

Biological Assessment of

Orange County Utilities Division Easterly Water Reclamation Facility

Orange County

NPDES #FL0038849

Sampled November 1998

August 1999

Biology Section
Division of Administrative and Technical Services
Bureau of Laboratories

Comprehensive Quality Assurance Plan No. 870346G

Department of Environmental Protection
Results of Fifth Year Inspections

Discharger: Orange County Utilities Division Easterly Reclamation Facility
County: Orange
NPDES Number: FL0038849
Permit Expiration Date: 6/18/2003

Toxics Sampling Inspection (**XSI**)	
Date Sampled:	9 November 1998
Results:	Atrazine was detected at a non-problem level. Aluminum, copper, iron, and lead were detected but complied with Class III standards.

Compliance Biomonitoring Inspection (**CBI**)	
Date Sampled:	9 November 1998
Results:	The effluent sample was not toxic to the invertebrate, *Ceriodaphnia dubia*, or to the fish, *Cyprinella leedsi*. No mortality occurred in either 48-hour static, screening bioassays.

Impact Bioassessment Inspection (**IBI**)	
Date Sampled:	9 November 1998
Results:	The study sites for this report were located in wetlands. The Department is currently developing biological assessment tools to better determine the health of the different wetland types in Florida, however, any interpretation of the biological data at this point should be considered preliminary. Further, the dissolved oxygen at the control site (0.6 mg/L) was insufficient to support a healthy macroinvertebrate community and therefore does not meet the criteria for a control site and any community comparisons to this site are not meaningful. Changes in the phytoplankton community structure may be associated with algal growth inhibition at the test site. These changes are reflected by decreases in taxa richness and algal density and an increase in the percent dominant taxon by 102% at the test site.

Water Quality Inspection (**WQI**)	
Date Sampled:	9 November 1998
Results:	Conductivity was significantly higher at the test site, but did not Class III standards. Dissolved oxygen was below the standard for Class III waters at the control site (Rule 62-302.530(31) FAC), however, this would appear to be unrelated to the discharge. The pH at the test was much higher than the control site level. Nutrients did not appear elevated due to the discharge. The effluent AGP was 48.3 mg dry wt/L. AGP was 81% lower at the test site compared to the control site which may indicate algal growth inhibition.

This biological assessment was prepared by DEP staff to provide information to be used in reviewing an NPDES permit renewal application for the subject facility. This assessment will be used in conjunction with other information concerning the facility and its receiving water body to determine appropriate final permit conditions.

Introduction

The Orange County Utilities Division Easterly Water Reclamation Facility is located in Orange County, Florida (see maps in the Appendix). This 19.0 MGD advanced wastewater treatment facility consists of two parallel treatment plants with a common preliminary treatment structure and effluent pump station (see Facility Summary in Appendix). The treatment process includes odor control, mechanical influent screening, grit removal, and finally thickening and de-watering of the remaining residues. The effluent undergoes nutrient removal, secondary clarification, tertiary filtration, and chlorination and dechlorination before it is discharged into a 6.2 MGD AADF permitted capacity combined man-made and natural wetlands system. This system provides further treatment of the effluent prior to its final discharge into an unnamed tributary of the Class III Econlockhatchee River. The permit file indicates that 9.5 MGD goes to their reuse system of which 2.5 MGD goes to the rapid rate land application system and 7 MGD to the Curtis H. Stanton Energy Center for once through cooling water. The actual mean flow during this survey was 9.781 MGD.

State permit limits for the facility are listed in Table 1. According to the facility's monthly operating reports, the plant has had only one exceedance of the permit limits within the past year. This exceedance occurred in August 1998, and resulted from a single maximum fecal coliform count of 2,516 counts/100 ml. The review also showed that the facility reports one to ten sewer overflows each month.

The study sites for this report were located in both natural and created wetlands in Orange County, Florida. The Department is currently developing biological assessment tools to better determine the health of different wetland types in Florida, however, any interpretation of the biological data at this point should be considered preliminary.

Methods

The focus of this investigation was to determine the discharger's effects on the receiving wetland. A comparison of biological community health was made between a control site (located in an adjacent natural wetland approximately 1,500 meters south of the treatment facility) and a test site (located approximately 1,000 meters below the man-made, redistribution wetland). 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. Data for this report was collected on November 9, 1998. The effluent was analyzed for nutrients, metals, and for organic constituents (base neutral and acid extractables, and pesticide extractables). Methods used for all chemical analyses are on file at the DEP Central Chemistry Laboratory in Tallahassee.

Acute screening toxicity bioassays, using the invertebrate, *Ceriodaphnia dubia,* and the fish, *Cyprinella leedsi* as test organisms, were performed on an effluent sample.

Benthic macroinvertebrate community structure and function was evaluated at the control and test sites utilizing discrete dip-net sweep collections from the available substrates (*e.g.*, snags, leaf packs, vegetation) within a 100 meter stretch at each sampling site. Normally, additional invertebrate collections using Hester-Dendy multiplate samplers are taken in conjunction with the dip-net samples; however, they were not completed during this sampling period due to low water levels.

Phytoplankton were sampled at both control and test sites via subsurface grabs. These samples were analyzed for the diversity and density of the taxa present, and chlorophyll *a*. *Selenastrum capricornutum* was used as the test organism for algal growth potential tests. Periphyton samples at both control and test sites were not collected during this sampling period due to low water levels. All field and laboratory biological methods followed Biology Section Standard Operating Procedures (SOPs) which can be viewed on our web site <www.dep.state.fl.us/labs/sops.htm>.

Several different measurements of macroinvertebrate and algal community health have been employed to determine the effects of the discharge. These measurements include: habitat assessment, taxa richness, Shannon-Weaver Diversity Index, the Florida Index, Ephemeroptera/Plecoptera/Trichoptera (EPT) Index, community composition, functional feeding groups, algal biomass, and the Stream Condition Index (SCI). For a discussion of each of these measures, see *Explanation of Measurements of Community Health* in the Appendix.

For graphical purposes, the percent differences between the control and test sites involving the num-

Table 1. Effluent limits and summary of chemistry data.

OCPUD Easterly Water Reclamation Facility	Effluent Limits	Effluent Samples	Control Site	Test Site 1
Organic Constituents (µg/L)				
Atrazine		0.18 I	-	-
Metals (µg/L)				
Aluminum	1,500 **	59 I	-	-
Arsenic	50 **	20 U	-	-
Cadmium	1.37 **b	0.05 U	-	-
Chromium	251 **b	10 U	-	-
Copper	14.52 **b	3.1 A	-	-
Iron	1000 **	41 I	-	-
Lead	4.32 **b	0.53 A	-	-
Mercury	0.0012 **	0.10 U	-	-
Nickel	193 **b	6 U	-	-
Selenium	5.0 **	40 U	-	-
Silver	0.07**	0.04 U	-	-
Zinc	129 **b	40 U	-	-
Nutrients (mg/L)				
Ortho-phosphate	-	0.13	0.007	0.004
Total phosphorus	≤ 2.4 *c	0.20	0.003	0.026
Ammonia	-	0.063 A	0.024	0.017
Nitrate+nitrite	-	2.1	0.004 U	0.005
TKN	-	1.1	0.97	0.86
Organic Nitrogen	-	1.037	0.73	0.843
Total Nitrogen	3.0 *a	3.2	0.974	0.865
General Phys-Chem Parameters				
Habitat Assessment	-	-	119	114
D.O. (mg/L)	2.0 *c	6.7	0.6	6.3
pH (SU)	6.0-8.5 *	7.0	4.8	7.0
Conductivity (µmhos/cm)	*	747	84	436
Temperature (°C)	-	26.3	17.4	18.1
C.B.O.D., 5 day (mg/L)	9.6 d	3.54 AJ	-	-
Total Residual Chlorine (mg/L)	≥ 0.5	2.2		
Flow (MGD)	19 *a	-	-	-
Hardness (mg $CaCO_3$)	-	127.1	-	-
AGP (mg dry wt/L)	-	48.3	1.1	0.2 I
Toxicity (48-hour static, screening bioassay)				
Bioassay - Fish	-	Not Toxic	-	-
Bioassay - Invertebrate	-	Not Toxic	-	-

a - Annual average
b - Value is hardness based
c - Single sample
d - Weekly average
A - Value reported is the mean of two or more determinations
I - Value is < the minimum quantitation limit, and ≥ the minimum detection limit
J - Estimated value
U - Analyzed for but not detected; value is the minimum detection limit
* Permit limit
** Class III water quality standard

ber of taxa, the diversity index, the Florida Index, the EPT Index, the diatom to blue-green algae ratio, the percent filter-feeders, the number of polychaete taxa, and the % pelecypods are measured as the control site minus test site divided by the control site. The percent differences between sites involving the % tubificids, % contribution, algal density, chlorophyll *a*, and algal growth potential are measured as the test site minus control site divided by the control site.

