Florida
Department of Environmental Protection

Biological Assessment of

City of Green Cove Springs

Wastewater Treatment Plant

Clay County

NPDES #FL0020915

Sampled October 1993

May 1994

Biology Section
Division of Technical Services

Department of Environmental Protection
Results of Fifth Year Inspections

Discharger: City of Green Cove Springs WWTP
County: Clay
NPDES Number: FL0020915
State Permit Expiration Date: 16 March 1997

Toxics Sampling Inspection (**XSI**)

Date Sampled: 7 October 1993

Results: No organic constituents were detected in the effluent, and none of the metals in the effluent exceeded Class III standards.

Compliance Biomonitoring Inspection (**CBI**)

Date Sampled: 7 October 1993

Results: The full strength effluent sample was not acutely toxic to the fish, *Cyprinella leedsi,* or to the water flea, *Ceriodaphnia dubia.*

Impact Bioassessment Inspection (**IBI**)

Date Sampled: 7 October 1993

Results: Taxa richness and Florida Index scores suggested that the test sites were similar to, or in the case of test site 1, better than the reference. The Shannon-Weaver diversity index decreased by 27.8% at test site 2, suggesting at least a moderate disturbance in the vicinity of the outfall. Further, test site 2 was dominated by *Limnodrilus hoffmeisteri* (57.2% of the total population), a well known pollution tolerant organism. Periphyton communities did not appear adversely affected by the discharge, with the exception of an increase in the % dominant taxon and a reduction in taxa richness at test site 2. It should be noted that phytoplankton communities collected during this study were typical of eutrophic waters. For example, between 44.5% and 69.8% of the phytoplankton populations consisted of cyanophytes at all sites. Additionally, phytoplankton chlorophyll *a* levels were quite elevated at the reference site and test site 1, greater than 89% and 95%, respectively, of the values found in other Florida streams.

Water Quality Inspection (**WQI**)

Date Sampled: 7 October 1993

Results: Effluent nutrient levels were moderately high compared to receiving water stations, and the unionized ammonia level violated ambient standards, Rule 17-302.530(3) FAC. Nutrients were generally lower at the test sites than at the reference site, where OPO_4 and NH_3 values exceeded those found in approximately 65% and 95%, respectively, of other Florida streams. It is possible that either the hydrology of the area (which is tidally influenced) enables the nutrient-rich effluent plume to reach the reference site, or the area is subject to non-point enrichment sources. Results of algal growth potential tests indicate that water from all three sites was above the eutrophication problem threshold. Fecal and total coliforms were sampled on two occasions. During the 13 September 1993 sampling, fecal coliform violations were noted at the reference site (Rule 17-302.530(6) FAC). During the 4 October 1993 sampling event, the standards for fecal and total coliforms were violated at both test sites (Rules 17-302.530(6) and 17-302.530(7) FAC). The effluent was not sampled during the October trip, making it difficult to determine if the discharge contributed to the problems seen at the receiving water stations.

Introduction

The City of Green Cove Springs Wastewater Treatment Plant is located on Harbor Road, Green Cove Springs, in Clay County. This municipal facility, with a design capacity of 1.25 MGD, treats domestic waste via contact stabilization (activated sludge) using two parallel treatment systems. The effluent is chlorinated (and subsequently dechlorinated) and discharged to the St. Johns River. At the time of this investigation, the facility was discharging at a rate of 0.734 MGD.

Permit limits are as follows: flow (restricted to 0.95 MGD annual average), BOD and TSS (20 mg/L annual average, 30 mg/L monthly average, 45 mg/L weekly average, and 60 mg/L one time maximum), pH (6.0 to 8.5 S.U.'s), fecal coliform bacteria (200 organisms/100 mL annual average), and chlorine residual (minimum of 0.5 mg/L for disinfection, maximum of 0.01 mg/L at discharge). Additionally, the facility is required to perform toxicity bioassays of the effluent, as well as conduct water quality sampling of the receiving waters on a quarterly basis (see Appendix).

This facility has had the following deficiencies in the past few years: exceeding the fecal coliform permit limit seven times, not submitting monitoring records on time, incorrect calibration of residual chlorine equipment, and problems with the flow recorder (see Facility Summary in Appendix). There have been no major problems associated with the facility, and deficiencies noted during inspections have generally been adequately addressed.

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 approximately 0.5 mile upstream of the Green Cove Springs discharge in Governor's Creek near the facility's monitoring site 4) and two test sites (at the confluence of Governor's Creek and the St. Johns River, approximately 100 yards on either side of the discharge near monitoring site 1) (see maps in Appendix). A habitat assessment was performed *in situ* to establish comparability between sites. Supplemental physical/chemical data were also collected on the effluent and study sites. Acute screening toxicity bioassays, using *Ceriodaphnia dubia* and *Cyprinella 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 with 3 petite Ponar dredge samples per station (Ross 1990). Periphyton was sampled at both reference and test sites by incubating glass microscope slides in a standard periphytometer for 28 days (Ross 1990). Phytoplankton was sampled at both reference and test sites via subsurface grabs. Chlorophyll *a* was also determined for periphyton and phytoplankton

communities (Ross 1990). Bacterial populations were analyzed for total and fecal coliforms following the methods of APHA (1989). Algal Growth Potential tests, using *Selenastrum capricornutum* as the test organism, followed Miller *et al.* (1978).

Major characteristics of community structure of control and test sites.

	Reference Site	Test Site 1	Test Site 2
Macroinvertebrate Ponar			
Number of Taxa	25	76	30
Florida Index	5	10	6
% Contribution of Dominant Taxon	30.5	33.7	57.2
Shannon-Weaver Diversity	3.6	4.2	2.6
% Oligochaeta	28.2	48.2	73.5
% Diptera	69.4	22.2	18.2
% Pelecypoda	0	11.4	3.1
% Amphipoda	7.2	0	0
% Gastropoda	0	3.9	0.3
% Polychaeta	0	1.7	0.5
% Trichoptera	0	1.5	0.5
% Others	2.4	7.9	0
% Predators/ Carnivores	27.5	5.6	1.4
% Deposit feeders (above surface)/Collector-Gatherers	26	13.9	6.1
% Deposit feeders (below surface)	41.5	53.6	80.5
% Suspension feeders/ Collector-Filterers	0.2	16.7	11
% Scavengers	0	1.4	0
% Plant piercers	0	2.6	0
% Scrapers	1.7	4.2	0.4
% Shredders	3.1	2	6
% Parasites	0	0.1	0
Phytoplankton Algae			
Number of Taxa	31	22	22
% Contribution of Dominant Taxon	33.5	30.9	32.5
Chlorophyll a (ug/L)	27.03	82.81	10.42
Diatom/Blue-green Abundance Ratio	0.12	0.51	0.29
% Blue-green	69.8	44.5	62.4
% Green	16.1	8.8	11.8
% Diatoms	9.3	46.7	25.8
Periphyton Algae			
Number of Taxa	58	48	33
% Contribution of Dominant Taxon	13.8	14.8	22.2
Chlorophyll a (mg/sq m)	59.45	14.50	14.75
Diatom/Blue-green Abundance Ratio	0.82	0.87	0.83
% Blue-green	16.6	12.6	16.7
% Green	2.9	1.1	1.1
% Diatoms	74.1	85.9	81.7
Algal Growth Potential (mg dry wt/L)	9.7	12.8	10.4

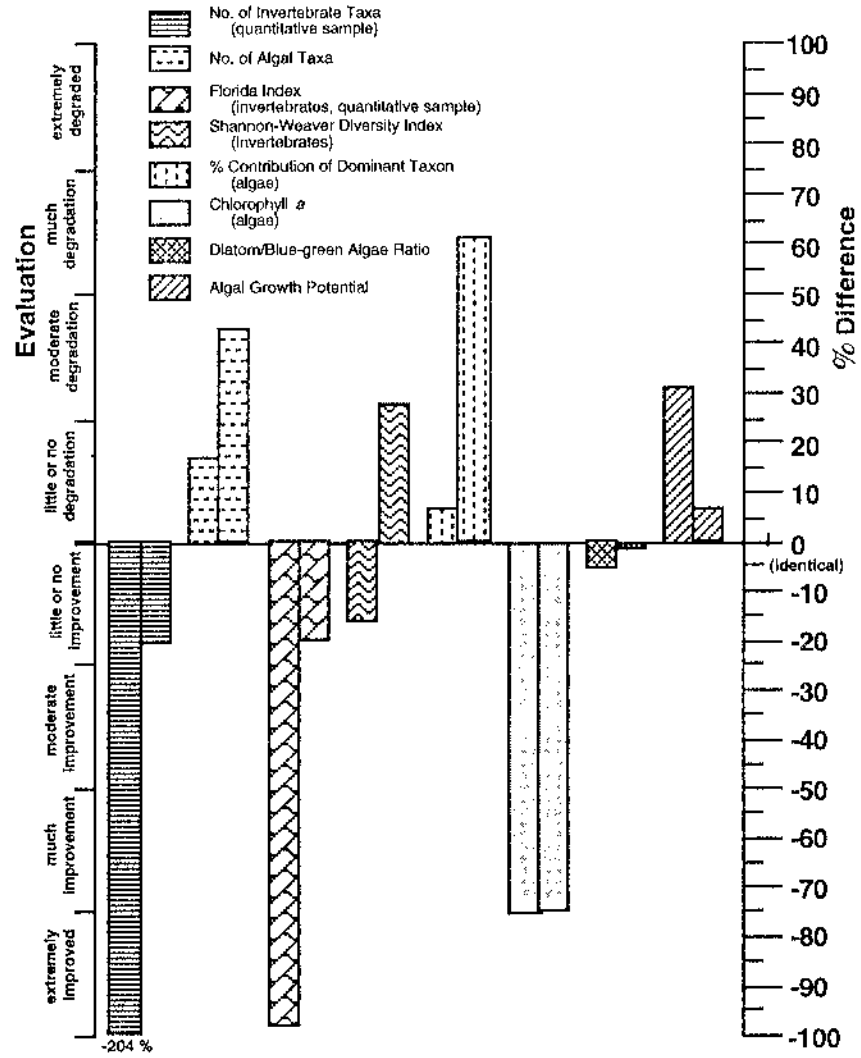
Explanation of Measurements of Community Health

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

For graphical purposes, the percent differences between the reference and test sites involving the number of taxa, the diversity index, Florida Index, and the diatom to blue-green algae ratio are mea-

sured 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: Scott Bulgrin, Lindy Payne, and Amy Kalmbacher (DEP Northeast District), Chris Barge, Lyn Burton, Marshall Faircloth, Russel Frydenborg, Christy LeDuc, Kathleen Lurding, Elizabeth Miller, Kim Pearce, Urania Quintana, Greg Wynn, and David Young (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.



