

Bioassays of

Marsh Cove Condominiums
Wastewater Treatment Plant

Fernandina Beach, Nassau County, Florida

NPDES #FL0032654

Sampled 5/21/01

September 2001

Biology Section

Division of Resource Assessment & Management

Comprehensive Quality Assurance Plan #870346G

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Introduction

Marsh Cove Condominiums Wastewater Treatment Plant, 123 West Hirth Road, Fernandina Beach, Nassau County, Florida, NPDES #FL0032654, tests performed on 22 to 24 May 2001.

This wastewater treatment plant has a design flow of 0.05 MGD and a three-month average flow of 0.03 MGD. The wastewater treatment process includes aeration, clarification, chlorination, and dechlorination. The treated effluent is discharged into the Class III marine waters of an unnamed, tidally influenced wetland.

During the bioassay sampling event the effluent appeared turbid. The turbidity was thought to be the result of a plant upset that was caused by a problem with the blowers. The blowers did not run for most of the 48 hours prior to the sampling event. In addition to the increase in turbidity, the only other noted result of the plant upset at that time was high bacteria counts. The facility was re-sampled on May 23rd for bacteria, and the bacteria counts were within permit limits (facility summary provided by Melissa Reynolds, FDEP, Jacksonville).

The toxicity tests discussed in this report were performed in accordance with methods described by Weber, 1993, *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*, 4th Edition, EPA/600/4-90/027F.

Results and Discussion

The FDEP Biology Section performed two 48-hour static acute screening toxicity bioassays on a sample of effluent from this facility. The test species used for these bioassays were the water flea, *Ceriodaphnia dubia*, and the bannerfin shiner, *Cyprinella leedsi*. The test results indicated that the 100% sample was acutely toxic to both the *C. dubia* and the *C. leedsi* test organisms, producing 35% mortality in the *C. dubia* within 48 hours, and 100% mortality within 24 hours of test initiation for the *C. leedsi* (Table 1).

The initial dissolved oxygen (DO) was 1.6 mg/L. The sample was aerated for a period of two hours to increase the DO to greater than 4.0 mg/L. Due to the low concentration of DO, the *C. leedsi* test was aerated continuously throughout the test period.

Total residual chlorine was 0.74 mg/L in the field, but was not detected in the sample in the laboratory. Total and unionized ammonia in the bioassay sample when received were 22.7 mg/L and 0.639 mg/L, respectively. The ammonia concentrations in the sample submitted for nutrient analyses by the FDEP Chemistry section was estimated at 28 mg/L. The total and unionized ammonia at 24 hours were 24.1 mg/L and 5.40 mg/L, respectively in the *C. leedsi* 100% sample test concentration. Further chemical analyses were performed on the sample, and several metals, organics, and a pesticide were identified (Table 2). The copper (9.8 µg/L) concentrations in the effluent exceeded the State of Florida surface water criteria for copper ($\leq$2.9 µg/L) in Class III marine waters (Table 2).

Unionized ammonia levels as low as 0.08 mg/L and 0.5 mg/L have been found to be acutely toxic to some freshwater fish and invertebrate species, respectively (EPA *Quality Criteria for Water 1986*, EPA 44015-86-001, 1986). We attribute the observed mortality primarily to the unionized ammonia

concentration in the sample. The copper concentration of the sample may also have contributed to the observed toxicity.

Conclusion

The sample of effluent collected from this facility on May 21, 2001, was acutely toxic to both test species, *C. dubia* within 48 hours and *C. leedsi* within 24 hours. The observed toxicity is attributed primarily to the sample's unionized ammonia concentration; however, the sample also contained copper at approximately three times the Class III marine surface water standard, which may also have contributed to the observed toxicity.

Table 1. Data recorded during the 48-hour acute screening bioassays of a sample of effluent from the Marsh Cove Condominiums Wastewater Treatment Plant, 123 West Hirth Road, Fernandina Beach, Nassau County, Florida, NPDES# FL0032654 performed on 22 to 24 May 2001.

Facility:	**Marsh Cove Condominiums WWTP**	**NPDES #**	**FL0032654**	Facility Type:	**Wastewater**	**Analysts:**	Shannon Gerardi
Location:	123 West Hirth Road	Contact/District:	C. Mason/ Northwest		**Treatment Plant**		Della Parker-Hanson
County:	Nassau	Test type:	static acute screen	Receiving Water:	unnamed		Marshall Faircloth
Sample Collection Date:	5/21/01 Time: 1000	# tests:	2		tidally influenced	**Reviewer:**	David Whiting
Test Beginning Date:	5/22/01 Time: 1510	Chlorination Type:	Chlorinated		herbaceous wetland		
Test Ending Date:	5/24/01 Time: 1400		sample collected after dechlorination		**Page 1 of 1**		

Organism: ***Ceriodaphnia dubia*** Life stage: < 24 hours old

	Sample/Diluent	SURVIVAL # Alive			pH			Temperature[B]			Dissolved Oxygen			Conductivity Uncorrected µmhos/cm	
Concentrations [A]	Volume(mL)	0 hr	24 hr	48 hr	0 hour	24 hour	48 hour	0 hour	24 hour	48 hour	0 hour	24 hour	48 hour	0 hour	48 hour
Control A	0/20	5	5	5	7.9	-	7.9	25.5	-	24.7	7.5	-	7.9	170	200
Control B	0/20	5	5	5	-	-	8.0	-	-	24.3		-	8.0	-	195
Control C	0/20	5	5	5	-	-	8.2	-	-	24.2	-	-	8.0	-	190
Control D	0/20	5	5	5	-	-	8.2	-	-	24.2	-	-	8.1	-	200
100% A	20/0	5	1	1	7.6	-	8.2	25.7	-	24.2	4.5	-	6.1	1175	1165
100% B	20/0	5	5	5	-	-	8.2	-	-	24.1	-	-	5.9	-	1205
100% C	20/0	5	4	2	-	-	8.2	-	-	24.1	-	-	6.0	-	1205
100% D	20/0	5	5	5	-	-	8.2	-	-	24.2	-	-	6.1	-	1210

[A] Sample aerated prior to test initiation for two hours to increase the initial dissolved oxygen concentrations from 1.6 mg/L to 4.0 mg/L.