The following personnel were involved in this investigation: Phil Kane and Steve Kent (DEP Central District), and Julie Baughman, Ken Espy, Marshall Faircloth, Russel Frydenborg, Joy Jackson, Michael Heyn, Elizabeth Miller, Urania Quintana, Johnny Richardson, Lisa Tamburello, Amy Weaver, Steve Wolfe, David Whiting, and Vicki Whiting (DEP Central Biology Laboratory in Tallahassee). The report was reviewed by the Point Source Studies Review Committee, consisting of Wayne Magley, Chuck Ziegmont, and Michael Tanski, as well as District representatives.

Results

The chemical and biological results are presented in Table 1 and Table 2.

Discussion

The control and test sites for this study were located in wetlands with no water velocity (see Habitat Assessment Data Sheets in Appendix). Although many marshes have been shown to have taxa richness and diversity values comparable to some flowing systems (FDEP 1994), the expectations among different wetland types is not well understood or defined. Further, it is unlikely that the extremely low level of dissolved oxygen at the control site (0.6 mg/L) was sufficient to support a healthy macroinvertebrate community and therefore invalidated the control versus test site concept.

The physical/chemical parameters indicate that pH and conductivity were significantly increased from background levels probably due to the facility's discharge (Table 1). The conductivity at the test site (436 µmhos/cm) was approxi-

Table 2. Community structure of control and test sites.

OCPUD Easterly Water Reclamation Facility	Control Site	Test Site
Macroinvertebrate Qualitative		
Number of Taxa	21	26
Florida Index	0	4
SCI	17	19
EPT Index	0	1
% Dominant Taxon	19.2	42.7
Community Composition		
% Coleoptera	5.1	0.0
% Diptera	48.5	72.7
% Ephemeroptera	0.0	9.1
% Gastropoda	0.0	2.7
% Lepidoptera	1.0	3.6
% Odonata	2.0	0.9
% Oligochaeta	21.2	5.5
% Oribatei	19.2	0.0
% Pelecypoda	0.0	0.9
% Other	3.0	4.6
Functional Feeding Groups		
% Predators	24.2	15.5
% Burrowing Deposit Feeders	14.0	4.0
% Shredders	6.1	9.6
% Surface Deposit Feeders	42.9	41.8
% Suspension Feeders/Filterers	5.1	24.1
Phytoplankton Algae		
Number of Taxa	23	14
Shannon-Weaver diversity	3.9	3.2
Chlorophyll *a* (µg/L)	1.0 U	1.0 U
Algal Density (#/mL)	170	96
% Blue-green	27.1	4.2
% Cryptophytes	1.2	43.7
% Diatoms	48.2	33.3
% Euglenophytes	2.4	6.3
% Green	20.0	10.4
AGP (mg dry wt/L)	1.1	0.2

U - Analyzed for but not detected; value is the minimum detection limit

mately 500% higher than the control site level (84 µmhos/cm). The effluent conductivity was 740 µmhos/cm and appeared to be the source of the elevated conductivity at the test site. The pH was substantially higher at the test site compared to the control site. The effluent, with a pH value of 7.0 SU, appears to have been the source of this elevation. The dissolved oxygen level at the control site (0.6 mg/L) did not meet the Class III water quality standard (Rule 62-302.530 (31) FAC) and was significantly lower than the test site (6.3 mg/L). As a result, the site does not meet the criteria for a control site and any community comparisons to this site are not meaningful.

Effluent aluminum, copper, lead, and iron were detected at concentrations that complied with Class III water quality standards (Table 1). Atrazine was detected in the effluent at a level below the minimum quantitation limit.

The effluent did not appear to contribute to nutrient enrichment at the test site (Table 1). The effluent AGP value was 48.3 mg/L. The AGP of the test site was 81% lower than the control site, which may indicate some algal growth inhibition. AGP did not exceed the 5 mg dry wt/L "problem threshold" at the control or test site.

The effluent sample was not toxic to the fish, *Cyprinella leedsi,* or to the invertebrate, *Ceriodaphnia dubia,* during the 48-hour bioassay (Appendix).

Comparing the phytoplankton communities between the control and test sites, the differences at the test site may be associated with algal growth inhibition (Table 2). These changes are reflected by decreases in taxa richness (-39%) and algal density (-44%), as well as an increase in the percent dominant taxon (+102%). The community at the test site shifted from one dominated by *Tabellaria* sp. and *Nitschia* sp., each represented 13% of the total individuals collected at the control site, to one dominated by *Cryptomonas* sp., representing 27% of the community at the test site.

Qualitative dip-net samples of the macroinvertebrate community revealed increases in taxa richness, the percentage of filter-feeders, and the number of chironomid taxa at the test site compared to the control site (Figure 2). These differences appear to be the result of differences in water chemistry and hydrology (see Habitat Assessment and Physical/Chemical Data Sheets in Appendix). The Florida and EPT indices and the SCI scores were

very low at both sites as would be expected in a non-flowing, wetland system (Table 2). The physical and chemical differences between the sampling sites due to the discharge were at least partly responsible for the differences in the phytoplankton and macroinvertebrate communities.

Literature Cited

Barbour, M. T., J. Gerritsen, and J. S. White. 1996. Development of the Stream Condition Index for Florida. Prepared for the Fla. Dept. Environ. Protection. 105 p.

EA Engineering, Science, and Technology and Tetra Tech, Inc. 1994. Bioassessment for the nonpoint source program (draft). Prepared for the Fla. Dept. Environ. Protection. Unpaginated.

FDEP. 1994. Lake bioassessments for the determination of nonpoint source impairment in Florida. Fla. Dept. Environ. Protection, Biology Section, Tallahassee, Fla. 73 p.

Miller, W. E., T. E. Maloney, and J. C. Greene. 1978. The *Selenastrum capricornutum* Printz algal assay bottle test. U. S. Environ. Protection 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. Water. Poll. Cont. Fed. 59(4): 222-227.

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

Weber, C. I. 1993. 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 pp.

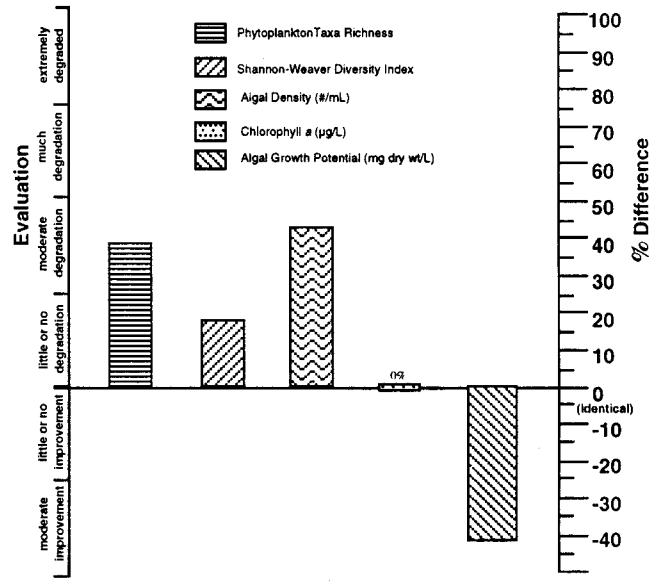


Figure 1. Effect of discharge on the phytoplankton community.

