

Bioassays of

Fernandina Beach Wastewater Treatment Plant

Fernandina Beach, Nassau County, Florida

NPDES #FL0027260

Sampled 10/1/01

February 2002

Biology Section

Division of Resource Assessment & Management

Comprehensive Quality Assurance Plan #870346G

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Biology Section
Bureau of Laboratories
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Introduction

Fernandina Beach Wastewater Treatment Plant, 1007 South Fifth Street, Fernandina Beach, Nassau County, Florida, NPDES #FL0027260, tests performed on 2 to 4 October 2001.

This wastewater treatment plant has a design flow of 3.5 MGD and an annual average flow of 2.0 MGD. This facility consists of three systems that operate in parallel: an oxidation-ditch system, a contact-stabilization system, and a conventional system. The oxidation-ditch system includes an aeration/anoxic basin, a secondary clarifier, an aerobic digester, and a chlorine contact chamber. The contact-stabilization system includes a stabilization tank, a contact tank, a secondary clarifier, and a chlorine contact chamber. The conventional system includes an aeration basin, a digester, two secondary clarifiers, and a chlorine contact tank. The facility is also equipped with two additional aerobic digesters. After treatment, the effluent is dechlorinated using sulfur dioxide and continuously discharged through a 75-ft outfall line into the Class III marine waters of the Amelia River (facility summary provided by Kathleen H. Gerard, 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 four 48-hour static acute screening toxicity bioassays on a sample of effluent collected from this facility using both freshwater and saltwater test species. The freshwater test species used for these bioassays were the water flea, *Ceriodaphnia dubia*, and the bannerfin shiner, *Cyprinella leedsi*. The saltwater test species used were the mysid shrimp, *Americamysis bahia*, and the inland silverside, *Menidia beryllina*. The original salinity of the sample was approximately one part per thousand (ppt). For the saltwater tests, aliquots of the sample were salt adjusted using Forty Fathoms® artificial sea salts to salinities of two ppt and seven ppt for the silverside and mysid tests, respectively, to ensure that the minimum required salinity was due to salt water ions (1 ppt for *M. beryllina*, 6 ppt for *A. bahia*). The control water was natural seawater (NSW) diluted to the test salinity. The salt-control water was NSW diluted to one ppt to match the salinity of the original sample and then salted to the salinity of the appropriate test. The *Americamysis bahia* test was invalidated due to excess control mortality (15% mortality) in the salt-control water. The test results did not indicate toxicity to the test species *C. dubia, C. leedsi, or M. beryllina* within 48 hours (Tables 1 and 2).

Total residual chlorine and total ammonia were not detected in the sample in the laboratory. Further chemical analyses were performed on the sample, and several metals and an herbicide were identified (Table 3).

Conclusion

The sample of effluent collected from this facility on October 1, 2001, did not show acute toxicity to the test species, *C. dubia, C. leedsi, or M. beryllina* within 48 hours. The *Americamysis bahia* test was invalidated due to excess control mortality (15% mortality) in the salt-control water.

Table 1. Data recorded during the 48-hour acute screening bioassays of a sample of effluent from the Fernandina Beach Wastewater Treatment Plant, 1007 South Fifth Street, Fernandina Beach, Nassau County, Florida, NPDES# FL0027260 performed from 2 to 4 October 2001.

Freshwater Species Test

Facility:	**Fernandina Beach WWTP**		**NPDES #**	**FL0027260**	Facility Type:	**Wastewater**	**Analysts:** Della Parker-Hanson
Location:	1007 South Fifth Street		Contact/District:	Pat O'Connor/Northeast		**Treatment Plant**	Joshua Ayres
County:	Nassau		Test type:	static acute screen			Marshall Faircloth
Sample Collection Date:	10/1/01	Time: 1100	# tests:	2	Receiving Water:	Amelia River	Eva Pastora
Test Beginning Date:	10/2/01	Time: 1530	Chlorination Type:	chlorinated			Daisys Tamayo
Test Ending Date:	10/4/01	Time: 1530		sample collected after dechlorination		**Page 1 of 1**	**Reviewer:** David Whiting

