

Biological Assessment of

Lake Wales Wastewater Treatment Plant

Polk County

NPDES #FL0026379

Sampled September 1992

December 1992

Biology Section
Division of Technical Services

Department of Environmental Regulation

Results of Fifth Year Inspections

Discharger: Lake Wales WWTP
County: Polk
NPDES Number: FL0026379
State Permit Expiration Date: 15 August 1993

Toxics Sampling Inspection (XSI)

Date Sampled: 28 September 1992

Results: No organic constituents were measured in the effluent. Metals detected in the effluent above quantitation limits included copper (10 µg/L), iron (20 µg/L), and zinc (36 µg/L). These values are within Class III standards.

Results:

Compliance Biomonitoring Inspection (CBI)

Date Sampled: 28 September 1992

Results: The full strength effluent sample was not acutely toxic to the water flea, *Ceriodaphnia dubia*, or to the fish, *Notropis leedsi*, as no mortality was observed in either test.

Impact Bioassessment Inspection (IBI)

Date Sampled: 28 September 1992

Results: Some measurements of macroinvertebrate community health suggested that biota at both sites were degraded. The biological integrity criterion (17-302.560(9) FAC) was violated at the test site, and Florida Index values indicated polluted conditions at both study sites. Many of the taxa which were abundant in the Peace Creek Canal, both upstream and downstream of the discharge, were those tolerant of organic enrichment. The data indicate that the facility is not solely responsible for the poor conditions of the receiving waters, although it contributes to the observed biological problems. While some periphyton community parameters suggested disturbance associated with the Lake Wales WWTP discharge, others indicated that conditions were worse upstream. Because of the extremely eutrophic conditions prevailing at the reference site, the effects of further nutrient enrichment by the facility become difficult to discern. To benefit the receiving waters, improvements in effluent quality should be accompanied by control of non-point sources of pollution.

Water Quality Inspection (WQI)

Date Sampled: 28 September 1992

Results: Extreme nutrient enrichment was observed in the Peace Creek Canal, both upstream and downstream of the discharge. For example, at the reference site, concentrations of ortho-phosphate (1.9 mg/L) and nitrate-nitrite (14 mg/L) were considerably higher than 95 % of all other Florida streams. Downstream of the discharge, concentrations of ortho-phosphate (2.6 mg/L) and nitrate-nitrite (21 mg/L) were even more elevated, due to the influence of the effluent. Results of algal growth potential tests indicate that waters at both the test site and the reference site may be subject to eutrophication effects. Class III standards for both fecal and total coliform bacteria were violated at the reference site, but not in the effluent sample or at the test site. These violations are probably due to cattle ranching activities.

Introduction

The Lake Wales Wastewater Treatment Plant is a 1.9 MGD (design flow) domestic wastewater treatment facility located in Polk County (see map in Appendix). Treatment consists of oxidation (with clarification), filtration, chlorination, de-chlorination, and pH adjustment. The final effluent is aerated prior to discharge to the Class III Peace Creek Canal (see map in Appendix). The facility does not have a mixing zone.

Permit limits are as follows: carbonaceous BOD (maximum of 15 mg/L), TSS (maximum of 60 mg/L, weekly average of 45 mg/L, annual average of 20 mg/L), organic nitrogen (maximum of 5.0 mg/L), pH (6.0 to 7.0), fecal coliforms (average of 200 organisms/100 mL), dissolved oxygen (minimum of 6.0 mg/L), and chlorine residual (minimum of 0.5 mg/L for disinfection, maximum of 0.01 mg/L at discharge) (see Facility Summary in Appendix).

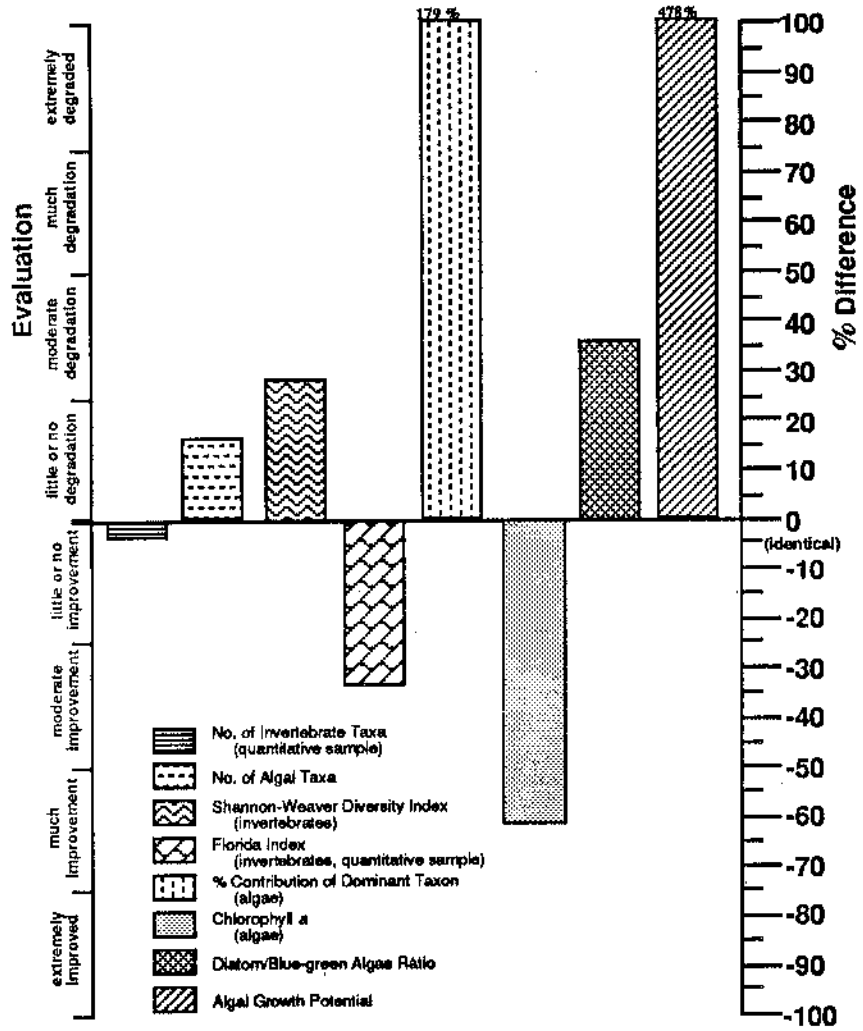
During the past few years, some minor problems with the plant have been documented. In May, 1992, an effluent spill occurred at the plant. There have also been intermittent failures of the equipment used for adjusting and monitoring the pH of the effluent.

