

Bioassays of the City of

Cedar Key Wastewater Treatment Plant

Cedar Key, Levy County, Florida

NPDES #FL0031216

Sampled 8/10/97

October 1997

Biology Section

Division of Administrative & Technical Services

Comprehensive Quality Assurance Plan #870346G

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Cedar Key Wastewater Treatment Plant

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Biology Section
Bureau of Laboratories
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Introduction

City of Cedar Key WWTP, 3rd Street and C Street, Cedar Key, Levy County, Florida, NPDES #FL0031216, tests performed on 12 to 14 August, 1997.

This extended-aeration wastewater treatment plant with tertiary filters has a design flow of 0.166 MGD. Treatment includes nitrogen removal, aeration, clarification, filtration, chlorination for disinfection, and dechlorination, if necessary, with sulfur dioxide gas. Effluent is discharged via a 50,000 ft^2 non-public-access drip irrigation system with an outfall to Back Bayou then to the Gulf of Mexico. Effluent receives additional filtration at the drip irrigation site prior to application (facility summary prepared by Heather Hayek and provided by Tim McKelvey, 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. Two additional 48-hour screening bioassays were performed on aliquots of the sample that were dechlorinated in the laboratory by the addition of 5.6 mL of 0.025N sodium thiosulfate per liter of sample. The test species used for these bioassays were the water flea, *Ceriodaphnia dubia*, and the bannerfin shiner, *Cyprinella leedsi*. The whole effluent tests showed toxicity, producing 100% mortality in both test species within 20 minutes of test initiation. The dechlorinated sample tests did not show toxicity (Table 1).

Total residual chlorine of the 100% whole effluent sample was 4.5 mg/L in the field and 5 mg/L in the laboratory. Total residual chlorine (TRC) of the dechlorinated aliquot of sample was <0.03 mg/L. Total ammonia was not detected in the sample. Further chemical analyses were performed on the sample and several metals were identified (Table 2).

Conclusion

The sample of effluent collected from this facility on August 11, 1997, showed toxicity to both test species. We attribute the toxicity to the total residual chlorine in the sample.

Table 1. Data recorded during the 48-hour acute screening bioassays of a sample of effluent from the City of Cedar Key WWTP, Cedar Key, Levy County, Florida, NPDES# FL0031216, performed on 12 to 14 August, 1997.

Facility:	City of Cedae Key WWTP			NPDES #	FL0031216	Facility Type:	Wastewater
Location:	3rd Street and C Street, Cedar Key			Contact/District:	Tim McKelvey/Northeast		Treatment Plant
County:	Levy			Test type:	static acute screen		
Sample Collection Date:	8/11/97	Time:	1145	# tests:	2	Receiving Water:	Drip Irrigation System
Test Beginning Date:	8/12/97	Time:	1410	Chlorination Type:	Chlorinated		and an outfall to Back Bayou, Gulf of Mexico
Test Ending Date:	8/14/97	Time:	1400				Page 1 of 1

Total Residual CL2	mg/L	Method
Field:	4.50	-
Lab: 100% sample:	5.00	DR-100
dechlorinated sample:	<0.03	DR-100

Ammonia	Total (mg/L)	Unionized (mg/L)
Control Water (fish):	<0.017	<0.017
Control Water (20% DMW) (cladocerans):	<0.017	<0.017
100% Sample:	<0.017	<0.017

Alk & Hardness	Alkalinity (mg/L)	Hardness (mg/L)
Control Water (fish):	125	130
Control Water (20% DMW) (cladocerans):	65	85
100% Sample:	170	320

Salinity	(ppt)
Control Water (fish):	0
Control Water (20% DMW) (cladocerans):	0
100% Sample:	1.2[E]

[E] Salinity determined from conductivity and temperature measurement.

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

	Sample/Diluent	SURVIVAL # Alive			pH			Temperature[B]			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	0/20	5	5	5	8.2	-	8.2	24.3	-	25.9	7.6	-	7.5	0.18	0.23
Control B	0/20	5	5	5	-	-	8.3	-	-	26.2	-	-	7.5	-	0.23
Control C	0/20	5	5	5	-	-	8.3	-	-	27.0	-	-	7.3	-	0.22
Control D	0/20	5	5	5	-	-	8.3	-	-	27.5	-	-	7.3	-	0.21
100% A	20/0	5	0[A]	-	7.3	-	-	25.3	-	-	6.7	-	-	2.26	-
100% B	20/0	5	0[A]	-	-	-	-	-	-	-	-	-	-	-	-
100% C	20/0	5	0[A]	-	-	-	-	-	-	-	-	-	-	-	-
100% D	20/0	5	0[A]	-	-	-	-	-	-	-	-	-	-	-	-
Decl100% A	20/0	5	5	5	7.1	-	8.4	25.0	-	26.0	7.0	-	7.1	2.20	2.55
Decl100% B	20/0	5	5	5	-	-	8.5	-	-	26.0	-	-	7.2	-	2.75
Decl100% C	20/0	5	5	5	-	-	8.5	-	-	26.2	-	-	7.2	-	2.59
Decl100% D	20/0	5	5	5	-	-	8.5	-	-	26.6	-	-	7.2	-	2.41

