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Biological Assessment of

City of Vero Beach Wastewater Treatment Plant

Indain River County

NPDES #FL0021661

Sampled March 1997

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August 1997

Biology Section
Division of Administrative and Technical Services

Comprehensive Quality Assurance Plan No. 870346G

Department of Environmental Protection
Results of Fifth Year Inspections

Discharger: Vero Beach Reuse Service Area
County: Indian River
NPDES Number: FL0021661
State Permit Expiration Date: 12-12-97

Toxics Sampling Inspection (XSI)

Date Sampled: 10 March 97

Results: The pesticide atrazine (0.42 µg/L) was detected in the effluent at a concentration well below chronically toxic levels. With the exception of non-problem levels of iron (140 µg/L), all effluent metals were less than detection limits.

Compliance Biomonitoring Inspection (CBI)

Date Sampled: 10 March 97

Results: The sample of chlorinated effluent was acutely toxic to the invertebrate, *Ceriodaphnia dubia*, and to the fish, *Cyprinella leedsi*. The effluent sample, after dechlorination in the laboratory, was still toxic to *Cyprinella leedsi*, but not toxic to *Ceriodaphnia*. Because the facility was not discharging to surface waters, this toxicity does not represent a violation.

Impact Bioassessment Inspection (IBI)

Date Sampled: 10 March 97

Results: Variations in benthic macroinvertebrate community characteristics between stations appeared to be more related to habitat (station geomorphometry), substrate attributes, and recruitment potential from the Indian River Lagoon, than to the influence of the discharge. The reference site, located in the Indian Lagoon, had much higher taxa richness and Shannon-Weaver diversity, as well as better representation of pollution sensitive taxa than did the test sites, which were situated in a dead end canal. The presence of a few pollution sensitive taxa at the test sites suggests at least moderately good water quality in the canal. Phytoplankton taxa richness and Shannon-Weaver diversity were better at the test sites than the reference site. The moderately elevated chlorophyll *a* (11.9 µg/L) found at test site 1 would not be unexpected for a poorly flushed canal system.

Water Quality Inspection (WQI)

Date Sampled: 10 March 97

Results: Although certain effluent nutrient measurements were elevated (*e.g.*, effluent TKN was 18 mg/L), no nutrient enrichment in the receiving waters could be attributed to the facility. Nutrient concentrations at the reference and test sites alike were relatively average for a Florida estuary. Algal growth potential (AGP) was measured to be 3.7 mg dry wt/L at the reference site, 7.5 mg dry wt/L at test site 1, and 3.5 mg dry wt/L at test site 2. These values are below the "problem threshold" of 10 mg dry wt/L for marine waters. Effluent AGP was 214.7 mg dry wt/L.

Introduction

The Vero Beach Wastewater Treatment Plant is located in Indian River County, Florida (see map in Appendix). Treatment at this 4.5 MGD complete-mix, activated sludge, advanced domestic wastewater treatment facility consists of biological processing, chemical additions, tertiary filtering, high level chlorination, and subsequent de-chlorination. The average flow from the facility is 3.8 MGD. Of this total, an average of 3.67 MGD of the effluent is discharged to groundwater at public access irrigation sites. A wet weather discharge to the Indian River Lagoon is permitted for up to 60 days per year, when the dilution factor in the receiving waters is at least 76.8:1. During the wet weather discharge period, the average daily flow is not to exceed 4.5 MGD.

Permit limits are as follows: flow (4.5 MGD), $CBOD_5$ (17.0 mg/L as a monthly average, 20.4 as a weekly average), total suspended solids (30.0 mg/L as a monthly average, 45.0 mg/L as a weekly average), total nitrogen (20.0 mg/L as a monthly average, 24.0 mg/L as a weekly average), total phosphorus (7.0 mg/L as an monthly average, 8.4 as a weekly average), fecal coliform bacteria (200 org/100 mL as an arithmetic mean, 800 org/100 mL maximum), pH (6.0 SU to 8.5 SU), total residual chlorine (minimum of 0.5 mg/L for disinfection, 0.01 mg/L maximum at discharge), and dissolved oxygen (minimum of 5.0 mg/L).

In addition to the above requirements, the facility also must conduct surface water monitoring, on a quarterly basis, at two locations in the Indian River (at stations north and south of the discharge canal).

Between the period from November, 1995, to October, 1996, the facility exceeded permit limits for: maximum residual chlorine after dechlorination (one time), maximum turbidity for reuse (on 4 occasions), and maximum days of discharge to surface waters (exceeded by 95 days) (see Facility Summary in Appendix).

Major characteristics of community structure of study sites.

	Reference Site	Test Site 1	Test Site 2
Macroinvertebrate Ponar			
Number of Taxa	38	12	12
Shannon-Weaver Diversity	3.1	1.4	0.7
% Polychaeta	83.5	88.6	92.8
# Polychaete taxa	17	6	5
% Tubificidae	2.5	0	4.9
% Amphipoda	3.2	1.2	0.5
% Gastropoda	4.5	0	0
% Isopoda	1.3	1.5	0.9
% Pelecypoda	2.0	3.7	2.2
% Mysidacea	1.6	0	0.7
% Cumacea	1.6	0	2.9
% Predator/Carnivores	6.5	3.7	0.5
% Above-Surface Deposit Feeders	26.3	41.7	46.1
% Below Surface Deposit Feeders	31.0	7.7	0.5
% Scavengers	2.2	1.4	0.9
% Suspension Feeders	26.6	42.9	51.5
% Scrapers	2.5	0	0
Phytoplankton Algae			
Number of Taxa	12	23	22
Shannon-Weaver Diversity	2.5	3.6	3.6
Chlorophyll a (µg/L)	1.0 U	11.9	1.0 U
Algal Density (#/mL)	370	983	1601
% Blue-green	0	5.1	0.5
% Green	2.6	8.6	5.0
% Diatoms	44.2	73.5	65.8
Algal Growth Potential (mg dry wt/l)	3.7	7.5	3.5

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 Indian River Lagoon, approximately 700 m southeast of the discharge) and two test sites (bracketing the discharge in an unnamed canal which flows to the Indian River Lagoon) (see maps in Appendix). A habitat as-

sessment was performed *in situ* to establish comparability between sites. The facility was not discharging during this study, therefore, samples of effluent were collected prior to routing to the re-use system. The facility had recently been discharging (until 6 March 1997, when the flow was 1.862 MGD). Supplemental physical/chemical data were also collected on the effluent and study sites. Acute screening toxicity bioassays, using *Ceriodaphnia dubia*, and *Cyprinella leedsi*, as test organisms, were performed on an effluent sample (Weber 1991). The effluent was analyzed for metals and for organic constituents (base neutral and acid extractables, 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.

