

Biological Assessment of

Jefferson Smurfit Corporation

Duval County

NPDES #FL0000892

Sampled 24 June and 7 August 1991

December 1991

Biology Section
Division of Technical Services

Department of Environmental Regulation

Results of Fifth Year Inspections

Discharger: Jefferson Smurfit Corporation
County: Duval
NPDES Number: FL0000892
State Permit Expiration Date: 10-31-91

Toxics Sampling Inspection (XSI)

Date Sampled: 7 August 1991

Results: Tentative identification of camphor (280 µg/L), endo-borneal (420 µg/L), 1-alpha-terpineol (410 µg/L), 1-(4-hydroxy-3-methoxyphenyl) ethanone (50 µg/L), aromatics (190 µg/L), aliphatics (770 µg/L), and other unidentified compounds (60 µg/L). The metals aluminum (2110 µg/L) and iron (505 µg/L) violated Class III standards.

Compliance Biomonitoring Inspection (CBI)

Date Sampled: 24 June 1991

Results: No toxicity to *Ceriodaphnia dubia*. Forty percent mortality to *Notropis leedsi*. Aeration during bioassay probably reduced toxicity by stripping volatile compounds. A chronic bioassay using *Arbacia* was invalidated due to problems with dilution water.

Impact Bioassessment Inspection (IBI)

Date Sampled: 7 August 1991

Results: Benthic macroinvertebrate community depressed throughout the system with less taxa recovered from the test sites. Biological integrity violations occurred at both test sites. Phytoplankton community was relatively low in density and species richness at all sites. Chlorophyll *a* lowest at impact sites, suspected that algal population may be inhibited. Although many potential causes of biological disturbance are present, data indicate that Jefferson Smurfit is a contributor to environmental stress in this reach of the St. Johns River.

Water Quality Inspection (WQI)

Date Sampled: 7 August 1991

Results: Nutrients elevated in the effluent, particularly ammonia. Unionized ammonia content was in toxic range, and may have caused mortality in the *N. leedsi* bioassay. Reference and test sites also had high nutrients, particularly test site 2, where dead fish were observed floating at the surface. AGP values were low at the reference site, but were above the problem threshold of 10 mg dry wt/L at the test sites, indicating eutrophication potential. Bacterial populations were elevated in the effluent, and exceedingly high at test site 2. Holding times were exceeded for the effluent sample. However, bacteriological standards were violated in the test site 2 sample.

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 Jefferson Smurfit Company (formerly Alton Packaging) is located at 1915 Wigmore Street in Jacksonville, Duval County, Florida. This facility uses pine wood to produce approximately 707 tons per day of Kraft pulp and linerboard. In the production process, up to 6 MGD of wastewater is generated and discharged to the St. Johns River. Prior to discharge, the effluent is treated by retention in a settling pond and by a Unox® treatment system. The wastewater is also fertilized with ammonia to promote the growth of microorganisms which aid in the degradation of wood waste. Sludges are separated from the effluent before discharge.

While permit limits for pH (6.0 to 9.0) and temperature (cause no harm to receiving water biota) are relatively straightforward, limits for BOD and TSS are based on a sliding scale which is dependent upon the facility's phase of production (see Appendix). Bioassays must also be performed.

Past problems with the plant include several exceedences of TSS limits which resulted in enforcement action from DER. The facility also sporadically discharges high unionized ammonia.

The facility has a mixing zone which extends radially from the outfall for 600 feet. Chronic toxicity limits apply at the edge of the mixing zone, while acute toxicity limits apply within the mixing zone.

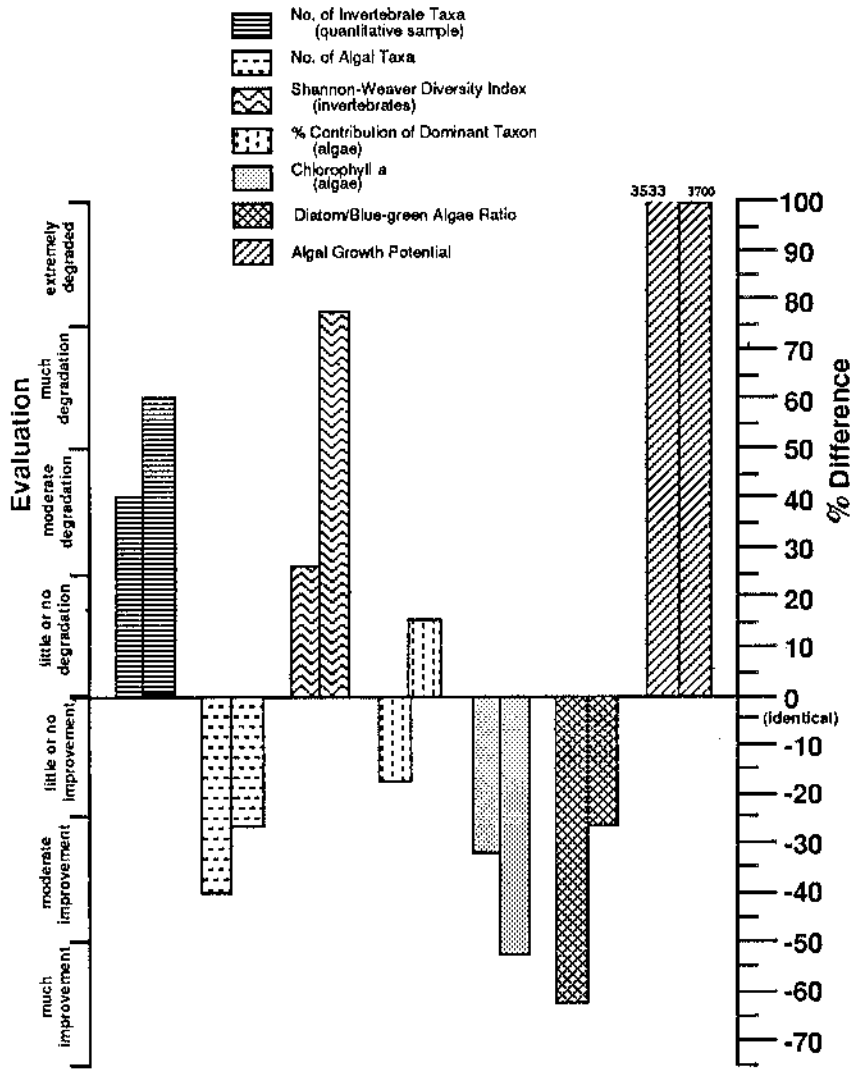
The FDER Biology Section has performed numerous toxicity bioassays on this facility, from September, 1981 to the present. Although the effluent was found to be toxic to *Mysidopsis bahia* in 1981, 1982, and 1984, several other bioassays were invalidated or were inconclusive. Since the BOD of the Smurfit effluent causes dissolved oxygen depletion in the bioassay test chambers, it must be aerated during the tests. During some tests, the D. O. would drop below 40% of saturation, thereby invalidating the bioassay. On other occassions, partial mortality (*e.g.*, 30% to 40%) would occur, but it was suspected that the aeration process was stripping volatile compounds in the sample, thereby reducing toxicity.