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

	Sample/Diluent	SURVIVAL # Alive			pH			Temperature[A]			Dissolved Oxygen			Conductivity Uncorrected ìmhos/cm	
Concentrations	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	8.0	-	8.3	24.5	-	25.2	7.5	-	7.8	180	210
Control B	0/20	5	5	5	-	-	8.3	-	-	25.1	-	-	7.8	-	195
Control C	0/20	5	5	5	-	-	8.4	-	-	25.0	-	-	7.8	-	185
Control D	0/20	5	5	5	-	-	8.4	-	-	24.9	-	-	7.8	-	190
100% A	20/0	5	5	5	7.6	-	8.6	24.6	-	25.0	7.5	-	8.0	920	970
100% B	20/0	5	5	5	-	-	8.7	-	-	25.0	-	-	8.0	-	1025
100% C	20/0	5	5	5	-	-	8.7	-	-	25.0	-	-	8.1	-	1010
100% D	20/0	5	5	5	-	-	8.7	-	-	24.9	-	-	8.2	-	1010

[A] Temperatures of room and test incubator were continuously recorded on a strip chart recorder.
Room Temperature range for the test period was 24.8-26.0 °C.
Incubator #2 temperature range for the test period was 26.0-26.5°C.

Organism: ***Cyprinella leedsi*** Life stage: 8 days

	Sample/Diluent	SURVIVAL # Alive			pH			Temperature[B]			Dissolved Oxygen			Conductivity Uncorrected ìmhos/cm	
Concentrations	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	0/500	5	5	5	7.9	8.5	8.5	24.5	23.0	24.0	7.7	7.9	7.8	290	320
Control B	0/500	5	5	5	7.9	8.4	8.5	24.4	23.9	24.0	7.6	7.8	7.8	295	315
Control C	0/500	5	5	5	7.9	8.4	8.5	24.2	24.0	24.0	7.5	7.7	7.9	295	330
Cotnrol D	0/500	5	5	5	7.9	8.4	8.5	24.1	23.7	24.1	7.6	7.9	7.9	295	320
100% A	500/0	5	5	5	7.6	8.2	8.4	24.5	23.7	24.1	7.7	7.8	7.8	935	960
100% B	500/0	5	5	5	7.6	8.2	8.4	24.6	23.9	24.1	7.6	7.6	7.8	950	975
100 % C	500/0	5	5	5	7.6	8.2	8.4	24.5	23.8	24.1	7.5	7.5	7.7	950	1020
100% D	500/0	5	5	5	7.6	8.3	8.4	24.4	23.8	24.0	7.5	7.6	7.8	940	1040

[B] Temperatures of room and test incubator were continuously recorded on a strip chart recorder.
Room Temperature range for the test period was 24.8-26.0°C.
Incubator #3 temperature range for the test period was 24.0-25.0°C.

Data Transcription Verification	
date:	1/9/02
by:	Gary Hardie
	Della Parker-Hanson

Total Residual CL2	mg/L	Method
Field:	<0.01	-
Lab:	<0.03	Hach

Ammonia	Total (mg/L)	Unionized (mg/L)
Control water (fish):	<0.017	<0.017
Control water (cladoceran):	<0.017	<0.017
100% Sample:	<0.017	<0.017

Alk & Hardness	Alkalinity (mg/L)	Hardness (mg/L)
Control water (fish):	152	143
Control water (cladoceran):	77	86
100% Sample:	159	278

Table 2. Data recorded during the 48-hour acute screening bioassays of a sample of effluent from the Fernandina Beach Wastewater Treatment Plant, 1007 South Fifth Street, Fernandina Beach, Nassau County, Florida, NPDES# FL0027260 performed from 2 to 4 October 2001.

