

Bioassays of

Buckman Street Wastewater Treatment Plant

Jacksonville, Duval County, Florida

NPDES #FL0026000

Sampled 11/18/96

March 1997

Biology Section

Division of Administrative & Technical Services

Comprehensive Quality Assurance Plan #870346G

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Buckman Street Wastewater Treatment Plant

Jacksonville, Duval County, Florida

NPDES #FL0026000

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Bureau of Laboratories
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Introduction

Buckman Street WWTP, 2221 Buckman Street, Jacksonville, Duval County, Florida, NPDES #FL0026000, tests performed on 19 to 21 November, 1996.

This wastewater treatment facility has a design flow of 52.6 MGD. Influent is from both domestic and industrial sources. Wastewater is treated by mechanical screening, grit removal, primary sedimentation, aeration, activated sludge biological treatment, secondary clarification, chlorination for disinfection, and dechlorination with sulfur dioxide gas prior to being discharged into the St. Johns River (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. Two additional 48-hour screening bioassays were performed on aliquots of the sample that were dechlorinated in the laboratory with 0.32 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 test results showed the sample to be toxic to the *Ceriodaphnia dubia,* producing 100% mortality in both the 100% whole effluent and the dechlorinated aliquot by 48-hours. No mortality was observed in the *Cyprinella leedsi* tests at 48-hours (Table 1).

The total residual chlorine (TRC) of the sample was 0.075 mg/L in the laboratory. The TRC of the dechlorinated aliquot was <0.03 mg/L. 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 total and unionized ammonia concentrations were 4.24 mg/L and 0.083 mg/L, respectively. Further chemical analyses were performed on the sample and several metals were identified (Table 2). The silver (0.40 µg/L) and zinc (400 µg/L) concentrations exceeded their respective State of Florida Class III freshwater surface water criterion for silver (≤0.07 µg/L) and zinc (242 µg/L) (FAC 62-302.530). In tests performed with *Ceriodaphnia dubia*, zinc concentrations as low as 95 µg/L, at hardnesses similar to the hardness of this sample, have produced 48-hour LC_{50}'s (USEPA *Aquire Toxicity Database*. January, 1997).

Conclusion

The sample of effluent collected from this facility on November 18, 1996, showed toxicity to *Ceriodaphnia dubia* but not to *Cyprinella leedsi*. We attribute the toxicity to the zinc and/or unknown constituents of the sample since the dechlorinated aliquot also produced 100% mortality. No Diazinon was detected with a quantitation limit of 0.1 µg/L; therefore, Diazinon is not a suspected source of toxicity, despite the history of Diazinon toxicity at this plant.

Table 1. Data recorded during the 48-hour acute screening bioassays of a sample of effluent from the Buckman Street WWTP, Jacksonville, Duval County, Florida, NPDES# FL0026000, performed on 19 to 21 November, 1996.

Facility:	**Buckman Street WWTP**			**NPDES #**	**FL0026000**	Facility Type:	**Wastewater Treatment Plant**
Location:	Buckman Street, Jacksonville			Contact/District:	Tim McKelvey/Northeast		
County:	Duval			Test type:	static acute screen		
Sample Collection Date:	11/18/96	Time:	1345	# tests:	2	Receiving Water:	St. Johns River
Test Beginning Date:	11/19/96	Time:	1412	Chlorination Type:	Chlorinated		
Test Ending Date:	11/21/96	Time:	1415	Sample collected after plant dechlorination unit.			**Page 1 of 1**

Total Residual CL2	mg/L	Method
Field:	-	-
Lab:	0.075	DR-100
Lab: Dechlorinated Sample:	<0.03	DR-100

Ammonia	Total (mg/L)	Unionized (mg/L)
Control Water (fish):	<0.017	<0.017
20% Dilute Mineral Water (cladocerans):	<0.017	<0.017
100% Sample:	4.24	0.043

Alk & Hardness	Alkalinity (mg/L)	Hardness (mg/L)
Control Water (fish):	125	130
20% Dilute Mineral Water (cladocerans):	70	85
100% Sample:	155	265
100% Dechlorinated Sample	165	275

