

Biological Assessment of

Arvah B. Hopkins Generating Station

Leon County

NPDES #FL0025518

Sampled May 1995

September 1995

Biology Section
Division of Administrative and Technical Services

Comprehensive Quality Assurance Plan No. 870346G

Department of Environmental Protection

Results of Fifth Year Inspections

Discharger: Arvah B. Hopkins Power Generating Station
County: Leon
NPDES Number: FL0025518
State Permit Expiration Date: 29 February 1996

Toxics Sampling Inspection (XSI)

Date Sampled: 5 May, 1995

Results: No organic pollutants were detected in the effluent. However, copper (81 µg/L) was detected in the discharge at a concentration which is known to be chronically toxic. Copper was not sampled at the edge of the facility's 800 m mixing zone, where the compliance level for copper is 30 µg/L.

Compliance Biomonitoring Inspection (CBI)

Date Sampled: 5 May, 1995

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

Impact Bioassessment Inspection (IBI)

Date Sampled: 5 May, 1995

Results: Substantial declines in macroinvertebrate taxa richness, Shannon-Weaver diversity, the Florida Index, and the EPT Index demonstrated the negative effects of the discharge on Beaver Creek. The 44.7% reduction in diversity has implications regarding the discharger's ability to comply with the biological integrity criterion. The Stream Invertebrate Index for Florida (SIIF) score at the reference site (with 21 points) placed it in the upper range of the "moderate impairment" category, whereas the test site SIIF value (13 points) ranked it as "severely degraded". Pollution sensitive species (*e.g.*, mayflies) were conspicuously absent from the test site, suggesting that the discharge is causing an imbalance of aquatic fauna. The test site biota may have responded to the copper (which was present in the discharge at chronically toxic levels), the relatively high conductivity (1020 µmhos/cm), the nutrient enrichment, or to an aspect of the discharge not measured during the survey. Periphyton taxa richness and diversity decreased by 34.4% and 32.2%, respectively, between the reference and test sites. Given the nutrient values, chlorophyll *a* was unusually low at the test site (0.9 mg/m^2). These algal community changes at the test site may also be related to the copper level of the discharge.

Water Quality Inspection (WQI)

Date Sampled: 5 May, 1995

Results: Fecal and total coliforms complied with water quality standards in all samples. Phosphorus enrichment, attributable to the facility, was noted at the test site. Nitrate-nitrite enrichment, probably due to stormwater inputs, was observed at the reference site. Algal Growth Potential was quite elevated at the reference site (32.9 mg dry wt/L, attributable to the nitrate-nitrite enrichment there). The AGP result at the test site suggested algal growth inhibition, possibly related to the elevated copper concentration of the discharge.

Introduction

The Arvah B. Hopkins Generating Station is an oil/natural gas powered electric generating facility owned and operated by the City of Tallahassee. The plant is located west of Tallahassee, on State Road 260, Leon County, Florida (see map in Appendix). Discharge from the Hopkins Power Plant consists of cooling tower blowdown, turbine cooling water, and treatment pond effluent. Effluent is discharged through a drainage ditch to Beaver Creek. Beaver Creek flows through the Lake Talquin Wildlife Management Area and ultimately feeds into the Class III Ochlockonee River just upstream of Lake Talquin. The design flow of the facility is 1.87 MGD. Flow during this survey was 1.78 MGD.

State permit limits are as follows: temperature (maximum of 80 °F or 26.7 °C), pH (6.0 to 8.5 S.U.'s), total residual chlorine (maximum of 0.01 mg/L at discharge), oil and grease (maximum of 5.0 mg/L), iron (maximum of 1000 µg/L), chromium (maximum of 50 µg/L), zinc (maximum of 30 µg/L), and copper (maximum of 30 µg/L at the downstream edge of an 800 m mixing zone) (see Facility Summary in Appendix). Additionally, acute toxicity tests are performed on the effluent. Monthly Operating Report data indicate that effluent parameters have complied with permit limits.

Major characteristics of community structure of control and test sites.

	Reference Site	Test Site
Macroinvertebrate Qualitative		
Number of Taxa	39	10
Florida Index	14	1
SIIF	21	13
EPT Index	5	1
% Contribution of Dominant Taxon	25.3	60.8
% Oligochaeta	1.2	11.3
% Diptera	34.9	26.8
% Ephemeroptera	7.9	0
% Trichoptera	22.4	60.8
% Coleoptera	29.5	0
% Other	4.1	1.9
% Predators	8.2	8.7
% Below Surface Deposit Feeders	1.3	11.5
% Above Surface Deposit Feeders	38.3	12.3
% Suspension Feeders	27.4	61.5
% Scrapers	20.9	0.5
% Shredders	3.8	5.6
% Other	0.2	0
Macroinvertebrate Hester-Dendy		
Number of Taxa	25	12
Florida Index	7	5
Shannon-Weaver Diversity	3.8	2.1
EPT Index	4	1
% Diptera	82.3	36.0
% Ephemeroptera	6.3	0
% Trichoptera	1.3	59.6
% Coleoptera	2.5	3.4
% Other	7.6	1.0
% Predators	19.0	12.5
% Suspension Feeders	23.3	59.3
% Shredders	3.1	4.0
% Above Surface Deposit Feeders	43.3	22.5
% Scrapers	10.0	1.7
% Other	1.2	0
Periphyton Algae		
Number of Taxa	29.0	19.0
Shannon-Weaver Diversity	4.3	3.1
Algal Density (#/sq. cm)	30,205	53,642
Chlorophyll a (mg/sq. m)	2.2	0.9
Diatom/Diatom + B-G Abundance Ratio	0.9	0.9
% Blue-green	7.6	11.0
% Green	3.8	11.8
% Diatoms	88.6	76.8
Algal Growth Potential (mg dry wt/l)	32.9	8.8

Methods

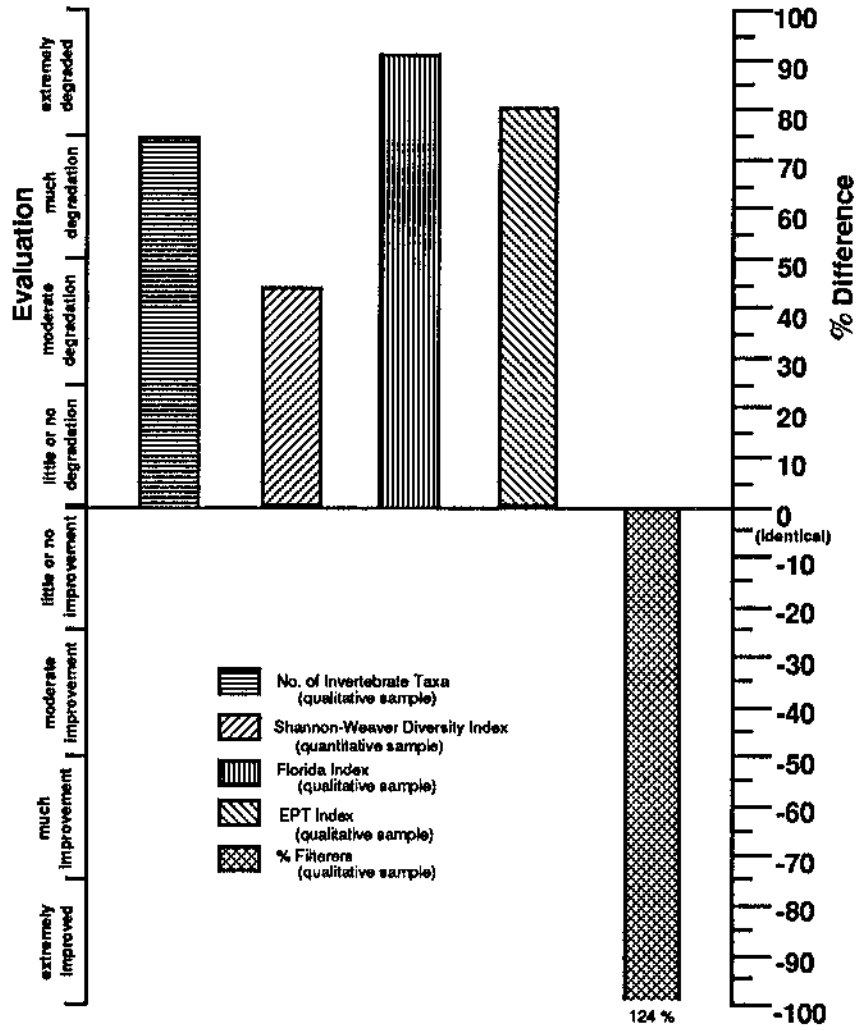
The focus of this investigation was to determine the discharger's effects on the receiving waters. A comparison of biological community health was made between a reference site (located in Three Pole Creek, an adjacent tributary of the Ochlockonee River) and a test site (located in Beaver Creek, approximately 100 m 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. 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). Additionally, nutrient analyses were performed on effluent, reference, and test sites. Methods used for all chemical analyses are on file at the Tallahassee DEP Chemistry Laboratory.

