Pooled	Het Corr	Weighted
Log-Normal [NED=A+B*log(X)]	Zero Threshold	0	No	No	No	Yes

Regression Summary

Iters	LL	AICc	BIC	Mu	Sigma	Adj R2	F Stat	Critical	P-Value	Decision(α:5%)
10	-21.64	47.84	49.63	1.155	0.09164	0.7705	1.627	2.928	0.2107	Non-Significant Lack of Fit

Point Estimates

Level	µg/L	95% LCL	95% UCL
LC50	14.3	12.98	15.76

Test Acceptability Criteria

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

Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision(α:5%)
Slope	10.91	2.131	6.736	15.09	5.122	<0.0001	Significant Parameter
Intercept	-12.61	2.471	-17.45	-7.765	-5.103	<0.0001	Significant Parameter

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Model	82.16195	82.16195	1	78.23	<0.0001	Significant
Lack of Fit	6.136899	1.534225	4	1.627	0.2107	Non-Significant
Pure Error	16.9697	0.942761	18			
Residual	23.1066	1.0503	22			

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision(α:5%)
Goodness-of-Fit	Pearson Chi-Sq GOF	23.11	33.92	0.3957	Non-Significant Heterogenity
	Likelihood Ratio GOF	23.08	33.92	0.3972	Non-Significant Heterogenity
Variances	Mod Levene Equality of Variance	1.286	2.773	0.3128	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.7803	0.9169	0.0001	Non-normal Distribution
	Anderson-Darling A2 Normality	2.574	2.492	<0.0001	Non-normal Distribution

48h Survival Rate Summary

C-µg/L	Control Type	Count	Mean	Min	Max	Calculated Variate(A/B)					
						Std Err	Std Dev	CV%	%Effect	A	B
5		4	1	1	1	0	0	0.0%	0.0%	20	20
7.2		4	1	1	1	0	0	0.0%	0.0%	20	20
10.3		4	0.9	0.6	1	0.1	0.2	22.22%	10.0%	18	20
14.7		4	0.55	0	1	0.2062	0.4123	74.97%	45.0%	11	20
21		4	0	0	0	0	0		100.0%	0	20
30		4	0	0	0	0	0		100.0%	0	20

CETIS Analytical Report

Report Date: 08 Dec-17 15:53 (p 2 of 2)

Test Code: 19060-L nominal | 09-5517-5535

Ceriodaphnia 48-h Acute Survival Test

Ramboll Environ

Analysis ID: 05-6888-4114

Endpoint: 48h Survival Rate

CETIS Version: CETISv1.8.4

Analyzed: 08 Dec-17 15:52

Analysis: Linear Regression (MLE)

Official Results: Yes

48h Survival Rate Detail

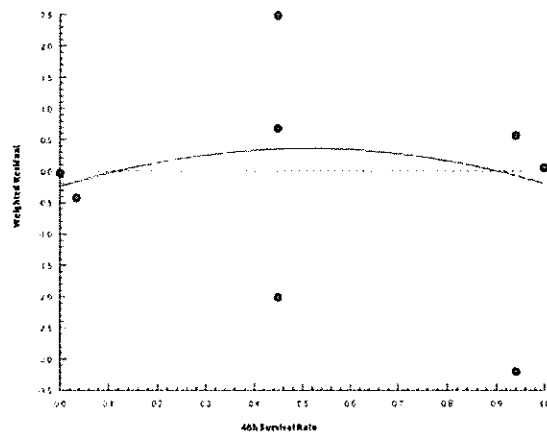
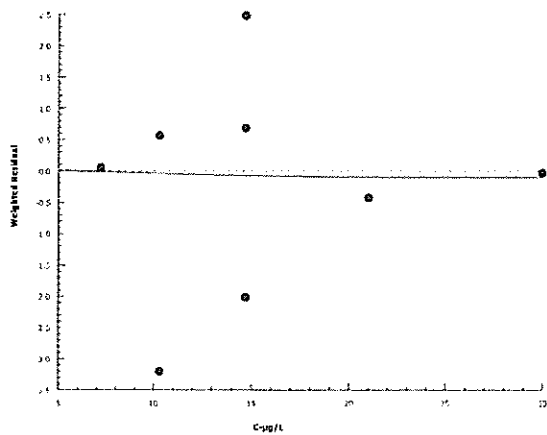
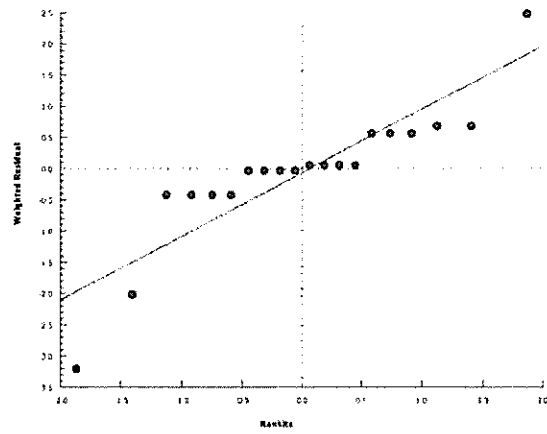
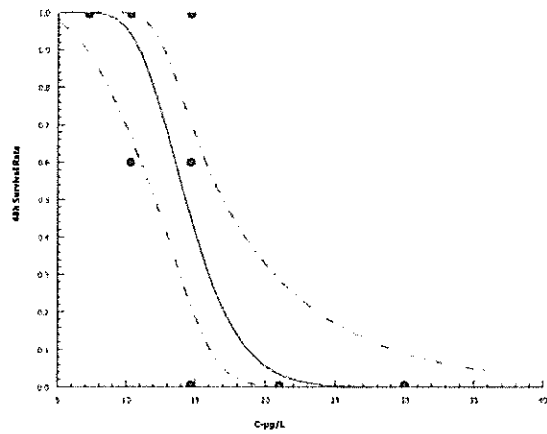
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
5		1	1	1	1
7.2		1	1	1	1
10.3		0.6	1	1	1
14.7		1	0.6	0.6	0
21		0	0	0	0
30		0	0	0	0

