Getting to the Bottom Line: How to Implement a Master Plan's Capital Improvement Plan With Linkage to a Financial Model

Marc Walch, Rishi Immanni, C.B. Flip Mellinger, and Michael Burton

In 2009, Marion County Utilities Department (MCUD), in collaboration with PBS&J, an engineering consulting firm, developed an integrated water and wastewater utility master plan. In order to apply best business practices, MCUD decided to use experienced consulting engineers, along with Burton & Associates, the county's rate consultant, to assist with development of a master plan. This created a public-private partnership that offered the opportunity to combine public agency practices with the experience of a private consulting engineer. The integrated master planning process (integrating financial planning with the utility master planning effort) and its significance to utilities will be described.

The master plan objectives were developed from the MCUD's overall goal to facilitate a planned and financially feasible 20-year capital plan for the utility's service area. Master planning tasks included identifying effective, permittable, environmentally sound, and financially feasible alternatives that will serve the long-term needs of MCUD and its customers. The plan will serve as a guiding document for Marion County (County) to manage and implement necessary improvements over the master planning period (through 2030). Accordingly, the consulting engineers developed a master plan that was easy to use and update, and in essence, has become a living document. Figure 1 shows the service area with existing infrastructure.

The use of technology in master planning had come a long way, by integrating geographic information systems (GIS), utilizing computer models for hydraulic modeling, and finally, integrating financial planning models as part of the comprehensive master planning process. The integration of data in Esri ArcGIS, hydraulic models in Innovyze InfoWater, and financial models in a proprietary financial analysis and management system (FAMS-XL©) has provided a platform to enhance historical master planning methodology to the next level: eyeing the bottom line. The resulting integrated master plan produced a capital improvement plan that identified all available and implementable funding sources.

Marc Walch P.E, DEE, is vice president—business consulting practice, at Brown and Caldwell Inc. in Maitland. Rishi Immanni P.E, GISP, is project manager at Tetra Tech in Orlando. C.B. Flip Mellinger is director at Marion County Utilities Department in Ocala. Michael Burton is president of Burton & Associates Inc. in St. Augustine.

The County is considered the southernmost county in north central Florida, and more rarely, the northernmost county in central Florida. The County is generally composed of rolling hills and has three lakes at its opposite borders: Orange Lake at the far northern part bordering Alachua County; Lake Kerr on the northeastern part bordering Putnam County; and Lake Weir, the largest of the three, is in the far southern region near the border with Lake County. Part of Lake George is also in Marion County, on the eastern boundary.

According to the 2000 U.S. census, Marion County had a population of 258,916. This is an increase of 64,083 from the 1990 census, which showed a population of 194,833. This represents an annual average growth rate of 2.88 percent. The census also estimated a 2006 (the last year for which an estimate is provided) population of 316,183, with an annual average growth rate of 3.39 percent.

For the purposes of the master plan, the estimate provided as part of the Water Resources Assessment and Management Study (WRAMS, April 2007) and updated by the County was used, as shown in Table 1.

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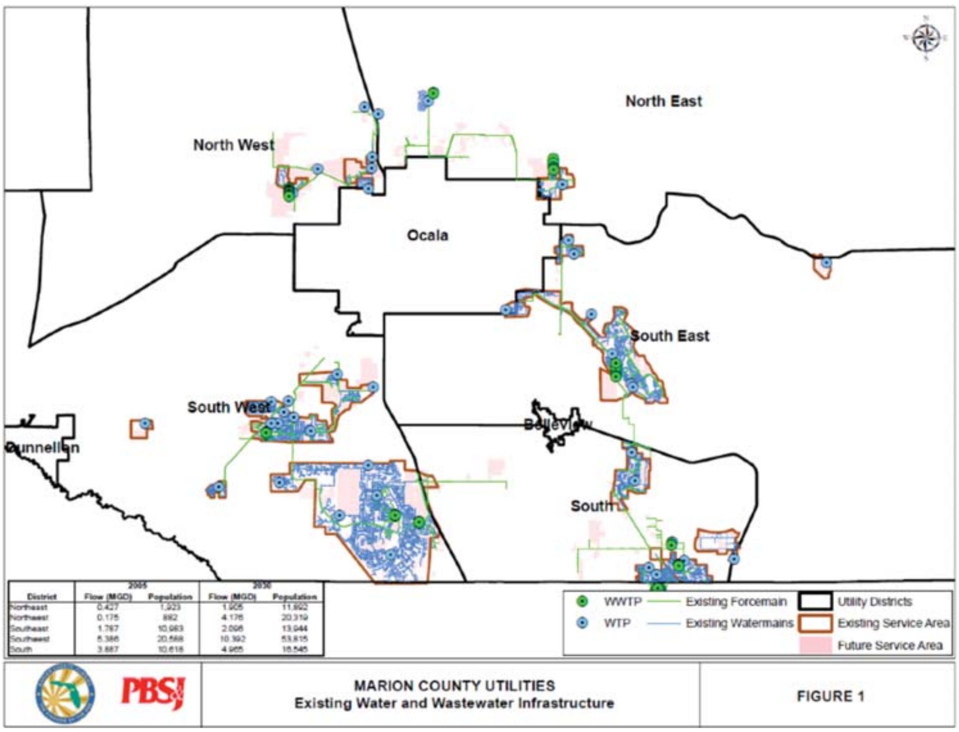

