RESULTS OF CHRONIC TOXICITY TESTS

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

Test date: November 3-10, 2020
Sampling period: November 1-6, 2020
Report date: November 23, 2020

Conducted For:

TOWAMENCIN MA
2225 Kriebel Rd
Lansdale, PA 19446

NPDES: PA0039004

Conducted and Prepared By:

ENVIROSCIENCE, INCORPORATED
5070 Stow Rd.
Stow, OH 44224

For ENVIROSCIENCE, INC.:

Katherine L. Hansler, Aquatic Biologist

For TOWAMENCIN MA:

_____, _____
(signature) (title)

November 23, 2020

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 3, 2020:

(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. The reproductive toxicity may have been caused by the increased conductivity of the second and third sampling events.

WET endpoints for Towamencin MA; 11/2020
sampling period: 11/01-06/20

C. dubia acute endpoint:	48-hour LC_{50} = >100% effluent, TU_a = <1.0	
C. dubia chronic endpoints:	NOEC=	72% effluent
	LOEC=	96% effluent
	Ch V=	83.14% effluent
	TU_c=	1.39 as 100÷NOEC
	IC_{25} =	68.58% effluent (TU_c as 100÷IC_{25} = 1.46)
	TIWC =	Pass (survival) Fail (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: 11/23/20

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: 0.156, 0.163, <0.02 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

11/23/20
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	11/01/20-0800	11/02/20-0800	
001	composite	3 gal	11/03/20-0805	11/04/20-0805	
001	composite	4 gal	11/05/20-0800	11/06/20-0800	

Dates/Times of Test Performance:			
Ceriodaphnia dubia		*Pimephales promelas*	
Start Date: MM/DD/YY	11/03/20	Start Date: MM/DD/YY	11/03/20
Start Time:	1230 hrs	Start Time:	1330 hrs
End Date: MM/DD/YY	11/10/20	End Date: MM/DD/YY	11/10/20
End Time:	1130 hrs	End Time:	1330 hrs

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

1. 11/03/20 at 1030 hrs; 2.6 °C
2. 11/05/20 at 1000 hrs; 6.0 °C
3. 11/09/19 at 1145 hrs; 6.0 °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:	4.5-12.5 hours, EnviroScience 11/03/20, 0000-0800	<24 hours, ES 11/02/20-1430
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:	11/03-0,1; 11/05-2,3; 11/07-4,5,6	11/03-0,1; 11/05-2,3; 11/07-4,5,6
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:							
03 November 20	8.6	7.6	1600	90	152	0.156/<0.02*	0.13
05 November 20	8.6	7.2	2760	100	192	0.163/<0.02*	0.00
07 November 20	8.6	7.5	3240	88	188	<0.02	0.28

*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 11/03/20 – 11/10/20 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	90	90	90	23.8	27.50
MHR+ST	100	100	100	100	100	100	100	24.7	20.29
24% Effluent	100	100	100	100	100	100	90	24.4	26.50
48% Effluent	100	100	100	100	100	100	100	30.6	8.98
72% Effluent	100	100	100	100	100	100	90	18.6	48.63
96% Effluent	100	90	90	90	90	90	70	15.4*	57.69
100% Effluent	100	100	90	90	90	90	90	14.0*	63.80

Acute 48-Hour LC_{50} = >100% 95% C.I. Lower Limit: --- 95% C.I. Upper Limit: ---	Survival NOEC = 100% Survival LOEC = >100%	Reproduction NOEC = 72% Reproduction LOEC = 96%	**Chronic Toxicity Unit (TUc):** **1.39 (100÷NOEC)**
Acute Toxicity Unit (TUa): <1.0 ($100 \div LC_{50}$)	Chronic Value Survival = >100%	Chronic Value Reprod. = 83.14%	
		IC_{25} = 68.58% IC_{50} = >100%	**TUc as $100 \div IC_{25}$: 1.46**

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

Methods used to determine NOEC: Shapiro-Wilk's, Bartlett's (pass), Bonferroni's, ICp model; Cetis 1.9.6.

[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 % producing 3 broods
90	25.1	21.39	90

TABLE 6

Results of a 7-Day *Pimephales promelas* Survival and Growth Test Conducted 11/03/20 – 11/10/20 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	100	100	100	90	0.351	10.63
DMW+ST	100	100	98	98	95	95	90	0.376	22.60
24% Effluent	100	100	98	98	98	98	98	0.444	10.17
48% Effluent	100	100	100	100	100	95	92	0.481	5.39
72% Effluent	100	100	100	100	100	100	100	0.476	6.56
96% Effluent	100	100	98	95	95	95	90	0.447	7.07
100% Effluent	100	100	98	95	95	95	90	0.424	13.01

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 1.9.6.

[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
0.9	12.8	0.392	12.2

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**	10/20/20-10/26/20	6 days	NaCl/ MHRW	100	33.5 young	IC_{25}: 0.918 g/l	yes
P. promelas *	10/20/20-10/27/20	7 days	KCl/ DMW	85	0.308 mg	IC_{25}: 1.057 g/l	yes

* chronic test.

Acute SRT charts maintained for acute test protocols only. For test dates 10/22-24/20, *C. dubia* 48-hr LC_{50} = 2.23 g NaCl/L MHRW at 25°C; 10/27-31/20, *P. promelas* 96-hr LC_{50} = 6.13 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.

Water fleas 48% "n" number changed to 9.

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; 11/2020

sampling period: 11/01-06/20

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

C. dubia chronic endpoints:
- NOEC= 72% effluent
- LOEC= 96% effluent
- Ch V= 83.14% effluent
- TU_c= 1.39 as 100÷NOEC
- IC_{25} = 68.58% effluent (TU_c as 100÷IC_{25} = 1.46)
- TIWC = Pass (survival) Fail (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)

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

3800-FM-BPNPSM0485 Rev. 10/2013
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.	11/02/20-0800	001	2.6°C	<36 hrs	0.156 mg/L	☒ Yes ☐ No
2.	11/04/20-0805	001	6.0°C	<36hrs	0.163 mg/L	☒ Yes ☐ No
3.	11/06/20-0800	001	6.0°C	<36hrs	<0.02 mg/L	☐ Yes ☒ No

TEST CONDITIONS

Date/Time of Test Initiation: **11/03/20-1230** Date/Time of Test Termination: **11/10/20-1130**

☒ 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: **4.5-12.5 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: **11/05/20** Conductivity: **292** µmhos/cm

pH: **7.1** TRC: **<0.02** mg/L

CONTROL RESULTS

Ceriodaphnia dubia

Survival: **90%**

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

Young per Surviving Female (if applicable): **25.1**

Pimephales promelas

Survival:

Mean Dry Weight of Survivors (if applicable):

REFERENCE TOXICITY TESTS

Date of most recent test: **10/20/20** 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		11/24/20	68-01628
Name of Laboratory Manager	Signature of Laboratory Manager	Date	DEP Lab ID No.

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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.	11/02/20-0800	001	2.6°C	<36 hrs	0.156 mg/L	☒ Yes ☐ No
2.	11/04/20-0805	001	6.0°C	<36hrs	0.163 mg/L	☒ Yes ☐ No
3.	11/06/20-0800	001	6.0°C	<36hrs	<0.02 mg/L	☐ Yes ☒ No

TEST CONDITIONS

Date/Time of Test Initiation: **11/03/20-1330** Date/Time of Test Termination: **11/10/20-1330**

☒ 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: **11/08/20** Conductivity: **177** µmhos/cm

pH: **7.3** 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: **90%**

Mean Dry Weight of Survivors (if applicable): **0.392**

REFERENCE TOXICITY TESTS

Date of most recent test: **10/20/20** 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		11/24/20	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 11/10/2020

Replicate No.	Control	TIWC
1	18	15
2	24	23
3	24	28
4	36	13
5	23	20
6	12	21
7	24	19
8	27	13
9	30	0
10	20	2
11		
12		
13		
14		
15		
Mean	23.800	15.400
Std Dev.	6.546	8.884
# Replicates	10	10

T-Test Result	-0.7633
Deg. of Freedom	15
Critical T Value	0.8662
Pass or Fail	**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	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 11/10/2020

