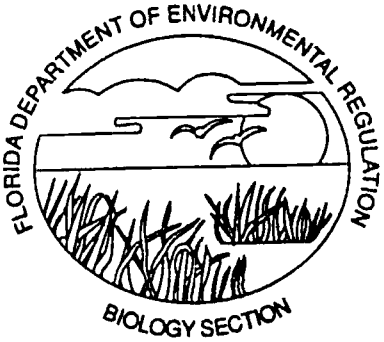


Bioassays of

Mayport Naval Station
Bilge Water Treatment Plant

Jacksonville, Duval County, Florida

DER Permit #IC 16-155209

Sampled 4/2/91

July 5, 1991

Biology Section
Division of Administrative and Technical Services

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DER #IC 16-155209

Biology Section
Bureau of Laboratories
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Introduction

Mayport Naval Station bilge water treatment plant, Jacksonville, Duval County, Florida, DER Permit# IC 16-155209, on 3 to 5 April, 1991.

This facility is located at Mayport Naval Station in Jacksonville. Bilge water is pumped from the ships into settling tanks, where it is held for 24 hours to allow separation of oil and grease which are returned to the fuel depot. The water is then pumped into another set of holding tanks where lime is added to coagulate more oil. The water is then treated by dissolved air floatation and the remaining oil is skimmed. The treated water is pumped to a settling pond which has an overflow pipe. Discharge via overflow is intermittent to the St. John's River.

The toxicity tests discussed in this report were performed in accordance with methods described by Peltier and Weber, 1985, *Methods for Measuring the Acute Toxicity of Effluents to Aquatic Organisms*, 3rd Edition, and by the FDER Biology Section, 1985, *Quality Assurance Manual for Performing Acute Toxicity Tests*, 2nd Edition.

Results and Discussion

The FDER Biology Section performed static acute screening toxicity bioassays on a sample of effluent from this facility. The conductivity of the sample suggested that the sample was slightly saline (2.5 ppt). Therefore, the saltwater mysid shrimp, *Mysidopsis bahia*, was used in addition to the freshwater bioassay test organisms, the water flea, *Ceriodaphnia dubia*, and the fish, *Notropis leedsi*.

The test results indicated that the sample salinty was too high for *C. dubia* and *N. leedsi*. The fish showed 100% mortality at 24 hours in 100% effluent. *C. dubia* showed 100% mortality at 48 hours in their two test concentrations, 50% and 100% effluent. Prior to loading the mysids, the salinity of the sample was increased to that of the control water (about 18 ppt). The mysid shrimp showed 100% mortality at 24 hours in 100% effluent ($LC_{50} < 100\%$).

Total residual chlorine was not detected in the sample. Further chemical analyses were performed on the sample. The organic compounds detected were: anthracene and phenathrene (< 2 µg/L each); 2,4-di-methylphenol (36 µg/L); and naphthalene (50 µg/L). The metals detected were: potassium, calcium, and aluminum (averaged 30.6, 70.6, and 125 µg/L, respectively); manganese (64 µg/L); magnesium (103 µg/L); iron (300 µg/L); sodium (777 µg/L); and strontium (1340 µg/L).

Conclusion

The sample of effluent from this facility was toxic to *M. bahia* on 2 April, 1991. Although the exact cause of toxicity was not determined, the chemistry analyses suggest that the observed mortality may be attributed to the various concentrations of the chemical constituents found in the sample.

The sample salinity was too high for *C. dubia* and *N. leedsi*. The mortality observed in these two tests may be attributed to the salinity.

Table 1. Concentration Series and Volumes Used for the Static Acute Screening Bioassays of the Mayport Naval Station bilge water treatment plant.

Ceriodaphnia dubia (water flea)

Concentration	Dilution Water	Sample	Total Volume
Control	20 mL	0 mL	20 mL
50.0%	10 mL	10 mL	20 mL
100.0%	0 mL	20 mL	20 mL

Notropis leedsi (bannerfin shiner)

Concentration	Dilution Water	Sample	Total Volume
Control	500 mL	0 mL	500 mL
100.0%	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%	0 mL	500 mL	500 mL

Table 2. Data recorded during the static acute screening bioassays of a sample of effluent from the Mayport Naval Station bilge water treatment plant, Jacksonville, Duval County, Florida, DER# IC 16-155209, on 3 to 5 April, 1991.

