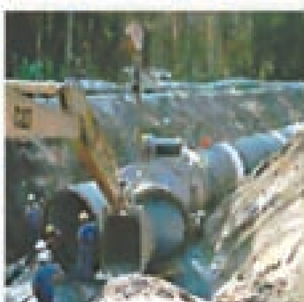
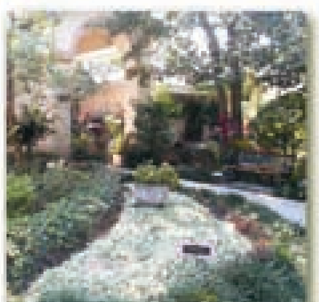
Southwest Florida Water Management District








Regional Water Supply Plan

December 1, 2006

Board Approved

Southwest Florida
Water Management District

WATERMATTERS.ORG · 1-800-423-1476

Southwest Florida Water Management District

Regional Water Supply Plan

Web Site: http://www.watermatters.org

December 2006

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Abbreviations

AMO	Atlantic Multi-decadal Oscillation
APT	Aquifer Performance Test
AR	Aquifer Recharge
ARR	Aquifer Recharge and Recovery
ASR	Aquifer Storage and Recovery
AWT	Advanced Wastewater Treatment
BEBR	Bureau of Economic and Business Research
BMP	Best Management Practices
BLS	Below Land Surface
CCI	Construction Cost Index
CFP	Cooperative Funding Program
CFS	Cubic Feet Per Second
CFRSF	Celery Field Regional Storage Facility
CWM	Comprehensive Watershed Management Initiative
CWCFGWB	Central West-Central Florida Ground-Water Basin
DACS	Department of Agriculture and Consumer Services
DOH	Department of Health
ENR	Engineering News Record
EPA	U.S. Environmental Protection Agency
EQIP	Environmental Quality Incentive Program
ESWS2	Enhanced Surface Water System 2
ET	Evapotranspiration
ETB	Eastern Tampa Bay
FAC	Florida Administrative Code
FARMS	Facilitating Agricultural Resource Management Systems
FASS	Florida Agricultural Statistics Service
FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FFA	Florida Forever Act
FIPR	Florida Institute of Phosphate Research
FPC	Florida Power Corporation
FPL	Florida Power and Light
FS	Florida Statutes
FY	Fiscal Year
GPD	Gallons Per Day
GPCD	Gallons Per Capita Per Day
GPDPH	Gallons Per Day Per Hole
GPF	Gallons Per Flush
GPM	Gallons Per Minute
GIS	Geographic Information System
HFCAWTP	Howard F. Curren Advanced Wastewater Treatment Plant
HR	Highlands Ridge
HWA	Heartland Water Alliance
IAS	Intermediate Aquifer System
I/C	Industrial/Commercial
ICI	Industrial, Commercial and Institutional
IFAS	Institute of Food and Agricultural Sciences

I & I	Inflow and Infiltration
IRWSMP	Integrated Regional Master Water Supply Plan
LFA	Lower Floridan Aquifer
LTPRG	Local Technical Peer Review Group
LWPIP	Lowest Wetted Perimeter Inflection Point
MARS	Manatee Agricultural Reuse Supply
MFL	Minimum Flows and Levels
M/D	Mining/Dewatering
MGD	Million Gallons Per Day
MG/L	Milligrams Per Liter
MIA	Most Impacted Area
NGF	National Golf Foundation's
NGVD	National Geodetic Vertical Datum
NPDES	National Pollution Discharge Elimination System
NTB	Northern Tampa Bay
NRCS	Natural Resources Conservation Service
NWSI	New Water Sources Initiative
O & M	Operation and Maintenance
OPPAGA	Office of Program Policy Analysis & Governmental Accountability
OFW	Outstanding Florida Water
PAC	Powder Activated Carbon
PCU	Polk County Utilities
PR/MRWSA	Peace River/Manasota Regional Water Supply
PG	Power Generation
PSI	Pounds Per Square Inch
QWIP	Quality of Water Improvement Program
RFP	Request For Proposal
ROMP	Regional Observation Monitoring Program
RO	Reverse Osmosis
REDI	Rural Economic Development Initiative
RWSP	Regional Water Supply Plan
RTS	Regional Transmission System
SA	Surficial Aquifer
SCADA	Supervisory Control And Data Acquisition
SPJC	Shell, Prairie and Joshua Creek
SWCFGWB	Southern West-Central Florida Ground-Water Basin
SWTP	Surface Water Treatment Plant
SWUCA	Southern Water Use Caution Area
TBC	Tampa Bypass Canal
TBW	Tampa Bay Water
TECO	Tampa Electric Company
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Loads
TRSIS	Tailwater Recovery and Seepage-water Interception System
UFA	Upper Floridan Aquifer
UG/L	Micrograms Per Liter
ULFT	Ultra Low Flow Toilet
ULV	Ultra Low Volume
USDA	U.S. Department of Agriculture
USF	University of South Florida

USGS	United States Geological Survey
WEIS	Water Efficient Landscape and Irrigation System Rebates
WMD	Water Management District
WMIS	Water Management Information System
WPA	Water Planning Alliance
WRAP	Water Resource Assessment Project
WRCA	Water Resource Caution Area
WSRD	Water Supply and Resource Development Program
WUCA	Water Use Caution Areas
WUP	Water Use Permit
WWTF	Wastewater Treatment Facility
WWTP	Wastewater Treatment Plant
ZLD	Zero Liquid Discharge

Executive Summary

Introduction

This Regional Water Supply Plan (RWSP) is an assessment of projected water demands and potential sources of water to meet these demands in the RWSP Planning Region of the Southwest Florida Water Management District (District) for the period from 2000 through 2025. The Planning Region is comprised of the 10-county area that extends from Pasco County in the north to Charlotte County in the south and includes the Northern Tampa Bay (NTB) Planning Area and Southern Water Use Caution Area (SWUCA) Planning Area.

The District did not prepare a RWSP for counties in the Northern Planning Area. This decision was based on the general lack of existing regional impacts to water resources. However, there are smaller-scale cumulative effects of withdrawals throughout the region and areas where the rate of growth has accelerated beyond what was previously anticipated to occur that could impact water resources through future ground-water withdrawals. These areas require focused attention to prevent harm to the resources from occurring. The District is involved in a wide range of water supply planning activities in the Northern Planning Area that include 1) comprehensive water supply planning conducted cooperatively by Marion County, the Withlacoochee Regional Water Supply Authority, the District, and the St. John's River Water Management District (SJRWMD), 2) extensive resource assessments involving the District, the SJRWMD, and the U.S. Geological Survey, 3) an aggressive program to establish minimum flows and levels, 4) the development of a sophisticated ground-water flow model that will be used to determine safe yield, and 5) programs to provide funding and technical assistance for the development of conservation and reclaimed water projects and conservation education programs.

The purpose of the RWSP is to provide the framework for future water management decisions in areas of the District where the hydrologic system is stressed due to ground-water withdrawals. The RWSP shows that sufficient alternative water sources (sources other than fresh ground water) exist in the Planning Region to meet future demands and replace some of the current withdrawals causing hydrologic stress. Because sources within the Planning Region are sufficient from a technical and economic perspective to meet these demands, the District's major focus for meeting demands has been on sources within the Planning Region. However, Polk County, which is divided between the District and the South Florida Water Management District (SFWMD), is exploring the possibility of importing water from the portion of their county in the South Florida Water Management District into their portion in the District. Although these options are included in this RWSP, the water they could potentially make available has not been added to the total amount available from sources within the District's Planning Region.

The RWSP also identifies hundreds of potential options and associated costs for developing alternative sources as well as fresh ground water. Options identified in the RWSP are not intended to represent the District's most "preferable" options for water supply development. They are, however, provided as reasonable concepts that water users in the Planning Region can pursue in their water supply planning. Water users can select a water supply option as presented in the RWSP or combine elements of different options that better suit their water supply needs provided that such options are consistent with the intent and direction of the RWSP. Additionally, the RWSP provides information to assist water users in developing funding strategies to construct water supply development projects.

Demand Estimates and Projections

The Demand Estimates and Projections portion of the RWSP details the District's methods and assumptions used in projecting water demand for each county in the Planning Region for the 2000-2025 planning period. Water supply demand has been projected for the agricultural, industrial/commercial, public supply, and recreation/aesthetic use categories. An additional water use category, environmental restoration, comprises new quantities of water that need to be developed and/or existing quantities that need to be retired to meet established minimum flows and levels (MFLs). The environmental restoration demand could increase during the planning period based on the recovery requirements of MFLs established in future years.

The demand projections represent those reasonable and beneficial uses of water that are anticipated to occur through the year 2025. Five-in-10 (average condition) and 1-in-10 (drought condition) demands have been determined for each five-year increment from 2000 to 2025, for each category. Demand projections for the 5-in-10 condition for the use categories listed above indicate that approximately 409 mgd of additional water supply will need to be developed and/or existing use retired to meet demand in the Planning Region through 2025. Public supply water use will increase by 227 mgd over the planning period. This accounts for over 55 percent of the projected increase in overall water demand in the Planning Region and is the largest increase of all the water use categories. Environmental restoration is next at 132 mgd or 32 percent of the projected increase. A reduction of approximately 74 mgd in agricultural and industrial/commercial water use, most of which is ground water, is projected to occur in the SWUCA. The 74 mgd in reductions in agricultural and industrial ground-water use is occurring as agricultural and mining areas are urbanized. An additional 68 mgd of reductions in ground-water withdrawals will occur through enhanced agricultural conservation and the retirement of permits associated with lands purchased for conservation, for a total of 142 mgd. The rapidly urbanizing coastal counties in the SWUCA will be supplied principally by alternative sources, not the retired ground-water quantities. The 50 mgd reduction in ground-water withdrawals required to meet the saltwater intrusion minimum aquifer level in the SWUCA can therefore be offset by the projected 142 mgd decrease in ground-water withdrawals. Some of the remaining 92 mgd in ground-water reductions may be re-permitted under certain conditions to meet demand in the inland counties in the SWUCA where access to alternative supplies is limited.

Meeting and Managing Future Water Demands

The Meeting and Managing Future Water Demands portion of the RWSP presents the results of the District's investigations to quantify the amount of water that is potentially available from all sources of water to meet demand in the Planning Region through the 2025 planning period. Sources of water that were evaluated include surface water/storm water, reclaimed water, conservation, seawater desalination, brackish ground-water desalination, and fresh ground water. Aquifer storage and recovery (ASR) is also discussed as a storage option with great potential to maximize the utilization of surface water and reclaimed water. The amount of water that is potentially available from these sources is compared to the demand projections and a determination is made as to the sufficiency of the sources to meet demand for the planning period.

Future water supply deficits/surpluses were calculated as the difference between projected water demand for the 2000-2025 planning period and demand calculated for the 2000 base year. The projected water demand in the Planning Region through 2025 is approximately 409 mgd. It was determined that up to 703 mgd is potentially available to meet this demand. In the SWUCA, the additional demand through 2025 is projected to be approximately 211 mgd while potentially available sources will be approximately 414 mgd. In the NTB area, the additional demand through 2025 is projected to be 194 mgd, as compared to potentially available sources of 289 mgd. Based on the information above, it is concluded that sufficient sources of water are available within the Planning Region to meet projected demand through 2025. It is further concluded that there are areas of the Planning Region that have limited access to alternative water supplies and that a regional approach to meeting future water demands is required.

Water Supply Development Component

The water supply development component of the RWSP contains hundreds of water supply options from which water users in the Planning Region can choose to meet their individual needs. In addition, the District has determined the associated costs of developing these options. The options were developed with the intent of optimizing the water supply potential of numerous sources including surface water/storm water, reclaimed water, conservation, seawater desalination, brackish ground water desalination, and fresh ground water. A planning level technical, environmental, and economic feasibility analysis was conducted for each option. It may be possible for some users to meet their future demands with fresh ground water. However, with the reductions in ground-water withdrawals mandated in the Partnership Agreement in the Northern Tampa Bay Water Use Caution Area (NTBWUCA) (68 mgd) and in the Recovery Strategy for the SWUCA (50 mgd), it is expected that future ground-water withdrawals in the region will be significantly less than what they are at present. These reductions in withdrawals are occurring due to the development of alternative sources, increased conservation, and transitions in ground-water dependent land uses such as agriculture to more urbanized land uses that can rely on alternative sources.

Water Resource Development Component

The water resource development component of the RWSP addresses water resource development projects identified through the planning process. The intent for water resource development projects is to enhance the amount of water available for water supply development. The District is primarily responsible for water resource development projects. Water resource development is “the formulation and implementation of regional water resource management strategies, including the collection and evaluation of surface water and ground-water data; structural and nonstructural programs; the development of regional water resource implementation programs; the construction, operation, and maintenance of works facilities to provide for flood control, surface and underground water storage, and ground-water recharge augmentation; and related technical assistance to local governments and to government-owned and privately owned water utilities” (s. 373.019(19), F.S.). As is apparent from this legislation, water resource development projects are classified as 1) data collection and analysis activities that support water supply development by local governments, utilities, regional water supply authorities and others and 2) projects that meet the more narrow definition of water resource development; i.e., “regional projects designed to create from traditional or alternative sources, an identifiable, quantifiable supply of water…”

For the data collection and analysis portion of water resource development, the District has budgeted approximately $38 million each year from FY2006 through FY2010 for a total of approximately $193 million. The activities support water supply development by local governments, utilities, regional water supply authorities and others.

The District currently has 19 projects that meet the more narrow definition of water resource development “projects.” These projects include alternative water supply research and/or pilot projects, agricultural water supply/environmental restoration projects, and projects to restore minimum flows to the upper Peace River. The total capital cost of developing these projects is approximately $86 million. A number of the projects associated with the restoration of minimum flows to the Peace River have land costs that are estimated to be $142 million. An estimate of the capital and land costs for all the projects is $228 million.

Water Supply Projects Under Development

As stated previously, approximately 409 mgd of new water supply will need to be developed during the 2000-2025 planning period to meet demand for all use sectors and to restore minimum flows and levels for impacted natural systems. As of the December 2006 release date of this RWSP, it is estimated that at least 50 percent of that demand has either been met or will be met by projects that are under development. Projects under development are those the District is co-funding that have either been 1) completed since the year 2000 (the base year for the 2006 RWSP), 2) are in the planning, design, or construction phase, or 3) are not yet in the planning phase but have been at least partially funded through the 2006 fiscal year.

The water supply projects under development are listed in this portion of the RWSP. These projects include major expansions of the water supply systems for Tampa Bay Water and the Peace River/Manasota Regional Water Supply Authority; including Tampa Bay Water's 25 mgd seawater desalination facility, development and expansion of reclaimed water systems including the Tampa Bay Regional Reclaimed Water Project, ASR Systems for both potable and reclaimed water, and conservation projects for public supply and agriculture.

Overview of Funding Mechanisms

The District's Governing Board and eight Basin Boards provide significant financial assistance for conservation and alternative source projects through three cooperative funding programs: 1) the Basin Board's Cooperative Funding Program (CFP) and Basin Initiatives, 2) the New Water Sources Initiative (NWSI), and 3) the Water Supply and Resource Development (WSRD) program. The financial assistance is provided primarily to governmental entities, but private entities are also eligible to participate in these programs. Projects are generally funded 50 percent by the Governing Board and Basin Boards with the local cooperators funding the remaining 50 percent. However, some of these programs, under certain circumstances, have the flexibility to fund up to 100 percent of the cost of projects. The State of Florida's Water Protection and Sustainability Program provides matching funds for the District's CFP, NWSI, and WSRD program for alternative water supply development assistance. The District applies these funds to cover 20 percent of the construction cost of eligible projects. The Florida Forever Program provides funding to the District for land acquisition, environmental restoration, and water resource development. The state also provides funding for the District's FARMS program. The amount of funding that is expected to be available in the Planning Region from these funding sources from 2007 through 2025 is approximately $2.44 billion.

As explained previously, of the 409 mgd of new water supply that will need to be developed during the 2000-2025 planning period to meet demand for all users and to restore minimum flows and levels for impacted natural systems, it is estimated that at least half of that demand has either been met or will be met by projects that are under development as of December 2006. To develop an estimate of the capital cost of the portion of the demand that is not yet under development, the District compiled a list of large-scale water supply development projects that have been proposed by Tampa Bay Water, the Peace River/Manasota Regional Water Supply Authority, the City of Tampa, and Pasco, Hillsborough, and Polk counties to meet the majority of the projected 2025 public water supply demand in the Planning Region. Water resource development projects proposed by the District to meet the minimum flow for the upper Peace River through large-scale restoration of the watershed were also included. The 152 mgd of water supply produced by these projects will meet the majority of the demand in the Planning Region that is not yet under development. It is estimated that the capital cost of these projects will be approximately $2.17 billion.

The $2.44 billion in financial resources available in the Planning Region through 2025 will be sufficient to cover the $2.17 billion capital cost of the projects outlined above. The remaining $270 million will be needed to cover the cost of smaller scale water supply projects and to serve as a reserve for the development of projects to replace water supplies that may be reduced as the result of the establishment or revision of minimum flows and levels. The underlying assumption of these financial projections is that the Governing and Basin Boards maintain their current millages and the state programs continue at their current funding levels.

Chapter 1. Introduction

This Regional Water Supply Plan (RWSP) is an assessment of projected water demands and potential sources of water to meet these demands in the District's Planning Region for the period from 2000 through 2025. The Planning Region is comprised of the 10-county area that extends from Pasco County in the north to Charlotte County in the south. This area includes the Northern Tampa Bay (NTB) Area and Southern Water Use Caution Area (SWUCA). The purpose of the RWSP is to provide the framework for future water management decisions in areas of the Southwest Florida Water Management District (District) where the hydrologic system is stressed due to ground-water withdrawals. The RWSP shows that sufficient alternative water sources (sources other than fresh ground water) exist in the Planning Region to meet future demands and replace some of the current withdrawals causing hydrologic stress. Because sources within the Planning Region are sufficient from a technical and economic perspective to meet these demands, the District's major focus for meeting demands has been on sources within the Planning Region. However, Polk County, which is divided between the District and the South Florida Water Management District, is exploring the possibility of importing water from their portion of the county in the South Florida Water Management District to their portion of the County in the District. Although these options are included in this RWSP, the water they could potentially make available has not been added to the total amount available from sources within the Planning Region.

The RWSP also identifies hundreds of potential options and associated costs for developing alternative sources as well as fresh ground water. The options are not intended to represent the District's most "preferable" options for water supply development. They are, however, provided as reasonable concepts that water users in the Planning Region can pursue in their water supply planning. Water users can select a water supply option as presented in the RWSP or combine elements of different options that better suit their water supply needs provided that such options are consistent with the intent and direction of the RWSP. Additionally, the RWSP provides information to assist water users in developing funding strategies to construct water supply development projects.

The requirement for regional water supply planning originated from legislation passed in 1997 that significantly amended Chapter 373, Florida Statutes (F.S.). New regional water supply planning requirements were codified in s. 373.0361, F.S., and this RWSP has been prepared pursuant to these provisions. Key components of this legislation included:

- Designation of one or more water supply planning regions within the District
- Preparation of a Districtwide Water Supply Assessment, and
- Preparation of a RWSP for areas where existing and reasonably anticipated sources of water were determined to be inadequate to meet future demand, based upon the results of the Water Supply Assessment.

Regional water supply planning requirements were amended as a result of the passage of Senate Bill 444 during the 2005 legislative session. The bill substantially strengthened requirements for the identification and listing of water supply development projects. In addition, the legislation was intended to foster better communications among water planners, city planners, and local utilities. Local governments are now allowed to develop their own water supply assessments, which the Water Management Districts are required to consider when developing their RWSPs. Finally, a trust fund was created that provides the Districts with state matching funds to support the development of alternative water supplies by local governments and water supply authorities.

Part A. Planning Process

Section 1. District-Wide Water Supply Assessment/Selection of the Planning Region

In June of 1998, the District's initial Water Supply Assessment was completed and accepted by the Governing Board. Four water supply Planning Regions (northern, west-central, east-central and southern) were identified for purposes of preparing the Water Supply Assessment. Three of the four Planning Regions generally corresponded to the jurisdictional areas of regional water supply authorities (Withlacoochee for the Northern region, Tampa Bay Water for the west-central region and Peace River/Manasota Regional Water Supply Authority (PR/MRWSA) for the southern region). The fourth Planning Region included portions of Polk, Highlands and Hardee counties, where the District co-funded a feasibility study for the establishment of a new regional water supply authority.

For the District's initial Water Supply Assessment completed in 1998, existing and reasonably anticipated sources of water were evaluated for each water supply Planning Region to determine the adequacy of these sources to meet projected demands. The District concluded that regional water supply planning should be initiated for the west-central, east-central and southern Planning Regions because *"traditional sources of water are not adequate for the planning period to supply water for all reasonable-beneficial uses and to sustain the water resources and related natural systems"* (373.0361(1), F.S.). Based upon this conclusion, the District's first RWSP, completed in 2001, was prepared for the area encompassed by the west-central, east-central, and southern water supply Planning Regions. Subsequent to completing the Water Supply Assessment, the District concluded that it would be beneficial to redefine these three regions into one water supply Planning Region that encompassed the District's southern ten counties from Pasco County south (Figure 1-1).

In planning for the 2006 RWSP, staff determined that it was not necessary to produce an updated Water Supply Assessment. Instead, demand projections for the Planning Region and the counties to the north, the Northern Planning Area, were developed for the period from 2000 to 2025 as part of producing the 2006 RWSP. Staff also determined that a RWSP would again be necessary for the Planning Region because of the region's heavy reliance on ground water, which has necessitated recovery strategies throughout the region. Extensive efforts have been made to recover ground-water levels and restore natural systems in the Northern Tampa Bay Water Use Caution Area (NTBWUCA) through wellfield reductions and alternative source development projects mandated in the Northern Tampa Bay New Water Supply and Ground-Water Withdrawal Reduction Agreement (Partnership Agreement). In addition, the District's Southern Water Use Caution Area (SWUCA) Recovery Strategy, adopted by the Governing Board in 2006, proposes an extensive program of natural system restoration, ground-water withdrawal reductions, and alternative source development projects to stabilize ground- and surface-water resources in the region.

Regarding the Northern Planning Area, a RWSP has not been prepared as part of the 2006 RWSP update. Staff presented the justification for this recommendation to the Governing Board in 2003 and the Board concurred. See Part B., Section 4, for an overview of water supply planning and resource assessment efforts in the Northern Planning Area.

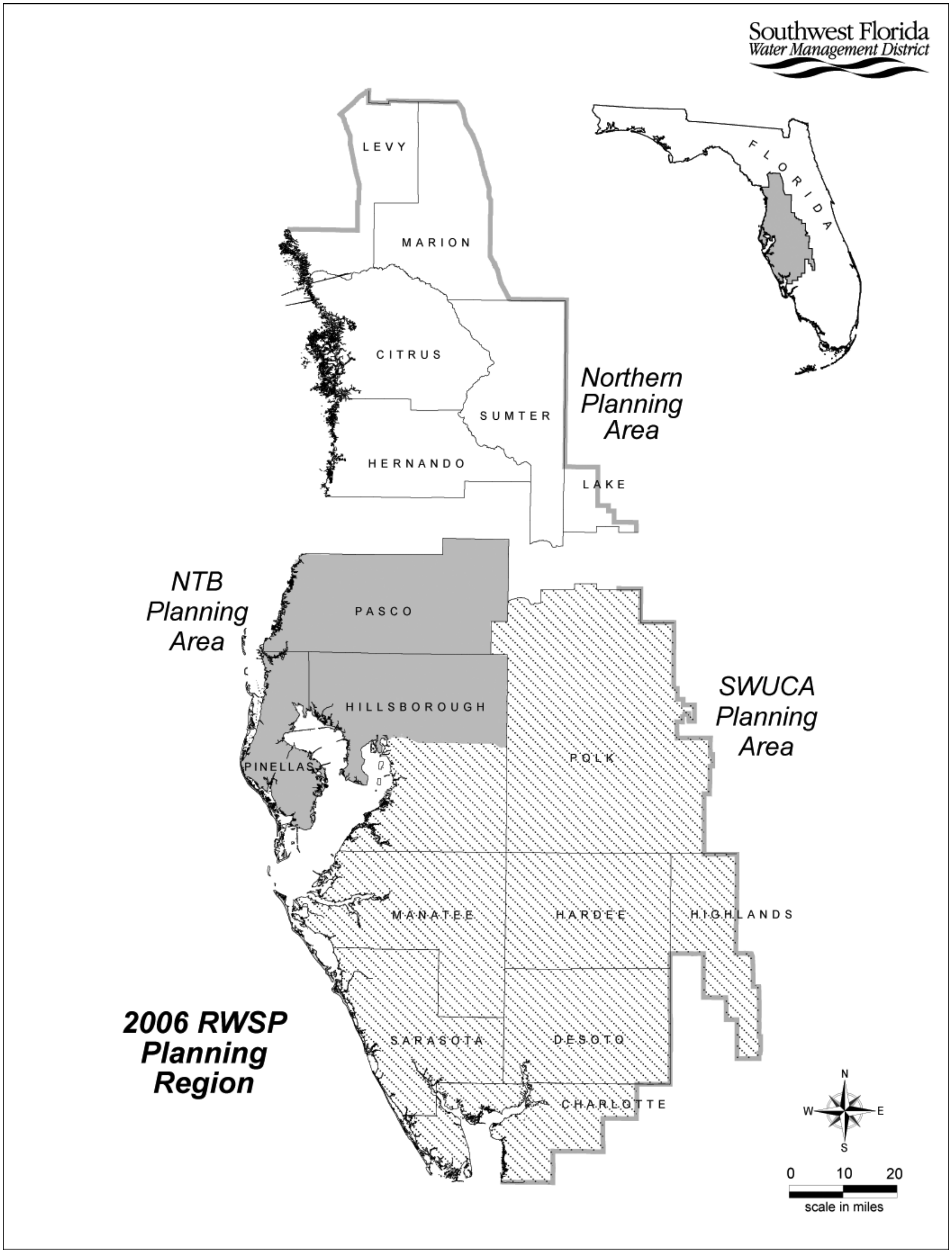

Figure 1-1. Location of the Northen Planning Area and the Northern Tampa Bay and SWUCA Planning Areas within the 2006 RWSP Planning Region.

Section 2. Outreach and Coordination

The RWSP was developed in an open public process, in coordination and cooperation with local governments and utilities, the agricultural community, business and industry representatives, environmental organizations and other affected and interested parties. The District's objective has been to actively involve all stakeholders in the RWSP planning process. The District has accomplished this by involving its standing advisory committees (public supply, agricultural, industrial, green industry and environmental) in the process. Affected parties have also been involved in the development of the RWSP by working with District staff to develop methods for projecting water demand, and assisting with the identification of potential options for water resource and water supply development. Finally, staff have regularly provided status reports to the District Basin Boards and Governing Board during their scheduled public meetings.

The District has also coordinated closely with the St. Johns River and the South Florida Water Management Districts in the preparation of the RWSP. Both of these water management districts have prepared or are preparing RWSPs for areas adjacent to the District's Planning Region. This inter-district coordination was intended to ensure:

- A consistent understanding of existing and projected water demands, particularly for areas split by the District boundaries.
- An understanding of how existing and future withdrawals in one District may contribute toward resource constraints in an adjacent District.
- The water resource and supply development options or recommendations contained in each District's respective RWSP would be compatible with those contained in the Plans of other Districts.

Finally, the District coordinated closely with the FDEP to ensure the State's expectations for the RWSP are met.

Section 3. The District's Guiding Principles for the RWSP

The RWSP is based on a number of important principles that guide the District's strategies to meet water supply demand over the planning period. The first set of guiding principles was developed for the 2001 RWSP and are still considered valid for the 2006 RWSP. The second set are new for the 2006 RWSP and are a reflection of how the District's water supply planning strategies are evolving in response to such factors as changes in water resources legislation, the initiation of water supply planning efforts by coalitions of local governments, development of new strategies to recover stressed ground-water resources such as conjunctive use, strategies to meet future demand through land use transitions, and advances in the District's scientific understanding of the resource.

1.0 Guiding principles developed for the 2001 RWSP

- *An emphasis on conservation:* Conservation is treated as a potential source of water for all major use types (e.g., agriculture, public supply, industrial, etc.).

- *An emphasis on reclaimed water:* Reclaimed water is a major source type, which has been investigated to meet future demands. This includes evaluation of new reclaimed water projects and an investigation into how existing reclaimed water projects can be made more efficient.

- *The role of constraints such as minimum flows and levels:* Potential water supply options included in this RWSP have been identified and screened utilizing a number of criteria, with perhaps the most critical being their ability to avoid and minimize potential environmental impacts. Prior to implementation of these or any other future water supply options, it will be necessary for projects to meet the conditions for issuance of a water use permit from the District.

- *Avoiding the need for mitigation of new withdrawal impacts:* All the water supply development options contained in the RWSP are designed to minimize the need for future mitigation. A number of the projects are intended to help offset impacts of existing projects.

- *Realistic demand projections:* The District used the best available information in the development of estimated future water demands within the Planning Region. This has included significant input from all major use sectors and other experts in the field.

- *Existing state policy on "Local Sources First":* The District has sought to maximize local sources in the preparation of the RWSP, consistent with existing State policies and District rules. Sources from within the Planning Region have been determined to be sufficient to meet all projected reasonable and beneficial demands through the Planning Period. Therefore, sources outside the Planning Region were not investigated.

2.0 Guiding principles developed since completion of the 2001 RWSP

- *Changes in water resources legislation.* Senate Bill 444, passed during the 2005 legislative session, substantially strengthens requirements directed at identifying and listing water supply projects. Changes made by the legislation are intended to foster better communication among water planners, city planners, and local utilities. Local governments are now able to develop their own water supply assessments and the Water Management Districts are required to consider them when developing their RWSPs. Local governments are directed to incorporate alternative water supply projects that they choose from the RWSP into the capital improvement elements of their comprehensive plans. The Water Management District's are required to develop the RWSP in coordination with local water supply authorities. An additional provision of the bill was the creation of the Water Protection and Sustainability Program; a trust fund that provides state matching funds to water management districts and local governments or private entities for the construction phase of alternative water supply projects. The water supply provisions of Senate Bill 444 are explained in greater detail in Chapter 9.

- *Expanding agricultural conservation programs.* By the year 2025, the District intends to work with the agricultural industry to reduce water use in the SWUCA by 40 mgd through agricultural water conservation measures. To reach this ambitious goal, the District, in Cooperation with the Florida Department of Agriculture and Consumer Services (FDACS), has developed the Facilitating Agricultural Resource Management Systems (FARMS) program. FARMS is an agricultural best management practices (BMPs), cost-share reimbursement program that involves both water quantity and quality aspects. It is intended to expedite the implementation of production-scale agricultural BMPs that will help agriculturalists reduce ground-water use from the Upper Floridan aquifer, improve water quality, and restore and augment the area's water resources and ecology. FARMS is a public/private partnership between the District and FDACS and private agriculturalists. Reimbursement cost-share rates for agriculturalists are based on the degree to which the agriculturalists implement both water quantity and water quality BMPs. The District is also continuing to fund agricultural research projects. Since 1979, the District has funded nearly 150 projects that help growers conserve water.

- *Water supply planning efforts by coalitions of local governments.* Water supply planning efforts have been undertaken by alliances of local governments and Water Supply Authorities. In addition to developing new water supply options, these entities have taken the planning level information in the 2001 RWSP and refined it to provide more detailed information on cost and feasibility for the water supply options in their local areas of interest. The District has coordinated closely with these efforts and in some cases has provided funding. The 2006 RWSP has been structured to incorporate much of the information developed from these planning efforts.

- *Assisting the recovery of ground-water resources through conjunctive use.* Public water supply systems that are capable of conjunctive use have access to both ground water and alternative sources such as surface water or desalinated seawater. In areas where the recovery of ground-water levels is necessary, it is important to have the ability to reduce ground-water withdrawals when possible. Maximizing the use of alternative sources when available can achieve reductions while ensuring demands are met. For example, water suppliers with access to both ground water and surface water can maximize the use of surface water during periods of high flows, which enables reductions in ground-water use. Additionally, the development of off-stream reservoirs and ASR for storage helps sustain yields of surface water sources well beyond high rainfall periods, which allows for further reductions in ground-water use. Through the optimized use of all available sources it may be possible to accelerate the process of achieving the desired rate of ground-water level recovery. The District will be working with water utilities and water supply authorities to explore the feasibility of implementing a conjunctive use approach to managing their water supplies.

- *Meeting future demand through land-use transitions.* In the SWUCA, land uses such as agriculture and mining are being displaced by residential and commercial land uses. It is anticipated that the water needs of the expanding residential and commercial land uses will be met in many areas by alternative supplies, such as the harvesting and storing of the wet-season flow of rivers, reclaimed water, and conservation. Because the land uses being replaced rely almost entirely on ground water, there will be a net reduction in ground-water use. A portion of this ground water will be retired to help meet the salt-water intrusion minimum aquifer level. The remainder can be used to meet the demands of residential and commercial development in areas where access to alternative supplies is limited.

- *Advances in the District's scientific understanding of the resource; the Atlantic Multi-Decadal Oscillation.* Based on an emerging body of research, District scientists have recently recognized that the region experiences prolonged wet and dry cycles that last an average of approximately 30 years. These cycles, known as the Atlantic Multi-decadal Oscillation (AMO), are caused by multi-decadal periods of warming and cooling of the North Atlantic Ocean's surface waters. Periods of warmer ocean temperature generally result in increases in rainfall over peninsular Florida. The existence of the AMO has profound implications for the District's water supply planning efforts. For example, harvesting and storing the wet-season flow of rivers is the alternative source with the greatest potential to meet future water supply needs. Since river flows are largely rainfall dependent, the 30-year rainfall cycles result in significant variations in river flows. The region is currently in the wet portion of the AMO cycle and river flows during the wet seasons will be higher, on average, than flows in the dry portion of the cycle. In determining minimum flows, assessing the impacts of land uses, and planning for water supply projects for rivers, scientists and engineers must base their conclusions on flow data that encompasses both wet and dry periods. Assessing the rivers based on the current high rainfall conditions could result in minimum flows that are set too high and yield projections that will be impossible to achieve during the dry portion of the cycle.

Section 4. Organization and Content of the RWSP

A *Format and Guidelines for Regional Water Supply Planning* document was developed by a group representing the five Water Management Districts and the FDEP to ensure a common understanding of, and approach to, meeting the legislative requirements for regional water supply planning. This RWSP has been prepared consistent with this document.

1.0 Geographic Organization of the RWSP

An important aspect of the 2006 RWSP is how its contents are organized geographically. Information in the Plan is sometimes presented in terms of the Planning Region; the entire ten-county area that the Plan addresses. When not presented in terms of the entire Planning Region, information in the RWSP, with the exception of Chapter 6, is presented in terms of the NTB and SWUCA Planning Areas (Figure 1-1). In Chapter 6, the Water Supply Development Component, the hundreds of water supply options that are available for development are segregated into three geographic regions: 1) the NTB Planning Area, which only in Chapter 6 includes the southern half of Hillsborough County (which is actually in the SWUCA), 2) the Peace River/Manasota Regional Water Supply Authority (PR/MRWSA) Planning Area, and 3) the Heartland Water Alliance (HWA) Planning Area (Figure 6-1). There are two reasons for segregating the options in this manner. First, these areas generally correspond to the service areas of Tampa Bay Water and the PR/MRWSA and the area encompassed by the HWA, where major water supply planning efforts are being conducted as described later in this Chapter. Second, the District's strategies for recovering ground-water levels generally encompass the areas where these water supply planning efforts are in progress. The division of the SWUCA into the two Planning Areas in Chapter 6 fits well with the SWUCA Recovery Strategy because the strategy is somewhat different for the two areas. In the rapidly urbanizing coastal counties encompassed by the PR/MRWSA Planning Area, increases in the efficiency of water use, retiring of permitted quantities from lands purchased for conservation, and the use of alternative sources by residential and commercial land uses that replace agricultural and mining interests, which have historically used ground water, is anticipated to significantly reduce the use of ground water by the year 2025. In the inland counties encompassed by the HWA Planning Area, some of the retired ground water may be re-permitted under certain conditions to meet demand where access to alternative supplies is limited.

2.0 Content of the RWSP

The following describes the content of the nine Chapters of the RWSP: Chapter 1, is the Introduction. Chapter 2, Resource Analysis, is a description of the physical characteristics, hydrology, geology/hydrogeology, and cultural resources of the Planning Region. The Chapter also contains a description of the technical investigations that provide the basis for the water resource management strategies that have been developed for the Planning Region. Chapter 3, Resource Protection Criteria, addresses the resource protection strategies the District has implemented or is considering implementing, including water use caution areas, the Northern Tampa Bay Recovery Strategy, the SWUCA Recovery Strategy, and the District's MFLs program. Chapter 4, Demand Estimates and Projections, is a quantification of the water supply needs for all existing and reasonably projected future uses through the year 2025. Chapter 5, Evaluation of Water Source Options, is an evaluation of the future water supply potential of traditional and alternative sources. Chapter 6 is the Water Supply Development component of the RWSP. Water supply development is defined as "*the planning, design, construction, operation, and maintenance of public or private facilities for water collection, production, treatment, transmission, or distribution for sale, resale, or end use*" (s. 373.019(21), F.S. This Chapter contains a description of hundreds of options to develop alternative sources. For each option, the estimated amount of water available for use and the estimated cost of developing the option have been included. Chapter 7 is the Water Resource Development Component of the RWSP. Water resource development is defined as *"the formulation and implementation of regional water resource management strategies, including the collection and evaluation of surface-water and ground-water data; structural and nonstructural programs to protect and manage water resources; the development of regional water resource implementation programs; the construction, operation, and maintenance of major public works facilities to provide for flood control, surface and underground-water storage, and ground-water recharge augmentation; and related technical assistance to local governments and to government-owned and privately-owned water utilities*" (s. 373.019(19), F.S.). The Chapter contains a discussion of water resource development projects that are currently being implemented for which the District is providing financial assistance. Chapter 8 is an overview of water supply development projects that are "under development." This term is defined as projects that the District is helping to fund that since the year 2000 have been completed, are under design/construction, or are planned with funding that has been at least partially budgeted through the District's fiscal year 2006. Chapter 9, Funding Mechanisms, contains an overview of the numerous federal, state, and water management district funding mechanisms available to develop water supply and water resource development projects. It also contains a projection of the amount of funding that is expected to be available in the Planning Region from District and state funding sources and accompanying cooperator match. These funding projections are compared to the capital cost of proposed large-scale water supply and water resource development projects that are likely to be constructed in the Planning Region by 2025.

Part B. Additional Water Supply Planning Efforts within the District

In addition to the District's water supply planning, a number of water supply planning efforts have been undertaken by alliances of local governments and Water Supply Authorities. These include Tampa Bay Water's Long-Term Water Supply Plan of the Master Water Plan, the Heartland Alliance Water Supply Plan, and the Water Planning Alliance Regional System Planning & Engineering Study in cooperation with the Peace River/Manasota Regional Water Supply Authority. In addition to developing new water supply options, these entities have taken the planning level information in the 2001 RWSP and refined it to provide more detailed information on cost and feasibility for the water supply options in their local areas of interest. The District has coordinated closely with these efforts and in some cases has provided funding. Much of the information developed from these planning efforts has been incorporated into the 2006 RWSP. Water supply planning efforts are also ongoing in the District's Northern Planning Area. The following is a description of the technical investigations and planning efforts listed above.

Section 1. Tampa Bay Water

Tampa Bay Water is a regional water supply authority that provides wholesale water for its six member governments. The Member Governments are Hillsborough, Pasco, and Pinellas counties, and the cities of New Port Richey, St. Petersburg, and Tampa. Tampa Bay Water is obligated to meet the current and future water needs of its Member Governments. In order to meet these needs, Tampa Bay Water owns and operates water supply facilities including wellfields, surface water withdrawals, a seawater desalination facility, treatment facilities, storage facilities such as the off-stream reservoir, pumping stations, and transmission mains.

1.0 Long-Term Water Supply Planning

The purpose of Tampa Bay Water's Long-Term Water Supply Planning program is to ensure that their water supplies are sufficient to meet current and future demands. Tampa Bay Water is required by an Interlocal Agreement with its member governments to update its Long-Term Plan of the Master Water Plan every five years to meet the water needs of the Member Governments for the next 20 years. The original Master Water Plan was developed in 1998. The first update was produced in 2003 entitled *Long-Term Water Supply Plan 2003 of the Master Water Plan. T*he next update of the plan will be in 2008. This document analyzes current and future water supplies and demands to determine if and when new supplies need to be developed. In 2001, Tampa Bay Water began its most recent cycle of its Long-Term Water Supply Planning program. The program considered water demands and supplies to the 20-year horizon and beyond with the understanding that developing a new water supply project can take many years. In the initial stage of the planning process, a comprehensive project list of over 300 project supply ideas that could serve as potential water sources was developed. These project concepts included all the projects identified in the District's 2001 RWSP. The comprehensive list was analyzed to develop a shortlist. Analysis included input from a technical advisory committee that included representatives from each member government, a planning advisory committee, and public input at public workshops and meetings. After further investigation of the shortlist, several projects were selected for more investigation. The Tampa Bay Water Board approved the incorporation of several of these water supply projects into the Master Water Plan.

The current Tampa Bay Water Master Water Plan consists of projects that have been approved by the Tampa Bay Water Board for further implementation. From the Master Water Plan, the Board chooses projects for system configurations. Projects selected for a system configuration typically undergo stages of development, with Board approval occurring at each stage prior to a project moving forward:

- preliminary design and major permitting
- final design, permitting, and property acquisition
- construction

The projects from System Configuration I; the Brandon Urban Dispersed Wells, Enhanced Surface Water System, and Tampa Bay Seawater Desalination, were completed by 2005, although the Desalination plant will be undergoing modifications through December 2006. As part of System Configuration II, Tampa Bay Water has prioritized phases A and B of the Downstream Enhancement Project to meet the future demand requirements beyond 2012. This project is described in detail in Chapter 6, Part C, Section 1.

Section 2. Water Planning Alliance Regional System Planning & Engineering Study

The Water Planning Alliance (WPA) is a voluntary planning body of local governments located in the PR/MRWSA service area. WPA membership includes Charlotte, DeSoto, Manatee, and Sarasota counties; the cities of Arcadia, Bradenton, North Port, Palmetto, Punta Gorda, Sarasota, and Venice; the Town of Long Boat Key; and the Englewood Water District. The WPA is operating in cooperation with the PR/MRWSA. The purpose of the study was to identify and demonstrate the feasibility of water supply options that could meet the potable water supply needs of member governments of the WPA through the next 20 years. The study was completed in two phases and produced a plan that identified a prioritized list of water supply development options. Phase I of the study inventoried existing water supply sources and facilities, compiled projected water supply needs for each WPA entity and for the region as a whole, inventoried wastewater and reuse systems, inventoried and quantified the benefits of current conservation programs, assessed the adequacy of WPA member governments' capital improvement programs, assessed existing and projected regulations, and evaluated water needs versus sources. In Phase II, a comprehensive list of future water supply and reclaimed water options was identified, conceptual technical screening and evaluation of potential water supply options were provided, various multi-project configurations and water transmission systems were evaluated, and a short-list of three multi-project configurations was developed. Phase II also included WPA member government and public workshops. This project built upon the planning level work in the District's RWSP by producing a more detailed analysis of the water supply options at the regional and local levels. This information was used by the WPA members to determine water supply development priorities for the region. The WPA Board forwarded the study to the PR/MRWSA to further evaluate and develop the options identified in the study. Water supply options developed by the WPA that meet District permitting criteria have been included in this RWSP.

Following completion of the WPA study, the PR/MRWSA initiated development of an Integrated Regional Water Supply Master Plan (IRWSMP). The IRWSMP will provide a more detailed analysis of the options identified in Phase 2 of the WPA Study, identify regional options to be included in the PR/MRWSA's Capital Improvements Program, and recommend the PR/MRWSA's next water supply option to be pursued. The IRWSMP is scheduled for completion at the end of 2006. In addition to the IRWSMP, the PR/MRWSA is working to create a regional potable water transmission system to interconnect water systems in their counties. This effort, known as the Regional Integrated Loop System Feasibility/Routing Study, was completed in the summer of 2006. The study investigated pipeline routing, including environmental impacts, connection points, pipe sizing, costs, prioritization of loop segments and phasing of construction.

Section 3. Heartland Water Alliance Water Supply Plan

The Heartland Water Alliance (HWA) is an informal group of local governments composed of DeSoto, Hardee, Highlands, and Polk counties. The study area is defined as the HWA member governments' four-county area. This project produced a consensus-developed water supply plan that determined and prioritized specific water supply options to help meet regional demand of all major user groups, including public supply, mining, agriculture, industry, power generation, and recreation, through 2025.

Specific tasks included a review of existing applicable planning documents, a projection of water demand in five-year increments through 2025, an inventory of wastewater and reclaimed water systems and flows, water management district rule development and applicability, an inventory of the benefits of current water conservation programs, and an evaluation of water demands versus water supplies through 2025. An identification and review of the feasibility of various water supply development strategies, such as ground-water withdrawals, surface water withdrawals, surface water collection and impoundments, ASR, storm water systems, reuse, permit quantity exchanges and water transfers within the acceptable confines of applicable permitting rule criteria and requirements, and land planning options was also completed. Water supply options were screened relative to cost, reliability, economics, time frame, public acceptance, permitability, and compatibility with plans being developed by the WPA in cooperation with the PR/MRWSA. The resultant interim water supply option list was presented to affected parties (HWA, water management districts, public supply utilities, Polk County Water Policy Advisory Committee, and others as applicable) to incorporate feedback. In the next phase of the project, the Water Supply Development Plan (Plan) was finalized. This included prioritized implementation strategies and plans for the water supply options. The Plan identified conceptual cost estimates and resource requirements, lead entities, partnerships, and permitting strategies. This project builds upon the planning level work associated with the District's RWSP in that more detailed work at the regional and local levels was accomplished, and the alliance parties used the information to reach a consensus on water supply development priorities for the region. Water supply options developed by the HWA that meet District permitting criteria have been included in the 2006 RWSP.

Section 4. Northern Planning Area

Similar to the 2001 RWSP, it was determined that for the 2006 RWSP the District would not prepare a RWSP for counties in the Northern Planning Area. This decision was based on the general lack of existing regional impacts to water resources. Based on review of long-term hydrologic trends in the region, large-scale regional declines in water levels in recent years have primarily coincided with and can generally be explained by an extended period of lower rainfall. Because the Upper Floridan aquifer is either unconfined or has little overlying confinement over much of the area, low rainfall means less recharge to the aquifer resulting in lower aquifer water levels. However, it is recognized that there are smaller-scale cumulative effects of withdrawals throughout the region. It is also recognized that there are areas within the region where the rate of growth has accelerated beyond what was previously anticipated to occur and that environmental features in these areas are threatened by ground-water withdrawals. These areas require focused attention to prevent harm to the resources from occurring. Based on computer model simulations to estimate the effects of meeting all projected 2025 water demands with ground water, the SJRWMD has included areas adjacent to the District in Lake and Marion counties in a priority water resource caution area.

In response to the rapidly increasing development pressures in the Northern Planning Area, the District initiated a process in 2006 to evaluate options for long-term water resources management. Principal goals of the effort are to develop short-term measures that can be implemented to optimize the use of available ground water to meet future demands while preventing unacceptable impacts to the resources. The strategy will be implemented prior to completion of the District's technical efforts but in advance of the significant harm that has occurred in the NTB/SWUCA Planning Region. One of the options being evaluated is to designate all or portions of the Northern Planning Area as a water use caution area (WUCA). This would complement the work of the SJRWMD that resulted in inclusion of portions of Lake and Marion counties in a priority water resource caution area. Initial discussions have focused on the area of northeast Sumter and southern Marion counties and would involve extending the technical work of the SJRWMD to suitable hydrologic boundaries in the District.

The effect of designating a WUCA in the region would be to enhance the District's Regulatory efforts. Enhancements could include establishing more stringent water conservation requirements such as water conserving rate structures, lower per capita water use rates, and lawn and landscape irrigation requirements. Because the pattern of development in some areas has tended towards high per capita use rates, the strategy would likely focus on options to minimize current and future use through best management and conservation practices so that use of available ground water as a future source of supply can be extended. Designation of the area would help ensure all users are held to the same standard of reasonable and beneficial use. In addition to requiring users to employ best available conservation practices, the strategy would likely include assessing the ability of individual permittees to participate in the development of alternative water supplies.

1.0 Water Supply Planning

There are two water supply planning efforts that encompass the majority of the Northern Planning Area that were being developed concurrently with the District's 2006 RWSP. These efforts are being undertaken by Marion County and the Withlacoochee Regional Water Supply Authority (WRWSA), both of whom received funding and technical assistance from the District beginning in 2004. The following is a brief overview of each of these efforts:

1.1 Marion County Water Resource Assessment and Management Project (WRAMP)

In response to increasing demands for ground water and the designation of areas within and adjacent to Marion County as priority water resource caution areas, Marion County initiated development of the WRAMP in 2004. The WRAMP is a cooperative effort between the District, the SJRWMD, and Marion County to define the future water demands in the County and identify how these demands can be met in an environmentally sustainable manner. Through the WRAMP, the District and the SJRWMD assisted the County in inventorying, evaluating, and assessing the water resources and long-term water requirements of Marion County, and determining the effects of using ground water to meet all the County's projected future water demands. The WRAMP also involves analyzing and modifying as necessary, comprehensive plan policies and land development regulations aimed at protecting, developing, and managing Marion County's water resources.

Major tasks for the WRAMP included projecting future water demands to 2025 and 2055; using a regional model to simulate the effects of meeting future demands exclusively with ground water; and evaluating whether projected demands can be met without adverse impacts to environmental systems. Current ground-water withdrawals in Marion County are approximately 60 million gallons per day (mgd). Estimated demands in 2025 and 2055 are 122 mgd and 201 mgd, respectively. Preliminary results indicate that Marion County can meet its future water demands through 2025 with ground water. However, after 2025 it is expected that the County will need to meet its demands through conservation, reclaimed water, and surface water from the Oklawaha or Withlacoochee Rivers.

1.2 WRWSA Regional Water Supply Master Plan Update

The WRWSA was established in 1972 and includes Citrus, Hernando, and Sumter counties and their cities, plus the City of Ocala. The purpose of the WRWSA is to assess potable water supply needs in the region, prepare plans to provide for those needs, and assist member governments in implementing their long-range water supply plans. Efforts to accomplish these objectives have included development of a Regional Water Supply Master Plan in 1996, construction of a 12 mgd regional water supply facility in Citrus County, and implementation of a Cooperative Funding Program to assist member governments with the development of water supply facilities.

In 2004, the WRWSA requested the District cooperatively fund an update to their 1996 Regional Water Supply Master Plan. Goals of the plan were to assess future water supply demands, evaluate whether these demands could be met in an environmentally sustainable manner, and identify alternative sources for meeting these demands. Within the area encompassed by the WRWSA, total water use is estimated to be about 130 mgd. An assessment of future demands indicates an increase in water use to about 179 mgd by 2025, and 253 mgd by 2055. Using a regional model, the effects of meeting future demands using ground water were determined. Although ground-water resources appear to be in good condition regionally, areas of local concern were identified, such as northeast Sumter County and southern and southwestern Hernando County. Potential alternative sources to meet future demands included seawater desalination, brackish ground-water desalination, reclaimed water, stormwater and water conservation. A detailed feasibility analysis of these options will be prepared and will involve evaluating potential environmental impacts, permitability, source viability, cost-benefit analysis, project sizing and potential conflicts.

2.0 Resource Assessments

Since the 1990s, the District has increased its efforts to improve the level of understanding of the hydrogeology of the Northern Planning Area. In 199X, the District initiated the Northern District Water

Resources Assessment Project (NDWRAP). Primary objectives of the WRAP are to expand the hydrologic data collection network and develop the modeling tools necessary to assess effects of ground-water withdrawals on water resources. Information developed as part of the WRAP will provide the technical foundation for future water resource management decisions. To date, major activities associated with the NDWRAP include construction of monitor wells at up to 15 sites, development of the Northern District ground-water flow model, analysis of water levels and flows, and assessments of the effects of withdrawals.

During the 1990s, the District was actively involved in funding hydrologic investigations and data collection efforts in the region. In the early-1990s, the District cooperatively funded a wellhead protection study with Hernando County that identified areas that contributed ground water to public supply wells in the county and a county-wide ground-water model. In the mid-1990s, the District cooperatively funded a water resources assessment project with the county. One of the principal tools developed for the project was a regional ground-water flow flow model that encompassed the entire northern ground-water basin. In 1998, the District entered into a cooperative effort with the WRWSA to construct monitor wells at six sites near areas of projected future ground-water withdrawals. In addition, the District cooperatively funded several studies with the U. S. Geological Survey to characterize and assess the hydrology of the area. These studies include characterizing and assessing the hydrology of coastal springs; quantifying the interaction between the Upper Floridan aquifer and Withlacoochee River; and developing a detailed water budget of Lake Panasoffkee. These efforts have been necessary to establish the technical foundation for determining the availability of ground water and support water resources management efforts in the region.

3.0 Establishment of Minimum Flows and Levels (MFLs)

The establishment of MFLs in the region is progressing according to the District's schedule for priority water bodies. The adoption of MFLs will likely affect the availability of ground water to meet future demands. In contrast to the NTB/SWUCA Planning Region where actual levels are below established MFLs at many sites and recovery is underway, in the Northern Planning Area, water resources are in relatively good condition. However, because of the rapid urbanization that is occurring in certain areas, there is increasing potential for unacceptable impacts to water resources to occur. Adoption of MFLs will enable proper water supply planning to occur and ensure the water demands of the natural systems are met prior to the occurrence of significant harm. Through the end of 2006, minimum levels have been adopted or approved by the Governing Board for the following lakes in the region:

- Citrus County: Ft. Cooper and Tsala Apopka
- Hernando County: Hunters, Lindsey, Mountain, Neff, Spring, and Weeki Wachee Prairie
- Sumter County: Big Gant, Deaton, Miona, Okahumpka, and Panasoffkee
- Levy: Marion

In an effort to adopt MFLs in the region prior to the occurrence of significant harm, several of the major water bodies appear on the 2007 list of priority water bodies:

- 2007: Weeki Wachee Spring
- 2008: Chassahowitzka River System/Spring, and Rainbow Springs
- 2009: Homosassa River System, Homosassa Spring, Upper Withlacoochee River System, and Middle Withlacoochee River System
- 2010: Crystal River, Kings Bay Spring, Gum Spring, and Hidden River Springs 1 and 2.

4.0 Alternative Water Supply Development

In addition to District-wide research and education efforts, the District is partnering with local governments to develop reclaimed water and water conservation projects and related education initiatives. The District's Cooperative Funding Initiative supports local projects for water conservation and reclaimed water. Since FY 1999, the District has provided $7.5 million toward conservation and reclaimed water projects. An explanation of these projects and education efforts is provided in the following text.

4.1 Conservation Incentives

The conservation and reclaimed water projects completed in recent years are just the beginning of the District's efforts to realize the significant potential for additional water savings in the Northern Planning Area. District is working with local governments to garner interest in projects like the toilet rebate project with Hernando County, which reached 191 customers and saved 9,120 gallons per day. Tremendous potential for water savings can be realized by implementing water conservation projects that cost less than $3 per thousand gallons saved. As an example, nearly 10 mgd could be saved by 2025 in the Northern Planning Area by implementing the non-agricultural water conservation options described in Chapter 6. In addition, adopting the appropriate rate structures and landscape, irrigation and plumbing codes and ordinances will ensure that growth in the region will have the least possible impact on water resources.

4.2 Conservation Education

The District supports a number of water conservation education initiatives in the Northern Planning Area including the Florida Yards and Neighborhoods Program, a media campaign focused on Florida-friendly landscaping, Community Education Grants to projects that focused on water conservation, and the Water Conservation Hotel and Motel Program (C.H.A.M.P.) that helps hotels and motels save water. The District has contracts with most of the school boards in the Northern Planning Area including Hernando, Citrus and Sumter counties, to provide education programs designed to enhance student and educator knowledge of water resources issues. In addition, the District funded 11 mini grants through its Youth Education program in Hernando, Citrus, and Sumter counties for water conservation projects that reached over 4,400 students.

4.3 Reclaimed Water Projects

The District has entered into reclaimed water partnerships with the cities of Brooksville, Ocala, Inverness and Wildwood, Sumter and Citrus counties, and Southern States Utilities (now Hernando County) to implement projects to offset traditional water supplies. The reclaimed water projects involve the design and construction of approximately 10 million gallons of storage and 50 miles of pipelines to provide nearly five mgd to recreational and residential customers to offset more than 3.7 mgd of traditional water supplies. In addition, the Homosassa Regional Wastewater and Reuse Project is replacing septic tanks and a package waste plant in an environmentally sensitive area affecting the Halls and Homosassa Rivers. The project is rehabilitating the Riverhaven wastewater collection system to improve water quality, and collect additional wastewater flows such that the new wastewater facilities for Citrus County can beneficially reuse 2.75 mgd of reclaimed water in the future.

4.4 Reclaimed Water Potential

At the present time it is not feasible to interconnect many of the reclaimed water systems of neighboring utilities in the Northern Planning Area due to limited plant flows and long distances between infrastructure. However, developing local projects to maximize the beneficial use of reclaimed water has significant potential. In 2005, the wastewater flows from the 39 wastewater treatment plants (WWTPs) capable of producing public access quality reclaimed water were 17.4 mgd; 6.9 mgd of which was used for beneficial purposes. Estimating future reclaimed water availability using only the wastewater flows from WWTPs currently in existence and assuming the completion of planned treatment upgrades to produce public access quality reclaimed water, the 2025 WWTP flows are estimated to be 28.2 mgd. If it is assumed that 75 percent of this flow will be used for beneficial purposes and measures are implemented to achieve 75 percent efficiency, the region could beneficially use 21.1 mgd of reclaimed water to offset 15.9 mgd of traditional sources.

Part C. Accomplishments Since Completion of the 2001 RWSP

A number of major RWSP initiatives that had not yet begun or were in their early stages when the 2001 RWSP was approved by the Governing Board, have been completed or have made substantial progress. These initiatives include: 1) the completion of major portions of the water supply projects that were part of the Tampa Bay Partnership Agreement, 2) substantial progress on developing and adopting additional minimum flows and levels, 3) formulation of a recovery strategy for the SWUCA, 4) alternative water supply projects under development throughout the Planning Region, 5) restoration projects to improve minimum flows in the upper Peace River, 6) the FARMS program to reduce agricultural water-use from the Upper Floridan aquifer, and 7) Quality of Water Improvement Program (QWIP) and the Well Plugging/Well Backplugging Program.

Section 1. NTBWUCA Recovery Strategy

The NTBWUCA Recovery Strategy is comprised of the reductions in ground-water withdrawals and alternative source development provisions in the Partnership Agreement and the adoption of MFLs.

1.0 Partnership Agreement

In an effort to help resolve the resource impacts in the NTBWUCA, the District entered into an agreement with Tampa Bay Water and its member governments (Tampa, St. Petersburg, New Port Richey and Hillsborough, Pasco and Pinellas counties). An overall strategy to reduce reliance on ground water, implement alternative sources and allow recovery of natural systems was put in place in May 1998 with the approval of the Northern Tampa Bay New Water Supply and Ground-Water Withdrawal Reduction Agreement (Partnership Agreement). The key objectives identified in the Agreement were the development of at least 85 mgd of new water supply, the phased reduction of withdrawals to no more than 90 mgd by December 31, 2007 from the existing 11 wellfields that comprise the central system, the ending of litigation, and up to $183 million in financial assistance from the District for new water supply development and conservation.

Tampa Bay Water has been very successful in achieving the objectives of the Partnership Agreement. As a result of the completion of the first phase of the Enhanced Surface Water System and the Brandon Urban Dispersed Wells, the requirement of developing at least 38 mgd of new alternative water supplies by 2003 was met. With the completion of the reservoir portion of the Enhanced Surface Water System and its subsequent filling and remediation of the Tampa Bay Seawater Desalination Plant, Tampa Bay Water will have developed a total of 97 mgd by the end of 2006. Tampa Bay Water's total new water supply capacity of 97 mgd exceeds the 85 mgd requirement.

Tampa Bay Water's phased pumpage reductions from the eleven consolidated permit wellfields in the NTB area required a reduction from the original permitted capacity of 191 mgd to no more than 121 mgd annual average beginning in 2003, and no more than 90 mgd annual average beginning in 2008. As a result of the development of the new water supplies and with the advent of favorable hydrologic conditions, annual average pumpage from the wellfields was reduced to below 90 mgd in 2003, four years ahead of schedule.

The Partnership Agreement also called for Tampa Bay Water's member governments to achieve 17 mgd of water savings through demand management measures by 2005. Tampa Bay Water's member governments were successful in achieving and exceeding this goal well in advance of the deadline.

2.0 NTBWUCA MFLs

MFLs in the NTBWUCA were adopted by the Governing Board in 1999. New water withdrawals cannot cause water levels or flows to fall below adopted MFLs unless the withdrawal is part of the recovery strategy. The current phase of the recovery strategy extends through the year 2010 and is based on the current knowledge of the state of the water resources of the area, the technology for water supply development including alternative sources and conservation, and existing and future reasonable-beneficial uses. The District will evaluate the state of recovery in 2010, and based on that analysis and evaluation, by December 31, 2010, the District will initiate rulemaking to: 1) revise the MFLs, as necessary; 2) adopt rules to implement new MFLs; and 3) revise the current phase of recovery to incorporate a second phase of recovery if necessary.

Section 2. Minimum Flows and Levels

Since the completion of the 2001 RWSP, the District has made significant progress on the development and adoption of MFLs in the Planning Region.

MFLs that have been adopted since the completion of the 2001 RWSP include:

- Forty-eight Category 1, 2, and 3 lakes in Highlands, Polk, Hillsborough, and Pasco counties

MFLs that have been approved and are currently awaiting formal adoption since completion of the 2001 RWSP include:

- The Floridan aquifer in the Eastern Tampa Bay Most Impacted Area of the SWUCA for saltwater intrusion
- Eight Category 1 and 2 lakes in Highlands and Polk counties
- Upper Peace River

MFLs peer reviewed in 2005 include:

- Alafia River (including Buckhorn and Lithia Springs)
- Middle Peace River
- Tampa Bypass Canal
- Upper Myakka River System

- Intermediate Aquifer System in the SWUCA

Section 3. SWUCA Recovery Strategy

The District has established MFLs in the SWUCA for the Upper Floridan aquifer in coastal Hillsborough, Manatee and Sarasota counties, the upper Peace River and eight lakes in the Lake Wales Ridge in Polk and Highlands counties. Since nearly all of these MFLs are not currently being met, the District has prepared a Recovery Strategy. The Recovery Strategy is designed to restore minimum flows to the upper Peace River and minimum levels to lakes in Highlands and Polk counties as soon as practical. It will also slow the inland movement of saltwater intrusion such that withdrawal infrastructure will be at minimal risk of water quality deterioration over the next century. Consistent with statutory direction, the strategy also ensures that there is ample water supply for all existing and projected reasonable and beneficial uses in this eight county area. The recovery strategy and rules were adopted in March of 2006. The SWUCA Recovery Strategy is a fundamental building block of the 2006 RWSP and every effort has been made to insure consistency between the two documents. Much of the information in the Recovery strategy has been incorporated into the 2006 RWSP. A full description of the SWUCA Recovery Strategy is provided in Chapter 3, Resource Protection Criteria.

Section 4. Alternative Water Supply Projects Under Development

In Chapter 4 it is explained that 409 mgd of new water supply is needed to meet the 2000 to 2025 demand for water supply and to restore minimum flows and levels for impacted natural systems. As of December 2006, it is estimated that at least half of that demand has either been met or will be met by projects that are under development (those projects that since the year 2000, have been completed, are in the design/construction phase, or are planned with funding at least partially secured in the FY2006 budget). The projects under development include major expansions of the water supply systems for Tampa Bay Water and the PR/MRWSA, extensive expansion of reclaimed water systems including the Tampa Bay Regional Reclaimed Water Project, aquifer storage and recovery systems for both potable and reclaimed water, and conservation projects for public supply and agriculture. Chapter 8 contains a detailed discussion of the water supply projects that are under development.

Section 5. Restoration Projects to Improve Minimum Flows in the Lower Peace River

Chapter 3 outlines the District's strategy for establishing MFLs for major water resources. The District is currently setting minimum flows for the Peace River. Surface-water drainage alterations, reduction in surface storage, long-term rainfall patterns and induced recharge due to ground-water withdrawals have all contributed to a reduction in dry season flows in the upper river. A requirement of minimum flow establishment is the development of a recovery strategy when actual levels are below or are anticipated to fall below established minimums. Actual flows are below the minimum flows being proposed for the upper Peace River. Since the completion of the 2001 RWSP, the District has developed a comprehensive strategy for restoration of minimum flows to the upper Peace River. Projects that are part of this strategy are described in Chapter 7, Water Resource Development.

Section 6. Facilitating Agricultural Resource Management Systems (FARMS)

FARMS is an agricultural best management practices (BMPs), cost-share reimbursement program that involves both water quantity and quality aspects. It is intended to expedite the implementation of production-scale agricultural BMPs that will help agriculturalists reduce ground-water use from the Upper Floridan aquifer, improve water quality, and restore and augment the area’s water resources and ecology. FARMS is a public/private partnership between the District and the Florida Department of

Agriculture and Consumer Services (FDACS) and private agriculturalists. Reimbursement cost-share rates for agriculturalists are based on the degree to which they implement both water quantity and water quality BMPs. To date, eight projects are complete and have offset a total of 3.2 mgd of ground water. An additional 16 projects have been Board approved and are in various stages of development. When completed, these projects will offset an additional 4.9 mgd of ground water for a total offset of 8.1 mgd. Through 2025, it is anticipated that the projects developed by the program will offset at least 40 mgd of agricultural ground-water use.

Section 7. Quality of Water Improvement Program (QWIP) and the Well Plugging/Well Backplugging Program

The QWIP was established in 1974 through Chapter 373, F.S., to restore ground-water conditions altered by well drilling activities. The QWIP's primary goal is to preserve ground- and surface-water resources through proper well abandonment. Plugging abandoned artesian wells eliminates the waste of water at the surface and the degradation of ground water from inter-aquifer contamination. Wells constructed prior to current well construction standards are often deficient in casing and expose several aquifers of varying water quality to one common wellbore. Thousands of these wells are in existence and they allow potable water supplies to be contaminated with mineralized water from deeper aquifers. Contaminated water and potable water can flow to the surface, which wastes water and can contaminate surface water.

Plugging wells involves filling the abandoned well with cement. Confinement is thus reestablished and mixing of varying water qualities and free flow is stopped. The emphasis of this program is primarily in the coastal portions of the SWUCA where the aquifer is confined and flowing wells can exist. Chapter 373, F.S., requires that artesian systems, those areas where water in a well will rise naturally above the confining unit, be specifically addressed. As of 2005, the QWIP has inspected 6,269 wells and plugged 3,794 wells throughout the Planning Region since the inception of the program in 1974.

Chapter 2. Resource Analyses

This Chapter is a description of the physical characteristics, hydrology, geology/hydrogeology, and cultural resources of the Planning Region. The Chapter also contains a description of the technical investigations that provide the basis for the water resource management strategies that have been developed for the Planning Region.

Part A. Description of the Planning Region

Section 1. Physical Characteristics

The Planning Region can be grouped into two distinct provinces with the division occurring roughly along Interstate 4. The NTB area is comprised of Pinellas and Pasco Counties and the portion of Hillsborough County not in the SWUCA. The remaining province, the SWUCA, includes all of the Planning Region to the south. Each region is distinct in its hydrogeologic setting. In the NTB area, much of the topography is largely a result of limestone dissolution and sediment deposition. Numerous closed depressions and sinkholes throughout the area reflect active solution of the underlying limestone. This type of terrain is termed karst topography. In the SWUCA, surficial deposits composed of sand, gravel, and clay form a thick sequence of sediments that overlie the carbonate aquifers. This thick sequence of sediments and limited ground-water circulation have subdued development of karst features in the western, central, and southern portions of the SWUCA (SWFWMD, 1988).

Land surface altitude from the Gulf Coast gradually increases from sea level to a high of about 150 feet National Geodetic Vertical Datum (NGVD) in eastern Pasco, northeastern Manatee, southeastern Hillsborough counties and interior Polk County. Land surface elevation continues to rise to the east where a series of north-northwesterly trending sand ridges interrupt the landscape in eastern Polk and Highlands counties (White, 1970). Elevation exceeds 300 feet NGVD at various points in the Lake Wales Ridge, the highest land elevation on the Florida peninsula.

Section 2. Hydrology

1.0 Rivers

The Planning Region contains ten major watersheds (Figure 2-1). In the NTB area, they are the Anclote River, Hillsborough River, and the Tampa Bypass Canal (TBC) (the former Six Mile Creek/Palm River watershed that was extensively altered by the construction of the TBC). Further south are the Alafia, Little Manatee, Braden, Manatee, Myakka, and Peace Rivers along with Myakkahatchee and Shell Creeks. There are many smaller tributaries to these larger systems as well as several coastal watersheds drained by many small tidally-influenced or intermittent streams.

2.0 Lakes

There are over 150 named lakes located in the NTB area with extensive water-level data. Lakes greater than 20 acres in size are included in Figure 2-1. Many lakes were formed by sinkhole activity and retain a hydraulic connection to the Upper Floridan aquifer. Others are surface depressions perched on relatively impermeable materials and reflect water table levels. Many of the lake systems are internally drained, while others are connected to river systems through natural streams or man-made canals. Many lakes have been altered by drainage and development with water-level control

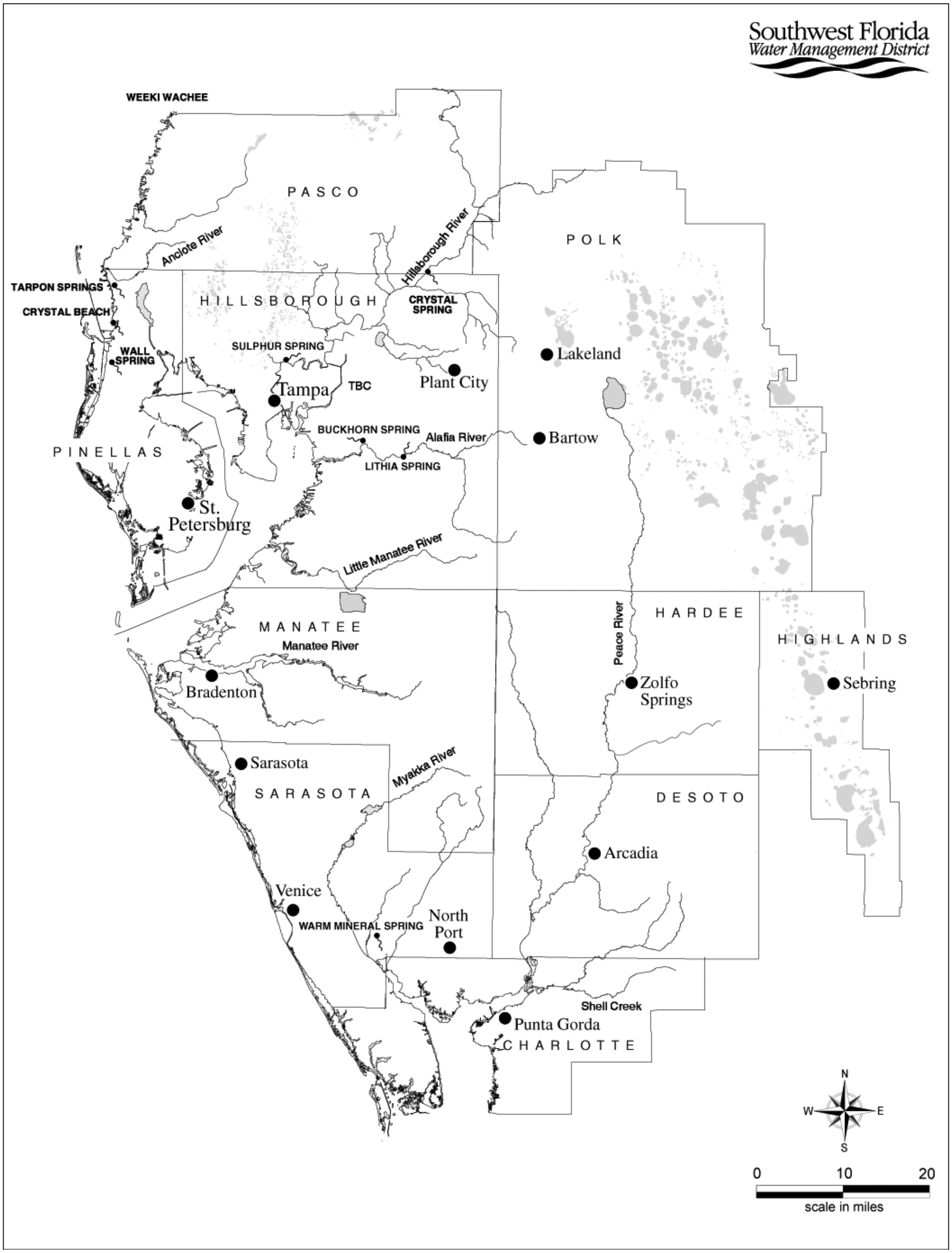

Figure 2-1. Major Hydrologic Features in the Planning Region

structures commonly present. About 50 lakes have been or are currently augmented with ground water from the Upper Floridan aquifer. In the eastern part of the SWUCA, almost 200 lakes and ponds are located along the ridges and flanks of the Lake Wales Ridge. The lakes are most likely the result of ancient sinkholes formed by the dissolution of the underlying limestone. The lakes range in size from a few tens of acres to more than 5,500 acres at Crooked Lake in southern Polk County. Flood control structures have been constructed on many of the lakes and until recently, several of the lakes, especially in the uplands portion of the central ridge, had not discharged water for the past 25 years due to low water levels. However, wetter than normal conditions in 2003, excessive rainfall from three hurricanes in 2004, and wet conditions again in 2005 have caused the lakes to rise to levels that have not been experienced since the 1950s.

3.0 Springs

Several springs of first magnitude (discharge exceeds 100 cubic feet per second (cfs)) and second magnitude (discharge is between 10 and 100 cfs) are located within the Planning Region. These include Crystal Spring in Pasco County, Wall, Crystal Beach, and Tarpon Springs in Pinellas County, Sulphur, Lithia, and Buckhorn Springs in Hillsborough County and Warm Mineral Spring in Sarasota County (Figure 2-1).

Crystal Spring is located in Pasco County near Zephyrhills and is one of the principle sources of the Hillsborough River's headwaters. Measured flow has averaged 57.6 cfs (37.4 mgd) for the period of record (1934 to present), though declines in flows have been noted over the past 40 years. Sulphur Springs is located on the Hillsborough River several miles north of downtown Tampa. During the dry season when the entire flow of the Hillsborough River is captured for water supply at the City of Tampa's Dam, Sulphur Springs is the only input of water to the lower Hillsborough River. The average flow of Sulphur Springs during the past five years is approximately 31 cfs (personal communication, Sid Flannery, SWFWMD).

Wall, Crystal Beach, and Tarpon Springs are located on the Gulf Coast in northern Pinellas County. Limited data indicate that the springs discharge brackish water and are strongly tidally influenced. Wall Springs was formerly a private recreation area that was purchased by Pinellas County as part of a county park. Although no flow data are available, it is probably a second magnitude spring. Crystal Beach Spring is a second magnitude (Scott and others, 2004), submarine spring located about 1000 feet southwest of the shoreline. Tarpon Springs, located in the City of Tarpon Springs, is tidally influenced and can reverse flow. Maximum recorded discharge is 1000 cfs (Roseneau and others, 1977).

Lithia and Buckhorn Springs are located on the Alafia River, south of Brandon in southeastern Hillsborough County. Lithia Springs is composed of two vents; Lithia Major and Lithia Minor. Periodic measurements of Lithia Springs since the early 1930s indicate an average discharge of between 30 and 40 cfs. Buckhorn Springs, composed of a number of vents spread over several acres, is located several miles down river of Lithia Springs. Periodic measurements made by District staff and Tampa Bay Water in the early 1990s, indicated that the combined average flow from four significant vents was approximately 17.6 cfs. This includes the water diverted from the spring for industrial purposes (Jones and others, 1994). An industrial operation diverts a total annual average of approximately 4.3 mgd from Lithia and Buckhorn Springs. The majority of this diversion is pumped from Lithia Major.

Warm Mineral Spring is located about 13 miles southeast of the City of Venice in Sarasota County. Periodic measurements indicate that average discharge is approximately 10 cfs (Roseneau and others, 1977). The warm temperature of the spring water indicates that the source of the water is probably much deeper in the aquifer than springs further to the north, which tend to have shallow flow systems.

The District is periodically questioned about freshwater springs in the Gulf of Mexico and the possibility of utilizing them for water supply. In response to these inquiries, the District conducted a two-year study of submarine springs in the Gulf of Mexico and Tampa Bay (Dewitt and others, 2003). The water quality and quantity of discharge were investigated at a number of submarine spring and karst features. Although some of the features discharged significant quantities of water, the quality of water in all cases was highly saline. This result was expected because the saltwater/freshwater interface, the boundary between fresh ground water and saline ground water in the Upper Floridan aquifer, is located onshore in much of the Planning Region. Therefore, it is highly unlikely that fresh ground water could be discharging offshore through springs.

4.0 Wetlands

Prior to significant development, approximately 54 percent of Florida was wetlands. However, due to drainage and development, only about 30 percent of the State is currently wetlands. Wetlands can be grouped into saltwater and freshwater types. Saltwater wetlands are found bordering estuaries which are coastal wetlands influenced by the mixing of freshwater and seawater. Tampa Bay and Charlotte Harbor are two large estuaries along the west-central Florida coast. Saltgrasses and mangroves are common estuarine plants.

Freshwater wetlands are common in inland areas of Florida. Hardwood-cypress swamps and marshes are two major freshwater wetland systems. Both systems are found either bordering lakes and rivers or standing alone as isolated wetlands. The hardwood-cypress swamps are forested systems with water at or above ground for a considerable portion of the year. Marshes are typically shallower systems vegetated by herbaceous plants rather than trees.

Section 3. Geology/Hydrogeology

Figure 2-2 is a generalized cross section of the hydrogeology of the entire District. As seen in this figure, the Central West-Central Florida Ground-Water Basin (CWCFGWB), where the NTB area is located, constitutes a hydrogeologic transition zone between the southern and northern parts of the District. The Southern West-Central Florida Ground-Water Basin (SWCFGWB) encompasses the southern portion of the District where the intermediate aquifer system and its associated clay confining units thin to the north and eventually become a single confining unit in the NTB area. Further north, in the central and northern portions of the CWCFGWB, this single confining unit becomes discontinuous and eventually disappears entirely in the northern part of the District. In this area, the Upper Floridan aquifer is unconfined.

1.0 NTB Area

In the NTB area, the surficial aquifer is comprised primarily of unconsolidated deposits of fine-grained sand, silt, and clayey sands with an average thickness of 30 feet. The surficial aquifer is found extensively throughout most of the NTB area except in northwestern Pasco County and most of Hernando County west of the Brooksville Ridge. Water table depth ranges from near land surface in wetlands and marshes to as much as 15 feet along sand ridges. The unconsolidated materials that comprise the surficial aquifer are generally low in permeability and do not yield or transmit significant quantities of water.

Figure I-6. Generalized North/South Geologic Cross Section through the SWFWMD

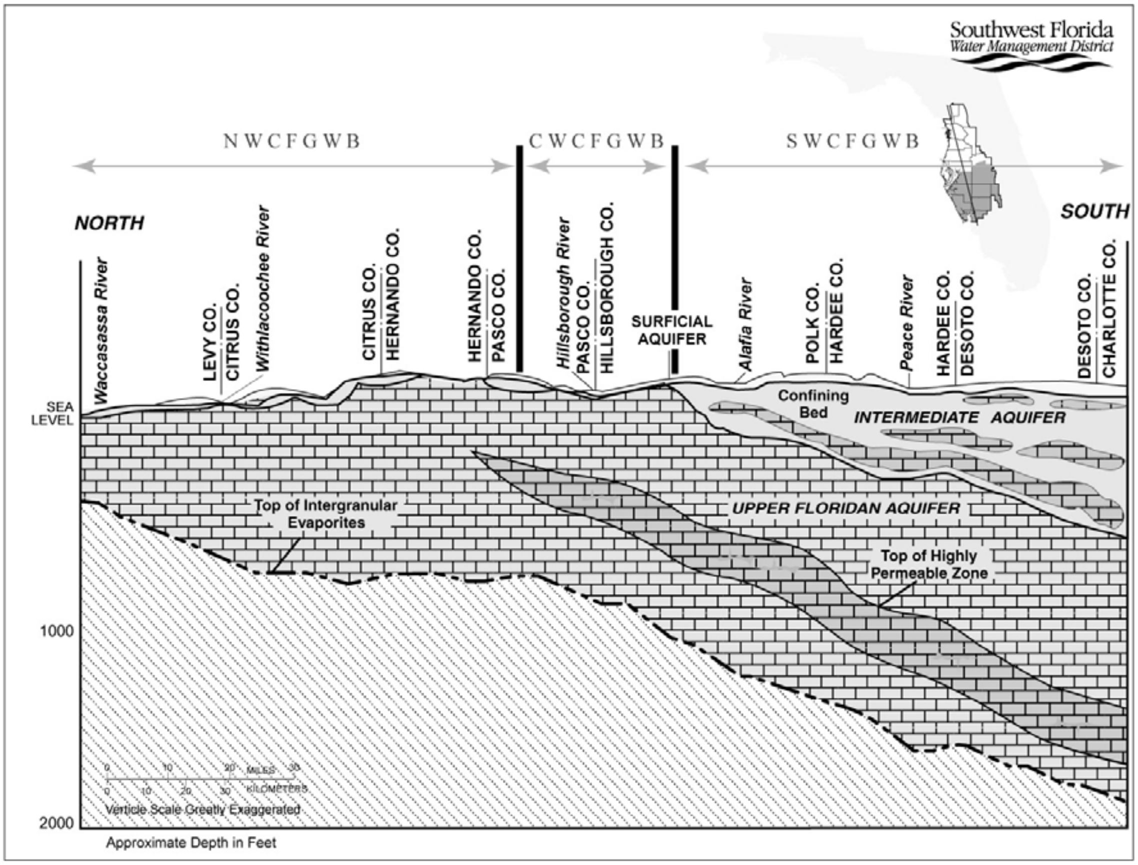

Figure 2-2. Generalized North-South Geologic Cross Section through the District.

Below the surficial aquifer is a semi-confining unit comprised chiefly of clay, silt, and sandy clay that retards the movement of water between the overlying surficial aquifer and the underlying Upper Floridan aquifer. Regionally, the thickness of the semi-confining unit varies from essentially zero to more than 60 feet. The clay thickness generally follows the regional trend of being thicker in the southern portions and thin or absent in the northern portions of the NTB area. However, the karst geology of the area has created a semi-confining unit that is highly variable locally. The Upper Floridan aquifer consists of a continuous series of carbonate units that include portions of the Tampa Member of the Arcadia Formation, Suwannee Limestone, Ocala Limestone, and Avon Park Formation. Except in the extreme northern portions of the Planning Region, ground water within the Upper Floridan aquifer is pressurized or under confined conditions. The middle confining unit of the Floridan aquifer lies near the base of the Avon Park Formation. It is composed of gypsiferous dolomite and dolomitic limestone and has a very low permeability. The middle confining unit is generally considered to be the base of the freshwater production zone of the Upper Floridan aquifer.

In the Green Swamp, recharge to the Upper Floridan aquifer is generally low. Although the confining unit is thin or absent in this area, the transmissivity of the Upper Floridan aquifer is low and the vertical head difference between the surficial and Upper Floridan aquifers is small, so recharge is low. The Green Swamp is the source of the Hillsborough, Withlacoochee, Peace, and Oklawaha Rivers.

2.0 SWUCA

The surficial aquifer produces relatively small quantities of water in the western and central portions of the SWUCA and is generally used for lawn irrigation or domestic water supply. The aquifer consists of fine sand, clayey sand, silt, shell, shelly marl, and some phosphorite. In this area, surficial deposits range in thickness from 10 feet in coastal areas to greater than 50 feet (SWFWMD, 1993). In the eastern portion of the SWUCA, the surficial aquifer extends from 10 to more than 300 feet in depth (Yobbi, 1996). The thickness of the surficial aquifer varies widely along the length of the Lake Wales Ridge from about 50 feet in Polk County to 300 feet in southern Highlands County (Yobbi, 1996). East and west of the Lake Wales Ridge, aquifer thickness is generally less than 100 feet. Recharge to the surficial aquifer is through infiltration of rainfall and irrigation water.

Underlying the surficial aquifer is the confined intermediate aquifer system. This aquifer consists predominately of discontinuous sand, gravel, shell, limestone, and dolomite beds. The intermediate aquifer system usually contains at least two distinct water-bearing zones (Wolansky, 1983). The water-bearing zones are separated by low-permeability sandy clays, clays, and marls. The aquifer system also includes major confining units that are comprised of sandy clay, clay, and marl. These confining beds restrict vertical movement of ground water between individual water bearing zones and between the overlying surficial and the underlying Upper Floridan aquifers.

In general, the thickness of the intermediate aquifer system increases from north to south across the SWUCA (Figure 2-2). Thickness of the intermediate aquifer system varies from less than 50 feet in central Hillsborough County to over 600 feet in Charlotte County (Duerr and others, 1988). Recharge to the intermediate aquifer varies from low to moderate depending upon seasonal ground-water use in the area.

