Water Reuse *for* Florida

Strategies *for* Effective Use *of* Reclaimed Water

Reuse Coordinating Committee
and the Water Conservation Initiative
Water Reuse Work Group

June 2003

Water Reuse for Florida:

Strategies for Effective Use of Reclaimed Water

The Reuse Coordinating Committee

Florida Department of Environmental Protection
Florida Department of Health
Florida Department of Agriculture and Consumer Services
Florida Department of Community Affairs
Florida Department of Transportation
Florida Public Service Commission
Northwest Florida Water Management District
St. Johns River Water Management District
South Florida Water Management District
Southwest Florida Water Management District
Suwannee River Water Management District

Water Reuse Work Group
Water Conservation Initiative

June 2003

Water reuse represents the wave of the future in water resource management. Thanks to foresighted utility managers and the Department's award-winning Water Reuse Program, Florida already is recognized as a national leader in water reuse.

David B. Struhs, Secretary, Florida DEP

A growing body of evidence suggests that water reuse will play an expanded and critical role in water management in the 21st century, not only in semiarid western states and the "sunbelt" states, but perhaps in all 50 states. Reusing water will be one of the essential tools of the 21st century water utility in ensuring a safe and adequate supply for their customer base.

G. Wade Miller, Executive Director, WateReuse Association

LIST OF TABLES

LIST OF FIGURES

TABLE OF CONTENTS

EXECUTIVE SUMMARY

OVERVIEW OF THE STRATEGIES

Florida is a national leader in water reuse. Reclaimed water has played a significant role in Florida's existing water supply picture, and its continued development is critical to meeting the growing water needs in the state. This report identifies strategies for increasing the efficiency and effectiveness of the use of reclaimed water in Florida, as directed by the ***2001 Florida Water Plan*** and as part of Phase II of the ***Water Conservation Initiative***.

The report was prepared jointly by the Reuse Coordinating Committee and the Water Conservation Initiative's Water Reuse Work Group. The report presents background information on water reuse, provides a summary of Florida's Water Reuse Program, traces the development of water reuse in Florida, and details 16 major, interrelated strategies for ensuring efficient and effective use of reclaimed water. The report identifies 11 legislative concepts, 15 rulemaking efforts, and 12 research activities that support and implement the water reuse strategies. Appendix C contains detailed discussions of the 16 strategies.

The report introduces two concepts – "potable quality water offset" and "recharge fraction" – that will play increasingly important roles in shaping efficient and effective water reuse in Florida. Indeed, efficiency and effectiveness of water reuse activities will be framed in terms of maximizing potable quality water offsets and recharge fractions.

Florida's objectives of encouraging and promoting water reuse remain viable and central to any discussion of water resource management. Strategies developed in the report focus on encouraging use of reclaimed water in all water use sectors and in all parts of Florida. This is highlighted in a strategy that encourages use of reclaimed water in lieu of other water sources. Given the significance of wastewater flows and relatively limited reuse experience in Southeast Florida, one strategy deals specifically with encouraging reuse in this part of the state. Another strategy notes that increased use of reclaimed water at state facilities should be promoted. As outlined in a separate strategy, wasteful effluent disposal practices must be discouraged as a means for promoting water reuse. Strategies dealing with the effective use of seasonal reclaimed water storage, supplemental water supplies, and reuse system interconnects are presented as a means for stimulating reuse activity.

Metering of reclaimed water use and implementation of volume-based rates for reclaimed water service are critical to ensuring efficient use of reclaimed water. One strategy is devoted to stimulation of metering and use of volume-based rates. An additional strategy deals with encouraging efficient irrigation practices.

The report recognizes that some types of reuse activity are more efficient and effective than others. Hence, a strategy promotes ground water recharge and indirect potable reuse as means for increasing recharge fractions. Another strategy discusses measures aimed at enabling relatively inefficient reuse systems to move toward more efficient and effective reuse activities.

Mandates generally have been avoided in the 16 strategies. Rather, a number of incentives have been identified to encourage utilities to implement efficient and effective water reuse systems. One strategy deals with developing stronger linkages from regional water supply planning (including integrated water resource planning) to water reuse, while a related strategy discusses possible permitting incentives favoring water reuse. However, the centerpiece of the discussion of possible incentives is a strategy that envisions development of viable funding programs. Loans or grants could serve to encourage implementation of efficient and effective reuse activities. A funding program also would provide opportunities to include loan or grant conditions stipulating efficiency measures, like metering and use of volume-based rates. In addition, a funding program offers potential to motivate utilities to invest in promising technologies, such as ultraviolet disinfection, membrane processes, membrane bioreactors, and sewer mining. This strategy also would establish a research program to address issues that may arise periodically.

One strategy deals with the important issue of water education. This strategy really deals with all aspects of water management and is regarded as being critical to Florida's efforts to meet the water needs of a growing population. Another strategy, which encourages reuse at state facilities, also has an education component. Use of reclaimed water at state parks, highway rest areas, welcome centers, college campuses, and other government facilities will serve to showcase effective reuse and promote public acceptance of this resource.

An important strategy presents several recommendations for ensuring continued safety of water reuse including strengthening cross-connection control requirements, reviewing rules affecting water programs for consistency, ensuring that current health and environmental data are fully assessed, and refining other water program rules. In addition, the state should continue to participate in and to evaluate the results of ongoing state and national pathogen studies. Additional studies of the so-called "emerging pollutants of concern" are merited.

The report includes a vision of water reuse in 2020 – a vision of a state making widespread use of reclaimed water and appropriate water reclamation technologies. It is a vision of reclaimed water being used efficiently and effectively to conserve potable quality water and to augment available water supplies. It is a vision of full implementation of a "water is water" philosophy founded on widespread public acceptance predicated on general knowledge of water issues. The 16 strategies framed in the report are designed to move Florida toward an "Age of Enlightenment" in water reuse.

RECOMMENDED STRATEGIES

The following strategies constitute Florida's plan for viewing reclaimed water as a valuable resource:

1. Encourage metering and volume-based rate structures.
2. Implement viable funding programs.
3. Facilitate seasonal reclaimed water storage (including aquifer storage and recovery).
4. Encourage use of reclaimed water in lieu of other water sources in the agricultural irrigation, landscape irrigation, industrial/commercial/institutional, and indoor water use sectors.
5. Link reuse to regional water supply planning (including integrated water resource planning).
6. Develop integrated water education programs.
7. Encourage ground water recharge and indirect potable reuse.
8. Discourage effluent disposal.
9. Provide water use permitting incentives for utilities that implement reuse programs.
10. Encourage reuse in Southeast Florida.
11. Encourage use of supplemental water supplies.
12. Encourage efficient irrigation practices.
13. Encourage reuse system interconnects.
14. Enable redirecting of existing reuse systems to more desirable reuse options.
15. Use reclaimed water at government facilities.
16. Ensure continued safety of water reuse.

LEGISLATION

The strategies developed in this report include several topics that should be considered for possible legislative action. These include the following:

1. Add a note in Section 403.064, Florida Statutes (F.S.), that encourages utilities to meter reclaimed water use and to use volume-based rates for reclaimed water use.

2. Provide for viable funding programs with needed appropriations.

3. Provide for a state-funded research program in association with the funding program.

4. As part of state funding programs, add provisions for standard grant/loan conditions requiring metering and volume-based rates.

5. Add emphasis on water reuse, regional water supply planning, and integrated water resources planning in the state's Comprehensive Planning Program.

6. Require development of integrated state water curricula.

7. Consider addressing possible consumptive use permitting incentives in Chapter 373, F.S.

8. Provide for a training and certification program for irrigation contractors.

9. In Section 403.064, F.S., encourage reuse activities that feature relatively high potable quality water offsets and/or recharge fractions.

10. Direct the use of reclaimed water at state facilities.

11. Provide for reporting of reuse efforts by the state agencies and direct the Department of Environmental Protection (DEP) to coordinate these efforts.

RULEMAKING

The strategies developed in this report include several topics that could be strengthened by rulemaking. These include:

1. Add provisions encouraging reclaimed water metering and volume-based rate structures to Chapters 62-40 and 62-610, Florida Administrative Code (F.A.C.).

2. Establish grant/loan conditions for metering and volume-based rates within state funding programs.

3. Establish the details of new state funding programs.

4. In the future, possibly consider review and refinement of aquifer storage and recovery rules in Rule 62-610.466, F.A.C.

5. Consider providing for longer term DEP permits for reuse programs that are consistent with regional water supply plans.

6. If supported by legislation, incorporate reuse, regional water supply planning, and integrated water resources planning into Department of Community Affairs' rules governing the state's Comprehensive Planning Program.

7. In the future, possibly consider refining Part V of Chapter 62-610, F.A.C., dealing with indirect potable reuse and ground water recharge.

8. In the water management districts' rules, consider adding consumptive use permitting incentives for implementing water reuse.

9. If authorized by legislation, provide details of a state training and certification program for irrigation professionals.

10. Establish irrigation efficiency standards.

11. Revise Rule 62-610.800(10), F.A.C., to enable redirecting of less desirable reuse systems to reuse activities featuring relatively high potable quality water offsets and/or recharge fractions.

12. Add notes to Chapter 62-610, F.A.C., encouraging reuse activities that feature relatively high potable quality water offsets and/or recharge fractions.

13. Strengthen cross-connection control requirements in Rule 62-555.360, F.A.C.

14. Refine DEP's pathogen monitoring form to update information related to lab certification and methods.

15. Continually review rules affecting water programs for consistency and to ensure that current health and environmental data are incorporated. As appropriate and as justified, refine the various water program rules.

RESEARCH

There are important research needs identified in this report. These include:

1. Establish a state research program.

2. Investigate fate and transport and water quality changes during aquifer storage and recovery.

3. There is an ongoing and continual need for research related to ground water recharge and indirect potable reuse.

4. Conduct total maximum daily load and/or water quality based effluent limit studies to support canal discharge in Southeast Florida.

5. Implement appropriate pilot studies of reuse technologies in Southeast Florida.

6. Evaluate reliability and durability of rain sensors and automatic shutoff devices and develop improved technologies.

7. Develop the key elements for inclusion in a state training and certification program for irrigation contractors.

8. Evaluate the results of the ongoing Water Environment Research Foundation (WERF) pathogen study.

9. DEP should fund a pathogen study at a water reclamation facility in Central Florida in an effort to supplement the ongoing WERF pathogen study.

10. DEP should fund a Giardia infectivity study to verify the results of a recent infectivity study completed by the Los Angeles County Sanitation District.

11. The Southwest Florida Water Management District should fund studies of the emerging pollutants of concern (EPOC) in reclaimed water and in other water sources.

12. As part of the pilot studies associated with the Comprehensive Everglades Restoration Plan, studies of the EPOC should be undertaken.

When the well is dry, we know the worth of water.

Benjamin Franklin, ***Poor Richard's Almanac***, 1746.

I. PURPOSE AND VISION

A STRATEGIC PLAN FOR WATER REUSE

Florida has been remarkably successful in moving toward water reuse as a means for managing domestic wastewater, conserving water, and managing water resources. Reclaimed water has played a significant role in water supply in Florida and will continue to do so in the future. Over the past 15 years, utilities, local governments, the water management districts, and state agencies have implemented water reuse programs, with the focus on increasing the volumes of reclaimed water used and in promoting public acceptance of reclaimed water. Unfortunately, overuse of this valuable water resource has occurred in some irrigation-based reuse systems. In addition, disposal practices (deep well injection and discharge to surface waters) have resulted in significant volumes of reusable water being lost from available water resources. Finally, implementation of water reuse has proven effective in reducing or avoiding adverse impacts on surface waters associated with surface water discharges.

This report has been developed in response to a directive in the ***2001 Florida Water Plan*** (1). Water Supply Action Step 1.4.1 in the ***2001 Florida Water Plan*** directed the Reuse Coordinating Committee to develop a strategy for increasing the efficiency and effectiveness of reclaimed water use. Development of this report also fits nicely with the goals and objectives of the Water Conservation Initiative. Reflecting this, the Water Reuse Work Group associated with the Water Conservation Initiative (WCI) has been heavily involved in development of this report.

This report presents strategies for implementation of an institutional and regulatory framework to better utilize reclaimed water as a valuable water resource – a water resource that should be used efficiently and effectively. Recognizing the value of reclaimed water, the institutional and regulatory framework also must discourage waste of a potentially valuable water product by effluent disposal practices, such as deep well injection and discharge to surface waters. This represents somewhat of a refinement of Florida's Water Reuse Program based on our experience over the last 15 years. Ideally, Florida's Water Reuse Program should:

1. Encourage and promote the use of reclaimed water (reflects statutory objectives).

2. Encourage efficient and effective use of reclaimed water (as developed in the Water Conservation Initiative).

3. Discourage effluent disposal (as a waste of a valuable resource).

OUR VISION OF WATER REUSE IN 2020

This document presents strategies that the Reuse Coordinating Committee views as necessary to help achieve the Committee's view of water reuse and water management in 2020. The Reuse Coordinating Committee envisions the following in 2020:

- Water reuse will be employed by all domestic wastewater treatment facilities having capacities of 0.1 million gallons per day (MGD) and larger. Statewide, on the order of 65 percent of all domestic wastewater will be reclaimed and reused for beneficial purposes.

- Effluent disposal using ocean outfalls, other surface discharges, and deep injection wells will be largely limited to facilities that serve as backups to water reuse facilities.

- Regulatory agencies, health agencies, utilities, and the public will embrace a "water is water" philosophy and will fully and readily accept the full range of water reuse options and the full range of alternative water supplies.

- Reclaimed water will be used in an efficient and effective manner, as a means to conserve and recharge potable quality water resources. Newer reuse systems will have potable quality water offsets and/or recharge fractions of 75 percent of larger.

- Ground water recharge and indirect potable reuse projects will become common practice.

- Membrane treatment technologies will be widely used for the production of high-quality reclaimed water, particularly for the control of pathogens and organic compounds.

- Ultraviolet (UV) disinfection will be the norm for water reuse and domestic wastewater facilities.

- "Sewer mining" will be common practice, particularly in the larger urban areas, as a means for enabling effective use of reclaimed water.

- Reclaimed water will be widely used to flush toilets in commercial facilities, industrial facilities, hotels and motels, and multiple-family residential units in Florida.

Children of a culture born in a water-rich environment, we have never really learned how important water is to us. We understand it, but we do not respect it.

William Ashworth, ***Nor Any Drop to Drink***, 1982.

II. BACKGROUND

STATE OBJECTIVES

Sections 403.064(1) and 373.250(1), Florida Statutes (F.S.), establish the encouragement and promotion of water reuse as formal state objectives (2,3). These sections further conclude that water reuse programs designed and operated in compliance with Florida's rules governing reuse are deemed protective of public health and environmental quality. In addition, Section 403.064(1), F.S., also concludes that "Reuse is a critical component of meeting the state's existing and future water supply needs while sustaining natural systems." Further, Section 367.0817(3), F.S., states that "The Legislature finds that reuse benefits water, wastewater, and reuse customers."

WATER USE IN FLORIDA

Florida is the fourth most populous state in the U.S. and the largest user of irrigation water east of the Mississippi River (4,5). Florida's population is projected to grow from about 16 million in 2000 to about 21 million in 2020 (5). As the state continues to grow, demand for fresh water also will increase. In 1995, Florida used about 7.2 billion gallons of water each day. By 2020, water use is forecast to grow to 9.1 billion gallons per day (4). In 2020, agriculture is expected to account for about 46 percent of Florida's total demand for fresh water. Public water supply will account for about 34 percent of the total. The remaining 20 percent of water use will be associated with industrial/commercial/electric generation, recreational irrigation, and domestic self supply.

If there is magic on this planet, it is contained in water.

Loran Eisely, ***The Immense Journey***, 1957.

Florida is a ground water state. In 1995, ground water accounted for 60 percent of all fresh water used in Florida (6). The dependence on ground water is particularly pronounced in the area of public water supply, where ground water represented about 90 percent of the water used.

As water is used within a community, inevitably a significant portion of that water is dirtied and is discharged to the municipal sewer system for treatment in a domestic wastewater treatment facility. In 2001, Florida's domestic wastewater treatment plants had a total capacity of about 2,220 MGD and actually treated about 1,486 MGD (7). In 2020, it is estimated that wastewater flows to be treated will reach 1,950 MGD. This represents 1,950 MGD of a water resource that can and should be reclaimed and reused for beneficial purposes.

WATER REUSE IN FLORIDA

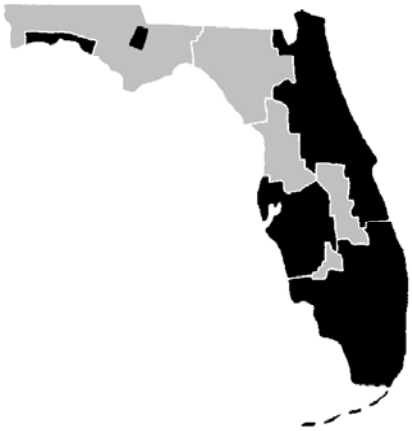
Importance of Water Reuse

Water reuse is an important component of both wastewater management and water resource management in Florida. Reuse offers an environmentally sound means for managing wastewater that dramatically reduces environmental impacts associated with discharge of wastewater effluent to surface waters. In addition, use of reclaimed water provides an alternative water supply for many activities that do not require potable quality water (like irrigation and toilet flushing), which serves to conserve available supplies of potable quality water. Finally, some types of reuse offers the ability to recharge and augment available water supplies with high-quality reclaimed water. These facts prompted the adoption of the state objectives referenced in the previous section. The water resource benefits of reuse were recognized in the Water Conservation Initiative (4). It is instructive to note that water reuse comprised one of the six major focus groups during development of the Water Conservation Initiative (along with four water use categories and a water pricing work group).

While Florida's freshwater resources are finite, we face continuing population growth, which will result in an additional four million Floridians between 2000 and 2020. With population growth, the state will see increased demands for water and increased volumes of wastewater, which must be managed to prevent pollution. It appears inevitable that, at some time, the state will see demands for water approach the available supplies.

Chapter 62-40, F.A.C., "Water Resource Implementation Rule" (formerly known as the "Water Policy") required the water management districts to assess their water resources and to designate "water resource caution areas" (8). The designated water resource caution areas (areas having current or future critical water supply problems) are shown in Figure 1. These water resource caution areas generally represent areas in the state where traditional water sources may not be adequate to meet expected water needs. Within these areas, water conservation, reuse, and other alternative resources will play critical roles in ensuring adequate water supply.

Figure 1. Water Resource Caution Areas.



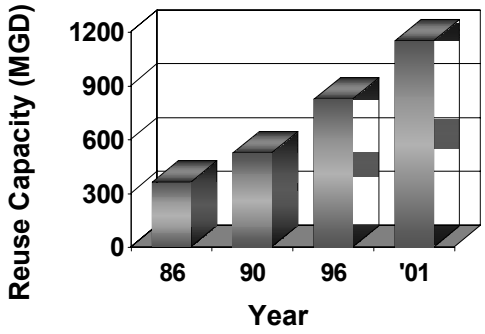
Reuse has been identified as a key component of the regional water supply plans prepared by the water management districts. Reuse strategies recommended in the regional water supply plans

include further development of urban reuse systems, reuse system interconnections, aquifer storage and recovery (ASR) for storage, and ground water recharge (9).

Reuse Trends in Florida

Reuse has become an integral part of wastewater management, water resource management, and ecosystem management in Florida. During the past 15 years, Florida has risen to be recognized as a national leader (along with California) in water reuse. Approximately 584 million gallons per day (MGD) of reclaimed water were reused for beneficial purposes in 2001. The total reuse capacity of Florida's domestic wastewater treatment facilities has increased from 362 MGD in 1986 to 1,151 MGD in 2001. The current reuse capacity represents about 52 percent of the total permitted domestic wastewater treatment capacity in Florida (7).

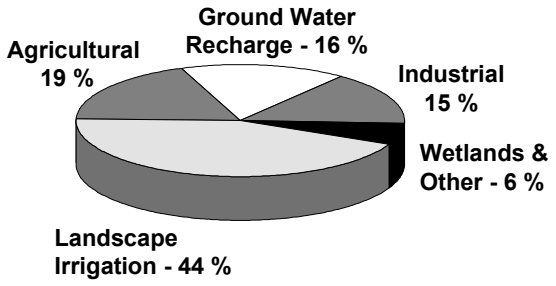
Figure 2. Growth of Reuse in Florida.



In 2001, reclaimed water from these reuse systems was used to irrigate 122,382 residences, 419 golf courses, 405 parks, and 188 schools. Irrigation of these areas accessible to the public represented about 44 percent of the 584 MGD of reclaimed water reused (7). Figure 3 shows the distribution of reclaimed water use by reuse types in Florida.

While Florida has been remarkably successful in implementing water reuse, work remains in this area. As reported in the ***2001 Reuse Inventory*** (7), Florida disposed of over 900 MGD of wastewater effluent using deep injection wells, ocean outfalls, and other surface water discharges. This represents a waste of what is potentially a valuable water resource. Where technically, environmentally, and economically feasible, this effluent should be reclaimed and reused for beneficial purposes.

Figure 3. Use of Reclaimed Water in Florida.



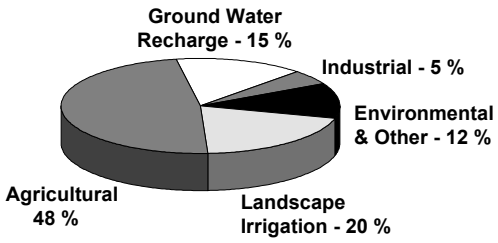
California's Experience

California pioneered water reuse in the United States and has long been recognized as a national leader in this endeavor. Use of reclaimed water for agricultural purposes dates back to 1890 in California (10). Landscape irrigation using reclaimed water was initiated at Golden Gate Park in

San Francisco in 1912. Large-scale ground water recharge using spreading basins began in the Los Angeles area in 1962 and Orange County initiated an injection project to create a seawater barrier in 1976. In 1970, about 156 MGD of reclaimed water was used. In 2002, reclaimed water use was estimated to be in the 400 to 520 MGD range. California's population in 2002 was about 35 million, as contrasted to Florida's population of about 17 million.

Figure 4 shows the distribution of reclaimed water use in California in 2000 (10). It is interesting to note California's heavy dependence on agricultural use and the more limited use of reclaimed water for landscape irrigation. About 125 golf courses were irrigated with reclaimed water.

Figure 4. Reuse in California



County Differences Within Florida

While reuse has proven to be very popular in Florida, differences exist among the counties. Reuse flows (the amount of reclaimed water used) expressed on a per capita basis [expressed in terms of gallons per capita (person) per day (gpcd)] will be used to make comparisons. Data was taken from the ***2001 Reuse Inventory*** (7). Statewide, reuse capacity averages 72.0 gpcd. This can be compared to the 100 gpcd figure often used to estimate demands for drinking water and often used to estimate domestic wastewater flows. Data for all 67 counties are presented in Appendix E.

Table 1 presents reuse flows expressed on a per capita basis for the 12 leading reuse counties in Florida (based on largest gpcd reuse flows). The Top 12 counties average almost 90 gpcd – a rather significant figure. The bottom 12 counties are shown in Table 2 (based on smallest gpcd reuse flows). The Bottom 12 only average 6 gpcd.

Table 3 presents data for the 12 most populous counties in Florida. These counties had a 2000 population of about 10.8 million – about 67 percent of the state's total population. Total domestic wastewater flow in these counties was 1,157 MGD (78 percent of the state total). These counties used 363 MGD of reclaimed water for beneficial purposes (62 percent of the state total).

In aggregate, the 12 most populous counties use reclaimed water at an average rate (33.58 gpcd) only slightly less than the state average (36.55 gpcd). However, an inspection of Table 3 reveals rather wide differences among the 12 most populous counties. Orange, Seminole, and Lee Counties are within the Top 12 reuse counties. Pinellas, Polk, Volusia, and Brevard Counties rank in the Top 25 reuse counties. Inspection of Table 3 reveals that Miami-Dade, Broward, and Duval Counties have been somewhat slower than much of the rest of the state to embrace water reuse. This is beginning to change in Duval County, as JEA (the regional utility serving the Jacksonville area) is implementing several reuse projects. Miami-Dade and Broward Counties

continue to rely heavily on ocean outfalls and deep well injection for effluent disposal. Miami-Dade and Broward Counties contain over 24 percent of Florida's population and generate 33 percent of the state's domestic wastewater. Yet Miami-Dade and Broward Counties account for less than four percent of all reuse capacity in the state.

Table 1. Top 12 Reuse Counties in Florida

Reuse Rank	County	Reuse Flow (gallons/day/person)	% of Wastewater That is Reused
1	Collier	106.66	89
2	Flagler	103.80	88
3	Osceola	102.72	99
4	Orange	99.91	98
5	Seminole	99.12	74
6	Okaloosa	98.37	101
7	Lee	79.17	88
8	Leon	74.42	100
9	Walton	70.34	100
10	Indian River	61.70	105
11	Manatee	61.69	60
12	Bradford	57.23	80
---	Top 12 Counties	89.96	89
---	Florida (average for 67 counties)	36.55	39

Rankings are based on per capita use of reclaimed water. Source: ***2001 Reuse Inventory*** (7).

Table 2. Bottom 12 Reuse Counties in Florida

Reuse Rank	County	Reuse Flow (gallons/day/person)	% of Wastewater That is Reused
56	Miami-Dade	7.82	6
57	Baker	7.59	25
58	Washington	7.15	18
59	Duval	6.29	6
60	Broward	5.91	5
61	Taylor	5.56	10
62	Monroe	3.41	5
63	Putnam	0.35	1
64	Calhoun	0.00	0
64	Dixie	0.00	0
64	Glades	0.00	0
64	Holmes	0.00	0
---	Bottom 12 Counties	6.67	6
---	Florida (average for 67 counties)	36.55	39

Rankings are based on per capita use of reclaimed water. Source: ***2001 Reuse Inventory*** (7).

Table 3. Reuse Activity in Florida's 12 Most Populous Counties

Popul. Rank	County	Reuse Rank	Reuse Flow (gallons/day/person)	% of Wastewater That is Reused
1	Miami-Dade	56	7.82	6
2	Broward	60	5.91	5
3	Palm Beach	36	25.77	26
4	Hillsborough	32	30.54	33
5	Pinellas	13	53.22	48
6	Orange	4	99.91	98
7	Duval	59	6.29	6
8	Polk	14	52.91	95
9	Brevard	25	37.63	50
10	Volusia	21	40.81	57
11	Lee	7	79.17	88
12	Seminole	5	99.12	74
---	12 Most Populous Counties	---	33.58	31
---	Florida (average for 67 counties)	---	36.55	39

Reuse rankings are based on per capita use of reclaimed water. Source: ***2001 Reuse Inventory*** (7).

WATER ISSUES RELATED TO REUSE

As noted by York et al (11), water reuse represents the intersection of the full range of water programs – surface water, ground water, underground injection control, wetlands, and drinking water. As such, a number of key water issues that cut across program lines are applicable to discussion of water reuse. The following sections discuss some of the key water issues.

All Water is Reused

> **In every glass of water we drink, some of the water has already passed through fishes, trees, bacteria, worms in the soil, and many other organisms, including people… Living systems cleanse water and make it fit, among other things, for human consumption.**
>
> Elliot A Norse, ***Animal Extinctions***, 1985.

Mother Nature is the great recycler. The Earth's finite supply of water is continually recycled and reused through the hydrologic cycle. Environmental professionals have long used the example of unplanned water reuse along the Mississippi River as an example. Minneapolis, St. Louis, Memphis, and many other cities use water from the Mississippi and its tributaries, dirty it, treat their wastewater, and discharge effluent back to the river. These domestic wastewater discharges along with industrial discharges, agricultural runoff, and stormwater discharges are all components of the water withdrawn by New Orleans and other downstream communities.

Ground water is very important in Florida, since it accounts for about 90 percent of the domestic water supply. Approximately 20 percent of Floridians consume ground water without any

treatment or disinfection. All fresh ground water containing total dissolved solids (TDS) less than 10,000 mg/L are considered as underground sources of drinking water (USDW).

Florida's ground water also is reused. It is important to recognize that ground water comes from the land's surface. Hence, the water percolating from the land's surface into the ground includes all of the inputs found in surface waters – agricultural runoff, stormwater, and domestic and industrial wastewater inputs. In addition, most reuse land application projects (rapid infiltration basins, sprayfields, and other irrigation projects – golf course, agricultural, and residential irrigation) ultimately return water to potable ground water, which may be available to downgradient users. Septic tanks and drainfields also serve to recharge the ground water. Septic tanks can represent significant contributions to the ground water. Consider that about 25 percent of Florida's population (roughly the national average) are served by septic tanks. In Florida, we withdraw ground water, use it, change its characteristics and quality, treat our wastewater, and return water back to the ground water.

Water is a Limited Resource

The Earth's supply of water is limited and essentially constant. Our population continues to grow. As the population increases, demands for water and quantities of wastewater also increase. At some point, we will reach a point where the demand for water grows to equal and exceed the available fresh water supply. Unfortunately, that time is not centuries removed. In fact, on a global scale, we may be close to reaching this point (12).

In Florida, the multitude of surface streams, lakes, wetlands, and coast provide a vision of abundant water supplies. However, this is not always the case. As noted previously, four of the state's five water management districts have identified Water Resource Caution Areas (See Figure 1) – areas facing critical water supply problems.

> **All the water that will ever be is, right now.**
>
> ***National Geographic***, October 1993.

In the Tampa Bay Area, the Southwest Florida Water Management District concluded that available ground water supplies have been overallocated in much of the Tampa Bay area. Hence, water reuse and desalination will play prominent roles in meeting water needs in the Tampa Bay area. It is interesting to note that the 50 MGD of effluent from Tampa's Howard Curan Wastewater Treatment Plant that is discharged to Tampa Bay probably represents the last available freshwater source in this area and multiple political jurisdictions have expressed interest in reusing this water.

The 1999 ***Comprehensive Everglades Restoration Plan*** (13), described as the world's largest ecosystem restoration effort, is designed to restore, protect, and preserve the water resources of central and southern Florida, including the Everglades. The Plan will ensure a reliable, adequate supply of fresh water for all water use sectors – the environment, urban, and agriculture. Approximately 80 percent of the new water captured by the Plan will go to the environment and 20 percent will be used to enhance urban and agricultural supplies. The Restoration Plan includes more than 60 major components; will take more than 30 years to complete; and will cost an

estimated total of $7.8 billion (1999 cost estimate). The Plan's predominant feature is water storage. The Plan captures most of the average 1.7 billion gallons of water a day that currently is discharged to the ocean. This water will be stored in more than 217,000 acres of new reservoirs and wetlands-based treatment areas, and about 300 ASR wells. Reuse of over 200 MGD of reclaimed water is included in the Plan.

Water reuse will play an important role in addressing water needs in East-Central Florida. The St. Johns River Water Management District's 2000 ***District Water Supply Plan*** (14) concludes that fresh ground water supplies will not be adequate to meet the projected water needs of the region without resultant unacceptable adverse impacts to water resources and related natural resources. The effective use of reclaimed water will be needed to help offset this shortfall in fresh ground water supplies.

The Panhandle is not immune to water problems. Rapid population growth in some coastal areas, particularly around Fort Walton Beach and Destin, has resulted in significant lowering of the ground water table. In the late 1930s and early 1940s, prior to significant development in the area, water levels (heads) were in the range of 50 to 70 feet above sea level at the coast. By the year 2000, water levels in some wells in the Fort Walton Beach area had dropped to 120 to 140 feet below sea level, for a total head change of up to 200 feet (15). Concerns for ground water levels in the coastal areas figured prominently in the Northwest Florida Water Management District's decision to designate the coastal portions of Santa Rosa, Okaloosa and Walton counties as a Water Resource Caution Area. The District has for the past several years, through its process of issuing of Consumptive Use Permits, strongly encouraged utilities to conserve and reuse water, tying increased reuse language into new Consumptive Use Permits, which for users within the Water Resource Caution Area are now only being issued for wells much farther inland from the coast.

Water is Water

As noted by York, et al. (12), there is need to adopt a "water is water" philosophy for water management. This recognizes the facts that the Earth's water supply is finite, that all water is reused, and that, regardless of the prefixes applied to water (storm-, surface-, ground-, waste-, reclaimed-), water is simply water. Even untreated domestic wastewater is in excess of 99.9 percent water (by weight). Much of the commonly used water-related terminology simply poses artificial barriers to the use of the so-called

A simple molecule, one oxygen and two hydrogen, held together by a force not thoroughly understood, water has for billions of years remained constant. Man however insists that it must be otherwise. "Waste" – What a terrible prefix to add to the most important life limiting substance on earth. Water is simply water. In the coming decades when what was once thought of as an unlimited resource becomes limited, man will have to erase the prefixes and recognize that water is quite simply water. Let's hope it's not too late!

Ronald Linsky, Executive Director,
National Water Research Institute

alternative sources. Of key interest is the fact that we tend to hold reclaimed water to higher standards than what are applied to other water sources – even when the waters will be used for the same purposes.

Of paramount importance is the removal of institutional and regulatory inconsistencies related to water. A key component is development of "use-based" standards that are independent of the source of the water used.

If we are to effectively manage water in an era of constrained supplies, it is imperative that a "water is water" philosophy be embraced by water managers and regulators. Further, the basic tenets of this philosophy must be effectively communicated to utilities and the public.

Water is Undervalued and Underpriced

Perhaps, the single biggest constraint facing water reuse in Florida is the fact that water historically has been undervalued and underpriced. Consider the prices charged for a range of popular beverages, as shown in Table 4. First, it must be noted that water is a substance that is absolutely essential to human survival. Yet, in the United States, treated drinking water is delivered to the customer's tap for about $1.90 per 1,000 gallons – an incredible bargain. The low cost of drinking water in the United States reflects the efficiency of the nation's drinking water utilities. However, the bargain represented by the low cost of drinking water poses major constraints and concerns in the management of our water resources.

As a society, we tend to equate "price" with "value." Hence, a $60,000 BMW is perceived to have a greater value than does a $15,000 Chevrolet. Price and value also relate rather directly to the care shown for a commodity. When considering the BMW and the Chevy, you probably will find a higher proportion of BMWs carefully protected by a custom cover and parked in the remote areas of the shopping mall's parking lot so as to minimize the possibility of collecting door dings. This also impacts on water management. At a cost of $0.00165 per gallon, it is difficult to convince the populace to turn the water off while brushing their teeth, to take shorter showers, to install low-volume toilets and shower heads, and to implement other water conservation measures.

Table 4. Prices of Popular Liquids

Liquid Commodity	Price ($/gal.)
Milk **	2.99
Leading Cola Product **	2.25
Beer **	14.20 – 17.80
Bottled Water	1.19 – 1.89
Drinking Water:	
Germany *	0.00685
United Kingdom *	0.00434
United States *	0.00191
Canada *	0.00016
Tallahassee, FL **	0.00165
Agricultural Water Supply ***	0.00005

* Source (16).
** Data obtained in Feb. 2001 in Tallahassee, FL.
*** "Price" represents the cost of energy to pump shallow, potable quality, ground water.