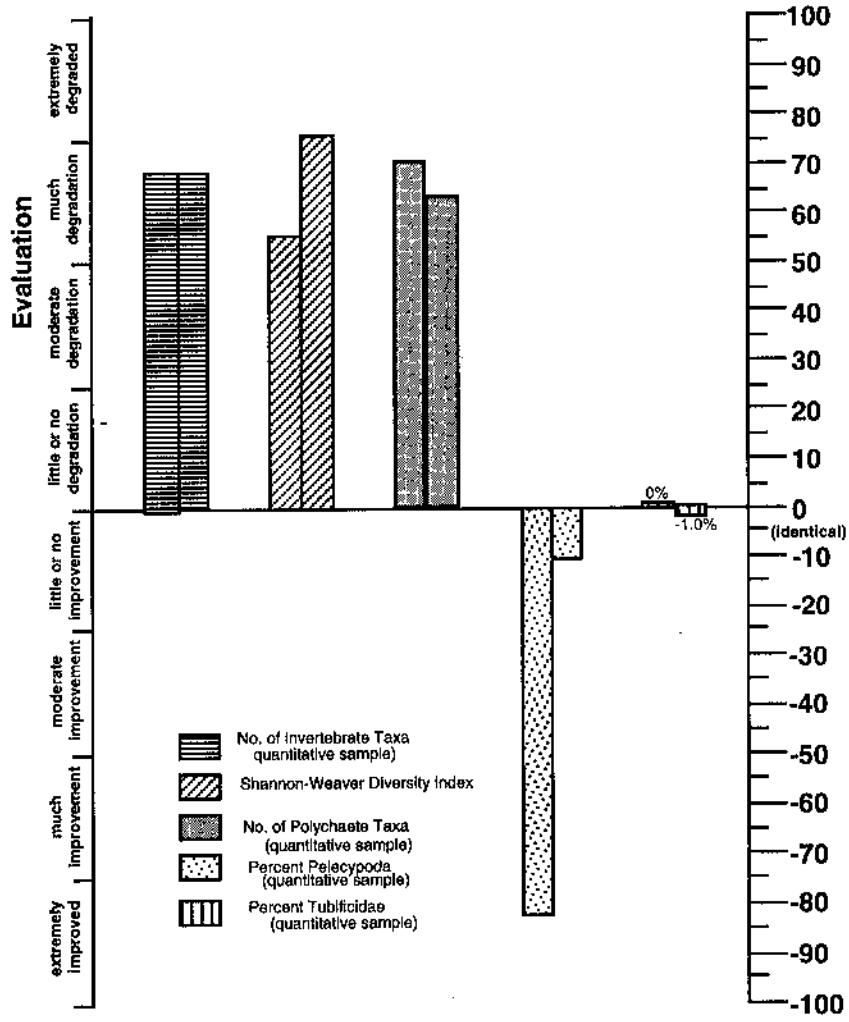
Benthic macroinvertebrate communities were evaluated at reference and test sites. Invertebrates were collected using three replicate petite Ponar grabs. Phytoplankton was sampled at both reference and test sites via subsurface grabs (Ross 1990). Chlorophyll *a* was also determined for phytoplankton communities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

Explanation of Measurements of Community Health

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

Habitat Assessment: Seven attributes known to have potential effects on the stream biota were evaluated and scored, with 20 points possible for each factor. Based on the sum of these individual scores, overall habitat quality for freshwater systems is assigned to one of four categories: Optimal (105-140 points); Suboptimal (70-104 points); Marginal (35-69 points); or Poor (0-34 points). For marine systems, the habitat assessment scores fall into these categories: Optimal (75-100 points); Suboptimal (50-74 points); Marginal (25-49 points); or Poor (0-24 points).

Taxa richness: Stress tends to reduce the number of different types of organisms present in a system, although moderate nutrient enrichment may sometimes be correlated with increased algal taxa richness.



Effect of discharge on the benthic macroinvertebrate community.

The left bar for each parameter shows differences between the reference site and test site 1. The right bar shows differences between the reference site and test site 2.

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

Numbers of pollution sensitive taxa: Some organisms become rare or absent as the intensity or duration of disturbance increases. For example, the Florida Index assigns points to stream-dwelling macroinvertebrates based on their sensitivity to pollution (see Ross 1990). A site with a high Florida Index score is considered healthy. Species sensitivity data from other sources, such as Hudson *et al.* (1990), Lenat (1993), and Chang *et al.* (1992) are used as appropriate.

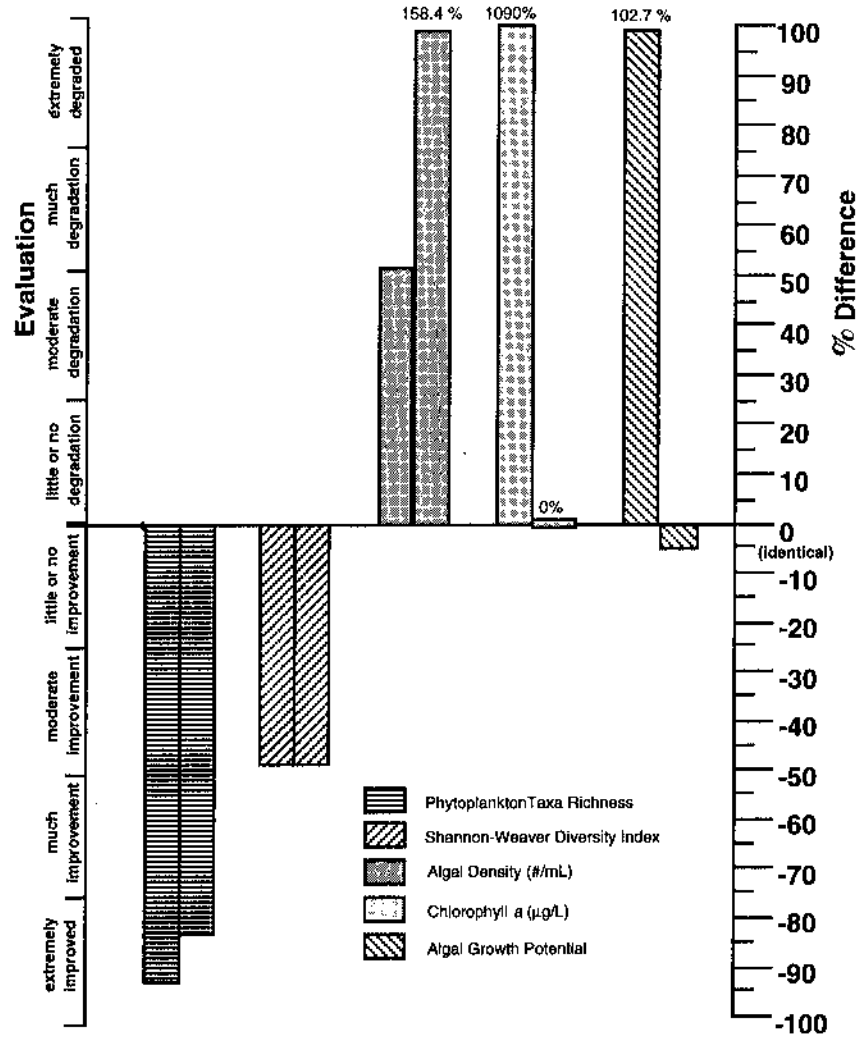
Ephemeroptera/Plecoptera/Trichoptera Index: This index is the sum of the number of EPT taxa present. Higher EPT values are associated with healthier systems.

Community structure: Substantial shifts in proportions of major groups of organisms, compared to reference conditions, may indicate degradation.

Algal biomass: High algal biomass (algal density or chlorophyll *a*) implies nutrient stress. A decreased diatom to blue-green algae ratio (calculated by dividing the number of individuals in the Bacillariophyta by the number of individuals in the Bacillariophyta + Cyanophyta) is often indicative of nutrient enriched conditions in flowing streams.

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

The Stream Condition Index for Florida (SCI) is a composite macroinvertebrate metric (Barbour *et al.* 1996). The SCI assigns points to a variety of parameters, depending on how closely each parameter approaches an expected reference condition (see SCI calculation table in Appendix).



Effect of discharge on the algal community.

The left bar for each parameter shows differences between the reference site and test site 1. The right bar shows differences between the reference site and test site 2.

For graphical purposes, the percent differences between the reference and test sites involving the number of taxa, the diversity index, the diatom to blue-green algae ratio, the % filter-feeders, the number of polychaete taxa, and the % pelecypods are measured as the reference site minus test site divided by the reference site. The percent differences between sites involving the % tubificids, algal density, chlorophyll *a*, and algal growth potential are measured as the test site minus reference site divided by the reference site.

The following personnel were involved in this investigation: Phil Kane, Ilia Herrera, and Steve Kent (DEP Central District) and Lyn Burton, Jennifer Eichelberger, Ken Espy, Marshall Faircloth, Russel Frydenborg, Joy Jackson, Elizabeth Miller, Urania Quintana, Bart Richard, Lisa Tamburello, David Whiting, and Vicki Whiting, (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 test sites were established in an artificially channelized, dead end canal, which is tidally connected with the Indian River Lagoon. The reference site was in the Indian River Lagoon proper, located near a spoil island (see maps in Appendix). The reference site, with 77 points, scored higher on the habitat assessment than did the test sites (each with 62 points). The test sites lost points in the categories of community types observed, freshwater discharges/alterations, and sediment type. Sediments at both test sites consisted of sand and mud, while sediments at the reference site consisted mostly of a combination of sand and shell.

