

Biological Assessment of

Adams Packing Association

Polk County

NPDES #FL0002801

Sampled January 1993

June 1993

Biology Section
Division of Technical Services

Department of Environmental Regulation
Results of Fifth Year Inspections

Discharger: Adams Packing Association
County: Polk
NPDES Number: FL0002801
State Permit Expiration Date: 1 September 1993

Toxics Sampling Inspection (XSI)

Date Sampled: 11 January 1993

Results: Organic constituents detected in the effluent included 2,4 dimethylphenol (5.6 µg/L), ethion (0.093 µg/L), and simazine (0.39 µg/L). Aluminum (51 µg/L), iron (655 µg/L), and zinc (18 µg/L) were also found in the effluent sample at levels above detection limits. None of these compounds was in excess of water quality standards.

Compliance Biomonitoring Inspection (CBI)

Date Sampled: 11 January 1993

Results: Toxic to *Ceriodaphnia dubia*, producing an LC_{50} of 34.72%. This is a violation of Rules 17-302.510(5)(p) FAC, 17-302.500(1)(d) FAC, and 17-4.244(3)(a) FAC. No mortality was observed in the fish bioassay.

Impact Bioassessment Inspection (IBI)

Date Sampled: 11 January 1993

Results: Shannon-Weaver diversity and Florida Index indicated that macroinvertebrate communities were stressed at both Lake Lena Run stations. Conditions were somewhat more degraded below the discharge, demonstrated by the reduced Florida Index and a population shift toward organisms known to be tolerant of organic pollution. The stress seen in benthic populations at the reference site was probably related to the reduced D. O. regime, elevated nutrients, and to sporadic (previously documented) toxic discharges from upstream sources. The somewhat less hospitable conditions found below the discharge were probably caused by the low D. O., the effluent toxicity detected by the concurrent *C. dubia* bioassay, and to increased nutrient enrichment. The data indicate that the Adams Packing discharge is contributing to imbalances in aquatic fauna in Lake Lena Run, a violation of Rule 17-302.560 (29) FAC. Changes in the periphyton community occurred below the discharge, but two measurements of algal health indicated improvement (taxa richness and the % contribution of dominant taxon) and two measurements indicated degradation (diatom to blue green algae ratio and chlorophyll *a*).

Water Quality Inspection (WQI)

Date Sampled: 11 January 1993

Results: Dissolved oxygen at both sites was below Class III Standards, 3.9 mg/L at the reference site and 3.4 mg/L downstream of the discharge. Both stations in Lake Lena Run were phosphorus enriched. The discharge was not solely responsible for this phosphorus enrichment, as the concentration of total phosphorus in the effluent was only somewhat elevated. The facility did cause the nitrate-nitrite to be elevated at the test site (higher than 80% of other Florida streams). Nitrate-nitrite was undetected at the reference site, but present in the effluent in concentrations similar to those found at the test site. Algal growth potential measured at both sites exceeded the 5 mg dry wt/L, "problem threshold".

Introduction

Adams Packing Association, located in Polk County, Florida, is a citrus processing facility. Wastewater streams from the fresh fruit area, concentrate plant, steam plant, sanitary sewer system, and feedmill are collected and pumped to the wastewater treatment plant. Treatment consists of aeration, clarification, filtration, and retention in clay-lined polishing ponds prior to discharge to the Class III waters of Lake Lena Run. Lake Lena Run flows southward into Lake Hancock, which is among the most eutrophic lakes in Florida.

Permit limits for this seasonally variable discharge are as follows: pH (6.0-8.5 S.U.), BOD (from April 1 to October 31: 24 mg/L daily maximum, 12 mg/L monthly average; from November 1 to March 31: 40 mg/L daily maximum, 20 mg/L monthly average), TSS (68 mg/L daily maximum, 34 mg/L monthly average), unionized ammonia (0.02 mg/L maximum), TKN (4.9 mg/L maximum), total nitrogen (4.9 mg/L maximum), and dissolved oxygen (5.0 mg/L minimum). With a design capacity of 2.1 MGD, the facility has been discharging an actual mean flow of near 1.4 MGD.

There are two outfalls for this plant. Outfall 002 consists of the strong wastewater discharged to Lake Lena Run, and is permitted by State and Federal authorities. Outfall 001, the weak wastewater (combined cooling water, barometric condenser water, wastewater from refrigeration) is permitted by the NPDES program only. The 002 dis-

Major characteristics of community structure of control and test sites.

	Reference Site	Test Site
Macroinvertebrate Qualitative		
Number of Taxa	49	41
Florida Index	11	2
% Contribution of Dominant Taxon	47.8	56.1
% Oligochaeta	8.4	2.5
% Diptera	73.1	91.8
% Gastropoda	4.9	3.0
% Malacostraca	10.2	1.9
% Coleoptera	1.0	0.1
% Other	2.4	0.7
% Predators	30.6	6.1
% Collector-Gatherers	39.6	56.5
% Collector-Filterers	4.5	0.4
% Scrapers	5.5	3.0
% Shredders	19.7	34.0
Macroinvertebrate Hester-Dendy		
Number of Taxa	25	24
Florida Index	11	7
Shannon-Weaver Diversity	2.1	2.4
% Malacostraca	4.5	3.2
% Diptera	91.3	91.8
% Gastropoda	3.4	1.4
% Trichoptera	0.1	3.3
% Coleoptera	0.2	0.2
% Other	0.5	0.1
% Predators	33.5	13.2
% Collector-Gatherers	36.0	47.2
% Collector-Filterers	1.0	3.4
% Scrapers	2.7	1.5
% Shredders	26.6	34.7
% Parasites	0.2	0.01
Periphyton Algae		
Number of Taxa	23	33
% Contribution of Dominant Taxon	29.0	21.3
Chlorophyll a (mg/sq. m)	2.0	11.3
Diatom/Diatom + B-G Abundance Ratio	0.91	0.66
% Blue-green	6.5	30.0
% Green	24.2	11.8
% Diatoms	69.4	58.2
Algal Growth Potential (mg dry wt/L)	26.7	19.7

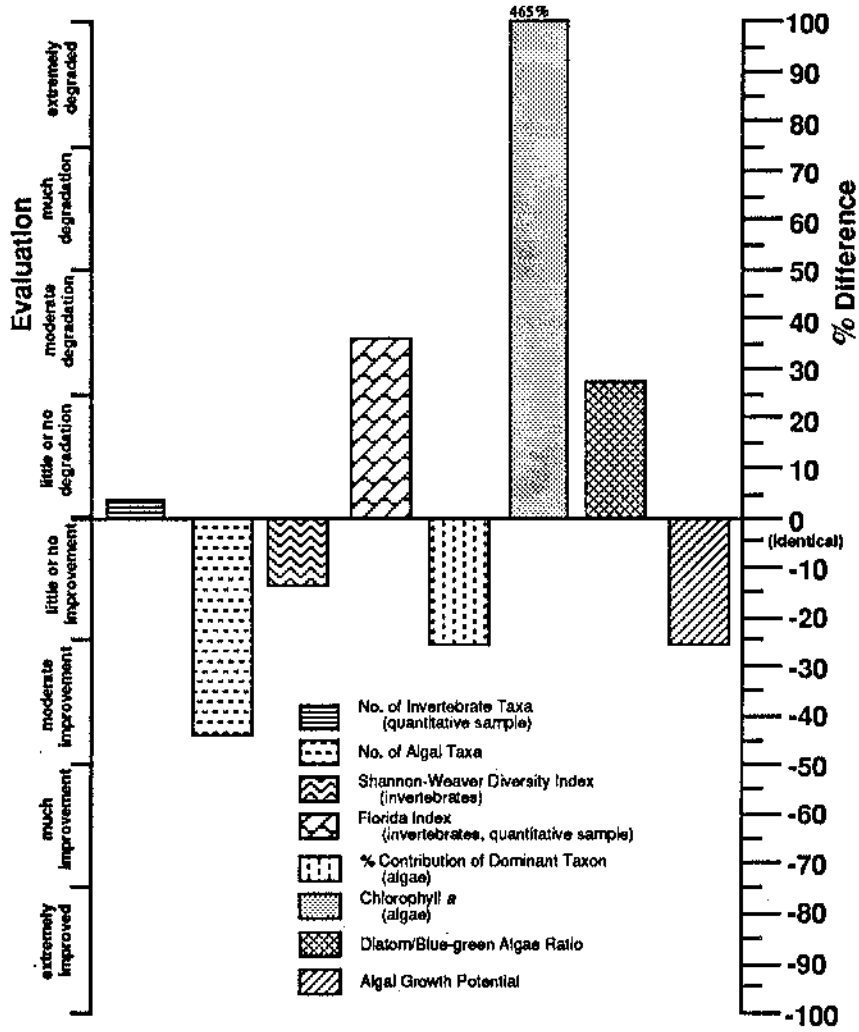
charge was emphasized during this investigation.

