

Bioassays of

Stone Container Corporation

Jacksonville, Duval County, Florida

NPDES #FL0000400

Sampled 2/9/98

June 1998

Biology Section

Division of Administrative & Technical Services

Comprehensive Quality Assurance Plan #870346G

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Stone Container Corporation

Jacksonville, Duval County, Florida

NPDES #FL0000400

Biology Section
Bureau of Laboratories
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Introduction

Stone Container Corporation, 9469 Eastport Road, Jacksonville, Duval County, Florida, NPDES #FL0000400, tests performed on 10 to 12 February, 1998.

This paper mill's wastewater treatment facility has a design flow of 20.0 MGD. Industrial wastewater is treated by primary clarification and biological treatment in three aerated lagoons. Domestic wastewater is treated in an above ground septic tank. Effluent from the septic tank (approximately 11,000 GPD) is chlorinated for disinfection prior to being mixed with the industrial wastewater effluent stream, immediately prior to primary clarification. Dechlorination is achieved through the dilution of the domestic wastewater by the industrial wastewater and the holding time in the treatment process. Retention time is 18-hours in the clarifier and 17-days in the aerated lagoons. Final effluent is discharged into the class III freshwater of the St. Johns River (facility summary provided by John Baxter, FDEP, Jacksonville).

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 from this facility. Due to the conductivity of the sample (2,100 µmhos/cm at 24.3°C), the test species used for these bioassays were the saltwater species: the mysid shrimp, *Americamysis bahia*, and the inland silverside minnow, *Menidia beryllina*.

To ensure that the minimum required salinity of 6 ppt for *Americamysis bahia* was due to seawater ions, the sample of effluent for the mysid test was adjusted to an apparent salinity of 7.1 ppt with 40 Fathoms® artificial sea salts. Two sets of controls were used for the mysid test. The first control was aged, 20 ppt Forty Fathoms artificial seawater, diluted with deionized water to 7.1 ppt. The second control was fresh Forty Fathoms artificial seasalts added to deionized water to match the 7.1 ppt salinity-adjusted sample. The purpose of the second control was to test for possible toxic effects of adding artificial seasalts to the samples. No toxic effects were observed in the fresh seasalt control. To accommodate the salinity requirement of 1-32 ppt for *Menidia beryllina*, the control water was adjusted to a salinity of 1.1 ppt using 40 Fathoms artificial sea salts and deionized water to match the apparent salinity of the effluent as collected. The salinity of the effluent was not adjusted for the *Menidia* test.

The salinity-adjusted whole effluent tests showed toxicity to *Americamysis bahia*, producing 90% mortality in 48-hours. The 100% sample did not show toxicity to *Menidia beryllina* (Table 1).

Total residual chlorine of the 100% whole effluent sample was 0.13 mg/L in the laboratory and was not measured in the field. This value is thought to be the result of interfering compounds in the sample and not from chlorine, because of the dilution of the domestic wastewater by the industrial wastewater and the 17-day retention time

in the treatment lagoons. The total and unionized ammonia concentrations were 1.17 mg/L and 0.168 mg/L, respectively, at 0-hour, and were 1.16 mg/L and 0.177 mg/L, respectively, at 48-hours. Further chemical analyses were performed on the sample, and several metals and the herbicide, atrazine, were identified (Table 2).

The calcium concentration in the effluent was 207 mg/L. A portion of the calcium is thought to come from the "lime loop bleed-off" of the industrial process. Elevated levels of calcium in excess of 200% of normal seawater concentrations have been shown to produce mortality in *Americamysis bahia* but not in *Menidia beryllina* (FDEP, 1995, *Protocols for determining Major-Seawater-Ion Toxicity in Membrane-Technology Water-Treatment Concentrate.* 87pp). The concentration of calcium in the salinity-adjusted 100% sample was approximately 300% of normal seawater proportion.

Conclusion

The sample of effluent collected from this facility on February 9, 1998, showed toxicity to *Americamysis bahia* but not to *Menidia beryllina*. The suspected cause of toxicity was the calcium concentration of the sample.

