

Biological Assessment of

Park Manor Wastewater Treatment Plant

Orange County

NPDES #FL0028291

Sampled January 1992

June 1992

Biology Section
Division of Technical Services

Department of Environmental Regulation

Results of Fifth Year Inspections

Discharger: Park Manor WWTP
County: Orange
NPDES Number: FL0028291
State Permit Expiration Date: 1 September 1992

Toxics Sampling Inspection (XSI)

Date Sampled: 14 January 1992

Results: No pesticides were detected in the outfall, although the sample bottles for other organic constituents (base neutrals, acid extractables) arrived broken at the Central Laboratory. A few metals were detected in the effluent, but these were at concentrations within Class III Standards.

Results:

Compliance Biomonitoring Inspection (CBI)

Date Sampled: 14 January 1992

Results: The effluent was not acutely toxic to the fish, *Notropis leedsi*, or to the cladoceran, *Ceriodaphnia dubia*, in 48 hour static bioassays.

Impact Bioassessment Inspection (IBI)

Date Sampled: 15 January 1992

Results: Macroinvertebrate communities were moderately affected by the Park Manor discharge, although biological conditions at the control site were also worse than expected, attributable to sedimentation from construction runoff. The fauna below the discharge was dominated by the pollution tolerant midge, *Polypedilum illinoense*. While Shannon-Weaver diversity was decreased at the test site, it was not low enough to be a violation.

Water Quality Inspection (WQI)

Date Sampled: 14 January 1992

Results: Nutrient concentrations in the effluent (ammonia=2.1 mg/L, nitrate-nitrite=6.9 mg/L) and downstream in the unnamed ditch (ammonia=0.75 mg/L, nitrate-nitrite=2.3 mg/L) were of concern. These data suggest that the Park Manor WWTP, as well as sources upstream of the discharge, may contribute to eutrophication effects farther downstream in the Little Econlockhatchee River. Construction activities that were in progress during this study may have been at least partially responsible for elevated nutrients. Follow-up sampling for algal growth potential on 4 May 1992 indicated that the unnamed ditch receiving discharge was below the 5 mg dry weight/L "problem threshold", suggesting that nutrient levels were acceptable at that time. The relatively elevated nutrient concentrations observed in the initial sampling indicate that nutrient enrichment may be a sporadic problem in the area.

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

Introduction

The Park Manor WWTP is a 0.35 MGD capacity domestic wastewater treatment facility. It is located near State Road 50 in Orange County (see map in Appendix). The plant discharges into an unnamed ditch that flows into a stream/wetland system, and subsequently to the Little Econlockhatchee River, located approximately one mile downstream. The treatment train consists of flow equalization, activated sludge processing, chemical phosphorus removal, tertiary filtration, and chlorination and dechlorination. The facility has a continuous discharge, which has averaged 0.29 MGD.

Permit limits are as follows: BOD and TSS (20 mg/L monthly average), ammonia (2 mg/L monthly average), total phosphorus (1.0 mg/L monthly average), dissolved oxygen (6.1 mg/L minimum at 30° C, see Appendix), and total residual chlorine (0.01 mg/L). The operation of the plant appears to have been satisfactory, having consistently met permit limits for the past year (Appendix). A surface water monitoring program, originally required by the permit, was discontinued in March 1989, when results of the program indicated that the facility was not causing or contributing to water quality violations.

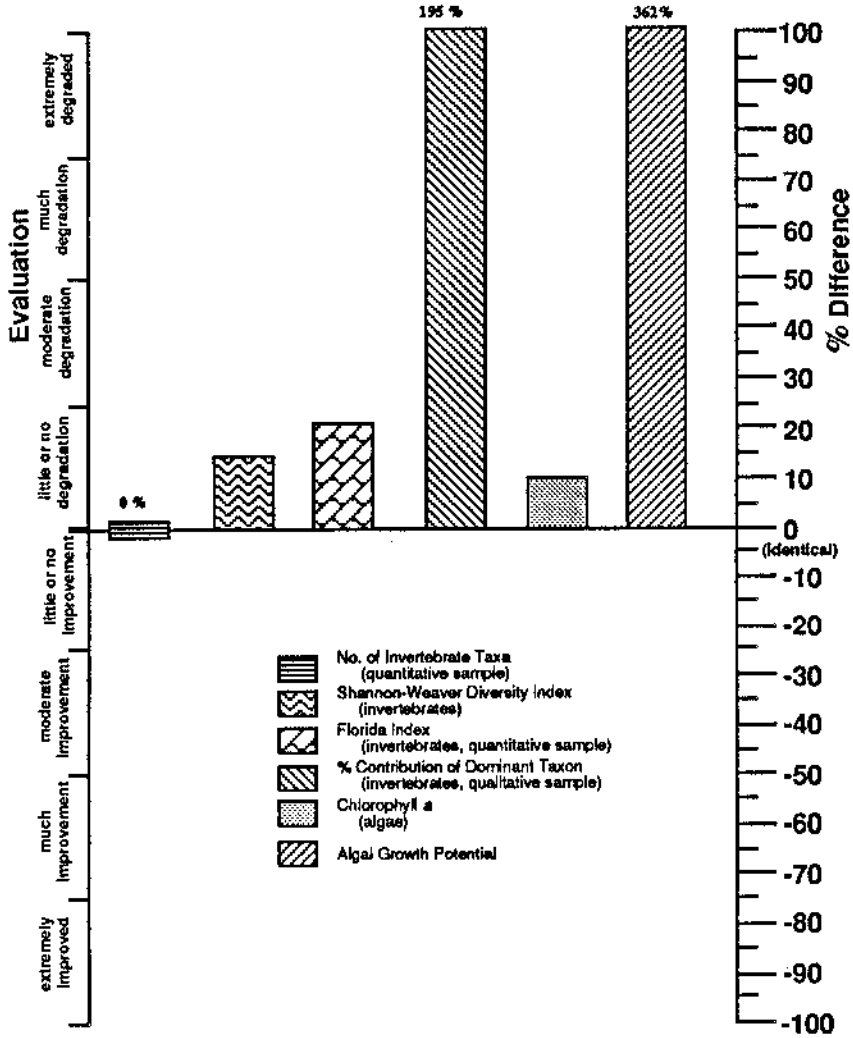
Methods

The focus of this investigation was to determine the discharger's effects on the receiving waters. A comparison of biological community health was made between a reference site (located in the unnamed ditch upstream from the WWTP discharge) and a test site (the area down gradient of the discharge) (see map in Appendix). A habitat assessment was performed *in situ* to establish comparability between sites. Supplemental physical/chemical data were also collected on water at the effluent and study sites. Acute screening toxicity bioassays, using *Ceriodaphnia dubia* and *Notropis leedsi* as test organisms, were performed on an effluent sample (Weber 1991). The effluent was analyzed for pesticide extractables and metals. Additionally, nutrient analyses were performed on effluent, reference, and test sites. Methods used for all chemical analyses are on file at the Tallahassee DER Chemistry Laboratory.

