

Biological Assessment of

DeLand Regional Wastewater Treatment Plant

Volusia County

NPDES #FL0020303

Sampled April 1993

October 1993

Biology Section
Division of Technical Services

Department of Environmental Protection
Results of Fifth Year Inspections

Discharger: DeLand Regional Wastewater Treatment Plant
County: Volusia
NPDES Number: FL0020303
State Permit Expiration Date: 27 November 1997

Toxics Sampling Inspection (XSI)

Date Sampled: 5 April 1993

Results: The herbicide, atrazine, was found at 0.77 µg/L, which is below acutely toxic levels. No metals were found in concentrations exceeding Class III water quality standards.

Compliance Biomonitoring Inspection (CBI)

Date Sampled: 5 April 1993

Results: Not toxic to the invertebrate, *Ceriodaphnia dubia*, or to the fish, *Notropis leedsi*. No mortality occurred during the 48 hour bioassays.

Impact Bioassessment Inspection (IBI)

Date Sampled: 5 April 1993

Results: Benthic macroinvertebrate communities were moderately degraded at the test site, demonstrated by decreases in taxa richness, Florida Index, and Shannon-Weaver diversity. Because of the additional potential sources of pollution from the marina and highway at the test site, it is difficult to establish the contribution of the DeLand effluent in causing the observed changes in benthic communities. Phytoplankton populations were virtually identical at the two stations, in terms of taxa richness, density, and species composition.

Water Quality Inspection (WQI)

Date Sampled: 5 April 1993

Results: Nutrients were not particularly high in the effluent, and very little variation in nutrient concentrations was noted between the reference and test sites. Total phosphorus, ammonia, and nitrate-nitrite were less than the average values for Florida streams at both receiving water stations. Ortho-phosphate was below the practical quantitation limit. TKN at both study sites was only slightly above average. Although the algal growth potential (AGP) was very high in the effluent, the test site AGP was actually slightly lower than the reference site AGP. AGP at both stations was slightly above the "problem threshold" of 5 mg dry wt/L.

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 DeLand Regional Wastewater Treatment Plant is located in Volusia County, Florida (see map in Appendix). This activated sludge "carousel" facility has a design capacity of 4.0 MGD, with an average flow during 1992 of 2.281 MGD. The plant utilizes chemical feed facilities and tertiary filtration, and the effluent is chlorinated for disinfection, and subsequently dechlorinated prior to discharge. A force main transports the effluent approximately five miles from the plant to the St. Johns River, west of DeLand (see map in Appendix). A portion of the treated effluent is discharged to groundwater at public access irrigation sites. Presently, reclaimed effluent is utilized by the nearby Southridge Golf Course, and three more sites are proposed (Appendix). Anticipated re-use capacity of these sites is 3.15 MGD, which would significantly reduce, or eliminate, the surface water discharge.

State effluent limits are as follows: Ultimate Oxygen Demand (700 lbs/day monthly average), total phosphorus (1.0 mg/L monthly average), chlorine residual for disinfection (≥ 0.5 mg/L), chlorine residual at discharge (0.01 mg/L), $CBOD_5$ (30 mg/L monthly average), TSS (30 mg/L monthly average), pH (6.0 to 8.5 SU's), and fecal coliform bacteria (200 organisms/100 mL annual average).

Permit violations over the past year have been few. The concentration of total phosphorus exceeded limits in December, 1991. Another problem with recording of total nitrogen and turbidity data of the MOR's occurred during this period. Both of these issues have been addressed by

Major characteristics of community structure of control and test sites.

	Reference Site	Test Site
Macroinvertebrate Qualitative		
Number of Taxa	27	22
Florida Index	9	5
% Contribution of Dominant Taxon	38.7	57.0
% Malacostraca	39.4	61.3
% Diptera	35.9	12.9
% Odonata	10.6	2.2
% Oligochaeta	4.2	7.5
% Gastropoda	2.1	4.3
% Hemiptera	4.9	1.1
% Other	2.9	10.7
% Above Surface Deposit Feeders	27.1	25.6
% Shredders	22.5	24.4
% Predator/Carnivores	22.3	7.5
% Scavengers	12.9	20.4
% Plant Piercers	5.3	9.7
% Below Surface Deposit Feeders	4.2	7.5
% Other	5.7	4.9
Macroinvertebrate Hester-Dendy		
Number of Taxa	33	21
Florida Index	14	6
Shannon-Weaver Diversity	3.81	3.03
% Diptera	82.4	26.2
% Malacostraca	9.0	57.1
% Trichoptera	0.5	4.8
% Ephemeroptera	4.0	0.8
% Oligochaeta	2.5	4.0
% Branchiobdellida	0	4.0
% Other	1.6	3.1
% Above Surface Deposit Feeders	42.4	56.6
% Suspension Feeders	22.1	23.6
% Predator/Carnivores	20.8	7.3
% Shredders	8.0	1.9
% Below Surface Deposit Feeders	2.6	4.0
% Parasites	0.8	4.0
% Other	3.3	2.6
Phytoplankton Algae		
Number of Taxa	21	21
% Contribution of Dominant Taxon	40.2	42.3
Diatom/Diatom + B-G Abundance Ratio	0.67	0.65
% Diatoms	60.1	55.5
% Blue-greens	29.9	30.1
% Greens	10.0	14.3
Algal Growth Potential (mg dry wt/l)	6.5	5.2

the facility. Overall, during the last year, effluent quality has improved in terms of annual averages of UOD and total phosphorus levels.

