

Biological Assessment of

City of Key West Wastewater Treatment Plant

Monroe County

NPDES #FL0025976

Sampled June 1996

September 1996

Biology Section
Division of Administrative and Technical Services

Comprehensive Quality Assurance Plan No. 870346G

Department of Environmental Protection
Results of Fifth Year Inspections

Discharger: City of Key West WWTP
County: Monroe
NPDES Number: FL0025976
State Permit Expiration Date: 25 November 1996

Toxics Sampling Inspection (XSI)

Date Sampled: 18 June 1996

Results: Effluent copper (3.0 µg/L) exceeded the Class III standard of 2.9 µg/L for marine waters and effluent nickel (10 µg/L) exceeded the Class III standard of 8.3 µg/L for marine waters (violations of Rules 62-302.530 (24) and (45) FAC, respectively). All other metals complied with Class III standards. Effluent cyanide (10 µg/L) exceeded the 1 µg/L limit for Class III marine waters (a violation of Rule 62-302.530(25) FAC).

Compliance Biomonitoring Inspection (CBI)

Date Sampled: 18 June 1996

Results: The effluent was not acutely toxic to the invertebrate, *Mysidopsis bahia,* or to the fish, *Menidia beryllina.*

Impact Bioassessment Inspection (IBI)

Date Sampled: 18 June 1996

Results: Measures of macroinvertebrate community health indicated that the discharge was not adversely affecting the receiving water communities. Several benthic community parameters at the test sites were either similar to, or better than, those found at the reference site. By way of comparison, both test site taxa richness and Shannon-Weaver diversity values were better than those found in approximately 85% of other Florida estuaries. Pollution sensitive organisms were well represented throughout the study area, also suggesting that conditions near the outfall were healthy. As expected from the well flushed, oligotrophic waters of the Florida Straits, chlorophyll *a* (less than 0.55 µg/L) and algal density values were extremely low. Overall, the facility did not appear to have an adverse effect on the receiving water algal communities.

Water Quality Inspection (WQI)

Date Sampled: 18 June 1996

Results: Fecal coliform bacteria were undetected in the effluent and at all three receiving water stations. Nutrient levels found at the reference site and at test site 2 were either very low compared to other Florida estuaries, or undetected. Nutrient levels at test site 1, however, distinctly indicated influence from the discharge. For example, test site 1 concentrations of ammonia (0.075 mg/L) and nitrate-nitrite (0.063 mg/L) were higher than those found in approximately 55% and 75%, respectively, of other Florida estuaries. This suggests the effluent plume was directed to the vicinity of test site 1 during this particular sampling event. Algal Growth Potential results at the reference site (1.05 mg dry wt/L) and at test site 2 (0.71 mg dry wt/L) were very low. AGP at test site 1 (7.8 mg dry wt/L) was moderately higher, although it still did not exceed the 10 mg dry wt/L "problem threshold" for marine waters. The effluent AGP was 127.3 mg dry wt/L.

Introduction

The Richard A. Heyman Environmental Protection Facility is a domestic wastewater treatment facility serving the City of Key West, Monroe County, Florida (see maps in Appendix). The facility is an extended aeration, secondary treatment plant. Treatment consists of mechanical bar screening and grit removal, mechanical aeration, dual clarification, and chlorination for disinfection with subsequent dechlorination. Residuals are aerobically digested, mechanically dewatered, and disposed of through land application at a site located on the mainland. Effluent is discharged into the Atlantic Ocean (Florida Straits) via a submerged pipe, at a distance of approximately 1,200 meters from shore, at a depth of 6 meters. This facility has a permitted flow of 7.2 MGD, and the average monthly flow during June, 1996, was 6.49 MGD. Flow on the actual day of sampling was 6.9 MGD.

Permit limits are as follows: flow (7.2 MGD annual average daily flow), CBOD and TSS (30 mg/L as a monthly average, 20 mg/L as an annual average, 45 mg/L as a weekly average, and a maximum of 60 mg/L), total residual chlorine (0.5 mg/L minimum for disinfection, 0.01 mg/L maximum at discharge), pH (6.5 - 8.0 SU), dissolved oxygen (1.5 mg/L minimum), fecal coliforms (200 organisms/100 mL maximum). The facility has been granted mixing zones for dissolved oxygen (a 28 foot radius from outfall) and chronic toxicity (a 25 foot radius from outfall).

During the past several years, there have been severe infiltration/ inflow problems associated with the facility's collection system. This has caused the annual average daily flow (which was 8.0 MGD in 1995) to exceed the permitted capacity of 7.2 MGD during 1995 and portions of 1996. Excessive infiltration/ inflow has also caused collection system failure, resulting in repeated discharges of untreated wastewater during the past two years. Numerous spills of untreated sewage to public access areas and to surface waters have been reported throughout 1995 and 1996. A Consent Order issued in 1989 required rehabilitation of the collection system and improvement of effluent disinfection and dechlorination equipment. Currently, a judgment is under revision to settle violations related to collection system failure documented during 1995.

Major characteristics of community structure of control and test sites.

	Reference Site	Test Site 1	Test Site 2
Macroinvertebrate Ponar			
Number of Taxa	32	71	49
Shannon-Weaver Diversity	4.22	4.19	4.3
% Polychaeta	33.6	26.5	41.7
% Amphipoda	12.5	37.7	4.0
% Gastropoda	0	1.3	5.4
% Decapoda	0	1.7	1
% Cumacea	35.5	1.0	0.5
% Tanaidacea	0	1.5	6.3
% Echinodermata	11.8	0.2	1.8
% Pelecypoda	4.6	1.7	2.2
% Isopoda	0.7	12.4	3.6
% Other	1.3	1.0	4.5
% Predator/Carnivores	20.1	35.6	14.8
% Above-Surface Deposit Feeders	4.9	2.1	2.5
% Below Surface Deposit Feeders	6.2	23.7	40.8
% Scavengers	11.5	9.7	5.3
% Suspension Feeders	41.5	4.0	9.3
% Browsers	3.5	9.0	1.5
% Unknown	12.4	15.9	25.9
Phytoplankton Algae			
Number of Taxa	7	7	5
Shannon-Weaver Diversity	2.27	2.2	1.86
Chlorophyll a (µg/L)	0.55 U	0.55 U	0.55 U
Algal Density (#/mL)	160.9	422.3	304.5
% Blue-green	6.3	35.7	3.5
% Green	0	4.8	3.5
% Diatoms	81.2	57.1	93.1
% Dinoflagellates	12.5	0	0
% Cryptophytes	0	2.4	0
Algal Growth Potential (mg dry wt/l)	1.05	7.8	0.72

Current data indicate improvements in effluent dissolved oxygen and reductions in the chlorination/dechlorination problems frequently reported prior to 1995.

Methods

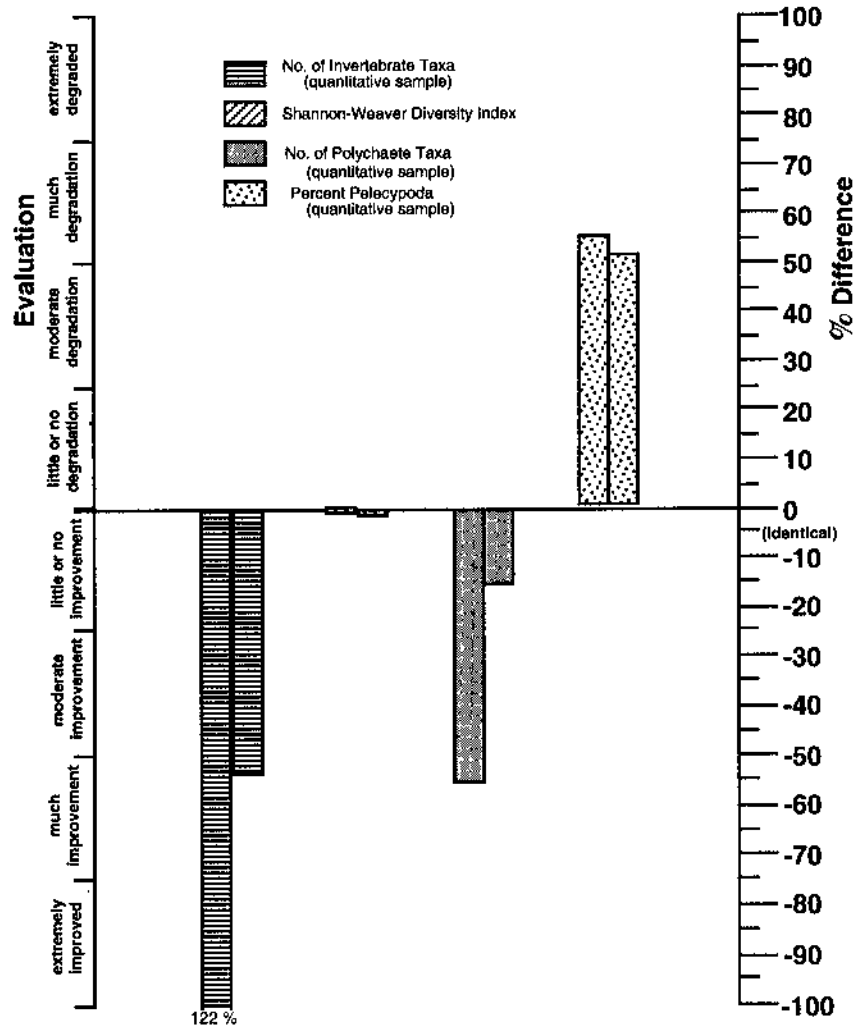
The focus of this investigation was to determine the discharger's effects on the receiving waters. A comparison of biological community health was made between a reference site (located one mile Northwest of the outfall) and two test sites bracketing the discharge (see maps in Appendix). A habitat assessment was performed *in situ* to establish comparability between sites. Supplemental physical/chemical data were also collected on the effluent and study sites. Acute screening toxicity bioassays, using *Mysidopsis bahia* and *Menidia beryllina* as test organisms, were performed on an effluent sample (Weber 1991). The effluent was analyzed for cyanide, 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. Chlorophyll *a* was also determined for phytoplankton communities (Ross 1990). Bacterial populations were analyzed for fecal coliforms following the methods of APHA (1989). Algal Growth Potential tests, using *Dunaliella tertiolecta* as the test organism, followed EPA (1974). Sediment from reference and test sites was analyzed for grain size and percent organic matter (Ross 1990).

