

Biological Assessment of

Anheuser Busch Inc., New Sod Farm

Duval County

NPDES #FL0041556

Sampled May and June 1992

September 1992

Biology Section
Division of Technical Services

Department of Environmental Regulation

Results of Fifth Year Inspections

Discharger: Anheuser Busch New Sod Farm
County: Duval
NPDES Number: FL0041556
State Permit Expiration Date: May 1993

Toxics Sampling Inspection (XSI)

Date Sampled: 6 May 1992

Results: The composite effluent sample from the Anheuser Bush New Sod Farm holding ponds contained silver (0.79 µg/L), iron (940 µg/L) and copper (17 µg/L). The silver and copper concentrations were higher than Class III standards, which may result in a violation during a discharge event from the ponds. No organic constituents were found in the sample within detection limits.

Compliance Biomonitoring Inspection (CBI)

Date Sampled: 6 May 1992

Results: The composite sample from the holding ponds was not toxic to the fish, *Notropis leedsi*, or to the cladoceran, *Ceriodaphnia dubia*.

Impact Bioassessment Inspection (IBI)

Date Sampled: 6 May 1992

Results: Macroinvertebrate communities were not adversely affected by the intermittent sod farm discharge. However, low Florida Index values at both sites suggested stress, probably due to the depressed dissolved oxygen levels in the stream. Periphyton communities in Thomas Creek below the sod farm were depauperate. Light limitation is the most probable cause for this reduction in periphyton biomass at the test site. Due to the elevated nutrients and AGP in Thomas Creek, undesirable algal or macrophyte growth is a potential problem farther downstream, where the tree canopy may become more open.

Water Quality Inspection (WQI)

Date Sampled: 6 May 1992

Results: Moderate nutrient enrichment was observed throughout Thomas Creek. The increases in ammonia and nitrate-nitrite at the test site may possibly be related to a known slaughterhouse/STP discharge located within two miles below the Busch facility, or from residential stormwater run-off near Lem Turner Road. Flow reversals (tidally induced) are common in this portion of Thomas Creek. Algal growth potential results indicated that water at both the reference and test sites were above the "eutrophication threshold" of 5 mg dry weight/L. Dissolved oxygen depletion was found both upstream and downstream of the facility. Total coliform bacteria exceeded Class III standards at the reference site and in the holding ponds, but were within standards at the test site.

These fifth year inspections provide the necessary information to evaluate the facility's impact on its receiving waters and to provide the basis for specific condition recommendations for permit renewal.

Introduction

The Anheuser-Busch New Sod Farm is located in Duval County on Lem Turner Road (see maps in Appendix). The farm was established to treat 1.7 MGD of residual brewery liquor via assimilation by the growing sod. The brewery effluent is sprayed directly onto 750 acres of turf. Five holding ponds are designed to collect leachate and stormwater run-off from the sod farm. The ponds discharge to surrounding wetlands only on an intermittent basis. These wetlands are part of the floodplain of Thomas Creek, a Class III waterway.

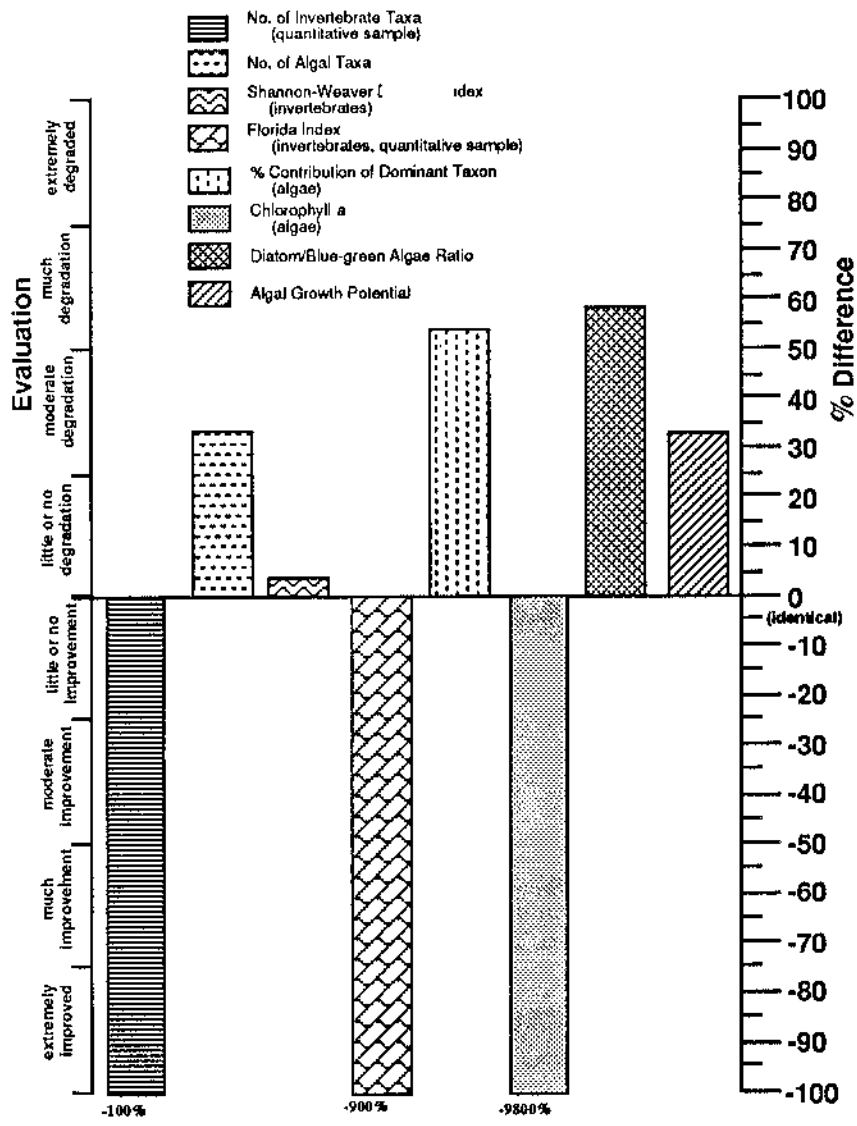
The Anheuser-Busch facility has exceeded permit limitations for unionized ammonia on 32 occasions. Dissolved oxygen concentrations in some of the ponds have also been below the minimum allowed. Nitrate levels were in violation of permit limitations in monitoring well #5 from October, 1990, through February, 1991. Populations of nuisance flies, which breed in the hydric soils and decaying vegetation of the sod farm, are sometimes abundant. On July 12, 1991, the dike around Tank 2 failed, releasing approximately 350,000 gallons of wastewater and rainwater to the wetlands between the farm and Pond #3.

Anheuser-Busch is currently addressing past problems, including developing alternatives or additions to the present treatment system which would optimize hydraulic and organic loadings. Flow meters have been installed at each of the outfalls.

Modifications to the present permit include the implementation of anaerobic digestion of effluent (brewery residual) prior to land application. Acute bioassays will also be required in the new permit.

Major characteristics of community structure of control and test sites.