Facility:	Mayport Naval Station, Bilge Water Treatment			DER #	IC 16-155209	Facility Type:	Industrial Waste,
Location:	Mayport Naval Station, Jacksonville			Contact/District:	Rita Falton / NE		Bilge Water
County:	Duval			Test type:	static acute screen		
Sample Collection Date:	4/2/91	Time:	1000 to 1800	# tests:	3	Receiving Water:	St. John's River
Test Beginning Date:	4/3/91	Time:	1400	Chlorination Type:	not chlorinated		
Test Ending Date:	4/5/91	Time:	0900			Page 1 of 2	

Total Residual Cl2	mg/l	Method
Lab:	0.0	Hach

Alk & Hardness	Alkalinity (mg/l)	Hardness (mg/l)
Control Water (fish):	115	125
Cond. Control Water (daphnids):	55	70
100% Sample:	120	-

Salinity (ppt)	
Control Water:	0
100% Sample:	2.5

Organism: ***Ceriodaphnia dubia*** Life stage: neonate
LC50: - Binomial: - Moving Average: - Probit: -

	SURVIVAL			Dissolved Oxygen			pH			Temperature			Conductivity	
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	9.1	8.0	8.9	7.6	7.7	8.3	21.2	21.7	21.3	144	193
Control	5	5	5	-	-	-	-	-	-	-	-	-	-	-
Control	5	5	5	-	-	-	-	-	-	-	-	-	-	-
Control	5	5	5	-	-	-	-	-	-	-	-	-	-	-
50%	5	3	0*	9.5	7.9	8.8	7.2	8.0	8.3	21.0	21.7	21.5	2,420	2,330
50%	5	5	0*	-	-	-	-	-	-	-	-	-	-	-
50%	5	4	0*	-	-	-	-	-	-	-	-	-	-	-
50%	5	5	0*	-	-	-	-	-	-	-	-	-	-	-
100%	5	5	0*	9.8	7.8	8.8	7.1	8.0	8.3	21.0	21.8	21.6	4,520	4,470
100%	5	5	0*	-	-	-	-	-	-	-	-	-	-	-
100%	5	4	0*	-	-	-	-	-	-	-	-	-	-	-
100%	5	5	0*	-	-	-	-	-	-	-	-	-	-	-

* Sample salinity was too high for this test organism. The mortality observed may be attributed to the salinity .

Table 2. "continued"

Facility:	Mayport Naval Station, Bilge Water Treatment			DER #	IC 16-155209	Facility Type:	Industrial Waste,
Location:	Mayport Naval Station, Jacksonville			Contact/District:	Rita Falton / NE		Bilge Water
County:	Duval			Test type:	static acute screen		
Sample Collection Date:	4/2/91	Time:	1000 to 1800	# tests:	3	Receiving Water:	St. John's River
Test Beginning Date:	4/3/91	Time:	1400	Chlorination Type:	not chlorinated		
Test Ending Date:	4/4/91	Time:	1300			Page 2 of 2	

Total Residual Cl2	mg/l	Method
Lab:	0.0	Hach

Alk & Hardness	Alkalinity (mg/l)	Hardness (mg/l)
Control Water (fish):	115	125
Cond. Control		
Water (daphnids):	55	70
100% Sample:	120	-

Organism: ***Notropis leedsi*** Life stage: 13 to 15 days

LC50: Binomial: - Moving Average: - Probit: -

	SURVIVAL			Dissolved Oxygen			pH			Temperature			Conductivity	
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	24 hour
Control	5	5	**	9.1	7.9	-	7.6	8.1	-	20.0	20.7	-	-	-
Control	5	5	**	9.1	7.9	-	7.6	8.1	-	-	-	-	235	242
100.0%	5	0 *	**	10.2	7.1	-	7.1	7.6	-	21.3	20.8	-	-	-
100.0%	5	0 *	**	10.2	7.1	-	7.1	7.6	-	-	-	-	4,880	4,750

