City of Idabel, Oklahoma
Water Effects Ratio Study

Revised August 21, 2017

January 27, 2017

GBMc & Associates
Strategic Environmental Services

Water Effects Ratio Study

Prepared for:

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January 27, 2017 - Revised August 21, 2017

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1.0 BACKGROUND/APPROACH

The Idabel Public Works Authority is authorized to discharge treated wastewater under OPDES Permit No. OK0027677 which became effective on November 1, 2012. The permit allows for discharge of treated wastewater from Outfall 001 at the city's wastewater treatment system (Facility I.D. No. S-10202) to Mud Creek in Planning Segment 410200. Among the permit's provisions are limits for the priority pollutants including copper. The numerical limits for copper are as follows:

Table 1. Idabel Public Works Authority OPDES Permit No. OK0027677 permit limits.

Parameter	Concentration Limits	
	Monthly Average (µg/L)	Daily Maximum (µg/L)
Copper, Total Recoverable	3.96	7.94

Permit limits for copper were calculated using the aquatic life criteria of the Oklahoma Water Quality Standards. A water effect ratio of 1.0 was assumed for purposes of the calculations.

Biomonitoring is another required provision of the Idabel OPDES permit. The permit specifies that the 7-day chronic *Pimephales promelas* test and the 7-day chronic *Ceriodaphina dubia* test be completed quarterly. Both lethal and sub-lethal endpoints are reported. The critical (effluent) dilution required in the tests is 100%.

Since the issuance of the current permit, the facility has not consistently achieved concentration limits for copper. However, biomonitoring tests consistently pass required endpoints. In order to address the permit violations, the Idabel Public Works Authority proposed to conduct a Water Effect Ratio (WER) study for copper (total and dissolved) to develop site specific criteria for the receiving stream. A work plan (4/21/15) was reviewed by the Oklahoma Water Resources Board (OWRB). Comments were provided by the OWRB and final work plan (7/15/15) addressing concerns was approved by the agency.

As stated in the workplan, the WER study was conducted using methodology available from the Oklahoma Water Resources Board (OWRB) and the EPA. The OWRB "Guidance Document for the Development of Site-Specific Water Quality Criteria for Metals" (OWRB 2003) provides procedural information for developing site-specific criteria within the State of Oklahoma. The EPA has developed a Streamlined Water-Effect Ratio Procedure for Discharges of Copper (March 2001). These documents were used in conjunction to develop site-specific total recoverable criterion which may be used to revise permit limits based on site-specific information while allowing for adequate protection of aquatic life in the receiving stream.

2.0 WATER EFFECTS RATIO PROCESS

A number of physical and chemical factors in effluent and effluent/receiving stream mixtures affect the toxicity of metals to aquatic life. In most instances, increases in substances such as hardness, total organic carbon, and total suspended solids greatly increase the concentration of metals required to produce a toxic endpoint. Because of this, there are typically differences between the toxicity of metals in laboratory water compared with site water (effluent). The process used to account for the difference in the toxicity of a metal in laboratory water with that of site water is termed a water effect ratio or WER. A WER is performed by conducting side-by-side toxicity tests using laboratory water and site water. The difference between the two is the "water effect." After the determination of a WER, this information should be used to adjust the instream criteria for the metal (copper) in accordance with state water quality standards. In turn, the adjusted criteria will then be used for OPDES permitting purposes associated with the Idabel Public Works Authority.

Guidance for conducting a WER study is presented by EPA in a document titled "Interim Guidance on Determination and Use of Water-Effect Ratios for Metals" (EPA-823-B-94-001, February 1994). For copper WER studies, more recent guidance is presented in "Streamlined Water-Effect Ratio Procedure for Discharges of Copper" (EPA-822-R-01-005, March 2001). This EPA methodology was utilized in conjunction with OWRB guidance presented in "Guidance Document for the Development of Site-Specific Water Quality Criteria for Metals" (OWRB 2003). For this copper WER study the OWRB and streamlined method were principally followed.

The OWRB guidance provides three options for conducting studies for the purpose of site-specific criterion development. Option one is the development of a final Water Effect Ratio (WER) for the basis of amending criteria. Option two is the development of a dissolved translator (f) used to translate the applicable statewide total criteria into a site-specific dissolved criteria through the use of a dissolved to total metal ratio. Option three is a combination of the WER and the dissolved translator. This study includes the combined use of a WER and a dissolved translator (Option 3) to calculate a final criterion translator (T). This Oklahoma defined final WER (fWER) is used to develop site specific total copper criteria.

3.0 SITE DESCRIPTION/DESIGN FLOWS

The Idabel Public Works Authority discharges to Mud Creek (Planning Segment 410200) via Outfall 001, which is located at Latitude 33º 51' 14.621", Longitude 94° 47' 22.200". Mud Creek travels east and north from the from the facility location to discharge into the Little River then to Millwood Lake in western Arkansas. The Outfall 001 discharge location is shown in Figure 1.

The Statement of Basis for the NPDES permit currently in effect was reviewed for discharge and receiving stream design flow characteristics. The effluent flow used as the basis for calculation of permit limits including copper and whole effluent toxicity (WET) was the POTW design flow of 1.65 MGD (2.56 cfs). The background flow rate (7Q2) of Mud Creek used in calculation of the permit limits was the default value 1 cfs (0.6463 MGD). Aquatic life criteria (total) for copper for Mud Creek, based on a mean hardness concentration of 32 mg/L is shown below.

Table 2. Mud Creek aquatic toxicity criteria.

Parameter	Hardness Dependent Aquatic Toxicity Criteria for Mud Creek	
	Acute Criterion (CMC) µg/L	Chronic Criterion (CCC) µg/L
Copper, Total	6.56	4.83

The WET test effective in the NPDES permit requires once per quarter chronic biomonitoring with a critical dilution of 100%. The critical dilution reflects the percent contribution of effluent mixed with receiving water. Therefore, because the chronic water quality criterion was the basis for the effective permit limit for copper and because the critical dilution for the effective chronic toxicity testing uses the same flow basis, the site water mix used for WER testing was 100% effluent with no dilution from upstream receiving water.

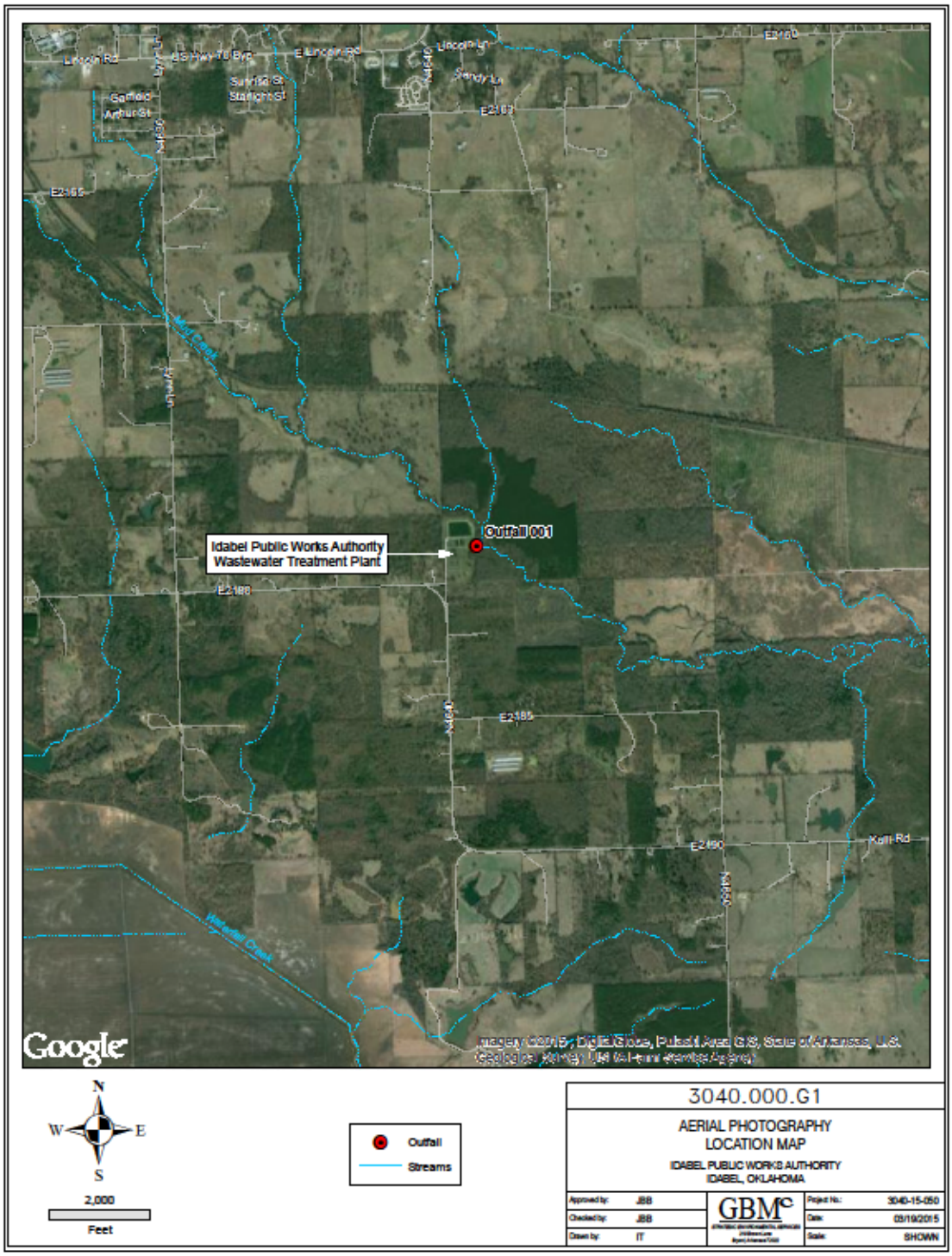

Figure 1. Aerial photography showing the Idabel Public Works Authority WWTP Outfall 001 discharge location in Idabel, OK.

4.0 SAMPLING

GBMc & Associates personnel and staff from the City of Idabel Public Work's Authority collected samples of effluent from the Outfall 001 discharge. Efforts included sampling for the toxicity testing portion of the WER study in addition to the collection of samples for the development of a dissolved translator. An initial range finding test was also conducted for the WER study to determine the appropriate spiking concentrations.

Sampling was conducted according to the project workplan included as Appendix A and according to GBM^c Standard Operating Procedures. During each sampling effort for the WER study, four individual samples of effluent were collected from the Outfall 001 discharge during an approximate six hour time period. This time period was chosen to reflect the sampling conducted for routine DMR sampling. The four samples were composited in the laboratory on a flow-weighted basis. Samples collected for the dissolved translator included eleven grab samples taken on separate days.

To the extent practicable, clean sampling techniques following EPA Method 1669 (modified according to GBM^c SOP), were used for the collection of water samples. All samples were handled using appropriate techniques and chain of custody procedures. Samples collected for WER development were collected greater than one month apart, as required by the Streamlined guidance document. Samples were collected during times of normal facility operation, with CBOD and TSS concentrations within permit limits and when relatively unaffected by rainfall inflow or slug loads. The appendices include DMR analytical data and summary, *in-situ* data at the time of sampling, and a summary of rainfall data preceding each sampling event.

4.1 Field Measurements

In-situ measurements, consisting of temperature, pH, and dissolved oxygen were taken in the effluent each time water samples were collected. Measurements were made with a YSI multi-parameter meter. The meter was calibrated daily in accordance with the GBM^c Quality Assurance Plan (QAP). Effluent flow, as measured by facility monitoring equipment, was recorded at each sample time. Routine DMR sampling was conducted on the same day as sampling efforts for the various WER studies.

4.2 Analytical Methodology

Samples were analyzed in the laboratory according to the procedures outlined in the most current release of Standard Methods for the Examination of Water and Wastewater using specific EPA approved methods. Table 3 summarizes the EPA approved analytical methods used by the laboratory during the study. American Interplex Laboratories, Little Rock, Arkansas completed both the analytical work and the WER toxicity tests. Table 4 provides a summary of analyses conducted during the study.

Table 3. Analytical methods followed during the WER study.

Parameter	Method	Preservative[1]	Holding Time
Total Metal	EPA200.7/200.8	4 ºC, HNO_3	6 Months
Dissolved Metal	EPA200.7/200.8	4 ºC, HNO_3	6 Months
T. Hardness	SM2340B	4 ºC, HNO_3	6 Months
T. Alkalinity	SM 2320B	4 ºC	14 Days
TSS	SM2540D	4 ºC	7 Days
TOC	SM5310C	4 ºC, H_2SO4	28 Days
DOC	SM5310C	4 ºC	28 Days
TDS	SM2540C	4 ºC	7 Days

[1] All chemical preservatives added after sample composite.

Table 4. Analysis conducted in conjunction with the WER toxicity testing.[1]

	Water Sample Source		
Analytical Parameter	**Effluent**	**Moderately hard lab water**	**Selected spiked test dilutions [2, 3]**
Total Metal	X	X	X
Dissolved Metal	X	X	X
Total Hardness	X	X	
Total Alkalinity	X	X	
pH	X	X	X
TSS	X	X	
TOC	X	X	
DOC	X	X	
Specific conductance	X	X	X
TDS	X		
Dissolved oxygen		X	X
Temperature		X	X
Routine DMR parameters	Routine parameters were analyzed by the permittee as part of routine monitoring on the same day as WER study samples are collected. Routine parameters include BOD, TSS, NH3-N, DO, T. Cadmium, T. Chromium, T. Copper, T. Selenium, T. Silver, T. Zinc, pH. The analytical data from this sampling can be found in Appendix B. Chlorides, Sulfates, and TDS are required monthly. However their scheduled analysis did not coincide with the WER sampling efforts therefore no data is available.		

[1] The normal battery of chemistry completed for routine biomonitring tests (pH, temperature, conductivity, dissolved oxygen, etc.) was completed during each WER test.

[2] Test treatments that bracket the LC50 were tested for these parameters. The lowest treatment that exhibited 100% mortality, the highest treatment that exhibited no effect, and the control were also tested for these parameters.

[3] Dilutions were prepared using copper sulfate.

5.0 WER TOXICITY TESTING DESIGN

5.1 Copper

The "Streamlined Water-Effect Ratio Procedure for Discharges of Copper" allows for use of one of two test species for toxicity testing in WER development. For this study, *Cerodaphnia dubia* was chosen as the test organism. *Ceriodaphnia dubia* were exposed to a number of copper treatments under static non-renewal conditions for 48 hours in the site water mixture (100% effluent) and in laboratory control water (moderately hard reconstituted). Concentrations of copper for the testing were based on a dilution series of 0.65. Details of the testing procedure can be found in Table 5. A summary of the methodology is presented below.

Ceriodaphnids were exposed to various spiked copper concentrations in lab water tests and site water tests using cupric sulfate 5-hydrate as the spiking agent. Test organisms were exposed to the copper treatments in 30 mL disposable beakers containing 15 mLs of test solution. A summary of test conditions is provided in Table 5. A control (lab water) that was not spiked with copper was run with each test. Spiked copper concentrations in the site water tests were prepared to range from 29.0 μg/L to 250 μg/L (nominal values). Spiked copper concentrations in the lab water tests ranged from 1.7 μg/L to 15.0 μg/L (nominal values). Spiking solutions for both the lab water and site water tests were made from the same laboratory water and spiking agent. However, different solutions were created for the site water and lab water tests as the spiking concentrations were different.

Standard randomization techniques for toxicity testing were utilized in the WER test. A random number generator was used to develop a template to select which organisms are selected from the 60 cup test board.

Tests were considered acceptable if control survival was equal to or greater than 90% and if the associated reference toxicity results fell within the upper and lower warning limits developed at the laboratory for each individual species. Test results used for WER development also met the following criteria:

- at least one treatment other than the control should exhibit mortality less than 50%;
- the percent of organisms affected should be greater than 50% in at least one treatment;
- the concentration of dissolved copper in test treatments should not decrease by more than 50% from the initial measurement to the final measurement; and

- the lab water LC50's should be within the range of LC50's determined in lab water at other laboratories under similar conditions.

Table 5. Summary of test conditions for copper WER toxicity testing.

Parameter	Test condition (Lab Water)	Test Condition (Site Water Mix)
Test Type	48-h Acute static non-renewal	48-h Acute static non-renewal
Chemical Test	Copper	Copper
Temperature	25°C	25°C
Light Quality	Ambient Laboratory	Ambient Laboratory
Light Intensity	50-100 ft-c	50-100 ft-c
Photoperiod	16h light, 8h dark	16h light, 8h dark
Test Chamber Type	30 mL minimum	30 mL minimum
Test Solution Volume	15 mL minimum	15 mL minimum
Solution Renewal	None[1]	None[1]
Age of Test Organisms	<24-h	<24-h
No. Organisms/Chamber	5	5
No. of Replicate Chambers	4	4
Feeding Regime	None	None
Aeration	None	None
Dilution Water (Test Water)	Moderately Hard Reconstituted	Effluent
Dilution Ratio	0.65	0.65
Number of treatments (metal concentrations)	6 treatments (15, 10, 6, 4, 3, 2 µg/L)	6 treatments (250, 163, 106, 69, 45, 29 µg/L)
Highest Copper Concentration	15 µg/L	250 µg/L

[1] Copper concentrations were measured in the test solution before test initiation and at the conclusion of the testing.

An LC50 was calculated for each test (site water mix (SWM) and lab water (LW)). Note that the original lab reports found in the appendices show LC50 calculations with the final copper concentrations. However, a lab report is also included which shows the LC50 calculations using a time weighted average copper concentration throughout the test. The time weighted average LC50 calculations were utilized in the WER calculations. To account for hardness differences, the LC50 of the SWM was normalized to the hardness of the lab water. The equation used to normalize the copper LC50 is presented below.

Normalization Equation for Copper

$$\text{Copper Normalized LC50} = \text{SWM LC50} * (\text{Lab water Hdns}/ \text{SWM Hdns})^{0.9422}$$

The ratio of SWM-LC50/LW-LC50 is the WER for that test. Individual WERs were calculated as the lesser of the site water LC50 divided by the laboratory water LC50, or the site water LC50 divided by the species mean acute value (SMAV). The final WER (fWER) is calculated as the geometric mean from the results of the individual WERs. EPA and OWRB guidance for the calculation of a WER are expressed as the inverse of each other. For the purposes of this study calculations will be shown according to the EPA

method as this is the commonly accepted calculation. A conversion to the Oklahoma specific OWRB defined WER will be provided at the conclusion of the report.

EPA defined WER
SWM-LC50 / Lesser of LW-LC50 or SMAV

OWRB defined WER
Lesser of LW-LC50 or SMAV / SWM-LC50

5.2 Dissolved Translator

A dissolved translator was developed using eleven grab samples analyzed for total and dissolved copper. Samples were collected on individual days. The samples were collected separately from the WER samples using clean sampling techniques. Copper data from the samples collected for the toxicity testing portion of the WER study was not utilized. However, the results were consistent with the data utilized for the translator calculation.

6.0 DATA HANDLING AND QUALITY ASSURANCE/QUALITY CONTROL

The laboratory's toxicity test results, analytical results, chain of custody forms and laboratory sheets were reviewed and necessary data recorded in a spreadsheet format.

Quality assurance and quality control measures taken during this study followed that of the project workplan included as Appendix A.

7.0 RESULTS

Several trips were made for the collection of samples for the WER and dissolved translator development from May through September 2016. Table 6 summarizes sampling efforts for each of the trips. Note that the first attempt to conduct the WER study (6/27/16) was not completed due to errors within the laboratory. Improper acid washing of laboratory equipment resulted in <24 hour failure of all samples including controls. No report was generated by the laboratory.

Table 6. Summary of WER tests performed for each sampling effort.

Date	WER Study	Dissolved Translator	Notes
5/3/16	X	X	Rangefinding test. Sampled by GBMC.
6/27/16	X	X	WER test was invalid due to laboratory errors. No lab report was issued. Sampled by GBMC.
6/28/16		X	Sampled by GBMC.
7/6/16		X	Sampled by Idabel staff.
7/7/16		X	Sampled by Idabel staff.
7/20/16		X	Sampled by Idabel staff.
7/21/16		X	Sampled by Idabel staff.
7/26/16	X	X	WER-1 test. Sampled by GBMC.
7/27/16		X	Sampled by GBMC.
7/28/16		X	Sampled by Idabel staff.
9/27/16	X	X	WER-2 test. Sampled by GBMC.

7.1 Water Quality Results Associated with WER Development

A summary of the analytical results of samples collected during the WER study from the SWM and from the moderately hard lab water are presented in the Water Quality Results summary found in Appendix B. *In-situ* and flow data from Outfall 001 at the time of sampling can be found on the *in-situ* summary also found in Appendix B. Results from composite sampling for routine permit required DMR sampling conducted on the same days as WER study sampling can be found in the DMR Data Summary of Appendix B. Corresponding laboratory reports are located in Appendix D of the report.

7.2 Toxicity Test Results Used for WER Development

7.2.1 Copper

Acute 48-hour static non-renewal toxicity tests were conducted for copper WER development. Two tests using *Ceriodaphnia dubia* were completed for copper. Both tests met acceptance criteria for use in developing the fWER. Complete laboratory reports are presented in Appendix D. A summary of the results of each test utilized in the development of the fWERs is presented in Tables 7 and 8.

Table 7. Ceriodaphnid toxicity test results for Total Copper.

Site Water		Lab Water	
Total Copper[1] (µg/L)	**(% Survival at 48-h)**	**Total Copper[1] (µg/L)**	**(% Survival at 48-h)**
Test Date: 7/26/16			
Control	100	Control	100
38.1	100	2.8	100
50.4	100	3.47	100

Site Water		Lab Water	
Total Copper[1] (µg/L)	**(% Survival at 48-h)**	**Total Copper[1] (µg/L)**	**(% Survival at 48-h)**
Test Date: 7/26/16			
71.9	100	4.42	100
108	100	5.55	100
152	0	8.36	15
248	0	12.7	0
LC50	128 µg/L	LC50	7.25 µg/L
Test Date: 9/27/16			
Control	100	Control	100
30	100	2.72	100
45.4	100	3.95	95
69.4	100	5.45	80
98.3	100	7.48	60
151	5	11.2	0
251	0	17.2	0
LC50	125 µg/L	LC50	7.17 µg/L

[1]Time weighted average concentrations.

Table 8. Ceriodaphnid toxicity test results for Dissolved Copper.

Site Water		Lab Water	
Dissolved Copper[1] (µg/L)	**(% Survival at 48-h)**	**Dissolved Copper[1] (µg/L)**	**(% Survival at 48-h)**
Test Date: 7/26/16			
Control	100	Control	100
32.7	100	2.48	100
42.1	100	3.02	100
60.6	100	3.87	100
88.8	100	5.02	100
125	0	7.72	15
194	0	12.3	0
LC50	105µg/L	LC50	6.66 µg/L
Test Date: 9/27/16			
Control	100	Control	100
26.6	100	2.6	100
39.3	100	3.3	95
59.8	100	5.12	80
88	100	6.94	60
126	5	10.2	0
210	0	16.1	0
LC50	108 µg/L	LC50	6.62 µg/L

[1]Time weighted average concentrations.

7.3 Water Effect Ratio Development

WERs are developed as the ratio of the LC50 in the site water mix divided by the greater of the LC50 in the lab water or the SMAV. In order to mitigate the effects of elevated water hardness on the LC50, each SWM LC50 and SMAV were normalized to the hardness of the lab water. Normalizing hardness in this manner eliminates any effect from reduced toxicity a metal may display due to hardness alone. For both tests the hardness normalized SMAV LC50's were greater than the lab water LC50s and were therefore used for WER calculation. WERs were developed for both total and dissolved copper. Table 9 below depicts LC50s and WERs for the copper tests.

Table 9. Summary of Copper LC50s and WERs.

	SWM LC50	SWM LC50 (normalized)	Lab Water LC50	WER	SMAV LC50	SMAV LC50 (normalized)	WER
WER-1 Total	125	160.7	7.25	22.16	24	23.5	6.82
WER-1 Dissolved	105	131.8	6.66	19.79	22.11	21.7	**6.08**
WER-2 Total	125	158.9	7.17	22.16	24	21.5	7.39
WER-2 Dissolved	108	137.3	6.62	20.74	22.11	19.8	**6.93**

*Copper Normalized LC50 = SWM LC50 * (Lab water Hdns/ SWM Hdns)^0.9422
WER-1 SWM Hardness = 77 mg/L, LW=98 mg/L
WER-2 SWM Hardness = 69 mg/L, LW = 89 mg/L

The fWER for use in recommending amendment of the copper criteria in the Oklahoma WQS was developed from the most stringent of either the hardness normalized lab water WER or the hardness normalized SMAV WER. Additionally, the total and dissolved WERs were compared to find the more stringent. After comparison, it was determined the dissolved copper WERs were the most stringent and were therefore be the focus of the fWER calculation.

The fWER, which is used to adjust the existing copper criteria to create site-specific criteria, is calculated as the geometric mean of all acceptable WERs from the study. A minimum of two acceptable WERs are required for calculation of an fWER according to the "Streamlined" method. For this study the two most stringent WERs from the ceriodaphnid acute site water tests were calculated from the hardness normalized site water mix and SMAV for dissolved copper. **WER-1 was 6.08 and WER-2 was 6.93, resulting in an fWER of 6.49.** The fWER is applicable to either the chronic criterion or the acute criterion.

fWER Geometric Mean Calculation

$fWER = \exp [\Sigma \ln(WERi) / n]$
Where: n = number of acceptable WERs
WERi = WER from ith test

As previously stated, the OWRB guidance defines a WER as the ratio of the lab water LC50 to the site water mix LC50. This is the inverse of a WER as defined by the EPA guidance. The table below provides the WERs and fWERs shown in both formats.

Table 10. EPA and OWRB fWERs for copper.

	EPA WER	OWRB WER
WER-1	6.08	0.165
WER-2	6.93	0.144
Final WER	6.49 (fWER)	0.154 (WER)

7.4 Dissolved Translator (f)

A dissolved translator (f) was developed for copper to be used in conjunction with the fWER in amending the Oklahoma WQS criteria for copper. A dissolved translator is calculated using the following calculation:

f = dissolved concentration of metal/total concentration of metal

Results from eleven samples used in calculating a dissolved translator for copper are found in Table 11.

Table 11. Results of clean metal sampling for the dissolved translator.

	Copper (µg/L)	
	Total	Dissolved
5/3/2016	2.2	1.2
6/27/2016	6.8	5.6
6/28/2016	4.8	3.3
7/6/2016	4.3	3.4
7/7/2016	2.9	3.0
7/20/2016	7.8	6.6
7/21/2016	8.4	7.1
7/26/2016	5.5	4.1
7/27/2016	5.2	3.9
7/28/2016	4.3	2.8
9/27/2016	1.5	1.0

The geometric mean of the ratio of the dissolved to total metal concentrations for the ten samples is used as the dissolved translator (f) and is shown in Table 12.

Table 12. Dissolved Translator

	Copper (Dissolved/Total)
5/3/2016	0.55
6/27/2016	0.82
6/28/2016	0.69
7/6/2016	0.79
7/7/2016	1.03
7/20/2016	0.85
7/21/2016	0.85
7/26/2016	0.75
7/27/2016	0.75
7/28/2016	0.65
9/27/2016	0.66
Geomean (f) (OWRB)	**0.75**
1/f (EPA)	**1.33**

7.5 Criterion Translator (T)

A criterion translator was calculated for copper using the calculated WER and dissolved translators. Per the OWRB guidance, a criterion translator is defined as:

$$T = WER \times f$$

The table below shows the Criterion Translator (T) for copper. Results are expressed to correlate with both EPA defined WERs and the OWRB guidance.

Table 13. Criterion translators.

	WER		Dissolved Translator (f)		Criterion Translator (T)	
	EPA	OWRB	EPA	OWRB	EPA	OWRB
Copper	6.49	0.154	1.33	0.75	8.62	0.116

8.0 CONCLUSIONS

1. The site-specific criteria calculated in the study should be applied to Mud Creek. The following presents the options for utilization of the study results as expressed in the Oklahoma Water Quality Standards (OAC Title 785. Chapter 45).

   $FWER_t = 0.1409$
   $FWER_d = 0.1541$
   $f = 0.7527$

$C_{cst} = 4.83$ µg/L	Statewide Criterion
$S_{cst} = 31.34$ µg/L	Option 1
$S_{cst} = 6.16$ µg/L	Option 2
$S_{cst} = 39.97$ µg/L	Option 3

$C_{ast} = 6.56$ µg/L	Statewide Criterion
$S_{ast} = 42.56$ µg/L	Option 1
$S_{ast} = 8.37$ µg/L	Option 2
$S_{ast} = 54.28$ µg/L	Option 3

   Idabel Public Works Authority requests amending the criteria utilizing Option 3 above. This results in a site specific WER adjusted copper acute criterion of 54.28 µg/L and a chronic criterion of 39.97 µg/L utilizing a final criterion translator (T) of 8.62 (0.1160 OWRB) based upon an fWER of 6.49 (0.1541 OWRB) and a dissolved translator (f) of 1.33 (0.75 OWRB). The criteria is calculated at an instream hardness of 32 mg/L.

2. Based upon the OWRB WER Guidelines the final permit limits for total copper for the Idabel Public Works Authority could be removed from the permit if the amended criterion results in no reasonable potential; or if reasonable potential is exceeded, the final permit limit for copper could be amended considering the application of the criterion translator to the instream criteria.

   The current and WER adjusted site specific criteria resulting from use of the final criterion translator for copper is shown in Table 14.

Table 14. Current and WER adjusted aquatic toxicity criteria (at 32 mg/L hardness).

Parameter	Existing Hardness Dependent Aquatic Toxicity Criteria		WER adjusted Hardness Dependent Aquatic Toxicity Criteria	
	Acute Criterion (CMC) µg/L	Chronic Criterion (CCC) µg/L	Acute Criterion (CMC) µg/L	Chronic Criterion (CCC) µg/L
Copper	6.56	4.83	54.28	39.97

Appendix A
Study Workplan

Water Effects Ratio Workplan
City of Idabel, OK

July 15, 2015

GBMc & Associates
Strategic Environmental Services

Water Effects Ratio Workplan

Prepared for:

City of Idabel, Oklahoma
201 East Main
Idabel, OK 74745

Prepared by:

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219 Brown Lane
Bryant, AR 72022

July 15, 2015

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FIGURE

1.0 BACKGROUND/APPROACH

The Idabel Public Works Authority is authorized to discharge treated wastewater under OPDES permit (Oklahoma Permit No. OK0027677) that became effective on November 1, 2012. The permit allows for discharge of treated wastewater from Outfall 001 at the treatment facility to Mud Creek. Among the permit's provisions are limits for priority pollutants including copper. The numerical limits for copper are as follows:

Parameter	Concentration Limits	
	Monthly Average (µg/L)	Daily Maximum (µg/L)
Copper, Total Recoverable	3.96	7.94

Permit limits for the copper were calculated using the aquatic life criteria of the Oklahoma Water Quality Standards. A water-effect ratio of 1.0 was assumed for purposes of the calculations.

Biomonitoring is another required provision of the Idabel Public Works Authority NPDES permit. The permit specifies that the 7-day chronic *Pimephales promelas* test and the 7-day chronic *Ceriodaphina dubia* test be completed quarterly. Both lethal and sublethal endpoints are reported. The critical (effluent) dilution required in the tests is 100%.

Since the issuance of the current permit, the facility has repeatedly failed to achieve required concentration limits for copper. In order to address these repeated permit violations, the Idabel Public Works Authority proposes to conduct a water effect ratio (WER) study for copper (total and dissolved). Results of the study will be used to develop site-specific criteria allowing for adequate protection of aquatic life in the receiving stream.

The WER study will be conducted following the "Streamlined Water-Effect Procedure for Discharges of Copper" (EPA, 2001). The Oklahoma Water Resources Board "Guidance Document for the Development of Site-Specific Water Quality Criteria for Metals" (OWRB 2003) provides procedural information for developing site-specific criteria within the State of Oklahoma. This document will be used in conjunction with the EPA methodology in development of an Oklahoma-defined final WER (fWER). The OWRB document

provides methodology for the development of a dissolved translator (f). This dissolved translator will be used in conjunction with the fWER to calculate a final criterion translator (T) which will be used to develop site-specific total recoverable criterion.

2.0 SITE DESCRIPTION/DESIGN FLOWS

The Idabel Public Works Authority discharges to Mud Creek (Planning Segment 410200) via Outfall 001, which is located at Latitude 33º 51' 14.621", Longitude 94° 47' 22.200". The receiving stream travels from Mud Creek to the Little River then to Millwood Lake in western Arkansas. The Outfall 001 discharge location is shown in Figure 1.

The Statement of Basis for the NPDES permit currently in effect was reviewed for discharge and receiving stream design flow characteristics. The effluent flow used as the basis for calculation of permit limits including copper and whole effluent toxicity (WET) was the POTW design flow of 1.65 MGD (2.56 cfs). The background flow rate (7Q2) of Mud Creek used in calculation of the permit limits was the default value 1 cfs (0.6463 MGD).

Aquatic life criteria (total) for copper for Mud Creek, based on a mean hardness concentration of 32 mg/L are shown below.

Parameter	Hardness Dependent Aquatic Toxicity Criteria for Mud Creek	
	Acute Criterion (CMC) µg/L	Chronic Criterion (CCC) µg/L
Copper, Total	6.56	4.83

The WET test requirements in the NPDES permit are for once per quarter chronic biomonitoring with a critical dilution of 100%. The critical dilution reflects the percent contribution of effluent mixed with receiving water. Therefore, since the chronic water quality criterion was the basis for the effective permit limits for copper and because the critical dilution for the chronic toxicity testing uses the same flow basis, the site water mix to be used for WER testing will contain no dilution from upstream receiving water.

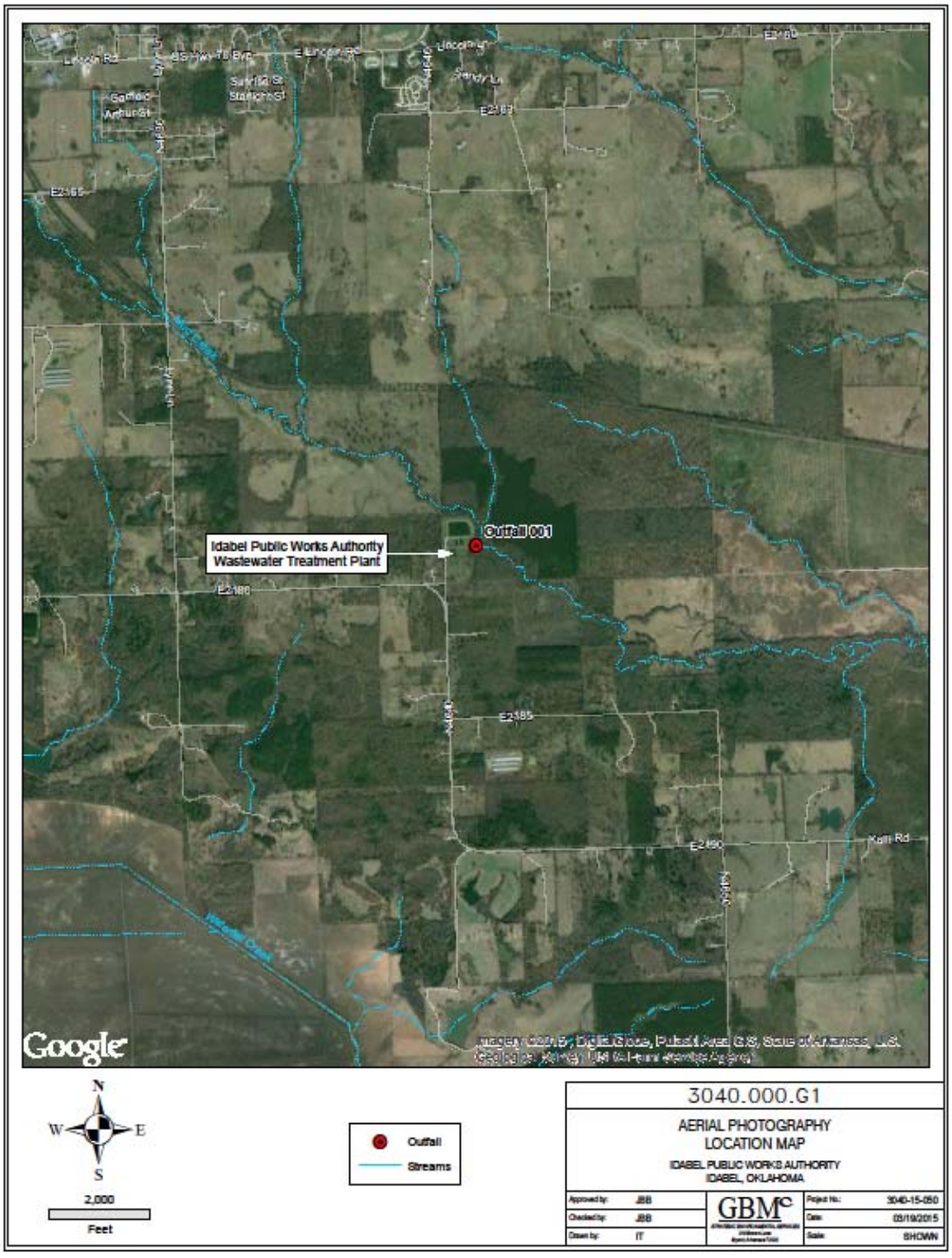

Figure 1. Aerial photography showing the Idabel Public Works Authority WWTP Outfall 001 discharge location in Idabel, OK.

3.0 SAMPLING

A minimum of three sampling trips will be conducted to collect samples of the Idabel Public Works Authority Outfall 001 for the copper WER test. The initial trip will be performed to gather grab samples which will be used to determine a range of concentrations of copper to be used in the toxicity tests. Remaining sample trips will involve the collection of composite samples required to complete the WER study including quality control and analysis of routine DMR parameters to ensure effluent conditions are representative of normal discharge. Sampling efforts for the study will also incorporate clean metals sampling and analysis to develop a dissolved translator. A minimum of 10 different samples is required to develop a site-specific translator. Multiple samples for total and dissolved metals analysis may be collected during the scheduled sampling trips. However, samples taken for the development of the dissolved translator will not be taken at a frequency greater than one per day.

Composite samples collected for the copper WER study will be collected using the procedures found below. During a single sampling trip, four individual effluent samples will be collected from Outfall 001 over a 6 hour time period during normal facility operating conditions. These samples will be composited on a flow-weighted basis in the laboratory to create the site water mix (SWM). Typical practice for composite sampling is done over 24-hours. However, 6-hour composite samples have been approved by ODEQ for the facility's DMR sampling and this reduced sampling time is believed to be representative due to retention time within the wastewater treatment system. Therefore, for purposes of the WER study, composite sampling will still be utilized but over a shortened (6-hour) length of time. Grab samples will be utilized for development of the dissolved to total metal translator.

Clean techniques sampling (modified), following EPA Method 1669 will be utilized for the water sample collection. Samples for WER toxicity testing for copper will be made at a minimum of one month apart. All sampling will occur during times of normal facility operation when CBOD and TSS concentrations are within permit limits, and when relatively

unaffected by rainfall inflow or slug loads. The sampling team will coordinate with facility personnel to ensure the facility and wastewater treatment systems are operating normally, with no upset conditions. The effluent flow and in-situ measurements at the time of the samples will be recorded. Information necessary for the laboratory to composite all samples will be specified on Chain of Custody (COC) forms prepared for the project.