Benthic macroinvertebrate communities were evaluated at reference and test sites. Invertebrates were collected from multiple substrates (*e.g.*, snags, leaf packs, vegetation) using discrete dip net sweeps. Additional invertebrate collections were accomplished using Hester-Dendy multiplate samplers which were incubated for 28 days (Ross 1990). Periphyton was sampled at both reference and test sites by incubating glass microscope slides in a standard periphytometer for 28 days (Ross 1990). Chlorophyll *a* was also determined for periphyton 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).

Explanation of Measurements of Community Health

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

Taxa richness: Stress tends to reduce the number of different types of organisms present in a system, although moderate nutrient enrichment may sometimes be cor-



Effect of discharge on the benthic macroinvertebrate community.

related with increased algal taxa richness.

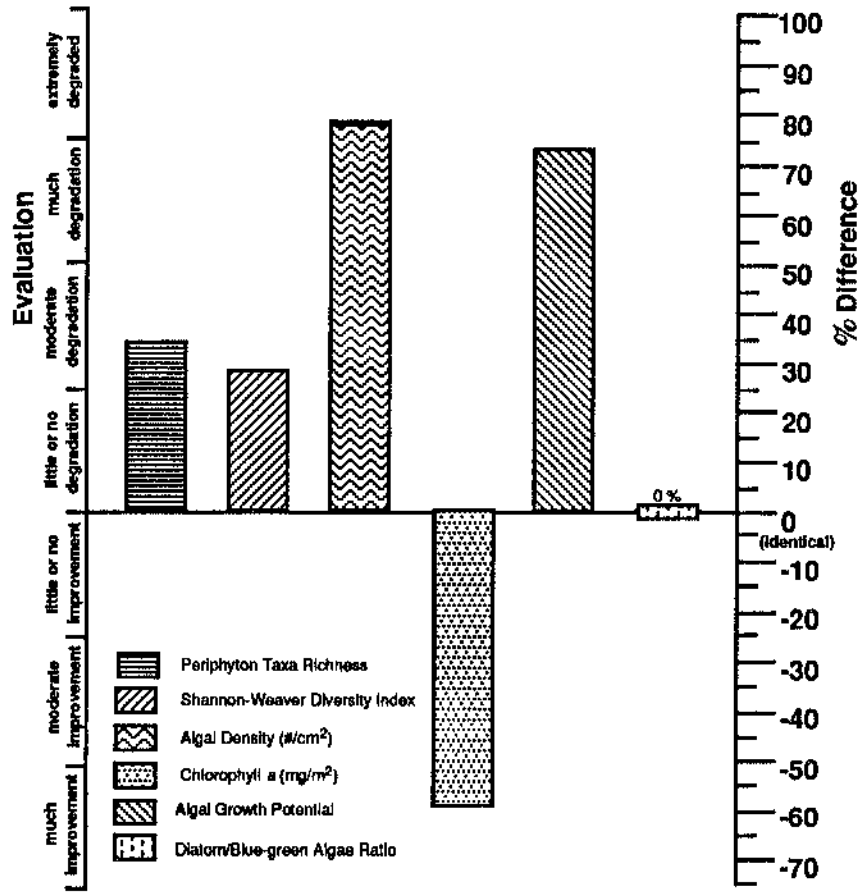
Shannon-Weaver diversity: This index is specified in the Florida Administrative Code as a measure of biological integrity. Low diversity scores are undesirable. They represent conditions where only a few organisms are abundant, to the exclusion of other taxa. Excessive numerical dominance of a single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

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

Ephemeroptera/Plecoptera/Trichoptera 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 reference conditions, may indicate degradation. In marine systems, an increase in the % tubificid oligochaetes, a decrease in the % pelecypods, and a decrease in the number of polychaete taxa are all considered indicators of disturbance (Engel *et al.* 1994).

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.



Effect of discharge on the algal community.

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

The Stream Invertebrate Index for Florida (SIIF) is a composite macroinvertebrate metric (EA Engineering 1994). The SIIF assigns points to a variety of parameters, depending on how closely each parameter approaches an expected reference condition (see SIIF calculation table in Appendix).

For graphical purposes, the percent differences between the reference 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 reference site minus test site divided by the reference site. The percent differences between sites involving algal density, chlorophyll *a*, and algal growth potential are measured as the test site minus reference site divided by the reference site.

The following personnel were involved in this investigation: Lyn Burton, Michael Corrigan, Christy

LeDuc, Marshall Faircloth, Russel Frydenborg, Kathleen Lurding, Tina Mikulski, Elizabeth Miller, Urania Quintana, Bart Richard, Lisa Tamburello, David Whiting, Vicki Whiting, and Greg Wynn (Tallahassee Biology Laboratory). The report was reviewed by the Point Source Studies Review Committee, consisting of Wayne Magley, Jan Mandrup-Poulsen, and Michael Tanski, as well as District representatives.

Results and Discussion

Habitat quality at the test site, with 131 points, was quite similar to that of the reference stream, with 134 points. The two streams share a common drainage basin divide. The test site (Beaver Creek) predominately receives the cooling water discharge and some stormwater runoff from the facility and surrounding areas, while the reference stream (Three Pole Creek) receives stormwater from the facility as well as runoff from forested areas. Physical/chemical measurements were mostly the same at the two sites, with one exception. Water at both sites was adequately oxygenated (dissolved oxygen was above 8.2 mg/L) and circumneutral (pH was 7.3 SU at the reference site and 7.6 SU at the test site). Temperature at the test site (21.6 °C) was somewhat higher than the reference site (18.3 °C), but within the permitted limit of 26.7 °C. Conductivity at the test site (1,020 µmhos/cm) was substantially more elevated than that of the reference site (198 µmhos/cm), although it still complied with Class III standards.

The effluent sample was not acutely toxic to the water flea, *Ceriodaphnia dubia*, or to the fish, *Cyprinella leedsi*. No mortality occurred during the two 48 hour acute bioassays (Appendix).

No organic pollutants were detected in the effluent. Of the metals analyzed for, only copper (81 µg/L) was detected in the effluent at a concentration of concern. It should be noted that copper was not sampled at the edge of the facility's 800 m mixing zone, where the compliance level for copper is 30 µg/L. However, the level of copper at the discharge point was high enough to be chronically toxic to some invertebrates (AQUIRE 1994). Iron was also found in the effluent (131 mg/L), but not at problem levels.