	Reference Site	Test Site
Macroinvertebrate Qualitative		
Number of Taxa	26	28
Florida Index	2	1
% Contribution of Dominant Taxon	18.8	41.5
%Diptera	18.8	77.5
%Malacostraca	37.6	6.3
% Odonata	14.1	0
% Pelecypoda	4.7	0.7
% Coleoptera	5.9	6.3
% Gastropoda	9.4	5.6
% Other	9.4	3.5
% Predators	26.3	6.8
% Collector-Gatherers	43.3	48.4
% Collector-Filterers	6.4	18.6
% Scrapers	9.4	22.5
% Shredders	11.0	3.4
% Parasites	3.5	0
Macroinvertebrate Hester-Dendy		
Number of Taxa	17	34
Florida Index	1	10
Shannon-Weaver Diversity	3.2	3.1
% Diptera	28.3	67.0
%Malacostraca	34.3	12.4
% Gastropoda	22.2	12.3
% Odonata	0	4.3
% Ephemeroptera	0	3.3
%Oligochaeta	14.1	0.5
% Other	1.0	0.2
% Predators	0.9	6.4
% Collector-Gatherers	65.1	53.9
% Collector-Filterers	6.2	22.9
% Scrapers	22.8	14.7
% Shredders	5.0	2.1
% Parasites	0.5	0.06
Periphyton Algae		
Number of Taxa	30	16
% Contribution of Dominant Taxon	27.7	42.9
Chlorophyll a (mg/sq. m)	30.27	0.63
Diatom/Diatom + B-G Abundance Ratio	0.95	0.4
% Blue-green	4.3	59.7
% Green	4.6	0
% Diatoms	89.6	40.3
% Other	1.5	0
Algal Growth Potential (mg dry wt/l)	9.6	12.8



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

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 Thomas Creek at US Highway 1 in Duval County) and a test site (also in Thomas Creek, about 500 m downstream of outfall #1) (see map in Appendix). A habitat assessment was performed *in situ* to establish comparability between sites. Since there was no discharge during this study, what is referred to as "effluent" in this report is actually a composite sample of the five holding ponds. Supplemental physical/chemical data were collected on this composite sample, and on the study sites. Acute screening toxicity bioassays, using Ceriodaphnia dubia and *Notropis leedsi* as test organisms, were performed on the composite sample (Weber 1991). The effluent was analyzed for metals and for organic constituents (base neutral and acid extractables, and pesticide extractables). Additionally, nutrient analyses were performed on effluent, reference, and test sites. Methods used for all chemical analyses are on file at the Tallahassee 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). 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. 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: Scott Bulgrin, district biologist (DER Northeast district) and Lyn Burton, Marshall Faircloth, Russel Frydenborg, Kathleen Lurding, Sandy McClure, and Kim Pearce (Tallahassee Biology Laboratory).

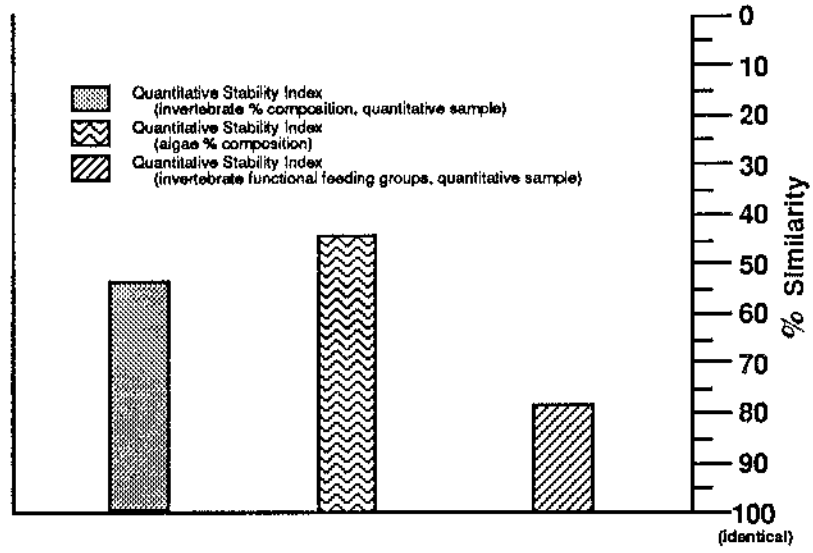
Results and Discussion

The portion of Thomas Creek studied during this investigation is a heavily vegetated, tannic, blackwater stream, located in a predominantly forested area. Potential non-point sources of pollution surrounding Thomas Creek include run-off from agricultural and residential lands and highways. Aquatic macrophytes, including *Nuphar*, *Lemna*, *Hydrocotyl*, and *Pontederia* were abundant in the stream, especially at the reference site.

The dissolved oxygen concentration was depressed at both sampling sites (2.1 upstream and 3.4 downstream). This is in violation of 17-302.560(21) FAC. The reference site was open to sunlight and characterized by low water velocity (less than 0.1 m/sec). The test site was mostly shaded (approximately 80% canopy cover), with higher water velocity (0.1 to 0.3 m/sec), and fewer aquatic macrophytes. The pH was typical of blackwater streams at both sampling locations (5.3 upstream, 5.5 downstream).

Habitat quality was slightly better at the downstream site (with 80 points) than at the upstream site (with 76 points). Both sites contained good to excellent habitat for benthic organisms. No evidence of sediment oils or odors was present.

The composite effluent sample (taken at each of the five holding ponds) was not toxic to the fish, *Notropis leedsi*, or to the water flea, *Ceriodaphnia dubia*. No organic constituents were found in the sample within detection limits. The composite effluent sample contained silver (0.79 µg/L), aluminum (372 µg/L), iron (940 µg/L), and copper (17 µg/L). The silver and copper concentrations were higher than Class III standards,



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

which may result in a violation during a discharge event from the ponds.

Moderate nutrient enrichment was evident throughout the study area. Ortho-phosphorus values were 1.1 mg/L, 0.19 mg/L, 0.22 mg/L in the composite sample, upstream sample, and the downstream sample, respectively. These ortho-phosphorus concentrations at the reference and test sites were higher than 72% and 75% of other ambient Florida streams, respectively. Total phosphorus values were also somewhat elevated (0.19 mg/L at the reference site and 0.24 mg/L at the test site). Ammonia concentrations in Thomas Creek were doubled downstream of the Anheuser Busch farm (from 0.15 mg/L to 0.3 mg/L). Ammonia at the test site was higher than 88% of other Florida streams. Nitrate-nitrite levels increased from 0.074 mg/L at the reference site to 0.14 mg/L below the sod farm. These increases in ammonia and nitrate-nitrite may possibly be related to a known slaughter house/STP discharge located within two miles below the Busch facility, or to residential stormwater run-off near Lem Turner Road. Flow reversals (tidally induced) are common in this portion of Thomas Creek (Wayne Magley, DER, personal communication). TKN levels in Thomas Creek were relatively unchanged downstream of the sod farm operations.

Algal growth potential was increased from 9.6 mg dry wt/L at the upstream site to 12.8 mg dry wt/L below the sod farm. AGP values above 5 mg dry wt/L are often associated with excessive macrophyte growth, algal blooms, lowered D.O., and fish kills (Raschke and Schultz 1987).

Total coliform bacteria counts were above Class III standards in the composite effluent sample (5000 organisms/100 mL) and at the reference site (3000 organisms/100 mL), but were within limits at the test site. Fecal coliforms were all within Class III standards in all samples.

