AR0021750

INTER-OFFICE MEMO

TO: Steve Floyd, Superintendent of Water and Wastewater Operations

FROM: Don Clover, Biologist

DATE: February 1, 2013

RE: Biomonitoring Results - Massard Plant

Please find below the chronic biomonitoring results for the first quarter of 2013. Lethal and sub-lethal toxicity were not experienced in the low-flow dilution of 8% effluent for the *Ceriodaphnia dubia* test organism. The test therefore passes at the low-flow dilution of 8% effluent for lethal and sub-lethal effects. Lethal and sub-lethal toxicity were not experienced in the low-flow dilution of 8% effluent for the fathead minnow (*Pimephales promelas*) test. The test therefore passes at the low-flow dilution of 8% effluent for lethal and sub-lethal effects.

Parameter #TGP3B- 0

Parameter #TGP6C- 0

Parameter #TLP3B- 0

Parameter #TLP6C- 0

Parameter #TOP3B- 11%

Parameter # TOP6C- 11%

Parameter #TPP3B- 11%

Parameter #TPP6C- 11%

Parameter #TQP3B- 13.23%

Parameter #TQP6C- 5.84%

Prepared By: Don Clover Date: 2/1/13

Reviewed By: L A. Mc Date: 02/04/13

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www.pacelabs.com

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Lenexa, KS 66219
(913)599-5665

January 25, 2013

Don Clover
City of Fort Smith
3900 Kelley Hwy.
Fort Smith, AR 72904

RE: Project: MASSARD BIOMONITORING
Pace Project No.: 60137013

Dear Don Clover:
Enclosed are the analytical results for sample(s) received by the laboratory on January 15, 2013. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

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

Sincerely,

Emily Webb for

Connie Sparks

connie.sparks@pacelabs.com
Project Manager

Enclosures

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CERTIFICATIONS

Project: MASSARD BIOMONITORING
Pace Project No.: 60137013

Southeast Kansas Certification IDs
808 West McKay, Frontenac, KS 66763
Arkansas Certification #: 12-019-0
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10116
Louisiana Certification #: 03055
Oklahoma Certification #: 2012-051
Texas Certification #: T104704407-12-3
Utah Certification #: KS000212012-2
Minnesota Certification #: 495004

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SAMPLE SUMMARY

Project: MASSARD BIOMONITORING
Pace Project No.: 60137013

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60137013001	MASSARD EFFLUENT	Water	01/14/13 08:00	01/15/13 10:30

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SAMPLE ANALYTE COUNT

Project: MASSARD BIOMONITORING
Pace Project No.: 60137013

Lab ID	Sample ID	Method	Analysts	Analytes Reported
60137013001	MASSARD EFFLUENT	EPA 821/R-02/013	TDH	1

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ANALYTICAL RESULTS

Project: MASSARD BIOMONITORING
Pace Project No.: 60137013

Sample: MASSARD EFFLUENT **Lab ID: 60137013001** Collected: 01/14/13 08:00 Received: 01/15/13 10:30 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Chronic Toxicity	Analytical Method: EPA 821/R-02/013							
Toxicity, Chronic	**Complete**		1.0	1		01/22/13 13:15		

REPORT OF LABORATORY ANALYSIS

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QUALIFIERS

Project: MASSARD BIOMONITORING
Pace Project No.: 60137013

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

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

MDL - Adjusted Method Detection Limit.

PRL - Pace Reporting Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

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: MASSARD BIOMONITORING
Pace Project No.: 60137013

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60137013001	MASSARD EFFLUENT	EPA 821/R-02/013	BIO/1593		

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Sample Condition Upon Receipt

WU#: 60137013

60137013

Client Name: T+S Mfg

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☒ Commercial ☐ Pace ☐ 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 ☐ Samples on ice, cooling process has begun

Cooler Temperature: 1.8

Temperature should be above freezing to 6°C

Optional
Proj. Due Date:
Proj. Name:

Date and Initials of person examining contents: MB 1/15/13 1030

		Comments:
Chain of Custody present:	☒ Yes ☐ No ☐ N/A	1.
Chain of Custody filled out:	☒ Yes ☐ No ☐ N/A	2.
Chain of Custody relinquished:	☒ Yes ☐ No ☐ N/A	3.
Sampler name & signature on COC:	☒ Yes ☐ No ☐ N/A	4.
Samples arrived within holding time:	☒ Yes ☐ No ☐ N/A	5.
Short Hold Time analyses (<72hr):	☒ Yes ☐ No ☐ N/A	6.
Rush Turn Around Time requested:	☐ Yes ☒ No ☐ N/A	7.
Sufficient volume:	☒ Yes ☐ No ☐ N/A	8.
Correct containers used:	☒ Yes ☐ No ☐ N/A	9.
-Pace containers used:	☒ Yes ☐ No ☐ N/A	
Containers intact:	☒ Yes ☐ No ☐ N/A	10.
Unpreserved 5035A soils frozen w/in 48hrs?	☐ Yes ☐ No ☒ N/A	11.
Filtered volume received for dissolved tests	☐ Yes ☐ No ☒ N/A	12.
Sample labels match COC:	☒ Yes ☐ No ☐ N/A	13.
-Includes date/time/ID/analyses Matrix: WT		
All containers needing preservation have been checked.	☐ Yes ☐ No ☒ N/A	14.
All containers needing preservation are found to be in compliance with EPA recommendation.	☐ Yes ☐ No ☒ N/A	
Exceptions: VOA, coliform, TOC, O&G, WI-DRO (water), Phenolics	☐ Yes ☐ No	Initial when completed _____ Lot # of added preservative _____
Trip Blank present:	☐ Yes ☐ No ☒ N/A	15.
Pace Trip Blank lot # (if purchased): _____		
Headspace in VOA vials (>6mm):	☐ Yes ☐ No ☒ N/A	16.
Project sampled in USDA Regulated Area:	☐ Yes ☐ No ☒ N/A	17. List State: _____