The cost of drinking water also impacts alternate water resources, including reclaimed water. In implementing water reuse programs, it is very difficult to price reclaimed water at or above the cost of drinking water. The result is that reclaimed water normally is significantly underpriced and undervalued. In many cases, reclaimed water use is not metered, which further compounds the valuation problem. As with drinking water, not metering and underpricing reclaimed water makes it more difficult to ensure efficient and effective use of reclaimed water. Not metering and underpricing generally leads to excessive use.

The low price of drinking water also reinforces the public's perception that there is an intrinsic "right" to an unlimited supply of inexpensive, safe water in the United States.

A 2002 survey conducted by the NUS Consulting Group (17) concluded that the cost of drinking water increased in 12 of the 14 countries surveyed. While the largest annual increase (20.4 percent) was reported in South Africa, a number of US cities reported annual increases of over 10 percent. Being driven by both water quality and scarcity, the trend toward more expensive drinking water in the US and abroad is expected to continue. This trend will continue to make reclaimed water and other alternative water supplies more economically attractive.

The Price of Water Normally Does Not Reflect Scarcity

Florida's regulation of water use does not provide a direct mechanism to price water as a function of relative scarcity. A potential user of water makes application to the appropriate water management district to use some quantity of water for a specific use. A set application review fee is paid and the water management district initiates its review process. If the water management district concludes that water is available and that this is a reasonable and beneficial use of water, the applicant receives a consumptive use permit. If the applicant seeks to use 1 MGD of water, it makes no difference whether the amount of available water is 5 MGD or 5,000 MGD. Having received a consumptive use permit, the user/utility incurs costs for pumping, treating, and distributing the water. In the case of a utility, these costs are passed along to its customers as the "price" of water delivered. For an end user, like a farmer, these costs represent his/her price for water. In large measure, this cost or price for water is independent of the quality and amount of water available in the area.

The basic economic tenet of "scarcity" normally is somewhat lost in eastern water law and in Florida's water management process. In a pure economic market, the price of a commodity would be related to its relative scarcity. A commodity that is present in an overwhelming abundance generally would command a relatively low price. However, if that same commodity were present in very limited supply, the price generally would be much greater.

REUSE OPTIONS AND DESIRABILITY

Chapter 62-610, F.A.C. (18), describes a wide range of reuse options that can be readily permitted in Florida. Appendix D presents a summary of available reuse activities. In addition, Rule 62-610.480, F.A.C., provides a framework for approval of other uses of reclaimed water that are not specifically identified in Chapter 62-610, F.A.C.

Not all reuse options are created equal. That is, all reuse options do not have the same level of desirability. As noted in the Reuse Work Group's Report for the Water Conservation Initiative (19) and in the final Water Conservation Initiative Report (4), to increase the efficiency and effectiveness of water reuse, reuse options having high Potable Quality Water Offsets or high Recharge Fractions offer the greatest potential for water conservation and wise water management. Table 5 lists average Potable Quality Water Offsets and Recharge Fractions, which were developed during the Water Conservation Initiative (4,19), for various reuse activities.

The frog does not drink up the pond in which he lives.

Native American saying.

Table 5. Relative Desirability of Reuse Activities

Desirability	Reuse Activity	Offset (a,c)	Recharge Fraction (b,c)
High	Indirect potable reuse	--	100
	Ground water recharge – injection to potable ground water	--	100
	Industrial uses	100	0
	Toilet flushing	100	0
	Rapid Infiltration Basins (where ground water is used)	0	90
	Efficient agricultural irrigation where irrigation is needed	75	25
	Efficient landscape irrigation (golf courses, parks, etc.)	75	10
	Efficient residential irrigation	60	40
	Cooling towers	100	0
	Vehicle washing	100	0
	Commercial laundries	100	0
	Cleaning of roads, sidewalks, & work areas	100	10
	Fire protection	100	10
	Construction dust control	100	0
	Mixing of pesticides	100	0
Moderate	Inefficient landscape irrigation (parks and other landscaped areas)	50	50
	Inefficient agricultural irrigation	50	50
	Surface water with direct connection to ground water (canals of SE Florida)	0	75
	Wetlands restoration (when additional water is needed)	75	10
	Inefficient residential irrigation	25	50
	Flushing & testing of sewers and reclaimed water lines	50	0
	Rapid Infiltration Basins where ground water is currently not used	0	25
Low	Aesthetic features (ponds, fountains, etc.)	75	10
	Sprayfields (irrigation of grass or other cover crop when irrigation would not normally be practiced)	0	50
	Wetlands (when additional water is not needed)	0	10

Notes:
(a) Percentage of reclaimed water that replaces potable quality water.
(b) Percentage of reclaimed water that augments potable quality ground water or augments Class I surface water.
(c) Depending on local circumstances, the offset and recharge may not be of equal importance.
Source: The Water Conservation Initiative (4,19)

III. FLORIDA'S CURRENT REUSE PROGRAM

This chapter presents an overview of Florida's Water Reuse Program. The program has been crafted to encourage and promote water reuse in Florida. The EPA has recognized the program for excellence in 1993, 1996, and 1999.

STATUTORY PROVISIONS

As described in the following paragraphs, there are several statutes that relate to water reuse.

Chapter 403, F.S.

This chapter provides the primary statutory authority for the DEP and its environmental control activities (2). Authorization is provided for regulation of wastewater management facilities, for implementation of the state's drinking water program, and for the other DEP programs.

This statute authorizes the issuance of construction permits and operation permits for domestic wastewater management facilities. Timeframes for permit application review and issuance or denial of permits are established. This statute mandates that the DEP issue permits if the applicant demonstrates that the proposed facilities will meet applicable statutory and rule requirements and will not violate water quality criteria.

Section 403.064, F.S. - This section contains the key statutory language dealing specifically with reuse. This section accomplishes the following:

1. Establishes the promotion and encouragement of reuse and water conservation as formal state objectives.

2. Concludes that reuse systems designed and operated according to DEP rules shall be considered environmentally acceptable and not a threat to public health and safety.

3. Requires applicants for domestic wastewater permits for facilities located in water resource caution areas to prepare reuse feasibility studies.

4. Requires utilities to implement reuse to the degree that reuse is feasible, based on the utility's reuse feasibility study.

5. Authorizes indoor uses of reclaimed water (toilet flushing, fire protection, and decorative water features).

6. Requires DEP domestic wastewater permits be consistent with requirements for reuse contained in consumptive use permits issued by the water management districts. This applies within water resource caution areas.

7. Encourages local governments to implement reuse projects.

8. Allows local governments to allocate costs of reuse systems in a reasonable manner.

9. Mandates that the Public Service Commission (PSC) allow utilities implementing reuse to recover the full cost of reuse facilities.

10. Requires that consumptive use permits be consistent with local reuse programs.

> **The encouragement and promotion of water conservation, and reuse of reclaimed water, as defined by the department, are state objectives and are considered to be in the public interest. The Legislature finds that the reuse of reclaimed water is a critical component of meeting the state's existing and future water supply needs while sustaining natural systems. The Legislature further finds that for those wastewater treatment plants permitted and operated under an approved reuse program by the department, the reclaimed water shall be considered environmentally acceptable and not a threat to public health and safety.**
>
> Section 403.064(1), F.S.

11. Mandates that local governments implementing reuse systems require developers to comply with the reuse program.

12. Where reuse is determined to be feasible, restricts the use of effluent disposal systems (surface water discharges, ocean outfalls, and deep well injection) to backups for reuse systems.

Section 403.135, F.S. - This section addresses liability issues for persons who use reclaimed water. A person practicing spray irrigation using reclaimed water is not liable for civil damages resulting from the irrigation, as long as the irrigation system complied with appropriate rules and permits. Acts of negligence and misconduct are not included in the limitation on liability. The owners and operators of wastewater treatment facilities providing reclaimed water for reuse are not excused from civil liability.

Section 403.086(7), F.S. – This section provides for backup discharges under the so-called APRICOT Act (named for the award-winning reuse project in Altamonte Springs). Facilities that provide advanced wastewater treatment (5 mg/L of $CBOD_5$, 5 mg/L of total suspended solids, 3 mg/L of total nitrogen, and 1 mg/L of total phosphorus) are authorized to discharge excess reclaimed water (subject to limitations provided) to surface waters.

Chapter 120, F.S.

This chapter controls rulemaking and other administrative functions of governmental agencies in Florida. Constraints are imposed on the DEP's and the water management districts' permitting

activities. Timeframes are established for permit application review and for issuance or denial of permits. Provisions for administrative challenges are established.

Chapter 373, F.S.

This chapter establishes the five water management districts (3). The focus largely is on regulation of water quantity. It provides several authorizations to the DEP and the water management districts, including the authority for the water management districts to issue consumptive use permits for water use.

Section 373.250, F.S. – This section also includes the state objectives related to encouraging and promoting water reuse and conservation.

Section 373.1961, F.S. – This section directs the water management districts that have designated water resource caution areas to implement funding programs for development of alternative water supply systems, including reclaimed water systems.

Chapter 367, F.S.

This chapter provides authorization for the PSC and its activities. The PSC has responsibility for regulation of rates charged by investor-owned utilities for water and wastewater service. The PSC's jurisdiction is limited to investor-owned utilities located in specific counties in Florida.

Section 367.0817(3), F.S. – This section requires that the PSC allow all prudent costs of a reuse project to be recovered in the utility's rates. This section also notes that water reuse benefits the water, wastewater, and reclaimed water customers. As a result, the PSC is authorized to enable utilities to recover the costs of a reuse project from their water, wastewater, and/or reuse customers.

Indian River Lagoon System and Basin Act

This Act, which is contained in Chapter 90-262, Laws of Florida, provides increased protection to the Indian River Lagoon System. The Act established three objectives for domestic wastewater facilities in this area:

1. Elimination of surface water discharges,

2. Investigation of the feasibility of reuse, and

3. Centralization of wastewater collection and treatment facilities.

Section 2 of the Act requires that no new discharges or increased loadings from domestic wastewater treatment facilities within the area be permitted. This section requires that surface

water discharge from domestic wastewater treatment facilities be eliminated before July 1, 1995. The Act allows exceptions in any of the following circumstances:

1. The permit applicant conclusively demonstrates that no other practical alternative exists and that the discharge will be treated to advanced treatment levels or higher.

2. The applicant conclusively demonstrates that the discharge will not cause or contribute to water quality violations and will not hinder efforts to restore the water quality in the Indian River Lagoon System.

3. The discharge is an intermittent surface water discharge occurring during wet weather conditions, subject to the requirements of applicable DEP rules.

Section 3 of this Act requires each owner of an existing sewage treatment facility within the Indian River Lagoon Basin to investigate the feasibility of using reclaimed water for beneficial purposes. These reuse feasibility studies were to be completed before July 1, 1992.

RULES

Chapter 62-610, F.A.C.

This chapter, which is entitled "Reuse of Reclaimed Water and Land Application," contains detailed regulations governing water reuse in Florida (18). While this chapter was established in 1989, basic rule requirements for some forms of land application and reuse dated back to the 1983 Land Application Manual (20). Subsequent to its original adoption, Chapter 62-610, F.A.C., has been revised in 1990, 1996, and 1999. The 1999 revisions, which were supported by a risk impact statement (21), added a rule governing ASR and expanded and strengthened rules dealing with ground water recharge and indirect potable reuse. The following types of reuse projects are addressed in this chapter:

1. Slow-rate systems (typically spray irrigation) having restricted public access to the irrigation sites [Part II of the chapter].

2. Slow-rate systems irrigating sites having unrestricted public access (such as parks and golf courses), residential properties, and edible food crops [Part III].

3. Rapid-rate systems (typically rapid-infiltration basins) for ground water recharge [Part IV].

4. Ground water recharge and indirect potable reuse [Part V].

5. Industrial uses of reclaimed water [Part VII].

Part III of this chapter regulates irrigation of public access areas, residential properties, and edible food crops. Higher levels of treatment and disinfection are needed for these types of reuse systems. Reclaimed water meeting the requirements of Part III also can be used for toilet flushing, fire protection, aesthetic purposes (such as use in decorative ponds and fountains),

sprinkling for construction dust control, and other useful purposes requiring a high quality reclaimed water. Part III also includes rules governing reclaimed water ASR systems [see Rule 62-610.466, F.A.C.] and the use of supplemental water supplies [see Rule 62-610.472, F.A.C.].

Criteria for categorizing wastewater management projects as “reuse” or “effluent disposal” are contained in Rule 62-610.810, F.A.C.

Provisions for limited wet weather discharges for reuse systems are contained in Rule 62-610.860, F.A.C. Under restricted conditions, the DEP can permit wet weather discharges with minimal water quality review.

The possible blending of concentrate from membrane water treatment facilities with reclaimed water is addressed in Rule 62-610.865, F.A.C.

Chapter 62-600, F.A.C.

This chapter, entitled "Domestic Wastewater Facilities," contains requirements for construction, operation, and permitting of domestic wastewater treatment facilities (22). Treatment and disinfection requirements are established.

Chapter 62-601, F.A.C.

This chapter, entitled "Domestic Wastewater Treatment Plant Monitoring," contains requirements for monitoring at domestic wastewater treatment facilities (23). Requirements for ground water monitoring at reuse and land application sites also are included. This chapter also requires most treatment facilities that provide reclaimed water for reuse to test their reclaimed water annually for parameters listed as primary and secondary drinking water standards.

Chapter 62-40, F.A.C.

This chapter, entitled “Water Resource Implementation Rule,” provides important direction in the water reuse arena (8). The DEP and the water management districts are charged with advocating and directing the reuse of reclaimed water as an integral part of water and wastewater management programs, rules and plans. These agencies also are directed to champion and develop sound water conservation practices and public information programs.

This chapter requires the water management districts to designate “water resource caution areas” – areas facing critical water supply problems during the next 20 years. This chapter establishes a mandatory reuse program by directing the water management districts through their consumptive use permitting programs to require a reasonable amount of reuse of reclaimed water within the designated water resource caution areas. The water management districts are also given the opportunity to require reuse outside of water resource caution areas, but the criteria for requiring reuse outside of these designated areas are more restrictive than the criteria that apply within water resource caution areas.

Pending Revisions – The DEP proposed revisions to Chapter 62-40, F.A.C., in January 2003. Several parties subsequently challenged these revisions. Hence, implementation of these rule revisions is being held in abeyance pending an administrative hearing. Should the proposed revisions be upheld, several of the revisions will affect Florida's Water Reuse Program. Perhaps of most significance is that the mandatory reuse provisions of Rule 62-40.416, F.A.C., would be expanded from application only within designated Water Resource Caution Areas to be applied statewide. Definitions for "potable quality water offset" and "recharge fraction" would be added to Rule 62-40.210, F.A.C. The revisions would establish increased efficiency and effectiveness of reclaimed water use as an objective of water resource management in Rules 62-40.310 and 62-40.416, F.A.C. In addition, Rule 62-40.412, F.A.C., would be modified to include efficient and effective use of reclaimed water as a means of conserving water. Encouragement of metering and use of volume-based rates for reclaimed water service would be added to Rule 62-40.416, F.A.C. Finally, the use of reclaimed water for wetlands augmentation would be encouraged in Rule 62-40.410, F.A.C.

Antidegradation Policy

The Antidegradation Policy is contained in Chapters 62-4 and 62-302, F.A.C. These rule provisions generally discourage any reductions in quality of the state's surface waters. Under this policy, any proposed new or expanded surface water discharges must be demonstrated to be in the public interest. As part of the "public interest" test, the applicant must evaluate the feasibility of reuse. If reuse is determined to be feasible, it will be preferred over the surface water discharge. This is a significant motivating force leading domestic wastewater utilities to water reuse.

Water Management District Rules

Each water management district has developed its own series of rules designed to implement programs authorized by Chapter 373, F.S., and by Chapter 62-40, F.A.C. The districts' rules are contained in the following series within Title 40 of the F.A.C.:

40A - Northwest Florida Water Management District

40B - Suwannee River Water Management District

40C - St. Johns River Water Management District

40D - Southwest Florida Water Management District

40E - South Florida Water Management District

All five districts use a uniform series of chapter numbers. General, procedural, and organizational rules are in Chapter 1. Discussion of consumptive use permitting is contained in Chapter 2. As an example, consumptive use permitting rules for the South Florida Water Management District are found in Chapter 40E-2, F.A.C.

The St. Johns River and South Florida Water Management Districts have promulgated separate rule chapters for the designation of Water Resource Caution Areas. The St. Johns River Water Management District made their designations in Chapter 40C-23, F.A.C., while the South Florida Water Management District made their designations in Chapter 40E-23, F.A.C.

REUSE CONVENTIONS

The Reuse Coordinating Committee published ***Reuse Conventions*** (24) in 1993. This document served three key purposes. First, it established consistent standards for terminology, concepts, and approaches for water reuse that were to be used by all water management districts in their District Water Management Plans. Second, it provided a clear statement of how Florida's Water Reuse Program was to be implemented. Finally, it addressed a series of 17 issues facing the Water Reuse Program. The issue areas were evaluated and recommendations for refining the Water Reuse Program were identified. Appendix F presents a summary of the status of each recommendation offered in the ***Reuse Conventions***. As noted in this summary, most of the recommendations have been implemented.

While many of the rule citations contained in ***Reuse Conventions*** currently are outdated, the contained description of the Water Reuse Program generally remains applicable.

REQUIRING WATER REUSE

Chapter 62-40, F.A.C., and Section 403.064, F.S., frame a mandatory reuse program. This section outlines the key features of the regulatory requirements for directing reuse and outlines how the program was intended to apply, as described in the ***Reuse Conventions*** (24), to various types of utilities and water users.

Inside Water Resource Caution Areas

Rule 62-40.416, F.A.C., requires implementation of a reasonable amount of reuse, unless reuse is not economically, technically, or environmentally feasible. This mandatory reuse program is implemented primarily through the water management districts' consumptive use permitting program. The Water Resource Caution Areas are shown in Figure 1.

Rule 62-40.416, F.A.C., allows the water management districts to limit areas within Water Resource Caution Areas that will be subject to mandatory reuse to areas where reuse is specified as a remedial or preventive action in the District Water Management Plan. Any such limitation of areas where reuse will be required must be designated by rule.

Municipalities and Utilities Having Responsibility for Water Supply and Wastewater Management - Consumptive use permits for these municipalities and utilities normally will include requirements for reuse. Reuse-related requirements may include restrictions on the quantities of water allowed to be withdrawn. This could enable limitations on water use to ensure that reclaimed water is used for appropriate beneficial purposes. Within the municipality's or utility's consumptive use permit, requirements may be placed on domestic wastewater treatment facilities having permitted or design capacities of 0.1 MGD or larger.

These requirements may be relatively general in nature, perhaps taking the form "facility X shall implement a reuse system by some specified date." Requirements may be significantly more detailed and may include directives aimed at requiring implementation of specific types of reuse activities. The water management districts do not issue separate consumptive use permits to domestic wastewater facilities, which would not otherwise need a consumptive use permit, solely to add requirements for reuse. Economic, environmental, and technical factors will be considered by the water management district as part of the reasonable-beneficial use considerations.

A municipality or utility should be given a reasonable period to implement reuse, depending on the type and extent of the anticipated reuse program. Generally, a period of five to seven years should be provided from the date of the consumptive use permit until supply of reclaimed water is initiated.

As required by Section 403.064, F.S., domestic wastewater permits issued by the DEP must be consistent with requirements for reuse contained in applicable water use permits issued by the water management districts. Detailed rule provisions related to this issue are contained in Rule 62-610.800(10), F.A.C.

Municipalities and Utilities Having Responsibility for Water Supply Only - Consumptive use permits for these municipalities and utilities may include requirements for reuse. Reuse-related requirements may include restrictions on quantities of water allowed to be withdrawn. This would enable limitations on use to ensure that reclaimed water is used for appropriate beneficial purposes. Limitations may be imposed reflecting increased water use efficiency. Economic, environmental, and technical factors will be considered by the water management district as part of the reasonable-beneficial use considerations.

Individual Users of Water - Individual users of water, such as farms and golf courses, are required to use reclaimed water, unless the applicant demonstrates to the water management district's satisfaction that use of reclaimed water is not feasible, based on economic, environmental, and technical factors. The water management districts normally will make determinations concerning feasibility and the districts should not rely solely on the applicant's conclusions. If the water management district concludes that use of reclaimed water is feasible, permits are modified to require use of reclaimed water, possibly with a backup allocation in the event that reclaimed water ever ceases to be available. If reclaimed water is not currently available, consumptive use permits normally include conditions requiring the use of reclaimed water once it becomes available.

Wastewater Facilities With Consumptive Use Permits - Some domestic wastewater facilities are subject to consumptive use permitting, typically for water wells located on-site. The water management districts may include reuse requirements in the consumptive use permits for these domestic wastewater treatment facilities.

Wastewater Facilities Without Consumptive Use Permits – This section applies to domestic wastewater treatment facilities, which are not controlled by municipalities or utilities having responsibility for water supply, and which are not subject to consumptive use permitting. As

noted previously, the water management districts do not issue any form of consumptive use permit to these facilities solely to impose reuse requirements.

The DEP is the sole permitting authority for these domestic wastewater facilities. The DEP will continue to discourage disposal options at these facilities. New and expanded surface water discharges will be subject to scrutiny under the Antidegradation Policy.

Pending Revisions to Chapter 62-40, F.A.C. – Pending revisions to Chapter 62-40, F.A.C., would extend the mandatory reuse provisions to apply statewide. Should these rule revisions withstand the pending challenge and be implemented, the activities outlined above as applying within designated Water Resource Caution Areas would be applied statewide.

Outside of Water Resource Caution Areas

Generally, reuse is not required outside designated Water Resource Caution Areas. The exceptions are described in the following paragraphs.

A water management district may require water users (farms, golf courses, etc.) in areas located outside of designated Water Resource Caution Areas to use reclaimed water, but only if all of the following conditions are met [Rule 62-40.416, F.A.C.]:

1. Reclaimed water is readily available,

2. Consideration is given to economic, environmental, and technical factors, and

3. The district has adopted rules for reuse in these areas.

The "readily available" clause was included to aid utilities implementing reuse systems. For example, this clause applies to the case where a utility has run a reclaimed water distribution line adjacent to a water user. Subject to these three criteria, the water user may be required to connect to the reuse system.

The water management districts may develop voluntary programs to encourage municipalities and utilities located outside of Water Resource Caution Areas to implement reuse programs.

Pending Revisions to Chapter 62-40, F.A.C. – Pending revisions to Chapter 62-40, F.A.C., would extend the mandatory reuse provisions to apply statewide. Should these rule revisions withstand the pending challenge and be implemented, the activities outlined above as applying outside of designated Water Resource Caution Areas would no longer be applicable.

The Antidegradation Policy

In addition, the Antidegradation Policy provides opportunities for the DEP to restrict new or expanded surface water discharges statewide. Under the Antidegradation Policy, if reuse is feasible, reuse will be preferred over a new or expanded surface water discharge.

REUSE FEASIBILITY STUDIES

There are several rules, statutes, or laws that require preparation of reuse feasibility studies. The DEP, with assistance from the water management districts and the PSC, published a guidance document entitled ***Guidelines for Preparation of Reuse Feasibility Studies for Applicants Having Responsibility for Wastewater Management*** (25). These guidelines are used by applicants for domestic wastewater permits, when required by the rules, laws, and statutes discussed previously. These guidelines also are used by applicants for consumptive use permits when the applicant also has responsibility for wastewater management.

In addition, the Reuse Coordinating Committee published guidelines for preparation of feasibility studies for use by individual water users (26).

ALLOCATING COSTS AMONG WASTEWATER, WATER, AND RECLAIMED WATER CUSTOMERS

The Florida Legislature has recognized the benefits of reuse, and has provided guidance in how reuse should be priced by the enactment of Section 367.0817(3), F.S. While that statute applies to utilities regulated by the Public Service Commission, its direction should be utilized by utilities throughout the state. Section 367.0817(3), F.S., reads:

> All prudent costs of a reuse project shall be recovered in rates. The Legislature finds that water reuse benefits the water, wastewater and reclaimed water customers. The Commission shall allow a utility to recover the costs of a reuse project from the utility's water, wastewater or reuse customer or any combination thereof as deemed appropriate by the Commission.

This legislation dictates that all prudent costs of a reuse project will be considered 100 percent used and useful, with no deferral of costs to future customers. It also provides flexibility in determining the method of recovery of reuse costs. The legislation is a departure from a more traditional approach where potable water customers pay only for direct costs associated with providing potable water service, and wastewater customers pay only for costs associated with wastewater service. Reclaimed water should be priced as a commodity in order to recognize the costs and benefits of reuse, while not discouraging its reasonable use, or negatively impacting the utilities' ability to dispose of its effluent.

If the utility does not charge for reclaimed water use, water and/or wastewater customers bear the entire cost of reuse. Since reuse customers receive benefit, it is appropriate to consider if a positive reuse rate can be implemented. Rates for reclaimed water can range from zero to the actual full cost of service. The level of reuse rates usually is not based on recovery of the full cost from the reclaimed water customers, and judgment must be exercised in determining the rate in each case. The approved rates are site-specific, based upon consideration of various customer and utility specific factors, which can lead to different rates for different reuse customers of the

same utility. The determination of the appropriate level of reuse rates is an evolving and dynamic process. Some of the factors to consider in setting the rates are (27):

- Benefits to the reclaimed water customer versus the benefits to the utility's water and wastewater customers.
- Alternative sources of water available to the potential reclaimed water customer.
- Alternative methods of effluent disposal for the utility.
- Cost of the alternatives.
- Impact of rates on current and potential customers.
- Reuse agreements.
- Reclaimed water rates in the area.

In most cases, when the reuse rate is established below the fully allocated cost of reuse service, the revenue deficiency must be made up by either the water customers or the wastewater customers. Again, the individual circumstances of the utility, its service area, and the customers will determine how the remaining revenue deficiency should be recovered.

Appropriate reuse rates should be established to encourage the use of reclaimed water, while recognizing that it is a scarce and valuable resource. Accordingly, the price of reuse service normally is set at a level less than the price of other water sources. However, reuse rates should be established with a usage-based rate structure so as to encourage the wise use of the resource.

COORDINATION

Multiple parties are involved in various aspects of water reuse. Hence, there is a great need to maintain open communication between the various agencies and to coordinate their activities.

Reuse Coordinating Committee

This long-standing committee was originally formed in 1992. It serves as the primary mechanism for promoting coordination and communication among the member agencies related to water reuse. Current membership includes the DEP, the five water management districts, the PSC, the Department of Health, the Department of Agriculture and Consumer Services, the Department of Community Affairs (DCA), and the Department of Transportation.

Permitting Coordination

Coordination between the water management districts and DEP districts at the permitting staff level also is needed and is occurring. Both parties play key roles. The water management districts regulate water users – potential users of reclaimed water. The water management

districts also deal with some utilities that have both water and wastewater responsibility – utilities that could provide reclaimed water service. The DEP regulates domestic wastewater facilities – potential suppliers of reclaimed water. The PSC, which regulates investor-owned utilities in some Florida counties, also plays a significant role for the utilities that they regulate. To effectively encourage and promote reuse, the water management districts, DEP, and the PSC work together to do some "matchmaking." This is accomplished through periodic meetings between permitting staff at the water management districts and at the DEP district offices. Staff from the PSC also participate in these coordination meetings. Such meetings provide opportunities to:

- Identify areas where reuse is not happening.
- Develop strategies for encouraging and promoting reuse.
- Review pending permit applications and develop strategies for encouraging wastewater facilities to implement reuse and for water users to use reclaimed water.
- Identify future permitting activities and develop strategies for bringing water users and suppliers of reclaimed water together.
- Promote communication, coordination, and understanding between the agencies.

Memoranda of Understanding

The PSC has entered into a memorandum of understanding (MOU) with the five water management districts. A separate MOU between the DEP and the PSC has been implemented. These MOUs delineate responsibilities of the various agencies in the water reuse arena. In addition, under the MOUs, the PSC will assist the water management districts and the DEP in review of reuse feasibility studies submitted by utilities subject to PSC regulation.

AGENCY ROLES

Department of Environmental Protection

The DEP plays a number of roles in Florida's Water Reuse Program. Florida's Water Reuse Coordinator is employed by the DEP to provide overall coordination and leadership in the reuse arena. This individual chairs the Reuse Coordinating Committee and the Reuse Technical Advisory Committee. He is assisted in this endeavor by a Water Reuse Specialist. The Water Reuse Specialist maintains and publishes an annual inventory of reuse activity in Florida. The DEP has responsibility for development and maintenance of rules governing water reuse activity in the state. A webpage devoted to water reuse is maintained by the DEP. Notable educational materials developed by the DEP include a printed brochure and a video on water reuse.

The DEP's six district offices implement the Domestic Wastewater Permitting Program, which includes permitting activities related to water reuse.

The DEP also administers state and federal funding programs that can be used to finance water reclamation and reuse facilities.

The DEP's Office of Water Policy provides general oversight of the rules and activities of the state's five water management districts.

Water Management Districts

The state's five water management districts implement the consumptive use permitting program (sometimes referred to as the water use permitting program). They play key roles in the Water Reuse Program, as they have the opportunity to encourage and direct water users and utilities to use reclaimed water and implement reuse programs. Several districts offer funding programs that can be used to finance reclaimed water infrastructure. Each water management district is represented on the Reuse Coordinating Committee. In addition, the water management districts are collectively represented by an individual on the Reuse Technical Advisory Committee.

Southwest Florida Water Management District (SWFWMD) – The SWFWMD implemented an aggressive alternative water supply development program, using the financial resources available to its eight basin boards and the Governing Board. The SWFWMD has worked closely with utilities, as well as other government and private entities, in identifying and addressing the water resource issues within its area, and has provided considerable technical and financial support for the planning, funding and implementation of effective and efficient reclaimed water projects. Since FY1987, the SWFWMD has budgeted more than $180 million dollars in grants to fund over 200 reclaimed water projects through the SWFWMD Cooperative Funding and New Water Sources Initiatives. SWFWMD funding requirements have evolved over time to ensure efficiency and cost-effectiveness through pre-project analysis and post-project evaluation. For example, the SWFWMD requires a minimum of 50 percent efficiency, guaranteed customer connection rates, approved education programs, and metering of all substantial customer connections in order to qualify for funding consideration. To help meet future water needs, the SWFWMD has identified the goal of achieving 75 percent utilization and 75 percent efficiency of reclaimed water flows by 2020. Approximately two thirds of the District has been designated as Water Resource Caution Areas. The SWFWMD is confident that the development of reclaimed water resources will play a key role in its mission to find and maintain adequate and ecologically sustainable resources within its boundaries.

St. Johns River Water Management District (SJRWMD) – The SJRWMD Governing Board's policy is to provide greater availability of reclaimed water and to implement reuse to the maximum extent feasible District-wide to help conserve available water resources. SJRWMD accomplishes the State of Florida objective to encourage and promote water conservation and reuse through the regulatory program, inter-agency coordination, the water supply planning process, and cost-share funding. The entire district has been designated as a Water Resource Caution Area.

South Florida Water Management District (SFWMD) – The SFWMD has implemented a comprehensive approach to encourage water reuse, including water supply planning, regulation, coordination, and funding. The District has completed four regional water supply plans

encompassing the District. Each plan contains region specific recommendations on the use of reclaimed water. The District requires all applicants for Water Use Permits to evaluate the feasibility of implementing water reuse, and it coordinates its reuse activities at the state, local, and water user levels. In addition, the SFWMD has had an alternative water supply funding program for over a decade. The SFWMD has provided over $26 million in alternative water supply grants for 113 projects since 1995, including water reuse projects, use of brackish water sources, and aquifer storage and recovery. These projects have resulted in over 250 MGD of water being made available. In addition, the SFWMD has committed $100 million a year towards implementation of the ***Comprehensive Everglades Restoration Plan*** (CERP). Implementation of the CERP (13) is projected to take over 30 years. About 90 percent of the SFWMD has been designated a Water Resource Caution Area.

Northwest Florida Water Management District (NWFWMD) – The NWFWMD actively encourages and promotes water reuse through its regulatory programs and water supply planning activities. The district designated the Telogia Creek Basin in Gadsden County and the southern portions of Okaloosa, Walton, and Santa Rosa Counties as Water Resource Caution Areas.

Suwannee River Water Management District (SRWMD) – The SRWMD has a relatively small population and few water supply problems. Hence this water management district has not identified any Water Resource Caution Areas and has not been very active in the Water Reuse Program.

Department of Health

The Department of Health is a long time partner in the Water Reuse Program. Reflecting the agency's expertise, the Department of Health provides input to the DEP and the Water Reuse Program on health-related issues. This is particularly important during rulemaking activities associated with the reuse regulations in Chapter 62-610, F.A.C., and the disinfection criteria contained in Rule 62-600.440, F.A.C. The Department of Health is represented on the Reuse Technical Advisory Committee and is a member of the Reuse Coordinating Committee.

The Department of Health also plays a key role in the Cross-Connection Control Program. Several of the county health departments have been delegated responsibility for administration of the Drinking Water Program, which includes direct involvement in the Cross-Connection Control Program. Several joint DEP/Department of Health memos have been issued providing guidance related to cross-connection control issues.

In 2002, a joint DEP/Department of Health Pathogen Committee was formed to facilitate review of pathogen data and to discuss issues related to pathogens in reclaimed water and other water sources.

Public Service Commission

The PSC has made a commitment to work with other agencies and organizations to promote the reuse of reclaimed water. The PSC's role in promoting the reuse of reclaimed water is as an economic regulator of certain investor-owned utilities. When those utilities are required by the

DEP or water management districts to implement reuse systems, the PSC has the responsibility of determining how the reuse costs should be recovered. Historically, effluent disposal was viewed as component of the wastewater treatment process, and thus, the costs were recovered through the wastewater rates. The passage of Section 367.0817, F.S., has provided the PSC with the flexibility to allocate reuse costs to the water, wastewater, and reuse customers, or any combination thereof. This has allowed the PSC to take a more proactive role in reviewing reuse projects and establishing reuse rates. Further, it has allowed the PSC to structure rates in ways that allow the utility to recover the costs associated with a reuse project without placing an undue financial burden on any one group of customers. Projects that would have been economically unfeasible are now possible as a result of this new cost allocation methodology.

Also, as an economic regulator the PSC has a role in promoting metering and volume-based rates for reclaimed water service. The PSC must evaluate many factors in determining the appropriateness of reuse projects and rates, but is striving to educate consumers about the value of reclaimed water through the establishment of volume-based rates when feasible. The PSC actively works with the DEP and water management districts during rate proceedings, and through quarterly reuse meetings, to help ensure the success of new reuse projects.

The PSC is represented on the Reuse Coordinating Committee.

Department of Agriculture and Consumer Services

Florida's agricultural community represents a significant user of water in Florida. Agriculture also is a significant user of reclaimed water in Florida. Hence, the Florida Department of Agriculture and Consumer Services is involved with the Water Reuse Program. Their involvement includes representation on the Reuse Coordinating Committee.