Total coliform bacteria were measured to be 1,500 organisms/100 mL at the reference site, 450 organisms/100 mL at the test site, and 300 organisms/100 mL in the effluent. Fecal coliforms at the reference site (200 organisms/100 mL), the test site (70 organisms/100 mL), and in the effluent (50 organisms/100 mL) also complied with Class III standards.

The total phosphorus concentration at the test site (0.43 mg/L) was higher than the values found in approximately 85% of other Florida streams (see Table of Typical Water Quality Parameters in Appendix). This test site phosphorus enrichment could be directly attributed to the discharge, which had a similar total phosphorus concentration (0.47 mg/L). Nitrogenous compounds in the effluent and at the test site were fairly average. In contrast, nitrate-nitrite was elevated at the reference site (0.53 mg/L), where it was higher than the values found in approximately 85% of other Florida streams. Total phosphorus at the reference site (0.12 mg/L) was average for a Florida stream.

Algal Growth Potential (AGP) exceeded the 5 mg dry wt/L "problem threshold" at both the reference site (32.9 mg dry wt/L) and at the test site (8.8 mg dry wt/L) (Raschke and Schultz 1987). The effluent AGP was 5.9 mg dry wt/L. The unusually elevated AGP at the reference site (attributable to the nitrate-nitrite enrichment there) is probably the result of stormwater inputs. The AGP of the test site was somewhat lower than expected, based upon the nutrient results. This suggests algal growth inhibition, possibly related to the elevated copper concentration of the discharge.

Most measures of macroinvertebrate health indicated that the discharge was adversely affecting the community. The Figure on page 2 indicates the degree of difference between the invertebrate populations of the reference and test sites. Larger differences (higher percentages) correspond with greater degrees of degradation. Negative values mean that the test site is better than the reference.

In the Hester-Dendy samples, substantial declines in taxa richness (25 taxa at the reference site, 12 at the test site), Shannon-Weaver diversity (3.8 at the reference site, 2.1 at the test site), and the EPT Index (4 at the reference site, 1 at the test site) demonstrated the negative effects of

the discharge. The 44.7% reduction in diversity has implications regarding the discharger's ability to comply with the biological integrity criterion. Since copper was detected in the discharge at a level which is chronically toxic to some invertebrates (AQUIRE 1994), it could have contributed to observed biological problems. Additionally, the elevated conductivity at the test site (1020 µmhos/cm) may have stressed the fauna there.

Dip net results showed a similar trend of declining community health at the test site. Taxa richness, the Florida Index, and the EPT Index decreased by 74.4%, 92.9%, and 80%, between the reference site and test sites, respectively. The Stream Invertebrate Index for Florida (SIIF) score at the reference site (with 21 points) placed it in the upper range of the "moderate impairment" category, whereas the test site SIIF value (13 points) ranked it as "severely degraded" (Appendix). Many species sensitive to pollution, including the stonefly, *Perlesta placida*, the mayfly, *Habrophlebiodes brunneipennis*, the caddisfly, *Chimarra* sp., as well as the chironomids, *Labrundinia* sp., *Polypedilum fallax*, *Rheotanytarsus exiguus* grp., *Stenochironomus* sp., *Thienemanniella* sp., and *Xylotopus par*, were relatively common at the reference site, but were absent from the test site. In summary, the macroinvertebrate data suggest that the discharge is degrading the biota of Beaver Creak, resulting in an imbalance of aquatic fauna.

The Figure on page 3 represents changes in the periphyton algal community. As was noted with the macroinvertebrates, larger differences (that is, higher percentages) correspond with greater degrees of degradation. Periphyton taxa richness and diversity decreased by 34.4% and 32.2%, respectively, between the reference and test sites. Given the nutrient values, chlorophyll *a* was unusually low at the test site (0.9 mg/m^2). These algal community changes at the test site may also be related to the copper level of the discharge.

Conclusions

The effluent sample was not toxic to the water flea, *Ceriodaphnia dubia*, or to the fish, *Cyprinella leedsi*.

No organic pollutants were detected in the effluent. However, copper (81 µg/L) was detected in the discharge at a concentration which is known to be chronically toxic. Copper was not sampled at the edge of the facility's 800 m mixing zone, where the compliance level for copper is 30 µg/L.

Fecal and total coliforms complied with water quality standards in all samples.

Phosphorus enrichment, attributable to the facility, was noted at the test site. Nitrate-nitrite enrichment, probably due to stormwater inputs, was observed at the reference site.

Algal Growth Potential was quite elevated at the reference site (32.9 mg dry wt/L, attributable to the nitrate-nitrite enrichment there. The AGP of the test site was somewhat lower than expected, based upon the nutrient results. This suggests algal growth inhibition, possibly related to the elevated copper concentration of the discharge.

Substantial declines in macroinvertebrate taxa richness, Shannon-Weaver diversity, the Florida Index, and the EPT Index demonstrated the negative effects of the discharge on Beaver Creek. The 44.7% reduction in diversity has implications regarding the discharger's ability to comply with the biological integrity criterion. The Stream Invertebrate Index for Florida (SIIF) score at the reference site (with 21 points) placed it in the upper range of the "moderate impairment" category, whereas the test site SIIF value (13 points) ranked it as "severely degraded". Pollution sensitive species (*e.g.*, mayflies) were conspicuously absent from the test site, suggesting that the discharge is causing an imbalance of aquatic fauna. The test site biota may have responded to the copper (which was present in the discharge at chronically toxic levels), the relatively high conductivity (1020 µmhos/cm), the nutrient enrichment, or to an aspect of the discharge not measured during the survey.

Periphyton taxa richness and diversity decreased by 34.4% and 32.2%, respectively, between the reference and test sites. Given the nutrient values, chlorophyll *a* was unusually low at the test site (0.9 mg/m^2). These algal community changes at the test site may also be related to the copper level of the discharge.

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Chemistry summary table for Arvah B. Hopkins Generating Station	Effluent	Reference Site	Test Site
Organic Constituents			
Oil & Grease (mg/l)	5.0 U		
Metals (ug/L)			
Aluminum	100 U		
Arsenic	10 U		
Copper	8 I		
Chromium	10 U		
Iron	131		
Lead	10 U		
Mercury	0.1 U		
Nickel	12 I		
Selenium	30 U		
Zinc	10 U		
Nutrients (mg/L)			
Ortho-phosphate	0.11 A	0.11 A	0.11 A
Total phosphorus	0.47	0.12	0.43
Ammonia	0.02 U	0.024 I	0.02 U
Nitrate+Nitrite	0.08	0.53	0.069
TKN	0.10	0.082 I	0.14
General Phys-Chem Parameters			
Habitat Assessment		134	131
D.O. (mg/L)	8.3	8.6	8.2
pH (SU's)	7.6	7.3	7.6
Conductivity (µmhos/cm)	1,040	198	1,020
Temperature (°C)	21.9	18.3	21.6
Hardness (mg CaCO3)	363		
Algal Growth Potential (mg dry wt/L)	5.9	32.9	8.8
Toxicity			
Bioassay Fish-Chlorinated	100 L		
Bioassay Invertebrate-Chlorinated	100 L		
Microbiological Communities (org/100 mL)			
Fecal coliform	50	200	70
Total coliform	300	1,500	450
Escherichia coli	22	140	76