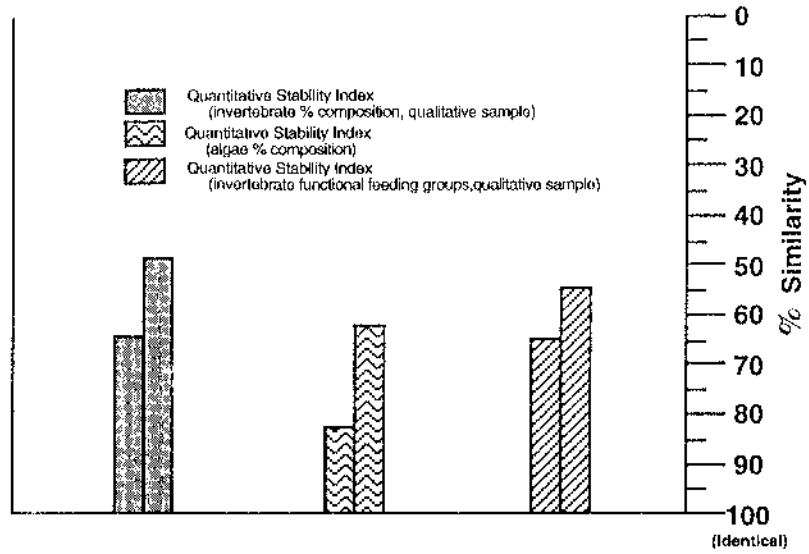
Effect of discharge on receiving water
(measured as difference between control and test sites).
(Left bar represents comparison between control site and test site 1; right bar represents comparison between control site and test site 2.)

Results and Discussion

This study took place in a cove of the St. Johns River, as well as in a tributary to that cove (see maps in Appendix). The St. Johns River is an unusual system, in that it originated as a coast-parallel lagoon, is low gradient, very wide, and flows from south to north (Appendix). Ten percent of the land near the reference site is used for residential purposes, but the majority of the land cover in the area consists of hammocks, hardwood swamps, and pine flatwoods. Residential, commercial, and recreational (boat ramp) uses were considerably higher at the two test sites. All study sites were similar in terms of habitat quality scores (with 77 points at the reference site and 68 points at both test sites). Most field parameters were similar between the reference and test sites (*e.g.*, conductivity was between 440 µmhos/cm and 510 µmhos/cm, mid-depth dissolved oxygen ranged from 7.5 mg/L to 8.2 mg/L, mid-depth temperature ranged from 29 °C to 31 °C, and pH ranged from 7.4 to 7.9 S.U.'s)

The full strength effluent sample was not acutely toxic to the fish, *Cyprinella leedsi*. While 10% of the *Ceriodaphnia dubia* exposed to full strength effluent died, this is not enough mortality to indicate a violation.

No organic constituents were detected in the effluent, although the following metals were found above quantitation limits: aluminum (152 µg/L), iron (76.4 µg/L), copper (6 µg/L), and zinc (29 µg/L). At a hardness of 107.3 mg/L (calculated from the calcium and magnesium concentrations in the efflu-



Effect of discharge on receiving water
(measured as similarity between control and test sites).
(Left bar represents comparison between control site and test site 1; right bar represents comparison between control site and test site 2.)

ent), the Class III copper standard is 12.6 µg/L and that for zinc is 112.5 µg/L. Therefore, none of the metals in the effluent exceeded ambient standards.

Effluent concentrations of ammonia (4.6 mg/L), nitrate-nitrite (2.6 mg/L), total phosphorus (1.2 mg/L), ortho-phosphate (0.87 mg/L), and TKN (6.0 mg/L) were elevated compared to receiving water stations. An unionized ammonia value of 0.04 mg/L was calculated using field measurements of pH and temperature. This is a violation of the Class III standard for predominantly freshwaters, Rule 17-302.530(3) FAC. Nutrients were generally higher at the reference site than at the test sites. For example, ortho-phosphate was 0.13 mg/L at the reference site, 0.084 mg/L at test site 1 and 0.048 mg/L at test site 2. While these test site concentrations were average or below average, ortho-phosphate at the reference site was higher than those values found in approximately 65% of other Florida streams (see Appendix). Similarly, reference site levels of ammonia (0.4 mg/L) and TKN (2.4 mg/L) were higher than those found in approximately 92% of other Florida streams, while test site concentrations of these compounds were fairly average. Either there are unidentified sources of nutrients affecting Governors Creek, or the hydrology of the area (which is tidally influenced) enables the nutrient-rich effluent plume to reach the reference site. In the latter scenario, greater dilution from the St. Johns River at the test sites would keep nutrient concentrations lower there than at the more protected Governors Creek station.

Results of algal growth potential (AGP) tests indicate that water from all three sites was above the eutrophication problem threshold. The AGP measured at the reference site (9.7 mg dry wt/L) was lower than those of the test sites (12.8 mg dry wt/L at test site 1 and 10.4 mg dry wt/L at test site 2). AGP of the effluent was 292.9 mg dry wt/L. AGP values above 5 mg dry wt/L are often associated with excessive macrophyte growth, algal blooms, lowered D.O., and fish kills (Raschke and Schultz 1987).

During the course of this study, fecal and total coliforms were sampled on two occasions. During the September 1993 sampling, coliform levels were well within Class III standards in the effluent and at the test sites, but fecal coliforms at the reference site were right at the legal limit of 800 organisms/100 mL. During the October 1993 sampling event, standards for fecal coliform bacteria (9000 organisms/100 mL at both test sites), as well as for total coliform bacteria (11,000 organisms/100 mL at test site 1 and 90,000 organisms/100 mL at test site 2) were violated (Rules 17-302.530(6) and 17-302.530(7) FAC). On this occasion, the coliforms at the reference site were within standards. The effluent was not sampled during the October trip, making it difficult to determine if the discharge contributed to the problems seen at the receiving water stations.

Some quantitative measures of macroinvertebrate community health suggested that the population at test site 1 was somewhat improved compared to the reference site community. However, diversity was decreased at test site 2. The figure on p. 3 indicates the degree of difference between the reference and test sites. Larger differences (that is, higher percentages) correspond with greater degrees of degradation. The figure on this page summarizes similarities between the sites. Smaller similarities (lower percentages) generally correspond with greater degradation.

In the Ponar samples, 25 taxa were collected at the reference site, increasing to 30 taxa at test site 2

and 76 taxa at test site 1. Similarly, the Florida Index was lowest (5) at the reference site, increasing to 6 at test site 2 and 10 at test site 1. These two parameters suggest that the test sites were similar to, or in the case of test site 1, better than the reference. The Shannon-Weaver diversity index was calculated to be 3.6 at the reference site. While diversity was higher (4.2) at test site 1, the 27.8% decrease in this index (down to 2.6) at test site 2, compared with the reference site, is analogous to a violation of the biological integrity criterion. However, since the rule states that Hester-Dendy samplers be used in predominately fresh waters, the reduction in Ponar sampler diversity does not represent a violation. The decrease in diversity does suggest at least a moderate disturbance in the vicinity of the outfall. Further, test site 2 was dominated by *Limnodrilus hoffmeisteri* (57.2% of the total population), a well known pollution tolerant organism. Functional feeding group relationships also appeared skewed at test site 2, in that 80.5% of the population consisted of below-surface deposit feeders (mostly oligochaetes and some polychaetes). In contrast, only 41.5% of the reference site community was below-surface deposit feeders.

Periphyton communities did not appear adversely affected by the Green Cove Springs WWTP discharge, with the exception of an increase in the percent contribution of dominant taxon and a reduction in the number of taxa at test site 2. *Synedra fasciculata*, a diatom that thrives in high conductivity water, was the dominant taxon at test site 2, making up 22.2% of the population. While the reference site dominant taxon (*Nitzschia amphibia*, a eutrophication indicator) was only 13.8% of the total, the absolute difference between these two sites was not significant. Periphyton taxa richness decreased from 58 at the reference site to 48 taxa at test site 1 and 33 taxa at test site 2, mostly due to decreases in the types of cyanophytes and diatoms. The periphyton chlorophyll *a* measured at the test sites (14.5 mg/m^2 at both sites) was lower than that of the reference site (59.5 mg/m^2).

It should be noted that phytoplankton communities collected during this study were typical of eutrophic waters. For example, between 44.5% and 69.8% of the phytoplankton populations consisted of cyanophytes at all sites. Additionally, phytoplankton chlorophyll *a* levels were quite elevated at some stations (27.0 µg/L at the reference site and 82.8 µg/L at test site 1, which are greater than 89% and 95%, respectively, values found in other Florida streams). Phytoplankton taxa richness also decreased from 31 at the reference site to 22 taxa at both test sites.

Conclusions

The full strength effluent sample was not acutely toxic to the fish, *Cyprinella leedsi*. While 10% of the *Ceriodaphnia dubia* exposed to full strength effluent died, this is not enough mortality to indicate a violation.

No organic constituents were detected in the effluent, and none of the metals in the effluent exceeded Class III standards.

