RESULTS OF CHRONIC TOXICITY TESTS

3-brood- *Ceriodaphnia dubia* static definitive renewal
7 day - *Pimephales promelas* static definitive renewal

Test date: November 5-12, 2019
Sampling period: November 3-8, 2019
Report date: November 22, 2019

Conducted For:

TOWAMENCIN MA
2225 Kriebel Rd
Lansdale, PA 19446

NPDES: PA0039004

Conducted and Prepared By:

ENVIROSCIENCE, INCORPORATED
5070 Stow Rd.
Stow, OH 44224

EnviroScience
Excellence In Any Environment

For ENVIROSCIENCE, INC.:

Katherine L. Hansler, Aquatic Biologist

For TOWAMENCIN MA:

_____, _____
(signature) (title)

November 22, 2019

Mr. Ralph Jacoby
Towamencin MA
2225 Kriebel Rd
Lansdale, PA 19446

Dear Mr. Jacoby:

Enclosed is a copy of EnviroScience's report for the following Whole Effluent Toxicity (WET) tests that were initiated on November 5, 2019:

(1) 3-brood static, renewal chronic bioassay using *Ceriodaphnia dubia* (water flea) and
(1) 7-day static, renewal chronic bioassay using *Pimephales promelas* (fathead minnow).

The tested concentrations were 24, 48, 72, 96, and 100 percent effluent diluted with moderately hard water. The TIWC is 96%. Endpoints are listed below.

WET endpoints for Towamencin MA; 11/2019
sampling period: 11/03-08/19

C. dubia acute endpoint:	48-hour LC_{50} = >100% effluent, TU_a = <1.0	
C. dubia chronic endpoints:	NOEC=	100% effluent
	LOEC=	>100% effluent
	Ch V=	>100% effluent
	TU_c=	1.00 as 100÷NOEC
	IC_{25} =	>100% effluent (TU_c as 100÷IC_{25} = <1.0)
	TIWC =	Pass (survival and reproduction)
P. promelas acute endpoint:	48-hour LC_{50} = >100% effluent	
	96-hour LC_{50} = >100% effluent; TU_a = <1.0	
P. promelas chronic endpoints:	NOEC=	100% effluent
	LOEC=	>100% effluent
	Ch V=	>100% effluent
	TU_c=	1.00 as 100÷NOEC
	IC_{25} =	>100% effluent (TU_c as 100÷IC_{25} = <1.0)
	TIWC =	Pass (survival and growth)

Please call me if you have any questions.

Sincerely,

Katherine L. Hansler

Katherine L. Hansler, Aquatic Biologist

enclosures

EnviroScience
5070 Stow Road
Stow, OH 44224
Toll Free: 800-940-4025 | Office: 330-688-0111 | Fax: 330-688-3858

TABLE 1.
Toxicity Test Report - General Information

1. Facility/Discharger: Towamencin MA Report Date: 11/22/19

2. Facility Address: 2225 Kriebel Rd, Lansdale, PA 19446

3. NPDES Permit #: PA0039004 4. Receiving Stream: _____

5. Facility Contact: Ralph Jacoby 6. Phone #: 215-855-8165

7. Testing Lab Name: EnviroScience, Inc., 5070 Stow Rd., Stow, OH 44224
PA Certification: 68-01628

8. Lab contact: Kate Hansler 9. Phone #: 330-688-0111

10. Outfall(s) Tested: 001

11. Test Species: *Ceriodaphnia dubia* Method: EPA 1002.0
Pimephales promelas Method: EPA 1000.0

12. Test Conditions: chronic, static-renewal, 3-brood *C. dubia*, 7-day *P. promelas*

13. Dechlorination? yes Original Chlorine Level: 0.152, 0.190, 0.134 mg/l

14. Report Contents:
. Report Contents:

General information .....Table 1
Sampling information .....Table 2
Test dates and times.....Table 2
Test conditions.....Table 3
Initial chemistry .....Table 4
Test results *C. dubia*.....Table 5
Test results *P. promelas*.....Table 6
Additional information .....Table 7
SRT information, dechlorination procedure, deviations/relevant information, summary of results, list of endpoints

Chain-of-Custody/bench sheets/analysis Attachment A
SRT Control Charts

Katherine L. Hansler
Signature of preparer

11/22/19
Date

Katherine L. Hansler
Name (typed or printed)

Aquatic Biologist
Title

TABLE 2

Sampling Summary					
Outfall	Sample Type grab/composite	Volume Received	Sample Collection		Flow - MGD
			Begin MM/DD/YY-Time	End MM/DD/YY-Time	
001	composite	3 gal	11/03/19-0800	11/04/19-0800	
001	composite	4 gal	11/05/19-0800	11/06/19-0800	
001	composite	4 gal	11/07/19-0800	11/08/19-0800	

Dates/Times of Test Performance:			
Ceriodaphnia dubia		*Pimephales promelas*	
Start Date: MM/DD/YY	11/05/19	Start Date: MM/DD/YY	11/05/19
Start Time:	1300 hrs	Start Time:	1430 hrs
End Date: MM/DD/YY	11/12/19	End Date: MM/DD/YY	11/12/19
End Time:	1300 hrs	End Time:	1430 hrs

Comments: Sample receipt in the testing laboratory and sample temperature upon receipt:

1. 11/05/19 at 1015 hrs; 1.5 °C
2. 11/07/19 at 1015 hrs; 1.0 °C
3. 11/09/19 at 1030 hrs; 1.8 °C

TABLE 3

Summary of toxicity test conditions for chronic testing with *Ceriodaphnia dubia* or *Pimephales promelas*.			
		Ceriodaphnia dubia	*Pimephales promelas*
1.	Age and origin of test organisms:	13-21 hours, EnviroScience 11/04/19, 1600-2400	<24 hours, ES 11/04/19-1535
2.	Test type and duration:	static, daily renewal, until 60% of control specimens produce 3rd brood	static, daily renewal, 7 days
3.	Light quality and intensity:	wide spectrum fluorescent/50-100 fc	wide spectrum fluorescent/50-100 fc
4.	Photoperiod:	16/8 hours light/dark	16/8 hours light/dark
5.	Test solution temperatures °C:	25.0±1.0	25.0±1.0
6.	Feeding regime:	daily: alga *Selenastrum capricornutum* to provide approx. 2.3×10^5 cells/ml; and 0.1ml YAT concentrate	200-600 newly hatched brine shrimp, *Artemia salina* per vessel twice daily, at start and end of workday
7.	Size of test vessel:	30 ml plastic cup	600 ml glass beaker
8.	Volume and depth of test solutions:	15 ml and 24 mm	250 ml and 4.2 cm
9.	No. of test organisms per vessel:	1	10
10.	No. of vessels per solution:	10	4
11.	Total no. of organisms per solution:	10	40
12.	Test concentrations as percent effluent:	24, 48, 72, 96, and 100	24, 48, 72, 96, and 100
13.	Renewal MM/DD-test days:	11/05-0,1; 11/07-2,3; 11/09-4,5,6	11/05-0,1; 11/07-2,3; 11/09-4,5,6
14.	Dilution and primary control water:	moderately hard reconstituted water (MHRW)	dilute mineral water (DMW)
15.	Secondary control:	moderately hard reconstituted water + sodium thiosulfate (MHRW+ST)	dilute mineral water + sodium thiosulfate (DMW+ST)
16.	Aeration:	not necessary	not necessary
17.	Endpoints:	mortality - no movement with gentle prodding (LC_{50}, TU_a); survival and reproduction NOEC (TU_c)	mortality - no movement with gentle prodding (LC_{50}, TU_a); survival and growth NOEC (TU_c)
18.	Disease treatment:		no
19.	Drying time and temperature:		24 hours at 60°C, cooled in desiccator

Notes: [1] Adverse effects are also recorded but are not used to calculate toxicity endpoints (e.g. NOEC, TU_c). Adverse effects include cumulative mortality plus behavioral effects such as immobility, atypical swimming, loss of equilibrium, or some other specified condition.

TABLE 4

Initial Water Quality. Values of pH, dissolved oxygen (DO) concentration, conductivity, total alkalinity, total hardness, and total residual chlorine for each new sample of effluent or control water. Values recorded for effluent and renewal solutions on intermediate days and values recorded for final solutions are tabulated on bench sheets in the Attachment.

Sample	DO mg/l	pH s.u.	Conductivity µmho/cm	Alkalinity mg/l $CaCO_3$	Hardness mg/l $CaCO_3$	Residual Chlorine mg/l	Ammonia mg/l
100% effluent:							
05 November 19	8.6	7.1	1655	70	132	0.152/<0.02*	0.41
07 November 19	8.6	7.2	3230	72	180	0.190/<0.02*	0.70
09 November 19	8.6	7.1	3830	78	216	0.134/<0.02*	0.49

*effluent was dechlorinated using sodium thiosulfate

Comments:
These results are only supporting data. Results cannot be reported to PA DEP for NPDES compliance.

Methods or Instrumentation used in chemical analysis:

Dissolved Oxygen: APHA (1998, 20th ed.) 4500-O G., YSI 5100
pH: APHA (1998, 20th ed.) 4500-H^+ B., Orion 920A/Orion 2Star
Conductivity: APHA (1998, 20th ed.) 2510 B., Orion 160
Total Alkalinity: APHA (1998, 20th ed.) 2320 B.
Total Hardness: APHA (1998, 20th ed.) 2340 C.
Total Residual Chlorine: APHA (1998, 20th ed.) 4500-Cl D., HACH Auto CAT 9000
Ammonia nitrogen: APHA (1992, 18th ed.) 4500-NH_3 C., HI 95715

TABLE 5

Results of a 3-Brood *Ceriodaphnia dubia* Survival and Reproduction Test Conducted 11/05/19 – 11/12/19 using Effluent from Outfall 001.

Test Solutions	Cumulative Percent Survival[a] Test Day							No. Young Produced per Specimen	
	1	2	3	4	5	6	7	Mean[a]	%CV
MHRW control/ dilution water	100	100	100	100	100	100	100	29.0	15.93
MHR+ST	100	100	100	100	100	100	100	32.4	13.89
24% Effluent	100	100	100	100	100	100	100	36.5	22.42
48% Effluent	100	100	100	100	100	100	100	36.4	11.30
72% Effluent	100	100	100	100	100	100	100	35.7	14.88
96% Effluent	100	100	100	100	80	80	80	26.4	49.20
100% Effluent	100	100	100	100	100	100	100	30.6	25.09

Acute 48-Hour LC_{50} = >100%	Survival NOEC = 100%	Reproduction NOEC = 100%	**Chronic Toxicity Unit (TUc):**
95% C.I. Lower Limit: --- 95% C.I. Upper Limit: ---	Survival LOEC = >100%	Reproduction LOEC = >100%	**1.0 (100÷NOEC)**
Acute Toxicity Unit (TUa): <1.0 (100÷LC_{50})	Chronic Value Survival = >100%	Chronic Value Reprod. = >100%	
		IC_{25} = >100%	**TUc as 100÷IC_{25}: <1.0**

Methods used to determine LC_{50}: None needed.

Methods used to determine NOEC: Shapiro-Wilk's, Bartlett's (fail), Steel's, ICp model; Cetis 1.9.1.

[a] - * indicates significant reduction from the primary control group (α= 0.05).

control group % survival	control group mean # young/survivor	control group %CV for mean young	control group % survivors producing 3 broods
100	29.0	15.93	90

TABLE 6

Results of a 7-Day *Pimephales promelas* Survival and Growth Test Conducted 11/05/19 – 11/12/19 Using Effluent from Outfall 001.

Test Solutions	Cumulative Percent Survival[a] Test Day							Dry Weight (mg) (based on number exposed)	
	1	2	3	4	5	6	7	Mean[a]	%CV
DMW control/ dilution water	100	100	100	98	98	98	98	0.293	9.51
DMW+ST	100	100	100	100	100	100	100	0.287	9.10
24% Effluent	100	100	100	95	92	92	92	0.316	3.02
48% Effluent	100	100	100	98	98	98	98	0.331	7.08
72% Effluent	100	100	100	100	100	100	95	0.327	17.10
96% Effluent	100	100	100	100	100	100	100	0.356	8.79
100% Effluent	100	100	100	100	98	98	98	0.316	7.69

Acute **96**-Hour LC_{50} = >100% (48-Hour LC_{50}: = >100%)	Survival NOEC = 100%	Growth NOEC = 100%	**Chronic Toxicity Unit (TUc):** **1.0 (100÷NOEC)**
95% C.I. Lower Limit: --- 95% C.I. Upper Limit: ---	Survival LOEC = >100%	Growth LOEC = >100%	
Acute Toxicity Unit (TUa): <1.0 (100÷96-Hour LC_{50})	Chronic Value Survival = >100%	Chronic Value Growth = >100%	
		IC_{25} = >100%	**TU_c as 100÷IC_{25}: <1.0**

Methods used to determine LC_{50}: None needed.