48h Survival Rate Binomials

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
5		5/5	5/5	5/5	5/5
7.2		5/5	5/5	5/5	5/5
10.3		3/5	5/5	5/5	5/5
14.7		5/5	3/5	3/5	0/5
21		0/5	0/5	0/5	0/5
30		0/5	0/5	0/5	0/5

Graphics

Log-Normal [NED=A+B*log(X)]



CETIS Analytical Report

Report Date: 08 Dec-17 14:38 (p 1 of 2)

Test Code: 19060-L Measere | 15-0798-1689

Ceriodaphnia 48-h Acute Survival Test

Ramboll Environ

Analysis ID: 06-7369-8431	Endpoint: 48h Survival Rate	CETIS Version: CETISv1.8.4
Analyzed: 08 Dec-17 14:38	Analysis: Linear Regression (MLE)	Official Results: Yes
Batch ID: 00-2044-9023	Test Type: Survival (48h)	Analyst:
Start Date: 01 Nov-17	Protocol: EPA/821/R-02-012 (2002)	Diluent: Mod-Hard Synthetic Water
Ending Date: 03 Nov-17	Species: Ceriodaphnia dubia	Brine: Not Applicable
Duration: 48h	Source: In-House Culture	Age:
Sample ID: 18-5175-5370	Code: 6E5F8B6A	Client: Town of Danville
Sample Date: 01 Nov-17	Material: Copper sulfate	Project: Special Studies
Receive Date: 01 Nov-17	Source: WER	
Sample Age: NA	Station: Town of Danville	

Sample Note: 2nd WER Very Hard Water - MEASURED T0 and T48 averaged

Linear Regression Options

Model Function	Threshold Option	Threshold	Optimized	Pooled	Het Corr	Weighted
Log-Normal [NED=A+B*log(X)]	Zero Threshold	0	No	No	No	Yes

Regression Summary

Iters	LL	AICc	BIC	Mu	Sigma	Adj R2	F Stat	Critical	P-Value	Decision(α:5%)
10	-21.55	47.68	49.46	1.106	0.09176	0.7722	1.582	2.928	0.2220	Non-Significant Lack of Fit

Point Estimates

Level	µg/L	95% LCL	95% UCL
LC50	12.78	11.61	14.1

Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision(α:5%)
Slope	10.9	2.124	6.735	15.06	5.132	<0.0001	Significant Parameter
Intercept	-12.06	2.352	-16.67	-7.448	-5.127	<0.0001	Significant Parameter

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Model	82.3323	82.3323	1	78.97	<0.0001	Significant
Lack of Fit	5.96655	1.491638	4	1.582	0.2220	Non-Significant
Pure Error	16.9697	0.942761	18			
Residual	22.93625	1.042557	22			

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision(α:5%)
Goodness-of-Fit	Pearson Chi-Sq GOF	22.94	33.92	0.4053	Non-Significant Heterogeneity
	Likelihood Ratio GOF	22.92	33.92	0.4065	Non-Significant Heterogeneity
Variances	Mod Levene Equality of Variance	1.287	2.773	0.3128	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.7748	0.9169	0.0001	Non-normal Distribution
	Anderson-Darling A2 Normality	2.634	2.492	<0.0001	Non-normal Distribution

48h Survival Rate Summary

C-µg/L	Control Type	Count	Mean	Min	Max	Calculated Variate(A/B)					
						Std Err	Std Dev	CV%	%Effect	A	B
4.4		4	1	1	1	0	0	0.0%	0.0%	20	20
6.7		4	1	1	1	0	0	0.0%	0.0%	20	20
9.2		4	0.9	0.6	1	0.1	0.2	22.22%	10.0%	18	20
13.1		4	0.55	0	1	0.2062	0.4123	74.97%	45.0%	11	20
18.9		4	0	0	0	0	0	100.0%	0	0	20
28.9		4	0	0	0	0	0	100.0%	0	0	20

CETIS Analytical Report

Report Date: 08 Dec-17 14:38 (p 2 of 2)
 Test Code: 19060-L Measere | 15-0798-1689

Ceriodaphnia 48-h Acute Survival Test

Ramboll Environ

Analysis ID: 06-7369-8431
 Analyzed: 08 Dec-17 14:38

Endpoint: 48h Survival Rate
 Analysis: Linear Regression (MLE)