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 the St. Johns River near the opposite shore from the outfall) and two test sites (approximately 900 ft on either side of the discharge, to compensate for tidal movement of the effluent plume) (see map in Appendix). A habitat assessment was performed *in situ* to establish

Major characteristics of community structure of control and test sites.

	Control Site	Test Site 1	Test Site 2
Macroinvertebrate Ponar			
Number of Taxa	5	3	2
Shannon-Weaver Diversity	1.92	1.38	0.41
% Polychaeta	33.3	71.3	0
% Malacostraca	33.3	0	8.1
% Sipuncula	0	28.7	0
% Decapoda	16.7	0	0
% Oligochaeta	16.7	0	0
% Thoracica	0	0	91.9
% Predators	8.3	13.8	0
% Collector-Gatherers	91.7	86.2	8.1
% Collector-Filterers	0	0	91.9
% Scrapers	0	0	0
% Shredders	0	0	0
Phytoplankton Algae			
Number of Taxa	15	21	19
% Contribution of Dominant Taxon	32.9	27.0	38.1
Chlorophyll a (µg/l)	7.3	4.9	3.4
Diatom/Blue-green Abundance Ratio	0.35	0.57	0.40
% Blue-green	36.6	28.6	46.4
% Green	32.9	19.0	7.1
% Diatoms	19.5	38.1	31.0
% Other	11.0	14.3	15.5
Algal Growth Potential (mg dry wt/l)	0.3	10.9	11.4



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

comparability between sites. Supplemental physical/chemical data were also collected on the effluent and study sites. Acute screening toxicity bioassays, using *Ceriodaphnia dubia* and *Notropis leedsi* as test organisms, were performed on an effluent sample (Peltier and Weber 1985, FDER 1985). The effluent was analyzed for organic constituents (base neutrals, acid extractables, and pesticide extractables) and metals. 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. Collection methods consisted of three ponar dredge grabs per station (Ross 1990). Phytoplankton was sampled at both reference and test sites via sub-surface grab samples. Chlorophyll *a* was also determined for phytoplankton communities (Ross 1990). Algal Growth Potential tests were performed, using *Dunaliella tertiolecta* for the test site samples, following EPA (1974).

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. 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, 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, chlo-

rophyll *a*, and algal growth potential are measured as the test site minus reference site divided by the reference site.

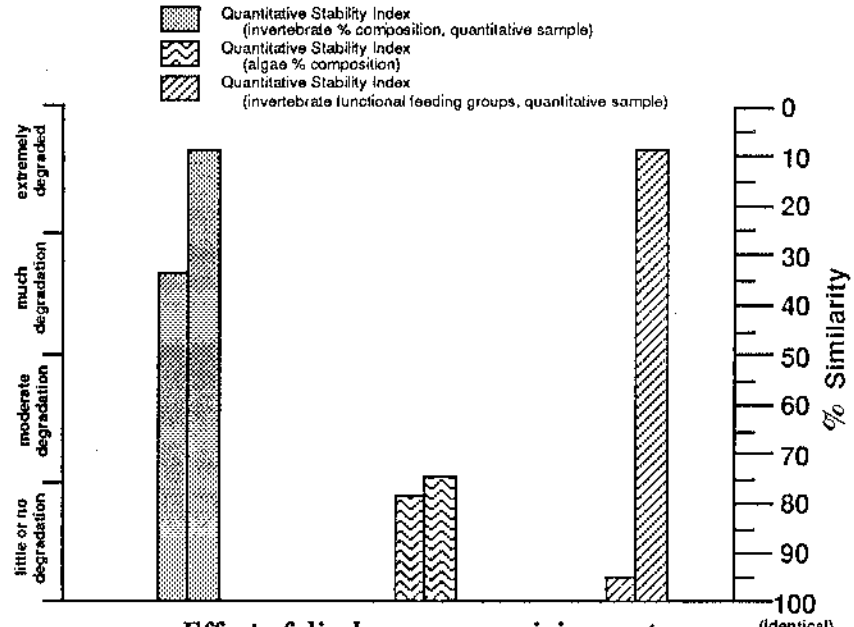
The following personnel were involved in this investigation: Wayne Magley and Doug Gilbert (DER Point Source Evaluation Section), Rita Felton (DER Northwest District), and Lyn Burton, Russel Frydenborg, Kathleen Lurding, and Sandy McClure (Tallahassee Biology Laboratory).

Results and Discussion

Habitat assessment scores for test sites 1 and 2 were 21 and 29, respectively (Appendix). The shoreline consisted almost entirely of vertical seawalls, and the land use surrounding these areas was primarily industrial. No natural vegetative communities were observed, and the potential for point and non-point source pollution was considerable. Although test site 2 scored higher for sediment type, the bottom substrate had a chemical or anaerobic odor with slight oil deposits. Also, dead fish were observed floating at the surface, along with an oily sheen. The sediments at test site 1 were characterized as anaerobic mud, and also possessed a chemical odor. The reference site was located approximately 100 yards offshore of an area which is predominantly forested, with mostly natural sources of runoff. Habitat score was 72, primarily because of the quality of the littoral area and the community types noted there (grass bed, beach, and tidal creek). No abnormal sediment deposits or odors were observed, and fish were common at this site. Water from all three sites was warm during the sampling (29.4 to 30.7°C), slightly above neutral in pH, adequately oxygenated (surface D.O. ranged from 5.4 to 6.1), and with conductivities ranging from 11800 to 25060 µmhos/cm) (Appendix).

