BIOASSAYS OF CONSERV CHEMICALS, INC.

NICHOLS, POLK COUNTY, FLORIDA

NPDES #FL0030139

SAMPLED 11/17/86

JANUARY 28, 1987

Biology Section
Division of Environmental Programs

BIOASSAYS OF CONSERV CHEMICALS, INC.

NICHOLS, POLK COUNTY, FLORIDA

NPDES #FL0030139

Biology Section
Bureau of Laboratories and
Special Programs
January 28, 1987

EXECUTIVE SUMMARY

Conserv Chemicals, Inc., Nichols, NPDES #FL0030139, on 18 to 20 November, 1986.

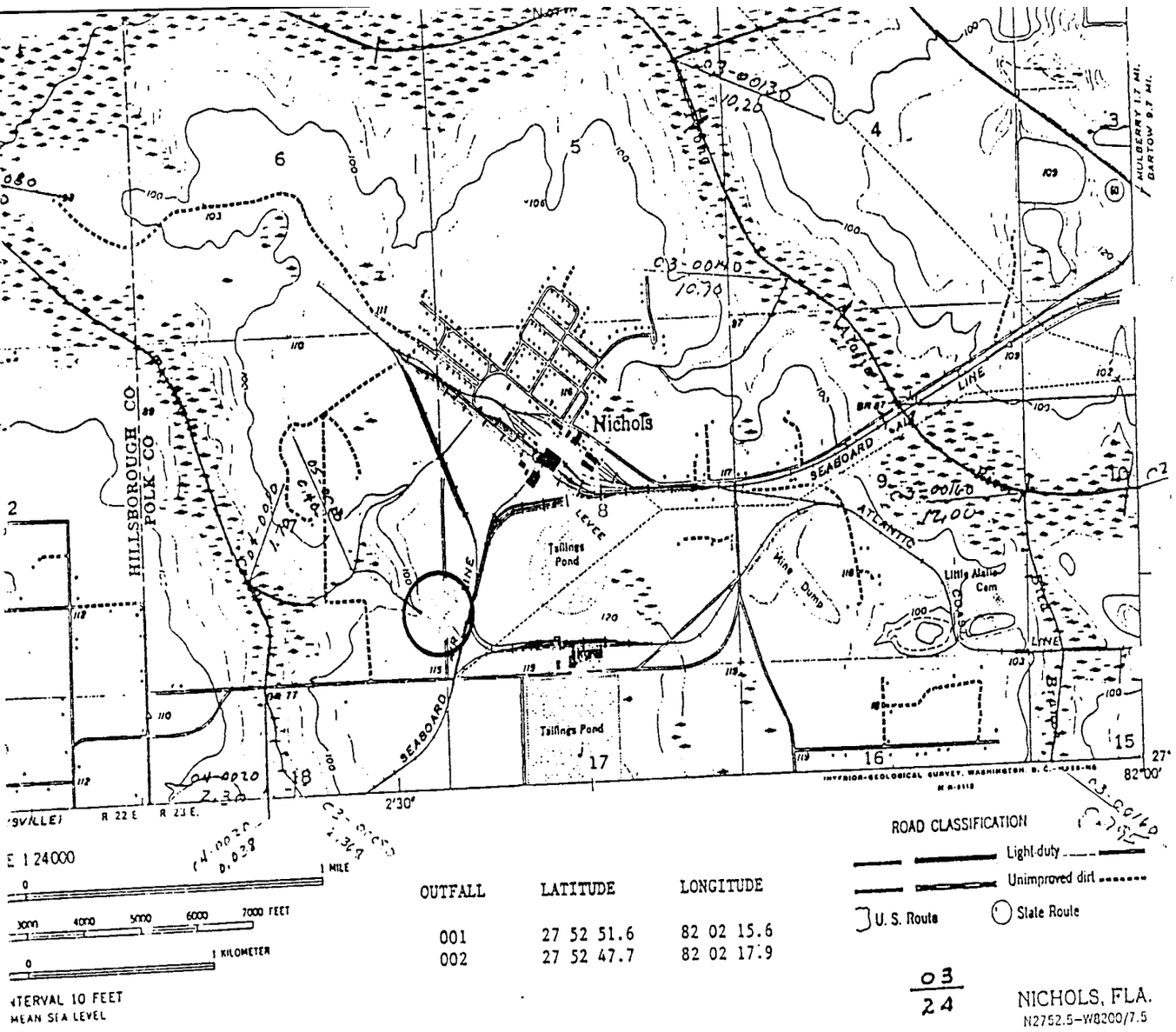
The sample of this phosphate facility's cooling water discharge (Outfall #001) was not acutely toxic to the test organisms, Daphnia pulex and Notropis leedsi. No organisms died during these 48 hour static acute screening bioassays (50.0% and 100.0% concentrations). The Ceriodaphnia dubia test was invalidated due to excess (> 10.0%) control mortality (data not reported). The concentrations of ammonia detected in the sample (0.07 mg/l total and 0.001 mg/l unionized) were insufficient to have been toxic to the test organisms. Further chemical analyses were not performed.