Effluent concentrations of ammonia (4.6 mg/L), nitrate-nitrite (2.6 mg/L), total phosphorus (1.2 mg/L), ortho-phosphate (0.87 mg/L), and TKN (6.0 mg/L) were elevated. The Class III standard for unionized ammonia in predominantly freshwaters (Rule 17-302.530(3) FAC) was violated in the effluent with a value of 0.04 mg/L. Nutrients were generally higher at the reference site than at the test sites. For example, ortho-phosphate and ammonia at the reference site were higher than those values found in approximately 65% and 95%, respectively, of other Florida streams. Either there are unidentified sources of nutrients affecting Governors Creek, or the hydrology of the area (which is tidally influenced) enables the nutrient-rich effluent plume to reach the reference site. In the latter scenario, greater dilution from the St. Johns River at the test sites would keep nutrient concentrations lower there than at the more protected Governors Creek station.

Results of algal growth potential tests indicate that water from all three sites was above the eutrophication problem threshold. The AGP measured at the reference site (9.7 mg dry wt/L) was lower than those of the test sites (12.8 mg dry wt/L at test site 1 and 10.4 mg dry wt/L at test site 2). AGP of the effluent was 292.9 mg dry wt/L.

During the course of this study, fecal and total coliforms were sampled on two occasions. During the September 1993 sampling, coliform levels were well within Class III standards in the effluent and at the test sites, but fecal coliforms at the reference site were right at the legal limit of 800 organisms/100 mL. During the October 1993 sampling event, standards for fecal coliform

bacteria (9000 organisms/100 mL at both test sites), as well as for total coliform bacteria (11,000 organisms/100 mL at test site 1 and 90,000 organisms/100 mL at test site 2) were violated (Rules 17-302.530(6) and 17-302.530(7) FAC). On this occasion, the coliforms at the reference site were within standards. The effluent was not sampled during the October trip, making it difficult to determine if the discharge contributed to the problems seen at the receiving water stations.

Taxa richness and Florida Index scores suggested that the test sites were similar to, or in the case of test site 1, better than the reference. The Shannon-Weaver diversity index decreased by 27.8% at test site 2, compared with the reference site, which is analogous to a violation of the biological integrity criterion. However, since the rule states that Hester-Dendy samplers be used in predominately fresh waters, the reduction in Ponar sampler diversity does not represent a violation. The decrease in diversity does suggest at least a moderate disturbance in the vicinity of the outfall. Further, test site 2 was dominated by *Limnodrilus hoffmeisteri* (57.2% of the total population), a well known pollution tolerant organism. Functional feeding group relationships also appeared skewed at test site 2, in that 80.5% of the population consisted of below-surface deposit feeders.

Periphyton communities did not appear adversely affected by the Green Cove Springs WWTP discharge, with the exception of an increase in the percent contribution of dominant taxon and a reduction in the number of taxa at test site 2. Periphyton taxa richness decreased from 58 at the reference site to 48 taxa at test site 1 and 33 taxa at test site 2, mostly due to decreases in the types of cyanophytes and diatoms. It should be noted that phytoplankton communities collected during this study were typical of eutrophic waters. For example, between 44.5% and 69.8% of the phytoplankton populations consisted of cyanophytes at all sites. Additionally, phytoplankton chlorophyll *a* levels were quite elevated at some stations (27.0 µg/L at the reference site and 82.8 µg/L at test site 1, which are greater than 89% and 95%, respectively, values found in other Florida streams).

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Chemistry summary table for

Green Cove Springs.	Effluent	Reference Site	Test Site 1	Test Site 2
Organic Constituents (ug/L)				
none detected				
Metals (ug/L)				
Aluminum	152 I			
Arsenic	20 U			
Cadmium	0.08 U			
Copper	6 I			
Chromium	10 U			
Iron	76.4			
Lead	15 U			
Mercury	0.1 U			
Nickel	5 U			
Silver	0.05 U			
Zinc	29			
Nutrients (mg/L)				
Ortho-phosphorus	0.87	0.13	0.084	0.048 I
Total phosphorus	1.2	0.055 A	0.095	0.097
Ammonia	4.6	0.40	0.022 U	0.067
Nitrate+Nitrite	2.6	0.020 U	0.020 U	0.039 I
TKN	6.0	2.4	1.2 A	1.3
Other Parameters				
Habitat Assessment		77	68	68
D.O. (surface, mg/L)	10.0	9.5	8.0	8.2
pH (SU's)	7.0	7.5	7.6	7.9
Conductivity (µmhos/cm)	480	440	510	500
Temperature (°C)	28.0	29	30	31
Hardness (mg/L CaCO3)	107.3			
Algal Growth Potential (mg dry wt/L)	292.9	9.7	12.8	10.4
Bioassay Fish	not toxic			
Bioassay Invertebrate	10 % mortality			
Fecal coliform (org/100 ml) (9-13-93)	80	800	20 K	130
Total coliform (org/100 ml) (9-13-93)	500	800	140	300
Fecal coliform (org/100 ml) (10-4-93)		230	9000	9000
Total coliform (org/100 ml) (10-4-93)		300	11000	90000
TSS (mg/L)	9	54	8	9
BOD (mg/L)	2 K	2 K	2 K	2.2

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

I - Value reported is less than the minimum quantitation limit, and greater than or equal to the minimun detection limit.

K - Actual valuc is known to be less than value given.

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

Typical Values for Selected Parameters in Florida Waters

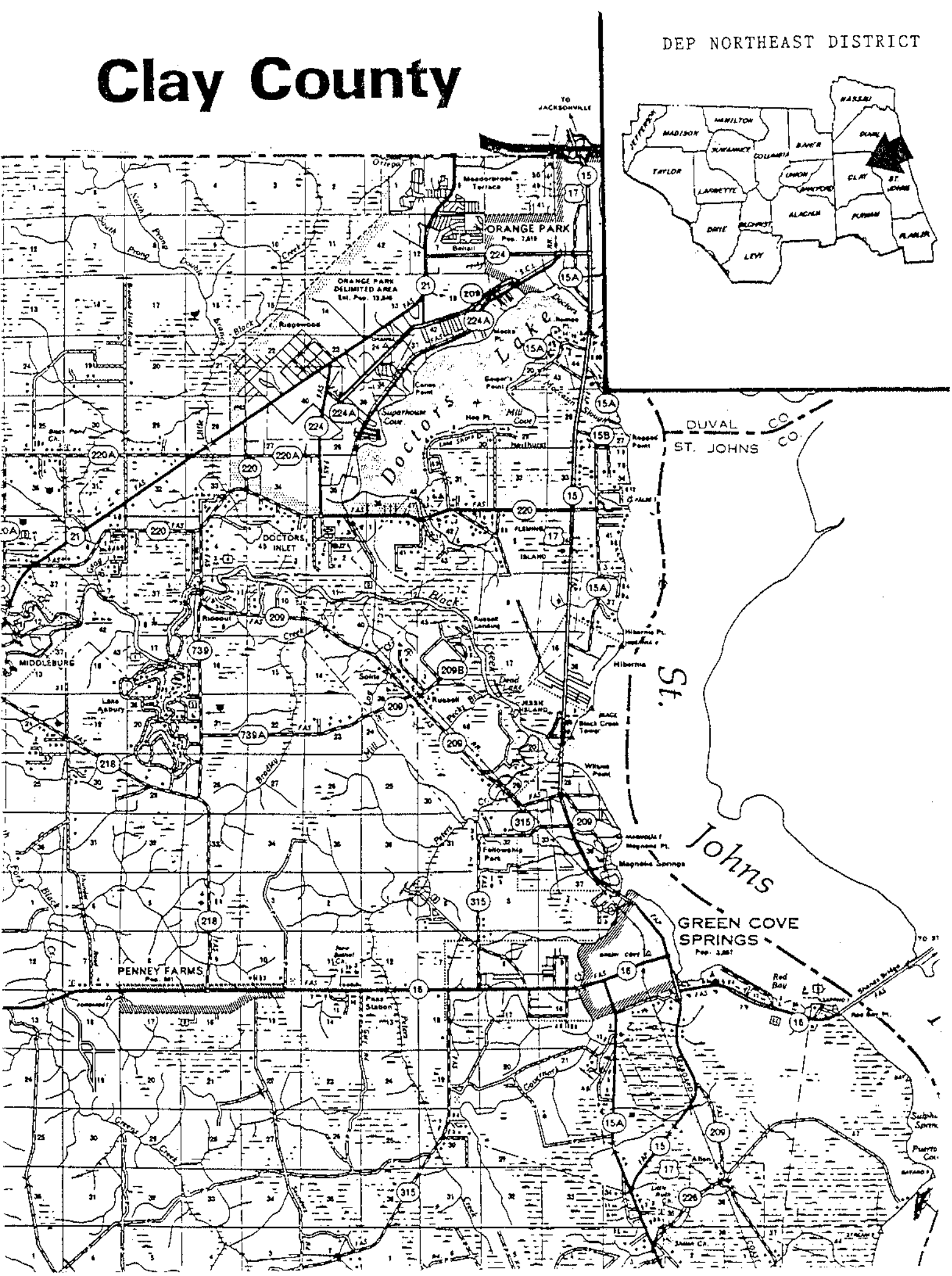
Adapted from Joe Hand, FDER, personal communication, 1991
(data was collected between 1980 and 1989)

