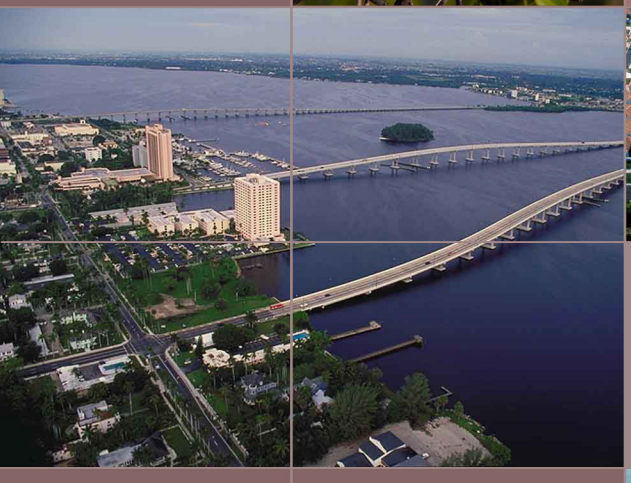
SOUTH FLORIDA WATER MANAGEMENT DISTRICT




LOWER WEST COAST
Water Supply Plan

2005-2006 UPDATE

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Acknowledgements

The South Florida Water Management District (SFWMD or District) would like to recognize and thank the Water Resources Advisory Commission (WRAC) Regional Water Supply Workshop participants for their contributions, comments, advice, information and assistance throughout the development of this *2005–2006 Lower West Coast Water Supply Plan Update*.

Furthermore, the SFWMD expresses appreciation to all District staff who contributed to the development and production of this plan update.

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Executive Summary

The South Florida Water Management District's (SFWMD or District) strategic goal for all of its water supply planning efforts is to ensure an adequate supply of water to protect natural systems and to meet all existing and projected reasonable-beneficial uses, while sustaining water resources for future generations.

This *2005–2006 Lower West Coast Water Supply Plan Update* (2005–2006 LWC Plan Update) supports the District's findings and recommendations in its *2000 Lower West Coast Water Supply Plan* (2000 LWC Plan), which suggest that most future water needs must be met through development of alternative water sources. Development of new traditional freshwater sources will limited by environmental protections, but some new freshwater development may still be practicable depending on local conditions and quantities needed. Considering the viability and availability of alternative supplies, and the constraints on development of traditional freshwater supplies, the focus of the 2005–2006 LWC Plan Update is on alternative water sources and projects.

The Lower West Coast (LWC) Planning Area has long been a leader in alternative water supply development. Alternative water sources include reclaimed water, surface water captured during wet-weather flows, aquifer storage and recovery, surface reservoirs, and brackish surface water and groundwater. Currently, brackish water sources provide about 40 percent of the area's public potable water supply, and reclaimed water use stands at over 90 percent of the wastewater flow for the area.

As part of the 2005–2006 LWC Plan Update development, the District solicited projects from local suppliers and a total of 153 water supply projects were evaluated. Fourteen traditional supply projects were evaluated, including 11 submitted by local utilities and three projects developed by the District to support an unmet future need by small local utilities. In total, if all of these traditional supply projects were permittable and developed as proposed, they represent about 25 million gallons per day (MGD) in new supply capacity.

During this process, 117 alternative water supply projects were also evaluated. The alternative sources these projects propose to use include the following:

BRACKISH WATER / 41 projects yielding a potential 231 MGD (finished water).

RECLAIMED WATER / 55 projects with a total constructed capacity of 307 MGD.

AQUIFER STORAGE AND RECOVERY (ASR) / 13 projects with a total dry-season capacity of 32 MGD.

SURFACE WATER / 8 projects with a total design capacity of 42 MGD.

In addition to listing proposed alternative water supply projects, this plan update provides regional project implementation strategies to planners, policy makers and utility directors. All local governments within the LWC Planning Area are required to prepare 10-Year Water Supply Facilities Work Plans that identify water supply projects, and adopt revisions to their comprehensive plans within 18 months following the approval of this water supply plan update.

The Water Protection and Sustainability Program provides annual state revenues matched with District funds to support alternative water supply development. This combination of state and District funds is available each year through the District's Alternative Water Supply Funding Program for projects that are ready to be constructed. Eligible projects can receive up to 40 percent of the construction costs for work that can be completed within the funding period (October 1 through August 1). Funding proposals are solicited in the spring of each year.

To be eligible for cost-share funding, the specific alternative water supply projects must be identified in the appropriate water supply plan. While inclusion in this 2005–2006 LWC Plan Update enables projects planned for the LWC Planning Area to be eligible to apply for funding assistance from the District's Alternative Water Supply Funding Program, a project's inclusion in this plan does not serve as an application for funding, nor does it guarantee funding. To apply for alternative water supply funding or for more information, see the SFWMD's Web site at: http://www.sfwmd.gov/watersupply.