The confined Upper Floridan aquifer is composed of a thick, stratified sequence of limestone and dolomite units. The Upper Floridan aquifer can be separated into an upper and lower flow zone. The Tampa Member and Suwannee Limestone together form the upper flow zone. The lower zone is termed the highly transmissive zone of the Avon Park Formation. The two zones are separated by the lower permeability Ocala Limestone which acts as a semi-confining layer. The two flow zones are locally connected, through the Ocala, by vertical solution openings along fractures or other zones of preferential flow (Menke and others, 1961). There is generally no recharge to the Upper Floridan aquifer along the coast. Further inland, natural recharge to the Upper Floridan aquifer increases from zero to one inch per year (Aucott, 1988). This low recharge rate is due to the thick sequence of multiple clay confining layers that overlie the Upper Floridan aquifer system. These clay layers severely restrict the vertical exchange of water from the surficial aquifer to the deeper Upper Floridan aquifer. One exception is the ground-water system underlying the eastern portion of the SWUCA. In this area, principally along the Lake Wales Ridge, leakage between the surficial and Floridan aquifers is greatest due to karst features. Estimated recharge rates in the Lake Wales Ridge area, based upon numeric modeling, range from about 6 to 15 in/yr (SWFWMD, 1993).

Section 4. Cultural Resources

The Planning Region is characterized by a diversity of land use types (Table 2-1), ranging from urban built-up areas such as most of Pinellas County (Pinellas County is the most densely populated county in the State) to predominantly agricultural land uses in DeSoto and Hardee counties. As is the case

Table 2-1. Land Use/Land Cover in the Planning Region.

Land Use/Land Cover Types (1999)	Acres	Percent
Urban & Built-up	865,650	19.36
Agriculture	1,458,848	32.63
Rangeland	314,976	7.05
Upland Forest	501,444	11.22
Water	204,407	4.57
Wetlands	760,019	17.00
Barren Land	9,733	0.22
Transportation, Communication & Utilities	59,013	1.32
Industrial and Mining	296,211	6.63
TOTAL	**4,470,303**	**100.0**

Source: FLUCCS & SWFWMD GIS Database, LULC 1999.

with Florida as a whole, much of the urban development within the region is concentrated along the coast. Significant phosphate mining activities, primarily in Hillsborough, Manatee and Polk counties, also occur in the Planning Region; however, future mining operations are anticipated to move southward into Hardee and DeSoto counties as phosphate reserves at existing mines are depleted. The population of the Planning Region is projected to grow from an estimated 4.2 million persons in 2000 to more than 6 million in 2025. This is an increase of approximately 1.8 million new residents; a 42 percent increase over the planning period. The majority of this population growth will be due to net migration.

Part B. Previous Technical Investigations

The 2006 RWSP builds on a series of cornerstone technical investigations that were undertaken by the District and the USGS during the past 15 years. These investigations have provided District staff with an understanding of the complex relationships between human activities (i.e., ground and surface water usage and large scale land-use alterations), climactic cycles, aquifer/surface water interactions, aquifer and surface hydrology, and water quality. These investigations are listed by categories and briefly outlined below.

Section 1. Water Resource Assessment Projects

In the late 1980s, the District initiated a program to conduct Water Resource Assessment Projects (WRAPs) to assess water availability in several regions. These projects are detailed assessments of the water resources and include intensive data collection, monitoring and ground-water modeling to characterize hydrologic conditions and determine the effects of water withdrawals. There are five areas in the District for which WRAPs have been initiated. The first three WRAPs were initiated in the late 1980s and early 1990s for the NTB area, eastern Tampa Bay area, and Highlands Ridge areas.

In the NTB area, resource impacts included lowered water levels in lakes and wetlands, impacts to existing legal users and limited saltwater intrusion caused primarily by ground-water withdrawals from 11 public supply wellfields in the area. In the Highlands Ridge area, resource impacts included lowered lake levels and impacts to existing legal users, caused primarily by agricultural ground-water withdrawals in the area. In the eastern Tampa Bay area, resource impacts included saltwater intrusion into the confined Upper Floridan aquifer caused by ground-water withdrawals for agriculture, industry and public supply. In the mid-1990s, a fourth WRAP was initiated which covered the southern portion of the District and encompassed both the eastern Tampa Bay WRAP and Highlands Ridge WRAP areas. The purpose of this WRAP was to assess the cumulative effects of all water withdrawals in the region. A fifth WRAP is being conducted for the Northern Planning Area. The eastern Tampa Bay WRAP was completed in 1993 and the northern Tampa Bay WRAP was completed in 1996. These studies have helped to define the availability of ground-water resources in the Planning Region.

In 1999, the District initiated the Northern Tampa Bay Phase II investigation as a follow-up to the northern Tampa Bay WRAP. Through a series of projects, this study will continue assessments of the biologic and hydrologic systems in NTB area to support the ongoing development of MFLs, water resources recovery, water use permitting, and environmental resource permitting. Projects will include the further development of MFLs methodologies, assessments of various techniques for restoring water levels in surface-water features, and expanded biologic and hydrologic data collection. These studies will continue through 2010. As the ongoing WRAPs are completed, the results of these studies will be incorporated into future updates of the RWSP.

Section 2. USGS Hydrologic Investigations

The District has a long-term cooperative program with the USGS to conduct regional hydrogeologic investigations. The goals of this program are to improve the understanding of cause and effect relationships. Funding for this program is generally on a 50/50 cost share basis with the USGS. However, this varies based on whether other cooperators are involved in the project and if requests for non-routine data collection or special project assignments are implemented.

Regional investigations of the hydrogeology of the District are an important aspect of the cooperative program. These investigations are intended to augment work conducted by District staff and are focused on improving the understanding of cause and effect relationships and developing analytical tools to be used in resource evaluations. In the past these investigations have included: 1) development of computer models of the regional ground-water flow systems for the SWFWMD, Highlands Ridge WUCA, Hardee and DeSoto counties, Cypress Creek, Cross Bar, and Morris Bridge wellfields, and the St. Petersburg aquifer storage and recovery (ASR) site, 2) detailed analysis of the hydrologic budgets for two benchmark lakes (Lucerne and Starr), 3) hydrogeologic characterization of the intermediate aquifer system, and 4) hydrologic assessments of the Peace and Alafia Rivers.

In recent years, this program has included projects to determine the effects of using ground water to augment stressed lakes and investigation of factors influencing coastal spring flows. Ongoing projects include: evaluation of the effects of using ground water for supplemental hydration of wetlands; hydrogeologic characterization of the intermediate aquifer system; use of ground-water isotopes to estimate lake seepage; statistical characterization of lake level fluctuations; and investigation of the hydrology of the Upper Hillsborough River Basin, and the effects of karst development on flow in the upper Peace River.

Section 3. Water Supply Investigations

In 1977, as part of the Corps of Engineers Four River Basins Area project, an assessment of water resources in the region was prepared to determine ways in which excess surface or ground water could be utilized, either singularly or "conjunctively," to help solve regional water supply problems. Objectives of the study were to evaluate current and anticipated water-resource problems in the study area; determine sites suitable for alleviating the identified problems; and describe preliminary design elements and costs associated with developing these sites. The study showed where problem areas would exist through the year 2035 and identified possible solutions to those problems. A major limitation of the study identified by the authors was that the environmental aspects of the projects were not investigated. Also, social and political considerations were not taken into account.

Since the 1970s, the District has conducted numerous hydrologic assessments designed to assess the effects of ground-water withdrawals and determine the availability of ground water in the region. In the late 1980s the Florida Legislature directed each of the Water Management Districts to conduct a Ground-Water Basin Resource Availability Inventory covering areas deemed appropriate by the Districts' Governing Boards. The District completed Inventory reports for 13 of the 16 counties within its jurisdiction. The three remaining counties, which were only partially contained within the District's boundaries, were to be completed by an adjacent water management district. These reports described the ground-water resources of the individual counties and respective ground water basins.

Based on the District's hydrologic and biologic monitoring programs and results of the hydrologic assessments that had been conducted, the District declared three areas as water use caution areas in the late 1980s because of observed impacts of ground-water withdrawals. Recognizing that the future supply of ground water was limited in some areas, the District prepared the *Water Supply Needs & Sources: 1990-2020 study* (SWFWMD, 1992). One of the more important objectives of the study was to provide a foundation from which the District could provide appropriate water resources management in the future. Key to the management approach was to optimize resources to provide for all reasonable and beneficial uses without causing unacceptable impacts to the resources, natural systems and existing legal users. The document assessed future water demands and sources through the year 2020. Major recommendations of the study included the need for users to rely on local sources to the greatest extent practicable to meet their needs before pursuing more distant sources, requiring users to increase their water use efficiency, and pursuing a regional approach to water supply planning and development.

In response to legislation in 1997 that clarified the role of water management districts in water supply planning, the District completed a water supply assessment in 1998 (SWFWMD, 1998). The assessment quantified water supply needs through the year 2020 and identified areas of the District that would not be able to meet those demands with traditional ground-water sources. As required by the legislation and based on the outcome of the water supply assessment, the District initiated preparation of a regional water supply plan for its southern 10-counties. This area encompasses the Northern Tampa Bay WUCA and the SWUCA. In 2001, the District published its first RWSP, which quantified water supply demands through the year 2020 and identified water supply options for developing alternative sources (sources other than fresh ground water). The RWSP concluded that ground water would be available to meet future demands on a limited basis only and that sufficient alternative sources existed in the Planning Regions to meet projected 2020 demands.

Section 4. Minimum Flows and Levels Investigations

In addition to the actual measurement of water level or flows, extensive field data is often required in support of MFL development. The types of studies done in support of MFL development are both ecologic and hydrologic in nature. They include basic biologic assessments such as the determination of the frequency, abundance and distribution of plant and animal species and their habitats. Ultimately this ecologic information is related to hydrology based on relationships to elevation or flow. Ecologic and hydrologic relationships are developed using either statistical or mechanistic models or a combination of the two. In estuaries, for example, 2 or 3 dimensional salinity models may be developed to assess how changes in flow affect the spatial and temporal distribution of various salinity zones. In certain circumstances, depending on the resources of concern, thermal or water quality models might be required as well. Considerable elevation (survey) data is also collected for generating bathymetric maps or coverages used for modeling purposes or simply to determine when important features such as roads, floor slabs, and docks become inundated or when flows or levels drop sufficiently low to affect recreation and aesthetics.

Section 5. Modeling Investigations

Since the 1970s, the District has been responsible for the development of numerous computer models to support resource evaluations and water supply investigations. These models have been subdivided into ground-water flow models for general resource assessments and solute transport models to assess past and future saltwater intrusion. In recent years the District has begun to support the use of integrated hydrologic models that simulate the entire hydrologic cycle and include details about both the surface water and ground-water flow systems. These models are being used to address questions where the interaction between ground water and surface water is significant.

Many of the early ground-water flow models were developed by the USGS through a cooperative studies program with the District. Over time, as more data were collected and computers became faster, the models developed by the District have included more detail about the hydrologic system. The models form an important part of hydrologic assessments performed by the District. The end result of the modeling process yields a tool that can be used to assess effects of current and future withdrawals and better understand hydrologic relationships. However, one of the most important aspects of modeling is the actual process of building the model. The process of building a model is invaluable in terms of organizing and assessing the available data and exploring hydrologic relationships to better understand the hydrogeology of the area.

1.0 Ground-Water Flow Models - NTB Area

Beginning in the late 1970s, the USGS, with cooperative funding from the District, created several models of the NTB area (Robertson and Mallory, 1977; Ryder, 1978, and 1980; Hutchinson, 1981, 1984 and 1985; and Fretwell, 1988). These models were generally used to evaluate effects of withdrawals for specific wellfield areas. Using information from these prior models, the District (Bengtsson, 1987) developed a transient ground-water model of the NTB area with an active water table to assess effects of withdrawals on surficial aquifer water levels. In 1993 the District completed development of the NTB model that covered approximately 1,500 square miles (Hancock and Basso, 1993). Together with monitoring data in the region, the NTB model was used to characterize and quantify the magnitude of ground-water withdrawal impacts occurring in the region.

In addition to the models developed by the District and USGS, models have been developed by Tampa Bay Water to support requests for ground- and surface-water withdrawals. These include Law Environmental (1994), SDI Environmental Services, Inc. (1995), and EMR-South (1995). In 1997, SDI-Environmental developed the first fully integrated model of the area that covered an area larger than that of the NTB Model. The District is currently working with Tampa Bay Water to develop a new generation of integrated model that builds on the previous efforts. This model is referred to as the Integrated Hydrologic Model and improves upon the interconnection algorithms developed for the previous integrated model and uses GIS technology to better represent all aspects of the physical system.

2.0 Ground-Water Flow Models – SWUCA

As with the NTB area, the early ground-water models developed for the SWUCA were done by the USGS (Wilson and Gerhart, 1980; and Ryder, 1985). Since the early 1990s, the District has been responsible for the development of three ground-water flow models. The Eastern Tampa Bay model (Barcelo and Basso, 1993) simulated flow within the Southern West-Central Ground-Water Basin (SWCFGWB), which does not include the eastern side of the Lake Wales Ridge that lies within the SWUCA. Though the model was originally designed to evaluate ground-water withdrawals for the Eastern Tampa Bay Water Resource Assessment Project, it has been used to evaluate effects of various proposed and existing withdrawals across the SWUCA in the SWCFGWB. Results of the modeling effort have confirmed the regional nature of the ground-water basin in the SWUCA. Following completion of the Eastern Tampa Bay Model, the USGS was contracted to develop a model of the Lake Wales Ridge area (Yobbi, 1996). The Lake Wales Ridge model has been used to provide assessments of the effects of regional ground-water withdrawals on surficial aquifer water levels in the Ridge area.

The most recent ground-water flow model for the SWUCA is the Southern District Model Version 1.0, which simulates ground-water flow in the entire District south of Hernando County (Beach and Chan, 2003). However, the model is primarily designed to simulate conditions throughout the District south of the Hillsborough River and Green Swamp. The Southern District Model Version 1.0 has replaced the Eastern Tampa Bay model as the principal tool for resource assessment and resource management.

3.0 Saltwater Intrusion Models – NTB Area

Although regional saltwater intrusion in the NTB area is not a major resource concern, as it is in the SWUCA, local and subregional saltwater intrusion has been observed. Saltwater intrusion models completed for the area include Dames & Moore (1988), GeoTrans, Inc (1988 and 1991), and HydroGeoLogic. Inc. These models have generally confirmed the localized nature of saltwater intrusion in the NTB area.

4.0 Saltwater Intrusion Models – SWUCA

There have been three major models developed to simulate historical and future saltwater intrusion in the SWUCA. The first of these models was a series of three two-dimensional, cross-section, models capable of simulating density dependent flow known as the Eastern Tampa Bay Cross-Section Models (HydroGeoLogic, Inc., 1991). Each model was designed as a geologic cross-section located along flow paths to the Gulf of Mexico or Tampa Bay. These models were used to make the initial estimates of movement of the saltwater-freshwater interface in the Eastern Tampa Bay WUCA. To address the three-dimensional nature of the interface, a sharp interface code, SIMLAS, was developed by HydroGeoLogic, Inc. (1993) for the District. The code was applied to the Eastern Tampa Bay area creating a sharp interface model of saltwater intrusion. Subsequent to this, the cross-sectional models were refined (HydroGeoLogic, Inc, 1994a) and the results were compared to those of the sharp interface model (HydroGeoLogic, Inc. 1994b). The cross-sectional models compared well with the sharp interface model.

In support of establishing a minimum aquifer level to protect against saltwater intrusion in the Most Impacted Area of the SWUCA, a fully three-dimensional, solute transport model of the Eastern Tampa Bay area was developed by HydroGeoLogic, Inc (2002). The model encompasses all of Manatee, Sarasota, and the southern half of Hillsborough and Pinellas counties and extends about 25 miles offshore. The model only simulates flow and transport in the Upper Floridan aquifer. The model was calibrated from 1900 to 2000, although there is only water quality data for the period 1990 to 2000. In the District's quest to improve the model, it was recalibrated the following year (HydroGeoLogic, Inc. 2003). Estimates of the number of wells and amount of water supply at risk to future saltwater intrusion under different pumping amounts were derived using this model.

Chapter 3. Resource Protection Criteria

This chapter provides a detailed description of the resource protection strategies the District has implemented or is considering implementing, including water use caution areas, the NTB Recovery Strategy, the SWUCA Recovery Strategy, and the District's MFLs program.

Part A. Water Use Caution Areas

In the late 1980s the District realized that certain interim resource management initiatives could be implemented to help prevent existing problems in the WRAP areas from getting worse prior to the completion of each WRAP. As a result, in 1989, the District established the NTB, ETB, and HR WUCAs, or Water Resource Caution Areas (WRCAs) as they are referred to in Chapter 62-40, Florida Administrative Code (F.A.C.) (Figure 3-1). The area of the Planning Region that is not included in one of these three WUCAs, or the SWUCA, was designated as a WRCA in 2006. This designation was pursuant to recent amendments to Chapter 62-40.520(2) F.A.C. by the FDEP. The amendments require the water management districts to designate any area requiring a water supply plan as a WRCA. This designation enables the FDEP to require utilities in the area to conduct reuse feasibility studies.

For each of the initial three WUCAs, a three-phased approach to water resources management was implemented, including: (1) short-term actions that could be put in place immediately, (2) mid-term or intermediate actions that could be implemented concurrent with the ongoing WRAPs, and (3) long-term actions that would be based upon the results of the WRAPs. Short-term actions for each WUCA included the establishment of a Work Group comprised of representatives from all types of water users within each WUCA (e.g., public supply, agriculture, industry), local governments, environmental representatives, and other interested parties. These Work Groups were convened to assist the District in the development of management plans for each WUCA. The main goal of the management plans was to stabilize and restore the water resource in each area through a combination of regulatory and non-regulatory efforts. The plans were adopted in 1990 and 1991. Additional short-term measures included development of conservation plans, permitting using cumulative impact analysis, and requiring withdrawals from stressed lakes to cease within three years.

One of the primary means of implementing the WUCA management plans was through modifications to the District's water use permitting rules for each specific WUCA. These modifications primarily addressed additional conservation requirements and investigation of alternative water sources for water use permittees. One significant change was the designation of the Most Impacted Area within the ETB WUCA, within which no net increase in permitted water use from the Upper Floridan aquifer was allowed. This would be accomplished by significantly limiting the issuance of new permitted quantities.

Section 1. SWUCA

Realizing that the Southern Ground-Water Basin should be managed in a comprehensive fashion, the entire southern portion of the District encompassing this basin was declared the SWUCA in October of 1992. The SWUCA encompasses approximately 5,100 square miles, including all or part of eight counties in the southern portion of the District. In response to growing demands from public supply, agriculture, mining, power generation and recreational uses, ground-water withdrawals steadily increased for nearly a century before peaking in the mid-1970s. These withdrawals resulted in declines in aquifer levels throughout the basin, which in some areas exceeded 50 feet. Although ground-water withdrawals have since stabilized as a result of management efforts, depressed aquifer levels continue

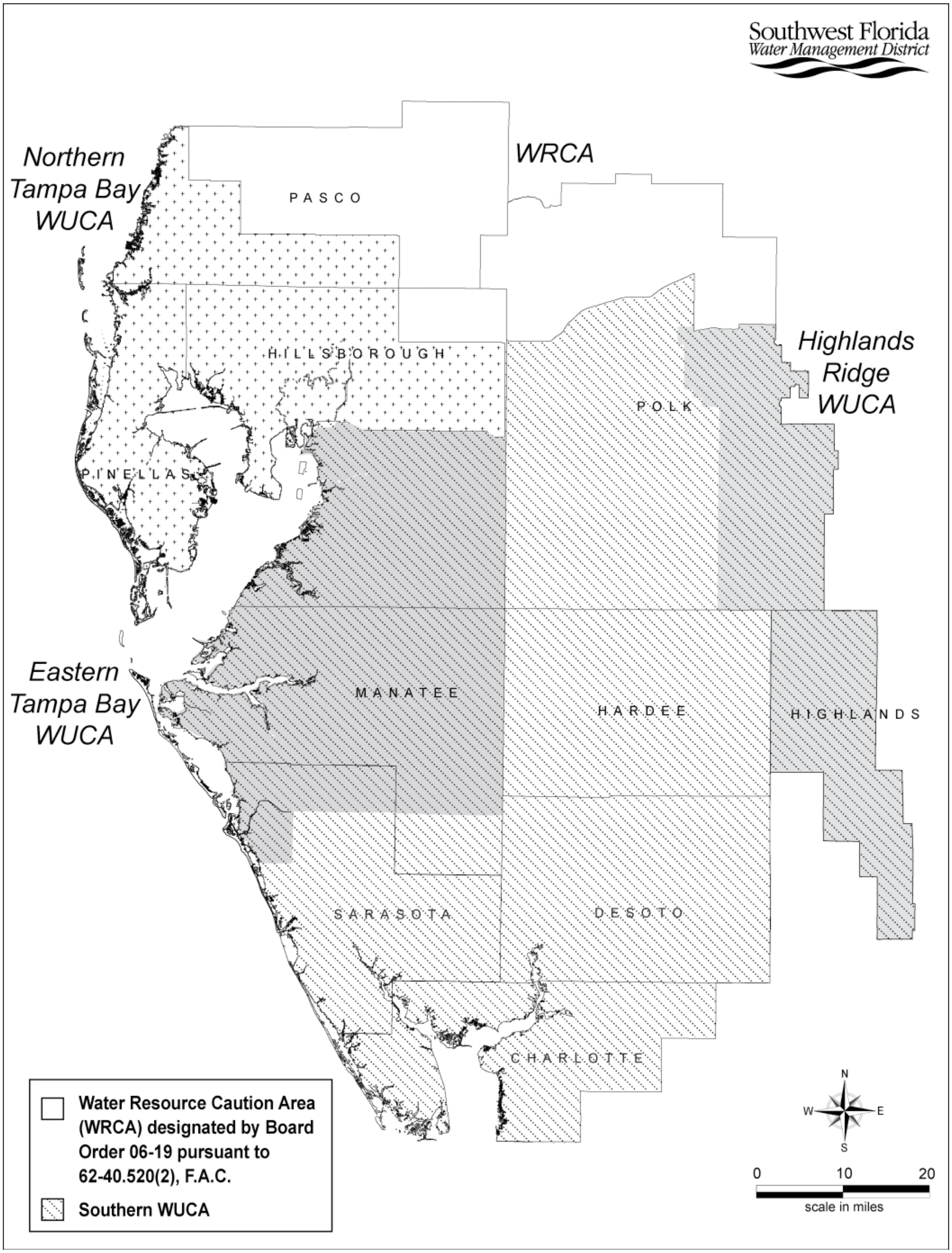

Figure 3-1. Location of the Northern Tampa Bay, Eastern Tampa Bay, and Highlands Ridge Water Use Caution Areas (WUCAs).

to cause saltwater intrusion, and contribute to reduced flows in the upper Peace River and lowered lake levels of some of the more "leaky" lakes in the upland areas of Polk and Highlands counties.

The SWUCA encompassed the previously established ETB and HR WUCAs. As with the previous WUCAs, the District convened a Work Group to assist in drafting a management plan for the area. The Work Group concluded a year-long series of meetings in late 1993. The District completed the management plan for the SWUCA in mid-1994, which included both regulatory and non-regulatory recommendations. To implement the regulatory component, the District subsequently initiated rulemaking.

The proposed 1994 SWUCA rule had three main objectives, including: (1) significantly halt saltwater intrusion into the confined Upper Floridan aquifer along the coast, (2) stabilize lake levels in Polk and Highlands counties, and (3) limit regulatory impacts on the region's economy and existing legal users. The principal concept of the rules was to establish a minimum aquifer level and, because existing levels were below this minimum, to allow renewal of existing permits while gradually reducing existing quantities. The rule also had a mechanism, referred to as reallocation, to allow the voluntary redistribution of existing permitted quantities to new uses and locations within the SWUCA. A number of parties filed objections to parts of the rule and an administrative hearing was conducted. In March 1997, the District received the administrative law judge's Final Order upholding the minimum Floridan aquifer level (and the science used to establish it) and the phasing in of conservation. However, the ruling on provisions for reallocation and preferential treatment of existing users was determined invalid. The scientific work conducted previously for the SWUCA and its implications for limited additional ground-water availability has been incorporated into this RWSP.

In 1998, the District initiated a reevaluation of the SWUCA management strategy in recognition that the reallocation and preference to existing legal users provisions of the previously proposed rule were found invalid and the District elected not to appeal these provisions of the Final Order. This reevaluation was also promoted by a recognition that resource conditions in the SWUCA had improved and was based on: 1) a decline in permitted and actual water use and improved ground-water levels, 2) new legislative direction provided in 1997 that required water resource planning and development and provisions for a recovery and prevention strategy, and 3) recognition of the long-term nature of the resource constraints.

1.0 SWUCA Recovery Strategy

The District has established MFLs in the SWUCA for the Upper Floridan aquifer in coastal Hillsborough, Manatee and Sarasota counties, the upper Peace River and eight lakes in the Lake Wales Ridge in Polk and Highlands counties. Since nearly all of these proposed minimum flows or levels are not currently being met, the District has prepared a Recovery Strategy. The Recovery Strategy is designed to restore minimum flows to the upper Peace River and minimum levels to lakes in Highlands and Polk counties as soon as practical. It will also slow the inland movement of saltwater intrusion such that withdrawal infrastructure will be at minimal risk of water quality deterioration over the next century. Consistent with statutory direction, the strategy will also ensure that ample supplies of water are available for all existing and projected reasonable and beneficial uses in this eight county area.

The strategy furthers the progressive water resource management that has evolved in the area over the last few decades. Financial incentives are provided to encourage conservation and development of alternative supplies so that the adverse effects of competition for water from the Upper Floridan aquifer will be minimized. Water resource development projects, such as restoring storage in headwater lakes in the Peace River watershed, will be undertaken by the District to restore perennial flow to the upper

Peace River and restore lake levels in the Lakes Wales Ridge, a strategy consistent with the 1997 revisions to the Water Resource Act of 1972. The strategy is also designed to take advantage of long-term land and water use planning to maximize the beneficial use of alternative supplies and further reduce ground-water withdrawals. The goals of the strategy are to accomplish the following in an economically, environmentally and technologically feasible manner:

- Restore minimum levels to priority lakes in the Lake Wales Ridge by 2025;
- Restore minimum flows to the upper Peace River by 2025;
- Reduce the rate of saltwater intrusion in coastal Hillsborough, Manatee and Sarasota counties by achieving the proposed minimum aquifer level for saltwater intrusion by 2025; once achieved, future efforts should seek further reductions in the rate of saltwater intrusion and the ultimate stabilization of the saltwater-freshwater interface; and,
- Ensure that there are sufficient water supplies for all existing and projected reasonable-beneficial uses.

In designing the Recovery Strategy every effort has been made to ensure all provisions are completely consistent with Chapter 373, Florida Statutes, the District's enabling legislation. The strategy also maximizes the use of existing District rules, and in the final analysis very few rule changes are required. The water resource and water supply development components of the strategy simply require “staying the course” which is how the District has addressed these issues for the past decade. For example, the District has developed a “financial engine” (Chapter 9) to encourage the development of alternative supplies and more aggressive demand management throughout the District, but emphasizes these efforts in the SWUCA and NTBWUCA. This “financial engine” also provides the necessary funding for water resource restoration projects in areas such as the upper Peace River, a critical component of the strategy. Finally, the strategy contemplates enhancements to how the District does business, such as streamlining collection and analysis of water use permitting data and forming staff teams to facilitate priority water use activities (e.g., reconstitution of the agricultural teams).

The management approaches outlined in the Recovery Strategy will be reevaluated and updated over time. The five-year updates to the RWSP include revisiting demand projections as well as reevaluation of potential sources, using the best available information. In addition, monitoring of recovery in terms of both resource trends and trends in permitted and used quantities of water, is an essential component of this Recovery Strategy. The monitoring will provide the information necessary to determine progress in achieving recovery and protection goals and will enable the District to take an adaptive management approach to the resource concerns in the SWUCA to ensure the goals and objectives established by the Governing Board are ultimately achieved. The Recovery Strategy and rules were adopted in March of 2006. The SWUCA Recovery Strategy is a fundamental building block of this RWSP and every effort has been made to insure consistency between the two documents. Much of the information in the Recovery Strategy has been incorporated into this RWSP.

Section 2. NTBWUCA

In 1989, the District's Governing Board declared an area encompassing parts of Hillsborough and Pasco counties and all of Pinellas County to be included in the NTBWUCA. The Governing Board took this action based on growing concerns about hydrologic impacts to wetlands, lakes, and rivers, resulting from ground-water withdrawals. Because the majority of ground-water use in the area is for public supply, most of the water resource impacts were located in areas surrounding the major public supply wellfields. The NTB Water Resource Assessment Project (NTBWRAP) was initiated as part of the long-term goal of the NTBWUCA to assess water resource impacts and determine water availability for the area. While the NTBWUCA was delineated to include the principal areas where the water supply was being used, the NTBWRAP area was delineated to include areas of significant ground-water withdrawals and water resource impacts.

The NTBWRAP area encompasses approximately 1,500 square miles, including parts of Hernando, Pasco, Hillsborough, Polk counties, and all of Pinellas County. Ground-water withdrawals in the area have increased from less than 50 mgd in 1960 to more than 200 mgd in the 1990s. Prior to the 1950s, many of the wells used for water supply in coastal communities experienced saltwater intrusion. Because of this and in order to meet the increasing demands of the area, the production of ground water for public supply moved to inland areas. In 1996, the District completed the NTBWRAP and concluded that the major public supply well fields were responsible for the majority of observed impacts to lakes in the area. Though it was also concluded that regional saltwater intrusion was not a major concern in the area, it is possible that saltwater intrusion could occur on a local scale.

In October 1998, the District's Governing Board approved MFLs for the NTB area, which included setting levels for 41 cypress wetlands and 15 lakes. Levels were also set for 7 Floridan aquifer wells for saltwater intrusion management. In February 1999, minimum flows were approved for the lower Hillsborough River. Since 1998, minimum levels have been adopted for 45 additional lakes in the NTB area. Concurrent with the District's efforts to establish MFLs in the NTB area, Tampa Bay Water and its member governments entered into an agreement with the District to reduce ground-water withdrawals from its regional well fields and work towards recovery in areas where water resources had been impacted. This agreement, commonly referred to as the Partnership Agreement, established that ground-water withdrawals from Tampa Bay Water's central system well fields would be reduced from a high 158 mgd to 90 mgd by the year 2007. The Partnership Agreement is one part of a plan adopted by rule (40D-80, F.A.C.) for environmental recovery in the NTBWUCA.

As part of the Partnership Agreement, the District combined all of the permits for Tampa Bay Water's central system well fields into one permit. Known as the Consolidated Permit, the permit requires an extensive water resource monitoring network around the individual well fields, along with many other data reporting and planning requirements. It is anticipated that Tampa Bay Water's monitoring network will address most of the data collection needs in and around major withdrawal centers, while the District's efforts will focus on the areas between and beyond Tampa Bay Water's withdrawal centers.

The District has committed to collect additional data to support the refinement and improvement of the MFL methodologies and to studying the benefits of using other management methods, such as augmentation, to achieve adopted MFLs. In 2010 the District must decide whether to re-adopt the current MFLs, or adopt new MFLs, and whether to adopt a second phase of the Recovery Strategy.

To accommodate coordination with local governments and agencies, the District established a Local Technical Peer Review Group (LTPRG) consisting of representatives from local and state agencies, municipalities, and other interest groups. The LTPRG will review hydrologic, biologic, and geologic studies in the NTBWUCA being performed by the District and other parties. Additionally, the District has developed a plan to continue research and development of management plans to achieve recovery. This plan, known as the NTB II Scope of Work, outlines data collection and research to 1) expand and improve data collection, 2) expand and evaluate existing MFL methods, 3) develop new MFL methods, 4) evaluate the effects of recovery, and 5) evaluate alternative management methods (including restoration projects, augmentation, and other such concepts).

1.0 NTBWUCA Recovery Strategy

The NTBWUCA Recovery Strategy is comprised of the reductions in ground-water withdrawals and alternative source development provisions in the Partnership Agreement and the adoption of MFLs. The Partnership Agreement required a reduction in ground-water withdrawals from the 11 wellfields in Tampa Bay Water's central system from 158 to 121 mgd by the end of 2002, and to 90 mgd by the end of 2007 (a total decrease of about 68 mgd). The Agreement also commits the District to provide funding assistance to Tampa Bay Water to develop alternative water supply projects to replace lost wellfield capacities. In the 2001 RWSP, this reduction was viewed as water demand that had to be replaced with new, alternative sources of water. As discussed in Chapter 8, several alternative water supply projects that were under development when the 2001 RWSP was approved, have been completed and have increased the availability of alternative water supplies in the region. These projects, as well as favorable rainfall conditions over the past few years, have enabled Tampa Bay Water to reduce ground-water withdrawals and meet the 90 mgd target several years ahead of the deadline. Figure 3-2 depicts the 12-month moving average ground-water withdrawals from Tampa Bay Water's central well-field system.

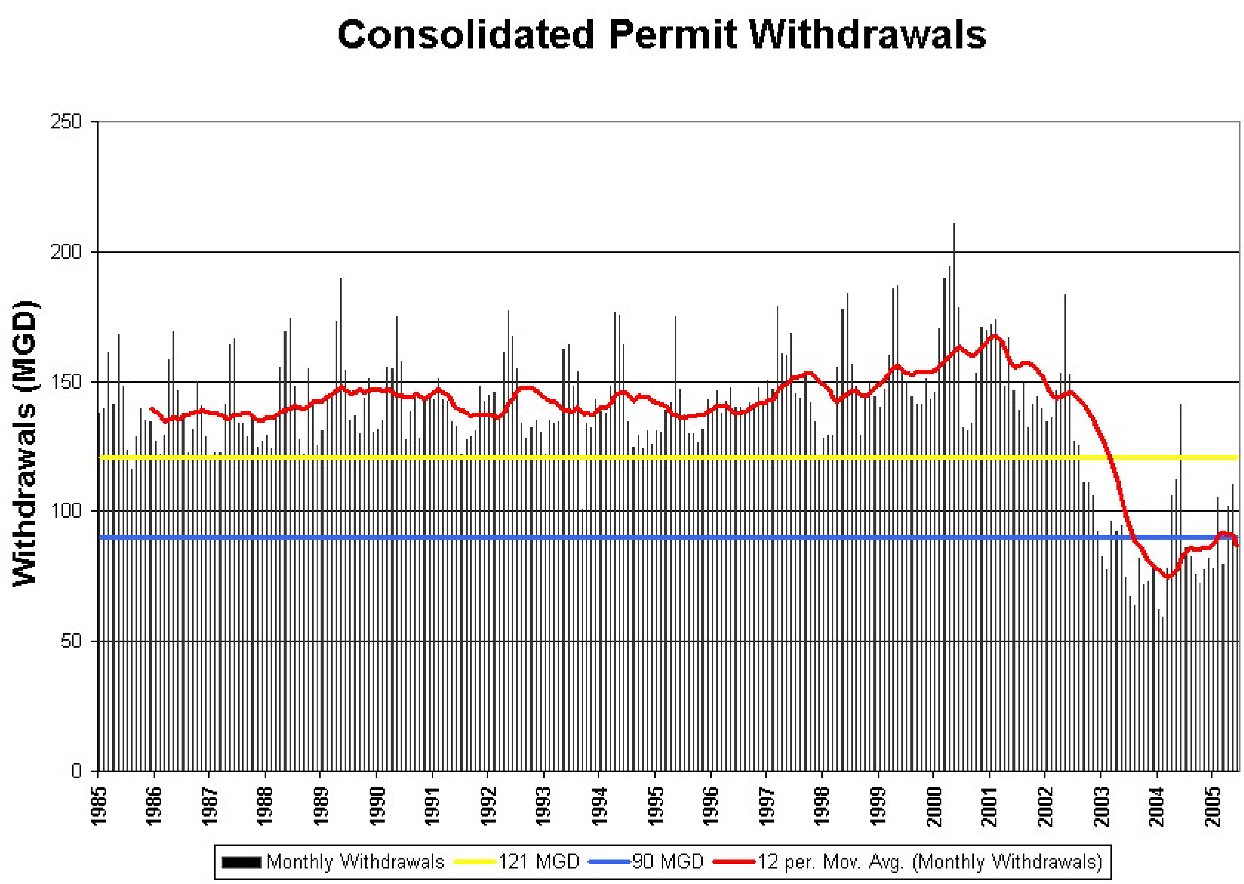

Figure 3-2. Twelve-month moving average ground-water withdrawals from Tampa Bay Water's Central Wellfield System.

MFLs in the NTBWUCA were adopted by the Governing Board in 1999. New water withdrawals cannot cause water levels or flows to fall below adopted MFLs unless the withdrawal is part of the recovery strategy. The current phase of the recovery strategy extends through the year 2010 and is based on the current knowledge of the state of the water resources of the area, the technology for water supply development including alternative sources and conservation, and existing and future reasonable-beneficial uses. The District will evaluate the state of recovery in 2010, and based on that analysis and evaluation, by December 31, 2010, the District will initiate rulemaking to: 1) revise the MFLs, as necessary; 2) adopt rules to implement new MFLs; and 3) revise the current phase of recovery to incorporate a second phase of recovery if necessary.

Part B. Minimum Flows and Levels

Section 1. Statutory and Regulatory Framework

A MFL is that level or flow below which significant harm occurs to the water resources or ecology of the area. The Florida Water Resources Act (Chapter 373, F.S.) and the Water Resource Implementation Rule (Chapter 62-40, F.A.C., formerly the State Water Policy) provide the basis for establishing MFLs and explicitly includes provisions for setting such flows and levels.

1.0 Florida Water Resources Act

The Water Resources Act requires the water management districts to establish minimum levels for both ground and surface waters and minimum flows for surface-watercourses below which significant harm to the area's water resources or ecology would result. In 1996 the Florida Legislature mandated the District submit a priority list and schedule for establishing minimum flows and levels by October 1, 1997 for surface-watercourses, aquifers, and surface waters in the counties of Hillsborough, Pasco, and Pinellas in the Northern Tampa Bay area (Section 373.042(2)). As now required in Chapter 373 (F.S. 373.042(2)), each year the District and the other water management district's update and submit for approval by the FDEP a priority list and schedule for the establishment of MFLs throughout their respective areas. The priority list and schedule is published annually in Florida Administrative Weekly and is posted on the District's website at watermatters.org.

The priority list further identifies those water bodies for which each water management district will voluntarily undertake independent scientific peer review. All information concerning MFLs is to be provided by the water management districts to local governments for development and revision of comprehensive plans, Subsection 373.0391(2).

1.1 Water Resource Implementation Rule

Chapter 62-40, F.A.C., highlights the State's approach to water management (Rule 62-40.110, F.A.C.). Water management district programs are required by Section 373.103(1), F.S., to be consistent with Chapter 62-40, F.A.C. Rules 62-40.310(4)(a) and 62-40.473, F.A.C., provide guidance for the establishment of MFLs to protect water resources and the environmental values associated with marine, estuarine, freshwater, and wetlands ecology.

Part C. The District's MFLs Program

Section 1. Introduction

Since the early 1970s, the District has been engaged in an effort to develop MFLs for water bodies. Beginning with the 1996 legislative changes to the MFL statute, the District has enhanced its program for development of MFLs. The District's MFLs program addresses all the requirements expressed in the previously referenced sections of the Florida Water Resources Act and the Water Resource Implementation Rule.

The District implements established MFLs primarily through its water supply planning, water use permitting and environmental resource permitting programs, and funding of water resource and water supply development projects that are part of a recovery or prevention strategy.

There are numerous District initiatives associated with the establishment of MFLs. These include:

- Identifying, prioritizing, and scheduling water bodies for setting MFLs
- Developing District-wide lake and stream classification systems and databases
- Implementing extensive data collection programs for water bodies that are scheduled for MFL establishment
- Performing applied research to support establishing scientifically sound MFLs
- Setting minimum levels for priority wetlands, lakes and aquifers, and minimum flows for priority springs, streams, and rivers
- Monitoring waters levels, hydrology, soils, and biological communities to verify that established MFLs are at appropriate levels
- Performing periodic reevaluation of established MFLs
- Implementing prevention and recovery strategies as appropriate to ensure adopted MFLs are achieved
- Developing and refining ground- and surface-water models, including integrated ground- and surface-water models where appropriate, to predict if water withdrawals will cause levels and flows to fall below established MFLs
- Providing information about MFLs to local governments and others for comprehensive planning
- Undertaking voluntary independent scientific peer review on the data and methodologies used to establish MFLs for all water body types on the priority list

Section 2. Priority-Setting Process

In accordance with the requirements of Section 373.042, F.S., the District has established a list of priority ground and surface waters for which MFLs will be set. As part of determining the priority list, the following factors are considered:

- The importance of the water bodies to the state or region
- The existence of or potential for significant harm to the water resources or ecology of the state or region to occur
- Whether historic hydrologic records (flows and/or levels) are available to allow statistical analysis and calibration of computer models when selecting particular water bodies in areas with many water bodies.
- The proximity of MFLs already established for nearby water bodies.

Section 3. Technical Approach to the Establishment of MFLs

The District's MFLs approach is designed to be applied to lakes, rivers, wetland systems, springs, and aquifers. The approach assumes that alternative hydrologic regimes exist that are different from historic conditions, but that will protect the structure and functions of aquatic and wetland resources from significant harm. For example, a historic condition could consist of an unaltered river or lake system with no withdrawal from local ground- or surface-water sources. A new hydrologic regime is associated with each increase in water use, from very small withdrawals that have no measurable effect on the historic regime to very large withdrawals that could markedly lower the long-term hydrologic regime. A threshold hydrologic regime may exist that is lower than historic, but which protects the water resources and ecology of the system from significant harm. Conceptually, the threshold regime, resulting primarily from water withdrawals, will have less frequent highs and more frequent lows.

The purpose of MFLs is to define this threshold hydrologic regime that would allow for water withdrawals while protecting the water resources and ecology from significant harm. Thus, MFLs represent minimum acceptable rather than historic or optimal hydrologic conditions.

1.0 Development of Wetland Minimum Levels

The District has developed a minimum levels methodology for palustrine cypress wetlands only, due to data limitations on other wetland systems. Palustrine wetlands are defined as isolated, freshwater wetlands. Data collection and analysis is ongoing for the development of minimum levels for other wetland types.

The establishment of minimum levels for isolated cypress wetlands was based on a statistical assessment of the relationship between hydrology and certain ecologic parameters in a number of wetlands. The goal was to identify a hydrologic threshold, expressed as a water level, beyond which it would be reasonable to expect that "significant harm" will occur in a wetland. A complete description of the methodology used for establishing minimum levels for palustrine cypress wetlands can be found in SWFWMD (1999a).

1.1 Implementation of Wetland Minimum Levels

Minimum levels for palustrine cypress wetlands are determined by surveying a normal pool, and calculating an elevation 1.8 feet below the normal pool. Such wetlands are determined to be below their minimum levels if the median stage (based on a long-term stage record) is below the adopted minimum level. To date, minimum levels have been set for 41 palustrine wetlands in Hillsborough, Pasco, and Pinellas counties in the NTB area.

1.2 Ongoing work

The District is currently developing methodologies for isolated marsh wetlands, which will include cypress marshes and wet prairies.

2.0 Development of Lake Minimum Levels

For the establishment of minimum levels, priority District lakes are classified as Category 1, 2 or 3 lakes. Systems with fringing cypress wetlands greater than 0.5 acres in size where water levels regularly rise to an elevation expected to fully maintain the viability of the wetlands (i.e., the median lake stage is not more than 1.8 feet below the normal pool) are classified as Category 1 lakes. Lakes with fringing cypress wetlands greater than 0.5 acres in size that have been structurally altered such that the median lake stage is more than 1.8 feet below the normal pool elevation are classified as Category 2 lakes. Lakes without fringing cypress wetlands or with less than 0.5 acres of fringing cypress wetlands are classified as Category 3 lakes.

Minimum lake levels are established using lake-specific significant change standards and other available information. For Category 1 or 2 lakes, a significant change standard is established 1.8 feet below the normal pool elevation. This standard identifies a desired median lake stage that if achieved, may be expected to preserve the ecological integrity of the lake-fringing wetlands. For Category 3 lakes, six significant change standards associated with dock-use, aesthetics, basin connectivity, recreation/ski use, water column mixing, and maintenance of species diversity, are developed. Potential changes in the coverage of herbaceous wetland vegetation and aquatic plants are also taken into consideration for development of Category 3 lake minimum levels.

The Minimum Lake Level is the elevation that a lake's water levels are required to equal or exceed 50 percent of the time on a long-term basis. For Category 1 Lakes, the Minimum Lake Level is established at the standard elevation 1.8 feet below the normal pool. The Minimum Lake Level for Category 2 lakes is established at the median lake stage that would be expected in the absence of withdrawal impacts, with existing structural alterations in place. For Category 3 lakes, the Minimum Lake Level is established at the most conservative (i.e., the highest) standard elevation, except where the standard elevation is above the median lake stage that would occur in the absence of withdrawals, with existing structural alterations in place. In these cases, the Minimum Lake Level is established at the median lake stage.

The High Minimum Lake Level is the elevation that a lake's water levels are required to equal or exceed ten percent of the time on a long-term basis. For Category 1 lakes, the High Minimum Lake Level is established 0.4 feet below the normal pool. The High Minimum Lake Level for Category 2 lakes is established at the elevation water levels would be expected to equal or exceed ten percent of the time, given existing structural alterations and the absence of withdrawal impacts. For Category 3 lakes, the High Minimum Lake Level is developed by summing the Minimum Lake Level elevation and the expected difference between the median lake stage and the water level equaled or exceeded ten percent of the time. A complete description of the methodology used for establishing minimum lake levels can be found in SWFWD (1999a and 2001).

2.1 Implementation of Lake Minimum Levels

Minimum levels are determined by surveying normal pool and control point (i.e., the point at which water flows from the lake) elevations, analysis of available lake stage data, and identification of appropriate significant change standards. Lakes are determined to be below their minimum levels if their long-term median lake stage is below the Minimum Lake Level or the long-term water level equaled or exceeded ten percent of the time is below their High Minimum Lake Level. To date, minimum levels have been adopted for 48 lakes in Hillsborough and Pasco counties in the NTB area.

3.0 Development of Saltwater Intrusion Minimum Aquifer Levels

Minimum aquifer levels in the Upper Floridan aquifer have been developed for the NTB WUCA and SWUCA to slow the rate of saltwater intrusion. Due to differing hydrogeologic conditions and water use patterns, the approaches used to determine minimum aquifer levels in these areas are slightly different.

The development of minimum aquifer levels is basically a three-step process. The first step is to assess the current status and anticipated future advancement of saltwater intrusion. For the SWUCA the number of wells and water supply potentially at risk to saltwater intrusion over the next 50 years was determined through use of a saltwater transport model. Secondly, a proposed goal of the saltwater intrusion minimum level in the area or region is determined. Finally, a network of monitor wells and corresponding water levels is selected to accomplish this goal. A complete description of the methodology can be found in SWFWMD (1999a and 2001).

3.1 Implementation of Saltwater Intrusion Minimum Aquifer Levels in the NTBWUCA

In 1999, the Governing Board adopted minimum aquifer levels to protect against saltwater intrusion in the NTBWUCA. The Board made the policy decision that the goal of minimum aquifer levels in the area should be to prevent further significant advancement of regional saltwater intrusion. After an assessment of available Upper Floridan aquifer monitor well data, the decision was made to set minimum aquifer levels in seven wells positioned in two transects. The first transect consists of four wells extending westward from the Eldridge-Wilde Wellfield, while the second transect consists of three wells extending southward from the Northwest Hillsborough Regional Wellfield. The two transects were chosen as priority areas because it was felt that the high quality monitor wells associated with these two large wellfields located relatively near the coast, were capable of providing the earliest sign of any advancement of regional saltwater intrusion for the area. Minimum aquifer levels were determined in each well by calculating the average water level over a period representing current ground-water withdrawal rates, which consisted of periods ranging from six to 10 years. These wells are determined to be below their minimum levels if the median stage (based on a long-term stage record) is below the adopted minimum level.

The District has installed additional wells in coastal areas, and will evaluate these areas for the potential development of additional minimum levels for regional saltwater intrusion. Because long-term data records (six years or more) are required, minimum levels analysis will be delayed until sufficient data are acquired.

3.2 Implementation of Saltwater Intrusion Minimum Aquifer Levels in the SWUCA

In 2002 the Governing Board approved a methodology for calculating a minimum aquifer level for saltwater intrusion in the SWUCA. It is anticipated that this level will be adopted in late 2006. In contrast to the approach used for the NTBWUCA, because of the well confined and highly transmissive nature of the Upper Floridan aquifer in the SWUCA, the minimum aquifer level was determined as the average ground-water level over the critical area of saltwater intrusion. The area over which the aquifer level was calculated is approximately 700 square miles and encompasses the coastal portions of southern Hillsborough, Manatee, and northern Sarasota counties. This is the ETB Most Impacted Area of the SWUCA. The Governing Board in 2002 directed that the minimum aquifer level be developed to slow the rate of saltwater intrusion based on the number of wells and water supply potentially at risk to saltwater intrusion in the future. The period over which the minimum aquifer level was calculated was the 10-year period from 1990 to 1999. This was the highest of the 10-year averages ending during the 1990s. Using an area-weighted average, ten wells were used to calculate the minimum aquifer level. Compliance with the minimum aquifer level is achieved when the 10-year moving average aquifer level is above the minimum level for five consecutive years. It is out of compliance when the 10-year moving average falls below the minimum level for two consecutive years. The District continues to expand and collect data from its coastal ground-water quality monitoring network in the SWUCA to better define the position of the interface in the Upper Floridan aquifer.

4.0 Development of Minimum Flows for Rivers

Fundamental to the District's approach for developing minimum flows in rivers is the realization that a flow regime is necessary to protect the ecological integrity of river systems. The initial step in this process requires an understanding of historic and current flow conditions to assess to what extent withdrawals or other anthropogenic factors have affected flows. To accomplish this task the District evaluated the effects of climatic oscillations on regional river flows and has identified two benchmark periods for the evaluation of minimum flows. Based on a comprehensive review of river flows throughout the District, the period 1940 to 1969 was demonstrated to consistently have higher river flows than the period 1970 to 1999. It is apparent from these data that flow declines attributed to human causes by some investigators are actually a function of climatic variation to a large degree.

For development of river minimum flows, the District identifies short-term seasonal flow standards and long-term compliance standards for selected river flow gauging sites. Short-term flow standards for periods of low, medium and high flows include prescribed flow reductions based on limiting potential changes in aquatic and wetland habitat availability that may be associated with seasonal changes in flow. The short-term standards also include low flow thresholds, which are based on maintaining adequate river depths for fish passage across shoal areas and maximizing the wetted stream channel width with the least amount of flow. Long-term minimum compliance standards identify the lowest average flows that may be expected for five- and ten-year periods, based on the long-term flow record and compliance with the short-term seasonal flow standards.

As required by the 1996 legislation, the District identified the Lower Hillsborough River as the priority surface-watercourse in the NTBWUCA for which minimum flows would be developed by October 1997. The determination of minimum flows for the Hillsborough River accounted for the fact that the system had experienced extensive changes and structural alterations. The Hillsborough River near the city of Tampa has been impounded in one form or another since the late 1800s. The present impoundment was built in the 1940s at the site of a previous hydroelectric dam. The Hillsborough River below the dam is a highly modified system which has experienced considerable shoreline hardening, filling of wetlands, sediment deposition, and impacts to water quality from stormwater runoff. The alterations of the Lower Hillsborough River have been so extensive that some hydrologic functions associated with floodplain and estuarine wetlands have essentially been lost. A complete description of the methodology used for establishing minimum flows for the lower Hillsborough River can be found in SWFWMD (1999b).

While accounting for the extensive changes and structural alterations to the Lower Hillsborough River, the District evaluated the beneficial effects of various rates of flow of fresh and near-freshwater on the downstream ecosystem. The existing flow regime of the Lower Hillsborough River is characterized by prolonged periods when there is no discharge at the reservoir spillway other than from dam leakage. The District’s analysis concentrated on minimum flows that might be released during periods when there would otherwise be no discharge at the reservoir spillway. The evaluation of potential hydrologic and ecologic benefits below the dam emphasized the relationships of flows with salinity distributions. Based on results from the evaluations, the Governing Board adopted a minimum flow for the Lower Hillsborough River of 10 cfs at the base of the Hillsborough River Reservoir dam as measured at the Rowlett Park Bridge Station. The minimum flow will be phased in through 2010 and adjustments may be made as a result of a re-evaluation that is scheduled to occur by the end of 2006.

In the SWUCA, the upper Peace River was the first river segment to be prioritized for establishment of minimum flows. This was because the upper portion of the Peace River Basin had undergone extensive alterations to the land as a result of urbanization, agriculture, and phosphate mining. In addition, there was a documented loss of springflow to the river due to lowering of the potentiometric surface of the Upper Floridan aquifer from ground-water withdrawals. The District only recommended "low" minimum flows for the upper portion of the river because of the extensive alteration to the land that had occurred and the uncertainty associated with quantifying the effects of these alterations on flows to the river. It was not certain if higher portions of the flow regime could be achieved based on the existing structural alterations. Low minimum flows were recommended at three gage sites on the river: Bartow, Ft. Meade, and Zolfo Springs. The low minimum flows were based on the higher of the flows required to maintain minimum depths for fish passage or the lowest wetted perimeter inflection point (LWPIP). The LWPIP is that flow that provides the greatest amount of inundated bottom habitat in the river channel on a per-unit flow basis. In 2002, the Governing Board approved "low" minimum flows of 17 cubic feet per second (cfs) at Bartow, 27 cfs at Ft. Meade and 45 cfs at Zolfo Springs. Adoption of these flows into District rules is anticipated in early 2006, following adoption of the SWUCA Recovery Strategy. Minimum flows have been adopted for two river segments in the SWUCA. In 2005, the Governing Board approved minimum flows for the middle segment of the Peace River and the upper segment of the Myakka River. The minimum flows include short-term seasonal flows and long-term compliance standards for existing gauge sites in each river segment.

4.1 Implementation of River Minimum Flows

Short-term seasonal flows and long-term minimum flow compliance standards are developed for each priority-river. For the Alafia, Hillsborough, Peace, and Myakka rivers, the three seasonal blocks of time that correspond with periods of low, medium, and high flows are: Block 1- April 20th to June 24th (65 days); Block 2 - October 28th to April 19th (176 days); and, Block 3 June 25th to October 27th (124 days) Prescribed flow reductions for each period are based on review of limiting factors affecting the availability of aquatic and wetland habitat in and adjacent the rivers. Minimum flows are established to prevent habitat losses of no more than 15 percent.

4.2 Ongoing Work

The District continues to conduct the necessary activities to support the establishment of minimum flows for rivers according to the District's MFLs priority list. Data collection, analysis, and development of a minimum flow has been completed for the upper and middle segments of the Peace River, upper Alafia River, and the Tampa Bypass Canal. The methods and data used for setting the minimum flow for these water bodies has been peer reviewed.

5.0 Scientific Peer Review

Chapter 373.042(4), F.S., permits affected parties to request Scientific Peer Review of the scientific and technical data and methodologies used to determine flows and levels. Such a request was made by a number of parties in October 1998 for the methodologies used to set MFLs in the NTBWUCA. This process was completed in August 1999 for lakes, isolated cypress wetlands, and aquifers in the NTBWUCA, and October 1999 for the Hillsborough River; and the results were published and presented to the Governing Board. The Governing Board found the results mostly supportive, although the Peer Review panel did offer many ideas for future analysis and potential improvement. As part of the adopted MFLs rules, the District has committed to pursuing independent scientific peer review as part of future efforts. Additionally, as required by rule in the NTBWUCA, the District established the NTB Local Technical Peer Review Group (LTPRG) to facilitate expert review of MFLs methodologies and assessments developed and made by the District. The LTPRG is made up of technical representatives of affected and interested parties in the NTB area and is facilitated by District staff. The LTPRG was initiated in 2000 and meets every two months.

As discussed in the section on the MFLs priority list, the District voluntarily seeks independent scientific peer review of MFLs methodologies that are developed for all priority water bodies. Since completion of the Peer Review for the NTB MFLs in 1999, the District has sought and obtained the review of methodologies developed for Category 3 Lakes; the upper and middle segments of the Peace River, the upper Myakka River, the upper Alafia River, the Tampa Bypass Canal, Sulphur Springs, and the Upper Floridan aquifer in the SWUCA.

6.0 MFLs Reassessment and Future Development

MFLs are established based on data available at the time. The District plans to conduct periodic reassessment of the adopted MFLs based on consideration of the significance of particular MFLs in water supply planning and the relevance of new data that may become available. Scientific analyses and data collection programs are outlined in the NTB Phase II Scope of Work.

Section 4. District MFLs Determined to Date

Locations of water bodies with established MFLs are shown in Figures 3-3a and 3-3b, and a complete list of established MFLs sites is provided in the Appendix for Chapter 3. MFLs currently adopted by rule include:

- Forty-one palustrine cypress wetlands in Hillsborough and Pasco counties
- Sixty-three Category 1, 2, and 3 lakes in Hernando, Highlands, Hillsborough, Pasco, and Polk counties.
- Seven Floridan aquifer wells for saltwater intrusion protection in the NTBWUCA
- The lower Hillsborough River below Fletcher Avenue, middle Peace River, upper Myakka River, and upper Alafia River.

MFLs that have been approved and are currently awaiting formal adoption include:

- The Floridan aquifer in the Most Impacted Area of the SWUCA for saltwater intrusion
- Eight Category 1 and 2 lakes in Highlands and Polk counties
- Upper Peace River

MFLs peer reviewed in 2005 include:

- Upper Alafia River (including Buckhorn and Lithia Springs)
- Tampa Bypass Canal
- Upper Myakka River System
- Middle Peace River
- Intermediate Aquifer System in the SWUCA
- Sulphur Springs

Section 5. Recovery and Prevention Strategy

1.0 Strategy/Goals

Section 373.0421(2), F.S., requires that a recovery or prevention strategy be developed if the existing flow or level in a water body is below, or within 20 years is projected to fall below, established MFLs. The District established recovery or prevention strategies by rule in Chapter 40D-80, F.A.C., and as

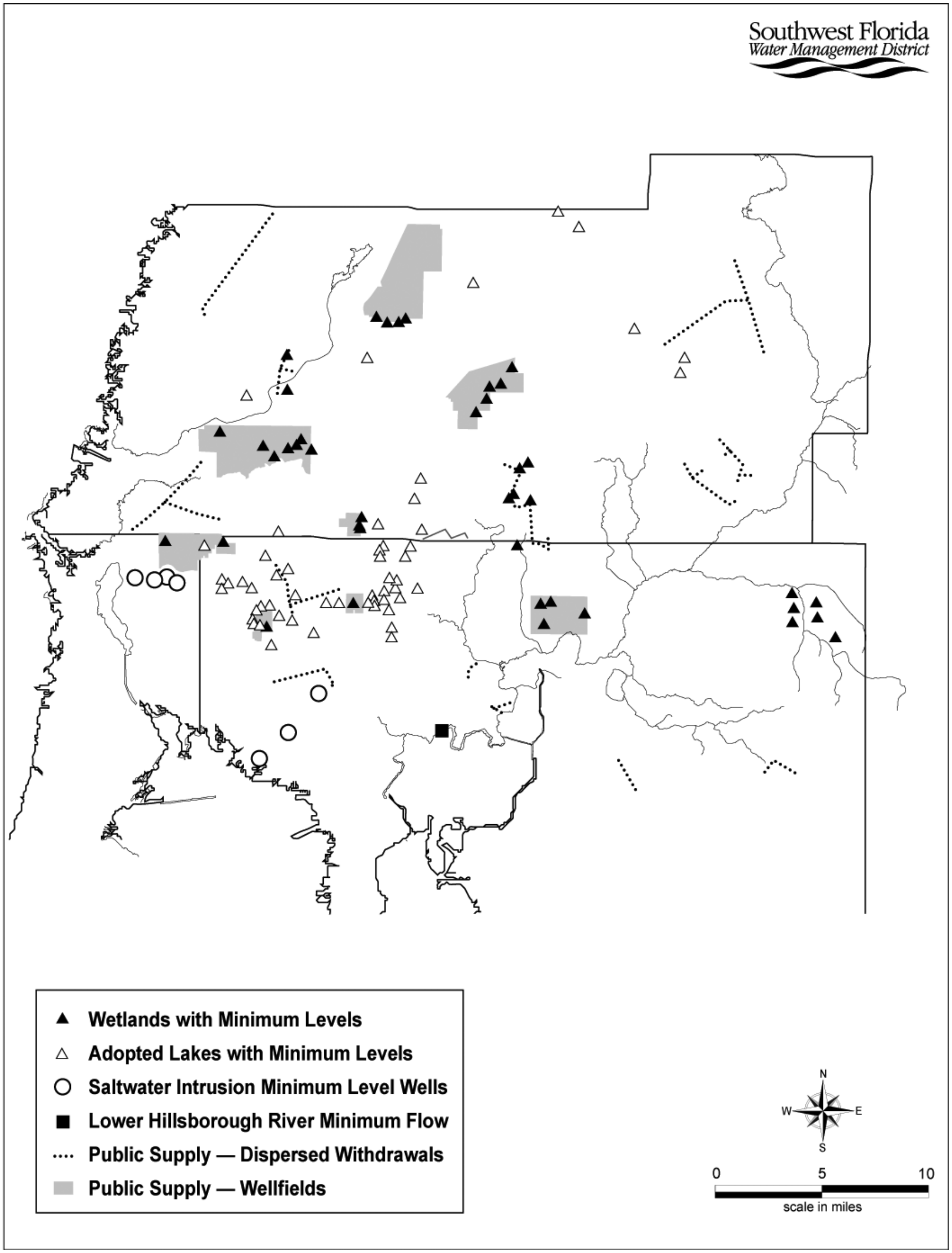

Figure 3-3a. Locations of Adopted and Approved MFL Waterbodies in the Northern Tampa Bay Area.

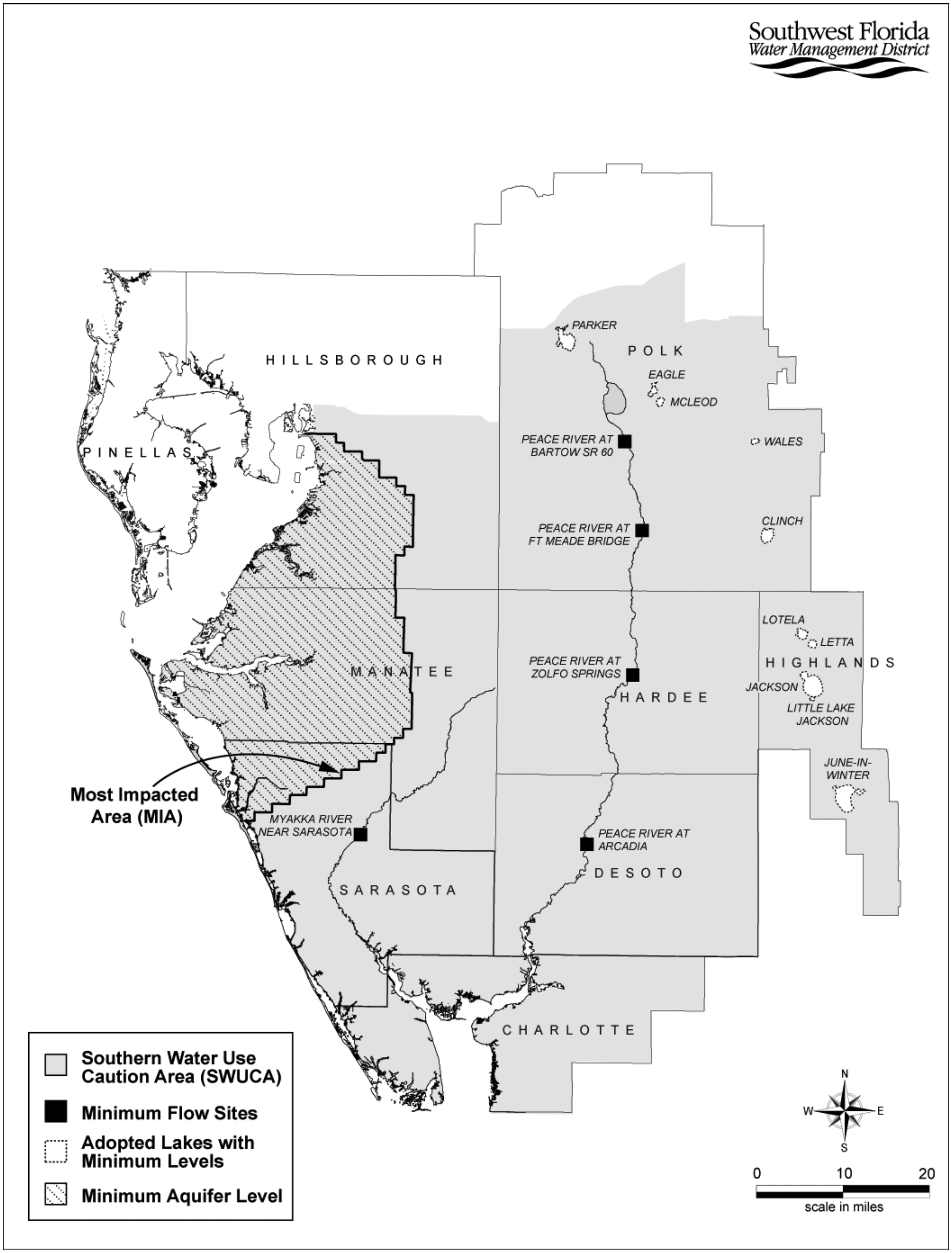

Figure 3-3b. Locations of Adopted and Approved MFL Waterbodies in the SWUCA Area.

part of the District Water Management Plan. When MFLs for a water body/system are not being met or, as part of a recovery strategy, are not expected to be met for some time in the future, the District will first examine the established MFLs in light of any newly obtained scientific data or other relevant information to determine whether the MFL should be reassessed. If no reassessment is necessary, a number of management tools are available to restore the water body/system to meet MFLs, including the following:

- Developing additional supplies
- Implementing structural controls and/or augmentation systems to raise levels or flows in water bodies
- Reducing WUP allocations
- Requiring use of alternative water supply sources

1.1 SWUCA Recovery Strategy

See Part A., Section 1, 1.0 of this Chapter.

1.2 NTBWUCA Recovery Strategy

See Part A., Section 2, 1.0 of this Chapter.

Part D. Reservations

Subsection 373.223(4), Florida Statutes authorizes reservations of water by providing as follows:

"The governing board or the department, by regulation, may reserve from use by permit applicants, water in such locations and quantities, and for such seasons of the year, as in its judgment may be required for the protection of fish and wildlife or the public health and safety..."

The District will consider establishing a reservation of water when a District water resource development project will produce water needed to achieve a MFL. For example, the District intends to establish minimum flows for the upper Peace River where compliance with actual flows are below the proposed minimum flows. The District is undertaking a project to raise water levels on Lake Hancock in order to provide the additional flows needed to meet the upper Peace River minimum flows. The Governing Board may reserve from permitting the quantity of water in Lake Hancock that will be needed for release to the upper Peace River to create the flows necessary to meet the minimum flows. When a reservation is established, only those water use withdrawals that do not reduce the reserved quantity will be authorized.

Reservations of water will be established by rule. The rulemaking process allows for public input to the Governing Board in its deliberations about establishing a reservation, including, among other matters, the amount of water to be reserved and the time of year the reservation would be effective.

Chapter 4. Demand Estimates and Projections

This Chapter details the District's methods and assumptions used in projecting water demand for each county in the Planning Region for the 2000 through 2025 planning period. Water supply demand has been projected for the agricultural, industrial/commercial, public supply, and recreation/aesthetic use sectors for each of the ten counties within the Planning Region. An additional water use category, environmental restoration, comprises new quantities of water that need to be developed and/or existing quantities that need to be retired to meet established minimum flows and levels (MFLs). The environmental restoration demand could increase during the planning period based on the recovery requirements of MFLs established in future years.

The demand projections represent those reasonable and beneficial uses of water that are anticipated to occur through the year 2025. Five-in-10 (average condition) and 1-in-10 (drought condition) demands have been determined for each five-year increment from 2000 to 2025, for each category. The demand projections for counties located partially in other water management districts (Charlotte, Highlands and Polk) reflect only the anticipated demands in those portions located within the District's boundaries. Demand projections were developed using a variety of resources. A detailed summation of the methods and assumptions used for projecting demand in each category of water use is provided in a technical memorandum for each respective category (Appendix 4).

General reporting conventions for the RWSP were guided by the document developed by the Water Planning Coordination Group: *Final Report: Development and Reporting of Water Demand Projections in Florida's Water Supply Planning Process, (WPCG, 2005).* This document was produced by the Water Demand Projection Subcommittee of the Water Planning Coordination Group. The subcommittee is comprised of representatives from the water management districts and the FDEP, and was formed in 1997 as a means to reach consensus on the methods and parameters used in developing RWSPs. Some of the key guidance parameters include:

- Establishment of a base year. The year 2000 was agreed upon as a base year. However, record-low rainfall in the District resulted in above-average water use for that year. In order to avoid over-projecting the 2025 demands, the projections for the public supply and recreation/aesthetic categories were based on water use in 2001. A theoretical 1-in-10 drought year condition for the base year was calculated only to maintain consistency in calculating additional 2025 demands under the same conditions.
- Water Use Reporting Thresholds. Minimum thresholds of water use within each water use category in the Planning Region were agreed upon as the basis for projection.
- Five-in-10 versus 1-in-10. For reporting demand in average versus drought conditions, specific parameters were prescribed for at least a portion of the demand related to all water supply categories except industrial/commercial. In general, demand is reported for a 5-in-10 average annual effective rainfall condition and a 1-in-10 drought year condition (an increase in water demand having a 10 percent probability of occurring during any given year.)

For planning purposes, the projected demand represents the total amount of water required to meet reasonable and beneficial water needs through 2025. Total demand does not account for reductions that could be achieved by additional demand management measures. Water conservation and other sources are accounted for separately in Chapter 5 as the means by which demand can be met.

Part A. Water Use Demand Projections

Water use demand projections are presented in five basic categories: 1) agriculture, 2) commercial/industrial, mining/dewatering and power generation, 3) public supply, 4) recreation/aesthetic, and 5) environmental restoration. The categorization provides for the projection of demand for similar water uses under similar assumptions, methods and reporting conditions.

Projected water demands were developed through identification and analysis of parameters that affect water use, and associated trends, within each category. This section summarizes the data sources, methods, assumptions and parameters considered in developing estimates of projected water demand. The projections are described according to water use category, and are further detailed according to the needs of each county.

Section 1. Agriculture

Agriculture represents the largest category of water use in the District. Included in this category are irrigated crops and other miscellaneous water uses associated with agricultural crop production within the District. Irrigated acreage was determined and reported in the RWSP for each of the categories shown below:

- Citrus
- Vegetables, Melons, and Berries (cucumbers, melons, potatoes, strawberries, tomatoes, other vegetables and row crops)
- Field Crops
- Greenhouse/Nursery
- Sod
- Pasture

Projected water uses associated with agricultural operations such as aquaculture, dairy, poultry, swine, etc., are reported as 'Miscellaneous.'

1.0 Assumptions and Methodologies for Projecting Agricultural Demand

Agricultural water use was estimated by determining, for each commodity in each county, the acreage and the associated irrigation requirements. Acreage was multiplied by the irrigation requirement to get estimated annual water use. Estimated average daily water use was calculated by dividing the estimated annual water use by 365 days. Discussions of more specific assumptions and methodologies pertinent to particular elements of the RWSP agricultural water use projections are presented in the technical memorandum contained in Appendix 4, and summarized in the following sections.

1.1 Selection of Base Year for Agricultural Demand Projections

The Water Demand Projection Subcommittee established 2000 as the base year for the RWSP planning period. Water use for 2000 was determined by multiplying irrigated crop acreage by crop irrigation requirements. The District's irrigation water use allocation program (AGMOD) was used to average water demands in 2000 in a manner consistent with the methodology prescribed in the Water Planning Coordination Group guidelines.

1.2 Agricultural Commodity Acreage Estimates and Projections

The University of Florida Institute of Food and Agricultural Sciences (IFAS) provided current and projected acreage for some of the crops and for some of the counties within the District. The projections (Taylor, Reynolds and Hughes, 2004) are based on historical agricultural land use data and the latest information available from the FDACS Bureau of Plant Inspections (nurseries), and the Florida Agricultural Statistics Service (FASS) (citrus, vegetables, melons, potatoes, strawberries and tomatoes). Tables 2.1 through 2.16 in Appendix 4 summarize projected acreage and water use through the year 2025 by county for each irrigated crop-reporting category.

1.3 Acreage and Water Use Projections for Agriculture

Projected water use is based on crop irrigation requirements derived from the District's AGMOD program. AGMOD utilizes historical temperature, effective rainfall, and solar radiation data to calculate the estimated irrigation requirements necessary to produce optimum crop yield under specified rainfall conditions. For the RWSP, AGMOD input parameters were designed to produce estimated crop irrigation requirements through 2025 for 5-in-10 and 1-in-10 conditions. Water use permitting rules are such that 1-in-10 demand can generally be met within each WUP, and therefore do not incur the need for additional water supply. However, it is important to note that while 1-in-10 is used for planning purposes, it is not the basis for water use permitting.

2.0 Agricultural Irrigation Demand Projections

General base year and planning period projections are presented in Table 4-1. For the 5-in10 condition, overall agricultural water use for irrigated commodities in the Planning Region is projected to be 421 mgd by 2025; an estimated decrease of 70 mgd over the planning period. Ninety-five percent of the projected decrease, 67 mgd, will occur in the SWUCA. The projected decrease in 2025 demand in the Planning Region for a 1-in-10 condition is estimated to be 98 mgd for irrigated commodities.

Agricultural water use is projected to decrease in seven of the ten counties in the Planning Region. The most significant decreases are in DeSoto, Manatee and Polk counties. Hardee County is expected to experience the greatest increase. The increase in Hardee County's projected water use is attributable to the southward movement of the citrus industry and possibly to the relatively low cost and greater availability of suitable land for agriculture, compared to other areas. While increases in citrus demand in Sarasota County are moderate, Hardee County's increase is relatively large, with a 32 percent increase in citrus acreage reflected in the 28 percent overall increase in its agricultural water demands. Table 4-2 summarizes total water use projections by county through 2025 for miscellaneous agricultural operations, including non-irrigated water uses such as cattle and swine. The estimated water use for miscellaneous agricultural operations is not anticipated to change over the planning period, and was therefore assumed not to contribute to additional demands.

There are noticeable differences in projected demands between the District's 2001 RWSP and this 2006 update. For example, for the 5-in-10 condition in the 2001 RWSP, the two counties with the largest projected agricultural demand were Polk and Manatee (approximately 135.0 mgd and 128.0 mgd, respectively). In the 2006 RWSP, Manatee County shows a 49 percent loss in citrus acreage and a 23 percent decrease in total agricultural water demand by 2025. Polk County shows a 41 percent loss in citrus acreage and 28 percent decrease in total agricultural water demand by 2025. Hillsborough County exhibits a 43 percent loss in citrus acreage but a nine percent increase in total

Table 4-1. Agricultural Irrigation Demand Projections (mgd) (5-in-10 and 1-in-10). Reformatted for 1 decimal place, and %'s. 3/10/06.

SOUTHERN WATER USE CAUTION AREA																
County	**2000**		**2005**		**2010**		**2015**		**2020**		**2025**		**Additional mgd**		**Additional %**	
	Avg	**1-10**	**Avg**	**1-10**	**Avg**	**1-10**	**Avg**	**1-10**	**Avg**	**1-10**	**Avg**	**1-10**	**Avg**	**1-10**	**Avg**	**1-10**
Charlotte	18.8	27.5	17.7	25.9	16.5	24.2	15.4	22.5	14.3	20.9	13.6	19.7	-5.2	-7.8	-28%	-28%
DeSoto	78.7	120.8	56.4	84.6	48.1	71.2	45.3	67.2	44.0	65.4	43.4	64.4	-35.3	-56.3	-45%	-47%
Hardee	55.3	85.5	57.6	90.9	61.2	98.5	68.3	111.3	75.7	124.2	83.2	137.1	27.9	51.6	50%	60%
Highlands	40.8	53.3	44.0	57.6	45.7	59.3	43.5	56.4	39.2	50.3	32.0	40.4	-8.8	-12.9	-22%	-24%
Hillsborough	48.1	55.9	48.6	58.7	49.9	58.4	50.7	58.8	51.5	59.1	52.3	59.5	4.2	3.6	9%	6%
Manatee	77.8	87.9	71.6	81.5	65.7	74.5	61.8	69.8	58.1	65.3	54.6	61.1	-23.2	-26.8	-30%	-30%
Polk	107.7	161.4	104.3	158.0	97.4	147.2	91.1	137.3	85.3	128.1	79.7	119.3	-28.0	-42.0	-26%	-26%
Sarasota	12.7	14.6	12.8	14.9	13.0	15.2	13.1	15.7	13.7	16.2	14.1	16.6	1.3	2.0	11%	14%
TOTAL	**440.0**	**606.9**	**413.1**	**572.2**	**397.4**	**548.7**	**389.4**	**538.8**	**381.7**	**529.3**	**372.8**	**518.2**	**-67.1**	**-88.6**	**-15%**	**-15%**
NTB AREA																
Hillsborough	28.2	32.8	28.6	34.5	29.3	34.3	29.8	34.5	30.2	34.7	30.7	34.9	2.5	2.1	9%	6%
Pasco	22.0	28.5	15.8	14.7	14.5	14.4	14.2	18.5	18.2	18.0	16.9	17.7	-5.1	-10.8	-23%	-38%
Pinellas	1.4	1.3	1.2	1.3	1.1	1.2	1.0	1.1	0.9	1.0	0.8	0.9	-0.6	-0.5	-41%	-35%
TOTAL	**51.6**	**62.6**	**45.5**	**50.4**	**44.9**	**49.8**	**45.0**	**54.0**	**49.3**	**53.6**	**48.4**	**53.5**	**-3.2**	**-9.1**	**-6%**	**-15%**
TEN-COUNTY PLANNING REGION																
Charlotte	18.8	27.5	17.7	25.9	16.5	24.2	15.4	22.5	14.3	20.9	13.6	19.7	-5.2	-7.8	-28%	-28%
DeSoto	78.7	120.8	56.4	84.6	48.1	71.2	45.3	67.2	44.0	65.4	43.4	64.4	-35.3	-56.3	-45%	-47%
Hardee	55.3	85.5	57.6	90.9	61.2	98.5	68.3	111.3	75.7	124.2	83.2	137.1	27.9	51.6	50%	60%
Highlands	40.8	53.3	44.0	57.6	45.7	59.3	43.5	56.4	39.2	50.3	32.0	40.4	-8.8	-12.9	-22%	-24%
Hillsborough	76.3	88.8	77.2	93.2	79.2	92.8	80.5	93.3	81.7	93.8	82.9	94.4	6.7	5.7	9%	6%
Manatee	77.8	87.9	71.6	81.5	65.7	74.5	61.8	69.8	58.1	65.3	54.6	61.1	-23.2	-26.8	-30%	-30%
Pasco	22.0	28.5	15.8	14.7	14.5	14.4	14.2	18.5	18.2	18.0	16.9	17.7	-5.1	-10.8	-23%	-38%
Pinellas	1.4	1.3	1.2	1.3	1.1	1.2	1.0	1.1	0.9	1.0	0.8	0.9	-0.6	-0.5	-41%	-35%
Polk	107.7	161.4	104.3	158.0	97.4	147.2	91.1	137.3	85.3	128.1	79.7	119.3	-28.0	-42.0	-26%	-26%
Sarasota	12.7	14.6	12.8	14.9	13.0	15.2	13.1	15.7	13.7	16.2	14.1	16.6	1.3	2.0	11%	14%
TOTAL	**491.6**	**669.5**	**458.6**	**622.6**	**442.3**	**598.5**	**434.3**	**592.8**	**431.0**	**582.9**	**421.3**	**571.8**	**-70.3**	**-97.8**	**-14%**	**-15%**

Table 4-2. Miscellaneous Agricultural Demand Projections (mgd).

County	2000	2005	2010	2015	2020	2025	Change in Demand	
							mgd	%
Charlotte	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0
DeSoto	1.0	1.0	1.0	1.0	1.0	1.0	0.0	0
Hardee	1.0	1.0	1.0	1.0	1.0	1.0	0.0	0
Highlands	0.5	0.5	0.5	0.5	0.5	0.5	0.0	0
Hillsborough	5.0	5.0	5.0	5.0	5.0	5.0	0.0	0
Manatee	0.8	0.8	0.8	0.8	0.8	0.8	0.0	0
Pasco	0.8	0.8	0.8	0.8	0.8	0.8	0.0	0
Pinellas	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0
Polk	2.0	2.0	2.0	2.0	2.0	2.0	0.0	0
Sarasota	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0
Totals	**11.6**	**11.6**	**11.6**	**11.6**	**11.6**	**11.6**	**0.0**	**0.0**

agricultural water demand. This increase is mainly due to increases in acreage for nurseries, vegetable/row crops, strawberries and tomatoes.

As is apparent from the text above, demand projections and analysis based on the IFAS and other sources indicate a decline in citrus and other crop acreages in the Planning Region over the planning period. The decline in agricultural acreage can, in part, be attributed to rapid population growth in the recent past and near future that leads to the conversion of agricultural land to urban land uses. Information available in the 2004 IFAS, FDACS, FASS and BEBR reports substantiate the correlation between population growth and the reduction in agricultural acreage in the District.

3.0 Uncertainties Associated with Agricultural Irrigation Demand Projections

The agricultural water demand projections are assumed to be reasonable based on the limited information that is available. There are two reasons why the information is limited. First, for confidentiality reasons, precise acreage projections for many crops are not available on an individual county basis. Such information is supplied to state agencies only under the condition that the county in which it is grown is not identified. Second, data at a sufficient level of detail for a thorough analysis is not available for many commodities.

These issues highlight a need for additional data that the District will address for future updates of the RWSP. In order to improve the projections of irrigated agricultural acreage, which is the basis for the demand projections, District staff intends to monitor actual changes in acreage for key commodities on an annual basis. Acreage projections will be adjusted, if necessary, to reflect changes in trends. The IFAS projections could be improved through more frequent data collection and disaggregated reporting of agricultural acreage. The IFAS projections are based on data that are limited by reporting and data collection constraints. For example, agricultural information is increasingly viewed as proprietary by growers, and consequently not reported except in the aggregate along with other crops and/or regions. District staff plans to work with IFAS, FASS, growers and other agencies to gather the acreage data required to more accurately project agricultural water demand.

Section 2. Industrial/Commercial, Mining/Dewatering and Power Generation (I/C,M/D,PG)

I/C,M/D,PG uses within the District include chemical manufacturing, food processing, mining/dewatering (M/D), thermoelectric power generation (PG), and miscellaneous industrial/commercial (I/C) uses. While diversified, much of the water used in food processing can be attributed to citrus and other agricultural crops. For the most part, chemical manufacturing is closely associated with phosphate mining and consists mainly of phosphate processing. PG water use is associated with cooling or other purposes involved in the generation of electricity. M/D water use is associated with a number of products mined within the Planning Region, including phosphate, limestone, sand, and shell.

For the other water use categories, there is a fundamental factor, common to all aspects of that water use, that can be used to anchor the water demand projections. Acres of an agricultural commodity, population in a public supply service area, and holes per golf course are examples of fundamental factors used to project demand in those categories. Such a factor does not exist for the I/C,M/D,PG category which significantly complicates the process of projecting demand. After rejecting other projection methods which were determined to be inaccurate, historic water usage data were relied on, as described below, to project water demand through 2025 in this category. Detailed information describing the methods and assumptions used to project demand is included in a technical memorandum included in Appendix 4.

1.0 Assumptions and Methodologies for Projecting I/C,M/D,PG Demand

1.1 Reporting Threshold

The Water Demand Projection Subcommittee identified a usage of 0.1 mgd as the reporting threshold for the I/C and M/D water use subcategories. The reporting threshold for the PG subcategory is all permitted or reported uses. However, only those collective water uses greater than 0.1 mgd generally are captured in the District's permitting process. In an attempt to enhance the accuracy of demand projections, it was decided that data from all I/C and M/D permitted or reported uses would be included regardless of the volume. There may be small commercial operations, with water uses which are less than the District's permitting threshold of 0.1 mgd or with well diameters of less than 6-inches, which are not included in these demand projections. For example, every fast food restaurant is actually a commercial operation using a daily quantity of water that falls below the District's permitting threshold. However, many of these small I/C operations are located in urban areas, obtain their water via the public supply system, and are accounted for under the demand projections for public supply.

1.2 Selection of Base Year for I/C,M/D,PG Demand Projections

The year 2000 is the baseline year used to develop and report water demand projections. As noted in the 2001 RWSP, the large turn over of water use permits is a consideration in comparing base year quantities to projected water demand. The reduction in the number of water use permits may be attributable to a number of factors including consolidation of multiple permits, closure of operations, and changes in industry classification. The turn over in the number of water use permits makes it difficult to predict with any degree of certainty whether permits will be in existence at any point during the planning period. Therefore, projected demand is based on: 1) those permits that existed in 2003 at the time the projections were developed, 2) the water use of active permits between 1998 and 2001, 3) permits that will likely be issued in the near future for pending or planned I/C,M/D,PG operations, and 4) an assumption that for every permit that lapses, a new one will take its place. The latter assumption is acknowledged to be conservative given that, at least in recent years, the number of permits issued is less than those that are closed. However, the lack of any clear trend in usage over time, combined with the historical evidence that while some permits lapse, new ones are issued, led staff to assume that the number of permits over time would remain constant.