Replicate No.	Control	TIWC
1	1	1
2	1	1
3	1	1
4	1	1
5	1	1
6	0	1
7	1	1
8	1	1
9	1	0
10	1	1
11		
12		
13		
14		
15		
Mean	0.900	0.900
Std Dev.	0.316	0.316
# 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		
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 11/10/2020

Replicate No.	Control	TIWC
1	1	0.8
2	0.8	1
3	1	0.9
4	0.8	0.9
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
Mean	0.900	0.900
Std Dev.	0.115	0.082
# Replicates	4	4

T-Test Result	7.3253
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	

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 11/10/2020

Replicate No.	Control	TIWC
1	0.335	0.42
2	0.309	0.433
3	0.396	0.441
4	0.361	0.492
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
Mean	0.350	0.447
Std Dev.	0.037	0.032
# Replicates	4	4

T-Test Result	8.7338
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	

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:
( ) Chronic Definitive
( ) Acute Definitive
( ) 48 hr. Screening
( ) 24 hr. Stormwater
( ) Pass/Fail _____

Test Species
( ) 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	Sample Site	Sample Type		Number of	Chemistry				
Date	Time	Date	Time	No.		Comp	Grab	Cubitainers	TRC	Cond	D.O.	pH	Temp. °C
11/1/20	8:00	11/2/20	8:00		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:	C. Fitzgerald
	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	
[signature]		11/2/20	8:15	Date Shipped		Client	Towamencin
	[signature]	110320	1030	Time Shipped		Sample ID's	TOWA 110320 EFF
				Method Shipped		Cond. Of Container	good
				ES Vehicle		Temp. °C	2.6

EnviroScience, Inc. Cooler Receipt Form

Client Towamencin

ES Sample ID TOWA 110320 EFF

Cooler Received by: MT

Date Cooler Received and Opened 110320

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 2.6 °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 (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:
( ) Chronic Definitive
( ) Acute Definitive
( ) 48 hr. Screening
( ) 24 hr. Stormwater
( ) Pass/Fail _____

Test Species
( ) 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
~~11/4/20~~ 11/3/20	~~8:~~ 805	11/4/20	805		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 Fulwood
	Upstream	Collectors Signature:	Cliff 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	
	Emily Ayres	11/05/20	1030	Date Shipped		Client	Towamencin Municipal
				Time Shipped		Sample ID's	TOWA 110520 EFF
				Method Shipped		Cond. Of Container	Good
				ES Vehicle		Temp. °C	10.0

EnviroScience, Inc. Cooler Receipt Form

Client Tuwamenah Municipal Authority

ES Sample ID TUWA110520 EFF

Cooler Received by: EF

Date Cooler Received and Opened 110520

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 6.0 °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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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:
( ) Chronic Definitive
( ) Acute Definitive
( ) 48 hr. Screening
( ) 24 hr. Stormwater
( ) Pass/Fail _____

Test Species
( ) 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
11/5/20	8AM	11/6/20	8AM		TMA	✓		4					

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:	Cliff Fuhrman
	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	
	[illegible]	11/6/20	1145	Date Shipped		Client	
				Time Shipped		Sample ID's	
				Method Shipped		Cond. Of Container	
				ES Vehicle		Temp. °C	

EnviroScience, Inc. Cooler Receipt Form

Client Tawamencin

ES Sample ID TCWA 110720 EFF

Cooler Received by: EF

Date Cooler Received and Opened 110720

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 6.0 °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

EnviroScience
Excellence In Any Environment

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

Project ID:	TOWA 110320	**Start Date:**	110320	**Time:**	1230
Permit No.:	PA0039004	**End Date:**	111020	**Time:**	1130
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	0y	0y	0y	0y	0y	0y	0y	0y	0y	0y	10	0 / 0
	4	49	39	69	59	59	49	69	39	59	49	10	0 / 0
	5	49	119	89	119	59	80	89	89	109	69	10	1 / 1
	6	0y	0y	0y	0y	0y	↓	0y	59	0y	0y	10	1 / 1
	7	109	109	109	209	139	↓	109	119	159	109	10	1 / 1
Totals		18	24	24	36	23	12	24	27	30	20	x̄ = 23.8	
Number of Broods		3	3	3	3	3	2	3	3	3	3	CV = 27.50	

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	0y	0y	0y	0y	0y	0y	0y	0y	0y	0y	10	0 / 0
	4	39	69	49	29	29	69	39	59	39	49	10	0 / 0
	5	69	139	39	69	99	139	99	69	39	99	10	0 / 0
	6	0y	149	0y	0y	0y	119	69	49	0y	0y	10	0 / 0
	7	159	0y	179	109	109	0y	109	139	129	109	10	0 / 0
Totals		24	33	24	18	21	30	28	28	18	23	x̄ = 24.7	
Number of Broods		3	3	3	3	3	3	3	3	3	3	CV = 20.29	

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	4	4	6	3	5	4	3	5	2	4	10	0 / 0
	5	10	12	9	8	10	8	7	9	6	6	10	0 / 0
	6	11	0	0	0	5	13	15	14	0	8	10	0 / 0
	7	0	11	19	0	10	0	80	0	13	0	10	10 / 01
Totals		25	27	34	11	30	25	25	28	21	18	x̄ = 24.4	
Number of Broods		3	3	3	2	3	3	3	3	3	3	CV = 26.50	

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

Project ID:	TDWR
Permit No.:	

Start Date:	110300

48%	Day	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 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	M	3	6	3	2	4	1	3	3	4	~~10~~ 9	0 / 0
	5	↓	11	8	9	11	8	10	6	6	8	9	0 / 0
	6	↓	3	0	0	6	9	9	10	8	9	9	0 / 0
	7	↓	15	14	19	12	10	11	16	8	10	9	0 / 0
Totals		X	32	28	31	31	31	31	35	25	31	$\bar{X}$ = 30.6	
Number of Broods		X	3	3	3	3	3	3	3	3	3	CV = 8.98	

72%	Day	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 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	5	3	4	0	3	3	6	4	2	2	10	0 / 0
	5	9	6	7	1	7	12	4	8	2	3	10	0 / 0
	6	0	7	0	0	0	2	8	5	4	7	10	0 / 0
	7	11	16	D	5	10	10	0	10	0	0	10	1 / 1
Totals		25	32	11	6	20	27	18	27	8	12	$\bar{X}$ = 18.6	
Number of Broods		3	3	2	2	3	3	3	3	3	3	CV = 48.63	

96%	Day	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	Number Adults	# Dead/ # Adversely Affected
	1	/	/	/	/	/	/	/	/	/	/	10	0 / 0
	2	/	/	/	/	/	/	/	/	D	/	10	1 / 1
	3	0	0	0	0	0	0	0	0	↓	0	10	1 / 1
	4	3	5	4	2	3	3	2	1	↓	0	10	1 / 1
	5	7	8	8	3	12	8	10	7	↓	0	10	1 / 1
	6	0	0	0	0	5	0	7	0	↓	2	10	1 / 1
	7	5	10	16	8	D	10	0	5	↓	D	10	3 / 3
Totals		15	23	28	13	20	21	19	13	0	2	$\bar{X}$ = 15.4	
Number of Broods		3	3	3	3	3	3	3	3	0	1	CV = 57.69	

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

Project ID:	TOWA
Permit No.:	

Start Date:	110330

	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number Adults	# Dead/ # Adversely Affected
100%	1											10	0 / 0
	2											10	0 / 0
	3	0	0	0	0	0	0	0	0	D	0	10	1 / 1
	4	0	2	1	3	0	0	4	2		2	10	1 / 1
	5	0	6	6	5	3	9	10	6		5	10	1 / 1
	6	0	0	0	0	1	0	14	2		0	10	1 / 1
	7	0	10	15	8	8	10	0	0	↓	8	10	1 / 1
Totals		0	18	22	16	12	19	28	10	0	15	$\bar{X}$ =	14.0
Number of Broods		0	3	3	3	3	2	3	3	0	3	CV =	63.80

	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:	TOWA
Permit No.:	

KHV

Start Date:	110320

Brood Board Information:

Replicate	1	2	3	4	5	6	7	8	9	10	BB #: 102320, 102620
	49	50	51	53	56	60	9	16	21	24	Date: 110320-110320
											Time: 2400 - 0800

Test Information:

Day	Initiation	Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7
YAT Batch #	YATD 101520	YAT D 101520		YATE 101520		YATE 101520		YATE 101520		YATF 101520		YATF 101520		
Algae Batch #	ESA 101620	ES B 101620		ESB 101620		ESB 101620		ESB 101620		ES 102330		ES102330		
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	24.3	24.0	24.0	24.0	24.4	24.0	24.6	24.8
MHR+ST	24.0	24.0	24.0	24.0	24.0	24.0	24.1	24.0	24.0	24.0	24.0	24.5	24.3	25.0
24%	24.0	24.0	24.1	24.0	24.0	24.0	24.5	24.0	24.0	24.0	24.0	24.4	24.1	25.0
48%	24.0	24.0	24.0	24.0	24.0	24.0	24.4	24.0	24.0	24.0	24.0	24.5	24.1	25.1
72%	24.0	24.0	24.0	24.0	24.0	24.0	24.2	24.0	24.0	24.0	24.0	24.4	24.0	25.0
96%	24.0	24.0	24.0	24.0	24.0	24.0	24.1	24.0	24.0	24.0	24.0	24.1	24.0	24.8
100%	24.0	24.0	24.0	24.0	24.0	24.0	24.3	24.0	24.0	24.0	24.0	24.0	24.0	24.3
Change time		13	50	13	15	13	25	12	20	13	20	12	10	1130
√transfer	√loading	√		√		√		√		√		√		—
Initials	TM	MT		CB		CB		CB		TM		TM		MT

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: 16 Nov-20 14:05 (p 1 of 1)
Test Code/ID: 5F6127DB / 16-0020-2715

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

Analysis ID:	02-5361-3953	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.9.6
Analyzed:	16 Nov-20 14:05	**Analysis:**	STP 2xK Contingency Tables	**Status Level:**	1

Sample ID:	04-2618-9128	**Code:**	19672148	**Project:**	
Sample Date:	02 Nov-20 08:00	**Material:**	POTW Effluent	**Source:**	Discharge Monitoring Report
Receipt Date:	03 Nov-20 10:30	**CAS (PC):**		**Station:**	001
Sample Age:	28h	**Client:**	Towamencin		

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	0.7632	Exact	1.0000	Non-Significant Effect
	48	1.0000	Exact	1.0000	Non-Significant Effect
	72	0.7632	Exact	1.0000	Non-Significant Effect
	96	0.2910	Exact	1.0000	Non-Significant Effect
	100	0.7632	Exact	1.0000	Non-Significant Effect

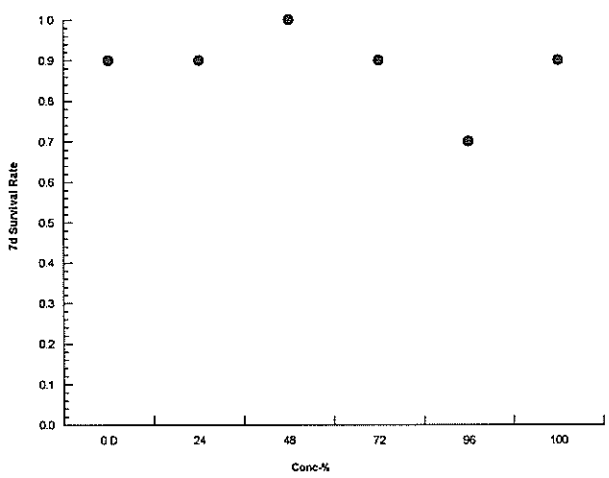
Data Summary

Conc-%	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
0	D	9	1	10	0.9	0.1	0.0%
24		9	1	10	0.9	0.1	0.0%
48		9	0	9	1	0	-11.11%
72		9	1	10	0.9	0.1	0.0%
96		7	3	10	0.7	0.3	22.22%
100		9	1	10	0.9	0.1	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	0.0000	1.0000	1.0000	1.0000	1.0000
24		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	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	
72		1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
96		1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000
100		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000

Graphics



CETIS Analytical Report

Report Date: 16 Nov-20 14:05 (p 1 of 2)
Test Code/ID: 5F6127DB / 16-0020-2715

Ceriodaphnia 7-d Survival and Reproduction Test — EnviroScience

Analysis ID:	21-3899-8442	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.9.6
Analyzed:	16 Nov-20 14:05	**Analysis:**	Parametric-Multiple Comparison	**Status Level:**	1

Sample ID:	04-2618-9128	**Code:**	19672148	**Project:**	
Sample Date:	02 Nov-20 08:00	**Material:**	POTW Effluent	**Source:**	Discharge Monitoring Report
Receipt Date:	03 Nov-20 10:30	**CAS (PC):**		**Station:**	001
Sample Age:	28h	**Client:**	Towamencin		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	72	96	83.14	1.389	33.84%

Bonferroni Adj t Test

Control vs	Conc-%	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Dilution Water	24	-0.1787	2.399	8.054	18	CDF	1.0000	Non-Significant Effect
	48	-1.959	2.399	8.274	17	CDF	1.0000	Non-Significant Effect
	72	1.549	2.399	8.054	18	CDF	0.3184	Non-Significant Effect
	96*	2.502	2.399	8.054	18	CDF	0.0387	Significant Effect
	100*	2.919	2.399	8.054	18	CDF	0.0129	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1876.91	375.382	5	6.661	7.0E-05	Significant Effect
Error	2987.02	56.3589	53			
Total	4863.93		58			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variance	Bartlett Equality of Variance Test	11.25	15.09	0.0467	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9635	0.9451	0.0736	Normal Distribution

Reproduction Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	10	23.8	19.12	28.48	24	12	36	2.07	27.50%	0.00%
24		10	24.4	19.77	29.03	25	11	34	2.045	26.50%	-2.52%
48		9	30.56	28.45	32.66	31	25	35	0.9146	8.98%	-28.38%
72		10	18.6	12.13	25.07	19	6	32	2.86	48.63%	21.85%
96		10	15.4	9.044	21.76	17	0	28	2.81	57.69%	35.29%
100		10	14	7.611	20.39	15.5	0	28	2.824	63.80%	41.18%

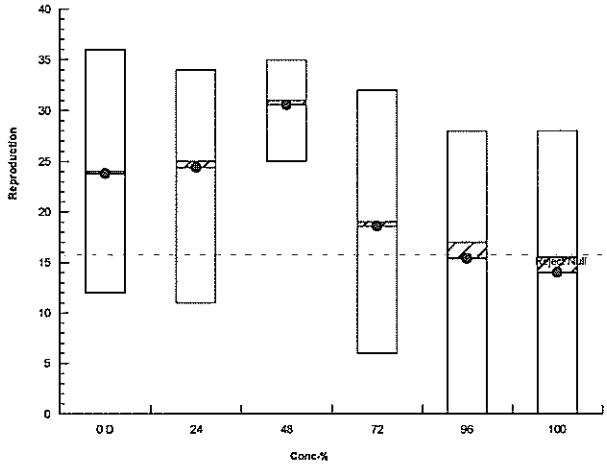
Reproduction Detail

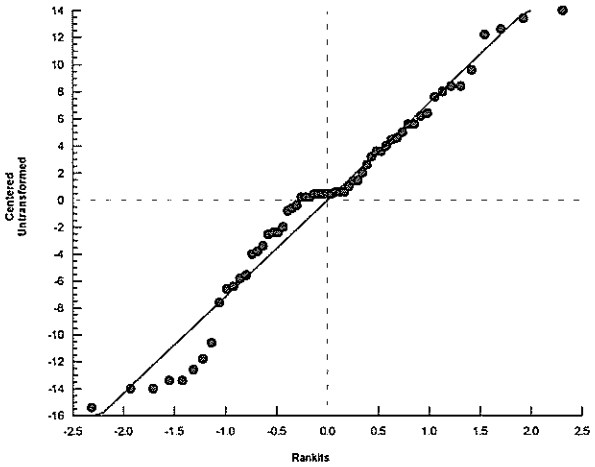
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	D	18	24	24	36	23	12	24	27	30	20
24		25	27	34	11	30	25	25	28	21	18
48		32	28	31	31	31	31	35	25	31	
72		25	32	11	6	20	27	18	27	8	12
96		15	23	28	13	20	21	19	13	0	2
100		0	18	22	16	12	19	28	10	0	15