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

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: Review for CLS Date: 1/16/13

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

CHAIN-OF-CUSTODY / Analytical Request Document

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

Page: 1 of 1

1644819

Section A Required Client Information:

Company: City of Ft. Smith
Address: 3900 Kelley Hwy
Ft. Smith AR 72904
Email To:
Phone: 479 784 Fax:
Requested Due Date/TAT:

Section B Required Project Information:

Report To: Lance McAvoy
Copy To:
Purchase Order No.:
Project Name: MASSARD Biomonitoring
Project Number:

Section C Invoice Information:

Attention: Lance McAvoy
Company Name: City of Ft. Smith
Address: 3900 Kelley Hwy 72904
Pace Quote Reference:
Pace Project Manager:
Pace Profile #:

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

Requested Analysis Filtered (Y/N)

Section D Required Client Information

Matrix Codes (MATRIX / CODE): Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Tissue TS; Other OT

SAMPLE ID (A-Z, 0-9 / -) Sample IDs MUST BE UNIQUE

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COLLECTED COMPOSITE START TIME	COLLECTED COMPOSITE END/GRAB DATE	COLLECTED COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	Chronic Ceriodaphnia Y/N	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	MASSARD Effluent			1/13/13	0800	1/14/13	0800										X ICE	X	X		60F37013
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: Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
TCl2 = <0.01 mg/L	Kristy L. Cantu	1/14/13	0905		1/15/13	1030	1.8	Y	Y	Y
FCl2 = <0.01 mg/L										

SAMPLER NAME AND SIGNATURE
PRINT Name of SAMPLER: Kristy L. Cantu
SIGNATURE of SAMPLER: Kristy L. Cantu
DATE Signed (MM/DD/YY): 1/14/13

ORIGINAL

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.

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REFERENCE #60137013

Pace Analytical Services, Inc.
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Lenexa, KS 66219
Phone: 913.599.5665
Fax: 913.599.1759

January 23, 2013

Lance McAvoy
City of Fort Smith (Massard)
3900 Kelley HWY
Fort Smith , AR 72904

Re: Lab Project Number: 60137013
Client Project ID: Wet Test

Dear:

Enclosed are the analytical results for sample(s) received by the laboratory. The results relate only to the samples included in this report. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

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

Sincerely,

Tim Harrell
Tim.Harrell@pacelabs.com
Technical Director

REPORT OF LABORATORY ANALYSIS

ACCREDITED IN ACCORDANCE WITH nelac

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REFERENCE #60137013

Pace Analytical Services, Inc.
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CHRONIC TOXICITY TEST FOR CITY OF FORT SMITH (MASSARD)

PERMIT # AR 0021750
AFIN # 66-00226

PERFORMED ON:

Pimephales promelas

and

Ceriodaphnia dubia

PREPARED FOR:

Lance McAvoy
City of Fort Smith (Massard)
3900 Kelley HWY
Fort Smith, AR 72904

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

January 23, 2013

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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TABLE OF CONTENTS

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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 FORT SMITH (MASSARD) effluent discharge from January 14, 2013 to January 18, 2013. 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 (LC50) are calculated using effluent concentrations and their corresponding percent mortality data. The LC50's and the 95% confidence intervals are calculated where appropriate by the Spearman-Karber method. Statistical analysis is accomplished by following steps in EPA 821-R-02-013, November 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 11% 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 11% for survival. The LC50 was estimated to be >11% effluent. No significant reduction in growth was observed in the 11% effluent concentration. The Toxic Units is <1. The IC25 is >11. The NOEC for growth in effluent was determined to be 11%. The PMSD is 14.4.

In Cladoceran section of testing, it was observed that the effluent had no significant effect on the survival of the organisms in the 11% 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 11% for survival. The LC50 was estimated to be >11% effluent. No significant reduction in reproduction was observed in the 11% effluent concentrations. The Toxic Units is <1. The IC25 is >11. The NOEC for reproduction in effluent was determined to be 11%. The PMSD is 13.5.

The chronic toxicity exhibited by the fathead minnows and the Ceriodaphnia treated by the effluent sampled from January 14 to January 18 from the CITY OF FORT SMITH (MASSARD) effluent discharge, is acceptable as described in EPA 821-R-02-013.

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INTRODUCTION

Pace Analytical was contracted to perform this chronic toxicity test on effluent from the CITY OF FORT SMITH (MASSARD) 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 Fort Smith (Massard) personnel collected sampling of the effluent. A sample of the effluent was delivered to Pace by commercial carrier on 1-15-13. Subsequent samples followed by delivery on 1-17-13 and on 1-19-13. All samples were stored at ≤ 6° 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 LC50, NOEC, and LOEC for survival, growth, and reproduction of these test species.

The Pimephales and Ceriodaphnia tests were initiated on 1-15-13 and carried out until 1-22-13. 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

Organisms used in these tests were cultured at Pace under controlled temperature and photo period conditions and/or were purchased from an external supplier. Pace maintains records of culture techniques for all organisms, whether produced in house or purchased.

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RESULTS

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TABLE 1

Permittee: CITY OF FORT SMITH (MASSARD) Effluent discharge.

