

**Toxicity Tests
For
Western VA Water Authority**

Report # 2577

Submitted To: Western VA Water Authority
Lisa Workman
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Roanoke, VA 24014

Submitted By: Biological Monitoring, Inc.
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Phone: 540-953-2821
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Report Date: Nov 26, 2021



Biological Monitoring, Inc. is accredited by The NELAC Institute (TNI 2009, ID:460015). The test results reported herein meet all requirements of TNI. The procedures are deemed compliant with the methods and acceptable for reporting.



Quality Manager

A handwritten signature in blue ink, reading "William J. Rosnabe", written over a horizontal line.



BIOLOGICAL MONITORING, INC

1800 KRAFT DRIVE SUITE 104 BLACKSBURG VIRGINIA 24060

PH:540-953-2821 EMAIL:BMI@BIOMON.COM WWW.BIOMON.COM



TNI ACCREDITED LAB# 460015

Toxicity Testing Data Summary

Client Western VA Water Authority **Permit #** VA0025020 **Sample** Pre/Post Outfall

Test ID WVA111621-1 **Result** NOEC = 100, IC25 > 100 **Pass/Fail** Pass **Next Step** NA

Test ID WVA111621-2 **Result** NOEC = 100, IC25 > 100 **Pass/Fail** Pass **Next Step** NA

Test ID WVA111621-3 **Result** NOEC = 100, IC25 > 100 **Pass/Fail** Pass **Next Step** NA

Test ID WVA111621-4 **Result** NOEC = 100, IC25 > 100 **Pass/Fail** Pass **Next Step** NA



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TNI ACCREDITED LAB# 460015

Certificate of Analysis

Client Western VA Water Authority

Report # 2577

BMI Project # 4187

Report Date Nov 26, 2021

Permit # VA0025020

Sample ID #s WVA111621-1, WVA111821-1,
WVA111921-1

Sample Pre Outfall

Test ID # WVA111621-1

Test Type Short Term Chronic

Organism Pimephales promelas

Test Start Date Nov 16, 2021

Test Start Time 1330

EPA Method # 1000

Test End Date Nov 23, 2021

Test End Time 1330

Photoperiod 16h L/ 8h D

Endpoint Survival

Method Dunnett's Test

Result NOEC = 100

Endpoint Survival

Method Graphical

Result 48h LC50 > 100

Endpoint Growth

Method Dunnett's Test

Result NOEC = 100

Endpoint Growth

Method Linear Interpolation

Result IC25 > 100

Endpoint Growth

Method PMSD

Result 12.9%

Final Result NOEC = 100, IC25 > 100, TUC = 1

Pass/Fail Pass



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TNI ACCREDITED LAB# 460015

Certificate of Analysis

Client Western VA Water Authority

Report # 2577

BMI Project # 4187

Report Date Nov 26, 2021

Permit # VA0025020

Sample ID #s WVA111621-1, WVA111821-1,
WVA111921-1

Sample Pre Outfall

Test ID # WVA111621-2

Test Type Short Term Chronic

Organism Ceriodaphnia dubia

Test Start Date Nov 16, 2021

Test Start Time 1400

EPA Method # 1002

Test End Date Nov 22, 2021

Test End Time 1400

Photoperiod 16h L/ 8h D

Endpoint Survival

Method Fisher's Exact Test

Result LC50 = 100

Endpoint Survival

Method Graphical

Result 48h LC50 > 100

Endpoint Reproduction

Method Dunnett's Test

Result NOEC = 100

Endpoint Reproduction

Method Linear Interpolation

Result IC25 > 100

Endpoint Reproduction

Method PMSD

Result NA

Final Result NOEC = 100, IC25 > 100, TUC = 1

Pass/Fail Pass



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TNI ACCREDITED LAB# 460015

Certificate of Analysis

Client	Western VA Water Authority	Report #	2577
BMI Project #	4187	Report Date	Nov 26, 2021
Permit #	VA0025020	Sample ID #s	WVA111621-1, WVA111821-1, WVA111921-1
Sample	Post Outfall	Test ID #	WVA111621-3

Test Type	Short Term Chronic	Organism	Pimephales promelas
Test Start Date	Nov 16, 2021	Test Start Time	1400
		EPA Method #	1000
Test End Date	Nov 23, 2021	Test End Time	1400
		Photoperiod	16h L/ 8h D

Endpoint	Survival	Method	Dunnett's Test	Result	NOEC = 100
Endpoint	Survival	Method	Graphical	Result	48h LC50 > 100
Endpoint	Growth	Method	Dunnett's Test	Result	NOEC = 100
Endpoint	Growth	Method	Linear Interpolation	Result	IC25 > 100
Endpoint	Growth	Method	PMSD	Result	12.9%

Final Result	NOEC = 100, IC25 > 100, TUC = 1	Pass/Fail	Pass
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TNI ACCREDITED LAB# 460015

Certificate of Analysis

Client	Western Virginia Water Authority	Report #	2577
BMI Project #	4187	Report Date	Nov 26, 2021
Permit #	VA0025020	Sample ID #s	WVA111621-1, WVA111821-1, WVA111921-1
Sample	Post Outfall	Test ID #	WVA111621-4

Test Type	Short Term Chronic	Organism	Ceriodaphnia dubia
Test Start Date	Nov 16, 2021	Test Start Time	1430
		EPA Method #	1002
Test End Date	Nov 22, 2021	Test End Time	1430
		Photoperiod	16h L/ 8h D

Endpoint	Survival	Method	Fisher's Exact Test	Result	NOEC = 100
Endpoint	Survival	Method	Graphical	Result	48h LC50 > 100
Endpoint	Reproduction	Method	Dunnett's Test	Result	NOEC = 100
Endpoint	Reproduction	Method	Linear Interpolation	Result	IC25 > 100
Endpoint	Reproduction	Method	PMSD	Result	NA

