

Biological Assessment of

Hastings WWTP

St. Johns County

NPDES #FL0042315

Sampled February 1999

October 1999

Biology Section
Division of Administrative and Technical Services
Bureau of Laboratories

Comprehensive Quality Assurance Plan No. 870346G

Department of Environmental Protection

Results of Fifth Year Inspections

Discharger: Hastings WWTP
County: St. Johns
NPDES Number: FL0042315
Permit Expiration Date:

Toxics Sampling Inspection **(XSI)**

Date Sampled: 15 February 1999

Results: Copper, lead, iron, and zinc were detected in the effluent at levels that complied with Class III water quality standards. The herbicide atrazine, an organic pollutant, was detected at a non-problem level.

Compliance Biomonitoring Inspection **(CBI)**

Date Sampled: 15 February 1999

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

Impact Bioassessment Inspection **(IBI)**

Date Sampled: 15 February 1999

Results: All measures of macroinvertebrate health indicated that the canal was severely stressed and there was very little difference between the study sites. The effluent appeared to be responsible for the degradation at the control and test sites due to the physical characteristics of the canal, namely a lack of flow and poor flushing. For this reason, a valid comparison can not be made between the sites. There were no pollution-sensitive taxa present at either site. These results indicate violations of the biological integrity criterion, a dominance of nuisance species, and a nutrient induced imbalance of natural populations of flora and fauna (Rules 62-302.530(11), (47), and (48)(b) FAC, respectively).

Water Quality Inspection **(WQI)**

Date Sampled: 15 February 1999

Results: Dissolved oxygen was below Class III water quality standards at both the control (2.0 mg/L) and test sites (3.9 mg/L) (Rule 62-302.530(31) FAC). Although background nutrient levels were high, nitrate+nitrite, ortho-phosphate, and ammonia concentrations at the test site were increased apparently due to the effluent. AGP at the test site (90.0 mg dry wt/L) greatly exceeded the 5 mg dry wt/L "problem threshold". The effluent AGP was 19.2 mg dry wt/L.

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

Introduction

The Town of Hastings Wastewater Treatment Plant is located in St. Johns County, Florida (see maps in the Appendix). This 0.120 MGD activated sludge facility treats municipal wastewater. The treatment process includes extended aeration (providing suspended growth nitrification - denitrification) with an anoxic zone, two clarifiers, two anthracite coal filters, and UV disinfection with backup chlorination available. During chlorination, the effluent will be discharged to on-site polishing ponds (see Facility Summary in Appendix). Under normal conditions, the effluent is continuously discharged into an unnamed canal that connects to an unnamed wooded swamp bordered to the east by Deep Creek (a Class III tributary of the St. Johns River). The actual mean flow during this survey is not known.

State permit limits for the effluent are listed in Table 1. According to the facility's monthly operating reports, the plant has had a history of non-compliance that includes: non-implementation of process control methods as well as TSS, CBOD5, and fecal coliform values that exceeded the permit limits . This facility has exceeded at least one permit limit for CBOD5, TSS, total ammonia, calculated unionized ammonia, dissolved oxygen, or fecal coliforms almost every month from 4/98 - 4/99 (see Facility Summary in the Appendix).

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 control site (located in an unnamed canal approximately 100 meters upstream of the discharge) and a test site (located in the same unnamed canal approximately 100 meters downstream of 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. Data for this report were collected on February 15, 1999. The effluent was analyzed for nutrients, metals, and organic constituents (base neutral and acid extractables, and pesticide extractables). Methods used for all chemical analyses are on file at the DEP Central Chemistry Laboratory in Tallahassee.

Acute screening toxicity bioassays, using the invertebrate, *Ceriodaphnia dubia,* and the fish, *Cyprinella leedsi*, as test organisms, were performed on an effluent sample. Bacterial populations were analyzed for total and fecal coliforms.

Benthic macroinvertebrates were evaluated at control 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 that were incubated for 28 days.

Periphyton were sampled at both control and test sites by incubating glass microscope slides in a standard periphytometer for 28 days. Phytoplankton were sampled at both control and test sites via subsurface grabs. Chlorophyll *a* was determined for both phytoplankton and periphyton communities. *Selenastrum capricornutum* was used as the test organism for algal growth potential tests. All field and laboratory biological methods were carried out following Biology Section Standard Operating Procedures (SOP's). The SOP's can be viewed on our web site at <www.dep.state.fl.us/labs/sops.htm>.

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

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

The following personnel were involved in this investigation: Pat O'Connor and Stephanie Jenkins (DEP Northeast District), and Julie Baughman, Ken Espy, Marshall Faircloth, Joy Jackson, Michael Heyn, Elizabeth Miller, Urania Quintana, Johnny Richardson, Lisa Homann, Amy Weaver, Steve

Table 1. Effluent limits and summary of chemistry data.

Town of Hastings WWTP	Effluent Limits	Effluent Sample	Control Site	Test Site
Organic Constituents (µg/L)				
Atrazine	-	0.15 I	-	-
Metals (µg/L)				
Aluminum	≤ 1,500 **	50 U	-	-
Arsenic	≤ 50 **	20 U	-	-
Cadmium	≤ 1.66 d	0.050 U	-	-
Chromium	≤ 309 d	10 U	-	-
Copper	≤ 17.9 d	1.7 A	-	-
Iron	≤ 1,000 **	130	-	-
Lead	≤ 5.92 d	0.28 I	-	-
Mercury	≤ 0.012 **	0.10 U	-	-
Nickel	≤ 238 d	6.0 U	-	-
Selenium	≤ 5.0 **	35 U	-	-
Silver	≤ 0.07 **	0.040 U	-	-
Zinc	≤ 160 d	23 I	-	-
Nutrients (mg/L)				
Ortho-phosphate	-	0.39	0.16	1.2
Total phosphorus	-	0.46 A	1.4	1.3
Ammonia	2.0 *c	0.079 A	0.16	0.73
Nitrate+nitrite	-	4.1	0.039 Q	0.88
TKN	-	1.0 A	2.6	1.8
Organic Nitrogen	-	0.921	2.44	1.07
Total Nitrogen	-	5.1	2.64	1.98
General Phys-Chem Parameters				
Habitat Assessment	-	-	57	72
D.O. (mg/L)	≤ 6.0	8.4	2.0	3.9
pH (SU)	6.0 - 8.5	7.4	7.1	6.5
Conductivity (mmhos/cm)	**	682	1193	678
Temperature (°C)	-	18.5	12.8	13.6
C.B.O.D., 5 day (mg/L)	-	2 K	2	2 K
TSS (mg/L)	-	2	16	5
Flow (MGD)	0.120 a	-	-	-
Hardness (mg $CaCO_3$)	-	163	-	-
AGP (mg dry wt/L)	-	19.2	3.9	90.0
Toxicity (48-hour static, screening bioassay)				
Bioassay - Fish	-	Not Toxic	-	-
Bioassay - Invertebrate	-	Not Toxic	-	-
Microbiology (# counts/100 ml)				
Fecal Coliforms	≤ 800 *b	10 K	3 K	80 B
Total Coliforms	≤ 2,400 **b	10 K	250	2,000

* Permit limit
** Class III water quality standard
A - Value is the mean of two or more determinations
B - Colony counts outside the acceptable dilution range
I - Value is < the MQL, and ≥ the MDL
K - Actual value is known to be less than value given
Q - Sample held beyond normal holding time
U - Analyzed for but not detected; value reported is the MDL

a - Annual average
b - Single sample
c - Monthly average
d - Based on hardness

Wolfe, David Whiting, and Vicki McGee (DEP Central Biology Laboratory in Tallahassee). The report was reviewed by the Point Source Studies Review Committee, consisting of Wayne Magley, Chuck Ziegmont, and Michael Tanski, as well as District representatives.

Results

The chemical and biological results for this report are presented in Tables 1-3.

Discussion

The habitat assessment scores were in the "marginal" range at the control site (57 points) and the "sub-optimal" range at the test site (72 points) (see Habitat Assessments in the Appendix). Both sites were located in a stagnant canal that receives runoff from agricultural and residential areas, has no productive habitat, little to no water flow, and severe silt smothering. The dissolved oxygen levels were below Class III water quality standards at the control site (2.0 mg/L) and test site (3.9 mg/L) (Rule 62-302.530(31) FAC).

Copper, lead, iron, and zinc were detected in the effluent at levels that complied with Class III water quality standards (Table 1). The herbicide atrazine, an organic pollutant, was detected at a non-problem level. The effluent sample was not toxic to the fish, *Cyprinella leedsi,* or to the invertebrate, *Ceriodaphnia dubia,* during the 48-hour bioassay (see Appendix).

Only low levels of fecal and total coliforms were present in the

Table 2. Algae community structure of study sites.