Due to the nature of the facility, its processes, and the wastewater treatment system the effluent discharge from Outfall 001 is relatively unaffected by rainfall. Additionally, the WER study is being conducted using 100% effluent. Therefore, the need to conduct the study during low flow conditions is not applicable. However, this condition of the guidance is noted and sampling efforts will be conducted during low-flow conditions to the extent practicable, when no recent significant rainfall events have occurred. Rainfall data for the area will be evaluated for the 2 weeks preceding each sampling event.

3.1 Sample Handling and Custody

After the samples have been collected, care will be taken in transporting the samples to the contract laboratory for analyses. All samples will be placed in the appropriate clean containers supplied by the laboratory with no air space in the sample container. Each sample container will be labeled with the sample I.D., date, time, and initials of collector(s). Samples will be placed in ice chests and maintained at 4º C for delivery to the laboratory in a timely manner in order to meet regulatory holding times. COC forms that include information on each sample delivered to the laboratory for analysis will be completed. Each COC form will be signed by each person handling the samples from collection in the field to receipt in the laboratory. The COC form will include all required information and will be checked for completeness prior to submission of samples to the laboratory.

3.2 Analytical Methodology

Samples will be analyzed in the laboratory according to the procedures outlined in the most current release of *Standard Methods for the Examination of Water and Wastewater*. Where specific EPA approved analysis methods exist, the laboratory shall

use them. Table 1 summarizes the analytical methods to be used during the study. American Interplex Laboratories, Little Rock, Arkansas will complete both the analytical work and the WER toxicity tests. Analyses required for the WER study are shown in Table 2.

Table 1. Analytical methods to be followed during the WER study.

Parameter	Method	Preservative[1]	Holding Time
Total Copper	EPA200.7/200.8	4 ºC, HNO_3	6 Months
Dissolved Copper	EPA200.7/200.8	4 ºC, HNO_3	6 Months
T. Hardness	EPA200.8	4 ºC, HNO_3	6 Months
T. Alkalinity	SM 2320B	4 ºC	14 Days
TSS	SM2540D	4 ºC	7 Days
TOC	SM5310C	4 ºC, H_2SO4	28 Days
DOC	SM5310C	4 ºC	28 Days
TDS	SM2540C	4 ºC	7 Days

[1]All chemical preservatives added after sample composite and/or dilution sub-sampling.

Table 2. Analysis to be conducted in conjunction with the WER toxicity testing.[1]

	Water Sample Source		
Analytical Parameter	**Effluent (SWM)**	**Lab water**	**Selected spiked test dilutions[2, 3]**
Total Copper	X	X	X
Dissolved Copper	X	X	X
Total Hardness	X	X	
Total Alkalinity	X	X	
pH	X	X	X
TSS	X	X	
TOC	X	X	
DOC	X	X	
Specific conductance	X	X	X
TDS	X		
Dissolved oxygen		X	X
Temperature		X	X
Routine DMR parameters	Routine parameters will be analyzed by the permittee as part of routine monitoring on the same day as WER study samples are collected. Routine parameters include BOD, TSS, NH3-N, DO, Chlorides, Sulfates, TDS, T. Cadmium, T. Chromium, T. Copper, T. Selenium, T. Silver, T. Zinc, pH.		

[1] The normal battery of chemistry completed for routine biomonitoring tests (pH, temperature, conductivity, dissolved oxygen, etc.) should be completed during each WER test.

[2] At a minimum the test treatments that bracket the LC50 must be tested for these parameters. The lowest treatment that exhibited 100% mortality, the highest treatment that exhibited no effect and the control should each also be tested for these parameters.

[3] Dilutions will be prepared using copper sulfate.

4.0 TESTING DESIGN

4.1 Copper WER

The "Streamlined Water-Effect Procedure for Discharges of Copper" (EPA 2001) and OWRB guidance will be followed for development of a water-effect ratio specifically for copper. A minimum of two WER toxicity test sets (consisting of a toxicity test using a SWM of 100% effluent; and a lab water toxicity test) will be conducted using *Ceriodaphina dubia*. Toxicity tests or both the SWM and lab water will be 48 hour acute static non-renewal tests. A summary of copper WER test conditions for *Ceriodaphina* is presented in Table 5.

Table 5. Summary of test conditions for copper WER toxicity testing.

Parameter	Test condition (Lab Water)	Test Condition (Site Water Mix)
Test Type	48-h Acute static non-renewal	48-h Acute static non-renewal
Chemical Test	Copper	Copper
Temperature	25°C	25°C
Light Quality	Ambient Laboratory	Ambient Laboratory
Light Intensity	50-100 ft-c	50-100 ft-c
Photoperiod	16h light, 8h dark	16h light, 8h dark
Test Chamber Type	30 mL minimum	30 mL minimum
Test Solution Volume	15 mL minimum	15 mL minimum
Solution Renewal	None[1]	None[1]
Age of Test Organisms	<24-h	<24-h
No. Organisms/Chamber	5	5
No. of Replicate Chambers	4	4
Feeding Regime	None	None
Aeration	None	None
Dilution Water (Test Water)	Moderately Hard Reconstituted	100% Effluent
Dilution Ratio	0.65	0.65
Number of treatments[2] (metal concentrations)	6 treatments (15, 9.8, 6.3, 4.1, 2.7, 1.7 µg/L)	To be determined by range finding test.
Highest Copper Concentration	15 µg/L	To be determined by range finding test.

[1] Copper concentration will be measured in the test solution before test initiation and at the conclusion of the testing.

[2] Treatment number and concentration may vary based on results of first WER testing.

Individual WERs (EPA methodology) will be calculated as the lesser of the site water (effluent) LC50 divided by the laboratory water LC50, or the site water LC50 divided by the species mean acute value (SMAV). Lab water used for tests will be reconstituted moderately hard water. The laboratory water LC50, SMAV, and SWM LC50 will be

normalized to the same hardness value. The fWER will be calculated as the geometric mean from the results of the individual WERs.

4.2 Dissolved Translator

A dissolved translator will be developed according to procedures outlined in "Guidance Document for the Development of Site-Specific Water Quality Criteria for Metals" (OWRB 2003). This translator will be used in conjunction with the WER to develop site-specific total recoverable criterion as opposed to the default statewide dissolved criterion. A minimum of ten samples from Outfall 001 will be collected and analyzed for dissolved and total copper. For this portion of the study, grab samples will be collected using clean sampling techniques.

5.0 DATA HANDLING AND INTERPRETATION

The laboratory's toxicity test results, analytical results, chain of custody forms and laboratory sheets will be reviewed for QA/QC and the data will be recorded in a spreadsheet format. Calculations will then be performed to develop a final water effect ratio (fWER), a dissolved translator (f), and a final criterion translator (T). The OWRB guidance for calculation of a WER is expressed as the inverse of the EPA guidance. Calculations for the WER will be expressed by both the EPA guidance and according to the OWRB guidance to agree with the dissolved translator and final criterion translator portions of the OWRB guidance.

An LC50 will be calculated for each SWM test and each lab water test using the copper concentrations measured in the test dilutions. Each SWM LC50 will be normalized to the hardness of the lab water test using the hardness equation for copper. The equation used for hardness normalization is provided below:

Copper - Normalized LC50 = SWM LC50 * (Lab water Hdns/ SWM Hdns)$^{0.9422}$

(4 significant digits should be maintained in calculations)

Once the LC50's have been calculated for each test the ratio of the SWM LC50 / LW LC50 or the SWM LC50 / SMAV (whichever is less) is the WER ratio for that test pair. The reciprocal of this value will represent the WER according to the OWRB guidance. A WER will be calculated for each pair of toxicity tests completed. This should result in a total of 2 copper WER's for ceriodaphnids. The fWER is calculated as the geometric mean of the two WER's.

The dissolved translator (f) will be calculated as the ratio of dissolved metal / total metal from 10 or more acceptable samples.

A final criterion translator (T) will be determined by calculating the product of the fWER and the dissolved translator (fWER x f = T). The statewide dissolved criterion will be divided by the criterion translator (T), which is the product of the Oklahoma-defined dissolved fWER and f, to obtain a site-specific total recoverable criterion. Subsequent to calculation of the revised water quality criterion, the facility's permit limits will be revised to reflect the new in-stream criterion resulting from the WER(s).

6.0 QUALITY ASSURANCE/QUALITY CONTROL

Trained scientists will conduct or supervise the field sampling and other associated activities at the sample location. Notes will be kept in field notebooks and/or specific field data forms that record information collected during the study, unusual observations, and a log of each day's activities. All data forms, calibration logs, field notes, and other study documentation will be reviewed by the Project Manager or Senior Scientist for completeness and accuracy.

6.1 Sample Collection QA/QC

Duplicate samples for key constituents (*e.g.* metals, TSS, etc.) shall be collected on 10% of the samples during the study. Duplicate samples should vary by no more than 30% relative percent difference (RPD) or the sample results will be considered suspect. In the event an RPD exceeds 30%, the Project Manager will investigate the incident to determine the cause of the exceedance and what action, if any, is necessary.

One field blank will be collected during each sample event for analysis of total metals (copper and zinc). Field blanks will consist of a sample of ultra pure laboratory water poured into the appropriate sample container in the field to simulate all possible contaminant exposures. Sampling methodology and equipment must be the same for field blanks as for routine sampling in the study. If a field blank is found to be contaminated, (>120% of the MDL) by a chemical of concern, an analysis will be conducted to determine the potential impact of the contamination on the results of the associated batch of samples. The Project Manager will determine the appropriate course of action from the results of the analysis.

6.2 Analytical QA/QC

The laboratory will validate analytical data by use of blanks, laboratory controls, spikes, and spike duplicates. Laboratory blanks measure the amount of each respective analyte contributed from the analytical procedure. A laboratory blank is considered out of control for a specific analyte if the value exceeds the higher of either the minimum detection limit (MDL) or 5% of the measured concentration in the sample. A laboratory control measures the ability of the laboratory to recover an analyte from a blank matrix. The laboratory spike sample is used to evaluate the laboratory's ability to recover an analyte in the sample matrix. The QC exceedance criteria for laboratory controls and spikes is based on upper and lower control limits derived from the laboratory's method specialized limits. The laboratory spike duplicate is used to evaluate the laboratory's precision (ability to attain similar analytical results from duplicate samples). A RPD is calculated for the spike and spike duplicate. The RPD is compared to method specialized limits to determine QC

exceedance. Any significant excursion from one of the QC parameters will result in a repeat of the analysis in question following an investigation by the laboratory as to the cause of the QC excursion and a report of the corrective actions taken.

6.3 Toxicity Testing QA/QC

Toxicity testing will be completed following EPA method 2002.O for the *Ceriodaphina* and EPA method 2000.D for the fathead minnow. Specific conditions are outlined in Section 4.0 of this study plan. Test acceptance criteria will meet standard method requirements:

1. 90% survival in controls; and
2. Laboratory organisms must be in the labs normal acceptable range for reference toxicity testing.

Initial metal concentrations will be compared to the final metal concentrations in the WER tests to ensure a sufficient concentration of metal was present throughout the duration of the test. Dissolved oxygen will be monitored on a daily basis to ensure levels remain within acceptable limits during laboratory testing. Should oxygen levels drop below 3.0 mg/L, test treatments will be renewed or aerated as appropriate.

6.4 General QA/QC Procedures and Information

GBM^c & Associates conducts scientific studies (both field and laboratory) in support of regulatory applications in various media including water and wastewater. An integral part of any successful scientific study is the Quality Assurance Plan and/or site specific work plan. Large-scale and/or long-term studies such as water quality modeling require a rigorous quality assurance program that can be implemented consistently by all participants throughout the duration of the study period. Study teams with GBM^c & Associates are provided a copy of the GBM^c & Associates Quality Assurance Plan (QAP) and, if available, a Study Work Plan to follow throughout the course of each study. GBM^c & Associates' full

QAP is available upon request. If a project specific plan exists for a given study, its procedures will supercede those of the GBM^c & Associates QAP, unless otherwise determined. The QAP contains information regarding quality assurance and quality control activities and procedures designed to facilitate the production of scientifically defensible data with a high level of accuracy and precision. Activities governed by this plan include:

1. aquatic ecology field studies,
2. general field operations,
3. sampling/monitoring programs, and
4. data reporting activities.

The QAP is composed mostly of standard operating procedures (SOPs) designed to provide methodology pertinent to completion of tasks in a consistent and defensible manner. All SOPs are based on accepted methodologies found in documents published by groups such as US-EPA, USGS, and Water Environment Federation (WEF). These SOPs are modified to take specific requirements into account when appropriate. Generally, modifications of SOPs based on state specific requirements are minor changes to the procedures followed by GBM^c personnel. The following sections provide general quality assurance/quality control guidance that supports the SOPs found in the Quality Assurance Plan for GBM^c & Associates, Scientific and Field Studies.

6.4.1 Key Personnel

Ultimate authority on any project falls into the hands of a GBM^c & Associates Principal who must approve all study plans and reports. Each study team is headed by a Project Manager who has oversight responsibility for the study procedures, applications, and the data generated. During field studies a designated field team leader, usually the Senior Scientist, will be in charge of the field operations. The field team leader is responsible for completion of data collection following appropriate QA/QC guidelines. Each study team member is responsible to ensure that the appropriate procedures are followed

and that safety and ethical standards are maintained to ensure the highest quality study results.

6.4.2 Training

All personnel participating in studies have been trained by experienced scientists/engineers to complete the necessary tasks or are in the process of being trained with appropriate oversight. Personnel participating in scientific studies shall be familiar with the SOPs appropriate to that particular study and the QAP. Personnel participating in scientific studies conducted pursuant to specific procedures specified by a regulatory authority (*e.g*., a state or federal environmental agency) shall be familiar with those specific procedures.

6.4.3 Field Trip Preparation

To ensure that all field activities can be conducted completely and efficiently, field teams will complete a Field Equipment Checklist prior to loading for the trip to ensure all necessary equipment is identified. The field team will check the condition and confirm proper function of all equipment and supplies before traveling to a site. In addition, they will prepare sample containers and labels for use to the extent possible prior to departure to the study site.

6.4.4 Instrument Inspections and Performance Tests

Where appropriate, calibration and performance tests are described in the SOP of the respective application. Generally, all equipment will be utilized per the manufacturer's directions. If during the course of the field activities equipment fails to conform to known QA/QC requirements, the equipment will be repaired or replaced with similar equipment that will meet QA/QC requirements.

6.4.5 Equipment Care and Maintenance

Equipment cleaning and maintenance procedures will follow manufacturer recommendations. Each day during a field trip equipment should be inspected before use (during calibration, etc.) to ensure functionality. All equipment will be inspected and cleaned immediately following a field trip and stored in a safe place to allow its future readiness. Portable field meters should be calibrated in the lab at least once a month to monitor readiness.

6.4.6 Assurance of Complete Data Collection

Upon conclusion of all activities at a given study location, the study plan should be reviewed to ensure all necessary data was collected. The field team should review all completed data forms and sample labels for accuracy, completeness, and legibility, and make a final inspection of samples. If information is missing from the forms or labels, the team leader should fill in the missing information prior to proceeding to the next study location. Any missing and/or compromised samples should be collected immediately. A field notebook should be maintained by the field team leader (at a minimum) to document field activities, data collected, deviations from method, and general observations and information related to the study. Every person should maintain individual field logs to document activities and observations during daily activities.

6.4.7 Data Handling and Analysis

All data collected during scientific studies should be checked by the team leader for completeness and accuracy. Field data forms should be complete and initialed by the completing scientist and the reviewing scientist. Data entry to spreadsheets and databases along with spreadsheet calculations shall be checked for accuracy at a rate of 10% (minimum) of the entries and calculation cells. Copies of the checked data and spreadsheets should be initialed by the reviewer and retained in the records. All calculations should be detailed in the body of written reports, or shown on GBM^c &

Associates Calculation Pages. Good notes regarding calculations should be kept and filed in the project notebook. All scientific reports shall be peer reviewed and/or reviewed by the Project Manager prior to approval by a GBM^{c} & Associates Principal.

7.0 REPORTING

Upon completion of the study, a complete report containing methods, test results, and measurements performed during the study (including sample custody forms, toxicity test data sheets, reference toxicant control charts, analytical chemistry reports, and statistical analyses); calculation procedures for fWERs, dissolved translators, total criterion translator for copper; recommendations for criteria modification; and QA/QC discussion will be prepared and submitted to the Oklahoma Water Resources Board for review and approval.

Appendix B
Summary of Analytical Data

In-situ Measurements

Idabel PWA
3040-15-050
In-Situ Data

Date	Time	Sample ID	Flow	Temperature	SPC	D.O.	D.O.
			(MGD)	(^oC)	($\mu s/cm^2$)	(%)	(mg/L)
WER-1							
7/26/2016	0700	001-1	0.652	27.6	447	86.2	6.77
7/26/2016	0900	001-2	0.922	27.9	750	95.1	7.45
7/26/2016	1100	001-3	0.866	28.6	343	98.2	7.61
7/26/2016	1300	001-4	1.277	28.8	281	101.1	7.79
WER-2							
9/27/2016	0700	001-1	0.864	23.8	466	73.4	6.17
9/27/2016	0900	001-2	0.685	23.8	461	74.2	6.24
9/27/2016	1100	001-3	0.897	24.2	459	80.9	6.76
9/27/2016	1300	001-4	1.052	24.8	351	84.9	7.05

DMR Data

Idabel PWA
4040-12-050
DMR Data

Date	NH3-N	BOD 5-day	TSS	Cd	Cu	Se	Ag
	(mg/L)	(mg/L)	(mg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
6/26/2016	0.83	--	--	< 0.2	< 10	< 5	< 0.2
6/27/2016	2.1	--	--	--	< 10	< 5	--
6/28/2016	2	4.1	4.8	--	24	< 5	--
9/27/2016	0.63	--	--	< 0.2	< 10	< 5	< 0.2
9/28/2016	0.64	--	--	--	< 10	< 5	--
9/29/2016	0.58	< 2	6	--	< 10	< 5	--

Chlorides, Sulfates, and TDS are required by permit to be analyzed once per month. These parameters were not sampled/analyzed during the WER study sampling efforts.

Water Quality Data

Idabel PWA
3040-15-050
Summary of Water Quality Results

Site Water Mix (SWM)

Date	D.O.	pH	Alkalinity	Hardness	Conductivity	TOC	DOC	TSS	TDS
	(mg/L)	(S.U.)	(mg/L)	(mg/L)	(umhos/cm)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
7/26/2016		6.3	14	77	340	9	7.9	4.4	320
9/27/2016		7.1	23	69	400	9.7	8.6	< 4	300

Lab Water (LW)

Date	D.O.	pH	Alkalinity	Hardness	Conductivity	TOC	DOC	TSS	TDS
	(mg/L)	(S.U.)	(mg/L)	(mg/L)	(umhos/cm)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
7/26/2016		7.6	62	97.8	320	< 1	< 1	< 4	200
9/27/2016		8	55	89	270	< 1	< 1	< 4	180

Rainfall data

Idabel PWA
3040-15-050
Rainfall Data for Idabel, OK

WER Sampling Trip #1

Idabel Mesonet Data Summary	
Date	Rainfall (in.)
7/12/2016	-
7/13/2016	-
7/14/2016	-
7/15/2016	-
7/16/2016	0.13
7/17/2016	-
7/18/2016	-
7/19/2016	-
7/20/2016	-
7/21/2016	-
7/22/2016	-
7/23/2016	-
7/24/2016	0.6
7/25/2016	-
7/26/2016	-

WER Sampling Trip #2

Idabel Mesonet Data Summary	
Date	Rainfall (in.)
9/13/2016	-
9/14/2016	-
9/15/2016	-
9/16/2016	-
9/17/2016	-
9/18/2016	0.95
9/19/2016	0.9
9/20/2016	-
9/21/2016	-
9/22/2016	-
9/23/2016	-
9/24/2016	-
9/25/2016	-
9/26/2016	-
9/27/2016	-

McCurtain County, Southeast Climate Division (CD 9)
33.93 N, 94.83 W

Initial to Final Metal Concentrations

Idabel PWA
3040-15-050
Initial to Final Copper Concentrations

WER-1
7/26/2016

Effluent

Nominal Cu (µg/L)	Measured Total Cu (pre-test) (µg/L)	Measured Total Cu (post-test) (µg/L)	Time Weighted Average (µg/L)	% Loss	Measured Dissolved Cu (pre-test) (µg/L)	Measured Dissolved Cu (post-test) (µg/L)	Time Weighted Average (µg/L)	% Loss	Mortality (n=20)	LC50 (ug/L)
29.0	36.0	40.2	38.1	-11.67	30.7	34.7	32.7	-13.03	0	
44.6	48.3	52.6	50.45	-8.90	39.7	44.5	42.1	-12.09	0	
68.7	69.4	74.4	71.9	-7.20	57.1	64	60.55	-12.08	0	Total = 128
106.0	101	115	108	-13.86	83.2	94.5	88.85	-13.58	0	
162.0	149	154	151.5	-3.36	121	129	125	-6.61	20	
250.0	245	250	247.5	-2.04	185	204	194.5	-10.27	20	Dissolved = 105

Laboratory Water

Nominal Cu (µg/L)	Measured Total Cu (pre-test) (µg/L)	Measured Total Cu (post-test) (µg/L)	Time Weighted Average (µg/L)	% Loss	Measured Dissolved Cu (pre-test) (µg/L)	Measured Dissolved Cu (post-test) (µg/L)	Time Weighted Average (µg/L)	% Loss	Mortality (n=20)	LC50 (ug/L)
1.7	2.85	2.75	2.8	3.51	2.65	2.32	2.485	12.45	0	
2.7	3.44	3.5	3.47	-1.74	3.19	2.84	3.015	10.97	0	
4.1	4.61	4.22	4.415	8.46	4.17	3.57	3.87	14.39	0	Total = 7.25
6.3	5.86	5.24	5.55	10.58	5.29	4.74	5.015	10.40	0	
9.8	8.82	7.91	8.365	10.32	8.33	7.10	7.715	14.77	17	
15.0	12.9	12.5	12.7	3.10	12.6	12.0	12.3	4.76	20	Dissolved = 6.66

WER-2
9/27/2016

Effluent

Nominal Cu (µg/L)	Measured Total Cu (pre-test) (µg/L)	Measured Total Cu (post-test) (µg/L)	Time Weighted Average (µg/L)	% Loss	Measured Dissolved Cu (pre-test) (µg/L)	Measured Dissolved Cu (post-test) (µg/L)	Time Weighted Average (µg/L)	% Loss	Mortality (n=20)	LC50 (ug/L)
29.0	29.1	30.9	30	-6.19	26	27.2	26.6	-4.62	0	
44.6	43	47.9	45.45	-11.40	36.5	42.1	39.3	-15.34	0	
68.7	63.1	75.7	69.4	-19.97	52.9	66.7	59.8	-26.09	0	Total = 125
106.0	93.6	103	98.3	-10.04	79.8	96.2	88	-20.55	0	
162.0	146	156	151	-6.85	115	137	126	-19.13	19	
250.0	233	269	251	-15.45	183	236	209.5	-28.96	20	Dissolved = 108

Laboratory Water

Nominal Cu (µg/L)	Measured Total Cu (pre-test) (µg/L)	Measured Total Cu (post-test) (µg/L)	Time Weighted Average (µg/L)	% Loss	Measured Dissolved Cu (pre-test) (µg/L)	Measured Dissolved Cu (post-test) (µg/L)	Time Weighted Average (µg/L)	% Loss	Mortality (n=20)	LC50 (ug/L)
1.7	2.85	2.6	2.725	8.77	2.95	2.26	2.605	23.39	0	
2.7	3.74	4.16	3.95	-11.23	3.52	3.09	3.305	12.22	1	
4.1	5.23	5.67	5.45	-8.41	4.98	5.25	5.115	-5.42	4	Total = 7.17
6.3	7.39	7.58	7.485	-2.57	7.03	6.86	6.945	2.42	8	
9.8	11.1	11.4	11.25	-2.70	10.3	10.10	10.2	1.94	20	
15.0	16.3	18	17.15	-10.43	16	16.2	16.1	-1.25	20	Dissolved = 6.62

Appendix C

Calculations

City of Idabel
3040-15-050
Rangefinding Results
5/3/2016

Effluent Hardness (µg/L)	87000
Lab water Hardness (µg/L)	88000
Total Copper SMAV (µg/L)	24
Normalized SMAV	21.3
D. Copper SMAV (µg/L)	22.11
Normalized SMAV	19.6

Total Copper - Ceriodaphnia

	LC50 (µg/L)	Normalized LC50		
Effluent	89.2	90.2	WER	15.12 Lab water
Lab Water	5.9	5.90	**WER**	**4.24 SMAV**

*Normalized LC50 = SWM LC50 x (lab hdns/swm hdns)^0.9422

Dissolved Copper - Ceriodaphnia

	LC50 (µg/L)	Normalized LC50		
Effluent	61.2	61.9	WER	10.81 Lab water
Lab Water	5.66	5.66	**WER**	**3.16 SMAV**

*Normalized LC50 = SWM LC50 x (lab hdns/swm hdns)^0.9422

City of Idabel
3040-15-050
WER - 1
7/26/2016

Effluent Hardness (µg/L)	77000
Lab water Hardness (µg/L)	98000
Total Copper SMAV (µg/L)	24
Normalized SMAV	23.5
D. Copper SMAV (µg/L)	22.11
Normalized SMAV	21.7

Total Copper - Ceriodaphnia

	LC50 (µg/L)	Normalized LC50
Effluent	128	160.7
Lab Water	7.25	7.25

WER	22.16	Lab water
WER	**6.82**	SMAV

*Normalized LC50 = SWM LC50 x (lab hdns/swm hdns)^0.9422

Dissolved Copper - Ceriodaphnia

	LC50 (µg/L)	Normalized LC50
Effluent	105	131.8
Lab Water	6.66	6.66

WER	19.79	Lab water
WER	**6.08**	SMAV

*Normalized LC50 = SWM LC50 x (lab hdns/swm hdns)^0.9422

City of Idabel
3040-15-050
WER - 2
9/27/2016

Effluent Hardness (µg/L)	69000
Lab water Hardness (µg/L)	89000
Total Copper SMAV (µg/L)	24
Normalized SMAV	21.5
D. Copper SMAV (µg/L)	22.11
Normalized SMAV	19.8

Total Copper - Ceriodaphnia

	LC50 (µg/L)	Normalized LC50
Effluent	125	158.9
Lab Water	7.17	7.17

WER 22.16 Lab water
WER **7.39** SMAV

*Normalized LC50 = SWM LC50 x (lab hdns/swm hdns)^0.9422

Dissolved Copper - Ceriodaphnia

	LC50 (µg/L)	Normalized LC50
Effluent	108	137.3
Lab Water	6.62	6.62

WER 20.74 Lab water
WER **6.93** SMAV

*Normalized LC50 = SWM LC50 x (lab hdns/swm hdns)^0.9422

City of Idabel
3040-15-050
Total/Dissolved Translator

001

	Total Cu (µg/L)	Diss Cu (µg/L)	Dissolved/Total Ratio
5/3/2016	2.2	1.2	0.55
6/27/2016	6.8	5.6	0.82
6/28/2016	4.8	3.3	0.69
7/6/2016	4.3	3.4	0.79
7/7/2016	2.9	3.0	1.03
7/20/2016	7.8	6.6	0.85
7/21/2016	8.4	7.1	0.85
7/26/2016	5.5	4.1	0.75
7/27/2016	5.2	3.9	0.75
7/28/2016	4.3	2.8	0.65
9/27/2016	1.5	1.0	0.66

QA/QC - Duplicates

	Total Cu (µg/L)	Diss Cu (µg/L)
5/3/16-D	2.08	1.18
RPD (%)	6.96	3.33
6/27/16-D	6.1	5.5
RPD (%)	10.85	1.80
7/6/2016	4.5	3.5
RPD (%)	4.55	2.90
7/20/2016	9.3	3.8
RPD (%)	17.54	53.85

QA/QC Trip Blanks

	Total Cu (µg/L)		Diss Cu (µg/L)	
6/27/16-TB		0.68	<	0.5
7/7/2016-TB	<	0.5	<	0.5
7/21/2016-TB	<	0.5	<	0.5
7/26/2016-TB	<	1	<	1
9/27/2016-TB	<	1	<	1

QA/QC Field Blank

	Total Cu (µg/L)		Diss Cu (µg/L)	
6/28/16-FB		1.5	<	0.5

City of Idabel
3040-15-050
Summary

WER

	Copper	
	Total	Dissolved
WER #1	6.82	6.08
WER #2	7.39	6.93
Geo Mean	7.10	6.49
1/Geo Mean (OWRB)	0.1409	0.1541

Total/Dissolved Translator (f)

	Copper
	(Dissolved/Total)
5/3/2016	0.55
6/27/2016	0.82
6/28/2016	0.69
7/6/2016	0.79
7/7/2016	1.03
7/20/2016	0.85
7/21/2016	0.85
7/26/2016	0.75
7/27/2016	0.75
7/28/2016	0.65
9/27/2016	0.66
Geo Mean	0.75
f	1.33
1/f (OWRB)	0.75

fWER

	Total Copper	Dissolved Copper
WER	7.10	6.49
f	1.33	1.33
fWER (EPA)	9.43	8.62
1/fWER or T (OWRB)	0.106	**0.1160**

City of Idabel
3040-15-050
Criteria Ammendment

FWERt	0.1409
FWERd	0.1541
f	0.7527

Chronic

Ccst	4.83	Statewide Criterion
Scst	31.34	Option 1
Scst	6.16	Option 2
Scst	39.97	Option 3

Acute

Cast	6.56	Statewide Criterion
Sast	42.56	Option 1
Sast	8.37	Option 2
Sast	54.28	Option 3

Option 3

	acute	chronic
Total Criteria	6.56	4.83
Conversion factor	0.96	0.96
Dissolved Criteria	6.2976	4.6368
T	0.1160	0.1160
Option 3	**54.28**	**39.97**

Option 2

	acute	chronic
Total Criteria	6.56	4.83
Conversion factor	0.96	0.96
Dissolved Criteria	6.2976	4.6368
f	0.75	0.75
Option 2	**8.37**	**6.16**

Option 1

	acute	chronic
Total Criteria	6.56	4.83
fWER (total)	0.1541	0.1541
Option 1	**42.56**	**31.34**

Appendix D
Laboratory

WER 1

AMERICAN INTERPLEX CORPORATION
LABORATORIES

October 13, 2016

Test Results of
Acute 48 hour Non-Renewal
Biomonitoring Testing
for

204166-1: Outfall 001 Total Copper
204166-2: Synthetic Water Total Copper
204166-3: Outfall 001 Dissolved Copper
204166-4: Synthetic Water Dissolved Copper

Revised to correct conductivity.

Prepared for:

Mr. Jonathon Brown
GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

Prepared by:

AMERICAN INTERPLEX CORPORATION
8600 Kanis Road
Little Rock, AR 72204-2322

GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
219 Brown Lane
Bryant, AR 72022

Re: Acute 48 hour Non-Renewal Biomonitoring utilizing *Ceriodaphnia dubia*
Outfall 001 Total Copper

Dear Mr. Jonathon Brown:

Please find attached the data for the water effects ratio study. The spiking solution utilized for the study was prepared from copper sulfate. The tests were conducted at 25 +/- 1 C and following the guidance from "Streamlined Water-Effect Ratio Procedure for Discharges of Copper", EPA-822-R-01-005. The LC50 data is calculated from the initial analytical data generated from the spiked test solutions. The data is summarized below for your review.

Ceriodaphnia dubia

Analyte	**Outfall 001**	**Synthetic Water**
Total Copper	123 ug/L	7.63 ug/L
Dissolved Copper	100 ug/L	7.08 ug/L

If I can be of further assistance, please feel free to contact me.

AMERICAN INTERPLEX CORPORATION

John Overbey
Chief Operating Officer

PDF cc: GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
jbrown@gbmcassoc.com

Dilution Water Samples: Outfall 001

Analysis	Result
Dissolved oxygen (mg/l)	8.1
pH (standard units)	7.2
Alkalinity (mg/l as CaCO3)	14
Hardness (mg/l as CaCO3)	77
Conductivity (umhos/cm)	340
Residual Chlorine (mg/l)	NA

Results Summary: Outfall 001 Total Copper

Ceriodaphnia dubia

The *Ceriodaphnia dubia* test was conducted from 27-JUL-2016 at 1615 to 29-JUL-2016 at 1430.

Statistical analyses:

NOEC = 101ug/L
LC50 = 123ug/L

Concentration	24 hour % Survival	48 hour % Survival	
Control	100	100	
36.0ug/L	100	100	
48.3ug/L	100	100	
69.4ug/L	100	100	
101ug/L	100	100	
149ug/L	0.00	0.00	*
245ug/L	0.00	0.00	*

*Significant difference compared to the control (p=0.05)

Ceriodaphnia dubia
Survival Data

Number of organisms per chamber: 5
Volume of test chamber: 30 ml

Age of organisms: <24 hours
Volume of test solution: 15 ml

Effluent Concentration		Number of Survivors 24 Hours	Number of Survivors 48 Hours	% Survival	CV %
Control	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
36.0ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
48.3ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
69.4ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
101ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
149ug/L	rep. A	0	0	0.00	0.00
	rep. B	0	0		
	rep. C	0	0		
	rep. D	0	0		
245ug/L	rep. A	0	0	0.00	0.00
	rep. B	0	0		
	rep. C	0	0		
	rep. D	0	0		

CV = Coefficient of variance = standard deviation X 100/mean

Ceriodaphnia dubia

Transformation of Data — Transform: Arc Sin(Square Root(Y))

Group	Identification	Rep	Value	Transformed
1	Control	1	1.00000	1.34530
1	Control	2	1.00000	1.34530
1	Control	3	1.00000	1.34530
1	Control	4	1.00000	1.34530
2	36ug/L	1	1.00000	1.34530
2	36ug/L	2	1.00000	1.34530
2	36ug/L	3	1.00000	1.34530
2	36ug/L	4	1.00000	1.34530
3	48.3ug/L	1	1.00000	1.34530
3	48.3ug/L	2	1.00000	1.34530
3	48.3ug/L	3	1.00000	1.34530
3	48.3ug/L	4	1.00000	1.34530
4	69.4ug/L	1	1.00000	1.34530
4	69.4ug/L	2	1.00000	1.34530
4	69.4ug/L	3	1.00000	1.34530
4	69.4ug/L	4	1.00000	1.34530
5	101ug/L	1	1.00000	1.34530
5	101ug/L	2	1.00000	1.34530
5	101ug/L	3	1.00000	1.34530
5	101ug/L	4	1.00000	1.34530
6	149ug/L	1	0.00000	0.22551
6	149ug/L	2	0.00000	0.22551
6	149ug/L	3	0.00000	0.22551
6	149ug/L	4	0.00000	0.22551
7	245ug/L	1	0.00000	0.22551
7	245ug/L	2	0.00000	0.22551
7	245ug/L	3	0.00000	0.22551
7	245ug/L	4	0.00000	0.22551

Ceriodaphnia dubia

Shapiro - Wilk's Test for Normality		Transform: Arc Sin(Square Root(Y))
D = 0		
W = 0		
Critical W = 0.896	(alpha = 0.01, N = 28)	
Critical W = 0.924	(alpha = 0.05, N = 28)	

Data FAIL normality test (alpha = 0.01).

Steel's Many-One Rank Test — Transform: Arc Sin(Square Root(Y))

Ho:Control<Treatment

Group	Identification	Rank Sum	Critical Value	DF	Sig 0.05
1	Control				
2	36ug/L	18.00	10.00	4.00	
3	48.3ug/L	18.00	10.00	4.00	
4	69.4ug/L	18.00	10.00	4.00	
5	101ug/L	18.00	10.00	4.00	
6	149ug/L	10.00	10.00	4.00	*
7	245ug/L	10.00	10.00	4.00	*

Critical values are 1 tailed (k=6)

Ceriodaphnia dubia

Graphical LC50 Method

Concentration	Number Exposed	Number Responding	Proportion Responding	Smoothed Proportion	Smoothed Adjusted Proportion
Control	20	0	0	0	0
36	20	0	0	0	0
48.3	20	0	0	0	0
69.4	20	0	0	0	0
101	20	0	0	0	0
149	20	20	1	1	1
245	20	20	1	1	1

LC50 = 123

Chemical Data for
Ceriodaphnia dubia

Day 1		Control	36.0ug/L	48.3ug/L	69.4ug/L	101ug/L	149ug/L	245ug/L
DO, mg/l	Initial	8.1	8.3	8.4	8.2	8.0	8.3	8.0
DO, mg/l	Final 1*	4.7	4.0	4.1	3.8	4.4	3.9	3.8
DO, mg/l	Final 2*	3.8	3.1	3.3	3.6	3.4	4.0	3.9
pH, su	Initial	7.2	7.2	7.2	7.2	7.2	7.2	7.2
pH, su	Final 1*	7.5	7.6	7.5	7.5	7.5	7.6	7.5
pH, su	Final 2*	7.7	7.7	7.7	7.7	7.7	7.7	7.8
Alkalinity, mg/l		14	NA	NA	NA	NA	NA	NA
Hardness, mg/l		77	NA	NA	NA	NA	NA	NA
Conductivity, umho/cm		340	NA	NA	NA	NA	NA	NA

GBM^c & Associates
219 Brown Ln.
Bryant, AR 72022
(501) 847-7077 Fax (501) 847-7943

Chain of Custody

204166

Report: jbrown@gbmcassoc.com

Client/Billing Information		SPECIAL INSTRUCTIONS/PRECAUTIONS:
Client:	Jonathan Brown	Composite samples according to flows listed below and perform
Company:	GBM^c & Assoc.	WER study (using attached tables) for Total and Dissolved Copper
Address:	219 Brown Lane	Ceriodaphnia only. Additional parameters on composite only.
	Bryant, Arkansas, 72022	Project Name / Number:
Phone No.:	501-847-7077	Idabel WER
Fax No.:	501-847-7943	3040-15-050

Sample ID	Sample Description	Date	Time	Matrix S=Sed/Soil W=Water	Number of Containers	Composite or Grab	Parameters for Analysis/Methods: Total / Dissolved Copper	WER Study	Hardness, Alkalinity, Conductivity	TOC, DOC, TSS, TDS			
TB	Trip Blank	7/26/16	0645	W	1	G	X						
001-TD	Morales Grab		0655	W	1	G	X						
001-1	Flow - 0.652 MGD		0700	W	1	G	X	X	X	X			
001-2	Flow - 0.922 MGD		0900	W	1	G	X	X	X	X			
001-3	Flow - 0.866 MGD		1100	W	1	G	X	X	X	X			
001-4	Flow - 1.277 MGD	↓	1300	W	1	G	X	X	X	X			
Preservative	(Sulfuric acid =S, Nitric acid =N, NaOH =B, Ice =I)						I	I	I	I			

Composite

Composite

Sampler(s): JBB	Shipment Method: Hand Delivered	Turnaround Time Required: Standard	
COC Completed by: JBB	Date: 7/27/16 Time: 0900	COC Checked by: [illegible]	Date: ~~7/27/16~~ 7/27/16 Time: 950
Relinquished by: JBB	Date: 7/27/16 Time: 1012	Received by:	Date: Time:
Relinquished by:	Date: Time:	Received in lab by: DANNY [illegible]	Date: 7-27-16 Time: 10:13
LABORATORY USE ONLY:	Samples Received On Ice?: (YES) or NO	Sample Temperature: 0.1°c	

204166

Concentrations for WER Test #1

Please perform a WER Study using concentrations listed below. The rangefinding should be conducted for copper using Ceriodaphnia. Analyses should be performed so that a WER can be calculated for both total and dissolved copper. The analysis of additional parameters should include: Hardness, Alkalinity, TOC, DOC, Conductivity, TSS, and TDS.

