City of Marco Island

Capacity Analysis Report Update For the City of Marco Island Reclaimed Water Production Facility

August 2010

CAR Update

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Section 1
Introduction

Chapter 62-600 of the Florida Administrative Code (F.A.C.), Domestic Wastewater Facilities, requires all permittees to be responsible for monitoring and tracking wastewater flows, forecasting long-range flow increases, and determining the need for facility expansions. Along with the requirements for flow monitoring and tracking, permittees are required to evaluate each facility with regard to treatment performance. To comply with these rules, this Capacity Analysis Report Update (CAR) has been prepared for the City of Marco Island Reclaimed Water Production Facility (RWPF) as defined in Rule 62-600.405, planning for Wastewater Facilities Expansion.

Rule 62-600.405 identifies the purpose and specific requirements for the permittee in planning for wastewater facilities expansion and the mechanism which the permittee should use to develop the plan. The rule has several purposes: 1) to alert the permittee to provide for timely planning, design, and construction of proposed wastewater facilities; 2) to ensure proper treatment and disposal of treated wastewater and its residuals; and, 3) to routinely track existing wastewater flows generated versus the permitted capacities of existing wastewater treatment plants. In general, it is the responsibility of the permittee to ensure that sufficient effort and planning occurs to allow for expansions of existing facilities when necessary.

This CAR is an update to the February 2009 CAR and includes historical flow data from 1999 to May 2010.

1.1 FDEP Requirements

Guidelines have been developed under Rule 62-600 to trigger the permittee to produce documents which address site-specific details related to wastewater facilities expansions. The Rule specifies conditions under which the permittee is to prepare the CAR, along with completion and submittal deadlines associated with the rated flow capacity versus actual treatment trends for a given facility. The CAR shall evaluate, identify, and contain at a minimum the following:

- Data showing an evaluation of the available treatment capacity and permitted capacity.
- Monthly average daily flows, three-month average daily flows, and annual average daily flows for the past ten years, or for the operating life of the facility if less than ten years.
- Seasonal variations in flows.
- A minimum ten-year projection of wastewater flows based on local population growth rates and water usage rates.

- Time estimate as to when three-month average daily flows will reach permitted capacity.
- Recommendations for treatment plant expansion, if determined to be necessary.
- A detailed schedule of dates for the planning, design, permit application, start of construction, and placing into operation expanded or new facilities.

The report shall be updated annually if the permitted capacity will be equaled or exceeded within the next ten years. If the permitted capacity will not be equaled or exceeded for at least ten years, then the report shall be submitted at five year intervals or upon application for an operation permit or permit renewal, whichever occurs first. The report shall be signed by the permittee, and signed and sealed by a Professional Engineer registered in Florida. A checklist is used by the Florida Department of Environmental Protection (FDEP) to determine if the CAR is complete.

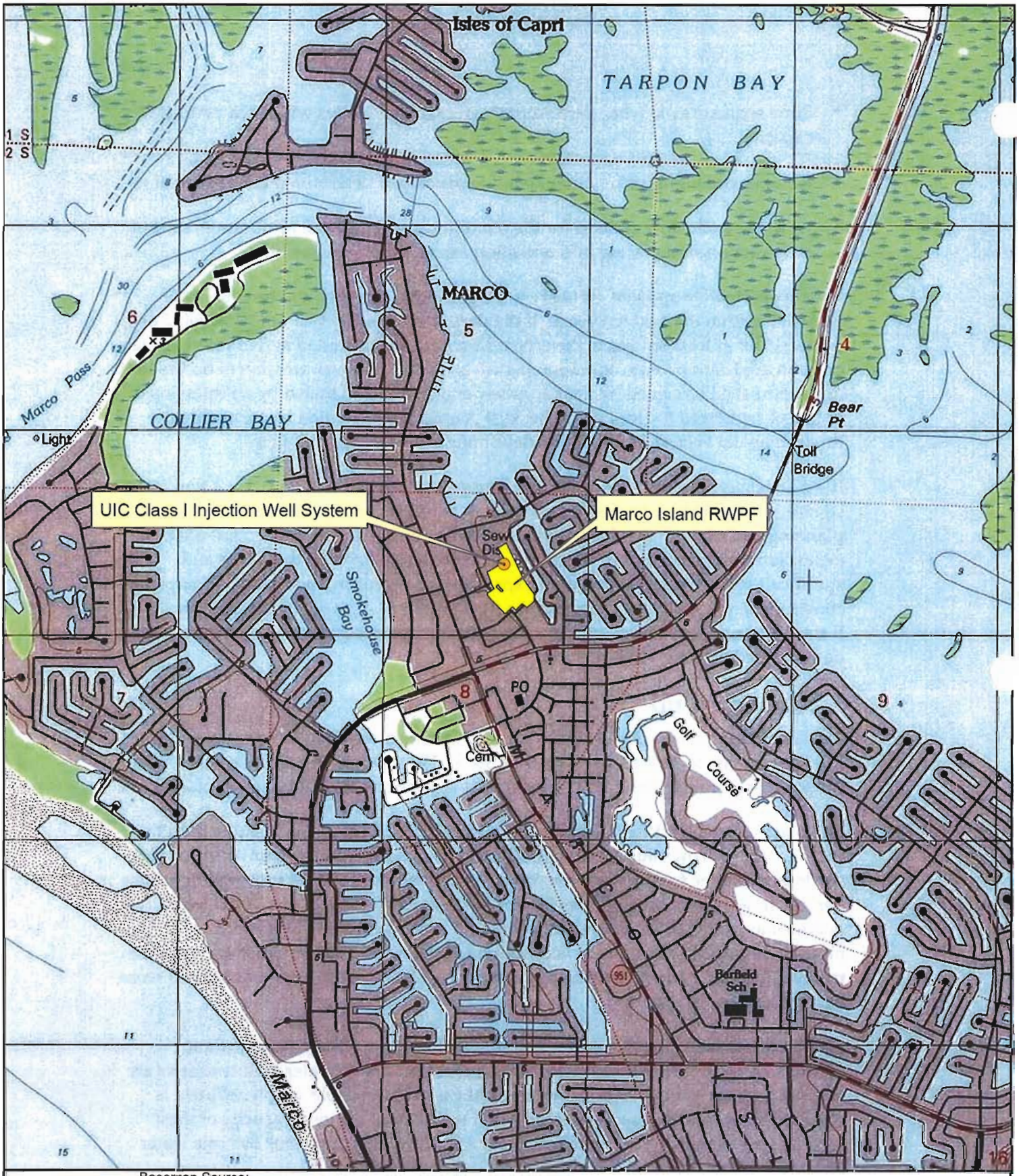
If expansion is required within the next five years, the CAR must contain a statement, signed and sealed by a Professional Engineer registered in the State of Florida, that planning and preliminary design of the necessary expansion have been initiated. If expansion is required in four years, this statement must include that plans and specifications are being prepared. If expansion is to occur in three years, a complete construction permit application must be filed within 30 days of submittal of the CAR. If the expansion is required within six months, an operating permit application must be submitted with the CAR.

1.2 Background

The City of Marco Island is located in Collier County along Florida's southwest coast. The City was incorporated on August 29, 1997. The newly formed City acquired the wastewater system by purchase from Florida Water Services in November of 2003.

The Marco Island RWPF is located at Latitude 25° 57' 30" N and Longitude 81° 43' 23" W, in Section 8, Township 52S Range 32E of Collier County, FL. **Figure 1-1** provides site location of the facility. The permitted capacity of the facility is 4.92 million gallons per day (mgd) based on the Three Month Average Daily Flow (TMADF).The facility is operated as Modified Ludzack-Ettinger (MLE) process followed by membrane bioreactors (MBR). The effluent is continuously monitored for turbidity and chlorine residual in order to document the requirements of F.A.C. 62-610 are met prior to reuse by public access irrigation.

Reclaimed water is stored in two 0.5 million gallon reuse storage tanks prior to distribution to the reuse system. In the event that reclaimed water quality criteria are not met, or if reclaimed water demand is less than the available supply, effluent is diverted to one of two on-site deep injection wells. Total disposal capacity of these wells is approximately 13.0 mgd and is shared with the city's reverse osmosis water treatment plant.



Basemap Source:
USGS 7.5' Topo Quad 1614

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Project Site

0 0.25 0.5 1 Miles

Marco Island RWPF
FDEP Permit No. FLA014167

Figure 1-1
Site Location Ma

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2.2.2 Three Month Average Daily Flow

The Three Month Average Daily Flow (TMADF) serves as the basis of the permitted flow to the facility. The TMADF is defined by the F.A.C. 62-600.200 (76) as " the total volume of wastewater flowing into a wastewater facility during a period of three consecutive months, divided by the number of days in this three-month period and expressed in units of mgd. The three-month average daily flow also can be calculated by adding the three monthly average daily flows observed during this three-month period and dividing by three." Process design and capacity rating are based on the TMADF. The TMADF for the period 2000 through May 2010 is provided in Table 2-2 and is shown on **Figure 2-3**.

The Maximum Three Month Average Daily Flow (MTMADF) typically occurs in March and April. **Table 2-2** shows the MTMADF in bold type. The ratio of the MTMADF to the Average Annual Daily Flow (AADF) is provided in **Table 2-3**. The 10-year average is 1.28. For planning purposes a MTMADF/AADF ratio of 1.28 will be used.

