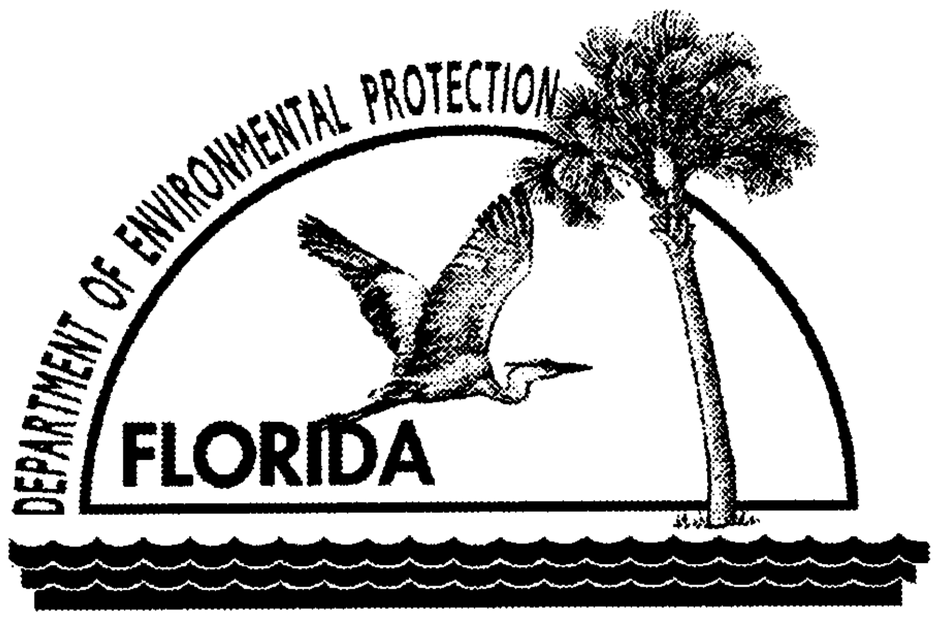


Bioassays of the City of

Boca Raton Wastewater Treatment Plant

Boca Raton, Palm Beach County, Florida

NPDES #FL0026344

Sampled 12/9/96

June 1997

Biology Section

Division of Administrative & Technical Services

Comprehensive Quality Assurance Plan #870346G

Bioassays of the City of

Boca Raton Wastewater Treatment Plant

Boca Raton, Palm Beach County, Florida

NPDES #FL0026344

Biology Section
Bureau of Laboratories
June 1997

Introduction

City of Boca Raton Wastewater Treatment Plant, 1501 Glades Road, Boca Raton, Palm Beach County, Florida, NPDES # FL0026344, tests performed on 10 to 12 December, 1996.

This wastewater treatment plant has a design flow of 17.5 MGD and a mean flow of 13.6 MGD. Wastewater is treated by the activated-sludge process with fine-bubble aeration, clarification, and chlorination for basic disinfection. Approximately half of the clarifier effluent may go to tertiary filters before being routed to a chlorination chamber for high level disinfection then routed to a storage tank. This water is reclaimed for irrigation. The facility is permitted to reclaim 9.0 MGD of tertiary treated water and currently reclaims approximately 0.9 MGD. Non-tertiary treated effluent is discharged into the Atlantic Ocean via an outfall located 5,000 feet offshore at a depth of 90 feet. The facility permit includes two circular mixing zones centered over the end of the outfall pipe with radii of 16 meters and 17 meters, respectively, for acute toxicity and chlorine (facility summary provided by Lisa M. Scott, FDEP, Southeast District, 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 toxicity bioassays on a sample of effluent from this facility. At the request of the Southeast District, the tests were conducted to reflect the permit requirements and were performed with a maximum concentration of 30% whole effluent. The resulting salinity of the sample when diluted with natural seawater having a salinity of 30.5 ppt was approximately 21.6 ppt; therefore, the test species used for these bioassays were the mysid shrimp, *Americamysis bahia*, in the definitive test and the inland silverside minnow, *Menidia beryllina*, in the screening test.