Town of Hastings WWTP	Control Site	Test Site
Phytoplankton Algae		
Number of Taxa	7	7
Shannon-Weaver diversity	2.38	1.54
Chlorophyll a (µg/L)	1.12 U	1.00 U
Algal Density (#/mL)	2,216	2,464
% Blue-green	8.1	5.6
% Green	27.0	32.3
% Diatoms	8.1	0.6
Periphyton Algae		
Number of Taxa	27	17
Shannon-Weaver diversity	2.75	2.63
Chlorophyll a (mg/m2)	43.7	43.9
Algal Density (#/cm2)	1,702,683	1,098,784
Diatom/Diatom + B-G Ratio	0.97	0.99
%Blue-green	2.5	1.1
% Diatoms	85.6	89.9
AGP (mg dry wt/L)	3.9	90.0

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

effluent (Table 1). Total and fecal coliforms were also detected at both the control and test sites at levels that complied with Class III water quality standards.

All of the nutrients at the study sites exceeded levels found in 70%–95% of other Florida streams (see Table 1 and *Typical Values for Selected Parameters in Florida Waters in Appendix*). The facility appeared to contribute to additional nutrient enrichment at the test site as seen from an increase of over 200% in ortho-phosphate and nitrate+nitrite from the control site to the test site (Table 1). The test site levels of these nutrients were higher than 95% of other Florida streams.

Examining the periphyton community data, the one significant change between the study sites was a 37% decrease in taxa richness at the test site compared to the control site (Figure 1). The unusually high algal densities and chlorophyll *a* values at both the control and test sites, indicated other sources of nutrients in the receiving waters in addition to the input from the facility (Table 2). The AGP increased over 2,000% from the control site (3.9 mg dry wt/L) to the test site (90.0 mg dry wt/L). The test site level greatly exceeded the 5 mg dry wt/L "problem threshold" (Raschke and Shultz 1987). The effluent AGP was 19.2 mg dry wt/L.

The receiving canal was severely stressed at the control and test sites (Table 3). The effluent appeared to be responsible for the degradation to the control and test sites due to the physical characteristics of the canal, namely a lack of flow and poor flushing (see Map and Physical/Chemical Characterization Sheets in the Appendix). For this reason, a valid comparison can not be made between the two sites.

The control site received no Florida Index points in either the dipnet or Hester-Dendy samples. The test site received three Florida Index points in the dipnet samples and none in the Hester-Dendy samples. There were no EPT taxa collected from either study site. The dominant taxa in the samples were the pollution-tolerant dipteran, *Chironomus* sp., and the equally pollution-tolerant oligochaete, *Limnodrilus hoffmeisteri*, at the control and test sites, respectively (see Macroinvertebrate Taxa Lists in the Appendix). These results indicate violations of the biological integrity criterion, a dominance of nuisance species, and a nutrient induced imbalance of natural populations of flora and fauna (Rules 62-302.530 (11), (47), and (48)(b) FAC, respectively).

Literature Cited

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

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

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

Miller, W. E., T. E. Maloney, and J. C. Greene. 1978. The *Sele-*

Table 3. Community structure of study sites.

Town of Hastings WWTP	Control Site	Test Site
Macroinvertebrate Qualitative		
% Dominant Taxon	35.8	32.4
EPT Index	0	0
Florida Index	0	3
Number of Taxa	13	14
SCI	19	21
Community Composition		
% Coleoptera	7.4	0.0
% Diptera	44.4	31.7
% Oligochaeta	42.0	64.8
% Pelecypoda	6.2	0.0
% Other	0.0	3.5
Functional Feeding Groups		
% Burrowing Deposit Feeders	39.5	33.1
% Predators	13.6	9.0
% Surface Deposit Feeders	36.4	31.4
% Suspension Feeders/Filterers	6.8	0.3
%Other	1.2	2.1
Macroinvertebrate Hester-Dendy		
Number of Taxa	8	8
Florida Index	0	0
Shannon-Weaver Diversity	1.40	2.84
EPT Index	0	0
Community Composition		
% Amphipoda	0.0	14.3
% Coleoptera	3.8	0.0
% Diptera	18.1	21.4
% Gastropoda	3.8	7.2
% Oligochaeta	74.3	57.2
Functional Feeding Groups		
% Predators	5.4	21.4
% Surface Deposit Feeders	16.5	28.6
% Suspension Feeders	0.0	0.0
% Scrapers	3.8	7.2
% Shredders	0.0	7.1

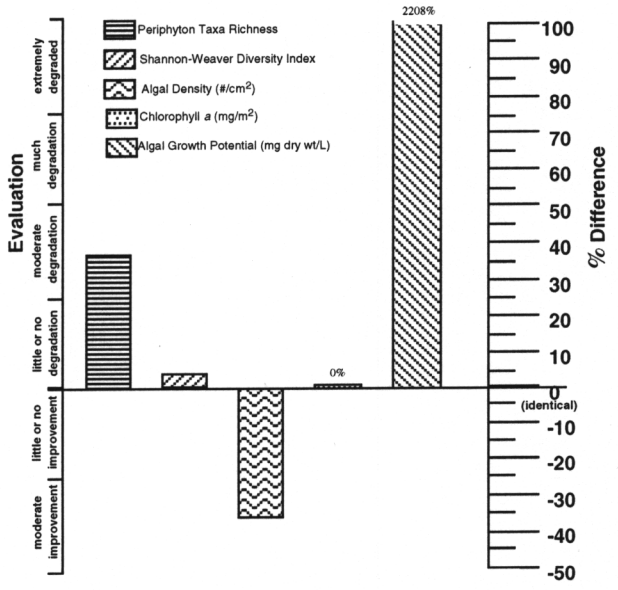


Figure 1. Effect of discharge on the periphyton community.

nastrum 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. 1993. Methods for measuring the acute toxicity of effluents to freshwater and marine organisms. 4th edition. EPA/600/4-90/027. U. S. EPA, Cincinnati, Ohio. 216 pp.

Town of Hastings WWTP - Control Site

Macroinvertebrate Dip Net (20 sweeps of most productive substrates)	**Value**	**Score** 5	3	1
Total Number of Taxa	13	≥18	17-9	<9
EPT Index	0	-	≥3	<3
# Chironomid Taxa	5	≥4	3-2	<2
% Contribution of Dominant Taxon	36	≤37	38-69	>69
% Diptera	44	-	≤67	>67
Florida Index	0	≥6	5-3	<3
% Suspension feeders/Filterers	7	≥25	25-13	<13

Total Score	**Northeast**	**19**
Interpretation of Scores	**Excellent**	26-31
	Good	20-25
	Poor	14-19
	Severely Degraded	7-13

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

Town of Hastings WWTP - Test Site

Macroinvertebrate Dip Net (20 sweeps of most productive substrates)	**Value**	**Score** 5	3	1
Total Number of Taxa	14	≥18	17-9	<9
EPT Index	0	-	≥3	<3
# Chironomid Taxa	6	≥4	3-2	<2
% Contribution of Dominant Taxon	32	≤37	38-69	>69
% Diptera	32	-	≤67	>67
Florida Index	3	≥6	5-3	<3
% Suspension feeders/Filterers	1	≥25	25-13	<13

Total Score	**Northeast**	**21**
Interpretation of Scores	**Excellent**	26-31
	Good	20-25
	Poor	14-19
	Severely Degraded	7-13

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

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 Phosphate	0.01	0.01	0.03	0.04	0.05	0.08	0.11	0.17	0.27	0.59	1.37
Turbidity	0.60	0.90	1.20	1.45	2.10	2.80	3.60	4.50	6.65	10.45	16.30

Units:

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

Explanation of Measurements of Community Health

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

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

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

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

The Florida Index: Some organisms become rare or absent as the intensity or duration of disturbance increases. The Florida Index, assigns points to stream-dwelling macroinvertebrates based on their sensitivity to pollution (see Ross 1990). A site with a high Florida Index score is considered healthy.