Copper Ceriodaphnia
(0.65 Dilution Ratio)

SWM	Lab Water
Cu (µg/L)	Cu (µg/L)
250	15
163	10
106	6
69	4
45	3
29	2
0 (Control)	0 (Control)

204166

Table 1. Analytical methods to be followed during the WER study.

Parameter	Method	Preservative[1]	Holding Time
Total Copper	EPA200.7/200.8	4 °C, HNO_3	6 Months
Dissolved Copper	EPA200.7/200.8	4 °C, HNO_3	6 Months
T. Hardness	EPA200.8	4 °C, HNO_3	6 Months
T. Alkalinity	SM 2320B	4 °C	14 Days
TSS	SM2540D	4 °C	7 Days
TOC	SM5310C	4 °C, H_2SO4	28 Days
DOC	SM5310C	4 °C	28 Days
TDS	SM2540C	4 °C	7 Days

[1]All chemical preservatives added after sample composite and/or dilution sub-sampling.

Table 2. Analysis to be conducted in conjunction with the WER toxicity testing.[1]

	Water Sample Source		
Analytical Parameter	Effluent (SWM)	Lab water	Selected spiked test dilutions[2,3]
Total Copper	X	X	X
Dissolved Copper	X	X	X
Total Hardness	X	X	
Total Alkalinity	X	X	
pH	X	X	X
TSS	X	X	
TOC	X	X	
DOC	X	X	
Specific conductance	X	X	X
TDS	X		
Dissolved oxygen		X	X
Temperature		X	X
Routine DMR parameters	Routine parameters will be analyzed by the permittee as part of routine monitoring on the same day as WER study samples are collected. Routine parameters include BOD, TSS, NH3-N, DO, Chlorides, Sulfates, TDS, T. Cadmium, T. Chromium, T. Copper, T. Selenium, T. Silver, T. Zinc, pH.		

[1] The normal battery of chemistry completed for routine biomonitoring tests (pH, temperature, conductivity, dissolved oxygen, etc.) should be completed during each WER test.

[2] At a minimum the test treatments that bracket the LC50 must be tested for these parameters. The lowest treatment that exhibited 100% mortality, the highest treatment that exhibited no effect and the control should each also be tested for these parameters.

[3] Dilutions will be prepared using copper sulfate.

204166

Table 5. Summary of test conditions for copper WER toxicity testing.

Parameter	Test condition (Lab Water)	Test Condition (Site Water Mix)
Test Type	48-h Acute static non-renewal	48-h Acute static non-renewal
Chemical Test	Copper	Copper
Temperature	25°C	25°C
Light Quality	Ambient Laboratory	Ambient Laboratory
Light Intensity	50-100 ft-c	50-100 ft-c
Photoperiod	16h light, 8h dark	16h light, 8h dark
Test Chamber Type	30 mL minimum	30 mL minimum
Test Solution Volume	15 mL minimum	15 mL minimum
Solution Renewal	None[1]	None[1]
Age of Test Organisms	<24-h	<24-h
No. Organisms/Chamber	5	5
No. of Replicate Chambers	4	4
Feeding Regime	None	None
Aeration	None	None
Dilution Water (Test Water)	Moderately Hard Reconstituted	100% Effluent
Dilution Ratio	0.65	0.65
Number of treatments[2] (metal concentrations)	6 treatments (15, 9.8, 6.3, 4.1, 2.7, 1.7 µg/L)	To be determined by range finding test.
Highest Copper Concentration	15 µg/L	To be determined by range finding test.

[1] Copper concentration will be measured in the test solution before test initiation and at the conclusion of the testing.

[2] Treatment number and concentration may vary based on results of first WER testing.

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
219 Brown Lane
Bryant, AR 72022

Re: Acute 48 hour Non-Renewal Biomonitoring utilizing *Ceriodaphnia dubia*
Synthetic Water Total Copper

Dilution Water Samples: Synthetic Water

Analysis	Result
Dissolved oxygen (mg/l)	7.7
pH (standard units)	8.4
Alkalinity (mg/l as CaCO3)	62
Hardness (mg/l as CaCO3)	98
Conductivity (umhos/cm)	320
Residual Chlorine (mg/l)	<0.05

Results Summary: Synthetic Water Total Copper

Ceriodaphnia dubia

The *Ceriodaphnia dubia* test was conducted from 27-JUL-2016 at 1605 to 29-JUL-2016 at 1420.

Statistical analyses:

NOEC = 5.86ug/L
LC50 = 7.63ug/L

Concentration	24 hour % Survival	48 hour % Survival	
Control	100	100	
2.85ug/L	100	100	
3.44ug/L	100	100	
4.61ug/L	100	100	
5.86ug/L	100	100	
8.82ug/L	20.0	15.0	*
12.9ug/L	0.00	0.00	*

*Significant difference compared to the control (p=0.05)

Ceriodaphnia dubia
Survival Data

Number of organisms per chamber: 5
Volume of test chamber: 30 ml

Age of organisms: <24 hours
Volume of test solution: 15 ml

Effluent Concentration		Number of Survivors 24 Hours	Number of Survivors 48 Hours	% Survival	CV %
Control	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
2.85ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
3.44ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
4.61ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
5.86ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
8.82ug/L	rep. A	0	0	15.0	128
	rep. B	2	1		
	rep. C	2	2		
	rep. D	0	0		
12.9ug/L	rep. A	0	0	0.00	0.00
	rep. B	0	0		
	rep. C	0	0		
	rep. D	0	0		

CV = Coefficient of variance = standard deviation X 100/mean

Ceriodaphnia dubia

Transformation of Data — Transform: Arc Sin(Square Root(Y))

Group	Identification	Rep	Value	Transformed
1	Control	1	1.00000	1.34530
1	Control	2	1.00000	1.34530
1	Control	3	1.00000	1.34530
1	Control	4	1.00000	1.34530
2	2.85ug/L	1	1.00000	1.34530
2	2.85ug/L	2	1.00000	1.34530
2	2.85ug/L	3	1.00000	1.34530
2	2.85ug/L	4	1.00000	1.34530
3	3.44ug/L	1	1.00000	1.34530
3	3.44ug/L	2	1.00000	1.34530
3	3.44ug/L	3	1.00000	1.34530
3	3.44ug/L	4	1.00000	1.34530
4	4.61ug/L	1	1.00000	1.34530
4	4.61ug/L	2	1.00000	1.34530
4	4.61ug/L	3	1.00000	1.34530
4	4.61ug/L	4	1.00000	1.34530
5	5.86ug/L	1	1.00000	1.34530
5	5.86ug/L	2	1.00000	1.34530
5	5.86ug/L	3	1.00000	1.34530
5	5.86ug/L	4	1.00000	1.34530
6	8.82ug/L	1	0.00000	0.22551
6	8.82ug/L	2	0.20000	0.46365
6	8.82ug/L	3	0.40000	0.68472
6	8.82ug/L	4	0.00000	0.22551
7	12.9ug/L	1	0.00000	0.22551
7	12.9ug/L	2	0.00000	0.22551
7	12.9ug/L	3	0.00000	0.22551
7	12.9ug/L	4	0.00000	0.22551

Ceriodaphnia dubia

Shapiro - Wilk's Test for Normality		Transform: Arc Sin(Square Root(Y))
D = 0.146		
W = 0.4993		
Critical W = 0.896	(alpha = 0.01, N = 28)	
Critical W = 0.924	(alpha = 0.05, N = 28)	

Data FAIL normality test (alpha = 0.01).

Steel's Many-One Rank Test					Transform: Arc Sin(Square Root(Y))
Ho:Control<Treatment					
Group	Identification	Rank Sum	Critical Value	DF	Sig 0.05
1	Control				
2	2.85ug/L	18.00	10.00	4.00	
3	3.44ug/L	18.00	10.00	4.00	
4	4.61ug/L	18.00	10.00	4.00	
5	5.86ug/L	18.00	10.00	4.00	
6	8.82ug/L	10.00	10.00	4.00	*
7	12.9ug/L	10.00	10.00	4.00	*

Critical values are 1 tailed (k=6)

Ceriodaphnia dubia

Spearman-Karber Method for Calculating LC50 Values

Concentration	Number Exposed	Number Responding	Proportion Responding	Smoothed Proportion	Smoothed Adjusted Proportion
Control	20	0	0	0	0
2.85	20	0	0	0	0
3.44	20	0	0	0	0
4.61	20	0	0	0	0
5.86	20	0	0	0	0
8.82	20	17	0.85	0.85	0.85
12.9	20	20	1	1	1

LC50 = 7.628
Upper Confidence Limit = 8.137
Lower Confidence Limit = 7.15

Variance = 0.000197

Chemical Data for
Ceriodaphnia dubia

Day 1		Control	2.85ug/L	3.44ug/L	4.61ug/L	5.86ug/L	8.82ug/L	12.9ug/L
DO, mg/l	Initial	7.7	7.8	7.7	7.7	7.8	7.9	7.9
DO, mg/l	Final 1*	4.3	3.9	3.5	3.7	4.1	4.1	4.0
DO, mg/l	Final 2*	3.7	3.9	3.8	3.6	3.9	3.5	3.5
pH, su	Initial	8.4	8.5	8.5	8.5	8.5	8.5	8.5
pH, su	Final 1*	8.3	8.2	8.2	8.2	8.3	8.1	8.1
pH, su	Final 2*	8.4	8.4	8.4	8.3	8.4	8.3	8.2
Alkalinity, mg/l		62	NA	NA	NA	NA	NA	NA
Hardness, mg/l		98	NA	NA	NA	NA	NA	NA
Conductivity, umho/cm		320	320	320	330	330	330	330
Residual Chlorine, mg/l		<0.05	NA	NA	NA	NA	NA	NA

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
219 Brown Lane
Bryant, AR 72022

Re: Acute 48 hour Non-Renewal Biomonitoring utilizing *Ceriodaphnia dubia*
Outfall 001 Dissolved Copper

Dilution Water Samples: Outfall 001

Analysis	Result
Dissolved oxygen (mg/l)	8.1
pH (standard units)	7.2
Alkalinity (mg/l as CaCO3)	14
Hardness (mg/l as CaCO3)	77
Conductivity (umhos/cm)	340
Residual Chlorine (mg/l)	NA

Results Summary: Outfall 001 Dissolved Copper

Ceriodaphnia dubia

The *Ceriodaphnia dubia* test was conducted from 27-JUL-2016 at 1615 to 29-JUL-2016 at 1430.

Statistical analyses:

NOEC = 83.2ug/L
LC50 = 100ug/L

Concentration	24 hour % Survival	48 hour % Survival	
Control	100	100	
30.7ug/L	100	100	
39.7ug/L	100	100	
57.1ug/L	100	100	
83.2ug/L	100	100	
121ug/L	0.00	0.00	*
185ug/L	0.00	0.00	*

*Significant difference compared to the control (p=0.05)

Ceriodaphnia dubia
Survival Data

Number of organisms per chamber: 5
Volume of test chamber: 30 ml

Age of organisms: <24 hours
Volume of test solution: 15 ml

Effluent Concentration		Number of Survivors 24 Hours	Number of Survivors 48 Hours	% Survival	CV %
Control	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
30.7ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
39.7ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
57.1ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
83.2ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
121ug/L	rep. A	0	0	0.00	0.00
	rep. B	0	0		
	rep. C	0	0		
	rep. D	0	0		
185ug/L	rep. A	0	0	0.00	0.00
	rep. B	0	0		
	rep. C	0	0		
	rep. D	0	0		

CV = Coefficient of variance = standard deviation X 100/mean

Ceriodaphnia dubia

Transformation of Data — Transform: Arc Sin(Square Root(Y))

Group	Identification	Rep	Value	Transformed
1	Control	1	1.00000	1.34530
1	Control	2	1.00000	1.34530
1	Control	3	1.00000	1.34530
1	Control	4	1.00000	1.34530
2	30.7ug/L	1	1.00000	1.34530
2	30.7ug/L	2	1.00000	1.34530
2	30.7ug/L	3	1.00000	1.34530
2	30.7ug/L	4	1.00000	1.34530
3	39.7ug/L	1	1.00000	1.34530
3	39.7ug/L	2	1.00000	1.34530
3	39.7ug/L	3	1.00000	1.34530
3	39.7ug/L	4	1.00000	1.34530
4	57.1ug/L	1	1.00000	1.34530
4	57.1ug/L	2	1.00000	1.34530
4	57.1ug/L	3	1.00000	1.34530
4	57.1ug/L	4	1.00000	1.34530
5	83.2ug/L	1	1.00000	1.34530
5	83.2ug/L	2	1.00000	1.34530
5	83.2ug/L	3	1.00000	1.34530
5	83.2ug/L	4	1.00000	1.34530
6	121ug/L	1	0.00000	0.22551
6	121ug/L	2	0.00000	0.22551
6	121ug/L	3	0.00000	0.22551
6	121ug/L	4	0.00000	0.22551
7	185ug/L	1	0.00000	0.22551
7	185ug/L	2	0.00000	0.22551
7	185ug/L	3	0.00000	0.22551
7	185ug/L	4	0.00000	0.22551

Ceriodaphnia dubia

Shapiro - Wilk's Test for Normality		Transform: Arc Sin(Square Root(Y))
D = 0		
W = 0		
Critical W = 0.896	(alpha = 0.01, N = 28)	
Critical W = 0.924	(alpha = 0.05, N = 28)	

Data FAIL normality test (alpha = 0.01).

Steel's Many-One Rank Test					Transform: Arc Sin(Square Root(Y))
Ho:Control<Treatment					
Group	Identification	Rank Sum	Critical Value	DF	Sig 0.05
1	Control				
2	30.7ug/L	18.00	10.00	4.00	
3	39.7ug/L	18.00	10.00	4.00	
4	57.1ug/L	18.00	10.00	4.00	
5	83.2ug/L	18.00	10.00	4.00	
6	121ug/L	10.00	10.00	4.00	*
7	185ug/L	10.00	10.00	4.00	*

Critical values are 1 tailed (k=6)

Ceriodaphnia dubia

Graphical LC50 Method

Concentration	Number Exposed	Number Responding	Proportion Responding	Smoothed Proportion	Smoothed Adjusted Proportion
Control	20	0	0	0	0
30.7	20	0	0	0	0
39.7	20	0	0	0	0
57.1	20	0	0	0	0
83.2	20	0	0	0	0
121	20	20	1	1	1
185	20	20	1	1	1

LC50 = 100

Chemical Data for
Ceriodaphnia dubia

Day 1		Control	30.7ug/L	39.7ug/L	57.1ug/L	83.2ug/L	121ug/L	185ug/L
DO, mg/l	Initial	8.1	8.3	8.4	8.2	8.0	8.3	8.0
DO, mg/l	Final	4.7	4.0	4.1	3.8	4.4	3.9	3.8
pH, su	Initial	7.2	7.2	7.2	7.2	7.2	7.2	7.2
pH, su	Final	7.5	7.5	7.6	7.5	7.5	7.5	7.5
Alkalinity, mg/l		14	NA	NA	NA	NA	NA	NA
Hardness, mg/l		77	NA	NA	NA	NA	NA	NA
Conductivity, umho/cm		340	NA	NA	NA	NA	NA	NA

Day 2		Control	30.7ug/L	39.7ug/L	57.1ug/L	83.2ug/L	121ug/L	185ug/L
DO, mg/l	Final	3.8	3.1	3.3	3.6	3.4	4.0	3.9
pH, su	Final	7.7	7.7	7.7	7.7	7.7	7.7	7.8

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
219 Brown Lane
Bryant, AR 72022

Re: Acute 48 hour Biomonitoring utilizing *Ceriodaphnia dubia*
Synthetic Water Dissolved Copper

Dilution Water Samples: Synthetic Water

Analysis	Result
Dissolved oxygen (mg/l)	7.7
pH (standard units)	8.4
Alkalinity (mg/l as CaCO3)	62
Hardness (mg/l as CaCO3)	98
Conductivity (umhos/cm)	320
Residual Chlorine (mg/l)	<0.05

Results Summary: Synthetic Water Dissolved Copper
Ceriodaphnia dubia

The *Ceriodaphnia dubia* test was conducted from 27-JUL-2016 at 1605 to 27-JUL-2016 at 1420.
Statistical analyses:
NOEC = 5.29ug/L
LC50 = 7.08ug/L

Concentration	24 hour % Survival	48 hour % Survival	
Control	100	100	
2.65ug/L	100	100	
3.19ug/L	100	100	
4.17ug/L	100	100	
5.29ug/L	100	100	
8.33ug/L	20.0	15.0	*
12.6ug/L	0.00	0.00	*

*Significant difference compared to the control (p=0.05)

Ceriodaphnia dubia
Survival Data

Number of organisms per chamber: 5
Volume of test chamber: 30 ml

Age of organisms: <24 hours
Volume of test solution: 15 ml

Effluent Concentration		Number of Survivors 24 Hours	Number of Survivors 48 Hours	% Survival	CV %
Control	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
2.65ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
3.19ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
4.17ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
5.29ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
8.33ug/L	rep. A	0	0	15.0	128
	rep. B	2	1		
	rep. C	2	2		
	rep. D	0	0		
12.6ug/L	rep. A	0	0	0.00	0.00
	rep. B	0	0		
	rep. C	0	0		
	rep. D	0	0		

CV = Coefficient of variance = standard deviation X 100/mean

Ceriodaphnia dubia

		Transformation of Data		Transform: Arc Sin(Square Root(Y))
Group	Identification	Rep	Value	Transformed
1	Control	1	1.00000	1.34530
1	Control	2	1.00000	1.34530
1	Control	3	1.00000	1.34530
1	Control	4	1.00000	1.34530
2	2.65ug/L	1	1.00000	1.34530
2	2.65ug/L	2	1.00000	1.34530
2	2.65ug/L	3	1.00000	1.34530
2	2.65ug/L	4	1.00000	1.34530
3	3.19ug/L	1	1.00000	1.34530
3	3.19ug/L	2	1.00000	1.34530
3	3.19ug/L	3	1.00000	1.34530
3	3.19ug/L	4	1.00000	1.34530
4	4.17ug/L	1	1.00000	1.34530
4	4.17ug/L	2	1.00000	1.34530
4	4.17ug/L	3	1.00000	1.34530
4	4.17ug/L	4	1.00000	1.34530
5	5.29ug/L	1	1.00000	1.34530
5	5.29ug/L	2	1.00000	1.34530
5	5.29ug/L	3	1.00000	1.34530
5	5.29ug/L	4	1.00000	1.34530
6	8.33ug/L	1	0.00000	0.22551
6	8.33ug/L	2	0.20000	0.46365
6	8.33ug/L	3	0.40000	0.68472
6	8.33ug/L	4	0.00000	0.22551
7	12.6ug/L	1	0.00000	0.22551
7	12.6ug/L	2	0.00000	0.22551
7	12.6ug/L	3	0.00000	0.22551
7	12.6ug/L	4	0.00000	0.22551

Ceriodaphnia dubia

Shapiro - Wilk's Test for Normality		Transform: Arc Sin(Square Root(Y))
D = 0.146		
W = 0.4993		
Critical W = 0.896	(alpha = 0.01, N = 28)	
Critical W = 0.924	(alpha = 0.05, N = 28)	

Data FAIL normality test (alpha = 0.01).

Steel's Many-One Rank Test					Transform: Arc Sin(Square Root(Y))
Ho:Control<Treatment					
Group	Identification	Rank Sum	Critical Value	DF	Sig 0.05
1	Control				
2	2.65ug/L	18.00	10.00	4.00	
3	3.19ug/L	18.00	10.00	4.00	
4	4.17ug/L	18.00	10.00	4.00	
5	5.29ug/L	18.00	10.00	4.00	
6	8.33ug/L	10.00	10.00	4.00	*
7	12.6ug/L	10.00	10.00	4.00	*

Critical values are 1 tailed (k=6)

Ceriodaphnia dubia

Spearman-Karber Method for Calculating LC50 Values

Concentration	Number Exposed	Number Responding	Proportion Responding	Smoothed Proportion	Smoothed Adjusted Proportion
Control	20	0	0	0	0
2.65	20	0	0	0	0
3.19	20	0	0	0	0
4.17	20	0	0	0	0
5.29	20	0	0	0	0
8.33	20	17	0.85	0.85	0.85
12.6	20	20	1	1	1

LC50 = 7.085
Upper Confidence Limit = 7.607
Lower Confidence Limit = 6.598

Variance = 0.0002383

Chemical Data for
Ceriodaphnia dubia

Day 1		Control	2.65ug/L	3.19ug/L	4.17ug/L	5.29ug/L	8.33ug/L	12.6ug/L
DO, mg/l	Initial	7.7	7.8	7.7	7.7	7.8	7.9	7.9
DO, mg/l	Final	4.3	3.9	3.5	3.7	4.1	4.1	4.0
pH, su	Initial	8.4	8.5	8.5	8.5	8.5	8.5	8.5
pH, su	Final	8.3	8.2	8.2	8.2	8.3	8.1	8.1
Alkalinity, mg/l		62	NA	NA	NA	NA	NA	NA
Hardness, mg/l		98	NA	NA	NA	NA	NA	NA
Conductivity, umho/cm		320	320	320	330	330	330	330
Residual Chlorine, mg/l		<0.05	NA	NA	NA	NA	NA	NA

Day 2		Control	2.65ug/L	3.19ug/L	4.17ug/L	5.29ug/L	8.33ug/L	12.6ug/L
DO, mg/l	Final	3.7	3.9	3.8	3.6	3.9	3.5	3.5
pH, su	Final	8.4	8.4	8.4	8.3	8.4	8.3	8.2

AMERICAN INTERPLEX CORPORATION
LABORATORIES

August 12, 2016
Control No. 204164

GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
219 Brown Lane
Bryant, AR 72022

This report contains the analytical results and supporting information for samples submitted on July 27, 2016. Attached please find a copy of the Chain of Custody and/or other documents received. Note that any remaining sample will be discarded two weeks from the original report date unless other arrangements are made.

This report is intended for the sole use of the client listed above. Assessment of the data requires access to the entire document.

This report has been reviewed by the Chief Operating Officer or a qualified designee.

John Overbey
Chief Operating Officer

This document has been distributed to the following:

PDF cc: GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
jbrown@gbmcassoc.com

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

SAMPLE INFORMATION

Project Description:
Six (6) water sample(s) received on July 27, 2016
Idabel WER
3040-15-050

Receipt Details:
A Chain of Custody was provided. The samples were delivered in one (1) ice chest.

Each sample container was checked for proper labeling, including date and time sampled. Sample containers were reviewed for proper type, adequate volume, integrity, temperature, preservation, and holding times. Any exceptions are noted below:

Sample Identification:

Laboratory ID	Client Sample ID	Sampled Date/Time	Notes
204164-1	Trip Blank	26-Jul-2016 0645	
204164-2	Metals Grab	26-Jul-2016 0655	
204164-3	001-1,2,3,4	26-Jul-2016 1300	
204164-4	Moderately Hard Water #4345		
204164-5	Effluent Spiking 250 ppb INITIAL		
204164-6	Effluent Spiking 250 ppb FINAL		
204164-7	Effluent Spiking 162 ppb INITIAL		
204164-8	Effluent Spiking 162 ppb FINAL		
204164-9	Effluent Spiking 106 ppb INITIAL		
204164-10	Effluent Spiking 106 ppb FINAL		
204164-11	Effluent Spiking 68.7 ppb INITIAL		
204164-12	Effluent Spiking 68.7 ppb FINAL		
204164-13	Effluent Spiking 44.6 ppb INITIAL		
204164-14	Effluent Spiking 44.6 ppb FINAL		
204164-15	Effluent Spiking 29.0 ppb INITIAL		
204164-16	Effluent Spiking 29.0 ppb FINAL		
204164-19	Synthetic MOD Water spiking 15.0 ppb INITIAL		
204164-20	Synthetic MOD Water spiking 15.0 ppb FINAL		
204164-21	Synthetic MOD Water spiking 9.75 ppb INITIAL		
204164-22	Synthetic MOD Water spiking 9.75 ppb FINAL		
204164-23	Synthetic MOD Water spiking 6.34 ppb INITIAL		
204164-24	Synthetic MOD Water spiking 6.34 ppb FINAL		
204164-25	Synthetic MOD Water spiking 4.12 ppb INITIAL		
204164-26	Synthetic MOD Water spiking 4.12 ppb FINAL		
204164-27	Synthetic MOD Water spiking 2.67 ppb INITIAL		
204164-28	Synthetic MOD Water spiking 2.67 ppb FINAL		
204164-29	Synthetic MOD Water spiking 1.74 ppb INITIAL		
204164-30	Synthetic MOD Water spiking 1.74 ppb FINAL		

Qualifiers:
H Analytical holding time exceeded regulatory requirements

Case Narrative:
Table II of 40 CFR Part 136.3 indicates analysis of pH, Total Residual Chlorine, and Dissolved Oxygen are to be performed on site or immediately after collection. American Interplex Corporation analyzes these parameters as soon as possible after laboratory receipt.

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

SAMPLE INFORMATION

References:

"Methods for Chemical Analysis of Water and Wastes", EPA/600/4-79-020 (Mar 1983) with updates and supplements EPA/600/5-91-010 (Jun 1991), EPA/600/R-92-129 (Aug 1992) and EPA/600/R-93-100 (Aug 1993).
"Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846)", Third Edition.
"Standard Methods for the Examination of Water and Wastewaters", (SM).
"American Society for Testing and Materials" (ASTM).
"Association of Analytical Chemists" (AOAC).

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

ANALYTICAL RESULTS

AIC No. 204164-1
Sample Identification: Trip Blank 26-Jul-2016 0645

Analyte		Result	RL	Units	Qualifier
Copper		**< 1**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1335 by 235		Batch: S41484	
Dissolved Copper		**< 1**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1332 by 235		Batch: S41484	

AIC No. 204164-2
Sample Identification: Metals Grab 26-Jul-2016 0655

Analyte		Result	RL	Units	Qualifier
Copper		**5.47**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1341 by 235		Batch: S41484	
Dissolved Copper		**4.10**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1338 by 235		Batch: S41484	

AIC No. 204164-3
Sample Identification: 001-1,2,3,4 26-Jul-2016 1300

Analyte		Result	RL	Units	Qualifier
Alkalinity as CaCO3		**14**	1	**mg/l**	
SM 2320 B 1997		Analyzed: 02-Aug-2016 1004 by 93		Batch: W56712	
Specific Conductance		**340**	2	**umho/cm**	
SM 2510 B 1997	Prep: 27-Jul-2016 1512 by 301	Analyzed: 27-Jul-2016 1523 by 301		Batch: W56657	
Total Dissolved Solids		**320**	10	**mg/l**	
SM 2540 C 1997	Prep: 28-Jul-2016 1051 by 100	Analyzed: 29-Jul-2016 1516 by 100		Batch: W56667	
pH		**6.3**		**Units**	H
SM 4500-H+ B 2000	Prep: 27-Jul-2016 1533 by 319	Analyzed: 27-Jul-2016 1632 by 319		Batch: W56658	
Total Organic Carbon		**9.0**	1	**mg/l**	
SM 5310 C 2000	Prep: 27-Jul-2016 1453 by 301	Analyzed: 11-Aug-2016 0923 by 301		Batch: W56648	
Total Suspended Solids		**4.4**	4	**mg/l**	
USGS 3765	Prep: 28-Jul-2016 1334 by 100	Analyzed: 29-Jul-2016 0935 by 100		Batch: W56668	
Copper		**5.71**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1416 by 235		Batch: S41484	
Hardness as CaCO3		**77**	1	**mg/l**	
SM 2340 B 1997	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1608 by 308		Batch: S41482	
Dissolved Organic Carbon		**7.9**	1	**mg/l**	
SM 5310 C 2000	Prep: 27-Jul-2016 1453 by 301	Analyzed: 11-Aug-2016 1522 by 301		Batch: W56648	
Dissolved Copper		**4.44**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1414 by 235		Batch: S41484	

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ANALYTICAL RESULTS

AIC No. 204164-4
Sample Identification: Moderately Hard Water #4345

Analyte		Result	RL	Units	Qualifier
Alkalinity as CaCO3 SM 2320 B 1997		**62** Analyzed: 02-Aug-2016 1004 by 93	1	**mg/l** Batch: W56712	
Specific Conductance SM 2510 B 1997	Prep: 27-Jul-2016 1512 by 301	**320** Analyzed: 27-Jul-2016 1523 by 301	2	**umho/cm** Batch: W56657	
Total Dissolved Solids SM 2540 C 1997	Prep: 28-Jul-2016 1051 by 100	**200** Analyzed: 29-Jul-2016 1516 by 100	10	**mg/l** Batch: W56667	
pH SM 4500-H+ B 2000	Prep: 27-Jul-2016 1533 by 319	**7.6** Analyzed: 27-Jul-2016 1632 by 319		**Units** Batch: W56658	
Total Organic Carbon SM 5310 C 2000	Prep: 27-Jul-2016 1453 by 301	**< 1** Analyzed: 10-Aug-2016 1744 by 301	1	**mg/l** Batch: W56648	
Total Suspended Solids USGS 3765	Prep: 28-Jul-2016 1334 by 100	**< 4** Analyzed: 29-Jul-2016 0935 by 100	4	**mg/l** Batch: W56668	
Copper EPA 200.8	Prep: 27-Jul-2016 1200 by 235	**< 1** Analyzed: 27-Jul-2016 1324 by 235	1	**ug/l** Batch: S41484	
Hardness as CaCO3 SM 2340 B 1997	Prep: 27-Jul-2016 1200 by 235	**97.8** Analyzed: 27-Jul-2016 1233 by 235	1	**mg/l** Batch: S41482	
Dissolved Organic Carbon SM 5310 C 2000	Prep: 27-Jul-2016 1453 by 301	**< 1** Analyzed: 11-Aug-2016 1534 by 301	1	**mg/l** Batch: W56648	
Dissolved Copper EPA 200.8	Prep: 27-Jul-2016 1200 by 235	**< 1** Analyzed: 27-Jul-2016 1321 by 235	1	**ug/l** Batch: S41484	

AIC No. 204164-5
Sample Identification: Effluent Spiking 250 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper EPA 200.8	Prep: 27-Jul-2016 1200 by 235	**245** Analyzed: 27-Jul-2016 1457 by 235	1	**ug/l** Batch: S41484	
Dissolved Copper EPA 200.8	Prep: 27-Jul-2016 1200 by 235	**185** Analyzed: 27-Jul-2016 1454 by 235	1	**ug/l** Batch: S41484	

AIC No. 204164-6
Sample Identification: Effluent Spiking 250 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper EPA 200.8	Prep: 29-Jul-2016 1540 by 235	**250** Analyzed: 29-Jul-2016 1727 by 235	1	**ug/l** Batch: S41501	
Dissolved Copper EPA 200.8	Prep: 29-Jul-2016 1540 by 235	**204** Analyzed: 29-Jul-2016 1724 by 235	1	**ug/l** Batch: S41501	

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ANALYTICAL RESULTS

AIC No. 204164-7
Sample Identification: Effluent Spiking 162 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**149**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1502 by 235		Batch: S41484	
Dissolved Copper		**121**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1500 by 235		Batch: S41484	

AIC No. 204164-8
Sample Identification: Effluent Spiking 162 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**154**	1	**ug/l**	
EPA 200.8	Prep: 29-Jul-2016 1540 by 235	Analyzed: 29-Jul-2016 1732 by 235		Batch: S41501	
Dissolved Copper		**129**	1	**ug/l**	
EPA 200.8	Prep: 29-Jul-2016 1540 by 235	Analyzed: 29-Jul-2016 1729 by 235		Batch: S41501	

AIC No. 204164-9
Sample Identification: Effluent Spiking 106 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**101**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1508 by 235		Batch: S41484	
Dissolved Copper		**83.2**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1505 by 235		Batch: S41484	

AIC No. 204164-10
Sample Identification: Effluent Spiking 106 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**115**	1	**ug/l**	
EPA 200.8	Prep: 29-Jul-2016 1540 by 235	Analyzed: 29-Jul-2016 1743 by 235		Batch: S41501	
Dissolved Copper		**94.5**	1	**ug/l**	
EPA 200.8	Prep: 29-Jul-2016 1540 by 235	Analyzed: 29-Jul-2016 1740 by 235		Batch: S41501	

AIC No. 204164-11
Sample Identification: Effluent Spiking 68.7 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**69.4**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1513 by 235		Batch: S41484	
Dissolved Copper		**57.1**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1511 by 235		Batch: S41484	

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ANALYTICAL RESULTS

AIC No. 204164-12
Sample Identification: Effluent Spiking 68.7 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**74.4**	1	**ug/l**	
EPA 200.8	Prep: 29-Jul-2016 1540 by 235	Analyzed: 29-Jul-2016 1749 by 235		Batch: S41501	
Dissolved Copper		**64.0**	1	**ug/l**	
EPA 200.8	Prep: 29-Jul-2016 1540 by 235	Analyzed: 29-Jul-2016 1746 by 235		Batch: S41501	

AIC No. 204164-13
Sample Identification: Effluent Spiking 44.6 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**48.3**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1524 by 235		Batch: S41484	
Dissolved Copper		**39.7**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1522 by 235		Batch: S41484	

AIC No. 204164-14
Sample Identification: Effluent Spiking 44.6 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**52.6**	1	**ug/l**	
EPA 200.8	Prep: 29-Jul-2016 1540 by 235	Analyzed: 29-Jul-2016 1754 by 235		Batch: S41501	
Dissolved Copper		**44.5**	1	**ug/l**	
EPA 200.8	Prep: 29-Jul-2016 1540 by 235	Analyzed: 29-Jul-2016 1751 by 235		Batch: S41501	

AIC No. 204164-15
Sample Identification: Effluent Spiking 29.0 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**36.0**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1530 by 235		Batch: S41484	
Dissolved Copper		**30.7**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1527 by 235		Batch: S41484	

AIC No. 204164-16
Sample Identification: Effluent Spiking 29.0 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**40.2**	1	**ug/l**	
EPA 200.8	Prep: 29-Jul-2016 1540 by 235	Analyzed: 29-Jul-2016 1800 by 235		Batch: S41501	
Dissolved Copper		**34.7**	1	**ug/l**	
EPA 200.8	Prep: 29-Jul-2016 1540 by 235	Analyzed: 29-Jul-2016 1757 by 235		Batch: S41501	

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ANALYTICAL RESULTS

AIC No. 204164-19
Sample Identification: Synthetic MOD Water spiking 15.0 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**12.9**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1244 by 235		Batch: S41484	
Dissolved Copper		**12.6**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1241 by 235		Batch: S41484	

AIC No. 204164-20
Sample Identification: Synthetic MOD Water spiking 15.0 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**12.5**	1	**ug/l**	
EPA 200.8	Prep: 29-Jul-2016 1540 by 235	Analyzed: 29-Jul-2016 1648 by 235		Batch: S41501	
Dissolved Copper		**12.0**	1	**ug/l**	
EPA 200.8	Prep: 29-Jul-2016 1540 by 235	Analyzed: 29-Jul-2016 1646 by 235		Batch: S41501	

AIC No. 204164-21
Sample Identification: Synthetic MOD Water spiking 9.75 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**8.82**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1249 by 235		Batch: S41484	
Dissolved Copper		**8.33**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1247 by 235		Batch: S41484	

AIC No. 204164-22
Sample Identification: Synthetic MOD Water spiking 9.75 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**7.91**	1	**ug/l**	
EPA 200.8	Prep: 29-Jul-2016 1540 by 235	Analyzed: 29-Jul-2016 1654 by 235		Batch: S41501	
Dissolved Copper		**7.10**	1	**ug/l**	
EPA 200.8	Prep: 29-Jul-2016 1540 by 235	Analyzed: 29-Jul-2016 1651 by 235		Batch: S41501	

AIC No. 204164-23
Sample Identification: Synthetic MOD Water spiking 6.34 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**5.86**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1255 by 235		Batch: S41484	
Dissolved Copper		**5.29**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1252 by 235		Batch: S41484	

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ANALYTICAL RESULTS

AIC No. 204164-24
Sample Identification: Synthetic MOD Water spiking 6.34 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**5.24**	1	**ug/l**	
EPA 200.8	Prep: 29-Jul-2016 1540 by 235	Analyzed: 29-Jul-2016 1659 by 235		Batch: S41501	
Dissolved Copper		**4.74**	1	**ug/l**	
EPA 200.8	Prep: 29-Jul-2016 1540 by 235	Analyzed: 29-Jul-2016 1657 by 235		Batch: S41501	

AIC No. 204164-25
Sample Identification: Synthetic MOD Water spiking 4.12 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**4.61**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1306 by 235		Batch: S41484	
Dissolved Copper		**4.17**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1303 by 235		Batch: S41484	

AIC No. 204164-26
Sample Identification: Synthetic MOD Water spiking 4.12 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**4.22**	1	**ug/l**	
EPA 200.8	Prep: 29-Jul-2016 1540 by 235	Analyzed: 29-Jul-2016 1710 by 235		Batch: S41501	
Dissolved Copper		**3.57**	1	**ug/l**	
EPA 200.8	Prep: 29-Jul-2016 1540 by 235	Analyzed: 29-Jul-2016 1708 by 235		Batch: S41501	

AIC No. 204164-27
Sample Identification: Synthetic MOD Water spiking 2.67 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**3.44**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1311 by 235		Batch: S41484	
Dissolved Copper		**3.19**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1309 by 235		Batch: S41484	

AIC No. 204164-28
Sample Identification: Synthetic MOD Water spiking 2.67 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**3.50**	1	**ug/l**	
EPA 200.8	Prep: 29-Jul-2016 1540 by 235	Analyzed: 29-Jul-2016 1716 by 235		Batch: S41501	
Dissolved Copper		**2.84**	1	**ug/l**	
EPA 200.8	Prep: 29-Jul-2016 1540 by 235	Analyzed: 29-Jul-2016 1713 by 235		Batch: S41501	

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ANALYTICAL RESULTS

AIC No. 204164-29
Sample Identification: Synthetic MOD Water spiking 1.74 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**2.85**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1317 by 235		Batch: S41484	
Dissolved Copper		**2.65**	1	**ug/l**	
EPA 200.8	Prep: 27-Jul-2016 1200 by 235	Analyzed: 27-Jul-2016 1314 by 235		Batch: S41484	

AIC No. 204164-30
Sample Identification: Synthetic MOD Water spiking 1.74 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**2.75**	1	**ug/l**	
EPA 200.8	Prep: 29-Jul-2016 1540 by 235	Analyzed: 29-Jul-2016 1721 by 235		Batch: S41501	
Dissolved Copper		**2.32**	1	**ug/l**	
EPA 200.8	Prep: 29-Jul-2016 1540 by 235	Analyzed: 29-Jul-2016 1719 by 235		Batch: S41501	

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DUPLICATE RESULTS

Analyte		AIC No.	Result	RPD	RPD Limit	Preparation Date	Analysis Date	Dil	Qual
Specific Conductance		204164-3	340 umho/cm			27Jul16 1512 by 301	27Jul16 1523 by 301		
	Batch: W56657	Duplicate	340 umho/cm	0.00	20.0	27Jul16 1512 by 301	27Jul16 1523 by 301		
pH		204164-3	6.3 Units			27Jul16 1533 by 319	27Jul16 1632 by 319		H
	Batch: W56658	Duplicate	6.3 Units	0.159	5.00	27Jul16 1533 by 319	27Jul16 1632 by 319		H
Total Dissolved Solids		204146-2	1300 mg/l			28Jul16 1051 by 100	29Jul16 1516 by 100		
	Batch: W56667	Duplicate	1300 mg/l	0.233	10.0	28Jul16 1052 by 100	29Jul16 1516 by 100		
Total Dissolved Solids		204147-2	720 mg/l			28Jul16 1051 by 100	29Jul16 1516 by 100		
	Batch: W56667	Duplicate	720 mg/l	0.557	10.0	28Jul16 1052 by 100	29Jul16 1516 by 100		
Total Suspended Solids		204180-1	41 mg/l			28Jul16 1334 by 100	29Jul16 0935 by 100		
	Batch: W56668	Duplicate	41 mg/l	0.976	20.0	28Jul16 1334 by 100	29Jul16 0935 by 100		
Total Suspended Solids		204176-3	4300 mg/l			28Jul16 1334 by 100	29Jul16 0935 by 100		
	Batch: W56668	Duplicate	4300 mg/l	0.234	20.0	28Jul16 1334 by 100	29Jul16 0935 by 100		
Alkalinity as CaCO3		204176-1	280 mg/l				02Aug16 1004 by 93		
	Batch: W56712	Duplicate	280 mg/l	1.06	10.0		02Aug16 1008 by 93		

LABORATORY CONTROL SAMPLE RESULTS

Analyte	Spike Amount	%	Limits	RPD	Limit	Batch	Preparation Date	Analysis Date	Dil	Qual
Specific Conductance	1412 umho/cm	99.9	90.0-110			W56657	27Jul16 1512 by 301	27Jul16 1523 by 301		
pH	-	100	98.0-102			W56658	27Jul16 1533 by 319	27Jul16 1632 by 319		
Total Organic Carbon	10 mg/l	105	80.0-120			W56648	27Jul16 1057 by 301	27Jul16 1155 by 301		
Copper	0.05 mg/l	98.8	85.0-115			S41484	27Jul16 1200 by 235	27Jul16 1300 by 235		
	0.05 mg/l	96.4	85.0-115	2.46	20.0	S41484	27Jul16 1200 by 235	27Jul16 1330 by 235		
Dissolved Organic Carbon	10 mg/l	105	80.0-120			W56648	27Jul16 1057 by 301	27Jul16 1155 by 301		

MATRIX SPIKE SAMPLE RESULTS

Analyte	Sample	Spike Amount	%	Limits	Batch	Preparation Date	Analysis Date	Dil	Qual
Total Organic Carbon	204162-1	10 mg/l	108	80.0-120	W56648	27Jul16 1057 by 301	27Jul16 1218 by 301		
	204162-1	10 mg/l	109	80.0-120	W56648	27Jul16 1057 by 301	27Jul16 1230 by 301		
	Relative Percent Difference:		0.533	25.0	W56648				

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LABORATORY BLANK RESULTS

Analyte	Result	RL	PQL	QC Sample	Preparation Date	Analysis Date	Qual
Alkalinity as CaCO3	< 1 mg/l	1	1	W56712-1		02Aug16 1008 by 93	
Specific Conductance	< 2 umho/cm	2	2	W56657-1	27Jul16 1512 by 301	27Jul16 1523 by 301	
Total Dissolved Solids	< 10 mg/l	10	10	W56667-1	28Jul16 1052 by 100	29Jul16 1516 by 100	
Total Organic Carbon	< 1 mg/l	1	1	W56648-1	27Jul16 1057 by 301	27Jul16 1143 by 301	
Total Suspended Solids	< 2 mg/l	2	2	W56668-1	28Jul16 1334 by 100	29Jul16 0935 by 100	
Copper	< 1 ug/l	1	1	S41484-1	27Jul16 1200 by 235	27Jul16 1230 by 235	
Copper	< 1 ug/l	1	1	S41501-1	29Jul16 1540 by 235	29Jul16 1634 by 235	
Dissolved Organic Carbon	< 1 mg/l	1	1	W56648-1	27Jul16 1057 by 301	27Jul16 1143 by 301	

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204164

Chain of Custody

Report: jbrown@gbmcassoc.com

Client/BILLING Information		SPECIAL INSTRUCTIONS/PRECAUTIONS:
Client:	Jonathan Brown	Composite samples according to flows listed below and perform WER study (using attached tables) for Total and Dissolved Copper Ceriodaphnia only. Additional parameters on composite only.
Company:	GBM^c & Assoc.	
Address:	219 Brown Lane	
	Bryant, Arkansas, 72022	Project Name / Number: Idabel WER 3040-15-050
Phone No.:	501-847-7077	
Fax No.:	501-847-7943	

Sample ID	Sample Description	Date	Time	Matrix S=Sed/Soil W=Water	Number of Containers	Composite or Grab	Parameters for Analysis/Methods: Total / Dissolved Copper	WER Study	Hardness, Alkalinity, Conductivity	TOC, DOC, TSS, TDS			
TB	Trip Blank	7/26/16	0645	W	1	G	X						
001-TD	Metals Grab		0655	W	1	G	X						
001-1	Flow - 0.652 MGD		0700	W	1	G	X	X	X	X			Composite
001-2	Flow - 0.922 MGD		0900	W	1	G	X	X	X	X			
001-3	Flow - 0.866 MGD		1100	W	1	G	X	X	X	X			
001-4	Flow - 1.277 MGD		1300	W	1	G	X	X	X	X			
Preservative	(Sulfuric acid =S, Nitric acid =N, NaOH =B, Ice =I)						I	I	I	I			

Composite

Sampler(s): JBB	Shipment Method: Hand Delivered	Turnaround Time Required: Standard	
COC Completed by: JBB	Date: 7/27/16 Time: 0900	COC Checked by: [signature]	Date: ~~7/50~~ 7/27/16 Time: 950
Relinquished by: [signature]	Date: 7/27/16 Time: 1012	Received by: _____	Date: _____ Time: _____
Relinquished by: _____	Date: _____ Time: _____	Received in lab by: DANNY PORTER	Date: 7-27-16 Time: 10:13
LABORATORY USE ONLY:	Samples Received On Ice?: (YES) or NO	Sample Temperature: 0.1°C	

Concentrations for WER Test #1

204164

Please perform a WER Study using concentrations listed below. The rangefinding should be conducted for copper using Ceriodaphnia. Analyses should be performed so that a WER can be calculated for both total and dissolved copper. The analysis of additional parameters should include: Hardness, Alkalinity, TOC, DOC, Conductivity, TSS, and TDS.

