Reuse in Florida: Moving Toward the 21st Century

David W. York and Lisa Wadsworth

The Florida Legislature has established the encouragement and promotion of water conservation and reuse of reclaimed water as formal state objectives [1, 2]. In response to these statutory objectives, DEP and other state agencies, particularly the water management districts, have implemented a comprehensive reuse program [3, 4]. The centerpiece of the program is a set of comprehensive rules governing a wide range of reuse activities [5]. Table 1 presents the contents of Florida's reuse rules contained in Chapter 62-610, F.A.C., Reuse of Reclaimed Water and Land Application. These rules are consistent with the national Guidelines for Water Reuse [6].

Table 1. Contents of Florida's Reuse Rules

Part	Contents
I	General: Applicability, definitions, technical guidance, O&M requirements, pretreatment programs.
II	Agricultural Irrigation: Feed, fodder, & pasture crops.
III	Urban Reuse: Irrigation of public access areas & residential properties, toilet flushing, aesthetic uses, dust control, others. Agricultural Irrigation: Edible food crops.
IV	Rapid-Rate Systems: Ground water recharge using rapid infiltration basins (RIBs) & absorption fields.
V	Ground Water Recharge: Injection projects. Indirect Potable Reuse: Augmentation of surface water supplies.
VI	Overland Flow Systems: A land application treatment system (not considered "reuse").
VII	Industrial Reuse: Cooling, process, & wash waters.
VIII	Permitting: Permitting requirements, reuse classification criteria, storage requirements, reporting requirements, & reuse feasibility study requirements.

Source: Chapter 62-610, F.A.C. (5)

Growth of Reuse

As shown in Figure 1, reuse has rapidly grown in popularity in Florida [7]. During just the last decade, the number of treatment facilities making reclaimed water available for reuse has grown from 118 to 444 (about a 275% increase). During this period, reuse capacity has increased from 362 to 826 MGD (about a 125-percent increase) and flows being reused grew from 206 to 402 MGD (about a 95% increase).

Current Reuse Activity

In 1996, there were 416 reuse systems in Florida [7] taking reclaimed water from 444 domestic wastewater treatment facilities. The total capacity of the reuse facilities was 826 MGD, which represented nearly 40% of the total permitted domestic wastewater treatment capacity in the state.

About 402 MGD of reclaimed water was used in Florida in 1996 [7] for various purposes as shown in Figure 2. Approximately 40% of Florida's reclaimed water is used to irrigate public access areas (golf courses, parks, other landscaped areas, and residential properties). The 1996 Reuse Inventory [7] noted that reclaimed water was used to irrigate 57,221 residential properties, 257 golf courses, 238 parks, and 100 schools in Florida.

Florida is home to a number of well known and award-winning reuse projects. The St. Petersburg reuse system (urban reuse), CONSERVII (agricultural reuse project serving portions of Orlando and Orange County), Project APRICOT (Altamonte Springs' urban reuse system), Orlando's wetlands project, and Tallahassee's agricultural reuse system are particularly notable.

The Future

The trend toward reuse is expected to continue in Florida. The major driving force is the state's population growth, which is projected to increase to about 20 million by 2020, a 40% increase over the population in 1995 [8]. The growth is expected to occur primarily in the coastal areas and the Orlando area. During the 1995-2020 period, reuse capacity is projected to increase by about 60%, the amount of reclaimed water used to double, [9] and reuse flows to increase faster than reuse capacity. This reflects the fact that reuse utilities are expected to begin sending increased flows to reuse systems that have been constructed over the last decade.

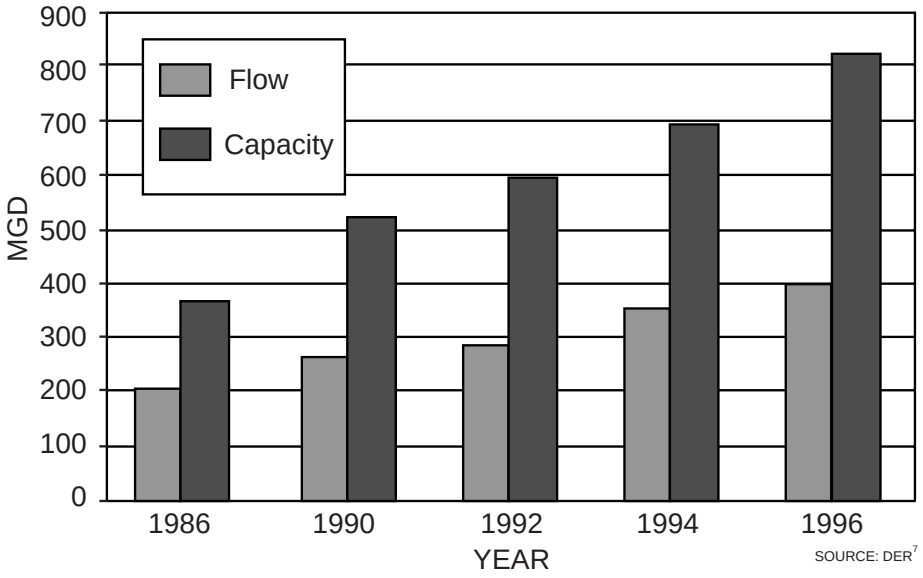
Reuse activity is expected to continue to focus on urban reuse systems (including irrigation of golf courses, parks, residential properties, and other landscaped areas, and other urban uses). Agricultural reuse and industrial reuse also are expected to see increased activity.

There is also growing interest in groundwater recharge and indirect potable reuse in Florida. Leading the way is the Tampa Water Resource Recovery Project. Recognizing the regional significance of this indirect potable reuse project, DEP is employing an "ecosystem team permitting" approach in an effort to "maximize net environmental benefits" from the project, and all permitting agencies and the public are involved in its final scoping. As much as 50 MGD of high-quality reclaimed water could be used to augment Tampa's surface water supply.

Two other indirect potable reuse projects are being developed and are in the pilot plant stage. West Palm Beach is pursuing a wetlands-based project. Reclaimed water would receive additional treatment by man-made and natural wetlands before being allowed to recharge ground water. A mixture of ground water and reclaimed water would then be recovered and used to augment the city's surface water supply.