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 minimum detection limit

L - Actual value is known to be greater than value given

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

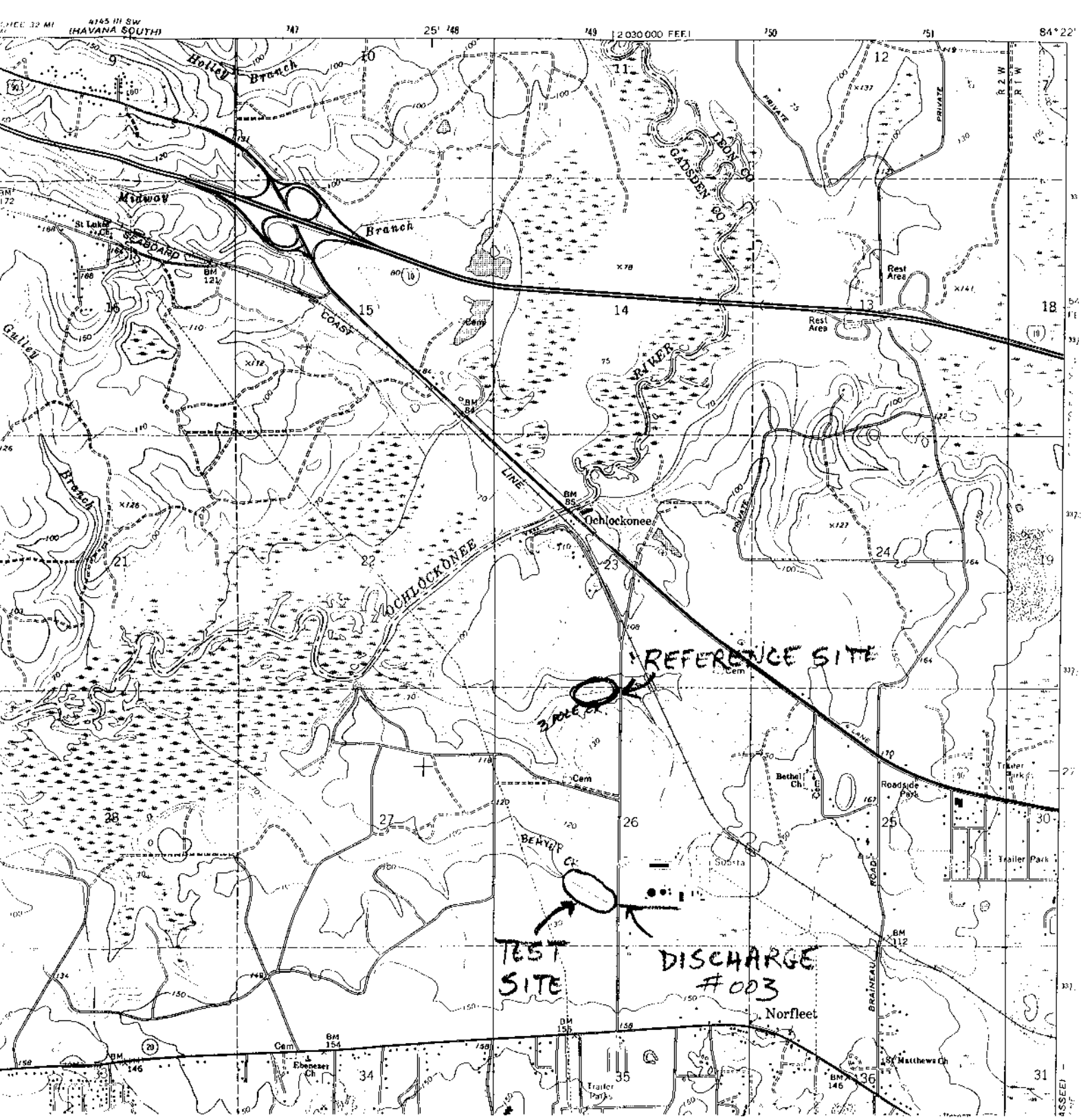
Typical Values for Selected Parameters in Florida Waters

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 Phosphate	0.01	0.01	0.03	0.04	0.05	0.08	0.11	0.17	0.27	0.59	1.37
Turbidity	0.60	0.90	1.20	1.45	2.10	2.80	3.60	4.50	6.65	10.45	16.30
LAKES (477 stations)											
Phytoplankton Chlorophyll *a*	0.80	1.71	2.88	4.28	10.06	13.40	20.00	30.10	47.20	65.44	113.90
Dredge Diversity	0.71	0.97	1.43	1.74	1.98	2.12	2.21	2.59	2.85	3.15	3.17
Dredge Taxa Richness	3.00	5.00	6.50	7.00	9.00	10.00	11.00	13.00	15.00	17.00	21.00
TKN	0.36	0.49	0.67	0.83	1.08	1.26	1.40	1.51	1.68	2.11	3.46
NH3+NH4	0.01	0.02	0.02	0.03	0.04	0.06	0.08	0.12	0.15	0.21	0.28
NO2-NO3	0.00	0.00	0.01	0.01	0.01	0.02	0.04	0.05	0.10	0.14	0.23
Total Phosphorus	0.01	0.02	0.02	0.03	0.05	0.07	0.09	0.11	0.14	0.23	0.42
Ortho-Phosphate	0.00	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.21	0.32
Turbidity	1.00	1.25	1.55	2.05	2.75	4.50	6.45	9.60	14.10	26.00	40.00
ESTUARIES (690 stations)											
Phytoplankton Chlorophyll *a*	2.14	3.28	4.49	5.13	6.00	6.93	7.94	9.60	12.40	17.60	22.20
Dredge Diversity	1.34	1.53	1.91	2.28	2.56	2.90	3.15	3.59	4.01	4.53	4.98
Dredge Taxa Richness	4.00	6.00	9.00	11.00	15.00	18.50	25.00	35.00	41.00	62.00	90.00
TKN	0.26	0.34	0.42	0.50	0.59	0.69	0.76	0.82	0.95	1.30	1.49
NH3+NH4	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.09	0.13	0.22	0.28
NO2-NO3	0.00	0.00	0.01	0.01	0.01	0.02	0.03	0.05	0.08	0.17	0.23
Total Phosphorus	0.01	0.02	0.06	0.07	0.10	0.11	0.14	0.17	0.23	0.43	0.59
Ortho-Phosphate	0.01	0.02	0.03	0.04	0.04	0.05	0.07	0.09	0.12	0.21	0.44
Turbidity	3.50	4.00	4.50	5.05	5.40	5.60	6.30	6.80	8.00	11.40	11.75

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


REFERENCE SITE
OK
TEST SITE
DISCHARGE #003
Holley Branch
Midway Branch
SEABOARD COAST LINE
RIVER
LEON CO
GADSDEN CO
PRIVATE
Rest Area
Ochlockonee
OCHLOCKONEE
Guiley Branch
Bethel Ch
Roadside Park
Trailer Park
Norfleet
Ebenezer Ch
St Matthews Ch
BRAINEAU ROAD
BM 121
BM 84
BM 154
BM 146
BM 112
Cem
Sousta
84°22'
30'
25'