Encompassing more than 5,100 square miles, the LWC Planning Area generally reflects the drainage patterns of the Caloosahatchee River Basin and the Big Cypress Swamp. The LWC Planning Area includes all of Lee County, most of Collier and Hendry counties, and portions of Glades, Charlotte and mainland Monroe counties. The Big Cypress Basin, which comprises all of Collier County and part of Monroe County, is also located within the planning area.

The LWC Planning Area's population is expected to increase from 908,500 in 2005 to about 1.6 million by 2025 (U.S. Bureau of the Census 2001). Most of the growth is projected to occur in Collier and Lee counties where population increases of 67 percent and 91 percent, respectively, are projected. Urban water demand (municipal, domestic self-supply, recreational and commercial) in the planning area will increase by 113 MGD in association with the population increase. Water demand associated with new power generation facilities proposed for the planning area will increase by 67 MGD in the next 20 years. By 2025,

agricultural acreage under cultivation in the LWC Planning Area is projected to increase by 13,400 acres, in part reflecting a shift in agricultural operations from Lee and Collier counties to Glades and Hendry counties, and requiring an additional 17 MGD in supply.

Traditional water sources for urban and agricultural use in the LWC Planning Area have included supplies from surface water, primarily the Caloosahatchee River (C-43 Canal), and three major aquifer systems: the Surficial Aquifer System, the Intermediate Aquifer System and the Floridan Aquifer System. The Surficial and Intermediate aquifer systems typically contain fresh water, while the Floridan Aquifer in the planning area contains brackish water.

Multiple factors, including water quality deterioration, interference with other existing users and protection of wetlands, continue to limit development of additional fresh groundwater supplies. New supplies from the Caloosahatchee River may be limited by efforts to protect Lake Okeechobee from high water levels and concerns for the integrity of the Herbert Hoover Dike. Alternatives to development of additional traditional freshwater sources to meet increased water needs include development of brackish groundwater in the Lower Hawthorn Aquifer; expansion of the reclaimed distribution and supply system; the capture of seasonally available surface water; and, improved storage opportunities for surface and reclaimed water.

The 2005–2006 LWC Plan Update is organized into seven chapters and nine appendices. The following briefly summarizes the focus of each chapter:

Chapter 1 – Introduction explains the purpose of the water supply plan document, provides an overview of the planning process, and summarizes the SFWMD's accomplishments since publication of the 2000 LWC Plan. New legislation as it relates to the responsibility of each of Florida's five water management districts, as well as the statutory requirements of local governments and water users, are also briefly reviewed.

Chapter 2 – Demand Estimates and Projections provides an updated overview of population and water use trends, by use category, for the LWC Planning Area through the Year 2025. Water use definitions, new calculation methods and estimation models are also discussed.

Chapter 3 – Resource Analysis identifies the region's water sources, summarizes the studies and analyses supporting this 2005–2006 LWC Plan Update, and discusses the tools in place that are used to protect water resources under state law.

Chapter 4 – Issues identifies resource issues in the LWC Planning Area, including limitations on development of new traditional freshwater supplies, coastal water quality issues associated with urbanization and storm water, and the

need to develop additional storage opportunities to enable the capture and beneficial use of seasonally available water resources.

Chapter 5 – Evaluation of Water Source Options reviews traditional sources, alternative water sources and storage options suitable for future use and further supply development. Comparative costs for supply development are provided.

Chapter 6 – Water Resource Development Projects discusses the SFWMD's projects that support the Water Supply Development projects (in Chapter 7) for the LWC Planning Area and the District's other planning areas. Water Resource Development projects are generally the responsibility of a water management district, and are intended to assure the availability of an adequate supply of water.

Chapter 7 – Water Supply Development Projects summarizes the projects anticipated to meet the LWC Planning Area's water supply needs for the next 20 years. Local governments, government-owned and privately owned utilities, regional water supply authorities, multijurisdictional water supply entities, self-suppliers, and other water users are primarily responsible for Water Supply Development projects. The primary focus is on alternative water supply projects, which become eligible for state and District funding as a result of inclusion in this water supply plan update.

The continued high rate of population growth in the LWC Planning Area, through the Year 2025, will require the region's increased commitment to water conservation and alternative water supply development. Comparison of population projections with the projects listed in this plan update indicates that existing and proposed new supplies are adequate to meet the projected future needs. The SFWMD will maintain efforts to assess water resources, coordinate critical resource protection strategies and projects, and restore vital environmental systems throughout the LWC Planning Area and south Florida.