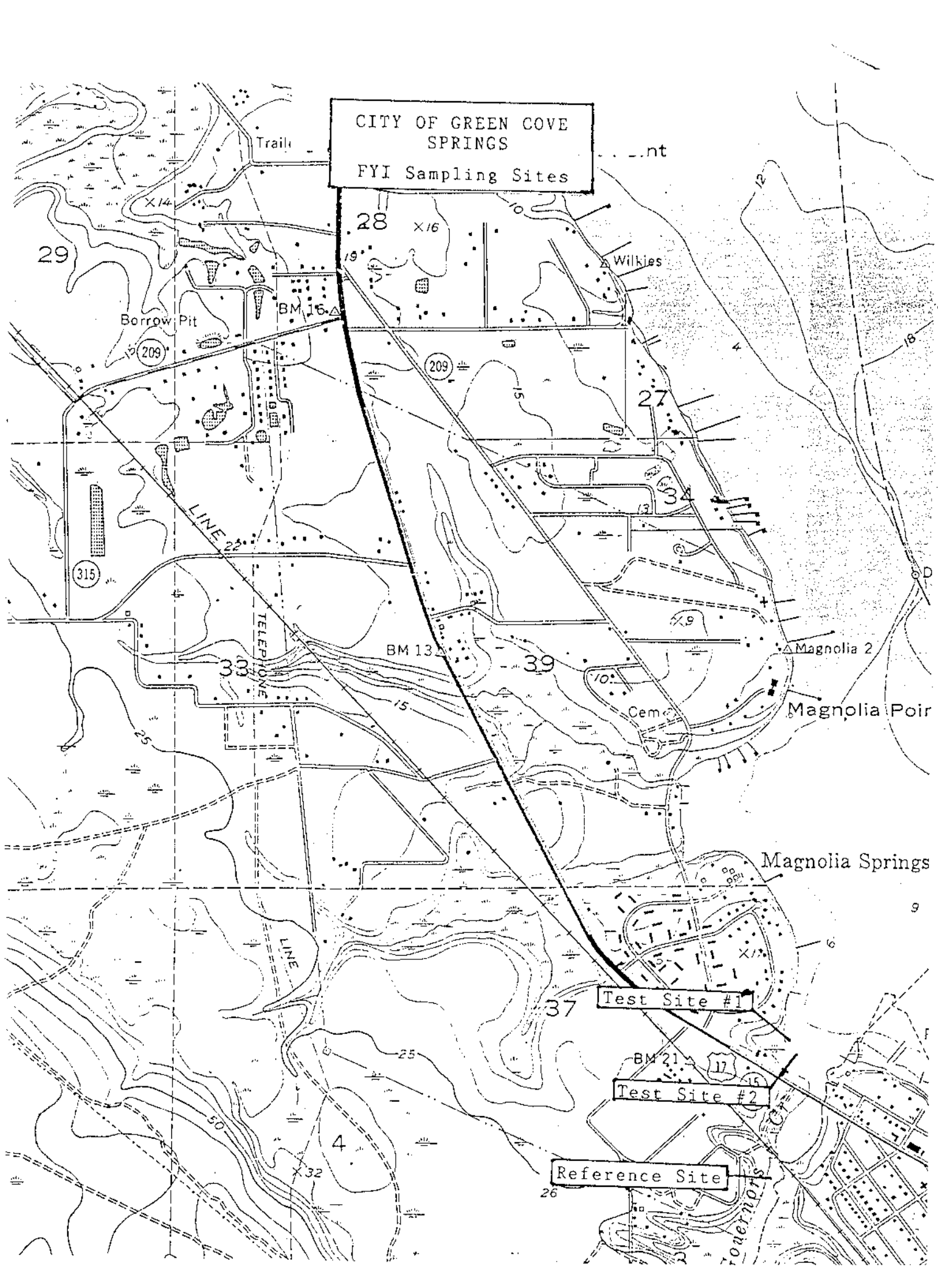
Percentile Distribution

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

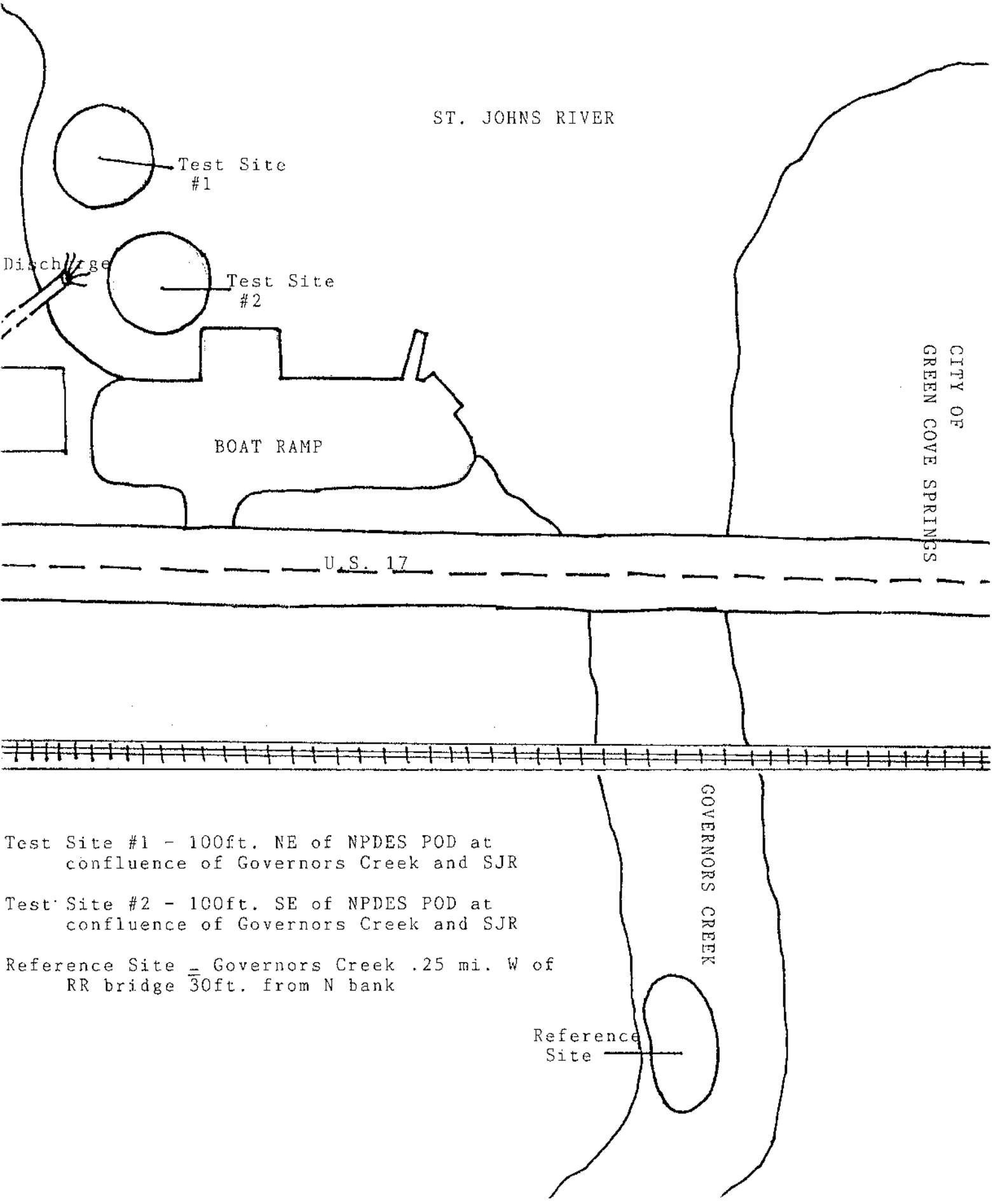
Units:
Phytoplankton Chlorophyll *a* (ug/L), Periphyton Chlorophyll *a* (mg/m^2), Nutrients (mg/L), Turbidity (NTU), Taxa richness and diversity values are for macroinvertebrates

Clay County


DEP NORTHEAST DISTRICT
NASSAU
HAMILTON
JEFFERSON
MADISON
SUWANNEE
COLUMBIA
BAKER
DUVAL
TAYLOR
LAFAYETTE
UNION
CLAY
ST. JOHNS
GILCHRIST
ALACHUA
PUTNAM
DIXIE
LEVY
FLAGLER
TO JACKSONVILLE
ORANGE PARK
ORANGE PARK DELIMITED AREA
DOCTORS INLET
Doctors Lake
DUVAL CO.
ST. JOHNS CO.
St. Johns
MIDDLEBURG
PENNEY FARMS
GREEN COVE SPRINGS
Hibernia
Magnolia Springs
Red Bay
Black Creek
Little Black Creek
Packet Branch
Peters Creek
Governors Creek
Trout Creek
Doctors Inlet
Lake Asbury
Fleming Island
Jessie Island
Meadowbrook Terrace
Ridgewood
Superhouse Cove
Mill Cove
Russell Landing
Fellowship Park
Shands Bridge
Allen
Sulphur Springs
Puerto Co
15
15A
15B
16
17
18
21
209
209B
218
220
220A
224
224A
226
315
739
739A


CITY OF GREEN COVE SPRINGS
FYI Sampling Sites
Test Site #1
Test Site #2
Reference Site
Magnolia Springs
Magnolia Poir
Magnolia 2
Wilkies
Borrow Pit
BM 16
BM 13
BM 21
Cem
LINE
TELEPHONE
28
29
27
34
33
39
37
4
209
315
17

TEST SITES / GREEN COVE SPRINGS WWTP



Test Site #1 - 100ft. NE of NPDES POD at confluence of Governors Creek and SJR

Test Site #2 - 100ft. SE of NPDES POD at confluence of Governors Creek and SJR

Reference Site - Governors Creek .25 mi. W of RR bridge 30ft. from N bank

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

FACILITY SUMMARY

Facility Name: City of Green Cove Springs (Harbor Road) WWTF		Date Summary Prepared: Feb. 16, 1994
Location (attach detailed map): Harbor Road Green Cove Springs, FL	County: Clay Lat/Long: 30°00'25"N / 81°41'31W	District: NE District
Federal Permit # and expiration date: FL0020915 Sept. 30, 1998	State GMS # and State expiration date: 3110M00851 Mar. 16, 1997 DD10-204080	Facility Type: Industrial (Municipal) Federal Agricultural Other (list):

Function of facility: To operate in parallel a 0.5 MGD contact stabilization (activated sludge) wastewater treatment plant (WWTP) and a 0.75 MGD contact stabilization (activated sludge) WWTP with chlorinated dechlorinated effluent from the combined 1.25 mgd. facilities.

