

Biological Assessment of

Greater Pine Island Water Association
Reverse Osmosis Plant

Lee County

NPDES #FL0025739

Sampled 23 October 1990

February 1991

Biology Section
Division of Administrative and Technical Services

Introduction

Biological, chemical, and toxicological data concerning the Greater Pine Island R.O. Plant discharge were collected on 23 October 1990 and analyzed. This information will be used to evaluate the facility's permit criteria.

This reverse osmosis plant is currently permitted to pump 1.1 MGD of water from a deep well and produce 0.55 MGD of potable water and 0.55 MGD of brine discharge. The effluent brine is discharged into Sand Dollar Waterway, a manmade canal which leads to Buzzard Bay and Matlatcha Pass Aquatic Preserve, an outstanding Florida Water (see map in Appendix).

The following summarizes the permit limitations for discharge effluent. The pH should be within the range of 6.0-8.5, the total phosphorus should be < 10 mg/l daily average or <15 mg/l daily maximum, and the total suspended solids (TSS) should be < 30 mg/l daily average or < 50 mg/l daily maximum. In addition, there should not be any floating solids or foam present from the discharge. In the past, problems have occurred with the format used to record information on monthly operating reports to the Department (averages rather than minimum and maximum values). These problems have since been resolved. Review of past reports revealed that no permit discharge limits were being exceeded.

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 at two sites chosen by the District Biologist, a background and a test site located in the Sand Dollar Waterway. 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. An acute screening toxicity bioassay using *Mysidopsis bahia* as the test organism was performed on an effluent sample (Peltier and Weber 1985, FDER 1985). The effluent was analyzed for chlorides approximately one week before bioassay samples were collected, and for organic constituents (base neutrals, acid extractables, and pesticide extractables) and metals at the same time that the bioassay was run. Additionally, limited nutrient analyses were performed on reference and test sites. Methods used for all chemical analyses are on file at the Tallahassee DER Chemistry Laboratory.

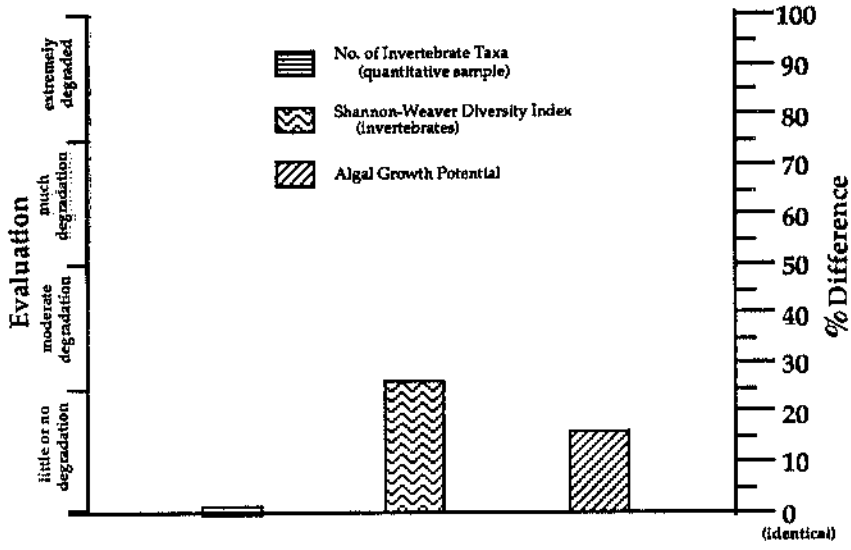
Benthic macroinvertebrate communities were evaluated at reference and test sites. The collection method consisted of three ponar grabs, in which all organisms were collected and identified in the laboratory (Ross 1990). Algal growth potential tests, using *Duneliella tertiolecta* as the test organism, followed EPA (1974).

Explanation of Measurements of Community Health

Several different measurements of macroinvertebrate community health have been employed. Many of these, such as the number of taxa and the Shannon-Weaver Diversity

Major characteristics of community structure of control and test sites.

	Control Site	Test Site
Macroinvertebrate Quantitative		
Number of Taxa	9	9
Shannon-Weaver Diversity	2.3	1.7
% Polychaeta	82.2	79.8
% Nematoda	0	16.0
% Pelycepoda	11.8	0
% Cnidaria	2.0	1.8
% Other	4.0	2.4
% Collector-Gatherers	47.1	22.4
% Collector-Filterers	11.7	0
% Scrapers	1.9	0
% Shredders	0	0.3
% Predatorss	39.3	77.3
Algal Growth Potential (mg dry wt/l)	5.6	6.5



Effect of discharge on receiving stream
(measured as difference between control and test sites).

