

February 23, 2021

Tony Brown  
City of Siloam Springs  
975 Anderson Avenue  
Siloam Springs, AR 72761

RE: Project: 4TH QTR WET  
Pace Project No.: 60360977

Dear Tony Brown:

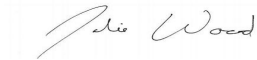
Enclosed are the analytical results for sample(s) received by the laboratory between February 09, 2021 and February 16, 2021. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Kansas City
- Pace Analytical Services - SE Kansas

If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Nolie Wood  
nolie.wood@pacelabs.com  
1(913)563-1401  
Project Manager

Enclosures



## REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full,  
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## CERTIFICATIONS

Project: 4TH QTR WET

Pace Project No.: 60360977

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### **Pace Analytical Services Kansas**

9608 Loiret Boulevard, Lenexa, KS 66219

Missouri Inorganic Drinking Water Certification #: 10090

Arkansas Drinking Water

Arkansas Certification #: 20-020-0

Arkansas Drinking Water

Illinois Certification #: 200030

Iowa Certification #: 118

Kansas/NELAP Certification #: E-10116

Louisiana Certification #: 03055

Nevada Certification #: KS000212020-2

Oklahoma Certification #: 9205/9935

Florida: Cert E871149 SEKS WET

Texas Certification #: T104704407-19-12

Utah Certification #: KS000212019-9

Illinois Certification #: 004592

Kansas Field Laboratory Accreditation: # E-92587

Missouri SEKS Micro Certification: 10070

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### **Pace Analytical Services Southeast Kansas**

808 West McKay, Frontenac, KS 66763

Arkansas Certification #: 18-016-0

Iowa Certification #: 118

Kansas/NELAP Certification #: E-10426

Louisiana Certification #: 03055

Oklahoma Certification #: 9935

Texas Certification #: T104704407

Utah Certification #: KS00021

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## REPORT OF LABORATORY ANALYSIS

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## SAMPLE SUMMARY

Project: 4TH QTR WET

Pace Project No.: 60360977

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60360977001	WASTEWATER PLANT	Water	02/08/21 09:00	02/09/21 08:00
60360977002	METALS	Water	02/10/21 09:00	02/16/21 18:50

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### SAMPLE ANALYTE COUNT

Project: 4TH QTR WET

Pace Project No.: 60360977

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60360977001	WASTEWATER PLANT	EPA 821/R-02/013	MEB	1	PASI-SE
60360977002	METALS	EPA 200.8	JGP	12	PASI-K

PASI-K = Pace Analytical Services - Kansas City

PASI-SE = Pace Analytical Services - SE Kansas

### REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS

Project: 4TH QTR WET

Pace Project No.: 60360977

Sample: <b>WASTEWATER PLANT</b>	Lab ID: <b>60360977001</b>	Collected: 02/08/21 09:00	Received: 02/09/21 08:00	Matrix: Water				
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
<b>Chronic Toxicity</b>								
Analytical Method: EPA 821/R-02/013								
Pace Analytical Services - SE Kansas								
Toxicity, Chronic	<b>Complete</b>		1.0	1		02/09/21 11:00		

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## ANALYTICAL RESULTS

Project: 4TH QTR WET

Pace Project No.: 60360977

<b>Sample: METALS</b>		<b>Lab ID: 60360977002</b>	Collected: 02/10/21 09:00	Received: 02/16/21 18:50	Matrix: Water			
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
<b>200.8 MET ICPMS</b>		Analytical Method: EPA 200.8 Preparation Method: EPA 200.8 Pace Analytical Services - Kansas City						
Antimony	ND	ug/L	1.0	1	02/18/21 09:16	02/19/21 13:42	7440-36-0	
Arsenic	ND	ug/L	1.0	1	02/18/21 09:16	02/19/21 13:42	7440-38-2	
Beryllium	ND	ug/L	0.50	1	02/18/21 09:16	02/22/21 14:17	7440-41-7	
Cadmium	ND	ug/L	0.50	1	02/18/21 09:16	02/19/21 13:42	7440-43-9	
Chromium	ND	ug/L	1.0	1	02/18/21 09:16	02/19/21 13:42	7440-47-3	
Copper	<b>2.2</b>	ug/L	1.0	1	02/18/21 09:16	02/19/21 13:42	7440-50-8	
Lead	ND	ug/L	1.0	1	02/18/21 09:16	02/19/21 13:42	7439-92-1	
Nickel	<b>3.6</b>	ug/L	1.0	1	02/18/21 09:16	02/19/21 13:42	7440-02-0	
Selenium	ND	ug/L	1.0	1	02/18/21 09:16	02/19/21 13:42	7782-49-2	
Silver	ND	ug/L	0.50	1	02/18/21 09:16	02/19/21 13:42	7440-22-4	
Thallium	ND	ug/L	1.0	1	02/18/21 09:16	02/19/21 13:42	7440-28-0	
Zinc	<b>51.2</b>	ug/L	10.0	1	02/18/21 09:16	02/19/21 13:42	7440-66-6	

## REPORT OF LABORATORY ANALYSIS

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### QUALITY CONTROL DATA

Project: 4TH QTR WET  
Pace Project No.: 60360977

QC Batch: 704767	Analysis Method: EPA 200.8
QC Batch Method: EPA 200.8	Analysis Description: 200.8 MET
	Laboratory: Pace Analytical Services - Kansas City

Associated Lab Samples: 60360977002

METHOD BLANK: 2838941 Matrix: Water  
Associated Lab Samples: 60360977002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Antimony	ug/L	ND	1.0	02/19/21 13:34	
Arsenic	ug/L	ND	1.0	02/19/21 13:34	
Beryllium	ug/L	ND	0.50	02/22/21 14:09	
Cadmium	ug/L	ND	0.50	02/19/21 13:34	
Chromium	ug/L	ND	1.0	02/19/21 13:34	
Copper	ug/L	ND	1.0	02/19/21 13:34	
Lead	ug/L	ND	1.0	02/19/21 13:34	
Nickel	ug/L	ND	1.0	02/19/21 13:34	
Selenium	ug/L	ND	1.0	02/19/21 13:34	
Silver	ug/L	ND	0.50	02/19/21 13:34	
Thallium	ug/L	ND	1.0	02/19/21 13:34	
Zinc	ug/L	ND	10.0	02/19/21 13:34	

LABORATORY CONTROL SAMPLE: 2838942

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Antimony	ug/L	40	38.3	96	85-115	
Arsenic	ug/L	40	40.9	102	85-115	
Beryllium	ug/L	40	39.5	99	85-115	
Cadmium	ug/L	40	40.1	100	85-115	
Chromium	ug/L	40	39.0	98	85-115	
Copper	ug/L	40	40.1	100	85-115	
Lead	ug/L	40	39.1	98	85-115	
Nickel	ug/L	40	39.6	99	85-115	
Selenium	ug/L	40	40.9	102	85-115	
Silver	ug/L	20	18.4	92	85-115	
Thallium	ug/L	40	37.9	95	85-115	
Zinc	ug/L	100	97.5	97	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2838943 2838944

Parameter	Units	60360977002		2838944		MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
		MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result						
Antimony	ug/L	ND	40	37.7	38.4	94	95	70-130	2	20	
Arsenic	ug/L	ND	40	41.2	42.0	102	105	70-130	2	20	
Beryllium	ug/L	ND	40	38.0	38.5	95	96	70-130	1	20	
Cadmium	ug/L	ND	40	38.1	39.0	95	97	70-130	2	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

### REPORT OF LABORATORY ANALYSIS

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### QUALITY CONTROL DATA

Project: 4TH QTR WET

Pace Project No.: 60360977

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2838943												2838944	
Parameter	Units	60360977002 Result	MS	MSD	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max	Qual	
			Spike Conc.	Spike Conc.							RPD		
Chromium	ug/L	ND	40	40	36.6	37.4	91	93	70-130	2	20		
Copper	ug/L	2.2	40	40	40.6	41.2	96	97	70-130	2	20		
Lead	ug/L	ND	40	40	40.1	40.9	99	101	70-130	2	20		
Nickel	ug/L	3.6	40	40	41.9	42.5	96	97	70-130	1	20		
Selenium	ug/L	ND	40	40	38.3	39.3	95	97	70-130	3	20		
Silver	ug/L	ND	20	20	17.5	19.6	86	97	70-130	12	20		
Thallium	ug/L	ND	40	40	37.9	39.0	95	97	70-130	3	20		
Zinc	ug/L	51.2	100	100	142	145	91	93	70-130	2	20		

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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## QUALIFIERS

Project: 4TH QTR WET

Pace Project No.: 60360977

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### DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

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**QUALITY CONTROL DATA CROSS REFERENCE TABLE**

Project: 4TH QTR WET  
Pace Project No.: 60360977

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60360977001	WASTEWATER PLANT	EPA 821/R-02/013	704855		
60360977002	METALS	EPA 200.8	704767	EPA 200.8	704851

**REPORT OF LABORATORY ANALYSIS**

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Sample Condition Upon Receipt

WO#: 60360977



Client Name: Siloam springs

Courier: FedEx  UPS  VIA  Clay  PEX  ECI  Pace  Xroads  Client  Other

Tracking #: \_\_\_\_\_ Pace Shipping Label Used? Yes  No

Custody Seal on Cooler/Box Present: Yes  No  Seals intact: Yes  No

Packing Material: Bubble Wrap  Bubble Bags  Foam  None  Other

Thermometer Used: T-298 Type of Ice: Wet Blue None

Cooler Temperature (°C): As-read 2-3 Corr. Factor -0.2 Corrected 2.1

Date and initials of person examining contents:

P 2/16/21

Temperature should be above freezing to 6°C

Chain of Custody present:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Chain of Custody relinquished:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Samples arrived within holding time:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Short Hold Time analyses (<72hr):	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	
Rush Turn Around Time requested:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	
Sufficient volume:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Correct containers used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Pace containers used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Containers intact:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Unpreserved 5035A / TX1005/1006 soils frozen in 48hrs?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Filtered volume received for dissolved tests?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Sample labels match COC: Date / time / ID / analyses	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Samples contain multiple phases? Matrix: <u>WT</u>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	
Containers requiring pH preservation in compliance? (HNO <sub>3</sub> , H <sub>2</sub> SO <sub>4</sub> , HCl<2; NaOH>9 Sulfide, NaOH>10 Cyanide) (Exceptions: VOA, Micro, O&G, KS TPH, OK-DRO)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	List sample IDs, volumes, lot #'s of preservative and the date/time added.
Cyanide water sample checks:		
Lead acetate strip turns dark? (Record only)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Potassium iodide test strip turns blue/purple? (Preserve)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Trip Blank present:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Headspace in VOA vials (>6mm):	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Samples from USDA Regulated Area: State:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Additional labels attached to 5035A / TX1005 vials in the field?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Comments/ Resolution: \_\_\_\_\_

Project Manager Review: \_\_\_\_\_ Date: \_\_\_\_\_

# CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

### Section A Required Client Information:

Company: City of Siloam Springs  
 Address: 975 Anderson Avenue  
 Siloam Springs, AR  
 Email To: abrown@siloomsprings.com  
 Phone: 479-228-2000 Fax:  
 Requested Due Date/TAT:

### Section B Required Project Information:

Report To: Tony Brown  
 Copy To: abrown@siloomsprings.com  
 Purchase Order No.:  
 Project Name: 4th QTR WET  
 Project Number:

### Section C Invoice Information:

Company Name:  
 Address:  
 Pace Quote Reference:  
 Pace Project Manager: Nollie Wood  
 Pace Profile #: 10809

REGULATORY AGENCY  
 NPDES  GROUND WATER  DRINKING WATER  
 UST  RCRA  OTHER  
 Site Location: AR  
 STATE: AR

ITEM #	Valid Matrix Codes MATRIX CODE DRINKING WATER DW WASTE WATER WW PRODUCT P SOIL/SOLID SL OIL OL VPE VP AR AR OTHER OT TISSUE TS	Matrix Code	COLLECTED		SAMPLE TYPE (G=GRAB C=COMP)	MATRIX CODE (see valid codes to left)	# OF CONTAINERS	Preservatives Unpreserved H <sub>2</sub> SO <sub>4</sub> HNO <sub>3</sub> HCl NaOH Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> Methanol Other	Analysis Test ↑ Analysis Test ↑	Requested Analysis Filtered (Y/N)	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
			DATE	TIME								
1		WW	2/7/21	10:00	C	WW	1				60360977	
2			2/10/21	9:00				Chronic WET Test			BPSN	
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS
Samples have a 24 hour hold time! return samples to the Frontenac Lab on ice!	Tony Brown Fair Hensell	2/8/21		Tony Brown Pace	2/10/21	9:00	Y Y Y Y
					2/16/21	18:50	Y Y Y Y

Temp In °C  
 Received on  
 Ica (Y/N)  
 Custody Sealed  
 Cooler (Y/N)  
 Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE  
 PRINT Name of SAMPLER: Tony Brown  
 SIGNATURE of SAMPLER: Tony Brown  
 DATE Signed (MM/DD/YYYY): 2/8/21

REFERENCE #60360977

**CHRONIC TOXICITY TEST FOR  
City of Siloam Springs**

PERMIT # AR0020273  
AFIN # 04-00106

PERFORMED ON:

Pimephales promelas

and

Ceriodaphnia dubia

PREPARED FOR:

City of Siloam Springs  
Attn: Tony Brown  
975 Anderson Avenue  
Siloam Springs, AR  
1-479-228-0934

PREPARED BY:  
Pace Analytical Services, Inc.  
808 West McKay  
Frontenac, KS 66763  
1-620-235-0003

February 18, 2021

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## SUMMARY

A Chronic Whole Effluent Toxicity Test using the 7-day chronic fathead minnows (Pimephales promelas), static renewal larval survival and growth test, and three brood 7-day chronic Cladoceran (Ceriodaphnia dubia), static renewal survival and reproduction test, was conducted on effluent discharge water collected at the City of Siloam Springs effluent discharge from February 8, 2021 to February 12, 2021. All the test methods followed are as listed in EPA 821-R-02-013, "Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms."

