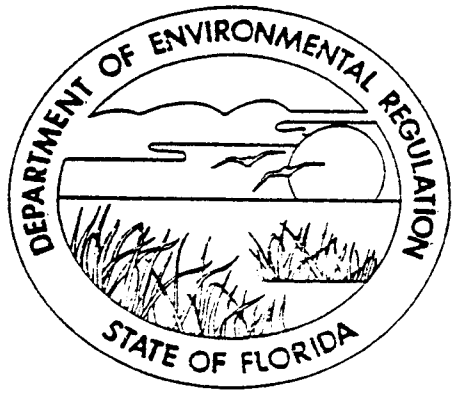


BULK DISTRIBUTION CENTER, INC.

PORT EVERGLADES, BROWARD COUNTY, FLORIDA

RECEIVING WATER AND ELUTRIATE BIOASSAYS

SAMPLED 10/24/83

Biology Section
Bureau of Water Analysis
December 6, 1983

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EXECUTIVE SUMMARY

Bulk Distribution Center, Inc., Port Everglades, Receiving Water Bioassay and Sediment Elutriate Bioassay, on 25 to 27 October, 1983.

One bioassay on receiving water and one sediment elutriate bioassay were performed on samples taken near Bulk Distribution Center, Inc. using *Mysidopsis bahia* as the test organism. The plant has a history of chronic spillage of various phthalate esters which are suspected of leaching into the groundwater and surrounding surface waters connected to the Intracoastal Waterway. No significant mortalities of *M. bahia* were observed during the test, and Mr. Thomas Keith, South Florida District Office, indicated that the samples were collected outside the area of known contamination.