Methods

The focus of this investigation was to determine the discharger's effects on the receiving waters. A comparison of biological community

Major characteristics of community structure of control and test sites.

	Control Site	Test Site
Macroinvertebrate Qualitative		
Number of Taxa	24	24
Florida Index	2	3
% Contribution of Dominant Taxon	22.8	23.0
% Oligochaeta	15.8	23.0
% Diptera	64.0	50.6
% Ephemeroptera	1.8	18.4
% Malacostraca	11.4	0
% Odonata	2.6	1.2
% Gastropoda	0.9	4.6
% Other	3.5	2.2
% Predators	13.9	17.2
% Collector-Gatherers	71.5	55.2
% Collector-Filterers	2.1	3.9
% Scrapers	1.4	16.9
% Shredders	10.5	5.9
% Piercers	0	0.9
% Parasites	0.6	0
Macroinvertebrate Hester-Dendy		
Number of Taxa	30	31
Florida Index	3	4
Shannon-Weaver Diversity	3.9	2.8
% Oligochaeta	2.8	0.1
% Diptera	87.6	35.0
% Ephemeroptera	3.8	42.9
% Gastopoda	1.0	21.3
% Odonata	0	0.4
% Malacostraca	4.7	0.3
% Predators	2.9	1.8
% Collector-Gatherers	71.5	53.9
% Collector-Filterers	4.0	0.9
% Scrapers	3.8	41.8
% Shredders	16.9	1.5
% Parasites	0.9	0.1
Periphyton Algae		
Number of Taxa	15	11
% Contribution of Dominant Taxon	29.0	81
Chlorophyll a (mg/sq. m)	30.6	11.68
Diatom/Diatom + B-G Abundance Ratio	0.9	0.57
% Blue-green	6.4	7.2
% Green	38.7	83.3
% Diatoms	54.9	9.5
% Other	0	0
Algal Growth Potential (mg dry wt/l)	5.1	29.5



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

health was made between a reference site (located in the Peace Creek Canal upstream of the discharge) and a test site (located downstream of the discharge in the Peace Creek Canal) (see map in Appendix). A habitat assessment was performed *in situ* to establish comparability between sites. Supplemental physical/chemical data were also collected on the effluent and study sites. Acute toxicity bioassays, using *Ceriodaphnia dubia* and *Notropis leedsi* as the test organisms, were performed on an effluent sample (EPA 1988). The effluent was analyzed for metals and for organic constituents (base neutral and acid extractables, and pesticide extractables). Additionally, analyses for nutrients 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 the reference site and test site. Invertebrates were collected from multiple substrates (e.g., snags, leaf packs, vegetation) using 20 discrete sweeps with a D-frame dip net. Additional invertebrate collections were accomplished using Hester-Dendy multiplate samplers which were incubated for 28 days (Ross 1990). Periphyton was sampled at both reference and test sites by incubating glass microscope slides in a standard periphytometer for 28 days (Ross 1990). Chlorophyll *a* was also determined for periphyton and phytoplankton communities (Ross 1990). Bacterial populations were analyzed for total and fecal coliforms following the methods of APHA (1989). Algal Growth Potential tests, using *Selenastrum capricornutum*, followed Miller *et al.* (1978).

Explanation of Measurements of Community Health

Several different measurements of macroinvertebrate and algal community health have been employed. Many of these, such as the number of taxa, Shannon-Weaver Diversity Index, 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 (for % composition) of 100% means that the two sites being compared are identical. This same type of procedure is used for calculating the QSI (for functional feeding groups).

For graphical purposes, the percent differences between the reference and test site involving the number of taxa, the diversity 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 contribution of dominant taxon, chlorophyll *a*, and algal growth potential are measured as the test site minus reference site divided by the reference site.

The following personnel were involved in this investigation: Pat Fricano, Jim Snitgen, and Kathryn Hicks (DER Southwest District), and Lyn Burton, Marshall Faircloth, Russel Frydenborg, Kathleen Lurding, and Kim Pearce (Tallahassee Biology Laboratory).