Measures of macroinvertebrate health indicated that the discharge was not adversely affecting the community. However, low Florida Index values at both sites suggested stress, probably due to the depressed dissolved oxygen levels in the stream. 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. Negative values mean that the test site is better than the control. The figure on p. 3 summarizes similarities between the sites. Smaller similarities (lower percentages) generally correspond with greater degradation.

In the Hester-Dendy samples, the test site scored considerably better than the reference site with respect to taxa richness and the Florida Index. Diversity was similar, and acceptable, at both sites. In the discrete dip net samples, macroinvertebrate indices at the reference site were the same as, or slightly higher than, the test site. Some differences in community composition between the two sites could be explained by the amount of sunlight reaching the stations and/or water velocity. For example, malacostracans (*Hyalella azteca, Asellus* sp.) were more abundant at the reference site in dip net samples. These organisms are generally more often found in sunny, lentic situations rather than in shady, fast flowing areas. In any case, the benthic data do not indicate any problems associated with the sod farm.

The rather substantial changes in the attached algal community observed between the reference and test sites may also be related to differences in solar energy reaching the stream at these two locations. Periphyton at the Thomas Creek test site was characterized by a 47% reduction in taxa richness, a 55% increase in the contribution of the dominant taxon, and a 9800% decrease in chlorophyll *a*, compared to the reference site. The tremendous decrease in algal biomass at the test site, despite the presence of elevated nutrients, suggests that populations there were limited by insufficient sunlight, sporadic inputs of materials inhibitory to algae, or macroinvertebrate grazing. The AGP result from the test site indicated that inhibitory substances were not present during the sampling. Scraper macroinvertebrates were represented at the test site, but they were not more abundant there than at the reference site, where a fairly normal algal population was found. Light limitation is the most probable cause for the reduction in periphyton at the test site. Due to the elevated nutrients and AGP, undesirable algal growth is a potential problem farther downstream, where the tree canopy may become more open.

Conclusions

The composite sample from the Anheuser Bush New Sod Farm holding ponds was not toxic to the fish, Notropis leeds*i*, or to the cladoceran, *Ceriodaphnia dubia*. No organic constituents were found in the sample within detection limits. The composite effluent sample contained silver (0.79 µg/L), iron (940 µg/L), and copper (17 µg/L). The silver and copper

concentrations were higher than Class III standards, which may result in a violation during a discharge event from the ponds.

While moderate phosphorus enrichment was observed throughout Thomas Creek, certain nitrogen species were higher below the sod farm. These increases in ammonia and nitrate-nitrite may possibly be related to a known slaughter house/STP discharge located within two miles below the Busch facility, or to residential stormwater run-off near Lem Turner Road. Flow reversals (tidally induced) are common in this portion of Thomas Creek (Wayne Magley, DER, personal communication). Algal growth potential results indicated that water at both the reference and test sites was above the "eutrophication threshold" of 5 mg dry weight/L. Dissolved oxygen depletion was found both upstream and downstream of the facility. Total coliform bacteria exceeded Class III standards at the reference site and in the holding ponds, but were within standards at the test site.

Macroinvertebrate communities were not adversely affected by the sod farm discharge, although certain indices of community health were lower than expected at both sites, probably due to the depressed dissolved oxygen in the stream.. Periphyton communities below the sod farm were depauperate. Light limitation is the most probable cause for this reduction in periphyton biomass at the test site. Due to the elevated nutrients and AGP (attributed only in part to the discharger), undesirable algal or macrophyte growth is a potential problem farther downstream, where the tree canopy becomes more open.

Literature Cited

American Public Health Assoc., American Water Works Assoc., and Water Pollution Control Federation. 1989. Standard Methods for the Examination of Water and Wastewater, 17th ed. New York, N.Y. 1268 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.

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.

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.

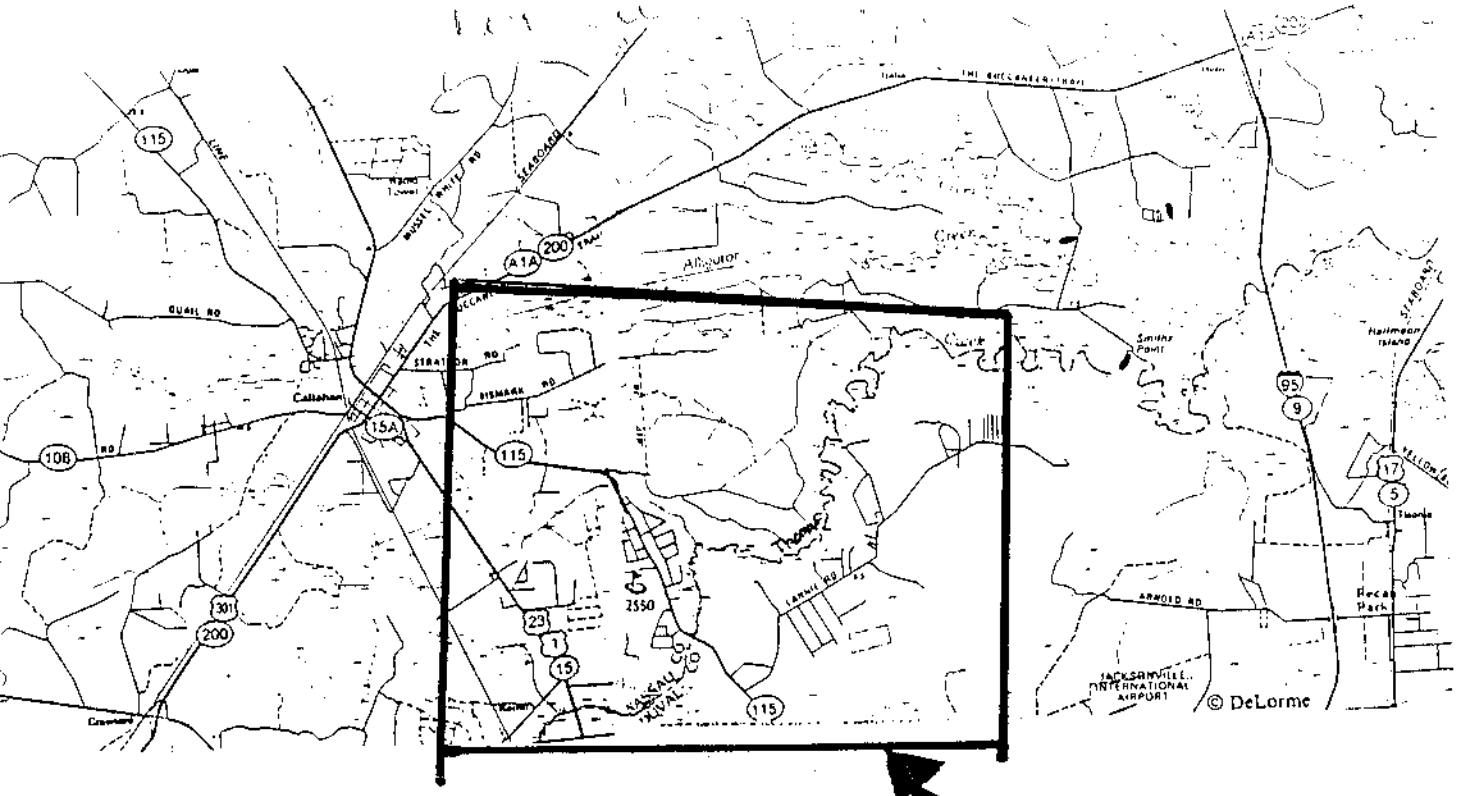
Chemistry summary table for Anheuser Busch New Sod Farm

