Bruce

City of Marco Island

Wastewater Treatment Facility
Capacity Analysis Report – Annual Update

FDEP Application No. FLA014167-009-DW1P

January 2007

Prepared By:

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Date: January 2, 2007

Certifications

Permittee

City of Marco Island
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Date 1-8-07

A. Rony Joel, P.E.
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Engineer of Record

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Date January 2, 2007

William H. McKenzie, Jr., P.E.
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The Permittee named above is fully aware and intends to comply with the recommendations and schedules included in this report.

The Engineer of Record agrees that the information contained in this report is true and correct to the best of his knowledge, and this report was prepared in accordance with sound engineering principles and the recommendations and schedules were discussed with the Permittee or the Permittee's delegated representative.

The Engineer of Record and Permittee certify that planning of the plant expansion has been initiated.

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Section 1
Introduction

1.1 Purpose

The most recent Capacity Analysis Report (CAR) was prepared in November 2005 for the City of Marco Island Wastewater Treatment Plant (WWTP) in support of a request for a substantial modification to the operating permit.

A CAR is required to document timely planning, design, and construction of needed expansions. Specifically, F.A.C. 62-600.405(8) requires the following submittals/ actions when it is determined by the CAR that flow will equal or exceed capacity:

- Within 5 years – initiate planning and preliminary design of expansion.
- Within 4 years – prepare plans and specifications.
- Within 3 years – submit an application to FDEP for expansion of the facility.

In addition, annual updated CARs are required when the most recent report documents that the permitted capacity will be equaled or exceeded within the next 10 years.

Flow projections from the 2005 CAR estimated that flow to the plant will exceed the permitted capacity in 2012. Although that occurrence is 5 years in the future, the City has elected to undertake a project at this time which will modify the plant to a membrane bioreactor (MBR) process in order to facilitate future expansion beyond 3.5 mgd. That modification is estimated to be operational in early 2007. This project (while not providing additional treatment capacity at this time), provides the City with the means to expand the plant in the future without requiring the purchase of additional land or taking the plant out of service. The City has initiated planning for plant expansion.

This annual update report was prepared by Camp Dresser & McKee Inc. (CDM) and is intended to comply with the requirements of the Florida Administrative Code (F.A.C. 62-600.405) and in general conformance with the Guidelines for Preparation of Capacity Analysis Reports as published by the Florida Department of Environmental Protection (FDEP).

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 WWTP is located at Latitude 25° 57′ 32″ N and Latitude 81° 43′ 23″ W, in Section 8, Township 52S Range 32E of Collier County, FL (see **Figure 1-1**). The permitted capacity of the plant is 3.5 million gallons per day (mgd) based on the TMADF. Plants 1 and 2 each have a capacity of 1.25 mgd and Plant 3 has a 1 mgd capacity. The plant provides secondary biological treatment with tertiary filtration or MBR and high level disinfection. The effluent is continuously monitored for turbidity and chlorine residual in order document the requirements of F.A.C. 62-610 are met prior to reuse by public access irrigation.

Recent improvements to the facility include modifications to Plant 3 to modify the treatment capacity from 1.0 mgd TMADF to 3.0 mgd TMADF. These modifications included replacing the existing centrifugal blowers with new, higher capacity centrifugal blowers; replacing the existing coarse bubble diffused aeration system with a new fine bubble diffused aeration system, modifying the flow pattern through the plant to create a Modified Ludzack-Ettinger Process (MLE) including an anoxic zone in the existing clarifier, and aeration in the existing contact, stabilization, and digestion compartments; adding four new skid mounted MBRs along with skid mounted permeate pumps, recycle pumps, positive displacement blowers, and chemical feed facilities; additional yard piping between the various process tanks, and site work to locate the new facilities in the area southwest of Plant 3.

The existing headworks structure has been modified by the addition of two, 2mm drum screens. The existing 6mm mechanical screen will be removed when a third drum screen is installed.

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, then effluent is diverted to one of two alternative effluent disposal sites: a 5.7 mgd deep injection well located on site and shared with the City's reverse osmosis plants and/or rapid infiltration basins (43 acres) located off-site.

Residuals generated by the biological processes are currently thickened on a gravity belt thickener, stabilized by aerobic digestion, dewatered and disposed in a landfill.

Recent modifications to the facility included the addition of new positive displacement blowers and coarse bubble diffusers to the existing aerobic digesters. New transfer pumps to reduce short circuiting through the digesters were added.

Figure 1-2 provides a process diagram.

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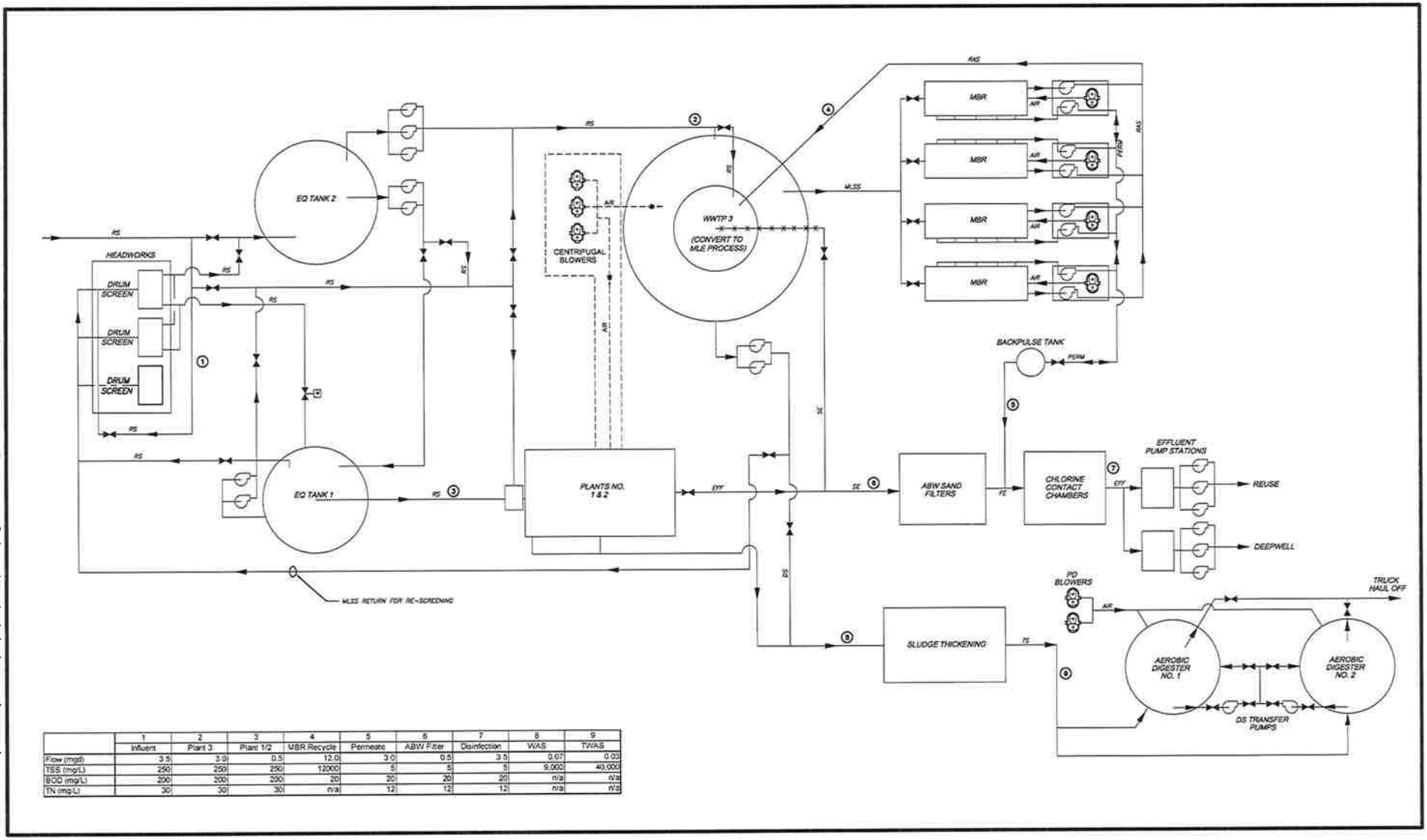
Figure 1-1 City of Marco Island WWTF Location



	1 Influent	2 Plant 3	3 Plant 1/2	4 MBR Recycle	5 Permeate	6 ABW Filter	7 Disinfection	8 WAS	9 TWAS
Flow (mgd)	3.5	3.0	0.5	12.0	3.0	0.5	3.5	0.07	0.03
TSS (mg/L)	250	250	250	12000	5	5	5	9,000	40,000
BOD (mg/L)	200	200	200	20	20	20	20	n/a	n/a
TN (mg/L)	30	30	30	n/a	12	12	12	n/a	n/a