The facility does not have a history of permit violations or plant upsets. However, bioassays indicate that the discharge has been acutely toxic in January, 1989; April, 1990; and in June, 1990. Results from a chronic toxicity test performed in December, 1991, were satisfactory.

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 upstream of the plant in Lake Lena Run) and a test site (also in Lake Lena Run, downstream of the discharge) (see map in Appendix). A habitat assessment was performed *in situ* to establish comparability between sites. Supplemental physical/chemical data were also collected on the effluent and study sites. Acute definitive and screening toxicity bioassays, using *Ceriodaphnia dubia* and *Notropis leedsi* as test organisms, respectively, were performed on an effluent sample (Weber 1991). The effluent was analyzed for metals and for organic constituents (base neutral and acid extractables, and pesticide extractables). Additionally, nutrient analyses were performed on effluent, as well as reference and test sites. Methods used for all chemical analyses are on file at the Tallahassee DER Chemistry Laboratory.

Benthic macroinvertebrate communities were evaluated at reference and test sites. 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). Algal growth potential tests, using *Selenastrum capricornutum* as the test organism, followed Miller *et al.* (1978).



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

Explanation of Measurements of Community Health

Several different measurements of macroinvertebrate and algal community health have been employed. Many of these, such as the number of taxa, Shannon-Weaver Diversity Index, and chlorophyll *a* are well known. Others are briefly explained here. The Florida Index assigns points to stream-dwelling macroinvertebrates based on their sensitivity to pollution (see Ross 1990). A site with a high Florida Index score is

considered healthy (*i.e.*, many clean-water organisms are present). Excessive numerical dominance of a single type of organism (a high % contribution of dominant taxon) is usually associated with disturbance. A decreased diatom to blue-green algae ratio (calculated by dividing the number of individuals in the Bacillariophyta by the number of individuals in the Bacillariophyta + Cyanophyta) is often indicative of nutrient enriched conditions. The determination of the Quantitative Stability Index (for taxonomic % composition) is a two step process. First, the relative proportions of major taxonomic groups are calculated for each site. Then, the lesser of the two percentages for each discrete taxonomic group is totaled. A QSI (% composition) of 100% means that the two sites being compared are identical. This same type of procedure is used for calculating the QSI (functional feeding groups).

For graphical purposes, the percent differences between the reference and test sites involving the number of taxa, the diversity index, Florida Index and the diatom to blue-green algae ratio are measured as the reference site minus test site divided by the reference site. The percent differences between sites involving the percent contribution of dominant taxon, 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: Pat Fricano, Kathy Hicks, Sherry Camp, and Jim Snitgen (DER Southwest District) and Lyn Burton, Marshall Faircloth, Russel Frydenborg, Kathleen Lurding, Kim Pearce, Urania Quintana, Landon Ross, and Greg Wynn (Tallahassee Biology Laboratory).

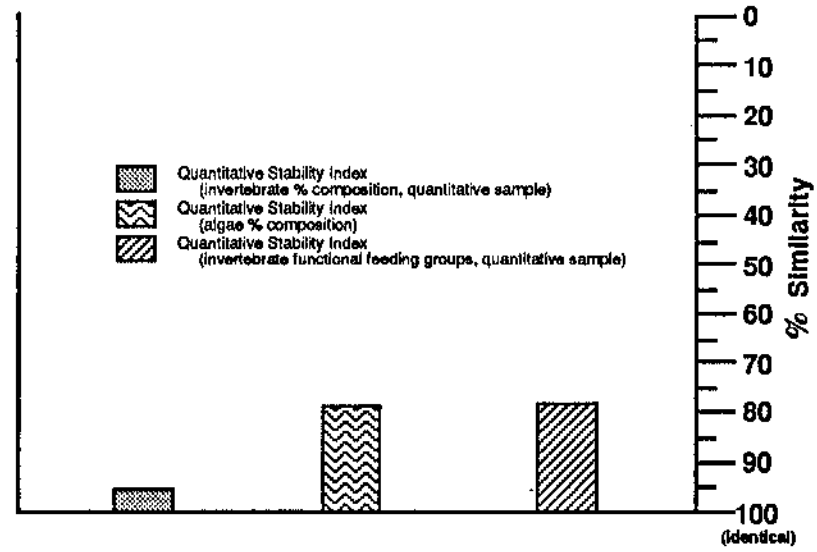
Results and Discussion

Lake Lena Run is a channelized stream whose source is the eutrophic Lake Lena. At the study area, a substantial portion of the stream flow is composed of cooling water from Auburndale Foods (Coca-Cola). An ammonia spill (released via the Coca-Cola cooling water discharge) caused a fish kill in Lake Lena Run on 17 February 1991. On February 14, 1993 (approximately one month after the sampling for this study), Auburndale Foods ceased discharging its cooling water into Lake Lena Run. Other discharges to Lake Lena Run which are currently upstream of the study area include Florida Distillers and the City of Auburndale WWTP.

Habitat quality at both the reference and test sites was identical, with scores of 70 at the two stations (Appendix). Half of the land in the area was subject to industrial uses and half was forested. Both stations scored well for water velocity (which was 0.25 m/sec) and substrate (80% of the stream had macrophyte coverage). However, the vegetation present at both stations consisted of a *Ludwigia* sp. monoculture, which may not have provided as desirable habitat characteristics as a mixture of plants would have. Dissolved oxygen at both sites was below Class III Standards, 3.9 mg/L at the reference site and 3.4 mg/L downstream of the discharge. These low D.O. values represent violations of Rule 17-302.560 (21) FAC. Both sites were slightly below neutral in pH (6.3). Conductivity was slightly lower at the reference site (323 µmhos/cm) than it was at the test site (414 µmhos/cm) (Appendix).

The static definitive bioassay performed with *Ceriodaphnia dubia* produced an LC50 of 34.72%. This is a violation of Rules 17-302.510(5)(p) FAC, 17-302.500(1)(d) FAC, and 17-4.244(3)(a) FAC. No mortality was observed in the fish bioassay.

Organic constituents detected in the effluent included 2,4 dimethylphenol



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

(5.6 µg/L), ethion (0.093 µg/L), and simazine (0.39 µg/L). Aluminum (51 µg/L), iron (655 µg/L), and zinc (18 µg/L) were also found in the effluent sample at levels above detection limits. None of these compounds was in excess of water quality standards.

Both the reference site and the test site had concentrations of total phosphorus (above 0.38 mg/L) and ortho-phosphorus (above 0.3 mg/L) which were higher than 80% of other Florida streams (see table of typical water quality parameters in Appendix). This indicates that Adams Packing discharge, which had a slightly elevated concentration of total phosphorus (0.41 mg/L), was not solely responsible for, but did contribute to, the phosphorus enrichment seen in Lake Lena Run. Nitrate-nitrite at the test site (0.46 mg/L) was higher than 80% of other Florida streams, but was undetected at the reference site. This increase at the test site was influenced by the 0.32 mg/L of nitrate-nitrite in the discharge. Total Kjeldahl Nitrogen was higher in the effluent (2.8 mg/L) and test site (1.3 mg/L), than at the reference station (0.7 mg/L). Ammonia was fairly low (below 0.05 mg/L) in all samples.

Results of algal growth potential tests indicated that waters in Lake Lena Run, or waters farther downstream in Lake Hancock, may be subject to eutrophication effects. The AGP measured at the reference site (26.7 mg dry wt/L) and the test site (19.7 mg dry wt/L) both exceeded the 5 mg dry wt/L, "problem threshold". This is the level above which the negative consequences associated with nutrient enrichment (D.O. depletion, algal blooms, fish kills) are probable (Raschke and Schultz 1987). Effluent AGP was 16.9 mg dry wt/L.

