EXECUTIVE SUMMARY

UTILITY MASTER PLAN

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Executive Summary

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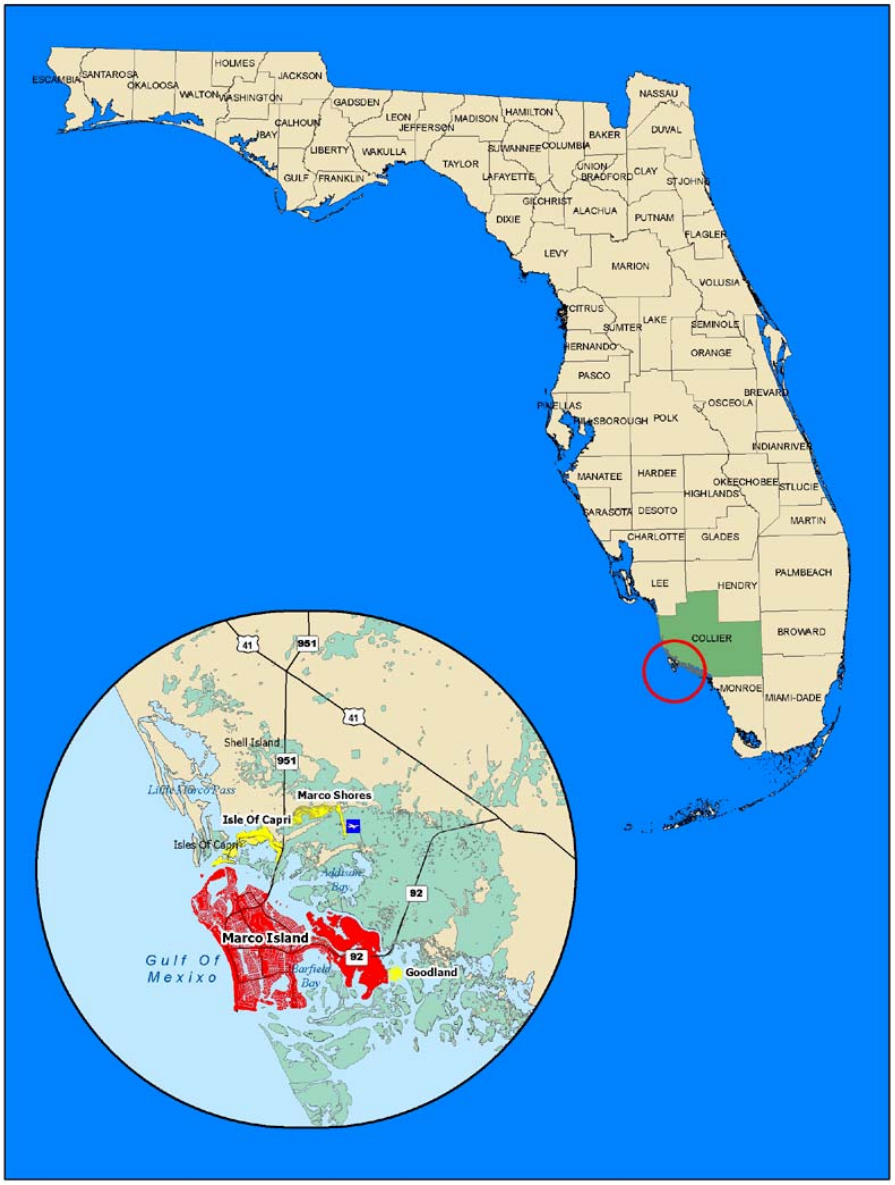
1 UTILITY MASTER PLAN – EXECUTIVE SUMMARY

1.1 PROJECT PURPOSE AND DESCRIPTION

The City of Marco Island is located in the southwest portion of the state of Florida in Collier County, (**Figure 1-1**), and was incorporated in August of 1997. Until recently, the majority of water and sewer utilities on the Island were owned and maintained by Florida Water Services. The City of Marco Island purchased these utilities in November 2003, with the exception of North Marco Utilities, a small franchise utility that services a community in the far north of the Island.

Figure 1-1 City of Marco Island Location Map



This Utility Master Plan (UMP) was performed to provide an overall strategy and direction for the management of the City's water and sewer systems. The objectives were to identify utility needs for the City for 2004 through 2010 in detail, as well as anticipated needs from 2010 through build-out conditions. The UMP describes current system conditions, defines the expansion of the utility system, provides recommendations on utility system expansions, and identifies regulatory issues that may impact the City's utility system.

The UMP encompasses a review of water resources, potable water systems and facilities, wastewater systems and facilities, an unsewered area strategy, and a feasibility assessment of reclaimed water aquifer storage and recovery (ASR). A capital improvement plan (CIP) is also included with strategies for financing.

1.2 STUDY AREA

The study area for the UMP differs from the existing service area (**Figure 1-2**), encompassing the City of Marco Island as well as Goodland and Key Marco (**Figure 1-3**). Although the City currently serves the community of Marco Shores (also known as Hammock Bay) and treats wastewater from the Isles of Capri, it is likely that Collier County will take over operation and maintenance of these areas in 2005. Therefore, Marco Shores and the Isles of Capri were not included in the scope of the UMP.

Figure 1-2 Existing Marco Island Utilities Service Area

Figure 1-3 Utility Master Plan Service Area

The City of Marco Island currently encompasses roughly 14 square miles, including its distinctive canal system. Only 1,122 acres of land (approximately 2,100 lots) remain undeveloped. As of February of 2004, approximately 70% of the area zoned for single family homes on the Island were connected to the water system. It was assumed that this figure would correlate directly to the percentage of homes and sites that were occupied on the Island. Similarly, the multi-family homes were 95% occupied and the commercial lots were estimated to be 90% occupied. These figures were determined from cross-referencing the billing and geographic information systems (GIS) data. Based on these figures, the City of Marco Island is estimated to be approximately 77% built out.

1.3 POPULATION

The existing permanent population estimates were determined by the City's Community Planning Department and are an average of the Electric Customer Method and the Building Permit Method. The Electric Customer Method counts the number of new electric customers that receive power in the service area and the Building Permit Method assumes that half of the new building permits issued will be occupied within the first month after the award of the permit. The City's estimate for the 2004 permanent population was adopted for use in this Master Plan and was 16,800.

The permanent population at build-out (2025) was projected to be 24,400, an increase of approximately 35%. The demands on utilities are impacted, to a large degree, by the seasonal population influx that Marco Island experiences during the winter months each year. The demands included in the UMP assume that the seasonal population will increase in proportion to the permanent population.

1.4 DEMANDS

1.4.1 Potable Water Demand

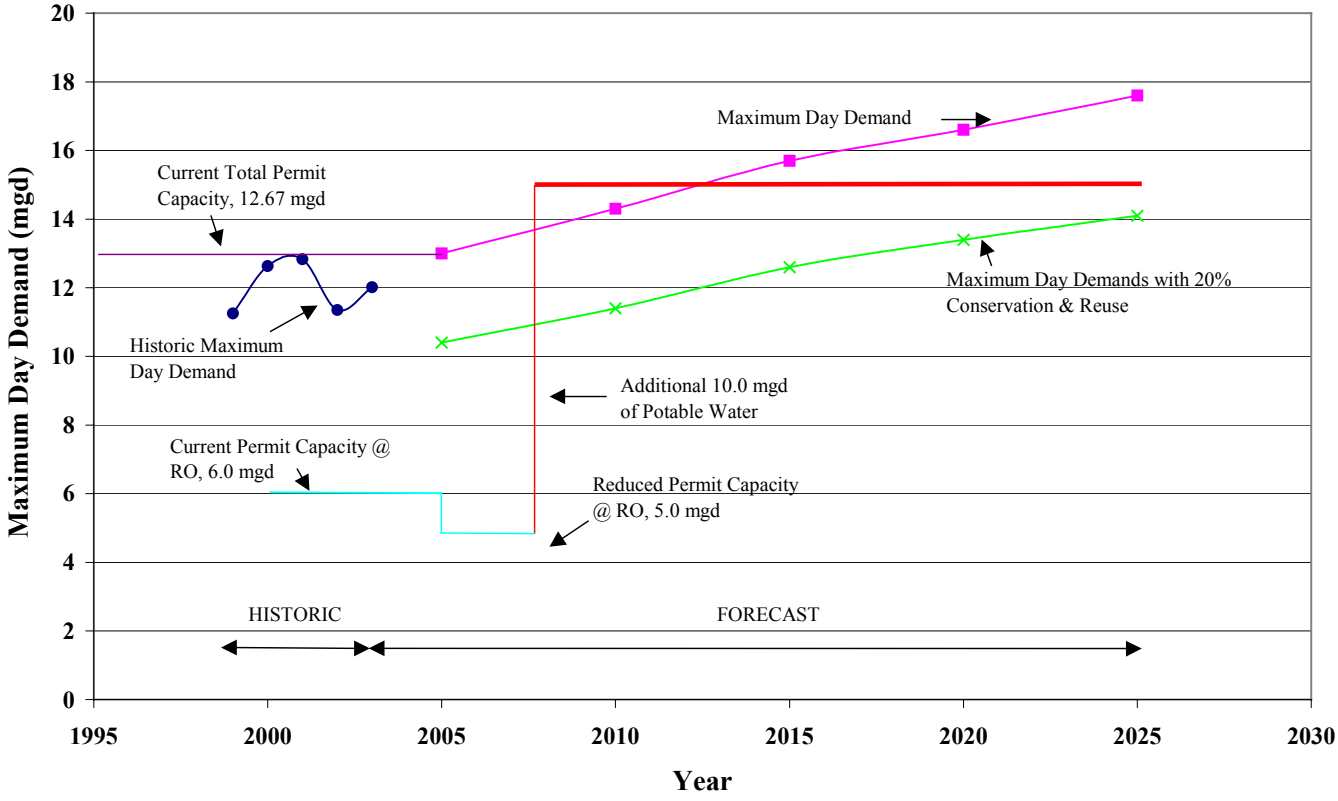
In order to develop potable water demands, historical monthly billing data for the City of Marco Island was used. Unfortunately, recorded production records were discontinuous and were not considered a reliable source for demand forecasting.

