Exhibit V

Countywide Comprehensive Plan For Pinellas County

Water Supply Element

Adopted on December 20, 1988 by the Pinellas County Board of County Commissioners as the Countywide Planning Authority and Recommended by the Pinellas Planning Council.

This document was a plan element of the PPC under previous legislation. Although the introduction and title page have been modified, references may remain concerning that previous legislation. It should be noted in such cases that Chapter 88–464 of the State Statues now applies to this document by the adoption of the Countywide Planning Authority.

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Introduction

Residents and elected officials of Pinellas County are well aware that urbanization in Florida is proceeding at a very rapid pace and that uncontrolled growth has created a multitude of problems. Capacities of natural and man-made systems are being pushed to their maximum limits daily. As a result, government officials are finding it increasingly difficult to cope with a growing list of problems.

Due to the problems created by uncontrolled urbanization and a sincere concern for Florida's total environment–urban, rural, and undeveloped areas, the Florida State Legislature has begun efforts, in recent years, to solve these problems.

This document is designed in part, to establish desirable countywide water supply policies. Along with policies enumerated in other *Countywide Comprehensive Plan* elements, the water supply policies outlined herein may provide an overall policy framework within which the Council can base future planning decisions.

Countywide Comprehensive Plan Definitions

Note: Goals, objectives, and policies must be viewed as an integrated, interdependent whole. For example, although certain environmental and economic aspects of housing do not appear as statements in the housing section, they would be applicable to housing by virtue of being included in the overall "policies plan."

Goals: Long-range community aspirations which represent significant positive gains which should be achieved by local governments and serve to establish the directions which the community will take. The "goal" describes the end condition that is sought; it is not an action nor a procedure, nor a process (i.e., good planning).

Objectives: Attainable targets which are action-oriented and designed to address outstanding community problems. An "objective" is a measurable component of a goal. Objectives are achieved in part through the implementation of planning policies. An objective is subordinated to goals and is organized such that each relate to specific goals.

Policies: Guidelines for action which direct the achievement of objectives and enable local governments to respond to a wide range of problems as they arise. A "policy" is one of several possible procedures; it is a predetermined mode of behavior, a predisposition toward certain courses of action (guideline).

Recommendations: Courses of action designed to achieve objectives within policy guidelines which address themselves to a set of specific problems. Recommendations are suggested courses of action that may be employed to solve existing problems and avoid their reoccurrence in the future. These may include performance criteria specific strategies, changes in administrative procedures or suggestions for further study. Recommendations do not constitute an "end state" rather, they offer potential solutions that should be considered.

Goal of Plan

To meet the legal requirements of state law which requires a potable water element that describes the water supply problems and needs of Pinellas County and the proposed solutions of these needs.

Scope of Plan

1. To formulate available countywide water supply data and studies into a general countywide plan which is a coordinated element of the *Countywide Comprehensive Plan*.

2. To provide goals, objectives, and implementation policies by which locally prepared plans can be reviewed.

3. To provide a countywide water supply planning guide for those jurisdictions that prefer to prepare separate detailed water supply plans.

Planning Coordination

State law requires the coordination of the several elements of the local comprehensive plan. The *Water Element* is being coordinated with other elements of the *Countywide Comprehensive Plan* in terms of land use, population projections, environmental constraints, and financial resources. This element is also being coordinated with the other water resource elements: wastewater, drainage, and solid waste. This

coordination and cooperation with the water agencies developing and planning water systems for Pinellas County. These include:

The West Coast Regional Water Supply Authority
The Pinellas County Water System
The St. Petersburg Water Department
The Clearwater Water Department
The Dunedin Water Department
The Belleair Water Department

Water Policy Coordination

The state law requires coordination of the local comprehensive plan with the comprehensive plans of adjacent municipalities, counties or region, and the state comprehensive plan.

To further the intent of the required coordination the water supply policies proposed in the recommendations of this plan element have been reviewed in relation to the proposed policies in the following documents.

- Tampa Bay Regional Planning Council, *Future of the Region*, June 1977
- Southwest Florida Water Management District, *Water Use Plan, 1978* (Preliminary)
- The Florida Department of Administration, Division of State Planning, *Water Element, The Florida State Comprehensive Plan, 1977*

The water supply related policies from these documents are included in the Appendix, of this report.

Water Element – State Comprehensive Plan

The recommendations in this element were reviewed in relation to the water supply policies of the [*Florida*] *State Comprehensive Plan, Water Element* and were generally found to be in conformance and agreement.

One policy in particular will have a significant impact on comprehensive planning for Pinellas County. This is water Policy #35 which states (in part) the following:

> Utilize local water resources to the greatest degree that is economically and environmentally feasible before considering inter-district, inter-basin, and other large-scale transfer of water. Subject to reasonable regulation, proposals

for the transfer of water should be reviewed and evaluated by appropriate state, regional, and local agencies having jurisdiction. The determination process, as required by law, should include a least the following minimum criteria to determine whether or not the proposed transfer is in the overall public interest.

(A) A comprehensive water conservation, reuse, and management program should be initiated in the area of need.

(B) A complete analysis of environmental impacts, the present and future water needs of potential supplying areas, and other impacts of water transfer should be conducted and environmental and economic costs estimated for both the supply and receiving areas.

(C) A comprehensive investigation should determine all costs and benefits for both the supply and receiving areas.

(D) Once all costs and benefits have been quantified to the greatest practical degree, equitable financing of transfers should be developed to insure that environmental and other costs are fully recognized and equitably financed.

(E) Evaluation and regulatory procedures should avoid the use of artificial boundary or quantity restraints but, rather, should evaluate each case on the basis of its effect on water resources and the overall public interest.[1]

This policy requires coordination of all elements of the comprehensive planning process in order to insure an adequate water supply for the present and future population of Pinellas County. This is being done in the *Countywide Comprehensive Plan* in which the major elements [of] land use, conservation, transportation and parks and open space have continuously been coordinated with the water resources elements during their development.

Water Use Plan–1977 & Preliminary Plan–1978, Southwest Florida Water Management District

The recommendations of the *Pinellas County*[*wide*] *Water Element* were reviewed in relation to the proposed policies of the district plan and were found to be in agreement in principle. It was not necessary to correlate existing facilities information, water demand projects or proposed plan strategies due to varying levels of detail and different time horizons. For example, the target year for the SWFWMD (Southwest Florida Water Management District) water demand projects is 2020, while the year 2000 is being used in the *Countywide Comprehensive Plan* to project public facility needs.

Future of the Region, Regional Comprehensive Plan Guide, Tampa Bay Regional Planning Council

The recommendations of the *Pinellas County*[*wide*] *Water Element* were reviewed against the policies and guides from these documents that impact on water supply planning. The recommendations were found to be in conformance with the Tampa Bay Regional Council water supply plan guides and policies.

Historical Background

Pinellas County is a peninsula mostly separated from the mainland by the salt waters of Tampa Bay on the east meeting the Gulf of Mexico on the west. The county is 40 miles long and varies in width from 10 miles to only 4 miles at the "neck" of the county. These basic features of Pinellas County are such that it never had water resources to maintain a large metropolitan population as has developed in the area. This fact was known in the 1920s when the City of St. Petersburg wells began to produce poor quality water. After studying the problem, the city decided to go to a better water source. In 1940, it purchased the Cosme-Odessa wellfield in Hillsborough County and the Section 21 land for future wellfield development. The Cosme-Odessa wellfield was developed in 1952, the Section 21 wellfield in 1962, and the South Pasco County wellfield in 1972. (See Figure 7 for the wellfield locations.)

The Pinellas County water system was developed in 1935 to supply water to the Gulf beaches. The original water supply was treated surface water from Walsingham and Taylor Reservoirs. Later wells in Clearwater area were added to the system. As population growth continued, the Pinellas County Water System realized as had St. Petersburg that the peninsula water sources would not be adequate. The Eldridge Wilde wellfield in the corner of northeast Pinellas and northwest Hillsborough was leased for development. It was put into operation in 1956. The surface water treatment was phased out and the wells in the Clearwater area were turned over to that city.

After the heavy annual rainfall and flooding of 1959 and 1960, this area had entered an extended drought period in which the water demands were continuing to grow rapidly. The Southwest Florida Water Management District (SWFWMD), which was established by state law in 1961 as a flood control district, was given the responsibility to regulate wellfield pumping. SWFWMD had the responsibility to formulate a district water plan element as part of the [*Florida*] *State Water Plan*.

Water requirements grew rapidly in the early 1970s, as a result of the population growth in the greater Tampa Bay area. Controversy between counties and cities occurred over ownership and control of water resources. SWFWMD was increasingly concerned with the proper management of the water resources in the area due to the increasing water demand from existing wellfields and their hydrologic and environmental impact. Political consensus arose that local governmental jurisdictions could not solve this regional water supply problem.

In August 1973, the City of St. Petersburg, Pinellas County, and Pasco County established the Cypress Creek Management Board to construct the Cypress Creek wellfield.

During this interim period, the Pinellas County Water System developed the East Lake Road wellfield which was designed as a peak facility to augment supplies for Eldridge-Wilde prior to the development of Cypress Creek.

In October 1974, following the passage of state enabling legislation, the West Coast Regional Water Supply Authority was formed. The five members are Hillsborough, Pinellas County, Pasco County, and the cities of St. Petersburg and Tampa (see Figure 1, Water Agency Boundaries).

In January 1977, the West Coast Regional Water Supply Authority assumed operation and control of the Cypress Creek wellfield with a water production capacity of 30 mgd [million gallons per day].

While the Cypress Creek wellfield was designed to provide sufficient regional water until the early 1980s, additional facilities have been planned through 2020. The portion of the regional plan through the year 2000 is given in this report.

[Figure 1, Water Agency Boundaries]

Summary of Findings and Recommendations

Summary of Findings

1. Pinellas County has limited fresh water resources due to the low pumping capacity of the local artesian aquifer wells. Wells in Pasco County can produce 15 times the water as those still producing in coastal Pinellas County. There are no productive municipal wells south of SR 686 (Bay Drive) in Pinellas County.

2. The regional approach to water supply is believed to be the best for the entire Tampa Bay region.

3. By the year 2000, Pinellas County will need 133 million gallons per day (mgd) of water on the average. On peak days, the county will need 213 mgd. These are increases of 40 mgd average and 64 mgd peak demand. Implementation of West Coast Regional Water Supply Authority plans in addition to the continued water production of existing water systems in Pinellas County should insure this projected water demand is met.

4. The greatest percentile water demand increases will occur in the northern undeveloped sectors of the county. These sectors are all within the service area of the Pinellas County Water System except, Oldsmar. The planning sector, which includes St. Petersburg, will have the greatest absolute total increase of the 12 planning sectors. This increase is 8 mgd average and 12 mgd peak water demand.

5. Studies indicate groundwater to be the best source of potable water for Pinellas County through the year 2000.

6. The shallow aquifer in Pinellas County contains significant reserves of water, which could be used more readily as a source of non-potable water.

7. It is estimated, on the average, 25% of the domestic use of potable water is for lawn sprinkling. This is estimated to be up to 48% of water use during the dry spring months.