	Effluent Composite	Reference Site	Test Site
Organic Constituents (ug/L)			
NONE DETECTED			
Metals (ug/L)			
Aluminum	372A		
Arsenic	20U		
Cadmium	.07U		
Copper	17		
Chromium	10U		
Iron	940A		
Lead	15U		
Mercury	0.1U		
Nickel	6T		
Silver	.79A		
Zinc	7T		
Nutrients (mg/L)			
Ortho-phosphorus	1.1A	0.19A	0.22A
Total phosphorus	1.2	0.19	0.24
Ammonia	.081A	0.15A	.30A
Nitrate+Nitrite	.084A	.074A	0.14A
TKN	2.3	1.2	1.3
Other Parameters			
Habitat Assessment		76	80
D.O. (mg/L)		2.1	3.4
pH (SU's)		5.3	5.5
Conductivity (µmhos/cm)		105	93
Temperature (°C)		22.7	21.0
Bioassay Fish-Dechlorinated	Not toxic		
Bioassay Invertebrate-Dechlorinated	Not toxic		
Fecal coliform (org/100 ml)	20	130	220
Total coliform (org/100 ml)	5000	3000	800

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



General Area Map of Anheuser Busch - New SOD FARM
Fifth Year Study

Map of Anheuser Busch Nelle

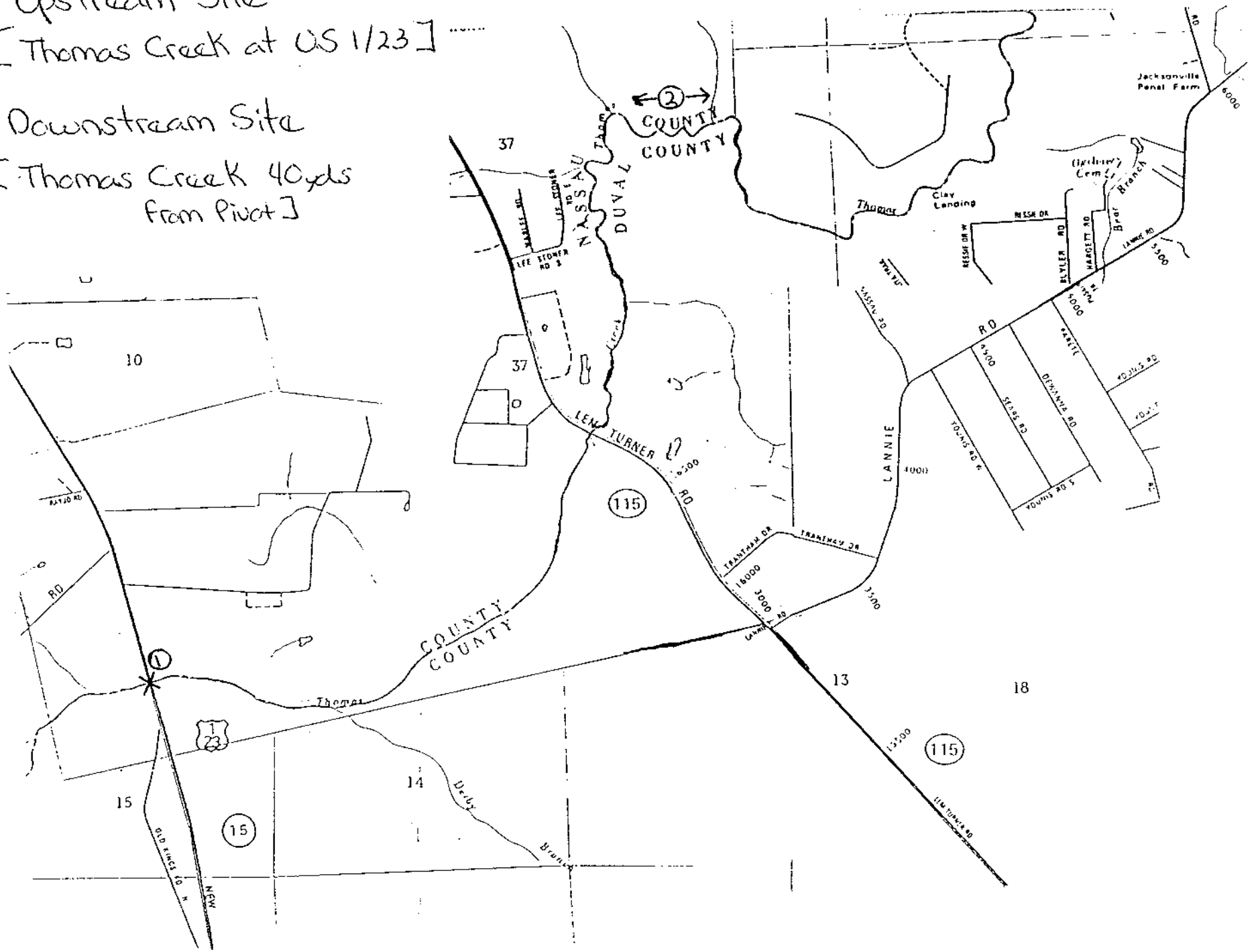
SOD FARM FIFth. Year Study

① Upstream Site

[Thomas Creek at US 1/23] ……

② Downstream Site

[Thomas Creek 40yds from Pivot]



STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

Facility Name: [illegible]	**Prepared by:** SCOTT BULGRIN **Date:** 05/14/92	
Location (attach detailed map): Lem Turner Road at Duval County Line	**County** DUVAL	**District** [illegible]
Federal Permit # FL0041556 **and expiration date:** Revised Draft issued Jan 25, 1990	**State GMS # and State expiration date:** [illegible]	**Facility Type:** Industrial Municipal Federal Agricultural **Other (list):**

Function of facility: Turf Growing (SOD) FARM

Description of treatment process: For the operation of a 1.7 MGD Land application System for the spray application of a residual brewery liquor as a nutrient material for growing turf.

with the permit modification, the treated brewery process effluent will be land applied on 750 acres on a 1,650 acre-section of land to act as a nutrient material for growing turf.

Receiving waters: wetlands which flow into Thomas Creek	**Classification:** Class III
Design Flow: 1.7 MGD	**Actual Mean Flow:** VARIED 1.0MGD - 1.6 MGD

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

therefore, the best time to sample is: whenever ponds are full.

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

No Mixing Zone for this Facility

List effluent limits:

Parameter	Limit (units)
1. Figure 1 NPDES 2. Figure 2, 3, 4	Effluent Limitations STATE Effluent Limitations

See Attached Sheets

Describe special permit conditions and permit modifications:

Permit modification of the current land application system that currently receives untreated brewery process effluents, to begin land application of treated brewery process effluent from an anaerobic digester treatment system. Acute Bicassay also included in modification.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

Anheuser-Busch New SOD FARM **FACILITY SUMMARY**
(Facility)

Description of permitted outfall(s): The permittee is able to discharge from the 5 ponds on the Farm, outfalls CO1, CO2, CO3, CO4, CO5 Stormwater runoff, groundwater to irrigation Field. Water flows through wetlands to Thomas Creek.