Decl = Dechlorinated sample

[A] All organisms dead at 0 hour + 20 minutes.

[B] Temperature of test incubator was continously recorded on a strip chart recorder. Incubator temperature range for the test period was 25.5-27.0°C.

Organism: ***Cyprinella leedsi*** Age: 12 days

	Sample/Diluent	SURVIVAL # Alive			pH			Temperature[D]			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	7.9	8.3	8.3	25.5	24.6	25.4	7.4	7.5	7.5	0.26	0.26
Control B	0/500	5	5	5	7.9	8.3	8.3	25.4	25.4	25.6	7.4	7.5	7.5	0.26	0.27
Control C	0/500	5	5	5	7.9	8.3	8.3	25.4	25.6	24.7	7.5	7.6	7.5	0.26	0.27
Control D	0/500	5	5	5	7.9	8.3	8.4	25.4	25.2	24.8	7.6	7.6	7.5	0.27	0.27
100% A	500/0	5	0[C]	-	6.9	-	-	23.7	-	-	6.5	-	-	2.23	-
100% B	500/0	5	0[C]	-	7.0	-	-	23.5	-	-	6.5	-	-	2.21	-
100% C	500/0	5	0[C]	-	7.0	-	-	23.5	-	-	6.5	-	-	2.21	-
100% D	500/0	5	0[C]	-	7.0	-	-	23.2	-	-	6.5	-	-	2.20	-
Decl100% A	500/0	5	5	5	7.1	7.9	8.2	23.9	24.8	24.2	6.8	7.4	7.4	2.24	2.27
Decl100% B	500/0	5	5	5	7.1	8.0	8.1	23.5	26.5	24.6	6.8	7.2	7.2	2.23	2.35
Decl100% C	500/0	5	5	5	7.1	8.0	8.1	23.5	25.1	24.8	6.8	7.2	7.0	2.23	2.37
Decl100% D	500/0	5	5	5	7.1	7.9	8.2	23.5	26.2	25.8	6.9	7.2	7.2	2.24	2.43

Decl = Dechlorinated sample

[C] All organisms dead at 0 hour + 20 minutes.

[D] Temperature of test incubator was continously recorded on a strip chart recorder. Incubator temperature range for the test period was 25.5-27.0°C.

Table 2. Results of chemical analyses on the effluent from the City of Cedar Key Wastewater Treatment Plant sampled on August 11, 1997.

Metals

Cadmium	0.08	mg/L[I]
Calcium	70.3	mg/L[A]
Iron	13	µg/L[I]
Lead	0.73	µg/L[I]
Magnesium	32.3	mg/L[A]
Sodium	307	µg/L[A]
Zinc	34	µg/L[I]

Pesticides and Herbicides

none detected

Base, Neutral, & Acid Extractable Organics

none detected

A Value reported is the mean of two or more determinations.

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

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: City of Cedar Key
County: Levy
Contact / District: Tim McKelvey / NED
NPDES Permit #: FL0031216
LIMS Sample #: 185620 LIMS Job #: 97-AQ6-12-07
sample log: 8/20/97 KR

Sample Collection: Date 8/11/97 Time 11:45
Test Beginning: Date 8/12/97 Time 1430
Test Ending: Date 8/14/97 Time 1400
Organism Batch #: 60 Diluent Batch #: Well
Organism Age: 12 days
Test Organism: Cyprinella (seeds)

Test Type: (Screening) / Definitive
(Static) / Static Renewal / Flow-through
Temperature range: room N/A
incubator 25.5-27.0°C
Test Number: 2 of 2

Remarks: D = dead, M = missing
Sample dechlorinated with 5.6 mL of 0.025 N Sodium thiosulfate per liter of sample for the dechlorinated test. Dechlorinated aliquot total Ammonia was < 0.017 mg/L.
All Test organisms dead in 100% sample within 30 minutes of loading.