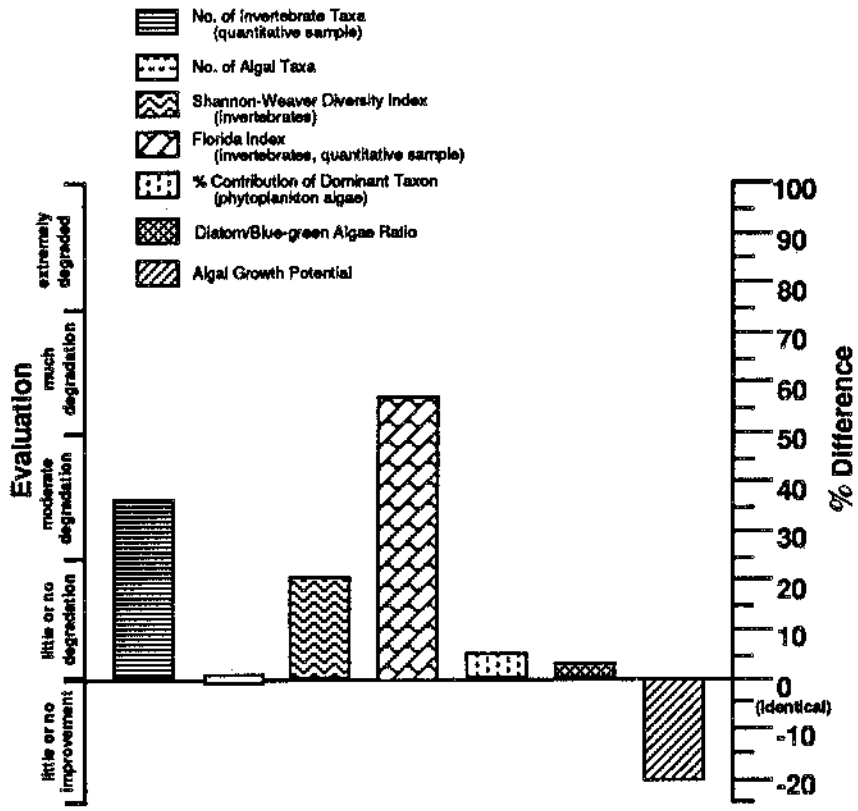
Methods

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 100 yards upstream of the outfall in the St. Johns River) and a test site (100 yards below the discharge). A habitat assessment was performed *in situ* to establish comparability between sites. Supplemental physical/chemical data were also collected on the effluent and study sites. Acute screening toxicity bioassays, using *Ceriodaphnia dubia* and *Notropis leedsi* as test organisms, were performed on an effluent sample (Weber 1991). The effluent was analyzed for metals and for organic constituents (base neutral and acid extractables, and pesticide extractables). Additionally, nutrient analyses were performed on effluent, reference, and test sites. Methods used for all chemical analyses are on file at the Tallahassee DEP Chemistry Laboratory.

Benthic macroinvertebrate communities were evaluated at reference and test sites. Invertebrates were collected from multiple substrates (*e.g.*, snags, leaf packs, vegetation) using discrete dip net sweeps. Additional invertebrate collections were accomplished using Hester-Dendy multiplate samplers which were incubated for 28 days (Ross 1990). Phytoplankton was sampled at both reference and test sites via subsurface grabs. 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 report. Many of these, such as the number of taxa and Shannon-Weaver Diversity Index are well known. Others are briefly explained here. The Florida Index assigns points to stream-dwelling macroinvertebrates based on their sensitivity to pollution (see Ross 1990). A site with a high Florida Index score is considered healthy (*i.e.*, many clean-water organisms are present). Excessive numerical dominance of a single type of organism (a high % contribution of dominant taxon) is usually associated with disturbance. A decreased diatom to blue-green algae ratio (calculated by dividing the number of individuals in the Bacillariophyta by the number of individuals in the Bacillariophyta + Cyanophyta) is often indicative of nutrient enriched conditions. The determination of the Quantitative Stability Index (for taxonomic % composition) is a two step process. First, the relative proportions of major taxonomic groups are calculated for each site. Then, the lesser of the two percentages for each discrete taxonomic group is totaled. A QSI (for % composition) of 100% means that the two sites being compared are identical.

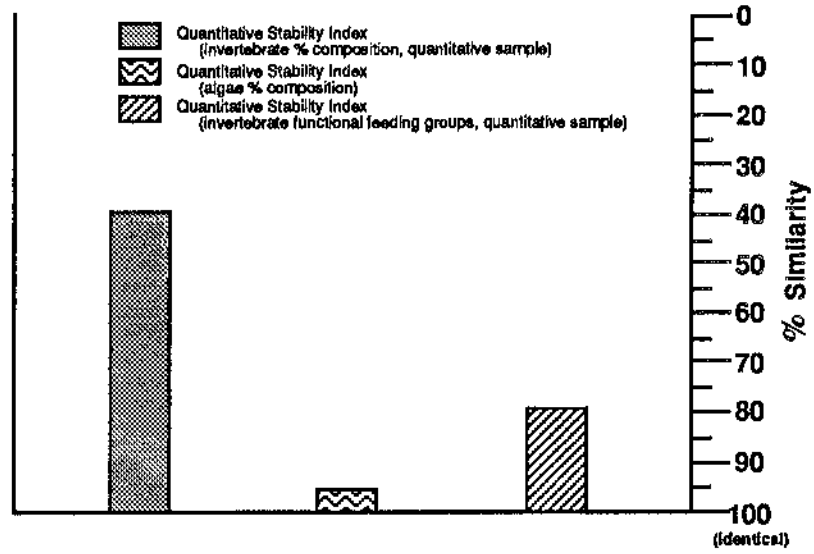


Effect of discharge on receiving stream
(measured as difference between control and test sites).

This same type of procedure is used for calculating the QSI (for functional feeding groups).

For graphical purposes, the percent differences between the reference and test sites involving the number of taxa, the diversity index, Florida Index and the diatom to bluegreen algae ratio are measured as the reference site minus test site divided by the reference site. The percent differences between sites involving the percent contribution of dominant taxon 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: Philip Kane and Steve Kent (DEP Central District) and Lyn Burton, Marshall Faircloth, Russel Frydenborg, Kathleen Lurding, Elizabeth Miller, Urania Quintana, Landon Ross, and Greg Wynn (Tallahassee Biology Laboratory). The report was reviewed by the Point Source Studies Review Committee, consisting of Wayne Magley, Jan Mandrup-Poulsen, and Michael Tanski, as well as District representatives.



