

BASIS FOR SIZING THE WATER PLANTS AND WASTEWATER PLANT PURCHASED FROM FLORIDA WATER SERVICES

Summary

A review of historical documents from 1989 to 1994 provided the information on the sizing of the water and wastewater plants on Marco Island. The principal factor in sizing the capacity for water treatment is the flow per single family residence and multi-family units. The principal factor in sizing the capacity for wastewater treatment is the wastewater generated per day per capita. The estimate of the maximum month water demand for 2010 were moderately higher by about 10 to 15% of the actual value but the predicted maximum month wastewater demand was much higher than actual value of 2.46 mgd.

Water Plants

Based on the prediction by Southern States Utilities (SSU) (see Draft Planning Document for Marco Island, 1994) the size for the two water treatment plants was expected to meet the demand at build-out. However, SSU was aware that the Reverse Osmosis Plant would have problems in the future maintaining high capacity operation (from degradation of the supply wells) and had planned on the ASR System to be developed to provide the additional raw water for the Lime Plant.

The best estimate used to predict the water demand was 664 gallons per day (gpd) per single family residence and 285 gpd for the multifamily units (see Draft Planning Document for Marco Island, 1994). At that time the multi-family units all used potable water for irrigation. The current usage of potable water by multifamily units is below 200 gpd because of the use of reclaimed water for irrigation. The 664 gpd for single family residences is 243,000 gallons per year (gpy) compared to the 224,000 gpy for FY 2011.

Wastewater Plant

The basis for sizing the Marco Island Wastewater Plant was to provide sufficient capacity to about year 2000 which had predicted average day flows of 3.5 mgd. The flow rates were based on a per capita in each type of residence. The value assumed in most instances was a level-of service of 100 gpd plus an additional 21% for commercial businesses so the design is 121 gpd per capita. The difference in the total wastewater flow from a single family residences and multifamily units was the use of a slightly higher per capita (about 0.2 to 0.5).

1.0 Background

Marco Island Wastewater Treatment Plant (WWTP)

The WWTP purchased by the City of Marco Island (City) was expanded in phases from 1970 to 1990. The first phase consisted of building Plant #1 which had a treatment capacity of 1.25 million gallons per day (mgd). By the late 1970's the treatment capacity

had to be expanded by 1.25 mgd with Plant #2 using the same technology. By 1989 the capacity had to be expanded by 1 mgd with the construction of Plant #3 using the same technology as Plants #1 and #2, but with a different physical configuration to limit the footprint.

Marco Island North Water Treatment Plant (NWTP)

The two water treatment plants on Marco Island were constructed in 1978 with a Lime Reactor (softening) vessel and sand filters with a capacity of 5 mgd. There was an existing 2 mgd Permutit Lime softening plant consisting of three precipitators (i.e., cone shape lime softening vessels) with six sand filters. The total treatment capacity was 7 mgd. The Permutit Lime Plant was decommissioned in 1991. From late 1991 until April 30, 1992 when the new SWTP started up the utility often had low pressure complaints since it could not meet the water demand. In 2000 a Zenon Membrane Filtration System with a capacity of 1.67 mgd was added to the 5.0 mgd Lime Plant (NWTP) so that the treatment capacity (that had been limited by the filtration capacity) was increased to 6.67 mgd.

Marco Island South Water Treatment Plant (sWTP)

Construction of the SWTP started in 1989 with a capacity of 4 mgd and two planned expansions of 1 mgd each occurred in 1995 and 1996.

2.0 Basis for the Sizing of the Water Plants and Wastewater Plant

Of all the documents received from Florida Water Services (FWS), three reports provide most of the information for the treatment capacities of the water plants and the wastewater plant purchased by the City. The Marco Island 10-Year Water and Wastewater Master Plan dated January 1991 by Hartman and Associates referenced two other reports with planning information: the Engineering Preliminary Design Report Marco Island Wastewater Treatment Plant Expansion Program by Dyer, Riddle, Mills & Precourt, Inc.; and the Collier County Growth Management Plan, Future Land Use Element. The 1991 Master Plan appears to contain all the relevant data from those two reports. The report with the most accurate predictions of water and wastewater flows (although still overestimates of actual values) was the Planning Document for Marco Island prepared in November 1994 by Southern States Utilities Planning and Engineering Dept.

