Florida
Department of Environmental Protection

Biological Assessment of

Titusville North Wastewater Treatment Plant

Brevard County

NPDES #FL0020389

Sampled September 1993

March 1994

Biology Section
Division of Technical Services

Department of Environmental Protection
Results of Fifth Year Inspections

Discharger: Titusville North Wastewater Treatment Plant
County: Brevard
NPDES Number: FL0020389
State Permit Expiration Date: 20 August 1994

Toxics Sampling Inspection (XSI)

Date Sampled: 20 September 1993

Results: Diazinon (0.74 µg/L) was found in the effluent in an acutely toxic concentration. No metals exceeding Class III standards were detected.

Compliance Biomonitoring Inspection (CBI)

Date Sampled: 20 September 1993

Results: The sample of final effluent was acutely toxic to the invertebrate, *Ceriodaphnia dubia*. All test organisms were dead within 24 hours. This is a violation of Rules 17-302.530(62) FAC, 17-302.500(1)(d) FAC, and 17-4.244(3)(a). No mortality occurred during the 48 hour bioassay of the fish, *Cyprinella leedsi*.

Impact Bioassessment Inspection (IBI)

Date Sampled: 20 September 1993

Results: Changes in benthic macroinvertebrate community structure indicated degradation at test site B which was probably associated with the discharge. The reference site and test site A were both strongly dominated by a pelecypod which is moderately sensitive to organic pollution and low dissolved oxygen levels. The population shifted at test site B to one dominated by a pollution tolerant polychaete. Taxa richness was reduced at both test sites, while Shannon-Weaver diversity was below average throughout the study area. The phytoplankton assemblage found in the Indian River was very sparse, with few taxa recovered at any site. Some algal community attributes indicated improved conditions at the test sites, with increases in taxa richness and diatom to blue-green algae ratio, and large decreases in the percent contribution of dominant taxon. Algal biomass, however, reflected the elevated nutrient concentrations at the test sites. Chlorophyll *a* at the test sites was higher than 88-93% of typical estuary systems, a 900% increase from the reference site. This elevated chlorophyll *a* may be an early symptom of floral community imbalances associated with the discharge.

Water Quality Inspection (WQI)

Date Sampled: 20 September 1993

Results: Nutrients were elevated in the effluent, particularly nitrate-nitrite and ammonia. Nitrate-nitrite concentrations measured at the test sites were higher than 95% of typical Florida estuaries, while ammonia concentrations exceeded the 75th percentile. Total Kjeldahl nitrogen levels were relatively high throughout the study area. Total phosphorus and orthophosphate were undetected or below average at all receiving water stations. Algal growth potential (AGP) at both test sites was above the "problem threshold" of 10 mg dry wt/L for marine waters, in direct response to levels of bioavailable nitrogenous compounds.

Introduction

The Titusville North Wastewater Treatment Plant is located on Buffalo Road in North Titusville, Brevard County, Florida (see maps in Appendix). This facility is an anaerobic/oxic type activated sludge wastewater treatment plant, with flow equalization, tertiary filtration, and a 2.75 MGD design flow capacity. The effluent is disinfected, dechlorinated, and discharged to the Class III Indian River though a 24 inch diameter cast iron outfall pipe, extending 1057 feet from the shoreline. From August, 1992, to July, 1993, the plant had been operating above its design capacity, with an actual mean flow of 2.972 MGD. During this survey, flow was measured to be 3.408 MGD (Gary Miller, DEP Central District, personal communication).

State permit limits are as follows: total nitrogen as N (25 mg/L monthly average, 152,417 lbs/yr), total phosphorus as P (1.0 mg/L monthly average, 6,096.7 lbs/yr), dissolved oxygen (≥ 2.0 mg/L), BOD and TSS (20 mg/L annual average), pH (6.0 to 8.5 S.U.), total chlorine residual (≥0.5 mg/L for disinfection, ≤0.01 mg/L at discharge), and fecal coliform bacteria (200 organisms/ 100 mL). Federal permit limits include BOD and TSS (30 mg/L monthly average, 45 mg/L weekly average), total nitrogen as N (31.25 mg/L monthly average, 37.5 mg/L weekly average), total phosphorus as P (1.25 mg/L monthly average, 1.5 mg/L weekly average), silver (0.35 µg/L daily maximum), and the same dissolved oxygen and pH limits. Note that the silver limit (0.35 µg/L) in the NPDES permit is substantially higher than Marine Class III Water Quality Standard for silver (0.05 µg/L). No previous bioassessments have been performed by FDEP, however, the NPDES permit does require toxicity testing.

Flow exceeded the permitted capacity from August, 1992, through May, 1993, as well as in July, 1993. The permit limit for the total annual nitrogen load (as lbs/ year) was exceeded five times between the period from April, 1992, to August, 1993. The total nitrogen concentration limit (as mg/L) was exceeded in July, 1993. The discharge to the Indian River from the Titusville North WWTP should cease by 30 June 1995, by order of the Indian River Lagoon Act (see Facility Summary in Appendix).

Methods

The focus of this investigation was to determine the discharger's effects on the receiving waters. A comparison of biological community health was made between a reference site (located 3/4 mile north of the outfall pipe) and two test sites bracketing the discharge, (approximately 100 yards north and south of outfall, see map in Appendix). A habitat assessment was performed *in situ* to establish comparability between sites. Supplemental physical/chemical data were also collected on the effluent and study sites. Acute screening toxicity bioassays,

Major characteristics of community structure of control and test sites.

	Reference Site	Test Site A	Test Site B
Macroinvertebrate Ponar			
Number of Taxa	45	29	24
Shannon-Weaver Diversity	1.9	1.9	2.6
% Pelecypoda	72.6	74.8	18.3
% Polychaeta	18.5	15.9	63.4
% Gastropoda	6.8	6.8	8.0
% Malacostraca	1.4	1.1	7.4
% Other	0.7	1.4	2.9
% Suspension Feeders	77.7	78.3	20.4
% Predator/Carnivores	1.8	11.4	58.5
% Above surface deposit feeders	1.9	4.3	11.1
% Below surface deposit feeders	12.4	2.0	0
% Scrapers	6.1	3.9	8.2
% Scavengers	0.1	0	1.8
Phytoplankton Algae			
Number of Taxa	5	15	18
% Contribution of Dominant Taxon	78.1	17.0	17.4
Diatom/Blue-green Abundance Ratio	0.4	0.9	0.8
Chlorophyll a (µg/L)	1.6	16.5	18.9
% Blue-green	12.5	3.8	13.0
% Green	78.1	13.2	10.9
% Diatoms	9.3	45.3	56.5
% Dinoflagellates	0.0	22.6	10.9
% Other	0.0	15.1	8.7
Algal Growth Potential (mg dry wt/L)	6.7	13.1	14.6

using *Ceriodaphnia dubia* and *Cyprinella leedsi* as test organisms, were performed on an effluent sample (Weber 1991). The effluent was analyzed for metals and for organic constituents (base neutral and acid extractables, 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 DEP Chemistry Laboratory.

Benthic macroinvertebrate communities were evaluated at reference and test sites. Invertebrates were collected via three Ponar grabs per site (Ross 1990). Phytoplankton was sampled at both reference and test sites by subsurface grabs (Ross 1990). Chlorophyll *a* was also determined for phytoplankton communities (Ross 1990). Algal Growth Potential tests, using *Selenastrum capricornutum* for the freshwater effluent and *Dunaliella tertiolecta* as the test organism for the marine receiving waters, followed Miller *et al.* (1978) and EPA (1974), respectively.

Explanation of Measurements of Community Health

Several different measurements of macroinvertebrate and algal community health have been employed in this report. 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 (for % composition) of 100% means that the two sites being compared are identical. This same type of procedure is used for calculating the QSI (for 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, chlorophyll *a*, and algal growth potential are measured as the test site minus reference site divided by the reference site.