Benthic macroinvertebrate communities were evaluated at reference and test sites. Collection methods

Major characteristics of community structure of control and test sites.

	Control Site	Test Site
Macroinvertebrate Qualitative		
Number of Taxa	38	28
Florida Index	13	11
% Contribution of Dominant Taxon	14.7	43.4
% Coleoptera	9.5	1.8
% Diptera	49.1	85.1
% Ephemeroptera	8.6	1.4
% Trichoptera	7.8	1.4
% Odonata	11.2	1.8
% Pelecypoda	0	5.4
% Other	13.8	3.1
% Predators	53.6	31.8
% Collector-Gatherers	24.0	34.9
% Collector-Filterers	9.7	6.2
% Scrapers	4.1	1.7
% Shredders	4.5	25.4
% Piercers	4.1	0
Macroinvertebrate Hester-Dendy		
Number of Taxa	28	28
Florida Index	14	11
Shannon-Weaver Diversity	3.7	3.2
% Oligochaeta	1.7	3.0
% Diptera	53.2	85.2
% Ephemeroptera	28.0	1.5
% Trichoptera	2.3	6.5
% Odonata	2.3	1.5
% Gastropoda	11.7	0
% Other	0.8	2.3
% Predators	23.1	32.4
% Collector-Gatherers	34.2	36.0
% Collector-Filterers	4.6	5.4
% Scrapers	24.7	0.8
% Shredders	13.4	25.4



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

consisted of 20 discrete dip net sweeps of multiple substrates (e.g., snags, vegetation, sediment). Additional benthic collections were made with Hester-Dendy multi-plate artificial substrate samplers that were incubated for 28 days. Algal growth potential tests, using *Selenastrum capricornutum* as the test organism, followed Miller *et al.* (1978).

Explanation of Measurements of Community Health

Several different measurements of macroinvertebrate and algal community health have been employed in this study. 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. The determination of the Quantitative Stability Index (for taxonomic % composition) is a two step process. First, the relative proportions of major taxonomic groups are calculated for each site. Then, the lesser of the two percentages for each discrete taxonomic group is totaled. A QSI (% composition) of 100% means that the two sites being compared are identical. This same type of procedure is used for calculating the QSI (functional feeding groups).

For graphical purposes, the percentage differences between the reference and test sites involving the number of taxa, the diversity index, and the Florida Index are measured as the reference site minus test site divided by the reference site. The percentage 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: Phil Kane and Eric Pluchino (DER Central District) and Lyn Burton, Russel Frydenborg, Kathleen Lurding, and Sandy McClure (Tallahassee Biology Laboratory).

Results and Discussion

The unnamed ditch receiving the Park Manor WWTP effluent is a macrophyte dominated canal that receives runoff from predominantly residential and commercial areas. Disturbances from construction (relocation of the ditch) were observed during sampling, as evidenced by the very high Total Suspended Solids results (220 mg/L at the control, 160

mg/L at the test site). The elevated TSS was not attributable to the discharge, which was low (0.6 mg/L) in TSS. Signs of erosion were observed at both sites.

Habitat quality was better at the test site (with 50 points) than it was at the control site (habitat score = 35 points) (Appendix). Both sites were highly oxygenated (above 9.2 mg/L). Conductivity (reference site = 95 µmhos/cm, test site = 300 µmhos/cm) and pH (reference site = 6.5, test site = 7.4) measurements were higher downstream of the discharge.

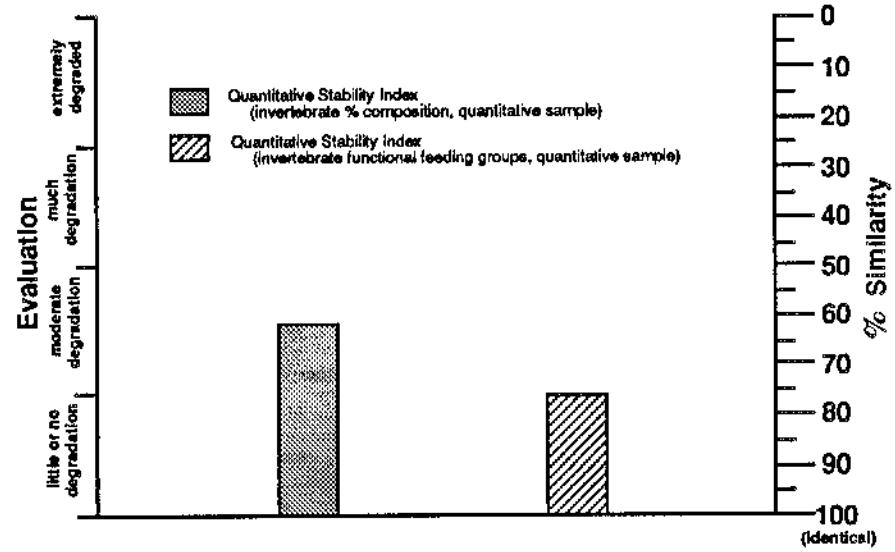
The effluent was not acutely toxic to the fish, *Notropis leedsi*, or to the cladoceran, *Ceriodaphnia dubia*, in 48 hour static bioassays.

No pesticides were detected in the grab sample of effluent. Sample bottles for other organic constituents (base neutrals, acid extractables) arrived broken at the Central Laboratory. Aluminum (62 µg/L), cadmium (0.4 µg/L), iron (11 µg/L), and zinc (21 µg/L) were found above analytical quantitation limits. These values are within Class III Standards.

While phosphorus concentrations (TP = 0.17 mg/L) were low in the effluent, nitrogen species were somewhat elevated. For example, effluent ammonia (2.1 mg/L) was slightly higher than the monthly average permit limit of 2.0 mg/L. Unionized ammonia in the effluent was calculated to be 0.034 mg/L. This is a violation of the unionized ammonia standard of 0.02 mg/L. Nitrate-nitrite was sufficiently high in the discharge (6.9 mg/L) for levels at the test site to be 2.3 mg/L. This nitrate-nitrite concentration measured at the test site was higher than 95% of all other Florida streams (see table of typical water quality values in Appendix). Similarly, ammonia measured at the test site (0.75 mg/L) was higher than 95% of Florida stream systems sampled. Nitrogen species measured at the control site were slightly lower, but still indicative of nutrient enrichment problems. Phosphorus concentrations were elevated at the control site (TP = 0.6 mg/L, which was higher than 87% of other streams), indicating sources of enrichment upstream of the WWTP (*e.g.*, construction or urban runoff). Previous data collected from this reference site indicated that nutrients were considerably lower, with an average TN of 0.8 mg/L and an average TP of 0.04 mg/L (Wayne Magley, FDER, personal communication). Construction activities that were in progress during this study may have been at least partially responsible for elevated nutrients. Depending on the relative contribution of flow from the unnamed WWTP ditch compared to the flow of the Little Econlackhatchee River, the Park Manor WWTP (and sources upstream) may potentially contribute undesirable nutrient loads to the Little Econlackhatchee River (especially during drought conditions). It should be noted that a wetland system immediately downstream of the WWTP may reduce the nutrient loading to the Little Econlackhatchee River. The Park Manor WWTP appeared responsible for a portion of the nitrogen loading, while sources upstream of the WWTP were causing most of the phosphorus enrichment and a portion of the nitrogen enrichment.