Figure No. 1-2
Process Flow Diagram

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1.3 Description

The Marco Island WWTP includes the following treatment unit processes:

- Preliminary treatment structure with two, 2mm drum screens
- Two parallel contact stabilization treatment Plants (Plant 1 @ 1.25 mgd and Plant 2 @ 1.25 mgd). Plant 2 will be taken off line when Plant 3 is fully operational
- One 3.0 MGD MLE process basin (Plant 3)
- Two traveling bridge automatic backwashing filters. One filter will be taken off line when Plant 3 is fully operational.
- Four MBR tanks (3 units for firm capacity, 1 unit for standby) at 1 mgd/each
- Two parallel chlorine contact basins
- Three reclaimed water transfer pumps
- Three deep well injection pumps
- Two 0.5 MG covered reclaimed water storage tanks
- Three vertical turbine reclaimed water high service pumps
- One gravity belt thickener
- Two aerobic digesters
- One odor control system
- Two emergency electrical generators
- Six hypochlorite storage tanks and hypochlorite metering pumps

Volumes and capacities for these are summarized in **Table 1-1.**

1.3.1 Preliminary Treatment

The existing preliminary treatment facility includes two new 2-mm Baycor drum screens. The peak hour capacity of the headworks using both screens is 12 mgd. Following preliminary treatment are two influent equalization tanks. Tank 1 is a 0.25 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 EQ Tank 2. From EQ Tank 2, flow is pumped to either Plant 3, or EQ Tank 1 (or to both). Flow from EQ Tank 1 is pumped to Splitter Box 1, which splits flow to Plants 1 and 2.

Table 1-1
Existing Unit Operations and Capacities at Marco Island WWTF

Area	Facility/Operation	Notes
Headworks	Mechanical Bar Screen	Primary Mechanical Screen – Baycor 2mm drum type screen. Peak Hour Capacity 5.0 mgd Back-up Mechanical Screen – Vulcan 6 mm x 30-inch wide – Climber type screen. Maximum capacity 7.0 mgd
	Flow Meter	
Equalization Tank 2	Covered Crom Tank	500,000 gallons Concrete Dome Cover
	Raw Wastewater Transfer Pumps	3 ea. 700 gpm Transfer Pumps to Plant 3 (Cornell Pumps)
	Raw Wastewater Transfer Pumps	2 ea 2,000 gpm ABS Transfer Pumps to EQ – 1.
Equalization Tank 1	Covered Crom Tank	EQ-1 250,000 gallons Aluminum Dome Cover
	Recirculation Pumps	2 ea 700 gpm Cornell Pumps
Odor Control System	2-Stage Liquid Scrubber	Treats exhaust from the Headworks Structure, Equalization Tank 2, and Equalization Tank 1
Treatment Plant 1	Stabilization Tank 1	100,970 gallons
	Stabilization Tank 2	100,970 gallons
	Contact Tank 1	100,970 gallons
	Clarifier 1	40 ft diameter
	Clarifier 2	40 ft diameter
Treatment Plant 2	Stabilization Tank 3	296,100 gallons
	Contact Tank 2	100,970 gallons
	Clarifier 3	50 ft diameter
Common Facilities to Plants 1 and 2	Splitter Box 1	Receives gravity flow from EQ Tank 1 and splits to Contact Tanks 1 and 2
	Splitter Box 2	Receives Mixed Liquor from Contact Tanks 1 and 2 and splits flow to Clarifiers ,2,and 3
	Sludge Pump Station	Receives Clarifier Underflow from Clarifiers 1,2,and 3 and pumps to Contact Tanks 1 and 3 Waste Sludge Pumped to Digesters

Table 1-1(continued)

Existing Unit Operations and Capacities at Marco Island WWTF

Area	Facility/Operation	Notes
Plant 3	Anoxic Zone	113,000 gallons
	Aeration Basin	605,000 gallons
	Membrane Tanks	4 @ 1.0 mgd (TMADF)
Blowers	Centrifugal Blowers	3 ea 200 hp centrifugal blowers provide air for Plants 1, 2, and 3 and digesters 1, 2, and 3.
Filtration	Traveling Bridge Filters	Traveling Bridge Sand Filters 2 ea @ 54 ft x 16 ft
Disinfection	Chlorine Contact Basin 1	Contact Tank 40,000 gallons
	Chlorine Contact Basin 2	Contact Tank 51,000 gallons
Digesters	Digester 1	205,000 gallons
	Digester 2	131,600 gallons
	Positive Displacement Blowers	2 @ 75 hp

1.3.2 Secondary Treatment

Secondary treatment includes the biological processes comprising Plants 1 and 2 and their associated clarifiers. Plant 3 has been modified to operate in the MLE mode and followed by an MBR with an anoxic tank for nitrogen reduction. The process basins and their respective volumes are summarized in Table 1-1. Plant 1 can treat 1.25 mgd (TMADF), Plant 2 can treat 1.25 mgd (TMADF), and Plant 3 can treat 3.0 mgd (TMADF). After the Plant 3 modifications are complete, Plant 1 or Plant 2 will be taken out of service. The permitted capacity of 3.5 mgd will not be exceeded.

1.3.3 Disinfection

Disinfection at the Marco Island WWTP 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% of the final reclaimed water samples with detectable fecal coliforms following disinfection.

Disinfection is provided using sodium hypochlorite in two chlorine contact basins as summarized in Table 1-1.

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 digesters for additional aerobic stabilization. Dewatering equipment is used to dewater stabilized biosolids for land application on approved agricultural sites. The solids are 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 well has a capacity of 5.76 mgd which 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 3.6 mgd capacity for the WWTF.

Section 2
Existing Conditions

2.1 Permitted Capacities

The permitted capacities associated with the Marco Island WWTP (Domestic Wastewater Facility Permit No. FLA014167-009-DW1P) are summarized in **Table 2-1.**

Table 2-1
Marco Island WWTP
Permitted Capacities

Permit Item	*Permitted Capacity (mgd)*
Operation Capacity (TMADF)	3.5
Underground Injection System, U001 – Injection Well IW-1	5.76
Reuse System R001 – Slow Rate Public Access Land Application	1.09
Reuse System R002 -	3.5

The flow and influent characteristics are summarized below. These data were estimated based on WWTP operating records. Influent data from January 1, 1999 to October 31, 2006 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 the influent magnetic flow meters located in the riser pipe at the headworks. Upon startup of the modified headworks structure, two new magnetic flow meters on the inlets to the new drum screen will measure the flow. These flow meters will be calibrated following start up. All flow entering the treatment facilities is measured at this point. An automatic sampler takes samples of the raw wastewater at this point to measure organic and solids loads.

2.2.1 Monthly Average Daily Flow

The monthly average daily flow averages the daily flow (mgd) during each calendar month. Monthly average daily flow 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 monthly average daily flow for the period from 1999 through October 2006. 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 WWTF Flow Data

Monthly Average Daily Flow (MGD)

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

Three Month Average Daily Flow (MGD)