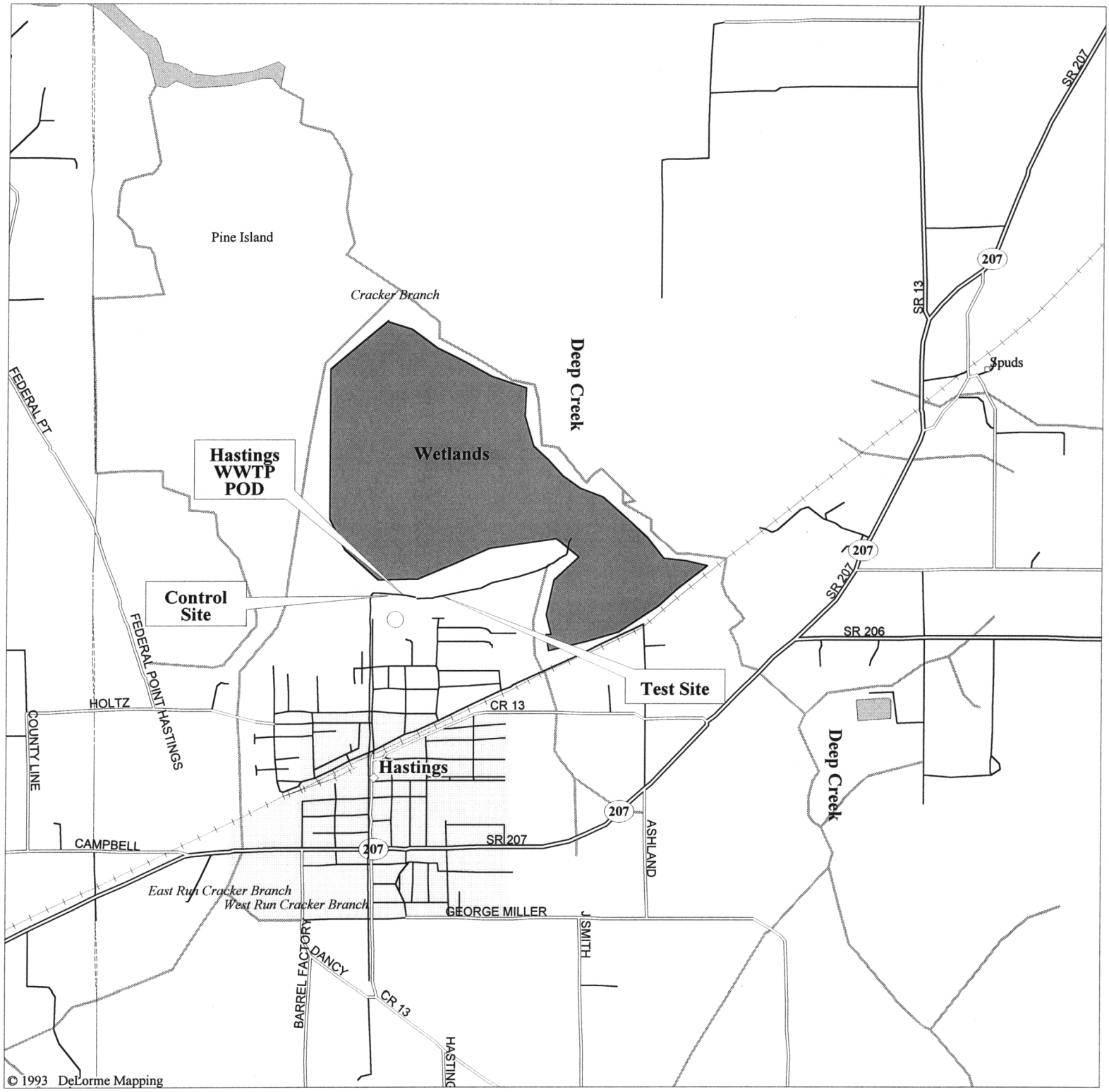
Ephemeroptera/Plecoptera/Trichoptera (EPT) Index: This index is the sum of the number of EPT taxa present. Higher EPT values are associated with healthier systems.

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

Algal biomass: High algal biomass (algal density or chlorophyll *a*) implies nutrient stress. A decreased diatom to blue-green algae ratio (calculated by dividing the number of individuals in the Bacillariophyta by the number of individuals in the Bacillariophyta + Cyanophyta) is often indicative of nutrient enriched conditions in flowing streams.

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

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



LEGEND

- Population Center
- State Route
- Geo Feature
- Town, Small City
- County Boundary
- Street, Road
- Major Street/Road
- State Route
- Railroad
- River
- Open Water

Scale 1:31,250 (at center)

2000 Feet

1000 Meters

Mag 14.00
Wed Sep 01 14:54:40 1999

Facility Information Sheet

please provide most recent information for our writing the bioassay reports

(you need NOT complete this sheet if sampling was part of a 5th-year BIOASSESSMENT)

Facility Name: TOWN OF HASTINGS WWTP

(as found on the permit)

NPDES permit #: FL00 42315

Facility Location: (road) NORTH MAIN STREET

(city) HASTINGS

(county) ST. JOHNS

Receiving Water: UNNAMED MAN-MADE CANAL THAT DISCHARGES TO AN UNNAMED WOODED SWAMP BORDERED TO THE EAST BY DEEP CREEK

Chlorination Type of Sample: ___ Chlorinated

(Non-chlorinated) - USE U.V. DISINFECTION

___ Sample collected after dechlorination •

Design Flow: 0.120 MGD Average Flow : _____

Type of Facility (e.g., WWTP, R/O, paper mill, etc): WWTP

Treatment that Wastewater Receives Prior to Discharge:

0.120 MGD EXTENDED AERATION WITH AN ANOXIC ZONE, 2 CLARIATORS (CLARIFIERS), 2 FILTERS, UV DISINFECTION, WHEN THE UV SYSTEM IS DOWN CHLORINE IS USED

• if so, what method of dechlorination is used at this facility? ~~AFTER~~ EFFLUENT FLOW ~~GOES~~ THROUGH THE OLD PERCOLATION PONDS THEN TO TO CANAL, DECHLORINATION IS MET DURING TIME IT TAKES TO GO THROUGH THE PONDS

Additional Comments: THIS FACILITY HAS A HISTORY OF NON COMPLIANCE

prepared by STEPHANIE JENKINS

revised 3/3/94 KP

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

Facility Name: TOWN OF HASTINGS WWTF	Prepared by: STEPHANIE JENKINS Date: — 7-6-99	
Location (attach detailed map): SEE ATTACHED MAP	County: ST. JOHNS	District: NED
Federal Permit # FL0042315 and expiration date:	State GMS # and 3155M 00 523 State expiration date:	Facility Type: ~~WW~~ Industrial (Municipal) Federal Agricultural Other (list):

Function of facility: DOMESTIC TO TREAT WASTEWATER

Description of treatment process:
ACTIVATED SLUDGE WITH AN ANOXIC ZONE, SECONDARY CLARIFICATON TERTIARY FILTERS + UV DISINFECTION, FURTHER DETAILS ON P. 1 OF DRAFT PERMIT

Receiving waters: UNNAMED MAN-MADE CANAL TO AN UNNAME ~~WETLANDS~~ SWAMP BORDED TO EAST BY DEEP CREEK	Classification: (MINOR) CATEGORY I, CLASS C
Design Flow: 0.150 / PERMITTED TO 0.120MGD	Actual Mean Flow:

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

therefore, the best time to sample is:

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

List effluent limits: SEE LIMITS IN DRAFT PERMIT ~~FROM PERMIT THAT EXPIRES 7-1-94~~

Parameter	Limit (units)
~~FLOW~~	0.120MGD
~~CBODS~~ SEE	5.00 mg/L
~~TSS~~ ATTACHED	5.00 mg/L

Describe special permit conditions and permit modifications:
SEE P. 12 + 13 OF DRAFT PERMIT

Department of Environmental Protection

Jeb Bush
Governor

Northeast District
7825 Baymeadows Way, Suite B200
Jacksonville, Florida 32256-7590

David B. Struhs
Secretary

STATE OF FLORIDA
DOMESTIC WASTEWATER FACILITY PERMIT

PERMITTEE:

Town of Hastings

RESPONSIBLE AUTHORITY:
Honorable Edward Singleton, Jr., Mayor
Town of Hastings
Post Office Box 427
Hastings, Florida 32145-0427

Phone Number: 904-692-1420

PERMIT NUMBER: FL0042315 (Minor)
ISSUANCE DATE: DRAFT
EXPIRATION DATE: DRAFT
FACILITY I.D. NO: FL0042315
PROJECT NO.: 001

FACILITY:

Town of Hastings WWTP
816 North Main Street
St. Johns County
Hastings, Florida 32145
Latitude: 29° 43' 43" N Longitude: 81° 30' 26" W

This permit is issued under the provisions of Chapter 403, Florida Statutes, Consent Order number 99- and applicable rules of the Florida Administrative Code and constitutes authorization to discharge to waters of the state under the National Pollutant Discharge Elimination System. The above named permittee is hereby authorized to operate the facilities shown on the application and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

TREATMENT FACILITIES:

An existing 0.120 MGD annual average daily flow (AADF) permitted capacity activated sludge facility operating in the extended aeration mode and providing suspended growth nitrification - denitrification (with methanol feed capability). The plant provides in excess of secondary treatment of domestic wastewater and consists of an influent bar screen, selector tank (6,600 gallons), two aeration tanks (52,000 gallons each), two surge tanks (9,950 gallons each), an aerobic digester (15,400 gallons), an anoxic zone (29,262 gallons), two clarators (12,900 gallons each), two anthracite coal filters, and ultraviolet disinfection with backup chlorination available. During chlorination, discharge of effluent will be to onsite polishing ponds. Construction at the facility will provide a surge or flow equalization tank (100,000 gallons), an aerobic digester (18,000 gallons), and one wedgewater sludge drying bed (400 square feet). New construction noted above has been cleared for use and was placed into service on May 28, 1999.

EFFLUENT DISPOSAL:

Surface Water Discharge: An existing 0.120 MGD annual average daily flow (AADF) permitted discharge to an unnamed, man-made canal (D001), connecting to a wooded swamp bordered to the east by Deep Creek (a tributary of the St. Johns River) and to the west by Cracker Branch (a tributary of Deep Creek) . The Hastings WWTF discharge is located approximately at latitude 29° 43' 43" N, longitude 81° 30' 26" W.