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.

Taxa richness: Stress tends to reduce the number of different types of organisms present in a system, although moderate nutrient



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.

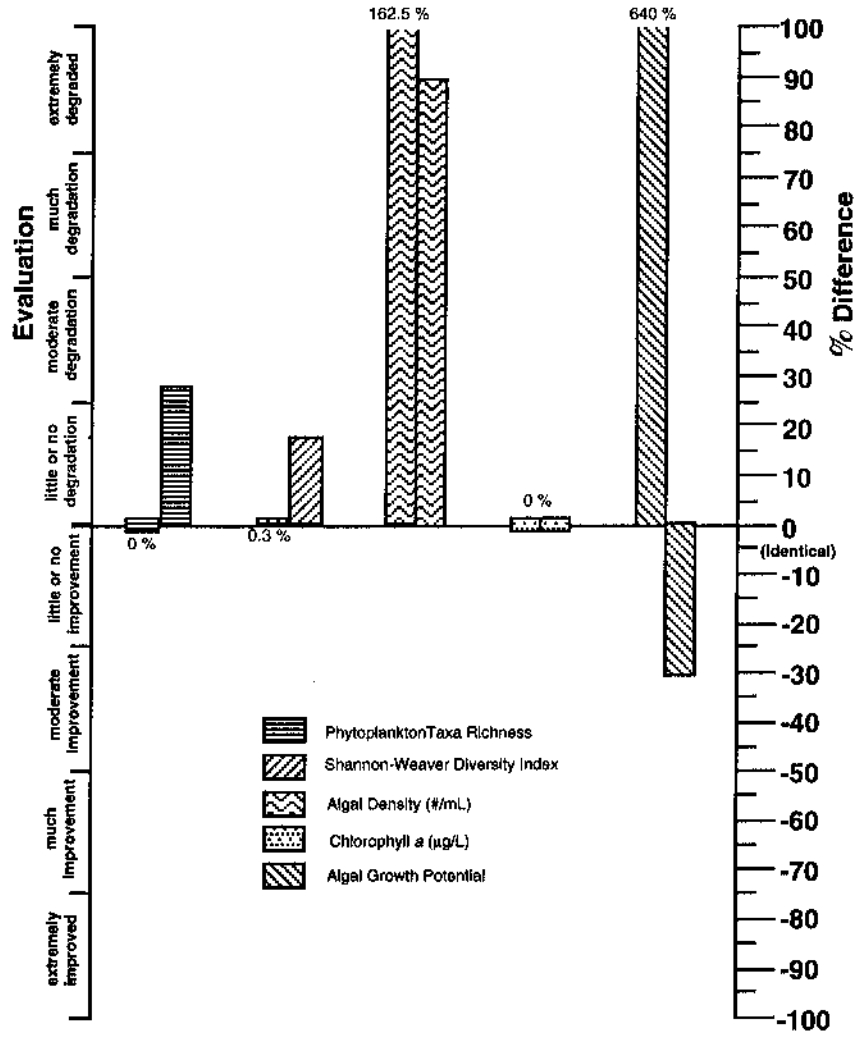
enrichment may sometimes be correlated with increased algal taxa richness.

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 Hulbert (1990), Hudson *et al.* (1990), Lenat (1993), Farrell (1992), Chang *et al.* (1992), and Whitmore (1989), are used as appropriate.

Community structure: Substantial shifts in proportions of major groups of organisms, compared to reference conditions, may indicate degradation. In marine systems, an increase in the % tubificid oligochaetes, a decrease in the % pelecypods, and a decrease in the number of polychaete taxa are all considered indicators of disturbance (Engel *et al.* 1994).

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.



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.

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).

For graphical purposes, the percent differences between the reference and test sites involving the number of taxa, the diversity index, the Florida 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: Nancy Brooking, Justine Hibberd, Gus

Rios, (DEP South District) and Lyn Burton, Marshall Faircloth, Russel Frydenborg, Joy Jackson, Kathleen Lurding, Tina Mikulski, Elizabeth Miller, Bart Richard, Urania Quintana, Lisa Tamburello, David Whiting, Vicki Whiting, and Greg Wynn (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 City of Key West WWTP outfall is located approximately 1,200 meters offshore, at a depth of 6 meters. The waters adjacent to the discharge area is designated as Outstanding Florida Waters. Habitat quality at each of the three receiving water sites was identical, with 82 points each. The sites scored in the good or excellent category regarding marine community types observed, tidal fluctuation, flow and wave action, and sediment type. While shoreline alterations and stormwater discharges were noted near the island, these sites were fairly far removed from these potentially deleterious influences. Sample depths ranged from 4.9 meters to 8.0 meters. The sediments at all three sites consisted largely of well oxygenated sand and shell, intermingled with patch reefs.

The water at the three receiving water stations was very similar with respect to physical/chemical parameters. Secchi readings were between 3.7 meters and 4.9 meters. Dissolved oxygen levels were adequate for aquatic life, ranging from 6.2 mg/L to 6.6 mg/L. Salinity ranged between 35 ppt and 36 ppt. Surface layer temperatures at the three receiving water sites were measured to be between 29.3° C and 29.7° C, while surface pH at each site was 7.9 SU.

The effluent was not acutely toxic to the invertebrate, *Mysidopsis bahia,* or to the fish, *Menidia beryllina.*

Copper (8 µg/L) and nickel (10 µg/L) were detected in the effluent at concentrations below their minimum quantitation limits, but greater than or equal to their minimum detection limits. For regulatory purposes, the concentrations of these metals were considered to be equal to their detection limits (which were 3.0 µg/L for copper and 10 µg/L for nickel). Therefore, effluent copper (3.0 µg/L) exceeded the Class III standard of 2.9 µg/L for marine waters and effluent nickel (10 µg/L) exceeded the Class III standard of 8.3 µg/L for marine waters (violations of Rules 62-302.530 (24) and (45) FAC, respectively). All other metals complied with Class III standards.

Cyanide (13 µg/L) was found in the effluent at a concentration below the minimum quantitation limit, but greater than or equal to the minimum detection limit (which was 10 µg/L). As described above, the effluent cyanide concentration was considered equal to 10 µg/L, which exceeds the 1 µg/L limit for Class III marine waters (a violation of Rule 62-302.530(25) FAC).

Fecal coliform bacteria were undetected in the effluent and at all three receiving water stations. Total coliforms were not sampled during this study.

Effluent concentrations of CBOD (10.6 mg/L) and TSS (9.5 mg/L) complied with the facility's permit limits.

Effluent concentrations of total phosphorus (1.7 mg/L), ortho-phosphate (1.3 mg/L), nitrate-nitrite (0.67 mg/L), ammonia (3.7 mg/L), and TKN (6.5 mg/L) were typical for a secondary-treated domestic wastewater. Nutrient levels found at the reference site and at test site 2 were either very low compared to other Florida estuaries, or undetected (see Table of Typical Water Quality Values in Appendix). Nutrient levels at test site 1, however, distinctly indicated influence from the discharge. For example, test site 1 concentrations of ammonia (0.075 mg/L) and nitrate-nitrite (0.063 mg/L) were higher than those found in approximately 55% and 75%, respectively, of other Florida estuaries. This suggests the effluent plume was directed to the vicinity of test site 1 during this particular sampling event.