Department of Transportation

The Florida Department of Transportation is involved in water reuse from several perspectives. First, reclaimed water can be used for landscape irrigation and toilet flushing at highway rest areas and welcome centers. Use of state rights-of-way offers potential for routing reclaimed water transmission lines. The Department of Transportation is represented on the Reuse Coordinating Committee.

Department of Community Affairs

Recognizing the importance of water reuse to Florida and the need to integrate reuse into state, regional, and local planning, the Florida Department of Community Affairs participates in the state's Water Reuse Program. Their involvement includes representation on the Reuse Coordinating Committee.

REUSE REFERENCE MATERIALS

This section lists several of the reference materials available to support water reuse efforts in Florida.

Statement of Support for Water Reuse

The ***Statement of Support for Water Reuse*** was developed by the Reuse Coordinating Committee in 2001. It is a strong endorsement by the DEP, the EPA, the five water management districts, the PSC, the Department of Health, the Department of Agriculture and Consumer Services, and the Department of Community Affairs in support of water reuse. This document can be found in Appendix G.

Code of Good Practices for Water Reuse in Florida

The ***Code of Good Practices for Water Reuse in Florida*** was published by the DEP and the Florida Water Environment Association's Water Reuse Committee in 2000 (28). Sixteen principles that define quality water reuse programs are organized into three basic themes – protection of public health and environmental quality, reuse system management, and public awareness. Appendix H includes this document.

Reuse Brochure

The DEP has developed a color brochure introducing water reuse. The brochure, which is periodically updated, is available at no cost and is useful for utilities wanting to inform the public about water reuse.

Reuse Video

In 1998, the DEP published a 20-minute video titled ***Every Drop Counts… Use it Again, Florida!*** This video is available at no cost and has proven popular among Florida's reuse utilities as a public education tool.

Reclaimed Water Guidebook

The Southwest Florida Water Management District published the ***Reclaimed Water Guide*** in 1999 (29). This document is available as a CD-ROM and also may be viewed on the District's webpage. The ***Reclaimed Water Guide*** is a compilation of useful materials (ordinances, regulations, contracts, signs, forms, financial information, and more) from successful water reuse projects in Florida. The information contained has proven very useful to other utilities initiating water reuse programs.

DEP Reuse WebPage

DEP's Water Reuse Program maintains a comprehensive webpage dealing with water reuse (www.dep.state.fl.us/water/reuse). This webpage provides access to applicable rules and forms and provides information on a wide range of reuse topics. Data from the current reuse inventory also is included on this webpage.

DEP Reuse Inventory

The DEP publishes an annual reuse inventory (7) to enable tracking of the success of Florida's Water Reuse Program. The inventory also serves as a valuable tool for utilities wanting to initiate or expand reuse activities. The inventory provides data on all domestic wastewater treatment facilities in Florida having permitted capacities of 0.1 MGD or larger.

Water has no taste, no color, no odor; it cannot be defined, art relished while ever mysterious. Not necessary to life, but rather life itself.

Antoine de Saint-Exupery, ***Wind, Sand, and Stars***, 1939.

Water is the one substance from which the earth can conceal nothing; it sucks out its innermost secrets and brings them to our very lips.

Jean Giraudoux, ***The Madwomen of Chaillot***, 1946.

IV. HISTORICAL PERSPECTIVE ON WATER REUSE

This chapter presents a brief review of the evolution of Florida's Water Reuse Program and provides the rationale behind the need to refine the program to better manage reclaimed water as a valuable water resource. For more detailed discussion of the development of Florida's Water Reuse Program, the reader is referred to several articles by York et al. (30,31,32). In addition, Figure 5 presents a timeline of water reuse in Florida showing landmark reuse systems and significant milestones in the development of Florida's Water Reuse Program. The rapid expansion of reuse capacity in Florida previously was highlighted in Figure 2.

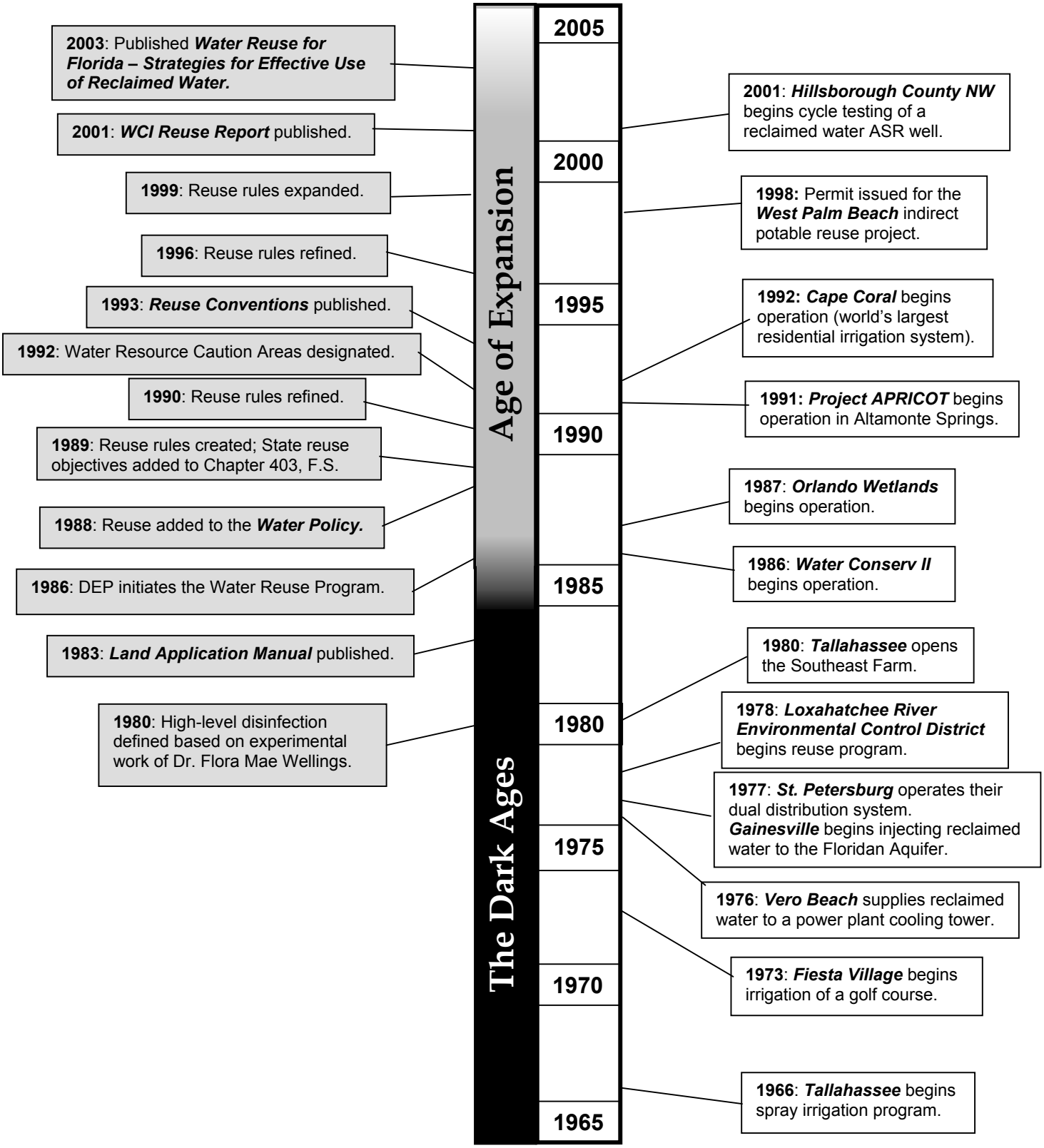
THE "DARK AGES" OF WATER REUSE

In articles tracing the development of Florida's reuse program, Ferraro and York (31) and York, et al. (32) referred to the period before the mid 1980s as the "Dark Ages of Reuse" – a period of limited reuse activity and very little institutional framework. This also can be thought of as the "Age of Disposal," since wastewater management in Florida was dominated by effluent disposal practices – surface water discharges, ocean outfalls, and Class I deep well disposal projects. Rules governing reuse were limited to the Land Application Manual (20) that dealt primarily with slow-rate land application systems (sprayfields) and rapid-rate land application systems (percolation ponds). Public access systems were addressed in only one paragraph and no effort had been made to encourage or facilitate some of the more desirable forms of reuse. In fact, the term "reuse" did not even appear in Florida's rules.

As water quality constraints began to make it difficult to find suitable locations for new or expanded surface water discharges, some utilities began to look at various land application methods as a means for managing domestic wastewater. As a result, Florida saw the implementation of Tallahassee's award-winning agricultural reuse system in the mid 1960s and the development of St. Petersburg's landmark dual distribution system in the late 1970s. A zero discharge determination for Shingle Creek and Lake Tohopekaliga motivated Orlando and Orange County to implement the award-winning Water Conserv II project in the mid 1980s. Facing water quality constraints, but also seeing the water resource benefits of reuse, forward thinking utilities like Altamonte Springs and the Loxahatchee River Environmental Control District initiated landmark reuse projects in the 1980s.

The lack of comprehensive rules governing water reuse posed significant hurdles for the early pioneers. Significant differences in permitting approaches and requirements between the six DEP district offices also presented uncertainties to consulting engineering firms doing business in various portions of Florida.

Figure 5. Florida's Water Reuse Timeline.



DAWN OF THE "AGE OF EXPANSION"

Prompted by then Secretary Dale Twatchman, the DEP embarked on development of a comprehensive Water Reuse Program in the mid 1980s. Recognizing the complementary roles played by DEP (regulates domestic wastewater systems – potential suppliers of reclaimed water) and the water management districts (regulate users of water – potential users of reclaimed water), the water management districts were immediately brought on board as partners in the fledgling Water Reuse Program. Other agencies soon began to participate in the program, as well. The Public Service Commission (PSC) became an early partner reflecting the Commission's important role in dealing with investor-owned utilities. Of course, the Department of Health immediately became a partner in the rulemaking process designed to craft rules governing water reuse. The basic tenets of the Water Reuse Program have always been protection of public health and protection of environmental quality.

In the late 1980s, the state objectives were adopted in Chapter 403, F.S., the mandatory reuse program was initiated, comprehensive rules governing water reuse were established, and Florida began to experience rapid growth in the reuse arena (30,31,32). Figure 2 depicts the rapid expansion in reuse that ensued.

Between earth and earth's atmosphere, the amount of water remains constant; there is never a drop more, never a drop less. This is a story of circular infinity, of a planet birthing itself.

Linda Hogan, ***Northern Lights***, 1990.

Building the Experience Base

With the dawning of the Age of Expansion, as utilities began implementing reuse systems, they faced the initial challenge of creating a market for their reclaimed water (31). Their treatment facilities continued to treat wastewater and to produce what was potentially usable reclaimed water. The supply of reclaimed water was there. Customers were needed to use the reclaimed water. Given that reuse and reclaimed water were largely unknown commodities, at least initially, many utilities encountered a skeptical and reluctant public. Hence, the need to educate and entice water users to be willing to use reclaimed water as a nonpotable water resource for landscape irrigation and other uses.

As noted previously, potable quality water historically has been priced very low. The result was that utilities had little choice but to practically give their reclaimed water away in an effort to motivate potential customers to use reclaimed water. Some of the early pioneers actually provided reclaimed water at no cost to users. Others resorted to very low user charges – charges well below the cost of potable water. In most cases, utilities resorted to flat rates – a fixed monthly fee for the use of reclaimed water. Three key considerations entered into the establishment of these low flat rates:

1. Flat rates avoided the need for meters on the reclaimed water service connections, which served to minimize costs for the utility and for their customers.

2. As noted, the availability of a cheap, unlimited, nonpotable water supply was a key selling point to reluctant customers.

3. These low flat rates encouraged maximum use of the utility's reclaimed water, which met the utility's wastewater management needs.

During the early years of the reuse program, many utilities touted reclaimed water as a limitless, drought-proof water supply. Such claims were intended to generate customers for fledgling reclaimed water systems.

Resulting Overuse

During the Age of Expansion, the reuse business boomed in Florida (31). More and more utilities implemented water reuse programs and their customer bases grew rapidly. Not surprisingly, the giveaway programs and systems that used low flat rates encouraged overuse of the reclaimed water resource. Certainly, these rate structures did little to encourage wise and efficient use of the resource. Many reclaimed water customers used more reclaimed water than was necessary for optimum plant growth. Even so, the resulting overuse was still not a concern for reuse systems since reclaimed water was still abundant within their systems. Of course, there was a significant seasonal variation in demand for reclaimed water, with the heaviest use during the dry season and minimal use during the wet season.

Data assembled by the Southwest Florida Water Management District (33) indicate that, in many instances, the use of reclaimed water may only offset about 25 percent of potable water use. That is, if a homeowner was using X gallons of water each month to water his lawn, upon changing to use reclaimed water, he/she may have used about 4X gallons of reclaimed water.

Florida Experiences Shortages

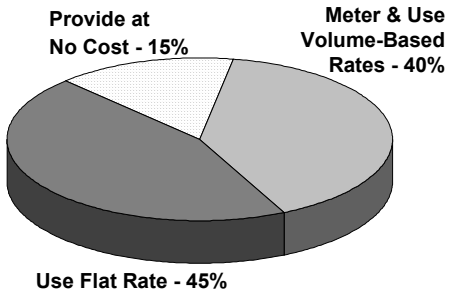
As the customer base of many systems began to grow, many utilities began to be concerned about the seasonal nature of reclaimed water use for irrigation (31). During the dry season, reuse demand climbed and, in some cases, was three to four times the demand experienced during the wet season. Systems had to be designed around the dry season demand in order to have sufficient reclaimed water for all customers. Designing systems with this constraint severely limited the ability of utilities to further expand their systems, and, therefore, the utilities had to rely heavily on alternate disposal systems such as surface water discharges during the wet season. Where available, utilities began to pursue supplemental supplies for augmentation of the reclaimed water system during the dry season, so that better use of reclaimed water could be achieved year-round. These supplemental water supplies were commonly either surface water or ground water and required coordination between the water management districts and the DEP. Some systems even used treated drinking water as a means for supplementing their reclaimed water supply.

Not all areas of Florida had supplemental water sources readily available for use in reuse systems (31). In some coastal areas of Florida, shortages of water for public supply posed concerns. During the 1990s, the efficiency of reclaimed water irrigation systems began to pose concerns

for increasing numbers of reclaimed water utilities. The extreme 2000-2001 drought saw some reuse systems beginning to run short of reclaimed water. Resulting low pressures in some reclaimed water distribution systems angered customers, who had been promised an unlimited, drought-proof supply of reclaimed water. Rate systems (some with metering for reclaimed water use) became more common. Several utilities that had employed low, flat rates attempted to implement metering and volume-based rate structures. In some cases, proposed changes to metering and volume-based rates were met with stiff opposition from reclaimed water customers, who believed that they were entitled to unlimited access to inexpensive reclaimed water in perpetuity. As a result, several proposed changes to metering and volume-based rates have been voted down.

Reclaimed water use and overuse are difficult to control without metering. According to the findings of a 2002 study conducted by the Southwest Florida Water Management District, the average single family residence using metered reclaimed water for irrigation used 534 gallons per day, however the average for unmetered reclaimed water was 980 gallons per day (34).

Figure 6. Metering of Residential Customers.

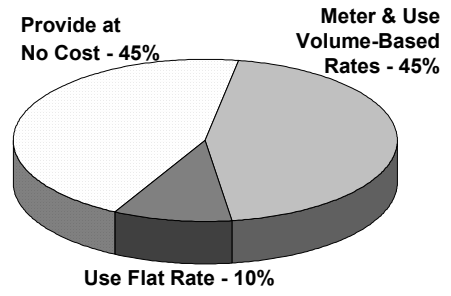


Source: DEP (35)

As shown in Figures 6 and 7, less than half of Florida's reclaimed water utilities currently meter reclaimed water service and employ volume-based user charges (35). Figure 6 presents data on metering and reclaimed water rate structures for utilities that provide reclaimed water for residential customers. Figure 7 presents similar data for nonresidential customers. It is interesting to note that 45 percent of reclaimed water utilities provide reclaimed water to nonresidential customers at no cost.

Measures taken to minimize the use of reclaimed water during the recent drought (2000-2001) include reducing the reclaimed system pressure, limitations on days of irrigation, rationing, metering, and public education. The available reclaimed water supplies have also been extended by taking large customers that have back-up groundwater and surface water supplies off-line and by supplementing the reuse system with stormwater/surface water or non-potable groundwater during periods of excess demand. A number of utilities also are evaluating ASR as a means of saving reclaimed water during wet periods for later use. Two utilities currently are involved in the initial cycle testing (operating reclaimed water ASR systems to demonstrate performance).

Figure 7. Metering of Nonresidential Customers.



Source: DEP (35)

The severity of the reclaimed water shortages varies among the water management districts and tends to be greatest where reclaimed water systems are most developed.

- The reuse systems in the more developed coastal areas in Santa Rosa, Okaloosa, and Walton counties within the Northwest Florida Water Management District experienced some shortages. In Destin, efforts were initiated to supplement with nonpotable water from the Sand and Gravel Aquifer.

- The Suwannee River Water Management District is in the early stages of water reuse development. Hence, shortages of reclaimed water are not yet a concern.

- In St. Johns River Water Management District, reclaimed water shortages were concentrated in the Orlando region and the coastal areas in Volusia, Brevard, and Indian River Counties. Supplemental surface water and nonpotable ground water were used at Altamonte Springs, Port Orange, Sanford, Cocoa, Brevard County, and Vero Beach to increase system reliability. The City of Cocoa also is evaluating reclaimed water ASR and the District is assisting with funding the project.

- The Southwest Florida Water Management District had several reuse systems that experienced shortages of reclaimed water during the drought (St. Petersburg, Pinellas County, Largo, Clearwater, Dunedin, Hillsborough County, Manatee County, Sarasota, and Bradenton). Several of these utilities are evaluating ASR and several others are proposing to supplement reclaimed water with another water source.

- Some reuse facilities in the South Florida Water Management District also experienced shortages during the drought. The Lee County, Cape Coral, Seacoast Utilities, and Loxahatchee River Environmental Control District reuse systems have dealt with constraints such as low reserve storage, reduced revenues when 10 to 20 percent cut-backs in service were implemented, and up to 17 percent reductions in wastewater flows when the seasonal population leaves by May 1st – the start of the highest irrigation demand period.

NEED TO REFINE THE WATER REUSE PROGRAM

2000 Reuse Round Table

The Water Reuse Committee of the Florida Water Environment Association (FWEA) has sponsored an annual Reuse Round Table since 1992. The Reuse Round Tables are open discussions of salient reuse issues facing Florida's reuse community. These annual gatherings of environmental and water reuse professionals representing utilities, engineering firms, and regulatory agencies are held in association with the annual Florida Water Resources Conference.

The 2000 Reuse Round Table, which was held in Tampa, served as a forum for developing a priority list of possible refinements to Florida's water reuse program (36). The highest ranked recommendation from the Reuse Round Table was the need to transition to a regulatory framework that placed increased emphasis on treating reclaimed water as a valuable resource.

2001 Reuse Round Table

The theme for the 2001 Reuse Round Table ("Viewing Reclaimed Water as a Valuable Resource") grew out of the prioritization of reuse needs identified at the 2000 Reuse Round Table (31). The FWEA's Water Reuse Committee framed the 2001 Reuse Round Table to provide a forum for discussion of this important issue. The 2001 Reuse Round Table featured several papers (31,37,38,39) that addressed the use efficiency issue associated with managing reclaimed water as a valuable resource. Other issues related to efficient and effective use of reclaimed water also were discussed during this public forum.

Reuse Coordinating Committee

Following the 2000 Reuse Round Table, the Reuse Coordinating Committee began discussing the possible need for transitioning to a program that treats reclaimed water as a valuable water resource. Subsequent activities related to the Water Conservation Initiative and the 2001 Florida Water Plan have heightened and focused this interest and activity.

2001 Florida Water Plan

The concept of valuing reclaimed water as a valuable resource also has surfaced at the DEP as an issue that merits increased attention. The ***2001 Florida Water Plan*** (1) includes Water Supply Action Step 1.4.1 focusing on the need to manage reclaimed water as a valuable water resource. This action step provided the primary motivation for this document.

It is interesting to note that the ***2001 Florida Water Plan*** (1) also includes two other provisions related to the important concept of "water is water." First, Water Quality Objective 2 looks to promote consistency among the various DEP water programs. This objective specifically recognizes that "all water is recycled through the environment." Water Quality Action Step 2.1.1 involves identification of inconsistencies among the water programs.

Second, Water Quality Action Step 2.2.2 requires evaluation of the possible need for numeric pathogen standards, which could serve as a key component of ensuring consistent management and regulation of water.

Water Conservation Initiative

The Water Conservation Initiative (4) provided an opportunity to begin exploring ways to ensure that reclaimed water is used efficiently and effectively. First, the Water Reuse Work Group published a report detailing 15 strategies for effectively using reclaimed water and water reuse as a means for conserving water (19). Most of the recommendations from the Water Reuse Work Group subsequently were incorporated into the final Water Conservation Initiative report (4). These two reports served as valuable input into development of the strategies contained in this document.

Southwest Florida Water Management District's Activities – A Model

The Southwest Florida Water Management District has been a leader in the water reuse arena. The District not only requires reuse feasibility studies, but also offers grants to cooperatively fund their preparation. More importantly, the District provides grant funding for reuse facilities. Since 1987, the District has provided more than $180 million in grants for over 200 reclaimed water projects (40). The extent of reuse activity in the Tampa Bay Area is strong testimony to the impact and success of the District's programs.

Recognizing that some reuse systems encouraged excessive and wasteful use of reclaimed water, the Southwest Florida Water Management District moved in 1996 to encourage more efficient use of reclaimed water. Cooperative funding agreements with utilities require them to have potable quality water offsets of at least 25 percent. This move generally served to increase the efficiency of use.

By early 1999, the District observed a troubling trend in many of the more developed reuse systems. During the dry months, many utilities were running out of reclaimed water. However, on an annual basis these systems were only reusing 50 to 60 percent of their treated wastewater. Reclaimed water customers were overusing reclaimed water to the point of wastefulness. The customers valued the reclaimed water service, but not the reclaimed water itself. Many residential customers were irrigating daily and using three to four times the amount of water that was necessary (41). This overuse had the effect of limiting new connections in several reuse systems. Reduced connections meant increased demands on traditional sources.

As a result, in 2000, the District modified its contractual reclaimed water requirements in all reclaimed water funding agreements. The District began requiring grant recipients to have a potable quality water offset rate of at least 50 percent. The grant recipients also are required to have a District-approved reclaimed water education program that promotes the efficient use and conservation of reclaimed water. In addition, grant recipients also must enact, or have the associated local government enact, an ordinance requiring dual distribution (potable and reclaimed) lines in new developments within their reclaimed water service area. Grant recipients must develop a policy and/or an ordinance, and provide for enforcement for the efficient use of reclaimed water for aesthetic landscape irrigation, which results in at least a 50-percent potable quality water offset. Examples include, but are not limited to, even/odd watering schedules, eliminating daytime reclaimed water irrigation, and residential metering coupled with volume-based rates for reclaimed water use. Grantees must guarantee that at least 50 percent of the customers within the project area will be connected within one year of project completion. Grantees also must install reclaimed water meters within the project service area (minimum of a master meter per subdivision). The grant recipient must maintain the meters and report the average annual daily flows, number of active customers, and provide a three-year pre- and post-reclaimed water offset report to the District supporting the 50 percent minimum offset requirement. In order to map existing as well as future reclaimed water systems, the District instituted a requirement for all grantees to provide the District with Geographic Information System (GIS) information on their reclaimed water systems.

The District's pursuit of increased utilization and efficiency is continuing, as the District has identified the reclaimed water goals of 75 percent utilization and 75 percent potable quality water offset by 2020 (42).

The Southwest Florida Water Management District's current policies and activities offer great promise as models for institutional programs designed to encourage efficient and effective use of reclaimed water. As demonstrated by this District, the "carrot" approach of coupling viable funding programs with conditions that encourage efficiency can pay dividends.

Needed Paradigm Shift

Within Florida's Water Reuse Program, there is a need to transition to a mindset that places increased emphasis on efficiency and effectiveness in the use of reclaimed water. Efficiency needs to become an integral part of traditional reuse activities – largely focusing on landscape and agricultural irrigation activities. It also involves placing increased emphasis on reuse activities, like ground water recharge and indirect potable reuse that feature relatively high recharge fractions. Such a paradigm shift will enable Florida to move to an "Age of Enlightenment" in water reuse.

Water is the driver of nature.

Leonardo da Vinci.

We do not inherit the earth from our ancestors, we borrow it from our children.

Native American proverb.

When the heavens weep, the earth lives.

Ancient Hawaiian proverb.

V. RECOGNIZING RECLAIMED WATER AS A VALUABLE RESOURCE – FLORIDA'S PLAN

THE PLAN

Table 6 lists the 16 strategies that constitute Florida's plan for managing reclaimed water as a valuable resource. The emphasis is on moving toward efficient and effective use of reclaimed water.

Table 6. Recommended Strategies

1.	Encourage metering and volume-based rate structures.
2.	Implement viable funding programs.
3.	Facilitate seasonal reclaimed water storage (including ASR).
4.	Encourage use of reclaimed water in lieu of other water sources in the agricultural irrigation, landscape irrigation, industrial/commercial/institutional, and indoor water use sectors.
5.	Link reuse to regional water supply planning (including integrated water resource planning).
6.	Develop integrated water education programs.
7.	Encourage ground water recharge and indirect potable reuse.
8.	Discourage effluent disposal.
9.	Provide water use permitting incentives for utilities that implement reuse programs.
10.	Encourage reuse in Southeast Florida.
11.	Encourage use of supplemental water supplies.
12.	Encourage efficient irrigation practices.
13.	Encourage reuse system interconnects.
14.	Enable redirecting of existing reuse systems to more desirable reuse options.
15.	Use reclaimed water at government facilities.
16.	Ensure continued safety of water reuse

Recommended Strategies

Brief summaries of the 16 strategies are contained in this section. The reader is referred to Appendix C for detailed discussions of each strategy. The discussions in Appendix C include background information, details of the recommended strategies, listing of agency roles, identification of needed legislation, identification of needed rulemaking, identification of research needs, and presentation of success stories related to the strategies.

1. Encourage metering and volume-based rate structures.

Metering reclaimed water use and charging for reclaimed water use based on the volume of water used are critical to ensuring efficient and effective use of reclaimed water. This strategy encourages utilities to meter and charge for reclaimed water service using a volume-based rate structure.

> **There is sufficiency in the world for man's need but not for man's greed.**
>
> Mahatma Ghandi.

2. Implement viable funding programs.

A state funding program targeted at water reuse projects is recommended. This program also should include a small research program targeted at water reuse issues. A viable funding program offers much potential for encouraging utilities to enter the water reuse arena. Funding should be targeted at reuse projects featuring relatively high potable quality water offsets or recharge fractions, as a means for encouraging efficient and effective water reuse. Loan/grant conditions could be used to further promote efficiency and effectiveness by requiring use of meters and volume-based rates for reclaimed water service. Viable funding programs can play significant roles in ensuring the success of several other strategies presented in this report.

3. Facilitate seasonal reclaimed water storage (including ASR).

Storage represents a major concern and constraint on many water reuse projects, particularly for those emphasizing use of reclaimed water for irrigation, where large seasonal fluctuations in reclaimed water use may be experienced. This strategy encourages use of viable storage solutions. Emphasis is placed on ASR.

4. Encourage use of reclaimed water in lieu of other water sources in the agricultural irrigation, landscape irrigation, industrial/commercial/institutional, and indoor water use sectors.

Water reuse must be fully integrated into all aspects of water resource management and must become the way of life within all water use sectors – agriculture, landscape irrigation, indoor uses, and industrial/commercial/institutional. In all water use sectors, emphasis must be placed on the use of reclaimed water in lieu of other water sources.

5. Link reuse to regional water supply planning (including integrated water resource planning).

Water reuse must be integrated into all water supply planning activities. Water planning, including comprehensive planning efforts, must fully consider the full range of alternative water supplies, including reclaimed water. Integrated water resource planning and management that takes a holistic view of all available water supplies (conventional and alternative) simply makes sense for Florida.

6. Develop integrated water education programs.

This is a critical strategy that really embraces the full range of water programs. Florida simply must do a better job of educating the public about the nature of water, limitations on water, the fact that all water is recycled, and the need for and issues involved with alternative water supplies.

7. Encourage ground water recharge and indirect potable reuse.

When considering efficiency and effectiveness of reclaimed water use, indirect potable reuse and ground water recharge offer significant advantages, including high recharge fractions. In looking toward the future, these types of reuse systems offer much promise and should be encouraged.

8. Discourage effluent disposal.

Florida has established the encouragement and promotion of water reuse as formal state objectives. While Florida has been remarkably successful in embracing water reuse, large quantities of wastewater effluent are wasted through surface water discharges, ocean outfalls, and deep injection wells. As Florida continues to encourage reuse, the state also must look at making better use of effluent (a potentially valuable water resource) that currently is being disposed of.

9. Provide water use permitting incentives for utilities that implement reuse programs.

In an effort to further encourage water reuse, the water management districts may be able to offer some incentives for implementation of water reuse projects through their water use permitting activities.

10. Encourage reuse in Southeast Florida.

Southeast Florida, particularly Miami-Dade and Broward Counties are home to a significant percentage of all Floridians. As a result, these counties feature large percentages of the state's total permitted capacity of domestic wastewater treatment facilities and total flows of domestic wastewater. Unfortunately, the vast majority of wastewater treated in these counties is wasted through effluent disposal practices. If the state is to make further significant gains in the water reuse arena, utilities in these counties must begin to limit effluent disposal. This relates rather directly to Strategy 8, above. Strategy 10 outlines courses of action designed to stimulate water reuse in Southeast Florida.

11. Encourage use of supplemental water supplies.

As water reuse systems mature and demands for reclaimed water approach and begin to exceed available supplies, effective use of ground water, surface water, treated stormwater, and even treated drinking water to supplement the reclaimed water supply offers potential for making better use of available reclaimed water supplies. This strategy discusses means for encouraging the effective use of supplemental water supplies.

12. Encourage efficient irrigation practices.

Studies by the Southwest Florida Water Management District document the fact that some irrigation practices using reclaimed water may not be very efficient. While metering and the use of volume-based rates, as described in Strategy 1, probably offer the greatest potential to increasing irrigation efficiency, other measures also are available and should be pursued. This is an area that probably will be developed in more detail by the Agricultural Water Use Work Group and Landscape Irrigation Work Group associated with the Water Conservation Initiative. Strategy 12 focuses on the use of rainfall sensors within reclaimed water irrigation systems and on development of training and certification programs for contractors installing irrigation systems.

13. Encourage reuse system interconnects.

Interconnection of reuse systems offer significant advantages in that greater flexibility and reliability will result. This strategy develops a framework for encouraging such interconnections.

14. Enable redirecting of existing reuse systems to more desirable reuse options.

As noted in the Water Conservation Initiative (4,19), reuse activities may have differing levels of desirability based on their anticipated potable quality water offsets and recharge fractions. This strategy frames recommendations designed to motivate utilities that currently have low-desirability reuse systems to move toward higher desirability reuse systems.

15. Use reclaimed water at government facilities.

For over 15 years, Florida's Water Reuse Program has used the slogan "Use it Again, Florida!" Florida's state agencies certainly should be considered central to a definition of "Florida" in the program's slogan. Unfortunately, in general, Florida's state agencies have not practiced significant water reuse. They should. In fact, as noted in this strategy, state and other governmental agencies should lead by example in water reuse. Not only does use of reclaimed water at state facilities conserve water, but it also can provide a very effective means of educating the public. Imagine widespread use of reclaimed water at parks, rest areas, welcome centers, and other governmental facilities, all with attractive and visible signs describing the use of reclaimed water and touting the advantages and safety of water reuse.

16. Ensure Continued Safety of Water Reuse.

This may be listed as the last of the 16 strategies, but it is integral and critical to the continued success of Florida's Water Reuse Program. This strategy addresses such topics as cross-connection control, public education, responsible utility management, responsive oversight, control of pathogens, control of the emerging pollutants of concern (EPOC), and implementation of a "water is water" philosophy.

"Encourage" versus "Require"

The recommended strategies generally present actions that the Reuse Coordinating Committee encourages. For the most part, the 16 strategies do not entail mandates. Recognizing the fact that several of the recommended strategies involve additional costs to reclaimed water utilities or to potential users of reclaimed water, an incentives-based approach is recommended. Hence, Strategy 2 (Implement viable funding programs) and Strategy 9 (Provide water use permitting incentives for utilities that implement reuse programs) are very significant. Without these incentives, the recommended program probably will not be fully implemented.

Interrelationships Between Strategies

The 16 recommended strategies are not mutually exclusive. As noted in the previous section, the strategies that provide incentives (viable funding mechanisms and permitting incentives) are regarded as an integral component of the overall plan. Such incentives will be necessary if Florida hopes to achieve timely implementation of the other strategies recommended in this chapter.

Interrelationships With Water Use Sectors

Strategy 4 is critical to water management efforts in Florida. Where appropriate, reclaimed water simply must be used in lieu of other water sources. This holds true for all four water use sectors (agriculture, landscape irrigation, industrial/commercial/institutional, and indoor use). The use of reclaimed water in the agriculture, landscape irrigation, and industrial/commercial/industrial sectors already is a relatively common practice in Florida. However, additional opportunities to conserve water through the use of reclaimed water abound in these water use sectors.

Maturity of Reuse Systems

Several of the recommended strategies are designed to encourage efficient use of reclaimed water. As noted earlier in this report, different reclaimed water systems probably will exhibit different degrees of maturity. Newer (immature) systems likely will face challenges in developing their customer bases and will be inclined to promote use of reclaimed water. These new systems will be tempted to avoid metering, volume-based rates, and other efficiency measures in pursuit of more customers, to encourage use of their reclaimed water supplies, and to keep system costs down. Older, more mature systems will be much more inclined to implement metering, volume-based rates, and other efficiency measures in an effort to conserve their resource and to be able to serve additional customers with their limited supplies.

As newer systems mature and start to face demands for reclaimed water that approach available supplies, the utilities probably will reach a point where metering, volume-based rates, and other efficiency measures will become increasingly attractive. As this point is reached, utilities will seriously consider moving toward metering and other efficiency measures. However, if the service has never been metered and if the customers have been led to believe that they will always have an unlimited supply of inexpensive reclaimed water available, these utilities can

expect difficulties in attempting to implement efficiency measures. Several utilities have encountered significant opposition to such transitions and have been unsuccessful in making needed changes. Hence, utilities would be well advised to give full consideration to implementing efficiency measures (like metering and volume-based rates) when they initiate their reclaimed water programs.

Water Supply Availability

The relative availability of water in an area also will influence the urgency of movement toward water reuse and the need for reclaimed water conservation measures. Where water is abundant and populations are relatively small, pressures to implement reuse normally will be low. However, some areas having abundant water resources, may face significant surface water quality constraints, such that wastewater management needs may dictate a move to water reuse. It also must be noted that many areas currently having low populations and abundant water may face future growth that will reshape the area's view of the relative abundance or scarcity of water. Perhaps the best time to plan for water reuse and conservation measures is before crisis conditions are encountered.