Palm Beach County also is developing an indirect potable reuse system. The county plans to provide a high level of treatment

Figure 1. Growth of Reuse in Florida



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with discharge to an area canal. Wells would be constructed along the canal and a mixture of reclaimed water, ground water, and canal water would be recovered and treated for potable purposes using reverse osmosis.

Another area of growing interest is aquifer storage and recovery (ASR). While Florida has permitted several ASR systems for storage of treated drinking water, ASR for storage of reclaimed water is not specifically addressed in existing rules, and permits have not been issued. Currently, ASR systems for storage of reclaimed water are proposed for reuse projects in Hillsborough and Manatee counties.

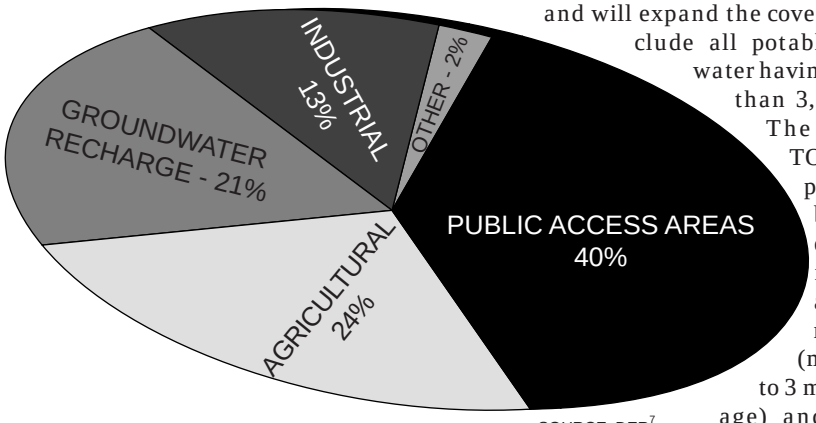
Ongoing Rulemaking

In an effort to be responsive to the future orientation of reuse in Florida, DEP is proposing revisions to the reuse rules in Chapter 62-610, F.A.C.[10]. As always, the basic tenet is formulation of rules that protect public health and environmental quality. Recent state legislation mandates that proposed rules having health implications be based on risk evaluations. In response, the DEP has prepared a draft risk impact statement[11] for the proposed rule revisions.

The proposed revisions focus on the following:

1. Refinement of rules governing ground water recharge and indirect potable reuse in Part V.
2. Refinement of disinfection requirements for some industrial uses of reclaimed water in Part VII.
3. Creation of a rule in Part III governing ASR of reclaimed water.
4. Creation of a rule in Part III governing the use of various water supplies to augment available supplies of reclaimed water.
5. Creation of a rule governing blending of demineralization concentrate with reclaimed water.

Figure 2. Reuse Activities in Florida



SOURCE: DER[7]

The most significant revisions are summarized in the following sections of this paper.

Table 2. Proposed Ground Water Recharge and Indirect Potable Reuse Rules

Reuse System Type	Requirements (a)
Injection to Ground Water [TDS < 3,000 mg/L]	Secondary treatment & filtration Total Organic Carbon (TOC): Average 3 mg/L * Maximum 5 mg/L * Total Organic Halogen (TOX): Average 0.2 mg/L Maximum 0.3 mg/L Meet primary & secondary drinking water standards & drinking water disinfection * Total nitrogen: 10 mg/L (average) ** Multiple barriers for organics & pathogens * Pilot testing program *
Injection to Ground Water [TDS > 3,000 mg/L]	Secondary treatment & filtration Drinking water disinfection * Meet primary drinking water standards Zone of discharge for secondary drinking water standards & sodium * Total nitrogen: 10 mg/L (average) **
Rapid Infiltration Basins	Secondary treatment (CBOD5 & TSS < 20 mg/L) Basic disinfection (200 fecal coliforms/100 mL) Nitrate: Maximum 12 mg/L (as N)
Rapid Infiltration Basins in Unfavorable Hydrogeologic Conditions (b)	Secondary treatment & filtration High-level disinfection Meet primary & secondary drinking water standards Total nitrogen: 10 mg/L (average) **
Discharge to Class I Surface Waters (used for potable supply)	Secondary treatment & filtration Drinking water disinfection * Meet primary & secondary drinking water standards Total nitrogen: 10 mg/L (average)

(a) Proposed revisions to Chapter 62-610, F.A.C. (10). Proposed revisions are noted as follows:
* Proposed revisions.
** Proposed new requirements.
(b) Applies to systems located in karst areas, systems recharging unconfined aquifers, continuously loaded systems, and systems loaded at rates greater than normally allowed for rapid-rate land application systems.

Groundwater Recharge and Indirect Potable Reuse: Much of the ongoing rulemaking centers on ground water recharge and indirect potable reuse concepts. Table 2 presents a summary of the proposed rules that relate to these activities.

Injection to Ground Water Having TDS Less Than 3,000 mg/L: Florida currently has rules governing injection of reclaimed water to high-quality portions of the Biscayne and Floridan aquifers having TDS concentrations less than 500 mg/L. The proposed rules will refine existing requirements and will expand the coverage to include all potable ground water having TDS less than 3,000 mg/L. The existing TOC limit is proposed to be tightened from 5 mg/L (average) and 9 mg/L (maximum) to 3 mg/L (average) and 5 mg/L (maximum). A 10-mg/L total nitrogen limit will be added. The current requirement for activated carbon treatment probably will be replaced with a requirement for "multiple barriers" for control of organics and pathogens. In addition, extensive pilot testing requirements, including health effects testing, are proposed to be substituted for the current full-scale testing requirements.

Current rules require compliance with Florida's high-level disinfection criteria. This requires that at least 75% of all observations of fecal coliforms be less than detection and that no single sample shall exceed 25 per 100 mL.

Total suspended solids are also required to be less than 5.0 mg/L. It has been proposed to replace the high-level disinfection requirements with the drinking water disinfection requirements for this type of project. This will essentially require that total coliforms be less than detection.

Injection to Ground Water Having TDS Greater Than 3,000 mg/L: As noted in Table 2, relatively minor revisions are proposed for this type of injection. A 10-mg/L total nitrogen limit is proposed. A zone of discharge is proposed to be allowed for parameters regulated as state secondary drinking water standards and for sodium (a state primary drinking water standard). Compliance with the ground water standards, which are the drinking water standards, for these

parameters would be required at the edge of the zone of discharge.