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

Results and Discussion

Habitat quality was essentially identical in the study area, as both sites received scores of 73. An abundance of favorable habitat was present, consisting mostly of aquatic macrophytes (40%), undercut banks and roots (10%), and snags (10%). Water velocity was adequate, and the banks were relatively stable with good riparian zone vegetation quality. The majority of surrounding land at both stations was forested, but a sizable amount (40% to 45%) is used for commercial and industrial purposes. One major difference between the sampling sites was the presence of a large marina adjacent to the test site, as well as the highway 44 bridge. While the test site was subject to the potential influences from these sources (*e.g.*, petroleum contamination), the reference site was not. Physical/chemical measurements at the two study sites were nearly identical. Both sites were circum-neutral in pH (7.3 SU's), and specific conductance was 900 and 890 µmhos/cm at reference and test sites, respectively. Dissolved oxygen was similar at the two study sites as well, 6.3 mg/L at the reference site and 6.5 mg/L at the test site (Appendix).

Analysis for organic constituents revealed the presence of atrazine, at 0.77 µg/L. The metals found in concentrations exceeding the practical quantitation limit (PQL) were iron (26 µg/L) and zinc (50 µg/L). Silver was found at 0.07 µg/L, which is below the PQL. No metals were present in excess of Class III water quality standards.

The sample of final effluent was not toxic to the invertebrate, *Ceriodaphnia dubia*, or to the fish, *Notropis leedsi*. No mortality occurred during the 48 hour bioassays (Appendix).

Nutrients were not particularly elevated in the effluent, with levels of ortho-phosphate of 0.18 mg/L, total phosphorus of 0.22 mg/L, ammonia of 0.06 mg/L, nitrate-nitrite of 2.6 mg/L, and TKN of 0.92 mg/L. The test site nutrient concentrations were very similar to those found at the reference site, and mostly below the average concentrations for Florida streams (see table of Typical Water Quality Values in Appendix). For example, total phosphorus (0.09 mg/L and 0.08 mg/L at reference and test sites, respectively) was lower than 63%-65% of other Florida stream systems, and ortho-phosphate was below the practical quantitation limit. Despite the somewhat elevated effluent nitrate-nitrite value, bioavailable forms of nitrogen (NH_3 and NO_2/NO_3) were also below the 50th percentile at both receiving water sites (see Chemistry summary table). TKN (1.1 mg/L at both sites)

was slightly higher than typical stream systems.

Although the algal growth potential (AGP) was very high in the effluent (99.9 mg dry wt/L), the test site AGP (5.2 mg dry wt/L) was actually slightly lower than the reference site AGP (6.5 mg dry wt/L). AGP at both stations was slightly above the "problem threshold" of 5 mg dry wt/L (Raschke and Schultz 1987).

Benthic macroinvertebrate communities appeared moderately degraded at the test site in both dip net sweeps and Hester-Dendy samples. 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, unless the test sites are better than the reference site. Complete taxa lists appear in the Appendix.

Taxa richness at the test site decreased by 19% and by 38%, compared to the reference site, in dip net sweeps and Hester-Dendy samplers, respectively. Florida Index followed a similar trend, dropping from 9 to 5 (sweep samples) and from 14 to 6 (Hester-Dendys). Shannon-Weaver diversity was 20.6% lower at the test site. Dipterans (*e.g., Polypedilum halterale* grp. and *Dicrotendipes simpsoni*) were more abundant at the reference site, while amphipods, particularly *Gammarus* sp. and *Hyalella azteca*, were more dominant at the test site. This shift in community structure was responsible for the high dissimilarity shown by the QSI for % composition. Because of the additional potential sources of pollution from the marina and highway, it is difficult to establish the contribution of the DeLand effluent in causing the observed changes in benthic communities.

Conversely, no differences in phytoplankton community structure were evident when comparing the reference site to the test site. Twenty-one taxa were identified from each station. Diatoms were dominant at both study areas (mainly *Synedra* sp.), followed by colonial blue-green algae. The Quantitative Stability Index for percent composition (95.4%) further demonstrates the extreme similarity of phytoplankton communities.

Conclusions

The sample of final effluent was not toxic to the invertebrate, *Ceriodaphnia dubia*, or to the fish, *Notropis leedsi*. No mortality occurred during the 48 hour bioassays.

Analysis for organic constituents revealed the presence of atrazine, at 0.77 µg/L. No metals were found in concentrations which exceed Class III water quality standards.

Nutrients were not particularly high in the effluent, and very little variation in nutrient concentrations was noted between the reference and test sites. Total phosphorus, ammonia, and nitrate-nitrite were less than the average values for Florida streams at both receiving water stations. Ortho-phosphate was below the practical quantitation limit. TKN at both study sites was only slightly above average.

Although the algal growth potential (AGP) was very high in the effluent, the test site AGP was actually slightly lower than the reference site AGP. AGP at both stations was slightly above the "problem threshold" of 5 mg dry wt/L.

Benthic macroinvertebrate communities were moderately degraded at the test site, demonstrated by decreases in taxa richness, Florida Index, and Shannon-Weaver diversity. Because of the additional potential sources of pollution from the marina and highway at the test site, it is difficult to establish the contribution of the DeLand effluent in causing the observed changes in benthic communities.

Phytoplankton populations were virtually identical at the two stations, in terms of taxa richness, density, and species composition.

Literature Cited

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 pp.