Table 2-3
MTMADF Data

Year	MTMADF (mgd)	AADF (mgd)	MTMADF/AADF
2000	2.08	1.84	1.13
2001	3.21	3.06	1.05
2002	3.37	2.03	1.67
2003	2.29	1.86	1.24
2004	2.40	1.83	1.32
2005	2.34	1.89	1.24
2006	2.32	1.76	1.32
2007	2.23	1.73	1.29
2008	2.25	1.80	1.25
2009	2.22	1.79	1.24
Average	2.47	1.96	1.28

2.2.3 Average Annual Daily Flow

Average Annual Daily Flow (AADF) is defined by the F.A.C. 62-600.200 (3) as "the total volume of wastewater flowing into a wastewater facility during any consecutive 365 days, divided by 365 and expressed in units of mgd". The AADF documents increasing flow due to increased wastewater generation, filtering out peaks and valleys inherent in the flow data. **Figure 2-1** provides the average annual daily flow along with MADF for the period from 2000 through December 2009.

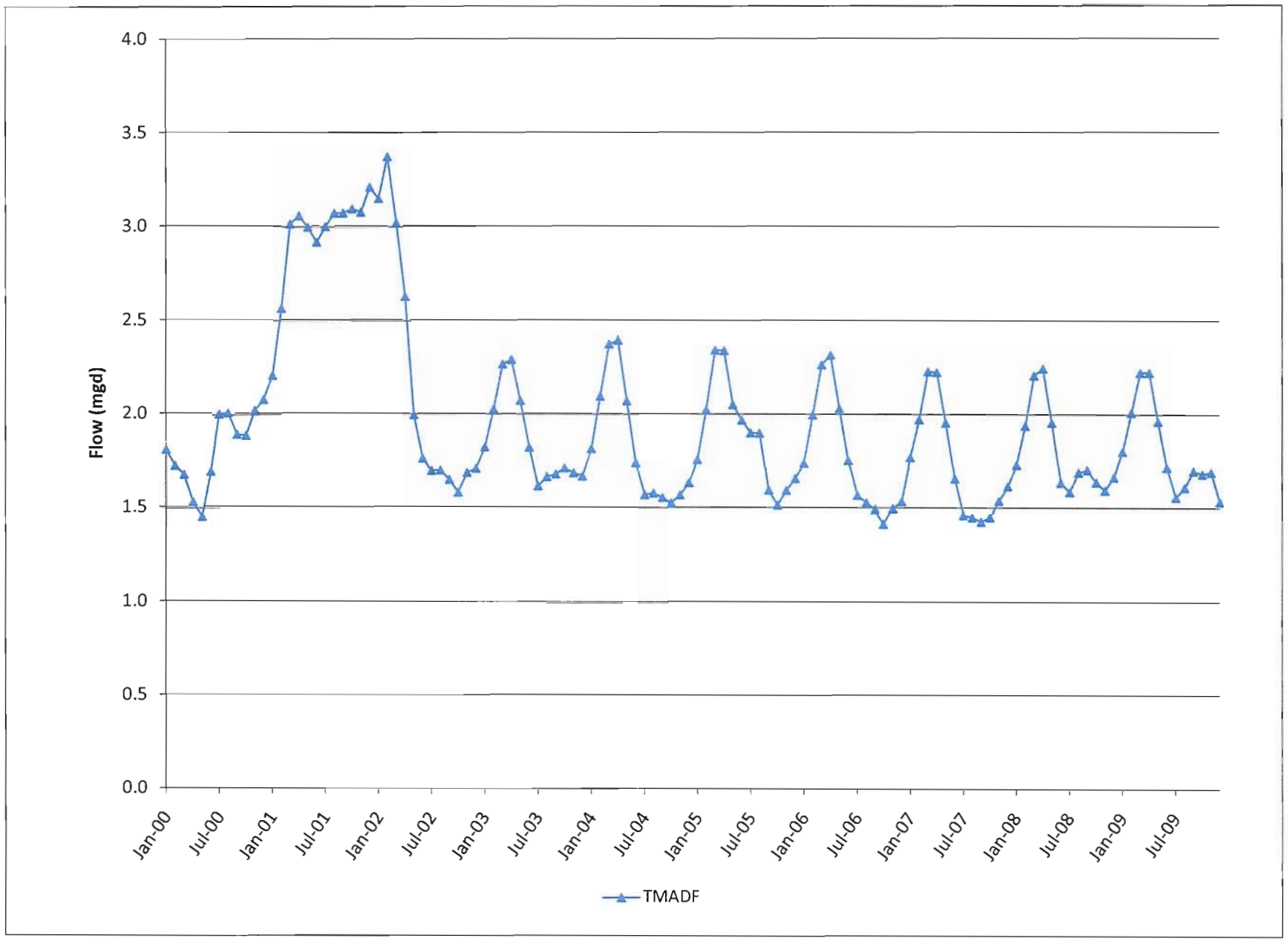

Figure 2-3
City of Marco Island RWPF
Three Month Average Daily ow

2.3 Seasonal Variations in Flow

As shown on Figure 2-2, the influent flow peaking factor varies seasonally at the Marco Island RWPF. Wastewater flow is typically above average during the winter months (January through April) and is below average during the rest of the year. These trends do not account for brief periods of intense flow that may accompany severe weather during the summer and fall months.

2.4 Updated Flow and Loading Information

The design influent concentrations for $CBOD_5$ and TSS are 200 mg/L. The design influent concentration for total nitrogen (TN) is 40 mg/L. The permitted capacity of facility is 4.92mgd TMADF and hence the permitted loading for $CBOD_5$ and TSS are 8,206 pounds per day and 1,641 pounds per day for TN based on the TMADF.

Influent $CBOD_5$ and TSS data from January 2007 to May 2010 are presented in **Table 2-4** and graphically in **Figure 2-4**. Influent $CBOD_5$ and TSS loadings are within the design and permitted loading for the facility. Maximum loadings are 5,139 pounds per day and 6,480 pounds per day for $CBOD_5$ and TSS, respectively.

Effluent $CBOD_5$, TSS and TN data from January 2007 to May 2010 are presented in **Table 2-5** and graphically in **Figure 2-5**. Effluent $CBOD_5$, TSS and TN concentrations are within the permitted limits for the facility.

Table 2-4
Marco Island RWPF Influent Data

		TMADF (MGD)	CBOD (mg/L)	CBOD (lb/day)	TSS (mg/L)	TSS (lb/day)
January	2007	1.77	208	3066	182	2683
February	2007	1.97	170	2795	248	**4069**
March	2007	2.23	180	3346	160	2974
April	2007	2.23	268	**4964**	188	3479
May	2007	1.95	172	2802	129	2099
June	2007	1.65	178	2449	133	1828
July	2007	1.46	163	1978	81	986
August	2007	1.45	172	2078	252	3044
September	2007	1.43	104	1240	207	2456
October	2007	1.45	92	1117	59	708
November	2007	1.54	135	1729	68	865
December	2007	1.61	165	2221	173	2328
January	2008	1.73	179	2578	204	2938
February	2008	1.94	178	2877	181	2925
March	2008	2.21	274	**5046**	181	**3334**
April	2008	2.25	183	3426	157	2940
May	2008	1.96	238	3881	142	2315
June	2008	1.63	192	2615	161	2193
July	2008	1.58	171	2259	139	1836
August	2008	1.69	145	2040	128	1801
September	2008	1.70	119	1688	131	1858
October	2008	1.64	151	2060	146	1992
November	2008	1.59	212	2817	254	3375
December	2008	1.66	206	2857	234	3245
January	2009	1.80	253	3799	225	3378
February	2009	2.01	275	4609	184	3084
March	2009	2.22	256	4748	191	**3543**
April	2009	2.22	277	**5139**	162	3006
May	2009	1.96	229	3747	146	2389
June	2009	1.71	149	2130	167	2388
July	2009	1.56	151	1960	85	1103
August	2009	1.61	117	1569	89	1194
September	2009	1.70	77	1089	67	948
October	2009	1.68	162	2269	111	1555
November	2009	1.69	221	3114	126	1775
December	2009	1.53	253	3233	119	1521
January	2010	1.73	218	3141	147	2118
February	2010	1.94	211	3420	153	2480
March	2010	2.30	234	4487	185	3548
April	2010	2.31	263	**5072**	336	**6480**
May	2010	2.04	168	2864	98	1671

Note: Maximum load indicated by bold type.