ASR: A new rule is proposed to address storage of reclaimed water meeting Part III requirements (high-level disinfection for public access reuse) using ASR. The basic rule requirements proposed parallel the requirements for the two injection cases discussed previously.

The most notable exception involves use of groundwater containing between 1,000 and 3,000 mg/L of TDS, which is not used as a source of potable water, for ASR. In this case, the proposed rule would impose the treatment requirements used for injection to ground waters having TDS greater than 3,000 mg/L.

In addition, an extended zone of discharge would be allowed for the ASR system in order to accommodate the "bubble" of reclaimed water stored in the formation. The extended zone of discharge would apply only to parameters regulated as secondary drinking water standards and to sodium, which is a primary drinking water standard established by Florida. Compliance for parameters afforded the extended zone of discharge would be at the edge of the extended zone of discharge.

Salinity Barriers: Injection systems used to control saltwater intrusion would parallel the normal injection cases described previously. The exception is for injection wells for salinity control, which inject reclaimed water at a point(s) where TDS in the receiving ground water is between 1,000 and 3,000 mg/L. As was done for ASR systems injecting into ground waters in this TDS range, the limits imposed on injection to ground water having TDS greater than 3,000 mg/L would be imposed on these salinity barrier wells. A setback distance of 1,000 feet to potable water supply wells is proposed.

Discharge to Class I Surface Waters: Only relatively minor revisions are proposed to the existing rules governing discharges to Class I surface waters (used for public water supply). Filtration will be specified as a treatment requirement. In addition, the existing requirement for high-level disinfection is proposed to be replaced with the drinking water disinfection requirements.

Rapid-Rate Land Application Systems: Rapid-rate land application systems, including rapid infiltration basins (RIBs) and absorption fields, are addressed in Part IV of Chapter 62-610, F.A.C. No significant changes are proposed for the vast majority of these systems.

Part IV also includes an existing rule that addresses rapid-rate systems in unfavorable hydrogeologic conditions (such as karst areas) and systems that are continuously loaded or are loaded at rates above what is normally allowed for most rapid-rate systems. The key change proposed for this special case of rapid-rate system is the proposed addition of a 10-mg/L total nitrogen limitation. The proposed text also clarifies how the drinking water standards will be applied as reclaimed water limits.

Industrial Uses: Part VII of Chapter 62-610, F.A.C., addresses use of reclaimed water for cooling, washing, and process water applications. Existing rules require secondary treatment and basic disinfection (200 fecal coliforms per 100 mL) for these types of reuse activities. The proposed revisions would impose the full requirements of Part III (filtration, high-level disinfection, and other controls) on reclaimed water used to manufacture paper used to wrap or package food or beverage products, and cosmetic or sanitary products intended for human dermal contact.

Two cases are proposed for use of reclaimed water in open cooling towers:

1. A 300-foot setback distance would be imposed from the cooling tower to the property line if secondary treatment and basic disinfection is provided. In addition, windblown sprays would be prohibited from reaching areas accessible to the public.
2. If the full Part III requirements (including high-level disinfection) are met, setback distances would not be required.

Supplemental Water Supplies: Several reuse projects in Florida use other water supplies to augment their available reclaimed water supply. CONSERV II uses groundwater to meet peak demands (notably freeze protection needs of the citrus growers). In Cape Coral, an extensive network of freshwater canals provides additional water to their urban reuse system. Altamonte Springs' Project APRICOT has used a variety of other waters to augment their reclaimed water supply.

The ongoing rulemaking includes proposed rules governing the use of groundwater, surface water, treated stormwater, and drinking water to augment the supply of reclaimed water.

Backflow prevention devices will be required to protect these supplemental water supplies. The type of backflow prevention device required will reflect the degree of hazard posed to the supplemental water supply. For example, an air gap separation will be required if drinking water is used, while a simple flap valve would be required for use of treated stormwater.

Treatment to meet high-level disinfection requirements will be required for surface waters or stormwater used as supplemental water supplies.

Demineralization Concentrate: An increasing number of water treatment facilities in Florida provide membrane treatment for demineralization or softening. Disposal of the resulting brine or concentrate poses a growing problem in Florida. Several utilities have successfully blended demineralization concentrate with reclaimed water.

The blending of demineralization concentrate with reclaimed water is being addressed in the ongoing rulemaking. The primary concern focuses on potential for elevated concentrations of inorganic materials in the reclaimed water/concentrate blend to adversely affect vegetation and soils. While blending probably will be allowed, constraints on the minimum blend ratio will be imposed. In addition, storage will be required on the concentrate stream to ensure that undiluted concentrate is not discharged to the reuse system.

Monitoring for Protozoan Pathogens: Reflecting growing interest in the protozoan pathogens, DEP has proposed inclusion of limited monitoring for Cryptosporidium and Giardia in reclaimed water that receives high-level disinfection. While numeric pathogen criteria are not proposed as part of the ongoing rulemaking, the proposed monitoring may prove useful in future rulemaking to address the protozoan pathogens in more detail.

In addition, DEP and several utilities in Florida have been working with the Water Environment Research Foundation to develop additional studies of the fate of pathogens in water reclamation facilities and in the natural environment.

Schedule: The fifth public workshop on proposed revisions to Chapter 62-610, F.A.C., has been scheduled for July 1998. It is anticipated that the proposed rule revisions will be considered for formal adoption at a public hearing before Florida's Environmental Regulation Commission during the winter of 1998-1999.

Summary

Reuse continues to grow in popularity in Florida. As we approach the 21st century, there is growing interest in ground water recharge, indirect potable reuse, and ASR. Ongoing rulemaking is designed to pave the way for these types of reuse activities.

References

1. "Reuse of Reclaimed Water." Section 403.064, Florida Statutes. Tallahassee, FL. 1989.
2. "Reuse of Reclaimed Water." Section 373.250, Florida Statutes. Tallahassee, FL. 1994.

Continues Page 39

Exploring New Water Supply Sources for the Tampa Bay Area

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lthough discussed in general terms for many years, the question of water supply for the Hillsborough, Pasco, and Pinellas urban centers finally came to the top of the agenda for both business and government in 1997. A combination of factors—angry homeowners in Pasco County who watched their lakes and wetlands dry up, time and money wasted by government suing government, SWFWMD's initial misstatements on cutbacks related to the setting of Minimum Flows and Levels, businesses' realization that prosperity stops without water, and, finally, threats from the Florida legislature that it would solve the problem if local governments did not—caused an awakening to the fact that regional cooperation was imperative. From that came the question, where would the Tampa Bay area find the water that is everyone's life necessity if groundwater was no longer the good old easy solution.