Chemistry summary table for

Deland Regional WWTP	Effluent	Reference Site	Test Site
Organic Constituents (ug/L)			
Atrazine	0.77		
Metals (ug/L)			
Aluminum	100 U		
Antimony	15 U		
Arsenic	20 U		
Cadmium	0.22 T	Blank contaminated	
Copper	5 U		
Chromium	10 U		
Iron	26 A		
Lead	15 U		
Mercury	0.1 U		
Nickel	5 U		
Selenium	30 U		
Silver	0.07 T		
Zinc	50 A		
Nutrients (mg/L)			
Ortho-phosphate	0.18	0.032 T	0.031 T
Total phosphorus	0.22	0.088	0.080
Ammonia	0.060	0.070 A	0.061
Nitrate-N	2.6		
Nitrate+Nitrite	2.6	0.077	0.087
TKN	0.92	1.1	1.1
Other Parameters			
Habitat Assessment		73	73
D.O. (mg/L)		6.3	6.5
pH (SU's)	7.5	7.3	7.3
Conductivity (µmhos/cm)	790	900	890
Temperature (°C)		21.3	21.2
Hardness (mg CaCO3)	157.7		
Algal Growth Potential (mg dry wt/L)	99.9	6.5	5.2
Bioassay Fish	Not toxic		
Bioassay Invertebrate	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

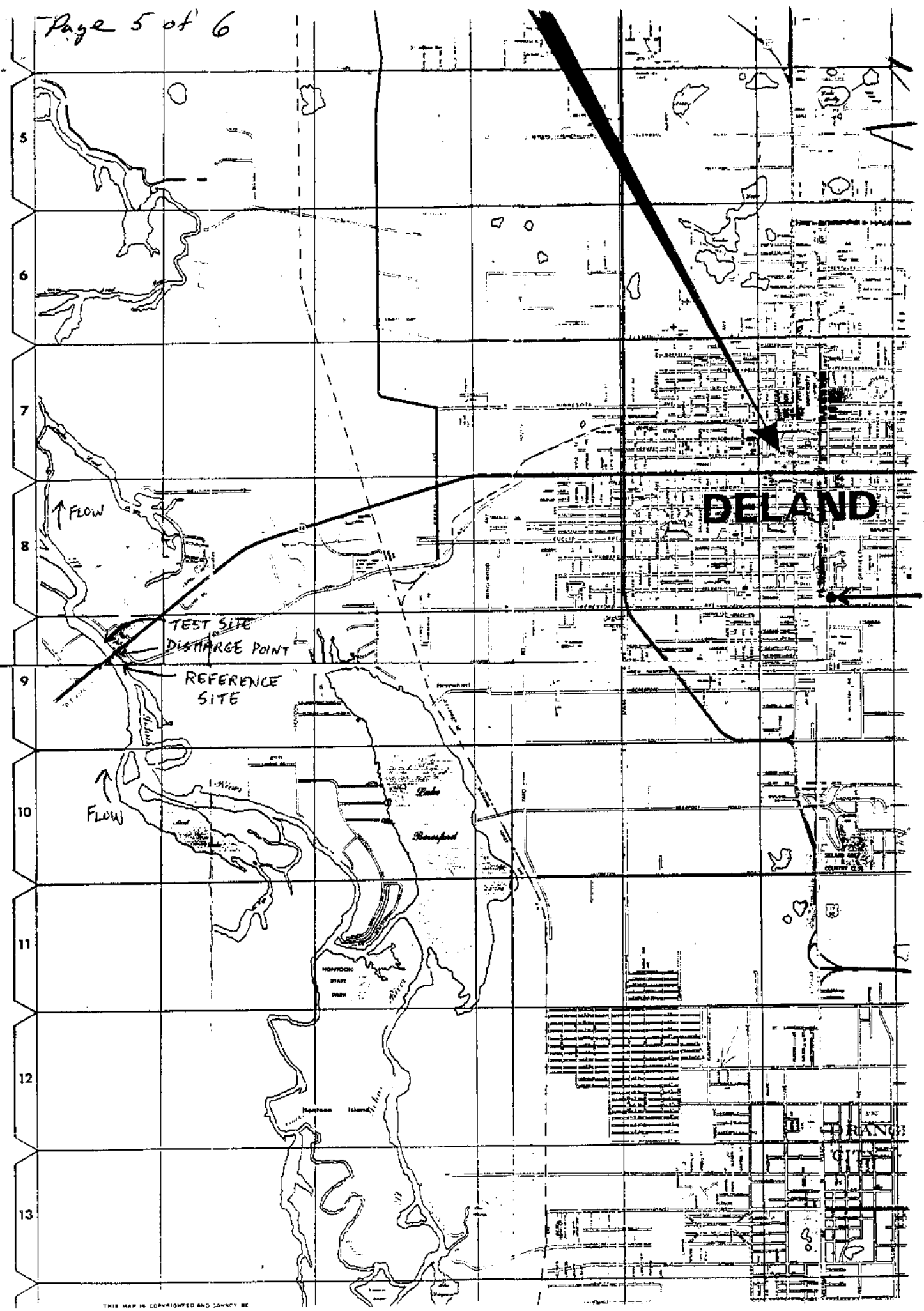
Typical Values for Selected Parameters in Florida Waters

