



Bioassays of the City of
Venice Reverse Osmosis Water Treatment Plant
Venice, Sarasota County, Florida
NPDES #FL0035335
Sampled 3/4/02

July 2002

Biology Section
Division of Resource Assessment & Management
Comprehensive Quality Assurance Plan #870346G

Bioassays of the City of
Venice Reverse Osmosis Water Treatment Plant
Venice, Sarasota County, Florida
NPDES #FL0035335

**Biology Section
Bureau of Laboratories
July 2002**

Introduction

City of Venice Reverse Osmosis Water Treatment Plant, 401 West Venice Avenue, Venice, Sarasota County, Florida, NPDES #FL0035335, tests performed on 5 to 7 March 2002.

This RO Plant has a design flow of 4.0 MGD and an annual average flow of 2.079 MGD (January, 2001-December, 2001). The concentrate from the facility is treated by chlorination for sulfide reduction and oxidation. The concentrate is also treated by aeration prior to discharge into the Class III Marine Waters of the Intracoastal Waterway, 200 feet south of the Venice Avenue Bridge. The facility is permitted for mixing zones for Radium^{226 & 228}, Gross Alpha Activity, and chronic toxicity (facility information provided by Joe Hillring, FDEP, Tampa; and, Bill Green, City of Venice, Venice, FL.).

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 collected from the City of Venice Reverse Osmosis Water Treatment Plant. The apparent salinity of the sample, based on conductivity and temperature measurements, was approximately 3‰; therefore, the test species used for these bioassays were the mysid shrimp, *Americamysis bahia*, and the inland silverside, *Menidia beryllina*. The test results indicated that the sample was acutely toxic to the *Americamysis bahia* test organisms, producing 100% mortality within 24-hours of test initiation. Test results did not show toxicity to the *Menidia beryllina* test organisms within 48 hours of test initiation (Table 1).

To ensure that the minimum salinity requirements of the test organisms (6‰ for *Americamysis bahia* and 1‰ for *Menidia beryllina*) were met, aliquots of the bioassay sample were adjusted by the addition of artificial-sea salts to apparent salinities of 9‰ and 4‰, respectively, for the *Americamysis bahia* bioassay and the *Menidia beryllina* bioassay. The control water for each bioassay was natural seawater (NSW) diluted with well water to the appropriate test salinity. To determine any detrimental effect of adding artificial sea salts to the sample, additional controls were prepared by diluting NSW to the apparent salinity (3‰) of the original sample, and then adjusting the salinity of the diluted NSW with artificial sea salts to the appropriate test salinity.

Total residual chlorine was not detected in the bioassay sample in the laboratory. The total and unionized ammonia concentrations were 0.640 mg/L and 0.019 mg/L, respectively. Total ammonia in the sample preserved for chemical analyses was 0.59 mg/L. Further chemical analyses were performed on the sample, and several metals and other constituents were identified (Table 2).

The chemistry results confirmed that the ion makeup of the sample was not in seawater proportions and that the apparent 3‰ 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 788 mg/L at 3‰ salinity (salinity based on conductivity and temperature). This is approximately twenty-two times (22X) the normal concentration for calcium in seawater of this salinity. The magnesium concentration was measured at 312 mg/L at 3‰ salinity. This is approximately three times (2.8X) the normal concentration for magnesium in seawater of this salinity. The elevated calcium and magnesium concentrations are two sources 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 March 4, 2002, did not show toxicity to *M. beryllina*, but did show acute toxicity to *A. bahia*. The cause of toxicity was attributed, at least in part, to the elevated calcium and magnesium concentrations in the sample. The presence of other unidentified toxicants cannot be ruled out without performing the major-seawater-ion imbalance toxicity testing.

Table 1.

Florida, NPDES# FL0035335, performed from 5 to 7 March 2002.

Facility: City of Venice RO Facility	NPDES # FL0035335	Facility Type: Reverse Osmosis Plant	Analysts: Della Parker-Hanson Joshua Ayres Gary Hardie Marshall Faircloth
Location: 401 West Venice Avenue	Contact/District: Grainger/Southwest	Receiving Water: Intracoastal Waterway	
County: Sarasota	Test type: static acute screen		
Sample Collection Date: 3/4/02	# tests: 2		
Time: 1040	Chlorination Type: Chlorinated		
Test Beginning Date: 3/5/02	sample collected after dechlorination		
Time: 1530			
Test Ending Date: 3/7/02			
Time: 1540			

Page 1 of 1

Reviewer: David Whiting

Organism: <i>Americamysis bahia</i>		Life stage: 2 days												Conductivity	
Concentrations	Sample/Diluent Volume(mL)	SURVIVAL # Alive			pH			Temperature ^B			Dissolved Oxygen			Uncorrected mmhos/cm	
		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	24 hour
Control A	0/500	5	5	-	8.0	8.0	-	23.8	25.1	-	7.9	6.2	-	15.0	15.3
Control B	0/500	5	5	-	8.0	8.0	-	23.7	24.8	-	7.6	6.6	-	15.3	15.6
Control C	0/500	5	5	-	8.0	8.0	-	23.7	24.5	-	7.6	6.6	-	15.3	15.6
Cotnrol D	0/500	5	5	-	8.0	8.0	-	23.7	24.1	-	7.7	6.6	-	15.4	16.3
Salt Ctrl A	0/500	5	4	-	8.2	8.2	-	23.5	24.1	-	7.7	6.1	-	14.4	14.8
Salt Ctrl B	0/500	5	4	-	8.2	8.2	-	23.5	24.2	-	7.7	6.3	-	14.3	14.6
Salt Ctrl C	0/500	5	5	-	8.2	8.2	-	23.5	24.4	-	7.8	6.5	-	14.3	14.6
Salt Ctrl D	0/500	5	5	-	8.2	8.2	-	23.5	24.3	-	7.8	6.5	-	14.3	14.9
100% A	500/0	5	0 ^A	-	7.7	8.1	-	23.5	24.3	-	7.1	6.1	-	14.4	14.9
100% B	500/0	5	0 ^A	-	7.7	8.1	-	23.5	24.8	-	7.1	6.0	-	14.5	14.8
100 % C	500/0	5	0 ^A	-	7.7	8.1	-	23.6	24.5	-	7.0	6.0	-	14.5	15.3
100% D	500/0	5	0 ^A	-	7.7	8.1	-	23.6	24.5	-	7.0	5.4	-	14.4	15.0

