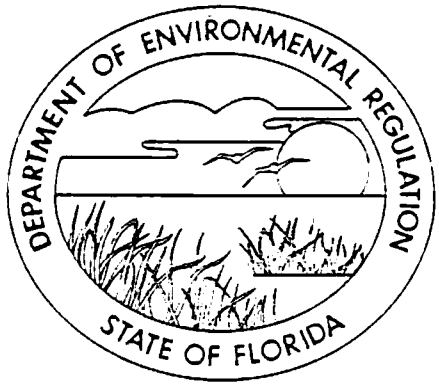


BIOASSAY OF SAUFLEY FIELD

SEWAGE TREATMENT PLANT

ESCAMBIA COUNTY, FLORIDA

(NPDES #FL0021041)

Biological Section
Bureau of Water Analysis
30 January 1980

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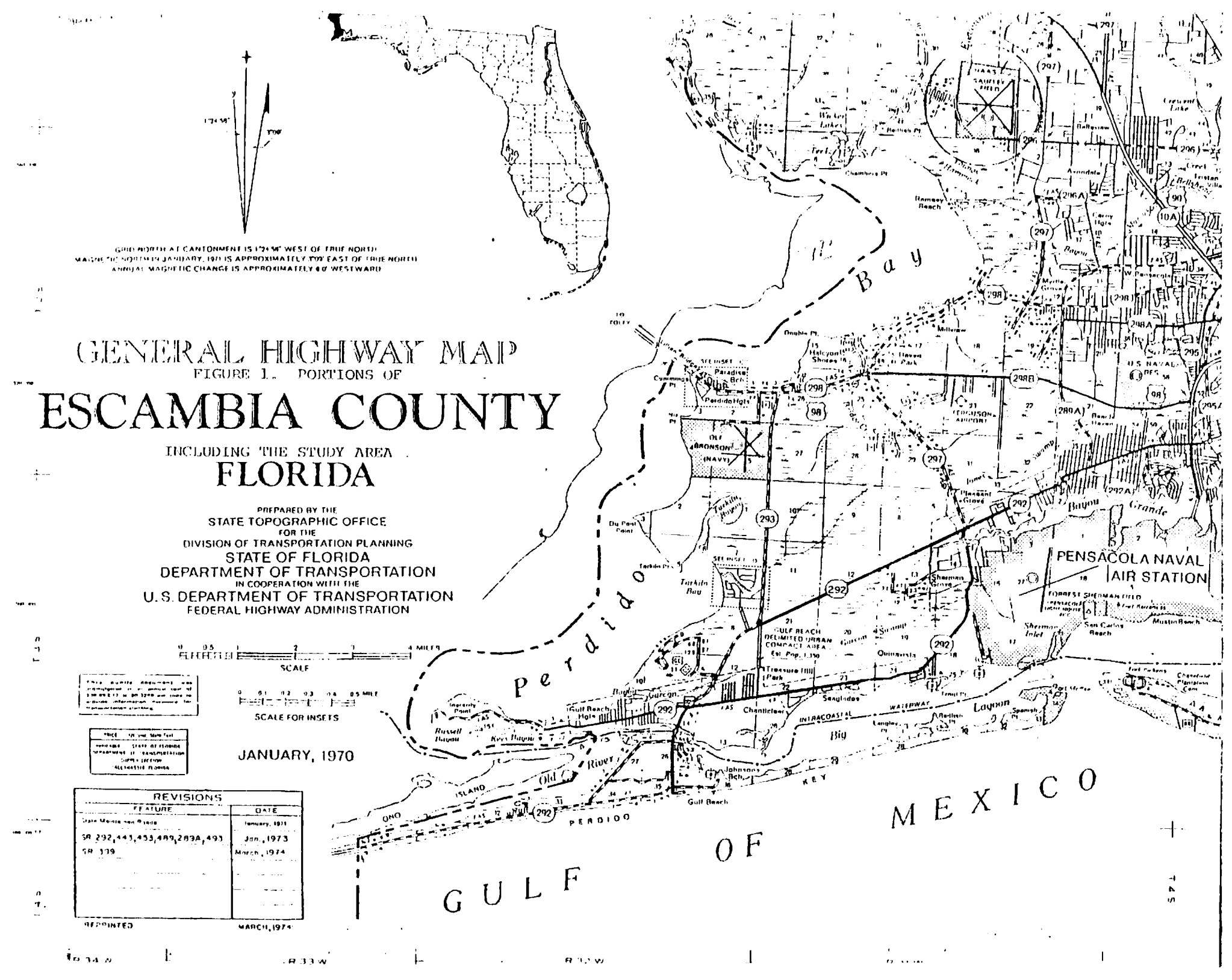
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INTRODUCTION

The Saufley Field Sewage Treatment Plant is located at Saufley Field Naval Air Station in Southwest Escambia County (Fig. 1). The plant is operated by the Navy Public Works Center and provides secondary sewage treatment for the wastewater generated at the naval facility. Approximately 0.21 MGD of effluent is discharged to the waters of Perdido Bay.