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

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

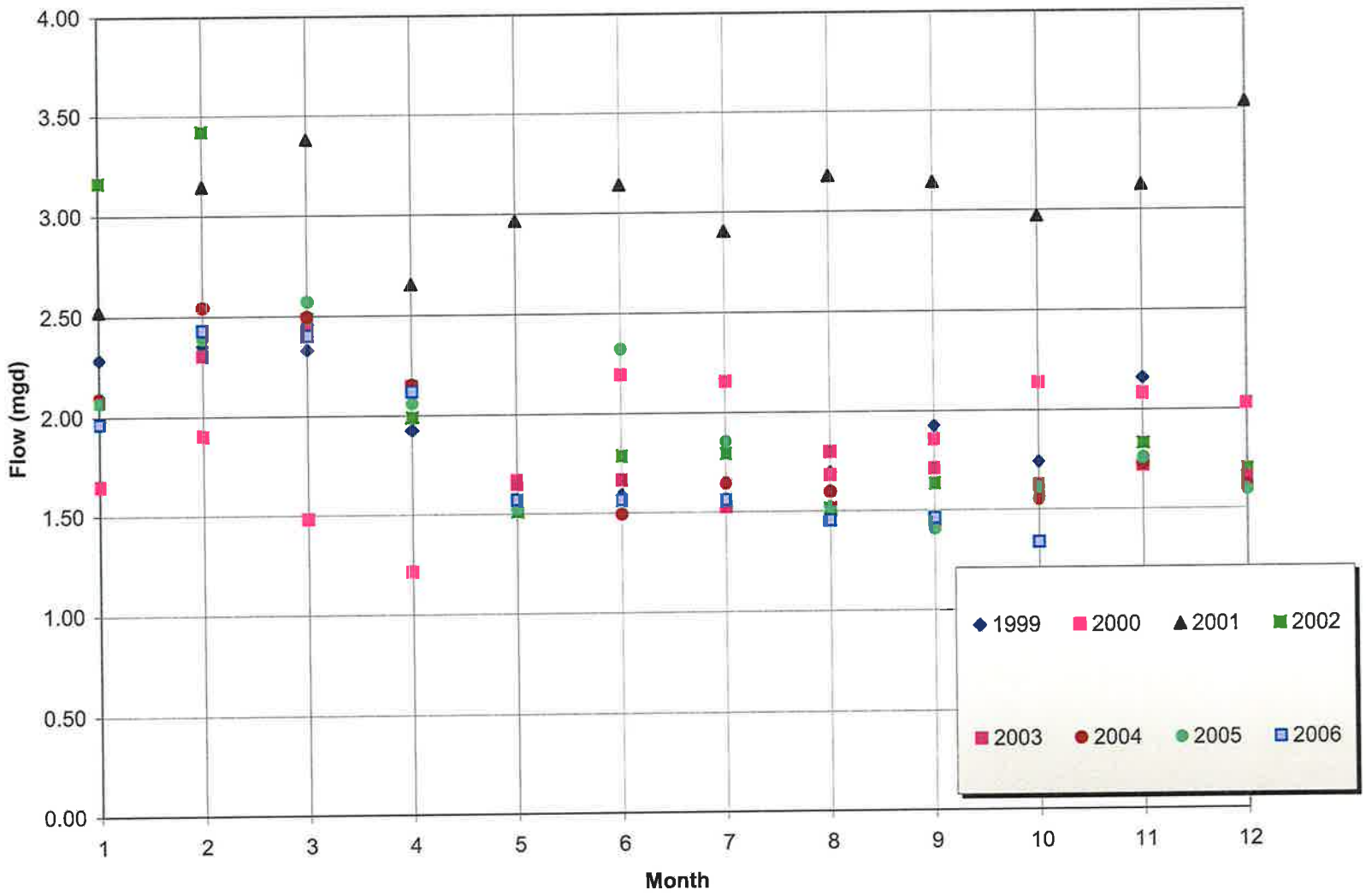

Figure 2-1
City of Marco Island WWTF
Monthly Average Flow 1999 through 2006 (October)

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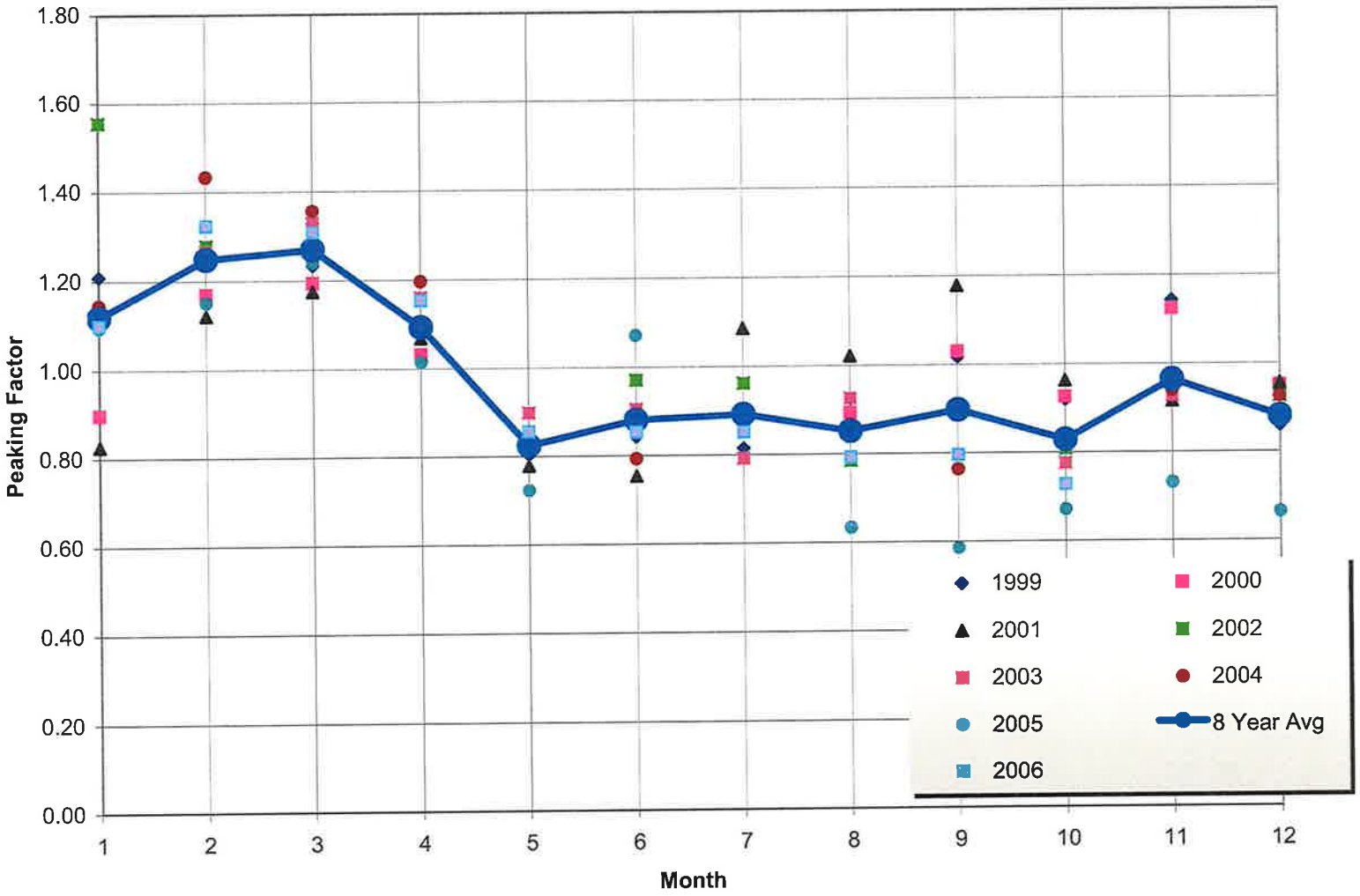

Figure 2-2
City of Marco Island WWTF
Monthly Average Flow Peaking Factor 1999 through 2006 (October)

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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 plant. The TMADF represents 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 1999 through September 2006 is provided on Table 2-1 and is shown on **Figure 2-3**.

The maximum three-month average daily flow (MTMADF) typically occurs in February, March and April. Table 2-1 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 7-year average is 1.27. For planning purposes a MTMADF/AADF ratio of 1.27 will be used.

Table 2-3
MTMADF Data

Year	MTMADF (mgd)	AADF (mgd)	MTMADF/AADF
1999	2.32	1.89	1.23
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
Average			1.27

2.2.3 Average Annual Daily Flow

Average Annual Daily Flow (AADF) is the total volume of flow passing through the WWTP during a calendar year (365 days from January 1 through December 31) divided by the number of days in that period and expressed as mgd. The AADF documents increasing flow due to increased wastewater generation, filtering out peaks and valleys inherent in the flow data.

Figure 2-4 provides the average annual daily flow.