LEGISLATION

The strategies developed in this report include several topics that should be considered for legislative action. These include the following:

1. Add a note in Section 403.064, F.S., that encourages utilities to meter reclaimed water use and to use volume-based rates for reclaimed water use (Strategy 1).

2. Provide for viable funding programs with needed appropriations (Strategy 2).

3. Provide for a state-funded research program in association with the funding program (Strategy 2).

4. As part of state funding programs, add provisions for standard grant/loan conditions requiring metering and volume-based rates (Strategy 1).

5. Add emphasis on water reuse, regional water supply planning, and integrated water resources planning in the state's Comprehensive Planning Program (Strategy 5).

6. Require development of integrated state water curricula (Strategy 6).

7. Consider addressing possible consumptive use permitting incentives in Chapter 373, F.S. (Strategy 9).

8. Provide for a training and certification program for irrigation contractors (Strategy 12).

9. In Section 403.064, F.S., encourage reuse activities that feature relatively high potable quality water offsets and/or recharge fractions (Strategy 14).

10. Direct the use of reclaimed water at state facilities (Strategy 15).

11. Provide for reporting of reuse efforts by the state agencies and direct DEP to coordinate these efforts (Strategy 15).

RULEMAKING

The strategies developed in this report include several topics that could be strengthened by rulemaking. These include:

1. Add provisions encouraging metering and volume-based rate structures to Chapters 62-40 and 62-610, F.A.C. (Strategy 1).

2. Establish grant/loan conditions for metering and volume-based rates within state funding programs (Strategy 1).

3. Establish the details of new state funding programs (Strategy 2).

4. In the future, possibly consider review and refinement of ASR rules in Rule 62-610.466, F.A.C. (Strategy 3).

5. Consider providing for longer term DEP permits for reuse programs that are consistent with regional water supply plans (Strategy 5).

6. If supported by legislation, incorporate reuse, regional water supply planning, and integrated water resources planning into DCA's rules governing the state's Comprehensive Planning Program.

7. In the future, possibly consider refining Part V of Chapter 62-610, F.A.C., dealing with indirect potable reuse and ground water recharge.

8. In the water management districts' rules, consider adding consumptive use permitting incentives for implementing water reuse (Strategy 9).

9. If authorized by legislation, provide details of a state training and certification program for irrigation professionals (Strategy 12).

10. Establish irrigation efficiency standards (Strategy 12).

11. Revise Rule 62-610.800(10), F.A.C., to enable redirecting of less desirable reuse systems to reuse activities featuring relatively high potable quality water offsets and/or recharge fractions (Strategy 14).

12. Add notes to Chapter 62-610, F.A.C., encouraging reuse activities that feature relatively high potable quality water offsets and/or recharge fractions (Strategy 14).

13. Strengthen cross-connection control requirements in Rule 62-555.360, F.A.C. (Strategy 16).

14. Refine DEP's pathogen monitoring form to update information related to lab certification and methods (Strategy 16).

15. Continually review rules affecting water programs for consistency and to ensure that current health and environmental data are incorporated. As appropriate and as justified, refine the various water program rules (Strategy 16).

RESEARCH

First, it must be noted that we will never have complete knowledge of every aspect of water quality and management. There will always be issues, concerns, and parameters for which we do not have all of the answers. Obviously, these issues translate into research needs. Such research needs need to be prioritized and undertaken in a logical and timely fashion.

The fact that we will never have complete information can be illustrated by consideration of the so-called EPOC. There are some 87,000 organic compounds that may be of interest (43). Let's assume that the scientific community were to make a concerted and organized effort (totally eliminating duplication of effort) to gather complete information on these 87,000 compounds. Further, let's assume that the scientific community could generate complete information on one compound per month. We would have complete information on these compounds in 7,250 years – and that assumes that the world's chemical industry does not create any new compounds during that period. Perhaps some will regard the assumption of one compound per month as being overly conservative. Assume 10 compounds per month and the timeframe decreases to 725 years.

Second, indirect potable reuse will feature significantly greater research needs than will nonpotable reuse activities.

Third, recognizing that water is water, most research really has direction, focus, and significance beyond just water reuse. In almost all cases, these are "water" issues.

Individual states, like Florida, do not have the resources available to undertake all needed research. In addition, pursuit of significant research by individual states may lead to possible waste of resources due to possible duplication of effort.

States should rely on EPA and the major research funding organizations to conduct needed research in the water reuse and management areas. It is important to note that the major funding entities [National Water Research Institute (NWRI), Water Environment Research Foundation (WERF), American Water Works Association Research Foundation (AWWA/RF), and the WateReuse Foundation] have joined forces to coordinate research targeted at water and water reuse. Related to water reuse, these entities have embarked on a program of funding reuse-

related research using priorities developed by the NWRI in 1999 (44). The top 10 research priorities established by the NWRI were:

1. Microbial risk assessment methodologies as a tool to help establish water reuse criteria.

2. Identify reuse criteria that are both protective of public health and enable maximum flexibility and efficient use of treatment technologies.

3. Understand the pathogen inactivation relationship and performance parameters for various disinfection and treatment processes to develop cost-effective public health protection.

4. Develop a program to quantify, measure, compare, and communicate relative levels of safety of non-potable reuse to the public and policymakers.

5. Develop new or refined water quality standards for chemical constituents (including pharmaceuticals and endocrine disrupters).

6. Establish a rational basis for demonstrating equivalent treatment with alternative processes for pathogen removal/inactivation.

7. Ensure recycled water is microbiologically safe for its intended uses.

8. Maintain water quality in the reclaimed water storage/distribution system.

9. Standardize protocols for field testing of equipment and water recycling practices.

10. Develop new or improved real-time and/or rapid-monitoring strategies to verify treatment and disinfection reliability.

In 2002, the WateReuse Foundation identified research priorities during an interactive session at the 2002 Reuse Research Conference (45). The top 11 research priorities identified at this conference included:

1. Reevaluate the Pomona Virus Study (a study that influenced California's Title 22 reuse regulations).

2. Develop molecular methods for rapid detection of pathogens.

3. Better define what is meant by "public acceptance."

4. Economic analysis of sustainable water use (benefits and costs).

5. Develop a procedure for communicating overall risk to the public – translating science and technology into statements of public safety.

6. Marketing strategies for reclaimed water.

7. Surrogate for organic removals by soil aquifer treatment.

8. Effects of nonpotable reclaimed waters on ground water.

9. Economics of membrane concentrates.

10. Wetland habitat creation using membrane concentrates.

11. Salinity management at the source.

There are important research needs identified in this report. These include:

1. Establish a state research program (Strategy 2).

2. Investigate fate and transport and water quality changes during ASR (Strategy 3).

3. There is an ongoing and continual need for research related to ground water recharge and indirect potable reuse (Strategy 7).

4. Conduct total maximum daily load (TMDL) and/or water quality based effluent limitation (WQBEL) studies to support canal discharge in Southeast Florida (Strategy 10).

5. Implement appropriate pilot studies of reuse technologies in Southeast Florida (Strategy 10).

6. Evaluate reliability and durability of rain sensors and automatic shutoff devices and develop improved technologies (Strategy 12).

7. Develop the key elements for inclusion in a state training and certification program for irrigation contractors (Strategy 12).

8. Evaluate the results of the ongoing WERF pathogen study (Strategy 16).

9. DEP should fund a pathogen study at a water reclamation facility in Central Florida in an effort to supplement the ongoing WERF pathogen study (Strategy 16).

10. DEP should fund a Giardia infectivity study to verify the results of a recent infectivity study completed by the Los Angeles County Sanitation District (Strategy 16).

11. The Southwest Florida Water Management District should fund studies of EPOC in reclaimed water and in other water sources (Strategy 16).

12. As part of the pilot studies associated with the ***Comprehensive Everglades Restoration Plan*** (13), studies of the EPOC should be undertaken (Strategy 16).

TECHNOLOGIES FOR THE FUTURE

Several treatment and disinfection technologies offer significant promise for water reuse in Florida and should be encouraged. A viable funding program, as discussed in Strategy 2, may offer potential to motivate utilities to invest in these promising technologies.

Ultraviolet (UV) Irradiation

UV is an effective disinfection method that does not create toxic disinfection byproducts such as those associated with chlorination. Use of UV also can be used to destroy some toxic materials, such as N-nitrosodimethylamine (NDMA). Further, UV will not contribute to formation of NDMA (as is possible when chlorine is used as the disinfectant). The National Water Research Institute (NWRI) has published guidelines for UV disinfection, which can be used to ensure effective and reliable disinfection. It is recommended that DEP adopt the NWRI guidelines by reference into the disinfection requirements contained in Rule 62-610, F.A.C., when this chapter is next opened for revisions.

Membrane Processes

Membrane Processes (microfiltration, ultrafiltration, nanofiltration, and reverse osmosis) are rapidly growing in popularity in the United States. These techniques offer significant advantages for enhanced pathogen removal, enhanced organics removal, and, for some types of membrane systems, removal of salts and dissolved solids from the reclaimed water. Reverse osmosis also offers promise for control of low molecular weight organics (including many of the pharmaceutically active compounds and personal care products). Double pass reverse osmosis can be used to produce reclaimed water having TDS less than 5 mg/L, which would be suitable for use in high-pressure boilers and in industrial applications that require extremely high quality water (like manufacture of computer chips). The costs of membranes continue to fall, making membrane treatment options much more attractive. In addition, advances in membrane technologies have resulted in increased run times and useful lives for membranes. At the same time, operating pressures for membrane processes continue to be reduced, which also increases their cost effectiveness.

Membrane Bioreactors (MBR)

MBRs feature the use of membranes, which may be submerged directly in the aeration basin to effect solid/liquid separation. Such MBR systems may eliminate the need for a secondary clarifier and filter for many reuse applications. MBRs feature small unit process footprints and high levels of treatment. This type of technology also may offer significant advantages for sewer mining applications.

Sewer mining

Sewer mining offers promise for water reuse in metropolitan areas where potential users of reclaimed water may be located considerable distances from regional wastewater treatment

plants. The use of satellite facilities can be used to provide reclaimed water in the immediate vicinity of potential users of reclaimed water.

LOOKING TO AN "AGE OF ENLIGHTENMENT"

Chapter I in this report presented a vision of water reuse in Florida in 2020 – a vision of a state making widespread use of reclaimed water and appropriate water reclamation technologies. It is a vision of reclaimed water being used efficiently and effectively to conserve potable quality water and to augment available water supplies. It is a vision of full implementation of a "water is water" philosophy founded on widespread public acceptance predicated on general knowledge of water issues. The 16 strategies framed in the report are designed to move Florida toward an "Age of Enlightenment" in water reuse – an age of efficient and effective use of reclaimed water.

If water is life, water conservation and reuse must be our way of life.

Anonymous.

VI. REFERENCES

1. Florida Department of Environmental Protection. Florida Water Plan: Implementing Watershed Management. Tallahassee: Florida Department of Environmental Protection. 2001.

2. Florida Legislature. Environmental Control. Chapter 403, Florida Statutes. Tallahassee: Florida Legislature.

3. Florida Legislature. Water Resources. Chapter 373, Florida Statutes. Tallahassee: Florida Legislature.

4. Florida Department of Environmental Protection. Florida Water Conservation Initiative. Tallahassee: Florida Department of Environmental Protection. 2002.

5. Florida Department of Environmental Protection. Implementing Regional Water Supply Plans: Is Progress Being Made? Annual Status Report on Regional Water Supply Planning and Water Resource Development Work Programs. Tallahassee, FL: Florida Department of Environmental Protection. 2002.

6. Marella, R.L. Water Withdrawals, Use, Discharge, and Trends in Florida, 1995. Water-Resources Investigations Report 99-4002. Tallahassee, FL: USGS. 1999.

7. Florida Department of Environmental Protection. 2001 Reuse Inventory. Tallahassee: Florida Department of Environmental Protection. 2002.

8. Florida Department of Environmental Protection. "Water Resource Implementation Rule." Chapter 62-40, Florida Administrative Code. Tallahassee: Florida Department of Environmental Protection. 1997.

9. Florida Department of Environmental Protection. Florida's Water Supply: Will There be Enough Water in 2020? Tallahassee: Florida Department of Environmental Protection. 2000.

10. Recycled Water Task Force. Water Recycling 2030: Recommendations of California's Recycled Water Task Force. Sacramento: California Department of Water Resources. 2003.

11. York, D.W., and L. Walker-Coleman. "Water Reuse: At the Intersection of Environmental Programs." Proceedings of Water Reuse 2000. AWWA and WEF. San Antonio, TX, Jan. 30 – Feb. 2, 2000.

12. York, D.W., R.B. Linsky, and L. Walker-Coleman. "Water is Water: A Guiding Principle for Water Resource Management." Proceedings of the 2001 Florida Water Resources Conference. AWWA/Florida Section, FWEA, and FW&PCOA. Jacksonville, FL. 2001.

13. U.S. Army Corps of Engineers and South Florida Water Management District. Central and Southern Florida Flood Control Project Comprehensive Review Study. Jacksonville, FL: U.S. Army Corp of Engineers and West Palm Beach, FL: South Florida Water Management District. 1999.

14. St. Johns River Water Management District. District Water Supply Plan. Special Publication SJ2000-SP1. Palatka, FL: St. Johns River Water Management District. 2000.

15. Northwest Florida Water Management District. Regional Water Supply Plan for Santa Rosa, Okaloosa, and Walton Counties. Havana, FL: Northwest Florida Water Management District. 2000.

16. "Global Price Survey." Global Water Report (a Financial Times Newsletter). Issue 81. October 1, 1999.

17. "Study: Cost of Water Rising in Many Countries, Including US." WaterTech.Online. www.watertechonline.com/news.asp?mode=4&N_ID=36237. November 20, 2002.

18. Florida Department of Environmental Protection. "Reuse of Reclaimed Water and Land Application." Chapter 62-610, Florida Administrative Code. Tallahassee: Florida Department of Environmental Protection. 1999.

19. Water Reuse Work Group. Using Reclaimed Water to Conserve Florida's Water Resources. A report to the Florida Department of Environmental Protection as part of the Water Conservation Initiative. 2001.

20. Florida Department of Environmental Regulation. Land Application of Domestic Wastewater Effluent in Florida. Tallahassee: Florida Department of Environmental Regulation. 1983.

21. Florida Department of Environmental Protection. Risk Impact Statement: Phase II Revisions to Chapter 62-610, F.A.C. Tallahassee: Florida Department of Environmental Protection. 1998.

22. Florida Department of Environmental Protection. "Domestic Wastewater Facilities." Chapter 62-600, Florida Administrative Code. Tallahassee: Florida Department of Environmental Protection. 1996.

23. Florida Department of Environmental Protection. "Domestic Wastewater Treatment Plant Monitoring." Chapter 62-601, Florida Administrative Code. Tallahassee: Florida Department of Environmental Protection. 1996.

24. Reuse Coordinating Committee. Reuse Conventions. Tallahassee: Florida Department of Environmental Protection. 1993.

25. Reuse Coordinating Committee. Guidelines for Preparation of Reuse Feasibility Studies for Applicants Having Responsibility for Wastewater Management. Tallahassee: Florida Department of Environmental Protection. 1991.

26. Reuse Coordinating Committee. Guidelines for Preparation of Reuse Feasibility Studies for Consumptive Use Permit Applicants. November 1996.

27. Florida Public Service Commission. White Paper on Reuse Rates. Tallahassee: Florida Public Service Commission. October 31, 2000.

28. Florida Department of Environmental Protection and the Florida Water Environment Association Water Reuse Committee. Code of Good Practices for Water Reuse in Florida. 2000.

29. Southwest Florida Water Management District. Reclaimed Water Guide. Brooksville, FL: Southwest Florida Water Management District. 1999.

30. York, D.W., and E.A. Potts. "The Evolution of Florida's Water Reuse Program." Proceedings of Water Reuse 1996. AWWA and WEF. San Diego, CA. 1996.

31. Ferraro, C., and D.W. York. "Reclaimed Water – A Valuable Florida Resource." Proceedings of the 2001 Florida Water Resources Conference. AWWA/Florida Section, FWEA, and FW&PCOA. Jacksonville, FL. 2001.

32. York, D.W., L. Walker-Coleman, and C. Ferraro. "Florida's Water Reuse Program: Past, Present, and Future Directions." Proceedings of Symposium XVII. WateReuse Association. Orlando, FL. 2002.

33. Southwest Florida Water Management District. Tampa Bay Area Regional Reclaimed Water Initiative. Southwest Florida Water Management District, 2002, Brooksville, Florida.

34. Southwest Florida Water Management District. Average Reclaimed Water Flows for Residential Customers in Pasco, Pinellas, and Hillsborough Counties. Southwest Florida Water Management District, 2002, Brooksville, Florida.

35. Florida Department of Environmental Protection. 1999 Reuse Inventory. Tallahassee: Florida Department of Environmental Protection. 2000.

36. Water Reuse Committee, Florida Water Environment Association. "The 2000 Reuse Round Table: Looking to the Future of Water Reuse in Florida." Florida Water Resources Journal. 52(8):27. August 2000.

37. Walker-Coleman, L., and A. Andrade. “How Much Does it Cost and Who Pays: A Look at Florida’s Reclaimed Water Rates.” Proceedings of the 2001 Florida Water Resources Conference. AWWA/Florida Section, FWEA, and FW&PCOA. Jacksonville, FL. 2001.

38. Andrade, A. “Evolution of Value: A Proactive Approach to Reuse.” Proceedings of the 2001 Florida Water Resources Conference. AWWA/Florida Section, FWEA, and FW&PCOA. Jacksonville, FL. 2001.

39. Jackson, J.A. “Case Studies: Increasing Reclaimed Water Use Efficiency.” Proceedings of the 2001 Florida Water Resources Conference. AWWA/Florida Section, FWEA, and FW&PCOA. Jacksonville, FL. 2001.

40. Southwest Florida Water Management District. FY 2003 Annual Alternative Water Supply Report. Brooksville, FL: Southwest Florida Water Management District. 2002.

41. Jackson, J.A., and A. Andrade. “Conservation of Reclaimed Water 2000." Florida Water Resources Journal. August 2000.

42. Southwest Florida Water Management District. Regional Water Supply Plan. Brooksville, FL: Southwest Florida Water Management District. 2001.

43. McGovern, P. and H.S. McDonald. “Endocrine Disrupters.” Water Environment & Technology. 15(1):35. January 2003.

44. National Water Research Institute. Non-Potable Water Recycling. Report from a workshop, Pomona, CA May 23-25, 1999.

45. “New Frontiers in Water Reuse Research.” WateReuse Foundation Annual Research Conference. Los Angeles, CA. June 3-4, 2002.

46. Castro, A. and M.E. Burton. “Implementation of Reclaimed Water Rates and Metering.” Florida Water Resources Journal. 54(8):35. August 2002.

47. Wright, C.P. Retrofit Programs, Reuse Projects, and Outdoor Water Conservation Efforts. Brooksville, FL: Southwest Florida Water Management District. 2002.

48. EPA and USAID. Guidelines for Water Reuse. Report EPA/625/R-92/004. Washington, DC: EPA & USAID. 1992.

49. Dixon, R. “Listening Between the Lines.” Irrigation Business and Technology. p. 6. October 2002.

50. Mecham, B.Q. “Saving Sensors.” Irrigation Business and Technology. p. 24. July/August 2001.

51. Kolpin, D.W., E.T. Furlong, M.T. Meyer, E.M. Thurman, S.D. Zaugg, L.B. Barber, and H.T. Buxton. "Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants in U.S. Streams, 1999-2000: A National Reconnaissance." Environmental Science & Technology. 36(6):1202. 2002.

52. Barnes, K.K., D.W. Kolpin, M.T. Meyer, E.M. Thurman, E.T. Furlong, S.D. Zaugg, and L.B. Barber. Water-Quality Data for Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants in U.S. Streams, 1999-2000. USGS Open File Report 02-94. Iowa City, IA: USGS. 2002.

53. Rose, J.B., and R.P. Carnahan. Pathogen Removal by Full Scale Wastewater Treatment. A report to the Florida Department of Environmental Protection. Tampa: University of South Florida. 1992.

54. Florida Department of Environmental Protection. "Wetlands Application." Chapter 62-611, Florida Administrative Code. Tallahassee: Florida Department of Environmental Protection. 1996.

55. Florida Department of Environmental Protection. "Ground Water Permitting and Monitoring Requirements." Chapter 62-522, Florida Administrative Code. Tallahassee: Florida Department of Environmental Protection. 2001.

APPENDIX A

ABBREVIATIONS AND ACRONYMS

ASR	Aquifer storage and recovery
AWT	Advanced wastewater treatment
BMP	Best management practices
BNR	Biological nutrient removal
$CBOD_5$	Carbonaceous biochemical oxygen demand (measured at five days)
CERP	Comprehensive Everglades Restoration Plan
DACS	Florida Department of Agriculture and Consumer Services
DCA	Florida Department of Community Affairs
DEP	Florida Department of Environmental Protection
DO	Dissolved oxygen
DOE	Florida Department of Education
DOH	Florida Department of Health
DOT	Florida Department of Transportation
EPA	United States Environmental Protection Agency
EPOC	Emerging pollutants of concern
F.A.C.	Florida Administrative Code
F.S.	Florida Statutes
FWEA	Florida Water Environment Association
FW&PCOA	Florida Water & Pollution Control Operators Association
g	Gram (a metric unit of mass)
gpcd	Gallons per capita (person) per day
L	Liter (a metric unit of volume)

MBR	Membrane bioreactor
mg	Milligrams (1/1,000 of a gram)
MGD	Million gallons per day (a measure of flow)
mg/L	Milligrams per liter (a measure of concentration)
mL	Milliliter (1/1,000 of a liter)
NDMA	N-nitrosodimethylamine
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units (a measure of turbidity)
NWFWMD	Northwest Florida Water Management District
NWRI	National Water Research Institute
PSC	Florida Public Service Commission
RIB	Rapid infiltration basin
RO	Reverse osmosis
SFWMD	South Florida Water Management District
SJRWMD	St. Johns River Water Management District
SRWMD	Suwannee River Water Management District
SWFWMD	Southwest Florida Water Management District
TDS	Total dissolved solids
TMDL	Total maximum daily load
TOC	Total organic carbon
TOX	Total organic halogens
TSS	Total suspended solids
UV	Ultraviolet light

WCI Water Conservation Initiative

WERF Water Environment Research Foundation

WMD Water management district

WQBEL Water quality-based effluent limitation

WWTP Wastewater treatment plant

APPENDIX B

GLOSSARY

Absorption field – A form of rapid-rate land application system; drainfield, including the application/distribution system, intended for the reuse of reclaimed water.

Activated sludge – A biological secondary treatment process commonly used to treat domestic wastewater. A large population of microorganisms (activated sludge) is maintained in suspension in the water being treated and is used to oxidize organic materials in the water. Air is provided to meet the needs of the microorganisms. A clarifier follows the aeration basin to separate the microorganisms from the liquid and some of the activated sludge is returned to the aeration basin.

Advanced wastewater treatment (AWT) – A term generally used to describe any level of wastewater treatment that provides treatment beyond secondary treatment. Florida Statutes define one specific level of advanced wastewater treatment applicable in well-defined geographic areas, which involves treatment to meet 5 mg/L $CBOD_5$, 5 mg/L TSS, 3 mg/L total nitrogen, and 1 mg/L total phosphorus.

Aquifer – A geological formation, group of formations, or part of a formation (stratum) that is capable of yielding potentially usable quantities of water from wells or springs.

Aquifer storage and recovery (ASR) – The use of an underground formation to store water. Water is injected to the subsurface formation during periods when excess water is available; remains in storage; and is subsequently withdrawn to meet increased demands for water.

Backflow prevention device – A device designed to prevent water from flowing backwards from a user's property into the drinking water distribution system.

Back-up water allocation – A permit for use of ground water or surface water that may be issued by a water management district to a user of reclaimed water for use in the event that reclaimed water ceases to be available.

Basic disinfection – A common level of disinfection used in Florida. Generally, this involves meeting an annual average limit of 200 fecal coliforms per 100 mL. This level of disinfection is typically used for surface water discharges and for some types of reuse projects (many RIBs and slow-rate systems featuring restricted public access).

Biological nutrient removal (BNR) – Biological treatment systems designed to remove nitrogen and phosphorus in addition to organic materials. Some of these BNR systems are capable of meeting the advanced wastewater treatment limits (see "advanced wastewater treatment" above) specified in some portions of the Florida Statutes.

Biosolids – A term commonly used in the United States to describe residuals or sludges produced during treatment of domestic wastewater. Florida uses the term "residuals" to refer to these materials.

Capacity – Capacity represents the maximum amount of wastewater that could potentially be treated by a domestic wastewater treatment facility (the plant capacity) or the maximum amount

of reclaimed water that could be distributed and used in a reuse system (reuse capacity). The capacity represents physical constraints imposed by mechanical equipment (like pumps) or by pipes and tanks. Capacity is commonly expressed in terms of millions of gallons per day (MGD).

Carbonaceous biochemical oxygen demand ($CBOD_5$) – The quantity of oxygen utilized in the carbonaceous biochemical oxidation of organic matter present in a water or wastewater, reported as a five-day value determined using approved methods.

Chlorination – The addition of chlorine to water, reclaimed water, or effluent to provide disinfection of that water.

Clarifier – A unit process used in wastewater treatment to separate solids from the liquid stream. Typically, the clarifier is a large basin that allows solids to settle to the bottom by gravity and scum to be collected at the water's surface.

Consumptive use – Use of any water that reduces the supply from which it is withdrawn or diverted.

Consumptive use permit (CUP) – A permit issued by a water management district that grants permission to make a consumptive use of water. Some water management districts refer to these as "water use permits."

Cross-connection – Any physical arrangement whereby a public water supply is connected, directly or indirectly, with any other water supply system, sewer, drain, conduit, pool, storage reservoir, plumbing fixture, or other device which contains or may contain contaminated water, sewage or other waste, or liquid of unknown or unsafe quality which may be capable of imparting contamination to the public water supply as the result of backflow. Cross-connections are specifically prohibited in both Chapters 62-555 and 62-610, F.A.C.

Cross-connection control program – A program designed to detect and prevent cross-connections. These programs commonly rely on dissemination of information to water users and on routine inspections of properties.

Deep well injection – A term that refers to effluent disposal using Class I injection wells. These wells are designed to inject effluent into isolated subsurface formations that contain G-IV ground water having TDS greater than 10,000 mg/L.

Disinfection – The selective destruction of pathogens in reclaimed water, wastewater effluents, and residuals.

Disposal – Effluent disposal involves the wasteful practice of releasing treated effluent back to the environment using ocean outfalls, surface water discharges, and deep injection wells.

Domestic wastewater – Wastewater derived principally from dwellings, business buildings, institutions, and the like; sanitary wastewater; sewage.

Drinking water standards – These are standards, which are contained in Chapter 62-550, F.A.C., define safe drinking water. The standards include both primary standards that are designed to protect human health and secondary standards that are designed to ensure that drinking water is aesthetically pleasing and palatable.

Edible crops – Crops that are intended for human consumption.

Effluent – Water that is not reused after flowing out of any plant or other works used for the purpose of treating, stabilizing, or holding wastes. Effluent is "disposed" of.

Emerging pollutants of concern (EPOC) – A term generally used to refer to endocrine disrupting compounds, pharmaceuticals, personal care products, and other organic materials that may be found in very low concentrations in surface waters and other waters. The EPOC generally originate from human activities and may be found in domestic wastewater, industrial wastewaters, agricultural runoff, stormwater, and other waters.

Fecal coliforms – A class of bacteria commonly used as an indicator of fecal matter in water; members of the coliform group capable of producing gas from lactose at 44.5 degrees C, as determined using approved methods.

Filter – A unit process using a granular media or other material that is designed to remove solids from water. Florida's high-level disinfection requirements mandate the use of a filter before the disinfection process as a means for ensuring effective pathogen control, particularly for viruses and the protozoan pathogens (Giardia and Cryptosporidium).

Filtration – A process for the removal of solids from water. Granular media, fabric, and a wide range of membranes may be used to provide filtration.

Flat rate – A fee structure in which the user pays a set amount regardless of the volume of water used.

Flow – The actual volume of water per unit time treated by a wastewater treatment plant or distributed through a reuse system. Flow is commonly expressed in terms of millions of gallons per day (MGD).

Ground water – Water below the land surface in the zone of saturation where water is at or above atmospheric pressure.

High-level disinfection – A level of disinfection required for many types of reuse activities, particularly for use of reclaimed water to irrigate residential lawns, public access areas, and edible crops. High-level disinfection couples filtration with the disinfection process to ensure effective control of pathogens. The filter must reduce TSS below 5.0 mg/L before the application of the disinfectant. The disinfected reclaimed water must have concentrations of fecal coliforms less than detection in at least 75 percent of all observations with no observation exceeding 25 per 100 mL.

Holding pond – A storage tank or artificial impoundment or pond constructed above, on, below, or partly below the ground surface that is designed and maintained to store a specific volume of reclaimed water.

Indirect potable reuse – The planned discharge of reclaimed water to a Class I surface waters to augment the supply of water available for drinking water and other uses. Indirect potable reuse is contrasted with "direct potable reuse" which involves the discharge of reclaimed water directly into a drinking water treatment facility or into a drinking water distribution system.

Irrigation – The application of water to the soil with the intent of meeting the water needs of crops, turf, or other vegetation.

Land application – The reuse of reclaimed water or the disposal of effluent on, above, or into the surface of the ground through spray irrigation, other irrigation techniques, rapid-rate systems, absorption fields, overland flow systems, or other methods.

Membrane bioreactor (MBR) – A process that couples membranes (typically microfiltration units) for solids separation with a biological secondary treatment process. Some MBRs will immerse the membranes directly in the aeration basin.

Membranes – A film-like material that can be used to separate solids from a liquid stream. Reverse osmosis can remove a portion of the dissolved solids from the water being treated.

Metering – The practice of measuring the volume of water or reclaimed water used.

Microfiltration – A membrane process that relies on the very small size of pores in the film to remove solids and some pathogens.

Milligrams per liter (mg/L) – The quantity of material present in water or wastewater expressed on the basis of the weight (milligrams) per unit volume of solution (liter).

Monitoring well – A strategically located well from which ground water levels are measured and samples are withdrawn for water quality analysis.

Pantone 522C – A lavender color that is used to color code plastic and PVC pipes used to convey reclaimed water.

Part III project – Refers to a reuse project permitted under Part III of Chapter 62-610, F.A.C., and includes the use of reclaimed water for irrigation of residential lawns, public access areas, and edible crops along with a wide range of urban activities.

Pathogen – A disease causing organism. Some bacteria, viruses, helminthes (worms), and protozoa are human pathogens.

Percolation – The generally vertical movement of water through soil or other unconsolidated medium to the water table and to lower aquifers where occurring.

Percolation pond – An artificial impoundment similar to a holding pond for which the design and operation provides for fluid losses through percolation/seepage in addition to evaporative losses.

pH – A measure of the degree to which a substance is acidic or basic. The pH is the negative common logarithm of the hydrogen-ion activity in moles per liter.

Potable quality water – Water that could be consumed as drinking water by humans. This includes treated drinking water provided by public water supply utilities and untreated Class F-I, G-I, and G-II ground water.

Potable quality water offset – The amount of potable quality water (Class F-I, G-I, or G-II ground water or water meeting drinking water standards) saved through the use of reclaimed water expressed as a percentage of the total reclaimed water used. The ***potable quality water offset*** is calculated by dividing the amount of potable water saved by the amount of reclaimed water used and multiplying the quotient by 100.

Preliminary treatment – Wastewater treatment processes located at or near the headworks that are designed to remove grit (sand), rags, large solids, and other debris that may damage other equipment in a domestic wastewater treatment facility. Preliminary treatment may include bar screens, other screens, comminutors, and grit chambers.

Primary treatment – A treatment process involving a clarifier for removal of relatively large solids before the secondary treatment process in a domestic wastewater treatment plant. Some modern treatment facilities will not include primary clarifiers, but will go directly from the preliminary treatment units to the secondary treatment process.

Public access area – An area that is intended to be accessible to the general public; such as golf courses, cemeteries, parks, landscape areas, hotels, motels, and highway medians. Public access areas include private property that is not open to the public at large, but is intended for frequent use by many persons. Public access areas also include residential dwellings. Presence of authorized farm personnel or other authorized treatment plant, utilities system, or reuse system personnel does not constitute public access. Irrigation of exercise areas and other landscape areas accessible to prisoners at penal institutions shall be considered as irrigation of public access areas.

Rain sensor – Devices that automatically shut off automatic irrigation systems when they detect a preset amount of rainfall.

Rapid infiltration basin (RIB) – A rapid-rate land application system permitted under Part IV of Chapter 62-610, F.A.C.; normally consisting of two or more percolation ponds.

Reasonable-beneficial use – The use of water in such quantity as is necessary for economic and efficient utilization for a purpose and in a manner which is both reasonable and consistent with the public interest.

Recharge fraction – The portion of reclaimed water used in a reuse system that recharges an underlying potable quality ground water (Class F-I, G-I, and G-II ground water) that is used for potable supply, or augments a Class I surface water, expressed as a percentage of the total reclaimed water used.

Reclaimed water – Water that has received at least secondary treatment and basic disinfection and is reused after flowing out of a domestic wastewater treatment facility.

Reclaimed water distribution system – A network of pipes, pumping facilities, storage facilities, and appurtenances designed to convey and distribute reclaimed water from one or more domestic wastewater treatment facilities to one or more users of reclaimed water.

Regional water supply planning – Process by which the water management districts develop 20-year water supply plans for defined regions.

Residuals – Means the solid, semisolid, or liquid residue generated during the treatment of domestic wastewater in a domestic wastewater treatment facility. Other terms commonly applied to "residuals" include "sludge" and "biosolids."

Restricted access – Access to the reuse site by the general public is controlled and that access to the reuse site by the public is infrequent. Such sites will be accessible to authorized operators and farm personnel.

Reuse – The deliberate application of reclaimed water for a beneficial purpose. Criteria used to classify projects as "reuse" or "effluent disposal" are contained in Rule 62-610.810, F.A.C.

Reverse Osmosis (RO) – A membrane treatment process capable of removing a portion of dissolved solids from water. Reverse osmosis features excellent removal of pathogens and will removes a portion of the so-called EPOC.

Secondary treatment – Wastewater treatment to a level that will achieve the effluent limitations specified in Rule 62-600.420(1)(a), F.A.C. This generally involves a biological treatment process such as activated sludge for the removal of organic materials. Secondary treatment facilities generally are designed to achieve 90-percent reductions in $CBOD_5$ and TSS and are operated to meet an annual average limit of 20 mg/L of $CBOD_5$ and TSS.

Septic tank – A watertight receptacle constructed to promote separation of solid and liquid components of wastewater, to provide limited digestion of organic matter, to store solids, and to allow clarified liquid to discharge for further treatment and disposal in a soil absorption system.

