

Bioassays of

Sanford North Wastewater Treatment Plant

Sanford, Seminole County, Florida

NPDES #FL0020141

Sampled 1/14/02

May 2002

Biology Section
Division of Resource Assessment & Management

Comprehensive Quality Assurance Plan #870346G

Bioassays of

Sanford North Wastewater Treatment Plant

Sanford, Seminole County, Florida

NPDES #FL0020141

Biology Section
Bureau of Laboratories
May 2002

Introduction

Sanford North Wastewater Treatment Plant, 1201 West Seminole Boulevard, Sanford, Seminole County, Florida, NPDES #FL0020141, tests performed on 15 to 17 January 2002.

This domestic wastewater treatment plant has a permitted capacity of 7.3 MGD annual average flow and a permitted surface water discharge of 1.0 MGD annual average flow. Most of the wastewater is directed to a city-wide reuse system. Treatment of the wastewater includes flow equalization, influent screening, grit removal, aeration, secondary clarification, chemical feed, filtration, chlorination, and dechlorination using sulfur dioxide. After treatment the effluent is discharged into the Class III fresh waters of the St. Johns River (facility information provided by David Schimerko, FDEP, Orlando).

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 collected from the outfall of this facility. The test species used were the waterflea, *Ceriodaphnia dubia,* and the bannerfin shiner, *Cyprinella leedsi*.

The total residual chlorine concentration of the effluent was >2.2 mg/L in the field and 3.8 mg/L in the bioassay sample in the laboratory. An aliquot of the sample was dechlorinated using 5.0 ml of 0.025N sodium thiosulfate per liter of sample and tested. The same ratio of sodium thiosulfate was also added to an aliquot of each of the control waters. The additional controls were used to test for any adverse effects to the test species by the addition of sodium thiosulfate. No mortality was observed in any of the controls. The TRC of the dechlorinated aliquot of sample was 0.12 mg/L. The dechlorinated sample tests did not show toxicity to either test species by 48 hours. However, the 100% sample showed toxicity, causing 100 % mortality to both species. The toxicity is attributed primarily to the chlorine in the sample since a lack of mortality was observed in the dechlorinated aliquot of sample. Total residual chlorine levels as low as 0.028 mg/L have been found to be acutely toxic to some freshwater fish and invertebrates (EPA *Quality Criteria for Water* 1986, EPA 44015-86-001, 1986). The dechlorination process used in the lab can also remove other toxicants, so chlorine cannot be identified as the sole cause for the observed toxicity.

Total ammonia was not detected in the sample in the laboratory. Further chemical analyses were performed on the sample, and several metals were identified (Table 2). The concentration of copper (19.0 µg/L) and TRC (3.80 mg/L) within the sample exceeded the State of Florida water quality criteria for copper (≤18.7 µg/L in a hardness of 171 mg/L as $CaCO_4$) and for TRC (<0.01 mg/L) in Class III fresh waters.

Conclusion

The sample of effluent collected from this facility on January 7, 2002, was acutely toxic to both test species within 48 hours. The concentrations of chlorine and copper found in the sample exceeded the State of Florida water quality criteria for Class III fresh waters.

Table 1. Data recorded during the 48-hour acute screening bioassays of a sample of effluent from the Sanford North Wastewater Treatment Plant, 1201 West Seminole Boulevard, Sanford, Seminole County, Florida, NPDES# FL0020141 performed from 15 to 17 January 2002.

Facility:	**Sanford North WWTP**	**NPDES #**	**FL0020141**	Facility Type:	**Wastewater Treatement Plant**	**Analysts:**	Della Parker-Hanson, Joshua Ayres, Gary Hardie, Marshall Faircloth
Location:	1201 West Seminole Boulevard	Contact/District:	Kane/Central				
County:	Seminole	Test type:	static acute screen				
Sample Collection Date:	1/14/02 Time: 0855	# tests:	2	Receiving Water:	St. Johns River		
Test Beginning Date:	1/15/02 Time: 1420	Chlorination Type:	Chlorinated				
Test Ending Date:	1/17/02 Time: 1450		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 µmhos/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	8.2	-	8.2	24.7	-	23.2	7.5	-	7.3	170	190
Control B	0/20	5	5	5	-	-	8.3	-	-	23.2	-	-	7.2	-	190
Control C	0/20	5	5	5	-	-	8.3	-	-	23.2	-	-	7.3	-	190
Control D	0/20	5	5	5	-	-	8.3	-	-	23.2	-	-	7.4	-	185
Dechl Ctrl A	0/20	5	5	5	8.1	-	8.3	24.8	-	23.2	7.9	-	7.4	250	270
Dechl Ctrl B	0/20	5	5	5	-	-	8.3	-	-	23.1	-	-	7.4	-	275
Dechl Ctrl C	0/20	5	5	5	-	-	8.3	-	-	23.1	-	-	7.5	-	290
Dechl Ctrl D	0/20	5	5	5	-	-	8.3	-	-	23.1	-	-	7.5	-	290
100% A	20/0	5	0	0	6.5	7.5	-	24.7	24.6	-	7.8	7.6	-	680	740[B]
100% B	20/0	5	0	0	-	7.5	-	-	24.3	-	-	7.6	-	-	770[B]
100% C	20/0	5	0	0	-	7.6	-	-	24.1	-	-	7.8	-	-	770[B]
100% D	20/0	5	0	0	-	7.6	-	-	24.0	-	-	7.9	-	-	765[B]
Dechl 100 A	20/0	5	5	5	6.9	-	7.8	24.9	-	23.3	7.7	-	7.4	760	735
Dechl 100 B	20/0	5	5	5	-	-	7.8	-	-	23.3	-	-	7.4	-	800
Dechl 100 C	20/0	5	5	5	-	-	7.8	-	-	23.2	-	-	7.5	-	830
Dechl 100 D	20/0	5	5	5	-	-	7.8	-	-	23.2	-	-	7.5	-	785

[A] Temperatures of room and test incubator were continuously recorded on a strip chart recorder.
Room Temperature range for the test period was 23.5-24.0 °C.
Incubator #3 temperature range for the test period was 25.0-26.0°C.