Methods used to determine NOEC: Shapiro-Wilk's, Bartlett's (pass), Dunnett's, ICp model; Cetis 1.9.1.

[a] - * indicates significant reduction from the primary control group (α= 0.05).

control group mean survival proportion	control group survival % CV	control group mean dry weight per **survivor** (mg)	control group dry weight %CV
0.975	5.1	0.301	10.0

Comments: NA = not applicable. SD = sample standard deviation. CV = SD÷mean.

TABLE 7 - Additional Toxicity Test Information

7.1 Standard Reference Toxicant (SRT) Test results (control charts are attached).

Reference Toxicant Test Results							
Species	Date	Duration	Toxicant/ Diluent	control specimens surviving %	controls: mean # young or mean dry weight (mg)	Results	Within control limits?
*C. dubia**	10/15/19-10/22/19	7 days	NaCl/ MHRW	100	36.4 young	IC_{25}: 1.370 g/l	yes
P. promelas *	10/15/19-10/22/19	7 days	KCl/ DMW	100	0.274 mg	IC_{25}: 0.974 g/l	yes

* chronic test.

Acute SRT charts maintained for acute test protocols only. For test dates 10/17-19/19, *C. dubia* 48-hr LC_{50} = 2.44 g NaCl/L MHRW at 25°C; 10/17-21/19, *P. promelas* 96-hr LC_{50} = 7.86 g NaCl/L MHRW at 25°C.

7.2 Indicate below any other relevant information that may aid in the evaluation of this report. Include any deviations from EPA methodology that were necessary for these tests as well as any sample manipulations which were performed, such as aeration, dechlorination with sodium thiosulfate, etc. and the justification for such manipulations or deviations. Attach additional pages as needed.

7.2.1 Minnow growth values were calculated according the most recent edition of U.S. EPA's manual (4th edition), which calculates growth as mean dry weight per fish using the number of specimens exposed rather than the number of survivors.

7.3 Summary of test results:

WET endpoints for Towamencin MA; 11/2019
sampling period: 11/03-08/19

C. dubia acute endpoint: 48-hour LC_{50} = >100% effluent, TU_a = <1.0

C. dubia chronic endpoints:
NOEC= 100% effluent
LOEC= >100% effluent
Ch V= >100% effluent
TU_c= 1.0 as 100÷NOEC
IC_{25} = >100% effluent (TU_c as 100÷IC_{25} = <1.0)
TIWC = Pass (survival and reproduction)

P. promelas acute endpoint: 48-hour LC_{50} = >100% effluent
96-hour LC_{50} = >100% effluent; TU_a = <1.0

P. promelas chronic endpoints:
NOEC= 100% effluent
LOEC= >100% effluent
Ch V= >100% effluent
TU_c= 1.0 as 100÷NOEC
IC_{25} = >100% effluent (TU_c as 100÷IC_{25} = <1.0)
TIWC = Pass (survival and growth)

ATTACHMENTS

Chain-of-Custody/Sample Submission form(s).
Bench sheets and data analysis.
Standard Reference Toxicant (SRT) Control Charts

TERMS

LC_{50} = median lethal effluent concentration = concentration that would kill half of the exposed specimens for a specified exposure period

TU_a = Acute Toxicity Unit = 100÷48-hour or 96-hour LC_{50}

NOEC = No Observed Effect Concentration

LOEC = Lowest Observed Effect Concentration

Ch V = Chronic Value = square root of NOEC*LOEC

TU_c = Chronic Toxicity Unit = 100÷NOEC

IC_{25} = Inhibition Concentration = concentration that would cause a 25% reduction in water flea reproduction or fathead minnow growth

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Cover Sheet

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF POINT AND NON-POINT SOURCE MANAGEMENT

WHOLE EFFLUENT TOXICITY (WET) TEST SUMMARY REPORT
COVER SHEET

NPDES Permit Number: **PA0039004** Facility Name: **Towamencin MA**

Species Tested: ☒ *Ceriodaphnia dubia* ☐ *Pimephales promelas* Test Type: ☒ Chronic ☐ Acute

Re-Test? ☐ Yes ☒ No (If Yes, indicate the date of original test completion: _____)

SAMPLE INFORMATION

	Date/Time	Sample Source	Temperature	Holding Time	Chlorine	Dechlorinated?
1.	11/04/19-0800	001	1.5°C	<36 hrs	0.152 mg/L	☐ Yes ☒ No
2.	11/06/19-0800	001	1.0°C	<36hrs	0.190 mg/L	☐ Yes ☒ No
3.	11/08/19-0800	001	1.8°C	<36hrs	0.134 mg/L	☐ Yes ☒ No

TEST CONDITIONS

Date/Time of Test Initiation: **11/05/19-1300** Date/Time of Test Termination: **11/12/19-1300**

☒ Renewal Test ☐ Non-Renewal Test Frequency of Renewals: **daily**

Dilution Series: **24, 48, 72, 96, 100** Target Instream Waste Concentration (TIWC): **96%**

Age of Organisms at Start of Tests: **13-21 hrs**

Number of Replicates: **10** Number of Organisms per Replicate: **1**

Source of Organisms: **ESCulture** Feeding Regimen: **daily**

Light Intensity: **50-100fc** Photoperiod: **16/8 light/dark**

Temperature measurements made at least once per 24-hour period? ☒ Yes ☐ No (attach log sheet)

DO measured daily in at least one replicate of each concentration? ☒ Yes ☐ No (attach log sheet)

Were the test chambers aerated? ☐ Yes ☒ No Rate:

pH measured daily in at least one replicate of each concentration? ☒ Yes ☐ No (attach log sheet)

Were test acceptability criteria in the EPA method met? ☒ Yes ☐ No

Were there any modifications to or deviations from EPA methods (if Yes, explain on separate sheet)? ☐ Yes ☒ No

DILUTION / REAGENT WATER

Date of Last Test for Chemistry: **11/06/19** Conductivity: **296** µmhos/cm

pH: **7.3** TRC: **<0.02** mg/L

CONTROL RESULTS

Ceriodaphnia dubia

Survival: **100%**

Percent that produced 3 broods (if applicable): **90 %**

Young per Surviving Female (if applicable): **29.0**

Pimephales promelas

Survival:

Mean Dry Weight of Survivors (if applicable):

REFERENCE TOXICITY TESTS

Date of most recent test: **10/15/19** Same conditions as test? ☒ Yes ☐ No

Were test acceptability criteria in the EPA method met? ☒ Yes ☐ No

TEST RESULTS

Control compared to: ☒ TIWC Dilution ☐ Other:

Survival: ☒ Pass ☐ Fail Growth: ☐ Pass ☐ Fail Reproduction: ☒ Pass ☐ Fail

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein; and based on my inquiry of the individuals personally responsible for obtaining the information, I believe the attached information is true, accurate and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine or imprisonment as provided by 18 Pa. C.S. §4904.

Katherine L. Hansler		11/22/19	68-01628
Name of Laboratory Manager	Signature of Laboratory Manager	Date	DEP Lab ID No.

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Cover Sheet

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF POINT AND NON-POINT SOURCE MANAGEMENT

WHOLE EFFLUENT TOXICITY (WET) TEST SUMMARY REPORT
COVER SHEET

NPDES Permit Number: **PA0039004** Facility Name: **Towamencin MA**

Species Tested: ☐ *Ceriodaphnia dubia* ☒ *Pimephales promelas* Test Type: ☒ Chronic ☐ Acute

Re-Test? ☐ Yes ☒ No (If Yes, indicate the date of original test completion: _____)

SAMPLE INFORMATION

	Date/Time	Sample Source	Temperature	Holding Time	Chlorine	Dechlorinated?
1.	11/04/19-0800	001	1.5°C	<36 hrs	0.152 mg/L	☒ Yes ☐ No
2.	11/06/19-0800	001	1.0°C	<36hrs	0.190 mg/L	☒ Yes ☐ No
3.	11/08/19-0800	001	1.8°C	<36hrs	0.134 mg/L	☒ Yes ☐ No

TEST CONDITIONS

Date/Time of Test Initiation: **11/05/19-1430** Date/Time of Test Termination: **11/12/19-1430**

☒ Renewal Test ☐ Non-Renewal Test Frequency of Renewals: **daily**

Dilution Series: **24, 48, 72, 96, 100** Target Instream Waste Concentration (TIWC): **96%**

Age of Organisms at Start of Tests: **<24hrs**

Number of Replicates: **4** Number of Organisms per Replicate: **10**

Source of Organisms: **ESCulture** Feeding Regimen: **daily**

Light Intensity: **50-100fc** Photoperiod: **16/8 light/dark**

Temperature measurements made at least once per 24-hour period? ☒ Yes ☐ No (attach log sheet)

DO measured daily in at least one replicate of each concentration? ☒ Yes ☐ No (attach log sheet)

Were the test chambers aerated? ☐ Yes ☒ No Rate:

pH measured daily in at least one replicate of each concentration? ☒ Yes ☐ No (attach log sheet)

Were test acceptability criteria in the EPA method met? ☒ Yes ☐ No

Were there any modifications to or deviations from EPA methods (if Yes, explain on separate sheet)? ☐ Yes ☒ No

DILUTION / REAGENT WATER

Date of Last Test for Chemistry: **11/09/19** Conductivity: **184** µmhos/cm

pH: **7.5** TRC: **<0.02** mg/L

CONTROL RESULTS

Ceriodaphnia dubia

Survival:

Percent that produced 3 broods (if applicable): %

Young per Surviving Female (if applicable):

Pimephales promelas

Survival: **98%**

Mean Dry Weight of Survivors (if applicable): **0.301**

REFERENCE TOXICITY TESTS

Date of most recent test: **10/15/19** Same conditions as test? ☒ Yes ☐ No

Were test acceptability criteria in the EPA method met? ☒ Yes ☐ No

TEST RESULTS

Control compared to: ☒ TIWC Dilution ☐ Other:

Survival: ☒ Pass ☐ Fail Growth: ☒ Pass ☐ Fail Reproduction: ☐ Pass ☐ Fail

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein; and based on my inquiry of the individuals personally responsible for obtaining the information, I believe the attached information is true, accurate and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine or imprisonment as provided by 18 Pa. C.S. §4904.

Katherine L. Hansler		11/22/19	68-01628
Name of Laboratory Manager	Signature of Laboratory Manager	Date	DEP Lab ID No.

DEP Whole Effluent Toxicity (WET) Analysis Spreadsheet

Type of Test	Chronic
Species Tested	Ceriodaphnia
Endpoint	Reproduction
TIWC (decimal)	0.96
No. Per Replicate	1
TST b value	0.75
TST alpha value	0.2

Facility Name: Towamencin MA

Permit No.: PA0039004

Test Completion Date: 11/12/2019

Replicate No.	Control	TIWC
1	20	7
2	24	26
3	27	35
4	31	38
5	27	34
6	33	36
7	31	33
8	30	23
9	36	32
10	31	0
11		
12		
13		
14		
15		
Mean	29.000	26.400
Std Dev.	4.619	12.989
# Replicates	10	10

T-Test Result	1.0939
Deg. of Freedom	12
Critical T Value	0.8726
Pass or Fail	**PASS**

Test Completion Date:

Replicate No.	Control	TIWC
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
Mean	0.000	0.000
Std Dev.		
# Replicates		

T-Test Result	
Deg. of Freedom	
Critical T Value	
Pass or Fail	

Test Completion Date:

Replicate No.	Control	TIWC
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
Mean		
Std Dev.		
# Replicates		

T-Test Result	
Deg. of Freedom	
Critical T Value	
Pass or Fail	

Test Completion Date:

Replicate No.	Control	TIWC
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
Mean		
Std Dev.		
# Replicates		

T-Test Result	
Deg. of Freedom	
Critical T Value	
Pass or Fail	

DEP Whole Effluent Toxicity (WET) Analysis Spreadsheet

Type of Test	Chronic
Species Tested	Ceriodaphnia
Endpoint	Survival
TIWC (decimal)	0.96
No. Per Replicate	1
TST b value	0.75
TST alpha value	0.2

Facility Name

Towamencin MA

Permit No.