Like all really demanding and puzzling social, economic, environmental, and political predicaments, Tampa Bay's water problem will require a complicated set of ideas to bring success. But, as inconceivable as it may seem, regulators are becoming more flexible, bureaucracies are becoming less provincial, and politicians from three counties and two cities have successfully agreed on new ideas.

Water sources that some would not have considered in the past are getting the attention they always deserved. Early in the 21st century, water already once used in our cities will be purified and blended back into potable supplies, water manufactured by desalting some of the Gulf of Mexico will be drinkable, and rainwater will be captured as drinking water rather than being drained away.

Near total dependence on groundwater is the rule for most of Florida, but, first for the city of St. Petersburg and later for Pinellas County, the need to go outside the county for groundwater began in the 1950's when the remaining wells on the Pinellas peninsula were deemed inadequate. St. Petersburg built wellfields in northwest Hillsborough County, and conflict began almost immediately. In the early 1960's several of the wellhouses were painted with "Yankee go home" graffiti.

As the Pinellas County water system grew, more wells were needed. The county bought other lands, later including huge former cattle ranches, and planned wellfields with capacities of 20 to 30 MGD.

Hillsborough County and the city of Tampa also began looking toward Pasco County. In the early 1970's SWFWMD floated the idea of building wellfields on lands it was buying for flood control and becoming a wholesale water provider for the area. However, since SWFWMD had just entered the regulatory field with its early groundwater regulatory concepts, it was decided by the Florida legislature that, to prevent the crisscrossing of pipelines into Pasco County from several thirsty local governments to the south, a new agency—the West Coast Regional Water Supply Authority (WCRWSA)—would be formed. The charter members in 1974 were the counties of Pinellas, Pasco, and Hillsborough and the cities of St. Petersburg and Tampa.

The WCRWSA's job was to be the wholesale groundwater supplier for all the members, but to leave for each member utility the treatment and retail distribution of the water.

From the beginning Pasco County complained that it was being used as a water source without any long term consideration of its needs. It was further concerned that as a minority member it could be outvoted. In view of these concerns, the WCRWSA conducted environmental studies for each proposed project to protect against serious effects to the lakes and wetlands, and SWFWMD issued Consumptive Use Permits to the Authority only after extensive negotiations had led to rigid permit conditions.

Because none of the members of the WCRWSA wanted money generated from water sales within its utility to be spent for water supplies for other local governments, each new wellfield project had to stand on its own income, and each had a different water rate. Some of the wellfields in the region continued to be operated by the member utilities. Cooperation among members on certain projects was difficult, even as it became clear that environmental effects of the wellfields were obvious. For years those effects were blamed on drought conditions, and scientific battles between SWFWMD and the WCRWSA went on and on. Urban-needs-versus-rural-supplies arguments raged.

In 1995, after years of what came to be known in the media as the "Tampa Bay Water Wars," the SWFWMD governing board made a determination that existing permits would not be renewed. WCRWSA, knowing that water had to keep flowing, fought with all the resources its members could muster.

The challenge to the SWFWMD order caused a huge Chapter 120 hearing lasting six weeks. The two government agencies suing each other cost water users and taxpayers over $7 million.

The final order was mixed, but, because SWFWMD had issued the permits and WCRWSA was living within them, the water kept flowing. At about the same time, the legislature mandated that the WCRWSA have a study done of its basic governance tenets in order to bring about a more workable economic and political system. Changes in the membership of the board of the WCRWSA created an opportunity to accomplish that.

The governor and key legislators had embraced the concept of Minimum Flows and Levels as a solution to the expanding statewide water supply problems, and a bill in the 1996 legislature forced its early implementation in the Tampa Bay area. The result was a decision by the SWFWMD governing board in 1997 that appeared to say the 190 MGD that is presently being pumped from eleven different wellfields needed to be reduced to 40 MGD.

Immediate and powerful repercussions throughout the business and political community followed, and it became certain that the all the pieces were in place and the timing right to assure big changes in groundwater pumping quantities and the attendant environmental consequences. It also became clear that the problem must be addressed with innovation, determination, and speed.

A "Partnership Plan" between SWFWMD and the WCRWSA was negotiated. It included SWFWMD funds to help with alternative supply concepts and a WCRWSA agreement to go in that direction instead of using groundwater. The legislature's threat to all the players, "either you do it or we will do it for you," was effective impetus. The WCRWSA's new governance plan makes it a true regional wholesale utility with a board of nine members (all elected officials from the member governments), a uniform rate structure, and operational control of all of the existing wellfields to optimize the rotation and resting. It also

officially changed the WCRWSA's name to Tampa Bay Water.

So, what do you do if your groundwater supplies are cut by half or more, and the construction of new wellfields is seen by almost all citizens with the same negativism as having a landfill nearby?

We often see lists of alternative water supplies that include conservation or aquifer storage and recovery, but these are not truly new sources. They are ways of making more efficient use or storage of the water that has already been extracted and treated.

Other ideas, such as interconnecting several utilities' supplies to help balance extractions and to use in case of emergency, need to be done early in the optimization part of the effort , but after those are done there are three true alternatives to groundwater: (1) capturing and using more surface water, (2) reusing the existing water supply, and (3) desalting mineralized waters.

In the Tampa Bay area, each of the alternatives are now in the intense planning stage. The projects are taking shape as follows:

Capturing and Using More Surface Water

"The Enhanced Surface Water System" is the formal name for the newest of Tampa Bay Water's Master Water Plan projects. It envisions the use of the Tampa Bypass Canal flood control works to capture the flood peaks of the Hillsborough River, the Tampa Bypass Canal drainage areas, and the Alafia River. These quantities would quickly be moved during and immediately following flood peaks through an 84-inch pipeline to a large surface-water reservoir to be constructed, possibly with the assistance of the phosphate industry, in eastern Hillsborough County. Preliminary ideas showed a 50-foot deep excavation with perimeter levees 50 feet above natural ground. Stored water would then be moved back the 20- or 30-mile distance for use as needed.