The City's peak demand, between midnight and 6 a.m., is attributed primarily to irrigation demands. It was estimated that over 60% of the City's annual potable demand was produced to meet irrigation demand. The City's gross water consumption is over 500 gallons per capita per day (gpcd) based on permanent residents. Correcting this gross consumption to reflect the seasonal residents reduces the average consumption to approximately 350 gpcd.

The combined treatment capacity of the two existing water treatment plants on Marco Island is 12.67 mgd and the City has seen demands in recent years in excess of 12 mgd. It is clear that the City's potable demands (**Figure 1-4**) will soon exceed the capacities of the two water treatment plants unless system-wide changes are made either in the form of conservation or additional capacity.

As the existing reuse system is limited to golf courses and hotels/condominiums along Collier Boulevard, residential irrigation demands are met with potable water. Currently, approximately half of the City's treated effluent is used as reclaimed water with the other half disposed of down a deep injection well. Deep well disposal can be reduced with an increase in the reclaimed water distribution network and additional reclaimed storage.

Figure 1-4 Future Demand Projections



1.4.2 Irrigation Water Demand

The recommended strategy is one that combines conservation measures, a revised rate structure, a move toward increased reuse utilization, providing additional raw water, and wastewater treatment capacity. The proposed demand projections assume that a 20% reduction in potable water consumption can be achieved through demand management measures. The measures will allow the City the necessary time to design and build additional water treatment facilities and will reduce the future demand on raw water sources.

1.5 WATER RESOURCES

Water resources for Marco Island and Marco Shores are currently provided by 18 production wells located on the Island. Three new wells are under construction and are scheduled to be online in February or April 2005. The City will also phase out three existing wells leaving a total of 18 wells. Water is also obtained from surface water that is derived from Marco Lakes located nine miles inland.

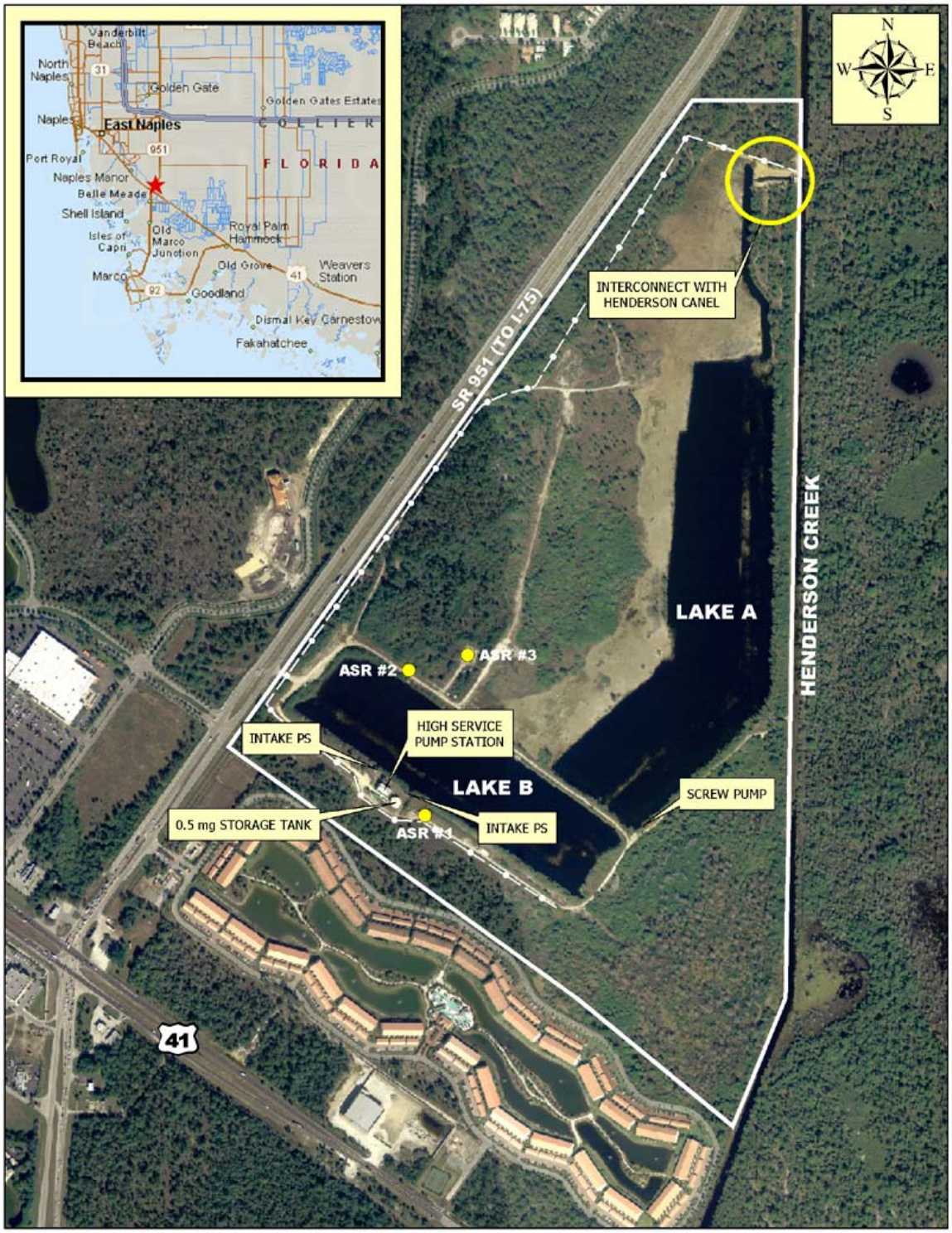
The brackish production wells on Marco Island were drilled into the Mid-Hawthorn Formation in the central and eastern areas of the Island (**Figure 1-5**). The current wellfield is capable of producing 9.2 mgd of raw water. This is expected to increase to approximately 11.4 mgd when construction of the additional three wells is completed. Water from the brackish production wells supplies a 6 mgd Reverse Osmosis (RO) water treatment plant (WTP) on the Island, which produces potable water for distribution. Approximately 25% of the raw brackish water is disposed of as concentrate from the treatment process.

Figure 1-5 Existing and Proposed RO Production Wells

The current South Florida Water Management District (SFWMD) Water Use Permit for Marco Island allows for a total annual withdrawal of 2,993 MG (8.2 mgd) of water from the brackish production wells. The potential wellfield yield is greater than the permit allocation, which should allow operational rotation of the pumped wells. However, approximately 75% of the annual well production flow occurs during the dry season (December through May). Additionally, elevated total dissolved solids (TDS) levels in some existing wells necessitates over pumping of some wells and under pumping of others to maintain combined levels appropriate for the RO membranes. This, paired with the seasonal pumpage, places a strain on the Mid-Hawthorn Aquifer. At present, during winter months, the average TDS of all wells combined is approximately 10,000 miligrams/liter (mg/L), which is the maximum design point of the RO WTP membranes.