Description of treatment process: A Class C Level II Domestic wastewater system discharging a secondarily treated effluent.

Receiving waters: St. Johns River		Classification: I II (III)
Design Flow: rated design 1.25MGD	Mean Flow: .706 MGD	Flow during survey: .734 MGD

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

therefore, the best time to sample is: Anytime

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

No mixing zone for this facility.

List effluent limits (if necessary, attach relevant paperwork):

Parameter	Limit (units)
See Attached Sheets	
A. State of Florida Permit	
B. NPDES Permit	

Describe special permit conditions and permit modifications:

Permittee required to conduct quarterly monitoring of the St. Johns River segment near the existing effluent outfall. Table of Monitoring Results and map of test sites attached.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

City of Green Cove Springs
(Facility)

Description of permitted outfall(s): Effluent from the City of Green Cove Springs leaves the facility at Harbor Rd. through a discharge pipe which flows into the St. Johns River approximately 100 yds North of the Clay County boat ramp located on US17 at the confluence of the St. Johns River and Governors Creek.

List permit violations (from MOR data or other source) and plant upsets that occurred within past year: Past MOR data from 1991 through August, 1993 did not indicate any plant upsets. Primary problem appears to have been high counts of fecal coliforms. The following violations occurred:

July, 1992	720/100ml	February, 1993	495/100ml
June, 1992	283/100ml	March, 1993	381/100ml
January, 1993	1600/100ml		
May, 1992	1600/100ml		
December, 1992	543/100ml		

Sampling technique and/or laboratory contamination were listed as possibilities for exceedence of permit parameters.

Describe previous impact bioassessments, WQBEL's, and previous or current enforcement actions: Warning Letter sent August 2, 1993 addressed several problems observed during a field inspection. Problems noted were several MOR not submitted to the Dept. in the required amount of time, improper disposal of residuals to the Rosemary Hill Landfill, required bimonthly progress reports on correction of operational deficiencies not provided to the Dept., flow chart recorder not operational and TRC meter not being calibrated each day of use. Facility responded on August 13, 1993 by addressing each problem stated and providing an explanation/solution ~~to~~ for each problem. The Sept. 7, 1993 inspection noted a few problems still remaining. These problems were addressed by the plant on October 5, 1993.

Discuss comparability of MOR results to past DER results and whether there are trends (improving, declining) in the data set: Past MOR data did not appear to indicate any major problems with the plant. Problems that were noted during inspections appeared to be addressed quickly and co-operatively.

Additional information: The City of Green Cove Springs has been conducting quarterly water quality monitoring of the St. Johns River in the discharge area. Results are included. There do not appear to be any unusual ~~re~~ results.

Staff contributing to this review (signature):

Lindy Payne Lindy Payne	ESI ~~(Biologist)~~
Scott Bulgrin (no longer with DEP)	ESII ~~(Inspector)~~
	~~(Engineer)~~
	( )
	( )
	( )

12. The monitoring requirements and effluent limitations for this plant are as follows:

PARAMETER	EFFLUENT LIMIT	MINIMUM FREQUENCY	SAMPLE TYPE	SAMPLE LOCATION
Flow (mgd)	0.95	Continous	(b)	Influent or Effluent
$CBOD_5$ (mg/l)	(a)	Weekly	8-hour Composite (e)	Influent (c) & Effluent (d)
TSS (mg/l)	(a)	Weekly	8-hour Composite (e)	Influent (c) & Effluent (d)
Organic-N (mg/l)	report	Quarterly	8-hour Composite (e)	Effluent (d)
NH_3-N (mg/l)	report	Quarterly	8-hour Composite (e)	Effluent (d)
TKN (mg/l)	report	Quarterly	8-hour Composite (e)	Effluent (d)
NO_2+NO_3-N (mg/l)	report	Quarterly	8-hour Composite (e)	Effluent (d)
Total P (mg/l)	report	Quarterly	8-hour Composite (e)	Effluent (d)
Ortho-P (mg/l)	report	Quarterly	8-hour Composite (e)	Effluent (d)
Total Chlorine Residual(mg/l)	0.5 min. (f) 0.01 max (g)	Daily, 5/week Weekly (h)	Grab	Effluent (f) (g)
pH Units	6.0 minimum 8.5 maximum	Daily, 5/week	Grab	Effluent (d)
Dissolved Oxygen (mg/l)	5.0 minimum	Daily, 5/week	Grab	Effluent (d)
Fecal Coliform no./100 (ml)	200 (i)	Weekly	Grab	Effluent (d)
Stream Monitoring	See Specific Condition No. 14			
Toxicity Monitoring	See Specific Condition No. 15			

(a)

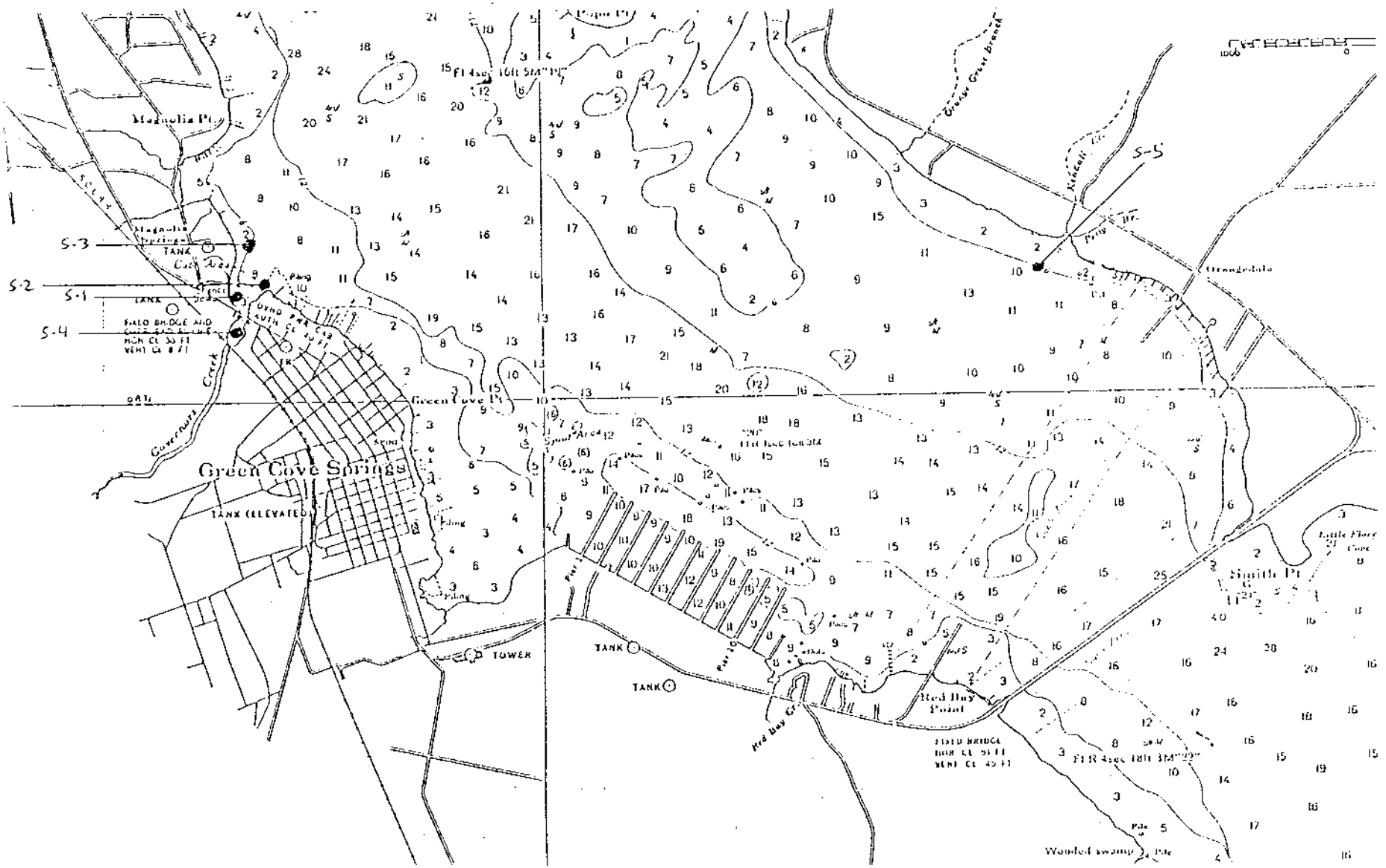
	ANNUAL	MONTHLY	WEEKLY	ONE TIME MAXIMUM
$CBOD_5$	20.0	30.0*	45.0*	60.0*
TSS	20.0	30.0*	45.0*	60.0*

* Rule 17-600.740, FAC

(b) Recording flowmeter and totalizer required.

(c) Influent samples shall be collected so that they do not contain digester supernatant or returned activated sludge, or any other plant process waters.

(d) Effluent samples shall be collected after final treatment at the nearest accessible point prior to discharge to the St. Johns River.


