CAPACITY ANALYSIS REPORT
MARCO ISLAND
WASTEWATER TREATMENT PLANT

Prepared For

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Prepared By

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October, 1992

SOUTHERN STATES UTILITIES, INC.
CAPACITY ANALYSIS REPORT
MARCO ISLAND WWTP

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CAPACITY ANALYSIS REPORT

RULE 17-600.405, F.A.C.

Facility Name: Marco Island Wastewater Treatment Plant

GMS Identification Number: _____

DER Reviewer: _____

Date Review Completed: _____

A. Determine if the report:

Yes	No	N/A	
X	___	___	1. Contains data showing the permitted capacity for the treatment, residuals, reuse, and disposal facilities [17-600.405(6)].
X	___	___	2. Evaluates the actual capacity of the treatment, residuals, reuse, and disposal facilities [17-600.405(6)].
			Notes: Design capacity and permitted capacity are defined in Rules 17-600.200(19) and (62), respectively.
X	___	___	3. Incudes the monthly average daily flows, three-month average daily flows, and annual average daily flows for the past ten years or for the length of time the facility has been in operation, whichever is less [17-600.405(6)].
X	___	___	4. Includes flow projections for the facility's service area during at least the next ten years [17-600.405(6)].
X	___	___	5. Bases these flow projections on local population growth rates, water usage rates, and seasonal variations in flow [17-600.405(6)].
X	___	___	6. Estimates the time for the three-month average daily flow to equal the permitted capacity [17-600.405(6)]. What is the estimated time? 7 years.
X	___	___	7. Includes recommendations in favor of expansions [17-600.405(6)].

Yes No N/A

8. For each recommended expansion, include a detailed schedule showing dates for:

X ___ ___ a. Planning [17-600.405(6)],

X ___ ___ b. Design [17-600.405(6)],

X ___ ___ c. Submittal of the Construction Permit Application [17-600.405(6)],

X ___ ___ d. Start of Construction [17-600.405(6)],

X ___ ___ e. Placing the New or Expanded Facilities into Operation [17-600.405(6)], and

X ___ ___ f. Submittal of the Operation Permit Application [17-600.405(6)].

X ___ ___ 9. Updates the flow-related and loading information contained in the preliminary design report submitted as part of the most recent permit application [17-600.405(6)].

___ ___ ___ 10. Is signed by the permittee, and signed and sealed by a professional engineer registered in Florida [17-600.405(7)].

B. If the report documents that the permitted capacity will be equaled or exceeded within the next:

Yes No N/A

___ X ___ 1. Five years, does the report include a statement, signed and sealed by a professional engineer registered in Florida, that planning and preliminary design of the necessary expansion have been initiated [17-600.405(8) (a)]?

___ X ___ 2. Four years, does the report include a statement, signed and sealed by a professional engineer registered in Florida, that plans and specifications for the necessary expansion are being prepared [17-600.405(8) (b)]?

___ X ___ 3. Three years, has the permittee submitted a complete construction permit application to the Department [17-600.405(8) (b)]? If not, note that the application must be submitted within 30 days of submittal of the capacity analysis report, for such a facility.

___ X ___ 4. Six months, has the permittee submitted to the Department an application for an operation permit for the expanded facility, required to be submitted no later than the submittal of the capacity analysis report [17-600.405(8) (d)]?

C. If any of the answers to Questions 11 through 14 is no, the permittee may request an adjusted schedule. The adjusted schedule should be based on design and construction schedules, population growth rates, flow projections, and the timing of new connections to the sewerage system, so that adequate capacity always will be available at the wastewater facility.

Yes No N/A

___ X ___ 1. Has the permittee requested an adjusted schedule [17-600.405(9)]?

___ X ___ 2. Has this request been approved by the Secretary or the Secretary's designee [17-600.405(9)]?

SECTION 1

SECTION 1

INTRODUCTION

1.1 OBJECTIVE

The purpose of this report is to prevent the Marco Island Wastewater Treatment Plant (WWTP) from violating their permits as a result of exceeding the permitted capacity of their facilities. It is also the purpose of this report to provide for the timely planning, design and construction of wastewater facilities necessary to provide proper treatment, reuse and disposal of domestic wastewater and the management of domestic residuals, as required in Chapter 17-600.405, FAC. In addition, this report will evaluate the existing treatment methods utilized at the Marco Island WWTP for treatment, management and disposal of wastewater and the residuals generated at this facility, as well as comparing the existing treatment facilities with the requirements for Class I reliability as defined by the United States Environmental Protection Agency (USEPA) Manual MCD-05 entitled Design Criteria for Mechanical, Electrical and Fluid System and Component Reliability. This report details and summarizes the results of the capacity analysis investigation, draws conclusions as to the capability of the individual wastewater treatment components and their ability to meet the required effluent permit limitations, provides for planning and recommends a plan of action for future expansions to the Marco Island WWTP treatment and disposal facilities.

1.2 BACKGROUND

Prior to 1989, the Deltona Corporation developed the areas of Marco Island. In addition, the Deltona Corporation constructed and operated an extensive wastewater utility system. In July of 1989, Southern States Utilities (SSU) purchased the wastewater facilities for the Marco Island service area. Since that time, numerous capital expansion projects, necessary to adequately serve the existing and growing customer base, have been undertaken.

The Marco Island wastewater system is located in southwestern Collier County, Florida as shown on Figure 1-1. The wastewater FPSC certificated area is shown on Figure 1-2. This area was transferred to SSU Services, Inc. via FPSC Order. The actual wastewater service area encompasses a larger area than the FPSC certificated service area since wholesale

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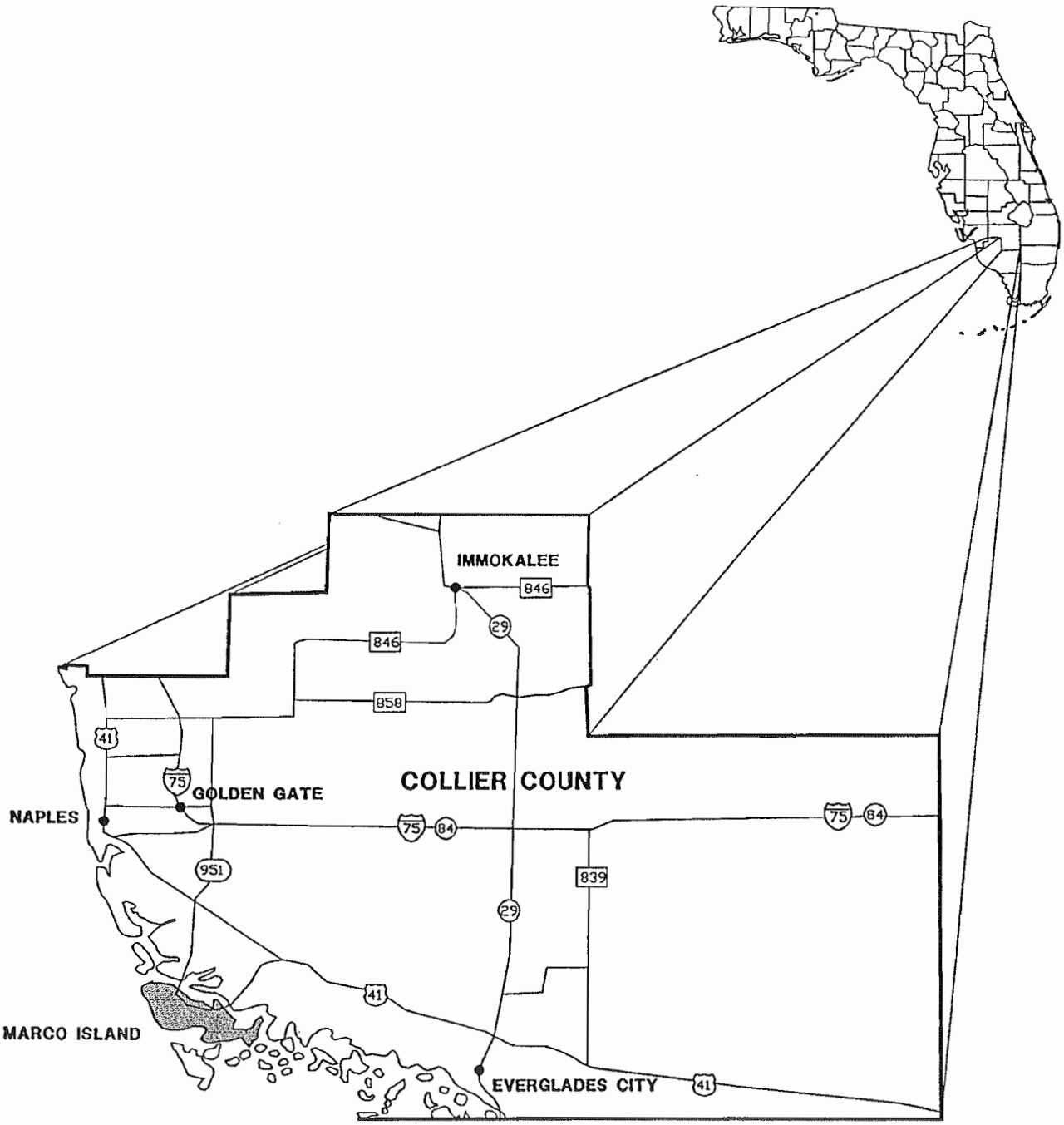

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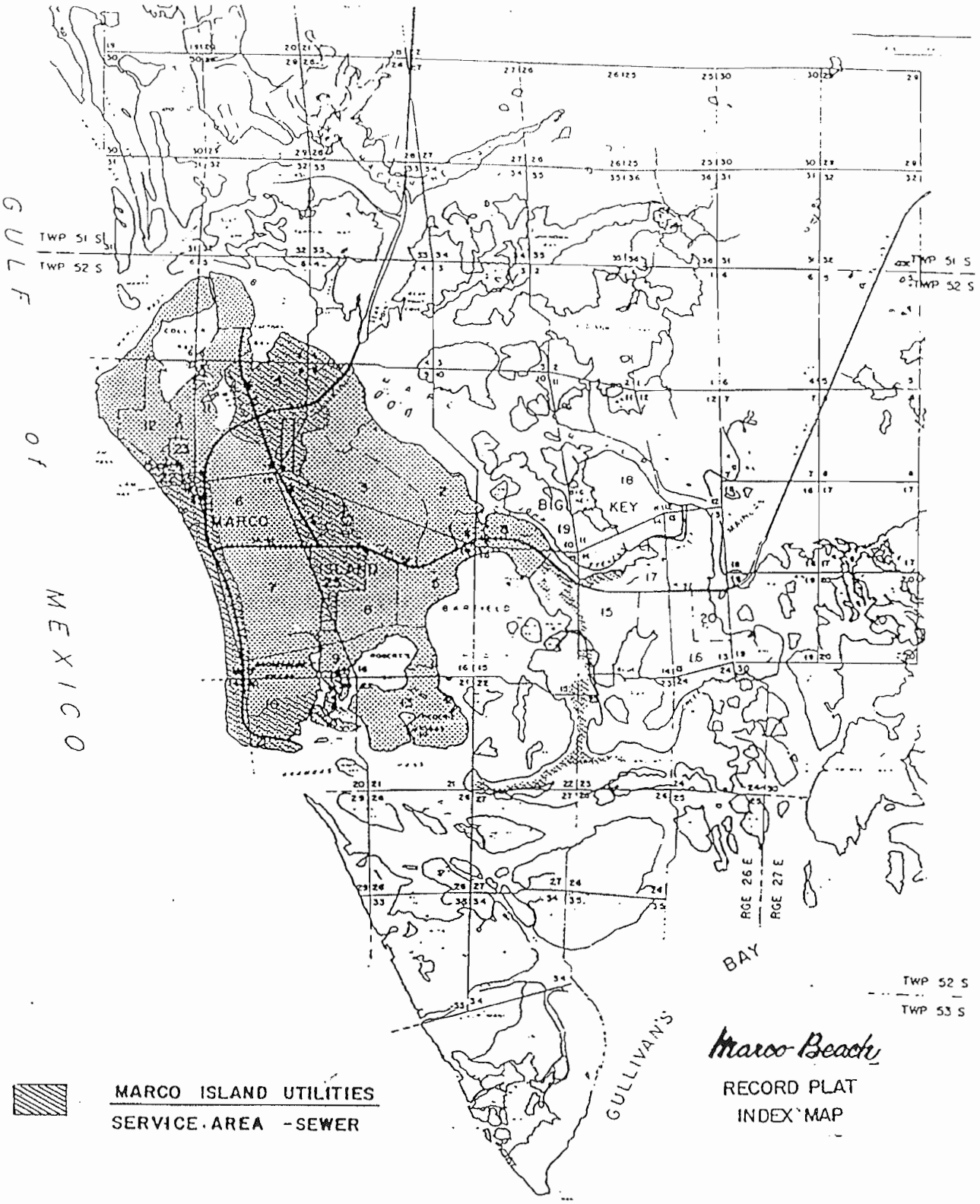
LOCATION MAP

FIGURE 1-1



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MARCO ISLAND UTILITIES FPSC SERVICE AREA MAP

FIGURE 1-2

wastewater service is provided to Collier County Utilities and North Marco Utilities. These utilities also operate collection systems on the island. The remainder of the island is served by individual on-site septic tank systems.

1.3 PERMIT SUMMARY

At the present time, The Marco Island WWTP operates under a FDER Consent Order. On December 15, 1988, FDER issued SSU a Consent Order OGC Case No. 88-0458 to resolve some non-compliance issues related to discharge levels of total suspended solids (TSS) in the WWTP effluent. On June 29, 1990, FDER issued SSU a Construction Permit (DC11-175650) to expand the Marco Island WWTP by 1.0 mgd. The 1.0 mgd expansion included additional contact and stabilization tankage, clarification, chlorine contact volume, filter units grvity thickening, effluent pumping, percolation ponds and additional aerobic digester volume. On October 18, 1990, FDER issued SSU a Temporary Operating Permit (DT11-166146) to operate the 2.5 mgd facility. The 1.0 mgd expansion was not complete as of this date. On October 22, 1991, FDER issued SSU another Consent Order to resolve some issues regarding improper effluent discharges. The FDER temporary operating permit expired on 8-30-91. At the present time, the Marco Island WWTP operates under the Consent Order OGD Case No. 91-1537 issued on October 22, 1991.

1.4 SCOPE OF SERVICES

The purpose of this report is to provide SSU with the information necessary to provide timely planning, design, permitting and construction of their wastewater facilities necessary to provide proper treatment and effluent disposal of domestic wastewater, as well as the management, treatment and disposal of domestic wastewater residuals. The scope of service has been developed to meet all the requirements of Rule 17-600.405, FAC. In addition, this report was developed to evaluate the unit wastewater treatment processes and the Class I reliability of the Marco Island WWTP. Summarized herein are the tasks for the study:

- Service Area Description. Evaluate the geographic extent and land use characteristics (i.e., development type, number of units, etc.) of the certificated wastewater service area for the Marco Island WWTP.

- Historical Wastewater Characteristics: A minimum of 10-years worth of historical wastewater influent flows to the Marco Island WWTP will be analyzed to determine the trends in average and maximum daily influent flows, as well as seasonal flow variations. The monthly average daily influent flows for the most recent 12-month period will be determined.

- In addition, 3-month average daily flow and annual average daily influent flows for the past 10 years will be developed and analyzed. All influent, effluent and wastewater residuals analytical data will be analyzed to determine averages, maximum and trends, as well as compliance with existing regulatory requirements.

- Facility Description. The existing WWTP will be evaluated to determine compliance with Class I requirements, as well as describe the efficiency of the facilities and any deficiencies noted. This will include a site visit, unit processes description and operational criteria with respect to the permitted capacities for treatment, residuals and effluent disposal/reuse systems.

- Flow Projections. Local population growth rates, development projections, service commitments, and other projections will be utilized to develop a projected population growth over a 10-year period. Utilizing a designated flow rate per equivalent residential unit (ERU), flow projections will be determined for this 10-year period. Utilizing these flow projections, the estimated time until the permitted capacities are reached (wastewater treatment, residuals and effluent disposal/reuse capacities) will be determined.

- Expansion Recommendations. The recommendations are based on the review of the historical data and projected wastewater flow expansion recommendations for the wastewater and residuals treatment and management processes, which will be categorized by unit process, and effluent disposal or reuse requirements. A schedule will then be developed that will identify planning, design, permitting, start of construction, duration of construction and facility start-up.

- Final Report. Ten (10) copies of the final report containing the above information will be furnished to SSU.

1.5 ACKNOWLEDGMENTS

HAI wishes to express its appreciation to Mr. Charles E. Wood, P.E., Mr. Rafael A. Terrero, P.E., Mr. Richard Foster, and the operating staff of Marco Island WWTP for their assistance and cooperation in the development of this report. The report was prepared by Mr. Harold E. Schmidt, Jr., P.E., Mr. Gary ReVoir, II, Ms. Lisa Looney, as well as others at HAI.

SECTION 2

SECTION 2

EXISTING CONDITIONS

2.1 GENERAL

A description of the existing treatment facility at the Marco Island WWTP is provided in this section. In addition, this section will summarize the last ten (10) years of historical flows and flow characteristics. The treatment facility is currently permitted as a 2.5 MGD contact-stabilization wastewater treatment facility. Figure 2-1 illustrates the existing facilities at the Marco Island WWTP.

2.2 DESCRIPTION OF FACILITIES

2.2.1 Treatment

The Marco Island WWTP is currently fed from lift stations in the collection and transmission system which are manifolded into the plant pretreatment structure. The pretreatment structure receives the entire plant flow prior to treatment. The pretreatment structure is a dual channel structure with one (1) channel containing a 6.0 MGD rated automatic mechanical bar screen and a manual bar screen. The other channel is for standby.

From the pretreatment structure, the raw sewage can be routed to either flow equalization tank no. 1 or no. 2. The raw flow is split based on the settings of manual weir gates at the end of the structure. Flow equalization basin no. 1 is a 250,000 gallon circular storage tank. Flow equalization basin No. 2 has a volume of 500,000 gallons. The raw equalized flow from tank no. 2 is then pumped at a constant rate to flow equalization tank no. 1. The total flow equalization volume provides over 21 percent of storage for the design average daily flow rate of 3.5 MGD (Maximum Month).

The Marco Island WWTP treatment plant is divided into two (2) parallel treatment trains. The first treatment train is a 2.5 MGD contact stabilization process treatment system. The second treatment train is the new 1.0 MGD contact stabilization package structure.