The Marco Lakes site consists of two man-made lakes, Lake A and Lake B and three ASR wells (**Figure 1-6**). Water is pumped from Lake B to supply the Marco Island and Marco Shores Lime Softening Plants. Lake A is separated from Lake B by a 40-foot wide embankment and includes a single culvert connection. When water levels in Lake A fall below the culvert a screw pump can be used to transfer water from Lake A into Lake B.

Figure 1-6 Marco Lakes Site Map



Water to Marco Lakes is primarily supplied by Henderson Creek, which runs parallel to the eastern side of the Marco Lakes site and ultimately discharges to Rookery Bay four miles to the southwest. Water from Henderson Creek recharges Marco Lakes through subsurface flow and through a sluice gate interconnect between Henderson Creek and Lake A. Based on flow records over the past nine years, it is estimated that Henderson Creek discharges an average of 16,653 MG (92 mgd) to the Gulf of Mexico via Rookery Bay during the wet season (July to November). Water flow during the dry season has fallen to zero in two of the past nine years.

The three ASR wells at the Marco Lakes site allow the storage of partially treated surface water underground during the wet season, when there is excess water available in Henderson Creek. Water abstracted from Lake B is diverted, filtered and chlorinated, and injected into the ASR wells. During the winter months water is then pumped from the wells to the Lime Softening Plants to supplement dry season demands.

The SFWMD Water Use Permit for Marco Lakes currently allows 3,015 MG of raw water to be extracted from Marco Lakes annually. The Marco Lakes permit does not specifically limit how the withdrawals can be used, i.e., of the 14.3 mgd allocation, 9.0 mgd does not specifically have to go to the ASR wells or 5.3 mgd to potable uses. The permit stipulates certain limitations on use of the water sources. Three new ASR wells are currently under construction at the Marco Lakes site and are expected to be online in July 2005.

The ASR storage of water from the lake is restricted to the period of July 15 to November 15. The sluice gate interconnect is permitted to be opened during the wet season between July 1 and November 30 to allow direct flow from Henderson Creek into Lake B.

It is recommended that the brackish water supply wells and the RO WTP be operated to produce a maximum of 5 mgd of treated water in 2007, and consequently, maximum daily demand will no longer be met under the current water distribution. In order to meet water demands in the near future and to attempt to limit further salinity increases in the brackish production wells, pumping from the wells should be limited to peak demand during the dry season. It is believed that this may allow the wells to recover to the extent that the rate of increase in TDS levels might be slowed, or even halted.

To make up for the reduced capacity from the brackish wells, water withdrawals from Marco Lakes must be increased during the dry season, a portion of which will go toward an expansion of the ASR system. Increased usage of ASR will provide additional dry season capacity and reliability. Also, additional water treatment capacity will be required almost immediately to meet increasing demands.

1.6 WATER TREATMENT

Marco Island's water treatment system is composed of three water treatment plants, including a 6.67 mgd Lime Softening (and membrane) Plant on the Island, a 0.72 mgd Lime Softening Plant at Marco Shores, and a 6 mgd (RO WTP on the Island (**Figure 1-7**). The service area for the Marco Shores water treatment facility will most likely be taken over by Collier County in 2005 and was not included in the long-term plans for the Marco Island water treatment system.

Figure 1-7 Water Treatment Plant Location Map

The Lime Softening Plant on the Island has a capacity of 6 mgd. In 2000, a 1.67 mgd nominal capacity membrane plant was installed at the Lime Softening Plant site. The membrane plant (known by manufacturers name as the "Zenon" plant) filters clarified softened water drawn from the existing reactor unit at the Lime Softening Plant.

In 1992, system capacity was increased by the construction of 12 production wells and a 4 mgd RO WTP. The RO WTP and operational wellfield was expanded to 6 mgd in 1996. There are now 18 wells on the Island and another 3 wells will be completed in early 2005. Brine produced at the RO WTP is disposed of through a Class I deep injection well located at the wastewater treatment plant (WWTP) site.

The RO WTP site includes 5 MG of ground level storage, and as a consequence, the RO WTP is the key source of supply during peak hour demands. As the Lime Softening Plant has only 1.5 MG of storage, it is necessary to restrict pumping rates from the Lime Softening Plant under peak hour demands in order to preserve adequate storage reserves. The total storage capacity on the Island is insufficient and more capacity will be required in the immediate future.

The Lime Softening Plant is co-located with the City's WWTP, which poses expansion problems for both facilities. As the Lime Softening Plant is nearing the end of its functional life, and as additional capacity is required of both the water and wastewater systems, it is recommended that the Lime Softening Plant be decommissioned. After the Lime Softening Plant is demolished, the site will be used solely for wastewater treatment (with the exception of the potable water high service pumps and storage tanks).

The RO WTP is in excellent condition and a significant resource for the City. However, the increasing trend of TDS levels from the production wells is cause for concern. The existing membranes are designed to take a maximum of 10,000 mg/L TDS, which is a level that is approached during the winter months when all wells are running. The construction of the new wells should help bring the total TDS down for a short time, but in the medium to long term, the RO WTP cannot continue to operate under the these conditions.

Additional treatment capacity is currently the most significant challenge facing the City. Several options for future water treatment were considered and ultimately a new treatment process is being recommended.

The recommended option is to reduce the City's dependence on the production (brackish) wells and to increase the capacity of the Marco Lakes system. The Marco Lakes system would supply the base demand throughout the year and the brackish wells would be used to meet seasonal peaks.

The Marco Lakes water, while not brackish, requires softening before potable use. A new pretreatment facility will be required to soften this surface water source and the most effective method of softening, in this instance, is through the use of nanofiltration (NF) membranes. It is proposed that one or two of the RO membranes at the existing RO WTP

be converted to NF membranes to process pretreated surface water from Marco Lakes. In addition to converting some of the membranes, additional new NF membranes must be constructed at the RO WTP site to replace the capacity that is currently supplied by the Lime Softening Plant.

The NF finished water will be blended with the RO finished water to produce a product similar in hardness to which the Marco Island Utilities customers are accustomed. The new pretreatment facility, which will also treat water pumped from the surface water ASR wells, will most likely be sited at the RO WTP site. Additional finished water storage capacity should also be installed both at the RO and Lime Softening Plant site to balance flows and equalize pressures to customers across Marco Island. This strategy gives the City operational flexibility and allows the City to make the most beneficial use of its current infrastructure.

1.7 HYDRAULIC MODELING

1.7.1 Water Distribution System

A hydraulic model of the existing City of Marco Island potable water distribution system was developed as part of the UMP. The main objective of the modeling was to determine the ability of the existing system to meet minimum operating pressures while delivering system demands, as well as identifying improvements necessary to maintain service and fire protection throughout the system.