Date Sampled No. 1: 1-14-13 8:00

No. 2: 1-16-13 8:00

No. 3: 1-18-13 8:00

Test Initiated: 14:00 Date: 1-15-13

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 A	B	C	D	E	Mean Dry Weight (mg)	CV% *
Control 0%	0.322	0.392	0.409	0.372	0.376	0.374	5.17
Dilution 1 3%	0.388	0.383	0.351	0.340	0.402	0.373	4.13
Dilution 2 5%	0.376	0.388	0.388	0.441	0.331	0.385	6.04
Dilution 3 6%	0.341	0.357	0.340	0.424	0.409	0.374	6.20
Dilution 4 8%	0.414	0.332	0.389	0.434	0.399	0.394	5.84
Dilution 5 11%	0.376	0.330	0.447	0.386	0.387	0.385	6.41

* Coefficient of Variation = Standard Deviation X 100 / Mean

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Permittee: CITY OF FORT SMITH (MASSARD) Effluent discharge.

FATHEAD MINNOW SURVIVAL

Conc. %	Percent Survival in Replicate Chambers					Mean Percent Survival			CV %
	A	B	C	D	E	24hr	48hr	7 day	
Control 0%	87.5	100	100	100	100	100	100	97.5	4.79
Dilution 1 3%	100	100	100	100	100	100	100	100	0.00
Dilution 2 5%	100	100	100	100	87.5	100	100	97.5	4.79
Dilution 3 6%	100	100	87.5	100	100	100	100	97.5	4.79
Dilution 4 8%	100	87.5	100	100	100	100	100	97.5	4.79
Dilution 5 11%	100	100	100	100	100	100	100	100	0.00

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Permittee: CITY OF FORT SMITH (MASSARD) Effluent discharge.

CERIODAPHNIA SURVIVAL AND REPRODUCTION

DATA TABLE FOR CERIODAPHNIA YOUNG PRODUCTION

Replicate	Control 0%	Dilution 1 3%	Dilution 2 5%	Dilution 3 6%	Dilution 3 8%	Dilution 4 11%
1	22	20	20	21	21	24
2	20	23	26	19	23	26
3	20	21	24	24	27	18
4	25	24	21	18	20	23
5	21	22	18	25	21	19
6	24	23	18	21	18	23
7	22	18	24	20	24	27
8	21	22	19	21	19	19
9	24	29	26	20	23	22
10	26	28	25	26	26	25
Mean	22.5	23.0	22.1	21.5	22.2	22.6
SD	2.121	3.367	3.247	2.635	2.936	3.098
CV %	9.43	14.64	14.69	12.26	13.23	13.71

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Permittee: CITY OF FORT SMITH (MASSARD) Effluent discharge.

CERIODAPHNIA MEAN PERCENT SURVIVAL

	Percent Effluent (%)					
Time Elapsed	Control 0%	Dilution 1 3%	Dilution 2 5%	Dilution 3 6%	Dilution 4 8%	Dilution 5 11%
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	0.0	0.0	0.0	0.0	0.0	0.0
CV %	0.0	0.0	0.0	0.0	0.0	0.0

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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 0.1 ml newly hatched brine shrimp nauplii three 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

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TABLE 2 (CONT.)

16. Dilution Water	Moderately Hard Synthetic Water prepared with MILLI-Q deionized water and reagent grade chemicals
17. Effluent concentrations	0%, 3%, 5%, 6%, 8%, 11%
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

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TABLE 2 (CONT.)

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 three 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%, 3%, 5%, 6%, 8%, 11%
18. Test duration	6 days - 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%.

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TABLE 2 (SECTION 2)

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

Permittee: CITY OF FORT SMITH (MASSARD). Effluent discharge.

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

SAMPLE NO. 1 COLLECTED: DATE: 1-14-13

SAMPLE NO. 2 COLLECTED: DATE: 1-16-13

SAMPLE NO. 3 COLLECTED: DATE: 1-18-13

TABLE 2 (SECTION 2)
INITIAL WATER QUALITY
EFFLUENT CONCENTRATION

	Control	100%
PH	7.82	7.55
D.O.	8.30	8.60
Temp	25	25
Alk	60	94
Hard	94	84
Cond	310	382
Chlorine	<0.1	<0.1

* D.O. is reported as mg/L
Alkalinity is reported as mg/L CaCO3
Hardness is reported as mg/L CaCO3
Conductance is reported as umhos
Chlorine is reported as mg/L

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TEST WATER QUALITY

24-Hour Water Quality Measurements

Effluent Concentration (%)	PH	D.O. (mg/l)	Temperature (C)
0% Control	7.76	7.60	25
3% Effluent	7.77	7.60	25
5% Effluent	7.79	7.60	25
6% Effluent	7.79	7.60	25
8% Effluent	7.80	7.70	25
11% Effluent	7.82	7.70	25

48-Hour Water Quality Measurements

Effluent Concentration (%)	PH	D.O. (mg/l)	Temperature (C)
0% Control	7.74	7.30	25
3% Effluent	7.76	7.30	25
5% Effluent	7.80	7.20	25
6% Effluent	7.80	7.20	25
8% Effluent	7.83	7.10	25
11% Effluent	7.87	7.10	25

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
Phone: 913.599.5665
Fax: 913.599.1759

FINAL WATER QUALITY

EFFLUENT CONCENTRATION

	Control	11%
pH	7.47	7.59
D.O.	6.90	7.10
Temp	25	25
Alk	62	66
Hard	98	96
Cond	428	479

* D.O. is reported as mg/L
Alkalinity is reported as mg/L CaCO3
Hardness is reported as mg/L CaCO3
Conductance is reported as umhos

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9608 Loiret Blvd.
Lenexa, KS 66219
Phone: 913.599.5665
Fax: 913.599.1759

TEST VALIDITY

The Pimephales promelas control survival rate was 97.5%. The mean dry weight (growth) of the Pimephales promelas was determined at 0.374 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 5.17. The Ceriodaphnia dubia survival rates were 100 in the control. The Ceriodaphnia in the control produced an average of 22.5 young over the seven-day exposure period. Percent CV values for Ceriodaphnia dubia control survival and reproduction was 0.00 and 9.43. Control data met or exceeded all criteria set out by EPA 821-R-02-013 for test acceptance.

