

Biological Assessment of

Citrus Belle

Hendry County

NPDES #FL0033898

Sampled January 1992

July 1992

Biology Section
Division of Technical Services

Department of Environmental Regulation
Results of Fifth Year Inspections

Discharger: Citrus Belle
County: Hendry
NPDES Number: FL0033898
State Permit Expiration Date: 30 September 1992

Toxics Sampling Inspection (XSI)

Date Sampled: 14 January 1992

Results: The concentration of iron was in violation of Class III standards (17-302.560(25) FAC). Analysis of organic constituents revealed the following compounds at estimated concentrations: aliphatics (1900 µg/L), alkyl sub. benzenes (300 µg/L), alkyl sub. phenols (58 µg/L), and aromatics (13 µg/L). It is likely that these organic constituents contributed to the observed toxicity.

Results:

Compliance Biomonitoring Inspection (CBI)

Date Sampled: 14 January 1992

Results: The sample of effluent was toxic to the invertebrate, *Ceriodaphnia dubia*, and to the bannerfin shiner, *Notropis leeds*, producing 48 hour LC_{50}'s of less than 100%. This is in violation of 17-302.510(5)(p), 17-302.500(1)(d), and 17-4.244(3)(a) FAC.

Impact Bioassessment Inspection (IBI)

Date Sampled: 13 January 1992

Results: During periods of no flow in Roberts Canal (as in this study), wind-driven currents may transport effluent to either of the sites sampled during this study. The biological data indicate that the canal is stressed at both locations, and although there were some differences between the sites, a clear upstream to downstream pattern of degradation could not be established.

Water Quality Inspection (WQI)

Date Sampled: 14 January 1992

Results: Dissolved oxygen was below Class III standards at the test site (2.7 mg/L), a violation of 17-302.560(21) FAC. Fecal coliform populations measured in the effluent (5,625,000 organisms/100ml) were in violation of 17-302.560(6) FAC. Total phosphorus was higher than 70% of typical Florida streams at the two study sites. TKN at the test site (6.3 mg/L) was much higher than that found in 95% of Florida streams. TKN at the upstream site (1.6 mg/L) was still higher than 85% of the stream systems measured. These nutrients were generally higher in the effluent.

These fifth year inspections provide the necessary information to evaluate the facility's impact on its receiving waters and to provide the basis for specific condition recommendations for permit renewal.

Introduction

Citrus Belle, located in Hendry County, Florida, is a citrus fruit processing operation, engaged in fruit packing and juice production (see map in Appendix). Strong and weak wastewater streams are mixed and screened for large particle removal prior to flow equalization and spray irrigation. Average wastewater flow is 0.2 MGD. Water from ditches surrounding the 73 acre spray field (which may contain leachate or surface run-off) is pumped to a ditch which empties into Roberts Canal. Roberts Canal discharges to Banana Creek which flows to the Caloosahatchee River (all waterbodies are Class III). Past FDER surveys indicated that the spray irrigation site was overloaded, as evidenced by the low storage capacity of the soils and the high BOD in the surrounding canal.

The following permit limits which are currently in effect are based upon the amount of raw material processed: BOD (0.8 lb./1000 lb. as a daily maximum, 0.4 lb./1000 lb. as a monthly average) and TSS (1.7 lb./1000 lb. as a daily maximum, 0.85 lb./1000 lb. as a monthly average). The permit also states that pH must be within 6.0 to 9.0 s.u.'s. FDER has since adopted more stringent requirements for citrus processors: BOD (0.14 lb./1000 lb. as a daily maximum, 0.07 lb./1000 lb. as a monthly average) and TSS (0.2 lb./1000 lb. as a daily maximum, 0.1 lb./1000 lb. as a monthly average).

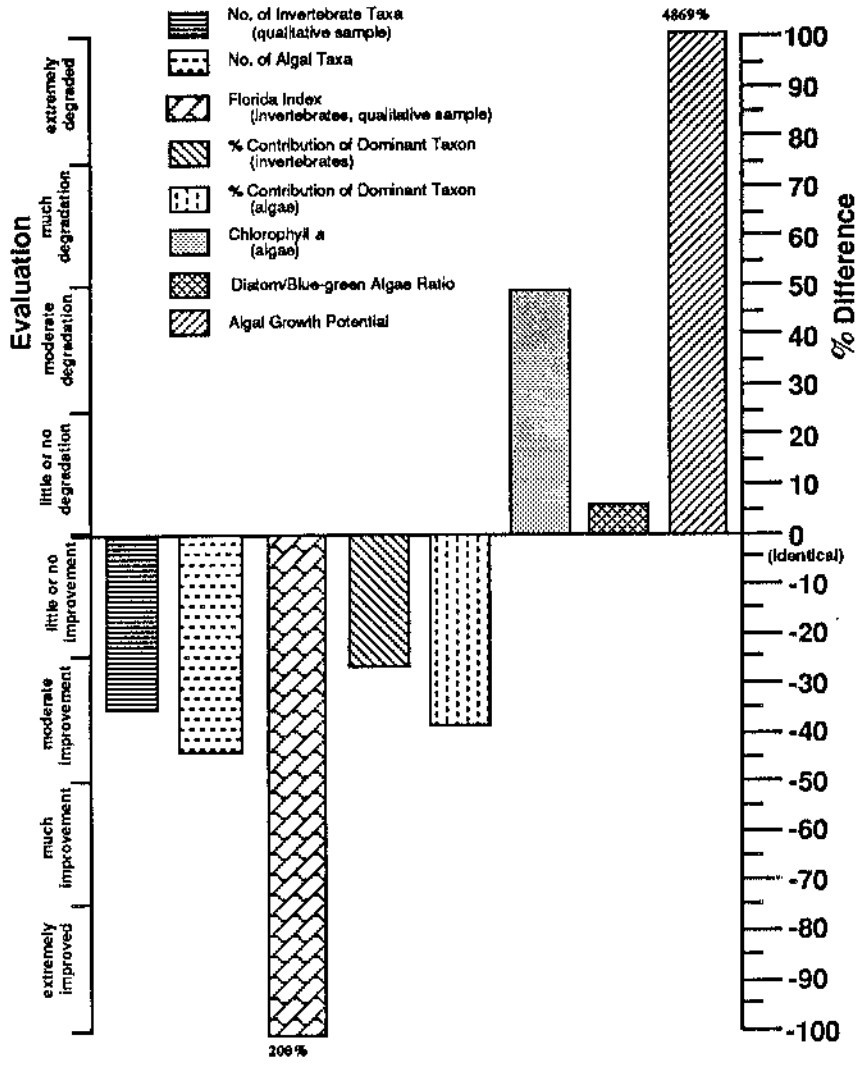
In 1984, a consent order was issued because of an unpermitted discharge of strong waste. Severe organic enrichment and fish kills were associated with the spill incident, and a fine was imposed. According to South District staff, the potential for direct surface water runoff from the spray field due to the lack of containment berms still exists. Groundwater Monitoring System data indicates that some of the facility's monitoring wells have exceeded permit limits for such parameters as organic nitrogen, total ammonia, sodium, dissolved residual solids, and ortho-phosphate. It has been suggested that the two separate permits for the juice production facility and fruit packing operations be combined, since both use the same outfall. Toxicity tests performed by the permittee on the effluent in 1986 and 1987 indicated no toxicity. These results conflict with findings of the present study, where toxicity was observed.