Final Result	NOEC = 100, IC25 > 100, TUC = 1	Pass/Fail	Pass
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Chronic Toxicity Test
(Pimephales promelas)

Page 1 of 4

Experiment I.D.# WVA111621-1
 Biologist(s): VR JR PR SS MM LJ
 Permit # VA 0025020
 Client: West VA Water Authority
 Effluent toxicant: Pre-outfall
 Sample Type: grab
 Sample Chlorine: <0.02
 Dilution Water Used MHRW
 Feeding Schedule: 0.5mL Artemia 2x daily
 Aeration: —
 Template #: NA

Start of Test Date: 11-16-21 Time: 1330
 End of Test Date: 11-23-21 Time: 1330
 Test Duration: 7 days
 Test Temperature: 25 ± 1°C
 Test Volume: 350mL
 Test Containers Used: 400mL
 Renewal Frequency: Daily
 Test Organism Age: ABS111621-1^① 24-48HR
 Organism Batch #: ABS111621-1
 Organisms per concentration: 40
 Waterbath/Shelf #: 5

SAMPLE COLLECTION							
Date(s)		Time(s)		TEST RENEWAL			
From:	To:	From:	To:	Date(s)	Time(s)	Test Day	Diluent Batch #:
11-15-21	—	11-16-21	—	11-16-21	1330	0	8052
				11-17-21	1300	1	8052
11-17-21	—	0817	—	11-18-21	1330	2	8052
11-18-21	—	0836	—	11-19-21	1400	3	8053
				11-20-21	1430	4	8053
				11-21-21	1400	5	8053
				11-22-21	1330	6	8053

Meters: Instrument Id#: Temp.: 067 pH: 061

DO: 061 Conductivity/Salinity: 061

Condition of Organisms at End of Test: Normal

Average weight per control fish: 0.557 Control Survival (%): 97.5

Comments: _____

Experiment ID: WVA111621-1

Conc: Units	Day	Number of Live Organisms				DO (mg/L)		pH		Alkalinity mg/L as CaCO ₃	Hardness mg/L as CaCO ₃	Cond./ Salinity umho/ 0/00	Temp. (C)		Feeding 1	Feeding 2	Comments	Initials
		A	B	C	D	Before	After	Before	After				Before	After				
WVA Q	0	10	10	10	10		8.65		8.17	64	88	314		25		✓		JP
	1	10	10	10	10	8.88	9.25	7.92	8.06			322	25	25	✓	✓		JP
	2	10	10	10	10	7.34	7.34	8.21	8.03			314	25	25	✓	✓		LS
	3	10	10	10	10	7.47	7.23	8.07	8.04	58	82	312	24	24	✓	✓		LS
	4	10	10	10	9	6.88	7.76	7.97	8.03			297	24	24	✓	✓		JP
	5	10	10	10	9	7.54	8.17	8.05	8.18			297	24	24	✓	✓		JP
	6	10	10	10	9	6.93	7.22	7.98	8.18			296	25	25	✓	✓		JP
	7	10	10	10	9	7.02		7.92					24		No Food			JP
WVA 100 Pre	0	10	10	10	10		10.36		8.17	410	580	368		25		✓		JP
	1	10	10	10	10	9.34	10.80	8.37	8.16			372	25	25	✓	✓		JP
	2	10	10	10	10	7.58	7.68	8.20	8.19	440	540	389	25	25	✓	✓		LS
	3	10	10	10	10	8.42	8.05	8.48	8.21	420	550	392	24	24	✓	✓		LS
	4	10	10	10	10	6.69	9.40	8.39	8.17			392	24	24	✓	✓		JP
	5	10	9	10	10	7.46	8.74	8.41	8.20			396	24	24	✓	✓		JP
	6	10	9	10	10	6.62	9.83	8.32	8.20			393	25	25	✓	✓		JP
	7	10	9	10	9	6.85		8.29					24		No Food			JP
	0																	
	1												25					
	2																	
	3																	
	4																	
	5																	
	6																	
	7														No Food			

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CETIS Analytical Report

Report Date: 26 Nov-21 10:57 (p 1 of 4)

Test Code/ID: WVA111621-1 / 09-7144-7831

Fathead Minnow 7-d Larval Survival and Growth Test

Biological Monitoring, Inc.

Analysis ID: 06-7709-2305	Endpoint: 7d Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 26 Nov-21 10:56	Analysis: Parametric-Control vs Treatments	Status Level: 1
Batch ID: 01-9081-1214	Test Type: Growth-Survival (7d)	Analyst: Lab Tech
Start Date: 16 Nov-21 13:02	Protocol: EPA/821/R-02-013 (2002)	Diluent: Mod-Hard Synthetic Water
Ending Date: 23 Nov-21 13:00	Species: Pimephales promelas	Brine:
Test Length: 7d	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age: 24
Sample ID: 12-0811-5730	Code: WVA111621-1	Project: WET Quarterly Compliance Test (4Q)
Sample Date: 16 Nov-21 08:06	Material: Effluent	Source: VA0025020 (VA0025020)
Receipt Date: 23 Nov-21 08:30	CAS (PC):	Station: PRE
Sample Age: 5h	Client: Western Va Water Authority	

Data Transform	Alt. Hyp	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	C > T	101	>101	n/a	0.9901	7.00%

Dunnett Multiple Comparison Test

Control	vs	Conc-%	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Dilution Water		100	0.8018	2.18	0.111	6	CDF	0.3402	Non-Significant Effect
		101	-0.8018	2.18	0.111	6	CDF	0.8969	Non-Significant Effect

