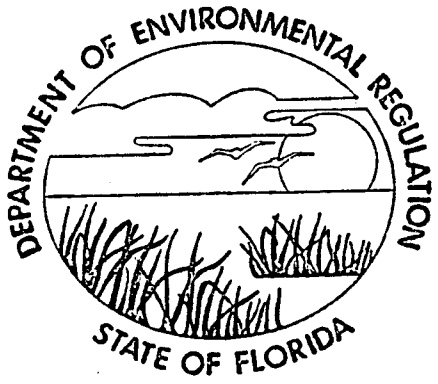


BIOASSAYS OF THE CITY OF CAPE CANAVERAL

SEWAGE TREATMENT PLANT

CAPE CANAVERAL, BREVARD COUNTY, FLORIDA

NPDES #FL0020541

SAMPLED 8/17/87

OCTOBER 15, 1987

Biology Section
Division of Environmental Programs

BIOASSAYS OF THE CITY OF CAPE CANAVERAL

SEWAGE TREATMENT PLANT

CAPE CANAVERAL, BREVARD COUNTY, FLORIDA

NPDES #FL0020541

Biology Section
Bureau of Laboratories and
Special Programs
October 15, 1987

EXECUTIVE SUMMARY

City of Cape Canaveral Sewage Treatment Plant, Cape Canaveral, Brevard County, Florida, NPDES #FL0020541, 18 to 20 August, 1987.

Three static acute toxicity bioassays and a Microtox® assay were performed on a sample of recovered water collected from the City of Cape Canaveral Sewage Treatment Plant, a facility which discharges into the Banana River. Results indicated that the sample was not acutely toxic to Ceriodaphnia dubia and Daphnia pulex, although some mortality occurred during the 48 hour bioassay. No mortality was noted in the Notropis leedsi test. The Microtox® assay indicated no toxicity to Photobacterium phosphoreum, with an EC_{50} (15 minutes, 15°C) of > 100%. The sample was de-chlorinated at the facility, and no ammonia was detected. Because the sample was not acutely toxic, chemical analyses were not performed.

INTRODUCTION

The City of Cape Canaveral Water Pollution Control Facility (sewage treatment plant) is located south of Central Boulevard and west of State Road 401 in Cape Canaveral, Brevard County, Florida (Fig. 1). According to the NPDES permit application (dated 24 March 1973), this facility began operations in 1966 and serves a population of approximately 5400. Since there are few private residences in the service area, a majority of the wastewater stems from commercial and industrial sources, including citrus packaging and facilities associated with port activities. The plant has a design capacity of 0.85 MGD but treats an average of only 0.47 MGD. Wastewater treatment at this plant consists of: comminution, contact stabilization, final clarification and chlorination (Fig. 2) prior to discharge to the Banana River through Outfall #001.

The Biology Section had previously performed bioassays on samples of pre-chlorinated, chlorinated and de-chlorinated recovered water from this facility, on 10 to 12 December, 1980. The results of those tests indicated that all three samples were acutely toxic to Mysidopsis bahia, with 48 hour LC_{50}'s of 56%, 42%, and 56%, respectively (FDER 1981). The cause of this toxicity was attributed, in part, to ammonia, chlorine and possibly chloramines.

To further evaluate the extent of toxicity of these discharge samples to the biota of the receiving waters, the Biology Section performed additional bioassays on grab samples from this facility on 26 to 28 January, 1982. Results indicated that the pre-chlorinated, chlorinated, and de-chlorinated samples were all toxic to M. bahia, with 48 hour LC_{50}'s of 15.4%, 29.8%, and 18.7%, respectively. The cause of this toxicity could not be attributed to a single cause, but to synergistic effects, including ammonia (FDER 1982).

Since that time, the facility has begun de-chlorinating the recovered water before discharge. Three static screening bioassays were performed on freshwater test organisms using a sample of this de-chlorinated recovered water discharge collected in August, 1987, as well as a Microtox® assay. Results are presented in this report. Those involved in performing the tests and in preparation of this report were: J. Epler, J. M. Faircloth, R. B. Frydenborg, K. M. Lurding, M. L. Roll, and L. A. Williams.

