

Biological Assessment of

Pride Resorts Wastewater Treatment Plant

Bay County

NPDES #FL0024562

Sampled December 1992

May 1993

Biology Section
Division of Technical Services

Department of Environmental Regulation
Results of Fifth Year Inspections

Discharger: Pride Resorts Wastewater Treatment Plant
County: Bay
NPDES Number: FL0024562
State Permit Expiration Date: 28 October 1993

Toxics Sampling Inspection (XSI)

Date Sampled: 7 December 1992

Results: An unusually large number of organic pollutants were found in the effluent (see Chemistry Summary Table). 2,4-dichlorophenol (2.4 µg/L) exceeded the Class III standard of 0.3 µg/L, a violation of Rule (17.302.560)(19) FAC. The level of aliphatic compounds (410 µg/L) is cause for concern, as short chain aliphatics may be toxic at this concentration. The presence of the pesticide chlorpyrifos (0.2 µg/L) may also be harmful to the biota, as its acute LC_{50} is 0.21 µg/L. The copper concentration in the effluent also violated the Class III standard for marine waters.

Compliance Biomonitoring Inspection (CBI)

Date Sampled: 7 December 1992

Results: Acutely toxic to the water flea, *Ceriodaphnia dubia*, killing all test organisms within 24 hours. The fish, *Notropis leedsi*, were also dead within this time period, however, a dissolved oxygen crash (caused by the exceedingly high effluent BOD) caused that bioassay to be invalidated.

Impact Bioassessment Inspection (IBI)

Date Sampled: 7 December 1992

Results: The benthic macroinvertebrate community was degraded at test site 2 (west of the discharge), where few taxa were recovered and the population consisted almost entirely of pollution tolerant polychaetes. Based on the chemistry results, the benthic population at test site 1 was better than expected. Tidal flushing and wave action there may have counteracted the poor water quality to some extent. Phytoplankton populations were sparse at both test sites. Due to a lack of corresponding reference site data, an imbalance determination was not possible.

Water Quality Inspection (WQI)

Date Sampled: 7 December 1992

Results: Effluent BOD_5 was 73 mg/L, violating the maximum daily amount allowed by the NPDES permit. Total suspended solids (TSS) in the effluent was 56 mg/L, just under the daily maximum of 60 mg/L. Effluent levels of total phosphorus (7.1 mg/L), ortho-phosphate (6.8 mg/L), ammonia (49 mg/L) and TKN (74 mg/L) were extremely high. At test site 1, which receives the discharge on an outgoing tide, these nutrients were all substantially greater than 95% of typical estuaries in the state. Algal growth potential was an extraordinary 258.9 mg dry wt/L at test site 1, far exceeding the "problem threshold" of 10 mg dry wt/L. Total coliform bacteria were found at levels which exceeded Class III standards in the effluent, and at test site 1, but holding times for these samples were exceeded. Fecal coliforms were not detected in the effluent, and were relatively low at both test sites.

Introduction

Pride Resorts, a trailer park located near Panama City Beach in Bay County, Florida contains a facility to treat its own domestic wastewater and laundry graywater. This 0.0365 MGD design flow Sewage Treatment Plant utilizes extended aeration and contact stabilization. Effluent is discharged to Alligator Bayou in the vicinity of the U.S. Naval Coastal Systems base, and ultimately enters St. Andrews Bay.

State and/or federal permit limits are as follows: BOD and TSS (annual average of 20 mg/L, daily maximum of 60 mg/L), pH (6.0 to 8.5), fecal coliform bacteria (maximum of 200 organisms/100 mL), and chlorine residual (minimum of 0.5 mg/L for disinfection, maximum of 0.01 mg/L at discharge). Past data indicate an extremely wide variation in levels of permit parameters, as well as nutrient measurements. In eight samplings during the period January 1986 to July 1989, the following range of values was noted: BOD (2 to 659 mg/L), TSS (5 to 4000 mg/L), NH_3 (0.34 to 36.6 mg/L), and TKN (1.65 to 310 mg/L). Fecal coliform permit limits were violated in May and July of 1990 (540 and 240 organisms/100 mL, respectively). Fecal coliforms as high as 90,000,000 organisms/100 mL have been measured at this facility (Appendix).

Methods

The focus of this investigation was to determine the discharger's effects on the receiving waters by comparing a test site to a reference site. Unfortunately, a station that was originally chosen as a reference site was later found to be significantly influenced by the facility's effluent. This study, which was complicated by the tidal influences on the effluent's movement and fate, ended up evaluating the biological community health at two test sites. Thomas Drive (Highway 3031) separates the marshy discharge area from the main portion of Alligator Bayou, often causing the effluent be retained upstream of the outfall. Additionally, effluent flows towards St. Andrews Bay on an outgoing tide. Two test sites were established, one west of the highway (test site 2) and the other east of the discharge in the main portion of Alligator Bayou (test site 1) (see maps in Appendix). A habitat assessment was performed *in situ* at each test site. Supplemental physical/chemical data were also collected on the effluent and study sites. Acute screening toxicity bioassays, using *Ceriodaphnia dubia* and *Notropis leedsi* as test organisms, were performed on an effluent sample (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 and test sites. Methods used for all chemical analyses are on file at the Tallahassee DER Chemistry Laboratory.

Benthic macroinvertebrate communities were evaluated by collecting three petite ponar grab samples

Major characteristics of community structure of control and test sites.