Physical/chemical parameters at the three study areas were similar. Mid-depth dissolved oxygen ranged from 7.3 to 8.1 mg/L and mid-depth pH was between 7.8 SU to 8.0 SU. Mid-depth salinity ranged 27.1 ppt at test site 1 to 31.1 ppt at the reference site and mid-depth temperature ranged from 24.1 to 24.5 °C.

The pesticide atrazine (0.42 µg/L) was detected in the effluent at a concentration well below chronically toxic levels (AQUIRE 1996). With the exception of non-problem levels of iron (140 µg/L), all effluent metals were less than detection limits.

The sample of chlorinated effluent was acutely toxic to the invertebrate, *Ceriodaphnia dubia*, and to the fish, *Cyprinella leedsi*, killing all test organisms within 20 minutes of exposure. The effluent sample, after dechlorination in the laboratory, was still toxic to *Cyprinella leedsi* (killing all fish within 48 hours), but not toxic to *Ceriodaphnia dubia* (with only 10% mortality in the full strength sample) (Appendix). Because the facility was not discharging to surface waters, this toxicity does not represent a violation.

Although certain effluent nutrient measurements were elevated (*e.g.*, effluent TKN was 18 mg/L), no nutrient enrichment in the receiving waters could be attributed to the facility. Nutrient concentrations at the reference and test sites alike were relatively average for a Florida estuary (see Typical Values in Appendix).

Algal growth potential (AGP) was measured to be 3.7 mg dry wt/L at the reference site, 7.5 mg dry wt/L at test site 1, and 3.5 mg dry wt/L at test site 2. These values are below the "problem threshold" of 10 mg dry wt/L for marine waters (Ron Raschke, U.S. EPA, personal communication). Effluent AGP was 214.7 mg dry wt/L.

Variations in benthic macroinvertebrate community characteristics between stations appeared to be more related to habitat (station geomorphometry), substrate attributes, and recruitment potential from the Indian River Lagoon, than to the influence of the intermittent discharge. The figure on p. 2 indicates the degree of difference between the invertebrate populations of the reference and test sites. Larger differences (that is, higher percentages) correspond with greater degrees of degradation. Negative values mean the test site is better than the reference site.

The reference site was located in the approximately 2,000 m wide Indian River Lagoon, while the test sites were situated in a 15 m wide man-made canal. A substantially greater number of taxa were found at the reference site (38 taxa) compared with the test sites (12 taxa apiece at both test sites). This increase in taxa richness largely consisted of additional polychaete, gastropod, isopod, and amphipod taxa not found at the test sites (see taxa list in Appendix). The reference site was located in the Indian River Lagoon, where recruitment of the predominantly sessile invertebrates would be expected via normal currents. The percentage of coarse particles (shell) in the sediment was also higher at the reference site. The test sites, located in a dead end canal system (approximately 200 m to 400 m from the mouth); had a higher percentage of fine sediment particles (mud) and would receive considerably less biological recruitment from the Indian River Lagoon.

While 17 polychaete taxa were found at the reference site, only 6 and 5 polychaete taxa were recovered from test sites 1 and 2, respectively. Shannon-Weaver diversity decreased from 3.1 at the reference

site (which is slightly above average for a Florida estuary), to 1.4 at test site 1 and 0.7 at test site 2. The test site 2 diversity is lower than values found in approximately 95% of other Florida estuaries, and probably reflects that it was situated in a dead end canal. Pelecypod abundance was comparable at all three sites, ranging from 2.0% of the total population at the reference site to 3.7% at test site 1. Tubificid oligochaetes were relatively uncommon at the reference site (2.5% of the total population) and at test site 2 (4.9%) and were absent from test site 1.

Several organisms considered by Farrell (1992) to be pollution sensitive, including the polychaetes, *Leitoscoloplos robustus* and *Prionospio heterobranchia*, the gastropod, *Caecum pulchellum*, the mysid, *Bowmaniella brasiliensis*, and the cumacean, *Oxyurostylis smithi* were present at the reference site, but not the test sites. A few pollution sensitive taxa were recovered from one or both test sites. These included the mysid, *Mysidopsis almyra*, the cumacean, *Cyclaspis varians*, the isopod, *Edotea montosa*, and the amphipod, *Ampelisca abdita*. The presence of such pollution sensitive taxa at the test sites suggests at least moderately good water quality in the canal.

The figure on p. 3 represents changes in the phytoplankton algal community. As was noted with the macroinvertebrates, larger differences (that is, higher percentages) correspond with greater degrees of degradation. Phytoplankton taxa richness increased from 12 taxa at the reference site to 23 taxa to 22 taxa at test sites 1 and 2, respectively. Shannon-Weaver diversity improved from 2.5 at the reference site to 3.6 at both test sites. While chlorophyll *a* was undetected at the reference site and at test site 2, the chlorophyll *a* at test site 1 (11.9 µg/L) was higher than those found in approximately 75% of typical Florida estuary systems. This chlorophyll a value would not be unexpected for a poorly flushed canal system.

Conclusions

The pesticide atrazine (0.42 µg/L) was detected in the effluent at a concentration well below chronically toxic levels. With the exception of non-problem levels of iron (140 µg/L), all effluent metals were less than detection limits.

The sample of chlorinated effluent was acutely toxic to the invertebrate, *Ceriodaphnia dubia*, and to the fish, *Cyprinella leedsi*. The effluent sample, after dechlorination in the laboratory, was still toxic to *Cyprinella leedsi*, but not toxic to *Ceriodaphnia*. Because the facility was not discharging to surface waters, this toxicity does not represent a violation.

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Phytoplankton taxa richness and Shannon-Weaver diversity was better at the test sites than the reference site. The moderately elevated chlorophyll *a* (11.9 µg/L) found at one test site would not be unexpected for a poorly flushed canal system.

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Chemistry Summary Table for Vero Beach WWTP.

	Effluent	Reference Site	Test Site 1	Test Site 2
Organic Constituents (ug/L)				
Atrazine	0.42			
Metals (ug/L)				
Aluminum	200 U			
Arsenic	10 U			
Cadmium	5 U			
Copper	25 U			
Chromium	10 U			
Iron	140			
Lead	5 U			
Mercury	0.1 U			
Nickel	5 U			
Selenium	10 U			
Silver	5 U			
Zinc	20 U			
Nutrients (mg/L)				
Ortho-phosphate	0.46 A	0.045	0.069	0.062 A
Total phosphorus	0.61	0.087	0.14	0.11
Ammonia	0.29 A	0.021	0.081	0.034
Nitrate/Nitrite	1.7 A	0.014	0.010 A	0.018
TKN	18 A	0.57	0.99	0.70
General Phys-Chem Parameters				
Habitat Assessment		77	60	60
D. O. (mg/L)		8.1	7.3	8.1
pH (SU)	7.1	8.0	7.8	8.0
Specific Conductance/(µmhos/cm)	1,065	46,700	41,310	45,100
Salinity (ppt)		31.3	27.7	29.1
Temperature (°C)		24.1	24.2	24.5
Hardness (mg CaCO3)	135.7			
Algal Growth Potential (mg dry wt/L)	214.7	3.7	7.5	3.5
Toxicity				
Bioassay Fish-Dechlorinated	Toxic			
Bioassay Invertebrate-Dechlorinated	10% mortality			
Bioassay Fish-Chlorinated	Toxic			
Bioassay Invertebrate-Chlorinated	Toxic			