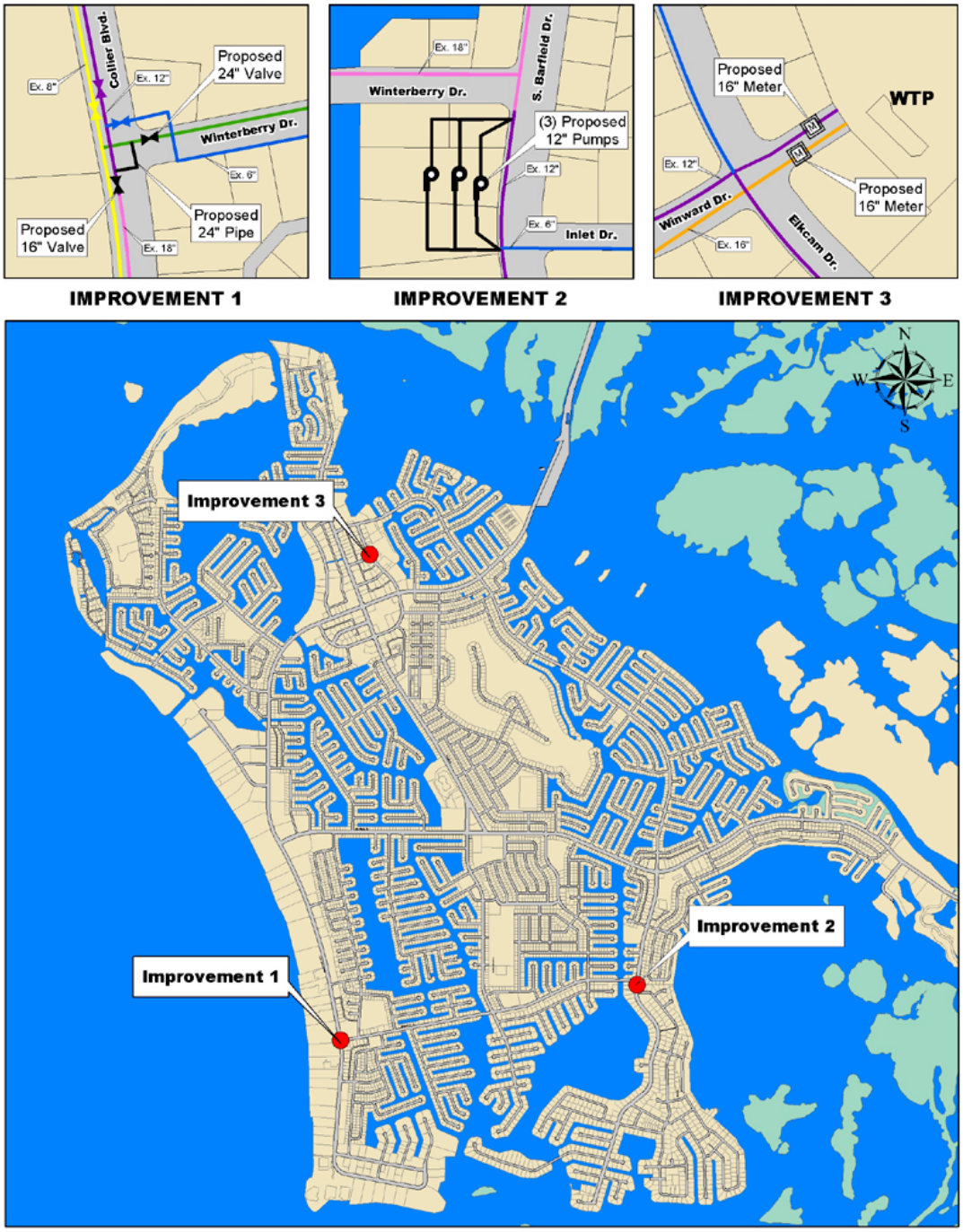
In addition to the 6.67 mgd Lime Softening Plant and the 6 mgd RO WTP, the City has approximately 106 miles of water distribution piping that includes PVC, HDPE, and asbestos cement (AC) pipe. Both treatment plants deliver treated water to customers via storage tanks and high service pump stations located at each water treatment plant site.

Each customer was assigned a demand based on the average demand for that billing type. Demands for residential customers were corrected for geographic location, as many of the larger residential users are in certain areas of the City. A seven day continuous recording event was used to collect data for verification and calibration of the hydraulic model. The analysis identified certain areas within the system that do not meet the adopted criteria. Most notably, the hydraulic model identified areas that are not currently protected by fire flow, including the Estates Area (south of Winterberry Drive, along South Barfield Drive), the Southwest Area (west of Seagrape Drive and south of Huron Waterway), and San Marco Road east of Dogwood Drive.

It was suggested that a 2-phase process be used to implement the recommended improvements. These improvements include upsizing pipelines, installation of additional valves and flow meters, and looping of distribution piping to avoid dead ends.

Phase 1 Improvements are shown on **Figure 1-8**.

Figure 1-8 Recommended Phase I Potable Water Improvements



Phase 2 improvements are shown on **Figure 1-9**.

Figure 1-9 Recommended Phase II Potable Water Improvements

1.7.2 Wastewater Collection System

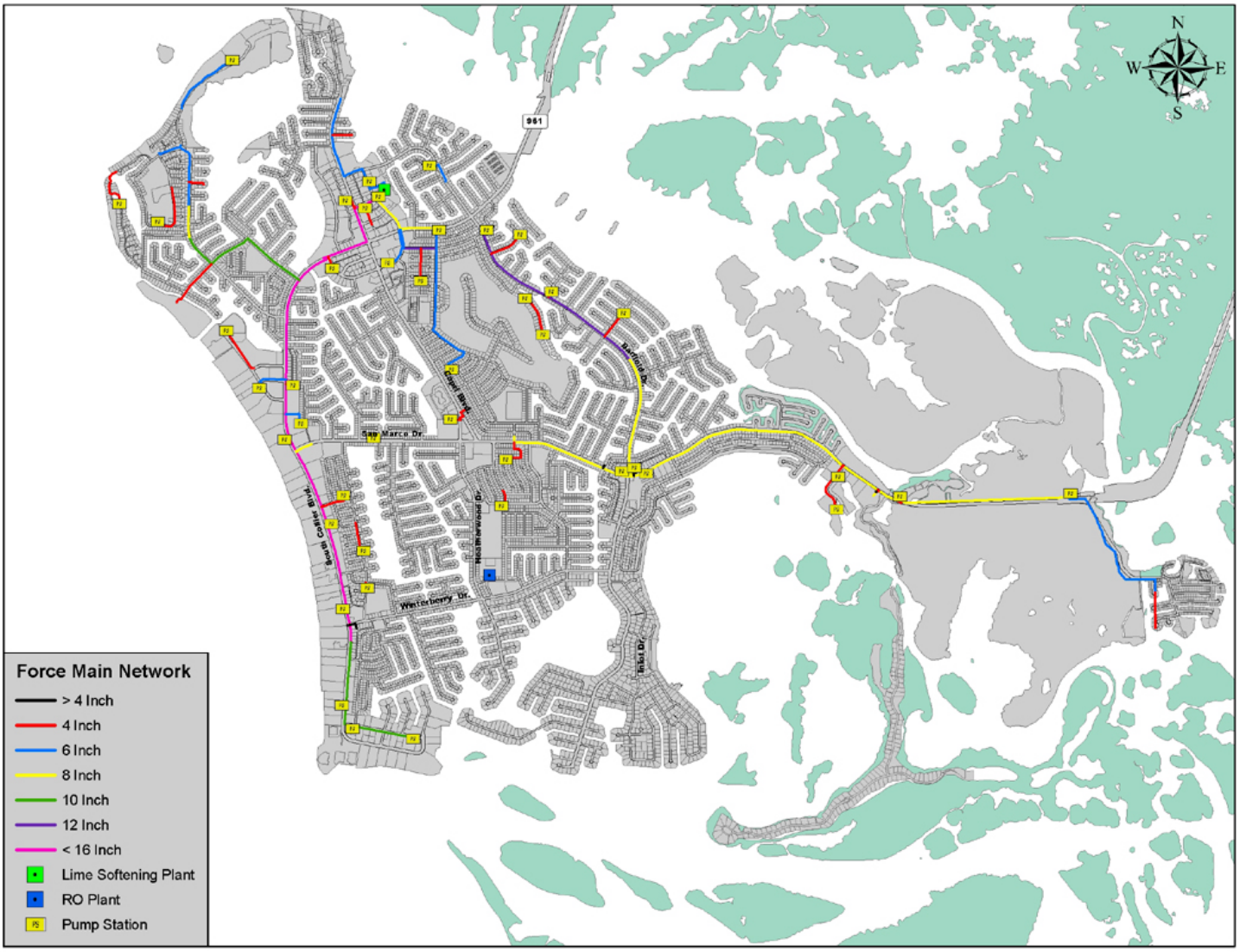
A hydraulic analysis of the wastewater collection (force main) system was also performed. The major objective of the modeling effort in this case was to determine the ability of the existing system to transfer current wastewater flows generated throughout the existing system to the Marco Island WWTP. Deficiencies and recommended solutions for those deficiencies were also detailed.

Marco Island's existing wastewater system is comprised of 39 miles of gravity sewer mains, 16 miles of force mains, 36 duplex pump stations, and a 3.5 mgd WWTP. There are also 18 smaller (0.5 horsepower) pump stations that were not included in this analysis. The force mains are made of PVC, ductile iron, and AC. The gravity sewer was primarily constructed of vitrified clay pipe.

The system was modeled with all pump stations operating simultaneously to determine the "worst case" scenario. When the existing system was modeled, 16 out of 36 pump stations were unable to meet the adopted criteria, including 10 that reached shut-off conditions and could not pump at all. It was clear that portions of the force main transmission system contain undersized pipes, pumps, and in some cases, velocities were up to 20 fps.

Again, a 2-phase approach was recommended for the force main improvements. Phase 1 consists of replacing existing 6-, 8-, and 12-inch force mains along Elkham Circle with a new 24-inch force main, installing Programable Logic Controllers (PLCs) at some pump stations, and a full pump station rehabilitation on eight of the existing lift stations (**Figure 1-10**).