1.3 Water Use Estimates and Projections for I/C,M/D,PG Demand

Demand was projected by multiplying the 2003 permitted quantity by the average percentage of water actually used in relation to the permitted quantity for the years 1998 through 2001. The average percentage of water actually used in relation to what was permitted was calculated by use type (I/C or M/D) on a county-by-county basis, and each county's percentage was applied to water use permits within that county. For PG permits, average percentage of water used was calculated on a permit-by-permit basis. As a result, PG projections for each permit reflect that permit's historic usage.

Extreme care was taken to verify that the methods and assumptions used were reasonable and resulted in realistic projections. District regulatory staff members reviewed all projections. Following regulatory review, the projections were presented to the District’s Industrial Advisory Committee for consideration, and the members concurred with the projection methodologies and outcome. The detailed methods and assumptions are presented in a technical memorandum included in Appendix 4.

2.0 Demand Projections for I/C,M/D,PG

Table 4-3 summarizes the collective base year and projected water demands for the I/C,M/D,PG category. For the 5-in-10 condition, an additional 7.6 mgd will be needed to meet the demands of all users in this category through 2025. The Water Demand Projection Subcommittee agreed that since water use in this category is not significantly affected by drought conditions, a 1-in-10 demand calculation is not necessary.

Table 4-3. Industrial/Commercial, Mining/Dewatering, Power Generation Demand Projections (mgd) (5-in-10).

County	2000	2005	2010	2015	2020	2025	Change in Demand	
							Avg	%
Charlotte	1.6	0.2	0.2	0.2	0.2	0.2	-1.4	-87
DeSoto	1.4	0.1	0.1	0.1	0.1	0.1	-1.3	-92
Hardee	5.9	7.7	12.5	12.8	13.2	13.5	7.6	128
Highlands	0.3	0.2	0.2	0.2	0.2	0.2	-0.1	-42
Hillsborough	19.7	23.9	24.6	25.4	26.1	26.9	7.2	36
Manatee	1.0	4.3	4.4	4.4	4.5	4.6	3.6	358
Pasco	5.6	7.9	8.1	8.3	8.5	8.7	3.0	54
Pinellas	0.6	0.3	0.4	0.4	0.4	0.4	-0.3	-41
Polk	81.6	71.9	66.0	67.5	69.1	70.6	-10.9	-13
Sarasota	0.6	0.7	0.8	0.8	0.8	0.8	0.2	28
Total	**118.5**	**117.3**	**117.1**	**120.0**	**123.0**	**126.1**	**7.6**	**6**

It is anticipated that water demand for the M/D subcategory will likely remain generally constant through 2025. It is expected that new mines will only be opened to replace others that have been mined out. The demand projections are lower than those estimated in the 2001 RWSP because higher quality phosphate deposits found in the northern portion of the SWUCA have been largely mined out. This is reflected in the 10.9 mgd decrease in projected water demand in Polk County through 2025 (Table 4-3).

Quantities used for processing mined products such as phosphate are expected to remain relatively constant. Water quantities used for food processing are likely to fluctuate depending upon prevailing market prices and also with crop yield, which is strongly affected by climatic conditions. Another factor that could affect water demand in this category is the composition of population growth. The population migration not only includes retirees from other parts of the country, but reflects an increasing number of working age people choosing to relocate in Florida, resulting in a large labor pool. Depending on the economic climate, the expansion of the labor pool is likely to attract new business and industry, and could result in greater water demand throughout the planning period.

The PG subcategory is expected to experience a slight increase in demand over the planning period. Florida's expanding population might be expected to affect the demand for electricity and, consequently, to increase the demand for water needed in the PG industry. While existing power plants plan to expand, some have indicated that they intend to do so without additional water demand. Some of the planned expansions involve peaking units only, which will not require additional water. Therefore, large increases in water demand for PG are not anticipated.

3.0 Uncertainties Associated with I/C,M/D,PG Demand Projections

In the 2001 RWSP (page 67), it was noted that limited data existed on which to base water demand projections for the I/C,M/D,PG category. While this is still true, a larger issue is the turn over in I/C,M/D,PG water use permits. In fact, the four-year period following the publication of the 2001 RWSP provided strong evidence that except for a few corporations, permit turn over is the most apparent trend associated with the I/C,M/D,PG category. Obviously, extensive turn over makes identification of long-term trends highly problematic and, therefore, the most recent water use data must be relied on. As was also identified in the 2001 RWSP as a point to improve upon, discrepancies may still exist between the baseline data contained in the Regulatory Data Base and the data that I/C,M/D,PG permittees assert to have submitted. Staff does not believe that these errors significantly effect I/C,M/D,PG projections and, statistically, can be discounted.

Section 3. Public Supply

The public supply category includes water use associated with customers of public and private utilities and domestic self-supply. Also factored into projections of public supply water use are estimates of use by utility customers who use small diameter wells on their property for outdoor irrigation.

1.0 Assumptions and Methodologies for Projecting Public Supply Demand

The Water Demand Projection Subcommittee final report was used as guidance for developing the demand projections, and detailed methods and assumptions are included in the March 2004 public supply technical memorandum (Appendix for Chapter 4.) The public supply category is comprised of water use associated with four subcategories, which include:

- Large Utilities. Utilities permitted for 0.5 mgd or greater. Associated water use information is presented for each individual permittee.
- Small Utilities. Utilities permitted for less than 0.5 mgd. Associated water use information is presented as a collective small utility subcategory.
- Domestic Self-Supply. This category includes individual private homes or businesses that are not utility customers and receive100 percent of their domestic water supply from a well or wells that are too small to require a District WUP. Associated water use information is presented under one combined domestic self-supply subcategory.
- Additional Irrigation Demand. This category is comprised of water use from domestic irrigation wells, which are those used for outdoor irrigation by persons that rely upon a utility for indoor and other non-irrigation water needs. These wells typically do not require a WUP due to their small size and limited volume of use.

The two main data sets that were used to develop public supply water demand projections are: 1) large utility base year water use and population information, and 2) county-wide base year and projected future population projections developed by the University of Florida BEBR. Public supply water demand is calculated by multiplying public supply per capita water use rates by future population estimates. The resulting projected water demands are aggregated to provide information for the respective areas addressed in this document.

Changes to the March 2004 technical memo (included in the Appendix for Chapter 4) were required to account for the District's acquisition of the northeastern portion of Polk County from the St. Johns River Water Management District in 2004, and the completion of the analysis of irrigation well data by the consultant in 2004. The public supply water use projections developed using 2003 BEBR population projections, were updated in Sept. 2006 when the 2005 BEBR population projections became available.

1.1 Per Capita Water Use

1.1.1 Public Supply and Domestic Self-Supply

Per capita water use is equal to the total water use withdrawals plus imports minus exports for a utility divided by its service area population. For projecting demand, per capita water use rates were assumed to remain constant throughout the planning period, and are applied to projections of service area populations. It is recognized that per capita water use is likely to decrease as the District and local governments aggressively pursue demand management measures such as conservation initiatives and reclaimed water projects.

Because 2000 was a very dry year and 2001 was much more consistent with average rainfall patterns, 2001 per capita water use rates were used to project future demand. Base year population was obtained from year 2000 figures. Base year water use was estimated using 2001 per capita and base year population. These data are included in the District's 2000 and 2001 *Estimated Water Use* reports.

Large utility per capita water use was calculated for each listed utility by applying the 2001 per capita use to the 2000 population in each utility service area. In determining small utility per capita water use, the water use of all small utilities is first added to the water use of non-reporting utilities. This total is then divided by the associated populations of those utilities. The domestic self supply per capita for 2001 was estimated to be equivalent to the overall average residential per capita water use rate for that county.

1.2 Base Year Population Estimates For Public Supply Demand Projections

1.2.1 Public Supply and Domestic Self-Supply

The 2000 base year population for each county was derived from the BEBR Florida Population Studies and was adjusted for seasonal factors. Seasonal population factors, such as commuters, tourists and seasonal residents, were gathered from various county planning documents. Different methods were used for each category, based on available data. For large utilities, the individual 2000 population of each large utility was derived from the 2000 *Estimated Water Use* report, Table A-1. County domestic self-supply populations were calculated as the difference between the 2000 total county population and the combined 2000 large and small utility populations. After populations were determined for the large and small public supply and domestic self-supply sub-categories, the percentage of total 2000 county population associated with each subcategory was determined. For those counties not fully contained within the District boundaries, only that portion of the population within the District is included.

The number of domestic irrigation wells was included as a separate population subcategory, and was developed by a consultant based primarily on the District's well construction database. Domestic irrigation wells were assumed to be those in the database that were smaller than six inches in diameter that had a use code for irrigation. The practice of "ganging" wells (several wells located in very close proximity for the purpose of increasing yield) was accounted for through an estimation technique. The results were compared with the FDEP-maintained Superact database, which has been developed for the purpose of assessing wells within a certain radius of contaminated petroleum and drycleaner sites. See the Appendix for Chapter 4 for detailed information.

1.3 Population and Water Use Projections for Public Supply

1.3.1 Public Supply and Domestic Self-Supply

Population was projected using the same subcategories as defined in the base year population calculations. For utilities, population projections were calculated by multiplying future county populations, extracted from various county planning documents, by the percentage of county-wide 2000 base year population that each utility represented. The same method was used for domestic self-supply. Future county-wide population was multiplied by the percent of the 2000 county-wide base population associated with domestic self-supply. Table 4-4 shows the base-year and projected population for the Planning Region.

Water demand projections are based on per-capita water use, and were calculated for each sub category (domestic self supply, small utilities and each individual large utility), within each county (Table 4-5). The planning documents used are summarized in the public supply technical memo in Appendix 4, where the projections are detailed on a county level.

Table 4-4. Projected Population for Public Supply and Domestic Self-Supply Water Users (persons).

County	Functional Population						Additional Population	
	2000	2005	2010	2015	2020	2025	Persons	%
Charlotte	154,870	162,927	182,252	200,446	217,158	232,073	77,203	50
DeSoto	35,717	36,193	40,071	44,844	48,174	51,171	15,454	43
Hardee	29,160	29,155	30,827	32,320	33,707	34,987	5,827	20
Highlands	87,278	91,457	99,231	106,473	113,323	119,293	32,015	37
Hillsborough	1,019,930	1,157,006	1,291,111	1,413,811	1,526,797	1,626,389	606,459	60
Manatee	291,524	334,825	378,208	418,140	455,103	487,775	196,251	67
Pasco	367,519	447,588	509,960	569,140	623,370	671,440	303,921	83
Pinellas	1,010,181	1,055,765	1,072,525	1,084,057	1,092,056	1,097,660	87,479	9
Polk	475,339	535,641	592,147	643,750	691,003	732,325	256,986	54
Sarasota	358,227	392,391	434,027	473,067	508,267	539,093	180,866	51
Total	**3,829,745**	**4,242,948**	**4,630,358**	**4,986,047**	**5,308,958**	**5,592,205**	**1,762,460**	**46**

Table 4-5. Public Supply (PS) and Domestic Self-Supply (DSS) Demand Projections (mgd) (5-in-10).

County	2000		2005		2010		2015		2020		2025		Change in Demand		Change (%)	
	PS	DSS	PS	DSS	PS	DSS	PS	DSS	PS	DSS	PS	DSS	PS	DSS	PS	DSS
Charlotte	14.1	4.0	14.9	4.3	16.6	4.8	18.3	5.2	19.8	5.7	21.2	6.1	7.1	2.0	50	50
DeSoto	1.3	2.1	1.3	2.1	1.5	2.3	1.6	2.6	1.8	2.8	1.9	2.9	0.6	0.9	43	43
Hardee	1.7	0.7	1.7	0.7	1.8	0.7	1.9	0.7	1.9	0.8	2.0	0.8	0.3	0.1	20	20
Highlands	8.7	1.3	9.1	1.4	9.9	1.5	10.6	1.6	11.3	1.7	11.9	1.8	3.2	0.5	37	37
Hillsborough	126.9	4.0	143.9	4.5	160.6	5.1	175.8	5.6	189.9	6.0	202.3	6.4	75.4	2.4	59	59
Manatee	36.3	0.2	41.7	0.2	47.1	0.2	52.1	0.2	56.7	0.3	60.8	0.3	24.5	0.1	67	67
Pasco	36.1	4.5	44.0	5.5	50.1	6.3	55.9	7.0	61.3	7.7	66.0	8.3	29.9	3.8	83	83
Pinellas	114.8	0.4	120.0	0.4	121.9	0.4	123.2	0.5	124.2	0.5	124.8	0.5	9.9	0.0	9	9
Polk	67.5	4.7	76.0	5.3	84.1	5.9	91.4	6.4	98.1	6.9	104.0	7.3	36.5	2.6	54	54
Sarasota	37.1	0.9	40.7	1.0	45.0	1.1	49.1	1.2	52.7	1.3	55.9	1.3	18.8	0.4	50	50
Total	**444.6**	**22.8**	**493.4**	**25.4**	**538.7**	**28.3**	**580.0**	**31.0**	**617.7**	**33.5**	**650.7**	**35.6**	**206.1**	**12.8**	**46**	**56**

1.3.2 Irrigation Wells

The amount of water withdrawn for outdoor irrigation from wells smaller than six inches was estimated and factored into the demand projections (Table 4-6). Since wells less than six inches in diameter do not require a water use permit, data were not available to quantify the related withdrawals. A consultant was retained to identify irrigation wells in the Planning Region and to develop an estimate of withdrawals from these wells. The consultant referenced *Effective Use of Reclaimed Water Demonstrated to Offset Water Demand*, (District, 2002) to develop the estimate of 300 gallons per day per well.

1.3.3 Five-in-10 vs. One-in-10 Demand

The public supply technical memorandum reflects public supply demand projections on a county-by-county basis. Both 5-in10 and 1-in-10 demands are presented in these tables. The 1-in-10 year drought event is “an event that results in an increase in water demand of a magnitude that would have a 10 percent probability of occurring during any given year” (Water Planning Coordination Group, 1998, revised in 2003). The final report also determined that between a six and ten percent increase in demand will occur in such an event for public supply water use. In order to maintain consistency with the Water Demand Projection Subcommittee guidelines, six percent was used as the factor by which public supply demand is expected to increase during a 1-in-10 condition. Therefore, the 1-in-10 water demand projections were calculated by multiplying the 5-in-10 demand by a factor of 1.06 (Table 4-7).

2.0 Public Supply Demand Projections

Water demand in the public supply category is a function of population. Population in the Planning Region is projected to increase by approximately 46 percent during the planning period. Only Pinellas and Hardee counties are expected to grow by a smaller percentage. Pinellas County population is expected to increase by only nine percent because of the lack of undeveloped land in the county. The population of Hardee County is expected to increase by only 20 percent probably because of its distance from major population and commercial centers.

Domestic irrigation wells are used by some water utility customers as a source of water for lawn and landscape irrigation. It is estimated that approximately 3.5 mgd of water was withdrawn from domestic irrigation wells in Pinellas County in 2001; the largest amount of all the counties in the Planning Region (Table 4-6). This was closely followed by Sarasota, Pasco, and Highlands counties, at 3.4, 3.0, and 2.5 mgd, respectively. Factors associated with relatively large domestic irrigation well water use include population, rates charged by utilities for potable water, soil type, and development trends. An example of the latter is the situation where potable water utility service was not initially available to homes in an area. When service became available, the domestic self-supply well was used only as the outdoor irrigation source. Pasco County is expected to have the largest domestic well water use by 2025, at 5.5 mgd, followed by Sarasota, Pinellas, and Highlands counties at 5.0, 3.8, and 3.4 mgd, respectively.

As depicted in Table 4-7, public supply demand in the Planning Region is projected to increase by 227 mgd, or 47 percent, to 713 mgd by 2025. Hillsborough County’s public supply water demand is projected to increase by 79 mgd, or 59 percent, to 211 mgd in 2025; the largest increase in the Planning Region. The largest percentage increase is projected in Pasco County, where the year 2000 demand of 44 mgd is projected to increase by 36 mgd, or 83 percent, to 80 mgd. Demand in Pinellas County is projected to increase by 10 mgd, or nine percent, to 129 mgd in 2025. This is the smallest percentage increase among all counties and results from the lack of available land for additional

Table 4-6. Number of Irrigation Wells and Associated Demand Projections (mgd) (5-in10).

County	Withdrawal Locations (#)							Associated Water Demand (mgd)						
	2000	2005	2010	2015	2020	2025	Change in Wells	2000	2005	2010	2015	2020	2025	Change in Demand
Charlotte	3,833	4,033	4,511	4,962	5,375	5,744	1,911	1.2	1.2	1.4	1.5	1.6	1.7	0.6
DeSoto	562	567	631	706	758	805	243	0.2	0.2	0.2	0.2	0.2	0.2	0.1
Hardee	538	538	569	596	622	646	108	0.2	0.2	0.2	0.2	0.2	0.2	0.0
Highlands	8,247	8,642	9,377	10,061	10,708	11,272	3,025	2.5	2.6	2.8	3.0	3.2	3.4	0.9
Hillsborough	5,812	6,593	7,358	8,057	8,701	9,268	3,456	1.7	2.0	2.2	2.4	2.6	2.8	1.0
Manatee	3,601	4,136	4,672	5,165	5,621	6,025	2,424	1.1	1.2	1.4	1.5	1.7	1.8	0.7
Pasco	9,999	12,177	13,874	15,484	16,960	18,267	8,269	3.0	3.7	4.2	4.6	5.1	5.5	2.5
Pinellas	11,786	12,318	12,513	12,648	12,741	12,807	1,021	3.5	3.7	3.8	3.8	3.8	3.8	0.3
Polk	4,034	4,545	5,025	5,463	5,864	6,214	2,181	1.2	1.4	1.5	1.6	1.8	1.9	0.7
Sarasota	11,168	12,233	13,531	14,748	15,845	16,806	5,638	3.4	3.7	4.1	4.4	4.8	5.0	1.7
Total	**59,580**	**65,782**	**72,060**	**77,889**	**83,195**	**87,855**	**28,275**	**17.9**	**19.7**	**21.6**	**23.4**	**25.0**	**26.4**	**8.5**

Table 4-7. Public Supply Demand Projections, Including Public Supply, Domestic Self-Supply (Both Presented in Table 4-5) and Private Irrigation Wells (Presented in Table 4-6) in mgd (5-in-10 and 1-in-10).

County	2001		2005		2010		2015		2020		2025		Change in Demand		% Change	
	Avg	1-10	Avg	1-10	Avg	1-10	Avg	1-10	Avg	1-10	Avg	1-10	Avg	1-10	Avg	1-10
SWUCA																
Charlotte	19.3	20.5	20.4	21.6	22.8	24.1	25.0	26.5	27.1	28.8	29.0	30.7	9.6	10.2	50%	50%
DeSoto	3.5	3.7	3.6	3.8	4.0	4.2	4.4	4.7	4.8	5.0	5.1	5.4	1.5	1.6	43%	43%
Hardee	2.5	2.7	2.5	2.6	2.6	2.8	2.8	2.9	2.9	3.1	3.0	3.2	0.5	0.5	20%	20%
Highlands	12.5	13.2	13.1	13.9	14.2	15.0	15.2	16.1	16.2	17.2	17.1	18.1	4.6	4.9	37%	37%
Hillsborough	21.0	22.2	24.5	26.0	29.4	31.1	35.2	37.4	42.0	44.5	49.3	52.3	28.4	30.1	135%	135%
Manatee	37.6	39.8	43.2	45.8	48.8	51.7	53.9	57.1	58.7	62.2	62.9	66.7	25.3	26.8	67%	67%
Polk	66.7	70.7	75.1	79.6	83.0	88.0	90.3	95.7	96.9	102.7	102.7	108.9	36.0	38.2	54%	54%
Sarasota	41.4	43.9	45.3	48.0	50.1	53.1	54.6	57.9	58.7	62.2	62.3	66.0	20.9	22.1	50%	50%
TOTAL	**204.5**	**216.7**	**227.6**	**241.2**	**254.9**	**270.1**	**281.5**	**298.4**	**307.3**	**325.7**	**331.3**	**351.2**	**126.9**	**134.5**	**62%**	**62%**
NTB Area																
Hillsborough	111.7	118.4	125.9	133.5	138.5	146.8	148.6	157.5	156.5	165.9	162.1	171.8	50.5	53.5	45%	45%
Pasco	43.7	46.3	53.2	56.4	60.6	64.2	67.6	71.7	74.1	78.5	79.8	84.6	36.1	38.3	83%	83%
Pinellas	118.8	125.9	124.2	131.6	126.1	133.7	127.5	135.1	128.4	136.1	129.1	136.8	10.3	10.9	9%	9%
TOTAL	**274.2**	**290.6**	**303.3**	**321.5**	**325.2**	**344.7**	**343.7**	**364.3**	**359.0**	**380.5**	**371.0**	**393.3**	**96.9**	**102.7**	**35%**	**35%**
Planning Region																
Charlotte	19.3	20.5	20.4	21.6	22.8	24.1	25.0	26.5	27.1	28.8	29.0	30.7	9.6	10.2	50%	50%
DeSoto	3.5	3.7	3.6	3.8	4.0	4.2	4.4	4.7	4.8	5.0	5.1	5.4	1.5	1.6	43%	43%
Hardee	2.5	2.6	2.5	2.6	2.6	2.8	2.8	2.9	2.9	3.1	3.0	3.2	0.5	0.5	20%	20%
Highlands	12.5	13.2	13.1	13.9	14.2	15.0	15.2	16.1	16.2	17.2	17.1	18.1	4.6	4.9	37%	37%
Hillsborough	132.6	140.6	150.4	159.4	167.9	177.9	183.8	194.8	198.5	210.4	211.4	224.1	78.8	83.6	59%	59%
Manatee	37.6	39.8	43.2	45.8	48.8	51.7	53.9	57.1	58.7	62.2	62.9	66.7	25.3	26.8	67%	67%
Pasco	43.7	46.3	53.2	56.4	60.6	64.2	67.6	71.7	74.1	78.5	79.8	84.6	36.1	38.3	83%	83%
Pinellas	118.8	125.9	124.2	131.6	126.1	133.7	127.5	135.1	128.4	136.1	129.1	136.8	10.3	10.9	9%	9%
Polk	73.4	77.9	82.8	87.7	91.5	97.0	99.5	105.4	106.8	113.2	113.1	119.9	39.7	42.1	54%	54%
Sarasota	41.4	43.9	45.3	48.0	50.1	53.1	54.6	57.9	58.7	62.2	62.3	66.0	20.9	22.1	50%	50%
TOTAL	**485.4**	**514.5**	**538.5**	**570.8**	**588.5**	**623.8**	**634.4**	**672.5**	**676.1**	**716.7**	**712.7**	**755.5**	**227.4**	**241.0**	**47%**	**47%**

development in the county. The cumulative Public Supply Demand Projections in Table 4-7 include demands from all subcategories of Public Supply (i.e., the sum of demands in Table 4-5 for PS and DSS and in Table 4-6 for Domestic Irrigation Wells = Planning Region Demands in Table 4-7).

3.0 Uncertainties Associated with Public Supply Demand Projections

The District's public supply demand projections are based on per capita water use supplied by utilities and population data provided by BEBR, which is the most accurate population projection data available. However, some stakeholders have expressed concern that the BEBR data does not adequately account for some areas of extremely high population growth. Examples include the northeast portion of Polk County along the I-4 corridor, and the Villages community in Sumter, Lake, and Marion counties (outside the Planning Region). The District has begun developing additional tools to refine demand projections in some of these areas, though the work is preliminary and is not expected to be complete before the finalization of this RWSP.

Section 4. Recreational/Aesthetic

The recreation/aesthetic category includes the self-supplied water use associated with the irrigation of golf courses, cemeteries, parks, medians, attractions, and other large self-supplied green areas. Water use for golf course irrigation comprises the significant majority of demand associated with this category. Recreation/aesthetic water use projections are based largely on historical trends and represent about 20 percent of the total additional demand projected for the Planning Region. Increased water use in this category can be largely attributed to golf courses, and the growth of golf courses can be attributed to factors such as the availability and cost of land, regional economy, and growth in the region's population. Some factors that seem to be having an effect on the increase in number of golf courses are availability of land, cost of land and availability of water for irrigation. The greatest opportunity for reducing the amount of potable water used to irrigate golf courses may be the use of reclaimed water.

When the population projections in the 2006 RWSP were updated from 2003 BEBR to 2005 BEBR, an increase of less than 5 percent in recreation/aesthetic demand was observed (1.3 mgd over twenty-five years). Because the increase was relatively insignificant, the recreation/aesthetic demands in the 2006 RWSP were not updated to the 2005 BEBR population projections.

1.0 Assumptions and Methodologies for Projecting Recreational/Aesthetic Demand

1.1 Reporting Threshold

The Water Demand Projection Subcommittee identified 0.5 mgd as the water use reporting threshold for this category. Using this threshold, a significant percentage of use would not be captured since the majority of users are below 0.5 mgd. Therefore, the District included all permitted or reported users for the recreation/aesthetic category.

1.2 Selection of Base Year

Golf course water demand projection methods differ from those of other subcategories in the Recreation/Aesthetic category. Therefore, this discussion is divided into golf courses and landscapes. The data and projection methods and assumptions are included in the technical memorandum produced for the recreation/aesthetic water demand projections (Appendix 4).

1.2.1 Golf Courses

Because the year 2000 was abnormally dry, 2001 was selected for the base year. Golf course water use in 2001 was divided by the number of golf course holes in each county in 2000 to determine the average number of gallons of water used per day per hole (gpdph) in each county for the base year.

The calculated average water use per hole for the base year varied from 1,296 gpdph in Desoto County to 9,798 in Highlands County.

1.2.2 Landscapes

For each county, base year water use for the landscape category was obtained from data in the 2001 *Estimated Water Use* report. Water used for recreational purposes other than golf courses in 2001 was divided by the county-wide population. The result was an average per capita water use for green space irrigation for each county. Year 2000 population and year 2001 demand was used since water use in 2000 for irrigation was assumed to be much higher than average due to drought conditions prevalent at the time.

1.3 Water use Estimates and Projections for Recreational/Aesthetic

The 1-in-10 Year Drought Subcommittee agreed that irrigation simulation models used for irrigation demand projections should be used to estimate recreational demand. Variables, such as temperature, sunlight, humidity and wind affect the amount of water loss from plants and the resulting irrigation requirements. Irrigation requirements were derived using the District's AGMOD. AGMOD uses historical temperature, effective rainfall, and solar radiation data to calculate irrigation requirements necessary to produce optimum yield for grass under specified rainfall conditions. It is recognized that the frequency and amount of precipitation has a significant impact on demands in this category. For the RWSP, AGMOD input parameters were designed to produce irrigation requirements for 5-in-10 and 1-in-10 conditions specific to each county's characteristics. The output of the program indicated that the percentage increase in optimum irrigation requirements for the 1-in-10 condition versus the 5-in-10 condition was 30 percent for golf courses and 26 percent for landscape. The projected water use for each sub-category for the 5-in10 condition was multiplied by this percentage to produce a projected water use for the 1-in-10 condition.

2.0 Projections for Recreational/Aesthetic Demand

2.1 Golf Courses

Future demand associated with golf courses was estimated based on historical trends. Data related to the actual number of golf course holes from 1984-2002 was obtained from the National Golf Foundation's (NGF), the Internet ("The Golf Guide"), permit information, and local governments. Through the use of linear regression, the number of golf course holes in each county was estimated and used to project golf course water use through 2025. The previously determined quantity of water used per golf course hole was applied to the number of holes to calculate water use through 2025. Although there are variations from county to county, there is a general upward trend in the growth of golf course holes.

The number of golf course holes for each county is statistically significant at a 90 percent confidence level when compared to a straight-line trend to 2025. That confidence level, together with the historical trend, provided the basis for the assumption that the trend could continue through 2025. However, the

District acknowledges the use of an historical trend to predict future demands could over project demands, given the decline in golf course developments. The strength of the relationship of population to golf courses remains to be seen over time. The number of golf course holes was projected for each county at five-year increments from 2000 to 2025 using the linear extrapolation from the linear regression. The number of golf course holes for each year, in each county, was multiplied by the associated gpdph resulting in a total projected water use of 22.3 mgd in 2025, as shown in Table 4-8.

Table 4-8. Golf Course Demand Projections (mgd) (5-in-10).

County	2001 (Base)	2005	2010	2015	2020	2025	Change in Demand
Charlotte	2.8	3.4	4.0	4.5	5.0	5.6	2.8
DeSoto	0.1	0.1	0.1	0.1	0.1	0.2	0.1
Hardee	0.1	0.2	0.2	0.2	0.3	0.3	0.2
Highlands	2.7	2.9	3.1	3.2	3.3	3.4	0.7
Hillsborough	6.7	7.5	8.2	8.9	9.6	10.2	3.6
Manatee	3.9	4.6	5.1	5.6	6.2	6.7	2.8
Pasco	4.3	4.7	5.3	6.0	6.7	7.3	3.0
Pinellas	3.4	3.6	3.7	3.8	3.9	4.0	0.7
Polk	6.4	7.5	8.5	9.5	10.5	11.6	5.2
Sarasota	5.8	6.5	7.2	7.9	8.5	9.2	3.4
Total	**36.3**	**41.0**	**45.4**	**49.8**	**54.2**	**58.5**	**22.3**

2.2 Landscapes

The county-wide average per capita water use for green space irrigation was multiplied by the anticipated population in each county for 2005, 2010, 2015, 2020, and 2025. The District's 10-county average per capita water use for green space irrigation is about four gallons per day per person. The demand for this category, which is anticipated to increase 8 mgd over the planning period, from 19 mgd in 2001 to 27 mgd in 2025, is driven by anticipated population increases. Landscape water use in Polk County is expected to nearly double over the planning period, from 6.3 mgd in the base year to nearly 11.6 mgd in 2025. This represents an 80-percent increase over the planning period. The greatest percent increase will be experienced by Hardee (138 percent) and Charlotte (98 percent) counties, while the least will be experienced by Pinellas (20 percent). Additional detail on the projections and methods are available in the Appendix for Chapter 4. Table 4-9 shows the projected demand for the recreation/aesthetic category through 2025.

3.0 Uncertainties Associated with Recreational/Aesthetic Demand Projections

The NGF historical data was used as a point from which to project future water demand for golf courses in the Planning Region. While the historical data provides an excellent frame of reference from most of the Planning Region, pockets of high population growth in the Planning Region may result in low demand projections in those areas. For the Planning Region as a whole, the projected demands are believed to be reasonable. District staff will continue to evaluate the effectiveness of the methodology to ensure it continues to be adequate for planning purposes.

Section 5. Environmental Restoration

Environmental restoration comprises quantities of water that may need to be developed and/or existing quantities that need to be retired to help impacted natural systems meet their MFLs. The District has developed a recovery strategy for the SWUCA. One of the requirements of the strategy is a 50 mgd reduction in ground-water withdrawals in order to meet the Salt-Water Intrusion Minimum Aquifer Level in the Upper Floridan aquifer. This 50 mgd is included as a demand in the environmental restoration category. It is anticipated that this demand will be met between 2005 and 2025 by the gradual reduction in agricultural ground-water use as agricultural lands are replaced by urban land uses that will be supplied by alternative sources. Since the 50 mgd reduction will occur gradually, it is divided into increments of 10 mgd in each five-year time increment from 2000 to 2025. An additional environmental restoration demand in the SWUCA is approximately 8 mgd that will be required for the upper Peace River to meet its minimum flow. The District is working to develop this quantity of water through a number of water resource development projects that will increase storage in Lake Hancock and in mined lands in the upper Peace River watershed.

In an effort to help resolve impacts from the over-development of ground water in the NTBWUCA, in 1998, the District entered into the Partnership Agreement with Tampa Bay Water and its member governments. The key objectives of the Partnership Agreement were the development of new water supply from sources other than ground water, the ending of litigation, financial assistance from the District for new water supply development and conservation. The development of new water sources would allow for the phased reduction of pumpage, in the amount of 68 mgd, from the existing 11 wellfields associated with the consolidated permit in NTBWUCA. This 68 mgd reduction is an environmental restoration demand that is included in the 2000-2005, and 2006-2010 time intervals and will be met during these intervals when Tampa Bay Water’s alternative source projects are all online. An additional environmental restoration demand in the NTB area is the quantity of water that will be necessary to meet the minimum flow for the lower Hillsborough River below the City of Tampa’s dam. District staff is in the process of determining the need to revise the 10 cfs (6 mgd) minimum flow for the lower river. It is anticipated that water from Sulphur Springs will be used to partially meet the minimum flow.

It is possible that demand for environmental restoration over the planning period could be higher if MFLs that remain to be set for a number of water bodies in the Planning Region require additional cutbacks or development of new supply. In addition, the MFLs set for the NTBWUCA will be re-evaluated in 2010 and, if determined to be insufficient for environmental recovery, could require additional ground-water reductions.

Table 4-9. Recreational/Aesthetic Demand Projections (mgd) (5-in-10).

County	2001		2005		2010		2015		2020		2025		Change in Demand	
	Avg	1-10	Avg	1-10	Avg	1-10	Avg	1-10	Avg	1-10	Avg	1-10	Avg	1-10
SWUCA														
Charlotte	3.0	3.9	3.6	4.7	4.2	5.4	4.8	6.2	5.3	6.9	5.8	7.6	2.9	3.7
DeSoto	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.1	0.1
Hardee	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.3	0.4	0.2	0.2
Highlands	3.3	4.2	3.5	4.5	3.7	4.7	3.8	4.9	4.0	5.1	4.1	5.3	0.9	1.1
Hillsborough	3.0	3.8	3.4	4.3	3.7	4.7	4.0	5.1	4.3	5.5	4.6	5.9	1.6	2.1
Manatee	5.6	7.3	6.5	8.4	7.2	9.3	8.0	10.3	8.7	11.2	9.4	12.2	3.8	4.9
Polk	8.1	10.5	9.4	12.1	10.5	13.6	11.7	15.0	12.8	16.5	13.9	18.0	5.8	7.5
Sarasota	8.2	10.5	9.1	11.8	10.0	12.9	10.9	14.0	11.8	15.2	12.6	16.3	4.4	5.7
Total	**31.5**	**40.7**	**35.9**	**46.3**	**39.7**	**51.3**	**43.6**	**56.2**	**47.4**	**61.1**	**51.1**	**66.0**	**19.6**	**25.3**
NTB Area														
Pasco	6.0	7.7	6.6	8.5	7.4	9.6	8.3	10.7	9.1	11.7	10.0	12.8	4.0	5.2
Pinellas	6.4	8.2	6.7	8.6	6.9	8.8	7.1	9.0	7.2	9.2	7.4	9.4	0.9	1.2
Hillsborough	10.7	13.6	12.0	15.4	13.1	16.8	14.2	18.2	15.3	19.6	16.4	20.9	5.7	7.3
Total	**23.0**	**29.5**	**25.3**	**32.4**	**27.4**	**35.2**	**29.5**	**37.9**	**31.6**	**40.6**	**33.7**	**43.2**	**10.7**	**13.7**
Planning Region														
Charlotte	3.0	3.9	3.6	4.7	4.2	5.4	4.8	6.2	5.3	6.9	5.8	7.6	2.857	3.711
DeSoto	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.068	0.088
Hardee	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.3	0.4	0.174	0.226
Highlands	3.3	4.2	3.5	4.5	3.7	4.7	3.8	4.9	4.0	5.1	4.1	5.3	0.878	1.134
Hillsborough	13.7	17.5	15.4	19.7	16.8	21.5	18.2	23.3	19.6	25.1	21.0	26.9	7.326	9.374
Manatee	5.6	7.3	6.5	8.4	7.2	9.3	8.0	10.3	8.7	11.2	9.4	12.2	3.802	4.902
Pasco	6.0	7.7	6.6	8.5	7.4	9.6	8.3	10.7	9.1	11.7	10.0	12.8	4.003	5.163
Pinellas	6.4	8.2	6.7	8.6	6.9	8.8	7.1	9.0	7.2	9.2	7.4	9.4	0.946	1.219
Polk	8.8	11.4	10.2	13.1	11.4	14.7	12.6	16.3	13.8	17.9	15.1	19.4	6.245	8.075
Sarasota	8.2	10.5	9.1	11.8	10.0	12.9	10.9	14.0	11.8	15.2	12.6	16.3	4.434	5.724
Total	**55.2**	**71.0**	**61.9**	**79.7**	**68.0**	**87.5**	**74.1**	**95.3**	**80.1**	**103.0**	**86.0**	**110.6**	**30.7**	**39.6**

Table 4-10, a summary of the demand for the environmental restoration category for the SWUCA and NTB areas, shows that the demand for environmental restoration over the 2000-2025 planning period is projected to be 132 mgd.

Table 4-10. Environmental Restoration Demand Projections (mgd).

	2005	2010	2015	2020	2025	Additional Demand
SWUCA						
Salt-Water Intrusion MFL	10.0	10.0	10.0	10.0	10.0	50.0
Upper Peace River MFL		8.0				8.0
NTB Area						
Northern Tampa Bay WUCA MFLs	56.8	11.2				68.0
Hillsborough River MFL	6.0					6.0
Planning Region						
Total	**72.8**	**29.2**	**10.0**	**10.0**	**10.0**	**132.0**

Section 6. Summary of Projected Increases and Reductions in Demand in the Planning Region

Tables 4-11a and 4-11b summarize the increases and decreases in demands for the 5-in-10 condition and the 1 in 10 condition respectively for agricultural, I/C,M/D,PG, public supply, recreation/aesthetic, and environmental restoration categories in the SWUCA and NTB area and the Planning Region as a whole. Increases and decreases in demand are tracked separately because calculating the total demand by subtracting the decreasing demand from the increasing demand would be saying that a large portion of the future demand will be met by ground water that has been given up agriculture and mining as areas where these land uses occur are urbanized. Although it is possible that a portion of the decrease in ground-water withdrawals will be used to meet some of the increase in demand through 2025, it is not certain how much will be used. The portion of the decrease in ground-water withdrawals that is not used to meet some of the demand, will raise the level of ground water in the aquifer which will help meet the salt-water intrusion minimum aquifer level. For this reason it is important to track declines in demand that result from reductions in ground-water withdrawals separate from increases in demand.

Table 4-11a shows that approximately 409 mgd of additional water supply will need to be developed and/or existing use retired to meet demand in the Planning Region through 2025. Public supply water use will increase by 227.4 mgd over the planning period. This accounts for nearly 56 percent of the projected increase in the Planning Region and is the largest increase of all the water use categories. Environmental restoration is next at 132 mgd or 32 percent of the projected increase. Most of this demand was met in the 2000-2005 time interval. Table 4-11a also shows a reduction of approximately 74 mgd in agricultural and industrial/commercial water use in the SWUCA, most of which is ground water. The 74 mgd in reductions is occurring as agricultural and mining areas are urbanized. An additional 68 mgd of ground water will be made available through enhanced agricultural conservation and the retirement of permits associated with lands purchased for conservation, for a total of 142 mgd. The rapidly urbanizing coastal counties in the SWUCA will be supplied principally by alternative sources, not the retired ground-water quantities. The 50 mgd reduction in ground-water withdrawals for environmental restoration in the SWUCA can therefore be offset by the projected 142 mgd decrease in water use, most of which is ground water. Some of the remaining 92 mgd in ground-water reductions may be re-permitted under certain conditions to meet demand in the inland counties in the SWUCA where access to alternative supplies is limited.

Table 4-11a. Summary of Projected Increases and Declines in Water Demand (mgd) (5-in-10).

Category	**2000**	**2005**		**2010**		**2015**		**2020**		**2025**		**Total**	
	Base	**Decrease**	**Increase**	**Decrease**	**Increase**	**Decrease**	**Increase**	**Decrease**	**Increase**	**Decrease**	**Increase**	**Decrease**	**Increase**
SWUCA													
Agriculture	440.0	-26.9		-15.6		-8.1		-7.6		-8.9		-67.1	
ICMDPG	98.1	-5.3		-1.7			2.2		2.2		2.3	-7.0	6.7
Public Sup	204.5		23.2		27.3		26.7		25.7		24.0		126.9
Recreation	31.5		4.4		3.8		3.9		3.8		3.7		19.6
Restoration	N/A		10.0		18.0		10.0		10.0		10.0		58.0
Decrease		**-32.2**		**-17.3**		**-8.1**		**-7.6**		**-8.9**		**-74.1**	
Increase	**774.1**		**37.6**		**49.1**		**42.8**		**41.7**		**40.0**		**211.2**
NTB Area													
Agriculture	51.6	-6.1		-0.6			0.1		4.4	-0.9		-7.6	4.5
ICMDPG	20.4		4.9		0.7		0.7		0.8		0.8		7.9
Public Sup	274.2		29.2		21.9		18.5		15.3		12.0		96.9
Recreation	23.0		2.3		2.1		2.1		2.1		2.1		10.7
Restoration	N/A		62.8		11.2								74.0
Decrease		**-6.1**		**-0.6**						**-0.9**		**-7.6**	
Increase	**369.2**		**99.2**		**35.9**		**21.4**		**22.6**		**14.9**		**194.0**
Planning Region													
Agriculture	491.6	-33.0		-16.2		-8.1	0.1	-7.6	4.4	-9.8		-74.7	4.5
ICMDPG	118.5	-6.1	4.9	-1.7	0.7		2.9		3.0		3.1	-7.0	14.6
Pub Sup	485.4		53.2		50.0		45.9		41.7		36.6		227.4
Recreation	55.2		6.7		5.9		6.0		5.9		5.8		30.3
Restoration			72.8		29.2		10.0		10.0		10.0		132.0
Decrease		**-38.3**		**-17.9**		**-8.1**		**-7.6**		**-9.8**		**-81.7**	
Increase	**1150.7**		**137.6**		**85.8**		**64.9**		**65.0**		**55.5**		**408.8**

Note: The Planning Region includes the northern portion of Polk County, which is not included in either the SWUCA or the NTB area. As a result, adding the SWUCA and NTB area quantities above yields slightly smaller totals than the totals for the Planning Region.

Table 4-11b. Summary of Projected Increases and Declines in Water Demand (mgd) (1-in-10).

Category	**2000**	**2005**		**2010**		**2015**		**2020**		**2025**		**Total**	
	Base	**Decrease**	**Increase**	**Decrease**	**Increase**	**Decrease**	**Increase**	**Decrease**	**Increase**	**Decrease**	**Increase**	**Decrease**	**Increase**
SWUCA													
Agriculture	606.9	-34.7		-23.5		-9.9		-9.5		-11.1		-88.6	
ICMDPG	98.1	-6.1		-0.9			2.2		2.2		2.3	-7.0	6.7
Public Sup	216.7		24.6		28.9		28.3		27.3		25.5		134.5
Recreation	40.7		5.6		5.0		4.9		4.9		4.9		25.3
Restoration	N/A		10.0		18.0		10.0		10.0		10.0		58.0
Decrease		**-40.8**		**-24.4**		**-9.9**		**-9.5**		**-11.1**		**-95.6**	
Increase	**962.4**		**40.2**		**51.9**		**45.4**		**44.4**		**42.7**		**224.5**
NTB Area													
Agriculture	62.6	-12.2		-0.6			4.2	-0.4		-0.1		-13.3	4.2
ICMDPG	20.4		4.9		0.7		0.7		0.8		0.8		7.9
Public Sup	290.6		30.9		23.3		19.6		16.2		12.7		102.7
Recreation	29.5		2.9		2.7		2.7		2.7		2.6		13.7
Restoration	N/A		62.8		11.2								74.0
Decrease		**-12.2**		**-0.6**				**-0.4**		**-0.1**		**-13.3**	
Increase	**403.2**		**101.5**		**37.9**		**27.2**		**19.7**		**16.1**		**202.5**
Planning Region													
Agriculture	669.5	-46.9		-24.1		-9.9	4.2	-9.9		-11.2		-101.9	4.2
ICMDPG	118.5	-6.1	4.9	-0.9	0.7		2.9		3.0		3.1	-7.0	14.6
Pub Sup	514.5		56.4		53.0		48.6		44.2		38.8		241.0
Recreation	71.0		8.7		7.8		7.8		7.7		7.6		39.6
Restoration	N/A		68.0		12.5		15.5		12.5		12.5		121.0
Decrease		**-53.0**		**-24.9**		**-9.9**		**-9.9**		**-11.2**		**-108.9**	
Increase	**1373.6**		**138.0**		**74.0**		**79.0**		**67.4**		**62.0**		**420.4**

Note: The Planning Region includes the northern portion of Polk County, which is not included in either the SWUCA or the NTB area. As a result, adding the SWUCA and NTB area quantities above yields slightly smaller totals than the totals for the Planning Region.

Table 4-12 summarizes the projected demand by county for the 5-in-10 and 1-in-10 conditions.
It is acknowledged that the projections represent estimates of demand, based on best available data, historical trends, and assumed conditions that may exist in the future. Efforts to collect data and refine models related to water use demand projections are in progress and will continue over the next five years. District staff has identified some improvements that can be made to demand projections, as pointed out in the description of methods associated with agricultural and public supply categories. Those include:

- Developing population projections tools that rely on a combination of sources, rather than just one, including BEBR, census data, and geographically specific characteristics.
- Working with appropriate agencies to gather the acreage data in the timeframes and degree of disaggregation required to sufficiently project water demand.

Part B. Comparison of Demands Between the 2001 RWSP and the 2006 RWSP

As discussed in the related sections throughout this chapter, the largest differences between the 2001 and 2006 RWSP demand projections are in the public supply and agriculture categories. While the 2006 public supply demand projections indicate growth throughout the Planning Region through 2025, the rate of growth is slightly less than anticipated in the 2001 RWSP. This is because the public supply projections in the 2001 RWSP were based on a 1990 census which showed a slightly higher rate of growth than the 2000 census used to formulate the public supply demand projections for the 2006 RWSP. In addition, the number of irrigation wells and their associated quantities were more accurately quantified for the 2006 RWSP. In the Agricultural water demand category, not only did the increases predicted in 2001 not occur but actual declines in demand were documented and were incorporated into the acreage models. The agricultural adjustments are largely related to substantial losses of citrus acreage and isolated increases in nursery acreage, both presumably related to increased population growth and associated urban development that was not anticipated in the 2001 RWSP. In addition, the projected agricultural water use in the 2006 RWSP is based on reduced permitted quantities that result from changes to the SWUCA rules that were implemented in January 2003.

Table 4-12. Demand Projections Summary by County (mgd) (5-in-10).

Categories by County	Planning Horizon						Change in Demand	
CHARLOTTE	**Base**	**2005**	**2010**	**2015**	**2020**	**2025**	**mgd**	**%**
Agriculture	18.8	17.7	16.5	15.4	14.3	13.6	-5.2	-28
Public Supply	19.3	20.4	22.8	25.0	27.1	29.0	9.6	50
ICMDPG	1.6	0.2	0.2	0.2	0.2	0.2	-1.4	-87
Rec./Aesthetic	3.0	3.6	4.2	4.8	5.3	5.8	2.8	93
DESOTO	**Base**	**2005**	**2010**	**2015**	**2020**	**2025**	**mgd**	**%**
Agriculture	78.7	56.4	48.1	45.3	44.0	43.4	-35.3	-44.9
Public Supply	3.5	3.6	4.0	4.4	4.8	5.1	1.5	43.3
ICMDPG	1.4	0.1	0.1	0.1	0.1	0.1	-1.3	-91.7
Rec./Aesthetic	0.2	0.2	0.2	0.2	0.2	0.2	0.1	40.2
HARDEE	**Base**	**2005**	**2010**	**2015**	**2020**	**2025**	**mgd**	**%**
Agriculture	55.3	57.6	61.2	68.3	75.7	83.2	27.9	50.4
Public Supply	2.5	2.5	2.6	2.8	2.9	3.0	0.5	20.0
ICMDPG	5.9	7.7	12.5	12.8	13.2	13.5	7.6	128.1
Rec./Aesthetic	0.1	0.2	0.2	0.3	0.3	0.3	0.2	118.2
HIGHLANDS	**Base**	**2005**	**2010**	**2015**	**2020**	**2025**	**mgd**	**%**
Agriculture	40.8	44.0	45.7	43.5	39.2	32.0	-8.8	-21.5
Public Supply	12.5	13.1	14.2	15.2	16.2	17.1	4.6	36.7
ICMDPG	0.3	0.2	0.2	0.2	0.2	0.2	-0.1	-42.4
Rec./Aesthetic	3.3	3.5	3.7	3.8	4.0	4.1	0.9	26.9
HILLSBOROUGH	**Base**	**2005**	**2010**	**2015**	**2020**	**2025**	**mgd**	**%**
Agriculture	76.3	77.2	79.2	80.5	81.7	82.9	6.7	8.7
Public Supply	132.6	150.4	167.9	183.8	198.5	211.4	78.8	59.5
ICMDPG	19.7	23.9	24.6	25.4	26.1	26.9	7.2	36.4
Rec./Aesthetic	13.7	15.4	16.8	18.2	19.6	21.0	7.3	53.6
MANATEE	**Base**	**2005**	**2010**	**2015**	**2020**	**2025**	**mgd**	**%**
Agriculture	77.8	71.6	65.7	61.8	58.1	54.6	-23.2	-30
Public Supply	37.6	43.2	48.8	53.9	58.7	62.9	25.3	67
ICMDPG	1.0	4.3	4.4	4.4	4.5	4.6	3.6	358
Rec./Aesthetic	5.6	6.5	7.2	8.0	8.7	9.4	3.8	67
PASCO	**Base**	**2005**	**2010**	**2015**	**2020**	**2025**	**mgd**	**%**
Agriculture	22.0	15.8	14.5	14.2	18.2	16.9	-5.1	-23
Public Supply	43.7	53.2	60.6	67.6	74.1	79.8	36.1	83
ICMDPG	5.6	7.9	8.1	8.3	8.5	8.7	3.0	54
Rec./Aesthetic	6.0	6.6	7.4	8.3	9.1	10.0	4.0	67

Table 4-12. Demand Projections Summary by County (mgd) (5-in-10) (Continued).

Categories by County	Planning Horizon						Change in Demand	
PINELLAS	**Base**	**2005**	**2010**	**2015**	**2020**	**2025**	**mgd**	**%**
Agriculture	1.4	1.2	1.1	1.0	0.9	0.8	-0.6	-41
Public Supply	118.8	124.2	126.1	127.5	128.4	129.1	10.3	9
ICMDPG	0.6	0.3	0.4	0.4	0.4	0.4	-0.3	-41
Rec./Aesthetic	6.4	6.7	6.9	7.1	7.2	7.4	0.9	15
POLK	**Base**	**2005**	**2010**	**2015**	**2020**	**2025**	**mgd**	**%**
Agriculture	107.7	104.3	97.4	91.1	85.3	79.7	-28.0	-26
Public Supply	73.4	82.8	91.5	99.5	106.8	113.1	39.7	54
ICMDPG	81.6	71.9	66.0	67.5	69.1	70.6	-10.9	-13
Rec./Aesthetic	8.8	10.2	11.4	12.6	13.8	15.1	6.2	71
SARASOTA	**Base**	**2005**	**2010**	**2015**	**2020**	**2025**	**mgd**	**%**
Agriculture	12.7	12.8	13.0	13.1	13.7	14.1	1.3	11
Public Supply	41.4	45.3	50.1	54.6	58.7	62.3	20.9	50
ICMDPG	0.6	0.7	0.8	0.8	0.8	0.8	0.2	28
Rec./Aesthetic	8.2	9.1	10.0	10.9	11.8	12.6	4.4	54
TOTAL	**Base**	**2005**	**2010**	**2015**	**2020**	**2025**	**mgd**	**%**
Agriculture	491.6	470.2	453.9	445.9	442.6	432.9	-70.3	-14
Public Supply	485.4	538.5	588.5	634.4	676.1	712.7	227.4	47
ICMDPG	118.5	117.3	117.1	120.0	123.0	126.1	7.6	6
Rec./Aesthetic	55.2	61.9	68.0	74.1	80.1	86.0	30.7	56

Chapter 5. Meeting and Managing Future Water Demands

This chapter presents the results of the District's investigations to quantify the amount of water that is potentially available from all sources of water to meet demand in the Planning Region through the 2025 planning period. Sources of water that were evaluated include surface water/storm water, reclaimed water, seawater desalination, brackish ground-water desalination, fresh ground water and conservation. Aquifer storage and recovery (ASR) is also discussed as a storage option with great potential to maximize the utilization of surface water and reclaimed water. The amount of water that is potentially available from these sources is compared to the demand projections presented in Chapter 4 and a determination is made as to the sufficiency of the sources to meet demand through the 2025 planning period.

Part A. Evaluation of Water Sources

Part A. is an assessment of existing and potentially available sources of water supply in the Planning Region. Sources that were evaluated include:

- Surface Water/Storm Water
- Reclaimed Water
- Seawater Desalination
- Brackish Ground Water Desalination
- Fresh Ground Water
- Conservation

Historically, about 85 percent of the water supply in the Planning Region has been provided by fresh ground water from the Upper Floridan aquifer. For the 2006 RWSP, as was the case for the 2001 RWSP, it is assumed that the amount of water supply needed to meet projected water demands over the planning period will principally come from sources other than fresh ground water. This assumption is based largely on the impacts of ground-water withdrawals on water resources in the NTB area and SWUCA (SWFWMD, 1996; SWFWMD, 1993) and previous direction from the Governing Board. Limited additional fresh ground-water supplies will be available from the surficial and intermediate aquifers, and from the Upper Floridan aquifer, subject to a rigorous, case-by-case permitting review. The Lower Floridan aquifer has the potential to be a significant source of additional water in the northeast portion of the Planning Region and a number of studies are in progress to evaluate this aquifer.

Many water users throughout the region have implemented conservation measures to reduce their water demands. Such conservation measures will continue to enable the water supply system to support more users with the same quantity of water and hydrologic stress. However, the region's continued growth will also require techniques and technologies such as improved water treatment methods, ASR, aquifer recharge systems, and off-stream reservoirs to meet the projected demands. The following discussion summarizes the status of various water supply sources and the potential for those sources to be used to meet projected water demand in the Planning Region.

Section 1. Surface Water/Storm Water

Within the Planning Region, the major river/creek systems include the Anclote, Hillsborough (including the Tampa Bypass Canal), Alafia, Braden, Little Manatee, Manatee, Myakka, and Peace Rivers; Myakkahatchee and Shell Creeks; and Cow Pen Slough. As is typical in west-central Florida, flows are highest during the four-month summer rainy season (June through September) and lowest at the end of the spring dry season in May. Major public supply utilities utilize the Alafia River, Hillsborough River, Tampa Bypass Canal, Braden River, Manatee River, Peace River, Myakkahatchee Creek and Shell Creek. The Hillsborough River, Braden River, Manatee River, and Shell Creek have in-stream dams that form reservoirs for storage. The City of Tampa, which relies on the Hillsborough River, as well as the Tampa Bypass Canal, for most of its water needs, currently withdraws an annual average quantity of about 65 mgd from these sources. Tampa Bay Water also uses the Hillsborough River and the Tampa Bypass Canal. From January 2003 to December, Tampa Bay Water supplied an average of about 36.3 mgd from these sources to their regional distribution system. The City of Bradenton utilizes the Evers' reservoir on the Braden River and currently diverts about 5.2 mgd for public supply needs. Manatee County withdraws about 28.7 mgd from Lake Manatee, which is an in-stream impoundment on the Manatee River. The City of Punta Gorda currently withdraws 4.0 mgd from the Shell Creek reservoir. Table 5-1 contains information on current use and permitted quantities of the major river systems in the Planning Region.

1.0 Criteria for Determining Potential Water Availability

Though minimum flows have been established on freshwater segments of some rivers, as of December 2006, no rivers have yet had minimum flows established for both their freshwater and estuarine segments. Future water supply development from these rivers will ultimately depend on the minimum flows that are established for both river segments. Therefore, it was necessary to develop planning level minimum flow criteria before estimating water availability. Before applying these criteria to determine surface water availability, it was necessary to construct an adjusted flow history for each river. This was done by adding historical withdrawals and accounting for ungaged portions of watersheds to estimate the total flow of the rivers at the locations of interest, prior to withdrawals. The minimum flow criteria were designed to ensure that existing uses and water supply needs of natural systems would be protected (CH2M Hill, 2000). For the 2006 RWSP, as was the case for the 2001 RWSP, the minimum flow was assumed to be the flow that is equaled or exceeded 85 percent of the time (P85). Diversions for water supply were zero when flows were below the assumed minimum flow. Therefore, 15 percent of the time, which occurs primarily in the dry season months of April, May, and early June, there were no calculated withdrawals from the rivers. This ensured that during periods of low flow, sufficient water would be available to sustain natural systems. This criterion was based largely on the minimum flow for the PR/MRWSA water use permit for withdrawals from the Peace River, which was actually the 87th percentile. Compared to criteria used by other water management districts, which varied from the P90 to P95, this number is conservative and reasonable to use for planning purposes.

As shown in Table 5-1, there are several rivers in the region that have instream impoundments. Though the potential yield for all the rivers will be subject to minimum flows once they are established, yields associated with rivers that have instream impoundments will also depend on the degree of structural alteration that has occurred and the habitat that is supported by the flows. For example, based on review of the analysis that was done in support of establishing minimum flows on the Lower Hillsborough River and Tampa Bypass Canal, it may be possible to develop additional water supply

Table 5-1. Summary of Current Withdrawals and Potential Availability of Water from Rivers in the Planning Region (mgd) Based On the Planning Level Minimum Flow Criteria (P85/10 Percent). Quantities May Change When the Actual Minimum Flow is Set.

Water Body	Adjusted Annual Average Flow[1]	10% of Mean Flow	Permitted Average Withdrawal Limits[2]	Current Use[3]	Theoretical Available Additional Withdrawals[4]	Average Days/Year with New Available Water[5]	Days/Year Available[6]	
							Min	Max
Rivers without an Instream Impoundment								
Anclote River[7]	43.4	4.34	0	0	2.5	310	185	365
Alafia River @ Bell Shoals Rd.[8]	261	26.1	28	11.4	3.3	29	1	82
Josephine Creek @ WMD Boundary[7]	46	4.6	0	0	4.5	310	149	366
Little Manatee River @FPL Reservoir	98.6	9.9	8.5	4.2	0.4	71	6	148
Myakka River @ Sarasota[7]	201	20.1	0	0	19.1	308	173	366
Peace River @ Treatment Plant	813	81.3	32.7	9.8	45.4	296	129	364
Rivers/Water Bodies with an Instream Impoundment								
Hillsborough River @ Dam[9]	255	25.5	113.0	83	TBD	TBD	TBD	TBD
Tampa Bypass Canal @ S-160[9]	102	10.2	29.0	18.4	TBD	TBD	TBD	TBD
Braden River @ Dam	68.7	6.87	7.0	5.2	1.6	72	17	118
Cow Pen Slough @ I-75[7]	44	4.4	0	0	4.3	309	--	--
Manatee River @ Dam	117	11.7	34.9	28.7	2.3	27	1	56
Myakkahatchee Creek @ Diversion	43.6	4.4	2.1	1.4	1.8	106	22	207
Shell Creek @ Dam	225	22.5	5.4	4.0	17.6	231	115	338
TOTAL			**260.6**	**166.1**	**102.8**			

Footnotes for Table 5-1 on the previous page:

1. Mean flow based on recorded USGS flow plus reported WUP withdrawals added back in when applicable. Maximum period of record used for rivers in the region is 1965-2003. Flow records for TBC (1975-2003), Manatee River (1982-2003), Braden River (1993-2003), and Myakkahatchee Creek (1981-2003) are shorter. Cow Pen Slough was estimated based on flow data for similar watersheds in the area.
2. Based on individual WUP permit conditions, which may or may not follow the current 10% diversion limitation guidelines.
3. Based on average reported withdrawals during the period 1999-2003.
4. Equal to remainder of 10% of total flow, after permitted uses allocated, with min flow cutoff for new withdrawals of P85 and max system diversion capacity of twice median flow (P50). Accounts for existing min flows (Peace River)
5. Based on estimated number of days that any additional withdrawal is available considering current permitted quantities and withdrawal restrictions.
6. The range of days that additional withdrawals would have been available in any particular year for the period 1965-2003.
7. There are no current or permitted withdrawals on the Myakka River, Anclote River, Josephine Creek, or Cow Pen Slough. Water supply development in the Upper Myakka River and Cow Pen Slough watersheds will likely occur as a result of restorations efforts that target a reduction of flows to environmentally impacted features.
8. Permitted withdrawals include Tampa Bay Water's WUP schedule and Mosaic Fertilizer, LLC. withdrawals from Lithia and Buckhorn springs. “Current use” for TBW withdrawals represents water that was sent to the regional distribution system and was determined to be 6.8 mgd based on average pumping for the period February 2003 to August 2005.
9. Permitted withdrawals for TBW are based on a permitted flow schedule and historical flows for the period 1975 to 1995 (31 mgd from the Hillsborough River and 29 mgd from the TBC). Current use for TBW is based on the period January 2003 to December 2005 and represents the average daily flows sent to the regional distribution system and does not include water sent to the regional reservoir in south Hillsborough County in 2005. Current use from the river included 65.1 mgd by the city of Tampa and 17.9 mgd by Tampa Bay Water; and,
10. Current use from the TBC was 18.4 mgd by Tampa Bay Water. Based on recent work for minimum flows establishment it may be possible to develop additional water supply from these sources by expanding current withdrawal limits associated with the water use permits. Additional work will be necessary to ensure any additional withdrawals do not cause environmental impacts.

from these systems by expanding current permit withdrawal limits. Additional analysis, however, is still needed in order to ensure the additional withdrawals do not cause adverse impacts to the environment.

A second criterion for determining surface water availability was to limit total withdrawals, including new and existing, to 10 percent of the total daily flow of the river when the flow exceeded the P85. Individual withdrawals were limited to 10 percent of the total daily flow at the point of the withdrawal. This is consistent with the ecological guideline used by the District during the 1980s and early 1990s to evaluate potential surface water withdrawals. Additional criteria included limiting maximum withdrawals as a practical engineering limitation to twice the median flow of the river, and ensuring that existing permitted withdrawals from the rivers would be protected.

The P85/10 percent criteria for each river was determined based on evaluation of historical flow and withdrawal data. In the 2001 RWSP, the period of record analyzed for most rivers was 1965 to 1998. This period was selected based on previous work by the District and others that found average annual rainfall for the period prior to 1960 to be higher than average annual rainfall after the early 1960s (Palmer and Nguyen, 1986; Barcelo, et al, 1990; Hancock and Smith, 1994; Basso, 2001). Estimates of available surface water supplies were based on the period of lower rainfall in order to provide a more reliable planning level quantity that could reasonably be expected to be available during both wet and dry periods. Using the higher rainfall period to estimate available surface water supplies would result in yields that would not be sustainable during extended dry periods without impacting the natural systems. For the 2006 RWSP, river yields were evaluated for the period 1965 to 2003 and found to be similar to the yields presented based on the period 1965 to 1998. For those rivers where data for this period were incomplete, the available period of record was used.

Based on a comparison of potentially available yields calculated using the P85/10 percent criteria and available yields calculated using the established minimum freshwater flows, the P85/10 percent criteria are reasonable. The amount of water to be developed in the future will be determined through the permitting process and based on adopted MFLs.

Figure 5-1 illustrates the effects of the P85/10 percent criteria using flows in the Peace River for 1995. The upper line is the observed flow and the lower line is the flow that would result from diversions according to the criteria discussed above. The area between the two lines represents the total amount that would potentially be available from the river for water supply. It is evident from this figure that the majority of water will be available during periods of high river flows; whereas, there is little or no water available when flows are near or below the P85.

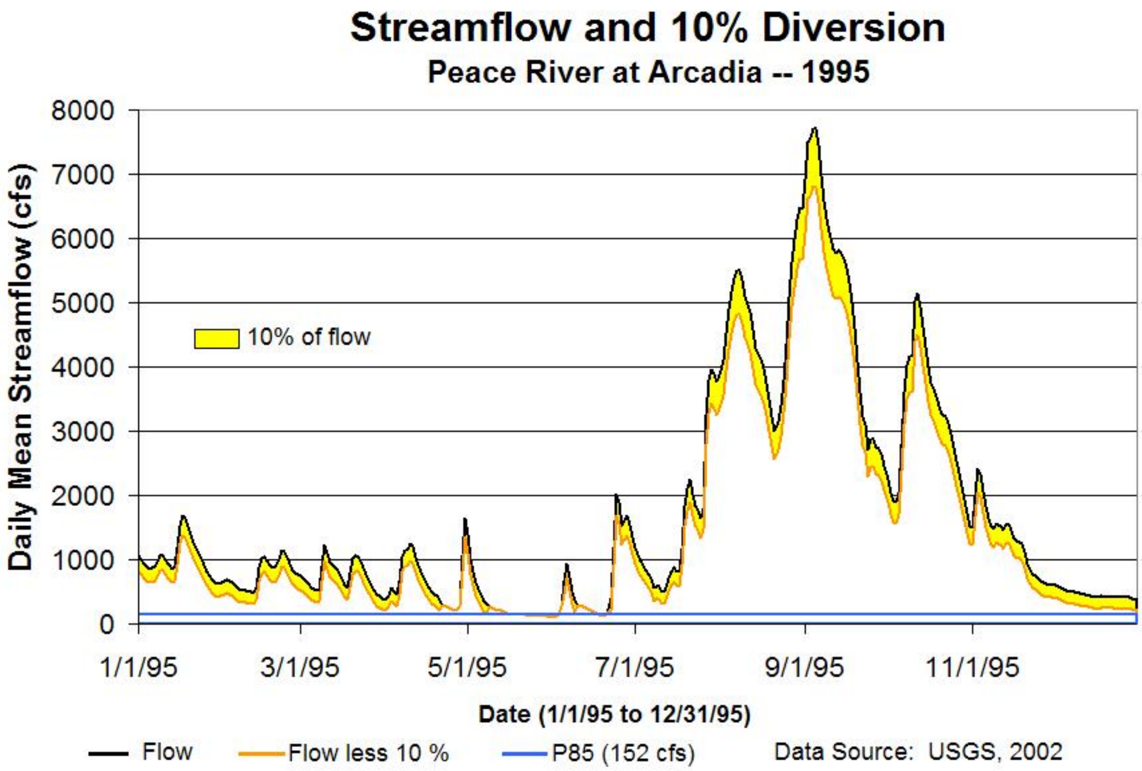

Figure 5-1. Hydrograph of Peace River Flow in 1995 Illustrating the Effect of the P85/10 Percent Withdrawal Criteria on River Flow.

The method for determining the quantity of water available for development from each river is outlined below using the Peace River as an example. The permitted withdrawal (if there is one) is subtracted from the quantity of water available based on the P85/10 percent withdrawal criteria. For cases where a flow schedule is prescribed in the water use permit, the flow schedule was used to determine the quantity of water that has been permitted and is unavailable for future allocation. In the case of the Peace River, the P85/10 percent criteria indicate that the River at the site of the PR/MRWSA's facility could contribute an annual average of 78.1 mgd. Subtracting the PR/MRWSA facility's permitted quantity of 32.7 mgd from the available 78.1 mgd, leaves 45.4 mgd that is available and not associated with a water use permit. Of the 32.7 mgd that the facility is permitted to withdraw, only 9.8 mgd was being utilized on an annual average basis during the period 1999 to 2003. In the past few years annual average withdrawals have been about 12 mgd. Subtracting the 9.8 mgd of actual use from the 78.1 mgd that is available using the P85/10 percent criteria, leaves 68.3 mgd that is available to meet future demands.

Subtracting the 9.8 mgd of currently used quantities from the 32.7 mgd the PR/MRWSA is permitted to supply, leaves 22.9 mgd of permitted but unused quantities. The facility is currently being expanded to add the capacity necessary to utilize the 22.9 mgd. The permitted but unused quantities for all water supply systems that withdraw from rivers have been summed and are considered to be a source of supply to meet future demand. The occurrence of climatic cycles that coincided with the period of record used in the 2001 RWSP has recently been corroborated by climatologists (e.g., Enfield, 2001). The following is a discussion of water availability for each of the major river systems.

Enfield indicated that in Florida, the period from the late 1920s to the early 1960s was a relatively wet period; whereas, the period from about 1965 to 1995 was a dry period. With this in mind, Kelly (2005) evaluated and documented trends in flow patterns for rivers throughout the District and Florida. He concluded that river flows in the District were about 30 percent higher during the period 1940 to 1969 as compared to the period 1970 to 1999. As noted by Enfield (2001), water management priorities will naturally shift from flood control during extended periods of high rainfall to water supply during extended periods of low rainfall. Understanding whether the region is in an extended wet or dry period is beneficial when developing water management priorities. This includes the public messaging that is beneficial for successful management of water shortages and long-term conservation efforts, as well as for the planning and development of alternative water supplies.

Anclote River

The Anclote River originates in south-central Pasco County, and discharges to the Gulf of Mexico at Tarpon Springs. The headwaters are poorly defined, and consist mostly of agricultural and natural lands. The lower one-third of the watershed is heavily developed with residential dwellings (SWFWMD, 1988c). The watershed is about 120 square miles, and contains several recording stations with long-term streamflow data. The annual average discharge from 1965 to 2003 at the most downstream gauging station is 43 mgd (67 cfs). Based on the planning level minimum flow criteria, 2.5 mgd of water supply is potentially available from the river. As with all rivers analyzed for this report, the availability of water supply will ultimately depend on the future establishment of MFLs. For the Anclote River in particular, a review of river flows for two different periods, 1940 to 1969 and 1970 to 1999; (Kelly, 2004) indicates there may be little or no water available from the river. This will be more fully assessed during the process of establishing the MFL for the river in 2007.

Hillsborough River

The most hydrologically significant river within the NTB area is the Hillsborough River, with a watershed of approximately 650 square miles. The interactions between the Hillsborough River watershed and the Upper Floridan aquifer are quite complex, and result in large wetland areas that act as ground-water discharge points in some areas, and perched surface-water storage basins in others.

Although most of the river systems in the NTB area are fed almost totally by overland flow or surficial aquifer discharge, the Hillsborough River receives significant contributions from the Upper Floridan aquifer. The river system originates in the Green Swamp, but much of the baseflow entering the river is discharged from the Upper Floridan and surficial aquifers along the course of the river. Several reaches of the river have direct contact with the Upper Floridan aquifer, and many springs are found along the bottom and banks. The banks of the Hillsborough River have been developed for residential use in the lower reaches of the river, and the river is dammed for public water supply ten miles upstream from its mouth. The greater part of the headwaters and upper reaches of the river are undeveloped. The annual average discharge from 1965 to 2003 is 255 mgd (395 cfs) as measured at the dam. This is net discharge after withdrawals. The reported annual average flow for the other water bodies is calculated after all upstream withdrawals have been added back to reproduce the unimpacted flow. The transfer of water into and out of the Hillsborough River is extremely complex involving not only public supply use but also transfers back and forth to the Tampa Bypass Canal. Consequently the reported flow value in Table 5-1 is not corrected for withdrawals. Current withdrawals from the river for water supply are about 83 mgd, 65.1 mgd by the city of Tampa and 17.9 mgd by Tampa Bay Water.

Based on recent work completed in support of the Tampa Bay Regional Reclaimed Water Project, and as presented in "NTB Planning Area Surface Water/Storm Water Option #1," in Chapter 6, Part C, Section 1, it may be possible to develop additional water supply from the Hillsborough River/TBC system by expanding existing permitted withdrawal limits. The potential for future, additional water supply will be based on further evaluation of the effects of increased diversions on the environment.

Tampa Bypass Canal

The Tampa Bypass Canal (TBC) System was built by the U.S. Army Corp of Engineers to provide flood protection for the Tampa metropolitan area. The canal system was completed in 1984 and extends 18 miles from the Lower Hillsborough Flood Detention Area to McKay Bay. The TBC breaches the Upper Floridan aquifer in some areas and acts as a conduit for ground-water exchange to and from the TBC. During the dry season, the city of Tampa is permitted to augment their in-stream reservoir with up to 20 mgd on an annual average basis from the TBC through a water use permit held by Tampa Bay Water. The annual average discharge of the TBC from October 1974 through 2003, after accounting for Tampa Bay Water's withdrawals, was 102 mgd (160 cfs). As part of the recovery strategy for the NTBWUCA, Tampa Bay Water developed the Enhanced Surface Water System, which withdraws additional quantities of water for potable water supply from the TBC. This water can be used directly or diverted to the new C.W. Bill Young Regional Reservoir for storage. From January 2003 to December 2005, Tampa Bay Water withdrew about 36.3 mgd from the TBC for distribution to their regional system; about 17.9 mgd of this was diverted from the Hillsborough River into the TBC for withdrawal.

Based on recent work completed in support of the Tampa Bay Regional Reclaimed Water Project, and as presented in "NTB Planning Area Surface Water/Storm Water Option #1," in Chapter 6, Part C, Section 1, it may be possible to develop additional water supply from the Hillsborough River/TBC system by expanding existing permitted withdrawal limits. The potential for future additional water supply will be based on evaluation of the effects of increased diversions on the environment.

Alafia River

The Alafia River watershed encompasses approximately 460 square miles. While most of the watershed is located in Hillsborough County, the headwaters are located in Polk County, where the land has been mined extensively for phosphate ore. The river extends 23 miles from its mouth at Hillsborough Bay near Gibsonton, eastward to the confluence of its two major tributaries: the North and South Prongs. Below the confluence of the North and South Prongs, the river has three major tributaries: Turkey, Fishhawk, and Bell Creeks. The adjusted annual flow of the Alafia River is 261 mgd (404 cfs). Mosaic Fertilizer, LLC., withdraws an annual average quantity of nearly 6.0 mgd from Lithia and Buckhorn Springs, which supply baseflow to the river. Tampa Bay Water's recently completed Enhanced Surface Water System is permitted to withdraw approximately 17.5 mgd from the Alafia River based on historical flows. The permit is structured around a withdrawal schedule that is based on flow. For the period from 1965 to 2003, Tampa Bay Water's withdrawal schedule would have yielded an annual average quantity of approximately 21.9 mgd. The schedule of withdrawals for either Mosaic or Tampa Bay Water is not conditioned or constrained by the withdrawals of the other party. Tampa Bay Water's withdrawals began in February of 2003 and from February 2003 to August 2005, averaged about 11.7 mgd, though only about 6.8 mgd was supplied to the regional distribution system. Any of the water withdrawn under this permit can be used directly or can be diverted to the C.W. Bill Young Regional Reservoir for storage. Combining the actual withdrawals by Mosaic and the limited amount of data available for Tampa Bay Water, current withdrawals from the river were determined to be about 16.3 mgd. Based on the established withdrawal criteria, an additional 3.3 mgd of water supply is potentially available from the river. However, as presented in "NTB Planning Area Surface Water/Storm Water Option #1" in Chapter 6, Part C, Section 1, it may be possible to develop additional water supply from the Alafia River if the minimum flow for the freshwater and estuarine segments of the river, when established in 2006, allow more withdrawals than the planning level minimum flow criteria.

Little Manatee River

The Little Manatee River watershed straddles the Manatee/Hillsborough county line and encompasses approximately 225 square miles. The river extends nearly 40 miles from its source in southeastern Hillsborough County, westward to its mouth at Tampa Bay near Ruskin. Several small tributaries contribute flow to the river including Dug, Cypress, and Carlton Branch Creeks. Tidal effects in the Little Manatee are discernible up to 15 miles upstream from the mouth (SWFWMD, 1988a). Based on flow data collected on the river at the USGS flow gage located near Wimauma, average annual discharge for the Little Manatee River is approximately 98.6 mgd (153 cfs).

Florida Power and Light (FPL) withdraws water from the Little Manatee River and stores it in a 3,500-acre cooling pond (Lake Parrish) for its 1,600 megawatt power generation facility. Average annual diversions from 1999 to 2003 were 4.2 mgd. The original water use permit allowed FPL to withdraw water from the river during high flow periods and for quantities greater than 10 percent of total flows. Under a permit revised in 2005, FPL is now allowed to withdraw up to an annual average of 8.5 mgd, with maximum daily withdrawals limited to 10 percent of the total river flow. The revised permit includes a single withdrawal schedule for normal operations and a schedule for what is termed "emergency" conditions. These emergency conditions become active when the level of the cooling pond falls below a pre-determined level. The revised permit is expected to significantly alter FPL's withdrawal schedule. In addition, in 2005 FPL completed expansion activities with the installation of a third generating unit that will provide an additional 1,100 megawatts of power. The unit is not yet running at full capacity; however, FPL expects that when the plant is under full operation, withdrawals from the river will be close to permitted quantities. Based on FPL's future water demands and withdrawal schedule, as well as the planning level minimum flow criteria, an additional 0.4 mgd is potentially available from the river.

Manatee River

The Manatee River watershed is located completely within Manatee County and encompasses approximately 330 square miles, including 83 square miles of the Braden River system. The river originates in northeast Manatee County, near Duette, and flows 45 miles to its mouth at the south end of Tampa Bay. A dam was constructed on the river in 1968, impounding about six miles of the river's middle reach forming Lake Manatee. Since tidal influences reach approximately 20 miles upstream from the mouth of the river nearly to the dam, no stream-gauging stations are in place downstream of the dam. Lake Manatee is operated as a public water supply reservoir by the Manatee County Utility Department. The adjusted annual average flow for the period from 1982 - 2003 is 117 mgd (182 cfs). However, this value might not be completely reliable. The utility typically holds water in the reservoir during the dry season and then releases large quantities during the wet season. This type of activity would skew the flow distributions and consequently affect the calculated potential withdrawal amounts. The Utility is permitted for average annual withdrawals of 34.9 mgd. Average annual diversions from 1999 to 2003 were 28.7 mgd. Based on the planning level minimum flow criteria, an additional 2.3 mgd is potentially available from the river.

Braden River

The Braden River discharges to the tidal reaches of the Manatee River about eight miles from Tampa Bay. From its confluence with the Manatee River, the river extends seven miles southeasterly and then about 12 miles easterly to its headwaters. The upper reaches of the system consist of channelized tributaries in central Manatee County. No gauging stations exist on the Braden River. A water-supply reservoir, Ward Lake (38 acres), was created in 1938 by damming the river just south of State Road 70. The reservoir was enlarged in 1985 and renamed the Bill Evers Reservoir (230 acres). The river is tidally influenced below the dam. The adjusted average annual discharge from 1993 - 2003 at the Braden River is 68.7 mgd (107 cfs). The City of Bradenton Utility Department is permitted for an average of seven mgd. Average annual diversions from 1999 to 2003 were 5.2 mgd. Based on the planning level withdrawal criteria, an additional 1.6 mgd of water supply is potentially available from the river.

Myakka River

The Myakka River extends 69 miles from its mouth at Charlotte Harbor northeasterly to its origins in northeast Manatee County and has a watershed that encompasses approximately 598 square miles. Major tributaries are Big Slough/Myakkahatchee Creek, Deer Prairie Slough/Creek and Owen Creek. Two lakes of significant size, Upper and Lower Myakka Lake, are located along the Myakka River, and have a combined surface area of 1,380 acres.

The river has been designated an Outstanding Florida Water and the segment through Sarasota County was designated a Wild and Scenic River. The Myakka River watershed has undergone extensive hydrologic alteration. Over the past few decades, inflows from irrigation water applied to agricultural lands are believed to have contributed to excess water entering Flatford Swamp and other areas of the river. Along the middle portion of the river, small dams were constructed on the Upper and Lower Myakka lakes. Other flow alterations, including those at Tatum Sawgrass, Vanderipe Slough, Clay Gully, Cow Pen Slough, and the Blackburn Canal, have shifted the timing of flows, drastically reduced storage areas, and diverted large quantities of water out of the watershed.

Seventy-three percent of the river's annual flow occurs during the wet season and the river has a broad, seasonally inundated floodplain. Historically, during the drier periods of the year, there was no flow in the upper river. However, in the last several decades, inflows from irrigated agricultural lands have significantly increased the dry season flow of the river and it no longer ceases flowing in the dry season. The adjusted annual average flow from 1965 to 2003 at the Myakka River near Sarasota is 201 mgd (313 cfs). This includes up to 14.5 to 17 mgd (22.5 to 26 cfs) of excess dry season flow that has been estimated to occur during eight months of the year (Kelly, 2005) as a result of irrigation of agricultural lands. As part of efforts to restore environmentally impacted areas in the upper watershed, it will be necessary to prevent excess surface water flows from entering Flatford Swamp. Through the diversion and capture of these excess flows, opportunities for water supply development will be created, which will help to advance environmental restoration efforts. There are currently no permitted withdrawals from the river. Based on the planning level minimum flow criteria, an additional 19.1 mgd of water supply is potentially available from the river.

Cow Pen Slough

The Cow Pen Slough watershed encompasses approximately 63 square miles with the majority located in Sarasota County. Only 9.5 square miles of the headwaters is located in Manatee County. Land use in the upper part of the watershed is primarily agricultural whereas in the lower part of the watershed it is mostly urban. Runoff from the watershed is conveyed through 14 miles of improved channel and outfalls into Dona Bay. Historically, a large portion of the upper watershed discharged into the Myakka River. In the 1960s the slough was channelized to enable agricultural development to occur in the area. This alteration resulted in the diversion of flows from the Myakka River and has contributed to excess freshwater flows entering Dona Bay, which has disrupted the natural freshwater/saltwater regime in the estuary. Two operational flood control structures are located on Cow Pen Slough (one just north of Laurel Road and the other just south of SR 72).

It is anticipated that future environmental restoration efforts in the watershed will focus on preventing the excess freshwater flows in the watershed from entering Dona Bay. Through the diversion and capture of these excess flows, opportunities for water supply development will be created, which will help to advance environmental restoration efforts. There is limited flow data available on Cow Pen Slough. As part of the District's MFLs effort, flow measurements on the Slough were initiated in 2003. Using data collected for the period since 2003, the annual average flow has been 72 mgd (111 cfs) as measured at the structure near Laurel Road. The available yield from Cow Pen Slough was based on flow data for similar watersheds in the area. Using these flow estimates and based on the planning level minimum flow criteria, 4.4 mgd of water supply is potentially available from the Slough. However, as ongoing restoration studies continue, more information will be available to better quantify excess flows within Cow Pen Slough, which may result in significantly higher yield estimates. Ultimately, the quantity of future water supply available from Cow Pen Slough will be determined through the permitting process and following the establishment of a minimum flow in 2007.

Myakkahatchee Creek

The Myakkahatchee Creek (Big Slough) watershed covers approximately 195 square miles with the largest segments in Manatee and Sarasota counties. Smaller portions of the watershed are also located in DeSoto and Charlotte counties. A tributary of the Myakka River, Myakkahatchee Creek is a channelized drainway for over 20 miles with the lower portion of the watershed situated in the City of North Port. In the upper reaches, land use is predominately pasture. Near the outlet, the land use is urban and residential and the many canals draining the urban areas are fitted with control structures. The annual average flow in Myakkahatchee Creek from 1981 to 2003, as measured at the structure near the withdrawal point upstream of the US 41 crossing, is 43.6 mgd (67.5 cfs). The City of North Port is permitted to withdraw an annual average of 2.1 mgd from Myakkahatchee Creek. Based on the planning level minimum flow criteria, an additional 1.8 mgd of water supply is potentially available from the Creek.

Peace River

The Peace River begins in the Green Swamp and flows south to Charlotte Harbor. The Peace River watershed encompasses approximately 1,800 square miles. Peace Creek drains approximately 93 square miles in the northeast part of the watershed, serving as an outlet for several lakes near the towns of Lake Alfred and Haines City. Saddle Creek Canal drains 231 square miles in the northwest portion of the watershed in Polk County, where the dominant drainage feature is Lake Hancock. Numerous lakes are present in the area north of Bartow, ranging in size from a few to about 4,600 acres. In this area surface-water drainage is ill defined. South of Bartow to about Ft. Meade, the land surface has been considerably altered by phosphate mining activities. Major tributaries south of Ft. Meade include Horse Creek, Joshua Creek, and Charlie Creek.

The major withdrawal from the Peace River is for public supply by the PR/MRWSA. The PR/MRWSA operates a regional water supply facility in southwest DeSoto County that consists of an 85-acre off-stream reservoir, with a capacity of 625 million gallons, and 20 ASR wells. Adjusted annual flow at the water treatment plant from 1965 through 2003 was 813 mgd (1,264 cfs). The PR/MRWSA is permitted to supply an annual average of 32.7 mgd from the river. In order to maximize storage in its reservoir and ASR system, the PR/MRWSA is permitted to withdraw 10 percent of the total flow of the river up to a maximum of 90 mgd when the flow, as measured the previous day at the Arcadia stream gauge, is above 84 mgd (130 cfs). Annual average diversions from 1999 to 2003 were 9.8 mgd, and in recent years has been about 12 mgd. The PR/MRWSA has been working to increase the storage and water treatment capacity of their Peace River facility. The current expansion will enable the facility to utilize its entire permitted quantity of 32.7 mgd by expanding the storage capacity of the reservoir from 625 million gallons to 6 billion gallons and doubling the water treatment plant capacity from 24 mgd to 48 mgd.

In order to maximize development of additional water supplies from the river, future withdrawals will need to be closely coordinated with the PR/MRWSA and other users. Based on the planning level minimum flow criteria, an additional 45.4 mgd of water supply is potentially available from the river.

