

Bioassays of

Mill Creek Elementary School STP

St. Augustine, St. Johns County, Florida

NPDES #FL0025658

Sampled 12/16/91

February 6, 1992

Biology Section
Division of Technical Services

Bioassays of

Mill Creek Elementary School STP

St. Augustine, St. Johns County, Florida

NPDES #FL0025658

Biology Section
Bureau of Laboratories
February 6, 1992

Introduction

Mill Creek Elementary School STP, St. Augustine, St. Johns County, Florida, NPDES #FL0025658, on 17 to 18 December, 1991.

This facility is located at the intersection of State Road 16 and Nine Mile Road in St. Augustine. The facility is a 4,000 gpd extended aeration sewage treatment plant. Chlorinated effluent is discharged to a drainage ditch to Mill Creek which flows into the St. Johns River.

The toxicity tests discussed in this report were performed in accordance with methods described by Weber, 1991, *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*, 4th Edition.

Results and Discussion

The FDER Biology Section performed static acute screening bioassays with a sample of effluent from this facility. The bioassay organisms used for these tests were the water flea, *Ceriodaphnia dubia*, and the fish, *Notropis leedsi*. The test results indicated that the sample was toxic as both tests resulted in 100% mortality within 24 hours.

The initial concentration of dissolved oxygen of the sample, when received in the bioassay lab and warmed to 22°C, was 0.3 mg/L. In the *N. leedsi* test, a portion of the sample was measured into two test jars and each aerated to > 7.0 mg/L prior to loading the fish. Two hours later, the D.O. in the sample jars had decreased to 2.0 mg/L. Air was then supplied to the jars for the remainder of the test to maintain ≥4.0 mg/L D.O. per test protocol. At test initiation, the sample was so turbid that the fish could not be seen in the test jars containing the sample volumes. By the next day, a layer of solids had settled to the bottom of each test vessel. In the *C. dubia* test, a portion of the sample was aerated to ≥ 40% saturation D.O. prior to test initiation.

Total residual chlorine was not detected in the sample. Total and unionized ammonia concentrations were 36.00 mg/L and 0.63 mg/L (Hach), respectively. The EPA document, *Quality Criteria for Water, 1986*, reports unionized ammonia to be acutely toxic to freshwater organisms at concentrations of 0.08 mg/L for fish and 0.53 mg/L for invertebrates. The unionized ammonia concentration of the sample is in violation of the Class III water quality standard (≤ 0.02 mg/L). Further chemical analyses were not performed on the sample.

Conclusion

The sample of effluent from this facility was toxic on 16 December, 1991. We attribute the toxicity, in part, to the unionized ammonia in the sample. We suggest continued monitoring of this effluent for the following potential water quality standard violations: unionized ammonia, dissolved oxygen, BOD, and turbidity.

Table 1. Concentration Series and Volumes Used for the Static Acute Screening Bioassays of the Mill Creek Elementary School STP on 17 to 18 December, 1991.

Ceriodaphnia dubia (water flea)

Concentration	Dilution Water	Sample	Total Volume
Control	20 mL	0 mL	20 mL
100 %	0 mL	20 mL	20 mL

Notropis leedsi (bannerfin shiner)

Concentration	Dilution Water	Sample	Total Volume
Control	500 mL	0 mL	500 mL
100 %	0 mL	500 mL	500 mL

Table 2. LC_{50} Data for the Bioassay of Mill Creek Elementary School STP effluent on 16 December, 1991.

Organism	Method of Data Analysis	LC_{50}
Chlorinated effluent		
Ceriodaphnia dubia	not calculated	< 100% [a]*
Notropis leedsi	not calculated	< 100% [a]**

[a] The LC_{50} is < 100% since all the organisms died in the lowest test concentration (100%).

* 21.5-hour LC_{50}.

** 22-hour LC_{50}.

Table 3. Data recorded during the acute screening bioassays of a sample of effluent from the Mill Creek Elementary School STP, St. Augustine, St. Johns County, Florida, NPDES# FL0025658, on 17 to 18 December, 1991.