Index are well known. Others are briefly explained here. Czekanowski's Similarity Index is a multivariate ordination procedure which compares organism abundance and taxonomic structure between sites. The determination of the Quantitative Similarity Index (for taxonomic % composition) is a two step process. First, the relative proportions of major taxonomic groups are calculated for each site. Then, the lesser of the two percentages for each discrete taxonomic group is totaled. A QSI (% composition) of 100% means that the two sites being compared are identical. This same type of procedure is used for calculating the QSI (functional feeding groups).

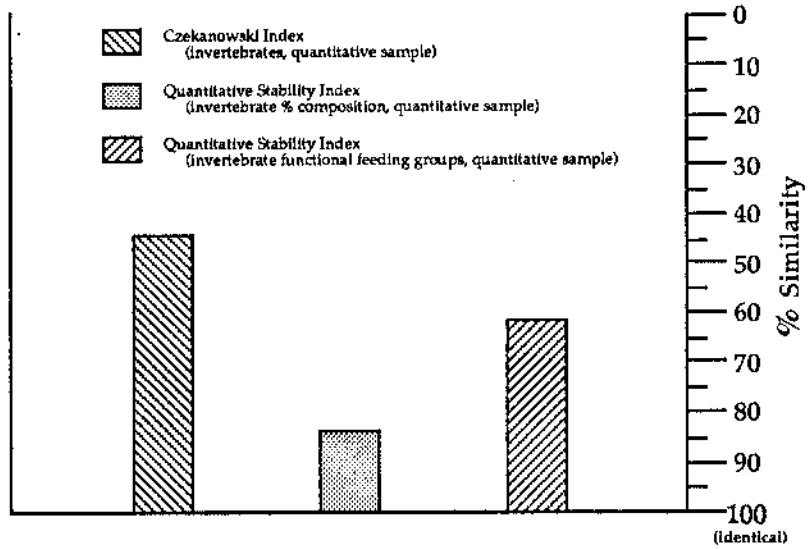
For graphical purposes, the percent differences between the reference and test sites involving the number of taxa and the diversity index are measured as the reference site minus test site divided by the reference site. The percent difference between sites involving the algal growth potential is measured as the test site minus reference site divided by the reference site.

The following personnel were involved in this investigation: Mark Charneski (DER South District) and Lyn Burton, Russel Frydenborg, Kathleen Lurding, and Sandra McClure (Tallahassee Biology Laboratory).

Results and Discussion

Habitat quality was essentially identical at background and discharge points with respect to littoral zone characteristics, tidal fluctuation and wave action, and freshwater discharges (Habitat Score = 39 at both sites, Appendix). The physical-chemical characterization (Appendix) indicated a 40% higher sand content in the substrate and lower dissolved oxygen at the discharge site (4.5 mg/l at test site, 6.6 mg/l at background site). Also, an H_2S odor was detected in the water at the test site. All other measurements demonstrated the close similarity of these two sites.

All effluent organic constituents analyzed from a single grab were below detection limits (Appendix). Metals analysis revealed the presence of copper (27 µg/l), iron 172 µg/l), and zinc (71 µg/l). In marine waters, these concentrations should not pose a threat to the biota. Of particular interest, however, was the



Effect of discharge on receiving stream
(measured as similarity between control and test sites).

60,000 µg/l of strontium detected in the effluent sample (Appendix). Riley and Chester (1971) report a normal strontium concentration in ambient seawater of 8,500 µg/l. Although no toxicological information could be found for this element, an almost order of magnitude higher than background level may be a potential problem.

Because imbalances of major ions can result in waters which receive the discharge from reverse-osmosis plants, chloride, fluoride, and sulfate were analyzed at background and test sites. The chloride measured in the effluent (650 mg/l) was much lower than the 8100 mg/l and 8200 mg/l found at background and downstream sites, respectively. Fluoride levels were very low and sulfate was found at concentrations typical of marine waters. Orthophosphate was undetected at both sites (Appendix).

Algal growth potential (AGP) tests performed on reference and test sites indicated a 16% increase at the test site, representing little or no degradation (see upper left figure, page 2). While these AGP levels are fairly high for marine waters, the increase cannot be clearly attributed to this facility's discharge. It is probable that non-point source runoff from the residential areas of Cape Coral is contributing to eutrophication problems in these canals. The effluent sample did not cause mortality to the shrimp, *Mysidopsis bahia*, in the 48 hour static acute toxicity test.