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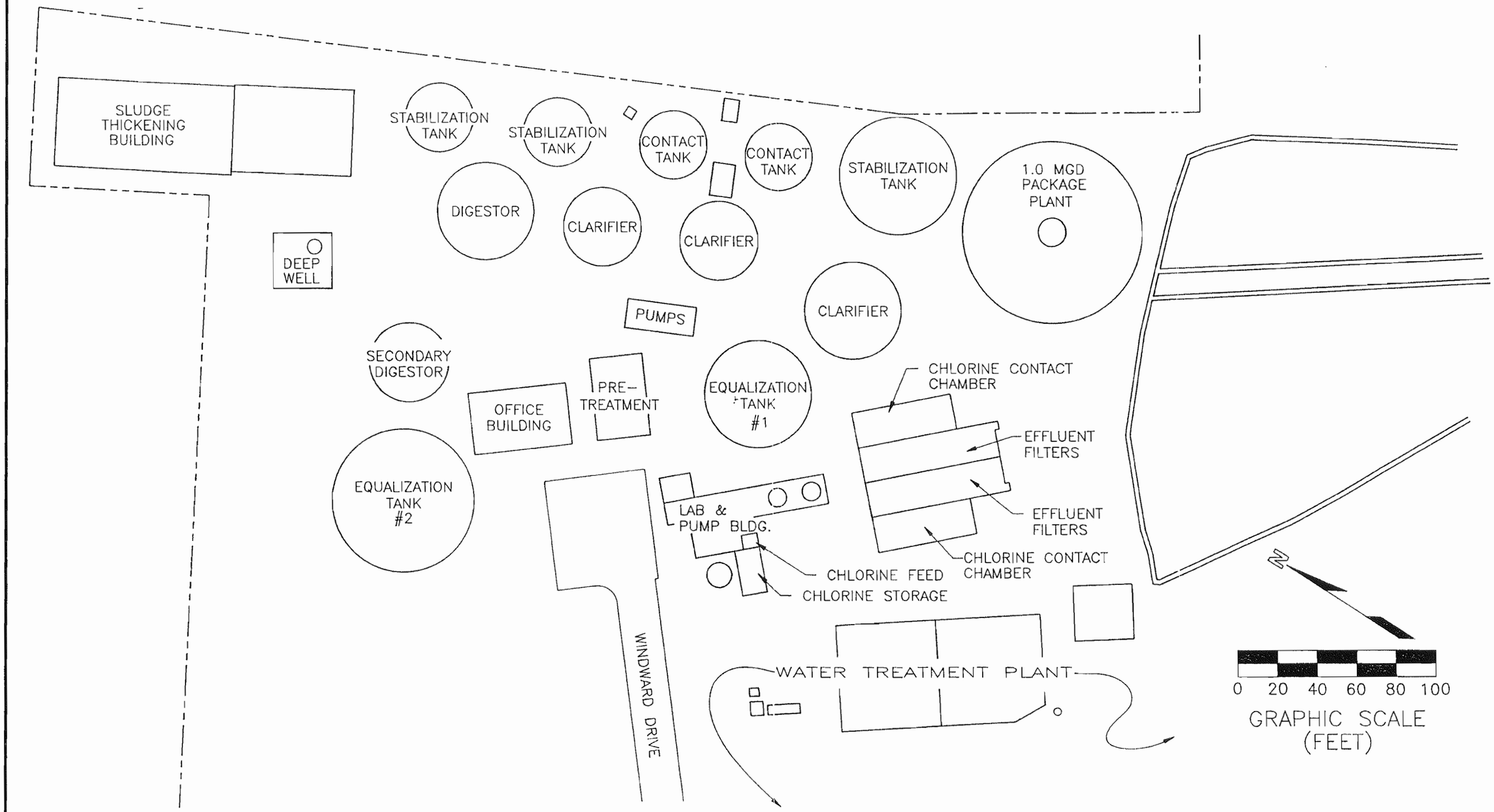

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SOUTHERN STATES UTILITIES, INC.
MARCO ISLAND WASTEWATER TREATMENT PLANT

FIGURE 2-1

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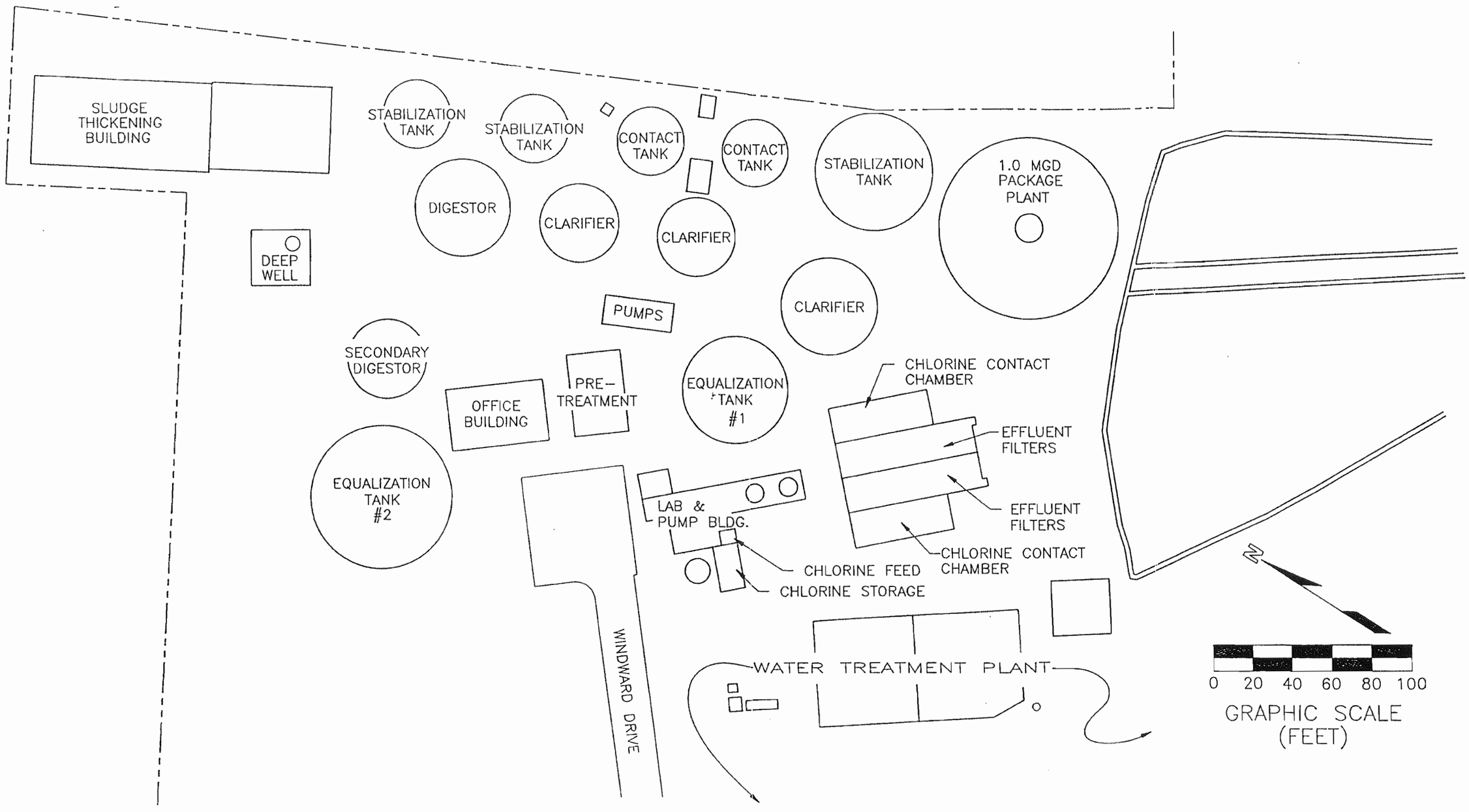

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SOUTHERN STATES UTILITIES, INC.
MARCO ISLAND WASTEWATER TREATMENT PLANT

FIGURE 2-1

The first treatment train consists of two (2) contact tanks and three (3) stabilization tanks. The raw flow from the equalization basins is split equally between the two (2) contact tanks. Each contact tank is a circular concrete structure with a volume of 100,970 gallons. Mixed liquor suspended solids (MLSS) from the stabilization tanks is pumped back to the contact tanks and mixed with the raw sewage. The MLSS is aerated and mixed by use of a surface mechanical aeration system. A diffused aeration system has been installed to supplement the air flow requirements during peak mass loading period.

The MLSS from the contact tanks is recombined into a clarifier splitter box. In the splitter box, the MLSS can be split to one of three (3) clarifiers. There are two (2) clarifiers with diameters of 40 feet and side water depths of 10 feet. The third clarifier has a diameter of 50 feet and a side water depth of 12 feet.

The settled solids are pumped to the one of the three (3) stabilization basins. Two (2) of the basins each have a volume of 100,970 gallons and the third tank has a volume of 296,730 gallons. The stabilization tanks are also aerated by surface mechanical air system. A diffused aeration system has also been installed to supplement the air flow requirement during peak mass loading period.

The clarified effluent is blended and flows to the filtration unit. The filtration unit consists of two (2) traveling bridge type filters rated each at 2.5 MGD. Each filter has approximately 864 square feet of surface area. The design overflow rate is 2.11 gpm/sf.

The filtered effluent is split into one of the two (2) chlorine contact chambers. The chlorine contact basins are designed to provide 15 minutes of contact time at peak flow.

The chlorinated effluent is discharged into the on-site effluent wet well.

The second treatment train is a 1.0 MGD contact package plant consisting of one (1) contact tank section and one (1) stabilization tank section, one (1) internal clarifier and one (1) aerobic digester section. Raw sewage is pumped from equalization basin No. 2 to the contact tank. The contact tank section has a volume of 125,306 gallons. Mixed liquor suspended solids (MLSS) from the stabilization tanks is pumped back to the contact tanks and mixed with the raw sewage. The mixture is aerated by use of a submerged diffused aeration system.

The MLSS from the contact tank flows into the internal clarifier splitter for solids separation. The clarifier has a diameter of 50 feet and a total volume of 169,200 gallons. The clarifier is rated at 794 gpd/sf at peak flow (1.56 MGD). The clarified effluent flows to the previously mentioned traveling bridge filters and the settled solids are pumped into the stabilization tank section of the structure for further treatment. The stabilization tank has a volume of 250,231 gallons and provides 6 hours of hydraulic retention time at the design flow (1.0 MGD).

Table 2-1 summarizes the existing facilities at the Marco Island WWTP.

2.2.2 Effluent Disposal

The Marco Island WWTP has a 3.5 MGD effluent disposal system consisting of slow-rate public-access irrigation, rapid-rate ground water recharge and deep well injection.

The plant currently provides public access level reclaimed water to two (2) golf courses, for median strip irrigation and to reuse on a public school grounds. Since adequate capacity is available utilizing other disposal sites and methods, these sites are only used on an "as-requested" basis. It is assumed that each site will use less than 2-inches per week.

Three (3) percolation pond cells were recently constructed to dispose of 3.5 MGD ADF. The ponds were recently completed and are currently in the start-up phase.

The Marco Island WWTP also has access to a deep well injection system. This system was also designed for disposal of the reject water (brine) from the Marco Island R.O. WTP. The deep well has approximately 5.7 MGD of capacity. 2.1 MGD is set aside for disposal of reject water (brine) from the R.O. WTP and 3.6 MGD is for alternate effluent disposal.

Historical flow data for all of the disposal sites for the period of September 1991 to September 1992 is provided in the Appendix. Table A-1 lists the monthly totals for each site and Table A-2 lists the daily average based on the monthly totals and the number of days per month.

2.3 DESIGN SUMMARY

Based on the data for the existing facilities as summarized in Table 2-1 and the average influent flow characteristics, the design operating parameters for the existing facilities were

TABLE 2-1

CAPACITY ANALYSIS REPORT
MARCO ISLAND WASTEWATER TREATMENT PLANT FACILITIES

SUMMARY

Preliminary Treatment	
Screening	Bar Rack
Type	Mechanical/Manual
Number of Units	1/1
Capacity (MGD) each	6.0
Treatment System #1 (2.5 MGD)	
Type	Contact-Stabilization
Number of Units	
Contact	2
Stabilization	3
Total Volume (gallons)	
Contact	201,940
Stabilization	498,670
Aeration	Surface Mechanical/Diffused Air
Type	
Number of Units	5
BHP Each	15
Clarifiers	
Type	Circular
Number of Units	3
Water Depth (ft.)	10/10/12
Total Surface Area (sq.ft.)	3,220
Total Volume (gal.)	385,025
Settling Aids	Polymer Feed System
Treatment System #2 (1.0 MGD)	
Type	Contact-Stabilization
Number of Units	
Contact	1
Stabilization	1
Total Volume (gallons)	
Contact	125,306
Stabilization	250,231

TABLE 2-1 (Continued)

CAPACITY ANALYSIS REPORT
MARCO ISLAND WASTEWATER TREATMENT PLANT FACILITIES

SUMMARY

Treatment System #2 1.0 MGD (Continued)	
Aeration	Submerged Coarse
Type	Bubble Diffusers
Number of Blower Units	3
BHP Each	150
Clarifiers	
Type	Circular
Number of Units	1
Water Depth (ft.)	12.5
Total Surface Area (sq.ft.)	1,963
Total Volume (gal.)	306,350
Sand Filters	
Type	Traveling Bridge
Number of Units	2
Bed Dimensions Each (area)	864 sq. ft.
Chlorination Facilities	
Max. Usage Rate, lbs/day	
Chlorinators	
Cylinder Type	1 Ton
Cylinder Number - On-line	2
Spare	2
Chlorine Contact Tank	
Number of Units	2
Total Volume (gallons)	91,800
Aerobic Digester	
Number of Units	3
Total Volume (Gallons)	562,591
Thickening	1 Gravity Belt

calculated. Table 2-2 lists the design influent flow characteristics and Table 2-3 lists the design operating parameters for the Marco Island WWTP.

2.4 HISTORICAL DATA

This section will present the historical data for the Marco Island wastewater system to determine trends and calculate accurate projections. The data consists of historical population data provided by the Collier County Planning Department and historical plant flow and flow characteristic data as listed on the monthly operating reports (M.O.R.) submitted to FDER.

2.4.1 Population Data

Historical population data was obtained from the Collier County Planning Department and from a previous HAI water and wastewater Master Plan for Marco Island. This data was utilized to evaluate the historical growth trends and calculate projected growth in the service area. Table 2-4 lists the historical population data for Collier County from 1930 to 1989. The data listed in Table 2-4 is presented only to evaluate percent increase in growth in this area of the state. Table 2-5 lists the historical population data for Marco Island from 1988 to 1990. The data from these tables was derived from historical data provided by the Collier County Planning Department. Based on the data from these tables, the Marco Island population is approximately 7.5 percent of the total Collier County population. Table 2-6 lists the historical population data for the entire service area from 1984 to 1991. This data was provided form historical Annual Reports for the utility and listed in the 1990 Master Plan prepared by HAI.

2.4.2 Annual/Monthly Flow Data

As required in Chapter 17-600.405(5), the historical plant flow records for the past ten (10) years for the Marco Island WWTP have been compiled. The data collected consists of the monthly average daily flows (MADF) for the plant for each of the twelve (12) months, in each of the 10 years. Figure 2-2 shows a graph of the MADF data from 1982 through 1991. Also included, is the running 3-month average daily flows (TMADF) for each of the twelve (12) months in each of the ten (10) years of data and the annual average daily flows (AADF) for each of the ten (10) years.

TABLE 2-2

CAPACITY ANALYSIS REPORT
MARCO ISLAND
WASTEWATER TREATMENT PLANT

INFLUENT FLOW CHARACTERISTICS

Parameter	Volume
Average Daily Flow Max. Month)	3.50 mgd
BOD_5 Concentration	161(1)/172(2) mg/l
TSS Concentration	153(1)/154(2) mg/l

Notes:

1. 12 month average (May 1991 - April 1992).
2. May 1987 - April 1992.

TABLE 2-3

CAPACITY ANALYSIS REPORT
MARCO ISLAND WASTEWATER TREATMENT PLANT

DESIGN OPERATING PARAMETER SUMMARY

Component	Design Criteria	3.5 mgd
Contact (hrs)	1.0-3.0	2.3
Stabilization (hrs)	3.0-8.0	5.1
Clarification[1]		
Overflow Rate (gpd/SF)	400-800	543
Solids Loading Rate (lbs/d/SF)	20-30	18.1
Filtration		
OFR (gpm/SF)	Avg. = 2.0	2.8
Chlorination	Avg. = 30	37.8
Tr(min.)	Pk. = 15	24.2
Sludge Stabilization[2] SRT (d)	20	27.6

Notes:

1. Assume 100% RAW Flow Rate @ MLSS - 2,000 mg/l.
2. Class C sludge per Chapter 17-640, F.A.C., and Ten States Standards.

Tr = hydraulic residence time.