Algal growth potential results from the 14 January 1992 collections appeared suspect. Therefore, subsequent samples for AGP were collected on 4 May 1992. Results of those test were: 9.3 mg dry weight/L (effluent), 0.8 mg dry weight/L (upstream), 3.7 mg dry weight/L (downstream). Values above 5 mg/L are generally associated with nutrient enrichment, which often lead to algal blooms, low dissolved oxygen, and fish kills (Raschke and Schultz 1987). The fact that the downstream site had an AGP below 5 mg dry weight/L during the follow-up sampling suggests that nutrient levels were acceptable at that time. The relatively elevated nutrient concentrations observed earlier indicate that nutrient enrichment may be a sporadic problem in the area.

Macroinvertebrate communities were moderately affected by the Park



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

Manor discharge, although it was apparent that biological conditions at the control site were also worse than expected, attributable to sedimentation from construction runoff. The figure on p. 2 indicates the degree of difference between the control and test sites. Larger differences (that is, higher percentages) correspond with greater degrees of degradation. Negative values mean that the test site is better than the control. The figure on p. 3 summarizes similarities between the sites. Smaller similarities (lower percentages) generally correspond with greater degradation.

Taxa richness was decreased by 26% at the test site (in the dip net samples), but the same number of taxa (28) was recovered from both sites on Hester-Dendy samplers. Florida Index was reduced at the downstream site in both data sets (as much as 21% in artificial substrates samples). The percent contribution of the dominant taxon (from dip net samples) indicated degraded conditions at the test site. The fauna below the discharge was dominated by the tolerant midge, *Polypedilum illinoense* (Hudson *et al.* 1990). While Shannon-Weaver diversity was also decreased at the test site, it was not low enough to be a violation.

Periphyton samplers were not deployed, so no direct evaluation of algal community health could be made. Free water chlorophyll *a* concentrations in the unnamed ditch were not high enough to be of concern, probably because water flow was sufficient to flush phytoplankton downstream. Nutrient data suggest that when flow decreases or becomes stagnant (perhaps further downstream in the Little Econlockhatchee during parts of the year) algal blooms and other eutrophication effects may appear.

Conclusions

The Park Manor Wastewater Treatment Plant was not acutely toxic to the water flea, Ceriodaphnia du*bia*, or to the fish, N*otropis leedsi*. No pesticides were detected in water from the outfall. A few metals were detected in the effluent, but these were at concentrations below Class III Standards.

Nutrient concentrations in the effluent and in the unnamed ditch were of concern, suggesting that the Park Manor WWTP, as well as sources upstream of the discharge, may sometimes contribute to eutrophication effects further downstream in the Little Econlockhatchee River. Construction activities may have been partially responsible for the elevated nutrients at the reference site. Follow-up sampling for algal growth potential on 4 May 1992 indicated that the unnamed ditch receiving discharge was below the 5 mg dry weight/L "problem threshold", suggesting that nutrient levels were acceptable at that time. The relatively elevated nutrient concentrations observed in the initial sampling indicate that nutrient enrichment may be a sporadic problem in the area.

Macroinvertebrate communities were moderately affected by the Park Manor discharge, although biological conditions at the control site were also worse than expected, attributable to sedimentation from construction runoff. The fauna below the discharge was dominated by the pollution tolerant midge, *Polypedilum illinoense*. While Shannon-Weaver diversity was decreased at the test site, it was not low enough to be a violation.

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.

Hudson, P. L., D. R. Lenat, B. A. Caldwell, and D. Smith. 1990. Chironomidae of the Southeastern United States: A checklist of species and notes on biology, distribution, and habitat. U. S. Fish Wildl. Serv., Fish. Wildl. Res. 7. 46 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 Park Manor Waterworks, Inc .

	Effluent	Control Site	Test Site
Organic Constituents (ug/L)			
No pesticides detected in effluent. Acid extractable and base-neutral sample bottles were broken on arrival to Central Laboratory.			
Metals (ug/L)			
Aluminum	62		
Arsenic	20 U		
Cadmium	0.4		
Copper	7 T		
Chromium	10 U		
Iron	11		
Lead	1 U		
Mercury	0.1 U		
Nickel	5 U		
Silver	0.07 U		
Zinc	21		
Nutrients (mg/L)			
Ortho-phosphorus	0.10 A	0.32 A	0.28 A
Total phosphorus	0.17	0.6	0.47
Ammonia	2.1 A	0.23 A	0.75
Nitrate+Nitrite	6.9 A	0.77 A	2.3 A
TKN	3.3	2.2	2.6
Other Parameters			
Habitat Assessment		35	50
D.O. (mg/L)	9.1	9.2	9.8
pH (SU's)	7.7	6.5	7.4
Conductivity (µmhos/cm)	600	95	300
Temperature (°C)		10.5	15.0
Chlorophyll a (ug/L)		5.1	5.6
AGP (mg dry wt/L) collected 4 May 1992	9.3	0.8	3.7
TSS (mg/L)	0.62	220	160
Bioassay Fish-Dechlorinated	Not toxic		
Bioassay Invertebrate-Dechlorinated	Not toxic		

A - Value reported is the mean of two or more determinations

T - Value reported is less than the practical quantitation limit

U - Material analyzed for but not detected; value reported is the minimum detection limit

