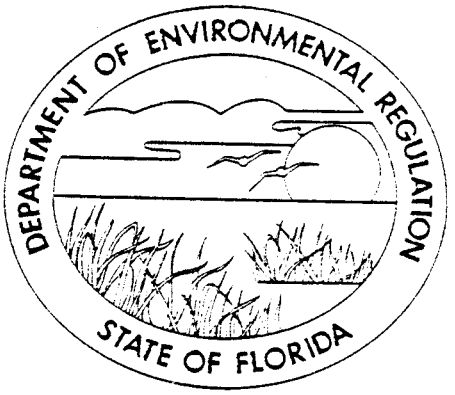
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BIOASSAY OF THE CITY OF PENSACOLA
MAIN STREET SEWAGE TREATMENT PLANT

Escambia County, Florida

(NPDES #FL0021440)

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Biological Section
Bureau of Water Analysis
30 January 1980

BIOASSAY OF THE CITY OF PENSACOLA MAIN STREET SEWAGE TREATMENT PLANT

Escambia County, Florida

(NPDES #FL0021440)

INTRODUCTION

The City of Pensacola Main Street Sewage Treatment Plant is located at the corner of Main Street and Coyle Street in Pensacola (Fig. 1). The plant provides advanced secondary treatment for domestic and industrial wastewater. Major liquid processes include extended aeration, secondary clarification and tertiary filtration prior to chlorination and discharge.

Major industrial wastewater contributors to the Main Street Treatment Plant include: a chemical company, 4 hospitals, a paperboard mill, a plastics plant, a wood preserving firm and Westinghouse Electric Corporation. Major suspected toxicants from these industries are phenolic compounds. Other suspected toxicants include chlorinated hydrocarbons.

The Main Street Treatment Plant currently discharges 12.5 MGD to Pensacola Bay through a 6,109 foot long pipe at a depth of 23.5 feet (Fig. 1). The plant is expected to increase this discharge to 20.0 MGD sometime in 1980.

On January 30, 1980 the Biological Section obtained 24-hour composite samples and performed a static bioassay to determine the existence and extent of toxicity to the biota of Pensacola Bay. The results of this test are reported here.