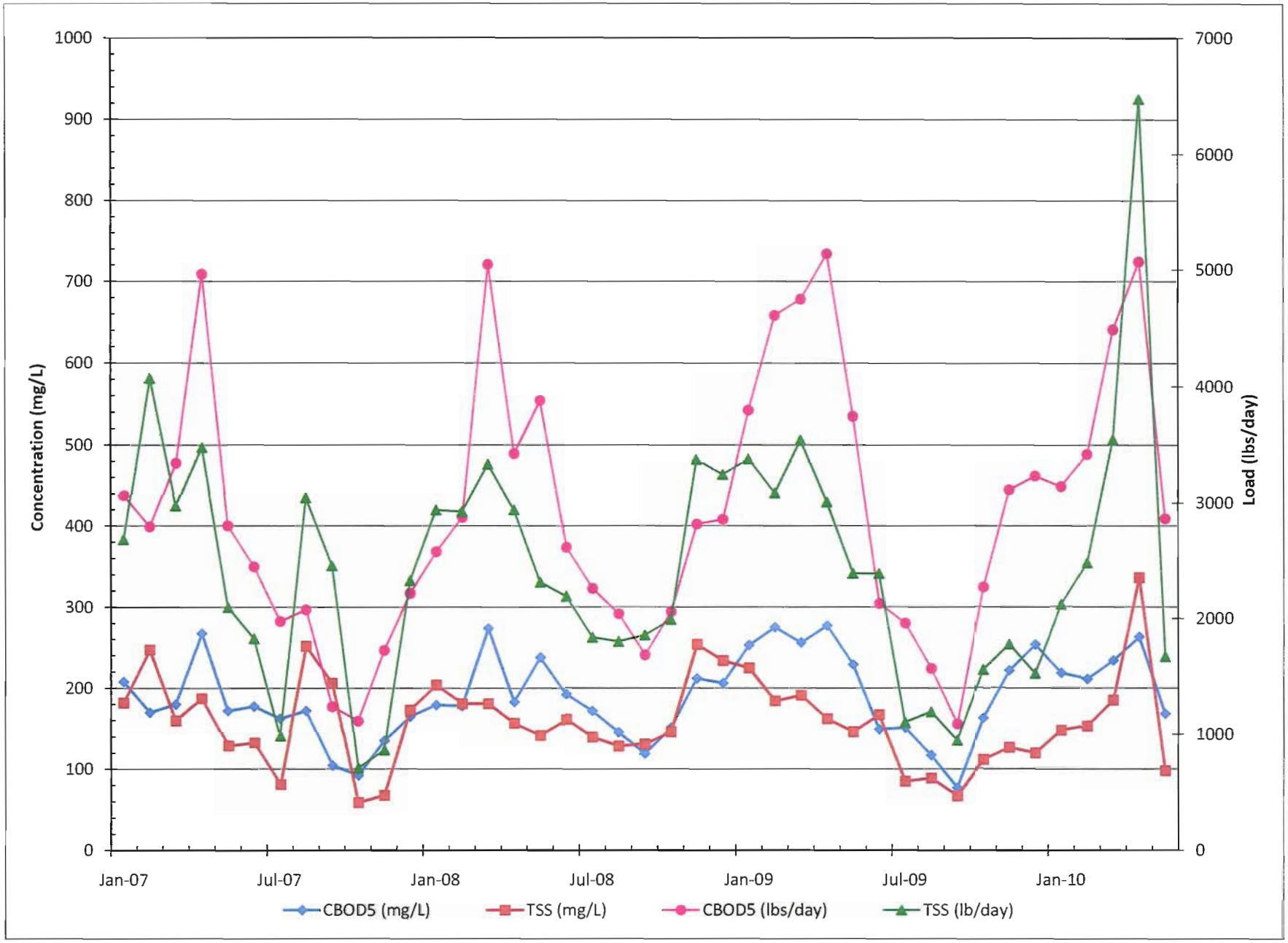

Figure 2-4
Marco Island RWPF
Influent CBOD5 and TSS Concentration and Load

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Table 2-5
Marco Island RWPF Effluent Data

		TMADF (MGD)	CBOD (mg/L)	CBOD (lb/day)	TSS (mg/L)	TSS (lb/day)	TN (mg/L)	TN (lb/day)
January	2007	1.53	4.9	62.6	1.4	17.6	3.1	39.5
February	2007	1.77	2.7	39.8	0.9	**13.0**	2.5	37.3
March	2007	1.97	3.5	57.5	0.6	10.2	6.3	102.8
April	2007	2.23	5.3	**98.5**	0.5	9.9	4.5	82.7
May	2007	2.23	4.7	87.2	0.5	9.3	7.3	**135.1**
June	2007	1.95	4.9	79.8	1.0	16.8	4.6	75.0
July	2007	1.65	5.0	69.0	1.0	13.7	4.8	65.5
August	2007	1.46	4.7	57.2	1.1	13.9	6.4	77.9
September	2007	1.45	2.3	27.8	1.0	12.3	4.5	54.7
October	2007	1.43	2.6	30.9	1.0	12.4	5.3	63.0
November	2007	1.45	3.5	42.3	1.0	11.5	3.3	39.6
December	2007	1.54	5.3	67.9	0.9	11.3	5.0	64.0
January	2008	1.61	3.8	51.1	1.0	13.2	3.3	44.5
February	2008	1.73	4.5	64.8	1.3	18.7	4.9	70.0
March	2008	1.94	5.5	**88.9**	1.2	19.4	5.3	85.2
April	2008	2.21	2.7	49.7	1.4	**25.8**	8.7	**160.6**
May	2008	2.25	1.9	35.6	1.2	22.5	3.1	57.3
June	2008	1.96	2.0	32.6	0.6	9.8	8.1	132.2
July	2008	1.63	2.3	31.3	0.6	8.2	3.9	53.3
August	2008	1.58	2.0	26.4	0.6	7.9	4.0	52.4
September	2008	1.69	2.0	28.1	0.7	10.1	4.2	58.5
October	2008	1.70	2.8	39.7	0.8	11.6	5.4	76.0
November	2008	1.64	1.9	25.9	0.9	11.6	5.6	75.7
December	2008	1.59	2.0	26.6	0.6	8.0	6.2	82.1
January	2009	1.66	2.0	27.7	0.6	8.6	5.1	70.6
February	2009	1.80	2.0	30.0	0.6	9.0	4.5	67.0
March	2009	2.01	2.0	33.5	0.6	10.1	6.5	**108.4**
April	2009	2.22	2.0	**37.1**	0.6	**11.1**	5.4	99.4
May	2009	2.22	2.0	37.1	0.6	11.1	3.6	66.4
June	2009	1.96	2.0	32.7	0.6	9.8	7.5	122.4
July	2009	1.71	2.0	28.6	0.6	8.6	4.5	63.6
August	2009	1.56	2.0	26.0	0.6	7.8	3.8	49.1
September	2009	1.61	2.0	26.8	0.6	8.0	5.3	70.9
October	2009	1.70	2.0	28.3	0.6	8.5	2.0	27.6
November	2009	1.68	1.9	26.6	0.6	8.4	6.4	89.1
December	2009	1.69	2.3	32.4	0.6	8.5	8.3	117.1
January	2010	1.53	2.2	28.1	0.6	7.7	9.1	116.8
February	2010	1.73	2.0	28.8	0.6	8.5	4.1	58.4
March	2010	1.94	1.9	30.8	0.6	9.7	6.2	100.8
April	2010	2.30	2.0	38.4	0.6	12.1	4.9	94.7
May	2010	2.31	2.0	38.6	0.6	11.6	**4.7**	90.4

Note: Maximum load indicated by bold type.

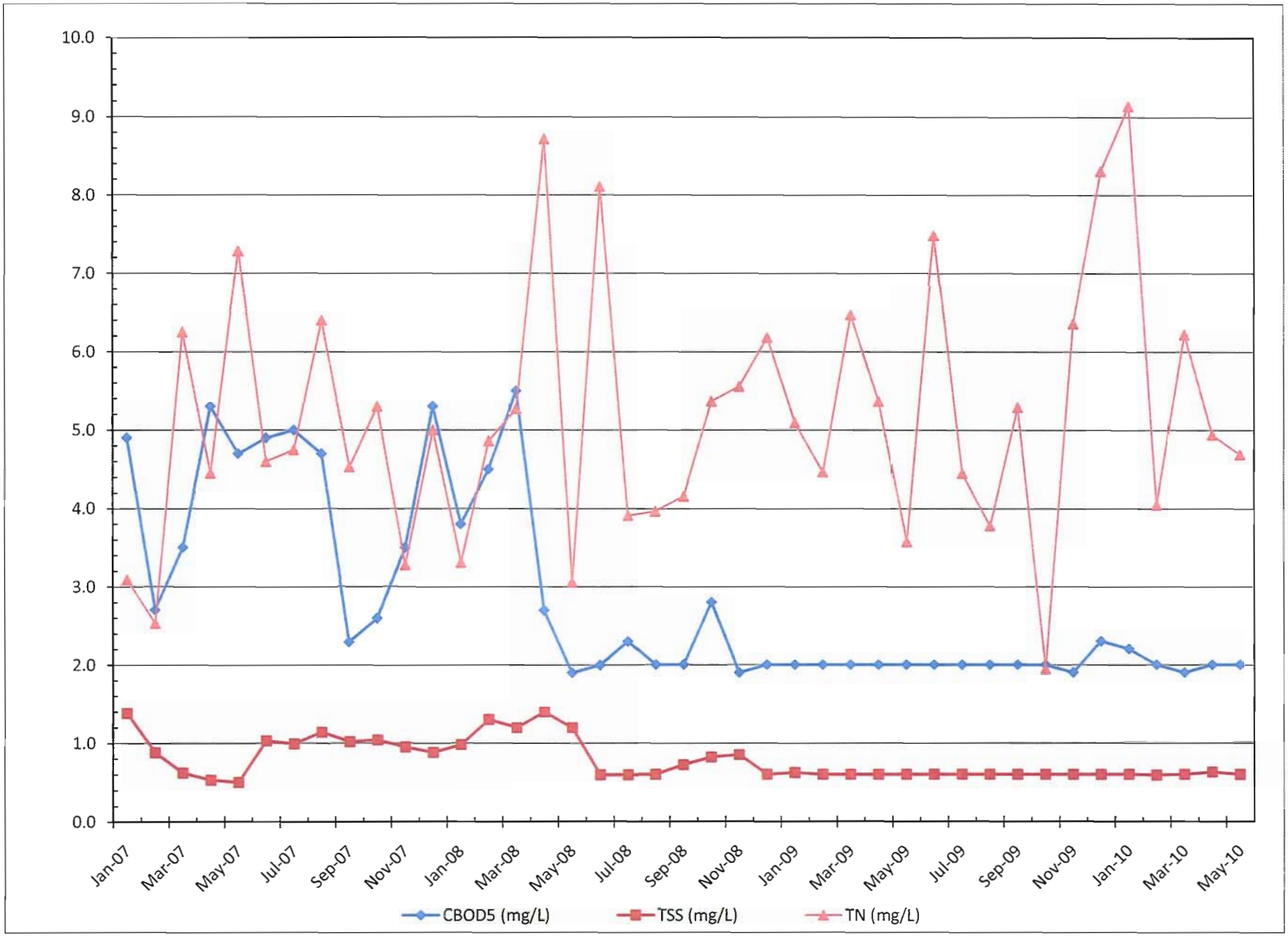

Figure 2-5
Marco Island RWPF
Effluent CBOD5, TSS and TN Concention

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Section 3
Future Conditions

3.1 Population and Flow Projections

The City of Marco Island's build out population and total number of residential unit projections are excerpted from the Ten Year Water Supply Facilities Work Plan dated July 2008 and attached as **Appendix A.** The build out MTMADF is estimated to be 4.92 mgd at 100 percent occupancy. **Table 3-1** provides the calculations for the projected flow. The calculations are based on applying the City's level of service standard of 100 gpd per capita for residential population and 2.16 persons per residential unit. The flow from non-residential users is calculated based on the type of user and is provided in **Appendix B.** Wastewater flows from non-residential users except hotels are scaled up using the ratio of projected population(at build out) to the current population in order to calculate the wastewater flows generated at build out.