8. Much of Pinellas County is suitable for the use of shallow well water for lawn irrigation.

9. It is projected that 10.3 mgd of potable water could be saved during peak demand periods of spring if all new single-family construction between 1976–2000 required shallow wells for lawn irrigation.

Summary of Recommendations

The Summary of Recommendations include[s] program recommendations for the major water systems serving Pinellas County through the year 2000. The summary also includes policy recommendations, which have been developed, as an outgrowth of the inter-relation of water supply and other major elements of the comprehensive plan (i.e., land use and conservation). The recommendations are listed under these two headings.

Program Recommendations

The following program recommendations are located on the map in Figure 2.

1. A regional interconnect transmission line is proposed, interconnecting the Tampa Water System, Cypress Creek, West Pasco, and all Pinellas County water systems. This will have the capacity to transfer up to 30 mgd during periods of localized water demand.

2. The Water Supply Authority proposes to expand the Cypress Creek wellfield from 30 mgd to 45 mgd to meet some of the future regional water demands.

3. The Cross Bar site is proposed as the next regional wellfield to meet water demand through 1985. The first stage is for 15 mgd to be completed by 1980, and the second stage is to be completed by 1985, with a total production of 30 mgd. The combined capacity of the two regional wellfields will be 60 mgd average and 75 mgd at peak flow.

[Figure 2, Summary of Recommendations Water Supply Element]

4. The Water Supply Authority has proposed that two additional wellfields be developed between 1985-2000. These are estimated to have a total capacity of 30 mgd. One is to be located east of the Cross Bar site in Pasco County; the other is proposed to be located in south Hernando County to serve northwest Pasco.

5. The Pinellas County Water System has five-year programs to build two large transmission mains to better serve the developing north and central sections of its service area.

6. Associated expansion programs include improvements to: (a) the Keller treatment plant, (b) expansion of the North Booster Station capacity, (c) construction of a beach storage and pumping station at Capri Isle in Treasure Island, (d) an intertie with St. Petersburg at Bayway Isles.

7. The St. Petersburg Water System has long-range plans to meet their water demands through the year 2000. The improvements include increased pumping capacity to the Oberly and Washington Terrace Stations, additional storage reservoirs, expansion of the Cosme water treatment plant, and improvement of the water softening system.

Policy Recommendations

1. Major water system jurisdictions should establish water conservation programs which would investigate and implement primary conservation elements such as non-potable water sources, conservation devices, public education and regulation and graduated water rates into a coordinated and comprehensive program.

2. All new residential dwelling units should use non-potable water sources for lawn irrigation in areas where these sources are feasible and do not have a detrimental effect on aquifer recharge potential.

3. Local comprehensive plans should be consistent with the objective of protecting groundwater resources.

4. Local water suppliers and affected regional agencies should continue to coordinate their water resource planning and development efforts within the county and Tampa Bay region.

5. Local governments that supply water to their residents should establish graduated water rates to discourage the high use of potable water, particularly for lawn irrigation.

6. Water system inter-tie feasibility studies should be made to investigate the possible advantages of interconnections between the Belleair and Dunedin water systems with the Pinellas County Water System.

Analysis of Existing Conditions

Water Source – The Floridan Aquifer

The limestone bedrock of southwest Florida, which comprises the Floridan Aquifer, is one of the most productive sources of potable water in the world. Due to the storage capacity and the high transmissivity of the limestone, the aquifer serves as a unique underground reservoir. (See *Conservation Element* of the [*Pinellas Countywide*] *Comprehensive Plan*.) Pinellas County's entire potable water supply is derived from artesian wells, which draw water from the Floridan Aquifer.

However, productive water resources are unevenly distributed within the aquifer due to local hydrologic conditions. Because most of Pinellas County is a coastal peninsula, water resources are quite limited in contrast with the adjacent inland portion of Florida. The limitations relate to the quantity and quality of the water available and the artesian pressure within the aquifer.

Throughout the aquifer, a lens of freshwater floats on dense saltwater. This freshwater lens varies in thickness from zero at the coastline to a few hundred feet several miles inland and to more than 1,000 feet 10 miles inland (see Section A-A′, Figure 3). In the 75% of Pinellas County, which is coastal peninsula, the lens of freshwater is rather narrow ranging from 100 feet to 300 feet in the southern and northern sections. Only the non-peninsula northeastern corner of the county contains significant freshwater reserves in excess of 1,000 feet. Figure 3 depicts hydrogeologic cross sections of Pinellas County indicating the thickness of the freshwater lens in different locations.

[Figure 3, Hydrogeologic Cross Sections - Pinellas County, Florida, East to West]

Distribution of Water Resources

Three municipalities maintain dispersed low yield wellfields on the peninsula; Belleair, Clearwater, and Dunedin. All of the dispersed wellfields are located north of a diagonal line running from the intersection of Ulmerton Road (SR 688) and Indian Rocks Road (SR 697) through Oldsmar. Below this line, the Floridan aquifer is generally brackish having a chloride content greater than 250 milligrams per liter (mg/l). The location of the diagonal line is influenced by Tampa Bay which acts as a barrier to the lateral artesian flow from inland areas. The directional orientation of the line is influenced by the southwest underground flow of water and pressure gradient emanating from the Cypress Creek potentiometric high in Pasco County[2] (see Fig. 4).

The artesian pressure or potentiometric surface of the aquifer significantly affects groundwater productivity. Along the coast, artesian pressure is naturally low and in the southern portion of the Pinellas peninsula it is especially low. In areas of low artesian pressure, wells installed close to the fresh/saltwater interface risk saltwater encroachment.

To protect against saltwater encroachment, peninsula wellfields must be widely dispersed and pumping alternated frequently. The safe yield of a typical peninsula well on the days when it is operating [in] ranges between .2 mgd in Belleair and central Clearwater to .5 mgd in the Countryside area.[3] A .2 mgd yield is sufficient water to supply the needs of 1,600 persons on an average day.

[Figure 4, Potentiometric Surface of Floridan Aquifer]

Well yields increase dramatically moving inland where the freshwater reserves are greater. A typical well in the Eldridge Wilde wellfield in the northeastern corner of Pinellas County averages 1 mgd. Further inland, in the new South Pasco and Cypress Creek wellfields located in Pasco County, a single well yields 3 mgd. A 3 mgd yield is sufficient water to supply the needs for 24,000 persons on an average day.

The uneven distribution of potable water in the Floridan Aquifer has resulted in Pinellas County's growing dependence upon water importation from inland wellfields. Figure 5 depicts total Pinellas water production from 1970 through 1977 by geographical areas. The data indicates a growing dependence upon mainland wellfields in Hillsborough and Pasco Counties. Their contribution increased from 46.6% of total supply in 1970 to 52.6% in 1977. Figure 5 indicates that the peninsular wellfields increased as a percentage of the total water production through 1975, then have decreased slightly since Cypress Creek began production in 1976. The northeast Pinellas County area has remained rather steady in total production but has also decreased as a percentage of the total production since 1973. This has been due in part to regulation of the Eldridge-Wilde wellfield by the Southwest Florida Water Management District.

Figure 5
Pinellas County Wellfields Production By Geographical Area, 1970-1977

	Dispersed Peninsula Wellfields**		Northeast Corner Of County***	
Year	**Production (mgd)***	**Percent**	**Production (mgd)***	**Percent**
1970	6.1	10.0%	26.5	43.4%
1971	7.4	11.1%	29.9	44.5%
1972	9.4	12.0%	35.0	44.5%
1973	10.1	12.7%	33.7	42.6%
1974	11.1	14.0%	33.3	42.2%
1975	11.5	14.5%	33.0	41.5%
1976	10.6	12.4%	34.9	40.9%
1977	11.6	12.3%	33.0	35.1%
	Pasco and Hillsborough Counties****		**Total Pinellas County All Sources**	
Year	**Production (mgd)***	**Percent**	**Production (mgd)***	**Percent**
1970	28.5	46.6%	61.1	100%
1971	29.9	44.5%	67.2	100%
1972	34.2	43.5%	78.6	100%
1973	35.4	44.7%	79.2	100%
1974	34.5	43.7%	78.9	100%
1975	35.0	44.0%	79.5	100%
1976	39.8	46.6%	85.3	100%
1977	49.5	52.6%	94.1	100%

* Million Gallons Per Day
** Includes the dispersed wellfields of Clearwater, Dunedin, and Belleair
*** Includes Pinellas County's Eldridge Wilde and the East Lake Tarpon wellfields.
**** Includes the City of St. Petersburg wellfields, Cosme Odessa, Section 21, South Pasco and the West Coast Regional Water Authority's Cypress Creek.

Source: Pinellas County Planning Department, 1977

The Wellfield System

Pinellas County's water supply is produced by five governments, which operate wellfields. These are: Pinellas County, St. Petersburg, Clearwater, Dunedin, and Belleair. The three largest systems (Pinellas County, St. Petersburg, and Clearwater) supply 95 percent of the county's population and are interconnected, allowing water transfers to occur regularly as needed. The West Coast Regional Water Supply

Authority assumed operation of the Cypress Creek wellfield in January 1977 and became one of the major water suppliers for Pinellas County.

Figure 6 indicates wellfield production by government from 1970-1977. As indicated, water production increased 28 percent over the five-year period; however, virtually all of the increase occurred between 1970 and 1972. The leveling off of production between 1973 and 1975 resulted principally from pumping controls imposed by the Southwest Florida Water Management District[4] as a part of its regional water management program. Those controls produced sprinkling bans and water conservation measures, which have kept water production at a stabilized rate of approximately 79 mgd in spite of continued population growth estimated at 60,000 persons (i.e., 1973-1975). During the same period, Pinellas County's average per capita use of the public water supply declined from 116 gallons per day to 107 gallons per day.

A noteworthy exception to the trend of stabilized water production was the significant expansion of the City of Clearwater's dispersed peninsula wellfield system. This was due to the city's annexation and wellfield expansion in the Countryside area, which is within the Coachman potentiometric high, an area of high wellfield productivity for peninsular Pinellas County. Following is a description of the wellfields operated by each jurisdiction. (See Figure 7 for the locations of wellfields.)

Figure 6
Pinellas County Wellfields Production By Supplier (mgd)*, 1970-1977

Year	Pinellas County	St. Petersburg	Clearwater	Dunedin	Belleair	Total County
1970	27.3	28.5	2.6	2.6	.8	61.8
1971	29.9	29.9	3.6	2.9	.9	67.2
1972	34.9	34.2	4.9	3.5	1.0	78.5
1973	33.7	35.5	5.9	3.2	.9	79.2
1974	33.4	34.5	6.6	3.5	.9	78.9
1975	33.0	36.1	7.3	3.3	.8	80.5
1976	41.6	33.1	6.6	3.2	.8	85.3
1977**	44.7	36.1	6.6	3.9	1.1	92.4

* Million Gallons Per Day
** Through June, 1977

Source: Pinellas County Planning Department, 1977

The City of St. Petersburg Wellfields

The second largest supplier of water in Pinellas County is the City of St. Petersburg, which operates three wellfields. These are Cosme Odessa, Section 21, and South Pasco. A fourth wellfield, Cypress Creek, began production in 1976, and has been developed jointly by St. Petersburg and Pinellas County. It is being operated by the West Coast Regional Water Supply Authority. Figure 8 indicates annual production of the three St. Petersburg wellfields from 1970-1977. Figure 9 contains basic wellfield statistics for the three St. Petersburg wellfields.

