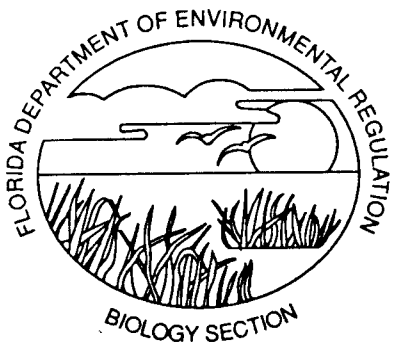


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Bioassays of

Kennedy Space Center Demineralized Water Plant

Kennedy Space Center, Brevard County, Florida

DER #IO 05-110843

Sampled 5/6 & 5/28, 1991

September 9, 1991

Biology Section
Division of Technical Services

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DER #IO 05-110843

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Introduction

Kennedy Space Center demineralized water plant (2 sampling events), Brevard County, Florida, DER #IO 05-110843, on 7 to 9 May, 1991, and 29 to 31 May, 1991.

This facility is located near the north end of the Kennedy Space Center and provides demineralized water for the Space Center. The source of water which is demineralized is drinking water supplied by the City of Cocoa Beach. The untreated effluent generated in the demineralization process is discharged intermittently, about 7,000 gallons each time, to the Indian River Lagoon.

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

A static acute screening bioassay was performed on a sample of effluent collected from this facility on 6 May, 1991. A static acute definitive bioassay was performed on a sample of effluent collected on 28 May, 1991. The test organism used in both tests was the mysid shrimp, *Mysidopsis bahia*. The bioassays indicated that both samples of effluent from this facility were toxic to *M. bahia*.

Total residual chlorine was not detected in the samples. No further chemical analyses were performed on the sample from 5/6/91. Chemistry samples were collected along with the bioassay sample on 5/28/91. Pesticides and most organics were undetected, although dibromochloromethane (est. 6 µg/L) and aliphatics (est. 13 µg/L) were tentatively identified. The samples expired prior to chemical analysis since they were not preserved properly due to a power failure in the lab.

Conclusion

The samples of effluent from this facility were toxic on May 6 and May 28, 1991.

Table 1. **Concentration Series and Volumes Used for the Static Acute Screening Bioassays of the Kennedy Space Center Demineralized Water Plant on 7 to 9 May, 1991.**

Mysidopsis bahia (mysid shrimp)

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

Concentration Series and Volumes Used for the Static Acute Definitive Bioassays of the Kennedy Space Center Demineralized Water Plant on 29 to 31 May, 1991.

Mysidopsis bahia (mysid shrimp)

Concentration	Dilution Water	Sample	Total Volume
Control	500 mL	0 mL	500 mL
25 %	375 mL	125 mL	500 mL
50 %	250 mL	250 mL	500 mL
75 %	125 mL	375 mL	500 mL
100 %	0 mL	500 mL	500 mL

Table 2. Data recorded during the static acute screening bioassay of a sample of effluent from the demineralized water plant at the Kennedy Space Center, Brevard County, Florida, DER# IO 05-110843, on 7 to 9 May, 1991.

Facility:	KSC - Demineralized Water Plant	DER #	IO 05-110843	Facility Type:	demineralized water plant
Location:	Kennedy Space Center	Contact/District:	Phil Kane / Central		
County:	Brevard	Test type:	static acute screen		
Sample Collection Date:	5/6/91 Time: 1015	# tests:	1	Receiving Water:	Indian River Lagoon
Test Beginning Date:	5/7/91 Time: 1330	Chlorination Type:	not chlorinated		
Test Ending Date:	5/9/91 Time: 1300			Page 1 of 1	