CONCLUSIONS

The No Observed Effect Concentration (NOEC) for Pimephales promelas was 11% for survival and 11% for growth. The No Observed Effect Concentration (NOEC) for Ceriodaphnia dubia was 11% for Survival and 11% for Reproduction. The tests were ran using a synthetic control against effluent concentrations of 3%, 5%, 6%, 8%, and 11%. The effluent sampled on 1-14-13, 1-16-13, and 1-18-13 exhibited acceptable chronic toxicity in Pimephales promelas and in Ceriodaphnia dubia during the exposure period as described in EPA 821-R-02-013.

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
Phone: 913.599.5665
Fax: 913.599.1759

APPENDIX A
STATISTICAL ANNALYSIS

60137013 Ft Smith FATHEAD SURVIVAL
File: 6137013A 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.

60137013 Ft Smith FATHEAD SURVIVAL
File: 6137013A 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.

60137013 Ft Smith FATHEAD SURVIVAL
File: 6137013A 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.

60137013 Ft Smith FATHEAD SURVIVAL
File: 6137013A Transform: ARC SINE(SQUARE ROOT(Y))

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.

60137013 Ft Smith FATHEAD SURVIVAL
File: 6137013A 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	3%	5	1.107	1.107	1.107
3	5%	5	0.991	1.107	1.084
4	6%	5	0.991	1.107	1.084
5	8%	5	0.991	1.107	1.084
6	11%	5	1.107	1.107	1.107

60137013 Ft Smith FATHEAD SURVIVAL
File: 6137013A 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	3%	0.000	0.000	0.000	0.00
3	5%	0.003	0.052	0.023	4.79
4	6%	0.003	0.052	0.023	4.79
5	8%	0.003	0.052	0.023	4.79
6	11%	0.000	0.000	0.000	0.00

60137013 Ft Smith FATHEAD SURVIVAL
File: 6137013A 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 < Critical F FAIL TO REJECT Ho: All equal

60137013 Ft Smith FATHEAD SURVIVAL
File: 6137013A Transform: ARC SINE(SQUARE ROOT(Y))

STEEL'S MANY-ONE RANK TEST - Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	1.084				
2	3%	1.107	30.00	16.00	5.00	
3	5%	1.084	27.50	16.00	5.00	
4	6%	1.084	27.50	16.00	5.00	
5	8%	1.084	27.50	16.00	5.00	
6	11%	1.107	30.00	16.00	5.00	

Critical values use k = 5, are 1 tailed, and alpha = 0.05

60137013 Ft Smith FATHEAD GROWTH
File: 6137013B Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

D = 0.032

W = 0.968

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.

60137013 Ft Smith FATHEAD GROWTH
File: 6137013B Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 0.99

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.

60137013 Ft Smith FATHEAD GROWTH
File: 6137013B Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.002	0.000	0.261
Within (Error)	24	0.032	0.001	
Total	29	0.034		

Critical F value = 2.62 (0.05,5,24)
Since F < Critical F FAIL TO REJECT Ho: All equal

60137013 Ft Smith FATHEAD GROWTH
File: 6137013B 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	0.374	0.374		
2	3%	0.373	0.373	0.060	
3	5%	0.385	0.385	-0.457	
4	6%	0.374	0.374	-0.000	
5	8%	0.394	0.394	-0.837	
6	11%	0.385	0.385	-0.474	

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

60137013 Ft Smith FATHEAD GROWTH
File: 6137013B 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	3%	5	0.055	14.6	0.001
3	5%	5	0.055	14.6	-0.011
4	6%	5	0.055	14.6	-0.000
5	8%	5	0.055	14.6	-0.019
6	11%	5	0.055	14.6	-0.011

60137013 Ft Smith FATHEAD GROWTH
File: 6137013B Transform: NO TRANSFORMATION

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
3%	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
5%	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
6%	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	NUMBER OF DEAD	TOTAL ANIMALS
CONTROL	10	0	10
8%	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	NUMBER OF DEAD	TOTAL ANIMALS
CONTROL	10	0	10
11%	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	3%	10	0	
2	5%	10	0	
3	6%	10	0	
4	8%	10	0	
5	11%	10	0	

60137013 Ft Smith CERIODAPHNIA DUBIA REPRODU
File: 6137013E 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	0	21	19	16	4

Calculated Chi-Square goodness of fit test statistic = 7.7333
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

60137013 Ft Smith CERIODAPHNIA DUBIA REPRODU
File: 6137013E Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 2.27

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.