IN ACCORDANCE WITH: The permit application received April 19, 1995 and additional information provided April 26, 1996, October 15, 1997, January 14, February 12, and November 17, 1998, and the limitations, monitoring requirements and other conditions as set forth in Pages 1 through 20 of this permit and Consent Order No.: 99-0349.

PERMITTEE: Town of Hastings
FACILITY: Town of Hastings WWTF

PERMIT NUMBER: FL0042315
ISSUANCE DATE: DRAFT
EXPIRATION DATE: DRAFT
FACILITY I.D. NO.: FL0042315

I. SURFACE WATER DISCHARGE MONITORING REQUIREMENTS

Surface Water Discharges

1. During the period beginning on the date of receipt of the "Notification Of Completion Of Construction For Wastewater Facilities", DEP Form 62-620.610(12) by the Northeast District Office and lasting through the duration of this permit, the permittee is authorized to discharge effluent from Outfall D001 directly to a man-made canal during use of the Ultraviolet disinfection system, or into an existing polishing pond which empties into the man-made canal during use of chlorination for disinfection. The canal empties into a wooded swamp which is bordered on the east by Deep Creek (a tributary of the St. Johns River) and to the west by Cracker Branch (a tributary of Deep Creek). Such discharge shall be limited and monitored by the permittee as specified below:

			Effluent Limitations				Monitoring Requirements			
Parameter	**Units**	**Max/Min**	**Annual Average**	**Monthly Average**	**Weekly Average**	**Single Sample**	**Monitoring Frequency**	**Sample Type**	**Monitoring Location Site Number**	**Notes**
Flow	mgd	Maximum	0.120				V-notch weir & ultrasonic with recorder	Recording flow meters and totalizers	EFA-1	See Cond.I.A.3 & I.A.16
Carbonaceous Biochemical Oxygen Demand (5 day)	mg/L	Maximum	5.0	6.25	7.5	10.0	Every Two Weeks	8-hour flow proportioned composite	EFA-1	See Cond.I.A.7
Percent Removal Carbonaceous Biochemical Oxygen Demand (5 day)	%	Minimum		90			Every Two Weeks	Calculated	EFA-1	See Cond.I.A.11
Total Suspended Solids	mg/L	Maximum	5.0	6.25	7.5	10.0	Every Two Weeks	8-hour flow proportioned composite	EFA-1	See Cond.I.A.7
Percent Removal - Total Suspended Solids	%	Minimum		90			Every Two Weeks	Calculated	EFA-1	See Cond.I.A.11
Fecal Coliform Bacteria	See Permit Condition I.A.4.						Every Two Weeks	Grab	EFA-1	See Cond.I.A.4 & I.A.7
pH	std. units	Range				6.0 to 8.5	5 Days/Week	Grab	EFA-1	See Cond.I.A.7

PERMITTEE: Town of Hastings
FACILITY: Town of Hastings WWTF

PERMIT NUMBER: FL0042315
ISSUANCE DATE: DRAFT
EXPIRATION DATE: DRAFT
FACILITY I.D. NO.: FL0042315

			Effluent Limitations				Monitoring Requirements			
Parameter	**Units**	**Max/Min**	**Annual Average**	**Monthly Average**	**Weekly Average**	**Single Sample**	**Monitoring Frequency**	**Sample Type**	**Monitoring Location Site Number**	**Notes**
Total Residual Chlorine (For Disinfection) during chlorine addition	mg/L	Minimum				0.5	5 Days/Week maximum or every day of chlorine use	Grab	EFD-1	See Cond.I.A.5 & I.A.17
Total Residual Chlorine (For Dechlorination) following chlorine addition	mg/L	Maximum				0.01	Every Day of Discharge from polishing pond	Grab	EFD-2	See Cond.I.A.6
Total Nitrogen as N	mg/L	Maximum	3.0	3.75	4.5	6.0	Every Two Weeks	8-hour flow proportioned composite	EFA-1	
Ammonia, Total as N	mg/L	Maximum		2.0			Every Two Weeks	Grab	EFA-1	See Cond.I.A.10
Ammonia, Unionized as N	mg/L	Maximum				Report	Monthly	Calculated	EFA-1	See Cond.I.A.10
Oxygen, Dissolved (DO)	mg/L	Minimum				6.0	5 Days/Week	Grab	EFA-1	
$NO_2 + NO_3$, as N	mg/L	Maximum				Report	Quarterly	8-hour flow proportioned composite	EFA-1	
Nitrogen, Total Kjeldahl as N	mg/L	Maximum				Report	Quarterly	8-hour flow proportioned composite	EFA-1	
Total Phosphorus as P	mg/L	Maximum				Report	Quarterly	8-hour flow proportioned composite	EFA-1	
Phosphorus in Total Orthophosphorus as P	mg/L	Maximum				Report	Quarterly	Grab	EFA-1	

2. Effluent samples shall be taken at the monitoring site locations listed in Permit Condition I. A. 1. and as described below:

Monitoring Location Site Number	Description of Monitoring Location
EFA-1	Sample point immediately after UV disinfection in manhole
EFD-1	Sample point immediately after chlorine disinfection
EFD-2	Sample point after polishing ponds

3. A v-notch weir and ultrasonic flowmeter, with a circular chart recording device, shall be utilized to measure flow and must be calibrated at least annually. *[62-601.200(17) and .500(6), 12-24-96]* By January 1, 2000, the permittee shall replace the temporary wooden structure used to reduce turbulence in the reaeration chamber (located at the v-notch weir) with a permanent baffled system in order to produce more reliable flow measurements. (See specific condition VI.3.)

4. The arithmetic mean of the monthly fecal coliform values collected during an annual period shall not exceed 200 per 100 mL of effluent sample. The geometric mean of the fecal coliform values for a minimum of 10 samples of effluent each collected on a separate day during a period of 30 consecutive days (monthly), shall not exceed 200 per 100 mL of sample. No more than 10 percent of the samples collected (the 90th percentile value) during a period of 30 consecutive days shall exceed 400 fecal coliform values per 100 mL of sample. Any one sample shall not exceed 800 fecal coliform values per 100 mL of sample. Note: To report the 90th percentile value, list the fecal coliform values obtained during the month in ascending order. Report the value of the sample that corresponds to the 90th percentile (multiply the number of samples by 0.9). For example, for 30 samples, report the corresponding fecal coliform number for the 27th value of ascending order. *[62-600.440(4)(c), 12-24-96]*

5. A minimum of 0.5 mg/L total residual chlorine must be maintained for a minimum contact time of 15 minutes based on peak hourly flow for periods of time in which chlorination must be used as the disinfection method. *[62-600.440(4)(b), 12-24-96]*

6. A maximum total residual chlorine content of 0.01 mg/L shall not be exceeded prior to discharge to waters of the State. The permittee may forgo measurement of the chlorine content of the discharge if a demonstration is made to the department that the holding time in the polishing pond exceeds 3 days.

7. Field testing, sample collection and preservation, laboratory testing, including quality control procedures, and all record keeping shall comply with Chapter 62-160, FAC. Compliance of reported results shall be in accordance with Rule 62-4.246, FAC. Each effluent parameter has an applicable method detection limit (MDL) and a practical quantitative limit (PQL).

Parameter	Analytical Method	MDL (units)	PQL (units)
Total Nitrogen			
$CBOD_5$	5210B	2.0 (mg/L)	10.0 (mg/L)
TSS	160.2	4.0 (mg/L)	4.0 (mg/L)
pH	150.1	0.10 (s.u.)	0.10 (s.u.)
Fecal Coliform	9222D	1/100 mL	2/100 mL

The MDLs and PQLs listed above shall constitute the minimum reporting levels for the duration of this permit. Equivalent methods are subject to approval by the Department for each effluent parameter. The Department shall not accept results for which the laboratory's MDLs or PQLs are greater than those listed above. Equivalent methods are subject to approval by the Department for each effluent parameter. See permit specific condition number I.A.10 and general condition IX.18. Unless otherwise specified, sample results shall be reported as follows:

a) Results greater than or equal to the PQL shall be reported as the measured quantity.

b) Results less than the PQL and greater than or equal to the MDL shall be reported as the PQL followed by the lab code "m" and shall be deemed equal to the MDL when necessary to calculate an average for that parameter.

c) Results less than the MDL shall be reported as the MDL followed by the lab code "u". A value of one half the MDL or half the effluent limit, whichever is lower, shall be used for that sample when necessary to calculate an average for that parameter. Values less than the MDL are considered to demonstrate compliance with an effluent limit or monitoring requirement. *[62-4.246 FAC, 8-16-98]*

8. Florida water quality criteria and standards shall not be violated as a result of the discharge. *[62-620.320(9), 11-29-94][62-302.510(5), 4-12-95]*

9. The Department reserves the right to require a series of tests to evaluate whole effluent toxicity of the discharge from any outfalls. If required, the Department shall provide notice to the permittee by issuing a permit modification. *[Rule 62-302.500(1)(d), FAC, 4-12-95]*

10. A grab sample of the final treated effluent shall be taken and analyzed for total ammonia. The temperature and pH of the effluent shall be recorded at the time of the collection of the total ammonia sample. Attachment B contains a chart and information for use in calculating the unionized ammonia.