Copper Ceriodaphnia
(0.65 Dilution Ratio)

SWM	**Lab Water**
Cu (µg/L)	**Cu (µg/L)**
250	15
163	10
106	6
69	4
45	3
29	2
0 (Control)	0 (Control)

204164

Table 1. Analytical methods to be followed during the WER study.

Parameter	Method	Preservative[1]	Holding Time
Total Copper	EPA200.7/200.8	4 °C, HNO_3	6 Months
Dissolved Copper	EPA200.7/200.8	4 °C, HNO_3	6 Months
T. Hardness	EPA200.8	4 °C, HNO_3	6 Months
T. Alkalinity	SM 2320B	4 °C	14 Days
TSS	SM2540D	4 °C	7 Days
TOC	SM5310C	4 °C, H_2SO4	28 Days
DOC	SM5310C	4 °C	28 Days
TDS	SM2540C	4 °C	7 Days

[1]All chemical preservatives added after sample composite and/or dilution sub-sampling.

Table 2. Analysis to be conducted in conjunction with the WER toxicity testing.[1]

	Water Sample Source		
Analytical Parameter	**Effluent (SWM)**	**Lab water**	**Selected spiked test dilutions[2,3]**
Total Copper	X	X	X
Dissolved Copper	X	X	X
Total Hardness	X	X	
Total Alkalinity	X	X	
pH	X	X	X
TSS	X	X	
TOC	X	X	
DOC	X	X	
Specific conductance	X	X	X
TDS	X		
Dissolved oxygen		X	X
Temperature		X	X
Routine DMR parameters	Routine parameters will be analyzed by the permittee as part of routine monitoring on the same day as WER study samples are collected. Routine parameters include BOD, TSS, NH3-N, DO, Chlorides, Sulfates, TDS, T. Cadmium, T. Chromium, T. Copper, T. Selenium, T. Silver, T. Zinc, pH.		

[1] The normal battery of chemistry completed for routine biomonitoring tests (pH, temperature, conductivity, dissolved oxygen, etc.) should be completed during each WER test.

[2] At a minimum the test treatments that bracket the LC50 must be tested for these parameters. The lowest treatment that exhibited 100% mortality, the highest treatment that exhibited no effect and the control should each also be tested for these parameters.

[3] Dilutions will be prepared using copper sulfate.

204164

Table 5. Summary of test conditions for copper WER toxicity testing.

Parameter	Test condition (Lab Water)	Test Condition (Site Water Mix)
Test Type	48-h Acute static non-renewal	48-h Acute static non-renewal
Chemical Test	Copper	Copper
Temperature	25°C	25°C
Light Quality	Ambient Laboratory	Ambient Laboratory
Light Intensity	50-100 ft-c	50-100 ft-c
Photoperiod	16h light, 8h dark	16h light, 8h dark
Test Chamber Type	30 mL minimum	30 mL minimum
Test Solution Volume	15 mL minimum	15 mL minimum
Solution Renewal	None[1]	None[1]
Age of Test Organisms	<24-h	<24-h
No. Organisms/Chamber	5	5
No. of Replicate Chambers	4	4
Feeding Regime	None	None
Aeration	None	None
Dilution Water (Test Water)	Moderately Hard Reconstituted	100% Effluent
Dilution Ratio	0.65	0.65
Number of treatments[2] (metal concentrations)	6 treatments (15, 9.8, 6.3, 4.1, 2.7, 1.7 µg/L)	To be determined by range finding test.
Highest Copper Concentration	15 µg/L	To be determined by range finding test.

[1] Copper concentration will be measured in the test solution before test initiation and at the conclusion of the testing.

[2] Treatment number and concentration may vary based on results of first WER testing.

Copper WER Study

Stock- 40ppm Cu from CuSO4*5H20; do not preserve with any acid.

The WER Test is a 48hr Non Renewal utilizing C. dubia, five (5) replicates with five (5) C. dubia per cup (5X5). The fifth replicate is the chemistry surrogate for 24 hour measurements of DO and pH.

The Control will be unspiked effluent for the effluent Test and Mod-Hard Water for the Synthetic Water Test.

Measure DO and pH at the beginning, 24hrs and end of the test. The 24hr measurement is to be made from a surrogate container. The surrogate solutions must contain C.dubia.

Effluent spiking:

1. 250ppb-Pipet 5ml of stock Copper solution and dilute to 800ml with effluent.
2. 162ppb- Dilute 650ml of 250ppb solution to 1000ml with unspiked effluent.
3. 106ppb-Dilute 650ml of 162ppb solution to 1000ml with unspiked effluent.
4. 68.7ppb-Dilute 650ml of 106ppb solution to 1000ml with unspiked effluent.
5. 44.6ppb-Dilute 650ml of 68.7ppb solution to 1000ml with unspiked effluent.
6. 29.0ppb-Dilute 650ml of 44.6ppb solution to 1000ml with unspiked effluent.

After preparation submit 50ml of each solution to SPC for analysis.

Synthetic MOD Water spiking:

1. 25.0ppb-Pipet 0.5ml of stock and dilute to 800ml with Mod Water.
2. 15.0ppb-Dilute ***600ml*** of 25.0ppb solution to 1000ml with Mod water.
3. 9.75ppb-Dilute **650ml** of 15.0ppb solution to 1000ml with Mod water.
4. 6.34ppb-Dilute 650ml of 9.75ppb solution to 1000ml with Mod water.
5. 4.12ppb-Dilute 650ml of 6.34ppb solution to 1000ml with Mod water.
6. 2.67ppb-Dilute 650ml of 4.12ppb solution to 1000ml with Mod water.
7. 1.74ppb-Dilute 650ml of 2.67ppb solution to 1000ml with Mod water.

We will be testing the following concentrations: **15.0, 9.75, 6.34, 4.12, 2.68, and 1.74** (After preparation submit 50ml of each solution to be tested to SPC for analysis of Cu.ll and Cu.diss.ll. This must be done the same day the test begins).

Submit finals (after testing) to spectroscopy for analysis of total and dissolved copper.

WER 2

AMERICAN INTERPLEX CORPORATION
LABORATORIES

October 21, 2016

Test Results of
Acute 48 hour Non-Renewal
Biomonitoring Testing
for

205951-1: Outfall 001 Total Copper
205951-2: Synthetic Water Total Copper
205951-3: Outfall 001 Dissolved Copper
205951-4: Synthetic Water Dissolved Copper

Prepared for:

Mr. Jonathon Brown
GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

Prepared by:

AMERICAN INTERPLEX CORPORATION
8600 Kanis Road
Little Rock, AR 72204-2322

GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
219 Brown Lane
Bryant, AR 72022

Re: Acute 48 hour Non-Renewal Biomonitoring utilizing *Ceriodaphnia dubia*
Outfall 001 Total Copper

Dear Mr. Jonathon Brown:

Please find attached the data for the water effects ratio study. The spiking solution utilized for the study was prepared from copper sulfate. The tests were conducted at 25 +/- 1 C and following the guidance from "Streamlined Water-Effect Ratio Procedure for Discharges of Copper", EPA-822-R-01-005. The LC50 data is calculated from the initial analytical data generated from the spiked test solutions. The data is summarized below for your review.

Ceriodaphnia dubia

Analyte	**Outfall 001**	**Synthetic Water**
Total Copper	120 ug/L	7.01 ug/L
Dissolved Copper	97.8 ug/L	6.64 ug/L

If I can be of further assistance, please feel free to contact me.

AMERICAN INTERPLEX CORPORATION

John Overbey
Chief Operating Officer

PDF cc: GBMc & Associates, Inc.
ATTN: Mr. Jonathan Brown
jbrown@gbmcassoc.com

Dilution Water Samples: Outfall 001

Analysis	Result
Dissolved oxygen (mg/l)	7.9
pH (standard units)	7.0
Alkalinity (mg/l as CaCO3)	23
Hardness (mg/l as CaCO3)	69
Conductivity (umhos/cm)	400
Residual Chlorine (mg/l)	<0.05

Results Summary: Outfall 001 Total Copper

Ceriodaphnia dubia

The *Ceriodaphnia dubia* test was conducted from September 30, 2016 at 1420 to October 2, 2016 at 1450.

Statistical analyses:

NOEC = 93.6ug/L
LC50 = 120ug/L

Concentration	24 hour % Survival	48 hour % Survival	
Control	100	100	
29.1ug/L	100	100	
43.0ug/L	100	100	
63.1ug/L	100	100	
93.6ug/L	100	100	
146ug/L	10.0	5.00	*
233ug/L	0.00	0.00	*

*Significant difference compared to the control (p=0.05)

Ceriodaphnia dubia
Survival Data

Number of organisms per chamber: 5
Volume of test chamber: 30 ml

Age of organisms: <24 hours
Volume of test solution: 15 ml

Effluent Concentration		Number of Survivors 24 Hours	Number of Survivors 48 Hours	% Survival	CV %
Control	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
29.1ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
43ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
63.1ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
93.6ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
146ug/L	rep. A	0	0	5.00	200
	rep. B	0	0		
	rep. C	1	1		
	rep. D	1	0		
233ug/L	rep. A	0	0	0.00	0.00
	rep. B	0	0		
	rep. C	0	0		
	rep. D	0	0		

CV = Coefficient of variance = standard deviation X 100/mean

Ceriodaphnia dubia

Transformation of Data — Transform: Arc Sin(Square Root(Y))

Group	Identification	Rep	Value	Transformed
1	Control	1	1.00000	1.34530
1	Control	2	1.00000	1.34530
1	Control	3	1.00000	1.34530
1	Control	4	1.00000	1.34530
2	29.1ug/L	1	1.00000	1.34530
2	29.1ug/L	2	1.00000	1.34530
2	29.1ug/L	3	1.00000	1.34530
2	29.1ug/L	4	1.00000	1.34530
3	43ug/L	1	1.00000	1.34530
3	43ug/L	2	1.00000	1.34530
3	43ug/L	3	1.00000	1.34530
3	43ug/L	4	1.00000	1.34530
4	63.1ug/L	1	1.00000	1.34530
4	63.1ug/L	2	1.00000	1.34530
4	63.1ug/L	3	1.00000	1.34530
4	63.1ug/L	4	1.00000	1.34530
5	93.6ug/L	1	1.00000	1.34530
5	93.6ug/L	2	1.00000	1.34530
5	93.6ug/L	3	1.00000	1.34530
5	93.6ug/L	4	1.00000	1.34530
6	146ug/L	1	0.00000	0.22551
6	146ug/L	2	0.00000	0.22551
6	146ug/L	3	0.20000	0.46365
6	146ug/L	4	0.00000	0.22551
7	233ug/L	1	0.00000	0.22551
7	233ug/L	2	0.00000	0.22551
7	233ug/L	3	0.00000	0.22551
7	233ug/L	4	0.00000	0.22551

Ceriodaphnia dubia

Shapiro - Wilk's Test for Normality		Transform: Arc Sin(Square Root(Y))
D = 0.04253		
W = 0.4337		
Critical W = 0.896	(alpha = 0.01, N = 28)	
Critical W = 0.924	(alpha = 0.05, N = 28)	

Data FAIL normality test (alpha = 0.01).

Steel's Many-One Rank Test — Transform: Arc Sin(Square Root(Y))

Ho:Control<Treatment

Group	Identification	Rank Sum	Critical Value	DF	Sig 0.05
1	Control				
2	29.1ug/L	18.00	10.00	4.00	
3	43ug/L	18.00	10.00	4.00	
4	63.1ug/L	18.00	10.00	4.00	
5	93.6ug/L	18.00	10.00	4.00	
6	146ug/L	10.00	10.00	4.00	*
7	233ug/L	10.00	10.00	4.00	*

Critical values are 1 tailed (k=6)

Ceriodaphnia dubia

Spearman-Karber Method for Calculating LC50 Values

Concentration	Number Exposed	Number Responding	Proportion Responding	Smoothed Proportion	Smoothed Adjusted Proportion
Control	20	0	0	0	0
29.1	20	0	0	0	0
43	20	0	0	0	0
63.1	20	0	0	0	0
93.6	20	0	0	0	0
146	20	19	0.95	0.95	0.95
233	20	20	1	1	1

LC50 = 119.6
Upper Confidence Limit = 125.2
Lower Confidence Limit = 114.3

Variance = 9.805E-05

Chemical Data for
Ceriodaphnia dubia

Day 1		Control	29.1ug/L	43.0ug/L	63.1ug/L	93.6ug/L	146ug/L	233ug/L
DO, mg/l	Initial	7.9	7.9	7.6	7.4	7.5	7.4	7.4
DO, mg/l	Final	7.7	8.1	7.9	8.8	8.8	8.8	8.7
pH, su	Initial	7.0	7.2	7.4	7.4	7.4	7.4	7.6
pH, su	Final	7.8	7.8	7.8	7.8	7.8	7.9	7.8
Alkalinity, mg/l		23	NA	NA	NA	NA	NA	NA
Hardness, mg/l		69	NA	NA	NA	NA	NA	NA
Conductivity, umho/cm		400	NA	NA	NA	NA	NA	NA
Residual Chlorine, mg/l		<0.05	NA	NA	NA	NA	NA	NA

Day 2		Control	29.1ug/L	43.0ug/L	63.1ug/L	93.6ug/L	146ug/L	233ug/L
DO, mg/l	Final	8.8	8.6	8.1	8.2	8.0	8.2	8.8
pH, su	Final	7.8	7.8	7.8	7.8	7.8	7.8	7.8

GBM^c & Associates
219 Brown Ln.
Bryant, AR 72022
(501) 847-7077 Fax (501) 847-7943

Chain of Custody

205951

Client/Billing Information		SPECIAL INSTRUCTIONS/PRECAUTIONS:
Client:	Jonathan Brown	Composite samples according to attached flows. Perform WER
Company:	GBM^c & Assoc.	study for total and dissolved copper WER (Ceriodaphnia only).
Address:	219 Brown Lane	Analyze additional parameters on composite only.
	Bryant AR 72022	Project Name / Number: Idabel WER
Phone No.:	(501) 847-7077	3040-15-050
Fax No.:	jbrown@gbmcassoc.com	

provided flow data

Sample ID	Sample Description	Date	Time	Matrix S=Sed/Soil W=Water	Number of Containers	Composite or Grab	Parameters for Analysis/Methods: Total & Dissolved Copper	WER Study	Hardness Alkalinity Conductivity	TOC, DOC TSS, TDS			
TB	Trip Blank	9/27/16	0655	W	1	G	X						
001-1	Grab 1		0700					X	X	X	} 2 Composite		
001-2	Grab 2		0900					X	X	X			
001-3	Grab 3		1100					X	X	X			
001-4	Grab 4		1300					X	X	X			
001TD	001 Grab		1305				X						
Preservative	(Sulfuric acid =S, Nitric acid =N, NaOH =B, Ice =I)						I	I	I	I			

Sampler(s): JBB	Shipment Method: Hand Delivered	Turnaround Time Required: Standard	
COC Completed by: [signature]	Date: 9/29/16 Time: 0835	COC Checked by: [signature]	Date: 9/28/16 Time: 0845
Relinquished by: _____	Date: _____ Time: _____	Received by: _____	Date: _____ Time: _____
Relinquished by: [signature]	Date: 9/29/16 Time: 0920	Received in lab by: D Brown	Date: 9-28-16 Time: 0920
LABORATORY USE ONLY:	Samples Received On Ice?: (YES) or NO	Sample Temperature: 6.1 °C	

V1.2 09/23/16

Flows for WER Study

Sample	Flow
001-1	0.864 MGD
001-2	0.685 MGD
001-3	0.897 MGD
001-4	1.052 MGD

CN

Hour	Flow		%	Milliliters for 3 gallons
	1	0.864	24.70	2805
	2	0.685	19.58	2224
	3	0.897	25.64	2912
	4	1.052	30.07	3415
	5	0	0.00	0
	6	0	0.00	0
	7	0	0.00	0
	8	0	0.00	0
	9	0	0.00	0
	10	0	0.00	0
	11	0	0.00	0
	12	0	0.00	0
	13	0	0.00	0
	14	0	0.00	0
	15	0	0.00	0
	16	0	0.00	0
	17	0	0.00	0
	18	0	0.00	0
	19	0	0.00	0
	20	0	0.00	0
	21	0	0.00	0
	22	0	0.00	0
	23	0	0.00	0
	24	0	0.00	0
Total		3.498		11356

created by: jo45
verified by: sb235 7/10/2012

Table 1. Analytical methods to be followed during the WER study.

Parameter	Method	Preservative[1]	Holding Time
Total Copper	EPA200.7/200.8	4 °C, HNO_3	6 Months
Dissolved Copper	EPA200.7/200.8	4 °C, HNO_3	6 Months
T. Hardness	EPA200.8	4 °C, HNO_3	6 Months
T. Alkalinity	SM 2320B	4 °C	14 Days
TSS	SM2540D	4 °C	7 Days
TOC	SM5310C	4 °C, H_2SO4	28 Days
DOC	SM5310C	4 °C	28 Days
TDS	SM2540C	4 °C	7 Days

[1]All chemical preservatives added after sample composite and/or dilution sub-sampling.

Table 2. Analysis to be conducted in conjunction with the WER toxicity testing.[1]

	Water Sample Source		
Analytical Parameter	Effluent (SWM)	Lab water	Selected spiked test dilutions[2, 3]
Total Copper	X	X	X
Dissolved Copper	X	X	X
Total Hardness	X	X	
Total Alkalinity	X	X	
pH	X	X	X
TSS	X	X	
TOC	X	X	
DOC	X	X	
Specific conductance	X	X	X
TDS	X		
Dissolved oxygen		X	X
Temperature		X	X
Routine DMR parameters	Routine parameters will be analyzed by the permittee as part of routine monitoring on the same day as WER study samples are collected. Routine parameters include BOD, TSS, NH3-N, DO, Chlorides, Sulfates, TDS, T. Cadmium, T. Chromium, T. Copper, T. Selenium, T. Silver, T. Zinc, pH.		

[1] The normal battery of chemistry completed for routine biomonitoring tests (pH, temperature, conductivity, dissolved oxygen, etc.) should be completed during each WER test.

[2] At a minimum the test treatments that bracket the LC50 must be tested for these parameters. The lowest treatment that exhibited 100% mortality, the highest treatment that exhibited no effect and the control should each also be tested for these parameters.

[3] Dilutions will be prepared using copper sulfate.

Table 5. Summary of test conditions for copper WER toxicity testing.

Parameter	Test condition (Lab Water)	Test Condition (Site Water Mix)
Test Type	48-h Acute static non-renewal	48-h Acute static non-renewal
Chemical Test	Copper	Copper
Temperature	25°C	25°C
Light Quality	Ambient Laboratory	Ambient Laboratory
Light Intensity	50-100 ft-c	50-100 ft-c
Photoperiod	16h light, 8h dark	16h light, 8h dark
Test Chamber Type	30 mL minimum	30 mL minimum
Test Solution Volume	15 mL minimum	15 mL minimum
Solution Renewal	None[1]	None[1]
Age of Test Organisms	<24-h	<24-h
No. Organisms/Chamber	5	5
No. of Replicate Chambers	4	4
Feeding Regime	None	None
Aeration	None	None
Dilution Water (Test Water)	Moderately Hard Reconstituted	100% Effluent
Dilution Ratio	0.65	0.65
Number of treatments[2] (metal concentrations)	6 treatments (15, 9.8, 6.3, 4.1, 2.7, 1.7 µg/L)	To be determined by range finding test.
Highest Copper Concentration	15 µg/L	To be determined by range finding test.

[1] Copper concentration will be measured in the test solution before test initiation and at the conclusion of the testing.

[2] Treatment number and concentration may vary based on results of first WER testing.

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
219 Brown Lane
Bryant, AR 72022

Re: Acute 48 hour Non-Renewal Biomonitoring utilizing *Ceriodaphnia dubia*
Synthetic Water Total Copper

Dilution Water Samples: Synthetic Water

Analysis	Result
Dissolved oxygen (mg/l)	7.5
pH (standard units)	8.2
Alkalinity (mg/l as CaCO3)	55
Hardness (mg/l as CaCO3)	89
Conductivity (umhos/cm)	270
Residual Chlorine (mg/l)	<0.05

Results Summary: Synthetic Water Total Copper

Ceriodaphnia dubia

The *Ceriodaphnia dubia* test was conducted from September 30, 2016 at 1420 to October 2, 2016 at 1500.
Statistical analyses:
NOEC = 7.39ug/L
LC50 = 7.01ug/L

Concentration	24 hour % Survival	48 hour % Survival	
Control	100	100	
2.85ug/L	100	100	
3.74ug/L	100	95.0	
5.23ug/L	100	80.0	
7.39ug/L	75.0	60.0	
11.1ug/L	5.00	0.00	*
16.3ug/L	0.00	0.00	*

*Significant difference compared to the control (p=0.05)

Ceriodaphnia dubia
Survival Data

Number of organisms per chamber: 5
Volume of test chamber: 30 ml

Age of organisms: <24 hours
Volume of test solution: 15 ml

Effluent Concentration		Number of Survivors 24 Hours	Number of Survivors 48 Hours	% Survival	CV %
Control	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
2.85ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
3.74ug/L	rep. A	5	5	95.0	10.5
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	4		
5.23ug/L	rep. A	5	5	80.0	20.4
	rep. B	5	3		
	rep. C	5	4		
	rep. D	5	4		
7.39ug/L	rep. A	5	5	60.0	47.1
	rep. B	4	3		
	rep. C	3	2		
	rep. D	3	2		
11.1ug/L	rep. A	0	0	0.00	0.00
	rep. B	1	0		
	rep. C	0	0		
	rep. D	0	0		
16.3ug/L	rep. A	0	0	0.00	0.00
	rep. B	0	0		
	rep. C	0	0		
	rep. D	0	0		

CV = Coefficient of variance = standard deviation X 100/mean

Ceriodaphnia dubia

		Transformation of Data		Transform: Arc Sin(Square Root(Y))
Group	Identification	Rep	Value	Transformed
1	Control	1	1.00000	1.34530
1	Control	2	1.00000	1.34530
1	Control	3	1.00000	1.34530
1	Control	4	1.00000	1.34530
2	2.85ug/L	1	1.00000	1.34530
2	2.85ug/L	2	1.00000	1.34530
2	2.85ug/L	3	1.00000	1.34530
2	2.85ug/L	4	1.00000	1.34530
3	3.74ug/L	1	1.00000	1.34530
3	3.74ug/L	2	1.00000	1.34530
3	3.74ug/L	3	1.00000	1.34530
3	3.74ug/L	4	0.80000	1.10710
4	5.23ug/L	1	1.00000	1.34530
4	5.23ug/L	2	0.60000	0.88608
4	5.23ug/L	3	0.80000	1.10710
4	5.23ug/L	4	0.80000	1.10710
5	7.39ug/L	1	1.00000	1.34530
5	7.39ug/L	2	0.60000	0.88608
5	7.39ug/L	3	0.40000	0.68472
5	7.39ug/L	4	0.40000	0.68472
6	11.1ug/L	1	0.00000	0.22551
6	11.1ug/L	2	0.00000	0.22551
6	11.1ug/L	3	0.00000	0.22551
6	11.1ug/L	4	0.00000	0.22551
7	16.3ug/L	1	0.00000	0.22551
7	16.3ug/L	2	0.00000	0.22551
7	16.3ug/L	3	0.00000	0.22551
7	16.3ug/L	4	0.00000	0.22551

Ceriodaphnia dubia

Shapiro - Wilk's Test for Normality		Transform: Arc Sin(Square Root(Y))
D = 0.4392		
W = 0.7135		
Critical W = 0.896	(alpha = 0.01, N = 28)	
Critical W = 0.924	(alpha = 0.05, N = 28)	

Data FAIL normality test (alpha = 0.01).

Steel's Many-One Rank Test					Transform: Arc Sin(Square Root(Y))
Ho:Control<Treatment					
Group	Identification	Rank Sum	Critical Value	DF	Sig 0.05
1	Control				
2	2.85ug/L	18.00	10.00	4.00	
3	3.74ug/L	16.00	10.00	4.00	
4	5.23ug/L	12.00	10.00	4.00	
5	7.39ug/L	12.00	10.00	4.00	
6	11.1ug/L	10.00	10.00	4.00	*
7	16.3ug/L	10.00	10.00	4.00	*

Critical values are 1 tailed (k=6)

Ceriodaphnia dubia

Probit Analysis for Calculating LC/EC Values

Concentration	Number Exposed	Number Responding	Observed Proportion Responding	Proportion Responding Adjusted for Controls	Predicted Proportion Responding
2.85	20	0	0	0	0.0017
3.74	20	1	0.05	0.05	0.0202
5.23	20	4	0.2	0.2	0.1698
7.39	20	8	0.4	0.4	0.5686
11.1	20	20	1	1	0.9332
16.3	20	20	1	1	0.997

Chi - Square for Heterogeneity (calculated) = 4.865
Chi - Square for Heterogeneity (tabular value at 0.05 level) = 9.488

Mu = 0.8456
Sigma = 0.1331

Parameter	Estimate	Std. Error	Lower 95% Conf.	Upper 95% Conf.
Intercept	-1.352	1.034	-3.379	0.6746
Slope	7.511	1.222	5.117	9.906

Theoretical Spontaneous Response Rate = 0

Estimated LC/EC Values and Confidence Limits

LC/EC Point	Exposure Conc.	Lower 95% Conf.	Upper 95% Conf.
1	3.435	2.43	4.159
5	4.233	3.27	4.92
10	4.732	3.819	5.398
15	5.101	4.232	5.76
50	7.009	6.265	7.893
85	9.63	8.463	11.85
90	10.38	9.016	13.15
95	11.6	9.878	15.38
99	14.3	11.67	20.73

Chemical Data for
Ceriodaphnia dubia

Day 1		Control	2.85ug/L	3.74ug/L	5.23ug/L	7.39ug/L	11.1ug/L	16.3ug/L
DO, mg/l	Initial	7.5	7.4	7.5	7.3	7.5	7.2	7.4
DO, mg/l	Final	8.7	8.6	8.6	8.6	8.6	8.6	8.5
pH, su	Initial	8.2	8.2	8.1	8.2	8.2	8.2	8.2
pH, su	Final	8.2	8.2	8.2	8.2	8.2	8.2	8.2
Alkalinity, mg/l		55	NA	NA	NA	NA	NA	NA
Hardness, mg/l		89	NA	NA	NA	NA	NA	NA
Conductivity, umho/cm		270	NA	NA	NA	NA	NA	NA
Residual Chlorine, mg/l		<0.05	NA	NA	NA	NA	NA	NA

Day 2		Control	2.85ug/L	3.74ug/L	5.23ug/L	7.39ug/L	11.1ug/L	16.3ug/L
DO, mg/l	Final	8.9	9.0	9.0	8.9	9.0	8.9	8.9
pH, su	Final	8.2	8.2	8.2	8.2	8.2	8.2	8.2

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
219 Brown Lane
Bryant, AR 72022

Re: Acute 48 hour Non-Renewal Biomonitoring utilizing *Ceriodaphnia dubia*
Outfall 001 Dissolved Copper

Dilution Water Samples: Outfall 001

Analysis	Result
Dissolved oxygen (mg/l)	7.9
pH (standard units)	7.0
Alkalinity (mg/l as CaCO3)	23
Hardness (mg/l as CaCO3)	69
Conductivity (umhos/cm)	400
Residual Chlorine (mg/l)	<0.05

Results Summary: Outfall 001 Dissolved Copper

Ceriodaphnia dubia

The *Ceriodaphnia dubia* test was conducted from September 30, 2016 at 1420 to October 2, 2016 at 1450.
Statistical analyses:
NOEC = 79.8ug/L
LC50 = 97.8ug/L

Concentration	24 hour % Survival	48 hour % Survival	
Control	100	100	
26.0ug/L	100	100	
36.5ug/L	100	100	
52.9ug/L	100	100	
79.8ug/L	100	100	
115ug/L	10.0	5.00	*
183ug/L	0.00	0.00	*

*Significant difference compared to the control (p=0.05)

Ceriodaphnia dubia
Survival Data

Number of organisms per chamber: 5
Volume of test chamber: 30 ml

Age of organisms: <24 hours
Volume of test solution: 15 ml

Effluent Concentration		Number of Survivors 24 Hours	Number of Survivors 48 Hours	% Survival	CV %
Control	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
26ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
36.5ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
52.9ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
79.8ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
115ug/L	rep. A	0	0	5.00	200
	rep. B	0	0		
	rep. C	1	1		
	rep. D	1	0		
183ug/L	rep. A	0	0	0.00	0.00
	rep. B	0	0		
	rep. C	0	0		
	rep. D	0	0		

CV = Coefficient of variance = standard deviation X 100/mean

Ceriodaphnia dubia

		Transformation of Data		Transform: Arc Sin(Square Root(Y))
Group	Identification	Rep	Value	Transformed
1	Control	1	1.00000	1.34530
1	Control	2	1.00000	1.34530
1	Control	3	1.00000	1.34530
1	Control	4	1.00000	1.34530
2	26ug/L	1	1.00000	1.34530
2	26ug/L	2	1.00000	1.34530
2	26ug/L	3	1.00000	1.34530
2	26ug/L	4	1.00000	1.34530
3	36.5ug/L	1	1.00000	1.34530
3	36.5ug/L	2	1.00000	1.34530
3	36.5ug/L	3	1.00000	1.34530
3	36.5ug/L	4	1.00000	1.34530
4	52.9ug/L	1	1.00000	1.34530
4	52.9ug/L	2	1.00000	1.34530
4	52.9ug/L	3	1.00000	1.34530
4	52.9ug/L	4	1.00000	1.34530
5	79.8ug/L	1	1.00000	1.34530
5	79.8ug/L	2	1.00000	1.34530
5	79.8ug/L	3	1.00000	1.34530
5	79.8ug/L	4	1.00000	1.34530
6	115ug/L	1	0.00000	0.22551
6	115ug/L	2	0.00000	0.22551
6	115ug/L	3	0.20000	0.46365
6	115ug/L	4	0.00000	0.22551
7	183ug/L	1	0.00000	0.22551
7	183ug/L	2	0.00000	0.22551
7	183ug/L	3	0.00000	0.22551
7	183ug/L	4	0.00000	0.22551

Ceriodaphnia dubia

Shapiro - Wilk's Test for Normality		Transform: Arc Sin(Square Root(Y))
D = 0.04253		
W = 0.4337		
Critical W = 0.896	(alpha = 0.01, N = 28)	
Critical W = 0.924	(alpha = 0.05, N = 28)	

Data FAIL normality test (alpha = 0.01).

Steel's Many-One Rank Test					Transform: Arc Sin(Square Root(Y))
Ho:Control<Treatment					
Group	Identification	Rank Sum	Critical Value	DF	Sig 0.05
1	Control				
2	26ug/L	18.00	10.00	4.00	
3	36.5ug/L	18.00	10.00	4.00	
4	52.9ug/L	18.00	10.00	4.00	
5	79.8ug/L	18.00	10.00	4.00	
6	115ug/L	10.00	10.00	4.00	*
7	183ug/L	10.00	10.00	4.00	*

Critical values are 1 tailed (k=6)

Ceriodaphnia dubia

Spearman-Karber Method for Calculating LC50 Values

Concentration	Number Exposed	Number Responding	Proportion Responding	Smoothed Proportion	Smoothed Adjusted Proportion
Control	20	0	0	0	0
26	20	0	0	0	0
36.5	20	0	0	0	0
52.9	20	0	0	0	0
79.8	20	0	0	0	0
115	20	19	0.95	0.95	0.95
183	20	20	1	1	1

LC50 = 97.81
Upper Confidence Limit = 101.9
Lower Confidence Limit = 93.83

Variance = 8.12E-05

Chemical Data for
Ceriodaphnia dubia

Day 1		Control	26.0ug/L	36.5ug/L	52.9ug/L	79.8ug/L	115ug/L	183ug/L
DO, mg/l	Initial	7.9	7.9	7.6	7.4	7.5	7.4	7.4
DO, mg/l	Final	7.7	8.1	7.9	8.8	8.8	8.8	8.7
pH, su	Initial	7.0	7.2	7.4	7.4	7.4	7.4	7.6
pH, su	Final	7.8	7.8	7.8	7.8	7.8	7.9	7.8
Alkalinity, mg/l		23	NA	NA	NA	NA	NA	NA
Hardness, mg/l		69	NA	NA	NA	NA	NA	NA
Conductivity, umho/cm		400	NA	NA	NA	NA	NA	NA
Residual Chlorine, mg/l		<0.05	NA	NA	NA	NA	NA	NA

Day 2		Control	26.0ug/L	36.5ug/L	52.9ug/L	79.8ug/L	115ug/L	183ug/L
DO, mg/l	Final	8.8	8.6	8.1	8.2	8.0	8.2	8.8
pH, su	Final	7.8	7.8	7.8	7.8	7.8	7.8	7.8

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
219 Brown Lane
Bryant, AR 72022

Re: Acute 48 hour Biomonitoring utilizing *Ceriodaphnia dubia*
Synthetic Water Dissolved Copper

Dilution Water Samples: Synthetic Water

Analysis	Result
Dissolved oxygen (mg/l)	7.5
pH (standard units)	8.2
Alkalinity (mg/l as CaCO3)	55
Hardness (mg/l as CaCO3)	89
Conductivity (umhos/cm)	270
Residual Chlorine (mg/l)	<0.05

Results Summary: Synthetic Water Dissolved Copper
Ceriodaphnia dubia

The *Ceriodaphnia dubia* test was conducted from September 30, 2016 at 1420 to October 2, 2016 at 1500.
Statistical analyses:
NOEC = 7.03ug/L
LC50 = 6.64ug/L

Concentration	24 hour % Survival	48 hour % Survival	
Control	100	100	
2.95ug/L	100	100	
3.52ug/L	100	95.0	
4.98ug/L	100	80.0	
7.03ug/L	75.0	60.0	
10.3ug/L	5.00	0.00	*
16.0ug/L	0.00	0.00	*

*Significant difference compared to the control (p=0.05)

Ceriodaphnia dubia
Survival Data

Number of organisms per chamber: 5
Volume of test chamber: 30 ml

Age of organisms: <24 hours
Volume of test solution: 15 ml

Effluent Concentration		Number of Survivors 24 Hours	Number of Survivors 48 Hours	% Survival	CV %
Control	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
2.95ug/L	rep. A	5	5	100	0.00
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	5		
3.52ug/L	rep. A	5	5	95.0	10.5
	rep. B	5	5		
	rep. C	5	5		
	rep. D	5	4		
4.98ug/L	rep. A	5	5	80.0	20.4
	rep. B	5	3		
	rep. C	5	4		
	rep. D	5	4		
7.03ug/L	rep. A	5	5	60.0	47.1
	rep. B	4	3		
	rep. C	3	2		
	rep. D	3	2		
10.3ug/L	rep. A	0	0	0.00	0.00
	rep. B	1	0		
	rep. C	0	0		
	rep. D	0	0		
16ug/L	rep. A	0	0	0.00	0.00
	rep. B	0	0		
	rep. C	0	0		
	rep. D	0	0		

CV = Coefficient of variance = standard deviation X 100/mean

Ceriodaphnia dubia

		Transformation of Data		Transform: Arc Sin(Square Root(Y))
Group	Identification	Rep	Value	Transformed
1	Control	1	1.00000	1.34530
1	Control	2	1.00000	1.34530
1	Control	3	1.00000	1.34530
1	Control	4	1.00000	1.34530
2	2.95ug/L	1	1.00000	1.34530
2	2.95ug/L	2	1.00000	1.34530
2	2.95ug/L	3	1.00000	1.34530
2	2.95ug/L	4	1.00000	1.34530
3	3.52ug/L	1	1.00000	1.34530
3	3.52ug/L	2	1.00000	1.34530
3	3.52ug/L	3	1.00000	1.34530
3	3.52ug/L	4	0.80000	1.10710
4	4.98ug/L	1	1.00000	1.34530
4	4.98ug/L	2	0.60000	0.88608
4	4.98ug/L	3	0.80000	1.10710
4	4.98ug/L	4	0.80000	1.10710
5	7.03ug/L	1	1.00000	1.34530
5	7.03ug/L	2	0.60000	0.88608
5	7.03ug/L	3	0.40000	0.68472
5	7.03ug/L	4	0.40000	0.68472
6	10.3ug/L	1	0.00000	0.22551
6	10.3ug/L	2	0.00000	0.22551
6	10.3ug/L	3	0.00000	0.22551
6	10.3ug/L	4	0.00000	0.22551
7	16ug/L	1	0.00000	0.22551
7	16ug/L	2	0.00000	0.22551
7	16ug/L	3	0.00000	0.22551
7	16ug/L	4	0.00000	0.22551

Ceriodaphnia dubia

Shapiro - Wilk's Test for Normality		Transform: Arc Sin(Square Root(Y))
D = 0.4392		
W = 0.7135		
Critical W = 0.896	(alpha = 0.01, N = 28)	
Critical W = 0.924	(alpha = 0.05, N = 28)	

Data FAIL normality test (alpha = 0.01).