Table 1. Data recorded during the 48-hour acute screening bioassays of a sample of effluent from the Stone Container Corporation Paper Mill, Jacksonville, Duval County, Florida, NPDES# FL0000400, performed on 10 to 12 February, 1998.

Facility:	**Stone Container Corporation WWTF**	NPDES #:	**FL0000400**	Facility Type:	**Paper Mill**
Location:	9469 Eastport Road, Jacksonville	Contact/District:	Tim McKelvey/Northeast		
County:	Duval	Test type:	static acute screen		
Sample Collection Date:	2/9/98 Time: 1315	# tests:	2	Receiving Water:	St. Johns River
Test Beginning Date:	2/10/98 Time: 1530	Chlorination Type:	non-chlorinated*		
Test Ending Date:	2/12/98 Time: 1450	*Domestic wastewater is chlorinated but the industrial wastewater which makes up most of the effluent stream is not chlorinated.			**Page 1 of 1**

Organism: ***Menidia beryllina*** Age: 12 days

	Sample/Diluent	SURVIVAL # Alive			pH			Temperature[A]			Dissolved Oxygen			Conductivity 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	8.5	7.8	7.9	23.8	24.6	24.4	7.5	8.1	7.1	2.06	2.16
Control B	0/500	5	5	5	8.5	7.8	7.9	23.7	24.9	24.5	7.5	8.2	7.1	2.06	2.19
Control C	0/500	5	5	5	8.5	7.8	7.9	23.7	25.2	24.9	7.4	8.1	7.2	2.06	2.18
Control D	0/500	5	5	5	8.5	7.8	7.8	23.7	25.1	25.0	7.5	8.0	7.1	2.07	2.17
100% A	500/0	5	5	5	8.4	8.4	8.5	24.3	24.8	24.9	7.5	5.4	5.2	2.10	2.16
100% B	500/0	5	5	5	8.4	8.4	8.5	24.3	24.8	25.1	7.5	5.4	5.1	2.10	2.17
100% C	500/0	5	5	5	8.4	8.4	8.5	24.5	25.5	25.1	7.5	4.7	4.9	2.10	2.17
100% D	500/0	5	5	5	8.4	8.4	8.5	24.8	25.4	25.0	7.5	4.8	5.0	2.10	2.18

[A] Temperatures of test incubator and test room were continously recorded on strip chart recorders.
Incubator temperature range for the test period was 26.0-26.5°C.
Room temperature range for the test period was 23.0-24.8°C.

Organism: ***Americamysis bahia*** Age: 5 days

	Sample/Diluent	SURVIVAL # Alive			pH			Temperature[B]			Dissolved Oxygen			Conductivity 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[C]	0/500	5	5	5	8.5	8.1	7.9	23.7	24.3	24.4	7.9	7.2	6.8	11.83	12.28
Control B[C]	0/500	5	5	5	8.5	8.1	7.8	23.7	24.3	25.1	7.8	7.3	6.8	11.84	12.64
Control C[C]	0/500	5	5	5	8.6	8.1	7.9	23.6	24.4	25.6	7.8	7.4	6.7	11.84	13.15
Control D[C]	0/500	5	5	5	8.6	8.1	7.9	23.6	25.3	25.4	7.9	7.4	6.6	11.86	12.57
Control A[D]	0/500	5	5	5	8.2	8.2	8.2	23.9	25.8	25.4	7.9	7.2	6.6	12.19	12.72
Control B[D]	0/500	5	5	5	8.2	8.2	8.2	24.2	25.4	25.3	7.8	7.1	6.5	12.18	12.93
Control C[D]	0/500	5	5	5	8.2	8.2	8.2	24.2	25.2	25.3	7.8	7.5	6.4	12.20	12.67
Control D[D]	0/500	5	5	5	8.3	8.2	8.2	24.3	25.1	25.3	7.9	7.5	6.4	12.21	12.83
100% A[E]	500/0	5	3	1	8.2	8.3	8.4	24.7	25.2	25.7	7.7	5.7	5.3	12.34	12.81
100% B[E]	500/0	5	2	1	8.2	8.3	8.4	24.8	25.0	26.0	7.5	5.5	5.4	12.36	12.99
100% C[E]	500/0	5	4	0	8.2	8.3	8.4	24.8	24.9	25.7	7.3	5.4	5.2	12.37	13.07
100% D[E]	500/0	5	4	0	8.2	8.3	8.4	24.9	25.0	25.6	7.1	5.2	5.2	12.37	12.82

