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Bioassays of

Jupiter Reverse Osmosis Treatment & Disposal Facility

Jupiter, Palm Beach County, Florida

NPDES #FL0042358

Sampled 10/30/00

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June 2001

Biology Section

Division of Resource Assessment & Management

Comprehensive Quality Assurance Plan #870346G

Bioassays of

Jupiter Reverse Osmosis Treatment & Disposal Facility

Jupiter, Palm Beach County, Florida

NPDES #FL0042358

Biology Section
Bureau of Laboratories
June 2001

Introduction

Jupiter Reverse Osmosis (RO) Treatment and Disposal Facility, 17403 Central Boulevard, Jupiter, Palm Beach County, Florida, NPDES #FL0042358, tests performed from October 31 to November 2, 2000.

This reverse osmosis concentrate treatment and disposal facility has a design flow of 4.0 MGD. Treatment of the effluent consists of sulfuric acid injection to lower the pH and degasification with a scrubber to remove gaseous hydrogen sulfide for odor control. The facility has a mixing zone for fluoride and combined radium 226 and radium 228. The effluent flows through the outfall pipe into the Class II Fresh Waters of the C-18 Canal (facility summary provided by Robert Hennes, FDEP, West Palm Beach).

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. Based on conductivity and temperature, the effluent had a salinity of approximately 11.5 parts per thousand (ppt). The test species used for these bioassays were the inland silverside minnow, *Menidia beryllina*, and the mysid shrimp, *Americamysis bahia.*

The control water was natural seawater (NSW) diluted to 17.5 ppt for the *M. beryllina* and *A. bahia* tests. An aliquot of the sample was adjusted to an apparent salinity of 17.5 ppt for the *M. beryllina* and *A. bahia* tests to ensure that the minimum required seawater ions (one ppt for *M. beryllina*, six ppt for *A. bahia*) were present. Test organisms were acclimated from 20 ppt to 17.5 ppt.

The test results did not indicate toxicity to the *M. beryllina.* However, the test results did indicate that the sample was toxic to *A. bahia* producing 60 percent mortality in 48 hours (Table 1).

Total residual chlorine was not detected in the sample. Total and unionized ammonia concentrations were 4.54 mg/L and 0.085 mg/L, respectively. Further chemical analyses were performed on the sample, and several metals were identified (Table 2).

The chemistry results confirmed that the ion makeup of the sample was not in seawater proportions and that the apparent 11.5 ppt salinity of the sample was due to elevated levels of ground-water ions. The observed mortality in the *A. bahia* test is likely due to the seawater-ion imbalance of the sample. Previous research conducted by the FDEP Biology Section demonstrated that *A. bahia* is much more sensitive to seawater-ion imbalances than is *M. beryllina.* (Wolfe, *et al.* 1995. Protocols for determining Major-Seawater-Ion Toxicity in Membrane-Technology Water-Treatment Concentrate. Florida Department of Environmental Protection, Bureau of Laboratories. 96pp.) The calcium concentration was measured at 364 mg/L at 11.5 ppt salinity (salinity based on conductivity and temperature). This is approximately 150 percent

greater than the normal background concentration for calcium in seawater of this salinity. The elevated calcium concentration is one source of toxicity in this sample, but other unidentified sources of toxicity cannot be ruled out without performing the major-seawater-ion imbalance toxicity testing protocols cited above.

Conclusion

The sample of effluent collected from this facility on October 30, 2000, did not show toxicity to *M. beryllina*, but did show acute toxicity to *A. bahia* at 48 hours. The cause of toxicity was attributed, at least in part, to the elevated calcium concentration in the sample. The presence of other unidentified toxicants cannot be ruled out without performing the major-seawater-ion imbalance toxicity testing protocols.

Table1. Data record the 48-hour acute screening bioassays of a sample of effluent from the Jupiter Reverse Osmosis Treatment and Disposal Facility, Jupiter, Palm Beach County, Florida, NPDES# FL0042358 performed on 31 October to 2 November 2000.

