8.1 INTRODUCTION

Over the past 20 years, the availability of water resources in the United States, once considered a given, has been challenged by growth in demand and the degradation of water quality by pollution. Particularly on the southern rim of the nation, and specifically in Florida, water providers and regulatory agencies have recognized the need to take steps to preserve and protect existing resources, explore new sources of water, and plan for a future in which traditional sources of water will not meet the expected demand of growing populations.

One of the most important considerations in this planning effort is the extent to which the reclamation and reuse of wastewater can substitute for potable water demand, thereby indirectly conserving available water resources. As utilities and regulators have pursued this goal, the complex financial and economic effects of the implementation of reclaimed water systems have often been poorly understood, resulting in a degree of frustration and disappointment. Significant issues that have emerged include:

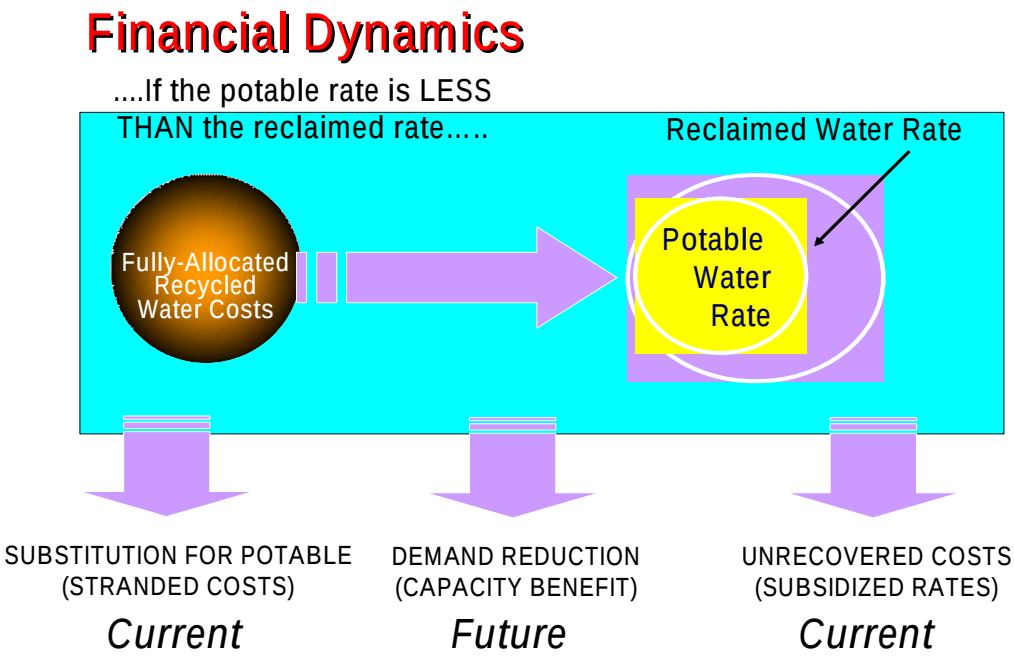
- Somewhat unexpectedly to some, the total cost of providing reclaimed water (treatment, transmission and distribution) often exceeds the current cost of providing potable water on a per unit basis. This occurs because potable water pricing is often based on historical average costs that are lower than the marginal cost of producing reclaimed water. The marginal cost of reclaimed water is frequently greater than the historic cost of potable due to the relatively low number of customers served coupled with the cost of developing a transmission and distribution system. This can be further exacerbated based on the allocation or assignment of wastewater treatment costs to the production of reclaimed water. Depending upon existing potable water plant capacity and the marginal cost of developing future potable water sources, this situation can persist for a significant period of time.
- Substituting reclaimed water use for potable water use reduces potable water demand. Since within the relevant range of demand water utility costs are fundamentally fixed in nature (that is, they do not vary with usage), as the number of potable consumption units is reduced, total costs remain essentially stable. The result is an increase in potable water and wastewater rates.
- In cases where potable water is available for the same uses as reclaimed water (e.g., landscape irrigation), potable water constitutes a perfect "substitute commodity" in relation to reclaimed water. Water and wastewater services are traditionally treated under a monopolistic model and priced on a regulated cost-of-service basis that allows for full cost recovery and in the case of investor-owned utilities, a fair return on investment. However, the availability of a substitute commodity effectively creates a "price ceiling" on reclaimed

water at the level of the potable water price. This is exacerbated by the fact that many consumers perceive reclaimed water as less desirable than potable water due to lingering concerns about its purity. This effectively drops the price ceiling for reclaimed water to some point below the price of potable water where the consumer perceives that this risk has been compensated for.