Test Acceptability Criteria

TAC Limits

Attribute	Test Stat	Lower	Upper	Overlap	Decision
Control Resp	0.975	0.8	>>	Yes	Passes Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0132797	0.0066398	2	1.286	0.3227	Non-Significant Effect
Error	0.0464788	0.0051643	9			
Total	0.0597585		11			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance Test	13	8.022	0.0022	Unequal Variances
Variances	Mod Levene Equality of Variance Test	3	8.022	0.1004	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9009	0.8025	0.1628	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%
100		4	0.9500	0.8581	1.0000	0.9500	0.9000	1.0000	0.0289	6.08%	2.56%
101		4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.00%	-2.56%

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%
100		4	1.331	1.181	1.48	1.331	1.249	1.412	0.04705	7.07%	2.97%
101		4	1.412	1.412	1.412	1.412	1.412	1.412	0	0.00%	-2.97%

7d Survival Rate Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	1.0000	1.0000	1.0000	0.9000
100		1.0000	0.9000	1.0000	0.9000
101		1.0000	1.0000	1.0000	1.0000

Angular (Corrected) Transformed Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	1.412	1.412	1.412	1.249
100		1.412	1.249	1.412	1.249
101		1.412	1.412	1.412	1.412

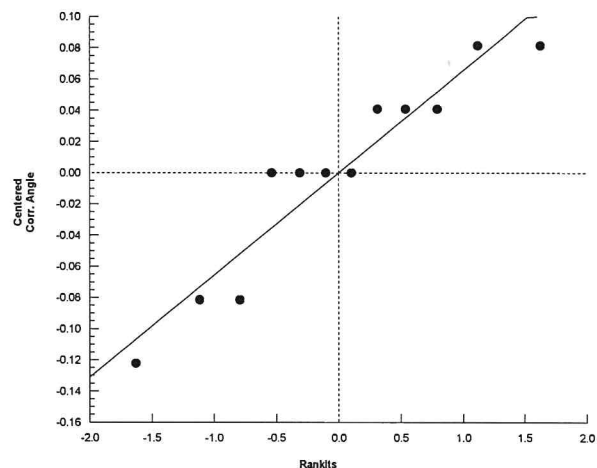
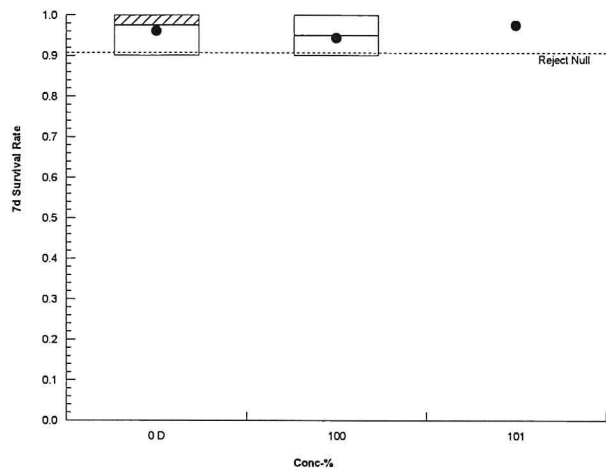
Fathead Minnow 7-d Larval Survival and Growth Test Biological Monitoring, Inc.

Analysis ID: 06-7709-2305	Endpoint: 7d Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 26 Nov-21 10:56	Analysis: Parametric-Control vs Treatments	Status Level: 1

7d Survival Rate Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	10/10	10/10	10/10	9/10
100		10/10	9/10	10/10	9/10
101		10/10	10/10	10/10	10/10

Graphics



CETIS Analytical Report

Report Date: 26 Nov-21 10:57 (p 3 of 4)

Test Code/ID: WVA111621-1 / 09-7144-7831

Fathead Minnow 7-d Larval Survival and Growth Test

Biological Monitoring, Inc.

Analysis ID: 20-9858-9059	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 26 Nov-21 10:56	Analysis: Parametric-Control vs Treatments	Status Level: 1
Batch ID: 01-9081-1214	Test Type: Growth-Survival (7d)	Analyst: Lab Tech
Start Date: 16 Nov-21 13:02	Protocol: EPA/821/R-02-013 (2002)	Diluent: Mod-Hard Synthetic Water
Ending Date: 23 Nov-21 13:00	Species: Pimephales promelas	Brine:
Test Length: 7d	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age: 24
Sample ID: 12-0811-5730	Code: WVA111621-1	Project: WET Quarterly Compliance Test (4Q)
Sample Date: 16 Nov-21 08:06	Material: Effluent	Source: VA0025020 (VA0025020)
Receipt Date: 23 Nov-21 08:30	CAS (PC):	Station: PRE
Sample Age: 5h	Client: Western Va Water Authority	

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	101	>101	n/a	0.9901	12.94%

Dunnett Multiple Comparison Test

Control	vs	Conc-%	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Dilution Water		100	1.157	2.18	0.072	6	CDF	0.2229	Non-Significant Effect
		101	0.1134	2.18	0.072	6	CDF	0.6216	Non-Significant Effect

Test Acceptability Criteria

TAC Limits

Attribute	Test Stat	Lower	Upper	Overlap	Decision
Control Resp	0.557	0.25	>>	Yes	Passes Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0035565	0.0017783	2	0.8131	0.4736	Non-Significant Effect
Error	0.0196835	0.0021871	9			
Total	0.02324		11			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	1.803	9.21	0.4059	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9814	0.8025	0.9886	Normal Distribution

Mean Dry Biomass-mg Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	0.557	0.4783	0.6357	0.548	0.511	0.621	0.02474	8.88%	0.00%
100		4	0.5187	0.4246	0.6129	0.5315	0.441	0.571	0.02959	11.41%	6.87%
101		4	0.5533	0.5139	0.5926	0.5565	0.521	0.579	0.01237	4.47%	0.67%

Mean Dry Biomass-mg Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.526	0.57	0.511	0.621
100		0.558	0.505	0.571	0.441
101		0.564	0.549	0.521	0.579

CETIS Analytical Report

Report Date: 26 Nov-21 10:57 (p 4 of 4)

Test Code/ID: WVA111621-1 / 09-7144-7831

Fathead Minnow 7-d Larval Survival and Growth Test

Biological Monitoring, Inc.