	Test Site 1	Test Site 2
Macroinvertebrate Ponar		
Number of Taxa	25	9
Shannon-Weaver Diversity	3.56	1.96
% Polychaeta	49.1	95.1
% Malacostraca	42.1	1.6
% Pelecypoda	6.4	0
% Decapoda	0.6	3.3
% Gastropoda	1.8	0
% Carnivores	28.1	65.6
% Deposit Feeders	43.9	31.1
% Suspension Feeders	19.3	0
% Browsers	5.2	1.3
% Scavengers	3.5	1.6
Phytoplankton Algae		
Number of Taxa	8	13
% Contribution of Dominant Taxon	27.0	27.4
Chlorophyll a (µg/L)	3.3	3.9
Diatom/Diatom + B-G Abundance Ratio	0.62	0.93
% Blue-green	35.1	2.7
% Green	8.1	30.1
% Diatoms	56.8	38.4
% Other	0	28.7
Algal Growth Potential (mg dry wt/l)	258.9	6.5

at both test sites. Phytoplankton was sampled at both test sites via subsurface grabs. Chlorophyll *a* was also determined for phytoplankton communities (Ross 1990). Bacterial populations were analyzed for total and fecal coliforms following the methods of APHA (1989). Algal Growth Potential tests, using *Selenastrum capricornutum* as the test organism for the freshwater effluent and *Dunaliella tertiolecta* for the saline receiving waters, followed Miller *et al.* (1978) and EPA (1974).

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 following personnel were involved in this investigation: Glenn Butts (DER Northwest District) and Lyn Burton, Marshall Faircloth, Russel Frydenborg, Kathleen Lurding, Elizabeth Miller, Kimberly Pearce, and Landon Ross (Tallahassee Biology Laboratory).

Results and Discussion

Although both test sites were subject to the influence of Pride Resort's effluent, depending on tidal movement, certain habitat aspects were substantially different. The littoral zone of test site 1 was characterized by vertical seawalls and docks, with very small areas of *Spartina* and *Juncus*, while test site 2 had a higher proportion of natural shoreline and more extensive *Spartina* and *Juncus* tracts. The bottom substrate at test site 1 had a higher percentage of rock/shell rubble and less silty muck, than did test site 2. The most important difference was probably the degree of tidal flushing from the bay, which was good at test site 1 but minimal at test site 2 (Appendix). Salinity was 6.9 and 4.5 ppt at test sites 1 and 2, respectively; pH (6.6 and 6.1) and dissolved oxygen (5.9 and 5.8) were similar.

The sample of effluent was acutely toxic to the water flea, *Ceriodaphnia dubia*, killing all test organisms within 24 hours. This toxicity violates Rules 17-302.510(5)(p), 17-302.500(1)(d), and 17-4.244(3)(a). The fish, *Notropis leedsi*, were also dead within 24 hours, however, a crash in dissolved oxygen invalidated that bioassay (Appendix). This dissolved oxygen plunge was not too surprising, since a BOD_5 of 73 mg/L was measured in the effluent, a violation of permit limits.

In addition to a high BOD, effluent quality was poor with regard to TSS (56 mg/L) and turbidity (42 NTU). These parameters serve to demonstrate the negative effects of the effluent plume on the receiving waters. For example, water clarity was reduced at the station which received the effluent on an outgoing tide (test site 1 TSS = 28 mg/L; turbidity = 18 NTU), but it was clearer at the station which was up-gradient of the discharge during sample collection (test site 2 TSS = 7 mg/L; turbidity = 2 NTU).

Analysis for organic compounds yielded an unusually high number of compounds. Those substances occurring at concentrations above practical quantitation limits included bis (2-ethylhexyl) phthalate (19 µg/L) and phenol (5.1 µg/L). Other compounds detected at concentrations below the reported value or below practical quantitation limits included naphthalene (0.8 µg/L), 2-chlorophenol (0.8 µg/L), 2,4-dichlorophenol (2.4 µg/L), and 2,4,6-trichlorophenol (1.7 µg/L). Although the concentration of 2,4-dichlorophenol was listed as below quantitation limit, the method detection limit for that compound is 0.8 µg/L. Therefore, this exceeds the Class III standard of 0.3 µg/L and constitutes a violation of Rule (17.302.560)(19) FAC. Other organic substances tentatively identified are listed in the chemistry summary table, along with their estimated concentrations. The level of aliphatic compounds (410 µg/L) may be cause for concern, as short chain aliphatics can be toxic to aquatic organisms at this concentration. Presumptive evidence of the presence of the pesticides bromacil (0.38 µg/L) and chlorpyrifos (0.2 µg/L) was revealed. The LC_{50} of chlorpyrifos to *Daphnia pulex* is 0.21 µg/L, in a 48 hour static acute bioassay (AQUIRE 1991).

Metals analysis gave the following results: aluminum (897 µg/L), copper (15 µg/L), iron (154 µg/L), and zinc (58 µg/L). The copper concentration is in violation of Class III standards for predominantly marine waters, Rule 17.302.560(15) FAC. While cadmium was detected at 0.32 µg/L, which is less than the practical

quantitation limit, this level is very close to the water quality standard of 0.3 µg/L.