Steel's Many-One Rank Test					Transform: Arc Sin(Square Root(Y))
Ho:Control<Treatment					
Group	Identification	Rank Sum	Critical Value	DF	Sig 0.05
1	Control				
2	2.95ug/L	18.00	10.00	4.00	
3	3.52ug/L	16.00	10.00	4.00	
4	4.98ug/L	12.00	10.00	4.00	
5	7.03ug/L	12.00	10.00	4.00	
6	10.3ug/L	10.00	10.00	4.00	*
7	16ug/L	10.00	10.00	4.00	*

Critical values are 1 tailed (k=6)

Ceriodaphnia dubia

Probit Analysis for Calculating LC/EC Values

Concentration	Number Exposed	Number Responding	Observed Proportion Responding	Proportion Responding Adjusted for Controls	Predicted Proportion Responding
2.95	20	0	0	0	0.0037
3.52	20	1	0.05	0.05	0.0182
4.98	20	4	0.2	0.2	0.1711
7.03	20	8	0.4	0.4	0.5736
10.3	20	20	1	1	0.9255
16	20	20	1	1	0.9981

Chi - Square for Heterogeneity (calculated) = 5.434
Chi - Square for Heterogeneity (tabular value at 0.05 level) = 9.488

Mu = 0.8225
Sigma = 0.1319

Parameter	Estimate	Std. Error	Lower 95% Conf.	Upper 95% Conf.
Intercept	-1.236	1.009	-3.214	0.7417
Slope	7.582	1.229	5.174	9.991

Theoretical Spontaneous Response Rate = 0

Estimated LC/EC Values and Confidence Limits

LC/EC Point	Exposure Conc.	Lower 95% Conf.	Upper 95% Conf.
1	3.279	2.336	3.956
5	4.032	3.133	4.674
10	4.503	3.653	5.124
15	4.851	4.042	5.464
50	6.645	5.952	7.474
85	9.103	8.009	11.19
90	9.807	8.526	12.4
95	10.95	9.333	14.48
99	13.47	11.01	19.46

Chemical Data for
Ceriodaphnia dubia

Day 1		Control	2.95ug/L	3.52ug/L	4.98ug/L	7.03ug/L	10.3ug/L	16.0ug/L
DO, mg/l	Initial	7.5	7.4	7.5	7.3	7.5	7.2	7.4
DO, mg/l	Final	8.7	8.6	8.6	8.6	8.6	8.6	8.5
pH, su	Initial	8.2	8.2	8.1	8.2	8.2	8.2	8.2
pH, su	Final	8.2	8.2	8.2	8.2	8.2	8.2	8.2
Alkalinity, mg/l		55	NA	NA	NA	NA	NA	NA
Hardness, mg/l		89	NA	NA	NA	NA	NA	NA
Conductivity, umho/cm		270	NA	NA	NA	NA	NA	NA
Residual Chlorine, mg/l		<0.05	NA	NA	NA	NA	NA	NA

Day 2		Control	2.95ug/L	3.52ug/L	4.98ug/L	7.03ug/L	10.3ug/L	16.0ug/L
DO, mg/l	Final	8.9	9.0	9.0	8.9	9.0	8.9	9.0
pH, su	Final	8.2	8.2	8.2	8.2	8.2	8.2	8.2

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
219 Brown Lane
Bryant, AR 72022

This report contains the analytical results and supporting information for samples submitted on September 28, 2016. Attached please find a copy of the Chain of Custody and/or other documents received. Note that any remaining sample will be discarded two weeks from the original report date unless other arrangements are made.

This report is intended for the sole use of the client listed above. Assessment of the data requires access to the entire document.

This report has been reviewed by the Chief Operating Officer or a qualified designee.

John Overbey
Chief Operating Officer

This document has been distributed to the following:

PDF cc: GBMc & Associates, Inc.
ATTN: Mr. Jonathan Brown
jbrown@gbmcassoc.com

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

SAMPLE INFORMATION

Project Description:
Six (6) water sample(s) received on September 28, 2016
Idabel WER
3040-15-050

Receipt Details:
A Chain of Custody was provided. The samples were delivered in one (1) ice chest.

Each sample container was checked for proper labeling, including date and time sampled. Sample containers were reviewed for proper type, adequate volume, integrity, temperature, preservation, and holding times. Any exceptions are noted below:

Sample Identification:

Laboratory ID	Client Sample ID	Sampled Date/Time	Notes
205948-1	TB	27-Sep-2016 0655	
205948-2	001TD	27-Sep-2016 1305	
205948-3	001-1,2,3,4	27-Sep-2016 1300	
205948-4	Moderately Hard Water		
205948-5	Effluent Spiking 250 ppb INITIAL		
205948-6	Effluent Spiking 250 ppb FINAL		
205948-7	Effluent Spiking 162 ppb INITIAL		
205948-8	Effluent Spiking 162 ppb FINAL		
205948-9	Effluent Spiking 106 ppb INITIAL		
205948-10	Effluent Spiking 106 ppb FINAL		
205948-11	Effluent Spiking 68.7 ppb INITIAL		
205948-12	Effluent Spiking 68.7 ppb FINAL		
205948-13	Effluent Spiking 44.6 ppb INITIAL		
205948-14	Effluent Spiking 44.6 ppb FINAL		
205948-15	Effluent Spiking 29.0 ppb INITIAL		
205948-16	Effluent Spiking 29.0 ppb FINAL		
205948-17	Synthetic MOD Water Spiking 15.0 ppb INITIAL		
205948-18	Synthetic MOD Water Spiking 15.0 ppb FINAL		
205948-19	Synthetic MOD Water Spiking 9.75 ppb INITIAL		
205948-20	Synthetic MOD Water Spiking 9.75 ppb FINAL		
205948-21	Synthetic MOD Water Spiking 6.34 ppb INITIAL		
205948-22	Synthetic MOD Water Spiking 6.34 ppb FINAL		
205948-23	Synthetic MOD Water Spiking 4.12 ppb INITIAL		
205948-24	Synthetic MOD Water Spiking 4.12 ppb FINAL		
205948-25	Synthetic MOD Water Spiking 2.67 ppb INITIAL		
205948-26	Synthetic MOD Water Spiking 2.67 ppb FINAL		
205948-27	Synthetic MOD Water Spiking 1.74 ppb INITIAL		
205948-28	Synthetic MOD Water Spiking 1.74 ppb FINAL		

Qualifiers:
H Analytical holding time exceeded regulatory requirements

Case Narrative:
Table II of 40 CFR Part 136.3 indicates analysis of pH, Total Residual Chlorine, and Dissolved Oxygen are to be performed on site or immediately after collection. American Interplex Corporation analyzes these parameters as soon as possible after laboratory receipt.

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

SAMPLE INFORMATION

References:

"Methods for Chemical Analysis of Water and Wastes", EPA/600/4-79-020 (Mar 1983) with updates and supplements EPA/600/5-91-010 (Jun 1991), EPA/600/R-92-129 (Aug 1992) and EPA/600/R-93-100 (Aug 1993).
"Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846)", Third Edition.
"Standard Methods for the Examination of Water and Wastewaters", (SM).
"American Society for Testing and Materials" (ASTM).
"Association of Analytical Chemists" (AOAC).

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

ANALYTICAL RESULTS

AIC No. 205948-1
Sample Identification: TB 27-Sep-2016 0655

Analyte		Result	RL	Units	Qualifier
Copper		**< 1**	1	**ug/l**	
EPA 200.8	Prep: 28-Sep-2016 1130 by 235	Analyzed: 28-Sep-2016 1350 by 235		Batch: S41818	
Dissolved Copper		**< 1**	1	**ug/l**	
EPA 200.8	Prep: 28-Sep-2016 1130 by 235	Analyzed: 28-Sep-2016 1348 by 235		Batch: S41818	

AIC No. 205948-2
Sample Identification: 001TD 27-Sep-2016 1305

Analyte		Result	RL	Units	Qualifier
Copper		**1.51**	1	**ug/l**	
EPA 200.8	Prep: 28-Sep-2016 1130 by 235	Analyzed: 28-Sep-2016 1356 by 235		Batch: S41818	
Dissolved Copper		**< 1**	1	**ug/l**	
EPA 200.8	Prep: 28-Sep-2016 1130 by 235	Analyzed: 28-Sep-2016 1353 by 235		Batch: S41818	

AIC No. 205948-3
Sample Identification: 001-1,2,3,4 27-Sep-2016 1300

Analyte		Result	RL	Units	Qualifier
Alkalinity as CaCO3		**23**	1	**mg/l**	
SM 2320 B 1997	Prep: 04-Oct-2016 1555 by 319	Analyzed: 04-Oct-2016 1620 by 319		Batch: W57386	
Specific Conductance		**400**	2	**umho/cm**	
SM 2510 B 1997	Prep: 04-Oct-2016 1512 by 319	Analyzed: 04-Oct-2016 1540 by 319		Batch: W57385	
Total Dissolved Solids		**300**	10	**mg/l**	
SM 2540 C 1997	Prep: 30-Sep-2016 1209 by 100	Analyzed: 03-Oct-2016 1511 by 100		Batch: W57351	
pH		**7.1**		**Units**	H
SM 4500-H+ B 2000		Analyzed: 28-Sep-2016 1332 by 321		Batch: W57324	
Total Organic Carbon		**9.7**	1	**mg/l**	
SM 5310 C 2000	Prep: 28-Sep-2016 1141 by 319	Analyzed: 28-Sep-2016 1937 by 319		Batch: W57322	
Total Suspended Solids		**< 4**	4	**mg/l**	
USGS 3765	Prep: 29-Sep-2016 1319 by 100	Analyzed: 30-Sep-2016 1438 by 100		Batch: W57338	
Copper		**2.20**	1	**ug/l**	
EPA 200.8	Prep: 28-Sep-2016 1130 by 235	Analyzed: 28-Sep-2016 1345 by 235		Batch: S41818	
Hardness as CaCO3		**69**	1	**mg/l**	
SM 2340 B 1997	Prep: 28-Sep-2016 1200 by 308	Analyzed: 28-Sep-2016 1421 by 308		Batch: S41821	
Dissolved Organic Carbon		**8.6**	1	**mg/l**	
SM 5310 C 2000	Prep: 28-Sep-2016 1142 by 319	Analyzed: 28-Sep-2016 1925 by 319		Batch: W57322	
Dissolved Copper		**1.55**	1	**ug/l**	
EPA 200.8	Prep: 28-Sep-2016 1130 by 235	Analyzed: 28-Sep-2016 1342 by 235		Batch: S41818	

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

ANALYTICAL RESULTS

AIC No. 205948-4
Sample Identification: Moderately Hard Water

Analyte		Result	RL	Units	Qualifier
Alkalinity as CaCO3		**55**	1	**mg/l**	
SM 2320 B 1997	Prep: 04-Oct-2016 1555 by 319	Analyzed: 04-Oct-2016 1620 by 319		Batch: W57386	
Specific Conductance		**270**	2	**umho/cm**	
SM 2510 B 1997	Prep: 04-Oct-2016 1512 by 319	Analyzed: 04-Oct-2016 1540 by 319		Batch: W57385	
Total Dissolved Solids		**180**	10	**mg/l**	
SM 2540 C 1997	Prep: 30-Sep-2016 1209 by 100	Analyzed: 03-Oct-2016 1511 by 100		Batch: W57351	
pH		**8.0**		**Units**	
SM 4500-H+ B 2000		Analyzed: 28-Sep-2016 1332 by 321		Batch: W57324	
Total Organic Carbon		**< 1**	1	**mg/l**	
SM 5310 C 2000	Prep: 28-Sep-2016 1141 by 319	Analyzed: 28-Sep-2016 2000 by 319		Batch: W57322	
Total Suspended Solids		**< 4**	4	**mg/l**	
USGS 3765	Prep: 29-Sep-2016 1319 by 100	Analyzed: 30-Sep-2016 1438 by 100		Batch: W57338	
Copper		**< 1**	1	**ug/l**	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1206 by 235		Batch: S41843	
Hardness as CaCO3		**89**	1	**mg/l**	
SM 2340 B 1997	Prep: 28-Sep-2016 1200 by 308	Analyzed: 28-Sep-2016 1424 by 308		Batch: S41821	
Dissolved Organic Carbon		**< 1**	1	**mg/l**	
SM 5310 C 2000	Prep: 28-Sep-2016 1142 by 319	Analyzed: 28-Sep-2016 1948 by 319		Batch: W57322	
Dissolved Copper		**< 1**	1	**ug/l**	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1203 by 235		Batch: S41843	

AIC No. 205948-5
Sample Identification: Effluent Spiking 250 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**233**	1	**ug/l**	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1324 by 235		Batch: S41843	
Dissolved Copper		**183**	1	**ug/l**	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1321 by 235		Batch: S41843	

AIC No. 205948-6
Sample Identification: Effluent Spiking 250 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**269**	1	**ug/l**	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1420 by 235		Batch: S41845	
Dissolved Copper		**236**	1	**ug/l**	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1417 by 235		Batch: S41845	

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ANALYTICAL RESULTS

AIC No. 205948-7
Sample Identification: Effluent Spiking 162 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**146**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1319 by 235		Batch: S41843	
Dissolved Copper		**115**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1316 by 235		Batch: S41843	

AIC No. 205948-8
Sample Identification: Effluent Spiking 162 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**156**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1414 by 235		Batch: S41845	
Dissolved Copper		**137**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1411 by 235		Batch: S41845	

AIC No. 205948-9
Sample Identification: Effluent Spiking 106 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**93.6**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1313 by 235		Batch: S41843	
Dissolved Copper		**79.8**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1310 by 235		Batch: S41843	

AIC No. 205948-10
Sample Identification: Effluent Spiking 106 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**103**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1409 by 235		Batch: S41845	
Dissolved Copper		**96.2**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1406 by 235		Batch: S41845	

AIC No. 205948-11
Sample Identification: Effluent Spiking 68.7 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**63.1**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1307 by 235		Batch: S41843	
Dissolved Copper		**52.9**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1304 by 235		Batch: S41843	

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ANALYTICAL RESULTS

AIC No. 205948-12
Sample Identification: Effluent Spiking 68.7 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**75.7**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1358 by 235		Batch: S41845	
Dissolved Copper		**66.7**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1355 by 235		Batch: S41845	

AIC No. 205948-13
Sample Identification: Effluent Spiking 44.6 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**43.0**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1301 by 235		Batch: S41843	
Dissolved Copper		**36.5**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1258 by 235		Batch: S41843	

AIC No. 205948-14
Sample Identification: Effluent Spiking 44.6 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**47.9**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1352 by 235		Batch: S41845	
Dissolved Copper		**42.1**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1349 by 235		Batch: S41845	

AIC No. 205948-15
Sample Identification: Effluent Spiking 29.0 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**29.1**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1250 by 235		Batch: S41843	
Dissolved Copper		**26.0**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1247 by 235		Batch: S41843	

AIC No. 205948-16
Sample Identification: Effluent Spiking 29.0 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**30.9**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1347 by 235		Batch: S41845	
Dissolved Copper		**27.2**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1344 by 235		Batch: S41845	

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ANALYTICAL RESULTS

AIC No. 205948-17
Sample Identification: Synthetic MOD Water Spiking 15.0 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**16.3**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1245 by 235		Batch: S41843	
Dissolved Copper		**16.0**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1242 by 235		Batch: S41843	

AIC No. 205948-18
Sample Identification: Synthetic MOD Water Spiking 15.0 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**18.0**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1504 by 235		Batch: S41845	
Dissolved Copper		**16.2**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1501 by 235		Batch: S41845	

AIC No. 205948-19
Sample Identification: Synthetic MOD Water Spiking 9.75 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**11.1**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1239 by 235		Batch: S41843	
Dissolved Copper		**10.3**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1236 by 235		Batch: S41843	

AIC No. 205948-20
Sample Identification: Synthetic MOD Water Spiking 9.75 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**11.4**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1458 by 235		Batch: S41845	
Dissolved Copper		**10.1**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1455 by 235		Batch: S41845	

AIC No. 205948-21
Sample Identification: Synthetic MOD Water Spiking 6.34 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**7.39**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1234 by 235		Batch: S41843	
Dissolved Copper		**7.03**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1231 by 235		Batch: S41843	

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ANALYTICAL RESULTS

AIC No. 205948-22
Sample Identification: Synthetic MOD Water Spiking 6.34 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**7.58**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1453 by 235		Batch: S41845	
Dissolved Copper		**6.86**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1450 by 235		Batch: S41845	

AIC No. 205948-23
Sample Identification: Synthetic MOD Water Spiking 4.12 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**5.23**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1223 by 235		Batch: S41843	
Dissolved Copper		**4.98**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1220 by 235		Batch: S41843	

AIC No. 205948-24
Sample Identification: Synthetic MOD Water Spiking 4.12 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**5.67**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1447 by 235		Batch: S41845	
Dissolved Copper		**5.25**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1444 by 235		Batch: S41845	

AIC No. 205948-25
Sample Identification: Synthetic MOD Water Spiking 2.67 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**3.74**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1217 by 235		Batch: S41843	
Dissolved Copper		**3.52**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1214 by 235		Batch: S41843	

AIC No. 205948-26
Sample Identification: Synthetic MOD Water Spiking 2.67 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**4.16**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1442 by 235		Batch: S41845	
Dissolved Copper		**3.09**	1	ug/l	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1439 by 235		Batch: S41845	

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ANALYTICAL RESULTS

AIC No. 205948-27
Sample Identification: Synthetic MOD Water Spiking 1.74 ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**2.85**	1	**ug/l**	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1212 by 235		Batch: S41843	
Dissolved Copper		**2.95**	1	**ug/l**	
EPA 200.8	Prep: 03-Oct-2016 1018 by 235	Analyzed: 03-Oct-2016 1209 by 235		Batch: S41843	

AIC No. 205948-28
Sample Identification: Synthetic MOD Water Spiking 1.74 ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**2.60**	1	**ug/l**	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1431 by 235		Batch: S41845	
Dissolved Copper		**2.26**	1	**ug/l**	
EPA 200.8	Prep: 03-Oct-2016 1222 by 235	Analyzed: 03-Oct-2016 1428 by 235		Batch: S41845	

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DUPLICATE RESULTS

Analyte		AIC No.	Result	RPD	RPD Limit	Preparation Date	Analysis Date	Dil	Qual
pH		205948-3	7.1 Units				28Sep16 1332 by 321		H
	Batch: W57324	Duplicate	7.1 Units	0.280	5.00		28Sep16 1333 by 321		H
Total Suspended Solids		205928-1	37 mg/l			29Sep16 1319 by 100	30Sep16 1438 by 100		
	Batch: W57338	Duplicate	37 mg/l	0.00	20.0	29Sep16 1320 by 100	30Sep16 1438 by 100		
Total Suspended Solids		205965-1	23 mg/l			29Sep16 1319 by 100	30Sep16 1438 by 100		
	Batch: W57338	Duplicate	22 mg/l	4.44	20.0	29Sep16 1320 by 100	30Sep16 1438 by 100		
Total Dissolved Solids		205922-1	1000 mg/l			30Sep16 1209 by 100	03Oct16 1511 by 100		
	Batch: W57351	Duplicate	1000 mg/l	0.299	10.0	30Sep16 1210 by 100	03Oct16 1511 by 100		
Total Dissolved Solids		205924-2	1000 mg/l			30Sep16 1209 by 100	03Oct16 1511 by 100		
	Batch: W57351	Duplicate	1000 mg/l	0.293	10.0	30Sep16 1210 by 100	03Oct16 1511 by 100		
Specific Conductance		205948-4	270 umho/cm			04Oct16 1512 by 319	04Oct16 1540 by 319		
	Batch: W57385	Duplicate	270 umho/cm	1.10	20.0	04Oct16 1513 by 319	04Oct16 1540 by 319		
Alkalinity as CaCO3		205948-4	55 mg/l			04Oct16 1555 by 319	04Oct16 1620 by 319		
	Batch: W57386	Duplicate	55 mg/l	0.00	10.0	04Oct16 1555 by 319	04Oct16 1620 by 319		

LABORATORY CONTROL SAMPLE RESULTS

Analyte	Spike Amount	%	Limits	RPD	Limit	Batch	Preparation Date	Analysis Date	Dil	Qual
Specific Conductance	1412 umho/cm	98.4	90.0-110			W57385	04Oct16 1513 by 319	04Oct16 1540 by 319		
pH	-	100	98.0-102			W57324		28Sep16 1333 by 321		
Total Organic Carbon	10 mg/l	100	80.0-120			W57322	28Sep16 1142 by 319	28Sep16 1726 by 319		
Copper	0.05 mg/l	97.4	85.0-115			S41818	28Sep16 1130 by 235	28Sep16 1233 by 235		
	0.05 mg/l	95.0	85.0-115	2.49	20.0	S41818	28Sep16 1130 by 235	28Sep16 1300 by 235		
Copper	0.05 mg/l	101	85.0-115			S41843	03Oct16 1018 by 235	03Oct16 1228 by 235		
	0.05 mg/l	101	85.0-115	0.00	20.0	S41843	03Oct16 1018 by 235	03Oct16 1256 by 235		
Copper	0.05 mg/l	98.8	85.0-115			S41845	03Oct16 1223 by 235	03Oct16 1403 by 235		
	0.05 mg/l	99.4	85.0-115	0.605	20.0	S41845	03Oct16 1223 by 235	03Oct16 1436 by 235		
Dissolved Organic Carbon	10 mg/l	100	80.0-120			W57322	28Sep16 1142 by 319	28Sep16 1726 by 319		

MATRIX SPIKE SAMPLE RESULTS

Analyte	Sample	Spike Amount	%	Limits	Batch	Preparation Date	Analysis Date	Dil	Qual
Total Organic Carbon	205946-1	10 mg/l	109	80.0-120	W57322	28Sep16 1142 by 319	28Sep16 1750 by 319		
	205946-1	10 mg/l	111	80.0-120	W57322	28Sep16 1142 by 319	28Sep16 1802 by 319		
	Relative Percent Difference:		1.58	25.0	W57322				

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LABORATORY BLANK RESULTS

Analyte	Result	RL	PQL	QC Sample	Preparation Date	Analysis Date	Qual
Alkalinity as CaCO3	< 1 mg/l	1	1	W57386-1	04Oct16 1555 by 319	04Oct16 1620 by 319	
Specific Conductance	< 2 umho/cm	2	2	W57385-1	04Oct16 1513 by 319	04Oct16 1540 by 319	
Total Dissolved Solids	< 10 mg/l	10	10	W57351-1	30Sep16 1210 by 100	03Oct16 1511 by 100	
Total Organic Carbon	< 1 mg/l	1	1	W57322-1	28Sep16 1142 by 319	28Sep16 1715 by 319	
Total Suspended Solids	< 2 mg/l	2	2	W57338-1	29Sep16 1320 by 100	30Sep16 1438 by 100	
Copper	< 1 ug/l	1	1	S41818-1	28Sep16 1130 by 235	28Sep16 1204 by 235	
Copper	< 1 ug/l	1	1	S41843-1	03Oct16 1018 by 235	03Oct16 1201 by 235	
Copper	< 1 ug/l	1	1	S41845-1	03Oct16 1223 by 235	03Oct16 1336 by 235	
Dissolved Organic Carbon	< 1 mg/l	1	1	W57322-1	28Sep16 1142 by 319	28Sep16 1715 by 319	

GBM[c] & Associates
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Chain of Custody

205948

Client/Billing Information		SPECIAL INSTRUCTIONS/PRECAUTIONS:
Client:	Jonathan Brown	Composite samples according to attached flows. Perform WER
Company:	GBM[c] & Assoc.	study for total and dissolved copper WER (Ceriodaphnia only).
Address:	219 Brown Lane	Analyze additional parameters on composite only.
	Bryant AR 72022	Project Name / Number: Idabel WER
Phone No.:	(501) 847-7077	3040-15-050
Fax No.:	jbrown@gbmcassoc.com	

Parameters for Analysis/Methods

Sample ID	Sample Description	Date	Time	Matrix S=Sed/Soil W=Water	Number of Containers	Composite or Grab	Total/Dissolved Copper	WER Study	Hardness Alkalinity Conductivity	TOC, DOC TSS, TDS			
TB	Trip Blank	9/27/16	0655	W	1	G	X						
001-1	Grab 1		0700					X	X	X	} Composite		
001-2	Grab 2		0900					X	X	X			
001-3	Grab 3		1100					X	X	X			
001-4	Grab 4		1300					X	X	X			
001TD	001 Grab		1305				X						
Preservative	(Sulfuric acid =S, Nitric acid =N, NaOH =B, Ice =I)						I	I	I	I			

provided flow data

Sampler(s): JBB	Shipment Method: Hand Delivered	Turnaround Time Required: Standard	
COC Completed by:	Date: 9/29/16 Time: 0835	COC Checked by:	Date: 9/28/16 Time: 0845
Relinquished by:	Date: Time:	Received by:	Date: Time:
Relinquished by:	Date: 9/29/16 Time: 0920	Received in lab by: D Brown	Date: 9-28-16 Time: 0920
LABORATORY USE ONLY:	Samples Received On Ice?: (YES) or NO	Sample Temperature: 6.1°C	

Flows for WER Study

Sample	Flow
001-1	0.864 MGD
001-2	0.685 MGD
001-3	0.897 MGD
001-4	1.052 MGD

CN

Hour	Flow		%	Milliliters for 3 gallons
	1	0.864	24.70	2805
	2	0.685	19.58	2224
	3	0.897	25.64	2912
	4	1.052	30.07	3415
	5	0	0.00	0
	6	0	0.00	0
	7	0	0.00	0
	8	0	0.00	0
	9	0	0.00	0
	10	0	0.00	0
	11	0	0.00	0
	12	0	0.00	0
	13	0	0.00	0
	14	0	0.00	0
	15	0	0.00	0
	16	0	0.00	0
	17	0	0.00	0
	18	0	0.00	0
	19	0	0.00	0
	20	0	0.00	0
	21	0	0.00	0
	22	0	0.00	0
	23	0	0.00	0
	24	0	0.00	0
Total		3.498		11356

created by: jo45
verified by: sb235 7/10/2012

Table 1. Analytical methods to be followed during the WER study.

Parameter	Method	Preservative[1]	Holding Time
Total Copper	EPA200.7/200.8	4 °C, HNO_3	6 Months
Dissolved Copper	EPA200.7/200.8	4 °C, HNO_3	6 Months
T. Hardness	EPA200.8	4 °C, HNO_3	6 Months
T. Alkalinity	SM 2320B	4 °C	14 Days
TSS	SM2540D	4 °C	7 Days
TOC	SM5310C	4 °C, H_2SO4	28 Days
DOC	SM5310C	4 °C	28 Days
TDS	SM2540C	4 °C	7 Days

[1]All chemical preservatives added after sample composite and/or dilution sub-sampling.

Table 2. Analysis to be conducted in conjunction with the WER toxicity testing.[1]

	Water Sample Source		
Analytical Parameter	**Effluent (SWM)**	**Lab water**	**Selected spiked test dilutions[2, 3]**
Total Copper	X	X	X
Dissolved Copper	X	X	X
Total Hardness	X	X	
Total Alkalinity	X	X	
pH	X	X	X
TSS	X	X	
TOC	X	X	
DOC	X	X	
Specific conductance	X	X	X
TDS	X		
Dissolved oxygen		X	X
Temperature		X	X
Routine DMR parameters	Routine parameters will be analyzed by the permittee as part of routine monitoring on the same day as WER study samples are collected. Routine parameters include BOD, TSS, NH3-N, DO, Chlorides, Sulfates, TDS, T. Cadmium, T. Chromium, T. Copper, T. Selenium, T. Silver, T. Zinc, pH.		

[1] The normal battery of chemistry completed for routine biomonitoring tests (pH, temperature, conductivity, dissolved oxygen, etc.) should be completed during each WER test.

[2] At a minimum the test treatments that bracket the LC50 must be tested for these parameters. The lowest treatment that exhibited 100% mortality, the highest treatment that exhibited no effect and the control should each also be tested for these parameters.

[3] Dilutions will be prepared using copper sulfate.

Table 5. Summary of test conditions for copper WER toxicity testing.

Parameter	Test condition (Lab Water)	Test Condition (Site Water Mix)
Test Type	48-h Acute static non-renewal	48-h Acute static non-renewal
Chemical Test	Copper	Copper
Temperature	25°C	25°C
Light Quality	Ambient Laboratory	Ambient Laboratory
Light Intensity	50-100 ft-c	50-100 ft-c
Photoperiod	16h light, 8h dark	16h light, 8h dark
Test Chamber Type	30 mL minimum	30 mL minimum
Test Solution Volume	15 mL minimum	15 mL minimum
Solution Renewal	None[1]	None[1]
Age of Test Organisms	<24-h	<24-h
No. Organisms/Chamber	5	5
No. of Replicate Chambers	4	4
Feeding Regime	None	None
Aeration	None	None
Dilution Water (Test Water)	Moderately Hard Reconstituted	100% Effluent
Dilution Ratio	0.65	0.65
Number of treatments[2] (metal concentrations)	6 treatments (15, 9.8, 6.3, 4.1, 2.7, 1.7 µg/L)	To be determined by range finding test.
Highest Copper Concentration	15 µg/L	To be determined by range finding test.

[1] Copper concentration will be measured in the test solution before test initiation and at the conclusion of the testing.

[2] Treatment number and concentration may vary based on results of first WER testing.

Time Weighted Average LC50 Calculations

AMERICAN INTERPLEX CORPORATION
LABORATORIES

December 02, 2016

GBMc & Associates
ATTN: Mr. Jonathan Brown
219 Brown Lane
Bryant, AR 72022

Re: LC50 Calculations
American Interplex Corporation Control No: 207708

Dear Mr. Brown:

As requested, the LC50 data has been recalculated based on the weighted average Copper concentrations provided in your emails dated November 11, 2016 and November 21, 2016.

The LC-50 data is presented below for your review:

		Total Copper, ug/L	Dissolved Copper, ug/L:
IdabelWER-1			
Effluent	7/26/2016	128	105
Synthetic		7.25	6.66
IdabelWER-2			
Effluent	9/27/2016	125	108
Synthetic		7.17	6.62
Tyson Grannis WER-1			
Site Water Mix	7/5/11	154	140
Synthetic		3.02	2.73
Tyson Grannis WER-2			
Site Water Mix	9/6/11	212	193
Synthetic		6.28	5.43

If I can be of any further assistance with this matter, please feel free to contact me.

Sincerely,

AMERICAN INTERPLEX CORPORATION

John Overbey
Chief Operating Officer

8600 Kanis Road • Little Rock, AR 72204 www.americaninterplex.com 501-224-5060 • FAX 501-224-5072

Appendix A2: Statistics

Ceriodaphnia dubia

Idabel WER-1 Effluent Total Copper

Graphical LC50 Method

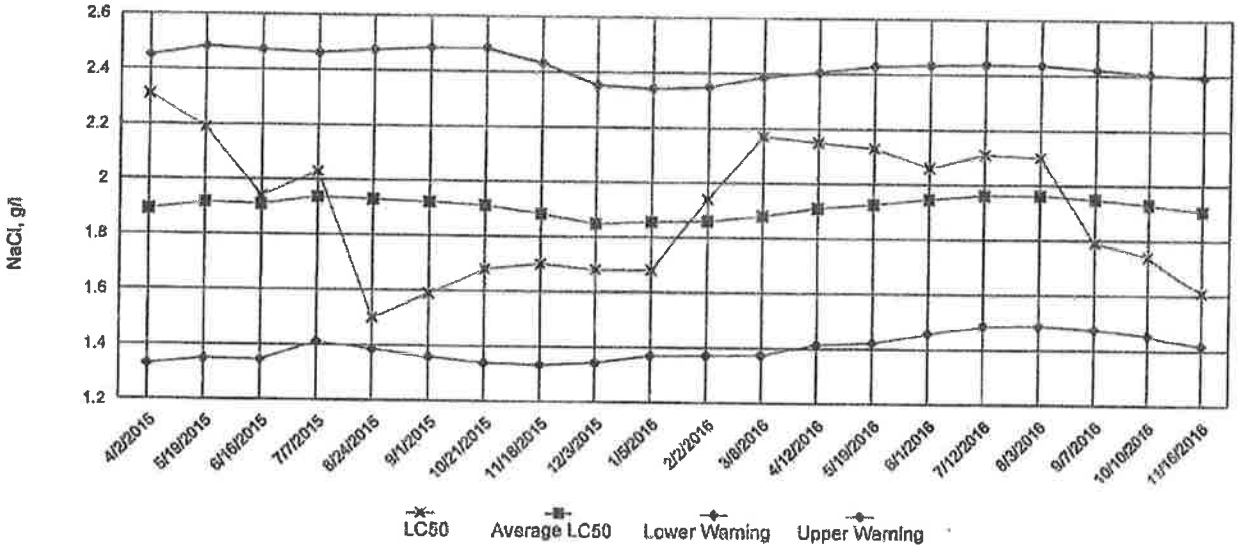
Concentration	Number Exposed	Number Responding	Proportion Responding	Smoothed Proportion	Smoothed Adjusted Proportion
Control	20	0	0	0	0
38.1	20	0	0	0	0
50.4	20	0	0	0	0
71.9	20	0	0	0	0
108	20	0	0	0	0
152	20	20	1	1	1
248	20	20	1	1	1

LC50 = 128

Appendix: A3

Acute Reference Toxicant, *Ceriodaphnia dubia*

LC50 Survival Data



Appendix A2: Statistics

Ceriodaphnia dubia

Idabel WER-1 Synthetic Total Copper

Spearman-Karber Method for Calculating LC50 Values

Concentration	Number Exposed	Number Responding	Proportion Responding	Smoothed Proportion	Smoothed Adjusted Proportion
Control	20	0	0	0	0
2.8	20	0	0	0	0
3.47	20	0	0	0	0
4.42	20	0	0	0	0
5.55	20	0	0	0	0
8.36	20	17	0.85	0.85	0.85
12.7	20	20	1	1	1

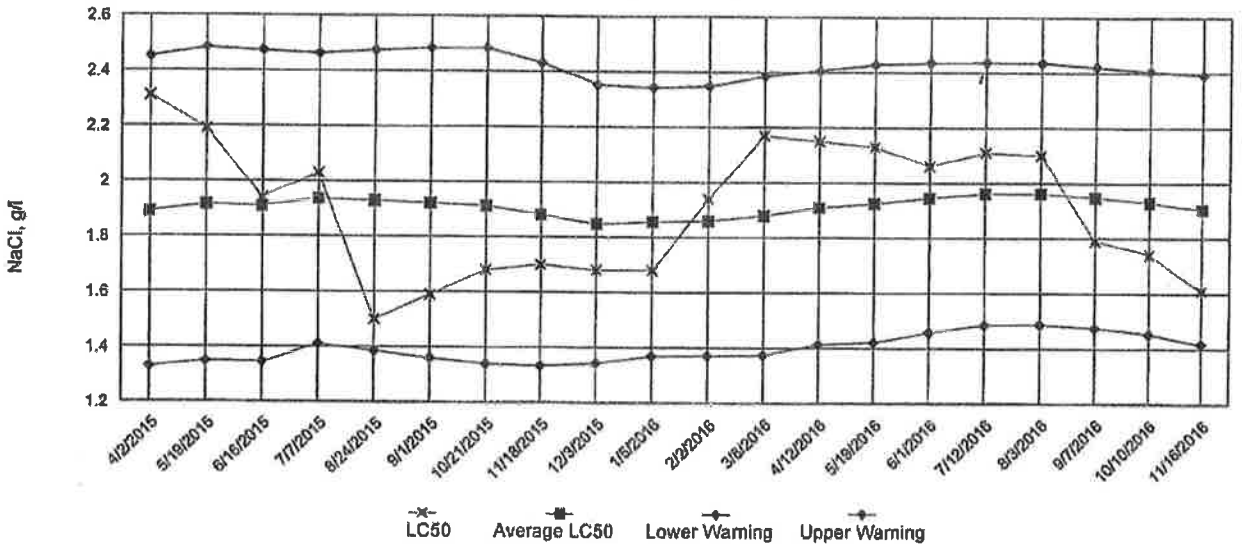
LC50 = 7.248
Upper Confidence Limit = 7.756
Lower Confidence Limit = 6.773