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

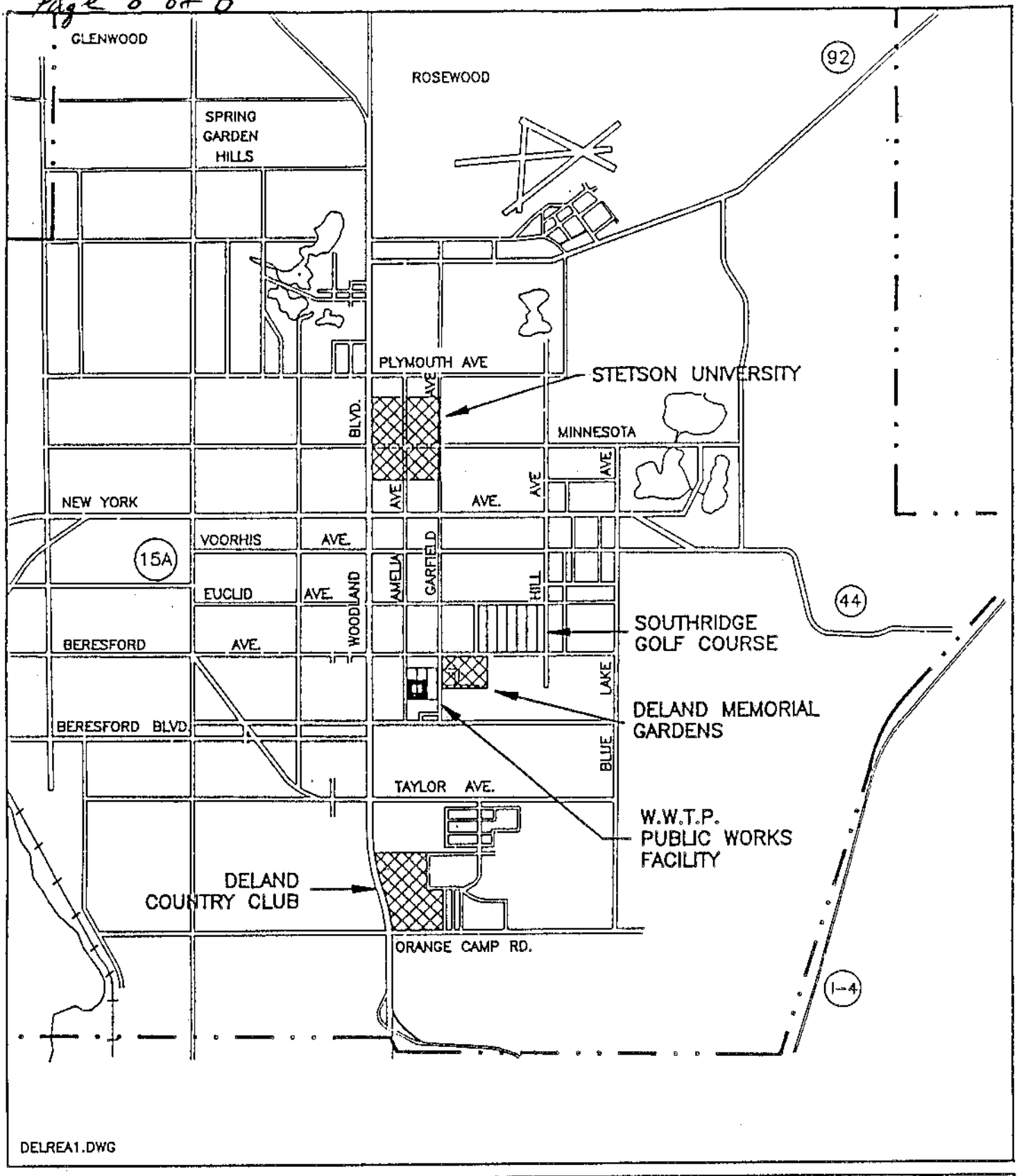
Percentile Distribution

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



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THE CITY OF DELAND

RECLAIMED WATER SERVICE AREAS

EXISTING

PROPOSED

FIGURE 1

DELAND 1882 FLORIDA

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

Facility Name: DeLand Regional W.W.T.P.		Date Summary Prepared: 2/23/93.
Location (attach detailed map): see attached maps	County: Volusia	District: Central
Federal Permit # FL0020303 and expiration date: 6-30-95	State GMS # and 3064/M06162 State expiration date: 11-27-97 0064-218880	Facility Type: Industrial (Municipal) Federal Agricultural Other (list):

Function of facility:
Domestic Wastewater Treatment Plant

Description of treatment process:
A 4.0 MGD design capacity activated sludge "carousel" wastewater treatment facility with chemical feed facilities and tertiary filtration. Disinfected/dechlorinated water is discharged to surface water via outfall pipe to the St. Johns River. Also, reclaimed water is discharged to ground water at public access irrigation sites as shown on the attached reuse service area map. Anticipated reuse capacity of these sites is 3.15 MGD.

Receiving waters: St. Johns River	Classification: I II (III)	
Design Flow: 4.0 MGD	Mean Flow: 2.281 MGD from Jan thru 12-92	Flow during survey: To be determined

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 (if necessary, attach relevant paperwork):

Parameter	Limit (units)
see attached sheet	

Describe special permit conditions and permit modifications:
New operating permit (0064-218880) issued on 12/4/92 included limits on TSS & $CBOD_5$ of 30 mg/L. Also, toxicity testing begins within 60 days of effective date of this permit. The discharge to public access irrigation sites requires high-level disinfection. Construction permit # DC64-290215, issued 10/9/91, also required high-level disinfection for public access irrigation. Permit (DC64-300315) was cleared for use on 1/2/92.

DeLand Regional
(Facility)

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

Description of permitted outfall(s):
A force main directly from the plant to the St. Johns River near the Highway 44 bridge west of DeLand.

List permit violations (from MOR data or other source) and plant upsets that occurred within past year:
On 12/91 Total Phosphorous as P was 1.9 mg/L. This violation has already been addressed by the permittee's letter dated 1/29/92 & EPA letter dated 2/27/92.
Total Nitrogen was not being reported weekly & turbidity daily on the MORs. This has already been addressed by Department's letter dated 9/4/92 & has been corrected on the MORs.
No plant upsets noted for the last 12 months.

Describe previous impact bioassessments, WQBEL's, and previous or current enforcement actions:
No previous bioassessments by DER. EPA does require toxicity testing in the NPDES permit.
District did a Level I WQBEL in March 1989 based upon the current operating data and the St. Johns River water quality data. These effluent limits became effective February 16, 1990.
No previous or pending enforcement actions.

Discuss comparability of MOR results to past DER results and whether there are trends (improving, declining) in the data set:
Comparing the MORs for the periods 1/92 – 12/92 vs 1/91 – 12/91 reveals the following:
1. CBOD annual average was 143 lbs/day in 1992 vs 212 lbs/day in 1991.
2. Phosphorous as P annual average was .664 mg/L in 1992 vs .938 in 1991.
As noted above, the quality of effluent has improved.

Additional information:
Operating Permit Number 0064-218880 for DeLand Regional was issued 12/9/92. This permit also allows discharge to ground water at public access irrigation sites at an anticipated reuse capacity of 3.15 MGD, therefore, it will substantially reduce the discharge to the St. Johns River.