The City is conducting a septic tank replacement program (STRP). When completed in 2013, the STRP will add an additional flow of 0.85 mgd.

Table 3-2 provides the projected population served from the Ten Year Water Supply Facilities Work Plan along with the projected flow from 2010 to 2025. The flow projections were calculated using actual MTMADF for the year 2009 and estimated MTMADF at build out. The MTMADF/AADF ratio of 1.28 calculated in Section 2.2.2 was used to determine the projected AADF since the flow projections were made for the MTMADF. **Figure 3-1** provides a graph of the data.

Table 3-1
Projected MTMADF Wastewater Flow at Buildout

Single Family units at Build out	8,839	
Multi Family units at Build out	10,713	
Level of service is 216 gpd per Residential unit	216	gpd*
Wastewater Generated by Residential Units	4,223,232	gpd
Wastewater Generated by Non Residential Users (scaled up)	701,302	gpd
Total Wastewater Generated	**4,924,534**	**gpd****

* The basis for level of service is 2.16 person per residence and 100 gpd per capita
**Represents anticipated Wastewater flow at 100% occupancy

Table 3-2
Flow Projection Summary Table

Year	Population	Historical AADF (mgd)	Historical MTMADF (mgd)	STRP MTMADF (mgd)	Projected MTMADF (mgd)	Projected AADF (mgd)
2003		1.86	2.29			
2004		1.82	2.40			
2005		1.89	2.34			
2006		1.76	2.32			
2007		1.73	2.23	0.08		
2008		1.80	2.25	0.31		
2009		1.79	2.22	0.12	2.22	1.76
2010	16,315			0.31	2.65	2.11
2011				0.15	2.93	2.32
2012				0.14	3.19	2.53
2013				0.13	3.44	2.73
2014					3.57	2.83
2015	17,338				3.69	2.93
2016					3.81	3.03
2017					3.94	3.12
2018					4.06	3.22
2019					4.18	3.32
2020					4.31	3.42
2021					4.43	3.52
2022					4.55	3.61
2023					4.68	3.71
2024					4.80	3.81
2025	19,187				4.92	3.91

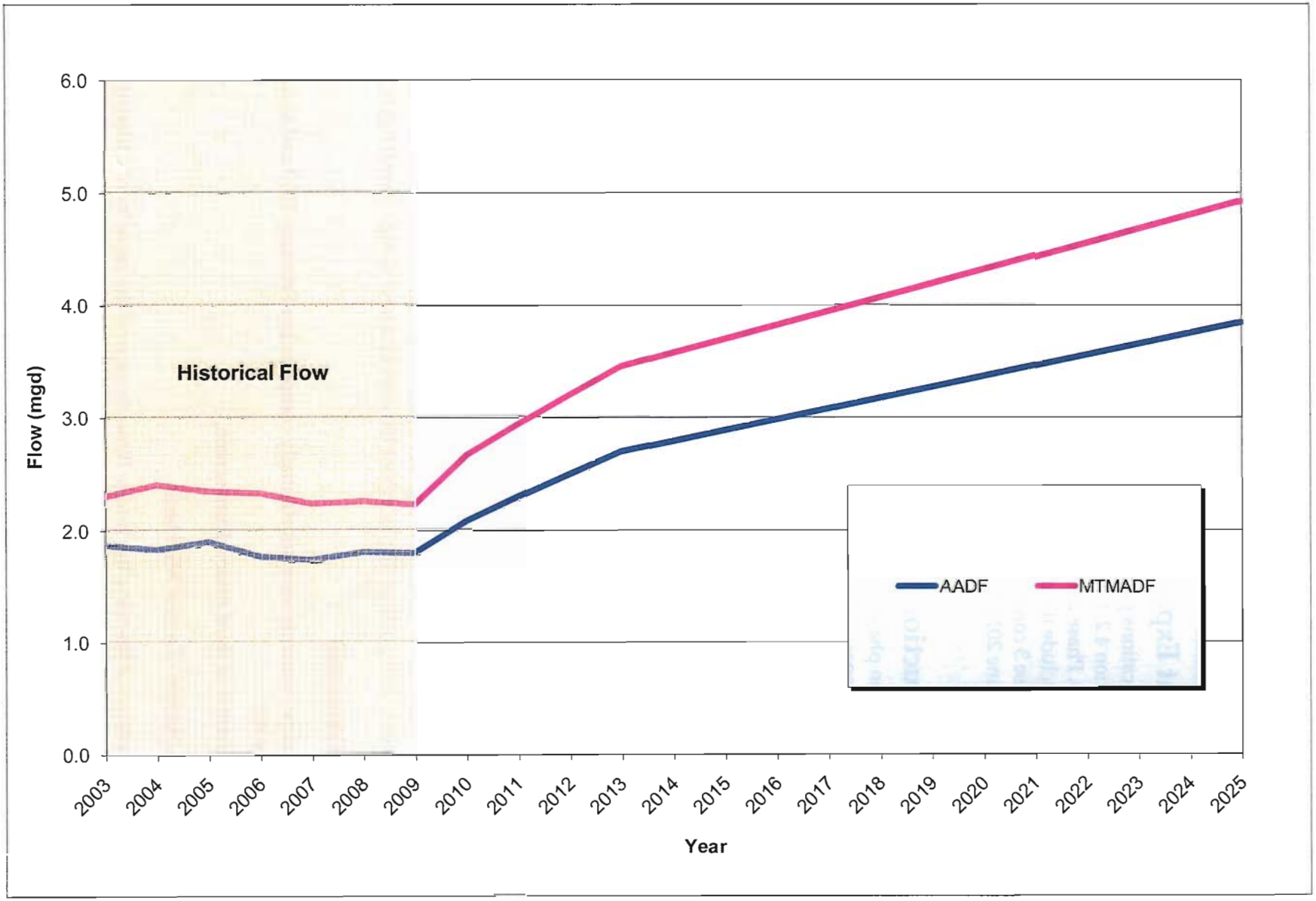

Figure 3-1
City of Marco Island RWPF Projected AADF and MTMADF

Residuals generated by biological processes are currently thickened on a gravity belt thickener, held in solids holding tanks, dewatered and disposed in a landfill. There are currently three existing solids holding tanks in operation.

Figure 1-2 provides an existing process flow diagram.

1.3 Description

The Marco Island RWPF currently includes the following treatment unit processes and equipment:

- Preliminary treatment structure with three, 2mm drum screens and three screenings washers/compactors.
- Two equalization basins.
- Five influent pumps and influent splitter box.
- Two MLE process basins.
- Five MBR tanks (4 units for firm capacity, 1 unit standby) with permeate and RAS pumps.
- Two parallel chlorine contact basins.
- Three reclaimed water transfer pumps.
- Three deep well injection pumps.
- Two covered reclaimed water storage tanks.
- Three vertical turbine reclaimed water high service pumps.
- RAS Splitter box.
- Three WAS pumps.
- One gravity belt thickener.
- Three sludge holding tanks.
- Chemical and biological odor control system .
- Two emergency electrical generators.
- Six hypochlorite storage tanks and three hypochlorite metering pumps.

