

Bioassays of

W. Carl Dicks Wastewater Treatment Plant

Lakeland, Polk County, Florida

NPDES #FL0039772

Sampled 10/26/98

June 1999

Biology Section

Division of Administrative & Technical Services

Comprehensive Quality Assurance Plan #870346G

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Introduction

W. Carl Dicks Wastewater Treatment Plant, 1825 Glendale Street, Lakeland, Polk County, Florida, NPDES #FL0039772, tests performed on 27 to 29 October, 1998.

This domestic wastewater treatment plant has a design flow of 13.7 MGD and a permitted flow of 10.5 MGD. Wastewater is treated by the activated-sludge process and is chlorinated for disinfection. Wastewater is pumped to a 1,200-acre man-made wetland for additional natural treatment prior to discharge to Ellis Branch, a tributary of the Alafia River. Dechlorination is by natural processes in the wetlands. The annual average discharge from the wetlands is 20 MGD. The average flow for the month of October, 1998, was 6.37 MGD (facility summary provided by Andrea Grainger and Joe Squitieri, FDEP, Tampa).

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 water-flea, *Ceriodaphnia dubia*, and the bannerfin shiner, *Cyprinella leedsi*. There was 15% mortality (3 of 20 organisms) in the *Ceriodaphnia dubia* test; however, this was not considered to be significant since 10% mortality (2 of 20 organisms) also occurred in the controls. The *Cyprinella leedsi* test results did not show toxicity (Table 1).

Total residual chlorine and total ammonia were not detected in the bioassay sample. Further chemical analyses were performed on samples from this facility and several metals and nutrients were identified (Table 2). Analyses were also performed on samples from this facility for chlorophyll, phytoplankton taxa, and algal growth potential (AGP) (Table 3). Comparative samples (e.g., upstream, downstream) were not collected for these analyses. Chlorophyll-a was not detected in the sample. The AGP was 7.585 mg dry weight/liter. This value exceeded the "problem threshold" of 5.0 mg dry weight/L which indicates a probable anthropogenic influence on the nutrient contents of the sample (Raschke, R.L. and D. A. Schultz. 1987. The use of the Algal Growth Potential Test for Data Assessment. J. Wat. Poll. Cont. Fed. 59(4): 222-227). Twenty-two taxa were detected in the phytoplankton analyses. The blue-green alga, *Dactylococcopsis* sp., was the most abundant taxa. None of the taxa present were known to be indicative of water quality problems (personal communication with E. Miller, FDEP Biology Section, Algal Biology Group, Tallahassee). Phytoplankton density was very low at approximately 292 organisms/mL. In the past, the facility had been found in violation of its permitted total suspended solids content due to elevated phytoplankton density. A change was made in the facility's wetlands-treatment process that appears to have eliminated this problem.

Chlorophyll, phytoplankton, and algal growth potential analyses are usually performed on samples from a minimum of three sites (an upstream reference site, the effluent discharge site, and a downstream receiving-water site). These are selected in order to determine if the effluent has an impact on the receiving-water system into which it is discharged. Since only the discharge site was sampled, the receiving-water

impacts can not be assessed at this time; however, these data might be usef reference for future sampling events.

Conclusion

The sample of effluent collected from this facility on October 26, 1998, did no significant toxicity in the *Ceriodaphnia dubia* test and did not show toxicity in t *Cyprinella leedsi* test. The impact of the effluent on the wetlands or subsequent receiving water could not be determined due to the lack of comparative samples.

Table 1. Data recorded during the 48-hour acute toxicity screening bioassays of a sample of effluent from the W. Carl Dicks WWTP, Lakeland, Polk County, Florida, NPDES# FL0039772, performed on 27 to 29 October, 1998.