Total Residual Cl2	mg/L	Method
Field:	-	-
Lab:	0.0	Hach

Salinity (ppt)	
Control Water:	15
100% Sample:	14

Organism: ***Mysidopsis bahia*** Age: 2 to 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	48 hour
Control	5	5	5	8.0	7.2	6.8	8.5	8.1	7.7	21.8	21.3	21.3	-	-
Control	5	5	5	8.0	7.2	6.8	8.5	8.1	7.8	-	-	-	25,100	25,400
100%	5	3	1	7.4	7.0	7.3	7.8	7.9	8.0	20.3	21.2	21.3	-	-
100%	5	2	1	7.4	7.0	7.4	7.8	7.9	8.0	-	-	-	23,000	24,100

Table 3. Data recorded during the static acute definitive bioassay of a sample of effluent from the demineralized water plant at the Kennedy Space Center, Brevard County, Florida, DER# IO 05-110843, on 29 to 31 May, 1991.

Facility:	KSC - Demineralized Water Plant	DER #	IO 05-110843	Facility Type:	demineralized water plant
Location:	Kennedy Space Center	Contact/District:	Phil Kane / Central		
County:	Brevard	Test type:	static acute definitive		
Sample Collection Date:	5/28/91 Time: 1350	# tests:	1	Receiving Water:	Indian River Lagoon
Test Beginning Date:	5/29/91 Time: 1430	Chlorination Type:	not chlorinated		
Test Ending Date:	5/31/91 Time: 1000				

Total Residual Cl2	mg/l	Method
Field:	-	-
Lab:	0.0	Hach

Salinity (ppt)	
Control Water:	17
100% Sample:	16

Organism: ***Mysidopsis bahia*** Age: 2 to 3 days
LC50: 87.84% Binomial: 87.84% 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	8.5	7.5	6.7	8.5	8.1	7.7	21.8	20.8	21.0	-	-
Control	5	5	5	8.5	7.6	6.9	8.5	8.1	7.8	-	-	-	24,000	24,400
25%	5	5	5	8.4	7.5	6.9	8.4	8.2	8.1	21.8	20.8	21.0	-	-
25%	5	5	5	8.4	7.5	6.9	8.4	8.2	8.1	-	-	-	24,200	24,700
50%	5	4	4	8.1	7.3	7.0	8.3	8.1	8.1	21.2	20.8	20.9	-	-
50%	5	5	5	8.1	7.3	7.0	8.3	8.1	8.1	-	-	-	24,400	24,900
75%	5	5	5	7.8	7.1	7.3	8.3	8.1	8.1	21.0	20.8	20.9	-	-
75%	5	5	5	7.8	7.2	7.3	8.3	8.1	8.1	-	-	-	24,600	25,100
100%	5	0	0	7.6	6.8	7.5	8.2	8.2	8.1	21.0	20.9	20.9	-	-
100%	5	0	0	7.6	7.0	7.6	8.2	8.2	8.1	-	-	-	24,800	25,400
supernate **														
** 100%	5	0	0	7.6	7.0	7.2	8.2	8.1	8.1	21.0	21.0	21.0	-	-
** 100%	5	1	1	7.6	6.9	7.2	8.2	8.1	8.0	-	-	-	24,800	25,400

** Sample bottle contained approx. 2 inches of floc, these two 100% samples were poured from the supernate.
All other concentrations used well-mixed effluent.

Table 4. **LC_{50} Data for Bioassay of the Kennedy Space Center Demineralized Water Plant on 7 to 9 May, 1991.**

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

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

LC_{50} Data for Bioassay of the Kennedy Space Center Demineralized Water Plant on 29 to 31 May, 1991.

Organism	Method of Data Analysis	48 Hour LC_{50} (95% Confidence Intervals)
Mysidopsis bahia	Binomial	87.84% (75%, 100%)[b]
	Moving Average	[c]
	Probit	[c]

b This LC_{50} is reported in the text since it is the most statistically conservative value of the data set.

c Due to an insufficient number of dead organisms, or to the irregular distribution of mortality, an LC_{50} value cannot be calculated using this method of statistical analysis.