The control water and the diluent for the definitive test was natural seawater having a salinity of 30.5 ppt. The control water for the screening test was natural seawater diluted with deionized water to the apparent salinity (approximately 21.5 ppt) of the 30% whole effluent in natural seawater.

The test results indicated that the sample was not toxic to either test species (Table 1). Total residual chlorine was not detected in the sample. The total ammonia and unionized ammonia concentrations were 0.08 mg/L and < 0.017 mg/L, respectively. Further chemical analysis were performed on the sample and several metals and the herbicide, atrazine, were detected (Table 2).

Conclusion

The sample of effluent, diluted to 30%, collected from this facility on 9 December, 1996, did not show toxicity.

Table 1. Data recorded during the 48-hour acute toxicity bioassays of a sample of effluent from the city of Boca Raton Water Treatment Plant, Boca Raton, Palm Beach County, Florida, NPDES#FL0026344, performed on 10 to 12 December, 1996.

Facility:	**City of Boca Raton WWTP**		NPDES #	FL0026344	Facility Type: Wastewater
Location:	1501 Glades Road, Boca Raton		Contact/District:	Terry Davis/ Southeast	Treatment Plant
County:	Palm Beach		Test type:	static acute definitive and screening	
Sample Collection Date:	12/9/96	Time: 1250	# tests:	2	Receiving Water: Atlantic Ocean
Test Beginning Date:	12/10/96	Time: 1515	Chlorination Type:	chlorinated	
Test Ending Date:	12/12/96	Time: 1515			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 (mysids):	< 0.017	< 0.017
30% sample:	<0.017	<0.017
100% Sample:	0.08	<0.017

Alk & Hardness	Alkalinity (mg/L)	Hardness (mg/L)
Control Water (fish):	115	-
Control Water (mysids):	110	-
30% sample:	115	-
100% Sample:	100	145

Salinity	(ppt)
Control Water (fish):	21.5
30% Sample:	21.5
Control Water (mysids):	30.5