Saltwater Species Test

Facility:	**Fernandina Beach WWTP**		**NPDES #**	**FL0027260**	Facility Type: **Wastewater**	**Analysts:**	Della Parker-Hanson
Location:	1007 South Fifth Street		Contact/District:	Pat O'Connor/Northeast	**Treatment Plant**		Joshua Ayres
County:	Nassau		Test type:	static acute screen			Marshall Faircloth
Sample Collection Date:	10/1/01	Time: 1110	# tests:	2	Receiving Water: Amelia River		Eva Pastora
Test Beginning Date:	10/2/01	Time: 1600	Chlorination Type:	chlorinated			Daisys Tamayo
Test Ending Date:	10/4/01	Time: 1515		sample collected after dechlorination	**Page 1 of 1**	**Reviewer:**	David Whiting

Organism: ***Americamysis bahia*** Life stage: 4 days

	Sample/Diluent	SURVIVAL # Alive			pH			TemperatureA			Dissolved Oxygen			Conductivity Uncorrected mmhos/cm	
Concentrations	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	0/500	5	5	5	8.0	8.2	8.2	24.3	24.7	25.6	7.5	7.5	6.8	11.8	12.8
Control B	0/500	5	5	4	8.0	8.2	8.2	23.6	24.5	25.2	7.4	7.4	6.7	11.9	12.8
Control C	0/500	5	5	5	8.0	8.2	8.2	23.3	24.3	25.2	7.5	7.5	6.7	11.7	13.3
Cotnrol D	0/500	5	5	5	8.0	8.2	8.2	23.3	24.2	25.1	7.6	7.5	6.7	11.9	12.9
Salt Ctrl A	0/500	5	5	4	8.3	8.3	8.3	24.7	23.8	25.4	7.4	7.5	6.8	12.1	13.8
Salt Ctrl B	0/500	5	5	5	8.3	8.3	8.3	24.7	24.0	25.5	7.4	7.6	6.8	12.1	12.9
Salt Ctrl C	0/500	5	5	3	8.3	8.3	8.3	24.7	24.0	25.5	7.4	7.6	6.8	12.1	13.3
Salt Ctrl D	0/500	5	5	5	8.3	8.3	8.3	24.6	24.0	25.5	7.4	7.6	6.8	12.1	13.3
100% A	500/0	5	5	3	8.0	8.3	8.3	24.7	23.8	25.3	7.5	7.6	6.3	12.0	13.8
100% B	500/0	5	5	4	8.0	8.3	8.2	24.6	24.0	25.3	7.4	7.7	6.3	12.0	12.8
100 % C	500/0	5	5	4	8.0	8.3	8.3	24.5	24.2	25.1	7.3	7.6	6.3	11.8	13.0
100% D	500/0	5	4	4	8.0	8.3	8.3	24.3	24.2	25.0	7.3	7.4	6.4	11.8	12.6

[A] Temperatures of room and test incubator were continuously recorded on a strip chart recorder.
Room Temperature range for the test period was 24.8-26.0°C.
Incubator #3 temperature range for the test period was 24.0-25.0°C.