TABLE 2-4

SOUTHERN STATES UTILITIES, INC.
MARCO ISLAND WASTEWATER TREATMENT PLANT

COLLIER COUNTY HISTORICAL POPULATION DATA(1)

Year	Historical Population Data	Percent Growth
1930	2,883	
1940	5,102	77.0
1950	5,488	27.2
1960	15,753	142.8
1970	38,040	141.5
1980	85,971	126.0
1981	91,090	6.0
1982	98,094	7.7
1983	102,520	4.5
1984	109,219	6.5
1985	115,221	5.5
1986	120,695	4.8
1987	126,631	4.9
1988	134,401	6.1
1989	144,721	7.7

(1) Data provided by Collier County Planning Department

TABLE 2-5

SOUTHERN STATES UTILITIES, INC.
MARCO ISLAND WASTEWATER TREATMENT PLANT

MARCO ISLAND HISTORICAL PERMANENT POPULATION DATA(1)

Year	Historical Population Data	Percent Growth
1988	10,093	
1989	10,909	8.1
1990	11,528	5.7

(1) Data provided by Collier County Planning Department

TABLE 2-6

SOUTHERN STATES UTILITIES, INC.
MARCO ISLAND WASTEWATER TREATMENT PLANT

WASTEWATER SERVICE AREA POPULATION RECORDS

	Single-Family Units		Multi-Family Units		Total	Total	Percent
Year	No.	Pop.	No.	Pop.	Units	Population	Growth
1984	1,072	2,894	7,526	16,557	8,598	19,452	
1985	1,083	2,924	8,065	17,743	3,148	20,667	6.25
1986	1,109	2,994	8,389	18,456	9,498	21,450	3.79
1987	1,232	3,326	8,518	18,740	9,750	22,066	2.87
1988	1,613	4,335	8,682	19,100	10,295	23,456	6.30
1989	1,633	4,409	8,889	19,556	10,522	23,965	2.17

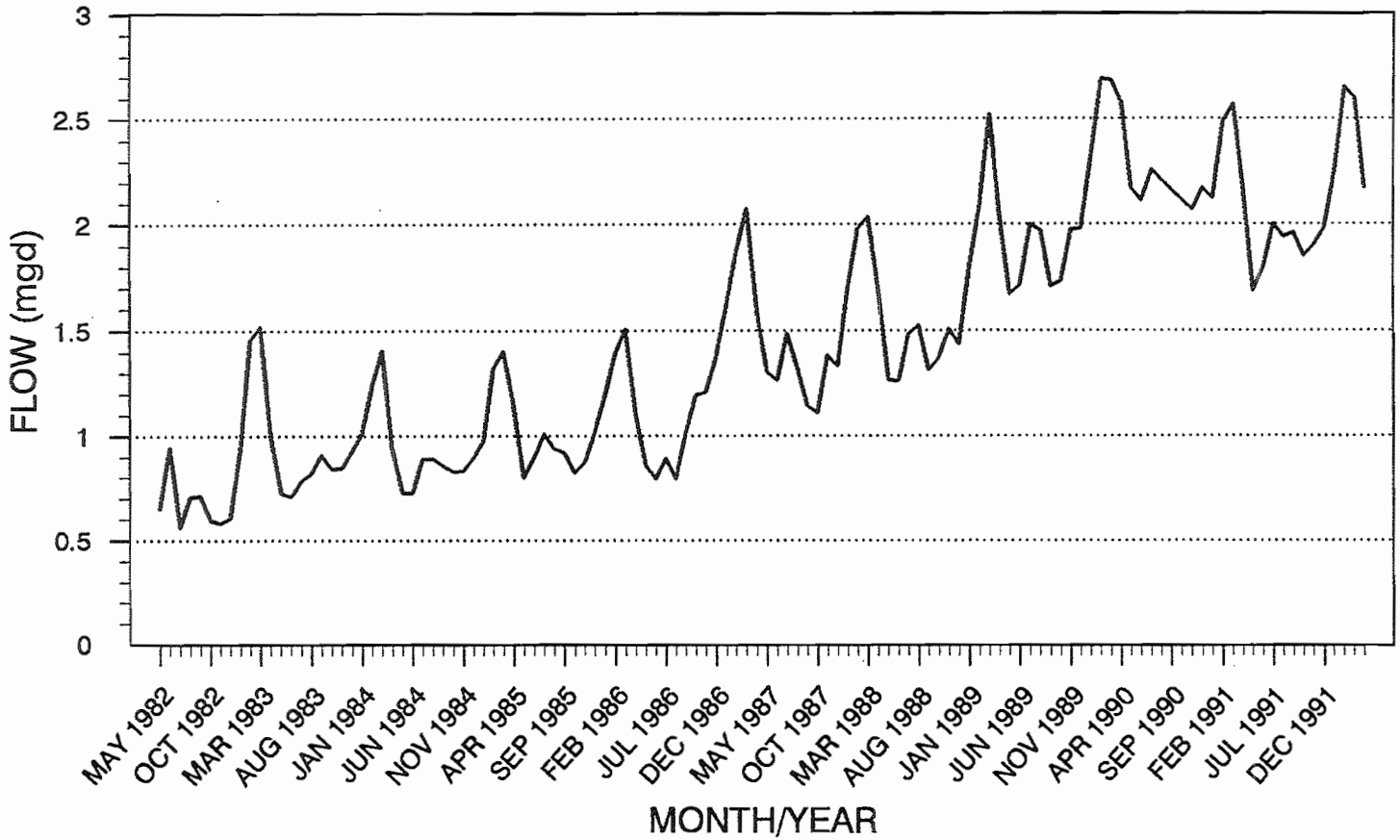

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FIGURE 2-2

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MARCO ISLAND WWTP
MONTHLY AVERAGE DAILY FLOWS

Figure 2-3 and Figure 2-4 show graphs of the TMADF and AADF, respectively, for the Insert Marco Island WWTP from 1982 through 1991. Table 2-7 lists the annual average daily flows for the Marco Island WWTP for the past ten (10) years (1982 - 1991). The monthly average daily flows and the running three-month average daily flows for the Marco Island WWTP for the past ten (10) years (1982 - 1991) are listed in the appendix (See Table A-1).

2.4.3 Seasonal Variations

A substantial amount of the service area for the Marco Island community can be classified as a resort area. It has been noted by the SSU staff that there is seasonal fluctuation in occupation of the existing residential units.

The monthly average daily flows for each of the ten (10) years were graphed to determine seasonal flow fluctuations (See Appendix Graphs A-1 through A-10). The ratio of the running TMADF and the AADF were plotted for each of the past ten (10) years to determine the monthly peak flow factor. Figure 2-5, shows the plot of the running TMADF/AADF ratio for 1982 through 1992. From these graphs, it can be determined that the TMADF can be as high as approximately 1.55 or as low as 0.763 times the annual average daily flow. Table 2-8 lists the maximum and minimum values for the ratio of TMADF to AADF for each of the past ten (10) years. Figure 2-6 illustrates the values as listed in Table 2-8. From this graph, it is noted that the maximum month ratio is steadily declining. In addition the maximum day values and maximum month values for each of the ten (10) years were compiled and compared to their respective average annual daily flow values. Table 2-9 lists the maximum day flow, maximum month flow, average annual daily flow. Table 2-9 also lists the maximum day to AADF and maximum month to AADF ratios for the period evaluated. It is noted that the ratios for both MDD:AADF and MMF:AADF are steadily decreasing with the increasing AADF.

2.4.4 Plant Performance

The plant performance is evaluated based on the results of the removal of the specific parameters addressed in the FDER Operating Permit. The FDER permit limits for the Marco Island WWTP effluent quality are listed in Table 2-10. Figures 2-7 and 2-8

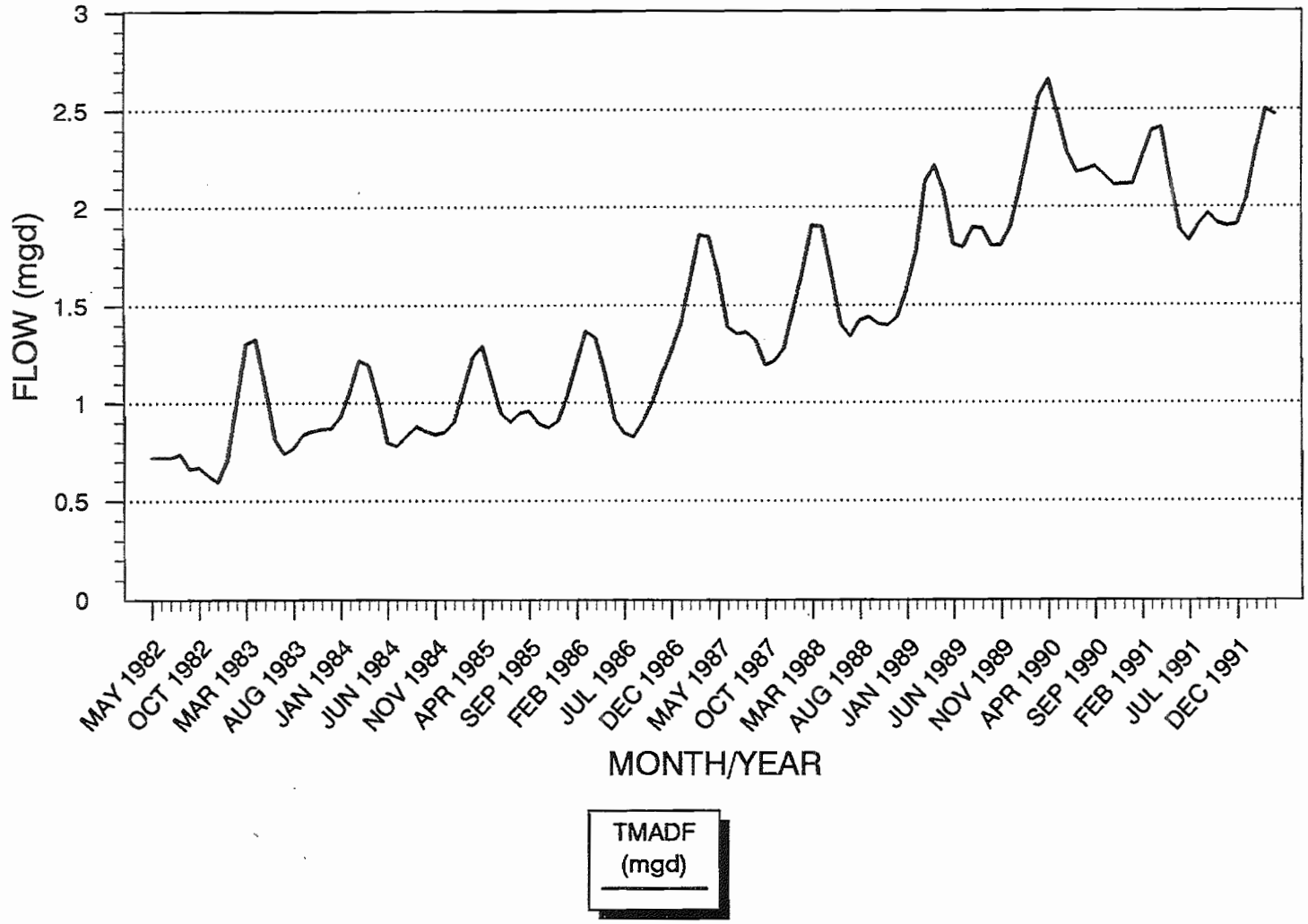

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FIGURE 2-3

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MARCO ISLAND WWTP
THREE MONTH AVERAGE DAILY FLOW

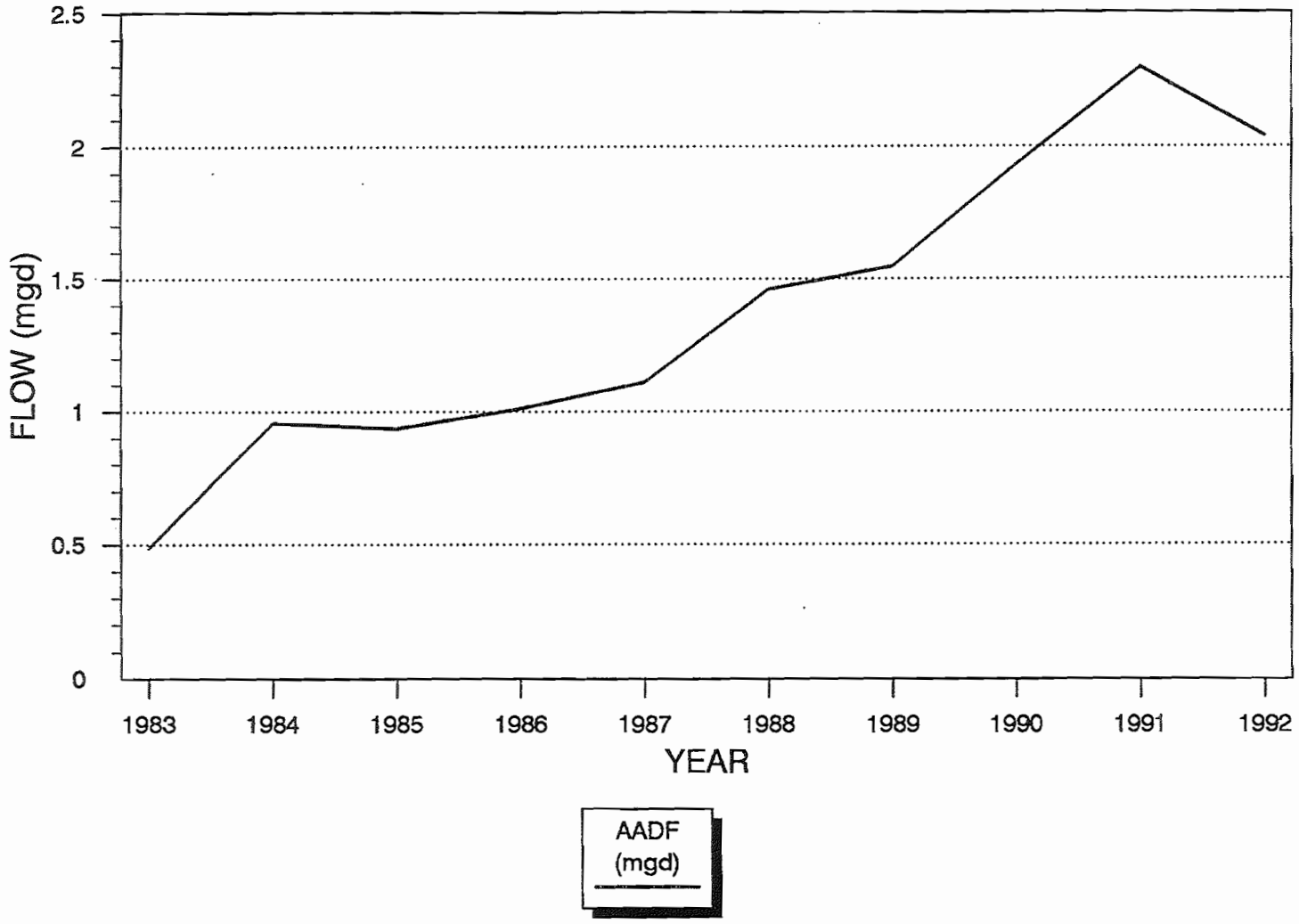

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FIGURE 2-4

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MARCO ISLAND WWTP
ANNUAL AVERAGE DAILY FLOW

TABLE 2-7

CAPACITY ANALYSIS REPORT
MARCO ISLAND WASTEWATER TREATMENT PLANT

HISTORICAL ANNUAL AVERAGE DAILY FLOWS
1982-1991

Year	AADF (mgd)
1982	0.775
1983	0.955
1984	0.935
1985	1.009
1986	1.109
1987	1.459
1988	1.545
1989	1.931
1990	2.294
1991	2.038

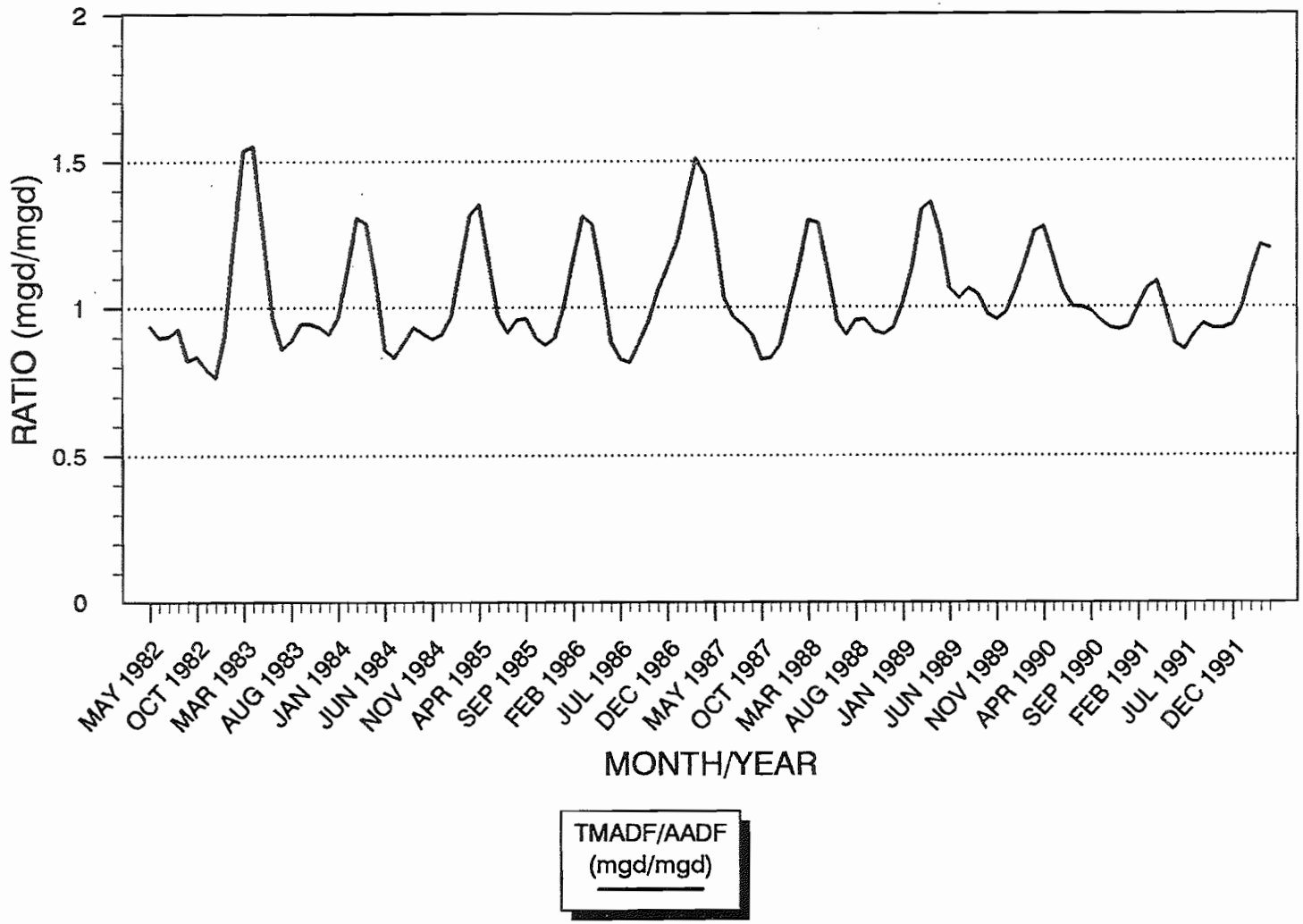

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FIGURE 2-5

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MARCO ISLAND WWTP
TMADF/AADF RATIO

TABLE 2-8

CAPACITY ANALYSIS REPORT
MARCO ISLAND WASTEWATER TREATMENT PLANT

RATIO OF TMADF/AADF

Year	Maximum	Minimum
1982-1983	1.550	0.763
1983-1984	1.304	0.859
1984-1985	1.349	0.830
1985-1986	1.310	0.872
1986-1987	1.507	0.814
1987-1988	1.295	0.823
1988-1989	1.357	0.906
1989-1990	1.271	0.956
1990-1991	1.165	0.923
1991-1992	1.210	0.857

(1) Annual period evaluated is May-April.