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	8.0	8.0	8.0	24.2	23.8	24.1	6.9	6.4	6.0	45.8	46.1
Control B	0/500	5	5	5	7.9	8.0	8.0	23.3	23.8	23.9	7.1	6.6	6.0	44.8	46.0
Control C	0/500	5	5	5	8.0	8.0	8.0	24.0	23.8	23.8	7.0	6.4	6.1	45.6	46.1
Control D	0/500	5	5	5	8.0	8.0	8.0	24.1	23.6	23.8	7.0	6.4	6.1	45.6	46.2
5.9% A	29.5/470.5	5	5	5	8.0	8.0	8.0	23.5	23.6	23.8	6.8	6.6	6.1	42.5	43.6
5.9% B	29.5/470.5	5	5	5	8.0	8.0	8.0	23.2	23.5	23.7	7.1	6.6	6.0	42.4	43.3
5.9% C	29.5/470.5	5	5	5	8.0	8.0	8.0	23.2	23.6	23.7	7.2	6.6	6.0	42.4	43.2
5.9% D	29.5/470.5	5	5	5	8.0	8.0	8.0	23.3	23.6	23.5	7.2	6.6	6.0	42.4	43.4
8.9% A	44.5/453.5	5	5	5	8.0	8.0	8.0	23.3	23.5	23.7	6.9	6.4	6.0	41.3	42.4
8.9% B	44.5/453.5	5	5	5	8.0	8.0	8.0	23.3	23.5	23.7	7.0	6.5	6.0	41.3	42.0
8.9% C	44.5/453.5	5	5	5	8.0	8.0	8.0	23.3	23.5	23.7	7.2	6.6	6.1	41.3	42.0
8.9% D	44.5/453.5	5	5	5	8.0	8.0	8.0	23.4	23.5	23.5	7.2	6.6	6.1	41.3	42.0
13.3% A	66.5/433.5	5	5	5	8.0	8.0	8.0	23.4	23.5	23.6	7.2	6.8	6.2	39.7	40.7
13.3% B	66.5/433.5	5	5	5	8.0	8.0	8.0	23.5	23.5	23.6	7.1	6.7	6.1	39.7	40.3
13.3% C	66.5/433.5	5	5	5	8.0	8.0	8.0	23.5	23.5	23.5	7.2	6.6	6.1	39.7	40.2
13.3% D	66.5/433.5	5	5	5	8.0	8.0	8.0	23.5	23.9	23.4	7.1	6.5	6.1	39.7	40.2
20% A	100/400	5	5	5	8.0	8.0	8.0	23.6	23.5	23.6	6.9	6.7	6.3	37.3	38.0
20% B	100/400	5	5	5	7.9	8.0	8.0	23.7	23.5	23.6	7.1	6.7	6.3	37.2	37.6
20% C	100/400	5	5	5	7.9	8.0	8.0	23.7	23.4	23.6	7.2	6.6	6.2	37.2	37.6
20% D	100/400	5	5	5	7.9	8.0	8.0	23.8	23.5	23.5	7.2	6.6	6.2	37.1	37.7
30% A	150/350	5	5	5	7.9	8.0	8.0	24.0	23.5	23.7	6.8	6.8	6.4	33.6	34.3
30% B	150/350	5	5	5	7.8	8.0	8.0	24.1	23.6	23.8	7.0	6.8	6.4	33.5	34.0
30% C	150/350	5	5	5	7.8	8.0	8.0	24.1	23.6	23.8	7.2	6.8	6.4	33.5	33.9
30% D	150/350	5	5	5	7.8	8.0	8.0	24.1	23.7	23.7	7.2	6.8	6.3	33.5	33.9

[A] Temperature of test room was continously recorded on a strip chart recorder.
Room temperature range for the test period was 23-24°C.

Organism: ***Menidia beryllina*** Age: 19 days

	Sample/Diluent	SURVIVAL # Alive			pH			Temperature[B]			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	8.0	7.9	8.0	23.5	23.8	23.8	6.9	6.7	6.7	33.2	33.8
Control B	0/500	5	5	5	8.0	8.0	8.0	23.3	23.8	23.7	7.3	6.7	6.6	33.2	33.9
Control C	0/500	5	5	5	8.1	8.0	8.0	23.3	23.7	23.7	7.4	6.9	6.6	33.2	33.9
Control D	0/500	5	5	5	8.0	8.0	8.0	23.4	23.6	23.6	7.4	6.8	6.6	33.3	33.9
30% A	500/0	5	5	5	7.9	8.0	8.0	23.6	23.8	23.6	7.5	6.7	6.6	32.4	33.8
30% B	500/0	5	5	5	7.9	8.0	8.0	23.6	23.7	23.6	7.0	6.7	6.6	33.1	33.6
30% C	500/0	5	5	5	7.8	8.0	8.0	23.6	23.6	23.5	7.4	6.7	6.5	33.1	33.5
30% D	500/0	5	5	5	7.8	8.0	8.0	23.4	23.6	23.5	7.4	6.8	6.5	33.1	33.6

[B] Temperature of test room was continously recorded on a strip chart recorder.
Room temperature range for the test period was 23-24°C.

Table 2. Results of chemical analyses on the effluent from the City of Boca Raton WWTP sampled on December 9, 1996.

Metals

Aluminum	77	µg/L
Calcium	48.1	mg/L
Chromium	5	µg/L[I]
Copper	6	µg/L[I]
Iron	69	µg/L
Lead	19	µg/L[I]
Magnesium	5.08	mg/L
Nickel	15	µg/L
Silver	0.21	µg/L
Zinc	25	µg/L[J]

Pesticides and Herbicides

Atrazine	0.18	µg/L[I]

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.