Reusing the Existing Water Supply

The Tampa Water Reuse Recovery Project contains exceptional innovation. It will be the first indirect potable reuse project in Florida and only the second east of the Mississippi River. It will take up to 50 MGD of the high quality effluent from the city's Howard F. Curren Advanced Wastewater Treatment Plant, treat it in a supplemental treatment plant adjacent to the Curren Plant to achieve drinking water standards, and pump the water in a 48-inch pipeline to the Tampa Bypass Canal. There, after mixing with groundwater from the canal, it can be withdrawn and treated in one or more conventional water treatment plants before distribution to the regional system of Tampa Bay Water or the city of Tampa.

The project pioneered an extraordinary pilot permitting project, called Ecosystem Team Permitting, authorized by the legislature and with DEP as the lead agency. Representatives of six environmental regulatory agencies and the two owners sat around one table devising the best project. By prior written agreement, the process was required to be completed in 12 months, and at the end of that time the city of Tampa and Tampa Bay Water were to know whether the project would be permitted. Initial success was achieved in June 1998, when DEP Secretary Virginia Wetherell signed the negotiated permit document as an "intent to issue."

Using Ecosystem Team Permitting, environmental benefits of the project were allowed to accrue anywhere in the ecosystem. Thus, major quantities of the new water will be used by Tampa Bay Water to rest and rotate wellfields and produce immediate environmental benefits in addition to providing some new drinking water supplies. Health effects questions of the concept have been addressed and successfully answered during a prior four-year comprehensive study.

The reuse recovery project can stand on its own or, if the enhanced surface water project is built, the water can become a drought-proof part of that option.

Desalting Mineralized Waters

The desalination request-for-proposals by Tampa Bay Water resulted in five competing alternatives for a desalting plant to be built in the Tampa Bay environs with a capacity of up to 50 MGD. The responding consortiums are some of the major membrane and electric power companies in the United States. The project is attractive because of the high visibility of the Tampa Bay area's water situation, and because it would be the largest reverse osmosis project in the nation. Tampa Bay Water is evaluating the submittals.

The new Tampa Bay Water governing board will soon make decisions about whether the additional water supplies of the Tampa Bay area consist of one, two, three, or appropriate combinations, of the projects discussed above. Regardless of what is decided, the era of "new" water will be introduced to Florida. ■

Residential Reclaimed Water Business in Pinellas County

Victor W. Formby, Thomas Jones, and Carrie S. Mann

This was the last article wtitten by Victor W. Formby, the utilities director of engineering for Pinellas County from 1994 until his death in March 1998. The article was finished by Carrie S. Mann, a public relations specialist with Pinellas County Utilities, assisted by Thomas Jones, a partner with Parsons Engineering Science, Inc.

The Pinellas County Water System was created by a special act of the Florida legislature in 1935 to provide water to the beach communities within the county. The original source of water, the Walsingham Reservoir in central Pinellas County, was soon insufficient because of rapid development. In the 1950's, the county acquired the rights to the 1,800-acre Eldridge-Wilde Wellfield property in northeastern Pinellas County. That wellfield was sufficient until the 1970's, at which time the county purchased the Cypress Creek property in Pasco County. Several years later the county acquired the Cross Bar Ranch, also in Pasco County.

Tampa Bay Water (formerly the West Coast Regional Water Supply Authority) was established by the cities of Tampa and St. Petersburg and the counties of Hillsborough, Pinellas, and Pasco in October 1974 as a result of state-enabling legislation (74-114, Laws of Florida). Each entity serves as a member of the agency's governing board, which meets for the purpose of developing, storing, and supplying water for county or municipal purposes in such a manner as will give priority to reducing adverse environmental effects of excessive or improper withdrawal of water from concentrated areas. Since the 1970's, the agency has provided potable water to its member governments at cost. These governments in turn serve the almost two million residents of the Tampa Bay region.

Pinellas County currently supplies approximately 68 MGD to its retail and wholesale customers. This is down from 77 MGD in 1988, primarily due to conservation efforts. The county serves approximately 104,000 retail customers and provides wholesale service to the cities of Tarpon Springs, Oldsmar, Safety Harbor, Clearwater, Pinellas Park, and Belleair.

Because of the geographic location of several municipalities, the water and sewer service areas of the county are bisected into two distinct service districts, the north and the south. Having unique geographic and operational characteristics, each districtz has developed more or less independently. The separation is more distinct in the cases of the sewer and reclaimed water service than the potable water system.

North Sewer Service Area

Rapid population growth and land development during the 1970's and 1980's brought rapid growth to the north service area. In the 1970's, the growth of the region was so brisk that the sewer system could not keep pace with the demand. As a result, a number of small, independent wastewater treatment facilities, operated and maintained by the county by agreement, were constructed by developers to serve golf communities.

Constructed with percolation ponds as a means of effluent disposal, the plants had to be continually expanded because of growth of the developments. Because the ponds were insufficient as a means of effluent disposal, a number of independent agreements were made with the developers to provide for the disposal of the effluent generated by the plants. This was the birth of the county's reclaimed system in the north service area.

There were independent systems created for the developments of East Lake Woodlands, Lansbrook, Tarpon Woods, Pine Ridge, and Cypress Run. In each case, effluent was transferred from the storage pond at the plant site to a holding pond or isolated lake on the golf course to be held until needed for golf course irrigation. The systems proved to be costly to operate and maintain.

Simultaneously, the county constructed the Northwest Wastewater Treatment Plant in Palm Harbor to provide sanitary sewer service to the unincorporated areas between Tarpon Springs and Dunedin. In November 1991, the plant equipment was upgraded and the treatment capacity was increased to replace the independent plant operations. Operating costs were reduced by providing treatment and disposal at a single facility.

In the mid 1990's, the county initiated a program to eliminate the independent wastewater treatment plants and to centralize treatment and disposal of wastewater at the newly expanded Northwest Wastewater Treatment Plant. The program required the construction of force mains to transport the untreated wastewater from the various locations to the Palm Harbor site. As part of the plant expansion, a 170-million-gallon lined holding pond was constructed at the plant site for effluent storage. In addition, pipelines for the transmission of effluent back to the golf courses were constructed. The county then had a dual system of raw wastewater and treated effluent pipelines traversing north Pinellas County that enabled single-family and multi-family users to be connected to the reclaimed water system. These residential users account for less than 10% of the volume of reclaimed water distributed in the north county service area.