The Jefferson Smurfit effluent sample was not toxic to the water flea, *Ceriodaphnia dubia*. A chronic bioassay using *Arbacia* was invalidated due to problems with dilution water. Some mortality (40%) to *Notropis leedsi* did occur in the fish bioassay, probably in response to the unionized ammonia content of the discharge (Appendix). At the beginning of the test, unionized ammonia was calculated at 0.03 mg/L, a level which can be toxic to some organisms. With aeration to overcome the BOD problems came an increase in pH (from 6.8 to 8.6) which theoretically would cause the unionized ammonia to rise to 1.8 mg/L. Unionized ammonia levels were probably much less, since the aeration of the sample would also tend to decrease this volatile form of ammonia It is known that these concentrations of unionized ammonia, were they present for very long, would have killed all the test fish. It is suspected that the bioassay test procedure of aeration contributes to underestimating the toxicity of this effluent which would be manifest in the receiving waters. Note that numerous dead fish were observed at test site 2.

Analysis of organic constituents yielded the following results: Di-n-butyl phthalate (< 3 µg/L), and the tentative identification (and estimated concentration) of camphor (280 µg/L), endo-borneal (420 µg/L), 1-alpha-terpineol (410 µg/L), 1-(4-hydroxy-3-methyoxyphenyl) ethanone (50 µg/L), aromatics (190 µg/L), aliphatics (770 µg/L), and unidentified compounds (60 µg/L). Most of these constituents are breakdown products of the compounds found in pine wood, and their concentrations are probably not at acutely toxic levels, although they may act synergistically to produce



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

chronic effects on the biota. The estimated level of aliphatics detected in the discharge may be a cause for concern. Short chain aliphatics (*e.g.*, Number 2 fuel oil) may be acutely toxic at concentrations as low as 100-400 µg/L (Dye and Frydenborg 1980).

Six metals were found in the effluent. Arsenic (35 µg/L), cadmium (0.3 µg/L), and copper (8 µg/L) were reported at values less than the practical quantitation limits. Aluminum, iron, and zinc were measured at 2110 µg/L, 505 µg/L, and 55 µg/L, respectively. The concentrations of aluminum and iron violate ambient standards for Class III marine waters.

Nutrients were elevated in the effluent, including total phosphorus (2.5 mg/L), ammonia (10.0 mg/L), and TKN (25.0 mg/L). Nitrate-nitrite was not detected. Based on parameters measured in the field, the unionized ammonia content was calculated to be 0.08 mg/L. This concentration is in the toxic range.

Nutrient concentrations (particularly nitrogen-containing compounds) at the test stations were higher than those found in typical Florida estuaries. STORET data from 700 estuary stations, for the period of 1980 to 1989, have been compiled into a percentile distribution (Appendix, Joe Hand, personal communication). Data from this present study were compared against these.

Concentrations of total phosphorus (0.16 mg/L), ammonia (0.49 mg/L), nitrate-nitrite (0.19 mg/L), and TKN (0.8 mg/L) were detected at test site 2. These ammonia and nitrate-nitrite levels were higher than 95% and 84%, respectively, of those found at all other estuaries in the state. The increased ammonia at this site may help to explain the presence of numerous dead fish observed at the time of sampling. Nutrient levels at test site 1 were similar with regard to NO_2NO_3 and TKN, but the ammonia concentration was less than half. At the reference site, NO_2NO_3 and TKN levels were elevated (0.18 and 1.1 mg/L, respectively), higher than 80%-83% of other estuaries.

Algal growth potential at the two test stations was somewhat high (10.9 and 11.4 mg dry wt/L at test sites 1 and 2, respectively), as would be expected from the nutrient concentrations. In marine systems (using *Dunaliella tertiolecta)*, 10 mg dry wt/L is considered indicative of eutrophication problems, which are generally associated with D.O. sags and fish kills (Ron Raschke, U.S. EPA, personal communication). In contrast, AGP at the reference site was low (0.3 mg dry wt/L).

Total and fecal coliform bacteria were analyzed by the Department of Health and Rehabilitative Services in Jacksonville (Appendix). The effluent contained 5,000 and 17,000 organisms/100 ml of fecal and total coliforms, respectively. Unfortunately, the holding time was exceeded before the effluent samples were analyzed. Bacterial levels at test site 2 were extraordinarily elevated, 30,000 org/100 ml fecal and 90,000 org/100 ml of total coliforms. Concentrations of these bacteria were considerably lower at the reference and test site 1. The high bacterial counts at test site 2 are in violation of Class III standards (17-302.560(5) FAC).

The phytoplankton community consisted of a mixture of marine and freshwater forms, probably due to the fluctuating salinities characteristic of estuaries (see taxa list in Appendix). Species richness was relatively low as compared to other estuaries along the eastern U. S. coast (Manzi *et al.* 1977), and ranged from 15 at the reference site to 21 and 19 at test sites 1 and 2, respectively (see table and figures). 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 reference. The figure on p. 3 summarizes similarities between the sites. Smaller similarities (lower percentages) generally correspond with greater degradation.

The percent contribution of the dominant taxon was similar for all three sites, and was the blue-green alga, *Chroococcus* sp., in all cases. The diatom/blue-green abundance ratio was higher at the test sites. Overall, the phytoplankton community in this portion of the St. Johns River was of moderate to low density and diversity. The quantitative stability index for percent composition indicated a relatively high degree of similarity between the test sites and the reference.

Chlorophyll *a* values were also moderate, but were somewhat higher at the reference site than at test sites 1 and 2, measured at 7.3, 4.9, and 3.4 µg/L, respectively. Given the high nutrient concentrations in this area, it is surprising that these values are near (at the reference site) or well below (at the test sites) the median chlorophyll *a* value for Florida estuaries. The decrease in secchi depth at the two test sites (1.4 and 1.5 m at test sites 1 and 2, respectively, compared to 1.8 m at the reference), was not due to algal turbidity. This suggests the possibility of algal inhibition due to light limitation by the highly colored effluent.