Macroinvertebrate community health may have been somewhat stressed in the vicinity of the discharge (see Table and Figures). The upper left figure on page 2 indicates the degree of difference between the control and test sites. Larger differences (that is, higher percentages) correspond with greater degrees of degradation. The Shannon-Weaver diversity at the test site was 26% lower than that of the control (technically, a biological integrity violation). This was primarily due to the higher numbers of polychaetes found there, particularly the opportunistic species, *Laeoneris culveri* and *Capitella capitata*. It is possible that the greater proportion of smaller grain size sediment at the test site allowed for higher populations of these organisms to become established. It should be noted that the same number of taxa (nine) was collected from each site.

The lower right figure (page 2) summarizes similarities between the sites. Smaller similarities (lower percentages) generally correspond with greater degradation. Czekanowski's Index indicated that the two communities were alike at only the 45% level. There was a somewhat better trophic resemblance between the sites (QSI for functional feeding groups = 62%). At 84%, the QSI (% composition) indicated a good deal of similarity between sites. The lack of nematodes and malacostracans at the reference site and the absence of gastropods, pelycepods, and oligochaetes at the test site were responsible for the observed differences (see taxa list in Appendix). While changes like these often represent degradation, the fact that the test site contained some sensitive epifaunal organisms (e.g., *Corophium louisianum*, *Hydrozoa* sp., and an unidentified anemone) indicates that the macroinvertebrate community is relatively intact. Therefore, these differences between stations may reflect substrate changes or natural variation, rather than the direct influence of this facility's discharge.

Conclusions

Results of macroinvertebrate community studies in the vicinity of the Greater Pine Island Reverse Osmosis Plant were not conclusive enough to attribute the observed changes solely to the discharge. Pollution sensitive organisms were collected at the test site, although diversity was somewhat reduced. Algal growth potential was elevated at the two sampling stations, indicating a possible non-point source enrichment problem in the area. The metals copper, iron, and zinc were detected in the effluent at non-toxic levels. Strontium was detected in the effluent at 60,000 µg/l, which is almost an order of magnitude higher than reported ambient values. No toxicity to the crustacean, Mysi*dopsis bahia,* was found in acute static bioassay tests.

Literature Cited

American Public Health Assoc., American Water Works Assoc., and Water Pollution Control Federation. 1989. Standard Methods for the Examination of Water and Wastewater, 17th ed. New York, N.Y. 1268 p.

