Bioassays of

Cross City #2 Wastewater Treatment Facility

Cross City, Dixie County, Florida

NPDES #FL0027791

Sampled 8/11/96

November 1996

Biology Section

Division of Administrative and Technical Services

Comprehensive Quality Assurance Plan #870346G

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Introduction

Cross City #2 WWTF, Hill Street and Boundary Street, Cross City, Dixie County, Florida, NPDES #FL0027791, tests performed on 12 to 14 August, 1996.

This activated sludge wastewater treatment facility has a design flow of 0.250 MGD. Wastewater treatment includes secondary biological treatment, clarification, chlorination for disinfection, and dechlorination with sulfur dioxide gas. Effluent is discharged to California Swamp via Belly Deep Creek and an unnamed ditch. This facility shares a common outfall with the Cross City #1 WWTP (facility summary provided by Jon Dinges, 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 species used for these tests were the waterflea, *Ceriodaphnia dubia*, and the bannerfin shiner, *Cyprinella leedsi*. The test results showed the sample to be acutely toxic to both test species, producing 100% mortality in the *Ceriodaphnia dubia* test and 95% mortality in the *Cyprinella leedsi* test in 24 hours (Table 1).

The level of total residual chlorine in the sample was <0.03 mg/L in the laboratory and 0.83 mg/L in the field. Total ammonia was not detected in the sample. Further chemical analyses were performed on the sample and several metals and pesticides were identified (Table 2). The copper (34 µg/L) and silver (0.69 µg/L) concentrations exceeded their respective State of Florida Class III surface water criteria of ≤19.5 µg/L for copper (hardness of 180 ppm as $CaCo_3$) and of less than 0.07 µg/L for silver (FAC 62-302.530). Copper concentrations as low as 17 µg/L have produced LC_{50}'s in tests performed with *Ceriodaphnia dubia* (USEPA AQUIRE toxicity database). The detected constituents of the sample were not known to be in sufficient quantity to cause the observed mortality in the *Cyprinella leedsi* test; therefore, a cause of mortality was not assigned in this test.

Conclusion

The sample of effluent collected from this facility on August 12, 1996 was acutely toxic to both the *Ceriodaphnia dubia* and the *Cyprinella leedsi* test organisms. We attribute the observed toxicity to both the copper and to unknown constituents of the sample.

Table 1. Data recorded during the 48-hour acute toxicity screening bioassays of a sample of effluent from the Cross City #2 WWTF, Cross City, Dixie County, Florida, NPDES#FL0027791, performed on 12 to 14 August, 1996.

Facility:	**Cross City #2 WWTF**			**NPDES #**	**FL0027791**	Facility Type: **WWTF**	
Location:	Hill and Boundary Streets			Contact/District:	T. McKelvey/Northeast		
County:	Dixie			Test type:	static acute screen		
Sample Collection Date:	8/12/96	Time:	1600	# tests:	2	Receiving Water:	Belly Deep Creek to a
Test Beginning Date:	8/12/96	Time:	1400	Chlorination Type:	Sample collected		ditch to California Swamp
Test Ending Date:	8/14/96	Time:	1400		after dechlorination	**Page 1 of 1**	

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

	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	24 hour
Control A	0/20	5	5	-	8.2	8.3	-	23.7	24.8	-	7.9	7.9	-	175	190
Control B	0/20	5	5	-	-	8.3	-	-	24.9	-	-	8.0	-	-	185
Control C	0/20	5	5	-	-	8.3	-	-	24.9	-	-	8.0	-	-	185
Control D	0/20	5	5	-	-	8.3	-	-	24.9	-	-	7.9	-	-	185
100% A	20/0	5	0	-	7.9	8.8	-	23.7	24.9	-	7.9	8.0	-	660	650
100% B	20/0	5	0	-	-	8.8	-	-	25.0	-	-	8.0	-	-	675
100% C	20/0	5	0	-	-	8.8	-	-	25.0	-	-	8.0	-	-	680
100% D	20/0	5	0	-	-	8.8	-	-	25.0	-	-	7.9	-	-	680

[A] Temperature of test incubator was continously recorded on a strip chart recorder. Incubator temperature range for the test period was 24.4-25.0°C.

Organism: ***Cyprinella leedsi*** Age: 12 to 14 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	23.7	24.3	23.9	7.9	7.7	7.9	245	250
Control B	0/500	5	5	5	8.0	8.4	8.5	23.6	24.2	23.8	7.9	7.8	7.9	245	250
Control C	0/500	5	5	5	8.0	8.4	8.4	23.6	24.2	23.8	8.0	7.9	7.9	245	250
Control D	0/500	5	5	5	8.0	8.4	8.5	23.6	24.2	23.8	8.0	7.9	7.9	250	250
100% A	500/0	5	0	0	7.7	8.3	-	23.6	24.2	-	7.3	7.8	-	675	685[C]
100% B	500/0	5	0	0	7.7	8.3	-	23.6	24.2	-	7.3	7.8	-	675	685[C]
100% C	500/0	5	1	1	7.7	8.3	8.6	23.5	24.1	23.8	7.3	7.9	7.6	675	680
100% D	500/0	5	0	0	7.7	8.3	-	23.6	24.2	-	7.3	7.9	-	675	685[C]

[B] Temperature of test room was continously recorded on a strip chart recorder. [C] 24-hour conductivity measurements. Room temperature range for the test period was 24.0-25.0°C.