List permit violations (from MOR data or other source) and plant upsets that occurred within past year: A warning notice No. WN 91-0021-IW16-NED was issued for nitrate levels for monitoring well #5 which were in permit violation from October 1990 to February 1991. On July 12, 1991 an incident occurred which caused brewery effluent from Tank 2 to be discharged which was not in accordance with the permit. The Dike around Tank 2 at Lem Turner Failed, releasing approximately 350,000 gallons of wastewater and rainwater to the wetlands between the farm and Pond 3. Some levels of un-ionized ammonia above the Permit limit of 0.02 mg/l.

Describe previous impact bioassessments, WQBEL's, and previous or current enforcement actions: A macroinvertebrate/biological investigation of Thomas Creek is currently being done by the University of Florida Professor hired by Anheuser-Busch in response to negotiations from FL D.E.R. to see how the creek is concerning un-ionized ammonia (which the Sod Farm (New) has had some problems with. A Consent order OGC File No. 90-1157 was also issued and is currently being worked on. Hopefully with the consent order and work by Anheuser Busch the water quality of the 5 ponds can be improved.

Discuss comparability of MOR results to past DER results and whether there are trends (improving, declining) in the data set: Although 32 of the 128 readings of un-ionized ammonia exceeded the permit limit, Anheuser-Busch has been trying to correct the problems by planting vegetation. Improvements in the discharge quality should be occurring. pH and dissolved oxygen have also had some problems at various ponds. Dissolved oxygen values have been low (below minimum) and corrective action has been tried by Anheuser-Busch.

Additional information: The New SOD FARM has had previous problems with moth fly populations so an action plan was developed in order to establish a means of identifying possible alternate treatment scenarios for the brewery process effluent with the goal of optimizing the hydraulic and organic loadings at the New SOD Farm. Flow meters have been installed at all the outfalls. On August 12, 1991 EPA conducted a compliance inspection. The planting of aquatic vegetation has also been implemented to keep algae populations down. CSI inspection by EPA stated that the "ponds at the Lem Turner facility appeared well maintained with some solids carry-over at outfall CO2.

Figure 1. NPDES Effluent Limitations

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - Final

1. During the period beginning on the effective date and lasting through the expiration date of this permit, the permittee is authorized to discharge from outfall(s) 001, 002, 003, 004, 005, stormwater runoff, groundwater to irrigation field.

   Such discharges shall be limited and monitored by the permittee as specified below:

PARAMETERS	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS	
	Annual Average	Maximum	Measurement Frequency	Sample Type
Flow, MGD	Report	--	1/per discharge*	Instantaneous
Biochemical Oxygen Demand (5 Day), mg/l	20.0	--	1/per discharge*	Grab
Total Suspended Solids, mg/l	20.0	--	1/per discharge*	Grab
Ammonia (unionized), mg/l	See page I-2, item 9		1/per discharge*	Grab
Total Kjeldahl Nitrogen, mg/l	Report	--	1/per discharge*	Grab
Total Organic Carbon, mg/l	Report	--	1/per discharge*	Grab
Total Nitrate as N, mg/l	Report	--	1/per discharge*	Grab
Dissolved Oxygen shall not be less than 5.0 mg/l			1/per discharge*	Grab
pH shall not be less than 6.0 nor greater than 8.5 standard units			1/per discharge*	Grab

*See page I-2, item 6

Figure 2. State Effluent Limitations

PERMITTEE:

Anheuser-Busch, Incorporated

I.D. Number: 3116P00505
Permit Number: IO16-148814
Date of Issue: August 12, 1988
Expiration Date: May 15, 1993
Modification Date: January 24, 1992

7. The monitoring requirements for the stormwater outfalls and effluent limitations are as follows:

PARAMETERS	EFFLUENT SAMPLING LOCATION NOTE 1	DISCHARGE LIMITATIONS Min. NOTE 2	Max. NOTE 2	Annual Average NOTE 2	MEASURE FREQUENCY	SAMPLE METHOD/ TYPE
DO (mg/L)	Outfalls 1 thru 5	5.0	---	-----	Once/week	Grab
Ammonia as N (unionized) (mg/L)	Outfalls 1 thru 5	--	0.02	-----	Once/week	Grab
pH (units)	Outfalls 1 thru 5	6.0	8.5	-----	Once/week	Grab
BOD_5 (mg/L)	Outfalls 1 thru 5	--	---	20.0	Once/week	Grab
TSS (mg/L)	Outfalls 1 thru 5	--	---	20.0	Once/week	Grab
TKN (mg/L)	Outfalls 1 thru 5	--	---	10.0	Once/week	Grab
TOC (mg/L)	Outfalls 1 thru 5	--	---	-----	Once/week	Grab
Flow (MGD)	Outfalls 1 thru 5	--	---	-----	Once/week	Flow Meter
Total Nitrogen (as N) (mg/L)	Outfalls 1 thru 5	See 17-302.510(3)(j) and 17-302.560(19)			Once/week	Grab
Nitrate as N (mg/L)	Outfalls 1 thru 5	--	---	-----	Once/week	Grab
Acute Toxicity	NOTE (3)	--	See Specific Condition No. 10		See Specific Condition No. 10	
Precipitation (inches/day)	Plant Site	--	---	-----	Daily	Rain Gauge

NOTE (1) Stormwater Outfalls 1 through 5 are shown on Figure 1, Exhibit I.

NOTE (2) Average, minimum and maximum values for the above parameters must be submitted as required on the attached MOR forms that are to be submitted monthly.

NOTE (3) A grab sample shall be taken at each stormwater Outfall 1 through 5 and composited for the acute toxicity monitoring requirement.

NOTE (4) Annual average limits shall be a running 12-month arithmetic mean.

Fig. 3 State Effluent Limitations

PERMITTEE:

Anheuser-Busch, Incorporated

I.D. Number: 3116P00505
Permit Number: I016-148814
Date of Issue: August 12, 1988
Expiration Date: May 15, 1993
Modification Date: January 17, 1992

8. The surface water monitoring requirements in Thomas Creek for this facility are as follows:

PARAMETERS	EFFLUENT SAMPLING LOCATION Note (1)	MONITORING REQUIREMENTS Min.	Max.	Annual Average	MEASURE FREQUENCY	SAMPLE METHOD/ TYPE
DO (mg/L)	Thomas Creek	5.0	---	----	Monthly	Grab
Ammonia as N (unionized) (mg/L)	Thomas Creek	--	0.02	----	Monthly	Grab
pH (std. units)	Thomas Creek	6.0	8.5	----	Monthly	Grab
Total Nitrogen (mg/L)	Thomas Creek	--	---	----	Monthly	Grab
Total Phosphorus (mg/L)	Thomas Creek	--	---	----	Monthly	Grab
Specific Conductivity (umhos/cm)	Thomas Creek	--	---	----	Monthly	Grab
NO_2/NO_3 as N (mg/L)	Thomas Creek	--	---	----	Quarterly	Grab
BOD_5 (mg/L)	Thomas Creek	--	---	----	Quarterly	Grab
TKN (mg/L)	Thomas Creek	--	---	----	Quarterly	Grab
TOC (mg/L)	Thomas Creek	--	---	----	Quarterly	Grab

NOTE (1) Surface water samples in Thomas Creek shall be collected at mid-stream below the stream surfaced at the following locations shown in Exhibit II.