Some measures of benthic macroinvertebrate community health indicated stressed conditions at both Lake Lena Run stations. The figure on p. 2 indicates the degree of difference between the reference and test sites. Larger differences (that is, higher percentages) correspond with greater degrees of degradation.

Shannon-Weaver diversity was 2.1 at the reference site and 2.4 at the test site. Both of these values are lower than 80% of typical Florida streams. Florida Index was also lower than expected at both sites, which should be 15 points at a minimum for flowing streams in central Florida. In the Hester-Dendy samples, the reference site received 11 Florida Index points, while the test site received 7 points. In dip net samples, Florida Index was reduced from 11 points at the reference site to 2 points at the test site. This indicates a decrease in pollution sensitive taxa below the discharge. In dip net samples, taxa richness was surprisingly high, although it declined by 16% at the test site, from 49 to 41 organisms. Taxa richness was about the same (near 25) at both sampling locations in the Hester-Dendy samples.

A population shift occurred between the upstream and downstream stations. The dominant taxa at the reference site included the midges, *Polypedilum convictum* and *Pentaneura inconspicua*, the amphipod, *Hyalella azteca*, and the oligochaete, *Allonais inaequalis* (see taxa list in Appendix). While many of these taxa were still present at the test site, the dominant taxa there included organisms known to be tolerant of organic pollution, such as the nuisance midges, Chironomus sp. and *Goeldichironomus holoprasinus* (Beck 1969, Hudson et al. 1990). The stress seen in macroinvertebrate populations at the reference site was probably related to the reduced dissolved oxygen regime and possibly to sporadic (previously documented) toxic discharges from upstream sources. The somewhat less hospitable conditions found below the discharge were probably caused by the low dissolved oxygen, the toxicity of the effluent detected by the concurrent *C. dubia* bioassay, as well as the increased nutrient enrichment from the discharge.

The figure on p. 3 summarizes similarities between the sites. Smaller similarities (lower percentages) generally correspond with greater degradation. In this particular case, the macroinvertebrate percent composition at the two sites was very similar. Since the macroinvertebrate assemblage, both above and below the discharge, was composed almost entirely of dipterans (causing the QSI for percent composition to be 96.3%), this is evidence, as mentioned earlier, that both sites were degraded. Functional feeding groups were not greatly changed between stations.

Changes in the periphyton community occurred below the discharge, but two measurements of algal health indicated improvement and two measurements indicated degradation. Twenty three taxa were collected at the reference site, while thirty three were represented in the test site sample (see taxa list in Appendix). The percent contribution of the dominant taxon was lower at the test site. Diatoms (69.4%) were most numerous upstream, while 6.5 % of the population there consisted of cyanophytes. The downstream population had a considerably higher abundance of blue-greens (30.0%), leading to a 27.5% decrease in the diatom to blue green ratio at the test site. A 465% increase in periphyton biomass (chlorophyll *a*) at the test site, compared to the control, also suggested that the discharge was exerting a negative influence on the attached algal community.

Conclusions

Dissolved oxygen at both sites was below Class III Standards, violating Rule 17-302.560 (21) FAC. The static definitive bioassay performed with *Ceriodaphnia dubia* produced an LC50 of 34.72%. This is a violation of Rules 17-302.510(5)(p) FAC, 17-302.500(1)(d) FAC, and 17-4.244(3)(a) FAC. No mortality was observed in the fish bioassay.

Organic constituents detected in the effluent included 2,4 dimethylphenol (5.6 µg/L), ethion (0.093 µg/L) , and simazine (0.39 µg/L). Aluminum (51 µg/L), iron (655 µg/L), and zinc (18 µg/L) were also found in the effluent sample at levels above detection limits. None of these compounds was in excess of water quality standards.

Both stations in Lake Lena Run were phosphorus enriched (higher than 80% of other Florida streams). The Adams Packing discharge had a somewhat elevated concentration of total phosphorus, but was not solely responsible for this phosphorus enrichment. The facility did cause the nitrate-nitrite to be elevated at the test site (which was also higher than 80% of other Florida streams). Nitrate-nitrite was undetected at the reference site, but present in the effluent in concentrations similar to those found at the test site.

Results of algal growth potential tests indicate that waters in Lake Lena Run, or waters farther downstream in Lake Hancock, may be subject to eutrophication effects. The AGP measured at the reference site (26.7 mg dry wt/L) and the test site (19.7 mg dry wt/L) both exceeded the 5 mg dry wt/L, "problem threshold". This is the level above which the negative consequences associated with nutrient enrichment (D.O. depletion, algal blooms, fish kills) are probable (Raschke and Schultz 1987). Effluent AGP was 16.9 mg dry wt/L.

Some measures of benthic macroinvertebrate community health indicated stressed conditions at both Lake Lena Run stations. Shannon-Weaver diversity and Florida Index were lower than expected at both sites, although the Florida Index was more reduced at the test site. A population shift occurred between the upstream and downstream stations. The abundance of organisms known to be tolerant of organic pollution, such as the nuisance midges, *Chironomus* sp. and *Goeldichironomus holoprasinus*, was much greater below the discharge. The stress seen in macroinvertebrate populations at the reference site was probably related to the reduced dissolved oxygen regime, nutrient enrichment, and possibly to sporadic (previously documented) toxic discharges from upstream sources. The somewhat less hospitable conditions found below the discharge were probably caused by the low dissolved oxygen, the toxicity of the effluent that was detected by the concurrent *C. dubia* bioassay, as well as the increased nutrient enrichment from the discharge. The data indicate that Adams Packing is contributing to imbalances in aquatic fauna in Lake Lena Run, a violation of Rule 17-302.560 (29) FAC.

Changes in the periphyton community occurred below the discharge, but two measurements of algal health indicated improvement and two measurements indicated degradation. Taxa richness and the percent contribution of the dominant taxon were better at the test site. The diatom to blue green algae ratio and chlorophyll *a* indicated that conditions were worse at the test site.

Literature Cited

Beck, E. C. and W. M. Beck. 1969. The Chironomidae of Florida. II. The nuisance species. Fla. Entomol. 52(1): 1-11.

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

Miller, W. E., T. E. Maloney, and J. C. Greene. 1978. The Selenastrum capricornutum Printz algal assay bottle test. U. S. Environ. Prot. Agency, EPA-600/9-78-018. 126 p.

Raschke, R. L. and D. A. Schultz. 1987. The use of the algal growth potential test for data assessment. J. Wat. Poll. Cont. Fed. 59(4): 222-227.

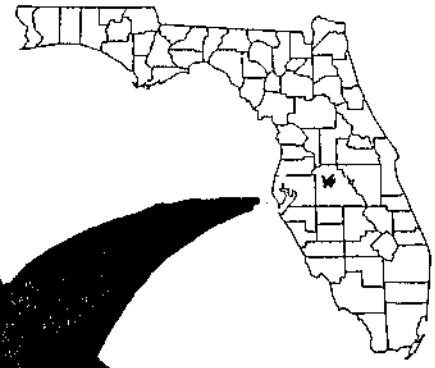
Ross, L. T. 1990. Methods for aquatic biology. Fla. Dept. Environ. Reg. Tech. Ser. 10(1): 1-47.