We recommend that the next bioassay sampling of this facility be performed on the industrial wastewater (Outfall #002) discharge.

INTRODUCTION

Conserv Chemicals, Inc. is located on State Road 676 near Nichols, Polk County, Florida (Fig. 1). The facility manufactures phosphatic fertilizer and diammonium phosphate, which are chemical produts of the phosphate mining industry. An average of 3.75 MGD of non-process once-through cooling water, pH neutralized if deemed necessary, is continuously discharged at outfall #001 (Fig. 2). Treated process wastewater is discharged sporadically from a holding and evaporation pond, when there is excess precipitation, at outfall #002 (Fig. 3). Discharge is to a drainage ditch, which flows to the Thirty Mile Creek and then to the Alafia River (NPDES file).

At the request of DER's Southwest district, the Biology Section performed three static acute screening bioassays (50.0% and 100.0% concentrations) on the wastewater from this facility's #001 outfall (cooling water). The results of these tests are presented in this report. Those involved in performing these tests and in preparation of this report were: M. L. Roll and P. G. Weiland.



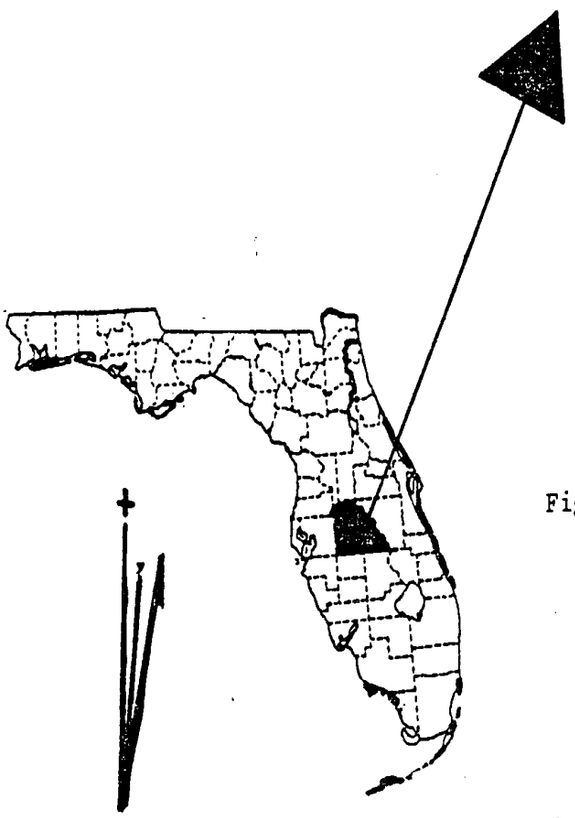


Figure 1. Portions of Polk County, Florida including Nichols and the location of Conserv Chemicals, Inc.