J Estimated value.

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Boca Raton WWTP
County: Palm Beach
Contact / District: T. Davis / SED
NPDES Permit #: FL0026344
LIMS Sample #: 162171 LIMS Job #: 96-DEC-10-02
sample log 12/13/96 DW
Test Type: Screening | Definitive
Static | Static Renewal | Flow-through
Test Number: 1 of 2
Remarks:

Sample Collection: Date 12/7/96 Time 12:50
Test Beginning: Date 12/10/96 Time 1515
Test Ending: Date 12/12-96 Time 1515
Organism Batch #: 341 Diluent Batch #: NSW
Organism Age: 3days
Test Organism: Americamysis bahia

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0	22.2 @ 22.2	8.6 @ 22.9 °C	102.7 @ 92.8
	7.0 @ 7.0			986 @ 1001 @ 24.0 °C
24 hr	7.0 @ 7.0	23.6 @ 23.6	8.4 @ 23.7 °C	10.7 @ 101.0
	7.0 @ 7.0			1003 @ 101.1 @ 25.0 °C
48 hr	7.0 @ 7.0	23.0 @ 23.0	8.5 @ 23.1 °C	10.5 @ 101.0
	7.0 @ 7.0			997 @ 101.1 @ 24.7 °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
Ctr A	B1	5	5	5	7.9	8.0	8.0	24.2	23.8	24.1	6.9	6.4	6.0	45.8	45.9	46.1
Ctr B	B2	5	5	5	7.9	8.0	8.0	23.3	23.8	23.9	7.1	6.6	6.0	44.8	45.7	46.0
Ctr C	B3	5	5	5	8.0	8.0	8.0	24.0	23.8	23.8	7.0	6.4	6.1	45.6	45.9	46.1
Ctr D	B4	5	5	5	8.0	8.0	8.0	24.1	23.8	23.8	7.0	6.4	6.1	45.6	46.0	46.2
5.9% A	B5	5	5	5	8.0	8.0	8.0	23.5	23.6	23.8	6.8	6.6	6.1	43.5	43.2	43.6
5.9% B	B6	5	5	5	8.0	8.0	8.0	23.2	23.6	23.7	7.1	6.6	6.0	42.4	43.1	43.3
5.9% C	B7	5	5	5	8.0	8.0	8.0	23.2	23.5	23.7	7.2	6.6	6.0	42.4	43.1	43.2
5.9% D	B8	5	5	5	8.0	8.0	8.0	23.3	23.6	23.5	7.2	6.6	6.0	42.4	43.2	43.4
8.9% A	B9	5	5	5	8.0	8.0	8.0	23.3	23.6	23.7	6.4	6.4	6.0	41.3	42.0	42.4
8.9% B	B10	5	5	5	8.0	8.0	8.0	23.3	23.5	23.7	7.0	6.5	6.0	41.3	41.8	42.0
8.9% C	B11	5	5	5	8.0	8.0	8.0	23.3	23.5	23.7	7.2	6.6	6.1	41.3	41.9	42.0
8.9% D	B12	5	5	5	8.0	8.0	8.0	23.4	23.5	23.5	7.2	6.6	6.1	41.3	41.9	42.0
13.3% A	B13	5	5	5	8.0	8.0	8.0	23.4	23.5	23.6	7.2	6.8	6.2	39.7	43.0	40.7
13.3% B	B14	5	5	5	8.0	8.0	8.0	23.5	23.5	23.6	7.1	6.7	6.1	39.7	41.0	40.3
13.3% C	B15	5	5	5	8.0	8.0	8.0	23.5	23.5	23.5	7.2	6.6	6.1	39.7	41.0	40.2
13.3% D	B16	5	5	5	8.0	8.0	8.0	23.5	23.5	23.4	7.1	6.5	6.1	39.7	41.0	40.2
20% A	B17	5	5	5	8.0	8.0	8.0	23.6	23.5	23.6	6.9	6.7	6.3	37.3	37.5	38.0
20% B	B18	5	5	5	7.9	8.0	8.0	23.7	23.5	23.6	7.1	6.7	6.3	37.2	37.4	37.6
20% C	B19	5	5	5	7.9	8.0	8.0	23.7	23.4	23.6	7.2	6.6	6.2	37.2	37.4	37.6
20% D	B20	5	5	5	7.9	8.0	8.0	23.8	23.5	23.5	7.2	6.6	6.2	37.1	37.5	37.7
30% A	B21	5	5	5	7.9	8.0	8.0	24.0	23.5	23.7	6.8	6.8	6.4	33.6	33.7	34.3
30% B	B22	5	5	5	7.8	8.0	8.0	24.1	23.6	23.8	7.0	6.8	6.4	33.5	33.6	34.0
30% C	B23	5	5	5	7.8	8.0	8.0	24.1	23.6	23.8	7.2	6.8	6.4	33.5	33.6	33.9
30% D	B24	5	5	5	7.8	8.0	8.0	24.1	23.7	23.7	7.2	6.8	6.3	33.5	33.7	33.9
Measured/Loaded by:		DW	ND	DW	JS	DN	DW	JS	DN	DW	JS	DN	DW	JS	DN	DW
Recorded by:		JS	ND	DW	JF	ND	ND	JF	ND	ND	JF	ND	ND	JF	ND	ND