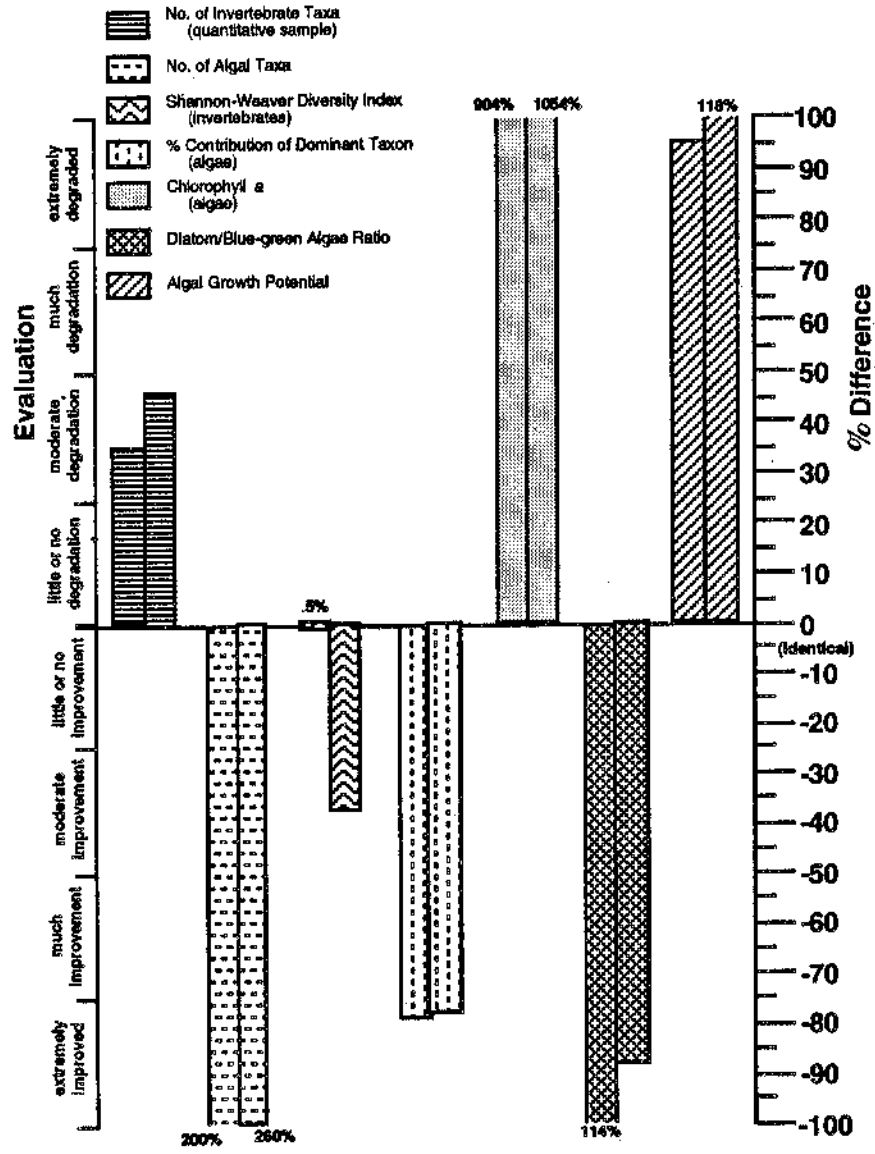
The following personnel were involved in this investigation: Phil Kane and Steve Kent (DEP Central District) and Lyn Burton, Marshall Faircloth, Russel Frydenborg, Roberto Llansó, Kathleen Lurding, Tina Mikulski, Elizabeth Miller, Kim Pearce, Tobin Rader, Urania Quintana, Greg Wynn, and David Young (Tallahassee Biology Laboratory). The report was reviewed by the Point Source Studies Review Committee, consisting of Wayne Magley, Jan Mandrup-Poulsen, and Michael Tanski, as well as District representatives.

Results and Discussion

The study area can best be characterized as a coast parallel, estuarine lagoon. Vegetation at the reference site consisted primarily of seagrasses and epiphytic macroalgal species, including *Caulerpa* sp., *Gracilaria* sp., and *Ulva* sp. Submerged seagrass beds were also found at the two test sites. Habitat quality was similar in all study areas, with scores of 70, 65, and 60 at the reference site, test site A, and test site B, respectively. Land use in the area was primarily forest, but some commercial and industrial areas were present at the test sites. All stations were similar with respect to many physical/chemical parameters, such as pH (ranging from 8.0 to 8.1 S.U.'s), specific conductance (ranging from 38,400 to 39,600 µmho/cm), and dissolved oxygen (6.6 mg/L at the reference site, 5.4 mg/L at test site A, and 6.0 mg/L at test site B). Water was clearer at the reference site (Secchi depth >1 m) than it was at the test sites (Secchi depth = 0.6 m). Substrate composition was similar at all study areas, consisting of a mixture of mud, silt, and sand (Appendix).

Analysis of the effluent for organic constituents revealed the presence of diazinon (0.74 µg/L), which is known to produce LC_{50}'s in cladocerans at concentrations as low as 0.5 µg/L (AQUIRE 1991). The metals scan detected calcium (47.2 mg/L), iron (44 µg/L), and magnesium (7.2 mg/L). None of these concentrations of metals represents a violation of Class III standards for marine waters.

The sample of effluent was acutely toxic to the invertebrate,



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

Ceriodaphnia dubia (Appendix). All test organisms were dead within 24 hours. This is in violation of Rules 17-302.530(62) FAC, 17-302.500(1)(d) FAC, and 17-4.244(3)(a) FAC. This toxicity can probably be attributed to the presence of diazinon in the effluent. No mortality occurred during the 48 hour bioassay of the fish, *Cyprinella leedsi*.

Of the nutrients measured in the effluent, nitrate-nitrite (8.0 mg/L) and ammonia (1.7 mg/L) appeared to have a direct enrichment effect on the receiving waters. Nitrate-nitrite concentrations measured at test sites A and B were higher than 95% of typical Florida estuaries, while ammonia concentrations there exceeded the 75th percentile (see table of Typical Water Quality Values in Appendix). Total Kjeldahl nitrogen levels were relatively high throughout the study area (1.3 mg/L at the reference site, 1.8 mg/L at the test sites), but were more elevated in the vicinity of the outfall. In contrast, total phosphorus and orthophosphate were undetected or below average at all receiving water stations.

Algal growth potential (AGP) levels were highly influenced by the concentrations of bioavailable nitrogenous compounds. At the reference site, AGP was 6.7 mg dry wt/L, while waters from test sites A and B yielded 13.1 and 14.6 mg dry wt/L, respectively. The test site AGP's were both above the "problem threshold" of 10 mg dry wt/L for marine waters, which is used to predict the undesirable effects of cultural eutrophication (Dr. Ron Raschke, U.S. EPA, personal communication). As would be expected from the nutrient concentrations, effluent AGP was very high, at 37.1 mg dry wt/L.

Measurements of benthic macroinvertebrate health yielded results which require more interpretation than usual. The figure on this page 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. 4 summarizes similarities between the sites. Smaller similarities (lower percentages) generally correspond with greater degradation. The average abundance of each individual taxon appears in the Appendix.

