Florida

Department of Environmental Protection

Bioassays of

Key Colony Beach Wastewater Treatment Plant

Key Colony Beach, Monroe County, Florida

NPDES #FL0021253

Sampled 12/6/94

93

FILE COPY
DO NOT REMOVE

March 1994

Biology Section
Division of Technical Services

Bioassays of

Key Colony Beach Wastewater Treatment Plant

Key Colony Beach, Monroe County, Florida

NPDES #FL0021253

Biology Section
Bureau of Laboratories
March 1994

Introduction

Key Colony Beach WWTP, Key Colony Beach, Monroe County, Florida, NPDES #FL0021253, tests performed on 7 to 9 December, 1993.

This wastewater treatment facility is located at 600 West Ocean Drive in Key Colony Beach and has a design flow of 0.22 MGD. Treatment of wastewater consists of extended aeration, clarification, gas chlorination for disinfection, and dechlorination with sulfur dioxide. Treated effluent is discharged into Bonefish Bay which joins the Atlantic Ocean. The facility has a permit to construct a Class V injection well to eliminate the surface water discharge (facility summary provided by Gus Rios and Nancy Brooking, FDEP Marathon).

The toxicity tests discussed in this report were performed in accordance with methods described by Weber, 1991, *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*, 4th Edition (EPA/600/4-90/027).

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 salinity of the sample was about 9.4 ppt, therefore, the test species used for these bioassays were the mysid shrimp, *Mysidopsis bahia*, and the inland silverside, *Menidia beryllina*. The control water for the tests was adjusted to a similar salinity using an artificial sea salt mixture (Forty Fathoms®); the salinity of the sample was not altered.

The test results indicated that the sample was toxic to the mysids, producing 30% mortality in 100% effluent. Although mortality occurred but was less than 50% in an effluent screening test, the results cannot be used to determine an LC_{50} or a violation of the acute toxicity rule.

However, 30% mortality in 100% effluent indicates two things. First, in a definitive acute test where an LC_{50} could be calculated, a violation of the end-of-pipe acute standard [17-302.500(1)(d) F.A.C.] would have probably occurred (LC_{50} < 300%). Second, a chronic test with this sample would show the presence of chronic toxicity in 100% effluent and a violation of the end-of-pipe chronic standard [17-302.530(62) F.A.C.] would have probably occurred (NOEC < 100%).

The sample did not show toxicity to *Menidia*. Total residual chlorine was 0.5 mg/L in the field and <0.03 mg/L in the laboratory. Total ammonia was not detected in the sample.

Further chemical analyses were performed on the sample and several metals were identified (Table 2). Copper (12 µg/L) and silver (0.37 µg/L) both exceeded their respective Class III marine surface water criterion of ≤ 2.9 µg/L and ≤ 0.05 µg/L. However, the metals did not appear to be present in concentrations known to be toxic to mysids. Pesticides and organics were not detected.

Conclusion

The sample of effluent collected from this facility on 6 December, 1993, showed toxicity to *Mysidopsis bahia*. The cause of toxicity was not determined.

The 30% mortality in the mysid screening test is not a violation of the end-of-pipe LC_{50} standard. However, this level of toxicity would have probably resulted in a violation of the acute toxicity standard (LC_{50} < 300% effluent) and of the chronic toxicity standard (NOEC < 100% effluent at end-of-pipe). Follow-up testing is recommended.

Table 1. Concentration series and volumes used for the 48-hour static acute screening bioassays of the Key Colony Beach WWTP effluent performed on 7 to 9 December, 1993.

Mysidopsis bahia (mysid shrimp)

Concentration	Dilution Water	Sample	Total Volume
Control	500 mL	0 mL	500 mL
100 %	0 mL	500 mL	500 mL

Menidia beryllina (inland silverside)

Concentration	Dilution Water	Sample	Total Volume
Control	500 mL	0 mL	500 mL
100 %	0 mL	500 mL	500 mL

Table 2. Results of chemical analyses on the effluent from Key Key Colony Beach WWTP, sampled on 06 December, 1993.

Pesticides & Herbicides

None Detected

Base-Neutral & Acid Extractables

None Detected

Metals

Aluminum	333	µg/L [I]			
Cadmium	0.15	µg/L [I]			
Iron	78	µg/L			
Silver	0.37	µg/L			
Calcium	165	mg/L (effluent)	38.4	mg/L	(trip blank)**a**
Copper	12	µg/L (effluent)	6	µg/L [I]	(trip blank)**a**
Magnesium	313	mg/L (effluent)	7	mg/L	(trip blank)**a**
Zinc	5	µg/L (effluent)	60	µg/L	(trip blank)**a**

I Value reported is between the laboratory method detection limit and the laboratory practical quantitation limit.

a Chemistry Laboratory personnel suspect that trip blank was prepared from tap water.