- Where fixed fees for unlimited usage have been implemented, the demand for reclaimed water has sometimes gone far beyond the utility's capacity to deliver. There is an inherent paradox in that when rainfall is high, higher levels of reclaimed water can be produced. However, since most reclaimed water is used for landscape irrigation, product availability is highest when seasonal demand is lowest. Conversely, in conditions of low rainfall, demand is high, but supplies are low. If guarantees of delivery are made, the cost of storage and/or augmentation with potable water greatly increases the cost of reclaimed water without a commensurate increase in rates: rates which must still be below the price of the substitute commodity.
- Each utility's unique circumstances are critical to making decisions regarding the development of reclaimed water systems and associated pricing policies. For example, utilities with limited wastewater disposal options may view reclaimed water systems primarily as an alternate disposal system. Where potable water resources are dwindling, the substitution of reclaimed water for some potable water uses may be the primary goal. The evaluation of financial consequences will differ markedly between these two situations.
- Unlike potable water supply benefits, which are enjoyed primarily by the same people and businesses that bear the costs, the full benefits of reclaimed water projects often are dispersed over a broader region (such as where reclaimed water projects' environmental and water supply improvements provide benefits to communities downstream). This implies a disconnect between who pays for a reclaimed water project (i.e., the utility's water and wastewater customers) and those who receive some of the important benefits (and may live beyond the service area boundaries and span multiple political jurisdictions). This raises issues about the equity and efficiency of traditional cost recovery approaches, and points toward broader cost sharing and subsidy needs.

In this situation, the rate design process must appropriately allocate those reclaimed water costs not recoverable through reclaimed water rates back to the water and wastewater rates. This can be accomplished by determining, through reasonable estimation processes, the amount of avoided capital and operating costs in each system provided through the use of reclaimed water. For the water system, these avoided costs are represented by the reduced need for water resources development and the cost of additional capacity for water plants, transmission systems, and distribution systems. For the wastewater system, these avoided costs are represented by the reduced need for disposal facilities.

Figure 8-1. Financial Dynamics



However, regardless of the future financial benefits associated with reclaimed water systems, there are two sources of negative financial impacts associated with the implementation of a reclaimed water system:

1. Unrecovered costs where the potable water rate is equal to or less than the cost of reclaimed water on a per unit basis.
2. Loss of revenue through the substitution of reclaimed water for potable water usage.

This discussion analyzes the six reclaimed water system expansion alternatives in terms of these factors. The analysis consists of the calculation of financial impact on the Coconut Creek Utility System and expresses that calculation as a percent of rate revenue imputed at buildout of the reclaimed water system expansion.

8.2 Assumptions of Analysis

1. Capital costs will be debt-financed over a period of 30 years at 6 percent interest, with a debt service reserve fund equal to one year's debt service included in the proceeds of the issue. Issuance costs are assumed to be 2.5 percent of par.
2. Reclaimed water demand by the City is 3 mgd at buildout.

3. Potable water demand for irrigation generally is significantly less than reclaimed water demand because of the latter's lower cost. It is assumed that potable water demand for these purposes would equal 50 percent of the demand if reclaimed water is available.
4. As discussed above, reclaimed water must be priced lower than potable water to be acceptable to consumers. It was assumed that the maximum price of reclaimed water is 80 percent of potable water.
5. Users of the 3 mgd provided by the system expansion will not be sewer customers.

These assumptions are based on our experience with environmental utility financing in general, and specifically on reclaimed water system financial dynamics.