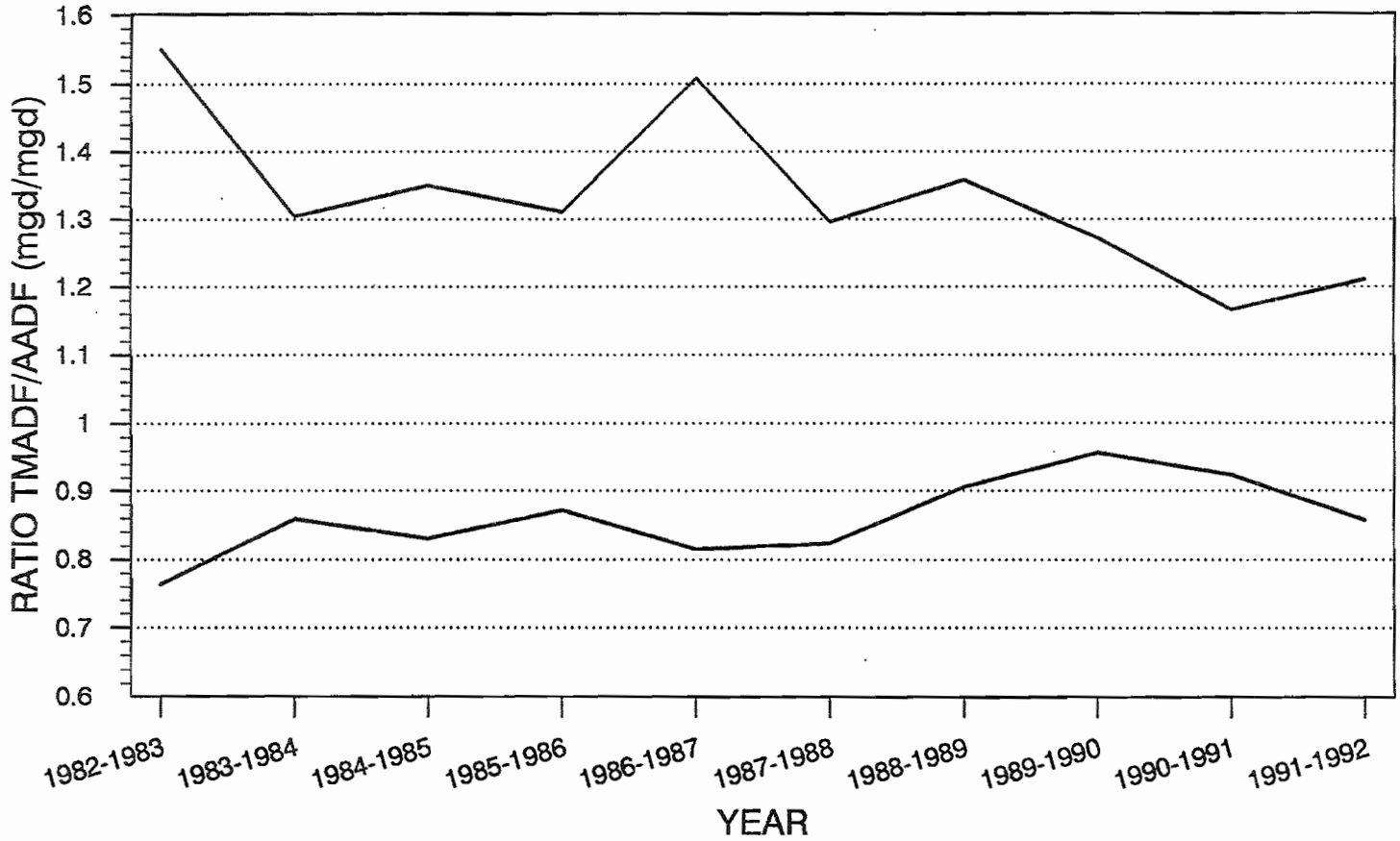

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FIGURE 2-6

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MARCO ISLAND WWTP
MAX/MIN - TMADF/AADF RATIO

TABLE 2-9

SOUTHERN STATES UTILITIES, INC.
MARCO ISLAND WASTEWATER TREATMENT PLANT

SEASONAL FLOW FACTORS

Year	Maximum Day (MGD)	Maximum Month (MGD)	AADF (MGD)	Maximum Day to AADF Ratio	Maximum Month to AADF Ratio
1982	2.499	1.078	0.486	5.14	2.22
1983	2.181	1.516	0.955	2.28	1.59
1984	1.704	1.405	0.935	1.82	1.50
1985	1.884	1.401	1.009	1.87	1.39
1986	2.264	1.506	1.109	2.04	1.36
1987	2.735	2.076	1.459	1.87	1.42
1988	2.297	2.034	1.545	1.49	1.32
1989	3.021	2.518	1.931	1.56	1.30
1990	3.555	2.689	2.294	1.55	1.17
1991	3.208	2.567	2.038	1.57	1.26
10-Year Average				2.12	1.45
5-Year Average				1.61	1.29
3-Year Average				1.56	1.25

TABLE 2-10

SOUTHERN STATES UTILITIES, INC.
MARCO ISLAND WASTEWATER TREATMENT PLANT

FDER PERMIT LIMITS FOR EFFLUENT

Parameter	Value
Average Daily Flow	3.5 mgd
BOD_5 Concentration	20.0 mg/l
TSS Concentration (1)	5.0 mg/l
TSS Concentration (2)	20.0 mg/l

(1) Public access level irrigation.
(2) Rapid rate percolation ponds.

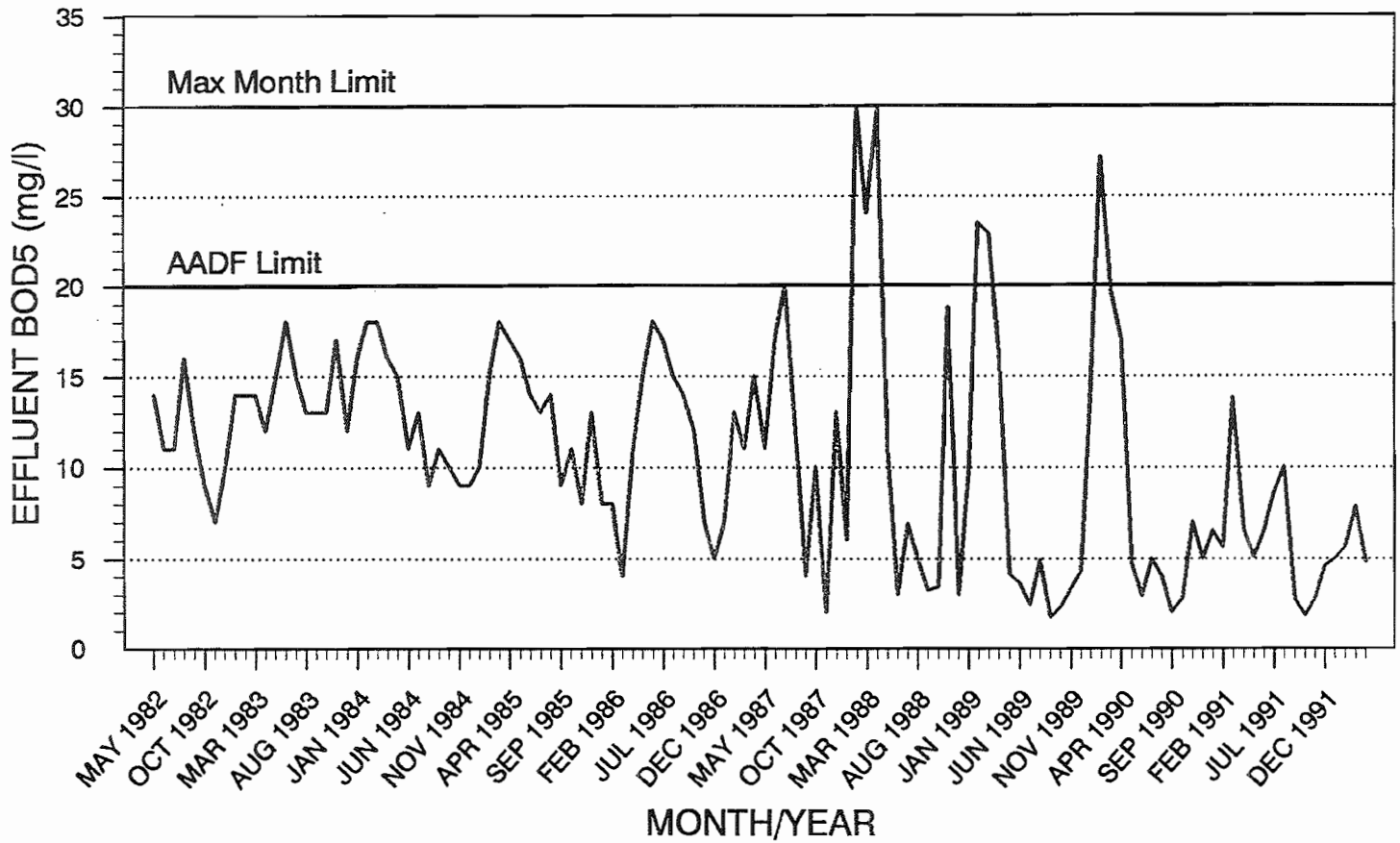

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FIGURE 2-7

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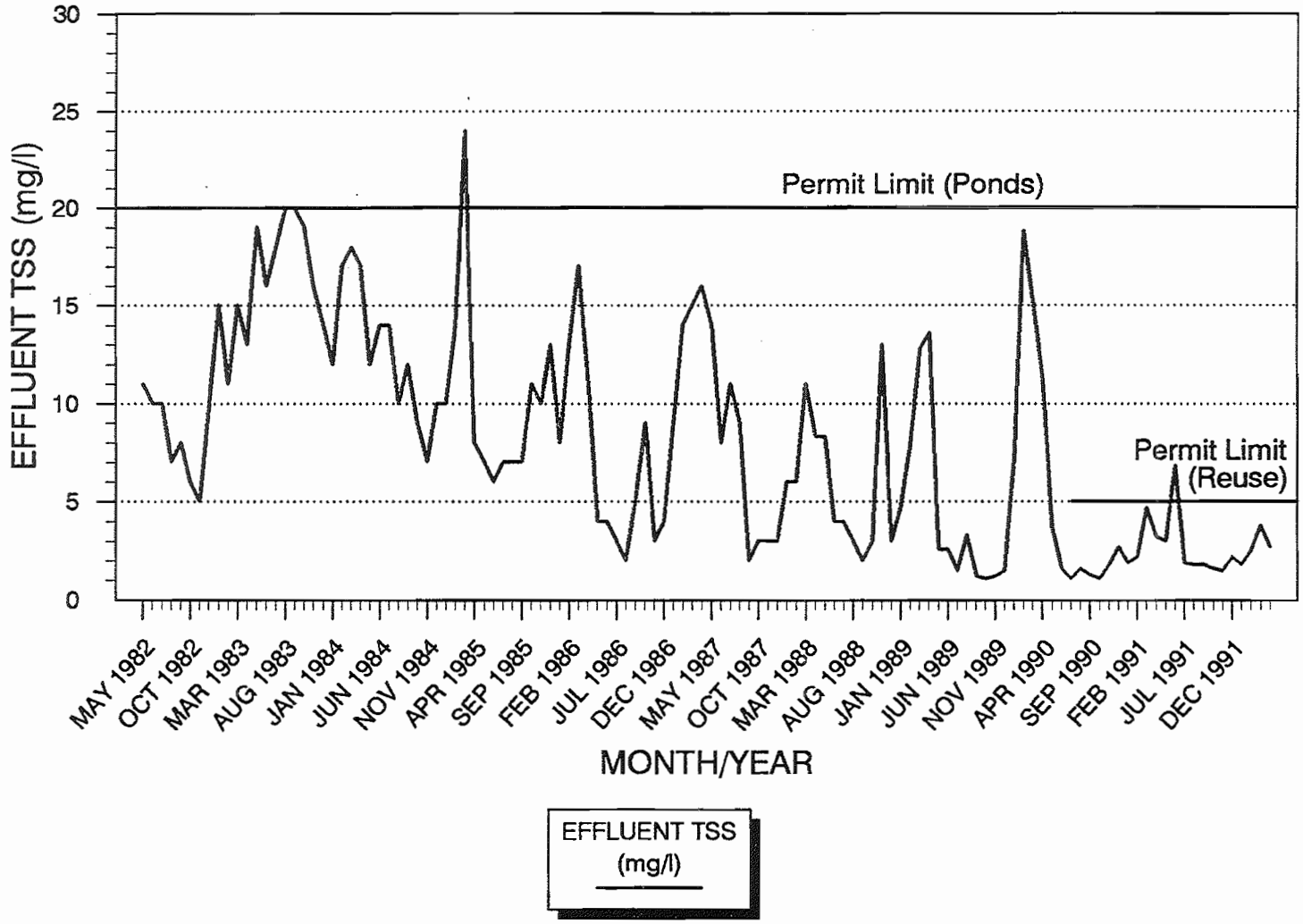
MARCO ISLAND WWTP
EFFLUENT BOD5 CONCENTRATION



92-231.00/FL-194

FIGURE 2-8

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MARCO ISLAND WWTP
EFFLUENT TSS CONCENTRATION

illustrate the effluent BOD_5 and TSS values for the past ten (10) years, respectively. Since the 1.0 MGD expansion to 3.5 MGD has been placed on-line, the Marco Island WWTP has met or exceeded all effluent requirements for BOD_5 and TSS.

2.5 REGULATORY REQUIREMENTS

As required by the rules and regulations of the FDER, the Marco Island WWTP must meet various rules for wastewater treatment and effluent disposal. The FDER also incorporates the Class I requirements of the USEPA for wastewater treatment facilities that are currently disposing of treated wastewater effluent on public access disposal sites. The primary rules which apply to this facility are Chapters 17-600, 17-610 and 17-640, FAC. Summarized in below are the regulatory requirements for these facilities.

Chapter 17-600, Domestic Wastewater Facilities, FAC, specifically governs the permitting and design of domestic wastewater treatment facilities. In addition, included in Chapter 17-600, FAC, are the treatment requirements for varying degrees of effluent disposal (e.g., non-public access, public access, etc.). In summary, the purpose of 17-600, FAC, is to provide minimum design wastewater treatment and disinfection standards, and where appropriate, shall be used in conjunction with other Department rules relating to the design, and operation and maintenance (O & M) of domestic wastewater treatment facilities.

Chapter 17-610, Reuse of Reclaimed Water and Land Application, FAC, sets the treatment criteria for effluent disposal on non-restricted and restricted public access effluent disposal sites. The present method of effluent disposal via land application at SSU is considered to be a combination of restricted and non-restricted public access. In summary, the following are required by the FDER for restricted and non-restricted public access effluent disposal sites:

- Restricted Access Site Requirements

    1. Secondary treatment with basic disinfection and a TSS concentration in the effluent of not more than 10.0 milligrams per liter (mg/1).

    2. Wet weather storage capacity shall be a minimum of 3 days plus the effects of climatic conditions.

3. Application sites shall be designed to prevent the entrance of surface runoff.

4. For all systems, appropriate warning signs shall be posted at the site boundaries and fencing to prevent access to the effluent disposal site.

5. Maintain a distance of 100 feet from the edge of the wetted area to buildings that are inhabited (i.e., office, lab, etc.) and property line. A setback of 500 feet shall be provided from the edge of the wetted area to potable supply wells and surface waters.

- Public Access Site Requirements

1. Meet secondary treatment with high level disinfection. Therefore, the effluent shall contain less than 5.0 mg/l of TSS.

2. Filtration shall be provided for TSS control.

3. Provide chemical feed facilities to aid in TSS removal. Chemical feed systems may be idle if the TSS limitation is being achieved without chemical addition.

4. Facility reliability shall have a minimum Class I per USEPA Manual, MCD-05.

5. Provide continuous on-line monitoring for turbidity before application of disinfectant.

6. Facility shall have an approved operating protocol designed to ensure that the high-level disinfection criteria will be met before the reclaimed water is released to the system.

7. Substandard reclaimed water shall either be stored for subsequent treatment or shall be discharged to another permitted disposal system.

8. Substandard storage required of a volume equal to flow of the treatment plant or the average daily permitted flow of the reclaimed water reuse system, whichever is less.

9. Provisions for recirculating the reject water to other parts of the treatment plant shall be incorporated into the design.

In addition to the above listed requirements, wet weather storage must also be provided when discharging to an irrigation system. Wet weather storage is for effluent storage when the weather conditions prohibit application of treated effluent on turf areas. The minimum FDER accepted volume of wet weather storage is generally three (3) days average daily flow. However, a mass balance must prove that the requirement is less than three (3) days. The mass balance considers factors such as application rate, evaporation and precipitation in determining wet weather storage. Typically, considering these factors, the storage requirement can be as great as 12 days.

Chapter 17-640, Domestic Wastewater Residuals, FAC, basically revised the old Chapter 17-7, FAC, to fall in line with the proposed USEPA 40 Code of Federal Regulations (CFR) 503. The new residuals rule was adopted on August 12, 1990; however, at present time, a number of items remain unresolved until the promulgation of 40 Code of Federal Regulations (CFR) 503. The unresolved items include concentration of metal and organics, pathogen sampling methodology, vector control provisions, etc. In addition, under Chapter 17-640, FAC, permitting, accountability for ultimate disposal of sludge and maintaining a plan for land application of sludge, which identifies specific application sites and proposed application rates, has been shifted to the generator of the sludge. In other words, under the new rule, when applying for a construction or operating permit, the permittee will be required to submit an Agricultural Use Plan as a component of the permit application. The Agricultural Use Plan for the Marco Island WWTP was recently submitted to FDER. Furthermore, Chapter 17-640, FAC, more specifically defines stabilization standards for land application of sludge. There are two (2) classes in the existing regulations for pathogen control:

- Processes Significantly Reduce Pathogens (PSRP).

- Processes to Further Reduce Pathogens (PFRP).

These processes are defined further in Table 2-11 and are defined in Section 17-640.600. Basically, this section identifies four (4) classes of sludge stabilization:

- Class AA - Processes which meet or exceed PFRP as defined in 40 CFR 257 and meets the requirements for metal content defined in Section 17-600.850(2).

- Class A - Processes which meet or exceed PFRP as defined in 40 CFR 257.

- Class B - Processes that are identified as PSRP, but not PFRP, as defined in 40 CFR 257.

- Class C - Processes that are identified as PSRP, but the design or operational characteristics do not meet the minimum requirements of 40 CFR 257.

Chapter 17-640, FAC also establishes the disposal site restrictions for the four (4) classes of stabilized sludge. As expected, the lesser the degree of stabilization, the more restrictions on the site in terms of public access, growing and harvesting. This section also identifies the setback distance criteria associated with the degree of stabilization.