Shell Creek

The Shell Creek/Prairie Creek watershed encompasses about 400 square miles and empties into the upper reaches of Charlotte Harbor. It is the largest sub-basin in the Peace River watershed. Shell Creek was impounded in 1964 by the construction of a dam, which created an 835-acre in-stream reservoir used for municipal supply by the City of Punta Gorda. The adjusted annual average discharge from 1965 to 2003 at the Shell Creek reservoir is 225 mgd (350 cfs). The City of Punta Gorda Utility Department is permitted for average annual withdrawals of 5.4 mgd. Average annual diversions from 1999 to 2003 were 4 mgd. Based on the planning level minimum flow criteria, an additional 17.6 mgd of water is potentially available from the river.

1.1 Summary of Surface Water Availability in the Planning Region

Based on planning level criteria, the total amount of additional surface water that could potentially be obtained from rivers in the Planning Region ranges from approximately 94 mgd to 197 mgd. This includes permitted but unused quantities of water, as well as unpermitted quantities of water from rivers in the area. With respect to permitted but unused quantities, approximately 94 mgd is available. With respect to the unpermitted quantities of water, based on the planning level minimum flow criteria of 10 percent of flow above the P85, it was calculated that approximately 103 mgd is potentially available. Factors affecting the quantities of water that are ultimately developed for water supply will include the future establishment of MFLs, the ability to develop sufficient storage capacity, and the ultimate success of adopted recovery plans. Though Table 5-1 depicts available surface water quantities at the more downstream gages, it is possible and likely that some of the water will be developed in upstream portions of the watersheds.

Section 2. Reclaimed Water

Reclaimed water is defined by FDEP as water that is beneficially reused after being treated to at least secondary wastewater treatment standards by a domestic wastewater treatment plant (WWTP). Reclaimed water can be used in a number of ways including decreasing reliance on potable water supplies, increasing ground-water recharge, and restoring natural systems.

The use of reclaimed water as a non-potable water supply has a long history in Florida. The City of Tallahassee started one of the first reclaimed water systems in Florida in the mid 1960s. By the late 1970s the City of St. Petersburg had the largest reclaimed water system in the United States. The City currently utilizes an average daily flow of 18 mgd of reclaimed water for residential irrigation and industrial/commercial use. Since FY1987 the District has provided more than $225 million in grant funding to over 259 reclaimed water projects (Wright, 2005).

To determine the current availability of reclaimed water in the region, District staff inventoried existing WWTPs and those that are currently under construction, with treatment capacities of 0.1 mgd or larger. The 0.1 mgd threshold was chosen in order to account for all public access reuse systems. There are 130 WWTPs with capacities of 0.1 mgd or larger included in the inventory. Data on WWTPs were gathered using a variety of methods, including questionnaires, FDEP reports, District reports, emails and phone calls to utilities. The data collected on each of the plants included the projected 2000 to 2025 design capacity, treatment & disinfection levels, wastewater flows, inflow and infiltration flow reductions, indoor water conservation related flow reductions, reuse types and reuse flows.

Within the Planning Region in the year 2000, 80 WWTPs were providing customers with 118 mgd of reclaimed water. The majority of these plants were providing reclaimed water for irrigation. While 118 mgd is a large amount, it represents only 40 percent of the 301 mgd of reclaimed water that was available. The remaining 183 mgd of reclaimed water was disposed of in rapid infiltration basins, sprayfields, surface waters or deep wells.

The percent of WWTP flows utilized in reclaimed water systems (utilization rate) varies by utility. At best, only 50 to 70 percent of WWTP flows actually go to reclaimed water customers. However, this is an improvement over the 1995 rate of 40 to 50 percent. The year 2000 wastewater and reuse data for WWTPs in the Planning Region are included in the Appendix for Chapter 5.

The highest utilization rates (50 to 70 percent) occur in coastal areas which typically have large populations and, therefore, large WWTP flows and potential reclaimed water customer bases. The coastal areas also tend to have limited supplies of water for landscape irrigation. In rural areas, limited WWTP flows reduce the potential for the development of reclaimed water systems. Utilization is also limited by seasonal supply and storage. The daily and seasonal supply of reclaimed water from a WWTP is normally fairly constant, however, the daily and seasonal demand from customers for that supply can be highly variable. A reclaimed water utility's utilization rate is limited by the peak demand/supply ratio.

A utility cannot expand its reuse system beyond peak flow demand, without experiencing shortages during certain times of the year. For example, a reclaimed water system with a one mgd flow normally is limited to supplying 0.5 mgd (50 percent utilization) on a yearly basis. This is because during the dry season demand for reclaimed water for irrigation can more than double. The key to increasing utilization beyond 50 percent is developing seasonal storage to capture and store reclaimed water that is available during the wet season when demand is low. This stored reclaimed water can then be used to augment the daily reclaimed water flows to meet peak demand in the dry season. In order to store these large volumes of seasonally available reclaimed water, surface-water reservoirs and/or reclaimed water ASR systems are required. In addition to seasonal storage, systems may have the opportunity to increase utilization by supplementing their reclaimed water systems with other water sources such as stormwater and in some cases, ground water during peak demand periods, thereby enabling the system to develop a larger customer base. A larger customer base ultimately leads to larger annual utilization and greater annual offsets.

Another important aspect of reclaimed water usage is the concept of offset. Reclaimed water offset is defined as the amount of traditional water sources (ground water, surface water) that is replaced by reclaimed water usage. Customers tend to use more reclaimed water than potable water because reclaimed water is generally less expensive and is not as restricted as irrigation with potable water. For example, a single-family residence with an in-ground irrigation system connected to potable water uses about 300 gpd for irrigation. However, if the same single family residence converts to an un-metered, flat-rate, reclaimed water irrigation supply without day-of-week restrictions, it will use approximately three times (900 gpd) as much reclaimed water as potable water (2002 Residential Reuse in the Tri-County Area, SWFWMD 2003). In this example, the offset rate would be 33 percent (300 gpd offset for 900 gpd reclaimed water utilization).

Different types of reclaimed water uses have different offset potentials. For example, a power plant or industry using one mgd of potable water for cooling or process water, after converting to reclaimed water, will normally use about the same quantity. In this example, the offset rate would be 100 percent (one mgd offset for one mgd utilization). Most reclaimed water utilities provide service to a wide variety of customers, and as a result, the average reclaimed water offset rate is estimated to be 60 percent. The District is actively cooperating with utilities to help identify ways to increase reclaimed water utilization and offset. For example, efficiency can be further enhanced with practices such as individual metering coupled with water conserving rates, efficient irrigation design and irrigation restrictions.

1.0 Calculation of Reclaimed Water Availability in the Planning Region

To estimate future reclaimed water availability, each county’s actual reclaimed water flow was determined using data reported to FDEP and information gathered from a survey. The survey was designed to determine the utility’s plans from 2000 through 2025 to reduce sewer flows from inflow and infiltration, and their plans for implementing indoor conservation projects during the same timeframe. Inflow is the undesirable storm water input and infiltration is the undesirable ground-water input (through leaky gravity sewers) into a sanitary sewer system. Each utility's inflow and infiltration and conservation plans will reduce future sewer flows and thereby reduce the availability of future reclaimed water. Therefore, these reductions from these efforts were subtracted from the actual 2000 WWTP flows.

Next, the estimated percentage increase in public water supply demand (2000-2025) was determined (Chapter 4, Part B, Section 3). Since WWTP flows are related to public water-supply demand, the percentage increase in public water supply demand was multiplied by the actual 2000 WWTP flows in each county to obtain an estimated 2025 WWTP flow by county. As illustrated in Table 5-2, it is estimated that an additional 112 mgd of reclaimed water will be produced within the Planning Region by 2025 (Projected 2025 WWTP flow minus the actual 2000 WWTP flow).

Table 5-2. Wastewater Treatment Plant Flows By County (mgd).

County	Actual 2000 WWTP Flow (mgd)[1]	Estimated WWTP Flow Reductions 2000 to 2025 (I&I mgd)[2]	Estimated WWTP Flow Reductions 2000 to 2025 (conservation mgd)[3]	Projected Increase 2000 to 2025 (%)[4]	Projected 2025 WWTP Flow (mgd)[5]
Pasco	18.04	0.30	0.00	+83	32.46
Pinellas	106.06	0.70	2.08	+9	112.58
Hillsborough	92.95	4.32	0.61	+60	140.83
Manatee	25.87	0.00	0.00	+67	43.20
Sarasota	21.39	0.48	0.38	+51	30.99
DeSoto	0.98	0.00	0.00	+43	1.40
Charlotte	7.46	0.25	0.00	+50	10.82
Polk	25.25	1.43	0.04	+54	36.62
Hardee	1.17	0.00	0.00	+20	1.40
Highlands	2.26	0.00	0.00	+37	3.10
Total	**301.43**	**7.48**	**3.11**	**+42%**	**413.4**

1. Data obtained from FDEP "2000 Reuse Inventory", (FDEP, 2000 Reuse Inventory, June 2001)
2. Data obtained through 2004 SWFWMD survey of individual utilities
3. Data obtained through draft SWFWMD Regional Water Supply Plan indoor conservation estimations
4. Data derived through draft SWFWMD Regional Water Supply Plan population increase estimates (Population Projections, BEBR, 2006).
5. Actual 2000 WWTP flows minus estimated WWTP flow reductions achieved through I&I and indoor conservation, multiplied by projected population increases.

To calculate future reclaimed water availability, the wastewater treatment plant flow was estimated based on population in each planning increment, and the potential uses and offsets were calculated. These values are presented in Table 5-2. The 2000 use reflects what was actually used in 2000, and offset was estimated based on District-wide average of 60 percent. WWTP flow is expected to increase from 301 mgd to 346 mgd by 2010. The potential utilization for 2010 and 2025 is estimated at 75 percent, representing the potential use if seasonal storage and other mechanisms described in this chapter are used. The offset is also estimated at 75 percent, reflecting the potential offset achievable with the implementation of BMPs for efficient reclaimed water use. In 2010, 260 mgd could be used to offset 195 mgd of potable water demands. Some of this is already in use, but employing seasonal storage and efficiency BMPs would increase the amount of reclaimed water available. As presented in Table 5-3, projects that will use 2010 flows are already underway. These are projects that were constructed since 2000, are in the process of design or construction, or are planned to be constructed by 2010. Between 2010 and 2025, it is estimated that an additional 67 mgd of reclaimed water will be produced, bringing the total to 413 mgd. Of this amount, 310 mgd could be used and 232 could offset regional water demands. For the purposes of this RWSP, additional reclaimed water use and offsets are conservatively estimated to be 192 mgd and 144, respectively. The utilities within the Planning Region are well on the way to meeting the projected 2000-2025 offsets of 144 mgd, as indicated by the constructed and planned projects during 2001- 2010 (see details in Tables 8-2 and 8-3).

Table 5-3. Potential of Reclaimed Water to Meet Regional Demands (mgd)[6].

Regional Potential	2000[1]	2010	2001-2010 Projects[3]	2025	Potential 2001-2025[7]
WWTP Flow[1,2]	301	346	346	413	413[9]
Beneficial Use[5]	118	260	192	310	192[8]
Offset[4]	71	195	120	232	144

1. 2000 data from FDEP Reuse Inventory (FDEP,2000).
2. 2010 and 2025 data derived from population projections, Chapter 4.
3. Use and offset for projects constructed or planned between 2000 and 2010 (SWFWMD,2006). See Tables 8-2 and 8-3.
4. 2000 estimated at 60%, remaining years estimated at 75 percent, unless otherwise specified.
5. Estimated at 75% use rates, assuming seasonal storage and other mechanisms described in this chapter are implemented.
6. Differences in numbers may occur due to rounding.
7. Represents the calculated beneficial reuse and offsets achievable, given the wastewater flows in the year 2025.
8. Represents the 2025 potential, less the reuse flows and offsets that have already been occurring through 2000.
9. Represents the total calculated wastewater treatment plant flows in 2025.

Section 3. Seawater Desalination

Seawater is defined as water in any sea, gulf, bay, or ocean having a total dissolved solids concentration greater than or equal to 35,000 mg/l (SWFWMD, 2000). Seawater is readily accessible in the coastal regions of the District and can potentially be developed as a water supply on a very large scale.

Two major problems with seawater desalination, excessive cost and disposal of the waste concentrate, have discouraged its development in the past. The first problem, excessive cost, continues to be addressed by recent technological improvements in the reverse osmosis (RO) process. RO is a membrane separation process in which water from a pressurized saline solution is separated from the solutes (the dissolved material) by flowing through a membrane. The RO process results in fresh product water and a highly mineralized waste concentrate. Approximately 30 percent of the water used in the RO process becomes waste concentrate that must be disposed of through methods that include surface-water discharge, deep well injection, or dilution at a WWTP. Surface-water discharge is the predominant disposal method due to its lower cost. Improvements in the RO process have helped to narrow the gap in cost between seawater desalination and the development of traditional supplies such as ground water and surface water. The second major problem is the disposal of the waste concentrate. A National Pollution Discharge Elimination System (NPDES) permit from the EPA must be obtained to discharge the concentrate into surface water. An additional technical issue is determining the potential ecological effects of new seawater or surface water withdrawals.

Since the release of the 2001 RWSP, technological advancements were made in the areas of energy recovery and Zero Liquid Discharge (ZLD). Energy recovery systems use the high-pressure concentrate flow exiting the RO membranes to drive turbines. In return, the energy produced from the turbines load the pumps feeding the source water into the RO membrane system. Research results indicate possible energy recovery rates between 30 and 40 percent (WRA, 2005). Energy recovery systems reduce the operation and maintenance costs associated with RO. Seawater Desalination costs presented in Chapter 6 take into account the use of a high-energy recovery turbine. ZLD is another technological advance worth noting. This technology addresses the issue of concentrate disposal for situations where traditional methods, such as surface water discharge or deep well injection is not feasible (WRA, 2005). ZLD treats concentrate to produce desalinated water and dry salts. Although expensive at $3.00/kgal of total product water, ZLD represents a potential concentrate disposal technology for those inland facilities where the need to protect surface water and ground-water resources precludes the use of other methods. Future updates of the RWSP will continue to investigate these technologies and the potential for further development of this water source.

1.0 Potential for Water Supply from Seawater Desalination

Potential sites for large-scale (at least 20 mgd) seawater desalination plants in the Planning Region have been identified as part of the RWSP process. The 20 mgd capacity was based on the economies of scale identified during the procurement process for Tampa Bay Water's seawater desalination plant at the Big Bend site. Four sites were evaluated and a discussion of these sites is presented in Chapter 6. For planning purposes, it is estimated that 75 mgd of water supply can be provided through seawater desalination facilities located at these sites. This includes an additional 10 mgd at the Tampa Bay Big Bend site, 25 mgd at the Anclote River site, and two 20 mgd options located in Manatee and Sarasota counties. Including the 25 mgd from Tampa Bay Water’s facility that is completed but undergoing remediation (see the following paragraph), a total of 100 mgd of water supply could be produced in the Planning Region. It is recognized that the potential exists to develop additional quantities of water through seawater desalination beyond what has been presented in this RWSP.

2.0 The Tampa Bay Water Seawater Desalination Facility

Tampa Bay Water’s seawater desalination facility is the only existing seawater desalination facility in the Planning Region. This facility is one of the cornerstone projects of the Partnership Agreement between the District and Tampa Bay Water. The District will provide $85 million toward the capital cost of this plant once it is operating as designed. Water produced from this plant will be used to offset scheduled reductions in wellfield withdrawals and to meet future demand.

The facility is co-located with Tampa Electric Company's Big Bend Power Plant on Tampa Bay near Apollo Beach and will have a capacity of 25 mgd, expandable to 35 mgd. The facility uses an innovative design to dilute the waste concentrate in the same discharge pipe and discharge canal that returns the cooling water from the power plant to the Bay. About 20 mgd of concentrate will be mixed and diluted with up to 1.4 billion gallons per day of seawater in the pipe. The end result will be discharge water that is diluted to within approximately 1.5 percent of the ambient bay water quality.

The estimated unit cost for delivery of this water to Tampa Bay Water’s distribution system is $3.19 per 1,000 gallons over a 30-year period. This price remains below historical ranges of approximately $4.00 to $8.00 per thousand gallons for seawater desalination.

Section 4. Brackish Ground Water Desalination

Brackish ground water is defined as ground water having impurity concentrations that exceed drinking water standards (TDS concentration greater than 500 mg/l). Within the Planning Region, brackish ground water is found principally in the near coastal portions of the Upper Floridan and intermediate aquifers. Brackish ground-water desalination facilities within the Planning Region are mostly in Charlotte, Pinellas, and Sarasota counties (Figure 5-2).

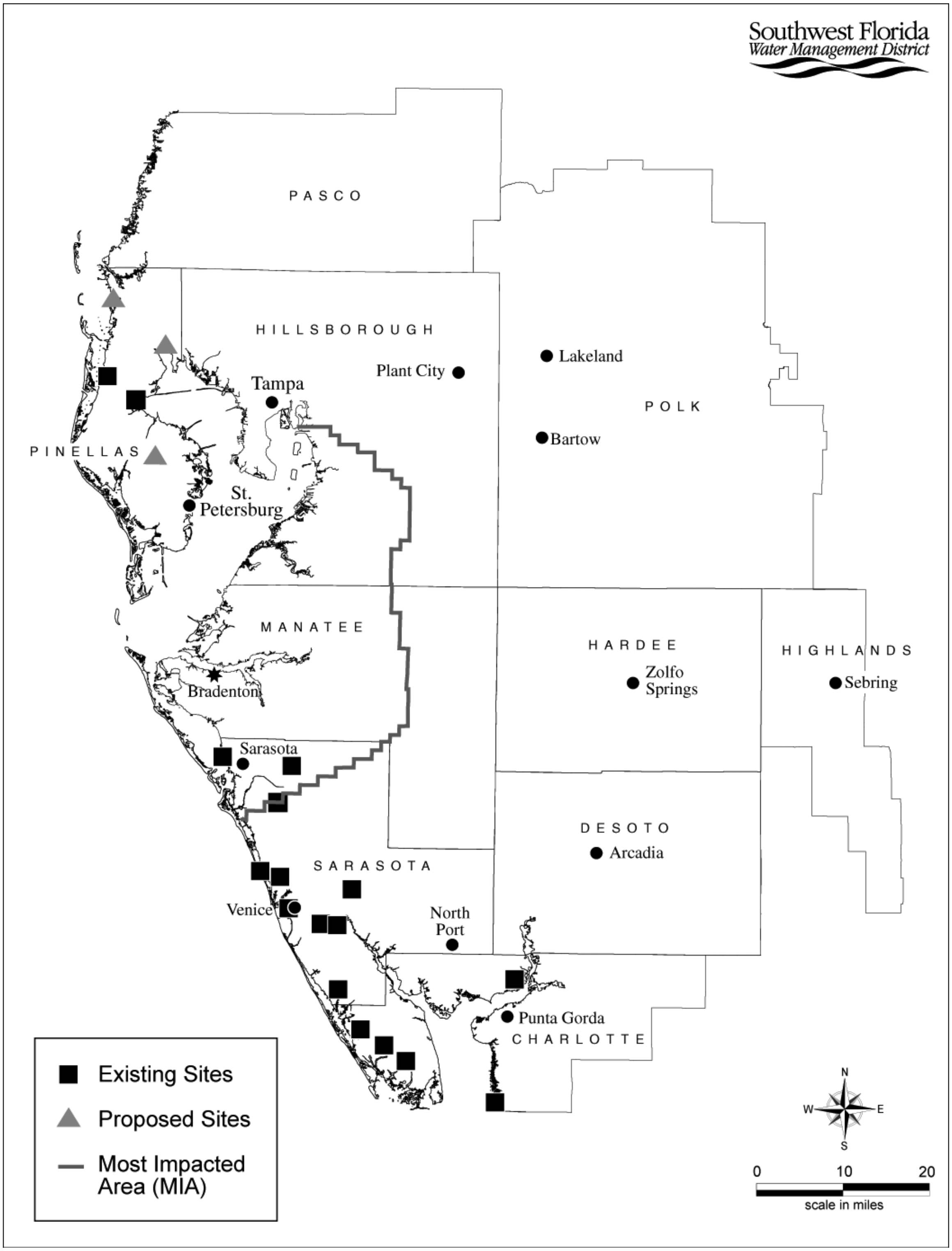

Figure 5-2. Brackish Ground-Water Desalination Facilities in the Planning Region.

Figure 5-3 depicts the generalized location of the freshwater/saltwater interface (as defined by the 1,000 mg/l isochlor) in the high production zone of the Upper Floridan aquifer throughout the Planning Region. Generally, water quality in the aquifer declines (TDS increases) to the south and west in the Planning Region. A similar trend is observed in the lower portion of the intermediate aquifer, though water quality in this aquifer is slightly better than in the Upper Floridan aquifer.

The predominant treatment technology for brackish ground water in the District is RO, (discussed in the previous section on seawater desalination). Approximately 30 percent of the water used in the RO process becomes waste concentrate that must be disposed of through methods that include surface-water discharge, deep well injection, or dilution at a WWTP. Surface-water discharge is the predominant disposal method due to its lower cost. It should be noted that the Total Maximum Daily Loads (TMDL) program has the potential to impact brackish desalination facilities through the establishment of pollutant discharge limitations. In light of this and other environmental considerations, deep well injection and dilution at municipal WWTPs are becoming more prevalent.

Historically, brackish ground-water desalination has been a more expensive source of water than traditional fresh ground water or surface-water sources. Because of this, public water suppliers and industries have used brackish ground water only when less expensive sources are unavailable.

However, improvements in technology involving low pressure reverse osmosis (RO) and ultra-filtration membranes have substantially reduced operating costs for newer systems. As membrane efficiencies have increased, the operating pressures and energy needed to drive the process have declined, thus significantly reducing costs. In addition, most treatment facilities further reduce their operating costs by blending product water with lower quality raw water.

Though brackish ground water remains a viable source of water, it is important that future withdrawals of brackish ground water are planned and operated so as not to exacerbate regional movement of the interface in the Upper Floridan aquifer in the SWUCA. Factors that affect the development of brackish ground-water supplies include the hydraulic properties and water quality of the aquifer, rates of ground-water withdrawal, and well configurations (e.g., well depths and spacings). Some degradation of the aquifer is expected with the withdrawal of brackish ground water, although it is usually localized and moderated through optimization of withdrawals and well configurations. Though the Florida Legislature declared brackish ground water an alternative water source in 2005 (Senate Bill 444), it remains a ground-water withdrawal and must occur in a manner that is consistent with applicable rules and water use management strategies for the area(s) in which the withdrawals will occur.

In the past, the District has only funded the feasibility of developing brackish ground-water sources and has not funded the development of ground-water production facilities. In fact, the District has not funded the development of any ground-water production facilities in the Planning Region. Ground water has been the traditional source of water used to supply about 80 percent of water demands in the Planning Region. In the late 1980s, it became apparent that water resource impacts were occurring as a result of withdrawals from the Upper Floridan aquifer. In order to prevent further impacts from occurring and achieve the desired levels of recovery, the District determined it would be necessary to reduce ground-water withdrawals from the Upper Floridan aquifer in the region. It was also necessary to ensure there would be adequate water supplies available to meet the growing demands in the region. In order to achieve these goals, the District implemented programs to provide financial incentives to encourage local governments to develop alternative water supplies. These alternative water supply projects would be used to reduce existing ground-water withdrawals from the Upper Floridan aquifer, as well as supply growing demands.

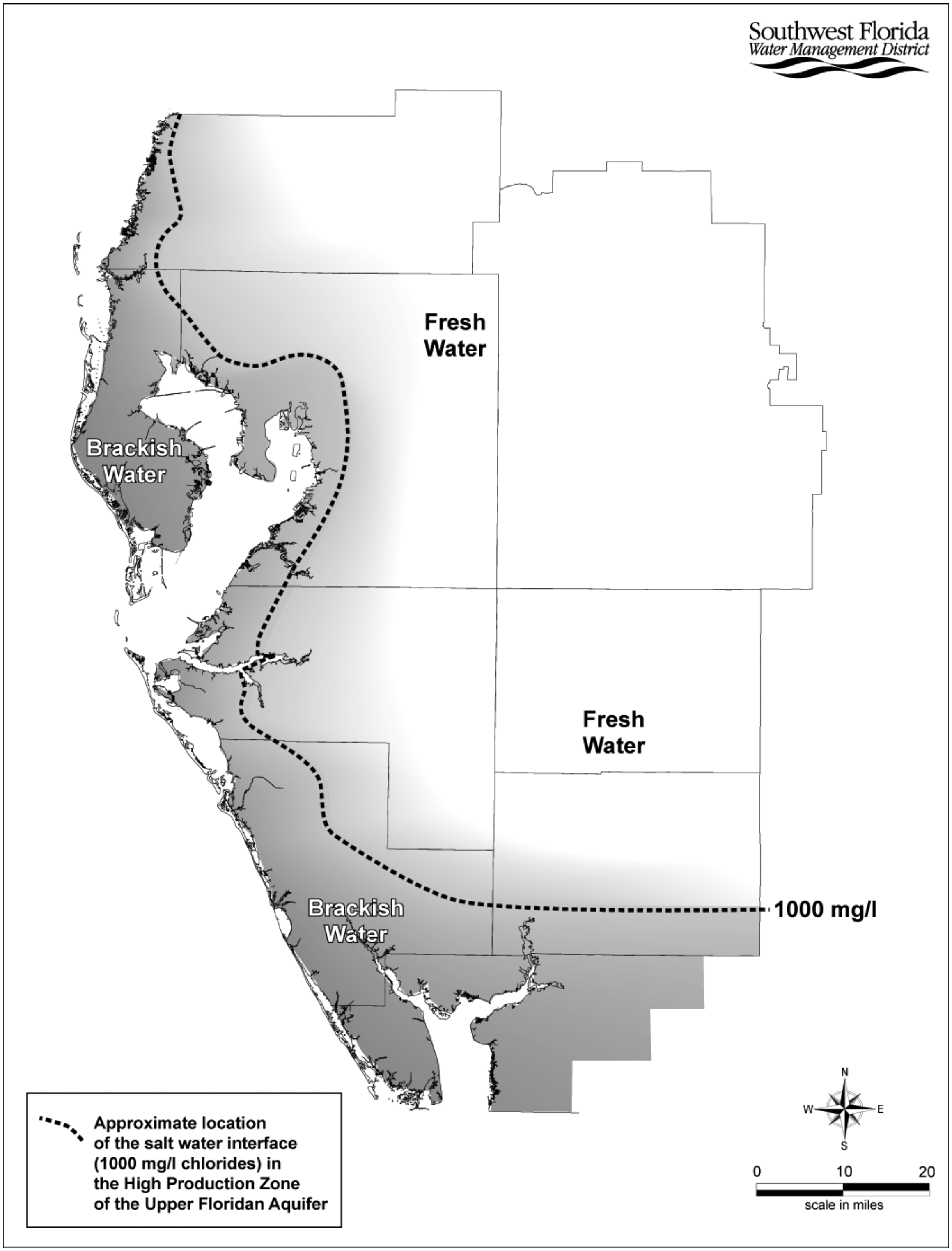

Figure 5-3. Generalized Location of the Freshwater/Saltwater Interface.

Though it may be possible to obtain a water use permit for a brackish withdrawal from the Upper Floridan aquifer, especially in the NTB area, the District remains committed to prioritizing the use of its monies to fund the development of water supply projects that make use of sources other than ground water. The Partnership Agreement is an example of this commitment, where the District agreed to provide funding for alternative water source projects, such as the Seawater Desalination Facility and Enhanced Surface Water Project, and specifically excluded funding for any fresh or brackish ground-water projects.

Because of the many complex factors discussed above, an analysis to determine the total amount of brackish ground water available for future water supply in the Planning Region was not performed. The ultimate availability of brackish ground water in the Planning Region, whether new or through expansion of existing facilities, must be determined on a case-by-case basis through the permitting process.

As an alternative to quantifying the absolute availability of brackish ground water, it was decided to quantify the capacities that exist within the current brackish ground-water supply infrastructure and projects that are planned or actively being developed in the Planning Region. This information is broken out below for the NTB area and the SWUCA.

1.0 NTB Area - Upper Floridan Aquifer Brackish Ground Water

Impacts of excessive pumping of ground water from the Upper Floridan aquifer in the NTBWUCA have largely been associated with the lowering of water levels in lakes and wetlands. Though there are instances where ground-water withdrawals have resulted in a degradation of water quality in wells, these instances have generally been associated with effects of localized withdrawals and not the combined effects of withdrawals in the region, as experienced in the SWUCA. This is largely the result of the differences in the hydrogeologic setting of the two areas. To date, there has been no evidence of regional saltwater intrusion occurring in the NTBWUCA. Though withdrawals from Tampa Bay Water's central well field system create a regional drawdown effect, it does not extend to all coastal areas and therefore, does not result in regional saltwater intrusion. Since withdrawals in the NTBWUCA tend to result in more localized impacts, it may be possible for a water user to obtain a permit to withdraw brackish ground-water from the Upper Floridan aquifer. If the requested quantities are projected to impact a lake or wetland, or degrade water quality in the aquifer affecting a nearby user, the request would need to be modified to determine a withdrawal quantity that would not result in such impacts.

In March 2001, Tampa Bay Water completed the second phase of the Mid Pinellas Brackish Reverse Osmosis feasibility study. The purpose of the effort was to develop a screening tool to evaluate potential brackish water wellfield sites in Hillsborough, Pasco and Pinellas counties. Pasco County was removed from the modeling effort due to geologic limitations. These limitations included a minimal or nonexistent intermediate confining layer separating the surficial and Upper Floridan aquifers and the potential for wetland impacts as a result of brackish water withdrawals.

Using previously published data, areas where aquifer water quality was in the range of 500 to 10,000 milligrams per liter (mg/l) of TDS were targeted. The reason for targeting this range is that RO treatment of water with TDS values over 12,000 mg/l requires high-pressure membrane treatment. High pressure RO is more expensive due to increased energy and membrane costs. Eleven potential sites were identified, seven in Pinellas County and four in Hillsborough County. The seven potential sites in Pinellas County were each evaluated using a withdrawal rate of six mgd. Based on the results of modeling simulations, it is possible to develop a brackish ground-water source at the Pinellas County sites for at least a 20-year period without exceeding the predetermined target value of 12,000 mg/l of TDS. A similar approach was taken to evaluate the potential for development of brackish ground water in Hillsborough County. However, the area where brackish ground water exists is within the Most Impacted Area (MIA) of the SWUCA and was not pursued further due to permitting difficulties and potential impacts to existing legal users.

The Cities of Tarpon Springs and Oldsmar are currently in the process of developing brackish ground-water desalination facilities in Pinellas County. In 1998, the City of Oldsmar and the District completed a feasibility analysis for developing a brackish ground-water supply for the City. The analysis concluded that the development of a brackish ground-water supply in the area was feasible. In 2004 the City submitted a request for a water use permit to supply 2 mgd of potable water. Tampa Bay Water's five mgd Mid Pinellas Project is currently on stand-by as a result of increasing costs and the difficulty of locating well sites in the project area. In 2005, the city of Tarpon Springs and the District initiated a project to conduct a feasibility analysis of a 4.5 mgd brackish ground water reverse osmosis facility. Together, the three plants have the potential to supply up to a total of 11.5 mgd of potable water.

1.1 NTB Area - Permitted but Unused Quantities of Brackish Ground Water from the Upper Floridan Aquifer

There are two brackish ground-water facilities in the NTB area that are not using their entire permitted allocation of ground water from the Upper Floridan aquifer. It is anticipated that these utilities will eventually grow into these unused quantities to meet future demand. The City of Clearwater's brackish R.O. facility is permitted to withdraw 6.3 mgd of brackish ground water. The city has previously withdrawn an average of 3 mgd, leaving an unused quantity of 3.3 mgd. Assuming a treatment efficiency of 70 percent, the facility has the potential to produce an additional 2.3 mgd of finished water. The city of Dunedin's brackish RO facility is permitted to withdraw 7.0 mgd of brackish ground water. Historically Dunedin has withdrawn an average of 5.2 mgd, leaving an unused quantity of 1.8 mgd. Assuming a 70 percent treatment efficiency, the available finished water quantity from unused withdrawals is 1.3 mgd. Summing the unused available supply quantities from these two facilities results in 3.6 mgd of additional water supply potentially available in the NTB area from brackish ground-water desalination.

2.0 SWUCA - Upper Floridan Aquifer Brackish Ground Water

Because brackish ground-water withdrawals from the Upper Floridan aquifer in the SWUCA have the potential to exacerbate the saltwater intrusion problem, requests for brackish ground water will be evaluated similarly to requests for fresh ground-water withdrawals. Proposed ground-water withdrawals, either fresh or brackish, cannot impact Upper Floridan aquifer water levels in the Most Impacted Area of the SWUCA. Ground-water withdrawals have been evaluated by this criterion since the early 1990s. Since that time, there has been no net increase in quantities of water permitted from the Upper Floridan aquifer in the MIA because of concerns about declining ground-water levels and saltwater intrusion. Requests for new withdrawals outside the MIA will be granted only if it is demonstrated that the withdrawals have no effect on ground-water levels in the Upper Floridan aquifer in the MIA. As discussed in the proposed SWUCA Recovery Strategy, if a proposed withdrawal impacts ground-water levels in the Most Impacted Area or impacts other MFL water bodies, it may be possible to receive a permit for the requested quantity if a "net benefit" can be achieved. A net benefit is an action a permittee can take to offset the projected effects of the withdrawal by an amount equal to the effect plus a ten percent improvement. A net benefit can be achieved through means such as retiring existing ground-water withdrawals. Until recovery is achieved and a determination as to the need for additional recovery is made, entities seeking additional water in coastal areas should consider brackish ground water from the Upper Floridan aquifer as an option only after all other sources of water including conservation have been fully explored and implemented.

In the SWUCA, there are 25 existing brackish ground-water desalination facilities that withdraw approximately 30 mgd from the lower permeable zone of the intermediate aquifer and the shallow portion of the Upper Floridan Aquifer. These withdrawals have little impact on regional salt-water intrusion because of their shallow source and relatively small magnitude.

2.1 SWUCA - Permitted but Unused Quantities of Brackish Ground Water from the Upper Floridan Aquifer

Of the 25 brackish ground-water desalination facilities in the SWUCA, 14 have water use permits (Table 5-4a) and the remaining 11 operate below the District's permitting threshold (Table 5-4b). In recent years, four facilities with permitted ground-water withdrawals totaling 3.1 mgd have been "mothballed" by Charlotte and Sarasota counties. The total permitted capacity of the active facilities within the SWUCA is 39 mgd. From 1998 to 2002, these facilities withdrew an estimated 21 mgd of brackish ground water and produced about 15 mgd of potable water. Assuming a 70 percent treatment efficiency, the available supply of finished water from permitted but unused brackish ground-water withdrawals is 10.1 mgd.

2.2 SWUCA - Investigation of the Hydraulic Barrier Concept in the Upper Floridan Aquifer

Saltwater intrusion in the Upper Floridan aquifer in the District is most prevalent along the coast of southern Hillsborough and northern Manatee counties. It has been suggested that the District create a hydraulic barrier in this area to mitigate the problem. A hydraulic barrier can be a “pressure ridge” or “pumping trough.” A “pressure ridge” is formed by injecting freshwater into the aquifer through a series of wells in a line parallel to the coast that forces water on both sides to flow away from the line of wells. In theory, this would prevent seawater from crossing the “ridge.” This is referred to as the “injection case.” Alternatively, the “pumping trough” extracts water from the wells so that saline water flows from the offshore side and fresher water flows from the landward side. Again, seawater is prevented from crossing the “trough.” This is referred to as the “extraction case.” The amount of protection that the system provides depends on the quantity of water injected or extracted.

In 2004, the District used HydroGeoLogic, Inc., to model the effects of extracting or injecting water into 24 wells located approximately one-mile from the coast, spaced one mile apart, and extending from the Alafia River in Hillsborough County to just north of the Manatee River in Manatee County. The extraction rates tested were one, two and five mgd per well and the injection rates tested were one and two mgd.

The wells were open only to the highly permeable layer within the Avon Park Formation as this is the portion of the Upper Floridan aquifer in which significant saltwater intrusion is occurring. The success of this work was measured by the number of District permitted wells that would no longer be at risk to saltwater intrusion. A well is considered to be at risk if the chloride concentration in the well exceeds 1,000 mg/l. The number of at risk wells was determined in previous efforts to model the impacts of saltwater intrusion.

Table 5-4a. Large Scale Brackish Ground-Water Desalination Plants With Water Use Permits (mgd).

District WUP	Name of Utility	County	Treatment Capacity	Annual Average Permitted Withdrawal	5 Year Average[10] Withdrawals	Available Supply[11]	Source Aquifer	Water Quality TDS (mg/L)	Discharge Type
005807	Camelot	Sarasota	0.1	0.4	0.2	0.1	Int.	200 - 1,000	Surface
001512	Charlotte Harbor[1]	Charlotte	0.8	0.7	0.5	0.1	Int.	1,200 - 1,900	Surface
002981	City of Clearwater	Pinellas	3.0	6.3	3.0	2.3	UFA	10 - 500	WWTP
010224	City of Sarasota	Sarasota	6.0	6.0	4.6	1.0	UFA	2,100	Surface
005393	City of Venice[2]	Sarasota	9.1	6.9	4.8	1.5	Int.	2,200 - 4,080	Surface
002980	Dunedin	Pinellas	9.5	7.0	5.2	1.3	UFA	200 - 2,200	WWTP
004866	Englewood Water Dist.[3]	Sarasota	3.0	5.4	2.9	1.8	Int.	7033	Deep Well
007494	Fiveland Investments[4]	Sarasota	0.5	0.2	NA	NA	Int.	4,000	Surface
000718	Gasparilla Island[5]	Charlotte	1.1	1.5	1.1	0.3	Int.	3,000 - 7,000	Deep Well
006364	Plantation[6]	Sarasota	NA	1.3	NA	NA	Int.	450 - 1,000	WWTP
002839	Rotunda West Utilities[7]	Charlotte	0.5	1.3	NA	NA	Surf./ Int.	3,200 - 4,500	Surface
008836	Sara. County Carlton Pit	Sarasota	12	7.3	6.5	0.6	UFA	1,000 - 2,000	Deep Well
006006	SouthbayUtilities[6]	Sarasota	0.2	0.3	NA	NA	Int.	1,450 - 4,000	Surface
003522	SSU/Burnt Store[8]	Charlotte	1.1	3.1	0.4	1.9	Int.	2020	Surface
007448	Sun n Fun Resort, Inc.[9]	Sarasota	0.1	0.2	0.1	0.1	Int.	100 - 600	Surface
004836	Venice Gardens[10]	Sarasota	2.0	4.4	0.3	2.3	Int./UFA	< 600/ <4,000	Deep Well
Total			**49**	**52.3**	**29.6**	**13.7**			

1 Based on discussions with Paul Brayton of Charlotte Harbor Utilities, treatment capacity has been upgrade to .75 mgd.
2 Based on discussions with Chris Sharek of the City of Venice Utilities, permitted withdrawal has been upgraded to 8.240 mgd.
3 Based on discussions with Rich Rolle of the Englewood Water District, the permitted withdrawal is 4.11 mgd.
4 Based on discussions with Walt Graham of DuFresne-Henry Inc., the consultant hired by Charlotte County to handle the renewal of the WUP permits, Charlotte County has mothballed the Fiveland Investments Utilities desalination infrastructure in 2001.
5 Based on discussions with Bonnie Pringle of Gasparilla Island Utilities, treatment capacity has been upgraded to 1.067 mgd.
6 Based on discussions with John Knowles of Sarasota County, Sarasota County mothballed Plantation and Southbay Utilities desalination infrastructure.
7 Based on discussions with Walt Graham of DuFresne-Henry Inc., Rotunda West Utilities has been off-line since 2001. Charlotte County is in the process of acquiring a permit to use part of the ASR reclaimed water system.
8 Based on discussions with Terry Briggs of Charlotte County Utilities, treatment capacity has been upgraded to 1.127 mgd.
9 Based on discussions with Sun n Fun Resort manager Tim Deputy, treatment capacity is 0.6 mgd.
10 Five-year average withdrawals from 1998 to 2002, as reported in SWFWMD's 2002 Estimated Water Use report.
11 Available Supply represents the sum of the difference between the annual average permitted withdrawal and 5 year average withdrawal, multiplied by an efficiency rate of 70% for active facilities.

Table 5-4b. Small Scale Brackish Ground-Water Desalination Plants Without Water Use Permits (mgd).

Name of Utility	County	Treatment Capacity	Permitted Total Avg Q	Source Aquifer	Water Quality TDS (mg/L)	Discharge Type[1]
Alligator Park	Charlotte	0.06	No WUP	Int.	<2000	SWP
Hunter Creek Village[3]	Charlotte	0.17	No WUP	Int.	<2000	SWP
Bay Lake Estates	Sarasota	0.05	No WUP	Int.	400-950	SWP
Ell-Cap 66	Sarasota	0.04	No WUP	Int.	450-900	SWP
Kings Gate Club	Sarasota	0.05	No WUP	Int.	250-680	SWP
Kings Gate MHP	Sarasota	0.06	No WUP	Int.	300-740	SWP
Knight Islands Utilities	Charlotte	0.03	No WUP	Int.	<2000	SWP
Lake Tippecanoe	Sarasota	0.04	No WUP	Int.	<2000	SWP
Lake Village MHP	Sarasota	0.05	No WUP	Int.	<2000	SWP
Venice ranch MHP	Sarasota	0.04	No WUP	Int.	120	SWP
Windward Isles MHP[2]	Sarasota	0.06	No WUP	Int.	<2000	WWTP
Total		**0.73**				

1 With the exception of Windward Isles MHP, all concentrate discharge in this table were to surface/storm water ponds.
2 Based on discussions with Paul Weeder of Windward Isles MHP, RO concentrate is now discharged to a County WWTP.
3 No information could be found on this Utility.

Table 5-5 shows the result of the simulation. In the Table, the base case represents the results of continuing to withdraw 600 mgd from the SWUCA over the next 50 years. For both the withdrawal and injection cases, ground-water withdrawals from the Upper Floridan aquifer in the SWUCA continued at 600 mgd.

Table 5-5. Results of Simulating the Extraction/Injection of Water in the Coastal Floridan Aquifer in the SWUCA to Reduce Salt-Water Intrusion Impacts.

Predictive Scenario	Extraction/ Injection (Mgal/day)	Number of Wells > 1,000 mg/L			
		Suwannee	Ocala	Avon Park	Total
Baseline Scenario	0	38	24	38	100
Extraction, 1 Mgal/day	-24	41	24	34	99
Extraction, 2 Mgal/day	-48	42	24	32	98
Extraction, 5 Mgal/day	-120	44	24	30	98
Injection, 1 Mgal/day	24	37	24	34	95
Injection, 2 Mgal/day	48	38	24	33	95

From the table it is apparent that very few additional wells would be protected by such a barrier. It also appears that additional wells in the Suwannee Limestone would be affected under the extraction case. This occurs primarily because a large number of wells in the Suwannee Limestone are located seaward of the sites selected for the barrier wells. At a regional scale, the scenarios that were evaluated showed little overall benefit compared to the difficulties and potential costs to implement the barrier concept. Whereas, creating a pressure ridge requires a significant source of freshwater, creating a pumping trough would require the disposal of significant quantities of brackish ground water that may be as much as 50 percent seawater. For the scenarios evaluated, the injection quantities were 24 and 48 mgd, and the withdrawal quantities were 24 mgd, 48 mgd, and 120 mgd. In addition to the difficulties created by the scale of either of these efforts, sites would have to be acquired for each of the wells and infrastructure developed for the routing of water to or from the sites.

2.3 SWUCA - Brackish Springs in the Gulf of Mexico

The District is periodically questioned about the existence of springs in the Gulf of Mexico that could be developed as a water supply source. Although the existence of a number of offshore springs has been documented, there is no evidence that the quality of water is suitable for development of an economically feasible water supply. Because the saltwater/freshwater interface, the boundary between fresh ground water and saline ground water in the Upper Floridan aquifer, is located onshore in much of the Planning Region, it is highly unlikely that fresh ground water is discharging offshore through the springs. This statement is supported by water quality investigations of a number of springs located directly on the coastline or a short distance offshore (Jones and others, 1997; Jones and others, 1998). The quality of the water discharging from these coastal springs is brackish at best.

In 2003, the District completed a field investigation of numerous features that had been identified previously as offshore springs. A report of the study entitled *"Submarine Springs and other Karst Features in Offshore Waters of the Gulf of Mexico and Tampa Bay, Southwest Florida Water Management District"* was released in December 2003. The conclusion of the investigation was that using offshore ground-water discharge as a source for potable water supplies in west-central Florida was not feasible. This was because there was no indication of freshwater discharge from the numerous karst features, large relict sinkholes, and spring vents that were investigated in the offshore environment of the eastern Gulf of Mexico.

3.0 SWUCA - Lower Floridan Aquifer Brackish Ground Water

An additional source of what is probably brackish-quality ground water that has not been used or even explored in the District is the Lower Floridan aquifer. The Floridan aquifer is usually divided into an Upper Floridan aquifer and a Lower Floridan aquifer (Miller, 1986), separated by one or more confining units. The most prevalent confining unit in the District is Middle Confining Unit II, which is characterized as carbonate rock with very low permeability and numerous inclusions of extremely low permeability evaporites. Middle Confining Unit I, also known as the Middle Semi-confining Unit, is prevalent in areas east of the District, in the St. Johns River and South Florida WMDs. The confining units overlap somewhere in the vicinity of the boundary between the three water management districts to the east.

The Lower Floridan aquifer is an extremely productive aquifer in central Florida, based on transmissivity tests that have been performed in that area. Water quality is also generally very good in central Florida but degrades to the west of Orlando. In the central Florida area of the St. Johns River WMD, approximately 20 percent of the water withdrawn from the Floridan aquifer, or about 110 mgd, is derived from the Lower Floridan aquifer (McGurk and Presley, 2002). Most of this water is withdrawn by public supply utilities. Within the District, no ground water is produced from the Lower Floridan aquifer as the water quality has generally been considered too brackish to justify its development. In

2003, the District initiated exploratory drilling into the Lower Floridan aquifer at Regional Observation Monitoring Program (ROMP) 74X located about two miles east of Davenport. Water quality at this site is characterized by very low chloride concentrations and relatively high sulfate concentrations of approximately 2,000 mg/l. The site is several miles south of the area believed to possess good water quality.

In 2004, Polk County and the District initiated a project to explore the water supply capacity of the Lower Floridan aquifer about 10 miles north of the ROMP 74X site. This is an area of rapid growth in the county with limited options for water supply development. The purpose of the exploratory work is to determine the water quality and water supply characteristics of the aquifer, as well as the characteristics of the confining unit separating the Upper Floridan and Lower Floridan aquifers in the area. Based on data collected at the ROMP 74X site, the primary water quality issue will be high sulfates and total dissolved solids. It is possible that this water could be used to augment outdoor watering systems or possibly mixed with water from the Upper Floridan aquifer to meet drinking water standards and used to meet potable demands. Prior to significant development of the Lower Floridan aquifer it will be necessary to develop an improved understanding of aquifer characteristics and recharge in order to better manage this resource.

4.0 Summary of Brackish Ground-Water Availability in the Planning Region

The availability of brackish ground water from the Upper Floridan aquifer will be limited in the future based on impacts to MFL water bodies. In the SWUCA, additional withdrawals from the Upper Floridan aquifer can exacerbate regional saltwater intrusion. However, in the southern portion of the SWUCA, it may be possible to obtain a water use permit to withdraw brackish ground water from the lower portion of the intermediate aquifer. Such withdrawals, if carefully managed, would have minimal impact on Upper Floridan aquifer water levels. Because impacts to lakes and wetlands rather than salt-water intrusion have been the principal resource concerns from over-development of ground water in the NTB area, it may be possible to obtain a water use permit for brackish ground-water withdrawals in that area.

For planning purposes, the amount of additional brackish groundwater that is available in the Planning Region was estimated by combining permitted but unused quantities at existing facilities and quantities from three proposed sites in the NTB area. A review of permitted quantities and current use from the 12 active facilities permitted by the District indicates there is an estimated 13.7 mgd of potable supply from brackish ground water that can be produced. Combining the unused quantities (13.7 mgd) and the potential development of three projects in the NTB area (11.5 mgd), the total amount of potential additional supply from brackish ground-water desalination in the Planning Region is approximately 25 mgd. The actual availability of brackish ground water quantities will be determined during the permitting process.

Section 5. Fresh Ground Water

Fresh ground water is the principal source for public water supply and other uses. In 2002, approximately 84 percent (965 mgd) of the 1.1 billion gallons per day used in the Planning Region was from ground-water sources. The majority was withdrawn from the Upper Floridan aquifer (about 866 mgd). Additional ground-water sources in the SWUCA include the surficial and intermediate aquifers. Water supply from permitted withdrawals from these sources in 1998 was about 14 mgd and 85 mgd, respectively.

1.0 NTB Area - Fresh Ground Water

As discussed in the Geology/Hydrogeology Section of Chapter 2, the NTB area generally consists of two aquifer systems separated by a semi-confining layer of clay. The ground-water system is karstic with variable confinement between the unconfined surficial sand aquifer and the underlying confined Upper Floridan aquifer. In 2001, ground-water use in the NTB area was 264 mgd with approximately 78 percent (205 mgd) withdrawn for public supply.

1.1 NTB Area - Surficial Aquifer Fresh Ground Water

With the exception of Pinellas County, the surficial aquifer in the NTB area currently provides very little water for water supply and is not anticipated to supply a significant amount in the future. Due to the leaky nature of the confining clay layer below the surficial aquifer, ground-water withdrawals from the Upper Floridan aquifer in the NTB area can significantly affect water levels within the surficial aquifer, thereby impacting surface features such as wetlands and lakes. Decades of ground-water withdrawals from the upper Floridan aquifer for public supply has led to long-term lowering of surficial aquifer water levels near wellfields. Due to the karst geologic setting of the region, the thickness of the surficial aquifer is highly variable, ranging from less than five to more than 90 feet. The aquifer in the area is generally low in permeability due to the presence of fine-grained sediments, has limited saturated thickness, and is suitable mostly for lawn irrigation and watering livestock. In Pinellas County, a shallow well reimbursement program has been implemented to encourage home owners to use the surficial aquifer for lawn watering rather than potable ground water principally derived from the Upper Floridan aquifer from wellfields in Hillsborough and Pasco counties. It is estimated that up to one mgd will be developed as part of this program.

1.2 NTB Area - Upper Floridan Aquifer Fresh Ground Water

In the NTB area, the additional demand for water supply for the period from 2000 through 2025 is projected to be approximately 173 mgd. Sixty-eight mgd of this demand is the quantity needed to replace reductions in ground-water withdrawals from Tampa Bay Water's wellfields required by the Partnership Agreement. The purpose of the reductions was to achieve environmental recovery in areas that had been stressed by excessive ground-water withdrawals. As a result of the development of alternative source projects and favorable hydrologic conditions, TBW was able to achieve the 68 mgd reduction in ground-water withdrawals during the 2000 - 2005 time interval. In 2010, a determination will be made as to whether a second phase of recovery is necessary. If a second phase is required, additional reductions in ground-water withdrawals would require the development of water supplies beyond what is currently projected. As a result, it is likely that any additional ground water developed in the area will be very limited and requests for ground water will continue to be carefully evaluated on a case-by case basis.

1.2.1 NTB Area – Upper Floridan Aquifer Permitted but Unused Quantities of Fresh Ground Water

A number of public supply utilities in the NTB area currently are not using their entire permitted allocation of ground water. It is anticipated that these utilities will eventually grow into these unused quantities to meet future demand. Based on review of the unused quantities of water associated with public supply water use permits, approximately 11.5 mgd of additional ground-water quantities can be withdrawn from the Upper Floridan aquifer by public supply utilities in the NTB area.

2.0 SWUCA - Fresh Ground Water

In the SWUCA, water-bearing sediments that thicken from north to south contain the surficial, intermediate, and Upper Floridan aquifers. The Upper Floridan aquifer is well confined by low permeability layers over most of the basin except the extreme northern and eastern portions along the Lake Wales Ridge. An additional aquifer, the Lower Floridan aquifer, exists throughout the Planning Region but contains usable water only in the northeastern portion of the Planning Region. The Lower Floridan aquifer is separated from the Upper Floridan aquifer by a thick, low permeability layer known as the Middle Confining Unit.

2.1 SWUCA - Surficial Aquifer Fresh Ground Water

Nearly 93 percent of current water use from permitted withdrawals in the surficial aquifer is for agricultural irrigation. The remaining seven percent is divided equally between public supply, recreational, and industrial/mining use. Small quantities are also withdrawn from the aquifer for lawn watering or individual household use. Estimates for this water use are not well known but probably average less than five mgd across the SWUCA. Water supply from permitted withdrawals in the surficial aquifer was about 15 mgd in 2001 with approximately 86 percent of this occurring in Highlands County. Another eight percent of the total withdrawals occurred in Polk County with the remaining six percent (0.8 mgd) split between Charlotte, Hardee, Hillsborough, and Sarasota counties. The large quantity of ground water withdrawn from the surficial aquifer in Highlands and Polk counties occurs in the Lake Wales Ridge, where surficial sands are highly permeable and average 200 to 300 feet thick. Over much of the remaining portion of the SWUCA, the surficial aquifer is much thinner and contains more fine-grained sediments, which considerably reduce the ability of the aquifer to yield significant quantities of water.

In Charlotte, southern Sarasota, and southern DeSoto counties a significant shell bed is found within the Caloosahatchee Marl Formation of the surficial aquifer. Although these shell beds are generally less than 25 feet thick, their permeability is similar to that of the Upper Floridan aquifer. In the southern coastal portion of the SWUCA, the Gasparilla Island Water Association has maintained a surficial aquifer wellfield (32 wells on 20 acres) near Placida for public supply use over the last 25 years. The wellfield was the only potable water source for Gasparilla Island until the Utility developed a reverse-osmosis wellfield and treatment plant in the early 1990s. Historically, withdrawals from the surficial wellfield averaged about 0.4 mgd; however, since the reverse osmosis wellfield was developed, withdrawals from the surficial wellfield have varied between 0.1 and 0.2 mgd. Further east in Charlotte County, agricultural users have begun using pits dug into the shell beds for irrigation of citrus. There are currently at least five locations within eastern Charlotte County that plan to utilize these shell pits for irrigation of citrus.

Though previous estimates of water availability from the surficial aquifer have been made, it is difficult to quantify potentially available amounts on a regional basis due to the uncertainty of characterizing the hydraulic capacity of the aquifer as well as local limitations on this supply. For this reason, estimates of potentially available quantities from the surficial aquifer were combined with estimates of potentially available quantities from the intermediate aquifer. As discussed below in the intermediate aquifer section, these estimates were largely based on identifying the types of demands that could reasonably be met using these aquifers. For example, because of the low yields that are generally characteristic of the surficial aquifer, it is limited to supplying small diameter, low-yield wells used for residential lawn watering.

2.2 SWUCA - Intermediate Aquifer Fresh Ground Water

The intermediate aquifer lies between the surficial aquifer and the Upper Floridan aquifer. It exists over much of the SWUCA and is most productive in Charlotte, DeSoto, and Sarasota counties. Use of the aquifer increases in the southern portion of the basin where the water-bearing zones increase in permeability and water quality of the Upper Floridan aquifer is poor. The upper portion of the intermediate aquifer is characterized by low permeability and is of limited extent. Water in this part of the aquifer is generally of sufficient quality and quantity to supply private domestic self-supply for indoor water use and outdoor irrigation. The lower portion of the intermediate aquifer is characterized by higher permeability and extends over much of the SWUCA. Because of the higher permeability, the lower zone is capable of supplying water to higher capacity irrigation and public supply wells. In the coastal portions of Sarasota and Charlotte counties, the lower portion of the intermediate aquifer is a source of brackish water that is often treated using reverse osmosis to supply public supply water systems. In the high growth area of the City of Northport, many wells have been constructed into the aquifer in recent years for domestic self supply. Because water in the intermediate aquifer in the area is often of low quality, water produced by wells often does not meet drinking water standards; and home owners either have home treatment systems or use bottled water for their potable needs. In 2001, the estimated water use from the intermediate aquifer totaled about 70 mgd.

The quantity of water potentially available through 2025 from the combined surficial and intermediate aquifers was estimated by first identifying the types of demands that could reasonably be met using these aquifers. Because the permeabilities of the surficial aquifer and upper portions of the intermediate aquifer are relatively low, it would not be practical to use these units to supply public water supply utilities or agricultural operations that require high rates of withdrawals. Water users requiring higher rates of withdrawals could potentially use the lower portion of the intermediate aquifer and possibly the shell beds in Charlotte and DeSoto counties. In the future, requests for withdrawals from the lower intermediate aquifer would need to be consistent with the SWUCA Recovery Strategy and most likely would be required to occur away from the Most Impacted Area in the more southern and eastern portions of the SWUCA. The types and amounts of the projected 2025 demand that could be met in the Planning Region using the surficial and upper intermediate aquifers include 1) 26.2 mgd for domestic self-supply indoor and outdoor water use, 2) 1.9 mgd for recreational water use, including golf courses, in Charlotte, Sarasota, Manatee, Hardee, DeSoto, and Highlands counties, and 3) 1.9 mgd for recreational water use in Polk and Hillsborough counties where the extent and thickness of the intermediate aquifer is limited. Finally, as previously noted, the highly permeable shell beds in portions of Charlotte and southern DeSoto counties are being utilized by those requiring high withdrawals rates. As part of the District's FARMS program, projects have been identified that will meet an additional four mgd of agricultural irrigation demands in the area. These demands were quantified for each county and are shown in Table 5-11.

Based on this approach the total amount of additional quantities that could be obtained from the surficial and intermediate aquifers through 2025 was estimated at 34.0 mgd. This is consistent with the SWUCA Recovery Strategy which estimates that up to 35 mgd could be supplied by a combination of these aquifers.

2.3 SWUCA - Upper Floridan Aquifer Fresh Ground Water

Average annual ground-water withdrawals in the SWUCA from 1990 to 1999, the period over which the salt-water intrusion minimum aquifer level was calculated, were about 650 mgd. About 90 percent of those withdrawals occurred from the Upper Floridan aquifer. In order for actual ground-water levels in the Eastern Tampa Bay Most Impacted Area of the SWUCA to consistently fluctuate above the proposed minimum aquifer level, ground-water withdrawals in the region will need to be reduced by up to 50 mgd. As discussed previously, the reduction in ground-water withdrawals in the SWUCA resulting from land-use transitions, enhanced agricultural conservation, and the retiring of water use permits on lands purchased for conservation is projected to be approximately 142 mgd. Subtracting 50 mgd in cutbacks necessary to meet the saltwater intrusion minimum aquifer level leaves 92 mgd. An important premise of the SWUCA Recovery Strategy is that as agriculture lands in coastal areas are urbanized, the water needs of the new urban areas will be met with alternative sources such as reclaimed water and wet season river flows that would be harvested and stored in off-stream reservoirs and ASR systems. A portion of the remaining 92 mgd, could, under certain conditions, be re-permitted for use in areas where access to alternative supplies is limited.

2.3.1 SWUCA - Upper Floridan Aquifer Permitted but Unused Quantities of Fresh Ground Water

A number of public supply utilities in the SWUCA currently are not using their entire permitted allocation of ground water. The District anticipates that these utilities will eventually grow into these unused quantities to meet future demand. Based on review of the unused quantities of water associated with public supply water use permits in the SWUCA, approximately 24.6 mgd of additional ground-water quantities will be withdrawn by public supply utilities from the Upper Floridan aquifer in the SWUCA. In addition, there is up to 7.1 mgd of permitted but unused quantities associated with power generation that is expected to occur in the SWUCA.

3.0 Summary of Fresh Ground-Water Availability in the Planning Region

In the future, the availability of ground water from the Upper Floridan aquifer for new uses in the Planning Region will be limited based on the projected impacts of those withdrawals on MFL water bodies and the overall status of recovery. In some cases new demands will be met using Upper

Floridan aquifer ground water, especially in the inland counties where access to alternative supplies is limited. However, the District anticipates that withdrawals in the Planning Region from this aquifer will be significantly less than today. This will be achieved through land use changes, increased water conservation, and development of alternative sources. Requests for additional ground water from the Upper Floridan aquifer will be evaluated to determine 1) whether the quantities are reasonable and beneficial, 2) whether conservation measures have been maximized, 3) whether alternative sources are available, and 4) whether the projected effects of the withdrawals impact MFL water bodies. If a proposed withdrawal impacts a MFL water body, it will be necessary for the impact to be offset by measures such as retiring an existing use that has at least an equivalent effect on the water body.

For ground-water users such as the agricultural community with little or no access to alternative sources, it is anticipated that they will continue to use ground water to meet their demands. A number of public supply utilities in the Planning Region currently are not using all of their permitted allocation of ground water. The District anticipates that these utilities will eventually grow into these unused quantities to meet future public supply demand. In the SWUCA there is approximately 24.6 mgd of unused permitted quantities available to public supply utilities and approximately 7.1 mgd of unused permitted quantities available for power generation for a total of 31.7 mgd. In the NTB area there is approximately 11.5 mgd available to public supply utilities. The result is approximately 43.2 mgd of currently unused permitted quantities are available in the Planning Region.

As proposed in the SWUCA Recovery Strategy, the reduction in ground-water use resulting from land use transitions, declines in industrial demand, increases in agricultural water use efficiencies, and the purchase of conservation lands with associated water use permits is approximately 142 mgd. Subtracting 50 mgd in ground-water cutbacks necessary to meet the saltwater intrusion minimum aquifer level from the 142 mgd that could become available leaves 92 mgd that potentially could be re-permitted in the SWUCA.

In the NTB area it is possible that up to one mgd can be supplied from the surficial aquifer in Pinellas County for lawn irrigation. In the SWUCA, additional ground water may be developed from the surficial, intermediate, and Lower Floridan aquifers. In some areas the surficial aquifer and upper portion of the intermediate aquifer will be viable sources of water to meet demands for lawn irrigation, domestic self-supply, and other irrigation uses. Additionally, some users will require higher rates of withdrawals, such as for public supply, recreational and agricultural uses. It is possible that some of these demands could be supplied by the lower portion of the intermediate aquifer in the southern and eastern portions of the area and the shell beds of Charlotte and DeSoto counties. It is estimated that up to 34 mgd may be supplied by these sources. The water supply capacity of the Lower Floridan aquifer is currently being investigated. Water quality is anticipated to be most suitable in the northeastern portion of Polk County and will degrade to the south and southwest. However, with treatment and the potential to blend sources, the Lower Floridan could become a viable source of water for the region.

Section 6. Non-Agricultural Water Conservation

Water conservation is defined as the beneficial reduction of potable-quality water use through mandatory or voluntary actions resulting in 1) the modification of water use practices, 2) the reduction of unaccounted-for losses, or 3) the installation and maintenance of low volume water use systems, processes, fixtures or devices.

Since the mid-1980s, water users in the Planning Region have been able to rely on the District for financial and technical assistance in the implementation of local water conservation efforts. Water users are encouraged to seek assistance by working with District staff when implementing water-saving programs and water conservation education.

Water savings have been achieved in the Planning Region through a combination of regulatory, economic, educational and incentive-based measures. While codes and ordinances requiring water efficiency are encouraged, these typically affect new (versus existing) water uses. Economic measures, such as water-conserving rate structures for customers of public supply systems, are also encouraged. Since education is crucial to any well-planned and implemented program, water conservation education is an essential part of any conservation option. Offering incentives to achieve needed water conservation is an accepted practice and is the basis for many of the options identified for managing demands in the Planning Region. The information contained in this section was based on the work performed by Ayres Associates, Inc., in 1999 for the 2001 RWSP, and updated for the 2006 RWSP.

Ayres identified specific conservation measures that could be implemented by the water users in the areas of public supply, domestic self-supply, recreation/aesthetic, I/C, M/D, PG. The information generated at that time was reviewed, updated based on current population, household and per capita estimates, and extrapolated through 2025. As part of updating the water conservation measures available for the future, information documenting current and past water conservation activities was

reviewed. Where conservation has already been implemented, it was subtracted from future water savings projections. An attempt was made to survey non-agricultural permittees in conjunction with efforts to determine projected future demand; however, time constraints precluded a representative response to the survey questionnaire. As a result, published reports were used in conjunction with the Ayers 1999 database. These included the *Retrofit Programs and Reuse Projects Summary Report (SWFWMD, 2004),* the 2001 RWSP and various reports from individual utilities participating in the Cooperative Funding Initiative.

The initial non-agricultural water conservation work for the 2006 RWSP was completed in 2004, but was updated in September 2006 using the most recent public supply demand projections. Based upon these updated projections, a significant change (increase or decrease) in 2025 estimated population resulted in some counties. Adjustments have been made accordingly for conservation measures in the public supply and domestic self-supply sectors affected by population.

Potential conservation measures that could be applied in each use category in the region were evaluated to determine the water savings potential and cost effectiveness of each. Water conservation measures with cost-effectiveness estimates equaling or exceeding three dollars per one thousand gallons ($3.00/1000 gal) were eliminated from consideration at this time. The threshold was increased from the $2.00/1000 gal used in the 2001 RWSP to account for inflation. If the cost of potable water increases to a level at which the costs of these measures become economically feasible, these measures will be re-evaluated. Three dollars per one thousand gallons was selected for use in the 2006 RWSP to keep this criterion in a monetary alignment with the cost estimation procedures detailed in the June 16, 2004 Technical Memorandum developed by CH2MHill titled "Cost Estimating and Economic Criteria for 2005 District Water Supply Plan." This memorandum cites a 34 percent increase over the criteria used for preparing the 2001 RWSP. For the purposes of calculating potential savings, the domestic self-supply category for which conservation measures are applicable includes both domestic self-supply and small utilities.

Based on the evaluation of all potentially applicable measures, specific ones were selected for further analysis. The measures selected for analysis include:

- High-efficiency clothes washer rebates
- Plumbing retrofit kit give-aways
- Ultra low volume (ULV) toilet rebates
- ULV urinal rebates
- Waterless urinal rebates
- Industrial/commercial spray valve replacements
- Residential water use surveys
- Water-efficient landscape and irrigation system rebates
- Industrial, commercial and institutional water use surveys
- Large landscape water use surveys
- Rain sensor shut-off device rebates
- Water budgeting

The analysis included factors that affect the effectiveness of water conservation practices. Additionally, some secondary factors were considered during evaluation and ranking of the water conservation measures; these include:

- Applicable water use categories
- Number of water users that may participate within each category
- Water savings rate of each measure
- Potential acceptability of the measure to participants and the implementing entity
- Compatibility with existing programs, or those that may be implemented concurrently
- Functional life of the measure
- Short term and long term effectiveness of a measure
- Cost-effectiveness ratio
- Level of ease with which a measure can be implemented
- Possibility of implementation on a regional basis

A program period was determined for each option that could be implemented within each water use category in each county. The estimated potential savings was based on several assumptions, including the assumption that options would begin to be implemented in 2005, and continue through 2025. The future savings attributable to water conservation considered the rate of growth projected to occur in each category as presented in the water demand projections in Chapter 4.

Equipment, research and development, and training costs were considered as “fixed” costs in estimating the costs of each measure. Such costs are anticipated to be incurred only once by each agency implementing a given measure, and only during the first year of the program. In addition to fixed costs, the actual cost of providing rebates, surveys, etc., was incorporated. It is important to note that an interest rate of six percent has been used in this plan for consistency with other options in this plan, and in accordance with the report, Cost Estimating and Economic Criteria for 2005 District Water Supply Plan, (WSPG 2004).

It is important to note that interactions between two or more of the conservation measures listed exist and could alter the overall water savings and program costs. For example, an “overlap” of savings can occur for water users participating in both water efficient irrigation system rebates and residential water use surveys. However, for the RWSP, each measure was evaluated individually and the combined costs and full potential of water savings for each measure were considered separately. This was necessary to identify appropriate and potentially effective conservation measures. It is recognized that this method could count a part of the savings twice, if for example, more than one exterior water conservation measure is selected for a specific water use sector. Similarly, costs would theoretically be less if two measures were implemented concurrently by one agency since start-up costs may only need to be incurred once. It was not possible to take into account the interaction or the overlap between the measures without first selecting specific conservation measures. To account for the possible overlap, the participation rate (or saturation rate) for different conservation measures was assumed less than the full potential.

Because each measure was evaluated for its regional impact, the practices investigated include those that could be applied similarly across the Planning Region thereby allowing the associated costs and savings to be measured and compared across the region. For that reason, some water conservation options with acknowledged water savings potential were not included in the RWSP, but continue to be encouraged by the District. These include, but are not limited to water conservation rates, sub-metering of multi-family and commercial master-metered complexes, codes and ordinances requiring water efficiency, supply-side water conservation (leak detection, system audits, etc.), and the development and dissemination of conservation education.

1.0 Public Supply and Domestic Self-Supply Water Conservation

Water conservation in the public supply sector has been, and will continue to be the primary source of non-agricultural water savings in the Planning Region. Public supply systems lend themselves to the administration of conservation programs since they measure each water customer’s water use, and can therefore focus, evaluate, and adjust the program to maximize savings potentials. The success of water conservation programs in public supply systems to date is demonstrated by the 10.5 mgd in savings that has been achieved within the Planning Region since 1991 (Wright, 2003). This represents savings achieved by utilities that have participated in the District’s Cooperative Funding Initiative, and do not include other savings that may have been achieved otherwise, nor do they include offsets from reclaimed water.

Although some savings in the Planning Region have been achieved, the potential for future public supply savings is expected to be significant. Some of the savings will occur from national and state regulations that mainly target interior plumbing fixtures and, to a limited extent, landscaping standards for single and multi-family residential properties. Despite savings already achieved, plumbing efficiency improvements in older (primarily pre-1995) facilities are still expected to yield considerable water savings. The addition of spray valve retrofits for commercial eating and drinking establishments provides local utilities with a specific conservation measure for their commercial and institutional customers. Also, exterior water use in general, and landscape irrigation in particular, present viable opportunities for water savings by customers of public water suppliers.

All of the measures evaluated, with the exception of ULV urinal rebates, are considered to be applicable in the public supply and domestic self-supply water use categories. In the public supply category, measures were evaluated at the utility level, where it was assumed each type of program would be implemented and, therefore, the costs indicated would be incurred by a public supply utility. The implementation of measures within the domestic self-supply category, and the associated costs and savings, were evaluated at the county level. Implementation of water conservation measures through a branch of county government is believed to be the most viable means to achieve countywide water conservation objectives for domestic self-supply water users.

1.1 Potential for Water Savings from Public Supply Water Conservation

In determining potential water savings that could be achieved through each type of measure, it was assumed that the measures would be implemented in 2005 and continue through 2025. Not all eligible residents were assumed to be motivated to actually participate in a program related to a particular measure. It was further assumed that not all establishments would participate, considering factors such as the age of the plumbing fixtures (post-1995 would not be eligible) and the number and types of programs previously offered to public and domestic self-supply water users in each county. For these reasons, the participation rates vary for each program in each utility and county, and none were assumed as high as 100 percent.

If the public water supply sector implements all of the voluntary water conservation measures presented above, a savings of 110 mgd will result between 2005 and 2025. If the mandatory public water supply sector measures are also implemented, the total savings is estimated to be 133.4 mgd. The importance of public supply water conservation is highlighted by the fact that 59 percent of the 2025 public supply demand of 227.4 mgd can be met through conservation.

Whether full implementation of all voluntary and mandatory water conservation measures identified actually occurs remains to be seen. It bears repeating that some measures are more cost effective than others; however, none greater than $3.00/1000 gal were considered in the savings calculations described in the previous paragraph. The most cost-effective among the water conservation measures identified are water efficient landscape and irrigation system rebates, which conserve about 28.2 mgd throughout the Planning Region at a cost of $1.51/Kgpd. This is followed closely by the implementation of plumbing retrofit kits (21.9 mgd saved at a cost of $0.62/Kgpd), ultra-low volume toilet rebates (23.5 mgd saved at a cost of $2.24/Kgpd), and rain sensor shutoff device rebates (18.9 mgd saved at a cost of $0.65/Kgpd). Two of the measures have a finite number of accounts where they can be implemented. The National Energy Policy Act of 1992 requires that all new residential construction built after 1994 be equiped with low-volume plumbing fixtures. As a result, these two plumbing-related measures are only applicable to accounts where the structures were constructed prior to 1995 and have not had the plumbing fixtures replaced or upgraded with fixtures manufactured after 1995. Similarly, Florida Statute 373.62, requires rain sensor shutoff devices on all new automatic irrigation systems installed after May 1, 1991.

2.0 Recreation/Aesthetic Water Conservation

The recreation/aesthetic category includes golf courses and large landscapes that obtain water directly from ground-water and surface-water sources, rather than from a public supply system. Although documented information was not available, it is generally accepted that some amount of water savings have been achieved by these users by using some degree of efficient irrigation practices and technology. The potential water savings reflect the implementation of specific exterior water conservation measures. It is expected that the large landscape surveys and the rain sensor shut-off device rebates are the two measures that would be applicable for implementation in this category. It should be noted that outdoor water conservation is impacted by rainfall and other climatic conditions, and the information presented in this discussion is based on average demands and savings.

In determining potential water savings for golf courses and for large landscapes, the number of each type of facility was determined. The number of golf courses as determined for the demand projections was used, and it was assumed that the total number of large landscapes, e.g., cemeteries, parks, and playgrounds, equal the number of golf courses in each county (Appendix for Chapter 5). As with public supply and domestic self-supply, participation rates depend on the nature of the program. Assumptions specific to each type of measure applicable to this category are provided in Chapter 6.

2.1 Potential for Water Savings from Recreation/Aesthetic Water Conservation

The projected demand for the 2000-2025 planning period for the Recreational/Aesthetic water use category is estimated to be 30.7 mgd. Water conservation measures for this sector are limited mainly to voluntary large landscape surveys and rain sensor shutoff device rebates. Consequently, the estimated water savings of 2.6 mgd that may be achieved through these voluntary measures also is limited, but if implemented could meet approximately 8.4 percent of the additional demand. The water savings potential in this sector could improve once ongoing research projects related to soil moisture sensors and evapotranspiration controllers are completed. Assuming research is favorable in terms of costs and water savings, such devices appropriate for use on large landscapes may become more widely available and encouraged by water professionals.

3.0 Industrial/Commercial, Mining/Dewatering and Power Generation Water Conservation

The I/C,M/D,PG category includes those factories, mines, power plants, and other commercial enterprises that obtain water directly from surface-water and/or ground-water sources through a water use permit. For the RWSP, the water conservation options most applicable for water users in this category were limited to water use surveys and landscape efficiency. Although it is acknowledged that water savings can be achieved by improving the efficiency of water-using industrial processes, the associated quantities and costs cannot be determined without a site-specific assessment of water use at each facility, or at least several similar facilities. According to the surveys sent to I/C,M/D,PG permittees in 1999, water use efficiency improvements related to industrial processes are being made to a limited extent. However, in only a few cases were survey respondents able to estimate the savings associated with the improvements (SWFWMD, 1999).

To date, the District has concentrated on education, and limited research, to promote water conservation in this water use category. Conservation measures applicable to this category include industrial/commercial/institutional (ICI) surveys and large landscape surveys. The number of permittees that could implement the measures was obtained from District data used for demand projections (Appendix for Chapter 5). Participation rates depend on the nature of the program; as with other categories the participation rate is always assumed to be less than 100 percent. Details related to how these options apply to the I/C,M/D,PG category are described in Chapter 6.

3.1 Potential for Water Savings from I/C,M/D,PG Conservation

The projected demand for the 2000-2025 planning period for the I/C,M/D,PG category is 7.6 mgd. Water conservation measures for this sector include voluntary ICI Surveys, large landscape surveys, plumbing retrofit kits, and ultra-low volume toilet rebates that can result in a savings of 0.44 mgd or 5.7

percent. It should be noted that in many cases, industrial and commercial cost management practices have minimized the volume of water used which has also minimized the costs associated with pumping, purchasing, and/or treating process, make-up, waste, and cooling water. Additionally, data for the water savings achieved through conservation measures in this category are limited to what was achieved in a handful of case studies, and are generally tied directly to the size of the operation. Consequently, water use does not significantly increase unless there is significant growth in the product sectors comprising the I/C and M/D water use sector. The potential for conservation in the I/C,M/D,PG category is conservative in that it was not fully explored. Doing so requires a case-by-case evaluation of each user's processes.

4.0 Summary of the Potential Water Savings from Non-Agricultural Water Conservation

Through the implementation of all voluntary options available to local governments, private entities and other water users, it is anticipated that 113 million gallons of water could be saved each day, at a cost of $1.12/1000 gal. If the mandatory measures are also implemented, the estimated savings increases to 138 mgd and costs approximately $1.01/1000 gal. Table 5-6 shows the potential non-agricultural water conservation that could be achieved in each category. The savings listed are considered to reflect conservative estimates.

Table 5-6. Potential Water Savings from Non-Agricultural Water Conservation in the Planning Region through 2025.

Identified Measures	Total Savings (mgd)	Average Total Cost ($/1000 gal)
Voluntary Measures		
Public Supply	96.7	$1.18
Domestic Self-Supply	13.2	$0.74
Recreation/Aesthetic	2.6	$0.49
I/C, M/D, PG	0.44	$0.99
Sub Total	**113**	**$1.12**
Mandatory Measures		
Water Budgeting	24.9	$0.56
Total	**138**	**$1.01**

Section 7. Agricultural Water Conservation

HSW Engineering was contracted by the District to identify and evaluate water conservation options and water supply development opportunities for agricultural water users. The objectives were to: 1) update the inventory of agricultural irrigation practices used for regionally significant commodities, irrigation systems and efficiencies, 2) update and identify new agricultural irrigation system modifications and best management practices, 3) perform and update planning level feasibility and cost analyses, 4) identify and/or update funding mechanisms, and 5) develop and/or update conceptual schedules for implementation. The water-conserving measures identified are considered reasonable within the context of accepted farming practices.

HSW built upon the work they completed for the 2001 RWSP, which included the identification of 20 model farms representing efficient water use options for various agricultural commodities. Models consist of water conservation options, such as irrigation system conversions and/or best management practices that are specific to agricultural commodities and associated water use factors such as soil type, climate conditions, crop type, etc. For the 2006 RWSP, HSW used various data sources including IFAS acreage, census data, the District's Regulatory database, and GIS-based land use data. The data was used to identify the model farms that best represent agricultural water use in the Planning Region. As a result, six model farms were selected, as shown in Table 5-7.

Table 5-7. Model Farms Identified as Most Representative of Agricultural Water Use in the Planning Region.

Selected Model Farms		
Crop	**Existing Irrigation System**	**Irrigation System Conversion**
Citrus – flatwoods	Microjet	No, other BMPs only
Tomatoes, fall or spring	Semi-closed seepage	No, other BMPs only
Tomatoes, fall or spring	Semi-closed seepage	Drip & other BMPs
Tomatoes, fall or spring	Semi-closed seepage	Fully Enclosed Seepage & other BMPs
Nurseries – container	Sprinkler	Line Source Emitter (spaghetti tube) & other BMPs
Other vegetables and row crops	Semi-closed seepage	No, other BMPs only

Sprinkler type systems are typically used for container nurseries, field crops and sod farms. Drip systems are steadily increasing in popularity, particularly for row crops grown using plastic film mulch, and are used in conjunction with a seepage system that is used for bed preparation and crop establishment. Microjet systems are the most common system used for citrus. Since supplemental irrigation for citrus exceeds all other quantities combined, more water is delivered by microjet systems than from all other systems. Surface irrigation, which includes semi-closed systems, is the most common type of irrigation for non-citrus crops in Florida. Details are available in the report submitted by HSW, which is contained in the Appendix for Chapter 5.

It is recognized that the model design parameters and case study results may not be directly transferable to all operations within a given commodity category. The model farm case studies should be viewed as a necessary construct to facilitate a standard basis for comparison of cost analyses and for estimation of water savings. An additional benefit of the model farms data is that it is being used to determine whether specific elements of projects implemented as part of the District's FARMS program are cost effective.

For each model farm, the costs per acre required to convert to a more efficient irrigation system and the cost to implement best management practices were estimated based on publicly available data and information and interviews with local irrigation system and farm management providers. Details, methods and assumptions are provided in the Appendix for Chapter 5. The potential savings associated with each of the model farm scenarios is included in Tables 5-8 and 5-9. The data in these tables represent the maximum potential savings if all growers were to install the most efficient irrigation systems and implement appropriate best management practices for their respective commodities. The potential savings by model farm, for the Planning Region in 2025 ranges from about 0.4 mgd to 1.0 mgd for vegetables and row crops in an average year and a drought year, respectively, to 7.4 mgd in an average year and 11.6 mgd in a drought year for citrus.

Table 5-8. Model Farm Potential Water Savings (mgd) (5-in-10).

Description of Model Farm/Irrigation System/BMP Scenario					Water Savings in MGD					
Model Farm Scenario ID	Crop	Existing Irrigation System	Irrigation System Conversion	2000	2005	2010	2015	2020	2025	Assumptions
1	Citrus – flatwoods[1]	Microjet	No, other BMPs only	9.8	8.6	8.1	7.9	7.6	7.4	100 percent implementation, maximum improvement
3	Tomatoes, fall or spring	Semi-closed seepage	No, other BMPs only	0.9	1.1	1.0	1.0	1.0	0.9	50 percent Implementation, 50 percent of maximum improvement
4	Tomatoes, fall or spring	Semi-closed seepage	Drip and other BMPs	0.9	1.1	1.1	1.0	1.0	0.9	25 percent Implementation, maximum improvement
5	Tomatoes, fall or spring	Semi-closed seepage	Fully Enclosed Seepage and other BMPs	0.9	1.1	1.0	1.0	1.0	0.9	25 percent Implementation, maximum improvement
Tomatoes – Total				2.8	3.2	3.0	3.0	2.9	2.8	
8	Nurseries – container	Sprinkler	Line Source Emitter (spaghetti tube) and other BMPs	1.9	2.1	2.2	2.3	2.3	2.4	100 percent implementation, maximum improvement
11	Other vegetables and row crops	Semi-closed seepage	No, other BMPs only	1.8	2.3	2.4	2.4	2.4	2.5	100 percent implementation, 50 percent maximum improvement

[1] Citrus model farm potential water savings were adjusted to be consistent with latest demand projections. Savings in Initial consultant report were slightly less, and are included in the Appendix for Chapter 5.

Notes: Model Farm Scenario 1 (Citrus Flatwoods): Existing microjet irrigation system is sufficient and no irrigation system conversion is required. Implement other BMPs only to achieve water savings.

Model Farm Scenario 3 (Tomatoes, fall or spring): Existing semi-closed seepage system is sufficient and no irrigation system conversion is required. Implement other BMPs only to achieve savings.

Model Farm Scenario 4(Tomatoes, fall or spring): Replace existing semi-closed seepage with drip irrigation system and implement BMPs.

Model Farm Scenario 5 (Tomatoes fall or spring): Replace existing semi-closed seepage irrigation system with fully enclosed seepage system, and implement other BMPs to achieve savings.

Model Farm Scenario 8 (Container nurseries): Replace existing sprinkler irrigation with line source emitters (also commonly known as “spaghetti tubing”) irrigation system and implement other BMPs to achieve water savings.

Model Farm Scenario 11 (Other vegetables and row crops): Existing, semi-closed seepage systems are sufficient and no irrigation system conversion is required. Implement other BMPs only to achieve savings.

For the SWUCA portion of the Planning Region, the District is permitting at an assumed efficiency of 75 percent for all crops, regardless of irrigation system. The data in this table can be viewed as the maximum potential savings if all growers were to install the most efficient irrigation systems and implement appropriate BMPs. The potential savings, by model farm for the Planning Region during average and drought conditions, ranges from 1-2 mgd for other vegetables and row crops to 10-16 mgd for citrus. The current assumption of 100 percent grower participation and rule changes for irrigation in the SWUCA resulted in higher irrigation efficiency estimates.

Table 5-9. Model Farm Potential Water Savings (mgd) (1-in-10).

Description of Model Farm/Irrigation System/BMP Scenario				Water Savings in MGD						
Model Farm Scenario ID	**Crop**	**Existing Irrigation System**	**Irrigation System Conversion**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**Assumptions**
1	Citrus – flatwoods[1]	Microjet	No, other BMPs only	15.87	13.8	13.0	12.7	12.4	12.0	100 percent implementation, maximum improvement
3	Tomatoes, fall or spring	Semi-closed seepage	No, other BMPs only	0.5	0.5	0.4	0.4	0.4	0.4	50 percent Implementation, 50 percent of maximum improvement
4	Tomatoes, fall or spring	Semi-closed seepage	Drip and other BMPs	0.5	0.5	0.4	0.4	0.4	0.4	25 percent Implementation, maximum improvement
5	Tomatoes, fall or spring	Semi-closed seepage	Fully Enclosed Seepage and other BMPs	0.5	0.5	0.4	0.4	0.4	0.4	25 percent Implementation, maximum improvement
Tomatoes – Total				1.5	1.4	1.3	1.3	1.2	1.2	
8	Nurseries – container	Sprinkler	Line Source Emitter (spaghetti tube) and other BMPs	2.2	2.3	2.5	2.5	2.6	2.7	100 percent implementation, maximum improvement
11	Other vegetables and row crops	Semi-closed seepage	No, other BMPs only	0.9	0.9	0.9	0.9	0.9	0.9	100 percent implementation, 50 percent maximum improvement

[1] Citrus model farm potential water savings were adjusted to be consistent with latest demand projections. Savings in initial consultant report were slightly less, and are included in Appendix 8.