Facility:	Mill Creek School		NPDES #	FL0025658	Facility Type: STP
Location:	SR 16 & Nine Mile Rd, St. Augustine		Contact/District:	Kathleen Gerard / NE	
County:	St. Johns		Test type:	static acute screen	
Sample Collection Date:	12/16/91	Time: 1100	# tests:	2	Receiving Water: Mill Creek to St. Johns River
Test Beginning Date:	12/17/91	Time: 1100	Chlorination Type:	chlorinated	
Test Ending Date:	12/18/91	Time: 0900			Page 1 of 1

Total Residual Cl2	mg/l	Method
Field:	-	not measured
Lab:	0.0	Hach

Ammonia	Total (mg/l)	Unionized (mg/l)
Control Water (fish):	0.00	0.00
Cond. Control Water (daphnids):	0.00	0.00
100% Sample:	36.00	0.63

Alk & Hardness	Alkalinity (mg/l)	Hardness (mg/l)
Control Water (fish):	115	119
Cond. Control Water (daphnids):	65	76
100% Sample:	398	400

Salinity (ppt)	
Control Water:	0
100% Sample:	0

Organism: *Ceriodaphnia dubia* Life stage: neonate
LC50: < 100% Binomial: - Moving Average: - Probit: -

	SURVIVAL *			pH			Temperature			Dissolved Oxygen			Conductivity	
Concentrations	# at 0 hr	Live at 24 hr	Live at 48 hr	0 hour	24 hour	48 hour	0 hour	24 hour	48 hour	0 hour	24 hour	48 hour	0 hour	24 hour
Control	5	5	-	7.8	8.0	-	21.8	22.7	-	8.9	8.1	-	139	147
Control	5	5	-	-	8.0	-	-	-	-	-	8.2	-	-	-
Control	5	5	-	-	8.1	-	-	-	-	-	8.2	-	-	-
Control	5	5	-	-	8.1	-	-	-	-	-	8.3	-	-	-
100%	5	0	-	7.5	8.0	-	22.0	22.3	-	2.5 **	3.7	-	998	1018
100%	5	0	-	-	7.9	-	-	-	-	-	3.3	-	-	-
100%	5	0	-	-	8.0	-	-	-	-	-	2.6	-	-	-
100%	5	0	-	-	7.9	-	-	-	-	-	2.7	-	-	-

* test terminated at 21.5 hours

** Sample was aerated to 8.8 mg/L DO prior to measuring into test vials.

Organism: *Notropis leedsi* Age: 11 days
LC50: < 100% Binomial: - Moving Average: - Probit: -

	SURVIVAL *			pH			Temperature			Dissolved Oxygen			Conductivity	
Concentrations	# at 0 hr	Live at 24 hr	Live at 48 hr	0 hour	24 hour	48 hour	0 hour	24 hour	48 hour	0 hour	24 hour	48 hour	0 hour	24 hour
Control	5	5	-	7.7	8.2	-	22.0	22.5	-	8.0	7.8	-	-	-
Control	5	5	-	7.7	8.2	-	-	-	-	8.1	7.8	-	230	250
100%	5	0	-	7.5	8.3	-	22.1	22.2	-	0.4 **	3.6	-	-	-
100%	5	0	-	7.5	8.3	-	-	-	-	0.3 **	3.6	-	1181	1174

* test terminated at 22 hours

** Sample in test jars was aerated to > 7.0 mg/L DO prior to loading fish. Jars were aerated during test to maintain DO >4.0 mg/L.

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: Mill Creek School
Address/City: _____
County: St Johns
Contact/District: KATHLEEN GERARD - NE
NPDES Permit #: FL00 25658 Outfall #: _____

Sample Collection: Date 12/16/91 Time 1100
Test Beginning: Date 12/17/91 Time 1100
Test Ending: Date 12/13/91 Time 0700
Test Organism: C. dubia
Life Stage/Age: < 24 hrs

Test Number: 1 of 2 Test Type: (Screening) | Definitive
(Static) | Static Renewal | Flow-through

Remarks: TEST TERMINATED AT 22 HOURS.
* work chamber # for N. leeds; in C. dubia spaces 12/16/91 AJ
Aerated sample prior to loading INTO TEST VIALS D.O. = 8.9

Instrument Calibrations:

	pH	DO	Temp	Cond
0 hr	7@7, 9@9	8.6@23.5	22.8@22.3°	134@22.7°C
24 hr	7@7, 9@9	8.6@23.5°	23.1@23.1	1355@23.2°C
48 hr				