Figure 1. Service Area with Existing Infrastructure

Table 1. Population Projections from County Water Resources Assessment and Management Study Data

Year	Population
2005	313,888
2010	371,479
2015	426,547
2020	479,759
2025	538,896
2030	597,806

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The County's public water supply is derived from groundwater rather than surface water sources. These sources are regulated by the St. Johns River Water Management District (SJRWMD) and the Southwest Florida Water Management District (SWFWMD). Three aquifer systems supply groundwater in SJRWMD: the surficial, the intermediate, and the Floridan.

The MCUD currently owns 38 water treatment plants (WTPs). The water systems are divided into five distinct areas of Marion County:

1. Northwest District
2. Southwest District
3. South District
4. Southeast District
5. Northeast District

The MCUD water system consists of approximately 535 mi of water transmission/distribution piping, ranging from 2 to 16 in. in diameter. The County incorporates a range of facilities in terms of design, process, equipment, capacity, age, condition, and performance. These facilities can be categorized as water supply/treatment facilities, re-pump facilities, and elevated storage tanks. A field review, assessment, and analysis of the MCUD's existing WTPs were completed as part of the master planning process.

The main objectives of the master plan were to:

- Evaluate the existing conditions to develop future demand projections for water, wastewater, and reclaimed water.
- Consider changes in MCUD policy and regulatory issues highlighting growth over a 20-year horizon.
- Evaluate the existing water distribution, wastewater collection, and reclaimed water distribution systems to accommodate the projected flows.
- Establish routing corridors and characterize distribution and collection system pipeline sizing and phasing of pipelines for water, wastewater, and reclaimed water service for the selected alternatives.
- Identify treatment facility improvements, expansion requirements to meet anticipated regulatory issues, and growth within the County's service areas.
- Identify modifications to systemwide monitoring and control systems to improve efficiency and level of service.
- Evaluate the financial feasibility for the identified capital improvement projects and identify the sources of funding.
- Evaluate the adequacy of the utility's revenues over a multiyear projection period to fund the identified capital improvement requirements of the master plan.

The master plan was initiated late in 2007 with extensive data collection; data and field reconnaissance was performed to evaluate the existing water and wastewater system. In 2008, GIS system networks were developed, existing hydraulic models were developed, and verifications were done to reflect the field conditions. Future scenarios and alternatives were further developed and analyzed for bottlenecks. In 2009, capital improvement projects (CIP) were developed systemwide and financial feasibility was evaluated to identify potential funding sources for each project identified

Table 2. Modified Water Resources Assessment and Management Study Data by District Compared to Consumptive Use Permits by District (all flows in mgd)

	2005	2010	2015	2020	2025	2030
Northeast District Demand	0.53	0.59	0.79	1.05	1.35	1.62
Permitted CUP Capacity (a)	0.77	0.87	0.93	1.00	1.03	1.04
Excess/(deficit)	0.24	0.28	0.14	(0.05)	(0.32)	(0.58)
Northwest District Demand	0.55	0.70	0.86	1.30	1.85	2.30
Permitted CUP Capacity (b)	1.08	1.08	1.08	1.08	1.08	1.08
Excess/(deficit)	0.53	0.38	0.22	(0.22)	(0.77)	(1.22)
Southeast District Demand	1.95	2.02	2.19	2.31	2.42	2.50
Permitted CUP Capacity (c)	1.77	2.34	2.42	2.45	2.47	2.47
Excess/(deficit)	(0.18)	0.32	0.23	0.14	0.05	(0.03)
South District Demand	4.06	4.40	4.58	4.79	4.92	5.01
Permitted CUP Capacity (d)	3.55	5.10	4.67	4.67	4.68	4.68
Excess/(deficit)	(0.51)	0.70	0.09	(0.12)	(0.24)	(0.33)
Southwest District Demand	5.18	5.94	6.27	6.80	7.49	8.26
Permitted CUP Capacity (e)	4.25	7.42	7.42	7.42	7.42	7.42
Excess/(deficit)	(0.93)	1.48	1.15	0.62	(0.07)	(0.84)
Total County Demand	12.27	13.65	14.69	16.25	18.03	19.69
Total Permitted CUP Capacity	11.42	16.81	16.52	16.62	16.68	16.69
Excess/(deficit)	(0.85)	3.16	1.83	0.37	(1.35)	(3.00)