60137013 Ft Smith CERIODAPHNIA DUBIA REPRODU
File: 6137013E Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	10	20.000	26.000	22.500
2	3%	10	18.000	29.000	23.000
3	5%	10	18.000	26.000	22.100
4	6%	10	18.000	26.000	21.500
5	8%	10	18.000	27.000	22.200
6	11%	10	18.000	27.000	22.600

60137013 Ft Smith CERIODAPHNIA DUBIA REPRODU
File: 6137013E Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	4.500	2.121	0.671	9.43
2	3%	11.333	3.367	1.065	14.64
3	5%	10.544	3.247	1.027	14.69
4	6%	6.944	2.635	0.833	12.26
5	8%	8.622	2.936	0.929	13.23
6	11%	9.600	3.098	0.980	13.71

60137013 Ft Smith CERIODAPHNIA DUBIA REPRODU
File: 6137013E Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	13.083	2.617	0.305
Within (Error)	54	463.900	8.591	
Total	59	476.983		

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

60137013 Ft Smith CERIODAPHNIA DUBIA REPRODU
File: 6137013E 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	22.500	22.500		
2	3%	23.000	23.000	-0.381	
3	5%	22.100	22.100	0.305	
4	6%	21.500	21.500	0.763	
5	8%	22.200	22.200	0.229	
6	11%	22.600	22.600	-0.076	

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

60137013 Ft Smith CERIODAPHNIA DUBIA REPRODU
File: 6137013E 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	3%	10	3.028	13.5	-0.500
3	5%	10	3.028	13.5	0.400
4	6%	10	3.028	13.5	1.000
5	8%	10	3.028	13.5	0.300
6	11%	10	3.028	13.5	-0.100

Conc. ID	1	2	3	4	5	6
Conc. Tested	0	3	5	6	8	11
Response 1	.322	.388	.376	.341	.414	.376
Response 2	.392	.383	.388	.357	.332	.330
Response 3	.409	.351	.388	.340	.389	.447
Response 4	.372	.340	.441	.424	.434	.386
Response 5	.376	.402	.331	.409	.399	.387

*** Inhibition Concentration Percentage Estimate ***
Toxicant/Effluent: Ft Smith
Test Start Date: 1/15/13 Test Ending Date: 1/22/13
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	0.374	0.033	0.381
2	5	3.000	0.373	0.026	0.381
3	5	5.000	0.385	0.039	0.381
4	5	6.000	0.374	0.040	0.381
5	5	8.000	0.394	0.038	0.381
6	5	11.000	0.385	0.042	0.381

*** 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	3	5	6	8	11
Response 1	22	20	20	21	21	24
Response 2	20	23	26	19	23	26
Response 3	20	21	24	24	27	18
Response 4	25	24	21	18	20	23
Response 5	21	22	18	25	21	19
Response 6	24	23	18	21	18	23
Response 7	22	18	24	20	24	27
Response 8	21	22	19	21	19	19
Response 9	24	29	26	20	23	22
Response 10	26	28	25	26	26	25

*** Inhibition Concentration Percentage Estimate ***
Toxicant/Effluent: Ft Smith
Test Start Date: 1/15/13 Test Ending Date: 1/22/13
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	22.500	2.121	22.750
2	10	3.000	23.000	3.367	22.750
3	10	5.000	22.100	3.247	22.100
4	10	6.000	21.500	2.635	22.100
5	10	8.000	22.200	2.936	22.100
6	10	11.000	22.600	3.098	22.100

*** 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.

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
Phone: 913.599.5665
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APPENDIX B
CHAIN OF CUSTODY FORMS

CHAIN-OF-CUSTODY / Analytical Request Document

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

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1644819

Section A Required Client Information:
Company: City of Ft. Smith
Address: 3900 Kelley Hwy Ft. Smith AR 72904
Email To:
Phone: 479 784 Fax:
Requested Due Date/TAT:

Section B Required Project Information:
Report To: Lance McAvoy
Copy To:
Purchase Order No.:
Project Name: MASSARD Biomonitoring
Project Number:

Section C Invoice Information:
Attention: Lance McAvoy
Company Name: City of Ft. Smith
Address: 3900 Kelley Hwy AR 72904
Pace Quote Reference:
Pace Project Manager:
Pace Profile #:

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

Section D Required Client Information

Matrix Codes (MATRIX / CODE): Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Tissue TS; Other OT

ITEM #	SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COLLECTED COMPOSITE START TIME	COLLECTED COMPOSITE END/GRAB DATE	COLLECTED COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	Requested Analysis Filtered (Y/N)	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	MASSARD Effluent			1/13/13	0800	1/14/13	0800										X	Y	X Chronic Minnow		
2																		Y	X Chronic Ceriodaphnia		
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12																					

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
TCl2 = <0.01 mg/L	Kristy L Cantu	1/14/13	0905	[signature]	1/15/13	1030	1.8	Y	Y	Y
FCl2 = <0.01 mg/L										

SAMPLER NAME AND SIGNATURE
PRINT Name of SAMPLER: Kristy L. Cantu
SIGNATURE of SAMPLER: Kristy L Cantu
DATE Signed (MM/DD/YY): 1/14/13

ORIGINAL

F-ALL-Q-020rev.07, 15-May-2007

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CHAIN-OF-CUSTODY / Analytical Request Document

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1553496

Section A Required Client Information:
Company: City of Fort Smith
Address: 3900 Kelley Hwy Ft. Smith, AR 72904
Email To:
Phone: 479-784-2337 Fax:
Requested Due Date/TAT:

Section B Required Project Information:
Report To: Lance McAvoy
Copy To:
Purchase Order No.:
Project Name: Massard Biomonitoring
Project Number:

Section C Invoice Information:
Attention: Lance McAvoy
Company Name: City of Fort Smith
Address: 3900 Kelley Hwy Ft. Smith, AR
Pace Quote Reference:
Pace Project Manager:
Pace Profile #:

REGULATORY AGENCY
☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER

Site Location STATE: AR

Section D Required Client Information

Matrix Codes MATRIX / CODE: Drinking Water DW, Water WT, Waste Water WW, Product P, Soil/Solid SL, Oil OL, Wipe WP, Air AR, Tissue TS, Other OT