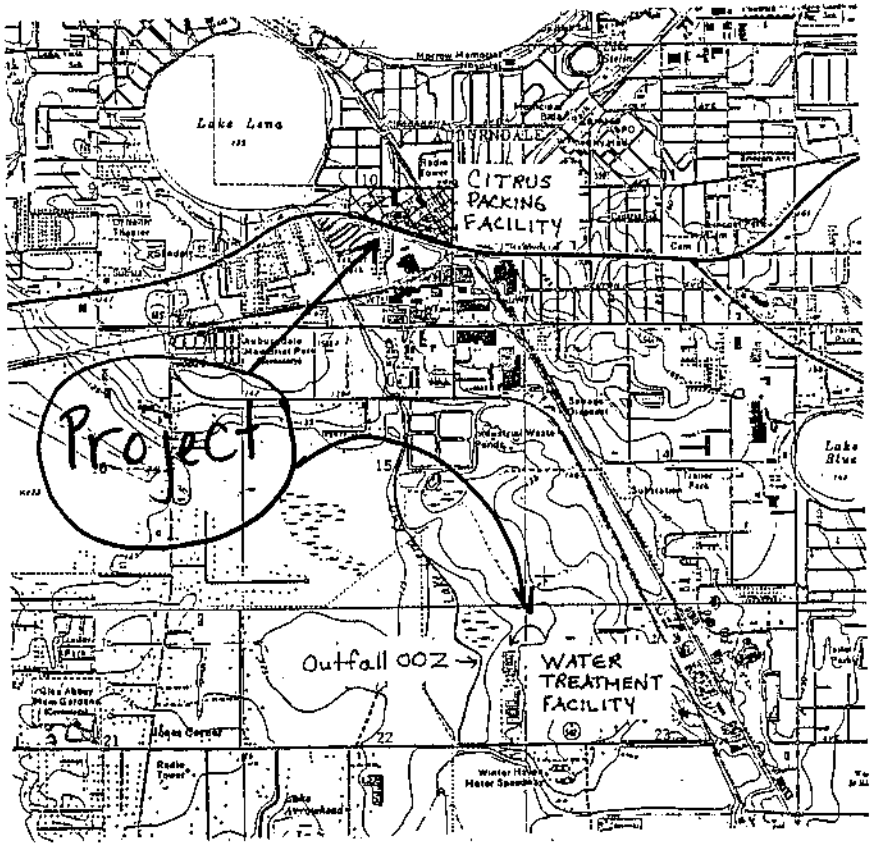
Weber, C. I. 1991. Methods for measuring the acute toxicity of effluents to freshwater and marine organisms. 4th edition. EPA/600/4-90/027. U. S. EPA, Cincinnati, Ohio. 216 p.

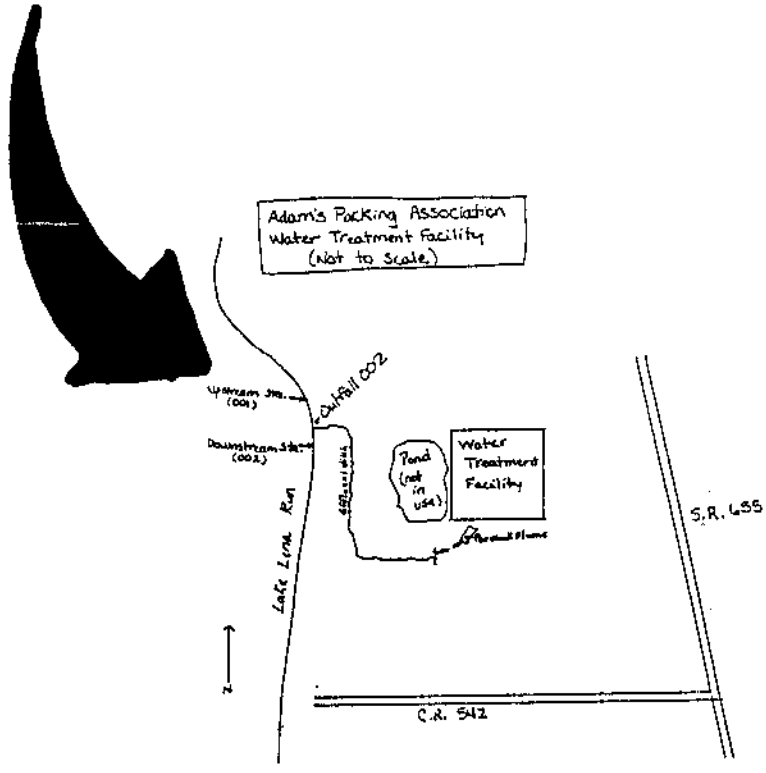
Chemistry summary table for

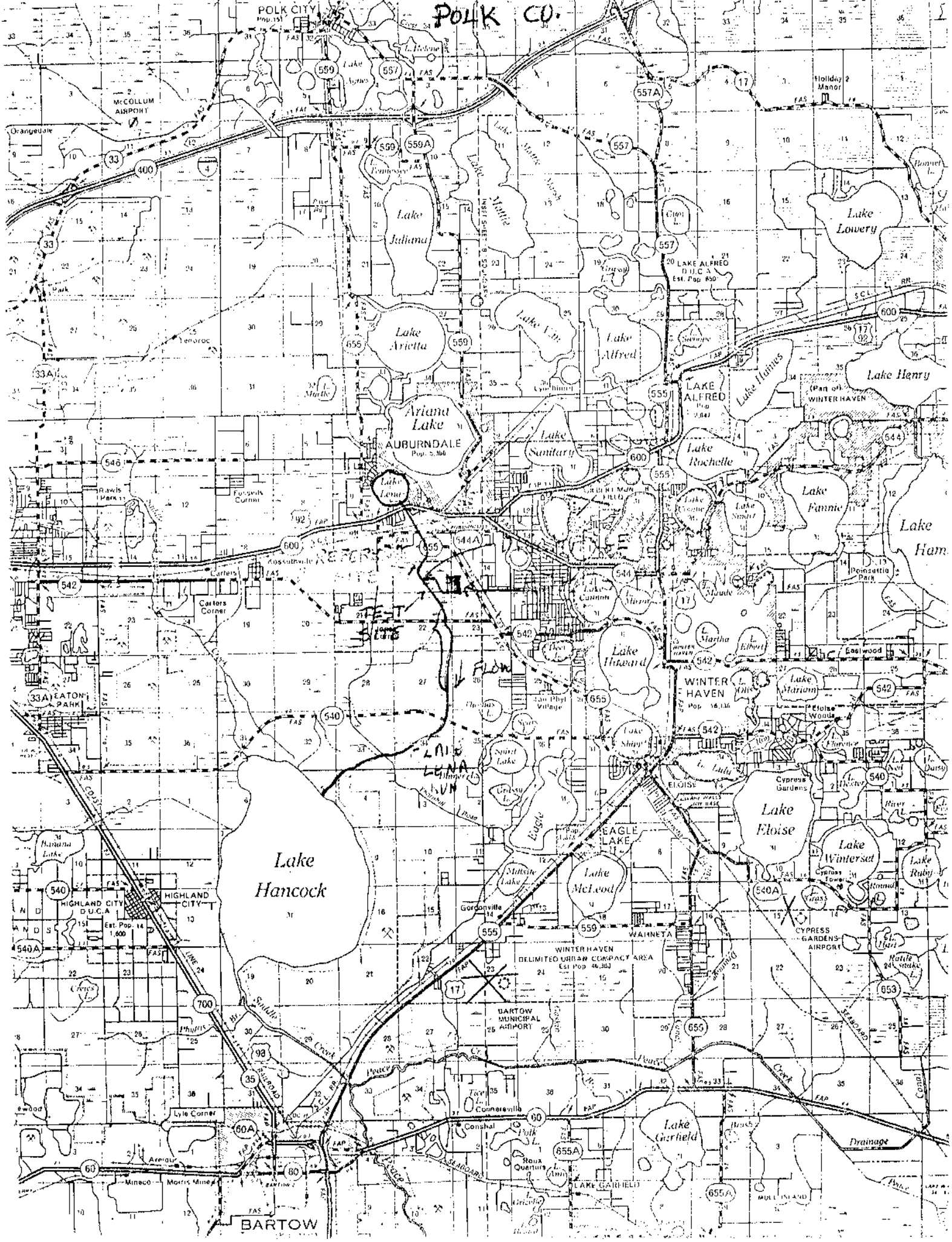
Adams Packing Association	Effluent	Reference Site	Test Site
Organic Constituents (ug/L)			
2,4-Dimethylphenol	5.6 T		
Ethion	0.093 T		
Simazine	0.39		
Metals (ug/L)			
Aluminum	51		
Antimony	15 U		
Arsenic	20 U		
Cadmium	0.08 U		
Copper	5 U		
Chromium	10 U		
Iron	655		
Lead	15 U		
Mercury	0.1 U		
Nickel	5 U		
Selenium	30 U		
Silver	0.05 U		
Zinc	18		
Nutrients (mg/L)			
Ortho-phosphorus	0.062	0.38 A	0.30
Total phosphorus	0.41	0.41 A	0.38
Ammonia	0.045	0.048	0.053
Nitrate+Nitrite	0.32	0.020 U	0.46
TKN	2.8	0.71 A	1.3
Other Parameters			
Habitat Assessment		70	70
D.O. (mg/L)	5.5	3.9	3.4
pH (SU's)	7.6	6.3	6.3
Conductivity (µmhos/cm)	580	323	414
Temperature (°C)		25.7	24.9
Hardness (mg CaCO3)	100		
Algal Growth Potential (mg dry wt/L)	16.9	26.7	19.7
Bioassay Fish-Dechlorinated	Not toxic		
Bioassay Invertebrate-Dechlorinated	LC50 = 35%		