Methods

The focus of this investigation was to determine the discharger's effects on the receiving waters. A comparison of biological community health was made between a reference site (located upstream of the discharge ditch in Roberts Canal) and a test site (downstream of the discharge ditch in Roberts Canal) (see map in Appendix). Unfortunately, due to the lack of flow in Roberts Canal, it is expected that the effluent from Citrus Belle affected both locations (via diffusion or wind), making the reference site somewhat unsuitable. A habitat assessment was

Major characteristics of community structure of control and test sites.

	Control Site	Test Site
Macroinvertebrate Qualitative		
Number of Taxa	17	23
Florida Index	1.0	3.0
% Contribution of Dominant Taxon	69.3	50.3
% Malacostraca	73.6	54.3
% Ephemeroptera	1.1	20.8
% Gastropoda	7.9	9.9
% Hemiptera	1.8	6.1
% Coleoptera	7.9	1.9
% Odonata	5.8	3.8
% Other	1.9	3.2
% Predators	17.7	12.6
% Collector-Gatherers	72.4	65.1
% Collector-Filterers	0	.2
% Scrapers	9.2	20.5
% Shredders	.7	1.6
Phytoplankton Algae		
Number of Taxa	18	26
% Contribution of Dominant Taxon	22.2	13.6
Chlorophyll a	13.5	20.2
Diatom/Diatom + B-G Abundance Ratio	0.54	0.51
% Blue-green	28.9	39.2
% Green	26.7	16.0
% Diatoms	33.3	41.6
% Other	11.1	3.2
Algal Growth Potential (mg dry wt/l)	.222	11.033



Effect of discharge on receiving stream
(measured as difference between control and test sites).

performed *in situ* to establish comparability between sites. Supplemental physical/chemical data were also collected on the effluent and study sites. Acute screening toxicity bioassays, using *Ceriodaphnia dubia* and *Notropis leedsi* as test organisms, were performed on an effluent sample (Weber 1991). The effluent was analyzed for metals and for organic constituents (base neutral and acid extractables, and pesticide extractables). Additionally, nutrient analyses were performed on effluent, reference, and test sites. Methods used for all chemical analyses are on file at the Tallahassee DER Chemistry Laboratory.

Benthic macroinvertebrate communities were evaluated at reference and test sites. Invertebrates were collected from multiple substrates (*e.g.*, snags, leaf packs, vegetation) using discrete dip net sweeps. Phytoplankton was sampled via sub-surface grabs. Chlorophyll *a* was also determined for phytoplankton communities (Ross 1990). Bacterial populations in the effluent were analyzed for fecal coliforms following the methods of APHA (1989).

Explanation of Measurements of Community Health

Several different measurements of macroinvertebrate and algal community health have been employed in this report. Many of these, such as the number of taxa and chlorophyll *a* are well known. Others are briefly explained here. The Florida Index assigns points to stream-dwelling macroinvertebrates based on their sensitivity to pollution (see Ross 1990). A site with a high Florida Index score is considered healthy (*i.e.*, many clean-water organisms are present). Excessive numerical dominance of a single type of organism (a high % contribution of dominant taxon) is usually associated with disturbance. A decreased diatom to blue-green algae ratio (calculated by dividing the number of individuals in the Bacillariophyta by the number of individuals in the Bacillariophyta + Cyanophyta) is often indicative of nutrient enriched conditions. The determination of the Quantitative Stability Index (for taxonomic % composition) is a two step process. First, the relative proportions of major taxonomic groups are calculated for each site. Then, the lesser of the two percentages for each discrete taxonomic group is totaled. A QSI (% composition) of 100% means that the two sites being compared are identical. This same type of procedure is used for calculating the QSI (functional feeding groups).

For graphical purposes, the percent differences between the reference and test sites involving the number of taxa, Florida Index, and the diatom to blue-green algae ratio are measured as the reference site minus test site divided by the reference site. The percent differences between sites involving the percent contribu-

tion of dominant taxon, AGP, and chlorophyll a are measured as the test site minus reference site divided by the reference site.

The following personnel were involved in this investigation: Ford Walton and Gary Millington (DER Southwest District) and Lyn Burton, Marshall Faircloth, Russel Frydenborg, Kathleen Lurding, and Sandy McClure (Tallahassee Biology Laboratory).

Results and Discussion

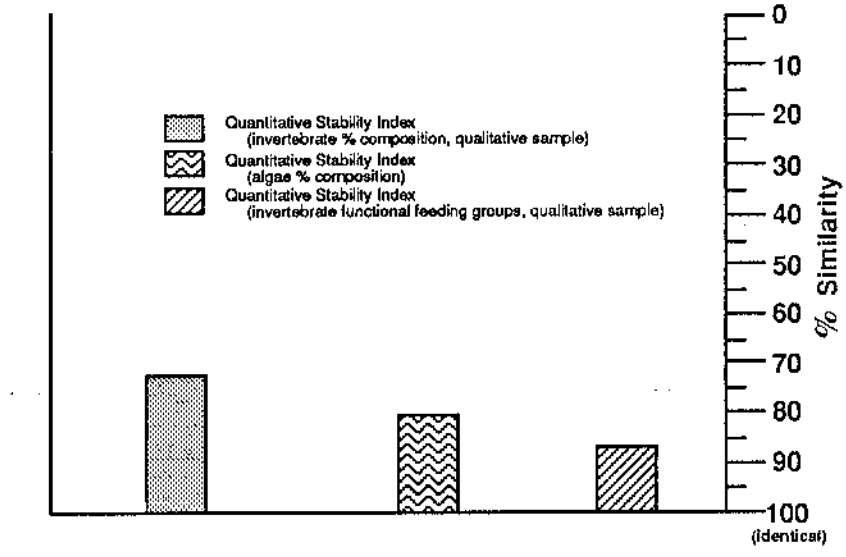
Habitat scores were 38 for the reference site and 42 for the test site (Appendix). Roberts Canal is a stagnant ditch, choked with aquatic weeds (the exotic *Hydrilla verticillata* and *Eichhornia crassipes*). *E. crassipes* covered a larger amount of the canal's surface area at the reference site. The system receives runoff from agricultural lands, including citrus groves and cattle pasture, and has fairly poor riparian zone vegetation. The pH at both sites was circum-neutral (7.3). Although dissolved oxygen was fairly low at the reference site (5.6 mg/L), it was below Class III standards at the test site (2.7 mg/L) (Appendix). This is a violation of 17-302.560 (21) FAC. Effluent BOD was elevated (greater than 126.2 mg/L), and may have contributed to the low D.O. at the test site. Since there is often no flow in Roberts Canal (as was the case during this study), discharge from Citrus Belle's effluent ditch may be transported north or south, due to diffusion or wind-induced currents. Therefore, it is expected that the biota at the "upstream" reference site may sometimes come into contact with Citrus Belle's effluent.

