

Bioassays of

Tampa Electric Company - Polk Power Station

Mulberry, Polk County, Florida

NPDES #FL0043869

Sampled 10/17/00

June 2001

Biology Section

Division of Resource Assessment & Management

Comprehensive Quality Assurance Plan #870346G

Bioassays of

Tampa Electric Company - Polk Power Station

Mulberry, Polk County, Florida

NPDES #FL0043869

Biology Section
Bureau of Laboratories
June 2001

Introduction

Tampa Electric Company Polk Power Station, State Road 37 and County Road 630, Mulberry, Polk County, Florida, NPDES #FL0043869, tests performed on 18 to 20 October 2000.

This facility is an electric generating plant with an average daily flow of 3.10 MGD through Outfall D-001. The cooling reservoir is a closed-loop system, which uses treated effluent from the on-site industrial wastewater treatment plant and from the on-site sanitary wastewater treatment facility. It also receives groundwater seepage, treated low-volume wastewater, treated waste from the on-site oil/water separators, groundwater from the Floridian aquifer, and recirculated cooling water. The cooling water comprises three groups of wastewater, each having their own treatment. The wastewater from the neutralization basin flows into the internal outfall I-003; the wastewater from the equalization basin flows into the internal outfall I-004; and the wastewater from the sanitary wastewater treatment plant flows into the internal outfall I-005. Each of the three internal outfalls flows into the cooling reservoir.

Process and service wastewater, as well as stormwater runoff and washdown from the material storage areas are treated by the on-site Industrial Wastewater Treatment (IWT) system. The system includes oils/water separation; neutralization tank; diversion boxes; coal, IWT sludge, and slag runoff retention basins; clarification; chemical restablization tank; filtration; and sludge handling system. Any oil-bearing equipment is segregated using curbed areas with drains that direct the washdown, runoff, minor leaks, and spills to the oil/water separator. The low-volume wastewater includes water from the Reverse Osmosis unit, treated boiler blowdown, and lab wastes. Low volume wastes are combined in a neutralization tank for pH adjustment. These wastewaters are treated in a neutralization tank before being discharged through internal outfall I-003 and used as cooling water.

Filter backwash water from the make-up water treatment is directed to the equalization basin and subsequently filtered. (The make-up water is groundwater that is pumped from wells to the surface. This water is then treated through reverse osmosis, and the waste product of the RO process is the filter backwash.) Metal cleaning wastes associated with combustion turbine and compressor washing is routed to the equalization basin for subsequent filtration treatment. After treatment, the effluent from the IWT is then sent to the cooling reservoir through internal outfall I-004.

The sanitary wastewater treatment system includes a covered, vented lift station and an activated sludge package unit. The components of the package unit are equalization, biological treatment, clarification, sludge digestion, filtration, and disinfection units. The treated effluent flows into the cooling system via internal outfall I-005.

The cooling water effluent receives no further treatment after being used for cooling before being discharged through Outfall D-001 into an unnamed reclaimed lake, which flows into an unnamed canal, and then into the Class III fresh waters of Little Payne Creek.

Additional effluent is discharged through Outfall D-002 into an unnamed canal that flows into Little Payne Creek. This effluent was not sampled for this inspection (facility summary information provided by Eddie Hughes, 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 Tampa Electric Company Polk Power Station's Outfall D-001. The test species used for these bioassays were the water flea, *Ceriodaphnia dubia*, and the bannerfin shiner, *Cyprinella leedsi*. The results of the test did not indicate toxicity to the test species *C. dubia* or *C. leedsi* at 48 hours (Table 1).

The sample was aerated from approximately 15 minutes to decrease the initial dissolved oxygen of 9.0 mg/L to 7.5 mg/L. The initial pH of the sample was 9.5 standard units. An aliquot of the sample was adjusted to the pH of 7.5 standard units using hydrochloric acid and tested along side the original sample. The purpose for running a pH-adjusted test was to test for possible toxic effects as a result of the high pH. (EPA notes that preferred pH conditions for a standard test are 6.0-9.0 standard units. Toxic effects of low or high pH may mask toxicants within a sample.) There were no mortalities in either the original or the pH-adjusted 100% sample at 48 hours.

Total residual chlorine and total ammonia were not detected in the sample. Further chemical analyses were performed on the sample, and several metals were identified (Table 2). The holding time for the pesticide analysis was exceeded.

Conclusion

The sample of effluent collected from this facility on October 17, 2000, did not show toxicity.

Table 1. Data recorded during the 48-hour acute screening bioassays of a sample of effluent from the Tampa Electric Company Polk Power Station, State Road 37 and County Road 630, Mulberry, Polk County, Florida, NPDES# FL0043869 performed on 18 to 20 October 2000.