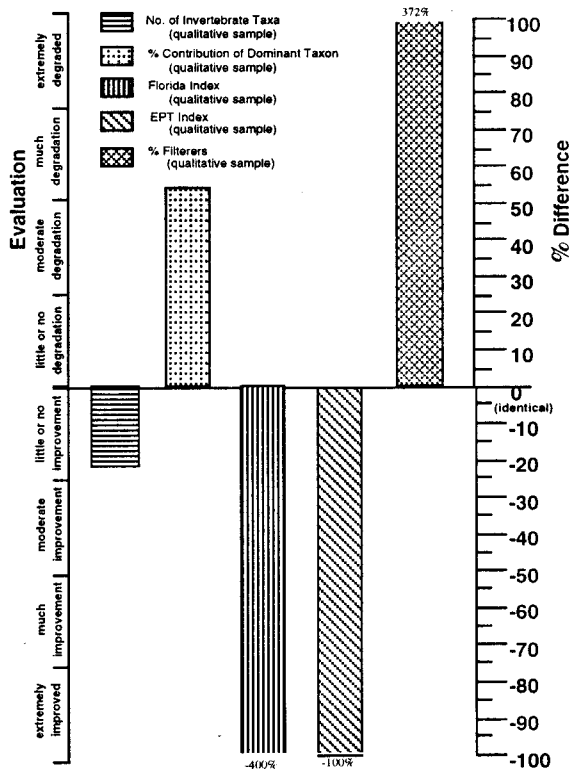


Figure 2. Effect of discharge on the macroinvertebrate community.

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 Phosphate	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-Phosphate	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-Phosphate	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

Explanation of Measurements of Community Health

Several different measurements of macroinvertebrate and algal community health have been employed to determine the effects of a discharge. These are briefly discussed here.

Taxa richness: Stress tends to reduce the number of different types of organisms present in a system, although moderate nutrient enrichment may sometimes be correlated with increased algal taxa richness.

Shannon-Weaver diversity: This index is specified in the Florida Administrative Code as a measure of biological integrity. Low diversity scores are undesirable. They represent conditions where only a few organisms are abundant, to the exclusion of other taxa. Excessive numerical dominance of a single type of organism (a high % contribution of the dominant taxon) is a related measure which is also associated with disturbance.

Numbers of pollution sensitive taxa: Some organisms become rare or absent as the intensity or duration of disturbance increases. Species sensitivity data from other sources, such as Chang *et al.* (1992), Farrell (1992), Hudson *et al.* (1990), Hulbert (1990), Lenat (1993), and Whitmore (1989), are used as appropriate.

Community structure: Substantial shifts in proportions of major groups of organisms, compared to control conditions, may indicate degradation. In marine systems, an increase in the % tubificid oligochaetes, a decrease in the % pelecypods, and a decrease in the number of polychaete taxa are all considered indicators of disturbance (Engel *et al.* 1994).

Trophic composition/feeding guilds: Disturbance can shift the feeding strategies of invertebrates. In Florida for example, pollution may be responsible for reducing the numbers of filter-feeders (FDEP 1994) and shredders (EA Engineering 1994).

Algal biomass: High algal biomass (algal density or chlorophyll *a*) implies nutrient stress.

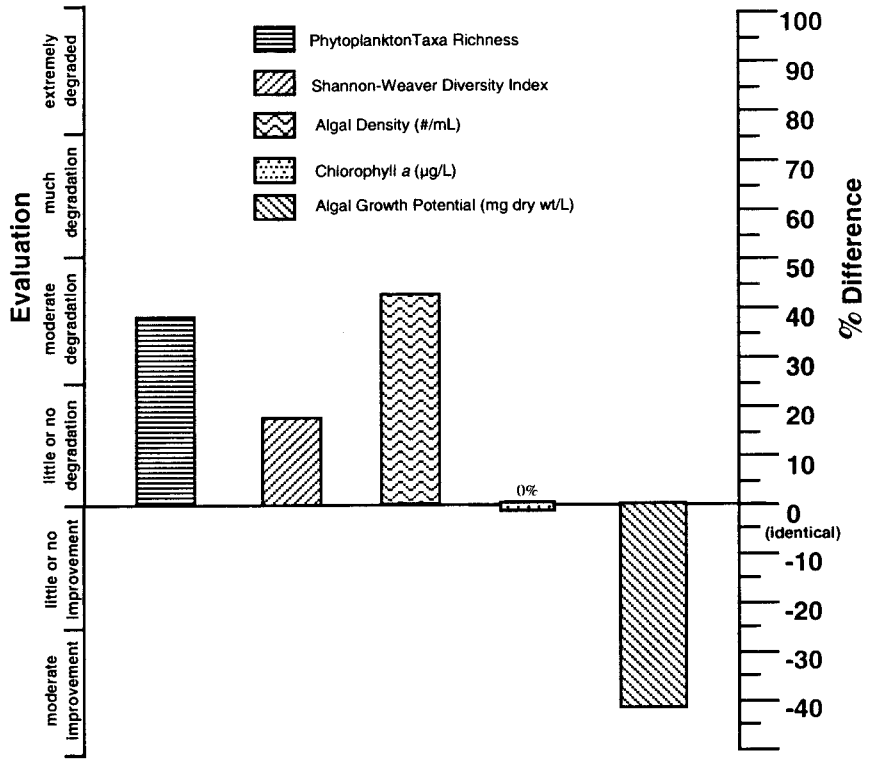


Figure 1. Effect of discharge on the phytoplankton community.

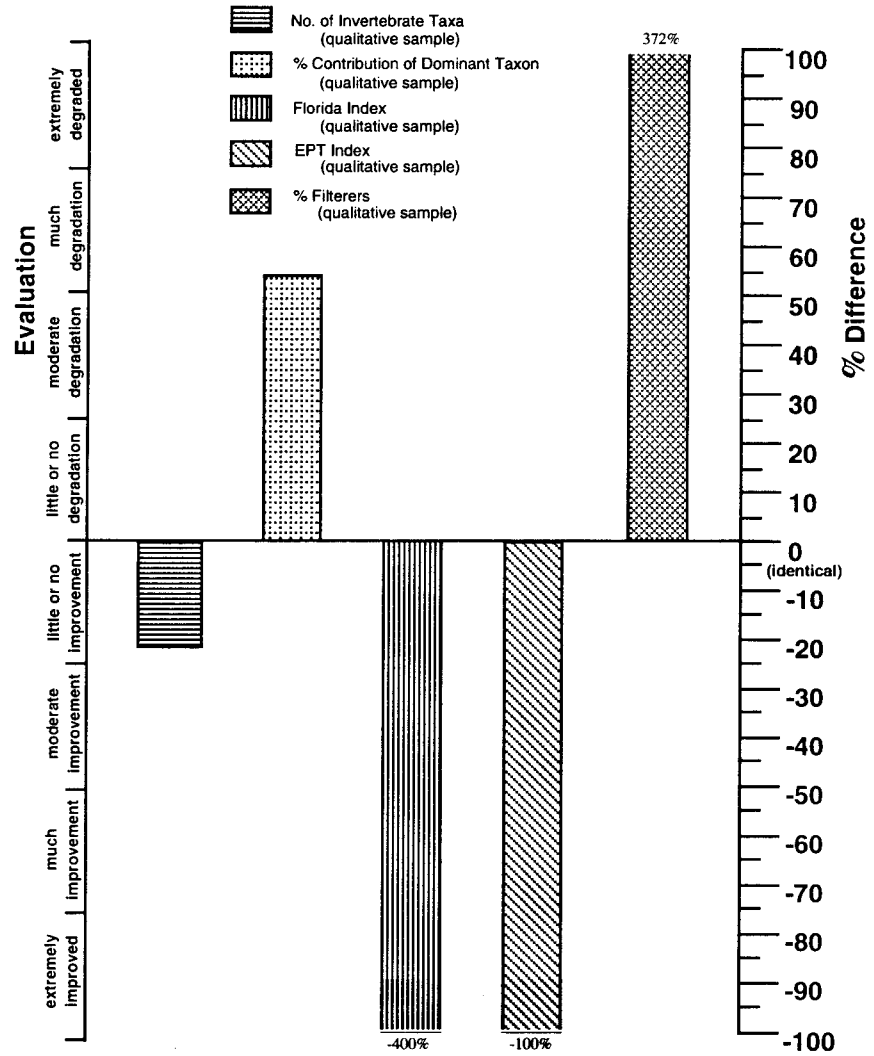


Figure 2. Effect of discharge on the macroinvertebrate community.