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Acronyms and Abbreviations

ADF	average daily flow
AFSIRS	Agricultural Field Scale Irrigation Requirements Simulation
ASR	aquifer storage and recovery
AWS	alternative water supply
BEBR	Bureau of Economic and Business Research
BMP	best management practice
BOR	Basis of Review
C&SF Project	Central and Southern Florida Flood Control Project
CERP	Comprehensive Everglades Restoration Plan
cfs	cubic feet per second
Ch.	Chapter (generally used to refer to a legal document)
CUP	consumptive use permitting
District	South Florida Water Management District
DSS	domestic self-supply
EAA	Everglades Agricultural Area
EAR	Evaluation and Appraisal Report
EDR	electrodialysis reversal
ERP	environmental resource permitting
ET	evapotranspiration
F.A.C.	Florida Administrative Code
FAS	Floridan Aquifer System
FDACS	Florida Department of Agriculture and Consumer Services
FDCA	Florida Department of Community Affairs
FDEP	Florida Department of Environmental Protection
FPL	Florida Power & Light
F.S.	Florida Statutes
FY	fiscal year
GIS	geographic information system
GPD or gpd	gallons per day

IAS	Intermediate Aquifer System
LEC	Lower East Coast
LEC Plan	Lower East Coast Water Supply Plan
LOER	Lake Okeechobee & Estuary Recovery
LOPP	Lake Okeechobee Protection Program
LOWP	Lake Okeechobee Watershed Project
LWC	Lower West Coast
LWC Plan	Lower West Coast Water Supply Plan
MDL	maximum developable limit
MFL	minimum flow and level
MGD or mgd	million gallons per day
mg/L	milligrams per liter
MGY or mgy	million gallons per year
MIL	mobile irrigation laboratory
MODFLOW	MODular 3-dimensional finite-difference groundwater FLOW model
NAVD	North American Vertical Datum
NRCS	Natural Resources Conservation Service
ppm	parts per million
ppt	parts per thousand
PWS	public water supply
RIDS	regional irrigation distribution system
RO	reverse osmosis
SAS	Surficial Aquifer System
SAV	Submerged Aquatic Vegetation
SFWMD	South Florida Water Management District
SFWMM	South Florida Water Management Model
STA	stormwater treatment area
SWFFS	Southwest Florida Feasibility Study
SWFWMD	Southwest Florida Water Management District
TAZ	traffic analysis zone
TDS	total dissolved solids
TMDL	total maximum daily load
U.S.	United States
USACE	United States Army Corps of Engineers

USDA	United States Department of Agriculture
USDA-NRCS	United States Department of Agriculture - Natural Resources Conservation Service
USGS	United States Geological Survey
WaterSIP	Water Savings Incentive Program
WCA	water conservation area
WPA	water preserve area
WRAC	Water Resources Advisory Commission
WWTP	wastewater treatment plant

1
Introduction

In the Lower West Coast (LWC) Planning Area, the population is projected to increase by 74 percent from Year 2005 to about 1.6 million by Year 2025. Traditional fresh groundwater and surface water supplies were shown more than a decade ago to be inadequate to meet much of the projected new demand for the region, and this has resulted in extensive development of alternative water sources. Meeting the updated water supply and demand projections for the current 20-year planning horizon will require a continued focus primarily on nontraditional water supply solutions. This *2005–2006 Lower West Coast Water Supply Plan Update* (2005–2006 LWC Plan Update) supports the *2000 Lower West Coast Water Supply Plan*'s (2000 LWC Plan) findings and recommendations, which call for development of alternative water sources to meet most of the region's new water supply needs.

Working closely with the South Florida Water Management District (SFWMD or District), local governments and water suppliers play a key role in identifying the water supply projects that have been or will be incorporated into their local comprehensive plans. This 2005–2006 LWC Plan Update describes and meets current statutory requirements, including a listing of proposed alternative water supply projects and regional project implementation strategies for planners, policy makers and utility directors.

PURPOSE

This 2005–2006 LWC Plan Update addresses the anticipated water supply needs of the LWC Planning Area for the next 20 years and how those needs will be met. Although some traditional supply development may be possible given appropriate local conditions, the majority of new water needs will be met through the development and funding of alternative water supplies. In addition, this 2005–2006 LWC Plan Update contains a list of alternative water supply projects for Fiscal Years 2006–2025. The alternative

NAVIGATE

The 2005–2006 LWC Plan Update consists of this Planning Document and Appendices. In addition, the accompanying CD contains electronic versions of this update package, as well as the *Consolidated Water Supply Plan Support Document*, supporting studies, documentation, data and the previous 2000 LWC Plan. This material is also available from the District's Water Supply Plan Web site: http://www.sfwmd.gov/watersupply.

water supply projects listed in this plan update are eligible for cost-sharing consideration through a separate annual funding process that is established by the SFWMD Governing Board consistent with statutory requirements.

Florida Water Law

LAW / CODE

Section 373.0361(1), Florida Statutes (F.S.) provides:

The governing board of each water management district shall conduct water supply planning for any water supply planning region within the district identified in the appropriate district water supply plan under Section 373.036, where it determines that existing sources of water are not adequate to supply water for all existing and future reasonable-beneficial uses and to sustain the water resources and related natural systems for the planning period.

The legal authority and requirements for water supply planning are included in Chapters 373, 403 and 187 of the Florida Statutes. During the State of Florida's 2005 legislative session, lawmakers revised state water law and created the Water Protection and Sustainability Program. The alternative water supply portion of this program is intended to reduce competition between users and natural systems for available water by encouraging the development of alternative water supplies. Chapter 4 of the *Consolidated Water Supply Plan Support Document* (SFWMD 2005–2006) further describes the Water Protection and Sustainability Program.