11. In addition to the specified limits, the monthly average effluent CBOD5 and total suspended solids shall not exceed 10% of the respective influent values (90% removal). The percent removal shall be reported on the Discharge Monitoring Report (DMR).

B. Other Limitations and Monitoring and Reporting Requirements

1. During the period beginning on the issuance date and lasting through the expiration date of this permit, the treatment facility shall be limited and monitored by the permittee as specified below:

			Limitations				Monitoring Requirements			
Parameter	**Units**	**Max/Min**	**Annual Average**	**Monthly Average**	**Weekly Average**	**Single Sample**	**Monitoring Frequency**	**Sample Type**	**Monitoring Location Site Number**	**Notes**
Carbonaceous Biochemical Oxygen Demand (5 day)	mg/L	Report				Report	Every Two Weeks	8-hour flow proportioned composite	INF-1	See Cond.I.B.3
Total Suspended Solids	mg/L	Report				Report	Every Two Weeks	8-hour flow proportioned composite	INF-1	See Cond.I.B.3

2. Samples shall be taken at the monitoring site locations listed in Permit Condition I. B. 1 and as described below:

Monitoring Location Site Number	Description of Monitoring Location
INF-1	Prior to any biological treatment

3. Influent samples shall be collected so that they do not contain digester supernatant or return activated sludge, or any other plant process recycled waters. *[62-601.500(4), 12-24-96]*

4. Parameters which must be monitored as a result of a surface water discharge shall be analyzed using a sufficiently sensitive method in accordance with 40 CFR Part 136. *[62-620.610(18), 11-29-94]*

5. The permittee shall provide safe access points for obtaining representative influent and effluent samples which are required by this permit. *[62-601.500(5), 12-24-96]*

6. During the period of operation authorized by this permit, the permittee shall complete and submit to the Department on a monthly basis Discharge Monitoring Report(s) (DMR), Form 62-620.910(10), as attached to this permit. The permittee shall make copies of the attached DMR form(s) and shall submit the completed DMR form(s) to the Department by the twenty-eighth (28th) of the month following the month of operation at the address specified below:

   Florida Department of Environmental Protection
   Wastewater Facilities Regulation Section, Mail Station 3551
   Twin Towers Office Building
   2600 Blair Stone Road
   Tallahassee, Florida 32399-2400

   [62-620.610(18), 11-29-94][62-601.300(1),(2), and (3),12-24-96]

8. Unless specified otherwise in this permit, all reports and notifications required by this permit, including 24-hour notifications, shall be submitted to or reported to, as appropriate, the Department's Northeast District Office District Office at the address specified below:

   Florida Department of Environmental Protection
   Northeast District Office District Office
   Florida Dept. of Environmental Protection 7825 Baymeadows Way, Suite 200B
   Jacksonville, Florida 32256-7590

   Phone Number - (904) 448-4330
   FAX Number - (904) 448-4366 All FAX copies shall be followed by original copies.

a. Records of all compliance monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation and a copy of the laboratory certification showing the certification number of the laboratory, for at least three years from the date the sample or measurement was taken;

b. Copies of all reports required by the permit for at least three years from the date the report was prepared;

c. Records of all data, including reports and documents, used to complete the application for the permit for at least three years from the date the application was filed;

d. Monitoring information, including a copy of the laboratory certification showing the laboratory certification number, related to the residuals use and disposal activities for the time period set forth in Chapter 62-640, F.A.C., for at least three years from the date of sampling or measurement;

e. A copy of the current permit;

f. A copy of the current operation and maintenance manual as required by Chapter 62-600, F.A.C.;

g. A copy of the facility record drawings;

h. Copies of the licenses of the current certified operators; and

i. Copies of the logs and schedules showing plant operations and equipment maintenance for three years from the date of the logs or schedules. The logs shall, at a minimum, include identification of the plant; the signature and certification number of the operator(s) and the signature of the person(s) making any entries; date and time in and out; specific operation and maintenance activities; tests performed and samples taken; and major repairs made. The logs shall be maintained on-site in a location accessible to 24-hour inspection, protected from weather damage, and current to the last operation and maintenance performed.

[62-620.350,11-29-94][61E12-41.010(1)(e), 11-02-93]

VI. COMPLIANCE SCHEDULES AND SELF-IMPOSED IMPROVEMENT SCHEDULES

1. The permittee shall complete the construction required in Consent Order No. 99-0349.

2. The permittee shall continue to address the problem of Inflow and Infiltration (I & I) of stormwater and shall document those areas of town where efforts have been made to reduce I & I. A plan to address any remaining I & I issues following the depletion of the currently earmarked funds from Rural Development ($100,000) and St. Johns River Initiative ($100,000) shall be

submitted to the department for review within 30 days following completion of the current I & I projects.

3. Within 60 days of receipt of issuance of this permit, the permittee shall submit a minor revision request with all necessary information to ensure proper handling and disposal of residuals generated at the facility.

4. The permittee shall repair or replace the intensity indication mechanism associated with Ultraviolet Disinfection system by January 1, 2000.

VII. INDUSTRIAL PRETREATMENT PROGRAM REQUIREMENTS

1. This facility is not required to have a pretreatment program at this time. [62-625.500, 11-29-94]

VIII. OTHER SPECIFIC CONDITIONS

1. If the permittee wishes to continue operation of this wastewater facility after the expiration date of this permit, the permittee shall submit an application for renewal, using Department Forms 62-620.910(1) and (2), no later than one-hundred and eighty days (180) prior to the expiration date of this permit. *[62-620.410(5), 12-24-96]*

2. Florida water quality criteria and standards shall not be violated as a result of any discharge or land application of reclaimed water or residuals from this facility. *[62-610.850(1)(a) and (2)(a), 1-9-96]*

3. In the event that the treatment facilities or equipment no longer function as intended, are no longer safe in terms of public health and safety, or odor, noise, aerosol drift, or lighting adversely affects neighboring developed areas at the levels prohibited by Rule 62-600.400(2)(a), F.A.C., corrective action (which may include additional maintenance or modifications of the permitted facilities) shall be taken by the permittee. Other corrective action may be required to ensure compliance with rules of the Department. Additionally, the treatment, management, use or land application of residuals shall not cause a violation of the odor prohibition in Rule 62-296.320(2), F.A.C. *[62-600.410(8), 12-24-96 and 62-640.400(6), 3-30-98]*

4. The deliberate introduction of stormwater in any amount into collection/transmission systems designed solely for the introduction (and conveyance) of domestic/industrial wastewater; or the deliberate introduction of stormwater into collection/transmission systems designed for the introduction or conveyance of combinations of storm and domestic/industrial wastewater in amounts which may reduce the efficiency of pollutant removal by the treatment plant is prohibited. *[62-604.130(3), 12-26-96]*

5. Collection/transmission system overflows shall be reported to the Department in accordance with Permit Condition IX. 20. *[62-604.550, 12-26-96] [62-620.610(20), 12-24-96]*

6. The operating authority of a collection/transmission system and the permittee of a treatment plant are prohibited from accepting connections of wastewater discharges which have not received

Town of Hastings - Summary of inspections from 1998

1-26-98 - Solids were discharging over the filters
- It was believed that due to the high solids that the UV system was ineffective, but chlorine was not applied to the effluent to compensate for this.
- The operator was not implementing any process control methods

1-27-98 - Plant was upset
- Only 5-6 inches of freeboard in the aeration basins
- Overflow basins were full (after aeration basins)
- Effluent flowing over the filters and going directly to the UV system
- Samples taken during the inspection:
  TSS - 164 mg/L
  CBOD5 - 21 mg/L
  Fecal coliform - 37,000/100 mL 32,000/100 mL

2-10-98 - Plant was recovering from an abnormal event, the filters were not working properly

The plant was rated significantly out-of compliance during all of these inspections.

There were numerous abnormal events during the heavy rains received during the early part of 1998 (Jan- Feb.) Also, on September 20, 1998 wastewater was overflowing the walls of the plant because of the heavy rains.