The benthic macroinvertebrate community in this reach of the St. Johns was notably depauperate, especially at the test sites. The highest taxa richness occurred at the reference site, represented by five taxa

(although this is still well below normal). One of these reference site organisms (*Rithropanopeus harrisii*) is considered relatively sensitive to pollution. In contrast, only 2 cosmopolitan polychaetes and a sipunculid worm were collected from test site 1. Further, the dominance of *Balanus* sp. at test site 2 caused the diversity to plunge to a very low value (0.41). Compared to the reference, the decreases in diversity of 28% for test site 1 and 79% for test site 2 are in violation of the Biological Integrity Criteria, 17-302.560(7) FAC.

The quantitative stability index for percent composition indicated moderate to much degradation. In the reference-test site 1 comparison, the QSI for functional feeding groups showed a high similarity and therefore little degradation. However, the reference to test 2 comparison resulted in only 8.1% similarity, reflecting the very different types of communities present. Although it is apparent that this entire reach of the St. Johns River is stressed, the area near the Jefferson Smurfit outfall was more degraded. This was especially true at the station which receives effluent on an outgoing tide, site 2.

Conclusions

The sample of effluent collected from the Jefferson Smurfit Company was not toxic to the freshwater invertebrate, *Ceriodaphnia dubia*, but caused 40% mortality to the fish, *Notropis leedsi*. It is suspected that toxicity of the sample was reduced by aeration during the bioassay. The specific cause of toxicity was probably the unionized ammonia detected in the sample, but could also have been related to the various organic consitiuents and metals measured. Of these, aluminum and iron concentrations were in violation of Class III standards for marine waters.

Nutrient concentrations were elevated in the effluent. Of particular significance was the 10 mg/L of total ammonia, which resulted in a calculated unionized ammonia value of 0.08 mg/L, a toxic level. Concentrations of total phosphorus and nitrogen-containing compounds were also high at the ambient stations. Ammonia and nitrate-nitrite levels at test site 2 were higher than 95% and 84%, respectively, of other estuarine areas in the state. Both the reference and test site 1 were also elevated, but not as severely as test site 2 (the station which receives effluent on an outgoing tide).

Algal growth potential was above the problem threshold of 10 mg dry wt/L at the two test sites, in response to the ample amounts of bioavailable nutrients, but was low at the reference site. Conversely, chlorophyll *a* was lower at the test stations. This suggests that some factor was inhibiting the natural phytoplankton population, possibly light limitation.

The phytoplankton community was low in taxa richness and density when compared to other estuaries in the Southeastern U. S. Each site was dominated by blue-green algae (mainly *Chroococcus* sp.) but the test sites also supported more diatoms. The differences observed between the reference and test sites were difficult to interpret due to the generally stressed nature of the system.

Benthic macroinvertebrate communities at all three ambient stations were depauperate and obviously stressed, the test sites more so than the reference. Highest taxa richness occurred at the reference site (5), including one organism which is somewhat pollution sensitive. Biological integrity violations occurred at both test sites, with reductions in diversity of 28% at test site 1 and 79% at test site 2.

This particular reach of the St. Johns River, the "bend" area, is considered the "most polluted part of the river" according the the 1990 305(b) report. Although this area receives other point source discharges and urban runoff, the data presented here indicates that Jefferson Smurfit is a contributor to the observed environmental problems.

Literature Cited

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Florida Department of Environmental Regulation. 1985. Quality assurance manual for performing acute toxicity tests. 2nd edition. Fla. Dept. Environmental Regulation, Biology Section, Tallahassee. 53 pp.

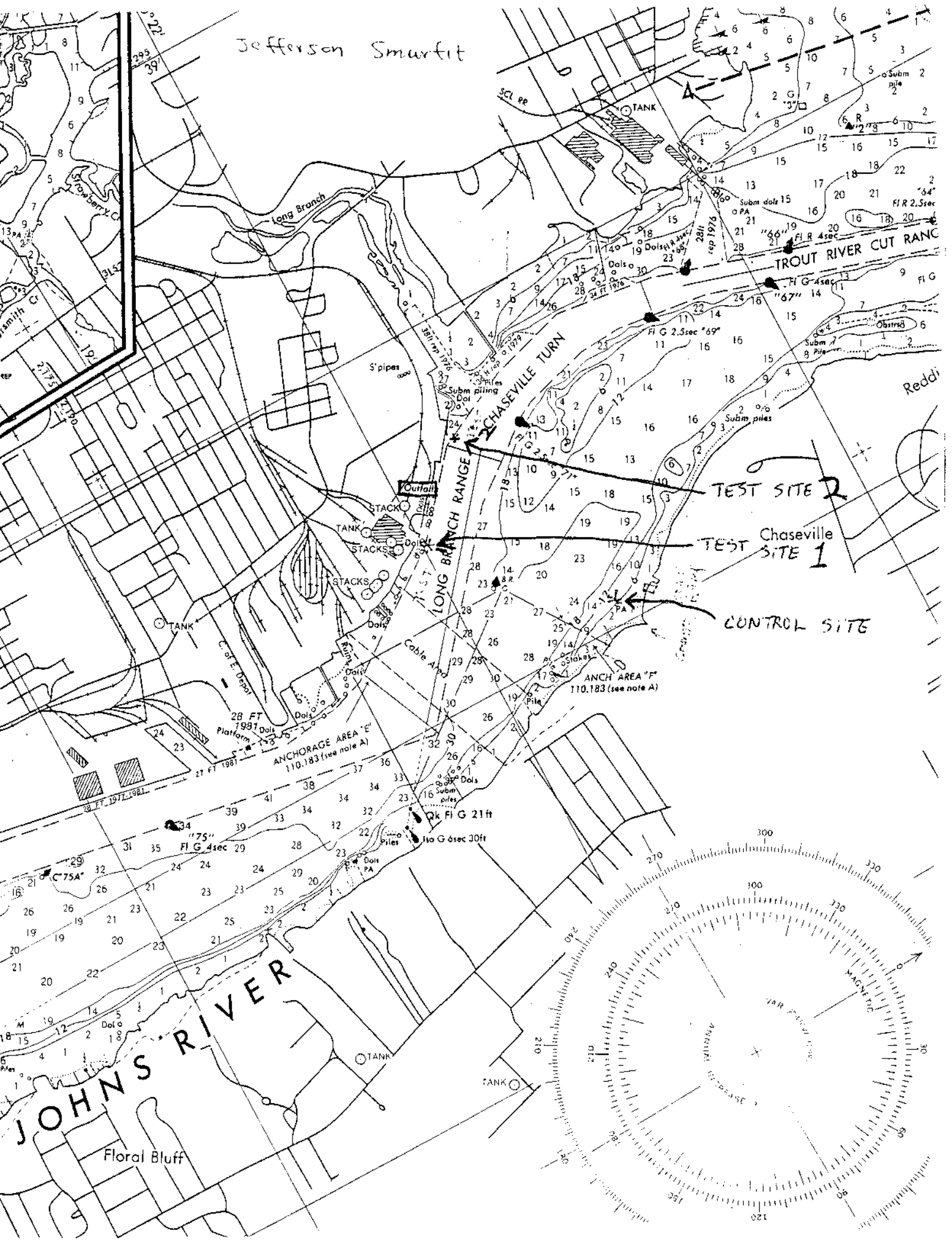
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Manzi, J. J., P. E. Stofan, and J. L. Dupuy. 1977. Spatial heterogeneity of phytoplankton populations in estuarine surface microlayers. mar. Biol. 41:29-38.