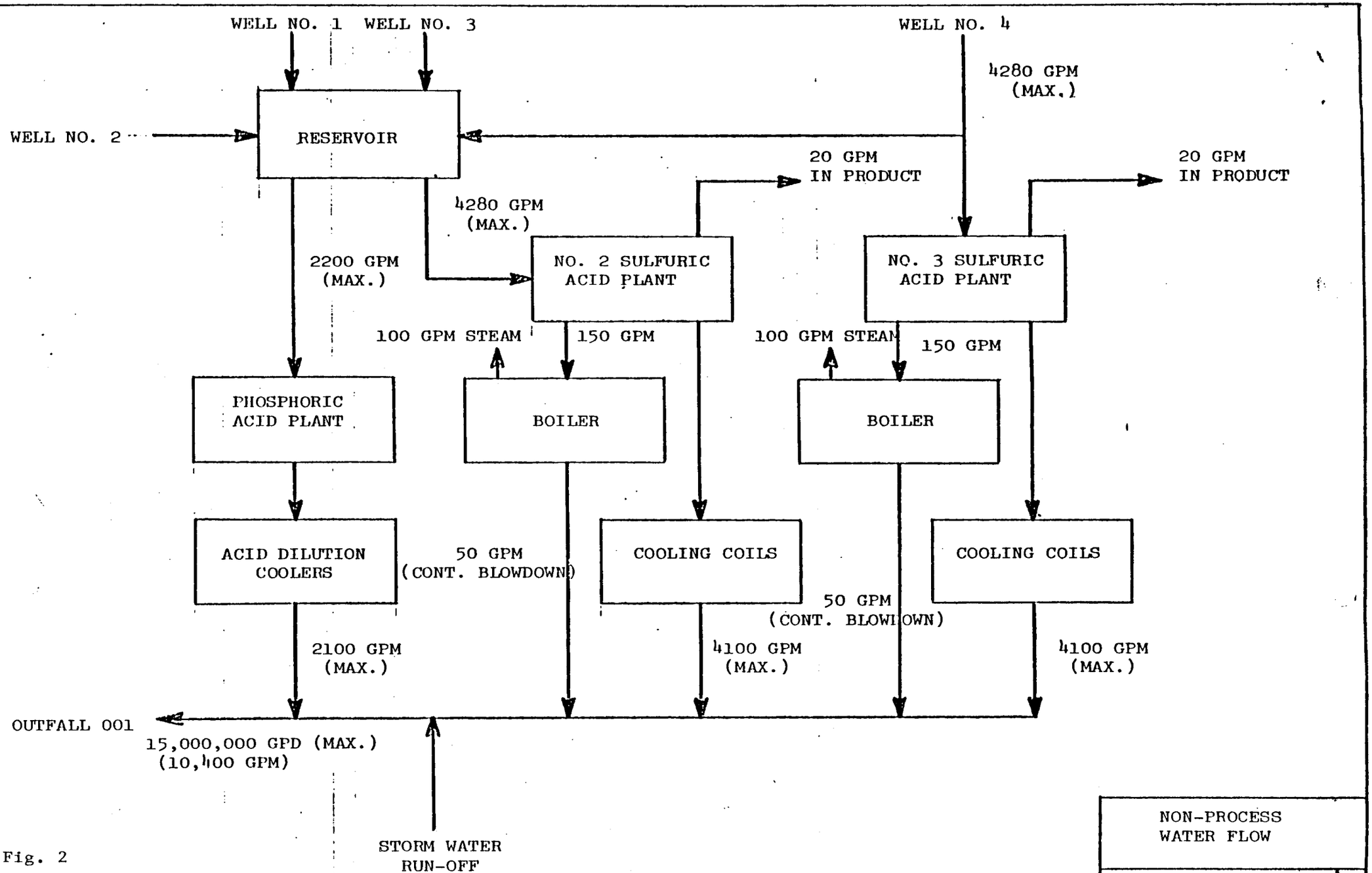


Fig. 2

NON-PROCESS
WATER FLOW

A.Rodriguez

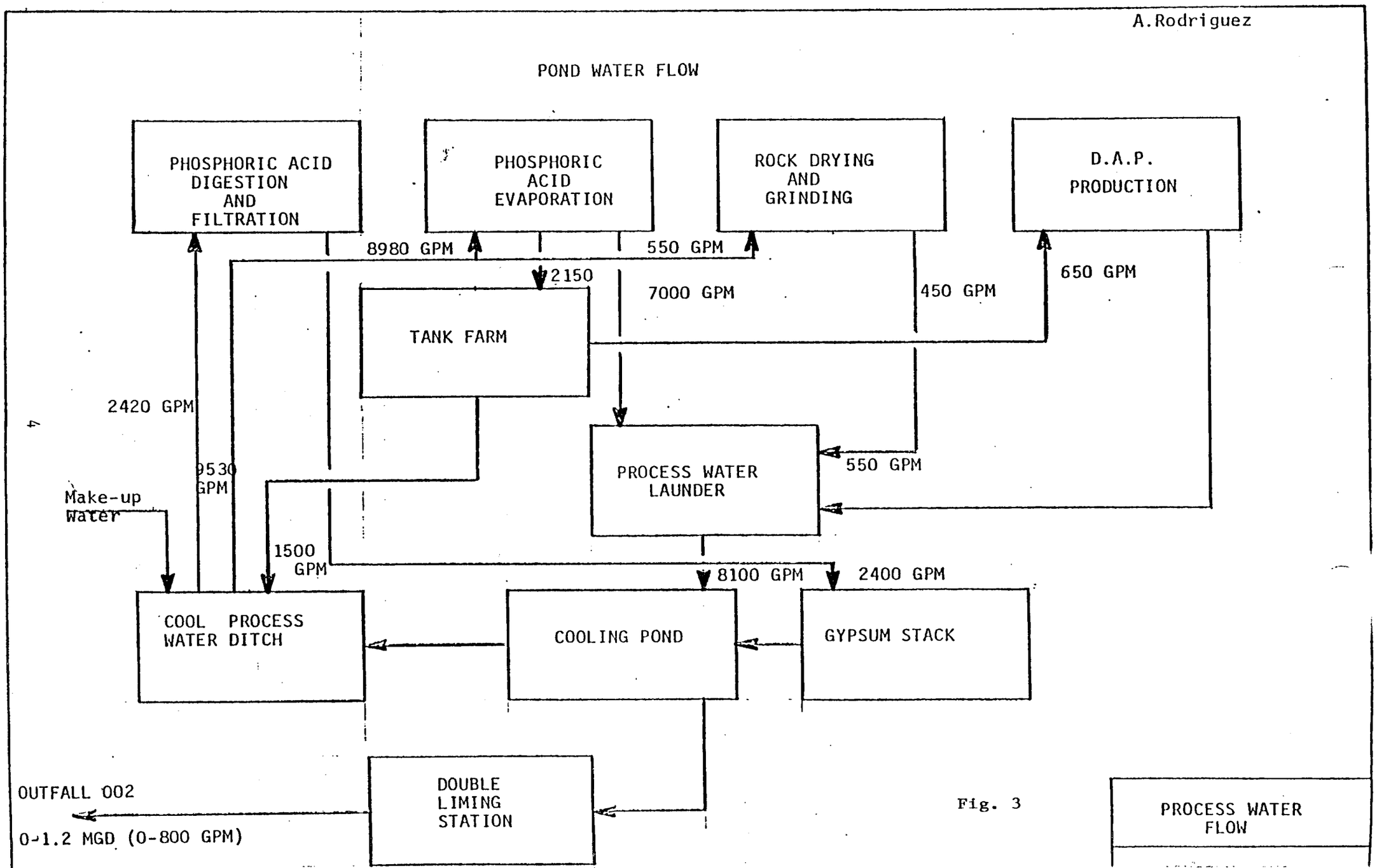


Fig. 3

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), the U.S. EPA (1978), 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.