DMR Review - April 1998 through April 1999

Mo/Yr.	CBOD5 (mg/L)	TSS (mg/L)	NH3-N (mg/L)	Fecal (#/100mL)	Union. NH3 (mg/L)	Org. N (mg/L)	Min. DO (mg/L)
4/99	2.25	3.17	0.43	1.0	0.008	2.76	5.3
3/99	6.1	16.49	0.185	100	.0635	3.21	5.45
2/99	6	<0.9	0.07	1	.008	2.25	5.02
1/99	4.1	19.85	1.98	TNTC	.0099	3.69	5.03
12/98	2.0	5.0	0.19	16	.007	2.0	7.42
11/98	2.0	15.97	0.25	316	.008	2.83	6.35
10/98	1.95	10.0	0.130	TNTC	.008	2.48	5.69
9/98	3.3	12.2	3.60	50	.040	3.53	3.72
8/98	2	4.25	0.175	27	.008	2.43	5.42
7/98	2	16.5	1.306	TNTC	.011	2.25	6.74
6/98	4.0	13.25	5.38	1	.034	3.09	6.05
5/98	2.8	26.5	6.76	200	.059	2.61	6.03
4/98	6.1	7.83	7.085	50.5	.076	1.635	6.03

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

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

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	TIME	RECEIVING BODY OF WATER:
	20030590	2/15/99	130	

REMARKS:	COUNTY:	LOCATION:	FIELD ID/NAME:
	St Johns	UNAMED Ditch 100 m Above Hastings WWTP POD	CONTROL SITE

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest/Natural	Silviculture	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
10		20	40	20	10		

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

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

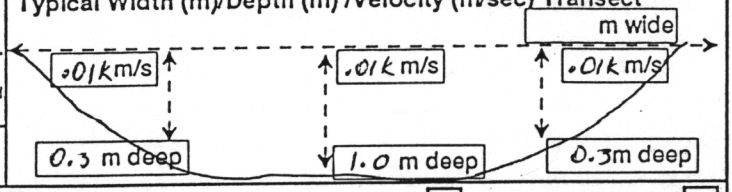
Width of riparian vegetation (m) on least buffered side: 8 — *List & map dominant vegetation on back*

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

Artificially Impounded ☐ yes

High Water Mark: 0.3 (m above present water level) + 1.0 (present depth in m) = 1.3 (m above bed)

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



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

SEDIMENT/SUBSTRATE

TOP 4" of Ditch is SEmi clear almost STAGNANT WATER BELOW is ANAEROBIC muck

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

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

Sediment Deposition: Sludge: ☐ Sand smothering: none (slight) moderate severe Silt smothering: none slight (moderate) severe Other:

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)				Sand			
Leaf Packs or Mats	80	10	DIPNET	Mud/Muck/Silt	20	10	DIPNET
Aquatic Vegetation				Other:			
Rock or Shell Rubble				Other:			
Undercut banks/Roots				*Draw aerial view sketch of habitats found in 100 m section*			

WATER QUALITY	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm) or Salinity (ppt):			Secchi (m):
Top								
Mid-depth	0.1	12.83	7.07	1.98	1193			0.1 L
Bottom								

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

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

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

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

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

Weather Conditions/Notes: Cool clear

RECEIVED
JUN - 4 1999

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

SAMPLING TEAM: ~~Wright~~ O'Connor JENKINS — DEPT. OF ENV. PROTECTION NORTHEAST DISTRICT - JAX

SIGNATURE: [signature] DATE: 2/15/99

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET (5-27-98)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
	21003590	2/15/99	

REMARKS:	COUNTY:	LOCATION:	FIELD ID/NAME:
NO FLOW	St Johns	UNAMED Ditch 100 m ABOVE HASTINGS WWTP POND	CONTROL SITE

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Primary Habitat Components				
Substrate Diversity [2]	Four or more productive habitats present (snags, tree roots, aquatic vegetation, leaf packs (partially decayed), undercut banks, rock). 20 19 18 17 16	Three productive habitats present. Adequate habitat. Some substrates may be new fall (fresh leaves or snags). 15 14 13 12 11	Two productive habitats present. Less than desirable habitat, frequently disturbed or removed. 10 9 8 7 6	One or less productive habitat. Lack of habitat is obvious, substrates unstable or smothered. 5 4 3 2 1
Substrate Availability [6]	Greater than 30% productive habitat present at site. 20 19 18 17 16	16% to 30% productive habitat, by aerial extent. 15 14 13 12 11	6% to 15 % productive habitat 10 9 8 7 6	Less than 5% productive habitat. 5 4 3 2 1
Water Velocity [2]	Max. observed at typical transect: >0.25 m/sec. but < 1 m/sec 20 19 18 17 16	Max. observed at typical transect: 0.1 to 0.25 m/sec 15 14 13 12 11	Max. observed at typical transect: 0.05 to 0.1 m/sec 10 9 8 7 6	Max. observed at typical transect <0.05 m/sec, or spate occurring; > 1 m/sec 5 4 3 2 1
Habitat Smothering [2]	Less than 20% of habitats affected by sand or silt accumulation	20%-50% of habitats affected by sand or silt accumulation	Smothering of 50%-80% of habitats with sand or silt, pools shallow, frequent sediment movement	Smothering of >80% of habitats with sand or silt, a severe problem, pools absent
Primary Score [12]	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Secondary Habitat Components				
Artificial Channelization [6]	No artificial channelization or dredging. Stream with normal, sinuous pattern 20 19 18 17 16	May have been channelized in the past (>20 yrs), but mostly recovered, fairly good sinuous pattern 15 14 13 12 11	Channelized, somewhat recovered, but > 80% of area affected 10 9 8 7 6	Artificially channelized, box-cut banks, straight, instream habitat highly altered 5 4 3 2 1
Bank Stability: Right Bank [6] / Left Bank [8]	Stable. No evidence of erosion or bank failure. Little potential for future problems. 10 9	Moderately stable. Infrequent or small areas of erosion, mostly healed over. 8 7 6	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. 5 4	Unstable. Many (60%-80%) raw, eroded areas. Obvious bank sloughing. 3 2 1
Riparian Buffer Zone Width: Right Bank [4] / Left Bank [7]	Width of native vegetation (least buffered side) greater than 18 m 10 9	Width of native vegetation (least buffered side) 12 m to 18 m 8 7 6	Width of native vegetation 6 to 12 m, human activities still close to system 5 4	Less than 6 m of native buffer zone due to intensive human activities 3 2 1
Riparian Zone Vegetation Quality: Right Bank [7] / Left Bank [7]	Over 80% of riparian surfaces consist of native plants, including trees, understory shrubs, or non-woody macrophytes. Normal, expected plant community for given sunlight & habitat conditions. 10 9	50% to 80% of riparian zone is vegetated, and/or one class of plants normally expected for the sunlight & habitat conditions is not represented. Some disruption in community evident. 8 7 6	25% to 50% of riparian zone is vegetated, and/or one or two expected classes of plants are not represented. Patches of bare soil or closely cropped vegetation, disruption obvious. 5 4	Less than 25% of streambank surfaces are vegetated and/or poor plant community (*e.g.* grass monoculture or exotics) present. Vegetation removed to stubble height of 2 inches or less. 3 2 1
Secondary Score [45]				

TOTAL SCORE [57]

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ANALYSIS DATE:	ANALYST:	SIGNATURE:
2/15/99	PO'Connor	PO'Connor

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

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

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	TIME	RECEIVING BODY OF WATER:
	20030591	2/15/99	1445	

REMARKS:	COUNTY:	LOCATION:	FIELD ID/NAME:
	St Johns	UNAMED Ditch 100 METERS BELOW HASTINGS WWTP POD	TEST SITE

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest/Natural	Silviculture	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
10		20	40	20	10		

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

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

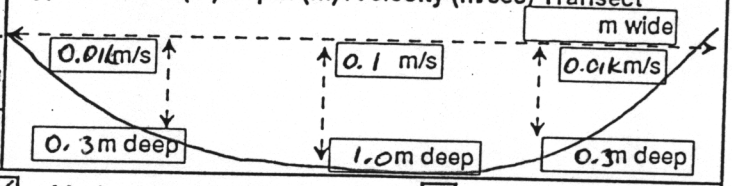
Width of riparian vegetation (m) on least buffered side: | *List & map dominant vegetation on back*

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

Artificially Impounded ☐ yes

High Water Mark: 0.3 (m above present water level) + 1.0 (present depth in m) = 1.3 (m above bed)

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



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

SEDIMENT/SUBSTRATE Top 4" of Ditch is clear water below is anaerobic muck

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

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

Sediment Deposition: Sludge: ☒ Sand smothering: none slight moderate severe Silt smothering: none slight moderate severe Other:

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)				Sand			
Leaf Packs or Mats	80	10	DIPNET	Mud/Muck/Silt	20	10	DIPNET
Aquatic Vegetation				Other:			
Rock or Shell Rubble				Other:			
Undercut banks/Roots							

Draw aerial view sketch of habitats found in 100 m section

WATER QUALITY	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm) or Salinity (ppt):			Secchi (m):
Top								
Mid-depth	0.1	13.57	6.54	3.86	678			0.1 ~~0.25~~
Bottom								

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

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

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

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

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

Weather Conditions/Notes: Cool clear

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

SAMPLING TEAM: O'Connor Jenkins DEPT. OF ENV. PROTECTION NORTHEAST DISTRICT - JAX

SIGNATURE: Patricia O'Connor

DATE: 2/15/99

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET (5-27-98)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
	20030591	2/15/99	

REMARKS:	COUNTY:	LOCATION:	FIELD ID/NAME:
	St. Johns	UNAMED Ditch 100 m below Hastings WWTP POD	Test Site