Sewer mining – The removal of untreated wastewater from sewers; treatment and disinfection of the wastewater at the point of removal to produce reclaimed water; and use of the reclaimed

water for beneficial purposes in the vicinity of withdrawal and treatment; with the return of any excess reclaimed water and residuals (sludges) to the sewer. This type of a treatment facility also may be referred to as a "skimming facility," "scalping facility," or "satellite facility."

Sludge – A somewhat dated term used to describe residuals or biosolids produced during treatment of domestic wastewater. Florida uses the term "residuals" to refer to these materials.

Stormwater – Water that results from a rainfall event.

Stormwater recycling – Capturing stormwater for irrigation or other beneficial uses.

Surface water – Water upon the surface of the earth, whether contained in bounds created naturally or artificially or diffused. Water from natural springs is classified as surface water when it exits from the spring onto the earth's surface.

Total dissolved solids (TDS) – Means the amount of dissolved constituents present in water or wastewater, usually expressed in milligrams per liter and analyzed as filterable residue, as determined using approved methods.

Total organic carbon (TOC) – A measure of the total amount of organic carbon found in a water, usually expressed in milligrams per liter.

Total organic halogens (TOX) – A measure of the total amount of organic materials having one or more halogen (chlorine, bromine, etc.) included in its molecular structure, usually expressed in milligrams per liter.

Total suspended solids (TSS) – Solids that either float on the surface of, or are suspended in, water or wastewater; the quantity of material removed from a sample in a laboratory test referred to as nonfiltrable residue, as determined using approved methods.

Treatment – Any method, technique, or process which changes the physical, chemical, or biological character or composition of wastewater and thereby reduces its potential for polluting waters of the state.

Treatment plant – Any plant or other works used for the purpose of treating, stabilizing, or holding wastes.

Turbidity – A condition in water or wastewater caused by the presence of suspended matter, resulting in the scattering and absorption of light rays, as determined using approved methods.

Total maximum daily loads (TMDL) – The sum of the individual wasteload allocations for point sources and the load allocations for nonpoint sources and natural background. Prior to determining individual wasteload allocations and load allocations, the maximum amount of a pollutant that a water body or water segment can assimilate from all sources without exceeding water quality standards must first be calculated.

Underground injection – Effluent disposal by well injection into underground geologic formations.

User of reclaimed water – An individual, corporation, entity, business, or other establishment that receives reclaimed water from a reclaimed water distribution system.

Utilization Rate – The ratio of the amount of reclaimed water used to the amount of domestic wastewater being treated. This will be expressed as a percentage. This may be used to describe an individual wastewater treatment plant or to describe a collection of treatment facilities (such as those in a county, water management district, or state).

Volume-based rate – A fee structure in which the user pays for water based on the volume used.

Wastewater – The combination of liquid and water-carried pollutants from residences, commercial buildings, industrial plants, and institutions together with any ground water, surface runoff or leachate that may be present.

Wastewater facilities – Any or all of the following: the collection/transmission system, the treatment plant, and the reuse or disposal system.

Water conservation – Preventing and reducing wasteful, uneconomical, impractical, or unreasonable use of water resources.

Water Conservation Initiative (WCI) – A program initiated in 2001 by the DEP, the water management districts, and other state agencies to develop strategies for conserving water in Florida. The WCI features significant consideration of water reuse as a means for conserving and augmenting available water supplies.

Water meter – A device used to measure the amount of water or reclaimed water used.

Water quality-based effluent limitation (WQBEL) – An effluent limitation, which may be more stringent than a technology-based effluent limitation, that has been determined necessary by the DEP to ensure that water quality standards in a receiving body of water will not be violated.

Water quality standards – Standards comprised of designated most beneficial uses (classification of waters), the numerical and narrative criteria applied to the specific water use or classification, the Florida Antidegradation Policy, and the moderating provisions contained in Chapters 62-302 and 62-4, F.A.C.

Water reclamation facility – A domestic wastewater treatment facility that produces reclaimed water for reuse.

Water resource caution area – A geographic area identified by a water management district having existing water resource problems or an area in which water resource problems are projected to develop during the next 20 years.

Water use permit (WUP) – A permit issued by a water management district that grants permission to use water. Some water management districts refer to these as "consumptive use permits."

Wellhead protection area – An area designated by the DEP in Chapter 62-521, F.A.C., consisting of a 500 foot radial setback distance around a potable water well, where ground water is provided the most stringent protection measures to protect the ground water source for a potable water well and includes the surface and subsurface area surrounding the well.

Xeriscape – A type of quality landscaping that conserves water and protects the environment by using site-appropriate plants, an efficient watering system, proper planning and design, soil analyses, practical use of turf, the use of mulches (which may include the use of solid waste compost and residuals), and proper maintenance.

APPENDIX C

STRATEGIES FOR MANAGING RECLAIMED WATER AS A VALUABLE RESOURCE

1. ENCOURAGE METERING AND VOLUME-BASED RATE STRUCTURES

BACKGROUND

Drinking water utilities routinely install meters on pipes carrying drinking water to individual customers' residences or establishments. Meters also can be used on reclaimed water service connections to measure use of reclaimed water by individuals and businesses. Studies done by the Southwest Florida Water Management District (34) conclude that simply providing meters can reduce the use of reclaimed water by residential customers by about 50 percent. Utilities implementing metering will incur increased costs associated with the purchase of the meters and for routine reading of the meters. Of course, these costs may be passed on to the utility's customers as part of their rates for reclaimed water service.

A volume-based rate structure assesses a charge for the water in proportion to the amount of water used. Since customers are billed for the amount of reclaimed water actually used, volume-based rates discourage overuse and waste of this water resource. Metering of reclaimed water use is necessary to implement volume-based reclaimed water rates.

Most reclaimed water utilities in Florida currently charge a flat monthly fee for reclaimed water service. This is due to the fact that many systems began implementing reuse at a time when it was important to have use of reclaimed water be more attractive to the customer than the use of potable water for irrigation, to encourage growth of the customer base. In addition, there was generally a much greater volume of reclaimed water available than the customer base could support and overuse was not discouraged.

As a reuse system with this type of rate structure becomes mature, shortages of reclaimed water become prevalent. The recent drought exacerbated this situation and shortages of reclaimed water became even more prevalent in mature reuse systems. Many systems sought approval for supplemental water supplies from the DEP and the water management districts. Observations made in the Southwest Florida Water Management District indicate that, before efficiency standards were implemented, when a customer switches from potable water to reclaimed water for irrigation, the volume used for irrigation is often as much as four times greater than that observed for potable water. This is due to the cost differential between the two sources, and the fact that there is often no additional cost to the customer for using greater amounts.

The Southwest Florida Water Management District investigated information on 14 reclaimed water systems in the Tampa Bay Area to determine the average amount reclaimed water used by single-family residential irrigation customers. The data reveal that metered single-family residential customers use an average of 534 gallons per day of reclaimed water. The average amount of reclaimed water used by unmetered flat rate single-family residential customers was 980 gallons per day, or almost double the amount of comparable metered customers (34). The data also reveal that amount of potable quality water offset by both the metered and the unmetered was approximately 300 GPD, therefore the metered customers are approximately 56%

efficient (based on potable quality water offset), while the unmetered flat rate customers are only 30% efficient (33). The experience of reuse systems with unmetered flat rate customers is that systems can be severely limited in developing their customer base to its full potential, due to over use of the reclaimed water by flat rate customers.

RECOMMENDED STRATEGY

Metering reclaimed water use and implementing volume-based rate structures are consistent with the philosophy that reclaimed water is a valuable water resource. Therefore, metering and use of volume-based rates should be encouraged as a means for promoting efficient and effective use of reclaimed water.

While rates for reclaimed water service should be less than that of potable water, the rates should not be in the form of a flat monthly fee. The charge for service should be based upon the volume that is used by the customer. If not, there will be a disincentive for the customer to use a reasonable amount of reclaimed water and overuse probably will occur.

Metering is a key element of any rate structure that is based on the volume of water used, and should be more widely implemented. The DEP and the water management districts should implement effective funding programs that include grants or loans for installing meters in existing areas served by reuse systems. This would serve as an incentive to utilities to implement metering and volume-based rate structures.

Grants or loans for new or expanded reuse systems should require meters and volume-based rate structures through the use of standard grant or loan conditions. Conditions are often placed on grants from the SWFWMD for construction of reuse systems. The SWFWMD requires metering, at least at the subdivision level, and encourages metering at the customer level. Additional requirements include reuse education, construction of dual distribution lines in new developments in reclaimed water service areas, and water offsets of not less than 50 percent. Practices like these should be employed by the other WMDs to increase reuse efficiency.

While DEP rules governing reuse are silent on requirements for rate structures and the need for metering, the DEP should consider implementing a system where long-term permits are available to utilities with efficient and effective reuse systems.

Rate structures for investor-owned utilities that implement a reuse system come under the purview of the PSC. At this time, volume-based rate structures for reclaimed water are strongly encouraged, but not required, by the PSC. The PSC should continue to encourage greater implementation of volume-based rate structures.

The WMDs also evaluate rate structures as part of the consumptive use permitting process. Utilities are required to develop a water conservation plan when applying for a permit to withdraw water for use. Therefore, when supplemental supplies are utilized, a consumptive use permit must be obtained from the appropriate WMD. The WMD currently requires conservation measures to be implemented for reuse systems when a supplemental supply is necessary. Incentives for metering and volume-based rate structures could be incorporated into this process.

WMDs should consider long-term permits for consumptive use of supplemental supplies where volume-based rate structures are implemented by the utility.

Utilities that initiate reclaimed water service are encouraged to be cognizant of any commitments that they make to their customers during the early years of their programs, as these commitments may make it difficult to change to metered service with volume-based rates at a future time. Reclaimed water utilities need to be aware that implementation of metered service with volume-based rates initially may serve as the basis for long term success within their programs.

IMPLEMENTATION ROLES

WMDs – Encourage use of metering and volume-based rate structures for reclaimed water utilities. Develop viable funding programs, which could be used to partially fund reclaimed water metering programs. Develop standard grant/loan conditions requiring the use of meters and volume-based rates for projects funded by the WMDs. Consider longer duration permits for utilities implementing reuse efficiency measures (including metering and volume-based rate structures).

DEP – Encourage use of metering and volume-based rate structures for reclaimed water utilities. Develop viable funding programs, which could be used to partially fund reclaimed water metering programs. Develop standard grant/loan conditions requiring the use of meters and volume-based rates for projects funded by DEP. Consider longer duration permits for utilities implementing reuse efficiency measures (including metering and volume-based rate structures).

PSC – Continue to encourage metering and volume-based rates for reclaimed water utilities.

Utilities – Give serious consideration to metering and use of volume-based rates as a means for promoting efficient and effective use of reclaimed water within their service areas. Seasonal rate structures may offer promise for dealing with the need to manage reclaimed water supplies during the wet season. Utilities initiating reuse systems are encouraged to examine future implications of metering and rate structure decisions at the time their system is first implemented.

LEGISLATION NEEDED

Legislation addressing this issue would be desirable. It is suggested that Section 403.064, F.S., be amended to include language encouraging reclaimed water utilities to implement metering and volume-based rates. In addition, statutes establishing funding programs in DEP and the water management districts should require imposition of grant or loan conditions that require use of metering and volume-based rates. The draft bill language contained in Appendix E includes language to accomplish this.

RULEMAKING NEEDED

If the bill language identified above is enacted, rulemaking will be needed by the DEP and the water management districts to implement these provisions.

Revisions to Chapters 62-40 and 62-610, F.A.C., that encourage use of metering and volume-based rates would be desirable. Pending revisions to Chapter 62-40, F.A.C., include encouragement of metering and use of volume-based rates for reclaimed water service.

RESEARCH NEEDS

None.

SUCCESS STORIES

Utilities in the Tampa Bay Area – A number of utilities in the SWFWMD have begun to implement a system whereby metering is utilized and rate structures are based on the volume of reclaimed water used by the customer.

Orange County – This county, which previously relied on unmetered reclaimed water service with flat rates, recently transitioned to the use of volume-based rates (46).

Loxahatchee – The Loxahatchee River Environmental Control District relies heavily upon metering and remote telemetry to maximize the effectiveness of their reuse system.

Palm Valley – In 2000, Palm Valley began providing reclaimed water to 147 existing residential customers for irrigation purposes, with plans to expand to an additional 148 projected customers. This reclaimed water service was being provided at no charge to the customers. In Order No. PSC-02-1111-PAA-WS, issued August 13, 2002, the PSC approved a residential reuse rate of $1.15 per 1,000 gallons. This rate is 50 percent of the utility's potable water rate of $2.30 per 1,000 gallons. The PSC ordered the utility to install reclaimed water meters and begin billing the customers on a volume-based rate no later than August 2003.

2. IMPLEMENT VIABLE FUNDING PROGRAMS

BACKGROUND

Funding programs can serve to actively encourage and promote water reuse. The remarkably successful funding program administered by the Southwest Florida Water Management District has demonstrated that providing initial financial assistance can be the difference in whether or not a utility implements a reuse project or program. At the local utility level, even a relatively small funding source can turn the tide in favor of a reuse project.

RECOMMENDED STRATEGY

Viable funding programs are needed in all five water management districts. This will result in additional reuse efforts, with increased recharge of available water resources and increased conservation of potable quality water. In addition, funding programs offer opportunities to impose grant or loan conditions that will encourage efficient and effective use of reclaimed water. Assistance need not be limited to conventional grants or loans. Low interest, zero interest, or even negative interest loans may be appropriate.

The Southwest Florida Water Management District already has implemented a successful grant program that has resulted in significant reuse activity within this water management district. Section 373.1961, F.S., requires other water management districts that have designated Water Resource Caution Areas to implement funding programs for reuse projects and for other alternative water sources projects. Other water management districts with projected water supply shortages should consider implementing funding programs similar in scope and scale to the existing program in the Southwest Florida Water Management District.

The funding program operated by the Southwest Florida Water Management District provides an opportunity to encourage a number of concepts related to reclaimed water efficiency and effectiveness. Grant conditions are used to ensure that the funding recipient implements a project having potable quality water offsets of at least 50 percent, adopts an ordinance requiring construction of dual distribution systems in new developments, guarantees that at least 50 percent of residents in areas served will connect, meters reclaimed water use, and institutes a customer education program.

The Northwest Florida Water Management District has designated water resource caution areas. However, this water management district faces significant financial limitations, which preclude full funding of such a program using normal water management district funding sources. Hence, supplemental state funding may be needed. This could be either a state appropriation directly to the Northwest Florida Water Management District for this purpose, or the development of a "set aside" within a state grant program. The funding programs should be directed at projects that will involve efficient and effective use of reclaimed water. Grant conditions designed to ensure efficient and effective reuse should be implemented. Standard grant/loan conditions requiring metering and volume-based rates (see Strategy 1) should be utilized.

The Suwannee River Water Management District has not designated water resource caution areas. As a result, a funding program in this district probably is not warranted.

In addition, the state funding program should include provisions for a small research funding program designed to support the state's reuse program. An annual funding level of $150,000 is suggested. This would enable study of various issues related to water reuse that will continue to arise.

An effective funding program of grants or loans, with adequate resources, could have multiple benefits: more reuse of reclaimed water, more recharge, and more supplies of water to meet growing demand. Such a program could be tailored to meet the diverse needs of different parts of the state. In general, a loan program may be more acceptable politically than a grant program.

The major obstacle that must be overcome, if this strategy is to be effectively implemented involves development of a viable funding source. Appropriation of General Revenue funds may be difficult to secure. Hence, Florida must be creative in looking for viable funding sources. Perhaps one of the most promising options that should be explored is some form of an Alternative Water Supply Fee. This could take the form of a fee on water use that would be identified for use in funding water reuse and alternative water supply projects. Consideration could be given to a two tiered fee structure – a higher fee imposed on utilities that have not implemented reuse and a lower (possibly zero) fee on utilities that have already implemented reuse. Another promising option would be a fee placed on volumes of wastewater that is disposed of. Other options could include use of Florida Forever Funds, funds from the state lottery, development of a water conservation and reuse license tag, a fee levied on landscaped acreage, and other possible sources.

Establishment of viable funding programs would be a major incentive for encouraging and promoting water reuse. In addition, viable funding programs at the state level and within the water management districts could be structured to encourage efficient and effective use of reclaimed water.

Federal funding associated with the Comprehensive Everglades Restoration Project may offer some promise for development of one or more of the large-scale reuse projects identified in this program.

IMPLEMENTATION ROLES

State Legislature – Provide authorizing legislation and needed appropriations for a funding program (to include a small research program).

DEP – Implement a state grant or loan program for water reuse projects within the Bureau of Water Facilities Funding. Rulemaking will be needed. Implement a reuse research program within the Bureau of Water Facilities Regulation.

WMDs – Implement expanded funding programs in the SFWMD, SJRWMD, and NWFWMD. Continue the excellent and effective funding program in the Southwest Florida Water Management District.

LEGISLATION NEEDED

State legislation and appropriations will be needed to fund a viable state grant program and a small research program.

RULEMAKING NEEDED

Rulemaking will be needed by the WMDs and by DEP to implement the funding programs.

RESEARCH NEEDS

A small research component will be useful in addressing key issues that will occasionally arise within the water reuse program.

SUCCESS STORIES

DEP – The DEP has managed grant and revolving loan programs that have been remarkably successful in funding needed wastewater management and reuse facilities. The original construction grants program provided grants totaling over $2 billion, which funded construction of over $3.1 billion of wastewater facilities. More recently, the state revolving loan fund has provided low-interest rate loans totaling over $1.1 billion for wastewater facilities. Both programs have been used to fund worthy reuse projects and facilities.

SWFWMD – The Southwest Florida Water Management District has implemented a very successful funding program for reuse and other alternative water supply projects. Through 2002, this district had budgeted grants totaling about $182 million, which contributed to the development of about 189 MGD of reuse capacity and construction of about 816 miles of reclaimed water pipes and storage facilities totaling 464 MG (47). This program should serve as a model for similar programs in other water management districts.

SFWMD – The South Florida Water Management District (SFWMD) has had a successful alternative water supply funding program for over a decade. The SFWMD has provided over $26 million in alternative water supply grants for 113 projects since 1995, including water reuse projects, use of brackish water sources, and aquifer storage and recovery. These projects have resulted in over 250 MGD of water being made available. In addition, the SFWMD has committed $100 million a year towards implementation of the Comprehensive Everglades Restoration Plan (CERP). Implementation of the CERP is projected to take over 30 years.

3. FACILITATE SEASONAL RECLAIMED WATER STORAGE (INCLUDING ASR)

BACKGROUND

A major issue faced by most reuse utilities involves the need to match demands for reclaimed water with available supplies of reclaimed water. This includes both daily considerations and long-term or seasonal considerations. Seasonal issues are key, because landscape irrigation and agricultural irrigation involve significant seasonal fluctuations in the need for water. To effectively meet peak seasonal demands, large volumes of storage typically will be needed. The development of storage techniques and an institutional framework that facilitates economical provision of seasonal storage will enable better utilization of reclaimed water. Better utilization of reclaimed water translates into greater conservation of potable quality water that alternatively would have been used for irrigation.

There are three primary means for storing reclaimed water: (1) covered storage tanks, (2) storage in open lakes or ponds, and (3) storage in underground, geologic formations. Covered tanks are frequently used to store reclaimed water. While storage tanks maintain the quality of the reclaimed water, they are expensive, and the expense generally makes them unattractive for long-term storage needs. Storage lakes and ponds generally are less expensive than tanks, but large land areas are needed to meet seasonal storage needs. In addition, growth of algae in the ponds may offer challenges to the operation of reclaimed water systems. In some cases, additional treatment and disinfection may be needed following storage in lakes or ponds. Numerous drinking water utilities store treated drinking water in subsurface formations using a technique known as aquifer storage and recovery (ASR). Of course, ASR also can be used to store reclaimed water.

RECOMMENDED STRATEGY

One of the most promising technologies for provision of seasonal storage is ASR. This alternative involves the use of an underground formation to store reclaimed water during low demand periods with subsequent recovery of the stored water to meet high demands for water.

The regulatory agencies need to be active in enabling use of reclaimed water. ASR projects, for example, should be monitored and possible refinements to state rules should be identified and adopted.

DEP should continue to be proactive when considering storage options for possible reuse projects. DEP should develop standardized approaches for permitting of ASR systems – perhaps through publication of a detailed program guidance memorandum. This would enable consistent permitting among the DEP district offices.

The primary impediments to implementing reclaimed water ASR projects are economic considerations and difficulties faced in moving a relatively new technology through the permitting process. Effective funding programs will be of assistance.

In the past, the key impediment to the use of ASR for reclaimed water has been the lack of state rules dealing with ASR. That changed in 1999 with the addition of Rule 62-610.466, F.A.C., which regulates ASR for reclaimed water. While that rule probably is not perfect, it represents an important first step toward facilitating the use of ASR for reclaimed water.

Several pioneering reclaimed water ASR projects are being developed and are working their way through DEP's permitting process. Information gained from these initial ASR projects will expand our knowledge of ASR technologies. As our knowledge expands, refinements to DEP's rules for reclaimed water ASR may be desirable. Future rulemaking aimed at refining the reclaimed water ASR rules possibly could consider provisions enabling implementation of reclaimed water ASR "wellfields" (collections of multiple ASR wells) and the possible use of portions of a ground water system for conveyance of high-quality reclaimed water from the point of injection to the point of withdrawal. Of course any refinements would have to be done in concert with DEP's Underground Injection Program.

As a result of the discussion of ASR using surface waters during the 2001 Legislative Session, a number of misconceptions and negative images have been formed related to ASR in general. Effective education and outreach will be needed to promote public acceptance of reclaimed water ASR.

The use of lakes for seasonal storage as part of a stormwater management system (like many lakes on golf courses) pose concerns for possible discharges to surface waters. Such surface water discharges must be permitted under the federal National Pollutant Discharge Elimination System (NPDES). Florida has implemented a process for permitting the use of lakes that discharge intermittently to waters of the state in Rule 62-610.830, F.A.C. The approach contained in this rule meets the NPDES requirements, is acceptable to EPA, imposes minimal requirements on the reuse utility, and probably represents an optimal approach for dealing with this issue.

Chapter 62-610, F.A.C., provides for the use of lakes that are part of the stormwater management system to store reclaimed water. This requires interaction with the state stormwater program. The DEP and the water management districts are encouraged to continue to work together to facilitate and streamline this permitting arrangement.

IMPLEMENTATION ROLES

WMDs – Implement effective funding programs. Work with DEP on projects involving the use of lakes that are part of the stormwater management system to store reclaimed water.

DEP – Implement effective funding programs. Be proactive and encourage ASR and other storage solutions. Develop standardized approaches for the permitting of reclaimed water ASR projects, perhaps through publication of a detailed program guidance memorandum.

Utilities – Actual implementation of storage systems is the responsibility of the utilities. Provision of sufficient seasonal storage to enable full utilization of reclaimed water supplies is encouraged. Fully consider use of ASR for meeting seasonal storage requirements.

LEGISLATION NEEDED

None.

RULEMAKING NEEDED

Currently, no rulemaking is needed. The DEP should periodically review and evaluate existing rules governing reclaimed water ASR. If rule refinements are merited after implementation and operation of several reclaimed water ASR projects, appropriate rule making should be pursued.

RESEARCH NEEDS

While current rules governing reclaimed water are protective of public health and environmental quality, additional research would be desirable. Additional information about the fate and transport of microbiological and chemical constituents in the subsurface should be obtained. Some of this information will be generated by reclaimed water ASR projects that currently are moving through the DEP permitting process. The proposed state research program discussed under Strategy 2 would find potential application in studies of reclaimed water ASR.

SUCCESS STORIES

Manatee County – Successfully uses large storage lakes. A degree of filtration and chlorination is provided for water pumped out of the storage reservoirs. The county also plans to implement ASR as a cornerstone of their large-scale agricultural reuse program.

Loxahatchee River Environmental Control District – Successfully uses a large storage lake.

Hillsborough County – The County has implemented the state's first reclaimed water ASR system at their northwest facility. Initial cycle testing with reclaimed water began in July 2001.

Other Reclaimed Water ASR Systems – Other reclaimed water ASR systems are currently moving through the DEP permitting process. These include projects in Sarasota County, Manatee County, St. Petersburg, Collier County, and the Englewood Water District. In 2002, the Englewood Water District became the second utility to initiate cycle testing of a reclaimed water ASR system.

Pompano Beach – This reuse system features two aesthetically pleasing reclaimed water storage tanks located in the heart of a metropolitan area.

4. ENCOURAGE USE OF RECLAIMED WATER IN LIEU OF OTHER WATER SOURCES IN THE AGRICULTURAL IRRIGATION, LANDSCAPE IRRIGATION, INDUSTRIAL/INSTITUTIONAL/COMMERCIAL, AND INDOOR WATER USE SECTORS

BACKGROUND

Potable quality water (treated drinking water or potable ground water) is not needed for many industrial, commercial, and institutional activities. Potable quality water also is not needed for toilet flushing, fire protection, or for use in decorative water features. Similarly, potable quality water is not needed for agricultural or landscape irrigation. For all of these activities, substitution of high-quality reclaimed water offers significant opportunities to conserve potable quality water.

Sections 373.250 and 403.064, F.S., established the encouragement and promotion of water reuse as state objectives. These sections also conclude that the use of reclaimed water in concert with DEP rules will protect public health and environmental quality.

Florida has implemented a comprehensive and very successful water reuse program designed to accomplish the state's reuse objectives. The details of the reuse program are contained in the 1993 ***Reuse Conventions*** (24). The EPA has recognized Florida's reuse program for excellence in 1993, 1996, and 1999.

Chapter 62-610, F.A.C., contains detailed rules governing a wide range of reuse activities (18). Florida's reuse rules are among the world's most comprehensive regulations governing water reuse. Recognizing the quality of these reuse rules, Florida's rules figured prominently in the development of EPA's ***Guidelines for Water Reuse*** (48).

Florida is recognized as a national leader in the water reuse arena. In 2001, reuse capacity in Florida totaled over 1.1 billion gallons per day (7) – about 52 percent of the state's total domestic wastewater treatment plant capacity! About 584 million gallons per day (MGD) of reclaimed water was used for beneficial purposes. Florida's use of reclaimed water is summarized below:

Reuse Type	% of Reclaimed Water Used
Landscape Irrigation	44%
Agricultural Irrigation	19%
Ground Water Recharge	16%
Industrial Activities	15%
Wetlands and Other Activities	6%
Total	100%

IMPLEMENTATION STRATEGY

Chapter 62-40, F.A.C., currently requires the use of reclaimed water in lieu of other water sources within Water Resource Caution Areas designated by the water management districts (8). Four water management districts (Northwest, St. Johns River, South Florida, and Southwest) have designated Water Resource Caution Areas (see Figure 1).

There are few impediments to these types of reuse activities. Detailed rules address these types of reuse activities. Part III of Chapter 62-610, F.A.C., addresses landscape irrigation and numerous other reuse activities. Part VII of Chapter 62-610, F.A.C., establishes the framework for dealing with industrial uses (18). Part VII addresses water quality issues related to the handling of the resulting industrial wastewater (water flowing out of an industrial process). A number of commercial and institutional uses of reclaimed water are specifically addressed in Part III of Chapter 62-610, F.A.C. Rule 62-610.476, F.A.C., addresses toilet flushing and fire protection, while Rule 62-610.479, F.A.C., deals with aesthetic uses of reclaimed water (18). Reflecting concerns for cross-connection control, DEP rules do not allow for the use of reclaimed water for toilet flushing in single-family residential units.

The DEP routinely processes permits for reuse systems. The water management districts also are accustomed to dealing with the use of reclaimed water. Given the extent of reuse activity in Florida, it is obvious that water reuse is acceptable and appropriate.

The water management districts offer longer duration water use permits for the use of reclaimed water. Using reclaimed water provides greater protection against water restrictions during times of drought. Nutrients contained in reclaimed water offer advantages to individuals and entities using water for irrigation.

The mandate to use reclaimed water within Water Resource Caution Areas already exists within Chapter 62-40, F.A.C. (8).

Obviously, there are costs involved in water reuse. The utility incurs costs of additional treatment and disinfection and costs associated with the distribution of reclaimed water. Water users may experience costs in changing from the use of other water sources to the use of reclaimed water. As a result, implementation of viable funding programs, as outlined in Strategy 2, can play a significant role in encouraging use of reclaimed water.

It may be desirable to update the ***Reclaimed Water Guide*** (29), which was published in 1999 to be a more comprehensive guidance manual for reuse system design and operation.

Educational materials are needed that target specific classes of potential reclaimed water users (like agriculture, the food industry, and various industrial classes). Educational and promotional materials for the public, utilities, and local and state politicians would be useful (see Strategy 6).

The water management districts need to continue to stress the need for use of the lowest acceptable quality water for intended uses.

Use of reclaimed water should be tied more directly to local and regional planning and approvals for development. This would include linkages through the Comprehensive Planning Program.

Continuing coordination between permitting staffs at the water management districts, the DEP, and the PSC help put potential users of reclaimed water in contact with suppliers of reclaimed water. This could lead to the establishment of "reuse zones" – areas within water resource caution areas where reclaimed water was readily available and was strongly encouraged and required. Such designations at the local level should be encouraged.

Within Phase II of the Water Conservation Initiative, the work groups related to the various water use categories need to stress the basic objective of this strategy – ***use reclaimed water in lieu of other water sources***.

IMPLEMENTATION ROLES

DEP – Provide leadership in the area of water reuse. Continue to require reuse feasibility studies for domestic wastewater treatment facilities and encourage implementation of reuse programs. Implement a reuse funding program (see Strategy 2).

WMDs – Continue to implement the mandatory reclaimed water use provisions of Chapter 62-40, F.A.C. Implement funding programs for water reuse. Fully implement the provisions of the ***Reuse Conventions*** (24).

WCI Work Groups – The encouragement of use of reclaimed water in lieu of other water sources needs to be emphasized in the strategies of the Water Conservation Initiative's work groups related to specific water use categories.

Utilities – Continue the move toward water reuse. Provide the treatment, disinfection, and operational control facilities needed and work with prospective users to enable wise and responsible use of reclaimed water. Implement quality cross-connection control, inspection, and public notification and education programs. Follow the ***Code of Good Practices for Water Reuse*** (28). Develop partnerships with reclaimed water customers, the water management district, and the DEP. Consider designation of "reuse zones."

Water Users – Recognize the water conservation advantages of reuse and be receptive to possible use of reclaimed water. Use reclaimed water in a wise and responsible manner. Develop a partnership with the reclaimed water utility.

LEGISLATION NEEDED

None.

RULEMAKING NEEDED

None.

RESEARCH NEEDS

No significant research needs.

The American Water Works Association's Research Foundation is wrapping up a study that will better define the water quality needs of a range of industrial users.

SUCCESS STORIES

Landscape Irrigation – In 2001, 378 treatment facilities made reclaimed water available for landscape irrigation (7). A total of 254 MGD of reclaimed water was used to irrigate landscaped areas – 110 MGD to irrigate 419 golf courses, 97 MGD to irrigate 122,382 residential properties, and 47 MGD to irrigate other landscaped areas (including 405 parks, 188 schools, and other areas).

> **St. Petersburg** – This city has used reclaimed water to irrigate over 9,500 residential lawns, 6 golf courses, 86 parks, 55 schools, college campuses, a baseball stadium, and other landscaped areas since 1977. Reclaimed water also is used for cooling water at the Tropicana Dome, at a hospital, and at other sites.
>
> **Altamonte Springs** – This reuse system focuses on landscape irrigation. Hose bibbs are featured for irrigation of over 6,000 residential lawns.
>
> **Cape Coral** – This is the world's largest residential irrigation system. Over 27,000 residential properties have reclaimed water service.

Agricultural Irrigation – In 2001, a total of 127 wastewater treatment facilities made reclaimed water available for irrigation of agricultural land (7). A total of 34 MGD was used to irrigate edible crops and an additional 76 MGD was used to irrigate feed, fodder, and pasture crops. While citrus accounts for the majority of edible crops irrigated, a number of other edible crops (including tomatoes, cabbage, peppers, watermelon, corn, eggplant, strawberries, peas, beans, herbs, squash, and cucumbers) also are irrigated with reclaimed water.

> **Water Conserv II –** This is one of the most highly acclaimed reuse projects in the world. Reclaimed water is used to irrigate extensive citrus groves, nurseries, and the Orange County National Golf Center. The project was initiated in the mid 1980s and also features a research foundation, which was formed to study agricultural reuse.
>
> **Manatee County –** Manatee County operates a large and diverse reuse system. It includes irrigation of citrus, row crops, and the world's second largest gladiola farm. Manatee County plans to expand their system into one of the world's largest agricultural reuse systems.
>
> **Tallahassee –** Tallahassee's award-winning reuse system uses about 17 MGD of reclaimed water to irrigate about 2,000 acres of feed and fodder crops. During portions of the year,

cattle also graze on the site. This is a contract farming operation featuring large center pivot irrigation rigs.

Commercial & Institutional – Reclaimed water can be used for a wide range of commercial and institutional activities. Reclaimed water can be and has been used in Florida to flush sewers, to clean streets and sidewalks, to mix pesticides, and to wash vehicles. Reclaimed water is used to wash animals in a zoo. A fire training center uses reclaimed water. Reclaimed water can be used for toilet flushing, for fire protection in hydrants and sprinkler systems, and for control of dust at construction sites. A number of municipalities have used reclaimed water to create, enhance, or restore wetlands. Reclaimed water is routinely used in decorative water features. Of course, reclaimed water is routinely used to irrigate turf and other landscaped areas at commercial, industrial, and institutional (cemeteries, parks, schools, colleges, prisons, and others) facilities.

Vehicle Washing – Altamonte Springs provides reclaimed water for use in a commercial car wash. Reclaimed water is used to wash tour buses at the Disney complex.

Correctional Facilities – The Florida Department of Corrections uses reclaimed water for flushing toilets and in laundry facilities in correctional institutions.

Nurseries – Reclaimed water is also used in many nurseries in Central Florida, and is ideal for this use. The City of Apopka, well known for its indoor foliage nurseries (the city is known as the "Indoor Foliage Capital of the World"), serves several wholesale and retail nurseries and ferneries with reclaimed water. Nelson & Sons rose nursery in Apopka has been using reclaimed water for over a decade with much success.

Decorative Water Features – The Kanapaha Botanical Gardens in Gainesville uses reclaimed water in the prominent water features in the gardens. A number of reuse systems feature decorative lagoons and fountains that use reclaimed water.

Disney Attractions – Reedy Creek Utilities provides reclaimed water for irrigation of golf courses, major resorts, plant nurseries, and the Wide World of Sports – all within the Disney Complex.

Industrial Uses – In 2001, a total of 91 domestic wastewater treatment facilities in Florida provided reclaimed water for a range of industrial uses (7). About 90 MGD was used for industrial activities. Reclaimed water is used to mix concrete and to make soil cement in Florida. Reclaimed water is also used in Florida's mining industry.