A noteworthy redistribution in St. Petersburg water production occurred in 1973 with the start up of the new South Pasco wellfield. The Southwest Florida Water Management District ordered dry weather production levels at Cosme Odessa and Section 21 wellfields cut back approximately 25 percent in phase with the opening of the new field. The net result was that although the South Pasco wellfield had a consumptive use permit for 20 mgd it actually produced a net increase of 11.5 mgd for the system.

The ordered cut back in production at Cosme Odessa and Section 21 resulted from SWFWMD's contention that Pinellas County maintains too many wellfields clustered near its northeast boundary on both sides of the Pinellas-Hillsborough County line. The four wellfields in question, St. Petersburg's Cosme Odessa and Section 21 and Pinellas County's Eldridge Wilde and East Lake are located within a corridor 13 miles long and 7 miles wide.

[Figure 7, Wellfields Serving Pinellas County]

In the late 1960s, residents of northwest Hillsborough County voiced complaints over dying vegetation (cypress heads and other water sensitive vegetation) and declining lake levels attributed to pumping wellfields. The City of St. Petersburg took steps to remedy the situation by installing jet pumps and deepening wells free of charge for residents whose shallow wells were affected. In addition, several small lakes in the area were filled using a portion of the artesian water production. Further, a portion of Section 21 was leased to Hillsborough County for use as a park.

St. Petersburg began cutting production at Section 21 in the early 1970s. Reduced production at Section 21 caused increased reliance on production from Cosme Odessa. Water production began at the South Pasco wellfield in 1973. The production from this well enabled St. Petersburg to reduce the production at Cosme Odessa and Section 21.

Figure 8
City of St. Petersburg Wellfields Production (mgd)*, 1970–1977

Year	Cosme Odessa	Section 21	South Pasco
1970	11.0	17.5	Undeveloped
1971	12.8	17.1	Undeveloped
1972	17.6	16.6	Undeveloped
1973	10.8	12.9	11.7
1974	8.6	9.0	16.9
1975	9.8	9.5	15.7
1976	9.1	8.9	15.1
1977**	11.3	10.0	16.5

* Million Gallons Per Day Averaged for the year.
** Through June, 1977

Source: St. Petersburg Water Department

Figure 9
City of St. Petersburg Wellfield Data

	Cosme Odessa	Section 21	South Pasco
Area	624 Acres	589 Acres	600 Acres
Producing Wells	32 Wells	6 Wells	8 Wells
Average Well Depth	300 Feet	350 to 450 Feet	700 Feet
Typical Production Per Well	.4 mgd*	1.5 mgd	3.0 mgd

* Million Gallons Per Day

Source: St. Petersburg Water Department, 1977

St. Petersburg has been in a relatively better situation than Pinellas County's other major suppliers regarding the quantity of water produced versus the demands on the system. As a result, St. Petersburg has loaned water to [the] Pinellas County Water System during the 1974, 1975, and 1976 dry seasons as follows:

1974 15.2 million gallons
1975 200 million gallons
1976 200 million gallons

Pinellas County has repaid St. Petersburg the borrowed water since the Cypress Creek wellfield began production in 1976.

Pinellas County Water System Wellfields

Pinellas County was operating three well fields in 1976: Eldridge Wilde, East Lake and Cypress Creek. The latter was developed as a cooperative venture with St. Petersburg and now is operated by the West Coast Regional Water Supply Authority. The oldest wellfield (Eldridge Wilde) began production in 1956; the East Lake wellfield was added as an auxiliary wellfield principally to provide additional dry weather capacity. The new Cypress Creek wellfield was brought into production in 1976.

Figures 10 and 11 identify water production and wellfield data from 1970 to 1977. At the main Eldridge Wilde wellfield, water production increased 32% between 1970 and 1972. With the imposition of pumping controls by SWFWMD, production stabilized between 1972 and 1974 and then declined slightly in 1975 with the initiation of the East Lake wellfield. The present SWFWMD pumping limitation of 35.2 mgd yearly average has not significantly reduced production at the Eldridge Wilde wellfield.

The East Lake wellfield is located aside Brooker Creek, Lake Tarpon's only freshwater source. For this reason and because the East Lake wellfield is closer to the saltwater interface than the other high yield wellfields, it is under close scrutiny by environmentalists and all regulatory and monitoring agencies as well as the Pinellas County Water System to insure the wellfield remains usable.

The estimated wellfield draw down in the Brooker Creek basin is shown on the map in Figure 11A.[5] The concentric circles indicate the lowering of the water table and the potentiometric surface of the aquifer in the wellfield locations. The principal concern is protection of the aquifer. Pinellas County developed the East Lake wellfield principally as an interim measure prior to the development of the Cypress Creek wellfield. Water production at the East Lake wellfield is restricted to 5 mgd during the peak demand dry season.

The Cypress Creek wellfield is located in a swamp area of Pasco County approximately 12 miles northeast of the Pinellas County Line. SWFWMD is committed to construct flood detention structures in the wellfield, which will improve its aquifer recharge potential; a similar proposal is being considered in the immediate recharge area of the East Lake wellfield;[6] in 1976, the wellfield was approved for 10 mgd test production. The SWFWMD *Water Use Plan*, 1977 draft, designated the Cypress Creek wellfield for an ultimate production level of 30 mgd.

Figure 10
Pinellas County Water System
Wellfields Production (mgd)*, 1970–1977

Year	Eldridge Wilde	East Lake	Cypress Creek
1970	26.5		
1971	29.9		
1972	35.0		
1973	33.7		
1974	32.9	.4	
1975	30.8	2.4	
1976	32.9	2.0	6.7 (Began 4/76)
1977	29.9	2.1	10.4
* Million Gallons Per Day			

Source: Pinellas County Water System, 1978

Figure 11
Pinellas County Water System Wellfields Data

	Eldridge Wilde	East Lake
Acreage	2,500	1,120
Producing Wells	56 Wells	8 Wells
Average Well Depth	375 Feet	125–335 Feet
Typical Production Per Well	1.0 mgd*	0.2 mgd
* Million Gallons Per Day		

Source: Pinellas County Water System, 1978

In April of 1976, Pinellas County purchased the 8,060-acre Cross Bar Ranch in Pasco County for future development as a major wellfield. As indicated on Figures 4 and 7, the wellfield is in a high potentiometric surface area with conditions comparable to those found at the South Pasco and Cypress Creek wellfield[s].

[Figure 11A, Wellfield Drawdowns – Estimated]

The City of Clearwater Dispersed Wellfield

The City of Clearwater operates the largest dispersed wellfield system on the Pinellas peninsula. Figure 12 indicates water production from 1970–1977. Most noteworthy was the rate of expanded production, which increased 181%, and the reduced dependence on water transfers from Pinellas County, which provided 73% of Clearwater's water in 1970 and 35% in 1975. As indicated in Figure 13, nine additional wells were in operation by July of 1976. These wells increased Clearwater's year-round production rate to over 10 mgd and will for the short term, make Clearwater nearly self-sufficient in water production.

This rapid expansion in water production was fostered by annexation and Clearwater's extension of its wellfield system northward on the Pinellas Ridge to the Countryside area. The Pinellas Ridge from Coachman Road (SR 590A) to Curlew Road (SR 586), sometimes referred to as the "Coachman High," has water production capabilities superior to most areas of peninsular Pinellas County.

The aquifer recharge of the Clearwater and Dunedin wellfields along the Pinellas Ridge is very important for long-term water resource protection. The quantity and quality of water available for recharge is relate to [the] intensity of development. These relationships are dealt with in detail in the [*Pinellas Countywide*] *Comprehensive Plan Land Use* and *Conservation* elements.

The Clearwater wells are tested for chlorides once monthly and wells near the coast are pumped at low levels and are alternated frequently.

Dunedin Wellfields

Dunedin has been operating 18 wells since 1971. Water production averages 4 mgd on a year's average basis and increases to 5 mgd in the dry growing season, April and May. The actual water demand in Dunedin in this period is about 6 mgd; therefore, Dunedin has instituted sprinkling restrictions on an annual basis.

Dunedin has recently completed five additional wells and has negotiated five additional sites and plans to have a total of ten new wells in production in the near future. Production expectations, for the ten new wells, are an additional 6 mgd. With capacity, Dunedin will have wellfield sufficiency in the immediate future; however, it plans a tie-in at the county transmission line for emergency use.

Figure 12
City of Clearwater Wellfields Production (mgd)*, 1970–1977

Year	Clearwater Dispersed Wellfield	Purchased From Pinellas County	Total Water Supplied	Percentage Purchased From Pinellas County
1970	2.63	6.86	9.49	73%
1971	3.63	7.00	10.63	66%
1972	4.85	7.22	12.07	60%
1973	5.92	5.49	11.41	48%
1974	6.62	4.77	11.39	42%
1975	7.31	3.90	11.21	35%
1976	6.55	4.96	11.45	43%
1977	6.55	7.36	13.90	52%
* Million Gallons Per Day ** Through June, 1977				

Source: Clearwater Water Department

Figure 13
City of Clearwater Wellfields Data

	City of Clearwater Dispersed Wellfields
Acreage	Clearwater City Limits
Producing Wells	25
Average Well Depth	270 to 300 Feet
Typical Production Per Well	.2 - .5 mgd

Source: Clearwater Water Department

The United States Geological Survey has monitoring wells in the Dunedin area. Water samples from Dunedin wellfields indicate that the salinity is averaging between 34 and 40 parts per million. Salinity must exceed 250 parts per million in order to taste the salt in the water. Wellfield data is shown in Figure 14 and 14A.

To serve the new wellfield, a new pump facility and treatment plant with a 2 million gallons storage capacity has been constructed.

Figure 14
City of Dunedin Wellfield Data

	Dunedin Dispersed Wellfield
Acreage	Dunedin City Limits
Producing Wells	18
Average Well Depth	96–290
Production Rate Per Well	0.26 mgd*
* Million Gallons Per Day	

Source: Dunedin Water Department, 1977

Figure 14A
City of Dunedin Wellfield Production (mgd)*, 1970–1977

Year	Average Production (mgd)	Peak Production (mgd)
1970	2.63	5.63
1971	2.88	5.38
1972	3.54	6.70
1973	3.23	6.20
1974	3.50	6.01
1975	3.29	5.99
1976	3.25	4.20
1977**	3.88	5.16
* Million Gallons Per Day ** Through June, 1977		

Source: West Coast Regional Water Supply Authority

Belleair Wellfields

The Belleair wellfield consists of six wells dispersed within the City of Belleair. The wells are all low yield coastal wells. The pumping of the wells is limited to 0.1 to 0.2 mgd to minimize saltwater intrusion. The City of Belleair wellfield production for the years 1970 to 1977 is given in Figure 14B.