A - Value reported is the mean of two or more determinations
T - Value reported is less than the practical quantitation limit
U - Material analyzed for but not detected; value reported is the minimum detection limit




Lake Lena
CITRUS PACKING FACILITY
Project
Outfall 002
WATER TREATMENT FACILITY
Lake Blue


Adam's Packing Association
Water Treatment Facility
(Not to Scale)
Outfall 002
Pond (not in use)
Water Treatment Facility
Lake Lena Run
S.R. 655
C.R. 542
N


POLK CO.
POLK CITY
McCOLLUM AIRPORT
Orangedale
Lake Juliana
Lake Arietta
Ariana Lake
AUBURNDALE
Pop. 5,366
Lake Lena
Lake Sanitary
Lake Rochelle
LAKE ALFRED
Pop. 3,843
Lake Alfred
Lake Haines
Lake Henry
(Part of) WINTER HAVEN
Lake Lowery
LAKE ALFRED D.U.C.A.
Est. Pop. 850
Lake Fannie
Lake Howard
WINTER HAVEN
Pop. 16,136
Lake Eloise
Lake Winterset
Lake Ruby
Lake Hancock
Lake McLeod
Lake Garfield
EAGLE LAKE
ELOISE
Cypress Gardens
CYPRESS GARDENS AIRPORT
WAINEETA
WINTER HAVEN DELIMITED URBAN COMPACT AREA
Est. Pop. 46,383
HIGHLAND CITY
HIGHLAND CITY D.U.C.A.
Est. Pop. 1,600
BARTOW MUNICIPAL AIRPORT
BARTOW
Auburndale
Lake Wales
Lake Hamilton
Eaton Park
Rawls Park
Carters Corner
Lyle Corner
Arcadia
Mineco
Morris Mines
Gordonville
Conneraville
Holiday Manor
Poinsettia Park
Eastwood
Cypress Gardens
Seaboard
Drainage
FLOW
LENA
Lena Run
Saddle Creek
Peace Creek
Banana Lake
Crooked Lake
Rattlesnake L.
Bonnet L.
Tiger L.
Polk L.
Roux Quarters L.
Mud Island
Lake Marion
Lake Shipp
Lake Martha
Lake Elbert
Lake Eloise Woods
Lake Parker
Lake Hollingsworth
Lake Mirror
Lake Morton
Lake Otis
Lake Idylwild
Lake Myrtle
Lake Summit
Lake Caroline
Lake Cannon
Lake Hunter
Lake Spirit
Lake Phyl Village
Lake Mattie
Lake Juniper
Lake Shore
Lake Ariana
Lake Lulu
Lake Thelma
Lake Dorsey
Lake Grassy
Lake Mattie
Lake Eagle
Lake Mattie
Lake Garfield
Lake Hollingsworth
Lake Parker
Lake Mirror
Lake Morton
Lake Otis
Lake Idylwild
Lake Myrtle
Lake Summit
Lake Caroline
Lake Cannon
Lake Hunter
Lake Spirit
Lake Phyl Village
Lake Mattie
Lake Juniper
Lake Shore
Lake Ariana
Lake Lulu
Lake Thelma
Lake Dorsey
Lake Grassy
Lake Mattie
Lake Eagle
Lake Mattie
Lake Garfield

FACILITY SUMMARY

Facility Name: ADAMS PACKING		Prepared by: Noblitt Date: 12-22-92
Location (attach detailed map): 625 Bridgers Ave, Auburndale, FL	County Polk	District SOUTHWEST
Federal Permit # FL0002801 and expiration date: Issued 9-25-91	State GMS # and 4053P2000 State expiration date: 9-1-93	Facility Type: (Industrial) Municipal Federal Agricultural Other (list):

Function of facility: Citrus processing

Description of treatment process: Waste streams from the steam plant, fresh fruit area, concentrate plant and sanitary wastewater feedmill are collected and pumped to the treatment plant. Treatment consists of aeration, clarification, filtration and polishing ponds (clay-lined) prior to discharge to Lake Lena Run (outfall 002)

Receiving waters: Lake Lena Run	Classification: CIII
Design Flow: 2.10 MGD maximum	Actual Mean Flow: ~1.4 MGD

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

therefore, the best time to sample is: end of October through February

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

No mixing zone

List effluent limits:

Parameter	Limit (units) Daily Max	30-Day Avg
BOD5 Nov1-Mar31	40.0	20
Apr1-Oct31	24	12
TSS	68	34
TKN	4.9	4.9
Total Nitrogen	49	4.9
Unionized Ammonia	0.02	—
D.O.	5.0 minimum	
pH	6.0-8.5 range	

Describe special permit conditions and permit modifications:

Adams Packing
(Facility)

DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

Description of permitted outfall(s): 002 - Strong wastewater outfall to Lk. Lena Run

001 - weak wastewater (combined can cooling water, barometric condenser water, wastewater from refrigeration) is permitted by the NPDES Permit only.

List permit violations (from MOR data or other source) and plant upsets that occurred within past year: No MOR violations noted. Plant upsets unknown

Describe previous impact bioassessments, WQBEL's, and previous or current enforcement actions:

Dec. 1991 chronic bioassay w/ C dubia were satisfactory
Apr. 1990 - discharge was acutely toxic
Jun. 1990 - discharge was acutely toxic
Jan. 1989 - discharge was acutely toxic

Discuss comparability of MOR results to past DER results and whether there are trends (improving, declining) in the data set: No trends

Additional information:

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 4)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	TIME	RECEIVING BODY OF WATER:
		1-11-93		Lake Lena Run

REMARKS:	LOCATION:	FIELD ID/NAME:
Lena Run flowing faster than usual due to recent rainfalls.	Adam's Packing Assoc	Upstream CC1

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
50					50	

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

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

Point-Source Pollution (list location and describe):
Coca-Cola Foods City of Auburndale WWTP All upstream of Adams Packing
Florida Distillers (Jasmine)

Estimated System Width (range, m):	5	Estimated System Depth (range, m):	0.75		yes
High Water Mark (m above bed):	1	Velocity (range, m/s):	0.25	Impounded	[ ]
				Channelized	[✓]

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

SEDIMENT/SUBSTRATE

Ludwigia Monoculture

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

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

Sediment Deposits: Sludge: [ ] Paper Fiber: [ ] Mud: [✓] Sand: [ ] Shell: [ ] Other: [✓] clay

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)				Riffles			
Leaf Packs				Sand / Clay Mixture	20	2	
Aquatic Vegetation	30	18		Mud/Muck/Silt			
Rock or Shell Rubble				Benthic leaf mats			
Undercut Banks/Roots				Other:			

WATER QUALITY

	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm):			Secchi (m):
Top								
Mid-depth	0.35	25.68	6.34	3.95	323			Bottom 0.75 m
Bottom								

System Type : Stream: [✓] (Sand Bottomed, Swamp & Bog, Alluvial, Sand Bot w/ Spring, Calcareous, Misc.) 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: [✓] orange

Weather Conditions:
Mostly Cloudy
Temperature 78°F

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

SAMPLING TEAM:	SIGNATURE:	DATE:
Pat Fricano, Jim Snitgen, Kathy Hicks	Pat Fricano	1/11/93

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

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME: SWIM DER	STORET STATION NUMBER:	DATE (M/D/Y): 1-11-93	RECEIVING BODY OF WATER: Lake Lena Run

REMARKS: Water Flowing faster than normal for season of year.	LOCATION: Adam's Packing	FIELD ID/NAME: Upstream C01