CETIS Version: CETISv1.8.4
 Official Results: Yes

48h Survival Rate Detail

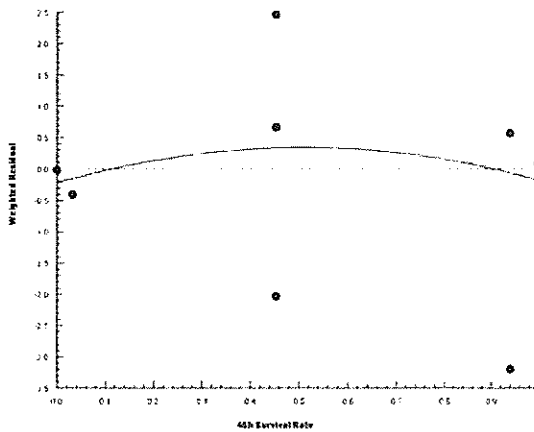
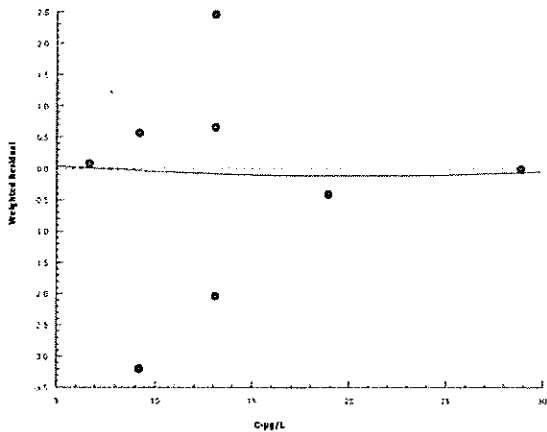
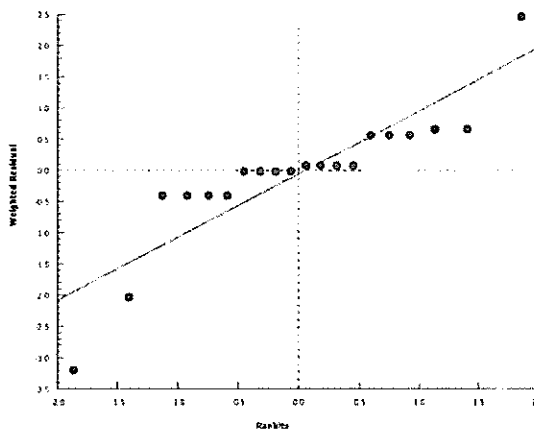
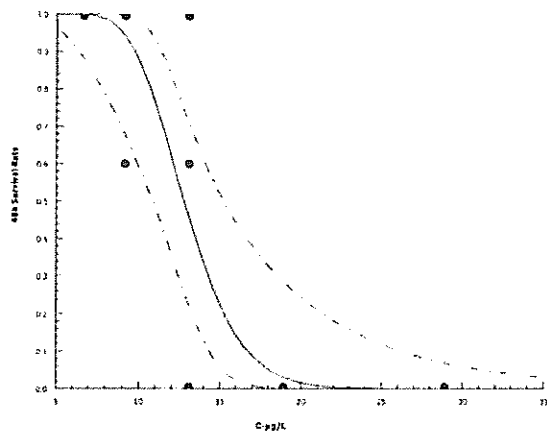
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
4.4		1	1	1	1
6.7		1	1	1	1
9.2		0.6	1	1	1
13.1		1	0.6	0.6	0
18.9		0	0	0	0
28.9		0	0	0	0

48h Survival Rate Binomials

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
4.4		5/5	5/5	5/5	5/5
6.7		5/5	5/5	5/5	5/5
9.2		3/5	5/5	5/5	5/5
13.1		5/5	3/5	3/5	0/5
18.9		0/5	0/5	0/5	0/5
28.9		0/5	0/5	0/5	0/5

Graphics

Log-Normal [NED=A+B*log(X)]



Client Sample Results

Client: Ramboll Environ US Corporation
Project/Site: Danville

TestAmerica Job ID: 490-140454-1

Client Sample ID: V. Hard

Date Collected: 11/08/17 11:00

Date Received: 11/08/17 12:53

Lab Sample ID: 490-140454-1

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	ND		0.00200		mg/L		11/09/17 09:19	11/09/17 18:14	1

Client Sample ID: V. Hard 7.2 T0

Date Collected: 11/08/17 11:00

Date Received: 11/08/17 12:53

Lab Sample ID: 490-140454-2

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.00685		0.00200		mg/L		11/09/17 09:19	11/09/17 18:17	1

Client Sample ID: V. Hard 14.7 T0

Date Collected: 11/08/17 11:00

Date Received: 11/08/17 12:53

Lab Sample ID: 490-140454-3

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.0142		0.00200		mg/L		11/09/17 09:19	11/09/17 18:20	1

Client Sample ID: V. Hard 5 T0

Date Collected: 11/08/17 11:00

Date Received: 11/08/17 12:53

Lab Sample ID: 490-140454-4

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.00459		0.00200		mg/L		11/09/17 09:19	11/09/17 18:23	1

Client Sample ID: V. Hard 21 T0

Date Collected: 11/08/17 11:00

Date Received: 11/08/17 12:53

Lab Sample ID: 490-140454-5

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.0206		0.00200		mg/L		11/09/17 09:19	11/09/17 18:26	1

Client Sample ID: V. Hard 30 T0

Date Collected: 11/08/17 11:00

Date Received: 11/08/17 12:53

Lab Sample ID: 490-140454-6

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.0306		0.00200		mg/L		11/09/17 09:19	11/09/17 18:29	1