Statistically significant ( $p < 0.05$ ) mortality is determined by Dunnet's procedure using average percent survival of each test concentration versus the average survival of the controls. If significant mortality occurs, median lethal concentrations are calculated using effluent concentrations and their corresponding percent mortality data. The 95% confidence intervals are calculated where appropriate by the Spearman-Kärber method. Statistical analysis is accomplished by following steps in EPA 821-R-02-013, February 2002 and by use of Toxstat version 3.4.

In minnow section of testing, it was observed that the effluent had no significant effect on the survival of the larvae at the 100% concentration. No significant mortality was observed in the other effluent concentrations after the 7-day exposure period. The No Observed Effect Concentration (NOEC) was determined to be 100% for survival. No significant reduction in growth was observed in the 100% effluent concentration. The Toxic Units is  $< 1$ . The IC<sub>25</sub> is  $> 100$ . The NOEC for growth in effluent was determined to be 100%. The PMSD was 14.1.

In Cladoceran section of testing, it was observed that the effluent had significant effect on the survival of the organisms in the 42, 56, 75, and 100% effluent concentration. No significant mortality was observed in the other effluent concentrations after the 7-day exposure period. The No Observed Effect Concentration (NOEC) was determined to be 32% for survival. Significant reduction in reproduction was observed in the 32, 42, 56, 75, and 100% effluent concentrations. The Toxic Units is 3.11. The IC<sub>25</sub> is 32.17. The NOEC for reproduction in effluent was determined to be  $< 32\%$ . The PMSD was 16.5.

The chronic toxicity exhibited by the fathead minnows and the Ceriodaphnia treated by the effluent sampled from February 8 to February 12 from the City of Siloam Springs effluent discharge, is not acceptable as described in EPA 821-R-02-013.

## INTRODUCTION

Pace Analytical was contracted to perform this chronic toxicity test on effluent from the City of Siloam Springs effluent discharge. Chronic toxicity was measured using the Pimephales promelas at larval for survival and growth test and the Ceriodaphnia dubia survival and reproduction test described in EPA 821-R-02-013, "Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms." The raw data of the study is stored at Pace Analytical Services, INC. 808 West McKay, Frontenac, KS 66763.

## TEST MATERIAL

City of Siloam Springs personnel collected sampling of the effluent. A sample of the effluent was delivered to Pace by commercial carrier on 2-09-21. Subsequent samples followed by delivery on 2-11-21, and on 2-13-21. All samples were stored at  $\leq 6^{\circ}$  Celsius. Moderately Hard Synthetic Water was used as a control and also to make the required dilutions in the test as described in EPA 821-R-02-013.

## TEST METHODS

Pace used EPA test method 1000.0 for conducting the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test. EPA test method 1002.0 was used for conducting the Cladoceran, Ceriodaphnia dubia, Survival and Reproduction Test. The tests were conducted to estimate the NOEC, and LOEC for survival, growth, and reproduction of these test species.

The Pimephales and Ceriodaphnia tests were initiated on 2-09-21 and carried out until 2-16-21. The Pimephales tests were conducted in 500 ml plastic jars with 250 ml of test solution. Eight larvae were placed in each of at least 5 replicates to make a total of 40 larvae per sample concentration. The Ceriodaphnia tests were carried out in 35ml vials containing 25 ml of test solution. One Neonate was placed in each of 10 replicates to make a total of 10 neonates per sample concentration.

## TEST ORGANISMS

The organisms used in these tests were cultured at Pace under controlled temperature and photoperiod conditions and/or were purchased from an external supplier. Pace maintains records of all culture techniques used in producing organisms.



REFERENCE #60360977

TABLE 1

Permittee: City of Siloam Springs Effluent discharge.

Date Sampled	No. 1: 2-8-21	9:00
	No. 2: 2-10-21	9:00
	No. 3: 2-12-21	9:00
Test Initiated: 11:00	Date: 2-9-21	
Test End: 11:30	Date: 2-16-21	

RESULTS

Ceriodaphnia dubia	Results
TLP3B	1
TGP3B	1
TOP3B	42
TPP3B	<32
TQP3B	SYN 13.02 CD N/A
Pimephales promelas	Results
TLP6C	0
TGP6C	0
TOP6C	100
TPP6C	100
TQP6C	9.66

Dilution Water used: Moderately Hard Synthetic Water

**FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL**  
**(*Pimephales promelas*)**

DATA TABLE FOR GROWTH OF FATHEAD MINNOWS

Effluent Concentration (%)	Average Dry Weight in Milligrams in Replicate Chambers					Mean Dry Weight (mg)	CV% *
	A	B	C	D	E		
Control 0%	0.327	0.386	0.429	0.392	0.401	0.387	9.66
Dilution 1 32%	0.337	0.396	0.448	0.405	0.401	0.397	9.97
Dilution 2 42%	0.384	0.410	0.372	0.311	0.374	0.370	9.83
Dilution 3 56%	0.400	0.429	0.373	0.315	0.402	0.384	11.27
Dilution 4 75%	0.413	0.357	0.413	0.366	0.398	0.389	6.78
Dilution 5 100%	0.351	0.406	0.362	0.365	0.432	0.383	8.96

\* Coefficient of Variation = Standard Deviation X 100 / Mean

**FATHEAD MINNOW SURVIVAL**

Conc. %	Percent Survival in Replicate Chambers					Mean Percent Survival			CV %
	A	B	C	D	E	24hr	48hr	7 day	
Control 0%	100	100	87.5	100	100	100	100	97.5	4.79
Dilution 1 32%	100	100	100	100	100	100	100	100	0.00
Dilution 2 42%	100	100	100	87.5	100	100	100	97.5	4.79
Dilution 3 56%	100	100	100	87.5	100	100	100	97.5	4.79
Dilution 4 75%	100	100	100	100	100	100	100	100	0.00
Dilution 5 100%	87.5	100	100	100	100	100	100	97.5	4.79

REFERENCE #60360977

Permittee: City of Siloam Springs Effluent discharge.

**CERIODAPHNIA SURVIVAL AND REPRODUCTION**

DATA TABLE FOR CERIODAPHNIA YOUNG PRODUCTION

Replicate	Control 0%	Dilution 1 32%	Dilution 2 42%	Dilution 3 56%	Dilution 4 75%	Dilution 5 100%
1	15	13	16	0	0	0
2	17	17	11	0	0	0
3	18	9	13	0	0	0
4	14	12	0	0	0	0
5	21	20	11	0	0	0
6	19	9	4	0	0	0
7	19	14	0	0	0	0
8	16	13	9	0	0	0
9	20	15	12	0	0	0
10	20	13	14	0	0	0
Mean	17.9	13.5	9.0	0.0	0.0	0.0
SD	2.331	3.342	5.715	0.0	0.0	0.0
CV %	13.02	24.75	63.51	N/A	N/A	N/A

**CERIODAPHNIA MEAN PERCENT SURVIVAL**

Time Elapsed	Percent Effluent (%)					
	Control 0%	Dilution 1 32%	Dilution 2 42%	Dilution 3 56%	Dilution 4 75%	Dilution 5 100%
24 hrs	100	100	100	100	100	100
48 hrs	100	100	100	100	100	100
7-day	100	100	80	0	0	0
SD	0.000	0.000	0.422	0.0	0.0	0.0
CV %	0.00	0.00	52.70	N/A	N/A	N/A

**TABLE 2**  
**SUMMARY OF TEST CONDITIONS FOR THE FATHEAD MINNOW**  
**(*Pimephales promelas*) LARVAL SURVIVAL AND GROWTH TEST**

1. Test type	Static renewal
2. Temperature	25 degrees Celsius
3. Light quality	Ambient laboratory light
4. Light intensity	Ambient laboratory levels
5. Photoperiod	16 hr light, 8 hr dark
6. Test chamber size	500 ml
7. Test solution volume	250 ml
8. Renewal of test concentrations	Daily
9. Age of test organism	< 24 hours
10. No. larvae/chamber	8
11. No. replicates/concentration	5
12. No. larvae/concentration	40
13. Feeding regime	Feed 0.15 g newly hatched brine shrimp nauplii two times daily. Larvae are not fed 12 hours prior to termination of test.
14. Cleaning	Siphon daily, immediately before test solution renewal
15. Aeration	None
16. Dilution Water	Moderately Hard Synthetic Water prepared with MILLI-Q deionized water and reagent grade chemicals
17. Effluent concentrations	0%, 32%, 42%, 56%, 75%, 100%
18. Test duration	7 days
19. Endpoints	Survival and growth
20. Test acceptability	80% or greater survival in the controls, Average dry weight in controls >0.25 mg, Coefficient of variation in the control must not exceed 40%.

**TABLE 2 (CONT.)  
SUMMARY OF TEST CONDITIONS FOR THE CLADOCERAN  
(Ceriodaphnia dubia) SURVIVAL AND REPRODUCTION TEST**

1. Test type	Static renewal
2. Temperature	25 degrees Celsius
3. Light quality	Ambient laboratory light
4. Light intensity	Ambient laboratory levels
5. Photoperiod	16 hr light, 8 hr dark
6. Test chamber size	30 ml
7. Test solution volume	25 ml
8. Renewal of test concentrations	Daily
9. Age of test organism	< 24 hours
10. No. larvae/chamber	1
11. No. replicates/concentration	10
12. No. larvae/concentration	10
13. Feeding regime	Feed 0.1 ml YCT and 0.1 ml of Algae daily. Larvae are not fed 12 hours prior to termination of test.
14. Cleaning	Siphon daily, immediately before test solution renewal
15. Aeration	None
16. Dilution Water	Moderately Hard Synthetic Water prepared with MILLI-Q deionized water and reagent grade chemicals
17. Effluent concentrations	0%, 32%, 42%, 56%, 75%, 100%
18. Test duration	Until 60% or more surviving control females have three broods or a maximum of 8 days.
19. Endpoints	Survival and Reproduction
20. Test acceptability	80% or greater survival in the controls, Average reproduction rate of 15 young / adult. Coefficient of variation in the control must not exceed 40%.

**BIOMONITORING CHRONIC TOXICITY REPORT  
FATHEAD MINNOW (Pimephales promelas)  
CHEMICAL PARAMETERS CHART**

Permittee: City of Siloam Springs Effluent discharge.

ANALYSTS: Pace Analytical Services, Inc.  
Timothy Harrell  
Mike Bollin

**TABLE 2 (SECTION 2)  
INITIAL WATER QUALITY  
EFFLUENT CONCENTRATION**

	Control	100%
PH	7.6	7.4
D.O.	8.5	8.3
Temp	25.0	25.0
Alk	64	82
Hard	98	168
Cond	315	727
Chlorine	<0.1	<0.1

- \* D.O. is reported as mg/L
- Alkalinity is reported as mg/L CaCO<sub>3</sub>
- Hardness is reported as mg/L CaCO<sub>3</sub>
- Conductance is reported as umhos
- Ammonia is reported as mg/L
- Chlorine is reported as mg/L

REFERENCE #60360977

TEST WATER QUALITY

24-Hour Water Quality Measurements

Effluent Concentration (%)	PH	D.O. (mg/l)	Temperature (C)
0% Control	7.6	6.9	24.9
32% Effluent	7.6	6.9	24.7
42% Effluent	7.6	6.9	24.7
56% Effluent	7.6	6.9	24.7
75% Effluent	7.6	6.9	24.7
100% Effluent	7.6	6.9	24.7

48-Hour Water Quality Measurements

Effluent Concentration (%)	PH	D.O. (mg/l)	Temperature (C)
0% Control	7.6	6.9	24.5
32% Effluent	7.6	6.9	24.7
42% Effluent	7.6	6.9	24.7
56% Effluent	7.6	6.8	24.7
75% Effluent	7.6	6.8	24.7
100% Effluent	7.6	6.8	24.7

REFERENCE #60360977

FINAL WATER QUALITY

EFFLUENT CONCENTRATION

	Control	100%
pH	7.6	8.0
D.O.	7.1	6.9
Temp	24.7	25.3
Alk	62	80
Hard	94	170
Cond	374	829

- \* D.O. is reported as mg/L
- Alkalinity is reported as mg/L CaCO<sub>3</sub>
- Hardness is reported as mg/L CaCO<sub>3</sub>
- Conductance is reported as umhos

TEST VALIDITY

The Pimephales promelas control survival rate was 97.5. The mean dry weight (growth) of the Pimephales promelas was determined at 0.387 mg/organism in the controls. The percent coefficient of variation (%CV) values for the fathead minnow control for survival and growth were 4.79 and 17.13. The Ceriodaphnia dubia survival rates were 100 in the control. The Ceriodaphnia in the control produced an average of 17.9 young over the seven-day exposure period. Percent CV values for Ceriodaphnia dubia control survival and reproduction was 0.00 and 13.02. Control data met or exceeded all criteria set out by EPA 8100-R-02-013 for test acceptance.



**REFERENCE TOXICANTS**

The absence of significant control mortality during this test indicated the health of the organisms and indicated that any significant mortality in the test concentrations was not due to contaminants or variations in testing conditions.

Reference toxicity testing is routinely performed by staff members in our biomonitoring - bioassay laboratory.

Start: 2/9/21 11:00                      End: 2/16/21 10:30

Reference Toxicant (NaCl)                      Pimephales promelas

Concentration of Toxicant	Avg. # of Live Organisms/replicate			
	0 hrs	24 hrs	48 hrs	7 days
10 g/l	40	4	0	0
8 g/l	40	33	11	4
6 g/l	40	40	36	24
4 g/l	40	40	40	39
2 g/l	40	40	40	40

IC25 (5.00 g/l Sodium Chloride)

Survival NOEC: 4.0 g/l

Reference Toxicant (NaCl)                      Ceriodaphnia Dubia

Concentration of Toxicant	Avg. # of Live Organisms/replicate			
	0 hrs	24 hrs	48 hrs	7 days
2.5 g/l	10	8	3	0
2.0 g/l	10	10	10	2
1.5 g/l	10	10	10	10
1.0 g/l	10	10	10	10
0.5 g/l	10	10	10	10

IC25 (1.14 g/l Sodium Chloride)

Survival NOEC: 1.5 g/l

Submitted By: \_\_\_\_\_  
 Timothy Harrell, Technical Director

60360977 Siloam Springs FATHEAD SURVIVAL  
File: 6360977A Transform: ARC SINE(SQUARE ROOT(Y))

Chi-square test for normality: actual and expected frequencies

---

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	2.010	7.260	11.460	7.260	2.010
OBSERVED	4	0	26	0	0

---

Calculated Chi-Square goodness of fit test statistic = 36.9480  
Table Chi-Square value (alpha = 0.01) = 13.277

Data FAIL normality test. Try another transformation.