S-1
S-2
S-3
S-4
S-5
Green Cove Springs
Green Cove Pt
Magnolia Pt
Magnolia Springs
TANK
TANK ELEVATED
TOWER
Governors Creek
Red Bay Point
Red Bay Cr
Orange Grove Branch
Orange Grove Pt
Little Flower Cove
Wooded swamp
FIXED BRIDGE AND CABLE SUBMARINE LINE
HOR CL 35 FT
VERT CL 8 FT
FIXED BRIDGE
HOR CL 51 FT
VERT CL 45 FT

GREEN COVE SPRINGS
Water Quality Monitoring Results

Monitoring Results for 06-30-93

Test Site	cBOD mg/L	NO2NO3 mg/L	TKN mg/L	Temp. C	Conduct. µmhos/cm
1	7.7	.37	.459	30	1270
2	8.7	.12	.382	31.1	1200
3	9.0	.01	<0.05	32.3	1150
4	2.7	.02	<0.05	31.6	1170
5	<1.0	.02	.473	29.3	1100

Monitoring Results for 02-25-93

Test Site	cBOD mg/L	NO2NO3 mg/L	TKN mg/L	Temp. C	Conduct. µmhos/cm
1	8.4	.61	1.18	17.3	320
2	8.4	.50	.77	15.1	316
3	16.0	.25	.90	15.2	546
4	4.8	.24	<0.50	15.2	571
5	6.0	.21	1.16	15.0	568

Monitoring Results for 11-24-92

Test Site	cBOD mg/L	NO2NO3 mg/L	TKN mg/L	Temp. C	Conduct. µmhos/cm
1	4.9	.49	.53	22.3	448
2	5.3	1.30	.68	21.9	699
3	8.3	.35	.71	22.1	729
4	6.8	.30	1.72	22.2	731
5	5.8	.28	1.77	22.3	701

Monitoring Results for 08-25-92

Test Site	cBOD mg/L	NO2NO3 mg/L	TKN mg/L	Temp. C	Conduct. µmhos/cm
1	8.3	<.05	1.9	28	545
2	1.0	<.05	1.1	29.2	778
3	1.0	<.05	0.6	29.6	772
4	<1.0	<.05	<0.5	29.3	804
5	<1.0	<.05	2.5	29.1	895

Monitoring Results for 07-15-92

Test Site	cBOD mg/L	NO2NO3 mg/L	TKN mg/L	Temp. C	Conduct. µmhos/cm
1	5.5	<.05	1.2	29.4	1100
2	3.3	<.05	0.8	29.4	1100
3	7.4	<.05	0.8	29.4	1100
4	8.5	<.05	<0.5	28.9	960
5	2.0	<.05	0.9	29.4	1000

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 4)

SUBMITTING AGENCY CODE: 50251 / SUBMITTING AGENCY NAME: FDEP NE District	STORET STATION NUMBER: 20030420	DATE (M/D/Y): 08/07/03	TIME: 1430	RECEIVING BODY OF WATER: Governors Creek

REMARKS:	LOCATION: Reg site/ Governors Creek .25 mi W of R.R. bridge 30ft from N bank.	FIELD ID/NAME: City of Green Cove Springs

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
90%			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): None

Septic systems and Rosemary Hill Landfill

Estimated System Width (range, m): 15-20	Estimated System Depth (range, m): 1.0-3.0	yes
High Water Mark (m above bed): .6m	Velocity (range, m/s): .2	Impounded ☐ Channelized ☐

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

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	60	5		Riffles			
Leaf Packs				Sand			
Aquatic Vegetation	20	5		Mud/Muck/Silt	5	5	
Rock or Shell Rubble				Benthic leaf mats			
Undercut Banks/Roots	15	5		Other:			

WATER QUALITY

	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm):			Secchi (m):
Top	1	29°	7.47	9.5	440			0.5
Mid-depth	2	29°	7.42	8.2	440			
Bottom	4	30°	7.44	2.5	440			

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

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: Partly cloudy, Hot mid 90's

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

SAMPLING TEAM:	SIGNATURE:	DATE:
Payne/ Kalmbacher	Payne	9/7/03

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

SUBMITTING AGENCY CODE: 21231	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
SUBMITTING AGENCY NAME: FDEP NE District	20030420	09/09/93	Governors Creek

REMARKS:	LOCATION: Big Tesle/Governors Creek, 25m W of RR bridge - East from N bank	FIELD ID/NAME: City of Green Cove Springs

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 29	Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs, undercut banks, rubble, or other stable habitat. **23-30 points**	20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat. **16-22 points**	5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat. **8-15 points**	Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious. **0-7 points**
Water Velocity 8	Max. observed: >0.3 m/sec. but < 1 m/sec **23-30 points**	Max. observed; 0.1 to 0.3 m/sec **16-22 points**	Max. observed; 0.05 to 0.1 m/sec **8-15 points**	Max. observed; <0.05 m/sec, or spate occurring; > 2 m/sec **0-7 points**
Artificial Channel/ Flow Alteration 15	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 10	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 10	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** 77

COMMENTS:

ANALYSIS DATE:	ANALYST:	SIGNATURE:
09/09/93	Payne/ Kalmbacher	Payne

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 4)

SUBMITTING AGENCY CODE: 21FLSJ SUBMITTING AGENCY NAME: FDEP NE District	STORET STATION NUMBER: 20030425	DATE (M/D/Y): 9/10/03	TIME: 1140	RECEIVING BODY OF WATER: Governors Creek
REMARKS:	LOCATION: Historical X 100ft NW of Governors Creek and Hwy 17		FIELD ID/NAME: City of Green Cove Springs	

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
10			30	50		10 hwy (runoff from)

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

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

Point-Source Pollution (list location and describe): highway runoff
Green Cove Springs WWTP

Estimated System Width (range, ~~m~~): 1/4 mi	Estimated System Depth (range, m): .5-1.5		yes
High Water Mark (m above bed): .5m?	Velocity (range, m/s): .05-.1	Impounded [ ] Channelized [ ]	

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

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	20	10	D+N	Riffles			
Leaf Packs				Sand	95	5	D+N
Aquatic Vegetation				Mud/Muck/Silt	5	5	D+N
Rock or Shell Rubble				Benthic leaf mats			
Undercut Banks/Roots				Other:			

WATER QUALITY

	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm):			Secchi (m):
Top	1	30°	7.16	8.0	510			0.9
Mid-depth	2	29°	7.17	7.5	510			
Bottom	4	28°	7.18	7.5	500			

System Type : Stream: [X] (Sand Bottomed / Sand Bot w/ Spring) Swamp & Bog Alluvial + Mud Calcareous Misc.) Lake: [ ] Wetland: [ ] Estuary: [ ] Other: [X] River

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

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

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

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

Weather Conditions: Partly cloudy - hot mid 90's

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

SAMPLING TEAM:	SIGNATURE:	DATE:
Payne / Kalmanovitch	Payne	9/9/03

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

SUBMITTING AGENCY CODE: 3321	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
SUBMITTING AGENCY NAME: NUS Corp	20030925	09/07/93	Governors Creek

REMARKS:	LOCATION: Test site #1 (100 ft. N.E. of the confluence of Governors Creek and the St. Johns River)	FIELD ID/NAME: City of Green Cove Springs

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 19	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 9	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 15	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 10	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 10	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.	68

COMMENTS: Sampling area is located on the west side of bank of the St. Johns River at the confluence of Governors Creek.

ANALYSIS DATE:	ANALYST:	SIGNATURE:
09/07/93	Payne/Kalmbacher	Payne/Kalmbacher

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 4)

SUBMITTING AGENCY CODE: 21021	STORET STATION NUMBER: 20030426	DATE (M/D/Y): 5/07/03	TIME: 1320	RECEIVING BODY OF WATER: Governors Creek
SUBMITTING AGENCY NAME: FDEP				

REMARKS:	LOCATION: Test site #12 (Downstream discharge confluence of STR and Governors Creek	FIELD ID/NAME: City of Green Cove Springs

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
10			30	50		10 (Coastal road front)

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

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

Point-Source Pollution (list location and describe): busy run off

Green Cove Springs WWTP

Estimated System Width (range, m): 1/4 mi	Estimated System Depth (range, m): .5-1.5	yes
High Water Mark (m above bed): .1 m	Velocity (range, m/s): .05-1.0	Impounded [ ] Channelized [ ]

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

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	30	10		Riffles			
Leaf Packs				Sand	100	5	
Aquatic Vegetation				Mud/Muck/Silt	5	5	
Rock or Shell Rubble	5	4		Benthic leaf mats			
Undercut Banks/Roots				Other:			

WATER QUALITY

	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm):			Secchi (m):
Top	1	31°	7.91	8.2	510			0.8
Mid-depth	2.5	31°	7.88	7.5	500			
Bottom	5	30°	7.84	5.3	503			

System Type : Stream: [X] (Sand Bottomed / Sand Bot w/ Spring / Swamp & Bog / Calcareous / Alluvial / Misc.) Lake: [ ] Wetland: [ ] Estuary: [ ] Other: [ ]

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

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

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

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

Weather Conditions: Partly cloudy, hot mid 90s

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

SAMPLING TEAM: Payne / Kalmbacher	SIGNATURE: [signature]	DATE: 5/7/03

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

SUBMITTING AGENCY CODE: 253 / SUBMITTING AGENCY NAME: FDEP NE District	STORET STATION NUMBER: 70030426	DATE (M/D/Y): 09/07/93	RECEIVING BODY OF WATER: Governors Creek

REMARKS:	LOCATION: Test site #2/ North side of discharge at confluence of SJR and Governors Creek	FIELD ID/NAME: City of Green Cove Springs

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 19	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 9	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 15	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 10	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 10	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** 68

COMMENTS:

ANALYSIS DATE:	ANALYST:	SIGNATURE:
9/7/93	Payne/ Kalmbacher	Payne/ Kalmbacher

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: GREEN COVE SP WWTP
Location:
County:
Contact/District:
NPDES Permit #: FL00 Outfall #:

Sample Collection: Date 9-7-93 Time 1035
Test Beginning: Date 9-8-93 Time 1330
Test Ending: Date 9-10-93 Time 1430
Organism Batch #: 36 Diluent Batch #: WELL
Organism Age: 11 DAYS
Test Organism: CYPRINELLA LEEDSI

61711 93-SEP-08-19

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
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	24.1 @ 24.1	8.3 @ 24.7	1009 @ 1,000 9780 @ 10,000 @ 24.6 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	23.9 @ 24.0	8.3 @ 24.3	1010 @ 1,000 9800 @ 10,000 @ 24.5 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	____ @ ____	____ @ ____	____ @ 1,000 ____ @ 10,000 @ ____ °C