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N): N N

ITEM #	SAMPLE ID	MATRIX CODE	SAMPLE TYPE (G=GRAB C=COMP)	COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other ICE	Analysis Test	Chronic Minnow	Chronic Ceriodaphnia	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	Massard Effluent	WW	C	1/15/13	0800	1/16/13	0800		1								X		X	X		
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			
T. Cl2 = 0.03 mg/L	John Hancock / City Fort Smith	1/16/13	1000	[signature]	1/17/13	~~1450~~ 1050	2.6	Y	Y	Y
F. Cl2 = 0.02 mg/L										

MB 1/17/13

ORIGINAL

SAMPLER NAME AND SIGNATURE
PRINT Name of SAMPLER: John Hancock
SIGNATURE of SAMPLER: [signature]
DATE Signed (MM/DD/YY): 1/16/13

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

~~*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.~~ [initials]

F-ALL-Q-020rev.07, 15-May-2007

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CHAIN-OF-CUSTODY / Analytical Request Document

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

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1644817

Section A Required Client Information:

Company: City of Fort Smith
Address: 3900 Kelley Hwy
Ft. Smith AR 72904
Email To:
Phone: 4797842337 Fax:
Requested Due Date/TAT:

Section B Required Project Information:

Report To: LANCE McAvoy
Copy To:
Purchase Order No.:
Project Name: MASSARD Biomonitoring
Project Number:

Section C Invoice Information:

Attention: Lance McAvoy
Company Name: City of Ft. Smith
Address: 3900 Kelley Hwy FS, AR
Pace Quote Reference:
Pace Project Manager:
Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER

Site Location STATE: AR

Section D Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Matrix Codes — MATRIX / CODE

Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Tissue	TS
Other	OT

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Requested Analysis Filtered (Y/N): Y/N	Analysis Test ↓	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	MASSARD Effluent	NW	C	1/17/13	0800	1/18/13	0800		1								X ICE	N	X Chronic Minnow		
1																		N	X Chronic Ceriodaphnia		
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
T.Cl2 = <0.01 mg/L	Kristy L Canto	1/18/13	0855	[signature]	1/19/13	0900	1.4 Y Y Y
F.Cl2 = 0.02 mg/L							

ORIGINAL

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Kristy Canto

SIGNATURE of SAMPLER: Kristy L Canto

DATE Signed (MM/DD/YY): 1/18/13

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

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-020rev.07, 15-May-2007

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
Phone: 913.599.5665
Fax: 913.599.1759

APPENDIX C

REFERENCE TOXICANTS SUMMARY

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
Phone: 913.599.5665
Fax: 913.599.1759

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: 12/18/12 12:30 End: 12/25/12 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	7	3	0
8 g/l	40	38	31	6
6 g/l	40	39	38	24
4 g/l	40	40	40	39
2 g/l	40	40	40	39

IC25 (5.02 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	3	0	0
2.0 g/l	10	10	6	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 (1.22 g/l Sodium Chloride)

Survival NOEC: 1.5 g/l

Submitted By: _____
Timothy Harrell, Technical Director

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
Phone: 913.599.5665
Fax: 913.599.1759

APPENDIX D
STATE AGENCY FORMS

Biomonitoring Form
Chronic Toxicity Summary Form
Pimephales promelas
Chemical Parameters Chart

Permittee: City of Fort Smith
NPDES No.: AR 0021750
Contact: Lance McAvoy
Analyst: Tim Harrell
Mike Bollin

Sample No. 1 Collected: Date: 1/14/2013 **Time:** 8:00
Sample No. 2 Collected: Date: 1/16/2013 **Time:** 8:00
Sample No. 3 Collected: Date: 1/18/2013 **Time:** 8:00
Test Begin: Date: 1/15/2013 **Time:** 14:00
Test End: Date: 1/22/2013 **Time:** 13:15

Dilution: 0 Day:	1	2	3	4	5	6	7	Comments
Temp (C)	25	25	25	25	25	25	25	
DO Initial	8.3	8	8.2	8.3	8	8.3	7.9	
DO Final	7.6	7.3	7	7.3	7.2	7.2	6.9	
pH Initial	7.82	7.46	7.48	7.44	7.44	7.44	7.51	
pH Final	7.76	7.74	7.48	7.58	7.52	7.58	7.47	
Alkalinity	60							
Hardness	94							
Conductivity	310							
Chlorine	<.1						<.1	

Dilution: 6 Day:	1	2	3	4	5	6	7	Comments
Temp (C)	25	25	25	25	25	25	25	
DO Initial		8.1	8.2	8.3	8.1	8.3	7.9	
DO Final	7.6	7.2	7.1	7.3	7.3	7.2	7	
pH Initial		7.58	7.57	7.51	7.52	7.5	7.57	
pH Final	7.79	7.8	7.52	7.66	7.6	7.65	7.51	
Alkalinity								
Hardness								
Conductivity								
Chlorine								

Dilution: 3 Day:	1	2	3	4	5	6	7	Comments
Temp (C)	25	25	25	25	25	25	25	
DO Initial		8	8.2	8.3	8	8.3	7.9	
DO Final	7.6	7.3	7	7.3	7.2	7.2	7	
pH Initial		7.54	7.55	7.47	7.47	7.46	7.53	
pH Final	7.77	7.76	7.49	7.62	7.56	7.62	7.49	
Alkalinity								
Hardness								
Conductivity								
Chlorine								

Dilution: 8 Day:	1	2	3	4	5	6	7	Comments
Temp (C)	25	25	25	25	25	25	25	
DO Initial		8.1	8.3	8.4	8.1	8.3	7.9	
DO Final	7.7	7.1	7.7	7.3	7.3	7.3	7	
pH Initial		7.58	7.6	7.51	7.52	7.51	7.6	
pH Final	7.8	7.83	7.55	7.68	7.6	7.65	7.56	
Alkalinity								
Hardness								
Conductivity								
Chlorine								