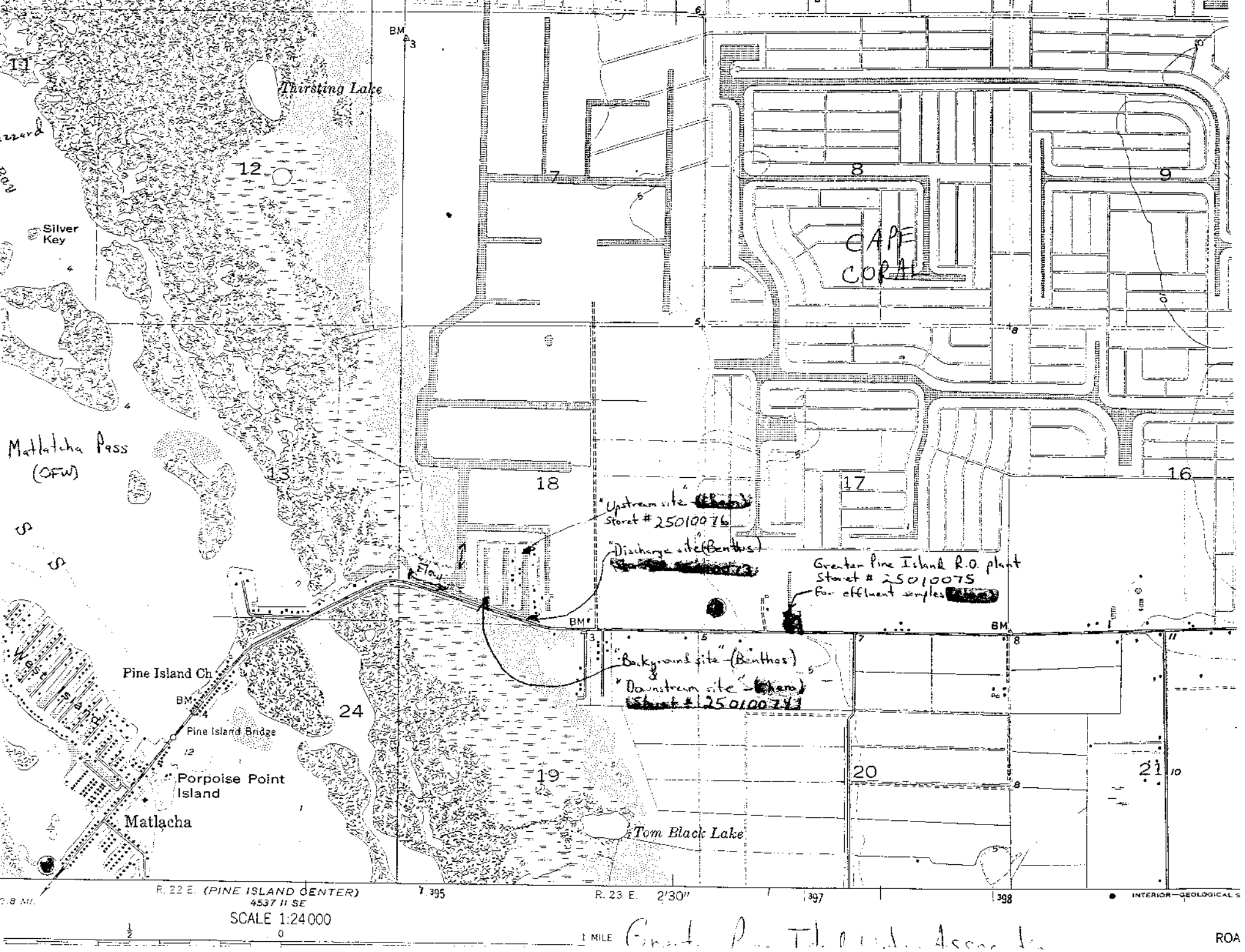
Environmental Protection Agency. 1974. Marine algal assay procedure: Bottle test. Nat'l. Environ. Res. Center, Office of Res. and Dev., U.S. EPA, Corvallis, Oregon. 43 p.

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

Peltier, W. H. and C. I. Weber. 1985. Methods for measuring the acute toxicity of effluents to freshwater and marine organisms. 3rd edition. EPA/600/4-85/013. U. S. EPA, Cincinnati, Ohio. 216 pp.

Riley, J. R. and R. Chester. 1971. Introduction to Marine Chemistry. Academic Press. 465 p.

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


Thirsting Lake
Silver Key
Matlatcha Pass (OFW)
CAPE CORAL
Greater Pine Island R.O. plant
Station # 25010075
for effluent samples
Upstream site
Station # 25010076
"Discharge site" (Benthos)
Flow
"Background site" (Benthos)
Downstream site
Station # 25010077
Pine Island Ch
Pine Island Bridge
Porpoise Point Island
Matlacha
Tom Black Lake
BM
11
12
13
18
17
16
24
19
20
21
7
8
9
10
R. 22 E. (PINE ISLAND CENTER)
4537 II SE
R. 23 E.
2'30"
395
397
398
SCALE 1:24000
1 MILE
INTERIOR—GEOLOGICAL S

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

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
	25010074	10/23/90	Sand Dollar Waterway

REMARKS:	LOCATION: Sand Dollar Waterway Granta Pine Island R.D. Background Site	FIELD ID/NAME:

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: 13	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 comunities observed from those listed. **26-37 points**	One comunity observed from those listed. **13-25 points**	No comunities observed from those listed. **0-12 points**
Tidal Fluctuation: 2	>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: 0	Only natural runoff.. **9-10 points**	Mostly natural runoff, but with a few, small stormwater sources. **6-8 points**	Considerable stormwater discharge from local roads, parking lots, etc. **3-5 points**	Extensive manmade discharges, especially from canals draining large tracts of land. **0-2 points**
Flow and Wave Action: 9	Light to moderate wave action present except under the harshest weather conditions. Flow unrestricted by manmade structures. **9-10 points**	—	—	Heavy wave action sometimes present even during average weather conditions, or flow restricted by manmade structures so that velocities are very high. **0-2 points**
Sediment Type: 12	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 34

COMMENTS:

ANALYSIS DATE:	ALYST:	SIGNATURE:
10-23-90	Chmurski	

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

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
	2501 0073	10/23/90	

REMARKS:	LOCATION:	FIELD ID/NAME:
	Discharge Pt. Greater Pine Island Water Assn.	BID2390 - 4