Upstream: Located on Thomas Creek at U.S. 1

Intermediate: Located on Thomas Creek at Lem Turner Road

Down Stream: Located on Thomas Creek north of Pivot 1-2.

Fig. 4 State Effluent Limitations

PERMITTEE:

Anheuser-Busch, Incorporated

I.D. Number: I16P00505
Permit Number: I016-148814
Date of Issue: August 12, 1988
Expiration Date: May 15, 1993
Modification Date: January 24, 1992

9. The Permittee shall sample and analyze the Brewery Liquid Nutrient (LN) at the location(s) listed below - for the following parameters:

PARAMETERS	WASTEWATER SAMPLING LOCATION NOTE (1)	MEASURE FREQUENCY	SAMPLE/METHOD TYPE
Flow (MGD) NOTE (2)	LN	Daily	Recording Flow Meter
pH (std units)	LN	At beginning and end of Land Application	Grab
TDS (mg/L)	LN	Quarterly	Grab
Total Nitrogen as N (mg/L)	LN	Quarterly	Grab
BOD_5 (mg/L)	LN	Quarterly	Grab
TKN (mg/L)	LN	Quarterly	Grab
TSS (mg/L)	LN	Quarterly	Grab
COD (mg/L))	LN	Quarterly	Grab
Total Phosphorus (mg/L)	LN	Quarterly	Grab
Nitrate as N (mg/L)	LN	Quarterly	Grab
pH (std units)	Soil All pivots NOTE (3)	Semi-annual during 1st & 3rd Calendar Quarters (NOTE (4)	NOTE (3)

NOTE (1) Sample location for the residual brewery liquor or liquid nutrient (LN) shall be at a point immediately prior to land application and be representative of the LN applied to all pivots.

NOTE (2) The residual brewery liquor or liquid nutrient (LN) flow limit is based on the daily peaking factor of 1.6 times the annual average flow of 1.7 MGD, i.e., 1.6 x 1.7 MGD = 2.72 MGD. The Permittee shall notify the Department and the Jacksonville Water Quality Division on any day that the application rate for residual brewery liquor or liquid nutrient (LN) is to exceed 2.72 MGD.

NOTE (3) Reports containing results of soil analysis include details of collection procedure. Soil samples will be collected in the following method:
(1) Soil samples for pH will be taken within the top six inches.
(2) Each pivot shall be divided into four quarters.
(3) Soil shall be collected for each quarter of each pivot and combined to form the analysis sample for the pivot.
(4) A total of fourteen of these samples shall be collected semi-annually (see table above), i.e., one composite per pivot per six months.
(5) Arithmetic mean for pH shall be > 4.4 standard units.

NOTE (4) pH limit for soil is based on natural soil pH.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 3)

SUBMITTING AGENCY CODE: 8031 / SUBMITTING AGENCY NAME: FL DER Northeast District	STORET STATION NUMBER:	DATE (M/DY): 05/06/92	TIME: 1250	RECEIVING BODY OF WATER: Thomas Creek into the Nassau River

REMARKS: Area used for recreation some trash in area and in water. Excessive Aquatic vegetation.	LOCATION: Thomas Creek at U.S. 1 WQI	FIELD ID/NAME: (UPSTREAM SITE)

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify) U.S. Highway
80						20

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

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

↳ RESIDENTIAL RUNOFF, Highway Runoff

Point-Source Pollution (list location and describe): NONE

Estimated System Width (range, m): 26-31	Estimated System Depth (range, m): 0.6-2	Impounded ☐ yes ☐ NO
High Water Mark (m above bed): 0.6	Velocity (range, m/s):	Channelized ☐ NO

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

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	15	4	DIP NET	Rock or Shell Rubble			
Leaf Packs	5	1	DIP NET	Sand	5	1	DIP NET
Aquatic Vegetation	30	6	DIP NET	Mud/Muck	20	1	DIP NET
Submerged Roots	15	3	DIP NET	Other:			
Undercut Banks	10	4	DIP NET	Other:			

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):	pH (SU):	Cond. (umho/cm):				Secchi (m):
Top	22.2	2.14	5.30	106				0.4
Mid-depth	22.7	2.14	5.26	105				
Bottom	21.9	2.14	5.26	105				

System Type : Stream: ☒ (Surficial Aquifer Fed / Deep Aquifer Fed) (Alluvial / Blackwater) Lake: ☐ Wetland: ☐ Estuary: ☐ Other: ☐

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

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

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

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

Weather Conditions: Sunny warm, mid 80's.

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

ANALYSIS DATE:	ANALYST:	SIGNATURE:
05/06/92	SCOTT BULGRIN	Scott Bulgrin

NUPHAR Duckweed Pickerelweed,

Bass, Sunfish, Bowfin, Gambusia, Pickerel

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

SUBMITTING AGENCY CODE: 8031 / SUBMITTING AGENCY NAME: FL DER Northeast DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 05/06/92	RECEIVING BODY OF WATER: Thomas Creek into the Ortega River

REMARKS: Area used for Recreation. Some trash in area and in water.	LOCATION: Thomas Creek at U.S.1 WQI	FIELD ID/NAME: (UPSTREAM SITE)

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 14	Max. observed: >0.3 m/sec. but < 1 m/sec **23-30 points**	Max. observed; 0.1 to 0.3 m/sec **16-22 points**	Max. observed; 0.05 to 0.1 m/sec **8-15 points**	Max. observed; <0.05 m/sec, or spate occurring; > 2 m/sec **0-7 points**
Artificial Channel/ Flow Alteration 15	No artificial channelization. Little activity (impervious surface) in watershed which would cause scouring during spates. **12-15 points**	—	—	Artificially channelized, or scouring present during spates because of excess impervious surface in watershed. **0-3 points**
Bank Stability 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 10	Over 80% of streambank surfaces consist of native plants, classified as: bottomland hardwoods, understory shrubs, or non-woody macrophytes. **9-10 points**	50% to 80% of riparian zone is vegetated, but one class of plants is not represented. **6-8 points**	25% to 50% of riparian zone is vegetated, but one or two classes of plants are not represented. **3-5 points**	Less than 25% of streambank surfaces are vegetated. Poor plant community (e.g. grass monoculture) present. **0-2 points**

Adjustments: 5 — Add **5 points** if cross-sectional area of flow is estimated to be greater than one square meter during periods of normal flow.	TOTAL SCORE: 76

COMMENTS: UPSTREAM SITE for Anheuser Busch NEW 300 FARM Fifth Year Study. Area packed with Aquatic Vegetation (Nuphar, duckweed, hyacinths, dollarweed) almost to an excess.

ANALYSIS DATE:	ANALYST:	SIGNATURE:
05/06/92	SCOTT BULGRIN	Scott J. Bulgrin

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 3)

SUBMITTING AGENCY CODE: 8031 / SUBMITTING AGENCY NAME: FL DER Northeast District	STORET STATION NUMBER:	DATE (M/D/Y): 05/06/92	TIME 1100	RECEIVING BODY OF WATER: Thomas Creek into the Suwannee River

REMARKS: Area predominantly forest. Habitat wise not very impacted.	LOCATION: Thomas Creek 40 yds from Pivot	FIELD ID/NAME: (Downstream Site)

RIPARIAN ZONE/INSTREAM FEATURES

Predominant Surrounding Land-Use (specify relative percent in each category): → Anheuser Busch New Sod Farm

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
80%		20%				

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

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

Point-Source Pollution (list location and describe): Anheuser Busch New Sod FARM upstream where Ponds 1-5 discharge to wetlands then to Thomas Creek.