Taxa richness was reduced at both test sites (29 and 24 at sites A and B, respectively) compared to the reference site, which had 45 taxa. Shannon-Weaver diversity was below the Statewide estuarine average of 2.9 at all three sites (1.9

at both the reference site and at test site A, increasing to 2.6 at test site B). The depressed diversities at the reference site and at test site A may be attributed to the high populations of pelecypods present, particularly *Brachiodontes exustus* (which made up about 73% of the total population at these sites). This bivalve is considered moderately tolerant to organic enrichment and low D. O. conditions by Farrell (1993). Several other benthic organisms which are sensitive to organic loading and low D.O. concentrations, such as the gastropods, *Bulla* spp., and the polychaetes, *Owenia* sp. A and *Sabella melanostigma*, were found at these two stations. Generally, the benthic macroinvertebrate community structure and function of the reference site and test site A were nearly identical, as demonstrated by the Qualitative Stability Indices for these attributes. However, even though diversity was somewhat higher at test site B, the macroinvertebrate assemblage was substantially different, dominated by the pollution tolerant polychaete, *Streblospio benedicti* (54%), the common pelecypod, *Rangia cuneata*, and the amphipod, *Grandidierella bonnieroides*. The substantial change in the populations of test site B, compared to the other sites, may be related to some aspect of the Titusville discharge. If the effluent plume is often directed towards test site B, the diazinon-related toxicity may be responsible for the observed community shifts.

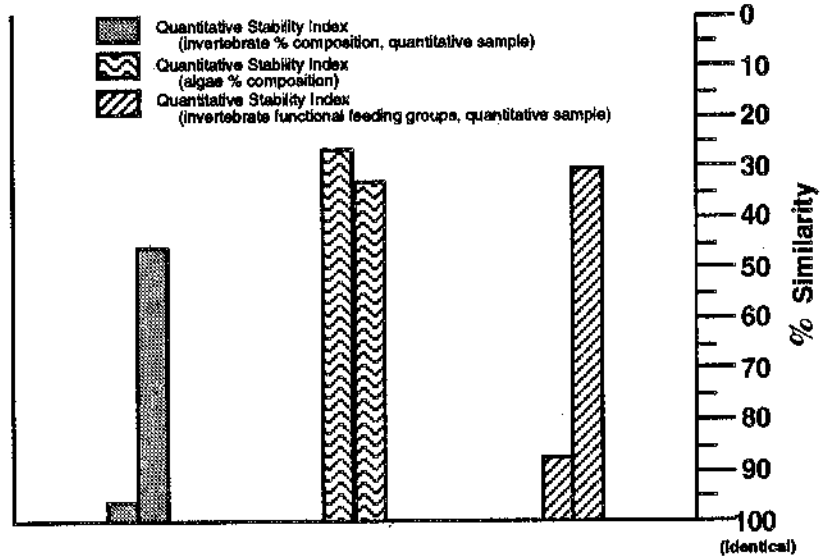
The phytoplankton assemblage found in the Indian River was very sparse, with few taxa recovered throughout the study area. The unicellular chlorophyte flagellate, *Dunaliella* sp., dominated at the reference site, while diatoms made up the majority of the population at the two test sites. Some measures of algal community health indicated improved conditions at the test sites, with increases in taxa richness and diatom to blue-green ratio, and large decreases in the percent contribution of dominant taxon. Algal biomass, however, was substantially increased at the two test sites, probably influenced by the concentrations of bioavailable nitrogenous compounds. Chlorophyll *a* at test sites A and B (16.5 µg/L and 18.9 µg/L, respectively) was higher than 88-93% of typical Florida estuaries, while chlorophyll *a* at the reference site (1.6 µg/L) was below the 5th percentile (Appendix). This elevated chlorophyll *a* may be an early symptom of floral community imbalances associated with the discharge.

Conclusions

The sample of final effluent was acutely toxic to the invertebrate, *Ceriodaphnia dubia*. All test organisms were dead within 24 hours. This is a violation of Rules 17-302.530(62) FAC, 17-302.500(1)(d) FAC, and 17-4.244(3)(a). No mortality occurred during the 48 hour bioassay of the fish, *Cyprinella leedsi*.

Diazinon (0.74 µg/L) was found in the effluent in an acutely toxic concentration, and probably was responsible for the observed mortality in the bioassays. The metals detected were calcium (47.2 mg/L), iron (44 µg/L), and magnesium (7.2 mg/L). None of these concentrations of metals represents a violation of Class III standards for marine waters.

Of the nutrients measured in the effluent, nitrate-nitrite (8.0 mg/L) and ammonia (1.7 mg/L) ap-



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

peared to have an enrichment effect on the marine receiving waters. Nitrate-nitrite concentrations measured at the test sites were higher than 95% of typical Florida estuaries, while ammonia concentrations exceeded the 75th percentile. Total Kjeldahl nitrogen levels were relatively high throughout the study area. In contrast, total phosphorus and orthophosphate were undetected or below average at all receiving water stations.

Algal growth potential (AGP) at both receiving water sites was above the "problem threshold" of 10 mg dry wt/L for marine waters, in direct response to levels of bioavailable nitrogenous compounds. As would be expected from the nutrient concentrations, effluent AGP was quite high, at 37.1 mg dry wt/L.

Measures of benthic macroinvertebrate community health indicated that the discharge may be having a detrimental effect at test site B. The macroinvertebrate assemblage was notably different from that of the reference site and test site A. The latter sites were strongly dominated by a pelecypod which is moderately sensitive to organic pollution and low dissolved oxygen levels, *Brachiodontes exustus*. The population shifted at test site B to one dominated by polychaetes, particularly the pollution tolerant, *Streblospio benedicti*. Although Shannon-Weaver diversity was higher at test site B than the other two stations, values throughout the study area were below average for a Florida estuary system. Taxa richness was substantially reduced at both test sites.

The phytoplankton assemblage found in the Indian River was very sparse, with few taxa recovered throughout the study area. Some algal community attributes indicated improved conditions at the test sites, with increases in taxa richness and diatom to blue-green algae ratio, and large decreases in the percent contribution of dominant taxon. As was observed with AGP levels, chlorophyll *a* was substantially higher at the two test sites, another sign of nutrient enrichment. This elevated chlorophyll *a* may be an early symptom of floral community imbalances associated with the discharge.

Literature Cited

Aquatic Toxicity Information Retrieval Data Base (AQUIRE). 1991. U.S. EPA Environmental Research Laboratory, Duluth, Mn.

Environmental Protection Agency. 1974. Marine algal assay procedure: Bottle test. Nat'l Environ. Res. Center, Office of Res. and Dev., U.S. EPA, Corvallis, Oregon. 43 p.

Farrell, D. H. 1993. A community based metric for marine benthos. Florida Dept. Environmental Protection. Southwest District Office. Unpublished report. 15 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.

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

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

Chemistry summary table for Titusville North WWTP

	Effluent	Reference Site	Test Site A	Test Site B
Organic Constituents (ug/L)				
Diazinon	0.74			
Metals (ug/L)				
Aluminum	100 U			
Antimony	15 U			
Arsenic	20 U			
Cadmium	0.8 U			
Calcium (mg/L)	47.2			
Copper	5 U			
Chromium	10 U			
Iron	44			
Lead	15 U			
Magnesium (mg/L)	7.2			
Mercury	0.1 U			
Nickel	5 U			
Selenium	30 U			
Silver	0.05 U			
Zinc	8 I			
Nutrients (mg/L)				
Ortho-phosphate	0.059	0.015 U	0.021 I	0.015 U
Total phosphorus	0.23	0.043	0.10	0.072
Ammonia	1.7	0.067	0.15	0.14
Nitrate+Nitrite	8.0	0.031 I	0.34	0.47
TKN	2.9	1.3	1.8	1.8
Other Parameters				
Habitat Assessment		70	65	60
D. O. (mg/L)	5.9	6.6	5.4	6.0
pH (SU's)	6.6	8.1	8.0	8.1
Conductivity (µmhos/cm)	912	39,600	38,400	39,000
Temperature (°C)	30.2	30.4	30.1	30.9
Algal Growth Potential (mg dry wt/L)	37.1	6.7	13.1	14.6
BOD5 (mg/L)	2.0 A			
TSS (mg/L)	2 U			
Bioassay Fish	Not toxic			
Bioassay Invertebrate	Toxic: LC50 < 100%			

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

I - Value reported is less than the minimum quantitation limit, and greater than or equal to the minimum detection limit

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

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

Facility Name: Titusville North WWTP		Date Summary Prepared: 9/1/93
Location (attach detailed map): See attached maps	County: Brevard	District: Central
Federal Permit # FL0020389 and expiration date: 3/31/94	State GMS # and 3005M00336 State expiration date: 8/20/94 0005-165/149	Facility Type: Industrial (Municipal) Federal Agricultural Other (list):

Function of facility:
Domestic Wastewater Treatment Plant

Description of treatment process:
A 2.75 MGD design capacity anaerobic/oxic type activated sludge wastewater treatment facility with flow equilization and tertiary filtration. The disinfected effluent is dechlorinated and discharged to surface water via outfall pipe to Indian River.