(a) Silver Springs Regional CUP: 639,000 through Dec. 9, 2028
Pilot Oil CUP: 230,411 GPD through Dec. 8, 2025
Salt Springs CUP: 92,876 GPD through April 23, 2019
Irish Acres CUP: 76,986 GPD through June 30, 2025
(b) Golden Ocala CUP: 417,000 GPD through May 29, 2018
Ashley Farms, Quail Meadows, the Fountains CUP: 660,600 GPD through Sept. 18, 2014
(c) Silver Springs Shores CUP: 1,925,000 GPD through March 10, 2012
Deer Path, Peppertree CUP: 225,753 GPD through Jan. 31, 2026
South Oak CUP: 190,000 GPD through Sept. 30, 2019
Silver Springs Woods/Village: 127,397 GPD through June 9, 2020
(d) Spruce Creek Golf and Country Club CUP: 2,990,000 GPD through July 8, 2013
Stonecrest CUP: 974,000 GPD through Dec. 12, 2026. Permit under review to increase CUP to 1,030,000 GPD.
Spruce Creek South CUP: 659,000 GPD through Dec. 12, 2026. Permit under review to increase CUP to 706,000 GPD.
South Lake Weir CUP: 58,000 GPD through Jan. 28, 2029
(e) Oak Run, Palm Cay, Oak Trace Villas, Pine Run, Dunnellon Airport, JB Ranch CUP: 3,774,925 GPD through May 25, 2010
Spruce Creek Preserve CUP: 448,000 GPD through June 25, 2012
Marion Oaks, Summerglen CUP: 3,200,000 GPD through Sept. 25, 2013

in the CIP. The master plan was completed in December 2009.

Methodology

Raw data from MCUD was analyzed and verified in ArcGIS. AutoCAD line types were converted to GIS shapefiles for all available pipeline infrastructure data available, and connectivity was established in ArcGIS. These shapefiles were then used to develop hydraulic models in InfoWater. Upon various iterations and verifications from the County engineering staff, the hydraulic models were finalized and were verified to reflect existing field conditions. Existing demands were loaded on the nodes in the hydraulic model; existing scenarios were created in the hydraulic model and were tested for average day, maximum day, and peak hour conditions to investigate any potential bottlenecks in the distribution system. Similar procedures were used to develop wastewater collection system and reclaimed water distribution system hydraulic models.

Water flow data were derived from the modified WRAMS study. The County's planning department provided a geodatabase file that included attributable data for each parcel within the County. In addition to a parcel identification number, the data included a flow generation factor for each parcel, in gal per capita/day, (gpcd), by:

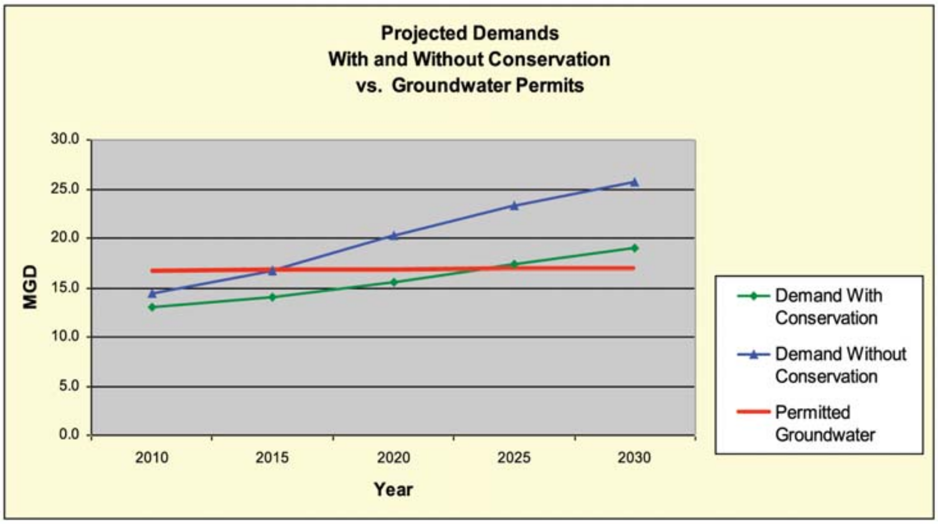
- Five-year increments from 2005 through 2060
- Population by parcel in five-year increments from 2005 through 2060
- Total flow per parcel in gal per day (gpd) in five-year increments from 2005 through 2060
- A particular parcel that would be supplied by public water supply or private system, such as an on-site well

Table 3. Medium Bureau of Economic and Business Research Water Demand Projections