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

Analysis ID:	21-3899-8442	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.9.6
Analyzed:	16 Nov-20 14:05	**Analysis:**	Parametric-Multiple Comparison	**Status Level:**	1

Graphics





CETIS Analytical Report

Report Date: 16 Nov-20 14:05 (p 1 of 1)
Test Code/ID: 5F6127DB / 16-0020-2715

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

Analysis ID:	14-6511-5822	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.9.6
Analyzed:	16 Nov-20 14:05	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1

Sample ID:	04-2618-9128	**Code:**	19672148	**Project:**	
Sample Date:	02 Nov-20 08:00	**Material:**	POTW Effluent	**Source:**	Discharge Monitoring Report
Receipt Date:	03 Nov-20 10:30	**CAS (PC):**		**Station:**	001
Sample Age:	28h	**Client:**	Towamencin		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	583220	1000	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC25	68.58	60.83	96.09	1.458	1.041	1.644
IC50	>100	n/a	n/a	<1	n/a	n/a

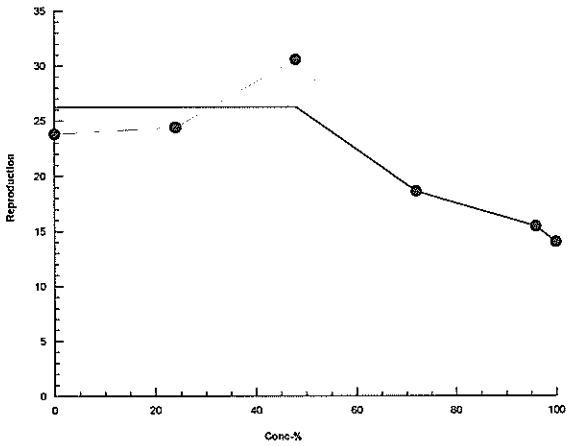
Reproduction Summary

			Calculated Variate						Isotonic Variate	
Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	Mean	%Effect
0	D	10	23.8	12	36	6.546	27.50%	0.0%	26.25	0.0%
24		10	24.4	11	34	6.467	26.50%	-2.52%	26.25	0.0%
48		9	30.56	25	35	2.744	8.98%	-28.38%	26.25	0.0%
72		10	18.6	6	32	9.046	48.63%	21.85%	18.6	29.15%
96		10	15.4	0	28	8.884	57.69%	35.29%	15.4	41.34%
100		10	14	0	28	8.932	63.80%	41.18%	14	46.67%

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	18	24	24	36	23	12	24	27	30	20
24		25	27	34	11	30	25	25	28	21	18
48		32	28	31	31	31	31	35	25	31	
72		25	32	11	6	20	27	18	27	8	12
96		15	23	28	13	20	21	19	13	0	2
100		0	18	22	16	12	19	28	10	0	15

Graphics



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

Project ID:	TONA 110320	**Start Date:**	110320	**Time:**	1330
Permit No.:	PA0039004	**End Date:**	111020	**Time:**	1330
Hatch #:	110220 1430 AMM BOBABC SKB KMC	**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	0 / 0	0 / 0	0 / 0	2 / 2
	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	2 / 2
	total %'s								
DMW+ST ~~24~~	A	10	0 / 0	0 / 0	1 / 1	1 / 1	1 / 1	1 / 1	2 / 2
	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	1 / 1	1 / 1	2 / 2
	D	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	total %'s								
24 ~~48~~	A	10	0 / 0	0 / 0	1 / 1	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								
48 ~~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	2 / 2	2 / 2
	D	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	1 / 1
	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	24.4	24.0	24.8	24.0	24.8	24.0	24.9	24.0	24.4	25.3
DMW+ST	24.0	24.0	24.0	24.0	24.4	24.0	25.0	24.0	24.7	24.0	25.0	24.0	24.2	25.2
24	24.0	24.0	24.0	24.0	24.3	24.0	24.8	24.0	24.4	24.0	24.9	24.0	24.4	25.2
48	24.0	24.0	24.0	24.0	24.6	24.0	24.8	24.0	25.0	24.0	24.7	24.0	24.1	25.1
72	24.0	24.0	24.0	24.1	24.8	24.0	24.9	24.0	24.9	24.0	25.0	24.0	24.4	25.2
96	24.0	24.0	24.0	25.0	24.8	24.0	25.1	24.0	25.0	24.0	25.2	24.0	24.1	25.4
100	24.0	24.0	24.0	24.7	24.7	24.0	25.1	24.0	24.9	24.0	25.3	24.0	24.8	25.4
renew time		1400		1330		1200		1235		1200		1220		1330
Initials	Set up EF	AT		AT		KAH		EF		KAH		EF		KAH
	n# AT													

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

Project ID:	TOWA 110320
Permit No.:	

KHV

Start Date:	110320

	Rep	n_i	# of P. promelas Mortalities / # P. promelas Adversely Affected						
			1	2	3	4	5	6	7
12 ~~40~~	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								
96 ~~100~~	A	10	0 / 0	0 / 0	1 / 1	1 / 1	1 / 1	1 / 1	2 / 2
	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	1 / 1	1 / 1	1 / 1	1 / 1
	total %'s								
100	A	10	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	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~~ 1
	D	10	0 / 0	0 / 0	1 / 1	2 / 2	2 / 2	2 / 2	2 / 2
	total %'s								
	A		/	/	/	/	/	/	/
	B		/	/	/	/	/	/	/
	C		/	/	/	/	/	/	/
	D		/	/	/	/	/	/	/
	total %'s								

Comments / Corrections:

Day	Date	Comments	Initials

CETIS Analytical Report

Report Date: 16 Nov-20 14:14 (p 1 of 4)
Test Code/ID: 5FBC82F7 / 16-0618-9815

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

Analysis ID:	13-7317-7259	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.9.6
Analyzed:	16 Nov-20 14:13	**Analysis:**	Nonparametric-Control vs Treatments	**Status Level:**	1

Sample ID:	12-1805-4265	**Code:**	TOWA110320	**Project:**	
Sample Date:	02 Nov-20 08:00	**Material:**	POTW Effluent	**Source:**	Discharge Monitoring Report
Receipt Date:	03 Nov-20 10:30	**CAS (PC):**		**Station:**	001
Sample Age:	29h	**Client:**	Towamencin		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	C > T	100	>100	n/a	1	16.32%

Steel Many-One Rank Sum Test

Control vs	Conc-%	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Dilution Water	24	21	10	2	6	CDF	0.9778	Non-Significant Effect
	48	19	10	3	6	CDF	0.9055	Non-Significant Effect
	72	22	10	2	6	CDF	0.9908	Non-Significant Effect
	96	18	10	3	6	CDF	0.8333	Non-Significant Effect
	100	18	10	3	6	CDF	0.8333	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0923948	0.018479	5	1.228	0.3365	Non-Significant Effect
Error	0.270815	0.0150453	18			
Total	0.36321		23			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variance	Bartlett Equality of Variance Test				Indeterminate
Distribution	Shapiro-Wilk W Normality Test	0.9117	0.884	0.0385	Normal Distribution

7d Survival Rate Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	0.9000	0.7163	1.0000	0.9000	0.8000	1.0000	0.0577	12.83%	0.00%
24		4	0.9750	0.8954	1.0000	1.0000	0.9000	1.0000	0.0250	5.13%	-8.33%
48		4	0.9250	0.7727	1.0000	0.9500	0.8000	1.0000	0.0479	10.35%	-2.78%
72		4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.00%	-11.11%
96		4	0.9000	0.7701	1.0000	0.9000	0.8000	1.0000	0.0408	9.07%	0.00%
100		4	0.9000	0.7701	1.0000	0.9000	0.8000	1.0000	0.0408	9.07%	0.00%