Algal Growth Potential (AGP) results compared favorably with the nutrient results. AGP at the reference site (1.1 mg dry wt/L) and at test site 2 (0.72 mg dry wt/L was very low. In comparison, AGP at test site 1 (7.8 mg dry wt/L) was moderately higher, although it still did not exceed the 10 mg dry wt/L "problem threshold" for marine waters (Ron Raschke, USEPA, personal communication). The effluent AGP was 127.3 mg dry wt/L.

Measures of macroinvertebrate community health indicated the discharge was not adversely affecting the receiving water communities. 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.

Several benthic community parameters at the test sites were either similar to, or better than, those found at the reference site. For example, macroinvertebrate taxa richness was

very high at test site 1 (71 taxa), intermediate at test site 2 (49 taxa), and lowest at the reference site (32 taxa). Shannon-Weaver diversity was similar, and excellent, at each station, ranging from 4.2 to 4.3. By way of comparison, both test site taxa richness and Shannon-Weaver diversity values were better than those found in approximately 85% of other Florida estuaries. The number of polychaete taxa was highest at test site 1 (with 31 taxa), intermediate at test site 2 (with 23 taxa), and lowest at the reference site (with 20 taxa). Pelecypods were similarly represented (between 1.7% to 4.6% of the total population) at each of the three sampling stations. Please note that the actual differences between the reference and test sites regarding the % pelecypod parameter are not as striking as they appear on the graph.

Pollution sensitive organisms were well represented throughout the study area. For example, the polychaetes, *Armandia agilis* and *Exogone dispar,* and the amphipod, *Gibberosus myersi*, were collected at the reference site. Similarly, taxa which require good water quality were found at one or both test sites. These included the polychaetes, *Leitoscoloplos fragilis* and *Platynereis dumerilii*, the amphipods, *Ampithoe longimana, Leucothoe spinicarpa*, and *Ericthonius brasiliensis,* as well as the echinoderm, *Amphipholis squamata*. The presence of such taxa suggests that conditions near the outfall were healthy.

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. As expected from the well flushed, oligotrophic waters of the Florida Straits, algal density (ranging from 161 cells/mL to 422 cells/mL) and chlorophyll *a* (less than 0.55 µg/L) values were extremely low. Note that the actual differences between the reference and test sites regarding algal density are not as striking as they appear on the graph. Only 7 phytoplankton taxa were recovered from both the reference site and test site 1, while 5 taxa were found at test site 2. Shannon-Weaver diversity ranged from 1.9 to 2.3. Diatoms were the most abundant algal group at all three sites, followed by cyanophytes. Overall, the facility did not appear to have an adverse effect on the receiving water algal communities.

Conclusions

The effluent was not acutely toxic to the invertebrate, *Mysidopsis bahia,* or to the fish, *Menidia beryllina.*

Effluent copper (3.0 µg/L) exceeded the Class III standard of 2.9 µg/L for marine waters and effluent nickel (10 µg/L) exceeded the Class III standard of 8.3 µg/L for marine waters (violations of Rules 62-302.530 (24) and (45) FAC, respectively). All other metals complied with Class III standards.

Effluent cyanide (10 µg/L) exceeded the 1 µg/L limit for Class III marine waters (a violation of Rule 62-302.530(25) FAC).

Fecal coliform bacteria were undetected in the effluent and at all three receiving water stations. Total coliforms were not sampled during this study.

Effluent nutrient concentrations were typical for a secondary-treated domestic wastewater. Nutrient levels found at the reference site and at test site 2 were either very low compared to other Florida estuaries, or undetected. Nutrient levels at test site 1, however, distinctly indicated influence from the discharge. For example, test site 1 concentrations of ammonia (0.075 mg/L) and nitrate-nitrite (0.063 mg/L) were higher than those found in approximately 55% and 75%, respectively, of other Florida estuaries. This suggests the effluent plume was directed to the vicinity of test site 1 during this particular sampling event.

Algal Growth Potential (AGP) results compared favorably with the nutrient results. AGPs at the reference site (1.05 mg dry wt/L) and at test site 2 (0.71 mg dry wt/L were very low. In comparison, AGP at test site 1 (7.8 mg dry wt/L) was moderately higher, although it still did not exceed the 10 mg dry wt/L "problem threshold" for marine waters. The effluent AGP was 127.3 mg dry wt/L.

Measures of macroinvertebrate community health indicated the discharge was not adversely affecting the receiving water communities. Several benthic community parameters at the test sites were either similar to, or better than, those found at the reference site. By way of comparison, both test site taxa richness and Shannon-Weaver diversity values were better than those found in approximately 85% of other Florida estuaries. Pollution sensitive organisms were well represented throughout the study area, also suggesting that conditions near the outfall were healthy.

As expected from the well flushed, oligotrophic waters of the Florida Straits, algal density and chlorophyll *a* (less than 0.55 µg/L) values were extremely low. Overall, the facility did not appear to have an adverse effect on the receiving water algal communities.

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Chemistry Summary Table for Key West WWTP.

	Effluent	Reference Site	Test Site 1	Test Site 2
Organic Constituents (ug/L)				
None Detected	None Detected			
Metals (ug/L)				
Aluminum	1000 U			
Arsenic	20 U			
Cadmium	0.5 U			
Calcium	152 A			
Copper	8 I			
Chromium	20 U			
Iron	130 A			
Lead	2 I			
Magnesium	339 A			
Mercury	0.10 U			
Nickel	10 U			
Selenium	40 I			
Silver	0.4 U			
Zinc	100 U			
Nutrients (mg/L)				
Ortho-phosphate	1.3	0.004 U	0.034 A	0.004 U
Total phosphorus	1.7	0.015 U	0.058	0.017 I
Ammonia	3.7 A	0.020 U	0.075	0.020 U
Nitrate+Nitrite	0.67	0.020 U	0.063	0.020 U
TKN	6.5 A	0.22	0.44	0.31 A
General Phys-Chem Parameters				
Habitat Assessment		82	82	82
D. O. (mg/L)	3.8	6.2	6.6	6.4
pH (SU)	7.0	7.9	7.9	7.9
Salinity (ppt)	10.1	35	36	35
Temperature (°C)	29.1	29.7	29.3	29.4
Cyanide (µg/L)	13 I			
Total Suspended Solids (mg/L)	9.5			
Biological Oxygen Demand, 5 day (mg/L)	10.6			
Hardness (mg CaCO3)	1775			
Algal Growth Potential (mg dry wt/L)	127.3	1.1	7.8	0.72
Toxicity				
Bioassay Fish	Not Toxic			
Bioassay Invertebrate	Not Toxic			
Microbiological Communities (org/100 mL)				
Fecal Coliform	1 U	1 U	1 U	1 U

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

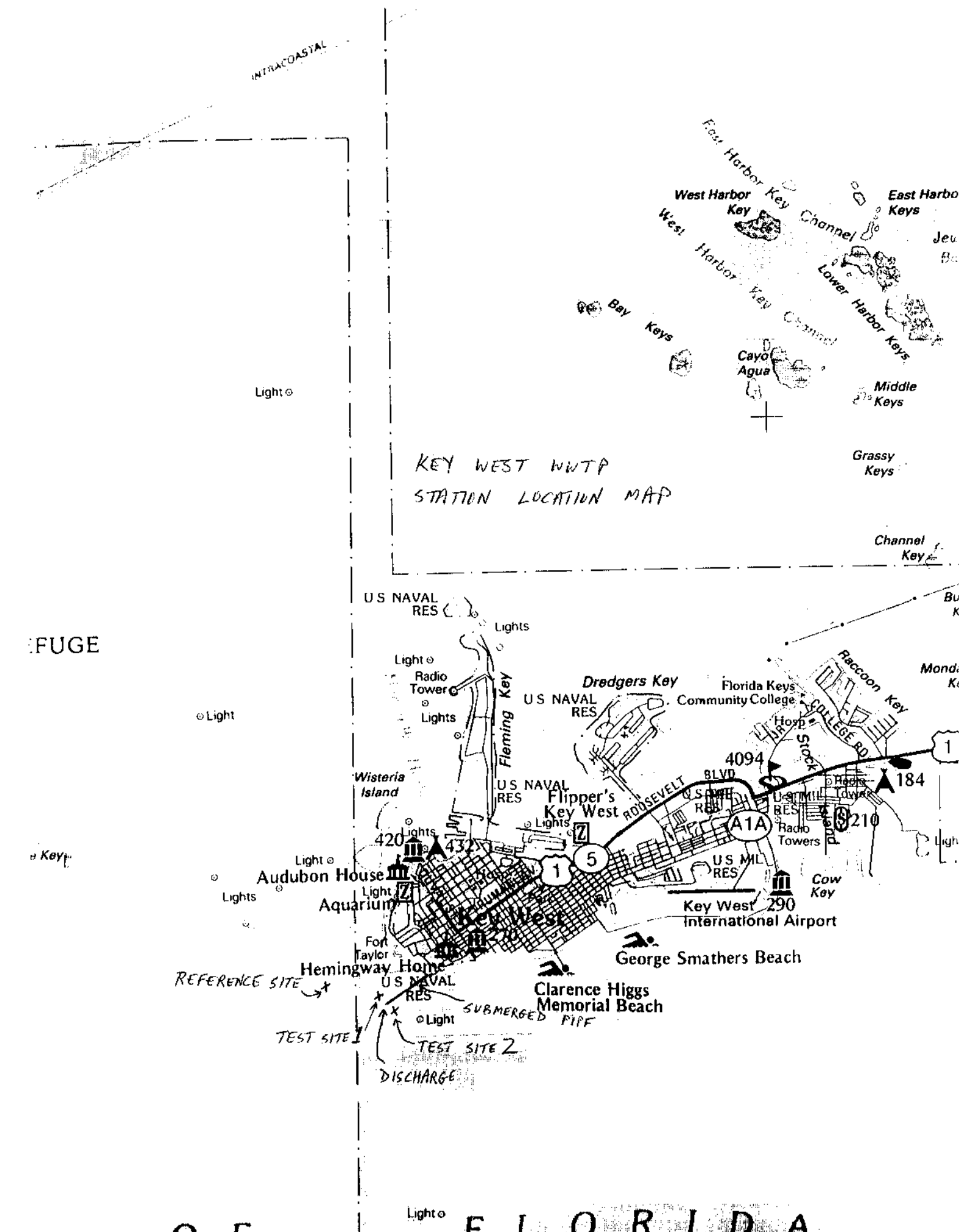
Typical Values for Selected Parameters in Florida Waters