PA0039004

Test Completion Date 11/12/2019

Replicate No.	Control	TIWC
1	1	0
2	1	1
3	1	1
4	1	1
5	1	1
6	1	1
7	1	1
8	1	1
9	1	1
10	1	0
11		
12		
13		
14		
15		
Mean	1.000	0.800
Std Dev.	0.000	0.422
# Replicates	10	10
T-Test Result		
Deg. of Freedom		
Critical T Value		
Pass or Fail	**PASS**	

Test Completion Date

Replicate No.	Control	TIWC
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
Mean	0.000	0.000
Std Dev.		
# Replicates		
T-Test Result		
Deg. of Freedom		
Critical T Value		
Pass or Fail		

Test Completion Date

Replicate No.	Control	TIWC
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
Mean	0.000	0.000
Std Dev.		
# Replicates		
T-Test Result		
Deg. of Freedom		
Critical T Value		
Pass or Fail		

Test Completion Date

Replicate No.	Control	TIWC
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
Mean		
Std Dev.		
# Replicates		
T-Test Result		
Deg. of Freedom		
Critical T Value		
Pass or Fail		

DEP Whole Effluent Toxicity (WET) Analysis Spreadsheet

Type of Test	Chronic
Species Tested	Pimephales
Endpoint	Survival
TIWC (decimal)	0.96
No. Per Replicate	10
TST b value	0.75
TST alpha value	0.25

Facility Name

Towamencin MA

Permit No.

PA0039004

Test Completion Date 11/12/2019

Replicate No.	Control	TIWC
1	1	1
2	0.9	1
3	1	1
4	1	1
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
Mean	0.975	1.000
Std Dev.	0.050	0.000
# Replicates	4	4

T-Test Result	26.1497
Deg. of Freedom	3
Critical T Value	0.7649
Pass or Fail	**PASS**

Test Completion Date

Replicate No.	Control	TIWC
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
Mean	0.000	0.000
Std Dev.		
# Replicates		

T-Test Result	
Deg. of Freedom	
Critical T Value	
Pass or Fail	

Test Completion Date

Replicate No.	Control	TIWC
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
Mean	0.000	0.000
Std Dev.		
# Replicates		

T-Test Result	
Deg. of Freedom	
Critical T Value	
Pass or Fail	

Test Completion Date

Replicate No.	Control	TIWC
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
Mean		
Std Dev.		
# Replicates		

T-Test Result	
Deg. of Freedom	
Critical T Value	
Pass or Fail	

DEP Whole Effluent Toxicity (WET) Analysis Spreadsheet

Type of Test	Chronic
Species Tested	Pimephales
Endpoint	Growth
TIWC (decimal)	0.96
No. Per Replicate	10
TST b value	0.75
TST alpha value	0.25

Facility Name: Towamencin MA

Permit No.: PA0039004

Test Completion Date: 11/12/2019

Replicate No.	Control	TIWC
1	0.309	0.348
2	0.286	0.391
3	0.32	0.367
4	0.257	0.317
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
Mean	0.293	0.356
Std Dev.	0.028	0.031
# Replicates	4	4

T-Test Result	7.2340
Deg. of Freedom	5
Critical T Value	0.7267
Pass or Fail	**PASS**

Test Completion Date:

Replicate No.	Control	TIWC
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
Mean	0.000	0.000
Std Dev.		
# Replicates		

T-Test Result	
Deg. of Freedom	
Critical T Value	
Pass or Fail	

Test Completion Date:

Replicate No.	Control	TIWC
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
Mean		
Std Dev.		
# Replicates		

T-Test Result	
Deg. of Freedom	
Critical T Value	
Pass or Fail	

Test Completion Date:

Replicate No.	Control	TIWC
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
Mean		
Std Dev.		
# Replicates		

T-Test Result	
Deg. of Freedom	
Critical T Value	
Pass or Fail	

EnviroScience
Excellence In Any Environment

EnviroScience, Inc.
5070 Stow Road
Stow, OH 44224
Phone (330) 688-0111
Fax (330) 688-3858
1-800-940-4025

Client: Towamencin Municipal Authority (TMA)
Address: 2225 Kriebel Road
Lansdale, PA 19446
Contact: Ralph Jacoby
Phone: 215-855-8165
Permit #: **PA0039004**

SAMPLE SUBMISSION AND CHAIN OF CUSTODY FORM

Test(s) to be performed:
(X) Chronic Definitive
( ) Acute Definitive
( ) 48 hr. Screening
( ) 24 hr. Stormwater
( ) Pass/Fail _____

Test Species
( ) P. promelas and C. dubia
(X) P. promelas
(X) C. dubia
( ) D. magna
( ) _____

Wastewater Type (Circle One)
Industrial Other
Municipal
Other _____

When listing a composite sample in the table below, please provide the start and end time of the composite period.

Start		End		Station No.	Sample Site	Sample Type		Number of Cubitainers	Chemistry				
Date	Time	Date	Time			Comp	Grab		TRC	Cond	D.O.	pH	Temp. °C
~~11/4~~ C.F					~~TMA~~	~~✓~~		~~3~~					
11/3/19	8AM	11/4/19	8AM	Plant	TMA	✓		3					

Comp. = Composite, D.O. = Dissolved Oxygen measured in mg/l, pH measured in s.u., Conductivity measured in uohm/cm

Sampling Collector's Information: please ✓ all appropriate boxes

✓	Effluent	Collectors Name:	Clifford Eulwood
	Upstream	Collectors Signature:	[signature]
	Near Field	M.G.D. =	
	Far Field	Weather Conditions:	
Plume Determined By What Method?			

EnviroScience Personnel Only

	Effluent	Collected By:	
	Upstream	Collectors Signature:	
	Near Field		
	Far Field		

Comments:

Received from:	Received by:	Date	Time	Shipping Information		EnviroScience Use Only	
				Date Shipped		Client	Towamencin
	[signature]	110519	1015	Time Shipped		Sample ID's	TOWA110519EFF
				Method Shipped		Cond. Of Container	good
				ES Vehicle		Temp. °C	1.5°C

EnviroScience, Inc. Cooler Receipt Form

Client Towamencin

ES Sample ID TOWA 110519 EFF

Cooler Received by: AM

Date Cooler Received and Opened 110519

Received from: FedEX ✓ UPS___ Client Drop Off____ ES Courier____

1. Were custody seals on the outside of cooler? Yes____ No ✓
   Were custody seals signed, dated and intact? Yes____ No ✓
2. Did Chain of Custody (COC) accompany the samples? Yes ✓ No____
3. Were the COC's signed in the appropriate places? Yes ✓ No____
   If No explain_____
4. Was the sample time and date filled in correctly? Yes ✓ No____
5. Sample Temperature upon receipt 1.5 °C
6. Did all sample container labels match the samples written on the COC? Yes____ No ✓
   Were the sample containers in good condition? Yes ✓ No____
7. Was sufficient quantity received to perform indicated tests? Yes ✓ No____
8. Was this sample received within required holding time? Yes ✓ No____

Explain any discrepancies or client notifications that occurred regarding this sample: no labels on cubes

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EnviroScience, Inc.
5070 Stow Road
Stow, OH 44224
Phone (330) 688-0111
Fax (330) 688-3858
1-800-940-4025

Client: Towamencin Municipal Authority
Address: 2225 Kriebel Road
Lansdale, PA 19446
Contact: Ralph Jacoby
Phone: 215-855-8165
Permit #: PA0039004

Tracking# 7910 0293 8943

SAMPLE SUBMISSION AND CHAIN OF CUSTODY FORM

Test(s) to be performed:
(X) Chronic Definitive
( ) Acute Definitive
( ) 48 hr. Screening
( ) 24 hr. Stormwater
( ) Pass/Fail _____

Test Species
(X) P. promelas and C. dubia
( ) P. promelas
( ) C. dubia
( ) D. magna
( ) _____

Wastewater Type (Circle One)
Industrial Other
Municipal
Other _____

When listing a composite sample in the table below, please provide the start and end time of the composite period.

Start		End		Station No.	Sample Site	Sample Type		Number of Cubitainers	Chemistry				
Date	Time	Date	Time			Comp	Grab		TRC	Cond	D.O.	pH	Temp. °C
11-5-19	8Am	11-6-19	8Am		TMA	✓							

Comp. = Composite, D.O. = Dissolved Oxygen measured in mg/l, pH measured in s.u., Conductivity measured in uohm/cm

Sampling Collector's Information: please ✓ all appropriate boxes

✓	Effluent	Collectors Name:	Clifford Fulwood
	Upstream	Collectors Signature:	Clifford Fulwood
	Near Field	M.G.D. =	
	Far Field	Weather Conditions:	
Plume Determined By What Method?			

EnviroScience Personnel Only

	Effluent	Collected By:	
	Upstream	Collectors Signature:	
	Near Field		
	Far Field		

Comments:

Received from:	Received by:	Date	Time	Shipping Information		EnviroScience Use Only	
				Date Shipped		Client	
	Conami	11/07/19	1015	Time Shipped		Sample ID's	
				Method Shipped		Cond. Of Container	
				ES Vehicle		Temp. °C	1.0

EnviroScience, Inc. Cooler Receipt Form

Client Towamencin M.A.

ES Sample ID TOWA 110719 EFF

Cooler Received by: CAB

Date Cooler Received and Opened 110719

Received from: FedEX X UPS___ Client Drop Off____ ES Courier____

1. Were custody seals on the outside of cooler? Yes____ No X
   Were custody seals signed, dated and intact? Yes____ No X
2. Did Chain of Custody (COC) accompany the samples? Yes X No____
3. Were the COC's signed in the appropriate places? Yes____ No X
   If No explain Sig needed in "recieved from" box
4. Was the sample time and date filled in correctly? Yes X No____
5. Sample Temperature upon receipt 1.0 °C
6. Did all sample container labels match the samples written on the COC? Yes____ No X
   Were the sample containers in good condition? Yes X No____
7. Was sufficient quantity received to perform indicated tests? Yes X No____
8. Was this sample received within required holding time? Yes X No____

Explain any discrepancies or client notifications that occurred regarding this sample:

Containers NOT labeled

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Fax (330) 688-3858

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EnviroScience, Inc.
5070 Stow Road
Stow, OH 44224
Phone (330) 688-0111
Fax (330) 688-3858
1-800-940-4025

Client: Towamencin Municipal Authority
Address: 2225 Kriebel Road
Lansdale, PA 19446
Contact: Ralph Jacoby
Phone: 215-855-8165
Permit #: PA0039004

Friday pick-up
TRC#
7910 02939527

SAMPLE SUBMISSION AND CHAIN OF CUSTODY FORM

Test(s) to be performed:
(X) Chronic Definitive
( ) Acute Definitive
( ) 48 hr. Screening
( ) 24 hr. Stormwater
( ) Pass/Fail _____

Test Species
(X) P. promelas and C. dubia
( ) P. promelas
( ) C. dubia
( ) D. magna
( ) _____

Wastewater Type (Circle One)
Industrial Other
Municipal
Other _____

When listing a composite sample in the table below, please provide the start and end time of the composite period.

Start		End		Station No.	Sample Site	Sample Type		Number of Cubitainers	Chemistry				
Date	Time	Date	Time			Comp	Grab		TRC	Cond	D.O.	pH	Temp. °C
11-7-19	8Am	11-8-19	8Am			X							

Comp. = Composite, D.O. = Dissolved Oxygen measured in mg/l, pH measured in s.u., Conductivity measured in uohm/cm

Sampling Collector's Information: please ✓ all appropriate boxes

✓	Effluent	Collectors Name:	Clifford Fulwood
	Upstream	Collectors Signature:	[signature]
	Near Field	M.G.D. =	
	Far Field	Weather Conditions:	
Plume Determined By What Method?			