A 8.0 12/10/96 JF per DW control

B 24 hr conductivity 13.3%

A 40.5 ND

B 40.1 ND

C 40.1 ND

D 40.1 ND

incorrect numbers can like ow 2/10/97

Investigators' Signatures

Reviewer

Form updated 4/01/96

Water Quality Parameters	Salt Water Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2 (mg/L):			not measured		
Lab Total Residual Cl2 (mg/L):	<0.03	<0.03	<0.03	DR-100	JS
Alkalinity (mg/L as $CaCO_3$):	well 120 salt 110	70	100	Hach	ND
Hardness (mg/L as $CaCO_3$):	well 125 salt NA	85	145	Hach	ND
Total ammonia (mg/L as N):	0.032	0.038	0.080	ORION	DN

Ammonia Ammonia Salt H_2O <0.017 Ammonia 30% Control <0.017 ORION Sample DN 12/14/96

Meter #98136 Meter Slope: -54.6 Blank: <0.017 Salinity: 30.5 ppt Salinity: 21.6 ppt

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Boca Raton WWTP
County: Palm Beach
Contact / District: T. Davis / SED
NPDES Permit #: FL0026344
LIMS Sample #: 162171 **LIMS Job #:** 96-DEC-10-02
sample log 12/13/96 DW

Sample Collection: Date 12/7/96 Time 12:50
Test Beginning: Date 12/10/96 Time 15:00
Test Ending: Date 12-14-96 Time 1500
Organism Batch #: 47 **Diluent Batch #:** USW
Organism Age: 19 days
Test Organism: Menidia beryllina

Test Type: Screening / Definitive
Static / Static Renewal / Flow-through

Test Number: 2 of 2

Remarks: Insufficient number of Menidia to conduct a definitive test.

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	22.2 @ 22.2	8.6 @ 22.9 °C	102.7 @ 92.8 986 @ 1001 @ 24.0 °C 9880 @ 9997
24 hr	7.0 @ 7.0 9.0 @ 9.0	23.6 @ 23.6	6.7 @ 23.7 °C	104.2 @ 101.0 1005 @ 1001 @ 25.0 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	23.0 @ 23.0	7.5 @ 23.1 °C	1059 @ 1012 997 @ 1001 @ 24.7 °C 9890 @ 9997