The new statutory provision strengthens the link between regional water supply plans and the potable water provisions contained within each local government's comprehensive plan. This portion of the law is designed to ensure that adequate potable water facilities are constructed and concurrently available with new development. All local governments within the LWC Planning Area are required to prepare 10-Year Water Supply Facilities Work Plans that identify water supply projects, and adopt revisions to comprehensive plans within 18 months following the approval of this water supply plan update.

Strengthening the Link between Regional Water Supply Planning and Local Government Comprehensive Planning

The Water Protection and Sustainability Program provides annual state revenues and matching District funds to support alternative water supply development, such as construction of

desalination, reclaimed water and new storage facilities. This combination of state and District funds is specifically for cost-sharing alternative water supply project construction costs. The program also adds permitting incentives for water providers selecting projects recommended by the water supply plans.

Regional Water Supply Plans

DISTRICT

Role of the South Florida Water Management District

The South Florida Water Management District (SFWMD or District) performs water supply planning for each region within its jurisdiction. The District's mission is to manage and protect water resources of the region by balancing and improving water quality, flood control, natural systems and water supply. The agency serves local governments by supporting efforts to safeguard existing natural resources and meet future water demands.

The SFWMD prepares water supply plans for each of its four planning areas to effectively support planning initiatives and address local issues. The regional water supply plans encompass a minimum 20-year future planning horizon and are updated every five years. Each regional water supply plan update provides revised water demand estimates and projections; an evaluation of existing regional water resources; identification of water supply-related issues; a discussion of present water source options; water resource and water supply development components including funding strategies; and, recommendations for meeting projected demands for the region. In addition, the 2005–2006 LWC Plan Update includes a discussion of minimum flows and levels (MFLs) established within the planning area; MFL recovery and prevention strategies where appropriate; water reservations adopted by rule; technical data; and, support information.

PLAN GOAL AND OBJECTIVES

The SFWMD's strategic goal for all of its water supply planning efforts is to ensure an adequate supply of water to protect natural systems and to meet all existing and projected reasonable-beneficial uses, while sustaining water resources for future generations. Additionally, the goal of the 2005–2006 LWC Plan Update is to identify sufficient sources of water to meet the needs of all reasonable-beneficial uses within the LWC Planning Area (**Figure 1**) for the Year 2025 during a 1-in-10 year drought event, while sustaining the region's water resources and related natural systems.

2005–2006 Lower West Coast Plan Objectives

The SFWMD established the Water Resources Advisory Commission (WRAC) to serve as an advisory body to the Governing Board. The WRAC is the primary forum for conducting workshops, presenting information and receiving public

input on water resource issues affecting south Florida. Commission members represent environmental, urban and agricultural interests from all four of the District's water supply planning areas.

The SFWMD held Water Supply Plan WRAC Issue Workshops throughout the water supply planning process. Stakeholders representing a cross-section of interests in the region—agricultural, industrial, environmental protection, utilities, local government planning departments, and state and federal agencies—attended the workshops. During the workshops, participants reviewed and provided comments for projected demands compiled by District staff. Individual meetings were held with local government planning departments and utilities, as well as agricultural industry representatives to discuss water demand projections and coordinate planning processes.

At regional WRAC Issue Workshops, stakeholders developed the following six objectives for this plan update, which provide an overall framework for the planning process. The objectives were modified from those developed for the 2000 LWC Plan.

WATER SUPPLY / Identify sufficient sources of water to meet reasonable-beneficial consumptive uses projected through 2025 under a 1-in-10 year drought event.

NATURAL SYSTEMS / Protect and enhance wetland systems and the water resources from harm due to water use, including drawdowns and harmful movement of saline water.

ESTUARINE AND RIVERINE SYSTEMS / Protect and enhance the estuarine and riverine systems through effective water deliveries and management of the water resources.

CONSERVATION AND ALTERNATIVE SOURCE DEVELOPMENT / Encourage conservation measures to improve the efficiency of water use, and support and promote the development of alternative sources.

LINKAGE WITH LOCAL GOVERNMENTS / Provide linkage between the LWC Plan Update and local government comprehensive plans.

COMPATIBILITY AND LINKAGE WITH OTHER PLANNING EFFORTS / Achieve compatibility with other related planning activities within the region.