Figure 1-10 Recommended Phase I Wastewater Collection Improvements



Phase 2 improvements include upsizing additional pipelines and five additional pump station rehabilitations.

1.7.3 Reclaimed Water Distribution System

The City's reclaimed system was also modeled. The major objective of the modeling was to determine the ability of the existing system to transfer current reclaimed water flows from the Marco Island WWTP to existing customers, as well as evaluate the ability of the system to deliver future flows after the sewer and WWTP expansions. Deficiencies were investigated and recommended solutions for the future reclaimed service area were also detailed.

The reclaimed water system is comprised of two 500,000 gallon storage tanks, three variable speed high service pumps, and transmission and distribution pipelines.

Primary users of the existing system are golf courses, hotels, and condominiums located on Collier Boulevard. The City also uses reclaimed water to irrigate some traffic medians.

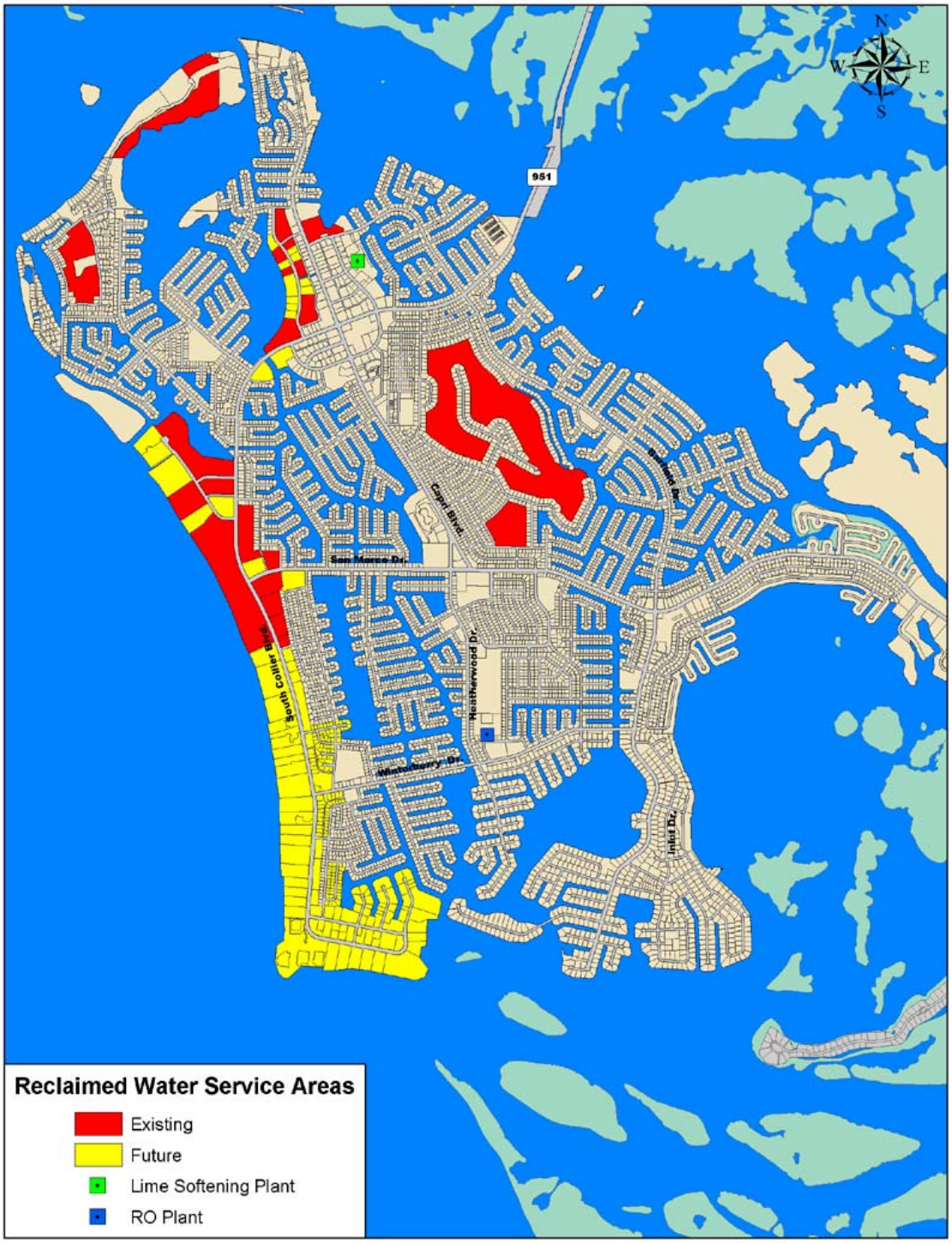
During periods of low demand (usually associated with wet weather) or substandard effluent quality, reclaimed water is discharged to an onsite Class I deep injection well. If the injection well is not operational, the effluent is pumped to rapid infiltration basins off of the Island.

Current reclaimed demands were determined from historical monthly billings for the existing reclaimed service area. Future reclaimed demands were determined by expanding the service area and assuming that 60% of the potable demand could be attributed to irrigation demands for these areas that are not currently served. Although only half of the City area is sewered, the areas of the City that do have sewer include the commercial and multi-family parcels that produce higher quantities of wastewater than residential parcels.

The current irrigation system often utilizes raw water from Marco Lakes to meet demand. In order to expand the irrigation system, additional reclaimed water storage needs to be provided or an alternate source of supplemental water should be identified to provide a reliable supply during the high demand season. Other than raw water from the Marco Lakes system that is marginal in terms of hardness for use as an irrigation supply, there is no source of supplementary water in the vicinity of Marco Island. The only viable method of storage for the large quantities of reclaimed water is reclaimed ASR. If the City wishes to increase the proportion of effluent that is reused, reclaimed ASR is the only method of achieving that goal.

It is recommended that the only areas that should be provided with reclaimed water, beyond those already being served, are the remainder of South Collier Boulevard (as infrastructure already exists), City parks, and medians. These areas together with the existing service area make up the future reclaimed service area (**Figure 1-11**).