Client Sample ID: V. Hard 10.3 T0

Date Collected: 11/08/17 11:00

Date Received: 11/08/17 12:53

Lab Sample ID: 490-140454-7

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.00995		0.00200		mg/L		11/09/17 09:19	11/09/17 18:32	1

TestAmerica Nashville

Client Sample Results

Client: Ramboll Environ US Corporation
Project/Site: Danville

TestAmerica Job ID: 490-140757-1

Client Sample ID: V Hard 48

Date Collected: 11/10/17 00:01
Date Received: 11/13/17 13:30

Lab Sample ID: 490-140757-1

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.00258		0.00200		mg/L		11/14/17 09:29	11/15/17 18:34	1

Client Sample ID: V Hard 5 T48

Date Collected: 11/10/17 00:01
Date Received: 11/13/17 13:30

Lab Sample ID: 490-140757-2

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.00417		0.00200		mg/L		11/14/17 09:29	11/15/17 18:37	1

Client Sample ID: V Hard 7.2 T48

Date Collected: 11/10/17 00:01
Date Received: 11/13/17 13:30

Lab Sample ID: 490-140757-3

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.00656		0.00200		mg/L		11/14/17 09:29	11/15/17 18:40	1

Client Sample ID: V Hard 10.3 T48

Date Collected: 11/10/17 00:01
Date Received: 11/13/17 13:30

Lab Sample ID: 490-140757-4

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.00851		0.00200		mg/L		11/14/17 09:29	11/15/17 18:43	1

Client Sample ID: V Hard14.7 T48

Date Collected: 11/10/17 00:01
Date Received: 11/13/17 13:30

Lab Sample ID: 490-140757-5

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.0120		0.00200		mg/L		11/14/17 09:29	11/15/17 18:46	1

Client Sample ID: V Hard 21 T48

Date Collected: 11/10/17 00:01
Date Received: 11/13/17 13:30

Lab Sample ID: 490-140757-6

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.0171		0.00200		mg/L		11/14/17 09:29	11/15/17 18:49	1

Client Sample ID: V Hard 30 T48

Date Collected: 11/10/17 00:01
Date Received: 11/13/17 13:30

Lab Sample ID: 490-140757-7

Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	0.0270		0.00200		mg/L		11/14/17 09:29	11/15/17 18:52	1

TestAmerica Nashville

Lab Water Event 2 Documents

48-HR ACUTE TOXICITY TEST DATA SHEET
EPA-821-R-02-012 Method 2002.0

LOG: <u>19129</u>	TEST TYPE: <u>Static, Daily Renewal</u>	TEST VESSEL CAPACITY: <u>30 mL</u>
JOB NO: _____	TEST ORGANISM: <u>Ceriodaphnia dubia</u>	TEST SOLUTION VOLUME: <u>15 - 20 mL</u>
CLIENT: <u>Town of Danville</u>	ORGANISM AGE (date): <u>12/11/17 (2 mo)</u>	NO. ORGANISMS/VESSEL: <u>5</u>
EFFLUENT: <u>Very Hard</u>	ORGANISM SOURCE: <u>11000</u>	NO. REPLICATES: <u>4</u>
SAMPLE "B" NOS.: <u>N/A</u>	PHOTOPERIOD: <u>16 hrs light/8 hrs dark</u>	DILUTION WATER: <u>Type: P&H No.: 11095</u>
SAMPLE DATE: <u>N/A</u>	START DATE/TIME: <u>12/11/17 1400</u>	DILUTIONS MADE BY: <u>HM</u>
ORGANISM SOURCE TEMP: <u>24.2</u>	END DATE/TIME: <u>12/11/17 1300</u>	FED @ LEAST 2 HR. PRIOR TO TEST: <u>Time: 11:30 Initials: HM</u>
FOOD BATCH: <u>16100, 16098</u>	RANDOMIZED BY: <u>HM</u>	48 hr. LC50 = <u>13.5</u> Nominal 95% CI = <u>11.8 - 15.3</u> <i>16.3 mg/L</i>

Conc (ppb)	Vessel ID	Survival (#)				DO (mg/L)			pH (s.u.)			Temperature (°C)			Conductivity (umhos/cm)		
		0	24	48	DEAD	0	24	48	0	24	48	0	24	48	0	24	48
Very Hard	A	5	5	5	0	8.4			7.95			24.2			590		
	B	5	5	5	0	8.5	8.4		8.1	8.1		24.0	24.1		587	582	
	C	5	5	5	0												
	D	5	5	5	0												
5	A	5	5	5	0	8.6			7.98			24.4			591		
	B	5	5	5	0	8.2	8.1		8.0	8.1		24.1	24.1		1607	1617	
	C	5	5	5	0												
	D	5	5	5	0												
7.2	A	5	5	5	0	8.5			8.0			24.6			592		
	B	5	5	5	0	8.4	8.3		8.2	8.1		24.2	24.6		1610	1604	
	C	5	5	4	1												
	D	5	5	5	0												
10.3	A	5	4	4	1	8.2			8.0			24.5			593		
	B	5	4	3	2	8.3	8.3		8.0	8.1		24.6	24.2		597	1601	
	C	5	4	3	2												
	D	5	3	4	1												

Params: <u>HM HM HM</u>	Control Primary	100% Effluent	Comments:
Initials: <u>HM HM HM</u>	Hardness (mg/L) <u>265</u>		MH made: <u>12/11/17</u>
Time: <u>11:30 11:30 11:30</u>	Alkalinity (mg/L) <u>45</u>		1st use: <u>12/11/17</u>
Date: <u>12/10 12/11 12/12</u>	TRC (mg/L) <u>10.5</u>		Light Level (fc): <u>99.1</u>
	Ammonia (mg/L) <u>0.1</u>		