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

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	48 hour
Control A	0/20	5	5	5	8.1	-	8.2	23.8	-	24.8	7.8	-	7.9	165	215
Control B	0/20	5	5	5	-	-	8.2	-	-	24.8	-	-	7.9	-	185
Control C	0/20	5	5	5	-	-	8.2	-	-	24.8	-	-	8.0	-	190
Control D	0/20	5	5	5	-	-	8.2	-	-	24.7	-	-	7.9	-	190
100% A	20/0	5	2	0	7.5	-	8.4	23.8	-	25.1	7.8	-	7.9	1070	1220
100% B	20/0	5	2	0	-	-	8.4	-	-	25.4	-	-	7.9	-	1215
100% C	20/0	5	1	0	-	-	8.4	-	-	25.4	-	-	7.8	-	1230
100% D	20/0	5	0	0	-	-	8.4	-	-	25.1	-	-	7.8	-	1205
Decl100% A	20/0	5	1	0	7.4	-	8.5	23.8	-	25.7	7.6	-	7.8	1095	1250
Decl100% B	20/0	5	0	0	-	-	8.5	-	-	25.7	-	-	8.0	-	1260
Decl100% C	20/0	5	0	0	-	-	8.5	-	-	25.7	-	-	7.8	-	1220
Decl100% D	20/0	5	1	0	-	-	8.5	-	-	25.6	-	-	7.8	-	1225

Decl = Dechlorinated sample

[A] Temperature of test incubator was continously recorded on a strip chart recorder. Incubator temperature range for the test period was 24.4-25.6°C.

Organism: ***Cyprinella leedsi*** Age: 11 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	7.9	8.0	8.4	24.3	24.9	24.5	7.8	7.3	7.8	250	260
Control B	0/500	5	5	5	7.9	7.3	8.4	24.3	24.4	24.7	7.8	7.4	7.8	250	260
Control C	0/500	5	5	5	8.0	8.3	8.4	24.3	25.1	24.8	7.7	7.3	7.9	250	265
Control D	0/500	5	5	5	8.0	8.3	8.4	24.4	24.8	24.7	7.7	7.4	7.9	250	260
100% A	500/0	5	5	5	7.2	7.9	8.2	24.3	25.2	24.4	7.0	6.9	7.6	1115	1145
100% B	500/0	5	5	5	7.2	7.9	8.2	24.3	25.1	24.4	7.0	7.0	7.5	1120	1150
100% C	500/0	5	5	5	7.2	7.9	8.2	24.2	25.1	24.4	7.0	6.9	7.6	1120	1150
100% D	500/0	5	5	5	7.2	7.9	8.2	24.3	24.8	24.7	7.0	6.9	7.6	1120	1160
Decl100% A	500/0	5	5	5	7.2	7.9	8.2	24.2	25.1	25.1	7.4	6.5	7.3	1115	1180
Decl100% B	500/0	5	5	5	7.2	7.9	8.2	24.2	24.8	24.5	7.3	6.7	7.3	1120	1155
Decl100% C	500/0	5	5	5	7.2	7.9	8.2	24.2	25.1	24.8	7.1	6.5	7.3	1120	1175
Decl100% D	500/0	5	5	5	7.2	7.9	8.2	24.2	25.0	24.9	7.3	6.7	7.3	1120	1175

Decl = Dechlorinated sample

[B] Temperature of test room was continously recorded on a strip chart recorder. Room temperature range for the test period was 24.5-25.0°C.

Table 2. Results of chemical analyses on the effluent from the Buckman Street Wastewater Treatment Facility sampled on November 18, 1996.

Metals

Aluminum	50	µg/L
Cadmium	1.61	µg/L
Calcium	63.7	mg/L
Chromium	6	µg/L[I]
Copper	14.2	µg/L
Iron	3490	µg/L[A]
Magnesium	23	mg/L
Nickel	15	µg/L
Silver	0.40	µg/L[I]
Zinc	400	µg/L

Pesticides and Herbicides

none detected

Base, Neutral, & Acid Extractable Organics

Nitrobenzene	1.9	µg/L[I]

[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: Buckman Street WWTP
County: Duval
Contact / District: Tim McKelvey / Northeast
NPDES Permit #: FL0026000
LIMS Sample #: 160089 LIMS Job #: 96-NOV-19-11
sample log 11-25-96

Sample Collection: Date 11-18-96 Time 1345
Test Beginning: Date 11-19-96 Time 1412
Test Ending: Date 11-21-96 Time 1415
Organism Batch #: 51 Diluent Batch #: 47
Organism Age: ≤24hours
Test Organism: Ceriodaphnia dubia