Figure 1-11 Future Reclaimed Service Area

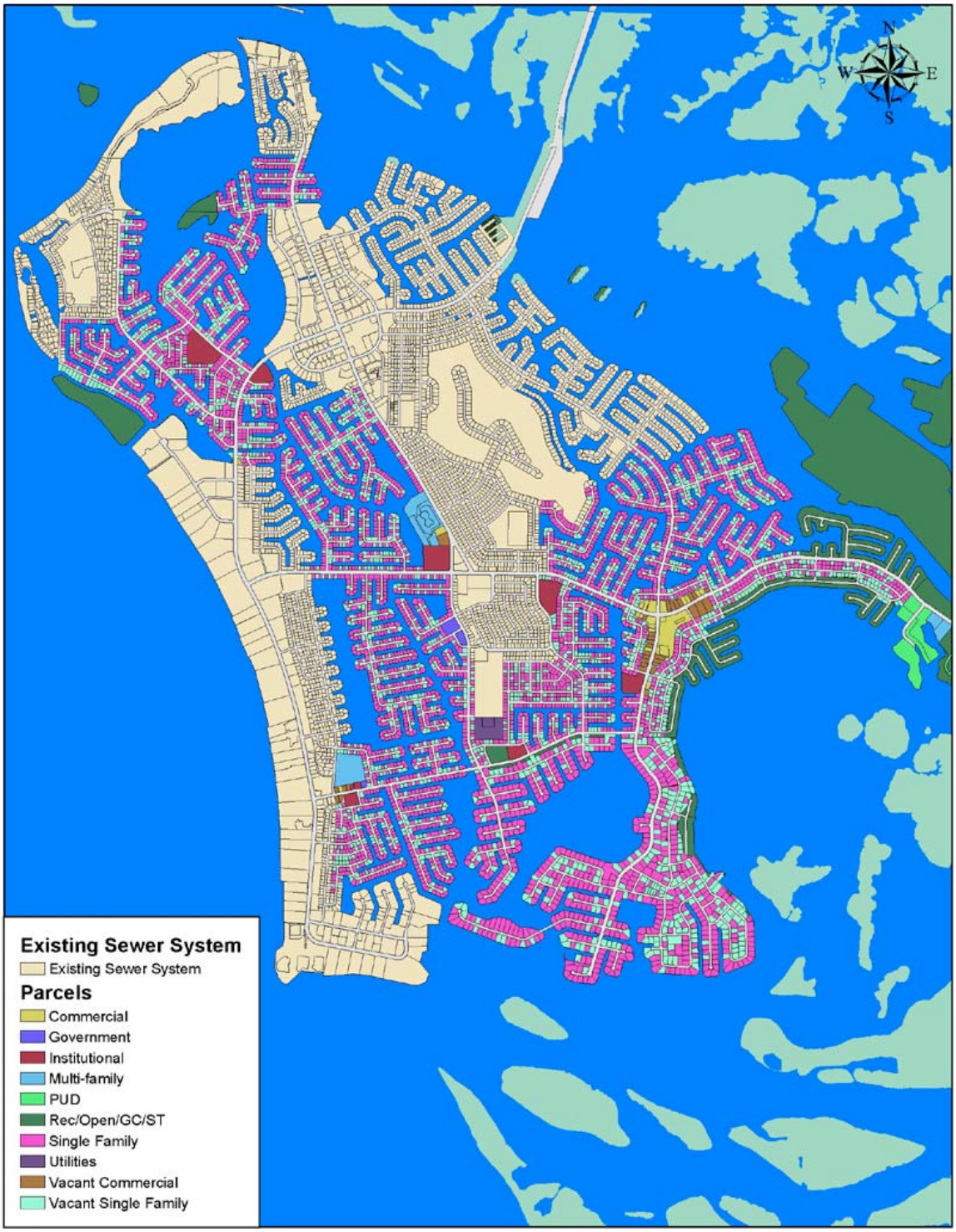


The analysis of the existing reclaimed system demonstrated that the system is adequately sized to meet current peak demands. With an extension of a 12-inch pipeline to the end of South Collier Boulevard, adequate irrigation service can be provided to the expanded (future) reclaimed service area.

1.8 UNSEWERED STRATEGY

The existing wastewater collection system on Marco Island consists of a system of gravity sewers, pumping stations, and force mains. The existing system was constructed in several phases by different entities. This system currently serves only 40% of the Island (by area), with the remainder of the population on septic tanks (**Figure 1-12**). A survey of a representative sample of residents from all areas of the City conducted in February 2004 determined that a majority of the City is in favor of extending the sewer to the areas of the Island that currently employ septic tanks.

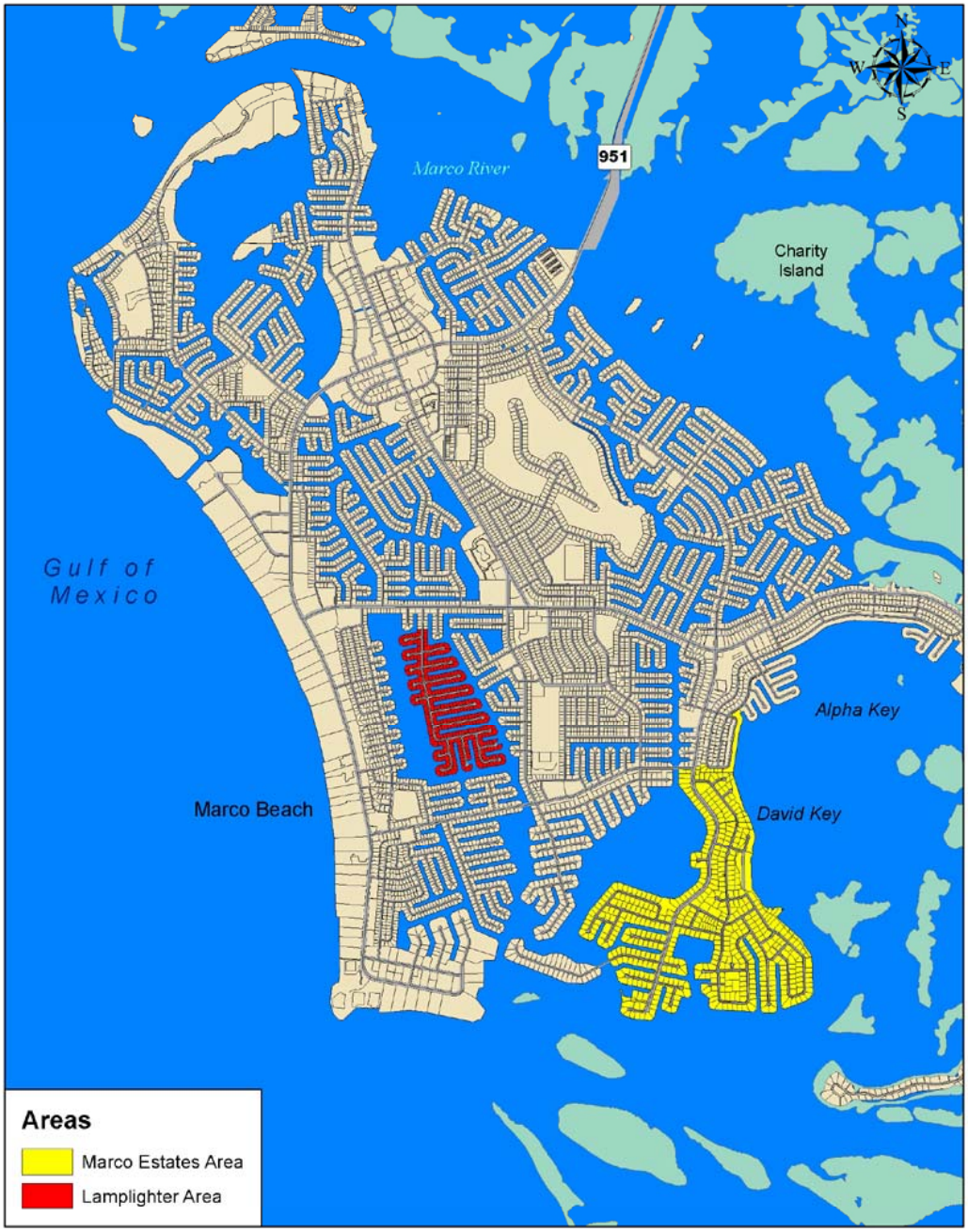
Figure 1-12 City of Marco Island Unsewered Areas



Four of the most common sewer collection technologies were evaluated to determine the best sewer collection method for the City, including conventional gravity sewer, vacuum sewer, a grinder pump system, and a septic tank effluent pump (STEP) system.

Detailed system layouts were developed for two areas of the City for each of the technologies in order to develop accurate cost comparisons. These two areas labeled the "Estates Area" and the "Lamplighter Area" were used to ensure that the costs were compared in areas with different lot size and variation in elevation (**Figure 1-13**).

Figure 1-13 Unsewered Strategy Representative Areas



The cost differences were not significant between the four sewer collection technologies. Therefore, non-cost factors were of higher importance in the selection of the best sewer collection method to construct in the unsewered areas of the Island. The factors that were considered included:

- Reliability;
- Construction disruption;
- Operator ease;
- Land requirements;
- Ability to operate under loss of power;
- Homeowner issues;
- Integration with the existing system, and,
- Inflow and infiltration.

After the evaluation of both costs and non-cost factors, as well as consensus from the Marco Island City Council and utility staff, it was decided that gravity sewer would be the best option for the City.

Preliminary catchment areas were identified for the gravity sewer alternative and are shown in **Figure 1-14**. It is important to note that it will be necessary to expand the wastewater treatment capacity on the Island prior to sending additional flow from the newly-sewered areas.