[B] Measurements taken at 24 hours.

Organism: ***Cyprinella leedsi*** Life stage: 10 days

	Sample/Diluent	SURVIVAL # Alive			pH			Temperature[D]			Dissolved Oxygen			Conductivity Uncorrected µmhos/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	8.2	8.5	24.7	24.4	24.3	7.7	7.3	7.2	235	250
Control B	0/500	5	5	5	7.9	8.3	8.5	24.6	24.4	24.4	7.5	7.4	7.0	260	270
Control C	0/500	5	5	5	7.9	8.3	8.5	24.6	24.4	24.2	7.3	7.4	6.9	265	275
Cotnrol D	0/500	5	5	5	7.9	8.3	8.5	24.7	24.0	24.2	7.3	7.2	7.0	270	270
Dechl Ctrl A	0/500	5	5	5	8.0	8.4	8.5	24.5	24.5	24.5	7.9	7.1	7.1	280	295
Dechl Ctrl B	0/500	5	5	5	8.0	8.4	8.5	24.4	24.4	24.3	7.4	7.1	6.8	285	300
Dechl Ctrl D	0/500	5	5	5	8.0	8.3	8.4	24.6	24.5	24.3	7.5	7.1	6.9	290	300
Dechl Ctrl D	0/500	5	5	5	8.0	8.3	8.4	24.5	24.9	24.5	7.5	7.0	6.6	290	300
100% A	500/0	5	[C]	-	6.6	-	-	24.8	-	-	7.9	-	-	690	-
100% B	500/0	5	[C]	-	6.6	-	-	24.8	-	-	7.7	-	-	740	-
100 % C	500/0	5	[C]	-	6.6	-	-	24.8	-	-	7.7	-	-	745	-
100% D	500/0	5	[C]	-	6.6	-	-	24.6	-	-	7.8	-	-	750	-
Dechl 100 A	500/0	5	5	5	6.9	8.6	7.5	24.9	24.1	24.3	7.6	6.5	6.6	770	745
Dechl 100 B	500/0	5	5	5	6.9	8.6	7.5	25.2	23.9	24.2	7.5	6.6	6.1	785	795
Dechl 100 C	500/0	5	5	5	6.9	8.6	7.5	25.2	23.9	24.5	7.6	6.7	6.1	775	815
Dechl 100 D	500/0	5	5	5	6.9	8.6	7.5	25.2	23.6	24.2	7.5	6.7	6.0	790	815

[C] Complete mortlity was observed in the 100% sample within two hours of test initiation.

[D] Temperatures of room and test incubator were continuously recorded on a strip chart recorder.
Room Temperature range for the test period was 23.5-24.0 °C.
Incubator #3 temperature range for the test period was 25.0-26.0°C.

LIMS	
Job number:	TLH-2002-01-15-25
Sample number:	571188

Data Transcription Verification	
date:	4/9/02
by:	Joshua Ayres, Gary Hardie

Total Residual CL2	mg/L	Method
Field:	>2.2	-
Lab:	3.80	Hach

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

Alk & Hardness	Alkalinity (mg/L)	Hardness (mg/L)
Control water (fish):	138	130
Control water (water flea):	73	81
100% Sample:	49	171

Table 2. Results of chemical analyses on the effluent from Sanford North Wastewater Treatment Plant sampled on January 14, 2002.

Metals

Aluminum	434	µg/L	[A]
Cadmium	0.12	µg/L	
Calcium	51.2	mg/L	
Copper	19	µg/L	
Iron	210	µg/L	
Lead	0.52	µg/L	[I]
Magnesium	9	mg/L	
Selenium	0.86	µg/L	[I]
Silver	0.67	µg/L	
Zinc	133	µg/L	

Pesticides and Herbicides

None detected

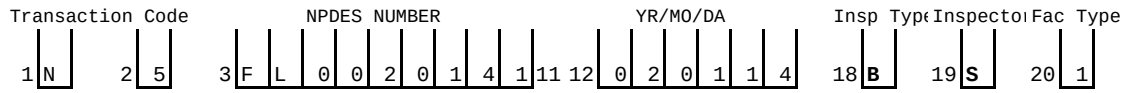
Base, Neutral, & Acid Extractable Organics

None detected

[A] Value reported is the mean of two or more determinations.
[I] The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.

The Bioassay of Sanford North Wastewater Treatment Plant effluent sampled on January 14, 2002, NPDES #FL0020141.

Fill Out This Section For All Surface Water Discharger Inspections(CEI, CSI, CBI, PAI, X

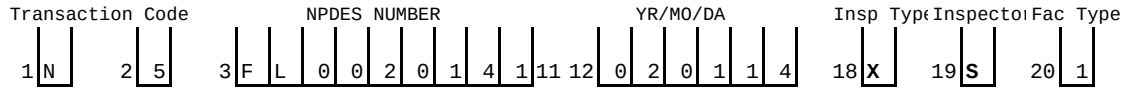


Remarks

66

The Priority Pollutants Analysis for Bioassay of Sanford North Wastewater Treatment Plant effluent sampled on January 14, 2002, NPDES #FL0020141.

Fill Out This Section For All Surface Water Discharger Inspections(CEI, CSI, CBI, PAI, X



Remarks

66