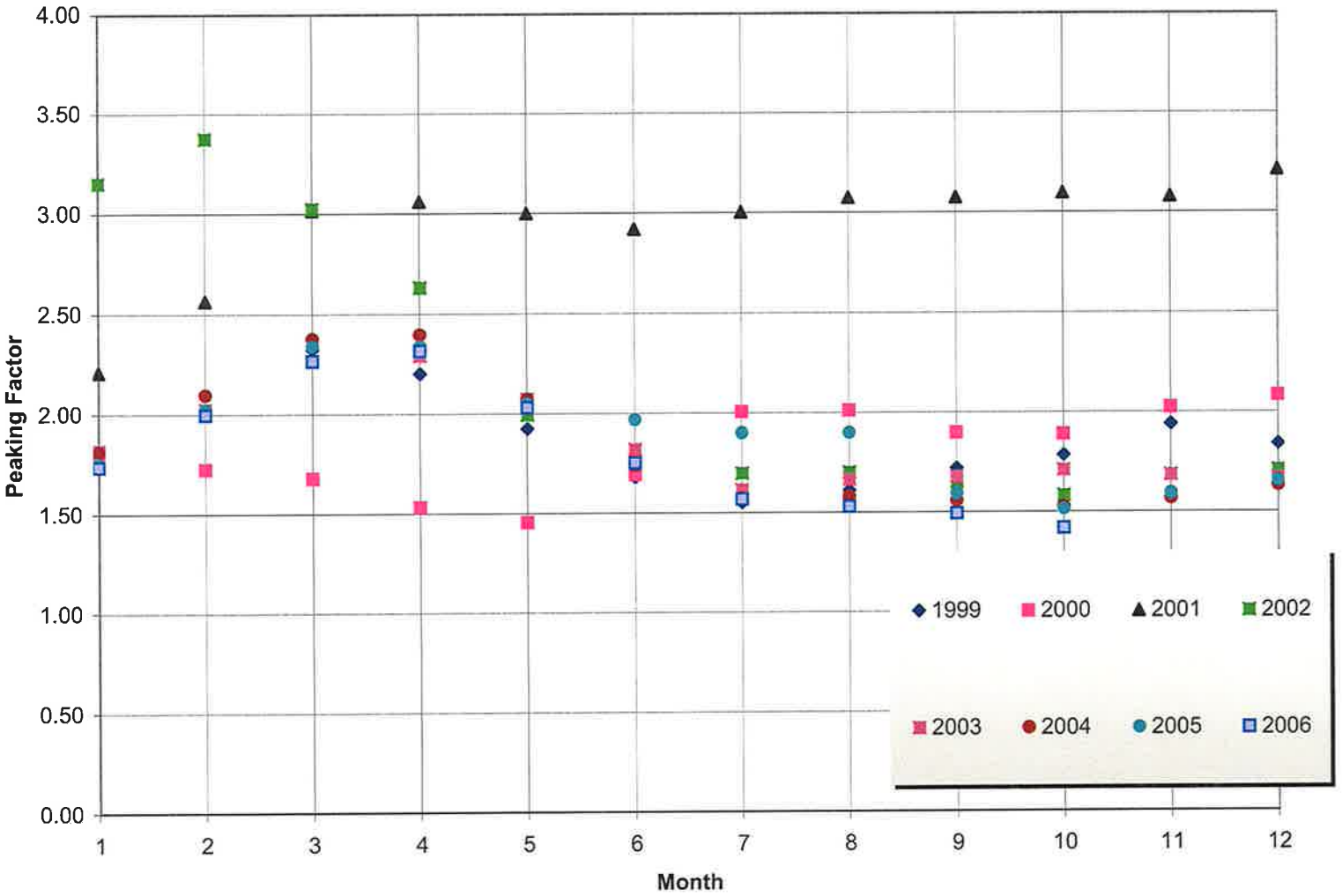

Figure 2-3
City of Marco Island WWTF
Three Month Average Daily Flow (mgd) 1999 through 2006 (October)

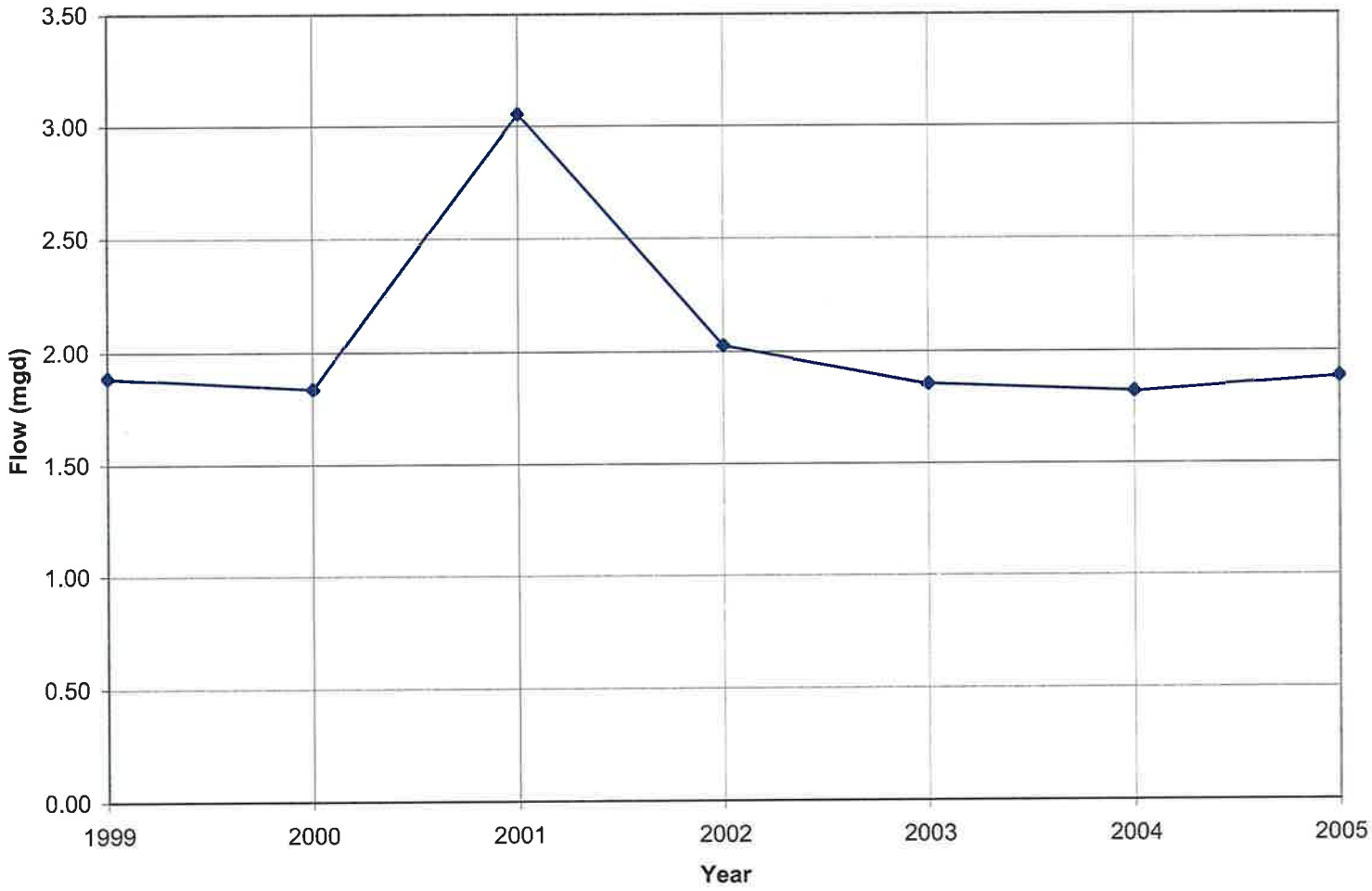

Figure 2-4
City of Marco Island WWTF Historical AADF

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2.3 Seasonal Variations in Flow

As shown on Figure 2-2, the influent flow peaking factor varies seasonally at the Marco Island WWTP. 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 capacity of the facility is based on a TMADF of 3 mgd to Plant No. 3 and 0.5 mgd combined flow to Plant Nos. 1 & 2. The design influent concentrations for CBODs and TSS data are 200 mg/L. The design influent concentration for total nitrogen (TN) is 40 mg/L. Thus, the design and permitted loading for CBODs and TSS are 5838 pounds per day and 1168 pounds per day for TN based on the TMADF.

Influent CBODs and TSS data are provided on **Table 2-4** for the past year (October 2005 - September 2006). Influent CBODs and TSS and TN loadings are within the design and permitted loading for the facility. Maximum loadings are 4,247 pounds per day and 3,733 pounds per day for CBODs and TSS, respectively. The maximum loading for TN is 837 pounds per day.

Table 2-4 Marco Island WWTF Influent Data

		TMADF (MGD)	CBOD (mg/L)	CBOD (lb/day)	TSS (mg/L)	TSS (lb/day)	TN (mg/L)	TN (lb/day)
October	2005	1.51	244	3077	249	3138	28	354
November	2005	1.59	183	2431	104	1386	25	336
December	2005	1.65	203	2804	134	1853	40	554
January	2006	1.74	173	2510	148	2138	44	637
February	2006	2.00	210	3500	163	2715	42	694
March	2006	2.26	202	**3816**	110	2078	40	**752**
April	2006	2.32	196	3783	176	**3399**	37	713
May	2006	2.03	183	3100	167	2830	35	590
June	2006	1.75	176	2565	159	2315	35	511
July	2006	1.57	155	2020	137	1790	37	486
August	2006	1.53	172	2193	138	1761	31	389
September	2006	1.49	134	1661	82	1016	24	296

Note: Maximum load indicated by bold type.

October 2005 data included one measurement of extremely high CBOD (440 mg/L) and TSS (770 mg/L) concentrations.

Section 3
Future Conditions

3.1 Population Projections

The City has estimated the total number of sewered parcels at buildout to be 19,552 residential units. Currently, 13,899 residential units (including vacant lots) are sewered. Land use information from the City of Marco Island Utility Master Plan (UMP) is provided in Appendix A.

The City has estimated the buildout maximum three month average daily flow (MTMADF) to be 5.0 mgd. **Table 3-1** provides the calculations for the projected flow. The calculations are based on applying the City's level of service standard of 220 gpd per residential unit to the calculated number of residential units. The flow from non-residential users is calculated based on the type of user and is provided in Appendix B.