Nutrients were extremely high in the effluent, with total phosphorus and ortho-phosphate measuring 7.1 and 6.8 mg/L, respectively. Ammonia was 49 mg/L and the concentration of TKN was 74 mg/L. Samples were collected on an outgoing tide, and the movement of effluent can be easily tracked by the nutrient levels at the two test sites. East of the discharge in Alligator Bayou (test site 1), all nutrients were very high, with the exception of nitrate-nitrite (which was below quantitation limit in the effluent and in both study sites). STORET data from 690 Florida estuary stations, for the period of 1980 to 1989, have been compiled into a percentage distribution, found in the Appendix (Joe Hand, personal communication). Data from this present investigation were evaluated against these values. Concentrations of orthophosphate (2.5 mg/L), total phosphorus (3.6 mg/L), ammonia (23 mg/L), and TKN (34 mg/L) were all substantially greater than 95% of typical estuaries in the state. At test site 2 (west of the discharge), nutrient compounds were either very low, undetected, or found at levels below practical quantitation limit.

Algal growth potential (AGP) at the two test sites clearly corresponded to nutrient levels. Where nutrient concentrations were excessive (test site 1), AGP was an extraordinary 258.9 mg dry wt/L. Algal growth potential at test site 2 was 6.5 mg dry wt/L, below the "problem threshold" of 10 mg dry wt/L used to indicate the likelihood of enrichment problems in marine or estuarine systems (Dr. Ron Raschke, U.S. EPA, personal communication).

Total coliform bacteria measured in the effluent was relatively high (3600 organisms/100 mL), but was excessive at test site 1 (53,000 organisms/100 mL). Ordinarily, these two measurements would have been in violation of ambient standards, but these particular samples were held beyond normal holding time. Fecal coliforms were undetected in the effluent, and were 180 and 260 organisms/100 mL at test sites 1 and 2, respectively.

Benthic macroinvertebrate communities appeared to be degraded west of the facility (test site 2), as only nine taxa were recovered and Shannon-Weaver diversity was 2.0. The area was strongly dominated by polychaetes (95%), particularly *Capitella capitata* and *Laeoneris culveri*. A complete list of taxa from each station appears in the Appendix. Waters from test site 1 yielded 25 taxa and a diversity of 3.6. The population at this station was made up of polychaetes (49%) and malacostracans (42%), with *Laeoneris culveri* and *Leptochelia rapax* as the dominant forms from these two groups, respectively. It is likely that the hydrologic regime of the system, as well as the plant discharge, influenced the benthic communities present. Due to the restriction of tidal flow by Thomas Drive, the area surrounding test site 2 is poorly flushed, with reduced recruitment potential from St. Andrews Bay. It is possible that the (acutely toxic) discharge plume is directed over the vicinity of test site 2 during certain tidal conditions (incoming tide). The depauperate benthic community found there may be the result of these factors. Based on the chemistry results, the benthic population at test site 1 was better than expected. Tidal flushing and wave action may have counteracted the poor water quality to some extent.

Differences in phytoplankton communities may also have been related to tidal movement. Algal density was nearly double at test site 2, where the reduced flushing would favor the development of algae living in the water column. Chlorophyll *a* values were very similar, however, probably due to differences in community composition. Algal populations at test site 1 were composed mostly of diatoms and cyanophytes, while a greater percentage of chlorophytes and other groups were present at test site 2.

Conclusions

The sample of effluent was acutely toxic to the water flea, *Ceriodaphnia dubia*, killing all organisms within 24 hours. This toxicity violates Rules 17-302.510(5)(p), 17-302.500(1)(d), and 17-4.244(3)(a). The fish, *Notropis leedsi*, were also dead within 24 hours, however, a crash in dissolved oxygen invalidated that bioassay.

Several factors indicated that the quality of the effluent was poor. A BOD_5 of 73 mg/L violated permit limits and probably caused the dissolved oxygen crash in the *N. leedsi* bioassay. Turbidity and TSS were also high in the effluent, as well as at the outgoing tide test site.

Analysis for organic compounds yielded a rather complex list. Two substances were found in concentrations above quantitation limit: bis (2-ethylhexyl) phthalate at 19 µg/L, and phenol at 5.1 µg/L. Several were detected at levels known to be less than those reported, or below practical quantitation limit. Although the concentration of 2,4-dichlorophenol

(2.4 µg/L) was listed as below quantitation limit, the method detection limit for that compound is 0.8 µg/L, which exceeds the Class III standard of 0.3 µg/L and constitutes a violation of Rule (17.302.560)(19) FAC. Another list of eight compounds was tentatively identified with estimated concentrations. The level of aliphatic compounds (410 µg/L) could be harmful, as short chain aliphatics can be toxic at this concentration. Finally, presumptive evidence for the presence of the pesticides bromacil (0.38 µg/L) and chlorpyrifos (0.2 µg/L) was noted. Chlorpyrifos can be toxic to *Daphnia pulex* at concentrations as low as 0.21 µg/L.

The following metals were found in the effluent above quantitation limits: aluminum (897 µg/L), copper (15 µg/L), iron (154 µg/L), and zinc (58 µg/L). The copper concentration is in violation of Class III standards for predominantly marine waters, Rule 17.302.560(15) FAC. While cadmium was detected at 0.32 µg/L, which is less than the practical quantitation limit, this level is very close to the ambient standard of 0.3 µg/L.

All nutrient compounds (except for nitrate-nitrite) were extremely high in the effluent and at test site 1, which receives the effluent on an outgoing tide. Concentrations of orthophosphate (2.5 mg/L), total phosphorus (3.6 mg/L), ammonia (23 mg/L), and TKN (34 mg/L) at test site 1 were all substantially greater than 95% of typical estuaries in the state. At test site 2, the station up-gradient of the discharge during sampling, nutrient compounds were either very low, undetected, or found at levels below practical quantitation limit.