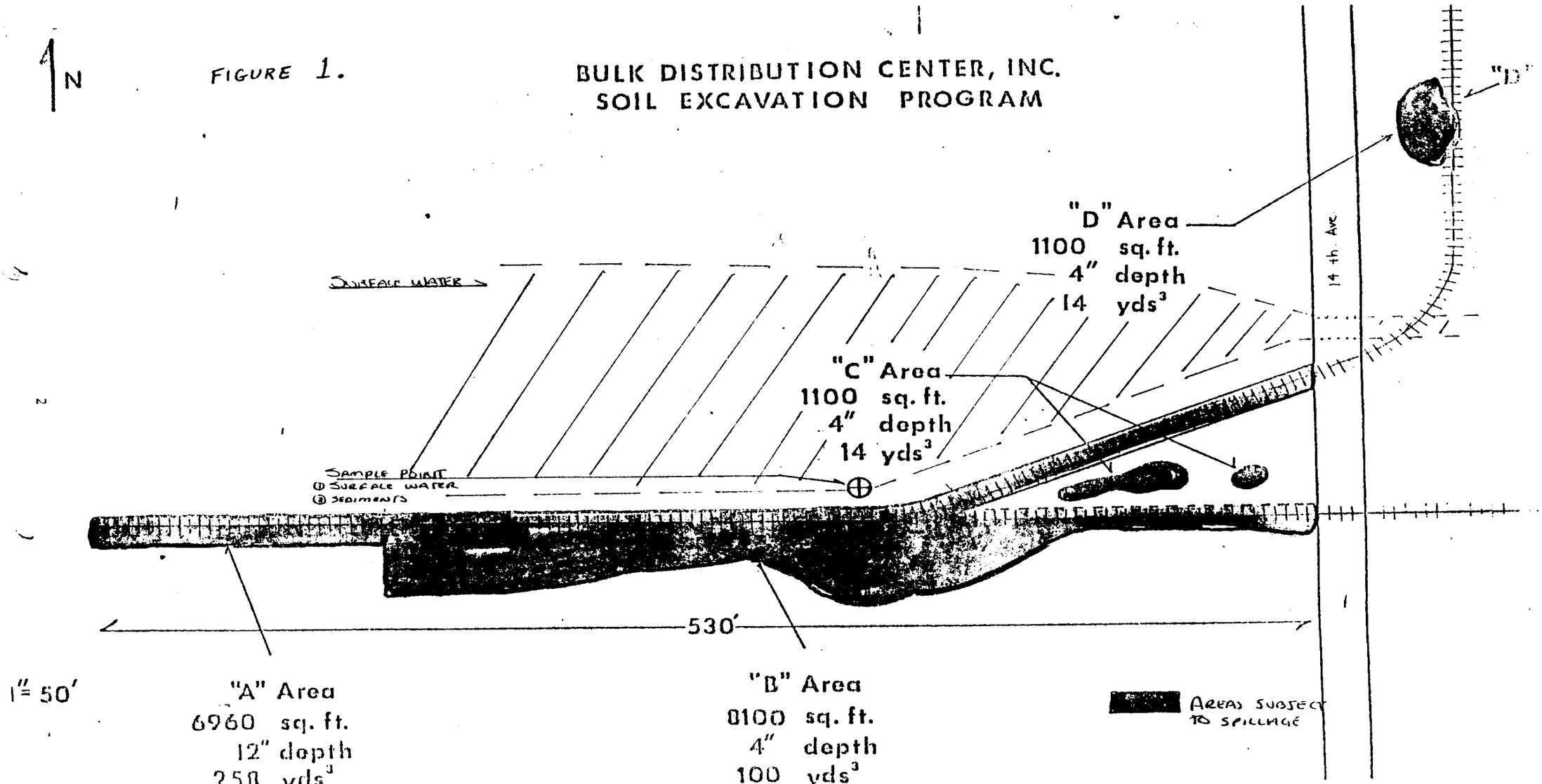
INTRODUCTION

Bulk Distribution Center, Inc., located in Port Everglades, transfers industrial chemicals from railroad cars to tank trucks for distribution. During transfer, materials such as Bis (2 ethylhexyl phthalate) (EPA Hazardous Waste Number U028), Di-n-octyl phthalate (EPA Hazardous Waste Number U107) and other phthalate esters have been discharged to the ground as a result of improper operations.

At the request of Mr. Thomas Keith, one receiving water bioassay and one sediment elutriate bioassay were performed on water and sediment samples collected near the contaminated area (Figure 1). The results of these tests, performed on 25 to 27 October 1983, are reported here. Those involved in performing the tests and the preparation of this report were: C. W. Dye, R. B. Frydenborg, and M. L. Roll.

FIGURE 1.

BULK DISTRIBUTION CENTER, INC.
SOIL EXCAVATION PROGRAM



METHODS AND MATERIALS

Test methods used to conduct this static bioassay and static elutriate bioassay are extensively described by the FDER Biology Section (1983). The organism selected for this study is among those recommended by Peltier (1978), the U.S. EPA (1978), and the FDER Biology Section (1983). The life history and maintenance procedures used to culture the organism are detailed below.

History and Maintenance of Bioassay Organisms

Mysidopsis bahia (mysid shrimp) - In September, 1978, approximately 300 adult mysid shrimp were obtained from the EPA laboratory in Gulf Breeze, Florida. The mysids are cultured under a 16:8 hour light-dark cycle in 10 and 15 gallon all-glass aquaria equipped with undergravel filtration and aeration. The mysid shrimp are cultured over a wide range of salinities (10-30 ppt) to minimize acclimation periods to low or high salinity effluents. Seawater is obtained from the FSU Marine Laboratory located at Turkey Point, Florida (salinity range 17-31 ppt) and partial water changes are performed weekly. Freshwater, for dilution of the seawater as necessary, is obtained from a deep well near the DER laboratory. The mysids are fed twice daily with freshly hatched *Artemia* (brine shrimp) and are kept at a constant temperature of 22° plus or minus 2°C. Adult or large juvenile mysids were used in this test.

To ensure the uniform sensitivity of these test organisms to toxic substances, the Biology Section conducts monthly standard reference toxicant bioassays using sodium lauryl sulfate as the reference toxicant.

Test Methods

One receiving water bioassay and one sediment elutriate bioassay were performed on water and sediment samples taken near Bulk Distribution Center, Inc. The tests were performed from 1045 hours on 25 October to 1100 hours on 27 October, 1983. Both the water and sediment samples were collected using standard sampling procedures. Separate samples were obtained for organics and metal analyses. Samples for the bioassays were iced and transported to the DER laboratory in Tallahassee for analyses within 24 hours of collection.

Described briefly, the elutriate test is a simplified method of extracting contaminates from soils or sediments. Approximately 500 mls. of thoroughly mixed sediment from the sampling site was combined with 2000 mls. of saltwater (1 : 4 vol./vol. ratio). The mixture was then divided equally and shaken in 2 gallon glass jars for 30 minutes at approximately 150 rpm, then allowed to settle for 1 hour. The resulting supernatants or "elutriates" were then siphoned into a separate glass flask and used as standard effluent for the elutriate bioassay (FDER 1983).

Saltwater for dilution of both the receiving water and elutriate samples was obtained from the FSU Marine Laboratory at Turkey Point (salinity = 26.0 ppt). An appropriate amount of the elutriate was mixed with the saltwater diluent to obtain a test concentration series of 10%, 25%, 50%, and 100% elutriate (Table 1).

The concentration series selected for the receiving water bioassay (Table 2) is that recommended by APHA (1980). Two replicates of each randomly arranged test concentration and of the controls were used to test with *Mysidopsis bahia*. Immediately prior to the bioassays, a suitable number of mysids were transferred by net from the 10 ppt, 15 ppt, 20 ppt and 25 ppt salinity aquaria to culture dishes for observation and selection of individuals for the tests. Individual mysid shrimp were siphoned using a glass tube, carefully examined for injury, and transferred to wide mouth quart jars, each containing 500 ml of the appropriate concentration. For each concentration, the mysid shrimp were pre-acclimated to within 4 ppt salinity. Five organisms were loaded per test chamber, giving ten per concentration. Based on the recommendations of EPA (1978), the mysids were fed brine shrimp *(Artemia)* nauplii at the rate of approximately 10 to 20 nauplii per mysid per day to minimize cannibalism.