The City is conducting a septic tank replacement program (STRP). The STRP will result in an additional flow of 1.24 mgd from 2007 to 2013.

Table 3-2 provides the projected population served from the UMP along with the projected flow from 2006 to 2025. **Figure 3-1** provides a graph of the data.

According to the projections, the permitted capacity (3.5 mgd TMADF) will be exceeded by the MTMADF in 2012.

Table 3-1 Projected Wastewater Flow at Buildout

Number of Residential Condos and Timeshares	10,713	
Single Family Homes or Lots (excludes Hideaway and Key Marco)	2,794	
Hideaway Lots	257	
Cape Marco Lots	135	
Total Number of Residences or Vacant Lots Sewered	13,899	
Level of Service is 220 gpd per residence	220	
Wastewater Generated by Residences	3,057,780	gpd
Wastewater Generated by Non Residential Users (scaled up)	701,302	gpd
Total Wastewater Generated Including South Barfield and Tigertail Districts Sewer Districts	**3,759,082**	**gpd**
Unsewered Parcels	5,653	
Wastewater Generate by Unsewered Parcels	1,243,660	gpd
Total Wastewater Generated	**5,002,742**	**gpd**

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	17285	1.89	2.34			
2006			2.32			1.82
2007				0.08	2.40	1.89
2008				0.31	2.74	2.16
2009				0.12	2.89	2.28
2010	19656			0.31	3.23	2.54
2011				0.15	3.47	2.73
2012				0.14	3.70	2.91
2013				0.13	3.92	3.09
2014					4.01	3.16
2015	21858				4.10	3.23
2016					4.19	3.30
2017					4.28	3.37
2018					4.37	3.44
2019					4.46	3.51
2020	22943				4.55	3.58
2021					4.64	3.65
2022					4.73	3.72
2023					4.82	3.80
2024					4.91	3.87
2025	24367				5.00	3.94

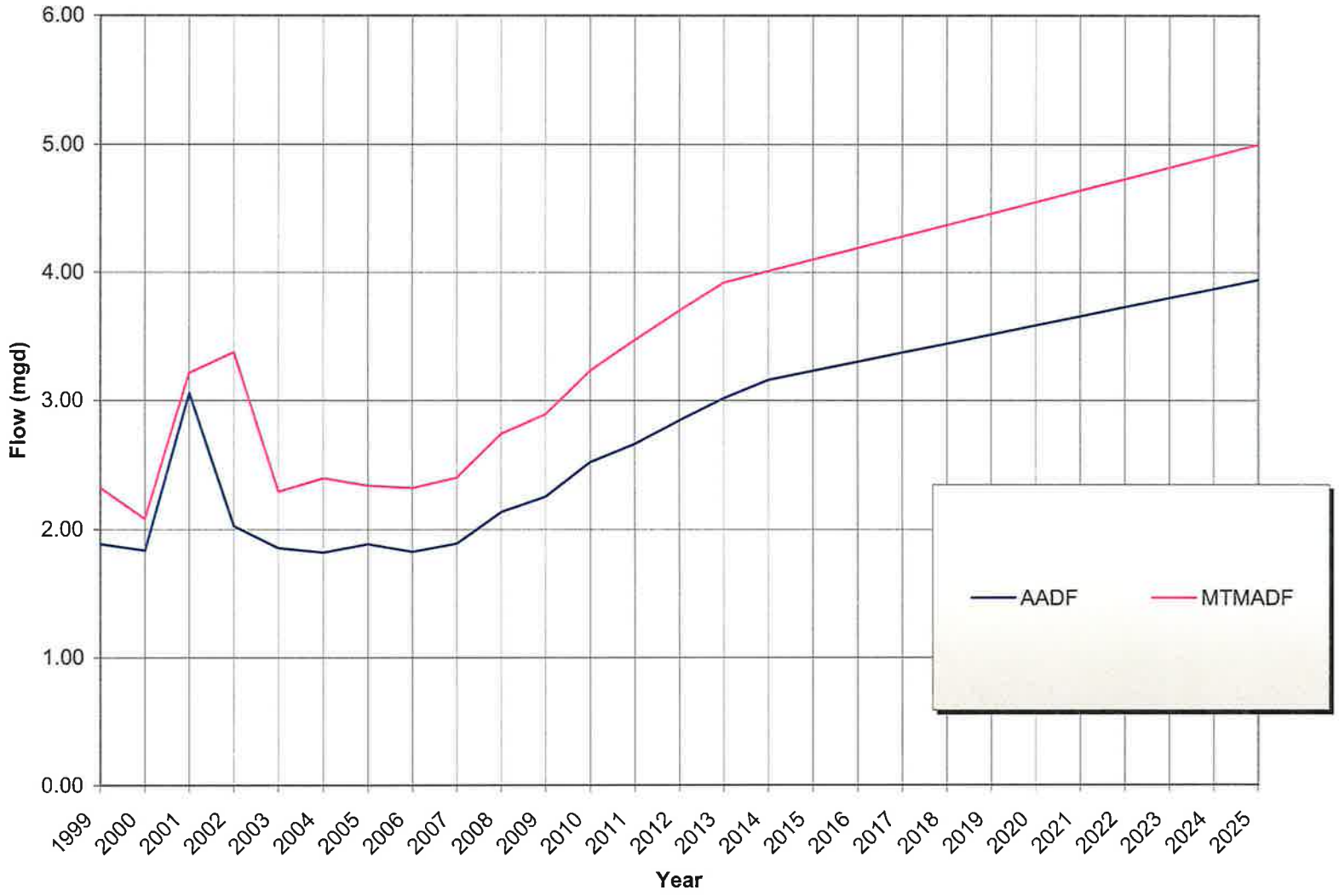


Figure 3-1
City of Marco Island WWTF Projected AADF and MTMADF

Section 4
Summary and Conclusions

4.1 Time Required for the MaximumThree Month Average Daily Flow to Reach Permitted Capacity

As Discussed in Section 3 the Maximum Three Month Average Daily Flow to the plant is expected to reach the currently permitted value of 3.5 mgd in the year 2012. Expansion of the wastewater collection system into non sewered areas is the primary source of increased flow.

4.2 Recommendations for Expansion

The MTMADF is projected to reach the permitted capacity of the facility in 2012. The projected buildout flow is 5.0 mgd. An expansion is proposed for the facility to provide a permitted capacity of 5.0 mgd TMADF. The expansion will include construction of an MLE process basin and the addition of two MBR tanks. In addition, during construction of the new process basins and MBR, plants No. 1 and 2 will be taken out of service and demolished. Prior to demolition, existing tanks will be evaluated for use as reclaimed water storage tanks to increase the amount of reuse available to the community. **Figures 4-1** through **4-5** provide the phasing of the proposed improvements to the WWTF.

4.3 Expansion Schedule

The preliminary design of the proposed expansion is underway. The schedule for the project is as follows:

Planning/Conceptual Design Complete	February 2007
Preliminary Design Starts	June 2007
Final Design Starts	January 2008
Construction Starts	January 2009
Construction Complete	December 2011

The City has initiated the design of an additional deep injection well that will be operational by December 2009.

4.4 Construction Phasing

The construction phases for the expansion of the facility to 5 mgd TMADF capacity are described below.

Phase 1

Construction of improvements described in Section 1 of the report which will be completed in early 2007. These improvements are shown on **Figure 4-1** and include:

- 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 4 – 1.0 MGD Submerged Membrane Bioreactors (MBRs) with associated piping and appurtenances,
- New 200 Hp aeration blowers,
- Installation of two 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

Phase 2 improvements are shown on **Figure 4-2** and include the following:

- Replace fuel storage,
- Convert existing Effluent Filter No. 2 to serve as a Chlorine Contact Chamber (CCC),
- Demolish existing CCC No. 2 and construct new electrical building,
- Convert portion of thickener building to maintenance facility,
- Relocate Deep Injection Well Pump Station,
- Demolish existing injection well sump

Phase 3

Phase 3 improvements are shown on **Figure 4-3** and include the following:

- Demolish Maintenance and Administration Building,
- Install third drum screen,
- Install new grit removal system,
- Upgrade/Add Generators and related switch gear,
- Install new switchgear in new electrical building,
- Demolish existing Plant No. 2,
- Install new raw feed pumps from equalization to new MLE/MBR Plant.