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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.


Jefferson Smurfit
TEST SITE 2
TEST SITE 1 Chaseville
CONTROL SITE
CHASEVILLE TURN
LONG BRANCH RANGE
TROUT RIVER CUT
Long Branch
Strawberry Cr
SCL RR
TANK
STACKS
Outfall
Cable Area
ANCHORAGE AREA "E" 110.183 (see note A)
ANCH AREA "F" 110.183 (see note A)
JOHNS RIVER
Floral Bluff
Fl G 4sec "67"
Fl G 2.5sec "69"
Fl R 4sec "66"
Fl R 2.5sec "64"
Qk Fl G 21ft
Iso G 6sec 30ft
"75" Fl G 4sec
"C"75A"
MAGNETIC
VAR 6°E (1979)
ANNUAL DECREASE

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

Facility Name: Jefferson Smurfit Corporation	Prepared by: Rita C. Felton Date: Aug 6, 1991	
Location (attach detailed map): 1915 Wigmore Street	County: Duval	District: FDER-NEA
Federal Permit # and expiration date: FL0000892 10/31/89	State GMS # and State expiration date: 3116P00387 10/31/91	Facility Type: (Industrial) Municipal Federal Agricultural Other (list):

Function of facility:
Production of Kraft Linerboard

Description of treatment process:
Operation of a 6.0 MGD Industrial wastewater Treatment System which includes equalization, primary clarification, activated sludge treatment with nutrient addition and pure oxygenation, and a sludge dewatering system with treated effluent discharging to the St. Johns River

Receiving waters: St. Johns River	Classification: III Marine waters Type I facility
Design Flow: 6.0 MGD	Actual Mean Flow:

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

therefore, the best time to sample is:

If facility has a mixing zone, give details (size, parameters affected, etc.):
The mixing zone extends radially 600 feet from the point of discharge. Discharge shall comply with the Chronic toxicity limits of 17-3.061(2)(P), FAC, at the edge of the mixing zone and shall comply with acute toxicity limits of 17-3.051(1)(d) FAC within the mixing zone.

List effluent limits:

Parameter	Limit (units)
Flow	none
PH	6.0 min 9.0 max
Temperature	shall not increase temp of RBW to cause any harm
BOD, TSS *	*
Zinc	none
Unionized Ammonia	none
BioAssay	

Describe special permit conditions and permit modifications:
* Limits are based on which phase of production the facility is in. (Currently Phase 2).

Phase		Limit are	Max
1	BOD	~~4~~882 lbs/D	9643
	TSS	10332	20064
2	BOD	5376	10752
	TSS	11520	23040
3	BOD	6205	12410
	TSS	13296	26592
4	BOD	6849	13698
	TSS	14676	29352

JEFFERSON SMURFIT
(Facility)

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

FACILITY SUMMARY

Description of permitted outfall(s):

List permit violations (from MOR data or other source) and plant upsets that occurred within past year:
March 90 - BS max exceeded on one day with a loading of 23952 lbs/day.

Describe previous impact bioassessments, WQBEL's, and previous or current enforcement actions:
1989 C.O. for BOD exceedances (daily ave. & max) & TSS several times during the months of June 89 to March 90. August 90, Case closed.

Discuss comparability of MOR results to past DER results and whether there are trends (improving, declining) in the data set:
There have been several C.I. performed by Department personnel with regards to BOD with permit limits. BS appears to be declining over the last few months, however, the permit allows for increases in BOD & TSS with production phase changes. (See SC #7 of permit).

Additional information:
high unionized ammonia values Feb 91 - April 91 0.027, 0.056, and 0.030 mg/L respectively
See attached 3e report

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

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER: St. Johns River
REMARKS:	LOCATION:		FIELD ID/NAME:

Habitat Parameter (score)	Excellent	Good	Fair	Poor
Littoral Alterations 9	None—Unaltered shoreline. **9-10 points**	Mostly natural shoreline, but with occasional riprap. **6-8 points**	Shoreline consisting mostly of riprap and vertical seawalls. **3-5 points**	Shoreline consisting almost entirely of vertical seawalls. **0-2 points**
Community Types Observed 35	At least four communities observed from the following list: mangrove swamp, marsh, oyster bar, grass bed, reef, saltern, natural beach, or tidal creek. **38-50 points**	Two or three communities observed from those listed. **26-37 points**	One community observed from those listed. **13-25 points**	No communities observed from those listed. **0-12 points**
Tidal Fluctuation 4	>0.75 m. **4-5 points**	0.5 - 0.75 m. **3 points**	0.25 - 0.5 m. **2 points**	<0.25 m. **0-1 point**
Freshwater Discharges/ Alterations 7	Only natural runoff.. **9-10 points**	Mostly natural runoff, but with a few, small stormwater sources. **6-8 points**	Considerable stormwater discharge from local roads, parking lots, etc. **3-5 points**	Extensive manmade discharges, especially from canals draining large tracts of land. **0-2 points**
Flow and Wave Action 9	Light to moderate wave action present except under the harshest weather conditions. Flow unrestricted by manmade structures. **9-10 points**	—	—	Heavy wave action sometimes present even during average weather conditions, or flow restricted by manmade structures so that velocities are very high. **0-2 points**
Sediment Type 8	Combination of sand, gravel, and shell. **12-15 points**	Primarily sand, with small areas of mud. **8-11 points**	Mixture of sand and mud, or well-aerated mud only. **4-7 points**	Anaerobic mud. **0-3 points**