Existing and planned unit processes/equipment and their capacities are summarized in **Table 1-1.**

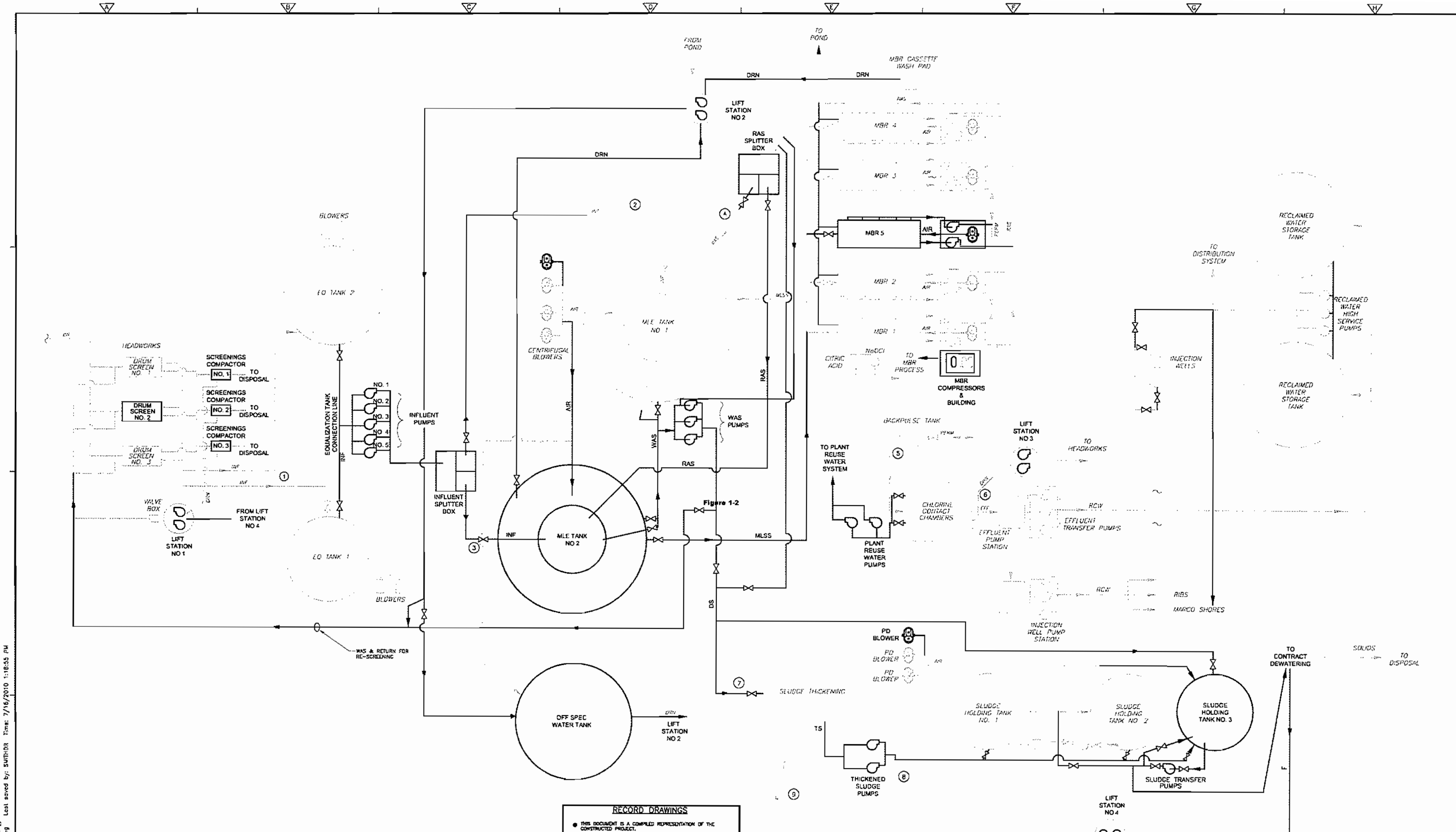

Table									
	1	2	3	4	5	6	7	8	9
	Influent	MLE Tank 1	MLE Tank 2	MBR Recycle	Permeate	Disinfection	WAS	TWAS	GBT FILTRATE
Flow (mgd)	5.0	2.5	2.5	20.0	5.0	5.0	0.82	0.033	0.049
TSS (mg/L)	250	250	250	10,000	2	2	10,000	25,000	n/a
BOD (mg/L)	200	200	200	10,000	2	5	n/a	n/a	n/a
TKN (mg/L)	40	40	40	n/a	12	12	n/a	n/a	n/a

RECORD DRAWINGS

- THIS DOCUMENT IS A COMPILED REPRESENTATION OF THE CONSTRUCTED PROJECT.
- THE FOLLOWING SOURCES WERE USED, AND UPON WHICH THE ENGINEER RELIED IN ITS PREPARATION

  CONTRACTOR/SUB CARDINAL CONTRACTORS, INC
- THIS DOCUMENT IS BELIEVED TO BE CORRECT TO THE BEST OF THE ENGINEER'S KNOWLEDGE, AND THE ACCURACY OF THE INFORMATION CANNOT BE GUARANTEED.

CDM REVIEWED BY: WAYNE M. KIMBALL, P.E. Date JULY/2010

NOTE: THESE STATEMENTS ARE REQUIRED BY RULE 61G15-30, F.A.C FOR RECORD DOCUMENTS THAT INCLUDE INFORMATION PROVIDED BY OTHERS.

REV. NO.	DATE	DRWN	CHKD	REMARKS
	7/10	DRS	WK	REVISED FOR RECORD
	5/08	AMB	WK	CONFORMED DRAWINGS

DESIGNED BY: W. KIMBALL
DRAWN BY: M. BANDA
SHEET CHK'D BY: W. KIMBALL
CROSS CHK'D BY: S. ABEL
APPROVED BY: S. ABEL
DATE: DECEMBER 2008

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CITY OF MARCO ISLAND, FLORIDA
MARCO ISLAND WWTP PHASE II
IMPROVEMENTS

PROCESS
FLOW DIAGRAM

DATE:
WAYNE M. KIMBALL
P.E. NO. 70469

PROJECT NO. 30126-60437
FILE NAME: G005PFDM

Figure 1-2

Xrefs: [CDV_2435, CDM_2436, FL_REC_1] Images: []
Filename: C:\cdmpw\smithdr\dms19215\G005PFDM.dwg Last saved by: SMITHDR Time: 7/16/2010 1:18:55 PM

Table 1-1 Existing and Planned Unit Processes/Equipment & Capacities

Unit Process/Equipment	No. of units	Volume or Capacity per Unit
Rotary Drum Screen	3	2.5 mgd ADF 5.0 mgd PHF
Equalization Tank No. 1		0.2 MG
Equalization Tank No. 2		0.5 MG
Equalization Tank No. 3 & 4[1]		0.5 MG
Equalization Tank Blowers[1]	4	700 scfm, 40 HP
Chemical and Biological Odor Control System	1	8500 scfm
Influent Pumps	5	1750 gpm at 30 ft TDH
MLE Tanks	2	0.3 MGD ADF 0.45 MGD MDF
Process Centrifugal Blowers	4	4300 scfm , 200 HP
MBR Tanks	5	1.0 MGD ADF 1.5 MGD MDF
Backpulse Tank	1	3625 gal
RAS pumps	5	3475 gpm at 27 ft TDH
Permeate Pumps	5	1340 gpm at 69 ft TDH
Chlorine Contact Chamber 1		130,000 gal
Chlorine Contact Chamber 2		150,000 gal
Hypochlorite Storage Tanks	6	2000 gal
Hypochlorite Day Tank	1	1000 gal
Hypochlorite Metering Pumps	3	27 gph
Effluent Transfer Pumps	3	1600 gpm at 50 ft TDH
Injection Well No.1		5.76 MGD MDF
Injection Well No.2		7.38 MGD MDF

Table 1-1 Existing and Planned Unit Processes/Equipment & Capacities

Injection Well Pumps	3	1600 gpm at 162 ft TDH
Injection Well Pumps[1]	3	2000 gpm at 170 ft TDH
Reclaimed Storage Tanks	2	0.5 MG
Reuse High Service Pumps	3	1600 gpm at 162 ft TDH
WAS Pumps	3	520 gpm at 56 ft TDH
Gravity Belt Thickener	1	700 gpm at 1% feed
Rotary Dum Thickener[1]	2	275 gpm at 1% feed
Thickened WAS pumps	2	300 gpm at 20 ft TDH
Thickened WAS pumps[1]	2	150 gpm at 92 ft TDH
Sludge Holding Tank 1		205,000 gal
Sludge Holding Tank 2		131,600 gal
Sludge Holding Tank 3		100,000 gal
Sludge Holding Tank 4[1]		258,000 gal
Sludge Transfer Pumps	3	300 gpm at 27 ft TDH
PD Blowers for Sludge Holding Tanks	3	1300 scfm, 75 HP
Supplemental Reclaimed Water Filter	1	2100 gpm
Emergency Generator	2	1500 KW

Note: [1]represents planned equipment/structures

1.3.1 Preliminary Treatment

The existing preliminary treatment facility includes three 2-mm Baycor drum screens. The peak hour capacity of the headworks using all three screens is 15 mgd. Following preliminary treatment are two influent equalization tanks. Tank 1 is a 0.20 MG Crom tank with an aluminum dome cover. Tank 2 is a 0.50 MG Crom tank with a concrete dome cover. Both equalization tanks and the headworks structure are ventilated through a two-stage liquid scrubber system for odor control. Wastewater flows by gravity from the headworks structure to either EQ Tank 1 or 2. Influent pumps transfer flow from EQ Tanks to influent splitter box which splits flow to each of the two MLE Tanks.

1.3.2 Secondary Treatment

Secondary treatment includes the biological treatment provided by two 3.0 mgd MLE Tanks followed by MBRs. Each MLE Tank consists of anoxic and aerobic zones to provide nitrogen reduction. MBRs have hollow-fiber membranes which provide ultrafiltration. The pore size of the membranes allows the "clean" water molecules to pass through the pores and be drawn off by the permeate pumps, leaving the solids behind.

1.3.3 Disinfection

Disinfection at the Marco Island RWPF must meet the requirements for high level disinfection as contained in F.A.C. 62-600. The two chlorine contact tanks must provide a minimum of 15 minutes contact and the chlorine residual at the end of the contact period must be 1.0 mg/l (minimum). In addition, the product of residual (expressed in mg/l) times contact period (in minutes) must be equal to or greater than 25 minutes-mg/l. Additional requirements for high level disinfection are:

- Fecal Coliform less than 1,000 colony forming units/100 ml prior to disinfection, and no more than 25 percent of the final reclaimed water samples with detectable fecal coliforms following disinfection.