Instrument Calibrations:	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	27.0 @ 27.1	8.1 @ 25.7 °C	106.2 @ 10.0 1018 @ 1004 @ 25.7 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	24.4 @ 24.5	8.1 @ 25.8 °C	1009 @ 1005 @ 25.5 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	24.4 @ 24.5	8.0 @ 26.0 °C	1020 @ 1015 @ 25.4 °C

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 h	pH 0 hr	pH 24 h	pH 48 h	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 h	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 h	UNCORRECTED Cond. (mmhos/cm) 0 hr	UNCORRECTED Cond. (mmhos/cm) 24 h	UNCORRECTED Cond. (mmhos/cm) 48 h
Ctr A	01	5	5	5	7.9	8.3	8.3	25.5	24.6	25.4	7.4	7.5	7.5	266A	0.26	0.26
Ctr B	02	5	5	5	7.9	8.3	8.3	25.4	25.4	25.6	7.4	7.5	7.5	266A	0.27	0.27
Ctr C	03	5	5	5	7.9	8.3	8.3	25.4	25.6	24.7	7.5	7.6	7.5	026	0.27	0.27
Ctr D	04	5	5	5	7.9	8.3	8.4	25.4	25.2	24.8	7.6	7.6	7.5	0.27	0.27	0.27
100% dCl A	012	5	5	5	7.1	7.9	8.2	23.9	24.8	24.2	6.8	7.4	7.4	2.24	2.30	2.27
100% dCl B	011	5	5	5	7.1	8.0	8.1	23.5	26.5	24.6	6.8	7.2	7.2	2.23	2.40	2.35
100% dCl C	010	5	5	5	7.1	8.0	8.1	23.5	25.1	24.8	6.8	7.2	7.0	2.23	2.34	2.37
100% dCl D	09	5	5	5	7.1	7.9	8.2	23.5	26.2	25.8	6.9	7.2	7.2	2.24	2.38	2.43
100% A	05	5	0		6.9			23.7			6.5			2.25		
100% B	06	5	0		7.0			23.5			6.5			2.21		
100% C	07	5	0		7.0			23.5			6.5			2.21		
100% D	08	5	0		7.0			23.2			6.5			2.20		
		8 All Sealed											CHA	0.260		
		0 hr + 30 minutes											CHB	0.260		
		mf 8/14/97														
Measured/Loaded by:		KJ	ND	ND	KJ	ND	DW	KJ	ND	DW	KJ	ND	DW	KJ	ND	DW
Recorded by:		MF	ND	ND	ND	MF	ND	ND	MF	ND	ND	MF	ND	ND	MF	ND

Investigators' Signatures

Water Quality Parameters (Salt Water / Well Water / 20% Min Water)

	Sample	Method	Measured by
Field Total Residual Cl2 (mg/L):	4.5	—	Tim McKelvey
Lab Total Residual Cl2 (mg/L): < 0.03	100% 5.0 / dil 20.63	DR-100	KR
Alkalinity (mg/L as $CaCO_3$): 125	170	Hach ~~320~~	ND
Hardness (mg/L as $CaCO_3$): 130	320	Hach	ND
Total ammonia (mg/L as N): < 0.017	< 0.017	Orion	MF

Parameter entries verified by MF
A Written in µmhos, should be in mmhos 8-12-97 ND
C Wrote in wrong place MF 8/15/97

Ammonia Meter #98136 Ammonia Meter Slope: -54.6 Ammonia Blank: 20.017 Control Salinity: 0 ppt Sample Salinity: 12 ppt

reviewer

form updated 4/01/96

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: City of Cedar Key
County: Levy
Contact / District: Tim McKelvey / NED
NPDES Permit #: FL0031216
LIMS Sample #: 185620 LIMS Job #: 97-AUG-12-07
sample log: 8/20/97 KR

Sample Collection: Date 8/11/97 Time 11:45
Test Beginning: Date 8/12/97 Time 1410
Test Ending: Date 8/14/97 Time 1400
Organism Batch #: 31 Diluent Batch #: 31
Organism Age: <24hr
Test Organism: Ceriodaphnia dubia

Test Type: (Screening) / Definitive
(Static) / Static Renewal / Flow-through
Temperature range: room NA
incubator 25.5-27.0°C
Test Number: 1 of 2
Remarks: D = dead, M = missing
Sample dechlorinated with 5.6mL of 0.25N Sodium thiosulfate per liter of sample for dechlorinated test.. Dechlorinated aliquot total Ammonia was <0.017 mg/L
ALL TOST organisms dead in 100% sample within 20minutes of loading.