South Sewer Service Area

The county's south sewer service area was the first to develop, and it did so in a more orderly fashion. There are two facilities in the area: the South Cross Bayou Water Reclamation Facility constructed in 1962 as a 3-MGD trickling filter plant and the McKay Creek Wastewater Treatment Facility initially constructed in 1966 as a 1.5-MGD activated sludge facility.

Because of the rapid growth of south Pinellas County, both plants were expanded a number of times. The South Cross Plant was expanded in 1970, 1973, and again in 1981, with the last expansion increasing capacity to 27 MGD. During this period, the plant discharged its effluent into Joe's Creek. When the Clean Water Act was passed in 1972, the county recognized the need to convert from surface water discharge to deep well injection.

The construction of a deep well injection system was completed in 1985. Operational problems resulted in traveling bridge sand filters being added, and the system was not fully operational until 1988. At that time, discharge into Joe's Creek was terminated, and all effluent disposal was by means of the deep well injection system.

The McKay Creek Plant was expanded to 6 MGD in 1980. Effluent was discharged into the intracoastal waterway adjacent to the plant until 1984 when two deep injection wells were constructed on site. The McKay Creek Plant experienced similar problems with the deep well injection system as the South Cross Plant. Despite these problems the deep wells are still used today.

On March 19, 1991, DEP issued a Warning Notice to Pinellas County that cited possible movement of the injected fluid into higher quality water zones at both plant sites. This action ultimately led to consent orders for both plants requiring the elimina-

tion of deep well injection. Currently, the South Cross Bayou Water Reclamation Plant is undergoing a $95 million expansion to upgrade it to a state-of-the-art advanced wastewater treatment plant. The county is working with the adjacent community and a neighborhood advisory committee for feedback, concerns, and problems. The county communicates to the neighboring community using a monthly newsletter, *Pinellas County Utilities—The South Cross Project Update.*

Planning and Consolidation

Pinellas County entered into an agreement with Parsons Engineering Science in 1993 to perform a comprehensive study of the deep well injection problem and potential alternative methods of effluent disposal. The study concluded that the wells should be decommissioned and that there were only two viable means of effluent disposal: discharging to Joe's Creek and/or public access irrigation. The most desirable choice was the latter. This was in accord with the county's policy of maximizing local resources as well as similar policies of DEP and SWFWMD and was consistent with the goals of the Tampa Bay National Estuary Program to reduce wastewater discharges into Tampa Bay.

In 1994, the county consolidated its water, sewer, and solid waste departments into a single entity known as the Pinellas County Utilities Department. That consolidation integrated resources for planning.

During the time that the sewer plants were experiencing rapid growth and expansion, the county's water system was also experiencing similar challenges. The county experienced a water supply shortage in the mid 1970's that resulted in a brief moratorium in building and several years of rationing of supplies for growth. Consequently, the county acquired property in adjacent counties and developed additional wellfields to supply Pinellas County. The development and growth of the wellfields resulted in strained relationships among local governmental jurisdictions. Recent droughts resulted in allegations of adverse impacts to the local environment. For these reasons, the county found itself in the position of needing to find and develop additional sources of water. Because of the consolidation of the utility services, the effluent produced by the wastewater treatment plants, formerly considered a disposal problem, was now looked upon as a potential resource to be developed.

By 1994 the county had embarked on its efforts to consolidate wastewater treatment in its northern service area. Several pipeline projects had been constructed. By 1995, it was possible to transport all raw wastewater to the Northwest Wastewater Treatment Plant. In 1996 and 1997 the county removed the independent wastewater plants at East Lake Woodlands, Pine Ridge, Tarpon Woods, and Lansbrook. Also in 1996, the county retained Parsons Engineering Science to review plant operations at its northwest plant and to prepare a reclaimed water master plan for its north service area. In 1995, the county had already retained Parsons Engineering Science to prepare a reclaimed water master plan for its southern planning area, including both the South Cross and McKay Creek Wastewater Treatment Plants.

The reclaimed water master plans for both the north and south service areas determined viable methods of effluent disposal to maximize reclaimed water, reduce potable water usage, minimize discharges, and provide reclaimed water service to surrounding communities.

The evaluation determined that the highest and best use was to reuse the effluent by establishing a residential reclaimed water distribution system. The planning effort determined the priority areas for implementation of service using the primary and secondary criteria. Primary criteria were potable water use per dwelling unit per acre and potential presence of chlorides in the ground water. Secondary criteria were the distance of the farthest residential area from the reclaimed water, transmission main network, demographics, and provision of reclaimed water service to surrounding communities.

A series of overlays identified zones of both the north and south service areas that maximized the benefits to be derived from delivering reclaimed water service. Mass balances indicated that, in the long term, there would be a shortage of reclaimed water and that not everyone in the priority zones would receive reclaimed water because of the seasonal variations in supply. Additional long-range plans, not yet initiated because of the available supply in the southern region, were prepared to evaluate various methods to augment the supply.

Implementation

Identification of the highest priority zones led to an assessment of construction funding for distribution systems. This method was selected because it was currently available and required no adoption of policies, procedures, or new ordinances. All wastewater treatment and reclaimed water transmission main costs would be absorbed by the system in its existing rates. Costs for distribution systems would be assessed to the benefiting property owners at 100% of cost. This required a local referendum to obtain approval by a majority of the property owners within a subdivision. The method was extremely time consuming and difficult. Property owners were reluctant to agree to the assessment, despite a general agreement that reclaimed water would benefit their areas, because they did not want a lien recorded against their properties upon the sale of their homes, if the balance of the assessment had not been completely satisfied.

Informational meetings with various homeowners' associations in both service areas provided person-to-person contact. If interest existed after the initial meetings, a questionnaire and ballot were mailed to each property owner. A 51% approval was required to proceed. Initial returns for the questionnaires and ballots was very good—about a 50% return rate on the first mailing. After compiling the initial data, a second mailing was generally required and occasionally a third. After at least eight subdivisions in the north service area were visited, only three small enclaves within the subdivisions (332 homes) approved an assessment. Several other areas in the north service area not visited took it upon themselves, with a grass-roots approach, to petition for reclaimed water service and obtained 51% approval from their property owners. In the south service area, only one subdivision approved the program. It was determined that if the envisioned system were to be constructed, a more global approach was necessary. At this point, the assessment program was put on hold while other approaches were considered.