Facility:	**W. Carl Dicks Wastewater Treatment Plant**		**NPDES #**	**FL0039772**	Facility Type: Wastewater
Location:	1825 Glendale Street, Lakeland		Contact/District:	Andrea Grainger/Southwest	Treatment Plant
County:	Polk		Test type:	static acute screen	Wetlands to
Sample Collection Date:	10/26/98	Time: 1130	# tests:	2	Receiving Water: Ellis Branch to the
Test Beginning Date:	10/27/98	Time: 1415	Chlorination Type:	Chlorinated*	Alafia River
Test Ending Date:	10/29/98	Time: 1430	*Dechlorination occurs in the wetlands.		Page 1 of 1

Total Residual CL2	mg/L	Method
Field:	not measured	
Lab:	<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):	129	121
Control Water (20% DMW) (cladocerans):	78	95
100% Sample:	140	211

Salinity	(ppt)
Control Water (fish):	0
Control Water (20% DMW) (cladocerans):	0
100% Sample:	0

Salinity is based on conductivity and temperature measurements.

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

	Sample/Diluent	SURVIVAL # Alive			pH			Temperature[A]			Dissolved Oxygen			Conductivity 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	4	8.1	-	8.0	23.7	-	24.8	7.2	-	7.5	165	185
Control B	0/20	5	5	4	-	-	8.0	-	-	24.7	-	-	7.8	-	190
Control C	0/20	5	5	5	-	-	8.0	-	-	24.3	-	-	7.8	-	190
Control D	0/20	5	5	5	-	-	8.1	-	-	24.1	-	-	7.8	-	195
100% A	20/0	5	5	5	7.9	-	8.3	23.9	-	24.7	7.4	-	8.1	695	760
100% B	20/0	5	5	4	-	-	8.3	-	-	24.7	-	-	8.1	-	750
100% C	20/0	5	5	5	-	-	8.3	-	-	24.3	-	-	8.0	-	750
100% D	20/0	5	5	3	-	-	8.4	-	-	24.2	-	-	8.1	-	790

[A] Temperature of test incubator #2 and test room were continuously recorded on strip chart recorders.
Incubator #2 temperature range for the test period was 23.3-24.4°C.
Test room temperature range for the test period was 24.0-25.0°C.

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

	Sample/Diluent	SURVIVAL # Alive			pH			Temperature[B]			Dissolved Oxygen			Conductivity 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	7.9	8.2	24.2	24.8	24.4	7.1	6.7	7.8	235	260
Control B	0/500	5	5	5	7.9	7.9	8.2	24.0	24.9	24.4	7.2	7.0	7.8	245	260
Control C	0/500	5	5	5	7.9	8.0	8.2	24.0	24.9	24.4	7.2	7.1	7.8	245	255
Control D	0/500	5	5	5	8.0	8.0	8.2	24.0	24.9	24.2	7.3	7.2	7.7	245	255
100% A	500/0	5	5	5	7.9	8.1	8.2	24.7	24.9	24.1	7.3	7.3	7.9	745	760
100% B	500/0	5	5	5	7.9	8.1	8.2	24.9	24.8	24.4	7.4	7.3	8.0	740	770
100% C	500/0	5	5	5	7.9	8.1	8.2	24.9	24.8	24.4	7.1	7.2	7.8	740	765
100% D	500/0	5	5	5	7.9	8.1	8.2	24.9	24.6	24.0	7.3	7.2	7.7	750	760

[B] Temperature of test incubator #3 and test room were continuously recorded on strip chart recorders.
Incubator #3 temperature range for the test period was 24.8-25.5°C.
Test room temperature range for the test period was 24.0-25.0°C.

Table 2. Results of chemical analyses on the effluent from the W. Carl Dicks WWTP, sampled on October 26, 1998.

Metals

Calcium	56.4	mg/L
Copper	0.5	µg/L[I]
Iron	58	µg/L
Lead	0.07	µg/L[I]
Magnesium	16.5	mg/L

Base, Neutral, & Acid Extractable Organics

None Detected

Oil and Grease

Oil and Grease	5.0	mg/L[K]

Pesticides

None Detected

Nutrients

Ammonia-N	0.13	mg/L
Nitrite/Nitrate-N	0.039	mg/L[I]
Total Kjeldahl Nitrogen	1.2	mg/L
Ortho-Phosphate	3.0	mg/L
Total Phosphorus	3.3	mg/L

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

[K] Actual value is known to be less than the reported value.