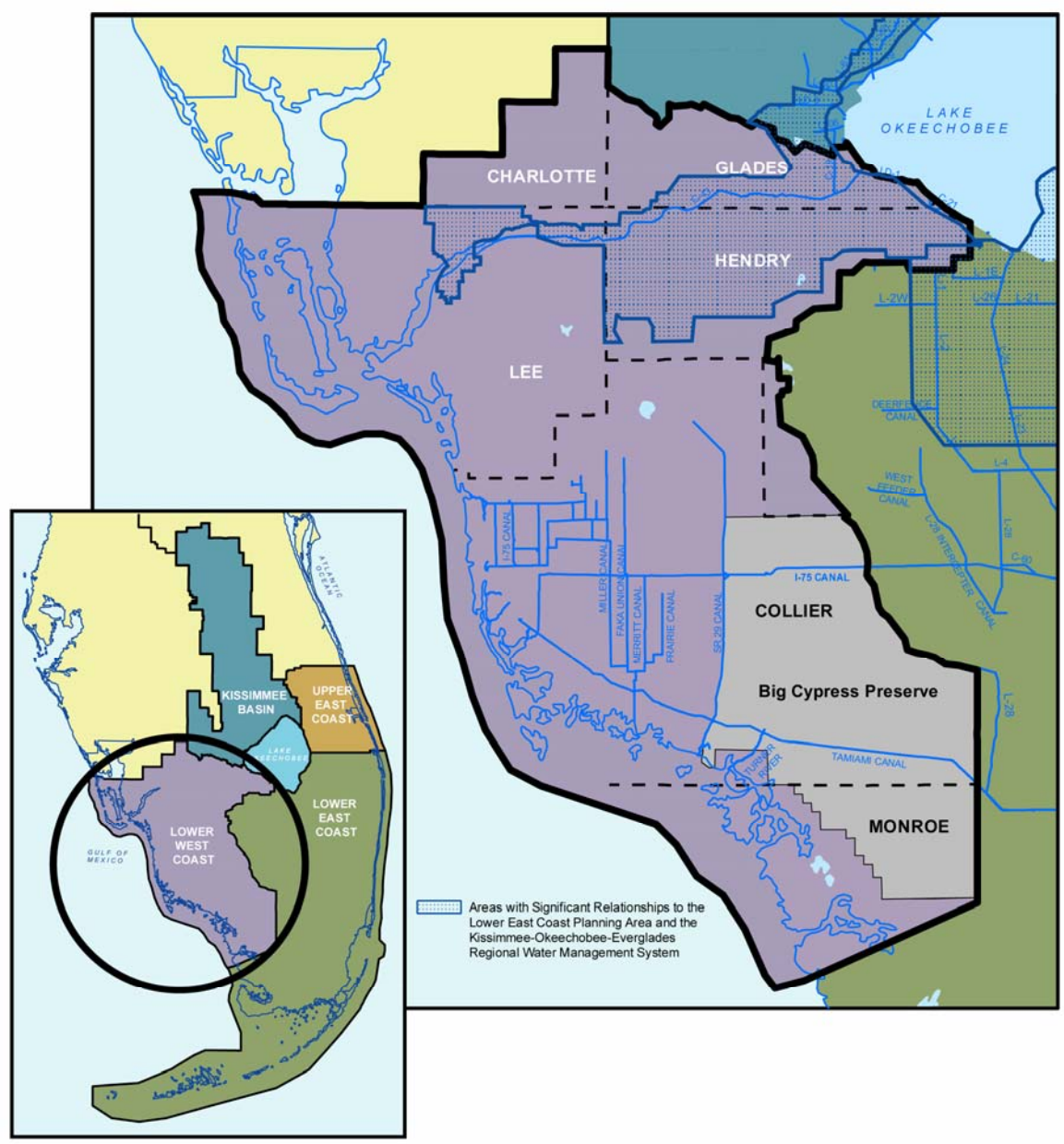


Figure 1. Lower West Coast Water Supply Planning Area.

Characteristics of the Lower West Coast Planning Area

- LWC Planning Area covers approximately 5,129 square miles.
- Includes all of Lee County, most of Collier and Hendry counties, and portions of Glades, Charlotte and mainland Monroe counties.
- Also includes the Big Cypress Basin, one of two administrative units in the SFWMD with its own board of directors. In the LWC Planning Area, the Big Cypress Basin encompasses all of Collier County and part of Monroe County.

- The LWC Planning Area generally reflects the drainage patterns of the Caloosahatchee River Basin and the Big Cypress Swamp.
- Population is expected to increase from 908,500 in 2005 to about 1.6 million by 2025 (U.S. Bureau of the Census 2001).
- Increased population, and industrial and agricultural operations will result in an increase of about 197 million gallons per day (MGD) in water demand during the next 20 years, most of which will come from an alternate source.
- Agricultural acreage is projected to increase by 13,400 acres from 2005 to 2025. Overall, agricultural water use is projected to increase by about 17 MGD.
- Traditional water sources include fresh groundwater from the Surficial Aquifer System (SAS) and Intermediate Aquifer System (IAS) and surface water, primarily from the Caloosahatchee River.
- The LWC Planning Area has long been a leader in alternative water supply projects. Currently, brackish water sources provide about 40 percent of the area's public potable water supply, and reclaimed water use (reuse) is over 90 percent of the wastewater flow for the area.
- Alternative water sources include reclaimed water, surface water captured during wet-weather flows, aquifer storage and recovery (ASR) and surface reservoirs, and brackish surface water and groundwater.

PLANNING PROCESS

1

Planning and Assessment

The process for development of the 2005–2006 LWC Plan Update incorporated extensive public participation, including nine public workshops, as well as coordination with local governments, adjoining water management districts, and other state and federal agencies. A review of previous planning efforts in the region and documentation of activities since the approval of the 2000 LWC Plan were a key starting point of this process. Planning efforts integrated development of Year 2025 demand projections, assessment of existing and projected resource conditions, and formulation of strategies to meet urban, agricultural and environmental water needs.