Angular (Corrected) Transformed Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	1.26	0.9795	1.54	1.26	1.107	1.412	0.08801	13.97%	0.00%
24		4	1.371	1.242	1.501	1.412	1.249	1.412	0.04074	5.94%	-8.87%
48		4	1.295	1.061	1.529	1.331	1.107	1.412	0.07348	11.35%	-2.82%
72		4	1.412	1.412	1.412	1.412	1.412	1.412	0	0.00%	-12.10%
96		4	1.254	1.056	1.453	1.249	1.107	1.412	0.06231	9.93%	0.42%
100		4	1.254	1.056	1.453	1.249	1.107	1.412	0.06231	9.93%	0.42%

7d Survival Rate Detail

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

KHV

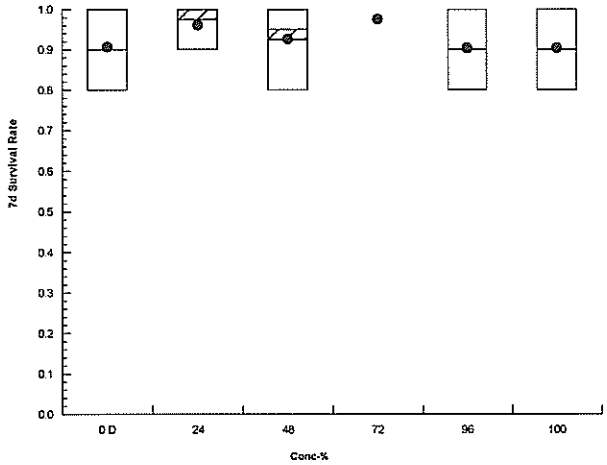
Fathead Minnow 7-d Larval Survival and Growth Test — **EnviroScience**

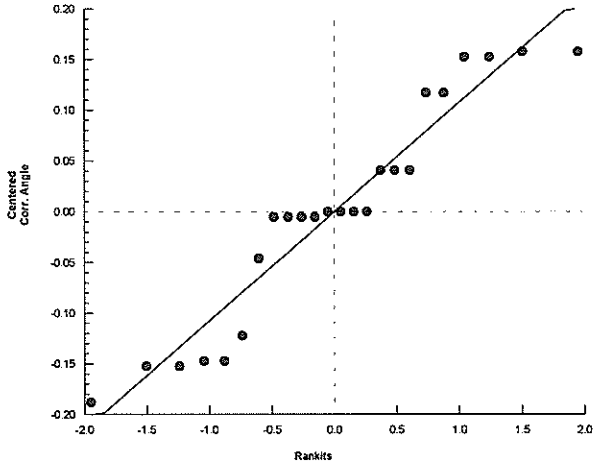
Analysis ID:	13-7317-7259	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.9.6
Analyzed:	16 Nov-20 14:13	**Analysis:**	Nonparametric-Control vs Treatments	**Status Level:**	1

Angular (Corrected) Transformed Detail

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

Graphics





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

Analysis ID:	19-2761-8259	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.9.6
Analyzed:	16 Nov-20 14:14	**Analysis:**	~~Parametric-Control vs Treatments~~	**Status Level:**	1

Sample ID:	12-1805-4265	**Code:**	TOWA110320	**Project:**	
Sample Date:	02 Nov-20 08:00	**Material:**	POTW Effluent	**Source:**	Discharge Monitoring Report
Receipt Date:	03 Nov-20 10:30	**CAS (PC):**		**Station:**	001
Sample Age:	29h	**Client:**	Towamencin		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	100	>100	n/a	1	18.91%

Dunnett Multiple Comparison Test

Control vs	Conc-%	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Dilution Water	24	-3.377	2.407	0.066	6	CDF	1.0000	Non-Significant Effect
	48	-4.739	2.407	0.066	6	CDF	1.0000	Non-Significant Effect
	72	-4.539	2.407	0.066	6	CDF	1.0000	Non-Significant Effect
	96	-3.486	2.407	0.066	6	CDF	1.0000	Non-Significant Effect
	100	-2.651	2.407	0.066	6	CDF	0.9999	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0448576	0.0089715	5	5.916	0.0021	Significant Effect
Error	0.0272956	0.0015164	18			
Total	0.0721531		23			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variance	Bartlett Equality of Variance Test	2.07	15.09	0.8394	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9476	0.884	0.2401	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	0.3505	0.2912	0.4098	0.3485	0.309	0.396	0.01863	10.63%	0.00%
24		4	0.4435	0.3717	0.5153	0.446	0.39	0.492	0.02256	10.17%	-26.53%
48		4	0.481	0.4398	0.5222	0.474	0.458	0.518	0.01295	5.39%	-37.23%
72		4	0.4755	0.4258	0.5251	0.4625	0.455	0.522	0.0156	6.56%	-35.66%
96		4	0.4465	0.3963	0.4967	0.437	0.42	0.492	0.01577	7.07%	-27.39%
100		4	0.4235	0.3358	0.5111	0.423	0.358	0.49	0.02754	13.01%	-20.83%

Mean Dry Weight-mg Detail

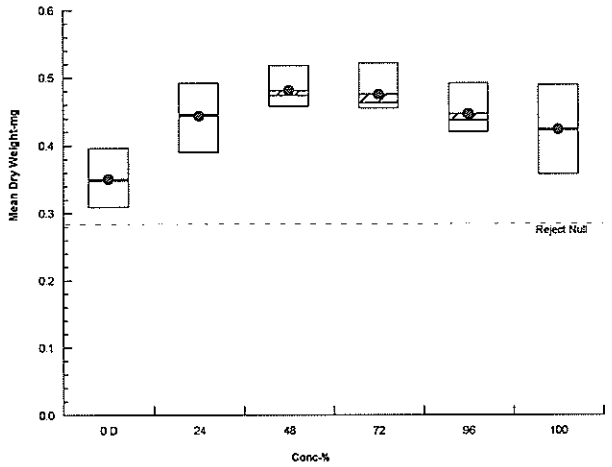
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.335	0.309	0.396	0.362
24		0.39	0.425	0.492	0.467
48		0.458	0.471	0.518	0.477
72		0.455	0.463	0.462	0.522
96		0.42	0.433	0.441	0.492
100		0.358	0.437	0.409	0.49

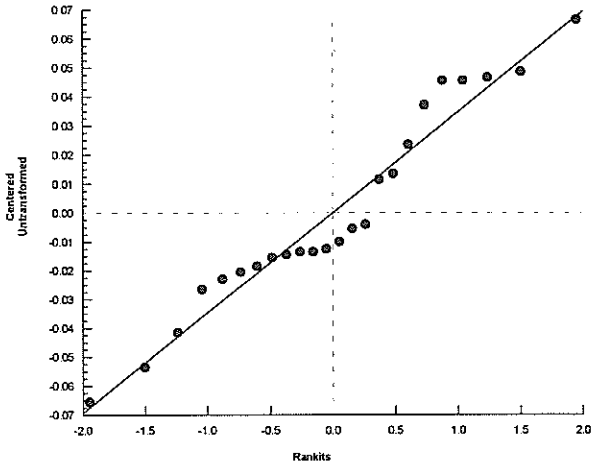
KHV

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

Analysis ID:	19-2761-8259	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.9.6
Analyzed:	16 Nov-20 14:14	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1

Graphics





CETIS Analytical Report

Report Date: 16 Nov-20 14:14 (p 1 of 1)
Test Code/ID: 5FBC82F7 / 16-0618-9815

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

Analysis ID:	08-5465-4620	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.9.6
Analyzed:	16 Nov-20 14:14	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1

Sample ID:	12-1805-4265	**Code:**	TOWA110320	**Project:**	
Sample Date:	02 Nov-20 08:00	**Material:**	POTW Effluent	**Source:**	Discharge Monitoring Report
Receipt Date:	03 Nov-20 10:30	**CAS (PC):**		**Station:**	001
Sample Age:	29h	**Client:**	Towamencin		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	1093096	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