The sample of effluent was extremely toxic to the invertebrate, *Ceriodaphnia dubia*, killing all test organisms within 24 hours. The effluent sample was also toxic to the bannerfin shiner, Notropis leeds*i*, producing a 48 hour LC_{50} of less than 100% (Appendix). This is in violation of 17-302.510(5)(p), 17-302.500(1)(d), and 17-4.244(3)(a) FAC.

Aluminum (90 µg/L) and iron (1180 µg/L) were measured in the effluent at concentrations above quantitation limits. The concentration of iron was in violation of Class III standards (17-302.560(25) FAC). Analysis of organic constituents revealed the following compounds at estimated concentrations: aliphatics (1900 µg/L), alkyl sub. benzene (300 µg/L), alkyl sub. phenol (58 µg/L), and aromatics (13 µg/L). It is likely that these organic constituents contributed to the observed toxicity.

Total phosphorus and orthophosphate measured in the effluent were 0.72 mg/L and 0.43 mg/L, respectively. With the exception of TKN (which was 3.5 mg/L) nitrogen containing compounds in the effluent were not notable. At the two study sites, total phosphorus was higher than 70% of typical Florida streams. STORET data from 1617 Florida stream stations, for the period of 1980 to 1989, have been compiled into a percentage distribution, found in the Appendix (Joe Hand, personal communication). Data from this present investigation were evaluated against these values. With the exception of TKN, nitrogen containing compounds were relatively low in Roberts Canal. TKN at the test site (6.3 mg/L) was much higher than that found in 95% of Florida streams. TKN at the upstream site (1.6 mg/L) was still higher than 85% of the stream systems measured.

Fecal coliform populations measured in the effluent (5,625,000 organisms/100ml) were in violation of Class III standards, 17-302.560(6) FAC. Fecal coliforms were less than 100 organisms/100 ml at the refer-



Effect of discharge on receiving stream
(measured as similarity between control and test sites).

ence and test sites (see chemistry summary table).

Qualitative measures of benthic macroinvertebrate community health indicated that Roberts Canal is a stressed system, but that conditions north of the discharge (the portion usually considered downstream) were slightly more favorable (see table, figures, and taxa lists in Appendix). The figure on p. 2 indicates the degree of difference between the reference and test sites. Larger differences (that is, higher percentages) correspond with greater degrees of degradation. Negative values mean that the test site is better than the reference. The figure on p. 3 summarizes similarities between the sites. Smaller similarities (lower percentages) generally correspond with greater degradation.

Taxa richness was higher at the test site (17 and 23 taxa found at reference and test sites, respectively), however, many of the organisms collected were tolerant of low D.O. and organic enrichment. Florida Index (1 at the reference, 3 at the test site) indicated that few intolerant organisms were able to survive at either sampling location. On the graph, this minor difference in Florida Index appears greater than the absolute values would suggest. In south Florida, a minimum Florida Index value of 10 is expected from undisturbed systems with adequate flow. Quantitative stability indices for community structure and functional feeding groups demonstrated a fair similarity between the reference and test sites. This is consistent with the evaluation that both sites were stressed.

Certain aspects of the phytoplankton community below the discharge appeared moderately improved compared to the upstream location, while other measurements indicated degradation. Twenty-six taxa were collected from the test site, while 18 were found at the reference site. The dominant taxon at the test site (13.6%) was *Synedra ulna*, an indicator of eutrophy (Lowe 1974). The dominant taxon at the reference site (22.2%) was an undetermined green flagellate, which was the second most abundant algal type at the test site. Flagellates also have been associated with nutrient enrichment. Chlorophyll *a* increased by 49.6% at the test site, accompanied by a 4869% increase in the algal growth potential. The AGP at the test site (11 mg algal wt/L) was above the 5 mg algal wt/L "problem threshold" (Raschke and Schultz 1987). The QSI for algal community structure (86%) illustrates that the two sites were similar. During periods of no flow in Roberts Canal, wind-driven currents may transport effluent to either station sampled in this study. The biological data indicate that the canal is stressed at both locations, and although there were some differences between the sites, a clear upstream to downstream pattern of degradation could not be established.

Conclusions

Dissolved oxygen was below ambient standards at the test site (2.7 mg/L), a violation of 17-302.560(21) FAC. The sample of effluent was toxic to the invertebrate, *Ceriodaphnia dubia*, and to the bannerfin shiner, *Notropis leedsi*, producing 48 hour LC_{50}'s of less than 100%. This is in violation of 17-302.510(5)(p), 17-302.500(1)(d), and 17-4.244(3)(q) FAC. Fecal coliform populations measured in the effluent (5,625,000 organisms/100ml) were in violation of Class III standards, 17-302.560(6) FAC. The concentration of iron was in violation of Class III standards (17-302.560(25) FAC). Analysis of organic constituents revealed the following compounds at estimated concentrations: aliphatics (1900 µg/L), alkyl sub. benzene (300 µg/L), alkyl sub. phenols (58 µg/L), and aromatics (13 µg/L). It is likely that these organic constituents contributed to the observed toxicity.

Total phosphorus was higher than 70% of typical Florida streams at the two study sites. TKN at the test site (6.3 mg/L) was much higher than that found in 95% of Florida streams. TKN at the upstream site (1.6 mg/L) was still higher than 85% of the stream systems measured. These nutrients were generally higher in the effluent.

During periods of no flow in Roberts Canal (such as encountered in this study), diffusion or wind-driven currents may transport effluent to either of the sampling sites. The biological data indicate that the canal is stressed at both locations, and although there were some differences between the sites, a clear upstream to downstream pattern of degradation could not be established.

Literature Cited

American Public Health Assoc., American Water Works Assoc., and Water Pollution Control Federation. 1989. Standard Methods for the Examination of Water and Wastewater, 17th ed. New York, N.Y. 1268 p.

Lowe, R. L. 1974. Environmental requirements and pollution tolerance of freshwater diatoms. U. S. Environ. Prot. Agency. EPA-670/4-74-005. 334 p.

Miller, W. E., T. E. Maloney, and J. C. Greene. 1978. The *Selenastrum capricornutum* Printz algal assay bottle test. U. S. Environ. Prot. Agency, EPA-600/9-78-018. 126 p.

Raschke, R. L. and D. A. Schultz. 1987. The use of the algal growth potential test for data assessment. J. Wat. Poll. Cont. Fed. 59(4): 222-227.

Ross, L. T. 1990. Methods for aquatic biology. Fla. Dept. Environ. Reg. Tech. Ser. 10(1): 1-47.

Weber, C. I. 1991. Methods for measuring the acute toxicity of effluents to freshwater and marine organisms. 4th edition. EPA/600/4-90/027. U. S. EPA, Cincinnati, Ohio. 216 p.

Chemistry summary table for Citrus Belle .