On January 30, 1980 the Biological Section obtained 24 hour composite effluent samples from the Saufley Field Plant and conducted a static bioassay to determine the existence and extent of toxicity to the biota of Perdido Bay. The results of this test are reported here.


GRID NORTH AT CANTONMENT IS 1°24'56" WEST OF TRUE NORTH
MAGNETIC NORTH IN JANUARY, 1970 IS APPROXIMATELY 1°00' EAST OF TRUE NORTH
ANNUAL MAGNETIC CHANGE IS APPROXIMATELY 6.0' WESTWARD
GENERAL HIGHWAY MAP
FIGURE 1. PORTIONS OF
ESCAMBIA COUNTY
INCLUDING THE STUDY AREA
FLORIDA
PREPARED BY THE
STATE TOPOGRAPHIC OFFICE
FOR THE
DIVISION OF TRANSPORTATION PLANNING
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
SCALE
SCALE FOR INSETS
JANUARY, 1970
REVISIONS
FEATURE
DATE
SR 292,443,453,489,289A,493
Jan., 1973
SR 399
March, 1974
REPRINTED
MARCH, 1974
Perdido Bay
GULF OF MEXICO
PENSACOLA NAVAL AIR STATION
PERDIDO KEY
Gulf Beach
Old River
Big Lagoon
Bayou Grande
Tarkiln Bayou
Russell Bayou
Key Bayou
Johnson Bch.
Sherman Inlet
Quietwater
Seaglades
Chanticleer
Gulf Beach Hgts.
Paradise Bch.
Perdido Hgts.
Halcyon Shores
Ramsey Beach
Sherman Grove
Pleasant Grove
Treasure Island Park
GULF BEACH DELIMITED URBAN COMPACT AREA
Est. Pop. 1,350
WATERWAY
INTRACOASTAL
FORREST SHERMAN FIELD
CRYSTAL LAKE
ESCAMBIA
ISLAND
R 34 W
R 33 W
R 32 W

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 maintenance procedures used to culture it are detailed below.

History 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. Rich Bradburn of the DER Pensacola Office (Northwest District) on January 29, 1980 using standard wastewater 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).

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. The organisms were not fed during this test.

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

Table 2. Data recorded during 48-hour, Daphnia pulex, static acute toxicity bioassay performed on the Saufley Field Naval Air Station Sewage Treatment Plant, Escambia County, Florida. 30 Jan. to 1 Feb. 1980. NPDES Permit #FL0002500.

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	2.5	18	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	10			7.9	8.9				8.14	8.2				123					125					232				
Control	B	10	10	10			7.9	8.8				8.16	8.2																		
5.6	A	10	4	0			8.0	8.8				8.09	8.2																		
5.6	B	10	8	0			8.0	8.9				8.09	8.2																		
10.0	A	10	0	0			8.0	8.9				8.05	8.2																		
10.0	B	10	0	0			8.1	8.9				8.05	8.2																		
18.0	A	10	0	0			8.0	8.9				7.98	8.1																		
18.0	B	10	0	0			8.0	8.9				7.97	8.2																		
32.0	A	10	0	0			8.1	8.9				7.84	8.1																		
32.0	B	10	0	0			8.2	8.9				7.83	8.1																		
56.0	A	10	0	0			8.4	8.9				7.61	8.0																		
56.0	B	10	0	0			8.4	9.0				7.56	8.0																		
100	A	10	0	0			8.7	8.9				6.55	7.4				20					35					172				
100	B	10	0	0			8.7	8.9				6.62	7.3																		

Remarks:

1. Total and free chlorine residuals at 100% effluent concentrations were 2.1 and 1.7 mg/l respectively.
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 18 hours.

Table 3 LC_{50} Data

Organism	Method of Data Analysis	2.5 hour LC_{50} and 95% confidence intervals
Daphnia pulex	Binomial	6.0% (0-10%)
	Moving average	*
	Probit	*

* When there are less than two concentrations at which the percent dead is between 0 and 100 neither the moving average nor probit methods can be used.

RESULTS AND DISCUSSION

Results of the bioassay of the Saufley Field NAS effluent indicated that this particular sample was toxic to Daphnia pulex. Within 18 hours all organisms in every concentration but the controls were dead. The LC_{50} values calculated for 2.5 hours was 6.0% (Table 3). The 18 hour LC_{50} was calculated to be less than 5.6%. The 96 hour LC_{50} for this facility would therefore be < 5.6%. The suspected toxicant in this case is chlorine since concentrations of 2.1 mg/l and 1.7 mg/l, total and free chlorine respectively, were determined for this sample. These concentrations of chlorine are known to be very toxic to the organism tested (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 procedures 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.

LITERATURE CITED

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

Peltier, William. 1978. Methods for measuring the acute toxicity of effluents to aquatic organisms. Environmental Research Laboratory. Athens, Georgia. EPA-600/4-78-012 (Revised July 1978) 51p.

U. S. Environmental Protection Agency. 1977. Bioassay for toxic and hazardous material. EPA-430/1-74-014.

U. S. Environmental Protection Agency. 1978. Bioassay procedures for the Ocean Disposal Permit Program. Environmental Research Laboratory. Gulf Breeze, Florida. EPA-600/9-78-010.