Facility:	**Jupiter RO**			**NPDES #**	**FL0042358**	Facility Type:	**Reverse Osmosis Plant**
Location:	17403 Central Boulevard			Contact/District:	T. Davis / SE-District		
County:	Palm Beach County			Test type:	static acute screen		
Sample Collection Date:	10/30/00	Time:	1055	# tests:	2	Receiving Water:	C-18 Canal
Test Beginning Date:	10/31/00	Time:	1350	Chlorination Type:	Not Chlorinated		
Test Ending Date:	11/2/00	Time:	1310				**Page 1 of 1**

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

Ammonia	Total (mg/L)	Unionized (mg/L)
Control Water (fish):	< 0.017	<0.017
100% Sample:	4.54	0.085

Alk & Hardness	Alkalinity (mg/L)	Hardness (mg/L)
Control Water (fish):	195	-
100% Sample:	103	-

Salinity[C]	(ppt)
Control Water:	17.5
100% Sample:	11.5
Adjusted Sample	17.5

[C] Salinity based on conductivity and temperature measurements.

Organism: ***Menidia beryllina*** Life stage: 11 days

	Sample/Diluent	SURVIVAL # Alive			pH			Temperature[A]			Dissolved Oxygen			Conductivity Uncorrected 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	8.1	8.1	8.2	24.6	24.7	24.6	7.1	6.7	6.8	26.9	23.6
Control B	0/500	5	5	5	8.1	8.1	8.2	24.6	24.1	24.3	7.2	6.8	6.8	27.7	27.8
Control C	0/500	5	5	5	8.1	8.1	8.2	24.6	24.3	24.0	7.3	6.8	7.0	27.8	28.0
Control D	0/500	5	5	5	8.1	8.1	8.2	24.6	24.2	24.0	7.3	6.8	6.9	27.8	27.7
Salt 100% A	500/0	5	5	5	7.5	7.8	8.0	24.5	23.9	24.1	7.0	6.9	6.9	28.8	29.3
Salt 100% B	500/0	5	5	5	7.5	7.8	8.0	24.4	23.9	24.3	7.0	6.9	6.9	28.8	29.1
Salt 100% C	500/0	5	5	5	7.5	7.8	8.0	24.5	24.1	24.4	7.0	6.9	6.7	28.8	29.3
Salt 100% D	500/0	5	5	5	7.5	7.8	8.0	24.5	24.6	24.1	7.1	6.7	6.9	28.9	29.3

[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 #3 temperature range for the test period was 24.5-26.0°C.

Organism: ***Americamysis bahia*** Life stage: 3 days

	Sample/Diluent	SURVIVAL # Alive			pH			Temperature[A]			Dissolved Oxygen			Conductivity Uncorrected 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	8.1	7.9	8.0	25.0	24.3	24.3	7.2	6.1	6.8	28.1	28.5
Control B	0/500	5	5	5	8.1	8.0	8.1	25.0	24.6	24.4	7.2	6.2	6.8	28.5	29.4
Control C	0/500	5	5	5	8.1	8.0	8.1	24.9	24.5	24.3	7.2	6.2	6.7	28.4	29.0
Control D	0/500	5	5	5	8.1	7.9	8.0	24.9	24.4	24.3	7.2	5.9	6.5	28.4	28.9
Salt 100% A	500/0	5	4	1	7.5	7.7	7.9	24.7	24.5	24.2	7.0	6.2	6.7	28.9	29.2
Salt 100% B	500/0	5	4	1	7.5	7.7	7.9	24.7	24.1	24.2	7.0	6.3	6.7	29.0	29.4
Salt 100% C	500/0	5	4	3	7.5	7.7	7.9	24.7	23.9	24.1	7.1	6.4	6.5	28.8	29.6
Salt 100% D	500/0	5	4	3	7.5	7.7	7.9	24.7	24.0	24.1	7.1	6.3	6.5	28.3	30.2

[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 #3 temperature range for the test period was 24.5-26.0°C.

Table 2. Results of chemical analyses on the effluent from the Jupiter Reverse Osmosis Treatment and Disposal Facility sampled on October 30, 2000.