Facility:	**Tampa Electric Company Polk Power Station**			**NPDES #**	**FL0043869**	Facility Type:	**Electric Generating Plant**
Location:	State Road 37 and County Road 630			Contact/District:	E. Hughes/ SW District		
County:	Polk			Test type:	static acute screen		
Sample Collection Date:	10/17/00	Time:	1100	# tests:	2	Receiving Water:	Little Payne Creek
Test Beginning Date:	10/18/00	Time:	1400	Chlorination Type:	non-chlorinated		
Test Ending Date:	10/20/00	Time:	1310				**Page 1 of 1**

Total Residual CL2	mg/L	Method
Field:	N/A	N/A
Lab:	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:	<0.017	<0.017

Alk & Hardness	Alkalinity (mg/L)	Hardness (mg/L)
Control Water (fish):	130	126
20% Dilute Mineral Water (cladocerans):	69	72
100% Sample:	102	189

Salinity[C]	(ppt)
Control Water:	<1
100% Sample:	<1

[C] Salinity based on conductivity and temperature measurements.

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	8.0	-	8.0	25.0	-	24.6	7.6	-	7.9	190	220
Control B	0/20	5	5	5	-	-	8.2	-	-	24.7	-	-	8.0	-	190
Control C	0/20	5	5	5	-	-	8.3	-	-	24.7	-	-	8.0	-	180
Control D	0/20	5	5	5	-	-	8.3	-	-	24.7	-	-	8.0	-	195
100% A	20/0	5	5	5	9.3	-	8.3	25.4	-	24.5	7.6	-	8.0	610	660
100% B	20/0	5	5	5	-	-	8.4	-	-	24.5	-	-	8.0	-	670
100% C	20/0	5	5	5	-	-	8.4	-	-	24.5	-	-	8.0	-	660
100% D	20/0	5	5	5	-	-	8.4	-	-	24.6	-	-	7.9	-	650
pH 100% A [D]	20/0	5	5	5	7.5	-	8.2	25.3	-	24.4	7.5	-	8.0	670	730
pH 100% B [D]	20/0	5	5	5	-	-	8.2	-	-	24.4	-	-	7.9	-	705
pH 100% C [D]	20/0	5	5	5	-	-	8.2	-	-	24.4	-	-	7.9	-	690
pH 100% D [D]	20/0	5	5	5	-	-	8.1	-	-	24.5	-	-	7.9	-	690

[D] This aliquot of sample was pH adjusted from 9.5 to 7.5 using HCl.

[A] Temperatures of room and test incubator were continuously recorded on a strip chart recorder.
Room Temperature range for the test period was 25.0-26.0°C.
Incubator #2 temperature range for the test period was 23.5-25.0°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	8.0	8.1	8.4	24.7	24.6	24.2	7.4	7.3	7.9	260	260
Control B	0/500	5	5	5	8.0	8.3	8.4	24.6	24.4	24.0	7.5	7.3	7.8	260	260
Control C	0/500	5	5	5	8.1	8.3	8.4	24.5	24.3	24.0	7.4	7.3	7.8	255	260
Control D	0/500	5	5	5	8.0	8.3	8.4	24.4	24.2	24.0	7.5	7.3	7.8	255	260
100% A	500/0	5	5	5	9.4	8.9	8.6	24.6	24.3	24.1	7.6	7.5	7.8	605	620
100% B	500/0	5	5	5	9.4	8.9	8.6	24.6	24.2	23.8	7.6	7.7	7.8	610	625
100% C	500/0	5	5	5	9.4	9.0	8.7	24.5	24.1	23.7	7.6	7.8	7.9	610	630
100% D	500/0	5	5	5	9.4	9.0	8.6	24.4	24.2	23.8	7.7	7.8	7.9	610	630
pH 100% A [E]	500/0	5	5	5	7.5	8.0	8.2	24.8	24.4	23.9	7.7	7.7	7.9	665	660
pH 100% B [E]	500/0	5	5	5	7.5	8.0	8.1	24.5	24.5	23.9	7.7	7.7	7.9	650	650
pH 100% C [E]	500/0	5	5	5	7.4	8.0	8.1	24.6	24.4	23.8	7.7	7.8	7.9	650	660
pH 100% D [E]	500/0	5	5	5	7.4	8.0	8.1	24.4	24.4	23.9	7.7	7.8	8.0	650	650

[E] This aliquot of sample was pH adjusted from 9.5 to 7.6 using HCl.

[B] Temperatures of room and test incubator were continuously recorded on a strip chart recorder.
Room Temperature range for the test period was 25 25.0-26.0°C
Incubator #3 temperature range for the test period was 24.0-25.0°C.

Table 2. Results of chemical analyses on the effluent from Tampa Electric Company Polk Power Station sampled on October 17, 2000.