Analysis ID: 20-9858-9059

Endpoint: Mean Dry Biomass-mg

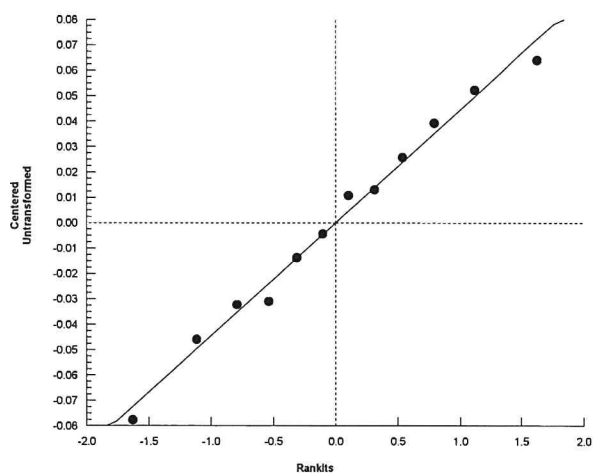
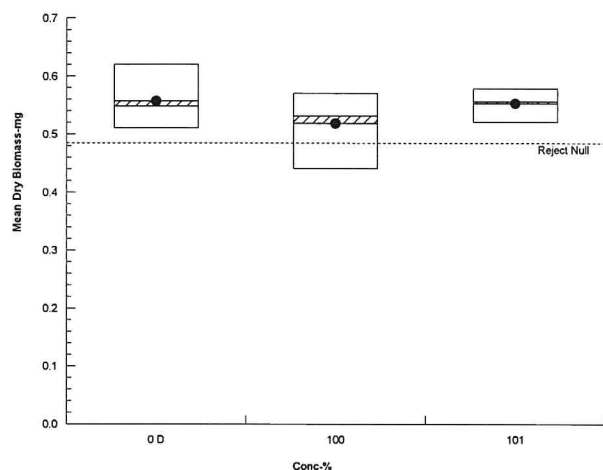
CETIS Version: CETISv1.9.4

Analyzed: 26 Nov-21 10:56

Analysis: Parametric-Control vs Treatments

Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 26 Nov-21 10:57 (p 1 of 1)
Test Code/ID: WVA111621-1 / 09-7144-7831

Fathead Minnow 7-d Larval Survival and Growth Test

Biological Monitoring, Inc.

Analysis ID: 21-2930-8790	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 26 Nov-21 10:56	Analysis: Linear Interpolation (ICPIN)	Status Level: 1
Batch ID: 01-9081-1214	Test Type: Growth-Survival (7d)	Analyst: Lab Tech
Start Date: 16 Nov-21 13:02	Protocol: EPA/821/R-02-013 (2002)	Diluent: Mod-Hard Synthetic Water
Ending Date: 23 Nov-21 13:00	Species: Pimephales promelas	Brine:
Test Length: 7d	Taxon: Actinopterygii	Source: Aquatic Biosystems, CO Age: 24
Sample ID: 12-0811-5730	Code: WVA111621-1	Project: WET Quarterly Compliance Test (4Q)
Sample Date: 16 Nov-21 08:06	Material: Effluent	Source: VA0025020 (VA0025020)
Receipt Date: 23 Nov-21 08:30	CAS (PC):	Station: PRE
Sample Age: 5h	Client: Western Va Water Authority	

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	1658614	1000	Yes	Two-Point Interpolation

Test Acceptability Criteria

Attribute	Test Stat	Lower	Upper	Overlap	Decision
Control Resp	0.557	0.25	>>	Yes	Passes Criteria

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	>101	n/a	n/a	<0.9901	n/a	n/a
IC10	>101	n/a	n/a	<0.9901	n/a	n/a
IC15	>101	n/a	n/a	<0.9901	n/a	n/a
IC20	>101	n/a	n/a	<0.9901	n/a	n/a
IC25	>101	n/a	n/a	<0.9901	n/a	n/a
IC40	>101	n/a	n/a	<0.9901	n/a	n/a
IC50	>101	n/a	n/a	<0.9901	n/a	n/a

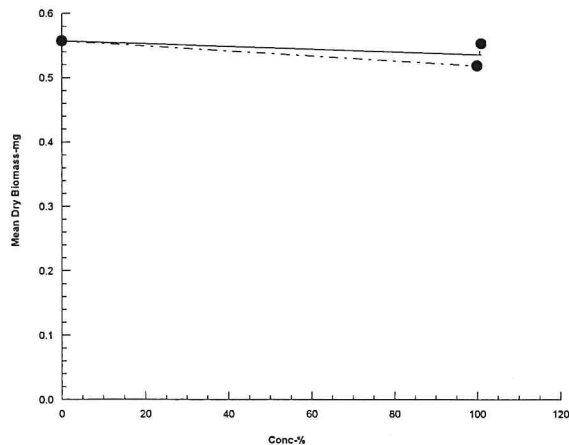
Mean Dry Biomass-mg Summary

Conc-%	Code	Count	Calculated Variate						Isotonic Variate	
			Mean	Min	Max	Std Dev	CV%	%Effect	Mean	%Effect
0	D	4	0.557	0.511	0.621	0.04947	8.88%	0.0%	0.557	0.0%
100		4	0.5187	0.441	0.571	0.05917	11.41%	6.87%	0.536	3.77%
101		4	0.5533	0.521	0.579	0.02474	4.47%	0.67%	0.536	3.77%

Mean Dry Biomass-mg Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.526	0.57	0.511	0.621
100		0.558	0.505	0.571	0.441
101		0.564	0.549	0.521	0.579

Graphics



Chronic Toxicity Test
(Ceriodaphnia dubia)