Runoff from Lem Turnpike. Septic Tank from residential Hog Farm runoff

Estimated System Width (range, m): 14-17	Estimated System Depth (range, m): 0.3-1	yes
High Water Mark (m above bed): 0.6	Velocity (range, m/s): Octagonal 0.12	Impounded ☐ NO
		Channelized ☐ NC

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

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	15	9	DIP NET	Rock or Shell Rubble			
Leaf Packs	5	1	DIP NET	Sand	5	1	DIP NET
Aquatic Vegetation	15	2	DIP NET	Mud/Muck	20	1	DIP NET
Submerged Roots	15	2	DIP NET	Other:			
Undercut Banks	25	4	DIP NET	Other:			

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):	pH (SU):	Cond. (µmho/cm):				Secchi (m):
Top	21.9	3.44	5.51	93				0.4
Mid-depth	21.0	3.44	5.51	93				
Bottom	21.0	3.44	5.51	93				

System Type : Stream: ☒ (Surficial Aquifer Fed / Deep Aquifer Fed) Alluvial / Blackwater Lake: ☐ Wetland: ☐ Estuary: ☐ Other: ☐

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

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

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

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

Weather Conditions: Sunny Warm, mid 80's.

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

Nelms Parkwood Pickwood

Bass, Sunfish, Bowfin, Gambusia

ANALYSIS DATE:	ANALYST:	SIGNATURE:
05/06/92	SCOTT BULGRIN	Scott Bulgrin

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

SUBMITTING AGENCY CODE: 8031 / SUBMITTING AGENCY NAME: FL D.E.R. NorthEast DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 05/06/92	RECEIVING BODY OF WATER: Thomas Creek into the Dessoa River

REMARKS: Predominant Forest/ Swamp area. Area used for recreation	LOCATION: Thomas Creek 40 yds from Pivot	FIELD ID/NAME: (Downstream Site)

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 29	Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs, undercut banks, rubble, or other stable habitat. **23-30 points**	20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat. **16-22 points**	5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat. **8-15 points**	Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious. **0-7 points**
Water Velocity 17	Max. observed: >0.3 m/sec. but < 1 m/sec **23-30 points**	Max. observed; 0.1 to 0.3 m/sec **16-22 points**	Max. observed; 0.05 to 0.1 m/sec **8-15 points**	Max. observed; <0.05 m/sec, or spate occurring; > 2 m/sec **0-7 points**
Artificial Channel/ Flow Alteration 15	No artificial channelization. Little activity (impervious surface) in watershed which would cause scouring during spates. **12-15 points**	—	—	Artificially channelized, or scouring present during spates because of excess impervious surface in watershed. **0-3 points**
Bank Stability 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 10	Over 80% of streambank surfaces consist of native plants, classified as: bottomland hardwoods, understory shrubs, or non-woody macrophytes. **9-10 points**	50% to 80% of riparian zone is vegetated, but one class of plants is not represented. **6-8 points**	25% to 50% of riparian zone is vegetated, but one or two classes of plants are not represented. **3-5 points**	Less than 25% of streambank surfaces are vegetated. Poor plant community (e.g. grass monoculture) present. **0-2 points**

Adjustments: 5	Add **5 points** if cross-sectional area of flow is estimated to be greater than one square meter during periods of normal flow.	TOTAL SCORE: 80

COMMENTS: FOREST Area, Unimpacted by man's activities. Downstream Site for Anheuser Busch New SOD FARM Fifth Year Study. Not as much vegetation (Aquatic) as in upstream Site), More canopy cover.

ANALYSIS DATE:	ANALYST:	SIGNATURE:
05/06/92	SCOTT BULGRIN	Scott Bulgrin

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: ANHEUSER-BUSCH SOD FARMS
Address/City:
County: DUVAL
Contact/District: RITA FELTON / NE
NPDES Permit #: FL0041530 **Outfall #:**

Sample Collection: Date 5/4/92 Time 13:50
Test Beginning: Date 5/5/92 Time 1210
Test Ending: Date 5/7/92 Time 1300
Test Organism: NOTROPIS LEEDSI
Life Stage/Age: 10 DAYS

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

Remarks:

Instrument Calibrations:

	pH	DO	Temp	Cond
0 hr	7@7-10@10	8.5@24°C	23.4@23.4°C	1360@23.7
24 hr	7@7-10@10	8.5@24°C	23.9@23.9	1378@24.2
48 hr	7@7,10@10	8.5@24.0	23.2@23.2	1372@24.1

		Number Live			pH			Temp. (°C)			DO (mg/L)			Cond. (µmhos/cm)		
Conc.	Chamber #	0	24	48	0	24	48	0	24	48	0	24	48	0	24	48
Control	76	5	5	5	7.7	7.8	8.3	23.1	22.7	22.8	9.1	8.7	9.5			
Control	142	5	5	5	7.7	7.8	8.3				9.1	8.7	9.5	240	242	244
100%	14	5	5	5	7.4	7.6	8.1	21.3	23.0	22.8	10.2	8.0	9.0			
100%	16	5	5	5	7.4	7.6	8.1				10.3	8.0	9.0	535	560	567
Measured/Loaded by:		MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	~~DK~~ MF	MF	MF
Recorded by:		MF	MF	KP	DK	KP	KP	DK	KP	KP	DK	KP	KP	DK	KP	KP

wrong initials KP 5/6/92 14:45

Investigators' Signatures

Marshall Fairclath
David [illegible]
Kim Pearce

[signature]
Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl_2:	Blank 0.0				
Lab Tot. Resid. Cl_2:	0.0	0.0	0.0	Hach	MF
Alkalinity:	125	73	118	Hach	DK
Hardness:	134	80	113	Hach	DK
Total Ammonia:	0.0	0.0	1.44	Hach	MF DK

Ammonia Meter Slope: ______ Ammonia Blank: 0.0 Salinity Sample: ______ ppt

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: ANHEUSER-BUSCH SOD FARMS
Address/City: SPRAY IRRIGATION
County: DUVAL
Contact/District: SCOTT BULGRIN/RITA FELTON/NE
NPDES Permit #: FL00 41530 Outfall #: _____

Sample Collection: Date 5/4/92 Time 13:50
Test Beginning: Date 5/5/92 Time 1210
Test Ending: Date 5/7/92 Time 1300
Test Organism: CERIODAPHNIA DUBIA
Life Stage/Age: <24 HRS

LIMS 33341 92-MAY-05-10

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

Remarks:

Instrument Calibrations:

	pH	DO	Temp	Cond
0 hr	7@7; 10@10	8.5@24°C	23.4@23.4	1360@23.7
24 hr	7@7; 10@10	8.5@24°	23.9@23.9	1378@24.2
48 hr	7@7; 10@10	8.5@24.0	23.2@23.2	1372@24.1

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	5	8.4		8.1	22.8		23.3	9.1		9.2	147		172
Control	B	5	5	5			8.1						9.2			
Control	C	5	5	5			8.1						9.2			
Control	D	5	5	5			8.1						9.2			
100 %	A	5	5	5	7.5		8.4	21.8		23.3	9.9		9.4	520		571
100 %	B	5	5	5			8.4						9.4			
100 %	C	5	5	5			8.4						9.4			
100 %	D	5	5	5			8.4						9.4			
Measured/Loaded by:		MF	MF	MF	MF		MF			MF			MF	MF		MF
Recorded by:		MF	MF	KP	DK		KP			KP			KP	DK		KP