Class A and Class AA will not be discussed with regard to the Marco Island WWTP, since PFRP is not a cost-effective sludge management alternative for this facility, primarily due to its size. However, as presently designed, this facility can meet either of the requirements for a Class B or C degree of stabilization. Summarized below are the restrictions for both Class B and C stabilized sludges.

- Class B - Application is limited to sod farms, pasture land, forest, highway shoulders and medians (limited access highways or roadways where public access is limited) and plant nursery use. Root crops, fruit and vegetables which come in contact with the soil shall not be grown on sludge application sites within 18 months of the last application. Root crops, fruits and vegetables which do not come in contact with the soil shall not be harvested within 30 days of the last application. Pasture vegetation shall not be cut or used for grazing by livestock for 30 days following the last application. Public access shall be restricted from the site for 12 months. Setbacks include 300 feet from a building occupied by the general public and 100 feet if the sludge is injected into the ground.

TABLE 2-11

WASTEWATER SLUDGE PROCESSING CLASSIFICATIONS AND CRITERIA UNDER 40 CODE OF FEDERAL REGULATIONS 257

1. Stabilized domestic wastewater treatment sludge and processes to Significantly Reduce Pathogens (PSRP).

   a. Aerobic digestion: The process is conducted by agitating sludge with air or oxygen to maintain aerobic conditions at residence times ranging from 60 days at 15 degrees Centigrade (°C) to 40 days at 20°C, with a minimum volatile solids reduction of at least 38 percent.

   b. Air drying: Liquid sludge is allowed to drain and/or dry on underdrained sand beds, or on paved or unpaved basins in which the sludge depth is a maximum of nine inches. Maximum of 3 months is needed, of which temperature average on a daily basis is above 0°C.

   c. Anaerobic digestion: The process is conducted in the absence of air at residence times ranging from 60 days at 20°C to 15 days at 35°C to 55°C, with a minimum volatile solids reduction of at least 38 percent.

   d. Composting: Using the in-vessel, static aerated pile, or windrow composting methods, the solid waste is maintained at minimum operating conditions of 40°C for five (5) days. For 4 hours during this period, the temperature exceeds 55°C.

   e. Lime stabilization: Sufficient lime is added to produce a pH of 12 standard units after 2 hours of contact.

   f. Other methods: Other methods of operating conditions may be acceptable if pathogens and vector attraction of the waste (volatile solids) are reduced to an extent equivalent to the reduction achieved by any of the above methods.

2. Composted and/or processed domestic wastewater treatment sludge and Processes to Further Reduce Pathogens (PFRP).

   a. Composting: Using in-vessel composting methods, the solid waste is maintained at operating conditions of 55°C or greater for 3 days. Using the windrow composting method, the solid waste attains a temperature of 55°C or greater for at least 15 days during the composting period. There will be a minimum of five (5) turnings of the windrow.

TABLE 2-11 (Continued)

WASTEWATER SLUDGE PROCESSING CLASSIFICATIONS AND CRITERIA UNDER 40 CODE OF FEDERAL REGULATIONS 257

b. Heat drying: Dewatered sludge cake is dried by direct or indirect contact with hot gases, and moisture content is reduced to 10 percent or lower. Sludge particles reach temperatures well in excess of 80°C or the wet bulb temperature of the gas stream in contact with the sludge at the point where it leaves the dryer is in excess of 80°C.

c. Heat treatments: Liquid sludge is heated to temperature of 90°C for 30 minutes.

d. Thermophillic aerobic digestion: Liquid sludge is agitated with air or oxygen to maintain aerobic conditions at a residence times of 10 days at 55° to 60°C, with a volatile solids reduction of at least 38 percent.

e. Other methods: Other methods or operating conditions may be acceptable if pathogens and vector attraction of the waste (volatile solids) are reduced to an extent equivalent to the reduction achieved by any of the above methods. Any of the processes listed below, if added following a PSRP facility, will further reduce pathogens.

(1) Beta ray irradiation: Sludge is irradiated with beta rays from an accelerator at dosages of at least 1.0 megarad at room temperature (i.e., 20°C).

(2) Gamma ray irradiation: Sludge is irradiated with gamma rays from certain isotopes such as Cobalt-60 and Cesium-137, at dosages of at least 1.0 megarad at room temperature (i.e., 20°C).

(3) Pasteurization: Sludge is maintained at least 30 minutes at a minimum temperature of 70°C.

(4) Other methods: Other methods or operating conditions may be acceptable as pathogens are reduced to an extent equivalent to the reduction achieved by any of the above add-on methods.

- Class C - Must meet the same requirements as a Class B sludge. However, root crops, fruits and vegetables which do not touch the ground cannot be harvested within 60 days following the last application, and the setback from a building occupied by the general public is now 500 feet, rather than 300 feet.

Based on the most recent information, it is apparent that the Class C sludge treatment process will be from Chapter 17-640, FAC since it has been deleted from 40 CFR 503. Whether the Class C sludge treatment processes are deleted from Chapter 17-640, FAC, the existing facilities will be required to meet the pathogen reduction levels for at least Class B sludge treatment processes which is presently proposed to be 2,000,000 fecal coliform colonies per gram of sludge.

USEPA Manual MCD-05 entitled Design Criteria for Mechanical, Electrical and Fluid System and Component Reliability is a reference standard used by the FDER. This document sets forth number of units and component requirements. In summary, Class I reliability requires quality in virtually all plant processes. Table 2-12 illustrates the Class I reliability requirements as they pertain to an activated sludge facility similar to the Marco Island WWTP.

The existing Marco Island WWTP as presently in service does completely comply with the Class I requirements as outlined in USEPA Manual MCD-05. However, the Phase II expansion will completely comply with the Class I requirements. Summarized in Table 2-13 is a comparison of the major unit processes at the Marco Island WWTP to the USEPA Class I reliability requirements.

TABLE 2-12

EPA CLASS I RELIABILITY REQUIREMENTS

Components	Requirements
1. Trash Removal or Comminution	Required.
2. Grit Removal	Required.
3. Backup Pumps	Required - Sufficient capacity of remaining pumps to handle peak flow with one (1) pump out of service.
4. Aeration Basin	Minimum of two (2) basins of equal volume.
5. Blowers	Multiple units - With largest unit out of service remaining units able to maintain design oxygen transfer.
6. Final Clarifier	Multiple basins - With largest unit out of service remaining units have capacity for at least 75 percent of design flow.
7. Filters	Multiple units - With largest unit out of service remaining units have capacity for at least 75 percent design flow.
8. Chlorine Contact Basin	Multiple basins - With largest unit out of service remaining units have capacity for at least 50 percent design flow.
9. Sludge Pumps	Sufficient capacity of remaining pumps to handle peak flow with one pump out of service; backup pump may be uninstalled.
10. Aerobic Sludge Digestion	
a. Aeration Basin	Backup basin not required.
b. Blowers	Minimum two (2) units - Permissible for less than design oxygen transfer with one (1) unit out of service.
c. Air Diffusers	Multiple sections - With largest section out of service, oxygen transfer capability not measurably impaired.

TABLE 2-12 (Continued)

EPA CLASS I RELIABILITY REQUIREMENTS

Components	Requirements
11. Power Sources	Two (2) separate and independent electric power sources from either two (2) separate utility substations or one substation and one standby generator.
12. Facilities Requiring Standy Power	Mechanical bar screens or comminutors, main pumps, secondary treatment, final clarifier, filtration, disinfection, critical lighting and ventilation.

TABLE 2-13

MAJOR PROCESS UNIT COMPARISON
OF THE EXISTING MARCO ISLAND WWTP TO EPA
CLASS I RELIABILITY REQUIREMENTS

Components	Requirements	Marco Island WWTP
Screening/Grit Removal	Provisions for screenings and grit removal.	Screening and grit removal facilities exist.
Aeration Basin	Minimum of two (2) basins of equal volume.	Equal basins exist
Final Clarifier	With largest unit out, remaining units have a capacity for 75 percent of design flow.	75 Percent criteria can be met with largest out of service (Class I reliability will be provided).
Filters	With largest unit out of service, remaining units have capacity for 75 percent of design flow.	Two (2) automatic backwash filters in service
Chlorine Contact	With largest unit out of service, remaining units have a capacity for at least 50 percent of design flow.	Dual chlorine contact basin in service.
Aerobic Digesters	Standby aerator required.	A standby aerator provided.

SECTION 3

SECTION 3

PROJECTED CONDITIONS

3.1 GENERAL

The following section describes the projected population and flow demand for the Marco Island Service Area.

3.2 POPULATION PROJECTIONS

Recent economic trends have slowed the market down considerably, making projections using current data questionable. In addition, the population data provided by the Collier County Planning Department indicates that the permanent population for Marco Island is nearly half of the seasonal population estimated by other sources. The Collier County data also indicates that the Marco Island area will increase in permanent population by approximately 6.75 percent for the next five (5) years (1993-1997) and 5.36 percent for the following five (5) years (1998-2002). Table 3-1 lists the Marco Island permanent population projections as provided by the Collier County Planning Department. The values listed in Table 3-1 are for Marco Island only and do not include seasonal increases. Table 3-2 lists the total Marco Island WWTP Service Area population projections as provided in a previous HAI Master Plan. These values include seasonal population estimates. This table also includes the estimated number of projected single-family and multi-family units. A review of the existing service area concludes that the areas served by central sewer are near build-out. The areas with some potential growth are areas currently served by septic systems. It appears that the Master Plan population estimates best reflect the growth of potential "sewered" customers. The County's projections are based on the population of the whole island, not just the sewered areas.

3.3 FLOW PROJECTIONS

The existing sewage flow data and population projections as discussed in the previous sections were used to estimate the sewage flow projections for the Marco Island WWTP. Historical seasonal population data and historical maximum month flows were utilized to determine a usage rate. Recent data indicates that this value is approximately 100 gallons per capita per

TABLE 3-1

SOUTHERN STATES UTILITIES, INC.
MARCO ISLAND WASTEWATER TREATMENT PLANT
PERMANENT POPULATION PROJECTIONS[1]

Year	Projected Population	Projected Percent Growth
1990	10,977	
1991	11,759	7.1
1992	12,723	8.2
1993	13,687	7.6
1994	14,651	7.0
1995	15,615	6.6
1996	16,623	6.5
1997	17,631	6.1
1998	18,638	5.7
1999	19,646	5.4
2000	20,653	5.1
2001	21,777	5.4
2002	22,902	5.2
2003	24,026	4.9
2004	25,150	4.7
2005	26,275	4.5

Note:

1. Data provided by Collier County Planning Department.

TABLE 3-2

SOUTHERN STATES UTILITIES, INC.
WASTEWATER SERVICE AREA POPULATION ESTIMATES

	Single-Family Units		Multi-Family Units		Total	Total
Year	No.	Pop.	No.	Pop.	Units	Population
1991	1,871	5,052	9,476	20,846	11,347	25,899
1992	2,000	5,401	9,727	21,399	11,727	26,800
1993	2,129	5,749	9,978	21,952	12,107	27,701
1994	2,258	6,098	10,229	22,505	12,487	28,603
1995	2,388	6,446	10,481	23,058	12,869	29,504
1996	2,517	6,795	10,732	23,611	13,249	20,405
1997	2,646	7,143	10,983	24,163	13,629	31,307
1998	2,775	7,492	11,235	24,716	14,010	32,208
1999	2,904	7,841	11,486	25,269	14,390	33,110
2000	3,033	8,489	11,737	25,822	14,770	34,011
2001	3,162	8,538	11,988	26,375	15,150	34,912
2002	3,291	8,886	12,240	26,927	15,531	35,814
2003	3,420	9,235	12,491	27,480	15,911	36,715
2004	3,549	9,583	12,742	28,033	16,291	37,616
2005	3,678	9,932	12,994	28,586	16,672	38,518
2006	3,808	10,280	13,245	29,139	17,053	39,419
2007	3,97	10,629	13,496	23,691	17,433	40,320
2008	4,066	10,977	13,747	30,244	17,813	41,22
2009	4,195	11,326	13,999	30,797	18,194	42,123
2010	4,324	11,675	14,250	31,350	18,574	43,025

day during the peak month. Utilizing 100 gpcd, the flow projections based on the recommended population projection method as discussed in the previous section are shown in Table 3-3.

The ten (10) years historical flow data also was used to estimate sewage flow projections by linear extrapolation. A linear regression analysis of the historical flow records was used to estimate the flow increase over the next ten (10) years. Figure 3-1 shows a plot of the historical flow data (1982 -1991) and a plot of the regression analysis, which includes flow projections to the year 2002. Table 3-4 lists the projected wastewater flows based on historical flow records. As noted in Table 2-9, the historical maximum month to annual average daily flow ratio has continued to increase. Utilizing the recent three (3) year average of 1.25 MMF/AADF, the maximum month flows were also calculated and listed in Table 3-4. Figure 3-2 illustrates the two (2) methods of flow projections. SSU believes that the method of utilizing population projections appears to be the more accurate estimate.

3.4 LOADING PROJECTIONS

Historical plant monthly records have shown that the influent flow waste characteristics (i.e.: BOD_5, TSS) do not vary significantly with time. Therefore, the future loadings to the plant will assume to increase based on flow increase and remain relatively constant with regards to concentration.

TABLE 3-3

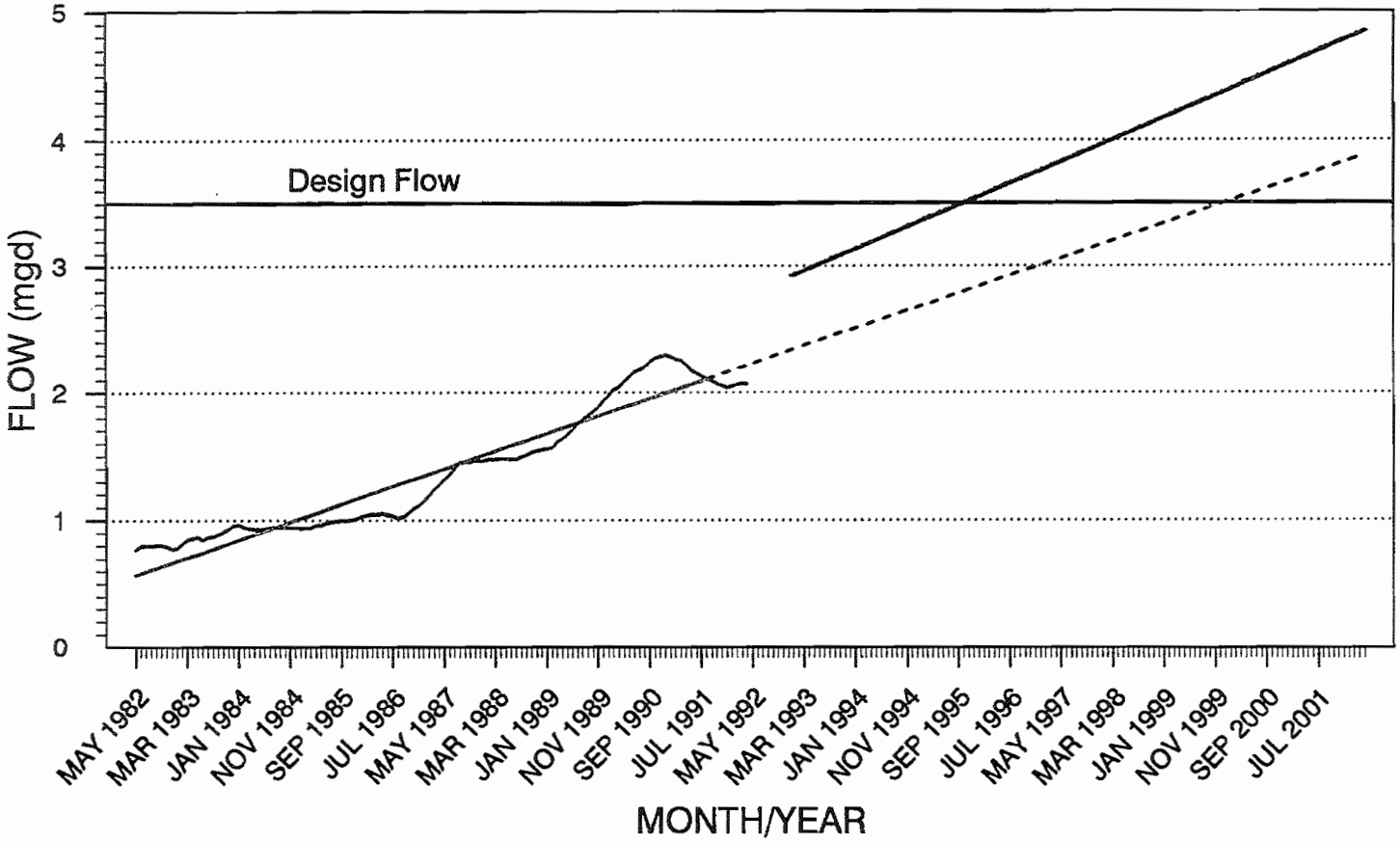
CAPACITY ANALYSIS REPORT
MARCO ISLAND WASTEWATER TREATMENT PLANT

FLOW PROJECTIONS BASED ON WASTEWATER SERVICE AREA POPULATION PROJECTION
1992-2005

Year	Projected Population	Projected Flow (MGD)[2]
1992	26800	2.68
1993	27701	2.77
1994	28603	2.86
1995	29504	2.95
1996	30405	3.04
1997	31307	3.13
1998	32208	3.22
1999	33110	3.31
2000	34011	3.40
2001	34912	3.49
2002	35804	3.58
2003	36715	3.67
2004	37616	3.76
2005	38518	3.85

Note:

1. Reference Table 3-2.
2. Based on 100 gallons per capita per day. These values are maximum month values.



92-231.00/FL-195

FIGURE 3-1

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MARCO ISLAND WWTP
WASTEWATER FLOW PROJECTION

TABLE 3-4

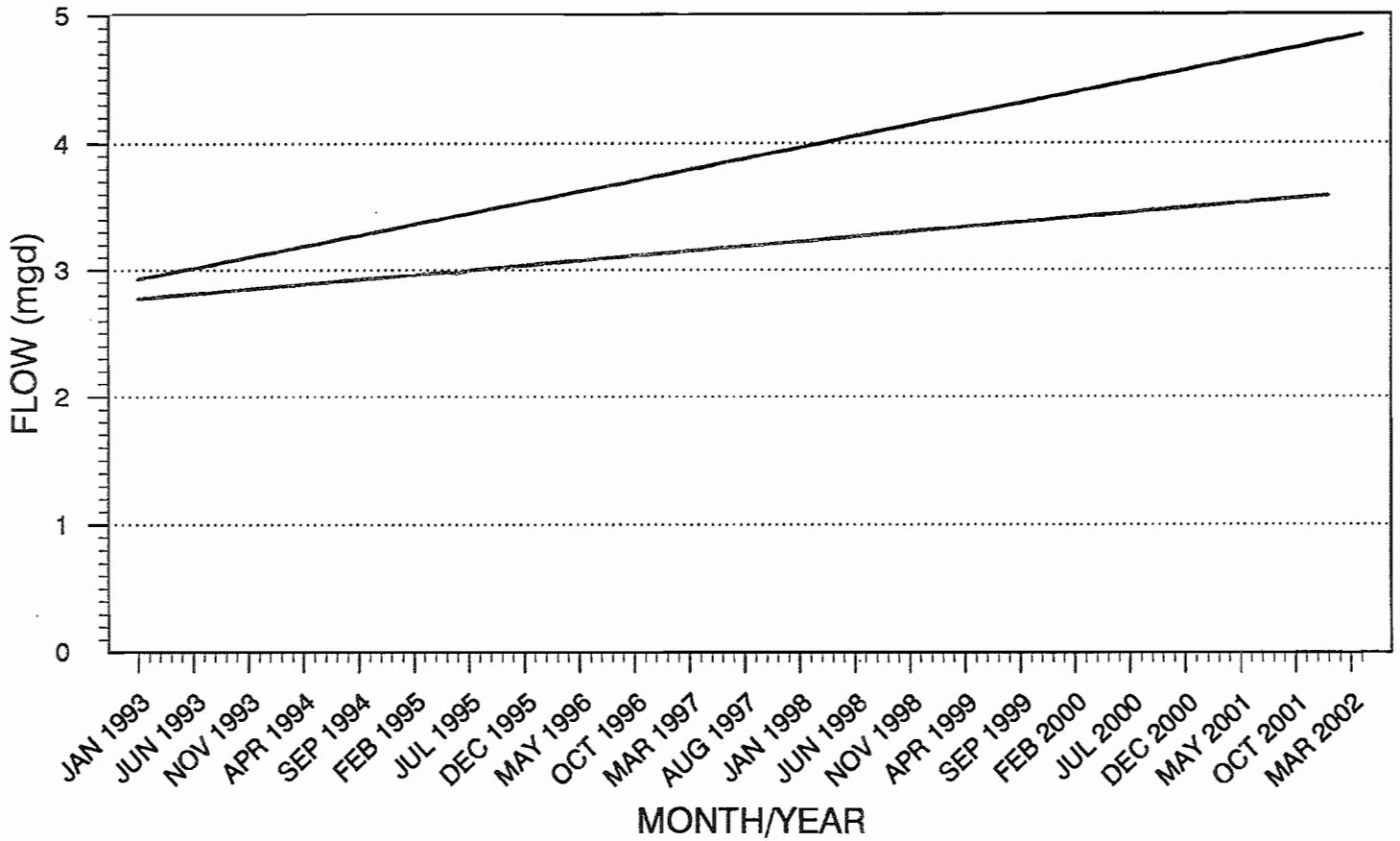
CAPACITY ANALYSIS REPORT
MARCO ISLAND WASTEWATER TREATMENT PLANT FACILITIES

FLOW PROJECTIONS BASED ON HISTORICAL FLOW DATA
1992-2005

Year	Projected Flow (MGD)[1]	Projected Flow[2]
1992	2.23	2.79
1993	2.41	3.01
1994	2.57	3.21
1995	2.74	3.43
1996	2.91	3.64
1997	3.07	3.84
1998	3.24	4.05
1999	3.40	4.25
2000	3.57	4.46
2001	3.74	4.68
2002	3.90	4.88
2003	4.07	5.09
2004	4.22	5.28
2005	4.39	5.49

Notes:

1. AADF
2. Maximum Month (1.25 MMF/AADF)



92-231.00/FL-196

FIGURE 3-2

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MARCO ISLAND WWTP
WASTEWATER FLOW PROJECTIONS

SECTION 4

SECTION 4

FACILITY NEEDS AND SCHEDULES

4.1 GENERAL

The following section evaluates the needs of the Marco Island WWTP, makes recommendations for corrective actions and presents the implementation schedule for corrective actions, maintenance and improvements.

4.2 FACILITY NEEDS

The needs of the Marco Island WWTP are based on both corrective action requirements in order to maintain the plant to treat the current permitted capacity, and improvements needed to treat flows up to the projected build-out of the Marco Island Service Area.

The Marco Island WWTP has had problems in the past meeting effluent limits for total suspended solids (TSS). This has caused the facility to be denied a regular operating permit and has been recently operating under either a temporary operating permit or a consent order. The facility needs to provide FDER with the appropriate data to justify the issuance of a regular operating permit for the Marco Island WWTP. The recent 1.0 MGD expansion provides the necessary facilities to treat the wastewater to meet all of the effluent limitations.

4.2.1 Corrective Actions

At the present time, there is only one (1) issue or corrective item necessary to maintain proper treatment of the existing permitted treatment and disposal capacity. Recently, during the Hurricane Andrew storm, some damage was done to one (1) of the clarifiers for treatment train #1.

4.2.2 Improvements

Since the completion of the 1.0 MGD expansion to the Marco Island WWTP, the facilities are capable of treating 3.50 MGD of wastewater flow on a maximum month basis. An effluent disposal expansion project was also completed recently. This project increased the total effluent disposal capacity to 3.50 MGD.

4.3 RECOMMENDATIONS

Based on the results of the projections in the previous section, the estimates utilizing historical flow are higher than the projections utilizing population projections. SSU believes that the wastewater flow projections based on the population projection method are more accurate estimates of future conditions in the service area. From the data provided in Table 2-8, it is evident that the peak month factor is continually decreasing as the average annual flow increases. Yet it is still consistently 25 percent higher than the AADF. Therefore, the Marco Island WWTP must be able to treat 1.25 times the projected AADF. Since the current rating of the facilities is 3.5 MGD, this must be considered the maximum month flow (MMF) capability and considered only a 2.8 MGD facility for annual average daily flows (AADF).

A review of the existing treatment facilities indicates that the design overflow rates of the clarification units may have been the cause of the permit violations. The design overflow rate (OFR) for the three (3) clarifiers in treatment train No. 1 is 558.4 gpd/sf at maximum average daily flow and in treatment train No. 2 the OFR for the one (1) clarifier is 509.3 gpd/sf at maximum average daily flow. These OFR's are within the typical recommended range for most clarifiers, but slightly higher than would be typically designed. The critical concern for clarifies with respect to overflow rates is the peak hour overflow rate. Peak hour overflow rates of less than or equal to 1,000 gpd/sf are typically desired. This would allow a peaking factor of approximately 1.8 times the maximum month ADF for the existing clarification facilities at the Marco Island WWTP. The Marco Island WWTP has 750,000 gallons of flow equalization volume. This is approximately 21 percent of the design maximum month ADF of 3.5 MGD. It appears that following the addition of the 500,000 gallons flow equalization basin, the effluent quality has consistently met or exceeded the permit requirements. The additional flow equalization volume reduces all downstream process peaking factors to the

maximum day design rate of 1.56. Therefore, it is concluded that future operational problems with clarifier performance during peak periods can be avoided.

4.4 IMPLEMENTATION SCHEDULE

It is estimated from Section 3, that the MMADF for the Marco Island WWTP will exceed the existing permitted capacity of 3.50 MGD, somewhere between the year 2000 and 2001. From the data presented in Section 3, it appears that the Marco Island facilities are sufficient for another 7 to 9 years. Table 4-1 lists an implementation schedule for the Marco Island WWTP.

TABLE 4-1

IMPLEMENTATION SCHEDULE

	1992	1993	1994	1995	1996	1997	1998	1999	2000
Prepare and Submit Operating Permit Renewal Application	XXX					XX			
Prepare Preliminary Engineering Report and Construction Permit Applications					XXXX				
Prepare Plans for Expansion						XXXX			
Begin Construction							XXXXXXX		
Place Facility Expansion On-Line								XX	
Prepare New Operating Permit Application									XX

SECTION 5

SECTION 5

STATEMENT FROM ENGINEER

Based on the inspection of the existing facilities and review of the recent wastewater plant operations data, the Marco Island WWTP will be capable of treating the wastewater flows projected over the period requested in the permit application (5 years) up to 3.5 MGD monthly average daily flow (MADF). As stated earlier in this report, this is also equivalent to 2.8 MGD average annual daily flow (AADF).

Following the construction of additional treatment, flow equalization, effluent disposal and settling aid feed equipment, the facilities are capable of providing treatment to meet all permit requirements, based on the review of the recent plant effluent data. In addition, the plant has a sub-standard effluent pond with recycle capabilities back to the treatment process to allow an alternative temporary disposal for effluent not meeting any of the permit limits. The plant also has on-site disposal capacity in their deep well (3.6 MGD) and 3.5 MGD worth of capacity in the new percolation ponds. The Marco Island WWTP has sufficient alternative disposal capacity if the plant can not meet certain effluent limit requirements for one or more of the disposal sites.

It is believed that the flow projections for the facility will not increase at the rate projected using a linear regression analysis of the past ten (10) years of historical flow data. A detailed review of the current service area noted that available land for development is quickly diminishing, leaving future growth projections limited. It is estimated based on growth projections provided by SSU, that the plant capacity (3.5 MGD Maximum Month) will not be exceeded for approximately seven (7) years. Since this report is required to be updated annually, the flow projections will also be analyzed annually to closely track the growth.

TABLE A-1

MARCO ISLAND WWTP EFFLUENT DISPOSAL QUANTITIES
MONTHLY TOTALS

Month	Injection Well (MGD)	Marco Island Golf Course (MGD)	Marco Shores Golf Course (MGD)	Medians (MGD)	Evap/ Percolation Ponds (MGD)
September, 1991	0	0.599	0.401	0	57.800
October, 1991	0	0.645	2.083	0	54.622
November, 1991	0	7.348	4.273	0	45.379
December, 1991	0	9.191	5.927	1.728	44.534
January, 1992	0	8.584	5.626	1.728	53.812
February, 1992	0	9.177	5.619	0.576	61.478
March, 1992	0	5.951	40.068[1]	0.432	34.149
April, 1992	0	5.226	40.291[1]	0.504	19.079
May, 1992	0	7.659	6.357	0.720	32.694
June, 1992	39.695	1.596	6.000	0.288	12.121
July, 1992	39.013	0.871	6.200	0	8.290
August, 1992	48.363	1.036	0.578	0	3.033
September, 1992	0	1.888	0.486	0	0

TABLE A-2

MARCO ISLAND WWTP EFFLUENT DISPOSAL QUANTITIES
MONTHLY TOTALS

Month	Injection Well (MGD)	Marco Island Golf Course (MGD)	Marco Shores Golf Course (MGD)	Medians (MGD)	Evap/ Percolation Ponds (MGD)
September, 1991	0	0.020	0.013	0	1.927
October, 1991	0	0.021	0.067	0	1.762
November, 1991	0	0.245	0.142	0	1.513
December, 1991	0	0.296	0.191	0.056	1.437
January, 1992	0	0.277	0.181	0.056	1.736
February, 1992	0	0.328	0.201	0.021	1.196
March, 1992	0	0.192	N/A	0.014	1.102
April, 1992	0	0.174	N/A	0.017	0.636
May, 1992	0	0.247	0.205	0.023	1.055
June, 1992	1.323	0.053	0.200	0.010	1.404
July, 1992	1.258	0.028	0.200	0	1.267
August, 1992	1.560	0.033	0.019	0	1.098
September, 1992	0	0.063	0.016	0	0

TABLE A-1

HISTORICAL FLOW DATA
JANUARY 1982 - DECEMBER 1991

Month/Year	Average Daily Flow (mgd)		
	1-Month	3-Month Running	Maximum Day
1982			
January	0.908		1.100
February	1.078		1.355
March	1.045	1.010	1.375
April	0.927	1.017	1.316
May	0.649	0.874	0.911
June	0.944	0.840	2.499
July	0.560	0.718	0.785
August	0.706	0.737	1.020
September	0.710	0.659	1.421
October	0.591	0.669	0.808
November	0.578	0.626	0.849
December	0.605	0.591	1.240
1983			
January	0.936	0.706	1.707
February	1.454	0.998	2.152
March	1.516	1.302	1.724
April	1.004	1.325	1.618
May	0.723	1.081	0.882
June	0.709	0.812	1.068
July	0.782	0.738	1.042
August	0.817	0.769	0.991
September	0.909	0.836	2.181
October	0.840	0.855	1.209
November	0.844	0.864	0.973
December	0.923	0.869	0.923
1984			
January	1.013	0.927	1.293
February	1.236	1.057	1.516
March	1.405	1.218	1.704
April	0.938	1.193	1.104
May	0.725	1.023	0.983

TABLE A-1 (Continued)

HISTORICAL FLOW DATA
JANUARY 1982 - DECEMBER 1991

Month/Year	Average Daily Flow (mgd)		
	1-Month	3-Month Running	Maximum Day
1984			
June	0.724	0.796	0.968
July	0.887	0.779	1.057
August	0.887	0.833	1.126
September	0.854	0.876	1.376
October	0.825	0.855	1.278
November	0.828	0.836	1.035
December	0.894	0.849	1.493
1985			
January	0.974	0.899	1.412
February	1.323	1.064	1.695
March	1.401	1.233	1.583
April	1.141	1.288	1.577
May	0.797	1.133	1.020
June	0.893	0.944	1.630
July	1.008	0.899	1.884
August	0.939	0.947	1.246
September	0.918	0.955	1.276
October	0.820	0.892	1.162
November	0.873	0.870	0.997
December	1.022	0.905	1.818
1986			
January	1.198	1.301	1.539
February	1.392	1.204	1.606
March	1.506	1.365	1.930
April	1.099	1.332	1.650
May	0.853	1.153	1.174
June	0.793	0.915	1.041
July	0.891	0.846	1.225
August	0.791	0.825	1.050

TABLE A-1 (Continued)

HISTORICAL FLOW DATA
JANUARY 1982 - DECEMBER 1991

Month/Year	Average Daily Flow (mgd)		
	1-Month	3-Month Running	Maximum Day
September	1.018	0.900	1.364
October	1.192	1.000	1.500
November	1.208	1.139	1.400
December	1.372	1.257	2.264
1987			
January	1.621	1.400	2.021
February	1.874	1.622	2.248
March	2.076	1.857	2.358
April	1.593	1.848	2.347
May	1.303	1.657	2.735
June	1.264	1.387	2.318
July	1.487	1.351	2.485
August	1.323	1.358	1.863
September	1.143	1.318	1.514
October	1.108	1.191	1.353
November	1.382	1.211	2.595
December	1.332	1.274	1.932
1988			
January	1.697	1.470	1.932
February	1.980	1.670	2.297
March	2.034	1.904	2.176
April	1.682	1.899	2.277
May	0.696	1.660	1.127
June	1.261	1.402	1.380
July	1.482	1.336	2.017
August	1.523	1.422	2.019
September	1.310	1.438	1.644
October	1.371	1.401	1.540
November	1.504	1.395	1.817
December	1.434	1.437	2.025

TABLE A-1 (Continued)

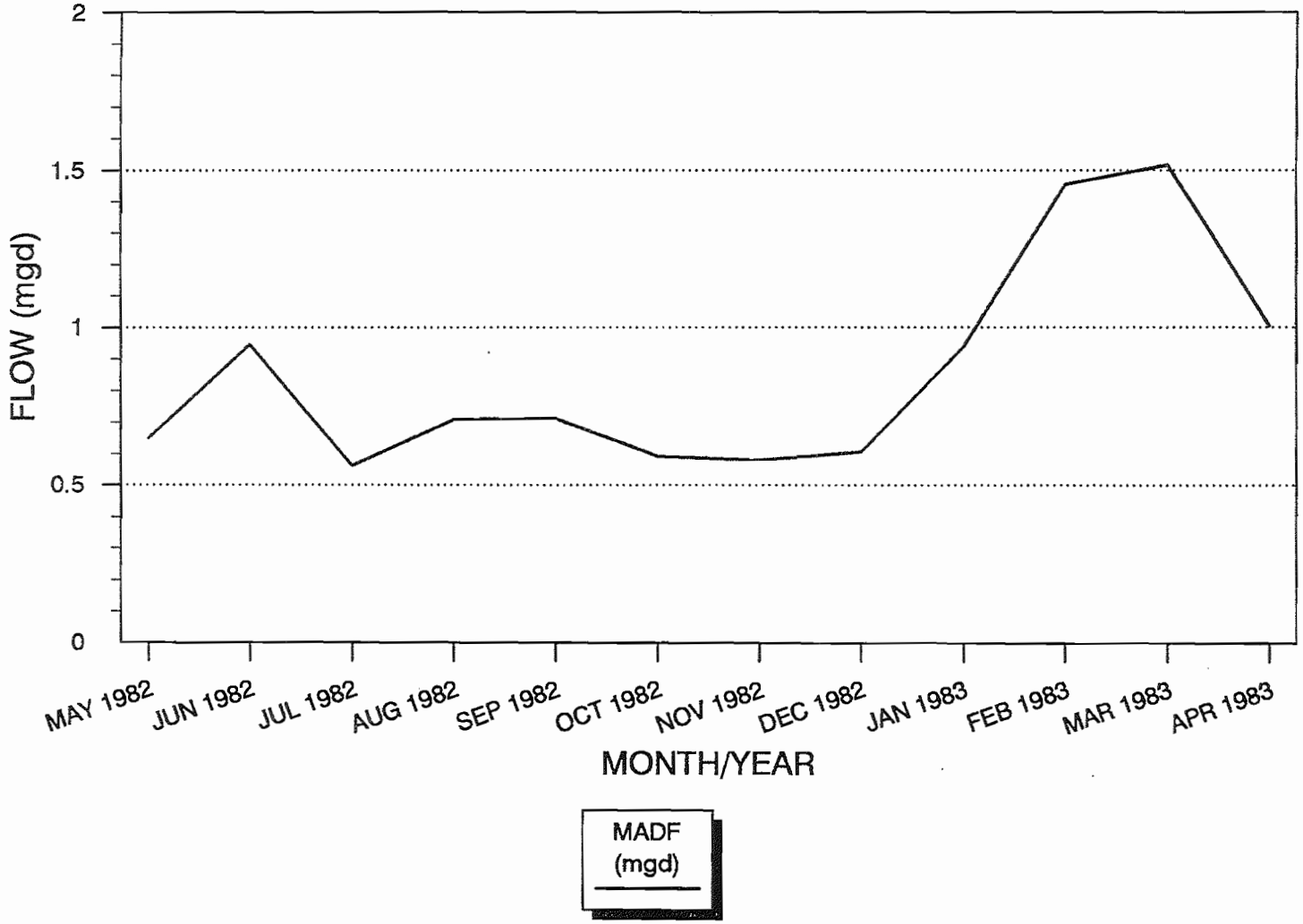
HISTORICAL FLOW DATA
JANUARY 1982 - DECEMBER 1991