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Experiment I.D.# WVA111621-2
 Biologist(s): JR VR PR SS MM
 Permit # VA 0025020
 Client: West VA Water Authority
 Effluent toxicant: Pre-outfall
 Sample Type: Composite grab
 Sample Chlorine: <0.02
 Dilution Water Used MHRW
 Feeding Schedule: 0.1 ml YCT and Rs Daily
 Aeration: —
 Template #: NA

Start of Test Date: 11-16-21 Time: 1400
 End of Test Date: 11-22-21 Time: 1400
 Test Duration: 3 Broods
 Test Temperature: 25 +/- 1 deg C
 Test Volume: 15 ml
 Test Containers Used: 30 ml PS
 Renewal Frequency: Daily
 Test Organism Age: —
 Organism Batch #: 110921 (1600-2200)
 Organisms per concentration: 10
 Waterbath/Shelf #: 8

SAMPLE COLLECTION							
Date(s)		Time(s)		TEST RENEWAL			
From:	To:	From:	To:	Date(s)	Time(s)	Test Day	Diluent Batch #:
11-15-21	—	0810	—	11-16-21	1400	0	8052
				11-17-21	1400	1	8052
11-17-21	—	0817	—	11-18-21	1430	2	8052
11-18-21	—	0836	—	11-19-21	1430	3	8053
				11-20-21	1400	4	8053
				11-21-21	1330	5	8053
				11-22-21	1400	6	

Food Batch/Days Used: YCT 110921 (0-5) Algae 110221-(0-3)
 YCT — Algae 110921 (4-5)

Meters: Instrument Id#: — Temp.: 06.7 pH: 06.1
 DO: 06.1 Conductivity/Salinity: 06.1

Condition of Organisms at End of Test: Normal
 Control Survival (%): 100 Average # Young/Female: 38.6
 Percent control female with 3 broods (%): 100
 Comments: —

MM 11-16-21

Experiment ID: NVA111621-2

Conc: Units	Day	A	B	C	D	E	F	G	H	I	J	# Young	# Adults	# Males	Init.
0	1	0	0	0	0	0	0	0	0	0	0	0	10		PR
	2	0	0	0	0	0	0	0	0	0	0	0	10		PR
	3	4	5	4	6	6	3	8	7	7	5	55	10	0	PR
	4	17	15	12	11	18	19	15	13	17	17	154	10	0	PR
	5	22	17	0	0	0	0	0	19	0	20	78	10	0	PR
	6	0	0	15	18	14	21	16	0	15	0	99	10	0	PR
	7														PR
	Total	43	37	31	35	38	43	39	39	39	42	386	10	0	PR
100	1	0	0	0	0	0	0	0	0	0	0	0	10		PR
	2	0	0	0	0	0	0	0	0	0	0	0	10		PR
	3	6	8	6	8	5	5	5	7	8	6	64	10	0	PR
	4	16	18	14	15	20	15	17	18	15	13	161	10	0	PR
	5	0	0	0	20	19	0	21	16	0	22	98	10	0	PR
	6	15	21	15	0	0	22	0	14	21	0	94	10	0	PR
	7														PR
	Total	37	47	35	43	44	42	43	41	44	41	417	10	0	PR
	1														
	2														
	3														
	4														
	5														
	6														
	7														
	Total														

Experiment ID: WVA11621-2

Conc: Units	Day	Temperature (C)		Dissolved Oxygen (mg/L)		pH		Cond. (umhos)	Alkalinity (mg/L CaCO ₃)	Hardness (mg/L CaCO ₃)	Food	Init.
		Before	After	Before	After	Before	After					
0	0		25		8.85		8.12	314	64	88	✓	kp
	1	25	28.6	8.58	9.25	7.99	8.08	327			✓	kp
	2	25	25	8.02	7.34	8.01	8.03	314			✓	25
	3	24	24	8.10	7.23	8.03	8.04	312	58	82	✓	kp
	4	24	25	8.13	7.16	8.05	8.03	297			✓	ss
	5	24	25	8.18	8.17	8.07	8.18	297			✓	ss
	6	25		8.23		8.10					✓	100
	7											
100 pre	0		25		10.36		8.17	368	410	580	✓	kp
	1	25	25	7.85	10.80	8.38	8.16	372			✓	kp
	2	25	25	7.96	7.68	8.40	8.19	389	440	540	✓	25
	3	24	24	8.04	8.05	8.37	8.21	392	420	550	✓	kp
	4	24	25	8.09	9.40	8.40	8.17	392			✓	ss
	5	24	25	8.13	8.74	8.41	8.20	390			✓	ss
	6	25		8.15		8.42					✓	100
	7											
	0											
	1											
	2											
	3											
	4											
	5											
	6											
	7											

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NELAC ACCREDITED LAB # 460015

Sample Collection – Chain of Custody Form

Lab Sample ID
(Lab Use Only)

W V A I I I G 2 1 - 1

General Information

Client Western VA Water Authority Contact Name/Phone # Lisa Workman/540-283-8253
Regional WPCP

NPDES Permit # VA 0025020 Outfall Name/# Roanoke River- Pre-Outfall

Sample Chlorinated? No Dechlorinated? —
Should BMI Dechlorinate Sample? No

Sampling Information



Grab Sample Date 11/15/21 ¹⁵ Time 0806 Volume 4 gallons
2w 11/15/21



Composite Sample Type _____ Time _____ Flow _____

Composite Start Date _____ Composite Start Time _____

Composite End Date _____ Composite End Time _____

Sub-samples _____ Frequency _____ Volume _____

Field Measurements Not needed

Temp at Collection Point	Temp In Collection Device	pH	Chlorine	Date/Time	Initials

Custody Information

Relinquished By	Date	Time	Received By	Date	Time
<u>Jon M. Gable</u>	<u>11-15-21</u>	<u>11:10</u>	<u>Sam Smith</u>	<u>11-15-21</u>	<u>1110</u>

* Eric Powers / WVWA
Printed Name/Affiliation

* Eric Powers
Signature

* 11-15-21
Date

Sample Check In (Lab Use Only)