9/22/93

Receiving waters: Indian River	Classification: I II (III)	(3.408 MGD)
Design Flow: 2.75 MGD	Mean Flow: 2.972 MGD from 8/92 thru 7/93	Flow during survey: To be determined

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

therefore, the best time to sample is:

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

List effluent limits (if necessary, attach relevant paperwork):

Parameter	Limit (units)
See attached sheets for State & Federal limits.	

Describe special permit conditions and permit modifications:
Operating permit # 0005-165/149 was modified in 1991 to include effluent loading limits (lb/yr) for Total Nitrogen - 152,417.0 lbs/yr and Total Phosphorous - 6,096.7 lbs/yr.

Titusville North
(Facility)

DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

Description of permitted outfall(s):
24 inch cast iron outfall to Indian River. The outfall is 1057 feet from the shoreline. It's located northeast of Titusville Yacht basin (see attached map(s).

List permit violations (from MOR data or other source) and plant upsets that occurred within past year:
Flow exceeded permitted capacity from August 1992 through May 1993 & July 1993.
Total Nitrogen annual loading rate was exceeded for the following months:

April 92 – March 93	=	153,867.36	lbs/yr
May 92 – April 93	=	155,913.95	"
June 92 – May 93	=	156,687.50	"
July 92 – June 93	=	160,927.59	"
Aug 92 – July 93	=	168,140.05	"

Also, Nitrogen exceeded the 30 day average limit of 25 mg/L for July 93 (26.26 mg/L).

Describe previous impact bioassessments, WQBEL's, and previous or current enforcement actions:
No previous bioassessments by DER. EPA does require toxicity testing in the NPDES permit.
WQBEL's – 208 plan by Brevard County was approved by DER in 1978.
No current formal enforcement actions.
Currently there is a "Memorandum of Understanding" which was entered into on July 16, 1992 between the city and the Department. This agreement establishes a framework to govern future wastewater system permitting with the city of Titusville including expansion of plant and submitting a Capacity Summary Report each month to determine if the Department will issue additional collection system permits.

Discuss comparability of MOR results to past DER results and whether there are trends (improving, declining) in the data set:
Comparing the MORs for the periods 7/92 – 6/93 vs 7/91 – 6/92:
1. Flow has increased by ≈.500 MGD (12 month avg.)
2. Total Nitrogen annual average was 17.537 mg/L vs 17.975 mg/L in 1993 (increase slightly).
3. Total Phosphorous annual average was .518 mg/L vs .471 in 1993 (decrease slightly).
4. TSS & BOD_5 remains about the same (low values).

Additional information:
The Indian River Lagoon Act requires the city to be out of the river by June 30, 1995.

Staff contributing to this review (signature):
Philip N. Kaser (Biologist)
Gary C. Miller (Inspector)
Al Custer (Engineer)
( )
( )
( )

FEDERAL EFFLUENT LIMITS TO INDIAN RIVER

Permit No. FL0020389

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on June 4, 1992 and lasting through the expiration date of this permit, the permittee is authorized to discharge from outfall(s) 001, sanitary wastewaters.

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

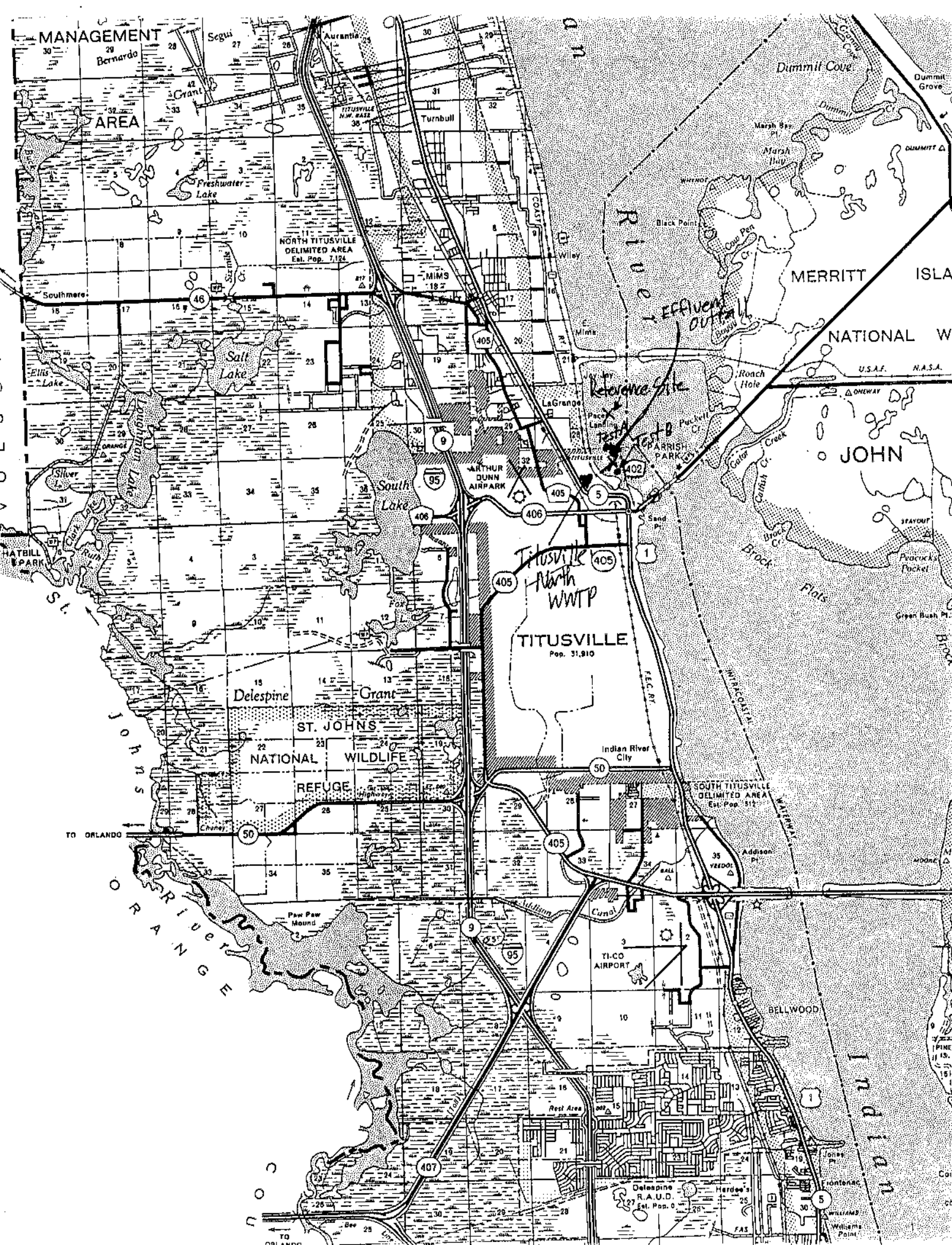
PARAMETERS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS		
	Annual Average	Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type	Sample Point
Flow, (MGD) --		Report	Report	--	Continuous	Meter	Effluent
Biochemical Oxygen Demand (5 Day)	--	30 mg/l	45 mg/l	--	1/Week	16 hr. Composite	Influent & Effluent
Total Suspended Solids	--	30 mg/l	45 mg/l	--	1/Week	16 hr. Composite	Influent & Effluent
Total Nitrogen (as N)	--	31.25 mg/l	37.5 mg/l	--	1/Week	16 hr. Composite	Effluent
Total Phosphorus (as P)	--	1.25 mg/l	1.5 mg/l	--	1/Week	16 hr. Composite	Effluent
Total Silver	--	--	--	0.35 ug/l	1/Month	24 hr. Composite	Effluent
Fecal Coliform Bacteria, N/100 ml	See Item 4 on Page I-3				1/Week	Grab	Effluent
Total Residual Chlorine	--	--	--	0.01 mg/l	1/Week	Grab	Effluent
pH shall not be less than 6.0 nor greater than 8.5 standard units.					Continuous	Meter	Effluent
Dissolved Oxygen shall not be less than 2.0 mg/l.					1/Week	Grab	Effluent