- Disinfection is provided using liquid sodium hypochlorite in two chlorine contact basins.

1.3.4 Residuals Processing and Disposal

A gravity belt thickener is used to thicken residuals to a concentration of approximately 2.0 to 2.5 percent. The thickened residuals are pumped into the sludge holding tanks, then dewatered by a contractor, and disposed of in a sanitary landfill.

1.3.5 Effluent Reuse and Disposal

Filtered and disinfected effluent flows by gravity to an effluent transfer pump station from which flow is pumped to the on site reuse storage tanks. The high service pump station pumps flow to the reuse system. Non-compliant effluent is diverted to a lined effluent holding pond or to the deep well injection pump station. The Deep Injection

Well No. 1 has a capacity of 5.76 mgd and Deep Injection Well No. 2 has a capacity of 7.38 mgd. Total disposal capacity of these wells is shared with the adjacent RO water treatment plant concentrate disposal system. The RO water treatment plant requires 2.16 mgd when operating all six process trains which leaves approximately 11.0 mgd capacity for the RWPF.

1.4 Planned Modifications/Improvements

Phase 3 and Phase 4 improvements to the RWPF include following:

- Conversion of Ground Storage Tank No. 1 and 2 to EQ Tanks No. 3 and 4 respectively.
- Addition of four positive displacement blowers for EQ tanks No. 2, 3 and 4.
- Replacement of gravity belt thickener with rotary drum thickeners.
- Conversion of off-spec storage tank to Aerobic Digester/Sludge Holding Tank No. 4.
- Addition of supplemental reclaimed water filter.

Improvements listed above do not affect treatment capacity of the facility but provide additional reliability and redundancy for existing processes.

Section 2
Existing Conditions

2.1 Permitted Capacities

The permitted capacities associated with the Marco Island RWPF (Domestic Wastewater Plant Permit No. FLA014167) are summarized in **Table 2-1.**

Table 2-1
Permitted Capacities

Permit Item	Permitted Capacity (mgd)
Operation Capacity (TMADF)	4.92
Underground Injection System, U001 - Injection Well IW -1	5.76
Underground Injection System, U002- Injection Well IW -2	7.38
Reuse System R001 - Slow Rate Public Access Land Application	2.434
Reuse System R002 - Rapid Rate Infiltration basins	3.5

The flow and influent characteristics are summarized below. Influent data obtained from RWPF operating records from January 1, 2000 to May 31, 2010 were used to develop average and maximum values for influent flow (mgd), CBOD (mg/L), and TSS (mg/L).

2.2 Flow

Influent flow to the plant is measured by three magnetic flow meters located on the riser pipe inlets to the drum screens. Output from the flow meters is used to pace the influent sampler. The automatic sampler takes flow proportioned samples that are analyzed to determine organic and solids loadings.

2.2.1 Monthly Average Daily Flow

The Monthly Average Daily Flow (MADF) is the average of the daily flows (mgd) for each calendar month. MADF values provide insight into the seasonality of flow, identifying periods of high and low flow. **Table 2-2** provides the flow data and **Figure 2-1** shows MADF and annual average daily flow for the period from 2000 through May 2010. It should be noted that the influent magnetic flow meter was replaced on February 26, 2002. The 2001 flow data exceeds all other years and is considered questionable. **Figure 2-2** shows the flow data normalized by the annual average daily flow (i.e., the "peaking factor"). The monthly flow peaking factor estimates the seasonality of flow to the plant as discussed in Section 2.3 below.

Table 2-2

Marco Island RWPF Flow Data

Monthly Average Daily Flow (MGD)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
January	2.28	1.65	2.52	3.16	2.07	2.09	2.07	1.96	2.04	1.85	2.03	2.10
February	2.35	1.90	3.14	3.42	2.31	2.54	2.39	2.43	2.31	2.35	2.29	2.33
March	2.33	1.48	3.38	2.48	2.43	2.50	2.57	2.40	2.34	2.42	2.35	2.47
April	1.92	1.22	2.66	1.99	2.15	2.15	2.06	2.12	2.03	1.96	2.04	2.14
May	1.52	1.67	2.96	1.51	1.65	1.57	1.52	1.57	1.49	1.48	1.50	1.53
June	1.59	2.19	3.14	1.78	1.67	1.49	2.32	1.57	1.44	1.46	1.61	
July	1.54	2.16	2.90	1.79	1.53	1.64	1.85	1.56	1.44	1.81	1.56	
August	1.69	1.68	3.18	1.52	1.80	1.60	1.52	1.45	1.46	1.79	1.66	
September	1.92	1.85	3.14	1.63	1.71	1.42	1.41	1.46	1.38	1.50	1.87	
October	1.74	2.14	2.97	1.59	1.62	1.55	1.61	1.34	1.51	1.62	1.51	
November	2.16	2.08	3.12	1.83	1.72	1.73	1.76	1.70	1.72	1.66	1.69	
December	1.62	2.03	3.54	1.70	1.66	1.62	1.60	1.57	1.61	1.71	1.40	
AADF	1.89	1.84	3.06	2.03	1.86	1.83	1.89	1.76	1.73	1.80	1.79	

Three Month Average Daily Flow (MGD)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
January		1.81	2.21	3.15	1.82	1.81	1.75	1.74	1.77	1.73	1.80	1.73
February		1.72	2.57	**3.37**	2.03	2.10	2.02	2.00	1.97	1.94	2.01	1.94
March	**2.32**	1.68	3.02	3.02	2.27	2.38	**2.34**	2.26	**2.23**	2.21	2.22	2.30
April	2.20	1.53	3.06	2.63	**2.29**	**2.40**	**2.34**	**2.32**	2.23	**2.25**	**2.22**	2.31
May	1.92	1.46	3.00	1.99	2.07	2.07	2.05	2.03	1.95	1.96	1.96	2.04
June	1.68	1.69	2.92	1.76	1.82	1.74	1.97	1.75	1.65	1.63	1.71	
July	1.55	2.01	3.00	1.70	1.61	1.57	1.90	1.57	1.46	1.58	1.56	
August	1.61	2.01	3.07	1.70	1.66	1.58	1.90	1.53	1.45	1.69	1.61	
September	1.72	1.90	3.07	1.65	1.68	1.56	1.59	1.49	1.43	1.70	1.70	
October	1.78	1.89	3.10	1.58	1.71	1.52	1.51	1.42	1.45	1.64	1.68	
November	1.94	2.02	3.08	1.68	1.68	1.57	1.59	1.50	1.54	1.59	1.69	
December	1.84	**2.08**	**3.21**	1.71	1.67	1.63	1.65	1.53	1.61	1.66	1.53	

Note: Bold type indicates peak three month average daily flow.

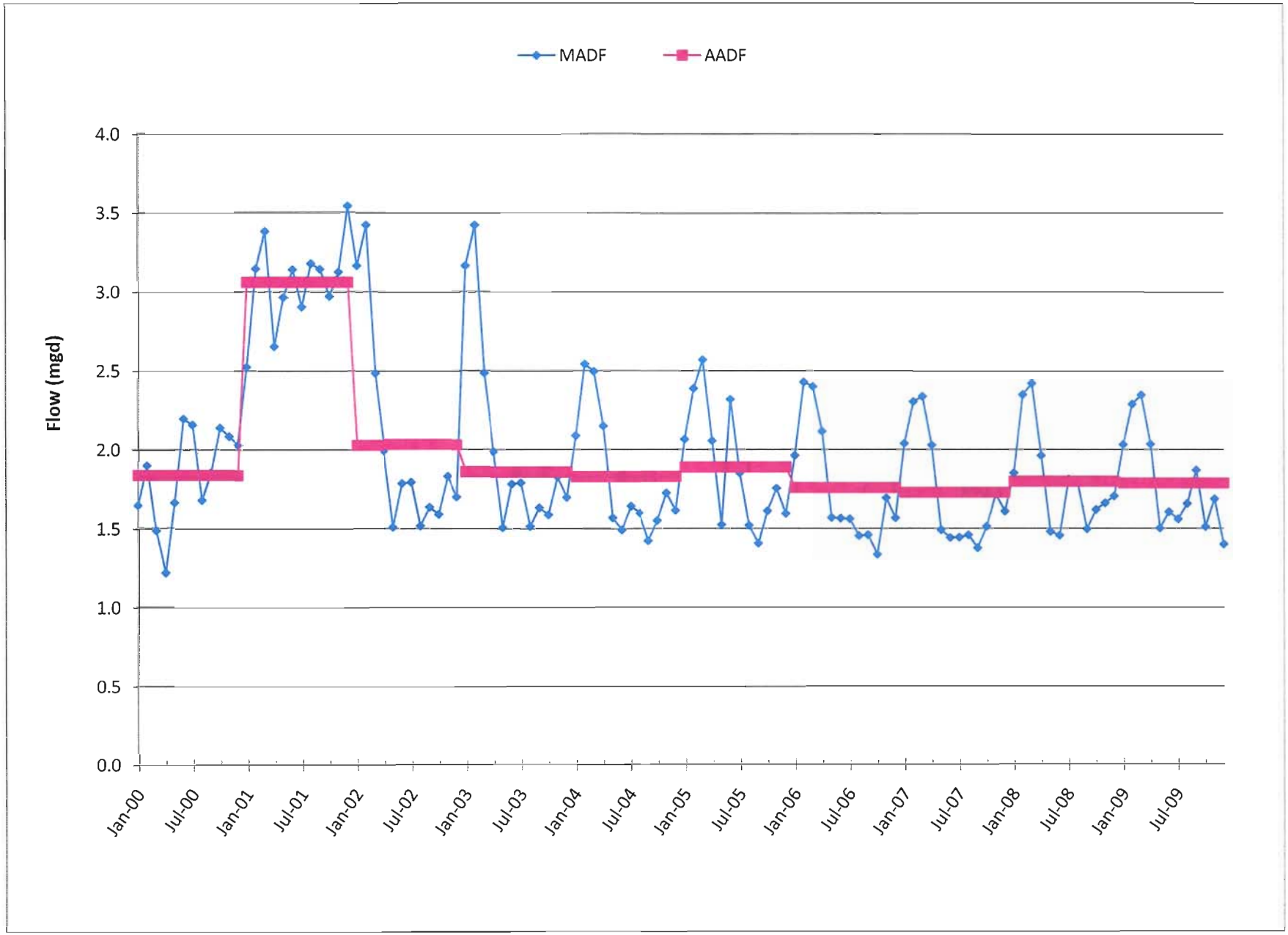


Figure 2-1
City of Marco Island RWPF
Monthly Average Daily Flow and Annual Average Daily Flow