48-HR ACUTE TOXICITY TEST DATA SHEET
EPA-821-R-02-012 Method 2002.0

LOG: 19129	TEST TYPE: Static, Daily Renewal	TEST VESSEL CAPACITY: 30 mL
JOB NO: —	TEST ORGANISM: <i>Ceriodaphnia dubia</i>	TEST SOLUTION VOLUME: 15 - 20 mL
CLIENT: Town of Danville	SAMPLE B #: N/A	NO. ORGANISMS/VESSEL: 5
EFFLUENT: Very Hard	TEST START DATE: 12/20/17	NO. REPLICATES: 4

Conc (ppb)	Vessel ID	Survival (#)				DO (mg/L)			pH (s.u.)			Temperature (°C)			Conductivity (umhos/cm)		
		0	24	48	DEAD	0	24	48	0	24	48	0	24	48	0	24	48
14.7	A	5	4	3	2	8.3			8.03			24.0			597		
	B	5	4	2	3		8.2	8.0		8.04	8.10	24.1	24.5		595	1003	
	C	5	4	2	3												
	D	5	3	1	4												
21	A	5	2	1	4	8.7			8.04			24.1			589		
	B	5	3	1	4		8.2	8.1		8.12	8.12	24.8	24.4		1001	1020	
	C	5	3	1	4												
	D	5	3	1	4												
30	A	5	1	0	5	8.3			8.04			24.0			584		
	B	5	1	0	5		8.0	8.0		8.14	8.20	24.1	24.3		1001	596	
	C	5	2	0	5												
	D	5	2	0	5												
Comments:																	

CETIS Analytical Report

Report Date: 11 Jan-18 15:58 (p 1 of 2)
 Test Code: 19129 | 00-4314-0637

Ceriodaphnia 48-h Acute Survival Test				Ramboll
Analysis ID: 13-6365-1635	Endpoint: 48h Survival Rate	CETIS Version: CETISv1.8.4		
Analyzed: 11 Jan-18 15:57	Analysis: Untrimmed Spearman-Kärber	Official Results: Yes		
Batch ID: 18-4760-2997	Test Type: Survival (48h)	Analyst:		
Start Date: 20 Dec-17	Protocol: EPA/821/R-02-012 (2002)	Diluent: Very Hard Synthetic Water		
Ending Date: 22 Dec-17	Species: Ceriodaphnia dubia	Brine: Not Applicable		
Duration: 48h	Source: In-House Culture	Age:		
Sample ID: 09-5358-7798	Code: 38D69856	Client: Town of Danville		
Sample Date: 20 Dec-17	Material: Copper sulfate	Project: Special Studies		
Receive Date: 20 Dec-17	Source: WER	<i>nominal</i>		
Sample Age: NA	Station: Town of Danville			

Spearman-Kärber Estimates

Threshold Option	Threshold	Trim	Mu	Sigma	LC50	95% LCL	95% UCL
Control Threshold	0	0.00%	1.129	0.0281	13.45	11.81	15.3

Test Acceptability Criteria

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

48h Survival Rate Summary

C-µg/L	Control Type	Count	Mean	Min	Max	Calculated Variate(A/B)					
						Std Err	Std Dev	CV%	%Effect	A	B
0	Lab Water	4	1	1	1	0	0	0.0%	0.0%	20	20
5		4	1	1	1	0	0	0.0%	0.0%	20	20
7.2		4	0.95	0.8	1	0.05	0.1	10.53%	5.0%	19	20
10.3		4	0.7	0.6	0.8	0.05774	0.1155	16.5%	30.0%	14	20
14.7		4	0.4	0.2	0.6	0.08165	0.1633	40.82%	60.0%	8	20
21		4	0.2	0.2	0.2	0	0	0.0%	80.0%	4	20
30		4	0	0	0	0	0		100.0%	0	20

48h Survival Rate Detail

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Lab Water	1	1	1	1
5		1	1	1	1
7.2		1	1	0.8	1
10.3		0.8	0.6	0.6	0.8
14.7		0.6	0.4	0.4	0.2
21		0.2	0.2	0.2	0.2
30		0	0	0	0

48h Survival Rate Binomials

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Lab Water	5/5	5/5	5/5	5/5
5		5/5	5/5	5/5	5/5
7.2		5/5	5/5	4/5	5/5
10.3		4/5	3/5	3/5	4/5
14.7		3/5	2/5	2/5	1/5
21		1/5	1/5	1/5	1/5
30		0/5	0/5	0/5	0/5