1.0 Inventory of Agricultural Irrigation Practices

1.1 Irrigation System Types

Irrigation systems vary primarily by crop and location within the District. Strict water use restrictions in the SWUCA, for example, have resulted in more growers installing irrigation systems and making operational changes that result in greater irrigation efficiency. Overall, the drip and fully enclosed seep systems have increased in use while semi-closed seep systems have decreased. Surface water use has also increased, especially for bed preparation and crop establishment. The Pacific Tomato Growers, Ltd. Flatford Swamp Surface-Water Exchange Project, funded in part by the District, is successfully using gas chlorinated surface water to irrigate tomatoes through drip tape.

Container nurseries primarily irrigate using overhead sprinkler systems, but some might use drip tube or drip tapes. Overhead sprinkler irrigation for container nurseries has an efficiency of 25 to 50 percent and can be as low as 15 percent, while the drip tubes/tape may have efficiencies as high as 80 percent. The potential water savings are based on the assumption of a 75 percent overall irrigation efficiency, as required in the SWUCA.

1.2 Best Management Practices

Best management practices, other than improvements to irrigation systems, include the following:

- field practices not including irrigation – includes tailwater recovery/rainwater harvesting, water table control structures, and precision agriculture
- cultural practices – includes pervious mulch and implanted reservoir tillage
- management practices – includes water table observation wells, tensiometers, laser leveling, variable rate pumping, water level metering, and irrigation scheduling.

BMP manuals have been adopted by rule by the Florida Department of Agriculture and Consumer Services for citrus, vegetable and agronomic crop, and containerized nursery industries, and these apply to most production regions within the District's geographic region.

2.0 Impact of Permitting Rule Changes in the SWUCA on Agricultural Water Conservation

In identifying agricultural water savings potential in the region, the irrigation systems used for each crop category and soil type were identified and savings were then calculated based on increased efficiency and acreage over time. This presented a challenge since the base year for the inventory of irrigation systems and the level of efficiency at which they operate is 2000, but SWUCA rule changes that were effective in 2003 impact the years for which savings were projected (2005-2025). Therefore, it was necessary to address the potential savings in the context of the rule change.

Considerable changes made to the SWUCA rules in 2003 resulted in reductions in the quantity of water permitted for supplementary irrigation needs. The new rules, which require at least 75 percent irrigation efficiency, impacted more than 90 percent of the irrigated acreage and associated demand within the SWUCA. In the Planning Region, about 59 percent of the potential reduction in agricultural water use identified in the 2001 RWSP (about 124 mgd and 189 mgd for the average and drought conditions respectively) that could result from the implementation of agricultural conservation measures, is due to the 2003 changes to the SWUCA rules. This means that projected savings that have already been achieved through changes to the SWUCA rules account for more savings than what could be achieved through the implementation of the conservation measures presented in the 2001 RWSP. Assuming the irrigation practices are put in place to achieve the required reductions in irrigation water use in the SWUCA, additional water savings through improved irrigation systems and best management practices are limited to about 3 to 10 percent of water use depending on the crop.

3.0 Potential Conservation in Major Commodities

Of the total agricultural water use in the Planning Region, approximately 86 percent is in the SWUCA. Citrus is permitted to use nearly 60 percent of the total agricultural water use in the Planning Region, and represents the commodity with the largest potential for water savings. The amount of actual consumption depends on rainfall and other climatic conditions. Significant savings are also possible in the subcategories of nurseries and tomatoes. The discussion of potential water conservation focuses on that which is possible by 2025; however, the actual savings over time fluctuate with acreage declines. For example, in the year 2010 the potential savings for all commodities in the Planning Region is 22.2 mgd, but is only 21.3 in 2025 due to a predicted loss of agricultural acreage.

3.1 Citrus

Potential savings in the citrus subcategory for the 1-in-10 condition in 2025 is 7.4 mgd. This represents approximately 35 percent of the total 2025 potential savings in the agricultural category. Citrus is a subcategory of agricultural water savings that was greatly impacted by recent rule changes in the SWUCA. The current SWUCA rule, in effect as of January 2003, omits the citrus grove drive lane from the total irrigated acreage upon which permits are based, and changes the rainfall event from a 2-in-10 to a 1-in-10 year. The cumulative demand reduction potential of this permit condition is about 30 mgd, or 11 percent of the water allocated for citrus in the Planning Region. This quantity was accounted for in the demand projections, and savings potential is therefore not applicable. Therefore, the 7.4 mgd savings potential identified in the citrus subcategory is in addition to the demand reduction associated with the SWUCA rule change.

3.2 Tomatoes

The next largest subcategory, in terms of both water use and savings potential, is tomatoes. Tomatoes are typically grown on plastic mulch and the soils are not as greatly impacted by evaporative water losses as other crops. Savings are generally derived from irrigation system conversions and BMPs. Potential savings in the tomatoes subcategory in 2025 is 3.8 mgd, representing approximately 18 percent of the total savings potential in the agricultural category.

3.3 Nurseries

Potential savings in the nurseries subcategory in 2025 is 2.4 mgd, representing nearly 11 percent of the total savings potential in the agricultural category. The savings are primarily related to irrigation system conversions from overhead to drip. As stated previously, the rate of irrigation efficiency varies among the systems used, but 75 percent efficiency was assumed to be consistent with the SWUCA rule.

4.0 Facilitating Agricultural Resource Management Systems (FARMS) Program

The FARMS program is a public/private partnership designed to assist the agricultural community with the implementation of production-scale, field demonstration agricultural best management practices. FARMS will provide resource benefits that include water quality improvement, reduction of ground-water use from the upper Floridan aquifer, and/or conservation, restoration, or augmentation of the area's water resources. Although the priority areas for the program are the upper Myakka River and Shell, Prairie, and Joshua Creek watersheds, projects can be developed throughout the SWUCA. Funding for the program is provided by FDACS, state appropriations, the District, and participating growers. These sources have contributed approximately $15 million to the program since its inception in 2000. As of November 2005, there are 24 FARMS projects that have either been completed, are under construction, or are planned with secured funding. When completed, these projects will result in an annual average water savings of approximately 8.1 mgd.

The District categorizes the FARMS program as water resource development and as such, additional information on the program is contained in Chapter 7. Table 7-3 is a summary of the 24 FARMS projects that are completed or are under development.

5.0 Summary of the Potential Water Savings from Agricultural Water Conservation

The total potential water savings from agricultural water conservation in the Planning Region in 2025 is estimated to be 21.3 mgd. Of this amount, about 18.3 mgd (86 percent) is in the SWUCA. The cost to implement the model farms ranges from $80 to $2000 per acre, depending on the model farm, location, crop type and other related factors. Table 5-10 summarizes the costs and savings by major category.

Table 5-10 shows that the potential for water savings resulting from agricultural water conservation for the 2000-2025 planning period, not including conservation achieved through the FARMS program is 21.3 mgd. The District estimates that the water savings achievable through the FARMS program for the planning period is approximately 40 mgd. This is based on the data presented in Table 7-3 that shows that the savings achieved by FARMS projects implemented for the 2000-2005 time interval was 8.1 mgd. If the FARMS program continues to implement projects at the current rate with similar water savings, a savings of 40 mgd by 2025 should be achievable. Therefore, the total water savings from agricultural water conservation could be 61.3 mgd.

Table 5-10. Potential Water Savings from Agricultural Water Conservation for the 2000-2025 Planning Period, not Including Conservation Achieved through the FARMS Program.

Commodity	Total Estimated Savings (mgd)	Total Cost ($/acre)*
Citrus	7.4	$78
Nursery**	2.4	$1,800
Tomato**	3.8	$400
Remaining	7.7	$100
Total	**21.3**	**$2,378**

Based on 75 percent participation
**** Capital plus O&M cost, per planted acre for the first year of irrigation conversion.***
** Savings and cost data are averages.

Section 8. Aquifer Storage and Recovery

The process of storing water in an aquifer when water supplies exceed demand and subsequently withdrawing the water when supplies are low and/or demands are high is known as aquifer storage and recovery (ASR). Water injected into the aquifer is either potable, reclaimed or partially treated surface water. For potable water systems, the water withdrawn from storage in the aquifer is disinfected, retreated if necessary, and pumped into the distribution system. To date, the majority of ASR projects have been limited to storage and recovery of potable water. However, several projects are in progress to determine the feasibility of utilizing reclaimed water (treated effluent or storm water). Reclaimed water ASR presents several additional permitting issues over and above those associated with potable water ASR projects. Currently, there are no reclaimed water ASR projects within the District that are fully permitted for routine operation.

The District, in cooperation with Manatee County, pioneered the use of ASR in Florida by developing the first potable water ASR system in the early 1980s. What was then a cutting edge technology has since become a common technique to expand water supplies in an environmentally sustainable manner. In the 1990s, the District provided partial funding for two projects; one with Manatee County, and the other with the City of St. Petersburg, to store reclaimed water for dry season irrigation use. The development of these projects is helping to address critical issues that will enable the eventual use of underground aquifers for storage of reclaimed water.

ASR offers several significant advantages over conventional water storage methods including the ability to store large volumes of water at relatively low cost with little environmental impact and no evaporative losses. The success of an ASR project is generally measured in terms of recovery efficiency; the percentage of the original injected water recovered from the storage zone before water quality or impacts from the recovery phase (withdrawal) become unacceptable. Since brackish aquifers (high TDS) may be used for storage, mixing of the injected water with native water is generally the limiting factor on recovery efficiency.

1.0 ASR Hydrologic Considerations

Hydrologic conditions necessary to make ASR feasible include a moderately permeable storage zone, which is adequately confined above and below by lower permeability layers, and which contains fairly good to moderate water quality. These factors tend to minimize the mixing of the injected water with native water in the storage zone. The permeability of the storage zone is important since low permeabilities would limit the quantity of water that could be injected, while a very high permeability would allow the injected water to migrate farther and mix more with native water. The presence of confining layers is necessary to limit or prevent the injection water from migrating upwards (a significant issue where density differences exist between the injected water and native water). Confining layers also serve to keep poorer quality water in adjacent zones from being captured during recovery. Poor native water quality in the storage zone will limit the percentage of usable water by degrading the injected water faster as a result of mixing processes. Additionally, the higher density of poor quality water in the aquifer tends to cause the lower density injected water to migrate upwards and 'float' in the upper portions of the storage zone.

In general, the recoverable percentage of injected water is typically 70 to 100 percent. It is possible, depending on the hydrologic conditions, for the recoverable volume of water to be greater than the volume originally stored. This generally results when the native water quality is good to fairly good, and mixing of the injected water and native water provides additional water of acceptable quality. In some cases, it may be desirable to leave behind a portion of injected water to restore depleted ground-water reserves. This can help to form or maintain a buffer zone between the stored water and surrounding brackish or poor quality native water to avoid geochemical plugging, or to build up a reserve for future recovery during droughts, emergencies, or anticipated times of higher demand.

2.0 ASR Permitting Requirements

Permits to develop ASR systems must be obtained from the District, FDEP, Department of Health (DOH) and possibly the EPA if an aquifer exemption is requested. The District is responsible for the quantity and rate of recovery including potential impacts to existing legal users (e.g., domestic wells), offsite land uses, and environmental features. The FDEP is responsible for the injection and storage portion of the project, and the DOH is responsible for the quality of the water delivered to the public.

2.1 ASR and Arsenic

The regulatory requirements associated with ASR have been evolving over the past 20 years in response to new issues discovered during the operation and testing of ASR systems. One issue in particular is the mobilization of naturally occurring arsenic in the aquifer by the interaction of the injected water with the aquifer's limestone matrix. Initially, operational ASR systems appeared capable of eventually meeting the arsenic drinking water standard of 50 micrograms/liter (ug/l) as the aquifer was flushed with water during the testing phase. However, the recent lowering of the standard from 50 ug/l to 10 ug/l on January 1, 2006, by the EPA has resulted in a standard that many sites may not be capable of achieving. District-funded research conducted by the University of South Florida (USF) has determined that minute quantities of pyrite in the limestone of the Upper Floridan aquifer contain arsenic. Chemical differences between the injected water and the native aquifer water cause arsenic bearing pyrite to undergo a geochemical process that releases arsenic.

The primary issue regarding the mobilization of arsenic in the aquifer is in FDEP's interpretation of the rules related to underground injection control wells. Currently, all drinking water standards must be met prior to water being injected into the ground, during storage in the aquifer and prior to distribution to the public. That is, activities related to ASR, such as injection and withdrawal of stored water, cannot cause water quality in the aquifer to exceed drinking water standards.

Most ASR projects in the District are located in coastal areas where water in the Upper Floridan aquifer is brackish. In these areas there is very little use of the water and the recovered water from ASR systems is treated to remove arsenic prior to distribution. Therefore, there has been no known exposure to arsenic above the current drinking water standard from water injected into the aquifer as a result of ASR.

In 2005, the District and the PR/MRWSA funded the construction of 13 additional monitor wells at the PR/MRWSA's ASR well fields to determine the extent of arsenic mobilization in the aquifer. Preliminary data collected from these wells, as well as data from other sites, indicates that the mobilized arsenic is limited to a radial distance of 200 to 400 feet around the ASR well and the concentrations decrease with each successive cycle of use. Though arsenic concentrations appear to improve with time, more data from additional cycle tests are needed before it can be determined if the new drinking water standard for arsenic (10 ug/l) will be achieved. Also in 2005, the District initiated an effort to identify options for pre-treating injected water to minimize the mobilization of arsenic in the aquifer. Results from this effort are not expected until late 2006 at the earliest.

Part B. Determination of Water Supply Deficits/Surpluses

Future water supply deficits/surpluses were calculated as the difference between projected demands for the 2025 planning period and demands calculated for the 2000 base year (Table 4-11a). The additional water demand in the Planning Region for the 2000-2025 planning period will be approximately 409 mgd. It is possible that the demand for environmental restoration could be higher because MFLs that could require additional cutbacks remain to be set for a number of water bodies in the Planning Region. In addition, the MFLs set for the NTBWUCA will be re-evaluated in 2010 and, if determined to be insufficient for environmental recovery, could require additional ground-water reductions.

Based on the evaluation of water supply sources contained in this chapter, it was determined that up to 703 mgd is potentially available to meet this demand (Table 5-11). In the SWUCA, the additional demand through 2025 is approximately 211 mgd while potentially available sources are approximately 414 mgd. In the NTB area, the additional demand through 2025 is approximately 194 mgd, as compared to potentially available sources of approximately 289 mgd. Included in Table 5-11 are the quantities of water associated with Tampa Bay Water's Seawater Desalination Facility, which is currently off line as it undergoes remediation, and the Enhanced Surface Water project, which is completed.

Based on the information above, it is concluded that sufficient sources of water are available within the Planning Region to meet projected demands through 2025. As evidenced from the summary of demands in Table 4-11a and 4-11b and the summary of potentially available sources in Table 5-11, it is

Table 5-11. Potential Water Availability (mgd) in the SWUCA, NTB Area, and Planning Region (2000 – 2025).

SWUCA										
County	**Conservation**		**Desalination**		**Reclaimed Water**	**Surface Water[3]**		**Fresh Ground Water**		
	Agricultural (including FARMS Program)[1]	**Non-Agricultural**	**Seawater**	**Brackish Ground Water[2]**	**Offsets**	**Permitted/ Unused**	**Unpermitted**	**IAS and SAS[4]**	**UFA Unused Permitted**	**Total**
Charlotte	5.6	8		1.3	4.6	1.4	17.6	7.8	0.0	46.9
DeSoto	6.8	1.1			0.7	22.9	25.4	2.2	0	59.9
Hardee	8.2	0.94			0.6	0	10	0.3	0.9	21.6
Highlands	6.4	3.5			1.7	0	4.5	1.7	3.3	21.9
Hillsborough	8.4	11.1	10		4.9	4.3	0.4	3.5	1.0	38.6
Manatee	9.3	10.6	20		13.0	8	3.9	6.7	0.1	69.1
Polk	7.7	18.6			8.3	NA	10	4.3	25.9	71.1
Sarasota	6.1	15.7	20	7.5	12.1	0.7	25.2	7.5	0.5	85.1
Total	**58.5**	**69.6**	**50**	**8.8**	**45.9**	**37.3**	**97.0**	**34.0**	**31.7**	**414.2**
NTB Area										
Hillsborough	2.0	19.8	25[5]		58.7	57.2	3.3	NA	4.8	169.1
Pasco	1.1	14.8	25		12.5	0	2.5	NA	3.3	54.5
Pinellas	0.1	33.8		14.2	27.0	NA	NA	1	1.4	65.5
Total	**3.2**	**68.4**	**50[5]**	**14.2**	**98.2**	**57.2**	**5.8**	**1**	**9.5**	**289.1**
Planning Region (includes northern Polk County outside the SWUCA)[6]										
Total	**61.7**	**138**	**100**	**23**	**144.1**	**94.5**	**102.8**	**35.0**	**41.2**	**703.3[6]**

1 It is estimated that the FARMS Program will decrease agricultural water use by 40 mgd through 2025. Since at this time it cannot be determined where these savings will occur, each county in the SWUCA was assigned 5 mgd in FARMS savings.
2 Available potable water supply is the currently unused permitted withdrawal times an assumed treatment efficiency of 0.7.
3 With the exception of the Alafia River, which is part of Tampa Bay Water's Enhanced Surface Water System, surface water sources were generally assigned to the county and "area" in which the point of withdrawal occurs as described in Table 5-1. A portion of the available flows from the Alafia and Hillsborough Rivers and the TBC will be used to complete the replacement of the scheduled reduction in capacities (68 mgd) of the central system wellfields by 2008. Water from the Peace River was also distributed to Polk County for the MFLs restoration effort and Hardee County.
4 Quantities are based on the projected demand that could be met using lower rates of production from the SAS and IAS. Assumes 30 percent of potable water demand is for outdoor use.
5 Quantities of water for seawater desalination assigned to the Northern Tampa Bay area include 25 mgd from Tampa Bay Waters Big Bend Plant in southern Hillsborough County. In 2005, this plant was offline and quantities from the plant are considered to be available to meet wellfield reductions and future demands.
6 Totals are for the entire 10 County Planning Region and includes an additional 3.4 mgd (1.4 mgd for non-agricultural conservation and 2.0 mgd for unused permitted UFA withdrawals) from the area of northern Polk County that is outside the SWUCA and that is not presented in the above portions of the table.
7 Hillsborough County SWUCA: 2025 36% total county, based on TBW Long-Term Demand Forecasting Model, June 2004; 2005-2025 increased by 20% of 2025 growth per five year increment (source: Table 4-39A, District Total Population Estimates and Water Demand Projections by Region).

further concluded that there are areas of the Planning Region that have limited access to alternative water supplies and that a regional approach to meeting future demands for water needs is required.

Chapter 6. Water Supply Development Component

The water supply development component of the RWSP requires the District to identify water supply options from which water users in the Planning Region can choose to meet their individual needs. In addition, the District is to determine the associated costs of developing these options. As discussed in Chapter 5, the sources of water that are potentially available to meet projected water demand in the Planning Region include surface water/storm water, reclaimed water, seawater desalination, brackish ground-water desalination, fresh ground water, and conservation. Investigations were conducted to identify reasonable options for developing each of the sources, to provide planning level technical and environmental feasibility analyses, and to determine costs to develop the options.

Part A. Statutory Requirements for Water Supply Development

Section 1. Description of Roles for Water Management Districts and Water Supply Entities

Water supply entities include local governments, government-owned or privately owned public supply utilities, special districts, regional water supply authorities, multijurisdictional water supply entities, self suppliers, or other water suppliers. A multijurisdictional water supply entity, as described in section 373.019(12), means two or more water utilities or local governments that have organized into a larger entity, or entered into an interlocal agreement or contract, for the purpose of more efficiently pursuing water supply development projects identified in the District's 2006 RWSP.

Consistent with Subsection 373,061(7)(a), within 6 months following approval or amendment of the District's 2006 RWSP, the District shall notify by certified mail each entity identified in sub-subparagraph (2) (a) 3.d. of that portion of the RWSP relevant to the entity. Upon request of such an entity, the District shall appear before and present its findings and recommendations to the entity.

Consistent with Subsection 373.061(7)(b), within 1 year after the notification by the District pursuant to paragraph (a), each entity identified in sub-subparagraph (2) (a) 3.d. shall provide to the District written notification of the following:

- The alternative water supply projects or options identified in Subparagraph 373.061(2) (a) which it has developed or intends to develop, if any; an estimate of the quantity of water to be produced by each project; and the status of project implementation, including development of the financial plan, facilities master planning, permitting, and efforts in coordinating multijurisdictional projects, if applicable. The information provided in the notification shall be updated annually and a progress report shall be provided by November 15 of each year to the District.

- If an entity does not intend to develop one or more of the alternative water supply project options identified in the 2006 RWSP, the entity shall propose, within 1 year after notification by the District pursuant to paragraph (a), another alternative water supply project option sufficient to address the needs identified in Paragraph (2) (a) within the entity's jurisdiction and shall provide an estimate of the quantity of water to be produced by the project and the status of project implementation as described in this paragraph. The entity may request that the District consider the other project for inclusion in the RWSP.

Section 2. Local Government Comprehensive Plans

Consistent with Subsection 163.3177(6) (c), within 18 months after the Governing Board approves the 2006 RWSP, local governments in the Planning Region must update their comprehensive plans to include

- Alternative water supply project(s) selected by the local governments from those identified in the 2006 RWSP pursuant to Subsection 373.0361 (2) (a), or proposed by the local government under Subsection 373.0361 (7) (b).

- Alternative water supply projects and traditional water supply projects and conservation and reuse, necessary to meet the water needs identified in Subsection 373.0361 (2) (a) within the local government's jurisdiction and include a work plan, covering at least a 10-year planning period for building public, private, and regional water supply facilities, including development of alternative water supplies as necessary to serve existing and new development

Section 3. Water Use Permitting

Pursuant to the provisions of Section 373.223(5), in evaluating an application for consumptive use of water which proposes the use of an alternative water supply project described in the 2006 RWSP and provides reasonable assurances of the applicant's capability to design, construct, operate, and maintain the project, the District's Governing Board or the FDEP shall presume that the alternative water supply use is consistent with the public interest under Section 373.223 (1) (c). However, where the District's Governing Board identifies the need for a multijurisdictional water supply entity or regional water supply authority to develop the alternative water supply project pursuant to Section 373.0361 (2) (a)2, the presumption shall be accorded only to that use proposed by such entity or authority. This Subsection does not effect evaluation of the use pursuant to the provisions of Subsections 373.223 (1) (a) and (b), (2), and (3), 373.2295, and 373.233, FS.

Pursuant to the provisions of Section 373.0361(6), except as provided in Sections 373.223 (3) and (5), the RWSP may not be used in the review of permits unless the RWSP or an applicable portion thereof has been adopted by rule. However, this subsection does not prohibit the District from employing the data or other information used to establish the RWSP in reviewing permits, nor does it limit the authority of the FDEP or Governing Board under Chapter 373, Part II.

Part B. Overview of Water Supply Development Options

Many of the options presented in this chapter were identified and evaluated as part of the 2001 RWSP. Because these options remain viable, they were updated and included in the 2006 RWSP. Where applicable, water supply options developed through the work of the additional regional planning efforts described in Chapter 1; Tampa Bay Water's Master Water Plan, the Water Planning Alliance (WPA) in cooperation with the PR/MRWSA, and the Heartland Water Alliance (HWA) (Polk, Hardee, Highlands, and DeSoto counties) are incorporated into this chapter. These options are not necessarily the District's preferred options but are provided as reasonable concepts that water users in the region may pursue in their water supply planning. A number of the options are of such a scale that they would likely be implemented by either a regional water supply authority or a group of users. Other options such as those involving reclaimed water and conservation would be implemented by individual utilities. It is anticipated that users will choose an option or combine elements of different options that best fit their needs for water supply development provided they are consistent with the RWSP. Following a decision to pursue an option identified in the RWSP, it will be necessary for the parties involved to conduct more detailed engineering, hydrologic and biologic assessments to provide the necessary technical support for developing the option and to obtain all applicable permits.

Preliminary technical and financial feasibility analyses were conducted on a subset of options for each water source. These analyses were considered to be at the planning level and were prepared to more fully develop concepts for water supply development options. In addition, the analyses provided reasonable estimates of the quantity of water that could be developed and the associated costs for development. In order to standardize the approach to analyzing the technical and financial feasibilities, all water supply options were evaluated according to criteria developed by Hazen and Sawyer (1999) and modified based on CH2M Hill (2004). These criteria included standardized service lives for capital equipment, interest rates and discount rates. The service life for capital equipment was set at 20 years and the interest rate used was 5.625 percent, based on the federal water resource planning discount rate. The present value of costs over the 20-year evaluation period were discounted to present value, in terms of 2005 dollars. Costs for engineering and administrative services, and contingency fees were assumed to be 15 percent, 10 percent, and 20 percent of total capital costs, respectively. In addition, standardized values were established for common water supply components and operation and maintenance costs such as land, water treatment, ASR construction, well construction, pump stations, transmission lines, and wastewater treatment plants.

The water supply options in this chapter are presented in the following manner. First, descriptive information for each of the six water sources is provided. Next, the Planning Region is segregated into three geographic regions: the NTB Planning Area, combined with the southern half of Hillsborough County which is located in the SWUCA, the PR/MRWSA Planning Area, and the HWA Planning Area (Figure 6-1)[1]. Within the section for each Planning Area, options to develop water from the sources are addressed for the six water sources starting with surface water/storm water. A description of one or more representative options for each source is included that more fully develops the concepts and refines estimates of development costs. Due to space limitations, only a small fraction of the options were described in the text; the majority of the options are included in tables. Options that are described in the text are not necessarily considered by the District to have a higher priority than those in the tables.

There are two reasons for segregating the options into Planning Areas. First, the Planning Areas generally correspond to areas where water supply authorities or groups of counties are conducting major water supply planning efforts. (Chapter 1 provides a full description of the water supply planning efforts in progress in each of the three Planning Areas). Second, the District's strategies for recovering ground-water levels generally encompass the areas where these water supply planning efforts are in progress. For example, the NTBWUCA and its recovery strategy loosely follow the area served by Tampa Bay Water. The SWUCA and its recovery strategy generally encompass the area where the WPA (in association with the PR/MRWSA) and the HWA are engaged in major regional water supply planning efforts.

[1] Although DeSoto County occurs in both the PR/MRWSA and HWA Planning Areas, for the purpose of the RWSP, it will only be part of the PR/MRWSA Planning Area.

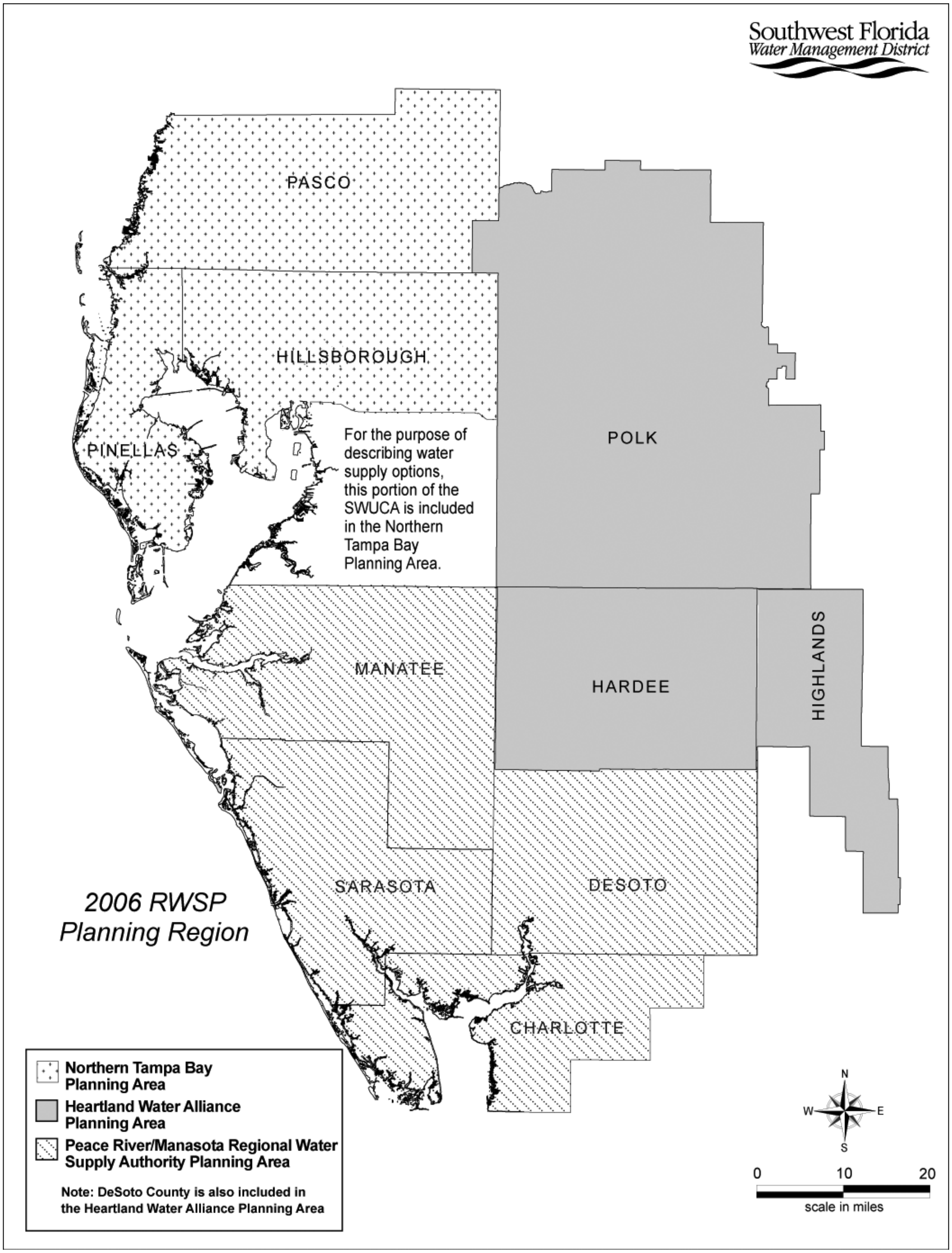

Figure 6-1. Location of the NTB, PR/MRWSA, and HWA Planning Areas. Note: These Planning Areas Are Used Only in Chapter 6 to Coincide with the Water Supply Planning Efforts of TBW, the PR/MRWSA, and HWA.

The division of the SWUCA into these areas fits well with the SWUCA Recovery Strategy because the strategy is somewhat different for the two areas. In the rapidly urbanizing coastal counties encompassed by the PR/MRWSA, land use transitions and retiring of permitted quantities from lands purchased for conservation, will significantly reduce the use of ground water. The urbanizing areas will not rely on the retired ground water but will primarily be supplied by alternative sources. In the inland counties encompassed by the HWA, some of the retired ground water may be re-permitted under certain conditions to meet demand where access to alternative supplies is limited.

Section 1. Surface Water/Storm Water Options

As shown in Chapter 5 Table 5-11, capturing and storing water from river/creek systems during times of high flow has the greatest potential of all the water sources to meet the 2025 demand. Based on planning level criteria, approximately 197 mgd could be developed for water supply if all the rivers/creeks in the Planning Region that are described in Chapter 5 were developed to their full potential. This does not include approximately 35 mgd that could be developed from the Kissimmee River outside of the Planning Region and used in central and western Polk County. Water supply options were developed for most of the rivers and creeks of significant size in the Planning Region and the Kissimmee River outside of the Planning Region. Options were also developed for a number of lakes.

Surface water/storm water options in the NTB, PR/MRWSA, and HWA Planning Areas were based on previous work that was prepared for the 2001 RWSP (SWFWMD, 2001 and CH2M Hill, 2000). In addition, Greeley and Hansen (2005) evaluated surface water options for the PR/MRWSA area and Black and Veatch (2005 draft) evaluated options for the HWA Planning area. Information on options previously presented in SWFWMD (2001) can be found in CH2M Hill (2000) and Hazen and Sawyer (2005).

1.0 System Interconnect/Improvement Options

The system interconnect/improvement options are critical components of water supply distribution systems. These options involve the construction of pipelines and booster pumping stations. Implementation of these options will help to regionalize potable water supply systems by providing transmission of water from areas of supply to areas of demand, which will increase the rotational reserve capabilities and provide redundancy of water supplies during emergency conditions.

Section 2. Reclaimed Water Options

Reclaimed water, if used effectively and efficiently, has great potential to help meet the 2025 water supply demand. Effective use of reclaimed water is achieved by providing it to customers that offer the greatest offset potential and efficient use is achieved by discouraging overuse. It is estimated that 144 mgd can be offset through 2025 by implementing projects using only those flows not already being supplied to customers as of 2000. If efficiency measures were applied retroactively, such that all WWTP flows could be used efficiently and effectively, the potential reaches 232 mgd

The District developed 137 reclaimed water options in the NTB, PR/MRWSA, and HWA Planning Areas that are included in tables in the sections for each Planning Area. An expanded description is provided for a subset of options that are representative examples of the different types of projects that could help maximize the use of reclaimed water supplies. These options were subjected to a detailed analysis to more fully develop the concepts and refine cost estimates. Listed below are eleven different types of reclaimed water options that are included in this section.

- Augmentation with Other Sources: Involves the introduction of another source (stormwater, surface water, ground water) into the reclaimed water system to expand the available supply.
- Aquifer Storage and Recovery: Involves the injection of reclaimed water into an aquifer during times of excess supply and the recovery of that same water for use during high demand.
- Distribution: Involves the expansion of a reclaimed water system to serve more customers.
- Efficiency/Research: Involves the study of ways utilities can maximize the efficiency and offset potential of reclaimed water systems to conserve more water (includes rate structures, telemetry control, watering restrictions, metering and others). Or involves reclaimed water research (water quality, future uses).
- Interconnect: Involves the interconnection of two or more reclaimed water systems to enhance the supply and allow for a better utilization of the resource.
- Natural System Restoration/Recharge: Involves the introduction of reclaimed water to create or restore natural systems and enhance surficial and or Floridan aquifer levels.
- Saltwater Intrusion Barrier: Involves the injection of reclaimed water into an aquifer along the coast to create a salinity barrier.
- Storage: Involves traditional reclaimed water storage including ground storage tanks, and pond storage.
- Streamflow Augmentation: Involves the introduction of reclaimed water downstream of an existing or potential potable water withdrawal point as a replacement flow to enable more efficient utilization of the surface-water supply.
- System Expansion: Involves the construction of multiple components (transmission, distribution, storage) necessary to deliver the reclaimed water to more customers.
- Transmission: Involves the construction of large reclaimed water mains to serve more customers.

In addition to capital costs, operation and maintenance (O&M) costs for each of the representative options were estimated. Reclaimed water flow data for 2004 and O&M cost data associated with current reclaimed water systems were collected to identify the median reclaimed water O&M cost estimate per 1000 gallons supplied. The data indicate that reclaimed water O&M costs are relatively consistent across system sizes with a median cost of $0.30 per 1,000 gallons supplied. This figure was used in cost calculations for individual reclaimed water options, unless system-specific O&M cost data were available.

Section 3. Seawater Desalination Options

Four seawater desalination options were evaluated. The total yield from these options is approximately 100 mgd. Investigation of potential seawater desalination options included identifying industrial dischargers for potential co-location with future desalination plants. Much of the near-shore area in the Planning Region has been designated as either Outstanding Florida Water (OFW) or aquatic preserves. For this reason, it was important and preferable to find potential sites that did not have either of these designations. Other criteria for identifying potential locations were access to existing public supply infrastructure and the magnitude of the nearby water demand (SWFWMD, 2000). A desalination facility developed at any of the four sites would be required to address the two major environmental permitting issues; the intake of water directly from the Gulf or a bay which usually results in loss of marine species as a result of impingement and entrainment and, the production and disposal of waste concentrate (also called brine, or reject).

As noted in the discussion under Part B above, standardized cost criteria were developed and applied to all options, which enabled a comparison of costs among the options (Hazen and Sawyer, 1999 and

CH2MHILL 2004). For this reason, the costs presented for the seawater and brackish water desalination options will differ from the costs developed during feasibility analysis. Costs associated with Tampa Bay Water's seawater desalination plant in southern Hillsborough County were provided by Tampa Bay Water and are based on actual costs incurred at the site. Additionally, the costs presented for the Anclote Power Plant option were provided by Tampa Bay Water.

Section 4. Brackish Ground Water Desalination Options

Brackish ground water is considered to be a viable source of water supply when it is obtained from the Upper Floridan aquifer in the NTB Planning Area, the intermediate aquifer in the PR/MRWSA Planning Area, and the Lower Floridan aquifer in the HWA Planning Area. Requests for brackish ground-water withdrawals will be evaluated similarly to requests for fresh ground water withdrawals. This is because, similar to fresh ground-water, brackish ground-water withdrawals cannot impact or delay the recovery of a stressed MFL water body. It is unlikely that options proposing to withdraw brackish water from the Upper Floridan aquifer in the PR/MRWSA or HWA Planning Areas would be permittable due to their potential to exacerbate existing resource problems that have resulted from ground-water withdrawals. The identification of brackish ground-water desalination options was based on a review of currently planned or proposed projects and an assessment of potential brackish ground-water resources in the region.

Section 5. Fresh Ground Water Options

In the NTB Planning Area, future requests for fresh ground water will be evaluated based on projected impacts to established MFL water bodies. In the vicinity of Tampa Bay Water's central well field system, it is unlikely additional ground water will be developed until a full evaluation of well field cutbacks and water level recovery in the region is made. For this reason, no options were developed in the NTB Planning Area for fresh ground water.

In the PR/MRWSA Planning Area, the use of additional fresh ground water from the upper Floridan aquifer to meet demands will be limited. However, options were developed for the surficial and intermediate aquifers because additional fresh ground water will be available from these aquifers.

Because of the limited availability of alternative supplies in the HWA Planning Area, a significant effort was undertaken to develop fresh ground-water options. The use of additional fresh ground water from the upper Floridan aquifer in the SWUCA will be limited. However, fresh ground water is available from the surficial and intermediate aquifers and from the upper Floridan aquifer in the SFWMD's portion of Polk and Highland's Counties. Of the 14 ground-water supply options developed for the HWA Planning Area, three propose to use the intermediate aquifer, one proposes to use the LFA, and the remaining 10 options propose to use the upper Floridan aquifer. Of the 10 upper Floridan aquifer projects, six were located in the SFWMD.

Section 6. Non-Agricultural Water Conservation Options

District staff identified conservation options appropriate for implementation by public supply, domestic self-supply, recreation/aesthetic, industrial/commercial (I/C) and mining/dewater (M/D) users. However, the focus was on public supply because it has the greatest potential by far to achieve water savings.

The options were then evaluated to determine individual water savings potential and cost effectiveness. Using information gathered from water use permittees and other District data, completed and ongoing water conservation efforts in the region were inventoried. Conservation options that have not been implemented were identified. Once all potential options were identified, the list was shortened to include those projects which met three criteria: 1) the option had to cost less than $3.00/1,000 gallons of water saved if implemented either independently or in conjunction with another program, 2) the option had to save a minimum of 10,000 gallons per day (gpd), and 3) the project favorably addressed the secondary considerations developed by Hazen and Sawyer (1999) and modified based on CH2M Hill (2004). As a result, the following eight water conservation measures were identified as having the greatest potential for water savings upon implementation in the Planning Region:

- Plumbing retrofit kit give-aways
- Ultra low volume toilet (ULV) rebates
- Water-efficient landscape and irrigation system rebates
- ICI water use surveys
- Industrial/commercial spray valve replacements
- Large landscape water use surveys
- Rain sensor shut-off device rebates
- Water budgeting

Specific options were identified at the utility level for public supply, and at the county level for other non-agricultural water users. In addition, costs and savings attributable to each option at the utility or county level were determined using the work of Ayres Associates (2000) for the 2001 RWSP, and other data available to the District. The costs included with each option are based on 2005 dollars and represent an update of similar information in the 2001 RWSP. Using the information provided in the technical memorandum entitled "Cost Estimating and Economic Criteria for the 2005 District Water Supply Plan" (CH2M Hill, 2004), the costs have increased approximately 34 percent. This accounts for the increase in the selection criteria for conservation measures from $2.00 per 1,000 gallons in the 2001 RWSP to $3.00 per 1,000 gallons presented above.

It should be noted that more than one water conservation option could be implemented by any given utility or county at one time. If such options target the same type of use (two separate options which both target landscape water use, for example), it is reasonable to expect that savings may be less than indicated, as will program start-up costs. Because both savings and costs are affected similarly, the cost-effectiveness of the combined options is not greatly affected, and is considered to be valid for planning purposes.

As discussed previously, some readily applicable conservation options were not addressed due to the wide variance in cost per thousand gallons saved, and the site-specific nature of their implementation. Two such measures in particular which have savings potential but were not addressed as part of the 2006 RWSP are water conserving rate structures and codes/ordinances which require water efficiency.

Section 7. Agricultural Water Conservation Options

Two approaches were taken to develop options for agricultural water conservation; the model farms concept and the evaluation of alternative water sources for agricultural irrigation. The model farms concept illustrates the potential for water savings for various scenarios of irrigation system conversions and/or best management practices for a number of different agricultural commodities. Twenty model farms were presented with different best management/irrigation system modifications applied to an existing farm. Irrigation system conversion/best management practices implementation represented by six of the 20 model farms encompasses most of the modifications expected in the Planning Region. The model farms concept is presented in detail in Chapter 5, Part A., Section 7, Agricultural Conservation.

The second approach was an evaluation of non-traditional sources of water that could potentially be available to agriculture. Four sources were identified that have applicability in the Planning Region and particularly in the SWUCA. These include: 1) the surficial aquifer, 2) rainwater harvesting, 3) substituting ground water with reclaimed water, and 4) withdrawal of excess water from the Flatford Swamp in the Upper Myakka River Watershed for agricultural irrigation. Although these sources are not applicable to every site and are not necessarily the most cost effective, they are examples of practical alternatives that could reduce the use of ground water from the stressed Upper Floridan aquifer. Although these options or variations of them could be implemented in all three Planning Areas, they are most applicable in the SWUCA. Therefore, to avoid duplication, the options are presented only in the PR/MRWSA Planning Area portion of this chapter.

Part C. Water Supply Development Options - NTB Planning Area

Section 1. NTB Planning Area - Surface Water/Storm Water Options

The Hillsborough River/Tampa Bypass Canal system has been an important source of water supply to the City of Tampa. Over the past several years, Tampa Bay Water has also begun to utilize this system to satisfy regional water demands. With the completion of the science necessary to determine minimum flows, it appears that additional water may be available from the system, especially at higher flows. Since 2003 the Alafia River has been used for water supply. Based on evaluation of river flows, there may be additional water supply that could be developed from the river during high flow periods. Since the completion of the 2001 RWSP, FPL renewed their water use permit for the Little Manatee River. The new withdrawal schedule resulted in very little additional water being available from this source. The Anclote and Pithlachascotte Rivers remain potential sources of water that could be used to augment impacted wetlands on the Starkey wellfield and possibly result in less reduction in ground-water withdrawals than previously anticipated. Table 6-1 is a list of potential surface water/storm water options in the NTB Planning Area.

NTB Planning Area Surface Water/Storm Water Option #1 – Downstream Enhancements using excess surface water flows from the Alafia and Hillsborough Rivers and the Tampa Bypass Canal.

Entity Responsible for Implementation: Tampa Bay Water

This option consists of the phased enhancement of Tampa Bay Water's Enhanced Surface Water System (ESWS). This option includes construction of pumps, storage, and treatment facilities needed to capture excess surface water flows from the Tampa Bypass Canal (TBC), Hillsborough River and/or the Alafia River. Based on the potential for additional water being available from the TBC, Hillsborough River and/or Alafia River, this project would follow flow-based withdrawal schedules for each stream to capture higher flows within the framework of what is harvested by the original Tampa Bay Water ESWS. The Downstream Enhancements project would include the expansion of pumping capacity at the TBC Pump Station, expansion of the treatment capacity of Tampa Bay Water's surface water treatment plant (SWTP) and construction of a second regional reservoir in a phased approach. Currently, Tampa Bay Water's system has the capacity to deliver 66 mgd to the surface water treatment plant and the capacity to deliver approximately 120 mgd to the reservoir. Pumping capacity at the TBC and Alafia River is approximately 180 mgd combined, dependant on ESWS operating conditions. Expanding the SWTP to 104 mgd and increasing the pumping capacity at the TBC Pump Station would provide an additional 130 mgd of raw water pumping capacity delivering additional water to storage in a second reservoir with an estimated 15 billion gallon storage capacity. For planning purposes, it is assumed the reservoir would be constructed on District property adjacent to the existing reservoir and that Tampa Bay Water would be granted an easement for the land. Based on a goal of bringing on supply concurrent with demand, development of the components of this option could be phased. The current project phasing conceptualization is summarized below to identify relevant components for which additional developmental analysis of options/yields would be required.

Phase	Components	Potential Water Supply Yield (mgd)
A	Higher flow WUP from the Hillsborough River and TBC, Reservoir Pump Station, Additional Regional HSPS, Surface WTP Expansion from 66 to 83 mgd, TBC Pump Station Improvements, Repump/Booster Station Improvements	15
B	Higher Flow WUP from the Hillsborough River and TBC, Surface WTP Expansion from 83 to 104 mgd	10
C	Higher Flow WUP from the Alafia River, New Reservoir (including wetlands mitigation and interconnecting piping)	13
D	Downstream Augmentation	10

Project components and costs are based on preliminary cost estimates by Tampa Bay Water:

Quantity Available (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O&M
25 (Phase A & B)	$208,334,000	$8,333,360	$2.21	$5,500,000
10 - 23 (Phase C & D)	TBD	TBD	TBD	TBD

TBD – to be determined.

Issues:

- The quantities of water available for this option are not anticipated to conflict with minimum flows and would require an expansion of the current permitted withdrawal quantities. Additional analysis would be required to ensure increased withdrawals would not cause harm to the environment. Results of the environmental analysis would guide the final sizing of project components and permitting.
- Tampa Bay Water is continuing to investigate the feasibility of Phases C and D. More specific cost information will become available as the analysis is completed.
- It is anticipated the project will provide up to 48 mgd of new water supply after completion of all phases.
- Total estimated cost for the Downstream Enhancement project is $680,508,207. This includes land acquisition, permitting, design, and construction associated with the system components described above and the planned system-interconnect projects.

Table 6-1. NTB Planning Area - List of Surface Water/Storm Water Options.

Option Water Body and Entity Responsible for Implementation	User Group	Avg Annual Yield (mgd)	Intake Capacity (mgd)	Capital Cost ($1,000/mgd)	Unit Cost ($1,000 gal)	Annual O&M ($1,000)	Storage Method/Level of Treatment	Distribution Method
Pasco County								
Anclote River Tampa Bay Water	Ag., Rec	2.5	10	12,921	3.95	933	ASR / 2	Supplement existing reuse system
Anclote River (SEEP) Tampa Bay Water	PS, Env	8	10	1,250	0.55	905	None / 3	Direct piping to impacted wetlands on Starkey wellfield to allow for increased gw withdrawals
Anclote River Tampa Bay Water	PS, Env	2.5	10	7,463	3.79	1,909	ASR / 1	Aquifer recharge or piped to impacted wetlands on Starkey wellfield
Pithlachascotte River Tampa Bay Water	PS, Env	0.5	4.3	20,220	5.60	185	ASR / 2	Piped to Starkey or N Pasco wellfields to rehydrate wetlands – increase yields
Cypress Creek Tampa Bay Water	PS	4.3	26	10,753	3.89	2,270	Off-stream Reservoir / 2	Aquifer recharge
Zephyr Creek Tampa Bay Water City of Zephyrhills	Rec	0.2	2	19,696	5.42	63	Stormwater detention & ASR / 2	Piped to reuse line for golf course irrigation
Pinellas County								
Lake Seminole Pinellas County Utilities	Urban reuse	1	9	4,581	1.04	231	Off-stream, ASR / 1	Distributed to reuse system
Lake Tarpon Pinellas County Utilities	Urban reuse	3.7	37	11,381	3.98	1,888	ASR / 2	Distributed to reuse system, or salinity barrier, or potable use
Hillsborough County								
Storm Water – Onsite Water Supply Local Governments	Rec	0.41	1.5	3,390	3.04	44,895	Stormwater Detention	Stormwater from a large pond is transported through a 10" line to adjacent golf course for irrigation

Table 6-1. NTB Planning Area - List of Surface Water/Storm Water Options (Continued).

Option Water Body and Entity Responsible for Implementation	User Group	Avg Annual Yield (mgd)	Intake Capacity (mgd)	Capital Cost ($1,000/mgd)	Unit Cost ($/1,000 gal)	Annual O&M ($1,000)	Storage Method/Level of Treatment	Distribution Method
S. Prong of Alafia River Tampa Bay Water	Ag, Ind	3.3	74	1,422	4.37	5,045	Phosphate settling pits, ASR / 3	Injected into non-potable aquifer for aquifer recharge
Bullfrog Creek Tampa Bay Water	PS, Ind, Ag	2.4	25	17,700	6.24	2,100	Off-stream reservoir, ASR / 3	Piped to adjacent urban, industrial, or agricultural users
Channel A Hillsborough County Water Resource Services Tampa Bay Water	Urban reuse	1	9	16,400	5.30	580	Off-stream reservoir, ASR / 3	Piped to Hillsborough County's reuse system

1.0 NTB Planning Area – System Interconnect/Improvement Options

The system interconnect/improvement options are critical components of Tampa Bay Water's regional water supply distribution system. These options involve the construction of pipelines and booster pumping stations. Implementation of these options will further regionalize the potable water supply system by providing transmission of water from areas of supply to areas of demand, which will increase the rotational reserve capabilities and providing redundancy of water supplies during emergency conditions. The system interconnect options are listed in Table 6-2. System interconnect projects that are under development are listed in Chapter 8.

Table 6-2. NTB Planning Area - List of System Interconnect/Improvement Options.

Option	Entity Responsible for Implementation	Capital Cost	Description
Morris Bridge Booster Pumping Station	Tampa Bay Water	$2,000,000	This project will allow TBW to maintain the original design capacity of this booster pumping station. Improvements to the pumps at this booster pumping station are required due to the higher regional system pressures that are anticipated as more alternative supply source capacity is implemented in the southeastern portion of TBW's system.
Cypress Creek Pumping Station Improvements	Tampa Bay Water	$2,000,000	This project will increase the pumping capacity of the Cypress Creek Pumping Station. Additional pumps will be required at this facility to handle the increasing demands and supplies of the regional system.

Section 2. NTB Planning Area - Reclaimed Water Options

In the 2000 base year, there were 52 wastewater treatment facilities (WWTF) in Hillsborough, Pasco and Pinellas counties collectively producing 217 mgd of reclaimed water (Table 6-3). Of that amount 75 mgd (35 percent) was beneficially used to offset 45 mgd (60 percent) of traditional water demands.

Table 6-3. 2000 Actual versus 2025 Potential Reclaimed Use and Offset in the NTB Planning Area.

	WWTPs	2000	2000 Use		2000 Offset		2025	2025 Use		2025 Offset	
County	(#)	Plant Flow	mgd	%	mgd	%	Plant Flow	mgd	%	mgd	%
Hillsborough	18.0	93.0	20.7	22%	12.4	60%	140.8	105.6	75%	79.2	75%
Pasco	17.0	18.0	7.6	42%	4.6	60%	32.5	24.3	75%	18.3	75%
Pinellas	17.0	106.1	46.7	44%	28.0	60%	112.5	84.4	75%	63.3	75%
Total	**52.0**	**217.1**	**75.0**	**35%**	**45.0**	**60%**	**285.9**	**214.3**	**75%**	**160.8**	**75%**

Therefore, only about one-third of the available reclaimed water produced in the region made its way to customers who could use it for irrigation, cooling or other appropriate purposes.

The region is predominantly urban, but some isolated agricultural holdings exist in eastern Hillsborough and Pasco counties. Wetlands and abandoned mining operations provide unique opportunities for using reclaimed water to restore natural systems and storing wet-weather reclaimed water flows for use in drier periods. The coastal areas of Hillsborough and Pinellas counties may also be ideal for seasonal reclaimed water storage, using ASR technology. The reclaimed water systems in the region are generally mature and, as such, the representative project options are dominated by interconnections, efficiency studies and seasonal storage project concepts.

The District's reclaimed water goals are ambitious, but achievable considering the development of increasingly sophisticated technologies and the growing demand for reclaimed water. By 2025, it is expected that 75 percent of reclaimed water available in the NTB Planning Area can be utilized. It is further expected that efficiency by the end user will increase from 60 percent to 75 percent through a combination of measures such as metering and volume-based rates and education. Using this formula, by 2025 it is estimated that 244 (75 percent) of the 286 mgd of reclaimed water being produced will be used for beneficial purposes, and 161 mgd (75 percent) of traditional water supplies will be offset as a result. Table 6-3 illustrates the reclaimed water potential. Following the table are evaluation summaries for representative projects that could help achieve the potential utilization and offset in the region. Table 6-4 is the list of additional reclaimed water options that could be implemented in the NTB Planning Area.

NTB Planning Area Reclaimed Water Option #1 - Plant City to Zephyrhills Interconnect

Entity Responsible for Implementation: City of Zephyrhills Utilities

This option is estimated to include the design and construction of 48,000 feet of 12-inch reclaimed water transmission line, an automated pump station, a two-million gallon storage tank, and a man-made wetland. This option would extend the City of Plant City's reclaimed water system along Hwy 39 to interconnect with the City of Zephyrhills' reuse system. The option would serve customers in and around Zephyrhills, in southeast Pasco County, and include a site that would be developed into a man-made wetland for natural system restoration in the upper Hillsborough River watershed. This option could provide approximately 2.0 mgd of reclaimed water from Plant City's advanced wastewater treatment (AWT) facility to restore/create a wetland and also to offset future withdrawals for agricultural, commercial, residential, and recreational customers. Total project cost is estimated to be $6.46 million for an offset of 1.2 mgd. The implementation timeframe is expected to be between 2011 and 2025.

Quantity Produced (mgd)	Capital Cost	Cost/mgd Offset	Cost/1,000 Gallons Offset	O&M/1,000 Gallons Offset
2.0 (1.2*)	$6,460,000	$5,383,000	$1.06	$0.50

*Beneficial offset (see Table 6-4 footnotes)

Issues:

- Competition for the reclaimed water resource by other alternative projects could affect the viability of the project.
- Availability of suitable land for wetland restoration/creation could prove difficult in this fast developing area.

NTB Planning Area Reclaimed Water Option #2 - Pinellas County Reuse Efficiency Study

Entity Responsible for Implementation: Pinellas County Utilities

An efficiency study of existing reuse systems in Pinellas County is needed to determine ways to maximize the efficient usage of reclaimed water and increase the benefit of offsetting the use of potable water for non-potable needs. When many of the existing reclaimed water options were developed in Pinellas County, the primary focus was maximizing effluent disposal, with potable water offsets considered to be ancillary benefits. In order to encourage connection to the reclaimed water systems, incentives were offered, such as free use of the water or a nominal flat monthly charge and no restrictions on irrigation frequency. These incentives promote an overuse of the reclaimed water supply resources. It has been demonstrated that irrigation use can more than double when customers switch from using public potable water supplies to reclaimed water. Because of these inefficiencies, many utilities are limited in their ability to serve irrigation demands in their service areas with reclaimed water. By promoting and implementing methods for more efficient use of reclaimed water, utilities could potentially serve more customers and increase the potable water offset.

This option will involve an evaluation of existing reclaimed water systems within the county, including the review of operations and policies. Measures will be proposed that can maximize efficiency, making more reclaimed water available for other users. Efficiency measures that may be examined include, but are not limited to: reclaimed water conservation rate structures, addition of metering of reclaimed water usage, water use restrictions, telemetry to control reclaimed water availability, and education programs. Estimates will be made on the quantity of additional reclaimed water that would be available for increased reuse if the efficiency measures were implemented.

The project timeframe is between 2011 and 2025. Approximately 112 mgd of reclaimed water is projected to be produced by wastewater treatment facilities within Pinellas County by 2025. Based on existing and planned projects, approximately 64 percent, or 72 mgd will be utilized for reuse by 2010. Using current reuse practices, an efficiency rate (offset of potable quality water) of only 60 percent, or 43 mgd, would be achieved. By increasing efficiency, the efficiency could potentially be increased to 75 percent, which would result in an additional 9 mgd offset of potable quality water.

Quantity Produced (mgd)	Capital Cost	Cost/mgd Offset	Cost/1,000 Gallons Offset	O&M/1,000 Gallons Offset
N/A (9*)	$100,000	$N/A	$N/A	$N/A

*Beneficial offset (see Table 6-4 footnotes)

Issues:

- In the short term, increased efficiency could lead to temporary increases in reclaimed water disposals. This temporary situation could result from the need to develop infrastructure required to bring the new customers on-line. Disposal may occur during the planning, design and construction phases.

NTB Planning Area Reclaimed Water Option #3 - Pinellas Southcross Interconnect to the Largo/Clearwater/Pasco Interconnect

Entity Responsible for Implementation: Pinellas County Utilities

This project would be an expansion of an ongoing regional reuse project that involves connecting the reuse systems of the cities of Clearwater and Largo, and Pasco County in order to maximize the use of surplus reclaimed water flows. The ongoing project will develop a reclaimed water ASR system in Clearwater, and interconnect it with the City of Largo to store surplus flows. In addition, the existing project is expected to involve the construction of a reuse transmission line to Pasco County's reuse system where surplus flows may be sent for use, storage and/or natural system restoration.

The Pinellas Southcross addition to this project is estimated to include the design and construction of 19,000 feet of a 16-inch reclaimed water transmission line ($2.13 million) from Pinellas County's Southcross AWT facility to the existing project at Largo. The project also includes a portion of the costs ($3.07 million) upsizing (to 30-inch diameter) of a planned main line to Pasco County, required to carry the additional flows north. The project would provide an additional 4.5 mgd of surplus reclaimed water from the Southcross AWT facility to serve customers in north Pinellas and Pasco counties, and to be stored and/or used for natural system restoration in Pasco County. The project expansion would offset an additional estimated 2.7 mgd. Total expansion project cost is preliminarily estimated to be $5.2 million. The implementation timeframe is expected to be between 2011 and 2025.

Quantity Produced (mgd)	Capital Cost	Cost/mgd Offset	Cost/1,000 Gallons Offset	O&M/1,000 Gallons Offset
4.50 (2.70*)	$5,200,000	$1,926,000	$0.38	$0.50

*Beneficial offset (see Table 6-4 footnotes)

Issues:

- Competition for the reclaimed water resource by other alternative projects could affect the viability of the project.
- The project would necessitate the development of a master agreement to coordinate funding, ownership, and O&M.

NTB Planning Area Reclaimed Water Option #4 - Pinellas Reclaimed Water Supplemental Supply From Lake Tarpon

Entity Responsible for Implementation: Pinellas County Utilities

This option involves the design and construction of appurtenances necessary to supplement the county's North Reclaimed Water System with water from Lake Tarpon to meet peak dry season reclaimed water demand. The goal of this option is to ensure sufficient dry season supply of reclaimed water and allow for system expansion as outlined in the Pinellas North County Reclaimed Water Master Plan. The option is contingent upon the favorable determination of an ongoing feasibility project, which includes an evaluation of the location, timing, and quantities available for withdrawal from the lake. The option would include design and permitting and construction of an intake structure, pumps, filtration and a high-level disinfection treatment system that would be necessary to meet FDEP's reclaimed water requirements. It is anticipated that the intake structure and pumps would be designed to supplement the reclaimed water system by up to three mgd during a 60-day period each year (0.5 mgd annualized supply). The District estimates that additional connections of 1,000 to 2,000 residential reclaimed water customers could be realized if the option is constructed. The project supply of 0.5 mgd would offset an estimated 0.3 mgd of potable irrigation in North Pinellas County. The project cost is preliminarily estimated to be $1 million. The feasibility study is expected to begin in 2006, and the option implementation timeframe is expected to be between 2010 and 2015.

Quantity Produced (mgd)	Capital Cost	Cost/mgd Offset	Cost/1,000 Gallons Offset	O&M/1,000 Gallons Offset
0.50 (0.30*)	$1,000,000	$3,333,000	$0.66	$0.50

*Beneficial offset (see Table 6-4 footnotes)

Issues:

- The use of Lake Tarpon water may result in lake level issues that could impact lakefront property owners.
- The project would necessitate the development of a District/County agreement to coordinate flows, timing, and other conditions of withdrawal.
- The option is contingent upon the favorable determination of an ongoing feasibility project.

NTB Planning Area Reclaimed Water Option #5 - South Hillsborough County ASR Wells /Recharge/Saltwater Intrusion Barrier

Entity Responsible for Implementation: Hillsborough County Water Resource Services

This option would provide reclaimed water storage, ground-water recharge and a saltwater intrusion barrier along the eastern shore of Tampa Bay in Hillsborough County. Reclaimed water could be injected into the UFA from Hillsborough County's Valrico, Falkenburg, and South County AWT facilities. Hillsborough County's SHARP project may make additional reclaimed water available for ASR as described in this option. Injection could occur during the wet season when demand for reclaimed water is relatively low. Excess water could be recharged into the aquifer using approximately 20 ASR wells. The county is investigating the subsurface storage of reclaimed water for recovery during periods of decreased supply and/or increased demand for its South and Central reclaimed water system.

Use of reclaimed water will allow public potable water savings and ground-water pumping offsets. From the projected annualized 10 mgd of reclaimed water supply, an annualized offset of approximately 10 mgd could be realized with implementation of the project. Option phases will include: 1) construction of initial ASR wells in the Big Bend and Alafia River areas, 2) ASR expansion, 3) interconnection of pipelines, and 4) construction of conveyance facilities from wet-weather sources. The first phase could involve construction and testing of ASR wells at the South County Dechlorination Facility (existing surface water outfall) in the Big Bend area, and in the Alafia River area in the vicinity of Cargill Park. The second phase could involve expansion of the ASR system to include 15 more wells (one-to-two mgd each) so that a total of 20 ASR wells constructed at the three sites. The project cost is preliminarily estimated to be $40.3 million for an annualized supply of 10 mgd and an annualized offset/recharge of 10 mgd. The implementation timeframe is between 2011 and 2025.

Quantity Produced (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	O&M/1,000 Gallons Offset
10 (10*)	$40,300,000	$4,300,000	$0.79	$0.29

*Beneficial offset

Issues:

- Competition for the reclaimed water by other projects could affect the viability of the project.

Table 6-4. NTB Planning Area - List of Reclaimed Water Options.

Option Name and Entity Responsible for Implementation	County	Type	Supply	Offset	Capital Cost	Cost/Ben	O&M/Offset
N. Hills./Pasco Intercon., Hills. Co. and Pasco Co.	Hills/Pasco	Intercon.	*1.50*	*0.90*	*4,850,000*	*$1.06*	*$0.50*
Reuse Expan Country Meadows WWTP 2011-2025, CW Utilities	Hills.	Sys. Expan.	*0.11*	*0.07*	*355,000*	*$1.06*	*$0.47*
Reuse Expan MacDill AFB WWTP 2011-2025, Dept. of Defense	Hills.	Sys. Expan.	*0.33*	*0.20*	*1,066,000*	*$1.06*	*$0.50*
Reuse Expan Pebble Creek WWTP 2011-2025, Pebble Cr. Util.	Hills.	Sys. Expan.	*0.17*	*0.10*	*549,000*	*$1.06*	*$0.51*
Reuse Expan Rice Creek 2011-2025, Rice Cr. Util.	Hills.	Sys. Expan NSR	*0.04*	*0.04*	*129,000*	*$0.64*	*$0.30*
Reuse Expan Windemere 2011-2025, Scarecrow Util.	Hills.	Sys. Expan	*0.20*	*0.12*	*646,000*	*$1.06*	*$0.50*
N.W. Hills. ASR Wells Expansion, Hills. Co.	Hills.	ASR	*1.00*	*0.80*	*4,300,000*	*$1.06*	*$0.36*
S. Hills. ASR Wells/Recharge/Saltwater Intru. Bar., Hills Co.	Hills.	ASR, Rech., SWB	*10.00*	*10.00*	*40,300,000*	*$0.79*	*$0.29*
Horizontal Well Reclaimed Sys. Aug., Hills. Co	Hills.	Aug.	2.00	1.20	16,672,110	*$2.74*	*$0.48*
N.W. Hills. Wetland, TBW and Hills. Co.	Hills.	NAT	*1.00*	*1.00*	*3,230,000*	*$0.64*	*$0.29*
C. Hills./Temple Terrace Intercon., Temple Terrace	Hills.	Intercon.	*1.00*	*0.60*	*3,230,000*	*$1.06*	*$0.50*
C. Hills/Plant City Intercon., Plant City	Hills.	Intercon.	*1.50*	*0.90*	*4,850,000*	*$1.06*	*$0.50*
Plant City Wetland, Plant City	Hills.	Rehyd./Wetland/NSR	*1.50*	*1.50*	*4,850,000*	*$0.64*	*$0.30*
Downstream Augmentation of Alafia River, TBW	Hills.	Streamflow	15.50	15.50	100,000,000	$1.27	*$0.30*
Mosaic Reclaimed Exchange, TBW	Hills.	Exchange	1.00	1.00	1,150,000	$0.23	*$0.30*
Reuse Expan in Hills. Co.-Cent. Co. Sys. 2011-2025, Hills. Co.	Hills.	Sys. Expan.	*1.75*	*1.05*	*5,658,000*	*$1.06*	*$0.48*
Reuse Expan in Hills. Co.-NW Co. Sys. 2011-2025, Hills Co.	Hills.	Sys. Expan.	*7.78*	*4.67*	*25,130,000*	*$1.06*	*$0.48*
Reuse Expan in Hills. Co.-S. Co. Sys. 2011-2025, Hills. Co.	Hills.	Sys. Expan.	*1.10*	*0.66*	*3,550,000*	*$1.06*	*$0.48*
Plant City to Zephyrhills Interconnect , City of Zephyrhills	Hills/Pasco	Intercon.	*2.00*	*1.20*	*6,460,000*	*$1.06*	*$0.50*
Reuse Expan in Plant City WWTP 2011-2025, Plant City	Hills.	Sys. Expan.	*4.31*	*2.59*	*13,920,000*	*$1.06*	*$0.50*
Reuse Expan in Tampa/Curren WWTP 2011-2025, Tampa	Hills.	Sys. Expan.	*26.98*	*16.19*	*87,150,000*	*$1.06*	*$0.50*
N.W. Hills. Telemetry, Hills Co.	Hills.	Sys./SCADA	*TBD*	*TBD*	*500,000*	*TBD*	*TBD*
N.W. Hills Trans. Expan. I, Hills. Co.	Hills.	Trans.	1.00	0.60	3,230,000	$1.06	*$0.48*

Table 6-4. NTB Planning Area - List of Reclaimed Water Options (Continued).

Option Name and Entity Responsible for Implementation	County	Type	Supply	Offset	Capital Cost	Cost/Ben	O&M/Offset
N.W. Hills Trans. Expan. II, Hills. Co.	Hills.	Trans.	1.00	0.60	3,230,000	$1.06	*$0.48*
N.W. Hills. Trans. Expan. III, Hills. Co.	Hills.	Trans.	1.00	0.60	3,230,000	$1.06	*$0.48*
Plant City Walden Lakes, Plant City	Hills.	Trans.	1.00	0.60	3,230,000	$1.06	*$0.50*
Plant City Hardee Board Trans., Plant City	Hills.	Trans.	0.35	0.35	1,130,500	$0.64	*$0.30*
Plant City Trans. Expan. I, Plant City	Hills.	Trans.	1.00	0.60	3,230,000	$1.00	*$0.50*
Pasco Co. Reuse Efficiency Study, Pasco Co.	Pasco	Efficiency	TBD	TBD	50,000	TBD	*TBD*
Reuse Expan in Dade City WWTP 2011-2025, Dade City	Pasco	Sys. Expan	0.13	0.08	420,000	$1.06	*$0.49*
Reuse Expan in Forest Lakes Estates WWTP 2011-2025, Labrador Util.	Pasco	Sys. Expan	*0.14*	*0.08*	*450,000*	*$1.06*	*$0.53*
Reuse Expan in Seven Springs (Aloha) WWTP 2011-2025, Aloha Util.	Pasco	Sys. Expan	*1.20*	*0.72*	*3,880,000*	*$1.06*	*$0.50*
Reuse Expan in Jasmine Lakes WWTP 2011-2025, Jasmine Lakes Util.	Pasco	Sys. Expan	*0.20*	*0.12*	*650,000*	*$1.06*	*$0.50*
Reuse Expan in Zephyrhills WWTP 2011-2025, City of Zephyrhills	Pasco	Sys. Expan	*1.75*	*1.05*	*5,650,000*	*$1.06*	*$0.50*
Reuse Expan in Travelers Rest WWTP 2011-2025, Travelers Rest Resort	Pasco	Sys. Expan	*0.03*	*0.02*	*97,000*	*$1.06*	*$0.45*
Reuse Expan in Pasco/NPR System 2011-2025, Pasco Co. and City of New Port Richey	Pasco	Sys. Expan	*7.30*	*4.38*	*23,580,000*	*$1.06*	*$0.20*
Reuse Expan in Palm Terrace Gardens 2011-2025, Florida Water Services	Pasco	Sys. Expan.	*0.15*	*0.09*	*485,000*	*$1.06*	*$0.50*
Pasco County Wet Weather Reclaimed Water Reservoirs II (Future Expansion of H305), Pasco Co.	Pasco	Storage/NSR	*6.00*	*3.60*	*19,380,000*	*$1.06*	*$0.50*
Pinellas Inter to Largo/Clearwater/Pasco Intercon., Pinellas Co.	Pinellas	Interconnect	*4.50*	*2.70*	*5,200,000*	*$0.38*	*$0.50*
Pinellas County Efficiency Study, Pinellas Co.	Pinellas	Efficiency	*TBD*	*TBD*	*50,000*	*TBD*	*TBD*
Reuse Expan in Belleair WWTP 2011-2025, Pinellas Co.	Pinellas	Sys. Expan.	*0.28*	*0.17*	*904,000*	*$1.06*	*$0.49*
Reuse Expan in Clearwater 2011-2025, City of Clearwater	Pinellas	Sys. Expan.	*8.71*	*5.23*	*28,133,000*	*$1.06*	*$0.50*
Reuse Expan in Dunedin 2011-2025, City of Dunedin	Pinellas	Sys. Expan.	*1.08*	*0.65*	*3,488,000*	*$1.06*	*$0.48*

Table 6-4. NTB Planning Area - List of Reclaimed Water Options (Continued).

Option Name and Entity Responsible for Implementation	County	Type	Supply	Offset	Capital Cost	Cost/Ben	O&M/Offset
Reuse Expan in Largo 2011-2025, City of Largo	Pinellas	Sys. Expan.	*5.41*	*3.24*	*17,474,000*	*$1.06*	*$0.88*
Reuse Expan in Mid-County WWTP 2011-2025, Mid-County Service, Inc.	Pinellas	Sys. Expan.	*0.86*	*0.52*	*2,649,000*	*$1.06*	*$0.50*
Reuse Expan in On Top of the World WWTP 2011-2025, Sidney Colen and Assoc.	Pinellas	Sys. Expan.	*0.01*	*0.01*	*32,000*	*$1.06*	*$0.30*
Reuse Expan in Pinellas Co. North System 2011-2025, Pinellas Co.	Pinellas	Sys. Expan.	*0.01*	*0.01*	*323,000*	*$1.06*	*$0.30*
Reuse Expan in Pinellas Co. South System 2011-2025, Pinellas Co.	Pinellas	Sys. Expan.	*1.96*	*1.18*	*6,330,000*	*$1.06*	*$0.50*
Reuse Expan in St. Petersburg System 2011-2025, City of St. Petersburg	Pinellas	Sys. Expan.	*21.08*	*12.65*	*68,090,000*	*$1.06*	*$0.50*
Reuse Expan in Tarpon Springs System 2011-2025, City of Tarpon Springs	Pinellas	Sys. Expan	*0.25*	*0.15*	*808,000*	*1.06*	*$0.50*
Pinellas ASR Wells, Pinellas Co.	Pinellas	ASR	*4.00*	*2.40*	*16,300,000*	*$1.34*	*$0.50*
St. Petersburg Reclaimed ASR, City of St. Petersburg	Pinellas	ASR	*5.00*	*3.00*	*20,300,000*	*$1.33*	*$0.50*
Pinellas Reclaimed Supplemental Supply with Lake Tarpon, Pinellas Co.	Pinellas	Supplemental Supply/Aug.	*0.50*	*0.30*	*1,000,000*	*$0.66*	*$0.50*
Pinellas Co. Reclaimed Efficiency, Pinellas Co.	Pinellas	Efficiency	*TBD*	*TBD*	*100,000*	*TBD*	*TBD*

The use of Italics denotes SWFWMD estimations. Not all projects have estimated costs. Some options are contingent upon others.
MGD Offset = (if estimated) Annualized Supply: 1. x 75% for Ag, & R/A/C, 2. x 100% for I/C, NSR, & PG. 3. x 60% for Variety and 4. for RES is number of customers X 300 gpd.
ASR & Intrusion Barrier Costs = (if estimated) Annualized Supply x 4 x $1,000,000 + $300,000.
Total Cost = (if estimated) = Annualized Supply x $3.23/Gallon (calc. of 139 active FY2000-2005 District funded reuse projects @ $422.4 million for 130.6 mgd reuse supply).
Preliminary Cost Per 1000 Gallons Offset = Project Cost amortized over 30 years @ a 6% interest rate.
System Expansion Supply 2011-2025 = Projected 2025 WWTP Flow minus 2010 Reuse (existing & planned reuse projects).
Preliminary O&M cost estimates were calculated using individual utility O&M data where available, and a median O&M cost if no specific data was available.
Preliminary O&M costs per 1000 gallons "offset" were calculated utilizing costs per 1000 gallons "supplied" data normalized for individual project efficiency.

- The viability of ASRs in the area will affect the viability of the project.
- Permitting may be an issue due to the proximity of other withdrawals in the area.
- The issue of elevated levels of arsenic in water recovered from ASR systems must be considered.

Section 3. NTB Planning Area - Seawater Desalination

NTB Planning Area Seawater Desalination Option #1 – Big Bend Expansion

Entity Responsible for Implementation: Tampa Bay Water

As noted previously, the existing 25 mgd desalination plant is currently being remediated to address issues with the pre-filtration system. Once the facility is repaired and has demonstrated a history of operation within the original design parameters, an option to expand the capacity of the facility by 10 mgd could be considered. The facility was designed and constructed to facilitate the implementation of such an expansion.

Prior to the existing plant being shut down, an extensive monitoring program in Tampa Bay indicated that there were no adverse impacts to the environment from concentrate discharge. A modification to the FDEP Industrial Wastewater Facility Permit would be required in order to accommodate the additional concentrate discharge from the expansion

Quantity Produced (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O&M
10	$24,337,623	$2,433,762	$3.19	$5,493,431

Issues:

- The effects of increasing the amount of waste concentrate from the Big Bend facility would require additional investigation.

NTB Planning Area - Seawater Desalination Option #2 - Anclote Power Plant

Entity Responsible for Implementation: Tampa Bay Water

This option would develop a facility that could produce 25 mgd of potable water for use in TBW's distribution system. The facility would be co-located with the existing Anclote Power Plant, which is located in southwestern Pasco County and owned and operated by Florida Power Corporation. This site has been the subject of previous seawater desalination evaluations for TBW and offers several advantages such as an existing source of pre-filtered cooling water for the power plant that can be used as intake water and a source of water for dilution of the discharge concentrate stream. A 9.7-mile pipeline would be constructed to deliver finished water from the plant to the S.K. Keller pumping station which would provide the connection to the TBW regional distribution system and blend the water for taste and corrosion control.

A seawater desalination facility at this site would obtain feed water from the power plant’s intake canal and release waster concentrate into its discharge canal. The waste concentrate from the desalination process would be diluted with 450 mgd to 2,900 mgd of cooling water from the power plant. Use of existing infrastructure would allow for a modification of the existing FDEP-Industrial Wastewater discharge permit or establish a new FDEP-Industrial Wastewater discharge permit for the desalination process. Additionally, the diluted concentrate would be discharged within Class III waters of the State and outside of the Pinellas County Aquatic Preserve OFW, potentially simplifying the waste concentrate discharge permitting process.

Quantity Produced (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O&M
25	$182,500,000	$7,300,000	$3.19	$10,180,000

Issues:

- Additional research on the effects of discharging waste concentrate at this site would be required by the FDEP for the NPDES permit application, prior to implementation. Though the waste concentrate will be discharged into Class III waters, an Outstanding Florida Waters body and an aquatic preserve exist nearby.

Section 4. NTB Planning Area - Brackish Ground Water

In the 2001 RWSP, three brackish ground-water supply options were identified in the NTB Planning Area. These projects included the Pinellas Park "P-3A", Clearwater "C-2" and the City of Oldsmar brackish ground-water option. Since publication of the 2001 RWSP, the city of Clearwater has completed construction of the Clearwater "C2" option and both TBW and the City of Oldsmar have completed feasibility analyses on locations similar to those described in the plan.

NTB Planning Area Brackish Ground-Water Option #1 – Mid-Pinellas Brackish Water Desalination Project

Entity Responsible for Implementation: Tampa Bay Water

This project would develop new brackish ground water wells from the Upper Floridan aquifer in central Pinellas County. The wells would individually pump an average of approximately 0.5 mgd. The wells would be sited to minimize localized aquifer drawdown impacts. Water from the brackish supply wells would be conveyed to a reverse osmosis treatment facility for desalination, stabilization, and disinfection. The current developmental plan by Tampa Bay Water locates the treatment facility at Pinellas County’s Logan Pump Station with delivery of the potable supply into the transmission / distribution system at this point. The project is expected to yield approximately 4.4 to 5 mgd of potable supply, depending on the number of wells developed. Currently, between 14 and 17 wells are proposed for development. Disposal of the reverse osmosis concentrate would be by deep well injection.

All project components and costs are based on estimates by Tampa Bay Water, who has done an extensive feasibility study of the concept. Some costs were modified to maintain consistency among all projects within the RWSP.

Quantity Available (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O&M
5	$42,030,000	$8,406,000	$3.46	$2,832,000

Issues:

- Local residents' concerns relating to sinkhole formation and intrusion of saltwater into shallow aquifers would need to be addressed.
- Land acquisition for well sites would be challenging, as real estate prices in the area have risen significantly, increasing this cost component.
- The Bridgeway Acres Landfill has been identified as a potential concern related to future permitting conditions of change in head differential around the landfill, which could impact well pumping rates.
- Mitigation in the project area could involve up to 1,747 private wells.
- Raw water pipeline along Starkey Road needs to be coordinated with the planned road widening project.

Section 5. NTB Planning Area - Fresh Ground Water Options

Future requests for fresh ground water will be evaluated based on projected impacts to established MFL water bodies. In the vicinity of TBW's central well field system, it is unlikely additional ground water will be developed until a full evaluation of well field cutbacks and water level recovery in the region is made.

NTB Planning Area Non-Fresh Ground-Water Option #1 – Crystals International Water Supply

Entity Responsible for Implementation: Tampa Bay Water

This project involves Tampa Bay Water exploring the shared use of water supply with Crystals International (a MasterTaste company), a Plant City manufacturer of vacuum-dehydrated fruit and vegetable products, and with other permitted water supply users in the project area. The possibility of a surplus water supply agreement for an additional 1 to 1.5 mgd with Plant City is also being discussed. Crystals has permits to use 3 to 3.5 mgd of groundwater in its process. Some, but not all, of that capacity is used in its vacuum-drying process and then discharged into a ditch adjacent to the property. It is possible to capture and treat this discharged water, as well as any surplus permitted capacity available when Crystals is not in full operation, and use it for the region's drinking water supply. Overall, this project could provide up to 5 mgd of new drinking water supply.

Quantity Available (mgd)	Capital Cost	Cost/mgd	Cost/1000 Gallons	Annual O&M
5	$24,516,000	$4,903,000	$1.80	$1,202,000

Section 6. NTB Planning Area - Non-Agricultural Water Conservation

NTB Planning Area Non-Agricultural Water Conservation Option #1 - Plumbing Retrofit Kit Give-Aways

Entity Responsible for Implementation: Water Supply Utilities

The purpose of this option is to achieve indoor water conservation through installation of plumbing retrofit kits containing equipment and instructions to retrofit high-volume plumbing fixtures. This option is appropriate for implementation in the domestic self-supply category, and multi-family and single family residential uses in the public supply category. Typically, retrofit kits contain easy-to-install low flow showerheads, faucet aerators, and toilet tank retrofit devices.

Costs are presented in first year planning period dollars. The cost to the administrator would be $55,000 per year including overhead while the program is being implemented. The cost to purchase and deliver the kits through a properly publicized neighborhood canvas program is estimated to be about $25 per household (Metropolitan, 1991), including about $10 for the retrofit kit and $15 for labor, including kit delivery and installation. The kit cost of $10 is considered to be average; it should be noted that by purchasing higher quality (more expensive) kit contents, device retention rates might increase, thereby increase program effectiveness. Annual costs incurred over the program period are assumed to be in first year planning dollars. Therefore, costs incurred beyond the first year are brought back to first year planning dollars by applying a present worth factor. The default interest rate used for the present worth analysis is six percent. Studies indicate that homes that installed kits can save as much as 21.8 gpd. Due to the limited useful life of toilet tank displacement devices, their contributions toward savings (1.3 gpd) are not considered, and a 20-year planning saving of 20.4 gpcd is assumed. Costs and potential savings associated with the implementation of this option in each county are summarized below.

Category	Quantity Conserved (gpd)	Cost/1,000 Gallons
Public Supply	12,327,000	$0.58
Domestic Self-Supply	455,205	$0.45

Issues:

- A solid customer contact program, such as the drop-and-canvass method, offers improved chances for achieving the estimated savings.

Non-Agricultural Water Conservation Option #2 - Ultra Low Volume Toilet (ULV) Rebates

Entity Responsible for Implementation: Water Supply Utilities

The ULV rebate option is designed to offer rebates as an incentive for customers to replace their high water-volume toilets with low-volume models which use less water. ULVs use about 1.6 gallons per flush (gpf), as opposed to older, less efficient models using 3.5 to 7.0 gpf, depending on their age. This option is considered to be most effective if implemented in two categories: (1) public supply, including single- and multi-family residential customers, as well as non-residential customers; and (2) domestic self-supply, involving single-family residences only. It was assumed that an average of 1.4 rebates would be issued per single-family program participant, 1.3 rebates would be issued per multi-family program participant, and 4.2 for the nonresidential category. It is assumed a utility would administer the program for public supply customers, and a county agency for water users not associated with a public supply system. The most common approach in existing programs for the implementation of the ULV toilet rebates option has been the reservation system, typically administered by a professional, experienced contractor.

In addition to ULV toilets, High Efficiency Toilets (HETs) are water efficient toilets that use 1.28 gallons per flush (gpf) or less. The water saved from replacing a high volume 3.5 gpf toilet with a HET, is 11 gallons per capita per day. In comparison, the water saved from replacing a high volume 3.5 gpf toilet with water efficient 1.6 gpf toilet, is 9.7 gallons per capita per day. High efficiency toilet rebates are considered a viable conservation measure, and may be used in conjunction with ULV toilet rebates. In addition, HET rebates may be used in place of ULV toilet rebates. Since HETs were not initially identified as a conservation measure option for the Planning Region, HETs were not evaluated for the RWSP at this time. HETs will be evaluated and included in future plans.

Costs include research and development, training, and rebates. Research and development costs, depending upon the number of rebates offered, are assumed to be between $30,000 (<10,000 rebates) and $70,000 (>25,000 rebates). Training costs, based on the same range of rebates, were assumed to be between $2,000 and $6,000. For the RWSP, it is assumed that the rebate offered would be $165 per toilet. Annual costs incurred over the program period are assumed to be in first year planning period dollars. Therefore, costs incurred beyond the first year are brought back to first year planning dollars by applying a present worth factor. The default interest rate used for the present worth analysis is six percent.

It was assumed that in this planning period, implementation of the ULV toilet rebate option would begin in 2005. The table below summarizes the costs and potential savings associated with the implementation of this option in each county within the Planning Region.

Category	Quantity Conserved (gpd)	Cost/1,000 Gallons
Public Supply	12,489,971	$2.42
Domestic Self-Supply	900,274	$1.22

Issues:

- The potential exists for program participants to replace toilet flappers with inappropriate models between three and five years after the ULV is installed, thereby reducing the savings potential. ULV programs should be accompanied by consumer education about flapper replacement to sustain estimated savings.

Non-Agricultural Water Conservation Option #3 - Water Efficient Landscape and Irrigation System Rebates (WEIS)

Entity Responsible for Implementation: Water Supply Utilities

This option is designed to reduce peak water demand by improving outdoor irrigation efficiency. The WEIS rebate is applicable to all accounts/water-use permittees that use in-ground sprinkler systems for landscape irrigation. It is considered to be most effective when implemented in the public supply and domestic self-supply categories of water use. It is assumed that public utilities or county agencies would implement this option. A rebate would be provided as an incentive to repair, modify and/or replace high water-use landscape and irrigation systems by:

- Installing multiple program controllers
- Installing innovative irrigation technology
- Maintaining separate irrigation zones for turf and landscape plant areas
- Maintaining sprays and rotors in separate zones
- Replacing sprinkler heads that have mismatched precipitation rates
- Installing automatic rain shut-off devices

Eligibility of each participant for rebates would be determined during an initial site audit to evaluate each irrigation system's design, operating condition, and current overall efficiency. The program administrator would use the data collected from the irrigation audit to develop a base irrigation schedule and identify necessary component repairs/replacement. This information would be provided to the customer for use in making eligible improvements. Following installation, the customer then would request their rebates from the program administrator. The program administrator would inspect the customer's improvements, verify proper installation and performance of the eligible system components in evaluating the rebate program, and develop a base-irrigation schedule to be used by each participant.