Metals

Cadmium	0.025	µg/L	I
Calcium	364	mg/L	
Copper	3.2	µg/L	I
Iron	40	µg/L	I
Lead	0.43	µg/L	I
Magnesium	448	mg/L	
Nickel	6.3	µg/L	I
Selenium	4.3	µg/L	I
Silver	0.046	µg/L	I

Pesticides and Herbicides

none detected

Base, Neutral, & Acid Extractable Organics

none detected

[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: Jupiter PC
County: Palm Beach
Contact / District: T. Davis / SE-DIST
NPDES Permit #: FL00-4238
LIMS Sample #: 49747 **LIMS Job #:** 7CH 2000-10-31-49
sample log 11-1-00 mt
Test Type: ~~Screening~~ | Definitive
Static | Static Renewal | Flow-through
Test Number: 1 of 2

Remarks:

Sample Collection: Date 10/30/00 Time 1055
Test Beginning: Date 10/31/00 Time 1350
Test Ending: Date 11/2/00 Time 1310
Organism Batch #: 302 **Diluent Batch #:** NSW
Organism Age: 3 days SRT toxicant batch #: NA
Test organism: A. bahia

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	E1	5	5	5	8.1	7.9	8.0	25.0	24.3	24.3	7.2	6.1	6.8	28.1	28.2	28.5
B	E2	5	5	5	8.1	8.0	8.1	25.0	24.6	24.4	7.2	6.2	6.8	28.5	28.9	29.4
C	E3	5	5	5	8.1	8.0	8.1	24.9	24.5	24.3	7.2	6.2	6.7	28.4	28.5	29.0
D	E4	5	5	5	8.1	7.9	8.0	24.9	24.4	24.3	7.2	5.9	6.5	28.4	28.4	27.1
100%. A	E5	5	4 ID	1 3D	7.5	7.7	7.9	24.7	24.5	24.2	7.0	6.2	6.7	28.9	28.9	29.2
B	E6	5	4 ID	1 3D	7.5	7.7	7.9	24.7	24.1	24.2	7.0	6.3	6.7	29.0	28.9	29.4
C	E7	5	4 ID	3 ID	7.5	7.7	7.9	24.7	23.9	24.1	7.1	6.4	6.5	28.8	29.0	29.6
D	E8	5	4 ID	3 ID	7.5	7.7	7.9	24.7	24.0	24.1	7.1	6.3	6.5	28.3	29.2	29.2
measured by:		YHK	SG	SG			SG			SG		SG	SG		SG	SG
recorded by:		SG	SG	SG			SG			SG		SG	SG		SG	SG

Investigators' Signatures
Shannon Howard
John Cox
Kristin
Jeff Wolfe
reviewer

form updated 3/3/99

Temperature Range °C
Incubator # 3 24.5 - 26.0 °C
Room 1246 25.0 - 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):			NA	NA	NA	SG
Lab Total Residual Cl2 (mg/L):	<0.03		<0.03	DR100	SG	SG
Alkalinity (mg/L as $CaCO_3$):	195		103	Hach	JA	SG
Hardness (mg/L as $CaCO_3$):	NA		NA	Hach	JA	SG
Total ammonia (mg/L as N):	<0.634		4.54	Denver	~~SG~~ YHK	SG
Salinity:	≈17.5		≈17.5	YSI	SG	SG

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Jupiter RO
County: Palm Beach
Contact / District: T. Davis / SE-DIST
NPDES Permit #: FL00 42358
LIMS Sample #: 491747 (11-6-00 mf) **LIMS Job #:** TCH-2000-10-31-49
sample log
Test Type: ~~Screening~~ | Definitive
(Static) | Static Renewal | Flow-through
Test Number: 2 of 2

Sample Collection: Date 10/30/00 Time 1055
Test Beginning: Date 10/31/00 Time 1410
Test Ending: Date 11/2/00 Time 1310
Organism Batch #: 42 **Diluent Batch #:** NSW
Organism Age: 11days SRT toxicant batch #: NA
Test organism: M. beryllina

Remarks:

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
CNTL. A	E9	5	5	5	8.1	8.1	8.2	24.6	24.7	24.6	7.1	6.7	6.8	26.9	27.4	23.6
B	E10	5	5	5	8.1	8.1	8.2	24.6	24.1	24.3	7.2	6.8	6.8	27.7	27.5	27.8
C	E11	5	5	5	8.1	8.1	8.2	24.6	24.3	24.0	7.3	6.8	7.0	27.5	27.6	28.0
D	E12	5	5	5	8.1	8.1	8.2	24.6	24.2	24.0	7.3	6.8	6.9	27.8	27.6	27.7
100% A	E13	5	5	5	7.5	7.8	8.0	24.5	23.9	24.1	7.0	6.9	6.9	28.8	28.9	29.3
B	E14	5	5	5	7.5	7.8	8.0	24.4	23.9	24.3	7.0	6.9	6.9	28.8	28.6	29.1
C	E15	5	5	5	7.5	7.8	8.0	24.5	24.1	24.4	7.0	6.9	6.7	28.8	29.0	29.3
D	E16	5	5	5	7.5	7.8	8.0	24.5	24.6	24.1	7.1	6.7	6.9	28.9	29.0	29.3
measured by:		YMK	SG	SG	SG	SG	SG	SG	SG	SG	SG	SG	SG	SG	SG	SG
recorded by:		SG	SG	SG	[illegible]	YMK	[illegible]	[illegible]	YMK	[illegible]	[illegible]	YMK	[illegible]	[illegible]	YMK	[illegible]

Investigators' Signatures
Shannon Gerard
John Cox
Jon Plaia
A H Wolfe
reviewer

form updated 3/3/99

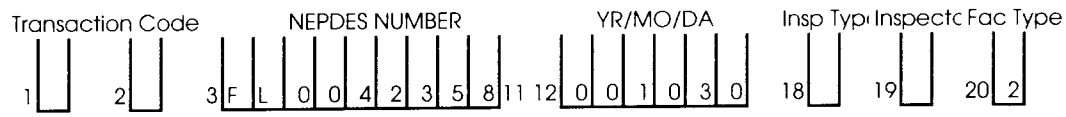
Temperature Range °C
Incubator # 3 24.5 - 26.0°C
Room B246 25.0° - 26.0°C

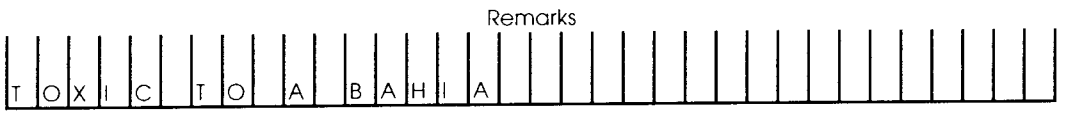
Salt Water / Well Water | 20% Min Water

Water Quality Parameters	Sample	Method	Measured by	Verified by
Field Total Residual Cl2 (mg/L):	NA	NA	NA	SG
Lab Total Residual Cl2 (mg/L):	<0.03	DR100	SG	SG
Alkalinity (mg/L as $CaCO_3$):	195	Hach	JA	SG
Hardness (mg/L as $CaCO_3$):	NA	Hach	JA	SG
Total ammonia (mg/L as N):	<0.054	Denver	YMK	SG
Salinity:	≈17.5	YSI	SG	SG

The Bioassay of the Jupiter Reverse Osmosis (RO) Treatment and Disposal Facility effluent sampled on October 30, 2000, NPDES #FL0042358

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

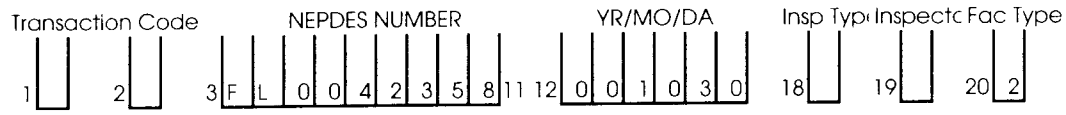


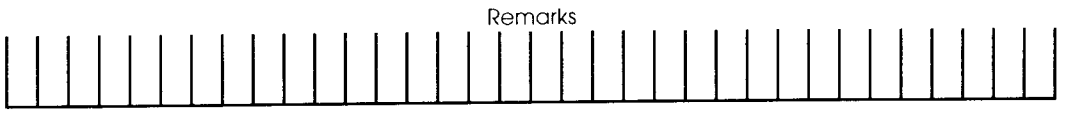


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The Priority Pollutants Analysis for Bioassay of the Jupiter Reverse Osmosis (RO) Treatment and Disposal Facility effluent sampled on October 30, 2000, NPDES #FL0042358

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





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