CETIS Analytical Report

Report Date: 11 Jan-18 15:58 (p 2 of 2)
Test Code: 19129 | 00-4314-0637

Ceriodaphnia 48-h Acute Survival Test

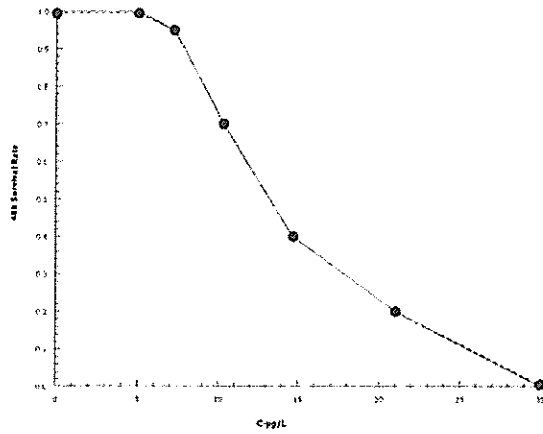
Ramboll

Analysis ID: 13-6365-1635
Analyzed: 11 Jan-18 15:57

Endpoint: 48h Survival Rate
Analysis: Untrimmed Spearman-Kärber

CETIS Version: CETISv1.8.4
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 11 Jan-18 16:10 (p 1 of 2)
 Test Code: 19129-measured | 20-1464-5885

Ceriodaphnia 48-h Acute Survival Test

Ramboll

Analysis ID: 12-0002-7024	Endpoint: 48h Survival Rate	CETIS Version: CETISv1.8.4
Analyzed: 11 Jan-18 16:10	Analysis: Untrimmed Spearman-Kärber	Official Results: Yes
Batch ID: 14-7331-6548	Test Type: Survival (48h)	Analyst:
Start Date: 21 Dec-17	Protocol: EPA/821/R-02-012 (2002)	Diluent: Mod-Hard Synthetic Water
Ending Date: 23 Dec-17	Species: Ceriodaphnia dubia	Brine: Not Applicable
Duration: 48h	Source: In-House Culture	Age:
Sample ID: 09-5358-7798	Code: 38D69856	Client: Town of Danville
Sample Date: 20 Dec-17	Material: Copper sulfate	Project: Special Studies
Receive Date: 20 Dec-17	Source: WER	
Sample Age: 24h	Station: Town of Danville	

Sample Note: measured

Spearman-Kärber Estimates

Threshold Option	Threshold	Trim	Mu	Sigma	LC50	95% LCL	95% UCL
Control Threshold	0	0.00%	1.023	0.02786	10.55	9.275	11.99

Test Acceptability Criteria

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

48h Survival Rate Summary

Calculated Variate(A/B)

C-µg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
2	Lab Water	4	1	1	1	0	0	0.0%	0.0%	20	20
3.5		4	1	1	1	0	0	0.0%	0.0%	20	20
5		4	0.95	0.8	1	0.05	0.1	10.53%	5.0%	19	20
9.7		4	0.7	0.6	0.8	0.05774	0.1155	16.5%	30.0%	14	20
10.8		4	0.4	0.2	0.6	0.08165	0.1633	40.82%	60.0%	8	20
15.1		4	0.2	0.2	0.2	0	0	0.0%	80.0%	4	20
24.6		4	0	0	0	0	0		100.0%	0	20

48h Survival Rate Detail

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
2	Lab Water	1	1	1	1
3.5		1	1	1	1
5		1	1	0.8	1
9.7		0.8	0.6	0.6	0.8
10.8		0.6	0.4	0.4	0.2
15.1		0.2	0.2	0.2	0.2
24.6		0	0	0	0

48h Survival Rate Binomials

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
2	Lab Water	5/5	5/5	5/5	5/5
3.5		5/5	5/5	5/5	5/5
5		5/5	5/5	4/5	5/5
9.7		4/5	3/5	3/5	4/5
10.8		3/5	2/5	2/5	1/5
15.1		1/5	1/5	1/5	1/5
24.6		0/5	0/5	0/5	0/5

CETIS Analytical Report

Report Date: 11 Jan-18 16:10 (p 2 of 2)
Test Code: 19129-measured | 20-1464-5885

Ceriodaphnia 48-h Acute Survival Test

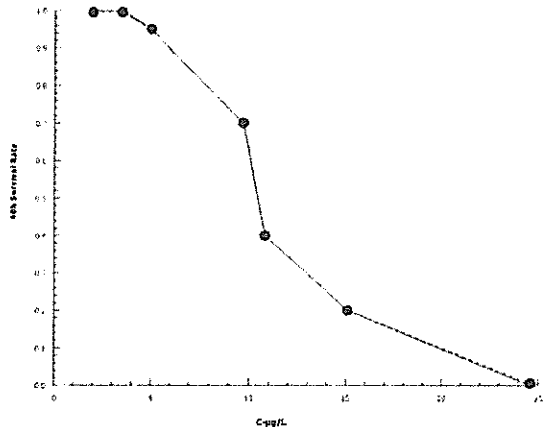
Ramboll

Analysis ID: 12-0002-7024
Analyzed: 11 Jan-18 16:10

Endpoint: 48h Survival Rate
Analysis: Untrimmed Spearman-Kärber

CETIS Version: CETISv1.8.4
Official Results: Yes

Graphics



Client Sample Results

Client: Ramboll Environ US Corporation
Project/Site: Danville

TestAmerica Job ID: 490-143469-1

Client Sample ID: V.Hard 5ppb T0

Date Collected: 12/20/17 09:00
Date Received: 12/20/17 14:35

Lab Sample ID: 490-143469-1

Matrix: Water

Method: 200.8 - Metals (ICP/MS)										
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac	
Copper	0.00317		0.00200		mg/L		12/22/17 12:40	12/26/17 16:44	1	

Client Sample ID: V.Hard 7.2ppb T0

Date Collected: 12/20/17 09:00
Date Received: 12/20/17 14:35

Lab Sample ID: 490-143469-2

Matrix: Water

Method: 200.8 - Metals (ICP/MS)										
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac	
Copper	0.00463		0.00200		mg/L		12/22/17 12:40	12/26/17 16:47	1	