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

Typical Values for Selected Parameters in Florida Waters

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

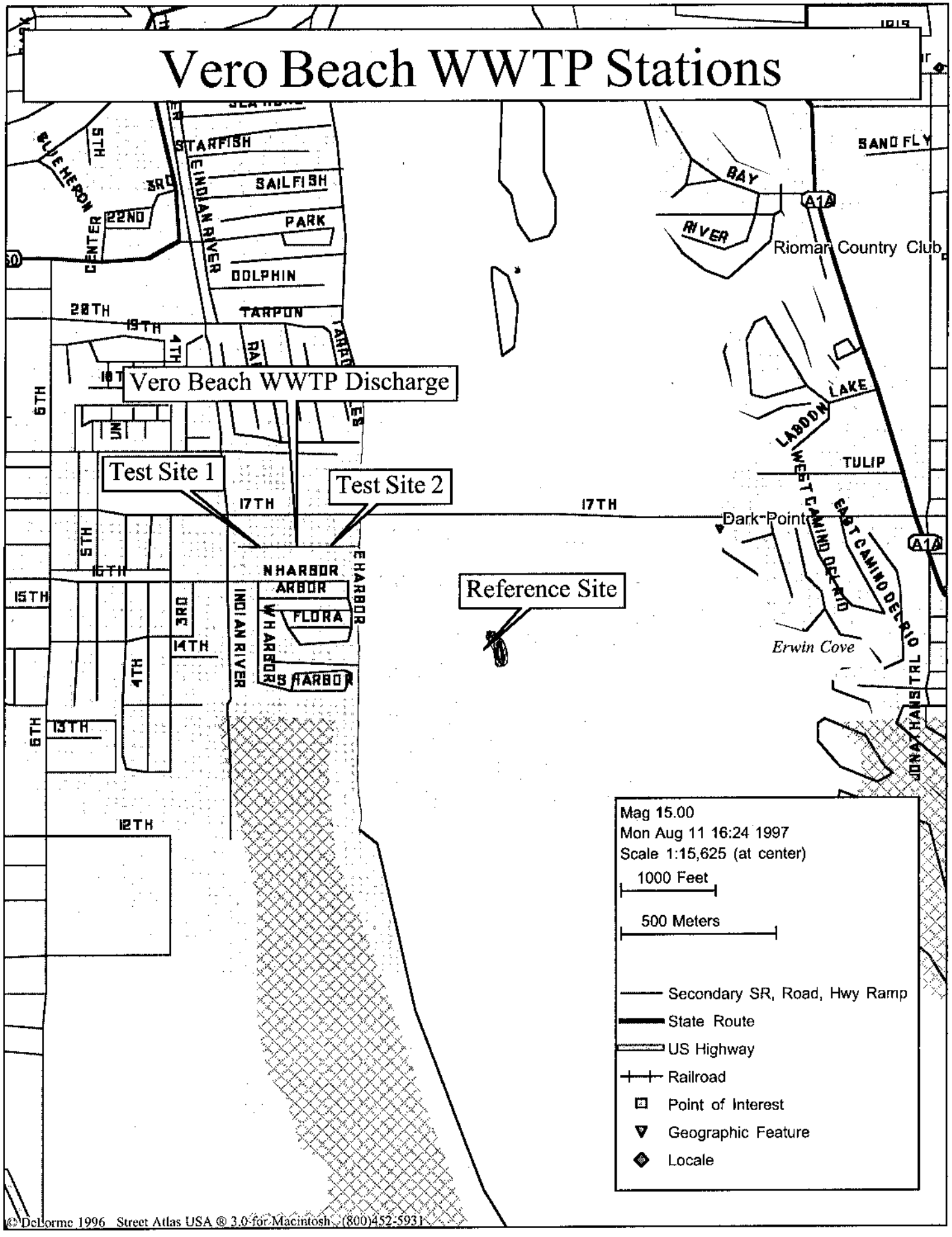
Percentile Distribution

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

Units:

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

Vero Beach WWTP Stations



DEPARTMENT OF ENVIRONMENTAL REGULATION

FACILITY SUMMARY

Name: Vero Beach Reuse Service Area		Date Summary Prepared: 2/26/97
Location (attach detailed map): See Attached Map	County: Indian River	District: Central
Federal Permit # FL0021661 and expiration date: 9/30/1998	State GMS # and 3031M03103 State expiration date: DO31-217129 exp. 12/12/97	Facility Type: Industrial (Municipal) Federal Agricultural Other (list):

Function of facility:
Domestic Wastewater Treatment Facility

Description of treatment process: This facility is a 4.5 mgd AADF complete-mix activated sludge wastewater treatment facility followed by a 4.95 mgd AADF water reclamation system which includes chemical feed facilities, tertiary filters, high-level chlorine tanks, a 3 mgd reclaimed water storage tank and associated transfer pumps. Reclaimed water is discharged to groundwater at public access irrigation sites with an anticipated capacity of 3.6 mgd. A wet-weather discharge via existing outfall to an adjacent drainage canal which discharges to the Indian River lagoon limited to 60 days a year, average daily flow to the canal is not to exceed 4.5 mgd.

Receiving waters: Indian River Lagoon

Classification: I II (III)

Design Flow:	Mean Flow:	Flow during survey:
4.5 MGD	3.30 mgd - Discharge 3.67 mgd - Reclaimed - Public Access	

Discharge is: Continuous Intermittent Seasonal (Rainfall dependent) → wet weather discharge
Other (describe) limited to sixty (60) days a year with a minimum stream dilution factor of 96:1 in the Indian River.
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 and NPDES Permits limits.	

Describe special permit conditions and permit modifications:

(1) City required to monitor 2 locations in the Indian River on a quarterly basis one downstream and one upstream of the confluence with the drainage ditch.

(2) on 10/6/94 permit was modified to add 2 rotary drum sludge thickeners and 2 blowers, replace diffusers in digesters, WAS line and pumps, construction of a bisulfite odor control system and fiberglass covers for digesters 1 & 2, and installation of polymer and caustic feed systems for pH control and construction of containment areas.

(3) Permit modified on 10/31/95 to require pre-treatment program.

(4) Permit modified on 1/09/96 to authorize irrigation @ the Moorings Community.

(5) 11/30/95 - Permit modified to make modifications to the [illegible] and Annual [illegible] permit.

City of Vero Beach
(Facility)

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

Description of permitted outfall(s):

Concrete pipe flows into an earthen drainage ditch, 30 inches in diameter, 0 feet from shore. Drainage ditch empties to the Indian River within the City limits.

List permit violations (from MOR data or other source) and plant upsets that occurred within past year:

Violations from MORs - 11/95 - 10/96: 0.68 mg/L TRC after dechlorination on 11/6/95. Turbidity for reuse was 4.1 NTU on 12/28/95 (max. of 40 NTU required). Turbidity of 5.99 NTU on 11/15/96. Turbidity of 5.7 NTU on 2/21/96. Turbidity of 4.6 NTU on 4/7/96.

Violations from DMRs: 11/95 - 11/96 - Exceeding total days of discharge (permitted to discharge 60 days total for the year). As of 11/96, they had discharged 155 days.

Major plant upset on 12/22/95, didn't affect discharge, but plant was "dead" due to some chemical dumped in plant from collection system.

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

(1) On 8/28/90 a Section 309 Order was issued by EPA due to toxicity violations from December 1988 through February 1990.

(2) No previous impact bioassessments.

Discuss comparability of MOR results to past DER results and whether there are trends (improving, declining) in the data set:

Review of MORs from 11/94 - 10/95 indicated the following, compared with the MORs from 11/95 - 10/96: For the surface water discharge, the fecal coliform was higher during more months, with highest values of 28 and 26 #/100 mL during the 95-96 year, compared with a highest value of 4 #/100 mL during the 94-95 year. During 94-95, TRC after dechlorination was over 0.01 mg/L on 1/95 (1.11 mg/L), while on 95-96 year, a maximum of 0.68 mg/L for 11/95 was reported. During year 94-95, a violation of TN (monthly Average) of 20.54 mg/L was reported. There were no violations of this parameter during year 95-96. Public Access reuse: During year 94-95, only during 3 months the turbidity was over 4.0 NTU. During year 95-96 it happened during 4 months.