Algal growth potential (AGP) at the two test sites was related to nutrient levels. Nutrient concentrations were excessive at test site 1, where AGP was an extraordinary 258.9 mg dry wt/L. This far exceeded the "problem threshold" of 10 mg dry wt/L which is used to indicate the likelihood of enrichment problems in marine or estuarine systems. Algal growth potential at test site 2 was 6.5 mg dry wt/L.

Total coliform bacteria were found at levels that exceeded Class III standards in the effluent, and at test site 1. Unfortunately, the holding time for bacteriological samples was exceeded, so a violation determination was not possible. Fecal coliforms were not detected in the effluent, and were relatively low at both test sites.

The benthic macroinvertebrate community was degraded at test site 2 (west of the discharge), where few taxa were recovered and the population consisted almost entirely of pollution tolerant polychaetes. Based on the chemistry results, the benthic population at test site 1 was better than expected. Tidal flushing and wave action there may have counteracted the poor water quality to some extent.

Differences in phytoplankton communities may also have been related to tidal movement. Taxa richness was higher at test site 2, and algal density was nearly double that of the other test site. The reduction in tidal flushing above the facility probably favored the development of water column algae. The similarity of chlorophyll *a* values despite the increased algal density at test site 2 appeared to be due to differences in community composition.

Literature Cited

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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.

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.

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Chemistry summary table for

Pride Resorts WWTP	Effluent	Test Site 1	Test Site 2
Organic Constituents (ug/L)			
Bis (2-ethylhexyl) phthalate	19		
Naphthalene	0.8 K		
2-Chlorophenol	0.8 K		
2,4-Dichlorophenol	2.4 T		
Phenol	5.1		
2,4,6-Trichlorophenol	1.7 T		
Bromacil	0.38 N		
Chlorpyrifos	0.2 N		
Tentative ID:			
Cyclotetradecane	13 J		
1-Hexadecene	12 J		
4-Methyl phenol	37 J		
Caffeine	38 J		
Dihydrocholesterol	260 J		
Camphor	27 J		
Other extractable aliphatics	410 J		
Unidentifiable organic compounds	200 J		
Metals (ug/L)			
Aluminum	897		
Antimony	15 U		
Arsenic	20 U		
Cadmium	0.32 T		
Copper	15		
Chromium	10 U		
Iron	154		
Lead	15 U		
Mercury	0.1 U		
Nickel	5 U		
Selenium	30 U		
Silver	0.05 U		
Zinc	58		
Nutrients (mg/L)			
Ortho-phosphate	6.8	2.5	0.020 U
Total phosphorus	7.1	3.6	0.1 T
Ammonia	49	23	0.17
Nitrate+Nitrite	1.0 T	0.05 T	0.05 T
TKN	74	34	0.98
Other Parameters			
Habitat Assessment		52	53
D.O. (mg/L)	0.95	5.9	5.8
pH (SU's)	7.1	6.6	6.1
Conductivity/Salinity (µmhos/cm or ppt)	1105	6.9 ppt	4.5 ppt
Temperature (°C)	21.7	20.1	20.2
TSS (mg/L)	56	28	7
Turbidity (NTU's)	42	18	2
BOD5 (mg/L)	73	7.0 L	2.3
Algal Growth Potential (mg dry wt/L)	19.6	258.9	6.5
Bioassay Fish-Dechlorinated	24 hr LC50<100%, test invalidated due to D.O. crash		
Bioassay Invertebrate-Dechlorinated	24 hr LC50<100%		
Fecal coliform (org/100 ml)	10 U	180 Q	260 Q
Total coliform (org/100 ml)	3600 Q	53,000 Q	2200 Q

J - Estimated value
K - Actual value is known to be less than value given
L - Actual value is known to be greater than value given
N - Presumptive evidence of presence of material
Q - Sample held beyond normal holding time
T - Value reported is less than the practical quantitation limit
U - Material analyzed for but not detected; value reported is the minimum detection limit