Variance = 0.0002168

Appendix: A3

Acute Reference Toxicant, *Ceriodaphnia dubia*

LC50 Survival Data



Appendix A2: Statistics

Ceriodaphnia dubia

Idabel WER-1 Effluent Dissolved Copper

Graphical LC50 Method

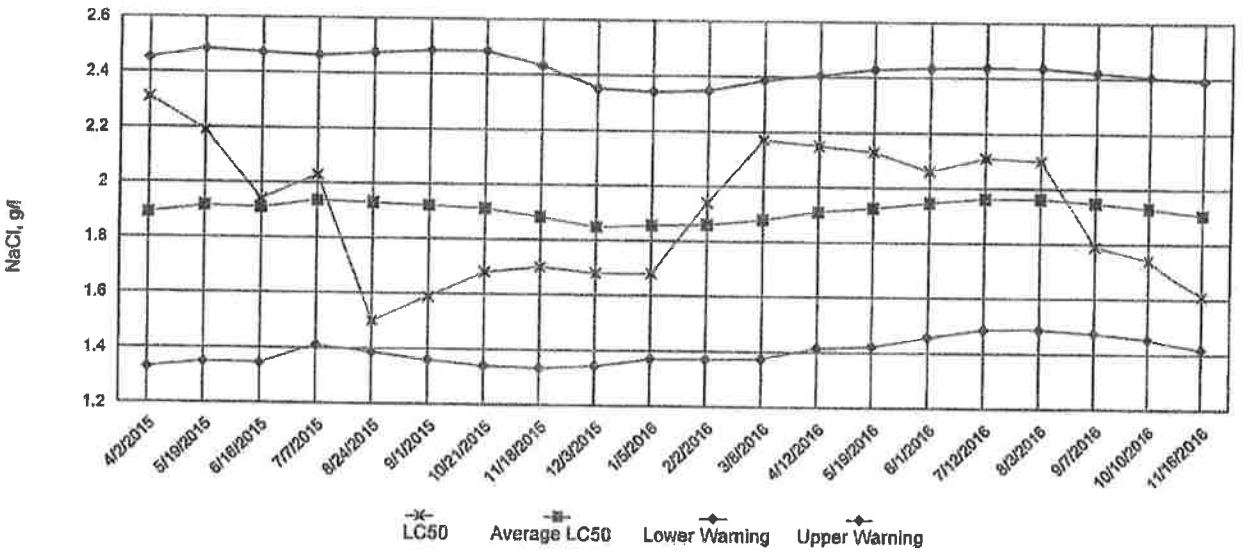
Concentration	Number Exposed	Number Responding	Proportion Responding	Smoothed Proportion	Smoothed Adjusted Proportion
Control	20	0	0	0	0
32.7	20	0	0	0	0
42.1	20	0	0	0	0
60.6	20	0	0	0	0
88.8	20	0	0	0	0
125	20	20	1	1	1
194	20	20	1	1	1

LC50 = 105

Appendix; A3

Acute Reference Toxicant, *Ceriodaphnia dubia*

LC50 Survival Data



Appendix A2: Statistics

Ceriodaphnia dubia

Idabel WER-1 Synthetic Dissolved Copper

Spearman-Karber Method for Calculating LC50 Values

Concentration	Number Exposed	Number Responding	Proportion Responding	Smoothed Proportion	Smoothed Adjusted Proportion
Control	20	0	0	0	0
2.48	20	0	0	0	0
3.02	20	0	0	0	0
3.87	20	0	0	0	0
5.02	20	0	0	0	0
7.72	20	17	0.85	0.85	0.85
12.3	20	20	1	1	1

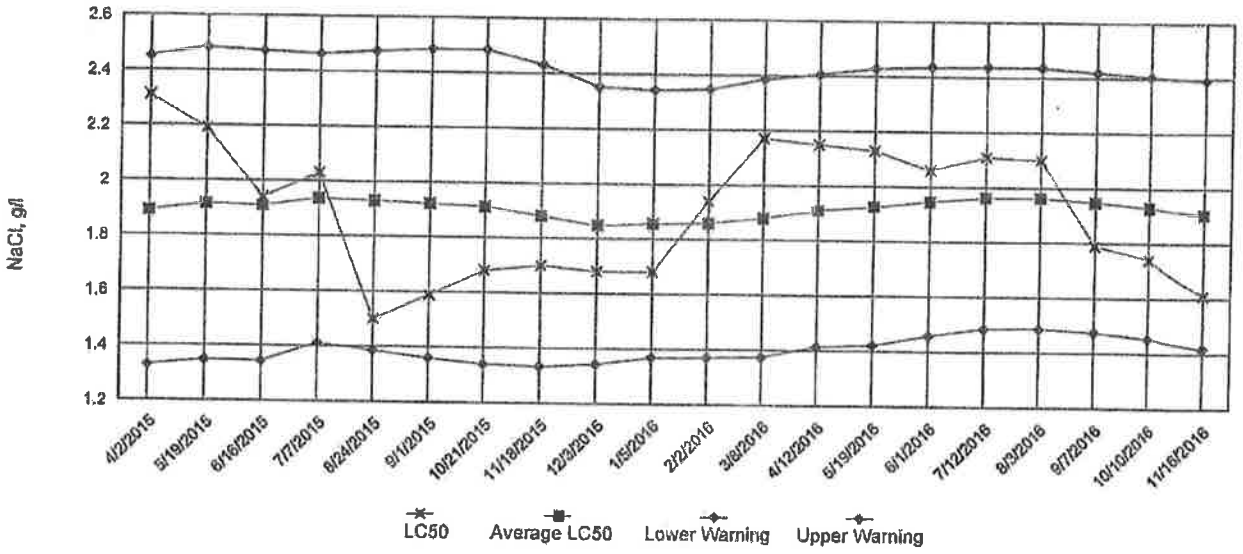
LC50 = 6.658
Upper Confidence Limit = 7.165
Lower Confidence Limit = 6.187

Variance = 0.0002541

Appendix: A3

Acute Reference Toxicant, *Ceriodaphnia dubia*

LC50 Survival Data



Appendix A2: Statistics

Ceriodaphnia dubia

Idabel WER-2 Effluent Total Copper

Spearman-Karber Method for Calculating LC50 Values

Concentration	Number Exposed	Number Responding	Proportion Responding	Smoothed Proportion	Smoothed Adjusted Proportion
Control	20	0	0	0	0
30	20	0	0	0	0
45.4	20	0	0	0	0
69.4	20	0	0	0	0
98.3	20	0	0	0	0
151	20	19	0.95	0.95	0.95
251	20	20	1	1	1

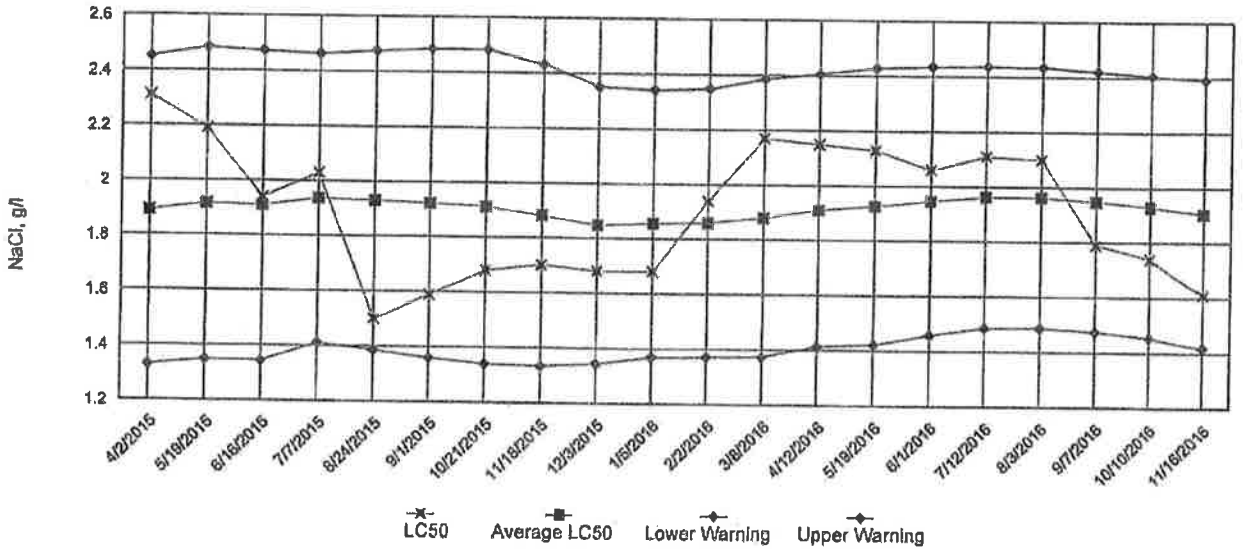
LC50 = 124.7
Upper Confidence Limit = 130.7
Lower Confidence Limit = 119

Variance = 0.0001036

Appendix: A3

Acute Reference Toxicant, *Ceriodaphnia dubia*

LC50 Survival Data



Appendix A2: Statistics

Ceriodaphnia dubia

Idabel WER-2 Synthetic Total Copper

Probit Analysis for Calculating LC/EC Values

Concentration	Number Exposed	Number Responding	Observed Proportion Responding	Proportion Responding Adjusted for Controls	Predicted Proportion Responding
2.72	20	0	0	0	0.0005
3.95	20	1	0.05	0.05	0.021
5.45	20	4	0.2	0.2	0.1749
7.48	20	8	0.4	0.4	0.5578
11.2	20	20	1	1	0.9361
17.2	20	20	1	1	0.9986

Chi - Square for Heterogeneity (calculated) = 4.324
Chi - Square for Heterogeneity (tabular value at 0.05 level) = 9.488

Mu = 0.8554
Sigma = 0.1273

Parameter	Estimate	Std. Error	Lower 95% Conf.	Upper 95% Conf.
Intercept	-1.719	1.142	-3.958	0.5195
Slope	7.855	1.34	5.228	10.48

Theoretical Spontaneous Response Rate = 0

Estimated LC/EC Values and Confidence Limits

LC/EC Point	Exposure Conc.	Lower 95% Conf.	Upper 95% Conf.
1	3.625	2.553	4.369
5	4.426	3.415	5.122
10	4.923	3.976	5.592
15	5.29	4.395	5.946
50	7.168	6.435	8.051
85	9.713	8.56	11.99
90	10.44	9.088	13.28
95	11.51	9.906	15.49
99	14.18	11.59	20.75

Appendix A2: Statistics

Ceriodaphnia dubia

Idabel WER-2 Effluent Dissolved Copper

Spearman-Karber Method for Calculating LC50 Values

Concentration	Number Exposed	Number Responding	Proportion Responding	Smoothed Proportion	Smoothed Adjusted Proportion
Control	20	0	0	0	0
26.6	20	0	0	0	0
39.3	20	0	0	0	0
59.8	20	0	0	0	0
88	20	0	0	0	0
126	20	19	0.95	0.95	0.95
210	20	20	1	1	1

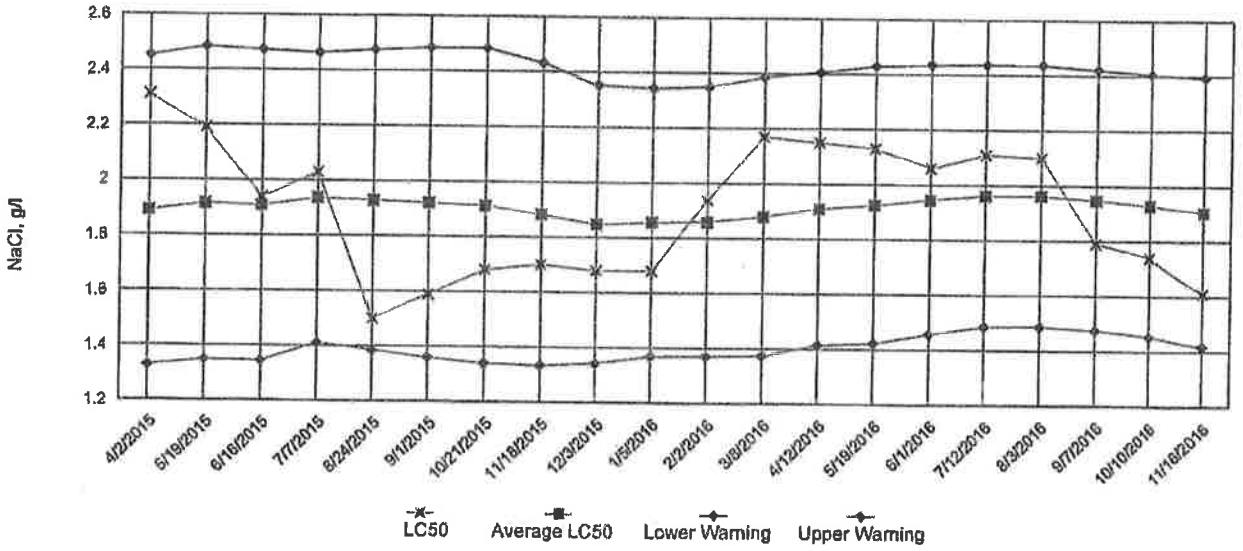
LC50 = 107.6
Upper Confidence Limit = 112.4
Lower Confidence Limit = 103

Variance = 8.918E-05

Appendix: A3

Acute Reference Toxicant, *Ceriodaphnia dubia*

LC50 Survival Data



Appendix A2: Statistics

Ceriodaphnia dubia

Idabel WER-2 Synthetic Dissolved Copper

Probit Analysis for Calculating LC/EC Values

Concentration	Number Exposed	Number Responding	Observed Proportion Responding	Proportion Responding Adjusted for Controls	Predicted Proportion Responding
2.6	20	0	0	0	0.0013
3.3	20	1	0.05	0.05	0.0122
5.12	20	4	0.2	0.2	0.2034
6.94	20	8	0.4	0.4	0.5614
10.2	20	20	1	1	0.9193
16.1	20	20	1	1	0.998

Chi - Square for Heterogeneity (calculated) = 6.309
Chi - Square for Heterogeneity (tabular value at 0.05 level) = 9.488

Mu = 0.8206
Sigma = 0.1342

Parameter	Estimate	Std. Error	Lower 95% Conf.	Upper 95% Conf.
Intercept	-1.114	1.07	-3.211	0.9829
Slope	7.451	1.293	4.916	9.986

Theoretical Spontaneous Response Rate = 0

Estimated LC/EC Values and Confidence Limits

LC/EC Point	Exposure Conc.	Lower 95% Conf.	Upper 95% Conf.
1	3.224	2.187	3.95
5	3.98	2.983	4.663
10	4.453	3.509	5.109
15	4.803	3.908	5.445
50	6.616	5.901	7.442
85	9.114	8.01	11.31
90	9.832	8.532	12.61
95	11	9.343	14.84
99	13.58	11.02	20.25

Appendix A2: Statistics

Ceriodaphnia dubia

Tyson Grannis WER-1 SWM Total Copper

Probit Analysis for Calculating LC/EC Values

Concentration	Number Exposed	Number Responding	Observed Proportion Responding	Proportion Responding Adjusted for Controls	Predicted Proportion Responding
4.75	20	0	0	0	0
53	20	0	0	0	0
77	20	0	0	0	0
120	20	1	0.05	0.05	0.05
175	20	16	0.8	0.8	0.8
305	20	20	1	1	1

Chi - Square for Heterogeneity (calculated) = 0.0001361
Chi - Square for Heterogeneity (tabular value at 0.05 level) = 9.488

Mu = 2.188
Sigma = 0.06589

Parameter	Estimate	Std. Error	Lower 95% Conf.	Upper 95% Conf.
Intercept	-28.2	7.624	-43.14	-13.26
Slope	15.18	3.477	8.363	21.99

Theoretical Spontaneous Response Rate = 0

Estimated LC/EC Values and Confidence Limits

LC/EC Point	Exposure Conc.	Lower 95% Conf.	Upper 95% Conf.
1	108.2	79.1	123.3
5	120	94.82	133.3
10	126.8	104.2	139.2
15	131.6	111	143.5
50	154	140.7	167.8
85	180.2	165.8	211.2
90	187.1	171	224.7
95	197.7	178.8	246.8
99	219.2	193.3	295.6

Appendix A2: Statistics

Ceriodaphnia dubia

Tyson Grannis WER-1 Synthetic Total Copper

Probit Analysis for Calculating LC/EC Values

Concentration	Number Exposed	Number Responding	Observed Proportion Responding	Proportion Responding Adjusted for Controls	Predicted Proportion Responding
1	20	0	0	0	0.0107
3.2	20	13	0.65	0.65	0.5467
5.15	20	15	0.75	0.75	0.8658
7.4	20	20	1	1	0.9686
12.5	20	20	1	1	0.9984
17	20	20	1	1	0.9998

Chi - Square for Heterogeneity (calculated) = 4.068
Chi - Square for Heterogeneity (tabular value at 0.05 level) = 9.488

Mu = 0.4807
Sigma = 0.2089

Parameter	Estimate	Std. Error	Lower 95% Conf.	Upper 95% Conf.
Intercept	2.699	0.6011	1.521	3.877
Slope	4.787	0.9546	2.916	6.658

Theoretical Spontaneous Response Rate = 0

Estimated LC/EC Values and Confidence Limits

LC/EC Point	Exposure Conc.	Lower 95% Conf.	Upper 95% Conf.
1	0.9879	0.3945	1.503
5	1.371	0.6696	1.919
10	1.633	0.8857	2.192
15	1.837	1.068	2.401
50	3.025	2.28	3.649
85	4.979	4.133	6.529
90	5.602	4.609	7.734
95	6.672	5.351	10.06
99	9.26	6.937	16.82

Appendix A2: Statistics

Ceriodaphnia dubia

Tyson Grannis WER-1 SWM Dissolved Copper

Probit Analysis for Calculating LC/EC Values

Concentration	Number Exposed	Number Responding	Observed Proportion Responding	Proportion Responding Adjusted for Controls	Predicted Proportion Responding
4.7	20	0	0	0	0
52	20	0	0	0	0
72	20	0	0	0	0
108	20	1	0.05	0.05	0.0499
160	20	16	0.8	0.8	0.8001
285	20	20	1	1	1

Chi - Square for Heterogeneity (calculated) = 0.0003454
Chi - Square for Heterogeneity (tabular value at 0.05 level) = 9.488

Mu = 2.146
Sigma = 0.06863

Parameter	Estimate	Std. Error	Lower 95% Conf.	Upper 95% Conf.
Intercept	-26.28	7.17	-40.33	-12.22
Slope	14.57	3.332	8.041	21.1

Theoretical Spontaneous Response Rate = 0

Estimated LC/EC Values and Confidence Limits

LC/EC Point	Exposure Conc.	Lower 95% Conf.	Upper 95% Conf.
1	96.98	70.05	111.1
5	108	84.58	120.5
10	114.4	93.33	126
15	118.9	99.6	130.1
50	140.1	127.5	153.2
85	165	151.2	194.6
90	171.5	156.2	207.5
95	181.6	163.6	228.8
99	202.3	177.5	276

Appendix A2: Statistics

Ceriodaphnia dubia

Tyson Grannis WER-1 Synthetic Dissolved Copper

Probit Analysis for Calculating LC/EC Values

Concentration	Number Exposed	Number Responding	Observed Proportion Responding	Proportion Responding Adjusted for Controls	Predicted Proportion Responding
1	20	0	0	0	0.0224
2.8	20	13	0.65	0.65	0.5189
5	20	15	0.75	0.75	0.8857
6.5	20	20	1	1	0.958
11.5	20	20	1	1	0.9979
12.5	20	20	1	1	0.9988

Chi - Square for Heterogeneity (calculated) = 6.419
Chi - Square for Heterogeneity (tabular value at 0.05 level) = 9.488

Mu = 0.4369
Sigma = 0.2177

Parameter	Estimate	Std. Error	Lower 95% Conf.	Upper 95% Conf.
Intercept	2.993	0.4759	2.06	3.926
Slope	4.594	0.8044	3.017	6.171

Theoretical Spontaneous Response Rate = 0

Estimated LC/EC Values and Confidence Limits

LC/EC Point	Exposure Conc.	Lower 95% Conf.	Upper 95% Conf.
1	0.8521	0.3942	1.265
5	1.199	0.6563	1.648
10	1.438	0.8589	1.903
15	1.627	1.028	2.1
50	2.734	2.123	3.302
85	4.597	3.801	5.988
90	5.198	4.256	7.066
95	6.236	4.982	9.12
99	8.775	6.579	14.98

Appendix A2: Statistics

Ceriodaphnia dubia

Tyson Grannis WER-2 SWM Total Copper

Spearman-Karber Method for Calculating LC50 Values

Concentration	Number Exposed	Number Responding	Proportion Responding	Smoothed Proportion	Smoothed Adjusted Proportion
Control	20	0	0	0	0
4.75	20	0	0	0	0
53.5	20	0	0	0	0
80	20	0	0	0	0
120	20	0	0	0	0
175	20	2	0.1	0.1	0.1
280	20	20	1	1	1

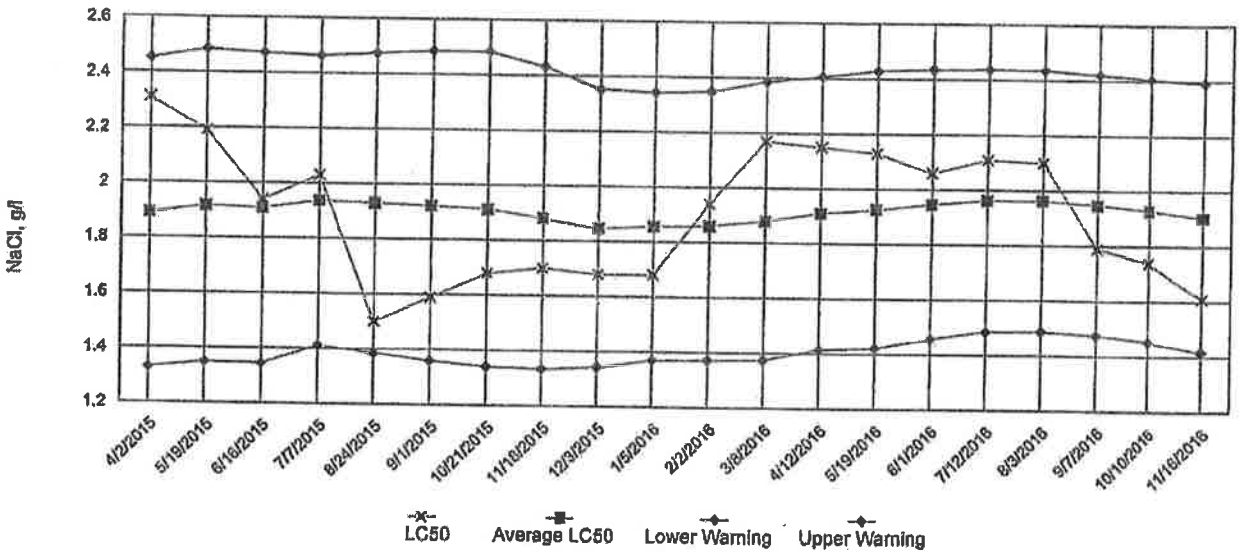
LC50 = 212.2
Upper Confidence Limit = 224.9
Lower Confidence Limit = 200.2

Variance = 0.0001604

Appendix: A3

Acute Reference Toxicant, *Ceriodaphnia dubia*

LC50 Survival Data



Appendix A2: Statistics

Ceriodaphnia dubia

Tyson Grannis WER-2 Synthetic Total Copper

Probit Analysis for Calculating LC/EC Values

Concentration	Number Exposed	Number Responding	Observed Proportion Responding	Proportion Responding Adjusted for Controls	Predicted Proportion Responding
1	20	0	0	0	0
2.7	20	0	0	0	0.0293
3.7	20	2	0.1	0.1	0.1178
5.4	20	10	0.5	0.5	0.3672
11	20	16	0.8	0.8	0.8951
14.5	20	20	1	1	0.9694

Chi - Square for Heterogeneity (calculated) = 4.739
Chi - Square for Heterogeneity (tabular value at 0.05 level) = 9.488

Mu = 0.7982
Sigma = 0.1939

Parameter	Estimate	Std. Error	Lower 95% Conf.	Upper 95% Conf.
Intercept	0.8839	0.6191	-0.3294	2.097
Slope	5.157	0.7677	3.652	6.661

Theoretical Spontaneous Response Rate = 0

Estimated LC/EC Values and Confidence Limits

LC/EC Point	Exposure Conc.	Lower 95% Conf.	Upper 95% Conf.
1	2.224	1.428	2.884
5	3.015	2.163	3.702
10	3.545	2.688	4.249
15	3.956	3.102	4.677
50	6.284	5.382	7.412
85	9.981	8.327	13.18
90	11.14	9.142	15.25
95	13.1	10.46	18.99
99	17.76	13.4	28.85

Appendix A2: Statistics

Ceriodaphnia dubia

Tyson Grannis WER-2 SWM Dissolved Copper

Spearman-Karber Method for Calculating LC50 Values

Concentration	Number Exposed	Number Responding	Proportion Responding	Smoothed Proportion	Smoothed Adjusted Proportion
Control	20	0	0	0	0
4.65	20	0	0	0	0
48.5	20	0	0	0	0
72.5	20	0	0	0	0
107	20	0	0	0	0
165	20	2	0.1	0.1	0.1
245	20	20	1	1	1

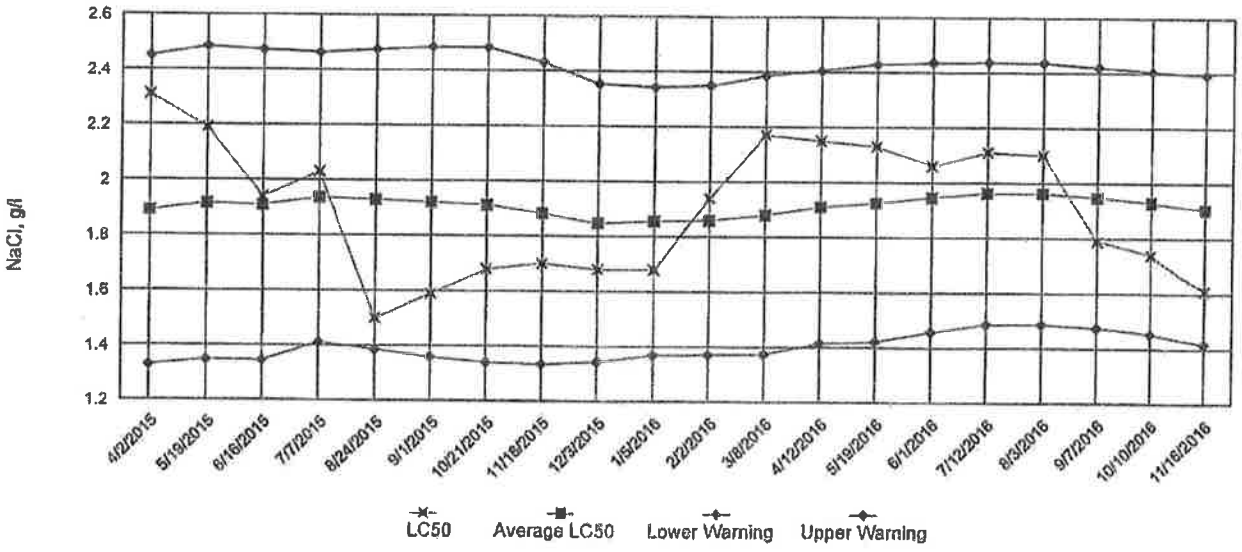
LC50 = 192.9
Upper Confidence Limit = 204.2
Lower Confidence Limit = 182.2

Variance = 0.0001533

Appendix: A3

Acute Reference Toxicant, *Ceriodaphnia dubia*

LC50 Survival Data



Appendix A2: Statistics

Ceriodaphnia dubia

Tyson Grannis WER-2 Synthetic Dissolved Copper

Probit Analysis for Calculating LC/EC Values

Concentration	Number Exposed	Number Responding	Observed Proportion Responding	Proportion Responding Adjusted for Controls	Predicted Proportion Responding
1	20	0	0	0	0.0001
2.4	20	0	0	0	0.0395
3.2	20	2	0.1	0.1	0.1275
4.5	20	10	0.5	0.5	0.3428
10	20	16	0.8	0.8	0.9053
12.2	20	20	1	1	0.9591

Chi - Square for Heterogeneity (calculated) = 6.597
Chi - Square for Heterogeneity (tabular value at 0.05 level) = 9.488

Mu = 0.735
Sigma = 0.2019

Parameter	Estimate	Std. Error	Lower 95% Conf.	Upper 95% Conf.
Intercept	1.36	0.5368	0.3078	2.412
Slope	4.953	0.7221	3.537	6.368

Theoretical Spontaneous Response Rate = 0

Estimated LC/EC Values and Confidence Limits

LC/EC Point	Exposure Conc.	Lower 95% Conf.	Upper 95% Conf.
1	1.842	1.181	2.399
5	2.528	1.813	3.115
10	2.994	2.268	3.598
15	3.355	2.629	3.978
50	5.432	4.64	6.439
85	8.795	7.293	11.7
90	9.857	8.038	13.61
95	11.67	9.254	17.07
99	16.02	11.98	26.3

Additional Lab Reports for Dissolved Translator Sampling

AMERICAN INTERPLEX CORPORATION
LABORATORIES

May 26, 2016
Control No. 201825

GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
219 Brown Lane
Bryant, AR 72022

This report contains the analytical results and supporting information for samples submitted on May 4, 2016. Attached please find a copy of the Chain of Custody and/or other documents received. Note that any remaining sample will be discarded two weeks from the original report date unless other arrangements are made.

This report is intended for the sole use of the client listed above. Assessment of the data requires access to the entire document.

This report has been reviewed by the Chief Operating Officer or a qualified designee.

John Overbey
Chief Operating Officer

This document has been distributed to the following:

PDF cc: GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
jbrown@gbmcassoc.com

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

SAMPLE INFORMATION

Project Description:
Two (2) water sample(s) received on May 4, 2016

Receipt Details:
A Chain of Custody was provided. The samples were delivered in one (1) ice chest.

Each sample container was checked for proper labeling, including date and time sampled. Sample containers were reviewed for proper type, adequate volume, integrity, temperature, preservation, and holding times. Any exceptions are noted below:

Sample Identification:

Laboratory ID	Client Sample ID	Sampled Date/Time	Notes
201825-1	001	03-May-2016 1030	1
201825-2	001-D	03-May-2016 1030	
201825-3	Moderately Hard Water	04-May-2016	
201825-4	Effluent spiking 300ppb INITIAL		
201825-5	Effluent spiking 300ppb FINAL		
201825-6	Effluent spiking 150ppb INITIAL		
201825-7	Effluent spiking 150ppb FINAL		
201825-8	Effluent spiking 75.0ppb INITIAL		
201825-9	Effluent spiking 75.0ppb FINAL		
201825-10	Effluent spiking 37.5ppb INITIAL		
201825-11	Effluent spiking 37.5ppb FINAL		
201825-12	Effluent spiking 18.8ppb INITIAL		
201825-13	Effluent spiking 18.8ppb FINAL		
201825-14	Synthetic MOD Water spiking 40.0ppb INITIAL		
201825-15	Synthetic MOD Water spiking 40.0ppb FINAL		
201825-16	Synthetic MOD Water spiking 20.0ppb INITIAL		
201825-17	Synthetic MOD Water spiking 20.0ppb FINAL		
201825-18	Synthetic MOD Water spiking 10.0ppb INITIAL		
201825-19	Synthetic MOD Water spiking 10.0ppb FINAL		
201825-20	Synthetic MOD Water spiking 5.00ppb INITIAL		
201825-21	Synthetic MOD Water spiking 5.00ppb FINAL		
201825-22	Synthetic MOD Water spiking 2.50ppb INITIAL		
201825-23	Synthetic MOD Water spiking 2.50ppb FINAL		
201825-24	Synthetic MOD Water spiking 1.25ppb INITIAL		
201825-25	Synthetic MOD Water spiking 1.25ppb FINAL		

Notes:
1. Sample was received unpreserved

Case Narrative:
There were no qualifiers for this data and all samples met quality control criteria.

References:
"Methods for Chemical Analysis of Water and Wastes", EPA/600/4-79-020 (Mar 1983) with updates and supplements EPA/600/5-91-010 (Jun 1991), EPA/600/R-92-129 (Aug 1992) and EPA/600/R-93-100 (Aug 1993).
"Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846)", Third Edition.
"Standard Methods for the Examination of Water and Wastewaters", (SM).
"American Society for Testing and Materials" (ASTM).
"Association of Analytical Chemists" (AOAC).

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Bryant, AR 72022

ANALYTICAL RESULTS

AIC No. 201825-1
Sample Identification: 001 03-May-2016 1030

Analyte		Result	RL	Units	Qualifier
Alkalinity as CaCO3 SM 2320 B 1997		**62** Analyzed: 06-May-2016 1019 by 93	1	**mg/l** Batch: W55836	
Specific Conductance SM 2510 B 1997	Prep: 06-May-2016 1427 by 308	**260** Analyzed: 06-May-2016 1510 by 308	2	**umho/cm** Batch: W55840	
Total Dissolved Solids SM 2540 C 1997	Prep: 06-May-2016 1623 by 100	**190** Analyzed: 09-May-2016 1538 by 100	10	**mg/l** Batch: W55845	
Total Organic Carbon SM 5310 C 2000	Prep: 05-May-2016 1555 by 308	**3.2** Analyzed: 05-May-2016 2014 by 308	1	**mg/l** Batch: W55830	
Total Suspended Solids USGS 3765	Prep: 05-May-2016 1230 by 100	**6.4** Analyzed: 06-May-2016 1149 by 100	4	**mg/l** Batch: W55822	
Copper EPA 200.8	Prep: 04-May-2016 1500 by 317	**2.23** Analyzed: 05-May-2016 1119 by 317	0.5	**ug/l** Batch: S41081	
Hardness as CaCO3 SM 2340 B 1997	Prep: 04-May-2016 1500 by 317	**87** Analyzed: 05-May-2016 1131 by 317	1	**mg/l** Batch: S41081	
Dissolved Organic Carbon SM 5310 C 2000	Prep: 05-May-2016 1556 by 308	**3.1** Analyzed: 05-May-2016 1950 by 308	1	**mg/l** Batch: W55830	
Dissolved Copper EPA 200.8	Prep: 04-May-2016 1500 by 317	**1.22** Analyzed: 05-May-2016 1116 by 317	0.5	**ug/l** Batch: S41081	

AIC No. 201825-2
Sample Identification: 001-D 03-May-2016 1030

Analyte		Result	RL	Units	Qualifier
Copper EPA 200.8	Prep: 04-May-2016 1500 by 317	**2.08** Analyzed: 05-May-2016 1125 by 317	0.5	**ug/l** Batch: S41081	
Dissolved Copper EPA 200.8	Prep: 04-May-2016 1500 by 317	**1.18** Analyzed: 05-May-2016 1122 by 317	0.5	**ug/l** Batch: S41081	

AIC No. 201825-3
Sample Identification: Moderately Hard Water 04-May-2016

Analyte		Result	RL	Units	Qualifier
Alkalinity as CaCO3 SM 2320 B 1997		**61** Analyzed: 06-May-2016 1019 by 93	1	**mg/l** Batch: W55836	
Specific Conductance SM 2510 B 1997	Prep: 06-May-2016 1427 by 308	**320** Analyzed: 06-May-2016 1510 by 308	2	**umho/cm** Batch: W55840	
Total Dissolved Solids SM 2540 C 1997	Prep: 06-May-2016 1623 by 100	**220** Analyzed: 09-May-2016 1538 by 100	10	**mg/l** Batch: W55845	
Total Organic Carbon SM 5310 C 2000	Prep: 05-May-2016 1555 by 308	**< 1** Analyzed: 05-May-2016 2026 by 308	1	**mg/l** Batch: W55830	
Total Suspended Solids USGS 3765	Prep: 05-May-2016 1230 by 100	**< 4** Analyzed: 06-May-2016 1149 by 100	4	**mg/l** Batch: W55822	

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ANALYTICAL RESULTS

AIC No. 201825-3 (Continued)
Sample Identification: Moderately Hard Water 04-May-2016

Analyte		Result	RL	Units	Qualifier
Copper		**< 0.5**	0.5	**ug/l**	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1735 by 317		Batch: S41081	
Hardness as CaCO3		**88**	1	**mg/l**	
SM 2340 B 1997	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1647 by 235		Batch: S41080	
Dissolved Organic Carbon		**< 1**	1	**mg/l**	
SM 5310 C 2000	Prep: 05-May-2016 1556 by 308	Analyzed: 05-May-2016 2002 by 308		Batch: W55830	
Dissolved Copper		**< 0.5**	0.5	**ug/l**	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1732 by 317		Batch: S41081	

AIC No. 201825-4
Sample Identification: Effluent spiking 300ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**309**	0.5	**ug/l**	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1616 by 317		Batch: S41081	
Dissolved Copper		**231**	0.5	**ug/l**	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1614 by 317		Batch: S41081	

AIC No. 201825-5
Sample Identification: Effluent spiking 300ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**224**	0.5	**ug/l**	
EPA 200.8	Prep: 09-May-2016 1729 by 317	Analyzed: 09-May-2016 1828 by 317		Batch: S41106	
Dissolved Copper		**160**	0.5	**ug/l**	
EPA 200.8	Prep: 09-May-2016 1729 by 317	Analyzed: 09-May-2016 1826 by 317		Batch: S41106	

AIC No. 201825-6
Sample Identification: Effluent spiking 150ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**160**	0.5	**ug/l**	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1622 by 317		Batch: S41081	
Dissolved Copper		**106**	0.5	**ug/l**	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1619 by 317		Batch: S41081	

AIC No. 201825-7
Sample Identification: Effluent spiking 150ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**94.4**	0.5	**ug/l**	
EPA 200.8	Prep: 09-May-2016 1729 by 317	Analyzed: 09-May-2016 1834 by 317		Batch: S41106	
Dissolved Copper		**77.6**	0.5	**ug/l**	
EPA 200.8	Prep: 09-May-2016 1729 by 317	Analyzed: 09-May-2016 1831 by 317		Batch: S41106	

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ANALYTICAL RESULTS

AIC No. 201825-8
Sample Identification: Effluent spiking 75.0ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**75.8**	0.5	ug/l	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1628 by 317		Batch: S41081	
Dissolved Copper		**53.1**	0.5	ug/l	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1625 by 317		Batch: S41081	

AIC No. 201825-9
Sample Identification: Effluent spiking 75.0ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**54.7**	0.5	ug/l	
EPA 200.8	Prep: 09-May-2016 1729 by 317	Analyzed: 09-May-2016 1840 by 317		Batch: S41106	
Dissolved Copper		**44.1**	0.5	ug/l	
EPA 200.8	Prep: 09-May-2016 1729 by 317	Analyzed: 09-May-2016 1837 by 317		Batch: S41106	

AIC No. 201825-10
Sample Identification: Effluent spiking 37.5ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**39.1**	0.5	ug/l	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1633 by 317		Batch: S41081	
Dissolved Copper		**27.2**	0.5	ug/l	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1630 by 317		Batch: S41081	

AIC No. 201825-11
Sample Identification: Effluent spiking 37.5ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**29.1**	0.5	ug/l	
EPA 200.8	Prep: 09-May-2016 1729 by 317	Analyzed: 09-May-2016 1845 by 317		Batch: S41106	
Dissolved Copper		**21.3**	0.5	ug/l	
EPA 200.8	Prep: 09-May-2016 1729 by 317	Analyzed: 09-May-2016 1842 by 317		Batch: S41106	

AIC No. 201825-12
Sample Identification: Effluent spiking 18.8ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**21.7**	0.5	ug/l	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1644 by 317		Batch: S41081	
Dissolved Copper		**15.4**	0.5	ug/l	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1642 by 317		Batch: S41081	