TOTAL SCORE 72

COMMENTS:		
ANALYSIS DATE: 8-7-91	ANALYST: Guest	SIGNATURE:

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

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER: St. John River

REMARKS:	LOCATION: Jacksonville Sub Sit	FIELD ID/NAME: Test-1

Habitat Parameter score	Excellent	Good	Fair	Poor
Littoral Alterations 1	None—Unaltered shoreline. **9-10 points**	Mostly natural shoreline, but with occasional riprap. **6-8 points**	Shoreline consisting mostly of riprap and vertical seawalls. **3-5 points**	Shoreline consisting almost entirely of vertical seawalls. **0-2 points**
Community Types Observed 1	At least four communities observed from the following list: mangrove swamp, marsh, oyster bar, grass bed, reef, saltern, natural beach, or tidal creek. **38-50 points**	Two or three communities observed from those listed. **26-37 points**	One community observed from those listed. **13-25 points**	No communities observed from those listed. **0-12 points**
Tidal Fluctuation 4	>0.75 m. **4-5 points**	0.5 - 0.75 m. **3 points**	0.25 - 0.5 m. **2 points**	<0.25 m. **0-1 point**
Freshwater Discharges/ Alterations 3	Only natural runoff.. **9-10 points**	Mostly natural runoff, but with a few, small stormwater sources. **6-8 points**	Considerable stormwater discharge from local roads, parking lots, etc. **3-5 points**	Extensive manmade discharges, especially from canals draining large tracts of land. **0-2 points**
Flow and Wave Action 9	Light to moderate wave action present except under the harshest weather conditions. Flow unrestricted by manmade structures. **9-10 points**	—	—	Heavy wave action sometimes present even during average weather conditions, or flow restricted by manmade structures so that velocities are very high. **0-2 points**
Sediment Type 3	Combination of sand, gravel, and shell. **12-15 points**	Primarily sand, with small areas of mud. **8-11 points**	Mixture of sand and mud, or well-aerated mud only. **4-7 points**	Anaerobic mud. **0-3 points**

TOTAL SCORE 21

COMMENTS:

ANALYSIS DATE: 8-7-91	ANALYST: G. Hoch	SIGNATURE:

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

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
		8-7-91	St. Johns River

REMARKS:	LOCATION:	FIELD ID/NAME:
	Jacksonville	DSJS2-T1-A

Habitat Parameter / score	Excellent	Good	Fair	Poor
Littoral Alterations 1	None—Unaltered shoreline. **9-10 points**	Mostly natural shoreline, but with occasional riprap. **6-8 points**	Shoreline consisting mostly of riprap and vertical seawalls. **3-5 points**	Shoreline consisting almost entirely of vertical seawalls. **0-2 points**
Community Types Observed 1	At least four communities observed from the following list: mangrove swamp, marsh, oyster bar, grass bed, reef, saltern, natural beach, or tidal creek. **38-50 points**	Two or three communities observed from those listed. **26-37 points**	One community observed from those listed. **13-25 points**	No communities observed from those listed. **0-12 points**
Tidal Fluctuation 4	>0.75 m. **4-5 points**	0.5 - 0.75 m. **3 points**	0.25 - 0.5 m. **2 points**	<0.25 m. **0-1 point**
Freshwater Discharges/ Alterations 3	Only natural runoff.. **9-10 points**	Mostly natural runoff, but with a few, small stormwater sources. **6-8 points**	Considerable stormwater discharge from local roads, parking lots, etc. **3-5 points**	Extensive manmade discharges, especially from canals draining large tracts of land. **0-2 points**
Flow and Wave Action 9	Light to moderate wave action present except under the harshest weather conditions. Flow unrestricted by manmade structures. **9-10 points**	—	—	Heavy wave action sometimes present even during average weather conditions, or flow restricted by manmade structures so that velocities are very high. **0-2 points**
Sediment Type 11 RIP RAP	Combination of sand, gravel, and shell. **12-15 points**	Primarily sand, with small areas of mud. **8-11 points**	Mixture of sand and mud, or well-aerated mud only. **4-7 points**	Anaerobic mud. **0-3 points**

TOTAL SCORE 29

COMMENTS:

ANALYSIS DATE:	ANALYST:	SIGNATURE:
8-7-91	Gilbert	

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
			St. John's

REMARKS:	LOCATION:	FIELD ID/NAME:
	Con...	C...

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other
100						

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):

Estimated Stream Width (range, m): 800	Estimated Stream Depth (range, m): 7		yes
High Water Mark (m above bed): 1	Velocity (range, m/s): 1	Impounded ☐ Channelized ☑	

Canopy Cover % (check box): Open: ☑ Lightly Shaded: ☐ Moderately Shaded: ☐ Heavily Shaded: ☐

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types (estimated % surface coverage):

Limestone:		Sand/Silt/Clay Mix:	20
Consolidated Clay:		Clay/Silt (inorganic):	
Gravel/Shell		Coarse Organic Debris:	
Sand	30	Mud/Muck (organic):	

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):		
Top	30.5	6.1	Secchi Depth (m):	1.8
Mid-depth	29.7	6.0	pH (SU):	7.4
Bottom	29.7	6.1	Conductivity (µmho/cm):	663 20K
			Other Parameters:	

Stream Type (check box): Blackwater: ☐ Deep Aquifer Fed: ☐ Surficial Aquifer Fed: ☐ Alluvial: ☐ 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:

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

ANALYSIS DATE	ANALYST:	SIGNATURE:
8-7-91	S. Hoar	

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
			St. Johns River

REMARKS:	LOCATION:	FIELD ID/NAME:
		TEST-1

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other
					X	

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):

Estimated Stream Width (range, m): 600	Estimated Stream Depth (range, m): 1.2		yes
High Water Mark (m above bed): 1	Velocity (range, m/s): .38	Impounded ☐ Channelized ☒	

Canopy Cover % (check box): Open: ☒ Lightly Shaded: ☐ Moderately Shaded: ☐ Heavily Shaded: ☐

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types (estimated % surface coverage):

Limestone:		Sand/Silt/Clay Mix:	
Consolidated Clay:		Clay/Silt (inorganic):	
Gravel/Shell		Coarse Organic Debris:	
Sand		Mud/Muck (organic):	