Titusville North

State Effluent Limits for Titusville North WWTP

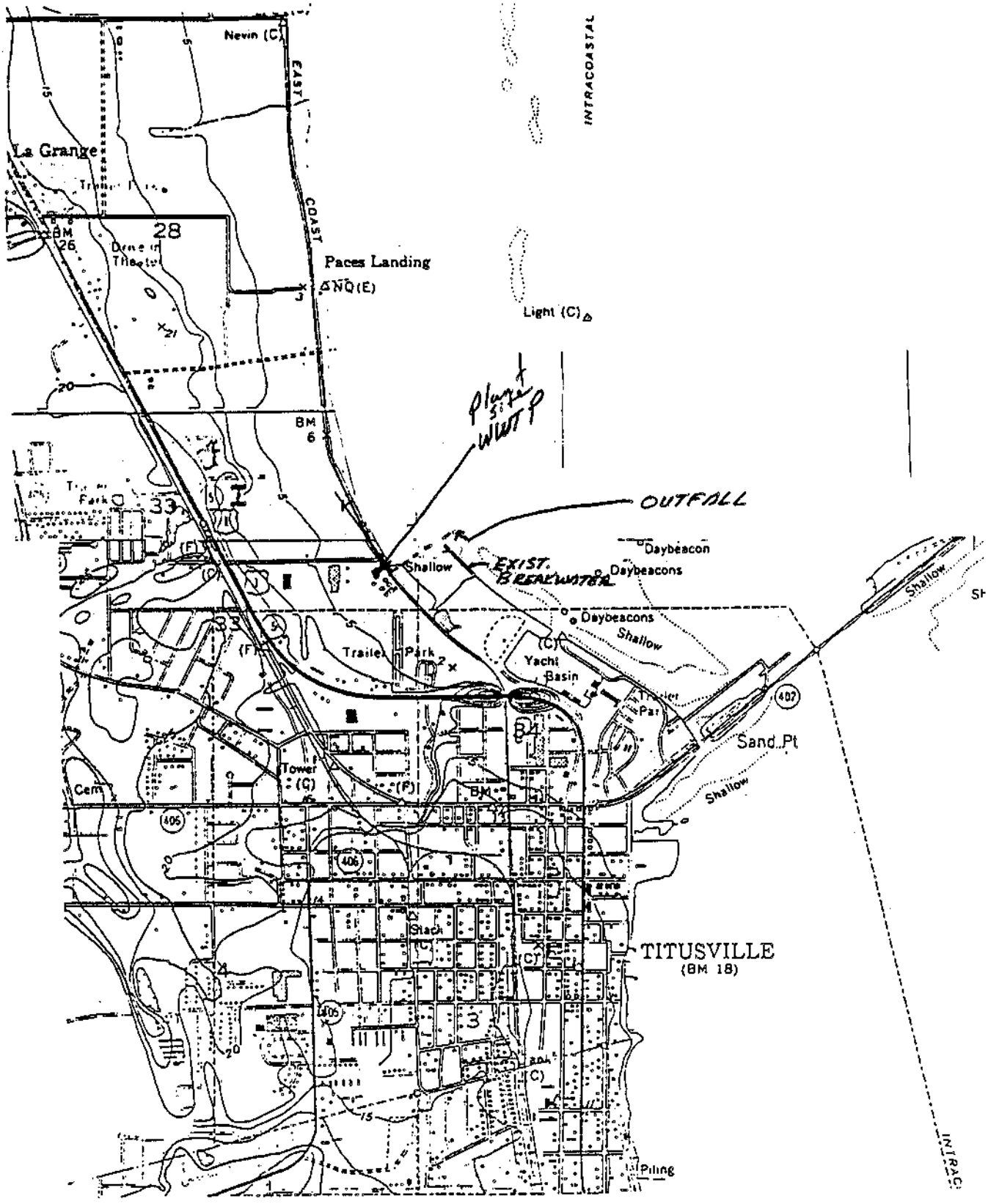
Parameter	Limit (units)
Total Nitrogen as N	25 mg/L*
Total Nitrogen as N	152,417.0 lbs/yr
Total Phosphorus as P	1.0 mg/L*
Total Phosphorus as P	6,096.7 lbs/yr
Dissolved Oxygen	≥ 2.0 mg/L
TSS	20 mg/L
BOD_5	20 mg/L
pH[5]	6 – 8.5 standard units
TCR before dechlorination	≥ 0.5 mg/L
TCR after dechlorination	≤ 0.01 mg/L
Fecal coliform	200 organisms/100 mL

*30 day average
TCR = total chlorine residual


MANAGEMENT
AREA
Segui
Bernardo
Aurantia
Grant
Turnbull
Freshwater Lake
NORTH TITUSVILLE DELIMITED AREA
Est. Pop. 7,124
Sixmile Cr.
Southmere
MIMS
Wiley
Indian River
Black Point
Cow Pen Cr.
Dummit Cove
Dummit Grove
Marsh Bay Pt.
Marsh Bay
DUMMITT
MERRITT ISLA
NATIONAL W
U.S.A.F.
N.A.S.A.
Ranch Hole
ONEWAY
→ effluent outfall
for Retrieval Site
Test A
Test B
LaGrange
Pace Landing
Puckett Cr.
PARRISH PARK
Gator Creek
Gator Cr.
Salt Lake
Ellis Lake
Doughnut Lake
ORANGE
Silver Lake
Clark Lake
Ruth Lake
HATBILL PARK
South Lake
ARTHUR DUNN AIRPARK
Titusville North WWTP
TITUSVILLE
Pop. 31,910
Sand Pt.
Brock Cr.
Brock Flats
Peacock's Pocket
STAYOUT
Green Bush Pt.
Fox Lake
Delespine
Grant
ST. JOHNS NATIONAL WILDLIFE REFUGE
Indian River City
SOUTH TITUSVILLE DELIMITED AREA
Est. Pop. 512
F.E.C.RY.
INTRACOASTAL WATERWAY
Addison Pt.
VEEDOL
BALL
TO ORLANDO
Chuney
Paw Paw Mound
Addison Canal
TI-CO AIRPORT
BELLWOOD
Rest Area
Delespine R.A.U.D.
Est. Pop. 0
Herdee's
Jones Pt.
Frontenac
WILLIAMS
Williams Point
FAS
St. Johns River
Indian River
407
406
405
95
50
46
9
5
1
402