Results and Discussion

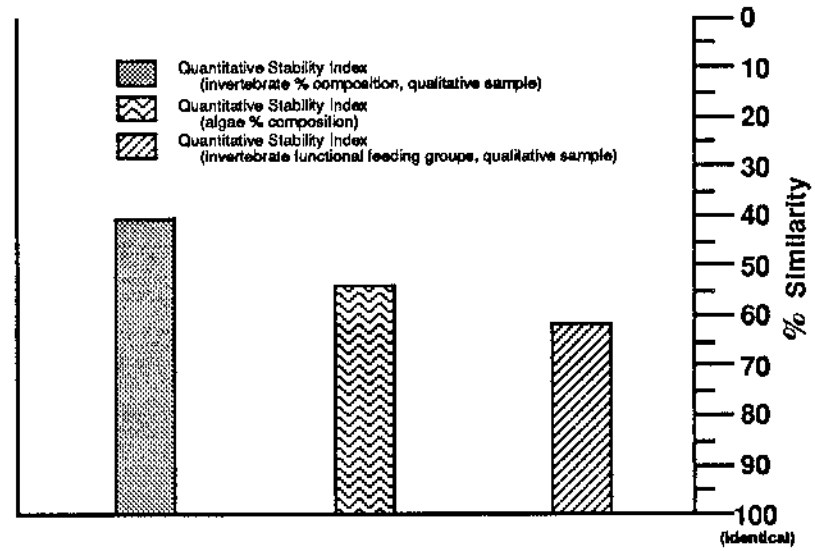
The study area (Peace Creek Canal) is highly altered by humans. The system has been artificially channelized and is completely surrounded by agricultural land uses (mostly cattle ranching) (Appendix). Obvious signs of non-point sources of pollution were present (*e.g.*, cattle excrement, trampled riparian zone). The test site (with 56 points) scored slightly higher with respect to habitat quality than did the reference site (with 49 points), though both sites had less than desirable habitat. Specific conductance at the test site (527 µmhos/cm), was higher than that of the reference site (430 µmhos/cm). Dissolved oxygen at the reference site (3.8 mg/L) was below the Class III standard (minimum of 5.0 mg/L). Dissolved oxygen at the test site was 7.0 mg/L, probably due to the addition of the aerated effluent. Water temperature (26.9 °C upstream, 28.0 °C downstream) and pH (5.7 upstream, 6.1 downstream) were similar at the two study sites.

The full strength effluent sample was not acutely toxic to the water flea, *Ceriodaphnia dubia*, or to the fish, *Notropis leedsi*, as no mortality was observed in either test.

No organic constituents were measured in the effluent. Metals detected in the effluent above quantitation limits included copper (10 µg/L), iron (20 µg/L), and zinc (36 µg/L). These values are within Class III standards.

Extreme nutrient enrichment was observed in the Peace Creek Canal, both upstream and downstream of the discharge (see chemistry summary table). For example, at the reference site, concentrations of ortho-phosphate (1.9 mg/L) and nitrate-nitrite (14 mg/L) were considerably higher than 95 % of all other Florida streams (see Table of Typical Water Quality Values in Appendix). Downstream of the discharge, concentrations of ortho-phosphate (2.6 mg/L) and nitrate-nitrite (21 mg/L) were even more elevated, due to the influence of the effluent.

Results of algal growth potential tests indicate that waters at both the test site and the reference site may be subject to eutrophication effects. The AGP's measured (29.5 mg dry wt/L at the test site; 5.1 mg dry wt/L at the reference site) were higher than the 5 mg dry wt/L, "problem threshold". It has been found that the negative consequences associated with nutrient enrichment (D.O. depletion, algal blooms, fish kills) are probable when the AGP exceeds this 5 mg dry



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

wt/L level (Raschke and Schultz 1987). The effluent AGP was 36.1 mg dry wt/L.

Fecal coliforms were < 1 organism/100 mL in the effluent sample, 120 organisms/100 mL at the test site, and 1000 organisms/100 mL at the reference site. Total coliform bacteria were < 1 organism/100 mL in the effluent sample, 1200 organisms/100 mL at the test site, and 7500 organisms/100 mL at the reference site. Class III standards for both fecal and total coliform bacteria were violated at the reference site, probably due to cattle ranching activities.

Certain measurements of macroinvertebrate community health suggested that biota at both sites were degraded. 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. The figure on p. 3 summarizes similarities between the sites. Smaller similarities (lower percentages) generally correspond with greater degradation.

Shannon-Weaver diversity was reduced by 28.2% at the test site, compared to the reference site. This is a violation of the biological integrity criterion (17-302.560(9) FAC). However, species richness was almost identical at both sites (24 taxa in dip net samples and about 30 taxa in Hester-Dendy samples). Florida Index values at both study sites were low (below 4), indicating polluted conditions, although the test site outscored the reference site by one point. Many of the taxa which were abundant in the Peace Creek Canal, both upstream and downstream of the discharge, were those tolerant of organic enrichment. These included *Chironomus sp., Einfeldia natchitocheae, Goeldichironomus spp., Kiefferulus sp.*, and *Limnodrilus hoffmeisteri*. Certain observations, such as the low dissolved oxygen at the reference site and the obvious non-point sources of pollution, indicate that the facility is not solely responsible for the poor conditions of the receiving waters, although it does contribute to the problems.

