

Bioassays of

Hollywood Southern Regional Wastewater Treatment Facility

Hollywood, Broward County, Florida

NPDES #FL0026255

3/4/02

July 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

Hollywood Southern Regional Wastewater Treatment Facility, 1621 North 14th Avenue, Hollywood, Broward County, Florida, NPDES #FL0026255, tests performed on 5 to 7 March 2002.

This wastewater treatment plant has a design flow of 42 MGD and annual average flow of 35.036 MGD (monthly operating report, March 4, 2002). The wastewater treatment system consists of mechanical bar screens, grit removal chambers, an influent pump station, an oxygenation system, clarifiers, and a chlorination system. The wastewater treatment system also includes an odor control system with scrubbers at the de-watering building, a residuals thickener facility, filter presses, and a lime-stabilization building. The facility doesn't actively dechlorinate the effluent but relies on chlorine dissipation as the effluent travels the 10,000 feet long outfall pipeline. Treated effluent from the facility is mixed, in a common mixing chamber, with treated effluents from both the Town of Davie WWTP and the Cooper City WWTP prior to entering the discharge pipeline. Combined effluent is discharged via an ocean outfall to the Class III waters of the Atlantic Ocean (facility summary provided by Hubert Philoctete, FDEP, West Palm Beach).

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 from the Hollywood Southern Regional Wastewater Treatment Facility. The entire aliquot of sample that was set aside for use in the freshwater tests was accidentally dechlorinated; therefore, freshwater tests on an unaltered effluent sample were not performed. The two saltwater bioassays were performed on salinity-adjusted aliquots of the effluent sample. The test species used for the freshwater bioassays were the water flea, *Ceriodaphnia dubia*, and the bannerfin shiner, *Cyprinella leedsi*. The test species used for the salinity-adjusted bioassays were the mysid shrimp, *Americamysis bahia*, and the inland silverside, *Menidia beryllina*.

The apparent salinity of the effluent sample was approximately 3‰ based on conductivity and temperature measurements. To ensure that the minimum salinity requirements of the marine test organisms (6‰ for *Americamysis bahia* and 1‰ for *Menidia beryllina*) were met and that the adjusted minimum salinity was from seawater ions and not ground water ions, aliquots of the bioassay sample were adjusted by the addition of artificial-sea salts to apparent salinities of 9‰ and 4‰, respectively, for the *Americamysis bahia* bioassay and the *Menidia beryllina* bioassay. The control water for each bioassay was natural seawater (NSW) diluted with well water to the appropriate test salinity. To determine any detrimental effect of adding artificial sea salts to the sample, additional controls were prepared by diluting NSW to the apparent salinity (~3‰) of the original sample, and then adjusting the salinity of the diluted NSW with artificial sea salts to the appropriate test salinity. Since total residual chlorine (0.11 mg/L) was detected in the sample, additional tests were performed on aliquots of the sample that had been dechlorinated by the addition of sodium thiosulfate. As noted earlier, the entire aliquot of sample reserved for the freshwater tests was dechlorinated. Controls for the sodium thiosulfate were created by adding similar concentrations of sodium thiosulfate to aliquots of the control waters used in each test. Neither the freshwater nor the saltwater test results indicated toxicity to any of the test species within 48 hours of test initiation (Table 1).

Total residual chlorine was measured at 0.42 mg/L in the field and 0.11 mg/L in the bioassay sample in the laboratory. The total and unionized ammonia concentrations in the bioassay sample were 11.0 mg/L and 0.66 mg/L, respectively. Total ammonia in the sample collected for chemical analyses was 9.9 mg/L. Further chemical analyses were performed on samples of effluent for base, neutral, and acid extractable organic compounds, metals, nutrients, and pesticides. Several metals, nutrients, and a pesticide were identified (Table 2).

Conclusion

The sample of effluent collected from this facility on March 4, 2002, did not show acute toxicity to either the freshwater or the saltwater test species within 48 hours of test initiation.

Table 1. Data recorded during the 48-hour acute screening bioassays of a sample of effluent from the City of Hollywood Wastewater Treatment Plant,1621 North 14th Avenue, Hollywood, Broward County, Florida, NPDES# FL0026255, performed from 5 to 7 March 2002.