Service Area	2010 (mgd)	2015 (mgd)	2020 (mgd)	2025 (mgd)	2030 (mgd)
With Conservation					
Northeast	0.510	0.707	0.956	1.231	1.507
Southeast	1.763	1.932	2.064	2.176	2.243
South	4.233	4.388	4.598	4.714	4.801
Northwest	0.325	0.484	0.926	1.473	1.930
Southwest	5.847	6.177	6.741	7.466	8.246
Total	**13.688**	**15.286**	**17.060**	**12.678**	**18.727**
Without Conservation					
Northeast	0.571	0.861	1.213	1.565	1.915
Southeast	1.918	2.086	2.246	2.364	2.434
South	4.683	5.258	5.784	5.924	6.028
Northwest	0.504	0.853	2.348	4.035	5.008
Southwest	6.468	7.328	8.303	9.130	10.027
Total	**14.145**	**16.386**	**19.894**	**23.019**	**25.413**

Conservation is estimated to account for a decrease in water demand of approximately 7 mgd in 2030.

Figure 2. Marion County Water Demands Versus Permitted Levels



These data was used for years 2005 through 2030, the study period of the master plan.

Water Demand Projections

Water demand projections were developed by multiplying population projections with per capita usage. Developing water demand projections was a critical process—predictions of future growth change as economic conditions change. The original WRAMS 2007 data based population growth on the medium-high predictions of Bureau of Economic and Business Research (BEBR). However, since 2007, growth has slowed and the medium predictions of BEBR more closely match the expectations of growth for the County. Both SJRWMD and SWFWMD rely on medium BEBR projections for population predictions.

Another issue with regard to population projections is what service areas are included as part of that population. Known developments can be planned as part of future service areas, but other future growth of service areas may be more complicated to predict.

Determining future per capita usages also requires continuous effort. Water management district methodology relies on historical data for future per capita usage; however, this per capita water usage can change significantly with rain amounts, rate changes, educational programs, and watering restrictions. It is important to consider these and other factors when projecting future water demand so that infrastructure planning provides sufficient, but not overbuilt, facilities.

The modified WRAMS data used for this master plan included the medium-high BEBR population values, combined with additions of future service areas and per capita usages that anticipated some conservation. In order to evaluate potential need for alternate water supply (AWS), the modified WRAMS data was re-evaluated with medium BEBR population projections and applying the same per capita values (which include assumptions of conservation). As a comparison, another evaluation of the projected water demands was developed by removing

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conservation from the per capita values. The two resulting water demand projections are shown in Table 3.

To plan the need for future AWS, a first step is comparing the projected water demands to permitted groundwater withdrawal amounts. Although the amount of permitted groundwater withdrawal may increase from its current value, the comparison gives a picture of the potential need for AWS for planning purposes. Figure 2 displays the projected water demands, both with and without conservation, along with the current permitted groundwater withdrawals.

In 2030, the demand without conservation is approximately 9 mgd more than the current permitted withdrawals. This deficit is an indication of the potential amount of AWS needed. If conservation is implemented as proposed, the deficit may be only 2 mgd.

The cost of AWS will vary depending on factors such as the quality of the water source and the level of treatment needed. The SJRWMD developed AWS costs in 2008 that were reported in *Engineering Assistance in Updating Information on Water Supply and Reuse System Component Cost*. The report developed costs for capital, and operation and maintenance costs for groundwater, surface water, and desalination supplies, in addition to reuse-related projects.

The capital costs for 2-mgd and 9-mgd groundwater, surface water, and desalination plants are shown in Figures 3 and 4, respectively. Distribution piping costs and other transfer piping costs are not included in the cost estimates.

Figures 3 and 4 also provide an estimate of the value of implementing the conservation plans, which reduce the overall water demands. Without conservation, the County would need to identify anywhere from $7.5 to $125.5 million in alternative water supply sources. With an aggressive conservation program, the alternative water supply sources will cost between $1.2 and $53.5 million. Conservation practices, therefore, could potentially save the County approximately $5.3 to $72 million over the next 20 years.

The figures identify significant cost differentials between groundwater, surface water, and desalination plants. A cost for a desalination plant can be anywhere from over 16 to over 40 times that of a groundwater plant, depending on the size of the plant. Surface water plant costs can range from 3.6 to 12 times that of a groundwater plant. The more groundwater that is available for the County, the more cost effective the water system will be for its customers.

Hydraulic Modeling

Water System

The County provided the layout of the existing water system in ArcGIS shapefiles for inclusion in a GIS-based model. Shapefiles were reviewed and scrubbed for connectivity to ensure that valves were properly placed and junction nodes were appropriately located. All sizing and pipe locations were derived directly from the County's shapefiles. A site visit was made to each of the County's WTPs to document and verify general information regarding pipe sizing, elevations, and overall status of each facility. In addition, the permits for each facility were reviewed for capacities.

The monthly operating reports were reviewed to determine average annual and peak-month flows. Nodal influence zones (NIZ) represent the approximate area served by each of the model demand nodes in the County water model. The NIZ are developed using the thiessen polygon method in ArcGIS. Model demand nodes are identified for the water model using best engineering judgment. The demand nodes are exported to ArcGIS shapefiles; the NIZ thiessen polygons were generated with the district and facility boundary polygons.