Test Type: Screening / Definitive
(Static) / Static Renewal / Flow-through

Test Number: 1 of 2

Remarks: Aliquot of sample dechlorinated with 0.32 ml of 0.025 N Sodium thiosulfate per liter of sample, Dechlorinated TRC = 0.03 mg/L
D = dead
M = missing

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	23.1 @ 23.2	8.4 @ 23.8 °C	102.4 @ 92.8 988 @ 1001 @ 24.7 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	23.2 @ 23.2	8.2 @ 25.0 °C	101.7 @ 92.8 983 @ 1001 @ 24.5 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	23.0 @ 23.0	8.2 @ 25.2 °C	103.3 @ 92.8 999 @ 1001 @ 24.9 °C

Ammonia @ 48hr = 5.04 mg/L

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. (µmhos/cm) 24 h	UNCORRECTED Cond. (µmhos/cm) 48 h
Control A	A	5	5	5	8.1		8.2	23.8		24.8	7.8		7.9	165		215
Control B	B	5	5	5			8.2			24.8			7.9			185
Control C	C	5	5	5			8.2			24.8			8.0			190
Control D	D	5	5	5			8.2			24.7			7.9			190
100% A	A	5	M (3) 2	0 (2D)	7.5		8.4	23.8		25.1	7.8		7.9	1070		1220
100% B	B	5	M (3) 2	0 (2D)			8.4			25.4			7.9			1215
100% C	C	5	1 (1D)	0 (1D)			8.4			25.4			7.8			1230
100% D	D	5	0 (5D)	0			8.4			25.1			7.8			1205
100% dcd A	A	5	1 (4D)	0 (1D)	7.4		8.5	23.8		25.7	7.6		7.8	1095		1250
100% dcd B	B	5	0 (5D)	0			8.5			25.7			8.0			1260
100% dcd C	C	5	0 (5D)	0			8.5			25.7			7.8			1220
100% dcd D	D	5	1 (4D)	0 (1D)			8.5			25.6			7.8			1225
		Age typo was incorrect 11-20-96 MF			3 is correct number of dead recorded 2 is correct number of alive											
Measured/Loaded by:		MF	MF	MF	JS		MF	JS		MF	JS			JS		MF
Recorded by:		DN	MF	MF	DN		DN	DN		DN	DN			DN		DN

Investigators' Signatures
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reviewer

form updated 4/01/96

Water Quality Parameters	Salt Water / Well Water	20% Min Water	100% / dcd Sample	Method	Measured by
Field Total Residual Cl2 (mg/L):			not measured (meter error)		
Lab Total Residual Cl2 (mg/L):	<0.03 →	—<0.03	0.075/0.080	Hach DR-100	DN (DR-100 corrected MF 11-20-96)
Alkalinity (mg/L as $CaCO_3$):	125	—70	155/165	Hach	DN
Hardness (mg/L as $CaCO_3$):	130	—85	265/275	Hach	DN
Total ammonia (mg/L as N):	<0.017	<0.017	4.24	Orion	MF

Ammonia Meter #98136 Ammonia Meter Slope: -54.0 Ammonia Blank: <0.017 Control Salinity: 0 ppt Sample Salinity: 0 ppt

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Buckman Street WWTP
County: Duval
Contact / District: Tim McKelvey / Northeast
NPDES Permit #: FL0026000
LIMS Sample #: 160089 LIMS Job #: 96-NOV-19-11
sample log 11-25-96

Sample Collection: Date 11-18-96 Time 1345
Test Beginning: Date 11-19-96 Time 1503
Test Ending: Date 11-21-96 Time 1500
Organism Batch #: 87 Diluent Batch #: well
Organism Age: 11 days
Test Organism: Cyprinella leedsi

Test Type: (Screening) | Definitive
(Static) | Static Renewal | Flow-through

Test Number: 2 of 2

Remarks: Dechlorinated test sample dechlorinated with 0.32 mL of 0.025 N sodium thiosulfate added per liter of sample. Dechlorinated TRC = 0.03 mg/L

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	23.1 @ 23.2	8.4 @ 23.8 °C	102.4 @ 92.8 988 @ 1001 @ 24.7 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	23.2 @ 23.2	8.2 @ 25.0 °C	101.7 @ ~~99.2~~ 24 92.3 983 @ 1001 @ 24.5 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	23.0 @ 23.0	8.2 @ 25.2 °C	103.3 @ 92.8 999 @ 1001 @ 24.9 °C