8.3 Analytical Method

The analysis is conducted using the following procedure:

- Annual debt service costs are determined based on total capital costs and the assumptions stated above.
- Annual debt service and annual O&M costs are summed to determine total annual costs.
- Total annual costs are divided by total annual consumption (based on 3 mgd of demand) to determine the reclaimed water rate per 1,000 gallons that fully recovers reclaimed water costs.
- This rate is compared to 80 percent of the potable water rate to determine the maximum reclaimed water rate.
- If the maximum reclaimed water rate is less than the full cost rate, unrecovered reclaimed water system annual costs are calculated.
- Lost potable water revenue is calculated based on the potable water rate and 50 percent of the reclaimed water demand.
- Unrecovered reclaimed water system annual costs (if any) are added to lost potable water revenue to determine total financial impact.
- Imputed annual water and sewer rate revenue at buildout is calculated by adding current rate revenue (approximately $12 million) to the potable water rate revenue that would be realized if reclaimed water is not available as a substitute. As stated above, potable water demand for the same purposes is assumed to be 50 percent of reclaimed water demand.
- Total financial impact is expressed as a percentage of imputed annual water and sewer rate revenue. This represents, all other things being equal and all assumptions proving correct, the amount of necessary rate increases for water and wastewater customers if the reclaimed water system expansion is realized.

8.4 Results of Analysis

The analysis is shown in Table 8-1 below. It may be summarized as follows:

- In alternative 1, full-cost reclaimed water rates are less than 80 percent of the potable rate, not requiring subsidizing of these costs by water and sewer users. The remaining alternatives require subsidies ranging from approximately $70,000 (Alternative 2A) to $6 million (Alternative 3B).
- Lost potable water revenue is the same in all cases, since expected demand for reclaimed water is 3 mgd for all alternatives. The implied lost revenue is about $1.9 million.
- The sole distinguishing factor is the degree to which reclaimed water costs must be subsidized by water and sewer users.
- Total financial impact as a percentage of imputed rate revenue is approximately 14 percent for all Alternative 1. The impact for other alternatives ranges from just over 14 percent for Alternative 2A, to 57 percent for Alternative 3B. This calculation is an estimate of the rate increases necessary to make up lost potable water revenue and reclaimed water system costs subsidies that would not be required without the expansion of the reclaimed water system.

Table 8.2 provides the water and wastewater revenue impact resulting from different levels of grant funding (10%, 25% and 50% funding of projects). For Alternatives 2A, 2B, 3A, 3B and 4, it can be observed that higher levels of grant funding reduce the need for increases in water and wastewater rate revenue. However, as observed for Alternative 1, the revenue impact will not fall below 13.67 percent. This increase represents the portion of lost water revenue resulting from addition of the reclaimed system and cannot be offset by grant funding. As discussed in Section 8.1, the addition of the reclaimed system will reduce potable water demand, resulting in a decrease in potable water revenue if no increase is implemented.

8.5 Conclusions of Financial Analysis

- The results of the financial analysis reflect common experience with the analysis of financial impact associated with the implementation of reclaimed water systems in a utility that also provides potable water and sewer services. Generally, the current impact is negative.
- The fact that there are implementation alternatives that do not require a subsidy from water and sewer users is a positive feature of the analysis. Often this is not possible.
- The loss of potable water revenue is an unavoidable feature of reclaimed water system implementation by a utility that also provides potable water services. This should not be a deterrent to implementation if it can be reasonably expected that the avoidance of future costs associated with the development of new water resources would exceed this lost revenue.

Table 8-2. Impact of Grant Funding

Alternatives	1	2A	2B	3A	3B	4
Percentage Grant Funding	**Impact as % imputed rate revenue**					
No Grant Funding	13.67%	14.16%	23.58%	40.26%	57.25%	43.20%
10% Grant Funding	13.67%	13.67%	20.90%	36.76%	52.74%	39.45%
25% Grant Funding	13.67%	13.67%	16.89%	31.52%	45.96%	33.82%
50% Grant Funding	13.67%	13.67%	13.67%	22.79%	34.67%	24.44%

8.6 Identification of Alternative Funding Mechanisms

Malcolm Pirnie performed an investigation of funding sources and mechanisms. The list of sources investigated is as follows:

8.6.1 Florida State Legislation Funding

8.6.1.1 Community Budget Issue Request

From mid-December to mid-January, the Florida Legislature solicits applications for "Community Budget Issue Request" (CBIR) projects. This process is an opportunity to secure legislative sponsorship of project funding through the state budget. Changes to the law during the 2006 Legislative Session have created uncertainty as to how CBIR projects will be reviewed in the future. The revised water project funding criteria requires that all projects must

A. protect public health and the environment or

B. Implement a state, local or regional plan related to water quality protection.

It is important to note that this funding source can not be used in conjunction with SB444 below, applicants are limited to only one of the two sources of funding.