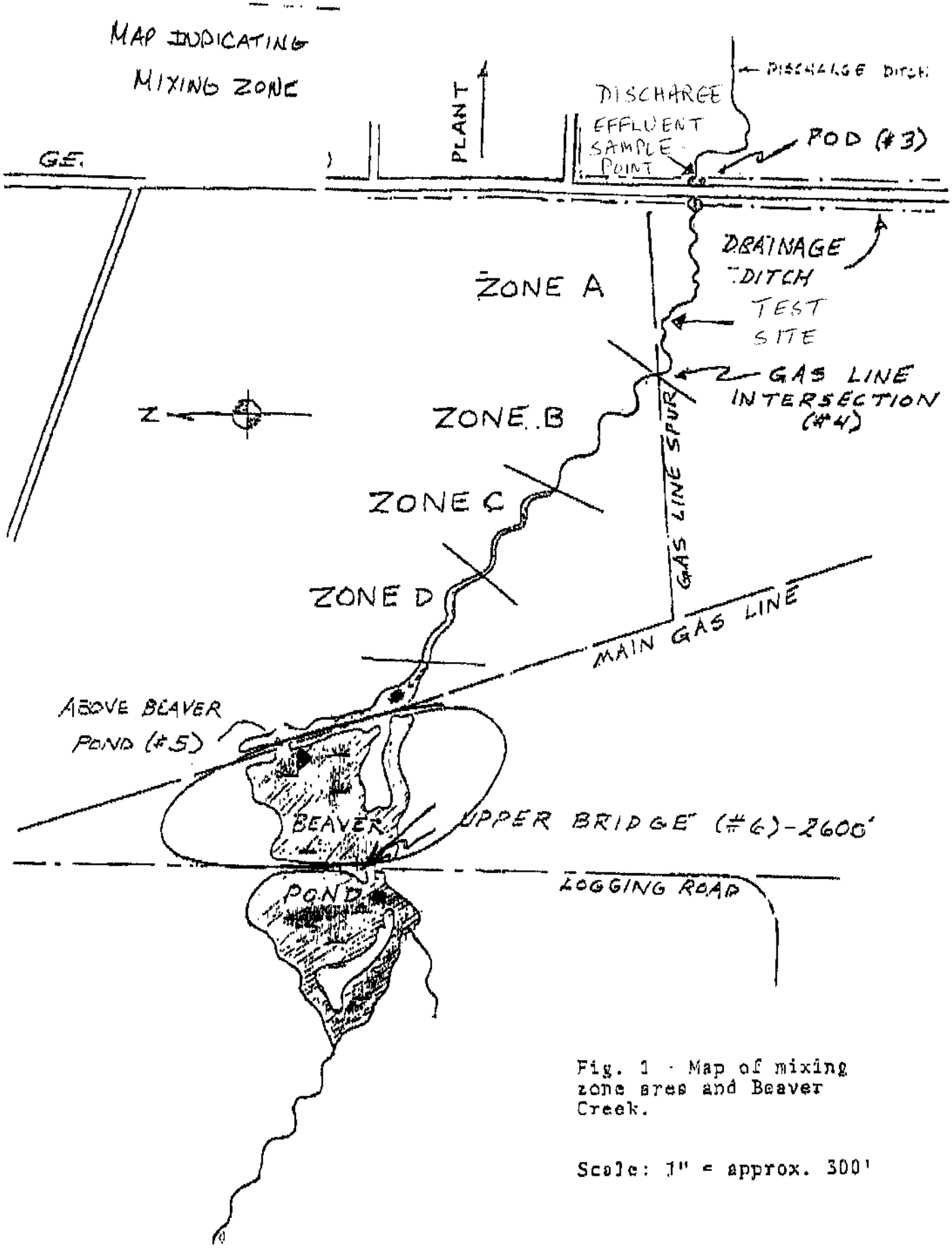


Fig. 1 - Map of mixing zone area and Beaver Creek.

Scale: 1" = approx. 300'

Facility Summary

Facility Name: Arvah B. Hopkins Generating Station

Date Summary Prepared: 07/31/95 (Revised Report)

Location map: Hopkins Plant
Geddie Road (CR 1585)
Tallahassee, FL 32304

County: Leon

District: 10/Northwest

NPDES Permit # FL0025518
expiration date: 02/29/96

State GMS # 1037M25518
State Certification: PA 74-03D

Facility Type: Industrial

Function of facility: The Arvah B. Hopkins Generating Station functions as an oil/gas-fueled steam electric power plant.

Description of treatment process: The permittee treats the treatment pond effluent, the auxiliary cooling water, the boiler blowdown, the demineralizer waste, and the air heater wash, by a lime caustic or magnesium hydroxide treatment consisting of mixing, flocculation, and sedimentation. (EPA Industrial Facility Fact Sheet, 1993)

Receiving waters: Okhlockonee River

Classification: I II **III**

(Drainage Ditch--Okhlockonee River--Lake Talquin)

Design Flow: 1.87 MGD

Mean Flow: 1.77 MGD

Flow during survey: 1.78 MGD (June 95 MOR)

Discharge is: **Continuous** Intermittent Seasonal Rainfall dependent
Other (describe)
best time to sample is:

If facility has a mixing zone, give details (size, parameters, etc.)
Mixing Zone: Boundary 800 meters downstream of the POD (point of discharge)

Parameter	Limit
Copper, total	30 ug/l

List effluent limits (attach relevant paperwork): Major Parameters Listed.

Parameter	Monitoring Point	Frequency
Chlorine, total Residual	POD	1/M
Oil and Grease	POD	1/M

pH, field	POD	C(b)
Flow, rate	POD	C(b)
Temperature, Water	POD	C(b)
Conductivity	POD	C(b)
Phosphorus, Total	POD	1/M
Orthophosphate, Total	POD	1/M
Sulfate, Total	POD	1/M
Chloride, Total	POD	1/M
Solids, total dissolved	POD	1/M
Oxygen, dissolved	POD	1/M
Iron, total	POD	1/Q
Mercury, total	POD	1/Q
Chromium, total	POD	1/Q
Copper, total	MZ	1/Q

The limitations for the effluent parameters are listed under 62-302 FAC.

In addition to the effluent monitoring requirements, the facility is required to submit quarterly monitoring well reports. The monitoring wells are sampled for the following parameters.

Parameter	**Frequency**
Sulfate	1/M
Chloride	1/M
Total Hardness	1/6M
pH	1/M
M alkalinity	1/6M
Conductivity	1/M
Solids, Total	1/6M

List permit violations (from MOR data or other source) and plant upsets within past year: No major parameter violations were noted.

Describe previous impact bioassessments, WQBEL's and previous or current enforcement actions: The latest bioassay on file was performed in October 1985. The effluent was not toxic to the test organisms. There are no pending or existing enforcement actions against the permittee.

Discuss comparability of MOR results to past FDEP results and whether there are trends (improving, declining) in the data set: An analysis for copper which was taken in conjunction with a 5th year study in May 1995 revealed a result of 81 ug/L. This result is considerably higher than the effluent results from both the POD and the mixing zone that the facility has reported in the past two years. The 5th year study also revealed that the amount of biodiversity within Beaver Creek, a receiving stream for the Hopkins discharge, has been reduced by forty-four percent. The reduction in diversity represents a violation of the biological integrity rule, 62.302.530 (11) FAC.

Additional information:

Staff contributing to this review (signature)

Biologist

Inspector

Engineer

Steven Kelly-Coop Steven Kelly 05/02/95 Other

Other

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 5)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	TIME	RECEIVING BODY OF WATER:
		5/1/95	8:30	BEAVER CK.

REMARKS:	LOCATION:	FIELD ID/NAME:
	Hopkins BEAVER CK STUDY	Test SITE

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest/Natural	Silviculture	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
80				10	10 (FUTURE TENANT)		

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

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

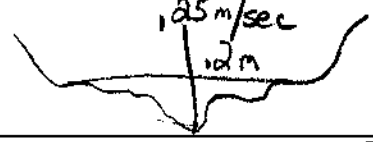
Width of riparian vegetation (m) on least buffered side: >100m

List & map dominant vegetation on back

Artificially Channelized ☐ no ☐ ☐ ☑ Artificially Impounded ☐ yes (recent, severe | some recovery | mostly recovered, more sinuous)

High Water Mark (m above bed): 1.3m

Typical Width (m)/Depth (m) /Velocity (m/sec) Transect (draw cross-section & provide at least 3 velocity & depth values)



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

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	5	5	NET	Sand	42		
Leaf Packs or Mats	~1	5	NET	Mud/Muck/Silt			
Aquatic Vegetation	—			Other: CONSOLIDATED FINE CLAY	42	5	NET
Rock or Shell Rubble	—			Other:			
Undercut Banks/Roots	10	5	NET	***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):	RIFFLES ABOVE		Secchi (m):
Top		21.6	7.6	8.2	1020			
Mid-depth								
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: HD-Rep2 Partial Exposed

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

SAMPLING TEAM:	SIGNATURE:	DATE:
Fry, LeDuc, Whiting, Richard, Corrigan Tamborello		5/1/95

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET (v2)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
		5/1/95	BEAVER CK.