Warning - The first three homogeneity tests are sensitive to non-normal data and should not be performed.

60360977 Siloam Springs FATHEAD SURVIVAL  
File: 6360977A Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

---

D = 0.043

W = 0.596

Critical W (P = 0.05) (n = 30) = 0.927

Critical W (P = 0.01) (n = 30) = 0.900

---

Data FAIL normality test. Try another transformation.

Warning - The first three homogeneity tests are sensitive to non-normal data and should not be performed.

60360977 Siloam Springs FATHEAD SURVIVAL

File: 6360977A Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

---

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	5	0.991	1.107	1.084
2	32%	5	1.107	1.107	1.107
3	42%	5	0.991	1.107	1.084
4	56%	5	0.991	1.107	1.084
5	75%	5	1.107	1.107	1.107
6	100%	5	0.991	1.107	1.084

---

60360977 Siloam Springs FATHEAD SURVIVAL

File: 6360977A Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

---

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	0.003	0.052	0.023	4.79
2	32%	0.000	0.000	0.000	0.00
3	42%	0.003	0.052	0.023	4.79
4	56%	0.003	0.052	0.023	4.79
5	75%	0.000	0.000	0.000	0.00
6	100%	0.003	0.052	0.023	4.79

---

60360977 Siloam Springs FATHEAD SURVIVAL

File: 6360977A Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

---

SOURCE	DF	SS	MS	F
Between	5	0.004	0.001	0.400
Within (Error)	24	0.043	0.002	
Total	29	0.047		

---

Critical F value = 2.62 (0.05,5,24)

Since  $F < \text{Critical } F$  FAIL TO REJECT  $H_0$ : All equal

60360977 Siloam Springs FATHEAD SURVIVAL

File: 6360977A Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 1 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	1.084	0.780		
2	32%	1.107	0.800	-0.866	
3	42%	1.084	0.780	0.000	
4	56%	1.084	0.780	0.000	
5	75%	1.107	0.800	-0.866	
6	100%	1.084	0.780	0.000	

Dunnnett table value = 2.36 (1 Tailed Value, P=0.05, df=24,5)

60360977 Siloam Springs FATHEAD SURVIVAL

File: 6360977A Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 2 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	5			
2	32%	5	0.054	7.0	-0.020
3	42%	5	0.054	7.0	-0.000
4	56%	5	0.054	7.0	-0.000
5	75%	5	0.054	7.0	-0.020
6	100%	5	0.054	7.0	0.000

60360977 Siloam Springs FATHEAD GROWTH  
File: 6360977B Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

---

D = 0.032

W = 0.939

Critical W (P = 0.05) (n = 30) = 0.927

Critical W (P = 0.01) (n = 30) = 0.900

---

Data PASS normality test at P=0.01 level. Continue analysis.

60360977 Siloam Springs FATHEAD GROWTH  
File: 6360977B Transform: NO TRANSFORMATION

---

Bartlett's test for homogeneity of variance

Calculated B1 statistic = 0.94

---

Table Chi-square value = 15.09 (alpha = 0.01, df = 5)

Table Chi-square value = 11.07 (alpha = 0.05, df = 5)

---

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

60360977 Siloam Springs FATHEAD GROWTH  
 File: 6360977B Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	5	0.327	0.429	0.387
2	32%	5	0.337	0.448	0.397
3	42%	5	0.311	0.410	0.370
4	56%	5	0.315	0.429	0.384
5	75%	5	0.357	0.413	0.389
6	100%	5	0.351	0.432	0.383

60360977 Siloam Springs FATHEAD GROWTH  
 File: 6360977B Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	0.001	0.037	0.017	9.66
2	32%	0.002	0.040	0.018	9.97
3	42%	0.001	0.036	0.016	9.83
4	56%	0.002	0.043	0.019	11.27
5	75%	0.001	0.026	0.012	6.78
6	100%	0.001	0.034	0.015	8.96

60360977 Siloam Springs FATHEAD GROWTH  
 File: 6360977B Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.002	0.000	0.299
Within (Error)	24	0.032	0.001	
Total	29	0.034		

Critical F value = 2.62 (0.05,5,24)  
 Since  $F < \text{Critical } F$  FAIL TO REJECT  $H_0$ : All equal

60360977 Siloam Springs FATHEAD GROWTH  
 File: 6360977B Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 1 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	0.387	0.387		
2	32%	0.397	0.397	-0.449	
3	42%	0.370	0.370	0.726	
4	56%	0.384	0.384	0.138	
5	75%	0.389	0.389	-0.104	
6	100%	0.383	0.383	0.164	

Dunnett table value = 2.36 (1 Tailed Value, P=0.05, df=24,5)

60360977 Siloam Springs FATHEAD GROWTH

File: 6360977B Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 2 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	5			
2	32%	5	0.055	14.1	-0.010
3	42%	5	0.055	14.1	0.017
4	56%	5	0.055	14.1	0.003
5	75%	5	0.055	14.1	-0.002
6	100%	5	0.055	14.1	0.004

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
32%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.  
 Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
42%	8	2	10
TOTAL	18	2	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 8.  
 Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
56%	0	10	10



TOTAL 10 10 20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 0.  
 Since b is less than or equal to 6 there is a significant difference  
 between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

NUMBER OF

IDENTIFICATION	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
75%	0	10	10
TOTAL	10	10	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 0.  
 Since b is less than or equal to 6 there is a significant difference  
 between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

NUMBER OF

IDENTIFICATION	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
100%	0	10	10
TOTAL	10	10	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 0.  
 Since b is less than or equal to 6 there is a significant difference  
 between CONTROL and TREATMENT at the 0.05 level.

SUMMARY OF FISHER'S EXACT TESTS

NUMBER NUMBER SIG

GROUP	IDENTIFICATION	EXPOSED	DEAD	(P= .05)
	CONTROL	10	0	
1	32%	10	0	
2	42%	10	2	
3	56%	10	10	*
4	75%	10	10	*
5	100%	10	10	*

60360977 Siloam Springs CERIODAPHNIA DUBIA SURVIVA  
 File: 6360977D Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	10	1.000	1.000	1.000
2	32%	10	1.000	1.000	1.000
3	42%	10	0.000	1.000	0.800
4	56%	10	0.000	0.000	0.000
5	75%	10	0.000	0.000	0.000
6	100%	10	0.000	0.000	0.000

60360977 Siloam Springs CERIODAPHNIA DUBIA SURVIVA  
 File: 6360977D Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	0.000	0.000	0.000	0.00
2	32%	0.000	0.000	0.000	0.00
3	42%	0.178	0.422	0.133	52.70
4	56%	0.000	0.000	0.000	N/A
5	75%	0.000	0.000	0.000	N/A
6	100%	0.000	0.000	0.000	N/A

60360977 Siloam Springs CERIODAPHNIA DUBIA SURVIVA  
 File: 6360977D Transform: NO TRANSFORM

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	13.333	2.667	90.000
Within (Error)	54	1.600	0.030	
Total	59	14.933		

Critical F value = 2.45 (0.05,5,40)  
 Since F > Critical F REJECT Ho: All equal

60360977 Siloam Springs CERIODAPHNIA DUBIA SURVIVA  
 File: 6360977D Transform: NO TRANSFORM

DUNNETT'S TEST - TABLE 1 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	1.000	1.000		
2	32%	1.000	1.000	0.000	
3	42%	0.800	0.800	2.598	*
4	56%	0.000	0.000	12.990	*
5	75%	0.000	0.000	12.990	*
6	100%	0.000	0.000	12.990	*

Dunnett table value = 2.31 (1 Tailed Value, P=0.05, df=40,5)

60360977 Siloam Springs CERIODAPHNIA DUBIA SURVIVA  
 File: 6360977D Transform: NO TRANSFORM

DUNNETT'S TEST - TABLE 2 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	10			
2	32%	10	0.178	17.8	0.000
3	42%	10	0.178	17.8	0.200
4	56%	10	0.178	17.8	1.000
5	75%	10	0.178	17.8	1.000
6	100%	10	0.178	17.8	1.000

60360977 Siloam Springs CERIODAPHNIA DUBIA REPRODU  
File: 6360977E Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

---

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	4.020	14.520	22.920	14.520	4.020
OBSERVED	3	5	43	8	1

---

Calculated Chi-Square goodness of fit test statistic = 29.2889  
Table Chi-Square value (alpha = 0.01) = 13.277

Data FAIL normality test. Try another transformation.

Warning - The first three homogeneity tests are sensitive to non-normal data and should not be performed.

60360977 Siloam Springs CERIODAPHNIA DUBIA REPRODU  
File: 6360977E Transform: NO TRANSFORMATION

Hartley's test for homogeneity of variance  
Bartlett's test for homogeneity of variance

---

These two tests can not be performed because at least one group has zero variance.

Data FAIL to meet homogeneity of variance assumption.  
Additional transformations are useless.

---

60360977 Siloam Springs CERIODAPHNIA DUBIA REPRODU  
 File: 6360977E Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	10	14.000	21.000	17.900
2	32%	10	9.000	20.000	13.500
3	42%	10	0.000	16.000	9.000
4	56%	10	0.000	0.000	0.000
5	75%	10	0.000	0.000	0.000
6	100%	10	0.000	0.000	0.000

60360977 Siloam Springs CERIODAPHNIA DUBIA REPRODU  
 File: 6360977E Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	5.433	2.331	0.737	13.02
2	32%	11.167	3.342	1.057	24.75
3	42%	32.667	5.715	1.807	63.51
4	56%	0.000	0.000	0.000	N/A
5	75%	0.000	0.000	0.000	N/A
6	100%	0.000	0.000	0.000	N/A

60360977 Siloam Springs CERIODAPHNIA DUBIA REPRODU  
 File: 6360977E Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	3116.333	623.267	75.905
Within (Error)	54	443.400	8.211	
Total	59	3559.733		

Critical F value = 2.45 (0.05,5,40)  
 Since  $F > \text{Critical } F$  REJECT  $H_0$ : All equal

60360977 Siloam Springs CERIODAPHNIA DUBIA REPRODU  
 File: 6360977E Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 1 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	17.900	17.900		
2	32%	13.500	13.500	3.433	*
3	42%	9.000	9.000	6.945	*
4	56%	0.000	0.000	13.968	*
5	75%	0.000	0.000	13.968	*
6	100%	0.000	0.000	13.968	*

Dunnett table value = 2.31 (1 Tailed Value, P=0.05, df=40,5)

60360977 Siloam Springs CERIODAPHNIA DUBIA REPRODU  
 File: 6360977E Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 2 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	10			
2	32%	10	2.960	16.5	4.400
3	42%	10	2.960	16.5	8.900
4	56%	10	2.960	16.5	17.900
5	75%	10	2.960	16.5	17.900
6	100%	10	2.960	16.5	17.900

Conc. ID	1	2	3	4	5	6
Conc. Tested	0	32	42	56	75	100
Response 1	15	13	16	0	0	0
Response 2	17	17	11	0	0	0
Response 3	18	9	13	0	0	0
Response 4	14	12	0	0	0	0
Response 5	21	20	11	0	0	0
Response 6	19	9	4	0	0	0
Response 7	19	14	0	0	0	0
Response 8	16	13	9	0	0	0
Response 9	20	15	12	0	0	0
Response 10	20	13	14	0	0	0

\*\*\* Inhibition Concentration Percentage Estimate \*\*\*

Toxicant/Effluent: Siloam Springs

Test Start Date: 2/9/21 Test Ending Date: 2/16/21

Test Species: Dubia

Test Duration: 7 Day

DATA FILE:

Conc. ID	Number Replicates	Concentration	Response Means	Std. Dev.	Pooled Response Means
1	10	0.000	17.900	2.331	17.900
2	10	32.000	13.500	3.342	13.500
3	10	42.000	9.000	5.715	9.000
4	10	56.000	0.000	0.000	0.000
5	10	75.000	0.000	0.000	0.000
6	10	100.000	0.000	0.000	0.000

The Linear Interpolation Estimate: 32.1667 Entered P Value: 25

Number of Resamplings: 80

The Bootstrap Estimates Mean: 31.2952 Standard Deviation: 3.9021

Original Confidence Limits: Lower: 23.8710 Upper: 37.0926

Resampling time in Seconds: 0.00 Random Seed: -958843814



Conc. ID	1	2	3	4	5	6
Conc. Tested	0	32	42	56	75	100
Response 1	.327	.337	.384	.400	.413	.351
Response 2	.386	.396	.410	.429	.357	.406
Response 3	.429	.448	.372	.373	.413	.362
Response 4	.392	.405	.311	.315	.366	.365
Response 5	.401	.401	.374	.402	.398	.432

\*\*\* Inhibition Concentration Percentage Estimate \*\*\*

Toxicant/Effluent: Siloam Springs

Test Start Date: 2/9/21 Test Ending Date: 2/16/21

Test Species: Fathead

Test Duration: 7 Day

DATA FILE:

Conc. ID	Number Replicates	Concentration	Response Means	Std. Dev.	Pooled Response Means
1	5	0.000	0.387	0.037	0.392
2	5	32.000	0.397	0.040	0.392
3	5	42.000	0.370	0.036	0.382
4	5	56.000	0.384	0.043	0.382
5	5	75.000	0.389	0.026	0.382
6	5	100.000	0.383	0.034	0.382

\*\*\* No Linear Interpolation Estimate can be calculated from the input data since none of the (possibly pooled) group response means were less than 75% of the control response mean.

# CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: 1 of 3

## Section A

Required Client Information:  
 Company: City of Siloam Springs  
 Address: 975 Anderson Avenue  
 Siloam Springs, AR  
 Email To: abrown@siloomsprings.com  
 Phone: 479-228-2000  
 Requested Due Date/TAT:

## Section B

Report To: Tony Brown  
 Copy To: abrown@siloomsprings.com  
 Purchase Order No.:  
 Project Name: 4th QTR WET  
 Project Number:

## Section C

Invoice Information:  
 Attention:  
 Company Name:  
 Address:  
 Pace Quote Reference:  
 Pace Project Manager: Nolie Wood  
 Pace Profile #: 10809

REGULATORY AGENCY  
 NPDES  GROUND WATER  DRINKING WATER  
 UST  RCRA  OTHER  
 Site Location STATE: AR

ITEM #	Section D Required Client Information		Valid Matrix Codes		MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED		SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives		Chronic WET Test	Requested Analysis Filtered (Y/N)	Pace Project No./ Lab I.D.
	Section D Required Client Information	Valid Matrix Codes	COMPOSITE START	COMPOSITE END/GRAB			Unpreserved	H <sub>2</sub> SO <sub>4</sub>			HNO <sub>3</sub>	HCl			
1	City of Siloam Springs Wastewater Plant	DW DRINKING WATER	DATE: 2/7/21	TIME: 10:00	ww	C	DATE: 02/08/21	TIME: 9:00		1					60360977
2		WT WASTE WATER													
3		WW WASTE WATER PRODUCT													
4		P PRODUCT													
5		SL SOILSOLID													
6		OL OIL													
7		WP WIPE													
8		AR AIR													
9		OT OTHER													
10		TS TISSUE													
11															
12															

Temp in °C	Received on	Cooler (Y/N)	Customly Sealed	Samples Intact
	2/8/21			

SAMPLER NAME AND SIGNATURE  
 PRINT Name of SAMPLER: Tony Brown  
 SIGNATURE of SAMPLER: Tony Brown

DATE Signed (MM/DD/YYYY): 2/8/21

ADDITIONAL COMMENTS  
 \*samples have a 24 hour hold time!  
 \*return samples to the Frontenac Lab on ice!





**Sample Condition Upon Receipt**

Client Name: Siloam Springs

Courier: FedEx  UPS  VIA  Clay  PEX  ECI  Pace  Xroads  Client  Other

Tracking #: \_\_\_\_\_ Pace Shipping Label Used? Yes  No

Custody Seal on Cooler/Box Present: Yes  No  Seals intact: Yes  No

Packing Material: Bubble Wrap  Bubble Bags  Foam  None  Other

Thermometer Used: T-111 Type of Ice: Wet Blue  None

Cooler Temperature (°C): As-read 2.6 Corr. Factor -.6 Corrected 2.0

Date and initials of person examining contents: 2/11/21  
T.S. 800

Temperature should be above freezing to 6°C

Chain of Custody present:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Chain of Custody relinquished:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Samples arrived within holding time:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Short Hold Time analyses (<72hr):	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Rush Turn Around Time requested:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	
Sufficient volume:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Correct containers used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Pace containers used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Containers intact:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Unpreserved 5035A / TX1005/1006 soils frozen in 48hrs?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Filtered volume received for dissolved tests?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Sample labels match COC: Date / time / ID / analyses	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Samples contain multiple phases? Matrix:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	List sample IDs, volumes, lot #'s of preservative and the date/time added.
Containers requiring pH preservation in compliance? (HNO <sub>3</sub> , H <sub>2</sub> SO <sub>4</sub> , HCl<2; NaOH>9 Sulfide, NaOH>10 Cyanide) (Exceptions: VOA, Micro, O&G, KS TPH, OK-DRO)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Cyanide water sample checks:		
Lead acetate strip turns dark? (Record only)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Potassium iodide test strip turns blue/purple? (Preserve)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Trip Blank present:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Headspace in VOA vials (>6mm):	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Samples from USDA Regulated Area: State:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Additional labels attached to 5035A / TX1005 vials in the field?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	

Client Notification/ Resolution: \_\_\_\_\_ Copy COC to Client? Y / N \_\_\_\_\_ Field Data Required? Y / N \_\_\_\_\_

Person Contacted: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Comments/ Resolution: \_\_\_\_\_

Project Manager Review: \_\_\_\_\_ Date: \_\_\_\_\_

# CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

### Section A

Required Client Information:  
Company: **City of Siloam Springs**  
Address: **975 Anderson Avenue**  
Siloam Springs, AR  
Email To: **abrown@siloamsprings.com**  
Phone: **479-228-2000** Fax:  
Requested Due Date/TAT:

Report To: **Tony Brown**  
Copy To: **abrown@siloamsprings.com**  
Purchase Order No.:  
Project Name: **4th QTR WET**  
Project Number:

### Section B

Invoice Information:  
Attention:  
Company Name:  
Address:  
Pace Quote Reference:  
Pace Project Manager: **Nolie Wood**  
Pace Profile #: **10809**

### Section C

REGULATORY AGENCY  
 NPDES  GROUND WATER  DRINKING WATER  
 UST  RCRA  OTHER  
Site Location **AR**  
STATE:

ITEM #	Valid Matrix Codes MATRIX CODE DRINKING WATER DW WASTE WATER WW WASTE WATER PRODUCT P SOIL/SOLID SL OIL OL WIPE WIP AIR AR OTHER OT TISSUE TS	COLLECTED		SAMPLE TYPE (G=GRAB C=COMP)	MATRIX CODE (see valid codes to left)	# OF CONTAINERS	Preservatives Unpreserved H <sub>2</sub> SO <sub>4</sub> HNO <sub>3</sub> HCl NaOH Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> Methanol Other	Analysis Test ↑ Y/N	Requested Analysis Filtered (Y/N)	Pace Project No./ Lab I.D.
		COMPOSITE START DATE TIME	COMPOSITE END/GRAB DATE TIME							
1	City of Siloam Springs Wastewater Plant	2/11/21 10:00	02/12/21 9:00	C	WW	1		X		Residual Chlorine (Y/N)
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS
*samples have a 24 hour hold time! *return samples to the Frontenac Lab on 1/6/21  TCA = 0.00	<i>Tony Brown</i>	2/11/21	12/18	<i>Shelley Rose</i>	2/13/21	8:00	Received on Ice (Y/N) Cooler (Y/N) Custody Sealed (Y/N) Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE  
PRINT Name of SAMPLER: **Tony Brown**  
SIGNATURE of SAMPLER: *Tony Brown*  
DATE Signed (MM/DD/YY): **2/11/21**



**Sample Condition Upon Receipt**

Client Name: Sivan Spigs

Courier: FedEx  UPS  VIA  Clay  PEX  ECI  Pace  Xroads  Client  Other

Tracking #: \_\_\_\_\_ Pace Shipping Label Used? Yes  No

Custody Seal on Cooler/Box Present: Yes  No  Seals intact: Yes  No

Packing Material: Bubble Wrap  Bubble Bags  Foam  None  Other

Thermometer Used: T-111 Type of Ice:  Wet  Blue  None

Cooler Temperature (°C): As-read 1.8 Corr. Factor -6 Corrected 1.2

Date and initials of person examining contents: EP

Temperature should be above freezing to 6°C

2/13/21 Jca

Chain of Custody present:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Chain of Custody relinquished:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Samples arrived within holding time:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Short Hold Time analyses (<72hr):	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Rush Turn Around Time requested:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	
Sufficient volume:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Correct containers used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Pace containers used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Containers intact:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Unpreserved 5035A / TX1005/1006 soils frozen in 48hrs?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Filtered volume received for dissolved tests?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> x/A	
Sample labels match COC: Date / time / ID / analyses	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Samples contain multiple phases? Matrix:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	
Containers requiring pH preservation in compliance? (HNO <sub>3</sub> , H <sub>2</sub> SO <sub>4</sub> , HCl<2; NaOH>9 Sulfide, NaOH>10 Cyanide) (Exceptions: VOA, Micro, O&G, KS TPH, OK-DRO)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	List sample IDs, volumes, lot #'s of preservative and the date/time added.
Cyanide water sample checks:		
Lead acetate strip turns dark? (Record only)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Potassium iodide test strip turns blue/purple? (Preserve)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Trip Blank present:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Headspace in VOA vials (>6mm):	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Samples from USDA Regulated Area: State:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Additional labels attached to 5035A / TX1005 vials in the field?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> x/A	

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Comments/ Resolution: \_\_\_\_\_

Project Manager Review: \_\_\_\_\_ Date: \_\_\_\_\_

March 30, 2021

Tony Brown  
City of Siloam Springs  
975 Anderson Avenue  
Siloam Springs, AR 72761

RE: Project: 1ST QTR WET (RE-TEST)  
Pace Project No.: 60363755

Dear Tony Brown:

Enclosed are the analytical results for sample(s) received by the laboratory between March 16, 2021 and March 22, 2021. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Kansas City
- Pace Analytical Services - SE Kansas

If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Nolie Wood  
nolie.wood@pacelabs.com  
1(913)563-1401  
Project Manager

Enclosures



## REPORT OF LABORATORY ANALYSIS

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## CERTIFICATIONS

Project: 1ST QTR WET (RE-TEST)

Pace Project No.: 60363755

---

### **Pace Analytical Services Kansas**

9608 Loiret Boulevard, Lenexa, KS 66219

Missouri Inorganic Drinking Water Certification #: 10090

Arkansas Drinking Water

Arkansas Certification #: 20-020-0

Arkansas Drinking Water

Illinois Certification #: 200030

Iowa Certification #: 118

Kansas/NELAP Certification #: E-10116

Louisiana Certification #: 03055

Nevada Certification #: KS000212020-2

Oklahoma Certification #: 9205/9935

Florida: Cert E871149 SEKS WET

Texas Certification #: T104704407-19-12

Utah Certification #: KS000212019-9

Illinois Certification #: 004592

Kansas Field Laboratory Accreditation: # E-92587

Missouri SEKS Micro Certification: 10070

---

### **Pace Analytical Services Southeast Kansas**

808 West McKay, Frontenac, KS 66763

Arkansas Certification #: 18-016-0

Iowa Certification #: 118

Kansas/NELAP Certification #: E-10426

Louisiana Certification #: 03055

Oklahoma Certification #: 9935

Texas Certification #: T104704407

Utah Certification #: KS00021

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## REPORT OF LABORATORY ANALYSIS

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## SAMPLE SUMMARY

Project: 1ST QTR WET (RE-TEST)

Pace Project No.: 60363755

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60363755001	SILOAM SPRINGS WASTEWATER PLAN	Water	03/15/21 09:00	03/16/21 08:00
60363755002	CITY OF SILOAM SPRINGS WASTEWA	Water	03/15/21 09:00	03/16/21 19:10
60363755003	201233	Water	03/17/21 09:00	03/18/21 19:00
60363755004	201232	Water	03/19/21 09:00	03/22/21 18:30

## REPORT OF LABORATORY ANALYSIS

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### SAMPLE ANALYTE COUNT

Project: 1ST QTR WET (RE-TEST)

Pace Project No.: 60363755

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60363755001	SILOAM SPRINGS WASTEWATER PLAN	EPA 821/R-02/013	MEB	1	PASI-SE
60363755002	CITY OF SILOAM SPRINGS WASTEWA	EPA 200.8	JGP	12	PASI-K
60363755003	201233	EPA 200.8	JGP	12	PASI-K
60363755004	201232	EPA 200.8	JGP	12	PASI-K

PASI-K = Pace Analytical Services - Kansas City

PASI-SE = Pace Analytical Services - SE Kansas

### REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS

Project: 1ST QTR WET (RE-TEST)

Pace Project No.: 60363755

---

**Sample: SILOAM SPRINGS WASTEWATER PLAN**      **Lab ID: 60363755001**      Collected: 03/15/21 09:00      Received: 03/16/21 08:00      Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
<b>Chronic Toxicity</b>								
Analytical Method: EPA 821/R-02/013								
Pace Analytical Services - SE Kansas								
Toxicity, Chronic	<b>Complete</b>		1.0	1		03/16/21 10:30		

## REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS

Project: 1ST QTR WET (RE-TEST)

Pace Project No.: 60363755

**Sample:** CITY OF SILOAM SPRINGS **Lab ID:** 60363755002 Collected: 03/15/21 09:00 Received: 03/16/21 19:10 Matrix: Water  
**WASTEWA**

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
<b>200.8 MET ICPMS</b>		Analytical Method: EPA 200.8 Preparation Method: EPA 200.8 Pace Analytical Services - Kansas City						
Antimony	ND	ug/L	1.0	1	03/24/21 14:57	03/27/21 14:01	7440-36-0	
Arsenic	ND	ug/L	1.0	1	03/24/21 14:57	03/27/21 14:01	7440-38-2	
Beryllium	ND	ug/L	0.50	1	03/24/21 14:57	03/27/21 14:01	7440-41-7	
Cadmium	ND	ug/L	0.50	1	03/24/21 14:57	03/27/21 14:01	7440-43-9	
Chromium	ND	ug/L	1.0	1	03/24/21 14:57	03/27/21 14:01	7440-47-3	
Copper	<b>1.6</b>	ug/L	1.0	1	03/24/21 14:57	03/27/21 14:01	7440-50-8	
Lead	ND	ug/L	1.0	1	03/24/21 14:57	03/27/21 14:01	7439-92-1	
Nickel	<b>1.5</b>	ug/L	1.0	1	03/24/21 14:57	03/27/21 14:01	7440-02-0	
Selenium	ND	ug/L	1.0	1	03/24/21 14:57	03/27/21 14:01	7782-49-2	
Silver	ND	ug/L	0.50	1	03/24/21 14:57	03/27/21 14:01	7440-22-4	
Thallium	ND	ug/L	1.0	1	03/24/21 14:57	03/27/21 14:01	7440-28-0	
Zinc	<b>34.7</b>	ug/L	10.0	1	03/24/21 14:57	03/27/21 14:01	7440-66-6	

## REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS

Project: 1ST QTR WET (RE-TEST)

Pace Project No.: 60363755

<b>Sample: 201233</b>		<b>Lab ID: 60363755003</b>		Collected: 03/17/21 09:00	Received: 03/18/21 19:00	Matrix: Water		
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
<b>200.8 MET ICPMS</b>		Analytical Method: EPA 200.8 Preparation Method: EPA 200.8						
		Pace Analytical Services - Kansas City						
Antimony	ND	ug/L	1.0	1	03/24/21 14:57	03/29/21 11:56	7440-36-0	
Arsenic	ND	ug/L	1.0	1	03/24/21 14:57	03/29/21 11:56	7440-38-2	
Beryllium	ND	ug/L	0.50	1	03/24/21 14:57	03/29/21 11:56	7440-41-7	
Cadmium	ND	ug/L	0.50	1	03/24/21 14:57	03/29/21 11:56	7440-43-9	
Chromium	ND	ug/L	1.0	1	03/24/21 14:57	03/29/21 11:56	7440-47-3	
Copper	<b>1.8</b>	ug/L	1.0	1	03/24/21 14:57	03/29/21 11:56	7440-50-8	
Lead	ND	ug/L	1.0	1	03/24/21 14:57	03/29/21 11:56	7439-92-1	
Nickel	<b>1.5</b>	ug/L	1.0	1	03/24/21 14:57	03/29/21 11:56	7440-02-0	
Selenium	ND	ug/L	1.0	1	03/24/21 14:57	03/29/21 11:56	7782-49-2	
Silver	ND	ug/L	0.50	1	03/24/21 14:57	03/29/21 11:56	7440-22-4	
Thallium	ND	ug/L	1.0	1	03/24/21 14:57	03/29/21 11:56	7440-28-0	
Zinc	<b>37.1</b>	ug/L	10.0	1	03/24/21 14:57	03/29/21 11:56	7440-66-6	

## REPORT OF LABORATORY ANALYSIS

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without the written consent of Pace Analytical Services, LLC.