A mandatory participation-without-assessment program was developed during another series of planning meetings. This new approach, which relied on the development of an "availability" charge, called for the highest priority zones to receive service on a mandatory basis. Use of the resource would not be required, but payment of a monthly availability charge would be mandatory. This was based on the same general principle as the assessment program, except that no lien would be levied on the benefiting property. The monthly fee provided the same repayment to the utility as the assessment program and eliminated the need for a local referendum and the filing of liens. Because of its nature, the program required the adoption of a reclaimed water service ordinance.

The county held public hearings and, in December 1997, adopted an ordinance for both the north and south reclaimed service areas, with specific priority zones designated, providing for the implementation of an availability fee.

Residents of the proposed priority zones appeared at county commission meetings to voice opposition. The commissioners approved an exemption for residents with existing wells. The commissioners also voted to reduce the availability charge from $10.40 with a payment period of 20 years, to a $7.00 availability charge with a 30 year payment life.

The county has solicited proposals from qualified consulting engineering firms for design and services during construction of the initial south county priority service projects. The south beach communities will receive service first. The supply transmission system, currently under construction, is estimated to be completed by mid-1999. The installation of the south beach transmission main is planned to commence late in 1998 and be completed in late 1999. The distribution system design. which began in April 1998, is scheduled to be completed by April 1999. The first communities to receive service will be North Redington Beach, Redington Shores, Redington Beach, Madiera Beach, and Treasure Island. The second phase of construction will serve the north beach communities of Indian Shores, Indian Rocks Beach, Belleair Beach, Belleair Shores, and Sand Key. These projects are scheduled for 2000 through 2002. Consultant selection will occur later this year. The combined south county beach communities project will add approximately 7,000 reclaimed water customers.

Simultaneously, consultant selection is proceeding for the north service area. These projects will be smaller in nature and number because of the limited availability of the resource.

Experience to Date

North County Reclaimed Service Area—While the planning efforts were underway, the existing system was in use and being operated as an on-demand supply, but its operation was being modified to accommodate the new plans. It was pressurized only on those days when irrigation was allowed by the current watering restrictions, and that necessitated the scheduling of backflow and irrigation system connection inspections for days when the system was in use. It also resulted in delays in providing service, which often resulted in higher costs to customers who were attempting to connect, or who were having work done on their irrigation systems, but it allowed more time for maintenance activities. When there was an operational problem resulting in the system being off, customers became upset because they would not receive service again until the next regularly scheduled day. That could damage certain types of plants during drought conditions. In addition, the need to turn the system on and off resulted in higher manpower requirements and higher operational costs.

The day-to-day operational costs and maintenance associated with the increase of reclaimed water hook-ups created financial considerations. In October 1995, the county enacted a schedule of rates and fees for reclaimed water. Previously, reclaimed water service had been provided free of charge.

Charging a fee for reclaimed water service impacted the way customers viewed the service provided: they perceived it in the same light as water supply and other services for which they pay a fee and expected quality service. Reductions in water quality and fluctuations in pressure were reported and explanations were demanded. This served as a frequent reminder that despite being an alternative source of water for non-essential uses, it was a Pinellas County Utilities service.

Customer complaints were most evident in the north service area, where the large lagoon became a regular stop for a variety of birds. That resulted in abundant aquatic life and, during warm weather, algae blooms. As a result, customers experienced clogged wye strainers and sprinkler heads.

Providing the type of system proposed by the master plan would require the system to be operated 24 hours per day, 7 days a week. When the system was activated for continuous use in June 1996, an initial concern was that users would exceed the allowable irrigation times and that the supply of reclaimed water would not be sufficient. As it turned out, while there were some problems associated with the change, sufficient quantity was not a problem.

Currently, the North Service Area provides reclaim service to just over 500 customers.

South County Service Area—In September 1991 the county entered an agreement with the cities of St. Petersburg Beach and South Pasadena for reclaimed water service. Under the agreement St. Petersburg Beach was to receive 1.5 MGD, South Pasadena 0.5 MGD, and the unincorporated area of Tierre Verde 0.5 MGD. In addition, the county was to operate and maintain the St. Petersburg Beach reclaimed water system, which had been completed in 1995. Service to the residents became available in January 1995, and by the end of the year the majority of applicants for service were connected.

Due to various considerations, St. Petersburg Beach decided to withhold service until the entire system had been completed. Notice postcards outlining instructions on how to apply for service were mailed to all 3,400 property owners. That resulted in a significant number of applications being received at the same time. Limited manpower resulted in delays in connecting applicants to the system: at one time, there was a six-week wait to connect, which resulted in numerous complaints. When manpower was increased and the waiting period reduced to about two weeks, the number of complaints dropped off.

There were also complaints about clogging of sprinkler heads caused by algae growth during the long period that water was held in the pipelines. A flushing program of several months was implemented.

The construction of the Tierre Verde system started in early 1995 and was completed by December 1995. The first customers were connected in the finished portions of the system in November 1995.

The system was divided into five sectors and applications for connection were mailed out by sector. Each sector was then connected while the next sector received notice. This approach resulted in a more uniform manpower requirement, shortened the time that water was held in the pipe prior to usage, and significantly reduced complaints about delays and clogging. The main drawback was an overall longer time for completion of all connections, but it was not apparent to the customer, as a mass mailing had communicated the five sectors and order of connection.

Usage of reclaimed water was underestimated. St. Petersburg Beach was using about 87% more and Tierre Verde about 200% more than originally estimated, particularly during high demand dry periods. It is believed that a large portion of the increased demand was due to usage for landscape installation. Continued monitoring of demand will determine if a reduction from initial volumes occurs.

It is interesting to note that both areas experienced similar connection rates. In St. Petersburg Beach 79% connected, and in Tierre Verde 78% connected. St. Petersburg Beach currently has 2,695 customers and Tierre Verde has 663.

Opportunities and Challenges

Pinellas County's future opportunities and challenges consist of educating cus-

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Potable Water Use Reductions For St. Petersburg Beach And Tierre Verde

	St. Pete Beach			Tierra Verde		
Fiscal Year	Potable Water Use (1,000 gal/yr)	% Annual Change	No. of RCW* Meters	Potable Water Use (1,000 gal/yr)	% Annual Change	No. of RCW* Meters
93/94	840,238	-	0	282,585		0
94/95	727,036	-13.5	1225	260,987	-7.6	0
95/96	614,818	-15.4	1499	218,311	-16.4	564
96/97	633,433	3.0**	1640	149,832	-31.4	645
Net Change	-206,805	-25.0		-132,753	-47.0	

* Reclaimed Water
** Due to a leveling off of savings at 25%.