REMARKS:	LOCATION:	FIELD ID/NAME:
	Hopkins	Test site

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Bottom Substrate/ Available Cover [18]	Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs (partially decayed), undercut banks, rubble, or other stable habitat. 20 19 18 17 16	20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat. Some substrates may be new fall (fresh leaves or snags). 15 14 13 12 11	5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat, frequently disturbed or removed. 10 9 8 7 6	Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious, substrates unstable. 5 4 3 2 1
Water Velocity [20]	Max. observed: >0.25 m/sec. but < 2 m/sec 20 19 18 17 16	Max. observed; 0.1 to 0.25 m/sec 15 14 13 12 11	Max. observed; 0.05 to 0.1 m/sec 10 9 8 7 6	Max. observed; <0.05 m/sec, or spate occurring; > 2 m/sec 5 4 3 2 1
Artificial Channelization [18]	No artificial channelization or dredging. Stream with normal, sinuous pattern (YEARS AGO - MOST NORMAL) 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
Deposition [20]	Less than 20% of habitats affected by sand or silt accumulation 20 19 18 17 16	20%-50% of habitats affected by sand or silt accumulation 15 14 13 12 11	Smothering of 50%-80% of habitats with sand or silt, pools shallow, frequent sediment movement 10 9 8 7 6	Smothering of >80% of habitats with sand or silt, a severe problem, pools absent 5 4 3 2 1
Bank Stability [20]	Stable. No evidence of erosion or bank failure. Little potential for future problems. 20 19 18 17 16	Moderately stable. Infrequent or small areas of erosion, mostly healed over. 15 14 13 12 11	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. 10 9 8 7 6	Unstable. Many (60%-80%) raw, eroded areas. Obvious bank sloughing. 5 4 3 2 1
Riparian Buffer Zone Width [20]	Width of native vegetation (least buffered side) greater than 18 m 20 19 18 17 16	Width of native vegetation (least buffered side) 12 m to 18 m 15 14 13 12 11	Width of native vegetation 6 to 12 m, human activities still close to system 10 9 8 7 6	Less than 6 m of native buffer zone due to intensive human activities 5 4 3 2 1
Riparian Zone Vegetation Quality [20]	Over 80% of streambank surfaces consist of native plants, including trees understory shrubs, or non-woody macrophytes. Plants growing naturally. 20 19 18 17 16	50% to 80% of riparian zone is vegetated, but one class of plants is not represented. Some disruption in community evident. 15 14 13 12 11	25% to 50% of riparian zone is vegetated, but one or two classes of plants are not represented. Patches of bare soil or closely cropped vegetation, disruption obvious. 10 9 8 7 6	Less than 25% of streambank surfaces are vegetated. Poor plant community (*e.g.* grass monoculture or exotics) present. Vegetation removed to stubble height of 2 inches or less. 5 4 3 2 1

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

[131] **TOTAL SCORE**

Comments

ANALYSIS DATE:	ANALYST:	SIGNATURE:
5-1-95	RBF	Russell Frydenborg

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 5)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	TIME	RECEIVING BODY OF WATER:
		5/1/95	9:45	THREE POLE CK.

REMARKS:	LOCATION:	FIELD ID/NAME:
	Hopkins THREE POLE CK. STUDY	REFERENCE SITE

RIPARIAN ZONE/INSTREAM FEATURES

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

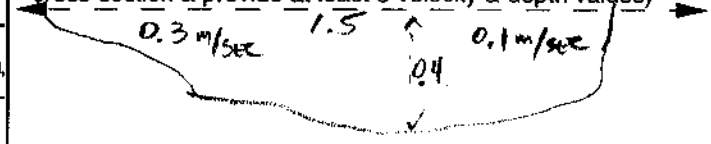
Forest/Natural	Silviculture	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
80				10		10	

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

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

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

Typical Width (m)/Depth (m) /Velocity (m/sec) Transect (draw cross-section & provide at least 3 velocity & depth values)



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

Artificially Impounded ☐ yes

High Water Mark (m above bed): 0.2

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

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	5	5	NET	Sand	70	0	
Leaf Packs or Mats	2	5	NET	Mud/Muck/Silt	10	0	
Aquatic Vegetation	—			Other:			
Rock or Shell Rubble	3	5	NET	Other:			
Undercut Banks/Roots	10	5	NET	***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	SURF	18.3	7.3	8.6	198			
Mid-depth								
Bottom								

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

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

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

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

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

Weather Conditions/Notes:

SUN CAME OUT WARMING

NERODIA FASCIATA ~ 3 FEET LONG

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

SAMPLING TEAM:	SIGNATURE:	DATE:
SAME	Russell Frydenborg	5-1-95

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET (v2)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
		5-1-95	3 POLE CK.

REMARKS:	LOCATION: NPDES STUDY 3 POLE CK	FIELD ID/NAME:
		REF SITE

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Bottom Substrate/ Available Cover [9]	Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs (partially decayed), undercut banks, rubble, or other stable habitat. 20 19 18 17 16	20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat. Some substrates may be new fall (fresh leaves or snags). 15 14 13 12 11	5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat, frequently disturbed or removed. 10 9 8 7 6	Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious, substrates unstable. 5 4 3 2 1
Water Velocity [20]	Max. observed: >0.25 m/sec. but < 2 m/sec 20 19 18 17 16	Max. observed; 0.1 to 0.25 m/sec 15 14 13 12 11	Max. observed; 0.05 to 0.1 m/sec 10 9 8 7 6	Max. observed; <0.05 m/sec, or spate occurring; > 2 m/sec 5 4 3 2 1
Artificial Channelization [20]	No artificial channelization or dredging. Stream with normal, sinuous pattern 20 19 18 17 16	May have been channelized in the past (>20 yrs), but mostly recovered, fairly good sinuous pattern 15 14 13 12 11	Channelized, somewhat recovered, but > 80% of area affected 10 9 8 7 6	Artificially channelized, box-cut banks, straight, instream habitat highly altered 5 4 3 2 1
Deposition [20]	Less than 20% of habitats affected by sand or silt accumulation 20 19 18 17 16	20%-50% of habitats affected by sand or silt accumulation 15 14 13 12 11	Smothering of 50%-80% of habitats with sand or silt, pools shallow, frequent sediment movement 10 9 8 7 6	Smothering of >80% of habitats with sand or silt, a severe problem, pools absent 5 4 3 2 1
Bank Stability [20]	Stable. No evidence of erosion or bank failure. Little potential for future problems. 20 19 18 17 16	Moderately stable. Infrequent or small areas of erosion, mostly healed over. 15 14 13 12 11	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. 10 9 8 7 6	Unstable. Many (60%-80%) raw, eroded areas. Obvious bank sloughing. 5 4 3 2 1
Riparian Buffer Zone Width [20]	Width of native vegetation (least buffered side) greater than 18 m 20 19 18 17 16	Width of native vegetation (least buffered side) 12 m to 18 m 15 14 13 12 11	Width of native vegetation 6 to 12 m, human activities still close to system 10 9 8 7 6	Less than 6 m of native buffer zone due to intensive human activities 5 4 3 2 1
Riparian Zone Vegetation Quality [20]	Over 80% of streambank surfaces consist of native plants, including trees understory shrubs, or non-woody macrophytes. Plants growing naturally. 20 19 18 17 16	50% to 80% of riparian zone is vegetated, but one class of plants is not represented. Some disruption in community evident. 15 14 13 12 11	25% to 50% of riparian zone is vegetated, but one or two classes of plants are not represented. Patches of bare soil or closely cropped vegetation, disruption obvious. 10 9 8 7 6	Less than 25% of streambank surfaces are vegetated. Poor plant community (*e.g.* grass monoculture or exotics) present. Vegetation removed to stubble height of 2 inches or less. 5 4 3 2 1