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Primary Habitat Components **Substrate Diversity** [2]	Four or more productive habitats present (snags, tree roots, aquatic vegetation, leaf packs (partially decayed), undercut banks, rock). 20 19 18 17 16	Three productive habitats present. Adequate habitat. Some substrates may be new fall (fresh leaves or snags). 15 14 13 12 11	Two productive habitats present. Less than desirable habitat, frequently disturbed or removed. 10 9 8 7 6	One or less productive habitat. Lack of habitat is obvious, substrates unstable or smothered. 5 4 3 2 1
Substrate Availability [6]	Greater than 30% productive habitat present at site. 20 19 18 17 16	16% to 30% productive habitat, by aerial extent. 15 14 13 12 11	6% to 15 % productive habitat 10 9 8 7 6	Less than 5% productive habitat. 5 4 3 2 1
Water Velocity [10]	Max. observed at typical transect: >0.25 m/sec. but < 1 m/sec 20 19 18 17 16	Max. observed at typical transect: 0.1 to 0.25 m/sec 15 14 13 12 11	Max. observed at typical transect: 0.05 to 0.1 m/sec 10 9 8 7 6	Max. observed at typical transect <0.05 m/sec, or spate occurring; > 1 m/sec 5 4 3 2 1
Habitat Smothering [5]	Less than 20% of habitats affected by sand or silt accumulation	20%-50% of habitats affected by sand or silt accumulation	Smothering of 50%-80% of habitats with sand or silt, pools shallow, frequent sediment movement	Smothering of >80% of habitats with sand or silt, a severe problem, pools absent
Primary Score [23]	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Secondary Habitat Components **Artificial Channelization** [6]	No artificial channelization or dredging. Stream with normal, sinuous pattern 20 19 18 17 16	May have been channelized in the past (>20 yrs), but mostly recovered, fairly good sinuous pattern 15 14 13 12 11	Channelized, somewhat recovered, but > 80% of area affected 10 9 8 7 6	Artificially channelized, box-cut banks, straight, instream habitat highly altered 5 4 3 2 1
Bank Stability Right Bank [7] Left Bank [8]	Stable. No evidence of erosion or bank failure. Little potential for future problems. 10 9	Moderately stable. Infrequent or small areas of erosion, mostly healed over. 8 7 6	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. 5 4	Unstable. Many (60%-80%) raw, eroded areas. Obvious bank sloughing. 3 2 1
Riparian Buffer Zone Width Right Bank [7] Left Bank [7]	Width of native vegetation (least buffered side) greater than 18 m 10 9	Width of native vegetation (least buffered side) 12 m to 18 m 8 7 6	Width of native vegetation 6 to 12 m, human activities still close to system 5 4	Less than 6 m of native buffer zone due to intensive human activities 3 2 1
Riparian Zone Vegetation Quality Right Bank [7] Left Bank [7]	Over 80% of riparian surfaces consist of native plants, including trees, understory shrubs, or non-woody macrophytes. Normal, expected plant community for given sunlight & habitat conditions. 10 9	50% to 80% of riparian zone is vegetated, and/or one class of plants normally expected for the sunlight & habitat conditions is not represented. Some disruption in community evident. 8 7 6	25% to 50% of riparian zone is vegetated, and/or one or two expected classes of plants are not represented. Patches of bare soil or closely cropped vegetation, disruption obvious. 5 4	Less than 25% of streambank surfaces are vegetated and/or poor plant community (*e.g.* grass monoculture or exotics) present. Vegetation removed to stubble height of 2 inches or less. 3 2 1
Secondary Score [49]				

[72] TOTAL SCORE

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ANALYSIS DATE:	ANALYST:	SIGNATURE:
2/15/99	PO Comm	

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: TOWN NAME correction 2/19/99 MF ~~City of~~ Hastings WWTP
County: St. Johns
Contact / District: Pat O'Conner / Northeast
NPDES Permit #: FL0042315
LIMS Sample #: 370392 **LIMS Job #:** TIH-1999-02-18-24
sample log 3/11/99 DW

Sample Collection: Date ~~2/16/99~~ 2/15/99 AS Time 11:00
Test Beginning: Date 2/16/99 Time 1220
Test Ending: Date 2/18/99 Time 1245
Organism Batch #: 9 **Diluent Batch #:** 5
Organism Age: <24 hours SRT toxicant batch #: NA
Test organism: Ceriodaphnia dubia

Test Type: (Screening) / Definitive
(Static) / Static Renewal / Flow-through
Test Number: 1 of 2

Remarks: Sample dechlorinated by the addition of 0.6 mL of 0.025N Sodium thiosulfate per liter of sample for the dechlorinated test. mf-2/16/99 TRC of Dechlorinated aliquot = 0.03 mg/L. Sample clear.

Room Temperature Range 21.0°C - 24.5°C
Incubator #2 Temperature Range 26.0 - 27.5°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) 0 hr	UNCORRECTED Cond. (µmhos/cm) 24 h	UNCORRECTED Cond. (µmhos/cm) 48 h
Ctl. A	A	5	5	5	8.1		8.1	25.9		24.3	7.7		7.8	175		185
Ctl. B	B	5	5	5			8.1			24.2			7.8			185
Ctl. C	C	5	5	5			8.1			24.2			7.8			185
Ctl. D	D	5	5	5			8.1			24.0			7.8			195
100% A	A	5	0 SD	—	7.6	8.1	—	25.5	25.4	—	7.9	8.1	—	630	675	—
100% B	B	5	0 SD	—		8.1	—		25.6	—		8.2	—		680	—
100% C	C	5	0 SD	—		8.1	—		25.5	—		8.2	—		675	—
100% D	D	5	0 SD	—		8.2	—		24.9	—		8.2	—		675	—
100% decl A	A	5	5	5	7.6		8.2	25.1		24.2	7.9		8.0	660		670
100% decl B	B	5	5	5			8.2			24.3			8.0			685
100% decl C	C	5	5	5			8.2			24.3			8.1			680
100% decl D	D	5	5	5			8.2			24.3			8.1			685
measured by:		MC	AS	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF
recorded by:		AS	FW	ML	MF	AS	CH	MF	AS	CH	MF	AS	CH	MF	AS	CH

Investigators' Signatures

Marshall Faircloth

Kimberly Shumate

Tracy Archbold

Courtney Head

reviewer

form updated 5/22/98

Water Quality Parameters	Salt Water / Well Water	20% Min Water	Sample	Method	Measured by	Verified by
Field Total Residual Cl2 (mg/L):			NOT measured			MF
Lab Total Residual Cl2 (mg/L):		20.03	0.48	DR 100	CH	MF
Alkalinity (mg/L as $CaCO_3$):		81	87	Hach	CH	MF
Hardness (mg/L as $CaCO_3$):		82	152	Hach	CH	MF
Total ammonia (mg/L as N):		0.022	0.033	Denver Instrument meter	MF	FW
Salinity:		0	0	YSI	MF/CH	MF

FDEP Biology Section — Acute Bioassay Bench Sheet

Name correction 2/19/99 MF

Sample Source: TOWN City of Hastings WWTP
County: St. Johns
Contact / District: Pat O'Connor / Northeast
NPDES Permit #: FL00 42315
LIMS Sample #: 370392 **LIMS Job #:** TLH-1999-02-18-24
sample log 3/11/99 DW

Sample Collection: Date 2/15/99 Time 11:00
Test Beginning: Date 2/16/99 Time 1300
Test Ending: Date 2/18/99 Time 1310
Organism Batch #: 10 **Diluent Batch #:** well H2O
Organism Age: 12day SRT toxicant batch #: NA
Test organism: Cyprinella leedsi

Test Type: (Screening) Definitive
(Static) Static Renewal I Flow-through
Test Number: 2 of 2 clear sample

Remarks: Sample for dechlorinated test dechlorinated by the addition of 0.6 mL of 0.025N sodium thiosulfate per liter of sample. mf-2-16-99
TRC of dechlorinated aliquot = <0.03 mg/L

Room Temperature Range 21.0 - 24.5 °C
Incubator #3 Temperature Range 25.5 - 26.5°C

Conc.	Chamber #	Number Live			pH			Temperature (°C)			D.O. (mg/L)			UNCORRECTED Cond. (mmhos/cm) (Cond. (µmhos/cm))		
		0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h
Ctl. A	A1	5	5	5	7.9	8.2	8.3	25.9	24.4	24.5	7.8	8.2	8.1	250	245	265
Ctl. B	A2	5	5	5	7.9	8.2	8.3	25.9	24.7	24.7	7.8	8.2	8.1	250	255	260
Ctl. C	A3	5	5	5	7.9	8.2	8.3	25.9	24.6	24.7	7.8	8.1	8.1	250	255	265
Ctl. D	A4	5	5	5	7.9	8.2	8.3	25.9	24.6	24.5	7.8	8.1	8.0	250	250	260
100% A	A5	5	0 SD	—	7.6	8.0	—	25.5	25.0	—	7.9	7.9	—	660	650	—
100% B	A6	5	0 SD	—	7.6	8.0	—	25.5	25.0	—	7.9	7.8	—	660	675	—
100% C	A7	5	0 SD	—	7.6	8.0	—	25.5	25.4	—	7.9	7.9	—	660	685	—
100% D	A8	5	0 SD	—	7.6	8.0	—	25.5	25.0	—	8.0	7.8	—	660	690	—
100% deCl A	A9	5	5	5	7.6	8.0	8.0	25.4	24.7	24.7	8.1	8.0	7.8	665	670	685
100% deCl B	A10	5	5	5	7.6	8.0	8.0	25.4	24.6	24.7	8.1	8.0	7.7	665	670	690
100% deCl C	A11	5	5	5	7.6	8.0	8.0	25.4	24.6	24.8	8.1	8.0	7.7	665	685	695
100% deCl D	A12	5	5	5	7.6	8.0	8.0	25.3	24.5	24.8	8.1	8.0	7.7	665	670	695
measured by:		DW	AS	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF
recorded by:		AS	FW	MF	MF	AS	CH	MF	AS	CH	MF	AS	CH	MF	AS	CH