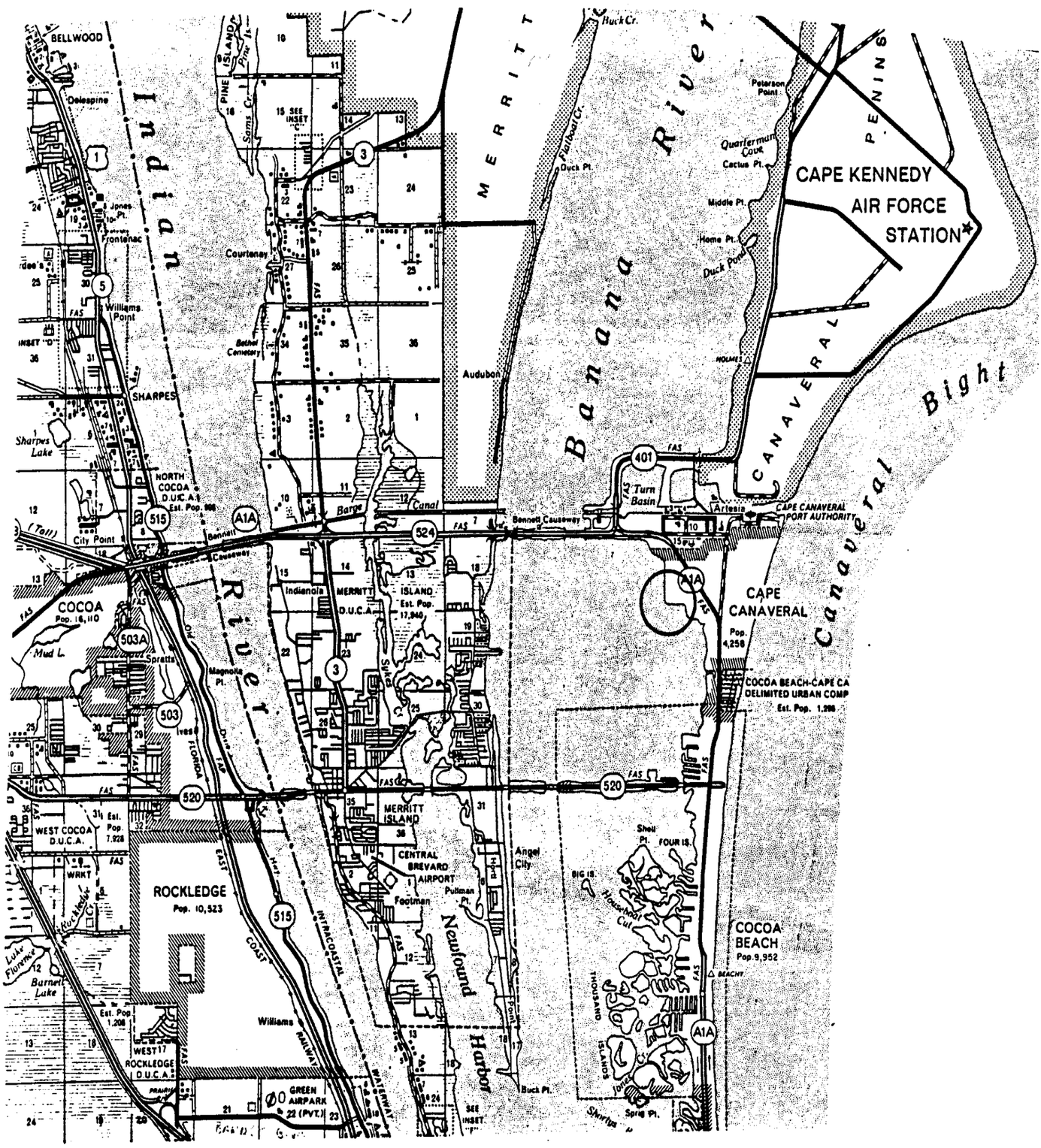
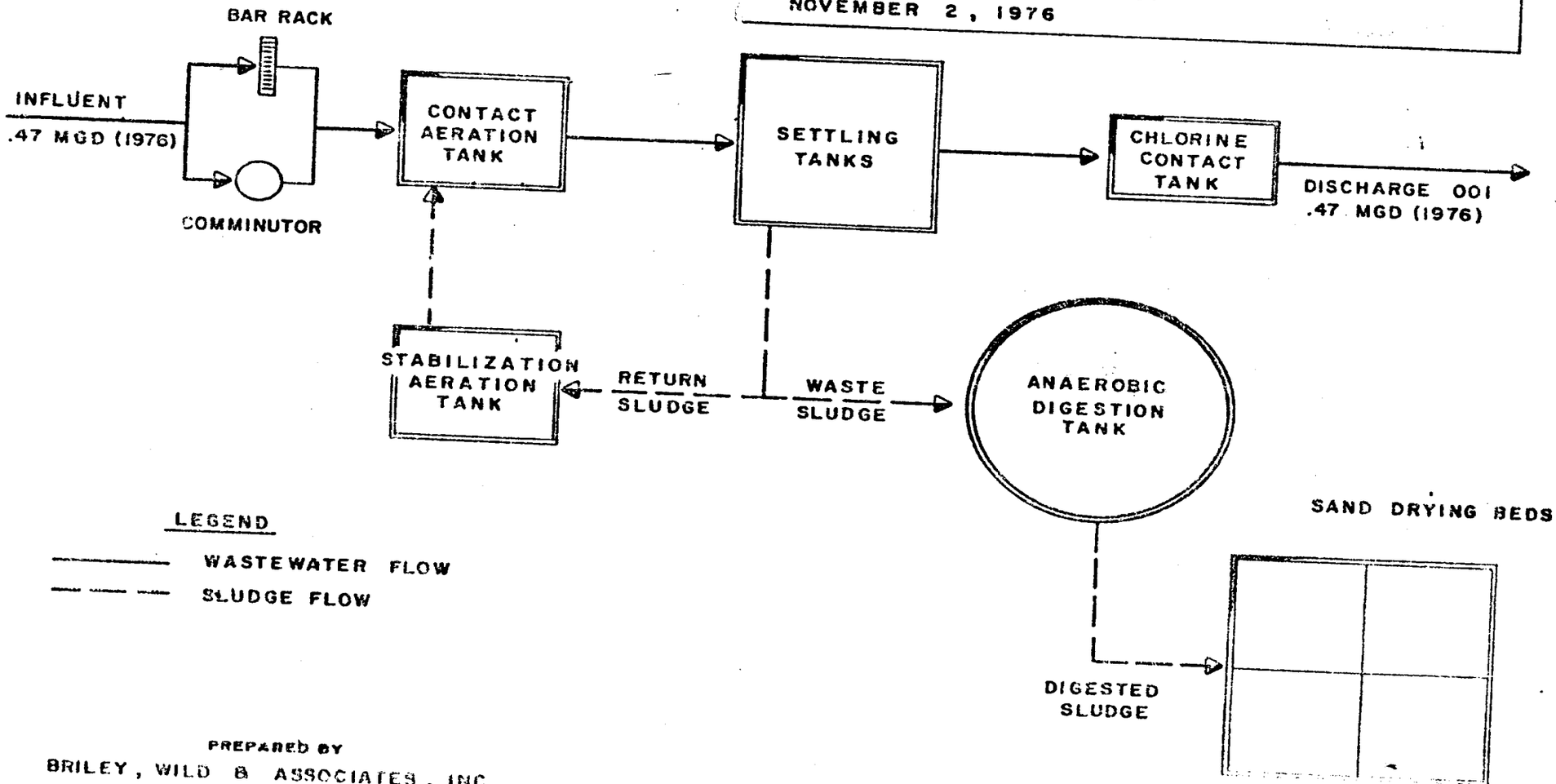