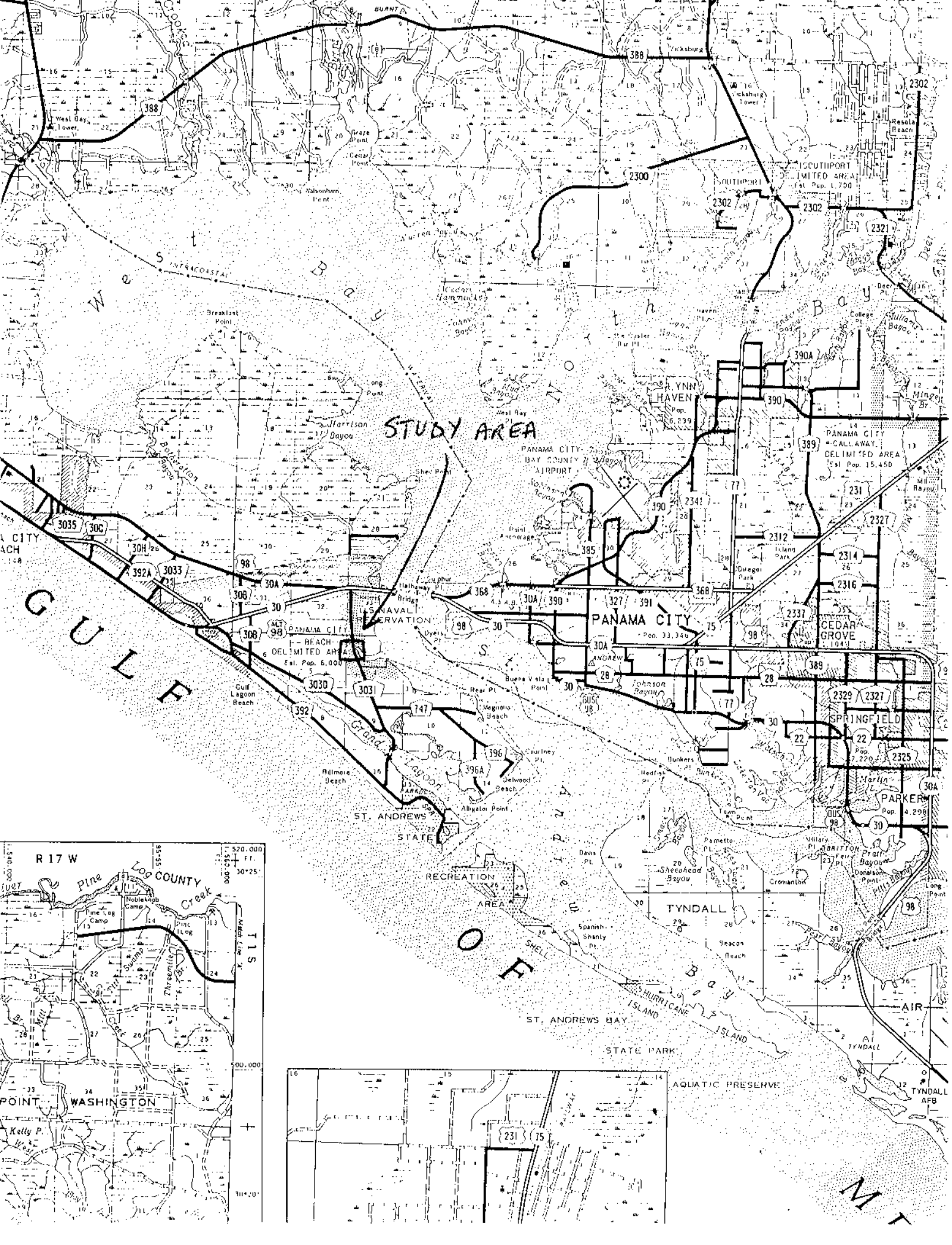
Typical Values for Selected Parameters in Florida Waters

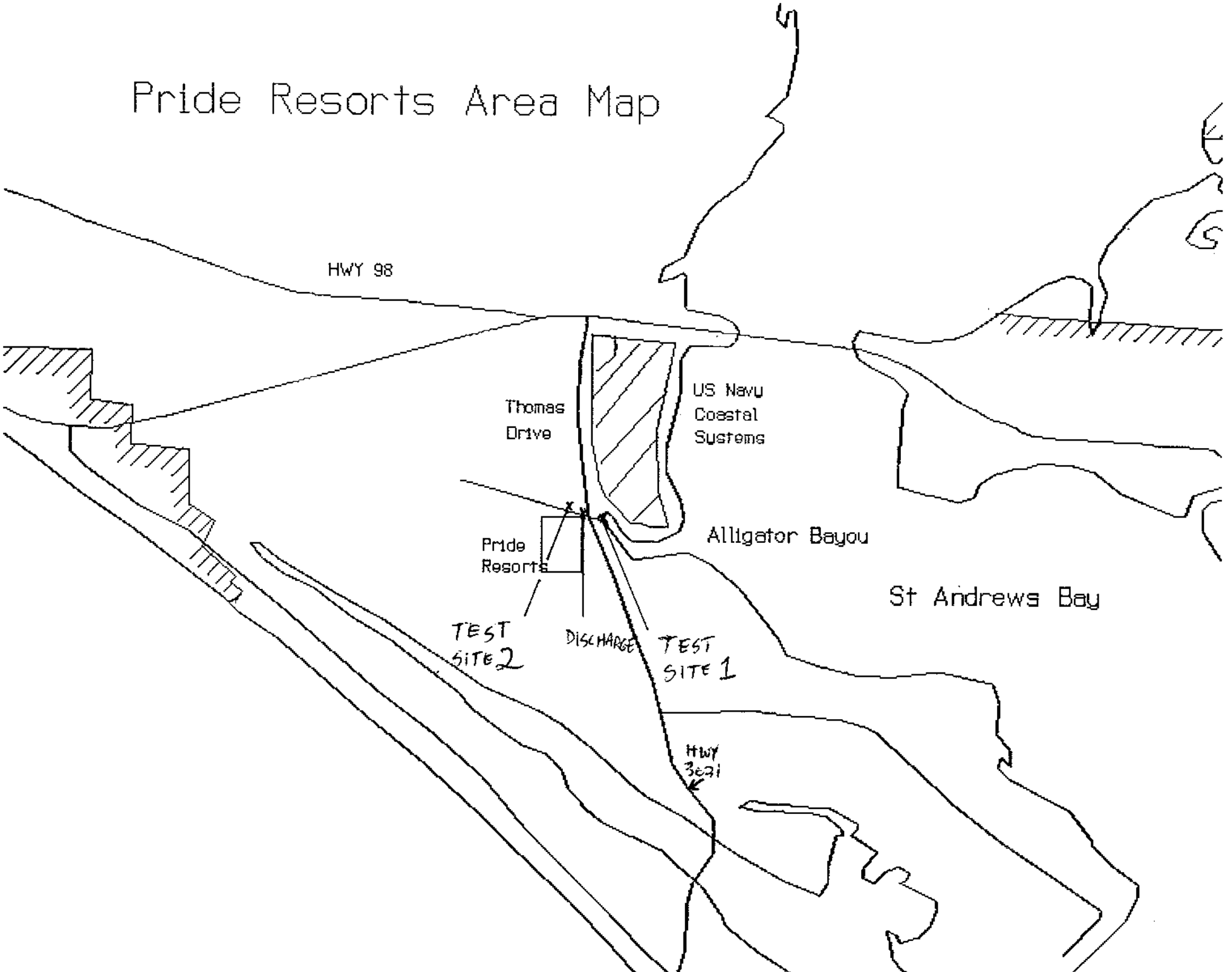
Adapted from Joe Hand, FDER, personal communication, 1991
(data was collected between 1980 and 1989)