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ANALYTICAL RESULTS

AIC No. 201825-13
Sample Identification: Effluent spiking 18.8ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**18.8**	0.5	ug/l	
EPA 200.8	Prep: 09-May-2016 1729 by 317	Analyzed: 09-May-2016 1856 by 317		Batch: S41106	
Dissolved Copper		**13.7**	0.5	ug/l	
EPA 200.8	Prep: 09-May-2016 1729 by 317	Analyzed: 09-May-2016 1854 by 317		Batch: S41106	

AIC No. 201825-14
Sample Identification: Synthetic MOD Water spiking 40.0ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**41.3**	0.5	ug/l	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1656 by 317		Batch: S41081	
Dissolved Copper		**41.5**	0.5	ug/l	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1653 by 317		Batch: S41081	

AIC No. 201825-15
Sample Identification: Synthetic MOD Water spiking 40.0ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**47.7**	0.5	ug/l	
EPA 200.8	Prep: 09-May-2016 1729 by 317	Analyzed: 09-May-2016 1908 by 317		Batch: S41106	
Dissolved Copper		**43.3**	0.5	ug/l	
EPA 200.8	Prep: 09-May-2016 1729 by 317	Analyzed: 09-May-2016 1905 by 317		Batch: S41106	

AIC No. 201825-16
Sample Identification: Synthetic MOD Water spiking 20.0ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**20.5**	0.5	ug/l	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1701 by 317		Batch: S41081	
Dissolved Copper		**20.1**	0.5	ug/l	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1658 by 317		Batch: S41081	

AIC No. 201825-17
Sample Identification: Synthetic MOD Water spiking 20.0ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**21.5**	0.5	ug/l	
EPA 200.8	Prep: 09-May-2016 1729 by 317	Analyzed: 09-May-2016 1913 by 317		Batch: S41106	
Dissolved Copper		**18.6**	0.5	ug/l	
EPA 200.8	Prep: 09-May-2016 1729 by 317	Analyzed: 09-May-2016 1910 by 317		Batch: S41106	

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ANALYTICAL RESULTS

AIC No. 201825-18
Sample Identification: Synthetic MOD Water spiking 10.0ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**9.95**	0.5	ug/l	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1707 by 317		Batch: S41081	
Dissolved Copper		**9.89**	0.5	ug/l	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1704 by 317		Batch: S41081	

AIC No. 201825-19
Sample Identification: Synthetic MOD Water spiking 10.0ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**11.3**	0.5	ug/l	
EPA 200.8	Prep: 09-May-2016 1729 by 317	Analyzed: 09-May-2016 1919 by 317		Batch: S41106	
Dissolved Copper		**8.89**	0.5	ug/l	
EPA 200.8	Prep: 09-May-2016 1729 by 317	Analyzed: 09-May-2016 1916 by 317		Batch: S41106	

AIC No. 201825-20
Sample Identification: Synthetic MOD Water spiking 5.00ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**5.27**	0.5	ug/l	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1718 by 317		Batch: S41081	
Dissolved Copper		**4.99**	0.5	ug/l	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1715 by 317		Batch: S41081	

AIC No. 201825-21
Sample Identification: Synthetic MOD Water spiking 5.00ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**6.02**	0.5	ug/l	
EPA 200.8	Prep: 09-May-2016 1729 by 317	Analyzed: 09-May-2016 1930 by 317		Batch: S41106	
Dissolved Copper		**4.48**	0.5	ug/l	
EPA 200.8	Prep: 09-May-2016 1729 by 317	Analyzed: 09-May-2016 1927 by 317		Batch: S41106	

AIC No. 201825-22
Sample Identification: Synthetic MOD Water spiking 2.50ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**2.80**	0.5	ug/l	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1723 by 317		Batch: S41081	
Dissolved Copper		**2.59**	0.5	ug/l	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1721 by 317		Batch: S41081	

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ANALYTICAL RESULTS

AIC No. 201825-23
Sample Identification: Synthetic MOD Water spiking 2.50ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**3.24**	0.5	**ug/l**	
EPA 200.8	Prep: 09-May-2016 1729 by 317	Analyzed: 09-May-2016 1936 by 317		Batch: S41106	
Dissolved Copper		**2.46**	0.5	**ug/l**	
EPA 200.8	Prep: 09-May-2016 1729 by 317	Analyzed: 09-May-2016 1933 by 317		Batch: S41106	

AIC No. 201825-24
Sample Identification: Synthetic MOD Water spiking 1.25ppb INITIAL

Analyte		Result	RL	Units	Qualifier
Copper		**1.55**	0.5	**ug/l**	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1729 by 317		Batch: S41081	
Dissolved Copper		**1.48**	0.5	**ug/l**	
EPA 200.8	Prep: 04-May-2016 1500 by 235	Analyzed: 04-May-2016 1726 by 317		Batch: S41081	

AIC No. 201825-25
Sample Identification: Synthetic MOD Water spiking 1.25ppb FINAL

Analyte		Result	RL	Units	Qualifier
Copper		**2.20**	0.5	**ug/l**	
EPA 200.8	Prep: 09-May-2016 1729 by 317	Analyzed: 09-May-2016 1941 by 317		Batch: S41106	
Dissolved Copper		**1.56**	0.5	**ug/l**	
EPA 200.8	Prep: 09-May-2016 1729 by 317	Analyzed: 09-May-2016 1938 by 317		Batch: S41106	

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DUPLICATE RESULTS

Analyte		AIC No.	Result	RPD	RPD Limit	Preparation Date	Analysis Date	Dil	Qual
Total Suspended Solids		201852-1	6.0 mg/l			05May16 1230 by 100	06May16 1149 by 100		
	Batch: W55822	Duplicate	5.6 mg/l	6.90	20.0	05May16 1231 by 100	06May16 1149 by 100		
Total Suspended Solids		201844-7	4400 mg/l			05May16 1230 by 100	06May16 1149 by 100		
	Batch: W55822	Duplicate	4400 mg/l	0.00	20.0	05May16 1231 by 100	06May16 1149 by 100		
Alkalinity as CaCO3		201844-1	290 mg/l				06May16 1015 by 93		
	Batch: W55836	Duplicate	300 mg/l	1.36	10.0		06May16 1559 by 93		
Alkalinity as CaCO3		201814-2	300 mg/l				06May16 1015 by 93		
	Batch: W55836	Duplicate	290 mg/l	1.70	10.0		06May16 1559 by 93		
Specific Conductance		201825-3	320 umho/cm			06May16 1427 by 308	06May16 1510 by 308		
	Batch: W55840	Duplicate	320 umho/cm	0.00	20.0	06May16 1427 by 308	06May16 1510 by 308		
Total Dissolved Solids		201838-1	1100 mg/l			06May16 1623 by 100	09May16 1538 by 100		
	Batch: W55845	Duplicate	1100 mg/l	0.456	10.0	06May16 1624 by 100	09May16 1538 by 100		
Total Dissolved Solids		201874-1	940 mg/l			06May16 1623 by 100	09May16 1538 by 100		
	Batch: W55845	Duplicate	950 mg/l	0.422	10.0	06May16 1624 by 100	09May16 1538 by 100		

LABORATORY CONTROL SAMPLE RESULTS

Analyte	Spike Amount	%	Limits	RPD	Limit	Batch	Preparation Date	Analysis Date	Dil	Qual
Specific Conductance	1412 umho/cm	103	90.0-110			W55840	06May16 1427 by 308	06May16 1510 by 308		
Total Organic Carbon	10 mg/l	101	80.0-120			W55830	05May16 1555 by 308	05May16 1740 by 308		
Copper	0.05 mg/l	108	85.0-115			S41081	04May16 1500 by 235	04May16 1639 by 317		
	0.05 mg/l	106	85.0-115	1.50	20.0	S41081	04May16 1500 by 235	04May16 1712 by 317		
Copper	0.05 mg/l	102	85.0-115			S41106	09May16 1729 by 317	09May16 1851 by 317		
	0.05 mg/l	104	85.0-115	2.13	20.0	S41106	09May16 1729 by 317	09May16 1924 by 317		
Dissolved Organic Carbon	10 mg/l	101	80.0-120			W55830	05May16 1555 by 308	05May16 1740 by 308		

MATRIX SPIKE SAMPLE RESULTS

Analyte	Sample	Spike Amount	%	Limits	Batch	Preparation Date	Analysis Date	Dil	Qual
Total Organic Carbon	201876-1	10 mg/l	93.3	80.0-120	W55830	05May16 1555 by 308	05May16 1804 by 308		
	201876-1	10 mg/l	93.0	80.0-120	W55830	05May16 1555 by 308	05May16 1816 by 308		
	Relative Percent Difference:		0.217	25.0	W55830				

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LABORATORY BLANK RESULTS

Analyte	Result	RL	PQL	QC Sample	Preparation Date	Analysis Date	Qual
Alkalinity as CaCO3	< 1 mg/l	1	1	W55836-1		06May16 1015 by 93	
Specific Conductance	< 2 umho/cm	2	2	W55840-1	06May16 1427 by 308	06May16 1510 by 308	
Total Dissolved Solids	< 10 mg/l	10	10	W55845-1	06May16 1624 by 100	09May16 1538 by 100	
Total Organic Carbon	< 1 mg/l	1	1	W55830-1	05May16 1555 by 308	05May16 1728 by 308	
Total Suspended Solids	< 4 mg/l	4	4	W55822-1	05May16 1231 by 100	06May16 1149 by 100	
Copper	< 0.5 ug/l	0.5	0.5	S41081-1	04May16 1500 by 235	04May16 1611 by 317	
Copper	< 0.5 ug/l	0.5	0.5	S41106-1	09May16 1729 by 317	09May16 1823 by 317	
Dissolved Organic Carbon	< 1 mg/l	1	1	W55830-1	05May16 1555 by 308	05May16 1728 by 308	

201825

GBM[c] & Associates
219 Brown Ln.
Bryant, AR 72022
(501) 847-7077 Fax (501) 847-7943

COPY

Chain of Custody

Client/Billing Information		SPECIAL INSTRUCTIONS/PRECAUTIONS:
Client:	Jonathan Brown	See Attachment for full list of parameters
Company:	GBMC	and instructions. Please use double bagged bottles
Address:	219 Brown Lane	for analysis of Total and Dissolved copper.
	Bryant, Arkansas 72022	Project Name / Number:
Phone No.:	501-847-7077	
Fax No.:	501-847-7943	

Sample ID	Sample Description	Date	Time	Matrix S=Sed/Soil W=Water	Number of Containers	Composite or Grab	Parameters for Analysis/Methods: WER Study	Total and Dissolved Copper	Hardness Alkalinity Conductivity	TOC, DOC TSS, TDS			
001	Outfall 001	5/3/16	1030	W	3	G	X	X	X	X	WER=AIC 201823		
001-D	Duplicate	5/3/16	1030	W	1	G		X					
Preservative	(Sulfuric acid =S, Nitric acid =N, NaOH =B, Ice =I)						I	I					

Sampler(s): JBB	Shipment Method: Hand Delivery	Turnaround Time Required: Standard	
COC Completed by:	Date: 5/4/16 Time: 0850	COC Checked by:	Date: 5/4/16 Time: 0854
Relinquished by:	Date: Time:	Received by:	Date: Time:
Relinquished by:	Date: 5/4/16 Time: 0926	Received in lab by: Danny Brown	Date: 5-4-16 Time: 0926
LABORATORY USE ONLY:	Samples Received On Ice?: YES or NO	Sample Temperature: 0.1	

Concentrations for WER Rangefinding

201825

Please perform range finding analysis for a WER Study using concentrations listed below. The rangefinding should be conducted for copper using Ceriodaphnia. Analyses should be performed so that a WER can be calculated for both total and dissolved copper. The analysis of additional parameters should include: Hardness, Alkalinity, TOC, DOC, Conductivity, TSS, and TDS.

Copper Ceriodaphnia
(0.5 Dilution Ratio)

SWM	Lab Water
Cu (µg/L)	Cu (µg/L)
300	20
150	10
75	5
38	3
19	1
0 (Control)	0 (Control)

AMERICAN INTERPLEX CORPORATION
LABORATORIES

July 7, 2016
Control No. 203448

GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
219 Brown Lane
Bryant, AR 72022

This report contains the analytical results and supporting information for samples submitted on June 29, 2016. Attached please find a copy of the Chain of Custody and/or other documents received. Note that any remaining sample will be discarded two weeks from the original report date unless other arrangements are made.

This report is intended for the sole use of the client listed above. Assessment of the data requires access to the entire document.

This report has been reviewed by the Chief Operating Officer or a qualified designee.

John Overbey
Chief Operating Officer

This document has been distributed to the following:

PDF cc: GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
jbrown@gbmcassoc.com

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

SAMPLE INFORMATION

Project Description:
Five (5) water sample(s) received on June 29, 2016
Idabel WER 3040-15-050

Receipt Details:
A Chain of Custody was provided. The samples were delivered in one (1) ice chest.

Each sample container was checked for proper labeling, including date and time sampled. Sample containers were reviewed for proper type, adequate volume, integrity, temperature, preservation, and holding times. Any exceptions are noted below:

Sample Identification:

Laboratory ID	Client Sample ID	Sampled Date/Time	Notes
203448-1	001	27-Jun-2016 1400	
203448-2	001-D	27-Jun-2016 1400	
203448-3	FB	28-Jun-2016 0720	
203448-4	001-TD	28-Jun-2016 0725	
203448-5	TB	27-Jun-2016 1345	

Case Narrative:
There were no qualifiers for this data and all samples met quality control criteria.

References:
"Methods for Chemical Analysis of Water and Wastes", EPA/600/4-79-020 (Mar 1983) with updates and supplements EPA/600/5-91-010 (Jun 1991), EPA/600/R-92-129 (Aug 1992) and EPA/600/R-93-100 (Aug 1993).
"Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846)", Third Edition.
"Standard Methods for the Examination of Water and Wastewaters", (SM).
"American Society for Testing and Materials" (ASTM).
"Association of Analytical Chemists" (AOAC).

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

ANALYTICAL RESULTS

AIC No. 203448-1
Sample Identification: 001 27-Jun-2016 1400

Analyte		Result	RL	Units	Qualifier
Copper		**6.8**	0.5	**ug/l**	
EPA 200.8	Prep: 06-Jul-2016 1001 by 07	Analyzed: 06-Jul-2016 1656 by 07		Batch: S41382	
Dissolved Copper		**5.6**	0.5	**ug/l**	
EPA 200.8	Prep: 06-Jul-2016 1001 by 07	Analyzed: 06-Jul-2016 1650 by 07		Batch: S41382	

AIC No. 203448-2
Sample Identification: 001-D 27-Jun-2016 1400

Analyte		Result	RL	Units	Qualifier
Copper		**6.1**	0.5	**ug/l**	
EPA 200.8	Prep: 06-Jul-2016 1001 by 07	Analyzed: 06-Jul-2016 1709 by 07		Batch: S41382	
Dissolved Copper		**5.5**	0.5	**ug/l**	
EPA 200.8	Prep: 06-Jul-2016 1001 by 07	Analyzed: 06-Jul-2016 1703 by 07		Batch: S41382	

AIC No. 203448-3
Sample Identification: FB 28-Jun-2016 0720

Analyte		Result	RL	Units	Qualifier
Copper		**1.5**	0.5	**ug/l**	
EPA 200.8	Prep: 06-Jul-2016 1001 by 07	Analyzed: 06-Jul-2016 1720 by 07		Batch: S41382	
Dissolved Copper		**< 0.5**	0.5	**ug/l**	
EPA 200.8	Prep: 06-Jul-2016 1001 by 07	Analyzed: 06-Jul-2016 1715 by 07		Batch: S41382	

AIC No. 203448-4
Sample Identification: 001-TD 28-Jun-2016 0725

Analyte		Result	RL	Units	Qualifier
Copper		**4.8**	0.5	**ug/l**	
EPA 200.8	Prep: 06-Jul-2016 1001 by 07	Analyzed: 06-Jul-2016 1732 by 07		Batch: S41382	
Dissolved Copper		**3.3**	0.5	**ug/l**	
EPA 200.8	Prep: 06-Jul-2016 1001 by 07	Analyzed: 06-Jul-2016 1726 by 07		Batch: S41382	

AIC No. 203448-5
Sample Identification: TB 27-Jun-2016 1345

Analyte		Result	RL	Units	Qualifier
Copper		**0.68**	0.5	**ug/l**	
EPA 200.8	Prep: 06-Jul-2016 1001 by 07	Analyzed: 06-Jul-2016 1743 by 07		Batch: S41382	
Dissolved Copper		**< 0.5**	0.5	**ug/l**	
EPA 200.8	Prep: 06-Jul-2016 1001 by 07	Analyzed: 06-Jul-2016 1738 by 07		Batch: S41382	

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

LABORATORY CONTROL SAMPLE RESULTS

Analyte	Spike Amount	%	Limits	RPD	Limit	Batch	Preparation Date	Analysis Date	Dil	Qual
Copper	0.05 mg/l	95.8	85.0-115			S41382	06Jul16 1002 by 07	06Jul16 1403 by 07		

MATRIX SPIKE SAMPLE RESULTS

Analyte	Sample	Spike Amount	%	Limits	Batch	Preparation Date	Analysis Date	Dil	Qual
Copper	203507-1	0.05 mg/l	87.4	75.0-125	S41382	06Jul16 1002 by 07	06Jul16 1410 by 07		
	203507-1	0.05 mg/l	88.9	75.0-125	S41382	06Jul16 1002 by 07	06Jul16 1415 by 07		
	Relative Percent Difference:		1.70	20.0	S41382				

LABORATORY BLANK RESULTS

Analyte	Result	RL	PQL	QC Sample	Preparation Date	Analysis Date	Qual
Copper	< 0.0005 mg/l	0.0005	0.0005	S41382-1	06Jul16 1002 by 07	06Jul16 1357 by 07	

203448

GBM[c] & Associates
219 Brown Ln.
Bryant, AR 72022
(501) 847-7077 Fax (501) 847-7943

Chain of Custody

Client/Billing Information		SPECIAL INSTRUCTIONS/PRECAUTIONS:
Client:	GBMc & Associates	Report: jbrown@gbmcassoc.com
Company:		
Address:	219 Brown Lane	
	Bryant, Arkansas, 72022	Project Name / Number: Idabel WER 3040-15-050
Phone No.:	501-847-7077	
Fax No.:	501-847-7943	

	Sample ID	Sample Description	Date	Time	Matrix S=Sed/Soil W=Water	Number of Containers	Composite or Grab	Parameters for Analysis/Methods: Total copper	Dissolved copper					
1	001		6/27/16	1400	W	1	G	X	X					
2	001-D		6/27/16	1400	W	1	G	X	X					
3	FB		6/28/16	0720	W	1	G	X	X					
4	001-TD		6/28/16	0725	W	1	G	X	X					
5	TB		6/27/16	1345	W	1	G	X	X					
Preservative	(Sulfuric acid =S, Nitric acid =N, NaOH =B, Ice =I)							I	I					

Sampler(s): JBB	Shipment Method: Hand Delivered	Turnaround Time Required: Standard	
COC Completed by:	Date: 6/29/16 Time: 0830	COC Checked by:	Date: 6/29/16 Time: 0905
Relinquished by:	Date: 6/29/16 Time: 0930	Received by:	Date: Time:
Relinquished by:	Date: Time:	Received in lab by:	Date: 6/29/16 Time: 0930
LABORATORY USE ONLY:	Samples Received On Ice?: (YES) or NO		Sample Temperature:

0.1

AMERICAN INTERPLEX CORPORATION
LABORATORIES

July 12, 2016
Control No. 203657

GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
219 Brown Lane
Bryant, AR 72022

This report contains the analytical results and supporting information for samples submitted on July 8, 2016. Attached please find a copy of the Chain of Custody and/or other documents received. Note that any remaining sample will be discarded two weeks from the original report date unless other arrangements are made.

This report is intended for the sole use of the client listed above. Assessment of the data requires access to the entire document.

This report has been reviewed by the Chief Operating Officer or a qualified designee.

Steve Bradford
Deputy Laboratory Director

This document has been distributed to the following:

PDF cc: GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
jbrown@gbmcassoc.com

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

SAMPLE INFORMATION

Project Description:
Two (2) water sample(s) received on July 8, 2016
Idabel WER

Receipt Details:
A Chain of Custody was provided. The samples were delivered in one (1) ice chest.
Ice chest #1 was delivered with shipping documentation.

Each sample container was checked for proper labeling, including date and time sampled. Sample containers were reviewed for proper type, adequate volume, integrity, temperature, preservation, and holding times. Any exceptions are noted below:

Sample Identification:

Laboratory ID	Client Sample ID	Sampled Date/Time	Notes
203657-1	001	06-Jul-2016 1348	
203657-2	001-D	06-Jul-2016 1349	

Case Narrative:
There were no qualifiers for this data and all samples met quality control criteria.

References:
"Methods for Chemical Analysis of Water and Wastes", EPA/600/4-79-020 (Mar 1983) with updates and supplements EPA/600/5-91-010 (Jun 1991), EPA/600/R-92-129 (Aug 1992) and EPA/600/R-93-100 (Aug 1993).
"Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846)", Third Edition.
"Standard Methods for the Examination of Water and Wastewaters", (SM).
"American Society for Testing and Materials" (ASTM).
"Association of Analytical Chemists" (AOAC).

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

ANALYTICAL RESULTS

AIC No. 203657-1
Sample Identification: 001 06-Jul-2016 1348

Analyte		Result	RL	Units	Qualifier
Dissolved Copper		**0.0034**	0.0005	**mg/l**	
EPA 200.8	Prep: 11-Jul-2016 0947 by 313	Analyzed: 11-Jul-2016 1626 by 07		Batch: S41401	
Total Recoverable Copper		**0.0043**	0.0005	**mg/l**	
EPA 200.8	Prep: 11-Jul-2016 0947 by 313	Analyzed: 11-Jul-2016 1632 by 07		Batch: S41401	

AIC No. 203657-2
Sample Identification: 001-D 06-Jul-2016 1349

Analyte		Result	RL	Units	Qualifier
Dissolved Copper		**0.0035**	0.0005	**mg/l**	
EPA 200.8	Prep: 11-Jul-2016 0947 by 313	Analyzed: 11-Jul-2016 1638 by 07		Batch: S41401	
Total Recoverable Copper		**0.0045**	0.0005	**mg/l**	
EPA 200.8	Prep: 11-Jul-2016 0947 by 313	Analyzed: 11-Jul-2016 1643 by 07		Batch: S41401	

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

LABORATORY CONTROL SAMPLE RESULTS

Analyte	Spike Amount	%	Limits	RPD	Limit	Batch	Preparation Date	Analysis Date	Dil	Qual
Copper	0.05 mg/l	101	85.0-115			S41401	11Jul16 0947 by 313	11Jul16 1547 by 07		
Total Recoverable Copper	0.05 mg/l	101	85.0-115			S41401	11Jul16 0947 by 313	11Jul16 1547 by 07		

MATRIX SPIKE SAMPLE RESULTS

Analyte	Sample	Spike Amount	%	Limits	Batch	Preparation Date	Analysis Date	Dil	Qual
Copper	203655-1	0.05 mg/l	95.0	75.0-125	S41401	11Jul16 0947 by 313	11Jul16 1553 by 07		
	203655-1	0.05 mg/l	96.4	75.0-125	S41401	11Jul16 0947 by 313	11Jul16 1558 by 07		
	Relative Percent Difference:		1.32	20.0	S41401				
Total Recoverable Copper	203655-1	0.05 mg/l	95.0	75.0-125	S41401	11Jul16 0947 by 313	11Jul16 1553 by 07		
	203655-1	0.05 mg/l	96.4	75.0-125	S41401	11Jul16 0947 by 313	11Jul16 1558 by 07		
	Relative Percent Difference:		1.32	20.0	S41401				

LABORATORY BLANK RESULTS

Analyte	Result	RL	PQL	QC Sample	Preparation Date	Analysis Date	Qual
Copper	< 0.0005 mg/l	0.0005	0.0005	S41401-1	11Jul16 0947 by 313	11Jul16 1541 by 07	
Total Recoverable Copper	< 0.0005 mg/l	0.0005	0.0005	S41401-1	11Jul16 0947 by 313	11Jul16 1541 by 07	

GBM[c] & Associates
219 Brown Ln.
Bryant, AR 72022
(501) 847-7077 Fax (501) 847-7943

Chain of Custody

2036057

Client/BILLING Information	
Client:	GBMc & Associates
Company:	GBMC
Address:	219 Brown Lane
	Bryant, Arkansas, 72022
Phone No.:	501-847-7077
Fax No.:	501-847-7943

SPECIAL INSTRUCTIONS/PRECAUTIONS:
Send results to Jonathan Brown @ jbrown@gbmcassoc.com
Call with questions - (501) 847-7077

Project Name / Number: Idabel WER

Sample ID	Sample Description	Date	Time	Matrix S=Sed/Soil W=Water	Number of Containers	Composite or Grab	Parameters for Analysis/Methods: Total Copper	Dissolved Copper					
001	Sample	7-6-16	1348	W	1	Grab	X	X					
001-D	Sample Duplicate	7-6-16	1349	W	1	Grab	X	X					
TB	Blank	7-7-16	1356	W	1	Grab	X	X		Did not receive			
001	Sample	7-7-16	1351	W	1	Grab	X	X		Did not receive			

Preservative (Sulfuric acid =S, Nitric acid =N, NaOH =B, Ice =I)

Sampler(s):

Shipment Method: FedEx

Turnaround Time Required: Standard

COC Completed by: M. Mitchell Date: 7-7-16 Time: 1401

COC Checked by: _____ Date: _____ Time: _____

Relinquished by: M. Mitchell Date: 7-7-16 Time: 1521

Received by: _____ Date: _____ Time: _____

Relinquished by: _____ Date: _____ Time: _____

Received in lab by: [signature] Date: 7/8/16 Time: 0935

LABORATORY USE ONLY: Samples Received On Ice?: (YES) or NO

Sample Temperature: 0.1

FedEx# 8717 5875 6428

V1.2 06/27/16

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
219 Brown Lane
Bryant, AR 72022

This report contains the analytical results and supporting information for samples submitted on July 22, 2016. Attached please find a copy of the Chain of Custody and/or other documents received. Note that any remaining sample will be discarded two weeks from the original report date unless other arrangements are made.

This report is intended for the sole use of the client listed above. Assessment of the data requires access to the entire document.

This report has been reviewed by the Chief Operating Officer or a qualified designee.

John Overbey
Chief Operating Officer

This document has been distributed to the following:

PDF cc: GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
jbrown@gbmcassoc.com

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

SAMPLE INFORMATION

Project Description:
Two (2) water sample(s) received on July 22, 2016
Idabel WER

Receipt Details:
A Chain of Custody was provided. The samples were delivered in one (1) ice chest.
Ice chest #1 was delivered with shipping documentation.

Each sample container was checked for proper labeling, including date and time sampled. Sample containers were reviewed for proper type, adequate volume, integrity, temperature, preservation, and holding times. Any exceptions are noted below:

Sample Identification:

Laboratory ID	Client Sample ID	Sampled Date/Time	Notes
204057-1	001	07-Jul-2016 1351	
204057-2	TB	07-Jul-2016 1352	

Case Narrative:
There were no qualifiers for this data and all samples met quality control criteria.

References:
"Methods for Chemical Analysis of Water and Wastes", EPA/600/4-79-020 (Mar 1983) with updates and supplements EPA/600/5-91-010 (Jun 1991), EPA/600/R-92-129 (Aug 1992) and EPA/600/R-93-100 (Aug 1993).
"Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846)", Third Edition.
"Standard Methods for the Examination of Water and Wastewaters", (SM).
"American Society for Testing and Materials" (ASTM).
"Association of Analytical Chemists" (AOAC).

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

ANALYTICAL RESULTS

AIC No. 204057-1
Sample Identification: 001 07-Jul-2016 1351

Analyte		Result	RL	Units	Qualifier
Copper		**0.0029**	0.0005	**mg/l**	
EPA 200.8	Prep: 25-Jul-2016 1339 by 313	Analyzed: 26-Jul-2016 1721 by 07		Batch: S41471	
Dissolved Copper		**0.0030**	0.0005	**mg/l**	
EPA 200.8	Prep: 25-Jul-2016 1339 by 313	Analyzed: 26-Jul-2016 1715 by 07		Batch: S41471	

AIC No. 204057-2
Sample Identification: TB 07-Jul-2016 1352

Analyte		Result	RL	Units	Qualifier
Copper		**< 0.0005**	0.0005	**mg/l**	
EPA 200.8	Prep: 25-Jul-2016 1339 by 313	Analyzed: 26-Jul-2016 1735 by 07		Batch: S41471	
Dissolved Copper		**< 0.0005**	0.0005	**mg/l**	
EPA 200.8	Prep: 25-Jul-2016 1339 by 313	Analyzed: 26-Jul-2016 1727 by 07		Batch: S41471	

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

LABORATORY CONTROL SAMPLE RESULTS

Analyte	Spike Amount	%	Limits	RPD	Limit	Batch	Preparation Date	Analysis Date	Dil	Qual
Copper	0.05 mg/l	108	85.0-115			S41471	25Jul16 1339 by 313	26Jul16 1348 by 07		

MATRIX SPIKE SAMPLE RESULTS

Analyte	Sample	Spike Amount	%	Limits	Batch	Preparation Date	Analysis Date	Dil	Qual
Copper	204054-1	0.05 mg/l	90.9	75.0-125	S41471	25Jul16 1339 by 313	26Jul16 1354 by 07		
	204054-1	0.05 mg/l	92.1	75.0-125	S41471	25Jul16 1339 by 313	26Jul16 1359 by 07		
	Relative Percent Difference:		1.20	20.0	S41471				

LABORATORY BLANK RESULTS

Analyte	Result	RL	PQL	QC Sample	Preparation Date	Analysis Date	Qual
Copper	< 0.0005 mg/l	0.0005	0.0005	S41471-1	25Jul16 1339 by 313	26Jul16 1330 by 07	

GBM^c & Associates
219 Brown Ln.
Bryant, AR 72022
(501) 847-7077 Fax (501) 847-7943

Chain of Custody

204057

Client/Billing Information		SPECIAL INSTRUCTIONS/PRECAUTIONS:
Client:	GBMc & Associates	Send Results to Jonathan Brown at
Company:		jbrown@gbmcassoc.com
Address:	219 Brown Lane	Call with questions (501) 847-7077
	Bryant, Arkansas, 72022	Project Name / Number: Idabel WER
Phone No.:	501-847-7077	
Fax No.:	501-847-7943	

	Sample ID	Sample Description	Date	Time	Matrix S=Sed/Soil W=Water	Number of Containers	Composite or Grab	Parameters for Analysis/Methods: Total Copper	Dissolved Copper					
(1)	001	Sample	7-7-16	1351	W	1	Grab	X	X					
(2)	TB	Blank	7-7-16	1352	W	1	GRAB	X	X					

Preservative (Sulfuric acid =S, Nitric acid =N, NaOH =B, Ice =I)

Sampler(s): M. Ichell	Shipment Method: Fedex	Turnaround Time Required:	
COC Completed by: M. Ichell	Date: 7-21-16 Time: 1320	COC Checked by:	Date: Time:
Relinquished by: Cody	Date: 7-21-16 Time: 1515	Received by:	Date: Time:
Relinquished by:	Date: Time:	Received in lab by: D. Brown	Date: 7-22-16 Time: 0920
LABORATORY USE ONLY:	Samples Received On Ice?: (YES) or NO	Sample Temperature: 2.6°C	

FED X : 8717 5875 6940

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
219 Brown Lane
Bryant, AR 72022

This report contains the analytical results and supporting information for samples submitted on July 22, 2016. Attached please find a copy of the Chain of Custody and/or other documents received. Note that any remaining sample will be discarded two weeks from the original report date unless other arrangements are made.

This report is intended for the sole use of the client listed above. Assessment of the data requires access to the entire document.

This report has been reviewed by the Chief Operating Officer or a qualified designee.

John Overbey
Chief Operating Officer

This document has been distributed to the following:

PDF cc: GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
jbrown@gbmcassoc.com

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

SAMPLE INFORMATION

Project Description:
Four (4) water sample(s) received on July 22, 2016
Idabel WER

Receipt Details:
A Chain of Custody was provided. The samples were delivered in one (1) ice chest.
Ice chest #1 was delivered with shipping documentation.

Each sample container was checked for proper labeling, including date and time sampled. Sample containers were reviewed for proper type, adequate volume, integrity, temperature, preservation, and holding times. Any exceptions are noted below:

Sample Identification:

Laboratory ID	Client Sample ID	Sampled Date/Time	Notes
204059-1	001	20-Jul-2016 1303	
204059-2	001-D	20-Jul-2016 1304	
204059-3	TB	21-Jul-2016 1246	
204059-4	001	21-Jul-2016 1246	

Case Narrative:
There were no qualifiers for this data and all samples met quality control criteria.

References:
"Methods for Chemical Analysis of Water and Wastes", EPA/600/4-79-020 (Mar 1983) with updates and supplements EPA/600/5-91-010 (Jun 1991), EPA/600/R-92-129 (Aug 1992) and EPA/600/R-93-100 (Aug 1993).
"Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846)", Third Edition.
"Standard Methods for the Examination of Water and Wastewaters", (SM).
"American Society for Testing and Materials" (ASTM).
"Association of Analytical Chemists" (AOAC).

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

ANALYTICAL RESULTS

AIC No. 204059-1
Sample Identification: 001 20-Jul-2016 1303

Analyte		Result	RL	Units	Qualifier
Copper		**0.0078**	0.0005	**mg/l**	
EPA 200.8	Prep: 25-Jul-2016 1339 by 313	Analyzed: 26-Jul-2016 1746 by 07		Batch: S41471	
Dissolved Copper		**0.0066**	0.0005	**mg/l**	
EPA 200.8	Prep: 25-Jul-2016 1339 by 313	Analyzed: 26-Jul-2016 1741 by 07		Batch: S41471	

AIC No. 204059-2
Sample Identification: 001-D 20-Jul-2016 1304

Analyte		Result	RL	Units	Qualifier
Copper		**0.0093**	0.0005	**mg/l**	
EPA 200.8	Prep: 25-Jul-2016 1339 by 313	Analyzed: 26-Jul-2016 1809 by 07		Batch: S41471	
Dissolved Copper		**0.0038**	0.0005	**mg/l**	
EPA 200.8	Prep: 25-Jul-2016 1339 by 313	Analyzed: 26-Jul-2016 1752 by 07		Batch: S41471	

AIC No. 204059-3
Sample Identification: TB 21-Jul-2016 1246

Analyte		Result	RL	Units	Qualifier
Copper		**< 0.0005**	0.0005	**mg/l**	
EPA 200.8	Prep: 25-Jul-2016 1339 by 313	Analyzed: 26-Jul-2016 1821 by 07		Batch: S41471	
Dissolved Copper		**< 0.0005**	0.0005	**mg/l**	
EPA 200.8	Prep: 25-Jul-2016 1339 by 313	Analyzed: 26-Jul-2016 1815 by 07		Batch: S41471	

AIC No. 204059-4
Sample Identification: 001 21-Jul-2016 1246

Analyte		Result	RL	Units	Qualifier
Copper		**0.0084**	0.0005	**mg/l**	
EPA 200.8	Prep: 25-Jul-2016 1339 by 313	Analyzed: 26-Jul-2016 1832 by 07		Batch: S41471	
Dissolved Copper		**0.0071**	0.0005	**mg/l**	
EPA 200.8	Prep: 25-Jul-2016 1339 by 313	Analyzed: 26-Jul-2016 1826 by 07		Batch: S41471	

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

LABORATORY CONTROL SAMPLE RESULTS

Analyte	Spike Amount	%	Limits	RPD	Limit	Batch	Preparation Date	Analysis Date	Dil	Qual
Copper	0.05 mg/l	108	85.0-115			S41471	25Jul16 1339 by 313	26Jul16 1348 by 07		

MATRIX SPIKE SAMPLE RESULTS

Analyte	Sample	Spike Amount	%	Limits	Batch	Preparation Date	Analysis Date	Dil	Qual
Copper	204054-1	0.05 mg/l	90.9	75.0-125	S41471	25Jul16 1339 by 313	26Jul16 1354 by 07		
	204054-1	0.05 mg/l	92.1	75.0-125	S41471	25Jul16 1339 by 313	26Jul16 1359 by 07		
	Relative Percent Difference:		1.20	20.0	S41471				

LABORATORY BLANK RESULTS

Analyte	Result	RL	PQL	QC Sample	Preparation Date	Analysis Date	Qual
Copper	< 0.0005 mg/l	0.0005	0.0005	S41471-1	25Jul16 1339 by 313	26Jul16 1330 by 07	

GBM[c] & Associates
219 Brown Ln.
Bryant, AR 72022
(501) 847-7077 Fax (501) 847-7943

Chain of Custody

204059

Client/Billing Information	
Client:	GBMc & Associates
Company:	
Address:	219 Brown Lane
	Bryant, Arkansas, 72022
Phone No.:	501-847-7077
Fax No.:	501-847-7943

SPECIAL INSTRUCTIONS/PRECAUTIONS:
Send results to Jonathan Brown @ jbrown@gbmcassoc.com
Call with questions - (501) 847-7077

Project Name / Number: Edebel WER

	Sample ID	Sample Description	Date	Time	Matrix S=Sed/Soil W=Water	Number of Containers	Composite or Grab	Parameters for Analysis/Methods: Total Copper	Dissolved Copper					
1	001	Sample	7-20-16	1303	W	1	Grab	X	X					
2	001-D	Sample Duplicate	7-20-16	1304	W	1	Grab	X	X					
3	TB	Blank	7-21-16	1246	W	1	Grab	X	X					
4	001	Sample	7-21-16	1246	W	1	Grab	X	X					

Preservative (Sulfuric acid =S, Nitric acid =N, NaOH =B, Ice =I)

Sampler(s): M. Edebel
Shipment Method: Fed Ex
Turnaround Time Required: Standard

COC Completed by: M. Edebel Date: 7-21-16 Time: 1320
COC Checked by: _____ Date: _____ Time: _____

Relinquished by: Cody Smith Date: 7-22-16 Time: 1515
Received by: _____ Date: _____ Time: _____

Relinquished by: _____ Date: _____ Time: _____
Received in lab by: D. BROWN Date: 7-22-16 Time: 0920

LABORATORY USE ONLY: Samples Received On Ice?: YES or NO
Sample Temperature: 2.6 °C

FedEx 8717 5875 6940

V1.2 06/27/16

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
219 Brown Lane
Bryant, AR 72022

This report contains the analytical results and supporting information for samples submitted on July 29, 2016. Attached please find a copy of the Chain of Custody and/or other documents received. Note that any remaining sample will be discarded two weeks from the original report date unless other arrangements are made.

This report is intended for the sole use of the client listed above. Assessment of the data requires access to the entire document.

This report has been reviewed by the Chief Operating Officer or a qualified designee.

John Overbey
Chief Operating Officer

This document has been distributed to the following:

PDF cc: GBMc & Associates, Inc.
ATTN: Mr. Jonathon Brown
jbrown@gbmcassoc.com

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

SAMPLE INFORMATION

Project Description:
Two (2) water sample(s) received on July 29, 2016
Idabel WER

Receipt Details:
A Chain of Custody was provided. The samples were delivered in one (1) ice chest.
Ice chest #1 was delivered with shipping documentation.

Each sample container was checked for proper labeling, including date and time sampled. Sample containers were reviewed for proper type, adequate volume, integrity, temperature, preservation, and holding times. Any exceptions are noted below:

Sample Identification:

Laboratory ID	Client Sample ID	Sampled Date/Time	Notes
204244-1	001	27-Jul-2016 1311	
204244-2	001	28-Jul-2016 1430	

Case Narrative:
There were no qualifiers for this data and all samples met quality control criteria.