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
Ctr A	C1	5	5	5	8.0	7.9	8.0	23.5	23.8	23.8	6.9	6.7	6.7	33.2	33.7	33.8
Ctr B	C2	5	5	5	8.0	8.0	8.0	23.3	23.8	23.7	7.3	6.7	6.6	33.2	33.7	33.9
Ctr C	C3	5	5	5	8.1	8.0	8.0	23.3	23.7	23.7	7.4	6.9	6.6	33.2	33.7	33.9
Ctr D	C4	5	5	5	8.0	8.0	8.0	23.4	23.6	23.6	7.4	6.8	6.6	33.3	33.7	33.9
30.0% A	C5	5	5	5	7.9	8.0	8.0	23.6	23.8	23.6	7.5	6.7	6.6	32.4	33.6	33.8
30.0% B	C6	5	5	5	7.9	8.0	8.0	23.3	23.7	23.6	7.0	6.7	6.6	33.1	33.5	33.6
30.0% C	C7	5	5	5	7.8	8.0	8.0	23.3	23.6	23.5	7.4	6.7	6.5	33.1	33.4	33.5
30.0% D	C8	5	5	5	7.8	8.0	8.0	23.4	23.6	23.5	7.4	6.8	6.5	33.1	33.5	33.6
Measured/Loaded by:		DW	DW	DW	JS	DN	DW	JS	DN	DW	JS	DN	DW	JS	DN	DW
Recorded by:		JS	DN	DW	JF	ND	ND	JF	ND	ND	JF	ND	ND	JF	ND	ND

Investigators' Signatures

12/10/96

reviewer

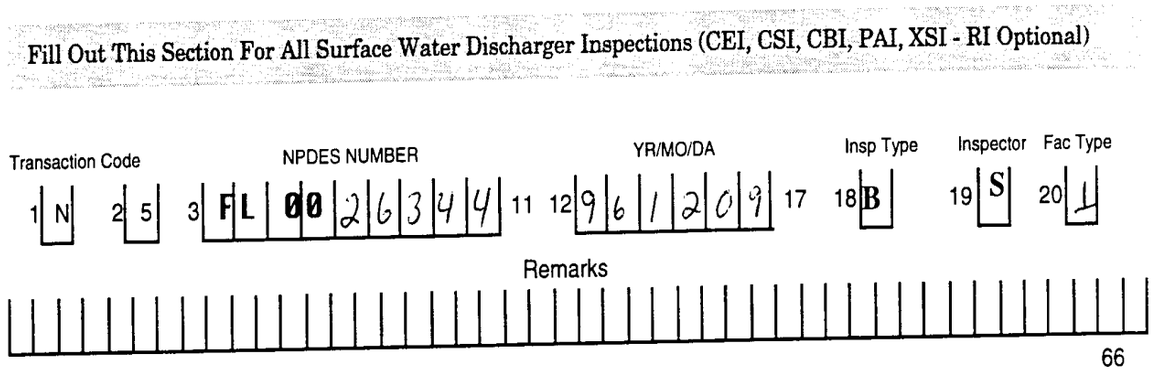
form updated 4/01/96

Water Quality Parameters

	Salt Water / Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2 (mg/L):			Not measured		
Lab Total Residual Cl2 (mg/L):	<0.03	<0.03	<0.03	DR-100	JS
Alkalinity (mg/L as $CaCO_3$):	well 120 / salt 115	70	100	Hach	ND
Hardness (mg/L as $CaCO_3$):	well 125 / salt NA	95	145	Hach	ND
Total ammonia (mg/L as N):	0.032	0.035	0.080	ORION	DN
	Ammonia Salt H2O <0.017	Ammonia 30% sample <0.017	Control Ammonia		Sample by mf

Meter #98136 Meter Slope: -54.6 Blank: <0.017 Salinity: 21.5 ppt Salinity: 21.5 ppt

The Bioassay of the City of Boca Raton WWTP effluent sampled on December 9, 1996, NPDES # FL0026344.



The Priority Pollutants Analysis for the Bioassay of the City of Boca Raton WWTP effluent sampled on December 9, 1996, NPDES # FL0026344.