The amount of each survey/rebate is estimated to be $655. Research and development costs vary depending upon the number of surveys conducted and are estimated to be between $10,000 (<10,000 surveys) and $45,000 (>25,000 surveys). Based on the same number of accounts, training is estimated to cost between $2,000 and $6,000.

Savings are limited to five years; as such, this option is designed to be repeated every five years. Savings are estimated to be equal to 22 gpd for each single-family and 15.6 gpd for each multi-family property (Ayres, 2000). This option may be implemented concurrently with irrigation system surveys, but potential savings are considered independently for the purposes of the RWSP. Costs and potential savings associated with providing rebates to all eligible public supply and domestic self-supply water users in each county of the Planning Region are summarized below.

Category	Quantity Conserved (gpd)	Cost/1,000 Gallons
Domestic Self-Supply	3,033,770	$0.87
Public Supply	18,294,863	$1.26

Issues: None

Non-Agricultural Water Conservation Option #4 - Industrial, Commercial and Institutional (ICI) Water Use Surveys

Entity Responsible for Implementation: Water Supply Utilities

The purpose of this option is to provide ICI water users with a free evaluation of their water use and specific recommendations for improving efficiency. It is assumed that a qualified consultant/contractor would be employed to administer the program. This option is most effective for the Non-residential Public Supply, I/C, and M/D category of water users. It is assumed that a county agency would take the lead in implementing the survey program.

The amount of each survey is estimated to be $3,450. Research and development costs vary depending upon the number of surveys conducted and are estimated to be between $20,000 (<10,000 surveys) and $50,000 (>25,000 surveys). Training costs would not be incurred since contractors are employed.

The option applies only to the interior water uses of the ICI water users for which the average savings is estimated to be 2,308 gpd. Costs and potential savings associated with providing rebates to all eligible public supply and I/C and M/D water users in each county of the Planning Region are summarized below.

Category	Quantity Conserved (gpd)	Cost/1,000 Gallons
Non-Residential Public Supply	1,554,566	$0.54
I/C and M/D	121,795	$0.27

Issues:

- Offering rebates along with the surveys may enhance the savings potential, but will also increase the costs.

Non-Agricultural Water Conservation Option #5 - Industrial/Commercial Spray Valve Replacement Rebates

Entity Responsible for Implementation: Water Supply Utilities

This option is designed to offer rebates as an incentive for eating and drinking establishments to replace their high water-volume spray valves with water conserving low volume spray valves. The option applies to interior water use by non-residential customers of the public supply category. The number of potential accounts that could benefit from this option was estimated from the identified number of establishments, by county, from the *Florida Statistical Abstracts* (BEBR, 2003). The county totals were then disaggregated among the county utilities based on the percentage of county population served by each utility. Further, it was assumed that there will not be a significant number of establishments using self-supply water sources.

As with other rebate programs, the customer would apply for their rebate, install or replace the spray valve(s), and provide documentation of purchase with their request for rebate payment. The program administrator would verify proper installation of the spray valve(s) and authorize payment of the rebate.

Costs are presented in first-year planning period dollars. The life of the option is assumed to be five years based on a conservative estimation of useful valve life in restaurant environment. The cost for a program administrator would be $55,000 per year including overhead while the program is being implemented. Current pricing for low flow spray valves range from $45 to $60. For the purposes of the RWSP, a rebate value of $25 is used for this option. Annual costs incurred over the program period are assumed to be in first-year planning dollars. Therefore, costs incurred beyond the first year are brought back to first-year planning dollars by applying a present worth factor. The default interest rate used for the present worth analysis is six percent.

Category	Quantity Conserved (gpd)	Cost/1,000 Gallons
Non-Residential Public Supply	410,365	$0.31

Issues:

- The Energy Policy Act of 2005, requires that all pre-rinse spray valves manufactured on or after January 1, 2006 must have a flow rate of not more than 1.6 gallons per minute, when measured with ASTM Test Method F2324. It should be noted that there is no companion legislation that requires spray valve users to purchase and install the more water efficient spray valves over the high volume spray valves. The District considers the pre-rinse spray valves measure to be a viable option for water conservation at this time.

Non-Agricultural Water Conservation Option #6 - Large Landscape Water Use Surveys

Entity Responsible for Implementation: Water Supply Utilities

This option is designed to improve irrigation efficiency associated with landscapes larger than one acre. The option applies to the nonresidential sub-category of the public supply category, the I/C and M/D category, and the recreational/aesthetic category. To improve the landscape water efficiency different types of technical support and incentives would be offered, depending on whether the account/permittee has a dedicated landscape meter or a mixed-use meter.

Landscape water use surveys would be offered to accounts with significant seasonal water use. Potential participants would be identified based on the savings potential and existing overall system efficiency. Such surveys would include a landscape water use evaluation, installation of meters, training in water-efficient landscape maintenance, and financial incentives for improving system efficiency. Follow-up surveys would be provided once every five years.

The cost of the option increases with the area surveyed. For the purposes of the RWSP, the amount of each survey is estimated to be $800. Research and development costs vary depending upon the number of surveys conducted and are estimated to be between $15,000 (<50 surveys) and $45,000 (>100 surveys). Based on the same number of accounts, training is estimated to cost between $2,000 and $6,000.

The average savings for this option is estimated to be 428 gpd for each large, non-residential landscape implementing all identified water conservation measures. The costs and potential savings associated with administering a program, including associated incentives, for all eligible water users in each county in the Planning Region are summarized below.

Category	Quantity Conserved (gpd)	Cost/1,000 Gallons
I/C and M/D	24,822	$1.80
Recreation/Aesthetic	598,082	$0.25
Public Supply	385,117	$1.96

Issues: None

Non-Agricultural Water Conservation Option #7 - Rain Sensor Shut-off Device Rebates

Entity Responsible for Implementation: Water Supply Utilities

The purpose of the rain sensor option is to reduce water used by automatic irrigation systems by eliminating irrigation during significant rain events. This is most effective in the public supply, domestic self-supply, and recreational/aesthetic categories. The option would be implemented by offering rebates to encourage the purchase and installation of the rain sensors. Inspection to determine proper installation is recommended. It is assumed the program would be administered by a consultant/contractor.

The amount of each rebate is estimated to be $65. Research and development costs vary depending upon the number of rebates offered and are estimated to be between $10,000 (<1,000 surveys) and $45,000 (>3,500 surveys). Based on the same number of accounts, training is estimated to cost between $2,000 and $6,000.

The average savings for this option is estimated to be 103 gpd per device based on a program implemented in Hernando County in 1997. Costs and potential savings associated with providing rebates to all eligible public supply, domestic self-supply, and recreational/aesthetic water users in each county of the Planning Region are summarized below.

Category	Quantity Conserved (gpd)	Cost/1,000 Gallons
Domestic Self-Supply	2,367,215	$0.31
Recreation/Aesthetic	490,137	$0.82
Public Supply	11,717,045	$0.54

Issues:

- The District is contributing to research into newer technology, including soil moisture sensors and evapotranspiration controllers that may yield similar or greater water savings.

Non-Agricultural Water Conservation Option #8 - Landscape Water Budgeting

Entity Responsible for Implementation: Water Supply Utilities

The concept of the water budgeting option is to require water associated with irrigation to remain within an annual budget. Based on a landscape and irrigation survey, a water budget is assigned to customers in a utility service area or water users within a municipal jurisdiction. This option represents the only mandatory option evaluated and recommended in that it would require a utility (using the billing system, for example) or local government (using meters and law enforcement, for example) to monitor and enforce the budgets. Budgeting allows landscape irrigation based on landscape characteristics such as plant material, soil, climate, weather patterns, and other critical decision factors. It provides an alternative to the two-day per week irrigation schedule enforced over most of the Planning Region. For the purposes of the RWSP, this option requires water users to adhere to the IFAS irrigation water schedule, which recommends 46 or less irrigation events per year. A total of 104 irrigation days per year are currently allowed based on watering restrictions.

The cost of $11 per public supply customer or non-public supply permittee is based on the monitoring and enforcement of water budgets. Research and development costs vary depending on the number of permittees/customers and are estimated to be between $30,000 (<1,000) and $70,000 (>2,500). Based on the same number of accounts, training is estimated to cost between $2,000 and $6,000.

The average savings for this option is estimated to be 78 gpd for single-family homes, 192 gpd for multi-family properties, and 578 gpd for non-residential properties. The table below summarizes the costs and potential savings associated with providing rebates to all eligible public supply and non-public supply water users in the region.

Category	Quantity Conserved (gpd)	Cost/1,000 Gallons
Public Supply	11,981,086	$0.53
Non-Public Supply	2,390,765	$0.47

Issues:

- Monitoring, enforcement and education are keys to the success of this measure. The per-customer costs may vary, depending on the degree to which monitoring and enforcement are required and/or can be automated.

Section 7. NTB Planning Area – Agricultural Conservation Options

Although the agricultural conservation options or variations of them could be implemented in all three Planning Areas, they are most applicable in the PR/MRWSA portion of the SWUCA. Therefore, to avoid duplication, the options are described only once in the PR/MRWSA Planning Area portion of this chapter, Part D, Section 7.

Part D. Water Supply Development Options – PR/MRWSA Planning Area

Section 1. PR/MRWSA Planning Area - Surface Water/Storm Water Options

The PR/MRWSA Planning Area includes a number of rivers of significant size including the Peace, Braden, Manatee, Myakka, and Shell Creek. With the exception of the Myakka River, all of these rivers are currently used for water supply. The Peace River is the most prominent drainage feature in the SWUCA, draining portions of Polk, Hardee, DeSoto, and Charlotte counties. It has the highest flow of all the rivers in the Planning Region with a mean annual flow of 813 mgd (1,259 cfs). Though the Myakka River has been designated an Outstanding Florida Water and a Wild and Scenic River, the watershed has experienced numerous alterations that have affected flows. These alterations include agricultural activities, drainage projects, and flood control projects. It is possible that water supply projects could be developed on the Myakka River that would help to restore the river and surrounding natural systems.

The PR/MRWSA has indicated they will require an additional 51 mgd to meet their 2025 demand. A number of surface water/storm water options were identified and analyzed for the PR/MRWSA Planning Area by the District and the WPA Regional System Planning and Engineering Study in cooperation with the PR/MRWSA. Table 6-5 is the list of surface water/storm water options developed by the District and Table 6-6 is the list developed by the WPA/PR/MRWSA. Some of these options appear on both lists. Project costs were estimated by the PR/MRWSA using a ratio of $10 million/mgd. These costs will be further refined during preparation of the PR/MRWSA's Integrated Regional Water Supply Master Plan that is anticipated to be complete in 2007.

PR/MRWSA Planning Area Surface Water/Storm Water Option #1 – Upper Myakka River Public Supply

Entity Responsible for Implementation: PR/MRWSA

This project consists of diverting the excess irrigation runoff water collected at Flatford Swamp to a reservoir. When needed, the water would be removed from the reservoir, treated at a new water treatment plant, and delivered to the regional potable water distribution system. Project components include a raw water pump station, impoundment structure for raw water storage, water treatment plant, and associated piping.

Quantity Available (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O&M
10	$100,000,000	$10,000,000	$2.76	$1,800,000

Issues:

- Implementation of this project would rely on the capture of excess irrigation runoff that has negatively impacted the Flatford Swamp. Capture of this water is necessary for restoration of the Swamp.
- The River's Wild and Scenic designation and Outstanding Florida Water Status needs to be considered when planning for diversions of flow entering the river.

PR/MRWSA Planning Area Surface Water/Storm Water Option #2 - Cow Pen Slough

Entity Responsible for Implementation: PR/MRWSA

This option consists of capturing excess flow from Cow Pen Slough for storage in an off-stream reservoir. It would provide a significant environmental benefit by reducing downstream flooding and fresh water/salt water imbalances in the Dona Bay estuary. The reservoir would have a 500 million gallon capacity and would be located in an existing borrow pit in the vicinity of the proposed withdrawal point. The water would be treated at a new water treatment plant with a capacity of 10 mgd then sent to potable water ASR wells for storage or directly to a regional distribution system. Project components include a pump station, reservoir, water treatment plant, five ASR wells (1 mgd each) and piping to the proposed regional distribution system.

Quantity Available (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O&M
5	$50,000,000	$10,000,000	$2.72	$820,000

Issues:

- As ongoing restoration studies continue, more information will be available to better quantify excess flows within Cow Pen Slough, which may result in significantly higher yield estimates. Ultimately, the quantity of future water supply available from Cow Pen Slough will be determined through the permitting process and following the establishment of a minimum flow in 2007.
- The designation of Dona Bay as an Outstanding Florida Water needs to be considered as future water supply projects from Cow Pen Slough are evaluated.
- The issue of elevated levels of arsenic in water recovered from ASR systems must be considered.

PR/MRWSA Planning Area Surface Water/Storm Water Option # 3 - Peace River

Entity Responsible for Implementation: PR/MRWSA

This option consists of a combination of additions and expansions at the Peace River/Manasota Regional Water Supply Authority's Peace River Facility. The option will develop additional water supply from the Peace River above the Authority's current permitted amount of 32.7 mgd. Additions include a

12 mgd expansion of the water treatment plant and 26 new ASR wells. Project components include a raw water pump station, additional water treatment plant capacity, reservoir, and/or ASR wells and associated piping.

Quantity Available (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O&M
24.4	$244,000,000	$10,000,000	$2.58	$2,800,000

Issues:

- The issue of elevated levels of arsenic in water recovered from ASR systems must be considered.

PR/MRWSA Planning Area Surface Water/Storm Water Option #4 - Shell Creek Public Supply

Entity Responsible for Implementation: PR/MRWSA

This option consists of a combination of improvements or additions to the City of Punta Gorda's existing potable water supply facility to increase the yield from Shell and Prairie Creeks. These improvements include expansion of the water treatment plant capacity from the existing capacity of 10.0 mgd; construction of a reservoir for increased raw water storage, and improvements to the existing reservoir structure to increase its reliability. Evaluation of reservoir alternatives and upstream enhancements are in progress. Project components include expansion of the existing water treatment plant (from 10 mgd to 20 mgd); a reservoir (to increase total raw water storage up to 20 BG); a pump station (to increase total raw water pumping capacity to at least 33 mgd); and necessary piping.

Quantity Available (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O&M
10	$100,000,000	$10,000,000	$2.68	$1,500,000

Issues:

- Additional flow data/modeling will be necessary to confirm anticipated withdrawals.

PR/MRWSA Planning Area Surface Water/Storm Water Option #5 - Myakkahatchee Creek Public Supply

Entity Responsible for Implementation: PR/MRWSA

This option consists of a combination of improvements or additions to the City of North Port's existing potable water supply facilities to increase the yield from the Myakkahatchee Creek/Coco Plum Waterway system. Improvements may include increased storage in the canal system through modification of control structures or operation of existing control structures, increased water treatment capacity, and use of interconnections with the regional system and other municipalities.

Quantity Available (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O&M
2	$20,000,000	$10,000,000	$2.68	$300,000

Issues:

- Additional flow data/modeling will be necessary to confirm anticipated withdrawals.

Table 6-5. PR/MRWSA Planning Area - List of Surface Water/Storm Water Options Developed by the District.

Option Water Body and Entity Responsible for Implementation	User Group	Avg Annual Yield (mgd)	Intake Capacity (mgd)	Capital Cost ($1,000/mgd)	Unit Cost ($/1,000 gal)	Annual O & M ($1,000)	Storage Method/Level of Treatment	Distribution Method
Manatee County								
Braden River City of Bradenton	PS	2.3	12	6,460	210	530	Expansion of City's reservoir (580 MG)	Distributed to City of Bradenton's public supply system
Braden River City of Bradenton	PS	1.6	12	10,562	4.35	1,178	ASR / 2	Distributed to City of Bradenton's public supply system
Braden River City of Bradenton	Ag	1.6	12	10,495	3.87	859	ASR / 2	Distributed to reclaimed water system
Braden River City of Bradenton	PS	1.6	12	2,496	4.13	2,079	ASR / 1	Distributed to City of Bradenton's public supply system
Flatford Swamp TBD	All	8	34	3,579	2.12	3,819	AR / 1	Aquifer conveyance to agricultural groundwater users
Tatum Sawgrass area-Upper Myakka River TBD	Ag	8.4	57	12,598	3.48	1,906	Off-stream reservoir, AR / 1	Aquifer conveyance to agricultural groundwater users
Frog Creek (stormwater) PR/MRWSA	PS	1	34	1,257	5.32	1,837	Off-stream reservoir, ASR 1	Distributed to PR/MRWSA public supply system
Frog Creek (stormwater) Manatee County	Ag, Urban Reuse	1	34	994	4.21	1,454	Off-stream reservoir, / 3	Distributed to MARS system
Gamble Creek Manatee County	Ag, Urban Reuse	3.9	39	8,834	3.09	1,544	Off-stream reservoir, ASR / 2	Distributed to MARS system
Tatum Sawgrass area-Peace River PR/MRWSA	Ag, PS	40	500	7,035	2.16	8,199	Off-stream reservoir, ASR / 1	Distributed to PR/MRWSA public supply system and agricultural users
Tatum Sawgrass area-Peace River TBD	Ag	40	500	4,141	1.50	8,159	Off-stream reservoir / 3	Piped directly to adjacent agricultural users
Manatee River TBD	Ag	2.3	50	2,634	5.62	4,219	AR / 1	Aquifer conveyance to agricultural groundwater users

Table 6-5. PR/MRWSA Planning Area - List of Surface Water/Storm Water Options Developed by the District (Continued).

Option Water Body and Entity Responsible for Implementation	User Group	Avg Annual Yield (mgd)	Intake Capacity (mgd)	Capital Cost ($1,000/mgd)	Unit Cost ($/1.000 gal)	Annual O&M ($1,000)	Storage Method/Level of Treatment	Distribution Method
Manatee River TBD	Ag, Env	2.3	50	2,639	4.40	3,191	ASR / 1	Aquifer conveyance to agricultural groundwater users or baseflow maintenance
Manatee River PR/MRWSA	PS	2.3	50	8,917	3.69	1,403	Off-stream reservoir / 1	Distributed to PR/MRWSA public supply system
Sarasota County								
Celery Fields (stormwater) Sarasota County	Urban reuse	2	22	10,532	2.48	970	Off-stream reservoir, ASR / 2	Distributed to reclaimed water system
Cow Pen Slough Sarasota County	Urban reuse	4.3	32	4,924	1.42	435	ASR / 2	Distributed to reclaimed water system
Cow Pen Slough PR/MRWSA	PS	4.3	32	7,682	2.27	830	Off-stream reservoir, ASR / 1	Distributed to Sarasota County's public supply system
Myakka River TBD	Ag	19.1	120	5,568	2.25	6,906	Off-stream reservoir, AR / 2	Aquifer conveyance to agricultural groundwater users
Myakka River PR/MRWSA	PS	19.1	120	4,327	2.01	7,171	Off-stream reservoir / 3	Distributed to PR/MRWSA public supply system
Myakkahatchee Creek PR/MRWSA	PS	1.8	15	12,974	4.98	1,332	ASR / 2	Distributed to PR/MRWSA public supply system
Myakkahatchee Creek PR/MRWSA	PS	1.8	15	13,534	5.03	1,285	ASR / 1	Distributed to PR/MRWSA public supply system
DeSoto County								
Joshua Creek TBD	Ag	3.8	26	18,629	6.97	3,810	AR / 2	Aquifer conveyance to agricultural groundwater users
Joshua Creek TBD	Ag	3.8	26	8,328	3.16	1,765	Off-stream reservoir / 3	Piped to Joshua Water Control District

Table 6-5. PR/MRWSA Planning Area - List of Surface Water/Storm Water Options Developed by the District (Continued).

Option Water Body and Entity Responsible for Implementation	User Group	Avg Annual Yield (mgd)	Intake Capacity (mgd)	Capital Cost ($1,000/mgd)	Unit Cost ($/1,000 gal)	Annual O&M ($1,000)	Storage Method/Level of Treatment	Distribution Method
Joshua Creek TBD	Ag	3.8	26	7,661	2.75	1,407	Off-stream reservoir, AR	Aquifer conveyance to agricultural groundwater users
Peace River PR/MRWSA	PS	45.3	500	20,646	9.04	69,078	ASR / 2	Distributed to PR/MRWSA public supply system
Peace River PR/MRWSA	PS	45.3	500	20,729	7.96	53,927	ASR / 2	Distributed to PR/MRWSA public supply system
Peace River PR/MRWSA	PS	45.3	500	6,267	1.94	8,611	Off-stream reservoir, ASR / 1	Distributed to PR/MRWSA public supply system
Prairie Creek TBD	Ag	12	92	19,373	7.32	12,806	AR / 2	Aquifer conveyance to agricultural groundwater users
Prairie Creek TBD	Ag	12	92	4,888	1.91	3,516	Offstream Reservoir / 3	Piped directly to agric. groundwater users
Prairie Creek TBD	Ag	12	92	5,313	1.94	3,202	Off-stream reservoir, AR / 2	Aquifer conveyance to agricultural groundwater Users
Charlotte County								
Shell Creek PR/MRWSA and/or City of Punta Gorda	PS	10	40	6,029	1.99	2,271	ASR / 2	Distributed to City of Punta Gorda's public supply system
Shell Creek TBD	Ag	10	40	9,235	2.49	1,440	AR / 2	Aquifer conveyance to agricultural groundwater users
Shell Creek PR/MRWSA and/or City of Punta Gorda	PS	10	40	15,715	4.47	3,301	ASR / 1	Distributed to City of Punta Gorda's public supply system

Table 6-6. PR/MRWSA Planning Area - Surface Water/Storm Water Options Identified by the WPA Regional System Planning and Engineering Study (Greeley and Hansen, 2005) in Cooperation with the PR/MRWSA.

Option Water Body and Entity Responsible for Implementation	User Group	Avg Annual Yield (mgd)	Intake Capacity (mgd)	Capital Cost ($1,000/mgd)	Unit Cost ($/1,000 gal)	Project Description
Charlotte County						
Shell Creek PR/MRWSA	PS	8	33.2	7,614	3.13	Project components may include expansion of water treatment plant capacity (from 8 MGD to 12 MGD or greater); expansion of ASR well system (from 4 existing wells to 8 total wells) for finished water storage, construction of a new off-line reservoir for raw water storage, improvements to existing in-line reservoir structure, and an increase of raw water yield of Prairie/Shell Creek source (from existing yield of 7.8 MGD to proposed yield of 17.8 MGD).
DeSoto County						
Long Island Marsh PR/MRWSA	PS/ENV	TBD	TBD	TBD	TBD	The project consists of restoring agricultural land within southeast Desoto County. The restoration project is being considered by SWFWMD and would increase water flow into the Shell and Prairie Creek system.
Manatee County						
Tatum Sawgrass/Flatford Swamp PR/MRWSA	PS/ENV	7	41.6	10,138	5.57	Project components may include diversion of surface water from the Myakka River and/or Flatford Swamp during periods of high flow; development of a natural reservoir at Tatum Sawgrass; distribution to agriculture with potable supply development from associated groundwater credits; or treatment to potable standards for freshwater injection with ASR wells for aquifer recharge or potable use.

Table 6-6. PR/MRWSA Planning Area - Surface Water/Storm Water Option Identified by the WPA Regional System Planning and Engineering Study (Greeley and Hansen, 2005) in Cooperation with the PR/MRWSA (Continued).

Option Water Body and Entity Responsible for Implementation	User Group	Avg Annual Yield (mgd)	Intake Capacity (mgd)	Capital Cost ($1,000/mgd)	Unit Cost ($/1,000 gal)	Project Description
Braden River City of Bradenton	PS	2.0	7.7	11,245	6.44	Withdraw Raw Water from Braden River at Ward Lake during high flow and pump into either brackish water ASR Wells (for Future Treatment for Public Supply and Saltwater Intrusion Control), pump into Brackish Water ASR wells for MARS system or treat and pump into freshwater ASR wells for potable.
Sarasota County						
Cow Pen Slough PR/MRWSA	PS/AG	5	16	8,122	4.14	Surface storage of diverted excess flows, Full Treatment or Partial Treatment at WTP then Pump to Freshwater Aquifer ASR or Brackish Water ASR for Potable or Irrigation respectively.
Myakkahatchee Creek PR/MRWSA and/or City of North Port	PS	1.29	4	TBD	3.66	Augment Water Storage at North Port's Water Supply Facility on Big Slough by Withdrawing Additional Water During High Stream Flows. Provide Level 1 treatment and pump to Freshwater Aquifer ASR Wells.

1.0 PR/MRWSA Planning Area - System Interconnect/Improvement Options and ASR Options

Included in the list of projects identified as part of the WPA's water supply planning efforts were several projects that will develop critical components of a regional water supply distribution system. The projects identified were alternate ASR sites and pipeline interconnects (Table 6-7). Implementation of these projects will further regionalize the potable water supply system by providing access to a diversity of sources and thereby, a redundancy of water supplies during emergency conditions.

Table 6-7. System Interconnect/Improvement Options and ASR Options Identified by the WPA Regional System Planning and Engineering Study in Cooperation with the PR/MRWSA (Greeley and Hansen, 2005).

Water Planning Alliance Project Number	Option Name and Entity Responsible for Implementation	Project Description
76	Sarasota County Potable Water Aquifer Storage and Recovery - Sarasota County	4 Potable Water ASR Wells in the vicinity of the Carlton WTF to provide an equivalent of a 120- day supply.
74	Sarasota County / Englewood Water District Potable Water Interconnect - Sarasota County	Potable Water Interconnect between Sarasota County and Englewood Water District
98	Charlotte County / City of Punta Gorda Water Interconnect - Punta Gorda	Interconnect between Charlotte County and Punta Gorda Potable Water Systems
151	Regional Integrated Loop System Phases 2 and 3 PR/MRWSA	Interconnection between the PR/MRWSA and the T. Mabry Carlton Facility in Sarasota County, and interconnection between the T. Mabry Carlton Facility and the Manatee River WTP in Manatee County.

Section 2. PR/MRWSA Planning Area – Reclaimed Water Options

In the 2000 base year, there were 37 WWTF in Charlotte, DeSoto, Manatee and Sarasota counties collectively producing 56 mgd of reclaimed water (Table 6-8). Of that amount 27 mgd (48 percent) was beneficially used to offset 16 mgd (60 percent efficiency) of traditional water demands. Therefore, only half of the available reclaimed water produced in the PR/MRWSA Planning Area was provided to customers for beneficial use, and the other half was disposed of to surface waters and deep disposal wells.

Table 6-8. 2000 Actual versus 2025 Potential Reclaimed Use and Offset in the PR/MRWSA Planning Area.

County	WWTPs	2000	2000 Use		2000 Offset		2025	2025 Use		2025 Offset	
	(#)	Plant Flow	mgd	%	mgd	%	Plant Flow	mgd	%	Mgd	%
Charlotte	10.0	7.5	1.9	26%	1.1	60%	10.8	8.1	75%	6.1	75%
DeSoto	3.0	1.0	0.1	8%	0.0	60%	1.4	1.0	75%	0.8	75%
Manatee	5.0	25.9	15.1	58%	9.0	60%	43.2	32.4	75%	24.3	75%
Sarasota	19.0	21.4	9.6	45%	5.8	60%	31.0	23.2	75%	17.4	75%
Total	**37.0**	**55.7**	**26.7**	**48%**	**16.0**	**60%**	**86.4**	**64.7**	**75%**	**48.6**	**75%**

The region has a mix of rural and urban areas thereby providing opportunities to supply urban, industrial, and agricultural users. In addition, coastal areas and old mined lands offer potential for capturing and seasonally storing reclaimed water for use during drier periods by implementing reclaimed water ASR and reservoir projects.

The District's goal is ambitious, but achievable considering the development of increasingly sophisticated technologies and growing demand for reclaimed water. By 2025, it is expected that 75 percent of reclaimed water available in the PR/MRWSA Planning Area can be utilized. It is further expected that efficiency by the end user will increase from 60 percent to 75 percent through a combination of measures such as metering and volume-based rates and education. Using this formula, by 2025 it is estimated that 65 mgd (75 percent) of the 86 mgd of reclaimed water being produced will be used for beneficial purposes, and 49 mgd (75 percent) of traditional water supplies will be offset as a result. Table 6-8 illustrates the potential for reclaimed water to meet future demand in the PR/MRWSA Planning Area. Following the table are evaluation summaries for representative options that could help achieve the higher potential utilization and offset in the region. Table 6-9 is the list of additional reclaimed water options that could be implemented in the PR/MRWSA Planning Area.

PR/MRWSA Planning Area Reclaimed Water Option #1 - Bradenton Agricultural Reuse and Natural Systems Restoration

Entity Responsible for Implementation: City of Bradenton Utilities

The purpose of this option is to provide approximately 4.8 mgd of reclaimed water to restore a wetland and offset existing withdrawals and to provide potable service to agricultural, commercial, residential, and recreational customers. Approximately 0.2 mgd could be used for recreational and landscape irrigation, 2.6 mgd could be used for agricultural irrigation, and 2.0 mgd could be used to augment a man-made wetland.

The project would include the design and construction of 24,800 feet of 18-inch and 16-inch reclaimed water transmission line, a pump station, a two million gallon storage tank, and a man-made wetland. This project would expand the city's reclaimed water system from Mixon Fruit Farm to SR 70, then south to a 30-acre city-owned site adjacent to Natalie Way. This 30-acre site could be developed into a man-made wetland for supplementing the base flow of the Braden River. The total project cost is estimated to be $4.8 million. The implementation timeframe for the option is expected to be between 2011 and 2025.

Quantity Produced (mgd)	Capital Cost	Cost/mgd Offset	Cost/1,000 Gallons Offset	O&M/1,000 Gallons Offset
4.8 (4*)	$4,770,000	$1,192,500	$0.24	$0.36

*Beneficial offset (see Table 6-9)

Issues:

- Competition for the reclaimed water could affect the viability of the project.
- Project land availability may be an issue due to the proximity of development and competition with other uses for the 30-acre city owned site.

PR/MRWSA Planning Area Reclaimed Water Option # 2 - Bradenton to MARS System Interconnect

Entity Responsible for Implementation: City of Bradenton Utilities

This project would interconnect the reuse system of the City of Bradenton and Manatee County's Manatee Agricultural Reuse System (MARS). The interconnection is estimated to include the design and construction of 21,000 feet of a 16-inch reclaimed water transmission line from one of Bradenton's existing mains to tie into the existing MARS system. The project would provide an additional 3.0 mgd of surplus reclaimed water from Bradenton's AWT facility to serve customers in Manatee County's system and would offset an estimated 2.25 mgd. Total cost of the option is estimated to be $2.25 million for an offset of 2.25 mgd. The implementation timeframe for the project is estimated to be between 2011 and 2025.

Quantity Produced (mgd)	Capital Cost	Cost/mgd Offset	Cost/1,000 Gallons Offset	O&M/1,000 Gallons Offset
3.00 (2.25*)	$2,350,000	$1,044,444	$0.21	$0.40

*Beneficial offset (see Table 6-9)

Issues:

- Competition for the reclaimed water could affect the viability of the project.
- The project would necessitate the development of a master agreement to coordinate funding, ownership, and O&M.

PR/MRWSA Planning Area Reclaimed Water Option #3 - Celery Fields Reuse Augmentation

Entity Responsible for Implementation: Sarasota County Utilities

The Celery Field Regional Storage Facility (CFRSF) is a regional stormwater management facility on approximately 346 acres adjacent to the Main C canal of Phillippi Creek, south of Fruitville Road and east of I-75, in Sarasota County. The CFRSF was developed as a multiple use facility responsible for stormwater storage for flood control, stormwater treatment for pollution control and supplemental reuse, and constructed wetlands for stormwater treatment and mitigation. The CFRST provides capacity to temporarily impound 326 million gallons of stormwater runoff for controlled release into Phillippi Creek.

The Celery Fields Reuse Augmentation option would utilize a portion of the stormwater stored in the CFRSF. This stormwater could be filtered and chlorinated prior to being introduced into Sarasota County's reuse system. It could be used to augment the reclaimed system during the peak, dry-season irrigation demand. The County's reclaimed water ASR wells (currently under development) could be used to store the treated stormwater during wet weather periods for later recovery during periods of high irrigation demands.

The option would include design, permitting and construction of an intake structure, pumps, filtration and a high level disinfection treatment system that would be necessary to meet FDEP's reclaimed water requirements, and 10,500 linear feet of 20-inch diameter pipeline to connect the county's reuse distribution system. It is anticipated that the intake structure and pumps would be designed to supplement the reclaimed water system by up to 6.0 mgd during an estimated 60 days (intermittent peak demands during each year) for an average of 1.0 mgd annualized project supply. The project supply of 1.0 mgd would offset an estimated 0.6 mgd of potable quality irrigation in Sarasota County. The project cost is estimated to be $3.23 million for an offset of 0.6 mgd. The implementation timeframe for the option is expected to be between 2011 and 2025.

Quantity Produced (mgd)	Capital Cost	Cost/mgd Offset	Cost/1,000 Gallons Offset	O&M/1,000 Gallons Offset
1.00 (0.60*)	$3,230,000	$3,230,000	$1.06	$0.50

*Beneficial offset (see Table 6-9)

Issues:

- Seasonal supply of the water from the wetland system may pose quantity/quality issues and could affect the viability of the project.
- The cost of the treatment technology necessary to treat the stormwater could affect the viability of the project.

PR/MRWSA Planning Area Reclaimed Water Option #4 - Sarasota County North/South System Interconnect

Entity Responsible for Implementation: Sarasota County Utilities

This option would interconnect the North and South reclaimed water systems of Sarasota County. The interconnection is estimated to include the design and construction of 63,000 feet of 16-inch reclaimed water transmission line. The project would provide an additional two mgd of surplus reclaimed water to offset 1.2 mgd. Total expansion project cost is estimated to be $7.1 million. Implementation timeframe for the option is expected to be between 2011 and 2025.

Quantity Produced (mgd)	Capital Cost	Cost/mgd Offset	Cost/1,000 Gallons Offset	O&M/1,000 Gallons Offset
2.00 (1.20*)	$7,056,000	$5,880,000	$1.16	$0.63

*Beneficial offset (see Table 6-9)

Issues:

- Competition for the reclaimed water could affect the viability of the project.

PR/MRWSA Planning Area Reclaimed Water Option #5 - Sarasota County Golf Reuse

Entity Responsible for Implementation: Sarasota County Utilities

This option involves the expansion of an existing reuse system to serve the Country Club of Sarasota. The design, permitting and construction of a transmission main is required. The County estimates this option could supply 0.25 mgd of reclaimed water to the golf course and offset 0.19 mgd of existing ground-water withdrawals. The total cost is estimated to be $750,000 for an offset of 0.19 mgd. The implementation timeframe for the option is expected to be between 2011 and 2025.

Quantity Produced (mgd)	Capital Cost	Cost/mgd Offset	Cost/1,000 Gallons Offset	O&M/1,000 Gallons Offset
0.25 (0.19*)	$750,000	$3,947,000	$0.78	$0.39

*Beneficial offset (see Table 6-9)

Issues: None

PR/MRWSA Planning Area Reclaimed Water Option #6 - DeSoto Correctional Reuse Expansion (Toilet/Laundry)

Entity Responsible for Implementation: Florida Department of Corrections

This option is an expansion of an existing reuse disposal system that would redirect the DeSoto Correctional Facility's WWTP effluent flows from spray field disposal to supply water for the facility's toilets and laundry. The concept has been used in other projects such as the Jefferson Correctional Institution toilet flushing reuse system.

This option includes the design and construction of 6-inch diameter reclaimed water transmission and 2-inch diameter distribution lines, a one million gallon storage tank and a pumping and chlorination facility to supply 0.20 mgd of reclaimed water to the prison and offset 0.2 mgd of ground-water use. The total cost of the option is estimated to be $640,000. The implementation timeframe for the option is expected to be between 2011 and 2025.

Quantity Produced (mgd)	Capital Cost	Cost/mgd Offset	Cost/1,000 Gallons Offset	O&M/1,000 Gallons Offset
0.20 (0.20*)	$640,000	$640,000	$0.64	$0.30

*Beneficial offset (see Table 6-9)

Issues:

- The WWTP would require upgrading to meet FDEP reclaimed water standards; however, such upgrades are anticipated to be required during the 2011-2025 timeframe.

PR/MRWSA Planning Area Reclaimed Water Option #7 - Punta Gorda Reclaimed Water System

Entity Responsible for Implementation: City of Punta Gorda Utilities

This option would redirect the effluent flows from the City of Punta Gorda's deep well disposal site to local golf, residential, commercial and industrial water users.

The option is estimated to include the design and construction of a high service pumping and chlorination facility, a 10 million gallon storage tank and transmission/distribution lines from the City's WWTP to supply 2.5 mgd of reuse to a varied urban customer base and offset 1.5 mgd of potable quality water. The total cost of the option is estimated to be $8 million. The implementation timeframe for the option is expected to be between 2011 and 2025.

Quantity Produced (mgd)	Capital Cost	Cost/mgd Offset	Cost/1,000 Gallons Offset	O&M/1,000 Gallons Offset
2.49 (1.49*)	$8,040,000	$4,296,000	$1.06	$0.50

*Beneficial offset (see Table 6-9)

Issues:

- The City's sewer system would require upgrading to reduce high inflow/infiltration issues and meet irrigation quality standards; however such upgrades are anticipated to be completed during the 2011-2025 timeframe.

Table 6-9. PR/MRWSA Planning Area - List of Reclaimed Water Options.

Option Name and Entity Responsible for Implementation	County	Type	Supply	Offset	Capital Cost	Cost/Ben	O&M/Offset
Punta Gorda Saltwater Barrier, City of Punta Gorda	Charlotte	Saltwater Bar.	*2.49*	*2.49*	*10,260,000*	*$0.81*	*$0.30*
Reuse Expan in Charlotte Corr. WWTP 2011-2025, FL Dept. of Corrections	Charlotte	Sys. Expan. Toilet	*0.15*	*0.15*	*485,000*	*$0.64*	*$0.30*
Reuse Expan in Charlotte Co. East WWTP 2011-2025, Charlotte Co.	Charlotte	Sys. Expan.	*1.15*	*0.69*	*3,715,000*	*$1.06*	*$0.50*
Reuse Expan in Charlotte Co. W. WWTP 2011-2025, Charlotte Co.	Charlotte	Sys. Expan	*0.01*	*0.01*	*32,000*	*$1.06*	*$0.30*
Reuse Expan in Rampart WWTP 2011-2025, Rampart Util.	Charlotte	Sys. Expan	*0.13*	*0.08*	*420,000*	*$1.06*	*$0.49*
Reuse Expan in Riverwoods WWTP 2011-2025, Riverwoods Util.	Charlotte	Sys. Expan	*0.05*	*0.03*	*162,000*	*$1.06*	*$0.50*
Reuse Expan in Sandlehaven WWTP 2011-2025, Sandlehaven Util.	Charlotte	Sys. Expan	*0.05*	*0.03*	*162,000*	*$1.06*	*$0.50*
Reuse Expan in Punta Gorda WWTP 2011-2025, City of Punta Gorda	Charlotte	Sys. Expan	*2.49*	*1.49*	*8,043,000*	*$1.06*	*$0.50*
Reuse Expan in Burnt Store WWTP 2011-2025, Charlotte Co.	Charlotte	Sys. Expan	*0.25*	*0.15*	*808,000*	*$1.06*	*$0.50*
Reuse Expan in Englewood WWTP 2011-2025, Englewood Water District	Charlotte	Sys. Expan	*0.01*	*0.01*	*32,000*	*$1.06*	*$0.30*
Rotunda Long Marsh Golf Expansion, Charlotte Co.	Charlotte	Trans.	0.40	0.30	460,000	*$0.31*	*$0.40*
Reuse Expan in Arcadia WWTP 2011-2025, City of Arcadia	DeSoto	Sys. Expan	*0.37*	*0.22*	*1,200,000*	*$1.06*	*$0.50*
Arcadia Ag. Reuse Expan., City of Arcadia	DeSoto	Sys. Expan	*0.37*	*0.28*	*1,200,000*	*$0.84*	*$0.40*
Desoto Correctional WWTP 2011-2025, FL Dept. of Corrections	DeSoto	Sys. Expan Toilet	*0.20*	*0.20*	*646,000*	*$0.64*	*$0.30*
Wood Memorial Hospital WWTP 2011-2025, G. Pierce Wood Memorial Hospital	DeSoto	Sys Expan Ind.	*0.11*	*0.11*	*355,000*	*$0.64*	*$0.30*
S. Hills./MARS Intercon., Hills. Co.	Hills/Man.	Intercon.	5.00	3.75	6,900,000	$0.36	*$0.40*
Manatee Co. ASR Expansion Wells, Manatee Co.	Manatee	ASR	*1.00*	*0.75*	*4,300,000*	*$1.13*	*$0.40*
Tailwater Recovery/Reuse, Various Ag. Entities	Manatee	Aug.	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*
Southern Reclaimed Water Rate Study, SWFWMD	Manatee	Efficiency	*TBD*	*TBD*	*100,000*	*TBD*	*TBD*
Longboat Key/Manatee Co./Sarasota Intercon., Town of Longboat Key	Manatee	Intercon.	2.00	1.50	8,434,650	$1.11	*$0.40*
Bradenton/MARS Intercon., City of Bradenton	Manatee	Intercon.	3.00	2.25	2,350,000	$0.21	*$0.40*
Palmetto/MARS Intercon., City of Palmetto	Manatee	Intercon.	*0.48*	*0.36*	*1,550,000*	*$0.85*	*$0.40*
Frog Creek MARS Storage, Manatee Co.	Manatee	Storage	1.00	TBD	3,500,000	TBD	*TBD*
IMC/MARS Augmentation, Manatee Co.	Manatee	Storage/Augment.	15.00	9.00	20,996,000	$0.46	*$0.50*

Table 6-9. PR/MRWSA Planning Area - List of Reclaimed Water Options (Continued).

Option Name and Entity Responsible for Implementation	County	Type	Supply	Offset	Capital Cost	Cost/Ben	O&M/Offset
Bradenton Agricultural Reuse & NSR, City of Bradenton	Manatee	Sys. Expan.	*4.8*	*4*	*4,770,000*	*$0.24*	*$0.36*
Manatee River Downstream Aug., Manatee Co.	Manatee	Streamflow	*1.00*	*1.00*	*3,230,000*	*$1.06*	*$0.30*
MARS /Lake Parrish, Manatee Co.	Manatee	Storage	8.00	TBD	4,643,770	TBD	*TBD*
Reuse Expan in Manatee Co. Sys. 2011-2025 (w/ int), Manatee Co.	Manatee	Sys. Expan.	*0.50*	*0.30*	*1,615,000*	*$1.06*	*$0.50*
Reuse Expan in Bradenton WWTP 2011-2025, City of Bradenton	Manatee	Sys. Expan.	*7.14*	*4.28*	*23,062,000*	*$1.06*	*$0.50*
Reuse Expan in Palmetto WWTP 2011-2025, City of Palmetto	Manatee	Sys. Expan.	*0.48*	*0.29*	*1,550,000*	*$1.06*	*$0.50*
Sarasota Regional ASR System Expan, Sarasota Co.	Sarasota	ASR	*1.00*	*0.75*	*4,300,000*	*$1.13*	*$0.40*
Celery Fields Reuse Aug., Sarasota Co.	Sarasota	Aug.	1.00	0.60	*3,230,000*	*$1.06*	*$0.50*
Sarasota Co. Reclaimed Water Study, Sarasota Co.	Sarasota	Efficiency	TBD	TBD	50,000	TBD	*TBD*
Sarasota Co. North/South Intercon., Sarasota Co.	Sarasota	Intercon.	2.00	*1.20*	*7,056,000*	*$1.16*	*$0.63*
Sarasota Golf Reuse, Sarasota Co.	Sarasota	Trans.	0.25	0.19	750,000	$0.78	*$0.39*
Sarasota, FGUA Intercon. & Expansion, Sarasota Co.	Sarasota	Intercon./Sys. Expan.	*3.39*	*2.03*	*10,950,000*	*$1.06*	*$0.50*
MARS/Sarasota Co. Intercon, Sarasota Co. & Manatee Co.	Sarasota	Intercon.	*0.70*	*0.42*	*2,260,000*	*$1.06*	*$0.50*
Sarasota Co./Siesta Key Intercon., Sarasota Co.	Sarasota	Intercon.	*2.09*	*1.25*	*6,750,000*	*$1.06*	*$0.50*
Flatford Swamp Reuse, Various Ag. Entities	Sarasota	Recharge/Reuse	10.00	7.50	13,800,000	*$0.36*	*$0.40*
Reuse Expan in Sarasota N./S. Co. Sys. 2011-2025, Sarasota Co.	Sarasota	Sys. Expan.	*0.70*	*0.42*	*2,260,000*	*$1.06*	*$0.63*
Reuse Expan in Aquasource Fruitville 2011-2025, Aqua America	Sarasota	Sys. Expan.	*0.65*	*0.39*	*2,100,000*	*$1.06*	*$0.50*
Reuse Expan in City of Venice Sys. 2011-2025 (w/intercon), City of Venice	Sarasota	Sys. Expan	*0.10*	*0.06*	*323,000*	*$1.06*	*$0.50*
Reuse Expan in Camelot Lakes 2011-2025, Camelot Lakes	Sarasota	Sys. Expan.	*0.03*	*0.02*	*97,000*	*$1.06*	*$0.45*
Reuse Expan in N. Port WWTP 2011-2025, City of North Port	Sarasota	Sys. Expan	*1.38*	*0.83*	*4,457,000*	*$1.06*	*$0.50*
Reuse Expan in City of Sarasota WWTP 2011-2025, City of Sarasota	Sarasota	Sys. Expan	*5.62*	*3.37*	*18,153,000*	*$1.06*	*$0.50*
Reuse Expan in Siesta Key WWTP 2011-2025, Sarasota Co.	Sarasota	Sys. Expan	*2.09*	*1.25*	*6,751,000*	*$1.06*	*$0.50*
Reuse Expan in Gulfgate WWTP 2011-2025, Sarasota Co.	Sarasota	Sys. Expan	*2.04*	*1.22*	*6,589,000*	*$1.06*	*$0.50*
Reuse Expan in S. Gate WWTP 2011-2025, Sarasota Co.	Sarasota	Sys. Expan	*1.35*	*0.81*	*4,361,000*	*$1.06*	*$0.50*
Optimization and Efficiency Study in Coastal SWUCA, Various Util.	Various	Efficiency	*TBD*	*TBD*	*100,000*	*TBD*	*TBD*

Footnotes for Table 6-9 on the previous page:
The use of Italics denotes SWFWMD estimations
Not all projects have estimated costs
Some options are contingent upon others
MGD Offset = (if estimated) Annualized Supply: 1. x 75% for Ag, & R/A/C, 2. x 100% for I/C, NSR, & PG. 3. x 60% for Variety and 4. for RES is number of customers X 300 gpd.
ASR & Intrusion Barrier Costs = (if estimated) Annualized Supply x 4 x $1,000,000 + $300,000
Total Cost = (if estimated) = Annualized Supply x $3.23/Gallon (calc. of 139 active FY2000-2005 District funded reuse projects @ $422.4 million for 130.6 mgd reuse supply)
Preliminary Cost Per 1000 Gallons Offset = Project Cost amortized over 30 years @ a 6% interest rate
System Expansion Supply 2011-2025 = Projected 2025 WWTP Flow minus 2010 Reuse (existing & planned reuse projects)
Preliminary O&M cost estimates were calculated using individual utility O&M data where available, and a median O&M cost if no specific data was available.
Preliminary O&M costs per 1000 gallons "offset" were calculated utilizing costs per 1000 gallons "supplied" data normalized for individual project efficiency.

Section 3. PR/MRWSA Planning Area – Seawater Desalination Options

There are currently no seawater desalination plants operating or planned for the area. The evaluation of seawater desalination as a source for the region focused on locating suitable areas that 1) would be compatible with adjacent land uses, 2) would be near existing potable water transmission infrastructure, and 3) could be permitted for disposal of the waste concentrate. Two sites were identified that meet these criteria: the Port Manatee site in Manatee County and a site in an industrial area near the Venice airport in Sarasota County. Each option was conceptualized as having a production capacity of 20 mgd.

PR/MRWSA Planning Area - Seawater Desalination Option #1 - Port Manatee

Entity Responsible for Implementation: PR/MRWSA

This option would develop 20 mgd of potable water at Port Manatee in northwestern Manatee County, on Tampa Bay. The site was chosen because of its industrial nature and proximity to a deep-water channel that could be used for intake and discharge facilities. Its location in Class III waters outside aquatic preserves or OFW may improve the potential for obtaining a permitted discharge at the site. Both intake and discharge structures would be located in the vicinity of the existing dredged channel to Port Manatee. The proximity of this site to the mouth of Tampa Bay may be advantageous with respect to disposal of concentrate from the plant. The large volumes of water entering and leaving the bay during a normal tidal cycle would provide the volume of water necessary for dilution of the waste concentrate.

This site has been identified for industrial land use on Manatee County's future land use map. The site is located approximately 0.5 miles from a point of connection to two potable water lines that are part of Manatee County's water system. The facility would be designed to take in 40 mgd of seawater and produce an estimated 20 mgd of finished water. However, in order to properly manage the disposal of waste concentrate from the facility, the seawater intake would be designed to withdraw up to 440 mgd of which 40 mgd would be feed water for the desalination process. The treatment process would result in 20 mgd of waste concentrate that would then be diluted with up to 400 mgd of seawater (20 to 1 ratio) and discharged to the Gulf.

Quantity Produced (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O&M
20	$157,295,192	$7,864,760	$4.61	$20,359,461

Issues:

- The facility, as evaluated, does not include co-location with an existing industrial discharger.
- Potential impacts requiring evaluation include the effects of a large scale intake of seawater and discharge of waste concentrate discharge to the bay. Although the waters receiving the waste concentrate are Class III designated OFW and an aquatic preserve are nearby.

As part of the Water Planning Alliance Regional System Planning and Engineering Study, the Port Manatee Site was evaluated for seawater desalination facility options with capacities of 5 mgd and 10 mgd. Financial information for these options is presented in the table below.

Quantity Produced (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O&M
5	$45,490,000	$9,098,000	$4.74	$3,004,000
10	$77,133,000	$7,713,300	$4.05	$5,236,000

PR/MRWSA Planning Area - Seawater Desalination Option #2 - Venice

Entity Responsible for Implementation: PR/MRWSA

This option would develop 20 mgd of potable water in the general vicinity of the Venice Airport. The site was chosen because it is in close proximity to areas of high water demand and has access to potential intake and discharge sites in the Intracoastal Waterway and Gulf of Mexico. The site is also located near an existing water treatment plant that is interconnected to the Sarasota County Water System and may provide a point of distribution for the product water. Because the site is also located near an existing WWTP, opportunity may exist to access an existing permitted surface discharge site.

The proposed intake would be located in the Intercoastal Waterway. Locating the intake in the waterway will help increase circulation in a portion of the waterway that has exhibited poor water quality. The waste concentrate would be sent through a pipeline to discharge in the Gulf of Mexico. In order to properly manage the disposal of concentrate from the desalination facility, the intake would be designed to withdraw up to 440 mgd from the Intercoastal Waterway, of which 40 mgd would be feed water for the desalination process. The process would result in 20 mgd of concentrate that would be diluted with up to 400 mgd of seawater (20 to 1 ratio) and discharged to the Gulf.

Quantity Produced (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O&M
20	$152,925,988	$7,646,299	$4.55	$20,318,888

Issues:

- The facility, as evaluated, does not include co-location with an existing industrial discharger.
- Potential impacts requiring evaluation include the effects of a large scale intake of seawater from the Intercoastal Waterway and concentrate discharge to the Gulf of Mexico. Although the waters receiving the waste concentrate are Class III designated OFW and an aquatic preserve are nearby.

As part of the WPA Regional System Planning and Engineering Study, the Venice Site was evaluated for seawater desalination facility options with capacities of 5 mgd and 10 mgd. Financial information for these options is presented in the table below.

Quantity Produced (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O&M
5	$42,535,000	$8,507,000	$4.58	$2,992,000
10	$70,246,000	$7,024,600	$3.83	$5,223,000

Section 4. PR/MRWSA Planning Area - Brackish Ground Water Options

In the southern portion of the PR/MRWSA Planning Area it is possible for brackish ground water to be withdrawn from the lower portion of the intermediate aquifer with minimal impact to the Upper Floridan aquifer. To demonstrate the costs associated with developing this resource in the southern portion of the Planning Region, a potential site was identified in Charlotte County. Table 6-10 is a list of additional brackish ground-water desalination projects proposed by the Water Planning Alliance Regional System Planning and Engineering Study in Cooperation with the PR/MRWSA.

PR/MRWSA Planning Area Brackish Ground-Water Option # 1 - Charlotte County Conceptual Site

Entity Responsible for Implementation: To Be Determined

A one mgd brackish ground-water desalination option in Charlotte County was evaluated to demonstrate the cost of developing this source in the southern portion of the Planning Region. Costs associated with this site may be generally applicable to regional brackish ground-water sites from southern Sarasota to central Charlotte counties. In this region, depth to brackish ground water is generally greater than in the NTB Planning Area.

The Charlotte County conceptual site is located in the vicinity of Charlotte Beach. This area has experienced extensive land/lot development over the past two decades and could potentially experience a large rate of growth in a short period of time. Depending on the availability of supplies from the PR/MRWSA facility and Rotunda West Utilities (from expansion), a new brackish ground-water desalination facility could be constructed to meet the additional needs. The proposed one mgd facility would incorporate a brackish ground-water wellfield, an RO desalination treatment system, storage tank(s), high service pumping station, stabilization system, and a deep injection well for waste concentrate. Brackish ground-water resources are present in the middle and lower intermediate aquifer, which is encountered at depths between 200 and 600 feet below land surface. Additional quantities could be developed from the intermediate aquifer at depths ranging from about 400 to 700 feet below land surface, depending on water quality and production needs.

Brackish desalination facilities in this region generally blend product water with fresh ground water from the surficial aquifer. The following estimated costs are associated with the development of a one mgd brackish ground-water desalination facility and associated systems. Costs could change depending on the quality of the brackish ground water, ability to blend product with a freshwater resource, technical advancements in desalination technology, transmission distances, and type of waste concentrate disposal system.

Quantity Produced (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons
1	$6,151,925*	$6,151,925	$2.55

*Estimations were calculated by updating the 2001 RWSP to current costs.

Issues:

Table 6-10. List of Brackish Ground-Water Options Identified in the WPA Regional System Planning and Engineering Study in Cooperation with the PR/MRWSA (Greeley and Hansen, 2005).

Option Name and Entity Responsible for Implementation	User Group	Avg Annual Yield (mgd)	Intake Capacity (mgd)	Capital Cost (k$/mgd)	Unit Cost ($/kgal)	Project Description
Charlotte County						
Charlotte County Brackish Ground-Water Desalination Option Charlotte County and/or PRMRWSA	PS	5	6.25	26,925	2.55	Proposed 5 mgd facility would incorporate a brackish ground-water wellfield, an RO treatment plant and storage tanks, high service pumping station and a deep injection well. If necessary, develop well credits to offset new source.
Sarasota County						
Sarasota County - Venice Gardens Water Treatment Plant Upgrade Sarasota County and/or PRMRWSA	PS	1	1.25	TBD	1.00	Venice Gardens WTP Upgrade, consisting of replacing lower efficiency membrane treatment with higher efficiency membrane treatment resulting in increased potable production from existing water use permits.
Carlton Wellfield Expansion Sarasota County and/or PR/MRWSA	PS	4	5.5	1,750	1.35	Expansion of Sarasota County's Carlton wellfield, consisting of increased withdrawals of 5.5 mgd from 8 new wells and uses existing water treatment plant capacity.

- Withdrawals cannot affect Upper Floridan aquifer water levels in the MIA of the SWUCA unless a net benefit is provided.

Section 5. PR/MRWSA Planning Area - Fresh Ground Water Options

Future requests for ground water from the UFA will be evaluated based on projected effects on established MFL water bodies. In particular, projected effects of ground-water withdrawals in the PR/MRWSA Planning Area cannot impact water levels in the MIA of the SWUCA. Because the area encompasses the MIA, priority will be given to reducing ground-water withdrawals when possible in order to contribute to water level recovery in the area. Requests for withdrawals of UFA ground water for new uses will be considered only if the requested use is reasonable and beneficial, incorporates maximum use of conservation, and there are no available alternative sources of water. If all these conditions are met and the projected effects of the withdrawals impact water levels in the MIA, it will be necessary for those effects to be offset prior to issuance of a water use permit.

Though the use of ground water from the UFA to meet new uses will be limited, it is possible to obtain ground water from the surficial and intermediate aquifers. The following option evaluates the use of horizontal wells to develop ground water from the surficial aquifer.

PR/MRWSA Planning Area - Fresh Ground-Water Option #1 - Surficial Aquifer Horizontal Well Systems

Entity Responsible for Implementation: Water Supply Utilities

Horizontal well systems can be used to supply water to public and private systems. They have been used to augment reuse, to irrigate cemeteries and golf courses, and for fire suppression systems. Horizontal wells are typically used in conjunction with a pond or other storage system (e.g., aquifer storage and recovery well, tank, retrofitted parking lot). These systems are advantageous in areas where the surficial aquifer is productive and where withdrawals from the lower aquifers are restricted.

Two basic options are provided. The first option is modeled after a horizontal well system and storage pond that was constructed for the Department of Veterans Affairs at Bay Pines Cemetery in Pinellas County. The horizontal well system includes six horizontal wells, a 1.4 million gallon storage pond, piping and a pump station. The completed system is estimated to yield 100,000 gpd. Operation and maintenance costs are estimated to be $2,500 per year per well.

Cemetery Lawn Irrigation

Potential Quantity Available (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O & M
0.10	$700,000	$7,000,000	$2.43	$15,000

The second option includes construction of a horizontal well system for a typical Florida golf course. The system includes one horizontal well, piping, and a pump station. This system will produce between 200-300 gallons per minute, or about 360,000 gpd. This option only develops water for distribution into an existing golf course irrigation system.

Golf Course Irrigation

Potential Quantity of Water Available (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O & M
0.36	$80,000	$222,000	$0.08	$2,500

Issues:

- Environmental setting and special construction specifications will affect horizontal well system costs. These factors include soil type, depth to water, terrain, and storage system(s) required.

Section 6. PR/MRWSA Planning Area - Non-Agricultural Water Conservation Options

All of the non-agricultural water conservations options are applicable in each Planning Area. Therefore, they are only described once in the NTB Planning Area portion of this chapter, Part C, Section 6.

Section 7. PR/MRWSA Planning Area – Agricultural Conservation Options

Agricultural Conservation Option #1 - Use of the Surficial Aquifer

Entity Responsible for Implementation: Agricultural Water Users

Nearly 90 percent of the irrigated acreage and demand in the Planning Region is located in the SWUCA. The surficial aquifer yields relatively small quantities of water in the central and western portions of the SWUCA where the water generally is used for irrigation and domestic supply. The surficial aquifer ranges in thickness from 10 feet near the coast to greater than 50 feet. In the eastern portion of the SWUCA, the aquifer extends from 10 to more than 300 feet in depth.

A significant percentage of agricultural production in the SWUCA is on spodic soils, which have a distinct layer called a spodic horizon. The spodic horizon, generally at a depth of three feet, acts as an aquitard, restricting the downward movement of water and maintaining the water table at, near, or above land surface, especially during the wet season (normally June through September). The close proximity to the surface of the surficial aquifer facilitates its use for options that include tailwater recovery and horizontal wells.

A field-scale example that could be adapted to many sites in the Planning Region uses a tailwater recovery and seepage-water interception system (TRSIS), (Bethune and Smajastrla, 1999). Using the TRSIS method to withdraw water from the surficial aquifer, the amount recovered for reuse was approximately eight percent of the total quantity applied during bed preparation and supplemental irrigation. A tailwater recovery system is a best management practice in four of the six model farms discussed in Chapter 5.

The water savings achieved by implementing the TRSIS are estimated to be 3.4 mgd and 4.0 mgd for the SWUCA and Planning Region, respectively. The unit cost is estimated to be $0.25 1 Kgal using 1999 construction costs.

An additional water supply may be available from the surficial aquifer using a deeper horizontal well recovery system that withdraws water from depths of 15 to 20 feet. Greater quantities would likely be available during dryer than normal years as well as higher yields using a horizontal well recovery system. The water savings that would be generated by implementing a horizontal well recovery system are roughly estimated to be 35.3 mgd and 40.1 mgd for the SWUCA and Planning Region, respectively. The unit cost includes the horizontal well construction, pump, engine, piping, and controls and is estimated to be $0.50 per 1 Kgal for a system having a 400 gpm capacity.

Option	Potential Savings (mgd)[1]	Capital Cost Per Acre ($)[2]	O&M Cost ($)/Acre	Cost/1,000 Gallons[3]
Surficial Aquifer (TRIS)	4.1	$388 (with screen) $347 (without screen) [4]	$1.51	$0.25

[1] If implemented in year 2005 on all acreage.
[2] Costs estimated in 1999 and included depreciation, insurance, taxes, and repairs (for a 300-acre farm).
[3] Using 1999 construction costs.
[4] HSW, p. 9, 2004

Issues:

- Extraction of water from the surficial aquifer will reduce the amount of recharge to the Floridan and intermediate aquifers and can impact nearby streams and wetlands. However, recharge in much of the SWUCA is low (except in the eastern portion of the SWUCA) and, with the exception of the deep horizontal well, the BMPs are mostly applicable to wet season irrigation.

Agricultural Conservation Option #2 - Rainwater Harvesting

Entity Responsible for Implementation: Agricultural Water Users

Because normal annual precipitation exceeds evapotranspiration, a net excess of water runs off nearly all agricultural land in the District. During the wet season there is an abundance of runoff; during a normal dry season the runoff is sporadic. During the wet season a relatively small network of ditches can provide the necessary hydraulic conditions to yield significant quantities of water. However, during the dry season the ability to store water between runoff events in a reservoir becomes critical.

Given these commonly encountered design conditions, a farm-scale prototype rainwater harvesting conceptual plan was developed to generate planning estimates of potential water savings. The site is typical of many row crop farms in the SWUCA. The crops assumed to be grown are fall and spring tomatoes; the total field acreage is approximately 1,000 acres, split in thirds between fall land, spring land, and fallow land. The production land is assumed to be rotated among all the fields. The predominate soil is the Myakka series. This scenario could justify an annual average water use allocation of approximately 1.5 mgd. The major components of the conceptual plan include: a surface water withdrawal pump station; a 30-acre irrigation reservoir, pump station, and distribution system; and a surface water runoff interception/diversion ditch.

The surface water withdrawal would include a 500-foot intake ditch to convey water from an intermittent stream to a sump having a maximum 3,000-gpm pump station. Surface water would then be pumped via 6,360-feet of 16-inch diameter pipe to a 30.2-acre irrigation reservoir. Water for bed preparation and supplemental irrigation would then be pumped to the fields using two 2,500-gpm pumps via 24,880-feet of irrigation main. A 6,100-foot interception ditch would divert runoff to an existing wetland perimeter ditch that discharges into the sump. Control structures would be installed on the interception ditch to maintain base flow downstream and allow large storm events to bypass the interception ditch.

The amount of rainwater that could potentially be harvested is conservatively estimated to be 0.53 mgd which is 35 percent of the total annual average water use allocation and 76 percent of the fall water use allocation. The estimated cost to permit and construct the rainwater harvesting system is $2,980,000. Assuming the grower participated in various incentive programs such as FARMS and the U.S. Department of Agriculture Natural Resource Conservation Service Environmental Quality Incentives Program, the cost to the grower could be significantly less.

The water savings that would potentially be generated by implementing a similar rainwater harvesting system on agricultural lands is conservatively estimated to be 35.3 mgd and 40.1 mgd for the SWUCA and Planning Region, respectively.

Option	Potential Savings (mgd)[1]	Capital Cost ($)[2]	O&M Cost ($)	Cost/1,000 Gallons
Rainwater Harvesting – Conceptual Plan	41.1	$13,80/Acre (avg.)[3]	$98.90/Acre	$2.16

[1] If implemented in year 2005 on all acreage, but does not include nurseries.
[2] Costs estimated in 1999 and included depreciation, insurance, taxes, and repairs.
[3] HSW, 2004, p. 10-11.

Issues: None.

Agricultural Conservation Option #3 - Reclaimed Water

Entity Responsible for Implementation: Water Supply Utilities

Agricultural use of reclaimed water has increased over the past decade. As of 2004, more than 9,000 acres of agriculture were irrigated using reclaimed water in the District (FDEP, 2005). In 2004, agricultural customers accounted for approximately 10 percent (15.2 mgd) of all the reclaimed water used (150 mgd) within the District.

The Manatee Agricultural Reuse Supply (MARS) project is an excellent example of a large-scale direct use of reclaimed water to irrigate agricultural lands. At a cost of $31.7 million, the MARS project has the potential to supply up to 12 mgd for agricultural irrigation at build out. The feasibility of using reclaimed water for agriculture depends on the location of reclaimed water infrastructure and type of crop requiring irrigation. Additional options that involve the direct use of reclaimed water for agriculture are described in Part D, Section 2 of this chapter and include:

- Reuse Expansion in Dade City WWTP 2011-2025 (Pasco County)
- Arcadia Agricultural Reuse Expansion (DeSoto County)
- Tailwater Recovery/Reuse (Manatee County)
- Bradenton/MARS Interconnection (Manatee County)
- Palmetto/MARS Interconnection (Manatee County)
- Frog Creek MARS Storage (Manatee County)
- IMC/MARS Augmentation (Manatee County)
- MARS/Lake Parrish (Manatee County)
- Reuse Expansion in Manatee County System 2011-2025 (with interconnect)
- MARS Sarasota County Interconnect (Sarasota County)
- Flatford Swamp Reuse (Sarasota County)
- Reuse Expansion in Zolfo Springs WWTP 2011-2025 (Hardee County)
- Reuse Expansion in Lake Placid WTP 2011-2025 (Highlands County)
- Reuse Expansion in Avon Park WWTP 2011-2025 (Highlands County)

- Sebring Reuse (Highlands County)
- Winter Haven Plant III Reuse (Polk County)
- Reuse Expansion in Lake Wales WWTP 2011-2025 (Polk County)
- Reuse Expansion in Lake Alfred System 2011-2025 (Polk County)

Reclaimed water can also be used indirectly to benefit agriculture. The injection of reclaimed water into the Upper Floridan aquifer in coastal areas would slow or halt the inland advance of salt water in the aquifer which would ensure that the aquifer could continue to supply water for agriculture. An example of this concept is the South Hillsborough County ASR Wells/Recharge/Saltwater Intrusion Barrier project (Table 6-4). An additional option that involves the indirect use of reclaimed water for agriculture that is similar to this concept is the Punta Gorda Saltwater Barrier (Table 6-9).

Agricultural Conservation Option #4 – Surface Water Sources

Entity Responsible for Implementation: Agricultural Water Users

In certain parts of the Planning Region, surface waters can be captured, stored and used to irrigate farmland. By doing so, irrigation losses and ground-water withdrawals can be reduced and, in some cases, hydroperiods of adjacent natural systems can be restored. An example is the Falkner-Flatford Swamp Surface Water Withdrawal Project. The project consists of three major components: 1) tailwater capture and distribution, 2) Boggy Creek withdrawal, and 3) Coker Creek capture and re-circulation. The water captured by the project is used to irrigate 4,600 acres of a tomato farm and offset 1.9 mgd of ground water. The total project cost was $4.1 million.

A similar project is the PTG-Flatford Swamp Surface Water Exchange Project in Manatee County. The project includes the following major components: 1) a surface-water withdrawal pump station, sump and conveyance trench, 2) construction of a 10-acre storage reservoir and pump station in an area that is used for row crop production, 3) modifications to a stream to direct irrigation runoff into the storage reservoir and riser boards designed and installed to allow wet season flows to enter Flatford Swamp, and 4) installation of sufficient pipe to convey surface water from the Flatford Swamp to the farm irrigation system. As a result of the project, between 1.7 and 2.0 mgd of surface water (annual average) are being used to irrigate portions of the 3,250-acre farm. The total project cost was $1.4 million.

Option	Potential Savings (mgd)	Capital Cost ($)	O&M Cost ($)	Cost/1,000 Gallons
Falkner Surface Water Exchange Project	1.9	$4,100,000	$109,000	$0.55

Part E. Water Supply Development Options – HWA Planning Area

Section 1. HWA Planning Area - Surface Water/Storm Water Options

The most prominent drainage feature in the HWA Planning Area, as well as the entire SWUCA, is the Peace River. As noted in Chapter 5, based on the planning level criteria, the Peace River has the ability to provide up to 45.3 mgd of additional water supply, the most of any surface water feature in the region. Several options have been identified for the Peace River that would benefit ground-water levels and provide for water supply. Although the availability of water is greater in downstream portions of the river, developing water supply options in the upper watershed would enable water suppliers to take advantage of the mined areas and reduce distribution costs by building projects closer to demand centers. In addition to the main stem of the Peace River, water supply options are proposed for several significant tributaries. The mining of phosphate ore in the upper watershed has resulted in considerable alterations to the land surface. These altered lands are well-suited to water resource development projects because of the large expanses of mine cuts and clay settling areas that result from mining activities. The clay settling areas could potentially be used, with some modifications, as surface water reservoirs. Several options were identified that take advantage of the mined lands. Other water sources in the HWA Planning Area include drainage features along the Lake Wales Ridge such as Josephine Creek in Highlands County. The Kissimmee River is a major potential water supply source that could be utilized in the HWA Planning Area. Located within the SFWMD, the river is the eastern boundary of Polk County.

Numerous surface water options were identified and analyzed for the HWA Planning Area by the District and the HWA planning effort. Tables 6-11 and 6-12 are the lists of surface water/storm water options identified by the District and HWA, respectively. Some of these options appear on both lists. The Upper Peace River, Josephine Creek. and Kissimmee River options are presented in greater detail on the following pages. Though options are identified in the upper part of the Peace River watershed, it is possible that the availability of water may not be sufficient. This is because of the efforts underway by the District to capture and store excess flows to be used to meet the proposed minimum flows on the upper river. The HWA planning effort included an option to withdraw water from the Kissimmee River in the SFWMD. Prior to development of this option it will be necessary for the District and SFWMD to address all issues associated with interdistrict transfers of water and to coordinate and agree on the downstream effects of this withdrawal.

HWA Planning Area Surface Water/Storm Water Option #1 – Kissimmee River Potable Supply

Entity Responsible for Implementation: SFWMD, Polk County Utilities

This option would be located within the SFWMD near the Polk/Osceola county line in the vicinity of Lake Kissimmee. The concept is for a regional supplier or cooperative to develop a surface water supply near Lake Kissimmee, blend it with other potable supplies and distribute the water through interconnects with nearby municipal systems. Neighboring utilities in the District that could potentially interconnect with this water supply include Polk County Utilities, the cities of Lakeland, Lake Alfred, Auburndale, Winter Haven, Lake Hamilton, Haines City, Davenport, and Dundee. Utilities and municipalities in the SJRWMD and SFWMD could also obtain water from this option.

It is anticipated that the option could provide a minimum of 35 mgd of potable supply. The option includes a surface water intake structure, treatment plant, reservoir, ASR wells, and associated pipelines and ancillary features. A 52.5 mgd intake structure would draw water off the Kissimmee River for storage in a 6.5 billion gallon off-stream reservoir prior to treatment, blending, and transport. Additionally, treated water could be captured from the river during periods of high flow, stored in the upper Floridan aquifer, then recovered during dry periods using 10 ASR wells, each with a capacity of 2 mgd. A long-term surface water quality assessment will be necessary to predict water quality treatment requirements for engineering design and costing. It is anticipated that surface water would be available throughout most of the year and could serve high growth areas of northeastern and north-central Polk County.

Quantity Available (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O&M
35	$277,000,000	$7,914,000	$2.16	$6,430,000

Issues:

- As with any water source withdrawn within the boundaries of one water management district and transported for use in another, an interbasin transfer will be required under Section 373.2295, F.S.
- Prior to implementation of this option it will be necessary to assess the effects of surface water diversions on downstream uses and natural systems and ensure proposed withdrawals do not interfere with downstream restoration efforts underway by the SFWMD.
- Implementation of this option will likely be a cooperative effort between the District, SFWMD, local governments such as Polk County and Osceola County, and municipalities in the region.

HWA Planning Area Surface Water/Storm Water Option #2 - Upper Peace River Aquifer Recharge and Industrial Supply

Entity Responsible for Implementation: Electric Power Industry, Phosphate Industry

This option involves storing excess flows from the upper Peace River in the upper Floridan aquifer to be used to offset future agricultural or industrial (power plant) ground-water uses in the area. A 1,500-acre partially filled clay setting area, located at the Clear Springs Mine four miles south of Bartow, could be used as an off-stream reservoir with a capacity of 6.5 billion gallons (20,000 acre-feet). Water would be diverted from the Peace River during high flow periods, pumped into existing created wetlands for treatment to remove solids, then allowed to flow into the clay settling basin. A treatment plant constructed adjacent to the reservoir would treat water to potable standards for aquifer recharge.

An annual average yield of 10 mgd may be available for diversion from the Peace River with a maximum diversion of 130 mgd. Water would be pumped approximately 3,000 feet from the River into wetlands. Two, five mgd Avon Park aquifer recharge wells would be installed to recharge the UFA.

Quantity Available (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O&M
10	$69,775,560	$6,977,556	3.35	$6,460,228

Issues:

- Berms around the clay settling area would require upgrading for surface-water storage.
- The feasibility of using clay settling areas as reservoirs would need to be evaluated.
- Potential impacts of surface-water withdrawals on the Payne Creek State Historic Site need to be considered.
- The quantity of water available for this or similar options in the upper Peace River watershed will ultimately depend on the quantity of water needed to achieve MFLs at the Bartow and Ft. Meade gages.
- Future withdrawals cannot interfere with the downstream existing legal uses.
- The issue of elevated levels of arsenic in water recovered from ASR systems must be considered.

HWA Planning Area Surface Water/Storm Water Option #3 – Peace Creek Canal Offstream Reservoir and Aquifer Recharge Project

Entity Responsible for Implementation: Polk County Utilities, Electric Power Industry, Phosphate Industry

This option proposes to divert excess surface water from the Peace Creek Canal for storage in an offstream reservoir and/or in the Upper Floridan aquifer. The water would be available for direct use from the reservoir or indirectly through aquifer recharge. Water developed from this option could supply public supply and commercial/industrial users in the area. The estimated annual-average yield is 8.5 mgd. Major components include a 12.8 mgd intake structure, a 12.8 mgd water treatment plant, six aquifer recharge and recovery (ARR) wells, five miles of pipeline, and a 1.5 billion gallon offstream reservoir. Water stored in the reservoir would be treated and injected into the Upper Floridan aquifer using six ARR wells, each with a capacity of 2 mgd. Recharge provided by these wells would have a positive effect on ground-water levels in the area, which could offset the effects of new ground-water development in the area.

Quantity Available (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O&M
8.5	$86,640,000	$10,193,000	$2.62	$1,577,000

Issues:

- The availability of supply from surface water sources contributing to Upper Peace River flows must be coordinated with the District's efforts to recover minimum flows.

Table 6-11. HWA Planning Area - List of Surface Water/Storm Water Options Developed by the District.

Option Water Body and Entity Responsible for Implementation	User Group	Avg Annual Yield (mgd)	Intake Capacity (mgd)	Capital Cost ($1,000/mgd)	Unit Cost ($/1,000 gal)	Annual O&M ($1,000)	Storage Method/Level of Treatment	Distribution Method
Polk County								
Peace Creek Canal Polk County and/or Other Use Group	Ag, PS, Ind	8.5	84	8,211	2.09	704	Off-stream reservoir, AR / 2	Aquifer conveyance to agricultural, public supply, & industrial groundwater users
IMC Clay Settling Ponds (stormwater) Polk County and/or Other Use Group	Ag, PS, Ind	3	10	4,657	1.71	711	Clay settling ponds, AR / 2	Aquifer conveyance to agricultural, public supply, & industrial groundwater users
Upper Peace River Polk County and/or Other Use Group	Ag, PS, Ind	10	130	6,890	3.26	6,193	Clay settling ponds, AR / 1	Aquifer conveyance to agricultural, public supply, & industrial groundwater users
Upper Saddle Creek Polk County and/or Other Use Group	Ag, PS, Ind	2.9	29	16,469	4.59	905	Clay settling ponds, AR / 1	Aquifer conveyance to agricultural, public supply, & industrial groundwater users
Highlands County								
Josephine Creek Highlands County and/or Other Use Group	Ag, PS, Ind	3.0	4	4,931	1.83	779	AR / 1	Aquifer conveyance to agricultural, public supply & industrial groundwater users
Hardee County								
Charlie Creek TBD	Ag	12	66	14,544	5.45	9,413	AR / 2	Aquifer conveyance to agricultural groundwater users
Charlie Creek TBD	Ag	12	66	4,003	1.53	2,710	Off-stream reservoir / 3	Piped to adjacent agricultural users
Peace River nr Zolfo Springs TBD	Ag	40	390	5,003	2.17	15,118	Off-stream reservoir / 3	Piped directly to adjacent agricultural users
Charlie Creek TBD	Ag	12	66	4,127	1.51	2,518	Off-stream reservoir, AR / 2	Aquifer conveyance to agricultural groundwater users
Upper Horse Creek TBD	Ag, PS, Ind	1.4	8.3	10,506	3.32	479	Off-stream reservoir, AR / 2	Aquifer conveyance to agriculture, public supply & industrial groundwater users

Table 6-12. HWA Planning Area - List of Surface Water/Storm Water Options Developed by the HWA Water Supply Planning Effort (Envisors and Black and Veatch, 2006).

Option Water Body and Entity Responsible for Implementation	User Group	Avg Annual Yield (mgd)	Intake Capacity (mgd)	Capital Cost ($1,000/mgd)	Unit Cost ($/1,000 gal)	Project Description
Polk County						
Upper Peace River Industry	Mining	2.15	3.23	5,126	$1.13	Interconnection of mined ponds and streams. Project will be used to supplement mining use.
Upper Peace River Polk County	PS	4.1	6.15	10,017	$2.60	Collect and treat surface runoff to potable standards and inject into the UFA for drought period use.
Kissimmee River Polk County	PS	35	52.5	7,754	$2.11	Capture and treat surface water and convey via pipeline to the SWFWMD.
Stormwater Industry	M/ID	6.8	20	4,065	$0.91	Capture and treat surface runoff and treat to potable standards for ARR.
Peace Creek Polk County and/or Other Use Group	AG,PS, I/C	8.5	12.75	10,193	$2.62	Construct an offstream reservoir to store flows from Peace Creek Canal.
Hardee County						
Surface runoff Industry	M/ID	1.3	4	12,800	$2.72	Collect and treat surface runoff in mined areas and treat to potable standards for ARR
Upper Horse Creek TBD	AG,PS,I/C	1.4	8.3	22,779	$5.23	Construct an offstream reservoir to store flows from Upper Horse Creek.
Highlands County						
Josephine Creek Highlands County and/or Other Use Group	AG,PS,I/C	3	4	9,453	$2.71	Capture and treat excess flow from Josephine Creek and treat to potable standards for ARR
DeSoto County						
Peace River PR/MRWSA	PS	40	TBD	TBD	TBD	Capture and store excess flows in an offstream reservoir and treat to potable standards for ASR.

Section 2. HWA Planning Area – Reclaimed Water Options

In the 2000 base year, there were 41 WWTP in Hardee, Highlands and Polk counties collectively producing 29 mgd of reclaimed water (Table 6-13.) Of that amount 17 mgd (60 percent) was beneficially used to offset 10 mgd of traditional potable supplies.

Table 6-13. 2000 Actual versus 2025 Potential Reclaimed Use and Offset in the HWA Planning Area.

County	WWTPs	2000	2000 Use		2000 Offset		2025	2025 Use		2025 Offset	
	(#)	Plant Flow	mgd	%	mgd	%	Plant Flow	mgd	%	mgd	%
Hardee	4.0	1.2	0.3	22%	0.2	60%	1.1	1.0	75%	0.8	75%
Highlands	7.0	2.3	0.0	--	0.0	--	3.1	2.3	75%	1.7	75%
Polk	30.0	25.3	16.4	65%	9.8	60%	36.6	27.4	75%	20.6	75%
Total	**41.0**	**28.7**	**16.7**	**60%**	**10.0**	**60%**	**41.1**	**30.7**	**75%**	**23.1**	**75%**

The HWA Planning Area is predominantly rural except for the Lakeland area and portions of northeast Polk County. Much of the area is dominated by agricultural, mining and industrial land uses. However, this is changing rapidly as development encroaches on agricultural lands and lands associated with the phosphate mining industry. Because the WWTP for the many small towns are small, inter-system connections are not among the short-listed options for maximizing reclaimed water. Instead, the focus is on discontinuing the current practice of disposing treated wastewater in rapid infiltration basins and spray fields and intend using the water within the towns and surrounding agricultural lands.

The District’s goal is ambitious, but is achievable considering the development of increasingly sophisticated technologies and growing demand for reclaimed water. By 2025, it is expected that 75 percent of reclaimed water available in the HWA Planning Area can be utilized. It is further expected that efficiency by the end user will increase from 60 percent to 75 percent through a combination of measures such as metering and volume-based rates and education. Using this formula, by 2025 it is estimated that 31 mgd (75 percent) of the 41 mgd of reclaimed water being produced will be used for beneficial purposes, and 23 mgd (75 percent) of traditional sources will be offset as a result. Table 6-13 illustrates the reclaimed water potential. Following the table are evaluation summaries for representative projects that could help achieve the goal of 75 percent utilization and offset in the region. Table 6-14 is a list of potential reclaimed water options that could be implemented in the HWA Planning Area.

HWA Planning Area Reclaimed Water Option #1 - Lakeland Zero Liquid Discharge Reuse

Entity Responsible for Implementation: City of Lakeland Utilities (Electric and/or Water)

The City of Lakeland's WWTP produce approximately 10 mgd of flow, of which the City's McIntosh power plant uses approximately 6.5 mgd for cooling purposes. The McIntosh power plant discharges approximately two mgd of highly mineralized cooling tower effluent into the City's wetland treatment system. In addition to the reclaimed water used for cooling purposes, between five and eight mgd of reclaimed water is also discharged directly into the wetland as a dilution agent, which has historically worked to achieve compliance with a discharge permit. The wetland discharges into the Alafia River system in accordance with the City's NPDES permit.

The Zero Liquid Discharge (ZLD) Reuse Project is a proposed treatment system for the highly mineralized McIntosh cooling tower effluent and would enable the use of the City's reuse flows in a more efficient manner. The City could treat the highly mineralized cooling tower effluent and reuse it, which not only creates approximately two mgd of high quality water, but would also free up at least five million gallons of reclaimed water the City currently uses to blend (dilute) the mineralized cooling tower effluent. The potential project option would include the following elements:

- A reverse osmosis (RO) unit that provides 80 percent efficiency could be installed to treat the two mgd of effluent from the McIntosh power plant. The resulting 1.6 mgd of permeate would have ultra-pure water quality and would be suitable for most potential applications in the area.
- The 0.4 mgd of brine discharge could then be treated in a ZLD unit, which employs a vapor extraction process similar to distillation. The result would be nearly 0.4 mgd of ultra-pure permeate water and a solid waste material, often referred to as a cake, which could be disposed of in an appropriate disposal facility.
- As with most projects, a feasibility study, prior to implementation, would be prudent.

Implementing this process would eliminate the City's brine concentrate and allow nearly 100 percent of the reclaimed water to be utilized for beneficial purposes, representing the capture of approximately seven mgd of reclaimed flows currently disposed of in the wetlands (two mgd concentrate and five mgd dilution reuse). This is not a new concept, as the City and others have evaluated the option of installing a brine concentration unit in the past. However, recent advances in membrane and vapor extraction technology have reduced the cost of these systems, warranting a reevaluation of the applicability of this type of system to the City's reuse flows. The cost of the option is estimated to be $7.5 million for an annualized supply of seven mgd and an annualized offset of seven mgd. The implementation timeframe is expected to be between 2011 and 2025.

Quantity Produced (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	O&M/1,000 Gallons Offset
7 (7*)	$7,500,000	$1,071,000	$0.21	$0.60

*Beneficial offset

Lakeland Electric has also investigated the feasibility of implementing this option and concluded that the beneficial offset would be 4.0 - 6.0 mgd with a capital cost of $31.5 million and an annualized O&M cost of $3.6 million resulting in annualized capital and O&M cost of $6.3 million (assuming capital recovery over a 20-year period and a 6% discount rate). The differences in beneficial offset between the District’s and Lakeland Electric’s feasibility analyses may be due to the reduced electrical production of the McIntosh power plant’s Unit 5 which is expected to increase in the future. Due to uncertainties regarding beneficial offset and costs of undertaking this option, additional studies should be performed to determine the feasibility of this project.

Issues:

- O&M of an estimated $1.5 million annually would have to be factored into the City budget. It is also important to note that O&M costs appear to be decreasing with related technological advancements.
- The reduction of reclaimed water and cooling tower effluent discharged into the City’s wetland treatment system could affect the operation of the system and the viability of other downstream projects associated with the wetland (see Lakeland Reclaimed Water Highway 60 Industrial Option).
- Additional feasibility studies should be performed before undertaking this project, and cooperative funding may be required to make this project feasible.