Staff contributing to this review (signature):
DR. Philip N. Kane (Biologist)
Gary L. Miller (Inspector)
Al Carlo (Engineer)
Christianne Fluaro, P.E. (Prog Mgr)
( )
( )

DeLand Regional

STATE EFFLUENT LIMITS TO ST JOHNS RIVER

Parameter	Limit (units)
UOD	700 lbs/day *
Total Phosphorous as P	1.0 mg/L *
Total chlorine residual before dechlorination	≥0.5 mg/L
Total chlorine residual after dechlorination	0.01 mg/L ***
$CBOD_5$	30 mg/L *
TSS	30 mg/L *
pH	6-8.5 Standard Units
Fecal Coliform	200 values per 100mL **

* Maximum monthly average

** Annual average

*** Daily maximum

UPSTREAM

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

SUBMITTING AGENCY CODE: 3D SUBMITTING AGENCY NAME: FDER CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 04/05/93	RECEIVING BODY OF WATER: ST. JOHN'S RIVER

REMARKS:	LOCATION:	FIELD ID/NAME:
UPSTREAM	CITY OF DELAND STP 1032 S. AMELIA AVE. DELAND, FLORIDA	DELAND STP

Habitat Parameter score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 26	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 16	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 12	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 6	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 8	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		TOTAL SCORE
5	Add **5 points** if cross-sectional area of flow is estimated to be greater than one square meter during periods of normal flow.	73

COMMENTS:

ANALYSIS DATE:	ANALYST:	SIGNATURE:
04/05/93	P. KANE	Philip N. Kane

MT FW QL=C SWEEP

DOWNSTREAM

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

SUBMITTING AGENCY CODE: 30 SUBMITTING AGENCY NAME: FDER CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 04/05/93	RECEIVING BODY OF WATER: ST. JOHN'S RIVER

REMARKS:	LOCATION:	FIELD ID/NAME:
DOWNSTREAM	CITY OF DELAND STP 1032 S. AMELIA AVE. DELAND, FLORIDA	DELAND STP

Habitat Parameter score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 26	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 16	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 12	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 6	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 8	Over 80% of streambank surfaces consist of native plants, classified as: bottomland hardwoods, understory shrubs, or non-woody macrophytes. **9-10 points**	50% to 80% of riparian zone is vegetated, but one class of plants is not represented. **6-8 points**	25% to 50% of riparian zone is vegetated, but one or two classes of plants are not represented. **3-5 points**	Less than 25% of streambank surfaces are vegetated. Poor plant community (e.g. grass monoculture) present. **0-2 points**

Adjustments 5	Add **5 points** if cross-sectional area of flow is estimated to be greater than one square meter during periods of normal flow.	TOTAL SCORE 73

COMMENTS:

ANALYSIS DATE:	ANALYST:	SIGNATURE:
04/05/93	P. KANE	Philip N. Kane

DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 4)

SUBMITTING AGENCY CODE: 30 / SUBMITTING AGENCY NAME: FDER CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/DY): 04/05/93	TIME 1238	RECEIVING BODY OF WATER: ST. JOHN'S RIVER

REMARKS:	LOCATION: CITY OF DELAND STP 1032 S. AMELIA AVE. DELAND, FLORIDA	FIELD ID/NAME: DELAND STP
UPSTREAM		

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
60				30	10	

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):

~~200' UP STREAM~~ PR MARINA

Estimated System Width (range, m): 100 m	Estimated System Depth (range, m): 0 - 3 m	Impounded N/A ☐ yes
High Water Mark (m above bed): 1 m.	Velocity (range, m/s): 0.02 PR	Channelized ☐

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

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	10	5	DIP NET	Riffles			~~DIP NET~~
Leaf Packs				Sand			
Aquatic Vegetation	40	5	SWEEP	Mud/Muck/Silt	40	5	SWEEP
Rock or Shell Rubble				Benthic leaf mats			
Undercut Banks/Roots	10	5	DIP NET	Other:			

WATER QUALITY

	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (~~µmho/cm~~):			Secchi (m):
Top	0.5	21.30	7.30	6.30	700 uS			0.5
Mid-depth								
Bottom								

System Type: Stream: ☒ (Sand Bottomed / Sand Bot w/ Spring / Swamp & Bog / Calcareous / Alluvial / Misc.) Lake: ☐ Wetland: ☐ Estuary: ☐ Other: ☐ ST JOHNS RIVER

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: OVERCAST

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

SAMPLING TEAM: KANE, KENT	SIGNATURE: Philip N. Kane	DATE: 04/05/93

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 4)

SUBMITTING AGENCY CODE: 30 / SUBMITTING AGENCY NAME: FDER CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/DY): 04/05/93	TIME	RECEIVING BODY OF WATER: ST. JOHN'S RIVER

REMARKS:	LOCATION:	FIELD ID/NAME:
DOWNSTREAM	CITY OF DELAND STP 1032 S. AMELIA AVE. DELAND, FLORIDA	DELAND STP

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
55				35	10	

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): ~~¼ MILE UPSTREAM~~ PK DELAND WWTP (BRIDGE US 44 TWO MARINAS)

Estimated System Width (range, m): 75-100	Estimated System Depth (range, m): 0-4	Impounded yes N/A ☐
High Water Mark (m above ~~bed~~ SURF): 1 mtr.	Velocity (range, m/s): 0.2	Channelized ☐

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

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	10	5	NET	Riffles			
Leaf Packs				Sand			
Aquatic Vegetation	40	5	NET	Mud/Muck/Silt	40	5	NET
Rock or Shell Rubble				Benthic leaf mats			
Undercut Banks/Roots	10	5	NET	Other:			

WATER QUALITY

	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmhos/cm):			Secchi (m):
Top	0.5	21.16	7.26	6.46	890			0.5
Mid-depth								
Bottom								

System Type : Stream: ☒ (Sand Bottomed / Sand Bot w/ Spring / Swamp & Bog / Calcareous / Alluvial / Misc.) Lake: ☐ Wetland: ☐ Estuary: ☐ Other: ☐ SPRINGS RIVER