Additional information:

Staff contributing to this review (signature):

Chris N. Kan, Ed.D	(Biologist)
Greg D. [illegible]	(Inspector)
Leo Miller 2/28/97	(Engineer)
[illegible]	(Supervisor)
Chris Fenard	(WFA)
	( )

PART I (CONTINUATION)
EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

2. In addition to the specified limits, the monthly average effluent total suspended solids concentrations shall not exceed 15% of the respective influent values (85% Removal). Percent removal shall also be reported on the Discharge Monitoring Report (DMR) Form (3320-1).

3. Samples collected to comply with the monitoring requirements specified herein shall be taken at the nearest accessible point after final treatment but prior to discharge to the receiving water.

4. The arithmetic mean of the monthly fecal coliform values (calculated as a geometric mean), collected during an annual period, shall not exceed 200 per 100 ml of reclaimed water or effluent sample. Any one sample shall not exceed 800 fecal coliform values per 100 ml of effluent sample.

5. The pH shall be monitored continuously via a recorder. The pH values shall not deviate outside the required range of 6.0 standard units to 8.5 standard units more than 1% of the time in any calendar month and no individual excursion shall exceed 60 minutes. An "excursion" is an unintentional and temporary incident in which the pH value of discharge wastewater exceeds the range set forth in this permit.

6. There shall be no discharge of floating solids or visible foam in other than trace amounts.

7. An LC_{20} of 100% or less in a test of 96 hours duration or less will constitute a violation of FAC (June 13, 1993) Section 17-4.244(3)(a) and the terms of this permit. The testing for this requirement must conform with Part IV of this permit.

8. The effluent shall not cause a visible sheen on the receiving water.

9. Tidal fluctuations, upstream of the discharge point, shall be reported when discharging into the Indian River. The minimum stream dilution factor (SDF) shall not be less than 76.8 in the Indian River. The tidal fluctuations, upstream of the discharge point, and the SDF must be submitted with the DMR.

10. Any bypass of the treatment facility which is not included in the effluent monitored above is to be monitored for flow and all other parameters (except acute whole effluent toxicity). For parameters other than flow, at least one grab sample per day shall be monitored. Daily flow shall be monitored or estimated, as appropriate, to obtain reportable data. All monitoring results shall be reported on a Discharge Monitoring Report (DMR) Form (3320-1).

11. According to Florida Administrative Code (FAC) Section 17-602.370, Classification and Staffing of Plants, dated May 8, 1985, this is a Class A, Category I treatment process that requires the services of a certified operator (Class C or higher) twenty-four (24) hours per day for seven (7) days per week. Also, the lead/chief operator shall be Class A.

12. TOTAL RESIDUAL CHLORINE (TRC) LIMIT: The daily maximum concentration of total residual chlorine (TRC) in the effluent shall not exceed 0.01 mg/l and shall be achieved by the effective date of the permit.

    Testing for total residual chlorine (TRC) shall be conducted according to either the low-level amperometric titration method or the DPD colorimetric method as specified in Section 4500-Cl E. or 4500-Cl G., respectively, Standard Methods for the Examination of Water and Wastewater, 17th Edition.

13. If the results for a given sample analysis are such that any parameter (other than fecal coliform) is not detected at or above the minimum level for the test method used, a value of zero will be used for that sample in calculating an arithmetic effluent mean value for the parameter. If the resulting calculated arithmetic mean value for that reporting period is zero, the permittee shall report "NODI=B" on the Discharge Monitoring Report (DMR) Form (EPA No. 3320-1). For fecal coliform, a value of 1.0 shall be used in calculating the geometric mean. If the resulting fecal coliform mean value is 1.0, the permittee shall report "NODI=B" on the DMR. For each quantitative sample value that is not detectable, the test method used and the minimum level for that method for that parameter shall be attached to and submitted with the DMR. The permittee shall then be considered in compliance with the appropriate effluent limitation and/or reporting requirement.

14. The permittee shall identify all wastewater discharges, at locations not authorized as permitted outfalls, that occur prior to the headworks of the wastewater treatment plant covered by this permit. The permittee shall submit, with the scheduled DMR, the following information for each discharge event at each source that occurs during the reporting period covered by the DMR:

    a.) the cause of the discharge;
    b.) duration and volume (estimate if unknown);
    c.) description of the source, e.g., manhole cover, pump station;
    d.) type of collection system that overflowed, i.e., combined or separate;
    e.) location by street address, or any other appropriate method;
    f.) date of event;
    g.) the ultimate destination of the flow, e.g., surface waterbody, land use location, via municipal separate storm sewer system to a surface waterbody, (show location on a USGS map or copy thereof); and
    h.) corrective actions or plans to eliminate future discharges.

PERMITTEE:
City of Vero Beach

I. D. Number: 3031M03103
Permit Number: DO31-217129
Expiration Date: 12/12/97

Attention: Hillman Goff, Director
Water & Wastewater Department

SPECIFIC CONDITIONS:

1. A. The required compliance sampling for discharge to the drainage ditch and surface water shall be as follows:

Parameter	Sample Point	Recording or sampling Frequency
Flow	(a)	continuous
Chlorine residual	(a) & (c)	continuous
pH	(a)	continuous
TSS*	(b)	weekly
$CBOD_5$*	(a)	weekly
Fecal coliform	(a)	weekly grab
Nitrate as N	(a)	weekly
Ammonia (NH_3) as N	(a)	weekly
Total Nitrogen as N	(a)	weekly
TKN as N	(a)	weekly
Total Phosphorous as P	(a)	weekly

(a) after disinfection (b) before disinfection (c) After dechlorination as a daily grab sample 7 days/week

B. The required sampling of the reclaimed water for reuse at public access sites shall be as follows:

Parameter	Sample Point	Recording or sampling Frequency (b)
Flow	(a)	continuous
Chlorine residual	(a)	continuous
Turbidity	(b)	continuous
pH	(a)	continuous
$CBOD_5$*	(a)	weekly
TSS*	(b)	daily, 7 days per week
Fecal coliform	(a)	daily, 7 days per week

(a) after disinfection (b) before disinfection

* Influent and effluent

The sampling and analysis required above shall be in accordance with Chapter 17-601, F.A.C. and approved standard methods. Properly executed reports shall be submitted monthly to this office by the 28th of the following month.

PERMITTEE:
City of Vero Beach

I. D. Number: 3031M03103
Permit Number: DO31-217129
Expiration Date: 12/12/97

Attention: Hillman Goff, Director
Water & Wastewater Department

SPECIFIC CONDITIONS:

After July 1, 1993 any laboratory test required by this permit shall be performed by a laboratory that has been certified by HRS in accordance with Rule 10D-41.100 - .113, F.A.C., to perform that test. On-site tests for dissolved oxygen, pH, and total chlorine residual shall be performed by a laboratory certified to test for dissolved oxygen, pH, and total chlorine residual or under the direction of an operator certified in accordance with Chapter 17-602, F.A.C.

2. Effluent Limitations for this facility, at the point of discharge to the drainage ditch, are as follows:

Parameter	Effluent Limitations (Maximum 30-day Average) mg/L
Biochemical Oxygen Demand ($CBOD_5$)	17.0
Total Suspended Solids (TSS)	30.0
Total Nitrogen as N	20.0
Total Phosphorous as P	7.0
Total Residual Chlorine (TRC)	0.01 (daily maximum)

3. A. The effluent intended for wet weather discharge shall be adequately chlorinated at all times, so as to maintain 0.5 mg/L total chlorine residual after a minimum contact period of 15 minutes (based upon peak flow) prior to dechlorination.

B. The reclaimed water delivered to public access land application systems shall be adequately chlorinated at all times so as to maintain a minimum of 1.0 mg/L total chlorine residual after a minimum contact period of 15 minutes (based upon peak hourly flow) or as required to comply with Rule 17-600.440(5), F.A.C.

4. Groundwater monitoring shall be performed in accordance with the previously approved groundwater monitoring plan, with the following modifications:

Reporting Frequency: The ground water monitoring data shall be reported according to the following schedule:

Sample Period	Report Due Date
1st Quarter (January-March)	April 15
2nd Quarter (April-June)	July 15
3rd Quarter (July-September)	October 15
4th Quarter (October-December)	January 15

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - Final

1. During the period beginning on the effective date and lasting through the expiration date of this permit, the permittee is authorized to discharge from outfall(s) 001, sanitary wastewater to a drainage ditch leading to the Indian River, only during wet weather conditions. The wet weather discharge is limited to sixty (60) days a year.