California makes extensive use of reclaimed water in a wide range of industrial processes, including carpet dying, paper making (including high-quality white papers), refineries, and others. Very high quality reclaimed water has been used for boiler feed water. A reclaimed water utility in the Los Angeles area provides extremely high-quality reclaimed water (they employ double pass reverse osmosis treatment to produce reclaimed water having TDS of less than 5 mg/L) for use in high-pressure boilers. A steel mill in the Baltimore area has used reclaimed water for several decades.

Power Plants – Power plants in Orange County, Vero Beach, Lakeland, and St. Marks use reclaimed water for cooling water. The municipal facility in Vero Beach has used reclaimed water for over 20 years.

Refuse to Energy Facilities – Refuse to energy facilities in Tampa, Pasco County, Pinellas County, and Hillsborough County use reclaimed water as cooling water. Low-pressure reverse osmosis (RO) is used to produce a high-quality reclaimed water suitable for use as boiler-feed water at the Pinellas County facility.

Indoor Uses – Reclaimed water can be used for several indoor activities, including the flushing of toilets, fire protection in sprinkler systems, and in decorative water features (such as those in shopping malls).

Toilet Flushing – Toilet flushing is a particularly attractive use of reclaimed water. Clearly, drinking water is not needed to flush toilets. In addition, toilet flushing accounts for a significant percentage of water use. From the viewpoint of a reclaimed water utility, a major advantage of using reclaimed water for toilet flushing is that it is a relatively constant water use over an annual cycle. This means that use for toilet flushing probably will not involve the large seasonal storage requirements typically encountered with agricultural or landscape irrigation activities. A number of correctional institutions in Florida use reclaimed water to flush toilet and a number of treatment facilities use reclaimed water for flushing toilets at the treatment plants. The Grand Canyon Village in Arizona has used reclaimed water for toilet flushing since the early 1900s. Irvine Ranch Water District in Southern California retrofitted a modern, upscale, high-rise office complex to use reclaimed water for toilet flushing. Marin County, CA uses reclaimed water to flush toilets.

Fire Protection – Reclaimed water is used for fire protection in St. Petersburg, Altamonte Springs, and other locations. In most cases, reclaimed water serves as a secondary fire protection service. Sydney, Australia is implementing a major reuse program that will feature reclaimed water as the city's primary fire protection service.

5. LINK REUSE TO REGIONAL WATER SUPPLY PLANNING (INCLUDING INTEGRATED RESOURCE PLANNING)

BACKGROUND

State policy encourages reuse of reclaimed water in regional water supply planning. All four water management districts that have prepared regional water supply plans have included water reuse as important components of their plans.

Several utilities in Florida have pursued development of integrated water resource plans and programs. These integrated resource plans involve management and use of reclaimed water, stormwater, and other available water supplies to meet local and regional needs. Such planning recognizes the utility of viewing all waters as potentially valuable water supplies. Integrated water resource planning embodies the basic principles of a "water is water" philosophy.

RECOMMENDED STRATEGY

Reclaimed water reuse and water use efficiency should be integral parts of regional water supply planning efforts. The WMDs and DEP already encourage reuse to be considered in regional water supply planning and this practice should continue and be intensified.

Funding for reuse projects and system improvements should be targeted at projects that are developed as part of a regional water supply planning effort. The water management districts and the DEP should place a high priority on projects that are an integral part of a water supply planning effort.

In addition, long-term DEP permits could also be made available to utilities that implement reuse projects linked with regional water supply planning. Utilities with reuse systems whose projects are described in regional water supply plans as effective and necessary for meeting future water demand could be eligible for long-term DEP permits.

Regional water supply planning should identify locations and specific projects where reuse activities can have a positive impact on reduction of water demand and augmentation of the potable water resource. Implementing projects that assist in meeting future water demands and reducing future impacts on potable water resources can result in maximum water conservation benefits. Because water reuse activities can have such an impact on future availability of water resources, it is vital that they be considered as an integral part of regional water supply planning.

Effective reuse projects that can have a positive impact on future water supplies may be relatively expensive. Viable funding programs (see Strategy 2) can play significant roles in encouraging these types of reuse and water resource management projects.

Use of reclaimed water should be tied more directly to local and regional planning and approvals for development. This could include linkages through the Comprehensive Planning Program.

Mandates are not necessary at this time.

IMPLEMENTATION ROLES

DEP – Implement effective funding programs targeted at reuse projects that are linked to regional water supply planning. Consider long-term permits for utilities that have effective reuse programs that are reflected in regional water supply plans. Be supportive of integrated water resources projects.

WMDs – Emphasize reclaimed water reuse as a key part of regional water supply planning. Implement effective funding programs targeted at reuse projects that are linked to regional water supply planning. Be supportive of integrated water resources projects.

DCA – Become more proactive in dealing with water reuse as an important component of comprehensive plans. Consider possible increased emphasis on water reuse and integrated water resource projects within the Comprehensive Planning Program.

Utilities – In developing local water resource management strategies, utilities are encouraged to ensure consistency and compatibility with regional water supply plans developed by the water management districts. Utilities also are urged to implement a "water is water" philosophy and to fully evaluate integrated resource management strategies.

LEGISLATION NEEDED

Legislation designed to provide greater emphasis on water reuse and integrated water resource projects in the Comprehensive Planning Program may merit consideration.

RULEMAKING NEEDED

The DEP may want to evaluate the potential desirability of allowing longer-term permits for reuse projects that are consistent with regional water supply plans. Particularly if statutory revisions are made, the DCA may want to evaluate the need for rulemaking designed to better incorporate water reuse and integrated water resource projects into their rules governing the Comprehensive Planning Program.

RESEARCH NEEDS

None.

SUCCESS STORIES

WMDs – Four of the state's five water management districts have developed regional water supply plans and all four plans place emphasis on water reuse and the use of reclaimed water.

West Palm Beach – This city has developed and implemented an integrated water resources plan that incorporates a wetlands-based water reclamation indirect potable reuse project, stormwater recycling via their Renaissance Project, aquifer storage and recovery of drinking water, and reservoirs to minimize their dependence on the Lake Okeechobee-Everglades regional water conveyance system.

Comprehensive Everglades Restoration Plan (CERP) – This is a major integrated water resource management plan that integrates a multitude of strategies to meet the water needs of South Florida. The plan includes surface water aquifer storage and recovery, water reuse, surface water reservoirs to capture storm water, seepage management, and operational changes.

Port Orange – Has implemented an integrated water resource management plan that makes use of reclaimed water and treated stormwater.

Indian River County – This county also has implemented an integrated water resource management program.

Orange County – This county is developing an integrated water resource program.

Regional Reclaimed Water Planning in the Tampa Bay Area – The Southwest Florida Water Management District, in association with local utilities, has developed a plan to maximize the use of reclaimed water in the Tampa Bay Area (33). In addition to traditional reuse activities, this activity focuses largely on making better use of reclaimed water during wet weather periods. Regional reclaimed water systems will be interconnected, emphasis will be placed on wet-weather storage (including ASR), natural system restoration, and reuse activities that are relatively immune from the influence of weather (like industrial uses) will be encouraged.

Sarasota County – This county has implemented an integrated water resource program.

Cocoa – This city also has implemented an integrated water resource program.

6. DEVELOP INTEGRATED WATER EDUCATION PROGRAMS

BACKGROUND

This strategy relates to overall water management. It involves a long-term strategy to educate the public, water professionals, utilities, politicians, and news media about water resources, conservation, reuse, and management. We need to instill an appreciation for and an understanding of a "water is water" philosophy of water management. In addition, we need to do a much better job of communicating relative risk concepts to the public.

RECOMMENDED STRATEGY

The regulatory agencies (DEP, water management districts, PSC, Department of Health, and others) have a range of public education activities. When dealing with water issues, these agencies need to coordinate their efforts to maximize effectiveness. Partnerships also should be formed with professional organizations like the Florida Water Environment Association, Florida Section of the American Water Works Association, the WateReuse Association, the Florida Department of Education, and the State University System.

Education activities should include the following concepts:

1. The fundamental nature of water, its origins, availability, and fate in the hydrologic cycle.

2. The intrinsic value of high-quality water supplies.

3. Wastewater management concepts – including water reclamation and reuse.

4. Recognition of the fact that water supplies are finite. This must include clear recognition of the fact that some areas in Florida are beginning to face water shortages.

5. Recognition of the fact that "water is water." Regardless of water's "origin" or current location in the hydrologic cycle, it remains water. Even untreated domestic wastewater (water in its "dirtiest" state) is over 99.9 percent water by weight.

6. The benefits of, need for, and opportunities for water conservation.

7. The benefits of, need for, and opportunities for water reuse.

8. The costs and value of water. This should include a discussion of the fact that water is dramatically undervalued and that any water resource development will require investment of public funds.

9. Relative risk concepts associated with water management and reuse in comparison with risks associated with other day-to-day activities.

Water education will have two basic components. First, there will be continuing needs to target specific issues, technologies, and projects – including issues like ASR and indirect potable reuse. Second, there is a generational component. We must ensure that, when it comes to the nine concepts outlined above, future generations are "water wise."

Education activities related to water need to be tailored for several target audiences:

1. The adult public.

2. School aged children.

3. Water professionals (regulators, utilities, and the engineering and scientific communities).

4. Politicians and other decision-makers.

5. The news media.

Several key elements that need to be integrated into the overall strategy are outlined below:

Water curricula – This includes development of an integrated water resource management curriculum for elementary and secondary schools. This also should target university students studying environmental engineering, water resources, environmental science, and other water-related fields. This has particular applicability when dealing with the generational issues.

Educational Displays and Materials – Professional quality displays should be developed for use at the State Fair, at science museums, and other locations. There should also be the development of related and integrated materials – brochures, videos, posters, and public service announcements for radio and television.

Reuse WebPage – DEP should continue to maintain a comprehensive webpage devoted to water reuse as a resource for utilities, engineers and scientists, educators, students, and the public.

Seminars for Teachers – Seminars for elementary and secondary school teachers may serve to facilitate water curriculums within the state's school system.

Seminars for the News Media – This will feature seminars and workshops designed to educate the news media about water resources and water reuse issues facing Florida. The sensitivity of terminology used in reporting needs to be effectively communicated.

Seminars for Elected Officials – Seminars targeted at the issues and concerns of elected officials at the local, regional, state, and national levels are needed.

Relative risk concepts are important. Environmental and water professionals generally do not do a very good job in communicating relative risks associated with water reuse and other projects to

the public. The public needs to be aware of the fact that virtually all aspects of human activity carry some level of risk. Indeed, there are risks associated with riding in an automobile, crossing the street, breathing, being inside a public building, swimming, eating at the salad bar, drinking water, and other normal human activities. Through education programs, the public needs to have a better understanding of and appreciation of relative risk concepts. This will be important as Florida begins to more actively pursue indirect potable and ground water recharge reuse concepts (see Strategy 7) and as water professionals deal with issues involving pathogens and the emerging pollutants of concern (see Strategy 16).

Some agencies may face financial and/or staff resource limitations. Pooling and coordination of resources should enable production of more and better materials at lower total costs. The key issues are not agency specific, nor are they tied to specific regions or water management districts. These are statewide issues and pooling of resources to develop effective statewide materials offers much promise.

If we are to truly integrate educational programs and materials in Florida, it is imperative that a lead agency be identified and given responsibility for ensuring that viable educational materials and programs are developed and implemented. Perhaps DEP is in the best position to champion, lead, and coordinate these efforts.

Inertia and funding constraints also must be overcome if new partnerships and joint ventures are to be pursued. A new Work Group has been formed during Phase II of the Water Conservation Initiative to address education needs related to water conservation and management.

IMPLEMENTATION ROLES

State Agencies and WMDs – Development of integrated educational materials and seminars, especially by the Department of Education.

Local Governments – Development of project specific materials.

Professional Associations – Professional associations, like the Florida Water Environment Association, the American Water Works Association, the National Water Research Institute, and the WateReuse Association should assist in the development of educational materials.

LEGISLATION NEEDED

Legislation designed to ensure integration of appropriate water education into the state curriculums for elementary, secondary, and college education programs may be desirable.

RULEMAKING NEEDED

None.

RESEARCH NEEDS

None needed. Ongoing research by the Water Environment Research Foundation, the National Water Research Institute, and the WateReuse Association Research Foundation is targeted at several key issues related to public education, public perception, and technology transfer to professionals and elected officials.

SUCCESS STORIES

WMDs – The Southwest Florida, St. Johns River, and South Florida Water Management Districts have implemented public education programs and have developed some excellent publications and media materials.

SWFWMD – In addition to other reuse materials, the Southwest Florida Water Management District also developed the ***Reclaimed Water Guide*** (29) – a reference document that has proven useful to numerous utilities as they begin to implement reuse programs.

DEP – The DEP has developed a reuse brochure, a reuse video, and a public service announcement.

7. ENCOURAGE GROUND WATER RECHARGE AND INDIRECT POTABLE REUSE

BACKGROUND

When Florida established its Water Reuse Program in the 1980s, the state embarked on a quest to create a fundamental paradigm shift in the wastewater industry. Prior to that time the industry focus was on "effluent disposal." The Water Reuse Program served to help reorient the mindset toward viewing reclaimed water as a resource that should be reused for beneficial purposes. In moving into the 21st Century, Florida once again faces a need to motivate a paradigm shift – this time within the state's water reuse community. In looking toward the future, we must begin to move in the direction of reuse technologies that will best serve to replenish and augment available water resources. Ground water recharge and indirect potable reuse will figure prominently in water resources management and should be encouraged.

Ground water recharge involves the discharge of reclaimed water into rapid infiltration basins, or after additional treatment, through injection wells to recharge the underlying ground water resource. Indirect potable reuse involves discharging high-quality reclaimed water that has received additional treatment into a surface water body that serves as a potable water source. Both ground water recharge and indirect potable reuse are regarded as highly desirable forms of reuse resulting from their relatively high recharge fractions (see Table 5).

Ground water recharge and indirect potable reuse offer some of the greatest water conservation benefits of all water reuse activities. Augmenting the potable water supply with reclaimed water without losses that can occur through evaporation conserves the reclaimed water so that it can be most effective in supplementing potable water sources. Unfortunately, public perception of utilizing reclaimed water to augment potable water sources in even an indirect manner has prevented some projects from implementation.

Florida has detailed rules governing ground water recharge and indirect potable reuse activities. Rapid infiltration basins are addressed in Part IV of Chapter 62-610, F.A.C. (18). Part V of this chapter addresses injection for ground water recharge along with indirect potable reuse activities. Part V also addresses the use of reclaimed water to control saltwater intrusion and the possible use of canals in Southeast Florida to recharge ground water supplies.

RECOMMENDED STRATEGY

DEP and the water management districts support and encourage these types of highly-desirable reuse projects. Several of the regional water supply plans developed by the water management districts feature these types of reuse activities. While considering permit applications for these types of reuse projects, the DEP has demonstrated its proactive support and willingness to fully implement applicable state rules. For these types of projects to succeed, DEP and the water management districts must continue to champion and support these projects.

Indeed, all involved agencies must support the concept, if public support is to be obtained for these types of projects. Since requirements for these projects are contained in Chapter 62-610, F.A.C., training on the requirements of the rule and the research that went into development of the rule should be provided to each agency involved in water supply and public health issues. The water management districts, PSC, DOH, and perhaps the DCA are key agencies that should be targeted for training. Training could be accomplished through annual meetings or workshops for each of the agencies or through special training events. The need for augmentation of potable water sources is a critical element that should be included as well as the research aspects and regulatory requirements.

In an effort to disseminate information on these types of reuse projects, the DEP partnered with the Florida Water Environment Association's (FWEA) Water Reuse Committee to sponsor a 2001 seminar that dealt specifically with ground water recharge, indirect potable reuse, and reclaimed water ASR. In 2003, DEP will partner with the FWEA's Water Reuse Committee and the WateReuse Association in hosting a seminar devoted to emerging issues facing water reuse. This series of seminars provides opportunities for utilities, state agencies, and consultants to learn more about these important reuse concepts.

A demonstration project where representatives from each agency are part of the project team will be beneficial in promoting these types of reuse activities. Data from the demonstration project could be utilized to demonstrate the benefits of an augmentation project as well as to demonstrate the safeguards that protect public health. Once all agencies involved agree on the appropriateness of these projects in augmenting potable water supplies, a statement of public support could be developed.

Acceptance of the ground water recharge and indirect potable reuse concepts as well as recognition of the need for these projects by the regulatory agencies, utilities, and the public is essential for project success. Therefore, the education needs identified in Strategy 6 are critical to the success of Strategy 7. Integral to this is the need to develop a "water is water" philosophy and a general understanding of water issues.

During the processing of a permit for an indirect potable reuse project in the Tampa Bay area, the project sponsors utilized a "team permitting" approach. All regulatory agencies involved with the project review worked together with the project sponsor and the public in an open fashion during the scoping and permitting of the process. In this case, the process could have resulted in issuance of a permit for a complex project within one calendar year. This basic approach offers promise for expediting future projects. The process also offers promise for effectively refining a project design to maximize net environmental benefits and public acceptance.

Financial assistance (see Strategy 2) and water use permitting incentives (see Strategy 9) may serve to increase interest in these types of reuse activities among Florida's utilities.

IMPLEMENTATION ROLES

DEP – Continue to provide leadership in the water reuse arena. Employ the team permitting concept for these types of projects. Remain proactive in supporting these types of reuse activities. Consider sponsoring a demonstration project where all agencies are involved and distribute information about the project through the media. Provide appropriate training opportunities for staff, agencies, utilities, and engineers – perhaps through continued partnerships with professional associations.

WMDs – Continue to actively support and encourage these types of reuse activities.

PSC - Actively support these types of reuse activities.

DOH – Continue to partner with the DEP in the water reuse arena. DOH has identified a reuse coordinator, who serves as the appropriate point of contact for water reuse issues. This person needs to stay abreast of developments in the water reuse arena, particularly as relates to the public health aspects.

Utilities – Fully consider these types of reuse options when developing water resource and water reuse strategies and programs.

DCA – Ensure that these types of reuse activities are fully considered in the Comprehensive Planning Program.

Professional Organizations – Organizations, like the FWEA Water Reuse Committee and the WateReuse Association, should continue their proactive involvement in the reuse arena. In addition, continued efforts to provide training and educational opportunities are needed.

LEGISLATION NEEDED

None.

RULEMAKING NEEDED

Currently, no rulemaking is needed. As DOH and DEP continue to review developments related to water reuse, if refinements to DEP's rules would be desirable, the rules should be revised appropriately.

RESEARCH NEEDS

While current rules governing these types of reuse activities are protective of public health and environmental quality, it must be recognized that there will always be research needs, and that the key issues are "water" issues – that is they apply to a wide range of water types and environments. Issues related to drinking water are of greatest interest, and these are somewhat independent of the immediate source water. Topics for further study focus on the ever-increasing numbers of organic compounds and their health significance, dose-response

relationships, control technologies, and fate and transport in the environment. Pathogens, endocrine disrupting compounds, pharmaceuticals, and personal care products all merit additional investigation, and numerous research efforts are underway.

SUCCESS STORIES

Water Factory 21 – Orange County, CA operates Water Factory 21, which injects high-quality reclaimed water into a potable quality aquifer. Originally, the project was designed as a means for retarding saltwater intrusion. However, the reclaimed water mound has moved inland and serves to augment ground water supplies at a water supply wellfield.

El Paso – This city injects high-quality reclaimed water in order to recharge a closed ground water basin.

Upper Ocoquon Sanitation District – This utility discharges high-quality reclaimed water to Bull Run, which flows into the Ocoquon Reservoir – the primary water supply for the Virginia suburbs of Washington, DC.

Los Angeles County Sanitation District – This utility has used a series of large rapid infiltration basins for over 30 years to recharge ground water supplies in the Los Angeles area.

West Palm Beach – This city has an innovative indirect potable reuse project under construction. This excellent, wetlands-based water reuse project was designed to augment the region's water supply. The DEP and South Florida Water Management District strongly supported this worthy project.

Water Conserv II – In addition to the significant agricultural irrigation component of this reuse project, an extensive network of rapid infiltration basins is used to recharge the region's ground water. In 2001, about 11 MGD was recharged.

Tampa Water Resource Recovery Project – This project ultimately was abandoned in favor of a major desalination project. However, this project served as a worthy example of the effectiveness of the team permitting concept for complex projects of this nature. Before the project sponsors decided to withdraw the permit application, the DEP and other agencies were moving toward issuance of the required permits within one year from the initiation of the review process. The project was supported by the various agencies involved in the review.

Orange County, FL and SJRWMD – These parties have partnered on an Aquifer Recharge Enhancement Program that will include the use of reclaimed water to reduce impacts to the surficial aquifer due to ground water withdrawals.

8. DISCOURAGE EFFLUENT DISPOSAL

BACKGROUND

Untreated wastewater is 99.9 percent water (by weight). It is a valuable water resource that can and should be reclaimed and used for beneficial purposes.

Effluent disposal using ocean outfalls, other surface water discharges, and deep well injection represents a waste of this water resource. By discouraging effluent disposal, additional reclaimed water can be made available, which will serve to conserve potable quality water resources while also serving to recharge available resources.

While Florida reused 584 MGD of reclaimed water, about 900 MGD of effluent was disposed of in 2001. This effluent represents an untapped water resource.

IMPLEMENTATION STRATEGY

This strategy largely represents a continuation of current programs. The DEP needs to continue aggressive implementation of the provisions of Section 403.064, F.S., related to reuse feasibility studies for utilities located within designated Water Resource Caution Areas. Where reuse is deemed feasible, it needs to be implemented to the extent feasible. Detailed guidelines for preparation of reuse feasibility studies already exist (25).

All new or expanded surface water discharges are subject to the Antidegradation Policy. The public interest test and requirements for reuse feasibility studies apply and serve as a mechanism for encouraging reuse. It is anticipated that very few new or expanded surface water discharges will be permitted.

The coming of total maximum daily loads (TMDLs) should serve as an added incentive for domestic wastewater dischargers to look at viable reuse options. In cases where the TMDL will mandate reductions in pollutant loading to surface waters, reuse will become more cost competitive and attractive.

The water management districts are encouraged to impose requirements for water reuse on consumptive use permit holders. Under the requirements of Section 403.064, F.S., permits issued by the DEP for domestic wastewater facilities must reflect requirements for reuse contained in the utilities consumptive use permit. This can be an effective means to motivate water reuse.

As noted in Section 403.064, F.S., one potential application for effluent disposal systems is as backups for legitimate reuse systems. However, implementation of efficient and effective reuse programs, coupled with viable storage options, may reduce the need for backup discharges.

Interconnecting reuse systems will provide greater flexibility within the reclaimed water systems and may serve to reduce needs for effluent disposal. In addition, diversification of the reuse

customer base and increased reliance on relatively constant water use customers (like some industries and toilet flushing) within a reuse system may diminish the need for back up discharges.

Some existing disposal systems may have technical constraints precluding reuse. An example is a domestic wastewater treatment system in the coastal area that receives wastewater having very high salt content (probably related to infiltration/inflow of saltwater into the sewer system). These systems may be unable to implement landscape irrigation reuse projects without construction of relatively expensive reverse osmosis treatment facilities. In such cases, sewer system rehabilitation should be considered to correct the situation.

Effective coordination between the permitting staffs at the water management districts, the DEP, and the PSC serves to encourage and promote water reuse, which will reduce needs for effluent disposal.

The impediments in moving from relatively inexpensive disposal options (deep well injection and ocean outfalls) to reuse are largely economic. Implementation of reuse generally is more expensive than some forms of effluent disposal. Funding assistance may serve to lessen the initial economic burden on these utilities (see Strategy 2).

Effective education programs targeting utilities, the public, and elected officials can help motivate utilities to move away from effluent disposal and toward water reuse.

The needed requirements and mandates already exist.

IMPLEMENTATION ROLES

DEP – Since the intended targets are domestic wastewater utilities, DEP through the domestic wastewater permitting program will implement this strategy. Continue to encourage and promote water reuse. Continue to use the Antidegradation Policy as a means for encouraging water reuse. Continue to ensure that domestic wastewater permits are consistent with requirements for reuse contained in utilities consumptive use permits, as authorized by Section 403.064, F.S. Fully implement the TMDL program. Implement viable funding programs.

PSC – Continue to encourage and direct investor-owned utilities to implement reuse. Implement viable funding programs.

WMDs – Continue to encourage and promote water reuse. Review the water management aspects of proposed deep well injection projects and have input into DEP's Underground Injection Control (UIC) Program. Where appropriate, include requirements for reuse in consumptive use permits for utilities having responsibility for water and wastewater services.

Utilities – Be receptive to opportunities for water reuse.

LEGISLATION NEEDED

None.

RULEMAKING NEEDED

None.

RESEARCH NEEDS

None related to this specific strategy.

SUCCESS STORIES

Reuse in Florida – Current reuse activity in Florida provides testimony to the effectiveness of this strategy. In 2001, reuse capacity totaled about 1.1 BGD – about 52 percent of the state's total permitted domestic wastewater capacity (based on facilities having capacities of 0.1 MGD or larger).

West Palm Beach – This utility, which historically has relied on deep well injection, is implementing a major, innovative, indirect potable reuse project.

Jacksonville – This utility, which historically has relied on surface water discharges to the St. Johns River, is beginning to implement several reuse projects.

Tampa – This utility, which has relied on a large outfall to Tampa Bay, is implementing a reuse program. This surface water discharge represents one of the last available sources of freshwater in the Tampa Bay area and multiple political jurisdictions would like to make better use of this water supply through reuse options.

9. PROVIDE CONSUMPTIVE USE PERMITTING INCENTIVES

BACKGROUND

Incentives offered by the water management districts through their consumptive use permitting programs (some water management districts refer to these as "water use permits") may serve to encourage utilities to implement reuse and to encourage water users to use reclaimed water.

RECOMMENDED STRATEGY

The water management districts could consider offering expanded incentives to utilities that implement reuse programs and to users of water who opt to use reclaimed water. Incentives could be focused on reuse systems featuring relatively high offsets or recharge fractions. Such incentives could take the form of:

1. Longer durations for consumptive use permits (sometimes referred to as "water use permits").

2. Recognition of reclaimed water use and associated potable quality water offsets and recharge fractions when calculating per capita water consumption and when considering water allocations. This should include allowance for reuse systems like ground water recharge and industrial reuse that do not directly influence per capita water use by residential customers. Allowances also could be made for reuse of the utility's reclaimed water in a different geographic area. When one utility provides reclaimed water for use by a second utility, the two utilities could share in such an incentive.

3. Continued consolidation of consumptive use permits for utilities practicing water reuse.

4. Reduced fees for consumptive use permits. Existing statutory or rule constraints may limit this possibility.

Providing incentives for implementing reuse could help motivate both reclaimed water utilities and water users to use reclaimed water. Any incentives must be carefully designed to assure that they are likely to change behavior and are not simply awarded to parties for what they would be doing in any event, as a permitting requirement or for other reasons. In all cases, incentives could be conditioned on making efficient and effective use of reclaimed water. This could be related to potable quality water offsets and recharge fractions associated with the reuse activities.

There may be policies of the water management districts or statutory provisions that may impose limitations on what the water management districts can do.

The DEP also might consider incentives in the form of longer duration permits for utilities that implement the most desirable forms of reuse (based on potable quality water offsets and recharge fractions).

Financial incentives involving viable funding programs are discussed under Strategy 2.

No mandates are recommended.

IMPLEMENTATION ROLES

WMDs – Investigate and evaluate possible incentives related to consumptive use permits that might encourage utilities to implement reuse programs and water users to use reclaimed water. Viable incentives should be implemented.

Reuse Coordinating Committee – Could serve as a forum for framing a consistent statewide approach.

LEGISLATION NEEDED

Legislation may be needed.

RULEMAKING NEEDED

Rulemaking will be needed.

RESEARCH NEEDS

None.

SUCCESS STORIES

WMDs – The water management districts have been proactive in dealing with water reuse and most currently offer some degree of incentives (typically by issuing longer-term permits) to utilities implementing reuse and to entities that use reclaimed water.

10. ENCOURAGE REUSE IN SOUTHEAST FLORIDA

BACKGROUND

In 2001, reuse capacity in Florida totaled over 1.1 billion gallons per day – about 52 percent of the state's total permitted capacity for domestic wastewater treatment plants (7). This represented about 72 gallons per day of capacity for each Floridian. Unfortunately, when it comes to embracing water reuse, Broward and Miami-Dade Counties have lagged behind the rest of the state. As an example, per capita reuse capacity in these two counties is less than 11 gallons per person per day. These are Florida's two most populous counties – accounting for 24 percent of the state's population and 33 percent of all domestic wastewater treated in Florida. However, they account for only about four percent of the state's reuse capacity. It also is interesting to note that over 70 percent of all reclaimed water used in these two counties is used for industrial purposes at the various wastewater treatment plant sites.

Broward and Miami-Dade Counties dispose of about 510 MGD through ocean outfalls and deep injection wells. With the possible exception of some relatively saline wastewater treated at a couple of facilities, this represents a potential water resource that is currently being wasted.

RECOMMENDED STRATEGY

Means should be found to dramatically increase reuse in Southeast Florida. As outlined in the following paragraphs, several avenues should be pursued in an effort to take advantage of available reuse opportunities.

Education: Education is needed within this geographic area. The public, press, utilities, and political entities must become better informed about water resource management, competing demands on the region's water resources, the need for conservation and reuse, and the attractiveness of water reuse in this area of the state. Effective water education programs, as outlined in Strategy 6 could pay dividends in Southeast Florida.

Traditional Reuse Opportunities: Utilities in these counties are encouraged to take advantage of relatively traditional and common reuse opportunities, as they become available. Utilities in these counties have noted that there simply are not enough golf courses to enable use of 500 MGD of water. This is correct. However, as demonstrated by the Pompano Beach project and other projects in this area, traditional reuse opportunities (golf course irrigation, irrigation of residential lawns, irrigation of other landscaped areas, and agricultural irrigation) are available for at least a portion of the flows in the region. In addition to increasing the amount of reuse in the area, implementation of relatively common irrigation uses of reclaimed water also offers public education benefits. It provides an opportunity for the public, the utilities, and political bodies to see and experience water reuse, reclaimed water, and purple pipe. Familiarity generates acceptance and stimulates future demands for reclaimed water. Familiarity and acceptance will be very important to successful implementation of more innovative and larger scale reuse options in the future.

Projects that showcase water reuse and provide educational opportunities have value. An example is the Wakodahatchee Wetlands in Palm Beach County. These wetlands featuring public access via boardwalks, and interpretative displays enables the public to see reclaimed water and its benefits first hand. In walking the boardwalks at the wetlands, one readily gains an appreciation for reclaimed water as a resource.

Industrial uses of reclaimed water, particularly for cooling water applications, should be pursued, as well as the potential for using reclaimed water to retard saltwater intrusion. There is also a potential for reclaimed water ASR projects. Provision of reclaimed water to the agricultural areas in Dade and Broward Counties should also be evaluated.

Sewer Mining: The densely populated character of the area, coupled with the location of several of the large regional wastewater treatment facilities near the coast, makes it difficult to convey reclaimed water back to the developing areas to the west. As a result, the major utilities should investigate the possibility of developing "sewer mining" or "skimming" water reclamation facilities. These would be subregional treatment facilities located in the developing areas – within areas offering significant potential demands for reclaimed water. Untreated domestic wastewater would be extracted from the sewerage system and treated to produce reclaimed water. Residuals (sludge) and any unused reclaimed water would be returned to the sewerage system for conveyance to the existing, large, regional treatment facilities. Demonstration projects may be beneficial in generating public support.

Canal Discharge for Ground Water Recharge: For a decade, utilities and water managers in Southeast Florida have discussed the possibilities of using reclaimed water to recharge the area's ground water through controlled discharges of high-quality reclaimed water to canals in the area. This canal discharge concept has potential value and merits attention. Recommended steps relating to increasing reuse by aquifer recharge via canal discharge include:

1. Making a solid technical demonstration that the area's groundwater needs to be augmented and that discharge to canals can effect this augmentation. This is essential for this type of project to be considered as "reuse."

2. Water quality based effluent limitations (WQBELs) will be needed.

These WQBELs will define the quality of reclaimed water needed to protect water quality in the canals. The canals are Class III waters and any discharge will have to ensure that surface water and ground water standards are met. Given that the canals are largely stagnant during dry weather periods, and that many of the canals are listed as "impaired waters" for nutrients, it is likely that WQBELs will place stringent limits on discharge of nutrients.

A team permitting approach for canal discharge to augment aquifer levels is suggested in an effort to maintain communication and coordination among the various permitting agencies and to facilitate the permitting process.

Large-Scale Reuse Programs: Other large scale reuse options merit consideration. Ground water recharge using very high-quality reclaimed water and rapid infiltration basins or injection wells should be considered. Ground water recharge via canal discharges was discussed in the previous section. Large wetlands projects also may have merit. Team permitting should be considered as these types of options are developed. Pilot or demonstration studies may be worthwhile. For some types of ground water recharge projects, DEP rules require pilot studies.

Reuse in the Comprehensive Everglades Restoration Project: The Comprehensive Everglades Restoration Project (13) includes two major reuse projects in West Dade County and South Dade County. These may be as large as 100 MGD each. Federal and state funding for these facilities should be pursued and secured.

Constraints on Disposal Options: Concerns with the existing deep well injection systems probably will provide added incentives to look toward water reuse options. These disposal wells feature permanent storage of secondarily treated effluent in saline underground formations. Unfortunately several existing wells have shown signs of possible migration of the injected effluent upward into overlying potable quality ground water. Ocean outfalls, particularly any proposed expansions or new outfalls, will face increased regulatory consideration. Hence, there will be increasing incentives for the utilities in Southeast Florida to evaluate reuse, particularly for any new growth and development.

Financial Assistance: The economic constraints are real. In addition to local funding sources, funding options through the CERP, the water management district, and the state should be pursued. Viable funding programs (see Strategy 2) would be of value.

Analyze Reuse Success Stories: There are several utilities in Southeast Florida that have successfully implemented water reuse programs. It could be valuable to conduct a short study of what prompted these utilities to pursue reuse and what factors contributed to their success. Summarizing the results of this study in a paper, perhaps for dissemination at the annual Florida Water Resources Conference, may provide valuable guidance to other utilities in the area.

IMPLEMENTATION ROLES

Partnerships – A partnership between the DEP, the South Florida Water Management District, the EPA, the Corps of Engineers, and the utilities is needed. A team permitting approach should be implemented.

SFWMD – Continue to be proactive in the reuse arena and to encourage and promote water reuse. Implementation of viable funding programs will be of value. Work toward increasing public awareness of water issues, constraints, and opportunities in this section of the state. Participate in team permitting activities and play major roles in needed partnerships related to reuse.

DEP – Continue to play a leadership role in the water reuse arena. Initiate team permitting approaches to permitting innovative reuse options. Play a major role in developing partnerships related to water reuse. Continue to encourage and promote water reuse in Southeast Florida.