HWA Planning Area Reclaimed Water Option # 2 - Lakeland Reclaimed Water Highway 60 Industrial

Entity Responsible for Implementation: City of Lakeland Water Utilities

This option involves using blended reclaimed water and stormwater to serve industrial chemical manufacturers such as Mosaic, CF Industries, and others located along State Road 60 corridor in Polk County. The source of the stormwater is the City of Lakeland wetlands treatment system. The option would include the design, permitting and construction of an intake structure, pumps, filtration and a high level disinfection treatment system necessary to meet FDEP's reclaimed water requirements, a second high service pump station, a six million gallon storage tank and 32,000 linear feet of 16-inch transmission main from the wetland treatment system to industrial users. Approximately two mgd of reclaimed water would be available for industrial reuse to offset two mgd of ground-water withdrawals. The cost of the option is estimated to be $6 million for an offset of 2.0 mgd. The supply and offsets available from this project would be reduced if the City reduces or suspends reclaimed water/cooling tower effluent discharges into their wetlands treatment system (see Lakeland ZLD Reuse Option). The implementation timeframe is expected to be between 2011 and 2025.

Quantity Produced (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	O&M per 1,000 Gallons Offset
2(2*)	$6,460,000	$3,230,000	$0.64	$0.30

*Beneficial offset

Issues:

- Seasonal and long-term supply of the water from the wetland system may pose quantity/quality issues and could affect the viability of the project.

HWA Planning Area Reclaimed Water Option # 3 - Zolfo Springs Agricultural Reuse

Entity Responsible for Implementation: City of Zolfo Springs

This option involves redirecting wastewater treated at the City of Zolfo Springs WWTP from its absorption field disposal site to local agricultural interests. The option includes the design and construction of 8,000 feet of 6-inch transmission main to transmit 0.14 mgd of reclaimed water to agricultural customers and offset 0.10 mgd of ground-water use. The cost of the option is estimated to be $0.45 million and the implementation timeframe is expected to be between 2011 and 2025.

Quantity Produced (mgd)	Capital Cost	Cost/mgd Offset	Cost/1,000 Gallons Offset	O&M per 1,000 Gallons Offset
0.14 (0.10*)	$450,000	$4,500,000	$0.89	$0.30

*Beneficial offset (see Table 6-14)

Issues:

- The WWTP would require upgrading to meet FDEP reclaimed water standards. However, such upgrades are anticipated to be required during the 2011-2025 timeframe.

HWA Planning Area Reclaimed Water Option #4 - Sebring Agricultural Reuse

Entity Responsible for Implementation: City of Sebring

This option involves redirecting effluent treated at the City of Sebring's' WWTP from its rapid infiltration basins to local agricultural interests. The option includes the design and construction of a high service pump station, a five-million gallon storage tank, and 26,400 feet of 12-inch reclaimed water transmission main. Approximately 1.25 mgd of reclaimed water would be transmitted to agricultural customers to offset 0.94 mgd of ground water. The cost of the option is estimated to be $4.0 million for an offset of 0.94 mgd. The implementation timeframe for the option is expected to be between 2011-2025.

Quantity Produced (mgd)	Capital Cost	Cost/mgd Offset	Cost/1,000 Gallons Offset	O&M per 1,000 Gallons Offset
1.25 (0.94*)	$4,038,000	$4,296,000	$0.85	$0.40

*Beneficial offset (see Table 6-14)

Issues:

- The WWTP would require upgrading to meet FDEP reclaimed water standards. However, such upgrades are anticipated to be required during the 2011-2025 timeframe.

Table 6-14. HWA Planning Area - List of Reclaimed Water Options.

Option Name and Entity Responsible for Implementation	County	Type	Supply	Offset	Capital Cost	Cost/Ben	O&M/Offset
Reuse Expan in Hardee Correctional WWTP 2011-2025, FL Dept. of Corrections	Hardee	Sys. Expan. Toilet Flushing/Laundry	*0.16*	*0.16*	*517,000*	*$0.64*	*$0.30*
Reuse Expan in Zolfo Springs WWTP 2011-2025, Town of Zolfo Springs	Hardee	Sys. Expan. Ag.	*0.14*	*0.14*	*452,000*	*$0.64*	*$0.30*
Reuse Expan in Bowling Green WWTP 2011-2025, City of Bowling Green	Hardee	Sys. Expan.	*0.05*	*0.05*	*162,000*	*$0.64*	*$0.30*
Reuse Expan in Wauchula WWTP 2011-2025, City of Wauchula	Hardee	Sys. Expan	*0.08*	*0.08*	*258,000*	*$0.64*	*$0.30*
Reuse Expan in Lake Placid WWTP 2011-2025, Lake Placid	Highlands	Sys. Expan.	*0.01*	*0.01*	*32,000*	*$1.06*	*$0.30*
Reuse Expan in Sun n Lake WWTP 2011-2025, Sun n Lake Improvement District	Highlands	Sys. Expan.	*0.62*	*0.37*	*2,003,000*	*$1.06*	*$0.50*
Reuse Expan in Kissimmee River Resort WWTP 2011-2025, Kissimmee River Resort	Highlands	Sys. Expan.	*0.01*	*0.01*	*32,000*	*$1.06*	*$0.30*
Reuse Expan in Avon Park WWTP 2011-2025, City of Avon Park	Highlands	Sys. Expan.	*0.92*	*0.55*	*2,972,000*	*$1.06*	*$0.50*
Highlands Co. Reuse Regionalization, Various Util.	Highlands	Intercon.	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*
Reuse Expan in Sebring WWTP 2011-2025, City of Sebring	Highlands	Sys. Expan.	*1.25*	*0.75*	*4,038,000*	*$1.06*	*$0.50*
Sebring Agricultural Reuse, City of Sebring	Highlands	Sys./Ag. Reuse	*1.25*	*0.94*	*4,038,000*	*$0.85*	*$0.40*
Winter Haven Plant III Reuse, City of Winter Haven	Polk	Ag. Reuse	*3.00*	*2.25*	*9,690,000*	*$0.85*	*$0.40*
Lakeland Wetland-Hwy 60 Industrial Reuse, City of Lakeland	Polk	Trans.	*2.00*	*2.00*	*6,460,000*	*$0.64*	*$0.30*
Polk Co. Reuse Efficiency Study, Various Util.	Polk	Efficiency	*TBD*	*TBD*	*50,000*	*TBD*	*TBD*
East-Cent. Reclaimed Water Rate Study, Polk Co.	Polk	Efficiency.	*TBD*	*TBD*	*25,000*	*TBD*	*TBD*
Lakeland/Polk Intercon., Polk Co.	Polk	Intercon.	*2.00*	*1.20*	*6,460,000*	*$1.06*	*$0.50*
Lakeland Zero Liquid Discharge-Power, City of Lakeland Electric or Water Util.	Polk	Trans./Treatment	*2.00*	*2.00*	*7,500,000*	*$0.74*	*$0.30*
Reuse Expan in Polk Co. Regional WWTP 2011-2025, Polk Co.	Polk	Sys. Expan.	*0.01*	*0.01*	*32,000*	*$1.06*	*$0.30*
Reuse Expan in Polk NE Regional WWTP 2011-2025, Polk Co.	Polk	Sys. Expan.	*0.01*	*0.01*	*32,000*	*$1.06*	*$0.30*
Reuse Expan in Polk NW Regional WWTP 2011-2025, Polk Co.	Polk	Sys. Expan	*0.01*	*0.01*	*32,000*	*$1.06*	*$0.30*

Table 6-14. Heartland Water Alliance Planning Area - List of Reclaimed Water Options (Continued).

Option Name and Entity Responsible for Implementation	County	Type	Supply	Offset	Capital Cost	Cost/Ben	O&M/Offset
Reuse Expan in Polk SW Regional WWTP 2011-2025, Polk Co.	Polk	Sys. Expan	*0.08*	*0.05*	*258,000*	*$1.06*	*$0.48*
Reuse Expan in Bartow WWTP 2011-2025, City of Bartow	Polk	Sys. Expan	*0.54*	*0.54*	*1,744,000*	*$0.64*	*$0.30*
Reuse Expan in Fort Meade WWTP 2011-2025, Fort Meade	Polk	Sys. Expan	*0.14*	*0.11*	*452,000*	*$0.85*	*$0.38*
Reuse Expan in Cypress Wood WWTP 2011-2025, City of Winter Haven	Polk	Sys. Expan	*0.28*	*0.17*	*904,000*	*$1.06*	*$0.49*
Reuse Expan in Haines City WWTP 2011-2025, Haines City	Polk	Sys. Expan	*1.17*	*0.70*	*3,779,000*	*$1.06*	*$0.50*
Reuse Expan in Lake Wales WWTP 2011-2025, City of Lake Wales	Polk	Sys. Expan	*0.59*	*0.35*	*1,906,000*	*$1.06*	*$0.51*
Reuse Expan in Winter Haven #2 WWTP 2011-2025, City of Winter Haven	Polk	Sys. Expan	*0.25*	*0.15*	*808,000*	*$1.06*	*$0.50*
Reuse Expan in Winter Haven #3 WWTP 2011-2025, City of Winter Haven	Polk	Sys. Expan	*3.59*	*2.15*	*11,596,000*	*$1.06*	*$0.50*
Reuse Expan in Auburndale Sys. WWTP 2011-2025, City of Auburndale	Polk	Sys. Expan	*0.55*	*0.41*	*1,777,000*	*$0.85*	*$0.40*
Reuse Expan in Lakeland Sys WWTP 2011-2025, City of Lakeland	Polk	Sys Expan.	*3.73*	*2.24*	*12,048,000*	*$1.06*	*$0.50*
Lakeland Cleveland Heights Golf, City of Lakeland	Polk	Trans.	0.50	0.38	1,616,000	*$0.84*	*$0.39*
Reuse Expan in Avon Park Correctional WWTP 2011-2025, FL Dept. of Corrections	Polk	Sys. Expan. Toilet Flushing/Laundry	*0.52*	*0.52*	*1,680,000*	*$0.64*	*$0.30*
Reuse Expan in Lake Alfred System 2011-2025, Lake Alfred	Polk	Sys. Expan.	*0.10*	*0.07*	*323,000*	*$0.85*	*$0.43*
Reuse Expan in Polk Co. Correctional WWTP 2011-2025, FL Dept. of Corrections	Polk	Sys. Expan. Toilet Flushing/Laundry	*0.23*	*0.23*	*743,000*	*$0.64*	*$0.30*

The use of Italics denotes SWFWMD estimations
Not all projects have estimated costs
Some options are contingent upon others
MGD Offset = (if estimated) Annualized Supply: 1. x 75% for Ag, & R/A/C, 2. x 100% for I/C, NSR, & PG. 3. x 60% for Variety and 4. for RES is number of customers X 300 gpd.
ASR & Intrusion Barrier Costs = (if estimated) Annualized Supply x 4 x $1,000,000 + $300,000
Total Cost = (if estimated) = Annualized Supply x $3.23/Gallon (calc. of 139 active FY2000-2005 District funded reuse projects @ $422.4 million for 130.6 mgd reuse supply)
Preliminary Cost Per 1000 Gallons Offset = Project Cost amortized over 30 years @ a 6% interest rate
System Expansion Supply 2011-2025 = Projected 2025 WWTP Flow minus 2010 Reuse (existing & planned reuse projects)
Preliminary O&M cost estimates were calculated using individual utility O&M data where available, and a median O&M cost if no specific data was available.
Preliminary O&M costs per 1000 gallons "offset" were calculated utilizing costs per 1000 gallons "supplied" data normalized for individual project efficiency.

Section 3. HWA Planning Area - Seawater Desalination Options

Because of the distance to seawater sources, no attempt was made to investigate a seawater desalination option for the HWA Planning Area.

Section 4. HWA Planning Area - Brackish Ground Water Options

Water quality in the UFA over much of the HWA Planning Area can be characterized as good. The exception is in southern DeSoto County where aquifer water quality becomes brackish. In that area, requests for brackish ground-water withdrawals will be treated similarly to requests for fresh ground water withdrawals. Most importantly, effects of these withdrawals cannot impact water levels in the MIA of the SWUCA. It is possible that brackish ground-water withdrawals can occur from the lower portion of the intermediate aquifer with minimal impact to the upper Floridan aquifer.

Another source of brackish ground water is the lower Floridan aquifer. As discussed in Chapter 5, this aquifer is used extensively in central Florida for drinking water supplies. The District is currently investigating the water quality and water supply production characteristics of this aquifer in northeastern Polk County. Because this source is a possible alternative to upper Floridan aquifer ground water, the District and Polk County are cooperating on a project to explore the lower Floridan aquifer. This project, known as the Northeast Regional Utility Service Area Lower Floridan Aquifer Test Well, is described in Chapter 8, Projects Under Development.

Section 5. HWA Planning Area - Fresh Ground Water Options

Water supply options developed as part of the HWA planning effort were reviewed for this plan. Because the inland counties have limited access to alternative sources, many options included additional development of ground water. Some of these options propose obtaining ground water from the portion of Polk County that is in the SFWMD. Though this would be an intra-district transfer of water, it would still be considered a local source since the use of the water would be in the same county from which it was developed. Close coordination between water management districts would need to occur prior to development of those sources.

Future requests for ground water from the upper Florida aquifer in the HWA Planning Area will be evaluated based on projected effects on established MFL water bodies. In particular, projected effects of ground-water withdrawals in the Planning Area cannot impact water levels in the MIA of the SWUCA and cannot impact minimum level lakes. Requests for ground water for new uses will be considered if the requested use is reasonable and beneficial, incorporates maximum use of conservation, and there are no available alternative sources of water. If regional ground-water levels are below target levels established as part of the proposed SWUCA rules and projected effects of withdrawals impact an MFL water body, it will be necessary for those effects to be offset prior to issuance of a water use permit. Requests for additional ground water may be facilitated by the retirement of a significant amount of ground water in the SWUCA that is occurring as the result of land-use transitions, agricultural conservation, and the retiring of permits associated with lands purchased for conservation.

Because of the limited availability of alternative sources in the HWA Planning Area, Black and Veatch (2005) identified 14 ground-water supply options. Three options propose to use the intermediate aquifer, one proposes to use the lower Floridan aquifer, and the remaining 10 options propose to use the upper Floridan aquifer. Of the 10 upper Floridan aquifer projects, six were located in the SFWMD. These projects are listed in Table 6-15.

Table 6-15. Fresh Ground-Water Supply Options Identified by the HWA (Black and Veatch, 2005).

Heartland Water Alliance Project Number	Entity Responsible for Implementation	Project Description
G4	Polk County Utilities	Upper Floridan aquifer wellfield in the SFWMD portion of northeastern Polk County. To serve high growth areas on the Ridge. Estimated yield is 10 mgd.
G5	Polk County Utilities	Upper Floridan aquifer wellfield in the SFWMD portion of eastern Polk County near Lake Hatchineha. To serve high growth areas on the Ridge. Estimated yield is 10 mgd.
G6	Polk County Utilities	Upper Floridan aquifer wellfield in the SFWMD portion of eastern Polk County near the Kissimmee River. To serve high growth areas on the Ridge. Estimated yield is 15 mgd.
G7	Polk County Utilities	Upper Floridan aquifer wellfield in the SFWMD portion of southeastern Polk County near Indian Lakes Estates. To serve high growth areas on the Ridge. Estimated yield is 10 mgd.
G38 & G39	Hardee County	Wellfields that use either the intermediate aquifer system or Lower Floridan aquifer in eastern Hardee County. To serve potable supply demands of county municipalities. Estimated yield is 1.5 mgd.
G40	Hardee County	Intermediate aquifer wellfield in southern Hardee County. To serve potable supply needs of Arcadia. Estimated yield is 1 mgd.
G58	PR/MRWSA	Intermediate aquifer wellfield in DeSoto County. To serve potable supply needs of the central county area. Estimated yield is 0.5 mgd.
G62	Highlands County	Upper Floridan aquifer wellfield in the SFWMD portion of Highlands County west of the Ridge on SR 70. To serve high growth areas of the Ridge area. Estimated yield is 2 mgd.
G63	Highlands County	Upper Floridan aquifer wellfield in the SFWMD portion of Highlands County, east of Sebring. To serve high growth areas on the Ridge. Estimated yield is 2 mgd.
G64	Highlands County	Upper Floridan aquifer wellfield in the SFWMD portion of Highlands County east of the Ridge along SR 70. To serve high growth areas on the Ridge. Estimated yield is 5 mgd.

Section 6. HWA Planning Area - Non-Agricultural Water Conservation Options

All of the non-agricultural water conservations options are applicable in each Planning Area. Therefore, they are only described once in the NTB Planning Area portion of this chapter, Part C, Section 6.

Section 7. HWA Planning Area - Agricultural Water Conservation Options

Although the agricultural conservation options or variations of them could be implemented in all three Planning Areas, they are most applicable in the PR/MRWSA portion of the SWUCA. Therefore, to avoid duplication, the options are described only once in the PR/MRWSA Planning Area portion of this chapter, Part D, Section 7.

Chapter 7. Water Resource Development Component

This chapter addresses the legislatively required water resource development projects identified through the planning process. In many cases it is very difficult to categorize the numerous projects receiving District funding assistance as water supply development or water resource development projects. However, the District has chosen to place most of the proposed options and projects that are under development, that are described in the RWSP, in the water supply development category. This chapter contains a much smaller number of projects that are under development that the District has placed in the water resource development category.

Part A. Statutory Requirements for Water Resource Development

Section 1. Description of Roles for Water Management Districts and Other Entities

The intent for water resource development projects is to enhance the amount of water available for water supply development. The District is primarily responsible for water resource development projects. Water resource development is defined as "*the formulation and implementation of regional water resource management strategies, including the collection and evaluation of surface water and ground-water data; structural and nonstructural programs to protect and manage water resources; the development of regional water resource implementation programs; the construction, operation, and maintenance of major public works facilities to provide for flood control, surface and underground water storage, and ground-water recharge augmentation; and related technical assistance to local governments and to government-owned and privately owned water utilities*" (s. 373.019(19), F.S.). Legislation Regarding the Role of Water Management Districts in Water Resource Development is as follows:

Section 373.0831, F.S., Water resource development; water supply development, states, in part:

> "*(1) The Legislature finds that:*
> *(a) The proper role of the water management districts in water supply is primarily planning and water resource development, but this does not preclude them from providing assistance with water supply development.*
> *(b) The proper role of local government, regional water supply authorities, and government-owned and privately owned water utilities in water supply is primarily water supply development, but this does not preclude them from providing assistance with water resource development.*
> *(2) It is the intent of the Legislature that:*
> *(a) Sufficient water be available for all existing and future reasonable-beneficial uses and the natural systems, and that the adverse effects of competition for water supplies be avoided.*
> *(b) Water management districts take the lead in identifying and implementing water resource development projects, and be responsible for securing necessary funding for regionally significant water resource development projects.*
> *(c) Local governments, regional water supply authorities, and government-owned and privately owned water utilities take the lead in securing funds for and implementing water supply development projects. Generally, direct beneficiaries of water supply development projects should pay the costs of the projects from which they benefit, and water supply development projects should continue to be paid for through local funding sources.*

(d) Water supply development be conducted in coordination with water management district regional water supply planning and water resource development.
(3) The water management districts shall fund and implement water resource development as defined in s. 373.019. Each governing board shall include in its annual budget the amount needed for the fiscal year to implement water resource development projects, as prioritized in its regional water supply plans."

Part B. Overview of Water Resource Development Projects

The District classifies water resource development projects into two broad categories. The first category encompasses data collection and analysis activities that support water supply development by local governments, utilities, regional water supply authorities and others. These activities are included in Section 1. The second category includes projects that meet the more narrow definition of water resource development; i.e., "regional projects designed to create from traditional or alternative sources, an identifiable, quantifiable supply of water for existing and/or future reasonable beneficial uses." These projects are included in Section 2.

Section 1. Data Collection and Analysis

The District has budgeted significant funds in FY2006 to implement the water resource development component of the RWSP. The activities summarized in Table 7-1 are mainly data collection and analysis activities that support water supply development by local governments, utilities, regional water supply authorities and others. The Table indicates that over $38 million will be allocated each year toward these activities between FY2006 and FY2010 for a total of approximately $193 million. Because budgets for the years beyond FY2006 have not yet been developed, funds for fiscal years FY2007 through FY2010 were set equal to FY2006 funding. This is thought to be valid because even though funding for each activity is expected to vary somewhat each year, the total cost of data collection and analysis activities for each fiscal year is expected to remain relatively constant through 2010. Funding for these activities is from the District's Governing Board and Basin Boards, water supply authorities, local governments, and the USGS. Following Table 7-1, each of the projects is further described.

1.0 Hydrologic Data Collection

The District has a comprehensive hydrologic conditions monitoring program. This program includes data collected by District staff and permittees, as well as data collected as part of the District's cooperative program with the USGS. Data collected from this program allow the District to gauge changes in the health of the water resource, monitor trends in conditions, identify and analyze existing or potential resource problems, and develop programs to correct existing problems and prevent future problems from occurring. The primary hydrologic conditions that are monitored include rainfall, evapotranspiration, lake levels, discharge and stage height of major streams, ground-water levels, various water quality parameters of both surface and ground water (including springs), and water use. In addition, the District monitors ecological conditions as they relate to both potential water use impacts and changes in hydrologic conditions. The District also monitors data submitted by Water Use Permit (WUP) holders to ensure compliance with permit conditions and to assist in monitoring hydrologic conditions.

Table 7-1. Major Water Resource Development Data Collection and Analysis Activities.

Project	FY2006 Costs ($)	FY2007 Costs ($)	FY2008 Costs ($)	FY2009 Costs ($)	FY2010 Costs ($)	Total Costs ($)	Funding Source
1) Hydrologic Data Collection	$3,346,890	$3,346,890	$3,346,890	$3,346,890	$3,346,890	$16,734,450	SWFWMD, USGS
2) Regional Observation Monitoring Program	$2,404,292	$2,404,292	$2,404,292	$2,404,292	$2,404,292	$12,021,460	SWFWMD, local partnerships
3) Quality of Water Improvement Program	$752,751	$752,751	$752,751	$752,751	$752,751	$3,763,755	SWFWMD
4) Flood Control Projects							
a) Data Collection	Included in Hydrologic Data Collection	Included in Hydrologic Data Collection	Included in Hydrologic Data Collection	Included in Hydrologic Data Collection	Included in Hydrologic Data Collection		SWFWMD, USGS
b) Remediating Existing Problems	$23,843,661	$23,843,661	$23,843,661	$23,843,661	$23,843,661	$119,218,305	SWFWMD, local govt. cooperators
c) CWM Initiative (includes DSS funding)	$2,798,861	$2,798,861	$2,798,861	$2,798,861	$2,798,861	$13,994,305	SWFWMD
d) Lake Levels/MFLs Program	$3,997,965	$3,997,965	$3,997,965	$3,997,965	$3,997,965	$19,989,825	SWFWMD
5) Hydrologic Investigations							SWFWMD, USGS, local govt. cooperators
a) USGS Hydrologic Studies	$719,550	$719,550	$719,550	$719,550	$719,550	$3,597,750	SWFWMD/USGS
b) Water Resource Assessment Projects	$640,794	$640,794	$640,794	$640,794	$640,794	$3,203,970	SWFWMD/USGS
Total	**$38,504,764**	**$38,504,764**	**$38,504,764**	**$38,504,764**	**$38,504,764**	**$192,523,820**	

2.0 Regional Observation Monitoring Program (ROMP)

This program has increased the density of the District's ground-water monitoring network since the mid-1970s by constructing additional monitor wells. The data from these monitoring sites are used to evaluate seasonal and long-term changes in ground-water levels and quality, and the interaction and connectivity between ground-water and surface-water bodies. The ROMP also performs geophysical logging on existing wells to provide needed data on well construction and water quality, most of which is incorporated into the District's Geographic Information Systems (GIS) database. Impacts resulting from increased water demand over the past 30 years have been documented and assessed through analysis of ground-water data. These impacts directly affect the District's planning, regulatory policies and programs. For example, ground-water data are used during the permitting process to model potential impacts of new uses. This information is also used to monitor existing permittees to prevent them from significantly impacting natural systems and existing legal users. Construction of new monitor wells also provides the opportunity to collect valuable technical information such as the geologic core that is recovered from various depths and water quality, and potentiometric levels. From these data, aquifers and confining units are delineated, location of the freshwater/ saltwater interface is determined and water quality within aquifers is characterized. The installation of long-term ground-water monitoring sites for the next few years will continue to target the District's WUCA. This will provide additional data for the WRAP, well performance data for wellhead protection projects and the aquifer characteristics inventory.

3.0 Quality of Water Improvement Program (QWIP)

The QWIP was established in 1974 through Chapter 373, F.S., to restore ground-water conditions altered by well drilling activities. The QWIP's primary goal is to preserve ground- and surface-water resources through proper well abandonment. Plugging abandoned artesian wells eliminates the waste of water at the surface and the degradation of ground water from inter-aquifer contamination. Wells constructed prior to current well construction standards are often deficient in casing and expose several aquifers of varying water quality to one common wellbore. Thousands of these wells are in existence and they allow potable water supplies to be contaminated with mineralized water from deeper aquifers. Contaminated water and potable water can flow to the surface, which wastes water and can contaminate surface water.

Plugging wells involves filling the abandoned well with cement. Confinement is thus reestablished and mixing of varying water qualities and free flow is stopped. Prior to plugging an abandoned well, the well is geophysically logged to determine the proper plugging method and to provide background water quality and geologic data for inclusion in the District's database. These data are used in the WRAP studies discussed later to determine changes in water quality. The emphasis of this program is primarily in the coastal portions of the SWUCA where the aquifer is confined and flowing wells can exist. Chapter 373, F.S., requires that artesian systems, those areas where water in a well will rise naturally above the confining unit, be specifically addressed.

Historically, the QWIP has proven to be a cost-effective method to prevent waste and contamination of potable water resources, both ground and surface waters. In January 1994, the District increased QWIP funding as an incentive for property owners to comply with well plugging requirements contained in the Florida Statutes.

4.0 Flood Control Projects

The District undertakes a number of flood protection activities. These activities include data collection, remediation of existing flood protection problems, the Comprehensive Watershed Management (CWM) initiative, and lake levels program. Each of these flood protection efforts is described below:

4.1 Data Collection

Data collection related to flood protection includes the regular assembly of information on such key indicators as rainfall, water levels and stream flows. The District's capability to assist in flood control has continued to improve during the past several years with the expansion of the District's Supervisory Control And Data Acquisition (SCADA) system. This computerized data collection system comprises the cornerstone of the District's flood data collection, through a District-wide network of more than 225 real time and data logger water level and rainfall data collection stations. The term “real time” means that the data are available within minutes of being measured via telemetry, whereas data logger means that the data can be captured electronically if queried by computer.

The SCADA system provides an early warning mechanism that allows flood problems to be anticipated by observing water level and rainfall trends. This information, which is automatically transmitted to District headquarters by radio, allows the District to operate its structures much more effectively during rainfall events and provides limited capability to remotely operate gates at water control structures. The system was designed with several fail-safe components to keep it operational during major storm events, when traditional communication lines may be inoperable.

The amount and detail of rainfall and stream level data now available for use by modelers has expanded significantly in recent years. In addition to the 131 rainfall sites on SCADA, the District operates 43 other recording rainfall gauges without telemetry. These instruments record rainfall accumulations every 15 minutes transmitting data hourly or daily. More recording rain gauges are being installed to develop a dense, Districtwide network of precipitation data.

The USGS monitors flow on all major rivers and streams in west-central Florida. During the past few years, mostly through a cooperatively funded program with the District, the USGS has instrumented 119 surface water sites and 133 ground-water sites on these rivers and streams with data collection instruments that have the capability to relay data by satellite. These data are posted on the USGS' Internet Web site, increasing accessibility for the many entities that use this information.

4.2 Remediating Existing Problems

While much of the District's focus is on prevention, existing flood problem areas can be addressed in numerous ways. The District is working with local governments through the Flood Protection Coordination Initiative to set priorities for remedial actions to address existing problems. Such actions may include conveyance improvements, creation of flood storage, relocation of structures out of flood prone areas, or other initiatives. Much of the funding for these projects is provided through the District's Basin Boards. Projects can be funded entirely by the Basin Board or shared equally between the Basin Board and a local cooperator.

4.3 CWM Initiative

This program is more fully described in the Watershed Management Chapter of the District Water Management Plan. With regard to flood protection, CWM provides a comprehensive analysis of surface-water hydrology and flooding issues for each of 11 major watersheds in the District. At a broad scale, CWM analyses help to identify existing problems and potential future problem areas through use of GIS technology and local involvement, and develop cross-disciplinary solutions. A significant component of implementing the CWM initiative is building the necessary decision support systems at the District. Technological enhancements are a critical component of this effort. The Water Management Information System (WMIS) will support the CWM initiative by integrating permitting and regulatory data with other spatial and temporal resource data in a web-based geographic information system that uses a unified data source to allow streamlining and improvement of District work processes.

4.4 Lake Levels Program

The District's Lake Levels Program, established in the 1970s, have provided adopted management levels for over 400 lakes throughout the District. Flood stage information from this program is used by many local governments in regulating development adjacent to lakes, as well as by the District in public flood protection education efforts. Information relative to flood protection from the Lake Levels Program is contained in the District publication, Flood-Stage Frequency Relations for Selected Lakes. This report, a compilation of flood level information for all lakes for which it is available, has been distributed to numerous local governments and is available from the District upon request.

The Lake Levels Program merged with the District's MFLs program in an effort to expand and enhance the management and protection of surface and ground-water resources.

5.0 Hydrologic Investigations

Hydrologic investigations include USGS Hydrologic Studies and detailed District studies entitled WRAPs, each of which are described below:

5.1 USGS Hydrologic Studies

The District has a long-term cooperative program with the USGS to collect hydrologic data and conduct regional hydrogeologic investigations. The goals of this program are to monitor for changes in the hydrologic system and improve the understanding of cause and effect relationships. Funding for this program is generally on a 50/50 cost share basis with the USGS. However, this varies based on whether other cooperators are involved in the project and if requests for non-routine data collection or special project assignments are implemented.

Hydrologic data collection is a large part of the cooperative program and is closely coordinated with the District's Hydrologic Data Section. The USGS provides ongoing monitoring of ground-water levels at 133 sites, and 119 surface-water sites within the entire District.

Regional investigations of the hydrogeology of the District are an important aspect of the cooperative program. These investigations are intended to augment work conducted by District staff and are focused on improving the understanding of cause and effect relationships and developing analytical tools to be used in resource evaluations. In the past these investigations have included: 1) development of computer models of the regional ground-water flow systems for the District, Highlands Ridge WUCA, Hardee and DeSoto counties, Cypress Creek, Cross Bar, and Morris Bridge wellfields, and the St. Petersburg ASR site, 2) detailed analysis of the hydrologic budgets for two benchmark lakes (Lucerne and Starr), 3) hydrogeologic characterization of the intermediate aquifer, and 4) hydrologic assessments of the Peace and Alafia Rivers.

In recent years, this program has included projects to determine the effects of using ground water to augment stressed lakes and investigation of factors influencing coastal spring flows. Ongoing projects include: evaluation of the effects of using ground water for supplemental hydration of wetlands; hydrogeologic characterization of the intermediate aquifer system (IAS); use of ground-water isotopes to estimate lake seepage; statistical characterization of lake level fluctuations; and investigation of the hydrology of the Upper Hillsborough River Basin.

5.2 The District's Water Resource Assessment Projects (WRAPs)

In the late 1980s, the District initiated a program to conduct WRAPs to assess water availability in several regions and to support the development and establishment of MFLs. These projects are detailed assessments of regional water resources and include intensive data collection and monitoring to characterize hydrologic conditions and determine effects of water withdrawals. There are five areas in the District for which WRAPs have been initiated. The first three WRAPs were initiated in the late 1980s and early 1990s for the NTB, ETB, and HR areas. These projects were initiated in response to falling lake levels, drying of wetlands, and the increased landward movement of the freshwater/saltwater interface. In the mid-1990s, a fourth WRAP was initiated that covered the southern portion of the District and encompassed both the ETB and HR WRAPs. A fifth WRAP is being conducted for the northern portion of the District, primarily focusing on areas north of Pasco County. The data collection element for the Northern District WRAP was initiated in 1998 to provide baseline hydrologic conditions. The ETB WRAP was completed in 1993 and the NTB WRAP was completed in 1996. The Southern District Ground-Water Flow Model was revised in 2006 and monitor well construction is ongoing as part of the Southern District WRAP. A regional ground-water flow model, developed as part of the Northern District WRAP program is scheduled to be complete in 2007. Completion of these projects provides the foundation for determining water availability and can assist in the establishment of MFLs. Once the studies are completed, water resource management programs established in these areas can be modified as necessary.

In 1999, the District initiated the NTB Phase II investigation as a follow-up to the NTB WRAP. Through a series of projects, this study will continue assessments of the biologic and hydrologic systems in NTB to support the ongoing development of MFLs, water resources recovery, water use permitting, and environmental resource permitting. Projects will include the further development of MFLs methodologies, assessments of various techniques for restoring water levels in surface-water features, and expanded biologic and hydrologic data collection. These studies will continue through 2010.

A key component of the NTB Phase II study is the extensive network of hydrologic and biologic data collection sites. The significant data collection network currently maintained by the District, Tampa Bay Water, and local governments will be reassessed, updated, and expanded as part of the study. Impacts to surface-water features are generally the most limiting factor to water supply development in the NTB area. Because the data from monitoring sites in surface-water features will form the basis of decisions concerning key water management issues, it is critical that data in the NTB area be collected for various types of systems, and spread throughout the study area. Specific target areas for expansion and upgrade include hydrologic and biologic data collection in a wider variety of wetland types, increased spatial coverage of wetland and nested aquifer monitor wells and staff gauges, and data collection in areas of minimal hydrologic impacts for control purposes. Upon completion, the District and Tampa Bay Water's combined network is projected to include over 600 wetland monitoring sites and over 500 aquifer monitoring sites.

Section 2. Water Resource Development Projects

The District currently has 19 projects that meet the more narrow definition of water resource development "projects." In the following text, the projects are segregated between the SWUCA and NTB areas. Twelve of the projects are in the SWUCA, four are in the NTB area and two are shared between both areas. The two shared projects are ASR research projects. These projects have been assigned to the SWUCA because geological conditions insure that most of the ASR development will occur there. District funding for a number of these projects is matched to varying degrees by local cooperators, including local governments, regional water supply authorities and others. In addition, a number of projects have received state and federal funding. District funds for these projects are being generated through a number of different mechanisms described in Chapter 9.

1.0 SWUCA

Table 7-2 shows the water resource development projects in the SWUCA. The total capital cost of developing these projects is approximately $81 million. A number of the projects associated with the restoration of minimum flows to the upper Peace River have land costs that are estimated to be $142 million. An estimate of the combined capital and land costs for all the projects in the SWUCA is $223 million.

A minimum of 41 mgd of water supply will be produced or conserved by the projects. A significant amount of additional water will be produced by a number of the projects but this quantity has not yet been determined. The following is a description of each of the projects.

1.1 Alternative Water Supply Research/Pilot Projects

The following projects are research and/or pilot projects designed to further the development of the innovative alternative water sources described in the RWSP. These projects include: 1) research to develop methods to improve the water quality of ASR systems (four projects), 2) a pilot-scale investigation of a wetland treatment system to treat storm water and reclaimed water for an ASR system, 3) two pilot-scale projects to determine the feasibility of rehydrating wetlands on wellfields with reclaimed water, 4) a brackish ground-water supply feasibility study, 5) a pilot project to augment lake levels to address minimum levels, 6) an evaluation of rehydrating wetlands with stormwater and 7) a pilot project to investigate the development of ground water from the lower Floridan aquifer. Although these projects are, for the most part, relatively small scale, their successful completion may lead to their development as major sources of water supply for the future.

a) Evaluation of Aquifer Storage and Recovery Systems

Background

This project involves the evaluation of the interactions between water that is injected into the Floridan aquifer and the rocks that make up the Floridan aquifer during the storage phase of ASR operations.

Table 7-2. Total Project and Land Cost for Water Resource Development Projects in the SWUCA.

Project	Project Cost District + Cooperator	Land Cost	Total Project and Land Cost	Funding Source	Quantity to be Developed or conserved (mgd)
1) Alternative Water Supply Research and/or Pilot Projects					
a) Eval. of ASR Systems	$186,480	N/A	186,480	SWFWMD	N/A
b) Hines Energy Recharge Recovery Project c) Natural Treatment of Wastewater / Stormwater	$1,157,914	N/A	1,157,914	FIPR SWFWMD	1.0
d) Polk Co Util Lower FL Test Well	$835,489	N/A	835,489	Polk Co. SWFWMD	TBD
e) SWUCA – Pilot Lake Augmentation	$640,000	N/A	640,000	SWFWMD	TBD
f) Eval of Arsenic processes during ASR activities PRMRWSA Wells/City of Tampa Wells g) Eval. Of Arsenic Processes	$1,050,000/$950,000 TBD	N/A N/A	$1,050,000/$950,000 TBD	SWFWMD & local partnerships	N/A N/A
2) Agricultural Water Supply/Environmental Restoration Projects					
a) Irrigation Well Back Plugging Program	$1,141,234	N/A	$1,141,234	SWFWMD	TBD
b) FARMS Program	TBD	N/A	TBD	FDACS SWFWMD	40.0
3) Restoration of Minimum Flows to the Upper Peace River					
a) L. Hancock Lake Level Modification b) L. Hancock Outfall Structure P-11 Modification c) L. Hancock Outfall Wetland Treatment System d) Upper Peace River Restoration/Development e) Effect of Karst Develop. on Peace River Flow f) Peace Creek Canal Watershed	75,000,000	$142,000,00	$217,000,000	USGS SWFWMD USDA-NRCS State of Florida	TBD
Total	**$80,961,117**	**$142,000,000**	**$222,961,117**		

Differences in water quality between source waters and aquifer water have resulted in difficulties in the operation of ASR systems. These difficulties range from poor recovery to mobilization of constituents in the aquifer that could contribute to the recovery of a lower quality of water. This effort is evaluating and identifying potential effects of storing treated water in the Floridan aquifer. Water quality data is being collected from source waters and aquifer storage zones to characterize differences that exist. In addition, core samples of aquifer storage zones are being analyzed to determine aquifer matrix composition. Geochemical modeling will then be conducted to determine what happens when these waters are mixed and come in contact with the aquifer matrix. Results of this effort will be used in the siting, design, operation, and maintenance of future ASR systems.

Status

A monitor well network consisting of 20 wells with discrete intervals open to the Suwannee Limestone was established in January of 2002 in the District's SWUCA. The first round of water samples from the network was collected in May of 2002. Analysis of water samples by the USF and District labs was completed by late June 2002. The second sampling of the monitor well network was completed in late October 2002. Analysis of these samples and arsenic speciation and total arsenic analysis was completed in February 2003. The analysis shows that the arsenic concentration in water samples obtained from the Floridan aquifer monitor wells is extremely minute (less than 100 parts per trillion). Trips were made to the Florida Geological Survey core lab in Tallahassee to collect several dozen feet of core obtained during construction of the wells that were included in the monitoring network. A representative number of core samples were analyzed using an electron microscope and a microprobe at Florida International University in Miami. Over 300 samples taken from the cores were analyzed for arsenic concentrations. The various methods used to analyze the samples appear to indicate that the source of arsenic in the core samples is minute pyrite crystals in the limestone. Water quality samples collected during the third sampling of the monitor well network were analyzed for arsenic in August. Analysis for all other parameters was completed by the District's in-house and overflow labs in August.

Geochemical modeling was conducted to determine under what conditions pyrite in the limestone becomes unstable during injection of recharge water. The data is being used to determine what can be done in regard to pretreatment to prevent the release of arsenic.

A transect of cores were drilled across an ASR wellfield in the City of Tampa. These cores were analyzed to determine how the cores have been impacted by ASR wells.

b) Hines Energy Complex Recharge/Recovery Project
c) Natural Treatment of Wastewater/Stormwater project

Background

This project conducted in support and association with the design, construction and testing of a one-million gallon per day (mgd) aquifer recharge/recovery well system is located at Florida Power Corporation's (FPC) Hines Energy Complex. An on-site cooling pond was used as the source of injection water. Water in the cooling pond was derived from the on-site capture of storm water and reclaimed water from the City of Bartow. Prior to injection, the water was treated to potable standards using wetlands treatment and sand filtration systems that have been constructed as part of the Natural Treatment of Wastewater/Stormwater project. This project, conducted in cooperation with the Florida Institute of Phosphate Research (FIPR), began in 1999 and was intended to enhance the water treatment aspects of the Hines Energy Complex Recharge/Recovery Project. The project is investigating the feasibility of using wetlands on waste clay settling areas to treat secondary treated wastewater and storm water to drinking water standards. Further water treatment would be achieved by use of sand tailing basins to provide filtration. Following treatment to drinking water standards, the water will be injected into the Upper Floridan aquifer (UFA) and withdrawn to supplement the cooling pond when there is insufficient water in the pond for power generation. If these projects are successful, FPC will expand the water quality treatment and recharge well systems to offset the effects of up to 12.5 mgd of future ground-water withdrawals.

Status

The Hines Energy Complex Aquifer Recharge/Recovery Project was completed in FY2005. A final report entitled "Pilot Project to Test Natural Water Treatment Capacity of Wetland and Tailing Sand Filtration on Mined Phosphate Lands" was submitted to the District in March 2005. Water quality test results indicate that effluent from the wetland-basin system currently meets 134 of the total 140 state drinking water standards for chemicals. With the exception of total coliform, the remaining five parameters that do not meet standards are secondary drinking water parameters. A second phase of work was initiated in March 2006. Work will be conducted to improve treatment effectiveness of the system based on recommendations put forward in the March 2005 report. In addition, data collection and laboratory testing will be initiated to examine the potential for arsenic mobilization in the limestone aquifer to occur using water produced from the wetland/basin system. The low oxygen concentrations observed in the water may prevent the occurrence of arsenic; however, further investigation and testing are needed to substantiate this.

d) Polk County Utilities Lower Floridan Aquifer Exploratory/Test Production Well

Background

This project includes the construction of an exploratory/test production well to an estimated depth of 2,450 feet below land surface (bls) in northeast Polk County. A large portion of Polk County has been included as part of the SWUCA. The development of additional ground-water supplies from the UFA in and adjacent to the SWUCA is uncertain at best and therefore, it is necessary for Polk County Utilities (PCU) to search for alternative water supplies in accordance with the District's RWSP and the District Water Management Plan (2000). The purpose of the exploratory well is two fold. Data will be collected on the hydrogeology and water quality of the aquifers and the confining units underlying the area during the construction and testing of the well to determine the viability of utilizing the lower Floridan aquifer (LFA) as a source of potable water. In addition, the data collected will allow both PCU and the District to better quantify the effects of ground-water withdrawals from the UFA on minimum flows and levels from the Surficial Aquifer (SA), wetlands, and surface-water bodies. Data collection and testing will include lithologic samples from drill cuttings and cores, geophysical logging, performance of pumping tests to measure aquifer parameters of the UFA and LFA, and water quality analysis of samples from the LFA, and the confining units. A seven-day Aquifer Performance Test (APT) will be conducted on the exploratory well utilizing two UFA monitoring wells. The water quality of the LFA in the vicinity of the Northeast Regional Utility Service Area is unknown. Water samples from production wells completed in the LFA and located between 8.5 and 21 miles from the anticipated location of the exploratory/test production well show considerable variation in concentrations of key parameters including sulfate, dissolved solids, and chloride. The water quality data collected during this project will be invaluable for assessing the potential for LFA ground-water withdrawals by neighboring water purveyors, now and in the future. Based on production wells in the Orlando area that are completed in the LFA, the potential production capacity of the exploratory/test production well, which will be completed with a 16-inch diameter final casing to an estimated depth of 1,300 feet bls and open hole to

1,550 feet bls, is three to five million gallons per day. This will provide a substantial savings in ground-water withdrawal from the UFA for this service area.

Status

The County officially acquired the site in August 2005. In January 2006, the County completed a contract with the drilling contractor. The District and the County agreed to amend their contract to extend the expiration date to March 31, 2007. This extension was necessitated by the delay in finding a suitable site for the exploration work. The contractor has completed the surficial aquifer well and the UFA well. These wells will be used to monitor these formations when the LFA is tested upon completion of construction. There has been considerable delay in the construction of the LFA well. The contractor has had a difficult time keeping the well free of sand below 450 to 480 feet, a highly permeable area filled with sand. As of November 2006, the consultant is preparing to set an 18 inch casing at a depth of 605 feet below land surface. The setting of the casing should preclude further dredging of sand from above.

e) Pilot Augmentation Project for Lake Lotela

Background

The goal of this project is to construct a pilot augmentation well and monitoring system to study the feasibility of ground-water augmentation to increase surface-water levels in Lake Lotela, an 800-acre lake in the Upper Carter Creek Watershed in Highlands County. The project will be accomplished through augmentation of the lake with ground water from the surficial aquifer or the Floridan aquifer. The project will help ensure compliance with the minimum levels that were established for Lake Lotela in 2005. The first phase of the Lake Lotela pilot augmentation project will be to investigate the feasibility of augmenting the lake using ground water pumped from either the surficial or Upper Floridan aquifer. The project will involve the purchase of approximately one to two acres of land within one-half mile of Lake Lotela; a feasibility analyses to determine surface-water leakage to the aquifer and water quantities needed for augmentation; design and permitting; installation of a pilot well/pump system (one 16-inch diameter surficial well 150 feet deep); installation of three monitoring wells; installation of an evapotranspiration (ET) and a rain gauge site; and installation of a pipeline (2,000 feet) from the well to the lake.

Land acquisition will be pursued for the purpose of installing a well for augmentation of the lake. A feasibility analysis to determine the quantity of water needed to maintain the lake stage at the minimum level will include development of appropriate water-budget parameters and an operations schedule. A preliminary water budget analysis indicates that approximately two to four mgd during dry weather conditions may be required for augmentation to overcome the vertical leakage to the Floridan aquifer and maintain the lake stage within the desired range of lake fluctuation in order to achieve the proposed minimum lake level. During wet periods, the rate will be low, probably less than two mgd.

The augmentation rate is not intended to overcome ET, since this is a natural component of the lakes water-budget and is necessary to produce the natural lake fluctuation. It is anticipated that virtually all the augmentation water will return to the aquifer, since augmentation will not result in an appreciable increase in ET. If land is available, the location of the augmentation well will be laterally downgradient of the lake to recapture and recirculate lateral seepage from the lake to the extent possible. Since there is a strong vertical flow component to the underlying aquifer, augmentation water that is not captured by the well will reach the Floridan aquifer relatively quickly.

Status

The project was just approved for initial development in 2006. The District incorporated the feasibility and design phases of this project as a task within the Carter Creek Watershed Management Program.

f) Evaluation of Arsenic Processes During ASR Activities

Background

ASR is a technology that has great potential to increase the availability of water supplies in the southern half of the District where water resources are most stressed. In recognition of this, the District has committed significant financial and staff resources to assist water supply authorities, local governments, and the private sector to develop ASR systems. The regulatory requirements associated with ASR, however, have been evolving over the past 20 years in response to new issues discovered during the operation and testing of ASR systems. In particular, the U.S. Environmental Protection Agency (EPA) has taken action to lower the drinking water standard for arsenic from 50 ug/l to 10 ug/l by January 1, 2006. In addition, the FDEP has accelerated the time frame for implementation of the new standard to January 2005. Meeting the new, lower standard has been difficult to date. Three projects are ongoing to investigate the nature and extent of arsenic mobilization in the aquifer as a result of ASR operations.

- PR/MRWSA ASR Monitoring Well Program - This project is a cooperative effort by the District and the PR/MRWSA to construct and test up to 13 monitor wells at the Authority's old and new ASR well fields. Following completion of the project, District staff will meet with the FDEP to discuss project results and determine a course of action to ensure ASR can remain a viable water supply option now and in the future.
- City of Tampa ASR Monitoring Well Project - Cooperatively fund with the City of Tampa the construction and testing of up to five monitoring wells at the City's Rome Avenue ASR well field and one Avon Park monitoring well at the City's Woodland Terrace ASR site. To provide the data necessary to satisfy the FDEP, a ground-water monitoring program has been proposed using the Tampa Rome Avenue ASR well field as one of the test sites. A total of up to five Upper Floridan aquifer monitoring wells and one Avon Park monitoring well are proposed to be drilled at the Rome Avenue ASR well field and the Woodland Terrace ASR site, respectively. Geologic data and water quality data will be collected during the operation of the ASR system to determine the extent of elevated levels of arsenic in the aquifer.
- Evaluation of Arsenic Mobilization Processes Occurring During ASR Activities -This project investigates methods to control arsenic mobilization in the Floridan aquifer resulting from ASR activities. Two consultant teams will investigate the probable mechanisms resulting in arsenic mobilization. Probable factors causing release of arsenic and options to minimize the release will be identified.

Status

- The PR/MRWSA ASR Monitoring Well Program – Installation of 13 new monitoring wells was completed in March of 2005. Several rounds of samples have since been collected and analyzed. Results form the monitoring wells indicate the arsenic mobilization problem is limited to a radius of about 100 feet from the ASR well.

- City of Tampa ASR Monitoring Well Project – Installation of six new monitoring wells was completed in June 2006. Early water quality data from the new wells indicates that the arsenic mobilization issue is limited to about 100 to 200 feet from the ASR wells.
- Evaluation of Arsenic Mobilization Processes Occurring During ASR Activities – Two independent consulting teams were contracted in February 2006 to assess causes for arsenic mobilization and identify options for pretreating the water to minimize the mobilization of arsenic in the aquifer. Preliminary results indicate that the removal of dissolved oxygen from the injection water could minimize arsenic mobilization. Based on the conclusions of the first consulting team, the District has initiated negotiations to design, build and test degasification at an existing site.

1.2 Agricultural Water Supply/Environmental Restoration Projects

These projects employ many of the agricultural water conservation strategies described in the RWSP to reduce ground-water withdrawals by increasing the water use efficiency of agricultural operations. The projects have the added benefit of reducing agricultural impacts to surface-water features. The projects are public/private partnerships in that the District provides financial incentives to farmers to increase the water use efficiency of their operations.

a) Irrigation Well Back-Plugging Program

Background

In the coastal and southern SWUCA, ground-water quality in the highly productive Floridan aquifer is generally marginal to poor. Investigations conducted by the District indicate that agricultural pumping in the highly productive zone of the Floridan aquifer can cause localized upward movement of mineralized ground water into irrigation wells. The use of mineralized ground water for irrigation reduces crop yield, corrodes pumping equipment, and degrades the water quality of downstream surface waters. Surface-water quality impacts have been documented in the Shell, Prairie and Joshua Creek (SPJC) watersheds located in DeSoto and Charlotte counties. As a result, these watersheds are a priority area for the back-plugging program. Back-plugging is also an important management tool in other areas of the SWUCA where irrigation wells exhibit poor water quality. Back-plugging of these wells to a recommended depth helps sustain surface water quality, assists in maintaining ground-water resources, and facilitates improved crop yields.

Status

The total number of back-plugged wells remains at 50, with 38 of the wells being located in the priority area of the SPJC watersheds. Water quality improvements, measured as an average reduction in total dissolved solids (TDS) and chloride concentrations are 55 percent and 68 percent, respectively, within the SPJC. The well yields have been reduced in the back-plugged wells by an average of 23 percent. Twelve wells within the SWUCA but outside SPJC have been back-plugged. These wells exhibited an average reduction of TDS and chloride concentrations of 49 percent and 65 percent respectively. The well yields were also reduced by approximately 31 percent.

b) Facilitating Agricultural Resource Management Systems (FARMS Program)

Background

The purpose of FARMS is to implement agricultural BMPs within the SWUCA, with priority status given to the SPJC watershed and the upper Myakka River watershed. The program has been developed in cooperation with FDACS to achieve water quality improvements and reduce ground water use in the region. FARMS projects provide benefits that include water quality improvement; reduced UFA withdrawals; and/or the conservation, restoration, or augmentation of water resources and ecology. The program is funded annually from state appropriations, FDACS, and the District Governing Board and Basin Boards. These funds are being used to develop projects that include tail-water recovery and increased irrigation efficiency practices. A portion of the state appropriation in 2003 and District matching funds were allocated to support the SPJC Well Rehabilitation program (new state appropriations do not support back-plugging).

Status

Table 7-3 is a summary of FARMS projects that are under development or completed. Four projects are complete in the SPJC watershed, the Citrus Creek Grove (Blue Heron Groves), TRB Groves Phases I and II, and American Citrus Products. All four have all entered into the five-year long operation and performance audit phase of their contracts. To date, the four operational projects have offset approximately 749,880,000 gallons (at a rate of approximately 1 mgd) of ground water with surface water. Seven FARMS projects are under construction in the SPJC watersheds.

The Upper Myakka watershed is the other priority area for the FARMS Program. FDACS is the lead agency in the Upper Myakka. Currently, the District has approved funding for three projects, McClure Properties, Ltd. Cameron Dakin Dairy, and ESDA Dairy. All three projects have signed contracts and construction has begun. In addition, the FARMS program has taken over the management of the two surface water withdrawal projects in Flatford Swamp. These projects, Pacific Tomato Growers (PTG) and Falkner Farms, predate the FARMS Program but due to their incorporation are now included in Table 7-3. The PTG Project has had two cost-shared Phases and the Falkner Project has had one. These three projects are complete and operational and have offset approximately 1,689,222,700 gallons (at a rate of approximately 1.5 mgd) of ground water with surface water.

There are now four approved projects outside the Program's priority areas of SPJC and Upper Myakka. One of these, the Lykes Bros. Project in Highlands County, is operational and the remaining projects are under construction.

1.3 Restoration of Minimum Flows to the Upper Peace River

An important chapter of the RWSP outlines the District's strategy for establishing minimum flows and levels for major water resources. The District is currently setting minimum flows for the Peace River. Surface-water drainage alterations, reduction in surface storage, long-term rainfall patterns and induced recharge due to ground-water withdrawals have all contributed to a reduction in low flows in the upper river. A requirement of minimum flow establishment is the development of a recovery strategy when actual levels are below or are anticipated to fall below established minimums. It is anticipated that actual flows will be below the minimum flows being proposed for the upper Peace River. These projects are key portions of the recovery strategy to restore minimum flows to the upper Peace River.

Table 7-3. Facilitating Agricultural Resource Management Systems (FARMS) Projects that are Completed Or Under Development in the SWUCA.

Project Name	Project Description	Projected Offset (GPD)	Total Reimbursement	Total Project
Citrus Creek Development	Capture and reuse of surface water and irrigation tailwater for citrus irrigation.	136,000	$16,474	$33,442
TRB Groves - Phase I and II	Precision automated irrigation event management. Capture and reuse of surface water and irrigation tailwater for citrus irrigation.	181,000	$201,930	$269,239
American Citrus Products	Capture and reuse of surface water and irrigation tailwater for citrus irrigation.	142,600	$133,836	$179,436
McCarlton Partners	Management and control of surface water for citrus irrigation.	66,000	$54,471	$110,939
Williams Farms - Phase I and II	Precision automated irrigation event management. Use of surface water for row crop irrigation.	908,400	$628,742	$906,966
Lady Moon Farms	Capture and reuse of surface water and irrigation tailwater for row crop irrigation.	132,500	$153,085	$306,170
JDI	Precision automated irrigation event management. Use of surface water for row crop irrigation.	352,000	$155,862	$213,981
William Head	Capture and reuse of surface water and irrigation tailwater for citrus irrigation.	71,000	$149,616	$199,488
FLM - PRR	Capture and reuse of surface water and irrigation tailwater for citrus irrigation.	170,900	$187,671	$250,226
Hancock Grove	Capture and reuse of surface water and irrigation tailwater for citrus irrigation.	222,500	$447,612	$650,940
Peace River Citrus	Precision automated irrigation event management for citrus irrigation	15,600	$11,845	$19,515

Table 7-3. Facilitating Agricultural Resource Management Systems (FARMS) Projects that are Completed Or Under Development in the SWUCA (Continued).

Project Name	Project Description	Projected Offset (GPD)	Total Reimbursement	Total Project
Lykes Bros.	Precision automated irrigation event management for citrus irrigation	125,000	$88,524	$177,047
Mosaic	Precision automated irrigation event management for citrus irrigation	46,500	$29,552	$59,104
Polkdale Farms	Precision automated irrigation event management. Use of surface water for blueberry irrigation.	46,800	$90,646	$181,291
DiMare	Precision automated irrigation event management.	226,000	$160,000	$275,000
Falkner Farms Phase I, II, III	Capture and reuse of surface water and irrigation tailwater for row crop bed preparation.	2,167,500	$1,569,300	$4,822,047
PTG - Phase I and II	Capture and reuse of surface water and irrigation tailwater for row crop irrigation.	2,570,000	$617,727	$1,462,866
McClure Properties	Capture and reuse of surface water and irrigation tailwater for row crop irrigation.	374,100	$411,277	$548,370
Cameron Dakin Dairy	Reduction of ground-water use and nutrient loading through reuse of dairy process water.	79,000	$84,782	$226,741
ESDA Dairy	Reduction of ground-water use and nutrient loading through reuse of dairy process water.	45,000	$143,943	$568,243
IFAS BMP	Water quantity and quality BMPs	N/A	$50,000	$50,000
Total		**8,078,400**	**$5,386,895**	**$11,511,051**

a) Lake Hancock Lake Level Modification

Background

Part of the proposed recovery strategy for the upper Peace River is to restore storage in Lake Hancock and release some of the water during the dry season to help meet the flow requirements. Historically, Lake Hancock fluctuated more than a foot higher than it has during the past several decades. This lowering was due to the dredging of the outfall canal in the early part of the last century. This project is evaluating the impact of replacing the District's outfall structure so that water levels can be maintained at higher levels. The evaluation is utilizing the regional flood study model recently developed in cooperation with Polk County for the Saddle Creek watershed.

Hancock levels. District staff will continue to meet with Polk County and other agencies to discuss inter-agency coordination for implementing the Lake Hancock Lake Level Modification. The consultant has completed the update of the Digital Terrain Model for the area adjacent to Lake Hancock and the impact analysis of raising lake levels on the Old Florida Plantation (OFP) Property. The District has purchased the 3,536 acres of the OFP property as part of the mitigation for projected impacts. Floodplain analyses have been conducted for the five-day rainfall event at the three alternative lake levels. The surface-water model is being used to project inundation areas, and identify impacts. The Preliminary Evaluation Report for Lake Hancock is complete. The consultant began Step 2, which entails the preliminary design and conceptual permitting of the Lake Hancock Modifications to raise the lake level from 98.7 feet up to 100.0 feet.

b) Lake Hancock Outfall Structure P-11 Modification

Background

This project proposes to restore storage in Lake Hancock by modifying or replacing the District's outfall structure so that water levels can be maintained at higher levels. This project will be coordinated with other Lake Hancock restoration efforts. In particular, there will be a supporting hydrologic analysis to determine which properties may need to be acquired due to risk of flood.

Status

This project cannot go forward until the previous project, the Lake Hancock Lake Level Modification Project, is completed.

c) Lake Hancock Outfall Wetland Treatment System

Background

This project is investigating the development of a wetland treatment system to improve water quality leaving the lake. The location has yet to be determined, but it may be at the southern end of the lake, immediately above the outfall structure, or downstream of the structure, or a combination of both. A plan utilizing a treatment system below the structure (which is highly probable) will necessitate the purchase of lands for construction of the treatment wetland, which may be several hundred acres in size. Water quality leaving Lake Hancock has been documented as a major source of poor water quality in the upper Peace River. There is evidence that this poor water quality affects the River all the way down to Charlotte Harbor and is a concern of public water supplies from the river. Funding for this project is to be from Florida Forever Trust funds set aside for water resource development projects such as this.

Status

Research, data acquisition and monitoring for the project were completed in March 2005. The Draft Alternative Treatment Technology Evaluation Report was submitted in June 2005 for review. The objective of the alternative treatment technologies evaluation is a comprehensive analysis of all applicable technologies to identify the most feasible options that will be recommended for pilot testing and/or bench scale tests. The District's consultant is currently finalizing the evaluation report.

d) Upper Peace River Resource Development Project (now includes the Upper Peace River Minimum Flow Enhancement Feasibility Study and the Hydraulic Reconnection of Non-Mandatory Phosphate Lands Project).

Background

This project will identify and evaluate potential water resource development projects in the upper Peace River watershed. In 2002, the District completed the technical work necessary for establishing minimum flows in the upper Peace River, and the first draft of the Peace River Cumulative Impacts Analysis Report. The upper Peace River Watershed has been heavily impacted by mining, development activities, and ground-water withdrawals. Proposed minimum "low" flows are currently not being met at the Bartow and Ft. Meade gauging sites. The District has developed the SWUCA Recovery Strategy that proposes concepts for development of water resource projects. Two of the concepts are storage of wet season rainfall in surface-water reservoirs for later release during period of low flow, and the reconnection of closed basin areas and hydraulic optimization of areas impacted by mining. Two projects, the upper Peace River Minimum Flow Enhancement project and the Hydraulic Reconnection of Non-Mandatory Phosphate Lands project, were initiated in FY2003 to accomplish similar goals. The upper Peace River Minimum Flow Enhancement project included funding for a feasibility analysis, and the design and permitting of a surface-water reservoir on reclaimed mine land. The District evaluated a reservoir site and began the land acquisition process. The property owner rejected the District's offer for purchase, which terminated the efforts for this site. As part of the Hydraulic Reconnection of Non-Mandatory Phosphate Lands project, District staff identified other potential reservoir locations, and areas that no longer contribute runoff to the river as a result of mining activities, but could be hydraulically reconnected. Both of these projects are consistent with the upper Peace River Resource Development project so they have been discontinued as individual projects, and incorporated into the Upper Peace River Resource Development project.

Status

Alternative reservoir sites are being evaluated, and District staff is collecting available information from property owners, mine companies, FDEP Bureau of Mine Reclamation, Central Florida Regional Planning Council, and others. The consultant continues work on elements of a watershed evaluation to identify the connectivity of the upper Peace River system, from the confluence of Saddle Creek and Peace Creek, south to Zolfo Springs. The tasks involve data collection and field reconnaissance.

e) Effect of Karst Development on Peace River Flow

Background

This project is a cooperative effort between the USGS and the District to assess the hydraulic connection between the river and underlying aquifers, characterize and map karst features within or adjacent to the river bed, and determine the amount of flow loss to the karst openings along the upper Peace River from Bartow to Ft. Meade. Long-term decline in Upper Floridan aquifer water levels has reversed the hydraulic gradient between the river and the underlying aquifers that occasionally resulted in loss of perennial flow along the river between Bartow and Homeland. Understanding the extent, timing, and magnitude of flow loss to the underlying aquifers is the first step in the process of developing water resource development projects that could eventually augment low flow conditions along the upper reach of the river. Major elements of the study include: 1) conducting an analysis of historical hydrogeologic and land-use information in the basin, 2) identifying, locating, and characterizing karst features in the river bed and flood plain, 3) quantifying the flow losses to the karst openings and gains from mining outfalls, and 4) assessing the hydraulic connection of the river to the underlying aquifers. Two new stream gaging stations have been installed on the river by the USGS between Bartow and Ft. Meade. The USGS has completed six seepage runs along the river to document dry season flow loss between Bartow and Ft. Meade. The District has conducted drilling and testing operations at three sites near the upper Peace River. Drilling operations involved collection of data on geology, hydraulic characteristics, and degree of connection between the riverbed and underlying aquifers. Monitor wells have been installed in the surficial aquifer, IAS, and the UFA at each site. The project is seven years in duration and will be completed by October 2008. A final report will present the findings of the study in FY2008.

Status

In October 2003, an interim project report was provided by the USGS that included the location of karst features and preliminary estimates of flow losses to the underlying aquifers. Agreements to cross the Clear Springs Mine property have been obtained to gain access for a minimum of a five-year period for three drilling sites along the Peace River. Coring has been completed into the Upper Floridan aquifer along with the construction of monitor wells at three sites (Bartow Wastewater Treatment Plant, Lower Dragline Crossing, and Kissengen Springs). APTs were completed on both the IAS and Upper Floridan aquifer wells during March and April 2005 at the Bartow Wastewater site. APTs were conducted during October 2006 at the Kissengen Spring site. Another seepage run was made along the river during April 2006. Continuous collection of river stage and aquifer level data has occurred since installation of the river gages and monitor wells.

f) Peace Creek Canal Watershed

Background

The District has identified the upper Peace River watershed, which includes the Peace Creek Canal system, as an area that has undergone significant land alterations. In addition, extensive withdrawals of ground water have resulted in significant declines in the level of the Floridan aquifer and flow in the upper Peace River. This project will identify projects that will restore lost basin storage, provide recharge to the aquifer, improve water quality, provide flood protection benefits and improve natural systems. The project will utilize the Peace Creek model to evaluate the potential for restoring wetlands and floodplain storage on several large agricultural properties in the Peace Creek watershed. Staff is working in partnership with several entities including the U.S. Department of Agriculture (USDA), Polk County, Peace Creek Drainage District, Lake Region Lakes Management District and the FDACS. The USDA, through the Farm Security and Rural Investment Act of 2002 (a.k.a. the Farm Bill), established funding programs to assist willing ranch and agricultural landowners with the restoration of wetlands that have had their functions reduced or eliminated by agricultural production practices, including pasture and forestry. The goal is to reduce the exaggerated response of the system to storm events and enhance flood protection. Restoration of these areas could be designed to help meet the minimum flow for the upper Peace River by storing excess surface water during periods of high flow for release during low flow periods in the river.

Status

The District's consultant is performing field reconnaissance to assess the surface water resources and to identify potential improvement projects within the Peace Creek Watershed eligible for USDA program funding.

2.0 NTB Area

Table 7-4 shows the water resource development projects in the NTB area. The total capital cost of developing these projects is approximately $5.4 million These projects are primarily research and/or pilot projects and although the amount of water they will produce is negligible, the concepts, if implemented on a larger scale, may produce significant quantities of water. The following is a description of each of the projects.

2.1 Alternative Water Supply Research/Pilot Projects

a) Section 21 Wellfield Rehydration Pilot Project

Background

The objective of this project is to investigate the feasibility of using storm water and reclaimed water to rehydrate stressed and impacted wetlands on the Section 21 wellfield in Hillsborough County, and to determine the effects of this type of rehydration on water levels, water quality and wetland health. A key component of the pilot project is the risk assessment (RA). The purpose of the RA is to measure the probability and level of possible public health consequences associated with rehydrating surface features on the wellfield with surface water and/or reclaimed water. The RA is focusing mainly on the potential risks associated with chemical and microbiological contaminants found in the source waters through the wellfield's surface and ground-water systems. Depending on the results of the RA and the determination of the risks involved, Tampa Bay Water, regulatory agencies, and other stakeholders will decide whether to go forward with the rehydration project. If the project proves to be feasible, the same approach can be taken at other wellfields to rehydrate wetlands that have been impacted by ground-water withdrawals.

Status

Completion of this project has been delayed due to rehabilitation work on the production wells at the Section 21 wellfield. A fourth amendment to the contract to modify the project scope of work and budget was approved in February 2003; and, a fifth amendment to the contract to modify the schedule for no additional cost was developed to extend the contract to March 15, 2007. A draft RA report was delivered to District staff in November 2006 and is currently being reviewed by staff.

b) Starkey Wellfield Rehydration Pilot Project

Background

The purpose of this project is to investigate the use of reclaimed water on the Starkey Wellfield in Pasco County to recharge the surficial aquifer, which in turn will provide recharge to the underlying Floridan aquifer. The water will be applied with an above-ground sprinkler system. A corollary benefit of recharging the surficial aquifer is that water may be available to rehydrate nearby wetlands. A portion of the sprinkler system has been installed and connected to Pasco County's reclaimed water transmission line and five surficial aquifer and three upper Floridan aquifer monitor wells have been installed. Data collection has begun on background conditions.

Table 7-4. Total Project Cost for Water Resource Development Projects in the NTB Area.

Project	Project Cost District + Cooperator	Land Cost	Total Project and Land Cost	Funding Source	Quantity to be Developed or conserved (mgd)
Alternative Water Supply Research and/or Pilot Projects					
a) Section 21 Wellfield Rehydration Pilot Project	$1,703,214	N/A	1,703,214	TBW SWFWMD USEPA	TBD
b) Starkey Wellfield Rehydration Pilot Project	$510,794	N/A	510,794	TBW SWFWMD	TBD
c) Tarpon Springs Preliminary Water Supply Feasibility Study	$404,248	N/A	404,248	Tarpon Springs SWFWMD	N/A
d) Cypress Creek Wellfield	$2,764,296	N/A	2,764,296	TBW SWFWMD	TBD
Total	**$5,382,552**		**$5,382,552**		**TBD**

Source: SWFWMD FY2006 Summarized Programmatic Activities Report

Status

This project is still on hold pending the determination that the application of reclaimed water to a wellfield area is feasible. TBW has learned that the cost of determining the safety of applying reclaimed water to the wellfield is on the order of $250,000 and would involve a year of sampling/analysis with probably an additional six months to finalize a report. A similar scenario exists for the Section 21 reclaimed water project and sampling would not commence on the Starkey project until Section 21 is finished. Therefore, there will not be a decision made on the Starkey project for at least 1 1/2 to 3 years assuming that the decision to spend the additional $250,000 is made. The additional funding would entail a contract amendment for the money as well as for the additional time required.

c) Tarpon Springs Preliminary Water Supply Feasibility Study

Background

The goal of this project is to evaluate two brackish ground-water zones within the UFA, Tampa Limestone and Upper Suwannee, in the Tarpon Springs area through a comprehensive drilling and testing program for the City of Tarpon Springs' future use. The project is an outgrowth and continuation of a prior study conducted by the City to search for alternative sources to water derived from TBW central wellfield system. That study recommended that the City investigate the feasibility of a brackish water reverse osmosis plant to supply 75 percent of their needs. Existing data suggest that brackish water reverse osmosis would be feasible but the actual geological and hydrological conditions in the area being considered for such a facility need to be determined. In order to collect the needed data, the City requested funding for a field testing technical evaluation to include wellfield siting evaluation, field testing plan, request for test program authorization; design, bid, and construction of two exploratory brackish wells and four monitor wells, and ground-water modeling.

Status

The City has completed this study, which showed that the project is feasible. At this time, the City plans to proceed to a more complete technical study as a preliminary step towards the design, permitting and construction of a brackish water RO facility.

d) Cypress Creek Wellfield Surface Water Management Project

Background

The project objectives are to re-hydrate wetlands impacted by pumping from the Cypress Creek wellfield and reduce flooding problems in the adjacent Saddlewood and Quail Hollow subdivision areas. The project will remove conveyance restrictions caused by construction of roads, and enhance surface-water storage within wetlands on the wellfield; including implementation of portions of the Phase I Mitigation Plan under TBW's Consolidated Water Use Permit. All construction will take place on the wellfield public lands, including improvements on District-owned property. Professional engineering services for BMP analysis through construction management are funded by TBW. The project involves the implementation of BMPs that includes design, construction document development, construction permitting, land acquisition, bidding and contractor selection, construction of the BMPs and construction engineering and inspection. Funding is included to complete the implementation of the BMPs. A cooperative funding expenditure agreement with TBW will be developed for construction of BMPs.

Status

The project was approved for initial development in 2006. Tampa Bay Water in cooperation with the District is developing a scope of work for the cooperative funding agreement.

Chapter 8. Water Supply Projects Under Development

The demand projections presented in Chapter 4 in Table 4-11a show that approximately 409 mgd of new water supply will need to be developed during the 2000-2025 planning period to meet demand for all use sectors and to restore minimum flows and levels for impacted natural systems. As of the December 2006 release date of this RWSP, it is estimated that at least 50 percent of that demand has either been met or will be met by projects that are under development. Projects under development are those the District is co-funding that have either been 1) completed since the year 2000 (the base year for the 2006 RWSP), 2) are in the planning, design, or construction phase, or 3) are not yet in the planning phase but have been at least partially funded through the 2006 fiscal year.

This Chapter provides an overview of water supply projects the District considers to be under development. The projects under development include major expansions of the water supply systems for Tampa Bay Water and the Peace River/Manasota/Regional Water Supply Authority (PR/MRWSA), development and expansion of reclaimed water systems including the Tampa Bay Regional Reclaimed Water Project, ASR Systems for both potable and reclaimed water, conservation projects for public supply and agriculture, and Tampa Bay Water's 25 mgd seawater desalination facility.

Part A. Projects Under Development

Section 1. Surface Water/Storm Water

1.0 NTB Area Surface Water/Storm Water Projects

All of the major surface water/storm water projects under development since the year 2000 in the NTB area are being implemented by Tampa Bay Water in cooperation with the District or its member governments. The projects include the Enhanced Surface Water System and the West Pasco Infrastructure Improvement Project. These projects are described on the following pages.

a) Enhanced Surface Water System (completed since the year 2000)

In 2002, Tampa Bay Water introduced the first alternative to ground water into their regional distribution system - surface water from local rivers. The new surface water supplies have allowed Tampa Bay Water to rest wellfields and supply up to 66 mgd of drinking water during periods of high rainfall. The key components of the Enhanced Surface Water System are:

- Alafia River Pump Station

  The Alafia River Intake and Pump Station is located near the Bell Shoals Road Bridge on the Alafia River. The water use permit issued by the District limits the harvest of water from this site to 10 percent of the river flow whenever flow at Bell Shoals Road is greater than 80 mgd. Withdrawals are capped at 51.7 mgd, and that amount is only allowed when the river flows at Bell Shoals Road are higher than 517 mgd.

- C.W. Bill Young Regional Reservoir

  The C.W. Bill Young Regional Reservoir is a 15 billion gallon, above ground, off-stream facility located in southeastern Hillsborough County. Surface water is harvested from the Tampa Bypass Canal (TBC) and Alafia and Hillsborough Rivers during wet periods and stored in the reservoir for use during dry periods. Construction of the reservoir was completed in early 2005, and intermittent filling began on March 1, 2005. The reservoir was filled to capacity in October of 2005.

- South-Central Hillsborough Intertie

  The South-Central Hillsborough Intertie is a 14-mile, 72-inch diameter pipe that connects the water treatment plant with the Alafia River pumping station. This pipeline moves water from the Alafia River pumping station and regional reservoir to the water treatment plant. It also conveys excess water from the TBC and Hillsborough River sources to storage in the reservoir.

- TBC Pump Station and Pipeline

  During construction of the TBC in the 1960s and 1970s, the top of the UFA was breached. This resulted in a large, stable flow of ground water into the canal. The TBC pumping station is located next to the canal near Dr. Martin Luther King Jr. Boulevard. From this site two surface water sources can be accessed; the TBC itself and water conveyed to the canal from the Hillsborough River through existing flood control structures.

  The TBC pipeline is a one-mile 84-inch diameter pipeline that conveys water from the TBC pumping station to the Regional Surface Water Treatment Plant. Besides conveying water directly to the surface water treatment plant, the TBC pipeline also connects with the South-Central Hillsborough Intertie to move excess water to the regional reservoir

- Regional Water Treatment Plants

  The site serves as a treatment and blending location for three water sources: surface, ground and desalinated water. Both the ground water and surface water are treated at the site then blended together with the water piped from the desalination plant before flowing into the regional system. In addition to surface water and ground-water treatment, the site is also used as a water storage, blending and distribution hub and for pipe storage during construction of other water supplies.

Financial information for the Enhanced Surface Water System is included in the following table.

Quantity Produced (mgd)	Capital Cost	Capital Cost (District's Share)	Cost/mgd	Cost/1,000 gallons
60 (66 peak capacity)	$274,000,000	121,377,035	$4,500,000	1.29

1.1 NTB Area System Interconnect/Improvement Projects

Table 8-1. List of System Interconnect/Improvement Projects in the NTB Area.

Project Name	Capital Cost	Description
West Pasco Infrastructure Improvement Project	$22,500,000	This project provides an additional source of water to the areas currently being served by TBW's Starkey and North Pasco Wellfields by interconnecting them to the regional system. When natural systems at the wellfields are most stressed, ground-water withdrawals will be reduced to near zero and the West Pasco service area will be supplied by this interconnection. These reductions would allow for environmental recovery at Starkey and North Pasco wellfields.
N.W. Hillsborough Pipeline	$8,050,000	This 10,000-ft, 36-inch diameter pipeline will allow supply from TBW's regional system to be delivered to the NW Hillsborough WTP. Currently, the NW Hillsborough WTP is dependant on supply from the NW Hillsborough Wellfield. As the demands at the NW Hillsborough WTP continue to grow, the NW Hillsborough Wellfield will not have sufficient capacity to meet the demand. Connecting the NW Hillsborough WTP to the regional system will reduce its dependence on the NW Hillsborough Wellfield, and allow alternative water supplies to be delivered to the WTP.
South-Central Hillsborough Infrastructure Improvements Phases IB and II	$12,060,000	These projects will allow TBW to deliver supply from the regional system to the South-Central Hillsborough service area. Currently, the service area is highly dependant on supply from the South Central Hillsborough Regional Wellfield (SCHRWF). As the demands in this service area increase, the SCHRWF will not have sufficient capacity to meet demand. Implementation of the SCHIIP Phase IB and II will reduce this service area's dependence on supply from the SCHRWF, and allow alternative water supplies to be delivered to the South Central Hillsborough service area.

2.0 SWUCA Surface Water/Storm Water Projects

The major surface water/storm water options under development since the year 2000 in the SWUCA are two projects to expand the PR/MRWSA water supply facility on the Peace River. The first is the Peace River Option, completed in 2001. The second is the regional expansion project that will be completed in 2009. These projects are described below.

a) Peace River Option (completed since the year 2000)

The purpose of the Peace River Option project was to expand the treatment capacity of the PR/MRWSA Facility from 12 mgd to 24 mgd and construct 12 additional ASR wells. Additionally, the project included the construction of a 23-mile transmission main that connected Sarasota County to the PR/MRWSA Facility and thereby, interconnected the major public supply utilities of Charlotte, DeSoto, and Sarasota counties. The Peace River Option project was initiated in 1997 and completed in 2001.

Quantity Produced (mgd)	Capital Cost	Capital Cost (District's Share)	Cost/mgd	Cost/1,000 gallons
6.0	$60,650,813	$20,755,154	$10,108,469	$1.90

b) PR/MRWSA Regional Expansion Project

The PR/MRWSA Regional Expansion Project will expand existing water supply facilities to enable Authority to deliver its total permitted allocation of 32.7 mgd to the their customers. The project includes a reservoir, increased water treatment plant capacity, and an extension of the regional transmission system to serve areas of DeSoto County.

- Reservoir Capacity Expansion

  The existing off-stream reservoir capacity of approximately 0.6 billion gallons is used for the storage of raw water withdrawn from the Peace River. The reservoir is used to store water diverted from the Peace River for supply to the Peace River Facility when river flows are below the minimum limits or when river water quality is poor. The proposed Regional Reservoir Expansion will provide approximately 6 billion gallons of additional storage, resulting in a total reservoir storage capacity of approximately 6.6 billion gallons. This storage volume is required to provide a sustainable supply to meet the PR/MRWSA's demands during dry periods when withdrawal from the Peace River is limited in order to maintain minimum flow to the downstream estuary and Charlotte Harbor. The PR/MRWSA consultant completed a site feasibility study and is in the process of finishing a basis of design report. Total estimated cost for this project is $49 million and is scheduled for completion in October 2008.

- Water Treatment Plant Capacity Expansion

  The current WTP capacity is 24 mgd. The proposed expansion is anticipated to provide an additional 24 mgd of treatment capacity and result in a total capacity of 48 mgd. The expansion is to include raw water pumping (river and reservoir), powder activated carbon (PAC) contact basins, rapid mix, flocculation and sedimentation basins, filters, chlorine contact basins, chemical feed systems, above-ground storage tanks, high service pumping, backwash recovery basins, residual thickening and mechanical dewatering system, instrumentation and controls. The additional treatment components will be incorporated into the existing treatment scheme and SCADA system. The expansion also includes the construction of an operations center. The PR/MRWSA's consultant completed an expansion analysis and Water Quality Master Plan Update earlier this year and is currently working on the basis of design report. The total estimated cost for the WTP expansion is $70.8 million and is scheduled for completion in October 2008.

- DeSoto County Regional Transmission System Extension

  The DeSoto County Regional Transmission System (RTS) extension will provide for transmission of potable water from the Peace River Facility to extended areas of DeSoto County. The RTS extension consists of approximately 5 miles of 20-inch diameter pipeline and may serve for future expansion of the Peace River Facility to locations beyond DeSoto County. The total estimated cost for the RTS extension is $3,632,000 and it was completed in September 2005.

  The RTS extension provides future opportunities to interconnect with other neighboring utilities within DeSoto and Charlotte counties. Further interconnection of utility systems would enhance regional supply management and provide the opportunity to rotate and rest sources of supply.

Quantity Produced (mgd)	Capital Cost	Capital Cost (District's Share)	Cost/mgd	Cost/1,000 gallons
14.7	$123,400,000	$42,756,969	$8,394,558	$2.05

c) Myakkahatchee Creek/Cocoplum Waterway

This option consists of a 2 mgd potable water ASR system at the City of North Port's existing water treatment plant. Excess flow in Myakkahatchee Creek would be pumped directly to the existing water treatment plant, treated, and stored in ASR wells. The option could be implemented in 4 phases. Phase I of the option began in 1999 and was funded by both the City of North Port and SWFWMD. Phase II of the project was completed in March 2001 and consisted of obtaining FDEP and SWFWMD permits. Phase III of the project, currently underway, includes construction and testing of one of the ASR well and monitoring wells. Project components include: construction of four new potable water ASR wells, a new raw water pumping and piping system that will increase pumping capacity to 4.0 mgd from Myakkahatchee Creek to the water treatment plant and a new ASR transfer pumping station.

Quantity Produced (mgd)	Capital Cost	Capital Cost District's Share)	Cost/mgd	Cost/1,000 gallons
1.29	$16,000,000	$8,000,000	$12,403,000	$3.86

2.1 SWUCA System Interconnect/Improvement Projects

Table 8-2. List of System Interconnect/Improvement Projects in the SWUCA.

Project Name	Capital Cost	Project Description
Emergency Backup Potable Water Supply Interconnect - Longboat Key	$4,200,000	12-inch diameter interconnect pipeline with the City of Sarasota
Regional Integrated Loop System Phase 1 PR/MRWSA - City of Punta Gorda Interconnect	$10,500,000	Interconnect between PR/MRWSA and Punta Gorda Potable Water Systems

Section 2. Reclaimed Water Projects

The objective of the District's reuse initiative is to expand the use of reclaimed water for appropriate purposes such as irrigation for landscaping and crops, ground-water recharge and industrial cooling and processing in order to offset existing or future demands for limited potable water supplies. In funding reclaimed water projects, the District requires that at least 50 percent of the reclaimed water must offset existing or planned ground- or surface-water withdrawals in order to qualify for funding consideration. This policy is intended to reduce the over-use of reclaimed water and increase the project benefits in terms of potable and ground-water offset. Millions of dollars of cooperative funding have been invested District-wide to assist in developing reuse projects, including construction and expansion of reuse transmission/distribution lines, pump stations and storage facilities to deliver reclaimed water to golf courses, recreational fields, commercial entities, residential subdivisions, community green spaces and industrial users. Table 8-3 is a summary of the benefits and costs that have been or will be realized by reclaimed water projects that the District has cooperatively funded through FY 2006.

Table 8-3. Information Summary of Reclaimed Water Projects[1] Cooperatively Funded by the District through FY2006.

District Board Providing Funding	Reclaimed Water Made Available (mgd)	Traditional Water Offset (mgd)	Gallons of Storage (millions)	Amount ($) Budgeted by the District[2]
Alafia River	7.3	5.2	12.1	$4,772,852
Coastal Rivers	14.8	9.8	17.7	$16,981,280
Hillsborough River	14.9	11.4	28.7	$12,560,531
Manasota	34.3	24.7	160.8	$21,145,020
NW Hillsborough	14.1	9.1	21.1	$19,590,336
Peace River	21.4	16.8	37.0	$19,217,444
Pinellas-Anclote River	61.5	34.2	123.5	$98,084,375
Withlacoochee River	4.8	3.6	4.7	$3,078,456
Governing Board	45.9	33.8	228.8	$30,389,240
Total	**219.3**	**148.9**	**634.40**	**$225,819,534**

1 Includes those projects within the Planning Region.
2 FY1987 – FY2006 totals, not including Partnership Agreement funding.
Source: Reuse and Conservation Projects Summary Report, October 2005, SWFWMD.

At build out these projects are conservatively estimated to offset potable quality water use by approximately 149 mgd. As of FY2006, the District's eight Basin Boards and the Governing Board have funded more than $225 million in grants for 259 reuse projects. As an indication of the success of these programs, approximately 90 percent of the WWTP's within the District supplied reclaimed water as of 2004 (FDEP, 2005). These treatment plants supplied more than 150 mgd of reclaimed water and beneficially reused approximately 45 percent of the wastewater generated in the District. Between 1995 and 2004, the volume of reclaimed water utilized within the District increased by 223 percent. In some areas of the District, the demand for reclaimed water exceeds the available supply. As a result of the efforts of the District and local governments to develop reclaimed water supplies, reuse in the District is expected to increase to more than 300 mgd by 2010. The combined impacts of reuse, conservation and education have resulted in a declining trend in per capita water use throughout the District's 16 county area. Tables 8-4 and 8-5 are listings of the reclaimed water projects that are currently classified as "under development" in the NTB area and SWUCA respectively.

Tables 8-4 and 8-5 show that there are a total of 150 reclaimed water projects under development in the NTB area and SWUCA, respectively. A description of one of these projects in the NTB area, the Tampa Bay Regional Reclaimed Water Project, is highlighted below because of its unprecedented size, interagency cooperation, and beneficial offset.

