Florida

Department of Environmental Protection

Bioassays of

Boca Chica Naval Air Station

Wastewater Treatment Plant

Boca Chica Key, Monroe County, Florida

NPDES #FL0020982

Sampled 9/27/93

December 1993

Biology Section
Division of Technical Services

Bioassays of

Boca Chica Naval Air Station
Wastewater Treatment Plant

Boca Chica Key, Monroe County, Florida

NPDES #FL0020982

Biology Section
Bureau of Laboratories
December 1993

Introduction

Boca Chica Naval Air Station WWTP, Boca Chica Key, Monroe County, Florida, NPDES #FL0020982, tests performed on 28 to 30 September, 1993.

This facility is located on Boca Chica Key near Mile 7.7 of US 1. The plant has a design-flow of 0.4 MGD with an average flow of 0.3 MGD, although it exceeds its design-flow due to inflow/infiltration problems. The facility uses an extended-aeration treatment process, enhanced by contact stabilization, clarification, chlorine disinfection, and dechlorination prior to effluent discharge to the Gulf of Mexico.

Due to inflow/infiltration from a rain event which occurred prior to sampling, the facility suffered a total solids washout which resulted in effluent of poor quality being discharged. The facility has a history of inflow/infiltration problems documented during previous FDEP inspections and was recently served Notice of Violation and Orders for Corrective Action legal papers (FDEP Field Summary and Inspection Report, Gus Rios and Nancy Brooking, Marathon).

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 8.5 ppt, therefore, the test species used for these bioassays were the mysid shrimp, *Mysidopsis bahia,* and inland silverside, *Menidia beryllina*. The control water for the tests was adjusted to a salinity of about 10 ppt using an artificial sea salt mixture (Forty Fathoms®); the salinity of the sample was not altered.

The sample exhibited some toxicity resulting in three deaths in the mysid test and two deaths in the silverside test. Total residual chlorine of the sample was 0.04 mg/L in the laboratory and < 0.5 mg/L in the field. Total and unionized ammonia concentrations were 4.05 and 0.03 mg/L, respectively.

Further chemical analyses were performed on the sample and indicated the presence of the metals shown in Table 2. The metals present each exceeded their respective Class III marine surface water criterion. The metals do not appear to be present in concentrations known to be acutely toxic to the test species. However, a zinc concentration of 120 µg/L was found to be chronically toxic to mysids (EPA *Water Quality Criteria*, 1986). Pesticides and organics were not detected in the sample.

Conclusion

The sample of effluent collected from this facility on 27 September, 1993, did show some toxicity. The cause of toxicity was not determined.

Table 1. Concentration series and volumes used for the 48-hour static acute screening bioassays of the Boca Chica Naval Air Station Wastewater Treatment Plant effluent performed on 28 to 30 September, 1993.

Menidia beryllina (inland silverside)

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

Mysidopsis bahia (mysid shrimp)

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 Boca Chica Naval Air Station WWTP, sampled on 27 September, 1993.

Metals

Aluminum	1950	µg/L	
Cadmium	4	µg/L	J
Calcium	158	mg/L	
Copper	51	µg/L	
Iron	1160	µg/L	
Magnesium	292	mg/L	
Silver	2.7	µg/L	
Zinc	141	µg/L	

Pesticides & Herbicides

None Detected

Base-Neutral & Acid Extractables

None Detected

J Value reported is the estimated value.

Table 3. Data recorded during the 48-hour acute screening bioassays of a sample of effluent from the Boca Chica Naval Air Station Wastewater Treatment Plant, Boca Chica Key, Monroe County, Florida, NPDES# FL0020982, performed on 28 to 30 September 1993.