Client Sample ID: V.Hard 10.3ppb T0

Date Collected: 12/20/17 09:00
Date Received: 12/20/17 14:35

Lab Sample ID: 490-143469-3

Matrix: Water

Method: 200.8 - Metals (ICP/MS)										
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac	
Copper	0.0102		0.00200		mg/L		12/22/17 12:40	12/26/17 16:50	1	

Client Sample ID: V.Hard 14.7ppb T0

Date Collected: 12/20/17 09:00
Date Received: 12/20/17 14:35

Lab Sample ID: 490-143469-4

Matrix: Water

Method: 200.8 - Metals (ICP/MS)										
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac	
Copper	0.00986		0.00200		mg/L		12/22/17 12:40	12/26/17 16:59	1	

Client Sample ID: V.Hard 21ppb T0

Date Collected: 12/20/17 09:00
Date Received: 12/20/17 14:35

Lab Sample ID: 490-143469-5

Matrix: Water

Method: 200.8 - Metals (ICP/MS)										
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac	
Copper	0.0145		0.00200		mg/L		12/22/17 12:40	12/26/17 17:02	1	

Client Sample ID: V.Hard 30ppb T0

Date Collected: 12/20/17 09:00
Date Received: 12/20/17 14:35

Lab Sample ID: 490-143469-6

Matrix: Water

Method: 200.8 - Metals (ICP/MS)										
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac	
Copper	0.0242		0.00200		mg/L		12/22/17 12:40	12/26/17 17:05	1	

TestAmerica Nashville

Client Sample Results

Client: Ramboll Environ US Corporation
Project/Site: Danville

TestAmerica Job ID: 490-143823-1

Client Sample ID: V.Hard 5ppb T48

Lab Sample ID: 490-143823-1

Date Collected: 12/22/17 09:00

Matrix: Water

Date Received: 12/27/17 14:00

Method: 200.8 - Metals (ICP/MS)										
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac	
Copper	0.00384		0.00200		mg/L	-	12/28/17 13:10	12/29/17 11:14	1	

Client Sample ID: V.Hard 7.2ppb T48

Lab Sample ID: 490-143823-2

Date Collected: 12/22/17 09:00

Matrix: Water

Date Received: 12/27/17 14:00

Method: 200.8 - Metals (ICP/MS)										
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac	
Copper	0.00544		0.00200		mg/L	-	12/28/17 13:10	12/29/17 11:17	1	

Client Sample ID: V.Hard 10.3ppb T48

Lab Sample ID: 490-143823-3

Date Collected: 12/22/17 09:00

Matrix: Water

Date Received: 12/27/17 14:00

Method: 200.8 - Metals (ICP/MS)										
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac	
Copper	0.00917		0.00200		mg/L	-	12/28/17 13:10	12/29/17 11:20	1	

Client Sample ID: V.Hard 14.7ppb T48

Lab Sample ID: 490-143823-4

Date Collected: 12/22/17 09:00

Matrix: Water

Date Received: 12/27/17 14:00

Method: 200.8 - Metals (ICP/MS)										
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac	
Copper	0.0117		0.00200		mg/L	-	12/28/17 13:10	12/29/17 11:29	1	

Client Sample ID: V.Hard 21ppb T48

Lab Sample ID: 490-143823-5

Date Collected: 12/22/17 09:00

Matrix: Water

Date Received: 12/27/17 14:00

Method: 200.8 - Metals (ICP/MS)										
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac	
Copper	0.0157		0.00200		mg/L	-	12/28/17 13:10	12/29/17 11:32	1	