Metals

Aluminum	660	µg/L [I]
Calcium	44.8	mg/L [A]
Copper	0.8	µg/L [I]
Iron	23	µg/L [I]
Magnesium	17.8	mg/L [A]
Selenium	1.1	µg/L [I]
Zinc	2	µg/L [I]

Pesticides and Herbicides[Q]

None detected

Base, Neutral, & Acid Extractable Organics

None detected

Other Analysis

Alpha, Total	9.9	pCi/L
Sulfate	83	mg/L

[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.
[Q] Samples held beyond normal holding time.

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Tampa Electric (TECO)
County: Polk
Contact / District: Patt L. Hughes / SW
NPDES Permit #: FL00 43869
LIMS Sample #: 48175 **LIMS Job #:** TH-2000-10-19-05

Sample Collection: Date 10/17/00 Time 11:00
Test Beginning: Date 10/18/00 Time 14:00
Test Ending: Date 10/20/00 Time 13:10
Organism Batch #: 55 **Diluent Batch #:** DMW #33
Organism Age: 24 hrs. SRT toxicant batch #: NA

sample log
Test Type: ~~Screening~~ | Definitive
~~Static~~ | Static Renewal | Flow-through
Test Number: 1 of 2

Test organism: C. dubia

Remarks: Sample aerated for 15 minutes to bring DO down from 9.0 to 7.6.
* wrong place 10/18/00 JA
- Initial pH 9.5. An aliquot was lowered to 7.5.

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
CNTL.	A	5	5	5	8.0	—	8.0	25.0	—	24.6	7.6	—	7.9	190	—	220
	B	5	5	5	~~9.3~~*	—	8.2	—	—	24.7	—	—	8.0	—	—	190
	C	5	5	5	~~7.7~~	—	8.3	—	—	24.7	—	—	8.0	—	—	180
	D	5	5	5	—	—	8.3	—	—	24.7	—	—	8.0	—	—	195
100%	A	5	5	5	9.3	—	8.3	25.4	—	24.5	7.6	—	8.0	610	—	660
	B	5	5	5	—	—	8.4	—	—	24.5	—	—	8.0	—	—	670
	C	5	5	5	—	—	8.4	—	—	24.5	—	—	8.0	—	—	660
	D	5	5	5	—	—	8.4	—	—	24.6	—	—	7.9	—	—	650
pH adjusted	A	5	5	5	7.5	—	8.2	25.3	—	24.4	7.5	—	8.0	670	—	730
	B	5	5	5	—	—	8.2	—	—	24.4	—	—	7.9	—	—	705
	C	5	5	5	—	—	8.2	—	—	24.4	—	—	7.9	—	—	690
	D	5	5	5	—	—	8.1	—	—	24.5	—	—	7.9	—	—	690
measured by:	YMK	~~SA~~	JG	MF	SG	—	SG	SG	—	SG	SG	—	SG	SG	—	JG
recorded by:		SG	SG	MF	SA	—	~~YMK~~	SA	—	~~YMK~~	SA	—	YMK	SA	—	YMK

(Following place initials DM)

Investigators' Signatures
Shannon Edwards
Katie
Josh Cyr
Marshall Faircloth
Della Tucker Howe

A.H. Wolfe
reviewer form updated 3/3/99

Temperature Range °C
Incubator # 2 23.5°C-25.0°C
Room B246 25.0°C-26.0°C

Water Quality Parameters	Salt Water / Well Water	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	DR100	SG	SG
Alkalinity (mg/L as $CaCO_3$):		69	102	Hach	JA	SG
Hardness (mg/L as $CaCO_3$):		72	184	Hach	JA	SG
Total ammonia (mg/L as N):		<0.017	<0.017	Denver	MF	SG
Salinity:		0	0	Ysi	SG	SG

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Tampa Electric (TECO)
County: Polk
Contact / District: E. Hughes / SW
NPDES Permit #: FL0043869
LIMS Sample #: 422175 **LIMS Job #:** ILH-2000-10-19-05-01

Sample Collection: Date 10/17/00 Time 11:00
Test Beginning: Date 10/18/00 Time 1445
Test Ending: Date 10/20/00 Time 1315
Organism Batch #: 82 **Diluent Batch #:** WRT
Organism Age: 11 days SRT toxicant batch #: NA

sample log
Test Type: ~~Screening~~ | Definitive
~~Static~~ | Static Renewal | Flow-through
Test Number: 2 of 2

Test organism: C. leedsi

Remarks: Sample aerated for 15 minutes to bring DO down from 9.0 to 7.6. Initial pH of 9.5. An aliquot was adjusted down to 7.6