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**
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Tidal Fluctuation 2	>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 10	Only natural runoff.. **9-10 points**	Mostly natural runoff, but with a few, small stormwater sources. **6-8 points**	Considerable stormwater discharge from local roads, parking lots, etc. **3-5 points**	Extensive manmade discharges, especially from canals draining large tracts of land. **0-2 points**
Flow and Wave Action 9	Light to moderate wave action present except under the harshest weather conditions. Flow unrestricted by manmade structures. **9-10 points**	—	—	Heavy wave action sometimes present even during average weather conditions, or flow restricted by manmade structures so that velocities are very high. **0-2 points**
Sediment Type 12	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 39

COMMENTS:

ANALYSIS DATE:	ANALYST:	SIGNATURE:
	Chymnek	

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
	25010074	10/23/90	Sand Dollar Waterway

REMARKS:	LOCATION: Sand Dollar Waterway Background Greater Pine Island Water Assn.	FIELD ID/NAME:

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other
			90	5		5 mangrove

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

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

Point-Source Pollution (list location and describe):

Estimated Stream Width (range, m): 15	Estimated Stream Depth (range, m): 1 2 5		yes
High Water Mark (m above bed): .4	Velocity (range, m/s):	Impounded ☐	
		Channelized ☑	

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

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types (estimated % surface coverage):

Limestone:		Sand/Silt/Clay Mix:	
Consolidated Clay:		Clay/Silt (inorganic):	
Gravel/Shell	10	Coarse Organic Debris:	
Sand:	90	Mud/Muck (organic):	

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):		
			Secchi Depth (m):	1.2
Top	30.0	6.6	pH (SU):	8.4
Mid-depth	29.7	5.6	Conductivity (µmho/cm):	1512
Bottom	29.6	5.2	Other Parameters:	

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

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

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

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

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

Weather Conditions:

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

ANALYSIS DATE:	ANALYST:	SIGNATURE:
	Chemist	

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/DAY):	RECEIVING BODY OF WATER:
	25010073	10/23/90	Sand Dollar Waterway

REMARKS:	LOCATION:	FIELD ID/NAME:
	Greater Pine Island Water Assn.	B102390 - 4

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other
			90	5		5 Mangrove

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):

Rd. discharge

Estimated Stream Width (range, m): 15	Estimated Stream Depth (range, m): 1.25		yes
High Water Mark (m above bed): .7	Velocity (range, m/s): none	Impounded ☐ Channelized ☑	

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

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types (estimated % surface coverage):

Limestone:		Sand/Silt/Clay Mix:	
Consolidated Clay:		Clay/Silt (inorganic):	
Gravel/Shell	50	Coarse Organic Debris:	
Sand:	50	Mud/Muck (organic):	

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):		
Top	24.6	4.5	Secchi Depth (m):	1
Mid-depth	↓	4.2	pH (SU):	7.5
Bottom	↓	4.3	Conductivity (µmho/cm):	1745
			Other Parameters:	

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

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

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

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

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

Weather Conditions: pt. cldy

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

ANALYSIS DATE:	ANALYST:	SIGNATURE:
10/23/90	Chauvette	[signature]

Sample Number: 90-OCT-24-10-01
Sample Location: Greater Pine Island-effluent
Field ID: B102390-1
Date/Time Collected: 23-OCT-1990 16:09:49.76
Comments:

Sample Status: Authorized by Liang T. Lin
Matrix: Effluent
Storet Station Number: 25010075

Sample Number: 90-OCT-24-10-01
Analysis Id: W-BNA

Test status: Authorized by Laura Harrison
Analysis Description: base-neutral-acid water analysis