Figure 1. Portions of Brevard County, Florida, including city of Cape Canaveral and study area.

Figure 2: SCHEMATIC OF WASTEWATER FLOW
CAPE CANAVERAL WATER POLLUTION CONTROL PLANT
CAPE CANAVERAL, FLORIDA
DISCHARGE SERIAL NO. 001
NOVEMBER 2, 1976



PREPARED BY
BRILEY, WILD & ASSOCIATES, INC.
CONSULTING ENGINEERS
ORMOND BEACH — CLEARWATER
FLORIDA

METHODS AND MATERIALS

Test methods used to conduct these static bioassays are extensively described by Peltier and Weber (1985) and the FDER Biology Section (1985). The organisms selected for this study include species recommended by Peltier and Weber (1985) and the FDER Biology Section (1985). Additionally, the Biology Section maintains cultures of several species of organisms indigenous to the State of Florida. One of these indigenous species was also selected for testing. Life histories of these test organisms and maintenance procedures used to culture them are detailed below.

The Microtox® assay was run according to the manufacturer's protocol described in the Microtox® System Operating Manual.

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, in June, 1987. This culture has been maintained since its arrival in 2 1/2 gallon all-glass aquaria, filled with unchlorinated DER well water, under a 16:8 hour light-dark cycle. Organisms are fed a liquified blend of Purina Trout Chow® and Cerophyl® twice daily, once daily on weekends, and are kept at a constant temperature of 22° ± 2°C. The aquaria are cleaned weekly by siphoning off half the water along with the detritus and excess organisms, and then refilling with fresh aerated well water. Additional measures are taken and/or new cultures started in the event of abnormal circumstances such as: declining populations, ephippia formation, or excessive fungal or bacterial growth.