Dissolved oxygen (YSI Model 57 oxygen meter), pH (Corning Model 7 pH meter with Orion Ross® combination electrode), temperature (NBS calibrated glass thermometer), and the number of live organisms were recorded for each test chamber at 0 hours, 24 hours, and 48 hours. The salinity (YSI Model 33 S-C-T meter) of each test concentration was recorded at the beginning and end of the test. All instruments were calibrated daily according to manufacturer's recommendations. These values were recorded on the bioassay data forms and are presented in Tables 3 and 4.

Table 1. Concentration Series and Volumes Used for the Elutriate Bioassay

Mysidopsis bahia (mysid shrimp)

Concentration	Dilution Water	Elutriate	Total Volume
10.0%	450 ml	50 ml	500 ml
25.0%	375 ml	125 ml	500 ml
50.0%	250 ml	250 ml	500 ml
100.0%	------	500 ml	500 ml

Table 2. Concentration Series and Volumes used for the receiving water bioassay

Mysidopsis bahia (mysid shrimp)

Concentration	Dilution Water	Receiving Water	Total Volume
Control	500 ml	------	500 ml
10.0%	450 ml	50 ml	500 ml
18.0%	410 ml	90 ml	500 ml
32.0%	340 ml	160 ml	500 ml
56.0%	220 ml	280 ml	500 ml
100.0%	------	500 ml	500 ml

Table 3. Data recorded during 48 hour, Mysidopsis bahia, static acute toxicity bioassay of Bulk Distribution Center, Inc., (Nearby Receiving Water) on 25 to 27 October, 1983.

Concentration or %	Number of Live Organisms			Dissolved Oxygen (mg/ℓ)			pH			Temperature (°C)			NH_3/N (mg/ℓ)		Salinity (ppt)	
	0	24	48	0	24	48	0	24	48	0	24	48	0	48	0	48
Control	5	5	5	8.1	7.1	7.0	8.2	8.1	7.9	20.4	19.0	19.5				
Control	5	5	5	8.1	7.1	7.0	8.2	8.1	7.9						25.8	26.9
10%	5	5	5	8.0	7.1	7.0	8.2	8.1	8.0	20.4	19.0	19.4				
10%	5	5	5	8.1	7.1	7.0	8.2	8.1	8.0						24.0	24.7
18%	5	5	5	8.2	7.4	7.1	8.2	8.1	8.0	20.4	19.0	19.4				
18%	5	5	5	8.2	7.3	7.1	8.2	8.1	8.0						22.2	23.0
32%	5	5	5	8.3	7.5	7.1	8.1	8.1	8.0	20.3	19.0	19.3				
32%	5	5	5	8.3	7.4	7.1	8.1	8.1	8.0						19.7	20.1
56%	5	5	5	8.5	7.8	7.4	8.0	8.0	8.1	20.1	19.1	19.4				
56%	5	5	5	8.5	7.7	7.4	8.0	8.0	8.1						14.8	15.1
100%	5	4	4	8.5	8.0	7.6	7.9	8.1	8.1	20.1	19.2	19.5				
100%	5	5	5	8.5	7.9	7.6	7.9	8.1	8.1						7.0[a]	7.3

Remarks: [a] Small amount of sea salt added to increase salinity of receiving water (100%) from 6.5 ppt to 7 ppt.

Table 4. Data recorded during 48 hour, *Mysidopsis bahia*, static acute sediment elutriate toxicity bioassay of Bulk Distribution Center, Inc. (sediment from nearby canal) on 25 to 27 October, 1983.

Concentration or	Number of Live Organisms			Dissolved Oxygen (mg/ℓ)			pH			Temperature (°C)			NH_3/N (mg/ℓ)		Salinity (ppt)	
	0	24	48	0	24	48	0	24	48	0	24	48	0	48	0	48
10%	5	5	5	7.6	6.3	6.8	8.2	8.0	7.9	20.7	19.2	19.7				
10%	5	5	5	7.6	6.5	6.8	8.2	8.0	7.9						26.0	24.0
25%	5	5	5	7.2	6.5	6.9	8.1	8.0	7.9	20.5	19.1	19.6				
25%	5	5	5	6.2	6.5	6.9	8.1	8.0	7.9						25.7	23.5
50%	5	5	5	6.3	6.0	6.9	8.0	7.9	7.9	20.4	19.3	19.9				
50%	5	5	5	6.3	6.0	6.9	8.0	7.9	7.9						25.0	23.3
100%	5	5	5	4.5	4.2	5.7	7.7	7.7	7.7	20.2	19.5	20.0				
100%	5	5	5	4.5	4.3	5.7	7.7	7.7	7.7						23.0	22.2

Remarks:

RESULTS AND DISCUSSION

The results of the receiving water bioassay and sediment elutriate bioassays indicated that neither sample was acutely toxic to *Mysidopsis bahia*. Only one shrimp died in the 100% concentration of the recieving water bioassay and none died in the elutriate test.

Note that elutriates taken directly from the contaminated soil would be much more likely to be toxic, although such results might be less readily useable for regulatory purposes.

LITERATURE CITED

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