Facility:	**Boca Chica Naval Air Station WWTP**	**NPDES #**	**FL0020982**	Facility Type:	**Wastewater treatment Plant**
Location:	Boca Chica Key	Contact / District:	Gus Rios / S		
County:	Monroe	Test type:	static acute screen		
Sample Collection Date:	**9/27/93** Time: 1000	# tests:	2	Receiving Water:	Gulf of Mexico
Test Beginning Date:	9/28/93 Time: 1300	Chlorination Type:	**Sample collected after dechlorination.**		
Test Ending Date:	9/30/93 Time: 1300		**Page 1 of 1**		

Total Residual Cl2	mg/l	Method
Field:	<0.5	DR-100
Lab:	0.04	DR-100

Ammonia	Total (mg/l)	Unionized (mg/l)
Control Water :	<0.017	0.00
100% Sample:	4.05	0.03

Alk & Hardness	Alkalinity (mg/l)	Hardness (mg/l)
Control Water:	175	-
100% Sample:	155	-

Salinity (ppt)	
Control Water:	10.0
100% Sample:	8.5

Organism: ***Mysidopsis bahia*** Age: 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	8.3	8.3	23.6	23.2	23.0	7.4	7.4	7.6	16.6	16.8
Control	5	5	5	8.3	8.3	8.3	-	-	22.9	7.4	7.4	7.7	16.6	16.8
100%	5	4	4	7.2	7.7	7.9	25.0	23.2	23.0	5.6	6.1	7.0	14.6	14.5
100%	5	4	3	7.2	7.7	8.0	-	-	23.0	5.6	6.2	7.1	14.6	14.5

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	8.3	8.2	8.3	23.6	23.2	22.9	7.3	7.4	7.6	16.6	16.9
Control	5	5	5	8.3	8.2	8.3	-	-	22.9	7.3	7.4	7.6	16.6	16.8
100%	5	5	5	7.1	7.7	7.9	25.0	23.2	22.9	5.6	6.1	7.0	14.6	14.3
100%	5	5	3	7.1	7.6	7.9	-	-	22.9	5.7	6.2	6.8	14.6	14.3

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: NAS Boca Chica
Location:
County: MONROE
Contact/District: GUS RIOS-NAN BY BROOKING MARATHON
NPDES Permit #: FL0020982 Outfall #:

Sample Collection: Date 9-27-93 Time 1000
Test Beginning: Date 9-28-93 Time 1300
Test Ending: Date 9-30-93 Time KP
Organism Batch #: 113 Diluent Batch #: 37
Organism Age: 4 days
Test Organism: Mysidopsis bahia

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

Test Number: 1 of 2

Remarks: 62765
93-SEP-28-21

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	24.1 @ 24.2	8.3 @ 24.4	1006 @ 1,000 9660 @ 10,000 @ 24.2 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	24.2 @ 24.3	8.4 @ 24.1	1000 @ 1,000 9600 @ 10,000 @ 24.1 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	23.8 @ 23.9	8.3 @ 23.8	1000 @ 1,000 9600 @ 10,000 @ 24.0 °C

Conc.	Chamber #	Number Live			pH			Temperature (°C)			D.O. (mg/L)			UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm)		
		0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h
Control A	8	5	5	5	8.2	8.3	8.3	23.6	23.2	23.0	~~8.8~~	7.4	7.6	16.6	16.6	16.8
Control B	413	5	5	5	8.3	8.3	8.3			22.9	~~8.8~~	7.4	7.7	16.6	16.8	16.8
100% A	1	5	4	4	7.2	7.7	7.9	25.0	23.2	23.0	~~7.1~~	6.1	7.0	14.6	14.3	14.5
100% B	390	5	4	3	7.2	7.7	8.0			23.0	~~7.1~~	6.2	7.1	14.6	14.4	14.5
											7.4					
											7.4					
											5.6					
											5.6					
											*changed D.O.					
											membrane					
											9/28/93 TM					
Measured/Loaded by:		TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM
Recorded by:		TR	TM	TM	TR	KP	TR	TR	KP	TR	TR	KP	TR	TR	KP	TR

Investigators' Signatures
Robin G. Rader
Tina Mikulski
Kim Pearce

Reviewer

form updated 7/8/93

Salt Water / Well Water

Water Quality Parameters

	Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2:			<0.5	—	GR/NB
Lab Total Residual Cl2:	<0.03	<0.03	0.04	DR-100	TM
Alkalinity:	175	70	155	Hach	TM
Hardness:	—	75	—	Hach	TM
Total Ammonia:	<0.017	—	4.05	Orion	AHW

Ammonia Meter #98136 Ammonia Meter Slope: -56.7 Ammonia Blank: <0.017

Control Salinity: 10 ppt Sample Salinity: 8.5 ppt

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: NAS Boca Chica
Location:
County: MONROE
Contact/District: GUS RIOS-NANCY BROOKING MARATHON
NPDES Permit #: FL00 20987 Outfall #:

Sample Collection: Date 9-27-93 Time 1100
Test Beginning: Date 9-28 93 Time 1300
Test Ending: Date 9-30-93 Time 1300
Organism Batch #: 24 Diluent Batch #: 37
Organism Age: 12 days
Test Organism: Menidia beryllina

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

Test Number: 2 of 2

Remarks: 62765
93SEP-28-21

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	24.1 @ 24.2	8.3 @ 24.4	1006 @ 1,000 9660 @ 10,000 @ 24.2 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	24.2 @ 24.3	8.4 @ 24.1	1000 @ 1,000 9600 @ 10,000 @ 24.1 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	23.8 @ 23.9	8.3 @ 23.8	1000 @ 1,000 9600 @ 10,000 @ 24.0 °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) Cond. (µmhos/cm) 0 hr	24 h	48 h
Control A	44	5	5	5	8.3	8.2	8.3	23.6	23.2	22.9	~~8.8~~	7.4	7.6	16.6	16.9	14.3
Control B	891	5	5	5	8.3	8.2	8.3			22.9	~~8.9~~	7.4	7.6	16.6	16.9	14.3
100% A	190	5	5	5	7.1	7.7	7.9	25.0	23.2	22.9	~~7.5~~	6.1	7.0	14.6	14.3	16.9
100% B	333	5	5	3	7.1	7.6	7.9			22.9	~~7.3~~	6.2	6.8	14.6	14.3	16.8
											7.3					
											7.3					
											5.6					
											5.7					
											*changed DO membrane 9/28/93 TM					
Measured/Loaded by:		TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM
Recorded by:		TR	TM	TM	TR	KP	TR	TR	KP	TR	TR	KP	TR	TR	KP	TR

Investigators' Signatures

Tobin G. Rader

Tina Mikulski

Kim Pearce

Reviewer

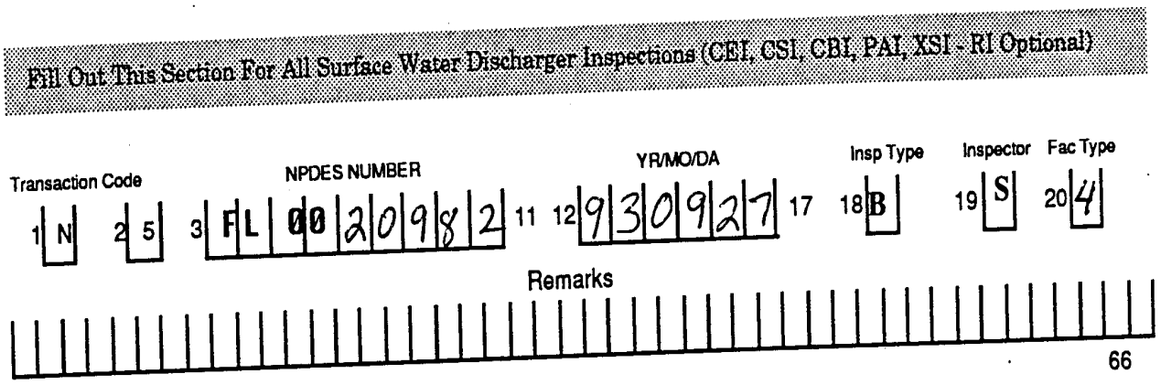
form updated 7/8/93

Water Quality Parameters

	(Salt Water/) Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2:			<0.5	—	NB/GR
Lab Total Residual Cl2:	<0.03	<0.03	0.04	DR-DR	TM
Alkalinity:	175	70	155	Hach	TM
Hardness:	—	75	—	Hach	TM
Total Ammonia:	<0.017	—	4.05	ORION	SHW

Ammonia Meter #98136 Ammonia Meter Slope: -56.9 Ammonia Blank: <0.017 Control Salinity: 10 ppt Sample Salinity: 8.5 ppt

The Bioassay of the Boca Chica Naval Air Station Wastewater Treatment Plant effluent sampled on September 27, 1993, NPDES# FL0020982.



The Priority Pollutants Analysis for the Bioassay of the Boca Chica Naval Air Station Wastewater Treatment Plant effluent sampled on September 27, 1993, NPDES# FL0020982.