Ceriodaphnia dubia (water flea) - A breeding culture of Ceriodaphnia dubia was obtained from the EPA laboratory in Athens, Georgia, in June, 1985. The culture is maintained in 2-1/2 gallon all-glass aquaria, filled with unchlorinated DER well water, under a 16:8 hour light-dark cycle. Organisms are fed a liquified blend of Purina Trout Chow®, Cerophyl® and Fleischmann's® yeast twice daily, once daily on weekends, and are kept at a constant temperature of 26° ± 2°C. The aquaria are cleaned weekly by siphoning off half the water along with the detritus and excess organisms, and then refilling with fresh aerated well water. Additional measures are taken and/or new cultures started in the event of abnormal circumstances such as: declining populations, ephippia formation, or excessive fungal or bacterial growth.

Notropis leedsi (bannerfin shiner) - Approximately 40 adult bannerfin shiners were obtained from an indigenous population in the upper Suwannee River during October, 1981. The breeding stock is maintained in 30 and 125 gallon all-glass aquaria equipped with a flow-through water exchange system. Water for this system is unchlorinated and is pumped from the DER deep well. The bannerfin shiners are reared at 22° ± 2°C under a 16:8 hour light-dark cycle and are fed Tetra-Min® and frozen Artemia (brine shrimp) twice daily, and once daily on weekends. Breeding and egg hatching are encouraged at 25°C. The eggs are laid between stacked red ceramic tiles separated by a 3mm bead of silicone. Most of the eggs

adhere to the tiles and are easily removed to heated, aerated hatching tanks. The narrow space between the tiles eliminates egg predation by adult fish. New hatching tanks are started regularly to segregate fry into even age groups. Newly hatched fry are fed a liquefied blend of Purina Trout Chow® and Cerophyl® twice daily. After one week, feeding is augmented with newly hatched Artemia nauplii and finely crushed Tetra Min®. The fish used in this test were 26 days old at the time of the test.

Photobacterium phosphoreum, a luminescent marine bacterium, is maintained as a freeze-dried culture, purchased from Microbics Corporation. Lot number M-603 was used in this assay. Immediately prior to the assay, the culture is rehydrated with 1.0 ml of specially purified water (Microtox® Reconstitution Solution).

Standard Reference Toxicity Assay

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

Three static acute toxicity bioassays were performed on a sample of recovered water collected from Outfall #001 of the City of Cape Canaveral Sewage Treatment Plant. The tests were performed from 0930 hours on 18 August to 0930 hours on 20 August, 1987.

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 collected by Mr. Louis Ley of DER's Central Florida District Office at 1300 hours on 17 August, 1987, using standard wastewater sampling procedures. 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 sample in the Tallahassee laboratory, the containers were placed in warm water and the temperature of the sample allowed to rise to 20° $\pm$ 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.

Freshwater Tests

Freshwater for dilution of the recovered water samples was obtained from the same DER deep well that is used to culture the test organisms. The concentration series selected for this study is given in Table 1.

Two replicates, of each concentration and a control, were used to test with the water fleas, Ceriodaphnia dubia and Daphnia pulex. Flint glass jars of either 60 ml (for C. dubia) or 250 ml (for D. pulex) capacity were used as test chambers, and either 50 ml or 200 ml of the appropriate test concentration was placed in each chamber. Ceriodaphnia were siphoned into a large culture dish and neonates were transferred by glass pipette, and loaded 10 per chamber, resulting in 20 per test concentration. Daphnia were siphoned into a large culture dish to isolate the proper size and age organisms (neonates). To accomplish this, the Daphnia were siphoned through a stainless steel screen. The trapped adults were then discarded. These neonates were then transferred by glass pipette, examined for injury, and were loaded 10 per chamber, resulting in 20 per test concentration. Water fleas were not fed during these tests.

Two replicates, of each concentration and a control, were used for the Notropis leedsi (bannerfin shiner) bioassay. The fish were transferred individually or by twos, into wide mouth quart jars containing 500 ml each of the appropriate test concentration, and were loaded 5 per chamber, resulting in 10 per concentration. Fish were not fed during this test.

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. Total alkalinity and total hardness (measured as $CaCO_3$ using HACH Chemical Company reagents) were recorded at the beginning of the test for the controls and the 100% sample concentration. The specific conductance (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 controls and the 100% 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 forms and are presented in Table 2.