Two of the periphyton community parameters examined suggested disturbance associated with the Lake Wales WWTP discharge. The percent contribution of the dominant taxon was increased by 179% between the reference and the test sites, and the diatom/blue-green ratio was reduced by 36.7%. However, the periphyton chlorophyll *a* measured at the reference site (30.6 mg/m^2) was higher than that of the test site (11.7mg/m^2). Phytoplankton chlorophyll a was also reduced at the test site by 96.7%. The alga, *Characium* sp., which is known to occur in nutrient polluted waters, was quite abundant at both sampling stations. Because of the extremely eutrophic conditions prevailing at the reference site, effects of further nutrient enrichment by the facility become difficult to discern.

Conclusions

The Peace Creek Canal is artificially channelized and completely surrounded by agricultural land uses. Obvious signs of non-point pollution sources were present (*e.g.*, cattle excrement, low dissolved oxygen). The system is highly stressed by human activities prior to the input of the Lake Wales WWTP effluent.

The full strength effluent sample was not acutely toxic to the water flea, *Ceriodaphnia dubia*, or to the fish, *Notropis leedsi*, as no mortality was observed in either test.

No organic constituents were measured in the effluent. Metals detected in the effluent above quantitation limits included copper (10 µg/L), iron (20 µg/L), and zinc (36 µg/L). These values are within Class III standards.

Extreme nutrient enrichment was observed in the Peace Creek Canal, both upstream and downstream of the discharge (see chemistry summary table). For example, at the reference site, concentrations of ortho-phosphate (1.9 mg/L) and nitrate-nitrite (14 mg/L) were considerably higher than 95 % of all other Florida streams. Downstream of the discharge, concentrations of orthophosphate (2.6 mg/L) and nitrate-nitrite (21 mg/L) were even more elevated, due to the influence of the effluent. Results of algal growth potential tests indicate that waters at both the test site and the reference site may be subject to eutrophication effects.

Class III standards for both fecal and total coliform bacteria were violated at the reference site, but not in the effluent sample or at the test site. These violations are probably due to cattle ranching activities.

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While some periphyton community parameters suggested disturbance associated with the Lake Wales WWTP discharge, others indicated that conditions were worse upstream. The alga, *Characium* sp., which is known to occur in nutrient polluted waters, was quite abundant at both sampling stations. Because of the extremely eutrophic conditions prevailing at the reference site, the effects of further nutrient enrichment by the facility become difficult to discern. To benefit the receiving waters, improvements in effluent quality should be accompanied by control of non-point sources of pollution.

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.

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 Lake Wales WWTP.

	Effluent	Control Site	Test Site
Organic Constituents (ug/L)			
None Detected	U		
Metals (ug/L)			
Aluminum	50 U		
Arsenic	20 U		
Cadmium	0.09 T		
Copper	10		
Chromium	10 U		
Iron	20		
Lead	15 U		
Mercury	0.1 U		
Nickel	5 U		
Silver	0.05 U		
Zinc	36		
Nutrients (mg/L)			
Ortho-phosphate	2.5	1.9	2.6
Total phosphorus	2.5	1.9	2.4
Ammonia	0.03 T	0.28	0.04
Nitrate+Nitrite	21	14	21
TKN	0.45	2.1	0.5
Other Parameters			
Habitat Assessment		49	56
D.O. (mg/L)		3.8	7.0
pH (SU's)	7.2	5.7	6.1
Conductivity (µmhos/cm)	492	430	527
Temperature (°C)		26.9	28
AGP (mg dry wt/L)	36.1	5.1	29.5
Bioassay Fish	Not toxic		
Bioassay Invertebrate	Not toxic		
BOD (mg/L)	1.8		
Phytoplankton chorophyll a (µg/L)		18.2	0.6
Fecal coliform (org/100 ml)	1 U	1000	120
Total coliform (org/100 ml)	1 U	7500	1200
Hardness (mg/L)	131		