CDM

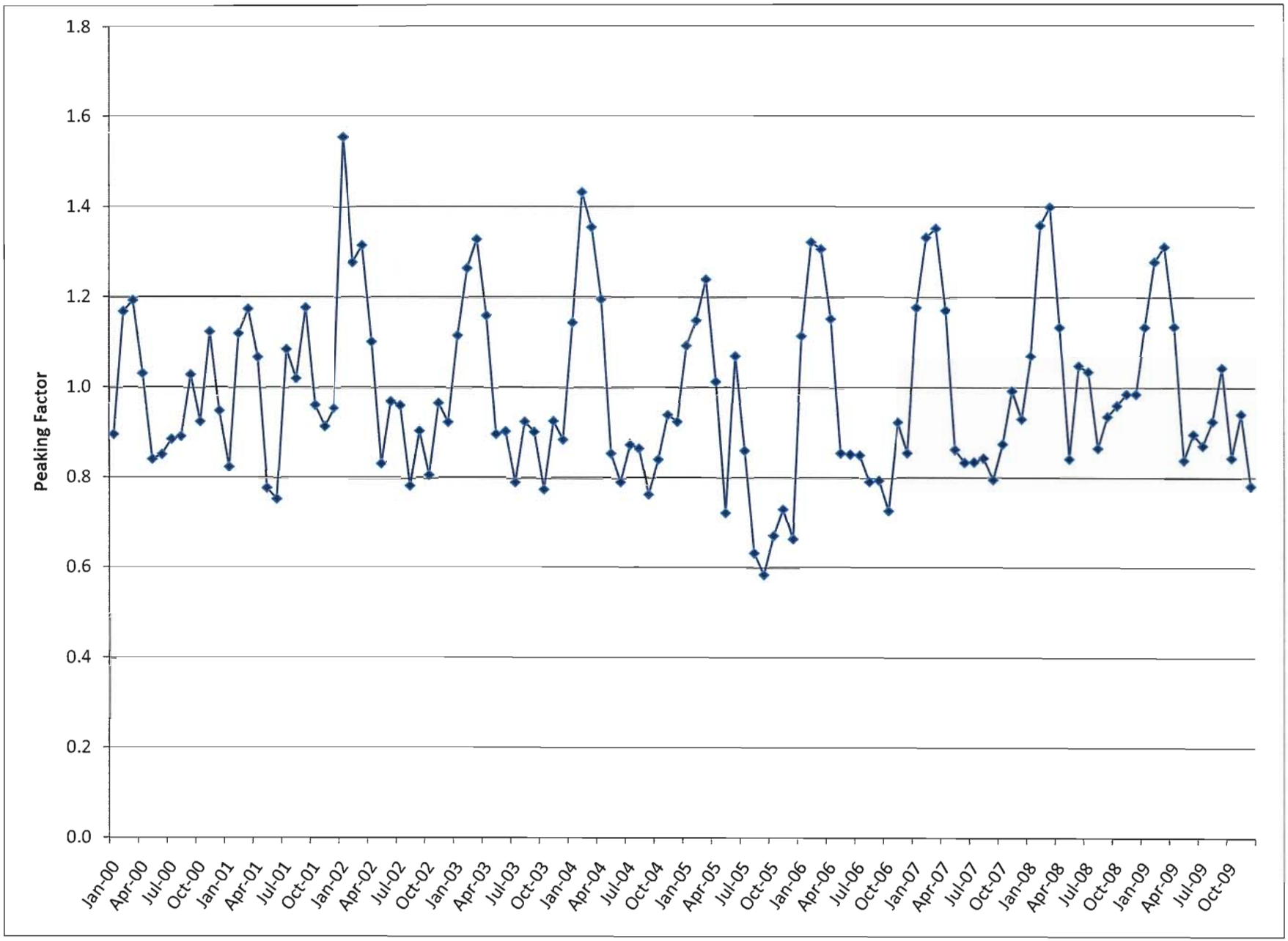


Figure 2-2
City of Marco Island RWPF
Monthly Average Flow Peaking Factor 2000 throug)09

Section 4
Summary and Conclusions

4.1 Current Expansion

A list of modifications performed and planned at the Marco Island RWPF is provided in detail in Section 4.2. Phase 2 final construction is estimated to be completed by December 2010. Phase 2 improvements that have been substantially completed at this point in time include the addition of a new 3.0 mgd MLE Tank 2 and a fifth 1.25 mgd MBR unit. Phase 3 construction started in April 2010 and is estimated to be completed in June 2011. Phase 4 construction is scheduled to start in the first quarter of 2011.

4.2 Construction Phasing

The construction phases for the improvements and expansion of the facility to 4.92 mgd TMADF capacity are described below.

Phase 1 (Completed)

Construction improvements described in Section 1 of the report were completed in early 2007. These improvements are as follows:

- Conversion of Plant No. 3 from a 1.0 mgd contact stabilization operating system to a 3.0 mgd MLE operating system utilizing fine bubble diffusers.
- Installation of four 1.0 mgd Submerged Membrane Bioreactors (MBRs) with associated piping and appurtenances.
- Installation of three new 200 Hp aeration blowers.
- Installation of two rotary Drum Screens at the headworks.
- Improvements to the aerobic digester system with installation of coarse bubble diffusers, new positive displacement blowers and new sludge transfer pumps.

Phase 2 (completed)

Phase 2 improvements were substantially completed in February 2010 and included the following:

- Installation of third rotary drum screen.
- Construction of a new MLE basin.
- Demolition of the traveling bridge filters to expand the capacity of Chlorine Contact Chambers 1 and 2.
- Demolition of existing MCC No. 2.

- Conversion of portion of sludge building to a maintenance facility.
- Construction of a new electrical switchgear building.
- Installation of new influent pumps that transfer screened wastewater from the equalization tanks to the MLE/MBR process units
- Replacement of existing waste activated sludge pumps.
- Installation of a fourth aeration system blower.
- Installation of a fifth MBR skid complete with piping and appurtenances.
- Construction of Injection Well No. 2.
- Demolition of existing Plant No.1 and 2.

Phase 3

Phase 3 improvements are currently under construction, are estimated to be completed by June 2011 and include the following:

- Demolition of existing gravity belt thickener.
- Installation of two new rotary drum thickeners.
- Installation of new fuel storage tank.
- Conversion of existing stabilization tank to a sludge holding tank No. 4.
- Conversion of existing 500,000 gallon water storage tank to Flow Equalization Basin No. 3.
- Electrical upgrades.
- Construction of an Instrumentation and Control Building.

Phase 4

Phase 4 improvements are estimated to be completed by December 2012 and include the following:

- Conversion of existing 500,000 gallon water storage tank to Flow Equalization Basin No. 4.
- Installation of a new supplemental reclaimed water filter.
- Installation of new higher capacity deep injection well pumps.

- Replacement of the wet well for Lift Station No. 1.
- Rehabilitation of the Injection well and effluent wet wells.

4.3 Conclusion

The Marco Island RWPF currently operates at 36 percent of the design and permitted capacity and produces effluent that meets permit requirements for water quality as discussed in Section 2.

Addition of a second MLE Tank and fifth MBR unit has increased the plant treatment capacity to the permitted capacity of 4.92 mgd TMADF .This is equal to the projected flow at build out (4.92mgd TMADF) in 2025. Since plant capacity will not be exceeded within next 10 years, annual updates to the CAR are not required. Based on current flow projections, the Marco Island RWPF has adequate capacity to treat flows at build out. CAR updates will only be required for operation permit renewals.

APPENDIX A

Population Projection Information
from Ten Year Water Supply Facilities Work Plan

City of Marco Island

Ten Year Water Supply Facilities Work Plan

Department of Public Works
Rony Joel, P.E., Director
July 17. 2008

population will occur from the building of single family homes. At build out the peak population that occurs in February and March is estimated to reach 46,000.

In 2008, an evaluation of existing gross acreage by land uses revealed that 3,451 acres or 47.4% of the total gross acreage in the city is dedicated to residential use. The remaining gross acreages are allocated to non-residential such as commercial and office (3.3%); government (0.1%); institutional (1.0%); utilities (0.3%); recreation/conservation (47.6%). The City does not anticipate substantial increases in land area in the near future. In the meantime, the residential and non-residential growth rate is anticipated to be moderate for the next 10 to 20 years, as the city's remaining vacant single family residential lots (2,097) develop as planned.

2.2 Relevant Regional Issues

As the state agency responsible for water supply in the Lower West Coast planning area, the South Florida Water Management District (SFWMD) plays a pivotal role in resource protection, through criteria used for Consumptive Use Permitting.