Temperature 3.3 pH 7.86 Chlorine <0.02 DO 10.55 Conductivity/Salinity 363

On Ice? ✓ Custody Seal? NA Alkalinity 410 Hardness 580

Visual Description clear Odor none

Ammonia (NH₃-N) 0.05 Initials MM Date/Time 11-16-21 / 0830



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NELAC ACCREDITED LAB # 460015

Sample Collection – Chain of Custody Form

Lab Sample ID
(Lab Use Only)

W	V	A	1	1	1	8	2	1	-	1
---	---	---	---	---	---	---	---	---	---	---

General Information

Client Western VA Water Authority Contact Name/Phone # Ira Hall / (540) 283-8253

NPDES Permit # VA 0025020 Outfall Name/# Roanoke River - Pre-outfall

Sample Chlorinated? No Dechlorinated? -
Should BMI Dechlorinate Sample? No

Sampling Information

☒

Grab Sample _____ Date 11/17/21 Time 0817 Volume 2 gallons

☐

Composite Sample Type _____ Time _____ Flow _____

Composite Start Date _____ Composite Start Time _____

Composite End Date _____ Composite End Time _____

Sub-samples _____ Frequency _____ Volume _____

Field Measurements

Temp at Collection Point	Temp In Collection Device	pH	Chlorine	Date/Time	Initials

Custody Information

Relinquished By	Date	Time	Received By	Date	Time
<u>Jay Br...</u>	<u>11/17/21</u>	<u>1216</u>	<u>Sam Sam</u>	<u>11/17/21</u>	<u>1217</u>

★ Zach Daniczo / WWA
Printed Name/Affiliation

★ Zach Daniczo
Signature

★ 11/17/21
Date

Sample Check In (Lab Use Only)

Temperature 0.9 pH 8.24 Chlorine 20.02 DO 14.28 Conductivity/Salinity 387

On Ice? ✓ Custody Seal? NA Alkalinity 440 Hardness 540

Visual Description clear Odor none

Ammonia (NH3-N) 0.10 Initials MM Date/Time 11-18-21/0845

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NELAC ACCREDITED LAB # 460015

Sample Collection – Chain of Custody Form

Lab Sample ID
(Lab Use Only)

W V A 1 1 1 9 2 1 - 1

General Information

Client Western VA Water Authority Contact Name/Phone # Ian Hall / (540) 283-8253

Regional WRP NPDES Permit # VA 0025020 Outfall Name/# Roanoke River: Pre-outfall

Sample Chlorinated? _____ Dechlorinated? _____
Should BMI Dechlorinate Sample? _____

Sampling Information



Grab Sample _____ Date 11/18/21 Time 0836 Volume 4 gallons



Composite Sample Type _____ Time _____ Flow _____

Composite Start Date _____ Composite Start Time _____

Composite End Date _____ Composite End Time _____

Sub-samples _____ Frequency _____ Volume _____

Field Measurements

Temp at Collection Point	Temp In Collection Device	pH	Chlorine	Date/Time	Initials

Custody Information

Relinquished By	Date	Time	Received By	Date	Time
<u>Ian Hall</u>	<u>11-18-21</u>	<u>11:38</u>	<u>Marlaire Martin</u>	<u>11-18-21</u>	<u>11:38</u>

★ Zachary Darienzo
Printed Name/Affiliation

★ Zachary Darienzo
Signature

★ 11/18/21
Date

Sample Check In (Lab Use Only)

Temperature 11.0 °C pH 8.15 Chlorine 0.02 DO 9.03 Conductivity/Salinity 403

On Ice? ✓ Custody Seal? NA Alkalinity 420 Hardness 550

Visual Description Clear Odor None

Ammonia (NH3-N) 0.06 Initials Yan Date/Time 11-19-21/0800

Chronic Toxicity Test
(Pimephales promelas)

Page 1 of 4

Experiment I.D.# WVA111621-3
 Biologist(s): VR JR PR SS MM
 Permit # VA0025020
 Client: West VA water Authority
 Effluent toxicant: Post-outfall
 Sample Type: Composite grab
 Sample Chlorine: <0.02
 Dilution Water Used MHRW
 Feeding Schedule: 0.15 ml Artemia 2x Daily
 Aeration: -
 Template #: NA

Start of Test Date: 11-16-21 Time: 1400
 End of Test Date: 11-23-21 Time: 1400
 Test Duration: 7 days
 Test Temperature: 25 +/- 1 deg C
 Test Volume: 350 ml
 Test Containers Used: 400 ml TriPours
 Renewal Frequency: Daily
 Test Organism Age: 24-48 HR
 Organism Batch #: ABS111621-1
 Organisms per concentration: 40
 Waterbath/Shelf #: 5

SAMPLE COLLECTION							
Date(s)		Time(s)		TEST RENEWAL			
From:	To:	From:	To:	Date(s)	Time(s)	Test Day	Diluent Batch #:
11-15-21	-	0842	-	11-16-21	1400	0	8052
				11-17-21	1430	1	8052
11-17-21	-	0916	-	11-18-21	1400	2	8052
11-18-21	-	0925	-	11-19-21	1330	3	8053
				11-20-21	1330	4	8053
				11-21-21	1400	5	8053
				11-22-21	1400	6	8053