Figure 14B
City of Belleair Wellfield Production (mgd)*, 1970–1977

Year	Average Production (mgd)	Peak Production (mgd)
1970	0.79	2.14
1971	0.91	2.23
1972	1.02	2.09
1973	0.93	2.32
1974	1.25	2.72
1975	0.85	1.96
1976	0.81	1.85
1977**	1.12	2.93
* Million Gallons Per Day ** Through June, 1977		

Source: West Coast Regional Water Supply Authority

Water Distribution Systems of Pinellas County

There are two major water distribution systems in the county. These are the Pinellas County Water System and the St. Petersburg Water System. They supply 86% of the water for the entire county. The cities of Clearwater, Dunedin, and Belleair have both water supply and distribution systems. The cities of Tarpon Springs, Safety Harbor, Oldsmar, Pinellas Park, and Gulfport have only water distribution systems.

Pinellas County Water System

The Pinellas County Water System produces and distributes potable water both on a wholesale and retail basis throughout the county. Its retail average demand is presently about 30 million gallons per day (mgd). It sells water retail in all the unincorporated areas and in the following municipalities:

Belleair Beach
Belleair Bluffs
Belleair shores
Indian Rocks Beach
Kenneth City
Largo
Madeira Beach
North Redington Beach
Redington Beach
Redington Shores
Treasure Island
Seminole

The Pinellas County Water System also supplies water on a wholesale basis to Clearwater, Pinellas Park, Safety Harbor, and Tarpon Springs. The wholesale usage averages about 14 to 15 mgd.

Water Treatment and Transmission

The Pinellas County Water System treats its raw water at the S. K. Keller plant located at the Eldridge Wilde wellfield. The Keller treatment and pumping facility consists of two water treatment plants with internal power sources and aeration and chlorination processing equipment. The combined treatment capacity is 75 mgd. The pumping capacity of this facility is estimated to be 83 mgd.

Figure 15 shows the major transmission lines and water storage areas in Pinellas County. Three transmission mains run from Keller Pumping Station to the North Booster Station near U.S. 19 and SR 580 (Main Street). From the booster station, one 30-inch and one 42-inch line furnish water to the distribution system that extends east to Safety Harbor and south to Ft. DeSoto.

Storage and Booster Stations

The Pinellas County Water System has four elevated storage tanks with a combined capacity of 1.7 million gallons, and four ground storage facilities with 35 million gallon capacity. These tanks usually provide water at sufficient pressure over its extensive service area. The storage not only provides water for normal use but also provides a reserve for times of peak demand, and for fire defense needs. The chlorination level is monitored at the storage tanks by a telemetry system so that additional chlorine can be automatically added when required.

[Figure 15, Major Water Transmission Lines & Water Storage Areas In Pinellas County]

St. Petersburg Water Distribution System

The St. Petersburg Water System distributes potable water on both a wholesale and retail basis. It sells water retail to the residents of St. Petersburg, South Pasadena and, a few unincorporated locations in its service area. The St. Petersburg Water System also supplies water on a wholesale basis to the cities of Gulfport and Oldsmar.

Water for the St. Petersburg Water System is pumped from its three wellfields to the Cosme Odessa Treatment plant and Pumping Station. This is the most complex of the water treatment systems because of its size and because it includes a softening process.

The raw water goes through four stages of treatment. These are aeration, lime softening, filtration, and chlorination. The treatment capacity of the Cosme plant is 41.3 mgd. The hardness of the raw water is about 220 parts per million (ppm). The treated water has a hardness of 100 ppm.

Transmission Mains

There are two transmission mains from the Cosme treatment plant, which have a capacity of 65 mgd. The locations of these mains are shown in Figure 15. The 36-inch line serves the Washington Terrace Pumping Station at 28th Street and 66th Avenue North. The 48-inch line serves the Oberly Pumping Station at 62nd Avenue and 66th Street North.

Storage Capacity

The St. Petersburg Water System has eleven water storage tanks and two booster-pumping stations. There is a total capacity of 13.5 million gallons [mg] storage at the Washington Terrace Station and 10 million gallons ground storage at the Oberly Station. There are three elevated storage tanks supplying water reserve each with a capacity of 0.5 million gallons. The current total storage capacity is 31.3 mg with an additional 7 mg under construction.

County/City Tie-In

The St. Petersburg Water System is tied into the Pinellas County Water System at two locations for mutual assistance in times of emergency. One is at 54th Avenue and 64th Street, which is a 12-inch main; the second is a 24-inch tie-in at Main Street (SR 580) and McMullen-Booth Road (SR 593). For two years before Cypress Creek began operating in 1976, St. Petersburg had transferred water to the county system during the spring peak demand months. Since then, all the borrowed water has been repaid to St. Petersburg.

Clearwater Distribution System

The Clearwater Water System has 27 active wells located throughout a dispersed wellfield within its incorporated boundaries. Ten of the wells are connected to individual storage tanks; five more wells will be directly connected to storage tanks in the near future. Wells not linked to a storage tank have chlorination units at the well pumps. Water pumped to the storage tanks is both pre-chlorinated and post-chlorinated as it leaves the tank for distribution. There are six tie-in connections with the Pinellas

County Water System. The Clearwater system estimates it distributes water to about 81,000 people.

Water Storage

The water is stored in ground and elevated storage tanks at key locations throughout the distribution area. The total storage capacity of the system is 13.3 million gallons. There are three 1 mg elevated storage tanks and one standpipe tank with a capacity of 0.3 million gallons. The system has two ground storage tanks each with a capacity of 5 million gallons. Two additional ground storage tanks are about to come on line. This will increase the total storage capacity to 23.3 mg.

Dunedin Water Distribution System

The Dunedin Water System's two treatment plants are located on CR 1 at San Christopher and CR 70 and Evans Road. The system has 18 active wells in a wellfield dispersed throughout the city. The raw water is pumped to the system's storage tanks for treatment. Each treatment plant has a 2 million gallon aerator-storage tank where the water is aerated and chlorinated. The system also has a 1 million gallon elevated storage tank at Curlew Road and U.S. 19A and a 0.5 million gallon elevated tank at San Christopher and Ruth Street. The total storage capacity is 5.5 million gallons. A tie-in with the Pinellas County Water System will be necessary in five to ten years as an emergency backup source and eventually to supplement the limited capacity of the city's wellfields.

Belleair Water Distribution System

The Belleair Water System consists of six wells dispersed within the incorporated area of Belleair. The raw water receives chlorination and softening in the treatment process. The system has a 250,000 gallon ground storage tank and a 350,000 gallon elevated tank. It presently serves a population of 3,800 people with no immediate plans for expansion. The City of Belleair has a very limited potential of population growth.

All water pressure for the distribution system comes from the elevated tank which provides about 60 pounds per square inch pressure to the customers. The water softening process softens the water to 100 ppm hardness using the lime method with sand filtration. The water PH is 8.0 after softening. The distribution system is quite old. The elevated tank was built in the 1920s and recently been repaired. The Belleair Water System is connected to the Pinellas County Water System for use only during emergency need for water pressure and flow.

Countywide Water Distribution

All the water systems in Pinellas County were surveyed to map their areas of water distribution. The major information derived from this survey is shown in Figure 16. This map designates the water systems within the county and delineates their current service areas and their areas of actual water distribution. Figure 16 is a representation of the present boundaries of respective water service areas in Pinellas County; as such, it is only a depiction of existing conditions as of December 1978. The cities that buy water wholesale from the Pinellas County Water System and St. Petersburg Water System have their own water distribution systems. These are differentiated from the county or St. Petersburg retail distribution systems on the map. The survey also included large developed areas which are on private well and distribution systems. This information is included on the map. The final survey, information which is mapped, shows areas that have both private water systems and septic tanks. This combination of uses could possibly cause contaminated water supplies, depending upon the individual situations.

[Figure 16, Pinellas County Water Service Area]

Water Demand Projections

Pinellas County Population Projections, 1975-2000

The primary population projections used for the water demand projections are those prepared by the Pinellas County Planning Department and used throughout the *Countywide* [*Comprehensive*] *Plan* for population related projections.[7] These population projections are given in Figure 17.

Figure 17
Population Projections County Total, 1975–2000

County Total Population*					
1975	**1980**	**1985**	**1990**	**1995**	**2000**
744,870	811,900	872,850	926,650	999,140	1,063,560
* Permanent residents plus seasonal residents; does not include tourists					

Source: Demographic Report – 1978

The county has been divided into 12 Planning Analysis Sectors. These are shown on the map in Figure 18. The population has been projected in five-year increments for the years 1975–2000 in these planning sectors. This data is given in the table of Figure 19. The population distribution for the years of 1975 and 2000 is shown on the map following Figure 19.

[Figure 18, Planning Analysis Sectors]

Demand Criteria

Water demand projections are calculated from the projected population of an area and the estimated per capita consumption for the time in question. There are two primary water demand criteria: (1) average per capita water consumption, and (2) the peak day consumption estimates.

Figure 19
Population Forecasts By Planning Sectors

Planning Sector	1975	1980	1985	1990	1995	2000
1	13,440	15,128	17,266	19,522	24,982	29,878
2	2,696	11,235	14,781	21,017	31,472	39,327
3	13,733	22,467	26,151	30,293	37,545	43,479
4	33,549	35,770	38,297	40,936	43,823	46,623
5	11,406	12,897	14,198	16,391	20,005	23,528
6	110,837	113,178	123,826	132,232	141,801	150,441
7	89,169	102,060	114,510	119,507	123,425	126,285
8	7,463	8,915	9,809	11,370	14,045	16,613
9	85,140	88,038	93,404	98,915	105,928	112,365
10	78,701	79,990	85,723	90,991	97,304	103,252
11	278,014	299,477	308,750	317,352	329,906	342,369
12	20,722	22,745	26,135	28,124	28,899	29,400
Total	744,870	811,900	872,850	926,650	999,135	1,063,560

Source: Demographic Study - Pinellas County, Florida, 1978.

[Population Distribution, 1980 and 2030]

The per capita consumption and peak day estimates have been calculated for Pinellas County.[8] The per capita consumption for Pinellas County includes domestic consumption and water that is normally used for commercial, industrial, and institutional use. The average per capita consumption is obtained by dividing the total water production by the number of people served. It is expressed in gallons per capita per day (gpcd).

The peak day demand for a water system is the highest 24-hour water demand during a year. The peak day to daily demand ratio is calculated from production data and indicates the degree the peak demand of a water system exceeds its average demand.

The criteria per capita consumption and peak to average demand ratios are given in the table of Figure 20 for the major systems of Pinellas County.[9]

Figure 20
Water Consumption Rate Criteria

Water System	Per Capita Consumption (gpcd)	Peak/ Average Ratio
Pinellas County – Clearwater (averaged)	120	1.65
Dunedin – Belleair (averaged)	150	1.87
St. Petersburg	110–124*	1.50
The per capita consumption is estimated to increase from 110 gpcd in 1970 to 124 gpcd in the year 2020		

Source: West Coast Regional Water Supply Authority, 1977

Projected Water Demand

The table in Figure 21 indicates the projected water demand for Pinellas County between 1975 and 2000. The water demand is shown as average and peak per capita consumption. The criteria used are 125 gpcd average and 200 gpcd peak consumption, with a peak-to-average ratio of 1.6. The water demand projections have been made for the entire county and for the 12 planning analysis sectors. Each projection set is calculated by multiplying the respective population by the average demand criteria 125 gpcd to obtain the average demand for the area, and multiplying the population by the peak demand criteria 200 gpcd, for the peak demand for the area.