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

Comments

[134] **TOTAL SCORE**

ANALYSIS DATE:	ANALYST:	SIGNATURE:
5-1-95	RBF	Russell Frydenborg

TEST SITE

Calculation & Interpretation of the Stream Invertebrate Index for Florida (SIIF) (Draft 1994)									
Macroinvertebrate Dip Net (20 sweeps of most productive substrates)	**Panhandle (65, 75a)**					**Peninsula (75b, c, d)**			
	Value	5	3	1	Score	5	3	1	Score
Number of Taxa	10	≥ 31	16–30	0–15	1	≥ 27	14–26	0–13	
EPT Index	1	≥ 7	4–6	0–3	1		≥ 4	0–3	
% Contribution of Dominant Taxon	60.8		≤ 20	> 20	1		≤ 37	> 37	
Florida Index	1	≥ 18	9–17	0–8	1	≥ 7	4–6	0–3	
% Diptera	26.8		≤ 38	> 38	3		≤ 32	> 32	
% Suspension feeders/ Collector-Filterers	61.5	≥ 12	7–11	0–6	5	≥ 8	4–7	0–3	
% Shredders	5.6		≥ 10	0–9	1		≥ 13	0–12	
% Crustacean+Mollusks (Peninsula only)		–	–	–			≥ 16	0–15	
# Crustacean+Mollusks (Peninsula only)		–	–	–			≥ 4	0–3	
Total Score	**Panhandle**				**13**	**Peninsula**			
Interpretation of Score	**No Impairment**				**29-23**	**No Impairment**			**33-27**
	Moderate Impairment				**22-15**	**Moderate Impairment**			**26-17**
	Severe Degradation				**14-7**	**Severe Degradation**			**16-9**

REFERENCE SITE

Calculation & Interpretation of the Stream Invertebrate Index for Florida (SIIF) (Draft 1994)									
Macroinvertebrate Dip Net (20 sweeps of most productive substrates)	**Panhandle (65, 75a)**					**Peninsula (75b, c, d)**			
	Value	5	3	1	Score	5	3	1	Score
Number of Taxa	39	≥ 31	16–30	0–15	5	≥ 27	14–26	0–13	
EPT Index	5	≥ 7	4–6	0–3	3		≥ 4	0–3	
% Contribution of Dominant Taxon	25.3		≤ 20	> 20	1		≤ 37	> 37	
Florida Index	14	≥ 18	9–17	0–8	3	≥ 7	4–6	0–3	
% Diptera	34.9		≤ 38	> 38	3		≤ 32	> 32	
% Suspension feeders/ Collector-Filterers	27.4	≥ 12	7–11	0–6	5	≥ 8	4–7	0–3	
% Shredders	3.8		≥ 10	0–9	1		≥ 13	0–12	
% Crustacean+Mollusks (Peninsula only)		–	–	–			≥ 16	0–15	
# Crustacean+Mollusks (Peninsula only)		–	–	–			≥ 4	0–3	
Total Score	**Panhandle**				**21**	**Peninsula**			
Interpretation of Score	**No Impairment**				**29-23**	**No Impairment**			**33-27**
	Moderate Impairment				**22-15**	**Moderate Impairment**			**26-17**
	Severe Degradation				**14-7**	**Severe Degradation**			**16-9**

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: A.B. Hopkins Gen. Plant
County:
Contact / District: Glen Butts / NW
NPDES Permit #: FL00 25518
LIMS Sample #: 10523 / **LIMS Job #:** 95-May-01-13

Sample Collection: Date 5-1-95 Time 810
Test Beginning: Date 5-2-95 Time 1000
Test Ending: Date 5-4-95 Time 1000
Organism Batch #: 17 **Diluent Batch #:** Well
Organism Age: 12 days
Test Organism: Cyprinella leedsi

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

Test Number: 2 of 2

Remarks:

Instrument Calibrations:	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
	meter # 7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 10.0 @ 10.0	24.4 @ 24.5	8.3 @ 24.1 °C	107.9 @ 98.6 1000 @ 1004 @ 24.6 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	23.9 @ 24.0	8.4 @ 23.5 °C	105.9 @ 98.6 993 @ 1004 @ 24.0 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	24.3 @ 24.4	8.3 @ 24.5 °C	106.8 @ 98.6 993 @ 1004 @ 24.3 °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
Control A	9	5	5	4	7.7	8.2	8.3	23.5	23.2	23.1	8.0	7.9	7.3	245	250	250
Control B	63	5	5	5	7.7	8.2	8.3	23.4		23.0	8.0	7.9	7.4	245	245	250
Control C	149	5	5	5	7.7	8.2	8.3	23.4		22.8	8.2	7.9	7.3	245	245	250
Control D	142	5	5	5	7.7	8.2	8.3	23.5		23.0	8.2	8.0	7.4	245	250	250
100% A	348	5	5	5	7.9	8.1	8.1	24.8	23.1	22.9	8.2	7.9	7.3	1080	1040	1045
100% B	501	5	5	4	7.9	8.1	8.2	24.8		22.7	8.2	7.9	7.4	1080	1045	1050
100% C	77	5	5	5	7.9	8.1	8.2	24.9		22.7	8.1	7.9	7.4	1080	1045	1065
100% D	48	5	5	5	7.9	8.1	8.2	24.9		22.9	8.1	8.0	7.4	1080	1055	1070
Recorded by:		TR	MF	TR	TR	TR	TR	TR	TR	TR	TR	TR	TR	TR	TR	TR
Measured/Loaded by:		MF	MF	TR	JN	MF	TR	JN	MF	TR	JN	MF	TR	JN	MF	TR

Investigators' Signatures

Robin C. Rader
Joyce Moath
Marshall Faircloth
Reviewer

form updated 10/05/94

Water Quality Parameters	Salt Water: Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2 (mg/L):					
Lab Total Residual Cl2 (mg/L):	<0.03		<0.03	DR-100	TMS
Alkalinity (mg/L as $CaCO_3$):	125		90	Hach	TR
Hardness (mg/L as $CaCO_3$):	120		400	Hach	TR
Total ammonia (mg/L as N):	<0.017		<0.017	orion	JN

Ammonia Meter #98136 Meter Slope: -57.9 Ammonia Blank: <0.017 Control Salinity: 0 ppt Sample Salinity: 0 ppt

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: A.B. Hopkins Gen Plant
County:
Contact / District: Glen Butts / NW
NPDES Permit #: FL00 25518
LIMS Sample #: 105231 **LIMS Job #:** 95-May-01-13 (completed 5/5/95)

Sample Collection: Date 5-1-95 Time 810
Test Beginning: Date 5-2-95 Time 1000
Test Ending: Date 5-4-95 Time 1000
Organism Batch #: 24 **Diluent Batch #:** 19
Organism Age: < 24hrs

Test Organism: Ceriodaphnia dubia

Test Type: (Screening) / Definitive
(Static) / Static Renewal / Flow-through

Test Number: 1 of 2

Remarks:

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 10.0 @ 10.0	24.4 @ 24.5	8.3 @ 24.1 °C	107.9 @ 98.6 1000 @ 1004 @ 24.6 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	23.9 @ 24.0	8.4 @ 23.5 °C	105.9 @ 98.6 995 @ 1004 @ 24.0 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	24.3 @ 24.4	8.3 @ 24.5 °C	106.8 @ 98.6 993 @ 1004 @ 24.3 °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	A	5	5	5	8.0		8.2	23.7		24.2	8.1		7.2	165		210
Control	B	5	5	5			8.2			24.3			7.2			185
Control	C	5	5	5			8.2			24.3			7.2			180
Control	D	5	5	5			8.2			24.3			7.2			185
100%	A	5	5	5	7.9		8.3	23.9		24.0	8.2		7.2	960		1100
100%	B	5	5	5			8.3			24.0			7.2			1070
100%	C	5	5	3			8.3			24.0			7.2			1070
100%	D	5	5	5			8.3			24.0			7.2			1070
Recorded by:		TR	MF	TR	TR		TR	TR		TR	TR		TR	TR		TR
Measured/Loaded by:		MF	MF	TR	JN		TR	JN		TR	JN		TR	JN		TR