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

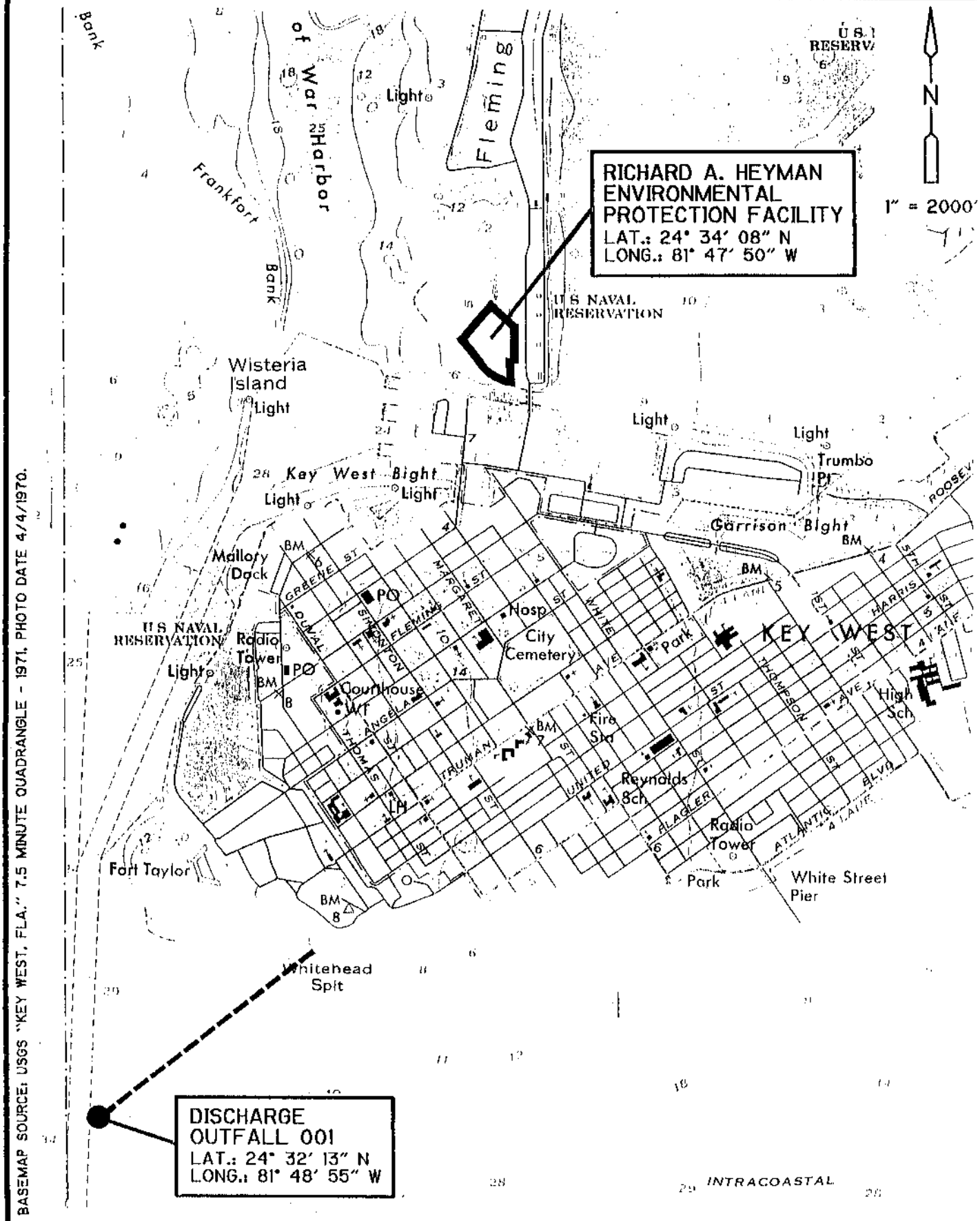
Percentile Distribution

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 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


KEY WEST WWTP
STATION LOCATION MAP
INTRACOASTAL
West Harbor Key
East Harbor Keys
West Harbor Key Channel
Lower Harbor Keys
Bay Keys
Cayo Agua
Middle Keys
Grassy Keys
Channel Key
Light
US NAVAL RES
Lights
Radio Tower
Fleming Key
Dredgers Key
Florida Keys Community College
Raccoon Key
COLLEGE RD
Stock Island
Wisteria Island
ROOSEVELT BLVD
Flipper's Key West
A1A
Radio Towers
4094
184
210
420
432
Audubon House
Aquarium
Key West
Fort Taylor
Hemingway Home
REFERENCE SITE
US MIL RES
Cow Key
Key West International Airport
290
George Smathers Beach
Clarence Higgs Memorial Beach
SUBMERGED PIPE
TEST SITE 1
TEST SITE 2
DISCHARGE
:FUGE
O F
F L O R I D A

Attachment 1



CITY OF KEY WEST
RICHARD A. HEYMAN ENVIRONMENTAL PROTECTION FACILITY

FACILITY AND DISCHARGE LOCATION MAP

CDM
environmental engineers, scientists, planners, & management consultants

Figure No. 3

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

FACILITY NAME: Richard A. Heyman Environmental Protection Facility (AKA City of Key West WWTP)
PREPARED BY: Gus Rios
DATE: 5/17/96

LOCATION (attach detailed map): Facility located on Flemming Key, KW
Outfall location: see maps(attachment I)
COUNTY: Monroe
DISTRICT: South District
Marathon Branch

FEDERAL PERMIT #FL0025976 AND EXPIRATION DATE: 10/31/99
STATE GMS# AND 5244M06172
STATE EXPIRATION DATE: 11/25/96
Permit #D044-188785
FACILITY TYPE: DW Industrial Municipal Federal Agricultural
OTHER (list):

FUNCTION OF FACILITY: - Domestic Wastewater Treatment Plant
- Serves the City of Key West

DESCRIPTION OF TREATMENT PROCESS: The facility is an extended aeration process wastewater treatment plant providing secondary treatment, with mechanical aeration and dual clarifiers, and basic disinfection with chlorine gas. Effluent is dechlorinated with sulfur dioxide prior to discharge to surface waters. Residuals are aerobically digested and disposed of at FDEP-permitted land application site located in the mainland.

RECEIVING WATERS: Atlantic Ocean
CLASSIFICATION: Class III

DESIGN FLOW: Permitted flow: 7.2 MGD
DESIGN FLOW: 10.0 MGD
ACTUAL MEAN FLOW: Annual ave. daily flow (May 95 - April 96) AADF

DISCHARGE IS: Continuous x Intermittent Seasonal Rainfall dependent
OTHER (describe)

IF FACILITY HAS A MIXING ZONE, GIVE DETAILS (size, parameters affected, etc.): Facility has a mixing zone for DO and Toxicity.
1. Dissolved Oxygen: 28-foot radius circle area from outfall point.
2. Toxicity: 25-foot radius circle area from outfall point.
This mixing zone is subject to the requirements specified in Rule 62-4.244 of the F.A.C.