Phase 4

Phase 4 improvements are shown on **Figure 4-4** and include the following:

- Construct New MLE Basin,
- Install fourth aeration system blower,
- Install two new MBR systems complete with piping and appurtenances,
- Replace existing waste activated sludge pumps,

FIGURE 4-1

WWTP Phase 1 (Current Contract) - 3.5 MGD

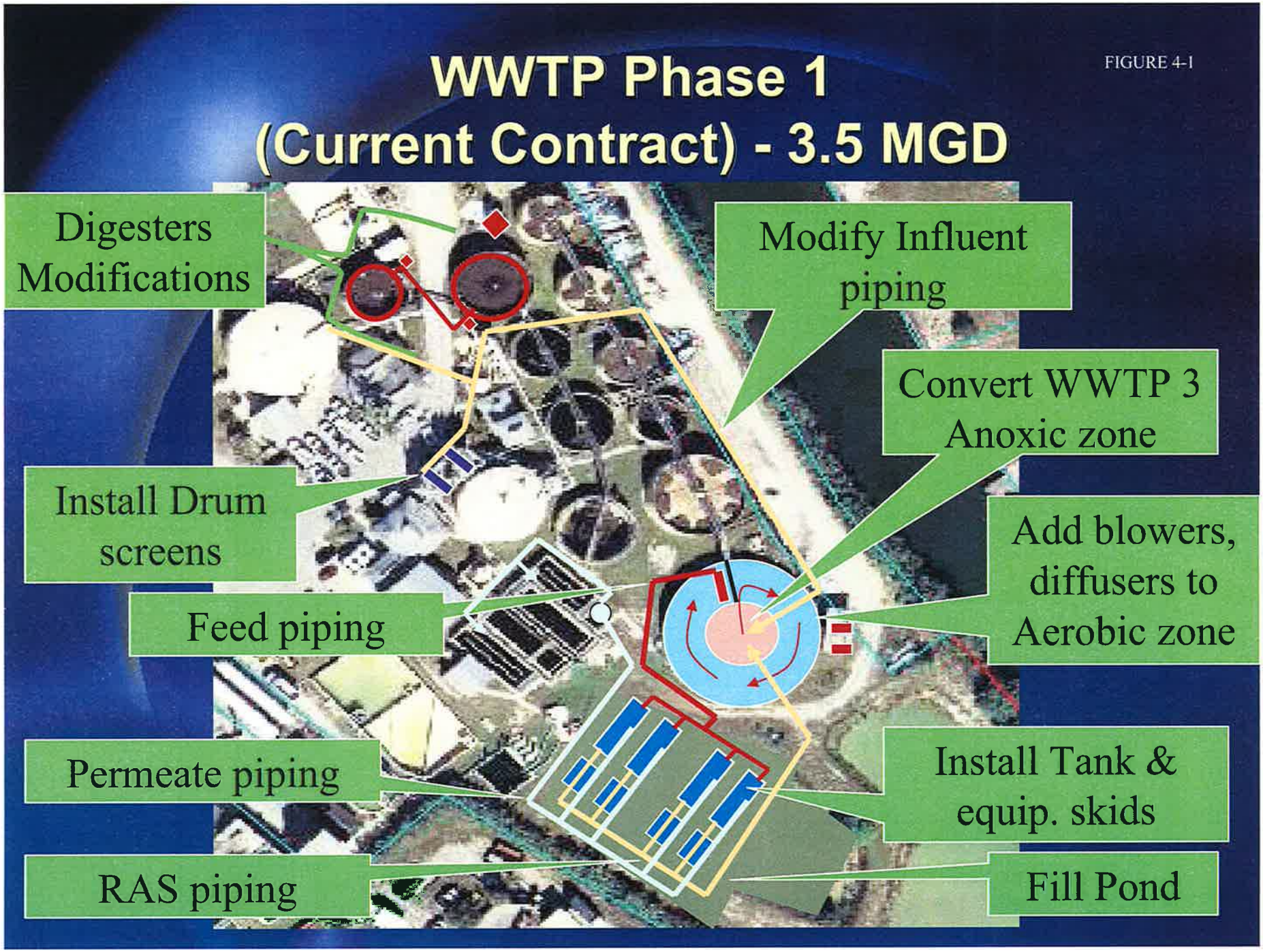
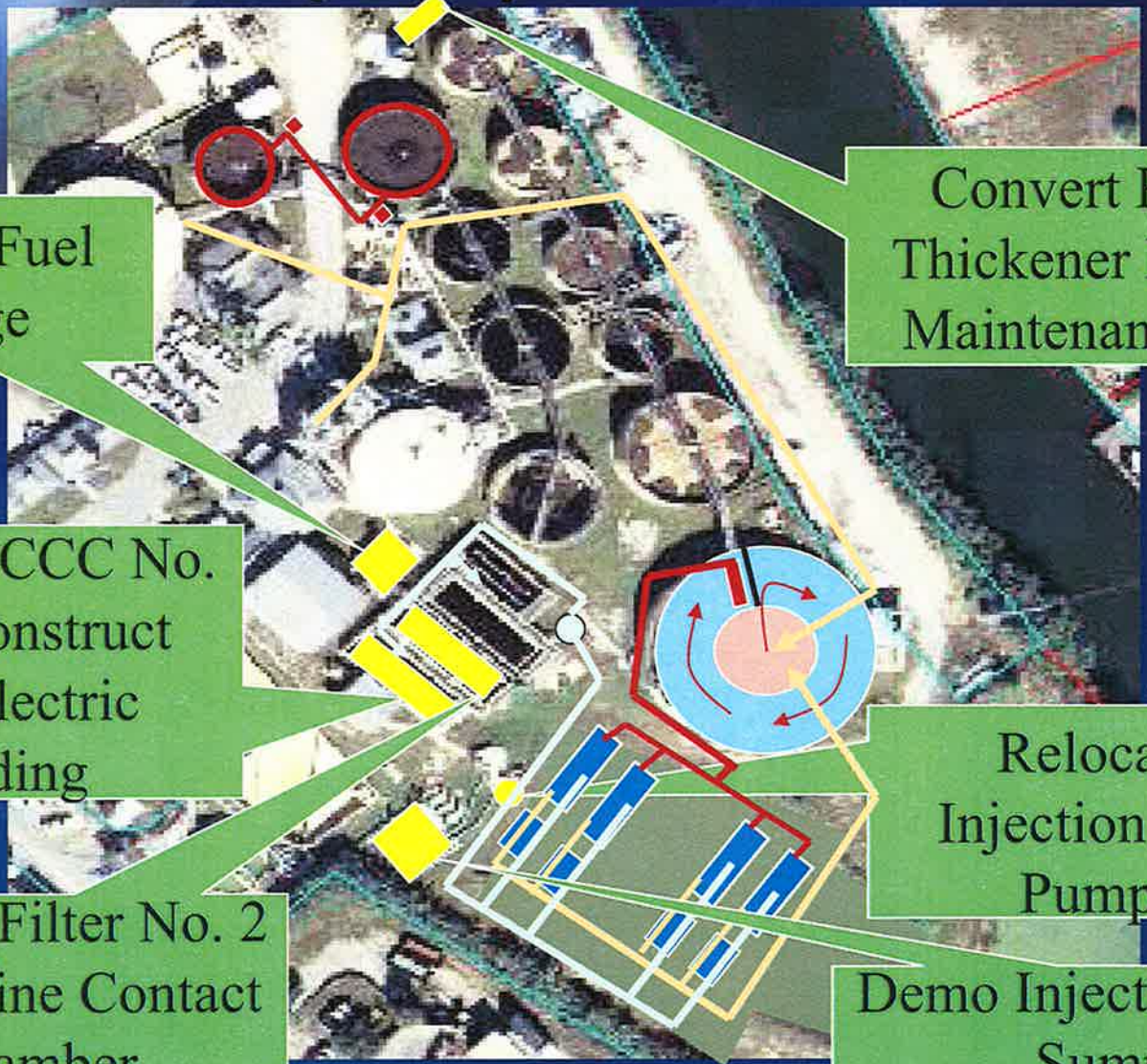