## ANALYTICAL RESULTS

Project: 1ST QTR WET (RE-TEST)

Pace Project No.: 60363755

<b>Sample: 201232</b>		<b>Lab ID: 60363755004</b>		Collected: 03/19/21 09:00	Received: 03/22/21 18:30	Matrix: Water		
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
<b>200.8 MET ICPMS</b>		Analytical Method: EPA 200.8 Preparation Method: EPA 200.8						
		Pace Analytical Services - Kansas City						
Antimony	ND	ug/L	1.0	1	03/24/21 14:57	03/29/21 11:58	7440-36-0	
Arsenic	ND	ug/L	1.0	1	03/24/21 14:57	03/29/21 11:58	7440-38-2	
Beryllium	ND	ug/L	0.50	1	03/24/21 14:57	03/29/21 11:58	7440-41-7	
Cadmium	ND	ug/L	0.50	1	03/24/21 14:57	03/29/21 11:58	7440-43-9	
Chromium	ND	ug/L	1.0	1	03/24/21 14:57	03/29/21 11:58	7440-47-3	
Copper	<b>1.4</b>	ug/L	1.0	1	03/24/21 14:57	03/29/21 11:58	7440-50-8	
Lead	ND	ug/L	1.0	1	03/24/21 14:57	03/29/21 11:58	7439-92-1	
Nickel	<b>1.3</b>	ug/L	1.0	1	03/24/21 14:57	03/29/21 11:58	7440-02-0	
Selenium	ND	ug/L	1.0	1	03/24/21 14:57	03/29/21 11:58	7782-49-2	
Silver	ND	ug/L	0.50	1	03/24/21 14:57	03/29/21 11:58	7440-22-4	
Thallium	ND	ug/L	1.0	1	03/24/21 14:57	03/29/21 11:58	7440-28-0	
Zinc	<b>30.1</b>	ug/L	10.0	1	03/24/21 14:57	03/29/21 11:58	7440-66-6	

## REPORT OF LABORATORY ANALYSIS

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### QUALITY CONTROL DATA

Project: 1ST QTR WET (RE-TEST)

Pace Project No.: 60363755

QC Batch:	710610	Analysis Method:	EPA 200.8
QC Batch Method:	EPA 200.8	Analysis Description:	200.8 MET
		Laboratory:	Pace Analytical Services - Kansas City

Associated Lab Samples: 60363755002, 60363755003, 60363755004

METHOD BLANK: 2860214 Matrix: Water

Associated Lab Samples: 60363755002, 60363755003, 60363755004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Antimony	ug/L	ND	1.0	03/27/21 13:45	
Arsenic	ug/L	ND	1.0	03/27/21 13:45	
Beryllium	ug/L	ND	0.50	03/27/21 13:45	
Cadmium	ug/L	ND	0.50	03/27/21 13:45	
Chromium	ug/L	ND	1.0	03/27/21 13:45	
Copper	ug/L	ND	1.0	03/27/21 13:45	
Lead	ug/L	ND	1.0	03/27/21 13:45	
Nickel	ug/L	ND	1.0	03/27/21 13:45	
Selenium	ug/L	ND	1.0	03/27/21 13:45	
Silver	ug/L	ND	0.50	03/27/21 13:45	
Thallium	ug/L	ND	1.0	03/27/21 13:45	
Zinc	ug/L	ND	10.0	03/27/21 13:45	

LABORATORY CONTROL SAMPLE: 2860215

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Antimony	ug/L	40	40.1	100	85-115	
Arsenic	ug/L	40	41.2	103	85-115	
Beryllium	ug/L	40	38.9	97	85-115	
Cadmium	ug/L	40	41.7	104	85-115	
Chromium	ug/L	40	39.9	100	85-115	
Copper	ug/L	40	39.6	99	85-115	
Lead	ug/L	40	39.4	99	85-115	
Nickel	ug/L	40	38.7	97	85-115	
Selenium	ug/L	40	41.5	104	85-115	
Silver	ug/L	20	19.0	95	85-115	
Thallium	ug/L	40	39.3	98	85-115	
Zinc	ug/L	100	101	101	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2860216 2860217

Parameter	Units	MS		MSD		MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual	
		60363755002	Result	Conc.	Conc.							Result
Antimony	ug/L	ND	40	40	40.4	40.1	100	100	70-130	1	20	
Arsenic	ug/L	ND	40	40	40.9	40.7	102	101	70-130	1	20	
Beryllium	ug/L	ND	40	40	39.1	38.1	98	95	70-130	3	20	
Cadmium	ug/L	ND	40	40	38.2	37.9	95	95	70-130	1	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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### QUALITY CONTROL DATA

Project: 1ST QTR WET (RE-TEST)

Pace Project No.: 60363755

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2860216 2860217											
Parameter	Units	60363755002 Result	MS	MSD	MS	MSD	MS	MSD	% Rec	Max	Qual
			Spike Conc.	Spike Conc.	Result	Result	% Rec	% Rec	Limits	RPD	
Chromium	ug/L	ND	40	40	39.6	39.2	98	97	70-130	1	20
Copper	ug/L	1.6	40	40	38.9	38.6	93	92	70-130	1	20
Lead	ug/L	ND	40	40	37.9	37.4	94	93	70-130	1	20
Nickel	ug/L	1.5	40	40	39.3	38.9	94	93	70-130	1	20
Selenium	ug/L	ND	40	40	38.9	39.3	96	98	70-130	1	20
Silver	ug/L	ND	20	20	16.9	16.9	85	85	70-130	0	20
Thallium	ug/L	ND	40	40	38.0	37.6	95	94	70-130	1	20
Zinc	ug/L	34.7	100	100	131	130	96	95	70-130	1	20

MATRIX SPIKE SAMPLE: 2860218								
Parameter	Units	60363755004 Result	Spike	MS	MS	% Rec	Qualifiers	
			Conc.	Result	% Rec	Limits		
Antimony	ug/L	ND	40	42.1	105	70-130		
Arsenic	ug/L	ND	40	42.7	106	70-130		
Beryllium	ug/L	ND	40	40.8	102	70-130		
Cadmium	ug/L	ND	40	40.4	101	70-130		
Chromium	ug/L	ND	40	41.0	101	70-130		
Copper	ug/L	1.4	40	40.9	99	70-130		
Lead	ug/L	ND	40	41.0	102	70-130		
Nickel	ug/L	1.3	40	40.6	98	70-130		
Selenium	ug/L	ND	40	40.0	99	70-130		
Silver	ug/L	ND	20	18.0	90	70-130		
Thallium	ug/L	ND	40	40.9	102	70-130		
Zinc	ug/L	30.1	100	130	100	70-130		

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

### REPORT OF LABORATORY ANALYSIS

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## QUALIFIERS

Project: 1ST QTR WET (RE-TEST)

Pace Project No.: 60363755

---

### DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

## REPORT OF LABORATORY ANALYSIS

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### QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 1ST QTR WET (RE-TEST)

Pace Project No.: 60363755

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60363755001	SILOAM SPRINGS WASTEWATER PLAN	EPA 821/R-02/013	710757		
60363755002	CITY OF SILOAM SPRINGS WASTEWA	EPA 200.8	710610	EPA 200.8	710638
60363755003	201233	EPA 200.8	710610	EPA 200.8	710638
60363755004	201232	EPA 200.8	710610	EPA 200.8	710638

### REPORT OF LABORATORY ANALYSIS

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Sample Condition Upon Receipt

WO#: 60363755



Client Name: Siloam springs

Courier: FedEx  UPS  VIA  Clay  PEX  ECI  Pace  Xroads  Client  Other

Tracking #: \_\_\_\_\_ Pace Shipping Label Used? Yes  No

Custody Seal on Cooler/Box Present: Yes  No  Seals intact: Yes  No

Packing Material: Bubble Wrap  Bubble Bags  Foam  None  Other

Thermometer Used: T-298 Type of Ice: Wet Blue  None

Cooler Temperature (°C): As-read 1.6 Corr. Factor 0.0 Corrected 1.6

Date and initials of person examining contents:

3/23/21

Temperature should be above freezing to 6°C

Chain of Custody present:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Chain of Custody relinquished:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Samples arrived within holding time:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Short Hold Time analyses (<72hr):	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	
Rush Turn Around Time requested:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	
Sufficient volume:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Correct containers used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Pace containers used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Containers intact:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Unpreserved 5035A / TX1005/1006 soils frozen in 48hrs?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Filtered volume received for dissolved tests?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Sample labels match COC: Date / time / ID / analyses	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Samples contain multiple phases? Matrix: <u>WT</u>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	
Containers requiring pH preservation in compliance? (HNO <sub>3</sub> , H <sub>2</sub> SO <sub>4</sub> , HCl<2; NaOH>9 Sulfide, NaOH>10 Cyanide) (Exceptions: VOA, Micro, O&G, KS TPH, OK-DRO)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	List sample IDs, volumes, lot #'s of preservative and the date/time added.
Cyanide water sample checks:		
Lead acetate strip turns dark? (Record only)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Potassium iodide test strip turns blue/purple? (Preserve)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Trip Blank present:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Headspace in VOA vials (>6mm):	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Samples from USDA Regulated Area: State:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Additional labels attached to 5035A / TX1005 vials in the field?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Comments/ Resolution: \_\_\_\_\_


Project Manager Review: \_\_\_\_\_ Date: \_\_\_\_\_

# CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

<b>Section A</b> Required Client Information:		<b>Section B</b> Required Project Information:		<b>Section C</b> Invoice Information:	
Company:	City of Siloam Springs	Report To:	Tony Brown	Attention:	
Address:	975 Anderson Avenue Siloam Springs, AR	Copy To:	abrown@siloamsprings.com	Company Name:	
Email To:	abrown@siloamsprings.com	Purchase Order No.:		Address:	
Phone:	479-228-2000	Project Name:	1st QTR WET (Re-Test)	Pace Quote Reference:	
Requested Due Date/TAT:		Project Number:		Pace Project Manager:	Nolie Wood
				Pace Profile #:	10809
				REGULATORY AGENCY	
				<input checked="" type="checkbox"/> NPDES <input type="checkbox"/> GROUND WATER <input type="checkbox"/> DRINKING WATER	
				<input type="checkbox"/> UST <input type="checkbox"/> RCRA <input type="checkbox"/> OTHER	
				Site Location	AR
				STATE:	

ITEM #	Valid Matrix Codes MATRIX CODE DRINKING WATER DW WASTE WATER WT WASTE WATER WW PRODUCT P SOIL/SOLID SL OIL OL WIPE WP AIR AR OTHER OT TISSUE TS	Matrix Code (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED		SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives	Analysis Test ↑	Requested Analysis Filtered (Y/N)	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
				COMPOSITE START	COMPOSITE END/GRAB							
1		WW	C	3/18/21	10:00	03/19/21	9:00					
2		WW	C	3/18/21	10:00	03/19/21	9:00					
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

<b>ADDITIONAL COMMENTS</b>	<b>RELINQUISHED BY / AFFILIATION</b>	<b>DATE</b>	<b>TIME</b>	<b>ACCEPTED BY / AFFILIATION</b>	<b>DATE</b>	<b>TIME</b>	<b>SAMPLE CONDITIONS</b>
*samples have a 24 hour hold time! Return samples to the Frontenac Lab on ice! TCR: 3-19-21 (1.03)	Tony Brown Eun Dudley just pure	3/19/21	0:00	Eun Dudley just pure Tony Brown	3/19/21	8:00	Temp in °C: 3.6 Received on Ice (Y/N): Cooler (Y/N): Custody Sealed (Y/N): Samples Intact (Y/N):
<b>SAMPLER NAME AND SIGNATURE</b>				<b>DATE Signed (MM/DD/YYYY):</b>			
PRINT Name of SAMPLER: Tony Brown				3/19/21			
SIGNATURE of SAMPLER: 							