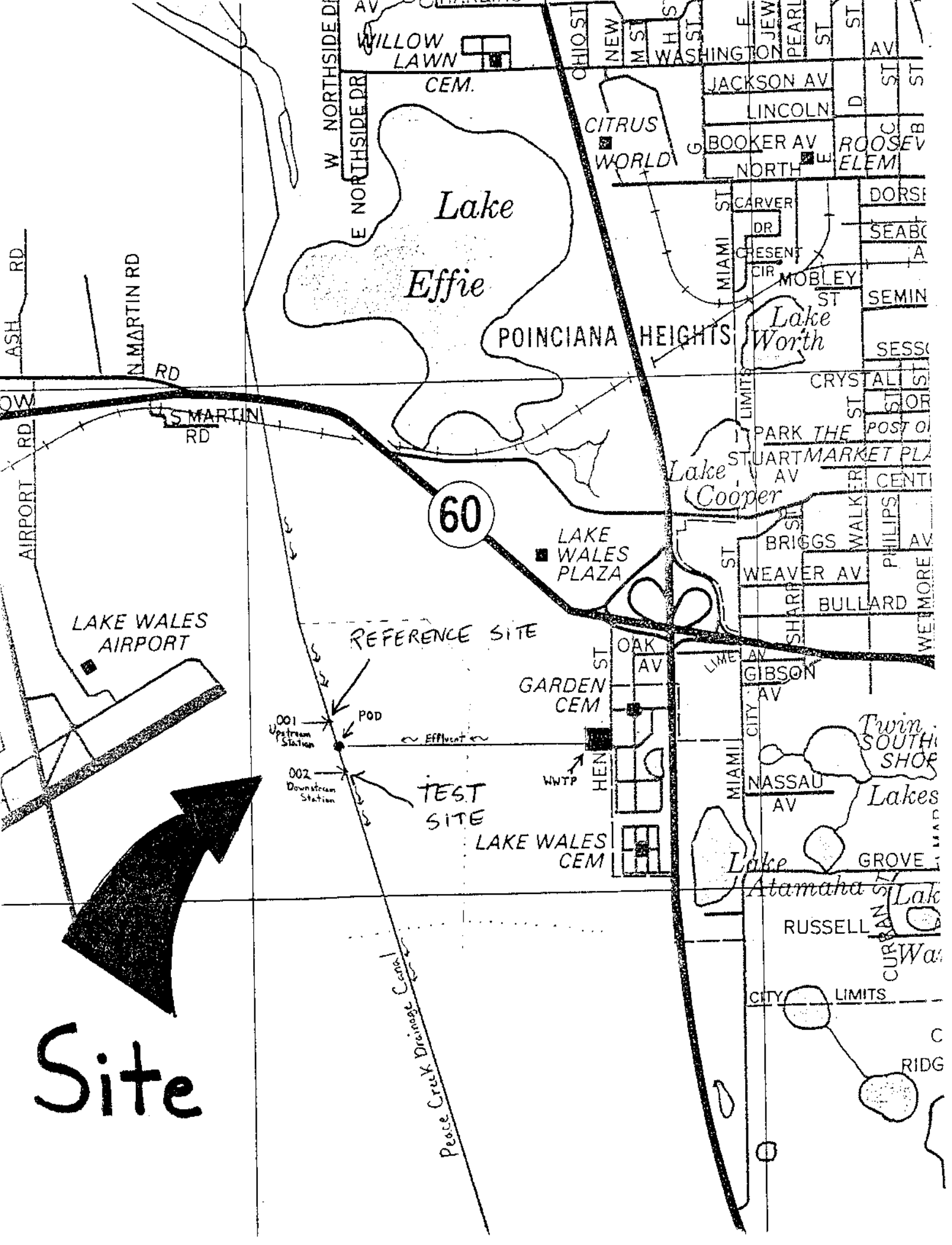
A - Value reported is the mean of two or more determinations
E - Scientific notation
J - Estimated value
K - Actual value is known to be less than value given
L - Actual value is known to be greater than value given
N - Not analyzed for this compound
T - Value reported is less than the practical quantitation 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
NA - Not applicable
NR - Not requested

Typical Values for Selected Parameters in Florida Waters

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

Parameter	Percentile Distribution 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
NH3+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


Site
REFERENCE SITE
POD
001 Upstream Station
002 Downstream Station
Effluent
TEST SITE
WWTP
Peace Creek Drainage Canal
Lake Effie
Lake Cooper
Lake Worth
Lake Atamaha
Twin Lakes
POINCIANA HEIGHTS
LAKE WALES AIRPORT
LAKE WALES PLAZA
LAKE WALES CEM
GARDEN CEM
WILLOW LAWN CEM.
CITRUS WORLD
ROOSEVELT ELEM
60
N MARTIN RD
S MARTIN RD
E NORTHSIDE DR
W NORTHSIDE DR
AIRPORT RD
ASH RD
OAK AV
GIBSON AV
WEAVER AV
BULLARD AV
BRIGGS AV
JACKSON AV
LINCOLN AV
BOOKER AV
NORTH AV
NASSAU AV
GROVE ST
RUSSELL
MOBLEY ST
CRESENT CIR
CARVER DR
MIAMI ST
CITY LIMITS
PARK THE
MARKET PLA
POST O
SEMIN
SEABO
DORSE
CRYSTAL
SESSO
CENTR
WASHINGTON
JEW
PEARL
NEW
OHIO ST

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

FACILITY SUMMARY

Facility Name: Lake Wales WWTP	Prepared by: [illegible] Date: 4-25

Location (attach detailed map): 500 North Street Lake Wales, FL 33859	County: Polk	District: [illegible]
Federal Permit # and expiration date: FLG 112637	State GMS # and State expiration date: 4053 MUG64 5-15-93	Facility Type: Industrial Municipal Federal Agricultural Other (list):

Function of facility: Domestic Waste Treatment

Description of treatment process: [illegible]

Receiving waters: [illegible]	Classification:
Design Flow: [illegible] MGD	Actual Mean Flow:

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

therefore, the best time to sample is:

If facility has a mixing zone, give details (size, parameters affected, etc.):

N/A

List effluent limits:

Parameter	Limit (units)
CBOD	15.0 mg/L max
TSS	20 mg/L annual max avg 30 mg/L weekly Avg 45 mg/L weekly Avg 60 mg/L any one sample
Organic Nitrogen	5.0 mg/L max
Ammonia Nitrogen	2.0 mg/L max
D.O.	6.0 minimum
pH	6.0 to 8.5 units
Fecal Coliform	200 annual/monthly avg

Describe special permit conditions and permit modifications:

[illegible]

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

(Facility)

Description of permitted outfall(s):

List permit violations (from MOR data or other source) and plant upsets that occurred within past year:

Describe previous impact bioassessments, WQBEL's, and previous or current enforcement actions:

Discuss comparability of MOR results to past DER results and whether there are trends (improving, declining) in the data set:

Additional information:

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:
		9-25-91	1:4	

REMARKS:	LOCATION: Lake Wales WWTP Upstream	FIELD ID/NAME: Sta 001

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
		100%				

Local Watershed Erosion (check box): None [X] Moderate [ ] Heavy [ ]

Local Watershed NPS Pollution (check box): No evidence [ ] Some potential sources [ ] Obvious sources [ ]

Point-Source Pollution (list location and describe):

N/A

			yes
Estimated System Width (range, m): 4-5 m	Estimated System Depth (range, m):		Impounded [ ]
High Water Mark (m above bed):	Velocity (range, m/s):		Channelized [ ]

Canopy Cover % : Open : [X] Lightly Shaded (11-45%): [ ] Moderately Shaded (46-80%): [ ] Heavily Shaded: [ ]

SEDIMENT/SUBSTRATE

Sediment Odors: Normal: [X] Sewage: [ ] Petroleum: [ ] Chemical: [ ] Anaerobic: [ ] Other: [ ]

Sediment Oils: Absent: [X] Slight: [ ] Moderate: [ ] Profuse: [ ]

Sediment Deposits: Sludge: [ ] Paper Fiber: [ ] Mud: [X] 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			
Aquatic Vegetation	25	10		Mud/Muck			
Submerged Roots				Other:			
Undercut Banks				Other:			

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):	pH (SU):	Cond. (µmho/cm):				Secchi (m):
Top								
Mid-depth	26.33	3.52	5.05	493				
Bottom								

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

Water Odors (check box): Normal: [X] Sewage: [ ] Petroleum: [ ] Chemical: [ ] Other: [ ]

Water Surface Oils (check box): Slick: [ ] Sheen: [ ] Globs: [ ] None: [X]

Clarity (check box): Clear: [X] Slightly turbid: [ ] Turbid: [ ] Opaque: [ ]

Color (check box): Tannic: [X] Green (algae): [ ] Clear: [ ] Other: [ ]

Weather Conditions: Cloudy 25°C

Abundance:	Absent	Rare	Common	Abundant
Periphyton	[ ]	[X]	[ ]	[ ]
Fish	[ ]	[ ]	[X]	[ ]
Aquatic Macrophytes	[ ]	[ ]	[ ]	[X]
Iron/sulfur Bacteria	[X]	[ ]	[ ]	[ ]

ANALYSIS DATE:	ANALYST:	SIGNATURE:
9-25-91	Kathryn A. Hicks	

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): 9-23-93	TIME	RECEIVING BODY OF WATER:

REMARKS:	LOCATION: Lake Wales WWTP Downstream	FIELD ID/NAME: Sta 002

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
		100%				

Local Watershed Erosion (check box): None [X] Moderate [ ] Heavy [ ]

Local Watershed NPS Pollution (check box): No evidence [ ] Some potential sources [ ] Obvious sources [X]

Point-Source Pollution (list location and describe):

N/A

Estimated System Width (range, m): 2-3	Estimated System Depth (range, m):		yes
High Water Mark (m above bed):	Velocity (range, m/s):	Impounded [ ]	
		Channelized [ ]	

Canopy Cover %: Open [X] Lightly Shaded (11-45%) [ ] Moderately Shaded (46-80%) [ ] Heavily Shaded [ ]

SEDIMENT/SUBSTRATE

Sediment Odors: Normal [ ] Sewage [ ] Petroleum [ ] Chemical [ ] Anaerobic [X] Other [ ]

Sediment Oils: Absent [X] Slight [ ] Moderate [ ] Profuse [ ]

Sediment Deposits: Sludge [ ] Paper Fiber [ ] Mud [X] Sand [X] Shell [ ] Other [ ]

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)				Rock or Shell Rubble			
Leaf Packs				Sand			
Aquatic Vegetation	30	10		Mud/Muck	60	10	
Submerged Roots				Other:			
Undercut Banks				Other:			

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):	pH (SU):	Cond. (µmho/cm):				Secchi (m):
Top	28							
Mid-depth	28	7.01	(meter)	521				bottom
Bottom								

System Type: Stream [ ] (Surficial Aquifer Fed / Deep Aquifer Fed / Alluvial / Blackwater) Lake [ ] Wetland [ ] Estuary [ ] Other [X]

Water Odors (check box): Normal [X] Sewage [ ] Petroleum [ ] Chemical [ ] Other [ ]

Water Surface Oils (check box): Slick [X] Sheen [ ] Globs [ ] None [X]

Clarity (check box): Clear [X] Slightly turbid [ ] Turbid [ ] Opaque [ ]

Color (check box): Tannic [X] Green (algae) [ ] Clear [ ] Other [ ]

Weather Conditions: Cloudy, 85°F

Abundance:	Absent	Rare	Common	Abundant
Periphyton	[ ]	[X]	[ ]	[ ]
Fish	[ ]	[ ]	[X]	[ ]
Aquatic Macrophytes	[ ]	[ ]	[ ]	[X]
Iron/sulfur Bacteria	[X]	[ ]	[ ]	[ ]

ANALYSIS DATE:	ANALYST:	SIGNATURE:
9-23-93	Kathryn A. Hicks	

DEPARTMENT OF ENVIRONMENTAL REGULATION

FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y): 9/28/92	RECEIVING BODY OF WATER: Peace Creek Canal

REMARKS: A canal tributary to Peace River. (Headwaters)	LOCATION: Lake Wales WWTP - upstream in Peace Creek Canal	FIELD ID/NAME: 001