Saltwater Tests

Facility:	**City of Hollywood WWTP**		**NPDES #**	**FL0026255**	Facility Type:	**Wastewater Treatment Plant**	**Analysts:** Della Parker-Hanson
Location:	1621 North 14th Avenue		Contact/District:	T. Davis/Southeast			Joshua Ayres
County:	Broward		Test type:	static acute screen			Gary Hardie
Sample Collection Date:	3/4/02	Time: 1045	# tests:	2	Receiving Water:	Atlantic Ocean	Marshall Faircloth
Test Beginning Date:	3/5/02	Time: 1530	Chlorination Type:	Chlorinated			
Test Ending Date:	3/7/02	Time: 1515				**Page 1 of 2**	**Reviewer:** David Whiting

Organism: ***Americamysis bahia*** Life stage: 2 days

		Sample/Diluent	SURVIVAL # Alive			pH			Temperature[A]			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	8.1	7.9	23.2	25.0	25.0	7.7	6.5	5.8	14.9	17.3
	Control B	0/500	5	5	5	8.0	8.1	7.9	23.3	24.6	24.6	7.7	6.5	5.6	15.2	16.4
	Control C	0/500	5	5	5	8.0	8.1	7.8	23.3	24.5	24.5	7.6	6.6	5.6	15.4	17.2
	Cotnrol D	0/500	5	5	5	8.0	8.1	7.8	23.3	24.9	24.9	7.7	6.6	5.1	15.4	16.7
	Salt Ctrl A	0/500	5	5	5	8.2	8.1	8.0	23.2	24.2	24.2	7.7	6.1	5.3	14.3	15.9
	Salt Ctrl B	0/500	5	5	5	8.2	8.1	7.9	23.3	24.2	24.2	7.7	6.2	5.4	14.3	15.5
	Salt Ctrl C	0/500	5	5	5	8.2	8.1	7.8	23.3	24.3	24.3	7.7	6.2	5.0	14.4	15.2
	Salt Ctrl D	0/500	5	5	5	8.2	8.1	8.0	23.3	24.2	24.2	7.5	6.1	4.9	14.3	15.5
Dechlorinated	Salt Ctrl A	0/500	5	5	5	8.2	8.1	7.8	25.1	24.8	24.8	7.6	5.9	4.7	15.0	16.1
Dechlorinated	Salt Ctrl B	0/500	5	5	5	8.2	8.1	8.0	25.3	24.4	24.4	7.5	5.9	4.5	15.1	15.4
Dechlorinated	Salt Ctrl C	0/500	5	5	5	8.2	8.1	8.0	25.4	24.3	24.3	7.5	6.0	5.5	15.2	15.4
Dechlorinated	Salt Ctrl D	500/0	5	5	5	8.2	8.1	8.0	25.4	24.1	24.1	7.5	6.1	5.7	15.1	16.4
Dechlorinated	100% A	500/0	5	5	5	7.2	8.0	8.0	23.4	25.5	25.5	7.5	5.7	5.3	15.6	18.0
Dechlorinated	100% B	500/0	5	5	5	7.2	8.0	8.0	23.2	25.8	25.8	7.5	5.9	5.0	15.6	16.4
Dechlorinated	100% C	500/0	5	5	5	7.2	8.0	7.9	23.2	24.5	24.5	7.5	5.9	4.8	15.6	16.9
Dechlorinated	100% D	500/0	5	5	5	7.2	8.0	8.0	23.3	24.2	24.2	7.5	5.9	4.8	15.6	16.6
	100% A	500/0	5	5	5	7.0	7.9	7.9	23.1	24.4	24.4	7.5	5.7	4.7	14.5	15.7
	100% B	500/0	5	5	5	7.0	7.9	7.8	23.3	25.0	25.0	7.5	5.7	4.2	14.5	15.5
	100% C	500/0	5	5	5	7.0	8.0	8.1	23.4	24.7	24.7	7.4	5.7	4.1	14.5	15.8
	100% D	500/0	5	5	5	7.0	8.0	8.0	23.5	24.1	24.1	7.4	5.7	5.5	14.5	15.9

[A] Temperatures of room and test incubator were continuously recorded on a strip chart recorder.
Room Temperature range for the test period was 22.5-25.0°C.
Incubator #3 temperature range for the test period was 25.0-25.5°C.