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:
90% OVERCAST
0° 0-10K

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

SAMPLING TEAM:	SIGNATURE:	DATE:
KANE, KENT	Philip N. Kane	04/05/93

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: Deland WWTP
Location:
County: Volusia
Contact/District: Phillip Kane / Central
NPDES Permit #: FL0020303 Outfall #:
5/2/93 93 APR 06 16

Sample Collection: Date 4/5/93 Time 10:15
Test Beginning: Date 4/6/93 Time 12:30
Test Ending: Date 4/8/93 Time 13:00
Organism Batch #: 15 Diluent Batch #: 6
Organism Age: < 24hrs
Test Organism: Ceriodaphnia Dubia

Test Type: Screening | Definitive
Static | Static Renewal | Flow-through

Test Number: 1 of 2
Remarks:

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm	
0 hr	7.0@7.0	22.1@22.2	8.5@23.2	969@1,000	23.1
	9.0@9.0			9800@10,000	
24 hr	7.0@7.0	22.3@22.4	8.5@23.2	980@1,000	23.4
	9.0@9.0			9900@10,000	
48 hr	7.0@7.0	23.0@23.1	8.5@23.2	975@1,000	23.5
	9.0@9.0			9800@10,000	

Conc.	Chamber #	Number Live 0	24	48	pH 0	24	48	Temperature (°C) 0	24	48	D.O. (mg/L) 0	24	48	Cond. (mmhos/cm) Cond. (µmhos/cm) 0	24	48
Control	A	5	5	5	8.5		8.3	22.8		23.6	7.9		8.3	160		180
Control	B	5	5	5			8.4						8.3			170
Control	C	5	5	5			8.4						8.3			170
Control	D	5	5	5			8.4						8.4			175
100%	A	5	5	5	~~7.5~~		8.5	23.5		23.6	7.7		8.3	780		740
100%	B	5	5	5			8.5						8.3			770
100%	C	5	5	5			8.5						8.3			790
100%	D	5	5	5			8.5						8.3			780
				*	7.6 recorded wrong # TR											
Measured/Loaded by:		MF	TM	TR	TM	TR	TM	TM	TR	TM	TM	TR	TM	TM	TR	TM
Recorded by:		TM	TR	TR	TR	TM	TR	TR	TM	TR	TR	TM	TR	TR	TM	TR

Investigators' Signatures
Tobin Rader
Tina Mikulski

Reviewer

form updated 10/20/92

	Salt Water/ Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2:			2.97		KANE
Lab Total Residual Cl2:	<0.03	<0.03	.08	DR-100	TR
Alkalinity:	125	70	123	Hach	TR
Hardness:	125	80	160	Hach	TR
Total Ammonia:	<0.017	<0.017	<0.017	Orion	MF

Cl2 Blank: _____ Ammonia Meter Slope: -55.4 Ammonia Blank: <0.017 Sample Salinity: 0 ppt

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: Deland WWTP
Location:
County: Volusia
Contact/District: Phillip Kone/Central
NPDES Permit #: FL0020303 53393 93APR 06 85 10 Mt 4/5/93
Outfall #:

Sample Collection: Date 4/5/93 Time 10:15
Test Beginning: Date 4/6/93 Time 12:30
Test Ending: Date Time
Organism Batch #: 15 **Diluent Batch #:** Well
Organism Age: 10 days
Test Organism: Notropis leedsi

Test Type: Screening | Definitive
Static | Static Renewal | Flow-through

Test Number: 2 of 2
Remarks:

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
0 hr	7.0 @ 7.0 9.0 @ 9.0	22.1 @ 22.2	8.5 @ 23.2	969 @ 1,000 9800 @ 10,000 23.3
24 hr	7.0 @ 7.0 9.0 @ 9.0	22.3 @ 22.4	8.5 @ 23.2	980 @ 1,000 9900 @ 10,000 23.4
48 hr	7.0 @ 7.0 9.0 @ 9.0	23.0 @ 23.1	8.5 @ 23.2	975 @ 1,000 9800 @ 10,000 23.5

Conc.	Chamber #	Number Live 0	Number Live 24	Number Live 48	pH 0	pH 24	pH 48	Temperature (°C) 0	Temperature (°C) 24	Temperature (°C) 48	D.O. (mg/L) 0	D.O. (mg/L) 24	D.O. (mg/L) 48	Cond. (mmhos/cm) or Cond. (µmhos/cm) 0	Cond. 24	Cond. 48
Control	76	5	5	5	7.9	8.3	8.4	22.6	22.4	22.2	7.9	8.3	8.4	240	240	240
Control	22	5	5	5	7.9	8.3	8.4				7.9	8.3	8.4	240	240	240
100%	86	5	5	5	7.5	8.1	8.3	23.2	22.4	22.1	7.9	8.2	8.5	790	780	785
100%	147	5	5	5	7.5	8.1	8.3				7.9	8.1	8.5	790	780	785
Measured/Loaded by:		MF	TM	TM	TM	TR	TM	TM	TR	TM	TM	TR	TM	TM	TR	TM
Recorded by:		TM	TR	TR	TR	TM	TR	TR	TM	TR	TR	TM	TR	TR	TM	TR

Investigators' Signatures
Robin Rader
Randall Faircloth
Tina Mikulski

Reviewer

form updated 10/20/92

Water Quality Parameters	Salt Water/ Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2:			2.97		Kone
Lab Total Residual Cl2:	<0.03	<0.03	.08	DR-100	TR
Alkalinity:	125	70	123	Hach	TR
Hardness:	125	80	160	Hach	TR
Total Ammonia:	<0.017	<0.017	<0.017	Orion	MF

Cl_2 Blank: _____ Ammonia Meter Slope: -55.4 Ammonia Blank: <0.017 Sample Salinity: 0 ppt

Phytoplankton taxa list and densities (#/mL) for DeLand WWTP, collected via subsurface grabs in the St. Johns River, on 5 April, 1993.