**Sample Condition Upon Receipt**

*Pre existing project*

*60363755*

Client Name: Siloam Springs

Courier: FedEx  UPS  VIA  Clay  PEX  ECI  Pace  Xroads  Client  Other

Tracking #: \_\_\_\_\_ Pace Shipping Label Used? Yes  No

Custody Seal on Cooler/Box Present: Yes  No  Seals intact: Yes  No

Packing Material: Bubble Wrap  Bubble Bags  Foam  None  Other

Thermometer Used: T-111 Type of Ice: Wet Blue  None

Cooler Temperature (°C): As-read 4.2 Corr. Factor -.6 Corrected 3.6

Date and initials of person examining contents: EP

3/20/21 8<sup>00</sup>

Temperature should be above freezing to 6°C

Chain of Custody present:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Chain of Custody relinquished:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Samples arrived within holding time:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Short Hold Time analyses (<72hr):	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Rush Turn Around Time requested:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	
Sufficient volume:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Correct containers used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Pace containers used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Containers intact:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Unpreserved 5035A / TX1005/1006 soils frozen in 48hrs?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Filtered volume received for dissolved tests?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> x/A	
Sample labels match COC: Date / time / ID / analyses	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Samples contain multiple phases? Matrix:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	
Containers requiring pH preservation in compliance? (HNO <sub>3</sub> , H <sub>2</sub> SO <sub>4</sub> , HCl<2; NaOH>9 Sulfide, NaOH>10 Cyanide) (Exceptions: VOA, Micro, O&G, KS TPH, OK-DRO)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	List sample IDs, volumes, lot #'s of preservative and the date/time added.
Cyanide water sample checks:		
Lead acetate strip turns dark? (Record only)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Potassium iodide test strip turns blue/purple? (Preserve)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Trip Blank present:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Headspace in VOA vials (>6mm):	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Samples from USDA Regulated Area: State:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Additional labels attached to 5035A / TX1005 vials in the field?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> x/A	

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Comments/ Resolution: \_\_\_\_\_

Project Manager Review: \_\_\_\_\_ Date: \_\_\_\_\_

REFERENCE #60363755

**CHRONIC TOXICITY TEST FOR  
City of Siloam Springs**

PERMIT # AR0020273  
AFIN # 04-00106

PERFORMED ON:

Pimephales promelas

and

Ceriodaphnia dubia

PREPARED FOR:

City of Siloam Springs  
Attn: Tony Brown  
975 Anderson Avenue  
Siloam Springs, AR  
1-479-228-0934

PREPARED BY:  
Pace Analytical Services, Inc.  
808 West McKay  
Frontenac, KS 66763  
1-620-235-0003

March 24, 2021

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## SUMMARY

A Chronic Whole Effluent Toxicity Test using the 7-day chronic fathead minnows (*Pimephales promelas*), static renewal larval survival and growth test, and three brood 7-day chronic Cladoceran (*Ceriodaphnia dubia*), static renewal survival and reproduction test, was conducted on effluent discharge water collected at the City of Siloam Springs effluent discharge from March 15, 2020 to March 19, 2020. All the test methods followed are as listed in EPA 821-R-02-013, "Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms."

Statistically significant ( $p < 0.05$ ) mortality is determined by Dunnet's procedure using average percent survival of each test concentration versus the average survival of the controls. If significant mortality occurs, median lethal concentrations are calculated using effluent concentrations and their corresponding percent mortality data. The 95% confidence intervals are calculated where appropriate by the Spearman-Kärber method. Statistical analysis is accomplished by following steps in EPA 821-R-02-013, February 2002 and by use of Toxstat version 3.4.

In minnow section of testing, it was observed that the effluent had no significant effect on the survival of the larvae at the 100% concentration. No significant mortality was observed in the other effluent concentrations after the 7-day exposure period. The No Observed Effect Concentration (NOEC) was determined to be 100% for survival. No significant reduction in growth was observed in the 100% effluent concentration. The Toxic Units is  $< 1$ . The IC25 is  $> 100$ . The NOEC for growth in effluent was determined to be 100%. The PMSD was 13.0.

In Cladoceran section of testing, it was observed that the effluent had no significant effect on the survival of the organisms in the 100% effluent concentration. No significant mortality was observed in the other effluent concentrations after the 7-day exposure period. The No Observed Effect Concentration (NOEC) was determined to be 100% for survival. No significant reduction in reproduction was observed in the 100% effluent concentrations. The Toxic Units is  $< 1$ . The IC25 is  $> 100$ . The NOEC for reproduction in effluent was determined to be 100%. The PMSD was 17.7.

The chronic toxicity exhibited by the fathead minnows and the *Ceriodaphnia* treated by the effluent sampled from March 15 to March 19 from the City of Siloam Springs effluent discharge, is acceptable as described in EPA 821-R-02-013.



## INTRODUCTION

Pace Analytical was contracted to perform this chronic toxicity test on effluent from the City of Siloam Springs effluent discharge. Chronic toxicity was measured using the Pimephales promelas at larval for survival and growth test and the Ceriodaphnia dubia survival and reproduction test described in EPA 821-R-02-013, "Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms." The raw data of the study is stored at Pace Analytical Services, INC. 808 West McKay, Frontenac, KS 66763.

## TEST MATERIAL

City of Siloam Springs personnel collected sampling of the effluent. A sample of the effluent was delivered to Pace by commercial carrier on 3-16-21. Subsequent samples followed by delivery on 3-18-21, and on 3-20-21. All samples were stored at  $\leq 6^{\circ}$  Celsius. Moderately Hard Synthetic Water was used as a control and also to make the required dilutions in the test as described in EPA 821-R-02-013.

## TEST METHODS

Pace used EPA test method 1000.0 for conducting the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test. EPA test method 1002.0 was used for conducting the Cladoceran, Ceriodaphnia dubia, Survival and Reproduction Test. The tests were conducted to estimate the NOEC, and LOEC for survival, growth, and reproduction of these test species.

The Pimephales and Ceriodaphnia tests were initiated on 3-16-21 and carried out until 3-23-21. The Pimephales tests were conducted in 500 ml plastic jars with 250 ml of test solution. Eight larvae were placed in each of at least 5 replicates to make a total of 40 larvae per sample concentration. The Ceriodaphnia tests were carried out in 35ml vials containing 25 ml of test solution. One Neonate was placed in each of 10 replicates to make a total of 10 neonates per sample concentration.

## TEST ORGANISMS

The organisms used in these tests were cultured at Pace under controlled temperature and photoperiod conditions and/or were purchased from an external supplier. Pace maintains records of all culture techniques used in producing organisms.

**TABLE 1**

Permittee: City of Siloam Springs Effluent discharge.

Date Sampled	No. 1: 3-15-21	9:00
	No. 2: 3-17-21	9:00
	No. 3: 3-19-21	9:00
Test Initiated: 10:30	Date: 3-16-21	
Test End: 10:50	Date: 3-22-21	

**RESULTS**

Ceriodaphnia dubia	Results
TLP3B	0
TGP3B	0
TOP3B	100
TPP3B	100
TQP3B	14.78
Pimephales promelas	Results
TLP6C	0
TGP6C	0
TOP6C	100
TPP6C	100
TQP6C	12.46

REFERENCE #60363755

Dilution Water used: Moderately Hard Synthetic Water

**FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL**  
**(Pimephales promelas)**

DATA TABLE FOR GROWTH OF FATHEAD MINNOWS

Effluent Concentration (%)	Average Dry Weight in Milligrams in Replicate Chambers					Mean Dry Weight (mg)	CV% *
	A	B	C	D	E		
Control 0%	0.374	0.417	0.490	0.411	0.501	0.439	12.46
Dilution 1 32%	0.455	0.486	0.441	0.488	0.421	0.458	6.32
Dilution 2 42%	0.464	0.462	0.404	0.480	0.474	0.457	6.66
Dilution 3 56%	0.410	0.44	0.412	0.449	0.489	0.441	7.33
Dilution 4 75%	0.384	0.505	0.484	0.478	0.456	0.461	10.11
Dilution 5 100%	0.417	0.400	0.418	0.436	0.472	0.429	6.39

\* Coefficient of Variation = Standard Deviation X 100 / Mean

FATHEAD MINNOW SURVIVAL

Conc. %	Percent Survival in Replicate Chambers					Mean Percent Survival			CV %
	A	B	C	D	E	24hr	48hr	7 day	
Control 0%	90	100	100	100	100	100	100	98	5.28
Dilution 1 32%	100	100	100	100	100	100	100	100	0.00
Dilution 2 42%	100	100	90	100	100	100	100	98	5.28
Dilution 3 56%	100	90	100	100	100	100	100	98	5.28
Dilution 4 75%	90	100	100	100	100	100	100	98	5.28
Dilution 5 100%	100	90	100	100	100	100	100	98	5.28

REFERENCE #60363755

Permittee: City of Siloam Springs Effluent discharge.

**CERIODAPHNIA SURVIVAL AND REPRODUCTION**

DATA TABLE FOR CERIODAPHNIA YOUNG PRODUCTION

Replicate	Control 0%	Dilution 1 32%	Dilution 2 42%	Dilution 3 56%	Dilution 4 75%	Dilution 5 100%
1	24	29	20	30	17	24
2	21	21	25	19	26	25
3	22	23	26	24	28	27
4	20	26	21	24	21	25
5	15	19	15	23	20	22
6	19	23	23	24	25	26
7	20	21	28	22	18	15
8	17	22	21	15	19	22
9	20	24	22	21	22	21
10	23	21	26	22	26	23
Mean	20.1	22.9	22.7	22.4	22.2	23.0
SD	2.685	2.885	3.773	3.864	3.824	3.399
CV %	13.36	12.60	16.62	17.25	17.22	14.78

**CERIODAPHNIA MEAN PERCENT SURVIVAL**

Percent Effluent (%)						
Time Elapsed	Control 0%	Dilution 1 32%	Dilution 2 42%	Dilution 3 56%	Dilution 4 75%	Dilution 5 100%
24 hrs	100	100	100	100	100	100
48 hrs	100	100	100	100	100	100
7-day	100	100	100	100	100	100
SD	0.000	0.000	0.000	0.000	0.000	0.000
CV %	0.00	0.00	0.00	0.00	0.00	0.00

**TABLE 2**  
**SUMMARY OF TEST CONDITIONS FOR THE FATHEAD MINNOW**  
**(*Pimephales promelas*) LARVAL SURVIVAL AND GROWTH TEST**

1. Test type	Static renewal
2. Temperature	25 degrees Celsius
3. Light quality	Ambient laboratory light
4. Light intensity	Ambient laboratory levels
5. Photoperiod	16 hr light, 8 hr dark
6. Test chamber size	500 ml
7. Test solution volume	250 ml
8. Renewal of test concentrations	Daily
9. Age of test organism	< 24 hours
10. No. larvae/chamber	8
11. No. replicates/concentration	5
12. No. larvae/concentration	40
13. Feeding regime	Feed 0.15 g newly hatched brine shrimp nauplii two times daily. Larvae are not fed 12 hours prior to termination of test.
14. Cleaning	Siphon daily, immediately before test solution renewal
15. Aeration	None
16. Dilution Water	Moderately Hard Synthetic Water prepared with MILLI-Q deionized water and reagent grade chemicals
17. Effluent concentrations	0%, 32%, 42%, 56%, 75%, 100%
18. Test duration	7 days
19. Endpoints	Survival and growth
20. Test acceptability	80% or greater survival in the controls, Average dry weight in controls >0.25 mg, Coefficient of variation in the control must not exceed 40%.

**TABLE 2 (CONT.)**  
**SUMMARY OF TEST CONDITIONS FOR THE CLADOCERAN**  
**(*Ceriodaphnia dubia*) SURVIVAL AND REPRODUCTION TEST**

1. Test type	Static renewal
2. Temperature	25 degrees Celsius
3. Light quality	Ambient laboratory light
4. Light intensity	Ambient laboratory levels
5. Photoperiod	16 hr light, 8 hr dark
6. Test chamber size	30 ml
7. Test solution volume	25 ml
8. Renewal of test concentrations	Daily
9. Age of test organism	< 24 hours
10. No. larvae/chamber	1
11. No. replicates/concentration	10
12. No. larvae/concentration	10
13. Feeding regime	Feed 0.1 ml YCT and 0.1 ml of Algae daily. Larvae are not fed 12 hours prior to termination of test.
14. Cleaning	Siphon daily, immediately before test solution renewal
15. Aeration	None
16. Dilution Water	Moderately Hard Synthetic Water prepared with MILLI-Q deionized water and reagent grade chemicals
17. Effluent concentrations	0%, 32%, 42%, 56%, 75%, 100%
18. Test duration	Until 60% or more surviving control females have three broods or a maximum of 8 days.
19. Endpoints	Survival and Reproduction
20. Test acceptability	80% or greater survival in the controls, Average reproduction rate of 15 young / adult. Coefficient of variation in the control must not exceed 40%.

**BIOMONITORING CHRONIC TOXICITY REPORT  
 FATHEAD MINNOW (Pimephales promelas)  
 CHEMICAL PARAMETERS CHART**

Permittee: City of Siloam Springs Effluent discharge.

ANALYSTS: Pace Analytical Services, Inc.  
 Timothy Harrell  
 Mike Bollin

**TABLE 2 (SECTION 2)  
 INITIAL WATER QUALITY  
 EFFLUENT CONCENTRATION**

	Control	100%
PH	7.6	7.5
D.O.	8.2	7.7
Temp	25.0	25.0
Alk	62	102
Hard	94	196
Cond	316	751
Chlorine	<0.1	<0.1

- \* D.O. is reported as mg/L
- Alkalinity is reported as mg/L CaCO<sub>3</sub>
- Hardness is reported as mg/L CaCO<sub>3</sub>
- Conductance is reported as umhos
- Ammonia is reported as mg/L
- Chlorine is reported as mg/L

TEST WATER QUALITY

24-Hour Water Quality Measurements

Effluent Concentration (%)	PH	D.O. (mg/l)	Temperature (C)
0% Control	7.7	6.9	24.8
32% Effluent	7.7	6.9	25.3
42% Effluent	7.7	6.8	25.3
56% Effluent	7.7	6.8	25.3
75% Effluent	7.7	6.8	25.3
100% Effluent	7.7	6.8	25.3

48-Hour Water Quality Measurements

Effluent Concentration (%)	PH	D.O. (mg/l)	Temperature (C)
0% Control	7.7	7.1	25.0
32% Effluent	7.7	7.1	25.0
42% Effluent	7.8	7.0	25.0
56% Effluent	7.8	6.9	25.0
75% Effluent	7.8	6.9	25.0
100% Effluent	7.8	6.9	25.0



FINAL WATER QUALITY

EFFLUENT CONCENTRATION

	Control	100%
pH	7.8	7.7
D.O.	7.2	6.8
Temp	25.1	24.9
Alk	60	108
Hard	96	192
Cond	357	864

- \* D.O. is reported as mg/L
- Alkalinity is reported as mg/L CaCO<sub>3</sub>
- Hardness is reported as mg/L CaCO<sub>3</sub>
- Conductance is reported as umhos

TEST VALIDITY

The Pimephales promelas control survival rate was 98. The mean dry weight (growth) of the Pimephales promelas was determined at 0.439 mg/organism in the controls. The percent coefficient of variation (%CV) values for the fathead minnow control for survival and growth were 5.28 and 12.46. The Ceriodaphnia dubia survival rates were 100 in the control. The Ceriodaphnia in the control produced an average of 20.1 young over the seven-day exposure period. Percent CV values for Ceriodaphnia dubia control survival and reproduction was 0.00 and 13.36. Control data met or exceeded all criteria set out by EPA 8100-R-02-013 for test acceptance.