Total Residual CL2	mg/L	Method
Field:	0.83	-
Lab:	<0.03	DR-100

Ammonia	Total (mg/L)	Unionized (mg/L)
Control Water (fish):	< 0.017	0.00
20% Dilute Mineral Water (cladocerans):	< 0.017	0.00
100% Sample:	<0.017	0.00

Alk & Hardness	Alkalinity (mg/L)	Hardness (mg/L)
Control Water (fish):	130	130
20% Dilute Mineral Water (cladocerans):	75	90
100% Sample:	225	180

Salinity	(ppt)
Control Water:	0
100% Sample:	0

Table 2. Results of chemical analyses on the effluent from the Cross City #2 WWTF sampled on August 12, 1996.

Metals

Aluminum	225	µg/L
Cadmium	0.1	µg/L[I]
Calcium	61.6	mg/L
Copper	34	µg/L
Iron	130	µg/L
Magnesium	5.91	mg/L
Silver	0.69	µg/L[A]
Zinc	41	µg/L

Pesticides and Herbicides

Chlorpyrifos ethyl	0.027	µg/L[T]
Diazinon	0.042	µg/L[T]

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.
[T] Value reported is less than the criterion of detection.

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Cross City #2
County: Dixie
Contact / District: Tim McKelvey / Northeast
NPDES Permit #: FL0027791
LIMS Sample #: 148548 LIMS Job #: 96-AUG-13-04
sample log 8-19-96
Test Type: Screening / Definitive
Static / Static Renewal / Flow-through
Test Number: 1 of 2
Remarks:

Sample Collection: Date 8/12/96 Time 1600
Test Beginning: Date 8-13-96 Time 1400
Test Ending: Date 8/14/96 Time 1400
Organism Batch #: 34 Diluent Batch #: 36
Organism Age: <24hours
Test Organism: Ceriodaphnia dubia

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	24.1 @ 24.1	8.3 @ 24.5 °C	111.9 @ 101.5 1000 @ 1006 @ 24.7 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	24.0 @ 24.0	8.2 @ 25.1 °C	110.3 @ 101.5 MF 993 @ 1006 @ 24.7 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	23.6 @ 23.6	8.3 @ 24.9 °C	114 @ 101.5 1012 @ 1006 @ 24.9 °C

only 2 reps 8-14-96

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. (mmhos/cm) Cond. (µmhos/cm) 0 hr	24 h	48 h
Ctr	A	5	5		8.2	8.3		23.7	24.8		7.9	7.9		175	190	
Ctr	B	5	5			8.3			24.9			8.0			185	
Ctr	C	5	5			8.3			24.9			8.0			185	
Ctr	D	5	5			8.3			24.9			7.9			185	
100%	A	5	0		7.9	8.8		23.7	24.9		7.9	8.0		660	650	
100%	B	5	0			8.8			25.0			8.0			675	
100%	C	5	0			8.8			25.0			8.0			680	
100%	D	5	0			8.8			25.0			7.9			680	
Measured/Loaded by:		MF	MF		DW	MF		DW	MF		DW	MF		DW	MF	
Recorded by:		MF	MF		DN	DN		DN	DN		DN	DN		DN	DN	

Investigators' Signatures

Dennis Nicholson
Marshal Faircloth
Lisa Mendel

reviewer

form updated 4/01/96

Water Quality Parameters

	Salt Water / Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2 (mg/L):			0.33	—	Jon Dinges
Lab Total Residual Cl2 (mg/L):	—	0.03	<0.03	DR100	LM
Alkalinity (mg/L as $CaCO_3$):	—	75	225	Hach	LM
Hardness (mg/L as $CaCO_3$):	—	90	180	Hach	LM
Total ammonia (mg/L as N):	—	<.017	<.017	Orion	LM/DN

Ammonia Meter #98136 Ammonia Meter Slope: -53.8 Ammonia Blank: <.017 Control Salinity: 0 ppt Sample Salinity: 0 ppt

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Cross City #2
County: Dixie
Contact / District: Tim McKelvey / Northeast
NPDES Permit #: FL0027791
LIMS Sample #: 148548 LIMS Job #: 96-AUG-13-04
sample log 8-14-96
Test Type: Screening | Definitive
Static | Static Renewal | Flow-through
Test Number: 2 of 2
Remarks:

Sample Collection: Date 8/12/96 Time 1600
Test Beginning: Date 8-13-96 Time 1440
Test Ending: Date 8/15/96 Time 1455
Organism Batch #: 59+60 Diluent Batch #: well H2O
Organism Age: 12-40 14 days
Test Organism: Cyprinella leedsi

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	24.1 @ 24.1	8.3 @ 24.5 °C	111.9 @ 101.5 1000 @ 1006 @ 24.7 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	24.0 @ 24.0	8.2 @ 25.1 °C	110.3 @ 101.5 998 @ 1006 @ 24.7 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	23.6 @ 23.6	8.3 @ 24.9 °C	114 @ 101.5 1012 @ 1006 @ 24.9 °C

		Number Live			pH			Temperature (°C)			D.O. (mg/L)			UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm)		
Conc.	Chamber #	0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h
Ctr A	763	5	5	5	8.0	8.4	8.5	23.7	24.3	23.9	7.9	7.7	7.9	245	255	250
Ctr B	601	5	5	5	8.0	8.4	8.5	23.6	24.2	23.8	7.9	7.8	7.9	245	250	250
Ctr C	505	5	5	5	8.0	8.4	8.4	23.6	24.2	23.8	8.0	7.9	7.9	245	250	250
Ctr D	701	5	5	5	8.0	8.4	8.5	23.6	24.2	23.8	8.0	7.9	7.9	250	255	250
100% A	118	5	0	0	7.7	8.3	–	23.6	24.2	–	7.3	7.8	–	675	685	–
100% B	308	5	0	0	7.7	8.3	–	23.6	24.2	–	7.3	7.8	–	675	685	–
100% C	351	5	1	1	7.7	8.3	8.6	23.5	24.1	23.8	7.3	7.9	7.6	675	685	680
100% D	476	5	0	0	7.7	8.3	–	23.6	24.2	–	7.3	7.9	–	675	685	–
Measured/Loaded by:		DW	DW	MF	DW	MF	MF	DW	MF	MF	DW	MF	MF	DW	MF	MF
Recorded by:		MF	DN	MF	DN	DN	MF	DN	DN	DW	DN	DN	DW	DN	DN	DW

Investigators' Signatures
David Whitt
Marshall Faircloth
Dejon Nicholson
Lyn Mould

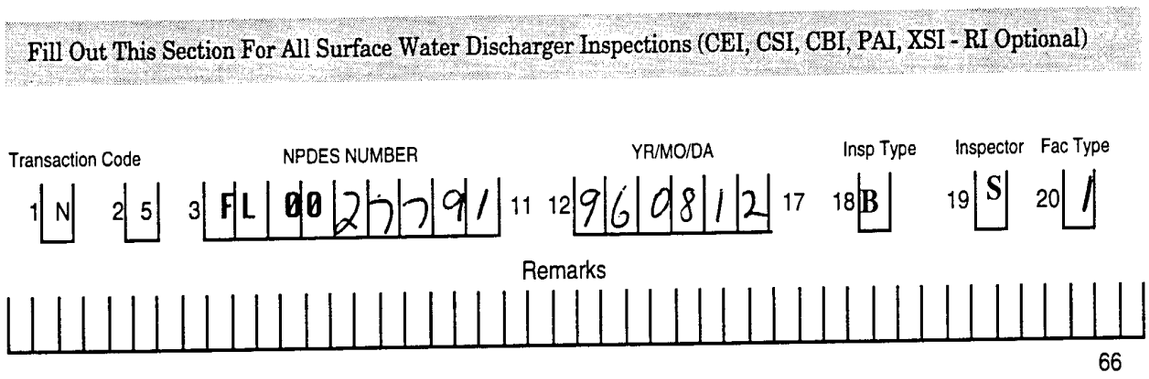
reviewer

form updated 4/01/96

Water Quality Parameters	Salt Water: Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2 (mg/L):			0.83	—	Jon Bivings
Lab Total Residual Cl2 (mg/L):	<0.03	—	<0.03	DR 100	LM
Alkalinity (mg/L as $CaCO_3$):	130	—	225	Hach	LM
Hardness (mg/L as $CaCO_3$):	130	—	180	Hach	LM
Total ammonia (mg/L as N):	<.017	—	<.017	Orion	LM/DN

Ammonia Meter #98136 Ammonia Meter Slope: -53.8 Ammonia Blank: <.017 Control Salinity: 0 ppt Sample Salinity: 0 ppt

The Bioassay of the Cross City #2 WWTF effluent sampled on August 12, 1996, NPDES #FL0027791.



The Priority Pollutants Analysis for the Bioassay of the Cross City #2 WWTF effluent sampled on August 12, 1996, NPDES #FL0027791.