Salinity (ppt)		
Control Water:	0	
100% Sample:	2.5	

* test terminated at 24 hours

** Sample salinity was too high for this test organism. The mortality observed may be attributed to the salinity .

Organism: ***Mysidopsis bahia*** Age: < 3 days

LC50: <100% Binomial: - Moving Average: - Probit: -

	SURVIVAL			Dissolved Oxygen			pH			Temperature			Conductivity	
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	24 hour
Control	5	5	*	9.3	6.9	-	8.4	8.2	-	21.0	20.9	-	-	-
Control	5	5	*	9.3	7.0	-	8.4	8.2	-	-	-	-	27,700	28,200
100%	5	0	*	9.2	6.7	-	7.3	7.8	-	21.5	21.0	-	-	-
100%	5	0	*	9.1	6.7	-	7.3	7.8	-	-	-	-	26,700	27,000

Salinity (ppt)		
Control Water:	18.6	
100% Sample:	17.7	sample salinity adjusted with sea salts

* test terminated at 24 hours

Table 3. Results of chemical analyses on the sample of effluent from the Mayport Naval Station bilge water treatment plant, on 2 April, 1991.

Base-Neutral-Acid Extractables

Anthracene	< 2.0	µg/L	
Naphthalene	50.0	µg/L	
Phenathrene	< 2.0	µg/L	
2,4-Dimethylphenol	36.0	µg/L	

Pesticide Extractables

none detected, sample exceeded holding time prior to analysis.

Metals

Aluminum	125.0	µg/L	a
Calcium	70.6	µg/L	a
Iron	300.0	µg/L	
Magnesium	103.0	µg/L	
Manganese	64.0	µg/L	
Potassium	30.6	µg/L	a
Sodium	777.0	µg/L	
Strontium	1340.0	µg/L	

[a] Value reported is the mean of two or more determinations.

Table 4. LC_{50} Data for Bioassay of Mayport Naval Station bilge water treatment plant, on 3 to 5 April, 1991.

Organism	Method of Data Analysis	48 Hour LC_{50} (95% Confidence Intervals)
Ceriodaphnia dubia	not calculated	[a]
Notropis leedsi	not calculated	[a]
Mysidopsis bahia	not calculated	< 100% [b]

a Sample salinity was too high for these test organisms, and may have attributed to the mortality observed.

b The LC_{50} is < 100% since all the organisms died in the lowest test concentration, (100%).

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: Mayport Naval Station
Address/City: Mayport
County: Duval
Contact/District: Scott Bulgin
NPDES Permit #: FLW Permit # IC16-155209 Outfall #:

Test Number: 1 of 3 Test Type: Screening | Definitive
Static | Static Renewal | Flow-through

Remarks: 2.5 salinity.

Sample Collection: Date 4/[illegible] Time [illegible]
Test Beginning: Date 4/[illegible] Time 1400
Test Ending: Date 4/[illegible] Time [illegible]
Test Organism: Crassostrea virginica
Life Stage/Age: 24 hour

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr	7.7 8.09	8.9 @ 25	1501 @ 24.1	21.0 @ 23.7
24 hr	7.7 8.09	5.75 @ 22.5	1458 @ 24.0	21.5 @ 23
48 hr	7.7 8.09	9.00 @ 21.0	1476 @ 23.5	21.0 @ 23.1

Conc.	Chamber #	Number Live 0	24	48	DO (mg/l) 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	Cond. (µmhos/cm) 0	24	48
Control		5	5	5	9.1	8.0	8.9	7.6	7.7	8.3	21.2	21.7	21.3	144	195	193
Control		5	5	5											195	
Control		5	5	5												
Control		5	5	5												
50%		5	3	0	9.5	7.9	8.8	7.2	8.0	8.3	21.0	21.7	21.5	2422	2570	2350
50%		5	5	0												
50%		5	4	0												
50%		5	5	0												
100%		5	5	0	9.8	7.8	8.4	7.1	8.0	8.3	21.0	21.8	21.6	4520	4340	4472
100%		5	5	0												
100%		5	4	0												
100%		5	5	0												
Measured/Loaded by:		MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF
Recorded by:		MF	AJ	MF	KP	AJ	SMC	KP	AJ	SMC	KP	AJ	SMC	KP	DJ	SMC