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 23	Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs, undercut banks, rubble, or other stable habitat. **23-30 points**	20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat. **16-22 points**	5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat. **8-15 points**	Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious. **0-7 points**
Water Velocity 20	Max. observed; >0.3 m/sec. **23-30 points**	Max. observed; 0.1 to 0.3 m/sec **16-22 points**	Max. observed; 0.05 to 0.1 m/sec **8-15 points**	Max. observed; <0.05 m/sec **0-7 points**
Artificial Channel/ Flow Alteration 7	No artificial channelization. Little activity (impervious surface) in watershed which would cause scouring during spates. **12-15 points**	—	—	Artificially channelized, or scouring present during spates because of excess impervious surface in watershed. **0-3 points**
Bank Stability 9	Stable. No evidence of erosion or bank failure. Little potential for future problems. **9-10 points**	Moderately stable. Infrequent or small areas of erosion, mostly healed over. **6-8 points**	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. **3-5 points**	Unstable. Many raw, eroded areas. Obvious bank sloughing. **0-2 points**
Riparian Zone Vegetation Quality 6	Over 80% of streambank surfaces consist of native plants, classified as: bottomland hardwoods, understory shrubs, or non-woody macrophytes. **9-10 points**	50% to 80% of riparian zone is vegetated, but one class of plants is not represented. **6-8 points**	25% to 50% of riparian zone is vegetated, but one or two classes of plants are not represented. **3-5 points**	Less than 25% of streambank surfaces are vegetated. Poor plant community (e.g. grass monoculture) present. **0-2 points**

Adjustments 5	Add **5 points** if cross-sectional area of flow is estimated to be greater than one square meter during periods of normal flow.	**TOTAL SCORE** 70

COMMENTS: Lena Run is a Ludwigia monoculture at this station. Water had a slightly orange color. Kind of like dilute orange juice

ANALYSIS DATE: 1/11/93	ANALYST: Pat Fricano	SIGNATURE: Pat Fricano

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 4)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	TIME	RECEIVING BODY OF WATER:
		1-11-93		Lake Lena Run

REMARKS:	LOCATION:	FIELD ID/NAME:
LENA Run flowing faster than normal due to recent rainfalls.	Adam's Packing Assoc.	Downstream CC2

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
50					50	

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

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

Point-Source Pollution (list location and describe): Coca Cola Foods City of Auburndale WWTP All upstream of Adams Packing. Florida Distillers

Estimated System Width (range, m): 5	Estimated System Depth (range, m): 0.75		yes
High Water Mark (m above bed):	Velocity (range, m/s): 0.25	Impounded	☐
		Channelized	☑

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

SEDIMENT/SUBSTRATE

Ludwigia Monoculture

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

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

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)				Riffles			
Leaf Packs				Sand	20	6	
Aquatic Vegetation	90	14		Mud/Muck/Silt			
Rock or Shell Rubble				Benthic leaf mats			
Undercut Banks/Roots				Other:			

WATER QUALITY

	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm):			Secchi (m):
Top								
Mid-depth	0.35	24.36	6.34	3.4	414			Bottom 0.75 m
Bottom								

System Type : Stream: ☑ (Sand Bottomed, Sand Bot w/ Spring, Swamp & Bog, Calcareous, Alluvial, Misc.) 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: ☑ Orange

Weather Conditions: Mostly Cloudy Temp about 78°

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

SAMPLING TEAM:	SIGNATURE:	DATE:
Pat Fricano, Kathy Hicks, Jim Snitgen	Pat Fricano	1/11/93

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

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME: SWD DER	STORET STATION NUMBER:	DATE (M/D/Y): 1-11-93	RECEIVING BODY OF WATER: Lake Lena Run

REMARKS: Water Flowing Faster than normal for season of year.	LOCATION: Adam's Packing Assoc.	FIELD ID/NAME: Downstream CC2

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 27	Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs, undercut banks, rubble, or other stable habitat. **23-30 points**	20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat. **16-22 points**	5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat. **8-15 points**	Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious. **0-7 points**
Water Velocity 20	Max. observed: >0.3 m/sec. but < 1 m/sec **23-30 points**	Max. observed; 0.1 to 0.3 m/sec **16-22 points**	Max. observed; 0.05 to 0.1 m/sec **8-15 points**	Max. observed; <0.05 m/sec, or spate occurring; > 2 m/sec **0-7 points**
Artificial Channel/ Flow Alteration 7	No artificial channelization. Little activity (impervious surface) in watershed which would cause scouring during spates. **12-15 points**	—	—	Artificially channelized, or scouring present during spates because of excess impervious surface in watershed. **0-3 points**
Bank Stability 9	Stable. No evidence of erosion or bank failure. Little potential for future problems. **9-10 points**	Moderately stable. Infrequent or small areas of erosion, mostly healed over. **6-8 points**	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. **3-5 points**	Unstable. Many raw, eroded areas. Obvious bank sloughing. **0-2 points**
Riparian Zone Vegetation Quality 6	Over 80% of streambank surfaces consist of native plants, classified as: bottomland hardwoods, understory shrubs, or non-woody macrophytes. **9-10 points**	50% to 80% of riparian zone is vegetated, but one class of plants is not represented. **6-8 points**	25% to 50% of riparian zone is vegetated, but one or two classes of plants are not represented. **3-5 points**	Less than 25% of streambank surfaces are vegetated. Poor plant community (e.g. grass monoculture) present. **0-2 points**

Adjustments 5	Add **5 points** if cross-sectional area of flow is estimated to be greater than one square meter during periods of normal flow.	**TOTAL SCORE** 70

COMMENTS: Lena Run is a Ludwigia monoculture at this station. Water has a orange color to it. Kind of like dilute orange juice.

ANALYSIS DATE: 1/11/93	ANALYST: Pat Fricano	SIGNATURE: Pat Fricano

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: Adams PACKING ASSOC
Address/City: _____
County: POLK
Contact/District: PAT FRICANO SW
NPDES Permit #: FL00 02801 Outfall #: _____

Sample Collection: Date 1-11-93 Time 1240
Test Beginning: Date 1/12/93 Time 13:30
Test Ending: Date 1-14-93 Time 1400
Test Organism: Ceriodaphnia dubia
Life Stage/Age: < 24 hrs

47879 93-JAN-12-10

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

Remarks:

$LC_{50} = 35\%$

Instrument Calibrations:

	pH	DO	Temp	Cond
0 hr	7.0, 10.0 @ 10	8.5 @ 23.6	23.2 @ 23.4	990 / 4450 @ 23.8°C
24 hr	7.1, 10.3 @ 10.4	8.4 @ 23.8	23.7 @ 23.7	990 / 994 @ 24.0
48 hr	7.07, 10.10	8.6 @ 22.4	22.0 @ 22.2	980 / 9800 @ 23.5

Conc.	Chamber #	Number Live 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	DO (mg/L) 0	24	48	Cond. (µmhos/cm) 0	24	48
Control	A	5	5	4	8.5		8.0	23.2		22.4	9.2		8.4	330		185
Control	B	5	5	5			8.0						8.4			140
Control	C	5	5	5			8.0						8.4			130
Control	D	5	5	5			8.0						8.4			130
25%	A	5	5	5	7.9		8.3	23.1		22.3	8.3		8.5	230		260
25%	B	5	5	5			8.3						8.5			265
25%	C	5	5	4			8.3						8.5			255
25%	D	5	5	5			8.3						8.5			275
50%	A	5	1	0	7.7		8.5	23.2		22.3	7.9		8.5	340		400
50%	B	5	2	0			8.5						8.5			390
50%	C	5	5	0			8.5						8.5			385
50%	D	5	0	0			8.5						8.5			390
75%	A	5	0	—	7.7	8.6	—	23.2	23.5	—	7.0	7.9	—	450	480	—
75%	B	5	0	—		8.6	—					7.9	—		490	—
75%	C	5	0	—		8.6	—					7.9	—		490	—
75%	D	5	0	—		8.6	—					7.9	—		485	—
100%	A	5	0	—	7.6	8.7	—	22.9	23.5	—	6.3	7.7	—	560	605	—
100%	B	5	0	—		8.7	—					7.7	—		615	—
100%	C	5	0	—		8.7	—					7.7	—		625	—
100%	D	5	0	—		8.7	—					7.7	—		620	—
Measured/Loaded by:		MF	TR	MF	TM	MF	MF	TM	MF	MF	TM	MF	MF	TM	MF	MF
Recorded by:		TR	TR	TM	TR	TR	TM	TR	TR	TM	TR	TR	TM	TR	JR	JM