The West Coast Regional Water Supply Authority has also projected water demand for Pinellas County.[10] The table in Figure 22 shows these projections through the year 2000. This projection has the data categorized by the major water systems and the smaller systems of Dunedin and Belleair combined.

The two water demand projections in Figures 21 and 22 vary slightly for the period 1975 to 1985. This is due to the difference in the population projections used. The West Coast Regional Water Supply Authority used a composite of several population projections that were available while the population projections used for Figure 21 are those prepared by the Pinellas County Planning Department.

Summary Of Water Projections

The areas of significant projected water demand are those areas of projected large population increases. Between 1975 and the year 2000 the greatest percentile water demand increase will occur in the northern underdeveloped sector of the county. These include planning sectors 1, 2, 3, and 5, with water demand increases from 100 percent to 1500 percent. These sectors are all within the Pinellas County Water System jurisdiction, except Oldsmar. The total county average is an increase of 43 percent.

Planning Sector 11 (St. Petersburg) indicates the greatest absolute increase of water demand between 1975 and 2000. This is 8 mgd average and 13 mgd peak absolute increase in demand. The projected water demand increase is roughly proportional to the city size within each planning sector with the exception of Sector 9 which includes Seminole. Sectors 3, 9, and 2 indicate large demand increases due to the large amounts of undeveloped land and projected growth rates in these sectors.

Countywide, the projected increase in water demand is considerable, with a 40 mgd average and 64 mgd peak increase in demand. This indicates that by the year 2000 the water demand will increase by almost one-half over what it was in 1975. The projected water demand and demand increase between 1975 and 2000 is graphically depicted in Figures 23, 24, and 25.

Figure 21
Projected Water Demand For Pinellas County, 1975–2000 - In Million Gallons Per Day (mgd)*

Sector	1975		1980		1985		1990		1995		2000	
	Avg.	Peak	Avg.	Peak	Avg.	Peak	Avg.	Peak	Avg.	Peak	Avg.	Peak
1	1.68	2.69	1.89	3.03	2.16	3.45	2.44	3.90	3.12	5.00	3.73	5.98
2	.34	.54	1.40	2.25	1.85	2.96	2.63	4.20	3.93	6.29	4.91	7.86
3	1.72	2.75	2.82	4.48	3.27	5.23	3.79	6.06	4.69	7.51	5.43	8.70
4	4.19	6.71	4.47	7.15	4.79	7.66	5.12	8.19	5.48	8.76	5.83	9.32
5	1.42	2.28	1.62	2.58	1.77	2.84	2.05	3.28	2.50	4.00	2.94	4.71
6	13.85	22.17	14.15	22.64	15.48	24.77	16.53	26.45	17.73	28.36	18.80	30.09
7	11.15	17.83	12.76	20.41	14.31	22.90	14.94	23.90	15.43	24.69	15.79	25.26
8	.94	1.49	1.11	1.78	1.23	1.96	1.42	2.27	1.76	2.81	2.08	3.32
9	10.64	17.03	11.00	17.61	11.67	18.68	12.36	19.78	13.24	21.19	14.04	22.47
10	9.84	15.74	10.00	16.00	10.72	17.14	11.37	18.20	12.16	19.46	12.91	20.65
11	34.75	55.60	37.43	59.90	38.59	61.75	39.67	63.47	41.24	65.98	42.80	68.47
12	2.59	4.14	2.84	4.55	3.27	5.23	3.51	5.63	3.61	5.78	3.68	5.88
Total County	93.11	148.97	101.49	162.38	109.11	174.57	115.83	185.33	124.89	199.83	132.94	212.71

* Based upon per capita consumption standards of 125 gpcd (average and 200 gpcd peak)

Source: Pinellas County Planning Department, 1977

Figure 22
Future Municipal Water Demands For Pinellas County

Year	Pinellas County Water System		St. Petersburg and Oldsmar		Dunedin and Belleair		Total County	
	Avg. Day (mgd)	Peak Day (mgd)	Avg. Day (mgd)	Peak Day (mgd)	Avg. Day (mgd)	Peak Day (mgd)	Avg. Day (mgd)	Peak Day (mgd)
1975	41.42	68.33	33.59	50.38	4.97	9.29	79.98	128.00
1980	46.38	76.53	40.71	61.06	5.74	10.73	92.83	148.32
1985	54.09	89.25	42.72	64.08	6.40	11.97	103.21	165.30
1990	61.67	101.76	44.90	67.36	6.95	12.99	113.52	182.11
1995	68.62	113.22	47.37	71.06	7.35	13.75	123.34	198.03
2000	75.04	123.82	49.29	73.94	7.75	14.48	132.08	212.24

Source: "Regional Water Supply Needs and Sources," p 4-50, West Coast Regional [Water] Supply Authority, 1977

[Figure 23, Projected Water Demand By Planning Analysis Sectors, 1975]

[Figure 24, Projected Water Demand By Planning Analysis Sectors, 2000]

[Figure 25, Increase in Water Demand By Planning Analysis Sectors, 1975-2000]

Plan Formulation and Implementation

Regional Plan

The West Coast Regional Water Supply Authority has prepared a 40-year *Water Supply Master Plan* for the tri-county area of Pinellas, Hillsborough, and Pasco counties.[11] The plan is for the time period of 1980-2000 and is presented in two phases. Phase I is for the time period 1980-1985 and Phase II plan is for 1985-2020.

The projected water demand for Pinellas County between 1977 and 2000, the time frame of the *Comprehensive Plan*, is provided for in the *Regional Water Supply Plan*. The projected water demand increase for Pinellas County during this period is 64 mgd peak demand. This water demand increase has been provided for in the staged capacity expansions of the *Regional Plan*. The plan is regional in the fact as well as in name, and a "Pinellas County" part of the plan cannot be readily drawn from the plan. The plan has five planning areas within the three counties (see Figure 26). Pinellas County is included in the Pinellas-West Pasco planning area. The development of the plan for this planning area is separated for Phase I (1980-1985). (See map of Figure 27.) However, during Phase II through the year 2000, the planning areas become inter-related so that the *Water Supply Plan for Pinellas County* is an integral part of the *Regional Plan*. The map in Figure 28 shows the portion of the Phase II regional plan that deals with the 1985-2000 time period and that which is interrelated to the Pinellas-West Pasco planning area.

[Figure 26, West Coast Regional Water Supply Authority Planning Areas]

[Figure 27, Regional Water Supply Plan – Phase I (1980–1985)]

[Figure 28, Regional Water Supply Plan – Phase II (1985-2000)]

Phase I Plan (1980–1985)

Water Sources

The major water systems in Pinellas County, and the Pinellas County Water System and the St. Petersburg Water System, rely upon the West Coast Regional Water Supply Authority to develop their new water sources. These two systems have their

distribution systems inter-connected and are inter-connected with the Authority's Cypress Creek System. Therefore, expansion of water sources for Pinellas County through 2000 is being done by the expansion of the water authority system.

Several basic water sources have been evaluated in the development of the potable water supply alternatives for Pinellas County.[12] These include groundwater, surface water, desalinated water, and treated wastewater. The general findings are that groundwater is the best source for development through 1985. There are not sufficient quantities of surface water available to supply even a small portion of the demand in Pinellas County without causing considerable environmental damage and requiring considerable treatment to meet potable water standards. The sources of desalinated and treated wastewater were rejected for the 1980-1985 planning period because of low benefit-cost ratios compared to using groundwater as a potable water source. These possible water sources are evaluated in 1985-2000 water supply planning.

Evaluation of Alternatives

The Water Authority has evaluated the alternatives for expansion of Pinellas County water sources.[13] The major criteria in considering the alternatives for expansion of the Cypress Creek System, other than hydrological criteria, were cost of carrying out the plan and time required to implement the plan.

The conclusion of the alternatives evaluation is as follows:

1. Groundwater development is the most economically feasible and implementable.

2. Groundwater development outside the Water Authority jurisdiction is not economically feasible for mid–range periods.

3. Seven sites in Pasco County are evaluated as prime locations for groundwater development which could be added as part of the Cypress Creek System. The site, which was chosen as being the most feasible, is Site 8-SE which is the north part of the Cross Bar site owned by Pinellas County. The water rights were transferred to the Water Authority for development. This site was found to have an estimated water capacity of at least 30 mgd average and 45 mgd peak production.

Cross Bar Wellfield Plan

The plan consists of two phases as a result of [the] SWFWMD consumptive use permitting regulations. The first is the development of a 15 mgd average wellfield capacity and the construction of a 60″ transmission main connecting the new site with

the Cypress Creek pumping station by 1980. The second phase would expand the wellfield to 45 mgd peak capacity before 1985. The general location of the Cross Bar wellfield and the transmission main is shown on the map of Figure 27. The Cross Bar wellfield plan is the most cost effective and could be implemented to meet the additional water demands projected for 1985.

Expansion of Cypress Creek System[14]

Two strategies are being followed to develop groundwater supplies for Pinellas County. These are to maximize the utilization of the Cypress Creek wellfield and to develop a new groundwater source, which can supply the regional water demand, and is located in an area accessible to the treatment and pumping capabilities of the Cypress Creek System.

The projected water demand for Pinellas County indicate that water demand will surpass the 30 mgd capacity that the completed Cypress Creek wellfield will add to the regional capacity before the year 1980.

To meet the demands projected for both Pinellas County and West Pasco County, the Water Authority has proposed expanding groundwater sources in the Cypress Creek System to provide an increase for 45 mgd by 1985. Upon completion the Cypress Creek System would have the water supply capacity shown in Figure 29.

Figure 29
Cypress Creek System Proposed Capacity, 1985

Wellfield	Capacity (mgd)	
	Average	Peak
Cypress Creek	30	30
Cross Bar		
1st Phase	15	15
2nd Phase	15	30
Total	60	75

Source: West Coast Regional Water Supply Authority[15]

Regional Interconnection Mains

A major alternative to developing new groundwater sources is the interconnection of water systems in the tri-county area of Pinellas, Hillsborough, and Pasco counties. The reason for considering this as an alternate water supply source for Pinellas County are:

1. It has worked successfully between Pinellas County Water System and the St. Petersburg Water Department during water shortages in the former system.

2. Excess capacity of one water system would be available to others exhibiting water shortages.

3. The reliability and cost efficiency of all the water systems in the region would be improved.

The evaluation of alternate interconnection schemes was done by the West Coast Regional Water Supply Authority.[16] This evaluation proposes two favorable interconnect routes impaction on Pinellas County. The first interconnecting main is a 60″ transmission main interconnecting the Cross Bar wellfield with the Cypress Creek pumping and treatment facility.

The second interconnect proposed in Phase I of the regional plan is a 30″ diameter pipeline interconnecting the Cypress Creek to Starkey wellfield. This interconnect and the expansion of Starkey wellfield are to meet the water demand in West Pasco County (see Figure 27).

Phase II Plan (1985-2000)

The Phase II *Regional Water Supply Plan* proposes new water sources, expansion of existing wellfields and interconnect transmission mains to meet the increased regional water demand for the time period. That portion of Phase II plan through the year 2000 that is interconnected to the Pinellas county water systems is briefly described below and shown on the map in Figure 28. This subregional area that is interconnected during the Phase II time period to the Pinellas county water systems is the entire tri-county area except Tampa and south Hillsborough County. For greater detail the reader should see the reference report: *Comprehensive Study of the Regional Water Supply Needs and Sources*, 1980-2020, West Coast Regional Water Supply Authority, 1978.