[C] Control made from aged 40-Fathoms® ASW diluted to test salinity.
[D] Control made from 40-Fathoms® artificial seasalt mix made up to test salinity.
[E] 40-Fathoms® artificial seasalt mix added to increase apparent salinity by 6 ppt.
[B] Temperatures of test incubator and test room were continously recorded on strip chart recorders.
Incubator temperature range for the test period was 26.0-26.5°C.
Room temperature range for the test period was 23.0-24.8°C.

Total Residual CL2	mg/L	Method
Field:	-	-
Lab:	0.13	DR-100

Ammonia	Total (mg/L)	Unionized (mg/L)
Control Water :	<0.017	<0.017
100% Sample at 0-hour:	1.170	0.168
100% Sample at 48-hours:	1.160	0.177

Alk & Hardness	Alkalinity (mg/L)	Hardness (mg/L)
Control Water (fish):	not measured	228
Control water (mysids):	not measured	not measured
100% Sample:	439	412

Salinity	(ppt)
Control Water (fish):	1.1
Control water (mysids):	7.1
100% Sample:	1.1
Salinity adjusted sample:	7.1

Salinity based on conductivity and temperature measuremonts.

Table 2. Results of chemical analyses on the effluent from the Stone Container Corporation sampled on February 9, 1998.

Metals

Aluminum	183	µg/L
Calcium	207.0	mg/L
Copper	3.5	µg/L
Iron	91	µg/L[J]
Lead	0.2	µg/L[I]
Magnesium	26.7	mg/L

Base, Neutral, & Acid Extractable Organics

None Detected

Herbicides / Pesticides

Atrazine	0.39	µg/L[J]

[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: Stone Container Corporation
County: Duval
Contact / District: Tim McKelvey / Northeast
NPDES Permit #: FL0000400
LIMS Sample #: 305-898 LIMS Job #: TLH 1998-02-10-03
sample log: 2/23/98 pm

Sample Collection: Date 2/9/98 Time 13:15
Test Beginning: Date 2/10/98 Time 1600
Test Ending: Date 2/12/98 Time 14:45
Organism Batch #: 36 Diluent Batch #: 4
Organism Age: 5 days
Test Organism: Americamysis bahia

Test Type: Screening / Definitive
Static / Static Renewal / Flow-through
Temperature range: room 23.0 - 24.8°C
incubator 26.6 - 26.5°C
Test Number: 1 of 2

Remarks: D = dead, M = missing
Initial sample DO = 3.3
Aerated ≈ 1 hour DO = 7.3
TRC value likely the result of interference by other compounds in the sample. Chlorine is NOT used at the facility per phone conversation with NE District personnel. MF 2/11/98
Total Ammonia @ 48 hours = 1.16 mg/L MF 3/12/98

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
Instrument Calibrations:				
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	21.5 @ 21.5	8.2 @ 25.3 °C	99.8 @ 96.3 984 @ 1005 @ 25.7 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	22.3 @ 22.4	8.1 @ 25.5 °C	101.5 @ 96.3 978 @ 1005 @ 25.9 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	23.5 @ 23.5	8.2 @ 24.9 °C	986 @ 963 990 @ 1005 @ 24.5 °C 9930 @ 10:8?