EnviroScience Personnel Only

	Effluent	Collected By:	
	Upstream	Collectors Signature:	
	Near Field		
	Far Field		

Comments:

Received from:	Received by:	Date	Time	Shipping Information		EnviroScience Use Only	
	Courtney Berish	110919	1030	Date Shipped	110819	Client	Towamencin
				Time Shipped	8am	Sample ID's	TOWA
				Method Shipped	Fedex	Cond. Of Container	good
				ES Vehicle		Temp. °C	1.8

EnviroScience, Inc. Cooler Receipt Form

Client Tourmenrin

ES Sample ID TOWA

Cooler Received by: CB

Date Cooler Received and Opened 110919

Received from: FedEX ___ UPS ✓ Client Drop Off ___ ES Courier ___

1. Were custody seals on the outside of cooler? Yes ___ No ✓
   Were custody seals signed, dated and intact? Yes ___ No ✓
2. Did Chain of Custody (COC) accompany the samples? Yes ✓ No ___
3. Were the COC's signed in the appropriate places? Yes ✓ No ___
   If No explain ___
4. Was the sample time and date filled in correctly? Yes ✓ No ___
5. Sample Temperature upon receipt 1-8 °C
6. Did all sample container labels match the samples written on the COC? Yes ✓ No ___
   Were the sample containers in good condition? Yes ✓ No ___
7. Was sufficient quantity received to perform indicated tests? Yes ✓ No ___
8. Was this sample received within required holding time? Yes ✓ No ___

Explain any discrepancies or client notifications that occurred regarding this sample: ___

EnviroScience
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5070 Stow Road
Stow, Ohio 44224
Phone (330) 688-0111; 1-800-940-4025
Fax (330) 688-3858

Project ID:	TOWA 110519	Start Date:	110519	Time:	1300
Permit No.:	PA0039004	End Date:	111219	Time:	1300
Diluent:	MHR				

MHR	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number Adults	# Dead/ # Adversely Affected
	1											10	0 / 0
	2											10	0 / 0
	3	0g	0g	0g	0g	0g	0g	0g	0g	0g	0g	10	0 / 0
	4	0g	4g	0g	0g	0g	0g	0g	0g	0g	0g	10	0 / 0
	5	8g	0g	6g	7g	6g	7g	5g	8g	4g	4g	10	0 / 0
	6	0g	9g	8g	10g	9g	11g	9g	11g	14g	8g	10	0 / 0
	7	12g	11g	13g	14g	12g	15g	17g	11g	18g	19g	10	0 / 0
Totals		20	24	27	31	27	33	31	30	36	31	$\bar{x}$ = 29.0	
Number of Broods		2	3	3	3	3	3	3	3	3	3	CV = 15.93	

MHR + ST	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number Adults	# Dead/ # Adversely Affected
	1											10	0 / 0
	2											10	0 / 0
	3	0g	0g	0g	0g	0g	0g	0g	0g	0g	0g	10	0 / 0
	4	0g	6g	0g	0g	0g	0g	0g	3g	0g	0g	10	0 / 0
	5	6g	0g	4g	5g	4g	4g	4g	0g	6g	6g	10	0 / 0
	6	9g	14g	11g	14g	12g	13g	11g	13g	14g	13g	10	0 / 0
	7	10g	15g	14g	18g	22g	13g	15g	20g	16g	9g	10	0 / 0
Totals		25	35	29	37	38	30	36	36	36	28	$\bar{x}$ = 32.4	
Number of Broods		3	3	3	3	3	3	3	3	3	3	CV = 13.89	

24%	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number Adults	# Dead/ # Adversely Affected
	1											10	0 / 0
	2											10	0 / 0
	3	0	0	0	0	0	0	0	0	0	0	10	0 / 0
	4	0	0	0	0	0	0	0	4	0	0	10	0 / 0
	5	7	0	4	8	8	7	5	0	5	6	10	0 / 0
	6	0	12	11	14	13	12	14	14	15	13	10	0 / 0
	7	10	16	15	22	24	17	20	21	20	22	10	0 / 0
Totals		17	34	30	44	45	36	39	39	40	41	$\bar{x}$ = 36.5	
Number of Broods		2	3	3	3	3	3	3	3	3	3	CV = 22.42	

EnviroScience Inc. ***Ceriodaphnia dubia*** **Survival and Reproduction; EPA 1002.0: pg. 2 of 4**

Project ID:	TINA
Permit No.:	

Start Date:	110519

48%	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number Adults	# Dead/ # Adversely Affected
	1	/	/	/	/	/	/	/	/	/	/	10	0 / 0
	2	/	/	/	/	/	/	/	/	/	/	10	0 / 0
	3	0	0	0	0	0	0	0	0	0	0	10	0 / 0
	4	0	4	0	0	0	0	0	0	0	0	10	0 / 0
	5	7	0	7	9	7	6	6	7	6	7	10	0 / 0
	6	13	12	14	13	12	13	13	12	9	12	10	0 / 0
	7	16	14	23	19	16	18	17	20	18	14	10	0 / 0
Totals		36	30	44	41	35	37	36	39	33	33	$\bar{x}$ = 36.4	
Number of Broods		3	3	3	3	3	3	3	3	3	3	CV = 11.30	

72%	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number Adults	# Dead/ # Adversely Affected
	1	/	/	/	/	/	/	/	/	/	/	10	0 / 0
	2	/	/	/	/	/	/	/	/	/	/	10	0 / 0
	3	0	0	0	0	0	0	0	0	0	0	10	0 / 0
	4	0	0	0	0	0	0	0	0	0	0	10	0 / 0
	5	8	0	6	8	7	8	5	8	6	6	10	0 / 0
	6	6	11	10	12	10	11	9	13	13	12	10	0 / 0
	7	10	19	16	22	15	21	22	20	18	19	10	0 / 0
Totals		24	36	32	42	32	40	36	41	37	37	$\bar{x}$ = 35.7	
Number of Broods		~~2~~ 3	3	3	3	3	3	3	3	3	3	CV = 14.88	

96%	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number Adults	# Dead/ # Adversely Affected
	1	/	/	/	/	/	/	/	/	/	/	10	0 / 0
	2	/	/	/	/	/	/	/	/	/	/	10	0 / 0
	3	0	4	0	0	0	0	0	0	0	0	10	0 / 0
	4	0	0	0	0	0	0	0	0	0	0	10	0 / 0
	5	~~10~~	8	3	7	4	5	4	2	5	~~0~~	10	2 / 2
	6	~~1~~	14	12	13	9	10	10	11	12	~~1~~	10	2 / 2
	7	~~14~~	19	20	18	21	21	19	~~10~~	15	~~1~~	10	2 / 2
Totals		7	26	35	38	34	36	33	23	32	0	$\bar{x}$ = 26.4	
Number of Broods		1	4	3	3	3	3	3	3	3	0	CV = 49.20	

EnviroScience Inc. ***Ceriodaphnia dubia*** **Survival and Reproduction; EPA 1002.0: pg. 3 of 4**

Project ID:	TDWA
Permit No.:	

Start Date:	110519

100%	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number Adults	# Dead/ # Adversely Affected
	1	/	/	/	/	/	/	/	/	/	/	10	0 / 0
	2	/	/	/	/	/	/	/	/	/	/	10	0 / 0
	3	0	0	0	0	0	0	0	0	0	0	10	0 / 0
	4	0	2	0	0	0	0	0	0	0	0	10	0 / 0
	5	4	0	3	6	5	7	3	5	6	4	10	0 / 0
	6	3	8	6	12	12	10	11	0	12	13	10	0 / 0
	7	16	21	15	21	21	16	20	10	19	15	10	0 / 0
Totals		23	31	24	39	38	33	34	15	37	32	$\bar{X}$ = 30.6	
Number of Broods		3	3	3	3	3	3	3	2	3	3	CV = 25.09	

	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number Adults	# Dead/ # Adversely Affected
	1												/
	2												/
	3												/
	4												/
	5												/
	6												/
	7												/
Totals												$\bar{X}$ =	
Number of Broods												CV =	

	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number Adults	# Dead/ # Adversely Affected
	1												/
	2												/
	3												/
	4												/
	5												/
	6												/
	7												/
Totals												$\bar{X}$ =	
Number of Broods												CV =	

EnviroScience Inc. ***Ceriodaphnia dubia*** **Survival and Reproduction; EPA 1002.0: pg. 4 of 4**

Project ID:	TONA
Permit No.:	

KHV

Start Date:	110519

Brood Board Information:

Replicate	1	2	3	4	5	6	7	8	9	10	BB #: 110219 A+B
	49	50	52	53	54	57	11	15	16	17	Date: 110419
											Time: 1600-2400

Test Information:

Day	Initiation	Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7
YAT Batch #	YATC 102119	YAT C 102119		YATC 102119		YATD 102119		YATD 102119		YATD 102119		YATBE 102119		
Algae Batch #	ABSB 102819	ABSC 102819		ABSC 102819		ABSC 102819		AROA 110919		AROA 110919		AROB 110919		
Test Level:	Solution Temperature °C for Initial (I) and Final (F) solutions													
	I	I	F	I	F	I	F	I	F	I	F	I	F	F
MHR	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
MHR+ST	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
24%	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
48%	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
72%	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
96%	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
100%	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Change time		13	15	12	30	13	00	13	55	13	40	13	35	~~16~~ 1300
√transfer	√Loading	√		√		√		√		√		√		
Initials	TM	MT		TM		TM		CB		TM		KC		KC

Initial is the initiation temperature, or the temperature of the new board C. dubia are being transferred into.

Comments Section:

Day	Date	Comments	Initials

Key M=Missing, D=Dead, KIT=Killed in transfer, m=empty, g=gravid, y=eyed, r=releasing, N=Sample number, A=Adversely affected

CETIS Analytical Report

Report Date:	19 Nov-19 12:05 (p 1 of 1)
Test Code:	4C8EC261 | 12-8442-4289

Ceriodaphnia 7-d Survival and Reproduction Test — **EnviroScience**

Analysis ID:	03-0715-9257	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.9.1
Analyzed:	19 Nov-19 12:04	**Analysis:**	STP-2xK Contingency Tables	**Official Results:**	Yes

Sample ID:	15-6097-4960	**Code:**	5D0A9670	**Client:**	Towamencin
Sample Date:	04 Nov-19 08:00	**Material:**	POTW Effluent	**Project:**	
Receipt Date:	05 Nov-19 10:15	**Source:**	Discharge Monitoring Report		
Sample Age:	29h	**Station:**	001		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU
Untransformed	C > T	100	> 100	n/a	1

Fisher Exact/Bonferroni-Holm Test

Control vs	Group	Test Stat	P-Type	P-Value	Decision(α:5%)
Dilution Water	24	1.0000	Exact	1.0000	Non-Significant Effect
	48	1.0000	Exact	1.0000	Non-Significant Effect
	72	1.0000	Exact	1.0000	Non-Significant Effect
	96	0.2368	Exact	1.0000	Non-Significant Effect
	100	1.0000	Exact	1.0000	Non-Significant Effect

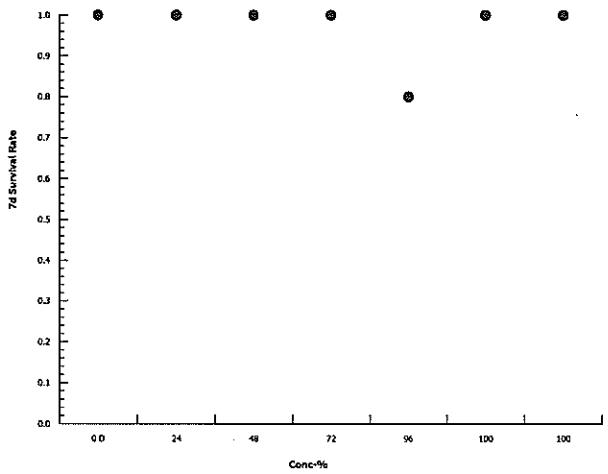
Data Summary

Conc-%	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
0	D	10	0	10	1	0	0.0%
24		10	0	10	1	0	0.0%
48		10	0	10	1	0	0.0%
72		10	0	10	1	0	0.0%
96		8	2	10	0.8	0.2	20.0%
100		10	0	10	1	0	0.0%

7d Survival Rate Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	D	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
24		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
48		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
72		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
96		0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000
100		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Graphics



CETIS Analytical Report

Report Date: 19 Nov-19 12:05 (p 1 of 2)
Test Code: 4C8EC261 | 12-8442-4289

Ceriodaphnia 7-d Survival and Reproduction Test — **EnviroScience**

Analysis ID:	21-4343-7064	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.9.1
Analyzed:	19 Nov-19 12:04	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