33341 92-MAY-05-10-01

BIOLOGY Matrix: W-SURF-FRH
Date Collected: 4-MAY-1992 13:50:00.
Field ID:Composite
BSY-SN-CLD BSY-SN-FSH

Investigators' Signatures

Marshall Faircloth
David Hoff
Kim Pearce

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:					
Lab Tot. Resid. Cl2:	0.0	0.0	0.0	Hach	MF
Alkalinity:	125	73	118	Hach	DK
Hardness:	134	80	113	Hach	DK
Total Ammonia:	0.0	0.0	1.44	Hach	MF-DK

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

Typical Values for Selected Parameters in Florida Waters

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

Percentile Distribution

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

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

Periphyton taxa and abundances for Anheuser Busch, collected in Thomas Creek, Duval County, collected 1 June 1992.

	Reference Site	Test Site
Diatoms		
Achnanthes affinis	41	2
A. hungarica	710	6
Cocconeis placentula	–	2
Cymbella minuta	162	–
Eunotia curvata	101	6
E. flexuosa	183	2
E. monodon	81	–
E. pectinalis	1582	57
E. tenella	20	–
Fragilaria crotonensis	162	–
Frustulia rhomboides	20	–
Gomphonema affine	162	–
G. parvulum	2210	6
Navicula confervacea	446	–
N. elginensis	41	2
N. festiva	345	–
N. minima	568	–
Nitzschia amphibia	41	–
N. palea	122	2
N. thermalis	–	10
Pinnularia subcapitata	142	–
Chlorophyta		
Characium sp.	122	–
Mougeotia sp.	20	–
Oedogonium sp.	41	–
Stigeocolonium sp.	183	–
Chrysophyta		
Ophiocytium sp.	81	–
Peroniella sp.	20	–
Synura sp.	20	–
Cyanophyta		
Anabaena sp.	20	2
Chroococcus sp.	122	–
Gloeocapsa sp.	20	2
Gloeothece sp.	–	2
Lyngbya sp.	–	2
Microcystis sp.	183	31
Phormidium sp.	–	100

Macroinvertebrate taxa list for the Anheuser Busch New Sod Farm (Duval County) collected via Hester-Dendy samplers on June 1, 1992.

	Control Site	Test Site
Coleoptera		
Dineutus sp.	–	1
Diptera		
Ablabesmyia mallochi	–	3
Ablabesmyia rhamphe grp.	–	8
Chironomus decorus grp.	2	4
Chironomus (Lobochironomus) sp.	7	28
Dicrotendipes modestus	–	6
Dicrotendipes simpsoni	13	383
Kiefferulus sp.	4	6
Labrundinia sp.4 Epler	–	2
Polypedilum tritum	1	–
Procladius sp.	–	5
Undetermined dipteran pupae	–	3
Tanytarsus sp.	–	17
Tanytarsus sp. G Epler	–	2
Tribelos jucundum	1	121
Ephemeroptera		
Stenacron floridense	–	8
Stenacron interpunctatum	–	21
Gastropoda		
Amnicola sp.	10	1
Undetermined ancylid	1	–
Campeloma floridense	1	2
Ferrissia sp.	–	6
Laevapex sp.	3	6
Micromenetus dilatus	1	66
Physella sp.	–	25
Undetermined gastropod	6	2
Hirudinea		
Batracobdella phalera	1	–
Helobdella fusca	–	1
Malacostraca		
Asellus sp.	34	96
Gammarus sp.	–	13
Odonata		
Undetermined Corduliidae	–	3
Enallagma cardenium	–	3
Epitheca sepia	–	1
Epitheca sp.	–	26
Ischnura sp.	–	3
Pachydiplax longipennis	–	2

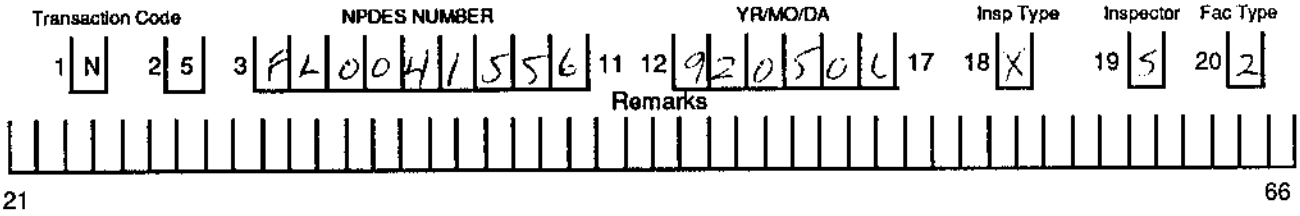
Oligochaeta		
Dero digitata	1–	–
Dero trifida	3	1
Haemonais waldvogeli	1	–
Slavina appendiculata	–	3

Macroinvertebrate taxa list for Anheuser Busch, Inc., collected via 20 discrete dip net sweeps on May 6,1992, in Thomas Creek.

	Control Site	Test Site
Coleoptera		
Bagous sp.	24	–
Celina sp.	–	48
Donacia sp.	72	–
Hydroporus or *Hygrotus* larvae	–	24
Hygrotus sp.	–	72
Peltodytes sp.	–	48
Suphisellus sp.	24	–
Tropisternus sp.	–	24
Diptera		
Chironomus (Lobochironomus) sp.	–	24
Chironomus sp.	–	24
Cryptotendipes sp.	–	24
Dicrotendipes modestus	–	48
Dicrotendipes simpsoni	48	24
Einfeldia natchitocheae	24	–
Palpomyia group	–	24
Polypedilum tritum	312	96
Undetermined dipteran pupae	–	72
Tanytarsus sp. G Epler	–	1416
Tanytarsus sp. L Epler	–	24
Tanytarsus sp. R Epler	–	24
Tanytarsus sp. T Epler	–	216
Undetermined Tipulidae	–	24
Tribelos jucundum	–	576
Zavreliella marmorata	–	24
Gastropoda		
Amnicola sp.	72	–
Aphaostracon sp.	–	24
Campeloma floridense	48	–
Littoridinops ? sp.	–	48
Micromenetus dilatus	24	48
Physella sp.	–	72
Planorbella duryi	24	–
Pseudosuccinea columella	24	–
Hemiptera		
Undetermined Hemiptera	24	–
Hirudinea		
Batracobdella phalera	48	–
Macrobdella ditetra	48	–
Placobdella parasitica	24	–
Placobdella translucens	24	–
Lepidoptera		

Undetermined Noctuidae	24	–
Malacostraca		
Asellus sp.	384	216
Hyalella azteca	216	–
Palaemonetes paludosus	144	–
Procambarus sp.	24	–
Odonata		
Enallagma cardenium	24	–
Enallagma sp.	48	–
Ischnura sp.	192	–
Nasiaeschna pentacantha	24	–
Oligochaeta		
Undetermined Enchytraeidae	–	72
Limnodrilus hoffmeisteri	–	48
Pelecypoda		
Sphaerium or *Musculium* sp.	96	24

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)