Microtox® Test

Upon receipt at the DER laboratory, a 20 ml subsample was collected in a small beaker. The sample was adjusted to 2% salinity with reagent grade dry sodium chloride to maintain the osmotic balance of the test

bacterium during the assay. Four two fold dilutions were made of the test sample resulting in a test range of 97%, 49.5%, 24.75%, 12.38%, and 0%. An incubation temperature of 15°C was maintained throughout the assay. Ten microliters of bacterial suspension was added to each of the 1.0 ml test dilutions. Light output (luminescence) was read after 5 and 15 minutes incubation, using the Microtox® analyzer and recorded on a Perkin-Elmer strip chart recorder. In the presence of a toxicant, the luminescence of the test organisms will decrease. In the presence of a stimulant, the luminescence will increase. Toxicity is calculated as a function of the light lost in the test sample, normalized to the control, and is reported as the effective concentration at which a 50% reduction, of light output is determined in 15 minutes (EC_{50}). Results are given in Table 4.

RESULTS AND DISCUSSION

The sample of recovered water collected from the City of Cape Canaveral STP was not acutely toxic to the test organisms. Although some mortality occurred in the 48 hour Ceriodaphnia dubia and Daphnia pulex tests (20% and 10%, resepctively), this was not sufficient to calculate and LC_{50} (Table 3). No mortality occurred in the Notropis leedsi test (Table 2). The Microtox® assay was not toxic to Photobacterium phosphoreum, with an EC_{50} (15 minutes, 15°C) of > 100% (Table 4). No ammonia was detected in this sample. Chemical analyses were not performed.

Table 1. Concentration Series and Volumes Used for These Static Bioassays.

Ceriodaphnia dubia (water flea)

Concentration	Dilution Water	Sample	Total Volume
Control	50.0 ml	--------	50 ml
50.0%	25.0 ml	25.0 ml	50 ml
100.0%	-------	50.0 ml	50 ml

Daphnia pulex (water flea)

Concentration	Dilution Water	Sample	Total Volume
Control	200.0 ml	--------	200 ml
50.0%	100.0 ml	100.0 ml	200 ml
100.0%	--------	200.0 ml	200 ml

Notropis leedsi (bannerfin shiner)

Concentration	Dilution Water	Sample	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, *Ceriodaphnia dubia*, *Daphnia pulex*, and *Notropis leedsi*, static acute toxicity bioassays of the City of Cape Canaveral STP, NPDES #FL0020541, 18 to 20 August, 1987.

Concentration or %	Number of Live Organisms			Dissolved Oxygen (mg/l)			pH			Temperature (°C)			Conductivity (umhos)	
	0	24	48	0	24	48	0	24	48	0	24	48	0	48
Ceriodaphnia dubia														
Control	10	10	10	8.5	7.8	8.7	7.8	7.9	8.0	19.7	20.1	19.8		
Control	10	10	10	8.5	7.8	8.8	7.8	7.9	8.0					
50%	10	10	10	8.7	8.0	9.0	7.4	7.8	7.9	20.4	20.0	19.6		
50%	11[a]	11	11	8.7	8.1	9.0	7.4	7.8	7.9					
100%	10	10	7	8.8	8.2	9.1	6.8	7.7	7.8	21.0	20.0	19.6		
100%	10	9	9	8.8	8.2	9.1	6.8	7.7	7.8					
Daphnia pulex														
Control	10	10	9[b]	8.7	8.6	8.7	7.9	7.9	8.0	20.1	20.1	19.8		
Control	10	10	10	8.7	8.7	8.7	7.9	8.0	8.0				190	200
50%	10	10	9	8.9	8.3	8.5	7.2	7.8	7.7	20.5	20.0	19.8		
50%	10	10	9	8.9	8.4	8.5	7.2	7.8	7.7				690	690
100%	10	9	9	9.1	8.5	8.5	6.8	7.6	7.6	21.4	20.0	19.7		
100%	10	9	9	9.1	8.5	8.5	6.8	7.6	7.6				1100	1100
Notropis leedsi														
Control	5	5	5	8.5	7.6	7.8	7.8	7.7	7.6	20.5	20.0	19.5		
Control	5	5	5	8.5	7.6	7.9	7.8	7.7	7.6				200	200
50%	5	5	5	8.7	7.8	8.0	7.1	7.5	7.5	20.9	19.9	19.5		
50%	5	5	5	8.7	7.8	8.0	7.1	7.5	7.5				700	680
100%	5	5	5	8.9	7.5	8.0	6.7	7.3	7.3	21.6	19.9	19.5		
100%	5	5	5	9.0	7.3	8.0	6.7	7.3	7.3				1120	1080

Control Water

NH_3(as NH_3)(mg/l) 0

Total ammonia (as N)(mg/l) 0

Total Alkalinity 108 (mg/l $CaCO_3$)

Total Hardness 113 (mg/l $CaCO_3$)

100% Sample

NH_3(as NH_3)(mg/l) 0

Total ammonia (as N)(mg/l) 0

Total Alkalinity 54 (mg/l $CaCO_3$)

Total Hardness 210 (mg/l $CaCO_3$)

[a] Extra organism loaded by mistake, allowed to remain.