The NIZ were overlaid accordingly with the parcel centroids and tagged with the respective NIZ identifications. The existing water demands from the parcels tagged to a NIZ are summarized and the demand is allocated to the corresponding model node to complete the existing demand allocation.

A maximum day factor of maximum month to average annual month, times average daily flow or two times average daily flow, whichever is higher, was used to calculate the maximum day demands. A peak hour factor of four times maximum day was used to calculate the peak hour demand. Average daily flow, maximum daily flow, and peak hour flow scenarios were created for existing and future conditions in five-year increments to analyze the system for bottlenecks.

Wastewater System

The County provided the layout of the existing wastewater system in ArcGIS shapefiles for inclusion in a GIS-based model.

Figure 3. Alternative Water Supply Costs for 2 MGD

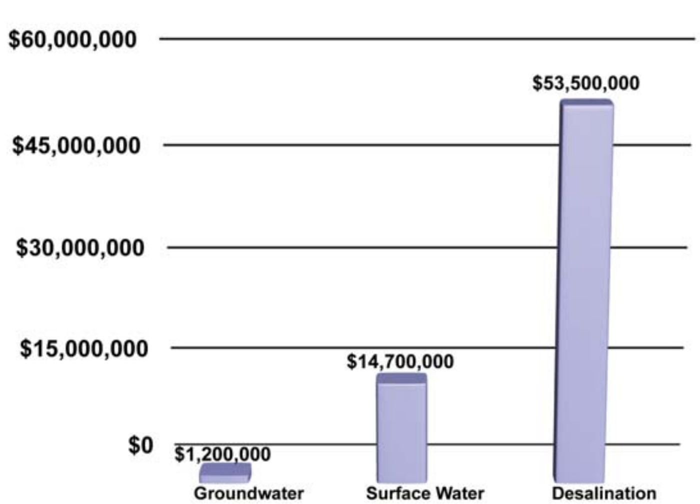
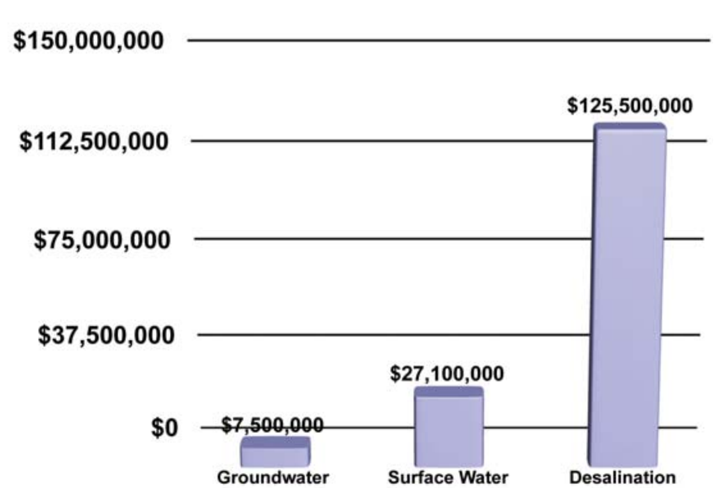


Figure 4. Alternative Water Supply Costs for 9 MGD



Shapefiles were reviewed and scrubbed for connectivity to ensure that valves were properly placed and junction nodes were appropriately located. All sizing and pipe locations were derived directly from the County's shapefiles. A site visit was made to each of the County's wastewater treatment plants (WWTPs) to document and verify general information regarding pipe sizing, elevations, and overall status of each facility.

The lift station service areas (LSSAs) for existing lift stations were defined by the County and provided as part of the master plan development. These areas generally encompass a gravity sewer system that is a tributary to each lift station. Where lift stations pump to a gravity line that subsequently flows to a downstream pump station, the collection area is assigned to its lift station as a primary identifier, and the downstream station as a secondary identifier.

The system connectivity was originally provided via shapefiles from the County. These were reviewed and modified, where necessary, due to minor connectivity issues. System connectivity was also compared to a series of charts provided by the County that confirmed individual lift station routing. Since not all LSSAs are served by lift stations that are directly manifolded to the receiving WWTP, the connectivity of these LSSAs to those manifolded must be established to provide required flow routing from each LSSA. Connectivities were developed to route flow to the appropriate WWTP or re-pump station, and were verified with County staff. This resulted in flow routing that is representative of current and proposed collection system operation. The connectivity of all lift stations was established to assign flows properly in a geodatabase.

The wastewater system hydraulic model was used to analyze and aid in sizing various elements of the transmission alternatives. Existing and future developments were analyzed by steady-state modeling of the pressurized wastewater transmission systems. Two methods of steady-state modeling were utilized: a pump model method and a flow model method.