2

Data Collection, Analysis and Issue Identification

Using the 2000 LWC Plan as a foundation, this water supply plan update involved collecting the latest information about water resources, rainfall, natural resources, water demands, water conservation and land use. Analyses, such as groundwater and surface water evaluations, regulatory information, mapping, wetland studies and other related data, confirmed the validity to previously identified issues and helped identify new issues that may have emerged.

3

Evaluation of Water Source Options

The next phase of the planning process consisted of modifying existing solutions or developing new solutions to address the identified issues. In areas where projected demands exceeded available supplies, solutions included use of alternative water supplies and water conservation. Each water source option was evaluated, and local and regional responsibilities were identified.

4

Water Supply Development

In order to expedite the Water Protection and Sustainability Program as directed by the legislation in 2005, the District requested water users and suppliers to complete project questionnaires identifying water supply projects intended to meet water needs for the next 20 years. This project information was compiled and evaluated by the District, with input from stakeholders, and was used to create **Chapter 7**: Water Supply Development Projects, which evaluates existing and proposed supplies relative to projected future water demand.

ACCOMPLISHMENTS

In preparing the 2000 LWC Plan, the planning process analyses identified key regional issues. These included surface water availability; limits on expanding the Surficial Aquifer System (SAS) and Intermediate Aquifer System (IAS); the water quality of the Floridan Aquifer System (FAS); discharges from Lake Okeechobee to the Caloosahatchee Estuary; and, saltwater intrusion vulnerability in coastal areas.

To resolve these issues, the 2000 LWC Plan contained 29 recommendations that were organized into the following eight water resource development categories:

- Conservation.
- Groundwater Resources.
- Reclaimed Water.
- Regional Irrigation Distribution System.
- Seawater.
- Storage.
- Surface Water.
- Related Implementation Strategies.

Development of each of these water source options required regional, as well as local involvement, which the 2000 LWC Plan discussed. Accomplishments and activities in each of these eight categories are discussed in the following sections.

Of 29 specific project recommendations in the eight categories listed in the 2000 LWC Plan, 27 were initiated during the plan's implementation, while two recommendations were not implemented. One program that would have provided the District with access to conduct aquifer and water quality testing during drilling of new municipal production wells was not implemented due to liability issues, and the other recommendation (Well Abandonment Program) was replaced with a regulatory program.

The Five-Year Water Resource Development Work Program, contained in the SFWMD's annual *South Florida Environmental Report, Volume II*, annually summarizes the progress of these recommendations. **Appendix C** tracks all the projects as originally detailed in the 2000 LWC Plan.

Conservation

A Mobile Irrigation Staff Member Teaches Water Conservation to Students

The 2000 LWC Plan identified the need to develop a Comprehensive Water Conservation Program, support existing mobile irrigation laboratories (MILs) and establish additional MIL labs. Coupled with city and county ordinances, the SFWMD adopted year-round conservation measures for landscape irrigation (Rule 40E-24), which became effective in 2003. In addition, the Districtwide campaign regarding landscape irrigation (the "Three-Day-A-Week Watering Plan") was completed in Fiscal Year 2004. There are five MILs in the LWC Planning Area: one agricultural and four urban. The agricultural MIL and two of the urban MILs are funded by the SFWMD. The potential water savings from the three District-funded LWC MILs for the past five years was 0.9 MGD (900,000 gallons per day), with a typical urban MIL performing about 140 evaluations per year. The estimated savings assume that each participant fully implements all of the MIL recommendations.

Another District program, the Water Savings Incentive Program (WaterSIP), funded noncapital cost projects for utilities and property owner associations, and participated in 50-50 cost-sharing for projects. The projects included indoor plumbing retrofits, showerhead and toilet replacements, and outdoor irrigation retrofits, such as rain sensors. Between 2000 and 2004, an estimated 147,000 gallons per day (GPD) of water was saved through the WaterSIP in the LWC Planning Area at a cost of $160,000 to the District.

The conservation effort has been strongly supported by local governments and represents a major accomplishment of the 2000 LWC Plan.

Groundwater Resources

The 2000 LWC Plan addressed the SAS, IAS and FAS in the LWC Planning Area for monitoring, rulemaking and modeling. Groundwater level and water quality monitoring was expanded between 2000 and 2005. Ongoing monitoring efforts continued in the SAS and IAS, and an additional 23 recorders were installed on SAS wells in Hendry County to evaluate local water level trends. The FAS network was expanded to 12 sites within the LWC Planning Area.

Continuous water-level recorders have been installed at these sites, and periodic water quality assessments are available.

In addition, the District and U.S. Geological Survey (USGS) cost-shared two investigations of the extent of saltwater intrusion in portions of the LWC Planning Area. **Chapter 4** summarizes the findings of these studies under the heading, "Multiple Issues Limit New Traditional Supplies."