[b] One *Daphnia* found stuck to side of jar.

Table 3. LC_{50} Data for Bioassays of the City of Cape Canaveral STP, NPDES #FL0020541, 18 to 20 August, 1987.

Organism	Method of Data Analysis	24 Hour LC_{50} and 95% Confidence Intervals	48 Hour LC_{50} and 95% Confidence Intervals
Ceriodaphnia dubia	Binomial	a	a
	Moving Average	a	a
	Probit	a	a
Daphnia pulex	Binomial	a	a
	Moving Average	a	a
	Probit	a	a
Notropis leedsi	Binomial Moving Average Probit	No Mortality	No Mortality

[a] Due to an insufficient number of dead organisms, or to the irregular distribution of mortality, an LC_{50} value cannot be calculated using this method of statistical analysis.

Table 4. Microtox test results, City of Cape Canaveral STP, NPDES #FL0020541, collected 17 August, 1987.

Microtox Test Culture Lot #M-603

	Final Readings	
% Sample	5-min (I_5)	15-min (I_{15})
0	93.5	50.0
0	88.0	47.0
0	85.0	45.5
12.38	100	54.0
12.38	99.0	54.0
12.38	100	54.0
24.75	98.0	53.5
24.75	92.0	49.0
24.75	97.0	53.0
49.5	99.0	54.0
49.5	98.0	54.5
49.5	94.0	52.0
99	100	61.5
99	92.0	54.5
99	99.5	58.0

EC_{50} (15 min., 15°C) > 100% sample
EC_{50} (15 min, 15°C) calculated using the Data Reduction Computer Program developed by Microbics Corporation for the Sharp Model EL-5100 (Microtox®) Systems Operating Manual, 1982.

LITERATURE CITED

Florida Department of Environmental Regulation, Biology Section. 1981. Bioassays of the City of Cape Canaveral Water Pollution Control Facility, Brevard County, Florida, NPDES Permit #FL0020541. FDER. 16 p.

_____. 1982. Bioassays of the City of Cape Canaveral Water Pollution Control Facility, Brevard County, Florida, NPDES #FL0020541, FDER. 17 p.

_____. 1985. Quality Assurance Manual for Performing Acute Toxicity Tests (Second Edition). FDER.

Peltier, W. and C. I. Weber. 1985. Methods for measuring the acute toxicity of effluents to aquatic organisms (Third Edition). Environmental Research Laboratory. Athens, Georgia. EPA-600/4-85-012. 217 p.

Industry/Toxicant: Cape Canaveral STP
Address: Cape Canaveral
Contact/District: CF
Effluent Serial Number: 001
NPDES Permit Number: FL0020541

BIOASSAY DATA FORM

Test Number: 1 of 3
Test Type: Static Renewal, (Screening) Conventional
Other:

Sample Collection: Date 8-17-87 Time 1300
Test Beginning: Date 8-18-87 Time 9:30
Test Ending: Date 20 Aug 87 Time 930
Test Organism: Ceriodaphnia dubia
Age/Life Stage: Neonates

Conc. or %	Test Container Number	Number of Live Organisms 0	24	48	72	96	Dissolved Oxygen (mg/l) 0	24	48	72	96	pH 0	24	48	72	96	Temperature °C 0	24	48	72	96	Conductivity 0	24	48	72	96
Control	5	10	10	10			8.5	7.8	8.7			7.8	7.9	8.0			19.7	20.1	19.8							
Control	92	10	10	10			8.5	7.8	8.8			7.8	7.9	8.0								1345				
50%	45	10	10	10			8.7	8.0	9.0			7.4	7.8	7.9			20.4	20.0	19.6							
50%	50	10	11A	11			8.7	8.1	9.0			7.4	7.8	7.9								1400				
100%	36	10	10	9			8.8	8.2	9.1			6.8	7.7	7.8			21.0	20.0	19.6							
100%	90	10	9	9			8.8	8.2	9.1			6.8	7.7	7.8								1400				
Initial of Investigator		JE	RBF	JMF			RBF	RBF	MLR			RBF	RBF	MLR			RBF	RBF	JMF			RBF				