The pump model option was used to simulate the pressurized transmission systems by incorporating the actual pump curves for the pumps at each lift station in the manifold system. The steady-state model simulation was used with a portion, or all, of the pumps in the manifold running concurrently. In large manifold systems, many of the smaller lift stations are generally not able to pump against the high-pressure head in the manifold created by the larger lift stations when all pumps are on. As a result, new lift stations are generally oversized by the designer to minimize the possibility of overflows at those lift stations. Over time, these oversized pumps increase the system head significantly in the "all pumps on" scenario.

Because these pumps are oversized, they run for shorter periods of time; therefore, the high system head will not be seen for extended periods of time and the system can operate, even with some pumps experiencing shut-off condition. However, this process can result in lift station head conditions such that the overall system peaking factors become greater than necessary and ultimately cause problems at the receiving WWTP. Also, the pump model can result in the oversizing of transmission lines to overcome the perceived problems in the modeled scenario.

The consulting engineer used the pump model to flag existing lift stations that could not pump against the "all pumps on" system head. These lift stations received closer

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scrutiny in the flow model for both existing and future conditions. The pump model is not as useful as the flow model for planning purposes, but it is useful in the design phase to help select pumps for specific applications.

The flow model option was used for evaluation of the lift stations and transmission system in this master planning effort. The flow model ignores pump curve information and instead adds a negative demand (flow input) at each lift station location. Determining flows for each of the lift stations in the network can be a significant challenge. Parcel-level flow estimates were developed for the master plan and used to estimate average daily flows at each of the existing and future lift stations by overlaying the LSSAs on the parcel coverage and summarizing the flows that were within each LSSA. In order to depict conditions in the system with the flow model, demands at lift stations that are not manifolded directly to one of the WWTPs must be added to the flow of the appropriate downstream LSSA.

Reclaimed Water System

The reclaimed hydraulic model system was created using the utility GIS information. The GIS-based data files consisted of attributed polylines representing the reclaimed pipe network. Nodes at the end of each pipe segment were created using the hydraulic modeling software. The WWTPs and the high service pumps were digitized manually. The reclaimed water system was simulated using the generally practiced methodology for simulating water distribution systems in which peak demands are routed through the system and pipes are sized to meet the hydraulic criteria, such as velocity and pressure specified under peak demand conditions. It was generally attempted to avoid using parallel pipes to provide increased capacity. The hydraulic modeling simulations helped identify the wastewater collection and reclaimed water distribution systems that are required to meet the flows and demands in 2030 for the alternatives evaluated.

Following the scenario-based hydraulic modeling are a series of iterations to identify deficiencies in the water, wastewater, and reclaimed water systems. The CIPs were identified to rectify the deficiencies in the systems and were then prioritized based on the five-year incremental future scenarios from the hydraulic models.

Integrated Financial Plan

A master plan revenue sufficiency analysis (MPRSA) was performed using a FAMS model for the County's water and wastewater system to assess the financial and rate impacts of the master plan's capital improvements. The FAMS is an interactive utility financial planning and rate model tool, developed by Burton & Associates, which simulates the financial dynamics of a utility over a multiyear projection period. The FAMS was used to identify alternative financial management plans, funding sources, and rate adjustments that would provide sufficient revenues to fund the MCUD requirements over a multiyear projection period, including the CIP as shown in Figure 5.

During the MPRSA, alternative multiyear financial management plans were evaluated via interactive work sessions with the consulting engineer and the County staff. During these work sessions, the impact of alternative capital improvement scenarios on key financial indicators was examined using graphical representations from the software-driven rate model. While the model was up and running, alternative analyses was conducted interactively with the consulting engineer and County staff.

In order to initialize the financial analysis, most of the information from the revenue sufficiency analysis done in recent rate analyses was utilized, including base revenue projections, fund balances, current number of connections, debt service schedules and terms, etc. However, updated budgeted financial information regarding the operational expenses of the water and wastewater enterprise fund (i.e., the FY 2009 amended budget and the FY 2010 proposed budget) was received. The county's multiyear CIP, based upon the current CIP and additional projects as identified by the master plan, were also updated. A series of meetings were conducted to counsel with the consulting engineer and County staff regarding updates or changes to assumptions and policies that would affect the MCUD, such

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Figure 5. Capital Improvement Projects

MARION COUNTY BOARD OF COUNTY COMMISSIONERS
CAPITAL IMPROVEMENT PROJECT DETAIL FORM

Clerk of the Circuit Court - Budget Department

A. PROJECT IDENTIFICATION

PROJECT NAME: Forcemain connecting Summerglen and Marion Oaks

DEPARTMENT / AGENCY:

PROJECT CODE: (if previously assigned)