LIST EFFLUENT LIMITS: State Permit

PARAMETER	LIMIT (units)
FLOW	7.2 MGD (AADF)
CBOD5/TSS	30 mg/L monthly average
	20 mg/L annual average
	45 mg/L weekly average
	60 mg/L max. at any time
Minimum total chlorine res. (effluent disinfection)	0.5 mg/L
Max. total chlorine res. (after dechlorination)	0.01 mg/L
PH	6.5 - 8.5 std. unit
Fecal Coliform	200 col./100ml annual ave.
	200 col./100ml geometric mean monthly
	800 col./100ml max. per grab sample
Dissolved Oxygen	1.5 mg/L minimum

DESCRIBE SPECIAL PERMIT CONDITIONS (state permit) AND PERMIT MODIFICAITONS:
Permit specific conditions 12 and 13 require water quality monitoring of surface waters by the outfall. Permit specific condition 14 contains STATE requirements for effluent toxicity testing pursuant to F.A.C. Rule 62.244(3)(a) which replaces the NFDES permit FL0025976 requirements.

Note: for NPDES parameters see Attachment II

City Of Key West WWTP
(Facility)

Description of permitted outfall(s):

The effluent is discharged through a 24" cast iron pipe which extends approximately 3,600 ft. offshore to the outfall location (see Attachment I).

The outfall consists of a single open-end pipe which discharges at an approximate depth of 18 ft. below the surface.

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

The Discharge Monitoring Reports, or the Semiannual Effluent Toxicity Reports, submitted during the fiscal year (July 1995 through April 1996) do not show violations of permit effluent limitations.

During the past several years this facility has experienced severe infiltration and inflow (I/I) problems in the collection system. These problems have caused the facility flows to exceed the permitted capacity during 1995 and 1996. Excessive I/I has also caused collection system failure resulting in repeated discharges of untreated wastewater from the sanitary sewer system during the past two years.

The excessive I/I problem also results in salt water (saline ground water) intrussion tinto the collection system. The facility operating staff have been measuring salinity levels at the major lift stations and influent concentrations ranging between 8.75 to 14 ppt have been recently reported. This is equivalent to 25 to 40 % seawater infiltration.

Permit violations documented during the fiscal year are described in paragraphs 7 through 10 of the "Draft" Fourth Amended Consent Judgement OGC Case No. 79-238-CA-17 (See Attachment III).

Describe previous impact bioassessments, WQBEL'S and previous or current enforcement actions:
1. PREVIOUS WATER QUALITY STUDIES AND BIOASSESSMENTS:

1. **Proposed Designation of the Waters of the Florida Keys As Outstanding Florida Waters. Report to the Environmental Regulatory Commission By the State of Florida Department of Environmental Regulation. 1985.** This report contains surface water quality data collected throughout the Florida Keys during the period of January 8 and February 20, 1985. Stations sampled included the Key West Outfall, Station 165, and an ambient background station, 164 , (See Attachment IV). These results are significant since this survey predates the construction of the WWTP facility and documents water quality conditions at the outfall during raw sewage discharges. These data show violations of fecal coliform Class III criteria at the time of sampling.

2. The USEPA and NOAA have conducted plume charaterization and dilution studies at the Key West Outfall. Recent outfall studies conducted by USEPA include the following:

a. Dilution Study - Key West POTW Discharge, Key West, Florida (May 9 - 16, 1994).

b. Chemical Tracer Analysis of Sediments Around the Key West, Florida Ocean Outfall, USEPA No. 3R-1975-NASA (December 3, 1993).

c. Assessing Geochemical and Biological Fate for Point Source Loads of Sewage-Derived Nitrogen and Organic Carbon in Coastal Waters of Southern Florida (USEPA Draft Report September 1995 - still under revision).

The Plume deliniation and dilution studies conducted by NOAA and USEPA (1993-1994) were used by

the City of Key West to satisfy requirements in Specific Condition 12 of the State permit. The City used the information gathered during these studies as reference for the following:

- To establish the above referenced mixing zones as described in the State permit.

- To ascertain and verify the location of the outfall. The coordinates are Lat. 24 deg. 32.23' N. by 81 deg. 48.88' W., as shown in the September 1993 modification to the State permit.

- To select adequate sampling stations for the water quality program required in Specific Condition 12 of the State permit.

3. **Quarterly Water Quality Reports of Receiving Waters.** Submitted by the City of Key West in compliance with Specific Condition 12 of the State permit. These reports contain physicochemical data for surface waters, such as Dissolved Oxygen, pH, and Conductivity, as well as Nutrients (Nitrogen/Phosphorus), Chlorophyll A and fecal/total coliform. The data collected during the past year documents significant improvements from surface water quality conditions reported for the outfall location during the OFW Study when receiving waters were still subject to raw sewage discharges.

These reports have been submitted in compliance with the permit since December 1994. These reports show very low fecal coliform values similar to ambient background at all stations. Also the DO profiles reported for the oufall plume have not shown any violations of Class III waters criteria.

Below is a summary of the average values for nutrients and Chlorophyll A reported for the outfall and receiving waters for the period comprising December 1994 through February 1996. Also shown are the average values for effluent Total Nitrogen and Total Phosphorous reported in the DMR for this period:

1. Effluent prior to discharge to surface waters:

Ave. TN = 4.52 mg/L ; Ave. TP = 1.16 mg/L

Note that TN includes Ammonia, Organic N, and Nitrate-Nitrite.

2. Outfall (Surface Water) stations:

Station description and coordinates are provided below:

a. Station # 1. Located 150' from outfall at 323 degrees from North.

Lat. 24 deg. 32.27 min. N / Long. 81 deg. 48.90 min. W

b. Station # 2. Located 150' from outfall at 170 degrees from North

Lat. 24 deg. 32.20 min. N / Long. 81 deg. 48.85 min. W

c. Ambient Background - Station # 3 Northwest of the Outfall.

Lat. 24 deg. 32.915 min. N / Long. 81 deg. 50.058 min. W

These results are overall average values per station (including all daily averages) reported during the aforementioned time period. All concentrations (except for Chl. A) are in mg/L :

Station #	NO2-NO3	NO3	NH3	TKN	O-Phos.	T-P	Chl. A (ug/L)
1	0.0176	0.0183	0.0213	0.1527	0.004	0.0046	1.1
2	0.0220	0.0130	0.0386	0.1510	0.0089	0.0111	1.1
3	0.0179	0.0187	0.0165	0.14	0.0043	0.0066	1.1

II. PREVIOUS ENFORCEMENT ACTIONS:

1. Third Amended Consent Judgement (OGC No. 79-238-CA-17) was issued on October 20, 1989, to require rehabilitation of the collection system and other facility upgrades. The City implemented a collection system rehabilitation program and, since then, has submitted semiannual reports to the Department in compliance with this Order. However, to this date excessive I/I problems still persist in the collection system.

2. A Notice of Violation (OGC 94-3735-44-DW) was issued on January, 1995, with Final Order issued on June 13, 1995. This Order required corrective actions to address permit violations related to several incidents of effluent disinfection and dechlorination equipment malfunction. The Order also required the City to take corrective steps to address the ongoing inflow/infiltration problems in the facility's collection system.

2. "Draft" Fourth Amended Consent Judgement - still undergoing revisions (OGC No. 79-238-CA-17). Drafted to address and settle violations related to collection system failure documented during 1995 as described in paragraphs 7 through 10 of the draft consent Judgement (See Attachment III).

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

As indicated above the effluent DMR results reported during the past Fiscal Year were, for the most part, in compliance with permit requirements except for the annual average daily flow which was reported to exceed the permitted capacity in 1995.

These DMR show improving trends from effluent DO, and Chlorination/dechlorination problems reported during previous years (before 1995).

Additional information:

The surface water sampling stations selected for this inspection are the same stations included in the City's Water Quality Monitoring Program in accordance with the State permit. The station ID numbers are the same as those used for the City's sampling stations. This facilitates comparison with the City's reports.

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - Final

These limitations are to be achieved by the effective date of the permit, and shall remain in effect until permit expiration for outfall Serial Number 001, sanitary wastewater.

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

ARAMETERS	DISCHARGE LIMITATIONS Other Units (Specify)			MONITORING REQUIREMENTS		
	Annual Average	Monthly Average	Weekly Average	Measurement Frequency	Sample Type	Sampling Point
low, MGD	--	Report	Report	Continuous	Recording flow meter & totalizer	Effluent
rbonaceous Biochem- cal Oxygen Demand 5-Day)	20.0 mg/l --	25.0 mg/l Report	40.0 mg/l --	5 days/week 5 days/week	24-hr. Composite	Effluent Influent
tal Suspended Solids	20.0 mg/l --	30.0 mg/l Report	45.0 mg/l --	5 days/week 5 days/week	24-hr. Composite	Effluent Influent
cal Coliform Bacteria (#/100 ml)		See Item 3 on Page I-3		5 days/week	Grab	Effluent
		See Item 4 on Page I-3		Continuous	Recorder	Effluent
tal Residual Chlorine		See Item 8 on Page I-4		5 days/week	Grab	
ute Whole Effluent Toxicity		See Item 9 on Page I-4		See Part IV	Grab	Effluent
tal Nitrogen, as N (mg/l)	--	Report	--	1/month	24-hr. Composite	Effluent
tal Phosphorus, as P (mg/l)	--	Report	--	1/month	24-hr. Composite	Effluent
ssolved Oxygen, mg/l		See Item 12 on Page I-4		7 days/week	Grab	

The sample point shall be Pump Station A.