Meters: Instrument Id#: Temp.: 073 pH: 061

DO: 061 Conductivity/Salinity: 061

Condition of Organisms at End of Test: Normal

Average weight per control fish: .557 Control Survival (%): 97.5

Comments: _____

MM 11-16-21
 SOP 002-1 - Rev. 09

Effective Date: 31JUL21

QC Officer: MM

Experiment ID: WVA111621-3

Conc: Units	Day	Number of Live Organisms				DO (mg/L)		pH		Alkalinity mg/L as CaCO ₃	Hardness mg/L as CaCO ₃	Cond./ Salinity umho/ 0/00	Temp. (C)		Feeding 1	Feeding 2	Comments	Initials
		A	B	C	D	Before	After	Before	After				Before	After				
WVA Q	0	10	10	10	10		8.85		8.17	64	88	314		25				KP
	1	10	10	10	10	8.88	9.25	7.12	8.08			322	25	25	✓	✓		KP
	2	10	10	10	10	7.34	7.34	8.21	8.03			314	25	25	✓	✓		LS
	3	10	10	10	10	7.97	7.23	8.07	8.04	58	82	312	24	24	✓	✓		LS
	4	10	10	10	9	6.88	7.76	7.97	8.03			297	24	24	✓	✓		KP
	5	10	10	10	9	7.54	8.17	8.05	8.18			297	24	24	✓	✓		KP
	6	10	10	10	9	6.93	7.72	7.78	8.18			296	25		✓	✓		KP
	7	10	10	10	9	7.02		7.92							No Food			KP
WVA 100 Post	0	10	10	10	10		9.03		8.24	430	630	451		25		✓		KP
	1	10	10	10	10	9.21	11.20	8.41	8.23			459	25	25	✓	✓		KP
	2	10	10	10	10	7.20	7.94	8.43	8.23	430	580	453	25	25	✓	✓		LS
	3	10	10	10	10	8.78	9.15	8.42	8.24	440	610	461	24	24	✓	✓		LS
	4	10	10	10	10	6.95	9.90	8.41	8.23			460	24	24	✓	✓		KP
	5	10	10	10	10	7.31	8.97	8.43	8.28			462	24	24	✓	✓		KP
	6	10	10	10	10	6.53	10.21	8.30	8.25			459	25	25	✓	✓		KP
	7	10	10	10	10	6.84		8.31							No Food			KP
	0																	
	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7														No Food			

Experiment ID: WVA111621-3

[illegible]

Signature: _____

Chronic Toxicity Test
(Ceriodaphnia dubia)

Page 1 of 5

Experiment I.D.# WVA111621-024
 Biologist(s): JR VR PR MM SS LJ KP
 Permit # VA 0025020
 Client: West VA Water Authority
 Effluent toxicant: Post-outfall
 Sample Type: Grab Composite
 Sample Chlorine: 20.02
 Dilution Water Used MHRW
 Feeding Schedule: 0.1 ml YCT and Rs Daily
 Aeration:
 Template #: NA

Start of Test Date: 11-16-21 Time: 1430
 End of Test Date: 11-22-21 Time: 1430
 Test Duration: 3 Broods
 Test Temperature: 25 +/- 1 deg C
 Test Volume: 15 ml
 Test Containers Used: 30 ml PS
 Renewal Frequency: Daily
 Test Organism Age: 16-5-22-5 hr
 Organism Batch #: 110921(1600-2200)
 Organisms per concentration: 10
 Waterbath/Shelf #: 8

SAMPLE COLLECTION							
Date(s)		Time(s)		TEST RENEWAL			
From:	To:	From:	To:	Date(s)	Time(s)	Test Day	Diluent Batch #:
11/15/21	—	0842	—	11-16-21	1430	0	8052
				11-17-21	1430	1	8052
11-17-21	—	0916	—	11-18-21	1400	2	8052
11-18-21	—	0925	—	11-19-21	1500	3	8053
				11-20-21	1500	4	8053
				11-21-21	1430	5	8053
				11-22-21	1430	6	

Food Batch/Days Used: YCT 101921(0-5) Algae 110221(0-3)
 YCT Algae 110921(4-5)

Meters: Instrument Id#: Temp.: 073 pH: 061
 DO: 061 Conductivity/Salinity: 061

Condition of Organisms at End of Test: Normal
 Control Survival (%): 100 Average # Young/Female: 38-3
 Percent control female with 3 broods (%): 100
 Comments:

MMM 11-16-21

Experiment ID: WVA11621-4

Conc: Units	Day	A	B	C	D	E	F	G	H	I	J	# Young	# Adults	# Males	Init.
0	1	0	0	0	0	0	0	0	0	0	0	0	10		AL
	2	0	0	0	0	0	0	0	0	0	0	0	10		AL
	3	5	4	4	6	7	4	7	7	5	4	53	10	0	AL
	4	13	16	19	11	14	15	15	13	18	14	148	10	0	AL
	5	0	0	0	0	0	0	0	0	23	0	23	10	0	AL
	6	14	22	16	17	21	18	11	14	0	26	159	10	0	AL
	7														
	Total	32	42	39	34	42	37	33	34	46	44	383	10	0	AL
100	1	0	0	0	0	0	0	0	0	0	0	0	10		AL
	2	0	0	0	0	0	0	0	0	0	0	0	10		AL
	3	8	6	6	5	8	7	4	7	4	4	63	10	0	AL
	4	16	9	18	18	15	16	17	15	18	11	153	10	0	AL
	5	0	0	22	0	0	0	18	0	0	0	40	10	0	AL
	6	19	19	0	22	14	24	0	17	16	19	150	10	0	AL
	7						①								
	Total	43	34	46	45	37	47	41	39	38	36	406	10	0	AL
	1														
	2														
	3														
	4														
	5														
	6														
	7														
	Total														