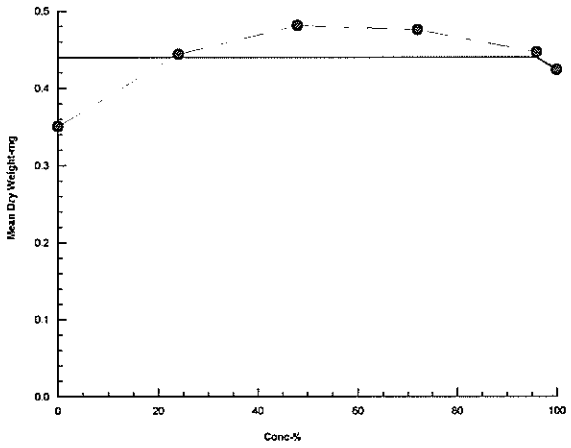
Mean Dry Weight-mg Summary

			Calculated Variate						Isotonic Variate	
Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	Mean	%Effect
0	D	4	0.3505	0.309	0.396	0.03726	10.63%	0.0%	0.4394	0.0%
24		4	0.4435	0.39	0.492	0.04512	10.17%	-26.53%	0.4394	0.0%
48		4	0.481	0.458	0.518	0.02591	5.39%	-37.23%	0.4394	0.0%
72		4	0.4755	0.455	0.522	0.0312	6.56%	-35.66%	0.4394	0.0%
96		4	0.4465	0.42	0.492	0.03155	7.07%	-27.39%	0.4394	0.0%
100		4	0.4235	0.358	0.49	0.05508	13.01%	-20.83%	0.4235	3.62%

Mean Dry Weight-mg Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.335	0.309	0.396	0.362
24		0.39	0.425	0.492	0.467
48		0.458	0.471	0.518	0.477
72		0.455	0.463	0.462	0.522
96		0.42	0.433	0.441	0.492
100		0.358	0.437	0.409	0.49

Graphics



KHV

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

Project ID:	IOWA 110320
Permit No.:	PA0039004

Start Date:	110320

Concen-tration	Rep. no.	Pan no.	Weight of pan (g)	Total dry wt. (g)	No. fish
DMW	A	Y1	1.10672	1.11007	10
	B	Y2	1.10645	1.10954	8
	C	Y3	1.09774	1.10170	10
	D	Y4	1.10714	1.11076	8
DMW+ST ~~24~~ 1.	A	Y5	1.10755	1.11016	~~8~~ 7
	B	Y6	1.09292	1.09653	10
	C	Y7	1.10168	1.10616	8
	D	Y8	1.10768	1.11200	10
24 ~~48~~ 1.	A	Y9	1.08714	1.09104	9
	B	Y10	1.12634	1.13059	10
	C	Y11	1.12707	1.13199	10
	D	Y12	1.11656	1.12123	10
48 ~~72~~ 1.	A	Y13	1.11556	1.12014	10
	B	Y14	1.12195	1.12666	10
	C	Y15	1.11316	1.11834	8
	D	Y16	1.10156	1.10633	9
72 ~~96~~ 1.	A	Y17	1.08242	1.08697	10
	B	Y18	1.09216	1.09679	10
	C	Y19	1.10054	1.10516	10
	D	Y20	1.10126	1.10648	10
96 ~~100~~ 1.	A	Y21	1.10293	1.10713	8
	B	Y22	1.10445	1.10878	10
	C	Y23	1.10538	1.10979	9
	D	Y24	1.09220	1.09712	9
Initials		TM	JV	MT	KAH

Comments:

Reviewer pgs 1-2 KH

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

Project ID:	IOWA
Permit No.:	

Start Date:	110320

Concen-tration	Rep. no.	Pan no.	Weight of pan (g)	Total dry wt. (g)	No. fish
100	A	Y25	1.17785	1.18143	9
	B	Y26	1.17379	1.17816	10
	C	Y27	1.17128	1.17537	~~10~~ 9
	D	Y28	1.15206	1.15696	8

	A				
	B				
	C				
	D				
Initials		TM	JV	MT	+ KAH

Quality Assurance

					Final-Initial (g)
Pan Tare	A	~~Y25~~ H33	~~1.17785~~ 1.14190	1.14193	
	B	~~Y26~~ H34	~~1.17379~~ 1.14207	1.14216	
	C	~~Y27~~ H35	~~1.17128~~ 1.09990	1.09991	
	D	~~Y28~~ H36	~~1.15206~~ 1.14342	1.14346	
Initials		TM	JV	MT	

S Weight calibrations	S wgt	Date: 110620	S wgt	Date: 111120
	2g	2.00000	2g	2.00000
	1g	0.99995	1g	0.99996
	500mg	0.49998	500mg	0.50000
	100mg	0.10002	100mg	0.10000
Initials		JV		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 @	111020	1415	65	KAH
Pans w/fish removed @	111120	1415	65	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	O	W	A	110320	Permit No.:	PA0039004	Date:	11	03	20

Conductivity µmhos/cm - **INITIAL**

level	0	1	2	3	4	5	6
MHR	310	303	299	308	291	291	292
24	1022	1030	966	900	1024	1049	1001
48	793	931	1477	1565	1762	1682	1694
72	1250	1248	2180	~~1642~~ 2120	2410	2450	2390
96	1575	1576	2680	2800	3190	3210	3140
100	1642	1654	2870	2890	3300	3290	3280
TST	304	317	309	320	291	291	292
				AT 11/6			

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

	day→	0	1	2	3	4	5	6
TECH	Initial	CB	CB	EF	AT	AT	MT	MT
TECH	Final	MT	EF	AT	AT	MT	MT	CB
DO	830							
	820							
	YSI	I F	I F	I F	I F	I F	I F	I F
pH	920	I F	I	I	F	X	I F	I F
	2Star		F	F	I	I 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
MHR	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	8.3	8.6	8.6
TST	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
MHR	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
TST	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	7.3	7.4	7.4	7.3	7.4	7.4	7.1
24	7.3	7.4	7.5	7.4	7.7	7.4	7.4
48	7.3	7.4	7.5	7.4	7.6	7.4	7.4
72	7.4	7.5	7.5	7.5	7.6	7.6	7.4
96	7.5	7.5	7.5	7.4	7.5	7.5	7.5
100	7.5	7.5	7.5	7.3	7.4	7.5	7.5
TST	7.3	7.5	7.7	7.7	7.4	7.4	7.1

pH s.u. - **FINAL**

level	0	1	2	3	4	5	6
MHR	7.5	7.9	7.9	7.7	7.6	7.4	7.6
24	7.6	7.8	7.8	7.6	7.5	7.4	7.6
48	7.6	7.9	7.7	7.8	7.6	7.5	7.6
72	7.7	7.9	7.8	7.8	7.8	7.7	7.7
96	7.7	8.0	7.9	7.9	7.8	7.8	7.7
100	7.8	8.0	7.9	7.9	7.9	7.9	7.8
TST	7.6	7.8	8.0	7.9	7.9	7.9	7.8

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

Project ID:	T	D	W	A	110320	Permit No.:	PA0039004	Date:	11	03	20

Conductivity µmhos/cm - **INITIAL**

level	0	1	2	3	4	5	6
DMW	184	179	176	182	182	175	177
24	528	522	839	839	939	936	942
48	872	869	1475	1501	1693	1683	1677
72	1221	1242	2090	2150	2500	2430	2400
96	1578	1582	2760	2710	3100	3180	3180
100	1642	1652	2870	2890	3300	3290	3280
TST	180	178	175	189	182	175	177

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

	day→	0	1	2	3	4	5	6
TECH	Initial	CB	CB	EF	AT	AT	MT	MT
TECH	Final	CB	EF	AT	AT	MT	MT	CB
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	F	F	I F	I
	2Star			F	I F	I		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
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	8.5	8.6	8.6
TST	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
24	8.4	8.6	8.6	8.6	8.6	8.6	8.6
48	8.2	8.6	8.6	8.6	8.6	8.6	8.5
72	8.0	8.6	8.6	8.6	8.6	8.6	8.3
96	8.0	8.6	8.6	8.6	8.6	8.6	8.2
100	7.8	8.6	8.6	8.6	8.6	8.6	8.0
TST	8.4	8.6	8.6	8.6	8.6	8.6	7.8

pH s.u. - **INITIAL**

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

pH s.u. - **FINAL**

level	0	1	2	3	4	5	6
DMW	7.6	7.6	7.8	7.8	7.2	7.3	7.5
24	7.5	7.2	7.6	7.3	7.2	7.2	7.5
48	7.5	7.2	7.6	7.2	7.4	7.5	7.5
72	7.5	7.4	7.6	7.4	7.6	7.6	7.6
96	7.4	7.84	7.6	7.4	7.6	7.7	7.7
100	7.5	7.4	7.6	7.6	7.7	7.7	7.8
TST	7.4	7.3	7.7	7.7	7.8	7.7	7.8