ATTACHMENT II

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - Final - Continued

1. These limitations are to be achieved by the effective date of the permit, and shall remain in effect until permit expiration for outfall Serial Number 001, sanitary wastewater.

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

PARAMETERS	DISCHARGE LIMITATIONS Other Units (Specify)			MONITORING REQUIREMENTS		
	Annual Average	Monthly Average	Weekly Average	Measurement Frequency	Sample Type	Sampling Point
Total Recoverable Copper, ug/l		See Item 13 on Page I-5		1/month	24-hr. Composite	Effluent

continues to experience severe inflow and infiltration (I/I) problems which have caused the Facility to become hydraulically overloaded.

7. The City submitted a Capacity Analysis Report on February 22, 1995. The report projected annual average daily flows below the permitted capacity of 7.2 MGD for 1995 and indicated that the collection system rehabilitation program would decrease I/I flows. However, all Discharge Monitoring Reports submitted by the City during year 1995, with the exception of March 1995, show three-month average daily flows exceeding the permitted capacity. The three-month average daily flow reported for March 1995 was 99% of the permitted capacity. The continued operation of this facility at flows exceeding the permitted capacity constitutes a violation of General Condition 2 of the permit, paragraph 9 of the Third Amended Consent Judgement, and Section 403.161, F.S., which makes it a violation to fail to comply with the conditions of a Department order or permit.

8. During the year 1995, and during February 1996, the City reported several incidents of collection system failure which resulted in the release of untreated sewage to public access areas and to State surface waters.

Wastewater spills to public access areas were reported by OMI personnel for the dates of January 22, February 20 and 27, March 16 and 19, April 25, May 12, July 26, August 14 and 19, September 5, and October 16, 17, 18 and 19, 1995. Wastewater spills from the collection system were also reported for the dates of February 18,

22, and 23 1996. The reports indicated that the majority of these spills were caused by blockage of old, substandard, gravity connections. However, some of the reported spills consisted of manhole, and gravity line, overflows caused by hydraulic overload due to excessive I/I during high tides and heavy rain. Similar spill incidents had been reported during previous years of operation. all these spills were reported and cleaned up by OMI staff in a timely manner.

The release of inadequately treated wastewater constitutes a violation of F.A.C. Rule 62-600.740(2)(a).

9. Sewage discharges from a stormwater drain to State surface waters in Garrison Bight were reported by OMI on October 16, 1995. According to this report sewage entered the stormwater system through a broken sanitary sewer line at a conflict point with the stormwater system. Repairs were performed by OMI crews as soon as the problem was located. However, sewage which had already entered the stormwater system before repairs could be completed was discharged into surface waters.

Surface water samples collected by OMI staff at the point of discharge were tested and showed a fecal coliform concentration of 60,000 colonies/100 mL. During an October 18, 1995 Department inspection, surface water samples were collected and tested at the Department's Marathon laboratory. The tests revealed a fecal coliform concentration of 27,000 colonies/100 mL. These fecal

DRAFT

coliform concentrations are indicative of untreated sewage contamination in the sampled waters. These values constitute a violation of the fecal coliform standard for Class III surface waters specified in F.A.C. Rule 62-302.530.

10. The outfall monitoring reports for the second, third and fourth quarter of 1995, show effluent concentrations of Cyanide, Gross Alpha Particle Activity, and Silver exceeding the maximum permissible limits for Class III waters, pursuant to F.A.C. Rule 62-302.530. The first quarterly report for 1996 (Dated March 19, 1996) still shows effluent concentrations of Cyanide exceeding the Class III waters limits. However, this report indicates effluent compliance with the Class III waters limit for Silver and Gross Alpha Particle Activity.

The City submitted information to the Department on October 16, 1995, indicating that the levels of Cyanide shown in the aforementioned reports were below the practical quantitation limit of their testing laboratory.

11. Within Forty five (45) days of the effective date of this Order the City shall submit to the Department a schedule for completion of the ongoing collection system rehabilitation work. This schedule will be subject to Department approval and shall address the following issues:

a. The schedule shall prioritize corrective actions by concentrating

3

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 5)

SUBMITTING AGENCY CODE: 8050 / SUBMITTING AGENCY NAME: FDEP S. DISTRICT MARATHON	STORET STATION NUMBER:	DATE (M/D/Y): 6/18/96	TIME 12:45 PM	RECEIVING BODY OF WATER: ATLANTIC Ocean
REMARKS: Offshore Station Background	LOCATION: Key West - N of from outfall Lat. 24°32.915'N / 81° 50.058'W			FIELD ID/NAME: KW-3-61896 STATION #3

RIPARIAN ZONE/INSTREAM FEATURES

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

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

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

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

Width of riparian vegetation (m) on least buffered side: | ***List & map dominant vegetation on back*** | Typical Width (m)/Depth (m) /Velocity (m/sec) Transect (draw cross-section & provide at least 3 velocity & depth values)

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

Artificially Impounded ☐ yes

High Water Mark (m above bed): N/A

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:

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: Patch reefs	50		
Rock or Shell Rubble				Other: Sand	50		
Shorezone (Roots/Veg.)				***Draw aerial view sketch of habitats found in 100 m section***			

WATER QUALITY	Depth (ft):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm) or Salinity (ppt):			Secchi (ft):
Top	1.0	29.3	7.91	6.56	54,442			16ft.
Mid-depth	10.8	28.96	7.92	6.55	54,550			Total depth 26.4
Bottom	22.4	28.91	7.93	6.60	54,529			

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

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): Normal Tannic: ☐ Green (algae): ☐ Clear: ☐ Other: ☐ N/A

Weather Conditions/Notes: [redacted] Tide Calm

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

SAMPLING TEAM: Justine Hibberd, Nancy Brooking, Gus Rias | SIGNATURE: Gus Rias, N Brooking, Justine Hibberd | DATE: 6/18/96

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

SUBMITTING AGENCY CODE: 8053 / SUBMITTING AGENCY NAME: FDEP S. District - Marathon Branch	STORET STATION NUMBER:	DATE (M/D/Y): 6/18/96	RECEIVING BODY OF WATER: Key West ATLANTIC Ocean
REMARKS: offshore station Background	LOCATION: North West from Outfall - Key West 1 mile LAT 24° 32.915'N / 81° 50.058 W		FIELD ID/NAME: KW-3-61896 STATION #3

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 45	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 5	Only natural runoff.. **9-10 points**	Mostly natural runoff, but with a few, small stormwater sources. **6-8 points**	Considerable stormwater discharge from local roads, parking lots, etc. **3-5 points**	Extensive manmade discharges, especially from canals draining large tracts of land. **0-2 points**
Flow and Wave Action 10	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 15	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 82

COMMENTS: Background station located more than a mile offshore from Key West

ANALYSIS DATE:	ANALYST:	SIGNATURE:
6/18/96	G. Rias	Gus Rios

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 5)

SUBMITTING AGENCY CODE: 8053 / SUBMITTING AGENCY NAME: FDEP S. District Marathon	STORET STATION NUMBER:	DATE (M/D/Y): 6/18/96	TIME: 11:30	RECEIVING BODY OF WATER: ATLANTIC Ocean

REMARKS: offshore station Outfall Plume	LOCATION: Keywest Outfall 150' From Outfall 323° from North	FIELD ID/NAME: KW-1-61896 STATION # 1

RIPARIAN ZONE/INSTREAM FEATURES

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

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

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

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

Width of riparian vegetation (m) on least buffered side: N/A

List & map dominant vegetation on back

Typical Width (m)/Depth (m) /Velocity (m/sec) Transect (draw cross-section & provide at least 3 velocity & depth values)

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

Artificially Impounded ☐ yes

High Water Mark (m above bed): N/A

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:

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: Patch reef	50		
Rock or Shell Rubble				Other: sand	50		
Shorezone (Roots/Veg.)				***Draw aerial view sketch of habitats found in 100 m section***			

WATER QUALITY	Depth (ft):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm) or Salinity (ppt):			Secchi (ft):
Top	1.0	29.38	7.9	6.37	53,952			12 ft
Mid-depth	11.0	28.96	7.92	6.40	54,415			TOTAL depth 16.0'
Bottom	15.0	28.96	7.93	6.45	54,415			

System Type : Stream: ☐ (1st - 2nd order / 3rd - 4th order / 5th - 6th order / 7th order or greater) Lake: ☐ Wetland: ☐ Estuary: ☐ Other: ☒ Offshore location Ocean

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): None Tannic: ☐ Green (algae): ☐ Clear: ☐ Other: ☐