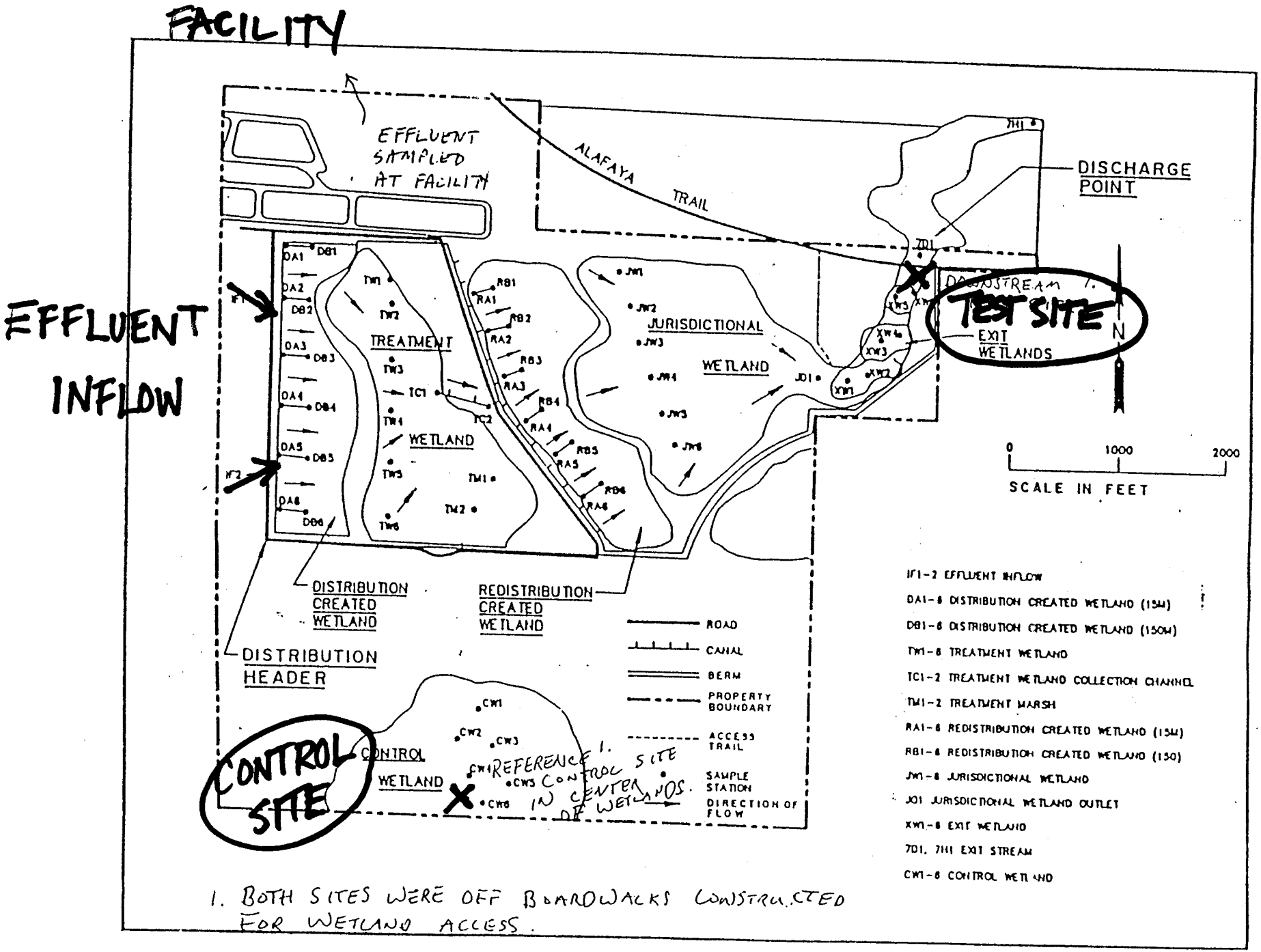


Figure 1-1. Wetlands and sampling stations with the Orange County Eastern Service Area integrated wetland reuse system.

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 Phosphate	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-Phosphate	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-Phosphate	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

Explanation of Measurements of Community Health

Several different measurements of macroinvertebrate and algal community health may have been employed to determine the effects of a discharge. These are briefly discussed here.

Habitat Assessment: Seven attributes known to have potential effects on the stream biota were evaluated and scored, with 20 possible points for each factor. Based on the sum of these individual scores, overall habitat quality is assigned to one of four categories: Optimal (105-140 points); Suboptimal (70-104 points); Marginal (35-69 points); and Poor (0-34 points).

Taxa richness: Stress tends to reduce the number of different types of organisms present in a system, although moderate nutrient enrichment may sometimes be correlated with increased algal taxa richness.

Shannon-Weaver diversity: This index is specified in the Florida Administrative Code as a measure of biological integrity. Low diversity scores are undesirable. They represent conditions where only a few organisms are abundant, to the exclusion of other taxa.

The Florida Index: Some organisms become rare or absent as the intensity or duration of disturbance increases. 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.

Ephemeroptera/Plecoptera/Trichoptera (EPT) Index: This index is the sum of the number of EPT taxa present. Higher EPT values are associated with healthier systems.

Community structure: Substantial shifts in proportions of major groups of organisms, compared to control conditions, may indicate degradation.

Algal biomass: High algal biomass (algal density or chlorophyll *a*) implies nutrient stress. 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 in flowing streams.

Functional Feeding Groups: Disturbance can shift the feeding strategies of invertebrates. In Florida, for example, pollution may be responsible for reducing the numbers of filter-feeders (FDEP 1994) and shredders (EA E eering 1994).

The Stream Condition Index (SCI): The SCI is a composite macroinvertebrate metric (Barbour *et al.* 1996) developed for Florida. The SCI assigns points to a variety of parameters, depending on how closely each parameter approaches an expected control condition (see SCI calculation table in Appendix).

MS 6515

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FACILITY SUMMARY

Facility Name: Orange County Utilities Division Easterly Water Reclamation Facility		**Date Summary Prepared:** 11/4/98
Location (Attach Detailed Map)	**County:** Orange	**District:** Central District
Federal Permit No.: FL0038849 **Expiration Date:** 9-30-98	**State GMS No.:** 3048C00334 **State Permit No.:** DO48-179466 **State Expiration Date:** 08-25-95	**Facility Type:** Municipal **Other (list):**

Function of Facility: Domestic wastewater treatment and effluent reclamation.

Description of treatment process: A 19.0 MGD (AADF) permitted capacity advanced wastewater treatment facility. The facility consists of two (2) parallel treatment plants with a common preliminary treatment structure and an effluent pump station. The treatment processes include odor control, mechanical influent screenings, grit removal, 2 five-stage (Bardenpho Process) carrousel nutrient removal treatment units with reaeration, chemical feed facilities, secondary clarification, tertiary filtration and chlorination with thickening and dewatering of residuals. Effluent disposal consists of a 6.2 MGD AADF permitted capacity combined man-made and natural receiving/reuse wetlands system. The receiving wetlands treatment/reuse system receives reclaimed water from the Eastern WRF for further treatment prior to discharge to an unnamed tributary of The Econlockhatchee River. A 9.5 MGD AADF permitted capacity restricted public access reuse system consisting of a 2.5 MGD AADF rapid-rate land application system, the RIBs Site, comprising 14 rapid infiltration basins. A 30-inch reclaimed water transmission main to the Curtis H. Stanton Energy Center for once-through no return cooling water supply (7.0 MGD AADF). A new slow-rate public access land application system (R002) consisting of a reclaimed water transmission/distribution system to be constructed in 3 phases, for public access irrigation of commercial and industrial areas, residential lawns, road medians and landscaped areas throughout the Eastern Reuse Service Area and for in-plant irrigation, with an anticipated reuse irrigation capacity of 8.93 MGD..

Receiving Waters: Econlockhatchee River **Describe:** Sheet flow through man-made and natural wetlands.	**Classification:** III Fresh **Describe:** Wetland flows to OFW Big Econlockhatchee River.