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 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


STUDY AREA
West Bay
St. Andrews Bay
GULF OF MEXICO
PANAMA CITY
PANAMA CITY BEACH
LYNN HAVEN
SPRINGFIELD
PARKER
CEDAR GROVE
TYNDALL
ST. ANDREWS STATE RECREATION AREA
ST. ANDREWS BAY
HURRICANE ISLAND
SHELL ISLAND
AQUATIC PRESERVE
PANAMA CITY-BAY COUNTY AIRPORT
SOUTHPORT
NAVAL OBSERVATION
TYNDALL AFB
R 17 W
T 1 S
POINT WASHINGTON
Log Cabin Creek
Pine Log
Grand Lagoon
INTRACOASTAL


Pride Resorts Area Map
HWY 98
Thomas
Drive
US Navy
Coastal
Systems
Alligator Bayou
Pride
Resorts
St Andrews Bay
TEST
SITE 2
DISCHARGE
TEST
SITE 1
HWY
3021

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

FACILITY SUMMARY

Facility Name: PRIDE RESORTS		**Date Summary Prepared :**
Location (attach detailed map):	**County** BAY	**District** NW DISTRICT
Federal Permit # FL0024562 **and expiration date:** 09-30-95	**State GMS # and** 1003P03164 **State expiration date:** 10-28-93	**Facility Type:** Industrial (Municipal) Federal Agricultural Other (list): TRAILOR PARK

Function of facility: TREAT DOMESTIC WASTEWATER AND LAUNDRY GREYWATER FROM TRAILOR PARK

Description of treatment process: SECONDARY DOMESTIC TREATMENT WITH EXTENDED AERATION AND CONTACT STABILIZATION DISCHARGE TO ALLIGATOR BAYOU TO ST. ANDREW BAY.

Receiving waters: ALLIGATOR BAYOU	**Classification:** I II (III)	
Design Flow: 0.0365 MGD	**Mean Flow:** 0.021 MGD	**Flow during survey:**

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

therefore, the best time to sample is: SUMMER SEASON

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

NO MIXING ZONES

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

Parameter	Limit (units)
pH	6.0 min 8.5 max
Chlorine Resid	0.5 mg/L min
Dissolved Oxygen	5.0 mg/L min
BOD - Final	N.L
BOD - Eff	20 mg/L Annual Average
Suspended Solids	N.L
Fecal Coliform	200 mg/L Annual Geometric Mean

Describe special permit conditions and permit modifications:

PRIDE RESORTS
(Facility)

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

Description of permitted outfall(s):

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

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

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

Additional information:

Staff contributing to this review (signature):

Glenn Butts (Biologist)

(Inspector)

(Engineer)

( )

( )

( )

HISTORIC CHEMISTRY DATA FOR PRIDE RESORTS

Date	TEMP (°C)	BOD (mg/L)	TSS (mg/L)	NH3 (mg/L)	TKN (mg/L)
7-12-89	28.4	2	5	0.34	1.65
2-2-89	23	104.1	14	36.6	43.3
1-26-89	20	45.9	12	31.5	33
1-25-89		51.2		28.3	32.5
1-19-89	20	69.7		32.7	57
6-10-87	26	18.8		26.8	28.4
2-7-84	14.1	659	4000	29	310
1-7-86	19	117.1	11.2	29.9	60.8

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

SUBMITTING AGENCY CODE: 8010 / SUBMITTING AGENCY NAME: NW DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 12-07-92	RECEIVING BODY OF WATER: ALLIGATOR BAYOU

REMARKS: TEST SITE 1	LOCATION: BELOW THOMAS DRIVE NEAR NAVY COASTAL SYSTEMS	FIELD ID/NAME: # 2

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 26	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 3	>0.75 m. **4-5 points**	0.5 - 0.75 m. **3 points**	0.25 - 0.5 m. **2 points**	<0.25 m. **0-1 point**
Freshwater Discharges/ Alterations 3	Only natural runoff.. **9-10 points**	Mostly natural runoff, but with a few, small stormwater sources. **6-8 points**	Considerable stormwater discharge from local roads, parking lots, etc. **3-5 points**	Extensive manmade discharges, especially from canals draining large tracts of land. **0-2 points**
Flow and Wave Action 6	Light to moderate wave action present except under the harshest weather conditions. Flow unrestricted by manmade structures. **9-10 points**	—	—	Heavy wave action sometimes present even during average weather conditions, or flow restricted by manmade structures so that velocities are very high. **0-2 points**
Sediment Type 11	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 52

COMMENTS: MOSTLY SEA WALLS, DOCKS, NAVY DIVER SCHOOL; SMALL AREA OF JUNCUS & Spartina, oyster beds, No grass beds; Good flushing from BAY

ANALYSIS DATE: 12-07-92	ANALYST: G.L. Butts	SIGNATURE: Glenn Butts

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

SUBMITTING AGENCY CODE: 8010 SUBMITTING AGENCY NAME: NW DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 12-07-92	RECEIVING BODY OF WATER: ALLIGATOR BAYOU

REMARKS:	LOCATION: ABOVE PRIDE RESORTS	FIELD ID/NAME:
TEST SITE 2		# 3

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 26	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 8	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 4	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 53

COMMENTS: Very organic substrate, black ooze, shell/sand, large tracts of Spartina, Juncus, poor flushing from BAY.