Investigators' Signatures
Marshall Brooks
Amber E. Shumate
Tom Ward
Courtney Hood

reviewer form updated 5/22/98

Water Quality Parameters	Salt Water: Well Water / 20% Min Water	Sample	Method	Measured by	Verified by
Field Total Residual Cl2 (mg/L):		not measured			MF
Lab Total Residual Cl2 (mg/L):	<0.03	0.48	DR-100	CH	MF
Alkalinity (mg/L as $CaCO_3$):	130	87	Hach	CH	MF
Hardness (mg/L as $CaCO_3$):	130	152	Hach	CH	MF
Total ammonia (mg/L as N):	<0.017	0.033	Dmyer Instrum Mod	MF	FW
Salinity:	0	0	VSF	MF/CH	MF

Town of Hastings WWTP - Control Site

Macroinvertebrate Dip Net (20 sweeps of most productive substrates)	Value	5	3	1	Score
Total Number of Taxa	13	≥18	17-9	<9	3
EPT Index	0	-	≥3	<3	1
# Chironomid Taxa	5	≥4	3-2	<2	5
% Contribution of Dominant Taxon	36	≤37	38-69	>69	5
% Diptera	44	-	≤67	>67	3
Florida Index	0	≥6	5-3	<3	1
% Suspension feeders/Filterers	6.8	≥25	25-13	<13	1
Total Score		**Northeast**			**19**
Interpretation of Scores		**Excellent**			26-31
		Good			20-25
		Poor			14-19
		Severely Degraded			7-13

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

Town of Hastings WWTP - Test Site

Macroinvertebrate Dip Net (20 sweeps of most productive substrates)	Value	5	3	1	Score
Total Number of Taxa	14	≥18	17-9	<9	3
EPT Index	0	-	≥3	<3	1
# Chironomid Taxa	6	≥4	3-2	<2	5
% Contribution of Dominant Taxon	32	≤37	38-69	>69	5
% Diptera	32	-	≤67	>67	3
Florida Index	3	≥6	5-3	<3	3
% Suspension feeders/Filterers	0.3	≥25	25-13	<13	1
Total Score		**Northeast**			**21**
Interpretation of Scores		**Excellent**			26-31
		Good			20-25
		Poor			14-19
		Severely Degraded			7-13

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

Periphyton taxa list and densities (#/cm^2) for Town of Hastings WWTP, collected via glass microscope slides in a man-made unnamed canal, on 15 February, 1999.

	Control Site	Test Site
Bacillariophyceae		
Achnanthes exigua	5714	–
Achnanthes hungarica	–	221338
Achnanthes lanceolata	34282	–
Achnanthes sp.	–	15810
Eunotia sp.	11427	7905
Gomphonema affine	11427	31620
Gomphonema angustatum	431385	173908
Gomphonema parvulum	145699	31620
Gomphonema sp.	514233	339912
Navicula capitata	11427	–
Navicula minima	17141	154146
Nitzschia amphibia	17141	–
Nitzschia ignorata	11427	–
Nitzschia palea	99990	11857
Nitzschia sp.	117131	–
Pennales	22855	–
Pinnularia sp.	5714	–
Chlorophyceae		
Characium sp.	59994	55334
Chlamydomonas sp.	59994	5929
Chlorella sp.	5714	1976
Dictyosphaerium sp.	2857	–
Microspora sp.	5714	1976
Oedogonium sp.	14284	3952
Oocystis sp.	2857	–
Stigeoclonium sp.	19998	5929
Undetermined Chlorophyceae	2857	–
Chrysophyceae		
Characiopsis sp.	8571	23715
Cryptophyceae		
Cryptomonas sp.	5714	–
Undetermined Cryptophyceae	14284	–
Cyanophyceae		
Anabaena sp.	–	1976
Calothrix sp.	2857	–
Chroococcus sp.	22855	1976
Microcystis sp.	2857	–
Oscillatoria sp.	11427	7905
Synechococcus sp.	2857	–

Phytoplankton taxa list and densities (#/mL) for the Town of Hastings WWTP, collected via subsurface grabs in a man-made unnamed canal, on 15 February, 1999.

	Control Site	Test Site
Bacillariophyceae		
Gomphonema sp.	–	15
Nitzschia sp.	60	–
Pennales	120	–
Chlorophyceae		
Chlamydomonas sp.	–	77
Undetermined Chlorophyceae	599	719
Chrysophyceae		
Lagynion sp.	–	92
Cyanophyceae		
Chroococcus sp.	120	–
Merismopedia sp.	–	46
Oscillatoria sp.	60	92
Cryptophyceae		
Chroomonas sp.	719	1408
Cryptomonas sp.	419	–
Euglenophyceae		
Phacus sp.	60	–
Trachelomonas sp.	–	15
Undetermined Euglenophyceae	60	–

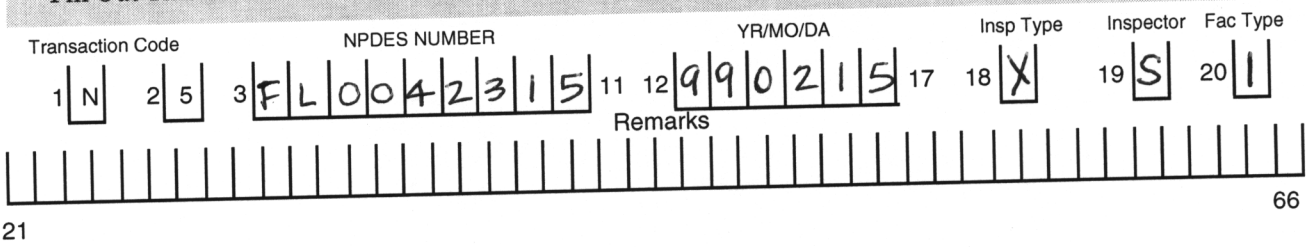
Benthic macroinvertebrate taxa list for the Town of Hastings WWTP, collected via Hester-Dendy artificial substrates in a man-made unnamed canal, on 15 February, 1999. Densities, in number/m^2, represent the mean of three replicates.

	Control Site	Test Site
Amphipoda		
Hyalella azteca	–	5
Coleoptera		
Dytiscidae	3	–
Hydrophilidae	5	–
Undetermined Coleoptera	3	–
Diptera		
Chironomus sp.	32	8
Goeldichironomus sp.	3	–
Tanypus carinatus	3	–
Tanypus sp.	8	–
Undetermined Chironomidae	5	–
Gastropoda		
Physella sp.	3	3
Planorbella sp.	3	–
Undetermined Gastropoda	5	–
Hirudinea		
Mooreobdella sp.	–	3
Mooreobdella tetragon	–	5
Oligochaeta		
Dero digitata	–	5
Dero digitata complex	–	3
Limnodrilus hoffmeisteri	206	3
Slavina appendiculata	–	3

Benthic macroinvertebrate taxa list for Town of Hastings WWTP, collected via 20 discrete dip net sweeps in a man-made unnamed canal, on 15 February, 1999.

	Control Site	Test Site
Amphipoda		
Hyalella azteca	–	3
Coleoptera		
Celina sp.	5	–
Hydrophilidae	1	–
Decapoda		
Palaemonetes paludosus	–	1
Diptera		
Chironomidae	2	1
Chironomus sp.	16	34
Clinohelea sp.	2	–
Corynoneura sp.	–	3
Goeldichironomus holoprasinus	6	–
Goeldichironomus sp.	2	6
Polypedilum convictum grp.	–	1
Polypedilum tritum	2	–
Tanypus carinatus	5	–
Tanytarsus sp. F Epler	–	1
Tanytarsus sp. V Epler	1	–
Gastropoda		
Undetermined Gastropoda	–	1
Hirudinea		
Gloiobdella elongata	–	1
Helobdella stagnalis	2	12
Oligochaeta		
Dero digitata complex	–	33
Haemonais waldvogeli	–	1
Limnodrilus hoffmeisteri	29	47
Nais communis	1	–
Pristina synclites	2	–
Pelecypoda		
Sphaeriidae	1	–
Undetermined Pelecypoda	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)