Design Flow: 19.5 MGD **Permit Limit:** 25.2 MGD	**Plant Mean Flow:** 8.892 MGD (1997) 9.781 MGD (1998)	**Flow During Survey: Plant:** **Other:**

Discharge is : Continuous
Other (describe): Average annual daily flow (AADF) to wetlands was 1.499 MGD in 1998 and 0.839 MGD in 1997.
Therefore, the best time to sample is any day during the week.

If facility has a mixing zone, give details (size, parameters affected, etc.): This facility does not have a mixing zone.

List effluent limits (if necessary, attach relevant paperwork):		**Describe special permit conditions and permit modifications:**
Parameter	**Limit (Units)**	
Attached	**Attached**	Pretreatment report is not due till May 1 of each year (1-21-1998). Notice of Intent to Issue Exemption to Dissolved Oxygen and pH limits to wetlands June 5, 1995. Exemption was good through Dec. 1995. Weirs are to be set so discharge from plant is to remain in the overland flow and isolated wetlands for 3 days prior to discharging to jurisdictional wetlands. Monitoring of surface water quality, biota, hydrology, and sediment chemistry is to be performed in the Phase III Experimental Wetlands. The Sixth Annual Summary Report due September 30, 1995. May 1, 1995 NPDES and FDEP permit combined. Flow to wetlands was increased to 6.2 MGD 11-18-94. Discussion to lower pH of effluent to wetlands on 10-7-93. Sulfuric acid would be added if pH needs to be <6.0 and carbon dioxide would be added if pH needs to be ≥6.0.

DEPARTMENT OF ENVIRONMENTAL PROTECTION
FACILITY SUMMARY

Description of permitted outfall(s): Groundwater discharge via 14 percolation ponds (90± acres). Surface water discharge via 150+ acre man-made wetlands and 150+ acres natural wetlands for a capacity of 6.2 MGD. The wetland discharge is to the Big Econlockhatchee River.

List of permit violations (from MOR/DMR or other source) and plant upsets that occurred within past year: A review of the MORs from August 1998 to September 1997 shows only one violation of permit limits. The violation occurred August 1998. The MOR reported the single maximum Fecal Coliform during the August monitoring period was 2516 Col\100 mL The facility reported the sampling event was some how biased during sampling. The review also showed the facility reports one to ten sewer overflows each month. The Department and Orange county has a task force to study the entire Orange County sewer overflows. No major plant upsets were noted in the file review.

Describe previous impact bioassessments, WQBEL's and previous or current enforcement actions: The last Fifth Year Inspection was performed August 25, 1992. The Compliance Biomonitoring Inspection (CBI) noted no mortality occurred for C. dubia or C. leedsi in the 48-hour acute WET test. The Impact Bioassessment Inspection (IBI) indicated no degradation resulting from the discharge of Eastern WWTF. The presence of more pollution sensitive taxa at the test site compared to the control, as well as other factors (low nutrients), suggests that the facility is causing no adverse effects to the macroinvertebrate community. With on exception, phyotoplankton community metrics indicated improvement or little change downstream of the discharge. While algal taxa richness was somewhat reduced at the test site, it is thought that water flow was responsible for this effect. The algal QSI for % composition indicated a moderate shift in the phytoplankton populations, from cyanophyte- and chlorophyte-rich assemblage at the reference site to one primarily composed of diatoms at the test site. The Water Quality Inspection (WQI) showed the concentrations of bio-reactive nutrients at the test site were near or- below detection limits. Algal growth potential was very low in the effluent (2.9 mg dry wt/L).

Discuss comparability of MOR/DMR results to past DEP results and whether there are trends (improving, declining) in the data set: A comparison of the MOR/DMRs for the periods from September 1997 to August 1998 with the period from August 1997 to September 1996 showed only slight increases of all parameters. The following is the increase in annual average for the following parameters: Flow to plant +0.997 MGD; Flow to power plant +0.967 MGD; Flow to RIBs no change; Flow to wetlands +0.013 MGD; $CBOD_5$ +0.096 mg/L; TSS +0.096 mg/L; Total No_x +0.820 mg/L; TKN +0.074 mg/L; NO_3 +0.03 mg/L; and Total Phosphorous +0.001 mg/L. The only significant increase is in annual flow to the plant. All other parameters show very slight increases.

Additional Information:

Staff contributing to this review (signature):

Phil Kam, Ed.D (Biologist)

John B. Bowles (Inspector)

(Engineer)

(Other

(Other)

NPDES Permit FL0038849 Effluent Limitations and Monitoring Requirements:

Parameter	Annual Average	Monthly Average	Weekly Average
Flow MGD	Report	Report	Report
$CBOD_5$ mg/L	5.0 mg/L	8.0 mg/L	9.6 mg/L
TSS mg/L	5.0 mg/L	8.0 mg/L	9.6 mg/L
Total Nitrogen mg/L	3.0 mg/L	5.0 mg/L	6.0 mg/L
Total Phosphorous mg/L	1.0 mg/L	2.0 mg/L	2.4 mg/L
pH SU	6.0 SU Minimum	8.5 SU Maximum	
Fecal Coliform #Col/100 mL	200 Col/100 mL	Report	
Dissolved Oxygen mg/L			2.0 mg/L Minimum

FDEP Permit DO48-179466 Effluent Limitations and Monitoring Requirements:

Parameter	Annual Average	Monthly Average	Single Grab
Flow MGD	19.0	Report	
$CBOD_5$ mg/L	5.0 mg/L	8.0 mg/L	
TSS mg/L	5.0 mg/L	8.0 mg/L	
Total Nitrogen mg/L	3.0 mg/L	5.0 mg/L	
Total Phosphorous mg/L	1.0 mg/L	2.0 mg/L	2.4 mg/L
pH SU	6.0 SU Minimum	8.5 SU Maximum	
Fecal Coliform #Col/100 mL			800 Col/100 mL
Dissolved Oxygen mg/L			2.0 mg/L Minimum
Total Residual Chlorine mg/L			≥0.5 mg/L

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (5-10-96)

SUBMITTING AGENCY CODE: 30 / SUBMITTING AGENCY NAME: FDEP CENTRAL	STORET STATION NUMBER: 20010611	DATE (M/D/Y): 11/09/98	TIME	RECEIVING BODY OF WATER: LITTLE ELON RIVER

REMARKS: UPSTREAM	COUNTY: ORANGE	LOCATION: OCPUDEASTERLY STP	FIELD ID/NAME: ES

RIPARIAN ZONE/INSTREAM FEATURES

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

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

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

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

Width of riparian vegetation (m) on least buffered side: >18M

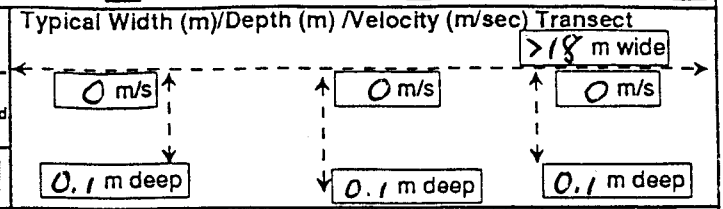
List & map dominant vegetation on back

Artificially Channelized ☑ no ☐ recent, severe ☐ some recovery ☐ mostly recovered, more sinuous

Artificially Impounded ☐ yes

High Water Mark: 0.1M (m above present water level) + 0.1M (present depth in m) = 0.2M (m above bed)

Typical Width (m)/Depth (m) /Velocity (m/sec) Transect



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 Deposition: Sludge: ☐ Sand smothering: none ☐ slight ☐ moderate ☐ severe ☐ Silt smothering: none ☐ slight ☐ moderate ☐ severe ☐ Other: NONE

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	15%	6	NET	Sand			
Leaf Packs or Mats	10%	6	NET	Mud/Muck/Silt	5%	2	NET
Aquatic Vegetation	70%	6	NET	Other:			
Rock or Shell Rubble				Other:			
Undercut banks/Roots				*Draw aerial view sketch of habitats found in 100 m section*			