The City relies on two raw water sources, both of which are just upstream from the Gulf of Mexico (i.e., no down gradient users). One raw water source is surface water from Marco Lakes (Lakes) located 8 miles north of Marco Island. The principal source of water for the Lakes is Henderson Creek which travels south along the east boarder of the Lakes is the principal source of water for the Lakes. A half mile past the Lakes, Henderson Creek flows over a weir at Route 41 into a salt water stream that flows into the Gulf of Mexico. The Lakes is the source of water for the North Water Treatment Plant (NWTP) on Marco Island The second raw water source is from wells on Marco Island that recover brine (i.e. water with salt levels of 5,000 to 18,000 pounds of dissolved salt per million pounds of water [ppm]) from the mid Hawthorne formation for treatment in the City's Reverse Osmosis Plant (a.k.a the South Water Treatment Plant [SWTP]).

Proper management of withdrawals of raw water at locations upstream from the sources of raw water for the City is needed to insure that the allocation of raw water for the City is available to meet future needs. In particular, development located along Henderson Creek upstream from Marco Lakes must not allow contaminants to degrade the quality of the water.

3.0 DATA AND ANALYSIS

3.1 Population Information

The City's existing and future population figures are derived from the City's Community Development Department and the University of Florida Shimberg Center. Between 1990 and 2000, the City's permanent population grew from 9,773 to 14,879, an increase of fifty-two percent. By 2010, the City's population is anticipated to increase to 16,315; 2015 to 17,338; and 2025 to 19,187 (represents an increase of twenty-eight percent over the 2000 population). This relatively minor population growth is reflective of the fact that the City is

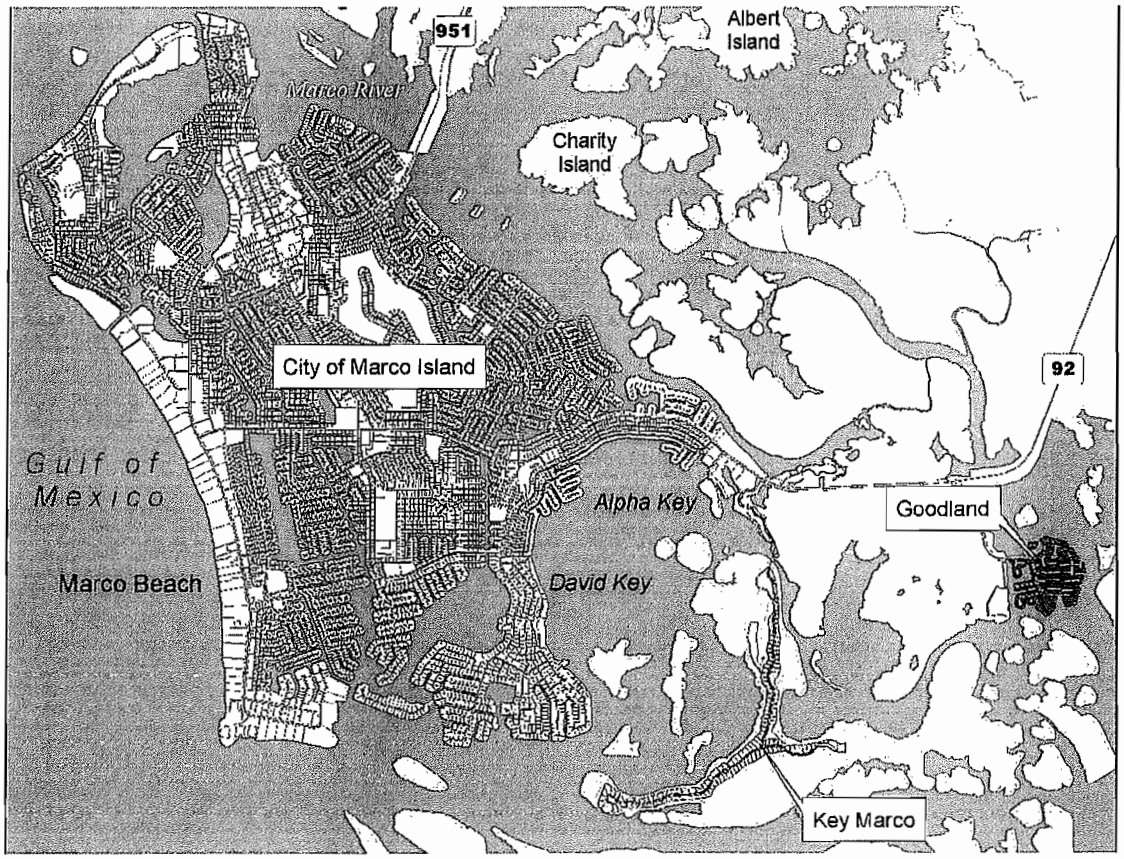
substantially built-out, with future development potential and population growth limited by the limited amount of remaining vacant and developable land.

3.2 Maps of Current and Future Areas Served

The MIU water service area includes all of the incorporated City of Marco Island except Key Marco. Marco Island has an inter-local Agreement with Collier County for bulk sale of potable water. The County distributes the water through direct sale customers in Goodland and Key Marco. Exhibit 1 shows the Marco Island drinking water service area.

EXHIBIT 1
MIU Drinking Water Service Area

Source: Marco Island Utilities 2007 Capacity Analysis Report



The Marco Island drinking water service area contains a mix of single family users, multi-family homes, planned unit developments (PUD), commercial users, institutions, recreational connections, hotels and government facilities.

The City's service area also includes Marco Shores which is located two miles north of Marco Island. The City has an inter-local Agreement with Collier County to purchase all the potable water to service Marco Shores.

3.3 Potable Water Level of Service Standard

The level-of-service is 200 gallons per day per person. The peak population on the island is expected to increase from 39,825 to 45,998 at build out (see Exhibit 2). When the population is at a peak during the months of February, March and April the rainfall is at a minimum and there is additional demand for irrigation water. Peak day demand in 2007 was 12.49 million gallons per day (mgd) and is expected to increase to about 13.5 million at build out.

With the planned increase of 1.67 mgd (possibly to 2 mgd) of capacity at the NWTP the total plant capacity will increase to 14.4 to 14.7 mgd which is sufficient to meet future peak demand. In addition a new 4 million gallons potable water storage tank at the NWTP is due to be online by the end of 2008. This will bring the total potable water storage capacity to 10.5 million gallons which will provide additional storage for a peak demand day.

With supplies of water sufficient to meet future demand and existing and planned expansion of treatment capacity there is no need to revise the level-of-service for residential and non-residential customers.

3.4 Population and Potable Water Demand Projections

Exhibit 3 shows the current and projected service connections in the Marco Island drinking water service area by connection type.

EXHIBIT 2
Marco Island Drinking Water Service Area Land Use and Peak Season Population
From Marco Island Utilities 2007 Capacity Analysis Report

Land Use	2006 Units	2006 Population[1]	Build Out Units	Build Out Population[1]
Single Family	6,671	12,506	8,839	16,722
Multi-Family	10,297	18,232	10,713	19,283
Commercial	2,636	4,634	2,636	5,535
Institutional	21	37	21	42
Recreational	113	113	113	113
Hotel / Timeshare	2,033	4,299	2,033	4,299
Government	2	4	2	4

EXHIBIT 2

Marco Island Drinking Water Service Area Land Use and Peak Season Population

From Marco Island Utilities 2007 Capacity Analysis Report

Land Use	2006 Units	2006 Population[1]	Build Out Units	Build Out Population[1]
Total	21,773	39,825	24,357	45,998

[1]Population during peak season that results in maximum day demand

EXHIBIT 3

2008-2017 Marco Island Projected Water Service Area Demands

From Marco Island Water Treatment Facilities 2008 Capacity Analysis Report

Year	Avg. Day Water Demand	Max Day Water Demand
2008	8.28	12.01
2009	8.35	12.10
2010	8.48	12.30
2011	8.62	12.50
2012	8.76	12.70
2013	8.89	12.89
2014	9.03	13.09
2015	9.16	13.29
2016	9.28	13.46
2017	9.33	13.53

3.5 Water Supply Provided by City of Marco Island

The City of Marco Island Utilities Department (MIU) maintains and operates two water treatment plants on Marco Island that are permitted with the Florida Department of Environmental Protection (FDEP) under PWS ID. Number: 5110183. The two plants are the North Water Treatment Plant (NWTP) that lime softens and filters raw water from Marco Lakes surface water supply and the South Water Treatment Plant (SWTP) that desalts brackish groundwater using reverse osmosis (RO). The permitted production capacity of the NWTP is 6.67 mgd and the permitted capacity of the SWTP is 6.0 mgd, for a total system production capacity of 12.67 mgd. The sources of raw water for both of these plants are described in the next two sections and then descriptions of the plants are presented.

APPENDIX B

Computing Nonresidential Wastewater Usage

Computing Non Residential Wastewater Usage

Hotels (only four majors Hotels, Marriott, Radisson, Hilton, Marco Beach)	325,000 gpd	
Top Food or Country Clubs		
Snook Inn	3,000 gpd	
Island County Club	8,000 gpd	
Yacht Club	3,000 gpd	
Other 125 restaurants (60 seat restaurants generate from 800 to 2500 gpd, assume 1500 gpd each)	187,500 gpd	
Schools, Churchs	10,000 gpd	
Two Car Washes & Progressive Auto	5,000 gpd	
Marco River Marina (water to wastewater)	6,000 gpd	
Businesses and offices (300 to 500)	100,000 gpd	also includes other hotels
Total Non Residential Wastewater	**647,500 gpd**	