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) 0 hr	UNCORRECTED Cond. (mmhos/cm) 24 h	UNCORRECTED Cond. (mmhos/cm) 48 h
Control	F1	5	5	5	8.5	8.1	7.9	23.7	24.3	24.4	7.9	7.2	6.8	11.83	12.12	12.25
Control	F2	5	5	5	8.5	8.1	7.8	23.7	24.3	25.1	7.8	7.3	6.8	11.84	12.26	12.64
Control	F3	5	5	5	8.6	8.1	7.9	23.6	24.4	25.6	7.8	7.4	6.7	11.84	12.21	13.15
Control	F4	5	5	5	8.6	8.1	7.9	23.6	25.3	25.4	7.9	7.4	6.6	11.86	12.59	12.57
Control	F5	5	5	5	8.2	8.2	8.2	23.9	25.8	25.4	7.9	7.2	6.6	1219	12.71	12.72
Control	F6	5	5	5	8.2	8.2	8.2	24.2	25.4	25.3	7.8	7.1	6.5	12.18	12.53	12.93
Control	F7	5	5	5	8.2	8.2	8.2	24.2	25.2	25.3	7.8	7.5	6.4	12.20	12.48	12.67
Control	F8	5	5	5	8.3	8.2	8.2	24.3	25.1	25.3	7.9	7.5	6.4	12.21	12.63	12.83
100 %	F9	5	5 2 3D	1 20	8.2	8.3	8.4	24.7	25.2	25.7	7.7	5.7	5.3	12.34	12.58	12.81
100 %	F10	5	2 3D	1 1D	8.2	8.3	8.4	24.8	25.0	26.0	7.5	5.5	5.4	12.36	12.52	12.99
100 %	F11	5	4 1D	0 4D	8.2	8.3	8.4	24.8	24.9	25.7	7.3	5.4	5.2	1237	1265	13.07
100 %	F12	5	4 1D	0 4D	8.2	8.3	8.4	24.9	25.0	25.6	7.1	5.2	5.2	1237	12.58	12.82
Measured/Loaded by		DW	FW	MF	DW	MF	MF	DW	MF	MF	DW	MF	MF	DW	MF	MF
Recorded by		MF	FW	MF	MF	FW	FW	MF	FW	FW	MF	FW	FW	MF	FW	FW

Investigators' Signatures

Marshall Fairbanks
Frank Newfield
Tamara Liccasey

Salt Water

Water Quality Parameters verified by MF

	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		0.13	HACH DR-100	TL/DW
Alkalinity (mg/L as $CaCO_3$)			439	Hach	FW
Hardness (mg/L as $CaCO_3$)					
Total ammonia (mg/L as N)	<0.017		1.17	Orion A-DR-100	MF 2/6/98

Ammonia Meter #98136 Meter Slope −58.6 Ammonia Blank <0.017 Control Salinity 7.1 ppt Sample adjusted to Salinity: 7.1 ppt

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Stone Container Corporation
County: Duval
Contact / District: Tim McKelvey / Northeast
NPDES Permit #: FL0000400
LIMS Sample #: 305898 LIMS Job #: TLH 1998-02-10-03
sample log: 2/23/98 DW

Sample Collection: Date 2/9/98 Time 1315
Test Beginning: Date 2/10/98 Time 1530
Test Ending: Date 2/12/98 Time 1450
Organism Batch #: 4 Diluent Batch #: 4
Organism Age: 12 days
Test Organism: Mysidopsis bahia

Test Type: (Screening) / Definitive
(Static) / Static Renewal / Flow-through
Temperature range: room 23.0 24.8°C
incubator 26.0–26.5°C
Test Number: 2 of 2

Remarks: D = dead, M = missing
Initial DO of sample = 3.3
aerated ≈ 1 hour DO = 7.3
Per phone conversation with NE District personnel, Chlorine is not used in the manufacturing process and should NOT be in the effluent. TRC likely due to interference by other compounds in the sample. MF 2/11/98
Total Ammonia @ 48 hours = 1.16 mg/L MF 2/12/98