	Effluent	Control Site	Test Site
Organic Constituents (ug/L)			
Aliphatics	1900 J		
Alkyl sub. benzenes	300 J		
Alkyl sub. phenols	58 J		
Aromatics	13 J		
Metals (ug/L)			
Aluminum	90		
Arsenic	20 U		
Cadmium	0.07 U		
Copper	6 T		
Chromium	10 U		
Iron	1180		
Lead	15 U		
Mercury	0.1 U		
Nickel	5 U		
Silver	0.07 U		
Zinc	8 T		
Nutrients (mg/L)			
Ortho-phosphorus	0.43 A	0.04 U	0.04 U
Total phosphorus	0.72	0.32	0.5
Ammonia	0.12 A	0.035 T	0.048 A
Nitrate+Nitrite	0.06 U	0.2 U	0.2 U
TKN	3.5	1.6	6.3
Other Parameters			
Habitat Assessment		38	42
D.O. (mg/L)	1.1	5.6	2.7
pH (SU's)	6.8	7.3	7.3
Conductivity (µmhos/cm)	1405		
Temperature (°C)		18.5	20.0
TSS (mg/L)	12 A	11	
Phyto Chlorophyll a (ug/L)		13.5	20.2
AGP (mg dry wt/L)	0.6	0.2	11.0
Bioassay Fish-Dechlorinated	Toxic LC50<100%		
Bioassay Invertebrate-Dechlorinated	Toxic LC50<100%		
Fecal coliform (org/100 ml)	5,625,000 L	100 K	100 K
BOD (mg/L)	126.2 L	1.2	

A - Value reported is the mean of two or more determinations
E - Scientific notation
J - Estimated value
K - Actual value is known to be less than value given
L - Actual value is known to be greater than value given
N - Not analyzed for this compound
T - Value reported is less than the practical quantitation limit
U - Material analyzed for but not detected; value reported is the minimum detection limit
Q - Evidence that analyte is present in sample is equivocal

Typical Values for Selected Parameters in Florida Waters

Adapted from Joe Hand, FDER, personal communication, 1991
(data was collected between 1980 and 1989)

Percentile Distribution

Parameter	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%
STREAMS (1617 stations)											
Phytoplankton Chlorophyll *a*	0.22	0.52	0.94	1.60	3.02	4.63	6.72	9.87	14.68	27.35	48.70
Periphyton Chlorophyll *a*	0.31	0.43	0.77	1.04	2.16	2.94	6.45	10.51	17.00	39.51	60.85
H-D Diversity	0.84	2.12	2.48	2.74	2.88	3.09	3.25	3.40	3.52	3.76	3.90
Qualitative Taxa Richness	9.00	12.00	17.00	20.00	22.00	24.50	26.00	28.00	31.00	37.00	53.00
H-D Taxa Richness	6.00	6.50	9.00	11.50	13.00	15.00	17.00	21.50	26.00	29.00	32.00
TKN	0.30	0.39	0.56	0.73	0.87	1.00	1.11	1.26	1.49	1.93	2.80
Ammonia	0.02	0.02	0.04	0.05	0.06	0.08	0.11	0.14	0.20	0.34	0.60
NO2-NO3	0.01	0.01	0.03	0.05	0.07	0.10	0.14	0.20	0.32	0.64	1.05
Total Phosphorus	0.02	0.03	0.05	0.06	0.10	0.13	0.18	0.25	0.39	0.74	1.51
Ortho Phosphorus	0.01	0.01	0.03	0.04	0.05	0.08	0.11	0.17	0.27	0.59	1.37
Turbidity	0.60	0.90	1.20	1.45	2.10	2.80	3.60	4.50	6.65	10.45	16.30
LAKES (477 stations)											
Phytoplankton Chlorophyll *a*	0.80	1.71	2.88	4.28	10.06	13.40	20.00	30.10	47.20	65.44	113.90
Dredge Diversity	0.71	0.97	1.43	1.74	1.98	2.12	2.21	2.59	2.85	3.15	3.17
Dredge Taxa Richness	3.00	5.00	6.50	7.00	9.00	10.00	11.00	13.00	15.00	17.00	21.00
TKN	0.36	0.49	0.67	0.83	1.08	1.26	1.40	1.51	1.68	2.11	3.46
NII3+NH4	0.01	0.02	0.02	0.03	0.04	0.06	0.08	0.12	0.15	0.21	0.28
NO2-NO3	0.00	0.00	0.01	0.01	0.01	0.02	0.04	0.05	0.10	0.14	0.23
Total Phosphorus	0.01	0.02	0.02	0.03	0.05	0.07	0.09	0.11	0.14	0.23	0.42
Ortho-Phosphorus	0.00	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.21	0.32
Turbidity	1.00	1.25	1.55	2.05	2.75	4.50	6.45	9.60	14.10	26.00	40.00
ESTUARIES (690 stations)											
Phytoplankton Chlorophyll *a*	2.14	3.28	4.49	5.13	6.00	6.93	7.94	9.60	12.40	17.60	22.20
Dredge Diversity	1.34	1.53	1.91	2.28	2.56	2.90	3.15	3.59	4.01	4.53	4.98
Dredge Taxa Richness	4.00	6.00	9.00	11.00	15.00	18.50	25.00	35.00	41.00	62.00	90.00
TKN	0.26	0.34	0.42	0.50	0.59	0.69	0.76	0.82	0.95	1.30	1.49
NH3+NH4	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.09	0.13	0.22	0.28
NO2-NO3	0.00	0.00	0.01	0.01	0.01	0.02	0.03	0.05	0.08	0.17	0.23
Total Phosphorus	0.01	0.02	0.06	0.07	0.10	0.11	0.14	0.17	0.23	0.43	0.59
Ortho-Phosphorus	0.01	0.02	0.03	0.04	0.04	0.05	0.07	0.09	0.12	0.21	0.44
Turbidity	3.50	4.00	4.50	5.05	5.40	5.60	6.30	6.80	8.00	11.40	11.75

Units:
Phytoplankton Chlorophyll *a* (ug/L), Periphyton Chlorophyll *a* (mg/m^2), Nutrients (mg/L), Turbidity (NTU), Taxa richness and diversity values are for macroinvertebrates

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

FACILITY SUMMARY

Facility Name: Citrus Belle	Prepared by: Gary A. Millington Date: 1/10/92	
Location (attach detailed map): approx. 6 mi south of LaBelle on Hwy 29.	County: Hendry – 26	District: South – 52
Federal Permit # FL0033898 and expiration date:	State GMS # and 5226P0000 13 State expiration date: I026-138701 9-30-92	Facility Type: (Industrial) Municipal Federal Agricultural Other (list):

Function of facility: Citrus fruit processing – juice production & fruit packing

Description of treatment process:
Screen for large particle removal. Effluent goes to a spray-field. Approximate area is 73 acres.

Receiving waters: Ditch to Roberts Canal. Roberts canal to Banana Creek to Caloosahatchee River	Classification: Class III
Design Flow: Sprayfield 0.45 MGD	Actual Mean Flow:

Discharge is: Continuous Intermittent (Seasonal) Rainfall dependent
Other (describe)

therefore, the best time to sample is: Winter

If facility has a mixing zone, give details (size, parameters affected, etc.):
None

List effluent limits:

Parameter	Limit (units) daily max	Limit (units) 30-day avg
BOD_5 *	0.80	0.40
TSS *	1.70	0.85
PH	6.0 – 9.0	

* units are pounds/1000 pounds raw material

Describe special permit conditions and permit modifications:

Citrus Belle
(Facility)

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

Description of permitted outfall(s): Water from ditches surrounding the sprayfields is pumped into a ditch that goes to Roberts Canal.