8.6.1.2 Alternative Water Supply Funding (SB444)

During the 2005 State Legislative Session a bill creating the Water Protection and Sustainability Program, or SB444, was enacted, providing state funding for Alternative Water Supply Projects that are identified in the Water Management Districts' Regional Water Supply Plans. Projects eligible for funding include reclaimed water projects. The bill requires funding recipients provide at least 60 percent of the projects construction cost. Approximately $46 million in project funding was recommended in 2006. As mentioned above, SB444 can not be used in conjunction with Community Budget Issue Request above.

8.6.2 Community Development Block Grant Program

These grants are aimed at benefiting neighborhoods with housing for low and moderate income persons. There is much competition for these grants with much of the funds being used for

Table 8-1. Annual Financial Impact Analysis at Buildout

Alternatives	1	2A	2B	3A	3B	4
ASSUMPTIONS						
Annual Interest Rate	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Term of Debt (years)	30	30	30	30	30	30
Issuance Cost (% par)	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Debt Service Reserve (Note1)	$ 2,498,973	$ 2,737,124	$ 3,716,278	$ 4,855,539	$ 6,278,007	$ 5,215,179
Demand (mgd)	3.0	3.0	3.0	3.0	3.0	3.0
Potable demand as % of RW demand	50%	50%	50%	50%	50%	50%
Max RW rate (%potable)	80%	80%	80%	80%	80%	80%
Capital Costs	$ 31,060,000	$ 34,020,000	$ 46,190,000	$ 60,350,000	$ 78,030,000	$ 64,820,000
Grant Funded	$ -	$ -	$ -	$ -	$ -	$ -
Total Capital Costs	$ 31,060,000	$ 34,020,000	$ 46,190,000	$ 60,350,000	$ 78,030,000	$ 64,820,000
Total Financed [4+7+(3*par)]	$ 34,397,948	$ 37,676,052	$ 51,153,935	$ 66,835,678	$ 86,415,707	$ 71,786,058
Annual Debt Service	$ 2,498,973	$ 2,737,124	$ 3,716,278	$ 4,855,539	$ 6,278,007	$ 5,215,179
Annual O & M Costs	450,000	371,000	701,000	1,880,000	2,820,000	1,930,000
Total Annual Costs	$ 2,948,973	$ 3,108,124	$ 4,417,278	$ 6,735,539	$ 9,098,007	$ 7,145,179
Consumption (1,000 gals)	1,095,000	1,095,000	1,095,000	1,095,000	1,095,000	1,095,000
Rate per 1,000 gals at cost	$ 2.69	$ 2.84	$ 4.03	$ 6.15	$ 8.31	$ 6.53
Potable water rate (Note 2)	$ 3.47	$ 3.47	$ 3.47	$ 3.47	$ 3.47	$ 3.47
RW Rate at Lesser of Cost (13) or Maximum % potable (6*14)	$ 2.69	$ 2.78	$ 2.78	$ 2.78	$ 2.78	$ 2.78
RW Revenue at max rate (12*15)	$ 2,948,973	$ 3,039,720	$ 3,039,720	$ 3,039,720	$ 3,039,720	$ 3,039,720
Unrecovered RW costs	$ -	$ 68,404	$ 1,377,558	$ 3,695,819	$ 6,058,287	$ 4,105,459
Lost potable water revenue (14*12*6)	$ 1,899,825	$ 1,899,825	$ 1,899,825	$ 1,899,825	$ 1,899,825	$ 1,899,825
Total Financial Impact (19+17) (Note 3)	$ 1,899,825	$ 1,968,229	$ 3,277,383	$ 5,595,644	$ 7,958,112	$ 6,005,284
Imputed Annual Water and Sewer Rate Revenue at Buildout (Note 4)	$ 13,899,825	$ 13,899,825	$ 13,899,825	$ 13,899,825	$ 13,899,825	$ 13,899,825
Impact as % imputed rate revenue	13.67%	14.16%	23.58%	40.26%	57.25%	43.20%

NOTES

(1) Equals one year's debt service.