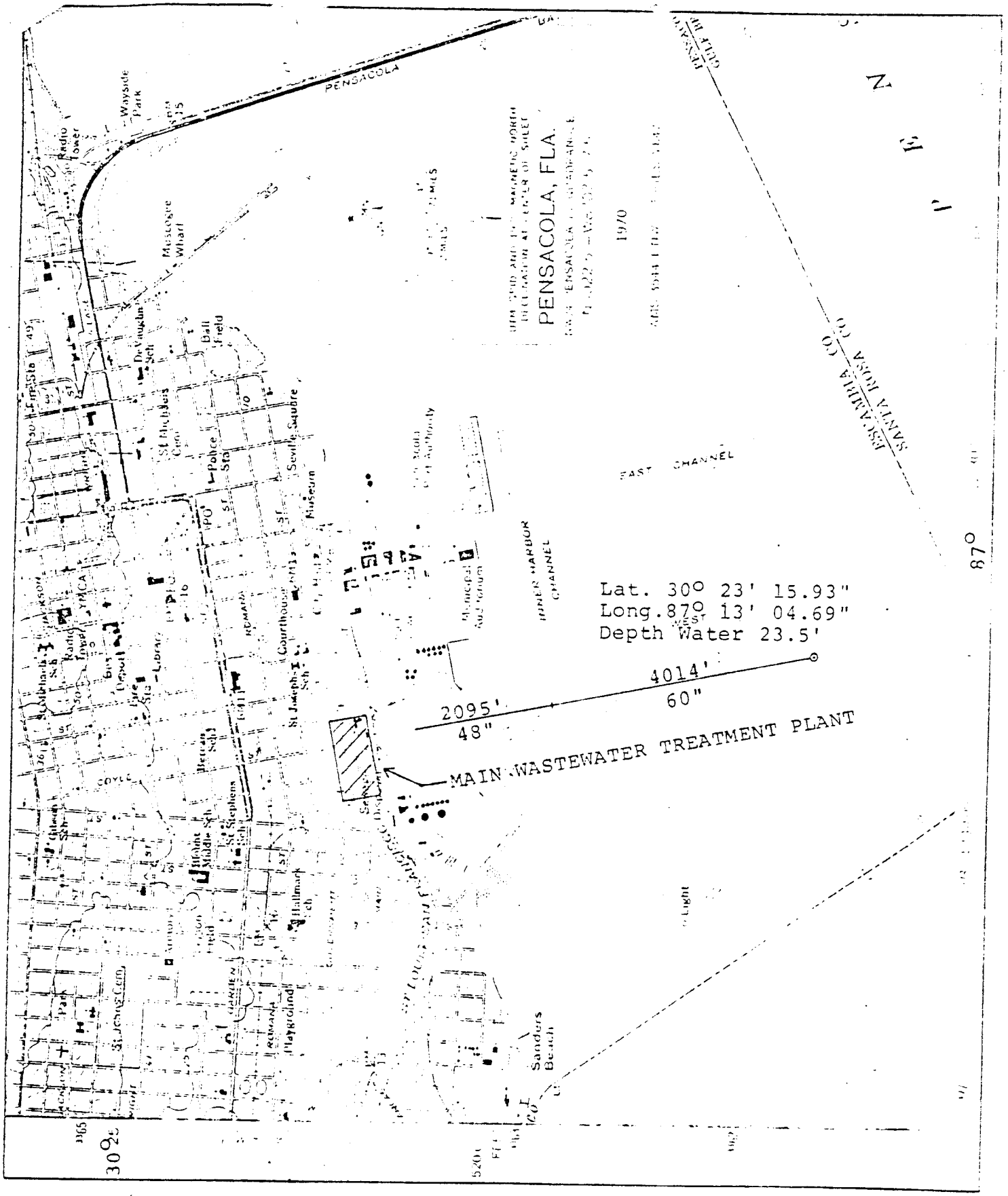


FIGURE 1. " LOCATION MAP " OF PENSACOLA MAINSTREET WASTEWATER TREATMENT PLANT
FROM U.S. GEOLOGICAL SURVEY MAP, 1970
MAIN WASTEWATER TREATMENT PLANT
PENSACOLA, ESCAMBIA, FLORIDA
JANUARY 12, 1979

METHODS AND MATERIALS

Test methods used for conducting this static bioassay are extensively described by Peltier (1978). The organism selected for this study is among those recommended by Peltier (1978) and the U.S. EPA (1978). The life history of this test organism and maintenanace procedures used to culture it are detailed below.

Histcry and Maintenance of Bioassay Organisms

Daphnia pulex - (water flea)

A breeding culture of Daphnia pulex was obtained from the EPA laboratory in Athens, Georgia on March 9, 1979. This culture has been maintained continually since its arrival, in 2½ gallon all glass aquaria using a 16:8 hour light-dark cycle. Organisms have been fed a liquified blend of Purina Trout Chow® and Cerophyl® twice daily. Daphnia used in this bioassay were siphoned into a large culture dish through a series of nested stainless steel screens to isolate the proper size and age organisms (neonates). These neonates were then pipetted individually from the culture dish and placed randomly into the test chambers at the beginning of the test.

Test Methods

A 48 hour static bioassay was conducted from January 30 to February 1 1980 on a 24 hour composite sample of effluent from outfall #001. The sample was collected by Mr. Rick Bradburn of the Pensacola Office (Northwest District) on January 29, 1980, using standard waste water sampling procedures. Separate samples were obtained for chemical and biological testing. Samples for metal analysis were preserved with HNO_3 (2ml/liter). Samples for organic chemical analysis and the bioassays were unpreserved. The samples were iced and transported to the DER laboratory in Tallahassee within 24 hours of collection.

Fresh water for dilution of the effluent sample was obtained from the same City of Tallahassee well that is used to culture the test organisms. The concentration series selected for this study are those recommended by APHA (1976) (Table 1).

Table 1

CONCENTRATION SERIES AND VOLUMES USED FOR THIS STATIC BIOASSAY

Water flea (*Daphnia pulex*)

Concentration	Dilution Water	Effluent	Total Vol.
Control	200 ml	-	200 ml
5.6%	189 ml	11 ml	200 ml
10.0%	180 ml	20 ml	200 ml
18.0%	164 ml	36 ml	200 ml
32.0%	136 ml	64 ml	200 ml
56.0%	88 ml	112 ml	200 ml
100%	-	200 ml	200 ml

Test Methods (continued)

Two replicates each with six concentrations and a control were used to test with Daphnia pulex. Flint glass jars of 250 ml capacity were used as test chambers. 200 ml of the appropriate test concentration was placed in each chamber (Table 2). Daphnia were transferred individually by glass pipette and were loaded 10 per chamber, resulting in 20 per test concentration.