Continue to discourage effluent disposal, particularly for new flows associated with growth in the area. Expedite development of WQBELs and TMDLs needed for canal discharge options.

Utilities – Become proactive in seeking viable reuse opportunities. Fully consider the use of sewer mining concepts. Develop a "water reuse" mindset and transition away from effluent disposal toward water reuse.

LEGISLATION NEEDED

None.

RULEMAKING NEEDED

None.

RESEARCH NEEDS

No formal research is needed. Studies or evaluations will be needed to establish WQBELs and/or TMDLs for canal discharge options. Pilot studies will be conducted in association with reuse projects proposed in the CERP.

SUCCESS STORIES

The Palm Beach County Area – Palm Beach County used to be highlighted as one of the counties lagging behind the rest of the state in reuse. However, in the last 6 years, utilities in Palm Beach County have increased the volume of reclaimed water being reused five-fold, and the percent of wastewater reused in the county has increased from 6 percent to 26 percent. With projects underway, this number will continue to increase.

Pompano Beach – Tapped into a large ocean outfall and built a high-level disinfection system that provides reclaimed water to irrigate a municipal golf course and other public access areas in Pompano Beach. Hence, a portion of Broward County's effluent that was headed for disposal in the Atlantic Ocean is reclaimed by Pompano Beach and used for beneficial purposes in their community.

Loxahatchee – The Loxahatchee River Environmental Control District operates an excellent and diverse reuse system. Reclaimed water is used to irrigate residential lawns, golf courses, a college campus, and a baseball stadium (the spring training home of two major league teams).

Palm Beach County – The Southern Region Water Reclamation Facility provides reclaimed water for irrigation of golf courses and residential lawns. Reclaimed water is also used in the Wakodahatchee Wetlands – a man-made wetland system that has proved an effective means of educating the public about reclaimed water.

Boca Raton – This city operates Project IRIS – a reuse system featuring irrigation of residential lawns, two golf courses, five parks, a hospital, a church, and a college campus.

West Palm Beach – This city has an innovative indirect potable reuse project under construction.

11. ENCOURAGE USE OF SUPPLEMENTAL WATER SUPPLIES

BACKGROUND

Use of another water source (surface water, ground water, stormwater, or treated drinking water) to augment supplies of reclaimed water (largely to meet peak demands) can enable better utilization of the water resource. The use of supplemental water supplies to meet peak demands for reclaimed water may enable a reclaimed water utility to be more aggressive in implementing its reclaimed water system. More customers can be served with reclaimed water and less "excess" reclaimed water will need to be disposed of.

There are no major regulatory impediments. Before 1999, utilities faced uncertainty in implementing supplemental water supplies due to a lack of state rules governing supplemental water supplies. However, Rule 62-610.472, F.A.C., was established in 1999 to facilitate the use of supplemental water supplies.

Of course, use of supplemental water supplies normally is subject to consumptive use permitting by the water management districts. In some areas, ground water may not be available as a supplemental source in times of drought.

In 2001 (7), 19 utilities used an average of 15 MGD of supplemental water in Florida. Surface water accounted for 11 MGD of the total, with Cape Coral using the majority (10 MGD) of this surface water. About 4 MGD of ground water also was used as a source of supplemental water supplies. Of the 19 utilities using supplemental water supplies, 17 utilities used an average of less than 1 MGD to supplement their reclaimed water systems.

RECOMMENDED STRATEGY

The regulatory agencies (DEP and the water management districts) should be proactive in response to requests from reclaimed water utilities to use supplemental water supplies as part of their reuse systems. Once reclaimed water efficiency and seasonal storage options have been implemented, the agencies should avoid placing unwarranted restrictions on use of supplemental water supplies.

The desired outcome is to have reclaimed water utilities be able to maximize the use of available reclaimed water supplies by using other water sources to meet peak demands enabling increased numbers of customers to be served and resulting is reduced volumes of reclaimed water being discharged through disposal systems. Particularly when treated drinking water and ground water are used to supplement reclaimed water supplies, care should be taken to ensure that the supplemental water supply is effectively and prudently used, such that this resource is not wasted. To combat this possible outcome, the Southwest Florida Water Management District encourages development of best management practices (BMPs), when supplemental water supplies are used.

Efficiency in the overall reuse system should be a prerequisite for the use of supplemental water supplies. Metering and volume-based rates (see Strategy 2) are key elements in ensuring efficiency.

No additional incentives or mandates are needed.

IMPLEMENTATION ROLES

DEP – Be proactive in enabling reclaimed water utilities to use supplemental water supplies to meet peak demands for reclaimed water.

WMDs – Be proactive in enabling reclaimed water utilities to use supplemental water supplies to meet peak demands for reclaimed water. Encourage efficient use of reclaimed water and supplemental water supplies. Consider development of BMPs for the use of supplemental water supplies.

Utilities – Consider using supplemental water supplies to meet peak demands for reclaimed water. Strive toward efficiency in the overall reuse system.

LEGISLATION NEEDED

None.

RULEMAKING NEEDED

None.

RESEARCH NEEDS

None.

SUCCESS STORIES

Cape Coral – Makes extensive use of water from their network of fresh water canals to augment supplies of reclaimed water. Using over 10 MGD of surface waters, this reuse system is the largest user of supplemental water in Florida.

Water Conserv II – Uses ground water as a supplemental water supply. Their ground water wells are used to provide freeze protection services to citrus growers using their reclaimed water.

Altamonte Springs – Uses treated drinking water and stormwater to supplement reclaimed water supplies.

Collier County Utilities – This utility developed a 3.5-MGD supplemental wellfield to meet peak irrigation demands, which has enabled them to increase the number of customers on their system.

Sanford – This city has tapped Lake Monroe as a supplemental water supply.

12. ENCOURAGE EFFICIENT IRRIGATION PRACTICES

BACKGROUND

Regardless of the water source used, for irrigation practices, efficiency equates to water conservation. Hence, promotion of irrigation efficiency was a recurring theme in the Water Conservation Initiative (WCI). In addition to the WCI Water Reuse Work Group, both the Agricultural Irrigation Work Group and Landscape Irrigation Work Group developed strategies related to irrigation efficiency (4). Key strategies dealing with agricultural irrigation included:

- Use of additional mobile irrigation labs.
- Increasing use of rainfall harvesting and recycling of irrigation water.
- Substitution of reclaimed water for other water sources.
- Development of improved methods for measuring water use.
- Development of improved methods for estimating agricultural water needs.
- Additional research to improve agricultural water use efficiency.
- Increased education and information transfer.

The landscape irrigation community also faces needs to improve efficiency. Rex Dixon, President of the Irrigation Association, noted (49):

> "The facts are, the landscape irrigation industry is a very visible user and abuser of water, with irrigation systems operating in the rain, with irrigation overflow running down drive ways and streets, with most irrigation controllers set to over water."

Hence, it is not surprising that the WCI Landscape Irrigation Work Group's strategies included (4):

- Implementation of statewide irrigation design and installation standards and require inspections.
- Expansion of education and outreach programs (including use of mobile irrigation labs).
- Implementation of a training and certification program for irrigation design and installation professionals.
- Development of guidelines for review of site plans.

- ❖ Research targeted at improved turf and landscape water conservation.
- ❖ Implementation of a training and certification program for landscape maintenance workers.
- ❖ Evaluate the use of water budgeting as an effective water conservation practice.
- ❖ Implement consistent statewide watering restrictions for landscape irrigation.

All of the strategies developed by the Agricultural Irrigation and Landscape Irrigation Work Groups have merit and offer potential for significant water savings. These strategies also have applicability to the use of reclaimed water for agricultural and landscape irrigation. However, two of these concepts offer significant promise for conserving reclaimed water, and will be further developed in Strategy 12. These include:

- ❖ Increased reliance on automatic rain sensors and shutoff devices.
- ❖ Training and certification of irrigation contractors.

Automatic rain sensors and shutoff devices for irrigation systems will prevent an irrigation system from operating during and immediately following rainfall events. At this time, new irrigation systems are required to have rain sensors with an automatic shutoff. Over time, many of these devices do not function properly and there is no mechanism whereby the system is checked for proper operation. The implementation of an effective program to enforce this existing requirement of the water management districts' rules would result in additional conservation of reclaimed water. It also would result in additional water conservation for systems utilizing other water sources. Mecham (50) concluded that correct use of weather sensors could save significant amounts of water.

A training and certification program should be developed to ensure that irrigation contractors are cognizant of the need and ways in which water conservation practices can be incorporated into the design and installation of an irrigation system. For instance, currently, rain sensors and automatic shutoff devices currently are required on new irrigation systems, but there is no mechanism to ensure that the requirement is met. Development of a training and certification program that would provide a mechanism to ensure that the irrigation system is designed and installed with conservation in mind would be a benefit in reducing water demand, regardless of the water source used for irrigation.

RECOMMENDED STRATEGY

During Phase II of the Water Conservation Initiative, the Agricultural Irrigation and Landscape Irrigation Work Groups should continue to refine their strategies dealing with encouraging efficient irrigation practices. This includes their strategies related to training and certification of individuals involved with the installation of irrigation systems.

Automatic Rain Sensors and Shutoff Devices – Section 373.62, F.S., requires that any person who purchases and installs an automatic lawn sprinkler system after May 1991 shall install,

maintain, and operate a rain sensor device or switch that will override the irrigation cycle of the sprinkler when adequate rainfall has occurred. This statutory directive should be fully implemented.

As with most products, some devices will perform better and last longer than others. The water management districts, a professional association, or individual utilities should consider evaluation of commercially available irrigation equipment and control devices. As an aid to designers, installers, operators, and homeowners, lists of superior and adequate equipment could be maintained and published.

The utility or other organization could offer rebates for the installation and use of rain sensors with automatic shutoff devices as an incentive for the installation and maintenance of the devices. Funding assistance from the state or water management districts for utilities to implement local rebate programs for installation and maintenance of rain sensors with associated automatic shutoff devices merits consideration.

A key issue with these types of devices relates to ensuring that the devices are maintained and remain operational. Means must be provided for inspection and maintenance.

Utilities that have water reuse systems are required to conduct a site visit when new customers first sign up for reclaimed water service. A cross connection control device must be installed on the potable water line serving the property of a new customer, and DEP rules require that the devices be inspected periodically for proper operation. As part of the customer signing up for service, the presence of rain sensors with appropriate automatic shutoff devices could be required. During the periodic inspections done in conjunction with cross connection control activities, the proper functioning of the rain sensors and automatic shutoff device could be checked and corrected, if necessary.

Home and building inspectors also could be charged with inspection of irrigation systems and automatic shutoff devices to ensure proper functioning of these systems and devices.

Another way to implement this strategy would be to require, as part of the conservation plan associated with the water management districts' water use permitting, that the utility certify that they have a plan for routinely checking the proper functioning of rain sensors and the automatic shutoff device. By this method, rain sensors and automatic shutoff devices on all irrigation systems within a utility would be routinely checked by the utility, and, if necessary, maintenance performed by the customer.

Training and Certification Programs – As noted by the WCI Agricultural and Landscape Irrigation Work Groups, there are several target audiences for training and certification programs. These include irrigation system designers, installers, and operators. Programs targeting designers and installers probably offer the most potential. For these groups, training and certification should focus on efficient irrigation practices along with proper use of reclaimed water.

A certification program is already in place for landscape architects. Part II of Chapter 481, F.S., regulates the practice of landscape architecture, which is defined to include "provision for irrigation systems." Landscape architects are trained and educated in irrigation and other aspects of water conservation and the licensing exam in Florida is heavily weighted on knowledge of irrigation practice. In fact the Florida Department of Transportation will only accept irrigation plans signed and sealed by a Florida Registered Landscape Architect. One element of training for this profession that may merit additional consideration relates to the proper and effective use of reclaimed water in landscape design and maintenance.

Training and certification programs targeted at irrigation contractors merit serious consideration. Funding assistance could be provided for an organization such as the Florida Water Wise Council, the Florida Irrigation Society, or other water or irrigation-related organization to develop a program for training and certification of irrigation contractors. Another option would be development of a certification or licensing program through the Florida Department of Business and Professional Regulation (DBPR). Utilities could then require that all irrigation contractors working on irrigation systems to be connected to their systems be certified by such an organization. Requiring irrigation contractors to be trained and certified through such a program could be made a part of a utility's water conservation plan in the consumptive use permitting process.

Of course, individual utilities or local political jurisdictions could implement their own training and certification programs. However, locally implemented programs may be more costly and probably would introduce considerable variability in quality and content across the state.

Other Irrigation Efficiency Measures – Several other issues related to irrigation efficiency merit discussion:

- Metering and volume-based rates are discussed in detail in Strategy 1. These concepts are central to encouraging and promoting efficient use of reclaimed water for irrigation, as well as for other purposes.

- Utilities could list wasteful irrigation users (individuals or firms) on a webpage.

- Utilities could implement irrigation limitations, such as the use of even/odd irrigation scheduling.

- This strategy also includes significant educational needs targeted at utilities, professional associations, regulatory agencies, and the public.

- Make increased use of mobile irrigation labs as an educational and technology transfer tool.

IMPLEMENTATION ROLES

WMDs – Consider requiring utilities or providing incentives for utilities to develop a program for rain sensor and automatic shutoff device installation and maintenance as part of the water

conservation plan included in consumptive use permitting. This concept would achieve significant conservation benefits for all irrigation systems, regardless of the water source.

Consider providing funding assistance to the Florida Water Wise Council, the Florida irrigation Society, or other water related organization for establishment of a program for training and certification of irrigation contractors and incorporate requirements for use of only trained and certified irrigation contractors into the water use permitting process. This would achieve the water conservation benefits for all irrigation systems – not just those for reclaimed water systems.

DBPR – Consider implementation of a certification or licensing program for irrigation contractors.

DEP – Consider requiring utilities to incorporate education about water conservation practices and the benefit of the installation and maintenance of rain sensors with their associated automatic shutoff devices into the public education information given to new customers when signing up for reclaimed water service.

Utilities – Consider incorporating water conservation practices, including information about the benefits of rain sensors and associated automatic shutoff devices into the information given to new customers when signing up for reclaimed water service. Encourage checking and maintenance of these devices by inserting information in the monthly bill sent to all customers of the water system, including both reclaimed water and potable water. Implement comprehensive cross-connection control and inspection programs.

LEGISLATION NEEDED

Legislation may be needed to establish a statewide training and certification program for irrigation contractors.

RULEMAKING NEEDED

Rulemaking probably will be needed to fully implement a training and certification program for irrigation contractors.

Rulemaking also will be needed to establish irrigation efficiency standards.

RESEARCH NEEDS

New irrigation systems are required to have a rain sensor and automatic shutoff device when the irrigation system is installed. Research into how durable and reliable these devices and soil moisture sensors are and how they could be improved for better performance should be considered.

Research into what elements should be included in a training and certification program for irrigation contractors will be required to properly design the program.

SUCCESS STORIES

Rebate Programs – Rebate programs offered by utilities to their customers for installation of other water saving devices such as toilets and showerheads have been proven successful in reducing water demand.

Broward County – This county has partnered with 15 cities and the South Florida Water Management District in offering free rain sensors (including free installation) to qualified individuals and businesses.

Loxahatchee – The Loxahatchee River Environmental Control District carefully regulates and controls the distribution of their reclaimed water supplies using an advanced metering and telemetry system. Effective coordination and cooperation with their reclaimed water customers is a key feature of their reuse program.

Landscape Architects – Florida has implemented a successful program for licensing landscape architects. This program includes elements related to design of irrigation systems.

Irrigation Association and Associated Landscape Contractors of America – These associations offer certification programs for landscape professionals. Recently, these associations announced a certification alliance that will expand certification opportunities for members of both organizations.

Pennbrooke Utilities, Inc. - In Order No. PSC-01-1246-PAA-WS, issued June 4, 2001, the PSC approved an offset of wastewater excess earnings in water rates in recognition of conservation related expenses. The Commission ordered Pennbrooke to implement an aggressive, proactive water conservation program geared to achieve significant, lasting reductions in consumption. A range of alternatives was offered, including system audits, utility ownership of irrigation systems, meter replacement, and water conservation education.

Sun Communities Finance Limited Partnership d/b/a Water Oak Utilities - In Order No. PSC-00-1165-PAA-WS, issued June 27, 2000 the PSC required the utility to implement a conservation program developed in conjunction with the SJRWMD. Specifically, the PSC approved an aggressive conservation program that included such items as xeriscape consulting and rebates, installation of moisture sensors, meter replacements, and irrigation audits. These programs were to be funded through water excess earnings, in lieu of reducing water rates.

SWFWMD - The Southwest Florida Water Management District has cooperatively funded more than 20 water conservation projects involving rain sensor retrofits, irrigation efficiency, Xeriscape rebates and other projects that encourage efficient irrigation practices.

13. ENCOURAGE REUSE SYSTEM INTERCONNECTS

BACKGROUND

This alternative refers to enhancing the connection between reclaimed water systems to facilitate reuse. More specifically, a connection between two or more reclaimed water distribution systems (may be owned or operated by different utilities) or between two or more domestic wastewater treatment facilities that provide reclaimed water for reuse activities.

Reuse system interconnects offer a means to increase both the efficiency and reliability of reuse systems. When two or more reuse systems are interconnected, there is additional flexibility present in meeting the demand of the reuse system customers, as well as an increase in the reliability of providing acceptable reclaimed water for reuse. For example:

- One system may be newer with fewer customers and be adjacent to a more mature system that could utilize additional reclaimed water to meet the needs of its customers.

- An interconnect between a mature reuse system and a system that has no reuse or limited reuse customers can help avoid or limit the need for a supplemental ground or surface water supply to meet seasonal demands in the more mature system.

- If one reclaimed water facility experiences a temporary problem with producing reclaimed water of acceptable quality, the interconnect with another facility can provide a means to enable continued delivery of reclaimed water to system customers while the problem is resolved.

- Interconnects may offer the ability to share system storage facilities, which would increase flexibility while maximizing utilization of existing storage facilities. As ASR becomes more common as a means for storing reclaimed water, reuse system interconnects could provide opportunities for development of shared ASR systems as key components of regional reuse programs.

RECOMMENDED STRATEGY

There are several mechanisms that should be utilized to encourage reuse system interconnects:

- Funding of reuse system improvements is always problematic for utilities. Grant or loan funding (see Strategy 2) could be made available to utilities specifically for interconnects between reuse systems.

- Conditions also could be placed on grants or loans for reuse system construction that would require interconnects between reuse systems, either within a utility's overall service area, if several treatment facilities exist, or between neighboring utilities.

- ❖ Consumptive use permitting incentives (see Strategy 9) also may offer promise.

IMPLEMENTATION ROLES

WMDs – Implement viable funding programs that place an emphasis on interconnects between reuse systems and other measures to increase reuse system efficiency and effectiveness.

DEP – Continue to be proactive in dealing with proposed interconnects. Implement viable funding programs that place an emphasis on interconnects between reuse systems and other measures to increase reuse system efficiency and effectiveness.

Utilities – Evaluate possibilities related to interconnecting water reclamation facilities and/or reuse systems and implement interconnects, when feasible and needed.

LEGISLATION NEEDED

None.

RULEMAKING NEEDED

None.

RESEARCH NEEDS

None.

SUCCESS STORIES

City of St. Petersburg - Has a mature interconnected reuse system with four water reclamation facilities.

Indian River County - Operates a successful interconnected reuse system with several of their water reclamation facilities.

Conserv II - The City of Orlando and Orange County have a joint reuse system (Water Conserv II) for ground water recharge, citrus irrigation, and residential irrigation that has been very successful in conserving potable quality water.

Cocoa Beach and Cape Canaveral – These cities have an interconnected system that demonstrates the benefit that can be achieved by an interconnect where one utility has an excess of reclaimed water that the other utility can utilize, reducing the need for a supplemental water supply.

Hillsborough County – The County has interconnected each of its four major wastewater treatment facilities in its Northwest Reuse System, increasing efficiency and reliability of delivering reclaimed water to users.

Collier County Utilities – This utility interconnected their 8-MGD South System with their 9.5-MGD North System with a 20-inch interconnect that allows flexibility and reliability to meet demands, allowed them to add users, and also ensured adequate disposal during periods of low demands.

Sarasota County – The North County Reuse System receives reclaimed water from four county treatment facilities and from the City of Sarasota. The South County Reuse System includes two county treatment facilities. The City of Venice treatment facility is planned to be interconnected with the South County Reuse System.

14. ENABLE REDIRECTION OF EXISTING REUSE SYSTEMS TO MORE DESIRABLE REUSE OPTIONS

BACKGROUND

Reuse activities are not all equally effective in conserving potable water sources or in offsetting existing potable quality water use. Reuse is defined in Chapter 62-610, F.A.C., as "the deliberate application of reclaimed water, in compliance with Department and District rules, for a beneficial purpose." This definition results in many activities being considered as reuse. In addition, Rule 62-610.810, F.A.C., provides further guidance on which types of projects are considered "reuse" versus "effluent disposal."

Some existing reuse systems do not provide for a significant reduction in water demand and may not serve to effectively recharge or supplement water sources. If these existing systems (and new ones as well) could be redirected to implement reuse projects that are more desirable from a water conservation perspective, additional water conservation benefits could be realized.

Appendix B contains a listing of reuse activities allowed by DEP rules. Relative desirabilities (based on potable quality water offset and recharge fractions) of various reuse activities are presented in Table 5.

RECOMMENDED STRATEGY

Section 403.064, F.S., requires that DEP permits for domestic wastewater facilities be consistent with requirements for reuse contained in water use permits issued by the WMDs. This statutory directive could be used to guide utilities in the direction of the most efficient and effective types of reuse.

Rule 62-610.800(10), F.A.C., provides clarification of how the DEP will apply the requirement in Section 403.064, F.S., for consistency between water use permits and DEP's domestic wastewater and reuse permits. Currently, this rule stipulates that DEP will not force abandonment of an existing permitted reuse system with a reuse system that is judged to be more efficient or effective. This rule should be revised to enable redirecting of less efficient reuse systems toward more efficient reuse systems that will result in increased water savings or more effective water management.

Utilities that have existing reuse systems that do not contribute significantly to water conservation or assist in recharging our potable water sources should be encouraged to implement projects that are more effective and desirable from a water conservation perspective. Funding assistance (see Strategy 2) probably will be needed to enable redirection, due to the investment that has already been made by the utility.

Another strategy that could be utilized would be the option of long-term DEP permits for wastewater utilities that implement effective and efficient reuse programs.

Long term DEP permits for wastewater utilities implementing effective and desirable reuse programs could be an effective incentive for utilities to be receptive to the possible redirection of less desirable, existing reuse systems to more attractive reuse activities.

Mandates are not necessary at this time.

IMPLEMENTATION ROLES

DEP – Consider revising Rule 62-610.800(10), F.A.C., to enable redirecting of existing inefficient reuse systems to more efficient reuse types. Evaluate the potential for issuing longer-term permits for effective and efficient reuse systems. Encourage and promote reuse options featuring relatively large potable water offsets and/or large recharge fractions.

WMDs – Implement effective funding programs that target the most effective forms of reuse. Fully implement the ***Reuse Conventions*** (24), and, where appropriate, encourage or require implementation of efficient and effective reuse systems.

Utilities – Utilities are encouraged to give preference to reuse options that feature relatively large potable water offsets and/or large recharge fractions, when developing reuse programs.

LEGISLATION NEEDED

Legislation that presents a recommendation to utilize reuse activities that feature relatively large potable water offsets and/or recharge fractions would be desirable.

RULEMAKING NEEDED

DEP Rule 62-610.800(10), F.A.C., should be revised to enable redirecting of reuse activities having low desirabilities to other reuse activities featuring relatively large potable water offsets and/or recharge fractions.

RESEARCH NEEDS

None.

SUCCESS STORIES

Water Reuse in Florida – Transition is not unprecedented in Florida. Perhaps the best example is the dramatic increase in water reuse activity in Florida over the last 20 years. Most of today's successful reuse programs were preceded by effluent disposal projects. Today's reuse projects represent the culmination of a transition away from effluent disposal.

Brevard County – The county's water reclamation facility at Viera converted from RIBs to reuse of reclaimed water for golf course, residential, and agricultural irrigation, with a created wetland providing wet weather discharge.

Orlando and Seminole County – The City of Orlando's reuse program in Eastern Orange and Seminole County redirected a portion of their wastewater effluent to reclaimed water project from a surface water discharge. They received $2 million from a federal grant for this project.

SWFWMD Funding Program – The Southwest Florida Water Management District has pioneered and championed the move toward efficient and effective use of reclaimed water. Within their funding program they include grant conditions requiring minimum acceptable potable quality water offsets or recharge fractions.

15. USE RECLAIMED WATER AT GOVERNMENT FACILITIES

BACKGROUND

Obviously, use of reclaimed water at state and other governmental facilities will serve to increase the amount of reclaimed water used in Florida. This will serve to conserve potable quality water.

Use of reclaimed water at state and other governmental facilities also will serve to further educate the public about the importance of reuse and the acceptability of using reclaimed water. Attractive and informative signing at state facilities, parks, rest areas, and welcome centers will be effective in educating the public.

For over 15 years, the slogan of the Water Reuse Program has been "***Use it Again, Florida!***" In many respects, the state agencies are "Florida." Unfortunately, we see little reuse activity at state facilities.

IMPLEMENTATION STRATEGY

State, national, local, and regional agencies should be strongly encouraged to use reclaimed water at their facilities and within their programs. This would include, but not be limited to using reclaimed water for landscape irrigation and for toilet flushing. Where appropriate, reclaimed water could also be used for making concrete and washing aggregate used to construct state-funded projects (like highways).

An annual scorecard reporting mechanism should be designed and implemented to track the success of the various state agencies in implementing water reuse.

As with most reuse activities, the key impediment probably will be costs. However, some of the agencies simply may be unaware of the availability and applicability of reclaimed water. An education function will be desirable to ensure that state agencies are aware of the state's water reuse objectives.

Legislative direction may be needed to fully capture the attention of the various state agencies.

IMPLEMENTATION ROLES

DEP – Serve as a coordinator for state activities. Annual status reports from the various agencies should be provided to DEP for incorporation into a short summary report.

State Agencies – Should begin to insist on use of reclaimed water at state facilities and within their programs. Agencies should consider educational signs and displays – particularly in high-visibility, high-use areas, like state parks, highway rest areas, and welcome centers.

National, Local, and Regional Agencies – Should begin to insist on use of reclaimed water at their facilities and within their programs.

LEGISLATION

Legislation requiring state agencies to use reclaimed water to the extent practicable should be pursued. Legislation also should establish a reporting program for state agencies in an effort to monitor the agencies' level of compliance with this mandate. This legislation also could establish recommendations for other agencies (national, local, and regional) to utilize reclaimed water to the extent practicable.

RULEMAKING

Rulemaking probably would not be needed. State agencies probably could meet the state directive using their ability to establish policies within their agencies.

RESEARCH NEEDS

None.

SUCCESS STORIES

Water Reuse – As noted previously, reuse has become very popular in Florida and Florida has become a national leader in water reuse. There are numerous reuse success stories across Florida related to virtually all types of uses for reclaimed water.

University of Florida – Uses reclaimed water from the university's wastewater treatment facility for landscape irrigation and industrial uses.

Florida Atlantic University – Uses reclaimed water for landscape irrigation.

Florida International University – Uses reclaimed water for landscape irrigation.

St. Petersburg – Provides reclaimed water for landscape irrigation at 86 parks and 55 schools.

Palm Beach County – Reclaimed water from the Southern Region Water Reclamation Facility is used in the Wakodahatchee Wetlands. This man-made wetland system is open to the public and features an extensive network of boardwalks and interpretive exhibits. The wetlands site is very popular and has proved to be an effective means of educating the public about reclaimed water.

Refuse to Energy Facilities – Facilities in the Tampa Bay area, Broward County, and Lee County use reclaimed water.

16. ENSURE CONTINUED SAFETY OF WATER REUSE

BACKGROUND

Since its beginning in the mid 1980s, Florida's Water Reuse Program has been built on a foundation of ensuring protection of public health and environmental quality. This basic tenet has driven development of Florida's rules governing water reuse and the permitting, monitoring, reporting, and compliance and enforcement activities related to water reuse. As we move into the 21st Century, a time that will see increased importance being placed on water reuse and dramatic increases in the popularity of reuse, it is incumbent on all organizations, agencies, utilities, and individuals and entities that use reclaimed water to be diligent in ensuring the continued safety of reuse practices in Florida.

As addressed in the following sections, emphasis must continue to be placed on cross-connection control, public education, responsible utility management, responsive regulatory oversight, control of pathogens, control of other organic and inorganic materials contained in wastewater (the so-called "emerging pollutants of concern" – the EPOC), and implementation of a "water is water" philosophy.

IMPLEMENTATION STRATEGY

Cross-Connection Control – For the use of reclaimed water in residential neighborhoods and for irrigation of other public access areas, this may be the most important element in protecting public health. Reclaimed water is sparkling clear and will be very difficult to distinguish from treated drinking water. While reclaimed water probably will meet nearly all (if not all) primary and secondary drinking water standards, it is not intended to be consumed on a long-term basis as drinking water. Hence, it is imperative that the drinking water and reclaimed water systems be kept separate and that cross-connections between the two systems not be created. Effective cross-connection control to ensure that the drinking water and reclaimed water systems remain separate is complicated by the fact that there may be multiple regulatory agencies and multiple utilities or local program areas involved in review of and implementation of cross-connection control programs. It is imperative that DEP and the Drinking Water Program (which may be contained in either DEP or in the county health department) critically review proposed cross-connection control programs, ensure that cross-connection control programs are implemented before a reuse system is placed into operation, and ensure that the appropriate utilities fully implement the approved cross-connection control programs. Coordination between DEP, the Department of Health, and the county health departments has been effectively addressed in a series of joint DEP/DOH memos. DEP's reuse rules contain provisions related to color coding and labeling of reclaimed water pipes and appurtenances and separation distances between drinking water and reclaimed water pipes. In addition, DEP's drinking water rules contain guidance and requirements for cross-connection control programs and activities. These rules must be effectively and consistently implemented. In addition, DEP's cross-connection control rules merit continued scrutiny and refinement when Chapter 62-555, F.A.C., is next opened for rule revisions. Utilities must recognize the significance of effective cross-connection control and inspection and the fact that the utilities bear the ultimate responsibility for implementation of

effective programs. The utilities must fully implement the inspection requirements contained in DEP rules. Effective public notification and education also can pay dividends in terms of minimizing the potential for members of the public or utility employees to create illegal cross-connections. The importance of cross-connection control is highlighted in the ***Code of Good Practices for Water Reuse in Florida*** (28), which is contained in Appendix H.

Public Education – Users of reclaimed water must be fully informed of the nature and quality of reclaimed water and the limitations on use of reclaimed water. Likewise, members of the public that have potential for coming into contact with reclaimed water or landscaped areas irrigated with reclaimed water have a right to be informed of the water reuse practice in the area. Effective notification and education helps ensure appropriate and safe use of reclaimed water and can pay dividends in reducing the potential for illegal cross-connections. Notification and education also serves to increase public acceptance of future reuse opportunities. In addition, education of contractors and plumbers will help prevent illegal cross-connections. DEP's reuse rules include requirements for education and notification of users of reclaimed water and for the posting of advisory signs. Per DEP rules, users of reclaimed water are to receive notification upon initiation of reclaimed water service and annually thereafter. The ***Reclaimed Water Guide*** (29) includes examples of advisory signs and public notification materials. The importance of public education and notification is highlighted in the ***Code of Good Practices for Water Reuse in Florida*** (28).

Responsible Utility Management – Utilities implementing water reuse programs must dedicate themselves to the pursuit of excellence. Management of their operations plays a significant role in determining the overall safety and effectiveness of their reuse systems. The ***Code of Good Practices for Water Reuse in Florida*** (28) provides a framework for quality management of a water reuse system. Utility managers and operation staff must adopt a "water supply" mindset and dedicate themselves to the reliable production of high-quality reclaimed water. Effective cross-connection control programs, effective public education and notification, and measures to ensure efficient and effective use of reclaimed water also figure prominently into quality reclaimed water utility operation and management.

Responsive Regulatory Oversight – There is a definite role for regulatory agencies in Florida's Water Reuse Program. Reclaimed water utilities must understand the rule requirements that govern water reuse systems and activities and must be held accountable for compliance with the rule requirements. Careful review of permit applications is imperative, as is the review of cross-connection control programs. Ongoing oversight is needed to ensure that the utilities comply with the reuse rules and their permits and that cross-connection control programs are fully and effectively implemented. Particularly for the more sensitive types of reuse (irrigation of residential lawns, public access areas, and edible crops under Part III of Chapter 62-610, F.A.C., and for ground water recharge and indirect potable reuse systems permitted under Part V of Chapter 62-610, F.A.C.), noncompliance with Florida's reuse rules cannot be tolerated. Florida's reuse rules merit periodic review to ensure that they continue to fully protect public health and environmental quality, while avoiding unwarranted obstacles that could retard implementation of viable and needed water reuse projects.

Control of Pathogens – Florida's high-level disinfection requirements and other treatment and disinfection criteria were originally established to ensure appropriate and effective control of pathogenic organisms. Of course, as additional information becomes available through monitoring, studies, and research, the regulatory agencies must continually review the updated information with an eye toward any possible need for refinement of the state's rules governing treatment, disinfection, and use controls to ensure continued protection of public health. This includes data related to bacterial, viral, protozoan, and helminthic pathogens. As an example, results obtained from monitoring for the protozoan pathogens (Giardia and Cryptosporidium) prompted an ongoing review and evaluation by a joint DEP/DOH work group.

Control of the Emerging Pollutants of Concern (EPOC) – Untreated domestic wastewater contains a vast array of organic and inorganic compounds. Treatment requirements imposed on water reclamation facilities, coupled with surface water quality standards, ground water standards, and drinking water standards, were designed to ensure protection of public health and environmental quality. As with pathogens, new information resulting from monitoring, studies, and research needs to be evaluated for any possible need to refine treatment, disinfection, or various water quality standards to ensure continued protection of environmental quality and public health. As an example, recent studies conducted by the USGS (51,52) demonstrated the presence of a range of organic materials (pharmaceuticals, personal care products, and endocrine disrupters) in the nation's waters. While present in very low concentrations, the identification of these materials in surface waters has prompted significant research and discussion of these materials throughout all water programs. The USGS sampled for 95 compounds at 139 locations in 30 states. One or more of the EPOC were found at 80 percent of the sampling locations. It should be noted that the USGS study featured evaluation of sampling sites located downstream from significant agricultural operations, industrial wastewater discharges, or domestic wastewater discharges. Of the 95 compounds studied by the USGS, 14 have drinking water standards or human health advisory levels and were detected at concentrations generally orders of magnitude less than the standards or health advisory levels. The USGS reported that aquatic toxicity studies had been done for 53 of these compounds. The median concentrations found by the USGS generally were orders of magnitude less than reported toxic values. A number of the compounds studied by the USGS were prescription or over-the-counter medications. Again, the concentrations found were very low. For example, Lincomycin, an antibiotic, is normally administered in doses of 500 mg. The USGS study reported a median concentration of 0.00006 mg/L. McGovern and McDonald (43) present an overview of issues related to endocrine disrupters.