Dilution: 5 Day:	1	2	3	4	5	6	7	Comments
Temp (C)	25	25	25	25	25	25	25	
DO Initial		8	8.2	8.3	8.1	8.3	7.9	
DO Final	7.6	7.2	7.1	7.3	7.2	7.2	7	
pH Initial		7.56	7.57	7.5	7.51	7.46	7.55	
pH Final	7.79	7.8	7.52	7.65	7.58	7.64	7.51	
Alkalinity								
Hardness								
Conductivity								
Chlorine								

Dilution: 11 Day:	1	2	3	4	5	6	7	Comments
Temp (C)	25	25	25	25	25	25	25	Init. 100%
DO Initial		8.2	8.3	8.4	8.2	8.3	7.9	8.6
DO Final	7.7	7.1	7.1	7.2	7.3	7.3	7.1	
pH Initial		7.62	7.62	7.55	7.55	7.53	7.59	7.55
pH Final	7.82	7.87	7.58	7.7	7.63	7.66	7.62	
Alkalinity								94
Hardness								84
Conductivity								382
Chlorine							<.1	<.1

Summary Reporting Forms Chronic Biomonitoring
Fathead Minnow Larvae Growth and Survival
(Pimephales promelas)

Permittee: City of Fort Smith **NPDES No.:** AR 0021750

		Time:	Date:		Time:	Date:
Composite 1 Collected	**From**	8:00	1/13/2013	**To**	8:00	1/14/2013
Composite 2 Collected	**From**	8:00	1/15/2013	**To**	8:00	1/16/2013
Composite 3 Collected	**From**	8:00	1/17/2013	**To**	8:00	1/18/2013

Test initiated: **am/pm** 14:00 PM **date** 1/15/2013
Test terminated: **am/pm** 13:15 PM **date** 1/22/2013

Dilution water used: **Receiving** **Reconstituted** X

Data Table for Survival

Effluent Conc.%	Percent Survival in Replicate Chambers					Mean Percent Survival			CV%*
	A	B	C	D	E	24h	48h	7 days	
Syn 0 %	87.5	100	100	100	100	100	100	97.5	4.79
3%	100	100	100	100	100	100	100	100	0
5%	100	100	100	100	87.5	100	100	97.5	4.79
6%	100	100	87.5	100	100	100	100	97.5	4.79
8%	100	87.5	100	100	100	100	100	97.5	4.79
11%	100	100	100	100	100	100	100	100	0

Data Table for Survival

Effluent Conc.%	Average Dry Weight in milligrams in Replicate Chambers					Mean Dry Weight mg	CV%*
	A	B	C	D	E		
Syn. 0%	0.322	0.392	0.409	0.372	0.376	0.374	5.17
3%	0.388	0.383	0.351	0.34	0.402	0.373	4.13
5%	0.376	0.388	0.388	0.441	0.331	0.385	6.04
6%	0.341	0.357	0.34	0.424	0.409	0.374	6.2
8%	0.414	0.332	0.389	0.434	0.399	0.394	5.84
11%	0.376	0.33	0.447	0.386	0.387	0.385	6.41

***coefficient of variation = standard deviation x 100/mean.**

Fathead Minnow Larvae Growth and Survival (cont)
(Pimephales promelas)

1. Dunnett's Procedure or Steels Many-One Rank Test as appropriate:

Is the mean survival at 7 days significantly different (p=.05) than the control survival for the % effluent corresponding to:

a) Low Flow or Critical Dilution	**(**	**8 %):**	**Yes:**	**No: X**
b) ½ Low Flow Dilution	**(**	**%):**	**Yes:**	**No:**

2. Dunnett's Procedure (or appropriate test):

Is the mean dry weight (growth) of the effluent at 7 days significantly different (p=0.05) than the control's dry weight for the % effluent corresponding to (significant non-lethal effects):

a) Low Flow or Critical Dilution	**(**	**8 %):**	**Yes:**	**No:** X
b) ½ Low Flow Dilution	**(**	**%):**	**Yes:**	**No:**

3. If you answered NO to 1. a) and 2. a) enter (0) otherwise enter (1): 0

4. If you answered NO to 1. b) and 2. b) enter (0) otherwise enter (1):

5. Enter response to item 3 on DMR Form, parameter #TEP6C.

6. Enter response to item 4 on DMR Form, parameter #TFP6C.

7. Enter percent effluent corresponding to each NOEC below and circle lowest number:

a) NOEC survival: 11 **% effluent**
b) NOEC reproduction: 11 **% effluent**

Biomonitoring Form
Chronic Toxicity Summary Form
Ceriodaphnia dubia
Chemical Parameters Chart

Permittee: City of Fort Smith
NPDES No.: AR 0021750
Contact: Lance McAvoy
Analyst: Tim Harrell
Mike Bollin

Sample No. 1 Collected: Date: 1/14/2013 **Time:** 8:00
Sample No. 2 Collected: Date: 1/16/2013 **Time:** 8:00
Sample No. 3 Collected: Date: 1/18/2013 **Time:** 8:00
Test Begin: Date: 1/15/2013 **Time:** 14:00
Test End: Date: 1/22/2013 **Time:** 13:15

Dilution: 0 Day:	1	2	3	4	5	6	7	Comments
Temp (C)	25	25	25	25	25	25	25	
DO Initial	8.3	8	8.2	8.3	8	8.3	7.9	
DO Final	7.6	7.3	7	7.3	7.2	7.2	6.9	
pH Initial	7.82	7.46	7.48	7.44	7.44	7.44	7.51	
pH Final	7.76	7.74	7.48	7.58	7.52	7.58	7.47	
Alkalinity	60							
Hardness	94							
Conductivity	310							
Chlorine	<.1						<.1	