Q - Evidence that analyte is present in sample is equivocal

Typical Values for Selected Parameters in Florida Waters

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

Percentile Distribution

Parameter	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%
STREAMS (1617 stations)											
Phytoplankton Chlorophyll *a*	0.22	0.52	0.94	1.60	3.02	4.63	6.72	9.87	14.68	27.35	48.70
Periphyton Chlorophyll *a*	0.31	0.43	0.77	1.04	2.16	2.94	6.45	10.51	17.00	39.51	60.85
H-D Diversity	0.84	2.12	2.48	2.74	2.88	3.09	3.25	3.40	3.52	3.76	3.90
Qualitative Taxa Richness	9.00	12.00	17.00	20.00	22.00	24.50	26.00	28.00	31.00	37.00	53.00
H-D Taxa Richness	6.00	6.50	9.00	11.50	13.00	15.00	17.00	21.50	26.00	29.00	32.00
TKN	0.30	0.39	0.56	0.73	0.87	1.00	1.11	1.26	1.49	1.93	2.80
Ammonia	0.02	0.02	0.04	0.05	0.06	0.08	0.11	0.14	0.20	0.34	0.60
NO2-NO3	0.01	0.01	0.03	0.05	0.07	0.10	0.14	0.20	0.32	0.64	1.05
Total Phosphorus	0.02	0.03	0.05	0.06	0.10	0.13	0.18	0.25	0.39	0.74	1.51
Ortho Phosphorus	0.01	0.01	0.03	0.04	0.05	0.08	0.11	0.17	0.27	0.59	1.37
Turbidity	0.60	0.90	1.20	1.45	2.10	2.80	3.60	4.50	6.65	10.45	16.30
LAKES (477 stations)											
Phytoplankton Chlorophyll *a*	0.80	1.71	2.88	4.28	10.06	13.40	20.00	30.10	47.20	65.44	113.90
Dredge Diversity	0.71	0.97	1.43	1.74	1.98	2.12	2.21	2.59	2.85	3.15	3.17
Dredge Taxa Richness	3.00	5.00	6.50	7.00	9.00	10.00	11.00	13.00	15.00	17.00	21.00
TKN	0.36	0.49	0.67	0.83	1.08	1.26	1.40	1.51	1.68	2.11	3.46
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

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

Facility Name: Park Manor WWTF	Prepared by: Al Castro Date:	
Location (attach detailed map): Attached	County ORANGE	District CENTRAL
Federal Permit # FL0028291 and expiration date: 9/30/92	State GMS # and 3048P02218 State expiration date: 9/1/92 Permit # D048-135851A	Facility Type: Industrial (Municipal) Federal Agricultural Other (list):

Function of facility: Domestic Waste Water Treatment Facility

Description of treatment process: A 0.350 MGD conventional activated sludge sewage treatment plant with flow equalization, chemical phosphorous removal, tertiary filtration and holding pond for substandard effluent. The disinfected/dechlorinated effluent is discharged to surface water via discharge line to a drainage ditch thru a stream/wetland system to the Little Econlockhatchee River.

Receiving waters: Little Econlockhatchee River (via a drainage ditch and stream/wetland system)	Classification: Class III OFW Classification Possible in 3/92 (Little Econ)
Design Flow: 0.350 MGD	Actual Mean Flow: 0.293 MGD

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: State and Federal

Parameter	Limit (units)
Secondary plus:	30 Day Average
BOD_5	20 mg/l
TSS	20 mg/l
Ammonia as N	2.0 mg/l
TP as P	1.0 mg/l
Total Residual Cl	0.01 mg/l
DO (State)	See attached DO-Temp. Correlation.

Describe special permit conditions and permit modifications: DER letter, dated 11/1/89, modified the conditions of the operating permit by establishing the TRC and DO effluent limits shown at left.
Special condition no. 2 of the operating permit required a surface water monitoring program to be implemented and final engineering report be submitted by 3/15/89 illustrating the results. Subsequently, the program was implemented and the report submitted. As a result, DER determined that the facility was not causing an contributing to water quality violations in the Little Econ at that time and therefore authorized discontinuation of the sampling program in the above referenced 11/1/89 letter.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

permitted outfall(s): See Attached Map for location
Facility outfall is a 12 inch ductile iron pipe which discharges into a drainage ditch.

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

Describe previous impact bioassessments, WQBEL's, and previous or current enforcement actions:
No pending enforcement action by DER at this time.
The effluent limits, on Page 1 of 2, for BOD_5, TSS, Ammonia and TP were established be Consent Order OGC Case No. 84-0591.

Discuss comparability of MOR results to past DER results and whether there are trends (improving, declining) in the data set:
Review of MORs submitted for period between 12/90 through Show plant effluent has consistantly met secondary and additional effluent limits stipulated on the first page of this summary.

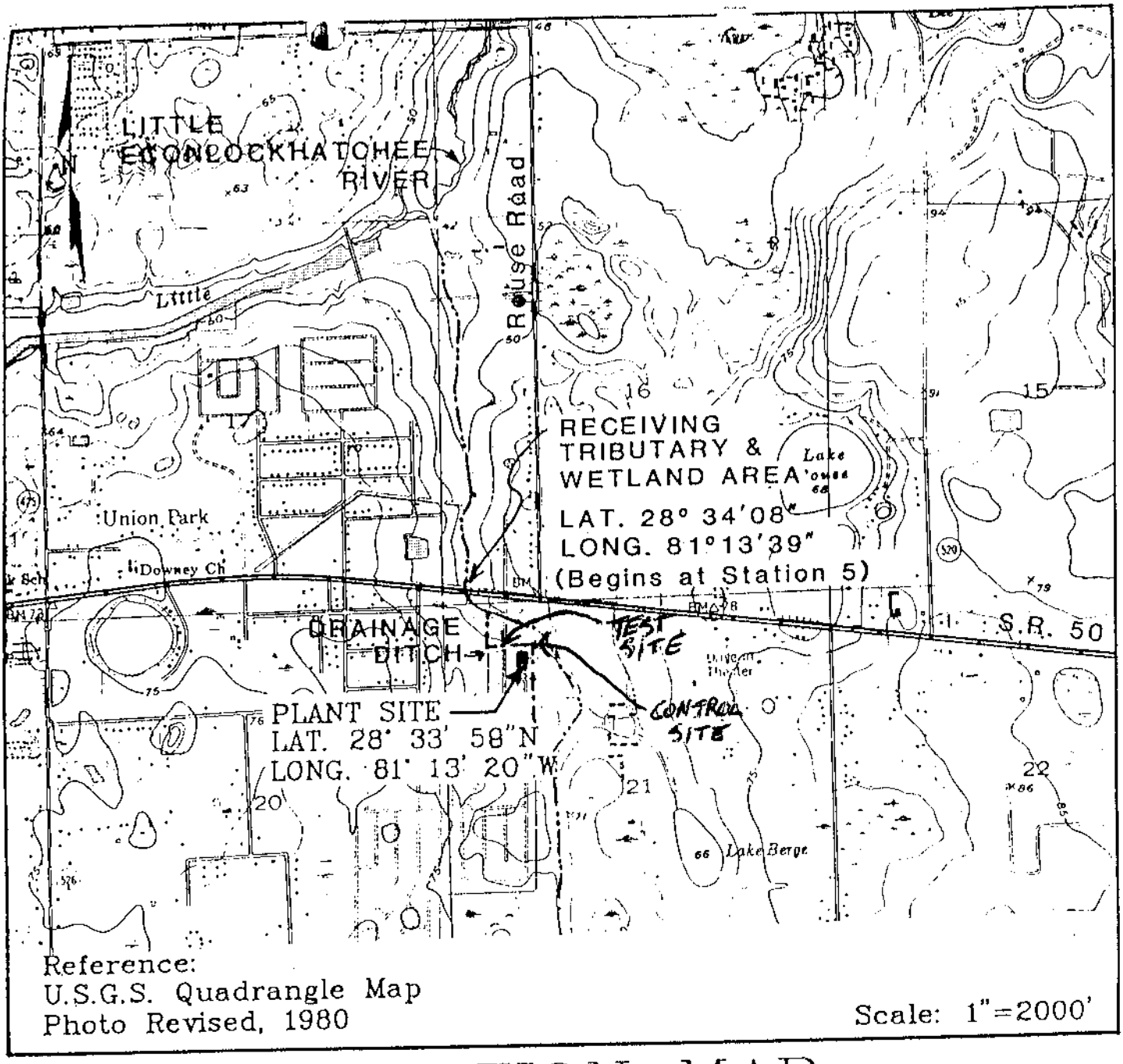
Additional information:

Park Manor W.W.T.F.

Dissolved Oxygen Effluent Limitation:

*Concentration (mg/L)	*Effluent Temperature
≥ 7.0	≤ 22
6.9	23
6.8	24
6.7	25
6.6	26
6.5	27
6.3	28
6.2	29
6.1	30

* Monthly (30 Day) Average



LOCATION MAP

LEGEND

Wastewater Treatment Facility Site

EXHIBIT I

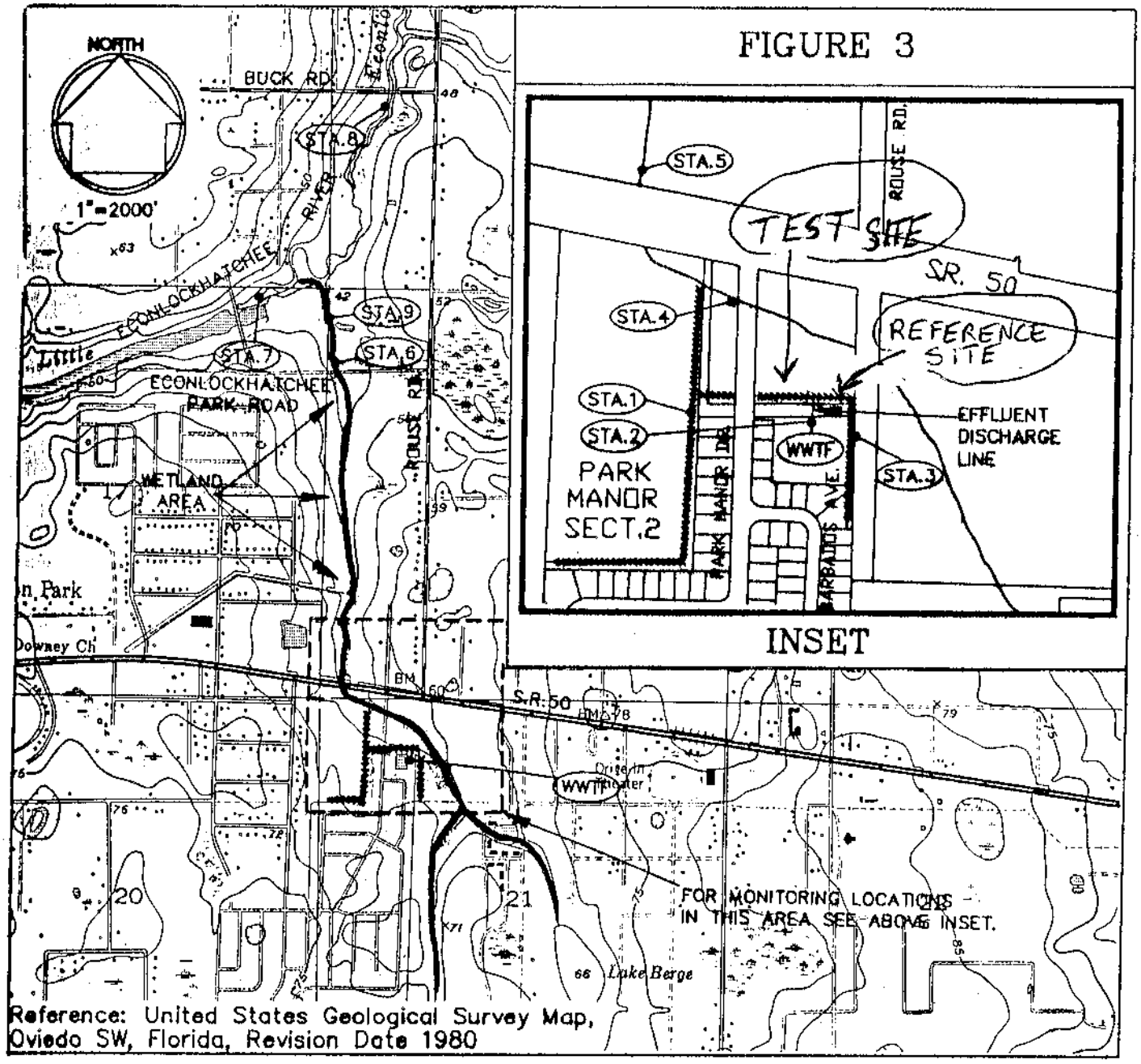
PARK MANOR

WASTEWATER TREATMENT FACILITY

COMMONWEALTH ENGINEERING ASSOCIATES, INC.

860 S.R. 434 N., SUITE A
ALTAMONTE SPRINGS, FLORIDA 32714
(305) 788-8111

FIGURE 3



INSET

Reference: United States Geological Survey Map, Oviedo SW, Florida, Revision Date 1980