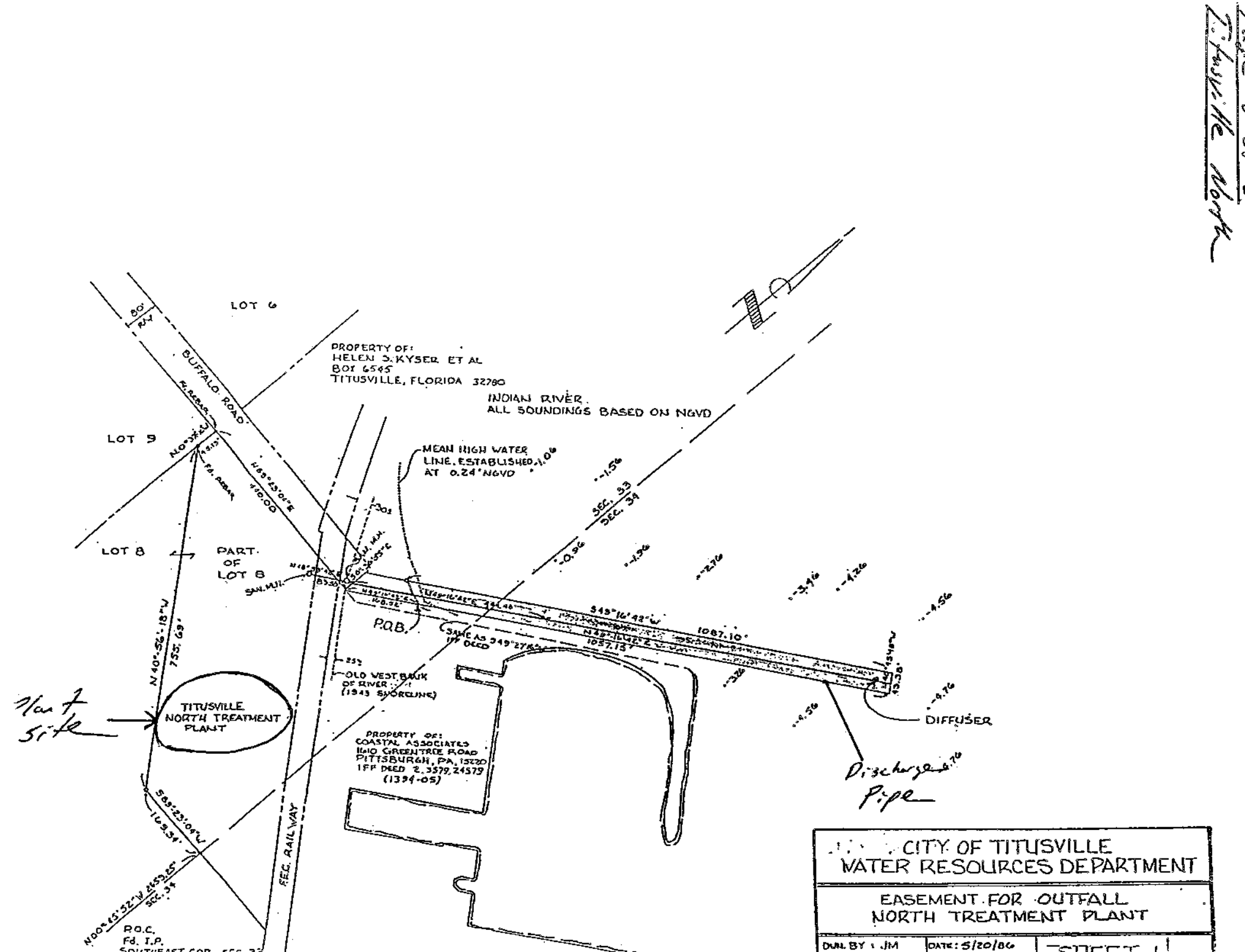
Page 3 of 6

Titusville North



N

1" = 2000'


LOT 6
80' R/W
BUFFALO ROAD
PROPERTY OF:
HELEN S. KYSER ET AL
BOX 6545
TITUSVILLE, FLORIDA 32780
INDIAN RIVER
ALL SOUNDINGS BASED ON NGVD
LOT 9
MEAN HIGH WATER LINE, ESTABLISHED AT 0.24' NGVD
SEC. 33
SEC. 34
LOT 8
PART OF LOT 8
P.O.B.
SAME AS 349°27'E IFF DEED
OLD WEST BANK OF RIVER (1943 SHORELINE)
TITUSVILLE NORTH TREATMENT PLANT
PROPERTY OF:
COASTAL ASSOCIATES
1110 GREENTREE ROAD
PITTSBURGH, PA. 15220
IFF DEED #3579,24579
(1394-05)
FEC. RAILWAY
P.O.C.
Fd. I.P.
SOUTHEAST COR. SEC. 33
DIFFUSER
Discharge Pipe
New Site
CITY OF TITUSVILLE
WATER RESOURCES DEPARTMENT
EASEMENT FOR OUTFALL
NORTH TREATMENT PLANT
DWN BY: JM
DATE: 5/20/86
SHEET 1

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 4)

SUBMITTING AGENCY CODE: 30 / SUBMITTING AGENCY NAME: FDEP CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 09/20/93	TIME	RECEIVING BODY OF WATER: INDIAN RIVER LAGOON

REMARKS: REFERENCE	LOCATION: TITUSVILLE NORTH STP 1105 BUFFALO ROAD NORTH TITUSVILLE, FL.	FIELD ID/NAME: TITUSVILLE NORTH STP

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
100						

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

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

Point-Source Pollution (list location and describe):

Estimated System Width (range, m): 2-3 m	Estimated System Depth (range, m): 0-4 m	yes
High Water Mark (m above bed): NA	Velocity (range, m/s): NA	Impounded [ ] Channelized [ ]

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

SEDIMENT/SUBSTRATE

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

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

Sediment Deposits: Sludge: [ ] Paper Fiber: [ ] Mud: [X] Sand: [X] Shell: [ ] Other: [ ] ALGAE

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)				Riffles			
Leaf Packs				Sand	10		
Aquatic Vegetation	90			Mud/Muck/Silt	20		
Rock or Shell Rubble				Benthic leaf mats			
Undercut Banks/Roots				Other:			

WATER QUALITY

	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm):			Secchi (m):
Top								
Mid-depth	0.5	30.4	8.1	6.6	39,600			Bottom 1 meter
Bottom								

System Type : Stream: [ ] (Sand Bottomed [ ] Swamp & Bog [ ] Alluvial [ ] Sand Bot w/ Spring [ ] Calcareous [ ] Misc.) Lake: [ ] Wetland: [ ] Estuary: [X] Other: [ ]

Water Odors (check box): Normal: [X] Sewage: [ ] Petroleum: [ ] Chemical: [ ] Other: [ ]

Water Surface Oils (check box): None: [X] Sheen: [ ] Globs: [ ] Slick: [ ]

Clarity (check box): Clear: [X] Slightly turbid: [ ] Turbid: [ ] Opaque: [ ]

Color (check box): Tannic: [ ] Green (algae): [ ] Clear: [X] Other: [ ]

Weather Conditions: 180° @ 5K (Wind south at 5 knots) 10% CLOUDS

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

SAMPLING TEAM: KANE, KENT	SIGNATURE: Philip N. Kane	DATE: 09/20/93

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 4)

SUBMITTING AGENCY CODE: 30 / SUBMITTING AGENCY NAME: FDEP CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 09/20/93	TIME	RECEIVING BODY OF WATER: INDIAN RIVER LAGOON

REMARKS:	LOCATION:	FIELD ID/NAME:
TEST A	TITUSVILLE NORTH STP 1105 BUFFALO ROAD NORTH TITUSVILLE, FL.	TITUSVILLE NORTH STP