1.0 NTB Area Reclaimed Water Projects

a) Tampa Bay Regional Reclaimed Water Project

The Regional Project is a collaboration between the District and three water suppliers to maximize the use of reclaimed water in the Tampa Bay Area. The project will help the partners (1) reduce the use of traditional water supplies for irrigation and other purposes, (2) increase the beneficial use of wet-weather reclaimed water flows, rather than continue the practice of discharging them to tide or deep wells, and (3) helping to restore the natural systems in Pasco and Hillsborough counties. Although the project continues to evolve, the District's partnership with the City of Tampa, Hillsborough County and Pasco County is expected to ultimately provide up to 9 mgd of available water supplies, and result in 8 mgd of ground-water recharge and natural system restoration, for a total project benefit of 17 mgd. As it is currently configured, the Regional Project includes the planning, design, permitting and construction of more than 50 miles of pipeline, 12 million gallons of diurnal reclaimed water storage, pumping and treatment facilities, and seasonal storage reservoirs. The project will serve 30,000 customers, and uses all of the dry-weather flows (55 mgd) from the City of Tampa's Howard F. Curran Waste Water Treatment Plant (HFC Plant), and some of the plant's wet-weather flows (30 mgd) for beneficial purposes.

- City of Tampa

The primary source of reclaimed water for the Regional Project is the HFC Plant. The city will plan, design, construct, own and operate about 23 miles of reclaimed water pipeline, and related pumping and storage facilities required to supply approximately 7.8 mgd to 13,000 customers in north Tampa to offset 3.9 mgd of traditional water supplies. The city's consultant is in the process of completing a basis of design report (20-percent design) for the project. The total cost for Tampa's portion of the project is estimated to be $66,214,000, and it is anticipated to be completed in 2015.

- Pasco County

Pasco County's portion of the project begins where the reclaimed water pipeline serving north Tampa terminates at the Pasco-Hillsborough County line. From there, the County will plan, design, construct and operate approximately 7.3 miles of pipeline and related pumping and storage facilities to serve up to 10,000 customers with reclaimed water. The new customers will receive approximately 6.0 mgd and offset approximately 3.0 mgd of traditional water resources. The total cost for Pasco County's portion of the project is estimated to be $57,042,000 and is expected to be completed in 2015.

- Hillsborough County

Hillsborough County's portion of the project involves using both wet- and dry-weather reclaimed water flows from the HFC Plant. The project involves the planning, design, construction and operation of about 16 miles of reclaimed water pipeline, pumping and diurnal storage to supply 7,000 customers with approximately 4.2 mgd of reclaimed water to offset 2.1 mgd of traditional water supply. The total cost for this dry-weather element of the project is $46,002,000, and is expected to be completed in 2014. The second element of Hillsborough County's portion of the project addresses the use of surplus reclaimed water available during non-peak demand periods. The county plans to build a reclaimed water reservoir to store up to 620 million gallons of reclaimed water to be used for natural systems restoration and to supplement the reclaimed water supply during periods of peak demand. The $45.9 million project is estimated to provide at least 4 mgd in natural system benefits, and is anticipated to be completed in 2014.

- Southwest Florida Water Management District

The District is interested in exploring ways to beneficially use surplus reclaimed water. It is estimated that it will cost approximately $7.6 million to achieve about 4 mgd in potable and ground-water resource benefits using surplus reclaimed water flows. A significant opportunity to achieve those goals appears to include building storage along with Pasco County and co-mingling Pasco and HFC Plant flows in reservoirs. The District and Pasco County have initiated a pilot project consisting of the planning, design and construction of a 100-million gallon reservoir that could bring an additional 926 customers on-line. Other reservoirs could be used to achieve at least 4 mgd in benefits by 2015.

Quantity Produced (mgd)	Capital Cost	Capital Cost (District's Share)	Cost/mgd	Cost/1,000 gallons
17	$222,778,000	$115,199,000	$13.10	$3.16

Table 8-4 Reclaimed Water Projects Under Development in the NTB Area (FY2000-FY2006).

Cooperator	General Project Description	Reuse (mgd)			Customer (#)		Costs		
		Produced	Offset	Stored	Type	Total	Total	District	$/Kg
Pasco County NTB WUCA									
Pasco County	Feasibility Study H012	n/a	n/a	n/a	n/a	n/a	$150,000	$50,000	n/a
	Trans, Pump, Storage H012	0.00	6.00	variable	rec, com, res	tbd	$18,970,000	$3,779,982	$0.76
	Pump, Storage K178	10.00	0.00	5.00	n/a	n/a	$1,075,000	$537,500	n/a
	Transmission K216	0.08	0.06	0.00	rec	1	$600,000	$238,965	$1.97
	Trans, Storage K307	5.50	3.30	2.00	ag, rec, com, res	tbd	$6,540,000	$3,270,000	$0.39
	Transmission K693	0.00	0.00	0.00	ag, rec, com, res	tbd	$1,009,240	$504,620	n/a
	Metering & Controls K790	0.00	0.00	0.00	n/a	n/a	$430,000	$215,000	n/a
	Transmission L104	0.00	0.00	0.00	ag, rec, com, res	tbd	$150,000	$75,000	n/a
	Metering & Controls L106	0.00	0.00	0.00	n/a	n/a	$358,000	$179,000	n/a
	Pump, Storage L267	0.16	0.09	variable	rec, res	301	$500,000	$250,000	$1.10
	Metering & Controls L268	0.00	0.00	0.00	n/a	n/a	$430,000	$215,000	n/a
	Trans, Storage L270	2.00	1.20	variable	com, res	4,000	$2,966,316	$941,580	$0.49
	Pump, Storage H005	0.00	0.00	2.30	n/a	n/a	$1,692,812	$846,406	n/a
	Transmission H302	4.00	2.20	0.00	rec, res	5,771	$693,000	$346,500	$0.06
	Transmission H304	10.00	6.00	0.00	rec, com, res	tbd	$1,114,000	$557,000	$0.04
	Trans, Storage, Pumping H307	10.00	6.00	10.00	rec, com, res	tbd	$9,192,200	$4,596,100	$0.37
	Transmission F026	0.30	0.15	0.00	nsr	n/a	$493,448	$246,724	n/a
	Storage H305	0.00	0.00	100.00	tbd	tbd	$7,730,000	$5,800,000	tbd
	Storage K301	0.00	0.00	variable	n/a	n/a	$3,631,960	$238,043	n/a
New Port Richey	Transmission K219	0.40	0.24	0.00	rec, com, res	tbd	$2,148,186	$1,074,093	$1.76
	Transmission L162	0.15	0.07	0.00	res	246	$719,400	$359,700	$2.03
Aloha Utilities	Transmission K016	0.63	0.47	0.00	rec, com, res	6	$6,008,000	$924,122	$2.52
Pinellas County NTB WUCA									
Pinellas County	Trans, Pump F028	1.40	0.50	0.00	res	1,600	$3,172,300	$1,203,000	$1.25
	Reuse R/O H003	0.08	0.08	0.00	ind	1	$694,400	$347,200	$1.71
	Pump, Storage K421	0.00	0.00	5.00	n/a	n/a	$3,312,000	$1,203,000	n/a
	Design K422	n/a	n/a	n/a	n/a	n/a	$60,000	$30,000	n/a
	Pump, ASR K422	0.00	0.00	variable	n/a	n/a	$3,312,000	$1,656,000	n/a
	Feasibility Study K422	n/a	n/a	n/a	n/a	n/a	$360,000	$180,000	n/a

Table 8-4 Reclaimed Water Projects Under Development in the NTB Area (FY2000-FY2006) (Continued).

Cooperator	General Project Description	Reuse (mgd)			Customer (#)		Costs		
		Produced	Offset	Stored	Type	Total	Total	District	$/Kg
	Feasibility Study K422	n/a	n/a	n/a	n/a	n/a	$360,000	$180,000	n/a
Pinellas County	Feasibility Study K682	n/a	n/a	n/a	n/a	n/a	$75,000	$37,500	n/a
	Pump, ASR K682	0.00	0.00	variable	n/a	n/a	$613,000	$306,500	n/a
	Trans, Pump, Storage K831	0.32	0.16	2.40	rec, res	8	$1,780,000	$801,000	$2.19
	Trans, Pump, Storage P776	8.00	2.80	6.00	res	5,368	$34,945,000	$15,385,645	$2.46
	Reuse Supp. Feasibility L375	n/a	n/a	n/a	n/a	n/a	$200,000	$100,000	n/a
Bellair	Feasibility Study K425	n/a	n/a	n/a	n/a	n/a	$35,000	$17,000	n/a
Clearwater	Trans, Pump, Storage K213	0.30	0.15	5.00	rec, com, res	tbd	$4,862,180	$1,669,275	$6.39
	Trans, Pump K392	1.20	0.60	0.00	rec, com, res	tbd	$2,200,000	$1,100,000	$0.88
	Transmission K426	0.27	0.20	0.00	com, res	220	$850,000	$425,000	$0.84
	Trans, Storage K513	0.55	0.39	1.00	com	20	$4,928,300	$2,103,985	$2.49
	Transmission K686	0.68	0.34	0.00	rec, com, res	476	$2,595,261	$1,297,630	$1.50
	Transmission K833	0.41	0.22	0.00	com, res	196	$2,400,000	$1,200,000	$2.15
	Trans, Pump L053	0.74	0.37	0.00	rec, com, res	622	$6,370,000	$2,065,000	$3.39
	Trans, Distribution L254	0.59	0.35	0.00	com, res, ind	769	$4,500,000	$250,000	$2.53
	Feasibility Study P786-1	n/a	n/a	n/a	n/a	n/a	$96,800	$48,400	n/a
	Trans, Pump P786-2	0.54	0.18	0.00	rec, com, res	tbd	$3,425,000	$812,500	$3.75
Dunedin	Transmission K033	0.43	0.17	0.00	res	tbd	$856,456	$441,570	$0.99
	Trans, Pump, Storage K201	0.27	0.14	1.00	res	421	$906,800	$453,400	$1.28
	Trans, Pump, Storage K312	0.37	0.19	2.00	res	620	$1,760,000	$880,000	$1.82
	Transmission K552	0.43	0.22	0.00	res	712	$2,224,000	$1,112,010	$1.99
	Transmission K673	0.02	0.01	0.00	res	39	$404,550	$202,275	tbd
	Transmission K834	0.03	0.01	0.00	res	42	$219,032	$125,000	$4.32
	Scada L076	0.00	0.00	0.00	n/a	n/a	$465,000	$232,500	n/a
Largo	Transmission K186	0.75	0.25	0.00	res	833	$1,232,000	$616,000	$0.97
	Transmission K427	0.13	0.04	0.00	res	88	$226,650	$113,325	$1.11
	Transmission K503	0.46	0.23	0.00	res	680	$2,000,000	$1,000,000	$1.88
	Transmission K674	0.12	0.06	0.00	res	200	$500,000	$250,000	$1.64
Oldsmar	Transmission K347	0.30	0.15	0.00	res, ind	500	$440,000	$220,000	$0.58
	Transmission K514	0.32	0.16	0.00	res	530	$300,000	$150,000	$0.45
	Transmission K515	0.07	0.04	0.00	res	115	$200,000	$100,000	$0.99
	Trans, Distribution K826	0.18	0.09	0.00	res	300	$660,000	$330,000	$1.45

Table 8-4. Reclaimed Water Projects Under Development in the SWUCA (FY2000-FY2006).

Cooperator	General Project Description	Reuse (mgd)			Customer (#)		Costs		
		Produced	Offset	Stored	Type	Total	Total	District	$/Kg
	Feasibility Study L095	n/a	n/a	n/a	n/a	n/a	$117,000	$41,000	n/a
	Transmission K517	0.33	0.25	0.00	res, rec	133	$255,000	$127,500	$0.10
Pinellas Park	Transmission K406	0.64	0.32	0.00	res	320	$793,634	$360,442	$0.49
	Transmission K516	0.40	0.20	0.00	res	660	$1,266,634	$633,317	$1.88
	Transmission K661	0.86	0.43	0.00	res	1,426	$2,730,000	$1,365,000	$1.01
	Trans, Distribution K694	0.84	0.42	0.00	res	1,400	$3,753,984	$1,876,922	$1.76
St. Petersburg	Transmission B004	0.00	0.00	0.00	com	2	$40,000	$20,000	n/a
	Pump, Well K424	0.67	0.00	variable	n/a	n/a	$450,000	$225,000	n/a
	Pump, Storage K687	0.00	0.00	2.20	n/a	n/a	$946,000	$472,534	n/a
	Storage K689	0.00	0.00	10.00	n/a	n/a	$2,840,000	$1,420,000	n/a
	Pump, Storage K847	0.00	0.00	20.00	n/a	n/a	$9,715,000	$2,452,500	n/a
	Pump, ASR P787	0.00	0.00	variable	n/a	n/a	$800,000	$400,000	n/a
Tarpon Springs	Transmission K691	0.37	0.18	0.00	res	618	$255,527	$98,000	$0.28
	Feasibility Study K840	n/a	n/a	n/a	n/a	n/a	$70,000	$35,000	n/a
	Telemetry K843	n/a	n/a	n/a	n/a	n/a	$59,995	$30,000	n/a
	Pump, Storage L051	0.00	0.00	3.00	n/a	n/a	$1,350,000	$675,000	n/a
Hillsborough County NTB WUCA									
Hillsborough County	Trans, Pump, Storage F020	13.20	7.90	5.00	ag, rec, com, res	4,539	$11,100,000	$5,442,000	$0.28
	Transmission F029	1.80	1.08	0.00	ag, rec, com, res	3,600	$2,400,000	$1,200,000	$0.26
	Pump, ASR K055	0.00	0.00	variable	n/a	n/a	$1,070,000	$535,000	n/a
	Trans, Pump F003	8.00	6.00	0.00	rec, com, ind	5	$6,589,263	$2,625,000	$0.16
	Pump, ASR K643	0.00	0.00	variable	n/a	n/a	$317,000	$309,500	n/a
	Pump K813	0.00	0.00	0.00	n/a	n/a	$900,000	$400,000	n/a
	Pump, Storage L103	0.00	0.00	5.00	n/a	n/a	$3,000,000	$1,500,000	n/a
Tampa Bay Water	Feasibility Study H306 I	n/a	n/a	n/a	n/a	n/a	$1,995,112	$997,556	n/a
	Trans, Pump H306 II+	14.00	14.00	tbd	tbd	tbd	$71,800,000	$35,900,000	$1.09
	Trans, Pump F011	2.00	2.00	0.00	nsr	n/a	$1,685,000	$420,500	$0.20
Lowry Park Zoo	Pump K622	0.04	0.03	0.00	n/a	n/a	$111,752	$55,877	$0.73
Tampa	Feasibility Study	n/a	n/a	n/a	n/a	n/a	$200,000	$100,000	n/a
	Trans, Pump, Storage K655	5.00	3.40	2.00	com, res	4,500	$32,700,000	$16,350,162	$2.31
	Trans, H301	tbd	tbd	tbd	rec, com, res, ind	tbd	$42,800,000	$21,400,000	tbd
	Trans, H303	7.80	3.90	tbd	res	13,000	$42,300,000	$21,150,000	$2.14
	Design – District only P750	5.00	3.40	0.00	res	5,000	$15,000,000	$600,000	$1.06
Tampa Bay Fisheries	Trans, Pump, Storage	0.12	0.09	variable	ag	1	$723,000	$361,500	$1.58
NTB WUCA Subtotals		**61.07**	**43.60**	**47.20**		**35,204**	**$260,133,901**	**$119,579,310**	**$1.07**

Table 8-4. Reclaimed Water Projects Under Development in the SWUCA (FY2000-FY2006).

Cooperator	General Project Description	Reuse (mgd)			Customer (#)		Costs		
		Produced	Offset	Stored	Type	Total	Total	District	$/Kg
Hillsborough County SWUCA									
Hillsborough County	Trans, Pump, ASR K509	0.00	0.00	variable	ag, rec, com, res	39	$1,000,000	$500,000	n/a
	Pump, ASR H010	0.00	0.00	variable	n/a	n/a	$1,500,000	$500,000	n/a
	Storage K644	0.00	0.00	5.00	n/a	n/a	$1,250,000	$625,000	n/a
	Trans, Storage (Share)	4.20	2.10	10.00	res	7,000	$17,600,000	$8,800,000	$1.65
	Storage, Recharge (Sharp)	10.00	4.00	tbd	tbd	tbd	$15,000,000	$7,500,000	$0.74
	Transmission H310	tbd	tbd	tbd	tbd	tbd	$6,600,000	$3,300,000	tbd
	Transmission L294	3.50	1.80	0.00	rec, com, res	4,286	$4,500,000	$1,800,000	$0.39
Polk County SWUCA									
Polk County	Pump, Storage, Telemetry H028	0.00	0.00	8.00	n/a	n/a	$2,173,500	$1,086,750	n/a
	Pump, Storage, Telemetry H029	0.00	0.00	8.00	n/a	n/a	$1,700,500	$850,250	n/a
	Trans, Pump, Storage K079	1.00	0.60	5.00	rec, res	1,000	$2,868,080	$1,434,040	$1.00
	Trans, Pump P563	1.00	0.60	0.00	com	2	$1,063,132	$531,566	$0.35
	Transmission F035	1.34	0.73	0.00	rec, com, res	1,801	$1,971,500	$985,750	$0.53
Dundee	Trans, Pump, Storage L553	0.36	0.18	4.50	res	600	$4,017,774	$3,013,774	$4.40
Winterhaven	Trans, Pump P366	0.14	0.10	0.00	com, rec	5	$130,000	$65,000	$0.26
	Feasibility Study L483	n/a	n/a	n/a	n/a	n/a	$100,000	$50,000	n/a
Aburndale	Trans, Pump K081	2.00	2.00	0.00	nsr	1	$886,620	$443,310	$0.09
Lake Wales	Trans, Pump, Storage P727	1.00	0.75	4.00	ag, rec	4	$5,870,000	$2,092,000	$1.54
Hardee County SWUCA									
City of Wauchula	Trans, Pump, Storage K430	1.00	1.00	1.00	ind	1	$5,354,000	$2,294,000	$1.06
Highlands County SWUCA									
Lake Placid	Trans, Pump, Storage L153	0.10	0.06	0.50	ag, rec, com	3	$1,374,200	$962,574	$4.51
Desoto County SWUCA									
City of Arcadia	Trans, Pump K889	0.40	0.30	0.00	ag	5	$600,000	$300,000	$0.39
Desoto County (DO	Feasibility Study L491	n/a	n/a	n/a	n/a	n/a	$50,000	$37,500	n/a

Table 8-5. Reclaimed Water Projects Under Development in the SWUCA (FY2000-FY2006).

Cooperator	General Project Description	Reuse (mgd)			Customer (#)		Costs		
		Produced	Offset	Stored	Type	Total	Total	District	$/Kg
Charlotte County SWUCA									
Charlotte County	Transmission H027	0.83	0.62	0.00	rec, com	12	$5,799,000	$1,643,250	$1.84
	Transmission, Pump K891	0.40	0.30	0.00	rec	3	$898,000	$449,000	$0.59
	Transmission K892	0.31	0.23	0.00	rec, res	4	$204,000	$102,000	$0.17
	Feasibility Study ASR L215	n/a	n/a	n/a	n/a	n/a	$870,000	$435,000	n/a
	Transmission L485	0.89	0.58	1.00	rec	1	$1,310,000	$655,000	$0.54
Englewood	Storage ASR, Pump K257	0.00	0.00	0.60	n/a	n/a	$920,000	$460,000	n/a
	Transmission L028	0.11	0.08	0.00	rec, com	2	$300,000	$150,000	$0.74
Manatee County SWUCA									
Manatee County	ASR F007	0.00	0.00	variable	n/a	n/a	$800,000	$325,000	n/a
	Trans, Pump, Storage F014	20.00	12.00	260.00	ag, rec, com, res	tbd	$37,670,000	$11,980,970	$0.62
	Feasibility Study L006	n/a	n/a	n/a	n/a	n/a	$400,000	$200,000	n/a
	Transmission L201	0.10	0.05	0.00	res	175	$179,000	$89,500	$0.71
Braden River	Trans, Pump K264	1.30	1.30	0.00	rec, com, res	tbd	$399,950	$199,975	$0.06
	Trans, Pump, Storage K488	0.70	0.70	variable	rec, com, res	tbd	$376,230	$188,115	$0.11
	Trans, Pump K594	0.45	0.27	0.00	rec, com, res	tbd	$400,000	$200,000	$0.29
Bradenton	Trans, Pump, Storage K262	4.80	3.60	2.00	ag, rec, com, res	tbd	$4,770,000	$1,485,000	$0.20
	Feasibility Study L515	n/a	n/a	0.00	n/a	n/a	$60,000	$30,000	n/a
Tropicana	Trans, Pump K130	0.79	0.79	0.00	com, ind	1	$300,000	$150,000	$0.07
Palmetto	Feasibility Study L229	n/a	n/a	n/a	n/a	n/a	$180,000	$90,000	n/a
Sarasota County SWUCA									
Sarasota County	Trans, Pump, Storage F017	2.80	2.10	52.00	ag, rec, com, res	tbd	$4,263,440	$2,068,220	$0.40
	Transmission F022	1.10	0.66	0.00	com, res	9	$2,237,000	$1,118,500	$0.67
	Trans, Pump, Storage FA24	0.60	0.36	3.00	rec, res	tbd	$2,220,000	$1,110,000	$1.22
	Transmission K002	0.36	0.25	0.00	rec	1	$829,000	$414,500	$0.65
	ASR K269	0.00	0.00	variable	n/a	n/a	$6,443,546	$3,221,773	n/a
City of Sarasota	Transmission L500	0.10	0.10	0.00	rec	1	$625,000	$250,000	$1.51
Englewood	Trans, Pump K910	0.40	0.30	0.00	rec	2	$900,000	$450,000	$0.59
Venice	Trans, Pump, Storage FB24	1.32	0.70	3.00	rec, com, res	1,587	$1,626,800	$813,400	$0.46
	Transmission K006	1.80	0.90	0.00	rec, com, res	294	$2,362,039	$1,181,019	$0.86
Venice Golf and CC	Trans, Pump L213	0.45	0.34	0.00	rec	1	$162,490	$81,245	$0.09
Aqua Utilities	Trans, Pump L522	0.57	0.57	0.00	com	1	$364,300	$209,471	$0.13
SWUCA Subtotals		**40.18**	**26.80**	**321.60**		**2,094**	**$77,869,795**	**$29,750,938**	**$0.74**

Table 8-5. Reclaimed Water Projects Under Development in the SWUCA (FY2000-FY2006) (Continued).

Cooperator	General Project Description	Reuse (mgd)			Customer (#)		Costs		
		Produced	Offset	Stored	Type	Total	Total	District	$/Kg
Pasco County "Other" (Non-WUCA)									
Dade City	Design K172	n/a	n/a	n/a	n/a	n/a	$232,500	$116,250	n/a
	Trans, Pump, Storage K172	0.85	0.64	0.50	ag	1	$1,955,000	$727,500	$0.60
Zephyrhills	Transmission K794	0.08	0.06	0.00	ec, com	3	$473,000	$236,500	$1.55
Polk County "Other" (Non-WUCA)									
Polk County	Trans, Pump, Storage K300	2.00	1.20	3.00	rec, res	2,203	$4,815,734	$2,407,867	$0.79
	Storage L475	0.00	0.00	3.00	variety	n/a	$3,880,606	$1,871,473	n/a
District "Other"									
Water Reuse Foundation	Reuse Water Treatment Study L112	n/a	n/a	n/a	n/a	n/a	$500,000	$275,000	n/a
	Reuse Research Study P173	n/a	n/a	n/a	n/a	n/a	$216,000	$50,000	n/a
	Reuse Research Study CCO P174	n/a	n/a	n/a	n/a	n/a	$200,000	$100,000	n/a
	Reuse Research Study ASR P175	n/a	n/a	n/a	n/a	n/a	$343,000	$100,000	n/a
	Reuse Water Quality Study P872-H	n/a	n/a	n/a	n/a	n/a	$470,000	$245,000	n/a
"Other" Subtotals		**2.93**	**1.90**	**6.50**		**2,207**	**$13,085,840**	**$6,129,590**	**$1.36**
Totals		**192.40**	**120.40**	**563.00**		**78,937**	**$586,481,133**	**$256,341,402**	**$0.96**

Source: Reuse and Conservation Projects Summary Report, October 1, 2005, SWFWMD, & District Project Database.

Rec = Recreation
Res = Residential
Ag = Agricultural
Com = Commercial
Ind = Industrial
N/A = Not Applicable
Nsr = Natural Systems Restoration
Trans = Transmission

1. Cost per 1,000 gallons offset amortized at 6% interest over 30 years.
2. Flows and Offsets for some projects are anticipated to be reached beyond 2010.

Section 3. Seawater Desalination Projects

1.0 NTB Area Seawater Desalination Projects

a) Tampa Bay Water Seawater Desalination Facility

The Tampa Bay Seawater Desalination facility will be an integral part of Tampa Bay Water's Regional Water Supply System. The facility, which is capable of producing 25 mgd of potable water, began production in March 2003 and has operated intermittently since, supplying more than 3.5 billion gallons of potable water to the regional system. The facility uses reverse osmosis membrane technology to remove minerals from seawater to produce drinking water.

The desalination facility was taken off line in the summer of 2005 and is being remediated to correct deficiencies in the design and construction of a number of different components. Tampa Bay Water anticipates the remediation to be completed by the end of 2006.

Quantity Produced (mgd)	Capital Cost	Capital Cost (District's Share)	Cost/mgd	Cost/1,000 gallons
25	$157,537,281	$85,000,000	$6,300,000	$3.19

Section 4. Brackish Ground-Water Desalination Projects

1.0 NTB Area Brackish Ground-Water Projects

a) Oldsmar Water Supply, Phase 4

The Oldsmar Water Supply Project is a continuation of the city's effort to develop a reverse osmosis treatment facility that will utilize 2.7 mgd of brackish ground water to produce 2.0 mgd of potable water. Phases 1 and 2 of the project, co-funded by the District's Pinellas-Anclote River Basin Board as part of the Cooperative Funding Program, included detailed wellfield analysis, evaluation of the treatability and byproducts disposal, and pre-permit application reviews. The hydrogeologic evaluation of the wellfield by the city's consultant determined that there was negligible surficial aquifer drawdown, and the brackish water quality was suitable for RO treatment. The treatability evaluation and optimization element of the study determined that a conventional RO treatment plant met the project objectives of being permittable and economically feasible.

Phase 3 of the project was for preliminary design and permitting and included development and evaluation of site specific technical data to be used in the permitting process, and the technical analysis and modeling that provided the foundation for the final design and permitting of the wellfields, RO treatment plant and byproducts discharge system. Phase 4 of the project includes preparation of Bid Documents, construction of the wellfields, water treatment plant, and the byproducts disposal system, and start-up. It is anticipated that Phase 4 will cost approximately $15 million.

Quantity Produced (mgd)	Capital Cost	Capital Cost (District's Share)	Cost/mgd	Cost/1,000 gallons
2.0	$14,915,466	$0	$7,457,733	$2.85

b) Tarpon Springs Water Supply

The Tarpon Springs Water Supply Project is a continuation of the City's efforts to develop a reverse osmosis treatment facility that will withdraw up to 6.4 mgd of brackish ground water to produce 4.5 mgd of potable water. The City initiated a water supply feasibility study in 2004 to characterize the hydrogeology and water quality of the Upper Floridan aquifer in the City. Results of the study will be used to design the brackish ground water well field. In 2006, the City completed construction of test wells, conducted an aquifer performance test, and determined the need for a membrane pilot testing program. The City's water supply project is targeted for completion in 2009 and will include construction of a reverse osmosis treatment facility. The District's Pinellas-Anclote River Basin Board, as part of the Cooperative Funding Program, has only contributed financially to the hydrogeologic exploration work portion of this project.

Quantity Produced (mgd)	Capital Cost	Capital Cost (District's Share)	Cost/mgd	Cost/1,000 gallons
4.5	$33,560,000	$0	$7,457,733	$1.70

2.0 SWUCA Brackish Ground-Water Projects

a) Polk County Northeast Regional Utility Service Area Lower Floridan Aquifer Test Well

The District and Polk County entered into a cooperative funding agreement to explore the lower Floridan aquifer as a potential source of water for public supply. The county is in need of additional sources to meet rapidly growing demands in northeastern Polk County.

The Northeast Regional Utility Service Area project includes the construction of an exploratory/test production well to an estimated depth of 2,450 feet below land surface. Data will be collected on the hydrogeology and water quality of all aquifers and confining units underlying the area. The ultimate objective is to determine the viability of utilizing the lower Floridan aquifer as a source of potable water in the area. Viability depends on the aquifer having production and quality characteristics that are suitable for a public supply production well. A seven-day aquifer performance test will be conducted on the exploratory well to determine the ability of the aquifer to produce water. Water quality in the lower Floridan aquifer in the vicinity of the Northeast Regional Utility Service Area is unknown, but based on a study by the USGS (O'Reilly and others, 2002) there is a good possibility that acceptable water quality will be found. Other data collection and testing will include lithologic samples from drill cuttings and cores, geophysical logging, and hydraulic parameter testing of the middle confining unit. The exploratory test well will be completed with a 16-inch diameter final casing to an estimated depth of 1,300 feet bls and open hole to 1,550 feet below land surface. The proposed depths are based on production wells in the Orlando area that are completed in the lower Floridan aquifer. The consultant's yield estimate, based on information from the Orlando wells, is three to five million gallons per day.

Quantity Produced (mgd)	Capital Cost	Capital Cost (District's Share)	Cost per mgd	Cost per 1,000 Gallons
TBD	$825,000	TBD	TBD	TBD

Section 5. Aquifer Storage and Recovery (ASR) Projects

The District has provided funding support for numerous ASR projects. There are currently 23 ASR and recharge/recovery projects in various stages of completion. Thirteen of these projects involve the storage of reclaimed water (highly treated wastewater) that is available in large quantities during the wet season; and eight projects involve potable water, three of which are currently operational ASR systems. Additionally, there are two projects that recharge water to the Upper Floridan aquifer but do not directly recover it.

The District is co-funding the development of all but three of the projects listed above. Projects that are currently either authorized to use ASR or that are performing operational testing with the beneficial use of the recovered water are capable of providing approximately 50 mgd of water during the dry season. Additionally, potable water ASR projects that are either in the feasibility or construction phases of development can potentially provide an additional 50 mgd, if they are built as originally planned. Figure 8-1 depicts the location of ASR projects under development in the Planning Region.

1.0 NTB Area – ASR Projects

There are 10 ASR projects under development in the NTB area. Two are potable ASR projects and eight are reclaimed water ASR projects. Table 8-6 lists all ASR projects currently under development in the NTB area and identifies the stage of development, project yield, and cost.

2.0 SWUCA - ASR Projects

There are seven ASR projects under development in the SWUCA. Two are potable water ASR projects, four are reclaimed water ASR projects, and two are aquifer recharge/recovery projects. Table 8-7 lists all ASR projects currently under development in the SWUCA and identifies the stage of development, project yield, and cost.

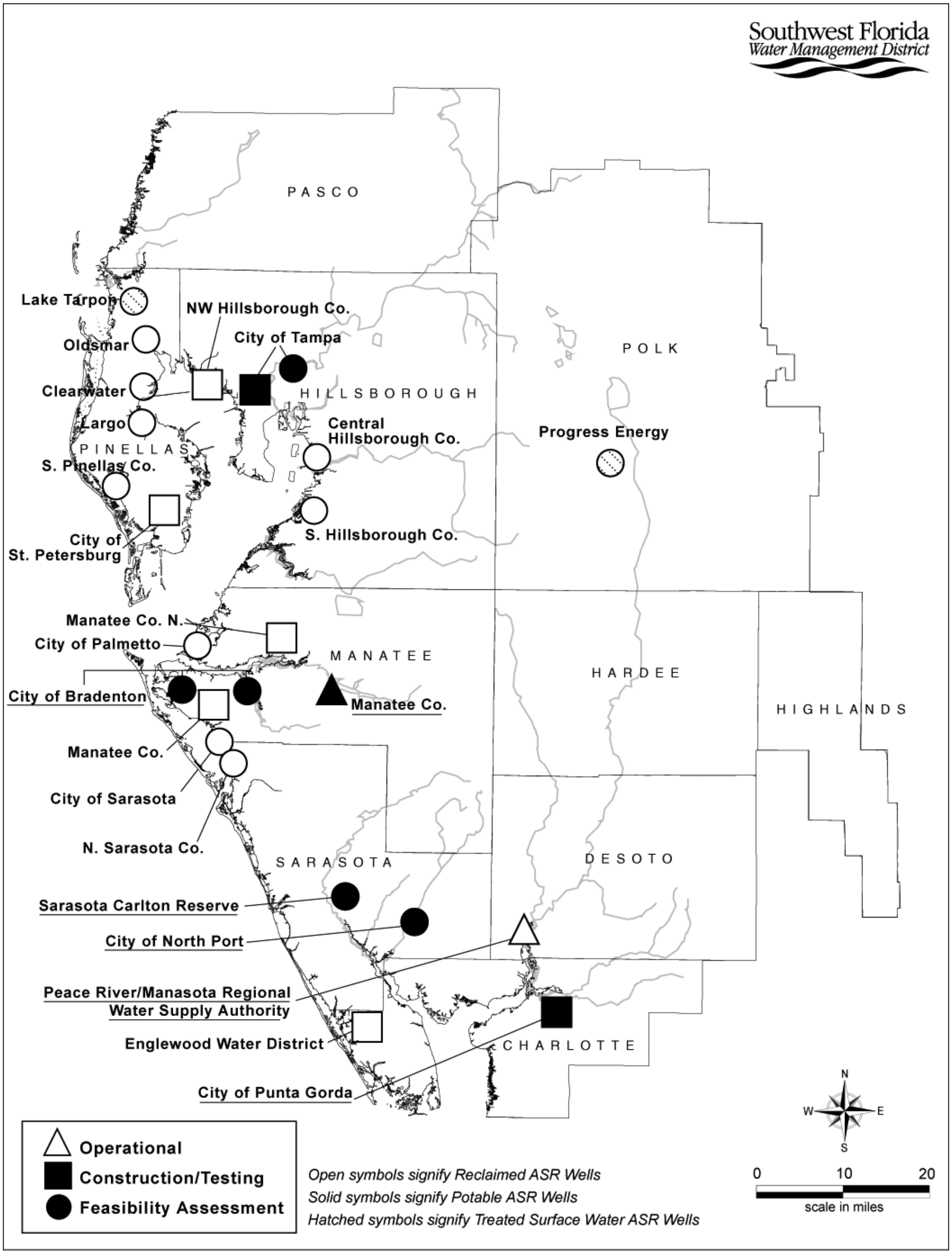

Figure 8-1. Location of ASR Projects Under Development in the Planning Region.

Table 8-6. Summary of ASR Projects in the NTB Area.

Project Site	Status	Test Well Annual Stored Volume Goal (MG)	Final System Goal			Approximate Cooperative Funding Total Project Costs (District Share is half of reported costs)
			Annual Stored Volume (MG)	100 Day Dry Season Yield (mgd)	Total Number of Wells	
Potable Water ASR Projects						
City of Tampa (Rome Avenue)	The feasibility study, including construction and testing of one ASR well, was completed in 1997.	100	100	1.0	1	Feasibility Program = $700,000
	Seven additional ASR wells have been constructed and are in the process of being tested.	n/a	900	9.0	7	Final System = $4,500,000 additional for the six wells.
City of Tampa (Hillsborough River Water Treatment Plant Area)	A feasibility study that includes construction and testing is underway. A permit has been issued to construct 19 wells.	200 – 400	3,000	30	10 – 20	Not receiving Cooperative Funding at this time.
Reclaimed Water ASR Projects						
Northwest Hillsborough	Feasibility Study Stage. Test well is constructed. Work was stopped after completion of cycle test 3b. Hillsborough County is reevaluates its options for storing reclaimed water.	135	720 – 1,000	7.2 – 10	7 – 8	Feasibility Program = $720,000 Cost for final system not available.
City of St. Petersburg	Feasibility Study Stage. ASR well construction is complete and cycle testing is in progress.	90 – 180	900 – 1,800	9 – 18	TBD	Feasibility Program = $800,000 Cost for final system not available.
Largo/Clearwater/Pasco	The feasibility study is completed. Only Clearwater is pursuing ASR and will start with an exploratory well first.	TBD	547	4.5	3	Feasibility, construction, testing =$4,220,000
South Pinellas Co. South Cross Bayou Facility	Feasibility stage completed. Waiting for the permit to convert and test existing injection wells to ASR well.	60-120	60-120	1.2	1-3	Feasibility $75,000; permitting construction and testing $600,000
Lake Tarpon Pinellas Co.	Feasibility stage completed and waiting for the permit to construct and test the ASR well.	60-120	60-120	1.2	1	Exploratory wells $150,000 Permitting $56,000
Hillsborough Co. Central ASR	Feasibility Study and construction permit are complete. No site work occurred and the project has been stopped while Hillsborough County reevaluates its options for storing reclaimed water.	125	500	4	4	$1,500,000 total project cost District share is $500,000

Table 8-6. Summary of ASR Projects in the NTB Area. (Continued).

Project Site	Status	Test Well Annual Stored Volume Goal (MG)	Final System Goal			Approximate Cooperative Funding Total Project Costs (District Share is half of reported costs)
			Annual Stored Volume (MG)	100 Day Dry Season Yield (mgd)	Total Number of Wells	
Hillsborough Co. Big Bend	Feasibility Study is complete; a construction permit has been issued; shallow and deep monitor wells were constructed; and ASR well design specs were completed. All other work is on hold while Hillsborough County reevaluates its options for storing reclaimed water.	125	1,000	8	7	Feasibility and ASR test well = $1,000,000, District's share is $500,000.
Project Site	**Status**	**Test Well Annual Stored Volume Goal (MG**	**Final System Goal**			**Approximate Cooperative Funding Total Project Costs (District Share is half of reported costs)**
			Annual Stored Volume (MG)	**100 Day Dry Season Yield (mgd)**	**Total Number of Wells**	
Hillsborough Co. Sydney Mine	ASR is being considered as a component of the regional reuse system	TBD	TBD	TBD	TBD	TBD
City of Oldsmar	Feasibility study is underway.	Pending outcome of feasibility study	NA	NA	NA	Feasibility study =- $82,0000
City of St. Petersburg "REWARD" Project	Recovery well has been drilled and is in the process of testing.	240	240	2.4	1	Estimated construction and testing is $450,000.

Table 8-7. Summary of ASR Projects Under Development in the SWUCA.

Project Site	Status	Test Well Annual Stored Volume Goal (MG)	Final System Goal			Approximate Cooperative Funding Total Project Costs (District Share is half of reported costs)
			Annual Stored Volume (MG)	100 Day Dry Season Yield (mgd)	Total Number of Wells	
Potable Water ASR Projects						
Peace River/Manasota Regional Water Supply Authority	PR/MRWSA	PR/MRWSA	PR/MRWSA	PR/MRWSA	PR/MRWSA	PR/MRWSA
	Avon Park ASR feasibility program. Well constructed. Cycle test pending installation of additional monitor well and availability of injection water.	180-450	TBD	TBD	TBD	Feasibility Program = $850,000
	Eleven additional Suwannee wells constructed and under operational testing.	n/a	1,680	16.8[1]	11	Final System = $5,000,000 more for the 11 wells.
Manatee County (Lake Manatee)	Two ASR wells have been permitted and operational since 1986.	n/a	180	1.8	2	Funding provided by the District in 1984.
Reclaimed Water ASR Projects						
Manatee County (SWRWWTP)	Four wells under operational testing.	n/a	1,800-3,000	18-30	4	This project is not receiving cooperative funding.
	Feasibility study underway, ASR well complete, cycle testing in progress. If successful, two more ASR wells planned.	90 – 180	320	3.2	3	Feasibility Program = $800,000 ($948,400) Final System = $1,200,000[2] more.
Manatee County (NRWWTP)	Feasibility study underway. Permit received to construct Avon Park ASR well. First exploratory Suwannee well completed in April 2001 not feasible.	Test ASR well has not been constructed yet.	480	4.8	3	Feasibility Program = $600,000 ($582,021[3]). Final system = $1,200,000[4] more.
North Sarasota County (Central County Utilities)	In construction stage. If successful, two more wells planned.	157	480	4.8	3	Feasibility Program = $810,000. The two remaining wells are estimated to cost a total of $3,850,000.
Englewood	In feasibility phase. ASR well constructed. Cycle testing pending FDEP approval of use of new Class 1 well to dispose of recovered water.	150	300	3.0	2	Feasibility Program = $920,000
Recharge – Recovery Projects						
Florida Power/Florida Inst. of Phosphate Research - Hines Energy Cmplx - Polk Co	Project feasibility stage. FDEP testing and well construction permit approval pending.	90	90	9.0	1	Feasibility Program = $1,140,000
CFI Aquifer Recharge/Recovery Project	Permitting and design phases will be complete in early 2007. Construction of wetland system and sand filtration basin will occur in 2007.	730	TBD	2	1	Total program = $4,500,000

Footnotes for Table 8-7 on the previous page:
[1] Upon completion total yield = 30 mgd. 12 mgd from existing plus 18 mgd from expansion.
[2] The original estimated cost was $800,000. Actual bid cost $948,400. District share equals $400,000.
[3] The original estimated cost was $600,000. Actual bid cost for wells only was $582,021. The District's share for this phase is estimated not to exceed $300,000.
[4] Not currently part of cooperative funding.

Term Definitions:
Preliminary Feasibility Report: Desktop analysis of existing data to evaluate the potential for ASR. This level of study generally includes an analysis of the water quality of the proposed injection water, availability and demand for this water, and hydrogeology of the potential ASR sites. Generally, this stage of study does not involve the installation of an ASR well, but may include a small diameter exploratory well to check TDS concentrations and the hydrogeology. An inventory of existing wells within one to two miles of each proposed ASR site is generally performed at this stage. The preliminary feasibility study is generally submitted with the Class V injection well permit application.
Final Feasibility Report: This report contains information obtained from the drilling and testing of one or more ASR wells. It would include the results of cycle testing, water quality analysis, and water level fluctuation as a result of injection and pumping. This report generally serves as the basis for expansion of the ASR system to achieve the project yield goal.
Final System: Includes all the necessary wells to store the overall project goal volume if feasibility is proven.
FDEP: Florida Department of Protection
MG: Million Gallons
WQCE: Water Quality Criteria Exemption FDEP = Florida Department of Protection
Feasibility Study Stage - Unless footnoted it includes demand projections, water quality assessment, permitting, site selection, well design, geologic testing, cycle testing, and final report.
Final System - Includes all the necessary wells to store the overall project goal volume if feasibility is proven.

Section 6. Conservation Projects Under Development

1.0 Indoor Conservation

The District's high level of commitment to water conservation is demonstrated by its continuing efforts to cooperatively fund conservation projects with local governments. Since 1991, the District has assisted local utilities with the distribution of nearly 224,637 ultra-low volume toilets, and 500,399 plumbing retrofit kits (including water efficient shower heads, low-flow faucet aerators and other items).

The programs, which cost the District and cooperating local governments a combined $36.5 million, yield an average savings of 11.9 million gallons of potable water per day. In addition, the District offers technical assistance to local entities to develop conservation programs, participates in research to ensure the latest conservation information is available to stakeholders, and retrofits restrooms at District service offices with ultra low volume plumbing fixtures and appropriate signage. Table 8-8 provides information on indoor conservation projects cooperatively funded in the Planning Region through FY2006.

Table 8-8. Summary of Indoor Conservation Projects Cooperatively Funded in the Planning Region through FY2006.

District Board Providing Funding	Number of Water Conservation Fixtures/Kits[1] Installed	Traditional Water Offset (gpd)	Amount ($) Budgeted by the District
Alafia River	12,056	660,883	817,991
Coastal Rivers	3,460	43,230	33,132
Hillsborough River	76,361	2,513,117	1,887,316
Manasota	8,140	392,810	282,200
NW Hillsborough	39,494	2,002,073	1,975,768
Peace River	1,000	45,493	108,215
Pinellas-Anclote River	347,322	6,012,702	11,774,832
Withlacoochee River	210	2,620	2,008
Total	488,043	11,672,928	16,881,462

Source: Reuse and Conservation Projects Summary Report, October 2005, SWFWMD.
[1] Kits include water efficient showerhead devices, low-flow faucet aerators, and other water saving items.

2.0 Outdoor Conservation

Outdoor water use and water savings associated with outdoor water conservation projects are difficult to measure since the plant materials, soils, irrigation systems and size of all irrigated areas are not the same. Outdoor water use can be a significant portion of a water supply utility's total demand. Since the majority of this use is irrigation-related, the District emphasizes "environmentally friendly" landscaping (including Florida-friendly landscaping and Florida Yards initiatives), outdoor water audits, leak detection surveys for utility systems and irrigation system efficiency analyses. This emphasis takes the form of public information and education, cooperative funding of demonstration projects, research, use of Florida-friendly landscaping on District properties, development of a model landscape ordinance and the passage of a Xeriscape Incentive Rule.

The District's standing advisory committees and the Cooperative Funding Program have been useful mechanisms for District staff in developing and refining outdoor conservation research and other projects. Projects related to landscaping efficiency have been funded by the District since 1992. The District has provided nearly $2.2 million toward cooperative landscape demonstration, irrigation efficiency audits, studies and rebate projects, for a collective estimated water-savings of 536,186 gpd. Table 8-9 is a summary of outdoor and indoor water conservation projects that are under development in the Planning Region during the period from 2000 through 2006.

3.0 Agricultural Conservation

In 2002, farmers that operate within the District used approximately 522 mgd to irrigate more than 400,000 acres of cropland. Various District programs provide a broad spectrum of services and assistance to agricultural industry. For nearly 30 years, the District has administered programs that have provided millions of dollars to fund more than 100 projects that have helped farmers increase the efficiency of their water use and improve water quality. Table 8-10 is a summary of those projects that are under development as of FY2006. Examples of these projects include:

- IFAS Research and Education Projects. These projects address current issues such as tailwater recovery, determination of crop water use requirements, field irrigation scheduling and frost/freeze protection.

- Mobile Irrigation Laboratory. This program, in cooperation with the Natural Resources Conservation Service (NRCS), conducts efficiency and conservation evaluations of agricultural irrigation systems. Since 1986, the mobile irrigation lab service has evaluated irrigation systems at over 900 sites in the District, and recommended management strategies and/or irrigation system adjustments.

In 2002, the District, in cooperation with the FDACS initiated the FARMS program. FARMS is an agricultural BMP cost-share reimbursement program that involves both water quantity and water quality aspects. It is intended to expedite the implementation of production-scale agricultural BMPs that will help agriculturalists become more efficient in their water use, improve water quality, and restore and augment the area's water resources and ecology. FARMS is a public/private partnership between the District and FDACS and private agriculturalists. Reimbursement cost-share rates for agriculturalists are based on the degree to which they implement both water quantity and water quality BMPs. Through 2025, it is anticipated that the projects that will have been developed by the program will offset at least 40 mgd of agricultural ground-water use. Since the District classifies the FARMS program as water resource development, additional information on the program including a complete list of projects under development is included in Chapter 7.

Table 8-9. Indoor and Outdoor Conservation Projects Under Development in the Planning Region (2000 – 2006[1]).

Cooperator	Phases[2]	General Project Description	Savings (gpd)	Devices/ rebates (#)[3]	Costs ($)		
					Total	District	$/Kgal Saved[5]
Charlotte County							
Charlotte Harbor	1	Irrigation Efficiency Audit	3,468	12	$7,484	$3,742	$1.37
Hillsborough County							
Tampa	4	Toilet Rebate	155,000	5,300	$633,994	$252,280	$0.96
Tampa	**2**	**Toilet Rebate**	**133,700**	**4,400**	**$600,000**	**$200,000**	**$1.05**
Tampa	1	Irrigation Efficiency Rebate	1,806	4	$1,600	$800	$0.55
Tampa	3	Plumbing Retrofit[4]	114,304	7,838	$621,813	210,906	$1.28
Hillsborough Co.	2	Toilet Rebate	278,343	12,518	$1,859,568	$525,000	$1.57
Manatee County							
Manatee	**1**	**Rain Sensor Rebate**	**25,000**	**250**	**$12,500**	**$6,250**	**$0.31**
Pasco County							
Pasco County	**2**	**Rain Sensor Rebate**	**33,000**	**500**	**$20,000**	**$10,000**	**$0.38**
Pinellas County							
St. Petersburg	3	Toilet Rebate	335,882	10,300	$1,390,324	$690,501	$0.97
St. Petersburg	**2**	**Toilet Rebate**	**48,326**	**1,421**	**$200,000**	**$100,000**	**$0.97**
St. Petersburg	**2**	**ICI Spray Valve Replacement**	**150,000**	**750**	**$40,000**	**$20,000**	**$0.16**
St. Petersburg	**2**	**Irrigation Efficiency Audit[6]**	**228,940**	**797**	**$310,100**	**$155,050**	**$0.86**
Pinellas County	2	Toilet Rebate	1,386,213	40,905	$4,645,838	$2,322,919	$0.78
Pinellas County	**3**	**Toilet Rebate**	**880,698**	**41,311**	**$5,014,603**	**$2,507,302**	**$1.34**
Pinellas County	**2**	**Soil Moisture Sensor Evaluation**	**TBD**	**64**	**$519,010**	**$519,010**	**TBD**
Pinellas County	**1**	**ICI Pilot Water Conservation**	**TBD**	**TBD**	**$300,000**	**$150,000**	**TBD**
AWWA Technical & Educ. Council	1	Retrofit Impact Study	n/a	n/a	$30,000	$15,000	n/a

Table 8-9. Indoor and Outdoor Conservation Projects Under Development in the Planning Region (2000 – 2006[1]) (Continued).

Cooperator	Phases[2]	General Project Description	Savings (gpd)	Devices/ rebates (#)[3]	Costs ($)		
Polk County							
Lake Wales	1	Plumbing Retrofit[4]	32,770	510	$52,492	$26,246	**$0.37**
Polk County	**1**	**Toilet Rebate**	**9,433**	**700**	**$100,000**	**$50,000**	**$2.49**
Sarasota County							
Sarasota County	2	Toilet Rebate	17,275	1,169	$200,000	$44,525	$2.72
Sarasota County	2	Showerhead Exchange	330,000	8,000	$24,000	$7,980	$0.05
City of Sarasota	3	Toilet Rebate	38,535	1,527	$300,000	$62,973	$1.83
City of North Port	1	Plumbing Retrofit[4]	7,000	420	$40,400	$20,200	$1.35
City of North Port	1	Rain Sensor Rebate	14,000	140	$9,600	$4,800	$0.43
District							
FDACS	1	Plant Establishment Research	n/a	n/a	$1,000,000	$250,000	n/a
IFAS	1	Interactive Landscape Website	n/a	n/a	$40,000	$40,000	n/a
Totals			**4,223,693**	**138,836**	**$17,973,326**	**$8,195,484**	**$1.17***

TBD = To Be Determined n/a = not applicable/savings not measurable

[1] Projects listed in BOLD type are in progress at the time of writing, all savings are anticipated to be realized by 2009.

[2] Number of phases of the project completed to date, and those currently in progress, including FY2006 projects.

[3/] Based on the project description, the number may be one of the following: fixtures, devices, audits, rebates, or kits (kits include showerheads, faucet aerators and other conservation items).

[4] Plumbing Retrofit projects include toilet rebates and showerheads, and possibly faucet aerators.

[5] Cost benefit amortized at 6% annual interest over 5 or 20 years, based on the type of project.

[6] Projects include reclaimed customers and water savings.

* The cost benefit is a weighted average based on the total benefit for the life of the project, amortized at 6 % for 20 years

Table 8-10. Agricultural Conservation Projects Under Development in the Planning Region (2000–2006).

Project	Crop Type	District Funding
Evaluation of Low Cost Irrigation Mgmt Devices to Reduce Water Use	All	$85,000
FL Automated Weather Network Data Dissemination and Education	All	$125,000
Workshops On Frost/Freeze Protection	All	$15,000
Determine Total Water Budget and Irrigation Requirements For Mature Southern Highbush Blueberries Grown on Pine bark	Blueberry	$153,000
Reduce Winter and Fall Citrus Irrigation	Citrus	$125,000
Citrus Water Management Training	Citrus	$24,000
Ag. Demonstration - Development and Determination of Citrus Leaf Freezing Temp. To reduce Cold Protection Quantities	Citrus	$16,000
Determining Reasonableness of District Amounts for Micro Irrigated Ridge Citrus in Highlands County	Citrus	$30,000
Investigation & Developing Methods to Determine Urban Landscape Irrigation for Planning and Permitting in Central Florida	Landscape	$20,000
Development of Irrigation Schedule & Crop Coif. For Trees (Seedlings to 5" Calipers)	Ornamental	$70,000
Reclaimed Water For Irrigation of Container-Grown Plants	Ornamental	$89,000
Determining Water Use During Production of Select Tropical Plants	Ornamental	$60,000
Evaluation and Development of an Et Reference Model for Irrigation of Wood Ornamentals	Ornamental	$99,900
Cold/Chill Protection of Tropical Plants in the Nursery	Ornamental	$160,000
Cold/Chill protection of tropical Plants in The Nursery	Ornamental	$160,000
Development of Irrigation Schedule & Crop Coif. For Trees (Seedlings to 5" Calipers) Phase II	Ornamental	$98,750
Sod Irrigation On-Farm Demonstration	Sod	$36,000
Field Evaluation of Bahiadwarf, For Water Use Efficiency, Turf Quality, Mowing Requirements and Persistence	Sod	$157,500
Enhancement of Strawberry Irrigation and Nutrient Management	Strawberry	$75,000
Protecting WQ Through the Use of Effective Water and Nutrient Management for Strawberry Production	Strawberry	$75,000
Water Required for Transplant Estab. of Plastic Mulched Crops	Tomato	$60,000
Characterizing Nitrogen Fertilizer Usage & Leaching in Fresh Market Tomato Fields of the Palmetto-Ruskin Agricultural Area	Tomato	$120,000
Crop Coefficient & Water Use For Water Melons	Vegetable	$130,000
Enhancing Irrigation & Nutrient BMPs for Seepage Irrigating	Vegetable	$90,000
Impact of Organic Amendments on Soil Water Retention & Water Cons	Vegetable	$175,000
Tailwater Recovery	Vegetable	$135,000
Evaluation & Demonstration of Soil Moisture Based On-demand Irrigation Controllers For Vegetable Production	Vegetable	$142,900
Total		**$2,527,050**

Chapter 9. Overview of Funding Mechanisms

This Chapter begins with the statutory responsibility for the District's role in water-supply funding. Next, an overview is provided of the numerous federal, state, and water management district funding mechanisms available to generate the funding necessary to meet the water supply demand projected through 2025 and restore minimum flows and levels to impacted natural systems. This is followed by a projection of the amount of funding that is expected to be generated or available in the Planning Region from these funding sources from 2007 through 2025. The funding projections include actual budgeted funding for water supply and water resource development for 2007 and projections of potential funding for 2008-2025.

As presented in Chapter 4, Table 4-11a, approximately 409 mgd of new water supply will need to be developed during the 2000-2025 planning period to meet demand for all users and to restore minimum flows and levels for impacted natural systems. As of the December 2006 release date of this RWSP, it is estimated that at least half of that demand has either been met or will be met by projects that are under development. Projects under development are those the District is co-funding that have either been 1) completed since the year 2000 (the base year for the 2006 RWSP), 2) are in the planning, design, or construction phase, or 3) are not yet in the planning phase but have been at least partially funded through the 2006 fiscal year.

To develop an estimate of the capital cost of developing the projects that will be needed to meet the portion of the 2025 demand that is not yet under development, the District compiled a list of large-scale water supply development projects that have been proposed by water suppliers to meet the majority of the projected 2025 public water supply demand in the Planning Region. Water resource development projects proposed by the District to the meet the minimum flow for the upper Peace River through large-scale restoration of the watershed were also included. The water supply produced from these water supply and water resource development projects will meet the majority of the water demand that is not yet under development in the Planning Region.

To determine the adequacy of funding to cover the cost of developing the projects needed to meet the portion of the 2025 demand that is not yet under development, the capital cost of the potential projects discussed above is compared to amount of funding that will be generated in the Planning Region through 2025 by the various District and state funding mechanisms.

Part A. Statutory Responsibility for Funding

The genesis for statutorily defining the water management districts' roles in funding water supply and water resource development is found in a report prepared by the Governor's Water Supply Development and Funding Work Group (1997). Much of the statutory guidance below was developed from this report.

> Section 373.0831, F.S. describes the responsibilities of the water management districts in regard to funding of water resource and water supply development projects:
>
> *(1)(a) The proper role of the water management districts in water supply is primarily planning and water resource development, but this does not preclude them from providing assistance with water supply development.*

(1)(b) The proper role of local government, regional water supply authorities, and government-owned and privately owned water utilities in water supply is primarily water supply development, but this does not preclude them from providing assistance with water supply development.

(2)(b) Water management districts take the lead in identifying and implementing water resource development projects, and are responsible for securing necessary funding for regionally significant water resource development projects.

(2)(c) Local governments, regional water supply authorities, and government-owned and privately owned utilities take the lead in securing funds for and implementing water supply development projects. Generally, direct beneficiaries of water supply development projects should pay the costs of the projects from which they benefit, and water supply development projects should continue to be paid for through local funding sources.

In accordance with the intent of the legislation and the promotion of efficient use of water, direct beneficiaries of water supply development projects should generally bear the costs of projects from which they benefit. However, affordability and equity are also valid considerations. The Governor's Water Supply Development and Funding Report also identifies numerous potential sources of funding for both water resource and water supply development.

Currently, the District funds both water supply and water resource development projects. In general, as discussed in Chapter 7, the District considers its water resource development activities to include: resource data collection and analysis, and water resource development projects. In terms of water supply development, the District has typically funded the development, storage and transmission of non-traditional sources of water, including reclaimed water and conservation. The following addresses potential sources of funding for water supply and water resource development projects.

Part B. Funding Mechanisms

Section 1. Water Utilities

Water supply development funding has been, and will remain, the primary responsibility of water utilities. Increased demand is generally caused by new customers that help to finance source development through their utility bills. This is true whether the new sources are traditional or alternative.

Water utilities draw from a number of revenue sources such as:

- connection fees,
- tap fees,
- impact fees (system development charges),
- base and minimum charges, and
- volume charges.

Connection and tap fees generally do not contribute to water supply development or treatment capital costs. Impact fees are devoted almost exclusively to the construction of source development, treatment and transmission facilities. Base charges generally contribute to fixed customer costs such as billing and meter replacement. However, a high base charge or a minimum charge, which covers the cost of the number of gallons of water use, may also contribute to source development, treatment and transmission construction cost debt service. Volume charges contribute to both source development/treatment/transmission debt service and operation and maintenance.

A survey of water utility fees and charges in the Planning Region was conducted in October 2005 to estimate revenues that contribute to source development, treatment, and transmission capital projects. The water use of the surveyed utilities constitutes the majority of utility-supplied water use in the region. Distribution system impact fees, when applicable[1], and connection and tap fees were excluded from the calculations. Impact, base and volume charges from surveyed utilities were weighted by the projected share in population growth of the utilities to form weighted average charges that were applied to the region's future customers and water use.

Between 2005 and 2025, new public water supply demand will generate an estimated $397 million in one-time water impact fees in the Planning Region. Recurring base/minimum charges will generate approximately $337 million during the same period. However, the resulting low weighted average base charges indicate that base charges will not contribute significantly to new source development ($5.81/month for single family residential accounts). Estimated volume charges will exceed $1.09 billion. While some of these revenues will go to pay existing facility debt service, most of that service will be retired in various stages over the next 20 years and debt service for new projects added. Projects built late in the 20-year planning period will continue to generate revenues for debt service for many years after 2025, the end of the 20-year planning period.

From an economic perspective, volume related charges are the most efficient means to finance new water supply development. Volume charge financing provides consumers and businesses the greatest degree of direct control over water-related costs. Such financing increases utility revenue stream variability but such variability could be reduced through the development of rate stabilization or reserve funds.

If volume charges are utilized to fund higher cost alternative water sources, the impact on rate-payers can be mitigated through existing and innovative rate structures and charges. High usage rate blocks can be set to reflect the full marginal cost of the next source of supply. If the rate change to implement this pricing is designed to exceed current revenue requirements, the additional revenue can be dedicated to new source development. Such pricing both encourages conservation and reduces the need for steeper increases in future rates. Additional conservation delays the need for new facilities and may reduce their required size.

The increased conservation in combination with collecting some construction revenues in advance of construction distributes price increases more evenly over time and smoothes out the "lumpy" nature of price increases inherent in common water-pricing practices. This allows customers to adjust water use practices and technology over time. If the change in rates were revenue neutral, additional conservation would still occur as the difference between average price and marginal price for larger water users increases. Indexing of prices is another means of distributing price increases over time.

There are a number of additional means available to mitigate the impact of higher cost sources to customers. Many of these are addressed in the American Water Works Association publications *Avoiding Rate Shock: Making the Case for Water Rates*, and *Thinking Outside the Bill: A Utility Manager's Guide to Assisting Low Income Water Customers*.

[1] Developers are typically required to supply on-site distribution lines and may be required to contribute to off-site infrastructure as well (in addition to impact fees).

Section 2. Water Management District

The District's Governing Board and eight Basin Boards provide significant financial assistance for conservation and alternative source projects through three cooperative funding programs: 1) the Basin Board's Cooperative Funding Program and Basin Initiatives, 2) the New Water Sources Initiative (NWSI), and 3) the Water Supply and Resource Development (WSRD) program. The financial assistance is provided primarily to governmental entities, but private entities are also eligible to participate in these programs. For example, financial assistance has been provided to private agricultural concerns such as Falkner Farms and Pacific Tomato Growers, both located in Manatee County, through the District's WSRD program. The funding assistance was provided for projects developed through the District's FARMS program to offset ground-water withdrawals for agricultural irrigation with excess surface water from the Flatford Swamp.

1.0 Cooperative Funding Program (CFP)

The CFP is a local matching grant program. The Basin Boards jointly participate with local governments and other entities in funding water management programs and projects of mutual benefit, including water supply and resource development projects and initiatives. The goal is to ensure proper development, use and protection of the regional water resources of the District. Projects are generally funded 50 percent by the Basin Boards with the local cooperators funding the remaining 50 percent. In 2004, the Basin Boards began to consider reduced funding matches for rural communities pursuant to the State's Rural Economic Development Initiative (REDI). For REDI-eligible projects, the Basin Boards have generally funded 75 percent of project costs, with the local governments funding the remaining 25 percent. With the passage of Senate Bill 444 in 2005, funding from the state's new Water Protection and Sustainability Program will significantly reduce the funding share of the Basin Boards and cooperators for certain projects. The CFP has been highly successful since its inception in 1988, with the Basin Boards providing cumulative project funding of approximately $333 million, which was matched by cooperators.

1.1 Basin Initiatives

The Basin Boards have an additional funding mechanism known as a Basin Initiative, which, in those cases where a project is of great importance or priority to a region, the Board can increase its percentage match or in some cases provide total funding for the project. Examples of Basin Initiatives include: 1) Quality of Water Improvement Program (QWIP); an initiative to plug deteriorated, free-flowing wells that waste water and cause inter-aquifer contamination, 2) the leak detection program; an initiative to conserve water by having District staff inspect and detect leaks in Public Water System pipelines, 3) data collection and analysis to support major District initiatives such as the minimum flows and levels program, and 4) various agricultural research projects designed to increase the water-use efficiency of agricultural operations.

2.0 New Water Sources Initiative (NWSI)

The NWSI was introduced in 1994 as a major funding mechanism for the development of regional water resource and supply projects, such as conservation, reclaimed water and storm water reuse, surface water and desalination. This program was created to assist in a "pay as you go," leveraged cooperative program in the development of sustainable, non-traditional and regional alternatives to ground-water use. NWSI projects are generally funded from the General Fund (25 percent), the appropriate Basin Boards (25 percent), and local cooperators (50 percent).

Since 1994, the General Fund has allocated $10 million per year for NWSI funding, with Basin Boards typically matching this annual allocation collectively, for approximately $20 million in combined NWSI funding per year. Each year, project proposals having regional water resource benefits are submitted to the District for NWSI funding consideration. Projects are selected based on recommendations by District staff and final approval by the District's Governing Board and Basin Boards. Since 1994, NWSI projects totaling $505 million have been completed or are in the process of being completed.

NWSI funding is fully committed to projects through 2007. It is anticipated that the Governing Board and Basin Boards will continue to generate collectively at least $20 million per year from 2008 through 2025 (Governing Board $10 million and Basin Boards $10 million).

Historically, the District's cooperative funding programs have required a cost share on an equal basis (50/50 cost share for eligible costs) with cooperators. However, as explained previously, funding from the state of Florida's Water Protection and Sustainability Program will significantly reduce the District's and cooperator's share of the funding for certain projects.

3.0 Water Supply and Resource Development (WSRD) Program

The District's WSRD program was established in 2000 to provide funding for projects of regional significance on a matching, flexible basis to complement the District's NWSI and Cooperative Funding programs. Through the annual budget, the Governing and Basin Boards have provided funds to develop alternative supplies and restore historic flows and levels. These funds are often matched on a variable basis by a partnering entity that benefits from the projects. Projects funded to date include reclaimed water, aquifer storage and recovery (ASR), agricultural conservation, and hydrologic restoration projects. Since 2000, WSRD projects totaling $337 million have been completed or are in the process of being completed.

It is anticipated that the Governing Board and Basin Boards will collectively contribute at least $40 million annually for this program from 2008 through 2025 (Governing Board $20 million and Basin Boards $20 million). This analysis assumes that 50 percent of the future WSRD budgets would be set aside for projects to be funded completely by the District. This is because certain projects such as the upper Peace River water resource development projects may not have local cooperators and may be funded entirely by the District. The remaining 50 percent would be matched on an equal cost basis.

Section 3. State Funding

1.0 State of Florida Water Protection and Sustainability Program

The new State of Florida Water Protection and Sustainability Program was created in the 2005 legislative session through Senate Bill 444. The program provides matching funds for the District Governing and Basin Boards' CFP, NWSI, and WSRD, for alternative water supply development assistance. For 2006, the first year of funding, the Legislature allocated $100 million for alternative water supply development assistance, with $25 million allocated for this District. The District was allocated $15 million for 2007. It is anticipated that the District may receive allocations of $15 million annually through 2015 for the program, subject to appropriation by the Legislature. Although future funding is anticipated, the legislation does not stipulate the program term**.** Program guidelines have been incorporated into Chapter 373, Florida Statutes, and include conditions on matching funding requirements, project selection, project benefits and project implementation. The following is a summary of some of the more pertinent criteria:

- Alternative Water Supplies projects eligible for funding are defined as projects that utilize salt water; brackish surface water and ground water; surface water captured predominately during wet-weather flows; sources made available through the addition of new storage capacity for surface or ground water; water that has been reclaimed after one or more public supply, municipal, industrial, commercial, or agricultural uses; the downstream augmentation of water bodies with reclaimed water; stormwater; and any other water supply source that is designated as non-traditional for a water supply Planning Region in the applicable regional water supply plan.

- Funding from the Program can only be used for the construction element of an eligible project.

- Applicants for project funding shall, at a minimum, be required to pay 60 percent of the project's construction costs. The State will provide up to 20 percent of construction costs with the Water Management Districts to provide an equal match. Water Management Districts and Basin Boards, may, at their discretion, use ad valorem or federal revenues to assist a project applicant in meeting the statutory funding match requirements.

- Governing boards' shall determine those projects that will be selected for financial assistance. The governing board may establish factors to determine project funding; however, significant weight will be given to the following factors:

  - provides environmental benefits by preventing or limiting water resource impacts.
  - reduces competition for water supplies.
  - replaces traditional sources in order to help implement a MFL or reservation.
  - implemented by a permittee that has achieved targets contained in a goal-based water conservation program.
  - quantity of water supplied as compared to its cost.
  - construction and delivery of reuse water is a major component.
  - implemented by a multi-jurisdictional water supply entity.
  - part of a plan to implement two or more alternative supply projects, which will produce water at a uniform rate for a multi-jurisdictional water supply entity.
  - the percent of project costs to be funded by the water supplier or water user.
  - includes sufficient preliminary planning/engineering to demonstrate that the project can be implemented within timeframes in the RWSP.
  - whether the project is a subsequent phase of a project that is underway.
  - whether and in what percentage a local government or local government utility is transferring water supply system revenues to the local government general fund in excess of reimbursements for services received from the general fund, including direct and indirect costs and legitimate payments in lieu of taxes.

- Following one or more meetings to solicit public input on eligible projects, the governing boards' shall select projects based upon the criteria set forth above.

The State funds will be applied toward the maximum 20 percent of the eligible projects' construction costs. In addition, the Legislature has established a goal for each Water Management District to annually contribute funding equal to 100 percent of the State funding for alternative water supply development assistance. The State's Water Protection and Sustainability Program, if continued by the

Legislature, could serve as a significant source of matching funds to assist in the development of alternative water supplies.

2.0 The Florida Forever Program

The Florida Forever Act (FFA), passed in 1999, is a $10 billion, 10-year, statewide program that will provide the District approximately $26.25 million per year for land acquisition, environmental restoration, and water resource development. At least 50 percent of these funds must be spent on land preservation over the life of the program. Of the Florida Forever funds currently allocated to water resource development ($130 million), the District has expended or committed $57.8 million ($44.4 million for land acquisition and $13.4 million for water body restoration.) The District intends to spend the remaining $72.2 million on land acquisition, primarily in support of water resource development. A "water resource development project" is defined as a project eligible for funding pursuant to Section 259.105 (Florida Forever) that increases the amount of water available to meet the needs of natural systems and the citizens of the State by enhancing or restoring aquifer recharge, facilitating the capture and storage of excess flows in surface waters, or promoting reuse (see Chapter 7). Implementation of eligible projects under Florida Forever includes land acquisition, land and water body restoration, ASR facilities, surface-water reservoirs and other capital improvements. An example of how the funds were used for water resource development was the purchase of lands around Lake Hancock within the Peace River watershed as the first step in meeting the minimum flow for the upper Peace River.

3.0 State Funding for the Facilitating Agricultural Resource Management Systems (FARMS) Program

During the 2002 legislative session, the District, in cooperation with the Florida Department of Agriculture and Consumer Services (FDACS), began pursuing state funds for the FARMS Program. This effort resulted in the District receiving state appropriations of $1.5 million in 2003 to address the resource goals associated with the Upper Myakka River and the Shell, Prairie and Joshua Creek watersheds. The District has since received additional state appropriations of $1 million for 2005, $1 million for 2006, and $500 thousand for 2007 to assist with the expansion of the FARMS Program throughout the SWUCA. In addition, the FDACS has provided project funding of $273,621 in 2003, $500,000 in 2004, and $50,380 in 2005. In 2003, the District executed the FARMS Operating Agreement with the FDACS. The agreement was subsequently amended in 2005. Under the current Operating Agreement, the District and FDACS have agreed to seek funding annually for a minimum of 10 years. This approach, coupled with the District's efforts to maintain other existing sources of state revenues, could add to the funds available for projects in the SWUCA.

Section 4. Federal Funding

In 1994, the District began an initiative to seek federal matching funds for water projects. Since that time, the Office of the Governor, the FDEP, other Water Management Districts and local government and regional water supply authority sponsors have joined with the District. Through a cooperative effort with members of Florida's Congressional Delegation, the Federal Initiative has grown substantially. In 1999, the effort was expanded to seek funding for the development of alternative source projects and in 2001, the State of Florida and the Water Management Districts expanded a list of projects in order to seek all available resources to develop an environmentally sustainable water supply strategy that would meet the demands of growth throughout the state. The projects include the use of alternative water supply technologies as well as stormwater retention and filtering and wastewater treatment. Each district certifies that the projects submitted for funding are regional in scope and that matching funds are available either from the District budget or from a local government sponsor.

To date a total of $95 million has been received by local cooperators. Federal matching funds from this initiative helped fund the construction of the C. W. Bill Young Regional Reservoir and will help fund the Tampa Bay Regional Reclaimed Water and Downstream Augmentation Project and the Peace River and Myakka River Watersheds Restoration Initiative. District staff considers funding for water supply projects to be a top priority and continues to work with the Office of the Governor, the FDEP and the members of the Florida Congressional Delegation to secure federal funding.

1.0 U.S. Department of Agriculture-Natural Resources Conservation Service (NRCS) Environmental Quality Incentive Program (EQIP)

The EQIP provides technical, educational, and financial assistance to eligible farmers and ranchers to address soil, water and related natural resource concerns on their lands. The program provides assistance to farmers and ranchers to comply with federal, State of Florida, and tribal environmental laws that encourage environmental enhancement. The purpose of the program is achieved through the implementation of a conservation plan, which includes structural, vegetative, and land management practices. The program is carried out primarily in priority areas that may be watersheds, regions and/or multi-state areas where significant resource concerns exist. Water supply and nutrient management through detention/retention or tail water recovery ponds can be pursued through this program.

The District's FARMS program cooperatively works with the NRCS EQIP program on both financial and technical levels. In this effort, FARMS staff has tried to coordinate dual cost-share projects whenever possible. By an agreement between the District, FDACS and the NRCS, the maximum funding for using both FARMS and EQIP is 75 percent of total project cost. To date, eight FARMS projects have involved some level of dual cost-share with EQIP, with several additional cooperative projects expected in the near future. On a technical level, agency interaction includes using the NRCS mobile irrigation lab to investigate using FARMS cost-share for improvements to the overall irrigation system efficiency, using NRCS engineering designs for regulatory agricultural exemptions whenever possible, and coordinating cost-share on specific project related infrastructure. As an example, FARMS may assist with an alternative source of irrigation water and EQIP assists with an upgrade to irrigation delivery system. The relationship is mutually beneficial, extends cost-share dollars, and provides more technical assistance to participants in both programs.

Section 5. Private Investment

Private investment is a potential source of funds to support water resource and water supply development in the District. A range of public/private ownership and investment options is available. These options range from all-public ownership and operation to all-private ownership and operation. Typically, in projects that depend heavily on the use of private investment, that investment is used to support initial capital costs. In these cases, funds to pay back the private capital investment and to support project operation and maintenance ultimately come from customer charge revenues. However, competition among private investors desiring to fund water supply development projects could act to reduce project costs, potentially resulting in lower customer charges.

Aside from investor-owned public supply utilities, private investment could take three distinct forms: 1) government-owned utilities, the District, or regional water supply authorities contracting with private entities to design, build or operate facilities with private funds; 2) self-supplied entities joining in cooperative institutions such as irrigation districts; and 3) private entities which could identify a customer base and become water supplier to one or more water use types.

1.0 Public-Private Utility Partnerships

The two major advantages of this type of arrangement are that the competition may reduce price and some of the risk may be shifted to the private investors. An example of this first type is the arrangement utilized by Tampa Bay Water to construct and operate a desalination plant. Private companies were asked to bid to provide 25 mgd of water through desalination. A primary consideration of the bid evaluation process was the rate that would be charged to the water supply authority for the water produced. The plant would be financed, built, owned and operated by the private company but would supply water to the authority. The competition among the bidders, combined with other factors, would result in the least expensive desalination water known to date. A number of factors, some of which were unrelated to the project, caused this arrangement to be altered and delivered water costs will be higher than originally proposed.

In spite of problems with individual projects, public-private partnerships are becoming more common because the water environment is becoming increasingly complex. Increasing numbers of regulated pollutants and new higher risk technologies drive privatization of some public water supply responsibilities. Partnerships work best where[2]:

- Risks are beyond public sector tolerance;
- A project is new and stand-alone;
- Construction and long-term operation are combined;
- There are clearly defined performance specifications; and
- There are clearly defined payment obligations.

Other government-owned utilities and the District could enter into such public-private arrangements. A significant issue is that small utilities may not have the resources or project sizes sufficient to attract private investment. This could, however, be remedied through multi-utility agreements or participation in a regional water supply authority. The additional benefit of cooperation in larger projects is the economies of scale common in the water supply industry.

2.0 Cooperatives and Special Districts

Just as a regional water supply authority is able to induce multiple private investors to bid on projects, it may be possible that community development districts could pursue the same type of strategy for more isolated areas. A community development district can be established under Chapter 190, F.S., for water supply purposes and may collect ad valorem taxes and charge fees for services (York, 1997). The taxes and fees could be used to initiate water supply development planning, request and evaluate bids, and then be used to pay back private investment.

Under the second type of arrangement, multiple self-supplied water users pool their resources to construct water facilities that they could not economically undertake on their own. Such private or public/private cooperative institutions are more common where water is not typically available at the user's site, such as in the western U.S. The most familiar forms are irrigation or water districts that use surface water as a source. Water is usually obtained from a supplier at a cost and then distributed among members by the district. Members cooperatively fund the construction of transmission and distribution facilities from the purchase point and pay for the purchased water. If ground-water sources

[2] Abstracted from: Kulakowski, Walter. "Private Partnerships: Pros and Cons." Presented to the Florida Section of the American Water Resources Association. July 29, 2005. Key West

become limited in a given area, and in particular if the ground water cannot be moved to where it is needed, the same type of economic forces that created irrigation and water districts in the west could develop in the District and the rest of Florida. Various forms of cooperative institutions in Florida, such as drainage districts and grower cooperatives, are addressed in a publication of the Office of Program Policy Analysis and Governmental Accountability (OPPAGA) of the Florida Legislature (OPPAGA, 1999).

3.0 Private Supply Investment (Aside from Investor-Owned Public Supply)

The third form is where investors identify an un-served customer base and develop water resource/supply facilities to meet those needs. It is this type of investment that many look to for the development of alternative water supplies. Such private investment will not likely occur unless regulatory measures to protect water resources and related environmental features limit further development of traditional, lower cost sources. Although the purpose of the regulatory measures is resource protection, they indirectly create a customer base for alternative source developers. The cost of the alternative sources developed and the extent of public participation and funding will determine the likely customers of such an enterprise.

Section 6. Summary of Funding Mechanisms

There are many potential institutions and sources of funding for water resource and water supply development. Because of their large and readily identifiable customer bases, public supply utilities and water supply authorities will likely have the least problems in securing funding. Funding mechanisms are already established for many District water supply and resource development projects. The most difficult challenge will be identifying cost-effective and economically efficient methods of meeting the needs of self-supplied users, which have a wide range of ability-to-pay for water, when their traditional, lower-cost sources of water are no longer readily available.

Part C. Projection of the Amount of Funding Anticipated to be Generated or Made Available in the Planning Region through State and District Funding Programs

Table 9-1 is a projection of the amount of funding that could be generated by the state and District funding programs within the Planning Region that were discussed above. An explanation of how the funding amounts were calculated follows the table.

- Cooperative Funding Program. If the Basin Boards in the Planning Region maintain their current levels of funding for the Cooperative Funding Program water supply and water resource development projects, it is estimated that an additional $171 million could be generated from 2007 through 2025. If cooperators match all of these funds, an additional $171million could be leveraged. If the Basin Boards elect to increase program funding for their other areas of responsibility (i.e., Flood Protection, Water Quality and Natural Systems), the funding projection could be significantly impacted.

- New Water Sources Initiative (NWSI). If the Governing and Basin Boards maintain their annual NWSI funding commitment of approximately $20 million per year through 2025, it is estimated that $18.4 million per year could be generated for the Planning Region from 2008 through 2025 for a total of $331 million. If cooperators match all of these funds, an additional $331 million could be leveraged.

Table 9-1. Projection of the Amount of Funding that could be Generated or Made Available by State and District Funding Programs within the Planning Region from 2007 through 2025.

Funding Projection	
Source	**Amount**
Basin Board Cooperative Funding Program.	$171 million
Funding generated assuming all of the Basin Board Cooperative Funding Program water supply funds are used for projects that would be matched by a partner on an equal cost share basis	$171 million
District NWSI funding	$331 million
Funding provided assuming all of the NWSI funds are used for projects that would be matched by a partner on an equal cost share basis	$331 million
District WSRD Program funding	$830 million
Funding provided assuming one half of the WSRD funds are used for projects that would be matched by a partner on an equal cost share basis.	$415 million
State of Florida, Water Protection & Sustainability Trust Fund (2007-2015)	$125 million
State of Florida, Florida Forever Trust Fund	$66 million
State of Florida Legislative Appropriations	TBD
State of Florida, Appropriations for FARMS	TBD
Federal Funds	TBD
Total	**$2.44 billion**

- Water Supply and Resource Development (WSRD) Program. If the Governing and Basin Boards maintain a funding commitment of $40 million per year through 2025, it is estimated that $36.8 million per year could be generated for the Planning Region from 2008 through 2025 for a total of $662 million. For 2007, the amount available is based on existing Governing Board and Basin Board project commitments totaling $33 million and existing Governing Board and Basin Board WSRD reserves of $135 million. At this level of funding, $830 million could be generated from 2007 through 2025. If local cooperators match half of these funds, an additional $415 million could be leveraged.

- Water Protection and Sustainability Trust Fund (WPSTF). Fifteen million in WPSTF dollars in second year funding was allocated to the District during the 2006 legislative session. Although the WPSTF program has been referenced as a ten-year funding program, the legislation does not specify a program term. If it is assumed that funding for the WPSTF continues through 2015 at $15 million per year, it is estimated that $13.8 million per year could be generated for the Planning Region from 2008 through 2015, for a total of $110.4 million. For 2007, $14.5 million has been allocated to the Planning Region. At this level of funding, an additional $125 million could be generated from 2007 through 2015 for alternative water supply development in the District.

- Florida Forever Trust Fund. The Governing Board has allocated one-half of the Florida Forever Funding ($13 million per year for a total of $130 million from 2001 through 2010) for water resource development. Of this amount, $58 million has been expended or encumbered for this purpose, leaving an estimated $72 million available from the Florida Forever Trust Fund for land acquisition in support of water resource development through 2010. If it is assumed that 92 percent of the funds will be allocated to the Planning Region, approximately $66 million will be available for land acquisition in support of water resource development in the Planning Region.

Table 9-1 shows that approximately $2.44 billion could potentially be generated or made available in the Planning Region to fund the water supply and water resource development projects necessary to meet the water supply demand through 2025 and restore minimum flows and levels for impacted water bodies. This figure is considered to be conservative since it is not possible to determine the amount of funding that will be allocated to the Planning Region from the Federal Government and state legislative appropriations.

Part D. Comparison of the Cost of Proposed Large-Scale Water Supply and Water Resource Development Projects to the Amount of Funding to be Generated or Made Available in the Planning Region through 2025.

As was explained previously, of the 409 mgd of new water supply that will need to be developed during the 2000-2025 planning period to meet demand for all users and to restore minimum flows and levels for impacted natural systems, it is estimated that at least half of that demand has either been met or will be met by projects that are under development as of December 2006. Projects under development are those the District is co-funding that have either been 1) completed since the year 2000 (the base year for the 2006 RWSP), 2) are in the planning, design, or construction phase, or 3) are not yet in the planning phase but have been at least partially funded through the 2006 fiscal year.

To develop an estimate of the capital cost of the portion of the demand that is not yet under development, the District compiled a list of large-scale water supply development projects that have been proposed by Tampa Bay Water, the Peace River/Manasota Regional Water Supply Authority, the City of Tampa, and Pasco, Hillsborough, and Polk Counties to meet the majority of the projected 2025 public water supply demand in the Planning Region. In addition, as shown in Chapter 7, water resource development projects have been proposed by the District to the meet the minimum flow for the upper Peace River through large-scale restoration of the watershed. These projects, their estimated costs, and quantity of water they will produce are listed in Table 9-2. The water supply produced from these projects, approximately 152 mgd, will meet the majority of the demand in the Planning Region that is not yet under development. It is estimated that the capital cost of these projects will be approximately $2.17 billion.

The $2.44 billion in financial resources that will be generated or made available in the Planning Region through 2025 (Table 9-1) will be sufficient to cover the $2.17 billion capital cost of the projects listed in Table 9-2. The remaining $270 million will be needed to cover the cost of smaller scale water supply projects and serve as a reserve for the development of projects to replace water supplies that may be reduced as the result of the establishment or revision of minimum flows and levels. The underlying assumption of these financial projections is that the Governing and Basin Boards will maintain their current millages and the state programs will continue at their current funding levels.

Table 9-2. Proposed Large-Scale Water Supply and Water Resource Development Projects in the Planning Region to be Completed or Under Development by 2025 (millions of $).

Project	Entity Responsible For Implementation	Quantities (mgd)	Capital Costs	Land Costs	Potentially Eligible Land Costs	Total Costs (Capital + Land)
Northern Tampa Bay Area						
Tampa Bay Regional Reclaimed Water	Hillsborough and Pasco Counties, City of Tampa	18	$223	-	-	$223
System Config II/III and System Interconnects	Tampa Bay Water	48	$579	$101	$82	$680
Total NTB		**66**	**$802**	**$101**	**$82**	**$903**
SWUCA						
Shell Creek Upper Myakka Cow Pen Slough Peace River Expansion Myakkahatchee Creek	PR/MRWSA	51	$412	$102	$77	$514
Regional Loop Transmission System	PR/MRWSA	N/A	$253	$10	-	$263
Kissimmee River	Polk County, SFWMD	35	$269	$8	$6	$277
Upper Peace River Restoration	SWFWMD	N/A	$75	$142	$138	$217
Total SWUCA		**86**	**$1,009**	**$262**	**$221**	**$1,271**
Total NTB and SWUCA		**152**	**$1,811**	**$363**	**$303**	**$2,174**

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