Weather Conditions/Notes: Flood Tide

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

SAMPLING TEAM: Justine Hibberd, Nancy Brooking, Gus Rios	SIGNATURE: N Brooking / Justine Hibberd	DATE: 6/18/96

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

SUBMITTING AGENCY CODE: 8053	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER: Key West
SUBMITTING AGENCY NAME: FDEP S. District Marathon		6/18/96	ATLANTIC Ocean

REMARKS: Offshore Station Outfall plume	LOCATION: Key West Outfall - Test Site #1 150' from Outfall at 323° from N	FIELD ID/NAME: KW-1-61896 STATION # 1

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 45	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 5	Only natural runoff.. **9-10 points**	Mostly natural runoff, but with a few, small stormwater sources. **6-8 points**	Considerable stormwater discharge from local roads, parking lots, etc. **3-5 points**	Extensive manmade discharges, especially from canals draining large tracts of land. **0-2 points**
Flow and Wave Action 10	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 15	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 82

COMMENTS:

ANALYSIS DATE:	ANALYST:	SIGNATURE:
6/18/96	Gus Rios	Gus Rios Justine Hubbard

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 5)

SUBMITTING AGENCY CODE: 8053 / SUBMITTING AGENCY NAME: FDEP S. District Marathon	STORET STATION NUMBER:	DATE (M/D/Y): 6/18/96	TIME 10:45	RECEIVING BODY OF WATER: ATLANTIC Ocean

REMARKS: offshore Station Outfall plume	LOCATION: Key West Outfall 150' from Outfall at 170° from North	FIELD ID/NAME: KW-2-61896 STATION #2

RIPARIAN ZONE/INSTREAM FEATURES

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

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

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

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

Width of riparian vegetation (m) on least buffered side: N/A

List & map dominant vegetation on back

Typical Width (m)/Depth (m) /Velocity (m/sec) Transect (draw cross-section & provide at least 3 velocity & depth values)

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

Artificially Impounded

High Water Mark (m above bed): N/A

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:

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: Patch reef	50		
Rock or Shell Rubble				Other: sand	50		
Shorezone (Roots/Veg.)				***Draw aerial view sketch of habitats found in 100 m section***			

WATER QUALITY	Depth (m): FF	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm) or Salinity (ppt):			Secchi (m):
Top	1.1	29.69	7.9	6.23	53,910			15 ft.
Mid-depth	10	29.22	7.9	6.29	54,241			TOTAL 17 ft.
Bottom	15.6	29.09	7.89	6.22	54,246			

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

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): None Tannic: ☐ Green (algae): ☐ Clear: ☐ Other: ☐

Weather Conditions/Notes: Flood Tide

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

SAMPLING TEAM: Justine Hibberd, Nancy Brooks, Gus Rios	SIGNATURE: Gus Rios, N. Brooks, Justine Hibberd	DATE: 6/18/96

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

SUBMITTING AGENCY CODE: 8053 / SUBMITTING AGENCY NAME: FDEP S. District Marathon	STORET STATION NUMBER:	DATE (M/D/Y): 6/18/96	RECEIVING BODY OF WATER: Key West ATLANTIC Ocean

REMARKS: Offshore Station Outfall Plume	LOCATION: Key West Outfall-Test Site 150' from outfall at 170° from N.	FIELD ID/NAME: KW-2-61896 STATION #2

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 46	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 5	Only natural runoff.. **9-10 points**	Mostly natural runoff, but with a few, small stormwater sources. **6-8 points**	Considerable stormwater discharge from local roads, parking lots, etc. **3-5 points**	Extensive manmade discharges, especially from canals draining large tracts of land. **0-2 points**
Flow and Wave Action 10	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 15	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 82

COMMENTS:

ANALYSIS DATE: 6/18/96	ANALYST: Gus Rios	SIGNATURE: Gus Rios

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Key West
County: Monroe
Contact / District: Gus Rios / South Marathon
NPDES Permit #: FL00 25976
LIMS Sample #: 142230 **LIMS Job #:** 96-JUN-18-03
sample log 6-20-96
Test Type: Screening | Definitive
Static | Static Renewal | Flow-through
Test Number: 1 of 2
Remarks:

Sample Collection: Date 6-17-96 Time 0915
Test Beginning: Date 6-18-96 Time 1335
Test Ending: Date 6-20-96 Time 1340
Organism Batch #: 166 **Diluent Batch #:** 24
Organism Age: 4 days
Test Organism: Mysidopsis bahia

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	24.0 @ 24.1	8.3 @ 24.8 °C	9730 @ 9869 995 @ 1006 @ 24.8 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	23.8 @ 23.9	8.2 @ 25.0 °C	984 @ 1006 9530 @ 9869 @ 24.4 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	23.7 @ 23.8	8.2 @ 25.2 °C	991 @ 1006 9550 @ 9869 @ 24.1 °C

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	C1	5	5	5	8.2	8.4	8.4	25.1	23.9	24.1	6.9	7.1	7.1	16.5	16.1	16.3
Control B	C2	5	5	5	8.2	8.4	8.4	25.1	23.8	24.1	6.9	7.1	7.2	16.5	16.1	16.3
Control C	C3	5	5	5	8.2	8.4	8.4	25.1	23.8	24.1	6.9	7.1	7.2	16.5	16.2	16.4
Control D	C4	5	5	5	8.2	8.4	8.4	25.1	24.1	24.1	6.9	7.1	7.2	16.5	16.2	16.3
100% A	C5	5	5	5	7.1	7.9	8.1	24.3	24.0	24.1	6.8	6.7	7.0	16.8	16.7	16.8
100% B	C6	5	5	5	7.1	7.9	8.1	24.2	23.9	24.0	6.8	6.7	7.0	16.8	16.7	16.7
100% C	C7	5	5	5	7.1	7.9	8.1	24.2	24.0	24.0	6.9	6.7	7.0	16.8	16.8	16.8
100% D	C8	5	5	5	7.1	7.9	8.1	24.2	24.0	24.0	6.9	6.7	7.0	16.8	16.8	16.9
Measured/Loaded by:		JM	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF
Recorded by:		MF	MF	MF	LM	DB	DB	LM	DB	DB	LM	DB	DB	LM	DB	DB

* 16.08 6-1

Investigators' Signatures
Marshall Faircloth
Tina Mikulski

reviewer

form updated 4/01/96

Water Quality Parameters

	Salt Water: Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2 (mg/L):			1.2	—	Nancy Brocking
Lab Total Residual Cl2 (mg/L):	<0.03	—	<0.03	DR-100	DB
Alkalinity (mg/L as $CaCO_3$):		—			
Hardness (mg/L as $CaCO_3$):		—			
Total ammonia (mg/L as N):	<.017	—	5.29	Orion	LM

Ammonia Meter #98136 Ammonia Meter Slope: -57.2 Ammonia Blank: <.017 Control Salinity: 9.8 ppt Sample Salinity: 9.8 ppt

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Key West
County: Monroe
Contact / District: Gus Rios / South-Marathon
NPDES Permit #: FL0025976
LIMS Sample #: 142230 LIMS Job #: 96-JAN-18-03
sample log 6-20-96
Test Type: Screening / Definitive
Static / Static Renewal / Flow-through
Test Number: 2 of 2

Remarks: 3 replicates were used in this test due to a shortage of test age organisms. mf 7/17/96

Sample Collection: Date 6-17-96 Time 0915
Test Beginning: Date 6-18-96 Time 1345
Test Ending: Date 6-20-96 Time 1340
Organism Batch #: 22 Diluent Batch #: 24
Organism Age: 12 days
Test Organism: Menidia beryllina

Instrument Calibrations:	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	24.0 @ 24.1	8.3 @ 24.8 °C	995 @ 1006 9730 @ 9869 @ 24.8 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	23.8 @ 23.9	8.2 @ 25.0 °C	984 @ 1006 9530 @ 9869 @ 24.9 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	23.7 @ 23.8	8.2 @ 25.2 °C	991 @ 1006 9550 @ 9869 @ 24.1 °C

		Number Live			pH			Temperature (°C)			D.O. (mg/L)			UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm)		
Conc.	Chamber #	0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h
Control A	C9	5	5	5	8.2	8.4	8.4	25.1	24.0	24.0	6.9	7.0	7.1	16.5	16.1	16.2
Control B	C10	5	5	5	8.2	8.4	8.4	25.1	23.9	23.9	6.9	7.0	7.0	16.5	16.1	16.2
Control C	C11	5	5	5	8.2	8.4	8.4	25.1	23.9	23.9	6.9	7.1	7.1	16.5	16.2	16.2
100% A	C13	5	5	5	7.1	7.9	8.1	24.2	24.1	24.0	6.8	6.7	7.0	16.8	16.8	16.9
100% B	C14	5	5	5	7.1	7.9	8.1	24.2	24.1	24.0	6.8	6.7	6.9	16.8	16.7	16.7
100% C	C15	5	5	5	7.1	7.9	8.1	24.2	24.0	23.9	6.8	6.7	7.0	16.8	16.8	16.6
Measured/Loaded by:		MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF
Recorded by:		MF	MF	MF	LM	DB	DB	LM	DB	DB	LM	DB	DB	LM	DB	DB

Investigators' Signatures
Marshall Fairchild
Liz Monck
Pam Rubinoff
Tina Mikulski

AH Wolfe
reviewer

form updated 4/01/96

Salt Water

Water Quality Parameters	Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2 (mg/L):			1.2	—	Nancy Bucking
Lab Total Residual Cl2 (mg/L):	<0.03	—	<0.03	DR-100	DB
Alkalinity (mg/L as $CaCO_3$) :		—			
Hardness (mg/L as $CaCO_3$) :		—			
Total ammonia (mg/L as N) :	<.017	—	5.29	Orion	LM

Ammonia Meter #98136 Ammonia Meter Slope: -57.2 Ammonia Blank: <.017 Control Salinity: 9.8 ppt Sample Salinity: 9.8 ppt

Benthic macroinvertebrate taxa list for City of Key West, collected via Ponar grab samples in the Straits of Florida, on 18 June, 1996. Densities, in number/m^2, represent the mean of three replicates.