Investigators' Signatures

Marshall Faircloth
Alison Jordan
Sandy McCorvey
Kim Pearce

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:					
Lab Tot. Resid. Cl2:			0.0	Hach	MF
Alkalinity:	115	55	120	Hach	MF
Hardness:	125	70	—	Hach	MF
Total Ammonia:					

Ammonia meter slope: Chemistech 0.0

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: Mayport Naval Station
Address/City: Mayport
County: Duval
Contact/District:
NPDES Permit #: _____ Outfall #: _____

Sample Collection: Date 4/22/91 Time 1000-1500
Test Beginning: Date 4/22/91 Time 1400
Test Ending: Date 4/24/91 Time 1200
Test Organism: Mysidopsis bahia
Life Stage/Age: 13-15 days

Test Number: 2 of 3 Test Type: ~~Screening~~ | Definitive
~~Static~~ | Static Renewal | Flow-through

Remarks: Composite
2.5 salinity
terminated at 24 hours

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr				
24 hr				
48 hr				

Conc.	Chamber #	Number Live 0	24	48	DO (mg/l) 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	Cond. (µmhos/cm) 0	24	48
Control	190	5	5		9.1	7.9		7.6	8.1		20.0	20.7		232		
Control	72	5	5		9.1	7.9		7.6	8.1					235	242	
100%	28	5	0		10.2	7.1		7.1	7.6		21.3	20.8				
100%	50	5	0		10.2	7.1		7.1	7.6					453	475	
Measured/Loaded by:		mf	mf		MF	MF		MF	MF		MF	MF		MF	MF	
Recorded by:		mf	MF		KP	AJ		KP	AJ		KP	AJ		KP	AJ	

Investigators' Signatures

Darrell Faircloth
Allison Ford
Kim Pearce

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:					
Lab Tot. Resid. Cl2:			0.0	Hach	MF
Alkalinity:	115	55	120	Hach	MF
Hardness:	125	70	—	Hach	MF
Total Ammonia:					

Ammonia meter slope: _____

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: Newport Naval Station
Address/City: Newport
County: Duval
Contact/District: Scott Baliyan
NPDES Permit #: _____ Outfall #: _____

Sample Collection: Date 4/[illegible]/97 Time 1000 +3°
Test Beginning: Date 4/[illegible]/97 Time 1400
Test Ending: Date 4/4/97 Time 1300
Test Organism: M. pidogae 6wks
Life Stage/Age: 2 3 day

Test Number: 3 of 3 Test Type: Screening | Definitive
Static | Static Renewal | Flow-through

Remarks: Composite
Sea Salt adjusted to ~ 17.5 ppt
terminated at 24 hours

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr				
24 hr				
48 hr				

Conc.	Chamber #	Number Live 0	24	48	DO (mg/l) 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	Cond. (µmhos/cm) 0	24	48
control	19	5	5		9.3	6.9		8.4	8.2		21.0	20.7		37,700		
Control	25	5	5		9.3	7.0		8.4	8.2					AJ	25,000	
100%	4	5	0		9.2	6.7		7.3	7.8		21.5	21.0		26,700		
100%	24	5	0		9.1	6.7		7.3	7.8					AJ	27,000	
Measured/Loaded by:		MF	MF		MF			MF	MF		MF	MF		MF	MF	
Recorded by:		MF	MF		KP			KP	AJ		KP	AJ		KP	AJ	

Investigators' Signatures

Mark W Sandusky
Ellen Jordan
-Kim Pearce

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:					
Lab Tot. Resid. Cl2:			0.0	Hach	MF
Alkalinity:	115	55	120	Hach	MF
Hardness:	125	70	—		
Total Ammonia:					

Ammonia meter slope: _____