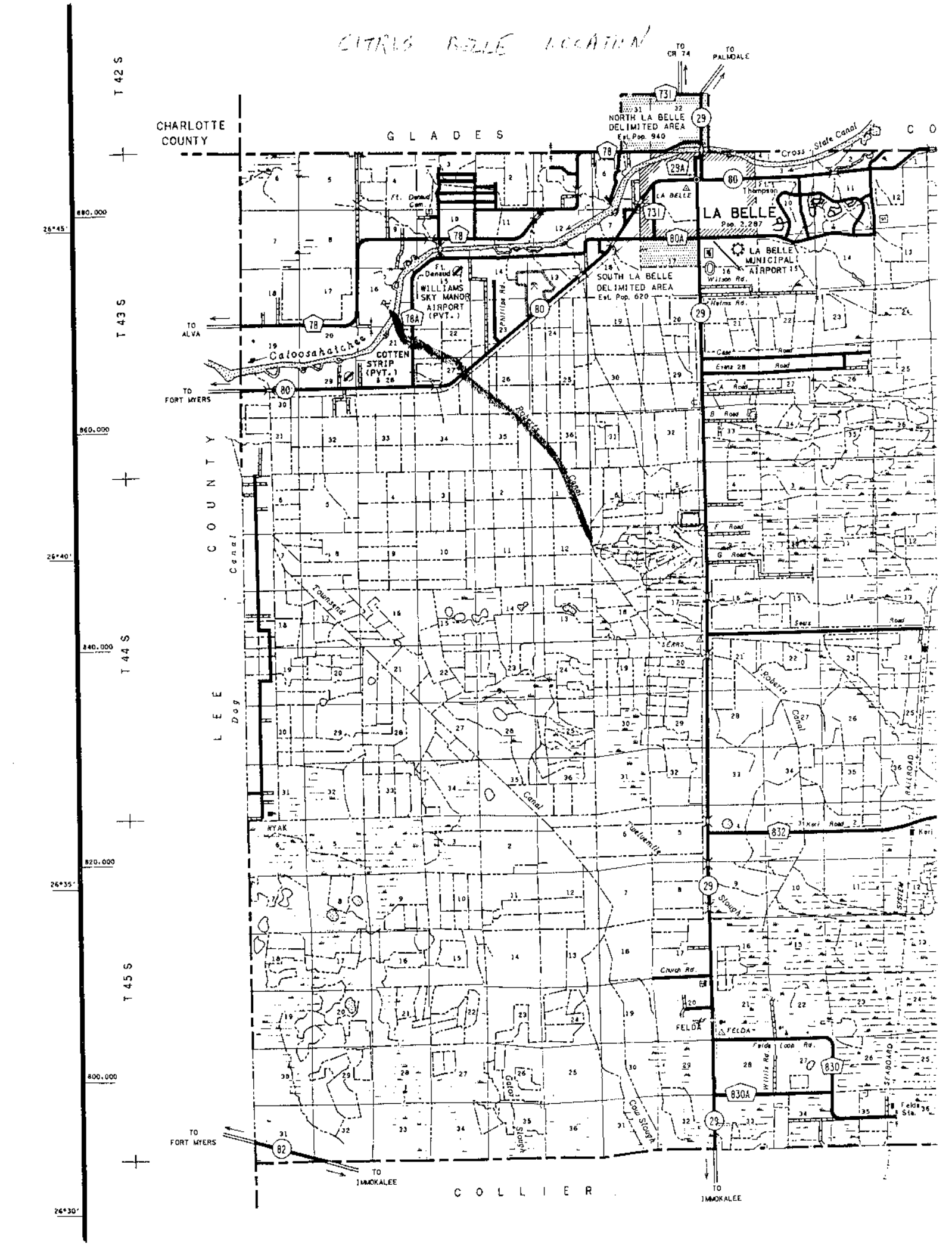
List permit violations (from MOR data or other source) and plant upsets that occurred within past year: None noted.

Describe previous impact bioassessments, WQBEL's, and previous or current enforcement actions:
In 1984 an enforcement case was opened and a Consent Order (84-0445) was issued because of an unpermitted discharge of strong waste. Four stations were established to determine impacts. Biological and chemical analyses were performed. (See file for more detail).
During 1986 and 1987 toxicity tests were performed as required by their NPDES permit. The file does not indicate that toxicity was found.

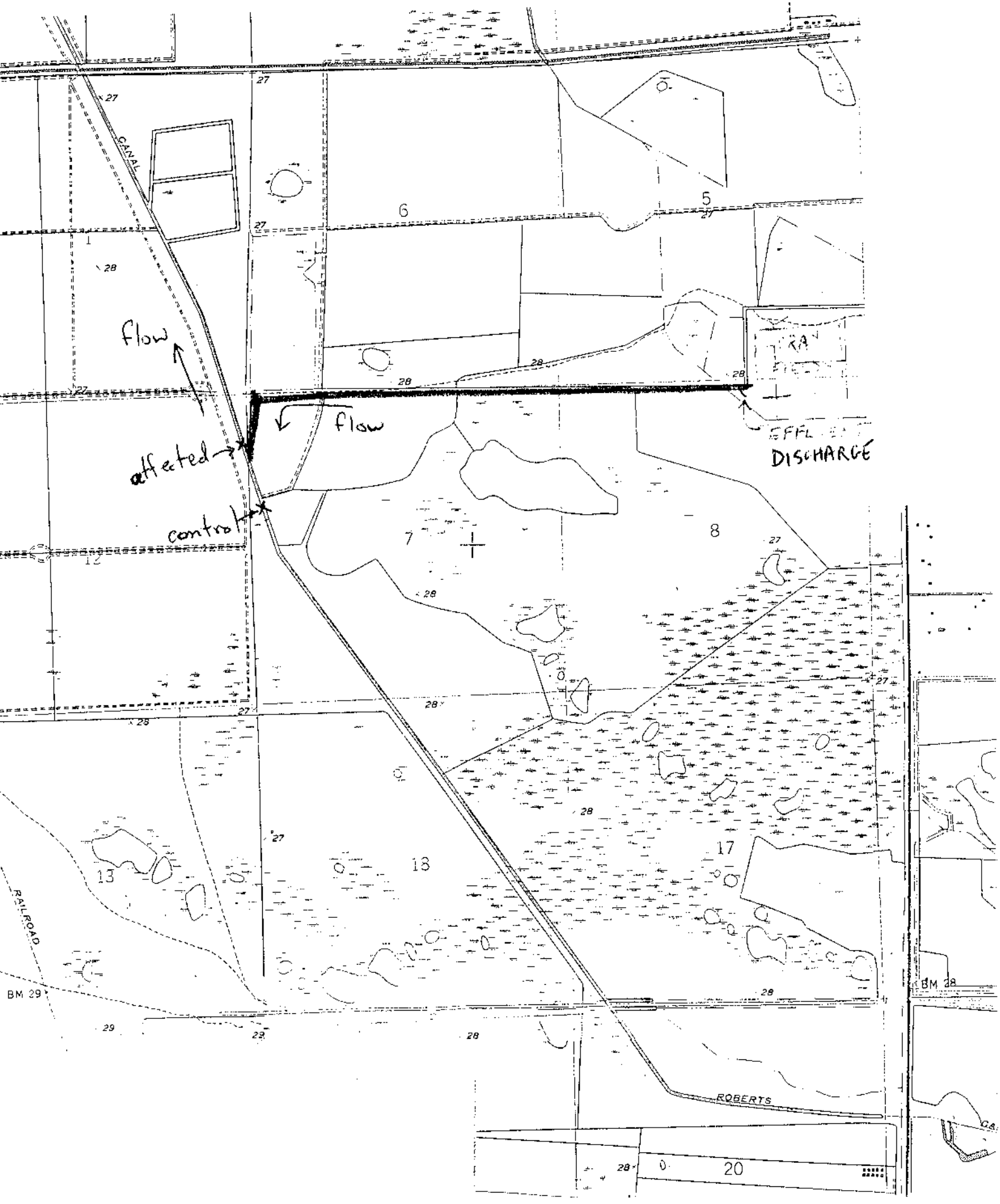
Discuss comparability of MOR results to past DER results and whether there are trends (improving, declining) in the data set:
Improvement has occurred over the year mainly due to improved sprayfield operation.