LIMS	
Job number:	TLH-2002-03-05-46
Sample number:	580622

ta Transcription Verification	
date:	4/12/02
by:	Joshua Ayres
	Gary Hardie

Total Residual CL2	mg/L	Method
Field:	-	-
Lab:	0.11	Hach

Ammonia	Total (mg/L)	Unionized (mg/L)
NSW	<0.017	<0.017
100% Sample:	11.00	0.66

Alk & Hardness	Alkalinity (mg/L)	Hardness (mg/L)
NSW	134	-
100% Sample:	174	-

Salinity [C]	ppt
Mysid control:	~9
Menidia control:	~4
Mysid 100% sample:	~9
Menidia 100% sample:	~4
unadjusted 100% Sampl	~3

[C] Salinity based on conductivity and temperature.

Table 1. Data recorded during the 48-hour acute screening bioassays of a sample of effluent from the City of Hollywood Wastewater Treatment Plant, 1621 North 14th Avenue, Hollywood, Broward County, Florida, NPDES# FL0026255, performed from 5 to 7 March 2002.

Freshwater Tests

Facility:	**City of Hollywood WWTP**		**NPDES #**	**FL0026255**	Facility Type:	**Wastewater Treatment Plant**	**Analysts:** Della Parker-Hanson, Joshua Ayres, Gary Hardie, Marshall Faircloth
Location:	1621 North 14th Avenue		Contact/District:	T. Davis/Southeast			
County:	Broward		Test type:	static acute screen			
Sample Collection Date:	3/4/02	Time: 1045	# tests:	2	Receiving Water:	Atlantic Ocean	
Test Beginning Date:	3/5/02	Time: 1530	Chlorination Type:	Chlorinated			
Test Ending Date:	3/7/02	Time: 1515				**Page 2 of 2**	**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	22.7	-	24.9	8.4	-	7.6	160	190
Control B	0/20	5	5	5	-	-	8.2	-	-	24.9	-	-	7.6	-	195
Control C	0/20	5	5	5	-	-	8.2	-	-	24.8	-	-	7.4	-	200
Control D	0/20	5	5	5	-	-	8.2	-	-	24.5	-	-	7.5	-	190
Dechl Ctrl A	0/20	5	5	5	8.3	-	8.4	22.5	-	24.7	8.1	-	7.6	160	200
Dechl Ctrl B	0/20	5	5	5	-	-	8.4	-	-	24.7	-	-	7.4	-	210
Dechl Ctrl C	0/20	5	5	5	-	-	8.4	-	-	24.5	-	-	7.6	-	210
Dechl Ctrl D	0/20	5	5	5	-	-	8.4	-	-	24.4	-	-	7.6	-	205
Dechl 100 A	20/0	5	5	5	7.2	-	8.4	22.0	-	24.6	7.9	-	7.7	3890	4900
Dechl 100 B	20/0	5	5	5	-	-	8.4	-	-	24.6	-	-	7.4	-	4900
Dechl 100 C	20/0	5	5	5	-	-	8.4	-	-	24.6	-	-	7.3	-	4890
Dechl 100 D	20/0	5	5	5	-	-	8.4	-	-	24.6	-	-	7.4	-	4600

[A] Temperatures of room and test incubator were continuously recorded on a strip chart recorder.
Room Temperature range for the test period was 22.5-25.0 °C.
Incubator #3 temperature range for the test period was 25.0-25.5°C.

Organism: ***Cyprinella leedsi*** Life stage: 12 days

	Sample/Diluent	SURVIVAL # Alive			pH			Temperature[B]			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	8.0	8.4	8.5	23.4	24.2	26.7	8.0	7.9	7.5	275	310
Control B	0/500	5	5	5	8.0	8.4	8.5	23.4	24.2	24.9	7.9	7.9	7.9	270	300
Control C	0/500	5	5	5	8.0	8.4	8.5	23.5	24.3	24.9	7.9	7.9	7.9	270	300
Control D	0/500	5	5	5	8.0	8.4	8.5	23.5	24.0	24.6	7.9	7.8	7.7	270	320
Dechl Ctrl A	0/500	5	5	5	8.1	8.5	8.5	24.2	24.1	24.9	8.0	7.4	8.0	265	290
Dechl Ctrl B	0/500	5	5	5	8.1	8.5	8.5	24.4	23.9	24.8	8.0	7.4	7.9	265	310
Dechl Ctrl C	0/500	5	5	5	8.1	8.5	8.5	24.6	24.0	25.5	8.0	7.7	7.8	265	290
Dechl Ctrl D	0/500	5	5	5	8.1	8.5	8.5	24.6	24.0	23.7	8.0	7.8	8.0	265	320
Dechl 100 A	500/0	5	5	5	7.0	8.0	8.2	23.4	23.9	23.9	7.8	7.5	7.9	3950	4560
Dechl 100 B	500/0	5	5	4	7.0	8.0	8.2	24.2	24.0	24.7	7.8	7.5	7.8	4100	4510
Dechl 100 C	500/0	5	5	5	7.0	8.0	8.2	23.1	24.2	24.6	7.8	7.6	7.7	3760	4300
Dechl 100 D	500/0	5	5	5	7.0	8.0	8.2	23.0	24.4	26.2	7.7	7.7	7.0	3800	4500