Table 3. Results of additional analyses on the effluent from the W. Carl Dicks WWTP, sampled on October 26, 1998.

Chlorophyll-A		
Chlorophyll-A	1.2	µg/L[U]
Phaeophytin-A	1.2	µg/L[U]
Phytoplankton		
Number of Taxa	22	
Algal Assay		
Algal Growth Potential	7.585	mg Dry Wt/L

U Material was analyzed for but not detected. The value reported is the minimum detection limit.

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: W. Carl Dicks Water Reclamation WWTP
County: Polk
Contact / District: Andrea Grainger / Southwest
NPDES Permit #: FL00 39772
LIMS Sample #: 353172 LIMS Job #: JLH-1998-10-27-25
sample log 11/9/98 DW
Test Type: Screening / Definitive
Static / Static Renewal / Flow-through
Test Number: 1 of 2

Sample Collection: Date 10/26/98 Time 11:30
Test Beginning: Date 10/27/98 Time 14:15
Test Ending: Date 10/29/98 Time 14:30
Organism Batch #: 47 Diluent Batch #: 52
Organism Age: <24 hrs SRT toxicant batch #: ——
Test organism: Ceriodaphnia dubia

Remarks: Cul Ture Room Temperature Range was 24.0°C-25.0°C
Incubator #2 temperature Range was 23.3-24.4°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) / Cond. (µmhos/cm) 0 hr	24 h	48 h
CTL A	Ⓐ D1 A	5	5	4 10	8.1		8.0	23.7		24.8	7.2		7.5	165		185
CTL B	D2 B	5	5	4 10			8.0			24.7			7.8			190
CTL C	D3 C	5	5	5			8.0			24.3			7.8			190
CTL D	D4 D	5	5	5			8.1			24.1			7.8			195
100% A	D5 A	5	5	5	7.9		8.3	23.9		24.7	7.4		8.1	695		~~755~~ 760
100% B	D6 B	5	5	4 10			8.3			24.7			8.1			750
100% C	D7 C	5	5	5			8.3			24.3			8.0			750
100% D	D8 D	5	5	3 20			8.4			24.2			8.1			790
measured by:		FW	FW	DAW	DAW		DW	DAW		DW	DAW		DW	DAW		DW
recorded by:		DAW	FW	DAW	FW		DAW	FW		DAW	FW		DAW	FW		DAW

Ⓐ wrote chamber #'s for C. keedsi by mistake. FW 10/27/98.
Ⓑ Sample readings written in column for 20% min water. FW 10/27/98

Investigators' Signatures

(DW)

reviewer

form updated 5/22/98

	Salt Water Well Water	Water Quality Parameters 20% Min Water	Sample	Method	Measured by	Verified by
Field Total Residual Cl2 (mg/L):			—	—	—	—
Lab Total Residual Cl2 (mg/L):	—	<0.03	<0.03	DR-100	CH	FW
Alkalinity (mg/L as $CaCO_3$):	—	Ⓑ 340 78	140	Hach	CH	FW
Hardness (mg/L as $CaCO_3$):	—	371 95	211	Hach	CH	FW
Total ammonia (mg/L as N):	—	<0.017	<0.017	Orion	FW	FW
Salinity:	—	—	0	YSI	FW	FW

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: W. Carl Dickinson Reclamation WWTP
County: Polk
Contact / District: Andrea Grainger / Southwest
NPDES Permit #: FL0039772
LIMS Sample #: 353172 LIMS Job #: JLH-1998-10-27-25
sample log 11/9/98 DW
Test Type: (Screening) | Definitive
Static (Static) Renewal | Flow-through
Test Number: 2 of 2

Sample Collection: Date 10/26/98 Time 11:30
Test Beginning: Date 10/27/98 Time 14:40
Test Ending: Date 10/29/98 Time 15:00
Organism Batch #: 82 Diluent Batch #: Well
Organism Age: 12 days SRT toxicant batch #: --
Test organism: Cyprinella leedsi