WATER QUALITY	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm) or Salinity (ppt):			Secchi (m):
Top								TO BOTTOM
Mid-depth	<0.1M	17.37	4.84	0.58	84			
Bottom								

System Type : Stream: ☐ (1st - 2nd order, 3rd - 4th order, 5th - 6th order, 7th order or greater) Lake: ☐ Wetland: ☑ Estuary: ☐ Other: ☐

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

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

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

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

Weather Conditions/Notes: SUN / CLOUDS

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

SAMPLING TEAM: KANE, KENT, (SAINT OCPUD)	SIGNATURE: Phil Kane	DATE: 11/09/98

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET (4-22-96)

SUBMITTING AGENCY CODE: 3C SUBMITTING AGENCY NAME: FDEP CENTRAL	STORET STATION NUMBER:	DATE (M/D/Y): 11/09/98	RECEIVING BODY OF WATER: LITTLE ELON RIVER

REMARKS: UPSTREAM	COUNTY: ORANGE	LOCATION: OCPUD EASTERLY STP	FIELD ID/NAME: ES

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Substrate Types & Availability 20	Greater than 30% snags, logs, tree roots, aquatic vegetation, leaf packs (partially decayed), undercut banks, rock, or other stable habitat. 20 19 18 17 16	16% to 30% snags, logs, tree roots, aquatic vegetation, leaf packs, etc. Adequate habitat. Some substrates may be new fall (fresh leaves or snags). 15 14 13 12 11	5% to 15% snags, logs, tree roots, aquatic vegetation, leaf packs, etc. Less than desirable habitat, frequently disturbed or removed. 10 9 8 7 6	Less than 5% snags, logs, tree roots, aquatic vegetation, leaf packs, etc. Lack of habitat is obvious, substrates unstable. or smothered. 5 4 3 2 1
Water Velocity 1	Max. observed at typical transect: >0.25 m/sec. but < 1 m/sec 20 19 18 17 16	Max. observed at typical transect: 0.1 to 0.25 m/sec 15 14 13 12 11	Max. observed at typical transect: 0.05 to 0.1 m/sec 10 9 8 7 6	Max. observed at typical transect <0.05 m/sec, or spate occurring; > 1 m/sec 5 4 3 2 1
Artificial Channelization 20	No artificial channelization or dredging. Stream with normal, sinuous pattern 20 19 18 17 16	May have been channelized in the past (>20 yrs), but mostly recovered, fairly good sinuous pattern 15 14 13 12 11	Channelized, somewhat recovered, but > 80% of area affected 10 9 8 7 6	Artificially channelized, box-cut banks, straight, instream habitat highly altered 5 4 3 2 1
Habitat Smothering 18	Less than 20% of habitats affected by sand or silt accumulation 20 19 18 17 16	20%-50% of habitats affected by sand or silt accumulation 15 14 13 12 11	Smothering of 50%-80% of habitats with sand or silt, pools shallow, frequent sediment movement 10 9 8 7 6	Smothering of >80% of habitats with sand or silt, a severe problem, pools absent 5 4 3 2 1
Bank Stability 20	Stable. No evidence of erosion or bank failure. Little potential for future problems. 20 19 18 17 16	Moderately stable. Infrequent or small areas of erosion, mostly healed over. 15 14 13 12 11	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. 10 9 8 7 6	Unstable. Many (60%-80%) raw, eroded areas. Obvious bank sloughing. 5 4 3 2 1
Riparian Buffer Zone Width 20	Width of native vegetation (least buffered side) greater than 18 m 20 19 18 17 16	Width of native vegetation (least buffered side) 12 m to 18 m 15 14 13 12 11	Width of native vegetation 6 to 12 m, human activities still close to system 10 9 8 7 6	Less than 6 m of native buffer zone due to intensive human activities 5 4 3 2 1
Riparian Zone Vegetation Quality 20	Over 80% of riparian surfaces consist of native plants, including trees, understory shrubs, or non-woody macrophytes. Normal, expected plant community for given sunlight & habitat conditions. 20 19 18 17 16	50% to 80% of riparian zone is vegetated, and/or one class of plants normally expected for the sunlight & habitat conditions is not represented. Some disruption in community evident. 15 14 13 12 11	25% to 50% of riparian zone is vegetated, and/or one or two expected classes of plants are not represented. Patches of bare soil or closely cropped vegetation, disruption obvious. 10 9 8 7 6	Less than 25% of streambank surfaces are vegetated and/or poor plant community (e.g. grass monoculture or exotics) present. Vegetation removed to stubble height of 2 inches or less. 5 4 3 2 1

0 Add 5 points if cross-sectional area of flow is estimated to be > one square meter during periods of normal flow.

Comments

119 TOTAL SCORE

ANALYSIS DATE: 11/09/98	ANALYST: KANE, KENT	SIGNATURE: Phil Kane

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (5-10-96)

SUBMITTING AGENCY CODE: 3C / SUBMITTING AGENCY NAME: FDEP CENTRAL	STORET STATION NUMBER: 20010610	DATE (M/D/Y): 11/09/98	TIME	RECEIVING BODY OF WATER: LITTLE ELON RIVER

REMARKS:	COUNTY:	LOCATION:	FIELD ID/NAME:
DOWNSTREAM	ORANGE	OCPUD EASTERLY STP	ES

RIPARIAN ZONE/INSTREAM FEATURES

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

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

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

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

Width of riparian vegetation (m) on least buffered side: >18M

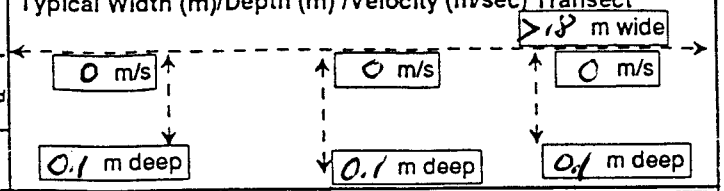
List & map dominant vegetation on back

Artificially Channelized ☑ no ☐ recent, severe ☐ some recovery ☐ mostly recovered

Artificially Impounded ☐ yes ☐ more sinuous

High Water Mark: 0.1M (m above present water level) + 0.1M (present depth in m) = 0.2M (m above bed)

Typical Width (m)/Depth (m) /Velocity (m/sec) Transect



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 Deposition: Sludge: ☐ Sand smothering: none ☐ slight ☐ moderate ☐ severe ☐ Silt smothering: none ☐ slight ☐ moderate ☐ severe ☐ Other: NONE

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	20%	6	NET	Sand			
Leaf Packs or Mats	10%	6	NET	Mud/Muck/Silt	10%	1	NET
Aquatic Vegetation	50%	6	NET	Other: BRUSH	10%	1	NET
Rock or Shell Rubble				Other:			
Undercut banks/Roots				*Draw aerial view sketch of habitats found in 100 m section*			

WATER QUALITY	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm) or Salinity (ppt):			Secchi (m):
Top								T2
Mid-depth	<0.1M	18.17	7.00	6.30	436			Bottom
Bottom								

System Type : Stream: ☐ (1st - 2nd order / 3rd - 4th order / 5th - 6th order / 7th order or greater) Lake: ☐ Wetland: ☑ Estuary: ☐ Other: ☐

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

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

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

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

Weather Conditions/Notes:

SUN / CLOUDS

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

SAMPLING TEAM:	SIGNATURE:	DATE:
KANE, KENT (GANT OCPUD)	Kent Kane	11/09/98

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET (4-22-96)

SUBMITTING AGENCY CODE: 30 / SUBMITTING AGENCY NAME: FDEP CENTRAL	STORET STATION NUMBER:	DATE (M/D/Y): 11/09/98	RECEIVING BODY OF WATER: LITTLE ECON RIVER