Water Sources

The Phase II water source evaluation considered water sources beyond the tri-county area. After extensive analysis the following new water source was recommended for development during the Phase II period.

Section II Wellfield

A major new regional well field is proposed for the later part of the time period. This facility would supply the entire tri-county incremental water requirements. The recommended location, call Site-II is in northeast Pasco County (see Figure 28). A transmission main from the Cypress Creek facility is to be extended to Site-II to interconnect this wellfield with the regional system.

Wellfield Expansions

The Phase II plan recommends expansion of the regional wellfields to meet much of the increased water demand during the early years of the planning period. The Cypress Creek wellfield and the Cross Bay Ranch wellfield are recommended to be incrementally expanded between 1985 and 1995. Cypress Creek wellfield is to be expanded from a peak capacity of 30 mgd to 40 mgd and finally 45 mgd capacity. Cross Bay Ranch wellfield is to be expanded from 45 mgd to a capacity which is consistent with hydrogeologic and environmental data collected from Phase I. These proposed wellfield expansions are based on hydrogeological studies assuming the entire land area under the Water Authority control is available for wellfield development.

Interconnection Transmission Mains

There are several interconnection mains recommended in Phase II that tie the Pinellas county water systems to three of the five regional planning areas. These interconnecting mains have been delineated by the Water Authority (see Figure 28).

A 30-inch diameter pipeline is proposed to interconnect the St. Petersburg Cosme water treatment plant to the River Oaks water treatment plant via the Sheldon Road wellfield. This interconnection is to provide for the water demand increase in northwest Hillsborough County from surplus water that will occur in the regional system.

A 42-inch diameter pipeline is proposed to interconnect the Cypress Creek treatment facility with the Morris Bridge treatment plant in Hillsborough County. The purpose of this transmission main is to transport water from the north regional facilities to Tampa to meet the incremental demand there.

An interconnect transmission main is recommended to connect the water facility at Weeki Wachi in Hernando County with the Starkey wellfields in Pasco County. This facility would capture about 6 mgd [of] surface water from the springs. The facility would include a treatment plant and pumping station. The water would be used to meet the incremental demand in the north Pasco County area. All the Phase II water sources, wellfield expansions, and interconnect transmission mains described above are shown on the map of Figure 28.

Regional Plan Implementation

The [West Coast Regional] Water [Supply] Authority, by law, must supply the future water needs of all citizens within its jurisdiction. The Water Authority is in the process of meeting the Phase I plan (1980-1985) water requirements. For the Phase II planning period (1985-2000) the Water Authority must conduct detailed investigations on the recommendations. A long range fiscal program for Phase I and Phase II must be established and procedures for attaining control of the recommended facilities must be determined.

Total cost estimates for Phase I and Phase II projects have been made.[17] The project cost estimates of the Phase I and Phase II projects impacting on the Pinellas County water systems are given in the table of Figure 30.

Financing

The enabling legislation of the Water Authority authorizes it to issue revenue bonds for financing capital improvement programs. This method is recommended for funding of the Master Water Supply projects. Consumption agreements with the Authority members are proposed to ensure the debt service payments of the revenue bonds whether the water is actually consumed by Pinellas County or by other members.

The approximate debt service has been calculated for each of the present Water Authority's Phase I members. If the Authority undertakes the Phase I capital improvements program and assuming the regional plan is funded with 30-year revenue bonds, all members would have to pay the authority a pro-rata share of $2,223,300 annually to retire the bonds. This payment is equivalent to about $.05 per 1,000

gallons sold by the member water system.[18] Similar water rate impacts have not yet been made for the Phase II capital improvement programs.

Figure 30
Project Cost Estimates For Water Supply Master Plan, 1980-2000

Phase I

Project	Estimated Cost
Cross Bar Ranch Wellfield	$12,000,000
Pasco Transmission Main	$1,990,000
Starkey Wellfield Expansion	$1,320,000
Total Phase I Costs	$15,310,000

Phase II

Project	Estimated Cost
Cross Bar Wellfield Expansion	$680,000
Cypress Creek Wellfield Expansion	$1,760,000
Interconnection Main (Starkey Pumping Station to Pasco Transmission Main)	$1,160,000
Starkey Wellfield Expansion	$6,040,000
Interconnection Main (Cosme Water Plant To Sheldon Wellfield)	$2,220,000
Weeki Wachi Facility and Interconnection Main	$16,600,000
Site II Regional Wellfield	$24,550,000
Interconnection Main (Cypress Creek to Morris Bridge Water Plant)	$10,020,000
Total Phase II Costs	$63,030,000

Source: West Coast Regional Water Supply Authority, 1978

Local Water System Plans and Implementation

Pinellas County Water System Plans

The Pinellas County Water System has been expanding to meet the existing and projected population growth for Pinellas County and the associated future water demand of this anticipated population. This expansion is based on the Water System's

Ten-Year Master Plan[19] and the updating of this plan through the Pinellas County Capital Improvements Program and Budgets.[20] This plan calls for the development of the Cross Bar wellfield, expanded transmission and distribution lines, and additional storage and pumping capacity.

The following programs are scheduled by the Pinellas County Water System to be completed within the next 5 years. The locations of these system improvements are shown in Figure 31.

1. *Eldridge Wilde 60″ diameter water transmission main* – This main is to serve the projected water demand in the north county. It will also be the largest main feeding the central and southern sections of the system's water service area. This main reduces to 48″ diameter at the North Booster Station. Estimated cost is $7,162,000. This project was completed in August 1978 and the transmission main is now operational.

2. *Belcher Road 48″ diameter water main* – This transmission line is proposed to serve the expanding residential and industrial area between East Bay [Drive] and Bryan Dairy Road. This project also has been completed.

    a. 48″ diameter water main. North Booster station to East Bay Drive. Estimated cost $500,000.

    b. 36″ diameter water main. Bryan Dairy Road to Oakhurst Pumping Station. Estimated cost $2,750,000.

3. *Keller Water Treatment Plant expansion* – Improvements are to be made in the water treatment system which may include water softening. The extent of the expansion will be dependent upon a water quality study presently underway. Estimated cost is $10,500,000.

4. *North Booster Station pumping capacity expansion* – Three additional booster pumps are to be added at this station for capacity to maintain adequate water supply pressure in the distribution system. Estimated cost is $2,078,680.

5. *Gulf Beaches Storage and Pumping Station* – This facility is being built to supply the projected future water demand in the beach communities and to meet the high peak demands associated with the beaches tourist oriented, residential and commercial needs. Construction cost is $2,021,208.

6. *St. Petersburg Water System intertie* – A water system intertie between St. Petersburg and Pinellas County at Bayway Isles is planned to give both systems more reliability in their southern-most service areas. Estimated cost is $500,000.

[Figure 31, Pinellas County Water System Capital Programs, 1977-1981]

St. Petersburg Water System Plans

A comprehensive water plan was completed in 1975 for the St. Petersburg Water System.[21] These studies were to determine the necessary additions to the St. Petersburg Water System through the year 2020.

The water plan was based on the following population and water demand projections and requirements.

1. The population of the service area will increase to about 513,000 people by the year 2020.

2. The estimated average consumption rate in 2020 will be 65.7 mgd. The estimated peak hour rate, which must be supplied by the water system during peak hour consumption for this year is 145.1 mgd.

The study indicates improvements would have to be made in the water system's distribution, transmission, treatment plant, and water source capacity to meet the projected demands of the year 2020. The following is a summary of the proposed water system improvements and estimated costs.

Distribution System

The major criteria, for the distribution system is to supply peak hour water demand throughout the service area. This will require additional trunk mains, increased pumping capacity at the Oberly Pumping Station and an additional storage facility comprising of two 5 mg storage reservoirs and a pumping station. The estimated construction costs of these improvements are $13,356,960.

Transmission System

The major criteria, for the transmission system is to have the capacity to transmit up to 98.6 mgd on a maximum demand day in the year 2020. The recommended improvements will provide capacity to transmit 64 mgd to the Oberley Station via the 48″ diameter main. The improvements are additional pumping capacity on both mains and the estimated construction cost is $1,652,000.

Treatment Plants

The major criteria, for the Cosme water plant in 2020 is to treat up to 98.6 mgd on a maximum demand day. To meet this requirement the following improvements must be made.

1. Construct additional aerators to bring the aeration capacity up to 98.6 mgd.

2. Construct additional water softening contact basins and make improvements to the water softening system to increase its softening capacity to 52.1 mgd. The combined estimated costs of both improvements (1 and 2) are $2,390,000.

Water Supply Sources

The major criteria, for the water supply sources is to have sufficient regulated capacity to supply water to the Cosme treatment plant at a rate equal to the maximum day demand. If the capacity of the Cypress Creek wellfield is limited to 30 mgd, and additional wellfield must be developed with an ultimate capacity of 36 mgd. This additional capacity is being developed by the West Coast Regional Water Supply Authority (see *Regional Plan*).

When the city must withdraw more than 12 mgd from the Cypress Creek 84″ diameter transmission main and additional wellfield and a collecting main will be required. The estimated construction cost of an additional wellfield and collecting main is $6,700,000.

The total estimated construction costs of the recommended facility improvements for the year 2020 is approximately $24,000,000.

Clearwater Water System[22]

The Pinellas County Water System is committed to provide Clearwater up to 10 mgd potable water plus additional amounts proportionate to the water demand of areas annexed which are presently served by the county.

The city is planning to expand its wellfield by five new wells and to have an ultimate capacity of 9-10 mgd. These five new wells should increase the city's capacity by 2-3 mgd. The combined capacity including Pinellas County water, is greater than 20 mgd. The city's plan estimates a 1995 population of 137,000 will require 20.6 mgd. Additional demand after 1995 will have to be obtained from the Pinellas County Water

System. Two additional 5 mgd ground storage tanks are being added to the Clearwater water system.

The Clearwater Capital Program and Budget for 1977-1982 has planned a total of $4,255,000 expenditures for water system expenditures during the six-year time period. The major improvements include expansion of the system, storage rehabilitation, and water line renewal and replacement.[23]

Dunedin and Belleair

Dunedin and Belleair have water systems independent from other systems in the county. These cities have potential for water system improvement and interconnecting with a major water system.

Some of the possible advantages [of] interconnecting could be an improvement in water quality, a decrease in dependence on a single water resource, the protection of the city's water resources and the ability for wellfield rotation.

It is recommended that feasibility studies be made to investigate the possible advantages of inter-tie connections between the water systems of Belleair and Dunedin with the Pinellas County Water System.

Water Conservation Plan

Introduction

The purpose of the water conservation plan is to propose a comprehensive set of potable water conservation strategies which can be used as policy guides for the development of a water conservation program for Pinellas County. The plan discusses several of the techniques which can be incorporated in a potable water conservation program. These include non-potable water source utilization, water saving devices, conservation practices and regulations and graduated water rates. From these, potable water conservation strategies are developed. A major aspect of a water conservation plan for Pinellas County is the protection of the natural aquifer recharge potential as related to land development practices. This subject is dealt with in greater detail in the *Conservation* and *Land Use Elements* of the *Pinellas County*[*wide*] *Comprehensive Plan*.