Instrument Calibrations:	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	27.0 @ 27.1	8.1 @ 25.7 °C	106.2 @ 101.0 1018 @ 1004 @ 25.7 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	24.4 @ 24.5 24.4 B	8.1 @ 25.8 °C	104.3 @ 101.0 1009 @ 1005 @ 25.5 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	24.3 @ 24.5	8.0 @ 26.0 °C	104.0 @ 101.0 1020 @ 1015 @ 25.4 °C

Basic Care Tim was in Cedar Key 8-14-97 ND

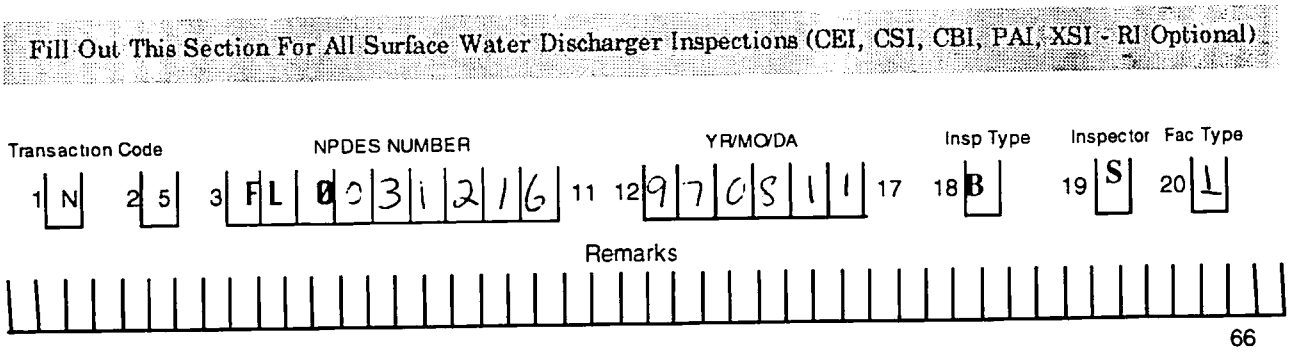
Conc.	Chamber #	Number Live 0 hr	24 h	48 h	pH 0 hr	24 h	48 h	Temperature (°C) 0 hr	24 h	48 h	D.O. (mg/L) 0 hr	24 h	48 h	UNCORRECTED Cond. (µmhos/cm) 0 hr	24 h	48 h
CTL	A	5	5	5	8.2		8.2	24.3		25.9	7.6		7.5	0.18		0.23
CTL	B	5	5	5			8.3			26.2			7.5			0.23
CTL	C	5	5	5			8.3			27.0			7.3			0.22
CTL	D	5	5	5			8.3			27.5			7.3			0.21
100% deCl	A	5	5	5	7.3		8.4	25.0		26.0	7.0		7.1	2.20		2.55
100% deCl	B	5	5	5			8.5			26.0			7.2			2.75
100% deCl	C	5	5	5			8.5			26.2			7.2			2.59
100% deCl	D	5	5	5			8.5			26.6			7.2			2.41
100%	A	5	0 A		7.1			25.3			6.7			2.26		
100%	B	5	0 A													
100%	C	5	0 A													
100%	D	5	0 A													
		A all dead at 0hr + 20minutes MF 8/12/97														
Measured/Loaded by:		ND	MF	ND	KS		DW	KS		DW	KS			KS		DW
Recorded by:		MF	MF	ND	ND		ND	ND		ND	ND			ND		ND

Investigators' Signatures
Marshall Faircloth
Ken Johnson
Kellie Kalstrom
Ann Wolfe

Water Quality Parameters	Salt Water Well Water	20% Min Water (minimum entries verified by MF)	Sample	Method	Measured by
Field Total Residual Cl2 (mg/L):			4.5 mg/L dechlorinated		Tim McKelvey
Lab Total Residual Cl2 (mg/L):		<0.03	5.0 / <0.03	DR 100	KR
Alkalinity (mg/L as $CaCO_3$):		65	170	Hach MF B 320	ND
Hardness (mg/L as $CaCO_3$):		85	320	Hach	ND
Total ammonia (mg/L as N):		<0.017	<0.017	Orion	MF

Ammonia Meter #98136 Ammonia Meter Slope: -54.6 Ammonia Blank: <0.017 Control Salinity: 0 ppt
B. wrote in wrong space MF 8/14/97 Sample Salinity: 1.2 ppt

The Bioassay of the City of Cedar Key WWTP effluent sampled on August 11, 1997, NPDES #FL0031216.



The Priority Pollutants Analysis for the Bioassay of the City of Cedar Key WWTP effluent sampled on August 11, 1997, NPDES #FL0031216.