Surface and groundwater models for this region are being implemented. Two hydrologic subregional models, the Surficial Aquifer System Model and Floridan Aquifer System Model, have been calibrated and will undergo independent scientific peer review in 2006 before becoming available for use by District staff or stakeholders.

Reclaimed Water and Regional Irrigation Distribution System

The 2000 LWC Plan recommended reclaimed water systems be connected to form a regional irrigation distribution system (RIDS), which led to a District-sponsored feasibility study. The LWC Planning Area continues to be a leader in the state, with 21 of 22 wastewater facilities producing or distributing reclaimed water. In 2004, the LWC Planning Area reused 93 percent of treated wastewater, or 72 MGD.

Construction of Regional Reclaimed Water Treatment Facility

The RIDS Feasibility Study evaluated the potential development of regional irrigation water distribution systems and other options to meet the growing urban irrigation demands of the LWC Planning Area. Accordingly, the objective of the study was to develop preliminary design information for an interconnected irrigation system that would maximize the use of nonpotable water to meet all or a portion of the projected Year 2020 urban irrigation demand.

The RIDS Project included three phases: Phase 1, Feasibility Analysis (completed in 2002); Phase 2, Subregional Analyses (completed in 2004); and, Phase 3, Implementation (which began in 2004). Implementation is being conducted by individual utilities with financial support provided through the District's Alternative Water Supply Grant Program.

The RIDS study area was divided into three subregions, and an inventory of potential alternative sources of supply was identified and prioritized. These preferred projects included reclaimed water/ASR (contingent upon regulatory considerations), surface water/ASR (contingent upon regulatory considerations) and other systems. Of the 32 identified projects, 28 involved aquifer storage and recovery (ASR) and four involved interconnects. It was estimated that these projects could provide up to 221 MGD of urban irrigation water by 2020 at an estimated total capital cost of $208 million.

Seawater

The 2000 LWC Plan identified the option of using seawater from the Gulf of Mexico as a raw water source. The plan concluded that seawater is a potential future supply source, but in 2000, was not cost-effective.

However, the District and Florida Power & Light (FPL) jointly funded a feasibility study to investigate the potential of co-locating a water treatment plant with an electric generating station using saline water for cooling purposes. The study assumed reverse osmosis (RO) as the treatment technology and identified two FPL plants, one in Fort Myers and another in Fort Lauderdale, as having the best potential for development of a water treatment plant. The Seawater Desalination Study is currently being updated.

Storage

Recommendations in the 2000 LWC Plan recognized three types of potential storage options and the goals associated with each option: aquifer storage and recovery (ASR), regional and local retention projects, and reservoirs.

Aquifer storage and recovery is the underground storage of injected water into an acceptable aquifer during times when water is available and the subsequent recovery of this water during high-demand periods. The District continued to work with other government agencies on water quality requirements and rulemaking to address the use of the FAS for ASR and water use. Of the 28 existing ASR wells in the SFWMD, 14 are located in the LWC Planning Area, including six operational ASR wells, seven wells in operational testing and one inactive ASR well.

Regional and local retention projects increase water availability and evaluate injection of surface water and other sources for saltwater intrusion barriers. The Big Cypress Basin, which encompasses all of Collier County and part of Monroe County, completed four retention projects, creating 365 acre-feet of additional annual retention volume.

Surface Water

Recommendations in the 2000 LWC Plan included projects to use surface water as a supply source. These projects include the Caloosahatchee River (C-43) Basin ASR Pilot Project, the C-43 (Caloosahatchee River) West Reservoir Project, the Southwest Florida Feasibility Study (SWFFS), and the establishment of minimum flows and levels (MFLs) for the Caloosahatchee River and Estuary. The Caloosahatchee River Basin ASR Pilot Project is a component of the Comprehensive Everglades Restoration Plan (CERP). The C-43 (Caloosahatchee River) West Reservoir Project is one of the District's Acceler8 projects. Acceler8 is a program to build high-priority CERP projects.

Caloosahatchee River/C-43 Canal

The Caloosahatchee River ASR Pilot Project was designed to address the technical and regulatory uncertainties regarding regional implementation of ASR projects. The C-43 West Reservoir Project is a component of a larger restoration project for the Caloosahatchee River and Estuary that will capture water from the Caloosahatchee River (C-43) during high-flow times for storage and dry-season use. A location has been acquired in Hendry County to construct a reservoir for 170,000 acre-feet of storage, which is approximately the equivalent of 79,000 Olympic-sized swimming pools—averaging 20 feet deep. Construction of test cells was completed in 2006. Full construction activities are scheduled to begin in the summer of 2007 and slated to finish late in 2010.

A LOCATION HAS BEEN ACQUIRED IN HENDRY COUNTY TO CONSTRUCT A RESERVOIR FOR 170,000 ACRE-FEET OF STORAGE, WHICH IS APPROXIMATELY THE EQUIVALENT OF 79,000 OLYMPIC-SIZED SWIMMING POOLS—AVERAGING 20 FEET DEEP.