Conc.	Chamber #	Number Live 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	DO (mg/L) 0	24	48	Cond. (µmhos/cm) 0	24	48
control	A ~~7~~ *	5	5		7.8	8.0		21.8	22.7		8.9	8.1		139	147	
control	B ~~8~~ *	5	5			8.0						8.2				
control	C	5	5			8.1						8.2				
control	D	5	5			8.1						8.3				
100%	A	5	0		7.5	8.0		22.0	22.3		2.5	3.7		998	1048	
100%	B	5	0			7.9						3.3				
100%	C	5	0			8.0						2.6				
100%	D	5	0			7.9						2.7				
Measured/Loaded by:		KP	MF		AJ			AJ			AJ			AJ		
Recorded by:		KP	KP		KP	AH		KP	AH		KP	AH		KP	AJ	

Investigators' Signatures

Thomas M. Jordan
Kim Pearce
Andrea Hammond

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:			NOT MEASURED		
Lab Tot. Resid. Cl2:			0.0	HACH	AJ
Alkalinity:	115	65	398	HACH	AJ
Hardness:	119	76	400	HACH	AJ
Total Ammonia:	0.0	0.0	36.0	HACH	AJ

Ammonia Meter Slope: _____
Ammonia Blank: 0.0
Salinity Sample: _____ ppt

DER Biology Section — Acute Bioassay Bench Sheet

12/5/91 cas

12 opa AJ/KP

Sample Source: Mill Creek School
Address/City:
County: St Johns
Contact/District: KATHLEEN GERARD - NE
NPDES Permit #: FL00 25658 Outfall #:

Sample Collection: Date 11/16/91 Time 1100
Test Beginning: Date 12/7/91 Time 1100
Test Ending: Date 12/8/91 Time 0830
Test Organism: N. leedsi
Life Stage/Age: 11 DAYS

Test Number: 2 of 2 Test Type: (Screening) | Definitive
Static | (Static Renewal) | Flow-through

Remarks: 48 hr 1 DILUTION TO MEASURE HACH AMMONIA (=0.5mL SAMPLE + 4.5 DI WATER) 3.0 on wheel
DID AERATE SAMPLE IN JARS PRIOR TO LOADING. D.O. RAISED TO >7.0

SAMPLE IS SO TURBID THAT THE ANIMALS COULD NOT BE SEEN, NOR COULD THE PROBES BE SEEN IN THE JARS

TEST TERMINATED AT 21.5 HRS.

Instrument Calibrations:

	pH	DO	Temp	Cond
0 hr	7@7@9	8.6@23.5°	22.3@22.3°	1340@22.7°C
24 hr	7@7@9	8.6@23.5°	23.1@23.1°	1355@23.2°
48 hr				

Conc.	Chamber #	Number Live 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	DO (mg/L) 0	24	48	Cond. (µmhos/cm) 0	24	48
Control	7	5	5		7.7	8.2		22.0	22.5		8.0	7.8				
Control	8	5	5		7.7	8.2					8.1	7.8		230	250	
100%	21	5	0		7.5	8.3		22.1	22.2		0.4	3.6				
100%	25	5	0		7.5	8.3					0.3	3.6		1181	1174	

Samples jars aerated prior to loading fish so that DO was raised to >7.0. Fish were loaded and air was stopped. Checked DO 2 hours later in jars + it had fallen to about 2.0 (avg). Air was then started into jars again and left on for the night. By 12/13 AM solids had settled to bottom of jars. Test terminated 12/13 at 0830 after 21.5 hours. To count survival/mortality, sample was poured into Carolina dish and fish bodies were retrieved from floc and counted.

Measured/Loaded by:	AJ	MF		AJ			AJ			AJ			AJ		
Recorded by:	KP	KP		KP	AH		KP	AH		KP	AH		KP	AH	

Investigators' Signatures

Alison Mfonda
Kim Pearce
Andrea Blumenauer

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:			NOT	MEASURED	
Lab Tot. Resid. Cl2:			0.0	HACH	AE
Alkalinity:	115	65	398	HACH	AJ
Hardness:	119	76	400	HACH	AJ
Total Ammonia:	0.0	0.0	36.9	HACH	AJ

Ammonia Meter Slope: _____ Ammonia Blank: 0.0 Salinity Sample: _____ ppt

The Bioassay of Mill Creek Elementary School STP effluent sampled on December 16, 1991, NPDES# FL0025658.