Investigators' Signatures

Robin C. Rader
Joyce Smith
Marshall Faircloth

Reviewer

form updated 10/05/94

Water Quality Parameters

	Salt Water Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2 (mg/L):					
Lab Total Residual Cl2 (mg/L):		<0.03	<0.03	DR-100	TM
Alkalinity (mg/L as $CaCO_3$):		75	90	Hach	TR
Hardness (mg/L as $CaCO_3$):		80	400	Hach	TR
Total ammonia (mg/L as N):		<0.017	<0.017	Orion	JN

Ammonia Meter #98136 Ammonia Meter Slope: -57.9 Ammonia Blank: <0.017 Control Salinity: 0 ppt Sample Salinity: 0 ppt

Benthic macroinvertebrate taxa list for the Arvah B. Hopkins Generating Facility, collected via Hester-Dendy artificial substrates on 5 May 1995. The test site was located 100 meters downstream from the discharge. The reference site was located in Three Pole Creek. Densities, in number/m^2, represent the mean of three replicates.

	Reference Site	Test Site
Gastropoda		
Ancylidae	3	–
Physella sp.	11	–
Ephemeroptera		
Acerpenna pygmaeus	5	–
Caenis sp.	8	–
Plecoptera		
Perlesta placida	3	–
Coleoptera		
Dineutus sp.	5	–
Stenelmis sp.	–	8
Megaloptera		
Corydalus cornuta	–	3
Trichoptera		
Cheumatopsyche sp.	3	140
Diptera		
Ablabesmyia mallochi	48	5
Atrichopogon sp.	–	13
Chironomidae	11	–
Cricotopus bicinctus grp.	–	5
Cricotopus or *Orthocladius* sp.	–	8
Dicrotendipes sp.	5	–
Dicrotendipes modestus	3	–
Dicrotendipes neomodestus	3	–
Dicrotendipes simpsoni	16	–
Hemerodromia sp.	3	40
Mesosmittia sp.	–	3
Parametriocnemus sp.	3	–
Paratanytarsus sp. B Epler	3	–
Paratendipes albimanus	3	–
Pentaneura inconspicua	3	–
Polypedilum fallax	19	–
Polypedilum illinoense grp.	–	5
Polypedilum laetum	–	3
Polypedilum tritum	–	3
Rheotanytarsus sp.	5	–
Stempellinella sp.	24	–
Tanytarsus sp.	3	–
Tanytarsus sp. A Epler	5	–
Tanytarsus sp. C Epler	3	–

Tanytarsus sp. L Epler	3	–
Tanytarsus sp. M Epler	8	–
Tanytarsus sp. W Epler	3	–
Thienemanniella sp. A Epler	3	–

Benthic macroinvertebrate taxa list for Arvah B. Hopkins Generating Facility, collected via 20 discrete dipnet sweeps on 5 May 1995. The test site was located 100 meters downstream from the discharge. The reference site was located in Three Pole Creek.

	Reference Site	Test Site
Oligochaeta		
Dero trifida	–	14
Limnodrilus hoffmeisteri	–	144
Nais communis	144	–
Gastropoda		
Laevapex sp.	144	–
Pseudosuccinea columella	48	–
Decapoda		
Cambaridae	–	14
Palaemonetes kadiakensis	48	–
Ephemeroptera		
Baetidae	192	–
Caenis sp.	1624	–
Habrophlebiodes brunneipennis	96	–
Odonata		
Cordulegaster maculata	48	–
Plecoptera		
Perlesta placida	192	–
Coleoptera		
Dubiraphia sp.	192	–
Helichus lithophilus	288	–
Stenelmis sp.	2,928	–
Trichoptera		
Cheumatopsyche sp.	1,776	850
Chimarra sp.	768	–
Trichoptera	48	–
Diptera		
Chironomidae	144	–
Conchapelopia sp.	96	–
Cricotopus or *Orthocladius* sp.	–	29
Cryptotendipes sp.	–	29
Hemerodromia sp.	480	115
Labrundinia sp.	48	–
Larsia decolorata	48	–
Paralauterborniella nigrohalterale	48	–
Paramerina sp.	144	–
Parametriocnemus sp.	1,152	–
Paratanytarsus sp. B Epler	48	–
Phaenopsectra sp.	48	14
Polypedilum aviceps	192	–

Polypedilum convictum grp.	48	–
Polypedilum fallax	192	–
Polypedilum illinoense	48	–
Polypedilum illinoense grp.	–	173
Rheotanytarsus exiguus	192	–
Simulium sp.	48	–
Stempellinella sp.	144	–
Stenochironomus sp.	96	–
Tanytarsus sp. L Epler	240	–
Tanytarsus sp. M Epler	144	–
Tanytarsus sp. U Epler	144	–
Thienemanniella sp. A Epler	48	–
Tipula sp.	–	14
Tipulidae	96	–
Tribelos fuscicornis	48	–
Xenochironomus xenolabis	48	–
Xylotopus par	48	–

Periphyton taxa list and densities (#/cm^2) for Arvah B. Hopkins Generating Facility, collected via standard diatometer on 5 May 1995. The test site was located 100 meters downstream from the discharge. The reference site was located in Three Pole Creek.

	Reference Site	Test Site
Cyanophyceae		
Anabaena sp.	–	244
Lyngbya sp.	–	5120
Oscillatoria sp.	863	1951
Phormidium sp.	1438	–
Bacillariophyceae		
Achnanthes hustedtii	4315	–
Achnanthes lanceolata	575	–
Achnanthes lanceolata dubia	1438	–
Achnanthes microcephala	863	–
Amphora sp.	–	4633
Caloneis bacillum	–	3170
Cocconeis placentula	575	–
Eunotia sp.	575	244
Frustulia rhomboides	288	–
Gomphonema parvulum	1151	–
Gyrosigma sp.	288	–
Melosira varians	863	–
Navicula capitata	863	–
Navicula cryptocephala	288	–
Navicula decussis	–	731
Navicula exigua	2014	–
Navicula minima	3740	9753
Navicula pupula	288	488
Navicula radiosa	1151	–
Navicula viridula	1151	–
Neidium dubium	1151	–
Nitzschia communis	–	2445
Nitzschia fonticola	575	–
Nitzschia palea	575	13167
Opephora martyi	288	–
Pennales	575	2926
Pinnularia sp.	–	244
Pinnularia abaujensis	288	–
Pinnularia gibba	288	–
Rhopalodia gibba	–	244
Stauroneis smithi	1726	–
Surirella sp.	575	2438
Synedra parasitica	288	–
Chlorophyceae		
Cylindrocapsa sp.	–	244

Gloeocystis sp.	–	488
Mougeotia sp.	288	–
Oedogonium sp.	863	–
Oocystis sp.	–	244
Scenedesmus sp.	–	6827
Euglenophyceae		
Trachelomonas sp.	–	244

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

1	2	3	11	12	17	18	19	20
Transaction Code		NPDES NUMBER		YR/MO/DA		Insp Type	Inspector	Fac Type
N	5	FL0025518		960229		X	5	1

Remarks

21 66

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

1	2	3	11	12	17	18	19	20
Transaction Code		NPDES NUMBER		YR/MO/DA		Insp Type	Inspector	Fac Type
N	5	FL0025518		960229		B	5	1

Remarks

21 66