Storet Number	Analyte	Result	Units
34205	Acenaphthene	10 U	ug/L
34200	Acenaphthylene	10 U	ug/L
39330	Aldrin	10 U	ug/L
34220	Anthracene	10 U	ug/L
34526	Benzo(a)anthracene	10 U	ug/L
34230	Benzo(b)fluoranthene	10 U	ug/L
34242	Benzo(k)fluoranthene	10 U	ug/L
34247	Benzo(a)pyrene	10 U	ug/L
34521	Benzo(g,h,i)perylene	15 U	ug/L
34292	Benzyl butyl phthalate	10 U	ug/L
	a-BHC	10 U	ug/L
39337	b-BHC	10 U	ug/L
39340	d-BHC	10 U	ug/L
	g-BHC	10 U	ug/L
39120	Benzidine	10 U	ug/L
34273	Bis(2-chloroethyl)ether	10 U	ug/L
34278	Bis(2-chloroethoxy)methane	15 U	ug/L
34283	Bis(2-chloroisopropyl)ether	15 U	ug/L
39100	Bis(2-ethylhexyl)phthalate	10 U	ug/L
34636	4-Bromophenyl phenyl ether	10 U	ug/L
34581	2-Chloronaphthalene	10 U	ug/L
34641	4-Chlorophenyl phenyl ether	10 U	ug/L
34320	Chrysene	10 U	ug/L
39310	4,4'-DDD	10 U	ug/L
39320	4,4'-DDE	10 U	ug/L
39300	4,4'-DDT	10 U	ug/L
34556	Dibenzo(a,h)anthracene	15 U	ug/L
39110	Di-n-butyl phthalate	10 U	ug/L
34536	1,2-Dichlorobenzene	10 U	ug/L
34566	1,3-Dichlorobenzene	10 U	ug/L
34571	1,4-Dichlorobenzene	10 U	ug/L
34631	3,3'-Dichlorobenzidine	10 U	ug/L
39380	Dieldrin	10 U	ug/L
34336	Diethylphthalate	10 U	ug/L
34341	Dimethylphthalate	10 U	ug/L
34611	2,4-Dinitrotoluene	10 U	ug/L
34626	2,6-Dinitrotoluene	10 U	ug/L
34596	Di-n-octyl phthalate	10 U	ug/L
34361	Endosulfan-I	10 U	ug/L

Continued

A - Value reported is the mean of two or more determinations
E - Scientific notation
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 - Not analyzed for this compound
T - Value reported is less than the practice quantiation limit
U - Material was analyzed for but not detected; The value reported is the mimimum detection limit
N/A - Not applicable NR - Not requested

Cont. from previous page for Sample Number: 90-OCT-24-10-01 Analysis_id: W-BNA

34356	Endosulfan-II	10 U	ug/L
34351	Endosulfan-sulfate	10 U	ug/L
39390	Endrin	10 U	ug/L
34366	Endrin-aldehyde	10 U	ug/L
34376	Fluoranthene	10 U	ug/L
34381	Fluorene	10 U	ug/L
39410	Heptachlor	10 U	ug/L
39420	Heptachlor-epoxide	10 U	ug/L
39700	Hexachlorobenzene	15 U	ug/L
34391	Hexachlorobutadiene	10 U	ug/L
34396	Hexachloroethane	60 U	ug/L
34386	Hexachlorocyclypentadiene	10 U	ug/L
34403	Indeno(1,2,3-cd)pyrene	10 U	ug/L
34408	Isophorone	10 U	ug/L
34696	Naphthalene	10 U	ug/L
34447	Nitrobenzene	10 U	ug/L
34438	N-Nitrosodimethylamine	50 U	ug/L
34428	N-Nitrosodi-n-propylamine	10 U	ug/L
34433	N-Nitrosodiphenylamine	15 U	ug/L
34671	PCB-1016	10 U	ug/L
39488	PCB-1221	10 U	ug/L
39492	PCB-1232	10 U	ug/L
39496	PCB-1242	10 U	ug/L
39500	PCB-1248	10 U	ug/L
39504	PCB-1254	10 U	ug/L
39508	PCB-1260	10 U	ug/L
	PCB-1262	10 U	ug/L
34461	Phenanthrene	10 U	ug/L
34469	Pyrene	10 U	ug/L
39400	Toxaphene	10 U	ug/L
34551	1,2,4-Trichlorobenzene	10 U	ug/L
34462	4-Chloro-3-methyl phenol	15 U	ug/L
34586	2-Chlorophenol	15 U	ug/L
34601	2,4-Dichlorophenol	15 U	ug/L
34606	2,4-Dimethylphenol	15 U	ug/L
34616	2,4-Dinitrophenol	30 U	ug/L
34657.	2-Methyl-4,6-dinitrophenol	30 U	ug/L
34591	2-Nitrophenol	15 U	ug/L
34646	4-Nitrophenol	50 U	ug/L
39032	Pentachlorophenol	15 U	ug/L
34694	Phenol	15 U	ug/L
34621	2,4,6-Trichlorophenol	15 U	ug/L

Comments (1):
(2):
(3):
(4):
(5):
(6):

End of Report

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L - Actual value is known to be greater than value given
N - Not analyzed for this compound
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U - Material was analyzed for but not detected; The value reported is the mimimum detection limit
N/A - Not applicable NR - Not requested