ANALYSIS DATE:	ANALYST:	SIGNATURE:
12-07-92	G.L. BUTTS	Glenn Butts

DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 3)

SUBMITTING AGENCY CODE: 8070 / SUBMITTING AGENCY NAME: NW DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 12-07-92	TIME: 1150	RECEIVING BODY OF WATER: ALLIGATOR BAYOU

REMARKS:	LOCATION: BELOW THOMAS DRIVE / NEAR NAVY COASTAL SYSTEMS	FIELD ID/NAME:
TEST SITE 1		# 2

RIPARIAN ZONE/INSTREAM FEATURES

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

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

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): PRIDE RESORTS WWTP

Estimated System Width (range, m):	Estimated System Depth (range, m): 1.0 M	yes
High Water Mark (m above bed):	Velocity (range, m/s):	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: ☐ Sheens

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)			PONAR	Rock or Shell Rubble	20		PONAR
Leaf Packs				Sand	30		
Aquatic Vegetation	20			Mud/Muck	20		
Submerged Roots				Other: OYSTER BED	10		
Undercut Banks				Other:			

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):	pH (SU):	Cond. (µmho/cm):	SAL	ORP		Secchi (m):
Top	20.05	5.93	6.58	12,550	6.9	0.188		
Mid-depth								
Bottom								

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

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

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

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

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

Weather Conditions: Cool, light rain

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

ANALYSIS DATE: 12-07-92	ANALYST: G.L. Butts	SIGNATURE: Glenn Butts

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 4)

SUBMITTING AGENCY CODE: 8010 / SUBMITTING AGENCY NAME: NW DISTRICT	STORET STATION NUMBER: 12-07-92	DATE (M/D/Y): 12-07-92	TIME: 1120	RECEIVING BODY OF WATER: ALLIGATOR BAYOU

REMARKS: TEST SITE 2	LOCATION: ABOVE PRIDE RESORTS	FIELD ID/NAME: # 3

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 ☐ Moderate ☒ Heavy ☐

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

Point-Source Pollution (list location and describe): RUNOFF FROM TRAILOR PARK, THOMAS DRIVE

Estimated System Width (range, m):	Estimated System Depth (range, m): 0.6 m	yes
High Water Mark (m above bed):	Velocity (range, m/s):	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: ☐ H_2S

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

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)			POWAR	Riffles			POWAR
Leaf Packs				Sand	20		
Aquatic Vegetation	20			Mud/Muck/Silt	40		
Rock or Shell Rubble	10			Benthic leaf mats			
Undercut Banks/Roots				Other: OYSTER BED	10		

WATER QUALITY

	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm):	SAL	ORP	Secchi (m):
Top	0.6	20.15	6.14	5.78	8730	4.5	0.206	
Mid-depth								
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: ☒ ORGANIC

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: Cool, light rain

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

SAMPLING TEAM: Glenn Butts Josie Penton	SIGNATURE: Glenn Butts	DATE: 12-7-92

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: PRIDE RESORTS
Address/City:
County: BAY
Contact/District: GLEN BUTTS
NPDES Permit #: FL0024562 Outfall #: 001

Sample Collection: Date 12-7-92 Time 1030
Test Beginning: Date 12-8-92 Time 1400
Test Ending: Date 12-9-92 Time 1400
Test Organism: C. DUBIA
Life Stage/Age: <24HRS

92-DEC-08-22 46040
verified 12/11/92 KP

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

DO
100.1% 8.59=8.52

Remarks:
TAN COLOR + TURBID
test terminated at 24 hours

Instrument Calibrations:

	pH	DO	Temp	Cond
0 hr	7.1/10.10	8.6@22.4°C	21.4@21.5	950 1K @ 23.5C 9550 10K
24 hr	6.92/10.01 7.2/9.10	8.53@23.2	22.3@22.2	970 9630 @ 23.7
48 hr				

Conc.	Chamber #	Number Live 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	DO (mg/L) 0	24	48	Cond. (µmhos/cm) 0	24	48
control	A	5	5		8.3	8.2		22.1	23.7		9.1	8.4		146	156	
control	B	5	5			8.2						8.3			158	
control	C	5	5			8.2						8.3			160	
control	D	5	5			8.2						8.3			160	
100%	A	5	0		7.6	8.5		22.1	24.2		6.9	7.1		950	885	
100%	B	5	0			8.5						7.1			920	
100%	C	5	0			8.5						7.1			925	
100%	D	5	0			8.5						7.1			925	
Measured/Loaded by:		MF	MF		MF	MF		MF	MF		MF	MF		MF	MF	
Recorded by:		MF	TR		KP	TR		KP	TR		KP	TR		KP	TR	