B. DESCRIPTION / JUSTIFICATION:

Construct approx. 910 LF of 12" forcemain from the Summerglen plant to SW 156th St.; Construct approx. 330 LF of 12" forcemain along SW 156th St to SW 153rd Loop.; Construct approx. 150 LF of 12" forcemain along SW 153rd Loop between SW 156th St. and SW 155th LN.; Construct approx. 4,430 LF of 12" forcemain along SW 155th LN between SW 153rd Loop and Marion Oaks BLVD.; Construct approx. 1,690 LF of 12" forcemain along Marion Oaks BLVD from SW 155th LN to the Marion Oaks plant.; Construct approx. 1,660 LF of 12" forcemain from Marion Oaks BLVD to the Marion Oaks plant.; ; ;

C. EXPENDITURE SCHEDULE

COST ELEMENTS	Fiscal Year 2015	Fiscal Year 2016	Fiscal Year	Fiscal Year	Fiscal Year	Five Year Total
PLANNING AND DESIGN	$ 103,200					$ 103,200
LAND						-
BUILDINGS						-
IMPROVEMENTS OTHER THAN BUILDINGS		$ 584,800				584,800
FURNITURE & EQUIPMENT						-
TOTAL:	$ 103,200	$ 584,800	$ -	$ -	$ -	$ 688,000

D. FUNDING SCHEDULE:

FUNDING SOURCES						
General Revenue						$ -
						-
						-
						-
TOTAL:	$ -	$ -	$ -	$ -	$ -	$ -

Department/Agency Head Signature: Date:

E. CAPITAL PROJECT EXPENDITURE SUMMARY

CAPITAL EXPENDITURES INCEPTION TO COMPLETION	Capital Expenditures
EXPENDED IN PRIOR YEARS	
PROJECTED TO EXPEND IN CURRENT YEAR	
PROPOSED COST REMAINING	
TOTAL COST OF PROJECT	$ -

F. OPERATING BUDGET IMPACT

RECURRING OPERATING COST	Start-up Costs First Year	Annual Cost Future Years
STAFF / PERSONNEL		
OPERATIONS		
MAINTENANCE		
(LESS) REVENUES/SAVINGS:		
NET OPERATING IMPACT:	$ -	$ -

Table 4. Summary Table of Annual Rate Revenue Adjustments

	FY 09	FY 10	FY 11	FY 12	FY 13	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19
Eff. Date	4/1/09	1/1/10	10/1/10	10/1/11	10/1/12	10/1/13	10/1/14	10/1/15	10/1/16	10/1/17	10/1/18
Water	5.00 %	5.00%	5.00%	2.00%	2.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%
Wastewater	13.00%	13.00%	13.00%	6.00%	6.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%
Combined	8.74%	8.87%	9.02%	4.09%	4.13%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%

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as future operating expenses not reflected in current budgets, customer growth, required levels of working capital reserves, escalation rates for operating and capital costs, etc. All of this information was entered into the FAMS interactive model. The model produces a multiyear projection of the sufficiency of the MCUD revenues to meet all of its current and projected financial requirements, and determines the level of rate revenue adjustments necessary in each year to provide sufficient revenues to fund all of the requirements.

The model also utilizes all available and unrestricted funds in each year of the projection period to pay for capital projects, in accordance with the rules of cash application defined with the consulting engineer and County staff within the model. To the extent that current revenues and unrestricted reserves are not adequate to fund all capital projects in any year of the projection period, the model identifies a borrowing requirement—either conventional revenue bonds or the State Revolving Fund (SRF)—to fund those projects or portions thereof that are determined to be eligible for borrowing. In this way, the model is used to develop a borrowing program that includes the required borrowing amount by year and the corresponding annual debt service obligations of the MCUD for each year in the projection period.

The CIP reflects a combination of the projects contained within the master plan, as well as the remaining projects identified in the County's current CIP that were not included in the master plan. It is important to note that FY 2019 does not include a complete detailed list of specific projects and therefore includes an estimate consistent with the level of average annual expenditures in the CIP and what was previously assumed in the 2009 revenue sufficiency analysis.

Given that the CIP was provided in current dollars, a 4 percent per year compounded construction cost inflation factor was applied to the CIP starting in FY 2011. The analysis reflects County staff's expectations as to grant funding for certain reclaimed water CIP projects (50 percent funding for projects within the Southwest Florida Water Management District, zero percent for projects within the St. Johns Water Management District). It was assumed that the County will contribute on an annual basis during the projection period an amount equal to 5 percent of the prior year's gross revenues (excluding capital charges) into a renewal and replacement fund that would be used for projects in the CIP.

Capital charge (i.e., impact fee) revenues are projected each year based upon the assumed charges multiplied by the projected units of growth in each respective year. Due to assumed levels of developer facility oversizing and/or capital contributions, it is assumed that the MCUD receives only 50 percent of annual projected water and wastewater capital charges.