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):	
Top	23.4		Secchi Depth (m): 1.5
Mid-depth	23.4		pH (SU): 7.6
Bottom	23.4		Conductivity (µmho/cm): 1253
			Other Parameters:

Stream Type (check box): Blackwater: ☐ Deep Aquifer Fed: ☐ Surficial Aquifer Fed: ☐ Alluvial: ☐ 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:

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

ANALYSIS DATE:	ANALYST:	SIGNATURE:

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y): 8-2-91	RECEIVING BODY OF WATER: St. John's
REMARKS:	LOCATION: Jellum Lumber	FIELD ID/NAME: DST36-TEST 5	

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other
					100	

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): Jellum Lumber

Estimated Stream Width (range, m): 800	Estimated Stream Depth (range, m): 7		yes
High Water Mark (m above bed): 1	Velocity (range, m/s): .2	Impounded ☐ Channelized ☑	

Canopy Cover % (check box): Open: ☑ Lightly Shaded: ☐ Moderately Shaded: ☐ Heavily Shaded: ☐

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types (estimated % surface coverage):

Limestone:		Sand/Silt/Clay Mix:	
Consolidated Clay:		Clay/Silt (inorganic):	
Gravel/Shell		Coarse Organic Debris:	
Sand		Mud/Muck (organic):	

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):		
Top	30.7	5.0	Secchi Depth (m):	.4
Mid-depth	30.1	5.2	pH (SU):	7.2
Bottom	29.6	5.6	Conductivity (µmho/cm):	114 x 3.2
			Other Parameters:	

Stream Type (check box): Blackwater: ☐ Deep Aquifer Fed: ☐ Surficial Aquifer Fed: ☐ Alluvial: ☐ 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: CA

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

ANALYSIS DATE: 8-7-91	ANALYST: G. Hall	SIGNATURE:

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: Jefferson Smurfit
Address/City:
County: Duval
Contact/District: Linwright / NE
NPDES Permit #: FL0000892 Outfall #: 001

Sample Collection: Date 6/24/91 Time 10:20
Test Beginning: Date 6/25/91 Time 12:20
Test Ending: Date 6/27/91 Time 12:15
Test Organism: C. dubia
Life Stage/Age: 24 hours

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

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr				
24 hr				
48 hr				

Remarks: * Replicate 1 missent
* counted again at 72 hours (4) live organisms
1 very dead body - no dilution in D.S. 100% ff.
all else control

Conc.	Chamber #	Number Live 0	24	48	DO (mg/l) 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	Cond. (umhos/cm) 0	24	48
Control		5	5	5	9.2	9.3	5.6	8.1	8.1	8.2	22.1	20.6	20.0	170	175	156
Control		5	5	5												
Control		5	4	4												
Control		5	4	3 *												
100%		5	5	5	4.7	9.0	8.7	6.8	8.4	8.5	19.5	20.8	21.0	1553	1589	1615
100%		5	5	5												
100%		5	5	5												
100%		5	5	5												
Measured/Loaded by:		AO	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF
Recorded by:		AJ	MJ	AJ	AJ	AJ	AJ	MJ	MJ	MJ	MJ	MJ	MJ	AJ	AJ	AJ

Investigators' Signatures

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Clz:			0.0	Hach	MF
Lab Tot. Resid. Clz:			0.0	Hach	MF
Alkalinity:	103	63	200	Hach	MA
Hardness:	130	80	268	Hach	MF
Total Ammonia:	0	0	1.1	ISE	MF

Ammonia meter slope:

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: Jefferson Smurfit
Address/City:
County: Duval
Contact/District: Jim Wright / NE
NPDES Permit #: FL0000892 Outfall #: 001

Sample Collection: Date 6/24/91 Time 1020
Test Beginning: Date 6/25/91 Time 1300
Test Ending: Date 6/27/91 Time 1400
Test Organism: N. Arcuata
Life Stage/Age: 25 days

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

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr	7.0 7.09	9.0 @ 21°	1346 1350	20.2 @ 22.4
24 hr	7.0 7.09	9.0 @ 21°	1350 1358	22.3 @ 23.2
48 hr	7.0 7.09	8.8 @ 22°	1358 1367	22.8 @ 23.3

Remarks:
* initial & 50% lower conductivities in Sulfate dilution water
** Used N. arcuata spoons

Conc.	Chamber #	Number Live 0	24	48	DO (mg/l) 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	Cond. (µmhos/cm) 0	24	48
Control	16	5	5		9.6	7.5	5.3	7.7	8.5	8.3	20.9	20.2	20.5	1350	1350	
Control	29	5	5		9.6	7.6	5.3	7.7	8.5	8.3				1340	1358	1340
100%	49	5	5		4.3*	7.4	6.5	6.6	8.3	8.2	19.9	20.2	20.8		1135	
100%	42	5	5		3.9*	7.4	6.3	6.6	8.6	8.2				1125	1358	1367
Measured/Loaded by		SM	MC		MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF
Recorded by:		MF	RS		AJ	AJ	AJ	AJ	AJ	AJ	AJ	AJ	AJ	AJ	AJ	AJ

Investigators' Signatures

Reviewer

Water quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:			0.0	Hach	MF
Lab Tot. Resid. Cl2:			0.0	Hach	MF
Alkalinity:	108	68	200	Hach	MF
Hardness:	120	80	368	Hach	MF
Total Ammonia:	0.0	0.0	1.0	Hach	MF