Table 3. Data recorded during the 48-hour static acute screening bioassays of a sample of effluent from the Key Colony Beach WWTP Key Colony Beach, Monroe County, Florida, NPDES# FL0021253, performed on 7 to 9 December, 1993.

Facility:	**Key Colony Beach WWTP**		**NPDES #**	**FL0021253**	Facility Type: **WWTP**
Location:	Key Colony Beach		Contact/District:	Gus Rios / South	
County:	Monroe		Test type:	static acute screen	
Sample Collection Date:	**12/6/93**	Time: 0900	# tests:	2	Receiving Water: Bonefish Bay to
Test Beginning Date:	12/7/93	Time: 1130	Chlorination Type:	**sample collected**	Atlantic ocean
Test Ending Date:	12/9/93	Time: 1130		**after dechlorination**	**Page 1 of 1**

Total Residual Cl2	mg/L	Method
Field:	0.50	DR-100
Lab:	< 0.03	DR-100

Ammonia	Total (mg/L)	Unionized (mg/L)
Control Water:	<0.017	0.00
100% Sample:	<0.017	0.00

Alk & Hardness	Alkalinity (mg/L)	Hardness (mg/L)
Control Water:	55	-
100% Sample:	110	-

Salinity	(ppt) *
Control Water:	9.6
100% Sample:	9.4

* Salinity converted from conductivity readings.

Organism: ***Mysidopsis bahia*** Life stage: 4 days

	SURVIVAL			pH			Temperature			Dissolved Oxygen			Conductivity (mmhos/cm)	
Concentrations	# at 0 hr	Live at 24 hr	Live at 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	5	5	5	8.2	7.7	7.7	22.0	22.0	21.5	7.3	7.9	8.1	15.3	15.6
Control	5	4	4	8.2	7.7	7.7	-	-	21.5	7.3	7.9	8.0	15.4	15.5
100%	5	5	4	6.6	7.5	7.8	22.1	21.9	21.6	6.9	7.6	7.4	15.1	15.3
100%	5	5	3	6.6	7.5	7.8	-	-	21.6	6.9	7.6	7.5	15.1	15.3

Organism: ***Menidia beryllina*** Age: 12 days

	SURVIVAL			pH			Temperature			Dissolved Oxygen			Conductivity (mmhos/cm)	
Concentrations	# at 0 hr	Live at 24 hr	Live at 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	5	5	5	8.2	7.7	7.7	21.9	21.8	21.7	7.2	8.1	7.8	15.4	15.6
Control	5	5	5	8.2	7.7	7.7	-	-	21.7	7.3	8.1	7.9	15.4	15.7
100%	5	5	5	6.6	7.5	7.8	22.1	21.9	21.7	6.9	7.5	7.8	15.1	15.3
100%	5	5	5	6.6	7.5	7.8	-	-	21.8	6.9	7.6	7.6	15.1	15.3

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Key Colony Beach WWTP
Location:
County: Monroe
Contact/District: Gus Rios / 5
NPDES Permit #: FL0021253 **Outfall #:**
LIMS 93DEC-07-10 66849

Sample Collection: Date 12.6.93 Time 0900
Test Beginning: Date 12.7.93 Time 1130
Test Ending: Date 12-9-93 Time 1130
Organism Batch #: 122 **Diluent Batch #:** 45
Organism Age: 4 days old
Test Organism: Mysidopsis bahia

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

Test Number: 1 of 2

Remarks:

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	21.8@21.8	8.5@23.4	970@1,000 9320@10,000@23.0°C
24 hr	7.0@7.0 9.0@9.0	21.3@21.4	8.8@21.5	969@1,000 9330@10,000@23.0°C
48 hr	7.0@7.0 9.0@9.0	24.0@24.1	8.6@23.0	970@1,000 9320@10,000@23.0°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
Control A	48	5	5	5	8.2	7.7	7.7	22.0	22.0	21.5	~~8.0~~	7.9	8.1	15.3	15.5	15.6
Control B	263	5	4	4	8.2	7.7	7.7			21.5	~~8.0~~	7.9	8.0	15.4	15.6	15.5
100% A	18	5	5	4	6.6	7.5	7.8	22.1	21.9	21.6	6.9	7.6	7.4	15.1	15.2	15.3
100% B	2	5	5	3	6.6	7.5	7.8			21.6	6.9	7.6	7.5	15.1	15.2	15.3
											7.3* salinity adjustment re-read DO after salinity knob was adjusted	TM 12/7				
Measured/Loaded by:		TM	MF	TM	MF	MF	TM	MF	MF	TM	MF	MF	TM	MF	MF	TM
Recorded by:		TM	MF	TM	TM	MF	TR	TM	MF	TR	TM	MF	TR	TM	MF	TR