While there is no immediate cause for concern, outputs from ongoing and planned research will be used to evaluate water quality standards and controls. This is nothing new. This is an ongoing process that has been employed in virtually all water programs for decades.

Implementing a "Water is Water" Philosophy – The "water is water" concept was discussed earlier in this report and is particularly significant when dealing with water reuse and other alternative water supplies. It must be remembered that many of the basic issues facing water reuse are really water issues that apply to the entire spectrum of water resources. Care must be taken to ensure that the regulatory community, utilities, and the public avoid holding any type of water (including reclaimed water) to a higher, unwarranted standard. Hence, any refinements to

water quality requirements for reclaimed water should be evaluated within the context of impacts on all water programs. Further, recognizing that "water is water," the various water programs and their rule requirements must be consistent.

IMPLEMENTATION ROLES

DEP – The DEP will play several important roles in efforts to ensure continued protection of public health and environmental quality:

1. Serve as a coordinator for water reuse activities in Florida. This includes continuing efforts to facilitate coordination and communication among all agencies and entities involved in Florida's Water Reuse Program. Review and dissemination of information related to the key components of Strategy 16 is incorporated into this role.

2. DEP will continue to refine rules, as needed. This includes surface water quality, ground water quality, and drinking water standards. It also includes rules governing water reuse, domestic wastewater, industrial wastewater, stormwater, underground injection control, and wellhead protection.

3. When a suitable opportunity presents itself, DEP should refine and strengthen the cross-connection control requirements in Rule 62-555.360, F.A.C.

4. The DEP should continue to promote communication and information transfer within the reuse community. DEP should continue to maintain a webpage dealing with water reuse as a means for facilitating dissemination of information related to water reuse. The DEP has partnered with the Florida Water Environment Association's (FWEA's) Water Reuse Committee in sponsoring two excellent seminars dealing with water reuse. The 2001 seminar dealt with indirect potable reuse, ground water recharge, and ASR. The 2003 seminar dealt with the EPOC, pathogens, algal toxins, and other emerging issues facing water reuse. In each odd numbered year, the DEP should continue to partner with the FWEA to sponsor seminars dealing with timely reuse issues and topics. In addition, DEP should continue to work with the FWEA's Water Reuse Committee in organizing the Reuse Round Table – an annual event held in conjunction with the Florida Water Resources Conference. The Reuse Round Table provides an excellent opportunity to exchange information within Florida's water reuse community. Recent Reuse Round Tables have dealt with such issues as the protozoan pathogens, managing reclaimed water as a valuable resource, and identification of priorities for the Water Reuse Program.

5. DEP should stay current on scientific developments in the water arena. This should include participation on advisory boards for the leading research funding organizations and in review of key literature related to water and water reuse.

6. DEP must continue to fully implement the cross-connection control requirements. Continued coordination with the DOH State Health Office and the county health departments is needed.

7. DEP must continue to fully implement the public notification and education requirements contained in DEP rules. In addition, the color coding, separation distance, signage, and other use controls imposed on reclaimed water systems should continue to be fully implemented.

8. DEP must continue to fully implement the reuse requirements in Chapter 62-610, F.A.C. This includes review of permit applications, monitoring results, and annual reuse reports, along with periodic inspections of reuse facilities.

9. DEP should be an active participant in research related to water reuse. In 1992, the DEP funded a landmark study of the fate of pathogens in a water reclamation facility (53). In 2002, DEP completed a small pathogen study at several reuse facilities. In 2003, DEP funded a second small pathogen study and a study designed to evaluate the infectivity of Giardia cysts and oocysts of Cryptosporidium in reclaimed water.

10. DEP should continue maintenance of a database for pathogen data (contains results from the DEP-required sampling for Giardia and Cryptosporidium). Refined information related to sampling and analysis (lab certification, methods, etc.) was posted to DEP's reuse webpage in January 2003. DEP's pathogen monitoring form should be refined to reflect this updated information.

11. DEP should strive to maximize consistency among and between the various water programs as a means for managing "water as water."

12. Recognizing the importance of the drinking water standards, DEP should ensure that Florida's drinking water standards include standards for all materials for which defensible contaminant limits exist.

13. As research yields additional information about the EPOC, the DEP should incorporate appropriate standards in Florida's surface water standards and drinking water standards, as justified. In addition, domestic wastewater, industrial wastewater, and water reuse rules may merit refinement, if justified by scientific studies and data.

DOH – The DOH should remain as a partner in Florida's Water Reuse Program by continuing to provide input related to health issues associated with water reuse. This includes serving on the Technical Advisory Committee for reuse rulemaking activities to help ensure that Florida's reuse rules will continue to be protective of public health. The DOH also should continue as an active participant on the Reuse Coordinating Committee. The DOH also is responsible for full implementation of the Safe Drinking Water Act in 10 delegated counties. Within these 10 delegated counties, DOH county health departments should continue to review and provide oversight on cross-connection control programs and to maintain effective lines of communication and coordination with DEP and the local utilities. In addition, DOH will continue to provide oversight of waterborne illness surveillance in Florida and will continue to investigate drinking water system complaints and issues.

DEP/DOH Pathogen Workgroup – DEP and DOH have formed a joint workgroup to review data related to the occurrence of the protozoan pathogens in reclaimed water. This joint workgroup will continue to review data and discuss issues related to the control of pathogens. Ultimately, this workgroup will have input into any decisions related to possible imposition of additional controls (if additional controls are deemed at some time to be justified) on pathogens in reclaimed water. In concert with a "water is water" philosophy, this also should include consideration of possible controls for other waters.

Reuse Coordinating Committee – This committee should continue to serve as a forum for communicating and coordinating among the participating agencies on the full range of reuse issues (including health-related issues).

WMDs – The water management districts play several key roles in encouraging reuse and in ensuring the continued safety of water reuse. Continuing water assessment and planning activities will focus on ensuring availability of adequate water supplies and likely will encourage development of reclaimed water and other alternative water supplies to meet future needs. Under the provisions of Chapter 62-40, F.A.C., the water management districts will continue to encourage, promote, and require use of reclaimed water (when reuse is economically, environmentally, and technically feasible). Financial assistance will continue to be made available for worthy water reuse projects. Continued coordination will be needed with DEP, PSC, other agencies, water users, and utilities.

SWFWMD – The Southwest Florida Water Management District published the ***Reclaimed Water Guide*** (29), which has proven very popular and useful. This document may be viewed through the District's webpage. The District also plans to update and expand this document. The DEP also should provide a link to the ***Reclaimed Water Guide*** from DEP's reuse webpage.

Utilities – Utilities are encouraged to subscribe to the provisions of the ***Code of Good Practices for Water Reuse in Florida*** (28). This includes committing to rigorous implementation of effective cross-connection control, inspection, and public education/notification programs.

Users – Individuals and entities using reclaimed water should use reclaimed water wisely in compliance with the requirements of Florida's reuse rules.

Legislature – Create and fund a water reuse research program (see Strategy 2).

Research Funding Organizations – Continue to fund needed research related to the full range of health issues associated with water reuse and water management. It is hoped that the funding organizations will coordinate activities to preclude unwarranted duplication of efforts.

State Universities – Continue to conduct research related to water reuse, particularly research deemed necessary by the DEP.

Florida Water & Pollution Control Operators Association (FW&PCOA) – Continue training and certification programs related to backflow prevention, cross-connection control, and water reuse.

LEGISLATION

As discussed in Strategy 2, legislation will be needed to create and fund a state research program targeted at water reuse.

RULEMAKING

As always, the possible need for refinement of Florida's rules governing water reuse and other water management endeavors will continue to be routinely reviewed and evaluated. The basic tenet remains continued protection of public health and environmental quality.

When a suitable opportunity presents itself, DEP should refine and strengthen the cross-connection control requirements in Rule 62-555.360, F.A.C.

Minor rulemaking should be initiated to refine DEP's pathogen monitoring form to update information related to laboratory certification and methods.

RESEARCH NEEDS

There will always be needs for research related to water. This includes research related to nonpotable reuse, indirect potable reuse and ground water recharge. A state-funded research program targeted specifically at water reuse is warranted.

A significant volume of research dealing with the EPOC is underway. This includes efforts to identify sources of these compounds, frequency of occurrence, concentrations, dose-response relationships, fate and transport in the environment, analytical methods, and control technologies. These efforts will continue and will expand. In Florida, the Southwest Florida Water Management District plans to study the EPOC in reclaimed water and in other waters. In addition, the EPOC will be further evaluated as part of the reuse pilot study associated with the Comprehensive Everglades Restoration Project (CERP).

Research related to pathogens in reclaimed water and other waters also is needed. Research needs to focus on the frequency of occurrence, concentrations, infectivity studies, analytical methods, fate and transport in the environment, control technologies, and risk assessment methodologies. The DEP funded two important studies in 2003 and the Water Environment Research Foundation (WERF) has a major pathogen study underway. The WERF study has been funded significantly by utilities and entities in Florida, and five of the seven treatment facilities that will be investigated are located in Florida.

SUCCESS STORIES

Water Reuse – As noted previously, reuse has become very popular in the Sunshine State, and Florida has become a national leader in water reuse. A number of Western States (California, Arizona, Nevada, Texas) also are very active in water reuse and a number of other states (Georgia, North Carolina, Washington, Massachusetts) are beginning to implement water reuse programs. There is a lot of reclaimed water being used for a wide range of beneficial purposes in Florida, in other states in the U.S., and abroad. It also must be noted that water reuse is recognized as a very safe and environment-friendly activity. In fact, there is absolutely no evidence or documentation of any adverse health impacts associated with water reuse in the U.S. or in other countries that provide adequate levels of treatment and disinfection. This statement of safety applies to the full range of nonpotable reuse activities. This statement also applies to planned indirect potable reuse programs (like El Paso, Water Factory 21, Los Angeles County Sanitation District, and Upper Occoquon). In addition, unplanned indirect potable reuse is commonly practiced, generally involving effluent having received lower levels of treatment and disinfection, along many rivers in the U.S. and abroad.

Cross-Connection Control Programs – A number of reclaimed water utilities have implemented quality cross-connection control and inspection programs. Pinellas County and St. Petersburg serve as excellent examples.

Public Notification and Education – A number of utilities have developed extensive and effective public education and notification programs. Several of these programs and their materials are highlighted in the ***Reclaimed Water Guide*** published by the Southwest Florida Water Management District (29).

FW&PCOA Training Programs – This Association offers worthy training and certification programs in backflow prevention, cross-connection control, and water reuse.

APPENDIX D

AVAILABLE REUSE OPTIONS

Type of Reuse System	Reuse Activities[1]	Part in Chapter 62-610[2]	Treatment & Disinfection Requirements[3]
Urban Irrigation & Other Public Access Uses [Dual Distribution Systems]	Irrigation of: Residential properties Golf courses Parks, athletic fields, schools Other landscaped areas Toilet flushing Fire protection Vehicle washing Decorative water features Construction dust control Commercial laundries Flushing of sewers Cleaning roads and sidewalks Making ice for ice rinks Other urban uses	III	Secondary treatment, filtration & high-level disinfection
Agricultural Irrigation	Irrigation of feed, fodder & pasture crops	II	Secondary treatment & basic disinfection
	Irrigation of edible crops	III	Secondary treatment, filtration & high-level disinfection
Industrial Applications	Cooling water	VII	Secondary treatment & basic disinfection (if filtration & high-level disinfection are provided setback distances are not required)
	Process water	VII	Secondary treatment & basic disinfection (additional treatment may be needed to meet the needs of a particular industrial application)
	Wash water	VII	Secondary treatment & basic disinfection
	Use at wastewater treatment plant	VII	Secondary treatment & basic disinfection (in some instances, reduced treatment & disinfection requirements apply)

Type of Reuse System	Reuse Activities[1]	Rule Part [2]	Treatment & Disinfection Requirements[3]
Wetlands	Use of reclaimed water to create, restore, or enhance wetlands [5]	---	Secondary treatment with nitrification & basic disinfection (some types of wetlands systems require higher levels of treatment or disinfection) [4]
Ground Water Recharge	Rapid infiltration basins (RIBs)	IV	Secondary treatment & basic disinfection Nitrate < 12 mg/L
	Rapid infiltration basins in unfavorable conditions (including areas in SE Florida overlying the Biscayne Aquifer)	IV	Secondary treatment, filtration & high-level disinfection. TN < 10 mg/L Meet drinking water standards.
	Injection to recharge ground water	V	Secondary treatment, filtration & full treatment disinfection. Multiple barriers for control of pathogens & organics. TOC & TOX limits. Meet drinking water standards. TN < 10 mg/L (reduced levels of treatment allowed for injection to high TDS ground water)
	Canal discharge in SE Florida	V	Secondary treatment, filtration & high-level disinfection. TN < 10 mg/L Meet WQBELs [4] Meet ground water standards. Must demonstrate that the discharge is "reuse."
	Create barriers to control saltwater intrusion	V	Similar to requirements for injection for ground water recharge.
	Use of wetlands that percolate to ground water [5,6]	---	Secondary treatment & basic disinfection. Meet ground water standards. (additional treatment and/or disinfection may be needed)
Indirect Potable Reuse	Augmentation of Class I surface waters	V	Secondary treatment, filtration & full treatment disinfection. TOC limit. TN < 10 mg/L Meet WQBELs[4]

Notes:
(1) These are reuse activities that can be readily permitted under existing DEP rules, primarily Chapter 62-610, F.A.C. (18).
(2) This refers to the specific part within Chapter 62-610, F.A.C. (18), under which the specific activity can be permitted.
(3) The reader is referred to the specific rules in Chapter 62-610, F.A.C. (18), for details on the actual treatment and disinfection requirements.
(4) The Antidegradation Policy must be met.
(5) Normally permitted under Chapter 62-611, F.A.C. (54).
(6) Ground water discharge aspects regulated under Chapter 62-522, F.A.C. (55).

APPENDIX E

COUNTY REUSE DATA

County	Population in 2000 [a]	WWTF Capacity (MGD) [b]	WWTF Flow (MGD) [c]	Reuse Capacity (MGD)	Reuse Flow (MGD)	Reuse Capacity (gpcd) [d]	Reuse Flow (gpcd) [e]	Flow (gpcd) Rank [f]	Population Rank [g]
Alachua	217,955	22.35	16.75	25.51	10.22	117.05	46.90	18	20
Baker	22,259	1.59	0.67	0.25	0.17	11.14	7.59	57	52
Bay	148,217	34.00	16.61	7.00	3.88	47.23	26.16	35	25
Bradford	26,088	4.15	1.86	2.70	1.49	103.30	57.23	12	50
Brevard	476,230	69.95	35.83	42.72	17.92	89.70	37.63	25	9
Broward	1,623,018	240.88	185.19	17.62	9.60	10.85	5.91	60	2
Calhoun	13,017	0.60	0.57	0.00	0.00	0.00	0.00	64	62
Charlotte	141,627	12.54	7.63	9.57	4.35	67.60	30.71	30	26
Citrus	118,085	5.33	2.73	4.83	2.73	40.93	23.15	37	31
Clay	140,814	13.87	7.92	2.35	1.14	16.69	8.06	54	27
Collier	251,377	34.77	30.02	37.30	26.81	148.36	106.66	1	18
Columbia	56,513	3.45	2.01	3.35	2.01	59.28	35.52	27	38
De Soto	32,209	2.70	1.23	3.09	0.52	95.94	15.99	45	48
Dixie	13,827	0.65	0.19	0.00	0.00	0.00	0.00	64	58
Duval	778,879	127.79	83.74	10.33	4.90	13.27	6.29	59	7
Escambia	294,410	35.19	19.85	13.42	4.269	45.60	14.50	46	15
Flagler	49,832	11.46	5.85	10.36	5.18	207.80	103.85	2	40
Franklin	11,057	1.58	1.40	0.58	0.52	52.00	47.30	17	64
Gadsden	45,087	3.95	1.91	0.65	0.40	14.42	8.81	53	42
Gilchrist	14,437	0.32	0.20	0.32	0.20	22.17	13.92	49	57
Glades	10,576	0.00	0.00	0.00	0.00	0.00	0.00	64	65
Gulf	13,332	0.55	0.28	0.35	0.19	26.25	14.48	47	60
Hamilton	13,327	1.53	0.84	0.18	0.10	13.13	7.88	55	61
Hardee	26,938	1.73	1.24	0.73	0.50	26.99	18.41	40	49
Hendry	36,210	2.33	1.63	2.33	1.63	64.35	45.07	19	44
Hernando	130,802	9.89	4.78	16.08	4.61	122.93	35.27	28	28
Highlands	87,366	5.22	2.21	3.00	1.53	34.34	17.49	44	34
Hillsborough	998,948	144.16	92.96	43.35	30.50	43.40	30.54	32	4
Holmes	18,564	1.40	0.76	0.00	0.00	0.00	0.00	64	56
Indian River	112,947	10.73	6.64	13.81	6.97	122.28	61.70	10	33
Jackson	46,755	4.84	2.90	0.98	0.67	21.07	14.30	48	41
Jefferson	12,902	1.16	0.52	0.30	0.18	23.17	13.64	50	63

County	Population in 2000 [a]	WWTF Capacity (MGD) [b]	WWTF Flow (MGD) [c]	Reuse Capacity (MGD)	Reuse Flow (MGD)	Reuse Capacity (gpcd) [d]	Reuse Flow (gpcd) [e]	Flow (gpcd) Rank [f]	Population Rank [g]
Lafayette	7,022	0.36	0.22	0.32	0.22	46.00	31.76	29	66
Lake	210,528	19.48	9.49	15.94	9.41	75.71	44.72	20	21
Lee	440,888	65.14	39.59	52.79	34.90	119.74	79.17	7	11
Leon	239,452	28.83	17.82	30.46	17.82	127.22	74.42	8	19
Levy	34,450	0.87	0.45	0.87	0.45	25.14	12.95	51	47
Liberty	7,021	0.20	0.13	0.20	0.13	28.49	17.95	43	67
Madison	18,733	1.11	0.99	1.11	0.99	59.25	52.69	16	55
Manatee	264,002	39.10	27.35	37.53	16.28	142.15	61.69	11	16
Marion	258,916	15.45	7.97	14.95	7.95	57.73	30.70	31	17
Martin	126,731	12.78	6.76	8.27	4.78	65.30	37.74	24	29
Miami-Dade	2,253,362	358.81	307.72	22.73	17.62	10.09	7.82	56	1
Monroe	79,589	12.22	5.64	0.70	0.27	8.85	3.41	62	35
Nassau	57,663	5.76	3.30	1.46	1.06	25.23	18.33	41	37
Okaloosa	170,498	27.66	16.62	29.75	16.77	174.48	98.37	6	24
Okeechobee	35,910	1.40	0.79	1.27	0.79	35.23	21.89	38	45
Orange	896,344	148.43	91.15	168.78	89.56	188.30	99.91	4	6
Osceola	172,493	26.95	17.94	39.46	17.72	228.75	102.72	3	23
Palm Beach	1,131,184	159.03	112.08	52.59	29.15	46.49	25.77	36	3
Pasco	344,765	31.76	18.47	31.65	18.18	91.81	52.75	15	13
Pinellas	921,482	168.25	101.28	130.10	49.04	141.19	53.22	13	5
Polk	483,924	53.35	26.87	58.50	25.61	120.88	52.91	14	8
Putnam	70,423	3.25	2.50	0.03	0.03	0.35	0.35	63	36
Santa Rosa	117,743	8.08	4.15	3.90	2.22	33.09	18.89	39	32
Sarasota	325,957	33.05	21.82	25.68	12.89	78.79	39.56	22	14
Seminole	365,196	79.22	49.15	75.93	36.20	207.91	99.12	5	12
St. Johns	123,135	15.71	9.88	9.66	3.61	78.49	29.35	33	30
St. Lucie	192,695	17.56	9.97	8.50	2.19	44.09	11.37	52	22
Sumter	53,345	3.20	2.10	5.50	2.10	103.10	39.44	23	39
Suwannee	34,844	1.54	0.97	1.54	0.97	44.05	27.87	34	46
Taylor	19,256	1.65	1.03	0.40	0.11	20.77	5.56	61	54
Union	13,442	0.70	0.48	0.70	0.48	52.08	35.56	26	59
Volusia	443,343	58.50	31.50	33.12	18.10	74.71	40.81	21	10
Wakulla	22,863	0.99	0.41	0.99	0.41	43.30	18.06	42	51
Walton	40,601	7.68	2.86	12.21	2.86	300.76	70.34	9	43

County	Population in 2000 [a]	WWTF Capacity (MGD) [b]	WWTF Flow (MGD) [c]	Reuse Capacity (MGD)	Reuse Flow (MGD)	Reuse Capacity (gpcd) [d]	Reuse Flow (gpcd) [e]	Flow (gpcd) Rank [f]	Population Rank [g]
Washington	20,973	1.57	0.85	0.27	0.15	12.87	7.15	58	53
Totals/Avg:	**15,982,378**	**2220.24**	**1486.50**	**1150.90**	**584.20**	**72.01**	**36.55**		

Notes:
(a) From the 2000 US Census.
(b) Capacity represents the maximum amount that could be treated by a wastewater treatment facility (WWTF) or reused within a water reuse system. A DEP permit will establish the permitted capacity.
(c) Flow is the actual amount of wastewater treated or reclaimed water being reused. Flow generally will be less than the capacity.
(d) Reuse capacity (gallons/day) divided by the county population. The result is capacity expressed in gallons per capita (person) per day (gpcd).
(e) Reuse flow (gallons/day) divided by the county population. The result is flow expressed in gallons per capita per day (gpcd).
(f) This county's rank among all Florida counties based on reuse flow in gpcd. Rank No. 1 has the highest gpcd reuse flow.
(g) This county's rank among all Florida counties based on population. Rank No. 1 has the largest population.
(h) Information taken from the ***2001 Reuse Inventory*** (7).

APPENDIX F

STATUS OF IMPLEMENTATION OF THE 1993 REUSE CONVENTIONS

Status of Implementation of the 1993 Reuse Conventions

Recommendations	Implementation Status	Future Actions
Issue 1. Program Standardization		
2. Develop reuse conventions.	Completed – Published Reuse Conventions in October 1993.	Continue to implement the recommendations, procedures, and terminology in the Reuse Conventions.
Issue 2. Terminology for "Critical Water Supply Problem Areas"		
3. Use term "Water Resource Caution Areas."	Has been revised in Chapter 403, F.S., in Chapter 62-40, F.A.C., and in 4 of the District Water Management Plans.	Continue to strive for consistent use of the term "Water Resource Caution Areas by all agencies, programs, and water management districts.
Issue 3. Definition of "Reuse"		
3. Revise definition to eliminate the advanced treatment discharge provision.	Completed - This clause was removed from the definition in Chapter 62-610, F.A.C., in 1996.	None.
4. Establish criteria for reuse projects.	Completed – Reuse/disposal criteria were added to Chapter 62-610, F.A.C., in 1996.	None.
5. Include reuse/disposal categorization in DEP permits.	Ongoing - Is being done (effective 5/1/95).	Continue to include categorizations in DEP permits.
6. Re-evaluate blanket reuse categorization of Part IV of Chapter 62-610, F.A.C.	Completed – Assessment completed during the Phase I rulemaking. All Part IV projects will continue to be categorized as "reuse."	None.

Recommendations	Implementation Status	Future Actions
Issue 4. Definition of "Feasible"		
1. No action - Continue to make case-by-case determinations.	Continuing to make case-by-case determinations of feasibility.	Continue to make case-by-case determinations of feasibility.
Issue 5. Scope of the Reuse Program		
1. Continue to focus on Water Resource Caution Areas.	Have focused on Water Resource Caution Areas. 2003 revisions to Chapter 62-40, F.A.C., will expand statewide.	With adoption of Chapter 62-40 revisions, focus will become statewide.
3. Continue to focus on domestic wastewater sources.	Continuing to focus on domestic wastewater sources.	Continue to focus on domestic wastewater sources.
6. Limit applicability to facilities having capacities of at least 0.1 MGD.	Section 403.064, F.S., revised in 1994 to reflect this limit.	None.
Issue 6. Program Coordination		
2. Continue meetings of the Reuse Coordinating Committee.	Committee continues to meet.	Continue to meet regularly.
3. Implement meetings between DEP and WMD permitting staffs.	Ongoing – Initiated meetings in December 1993. The DEP districts were reminded of the importance of these meetings in August 1998 and again in 2001.	Continue to meet regularly.
Issue 7. DEP and WMD Authority		
2. Eliminate the "loophole" in Section 403.064, F.S.	Eliminated in 2002.	None.
3. Rule revisions to expand DEP role.	Completed evaluation. Insufficient statutory authority to pursue further.	None.

Recommendations	Implementation Status	Future Actions
4. Provide statutory authority for DEP to require reuse.	Attempted (unsuccessfully) during the 1994 Session.	Monitor the effectiveness of the program and re-evaluate the possible need at some future time.
7. Place emphasis on consumptive use permitting program for imposing reuse requirements.	Ongoing.	Continue to emphasize the consumptive use permitting program. Fully implement the recommendations in the Reuse Conventions.
8. Provide statutory authority for DEP to consider requirements for reuse contained in consumptive use permits.	Statutory authority added to Section 403.064, F.S., in 1994. DEP/WMD linkage added to Chapter 62-610, F.A.C., in 1996.	Continue implementation of this DEP/WMD linkage. Encourage the WMDs to place requirements for reuse in CUPs.
6. Comprehensive reuse legislation (including Options 2, 4, and 8).	Completed - Legislation enacted in 1994.	None.
Issue 8. Discourage Effluent Disposal		
2. Seek statutory limitations on deep well injection.	Completed - Legislation enacted in 1994 addressed deep well injection. Similar language was added in 1995 addressing effluent disposal by surface water discharges.	Continue to implement these statutory limitations.
4. Expand Antidegradation Policy.	Attempted (unsuccessfully) in 1994 to expand this policy in DEP rules.	None.
5. Incorporate WMD approval in DEP deep well permitting.	Attempted (unsuccessfully) to incorporate this in Chapter 62-528, F.A.C.	None.
Issue 9. Reuse Feasibility Studies		
2. Prepare guidelines for water users.	Completed - The Reuse Coordinating Committee published guidelines in 1997.	WMDs to continue to employ these guidelines.

Recommendations	Implementation Status	Future Actions
3. Incorporate feasibility study requirements in DEP rules.	Completed - Added to Chapter 62-610, F.A.C., in 1996.	Continue to implement these rule provisions.
Issue 10. Reuse Rule Revisions		
2. Comprehensive rulemaking on Chapter 62-610, F.A.C.	Completed - Phase I revisions became effective in 1996. Phase II revisions adopted in 1999.	None.
3. Conduct a study of alternative disinfection technologies (if funds become available).	Conducted a literature review of alternative disinfection technologies in 1995.	Incorporate UV disinfection requirements in Chapter 62-600, F.A.C., when this chapter is next opened for rulemaking.
Issue 11. Wet Weather Discharges		
1. No action.	No action recommended. A new mechanism for permitting wet weather discharges was developed at the request of Partners for a Better Florida and was added to Section 403.086, F.S., in 1994. DEP developed a guidance memo to implement this program.	Continue to permit wet weather discharges using existing statutory and rule mechanisms.
Issue 12. Indirect Potable Reuse		
2. Statutory revisions to eliminate injection prohibition in Section 403.859(7), F.S.	Completed - Statute was revised in 1994.	None.

Recommendations	Implementation Status	Future Actions
3. Rule revisions & policy to encourage indirect potable reuse.	Completed - Is included in the Phase II revisions to Chapter 62-610, F.A.C., which were adopted in 1999. DEP used ecosystem team permitting to develop draft permit for the Tampa Water Resource Recovery Project. DEP has issued a permit for an innovative project in West Palm Beach.	Continue proactive approach to permitting this type of reuse projects.
Issue 13. Public Information		
2. Develop additional statewide public information materials (if funds become available).	Joint DEP, WMD, Florida Water Reuse Committee project resulted in preparation of a reuse video. DEP updated its reuse brochure in 1996. DEP developed a reuse web page in 1997. DEP published a reuse video and a reuse slide show in 1999.	Continue to maintain DEP's reuse web page. Developed public information materials as needed and as funds become available.
Issue 14. Financial Assistance		
2. Evaluate increasing priority scores for reuse projects for SRF.	Evaluation completed - Revisions to the priority system are not merited. Reuse projects already receive increased priority scores.	None.
3. Develop a state reuse funding program (if a funding source becomes available).	Not possible - A state funding source has not been identified. 1994 legislation directed the WMDs to develop funding programs. 4 WMDs have implemented funding programs. By far the most active and effective program is in the SWFWMD.	Continue the WMDs' funding programs.

Recommendations	Implementation Status	Future Actions
Issue 15. Conservation of Reclaimed Water 1. No action.	In 2001, the Water Conservation Initiative concluded that efforts to use reclaimed water effectively and efficiently were needed.	The Water Conservation Initiative and the Reuse Coordinating Committee will continue to formulate strategies for using reclaimed water effectively and efficiently.
Issue 16. Regulation of Reuse Service Areas 1. No action.	No action needed. The PSC has evaluated possible need for regulating service areas for investor owned utilities.	None.
Issue 17. Regulation of Reuse Rate Structures 1. No action.	No action needed.	None.

Note: The recommendations listed in this table were included in the 1993 ***Reuse Conventions*** (24).

APPENDIX G

STATEMENT OF SUPPORT FOR WATER REUSE

Statement of Support for Water Reuse

The Florida Department of Environmental Protection; the United States Environmental Protection Agency, Region 4; the Florida Department of Health; the Florida Public Service Commission; the Florida Department of Agriculture and Consumer Services; the Florida Department of Community Affairs; the Northwest Florida Water Management District; the South Florida Water Management District; the St. Johns River Water Management District; the Southwest Florida Water Management District; and the Suwannee River Water Management District (collectively "Participating Agencies") adopt the following joint statement of support for water reuse:

Whereas, water reuse is defined as the beneficial use of reclaimed water (treated wastewater) for landscape and golf course irrigation; agricultural irrigation; industrial uses; toilet flushing; fire protection; decorative water features; ground water recharge; indirect potable reuse; wetlands creation, restoration, and enhancement; and other uses allowed by Florida's reuse rules; and

Whereas, Florida Statutes establish the encouragement and promotion of water reuse as state objectives; and

Whereas, Florida's Water Resource Implementation Rule advocates and directs that reuse of reclaimed water be established as an integral part of water and wastewater management programs in Florida; and

Whereas, water reuse provides an environmentally sound means for managing wastewater, while conserving water and replenishing valuable water supplies; and

Whereas, Florida law and regulations are fully protective of public health and environmental quality; and

Whereas, the capacity of water reuse systems in Florida exceeds one billion gallons per day; and

Whereas, Florida's extensive experience with water reuse has demonstrated the viability and acceptability of water reuse practice; and

Whereas, the EPA has recognized Florida's Water Reuse Program for excellence in 1993, 1996, and 1999; and

Whereas, the EPA encourages water reuse as a means for managing wastewater under the provisions of the Clean Water Act; and

Whereas, Florida Statutes require the Florida Public Service Commission to allow recovery of all prudent reuse costs in customer rates, which may be allocated among the utilities' water, wastewater, or reuse customers, or any combination thereof; and

Whereas, the Florida Department of Environmental Protection and the water management districts have formally agreed to assist the Florida Public Service Commission in rate cases in the proper evaluation of reuse issues and the resulting costs, and promote customer acceptance of reuse through expert testimony at formal hearings, and at informal customer meetings; and

Whereas, Congress established pollution prevention as a national objective in the Pollution Prevention Act of 1990 and the EPA includes increased efficiency in the use of water as part of a new environmental ethic; and

Whereas, the EPA, the Florida Department of Environmental Protection, and the state's water management districts have participated in the funding of water reuse systems in Florida and all Participating Agencies have encouraged and promoted the safe implementation of water reuse in Florida.

Now, therefore, the Participating Agencies resolve to continue to encourage and promote water reuse, to work together to overcome institutional and regulatory disincentives and funding constraints, to ensure protection of public health and environmental quality, and to promote public acceptance of water reuse in Florida.

Florida Department of Agriculture
And Consumer Services

APPENDIX H

CODE OF GOOD PRACTICES FOR WATER REUSE IN FLORIDA

Code of Good Practices for Water Reuse in Florida

Florida Department of Environmental Protection
The Florida Water Environment Association's Water Reuse Committee

Those who embrace the ***Code of Good Practices for Water Reuse in Florida*** commit to "do the right thing" by upholding the following 16 principles of conduct related to protection of public health and environmental quality, management of the reuse system, and public awareness:

Protection of Public Health and Environmental Quality

Public Health Significance – To recognize that distribution of reclaimed water for non-potable purposes offers potential for public contact and that such contact has significance related to the public health.

Compliance – To comply with all applicable state, federal, and local requirements for water reclamation, storage, transmission, distribution, and reuse of reclaimed water.

Product – To provide reclaimed water that meets state treatment and disinfection requirements and that is safe and acceptable for the intended uses when delivered to the end users.

Quality Monitoring and Process Control – To continuously monitor the reclaimed water being produced and rigorously enforce the approved operating protocol such that only high-quality reclaimed water is delivered to the end users.

Effective Filtration – To optimize performance of the filtration process in order to maximize the effectiveness of the disinfection process in the inactivation of viruses and to effectively remove protozoan pathogens.

Cross-Connection Control – To ensure that effective cross-connection control programs are rigorously enforced in areas served with reclaimed water.

Inspections – To provide thorough, routine inspections of reclaimed water facilities, including facilities located on the property of end users, to ensure that reclaimed water is used in accordance with state and local requirements and that cross-connections do not occur.

Reuse System Management

Water Supply Philosophy – To adopt a "water supply" philosophy oriented towards reliable delivery of a high-quality reclaimed water product to the end users.

Conservation – To recognize that reclaimed water is a valuable water resource, which should be used efficiently and effectively to promote conservation of the resource.

Partnerships – To enter into partnerships with the Department of Environmental Protection, the end users, the public, the drinking water utility, other local and regional agencies, the water management district, and the county health department to follow and promote these practices.

Communications – To provide effective and open communication with the public, end users, the drinking water utility, other local and regional agencies, the Department of Environmental Protection, the water management district, and the county health department.

Contingency Plans – To develop response plans for unanticipated events, such as inclement weather, hurricanes, tornadoes, floods, drought, supply shortfalls, equipment failure, and power disruptions.

Preventative Maintenance – To prepare and implement a plan for preventative maintenance for equipment and facilities to treat wastewater and to store, convey, and distribute reclaimed water.

Continual Improvement – To continually improve all aspects of water reclamation and reuse.

Public Awareness

Public Notification – To provide effective signage advising the public about the use of reclaimed water and to provide effective written notification to end users of reclaimed water about the origin of, the nature of, and proper use of reclaimed water.

Education – To educate the public, children, and other agencies about the need for water conservation and reuse, reuse activities in the state and local area, and environmentally sound wastewater management and water reuse practices.

May 1, 2000