Dilution: 6 Day:	1	2	3	4	5	6	7	Comments
Temp (C)	25	25	25	25	25	25	25	
DO Initial		8.1	8.2	8.3	8.1	8.3	7.9	
DO Final	7.6	7.2	7.1	7.3	7.3	7.2	7	
pH Initial		7.58	7.57	7.51	7.52	7.5	7.57	
pH Final	7.79	7.8	7.52	7.66	7.6	7.65	7.51	
Alkalinity								
Hardness								
Conductivity								
Chlorine								

Dilution: 3 Day:	1	2	3	4	5	6	7	Comments
Temp (C)	25	25	25	25	25	25	25	
DO Initial		8	8.2	8.3	8	8.3	7.9	
DO Final	7.6	7.3	7	7.3	7.2	7.2	7	
pH Initial		7.54	7.55	7.47	7.47	7.46	7.53	
pH Final	7.77	7.76	7.49	7.62	7.56	7.62	7.49	
Alkalinity								
Hardness								
Conductivit								
Chlorine								

Dilution: 8 Day:	1	2	3	4	5	6	7	Comments
Temp (C)	25	25	25	25	25	25	25	
DO Initial		8.1	8.3	8.4	8.1	8.3	7.9	
DO Final	7.7	7.1	7.7	7.3	7.3	7.3	7	
pH Initial		7.58	7.6	7.51	7.52	7.51	7.6	
pH Final	7.8	7.83	7.55	7.68	7.6	7.65	7.56	
Alkalinity								
Hardness								
Conductivit								
Chlorine								

Dilution: 5 Day:	1	2	3	4	5	6	7	Comments
Temp (C)	25	25	25	25	25	25	25	
DO Initial		8	8.2	8.3	8.1	8.3	7.9	
DO Final	7.6	7.2	7.1	7.3	7.2	7.2	7	
pH Initial		7.56	7.57	7.5	7.51	7.46	7.55	
pH Final	7.79	7.8	7.52	7.65	7.58	7.64	7.51	
Alkalinity								
Hardness								
Conductivit								
Chlorine								

Dilution: 11 Day:	1	2	3	4	5	6	7	Comments
Temp (C)	25	25	25	25	25	25	25	Init. 100%
DO Initial		8.2	8.3	8.4	8.2	8.3	7.9	8.6
DO Final	7.7	7.1	7.1	7.2	7.3	7.3	7.1	
pH Initial		7.62	7.62	7.55	7.55	7.53	7.59	7.55
pH Final	7.82	7.87	7.58	7.7	7.63	7.66	7.62	
Alkalinity								94
Hardness								84
Conductivit								382
Chlorine							<.1	<.1

Summary Reporting Forms
Chronic Biomonitoring

Ceriodaphnia dubia Survival and Reproduction

Permittee: City of Fort Smith **NPDES No.:** AR 0021750

		Time:	Date:		Time:	Date:
Composite 1 Collected	**From**	8:00	1/13/2013	**To**	8:00	1/14/2013
Composite 2 Collected	**From**	8:00	1/15/2013	**To**	8:00	1/16/2013
Composite 3 Collected	**From**	8:00	1/17/2013	**To**	8:00	1/18/2013

Test initiated: **am/pm** 14:00 PM **date** 1/15/2013
Test terminated: **am/pm** 13:15 PM **date** 1/22/2013

Dilution water used: **Receiving** **Reconstituted** X

Percent Survival

Time of Reading	Percent Effluent					
	0	3	5	6	8	11
24h	100	100	100	100	100	100
48h	100	100	100	100	100	100
End of test	100	100	100	100	100	100

Number of Young Produced per Female @ End of Test

Rep	0	3	5	6	8	11
A	22	20	20	21	21	24
B	20	23	26	19	23	26
C	20	21	24	24	27	18
D	25	24	21	18	20	23
E	21	22	18	25	21	19
F	24	23	18	21	18	23
G	22	18	24	20	24	27
H	21	22	19	21	19	19
I	24	29	26	20	23	22
J	26	28	25	26	26	25
Mean	22.5	23	22.1	21.5	22.2	22.6
CV%*	9.43	14.64	14.69	12.26	13.23	13.71

***coefficient of variation = standard deviation x 100/mean.**

Ceriodaphnia dubia
Survival and Reproduction (cont)

1. Fisher's Exact Test:

Is the mean survival at the end of the test significantly different (p=.05) than the control survival for the % effluent corresponding to (lethality):

a) Low Flow or Critical Dilution	**(**	**8 %):**	**Yes:**	**No: X**
b) ½ Low Flow Dilution	**(**	**%):**	**Yes:**	**No:**

2. Dunnett's Procedure or Steel's Many-One Rank Test as appropriate:

Is the mean number of young produced per female significantly different (p=.05) than the control's number of young per female for the % effluent corresponding to (significant non-lethal effects):

a) Low Flow or Critical Dilution	**(**	**8 %):**	**Yes:**	**No:** X
b) ½ Low Flow Dilution	**(**	**%):**	**Yes:**	**No:**

3. If you answered NO to 1. a) and 2. a) enter (0) otherwise enter (1): 0

4. If you answered NO to 1. b) and 2. b) enter (0) otherwise enter (1):

5. Enter response to item 3 on DMR Form, parameter #TEP3B.

6. Enter response to item 4 on DMR Form, parameter #TFP3B.

7. Enter percent effluent corresponding to each NOEC below and circle lowest number:

a) NOEC survival:	11 **% effluent**
b) NOEC reproduction:	11 **% effluent**