REFERENCE TOXICANTS

The absence of significant control mortality during this test indicated the health of the organisms and indicated that any significant mortality in the test concentrations was not due to contaminants or variations in testing conditions.

Reference toxicity testing is routinely performed by staff members in our biomonitoring - bioassay laboratory.

Start: 3/16/21 11:30

End: 3/23/21 11:00

Reference Toxicant (NaCl) Pimephales promelas

Concentration of Toxicant	Avg. # of Live Organisms/replicate			
	0 hrs	24 hrs	48 hrs	7 days
10 g/l	40	5	0	0
8 g/l	40	16	12	4
6 g/l	40	40	40	25
4 g/l	40	40	40	39
2 g/l	40	40	40	38

IC25 (5.18 g/l Sodium Chloride)

Survival NOEC: 4.0 g/l

Reference Toxicant (NaCl) Ceriodaphnia Dubia

Concentration of Toxicant	Avg. # of Live Organisms/replicate			
	0 hrs	24 hrs	48 hrs	7 days
2.5 g/l	10	7	3	0
2.0 g/l	10	10	10	1
1.5 g/l	10	10	10	1
1.0 g/l	10	10	10	10
0.5 g/l	10	10	10	10

IC25 (1.15 g/l Sodium Chloride)

Survival NOEC: 1.5 g/l

Submitted By: \_\_\_\_\_  
 Timothy Harrell, Technical Director

60363755 Siloam Springs FATHEAD SURVIVAL  
File: 6363755A Transform: ARC SINE(SQUARE ROOT(Y))

Chi-square test for normality: actual and expected frequencies

---

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	2.010	7.260	11.460	7.260	2.010
OBSERVED	5	0	25	0	0

---

Calculated Chi-Square goodness of fit test statistic = 36.9753  
Table Chi-Square value (alpha = 0.01) = 13.277

Data FAIL normality test. Try another transformation.

Warning - The first three homogeneity tests are sensitive to non-normal data and should not be performed.

60363755 Siloam Springs FATHEAD SURVIVAL  
File: 6363755A Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

---

D = 0.106

W = 0.558

Critical W (P = 0.05) (n = 30) = 0.927  
Critical W (P = 0.01) (n = 30) = 0.900

---

Data FAIL normality test. Try another transformation.

Warning - The first three homogeneity tests are sensitive to non-normal data and should not be performed.

60363755 Siloam Springs FATHEAD SURVIVAL  
 File: 6363755A Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	Control	5	1.249	1.412	1.379
2	32%	5	1.412	1.412	1.412
3	42%	5	1.249	1.412	1.379
4	56%	5	1.249	1.412	1.379
5	75%	5	1.249	1.412	1.379
6	100%	5	1.249	1.412	1.379

60363755 Siloam Springs FATHEAD SURVIVAL  
 File: 6363755A Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	Control	0.005	0.073	0.033	5.28
2	32%	0.000	0.000	0.000	0.00
3	42%	0.005	0.073	0.033	5.28
4	56%	0.005	0.073	0.033	5.28
5	75%	0.005	0.073	0.033	5.28
6	100%	0.005	0.073	0.033	5.28

60363755 Siloam Springs FATHEAD SURVIVAL  
 File: 6363755A Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.004	0.001	0.200
Within (Error)	24	0.106	0.004	
Total	29	0.111		

Critical F value = 2.62 (0.05,5,24)  
 Since  $F < \text{Critical } F$  FAIL TO REJECT  $H_0$ : All equal

60363755 siloam Springs FATHEAD SURVIVAL  
 File: 6363755A Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 1 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Control	1.379	0.980		
2	32%	1.412	1.000	-0.775	
3	42%	1.379	0.980	0.000	
4	56%	1.379	0.980	0.000	
5	75%	1.379	0.980	0.000	
6	100%	1.379	0.980	0.000	

Dunnett table value = 2.36 (1 Tailed Value, P=0.05, df=24,5)

60363755 Siloam Springs FATHEAD SURVIVAL

File: 6363755A Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 2 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	Control	5			
2	32%	5	0.046	4.7	-0.020
3	42%	5	0.046	4.7	0.000
4	56%	5	0.046	4.7	0.000
5	75%	5	0.046	4.7	0.000
6	100%	5	0.046	4.7	0.000

60363755 Siloam Springs FATHEAD GROWTH  
File: 6363755B Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

---

D = 0.035

W = 0.981

Critical W (P = 0.05) (n = 30) = 0.927

Critical W (P = 0.01) (n = 30) = 0.900

---

Data PASS normality test at P=0.01 level. Continue analysis.

60363755 Siloam Springs FATHEAD GROWTH  
File: 6363755B Transform: NO TRANSFORMATION

---

Bartlett's test for homogeneity of variance

Calculated B1 statistic = 3.17

---

Table Chi-square value = 15.09 (alpha = 0.01, df = 5)

Table Chi-square value = 11.07 (alpha = 0.05, df = 5)

---

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

60363755 Siloam Springs FATHEAD GROWTH  
 File: 6363755B Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	Control	5	0.374	0.501	0.439
2	32%	5	0.421	0.488	0.458
3	42%	5	0.404	0.480	0.457
4	56%	5	0.410	0.489	0.441
5	75%	5	0.384	0.505	0.461
6	100%	5	0.400	0.472	0.429

60363755 Siloam Springs FATHEAD GROWTH  
 File: 6363755B Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	Control	0.003	0.055	0.024	12.46
2	32%	0.001	0.029	0.013	6.32
3	42%	0.001	0.030	0.014	6.66
4	56%	0.001	0.032	0.014	7.33
5	75%	0.002	0.047	0.021	10.11
6	100%	0.001	0.027	0.012	6.39

60363755 Siloam Springs FATHEAD GROWTH  
 File: 6363755B Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.004	0.001	0.602
Within (Error)	24	0.035	0.001	
Total	29	0.039		

Critical F value = 2.62 (0.05,5,24)  
 Since  $F < \text{Critical } F$  FAIL TO REJECT  $H_0$ : All equal

60363755 Siloam Springs FATHEAD GROWTH  
 File: 6363755B Transform: NO TRANSFORMATION

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Control	0.439	0.439		
2	32%	0.458	0.458	-0.813	
3	42%	0.457	0.457	-0.755	
4	56%	0.441	0.441	-0.091	
5	75%	0.461	0.461	-0.946	
6	100%	0.429	0.429	0.415	

Dunnett table value = 2.36 (1 Tailed Value, P=0.05, df=24,5)

60363755 Siloam Springs FATHEAD GROWTH

File: 6363755B Transform: NO TRANSFORMATION

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	Control	5			
2	32%	5	0.057	13.0	-0.020
3	42%	5	0.057	13.0	-0.018
4	56%	5	0.057	13.0	-0.002
5	75%	5	0.057	13.0	-0.023
6	100%	5	0.057	13.0	0.010



FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
32%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.  
 Since b is greater than 6 there is no significant difference  
 between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
42%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.  
 Since b is greater than 6 there is no significant difference  
 between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
56%	10	0	10

TOTAL 20 0 20

CRITICAL FISHER'S VALUE (10,10,10) ( $p=0.05$ ) IS 6. b VALUE IS 10.  
 Since b is greater than 6 there is no significant difference  
 between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
75%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) ( $p=0.05$ ) IS 6. b VALUE IS 10.  
 Since b is greater than 6 there is no significant difference  
 between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
100%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) ( $p=0.05$ ) IS 6. b VALUE IS 10.  
 Since b is greater than 6 there is no significant difference  
 between CONTROL and TREATMENT at the 0.05 level.

SUMMARY OF FISHER'S EXACT TESTS

NUMBER NUMBER SIG

GROUP	IDENTIFICATION	EXPOSED	DEAD	(P= .05)
	CONTROL	10	0	
1	32%	10	0	
2	42%	10	0	
3	56%	10	0	
4	75%	10	0	
5	100%	10	0	

60363755 Siloam Springs CERIODAPHNIA DUBIA SURVIVA  
File: 6363755D Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

---

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	10	1.000	1.000	1.000
2	32%	10	1.000	1.000	1.000
3	42%	10	1.000	1.000	1.000
4	56%	10	1.000	1.000	1.000
5	75%	10	1.000	1.000	1.000
6	100%	10	1.000	1.000	1.000

---

60363755 Siloam Springs CERIODAPHNIA DUBIA SURVIVA  
File: 6363755D Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

---

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	0.000	0.000	0.000	0.00
2	32%	0.000	0.000	0.000	0.00
3	42%	0.000	0.000	0.000	0.00
4	56%	0.000	0.000	0.000	0.00
5	75%	0.000	0.000	0.000	0.00
6	100%	0.000	0.000	0.000	0.00

---

60363755 Siloam Springs CERIODAPHNIA DUBIA REPRODU  
File: 6363755E Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

---

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	4.020	14.520	22.920	14.520	4.020
OBSERVED	4	12	26	15	3

---

Calculated Chi-Square goodness of fit test statistic = 1.1260  
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

60363755 Siloam Springs CERIODAPHNIA DUBIA REPRODU  
File: 6363755E Transform: NO TRANSFORMATION

---

Bartlett's test for homogeneity of variance  
Calculated B1 statistic = 2.00

---

Table Chi-square value = 15.09 (alpha = 0.01, df = 5)  
Table Chi-square value = 11.07 (alpha = 0.05, df = 5)

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

60363755 Siloam Springs CERIODAPHNIA DUBIA REPRODU  
 File: 6363755E Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	10	15.000	24.000	20.100
2	32%	10	19.000	29.000	22.900
3	42%	10	15.000	28.000	22.700
4	56%	10	15.000	30.000	22.400
5	75%	10	17.000	28.000	22.200
6	100%	10	15.000	27.000	23.000

60363755 Siloam Springs CERIODAPHNIA DUBIA REPRODU  
 File: 6363755E Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	7.211	2.685	0.849	13.36
2	32%	8.322	2.885	0.912	12.60
3	42%	14.233	3.773	1.193	16.62
4	56%	14.933	3.864	1.222	17.25
5	75%	14.622	3.824	1.209	17.22
6	100%	11.556	3.399	1.075	14.78

60363755 Siloam Springs CERIODAPHNIA DUBIA REPRODU  
 File: 6363755E Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	58.283	11.657	0.987
Within (Error)	54	637.900	11.813	
Total	59	696.183		

Critical F value = 2.45 (0.05,5,40)  
 Since  $F < \text{Critical } F$  FAIL TO REJECT  $H_0$ : All equal

60363755 Siloam Springs CERIODAPHNIA DUBIA REPRODU  
 File: 6363755E Transform: NO TRANSFORMATION

## DUNNETT'S TEST - TABLE 1 OF 2

Ho:Control&lt;Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	20.100	20.100		
2	32%	22.900	22.900	-1.822	
3	42%	22.700	22.700	-1.692	
4	56%	22.400	22.400	-1.496	
5	75%	22.200	22.200	-1.366	
6	100%	23.000	23.000	-1.887	

Dunnett table value = 2.31 (1 Tailed Value, P=0.05, df=40,5)

60363755 Siloam Springs CERIODAPHNIA DUBIA REPRODU  
 File: 6363755E Transform: NO TRANSFORMATION

## DUNNETT'S TEST - TABLE 2 OF 2

Ho:Control&lt;Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	10			
2	32%	10	3.551	17.7	-2.800
3	42%	10	3.551	17.7	-2.600
4	56%	10	3.551	17.7	-2.300
5	75%	10	3.551	17.7	-2.100
6	100%	10	3.551	17.7	-2.900

Conc. ID	1	2	3	4	5	6
Conc. Tested	0	32	42	56	75	100
Response 1	.374	.455	.464	.410	.384	.417
Response 2	.417	.486	.462	.444	.505	.400
Response 3	.490	.441	.404	.412	.484	.418
Response 4	.411	.488	.480	.449	.478	.436
Response 5	.501	.421	.474	.489	.456	.472

\*\*\* Inhibition Concentration Percentage Estimate \*\*\*

Toxicant/Effluent: Siloam Springs

Test Start Date: 3/16/21 Test Ending Date: 3/23/21

Test Species: Fathead

Test Duration: 7 Day

DATA FILE:

Conc. ID	Number Replicates	Concentration	Response Means	Std. Dev.	Pooled Response Means
1	5	0.000	0.439	0.055	0.451
2	5	32.000	0.458	0.029	0.451
3	5	42.000	0.457	0.030	0.451
4	5	56.000	0.441	0.032	0.451
5	5	75.000	0.461	0.047	0.451
6	5	100.000	0.429	0.027	0.429

\*\*\* No Linear Interpolation Estimate can be calculated from the input data since none of the (possibly pooled) group response means were less than 75% of the control response mean.