Month/Year	Average Daily Flow (mgd)		
	1-Month	3-Month Running	Maximum Day
1989			
January	1.793	1.577	2.171
February	2.078	1.768	2.494
March	2.518	2.130	3.021
April	2.045	2.214	2.553
May	1.670	2.078	2.048
June	1.711	1.809	2.154
1988			
July	1.998	1.793	2.686
August	1.971	1.894	2.664
September	1.705	1.891	2.158
October	1.731	1.802	1.937
November	1.973	1.803	2.464
December	1.978	1.894	2.880
1990			
January	2.321	2.091	2.692
February	2.689	2.329	3.027
March	2.683	2.564	2.985
April	2.573	2.648	3.506
May	2.171	2.476	3.555
June	2.111	2.285	2.536
July	2.257	2.180	2.711
August	2.210	2.193	2.642
September	2.163	2.210	2.801
October	2.113	2.162	2.828
November	2.067	2.114	2.267
December	2.170	2.117	2.532

TABLE A-1 (Continued)

HISTORICAL FLOW DATA
JANUARY 1982 - DECEMBER 1991

Month/Year	Average Daily Flow (mgd)		
	1-Month	3-Month Running	Maximum Day
1991			
January	2.123	2.120	2.405
February	2.487	2.260	2.966
March	2.567	2.392	2.842
April	2.177	2.410	2.636
May	1.683	2.142	2.105
June	1.795	1.885	2.590
July	2.000	1.826	2.750
August	1.940	1.912	2.252
September	1.960	1.967	3.208
October	1.850	1.917	2.133
November	1.900	1.903	2.182
December	1.980	1.910	2.995



92-231.00/FL-178

FIGURE A-1

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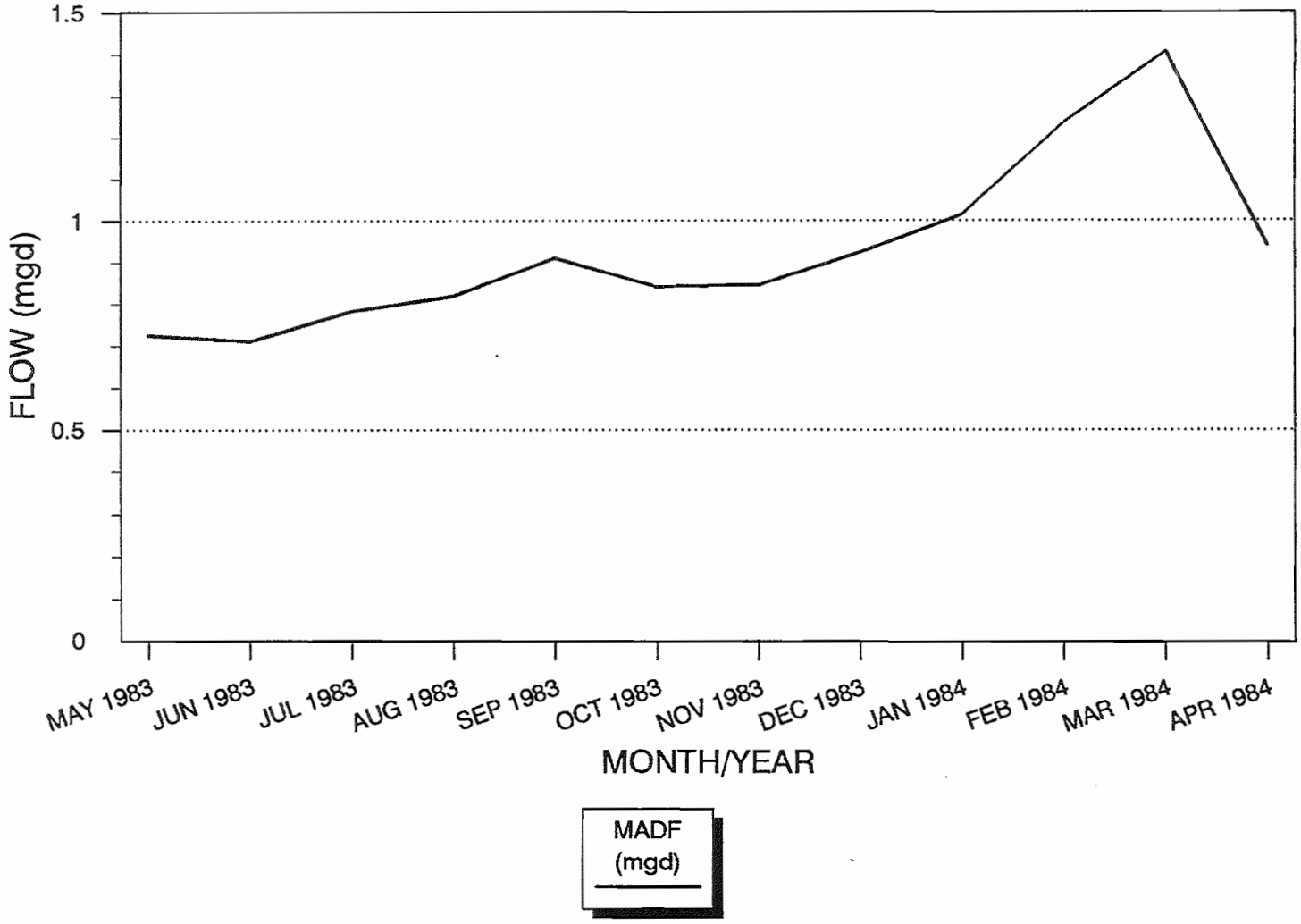
MARCO ISLAND WWTP
AVERAGE MONTHLY FLOW



92-231.00/FL-179

FIGURE A-2

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MARCO ISLAND WWTP
AVERAGE MONTHLY FLOW

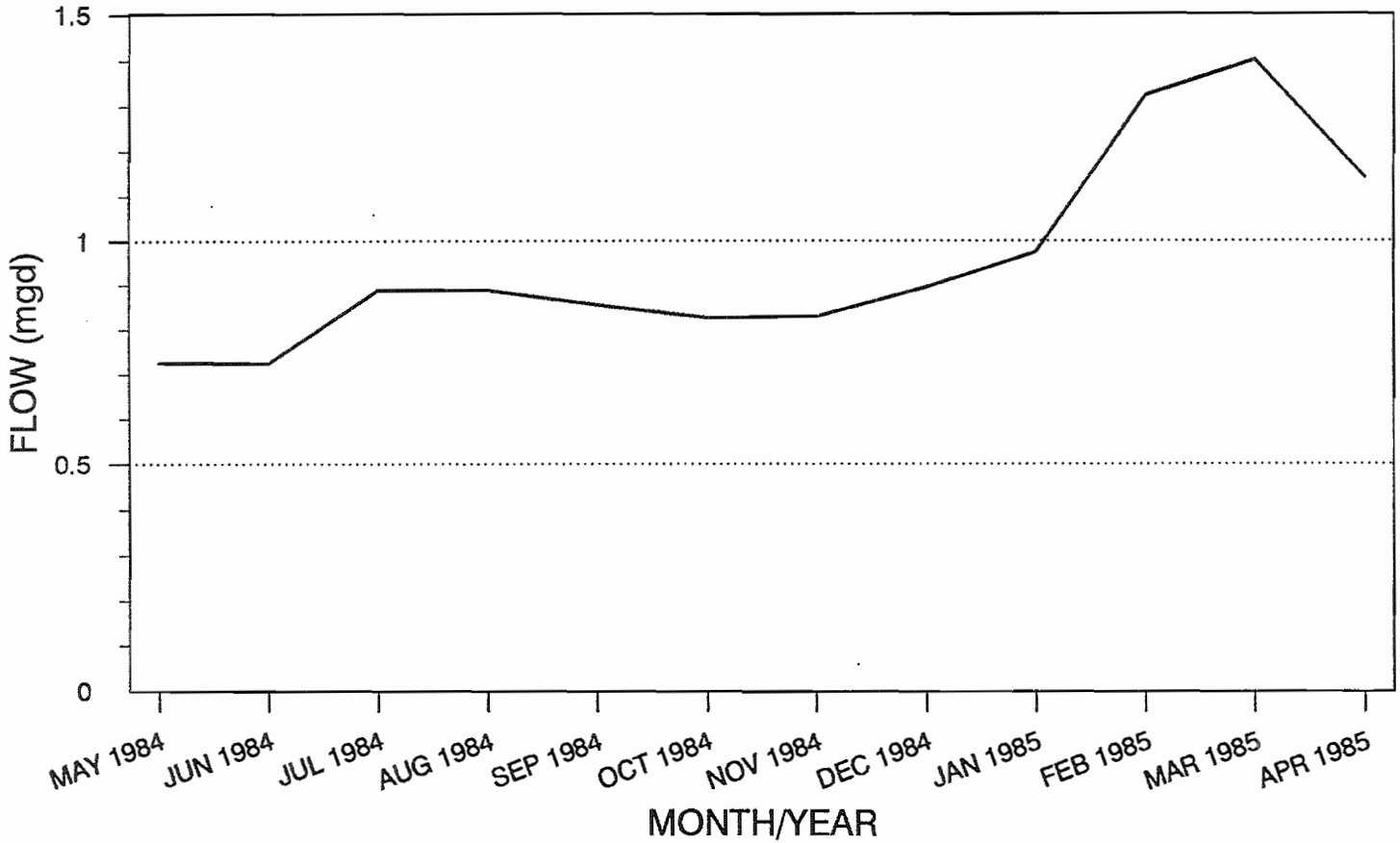

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FIGURE A-3

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MARCO ISLAND WWTP
AVERAGE MONTHLY FLOW

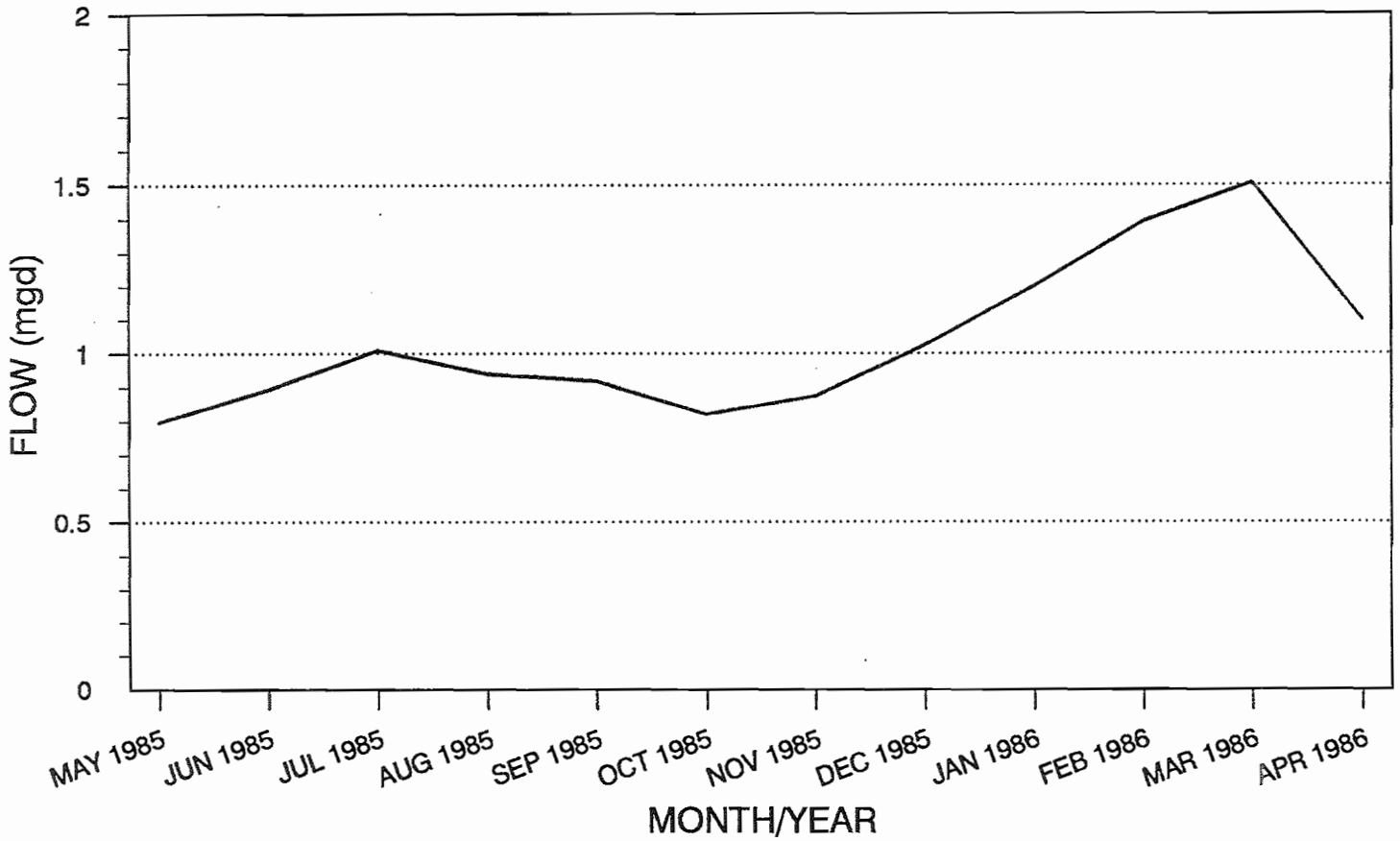

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FIGURE A-4

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MARCO ISLAND WWTP
AVERAGE MONTHLY FLOW

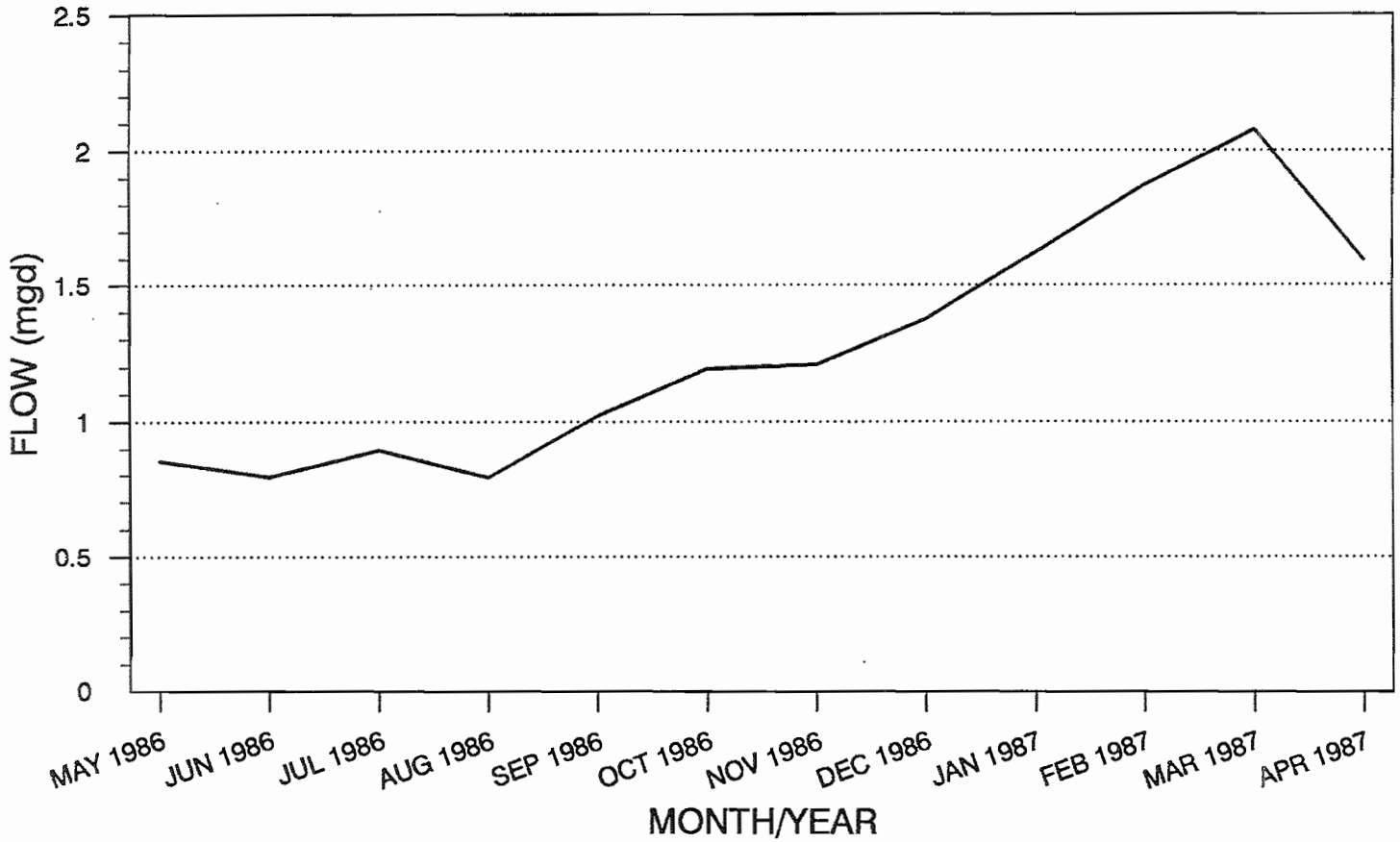

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FIGURE A-5

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MARCO ISLAND WWTP
AVERAGE MONTHLY FLOW