Investigators' Signatures
Kim Pearce
Marbet Fairchild
Robin Raden

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:			TRACE		GB
Lab Tot. Resid. Cl2:			0.03	DR-100	KWP
Alkalinity:	125	72	392	HACH	MF
Hardness:	122	84	155	HACH	MF
Total Ammonia:	0.0	0.0	35.8	orion	MF

Ammonia Meter Slope: -55.6
Ammonia Blank: 0.0
Salinity Sample: _____ ppt

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: PRIDE RESORTS
Address/City:
County: BAY
Contact/District: GLEN BUTTS
NPDES Permit #: FL00 24562 Outfall #: 001

Sample Collection: Date 12-7-92 Time 1030
Test Beginning: Date 12-8-92 Time 1400
Test Ending: Date 12-9-92 Time 1400
Test Organism: N. LEEDSI
Life Stage/Age: 11 DAYS

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

92-DEC-08-22 46040
verified 12/1/92 KP

Remarks:
test terminated at 24 hours
D.O. crash

Instrument Calibrations:

	pH	DO	Temp	Cond
0 hr	7@7, 10@10	8.6@22.4	21.4@21.5	950 9550 @22.5° 970
24 hr	7@7, 10@10	8.5@23.2	22.3@22.2	9630 @23.7
48 hr				

Conc.	Chamber #	Number Live 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	DO (mg/L) 0	24	48	Cond. (µmhos/cm) 0	24	48
control	41	5	5		7.8	8.2		21.4	22.3		8.9	8.3		235	240	
control	13	5	5		7.8	8.2					8.9	8.3		235	235	
100%	74	5	0		7.4	7.9		21.7	22.2		5.8	2.6		970	960	
100%	219	5	0		7.4	7.8					5.8	2.5		970	960	
Measured/Loaded by:		MF	TR		MF	MF		MF	MF		MF	MF		MF	MF	
Recorded by:		KP	TR		KP	TR		KP	TR		KP	TR		KP	TR	

Investigators' Signatures
Kim Pearce
Marshall Faircloth
Tobin Rader

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:			TRACE		GB
Lab Tot. Resid. Cl2:			0.03	DR-100	KWP
Alkalinity:	125	72	392	Hach	MF
Hardness:	122	84	155	Hach	MF
Total Ammonia:	0.0	0.0	35.8	Orion	MF
	Ammonia	Ammonia	Salinity		

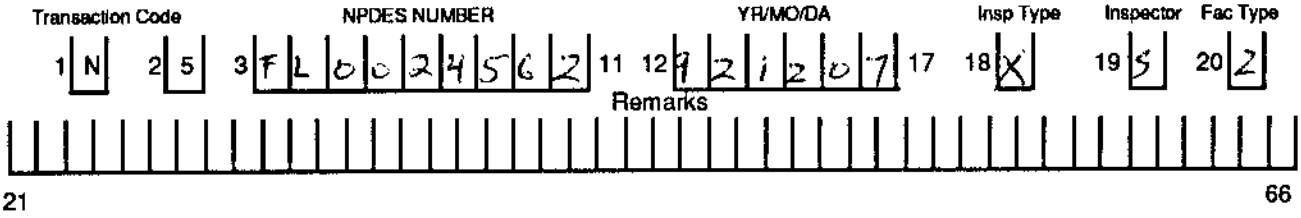
Phytoplankton taxa list and densities (#/mL) for Pride Resorts STP, collected via subsurface grabs from two test sites on 7 December, 1992, Bay County, Florida.

	Test site 1	Test site 2
Diatoms		
Achnanthes sp.	–	194
Amphora sp.	147	139
Bacillaria sp.	–	139
Ditylum sp.	–	28
Navicula sp.	293	111
Nitzschia sp.	176	139
Stauroneis sp.	–	28
Chlorophyta		
Chlamydomonas sp.	59	56
Oedogonium sp. ?	29	–
Unknown chlorophyte flagellate	–	554
Chloromonadophyta		
Vacuolaria sp. ?	–	527
Cyanophyta		
Aphanothece sp.	293	–
Chroococcus sp.	29	28
Oscillatoria sp.	–	28
Synechococcus sp.	59	–
Euglenophyta		
Euglena sp.	–	55

Macroinvertebrate taxa list for Pride Resorts STP, collected via petite Ponar grab from two test sites on 8 December, 1992, Bay County, Florida. Densities (#/m^2) represent the average of three grabs.

	Test Site 1	Test Site 2
Decapoda		
Palaemonetes pugio	12.5	25.0
Gastropoda		
Haminoea succinea	37.4	–
Malacostraca		
Corophium sp.	274.5	–
Leptochelia rapax	486.5	12.5
Melita cf. *nitida*	137.2	–
Pelecypoda		
Anomalocardia cuneimeris	49.9	–
Laevicardium mortoni	12.5	–
Macoma tenta	62.4	–
Tellina sp.	12.5	–
Polychaeta		
Capitella capitata	12.5	199.6
Ceratonereis longicirrata	–	37.4
Diopatra cuprea	12.5	–
Glycera sp.	37.4	–
Hobsonia florida	112.2	12.5
Laeonereis culveri	449.1	411.7
Leitoscoloplos fragilis	37.4	–
Lumbrineris tenuis	25.0	–
Mediomastus californiensis	149.7	–
Neanthes succinea	49.9	12.5
Pectinaria gouldii	12.5	–
Phyllodoce arenae	12.5	–
Polydora sp.	12.5	–
Prionospio heterobranchia	62.4	–
Scolelepis squamata	37.4	–
Streblospio benedicti	12.5	12.5
Undetermined nereid	12.5	37.4

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



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