References:
"Methods for Chemical Analysis of Water and Wastes", EPA/600/4-79-020 (Mar 1983) with updates and supplements EPA/600/5-91-010 (Jun 1991), EPA/600/R-92-129 (Aug 1992) and EPA/600/R-93-100 (Aug 1993).
"Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846)", Third Edition.
"Standard Methods for the Examination of Water and Wastewaters", (SM).
"American Society for Testing and Materials" (ASTM).
"Association of Analytical Chemists" (AOAC).

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

ANALYTICAL RESULTS

AIC No. 204244-1
Sample Identification: 001 27-Jul-2016 1311

Analyte		Result	RL	Units	Qualifier
Copper		**0.0052**	0.0005	**mg/l**	
EPA 200.8	Prep: 01-Aug-2016 0900 by 313	Analyzed: 01-Aug-2016 1738 by 07		Batch: S41502	
Dissolved Copper		**0.0039**	0.0005	**mg/l**	
EPA 200.8	Prep: 01-Aug-2016 0900 by 313	Analyzed: 01-Aug-2016 1622 by 07		Batch: S41502	

AIC No. 204244-2
Sample Identification: 001 28-Jul-2016 1430

Analyte		Result	RL	Units	Qualifier
Copper		**0.0043**	0.0005	**mg/l**	
EPA 200.8	Prep: 01-Aug-2016 0900 by 313	Analyzed: 01-Aug-2016 1743 by 07		Batch: S41502	
Dissolved Copper		**0.0028**	0.0005	**mg/l**	
EPA 200.8	Prep: 01-Aug-2016 0900 by 313	Analyzed: 01-Aug-2016 1628 by 07		Batch: S41502	

AMERICAN INTERPLEX CORPORATION
LABORATORIES

GBMc & Associates, Inc.
219 Brown Lane
Bryant, AR 72022

LABORATORY CONTROL SAMPLE RESULTS

Analyte	Spike Amount	%	Limits	RPD	Limit	Batch	Preparation Date	Analysis Date	Dil	Qual
Copper	0.05 mg/l	105	85.0-115			S41502	01Aug16 0900 by 313	01Aug16 1502 by 07		

MATRIX SPIKE SAMPLE RESULTS

Analyte	Sample	Spike Amount	%	Limits	Batch	Preparation Date	Analysis Date	Dil	Qual
Copper	204248-1	0.05 mg/l	97.7	75.0-125	S41502	01Aug16 0900 by 313	01Aug16 1508 by 07		
	204248-1	0.05 mg/l	97.5	75.0-125	S41502	01Aug16 0900 by 313	01Aug16 1514 by 07		
	Relative Percent Difference:		0.191	20.0	S41502				

LABORATORY BLANK RESULTS

Analyte	Result	RL	PQL	QC Sample	Preparation Date	Analysis Date	Qual
Copper	< 0.0005 mg/l	0.0005	0.0005	S41502-1	01Aug16 0900 by 313	01Aug16 1457 by 07	

GBM^c & Associates
219 Brown Ln.
Bryant, AR 72022
(501) 847-7077 Fax (501) 847-7943

Chain of Custody

204244

Client/Billing Information		SPECIAL INSTRUCTIONS/PRECAUTIONS:
Client:	GBMc & Associates	Send results to Jonathan Brown
Company:		jbrown@gbmca350c.com
Address:	219 Brown Lane	Call (501) 847-7077 with questions.
	Bryant, Arkansas, 72022	Project Name / Number: Idabel WER
Phone No.:	501-847-7077	
Fax No.:	501-847-7943	

	Sample ID	Sample Description	Date	Time	Matrix S=Sed/Soil W=Water	Number of Containers	Composite or Grab	Parameters for Analysis/Methods: Total Copper	Dissolved Copper					
1	001	Sample	7-27-16	1311	W	4	Grab	X	X					
2	001	Sample	7-28-16	1430	W	1	Grab	X	X					

Preservative (Sulfuric acid =S, Nitric acid =N, NaOH =B, Ice =I)

Sampler(s): Mikell Isabel	Shipment Method: Fed Ex	Turnaround Time Required: Standard	
COC Completed by: Mikell	Date: 7-28-16 Time: 1415	COC Checked by:	Date: Time:
Relinquished by: Mikell	Date: 7-28-16 Time: 1521	Received by:	Date: Time:
Relinquished by:	Date: Time:	Received in lab by:	Date: 7/29/16 Time: 0910
LABORATORY USE ONLY:	Samples Received On Ice?: (YES) or NO	Sample Temperature: 4.4	

FedEx# 8717 5875 6950

DMR Monitoring

AMERICAN INTERPLEX CORPORATION
LABORATORIES

Idabel Public Works Authority
ATTN: Mr. Steve Surratt
201 East Main
Idabel, OK 74745

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This report has been reviewed by the Chief Operating Officer or a qualified designee.

John Overbey
Chief Operating Officer

This document has been distributed to the following:

PDF cc: Idabel Public Works Authority
ATTN: Mr. Steve Surratt
ipwadirector@yahoo.com

Idabel Public Works Authority
ATTN: Mr. Mitchell Bruner
mitchellbruner1987@yahoo.com

Idabel Public Works Authority
ATTN: Mr. Brandon Gragg
brandongragg_2008@yahoo.com

AMERICAN INTERPLEX CORPORATION
LABORATORIES

Idabel Public Works Authority
201 East Main
Idabel, OK 74745

SAMPLE INFORMATION

Project Description:
Three (3) water sample(s) received on July 29, 2016
Clean Metals-Oklahoma
P.O. No. 0002

Receipt Details:
A Chain of Custody was provided. The samples were delivered in one (1) ice chest.
Ice chest #1 was delivered with shipping documentation.

Each sample container was checked for proper labeling, including date and time sampled. Sample containers were reviewed for proper type, adequate volume, integrity, temperature, preservation, and holding times. Any exceptions are noted below:

Sample Identification:

Laboratory ID	Client Sample ID	Sampled Date/Time	Notes
204245-1	1-3	26-Jul-2016 1500	
204245-2	2-3	27-Jul-2016 1500	
204245-3	3-3	28-Jul-2016 1500	

Case Narrative:
There were no qualifiers for this data and all samples met quality control criteria.

References:
"Methods for Chemical Analysis of Water and Wastes", EPA/600/4-79-020 (Mar 1983) with updates and supplements EPA/600/5-91-010 (Jun 1991), EPA/600/R-92-129 (Aug 1992) and EPA/600/R-93-100 (Aug 1993).
"Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846)", Third Edition.
"Standard Methods for the Examination of Water and Wastewaters", (SM).
"American Society for Testing and Materials" (ASTM).
"Association of Analytical Chemists" (AOAC).

AMERICAN INTERPLEX CORPORATION
LABORATORIES

Idabel Public Works Authority
201 East Main
Idabel, OK 74745

ANALYTICAL RESULTS

AIC No. 204245-1
Sample Identification: 1-3 26-Jul-2016 1500

Analyte		Result	RL	Units	Qualifier
Cadmium		**< 0.2**	0.2	**ug/l**	
EPA 200.8	Prep: 01-Aug-2016 0900 by 313	Analyzed: 01-Aug-2016 1525 by 07		Batch: S41502	
Copper		**< 10**	10	**ug/l**	
EPA 200.8	Prep: 01-Aug-2016 0900 by 313	Analyzed: 01-Aug-2016 1525 by 07		Batch: S41502	
Selenium		**< 5**	5	**ug/l**	
EPA 200.8	Prep: 01-Aug-2016 0900 by 313	Analyzed: 01-Aug-2016 1525 by 07		Batch: S41502	
Silver		**< 0.2**	0.2	**ug/l**	
EPA 200.8	Prep: 01-Aug-2016 0900 by 313	Analyzed: 01-Aug-2016 1525 by 07		Batch: S41502	

AIC No. 204245-2
Sample Identification: 2-3 27-Jul-2016 1500

Analyte		Result	RL	Units	Qualifier
Copper		**< 10**	10	**ug/l**	
EPA 200.8	Prep: 01-Aug-2016 0900 by 313	Analyzed: 01-Aug-2016 1531 by 07		Batch: S41502	
Selenium		**< 5**	5	**ug/l**	
EPA 200.8	Prep: 01-Aug-2016 0900 by 313	Analyzed: 01-Aug-2016 1531 by 07		Batch: S41502	

AIC No. 204245-3
Sample Identification: 3-3 28-Jul-2016 1500

Analyte		Result	RL	Units	Qualifier
Copper		**24**	10	**ug/l**	
EPA 200.8	Prep: 01-Aug-2016 0900 by 313	Analyzed: 01-Aug-2016 1537 by 07		Batch: S41502	
Selenium		**< 5**	5	**ug/l**	
EPA 200.8	Prep: 01-Aug-2016 0900 by 313	Analyzed: 01-Aug-2016 1537 by 07		Batch: S41502	

AMERICAN INTERPLEX CORPORATION
LABORATORIES

Idabel Public Works Authority
201 East Main
Idabel, OK 74745

LABORATORY CONTROL SAMPLE RESULTS

Analyte	Spike Amount	%	Limits	RPD	Limit	Batch	Preparation Date	Analysis Date	Dil	Qual
Cadmium	0.05 mg/l	105	85.0-115			S41502	01Aug16 0900 by 313	01Aug16 1502 by 07		
Copper	0.05 mg/l	105	85.0-115			S41502	01Aug16 0900 by 313	01Aug16 1502 by 07		
Selenium	0.05 mg/l	107	85.0-115			S41502	01Aug16 0900 by 313	01Aug16 1502 by 07		
Silver	0.02 mg/l	113	85.0-115			S41502	01Aug16 0900 by 313	01Aug16 1502 by 07		

MATRIX SPIKE SAMPLE RESULTS

Analyte	Sample	Spike Amount	%	Limits	Batch	Preparation Date	Analysis Date	Dil	Qual
Cadmium	204248-1	0.05 mg/l	100	75.0-125	S41502	01Aug16 0900 by 313	01Aug16 1508 by 07		
	204248-1	0.05 mg/l	102	75.0-125	S41502	01Aug16 0900 by 313	01Aug16 1514 by 07		
	Relative Percent Difference:		1.52	20.0	S41502				
Copper	204248-1	0.05 mg/l	97.7	75.0-125	S41502	01Aug16 0900 by 313	01Aug16 1508 by 07		
	204248-1	0.05 mg/l	97.5	75.0-125	S41502	01Aug16 0900 by 313	01Aug16 1514 by 07		
	Relative Percent Difference:		0.191	20.0	S41502				
Selenium	204248-1	0.05 mg/l	103	75.0-125	S41502	01Aug16 0900 by 313	01Aug16 1508 by 07		
	204248-1	0.05 mg/l	101	75.0-125	S41502	01Aug16 0900 by 313	01Aug16 1514 by 07		
	Relative Percent Difference:		1.67	20.0	S41502				
Silver	204248-1	0.02 mg/l	107	75.0-125	S41502	01Aug16 0900 by 313	01Aug16 1508 by 07		
	204248-1	0.02 mg/l	109	75.0-125	S41502	01Aug16 0900 by 313	01Aug16 1514 by 07		
	Relative Percent Difference:		2.09	20.0	S41502				

LABORATORY BLANK RESULTS

Analyte	Result	RL	PQL	QC Sample	Preparation Date	Analysis Date	Qual
Cadmium	< 0.0002 mg/l	0.0002	0.0002	S41502-1	01Aug16 0900 by 313	01Aug16 1457 by 07	
Copper	< 0.006 mg/l	0.006	0.006	S41502-1	01Aug16 0900 by 313	01Aug16 1457 by 07	
Selenium	< 0.002 mg/l	0.002	0.002	S41502-1	01Aug16 0900 by 313	01Aug16 1457 by 07	
Silver	< 0.0002 mg/l	0.0002	0.0002	S41502-1	01Aug16 0900 by 313	01Aug16 1457 by 07	

City of Idabel – Clean Sampling

201 East Main
Idabel, OK 74745
Phone (580) 286-5631 Fax (580) 286-3897

Chain of Custody

Ship Samples To:
American Interplex Laboratories
8600 Kanis Road
Little Rock, AR 72204-2322
(501) 224-5060 Fax (501) 224-5072

Client/Billing Information:		SPECIAL INSTRUCTIONS/PRECAUTIONS:
Client:	Steve Surratt	Report results at the following Detection Levels (DL) – Copper: 10 ug/L , Selenium: 5 ug/L
Company:	City of Idabel	Please "flow weight" grab samples 001-1 thru 001-6 to make one composite sample for analysis.
Address:	201 East Main	Use flows provided below for each grab sample to make composite sample.
	Idabel, OK 74745	Project Name / Number: Clean Metals - Oklahoma
Phone No.:	(580) 286-5631	
Fax No.:	(580) 286-3897	

	Sample ID	Outfall Flow (MGD)	Date	Time	Matrix S=Sed/Soil W=Water	Number of Containers	Composite or Grab	Parameters for Analysis/Methods: Clean Cu	Clean Se	Clean Cr	Clean Ag	Clean Cd	Clean Zn				
1	1-3		7-26-16	1000-1500	W	1	Comp	x	x		x	x					
2	2-3		7-27-16	1000-1500	W	1	Comp	x	x								
3	3-3		7-28-16	1000-1500	W	1	Comp	x	x								
Preservative		(Sulfuric acid =S, Nitric acid =N, NaOH =B, Ice =I)						I	I	I	I	I	I				

Sampler(s): Mitchell B Cody S	Shipment Method: FED EX	Turnaround Time Required: **Normal**
COC Completed by: Mitchell	Date: 7-28-16 Time: 1400	COC Checked by: _____ Date: _____ Time: _____
Relinquished by: Mitchell	Date: 7-28-16 Time: 1521	Received by: _____ Date: _____ Time: _____
Relinquished by: _____	Date: _____ Time: _____	Received in lab by: [signature] Date: 7/29/16 Time: 0900
LABORATORY USE ONLY:	Samples Received On Ice? : YES or NO	Sample Temperature: 4.4

FedEx#8717 5875 6950

AMERICAN INTERPLEX CORPORATION
LABORATORIES

Idabel Public Works Authority
ATTN: Mr. Steve Surratt
201 East Main
Idabel, OK 74745

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This report has been reviewed by the Chief Operating Officer or a qualified designee.

Steve Bradford
Deputy Laboratory Director

This document has been distributed to the following:

PDF cc: Idabel Public Works Authority
ATTN: Mr. Steve Surratt
ipwadirector@yahoo.com

Idabel Public Works Authority
ATTN: Mr. Mitchell Bruner
mitchellbruner1987@yahoo.com

Idabel Public Works Authority
ATTN: Mr. Brandon Gragg
brandongragg_2008@yahoo.com

AMERICAN INTERPLEX CORPORATION
LABORATORIES

Idabel Public Works Authority
201 East Main
Idabel, OK 74745

SAMPLE INFORMATION

Project Description:
Three (3) water sample(s) received on July 29, 2016
Clean Metals-Oklahoma
P.O. No. 0002

Receipt Details:
A Chain of Custody was provided. The samples were delivered in one (1) ice chest.
Ice chest #1 was delivered with shipping documentation.

Each sample container was checked for proper labeling, including date and time sampled. Sample containers were reviewed for proper type, adequate volume, integrity, temperature, preservation, and holding times. Any exceptions are noted below:

Sample Identification:

Laboratory ID	Client Sample ID	Sampled Date/Time	Notes
204247-1	NH3	26-Jul-2016 1500	
204247-2	NH3	27-Jul-2016 1500	
204247-3	NH3 BOD5 TSS	28-Jul-2016 1500	

Qualifiers:
D Result is from a secondary dilution factor

References:
"Methods for Chemical Analysis of Water and Wastes", EPA/600/4-79-020 (Mar 1983) with updates and supplements EPA/600/5-91-010 (Jun 1991), EPA/600/R-92-129 (Aug 1992) and EPA/600/R-93-100 (Aug 1993).
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"Standard Methods for the Examination of Water and Wastewaters", (SM).
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"Association of Analytical Chemists" (AOAC).

AMERICAN INTERPLEX CORPORATION
LABORATORIES

Idabel Public Works Authority
201 East Main
Idabel, OK 74745

ANALYTICAL RESULTS

AIC No. 204247-1
Sample Identification: NH3 26-Jul-2016 1500

Analyte		Result	RL	Units	Qualifier
Ammonia as N		**0.83**	0.1	**mg/l**	
SM 4500-NH3 G 1997	Prep: 01-Aug-2016 1502 by 319	Analyzed: 02-Aug-2016 0918 by 319		Batch: W56703	

AIC No. 204247-2
Sample Identification: NH3 27-Jul-2016 1500

Analyte		Result	RL	Units	Qualifier
Ammonia as N		**2.1**	0.5	**mg/l**	D
SM 4500-NH3 G 1997	Prep: 01-Aug-2016 1502 by 319	Analyzed: 02-Aug-2016 1005 by 319		Batch: W56703	Dil: 5

AIC No. 204247-3
Sample Identification: NH3 BOD5 TSS 28-Jul-2016 1500

Analyte		Result	RL	Units	Qualifier
Ammonia as N		**2.0**	0.5	**mg/l**	D
SM 4500-NH3 G 1997	Prep: 01-Aug-2016 1502 by 319	Analyzed: 02-Aug-2016 0922 by 319		Batch: W56703	Dil: 5
BOD 5-day		**4.1**	2	**mg/l**	
SM 5210 B 2001	Prep: 29-Jul-2016 1353 by 271	Analyzed: 03-Aug-2016 1039 by 271		Batch: W56682	
Total Suspended Solids		**4.8**	4	**mg/l**	
USGS 3765	Prep: 01-Aug-2016 0823 by 100	Analyzed: 01-Aug-2016 1425 by 100		Batch: W56691	

AMERICAN INTERPLEX CORPORATION
LABORATORIES

Idabel Public Works Authority
201 East Main
Idabel, OK 74745

DUPLICATE RESULTS

Analyte		AIC No.	Result	RPD	RPD Limit	Preparation Date	Analysis Date	Dil	Qual
BOD 5-day		204250-2	3.7 mg/l			29Jul16 1353 by 271	03Aug16 0955 by 271		
	Batch: W56682	Duplicate	4.2 mg/l	12.2	20.0	29Jul16 1354 by 271	03Aug16 0958 by 271		
Total Suspended Solids		204222-1	36 mg/l			01Aug16 0823 by 100	01Aug16 1425 by 100		
	Batch: W56691	Duplicate	36 mg/l	1.12	20.0	01Aug16 0824 by 100	01Aug16 1425 by 100		
Total Suspended Solids		204265-1	< 4 mg/l			01Aug16 0823 by 100	01Aug16 1425 by 100		
	Batch: W56691	Duplicate	< 4 mg/l	0.00	20.0	01Aug16 0824 by 100	01Aug16 1425 by 100		

LABORATORY CONTROL SAMPLE RESULTS

Analyte	Spike Amount	%	Limits	RPD	Limit	Batch	Preparation Date	Analysis Date	Dil	Qual
Ammonia as N	1 mg/l	117	80.0-120			W56703	01Aug16 1502 by 319	02Aug16 0901 by 319		
BOD 5-day	200 mg/l	107	84.5-115			W56682	29Jul16 1354 by 271	03Aug16 0938 by 271		

MATRIX SPIKE SAMPLE RESULTS

Analyte	Sample	Spike Amount	%	Limits	Batch	Preparation Date	Analysis Date	Dil	Qual
Ammonia as N	204254-2	1 mg/l	105	80.0-120	W56703	01Aug16 1502 by 319	02Aug16 0908 by 319		
	204254-2	1 mg/l	106	80.0-120	W56703	01Aug16 1502 by 319	02Aug16 0910 by 319		
	Relative Percent Difference:		1.13	25.0	W56703				

LABORATORY BLANK RESULTS

Analyte	Result	RL	PQL	QC Sample	Preparation Date	Analysis Date	Qual
Ammonia as N	< 0.1 mg/l	0.1	0.1	W56703-1	01Aug16 1502 by 319	02Aug16 0900 by 319	
BOD 5-day	< 2 mg/l	2	2	W56682-1	29Jul16 1354 by 271	03Aug16 0937 by 271	
Total Suspended Solids	< 4 mg/l	4	4	W56691-1	01Aug16 0824 by 100	01Aug16 1425 by 100	

City of Idabel – Clean Sampling

201 East Main
Idabel, OK 74745
Phone (580) 286-5631 Fax (580) 286-3897

Chain of Custody

Ship Samples To:

American Interplex Laboratories
8600 Kanis Road
Little Rock, AR 72204-2322
(501) 224-5060 Fax (501) 224-5072

204247

Client/Billing Information							SPECIAL INSTRUCTIONS/PRECAUTIONS:									
Client:	Steve Surratt															
Company:	City of Idabel															
Address:	201 East Main															
	Idabel, OK 74745	Project Name / Number:					Parameters for Analysis/Methods									
Phone No.:	(580) 286-5631	Clean Metals - Oklahoma														
Fax No.:	(580) 286-3897															
	Sample ID	Outfall Flow (MGD)	Date	Time	Matrix S=Sed/Soil W=Water	Number of Containers	Composite or Grab					TSS	NH3	TDS, Sulfate, Chloride	BOD'5		
1	NH3		7-26-16	1000-1500	W	1	Comp						X				
2	NH3		7-27-16	1000-1500	W	1	Comp						X				
3	NH3		7-28-16	1000-1500	W	1	Comp						X				
3	BOD5 TSS		7-28-16	1000-1500	W	1	Comp					X			X		
Preservative	(Sulfuric acid =S, Nitric acid =N, NaOH =B, Ice =I)											I	I, S	I	I		

Sampler(s): Mitchell B Cody S	Shipment Method: FED EX	Turnaround Time Required: Normal
COC Completed by: [signature]	Date: 7-28-16 Time: 1402	COC Checked by: _____ Date: _____ Time:
Relinquished by: [signature]	Date: 7-28-16 Time: 1521	Received by: _____ Date: _____ Time:
Relinquished by: _____	Date: _____ Time: _____	Received in lab by: [signature] Date: 7/29/16 Time: 0910
LABORATORY USE ONLY:	Samples Received On Ice? : (YES) or NO	Sample Temperature: 4.4

FedEx 8717 8375 6950

V1.2 07/28/16

AMERICAN INTERPLEX CORPORATION
LABORATORIES

Idabel Public Works Authority
ATTN: Mr. Steve Surratt
201 East Main
Idabel, OK 74745

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John Overbey
Chief Operating Officer

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Idabel Public Works Authority
ATTN: Mr. Brandon Gragg
brandongragg_2008@yahoo.com

AMERICAN INTERPLEX CORPORATION
LABORATORIES

Idabel Public Works Authority
201 East Main
Idabel, OK 74745

SAMPLE INFORMATION

Project Description:
Three (3) water sample(s) received on September 30, 2016
Clean Metals-Oklahoma
P.O. No. 247

Receipt Details:
A Chain of Custody was provided. The samples were delivered in one (1) ice chest.
Ice chest #1 was delivered with shipping documentation.

Each sample container was checked for proper labeling, including date and time sampled. Sample containers were reviewed for proper type, adequate volume, integrity, temperature, preservation, and holding times. Any exceptions are noted below:

Sample Identification:

Laboratory ID	Client Sample ID	Sampled Date/Time	Notes
206002-1	1-3	27-Sep-2016 1500	
206002-2	2-3	28-Sep-2016 1500	
206002-3	3-3	29-Sep-2016 1500	

Case Narrative:
There were no qualifiers for this data and all samples met quality control criteria.

References:
"Methods for Chemical Analysis of Water and Wastes", EPA/600/4-79-020 (Mar 1983) with updates and supplements EPA/600/5-91-010 (Jun 1991), EPA/600/R-92-129 (Aug 1992) and EPA/600/R-93-100 (Aug 1993).
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"Association of Analytical Chemists" (AOAC).

AMERICAN INTERPLEX CORPORATION
LABORATORIES

Idabel Public Works Authority
201 East Main
Idabel, OK 74745

ANALYTICAL RESULTS

AIC No. 206002-1
Sample Identification: 1-3 27-Sep-2016 1500

Analyte		Result	RL	Units	Qualifier
Cadmium		**< 0.2**	0.2	**ug/l**	
EPA 200.8	Prep: 03-Oct-2016 1408 by 313	Analyzed: 03-Oct-2016 1814 by 235		Batch: S41846	
Copper		**< 10**	10	**ug/l**	
EPA 200.8	Prep: 03-Oct-2016 1408 by 313	Analyzed: 03-Oct-2016 1814 by 235		Batch: S41846	
Selenium		**< 5**	5	**ug/l**	
EPA 200.8	Prep: 03-Oct-2016 1408 by 313	Analyzed: 03-Oct-2016 1814 by 235		Batch: S41846	
Silver		**< 0.2**	0.2	**ug/l**	
EPA 200.8	Prep: 03-Oct-2016 1408 by 313	Analyzed: 03-Oct-2016 1814 by 235		Batch: S41846	

AIC No. 206002-2
Sample Identification: 2-3 28-Sep-2016 1500

Analyte		Result	RL	Units	Qualifier
Copper		**< 10**	10	**ug/l**	
EPA 200.8	Prep: 03-Oct-2016 1408 by 313	Analyzed: 03-Oct-2016 1820 by 235		Batch: S41846	
Selenium		**< 5**	5	**ug/l**	
EPA 200.8	Prep: 03-Oct-2016 1408 by 313	Analyzed: 03-Oct-2016 1820 by 235		Batch: S41846	

AIC No. 206002-3
Sample Identification: 3-3 29-Sep-2016 1500

Analyte		Result	RL	Units	Qualifier
Copper		**< 10**	10	**ug/l**	
EPA 200.8	Prep: 03-Oct-2016 1408 by 313	Analyzed: 03-Oct-2016 1826 by 235		Batch: S41846	
Selenium		**< 5**	5	**ug/l**	
EPA 200.8	Prep: 03-Oct-2016 1408 by 313	Analyzed: 03-Oct-2016 1826 by 235		Batch: S41846	

AMERICAN INTERPLEX CORPORATION
LABORATORIES

Idabel Public Works Authority
201 East Main
Idabel, OK 74745

LABORATORY CONTROL SAMPLE RESULTS

Analyte	Spike Amount	%	Limits	RPD	Limit	Batch	Preparation Date	Analysis Date	Dil	Qual
Cadmium	0.05 mg/l	101	85.0-115			S41846	03Oct16 1408 by 313	03Oct16 1643 by 235		
Copper	0.05 mg/l	99.1	85.0-115			S41846	03Oct16 1408 by 313	03Oct16 1643 by 235		
Selenium	0.05 mg/l	100	85.0-115			S41846	03Oct16 1408 by 313	03Oct16 1643 by 235		
Silver	0.02 mg/l	102	85.0-115			S41846	03Oct16 1408 by 313	03Oct16 1643 by 235		

MATRIX SPIKE SAMPLE RESULTS

Analyte	Sample	Spike Amount	%	Limits	Batch	Preparation Date	Analysis Date	Dil	Qual
Cadmium	206008-1	0.05 mg/l	98.0	75.0-125	S41846	03Oct16 1408 by 313	03Oct16 1649 by 235		
	206008-1	0.05 mg/l	97.2	75.0-125	S41846	03Oct16 1408 by 313	03Oct16 1654 by 235		
	Relative Percent Difference:		0.811	20.0	S41846				
Copper	206008-1	0.05 mg/l	91.7	75.0-125	S41846	03Oct16 1408 by 313	03Oct16 1649 by 235		
	206008-1	0.05 mg/l	92.9	75.0-125	S41846	03Oct16 1408 by 313	03Oct16 1654 by 235		
	Relative Percent Difference:		1.29	20.0	S41846				
Selenium	206008-1	0.05 mg/l	97.7	75.0-125	S41846	03Oct16 1408 by 313	03Oct16 1649 by 235		
	206008-1	0.05 mg/l	95.5	75.0-125	S41846	03Oct16 1408 by 313	03Oct16 1654 by 235		
	Relative Percent Difference:		2.23	20.0	S41846				
Silver	206008-1	0.02 mg/l	96.3	75.0-125	S41846	03Oct16 1408 by 313	03Oct16 1649 by 235		
	206008-1	0.02 mg/l	96.7	75.0-125	S41846	03Oct16 1408 by 313	03Oct16 1654 by 235		
	Relative Percent Difference:		0.443	20.0	S41846				

LABORATORY BLANK RESULTS

Analyte	Result	RL	PQL	QC Sample	Preparation Date	Analysis Date	Qual
Cadmium	< 0.0002 mg/l	0.0002	0.0002	S41846-1	03Oct16 1408 by 313	03Oct16 1637 by 235	
Copper	< 0.006 mg/l	0.006	0.006	S41846-1	03Oct16 1408 by 313	03Oct16 1637 by 235	
Selenium	< 0.002 mg/l	0.002	0.002	S41846-1	03Oct16 1408 by 313	03Oct16 1637 by 235	
Silver	< 0.0002 mg/l	0.0002	0.0002	S41846-1	03Oct16 1408 by 313	03Oct16 1637 by 235	

City of Idabel – Clean Sampling

201 East Main
Idabel, OK 74745
Phone (580) 286-5631 Fax (580) 286-3897

Chain of Custody

Ship Samples To:

American Interplex Laboratories
8600 Kanis Road
Little Rock, AR 72204-2322
(501) 224-5060 Fax (501) 224-5072

206002

Client/Billing Information		SPECIAL INSTRUCTIONS/PRECAUTIONS:
Client:	Steve Surratt	**Report results at the following Detection Levels (DL) – Copper: 10 ug/L , Selenium: 5 ug/L**
Company:	City of Idabel	Please "flow weight" grab samples 001-1 thru 001-6 to make one composite sample for analysis.
Address:	201 East Main	Use flows provided below for each grab sample to make composite sample.
	Idabel, OK 74745	**Project Name / Number:**
Phone No.:	(580) 286-5631	Clean Metals - Oklahoma
Fax No.:	(580) 286-3897	

Sample ID	Outfall Flow (MGD)	Date	Time	Matrix S=Sed/Soil W=Water	Number of Containers	Composite or Grab	Parameters for Analysis/Methods: Clean Cu	Clean Se	Clean Cr	Clean Ag	Clean Cd	Clean Zn				
1 1-3		9-27-16	1000-1500	W	1	Comp	x	x		x	x					
2 2-3		9-28-16	1000-1500	W	1	Comp	x	x								
3 3-3		9-29-16	1000-1500	W	1	Comp	x	x								
Preservative	(Sulfuric acid =S, Nitric acid =N, NaOH =B, Ice =I)						I	I	I	I	I	I				

Sampler(s): Mitchell B Cody S	Shipment Method: FED EX	Turnaround Time Required: **Normal**
COC Completed by: [signature]	Date: 9-29-16 Time: 1402	COC Checked by: _____ Date: _____ Time: _____
Relinquished by: [signature]	Date: 9-29-16 Time: 1414	Received by: _____ Date: _____ Time: _____
Relinquished by: _____	Date: _____ Time: _____	Received in lab by: D-Brown Date: 9-30-16 Time: 0830
LABORATORY USE ONLY:	**Samples Received On Ice? :** (YES) or NO	**Sample Temperature:** 0.4°C

FED X : 8102 5796 8866

AMERICAN INTERPLEX CORPORATION
LABORATORIES

Idabel Public Works Authority
ATTN: Mr. Steve Surratt
201 East Main
Idabel, OK 74745

This report contains the analytical results and supporting information for samples submitted on September 30, 2016. Attached please find a copy of the Chain of Custody and/or other documents received. Note that any remaining sample will be discarded two weeks from the original report date unless other arrangements are made.

This report is intended for the sole use of the client listed above. Assessment of the data requires access to the entire document.

This report has been reviewed by the Chief Operating Officer or a qualified designee.

John Overbey
Chief Operating Officer

This document has been distributed to the following:

PDF cc: Idabel Public Works Authority
ATTN: Mr. Steve Surratt
ipwadirector@yahoo.com

Idabel Public Works Authority
ATTN: Mr. Mitchell Bruner
mitchellbruner1987@yahoo.com

Idabel Public Works Authority
ATTN: Mr. Brandon Gragg
brandongragg_2008@yahoo.com

AMERICAN INTERPLEX CORPORATION
LABORATORIES

Idabel Public Works Authority
201 East Main
Idabel, OK 74745

SAMPLE INFORMATION

Project Description:
Three (3) water sample(s) received on September 30, 2016
Clean Metals-Oklahoma
P.O. No. 247

Receipt Details:
A Chain of Custody was provided. The samples were delivered in one (1) ice chest.
Ice chest #1 was delivered with shipping documentation.

Each sample container was checked for proper labeling, including date and time sampled. Sample containers were reviewed for proper type, adequate volume, integrity, temperature, preservation, and holding times. Any exceptions are noted below:

Sample Identification:

Laboratory ID	Client Sample ID	Sampled Date/Time	Notes
205999-1	NH3	27-Sep-2016 1500	
205999-2	NH3	28-Sep-2016 1500	
205999-3	BOD5 TSS, NH3	29-Sep-2016 1500	

Case Narrative:
There were no qualifiers for this data and all samples met quality control criteria.

References:
"Methods for Chemical Analysis of Water and Wastes", EPA/600/4-79-020 (Mar 1983) with updates and supplements EPA/600/5-91-010 (Jun 1991), EPA/600/R-92-129 (Aug 1992) and EPA/600/R-93-100 (Aug 1993).
"Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846)", Third Edition.
"Standard Methods for the Examination of Water and Wastewaters", (SM).
"American Society for Testing and Materials" (ASTM).
"Association of Analytical Chemists" (AOAC).

AMERICAN INTERPLEX CORPORATION
LABORATORIES

Idabel Public Works Authority
201 East Main
Idabel, OK 74745

ANALYTICAL RESULTS

AIC No. 205999-1
Sample Identification: NH3 27-Sep-2016 1500

Analyte		Result	RL	Units	Qualifier
Ammonia as N		**0.63**	0.1	**mg/l**	
SM 4500-NH3 G 1997	Prep: 03-Oct-2016 1325 by 321	Analyzed: 03-Oct-2016 1622 by 321		Batch: W57374	

AIC No. 205999-2
Sample Identification: NH3 28-Sep-2016 1500

Analyte		Result	RL	Units	Qualifier
Ammonia as N		**0.64**	0.1	**mg/l**	
SM 4500-NH3 G 1997	Prep: 03-Oct-2016 1325 by 321	Analyzed: 03-Oct-2016 1624 by 321		Batch: W57374	

AIC No. 205999-3
Sample Identification: BOD5 TSS, NH3 29-Sep-2016 1500

Analyte		Result	RL	Units	Qualifier
Ammonia as N		**0.58**	0.1	**mg/l**	
SM 4500-NH3 G 1997	Prep: 03-Oct-2016 1325 by 321	Analyzed: 03-Oct-2016 1625 by 321		Batch: W57374	
BOD 5-day		**< 2**	2	**mg/l**	
SM 5210 B 2001	Prep: 30-Sep-2016 1049 by 271	Analyzed: 05-Oct-2016 0915 by 271		Batch: W57346	
Total Suspended Solids		**6.0**	4	**mg/l**	
USGS 3765	Prep: 30-Sep-2016 1453 by 100	Analyzed: 03-Oct-2016 1006 by 100		Batch: W57353	

AMERICAN INTERPLEX CORPORATION
LABORATORIES

Idabel Public Works Authority
201 East Main
Idabel, OK 74745

DUPLICATE RESULTS

Analyte		AIC No.	Result	RPD	RPD Limit	Preparation Date	Analysis Date	Dil	Qual
BOD 5-day		205999-3	< 2 mg/l			30Sep16 1049 by 271	05Oct16 0915 by 271		
	Batch: W57346	Duplicate	< 2 mg/l	0.00	20.0	30Sep16 1049 by 271	05Oct16 0917 by 271		
Total Suspended Solids		205990-1	28 mg/l			30Sep16 1453 by 100	03Oct16 1006 by 100		
	Batch: W57353	Duplicate	28 mg/l	0.00	20.0	30Sep16 1454 by 100	03Oct16 1006 by 100		
Total Suspended Solids		205985-3	4400 mg/l			30Sep16 1453 by 100	03Oct16 1006 by 100		
	Batch: W57353	Duplicate	4400 mg/l	0.454	20.0	30Sep16 1454 by 100	03Oct16 1006 by 100		

LABORATORY CONTROL SAMPLE RESULTS

Analyte	Spike Amount	%	Limits	RPD	Limit	Batch	Preparation Date	Analysis Date	Dil	Qual
Ammonia as N	1 mg/l	111	80.0-120			W57374	03Oct16 1326 by 321	03Oct16 1602 by 321		
BOD 5-day	200 mg/l	102	84.5-115			W57346	30Sep16 1049 by 271	05Oct16 0854 by 271		

MATRIX SPIKE SAMPLE RESULTS

Analyte	Sample	Spike Amount	%	Limits	Batch	Preparation Date	Analysis Date	Dil	Qual
Ammonia as N	205978-1	1 mg/l	97.9	80.0-120	W57374	03Oct16 1326 by 321	03Oct16 1605 by 321		
	205978-1	1 mg/l	101	80.0-120	W57374	03Oct16 1326 by 321	03Oct16 1607 by 321		
	Relative Percent Difference:		2.57	25.0	W57374				

LABORATORY BLANK RESULTS

Analyte	Result	RL	PQL	QC Sample	Preparation Date	Analysis Date	Qual
Ammonia as N	< 0.1 mg/l	0.1	0.1	W57374-1	03Oct16 1326 by 321	03Oct16 1600 by 321	
BOD 5-day	< 2 mg/l	2	2	W57346-1	30Sep16 1049 by 271	05Oct16 0853 by 271	
Total Suspended Solids	< 4 mg/l	4	4	W57353-1	30Sep16 1454 by 100	03Oct16 1006 by 100	

City of Idabel – Clean Sampling

201 East Main
Idabel, OK 74745
Phone (580) 286-5631 Fax (580) 286-3897

Chain of Custody

Ship Samples To:

American Interplex Laboratories
8600 Kanis Road
Little Rock, AR 72204-2322
(501) 224-5060 Fax (501) 224-5072

205999

Client/Billing Information		SPECIAL INSTRUCTIONS/PRECAUTIONS:
Client:	Steve Surratt	
Company:	City of Idabel	
Address:	201 East Main	
	Idabel, OK 74745	Project Name / Number: Clean Metals - Oklahoma
Phone No.:	(580) 286-5631	
Fax No.:	(580) 286-3897	

	Sample ID	Outfall Flow (MGD)	Date	Time	Matrix S=Sed/Soil W=Water	Number of Containers	Composite or Grab	TSS	NH3	TDS, Sulfate, Chloride	BOD'5
1	NH3		9-27-16	1000-1500	W	1	Comp		X		
2	NH3		9-28-16	1000-1500	W	1	Comp		X		
3	NH3		9-29-16	1000-1500	W	1	Comp		X		
3	BOD5 TSS		9-29-16	1000-1500	W	1	Comp	X			X
Preservative	(Sulfuric acid =S, Nitric acid =N, NaOH =B, Ice =I)							I	I, S	I	I

Parameters for Analysis/Methods

Sampler(s): Mitchell B Cody S

Shipment Method: FED EX

Turnaround Time Required: **Normal**

COC Completed by: M. Cody Date: 9-29-16 Time: 1422

COC Checked by: _____ Date: _____ Time: _____

Relinquished by: M. Cody Date: 9-29-16 Time: 1414

Received by: _____ Date: _____ Time: _____

Relinquished by: _____ Date: _____ Time: _____

Received in lab by: B-Brown Date: 9-30-16 Time: 0730

LABORATORY USE ONLY: Samples Received On Ice? : (YES) or NO Sample Temperature: 0.4°C

FED EX : 8102 5796 8866

V1.2 08/04/16