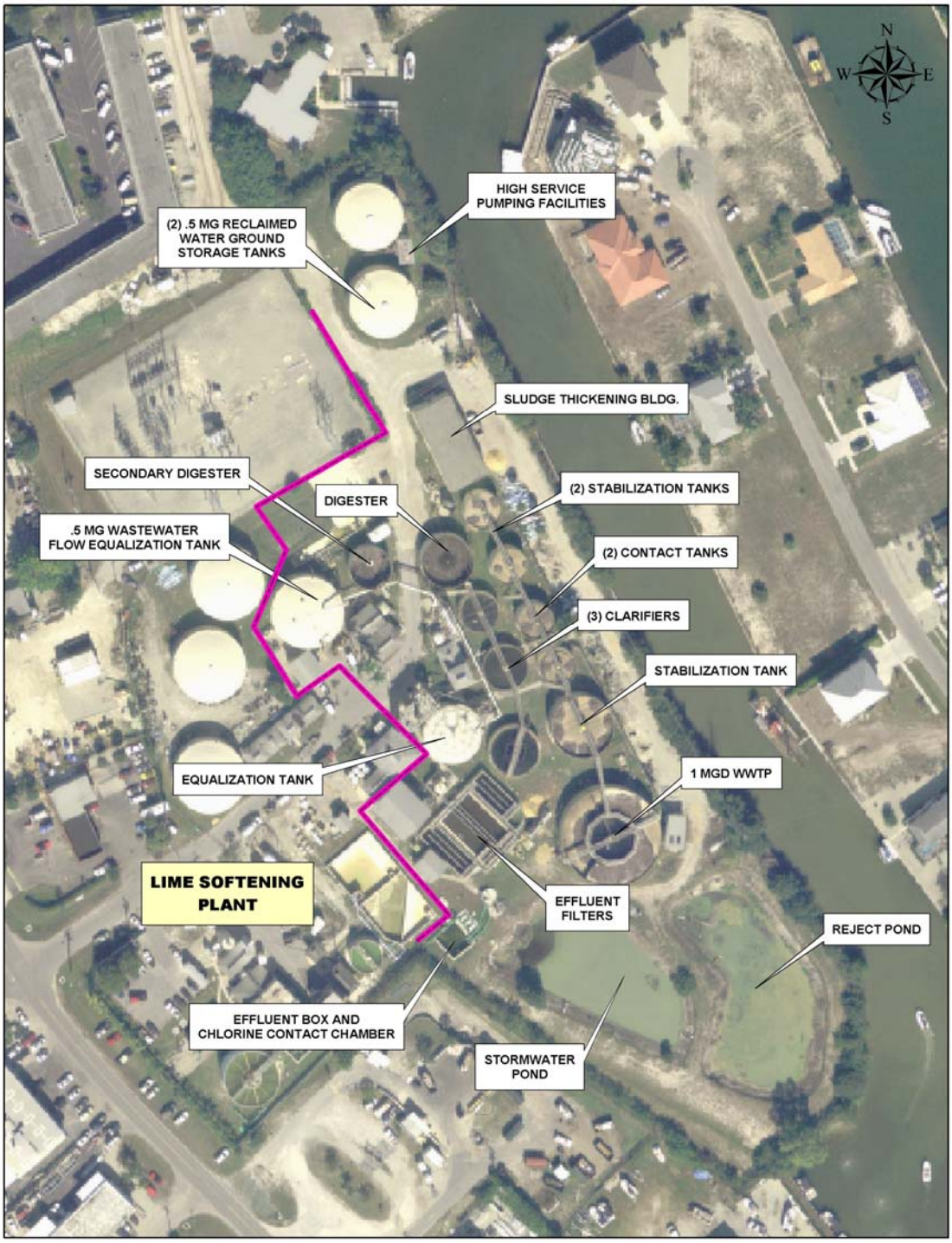
Figure 1-14 Unsewered Area Preliminary Catchment Areas

1.9 WASTEWATER TREATMENT

The existing Marco Island WWTP (**Figure 1-15**) is a contact stabilization plant on the north-central part of the Island. The current facilities are permitted to treat a total of 3.5 MG of wastewater on an average annual daily basis. The first stage was constructed in 1972 as a 2.5 mgd contact stabilization plant with aerobic digestion in two 1.25 mgd parallel treatment trains. The WWTP was designed around dual, essentially identical, treatment trains.

The facilities were expanded in 1990 with the addition of the 1 mgd package plant to accommodate the increasing flows and loads. In 1991 a Class I deep injection well for effluent disposal was constructed. The most recent addition to the facility occurred in 1999 to include the two reclaimed water storage tanks and additional reclaimed distribution infrastructure. Under normal operating conditions, the effluent from the plant is used as reclaimed water for irrigation. When there is low demand for reclaimed water, effluent is disposed of to the deep injection well or, in emergencies, to the rapid infiltration basins (RIBs).

Figure 1-15 Marco Island WWTP Site Layout

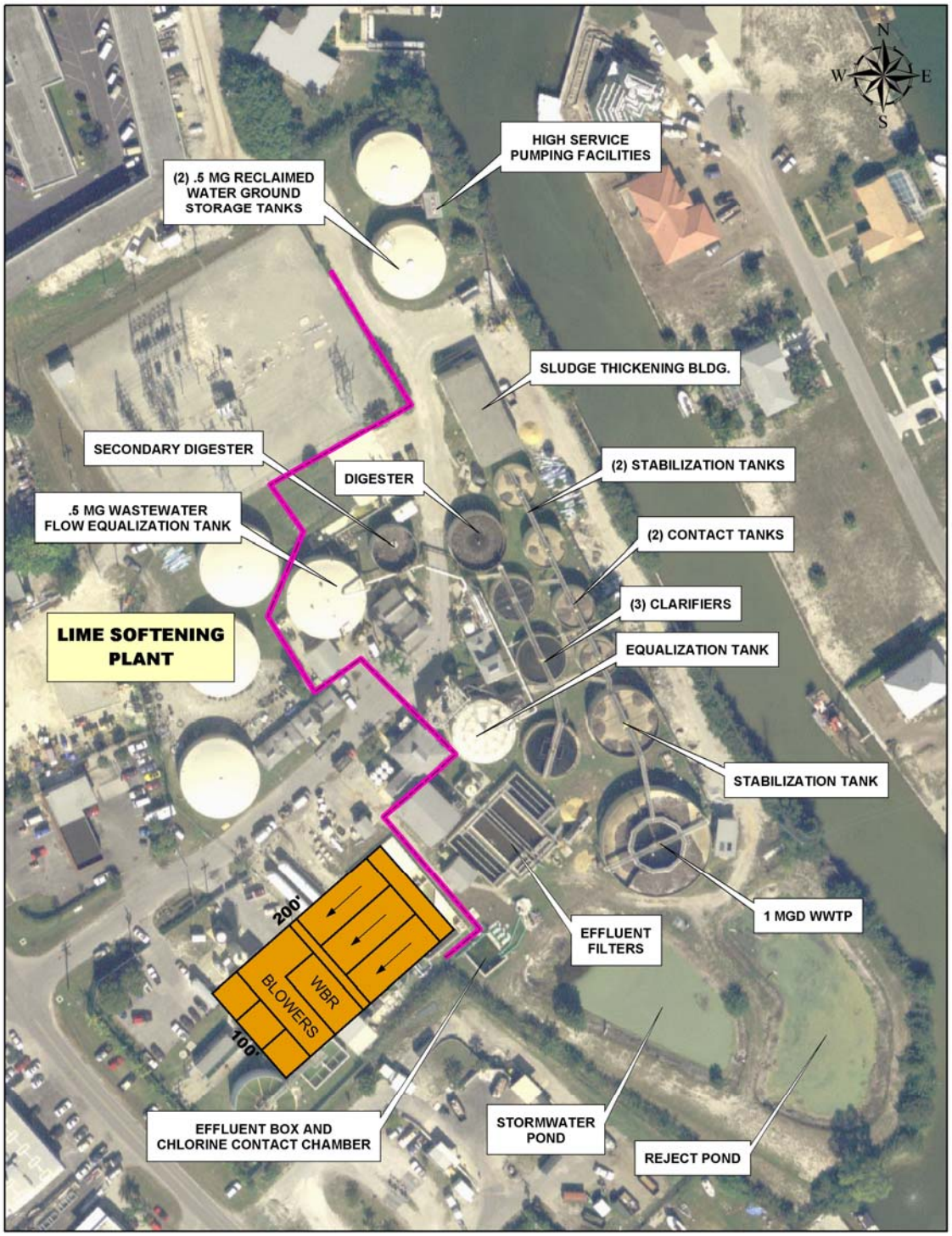


The maximum wastewater demand in the year 2025 was determined to be approximately 5 mgd average daily flow (ADF) during the peak season for ultimate build-out conditions. The existing plant, while functional, was not designed for ultimate flows, operational ease, or an optimal layout. The older parts of the plant are also over 30 years old and are nearing the end of their useful lives. The only feasible location for the new 5 mgd plant is on the site of the Lime Softening Plant that will be taken out of service as soon as the necessary modifications to the water treatment system are made.

As soon as the Lime Softening Plant is decommissioned and demolished, the site will be open and available for wastewater expansion. It is recommended that the City commence design of the new 5 mgd plant. The plant would incorporate biological nutrient removal either with or without Membrane Bioreactors (MBRs). The recommended solution is detailed in **Figure 1-16**. The figure demonstrates the most cost-effective solution, which is building the new plant in one stage. It would be possible to phase the construction of the new plant, but this would ultimately be a more expensive option. If this strategy were preferred, significant investigation of the existing site and underground piping network would be required prior to design.