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

PARAMETERS	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS (During Discharge)		
	Monthly Average	Weekly Average	Measurement Frequency	Sample Type	Sample Point
Flow, MGD	Report	----	Continuous	Recording Flowmeter & Totalizer	Effluent
Carbonaceous Biochemical Oxygen Demand (5 Day) $CBOD_5$	17.0 mg/l	20.4 mg/l	1/Week	24-hr composite	Effluent
Total Suspended Solids, (TSS)	Report	----	1/Week	24-hr	Influent
	30.0 mg/l	45.0 mg/l	1/Week	composite	Effluent
Total Nitrogen, (as N)	20.0 mg/l	24.0 mg/l	1/Week	24-hr composite	Effluent
Total Phosphorus, (as P)	7.0 mg/l	8.4 mg/l	1/Week	24-hr composite	Effluent
Fecal Coliform Bacteria, N/100 ml	(See Item 4, page I-2)		1/Week	Grab	Effluent
Dissolved Oxygen	Shall not be less than 5.0 mg/l		5 Days/Wk	Grab	Effluent
pH, standard units	(See Item 5, page I-2)		Continuous	Recorder	Effluent
Total Residual Chlorine (TRC), mg/l	(See Item 12, Page I-3 for final effluent limits and approved testing procedures.)		7 Days/Wk	Grab	Effluent
Acute Whole Effluent Toxicity	(See Item 7 on Page I-2)		See Part IV	Grab	Effluent

REFERENCE

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (5-10-96)

SUBMITTING AGENCY CODE: 30 / SUBMITTING AGENCY NAME: FDEP CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 03/10/97	TIME 1151	RECEIVING BODY OF WATER: INDIAN RIVER LAGOON

REMARKS: REFERENCE	COUNTY: I.R.	LOCATION: CITY OF V.B. STP I.R. BLVD + 17TH ST. VERO BEACH, FL.	FIELD ID/NAME: VERO BEACH

RIPARIAN ZONE/INSTREAM FEATURES

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

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

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

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

Width of riparian vegetation (m) on least buffered side: 0

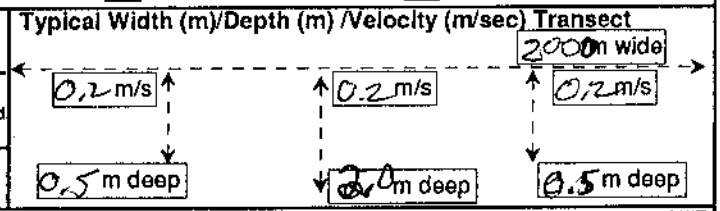
List & map dominant vegetation on back

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

Artificially Impounded ☐ yes

High Water Mark: 0.25 (m above present water level) + 0.5 (present depth in m) = 0.75 (m above bed)

Typical Width (m)/Depth (m) /Velocity (m/sec) Transect



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

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)				Sand			
Leaf Packs or Mats				Mud/Muck/Silt			
Aquatic Vegetation				Other:		5	PDWA
Rock or Shell Rubble				Other:			
Undercut banks/Roots				***Draw aerial view sketch of habitats found in 100 m section***			

WATER QUALITY	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm) or Salinity (ppt):			Secchi (m):
Top								TO BOT
Mid-depth	0.5m	24.07	8.03	8.12	46700	31.3		
Bottom								

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

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

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

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

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

Weather Conditions/Notes:

SUN

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

SAMPLING TEAM: KANE, KENT	SIGNATURE: Phil Kane	DATE: 03/10/97

REFERENCE

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): 03/10/97	RECEIVING BODY OF WATER: INDIAN RIVER LAGOON

REMARKS: REFERENCE	LOCATION: CITY OF VERO BEACH S/P I.R. BWD. + 17th ST. VERO BEACH, FL	FIELD ID/NAME: VERO BEACH

Habitat Parameter score	Excellent	Good	Fair	Poor
Littoral Alterations 4	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 43	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 6	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 14	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 77

COMMENTS: POWAR # 20298

ANALYSIS DATE: 03/10/97	ANALYST: KANE, KENT	SIGNATURE: Kent Kane

TEST SITE

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (5-10-96)

SUBMITTING AGENCY CODE: 30 / SUBMITTING AGENCY NAME: FDEP CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 03/10/97	TIME: 1040	RECEIVING BODY OF WATER: INDIAN RIVER LAGOON

REMARKS: TEST 1	COUNTY: I.R.	LOCATION: CITY OF V.B. STP, I.R. BLVD. & 17TH ST., VERO BEACH, FL.	FIELD ID/NAME: VB

RIPARIAN ZONE/INSTREAM FEATURES

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

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

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

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

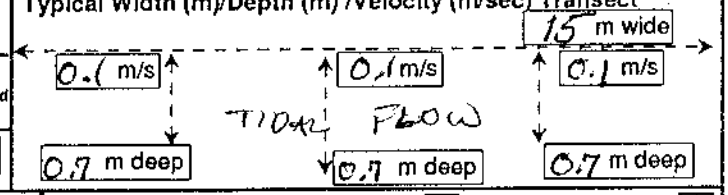
Width of riparian vegetation (m) on least buffered side: 0 — *List & map dominant vegetation on back*

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

Artificially Impounded ☑ ~~yes~~

High Water Mark: 0.1 (m above present water level) + 0.7 (present depth in m) = 0.8 (m above bed)

Typical Width (m)/Depth (m) /Velocity (m/sec) Transect



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

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)				Sand			
Leaf Packs or Mats				Mud/Muck/Silt			
Aquatic Vegetation				Other:		5	PONAR
Rock or Shell Rubble				Other:			
Undercut banks/Roots				*Draw aerial view sketch of habitats found in 100 m section*			

WATER QUALITY	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm) or Salinity (ppt):			Secchi (m):
Top								TO BOT
Mid-depth	0.3 m	24.22	7.78	7.34	41310	30.71		
Bottom								

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

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

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

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

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

Weather Conditions/Notes:

SUN NO WIND

WEST OF OUTFALL

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

SAMPLING TEAM: KANE, KENT	SIGNATURE: Phil Kane	DATE: 03/10/97

TEST

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): 03/10/97	RECEIVING BODY OF WATER: INDIAN RIVER LAGOON
REMARKS: TEST 1	LOCATION: CITY OF VERO BEACH SPP I.R. BWD. + 17th St. VERO BEACH, FL.		FIELD ID/NAME: VB

Habitat Parameter score	Excellent	Good	Fair	Poor
Littoral Alterations 6	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 37	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 62

COMMENTS: WEST OF OUTFALL PO NAK # 20298

ANALYSIS DATE: 03/10/97	ANALYST: KANE, KENT	SIGNATURE: Kent Kane

TEST 2 SITE 2

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (5-10-96)

SUBMITTING AGENCY CODE: 30 / SUBMITTING AGENCY NAME: FDEP CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 03/10/97	TIME 1121	RECEIVING BODY OF WATER: INDIAN RIVER LAGOON
REMARKS: TEST 2	COUNTY: I.R.	LOCATION: CITY OF V.B. STP I.R. BLVD. & 17TH ST. VERO BEACH, FL.		FIELD ID/NAME: VB

RIPARIAN ZONE/INSTREAM FEATURES

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

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

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

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

Width of riparian vegetation (m) on least buffered side: 0

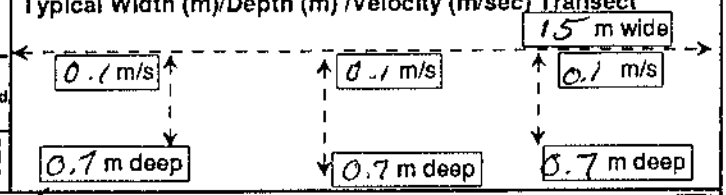
List & map dominant vegetation on back

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

Artificially Impounded ☐ yes

High Water Mark: 0.1 (m above present water level) + 0.7 (present depth in m) = 0.8 (m above bed)