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover: 15	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: 8	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: 8	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: 8	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: 49

COMMENTS: Fish Seen include mosquito fish. Evidence of Numerous Cattle Present - (hoof prints + droppings)

ANALYSIS DATE: 9/28	ANALYST: P. Fricano	SIGNATURE: Pat Fricano

DEPARTMENT OF ENVIRONMENTAL REGULATION

FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y): 9/28/92	RECEIVING BODY OF WATER: Peace Creek Canal

REMARKS: A canal / tributary to Peace River, (Headwaters)	LOCATION: Lake Wales WWTP Downstream in Peace Creek Canal	FIELD ID/NAME: CC2

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover — 15	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 — 15	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 — 8	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 — 8	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 — 56

COMMENTS: Fish Seen include mosquito fish, bluegill + dollar sunfish. Numerous cattle present (on the hoof)

ANALYSIS DATE: 9/28/92	ANALYST: P. Fricano	SIGNATURE: Pat Fricano

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: LAKE WALES, City of
Address/City:
County: POLK
Contact/District: SW
NPDES Permit #: FL00 Outfall #:

Sample Collection: Date 9-28-92 Time 1045
Test Beginning: Date 9-29-92 Time 1400
Test Ending: Date 10-1-92 Time 1400
Test Organism: N. LEEDSI
Life Stage/Age: 9 days

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

423073 92-SEP-29-28
entered 10/1

Remarks:

Instrument Calibrations:

	pH	DO	Temp	Cond
0 hr	7@7|90@10	8.5@24.0	23.2@ 23.2	971 @23.4 9590
24 hr	7?, 9.9	8.7@23°C	22.8@22.8	956 9390 @23.0
48 hr	7@7, 9@9	8.8@22.0	22.0@22.3	943/9290 22.5

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	142	5	5	5	7.8	8.2	8.4	23.5	22.5	22.0	8.5	8.3	9.1	~~2434~~		
control	7	5	5	5	7.8	8.2	8.4				8.5	8.4	9.1	243	239	238
100%	21	5	5	5	7.2	7.7	8.0	21.5	22.5	22.0	8.6	8.4	9.2	~~492~~ *		
100%	147	5	5	5	7.2	7.7	8.0				8.6	8.4	9.2	492	502	504

* recorded in wrong space MF 9/29/92

Measured/Loaded by:	MA	KP	KP	KP	KP	MF	KP	KP	MF	KP	KP	MF	KP	KP	MF
Recorded by:	MF	KP	KP	MF	KP	KP	MF	KP	KP	MF	KP	KP	MF	MF	KP

Investigators' Signatures

Kim Pearce
Marshall Faircloth

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:					
Lab Tot. Resid. Cl2:	0.0		<0.02	DR-100	KP
Alkalinity:	124	70	60	Hach	KP
Hardness:	125	77	131	Hach	KP
Total Ammonia:	0.0	0	0	Orion	MF

Ammonia Meter Slope: -55.0
Ammonia Blank: 0.0
Salinity Sample: 0 ppt

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: LAKE WALES, City of
Address/City:
County: POLK
Contact/District: SW
NPDES Permit #: FL00 Outfall #:

Sample Collection: Date 9-28-92 Time 1045
Test Beginning: Date 9-29-92 Time 1400
Test Ending: Date 10-1-92 Time 1400
Test Organism: C. DUBIA
Life Stage/Age: <24 HRS

Test Number: 1 of 2 Test Type: (Screening) Definitive 42303 92-SEP-29-28
(Static) Static Renewal | Flow-through entered 10/1

Remarks:

Instrument Calibrations:

	pH	DO	Temp	Cond
0 hr	7@7, 10@10	8.5@24.0	23.2@ 23.2	971 9590 @23.4
24 hr	7@7, 9@9	8.7@23.0	22.8@22.8	956 9390 @23.0
48 hr	7@7, 9@9	8.8@22.0	22.0@22.3	943/9290 @22.4

		Number Live			pH			Temp. (°C)			DO (mg/L)			Cond. (µmhos/cm)		
Conc.	Chamber #	0	24	48	0	24	48	0	24	48	0	24	48	0	24	48
control	A	5	5	5	8.5		8.3	23.0		23.2	8.6		8.9	166		168
control	B	5	5	5			8.3						8.9			
control	C	5	5	5			8.3						8.9			
control	D	5	5	5			8.3						8.9			
100%	A	5	5	5	7.3		8.1	22.0		23.2	8.6		8.9	479		520
100%	B	5	5	5			8.1						8.9			
100%	C	5	5	5			8.1						8.9			
100%	D	5	5	5			8.1						8.9			
Measured/Loaded by:		KP	MF	KP	KP		MF	KP		MF	KP		MF	KP		MF
Recorded by:		MF	KP	KP	MF		KP	MF		KP	MF		KP	MF		KP

Investigators' Signatures

Kim Kearce
Marshall Faircloth

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:					
Lab Tot. Resid. Cl2:	0.0		<0.02	DR-100	KP
Alkalinity:	124	70	60	Hach	KP
Hardness:	125	77	131	Hach	KP
Total Ammonia:	0	0	0	orion	MF

Ammonia Meter Slope: -55.0
Ammonia Blank: 0.0
Salinity Sample: 0 ppt

Taxa list for Lake Wales STP, collected above and below the discharge via Hester-Dendy samplers on 28 September 1992.