FIGURE 4-2

WWTP Phase 2 (2007) - 3.5 MGD



Replace Fuel Storage

Convert Portion of Thickener Building to Maintenance Facility

Demolish CCC No. 2 and Construct New Electric Building

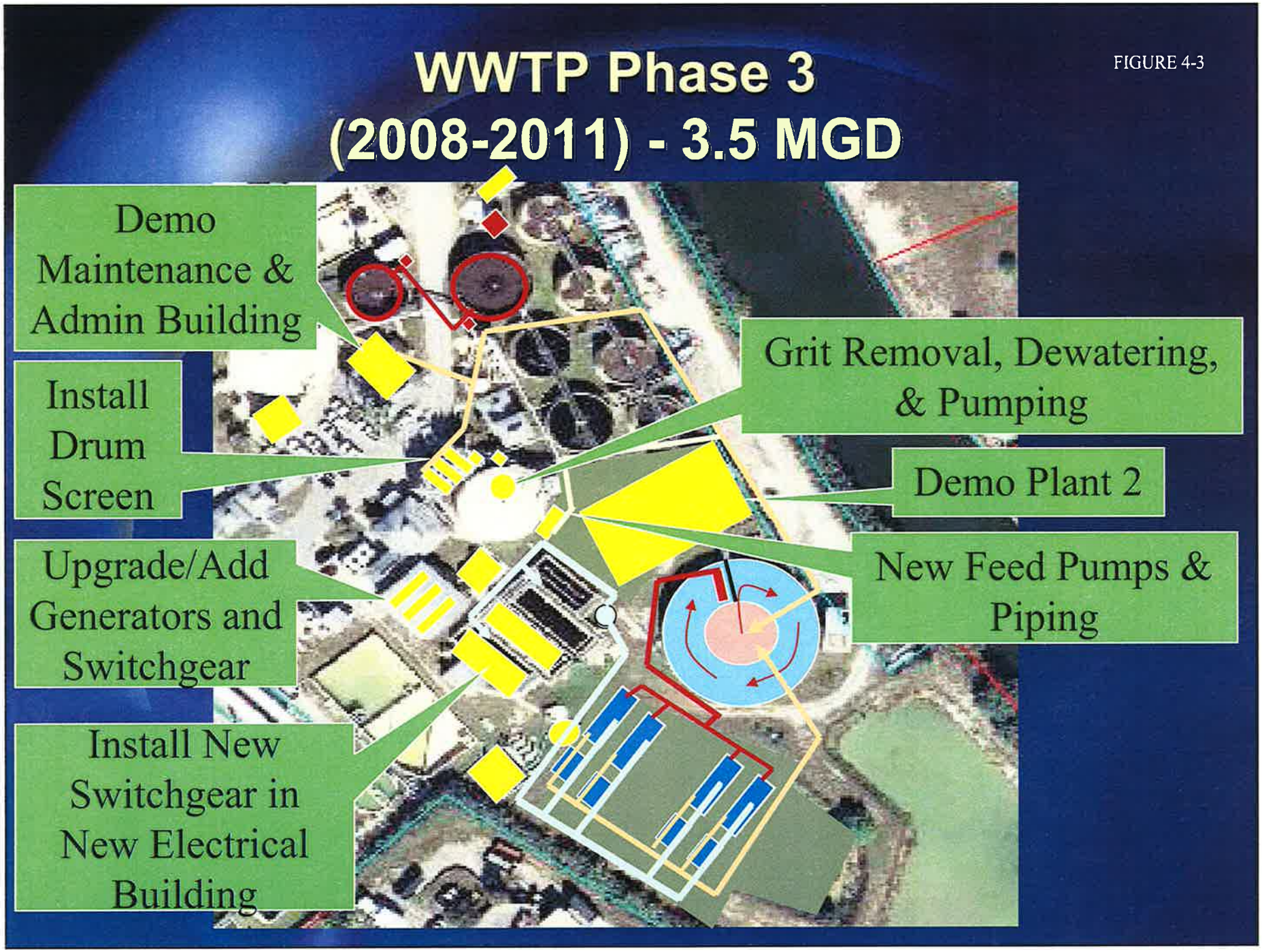
Relocate Injection well Pumps

Convert Filter No. 2 to Chlorine Contact Chamber

Demo Injection Well Sump

FIGURE 4-3

WWTP Phase 3 (2008-2011) - 3.5 MGD



- New administration/control building
- Construct new deep injection well,
- Convert effluent filter No. 1 to serve as a CCC,
- Demolish Plant No. 1, leaving one existing stabilization tanks for use an third aerobic digester,
- Install additional positive displacement blower for aerobic digestion system,
- Construct new Collection/Distribution Building for equipment inventory storage, garage facilities and C/D office.

Phase 5

Phase 5 improvements are shown on **Figure 4-5** and include the following:

- Construct new administration/control building and parking area,
- Demolish laboratory and control room.

Rule 17-600.405(9) requires "A statement, signed and sealed by the professional engineer responsible for planning and preliminary design, that planning and preliminary design of the necessary expansion have been initiated" if the permitted capacity will be equaled or exceeded within the next five years. The required statement is included in this report.

FIGURE 4-4

WWTP Phase 4 (2008-2011) - 5 MGD

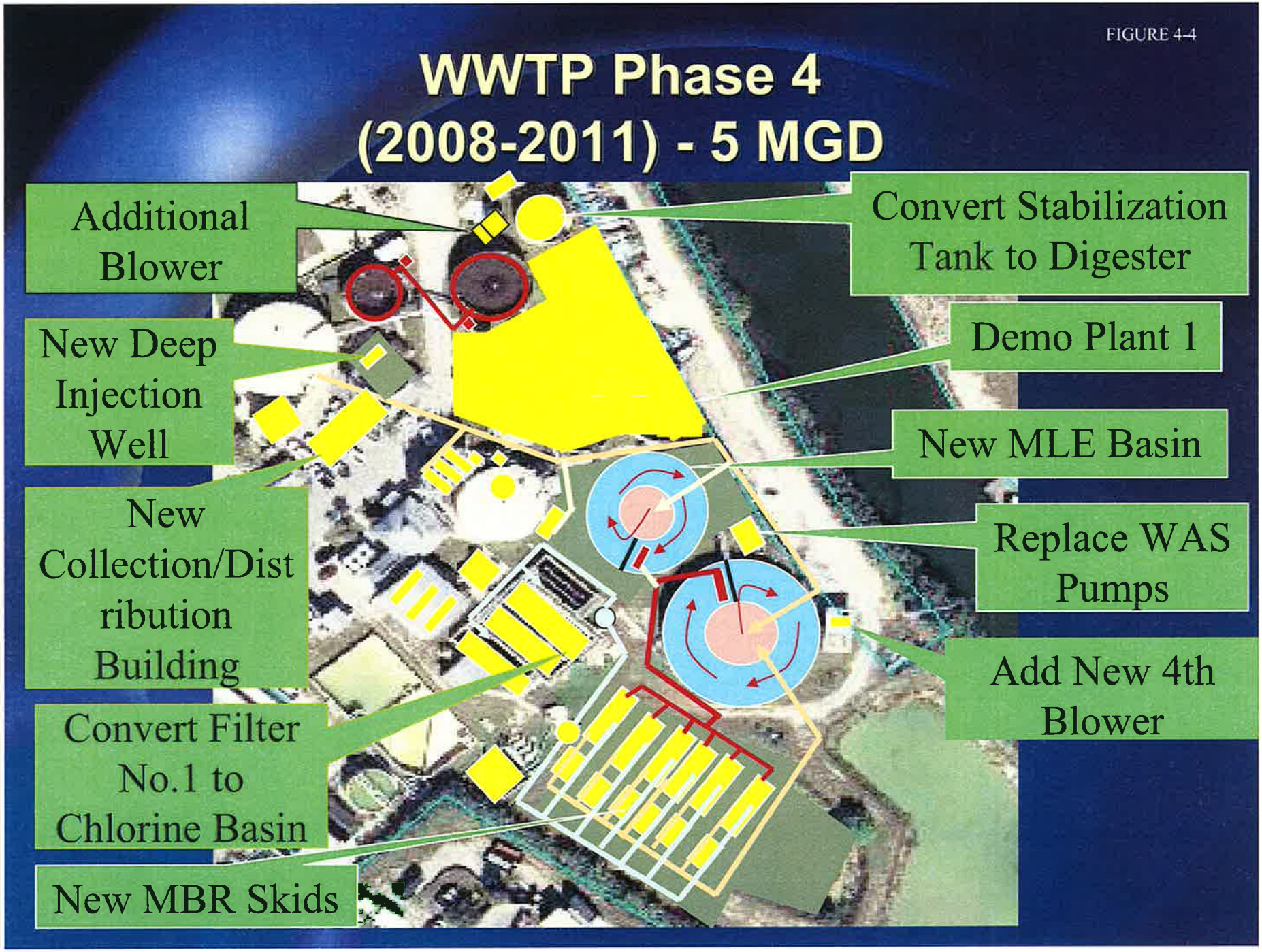
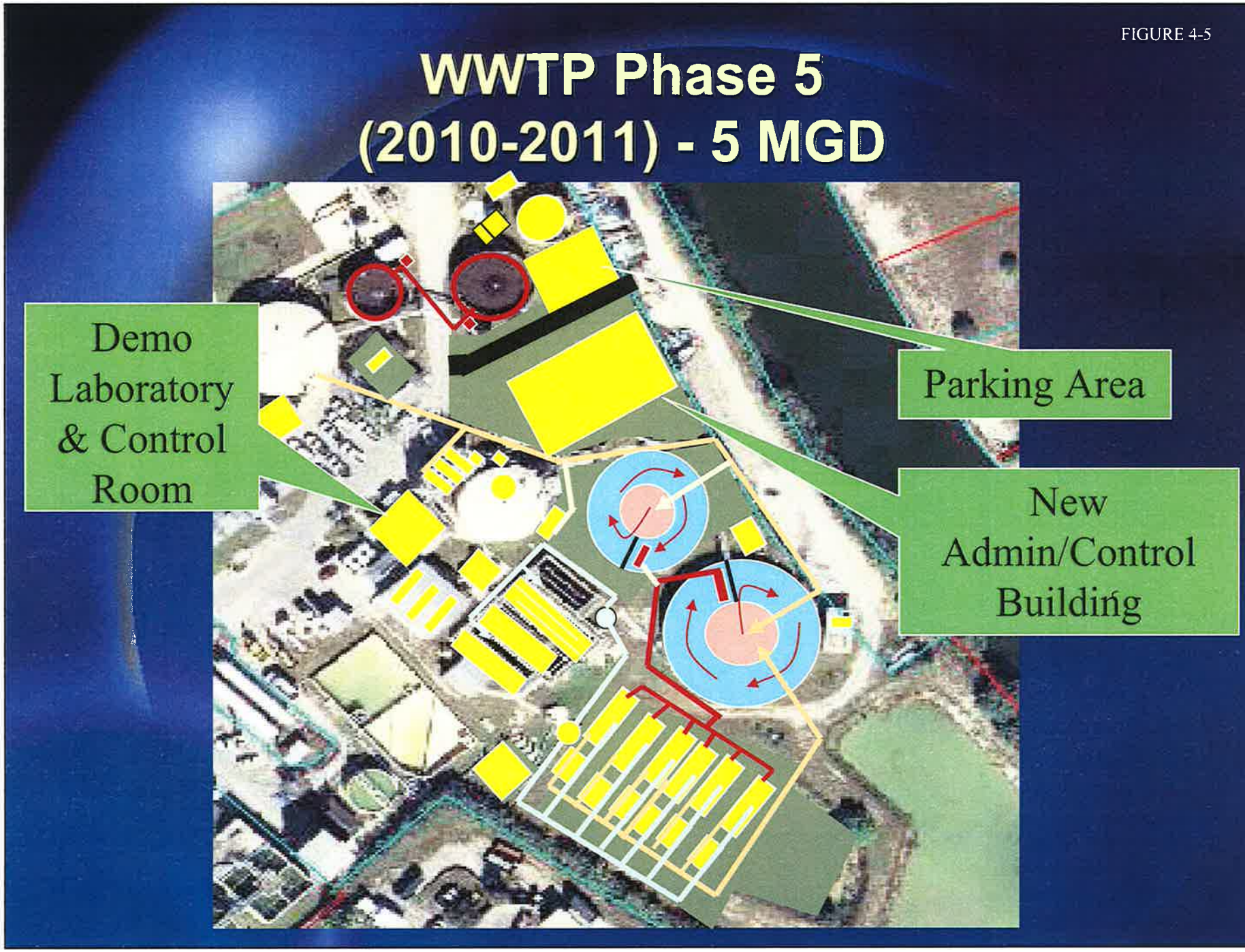