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 h	pH 0 hr	pH 24 h	pH 48 h	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 h	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 h	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 0 hr	24 h	48 h
control	88	5	5	5	7.9	8.2	8.1	23.6	24.1	24.2	7.9	8.3	8.8	275	250	250
control	11	5	5	5	7.9	8.2	8.4			24.1	7.9	8.4	8.7	245	250	250
100%	348	5	5	5	7.5	7.8	8.0	23.2	24.1	24.1	8.6	7.5	7.2	405	430	430
100%	10	5	5	5	7.5	7.9	8.0			24.0	8.6	7.5	7.3	425	430	430
Measured/Loaded by:		TR	TM	MF	MF	TM	MF	MF	TM	MF	MF	TM	MF	MF	TM	MF
Recorded by:		KP	TM	MF	KP	TR	KP	KP	TR	KP	KP	TR	KP	KP	TR	KP

entered C.dubia readings KP 9/8/93

jar 88 245
jar 11 245
jar 348 425
jar 10 425

Investigators' Signatures

Kim Pearce
Tara A. Rader
Marshall Faircloth

Reviewer

Water Quality Parameters	Salt Water/ Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2:			NOT	MEASURED	
Lab Total Residual Cl2:	<0.03	<0.03	<0.03	DR-100	KP
Alkalinity:	132	83	127	Hach	KP
Hardness:	141	93	118	Hach	KP
Total Ammonia:	<0.017	<0.017	4.01	Orion	MF

Ammonia Meter #98126 Ammonia Slope: -57.1 Ammonia Blank: <0.017 Control Salinity: 0 ppt Sample Salinity: 0 ppt

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: CITY OF GREEN COVE SPRINGS WWTP
Location:
County:
Contact/District:
NPDES Permit #: FL00 Outfall #:

Sample Collection: Date 9-7-93 Time 1035
Test Beginning: Date 9-8-93 Time 1255
Test Ending: Date 9-10-93 Time 1430
Organism Batch #: 108 Diluent Batch #: 22
Organism Age: 24 HRS
Test Organism: CERIODAPHNIA DUBIA

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

Test Number: 1 of 2

Remarks:

61711 93-SEP-08-19

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	24.1 @ 24.1	8.3 @ 24.7	1009 @ 1,000 9780 @ 10,000 @ 24.6 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	23.9 @ 24.0	8.3 @ 24.3	1010 @ 1,000 9800 @ 10,000 @ 24.5 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	24.5 @ 24.5	8.3 @ 24.4	1008 @ 1,000 9770 @ 10,000 @ 24.5 °C

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 h	pH 0 hr	pH 24 h	pH 48 h	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 h	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 h	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 0 hr	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 24 h	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 48 h
control	A	5	5	5	8.3		8.4	23.6		25.0	8.0		8.5	175		210
control	B	5	5	5			8.4			25.0			8.5			185
control	C	5	5	5			8.4			24.9			8.5			190
control	D	5	5	5			8.4			24.3			8.7			195
100%	A	5	5	5	7.6		8.4	23.5		25.0	8.3		8.4	405		440
100%	B	5	4	4			8.4			25.0			8.4			440
100%	C	5	5	4			8.4			24.9			8.4			430
100%	D	5	5	5			8.4			24.4			8.5			440
Measured/Loaded by:		MF	TR	MF	MF		MF	MF		MF	MF		MF	MF		MF
Recorded by:		KP	TR	KP	KP		KP	KP		KP	KP		KP	KP		KP

Investigators' Signatures

Kim Pearce
Tobin A. Rader
Marshall Faircloth

Reviewer

	Salt Water/ (Well Water)	20% Min Water	Sample	Method	Measured by
Water Quality Parameters					
Field Total Residual Cl2:			NOT	MEASURED	
Lab Total Residual Cl2:	<0.03	<0.03	<0.03	DR100	KP
Alkalinity:	132	83	127	Hach	KP
Hardness:	141	93	118	Hach	KP
Total Ammonia:	<0.017	<0.017	4.01	Orion	MF

Ammonia Meter #98136 Ammonia Meter Slope: -57.1 Ammonia Blank: <0.017 Control Salinity: 0 ppt Sample Salinity: 0 ppt

form updated 7/8/93

Periphyton taxa list and densities (#/mm^2) for Green Cove Springs WWTP, collected via glass microscope slides, on 29 September, 1993.

	Reference site	Test A	Test B
Diatoms			
Achnanthes affinis	53	–	–
Achnanthes exigua	15	308	–
Achnanthes hauckiana	–	12	–
Achnanthes hungarica	44	–	–
Achnanthes lanceolata	–	37	–
Achnanthes linearis	29	–	–
Achnanthes lanceolata v. *dubia*	48	–	–
Amphora acutiuscula	–	1281	557
Amphora birugula	73	–	–
Amphora ovalis	5	74	–
Amphora sabiniana	–	37	–
Amphora submontana	–	25	–
Amphora veneta	–	74	–
Bacillaria paradoxa	174	222	156
Capartogramma crucicula	–	–	22
Cocconeis placentula	377	505	579
Coscinodiscus sp.	24	148	156
Cyclotella meneghiniana	97	419	201
Cymbella curvirostrum	–	185	–
Cymbella lunata	106	–	423
Cymbella minuta	63	382	–
Diploneis ovalis	–	136	535
Entomoneis ornata	–	197	–
Fragilaria construens	–	–	22
Fragilaria elliptica	5	–	–
Fragilaria intermedia	–	12	–
Fragilaria vaucheriae	–	12	–
Gomphonema augur	5	–	–
Gomphonema gracile	19	185	201
Gomphonema parvulum	19	382	45
Gyrosigma eximium	–	12	–
Gyrosigma nodiferum	–	–	22
Gyrosigma scalproides	15	–	–
Melosira granulata	–	12	–
Melosira sp.	5	–	–
Melosira varians	–	37	–
Navicula clementis	–	160	–
Navicula confervacea	5	–	45
Navicula cocconeiformis	5	–	–
Navicula cryptocephala	15	62	–
Navicula hungarica	5	25	22
Navicula minima	24	–	–

Navicula odiosa	–	12	–
Navicula pusilla v. *jamalinensis*	39	–	–
Navicula placentula	5	–	–
Navicula simula	5	–	–
Navicula viridula	77	25	312
Nitzschia amphibia	397	136	1448
Nitzschia constricta	5	86	–
Nitzschia gracilis	5	–	–
Nitzschia hantzchiana	–	25	–
Nitzschia palea	169	1256	646
Nitzschia romana	–	–	111
Nitzschia sigma	19	–	–
Nitzschia sp.	–	–	22
Pleurosigma salinarum	–	74	67
Stauroneis amphioxys	5	–	–
Stauroneis anceps	–	25	–
Synedra delicatissima v. *angustissima*	–	12	–
Synedra fasciculata	5	825	2183
Synedra ulna	135	–	267
Chlorophyta			
Ankistrodesmus sp.	5	25	–
Dunaliella sp.	5	–	–
Oedogonium sp.	5	–	22
Scenedesmus acuminatus	–	–	22
Scenedesmus quadricauda	–	25	22
Scenedesmus sp.	15	–	–
Staurastrum sp.	–	12	–
Stigeocolonium sp.	29	25	45
Ulothrix sp.	24	–	–
Unknown chlorophyte flagellate	–	12	–
Chrysophyta			
Mallomonas sp.	–	25	–
Unknown Chrysophyta sp.	–	–	22
Cyanophyta			
Anabaena sp.	5	–	–
Aphanocapsa sp.	5	–	–
Aphanothece sp.	–	25	22
Arthrospira sp.	5	–	–
Chamaesiphon sp.	82	–	–
Chroococcus sp.	58	788	624
Gloeothece sp.	10	–	–
Lyngbya sp.	87	74	223
Merismopedia sp.	5	–	–
Merismopedia tenuissima	–	–	45
Microcoleus sp.	5	–	–
Microcystis sp.	10	12	–

Nostoc sp.	5	–	–
Oscillatoria sp.	193	185	735
Euglenophyta			
Euglena sp.	203	12	22
Eutreptia sp.	10	–	–
Pyrrhophyta			
Gymnodinium sp.	5	–	–
Prorocentrum sp.	10	–	–
Total	2877	8637	9846

Phytoplankton taxa list and densities (#/mL) for Green Cove Springs WWTP, collected via subsurface grabs, on 29 September, 1993.

	Reference Site	Test A	Test B
Diatoms			
Achnanthes sp.	–	1657	1534
Chaetoceros sp.	61	–	–
Cocconeis sp.	123	246	123
Coscinodiscus sp.	–	–	61
Cyclotella sp.	61	430	430
Entomoneis sp.	61	–	–
Melosira sp.	675	–	–
Navicula sp.	61	246	307
Nitzschia sp.	184	614	307
Plagiotropis sp.	61	–	–
Skeletonema sp.	123	6260	2148
Synedra sp.	–	–	61
Chlorophyta			
Ankistrodesmus sp.	675	614	1105
Closterium sp.	61	–	–
Coelastrum sp.	–	430	–
Crucigenia sp.	–	123	–
Dunaliella sp.	61	–	–
Gloeocystis sp.	61	–	–
Golenkinia sp.	61	–	–
Gonium sp.	123	–	–
Oocystis sp.	–	61	184
Pediastrum sp.	–	123	–
Pteromonas sp.	61	–	–
Scenedesmus sp.	491	246	614
Tetraedron sp.	552	–	184
Ulothrix sp.	307	–	–
Unknown chlorophyte flagellate	–	184	184
Chrysophyta			
Mallomonas sp.	61	–	–
Synura sp.	184	–	–
Cyanophyta			
Anabaena sp.	–	368	184
Chroococcus sp.	5094	2087	1596
Gloeocapsa sp.	1412	246	552
Gloeothece sp.	491	–	–
Lyngbya contorta	–	184	246
Lyngbya sp.	184	368	1043
Merismopedia sp.	614	1105	1841

Microcystis sp.	2210	4419	6260
Oscillatoria sp.	614	123	246
Spirulina sp.	–	123	61
Euglenophyta			
Euglena sp.	184	–	–
Pyrrhophyta			
Peridinium nipponicum	246	–	–
Peridinium brevipes	61	–	–
Total	15218	20257	19271

Taxa list for Green Cove Springs WWTP, collected via 20 dip net sweeps in the Saint John's River, on 07 November, 1993.