Typical Width (m)/Depth (m) /Velocity (m/sec) Transect



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

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)				Sand			
Leaf Packs or Mats				Mud/Muck/Silt			
Aquatic Vegetation				Other:		5	POM
Rock or Shell Rubble				Other:			
Undercut banks/Roots				Draw aerial view sketch of habitats found in 100 m section			

WATER QUALITY	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm) or Salinity (ppt):	Salinity		Secchi (m):
Top								TO BOT
Mid-depth	0.7M	24.57	8.22	8.10	45100	29.1		
Bottom								

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

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

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

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

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

Weather Conditions/Notes: EAST OF OUTFALL SUN

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

SAMPLING TEAM:	SIGNATURE:	DATE:
KANE, KENT		03/10/97

TEST SITE 2

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): 03/10/97	RECEIVING BODY OF WATER: INDIAN RIVER LAGOON
REMARKS: TEST .2	LOCATION: CITY OF VERO BEACH S/P I.R. BLVD. + 17th ST. VERO BEACH, FL		FIELD ID/NAME: VB

Habitat Parameter / score	Excellent	Good	Fair	Poor
Littoral Alterations [6]	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 [37]	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 [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, o 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 [72]

COMMENTS: EAST OF OUTFALL POWER #20298

ANALYSIS DATE: 03/10/97	ANALYST: KANE, KENT	SIGNATURE: Kent Kane

Facility Information Sheet

please provide most recent information for our writing the bioassay reports

(you need NOT complete this sheet if sampling was part of a 5th-year BIOASSESSMENT)

Facility Name: CITY OF VERO BEACH STP

(as found on the permit)

NPDES permit #: FL00 21661

Facility Location: (road) I.R. BLVD. + 17TH ST.

(city) VERO BEACH

(county) INDIAN RIVER

Receiving Water: INDIAN RIVER LAGOON

Chlorination Type of Sample: ✓ Chlorinated 3.24 mg/l.

___ Non-chlorinated

X Sample collected after dechlorination •

Design Flow and/or Average Flow (circle one): PK 4.5 MGD

Type of Facility (e.g., WWTP, R/O, paper mill, etc): WWTP

Treatment that Wastewater Receives Prior to Discharge:

COMPLETE MIX ACTIVATED SLUDGE PLANT

• if so, what method of dechlorination is used at this facility? SO_2

Additional Comments:

AT ~~CL~~ PK CONTACT CHAMBER WEIR AS NOT DISCHARGING, SO H_2O IS BEFORE REUSE

prepared by P. KANE

revised 1/21/94 KP

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Vero Beach WWTP
County: Indian River
Contact / District: Dr. Phil Kane / Central
NPDES Permit #: FL0021661
LIMS Sample #: 171658 LIMS Job #: 97-MAR-11-16
sample log: 3/17/97 ow
Test Type: (Screening) | Definitive
(Static) | Static Renewal | Flow-through
Temperature range: room 24-25°C
incubator 24.4-25.6°C
Test Number: 2 of 2
Remarks: D = dead, M = missing

Sample Collection: Date 3-10-97 Time 0940
Test Beginning: Date 3-11-97 Time 1420
Test Ending: Date 3-13-97 Time 1415
Organism Batch #: 16 Diluent Batch #: well
Organism Age: 12 days
Test Organism: Cyprinella leedsi

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	23.6 @ 23.6	8.3 @ 24.9 °C	1022 @ 1018 981 @ 1001 @ 25.1 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	22.9 @ 23.0	8.2 @ 25.1 °C	1013 @ 1018 980 @ 1001 @ 24.6 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	24.5 @ 24.6	8.4 @ 24.0 °C	1039 @ 1018 1004 @ 1001 @ 25.2 °C

Total ammonia = 9.2 mg/L @ 48 hours

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 h	pH 0 hr	pH 24 h	pH 48 h	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 h	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 h	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 0 hr	24 h	48 h
Control A	B1	5	5	5	7.6	8.2	8.2	24.5	23.8	24.2	7.5	8.3	7.8	250	250	255
Control B	B2	5	5	5	7.6	8.2	8.2	24.5	23.7	24.1	7.6	8.3	7.8	260	255	260
Control C	B3	5	5	5 (3:20)	7.6	8.2	8.2	24.4	23.8	24.0	7.4	8.3	7.9	250	250	250
Control D	B4	5	5	5	7.6	8.2	8.2	24.3	24.0	24.2	7.5	8.4	7.9	250	250	250
100% A	B5	5	0 A		7.1	7.2	-	23.8	24.2	-	6.7	6.8	-	1065	1075	-
100% B	B6	5	0 A		7.1	7.2	-	23.7	24.0	-	6.8	6.8	-	1065	1075	-
100% C	B7	5	0 A		7.1	7.2	-	23.7	24.0	-	6.5	6.8	-	1065	1075	-
100% D	B8	5	0 A		7.1	7.2	-	23.7	24.0	-	6.5	6.8	-	1070	1075	-
100% A decl	B9	5	1 (1:40)	0 (1:10)	7.2	7.9	8.0	24.3	23.9	24.3	7.0	7.7	6.8	1085	1080	1090
100% B decl	B10	5	2 (2:30)	0 (1:20)	7.2	7.9	8.0	24.3	23.9	24.2	7.0	7.7	6.8	1085	1085	1095
100% C decl	B11	5	1 (1:40)	0 (1:10)	7.2	7.9	8.0	24.3	23.9	24.1	6.9	7.6	6.8	1085	1090	1095
100% D decl	B12	5	2 (2:30)	0 (1:20)	7.2	7.9	8.0	24.4	24.2	24.3	7.0	7.6	6.5	1100	1095	1095
			A all decl within 20 minutes of loading. MF 3/11/97 1440													
Measured/Loaded by:		KJ	MF	ND	KR	DW	ND	KR	DW	ND	KR	DW	ND	KR	DW	ND
Recorded by:		MF	MF	ND	KJ	KS	KR	KJ	KS	KR	KJ	KS	KR	KS	KS	KR

Investigators' Signatures
Marshall Faircloth
Kellie Ralston
Keri Johnson
A H Wolfe

Water Quality Parameters	Salt Water: Well Water / 20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2 (mg/L)		3.24	—	Dr. Phil Kane
Lab Total Residual Cl2 (mg/L)	<0.03	2.70	DR 100	KJ
Alkalinity (mg/L as $CaCO_3$)	120	155	Hach	KR
Hardness (mg/L as $CaCO_3$)	135	135	Hach	KR
Total ammonia (mg/L as N)	<0.017 <0.017	9.94	Orion	MF

Ammonia Meter #98136 Ammonia Meter Slope −55.5 Ammonia Blank <0.017 Control Salinity: 0 ppt Sample Salinity 0 ppt

reviewed form updated 4/01/96

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Vero Beach WWTP
County: Indian River
Contact / District: Dr. Phil Kane / Central
NPDES Permit #: FL0022661
LIMS Sample #: 171658 **LIMS Job #:** 97-MAR1116
sample log: 3/7/97 am
Test Type: (Screening) / Definitive
(Static) / Static Renewal / Flow-through
Temperature range: room 24-25°C
incubator 24.4-25.6°C
Test Number: 1 of 2
Remarks: D = dead, M = missing
decl = declorinated 3.3 ml of 0.025N Sodium Thiosulfate added per liter of sample

Sample Collection: Date 3/10/97 Time 1445
Test Beginning: Date 3/11/97 Time 1400
Test Ending: Date 3-13-97 Time 1400
Organism Batch #: 8 **Diluent Batch #:** 5
Organism Age: <24 hours
Test Organism: Ceriodaphnia dubia