Client Sample ID: V.Hard 30ppb T48

Lab Sample ID: 490-143823-6

Date Collected: 12/22/17 09:00

Matrix: Water

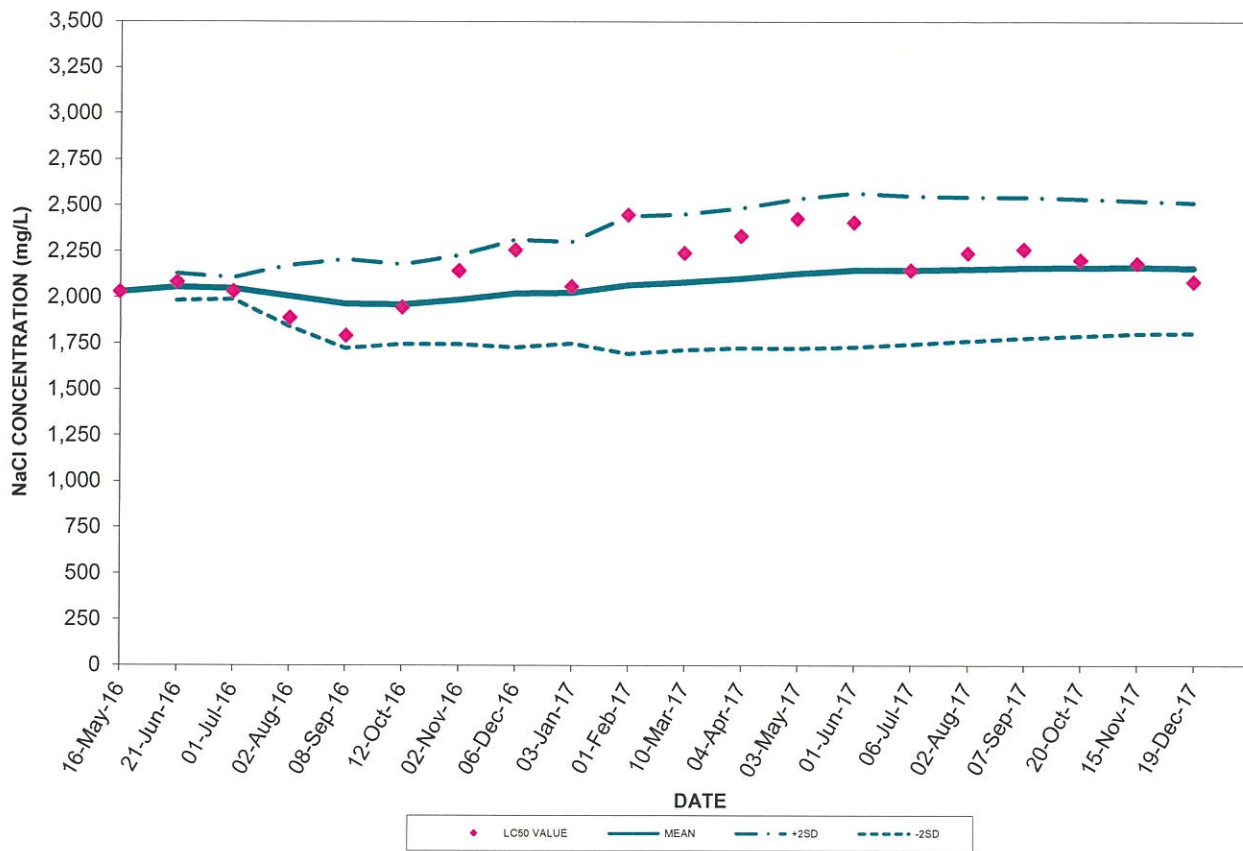
Date Received: 12/27/17 14:00

Method: 200.8 - Metals (ICP/MS)										
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac	
Copper	0.0250		0.00200		mg/L	-	12/28/17 13:10	12/29/17 11:35	1	

TestAmerica Nashville

Control Charts

RAMBOLL ENVIRON ACUTE REFERENCE TOXICANT (NaCl) 2016 - 2017
Ceriodaphnia dubia



Ramboll Environ Ecotox Reference Toxicant Testing

Ceriodaphnia dubia ACUTE REFERENCE TOXICANT TESTING - SODIUM CHLORIDE (NaCl) 2016 - 2017

Test Number	Log Number	Test Initiation Date	Control Survival (%)	48-hr LC50 (mg/L)	95% Confidence Intervals (mg/L)	LC50 Cumulative Mean (mg/L)	LC50 Cumulative St. Dev. (mg/L)	2+ St. Dev. (mg/L)	2- St. Dev. (mg/L)	Coefficient of Variation (%)
1	18228	16-May-16	100	2,030	1,940 - 2,123	2,030				
2	18299	21-Jun-16	100	2,082	1,992 - 2,176	2,056	37	2,130	1,982	0
3	18326	01-Jul-16	100	2,032	1,952 - 2,115	2,048	29	2,107	1,989	1
4	18363	02-Aug-16	100	1,899	1,814 - 1,969	2,008	83	2,174	1,842	4
5	18428	08-Sep-16	95	1,792	1,622 - 1,923	1,965	121	2,206	1,724	5
6	18475	12-Oct-16	100	1,946	1,876 - 2,024	1,962	108	2,178	1,746	5
7	18510	02-Nov-16	100	2,145	2,057 - 2,236	1,988	121	2,229	1,747	6
8	18631	06-Dec-16	100	2,258	2,185 - 2,335	2,022	147	2,315	1,728	7
9	18671	03-Jan-17	100	2,059	1,958 - 2,164	2,026	138	2,302	1,750	6
10	18713	01-Feb-17	100	2,450	2,374 - 2,528	2,068	187	2,442	1,695	9
11	18770	10-Mar-17	100	2,242	2,153 - 2,334	2,084	185	2,454	1,714	8
12	18808	04-Apr-17	100	2,335	2,222 - 2,454	2,105	191	2,486	1,724	9
13	18853	03-May-17	100	2,429	2,320 - 2,543	2,130	203	2,537	1,723	9
14	18895	01-Jun-17	100	2,410	2,310 - 2,510	2,150	209	2,568	1,732	9
15	18936	06-Jul-17	100	2,148	2,050 - 2,251	2,150	202	2,553	1,747	9
16	18977	02-Aug-17	100	2,242	2,133 - 2,356	2,156	196	2,548	1,763	9
17	18919B	07-Sep-17	100	2,262	2,167 - 2,359	2,162	192	2,545	1,779	9
18	19043	20-Oct-17	100	2,204	2,126 - 2,284	2,164	186	2,537	1,792	8
19	19085	15-Nov-17	100	2,186	2,098 - 2,278	2,165	181	2,527	1,803	8
20	191126	19-Dec-17	90	2,087	2,021 - 2,156	2,161	177	2,515	1,807	8

Notes.

Moderately Hard Water was used as the Control Water in each test

LC50 - Concentration of sodium chloride which was lethal to 50 percent of the test organisms.

NC - Not calculable; NA - Not Applicable