Remarks:
Room temperature range was 24.0°C-25.0°C
Incubator #3 Temperature Range 24.8-25.5°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
CtlA	D1	5	5	5	7.9	7.9	8.2	24.2	24.8	24.4	7.1	6.7	7.8	235	250	260
CtlB	D2	5	5	5	7.9	7.9	8.2	24.0	24.9	24.4	7.2	7.0	7.8	245	250	260
CtlC	D3	5	5	5	7.9	8.0	8.2	24.0	24.9	24.4	7.2	7.1	7.8	245	240	255
CtlD	D4	5	5	5	8.0	8.0	8.2	24.0	24.9	24.2	7.3	7.2	7.7	245	245	255
100%A	D5	5	5	5	7.9	8.1	8.2	24.7	24.9	24.1	7.3	7.3	7.9	745	720	760
100%B	D6	5	5	5	7.9	8.1	8.2	24.9	24.8	24.4	7.4	7.3	8.0	740	725	770
100%C	D7	5	5	5	7.9	8.1	8.2	24.9	24.8	24.4	7.1	7.2	7.8	740	730	765
100%D	D8	5	5	5	7.9	8.1	8.2	24.9	24.6	24.0	7.3	7.2	7.7	750	740	760
measured by:		DW	DAW	DAW	DAW	DAW	DW	DAW	DAW	DW	DAW	DAW	DW	DAW	DAW	DW
recorded by:		CH	FW	DAW	DW	FW	DAW	DW	FW	DAW	DW	FW	DAW	FW	FW	DAW

Investigators' Signatures

(DW)

(DAW)

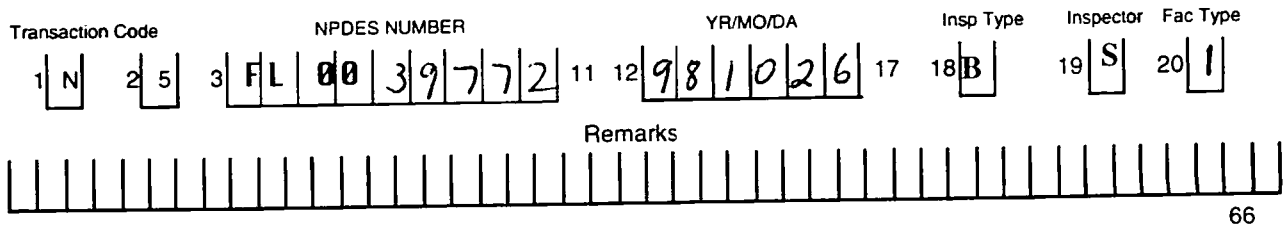
reviewer

form updated 5/22/98

	Salt Water (Well Water)	20% Min Water	Water Quality Parameters Sample	Method	Measured by	Verified by
Field Total Residual Cl2 (mg/L):			—	—	—	—
Lab Total Residual Cl2 (mg/L):	<0.03	—	<0.03	DR-100	CH	FW
Alkalinity (mg/L as $CaCO_3$):	129	—	140	Hach	CH	FW
Hardness (mg/L as $CaCO_3$):	121	—	211	Hach	CH	FW
Total ammonia (mg/L as N):	<0.017	—	<0.017	Orion	FW	FW
Salinity:	—	—	0	YSI	FW	FW

The Bioassay of the W. Carl Dicks WWTP effluent sampled on October 26, 1998, NPDES #FL0039772.

Fill Out This Section For All Surface Water Discharger Inspections (CEI, CSI, CBI, PAI, XSI - RI Optional)



The Priority Pollutants Analysis for the Bioassay of the W. Carl Dicks WWTP effluent sampled on October 26, 1998, NPDES #FL0039772.

Fill Out This Section For All Surface Water Discharger Inspections (CEI, CSI, CBI, PAI, XSI - RI Optional)

