

BIOASSAY OF THE LANSING SMITH POWER PLANT

PANAMA CITY, BAY COUNTY, FLORIDA

NPDES #FL0002267

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DECEMBER 23, 1985

Biology Section
Division of Environmental Programs

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NPDES #FL0002267

Biology Section
Bureau of Laboratories and
Special Programs
December 23, 1985

EXECUTIVE SUMMARY

Lansing Smith Power Plant, Bay County, NPDES #FL0002267, on 13 to 15 November, 1985.

The sample of effluent collected from the Lansing Smith Power Plant outfall #001 was not toxic to the test organism, Mysidopsis bahia. No mortality occurred in the 48 hour screening test. Chemical analyses were not performed since the sample was not toxic.

INTRODUCTION

The Lansing Smith Power Plant is a coal fired steam-electricity generating facility owned and operated by Gulf Power Company, located in Panama City, Bay County, Florida (Fig. 1). The wastewater treatment facility treats condenser cooling water, metal cleaning wastes and boiler blowdown. Discharge from the Lansing Smith Power Plant may consist of thermal discharge (001), copper, iron and treatment pond effluent (002), and oils and grease (003) (data from NPDES file). Discharge is to Warren Bayou, a tributary to West Bay.

The Biology Section performed a static acute toxicity bioassay on a sample of effluent collected from the Lansing Smith Power Plant outfall #001, from 13 to 15 November, 1985. The results of the test are presented in this report. Those involved in performing the test and in preparation of this report were: R. B. Frydenborg, M. L. Moultrie, and M. L. Roll.

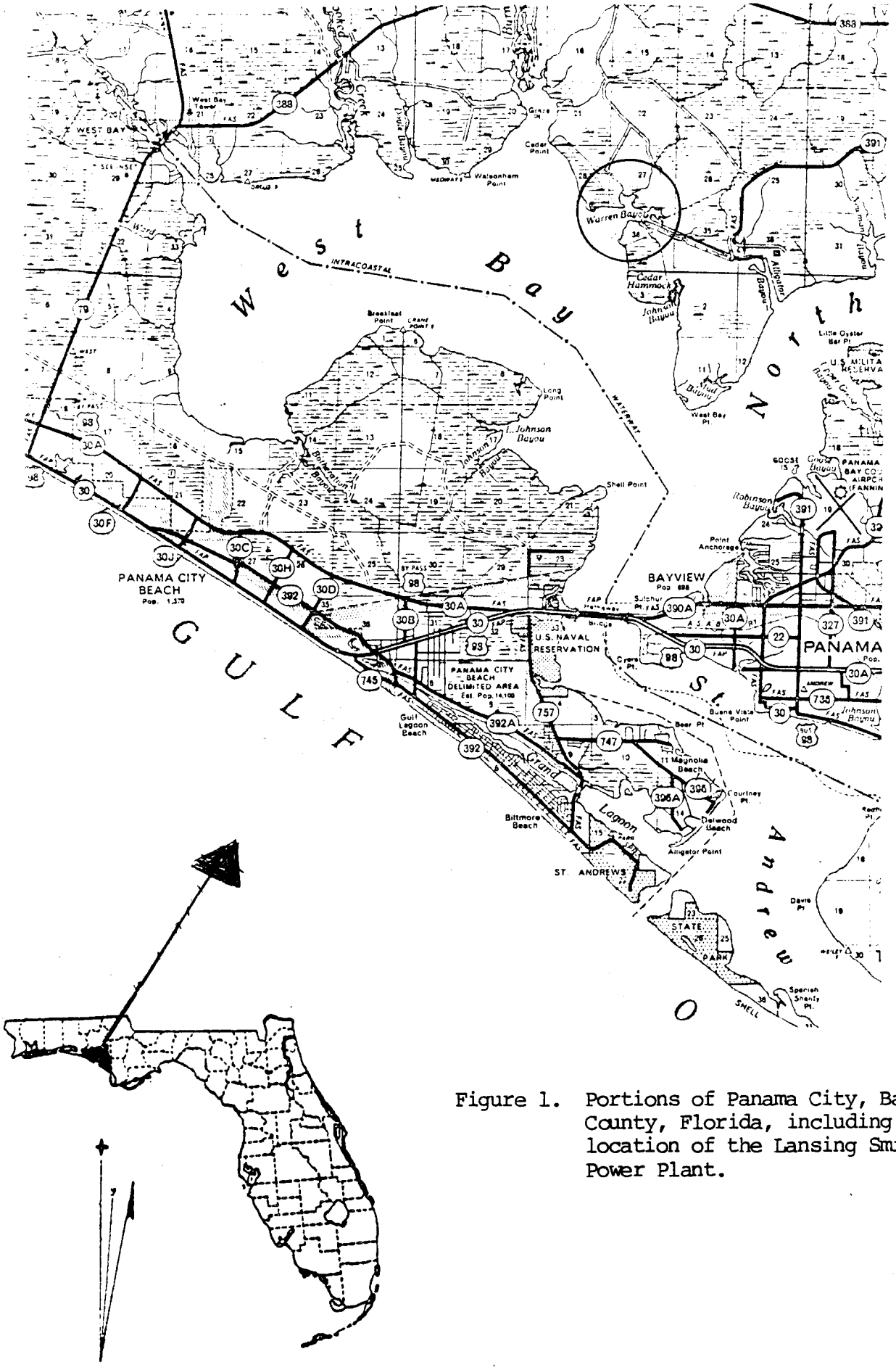


Figure 1. Portions of Panama City, Bay County, Florida, including location of the Lansing Smith Power Plant.