Dissolved oxygen, pH, and the number of live organisms were recorded for each test chamber at 0 hours, 24 hours, and 48 hours. Total alkalinity, total hardness and conductivity were recorded at the beginning of the test for the controls and 100% effluent concentrations. These values were recorded daily on the bioassay data form and are presented in Table 2. Organisms were not fed during this test.

RESULTS AND DISCUSSION

Results of this bioassay indicate that this particular effluent sample from the Pensacola Main Street Sewage Treatment Plant was toxic to Daphnia pulex. All test organisms in all concentrations (except the controls) were killed within 17.5 hours. The 17 hour LC_{50} for this effluent was < 5.6%, therefore the 96 hour LC_{50} would be < 5.6%. The suspected toxicant in this test was chlorine since a concentration of 2.0 mg/l total residual chlorine was measured in the bioassay sample at the beginning of the test. This concentration of chlorine is known to be extremely lethal to Daphnia pulex (U.S. EPA, 1977).

Chapter 17-3.051, Florida Administrative Code, indicates that "all waters of the State shall at all places and at all times be free from...components of discharges which...are acutely toxic." "Acute toxicity" is defined in Chapter 17-3.021(1) to mean "the presence of one or more substances...in amounts which are greater than one-third (1/3) of the amount lethal to 50% of the test organisms in 96 hours (96 hour LC_{50})...". In the absence of a mixing zone, this 1/3 of the 96 hour LC_{50} applies at the point of discharge. Chapter 17-4.244(4) states that "in no event shall the maximum concentration of wastes in the mixing zone exceed the amount lethal to 50% of the test organisms in 96 hours (96 hour LC_{50}) for a species significant to the indigenous aquatic community..." This criterion applies at the point of discharge if there is a mixing zone. The distinction between presence or absence of a mixing zone is not relevant here, however, since the testing procedure used does not involve effluent concentration. The 1/3 of the 96 hour LC_{50} criterion is three times as stringent as the 96 hour LC_{50} criterion, and therefore, in the absence of a mixing zone, the procedure used is very lenient. The procedure followed is also lenient in that testing is only done for 48 hours. The 96 hour LC_{50} derived from this testing is therefore reported as "less than or equal to" the 48 hour measurement. The value found after 48 hours can never be more restrictive than the value found after 96 hours. It must be noted that all organisms used in these tests are significant to the indigenous aquatic community since they are sensitive to toxic substances which may be expected to impact the indigenous community.

The toxicity reported here is in excess of allowable limits.

Table 2. Data recorded during 48-hour, Daphnia pulex, static acute toxicity bioassay performed on the Pensacola Main Street Sewage Treatment Plant, Pensacola, Escambia County, Florida. NPDES Permit #FL0021440 30 Jan. to 1 Feb. 1980

Conc. or %	Test Container Number	Number of Live Organisms					Dissolved Oxygen (mg/l)					pH					Total Alkalinity (mg/l as $CaCO_3$)					Total Hardness (mg/l as $CaCO_3$)					Conductivity (umhos)				
		0	17.5	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
Control	A	10	10				7.6	8.8				8.12	8.1				123					125					233				
Control	B	10	10				7.6	8.8				8.11	8.2																		
5.6	A	10	0				7.6	8.9				8.00	8.2																		
5.6	B	10	0				7.7	8.9				8.02	8.2																		
10.0	A	10	0				7.5	8.9				7.94	8.2																		
10.0	B	10	0				7.5	8.9				7.93	8.2																		
18.0	A	10	0				7.5	8.9				7.83	8.1																		
18.0	B	10	0				7.6	8.9				7.83	8.1																		
32.0	A	10	0				7.6	8.9				7.68	8.1																		
32.0	B	10	0				7.6	8.9				7.67	8.0																		
56.0	A	10	0				7.4	8.9				7.50	8.0																		
56.0	B	10	0				7.4	8.8				7.46	8.0																		
100	A	10	0				7.35	8.8				7.23	7.8				88					77					310				
100	B	10	0				7.35	8.8				7.19	7.8																		

Remarks:

1. Total residual chlorine of 100% effluent 2.00mg/l. Free chlorine was not detectable.

2. Temperature range during test 20.0° to 21.0°C.

3. Test was terminated at 24 hours due to complete mortality of all organisms except control groups at 17.5 hours.

LITERATURE CITED

American Public Health Association. 1976. Standard Methods for the Examination of Water and Wastewater. 14th ed. pp. 1193.

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