Conc.	Chamber #	Number Live			pH			Temperature (°C)			D.O. (mg/L)			UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm)		
		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
Control A	A1	5	5	5	7.9	8.0	8.4	24.3	24.9	24.5	7.8	7.3	7.8	250	260	260
Control B	A2	5	5	5	7.9	8.3	8.4	24.3	24.4	24.7	7.8	7.4	7.8	250	255	260
Control C	A3	5	5	5	8.0	8.3	8.4	24.3	25.1	24.8	7.7	7.3	7.9	250	260	265
Control D	A4	5	5	5	8.0	8.3	8.4	24.4	24.8	24.7	7.7	7.4	7.9	250	260	260
100% A	A5	5	5	5	7.2	7.9	8.2	24.3	25.2	24.4	7.0	6.9	7.6	1115	1160	1145
100% B	A6	5	5	5	7.2	7.9	8.2	24.3	25.1	24.4	7.0	7.0	7.5	1120	1150	1150
100% C	A7	5	5	5	7.2	7.9	8.2	24.2	25.1	24.4	7.0	6.9	7.6	1120	1150	1150
100% D	A8	5	5	5	7.2	7.9	8.2	24.3	24.8	24.7	7.0	6.9	7.6	1120	1140	1160
100% ded A	B9	5	5	5	7.2	7.9	8.2	24.2	25.1	25.1	7.4	6.5	7.3	1115	1155	1180
100% ded B	B10	5	5	5	7.2	7.9	8.2	24.2	24.8	24.5	7.3	6.7	7.3	1120	1145	1155
100% ded C	B11	5	5	5	7.2	7.9	8.2	24.2	25.1	24.8	7.1	6.5	7.3	1120	1165	1175
100% ded D	B12	5	5	5	7.2	7.9	8.2	24.2	25.0	24.9	7.3	6.7	7.3	1120	1160	1175
Measured/Loaded by:		DN	MF	DN	JS	MH	MF	JS	MH	MF	JS	MH	MF	JS	MH	MF
Recorded by:		JS	MF	DN	DN	DN	DN	DN	DN	DN	DN	DN	DN	DN	DN	DN

Investigators' Signatures
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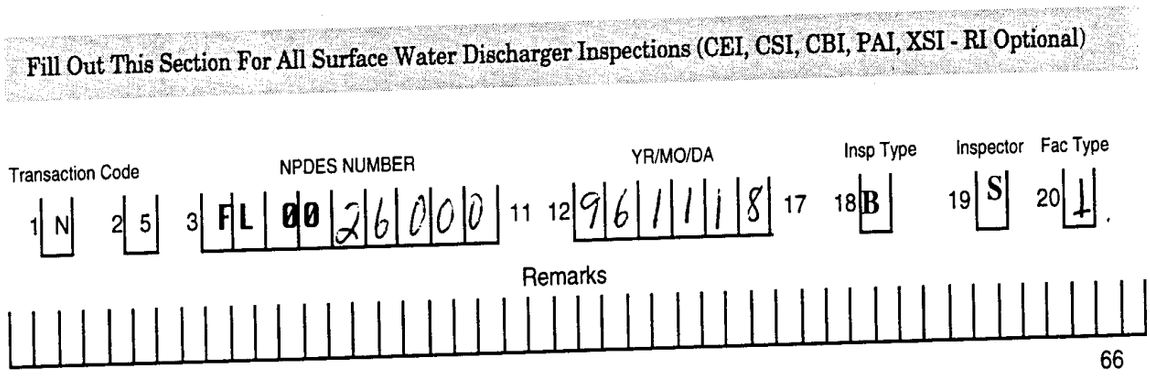
AHwolfe
reviewer

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):			NOT measured		
Lab Total Residual Cl2 (mg/L):	<0.03	<0.03	0.015/<0.03	DR-100	DN
Alkalinity (mg/L as $CaCO_3$):	125	70	155/165	Hach	DN
Hardness (mg/L as $CaCO_3$):	130	85	265/275	Hach	DN
Total ammonia (mg/L as N):	<0.017	<0.017	4.24	0510N	MF

Ammonia Meter #98136 Ammonia Meter Slope: 54.0 Ammonia Blank: <0.017 Control Salinity: 0 ppt Sample Salinity: 0 ppt

The Bioassay of the Buckman Street WWTP effluent sampled on November 18, 1996, NPDES #FL0026000.



The Priority Pollutants Analysis for the Bioassay of the Buckman Street WWTP effluent sampled on November 18, 1996, NPDES #FL0026000.