Existing Water Conservation Programs

Comprehensive Water Resources Management

The Pinellas County Government and the City of St. Petersburg have both consolidated the water supply and wastewater treatment functions under a single department for each jurisdiction. This provides for comprehensive water resource management and conservation measures.

Water Reuse

All the governments in Pinellas County are investigating the reuse of wastewater effluent for spray irrigation of parks and golf courses where it is a cost effective process.[24]

St. Petersburg has a water reuse demonstration program which will soon be expanded to include selling highly purified wastewater effluent to residents for lawn sprinkling. This program has been distributing water from the Southwest wastewater treatment plant to various parks, golf courses and commercial establishments in southwest St. Petersburg.

Shallow Aquifer Lawn Irrigation

Pinellas County and most of the larger cities require that all new apartment and condominium complexes employ retention ponds or shallow aquifer wells for lawn irrigation.

Dispersed Peninsular Wellfields

Seventy-five percent of Pinellas County is a peninsula in the coastal zone with poor artesian water resources. However, Belleair, Clearwater, and Dunedin utilize low yield dispersed wellfields within their city limits. These wellfields produce approximately 13 mgd or about 14% of the county's water needs. This use of local water sources considerably reduces the need for importing potable water.

Emergency Sprinkling Bans

The larger governments in Pinellas County have adopted sprinkling band ordinances for the purpose of conserving potable water should an emergency water shortage occur.

Public Information Programs

The City of St. Petersburg and the Pinellas County Government have ongoing water conservation public information programs.

Shallow Aquifer Utilization

Pinellas Shallow Aquifer

The shallow aquifer consists of the water saturated surface sand which covers most of the county. This sand varies from 0 to 90 feet in depth. Generally, the thickness of the sand corresponds with the topography of the land. For example, the surface sand tends to be greater in thickness along the Pinellas Ridge. There is also a general trend for the surface sand to increase in thickness from north to south Pinellas County where in locations like Pinellas Point or Treasure Island the surface is about 60 feet deep.[25]

Estimate of Water Stored in Shallow Aquifer

The shallow aquifer is that portion of the surface sand from the water table down to the confining layer of low permeable material above the Floridan Aquifer.

The water table varies in depth from the surface to the land from about 10 to 15 feet. The average depth to the water table for Pinellas County is five feet below the land surface. The water table fluctuates about three feet due to seasonal variations in rainfall. At the higher elevations on the Pinellas Ridge the water table will vary by five feet during any given year.[26] (See the *Countywide Plan Conservation Element* for further water table analysis.)

Countywide, the average thickness of the surface sand is about 25-30 feet. Taking a conservative estimate of the shallow aquifer being on an average 15 feet thick countywide, the estimate of the storage capacity can be made. This calculated shallow aquifer storage capacity for the entire county is about 263 billion gallons of water. To put this in a meaningful perspective, the total production of all the wellfields of Pinellas County, St. Petersburg, Clearwater, Dunedin, and Belleair for the entire year of 1975 was 29 billion gallons of water. This, of course, does not imply that 263 billion gallons of water can be pumped from the shallow aquifer. It is merely and indication of the vast water resource present in the surface sand of Pinellas County.

Shallow Wells for Lawn Sprinkling

Shallow wells containing screened well points can readily supply sufficient water for lawn sprinkling in most parts of Pinellas County during the months when there is a deficiency of rain. This type of well is capable of 3-15 gallons per minute for each well point. Several of these should be adequate for the average size lot in Pinellas County. When a more elaborate sprinkling system is desired, multiple well points can supply greater amounts of water.

Shallow wells for lawn can greatly alleviate the demand put upon the municipal and county wellfields during peak demand.

Pinellas County based water system pumped on the average 78 mgd in 1975. The average peak production during May of that year was 100 mgd. During the dormant month of February the average production was down to 68 mgd. Between the low production of February and the peak month of May, a considerable savings on the potable water consumption could be had by the use of shallow wells for lawn sprinkling (42%).

Shallow Wells in Pinellas County

Several shallow well drillers were contacted to get practical information concerning the use of shallow wells for lawn sprinkling in Pinellas County. The basic question of inquiry was what areas of the county have shallow wells been used successfully for lawn sprinkling and what areas have the shallow well drillers had trouble getting productive wells. The results of this survey are shown on the map in Figure 32. It can be seen that shallow wells have been used for lawn sprinkling in a large part of the county.

Also denoted are the areas the shallow well drillers have had difficulty getting productive shallow wells. Generally, the areas where there have been difficulty getting productive shallow wells have been northeast St. Petersburg, North Pinellas Park, the coastal areas of Dunedin and Palm Harbor, and much of the dredged and filled areas along the gulf beaches and Tampa Bay. Other areas where shallow wells are often unproductive are along river and creek beds where the surface sand has been eroded by drainage of the basin.

This map is a general guide indicating where productive shallow wells can be drilled for lawn sprinkling throughout the county. It is by no means a detailed account of the feasibility of shallow wells for a particular location. Generally, if someone in the

neighborhood has a shallow well the chances are very good that other productive shallow wells can be installed in that area.

The best way to find out the feasibility of shallow wells for a particular area is to contact shallow well drillers who have drilled wells in that location. They have detailed knowledge of the areas of the county in which they have worked and are the best reference for persons interested in utilizing the shallow aquifer for lawn sprinkling.

[Figure 32, Shallow Well Suitability]

Water Savings Projects: 1976-2000

There could be a considerable saving of water if, where feasible, all new single-family dwelling units built by the year 2000 had shallow wells for lawn sprinkling.

The projected population for the year 2000 is 1,063,560. The 1976 population estimate is 759,650. The projected increase in dwelling units from 1976 to 2000 is 150,134. There is projected an increase of 77,560 single-family dwelling units by the year 2000.[27] The 1970 countywide persons per dwelling unit average was 2.4 and is expected to be 2.26 by 2000. The number of persons per household for single-family residences is normally greater than the countywide average, however, for simplicity the countywide average will be used.

Projected Water Savings - New Single-family Construction

As indicated on the previous page, average countywide water production data for 1975 indicate that during the peak months of April and May approximately 42% of the production is used for lawn sprinkling. During the peak sprinkling months the per capita water use was 141 gpcd.

For the estimated 77,560 new single-family households by the year 2000 with an average of 2.26 persons, there could be a savings of 10.3 mgd of potable water by sprinkling during peak months from shallow aquifer wells.

Projected Water Savings - Percentage of Total Dwelling Units

Considerable amounts of potable water could be saved year round and especially during the peak demand months if 25% to 50% of the total dwelling units in Pinellas County used shallow wells for lawn sprinkling. Existing RPD zoning regulations in

unincorporated Pinellas County require shallow wells for multifamily development. Figure 33 gives the estimated savings of potable water that could occur under those conditions for the years or 1975 and 2000. The estimated savings are based on peak demand during the spring when 59 gpcd are used for lawn sprinkling.

Figure 33
Estimated Water Savings During Peak Demand

Year	% Dwelling Units	Water Savings
1975	25%	11.0 mgd
1975	50%	22.0 mgd
2000	25%	17.1 mgd
2000	50%	34.2 mgd

Source: Pinellas County Planning Department, 1978.

Treated Wastewater Utilization

The section 201 Wastewater Treatment and disposal studies have evaluated the use treated wastewater for lawn and vegetation spray irrigation. The primary purpose of this process has been as a viable wastewater effluent disposal method. However, a secondary purpose of the process is its great potential for potable water conservation. This method has been most fully pursued in the St. Petersburg 201 planning area due to factors that are characteristic of the south Pinellas County area.[28]

St. Petersburg has identified areas that could use the recycled wastewater effluent for irrigation purposes. The major customers for the recycled water have been golf courses, parks, road median strips, school grounds and open spaces.

Nutrients are retained in the recycled effluent so that use of the treated wastewater for vegetation irrigation decreases the need for chemical fertilizers. The recycled effluent is less costly then potable water and can decrease the peak potable water demand by as much as 40 percent. This conserves potable water and lessens the need for water system expansion.

Water Conserving Devices

Water conserving devices are important to a demand reduction program because they have a permanent effect that habit changing practices do not have. Recent changes to federal law have made demand reduction methods a condition for receiving federal funds for water projects. Therefore, water conserving devices should be an integral part of any water conservation program.

There are many devices that are available, which allow large reductions in water needed in the home. These devices are based on restricting flows through fixtures while reducing the volume of water from 30% to 70%.

Special water closets can be used as water saving devices. These use 2.5 to 3.5 gallons per flush compared to 5 gallons for a standard toilet. The simplest of the devices are the volume reducers. They consist of plastic dams, which are placed in the reservoir and decrease the amount of water for the flush cycle. A more complex version is the dual flush toilet, which uses 2.5 gallons for liquid waste flushing. The impact of this proposal on sewage treatment plants should be analyzed prior to implementation on a broad scale.

Practice and Regulation

An effective water conservation program must include public programs for water conservation. The primary aspect of this would be an active public information and educational program to promote water consumer practices that encourage water conservation. For example, water conserving practices for lawn irrigation should be promoted as part of the public information program. The public should be made aware that lawn sprinkling during the daytime allows between 40% to 70% of the water to be lost by evapotranspiration. This is poor water conservation practice whether the source is potable water or water from shallow wells. The public information strategy for consumers of recycled wastewater effluent might be to encourage consumption if the alternative is the less desirable conservation disposal method of deep well injection.

Emergency sprinkling bans have been used in Pinellas County as a regulatory practice for water conservation during times of acute water shortage. Consideration should be given to make the sprinkling ban regulations graduated in scope so that they could be applied to avert a water shortage rather than only alleviating an existing water shortage condition.

Graduated Water Rates

Graduated water rates or surcharges can be an effective part of a comprehensive water conservation plan. Increasing water rates above a base rate can be a strong economic incentive for water conservation practices. This is especially true for residential use where water consumption above base consumption is mainly used for lawn irrigation and there are alternate non-potable water sources available for use. The graduated rate and especially the surcharge should be an integral part of the overall conservation program. Its use should be closely associated with the public information and education program during times of water shortages.

Proposed Potable Water Conservation Strategies

1. The governments controlling the major water systems in the county should establish comprehensive potable water conservation programs that incorporate all the major elements described and are coordinated with each other. The programs should investigate the feasibility and cost effectiveness of using non-potable water sources such as shallow wells and recycled wastewater effluent for water uses not requiring potable water. The major uses would be for lawn irrigation and toilet flushing; however, other uses should be investigated.

2. The Pinellas County Planning Council should develop and recommend a model water conservation ordinance for adoption by Pinellas County governments. The major feature of this ordinance would be that all new single-family, multiple family, commercial, and industrial development should have shallow wells for lawn irrigation. This would not be required in areas of the county unsuitable for productive shallow wells or where other sources of irrigation quality water are available such as pond water, urban runoff of treated wastewater.

3. The water conservation programs should include investigations into the benefit and feasibility for requiring the use of water saving appliances in Pinellas County. They should investigate the use of water conserving devices in all public, commercial, industrial and residential new construction and retrofitting of these devices into existing structures as the old facilities are remodeled. These investigations should be made in conjunction with the building departments to improve the chances of implementation through the building and housing codes.