It is also important to note that this analysis reflects the results of the expansion percentage project study performed by the consulting engineer that identified the allocations of annual revenue bond debt service to each system, as well as what portion of the debt allocation to each system was for expansion-related assets. Per that analysis, the MPRSA reflects a 37 percent allocation of the annual revenue bond debt service obligations of the MCUD to the water system and 63 percent to the wastewater system. Furthermore, the MPRSA reflects that 62 percent of the water system debt service allocation and 45 percent of the wastewater system debt service allocation is expansion-related and is eligible to be paid with capital charge revenues. This means that 23 percent of the MCUD annual debt service is assumed to be eligible to be paid with water capital charges and 28 percent is eligible to be paid with wastewater capital charges.

Results

Revenue Sufficiency Analysis Results from 2009

The 2009 revenue sufficiency analysis (RSA) identified three scenarios or rate adjustment plans for consideration by the Board of County Commissioners (BCC). The rate adjustment plans in the 2009 RSA were based upon estimated FY 2009 revenues, operating expenses reflecting the FY 2009 budget and current growth assumptions, and a CIP (in future year dollars) of $152.3 million from FY 2009 – FY 2019. The BCC ultimately approved the rates as shown in Table 4 through FY 2011. It is important to note that while the rates from this scenario did meet many of the MCUD financial requirements and resulted in the lowest near-term rate increases to customers, they did not provide for adequate working capital reserves for the MCUD in FY 2009 – FY 2012.

Master Plan Revenue Sufficiency Analysis Plan Results

The MPRSA reflects the same estimated revenues for FY 2009, the FY 2009 amended budget and FY 2010 proposed budget for operating expenses, slightly lower growth projections, and a new CIP (in future year dollars) of $151.8 million from FY 2009 – FY 2019. Relative to the CIP, the updated CIP contains lower near-term capital expenditure requirements in each year from FY 2009 – FY 2012 than what was included in the 2009 RSA ($11 million in total). Therefore, despite lower growth projections during that same time period, the rate adjustment plan as approved by the BCC through FY 2011 and as projected through FY 2012 is sufficient and will now provide for adequate reserves for the MCUD.

However, from FY 2013 – FY 2017, the new CIP is higher than what was included in the 2009 RSA ($11 million in total). Therefore, assuming the same annual rate adjustment plan of 4 percent per year as identified in the 2009 RSA, the MPRSA now provides slightly lower levels of annual debt service coverage due to larger borrowing requirements associated with the funding of the increased CIP. It also results in reserves that meet or are within 5 percent of the minimum target amounts in all years of the analysis.

Given the level of variability inherent in long-term projections, and the fact that the MCUD performs annual revenue sufficiency updates, it was concluded that the rate adjustment plan as identified in the 2009 RSA is sufficient to fund the full operating and capital cost requirements, including the capital projects within the master plan.

Master Plan Revenue Sufficiency Analysis Results and Recommendations

Based on MPRSA, the approved plan of water and wastewater rate adjustments through FY 2011 would generate sufficient revenue to satisfy the MCUD current and projected cost requirements, including the net income coverage requirements of the MCUD bondholders, annual cash expenditure requirements, and adequate working capital reserves. Moreover, the plan of 4 percent annual water and wastewater rate revenue adjustments from FY 2012 – FY 2019 as identified in the 2009 RSA would be sufficient in each year of the projection period to fund the full cost requirements of the utility.

The current fund balances of the MCUD are inadequate to fund all of the CIP through the end of the projection period (consistent with the findings of the 2009 RSA). Therefore, the MCUD will be required to borrow funds in many years of the projection period, including in FY 2010 (whether it is with bank loans/revenue bonds and/or SRF loans). Specifically, a plan of capital finance would be recommended that utilizes commercial paper or a bank loan for a year or two, with periodic revenue bond issuances that would take out/refinance the commercial paper/bank loans, as well as provide proceeds for new CIP projects.

The MCUD should perform annual revenue sufficiency updates so that additional or revised information may be incorporated into the determination of future rate adjustments that might be necessary. Advanced planning will play a prominent role in avoiding significant future rate impacts to the MCUD customers due to circumstances and conditions occurring differently than currently projected.

Conclusion

Historically, master plans were developed without a financial feasibility component. This project showcases an example of an organized method to utilize best business practices by integrating components of a master plan (hydraulic models, CIP, potential funding sources for CIP, and financially feasible analyses for revenue sufficiency) into one resource that can be used in day-to-day utility management. Figure 6 shows the control panel of the financial model and Appendix A (available on the *Journal* website at www.frwj.com) shows supporting data for the master plan revenue sufficiency analysis.

This innovative approach of integrating a financial component to evaluate the revenue sufficiency and identify potential sources of funding should be incorporated in every master plan to enhance the focus on best business practices that ultimately yields efficient utility management. ♁

Figure 6. Financial Analysis and Management System