(2) Rate for highest block.

(3) Assumes RW users are not sewer service users.

(4) Approx. $12,000.000 in current total rate revenue plus potable water revenue that would be used by RW customers if RW were not available.

neighborhood improvements such as street paving, sidewalk repair and replacement, and street lighting.

8.6.3 Environmental Education Grant Program

Environmental Education Grants are aimed at supporting environmental education projects that enhance the public's awareness, knowledge, and skills to make informed and responsible decisions that affect environmental quality. Congress has annually appropriated $3 million to this program. Majority of these funds are awarded by the EPA's ten regional offices with awards typically being $50,000 or less.

8.6.4 Florida State Revolving Fund (SRF)

This loan program provides low-interest loans to local governments for eligible projects including reclaimed water projects. Interest rates on loans vary based on an applicant's economic resources and range from as much as 80 percent below market rates to 20 percent below market rates. The Clean Water SRF is by far Florida's largest financial assistance program for water-related infrastructure.

8.6.5 State Bond Loan Program

The State Bond Loan Program is jointly administered by the Department of Environmental Protection and the Division of Bond Finance of the State Board of Administration. Up to $300 million in State of Florida, tax exempt, full faith and credit, Pollution Control Bonds may be issued annually at market rates. Bond proceeds are then loaned to local governments. Loans from this program may be used for projects related to "drinking water, wastewater, stormwater, solid waste, and air pollution", reclaimed water projects are not listed as eligible.

8.6.6 Utility Revenue Bonds

Utility Revenue Bonds are a form of Municipal Bonds used to finance the construction of utility projects. These bonds are repaid from the operating revenue generated after completion of the project. There is no limit as to the amount of Utility Revenue Bonds that may be issued; however, the utility must meet criteria set forth in the bond indenture, including coverage requirements.

8.6.7 Short Term Notes

In the short term, construction can be financed through bond anticipation notes, or commercial paper. These short-term borrowings could be renewed until retired by utility revenue bonds. These forms of short-term borrowing are typically used until more permanent forms of financing, such as revenue bonds, are complete.

8.7 Financial Plan

Several alternatives are mentioned for funding the reclaimed projects outlined herein. Among these alternatives are federal, state and local grants, state loan programs, and traditional financing including revenue bonds and short-term notes. Table 8-3 below provides general guidelines regarding these funding mechanisms.

Table 8-3. Guidelines for Funding Mechanisms

Funding Mechanism	Guidelines
Federal, State and Local Grants • Community Budget Issue Request (CBIR) • Alternative Water Supply Funding • Community Development Block Grant Program • Environmental Education Grant Program	Where available, grant funding should be considered as a source of funding, however, competition for these funds is great and sources are limited. Disadvantaged communities typically have a greater opportunity for grants. Changes during the 2006 Legislative Session have created uncertainty as to how CBIR grants will be reviewed. Under most circumstances, grant recipients are required to provide a portion of a projects construction cost. See discussion below regarding the impact of grant funding on water and wastewater rate revenue.
State Loan Programs • Florida State Revolving Fund (SRF) • State Bond Loan Program	Consideration should be given to applying for the Florida SRF. Forms for this submittal are available from the FDEP. This loan program provides loans with interest rates from 80% to 20% below market, depending on eligibility.
Traditional Financing • Revenue Bonds • Short-Term Notes	To the extent that grants are not available the City should consider traditional sources of financing. Short-term sources, such as, bond anticipation notes and commercial paper, can be used as interim financing until more permanent sources (revenue bonds) are complete.

An analysis of the impact of different levels of grant funding (10%, 25% and 50% of capital costs), included as Table 8-2, provides a comparison of the revenue impact on water and wastewater, for each reclaimed treatment alternative, at each level of grant funding. It is observed that for alternatives 2A, 2B, 3A, 3B and 4, higher levels of grant funding will require less impact on water and wastewater revenue. However, as observed for alternative 1, the revenue impact will not fall below 13.67 percent

as this increase represents the portion of lost water revenue resulting from addition the reclaimed system and cannot be offset by grant funding.