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

Project ID: TOWA 110320 Permit No.: PA0039004
Test Date: 110320

Sample Type: →	EFFLUENT					
EnviroScience No.:	TOWA 110320EFF	TOWA 110320 EFF	TOWA 110720EFF			
D. Oxygen (mg/l-%sat) **>4 & <100%?**	8.6	8.6	8.6			
pH (s.u) **6-9?**	7.6	7.2	7.5			
Conductivity (µmhos/cm)	1600	2760	3240			
Alkalinity (mg/l $CaCO_3$) **MDL = 20 mg/l**	(4.5)90	(5.0)100	(4.4)88			
Hardness (mg/l $CaCO_3$) **MDL = 5 mg/l**	(38)152	(4.8)192	(4.7)188			
TRC_I (mg/l) **<0.02?**	0.156	0.163	<0.02			
TRC_A (mg/l) <0.02?	<0.02	<0.02	–			
Ammonia as N (mg/L)	0.13	0.00	0.28			
Tech Initials :	CB	EF	AT			

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 #)

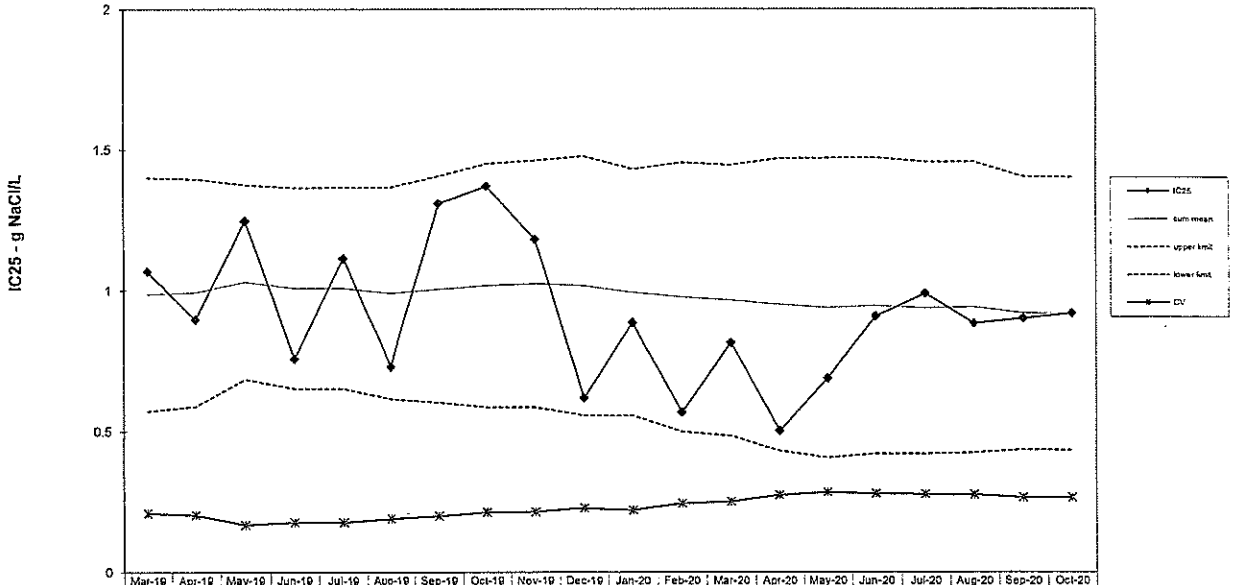
Dechlorination procedure:
TRC_I = total residual chlorine, initial value measured prior to dilution or use of sample.
TRC_A = TRC value measured after dechlorination.

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.

KH✓

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



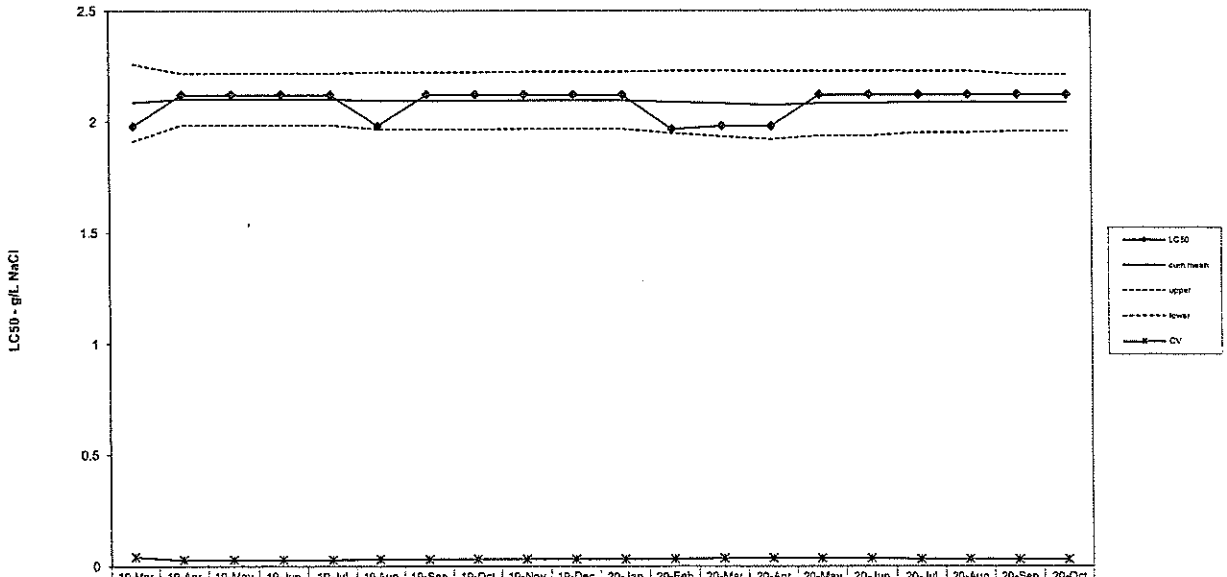
	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20
IC25	1.088	0.8951	1.246	0.7586	1.114	0.7289	1.308	1.37	1.182	0.6177	0.8853	0.5672	0.8133	0.5022	0.6875	0.9084	0.9889	0.8826	0.9003	0.918
cum mean	0.95813	0.99268	1.03002	1.00805	1.00675	0.99015	1.00445	1.01795	1.02385	1.01639	0.99385	0.9763	0.96437	0.94957	0.93857	0.94592	0.93807	0.94049	0.91971	0.91705
upper limit	1.40037	1.39824	1.3752	1.3645	1.36601	1.36548	1.40578	1.44982	1.46127	1.47646	1.43162	1.45323	1.44525	1.46868	1.4706	1.47166	1.45586	1.45668	1.40477	1.40151
lower limit	0.57189	0.58907	0.68484	0.6516	0.65149	0.61431	0.60311	0.58607	0.58602	0.55631	0.55608	0.49937	0.48346	0.43046	0.40853	0.42018	0.42027	0.4243	0.43464	0.43259
CV	0.21003	0.20329	0.16756	0.1768	0.17708	0.18953	0.19978	0.21213	0.21376	0.22633	0.22024	0.24426	0.24933	0.27334	0.28343	0.2779	0.27599	0.27443	0.26371	0.26414