Sample Number: 90-OCT-24-09-01
Sample Location: Greater Pine Island-Effluent
Field ID: B102390-1
Date/Time Collected: 23-OCT-1990 16:02:25.49
Comments:

Sample Status: Authorized by Tim Fitzpatrick
Matrix: Effluent
Storet Station Number:

Sample Number: 90-OCT-24-09-01
Analysis Id: HG-H-W

Test status: Authorized by Jack Merritt
Analysis Description: Mercury by cold vapor using hydride sys.-water

Storet Number	Analyte	Result	Units
71900	Mercury	0.1 U	ug/L

Sample Number: 90-OCT-24-09-01
Analysis Id: W-ICP-23

Test status: Authorized by Tim Fitzpatrick
Analysis Description: ICP multielement analysis for water samples

Storet Number	Analyte	Result	Units
01106	Aluminum	15 U	ug/L
01002	Arsenic	20 U	ug/L
01097	Antimony	NR	ug/L
01007	Barium	NR	ug/L
01012	Beryllium	NR	ug/L
01027	Cadmium	3 U	ug/L
00916	Calcium	NR	mg/L
01034	Chromium	10 U	ug/L
01037	Cobalt	NR	ug/L
01042	Copper	27	ug/L
01045	Iron	172	ug/L
01051	Lead	15 U	ug/L
00927	Magnesium	NR	mg/L
01055	Manganese	NR	ug/L
01067	Nickel	5 U	ug/L
00937	Potassium	NR	mg/L
01147	Selenium	30 U	ug/L
01077	Silver	NR	ug/L
00929	Sodium	NR	mg/L
01082	Strontium	60000	ug/L
01059	Thallium	NR	ug/L
01087	Vanadium	NR	ug/L
01092	Zinc	71	ug/L
	Comment	NONE	

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N/A - Not applicable NR - Not requested

Sample Number: 90-OCT-25-28-01 Sample Status: Authorized by Yuh-Hsu Pan
Sample Location: Greater Pine Island Water Assoc. Matrix: Salt Surf Water
Field ID: C101790-10 Storet Station Number:
Date/Time Collected: 15-OCT-1990 10:30:29.67
Comments:

Sample Number: 90-OCT-25-28-01 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-CL Analysis Description: Analysis for chloride in water

Storet Number	Analyte	Result	Units
00940	Chloride	650 A	mg Cl/L

End of Report

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N/A - Not applicable NR - Not requested

Sample Number: 90-OCT-24-08-02 Sample Status: Authorized by Yuh-Hsu Pan
Sample Location: Greater Pine Island Water Assn-upstream Matrix: Salt Surf Water
Field ID: B102390-3 Storet Station Number:
Date/Time Collected: 23-OCT-1990 15:49:04.63
Comments:

Sample Number: 90-OCT-24-08-02 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-CL Analysis Description: Analysis for chloride in water

Storet Number	Analyte	Result	Units
00940	Chloride	8100 A	mg Cl/L

Sample Number: 90-OCT-24-08-02 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-F Analysis Description: Analysis for fluoride in water

Storet Number	Analyte	Result	Units
00951	Fluoride	0.65 A	mg F/L

Sample Number: 90-OCT-24-08-02 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-PO4 Analysis Description: Orthophosphate analysis for water samples

Storet Number	Analyte	Result	Units
70507	O-Phosphate-P	0.020 U	mg P/L

Sample Number: 90-OCT-24-08-02 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-SO4 Analysis Description: Analysis for sulfate in water

Storet Number	Analyte	Result	Units
00945	Sulfate	1400 A	mg SO4/L

End of Report

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L - Actual value is known to be greater than value given
N - Not analyzed for this compound
T - Value reported is less than the practice quantiation limit
U - Material was analyzed for but not detected; The value reported is the minimum detection limit
N/A - Not applicable NR - Not requested

Sample Number: 90-OCT-24-08-01 Sample Status: Authorized by Yuh-Hsu Pan
Sample Location: Greater Pine Island Water Assn-downstream Matrix: Salt Surf Water
Field ID: B102390-2 Storet Station Number:
Date/Time Collected: 23-OCT-1990 15:49:04.63
Comments:

Sample Number: 90-OCT-24-08-01 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-CL Analysis Description: Analysis for chloride in water

Storet Number	Analyte	Result	Units
00940	Chloride	8200 A	mg Cl/L

Sample Number: 90-OCT-24-08-01 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-F Analysis Description: Analysis for fluoride in water