	Reference Site	Test Site 1	Test Site 2
Platyhelminthes			
Platyhelminthes	–	14	–
Nemertea			
Rhynchocoela	–	14	139
Polychaeta			
Amblyosyllis sp.	–	14	–
Ampharetidae	28	–	–
Arabella multidentata	–	14	–
Aricidea	14	264	69
Armandia agilis	14	14	–
Autolytus prolifera	–	14	–
Axiothella sp.	14	–	28
Capitella sp.	14	–	–
Capitellidae	14	83	194
Caulleriella sp.	–	–	14
Caulleriella alata	–	14	–
Cirrophorus sp.	–	14	–
Cirrophorus branchiatus	–	28	–
Dentatisyllis carolinae	14	–	–
Dorvillea sp.	–	14	–
Dorvilleidae	–	56	–
Eunice sp.	–	14	28
Exogone dispar	–	–	14
Exogone lourei	14	–	–
Fabriciola trilobata	14	–	–
Geminosyllis sp.	–	–	14
Goniadidae	14	–	–
Goniadides carolinae	69	14	–
Haplosyllis spongicola	–	14	–
Hesionidae	–	14	–
Hesionura elongata	–	14	–
Heteropodarke formalis	–	56	–
Isolda pulchella	–	14	–
Leitoscoloplos sp.	–	14	14
Leitoscoloplos fragilis	–	–	14
Lepidonotus sublevis	–	14	–
Loimia medusa	14	–	–
Lumbrinerides sp.	–	–	14
Lumbrineris sp.	42	14	14
Maldanidae	28	–	–
Malmgreniella sp.	–	–	14

	Reference Site	Test Site 1	Test Site 2
Mediomastus sp.	14	–	–
Mooreonuphis sp.	–	56	14
Mooreonuphis nebulosa	–	–	69
Nematonereis sp.	–	–	28
Nereidae	–	83	14
Onuphidae	–	42	–
Onuphis sp.	42	–	–
Paraonidae	–	167	14
Phyllodoce sp.	28	–	–
Phyllodocidae	–	14	–
Pionosyllis sp.	–	14	–
Platynereis dumerilii	–	14	–
Polychaeta	28	69	–
Polyophthalmus pictus	–	–	14
Prionospio steenstrupi	14	–	–
Protodorvillea sp.	–	14	125
Pseudeurythoe sp.	–	–	42
Questa sp.	14	–	–
Questa caudicirra	83	347	181
Questidae	–	208	181
Sabellidae	14	56	14
Scolelepis squamatus	–	–	14
Scoloplos sp.	–	14	14
Scoloplos rubra	14	–	–
Sphaerosyllis magnidentata	–	14	–
Spionidae	–	28	–
Sthenelais sp.	–	14	–
Sthenelais limicola	14	–	–
Syllidae	83	278	111
Syllis sp.	–	14	14
Syllis cornuta	28	–	–
Terebellidae	–	28	14
Tharyx sp.	28	–	–
Typosyllis sp.	–	42	–
Oligochaeta			
Oligochaeta	–	1278	903
Gastropoda			
Bulla striata	–	–	14
Caecum nitidum	–	69	–
Caecum pulchellum	–	28	–
Columbella mercatoria	–	–	14
Gastropoda	–	–	56
Marginella sp.	–	–	28
Nassarius vibex	–	–	14
Natica pusilla	–	14	–
Naticidae	–	–	42
Pelecypoda			
Glycymeris sp.	–	14	–
Macoma sp.	42	–	–

	Reference Site	Test Site 1	Test Site 2
Macoma tenta	–	–	14
Mytilidae	–	42	–
Pelecypoda	14	14	–
Semelidae	–	–	14
Tagelus sp.	–	–	28
Tellina sp.	–	–	14
Tellinidae	42	69	–
Pycnogonida			
Achelia sp.	–	28	–
Cumacea			
Cumacea	181	14	–
Cyclaspis sp.	375	56	–
Cyclaspis unicornis	28	14	–
Cyclaspis varians	56	–	14
Oxyurostylis sp.	14	–	–
Oxyurostylis smithi	97	–	–
Tanaidacea			
Apseudes sp.	–	42	125
Hargeria rapax	–	69	14
Kalliapseudes	–	14	28
Tanaidacea	–	–	28
Isopoda			
Astacilla cymodocea	–	28	–
Cyathura polita	–	–	28
Erichsonella sp.	–	14	–
Exosphaeroma alba	14	–	–
Janiridae	–	694	–
Mesanthura bivittata	–	–	14
Microparasellidae	–	222	–
Munnidae	–	–	14
Paracereis caudata	–	–	56
Sphaeromatidae	–	69	–
Uromunna hayesi	–	14	–
Amphipoda			
Ampelisca vadorum	–	–	14
Amphipoda	14	42	56
Ampithoe longimana	–	42	–
Ampithoidae sp.	–	14	–
Caprella sp.	–	1889	–
Caprellidae	–	542	–
Cerapus sp.	14	42	–
Corophiidae	97	14	–
Corophium sp.	–	14	–
Elasmopus sp.	–	83	–
Ericthonius sp.	–	14	–
Ericthonius brasiliensis	–	14	–
Gibberosus myersi	83	14	–
Gitanopsis sp.	–	83	–
Lembos sp.	–	56	–

	Reference Site	Test Site 1	Test Site 2
Lembos websteri	–	83	14
Leucothoe spinicarpa	–	139	–
Lysianopsis alba	–	42	42
Melita sp.	–	14	–
Monoculodes	28	–	–
Phtisica marina	28	–	–
Podoceridae	–	14	–
Stenothoe sp.	–	14	–
Decapoda			
Decapoda	–	28	–
Hippolyte sp.	–	28	–
Hippolytidae	–	42	–
Majidae	–	–	14
Palaemonidae	–	14	–
Pilumnus dasypodus	–	14	–
Portunidae	–	–	14
Thor sp.	–	14	–
Sipuncula			
Phascolion strombi	14	–	–
Nematoda			
Phoronis sp.	14	–	–
Echinodermata			
Amphioplus sp.	–	–	28
Amphipholis sp.	–	–	28
Amphipholis squamata	250	–	–
Amphiuridae	–	14	–
Chaetognatha			
Sagitta sp.	–	28	–

Phytoplankton taxa list and densities (#/mL) for City of Key West, collected via subsurface grabs in the Straits of Florida, on 18 June, 1996.

	Reference Site	Test Site 1	Test Site 2
Cyanophyceae			
Gloeocapsa sp.	–	–	11
Lyngbya sp.	10	–	–
Oscillatoria sp.	–	151	–
Bacillariophycea			
Achnanthes sp.	10	–	–
Chaetoceros sp.	40	121	126
Cymbella sp.	10	–	–
Nitzschia sp.	40	70	42
Nitzschia longissima	30	20	11
Pennales	–	–	11
Rhaphoneis sp.	–	10	–
Rhizosolenia sp.	–	20	95
Chlorophyceae			
Chlorophyceae	–	20	11
Dinophyceae			
Gymnodinium sp.	10	–	–
Peridinium sp.	10	–	–
Chryptophyceae			
Chroomonas sp.	–	10	–

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

1	2	3	11	12	17	18	19	20
Transaction Code		NPDES NUMBER		YR/MO/DA		Insp Type	Inspector	Fac Type
N	5	FL0025976		960618		X	5	1

Remarks

21 66

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

1	2	3	11	12	17	18	19	20
Transaction Code		NPDES NUMBER		YR/MO/DA		Insp Type	Inspector	Fac Type
N	5	FL0025976		960618		F	5	1

Remarks

21 66