Investigators' Signatures

Tina Mikulski
Tobin Rader
Marshall Faulstich

Reviewer

Water-quality Parameters

	Well Water	Cond. Water 20%	Sample	Method	Measured by
Field Tot. Resid. Cl2:			not measured		
Lab Tot. Resid. Cl2:	.08	.04	.04	DR100	TR
Alkalinity:	115	70	270	Hach	TM
Hardness:	120	15	100	Hach	TM
Total Ammonia:	0.0	0.0	0.0	Hach	TM

Ammonia Meter Slope: -58.6
Ammonia Blank: 0.0
Salinity Sample: _____ ppt

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: Adams PACKING ASSOC
Address/City:
County: POLK
Contact/District: PAT FRICANO SW
NPDES Permit #: FL00 02801 Outfall #:

Sample Collection: Date 1-11-93 Time 1240
Test Beginning: Date 1/12/93 Time 13:30
Test Ending: Date 1-14-93 Time 1400
Test Organism: Notropis Leedsi
Life Stage/Age: 11 days

47879 93-JAN-12-10

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

Remarks:

Instrument Calibrations:

	pH	DO	Temp	Cond
0 hr	7.07, 10.05 10.10	8.5 @ 23.6	23.2 @ 23.4	930 / 1450 @ 23.8°C
24 hr	7.07, 10.03, 10.04	8.4 @ 23.8	23.7 @ 23.7	990 / 1440 @ 24.0°C
48 hr	7.07, 10.10	8.6 @ 22.4	22.0 @ 22.2	930 / 1500 @ 23.3

Conc.	Chamber #	Number Live 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	DO (mg/L) 0	24	48	Cond. (µmhos/cm) 0	24	48
Control	A (13)	5	5	5	7.9	8.2	8.3	22.2	22.6	22.2	8.6	8.0	8.3	235	245	240
Control	B (99)	5	5	5	7.9	8.2	8.3				8.6	8.0	8.3	240	240	240
100%	A (74)	5	5	5	7.6	8.0	8.2	22.4	22.7	22.0	5.5	5.0	6.1	575	580	580
100%	B (48)	5	5	5	7.6	8.0	8.2				5.5	4.9	6.1	580	585	580
Measured/Loaded by:		MF	TR	mf	TM	MF	mf	TM	MF	mf	TM	MF	mf	TM	MF	mf
Recorded by:		TR	TR	TM	TR	TR	TM	TR	TR	TM	TR	TR	TM	TR	TR	TM

Investigators' Signatures

Tina Mikulski
Tobin Rader
Marbol Faircloth

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:			not measured		
Lab Tot. Resid. Cl2:	.08	.04	.04	DR100	TR
Alkalinity:	115	70	270	Hach	TM
Hardness:	120	75	100	Hach	TM
Total Ammonia:	0.0	0.0	0.0	Hach	TM MF

Ammonia Meter Slope: -58.6
Ammonia Blank: 0.0
Salinity Sample: _____ ppt

[redacted] MONTANA STATE UNIV
FOR REFERENCE, CITE:
HAMILTON, M.A., R.C. RUSSO, AND R.V. THURSTON, 1977.
TRIMMED SPEARMAN-KARBER METHOD FOR ESTIMATING MEDIAN
LETHAL CONCENTRATIONS IN TOXICITY BIOASSAYS.
ENVIRON. SCI. TECHNOL. 11(7): 714-719;
CORRECTION 12(4):417 (1978).

DATE: 01/12/93 TEST NUMBER: 4 DURATION: 48 HR

CHEMICAL: [redacted] SPECIES: C. DUBIA

RAW DATA:

CONCENTRATION(%)	25.00	50.00	75.00	100.00
NUMBER EXPOSED:	20	20	20	20
MORTALITIES:	1	20	20	20
SPEARMAN-KARBER TRIM:		5.00%		

SPEARMAN-KARBER ESTIMATES: [redacted]
95% CONFIDENCE LIMITS
ARE NOT RELIABLE.

EPA PROBIT ANALYSIS PROGRAM
USED FOR CALCULATING EC VALUES
Version 1.4

ADAMS PACKING TESTED 01/12/93, C. dubia

Note : data file must contain at least two
concentrations for which the percent
responding is between 0% and 100%

Typical Values for Selected Parameters in Florida Waters

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

Parameter	Percentile Distribution 5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%
STREAMS (1617 stations)											
Phytoplankton Chlorophyll *a*	0.22	0.52	0.94	1.60	3.02	4.63	6.72	9.87	14.68	27.35	48.70
Periphyton Chlorophyll *a*	0.31	0.43	0.77	1.04	2.16	2.94	6.45	10.51	17.00	39.51	60.85
H-D Diversity	0.84	2.12	2.48	2.74	2.88	3.09	3.25	3.40	3.52	3.76	3.90
Qualitative Taxa Richness	9.00	12.00	17.00	20.00	22.00	24.50	26.00	28.00	31.00	37.00	53.00
H-D Taxa Richness	6.00	6.50	9.00	11.50	13.00	15.00	17.00	21.50	26.00	29.00	32.00
TKN	0.30	0.39	0.56	0.73	0.87	1.00	1.11	1.26	1.49	1.93	2.80
Ammonia	0.02	0.02	0.04	0.05	0.06	0.08	0.11	0.14	0.20	0.34	0.60
NO2-NO3	0.01	0.01	0.03	0.05	0.07	0.10	0.14	0.20	0.32	0.64	1.05
Total Phosphorus	0.02	0.03	0.05	0.06	0.10	0.13	0.18	0.25	0.39	0.74	1.51
Ortho Phosphorus	0.01	0.01	0.03	0.04	0.05	0.08	0.11	0.17	0.27	0.59	1.37
Turbidity	0.60	0.90	1.20	1.45	2.10	2.80	3.60	4.50	6.65	10.45	16.30
LAKES (477 stations)											
Phytoplankton Chlorophyll *a*	0.80	1.71	2.88	4.28	10.06	13.40	20.00	30.10	47.20	65.44	113.90
Dredge Diversity	0.71	0.97	1.43	1.74	1.98	2.12	2.21	2.59	2.85	3.15	3.17
Dredge Taxa Richness	3.00	5.00	6.50	7.00	9.00	10.00	11.00	13.00	15.00	17.00	21.00
TKN	0.36	0.49	0.67	0.83	1.08	1.26	1.40	1.51	1.68	2.11	3.46
NH3+NH4	0.01	0.02	0.02	0.03	0.04	0.06	0.08	0.12	0.15	0.21	0.28
NO2-NO3	0.00	0.00	0.01	0.01	0.01	0.02	0.04	0.05	0.10	0.14	0.23
Total Phosphorus	0.01	0.02	0.02	0.03	0.05	0.07	0.09	0.11	0.14	0.23	0.42
Ortho-Phosphorus	0.00	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.21	0.32
Turbidity	1.00	1.25	1.55	2.05	2.75	4.50	6.45	9.60	14.10	26.00	40.00
ESTUARIES (690 stations)											
Phytoplankton Chlorophyll *a*	2.14	3.28	4.49	5.13	6.00	6.93	7.94	9.60	12.40	17.60	22.20
Dredge Diversity	1.34	1.53	1.91	2.28	2.56	2.90	3.15	3.59	4.01	4.53	4.98
Dredge Taxa Richness	4.00	6.00	9.00	11.00	15.00	18.50	25.00	35.00	41.00	62.00	90.00
TKN	0.26	0.34	0.42	0.50	0.59	0.69	0.76	0.82	0.95	1.30	1.49
NH3+NH4	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.09	0.13	0.22	0.28
NO2-NO3	0.00	0.00	0.01	0.01	0.01	0.02	0.03	0.05	0.08	0.17	0.23
Total Phosphorus	0.01	0.02	0.06	0.07	0.10	0.11	0.14	0.17	0.23	0.43	0.59
Ortho-Phosphorus	0.01	0.02	0.03	0.04	0.04	0.05	0.07	0.09	0.12	0.21	0.44
Turbidity	3.50	4.00	4.50	5.05	5.40	5.60	6.30	6.80	8.00	11.40	11.75

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

Periphyton taxa list for Adams Packing, collected via glass microscope slides in Lake Lena Run, on 11 January, 1993. Densities are in number/mm^2.