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
50				25	25	

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

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

Point-Source Pollution (list location and describe): STP DISCHAGE 100 YD S TO SOUTH

Estimated System Width (range, m): 2 MILES	Estimated System Depth (range, m): 0-4 m		N/A yes
High Water Mark (m above bed): N/A	Velocity (range, m/s): N/A	Impounded [ ] Channelized [ ]	

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

SEDIMENT/SUBSTRATE

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

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

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

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

WATER QUALITY

	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm):			Secchi (m):
Top								
Mid-depth	1 m	30.1	7.95	5.36	38,400			0.6
Bottom								

System Type : Stream: [ ] (Sand Bottomed, Swamp & Bog, Alluvial, Sand Bot w/ Spring, Calcareous, Misc.) Lake: [ ] Wetland: [ ] Estuary: [X] Other: [ ]

Water Odors (check box): Normal: [ ] Sewage: [X] EFF. Petroleum: [ ] Chemical: [ ] Other: [ ]

Water Surface Oils (check box): None: [X] Sheen: [ ] Globs: [ ] Slick: [ ]

Clarity (check box): Clear: [ ] Slightly turbid: [X] Turbid: [ ] Opaque: [ ]

Color (check box): Tannic: [ ] Green (algae): [X] Clear: [ ] Other: [ ]

Weather Conditions: (Dove south at 5 knots)
190° @ 5K
70% clouds

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

SAMPLING TEAM:	SIGNATURE:	DATE:
KANE, KENT	Philip N. Kane	09/20/93

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 4)

SUBMITTING AGENCY CODE: 30 / SUBMITTING AGENCY NAME: FDEP CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 09/20/93	TIME	RECEIVING BODY OF WATER: INDIAN RIVER LAGOON

REMARKS:	LOCATION:	FIELD ID/NAME:
TEST B	TITUSVILLE NORTH STP 1105 BUFFALO ROAD NORTH TITUSVILLE, FL.	TITUSVILLE NORTH STP

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
25				25	50	

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

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

Point-Source Pollution (list location and describe): STP DISCHARGE

Estimated System Width (range, m): 2.5 MILES	Estimated System Depth (range, m): 0-4m	N/A	yes
High Water Mark (m above bed): N/A	Velocity (range, m/s): N/A	Impounded ☐	Channelized ☐

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: ☐

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

WATER QUALITY

	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm):			Secchi (m):
Top								
Mid-depth	1M	30.89	8.12	5.95	39,000			0.6
Bottom								

System Type : Stream: ☐ (Sand Bottomed / Sand Bot w/ Spring / Swamp & Bog / Calcareous / Alluvial / Misc) Lake: ☐ Wetland: ☐ Estuary: ☑ Other: ☐

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

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

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

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

Weather Conditions: 180° @ 5K (due south at 5 knots) 70% CLOUDS

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

SAMPLING TEAM:	SIGNATURE:	DATE:
KANE, KENT	Philip N. Kane	09/20/93

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

SUBMITTING AGENCY CODE: 30 SUBMITTING AGENCY NAME: FDEP CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 09/20/93	RECEIVING BODY OF WATER: INDIAN RIVER LAGOON

REMARKS:	LOCATION:	FIELD ID/NAME:
REFERENCE	TITUSVILLE NORTH STP 1105 BUFFALO ROAD NORTH TITUSVILLE, FL.	TITUSVILLE NORTH STP

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 1	>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 9	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 7	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 70

COMMENTS: CAULERPA 2 / GRACILARIA / sea lettuce ULVA

ANALYSIS DATE:	ANALYST:	SIGNATURE:
09/20/93	DR. PHIL KANE	Philip N. Kane

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

SUBMITTING AGENCY CODE: 30 SUBMITTING AGENCY NAME: FDEP CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 09/20/93	RECEIVING BODY OF WATER: INDIAN RIVER LAGOON

REMARKS: TESTA	LOCATION: TITUSVILLE NORTH STP 1105 BUFFALO ROAD NORTH TITUSVILLE, FL.	FIELD ID/NAME: TITUSVILLE NORTH STP

Habitat Parameter score	Excellent	Good	Fair	Poor
Littoral Alterations 8	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 1	>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 5	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 7	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 65

COMMENTS:

ANALYSIS DATE: 09/20/93	ANALYST: DR. PHIL KANÉ	SIGNATURE: Philip N. Kane

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

SUBMITTING AGENCY CODE: 30 / SUBMITTING AGENCY NAME: FDEP CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 09/20/93	RECEIVING BODY OF WATER: INDIAN RIVER LAGOON

REMARKS: TEST B	LOCATION: TITUSVILLE NORTH STP 1105 BUFFALO ROAD NORTH TITUSVILLE, FL	FIELD ID/NAME: TITUSVILLE NORTH STP

Habitat Parameter / score	Excellent	Good	Fair	Poor
Littoral Alterations 3	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 1	>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 5	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 7	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 60

COMMENTS:

ANALYSIS DATE: 09/20/93	ANALYST: DR. PHIL KANE	SIGNATURE: Philip N. Kane

COLLECTED 9-20-93 BEGAN 9-21-93 KP

Sample Source: Titusville North WWTP
Location: Titusville North STP
County: BREVARD
Contact/District: Phil Kane / Central District
NPDES Permit #: FL00 20389 **Outfall #:**

Sample Collection: Date 9-20-93 Time 0930
Test Beginning: Date 9-24-93 Time 1300
Test Ending: Date 9-22-93 Time 1300
Organism Batch #: 110 **Diluent Batch #:** 24
Organism Age: <24hrs
Test Organism: Ceriodaphnia dubia

62386 93-SEP-21-26

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

Test Number: 1 of 2

Remarks:
test terminated @24 hours due to 100% test mortality

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	24.6 @ 24.7	8.3 @ 24.5	1005 @ 1,000 9720 @ 10,000 @ 24.7
24 hr	7.0 @ 7.0 9.0 @ 9.0	24.4 @ 24.5	8.3 @ 24.5	990 @ 1,000 9590 @ 10,000 @ 24.5°
48 hr	___ @ 7.0 ___ @ ___	___ @ ___	___ @ ___	___ @ 1,000 ___ @ 10,000 @ ___

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 h	pH 0 hr	pH 24 h	pH 48 h	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 h	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 h	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 0 hr	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 24 h	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 48 h
Control	A	5	5		8.4	8.2		24.2	23.9		8.7	8.0		180	205	
Control	B	5	5			8.2			23.8			8.0			190	
Control	C	5	5			8.2			23.8			7.9			185	
Control	D	5	5			8.2			23.6			8.0			190	
100%	A	5	0		6.7	7.9		25.3	23.8		6.8	7.9		890	940	
100%	B	5	0			7.9			23.9			7.8			895	
100%	C	5	0			7.9			23.8			7.8			870	
100%	D	5	0			7.9			23.7			7.7			890	
Measured/Loaded by:		MF	KP		MF	MF		MF	MF		MF	MF		MF	MF	
Recorded by:		MF	KP		TR	MF		TR	TM		TR	TM		TR	TM	

Investigators' Signatures

Robin O'Rade
Marshall Faulkner
Kim Pearce
Tina Mikulsky
Reviewer

	Salt Water/ (Well Water)	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2:			not measured		
Lab Total Residual Cl2:	<0.03	<0.03	<0.03	DR-100	TR
Alkalinity:	125	70	60	Hach	TR
Hardness:	120	80	145	Hach	TR
Total Ammonia:	<0.017	<0.017	1.84	Orion	MF