When all these reports were written the only user of reclaimed or raw water was the Island Country Club. The water demand predictions in all these reports must be subtracted by the additional reclaimed and raw water (about 1.5 to 2 mgd except for the rainy season) in order to estimate the predicted demand for potable water.

Collier County and Marco Island Water Supply Feasibility Study, August 1989

The earliest relevant report on planning found is the Collier County and Marco Island Water Supply Feasibility Study by Hole Montes and Associates, dated August 1989. This report is primarily evaluates various water supplies located in Collier County that

could be used for as a raw water supply for Marco Island. The report does provide data on population, single and multifamily housing units, and potable water demand for 1988 and projections through 2010. The basis for the water demand was 200 gallons per day per person with a peaking factor of 1.5. Of the total demand, 65% is attributed to irrigation (Attachment #1, page 7). The report overestimated the population growth and predicted a peak population of 62,145 in 2010 (Attachment #1, page 9); and as a result it overestimated the annual average daily water demand at 12.839 mgd (Attachment #1, page 9). The flow for the maximum month (assume it is February or March) is given in Table 2 (Attachment #1, page 10) and it also provides a breakdown of the amount of water for irrigation and potable water. The annual average water demand of 12.839 mgd today would be taken as the sum of the reclaimed water (and raw water for irrigation) and potable water. Subtracting the reclaimed water and raw water for irrigation from the 12.839 mgd gives about 10.8 mgd compared to the actual potable water demand of 6.7 mgd.

Marco Island 10-Year Water and Wastewater Master Plan, January 1991

The 10-Year Master Plan was prepared by Hartman and Associates and as previously noted includes data from the Preliminary Engineering Report and the Collier County Growth Management Plan. Attachment #2 is the Executive Summary and noted on page 1 is a level-of-service of 800 gallons per day (gpd) of water for single family residences, and 285 gpd water for multifamily units. The 800 gpd per residence is the water that must leave the plants and it includes about 7% loss; the actual demand is 744 gpd or 271,500 gallons per year (gpy). This is a reasonable (but a little high) estimate. In FY2011 the actual average flow billed was 224,000 gpy per residence.

Wastewater demand is based on 121 gpd per capita for both single family residences and multifamily units.

Attachment #3 is Section 2 of the report and provides the historical data and projections of water and wastewater flows. Page 2-2 notes the projections for water and wastewater flows assumes that the flows to septic systems will be connected to the sanitary system and the service area expanded to Horrs Island. Figure 2-8 shows the predicted annual average daily water demand and the maximum day up to year 2000 (limit of report 10 years). Figure 2-12 shows the predicted wastewater flows up to year 2000. Both estimates are higher than actual and the wastewater is much higher than what is expected. An estimate of wastewater flow at build-out will be about 3.8 mgd for the daily flow in the maximum month. This compares to an estimate of 6.2 mgd in year 2008.

Draft Planning Document for Marco Island, November 1994

This report (Attachment #4) was prepared by the Planning and Engineering Department of Southern States Utilities (SSU) the owner of the utility. It has the best predictions of water and wastewater flows. Page 3-9 has a table showing single family residences demand (at the plant) of 715 gpd and 668 gpd at the residence. The 668 gpd is 243,000gpy which was a typical value for the years 2000 to 2007. For multifamily units the values are 305 gpd at the plant and 285 gpd at the unit. Figure 3-1 shows an estimate

of the maximum day for 2010 at about 10.7 mgd. The actual maximum water demand was 9.6 mgd in March (there was a 9.9 mgd in October that was probably an anomaly). Note the 9.6 mgd is potable water but the 10.7 gpd includes potable and reclaimed water.

Wastewater Capacity Analysis Reports – 1992 and 1994

The Wastewater Capacity Analysis Reports for 1992 and 1994 by Hartman and Associates have predictions of wastewater flows but that data has been included in the SSU report.