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	21.5 @ 21.5	8.2 @ 25.3 °C	998 @ 96.3 989 @ 1005 @ 25.7 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	22.3 @ 22.4	8.1 @ 25.5 °C	101.5 @ 96.3 978 @ 1005 @ 25.9 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	23.5 @ 23.5	8.2 @ 24.9 °C	98.6 @ 96.3 990 @ 1005 @ 24.5 °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) 0 hr	~~UNCORRECTED~~ Cond. (mmhos/cm) 24 h	~~UNCORRECTED~~ Cond. (mmhos/cm) 48 h
Control	D1	5	5	5	8.5	7.8	7.9	23.8	24.6	24.4	7.5	8.1	7.1	2.06	2.14	2.16
Control	D2	5	5	5	8.5	7.8	7.9	23.7	24.9	24.5	7.5	8.2	7.1	2.06	2.16	2.19
Control	D3	5	5	5	8.5	7.8	7.9	23.7	25.2	24.9	7.4	8.1	7.2	2.06	2.17	2.18
Control	D4	5	5	5	8.5	7.8	7.8	23.7	25.1	25.0	7.5	8.0	7.1	2.07	2.15	2.17
100 %	D5	5	5	5	8.4	8.4	8.5	24.3	24.8	24.9	7.5	5.4	5.2	2.10	2.14	2.16
100 %	D6	5	5	5	8.4	8.4	8.5	24.3	24.8	25.1	7.5	5.4	5.1	2.10	2.15	2.17
100 %	D7	5	5	5	8.4	8.4	8.5	24.5	25.5	25.1	7.5	4.7	4.9	2.10	2.18	2.17
100 %	D8	5	5	5	8.4	8.4	8.5	24.8	25.4	25.0	7.5	4.8	5.0	2.10	2.18	2.18
Measured/Loaded by:		DW	DW	FW	DW	MF	MF	DW	MF	MF	DW	MF	MF	DW	MF	MF
Recorded by:		MF	DW	FW	MF	FW	FW	MF	FW	FW	MF	FW	FW	MF	FW	FW

Investigators' Signatures

Marshall Faircloth

Tim Weinhold

Tim McKelvey

reviewer

Water Quality Parameters verified by MF

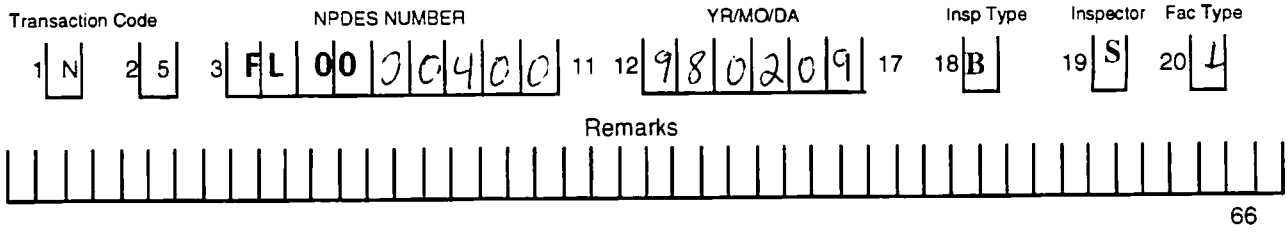
	Well Water	20% Min Water	Salt Water Sample	Method	Measured by
Field Total Residual Cl2 (mg/L):			not measured		
Lab Total Residual Cl2 (mg/L):	<0.03		0.13	~~Hach~~ MF	TL/DW
Alkalinity (mg/L as $CaCO_3$):			439	Hach	FW
Hardness (mg/L as $CaCO_3$):	228		412	Hach	FW
Total ammonia (mg/L as N):	<0.017		1.17	Orion	MF

A DR-160 MF 2-11-98

Ammonia Meter #98136 Ammonia Meter Slope: -55.6 Ammonia Blank: <0.017 Control Salinity: 11 ppt Sample Salinity: 1.1 ppt

The Bioassay of the Stone Container Corporation effluent sampled on February 9, 1998, NPDES #FL0000400.

Fill Out This Section For All Surface Water Discharger Inspections (CEI, CSI, CBI, PAI, XSI - RI Optional)



The Priority Pollutants Analysis for the Bioassay of the Stone Container Corporation effluent sampled on February 9, 1998, NPDES #FL0000400.

Fill Out This Section For All Surface Water Discharger Inspections (CEI, CSI, CBI, PAI, XSI - RI Optional)