	Reference Site	Test Site
Diatoms		
Achnanthes sp.	918	295
Cyclotella sp.	481	211
Melosira sp.	44	758
Nitzschia sp.	131	126
Synedra sp.	4767	4844
S. ulna	44	–
Unidentified pennate diatom	743	126
Chlorophyta		
Closterium sp.	–	42
Kirchneriella sp.	44	126
Pediastrum sp.	88	84
Scenedesmus sp.	612	885
Tetraedron sp.	131	126
Tetraspora sp.	131	–
Tetrastrum sp.	–	126
Unknown chlorophyte flagellate	175	253
Cyanophyta		
Anabaena sp.	44	42
Anabaenopsis sp.	88	42
Chroococcus sp.	918	885
Dactylococcopsis sp.	219	379
Lyngbya contorta	306	337
L. limnetica	175	211
Merismopedia sp.	262	126
Microcystis sp.	1530	1432
Total	11,851	11,456

Benthic macroinvertebrate taxa list for DeLand WWTP, collected via 20 discrete dip net sweeps in the St. Johns River, on 5 April, 1993.

	Reference Site	Test Site
Acarina		
Arrenurus sp.	14	196
Piona sp.	–	28
Diptera		
Chironomus sp.	–	56
Cladotanytarsus sp.	70	–
Cricotopus bicinctus	14	–
C. (Isocladius) sp.	14	–
Dicrotendipes simpsoni	–	28
Palpomyia / Bezzia grp..	56	–
Paralauterborniella nigrohalteralis	14	–
Polypedilum halterale grp.	322	168
P. illinoense	168	28
Procladius sp.	–	28
Stenochironomus sp.	14	–
Tanytarsus sp. G Epler	28	–
Xenochironomus xenolabis	14	–
Zavreliella marmorata	–	28
Ephemeroptera		
Caenis sp.	14	–
Gastropoda		
Amnicola dalli johnsoni	14	–
Littoridinops sp. ?	28	28
Spilochlamys sp.	–	28
Viviparus georgianus	–	56
Hemiptera		
Mesovelia sp.	14	–
Neoplea sp.	70	28
Undetermined belostomatid	14	–
Hirudinea		
Helobdella triserialis	–	28
Lepidoptera		
Undetermined lepidopteran	–	28
Malacostraca		
Amphipoda		
Hyalella azteca	770	1484
Decapoda		
Palaemonetes paludosus	–	56
Isopoda		
Asellus sp.	–	56
Cassidinidea ovalis	14	–

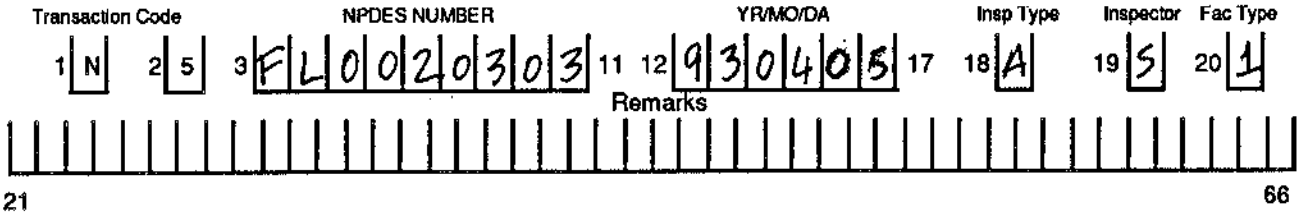
Neuroptera		
Sisyra sp.	14	–
Odonata		
Enallagma cardenium	70	–
E. pollutum	–	28
Ischnura sp.	126	28
Telebasis byersi	14	–
Oligochaeta		
Dero trifida	–	28
Limnodrilus hoffmeisteri	42	140
Nais communis	28	–
Slavina appendiculata	14	–
Spirosperma ferox	–	28
Trichoptera		
Hydropsyche sp.	14	–
Total	1988	2604

Benthic macroinvertebrate taxa list for DeLand WWTP, collected via Hester-Dendy artificial substrates in the St. Johns River, on 4 May, 1993. Densities, in number/m^2, represent the mean of three replicates.

	Reference Site	Test Site
Acarina		
Undetermined oribatid	–	1.0
Amphipoda		
Corophium lacustre ?	5.1	19.2
Gammarus sp.	10.1	51.5
Hyalella azteca	3.0	2.0
Branchiobdellida		
Undetermined branchiobdellid	–	5.1
Decapoda		
Rhithropanopeus harrisii	1.0	1.0
Diptera		
Ablabesmyia mallochi	2.0	–
A. rhamphe grp.	22.2	5.1
Cladotanytarsus sp.	12.1	–
Cricotopus bicinctus	1.0	–
Dicrotendipes simpsoni	54.6	16.2
D. prob. *tritomus*	–	1.0
Endochironomus nigricans	2.0	–
Glyptotendipes sp.	1.0	–
Kiefferulus sp.	–	1.0
Nanocladius sp.	–	1.0
N. distinctus	1.0	–
Palpomyia/Bezzia grp.	1.0	–
Parachironomus carinatus	2.0	–
Polypedilum convictum grp.	2.0	–
P. *halterale* grp.	3.0	1.0
P. *illinoense*	30.3	–
P. *scalaenum* grp.	2.0	1.0
Stenochironomus sp.	1.0	1.0
Tanytarsus sp. C Epler	1.0	–
Tanytarsus sp. G Epler	1.0	–
Tanytarsus sp. R Epler	4.0	–
Tanytarsus sp. T Epler	4.0	–
Tribelos fuscicorne	13.1	5.1
Xenochironomus xenolabis	1.0	–
Undetermined dipteran pupa	4.0	1.0
Ephemeroptera		
Caenis sp.	6.1	–
Stenacron floridense	2.0	–
S. interpunctatum	–	1.0

Gastropoda		
Undetermined ancylid	–	1.0
Littoridinops sp. ?	–	1.0
Hirudinea		
Helobdella fusca	1.0	–
Odonata		
Ischnura ramburii	1.0	–
Oligochaeta		
Nais communis	1.0	–
Slavina appendiculata	4.0	5.1
Trichoptera		
Hydropsyche sp.	1.0	–
Neureclipsis sp.	–	6.1
Total	200.6	127.4

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)