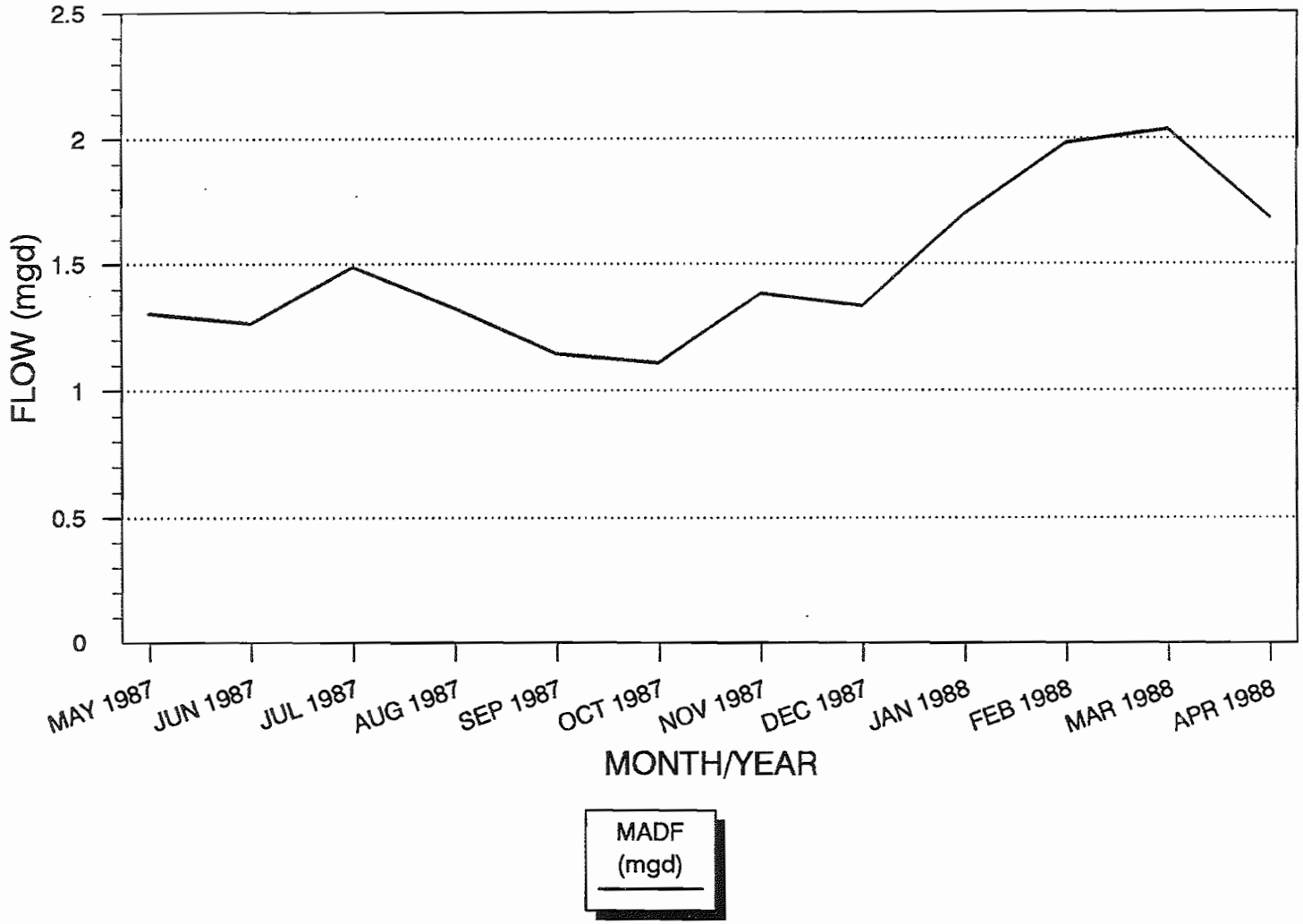

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FIGURE A-6

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MARCO ISLAND WWTP
AVERAGE MONTHLY FLOW

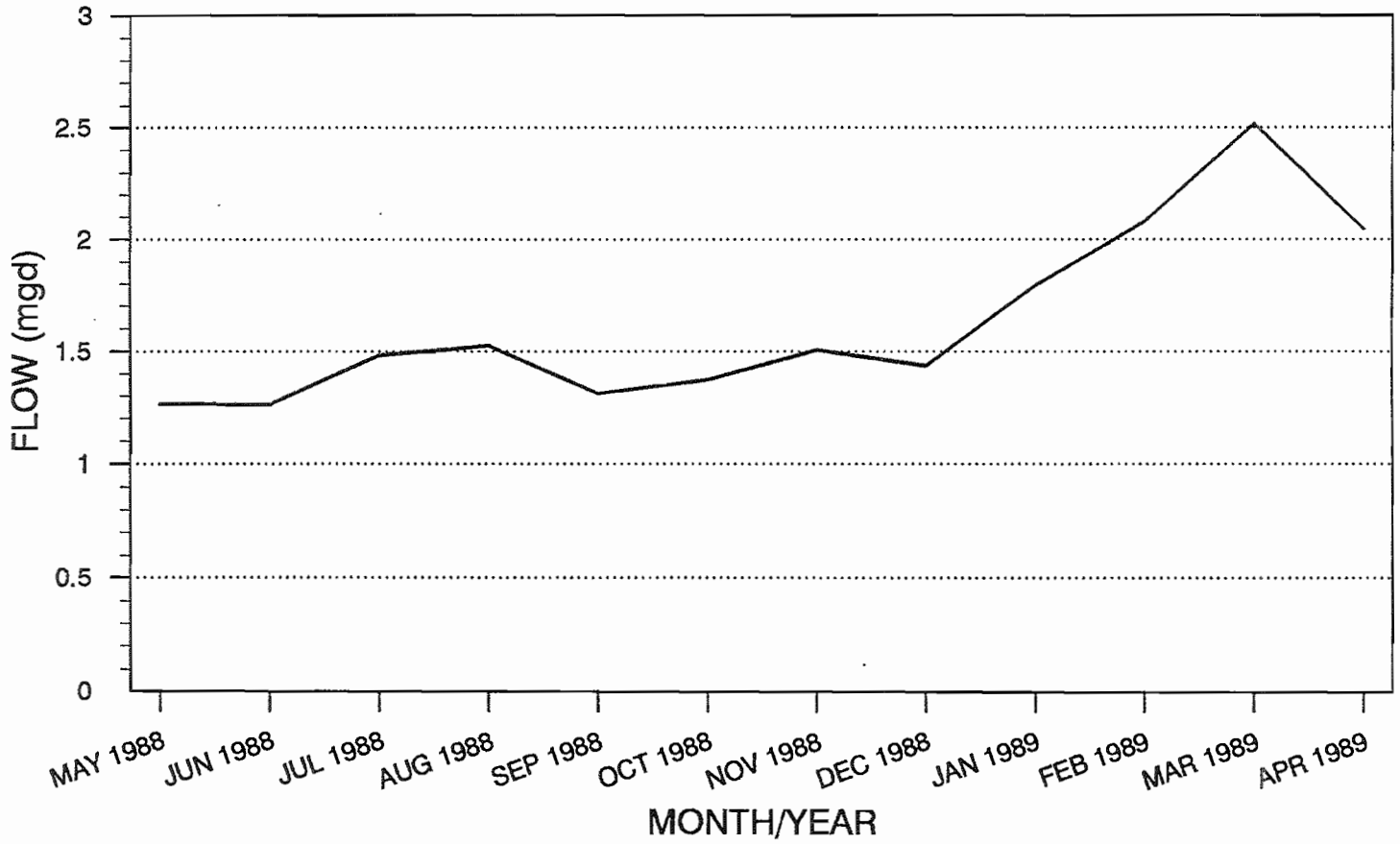

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FIGURE A-7

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MARCO ISLAND WWTP
AVERAGE MONTHLY FLOW

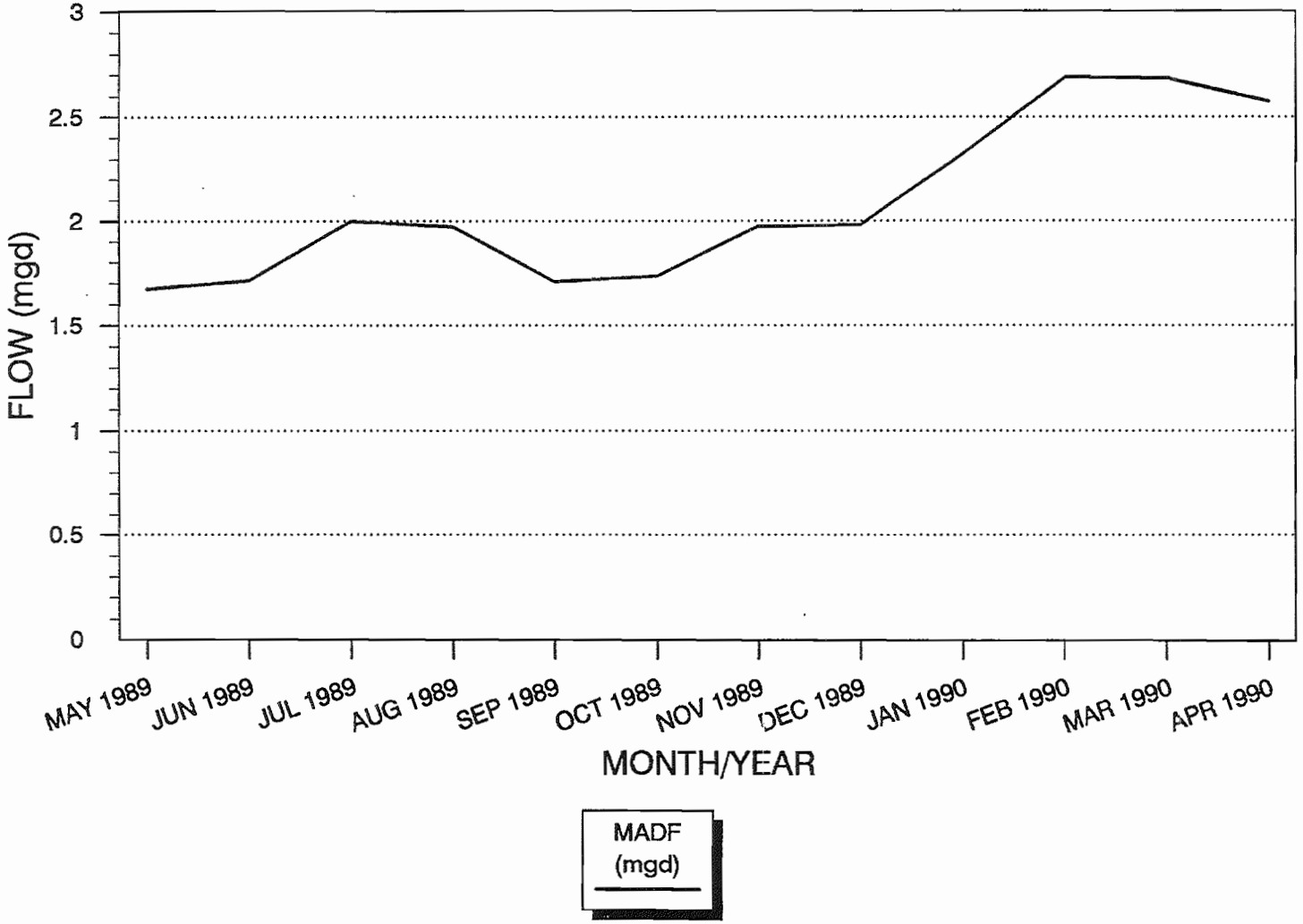

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FIGURE A-8

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MARCO ISLAND WWTP
AVERAGE MONTHLY FLOW

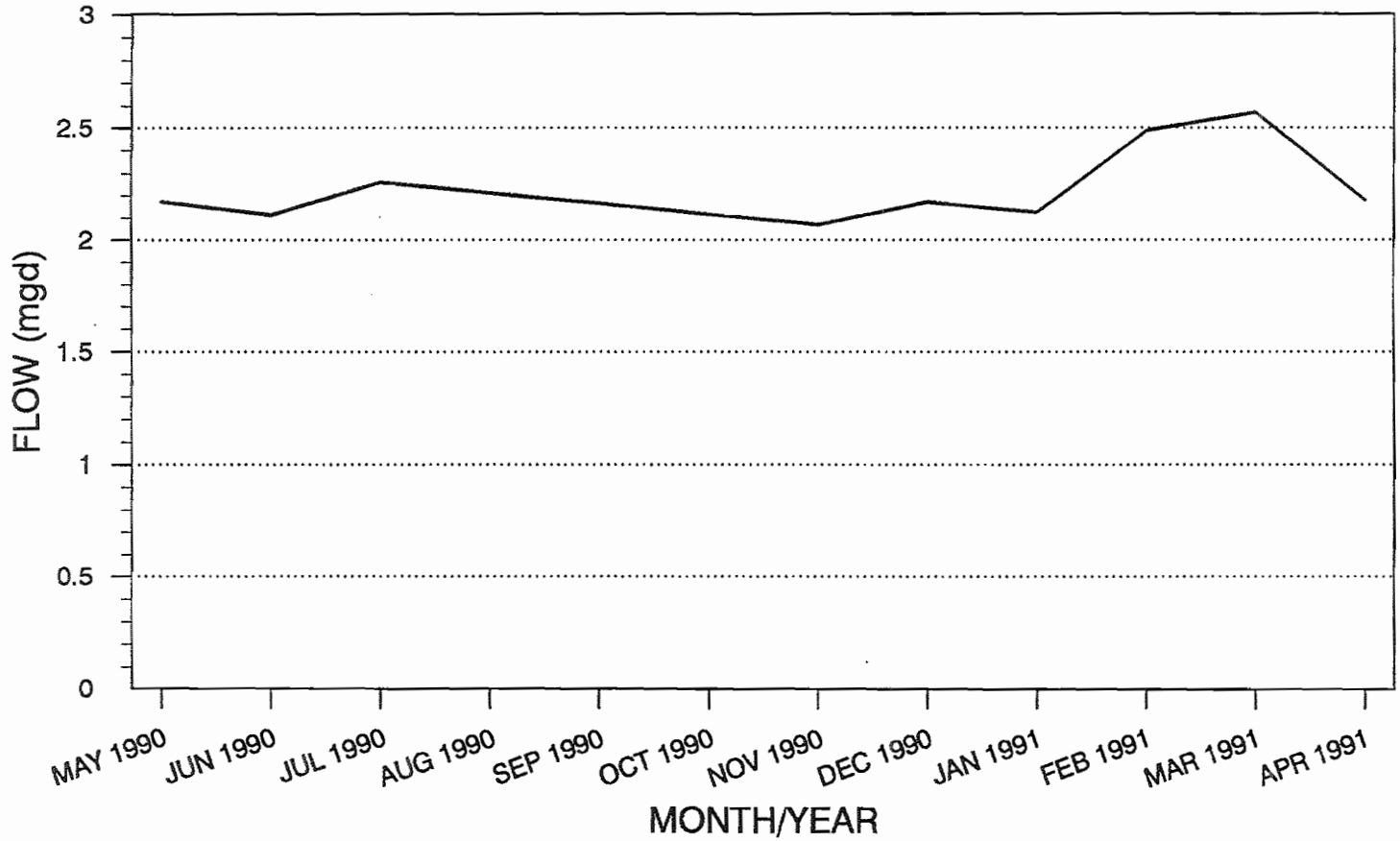

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FIGURE A-9

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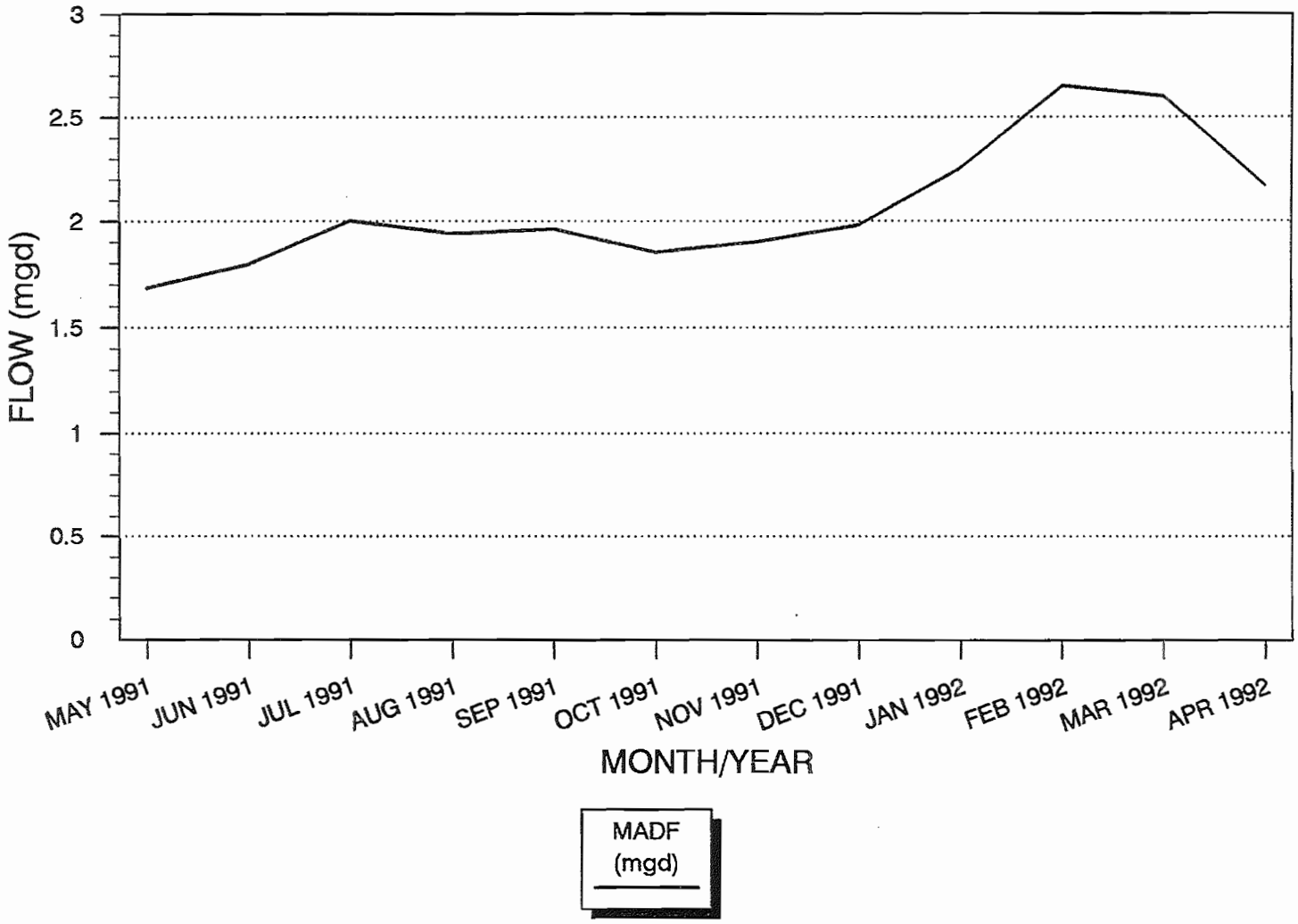
MARCO ISLAND WWTP
AVERAGE MONTHLY FLOW



92-231.00/FL-187

FIGURE A-10

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MARCO ISLAND WWTP
AVERAGE MONTHLY FLOW