Sample ID:	15-6097-4960	**Code:**	5D0A9670	**Client:**	Towamencin
Sample Date:	04 Nov-19 08:00	**Material:**	POTW Effluent	**Project:**	
Receipt Date:	05 Nov-19 10:15	**Source:**	Discharge Monitoring Report		
Sample Age:	29h	**Station:**	001		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	100	> 100	n/a	1	27.39%

Steel Many-One Rank Sum Test

Control vs	Conc-%	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Dilution Water	24	138	75	2	18	Asymp	1.0000	Non-Significant Effect
	48	144.5	75	3	18	Asymp	1.0000	Non-Significant Effect
	72	141.5	75	2	18	Asymp	1.0000	Non-Significant Effect
	96	112	75	2	18	Asymp	0.9455	Non-Significant Effect
	100	119.5	75	3	18	Asymp	0.9889	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	944.933	188.987	5	3.14	0.0147	Significant Effect
Error	3249.8	60.1815	54			
Total	4194.73		59			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	16.79	15.09	0.0049	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8956	0.9459	9.1E-05	Non-Normal Distribution

Reproduction Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	10	29	25.7	32.3	30.5	20	36	1.461	15.93%	0.00%
24		10	36.5	30.65	42.35	39	17	45	2.587	22.42%	-25.86%
48		10	36.4	33.46	39.34	36	30	44	1.301	11.30%	-25.52%
72		10	35.7	31.9	39.5	36.5	24	42	1.68	14.88%	-23.10%
96		10	26.4	17.11	35.69	32.5	0	38	4.107	49.20%	8.97%
100		10	30.6	25.11	36.09	32.5	15	39	2.428	25.09%	-5.52%

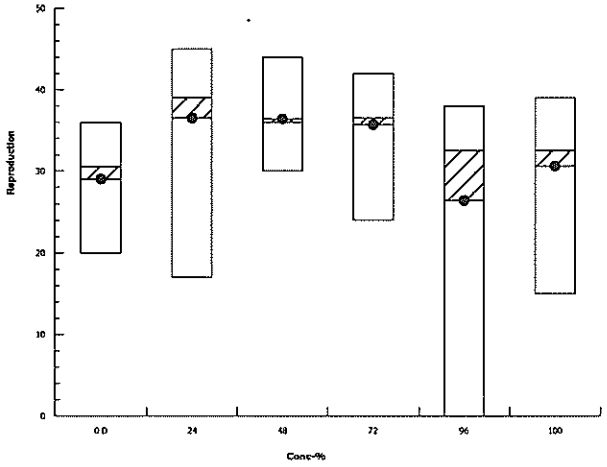
Reproduction Detail

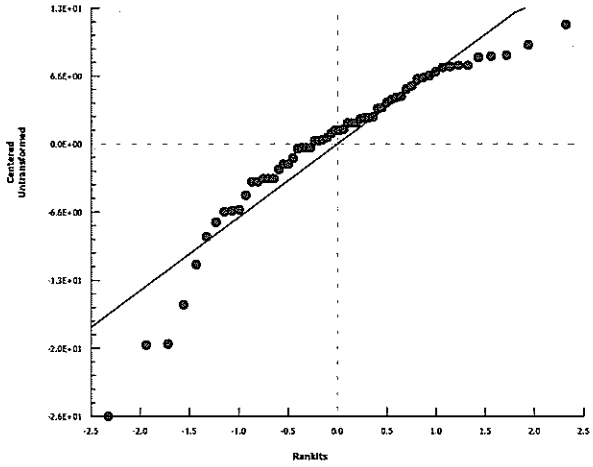
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	D	20	24	27	31	27	33	31	30	36	31
24		17	34	30	44	45	36	39	39	40	41
48		36	30	44	41	35	37	36	39	33	33
72		24	36	32	42	32	40	36	41	37	37
96		7	26	35	38	34	36	33	23	32	0
100		23	31	24	39	38	33	34	15	37	32

Ceriodaphnia 7-d Survival and Reproduction Test — **EnviroScience**

Analysis ID:	21-4343-7064	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.9.1
Analyzed:	19 Nov-19 12:04	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

Graphics





CETIS Analytical Report

Report Date:	19 Nov-19 12:05 (p 1 of 1)
Test Code:	4C8EC261 | 12-8442-4289

Ceriodaphnia 7-d Survival and Reproduction Test — **EnviroScience**

Analysis ID:	08-1091-8837	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.9.1
Analyzed:	19 Nov-19 12:05	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Sample ID:	15-6097-4960	**Code:**	5D0A9670	**Client:**	Towamencin
Sample Date:	04 Nov-19 08:00	**Material:**	POTW Effluent	**Project:**	
Receipt Date:	05 Nov-19 10:15	**Source:**	Discharge Monitoring Report		
Sample Age:	29h	**Station:**	001		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	1595469	1000	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC25	>100	n/a	n/a	<1	n/a	n/a

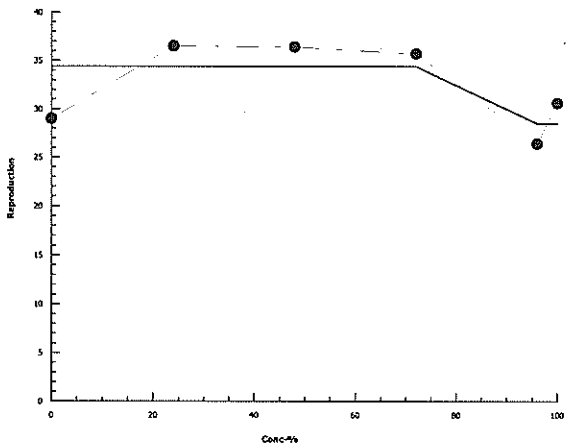
Reproduction Summary

			Calculated Variate						
Conc-%	**Code**	**Count**	**Mean**	**Min**	**Max**	**Std Err**	**Std Dev**	**CV%**	**%Effect**
0	D	10	29	20	36	1.461	4.619	15.93%	0.0%
24		10	36.5	17	45	2.587	8.182	22.42%	-25.86%
48		10	36.4	30	44	1.301	4.115	11.30%	-25.52%
72		10	35.7	24	42	1.68	5.314	14.88%	-23.1%
96		10	26.4	0	38	4.107	12.99	49.20%	8.97%
100		10	30.6	15	39	2.428	7.677	25.09%	-5.52%

Reproduction Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	D	20	24	27	31	27	33	31	30	36	31
24		17	34	30	44	45	36	39	39	40	41
48		36	30	44	41	35	37	36	39	33	33
72		24	36	32	42	32	40	36	41	37	37
96		7	26	35	38	34	36	33	23	32	0
100		23	31	24	39	38	33	34	15	37	32

Graphics



EnviroScience Inc. *Pimephales promelas* Survival Data; EPA 1000.0: pg. 1 of 2

Project ID:	TOWA110519	**Start Date:**	110519	**Time:**	1430
Permit No.:	PA0039004	**End Date:**	111219	**Time:**	1430
Hatch #:	CBG KLH BOB 1535 HOT BIG 110419	**Origin:**	ES cultures	**Diluent:**	DMW

	Rep	n	# of P. promelas Mortalities / # of P. promelas Adversely Affected						
			1	2	3	4	5	6	7
DMW	A	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	B	10	0 / 0	0 / 0	0 / 0	1 / 1	1 / 1	1 / 1	1 / 1
	C	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	D	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	total %'s								
DMW + ST	A	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	B	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	C	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	D	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	total %'s								
24	A	10	0 / 0	0 / 0	0 / 0	1 / 1	1 / 1	1 / 1	1 / 1
	B	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	C	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	D	10	0 / 0	0 / 0	0 / 0	1 / 1	2 / 2	2 / 2	2 / 2
	total %'s								
48	A	10	0 / 0	0 / 0	0 / 0	1 / 1	1 / 1	1 / 1	1 / 1
	B	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	C	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	D	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	total %'s								

Test Solution Temperature - °C. Key : I=initial (fresh renewal solution) , F = final (24-hr old solution)

test level:	*I*	*I*	*F*	*I*	*F*	*I*	*F*	*I*	*F*	*I*	*F*	*I*	*F*	*F*
DMW	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
DMW+ST	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
24	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
48	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
72	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
96	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
100	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
renew time		~~1235~~ 1235		1320		1350		1340		1340		1400		
Initials	Set up JB	JB		AM		CB		JB		JB		TM		AM
	n# JB													

EnviroScience Inc. *Pimephales promelas* Survival Data; EPA 1000.0: pg. 2 of 2

Project ID:	TOWA
Permit No.:	

KHV

Start Date:	110519

	Rep	n_i	# of P. promelas Mortalities / # P. promelas Adversely Affected						
			1	2	3	4	5	6	7
72	A	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	B	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	C	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	1 / 1
	D	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	1 / 1
	total %'s								
96	A	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	B	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	C	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	D	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	total %'s				0				
100	A	10	0 / 0	0 / 0	0 / 0	0 / 0	1 / 1	1 / 1	1 / 1
	B	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	C	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	D	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	total %'s								
	A		/	/	/	/	/	/	/
	B		/	/	/	/	/	/	/
	C		/	/	/	/	/	/	/
	D		/	/	/	/	/	/	/
	total %'s								

Comments / Corrections:

Day	Date	Comments	Initials

CETIS Analytical Report

Fathead Minnow 7-d Larval Survival and Growth Test — **EnviroScience**

Analysis ID:	00-5064-6012	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.9.1
Analyzed:	19 Nov-19 12:18	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Sample ID:	17-5003-7282	**Code:**	684F7322	**Client:**	Towamencin
Sample Date:	04 Nov-19 08:00	**Material:**	POTW Effluent	**Project:**	
Receipt Date:	05 Nov-19 10:15	**Source:**	Discharge Monitoring Report		
Sample Age:	30h	**Station:**	001		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	C > T	100	> 100	n/a	1	9.86%

Dunnett Multiple Comparison Test

Control vs	Conc-%	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Dilution Water	24	1.176	2.407	0.156	6	CDF	0.3467	Non-Significant Effect
	48	0	2.407	0.156	6	CDF	0.8333	Non-Significant Effect
	72	0.6289	2.407	0.156	6	CDF	0.5903	Non-Significant Effect
	96	-0.6289	2.407	0.156	6	CDF	0.9554	Non-Significant Effect
	100	0	2.407	0.156	6	CDF	0.8333	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.032643	0.0065286	5	0.7777	0.5785	Non-Significant Effect
Error	0.151103	0.0083946	18			
Total	0.183746		23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance Test	4.164	4.248	0.0109	Equal Variances
Variances	Mod Levene Equality of Variance Test	1.57	4.248	0.2188	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9008	0.884	0.0224	Normal Distribution

7d Survival Rate Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	0.9750	0.8954	1.0000	1.0000	0.9000	1.0000	0.0250	5.13%	0.00%
24		4	0.9250	0.7727	1.0000	0.9500	0.8000	1.0000	0.0479	10.35%	5.13%
48		4	0.9750	0.8954	1.0000	1.0000	0.9000	1.0000	0.0250	5.13%	0.00%
72		4	0.9500	0.8581	1.0000	0.9500	0.9000	1.0000	0.0289	6.08%	2.56%
96		4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.00%	-2.56%
100		4	0.9750	0.8954	1.0000	1.0000	0.9000	1.0000	0.0250	5.13%	0.00%

Angular (Corrected) Transformed Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	1.371	1.242	1.501	1.412	1.249	1.412	0.04074	5.94%	0.00%
24		4	1.295	1.061	1.529	1.331	1.107	1.412	0.07348	11.35%	5.56%
48		4	1.371	1.242	1.501	1.412	1.249	1.412	0.04074	5.94%	0.00%
72		4	1.331	1.181	1.48	1.331	1.249	1.412	0.04705	7.07%	2.97%
96		4	1.412	1.412	1.412	1.412	1.412	1.412	0	0.00%	-2.97%
100		4	1.371	1.242	1.501	1.412	1.249	1.412	0.04074	5.94%	0.00%

7d Survival Rate Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	1.0000	0.9000	1.0000	1.0000
24		0.9000	1.0000	1.0000	0.8000
48		0.9000	1.0000	1.0000	1.0000
72		1.0000	1.0000	0.9000	0.9000
96		1.0000	1.0000	1.0000	1.0000
100		0.9000	1.0000	1.0000	1.0000