Ammonia meter slope: 1% after 24 hours

Chemistry summary table for Jefferson Smurfit Corporation

	Effluent	Control Site	Test Site 1	Test Site 2
Organic Constituents (ug/L)				
Di-n-butyl phthalate	3 K			
Tentative id's & estimated conc.:				
camphor	280			
endo-borneal	420			
1-alpha-terpineol	410			
1-(4-hydroxy-3-methoxyphenyl) ethanone	50			
aromatics	190			
aliphatics	770			
Unidentified Compounds	60			
Metals (ug/L)				
Aluminum	2110 A			
Arsenic	35 T			
Cadmium	0.3 T			
Copper	8 T			
Chromium	10 U			
Iron	505 A			
Lead	15 U			
Mercury	0.2 U			
Nickel	5 U			
Silver	0.14 U			
Zinc	55 A			
Nutrients (mg/L)				
Ortho-phosphorus	1.5 A	0.092 A	0.11 A	0.16 A
Total phosphorus	2.5	0.09	0.11	0.16
Ammonia	10.0 A	0.055 T	0.20 A	0.49 A
Nitrate+Nitrite	0.04 U	0.18 A	0.18 A	0.19 A
TKN	25.0	1.10	0.76	0.80
Other Parameters				
Habitat Assessment		72	21	29
D.O. (mg/L)		6.1	5.5	5.4
pH (SU)	6.6	7.4	7.3	7.2
Conductivity (µmhos/cm)		11800	25060	22920
Temperature (°C)	40.9	30.5	29.4	30.7
Bioassay Fish	40% mortality			
Bioassay Invertebrate	Not toxic			
Fecal coliform *	5,000	230	300	30,000
Total coliform *	17,000	1,100	2,300	90,000

* Samples exceeded holding time

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

K - Actual value is known to less than value given

T - Value reported is less than the practical quantitation limit

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

Typical Estuarine STORET Values Based on 1980 – 1989 Period
(Produced by Joe Hand DER Standards & Monitoring)

Parameter	Percentile Distribution				
	10	30	50	70	95
BOD5 (mg/L)	0.70	1.10	1.50	1.90	4.00
Chl *a* - corrected (µg/L)	3.28	5.13	6.93	9.60	22.20
DO (mg/L)	5.00	6.10	6.60	7.10	9.00
TKN (mg/L)	0.34	0.50	0.69	0.82	1.49
NH3 +NH4 (mg/L	0.02	0.04	0.06	0.09	0.28
NO2+NO3 (mg/L)	0.00	0.01	0.02	0.05	0.23
TP (mg/L)	0.02	0.07	0.11	0.17	0.59
FC (MFM/100 mL)	4.0	10.0	15.0	40.0	396.0
TC (MFI/100 mL)	7.0	24.0	65.0	100.0	1300.0
Total Residual (NFLT mg/L)	7.0	11.5	19.0	25.6	76.0
Secchi (m)	0.60	0.80	1.0	1.2	2.6
Water Temp (°C)	20.27	24.00	25.00	26.20	29.10

STATE OF FLORIDA
DEPARTMENT OF HEALTH AND REHABILITATIVE SERVICES

RECEIVED
DEP ENVIRONMENTAL REG.
SEP 6 1991
Point Source
Evaluation Section

Bacteriological Analysis of Environmental Waters*

County Duval County Address 7852 Baymeadows Way (FDER)

Collector Rita Felton F.D.E. R. Location Jefferson Smurfit

Date Collected 8-7-91 Date Rec'd 8-7-91 Date Reported 8-14-91

Lab. No.	Station No.	Total Coliform MPN/MF**	Fecal Coliform MPN/MF**	Fecal Strep. MPN/MF**	Entero-cocci MF	E. Coli. MF
03227	Control	1,100	230			
03228	Test 1	2,300	300			
03229	Test 2	90,000	30,000			
03230	Effluent	17,000	5,000			

*All results reported as MPN or MF value per 100 ml.
*Method used is that which is circled.

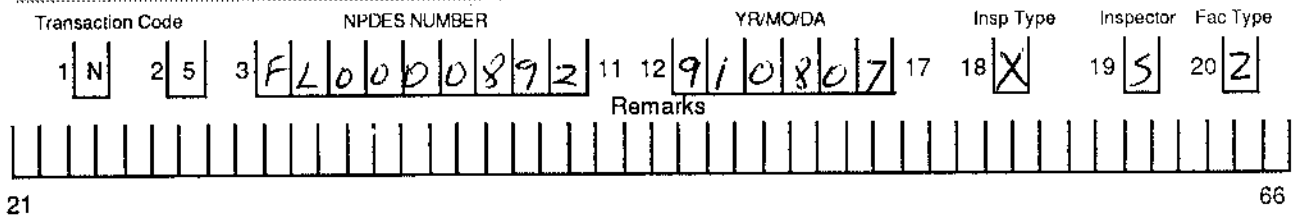
Macroinvertebrate taxa list for Jefferson Smurfit, Duval County, collected via ponar dredge, on 7 August 1991.

	Test Site 1	Test Site 2	Control Site
Decopoda			
Rhithropanopeus harrisii	–	–	12
Malacostraca			
Corophium lacustre	–	–	12
Uromunna reynoldsi	–	12	12
Oligochaeta			
Undetermined Marine Oligochaeta	–	–	12
Polychaeta			
Neanthes succinea	12	–	–
Streblospio benedicti	50	–	24
Sipuncula			
Undetermined Sipuncula	25	–	–
Thoracica			
Balanus sp.	–	137	–

Phytoplankton taxa list and abundances for Jefferson Smurfit Corporation, Duval County, collected in the St. Johns River on 7 August 1991.

	Control Site	Test Site 1	Test Site 2
Diatoms			
Achnanthes sp.	–		44
Chaetoceros sp.	–	44	88
Cocconeis sp.	–	44	–
Coscinodiscus sp.	43	176	44
Cyclotella sp.	–	132	264
Ditylum sp.	–	88	–
Eunotia sp.	–	–	44
Mastogloia sp.	–	44	–
Melosira sp.	43	–	88
Navicula sp.	172	44	–
Nitzschia sp.	344	176	176
Nitzschia sp. 1	–	44	–
Nitzschia sp. 2	–	–	88
Nitzschia sp. 3	–	–	176
Pleurosigma sp.	–	44	–
Rhizosolenia sp.	–	–	44
Skeletonema sp.	86	220	88
Chlorophyta			
Arthrodesmus sp.	43	–	–
Chlamydomonas sp.	258	–	88
Coelastrum sp.	–	44	–
Gloeocystis sp.	–	44	–
Pediastrum sp.	–	–	44
Scenedesmus sp.	387	308	132
Tetraedron sp.	–	44	–
Ulothrix sp.	172	44	–
Unknown Chlorophyte Flagellate	301	44	–
Cryptophyta			
Cryptomonas sp. 1	258	220	396
Cryptomonas sp. 2	129	176	176
Cyanophyta			
Anabaena sp.	43	–	–
Aphanothece sp.	–	–	132
Chroococcus sp.	1160	747	1407
Merismopedium sp.	86	44	176

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)