REMARKS: DOWNSTREAM	COUNTY: ORANGE	LOCATION: OCPUD EASTERLY STP	FIELD ID/NAME: ES

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Substrate Types & Availability 20	Greater than 30% snags, logs, tree roots, aquatic vegetation, leaf packs (partially decayed), undercut banks, rock, or other stable habitat. 20 19 18 17 16	16% to 30% snags, logs, tree roots, aquatic vegetation, leaf packs, etc. Adequate habitat. Some substrates may be new fall (fresh leaves or snags). 15 14 13 12 11	5% to 15% snags, logs, tree roots, aquatic vegetation, leaf packs, etc. Less than desirable habitat, frequently disturbed or removed. 10 9 8 7 6	Less than 5% snags, logs, tree roots, aquatic vegetation, leaf packs, etc. Lack of habitat is obvious, substrates unstable. . or smothered. 5 4 3 2 1
Water Velocity 1	Max. observed at typical transect: >0.25 m/sec. but < 1 m/sec 20 19 18 17 16	Max. observed at typical transect: 0.1 to 0.25 m/sec 15 14 13 12 11	Max. observed at typical transect: 0.05 to 0.1 m/sec 10 9 8 7 6	Max. observed at typical transect <0.05 m/sec, or spate occurring; > 1 m/sec 5 4 3 2 1
Artificial Channelization 20	No artificial channelization or dredging. Stream with normal, sinuous pattern 20 19 18 17 16	May have been channelized in the past (>20 yrs), but mostly recovered, fairly good sinuous pattern 15 14 13 12 11	Channelized, somewhat recovered, but > 80% of area affected 10 9 8 7 6	Artificially channelized, box-cut banks, straight, instream habitat highly altered 5 4 3 2 1
Habitat Smothering 18	Less than 20% of habitats affected by sand or silt accumulation 20 19 18 17 16	20%-50% of habitats affected by sand or silt accumulation 15 14 13 12 11	Smothering of 50%-80% of habitats with sand or silt, pools shallow, frequent sediment movement 10 9 8 7 6	Smothering of >80% of habitats with sand or silt, a severe problem, pools absent 5 4 3 2 1
Bank Stability 20	Stable. No evidence of erosion or bank failure. Little potential for future problems. 20 19 18 17 16	Moderately stable. Infrequent or small areas of erosion, mostly healed over. 15 14 13 12 11	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. 10 9 8 7 6	Unstable. Many (60%-80%) raw, eroded areas. Obvious bank sloughing. 5 4 3 2 1
Riparian Buffer Zone Width 20	Width of native vegetation (least buffered side) greater than 18 m 20 19 18 17 16	Width of native vegetation (least buffered side) 12 m to 18 m 15 14 13 12 11	Width of native vegetation 6 to 12 m, human activities still close to system 10 9 8 7 6	Less than 6 m of native buffer zone due to intensive human activities 5 4 3 2 1
Riparian Zone Vegetation Quality 15	Over 80% of riparian surfaces consist of native plants, including trees, understory shrubs, or non-woody macrophytes. Normal, expected plant community for given sunlight & habitat conditions. 20 19 18 17 16	50% to 80% of riparian zone is vegetated, and/or one class of plants normally expected for the sunlight & habitat conditions is not represented. Some disruption in community evident. 15 14 13 12 11	25% to 50% of riparian zone is vegetated, and/or one or two expected classes of plants are not represented. Patches of bare soil or closely cropped vegetation, disruption obvious. 10 9 8 7 6	Less than 25% of streambank surfaces are vegetated and/or poor plant community (e.g. grass monoculture or exotics) present. Vegetation removed to stubble height of 2 inches or less. 5 4 3 2 1

0 Add 5 points if cross-sectional area of flow is estimated to be > one square meter during periods of normal flow.

114 TOTAL SCORE

Comments EFFLUENT WATER WE F WOULD WATER AT A POWER PLA HAS INCREASED. LESS WATER TO THE WETLAND.

ANALYSIS DATE: 11/09/98	ANALYST: KANE, KENT	SIGNATURE: Kent Kane

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: ES Effluent Eastorly Subregional WWTP
County: Orange
Contact / District: Phil Kane
NPDES Permit #: FL00 38849
LIMS Sample #: 355877 LIMS Job #: TLH-1998-11-10-18
sample log 11/27/98 ow

Sample Collection: Date 11-09-98 Time 0830
Test Beginning: Date 11/10/98 Time 15:45
Test Ending: Date 11-12-98 Time 1500
Organism Batch #: 86 Diluent Batch #: well
Organism Age: 12 days SRT toxicant batch #: —

Test organism: Cyprinella leedsi

Test Type: Screening / Definitive
(Static) / Static Renewal / Flow-through
Test Number: 2 of 2
Room Temperature Range 24.5°-25.5°C
Incubator #3 Temp Range 25.0-26.5°C

Remarks: Dechlorinated an aliquot of sample by the addition of 0.6mL of 0.025N Sodium Thiosulfate per liter of sample at 11-10-98

Conc.	Chamber #	Number Live 0 hr	24 h	48 h	pH 0 hr	24 h	48 h	Temperature (°C) 0 hr	24 h	48 h	D.O. (mg/L) 0 hr	24 h	48 h	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 0 hr	24 h	48 h
Ctr A	E1	5	5	5	7.9	8.0	8.4	24.7	25.1	24.7	7.0	7.6	7.8	230	230	255
Ctr B	E2	5	5	5	7.9	8.0	8.4	24.4	25.1	24.9	7.4	7.6	8.0	235	245	260
Ctr C	E3	5	5	5	7.9	8.0	8.4	24.4	25.0	24.8	7.3	7.8	7.9	250	245	255
Ctr D	E4	5	5	5	7.7	8.0	8.4	24.6	24.9	24.9	7.5	7.8	8.0	250	250	255
100% A	E5	5	0SD	0	7.6	8.0	—	25.0	24.9	—	7.1	7.8	—	670	670	—
100% B	E6	5	0SD	0	7.7	8.1	—	25.1	24.8	—	7.1	7.8	—	755	740	—
100% C	E7	5	0SD	0	7.7	8.1	—	25.1	24.7	—	7.1	7.7	—	765	745	—
100% D	E8	5	0SD	0	7.7	8.1	—	25.3	24.7	—	7.1	7.7	—	775	745	—
100% dechl A	883	5	5	5	7.7	8.2	8.5	25.1	24.7	24.7	7.1	7.8	8.0	770	750	765
100% dechl B	763	5	5	5	7.7	8.2	8.5	25.1	24.9	25.0	7.1	7.8	8.0	770	760	795
100% dechl C	136	5	5	5	7.8	8.2	8.5	25.0	25.1	24.9	6.9	7.8	7.7	770	665	795
100% dechl D	306	5	5	5	7.8	8.2	8.5	25.0	24.9	25.0	7.1	7.6	7.7	780	745	800
measured by:		DW	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
recorded by:		FW	CH	CH	DW	CH	DW	DW	CH	DW	DW	CH	DW	DW	CH	DW

Investigators' Signatures

Marbell Faircloth (ow)
Courtney Hall
David A. Wharton FT DW
Tom Wenholz

Water Quality Parameters	Salt Water: Well Water	20% Min Water	Sample	Method	Measured by	Verified by
Field Total Residual Cl2 (mg/L):			2.2	Facility meter	Phil Kane	MF
Lab Total Residual Cl2 (mg/L):		—	0.5	DR-100	CH	MF
Alkalinity (mg/L as $CaCO_3$):	125	—	210	Hach	CH	MF
Hardness (mg/L as $CaCO_3$):	123	—	130	Hach	CH	MF
Total ammonia (mg/L as N):	<0.017	—	<0.017	Orion	FW	MF
Salinity:	0	—	0	YCT meter	MF/DW	MF

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: ES Effluent WWTP Easterly Subregional
County: Orange
Contact / District: Phil Kane
NPDES Permit #: FL0038849
LIMS Sample #: 355877 LIMS Job #: TLH-19981-10-18
sample log 11/23/98-DC
Test Type: Screening | Definitive
Static | Static Renewal | Flow-through
Test Number: 1 of 2

Sample Collection: Date 11/09/98 Time 0830
Test Beginning: Date 11/10/98 Time 1600
Test Ending: Date 11-12-98 Time 1510
Organism Batch #: 49 Diluent Batch #: 54
Organism Age: <24-hr SRT toxicant batch #: —
Test organism: Ceriodaphnia dubia

Remarks: Dechlorinated an aliquot of sample with 0.025N Sodium Thiosulfate added at the rate of 0.6mL per 1 Liter of Sample MF 11-10-98