KHV

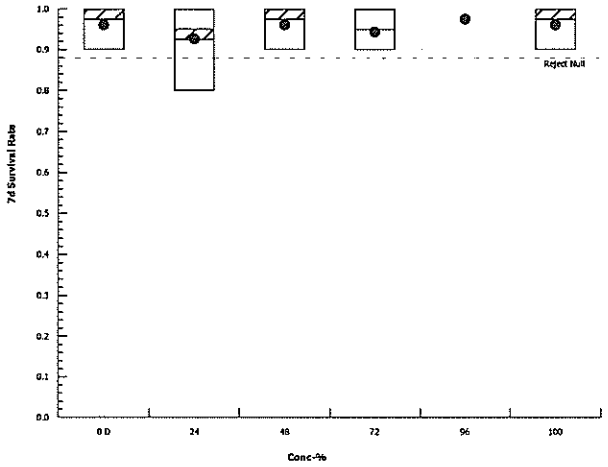
Fathead Minnow 7-d Larval Survival and Growth Test — **EnviroScience**

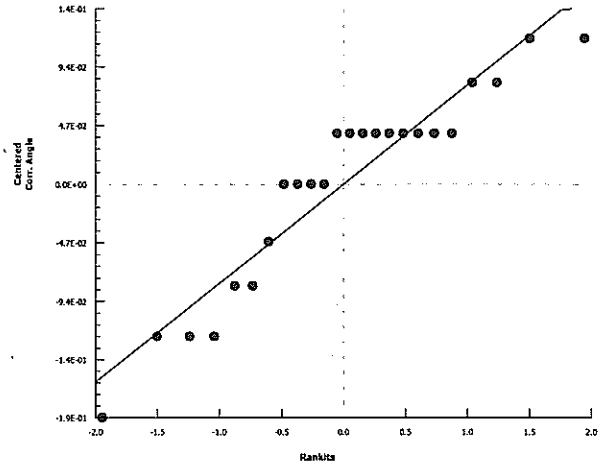
Analysis ID:	00-5064-6012	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.9.1
Analyzed:	19 Nov-19 12:18	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Angular (Corrected) Transformed Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	1.412	1.249	1.412	1.412
24		1.249	1.412	1.412	1.107
48		1.249	1.412	1.412	1.412
72		1.412	1.412	1.249	1.249
96		1.412	1.412	1.412	1.412
100		1.249	1.412	1.412	1.412

Graphics





Fathead Minnow 7-d Larval Survival and Growth Test — **EnviroScience**

Analysis ID:	09-9924-9591	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.9.1
Analyzed:	19 Nov-19 12:18	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Sample ID:	17-5003-7282	**Code:**	684F7322	**Client:**	Towamencin
Sample Date:	04 Nov-19 08:00	**Material:**	POTW Effluent	**Project:**	
Receipt Date:	05 Nov-19 10:15	**Source:**	Discharge Monitoring Report		
Sample Age:	30h	**Station:**	001		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	100	> 100	n/a	1	18.54%

Dunnett Multiple Comparison Test

Control vs	Conc-%	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Dilution Water	24	-0.997	2.407	0.054	6	CDF	0.9826	Non-Significant Effect
	48	-1.662	2.407	0.054	6	CDF	0.9975	Non-Significant Effect
	72	-1.507	2.407	0.054	6	CDF	0.9960	Non-Significant Effect
	96	-2.781	2.407	0.054	6	CDF	0.9999	Non-Significant Effect
	100	-1.019	2.407	0.054	6	CDF	0.9836	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0085995	0.0017199	5	1.689	0.1883	Non-Significant Effect
Error	0.018331	0.0010184	18			
Total	0.0269305		23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	7.359	15.09	0.1953	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9717	0.884	0.7084	Normal Distribution

Mean Dry Weight-mg Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	0.293	0.2487	0.3373	0.2975	0.257	0.32	0.01393	9.51%	0.00%
24		4	0.3155	0.3003	0.3307	0.316	0.305	0.325	0.004769	3.02%	-7.68%
48		4	0.3305	0.2933	0.3677	0.3235	0.312	0.363	0.01169	7.08%	-12.80%
72		4	0.327	0.238	0.416	0.3135	0.278	0.403	0.02796	17.10%	-11.60%
96		4	0.3557	0.306	0.4055	0.3575	0.317	0.391	0.01563	8.79%	-21.42%
100		4	0.316	0.2773	0.3547	0.3165	0.293	0.338	0.01216	7.69%	-7.85%

Mean Dry Weight-mg Detail

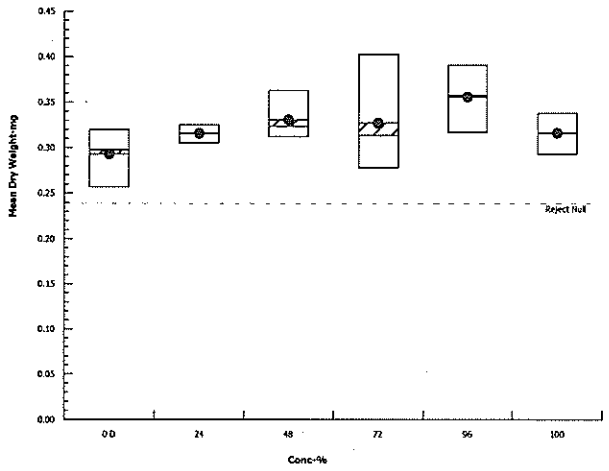
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.309	0.286	0.32	0.257
24		0.31	0.325	0.322	0.305
48		0.332	0.363	0.312	0.315
72		0.334	0.403	0.293	0.278
96		0.348	0.391	0.367	0.317
100		0.297	0.336	0.338	0.293

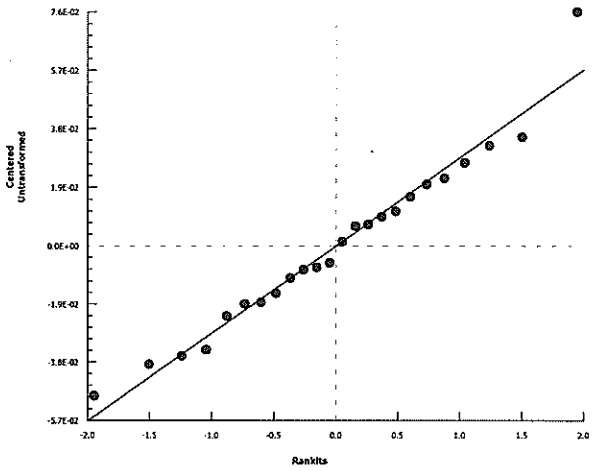
PHV

Fathead Minnow 7-d Larval Survival and Growth Test — **EnviroScience**

Analysis ID:	09-9924-9591	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.9.1
Analyzed:	19 Nov-19 12:18	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Graphics





CETIS Analytical Report

Report Date:	19 Nov-19 12:19 (p 1 of 1)
Test Code:	6C5D81AC | 18-1806-7372

Fathead Minnow 7-d Larval Survival and Growth Test — **EnviroScience**

Analysis ID:	11-9208-1405	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.9.1
Analyzed:	19 Nov-19 12:18	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Sample ID:	17-5003-7282	**Code:**	684F7322	**Client:**	Towamencin
Sample Date:	04 Nov-19 08:00	**Material:**	POTW Effluent	**Project:**	
Receipt Date:	05 Nov-19 10:15	**Source:**	Discharge Monitoring Report		
Sample Age:	30h	**Station:**	001		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	649619	1000	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC25	>100	n/a	n/a	<1	n/a	n/a

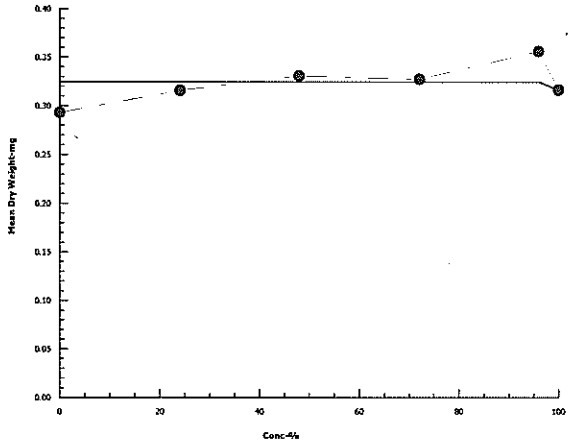
Mean Dry Weight-mg Summary

			Calculated Variate						
Conc-%	**Code**	**Count**	**Mean**	**Min**	**Max**	**Std Err**	**Std Dev**	**CV%**	**%Effect**
0	D	4	0.293	0.257	0.32	0.01393	0.02787	9.51%	0.0%
24		4	0.3155	0.305	0.325	0.004769	0.009537	3.02%	-7.68%
48		4	0.3305	0.312	0.363	0.01169	0.02339	7.08%	-12.8%
72		4	0.327	0.278	0.403	0.02796	0.05592	17.10%	-11.6%
96		4	0.3557	0.317	0.391	0.01563	0.03126	8.79%	-21.42%
100		4	0.316	0.293	0.338	0.01216	0.02432	7.70%	-7.85%

Mean Dry Weight-mg Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.309	0.286	0.32	0.257
24		0.31	0.325	0.322	0.305
48		0.332	0.363	0.312	0.315
72		0.334	0.403	0.293	0.278
96		0.348	0.391	0.367	0.317
100		0.297	0.336	0.338	0.293

Graphics



KHV

EnviroScience Inc. *Pimephales promelas* Growth Data; EPA 1000.0: pg. 1 of 2

Project ID:	TOWA110519
Permit No.:	PA0039004

Start Date:	110519

Concen-tration	Rep. no.	Pan no.	Weight of pan (g)	Total dry wt. (g)	No. fish
DMW	A	W1	1.11818	1.12127	10
	B	W2	1.14478	1.14764	9
	C	W3	1.12132	1.12452	10
	D	W4	1.11808	1.12065	10
DMW+ST	A	W5	1.11990	1.12295	10
	B	W6	1.12188	1.12443	10
	C	W7	1.12914	1.13190	10
	D	W8	1.12555	1.12866	10
24	A	W9	1.13322	1.13632	9
	B	W10	1.12770	1.13095	10
	C	W11	1.13842	1.14164	10
	D	W12	1.14820	1.15125	8
48	A	W13	1.10891	1.11223	9
	B	W14	1.12384	1.12747	10
	C	W15	1.12857	1.13169	10
	D	W16	1.16207	1.16522	10
72	A	W17	1.14192	1.14526	10
	B	W18	1.13794	1.14197	10
	C	W19	1.10910	1.11203	9
	D	W20	1.12885	1.13163	9
96	A	W21	1.10925	1.11273	10
	B	W22	1.11257	1.11648	10
	C	W23	1.12588	1.12955	10
	D	W24	1.11617	1.11934	10
Initials		KH	MT	JV	AM

Comments:

Reviewer pgs 1-2 KH

EnviroScience Inc. *Pimephales promelas* Growth Data; EPA 1000.0: pg. 2 of 2

Project ID:	TOWA
Permit No.:	

Start Date:	110519

Concen-tration	Rep. no.	Pan no.	Weight of pan (g)	Total dry wt. (g)	No. fish
100	A	W25	1.11661	1.11958	9
	B	W26	1.13427	1.13763	10
	C	W27	1.14757	1.15095	10
	D	W28	1.14785	1.15078	10

	A				
	B				
	C				
	D				
Initials		KH	MT	JV	KC

Quality Assurance

					Final-Initial (g)
Pan Tare	A	X29	1.13878	1.13879	
	B	X30	1.14369	1.14368	
	C	X31	1.14556	1.14556	
	D	X32	1.13617	1.13615	
Initials		KH	MT	JV	

S Weight calibrations	S wgt	Date: 111119	S wgt	Date: 111519
	2g	2.00002	2g	2.00003
	1g	0.99999	1g	0.99995
	500mg	0.49999	500mg	0.50001
	100mg	0.10006	100mg	0.10005
Initials		MT		JV

1. pans without fish are dried at 60 °C for 24 hours, and placed in desiccator to cool before they are tared on AND ER-182-A balance
2. pans with fish are dried at 60 °C for 24 hours, and placed in desiccator to cool before weighing on AND ER-182-A balance

Please note time of drying:	Date	Time	Oven °C	By (initials)
Pans w/fish in oven @	111219	1510	63	KC
Pans w/fish removed @	111319	1510	68	MT

Pans w/dried fish placed in desiccator immediately upon removal from the drying oven.