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0	23.6 @ 23.7	8.3 @ 24.9 °C	1022 @ 1018
	9.0 @ 9.0			981 @ 1001 @ 25.1 °C
24 hr	7.0 @ 7.0	23.4 @ 23.0	8.2 @ 23.1 °C	1013 @ 1018
	9.0 @ 9.0			980 @ 1001 @ 24.6 °C
48 hr	7.0 @ 7.0	24.5 @ 24.6	8.4 @ 24.0 °C	1039 @ 1018
	9.0 @ 9.0			1004 @ 1001 @ 25.2 °C

total ammonia = 9.2 mg/L @ 48 hours

Conc.	Chamber #	Number Live 0 hr	24 hr	48 h	pH 0 hr	24 hr	48 h	Temperature (°C) 0 hr	24 hr	48 h	D.O. (mg/L) 0 hr	24 h	48 h	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 0 hr	24 h	48 h
Control A	A	5	5	5	7.8		8.0	23.9		24.6	7.5		7.5	175		185
Control B	B	5	5	5			8.0			24.5			7.5			195
Control C	C	5	5	5			8.0			24.5			7.5			190
Control D	D	5	5	4 10			8.0			24.5			7.5			205
100% A	A	5	0 A	—	7.2	7.3		23.7	24.7		6.5	7.1		1030	1020	1080 A
100% B	B	5	0 A	—		7.3			24.5			7.1			1052	1080 A
100% C	C	5	0 A	—		7.3			24.5			7.2			1055	1080 A
100% D	D	5	0 A	—		7.3			24.4			7.2			1055	
100% A decl	A	5	5	4 10	7.2		8.2	23.9		24.4	6.9		7.5	1055		1050
100% B decl	B	5	5	5			8.2			24.5			7.4			1080
100% C decl	C	5	5	5			8.2			24.5			7.4			1090
100% D decl	D	5	4 10	4			8.2			24.5			7.4			1080
			A all dead within 20 minutes of loading mf 3/11/97 1420													A Write #'s for 100% decl in spaces for 100%
Measured/Loaded by:		ND	MF	KR	KR	DKR	KR	KR		KR	KR		KR	KR		KR
Recorded by:		MF	MF	KR	KS	ND	ND	KS		ND	KS		ND	KS		ND

Investigators' Signatures
Marshall Faircloth
M. C. Leigh
Kellie Ralston
Kris Johnson
A. H. Wolfe
reviewer form updated 4/01/96

Blank initials in water column

Salt Water / Well Water

Water Quality Parameters		20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2 (mg/L):			3.24	—	Dr. Phil Kane
Lab Total Residual Cl2 (mg/L):		<0.03	2.70	DR100	KS
Alkalinity (mg/L as $CaCO_3$):		75	155	Hach	KR
Hardness (mg/L as $CaCO_3$):		90	153	Hach	KR
Total ammonia (mg/L as N):	20.017	<0.017	9.94	Orion	MF

Ammonia Meter #98136 Ammonia Meter Slope: -55.5 Ammonia Blank: 20.017 Control Salinity: 0 ppt Sample Salinity: 0 ppt

Benthic macroinvertebrate taxa list and densities (#/m²) for Vero Beach WWTP, collected via 3 petite Ponar grabs per station in the Indian River Lagoon, on 26 February, 1997.

	Reference Site	Test Site 2	Test Site 1
Actiniaria	14	–	–
Polychaeta	14	–	–
Eteone heteropoda	–	14	–
Hesionidae	–	–	56
Brania sp.	56	–	–
Nereidae	14	–	–
Nereis succinea	14	–	–
Nereis sp.	14	–	–
Laeonereis culveri	708	28	222
Stenoninereis martini	–	–	56
Glycera capitata	28	–	–
Goniadidae	14	–	–
Glycinde solitaria	56	–	–
Onuphidae	56	14	–
Diopatra cuprea	14	–	–
Lumbrineris sp.	14	–	–
Leitoscoloplos robustus	14	–	–
Leitoscoloplos sp.	28	–	–
Paraonidae	28	–	–
Aricidea philbinae	1056	–	–
Spionidae	764	–	42
Prionospio heterobranchia	56	–	–
Streblospio benedicti	3194	5667	3486
Scolelepis sp.	153	–	–
Capitellidae	42	14	–
Capitella sp.	153	–	–
Capitella capitata	1486	14	125
Hobsonia florida	56	14	–
Sabellidae	14	–	–
Oligochaeta	–	–	28
Tubificidae	194	–	194
Tectidrilus sp.	42	–	–
Gastropoda	14	–	–
Caecum pulchellum	181	–	–
Nassarius vibex	14	–	–
Turbonilla interrupta	69	–	–
Acteonidae	14	–	–
Acteon sp.	125	–	–
Acteocina canaliculata	14	–	–
Pelecypoda			
Tellina versicolor	14	–	–

Parastarte sp.	42	139	139
Parastarte triquetra	139	–	28
Mysidacea			
Mysidopsis sp.	14	28	–
Mysidopsis almyra	–	14	–
Bowmaniella brasiliensis	97	–	–
Cumacea			
Oxyurostylis sp.	56	83	–
Oxyurostylis smithi	14	–	–
Cyclaspis sp.	83	28	–
Cyclaspis varians	–	69	–
Tanaidacea			
Hargeria rapax	14	–	–
Isopoda			
Cyathura polita	28	–	14
Sphaeromatidae	14	–	–
Exosphaeroma sp.	42	–	–
Erichsonella sp.	14	–	–
Erichsonella attenuata	28	–	–
Edotea montosa	–	56	56
Amphipoda			
Ampelisca sp.	–	28	14
Ampelisca abdita	14	–	–
Ampithoidae	14	–	–
Cymadusa sp.	97	–	–
Grandidierella bonnieroides	83	–	28
Gammarus mucronatus	–	–	14
Caprellidae	97	–	–

Phytoplankton taxa list and densities (#/m^2) for Vero Beach WWTP, collected via subsurface grabs in the Indain River Lagoon, on 26 February, 1997.

	Reference Site	Test Site 2	Test Site 1
Cyanophyceae			
Chroococcus sp.	–	–	8
Gomphosphaeria sp.	–	–	8
Synechococcus sp.	–	–	8
Oscillatoria sp.	–	8	17
Anabaena sp.	–	–	8
Bacillariophyceae			
Melosira sp.	–	8	–
Leptocylindrus sp.	–	354	286
Skeletonema sp.	–	–	25
Cyclotella sp.	5	105	84
Thalassiosira sp.	–	161	67
Coscinodiscus sp.	–	8	17
Biddulphia sp.	–	–	17
Chaetoceros sp.	5	8	–
Rhizosolenia sp.	48	40	25
Pennales sp.	10	64	34
Achnanthes sp.	–	16	–
Naviculaceae	–	16	–
Navicula sp.	5	32	76
Caloneis sp.	–	–	8
Mastogloia sp.	–	–	8
Entomoneis sp.	10	16	8
Amphora sp.	–	–	8
Nitzschia sp.	58	153	50
Nitzschia constricta	5	–	–
Bacillaria sp.	10	–	–
Cylindrotheca sp.	10	64	8
Surirella sp.	–	8	–
Chlorophyceae			
Dunaliella sp.	10	64	84
Chlorella sp.	–	8	–
Closterium sp.	–	8	–
Tetraselmis sp.	5	121	17
Euglenophyceae			
Phacus sp.	–	8	–
Dinophyceae			
Dinophyceae	–	–	34
Kryptoperidinium sp.	–	32	42
Cryptophyceae			
Chroomonas sp.	173	201	34
Cryptomonas sp.	–	19	97

Phacus sp.	–	8	–
Dinophyceae			
Dinophyceae	–	–	34
Kryptoperidinium sp.	–	32	42
Cryptophyceae			
Chroomonas sp.	173	201	34
Cryptomonas sp.	–	19	97

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

Transaction Code	NPDES NUMBER	YR/MO/DA	Insp Type	Inspector	Fac Type
1 N 2 5	3 FL0021661 11	12 970310 17	18 X	19 S	20 I

Remarks

21 66

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

Transaction Code	NPDES NUMBER	YR/MO/DA	Insp Type	Inspector	Fac Type
1 N 2 5	3 FL0021661 11	12 970310 17	18 B	19 S	20 I

Remarks

21 66