Organism: ***Menidia beryllina*** Life stage: 8 days

	Sample/Diluent	SURVIVAL # Alive			pH			TemperatureA			Dissolved Oxygen			Conductivity Uncorrected mmhos/cm	
Concentrations	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	0/500	5	5	5	8.0	8.2	8.3	24.3	24.3	25.1	7.6	7.3	7.1	4.2	4.6
Control B	0/500	5	5	5	8.0	8.2	8.3	23.6	24.3	25.5	7.4	7.5	7.2	4.1	4.8
Control C	0/500	5	5	5	8.0	8.2	8.3	23.3	24.1	25.3	7.5	7.5	7.2	4.1	4.7
Cotnrol D	0/500	5	5	5	8.0	8.2	8.3	23.0	24.0	25.3	7.5	7.3	7.2	4.1	4.6
Salt Ctrl A	0/500	5	5	5	8.0	8.2	8.3	24.0	23.9	25.3	7.5	7.4	7.2	3.8	4.2
Salt Ctrl B	0/500	5	5	5	8.0	8.2	8.3	23.9	24.0	25.2	7.4	7.4	7.2	3.8	4.2
Salt Ctrl C	0/500	5	5	5	8.0	8.3	8.3	23.9	24.0	25.2	7.5	7.2	7.2	3.8	4.3
Salt Ctrl D	0/500	5	5	5	8.0	8.3	8.3	23.6	24.0	25.3	7.4	7.4	7.2	3.8	4.2
100% A	500/0	5	5	5	7.7	8.3	8.3	24.6	24.0	25.3	7.4	7.5	7.0	3.7	4.0
100% B	500/0	5	5	5	7.7	8.3	8.3	24.9	24.0	25.2	7.4	7.4	7.0	3.7	4.2
100 % C	500/0	5	5	5	7.7	8.3	8.3	25.0	23.7	25.1	7.4	7.4	7.0	3.7	4.2
100% D	500/0	5	5	5	7.7	8.3	8.3	25.0	23.7	25.0	7.3	7.5	7.0	3.7	4.2

[A] Temperatures of room and test incubator were continuously recorded on a strip chart recorder.
Room Temperature range for the test period was 24.8-26.0°C.
Incubator #3 temperature range for the test period was 24.0-25.0°C.

Data Transcription Verification	
date:	1/9/02
by:	Della Parker-Hanson Gary Hardie

Total Residual CL2	mg/L	Method
Field:	<0.01	-
Lab:	<0.03	Hach

Ammonia	Total (mg/L)	Unionized (mg/L)
NSW	<0.051	<0.051
100% Sample:	<0.017	<0.017

Alk & Hardness	Alkalinity (mg/L)	Hardness (mg/L)
NSW	133	-
100% Sample:	159	278

Salinity [B]	ppt
Control waters (mysid):	~7
Control waters (silverside):	~2
unadjusted 100% sample:	~1
adjusted 100% (mysid):	~7
adjusted 100% (silverside):	~2

[B] Salinity based on conductivity and temperature.

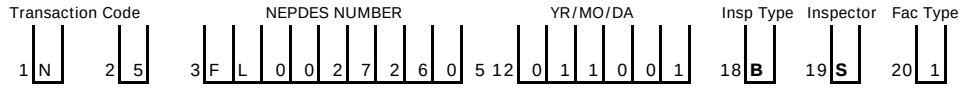
Table 3. Results of chemical analyses on the effluent from Fernandina Beach Wastewater Treatment plant sampled on October 1, 2001.

Metals			
Calcium	63	mg/L	
Copper	2.22	µg/L	
Iron	47	µg/L	I
Magnesium	27.8	mg/L	
Silver	0.08	µg/L	I
Zinc	26	µg/L	
Pesticides and Herbicides			
Atrazine	0.13	µg/L	I
Base, Neutral, & Acid Extractable Organics			
None detected			

[I] The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.

The Bioassay of Fernandina Beach Wastewater Treatment Plant effluent sampled on October 1, 2001, NPDES #FL0027260.

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

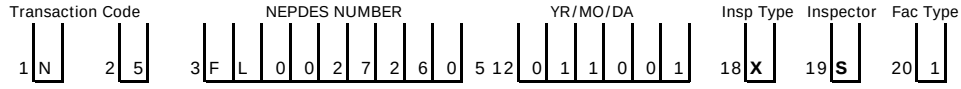


Remarks

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The Priority Pollutants Analysis for Bioassay of Fernandina Beach Wastewater Treatment Plant effluent sampled on October 1, 2001, NPDES #FL0027260.

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



Remarks

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