Tampa Water Resource Recovery Project: Discussion Broadens

David Bracciano, Brad Baird, Phil Waller, and Sara Katz

David Bracciano is the Tampa Bay Water project manager. Brad Baird is the city of Tampa project manager. Phil Waller is the Montgomery Watson project manager.

The novelty in Tampa Bay's water supply situation can be found within the development process for the Tampa Water Resource Recovery Project. The project involves the collaboration of various public agencies as well as participation from the public. The city of Tampa, Tampa Bay Water (the region's water supplier, formerly known as the West Coast Regional Water Supply Authority), SWFWMD, and EPA are cooperating on the project to examine purified water as a new water resource for the region.

The project involves the use of advanced technology to treat reclaimed water through a state-of-the-art, five-step multiple barrier treatment process. Reclaimed water from the Howard F. Curren Advanced Wastewater Treatment Plant would undergo lime treatment, recarbonation, filtration, granular activated carbon, and ozone disinfection to produce drinking water that meets all state and federal health and safety standards. The treated water would then be added to the existing water supply by being piped to the Tampa Bypass Canal and either withdrawn directly or sent to the Hillsborough River. The blended water would be treated again at a conventional water treatment plant before distribution to the public.

Tampa Bay Water's current Master Water Plan estimates that the three-county region needs at least 85 MGD of additional drinking water resources by 2007, not only to meet the future demands of residents and businesses in the region, but also to provide for resting and rotation of existing water supply sources. While the project can produce up to 50 MGD of drought-resistant water year-round, it is only one component of an overall solution that involves additional alternative options, such as conservation, desalting seawater, and enhancing surface water storage. As Tampa Bay Water considers how the different water resource options fit into an overall puzzle, there are certain elements to the purification review process that fall within a new spectrum.

Public Participation

Since the beginning of the implementation program, the project sponsors have gone to great lengths to involve the public in a dialogue about the project, by addressing key concerns and issues, as well as to provide information that is comprehensive, easy to understand, and relevant to the public. The tremendous amount of public comment received to date demonstrates the deep interest in the Tampa Bay region about water supply, and further assures project sponsors of the importance of including the public in development of the alternative.

In addition to general public input, a Public Working Committee reviewed the project. This independent process was a significant milestone because it involved having a broad-based group of citizens from throughout the three counties—with different, and often opposing, interests—review the project and reach a consensus recommendation. The discussions eventually changed portions of the project design, but the process itself was indispensable by assuring that the project was explored from different perspectives.

Following eight months of review, the Public Working Committee concluded, "the Tampa Water Resource Recovery Project can be a safe, reliable, environmentally beneficial, drought-proof source of additional water for the tri-county region. The project should be implemented as part of a multi-pronged solution to the region's water supply problems."

This summer, EPA released the draft Environmental Impact Statement (EIS), and DEP released a draft ecosystem team permit that addresses the design, construction, and operation of the project at a capacity of up to 50 MGD.

The draft EIS and ecosystem team permit were advertised to the public, and a hearing on July 14 provided further opportunity for the public to comment on the project. The EPA draft EIS calls for the project to move forward, and DEP says the proposed process is permittable. While approval from the regulating agencies helps the project stay on track, public understanding and ultimate approval is just as important.

Ecosystem Team Permitting

The project has recently completed the Ecosystem Team Permitting process. Under this procedure, DEP, EPA, SWFWMD, the Hillsborough County Environmental Protection Commission, the State Health Department and other regulatory agencies participated in a consensus process to address all the permitting issues. One overall draft permit, incorporating the requirements of all the regulatory agencies participating in the process, has been advertised by DEP

The ecosystem team permit is a holistic approach that balances the environmental impacts of the total project and seeks to develop an overall net ecosystem benefit. By taking a broader view of the proposed project, this unique cooperative effort benefits the ecosystem as a whole because the project must meet all existing rules and regulations while encompassing additional improvements that result in a net ecosystem benefit. Thus, it is possible to develop a safe, reliable water source while providing measurable environmental benefits.

Future for Purification

It will be at least a few years before the Tampa Bay Region's water supply is enhanced by purified water. Once the public comment period is complete, and the project has completed all the federal, state and local permitting requirements, it will be on the table of possible alternative solutions for Tampa Bay Water to review. The Tampa Bay Water board of directors will choose projects that can be implemented and provide up to 46 MGD of new water by December 2002. The Tampa Water Resource Recovery Project could not be implemented that quickly, but it can remain as part of the diverse mix of options. The project also offers the benefits of being drought-proof and of providing environmental benefits.

The innovative approach that has been applied to this project may well become the standard by which others are measured. And. if public involvement and collaborative decision-making in water projects is here to stay, the projects, and thus the public, will benefit most from this novel process in the end. ■

Reuse in Florida *from Page 33*

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Credits

Water Business *from Page 38*

tomers to conserve the reclaimed water resource, which is not currently restricted by SWFWMD. During high demand periods, low water pressure is experienced by end users. Based on mushrooms and other plant life thriving in damp grass environments, it is apparent that customers are over-watering their property.

A delicate balance must be maintained. During wet periods, because of limited storage capacity, it is necessary that customers use the water. During dry periods, customers need to voluntarily conserve reclaimed water. Instituting a high-use surcharge may curb unnecessary use. In the future, the county may look at building additional storage tanks for the reclaimed water program.

Pinellas County is working on projects for augmentation by utilizing water from Lake Tarpon and municipal interconnections with the cities of Clearwater, Oldsmar, and Tarpon Springs to buy their effluent. The county is also instituting a shallow well initiative that will indirectly augment the reclaimed water project.

The county has implemented a "Contribution-in-Aid-of-Construction" program, which is a conservation incentive for municipal users of potable water to develop reclaimed water facilities within their communities. The amount of aid is based on one dollar per gallon for each gallon of potable water capacity saved on an average daily basis from the amount continuously supplied by the county.

Goals and challenges can be met through education and outreach programs throughout our reclaim service community. The communities are appreciative of the reclaimed water service and are agreeable to work towards solutions with us. ■