Room Temperature Range 24.5°C-25.5°C
Incubator #2 Temp Range 25.5°C-26.0°C

Conc.	Chamber #	Number Live			pH			Temperature (°C)			D.O. (mg/L)			UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm)		
		0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h
ctr	A	5	5	5	8.1		8.0	24.3		24.6	7.6		7.6	175		180
ctr	B	5	5	5			8.0			24.5			7.7			180
ctr	C	5	5	5			8.1			24.4			7.7			180
ctr	D	5	5	5			8.1			24.3			7.7			185
100%	A	5	5	5	7.7		8.7	24.4		24.3	7.6		7.8	705		680
100%	B	5	5	5			8.8			24.3			7.7			760
100%	C	5	5	5			8.8			24.2			7.7			760
100%	D	5	5	5			8.8			24.3			7.8			750
100%dzCl⁻	A	5	5	4	7.8		8.8	24.5		24.3	7.6		7.6	755		750
100%dzCl⁻	B	5	5	5			8.8			24.3			7.8			750
100%dzCl⁻	C	5	5	4			8.8			24.3			7.8			745
100%dzCl⁻	D	5	5	5			8.8			24.3			7.8			790
measured by:		DAW	CH	DAW	CH		CH	CH		CH	CH		CH	CH		CH
recorded by:		FW	CH	DAW	DAW		DAW	DAW		DAW	DAW		DAW	DAW		DAW

Investigators' Signatures

(DAW)

Marshall Faircloth

Tom Murdoch

Courtney Head

Dennis Wingfield (DAW)

Water Quality Parameters	Salt Water Well Water	20% Min Water	Sample	Method	Measured by	Verified by
Field Total Residual Cl2 (mg/L):			2.2	Facility meter	Phil Kane	mf
Lab Total Residual Cl2 (mg/L):	—	<0.03	0.5	DR400	CH	mf
Alkalinity (mg/L as $CaCO_3$):	—	78	210	Hach	CH	mf
Hardness (mg/L as $CaCO_3$):	—	82	130	Hach	CH	mf
Total ammonia (mg/L as N):	—	<0.017	<0.017	Orion	fw	mf
Salinity:	—	0	0	YCT meter	mf/DAW	mf

OCPUD - Control Site

Macroinvertebrate Dip Net (20 sweeps of most productive substrates)	Value	5	3	1	Score
Total Number of Taxa	21	≥27	26-14	<14	3
EPT Index	0	≥4	3-2	<2	1
# Chironomid Taxa	7	≥9	8-5	<5	3
% Contribution of Dominant Taxon	19	≤30	31-65	>65	5
% Diptera	49	-	≤52	>52	3
Florida Index	0	≥10	9-5	<5	1
% Suspension feeders/Filterers	5.1	≥15	14-8	<8	1
Total Score			**Peninsula**		**17**
Interpretation of Scores			**Excellent**		27-33
			Good		21-26
			Poor		14-20
			Severely Degraded		7-13

Winter Index Period: Stream Condition Index (SCI) for Florida Peninsula (April 1996)

OCPUD - Test Site

Macroinvertebrate Dip Net (20 sweeps of most productive substrates)	Value	5	3	1	Score
Total Number of Taxa	26	≥27	26-14	<14	3
EPT Index	1	≥4	3-2	<2	1
# Chironomid Taxa	12	≥9	8-5	<5	5
% Contribution of Dominant Taxon	43	≤30	31-65	>65	3
% Diptera	73	-	≤52	>52	1
Florida Index	4	≥10	9-5	<5	1
% Suspension feeders/Filterers	24	≥15	14-8	<8	5
Total Score			**Peninsula**		**19**
Interpretation of Scores			**Excellent**		27-33
			Good		21-26
			Poor		14-20
			Severely Degraded		7-13

Winter Index Period: Stream Condition Index (SCI) for Florida Peninsula (April 1996)

Phytoplankton taxa list and densities (#/mL) for Orange County Utilities Division Easterly Water Reclamation Facility, collected via subsurface grabs in receiving water, on 9 November, 1998.

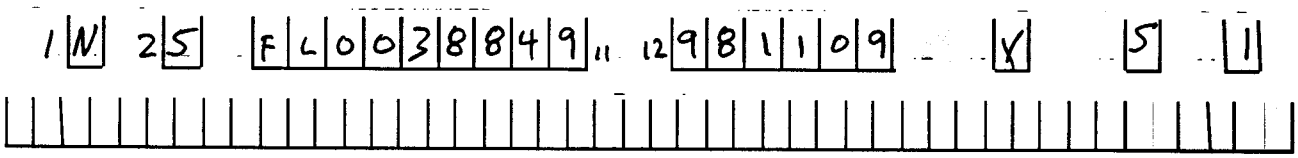
	Control Site	Test Site
Bacillariophyceae		
Amphora sp.	-	2
Cocconeis sp.	-	1-
Coscinodiscus sp.	4	-
Cyclotella sp.	10	1-
Fragilaria sp.	12	-
Gomphosphaeria sp.	-	2
Melosira sp.	2	-
Navicula sp.	6	-
Nitzschia sp.	20	8
Pennales sp.	8	2
Tabellaria sp.	20	-
Chlorophyceae		
Chlamydomonas sp.	6	-
Closterium sp.	-	2
Cosmarium sp.	2	-
Crucigenia sp.	2	-
Scenedesmus sp.	16	2
Tetraedron sp.	2	2
Undetermined Chlorophyceae	6	4
Chrysophyceae		
Mallomonas sp.	-	2
Synura sp.	2	-
Cryptophyceae		
Chroomonas sp.	-	16
Cryptomonas sp.	2	26
Cyanophyceae		
Anabaena sp.	4	-
Aphanocapsa sp.	2	-
Dactylococcopsis sp.	2	2
Lyngbya sp.	6	-
Lyngbya contorta	14	-
Merismopedia sp.	2	-
Microcystis sp.	6	-
Oscillatoria sp.	8	-
Scytonema sp.	2	-
Euglenophyceae		
Euglena sp.	-	4
Phacus sp.	2	2
Undetermined Euglenophyceae	2	-

Benthic macroinvertebrate taxa list for Orange County Utilities Division Easterly Water Reclamation Facility, collected via 20 discrete dip net sweeps in receiving water, on 9 November, 1999.

	Control Site	Test Site
Acari		
Undetermined Oribatei	19	–
Amphipoda		
Hyalella azteca	–	1
Coleoptera		
Dytiscidae	1	–
Enochrus sp.	1	–
Suphisellus puncticollis	3	–
Collembola		
Undetermined Collembola	–	2
Diptera		
Chironomus sp.	4	1
Clinotanypus sp.	–	2
Culicidae	5	–
Guttipelopia guttipennis	–	1
Kiefferulus sp.	10	–
Labrundinia sp.	–	1
Larsia sp.	3	–
Monopelopia boliekae	6	1
Palpomyia/Bezzia grp.	1	–
Parachironomus hirtalatus	2	–
Polypedilum beckae	–	1
Polypedilum illinoense grp.	–	1
Polypedilum sp.	2	2
Polypedilum trigonum	3	–
Polypedilum tritum	5	9
Tanytarsus sp. f Epler	–	42
Tanytarsus sp. g Epler	–	1
Tanytarsus sp. j Epler	–	1
Tanytarsus sp. v Epler	–	2
Tanytarsus sp.	–	5
Undetermined Chironomidae pupae	7	10
Ephemeroptera		
Callibaetis floridanus	–	10
Gastropoda		
Micromenetus dilatatus avus	–	2
Planorbidae	–	1
Heteroptera		
Belostoma sp.	1	–
Hydrometra sp.	–	1
Mesovelia sp.	2	–
Lepidoptera		
Acentria sp.	–	4
Bactra sp.	–	1

Undetermined Lepidoptera	1	–
Odonata		
Argia sp.	–	1
Libellulidae	2	–
Oligochaeta		
Aulodrilus pigueti	–	1
Dero digitata complex	7	2
Dero vaga	6	–
Enchytraeidae	1	–
Haemonais waldvogeli	–	1
Pristina leidyi	1	–
Pristina sp.	6	1
Pristinella longisoma	–	1
Pelecypoda		
Undetermined Pelecypoda	–	1

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)