	Reference site	Test site
Diatoms		
Achnanthes clevei	–	3
A. exigua	59	231
A. hungarica	3	3
A. hustedtii	–	3
A. lanceolata v. *apiculata*	3	–
Capartogramma crucicula	7	9
Cocconeis placentula	7	3
Cyclotella sp.	–	6
Eunotia curvata	3	3
E. pectinalis	7	19
Fragilaria sp.	–	9
F. leptostauron	10	–
Gomphonema gracile	–	3
G. parvulum	3	168
G. subclavatum	–	3
Navicula confervacea	3	3
N. elginensis	–	3
N. falaisensis v. *lanceolata*	3	–
N. festiva	3	–
N. gibbosa	–	3
N. minima	10	59
N. pupula	3	–
N. radiosa	3	–
N. viridula	3	22
Nitzschia amphibia	3	6
N. palea	3	69
Pinnularia maior	3	–
Chlorophyta		
Characium sp.	–	6
Golenkinia sp.	–	3
Scenedesmus sp.	46	3
Stigeocolonium sp.	3	115
Cyanophyta		
Anabaena sp.	–	69
Aphanocapsa sp.	–	22
Aphanothece sp.	–	62
Chroococcus sp.	–	16
Dactylococcopsis sp.	–	97
Gloeocapsa sp.	–	6
Gloeothece sp.	–	41
Lyngbya sp.	10	–
Merismopedia sp.	3	–
Phormidium sp.	–	3
Plectonema sp.	–	9

Phytoplankton taxa list for Adams Packing, collected via subsurface grabs in Lake Lena Run, on 11 January, 1993. Densities are in number/mL.

	Reference Site	Test Site
Diatoms		
Achnanthes sp.	101	130
Cyclotella sp.	25	–
Melosira sp.	25	–
Nitzschia sp.	25	–
Chlorophyta		
Actinastrum sp.	–	130
Ankistrodesmus sp.	–	521
Chlamydomonas sp.	–	130
Oocystis sp.	–	130
Scenedesmus sp.	404	781
Unknown chlorophyte flagellate	25	651
Cyanophyta		
Anabaena sp.	–	260
Aphanothece sp.	–	23,695
Chroococcus sp.	101	911
Dactylococcopsis sp.	–	6,900
Oscillatoria sp.	51	5,468
Euglenophyta		
Phacus sp.	–	130
Trachelomonas sp.	–	130

Taxa list for Adams Packing Association, collected via 20 dip net sweeps in Lake Lena Run, above and below the discharge, on 11 January 1993.

	Reference Site	Test Site
Coleoptera		
Hygrobates sp.	12	5
Berosus sp.	–	3
Berosus striatus	–	1
Dineutus carolinus	–	1
Dineutus serrulatus serrulatus	2	–
Dineutus sp.	57	8
Hydrobiomorpha casta	–	1
Undetermined coleopteran sp.	1	–
Suphisellus sp.	2	–
Tropisternus blatchleyi	–	1
Collembola		
Isotomurus palustris	1	1
Diptera		
Ablabesmyia rhamphe grp.	28	–
Asheum beckae	28	83
Atrichopogon sp.	1	–
Chironomus sp.	84	6142
Corynoneura sp.	28	–
Goeldichironomus holoprasinus	–	1826
Odontomyia sp.	4	1
Palpomyia grp. sp.	7	5
Parachironomus carinatus	–	83
Pentaneura inconspicua	588	–
Polypedilum convictum grp.	2996	1494
Polypedilum illinoense	28	–
Polypedilum scalaenum grp.	224	166
Polypedilum tritum	168	83
Undetermined dipteran pupae	138	169
Rheotanytarsus distinctissimus grp.	28	–
Rheotanytarsus exiguus grp.	224	–
Tipula sp.	–	
Ephemeroptera		
Caenis sp.	32	8
Gastropoda		
Hebetancyclus excentricus	60	30
Melanoides sp.	217	290
Micromenetus dilatus	6	–
Physella sp.	2	–
Planorbella duryi	17	9
Pseudosuccinea sp.	5	–
Hemiptera		
Belostoma sp.	–	2
Hebrus sp.	1	–
Undetermined Hemiptera sp.	12	–
Hirudinea		

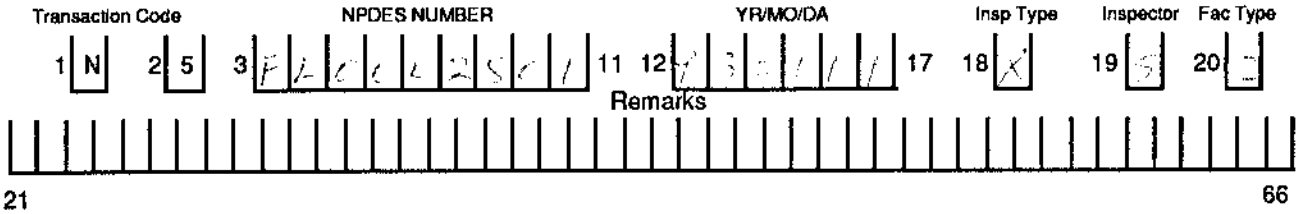
Batracobdella phalera	1	2
Helobdella fusca	1	–
Helobdella stagnalis	1	3
Mooreobdella sp.	–	1
Lepidoptera		
Undetermined Pyralidae sp.	31	3
Undetermined lepidopteran	1	–
Malacostraca		
Hyalella azteca	635	197
Palaemonetes paludosus	–	1
Procambarus alleni	–	3
Procambarus fallax	1	2
Procambarus sp.	–	4
Odonata		
Enallagma cardenium	32	14
Ischnura sp.	1	–
Oligochaeta		
Allonais inaequalis	428	88
Dero furcata	–	7
Undetermined Enchytraeidae	3	–
Limnodrilus hoffmeisteri	81	156
Lumbriculus variegatus	11	–
Nais communis	3	7
Undeter. tubificid w/o capilliform setae	–	14
Pelecypoda		
Corbicula manilensis	21	7
Platyhelminthes		
Dugesia sp.	–	1
Rhynchocoela		
Prostoma rubra	4	–
Trichoptera		
Cheumatopsyche sp.	1	32
Oxyethira sp.	3	1
Undetermined trichopteran pupa	1	–

Benthic macroinvertebrate taxa list for Adams Packing Association, collected via Hester-Dendy artificial substrates in Lake Lena Run, on 11 January, 1993. Densities are in number/m^2.

	Reference Site	Test Site
Acarina		
Hygrobates sp.	–	2
Coleoptera		
Dineutus sp.	4	13
Diptera		
Ablabesmyia mallochi	26	–
A. rhamphe grp.	6	12
Asheum beckae	–	12
Chironomus sp.	4	3722
Corynoneura sp.	7	–
Goeldichironomus holoprasinus	–	553
G. natans ?	–	37
Kiefferulus sp.	7	–
Palpomyia grp. sp.	2	–
Pentaneura inconspicua	174	241
Polypedilum convictum grp.	1264	2470
P. halterale grp.	–	19
P. scalaenum grp.	420	314
Rheotanytarsus distinctissimus grp.	7	–
R. exiguus grp.	13	–
Thienemanniella sp.	–	25
Undetermined dipteran pupae	30	323
Undetermined tanypod	6	–
Ephemeroptera		
Baetis intercalaris	1	–
Caenis sp.	–	3
Stenacron interpunctatum	1	–
Gastropoda		
Hebetancyclus excentricus	40	47
Melanoides sp.	14	48
Physella sp.	2	1
Planorbella duryi	16	7
Undetermined Ancylidae	–	16
Hirudinea		
Batracobdella phalera	–	1
Helobdella stagnalis	7	1
Malacostraca		
Hyalella azteca	96	269
Oligochaeta		
Nais communis	3	3
Pelecypoda		
Sphaerium or *Musculium* sp.	1	–

Trichoptera		
Cheumatopsyche sp.	1	277
Undetermined trichopteran pupa	–	1

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



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