[B] Temperatures of room and test incubator were continuously recorded on a strip chart reco
Room Temperature range for the test period was 25.0-26.5°C.
Incubator #2 temperature range for the test period was 25.5-27.5°C.

Organism: ***Cyprinella leedsi*** Life stage: 11 days

	Sample/Diluent	SURVIVAL # Alive D			pH			Temperature[E]			Dissolved Oxygen			Conductivity Uncorrected µmhos/cm	
Concentrations [C]	Volume(mL)	0 hr	24 hr	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 A	0/500	5	5	-	7.9	8.5	-	25.3	23.7	-	7.3	8.0	-	275	285
Control B	0/500	5	5	-	7.9	8.6	-	25.0	24.8	-	7.3	7.7	-	265	270
Control C	0/500	5	5	-	7.9	8.5	-	24.8	24.3	-	7.4	7.8	-	265	285
Control D	0/500	5	5	-	7.9	8.6	-	24.7	26.1	-	7.4	7.5	-	260	290
100% A	500/0	5	0	-	7.6	8.6	-	25.4	23.9	-	5.1	7.8	-	1185	1110
100% B	500/0	5	0	-	7.6	8.6	-	25.6	24.1	-	4.9	7.7	-	1205	1135
100% C	500/0	5	0	-	7.6	8.5	-	25.7	25.0	-	4.8	7.4	-	1190	1160
100% D	500/0	5	0	-	7.6	8.5	-	25.8	26.3	-	5.0	6.9	-	1200	1195

[C] Sample aerated prior to test initiation for two hours to increase the initial dissolved oxygen concentrations from 1.6 mg/L to 4.0 mg/L. The entire test, including controls, were aerated continuously throughout the test period.

[D] Test terminated at 24 hours due to 100% mortality in the 100% sample.

[E] Temperatures of room and test incubator were continuously recorded on a strip chart recorder.
Room Temperature range for the test period was 25.0-26.5°C.
Incubator #3 temperature range for the test period was 24.5-26.0°C.

Data Transcription Verification	
date:	9/25/01
by:	Joshua Ayres
	Della Parker-Hanson

Total Residual CL2	mg/L	Method
Field:	0.74	NA
Lab:	<0.03	Hach

Ammonia	Total (mg/L)	Unionized (mg/L)
Control Water (fish):	< 0.017	<0.017
20% Dilute Mineral Water (cladocerans):	< 0.017	<0.017
100% Sample:	22.70	0.639
Sample at 24 hours:	24.10	5.400

Alk & Hardness	Alkalinity (mg/L)	Hardness (mg/L)
Control Water (fish):	135	129
20% Dilute Mineral Water (cladocerans):	76	80
100% Sample:	266	288

Table 2. Results of chemical analyses on the effluent from Marsh Cove Condominiums Wastewater Treatment Plant sampled on May 21, 2001.

Metals			
Arsenic	3.8	µg/L	[I]
Cadmium	0.041	µg/L	[I]
Calcium	69.3	mg/L	
Copper	9.8	µg/L	
Iron	250	µg/L	
Lead	0.57	µg/L	[I]
Magnesium	17	mg/L	
Silver	0.042	µg/L	[I]
Pesticides and Herbicides			
Atrazine	0.06	µg/L	[I]
Base, Neutral, & Acid Extractable Organics			
2,4-Dichlorophenol	1.8	µg/L	[I]
Benzyl alcohol	13	µg/L	
Diethyl phthalate	1.8	µg/L	[I]
m,p-Cresols	66	µg/L	
Phenol	20	µg/L	

[I] Value reported is less than the minimum quantitation limit and greater than or equal to the minimum detection limit.

The Bioassay of Marsh Cove Condominiums Wastewater Treatment Plant effluent sampled on May 21, 2001, NPDES #FL0032654.

Fill Out This Section For All Surface Water Discharger Inspections(CEI, CSI, CBI, PAI, XSI-RI Optional)

Transaction Code	NEPDES NUMBER	YR/MO/DA	Insp Type	Inspector	Fac Type
1 N 2 5	3 F L 0 0 3 2 6 5 4	11 12 0 1 0 5 2 1	18 **B**	19 **S**	20 2

Remarks

T O X I C T O C D U B I A & C L E E D S I

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The Priority Pollutants Analysis for Bioassay of Marsh Cove Condominiums Wastewater Treatment Plant effluent sampled on May 21, 2001, NPDES #FL0032654.

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Transaction Code	NEPDES NUMBER	YR/MO/DA	Insp Type	Inspector	Fac Type
1 N 2 5	3 F L 0 0 3 2 6 5 4	11 12 0 1 0 5 2 1	18 **X**	19 **S**	20 2

Remarks

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