The only major short-term improvement being proposed for the wastewater treatment plant is the addition of a sludge dewatering facility to the biosolids treatment. The dewatering facility will reduce the quantity of biosolids that need to be transported from the site and is economically justifiable based on reduced operating cost. It should be designed to serve the existing and future plants.

Figure 1-16 Future WWTP Recommended Solution



In addition to a new wastewater treatment plant, new support facilities should be provided, as well as a SCADA system. It is also recommended that the City change from sodium hypochlorite to ultraviolet (UV) disinfection for the wastewater effluent in order to be eligible for a reclaimed ASR system should the City choose to go ahead with that option.

1.10 RECLAIMED AQUIFER STORAGE AND RECOVERY (ASR)

The Marco Island WWTP currently discharges treated wastewater (reclaimed water) first to reuse customers, and if the demand is low, to the deep well injection. This excess reclaimed water could potentially be stored underground in ASR wells, which, when recovered, could be used to offset potable water use by meeting non-potable demands such as irrigation.

The feasibility of reclaimed ASR for the Marco Island service area was investigated in 1999 by Florida Water Services. It was determined at this time that reclaimed ASR is feasible within the Suwannee Aquifer at a depth of 820 feet below land surface. This aquifer was chosen due to its lack of competing users, adequate confinement, sufficient capacity and potential to be permitted for such use. The MWH feasibility study included in this UMP provides updated wastewater quality data, a flow balance, a preliminary testing program, including permitting requirements, and cost estimates. Additional recommendations have been included for the development of an ASR system on Marco Island.

The primary focus of permitting an ASR project is typically the interaction of the water quality of the native aquifer and the water to be stored. Reclaimed ASR wells are classified by the Florida Department of Environmental Protection (FDEP) as Class V, Group 3 injection wells. The selection of a potential storage is limited by the quality of the reclaimed water. There is greater flexibility in storage zone selection for waters that meet primary drinking water standards. If the water does not meet primary drinking water standards, the only storage zones available would be those with non-potable water (TDS > 10,000 mg/L).

Updated water quality records of treated wastewater (reclaimed water) were obtained from the OPS 32 system to determine compliance with primary and secondary water quality standards. The records show that nitrate levels have exceeded primary drinking water standards. Therefore, a storage zone below potable aquifers with sufficient confinement will be required for a reclaimed ASR system on Marco Island. The Suwannee Aquifer will meet this requirement if adequate confinement can be demonstrated.

The availability of reclaimed water for ASR injection was also examined to estimate optimal storage and recovery intervals during the year, as well as how much water would be available for storage and subsequent retrieval. As discussed, the highest demand for reclaimed water for irrigation on Marco Island is during the dry months. To meet these

demands, reclaimed water could be stored underground during the rainy season and recovered during the dry season.

Prior to preparing and submitting the application for an FDEP Class V, Group 3 Injection Well construction permit, it is recommended an exploratory test well be constructed to confirm the hydrogeologic characteristics of the storage zone and also the level of confinement above the potential storage zone. Upon confirmation of ASR feasibility, the well could be converted into a storage zone monitor well, which is required in this type of installation.

It is further recommended that the quality of the reclaimed water of the WWTP be verified to determine if nitrates can be lowered to within primary water quality standards. Lowering levels of nitrates to acceptable limits will significantly increase the potential for successful permitting of an ASR system for reclaimed water on Marco Island. The construction of the new WWTP will aid greatly in these permitting efforts.

1.11 CAPITAL IMPROVEMENT PLAN

The CIP for the City has been developed to include the projects necessary to implement the recommended program described in the UMP. The point at which new facilities will be required is difficult to determine with certainty as most events are dependent on conditions at other sites on and around the City. Therefore, a strategy of milestones should be employed, rather than strict design and construction schedules. This plan will be flexible enough that it can accommodate the City's adopted funding approach.

Included in the CIP are larger milestones that are necessary to accommodate the City's growth. These include new water treatment facilities, new wastewater treatment facilities, and sewering the currently unsewered portions of the Island. The City's first priority will be to construct additional water treatment capacity. After these facilities are in place, the existing Lime Softening Plant can and should be taken out of service. As soon as facilities associated with the Lime Softening Plant are demolished, the new WWTP plant can be built to service the unsewered areas of the Island.

1.12 FINANCING

A critical element associated with the preparation of the water and wastewater master planning process focuses on the financial evaluation of the system. Specifically, the financial evaluation focuses on the ability of the system operating revenues (derived primarily through rates and charges) to adequately fund the capital improvement plan identified during the master planning process. Specifically, the financial evaluation focuses on the sufficiency of the existing rate revenues to fund the capital improvement plan and provide additional information to the City and its consulting engineers relative to the projects required for service area development and capacity needs.

For the purpose of this water and wastewater master plan capital funding analysis, a projected nine-year study period has been utilized for the determination of the water and

wastewater systems revenue requirements. The objective of this study period is to determine the potential rate levels that will ensure continuing and adequate service to meet future period requirements. It was determined that the revenue requirements for this analysis would be predicated on the projected utility costs for the nine fiscal year period ending September 30, 2013.

Presented on Table 1 in Appendix E are financial projections for the System. The table includes annual projections of Gross Revenues, Cost of Operations and Maintenance, Bond Service requirements, required deposits to the various funds and accounts established by the Bond Resolution, including the Renewal, Replacement and Improvement Fund and the debt service Reserve Fund, and balances available for capital outlay and other System purposes. Projected Gross Revenue includes those from sales (rate revenue), interest income on the available unrestricted funds as defined in the Bond Resolution, and other miscellaneous revenues anticipated to be derived from operations. The projected sales revenue has been forecasted based on revenue anticipated to be derived from the existing rates of the City System.

Projected revenues from current rates and charges for the water and wastewater systems have been based on: i) the schedule of rates and charges currently in effect which were approved by the City per Resolution No. 04-52, dated November 1, 2004; and ii) the forecast of water and wastewater customers and sales (water use and billed wastewater flow) for the respective utility systems. A summary of the projected sales revenues by utility type, service area, and customer class is included on Table 4 in Appendix E. Interest income has been estimated on balances in certain funds created by the Bond Resolution including balances in the Revenue Fund and Surplus Fund (operating reserves); Bond Service Fund, including the Reserve Fund, if applicable; and the Renewal, Replacement and Improvement Fund. Projected Cost of Operations and Maintenance is based on various factors such as projected expense increases due to inflation and projected changes in expenses due to anticipated changes in operations. Funds received from the application of Water and Sewer System Capital Facilities Fees from the System have been assumed, for the purposes of the determination of capital expenditure financing, not to be available to pay Cost of Operations and Maintenance or Bond Service requirements. However, such fees have been recognized in the determination of debt service coverage requirements since they are considered as a Pledged Revenue for rate covenant requirements under the terms of the Bond Resolution.

The development of the estimated revenue requirements for the City's water and wastewater systems required several assumptions and considerations, detailed later in the report, and the development of certain analyses relative to utility operations. The City approved budget for the Fiscal Year 2005 served as the basis of the projection of the revenue requirements for the forecast period.

Based on the forecast of sales for the water and wastewater system, the assumptions and considerations set forth later in this section of the report with respect to the determination of projected water and wastewater system expenditures, the rate revenue surplus/(deficiency) is anticipated to be as follows:

	Adequacy of Existing Rates			
Fiscal Year	Gross Revenues	Revenue Requirments	Revenue Surplus/ (Deficiency)	Required Increase
2005	17,823,476	17,717,380	106,097	0.00%
2006	18,513,381	18,301,975	211,405	0.00%
2007	19,230,200	18,668,741	561,460	0.00%
2008	19,878,874	22,368,463	(2,489,588)	13.00%
2009	23,248,900	22,497,464	751,435	0.00%
2010	24,162,534	24,142,204	20,330	0.00%
2011	24,705,271	24,580,011	125,259	0.00%
2012	25,393,289	24,994,606	398,683	0.00%
2013	26,019,672	25,438,182	581,490	0.00%

As illustrated above and as shown in detail on Table 1 in Appendix E, a revenue deficiency is projected to exist in the Fiscal Year 2008 which, if enacted to be recovered from rates, is anticipated to be sufficient to meet the expenditure needs of the water and wastewater system through the forecast period identified in this analysis.

The remainder of this section of the report includes a discussion of the assumptions used in the development of the financial forecast, presentation of the ability of revenues from system rates to meet the capital expenditure requirements allocable to the operations of the system, and presents the assumed financing plan associated with the capital improvement planning process.