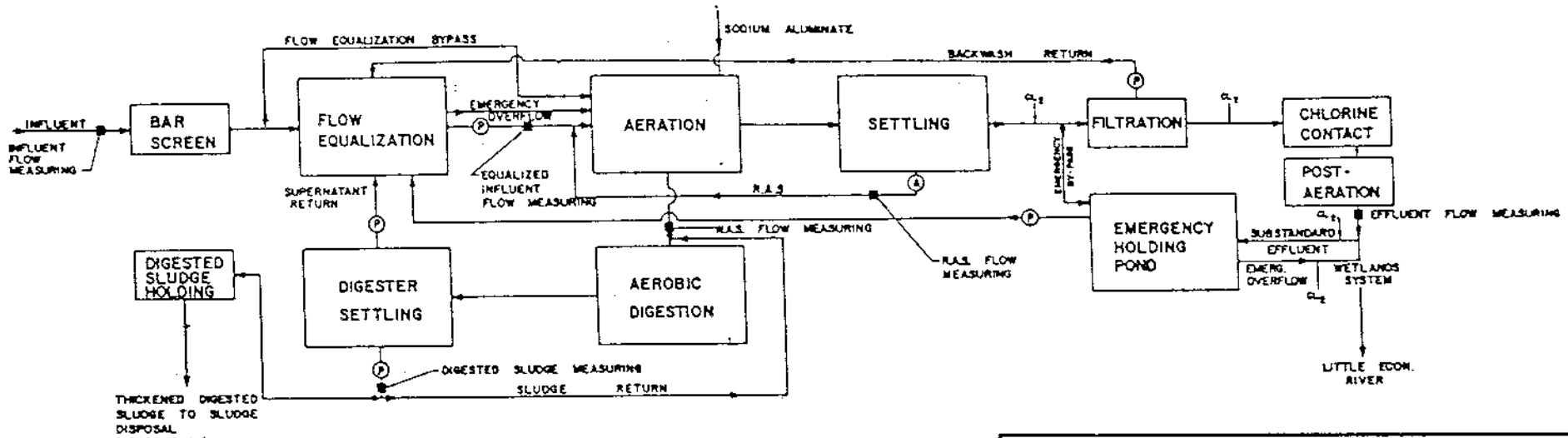
LOCATION MAP

LEGEND

- STA.# — MONITORING STATION
- UN-NAMED CREEK
- DRAINAGE DITCH
- WWTF — WASTEWATER TREATMENT FACILITY

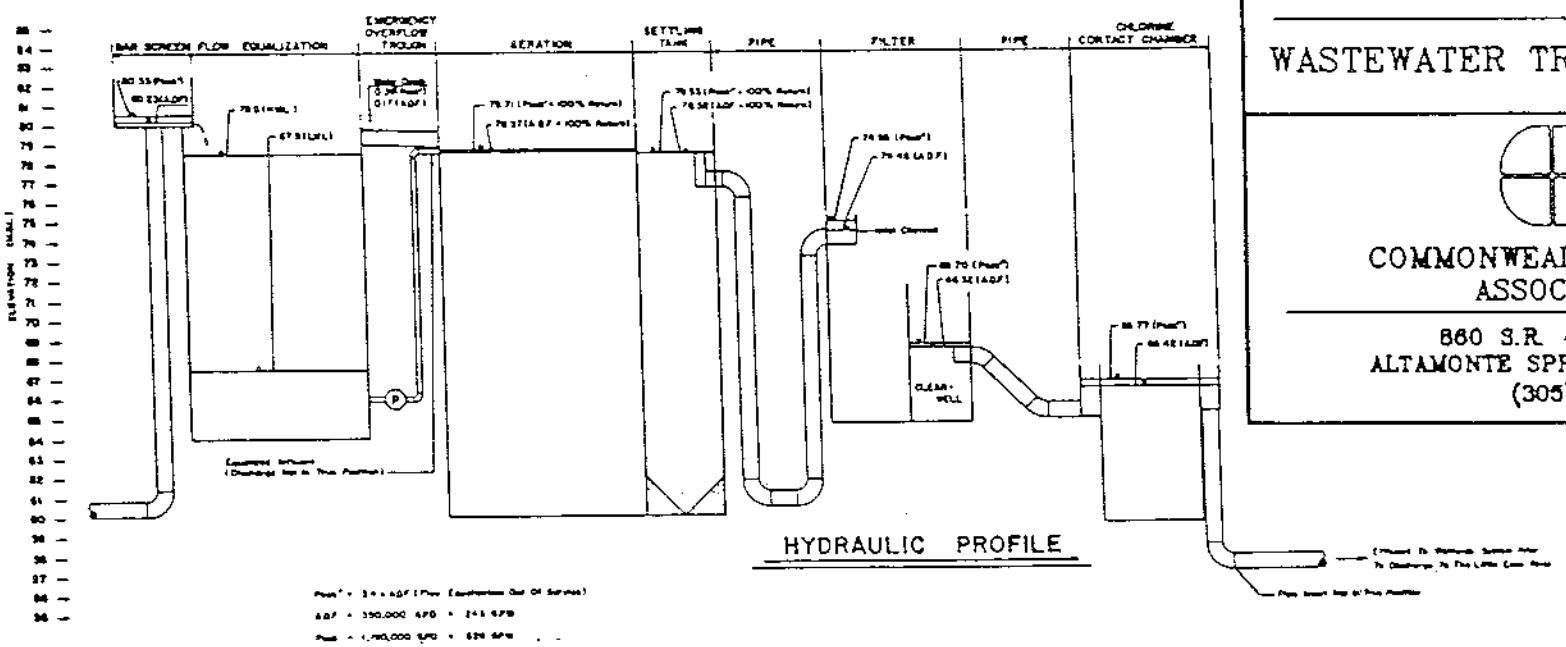
PARK MANOR
WASTEWATER TREATMENT FACILITY
MONITORING STATIONS 1–9

Commonwealth
ENGINEERING ASSOCIATES
2180 WEST S.R. 434, SUITE 3100
LONGWOOD, FLORIDA 32779-5010
(407)788-8111 FAX (407)774-4002



FLOW SCHEMATIC

Ⓟ - PUMP
Ⓐ - AIR LIFT



HYDRAULIC PROFILE

PARK MANOR

WASTEWATER TREATMENT FACILITY

COMMONWEALTH ENGINEERING ASSOCIATES, INC.
860 S.R. 434 N., SUITE A
ALTAMONTE SPRINGS, FLORIDA 32714
(305) 788-8111

FLOW SCHEMATIC and HYDRAULIC PROFILE

EXHIBIT IV

COMPARABLE SITE

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

SUBMITTING AGENCY CODE: 32 / SUBMITTING AGENCY NAME: FDER CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 01/15/92	RECEIVING BODY OF WATER: LITTLE ECONLOCKHATCHEE RIVER

REMARKS:	LOCATION: PARK MANOR WATERWORKS, INC. 1527 PARK MANOR DRIVE ORLANDO, FLORIDA 32817	FIELD ID/NAME: PARK M STP

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 10	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 0	No artificial channelization. Little activity (impervious surface) in watershed which would cause scouring during spates. **12-15 points**	—	—	Artificially channelized, or scouring present during spates because of excess impervious surface in watershed. **0-3 points**
Bank Stability 3	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 4	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 [illegible] 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** 35

COMMENTS:

ANALYSIS DATE: 01/15/92	ANALYST: P. KANE	SIGNATURE: Philip N. Kane, Ed.D.