[B] Temperatures of room and test incubator were continuously recorded on a strip chart recorder.
Room Temperature range for the test period was 22.5-25.0°C.
Incubator #3 temperature range for the test period was 25.0-25.5°C.

LIMS	
Job number:	TLH-2002-03-05-46
Sample number:	580622

Data Transcription Verification	
date:	4/12/02
by:	Joshua Ayres, Gary Hardee

Total Residual CL2	mg/L	Method
Field:	-	-
Lab:	0.11	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:	11.00	0.660

Alk & Hardness	Alkalinity (mg/L)	Hardness (mg/L)
Control water (fish):	144	146
Control water (water flea):	76	76
100% Sample:	174	-

Salinity [C]	ppt
Control waters:	<1
100% sample:	~3

[C] Salinity based on conductivity and temperature.

Table 2. Results of chemical analyses on the effluent from City of Hollywood Wastewater Treatment Plant sampled on March 4, 2002.

Metals

Calcium	94.7	mg/L
Copper	5.4	µg/L
Iron	560	µg/L
Lead	0.53	µg/L [I]
Magnesium	77.9	mg/L
Silver	0.39	µg/L
Zinc	21.5	µg/L

Nutrients

Ammonia	9.9	mg N/L
Nitrite+Nitrate	1.9	mg N/L
Total Kjeldahl Nitrogen	13	mg N/L
Orthophosphate	1.4	mg P/L
Total Phosphorus	1.3	mg P/L

Pesticides and Herbicides

Atrazine	0.65	µg/L

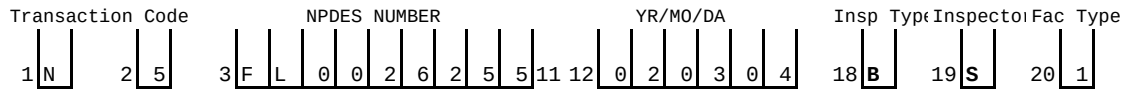
Base, Neutral, & Acid Extractable Organics

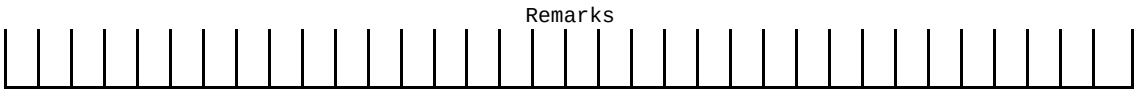
None detected

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

The Bioassay of City of Hollywood Wastewater Treatment Plant

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

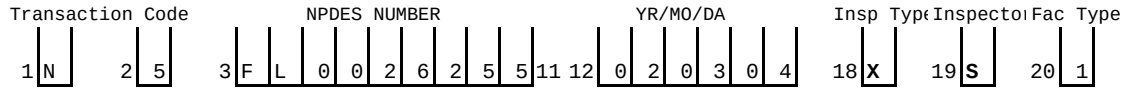


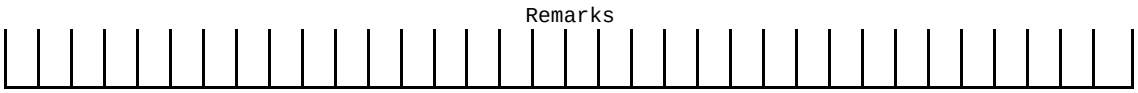


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The Priority Pollutants Analysis for Bioassay of City of Hollywood Wastewater Treatment Plant effluent sampled on March 4, 2002, NPDES #FL0026255.

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





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