^A Test terminated at 24 hours due to complete mortality in the 100% sample. ^B Temperatures of room and test incubator were continuously recorded on a strip chart recorder. Room Temperature range for the test period was 22.5-25.0°C. Incubator #3 temperature range for the test period was 25.0-25.5°C.

Organism: <i>Menidia beryllina</i>		Life stage: 13 days												Conductivity	
Concentrations	Sample/Diluent Volume(mL)	SURVIVAL # Alive			pH			Temperature ^C			Dissolved Oxygen			Uncorrected mmhos/cm	
		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	8.2	8.2	23.5	25.1	24.0	7.8	7.2	7.4	6.85	8.07
Control B	0/500	5	5	5	8.0	8.2	8.2	23.6	25.1	23.8	7.8	7.2	7.4	7.31	7.84
Control C	0/500	5	5	5	8.0	8.2	8.2	23.7	25.1	23.9	7.8	7.1	7.4	7.38	7.84
Cotnrol D	0/500	5	5	5	8.0	8.2	8.2	23.7	24.9	24.2	7.8	7.1	7.3	7.36	8.03
Salt Ctrl A	0/500	5	5	5	8.1	8.2	8.3	23.6	24.9	24.1	7.8	7.0	7.3	6.96	7.45
Salt Ctrl B	0/500	5	5	5	8.1	8.2	8.3	23.5	25.0	24.1	8.0	7.1	7.3	6.87	7.39
Salt Ctrl C	0/500	5	5	5	8.1	8.2	8.3	23.6	25.3	24.1	7.9	7.1	7.3	6.91	7.32
Salt Ctrl D	0/500	5	5	5	8.1	8.2	8.3	23.6	25.3	24.0	7.9	7.0	7.4	6.91	7.46
100% A	500/0	5	5	5	7.6	8.1	8.3	23.9	25.3	24.2	7.1	6.5	7.3	6.63	6.96
100% B	500/0	5	5	5	7.6	8.1	8.3	23.9	25.2	23.7	7.1	6.5	7.2	6.66	7.08
100 % C	500/0	5	5	5	7.6	8.1	8.3	24.0	25.3	23.9	7.1	6.6	7.6	6.64	6.98
100% D	500/0	5	5	5	7.6	8.1	8.3	24.0	25.3	23.9	7.1	6.6	7.5	6.65	6.87

^C Temperatures of room and test incubator were continuously recorded on a strip chart recorder. Room Temperature range for the test period was 22.5-25.0°C. Incubator #3 temperature range for the test period was 25.0-25.5°C.

LIMS	
Job number:	TLH-2002-03-05-03
sample number:	580469

Data Transcription Verification	
date:	4/24/02
by:	Joshua Ayres /Gary Hardie

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

Ammonia	Total (mg/L)	Unionized (mg/L)
NSW	<0.017	<0.017
100% Sample:	0.640	0.019

Alk & Hardness	Alkalinity (mg/L)	Hardness (mg/L)
NSW	134	-
100% Sample:	256	-

Salinity ^D	ppt
Mysid Control	~9
Menidia Control:	~4
Mysid 100% sample:	~9
Menidia 100% sample:	~4
unadjusted 100% Sample	~3

^D Salinity based on conductivity and temperature.

Table 2. Results of chemical analyses on the effluent from City of Venice RO facility sampled on March 4, 2002.

Metals

Calcium	788	mg/L	
Copper	0.5	µg/L	¹
Magnesium	312	mg/L	
Nickel	2.5	µg/L	¹

Other

Chloride	480	mg/L	
Fluoride	3.3	mg/L	
Sulfide	1.2	mg/L	^A
Radium 226	1.8	pCi/L	
Radium 228	5.9	pCi/L	

Pesticides and Herbicides

None detected

Base, Neutral, & Acid Extractable Organics

None detected

^A Value reported is the mean of two or more determinations.

¹ The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.

The Bioassay of the City of Venice RO facility effluent sampled on March 4, 2002, NPDES #FL0035335.

Fill Out This Section For All Surface Water Discharger Inspections(CEI, CSI, CBI, PAI, X

Transaction Code		NPDES NUMBER										YR/MO/DA				Insp Type	Inspector	Fac Type									
1	N	2	5	3	F	L	0	0	3	5	3	3	5	11	12	0	2	0	3	0	4	18	B	19	S	20	1

Remarks																												
T	O	X	I	C	T	O	A	B	A	H	I	A																

The Priority Pollutants Analysis for the Bioassay of the City of Venice RO facility effluent sampled on March 4, 2002, NPDES #FL0035335.

Fill Out This Section For All Surface Water Discharger Inspections(CEI, CSI, CBI, PAI, X

Transaction Code		NPDES NUMBER										YR/MO/DA				Insp Type	Inspector	Fac Type									
1	N	2	5	3	F	L	0	0	3	5	3	3	5	11	12	0	2	0	3	0	4	18	X	19	S	20	1

Remarks																												