Test Date

EnviroScience QC/SRT Chart rev. 11/03/20

Tests conducted with MHRW

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



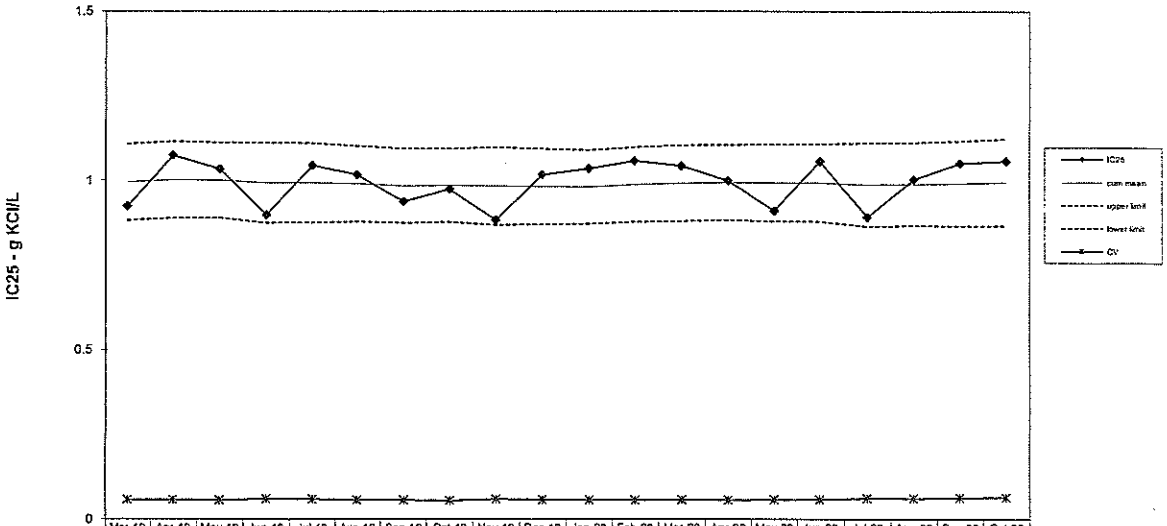
	19-Mar	19-Apr	19-May	19-Jun	19-Jul	19-Aug	19-Sep	19-Oct	19-Nov	19-Dec	20-Jan	20-Feb	20-Mar	20-Apr	20-May	20-Jun	20-Jul	20-Aug	20-Sep	20-Oct
LC50	1.979	2.121	2.121	2.121	2.121	1.979	2.121	2.121	2.121	2.121	2.121	1.955	1.979	1.979	2.121	2.121	2.121	2.121	2.121	2.121
cum mean	2.08585	2.1013	2.1013	2.1013	2.1013	2.0942	2.0942	2.0942	2.0961	2.0961	2.0961	2.0883	2.0812	2.0741	2.0819	2.0819	2.089	2.089	2.0848	2.0848
upper	2.25992	2.21864	2.21864	2.21864	2.21864	2.22313	2.22313	2.22313	2.22546	2.22546	2.22546	2.2296	2.22967	2.22603	2.22818	2.22818	2.22784	2.22784	2.21359	2.21359
lower	1.91178	1.98396	1.98398	1.98396	1.98398	1.96527	1.96527	1.96527	1.96674	1.96674	1.96674	1.947	1.93273	1.92017	1.93562	1.93562	1.95016	1.95016	1.95601	1.95601
CV	0.04173	0.02792	0.02792	0.02792	0.02792	0.03078	0.03078	0.03078	0.03086	0.03086	0.03086	0.03383	0.03567	0.03711	0.03513	0.03513	0.03323	0.03323	0.03089	0.03089

Test Date

EnviroScience QC/SRT Chart rev. 11/03/20

Tests conducted with MHRW

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



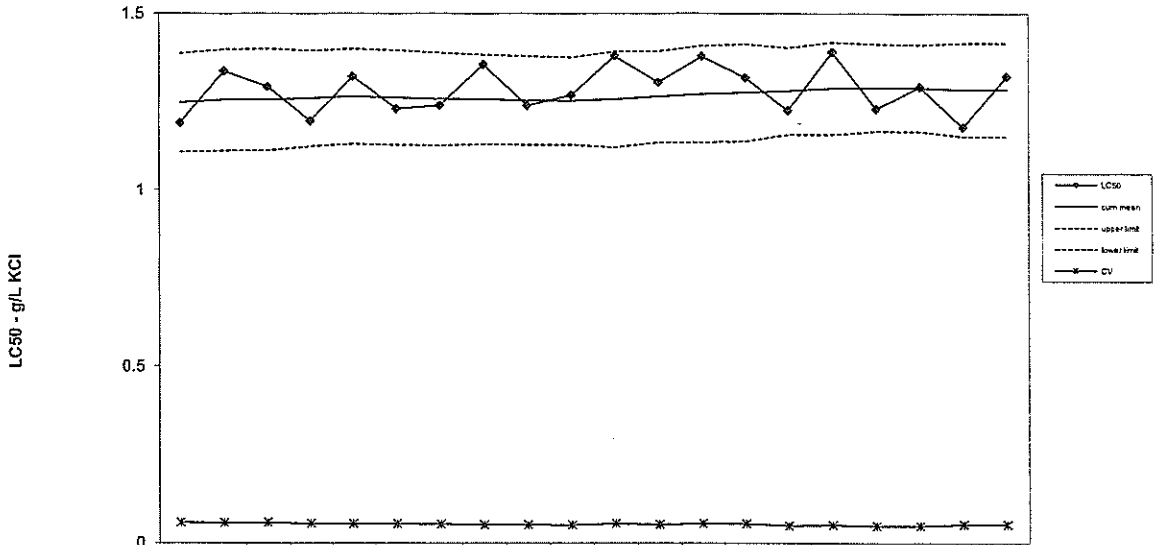
	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20
IC25	0.9231	1.074	1.033	0.8975	1.044	1.016	0.9367	0.974	0.8826	1.016	1.035	1.057	1.042	0.9985	0.9093	1.056	0.891	1.003	1.05	1.057
cum mean	0.99454	1.00186	1.00086	0.99333	0.99278	0.99988	0.98407	0.98556	0.98336	0.98171	0.98056	0.98734	0.99137	0.99335	0.99244	0.99284	0.98729	0.98925	0.9909	0.99479
upper limit	1.10758	1.11543	1.11258	1.11176	1.1101	1.10147	1.09392	1.09393	1.09835	1.09364	1.08963	1.09777	1.10368	1.10454	1.10628	1.10756	1.11056	1.11219	1.11627	1.12342
lower limit	0.8815	0.88848	0.88913	0.8749	0.87546	0.87829	0.87421	0.87719	0.86837	0.86978	0.87149	0.87691	0.87905	0.88208	0.8786	0.87812	0.86402	0.86631	0.86553	0.86615
CV	0.05683	0.05663	0.05582	0.05961	0.05909	0.05637	0.05582	0.05498	0.05847	0.05701	0.05561	0.05592	0.05665	0.05601	0.05735	0.05777	0.06243	0.06214	0.06326	0.06465

Test Date

EnviroScience QC/SRT Chart rev. 11/03/20

Tests conducted with DMW

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



	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20
LC50	1.186	1.337	1.292	1.194	1.321	1.229	1.239	1.355	1.238	1.267	1.38	1.304	1.378	1.317	1.224	1.39	1.229	1.291	1.177	1.321
cum mean	1.247	1.2542	1.2556	1.2586	1.265	1.2611	1.257	1.2558	1.2529	1.2511	1.2559	1.2633	1.2712	1.275	1.2795	1.2871	1.2897	1.2883	1.2836	1.2836
upper limit	1.3876	1.3979	1.4003	1.3949	1.4003	1.3957	1.3889	1.3833	1.3792	1.3754	1.3925	1.393	1.4086	1.4133	1.4034	1.4187	1.414	1.4117	1.4166	1.4167
lower limit	1.1084	1.1104	1.1108	1.1222	1.1297	1.1264	1.125	1.1282	1.1265	1.1267	1.1193	1.1336	1.1335	1.1368	1.1556	1.1555	1.1654	1.1648	1.1505	1.1505
CV	0.0564	0.0573	0.0576	0.0542	0.0535	0.0534	0.0525	0.0508	0.0504	0.0497	0.0544	0.0513	0.0541	0.0542	0.0484	0.0511	0.0482	0.0479	0.0518	0.0518

Test Date

EnviroScience QC/SRT Chart rev. 11/03/20

Tests conducted with DMW