Conc. ID	1	2	3	4	5	6
Conc. Tested	0	32	42	56	75	100
Response 1	24	25	20	30	17	24
Response 2	21	21	25	19	26	25
Response 3	22	23	26	24	28	27
Response 4	20	26	21	24	21	25
Response 5	15	19	15	23	20	22
Response 6	19	23	23	24	25	26
Response 7	20	21	28	22	18	15
Response 8	17	22	21	15	19	22
Response 9	20	24	22	21	22	21
Response 10	23	21	26	22	26	23

\*\*\* Inhibition Concentration Percentage Estimate \*\*\*  
 Toxicant/Effluent: Siloam Springs  
 Test Start Date: 3/16/21 Test Ending Date: 3/23/21  
 Test Species: Dubia  
 Test Duration: 7 Day  
 DATA FILE:

Conc. ID	Number Replicates	Concentration	Response Means	Std. Dev.	Pooled Response Means
1	10	0.000	20.100	2.685	22.150
2	10	32.000	22.500	2.121	22.150
3	10	42.000	22.700	3.773	22.150
4	10	56.000	22.400	3.864	22.150
5	10	75.000	22.200	3.824	22.150
6	10	100.000	23.000	3.399	22.150

\*\*\* No Linear Interpolation Estimate can be calculated from the input data since none of the (possibly pooled) group response means were less than 75% of the control response mean.



# CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

**Section A** Required Client Information: **Section B** Required Project Information: **Section C** Invoice Information:

Company: City of Siloam Springs	Report To: Tony Brown	Attention:
Address: 975 Anderson Avenue	Copy To: abrown@siloomsprings.com	Company Name:
Siloam Springs, AR	Purchase Order No.:	Address:
Email To: abrown@siloomsprings.com	Project Name: 1st QTR WET (Re-Test)	Pace Quote Reference:
Phone: 479-228-2000	Requested Due Date/TAT:	Pace Project Manager:
		Pace Probe #: 10909

**REGULATORY AGENCY**

NPDES     GROUND WATER     DRINKING WATER  
 UST     RCRA     OTHER

Site Location: AR

ITEM #	Section D Required Client Information	Valid Matrix Codes MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED				SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives						Analysis Test	Requested Analysis Filtered (Y/N)	Chronic WET Test Metals-Zn	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
				DATE	TIME	DATE	TIME			H <sub>2</sub> SO <sub>4</sub>	HNO <sub>3</sub>	HCl	NaOH	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub>	Methanol					
1	City of Siloam Springs Wastewater Plant	WW C	C	3/14/21	10:00	03/15/21	9:00	1								X		60363755		
2		WW C	C	3/14/21	10:00	03/15/21	9:00	1								X				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				

**ADDITIONAL COMMENTS**

Return samples to the Frontenac Lab on Ice!

TCR: (06) 3-15-21

Relinquished by / Affiliation: Tony Brown

Accepted by / Affiliation: Tony Brown

Date: 3/15/21

Time: 9:11

Temp in °C: 18

Received on Ice (Y/N): Y

Custody Sealed Cooler (Y/N): Y

Samples Intact (Y/N): Y



# CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

**Section A** Required Client Information: **Section B** Required Project Information: **Section C** Invoice Information:

Company: City of Siloam Springs  
 Address: 975 Anderson Avenue  
 Siloam Springs, AR  
 Email To: abrown@siloamsprings.com  
 Phone: 479-228-2000  
 Requested Due Date/TAT: \_\_\_\_\_

Report To: Tony Brown  
 Copy To: abrown@siloamsprings.com  
 Purchase Order No.: \_\_\_\_\_  
 Project Name: 1st QTR WET (Re-Test)  
 Project Number: \_\_\_\_\_

Company Name: \_\_\_\_\_  
 Attention: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 Pace Quote Reference: \_\_\_\_\_  
 Pace Project Manager: Nolie Wood  
 Pace Profile #: 10809

REGULATORY AGENCY:  NPDES  GROUND WATER  DRINKING WATER  
 UST  RCRA  OTHER \_\_\_\_\_

Site Location: AR  
 STATE: \_\_\_\_\_

ITEM #	Section D Required Client Information	Valid Matrix Codes MATRIX CODE	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED		SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives						Analysis Test	Requested Analysis Filtered (Y/N)	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
				DATE	TIME			DATE	TIME	H <sub>2</sub> SO <sub>4</sub>	HNO <sub>3</sub>	HCl	NaOH				
1	City of Siloam Springs Wastewater Plant	WW, C	C	3/16/21	10:00	03/17/21	9:00	1							X		836694
2		WW, C	C	3/16/21	10:00	03/17/21	9:00	1							X		201233
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	

**ADDITIONAL COMMENTS**

\*Samples have a 24 hour hold time!  
 \*Return samples to the Frontenac Lab on ice!

RELINQUISHED BY / AFFILIATION: Tony Brown  
 DATE: 3/17/21  
 TIME: 12:46

ACCEPTED BY / AFFILIATION: Tony Brown  
 DATE: 3/16/21  
 TIME: 800

Temp in °C: 16  
 Received on Ice (Y/N): Y  
 Custody Sealed Cooler (Y/N): Y  
 Samples Intact (Y/N): Y

SAMPLER NAME AND SIGNATURE: Tony Brown  
 PRINT Name of SAMPLER: Tony Brown  
 SIGNATURE OF SAMPLER: \_\_\_\_\_  
 DATE Signed (MM/DD/YY): 3/17/21



Sample Condition Upon Receipt

Client Name: Siloam Springs Renewal water

Courier: FedEx [ ] UPS [ ] VIA [x] Clay [ ] PEX [ ] ECI [ ] Pace [ ] Xroads [ ] Client [ ] Other [ ]

Tracking #: \_\_\_\_\_ Pace Shipping Label Used? Yes [ ] No [x]

Custody Seal on Cooler/Box Present: Yes [x] No [ ] Seals intact: Yes [x] No [ ]

Packing Material: Bubble Wrap [ ] Bubble Bags [ ] Foam [ ] None [x] Other [ ]

Thermometer Used: T-111 Type of Ice: Wet [x] Blue [ ] None [ ]

Cooler Temperature (°C): As-read 2.2 Corr. Factor -.6 Corrected 1.6

Date and initials of person examining contents: TS 3/18/21

Temperature should be above freezing to 6°C

Table with 3 columns: Question, Yes/No/N/A checkboxes, and Notes. Rows include Chain of Custody, Samples arrived, Short Hold Time, Rush Turn Around Time, Sufficient volume, Containers used, Containers intact, Unpreserved soils, Filtered volume, Sample labels match COC, Samples contain multiple phases, Containers requiring pH preservation, Cyanide water sample checks, Trip Blank present, Headspace in VOA vials, Samples from USDA Regulated Area, and Additional labels attached to 5035A / TX1005 vials.

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Comments/ Resolution: \_\_\_\_\_

Project Manager Review: \_\_\_\_\_ Date: \_\_\_\_\_



# CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

<b>Section A</b> Required Client Information:		<b>Section B</b> Required Project Information:		<b>Section C</b> Invoice Information:	
Company:	City of Siloam Springs	Report To:	Tony Brown	Attention:	
Address:	975 Anderson Avenue	Copy To:	abrown@siloamsprings.com	Company Name:	
	Siloam Springs, AR	Purchase Order No.:		Address:	
Email To:	abrown@siloamsprings.com	Project Name:	1st QTR WET (Re-Test)	Pace Quote Reference:	
Phone:	479-228-2000	Fax:		Pace Project Manager:	Noile Wood
Requested Due Date/TAT:		Project Number:		Pace Profile #:	10809
<b>REGULATORY AGENCY</b>			<input checked="" type="checkbox"/> NPDES <input type="checkbox"/> GROUND WATER <input type="checkbox"/> DRINKING WATER <input type="checkbox"/> UST <input type="checkbox"/> RCRA <input type="checkbox"/> OTHER		
Site Location			STATE: AR		

ITEM #	Section D Required Client Information	Valid Matrix Codes MATRIX CODE	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED		SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives						Requested Analysis Filtered (Y/N)	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.	
					COMPOSITE START	COMPOSITE END/GRAB			H <sub>2</sub> SO <sub>4</sub>	HNO <sub>3</sub>	HCl	NaOH	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub>	Methanol				Other
1	City of Siloam Springs Wastewater Plant	DRINKING WATER WASTE WATER PRODUCT SOIL/SOLID OIL WIPE AIR OTHER TSS	WW/ C	C	3/18/21	10:00	03/19/21	9:00	1									
2	2.5 (836602) 1.0 (828432)		WW/ C	C	3/18/21	10:00	03/19/21	9:00	1	X								
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		

\*Samples have a 24 hour hold time!

\*Return samples to the Frontenac Lab on ice!

TCR: 3-19-21 (1.03)

RELINQUISHED BY / AFFILIATION: Tony Brown

DATE: 3/19/21

TIME: 0:00

ACCEPTED BY / AFFILIATION: Eun Hee Lee

DATE: 3/19/21

TIME: 8:00

Temp In °C: 32

Received on Ice (Y/N): Y

Custody Sealed Cooler (Y/N): Y

Samples Intact (Y/N): Y

SAMPLER NAME AND SIGNATURE: Tony Brown

PRINT Name of SAMPLER: Tony Brown

SIGNATURE OF SAMPLER: *Tony Brown*

DATE Signed (MM/DD/YY): 3/19/21

\*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020 rev.08, 12-Oct-2007



Sample Condition Upon Receipt

Client Name: Siloam Springs

Courier: FedEx  UPS  VIA  Clay  PEX  ECI  Pace  Xroads  Client  Other

Tracking #: \_\_\_\_\_ Pace Shipping Label Used? Yes  No

Custody Seal on Cooler/Box Present: Yes  No  Seals intact: Yes  No

Packing Material: Bubble Wrap  Bubble Bags  Foam  None  Other

Thermometer Used: T-111 Type of Ice: Wet Blue  None

Cooler Temperature (°C): As-read 4.2 Corr. Factor -.6 Corrected 3.6

Date and initials of person examining contents: EP

3/20/21 800

Temperature should be above freezing to 6°C

Chain of Custody present:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Chain of Custody relinquished:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Samples arrived within holding time:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Short Hold Time analyses (<72hr):	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Rush Turn Around Time requested:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	
Sufficient volume:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Correct containers used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Pace containers used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Containers intact:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Unpreserved 5035A / TX1005/1006 soils frozen in 48hrs?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Filtered volume received for dissolved tests?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> x/A	
Sample labels match COC: Date / time / ID / analyses	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Samples contain multiple phases? Matrix:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	
Containers requiring pH preservation in compliance? (HNO <sub>3</sub> , H <sub>2</sub> SO <sub>4</sub> , HCl<2; NaOH>9 Sulfide, NaOH>10 Cyanide) (Exceptions: VOA, Micro, O&G, KS TPH, OK-DRO)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	List sample IDs, volumes, lot #'s of preservative and the date/time added.
Cyanide water sample checks:		
Lead acetate strip turns dark? (Record only)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Potassium iodide test strip turns blue/purple? (Preserve)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Trip Blank present:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Headspace in VOA vials (>6mm):	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Samples from USDA Regulated Area: State:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Additional labels attached to 5035A / TX1005 vials in the field?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> x/A	

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Comments/ Resolution: \_\_\_\_\_

Project Manager Review: \_\_\_\_\_ Date: \_\_\_\_\_



## Memorandum

To: State Representative of the Arkansas Energy & Environment (DEQ),  
Cc: Steve Gorszcyk, Public Works Director  
From: Tony Brown, Wastewater Superintendent  
Date: March 24, 2021  
Re: 1<sup>st</sup> QTR WET TEST Results between February 09, 2021, and February 16, 2021

### **Background:**

Wastewater staff received the analytical results for sample(s) received by Pace Analytical laboratory between February 09, 2021, and February 16, 2021. In the summary of the report, we were told in error that we passed the chronic toxicity test per the EPA 821-R-02-013.

I received a phone call on February 10, 2021, from the Technical Director, Tim Harrell at Pace Analytical informing us that the Wednesday, February 10, 2021 sample was not getting the desired results. I requested Pace Analytical to run a Metals test to see if we could determine the root cause of the negative results. The first and third samples taken on Monday, February 8, 2021, and Friday, February 12, 2021, had no negative effects and had the desired results.

I requested Pace Analytical to send us the coolers and sample containers so we could rerun the 1<sup>st</sup> quarter WET test. We received the coolers and containers and scheduled the retest to run between February 15, 2021, and February 20, 2021. We are currently awaiting the results of that test, and I will attach the results to the original WET test submitted to the Net-DMR.

**Root Cause Analysis:**

The Metals (EPA Method 200.8) test run by Pace Analytical provided information on the sample from Wednesday, February 10, 2021. Zinc was reported at 51.2 ug/L and Copper at 2.2 ug/L.

As a result of extremely cold temperatures between Tuesday, February 9, 2021, and Wednesday, February 10, 2021, and a subsequent unscheduled power outage, all process control equipment was offline with no power to operate the process control equipment. This included the backbone of the nutrient removal process, the centrifugal blowers which provide aeration. As a secondary benefit, the aeration system also provides a heat source for optimum biological activity. With that heat source removed and temperatures at -5°C, the autotrophic-nitrifying bacteria cease functioning. With no biological activity removing nutrients/metals this resulted in an environment not suitable for the survivability or reproduction of the Ceriodaphnia dubia.

It is my opinion that we failed the 1<sup>st</sup> quarter Chronic Whole Effluent Toxicity test due to multiple factors that were completely out of our control. The service interruption resulted in the Siloam Springs Wastewater Plant being shutdown. Extremely low temperatures caused the generator not to start, due to the gelling of the diesel fuel. At 32 degrees, the wax in the liquid form will crystallize and leave the fuel tank clouded. At 10-15 degrees, it will finally start to gel and clog the tank and fuel filters. This perfect storm combined a rare set of circumstances that drastically and negatively affected the outcome of the 1<sup>st</sup> quarter Chronic Whole Effluent Toxicity Test.

Respectfully,

Wastewater Superintendent (NPDES Permit: AR0020273)

**Attachments:**

NET-DMR Pace Analytical 1<sup>st</sup> QTR WET (Results), Pace Analytical Metals (EPA 200.8)