① AL 11-22-21

Experiment ID: WVA111621-4

Conc: Units	Day	Temperature (C)		Dissolved Oxygen (mg/L)		pH		Cond. (umhos)	Alkalinity (mg/L CaCO ₃)	Hardness (mg/L CaCO ₃)	Food	Init.
		Before	After	Before	After	Before	After					
0	0		25		8.85		8.17	314	64	88	✓	HP
	1	25	25.6	8.58	9.25	7.99	8.08	322			✓	
	2	25	25	8.11	7.34	8.01	8.03	314			✓	LS
	3	24	24	8.18	7.23	8.07	8.04	312	58	82	✓	HP
	4	24	25	8.37	7.76	8.10	8.03	297			✓	SS
	5	24	25	8.46	8.17	8.12	8.18	297			✓	SS
	6	25		8.50		8.13						
	7											
100 post	0		25		9.03		8.24	451	430	630	✓	HP
	1	25	25	7.99	11.20	8.43	8.23	459			✓	HP
	2	26	25	8.04	7.94	8.44	8.23	453	430	580	✓	LS
	3	24	24	8.25	9.15	8.45	8.29	461	440	610	✓	HP
	4	24	25	8.36	9.90	8.46	8.23	460			✓	SS
	5	24	25	8.45	8.97	8.47	8.28	462			✓	SS
	6	25		8.51		8.49						
	7											
	0											
	1											
	2											
	3											
	4											
	5											
	6											
	7											

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NELAC ACCREDITED LAB # 460015

Sample Collection – Chain of Custody Form

Lab Sample ID
(Lab Use Only)

W V A 1 1 1 6 2 1 - 2

General Information

Client Western VA Water Authority Contact Name/Phone # Lisa Workman/540-283-8253

Regional WPCP
NPDES Permit # VA 0025020 Outfall Name/# Roanoke River - Post-Outfall

Sample Chlorinated? No Dechlorinated? -
Should BMI Dechlorinate Sample? No

Sampling Information



Grab Sample Date 11/15/21 Time 0842 Volume 4 gallons

sw 11/15/21



Composite Sample Type _____ Time _____ Flow _____

Composite Start Date _____ Composite Start Time _____

Composite End Date _____ Composite End Time _____

Sub-samples _____ Frequency _____ Volume _____

Field Measurements Not needed

Temp at Collection Point	Temp In Collection Device	pH	Chlorine	Date/Time	Initials

Custody Information

Relinquished By	Date	Time	Received By	Date	Time
<u>for mgler</u>	<u>11-15-21</u>	<u>11:10</u>	<u>Jim Jim</u>	<u>11-15-21</u>	<u>11:10</u>

* Eric Powers WVWA * E. Powers * 11-15-21
Printed Name/Affiliation Signature Date

Sample Check In (Lab Use Only)

Temperature 3.3 pH 7.95 Chlorine 0.02 DO 10.64 Conductivity/Salinity 448

On Ice? ✓ Custody Seal? NA Alkalinity 430 Hardness 630

Visual Description clear Odor none

Ammonia (NH₃-N) 0.00 Initials MM Date/Time 11-16-21 / 0830

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NELAC ACCREDITED LAB # 460015

Sample Collection – Chain of Custody Form

Lab Sample ID
(Lab Use Only)

W V A 1 1 1 8 2 1 - 2

General Information

Client Western VA Water Authority Contact Name/Phone # Tan Hall / (540) 283-8253
Regional WPCP

NPDES Permit # VA 0025020 Outfall Name/# Roanoke River - Post-Outfall

Sample Chlorinated? No Dechlorinated? -
Should BMI Dechlorinate Sample? No

Sampling Information

☒ Grab Sample Date 11/17/21 Time 0916 Volume 2 gallons

☐ Composite Sample Type _____ Time _____ Flow _____

Composite Start Date _____ Composite Start Time _____

Composite End Date _____ Composite End Time _____

Sub-samples _____ Frequency _____ Volume _____

Field Measurements

Temp at Collection Point	Temp In Collection Device	pH	Chlorine	Date/Time	Initials

Custody Information

Relinquished By	Date	Time	Received By	Date	Time
<u>[Signature]</u>	<u>11/17/21</u>	<u>1216</u>	<u>[Signature]</u>	<u>11-17-21</u>	<u>1217</u>

★ Jon Mapler
Printed Name/Affiliation

★ [Signature]
Signature

★ 11-16-21
Date

Sample Check In (Lab Use Only)

Temperature 0.9 pH 8.31 Chlorine 0.02 DO 15.67 Conductivity/Salinity 477

On Ice? ☒ Custody Seal? NA Alkalinity 430 Hardness 580

Visual Description clear Odor none

Ammonia (NH₃-N) 0.08 Initials MM Date/Time 11-18-21 10045

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Sample Collection – Chain of Custody Form

Lab Sample ID
(Lab Use Only)

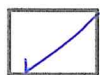
W V A 1 1 1 A 2 1 - 2

General Information

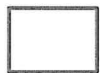
Client Western VA Water Authority Contact Name/Phone # Ian Hall / (540) 283-8253
Regional WPCP
NPDES Permit # VA 0025020 Outfall Name/# Roanoke River Post-outfall

Sample Chlorinated? _____ Dechlorinated? _____
Should BMI Dechlorinate Sample? _____

Sampling Information



Grab Sample _____ Date 11/18/21 Time 09:25 Volume 4 gallons



Composite Sample Type _____ Time _____ Flow _____

Composite Start Date _____ Composite Start Time _____

Composite End Date _____ Composite End Time _____

Sub-samples _____ Frequency _____ Volume _____

Field Measurements

Temp at Collection Point	Temp In Collection Device	pH	Chlorine	Date/Time	Initials

Custody Information

Relinquished By	Date	Time	Received By	Date	Time
<u>Ian Hall</u>	<u>11-18-21</u>	<u>11:38</u>	<u>Marlaena Martin</u>	<u>11-18-21</u>	<u>1138</u>

★ Zachary Darcenzo
Printed Name/Affiliation

★ Zachary Darcenzo
Signature

★ 11/18/21
Date

Sample Check In (Lab Use Only)

Temperature 11.6°C pH 8.24 Chlorine 20.02 DO 9.91 Conductivity/Salinity 442

On Ice? ☒ Custody Seal? NA Alkalinity 440 Hardness 610

Visual Description Clear Odor None

Ammonia (NH₃-N) 0.11 Initials van Date/Time 11-19-21/0800