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 March, 1979. 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.

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 separate 48 hour static acute screening bioassays (50.0% and 100.0% concentrations) were performed on effluent from Conserv Chemicals, Inc. The tests were performed from 1030 hours on 18 November to 1030 hours on 20 November, 1986.

The sample was collected by Mr. David F. Demmi of DER's Southwest office at 1015 hours on 17 November, 1986, using standard wastewater sampling procedures. The samples were iced and transported to the DER laboratory in Tallahassee for analyses within 25 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 samples 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 effluent sample was obtained from the same DER deep well that is used to culture the test organisms. The concentration series selected for this study is presented 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% effluent 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% 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 These Static Bioassays.

Ceriodaphnia dubia (water flea)

Concentration	Dilution Water	Effluent	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	Effluent	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	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, Daphnia pulex and Notropis leedsi, static acute screening bioassays of Conserv Chemicals, Inc., Nichols, Polk County, Florida, NPDES #FL0030139 on 18 to 20 November, 1986.

Concentration or %	Number of Live Organisms			Dissolved Oxygen (mg/l)			pH			Temperature (°C)				
	0	24	48	0	24	48	0	24	48	0	24	48	0	48
Daphnia pulex														
Control	10	10	10	8.5	8.7	8.7	8.2	8.1	8.1	22.0	21.4	21.5		
Control	10	10	10	8.5	8.7	8.7	8.2	8.1	8.1				215	220
50.0%	10	10	10	8.1	8.6	8.6	7.9	8.1	8.1	21.3	21.3	21.4		
50.0%	5	5	5	8.1	8.6	8.6	7.9	8.1	8.1				338	335
100.0%	10	10	10	7.6	8.6	8.2	7.6	8.2	8.2	20.4	21.3	21.4		
100.0%	10	10	10	7.6	8.6	8.2	7.6	8.2	8.2				450	453
Notropis leedsi														
Control	5	5	5	8.5	8.3	8.4	7.6	8.0	8.0	22.0	21.5	21.4		
Control	5	5	5	8.5	8.3	8.4	7.6	8.0	8.0				220	225
50.0%	5	5	5	8.1	8.1	8.2	7.6	8.0	8.0	21.2	21.3	21.2		
50.0%	5	5	5	8.1	8.1	8.2	7.6	8.0	8.0				342	342
100.0%	5	5	5	7.5	8.1	8.2	7.5	8.0	8.1	20.7	21.2	21.1		
100.0%	5	5	5	7.5	8.1	8.2	7.5	8.0	8.1				460	453

Control Water

NH_3(as NH_3)(mg/l): 0

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

Total Alkalinity (mg/l $CaOO_3$): 109

Total Hardness (mg/l $CaOO_3$): 112

100% Effluent

NH_3(as NH_3)(mg/l): .07

Total ammonia (as N)(mg/l): .001

Total Alkalinity (mg/l $CaOO_3$): 152

Total Hardness (mg/l $CaOO_3$): 180

Note: Total Residual Chlorine: None Detected

RESULTS AND DISCUSSION

The sample of Conserv Chemicals' cooling water discharge (Outfall #001) was not acutely toxic to the test organisms, Daphnia pulex and Notropis leedsi (Table 2). No organisms died during these 48 hour static acute screening bioassays (50.0% and 100.0% concentrations). The Ceriodaphnia dubia test was invalidated due to excess (> 10.0%) control mortality (data not reported). The ammonia detected in the sample (0.07 mg/l total and 0.001 mg/l unionized) was insufficient to have caused any toxicity. Further chemical analyses were not performed.

Recommendation

We recommend only routine inspection and biomonitoring of this facility. However, a bioassay sampling and testing of Conserv Chemicals' industrial wastewater (Outfall #002) when discharging would be informative.

LITERATURE CITED

Florida Department of Environmental Regulation, Biology Section. 1985a. Methods and Quality Assurance for Performing Acute Toxicity Tests. FDER. 53 pp.

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 pp.