METHODS AND MATERIALS

Test methods used to conduct this static bioassay are extensively described by Peltier and Weber (1985) and the FDER Biology Section (1985). The organism selected for this study is among those recommended by Peltier and Weber (1985), the U.S. EPA (1978), and the FDER Biology Section (1985). 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 (15-30 ppt) to minimize acclimation periods to low or high salinity effluents. Seawater, used for culturing the test organisms and as diluent in the bioassays, is prepared by mixing artificial sea salts (Forty Fathoms®) and well water to obtain a final salinity of 20-30 ppt. Freshwater, for dilution of the seawater as necessary, is obtained from a deep well near the DER laboratory. The mysids are fed twice daily and once daily on weekends with freshly hatched Artemia (brine shrimp) and are kept at a constant temperature of 23° ± 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

Methods used to perform acute toxicity bioassays are described by Peltier and Weber (1985) and the FDER Biology Section (1985). Some of the methods described below are more specific than those of Peltier and Weber. These will be noted in more detail.

Sampling Methods and Test Dates

A 48 hour static acute toxicity screening biossay was performed on a sample of effluent collected from the Lansing Smith Power Plant outfall #001. The test was performed from 1440 hours on 13 November to 1430 hours on 15 November, 1985.

The sample was collected by Mr. Stephen Baisden of DER's Northwest District office at 1100 hours on 12 November, 1985 using standard wastewater sampling procedures. Separate samples were obtained for chemical and biological testing. Samples for metal analyses were preserved with HNO_3. Samples for organic chemical analyses and for the bioassays were unpreserved. The samples were iced and transported to the DER laboratory in Tallahassee for analyses within 24 hours of collection.

Test Temperature

Upon arrival of the iced (4°C) bioassay samples in the Tallahassee laboratory, the containers were placed in warm water and the temperature of the samples allowed to rise to 20° ± 2°C. Although this temperature may be different than the temperature of the sample during collection, it is the temperature range to which the test organisms are acclimatized and is the range recommended in the above referenced bioassay protocols. This avoids stressful effects caused by exposure to unusually cold or warm samples.

Saltwater Test

Saltwater for dilution of the effluent sample was prepared from artificial sea salts (Forty Fathoms®), and adjusted with DER well water until a salinity of approximately 20 ppt was achieved.

The concentration series selected for this study is presented in (Table 1). Two replicates of each 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 appropriate salinity aquarium to a culture dish 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.

Test Parameters

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 concentration 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. Ammonia concentrations, including the total and unionized fraction (expressed in mg/l as N and as NH_3, respectively), were recorded in the control and the 100% effluent test concentration at the beginning of the test. Total ammonia concentrations were determined using an Orion® specific ion probe and an Orion Ionalyzer®. The unionized fraction was then calculated based on the total ammonia concentration, and the pH, temperature, and salinity of the sample. These values were recorded on the bioassay data form and are presented in Table 2.

Table 1. Concentration Series and Volumes Used for This Static Bioassay

Mysidopsis bahia (mysid shrimp)-screening test only

Concentration	Dilution Water	Effluent	Total Volume
Control	500 ml	--------	500 ml
50.0%	250 ml	250 ml	500 ml
100.0%	------	500 ml	500 ml

Table 2. Data recorded during 48 hour, Mysidopsis bahia, static acute toxicity bioassay of the Lansing Smith Power Plant, Panama City, Bay County, Florida, NPDES #FL0002267, on 13 to 15 November, 1985.

Concentration or %	Number of Live Organisms			Dissolved Oxygen (mg/l)			pH			Temperature (°C)			Salinity (ppt)		
	0	24	48	0	24	48	0	24	48	0	24	48	0	48	
Control	5	5	5	8.4	6.5	5.9	8.6	8.4	8.2	21.3	20.6	21.1			Control Water
Control	5	5	5	8.4	6.5	5.9	8.6	8.4	8.2				18.9	19.8	NH_3(as NH_3)(mg/l) 0 / Total Alkalinity (mg/l $CaCO_3$)
50.0%	5	5	5	8.5	6.3	6.5	8.4	8.1	8.0	21.2	20.4	20.9			
50.0%	5	5	5	8.5	6.3	6.8	8.4	8.1	8.0				20.1	21.0	
100.0%	5	5	5	8.6	6.1	6.9	7.9	7.6	7.6	21.3	20.4	20.9			Total ammonia (as N)(mg/l) / Total Hardness (mg/l $CaCO_3$)
100.0%	5	5	5	8.6	6.1	6.9	7.9	7.6	7.6				21.9	22.5	0
															100% Effluent
															NH_3(as NH_3)(mg/l) 0 / Total Alkalinity (mg/l $CaCO_3$)
															Total ammonia (as N)(mg/l) 0 / Total Hardness (mg/l $CaCO_3$)

RESULTS AND DISCUSSION

The sample of effluent collected from the Lansing Smith Power Plant outfall #001 was not toxic to the test organism, Mysidopsis bahia. No mortality occurred in the 48 hour screening test (Table 2). Chemical analyses were not performed since the sample was not toxic.

LITERATURE CITED

Florida Department of Environmental Regulation, Biology Section. 1985a. Quality Assurance Manual for Performing Acute Toxicity Tests. (Second Edition). FDER.

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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. 121 p.