	Reference Site	Test Site
Cnidaria		
Hydra sp.	–	1
Diptera		
Ablabesmyia peleensis	–	1
Ablabesmyia sp. B Epler	–	1
Asheum beckae	2	2
Chironomus decorus grp.	1	–
Chironomus sp.	16	10
Cladopelma sp.	1	–
Dicrotendipes simpsoni	–	2
Dicrotendipes sp.	1	–
Einfeldia natchitocheae	1	–
Endochironomus nigricans	–	1
Glyptotendipes meridionalis	1	2
Glyptotendipes sp. B Epler	2	1
Glyptotendipes sp.	1	–
Goeldichironomus carus	3	2
Goeldichironomus holoprasinus	2	47
Goeldichironomus natans ?	2	16
Goeldichironomus pictus	1	–
Goeldichironomus sp.	7	23
Kiefferulus sp.	8	31
Parachironomus carinatus	1	–
Parachironomus directus	–	1
Parachironomus monochromus	1	1
Polypedilum convictum grp.	1	–
Polypedilum tritum	1	–
Paramerina sp.	1	–
Procladius bellus	1	–
Procladius sp.	–	1
Undetermined dipteran pupae	1	7
Tanytarsus sp. E Epler	–	5
Tanytarsus sp. F Epler	–	1
Tanytarsus sp. G Epler	–	1
Tanypus carinatus	–	1
Zavreliella marmorata	1	2
Ephemeroptera		
Caenis sp.	1	190
Centroptilum viridocularis	1	–
Stenonema floridense	1	–
Gastropoda		
Hebetancyclus excentricus	1	88
Physella sp.	–	7
Malacostraca		

Hyalella azteca	3	1
Odonata		
Ischnura ramburii	–	1
Pachydiplax longipennis	–	1
Oligochaeta		
Dero trifida	1	1
Limnodrilus hoffmeisteri	1	–
Trichoptera		
Oecetis sp.	–	1

Taxa list for Lake Wales STP, collected above and below the discharge via discrete sweep dip net sampling on 28 September 1992.

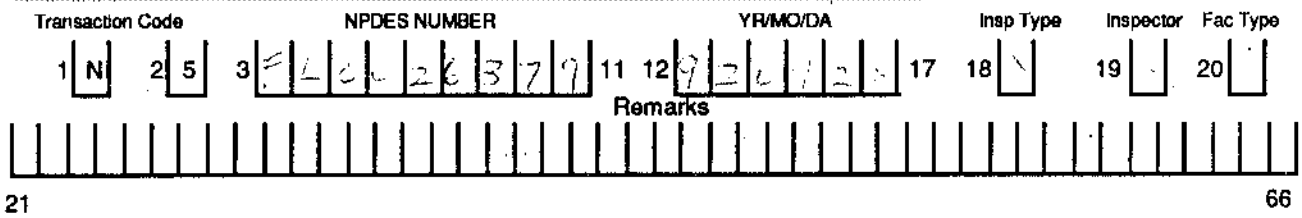
	Reference Site	Test Site
Acarina		
Arrenurus sp.	24	–
Undetermined acarina sp.	–	24
Coleoptera		
Peltodytes sp.	–	24
Diptera		
Ablabesmyia peleensis	–	24
Ablabesmyia sp. B Epler	24	–
Chironomus decorus grp.	–	24
Chironomus sp.	432	168
Cladotanytarsus sp.	72	72
Cladopelma sp.	–	120
Einfeldia natchitocheae	624	–
Glyptotendipes meridionalis	24	–
Goeldichironomus amazonicus	216	24
Goeldichironomus holoprasinus	–	24
Goeldichironomus natans ?	–	48
Goeldichironomus sp.	24	72
Kiefferulus sp.	24	–
Palpomyia grp.	24	24
Parachironomus carinatus	24	–
Parachironomus sp. A Epler	24	–
Procladius bellus	24	72
Procladius sp.	96	72
Undetermined dipteran pupae	–	72
Tanytarsus sp. E Epler	–	48
Tanytarsus sp. F Epler	24	48
Tanytarsus sp. G Epler	–	24
Tanypus carinatus	96	96
Zavreliella marmorata	–	24
Ephemeroptera		
Caenis sp.	48	384
Gastropoda		
Hebetancyclus excentricus	24	96
Hemiptera		
Belostoma flumineum	24	–
Lepidoptera		
Undetermined lepidopteran	48	–
Malacostraca		
Hyalella azteca	312	–
Odonata		
Erythemis simplicicollis	48	–
Ischnura sp.	24	–

Perithemis tenera seminole	–	24
Oligochaeta		
Limnodrilus hoffmeisteri	432	480

Periphyton taxa list for Lake Wales STP, collected 29 September, 1992.

	Reference Site	Test Site
Diatoms		
Achnanthes exigua	3888	567
A. linearis	430	81
Gomphonema sp.	21	–
G. augur	86	54
Navicula sp.	43	–
Nitzschia sp.	107	–
N. amphibia	21	–
Chlorophyta		
Characium sp.	2427	6044
Chlorococcum sp.	–	27
Oedogonium sp.	236	54
Scenedesmus sp.	150	–
Stigeocolonium sp.	430	81
Cyanophyta		
Anabaena sp.	129	135
Chamaesiphon sp.	43	81
Chroococcus sp.	172	189
Lyngbya sp.	193	135

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)