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
CNTR. A	C9	5	5	5	8.0	8.1	8.4	24.7	24.6	24.2	7.4	7.3	7.9	260	270	260
B	C10	5	5	5	8.0	8.3	8.4	24.6	24.4	24.0	7.5	7.3	7.8	260	245	260
C	C11	5	5	5	8.1	8.3	8.4	24.5	24.3	24.0	7.4	7.3	7.8	255	240	260
D	C12	5	5	5	8.0	8.3	8.4	24.4	24.2	24.0	7.5	7.3	7.8	255	255	260
100% A	C13	5	5	5	9.4	8.9	8.6	24.6	24.5	24.1	7.6	7.5	7.8	605	620	620
B	C14	5	5	5	9.4	8.9	8.6	24.4	24.2	23.8	7.6	7.7	7.8	610	625	625
C	C15	5	5	5	9.4	9.0	8.7	24.5	24.1	23.7	7.6	7.8	7.9	610	625	630
D	C16	5	5	5	9.4	9.0	8.6	24.4	24.2	23.8	7.7	7.8	7.9	610	625	630
pH adjusted A	C17	5	5	5	7.5	8.0	8.2	24.8	24.4	23.9	7.7	7.7	7.9	665	665	660
B	C18	5	5	5	7.5	8.0	8.1	24.5	24.5	23.9	7.7	7.7	7.9	650	660	650
C	C19	5	5	5	7.4	8.0	8.1	24.6	24.4	23.8	7.7	7.8	7.9	650	620	660
D	C20	5	5	5	7.4	8.0	8.1	24.4	24.4	23.9	7.7	7.8	8.0	650	665	650
measured by:	SG	~~YMH~~	SG	MF	SG	SG	SG	SG	SG	SG	SG	SG	SG	SG	SG	SG
recorded by:	JA	~~SG~~	SG	MF	JA	JA	YMH	JA	JA	YMH	JA	JA	YMH	JA	JA	YMH

Investigators' Signatures
Shannon Gerard
Marshall Faircloth
AH Wolfe
reviewer

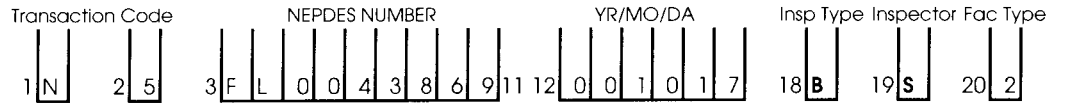
Temperature Range °C
Incubator # 3 24.0-25.0 °C
Room B246 25.0-26.0 °C

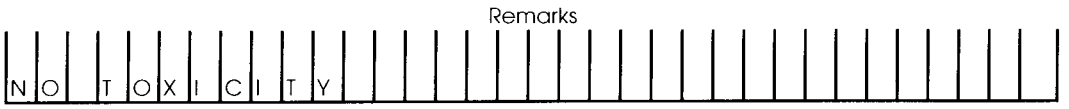
Water Quality Parameters	Salt Water: Well Water	Salt Water: 20% Min Water	Sample	Method	Measured by	Verified by
Field Total Residual Cl2 (mg/L):						
Lab Total Residual Cl2 (mg/L):	<0.03		<0.03	DR100	SG	SG
Alkalinity (mg/L as $CaCO_3$):	130		102	Hach	JA	SG
Hardness (mg/L as $CaCO_3$):	126		189	Hach	JA	SG
Total ammonia (mg/L as N):	<0.017		<0.017	Denver	MF	SG
Salinity:	0		0	YSI	SG	SG

form updated 3/3/99

The Bioassay of Tampa Electric Company Polk Power Station effluent sampled on October 17, 2000, NPDES #FL0043869.

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

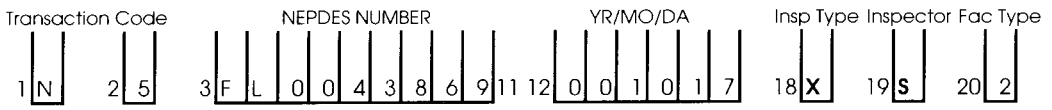


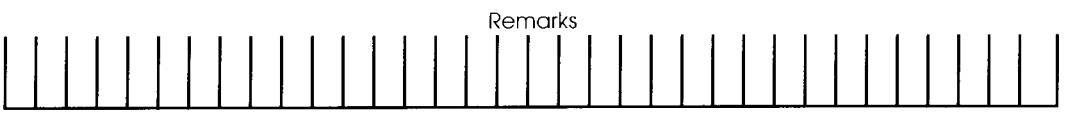


66

The Priority Pollutants Analysis for Bioassay of Tampa Electric Company Polk Power Station effluent sampled on October 17, 2000, NPDES #FL0043869.

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





66