	Test Site 1	Test Site 2	Reference Site
Acarina			
Arrenurus sp.	–	–	216
Amphipoda			
Gammarus sp.	408	1224	–
Hyalella azteca	–	360	2856
Balanus eburneus	720	168	–
Coleoptera			
Microcylloepus pusillus	–	–	24
Peltodytes sp.	–	–	24
Decapoda			
Palaemonetes paludosus	336	216	–
Rhithropanopeus harrisii	456	960	–
Diptera			
Atrichopogon sp.	–	–	120
Cladotanytarsus sp.	72	384	–
Cladopelma sp.	–	–	48
Clinotanypus sp.	–	–	48
Corynoneura sp.	–	–	48
Cricotopus bicinctus	–	48	–
Culicoides sp.	–	–	48
Dicrotendipes modestus	–	–	24
Dicrotendipes simpsoni	24	–	24
Endochironomus subtendens	24	–	192
Glyptotendipes sp. B Epler	–	–	240
Goeldichironomus fluctuans	–	–	48
Labrundinia neopilosella	–	–	96
Larsia decolorata	–	–	96
Monopelopia boliekae	–	–	48
Nanocladius sp.	–	–	24
Odontomesa sp.	–	–	24
Palpomyia grp. sp.	48	192	1104
Parachironomus carinatus	–	–	24
Parachironomus directus	24	–	192
Parachironomus sp.	24	48	–
Polypedilum halterale grp.	96	96	–
Procladius sp.	–	72	48
Undetermined Dipteran pupae	48	24	360
Tanytarsus sp.	24	–	–
Tanytarsus sp. F Epler	–	24	48
Tanytarsus sp. G Epler	24	408	–
Tanytarsus sp. T Epler	24	–	–
Undetermined Tanypodinae	–	–	24

Tanypus carinatus	–	–	24
Zavreliella marmorata	–	–	408
Ephemeroptera			
Caenis diminuta	120	72	–
Caenis sp.	–	–	240
Callibaetis floridanus	24	24	–
Callibaetis sp.	–	–	24
Hexagenia sp.	–	–	24
Undetermined Ephemeropteran sp.	–	–	72
Gastropoda			
Undetermined Ancylidae sp.	–	–	72
Undetermined Hydrobiidae	–	–	2592
Littoridinops monroensis	216	2040	–
Planorbella duryi	–	–	288
Hemiptera			
Belostoma flumineum	24	–	–
Belostoma sp.	–	24	–
Mesovelia mulsanti	24	–	72
Mesovelia sp.	–	24	–
Microvelia sp.	–	–	96
Trepobates sp.	–	–	48
Hirudinea			
Helobdella stagnalis	–	–	24
Undetermined Hirudinean sp.	–	–	48
Isopoda			
Cassidinidea ovalis	–	72	–
Cyathura polita	48	–	–
Sphaeroma tenebrans	24	24	–
Uromunna reynoldsi	–	24	–
Lepidoptera			
Undetermined Pyralidae sp.	–	48	96
Nemertea			
Prostoma rubrum	–	–	24
Odonata			
Enallagma divagans	24	–	–
Enallagma pallidum	–	–	24
Erythemis simplicicollis	–	24	48
Ischnura hastata	–	72	–
Ischnura ramburii	24	–	24
Ischnura sp.	–	–	24
Pachydiplax longipennis	–	–	24
Oligochaeta			
Allonais inaequalis	–	24	–
Aulodrilus pigueti	–	–	96
Bratislava unidentata	24	192	96
Dero lodeni	–	–	24
Dero pectinata	–	–	432
Dero trifida	168	192	168
Haber speciosus	–	–	96

Haemonais waldvogeli	–	–	72
Limnodrilus hoffmeisteri	1080	1032	240
Nais communis	–	–	48
Pristina aequiseta	–	24	96
Pristina leidyi	–	–	120
Pristina synclites	–	168	–
Slavina appendiculata	–	–	120
Pelecypoda			
Brachiodontes exustus	408	2928	–
Mytilopsis sp.	–	–	312
Platyhelminthes			
Dugesia sp.	–	–	72
Trichoptera			
Ceraclea sp.	–	24	–
Hydroptila sp.	–	–	24
Oecetis sp.	–	–	24
Undetermined Trichoptera pupa	–	24	–

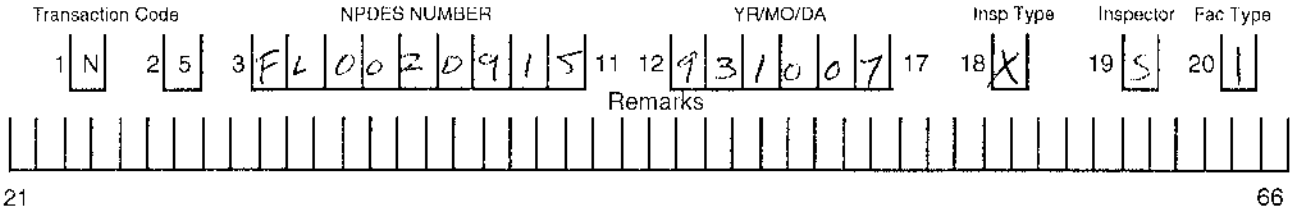
Taxa list for Green Cove Springs WWTP collected via Ponar grab, on 4 October 1993.

	Test Site 1	Test Site 2	Reference Site
Acarina			
Undetermined Oribatidae sp.	12	–	–
Amphipoda			
Odagammarus sp.	12	–	–
Gammarus tigrinus	387	–	–
Hyalella azteca	549	–	–
Cirripedia			
Balanus eburneus	137	–	–
Balanus sp.	87	–	–
Decapoda			
Palaemonetes paludosus	12	–	–
Palaemonetes pugio	75	–	–
Palaemonetes sp.	12	–	–
Rhithropanopeus harrisii	162	–	–
Undetermined Xanthidae	187	–	–
Diptera			
Ablabesmyia sp.	37	–	–
Chaoborus sp.	–	–	1135
Chironomus sp.	37	112	50
Cladotanytarsus sp.	961	2096	12
Cladopelma sp.	–	–	75
Clinotanypus sp.	–	–	225
Coelotanypus sp.	112	37	–
Coelotanypus tricolor	25	–	–
Cricotopus bicinctus	50	–	–
Cricotopus/Orthocladius grp. sp.	12	–	–
Cryptochironomus sp.	12	12	12
Dicrotendipes simpsoni	87	–	–
Dicrotendipes sp.	12	–	–
Djalmabatista pulcher	75	–	–
Einfeldia natchitocheae	–	–	12
Einfeldia sp.	25	–	–
Endochironomus subtendens	37	–	–
Glyptotendipes sp.	12	–	–
Larsia berneri	–	100	–
Larsia decolorata	50	–	–
Nanocladius sp.	37	–	–
Odontomesa sp.	12	–	–
Palpomyia grp. sp.	175	25	75
Parachironomus directus	37	–	–
Polypedilum fallax grp.	–	–	12
Polypedilum halterale grp.	25	100	225
Procladius sp.	12	100	262
Paratanytarsus sp. B Epler	12	–	–

Undetermined Dipteran pupae	50	200	–
Rheotanytarsus exiguus grp.	12	12	–
Tanytarsus sp. F Epler	12	–	–
Tanytarsus sp. G Epler	449	412	12
Tanytarsus sp. L Epler	12	–	–
Tanypus carinatus	–	–	87
Tanypus neopunctipennis	–	–	75
Tanypus punctipennis	–	–	12
Zavreliella marmorata	–	100	299
Ephemeroptera			
Caenis sp.	87	–	87
Callibaetis floridanus	12	–	–
Gastropoda			
Undetermined Hydrobiidae	474	50	–
Littoridinops monroensis	37	–	–
Hemiptera			
Belostoma lutetium	12	–	–
Belostoma sp.	12	–	–
Trepobates sp.	87	–	–
Trepobates subnitidus	12	–	–
Isopoda			
Cyathura polita	12	–	–
Erichsonella floridana	12	–	–
Idotea metallica ?	12	–	–
Probopyrus pandalicola	12	–	–
Mysidacea			
Mysidopsis sp.	–	12	–
Odonata			
Enallagma sp.	12	–	–
Erythemis simplicicollis	12	–	–
Ischnura ramburii	25	–	–
Oligochaeta			
Aeolosoma sp.	25	–	–
Aulodrilus pigueti	112	561	237
Bratislava unidentata	374	62	–
Dero digitata	25	225	50
Dero pectinata	250	12	12
Dero trifida	487	137	225
Undetermined Enchytraeidae	25	–	–
Haber speciosus	162	37	–
Haemonais waldvogeli	50	100	–
Ilyodrilus templetoni	75	611	–
Limnodrilus hoffmeisteri	4429	8483	337
Pristina aequiseta	150	–	12
Pristina longiseta	50	–	–
Pristina synclites	25	–	–
Pristinella jenkinae	62	–	–
Pristinella sp.	–	187	–
Slavina appendiculata	–	–	37

Spirosperma ferox	25	487	137
Pelecypoda			
Anomalocardia cuneimeris	125	–	–
Brachiodontes exustus	37	–	–
Corbicula manilensis	–	200	–
Gemma gemma	50	–	–
Mytilopsis leucophaeta	1185	–	–
Undetermined Pelecypoda sp.	100	200	–
Sphaerium or *Musculium* sp.	–	75	–
Polychaeta			
Laeonereis culveri	–	37	–
Undetermined Polychaeta sp.	–	37	–
Streblospio benedicti	200	–	–
Trichoptera			
Hydroptila sp.	25	–	–
Undetermined Trichoptera pupa	200	–	–

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



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