4. The governments controlling the major water systems in the county should promote public education of water conservation. Economics and regulations can increase water conservation to a moderate extent. However, long-term consumer

attitudes are also required to conserve water. An ongoing public education program concerning water conservation in Pinellas County is recommended. This program should stress the fact that Pinellas County has limited water resources compared to its present and future population's water needs. The program should include some of the activities that citizens can do to help conserve potable water in Pinellas County.

5. The use of graduated water rates or surcharges should be made an integral part of the water conservation programs in Pinellas County. The use of water rates as a conservation device could be done in two phases. The first phase would be a year round conservation measure by which an increased water rate would be used for water consumption above a base water quantity that is determined as a reasonable level of water consumption for each type of customer. The second phase could be an upward sliding rate or a surcharge for periods of water shortage. This would be a further economic incentive to conserve water during times of shortage.

Both phases of the graduated water rate program would have to be coordinated with the other elements of a water conservation program, along with special coordination with the public education and information programs.

Appendix

Water Supply Policies

Tampa Bay Regional Planning Council – *Future of the Region*, (1977), p. 18.

Water Supply – Land use planning and development decisions should consider the constraints of water systems and supplies.

1. Surface Water – Surface water shall be protected as economic and recreational resources and as existing and potential sources of potable water supply and aquifer recharge.

2. Ground – Groundwater resources shall be protected as economic and potable water resources. Areas of high volume recharge should be protected form development which would alter their natural function.

3. The allocation of water resources should consider the long-term domestic, industrial, agricultural and mining needs of the region.

Southwest Florida Water Management District, *District Water Management Plan – 78 (Preliminary)*, p. 52.

A. Coordinated water management planning with land use and water quality planning to insure the long range maintenance or enhancement of water quality.

B. All regions should utilize local water resources to the greatest degree that is economically and environmentally feasible before considering the importation of more distant water resources.

C. Encourage water conservation practices and the development and implementation of reuse techniques throughout the district.

D. Manage the water resources in order to insure a safe, sustained water supply.

E. Water resources of the district will be developed in a manner that will minimize the overall adverse environmental impact.

F. Reserve water for essential non-withdrawal demands such as navigation, recreation and the maintenance of natural systems.

G. Where feasible, encourage the use and the reuse of water of the lowest acceptable quality for the purpose intended.

H. Water users (domestic, industrial and agricultural) should be aware of water resource limitations and should plan their future water needs with due consideration of these limitations.

I. Encourage the preservation and utilization of naturally occurring water storage and recharge areas.

J. Encourage interconnection of all appropriate water supply systems to maximize the benefits of these sources.

K. Thermoelectric power plants should be encouraged to utilize non-potable water resources for cooling purposes.

L. Encourage the multiple use of all natural and man-made surface water bodies within the district.

The Florida Department of Administration – Division of State Planning, *Land Development Element – The Florida State Comprehensive Plan,* 1977, p. 112.

42. Provide water for present and future development in the State, consistent with sound water resources planning and management.

43. Base land development decisions on quantitative knowledge of the short- and long-term capabilities of the hydrologic units to provide adequate supplies of water.

44. Coordinate land use planning and water management to ensure the long-range maintenance and enhancement of water quantity and quality.

45. Encourage closer cooperation between State, regional and local resource planning agencies to ensure all levels of government for planning purposes.

The Florida Department of Administration – Division of State Planning, *Land Development Element – The Florida State Comprehensive Plan,* 1977, p. 182

31. Utilize water and land management practices and programs which retard runoff and enhance percolation to increase the quantity and protect the quality of groundwater.

32. Manage groundwater to insure that water levels are not drawn down to such a degree that yield is adversely affected or that resource degradation takes place.

33. Maintain the highest practical surface water levels and water level fluctuations to provide for reasonable beneficial uses and to provide for a balance of urban, agricultural and natural systems.

34. Insure that water management projects are designed and operated to maintain and enhance natural systems as well as the systems of man.

35. Utilize local water resources to the greatest degree that is economically and environmentally feasible before considering inter-district, inter-basin, and other large-scale transfer of water. Subject to reasonable regulation, proposals for the transfer of water should be reviewed and evaluated by appropriate state, regional, and local agencies having jurisdiction. The determination process, as required by law, should include at least the following minimum criteria to determine whether or not the proposed transfer is in the overall public interest.

36. Encourage the supply of water in quantities which would not result in the destruction or degradation of natural systems, other water related resources, or values which are vital to the long-term public interest.

37. Water management planning should recognize that the availability and cost of energy supplies, now and in the future, could set limits on the quantity of water that can be drained from or supplied to an area and the extent that water treatment can be depended upon to improve water quality.

38. Encourage the capture, use and reuse of runoff water and other relatively low quality water supplies to the extent practical for uses which do not require high quality water before using groundwater.

39. Undertake an inventory and classification of the water resources of the state and, to the extent practical, develop a standard methodology to allow the quantitative projection of the amount of water available for present and future conditions.

Bibliography

Black, Crow and Eidsness, Inc., *Pinellas County Water System Ten-Year Master Plan.* Gainesville, Florida: 1973.

Bureau of Geology, Florida Department of Natural Resources, *Geology of Pinellas County*, Tallahassee, Florida: 1977.

City of Clearwater, *1977-1983 Capital Improvement Program 1977-1978 Capital Budget*. Clearwater, Florida: 1977.

The Florida Department of Administration, Division of State Planning, *Water Element – The Florida State Comprehensive Plan*, Tallahassee, Florida: 1978.

Geraghty and Miller, Inc., *Management of the Water Resources of the Pinellas-Anclote and Northwest Hillsborough Basins West-Central Florida.* Tampa, Florida: 1976.

Greeley and Hansen, *St. Petersburg, Florida Water Supply System Comprehensive Water Plan.* 1975.

Pinellas County Board of County Commissioners, *Pinellas County Comprehensive Budget – Fiscal Year 1977-1978*. Clearwater, Florida: 1977.

Pinellas County Environmental Assessment Task Force, *Surface Water Quality Assessment – Pinellas County, Florida.* Clearwater, Florida: 1974.

Pinellas County Planning Council, *Community Facilities Pinellas County*. Clearwater, Florida 1971.

Pinellas County Planning Council, *Population Estimates Pinellas County 1970-1977.* Clearwater, Florida: 1977.

Pinellas County Planning Council, *Population Forecasts Pinellas County, Florida*. Clearwater, Florida: 1977.

Pinellas County Planning Council, *Preliminary Goals, Policies and Economic Assumptions Pinellas County General Plan for the Year 2000*. Clearwater, Florida: 1977.

Pinellas County Planning Department, *Pinellas Area Transportation Study Year 2000 Socio-Economic Data Cross Classification Variables*, Clearwater, Florida: 1977.

Register and Cummings, Inc., *Utilities Element – Clearwater Comprehensive Plan (Draft)*. Jacksonville, Florida: 1977.

Southwest Florida Water Management District, *District Water Management Plan – 1978 (Preliminary)*. Brooksville, Florida: SWFWMD 1977.

Southwest Florida Water Management District, *Water Use Plan, 1977*. Brooksville, Florida: SWFWMD 1977.

Tampa Bay Regional Planning Council, *Areawide Water Systems*. St. Petersburg, Florida: 1974.

Tampa Bay Regional Planning Council, *Future of the Region*. St. Petersburg, Florida: 1977.

Tampa Bay Regional Planning Council, *Regional Comprehensive Plan Guide*. St. Petersburg, Florida: 1977.

U. S. Geological Survey, *Ground-Water Resources of the Clearwater – Dunedin Area, Florida, (Preliminary)*. Tampa, Florida: 1975.

West Coast Regional Water Supply Authority, *Regional Water Supply Needs and Sources Phase I.* Clearwater, Florida: Ross, Saarimen, Bolten and Wilder, Inc., 1977.

Footnotes

[1] Florida Department of Administration, Division of State Planning, *Water Element – The Florida State Comprehensive Plan,* (Tallahassee, Florida : 1978), p. 183.

[2] Potentimetric high refers to a high potentiometric surface whish is a measure of artesian pressure. At a given potentiometric contour, the water level in an artesian well will rise to the contour height above mean sea level.

[3] The low yield coastal wells are limited in pumping capacity because salt content of the water increases with pumping above their rated capacities. The salt content of the water is monitored by the Pinellas County Health Department.

[4] The Southwest Florida Water Management District (SWFWMD) is a fourteen county state agency established to manage and regulate water resources. Its principal concerns are flood control and water supply.

[5] Briley, Wild & Associates, Inc., *Brooker Creek Water Management Plan* – Southwest Florida Water Management District Northwest Hillsborough Basin Pinnellas-Anclote Basin Board (Ormand Beach, Florida: 1978), Pages 5 – 13.

[6] *Ibid*., p. 10 – 4.

[7] Pinellas County Planning Department, *Population Forecasts Pinellas County, Florida* (Clearwater, Florida; Revised 8-9-77).

[8] West Coast Regional Water Supply Authority (WCRWSA) *Regional Water Supply Needs and Sources Phase I* (Clearwater, Florida: Ross, Saarinen, Bolton, and Wilder, Inc., 1977), Page 4 – 41.

[9] West Coast Regional Water Supply Authority (WCRWSA), *Ibid*., Page 4 – 43.

[10] *Ibid*.

[11] West Coast Regional Water Supply Authority, Op. Cit., p. 9-1.

[12] West Coast Regional Water Supply Authority (WCRWSA), *Ibid*., Page 6-72.

[13] West Coast Regional Water Supply Authority (WCRWSA), *Ibid*., Page 6-071 (Z).

[14] West Coast Regional Water Supply Authority (WCRWSA), *Ibid*., Page 6-496.

[15] *Ibid*. Correspondence 9/25/78.

[16] West Coast Regional Water Supply Authority (WCRWSA), *Ibid*., Page 6-250.

[17] West Coast Regional Water Supply Authority, Op. Cit., Pages 12-32.

[18] WCRSA, Op. Cit., Page 10-16

[19] Black, Crow and Eidsness, *Pinellas County Water System Ten-Year Master Plan,* (Gainsville, Florida, 1973).

[20] Pinellas County Board of County Commissioners, *Pinellas County Comprehensive Budget – Fiscal Year 1977-1978*.

[21] Greeley and Hansen, St. Petersburg, Florida Water Supply System Comprehensive Water Plan, (1975).

[22] Register and Cummings, Inc., *Utilities Element – Clearwater Comprehensive Plan (Draft)*, (1977) Page 181.

[23] City of Clearwater, *1977-1983 Capital Improvement Program and 1977-1978 Capital Budget*, (1977).

[24] Dawkins & Associates, Inc., *North Pinellas County 201 Facilities Planning – Preliminary*, (October, 1976).

[25] Bureau of Geology, Florida Department of Natural Resources*, Geology of Pinellas County,* 1976.

[26] U.S. Geological Survey, *Groundwater Resources of the Clearwater – Dunedin Area*. (Tampa, Florida : 1975), Page 25

[27] Pinellas County Planning Department, *Pinellas area Transportation Study Year 2000 Socio-Economic Data Cross Classification Variables*. (1977).

[28] St. Petersburg Comprehensive Plan – Water Element (June 1978), Page 30.