Investigators' Signatures

Tina Mikulski
Randall Faircloth
Tobin Ce-Rader

Reviewer

form updated 7/8/93

Water Quality Parameters

	Salt Water/ Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2:			0.5	DR-100	G-R/RB
Lab Total Residual Cl2:	<0.03	N/A	<0.03	DR100	TM
Alkalinity:	55	N/A	110	Hach	TM
Hardness:	—	N/A	—	Hach	TM
Total Ammonia:	<0.017	N/A	<0.017	Orion	MF

Ammonia Meter #98136 Ammonia Meter Slope: -55.9 Ammonia Blank: <0.017 Control Salinity: 9.6 ppt Sample Salinity: 9.8 ppt

9.4 instead of 9.8 MF 12/9/93

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Key Colony Beach WWTP
Location:
County: Monroe
Contact/District: Gus Rios / S
NPDES Permit #: FL0021253 Outfall #:
Lims 93 Dec 07-10 66849

Sample Collection: Date 12/6/93 Time 0900
Test Beginning: Date 12/7/93 Time 1130
Test Ending: Date 12-9-93 Time 1130
Organism Batch #: 34 Diluent Batch #: 45
Organism Age: 12 days old
Test Organism: Mysidopsis bahia

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

Test Number: 2 of 2

Remarks:

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	21.8@21.8	8.5@23.4	970@1,000 9320@10,000@23.0°C
24 hr	7.0@7.0 9.0@9.0	21.3@21.4	8.8@21.5	9.9@1,000 9330@10,000@23.0°C
48 hr	7.0@7.0 9.0@9.0	24.0@24.1	8.6@23.0	970@1,000 9320@10,000@23.0°C

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
Control A	4	5	5	5	8.2	7.7	7.7	21.9	21.8	21.7	7.2	8.1	7.8	15.4	15.5	15.6
Control B	65	5	5	5	8.2	7.7	7.7			21.7	7.3	8.1	7.9	15.4	15.5	15.7
100% A	20	5	5	5	6.6	7.5	7.8	22.1	21.9	21.7	6.9	7.5	7.8	15.1	15.2	15.3
100% B	15	5	5	5	6.6	7.5	7.8			21.8	6.9	7.6	7.6	15.1	15.2	15.3
	1															
Measured/Loaded by:		MF	MF	TM	MF	MF	TM	MF	MF	TM	MF	MF	TM	MF	MF	TM
Recorded by:		TM	MF	TM	TM	MF	TR	TM	MF	TR	TM	MF	TR	TM	MF	TR

Investigators' Signatures

Tina Mikkelsen
Marshall Faircloth
Robin A. Rader

Reviewer

form updated 7/8/93

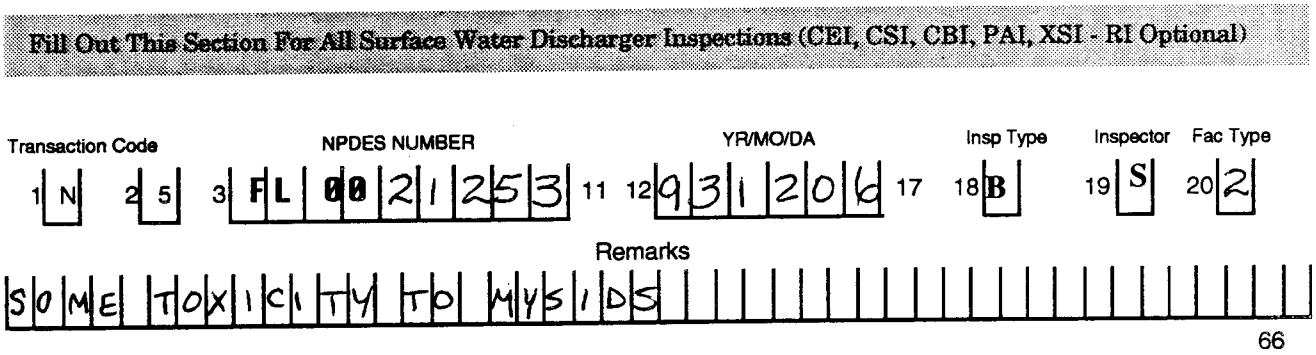
(Salt Water) Water Quality Parameters

	Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2:			0.5	DR-100	GR/NB
Lab Total Residual Cl2:	<0.03	N/A	<0.03	DR-100	TM
Alkalinity:	55	N/A	110	Hach	TM
Hardness:	—	N/A	—	Hach	TM
Total Ammonia:	20.017	NA	20.017	Orion	MF

Ammonia Meter #98136 Ammonia Meter Slope: -55.9 Ammonia Blank: 20.017 Control Salinity: 9.6 ppt Sample Salinity: 9.3 ppt

9.4 measured conversion chart 2/10/94 mc

The Bioassay of Key Colony Beach WWTP effluent sampled on 6 December, 1993, NPDES #FL0021253.



The Priority Pollutants Analyses for the Bioassay of Key Colony Beach WWTP effluent sampled on 6 December, 1993, NPDES #FL0021253.