Alkalinity/Hardness (mg/l as $CaCO_3$)
Control Water: 108/113
100% Sample: 54/210
Other:
Measured by: KML

Ammonia unionized/total (mg/l as NH_3/N)
Hour 0 0/0
Control Water: 0/0
100% Sample: 0/0
Other:

Hour ____
Control Water:
100% Sample:
Other:
Measured by:

Signatures:
Joseph Fauchette
KH Lindsay
Russell Frydenborg
Morton S. Roll

A-extra organism added by mistake

Instrument Calibrations:

	pH Meter:	DO Meter:	S-C-T Meter:
0 Hours	7 at 7; 9 at 9	9.1 at 30.5°C	10 @ 10 25 25
24 Hours	7 at 7; 9 at 9	9.2 mg/l at 20.0	11 @ 10 25.7 @ 30
48 Hours	7 at 7; 9 at 9	9.2 mg/l at 20°C	10.2 @ 10 25.2 @ 30
72 Hours			
96 Hours			

Remarks:

Total Residual Chlorine:
Field data: ____ Method: ____
Lab: N.D. Method: HACH
Lab: ____ Method: ____

De-chlorinated:
Measurements by: MLR

Reviewed by:
Date: 10/14/87

Industry/Texticant: Cape Canaveral STP
Address: Cape Caldaveral
Contact/District: CF
Effluent Serial Number: 001
NPDES Permit Number: FL0020541

BIOASSAY DATA FORM

Test Number: 2 of 3
Test Type: Static Renewal (Screening) Conventional
Other:

Sample Collection: Date 8-17-87 Time 1300
Test Beginning: Date 8-18-87 Time 0900
Test Ending: Date 20 Aug 87 Time 0900
Test Organism: Daphnia pulex
Age/Life Stage: Neonates

Conc. or %	Test Container Number	Number of Live Organisms 0	24	48	72	96	Dissolved Oxygen (mg/l) 0	24	48	72	96	pH 0	24	48	72	96	Temperature °C 0	24	48	72	96	Conductivity 0	24	48	72	96
Control	69	10	10	9[a]			8.7	8.6	8.7			7.9	7.9	8.0			20.1	20.1	19.8							
Control	41	10	10	10			8.7	8.7	8.7			7.9	8.0	8.0								190 200		200		
50%	10	10	10	9			8.9	8.3	8.5			7.2	7.8	7.7			20.5	20.1	19.8							
50%	78	10	10	9			8.9	8.4	8.5			7.2	7.8	7.7								690		690		
100%	49	10	9	9			9.1	8.5	8.5			6.8	7.6	7.6			21.4	20.0	19.7							
100%	67	10	9	9			9.1	8.5	8.5			6.8	7.6	7.6								1100		1100		
Initial of Investigator		KHL	RBF	MLR JMF			RBF	RBF	JMF			RBF	RBF	JMF			RBF	RBF	JMF			RBF	JMF	JMF		

Alkalinity/Hardness (mg/l as $CaCO_3$)
Control Water: 108/43
100% Sample: 54/210
Other:
Measured by: KME

Ammonia unionized/total (mg/l as NH_3/N)
Hour 0
Control Water: 0/0
100% Sample: 0/0
Other:
Hour ____
Control Water:
100% Sample:
Other:
Measured by: JMF

Signatures:
Joseph Faucett
K H Lwdins
Russell Frydenborg
Martin S Rll

Instrument Calibrations:

	pH Meter:	DO Meter:	S-C-T Meter:
0 Hours	See Test #1		
24 Hours			
48 Hours			
72 Hours			
96 Hours			

Remarks: [a] One Daphnia stuck to side of jar

Total Residual Chlorine:
Field data: ____ Method: ____
Lab: ND Method: HACH
Lab: ____ Method: ____
De-chlorinated:
Measurements by: MLR

Reviewed by:
Date: 10/14/87

Industry/Toxicant: Cape Canaveral STP
Address: Cape Canaveral
Contact/District:
Effluent Serial Number: 001
NPDES Permit Number: FL0020541

BIOASSAY DATA FORM

Test Number: 3 of 3
Test Type: Static-Renewal (Screening) Conventional
Other:

Sample Collection: Date 8-17-87 Time 1300
Test Beginning: Date 8-18-87 Time 0900
Test Ending: Date 20 Aug 87 Time 0900
Test Organism: Notropis leedsi
Age/Life Stage: 26 days