COMPARABLE SITE

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 3)

SUBMITTING AGENCY CODE: 30 / SUBMITTING AGENCY NAME: FDER CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 01/15/92	TIME: 1000	RECEIVING BODY OF WATER: LITTLE ECONLOCKHATCHEE RIVER

REMARKS: IMPACTED BY RELOCATED DITCH SO HIGH TURBIDITY	LOCATION: PARK MANOR WATERWORKS, INC. 1527 PARK MANOR DRIVE ORLANDO, FLORIDA 32817	FIELD ID/NAME: PARK M STP

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
5			90%	5%		

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

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

Point-Source Pollution (list location and describe):

Estimated System Width (range, m): 1.2-4.6	Estimated System Depth (range, m): 0.1-0.8	yes
High Water Mark (m above bed): 0.6	Velocity (range, m/s): 0.5-0.15	Impounded ☐ Channelized ☐

Canopy Cover % 30% Open : ☐ Lightly Shaded (11-45%): ☒ Moderately Shaded (46-80%): ☐ Heavily Shaded: ☐

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)				Rock or Shell Rubble			
Leaf Packs				Sand	75%	5	
Aquatic Vegetation	25%	15		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	10.5	9.2	6.5	95				0.05
Bottom								

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

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

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

Clarity (check box): Clear: ☒ Slightly turbid: ☐ Turbid: ☒ DURING CONSTRUCTION Opaque: ☐

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

Weather Conditions:

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

ANALYSIS DATE: 01/15/92	ANALYST: P. KANE	SIGNATURE: Philip N. Kane, Ed.D.

RANATRA IN H.D. BAG #2 FOUND ON VEGETATION NEAR H.D., NOT ON H.D. 2

TEST SITE

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

SUBMITTING AGENCY CODE: 3c SUBMITTING AGENCY NAME: FDER CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 01/15/92	RECEIVING BODY OF WATER: LITTLE ECONLOCKHATCHEE RIVER

REMARKS:	LOCATION: PARK MANOR WATERWORKS, INC. 1527 PARK MANOR DRIVE ORLANDO, FLORIDA 32817	FIELD ID/NAME: PARK M STP

Habitat Parameter score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 23	Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs, undercut banks, rubble, or other stable habitat. **23-30 points**	20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat. **16-22 points**	5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat. **8-15 points**	Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious. **0-7 points**
Water Velocity 20	Max. observed: >0.3 m/sec. but < 1 m/sec **23-30 points**	Max. observed; 0.1 to 0.3 m/sec **16-22 points**	Max. observed; 0.05 to 0.1 m/sec **8-15 points**	Max. observed; <0.05 m/sec, or spate occurring; > 2 m/sec **0-7 points**
Artificial Channel/ Flow Alteration 0	No artificial channelization. Little activity (impervious surface) in watershed which would cause scouring during spates. **12-15 points**	—	—	Artificially channelized, or scouring present during spates because of excess impervious surface in watershed. **0-3 points**
Bank Stability 13	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 4	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 0	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** 50

COMMENTS:

ANALYSIS DATE: 01/15/92	ANALYST: P. KANE	SIGNATURE: Philip N. Kane, Ed.D.

TEST SITE

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 3)

SUBMITTING AGENCY CODE: 30 / SUBMITTING AGENCY NAME: FDER CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 01/15/92	TIME: 1000	RECEIVING BODY OF WATER: LITTLE ECONLOCKHATCHEE

REMARKS: HESTER DENDY BLOCK 1 BURNS	LOCATION: PARK MANOR WATERWORKS, INC. 1527 PARK MANOR DRIVE ORLANDO, FLORIDA 32817	FIELD ID/NAME: PARK M STP

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
5%			90%	5%		

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

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

Point-Source Pollution (list location and describe): PARK MANOR STP

Estimated System Width (range, m): 3-4.0	Estimated System Depth (range, m): 0.6	yes
High Water Mark (m above bed): ~0.5	Velocity (range, m/s): .25	Impounded ☐ Channelized ☐

Canopy Cover %: 30 Open: ☐ Lightly Shaded (11-45%): ☒ Moderately Shaded (46-80%): ☐ Heavily Shaded: ☐

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)				Rock or Shell Rubble			
Leaf Packs				Sand	30%	6	
Aquatic Vegetation	70%	14		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	15.0	9.8	7.4	310				Bottom 0.2m
Bottom								

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

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

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

Clarity (check box): Clear: ☒ NORMALLY Slightly turbid: ☐ Turbid: ☒ DURING CONSTRUCTION Opaque: ☐

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

Weather Conditions:

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

ANALYSIS DATE: 01/15/92	ANALYST: P. KANE	SIGNATURE: Philip N. Kane, Ed.D

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: Park Manor
Address/City: 1527 Park Manor Dr Orlando
County: Orange
Contact/District: Phil Kane / C
NPDES Permit #: FL00 Outfall #:

Sample Collection: Date 1/14/92 Time 0930
Test Beginning: Date 1/15/92 Time 1400
Test Ending: Date 1/18/92 Time 1050
Test Organism: N. Cercla
Life Stage/Age: 24 days

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

27544

Remarks:

Instrument Calibrations:

	pH	DO	Temp	Cond
0 hr	7@7@9	8.6@23.5	22.5@23.1	1359@23.4
24 hr	7.9.9	8.6@23.5°C	22.5°C@22.5°C	1332@22.8°C@1347
48 hr	7@7.9@9	8.7@28.0	21.0@21.3	1303@21.8@ 1321

Conc.	Chamber #	Number Live 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	DO (mg/L) 0	24	48	Cond. (µmhos/cm) 0	24	48
Contrd	13	5	5	5	7.8	8.1	8.3	20.9	21.2	20.2	9.6	8.6	8.9			
Contrd	7	5	5	5	7.8	8.1	8.2				9.6	8.6	8.7	270	235	234
100%	43	5	5	5	7.7	8.1	8.2	21.8	21.3	20.2	9.1	8.2	8.8			
100%	1	5	5	5	7.7	8.1	8.2				9.1	8.2	8.8	600	605	600
Measured/Loaded by:		MF		MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF
Recorded by:		MF		MF		AJ	AJ		AJ	AJ		AJ	AJ		AJ	AJ

Investigators' Signatures

Alison Jones
Marshall Faircloth

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:					
Lab Tot. Resid. Cl2:	0.0	0.0	0.0	HACH	MF
Alkalinity:	130	70	145	HACH	AJ
Hardness:	130	85	120	HACH	
Total Ammonia:	0	0	2.88	Hach	

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

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: Park Manor
Address/City: 1527 Park Manor Dr, Orlando
County: Orange
Contact/District: Phil Kane / C
NPDES Permit #: FL00 Outfall #:

Sample Collection: Date 1/14/92 Time 0930
Test Beginning: Date 1/15/92 Time 1400
Test Ending: Date 1/17/92 Time 1050
Test Organism: C. dubia
Life Stage/Age: <24 hrs

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

Remarks:

27544

Instrument Calibrations:

	pH	DO	Temp	Cond
0 hr	7.9 7.9	8.6@23.5	22.9@23.1	1359@23.4
24 hr	7.8 7.8 9	8.6@23.5°C	22.5°C@22.5°C	1337@22.8°C@1347
48 hr	7.9 7.9 9	8.7@23.0	21.0@21.8°	1301K@21.8° 1321

Conc.	Chamber #	Number Live 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	DO (mg/L) 0	24	48	Cond. (µmhos/cm) 0	24	48
Control		5	4	4	8.1		8.2	22.1		23.9	9.3		9.1	158		187
Control		5	5	5			8.2						9.2			
Control		5	5	5			8.2						9.2			
Control		5	5	5			8.2						9.2			
100%		5	5	5	7.7		8.6	21.3		23.8	9.2		9.2	555		648
100%		5	5	5			8.6						9.2			
100%		5	5	5			8.6						9.2			
100%		5	5	5			8.6						9.2			
Measured/Loaded by:		AJ	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF		MF
Recorded by:		MF	MF	MF	AJ	AJ MF	AJ	AJ	AJ MF	AJ	AJ	AJ MF	AJ	AJ		AJ

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:					
Lab Tot. Resid. Cl2:	0.0	0.0	0.0	HACH	MF
Alkalinity:	130	70	145	HACH	AJ
Hardness:	130	85	120	HACH	MF
Total Ammonia:	0	0	2.88	Hach	MF

Investigators' Signatures

Reviewer

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

Taxa list for Park Manor Waterworks, Inc., collected via Hester-Dendy samplers above and below the discharge on 15 January, 1992.

	Reference Site	Test Site
Coleoptera		
Hydroporus/Hygrotus sp.	1	–
Diptera		
Ablabesmyia mallochi	11	1
Ablabesmyia rhamphe grp.	13	3
Chironomus decorus grp.	17	7
Chironomus (Lobochironomus) sp.	21	17
Chironomus sp.	4	–
Chironomus stigmaterus	1	–
Cryptochironomus sp.	2	5
Goeldichironomus holoprasinus	4	6
Goeldichironomus natans ?	1	–
Hemerodromia sp.	–	6
Kiefferulus dux	1	3
Labrundinia sp.4 Epler	1	–
Larsia decolorata	–	1
Limnophila sp.	–	1
Monopelopia boliekae	1	–
Nanocladius sp.	3	2
Palpomyia grp. sp.	6	3
Paracladopelma sp.	–	1
Pentaneura inconspicua	–	6
Polypedilum convictum grp.	–	1
Polypedilum halterale grp.	–	1
Polypedilum illinoense	1	94
Polypedilum scalaenum	–	5
Undetermined dipteran pupae	3	10
Tanytarsus sp.	1	–
Ephemeroptera		
Caenis sp.	46	3
Stenonema floridense	2	–
Gastropoda		
Hebetancyclus excentricus	18	–
Micromenetus dilatus	2	–
Hemiptera		
Undetermined hemipteran sp.	–	1
Odonata		
Argia fumipennis	2	–
Argia sp.	1	2
Argia tibialis	1	–
Undetermined odonate sp.	–	1

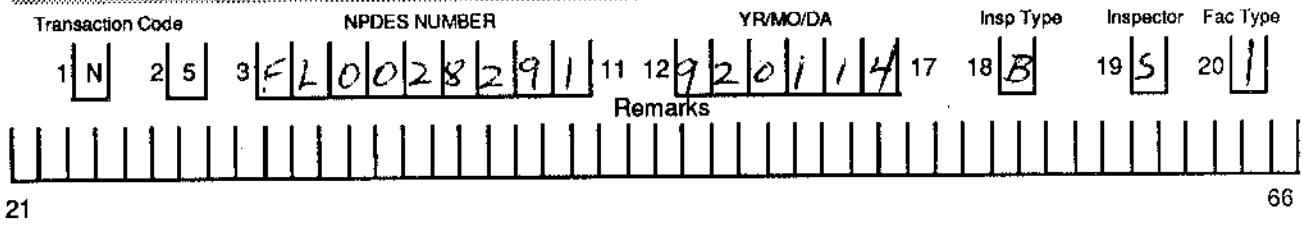
Oligochaeta		
Limnodrilus hoffmeisteri	1	2
Nais elinguis	–	1
Slavina appendiculata	2	–
Undetermined tubificid w/o capilliform setae	–	3
Pelecypoda		
Musculium/Sphaerium grp.	–	3
Trichoptera		
Cheumatopsyche sp.	–	12
Cyrnellus fraternus	4	1

Taxa list for Park Manor Waterworks, Inc., collected via 20 discrete dip net sweeps of multiple substrates above and below the discharge on 15 January, 1992.

	Reference Site	Test Site
Acarina		
Undetermined Halacaridae	0	1
Neumania sp.	2	0
Coleoptera		
Hydrobiomorpha casta	0	3
Peltodytes muticus	4	0
Suphisellus sp.	6	1
Tropisternus lateralis nimbatus	1	0
Diptera		
Ablabesmyia mallochi	2	3
Ablabesmyia rhamphe grp.	3	0
Anopheles sp.	0	2
Atrichopogon sp.	1	0
Chironomus decorus grp.	2	6
Chironomus (Lobochironomus) sp.	7	23
Clinotanypus sp.	3	0
Cryptochironomus sp.	2	2
Goeldichironomus amazonicus	1	0
Goeldichironomus holoprasinus	3	2
Larsia decolorata	0	2
Nanocladius sp.	1	5
Palpomyia grp.	17	12
Paracladopelma sp.	1	3
Pentaneura inconspicua	4	2
Polypedilum illinoense	1	96
Polypedilum scalaenum	1	15
Pseudosmittia sp.	1	2
Undetermined dipteran pupae	3	9
Simulium sp.	1	0
Undetermined dipteran species	0	2
Stenochironomus sp.	0	2
Stratiomys sp.	1	0
Undetermined	1	0
Toxorhynchites sp.	1	0
Ephemeroptera		
Caenis sp.	10	3
Gastropoda		
Micromenetus sp.	0	2
Hemiptera		
Immature Corixidae	1	0
Mesovelia sp.	5	0
Pelocoris sp.	1	0
Undetermined hemipteran sp.	3	0

Malacostraca		
Asellus sp.	1	0
Odonata		
Argia sp.	6	3
Enallagma cardenium	6	1
Ischnura sp.	1	0
Oligochaeta		
Limnodrilus hoffmeisteri	1	3
Lumbriculus inconstans	1	0
Undetermined tubificid w/o capilliform setae	1	1
Pelecypoda		
Musculium/Sphaerium grp.	0	12
Trichoptera		
Cheumatopsyche sp.	6	1
Hydropsyche sp.	3	0
Nectopsyche sp.	0	1
Undetermined trichopteran pupa	0	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)