EnviroScience Inc. Chronic Toxicity - Daily Chemistry Bench Sheet for ☑ *C. dubia* or ☐ *FHM* (check one)

Project ID:	T	D	W	A	110519	Permit No.:	PA0039004	Date:	11	05	19

Conductivity µmhos/cm - **INITIAL**

level	0	1	2	3	4	5	6
MHR	301	312	313	298	301	297	296
MHR+ST	319	335	320	331	321	327	312
24	615	646	1015	1021	1244	1266	1256
48	979	974	1744	1735	1326	2020	2070
72	1315	1346	2460	2440	2870	2910	2990
96	1604	1644	3170	3140	3160	3690	3810
100	1650	1702	3240	3290	3890	3940	3920

please initial and enter "I" and "F" in the appropriate instrument box.

	day→	0	1	2	3	4	5	6
TECH	Initial	MT	KG	MT	JB	KG	JB	MT
TECH	Final	KG	MT	TM	KG	JB	MT	JB
DO	830							
	820							
	YSI	I F	I F	I F	I F	I F	I F	I F
pH	920	I F	I	I		I F	F	I F
	2Star		F	F	I		I	
cond.	160	I	I	I	I	I	I	I

Final chemistry **must** be analyzed within 15 minutes of sampling.

Dissolved Oxygen mg/l - **INITIAL**

level	0	1	2	3	4	5	6
MHR	8.6	8.6	8.6	8.6	8.6	8.6	8.6
MHR+ST	8.6	8.6	8.6	8.6	8.6	8.6	8.6
24	8.6	8.6	8.6	8.6	8.6	8.6	8.6
48	8.6	8.6	8.6	8.6	8.6	8.6	8.6
72	8.6	8.6	8.6	8.6	8.6	8.6	8.6
96	8.6	8.6	8.6	8.6	8.6	8.6	8.6
100	8.6	8.6	8.6	8.6	8.6	8.6	8.6

KH

Dissolved Oxygen mg/l - **FINAL**

level	0	1	2	3	4	5	6
MHR	8.6	8.6	8.6	8.6	8.6	8.6	8.6
MHR+ST	8.6	8.6	8.6	8.6	8.6	8.6	8.6
24	8.6	8.6	8.6	8.6	8.6	8.6	8.6
48	8.6	8.6	8.6	8.6	8.6	8.6	8.6
72	8.6	8.6	8.6	8.6	8.6	8.6	8.6
96	8.6	8.6	8.6	8.6	8.6	8.6	8.6
100	8.6	8.6	8.6	8.6	8.6	8.6	8.6

pH s.u. - **INITIAL**

level	0	1	2	3	4	5	6
MHR	7.5	7.2	7.5	7.3	7.3	7.4	7.3
MHR+ST	7.2	7.2	7.6	7.4	7.7	7.4	7.2
24	7.2	7.2	7.4	7.3	7.5	7.3	7.2
48	7.2	7.1	7.4	7.3	7.5	7.2	7.2
72	7.1	7.1	7.3	7.2	7.3	7.2	7.1
96	7.1	7.1	7.3	7.2	7.3	7.2	7.1
100	7.1	7.1	7.2	7.1	7.2	7.1	7.0

pH s.u. - **FINAL**

level	0	1	2	3	4	5	6
MHR	7.3	7.8	7.5	7.6	7.7	7.5	7.2
MHR+ST	7.3	7.7	7.5	7.6	7.7	7.5	7.2
24	7.3	7.7	7.6	7.6	7.7	7.6	7.3
48	7.3	7.8	7.8	7.6	7.7	7.7	7.4
72	7.3	7.8	7.8	7.6	7.7	7.7	7.5
96	7.3	7.8	7.8	7.7	7.7	7.8	7.6
100	7.3	7.8	7.8	7.7	7.8	7.8	7.7

EnviroScience Inc. Chronic Toxicity - Daily Chemistry Bench Sheet for ☐ *C. dubia* or ☑ *FHM* (check one)

Project ID:	T	O	W	A	110519	Permit No.:	PA0039004	Date:	11	05	19

Conductivity µmhos/cm - **INITIAL**

level	0	1	2	3	4	5	6
DMW	178	182	180	182	183	183	184
DMW+ST	184	185	182	185	179	191	191
24	560	561	884	949	1096	1104	1112
48	901	922	1649	1667	2000	1977	1984
72	1273	1271	2380	2400	2890	2870	2860
96	1627	1592	3120	3120	3730	3760	3720
100	1650	1702	3240	3290	3890	3940	3920

please initial and enter "I" and "F" in the appropriate instrument box.

	day→	0	1	2	3	4	5	6
TECH.	Initial	MT	KC	MT	OB	KC	OB	MT
TECH	Final	KC	MT	OB	KC	OB	MT	OB
DO	830							
	820							
	YSI	I F	I F	I F	I F	I F	I F	I F
pH	920	I F	I F	I		I F		I
	2Star			F	I F		I F	F
cond.	160	I	I	I	I	I	I	I

Final chemistry **must** be analyzed within 15 minutes of sampling.

Dissolved Oxygen mg/l - **INITIAL**

level	0	1	2	3	4	5	6
DMW	8.6	8.6	8.6	8.6	8.6	8.6	8.6
DMW+ST	8.6	8.6	8.6	8.6	8.6	8.6	8.6
24	8.6	8.6	8.6	8.6	8.6	8.6	8.6
48	8.6	8.6	8.6	8.6	8.6	8.6	8.6
72	8.6	8.6	8.6	8.6	8.6	8.6	8.6
96	8.6	8.6	8.6	8.6	8.6	8.6	8.6
100	8.6	8.6	8.6	8.6	8.6	8.6	8.6

Dissolved Oxygen mg/l - **FINAL**

level	0	1	2	3	4	5	6
DMW	8.6	8.6	8.6	8.6	8.6	8.6	8.6
DMW+ST	8.6	8.6	8.6	8.2	8.6	8.6	8.6
24	8.5	8.6	8.6	8.2	8.6	8.6	8.5
48	8.6	8.6	8.6	7.8	8.6	8.5	8.3
72	8.6	8.6	8.6	7.7	8.6	8.6	8.2
96	8.6	8.6	8.6	7.8	8.6	8.6	8.1
100	8.5	8.6	8.6	8.2	8.6	8.5	8.1

pH s.u. - **INITIAL**

level	0	1	2	3	4	5	6
DMW	7.4	7.0	7.4	7.2	7.3	7.4	7.5
DMW+ST	7.4	7.4	7.6	7.5	7.4	7.4	7.3
24	7.4	7.3	7.5	7.4	7.4	7.4	7.3
48	7.3	7.3	7.5	7.3	7.3	7.2	7.2
72	7.2	7.2	7.4	7.2	7.3	7.2	7.1
96	7.1	7.1	7.3	7.1	7.2	7.1	7.0
100	7.1	7.1	7.2	7.1	7.2	7.1	7.0

pH s.u. - **FINAL**

level	0	1	2	3	4	5	6
DMW	7.2	7.6	7.4	7.5	7.4	7.4	7.3
DMW+ST	7.1	7.6	7.4	7.4	7.4	7.3	7.2
24	7.1	7.5	7.4	7.4	7.3	7.5	7.4
48	7.1	7.6	7.5	7.4	7.4	7.5	7.4
72	7.1	7.6	7.5	7.4	7.4	7.5	7.4
96	7.1	7.6	7.5	7.5	7.5	7.4	7.4
100	7.2	7.6	7.6	7.6	7.5	7.5	7.4

CHRONIC BIOASSAY:
INITIAL WATER QUALITY CHECKS (DO, pH, conductivity); CHLORINE, ALKALINITY, HARDNESS DATA.

Project ID: TOWA110519 Permit No.: PA0039004
Test Date: 110519

Sample Type: →	EFFLUENT					
EnviroScience No.:	TOWA110519 EFF	TOWA110219 EFF	TOWA 110919 EFF			
D. Oxygen (mg/l-%sat) **>4 & <100%?**	8.6	8.6	8.6			
pH (s.u) **6-9?**	7.1	7.2	7.1			
Conductivity (µmhos/cm)	1655	3230	3830			
Alkalinity (mg/l $CaCO_3$) **MDL = 20 mg/l**	(3.5) 70	MT ~~4~~ (3.6) 72	(3.9) 78			
Hardness (mg/l $CaCO_3$) **MDL = 5 mg/l**	(3.3) 132	(4.5) 180	(5.4) 216			
TRC_I (mg/l) **<0.02?**	0.152	0.190	0.134			
TRC_A (mg/l) <0.02?	<0.02	<0.02	<0.02			
Ammonia as N (mg/L)	0.41	0.70	0.49			
Tech Initials :	MT	MT	[illegible]			

Methods/Instrumentation :
DO: APHA (1998) 4500-O G, YSI 5100; pH: APHA (1998) 4500-H B, Orion 920A/2Star; Conductivity: APHA (1998) 2510-B, Orion 160; Hardness: APHA (1998) 2340-C; Alkalinity: APHA (1998) 2320-B; Chlorine: APHA (1998) 4500-Cl D, HACH Auto CAT9000

Sample Type: effluent (outfall # if more than one), upstream, downstream (NF, FF), lab water, etc.

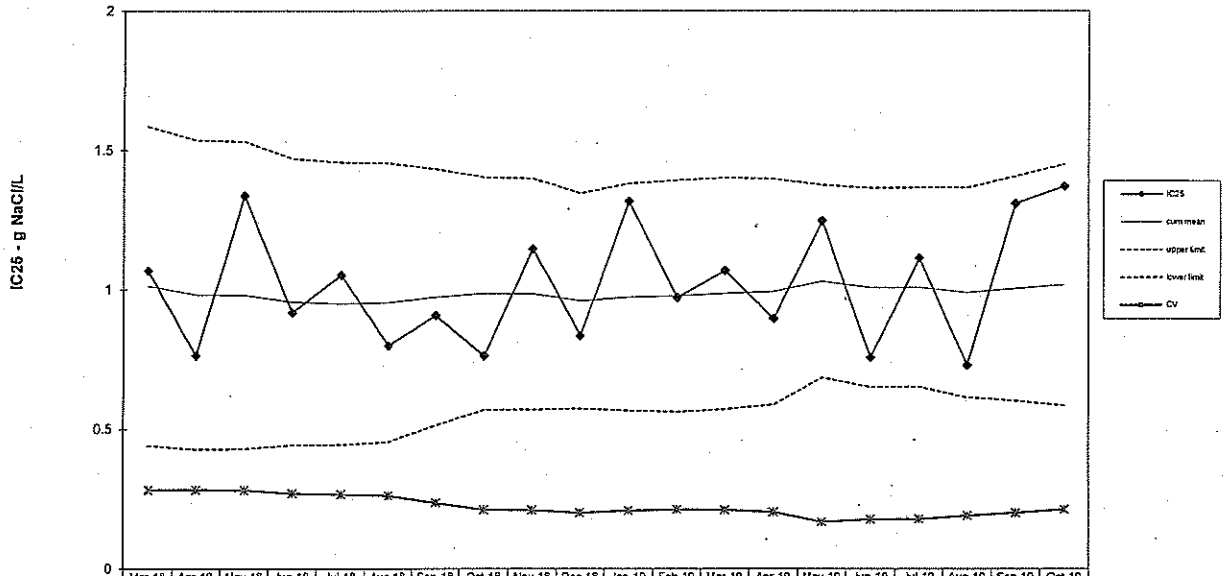
EnviroScience No.: Tracking number from C-O-C (client code+date received+type/outfall/unique #)

Dechlorination procedure:
TRC_I = total residual chlorine, initial value measured prior to dilution or use of sample.
TRC_A = TRC value measured after dechlorination.

Sodium thiosulfate is used to reduce Total Residual Chlorine by dosing with 6.7 mg $Na_2S_2O_3$ per mg TRC.
A 6.7 mg/ml $Na_2S_2O_3$ solution is used; dose mls = X mg/l * liters in sample container being treated.

Comments: Describe dechlorination/pH-adjustments including lot numbers, concentration, volumes of sodium thiosulfate or acid/base solutions and volume of sample treated, preparation of blanks; problems associated with data collection, etc. Initial all entries along with date/time/sample #. Attach additional pages if necessary.