Conc. or %	Test Container Number	Number of Live Organisms 0	24	48	72	96	Dissolved Oxygen (mg/l) 0	24	48	72	96	pH 0	24	48	72	96	Temperature °C 0	24	48	72	96	Conductivity 0	24	48	72	96
Control	—	5	5	5			8.5	7.6	7.8			7.8	7.7	7.6			20.5	20.0	19.5							
Control	58	5	5	5			8.5	7.6	7.9			7.8	7.7	7.6								200		200		
50%	70	5	5	5			8.7	7.8	8.0			7.1	7.5	7.5			20.9	19.9	19.5							
50%	99	5	5	5			8.7	7.8	8.0			7.1	7.5	7.5								700		680		
100%	3	5	5	5			8.9	7.5	8.0			6.7	7.3	7.3			21.6	19.9	19.5							
100%	—	5	5	5			9.0	7.3	8.0			6.7	7.3	7.3								1120		1080		
Initial of Investigator		KMLF		MLR			RBF	RBF	JMF			RBF	RBF	JMF			RBF	RBF	JMF			RBF	JMF	JMF		

Alkalinity/Hardness (mg/l as $CaCO_3$)
Control Water: 108 / 112
100% Sample: 54 / 216
Other:
Measured by: KML

Ammonia unionized/total (mg/l as NH_3/N)
Hour 0
Control Water: 0/0
100% Sample: 0/0
Other:

Hour ____
Control Water:
100% Sample:
Other:
Measured by: jmf

Signatures:
Joseph Faircloth
K M Lessing
Russel Frydenborg
Martin L Rolf

Instrument Calibrations:

	pH Meter	DO Meter	S-C-T Meter
0 Hours	See Test # 1.		
24 Hours			
48 Hours			
72 Hours			
96 Hours			

Remarks:

Total Residual Chlorine:
Field data: ____ Method: ____
Lab: N.D. Method: HACH
Lab: ____ Method: ____

De-chlorinated:
Measurements by: MLR

Reviewed by:
Date: 10/14/87

MICROBICS MICROTOX™ DATA REDUCTION SHEET

SAMPLE ID NO. _____ COLLECTED BY: _____

SOURCE: City of Cape Canaveral DATE: _____ TIME: _____

REPORTED RESULTS: TOXIC ☐ NON-TOXIC ☒ MAX Γ = _____ FOR CONCENTRATION = _____

GRAPH ☐ CALC ☐ EC 50 (15 MIN, 15 °C) = >100 ☒ % SAMPLE ☐ mg/L

CONFIDENCE FACTOR = _____ ☐ OTHER _____

95% CONFIDENCE INTERVAL _____ TO _____

REMARKS: _____

SAMPLE DATA: SAMPLE TYPE (EFFLUENT, LEACHATE, ETC.): effluent - de Cl2 at Plan

DATE ASSAYED: 8 - 17 - 87; TIME: 1:00 PM

VISUAL COLOR: none; CORRECTION REQUIRED: YES ☐ NO ☐

VISUAL TURBIDITY: none; SEPARATION REQUIRED: YES ☐ NO ☐

INITIAL pH: 6.8; pH ADJUSTED TO: _____ WITH _____

OSMOTICALLY ADJUSTED WITH: MOAS ☐ DRY NaCl ☒ OTHER ☐ _____

PRIMARY DILUTION OF SAMPLE: none

OPERATOR: Leslee; REAGENT VIAL LOT NO. M - 603

REMARKS: _____

MICROTOX 99% TEST

Sample Cuvette	% Sample	Final Readings 5 min	Final Readings 15 min	Γ5	Γ15	Notes
A1	0	93.5	50			
B1	0	88	47			
C1	0	85	45.5			
A2	12.28	100	54	-.11	-.12	
B2	12.28	99	54	-.11	-.12	
C2	12.28	100	54	-.11	-.12	
A3	24.75	98	53.5	-.07	-.08	
B3	24.75	92	49	-.07	-.08	
C3	24.75	97	53	-.07	-.08	
A4	49.5	99	54	-.05	-.11	
B4	49.5	98	54.5	-.05	-.11	
C4	49.5	94	52	-.05	-.11	
A5	99	100	61.5	-.09	-.18	
B5	99	92	54.5	-.09	-.18	
C5	99	99.5	58	-.09	-.18	
EC_{50} (15 min, 15 °C)		By Graph				
		By Calculator		>100	>100	

Reviewed by _____

Date 10/14/87