Additional information:
Two facilities owned by Citrus Belle, a processing plant and a packinghouse, are on adjoining properties and use the same monitoring plan and discharge outfall. They are currently under two GMS numbers and two different permits. They should be combined.

CITRUS BELLE LOCATION



CITRUS BELLE SITE MAP



STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 3)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	TIME	RECEIVING BODY OF WATER:
DER SOUTH DIST		1-13-92	1206	ROBERTS CANAL

REMARKS:	LOCATION:	FIELD ID/NAME:
	CITRUS BELLE	AFFECTED (ROBERTS CANAL)

RIPARIAN ZONE/INSTREAM FEATURES

Predominant Surrounding Land-Use (specify relative percent in each category):

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
	50	50				

Local Watershed Erosion (check box): None ☑ Moderate ☐ Heavy ☐

Local Watershed NPS Pollution (check box): No evidence ☐ Some potential sources ☑ Obvious sources ☐

Point-Source Pollution (list location and describe): CITRUS BELLE - PROCESS WATER DISCHARGE
BERRY CITRUS - GROVES
CATTLE - SPARSE

Estimated System Width (range, m): 10	Estimated System Depth (range, m): 0.5		yes
High Water Mark (m above bed): 1.5	Velocity (range, m/s): 0	Impounded ☐ Channelized ☑	

Canopy Cover % : Open : ☑ Lightly Shaded (11-45%): ☐ Moderately Shaded (46-80%): ☐ Heavily Shaded: ☐

SEDIMENT/SUBSTRATE

Sediment Odors: Normal: ☑ Sewage: ☐ Petroleum: ☐ Chemical: ☐ Anaerobic: ☐ Other: ☐

Sediment Oils: Absent: ☑ Slight: ☐ Moderate: ☐ Profuse: ☐

Sediment Deposits: Sludge: ☐ Paper Fiber: ☐ Mud: ☐ Sand: ☐ Shell: ☐ Other: ☐

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)				Rock or Shell Rubble			
Leaf Packs				Sand	40	4	NET
Aquatic Vegetation	100	4&M	NET	Mud/Muck UNDER PLANTS	100	1	
Submerged Roots				Other:			
Undercut Banks				Other:			

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):	pH (SU):	Cond. (µmho/cm):				Secchi (m):
Top								
Mid-depth	16.5	2.7	7.3					
Bottom								

System Type : Stream: ☐ (Surficial Aquifer Fed / Deep Aquifer Fed / Alluvial / Blackwater) Lake: ☐ Wetland: ☐ Estuary: ☐ Other: ☒

Water Odors (check box): Normal: ☑ Sewage: ☐ Petroleum: ☐ Chemical: ☐ Other: ☐

Water Surface Oils (check box): Slick: ☐ Sheen: ☐ Globs: ☐ None: ☑

Clarity (check box): Clear: ☐ Slightly turbid: ☑ Turbid: ☐ Opaque: ☐

Color (check box): Tannic: ☑ Green (algae): ☐ Clear: ☐ Other: ☐

Weather Conditions:

Abundance:	Absent	Rare	Common	Abundant
Periphyton	☐	☒	☐	☐
Fish	☐	☐	☐	☒
Aquatic Macrophytes	☐	☐	☐	☒
Iron/sulfur Bacteria	☒	☐	☐	☐

ANALYSIS DATE:	ANALYST:	SIGNATURE:
1-13-92	A.S. WALTON	Albert S. Walton

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
		1-13-92	

REMARKS:	LOCATION:	FIELD ID/NAME:
	CITRUS BELLE	

Habitat Parameter score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 23	Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs, undercut banks, rubble, or other stable habitat. **23-30 points**	20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat. **16-22 points**	5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat. **8-15 points**	Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious. **0-7 points**
Water Velocity 0	Max. observed: >0.3 m/sec. but < 1 m/sec **23-30 points**	Max. observed; 0.1 to 0.3 m/sec **16-22 points**	Max. observed; 0.05 to 0.1 m/sec **8-15 points**	Max. observed; <0.05 m/sec, or spate occurring; > 2 m/sec **0-7 points**
Artificial Channel/ Flow Alteration 0	No artificial channelization. Little activity (impervious surface) in watershed which would cause scouring during spates. **12-15 points**	—	—	Artificially channelized, or scouring present during spates because of excess impervious surface in watershed. **0-3 points**
Bank Stability 9	Stable. No evidence of erosion or bank failure. Little potential for future problems. **9-10 points**	Moderately stable. Infrequent or small areas of erosion, mostly healed over. **6-8 points**	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. **3-5 points**	Unstable. Many raw, eroded areas. Obvious bank sloughing. **0-2 points**
Riparian Zone Vegetation Quality 5	Over 80% of streambank surfaces consist of native plants, classified as: bottomland hardwoods, understory shrubs, or non-woody macrophytes. **9-10 points**	50% to 80% of riparian zone is vegetated, but one class of plants is not represented. **6-8 points**	25% to 50% of riparian zone is vegetated, but one or two classes of plants are not represented. **3-5 points**	Less than 25% of streambank surfaces are vegetated. Poor plant community (e.g. grass monoculture) present. **0-2 points**

Adjustments 5	Add **5 points** if cross-sectional area of flow is estimated to be greater than one square meter during periods of normal flow.	TOTAL SCORE 42

COMMENTS: CANAL COVERED W/ WATER LETTUCE, COONTAIL, UNDERNEATH MUCK OVER SAND ON BOTTOM

ANALYSIS DATE:	ANALYST:	SIGNATURE:
1-13-92	A.S. WALTON	

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 3)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME: DER SOUTH DIST	STORET STATION NUMBER:	DATE (M/D/Y): 1-13-92	TIME 1500	RECEIVING BODY OF WATER:

REMARKS:	LOCATION: CITRUS BELLE	FIELD ID/NAME: ROBERTS CANAL UPSTREAM CONTROL

RIPARIAN ZONE/INSTREAM FEATURES

Predominant Surrounding Land-Use (specify relative percent in each category):

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
	50	50				

Local Watershed Erosion (check box): None ☑ Moderate ☐ Heavy ☐

Local Watershed NPS Pollution (check box): No evidence ☐ Some potential sources ☑ Obvious sources ☐

Point-Source Pollution (list location and describe): BERRY CITRUS – GROVES
CITRUS BELLE – PROCESS WATER

Estimated System Width (range, m): 10	Estimated System Depth (range, m): 0.5	yes
High Water Mark (m above bed): 1.5	Velocity (range, m/s): 0	Impounded ☐ Channelized ☑

Canopy Cover % : Open : ☑ Lightly Shaded (11-45%): ☐ Moderately Shaded (46-80%): ☐ Heavily Shaded: ☐

SEDIMENT/SUBSTRATE

Sediment Odors: Normal: ☑ Sewage: ☐ Petroleum: ☐ Chemical: ☐ Anaerobic: ☐ Other: ☐ _____

Sediment Oils: Absent: ☑ Slight: ☐ Moderate: ☐ Profuse: ☐

Sediment Deposits: Sludge: ☐ Paper Fiber: ☐ Mud: ☐ Sand: ☐ Shell: ☐ Other: ☐

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)				Rock or Shell Rubble			
Leaf Packs				Sand MIXED UNDER PLANTS	50		
Aquatic Vegetation	100 *	9	NET	Mud/Muck	50	1	net
Submerged Roots				Other:			
Undercut Banks				Other:			

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):	pH (SU):	Cond. (µmho/cm):				Secchi (m):
Top								
Mid-depth	20.0	5.6	7.3					
Bottom								

System Type : Stream: ☐ (Surficial Aquifer Fed / Deep Aquifer Fed / Alluvial / Blackwater) Lake: ☐ Wetland: ☐ Estuary: ☐ Other: ☑ DRAINAGE CANAL

Water Odors (check box): Normal: ☑ Sewage: ☐ Petroleum: ☐ Chemical: ☐ Other: ☐ _____

Water Surface Oils (check box): Slick: ☐ Sheen: ☐ Globs: ☐ None: ☑

Clarity (check box): Clear: ☐ Slightly turbid: ☑ Turbid: ☐ Opaque: ☐

Color (check box): Tannic: ☑ Green (algae): ☐ Clear: ☐ Other: ☐ _____

Weather Conditions: PTLY CLOUDY

Abundance:	Absent	Rare	Common	Abundant
Periphyton	☐	☑	☐	☐
Fish	☐	☐	☑	☐
Aquatic Macrophytes	☐	☐	☐	☑
Iron/sulfur Bacteria	☑	☐	☐	☐

ANALYSIS DATE: 1-13-92	ANALYST: A.S. WALTON	SIGNATURE: Albert A Walton J

* HYACINTHS COVERED GREATER AMOUNT OF SURFACE AREA AT THIS SITE THAN AT TEST SITE

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME: DER SOUTH DIST	STORET STATION NUMBER:	DATE (M/D/Y): 1-13-92	RECEIVING BODY OF WATER:

REMARKS:	LOCATION: CITRUS BELLE	FIELD ID/NAME: UPSTREAM ROBERTS CANAL / CONTROL

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 23	Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs, undercut banks, rubble, or other stable habitat. **23-30 points**	20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat. **16-22 points**	5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat. **8-15 points**	Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious. **0-7 points**
Water Velocity 0	Max. observed: >0.3 m/sec. but < 1 m/sec **23-30 points**	Max. observed; 0.1 to 0.3 m/sec **16-22 points**	Max. observed; 0.05 to 0.1 m/sec **8-15 points**	Max. observed; <0.05 m/sec, or spate occurring; > 2 m/sec **0-7 points**
Artificial Channel/ Flow Alteration 0	No artificial channelization. Little activity (impervious surface) in watershed which would cause scouring during spates. **12-15 points**	—	—	Artificially channelized, or scouring present during spates because of excess impervious surface in watershed. **0-3 points**
Bank Stability 7	Stable. No evidence of erosion or bank failure. Little potential for future problems. **9-10 points**	Moderately stable. Infrequent or small areas of erosion, mostly healed over. **6-8 points**	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. **3-5 points**	Unstable. Many raw, eroded areas. Obvious bank sloughing. **0-2 points**
Riparian Zone Vegetation Quality 3	Over 80% of streambank surfaces consist of native plants, classified as: bottomland hardwoods, understory shrubs, or non-woody macrophytes. **9-10 points**	50% to 80% of riparian zone is vegetated, but one class of plants is not represented. **6-8 points**	25% to 50% of riparian zone is vegetated, but one or two classes of plants are not represented. **3-5 points**	Less than 25% of streambank surfaces are vegetated. Poor plant community (e.g. grass monoculture) present. **0-2 points**

Adjustments 5	Add **5 points** if cross-sectional area of flow is estimated to be greater than one square meter during periods of normal flow.	**TOTAL SCORE** 38

COMMENTS: BAHAI-TYPE GRASS ON BANK, SAND-MUCK BOTTOM, COVERED BY HYACINTH, WATER LETTUCE, HYDRILLA

ANALYSIS DATE: 1-13-92	ANALYST: A.S. WALTON	SIGNATURE: Albert S Walton Jr

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: Citrus Belle
Address/City:
County: Hendry
Contact/District: Gary Millington / 5
NPDES Permit #: FL00 Outfall #:

Sample Collection: Date 1/14/92 Time 1145
Test Beginning: Date 1/15/92 Time 1400
Test Ending: Date 1/17/92 Time 1050
Test Organism: N. cordi
Life Stage/Age: 24 days

Test Number: 1 of 2 Test Type: Screening | Definitive
Static | Static Renewal | Flow-through

27573

Remarks:
+ aerated to >40% saturation prior to loading
"strong Odor, very dark, green color. Cleared considerably at 24 hours. mf 1/16/92"

Instrument Calibrations:

	pH	DO	Temp	Cond
0 hr	7@7 9@9	8.6@23.5	22.5@23.1	1359@23.4
24 hr	7@7 9@9	8.6@23.5c	22.5°@22.5c	1332@22.8°C 1347
48 hr	7@7 9@9	8.7@23.0	21.0@21.3	1304@21.8° 1321

Conc.	Chamber #	Number Live 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	DO (mg/L) 0	24	48	Cond. (µmhos/cm) 0	24	48
Control	68	5	5	5	7.8	8.3	8.3	21.0	21.6	20.2	9.4	9.0	8.9			
Control	44	5	5	5	7.9	8.3	8.3				9.5	9.1	9.0	230	239	236
100%	26	5	3	2	6.8	8.3	7.9	22.2	21.6	20.7	1.1	7.4	1.3			
100%	61	5	5	1	6.8	8.3	7.9				0.8	7.6	1.2	1405	1403	1411
Measured/Loaded by:		MF	MF	ML	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF
Recorded by:		MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF

27573 92-JAN-15-23-01
BIOLOGY Matrix: W-EFFLUENT
Date Collected: 14-JAN-1992 11:45:00.
Field ID:
BSY-SN-CLD BSY-SN-FSH

Investigators' Signatures
Alison Jo
Marshall Faircloth

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:			not measured		
Lab Tot. Resid. Cl2:	0.0	0.0	0.0	HACH	MF
Alkalinity:	130	>0	350	HACH	MF
Hardness:	130	85	325	HACH	MF
Total Ammonia:	0	5	3.6	Hach	MF

Ammonia Meter Slope: _____ Ammonia Blank: _____ Salinity Sample: _____ ppt

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: Citrus Bella
Address/City:
County: Hendry
Contact/District: Gary Mullington / 5
NPDES Permit #: FL00 Outfall #:

Sample Collection: Date 1/14/92 Time 1645
Test Beginning: Date 1/15/92 Time 1400
Test Ending: Date 1/16/92 Time 1400
Test Organism: C. dubia
Life Stage/Age: <24 hrs

Test Number: 1 of 2 Test Type (Screening) | Definitive
(Static) Static Renewal | Flow-through

27573

Remarks:
48 hour readings are actually 24 hours Readings
test terminated 1/16/92

Instrument Calibrations:

	pH	DO	Temp	Cond
0 hr	7@7@9	8.6@23.5	22.9@23.1	1359@23.4
24 hr	7@7-9@9	8.6@23.5°C	22.5°C@22.5°C	1332@22.8°C@134)
48 hr	7@7@9	8.7@23.0	21.0@21.3	1304@22.8@132

Conc.	Chamber #	Number Live 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	DO (mg/L) 0	24	48	Cond. (µmhos/cm) 0	24	48
Control		5	5		8.1		8.3	22.1		22.8	9.3		8.8	1348		1400
Control		5	5				8.3						8.8			
Control 100%		5	5				8.3						8.8			
Control 100%		5	5				8.3						8.8			
100%		5	0		6.8		8.1	21.8		22.1	4.1		2.3	1207		1348
100%		5	0				8.1						1.6			
100%		5	0				8.1						1.7			
100%		5	0				8.1						2.0			
Measured/Loaded by:		AJ	AJ		MF		MF	MF		MF	MF		MF	MF		MF
Recorded by:		MF	MF													

Investigators' Signatures
Marshall Faulkner

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:			not measured		
Lab Tot. Resid. Cl2:	0.0	0.0	0.0	HACH	MF
Alkalinity:	130	70		HACH	
Hardness:	130	85		HACH	
Total Ammonia:	0	0	3.0	HACH	

Ammonia Meter Slope: _____ Ammonia Blank: 0 Salinity Sample: _____ ppt

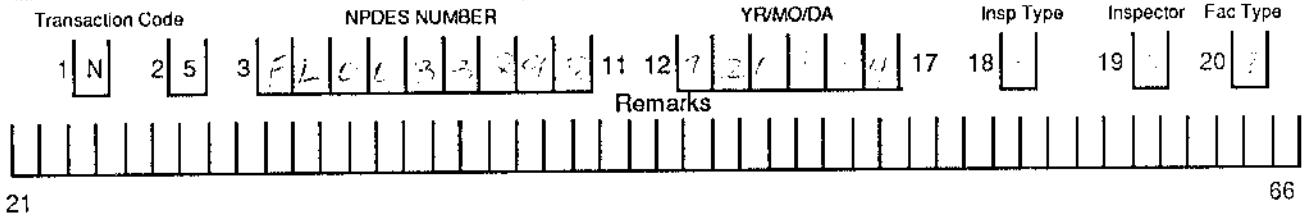
Macroinvertebrate taxa list for Citrus Belle collected via 20 discrete dip net sweeps of multiple substrates from Roberts Canal upstream and downstream of the discharge on 13 January 1992.

	Reference Site	Test Site
Coleoptera		
Berosus sp.	–	3
Celina sp.	–	2
Hydrovatus sp.	7	–
Suphisellus sp.	13	4
Undetermined Curculionidae	2	–
Diptera		
Ablabesmyia annulata	–	2
Ablabesmyia idei	1	–
Ablabesmyia peleensis	–	1
Ablabesmyia rhamphe	–	1
Chironomus (Lobochironomus) sp.	–	1
Mansonia dyari	–	1
Odontomyia sp.	4	2
Ephemeroptera		
Caenis sp.	3	99
Gastropoda		
Micromenetus dilatus	9	22
Physella sp.	2	–
Pyrgophorus platyrachis	11	25
Hemiptera		
Mesovelia sp.	–	2
Pelocoris sp.	–	1
Undetermined hemipteran	3	23
Undetermined Pleidae	2	3
Lepidoptera		
Undetermined Pyralidae	–	7
Malacostraca		
Hyalella azteca	192	239
Palaemonetes paludosus	5	19
Procambarus sp.	7	–
Odonata		
Aphylla williamsoni	1	–
Brachymesia gravida	1	–
Enallagma pollutum	–	6
Enallagma sp.	4	2
Erythemis simplicicollis	2	–
Ischnura ramburii	–	8
Ischnura sp.	7	–
Pachydiplax longipennis	1	1
Perithemis tenera seminole	–	1

Phytoplankton taxa list for Citrus Belle, Hendry County, collected via subsurface grabs in Roberts Canal on 10 February 1992.

	Reference Site	Test Site
Diatoms		
Achnanthes exigua	43	–
A. linearis	–	43
A. lanceolata v. *dubia*	86	–
Epithemia sp.	–	43
Eunotia sp.	–	129
E. pectinalis	43	–
Gomphonema parvulum	43	215
Melosira sp.	–	172
Navicula sp.	86	43
N. viridula	43	–
Nitzschia acicularis	–	129
N. filiformis	86	43
N. fonticola	–	43
N. palea	–	301
Pinnularia sp.	43	–
Rhopalodia sp.	129	43
Synedra sp.	43	301
S. ulna	–	730
Chlorophyta		
Characium sp.	–	43
Closterium sp.	–	43
Cosmarium sp.	43	–
Mougeotia sp.	43	129
Unknown chlorophyte flagellate	430	644
Chrysophyta		
Mallomonas sp.	–	43
Cryptophyta		
Cryptomonas sp.	129	86
Cyanophyta		
Anabaena sp.	215	129
Chroococcus sp.	172	601
Gloeocapsa sp.	–	86
Lyngbya sp.	172	–
Merismopedium sp.	–	473
Oscillatoria sp.	–	215
Phormidium sp.	–	601
Euglenophyta		
Trachelomonas sp.	86	43

Fill Out This Section For All Surface Water Discharger Inspections (CEI, CSI, CBI, PAI, XSI - RI Optional)



Fill Out This Section For All Surface Water Discharger Inspections (CEI, CSI, CBI, PAI, XSI - RI Optional)