Table 5. **Results of chemical analyses on the sample of effluent from the Kennedy Space Center Demineralized Water Plant on 29-31 May, 1991.**

Base-Neutral-Acid Extractables

None detected. Tentative identification of dibromochloromethane (est. 6 µg/L) and aliphatics (est. 13 µg/L). Sample expired prior to analysis. Sample not preserved properly due to power failure in lab.

Pesticide Extractables

None detected. Sample expired prior to analysis. Sample not preserved properly due to power failure in lab.

Metals

Sample not analyzed for metals.

Outfall #:

Test Type: Screening | Definitive

Static | Static Renewal | Flow-through

SAMPLE SALINITY = 14.4 ppt

Instrument Calibrations:

	DO	Cond	Temp
0 hr	7@7.9@9	8.8@22	1390@24.5	22@24.7
24 hr	7@7.9@9	8.9@22	1390@24.6	22@24.5
48 hr	7@7.9	8.8@22	1393@24.2°C	21.8@24.1°C

				Survival			DO (mg/L)						Temp. (°C)			Cond. (µmhos/cm)		
				0	24	48	0	24				48	0	24	48	0	24	48
			1			1	7.4	7.0	7.3	7.8	7.9	8.0	20.3	21.2	21.3			
		2	1			1	7.4	7.0	7.4	7.8	7.9	8.0				23000	23900	24100
			5			5	8.0	7.2	6.5	8.5	8.1	7.7	21.8	21.3	21.3			
		5	5			5	8.0	7.2	6.8	8.5	8.1	7.8				25100	25100	25400
				MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF
				KP	KP	KP	KP	KP	KP	KP	KP	KP	KP	KP	KP	KP	KP	KP

Water-quality Parameters

	Sample	Method	Measured by
Lab Tot. Residual Chl.			
Lab Tot. Residual Chl.	0.0	Hach	MF 8 a.m. C.C
Alkalinity			
Hardness			
Total Ammonia			

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: [illegible] Sample Collection: Date 5/28/91 Time 1350
Address City: [illegible] Test Beginning: Date 5/29/91 Time 1430
County: [illegible] Test Ending: Date 5/31/91 Time 1000
Test Facility: [illegible] Test Organism: Ryzolysis bahia
Permit #: [illegible] Outfall #: Life Stage/Age: 22 → 3 days

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

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr	7.7/7.9	8.8/22°	1391@24°/1383	21.7@24.9
24 hr	7.7/7.9	8.8/22°	1384@23.8°/1376	21.0@23.4°
48 hr	7.7/7.9	8.8/22°	1389@24.0°/1381	21.2@23.6°

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
				5		7.5	6.2	8.5	8.1	7.7	21.8	20.8	21.0			
						7.4	6.9		8.1	7.8				24,200	24000	24400
				5			6.9		8.2	8.1	21.8	20.8	21.0			
						7.1	6.9	8.1	8.2	8.1	21.8			24,200	24,300	24700
				4		7.3	7.0	8.3	8.1	8.1	21.8	20.8	20.9			
						7.6	7.0	8.3	8.1	8.1				24,400	24600	24900
					7.3	7.1	7.3	8.3	8.1	8.1	21.0	20.8	20.9			
				5	7.3	7.2	7.3	8.3	8.1	8.1				24,600	24,800	25100
					7.6	6.8	7.5	8.2	8.2	8.1	21.0	20.9	20.9			
				0	7.6	7.0	7.6	8.2	8.2	8.1				24,800	25100	25400
					7.6	7.0	7.2	8.2	8.1	8.1	21.0	21.0	21.0	[illegible]		
				1	7.6	6.9	7.2	8.2	8.1	8.0				24,800	25,200	25400

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Initial Receiving Water	[illegible]				
Final Receiving Water			0.0	IF-L	MF
Alkalinity					
Hardness					
Salinity					

Ammonia meter slope: [illegible]