Storet Number	Analyte	Result	Units
00951	Fluoride	0.65 A	mg F/L

Sample Number: 90-OCT-24-08-01 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-PO4 Analysis Description: Orthophosphate analysis for water samples

Storet Number	Analyte	Result	Units
70507	O-Phosphate-P	0.020 U	mg P/L

Sample Number: 90-OCT-24-08-01 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-SO4 Analysis Description: Analysis for sulfate in water

Storet Number	Analyte	Result	Units
00945	Sulfate	1600 A	mg SO4/L

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N - Not analyzed for this compound
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U - Material was analyzed for but not detected; The value reported is the mimimum detection limit
N/A - Not applicable NR - Not requested

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: Greater Pine Island Water Assn. **Sample Collection:** Date 10-23-90 Time 1000
Address/City: _____ **Test Beginning:** Date 10-24-90 Time 930
County: _____ **Test Ending:** Date 10-26-90 Time 1000
Contact/District: Mark Chamberlain South District **Test Organism:** LB Mysidopsis bahia
NPDES Permit #: _____ **Outfall #:** _____ **Life Stage/Age:** LB 19 days <7 days

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

Remarks: Salinity 15 ~~ppt~~ LB ppt

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr				
24 hr				
48 hr				

Conc.	Chamber #	Number Live 0	24	48	DO (mg/l) 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	Cond. (µmhos/cm) 0	24	48
control																
control	39	5	5	5	7.5	6.8	5.0	8.4	8.2	7.4	23.0	22.2	21.6	22100	23100	23200
100%	119	5	5	5	5.4	6.4	4.9	6.7	8.0	7.8	22.4	22.1	21.6	22100	23100	23200
100%	87	5	5	5	5.5	6.6	4.8	6.7	8.2	7.9	22.5	22.0	21.6	22100	23100	23200
Measured/Loaded by:		MF	MF	MF	SMC	SMC	SMC	SMC	SMC	SMC	SMC	SMC	SMC	SMC	SMC	SMC
Recorded by:		SMC	SMC	MF	LB	MF	SMC	LB	MF	SMC	LB	MF	SMC	LB	MF	SMC

Investigators' Signatures

Sandy McCann
Mark V Tarbell
Lyn Burton

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:					
Lab Tot. Resid. Cl2:					
Alkalinity:					
Hardness:					
Total Ammonia:					

Ammonia meter slope:

Macroinvertebrate taxa list for Greater Pine Island Water Association Reverse Osmosis Plant, Lee County, Florida, collected via ponar grab in the area of the discharge on 23 October 1990.

	Reference Site	Test Site
Cnidaria		
Hydrozoa sp.	+	+
Unidentified anemone	–	+
Diptera		
Chironomus decorus grp.	–	+
Gastropoda		
Melongena corona	+	–
Malacostraca		
Corophium louisianum	–	+
Nematoda		
Undetermined nematoda species	–	+
Oligochaeta		
Undetermined oligochaete sp.	+	–
Pelycepoda		
Corbula contracta	+	–
Macroma tenta	+	–
Polychaeta		
Capitella capitata	+	+
Laeoneris culveri	+	+
Scoloplos fragilis	+	+
Streblospio benedicti	+	+
TOTAL	**9**	**9**

Department of Environmental Regulation

Results of Fifth Year Inspections

Discharger:	Greater Pine Island Water Association
County:	Lee
NPDES Number:	FL0025739
State Permit Expiration Date:	June 5, 1991

Toxics Sampling Inspection (**XSI**)	
Date Sampled:	10-23-90
Results:	Copper 27 µg/l, Iron 172 µg/l, Strontium 60,000 µg/l, Zinc 71 µg/l

Compliance Biomonitoring Inspection (**CBI**)	
Date Sampled:	10-23-90
Results:	No toxicity to *Mysidopsis bahia*

Impact Bioassessment Inspection (**IBI**)	
Date Sampled:	10-23-90
Results:	Algal Growth Potential elevated at both sites, which could be indicative of non-point source enrichment problems. Benthic macroinvertebrate community slightly stressed, however these results were not conclusive enough to attribute the observed changes solely to the Greater Pine Island discharge.

Water Quality Inspection (**WQI**)	
Date Sampled:	
Results:	

These fifth year inspections provide the necessary information to evaluate the facility's impact on its receiving waters and to provide specific condition recommendations for renewal to resolve any concerns.