FIGURE 4-5

WWTP Phase 5 (2010-2011) - 5 MGD



APPENDIX A

Land Use Information from the Utility Master Plan

1.4 LAND USE

1.4.1 Current Land Use

The City of Marco Island encompasses approximately 14 square miles, of which, only 1,122 acres are undeveloped. There is limited growth potential and future land uses in the City of Marco Island are not expected to significantly change.

In order to determine the build-out and land use of the Island and the surrounding areas, the most current land use information (April 2004) from the City of Marco Island Community Planning Department was used.

The City's current breakdown of land use categories are presented in Table 1-2.

Table 1-2 City of Marco Island Existing Land Use

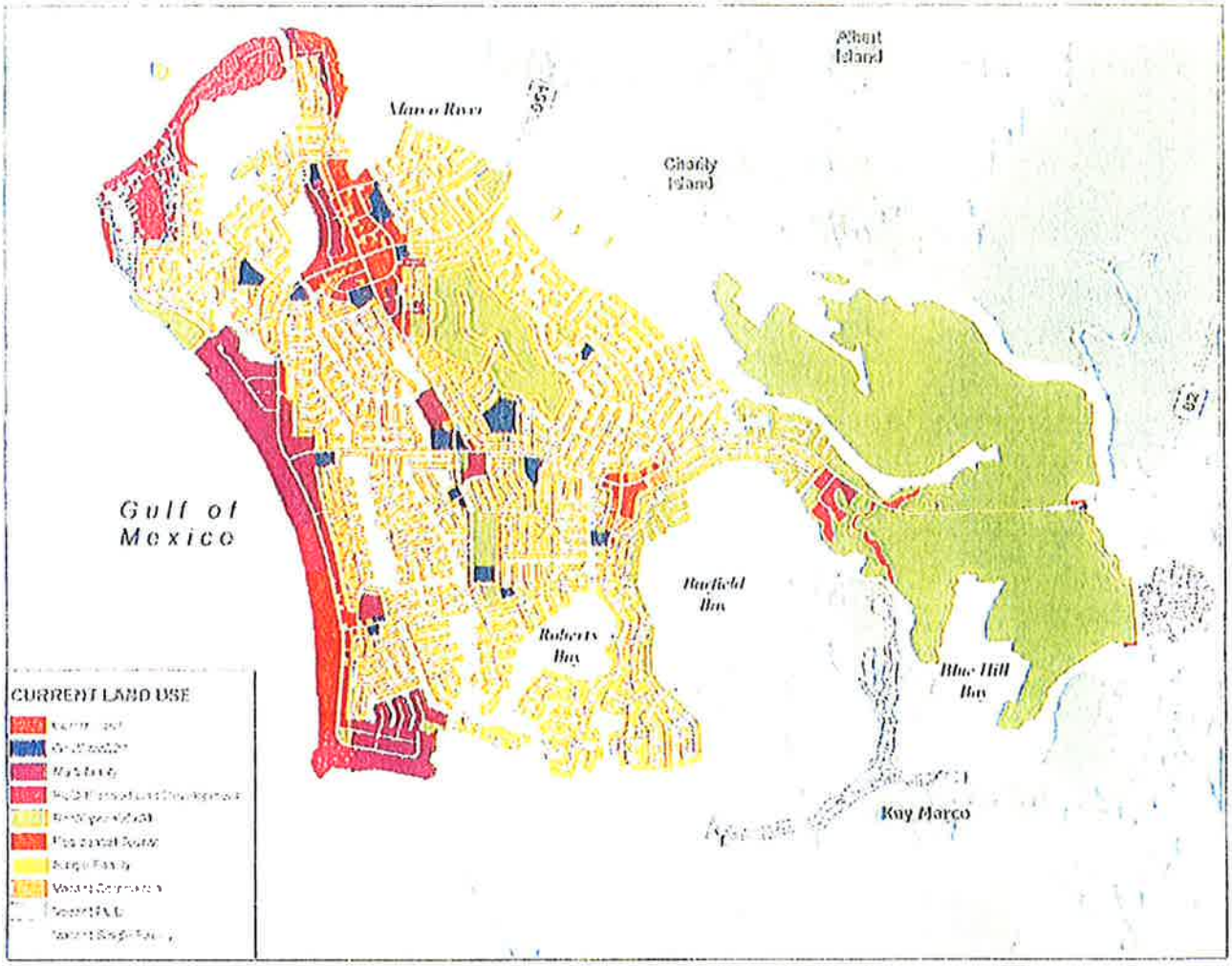
Category	Land (Acres)	% of Total Land Use
Single Family	1,574	26.6%
Multi-Family	420	7.1%
Commercial	162	2.7%
Recreational/Conservation	2,241	37.9%
Resort Residential	97	1.6%
Utilities	29	0.5%
Government/Institutional	108	1.8%
Other	165	2.8%
Vacant	1,122	19.0%
Total	5918	100%

Based on the water service classifications and the number of such services connected in February 2004, approximately 70% of the area zoned for single family households were connected to the water system (occupied). Similarly the multi-family households were estimated to be 95% connected and commercial parcels were estimated to be 90% connected.

Based on the information summarized above, the City is approximately 77% built-out. If all unserved properties were connected to the water system, it was estimated that total water demand would increase by approximately 29%.

Figure 1-6 shows the current land use on Marco Island

Figure 1-6 Current Marco Island Land Use



1.5 Future Development

The City of Marco Island has historically been, and will continue to be, a residential community. At roughly 77% build-out, the remainder of the available land is currently zoned for new homes or condominiums. The high degree of build-out on the Island and the high cost of land greatly affect opportunities to expand and improve existing utility facilities and infrastructure. The cost of land minimizes the options for locating new utility facilities on the Island and increases the pressure to place some of these facilities off the Island. Figure 1-7 displays the future land use for the City of Marco Island

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**	