Ammonia Meter #98136 Ammonia Meter Slope: -57.6 Ammonia Blank: <0.017 Control Salinity: 0 ppt Sample Salinity: 0 ppt

form updated 7/8/93

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Titusville North WWTP
Location: Titusville North STP
County: Brevard
Contact/District: Phil Kane / Central District
NPDES Permit #: FL0020389 **Outfall #:**

Sample Collection: Date ~~9-23-93~~ 9-20-93 Time 0930
Test Beginning: Date 9-21-93 Time 1300
Test Ending: Date 9-23-93 Time 1300
Organism Batch #: 39 **Diluent Batch #:** well
Organism Age: 9 days old
Test Organism: Cyprinella leedsi

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

Test Number: 2 of 2

Remarks:

622386 93-SEP-21-26

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	24.6 @ 24.7	8.3 @ 24.5	1005 @ 1,000 9720 @ 10,000 @ 24.7°C
24 hr	7.0 @ 7.0 9.0 @ 9.0	24.4 @ 24.5	8.3 @ 24.5	990 @ 1,000 9590 @ 10,000 @ 24.5°C
48 hr	7.0 @ 7.0 9.0 @ 9.0	23.9 @ 24.0	8.4 @ 24.0	1005 @ 1,000 9730 @ 10,000 @ 24.5°C

Conc.	Chamber #	Number Live			pH			Temperature (°C)			D.O. (mg/L)			UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm)		
		0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h
Control A	219	5	5	5	7.8	8.2	8.3	24.0	24.6	24.2	8.1	7.7	8.1	245	275	270
Control B	28	5	5	5	7.8	8.2	8.3			24.2	8.1	7.7	8.0	245	250	250
100% A	120	5	5	5	6.7	7.4	7.6	25.7	24.6	24.2	6.8	7.1	7.8	940	920	915
100% B	390	5	5	5	6.7	7.3	7.6			24.1	6.8	7.1	7.6	940	920	915
Measured/Loaded by:		MF	KP	TM	MF	MF	TM	MF	MF	TM	MF	MF	TM	MF	MF	TM
Recorded by:		MF	KP	TM	TR	TM	TR	TR	TM	TR	TR	TM	TR	TR	TM	TR

Investigators' Signatures

Tobin C. Rader
Marshall Faircloth
Kim Pearce
Tina M. Kuldell
Reviewer

	Salt Water/ (Well Water)	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2:			not measured		
Lab Total Residual Cl2:	<0.03	<0.03	<0.03	DR100	TR
Alkalinity:	125	70	60	Hach	TR
Hardness:	120	80	145	Hach	TR
Total Ammonia:	<0.017	<0.017	1.84	Orion	MF

Ammonia Meter #98136 Ammonia Meter Slope: -57.6 Ammonia Blank: <0.017 Control Salinity: 0 ppt Sample Salinity: 0 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

Benthic macroinvertebrate taxa list for Titusville North WWTP, collected via Ponar grab samples in the Indian River, on 20 September, 1993. Densities, in number/m^2, represent the mean of three replicates.

	Reference Site	Test Site A	Test Site B
Cnidaria			
Undetermined anthozoa	187	37	112
Echinodermata			
Ophiophragmas filograneus	112	112	37
Gastropoda			
Bulla sp.	1,085	–	–
Bulla striata	–	524	–
Caecum pulchellum	150	–	–
Cerithium sp.	225	75	–
Crepidula sp.	37	–	–
Crepidula maculosa	187	187	–
Haminoea sp.	37	–	–
Haminoea succinea	–	37	75
Mitrella lunata	150	150	187
Modulus sp.	337	150	–
Nassarius vibex	–	–	112
Prunum sp.	337	–	–
Prunum apicinum	–	75	–
Pseudoneptunea sp.	150	–	–
Retusa sp.	–	75	–
Retusa canaliculata	–	–	112
Rissonia sp.	112	–	–
Triphora sp.	112	–	–
Turbonilla sp.	636	37	37
Undetermined Nudibranchia	37	–	–
Malacostraca			
Amphipoda			
Grandidierella bonnieroides	636	75	412
Decapoda			
Ogyrides alphaerostris	–	37	–
Rhithropanopeus harrisii	75	–	–
Sergia splendens	–	112	–
Isopoda			
Erichsonella attenuata	75	–	–
Mysidacea			
Mysidopsis almyra	–	–	37
Mysidopsis bahia	–	–	37
Pelecypoda			
Anadara sp.	–	–	37
Brachiodontes exustus	38,024	13,847	–
Chione cancellata	262	–	–
Geukensia demissa	–	–	75

Mulinia lateralis	–	487	–
Parastarte triquetra	75	37	–
Rangia cuneata	–	–	1,010
Tellina sp.	–	75	37
Undetermined venerid	–	–	37
Undetermined pelecypod	112	–	–
Platyhelminthes			
Undetermined polyclad	–	–	37
Polychaeta			
Capitella capitata	37	–	–
Cistena gouldii	150	150	–
Clymenella torquata	75	–	–
Diopatra cuprea	75	–	112
Dorvillea sociablis	37	–	–
Eunice websteri	37	–	–
Glycinde solitaria	75	75	37
Gyptis brevipalpa	–	–	75
Marphysa sanguinea	75	–	–
Melinna cristata	112	37	–
Nereis succinea	37	–	–
Ophelia denticulata	37	–	–
Owenia sp. A.	6,100	225	–
Paraprionospio pinnata	–	262	262
Paranaitis sp.	150	75	–
Pista sp.	112	–	–
Podarke obscura	412	–	37
Polydora socialis	–	–	37
Prionospio pygmaea	75	–	–
Sabella melanostigma	1,235	187	–
Sabella microphthalma	37	–	–
Spiophanes bombyx	–	–	37
Streblospio benedicti	–	1,984	3,555
Syllis hyalina	150	37	–
Undetermined ampharetid	–	37	–
Undetermined maldanid	37	–	–
Undetermined Polychaeta	749	–	–
Sipuncula			
Phascolion strombi	37	112	–
Total	52,991	19,310	6,543

Phytoplankton taxa list and densities (#/mL) for Titusville North WWTP, collected via subsurface grabs in Indian River, on 20 September, 1993.

	Reference Site	Test A	Test B
Diatoms			
Chaetoceros sp.	–	–	516
Cocconeis sp.	64	393	–
Entomoneis sp.	–	66	–
Melosira sp.	–	–	64
Navicula sp.	129	393	322
Nitzschia closterium	–	197	–
Nitzschia pungens	–	328	258
Nitzschia reversa	–	131	193
Pleurosigma sp.	–	–	64
Skeletonema sp.	–	66	64
Synedra sp.	–	–	64
Unidentified diatom sp.	–	–	129
Chlorophyta			
Carteria sp.	–	131	–
Dunaliella sp.	1611	328	258
Pandorina sp.	–	–	64
Cryptophyta			
Chroomonas sp.	–	197	–
Cyanophyta			
Chamaesiphon sp.	–	–	129
Gloeothece sp.	64	–	–
Merismopedia sp.	–	131	–
Microcystis sp.	193	–	258
Euglenophyta			
Euglena sp.	–	197	193
Phacus sp.	–	131	–
Haptophyceae			
Prymnesium sp.	–	–	64
Pyrrhophyta			
Ceratium sp.	–	–	64
Gymnodinium sp.	–	197	193
Peridinium sp.	–	590	64
Total	2061	3476	2961

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

1 Transaction Code	2	3 NPDES NUMBER	11	12 YR/MO/DA	17	18 Insp Type	19 Inspector	20 Fac Type
N	5	FL0020389		930920		B	S	1

Remarks

21 66

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

1 Transaction Code	2	3 NPDES NUMBER	11	12 YR/MO/DA	17	18 Insp Type	19 Inspector	20 Fac Type
N	5	FL0020389		930920		X	S	1

Remarks

21 66