EnviroScience QC Chart - *Ceriodaphnia dubia*
Chronic Toxicity Endpoint - Reproduction IC_{25}



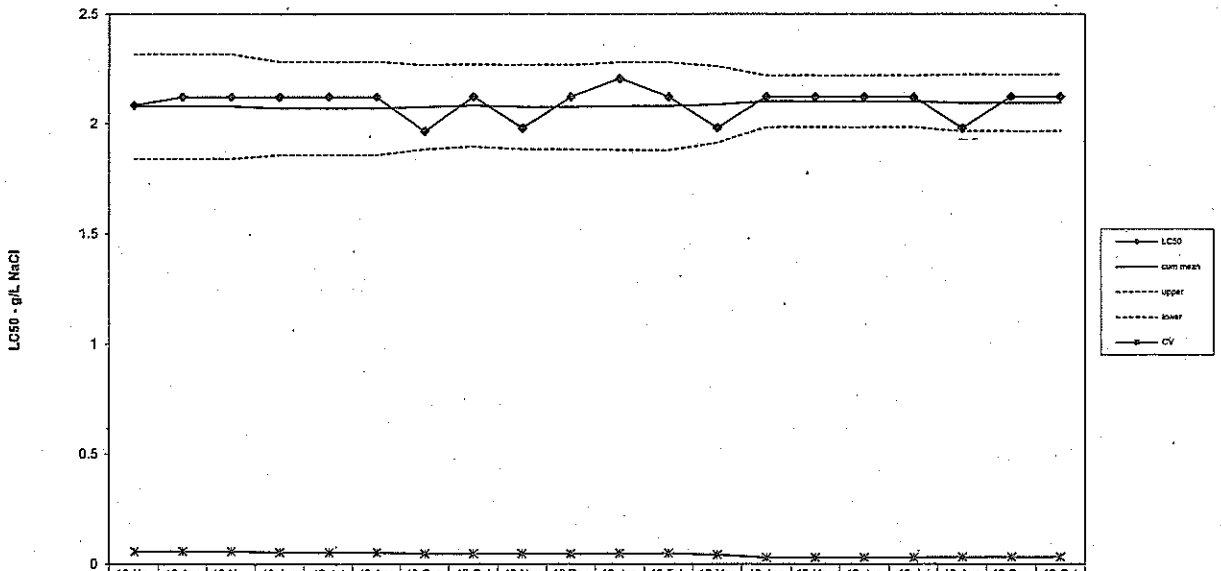
	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19
IC25	1.068	0.7629	1.336	0.9182	1.052	0.7961	0.9076	0.7613	1.146	0.8341	1.316	0.9711	1.058	0.8961	1.246	0.7566	1.114	0.7289	1.308	1.37
cum mean	1.01263	0.98173	0.98038	0.95809	0.95014	0.954	0.97287	0.98585	0.98455	0.9598	0.9739	0.9777	0.98513	0.99266	1.03002	1.00805	1.00875	0.99015	1.00445	1.01795
upper limit	1.58445	1.53627	1.53113	1.45978	1.45604	1.45367	1.43203	1.40155	1.39796	1.34466	1.37895	1.39178	1.40037	1.39624	1.3752	1.3645	1.36601	1.36548	1.40578	1.44982
lower limit	0.44081	0.42718	0.42962	0.44239	0.44423	0.45433	0.5137	0.57014	0.57113	0.57494	0.56785	0.56362	0.57189	0.58907	0.68484	0.6516	0.65149	0.61481	0.60311	0.58607
CV	0.28234	0.28243	0.28089	0.26864	0.26623	0.26188	0.23599	0.21084	0.20995	0.20049	0.20847	0.21176	0.21003	0.20329	0.16756	0.1768	0.17708	0.18953	0.18978	0.21213

Test Date

EnviroScience QC/SRT Chart rev. 10/23/19

Tests conducted with MHRW

EnviroScience QC Chart- *Ceriodaphnia dubia*
Chronic Toxicity Endpoint - Survival LC50



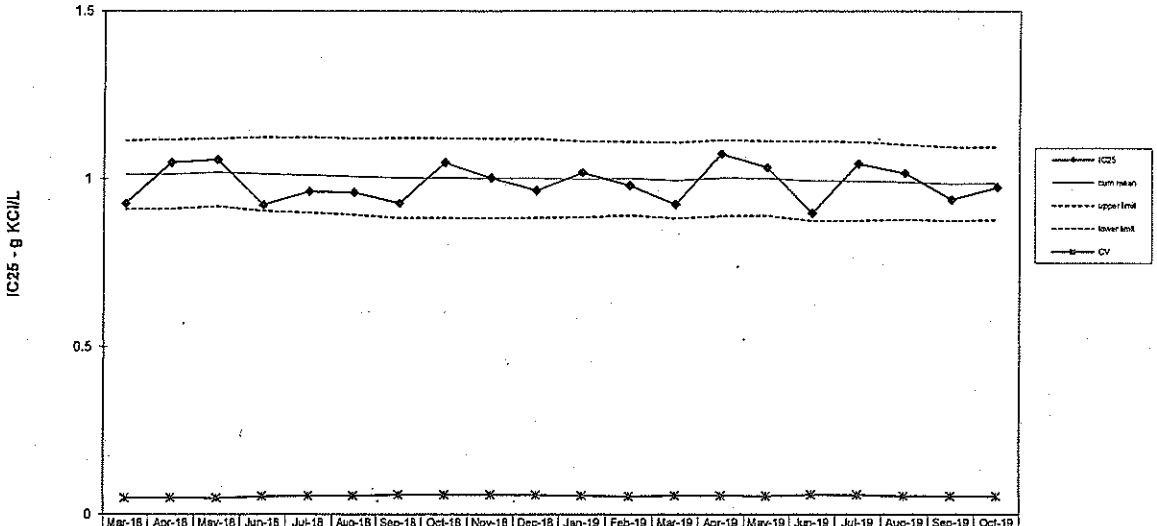
	18-Mar	18-Apr	18-May	18-Jun	18-Jul	18-Aug	18-Sep	18-Oct	18-Nov	18-Dec	19-Jan	19-Feb	19-Mar	19-Apr	19-May	19-Jun	19-Jul	19-Aug	19-Sep	19-Oct
LC50	2.083	2.121	2.121	2.121	2.121	2.121	1.965	2.121	1.979	2.121	2.205	2.121	1.979	2.121	2.121	2.121	2.121	1.979	2.121	2.121
cum mean	2.07875	2.07875	2.07875	2.06915	2.06915	2.06915	2.07505	2.08215	2.07505	2.07505	2.07925	2.07925	2.08585	2.1013	2.1013	2.1013	2.1013	2.0942	2.0942	2.0942
upper	2.31646	2.31646	2.31646	2.28114	2.28114	2.28114	2.26659	2.26918	2.26659	2.26659	2.27856	2.27856	2.25992	2.21864	2.21864	2.21864	2.21864	2.22313	2.22313	2.22313
lower	1.84104	1.84104	1.84104	1.85716	1.85716	1.85716	1.88351	1.89512	1.88351	1.88351	1.87994	1.87994	1.91178	1.98396	1.98396	1.98396	1.98396	1.96527	1.96527	1.96527
CV	0.05718	0.05718	0.05718	0.05123	0.05123	0.05123	0.04615	0.04491	0.04615	0.04615	0.04793	0.04793	0.04173	0.02792	0.02792	0.02792	0.02792	0.03078	0.03078	0.03078

Test Date

EnviroScience QC/SRT Chart rev. 10/23/19

Tests conducted with MHRW

EnviroScience QC Chart - *Pimephales promelas*
Chronic Toxicity Endpoint - Growth IC_{25}



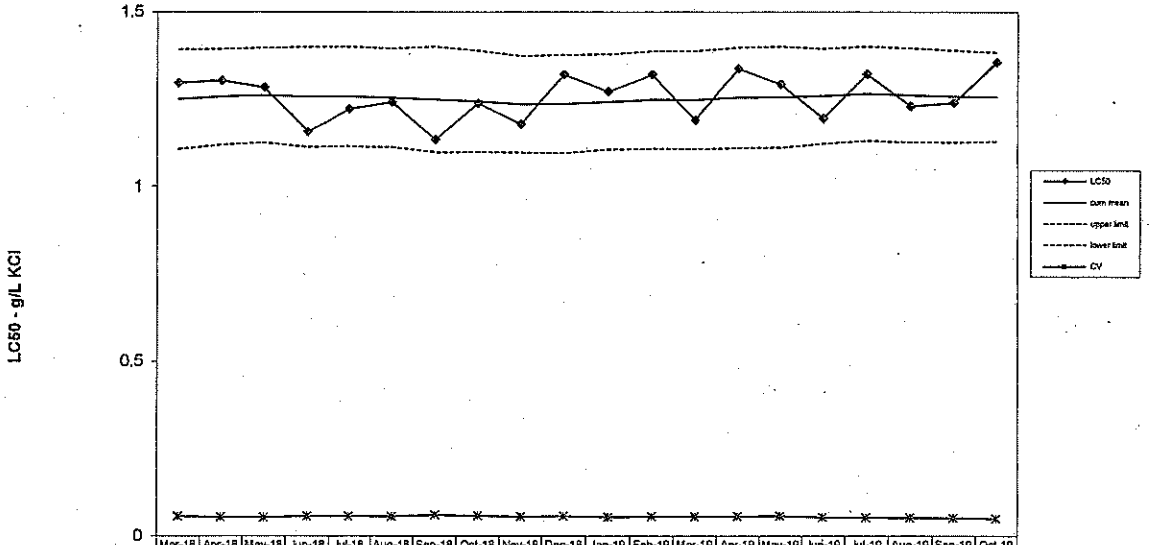
	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19
IC25	0.9266	1.049	1.058	0.9214	0.9815	0.9586	0.9277	1.048	1.002	0.9638	1.017	0.9793	0.9231	1.074	1.033	0.8975	1.044	1.016	0.9367	0.974
cum mean	1.01189	1.01404	1.01934	1.01406	1.01104	1.00692	1.0024	1.0022	1.00105	1.00129	0.99849	1.00064	0.99454	1.00186	1.00086	0.99333	0.99278	0.98986	0.98407	0.98556
upper limit	1.11431	1.11773	1.12048	1.12414	1.1235	1.12079	1.12148	1.12093	1.11929	1.11919	1.11179	1.11055	1.10758	1.11543	1.11258	1.11176	1.1101	1.10147	1.09392	1.09393
lower limit	0.90946	0.91034	0.9182	0.90398	0.89857	0.89304	0.88334	0.88347	0.88281	0.88338	0.88518	0.89072	0.8815	0.88648	0.88913	0.8749	0.87546	0.87829	0.87421	0.87719
CV	0.05051	0.05113	0.04961	0.05428	0.05562	0.05654	0.05939	0.05923	0.05906	0.05858	0.05674	0.05493	0.05683	0.05663	0.05582	0.05961	0.05909	0.05637	0.05582	0.05498

Test Date

EnviroScience QC/SRT Chart rev. 10/24/19

Tests conducted with DMW

EnviroScience QC Chart - *Pimephales promelas*
Chronic Toxicity Endpoint - Survival LC50



	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19
LC50	1.296	1.303	1.283	1.156	1.221	1.241	1.133	1.235	1.177	1.32	1.271	1.32	1.189	1.337	1.292	1.194	1.321	1.229	1.239	1.355
cum mean	1.2494	1.2569	1.2604	1.2566	1.257	1.2539	1.2487	1.2437	1.2348	1.2361	1.2416	1.2477	1.247	1.2542	1.2556	1.2586	1.265	1.2611	1.257	1.2558
upper limit	1.3923	1.3941	1.3984	1.4	1.3999	1.3952	1.3999	1.389	1.373	1.3771	1.3784	1.3872	1.3876	1.3979	1.4003	1.3949	1.4003	1.3957	1.3889	1.3833
lower limit	1.1065	1.1197	1.1244	1.1132	1.1141	1.1125	1.0974	1.0983	1.0965	1.095	1.1052	1.1082	1.1064	1.1104	1.1108	1.1222	1.1297	1.1264	1.125	1.1282
CV	0.0572	0.0546	0.054	0.0571	0.0569	0.0564	0.0606	0.0584	0.056	0.0571	0.055	0.0559	0.0564	0.0573	0.0576	0.0542	0.0535	0.0534	0.0525	0.0508

Test Date

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Tests conducted with DMW