The U.S. Army Corps of Engineers (USACE) and the SFWMD are conducting the SWFFS, which will develop a water resources plan for the entire southwest Florida area. The study will also provide for ecosystem and marine/estuary restoration and protection, environmental quality, flood protection, water supply and other water-related purposes. It is anticipated that this study will be completed by 2008.

Related Implementation Strategies

Related implementation strategies include recommended rulemaking and regulatory efforts that applied to several of the future source options from the 2000 LWC Plan, or those that could not be associated with a specific source option.

Consumptive use permitting rules were revised regarding the 1-in-10 year level of certainty, resource protection criteria, water shortage triggers, saltwater intrusion, special designations and permit duration. The rules were revised and approved in 2002 and 2003 and the District's *Basis of Review for Water Use Permit Applications* was revised in 2003 (SFWMD 2003), which requires that withdrawals of water must not cause adverse impacts to environmental features that are sensitive to magnitude, seasonal timing and duration of inundation.

The SFWMD established a MFL for the Caloosahatchee River and Estuary in 2000. This rule established a minimum flow of 300 cubic feet per second (cfs) at the Franklin Lock and Dam, or S-79 Structure, on the Caloosahatchee River in order to protect downstream submerged aquatic vegetation communities from significant harm. The MFL Rule recognized that the minimum flow could not be consistently met and identified specific CERP projects as a recovery plan. An update of the Caloosahatchee River and Estuary MFL was initiated in 2003. Minimum flows and levels are further discussed in **Chapter 3**.

In 2001, MFLs were also established for three aquifers in the LWC Planning Area, including the Lower Tamiami, Sandstone and Mid-Hawthorn aquifers. The established MFLs for each were the structural top of the aquifers. In addition, maximum developable limits (MDLs) were established 20 feet above the top of these confined aquifers to ensure that water levels do not reach the MFLs.

WATER SUPPLY PLANNING FOR THE NEXT 20 YEARS

To determine the water supply needs of the LWC Planning Area for the next 20 years, establishing baseline and projected water use information is part of the planning process. **Chapter 2** presents the demand estimates and projections by water use category.

Urban Development in the LWC

In the Lower West Coast (LWC) Planning Area, the population is projected to increase by 74 percent from Year 2005 to about 1.6 million by Year 2025.

…Meeting the updated water supply and demand projections for the current 20-year planning horizon will require a continued focus primarily on nontraditional water supply solutions. This 2005–2006 LWC Plan Update calls for development of alternative water sources to meet most of the region's new water supply needs.

2

Demand Estimates and Projections

Water demands in this chapter are first considered in terms of the demands of the water users or customers. This is the water that directly meets the needs of the users. Additional data in **Chapter 7** and **Appendix D** present the water withdrawal demands (demands on the water resources) needed to meet these user and customer demands. The water withdrawal demands reflect the proposed selections of sources, treatment processes, storage options and reuse of reclaimed water that result from the projects identified in **Chapter 7**. The water withdrawal demands in **Appendix D** are also presented in this chapter.

The planning period for this update of the Lower West Coast (LWC) Plan is 2005 to 2025. Extensive baseline information was collected for Year 2000, including population, land use, cropping and irrigation systems, historical water use, climatic conditions, etc. This information was used to develop water use factors, such as per capita finished water demands by utility, which were then used along with projected variables, such as population, to project future water demands. Some data, such as population by county, were updated through 2005 since these estimates have recently become available.

DISTRICT

User/Customer Demand or **Net Demand:** The water demands of the end user, after accounting for treatment and process losses, and inefficiencies (e.g., irrigation inefficiency). When discussing Public Water Supply, the term "finished water demand" is commonly used.

Withdrawal Demand or **Raw Water Demand:** The amount of water that must be withdrawn from the groundwater or surface water system to meet a particular need. Withdrawal demands are nearly always higher than User/Customer Demands because of inherent treatment and process losses, and inefficiencies associated with delivering water from the source to the end user.

NAVIGATE

Appendix D provides a full description of the methods used to estimate water use for each major usage category and includes estimates of both the customer demands discussed here and the raw water withdrawals, which would result from implementation of the projects discussed in **Chapter 7**.

This chapter provides an overall perspective of the user/customer and water withdrawal demands and associated growth from 2005 to 2025. The water demand projections summarized in this chapter are presented in terms of average weather conditions. **Appendix D** provides demand projections for 1-in-10 year drought conditions. It also provides additional information about water demand within each use category. In the case of agriculture, acreage and demands by crop type are included, and in the case of public water supplies, population and demands by utility are provided. Although not quantified in this chapter, environmental demands are addressed during the water supply planning process using resource protection criteria.

LAW / CODE

A 1-in-10 year drought event is an event that results in an increase in water demand to a magnitude that would have a 10 percent probability of being exceeded during any given year. Subsection 373.0361(2)(a), Florida Statutes (F.S.), states the level of certainty planning goal associated with identifying demands shall be based on meeting demands during a 1-in-10 year drought event.

DEMANDS BY WATER USE CATEGORY

Water demand estimates for 2000 and projections through 2025 were made in five-year increments for each of the six water supply categories (defined to the right). Key results in terms of user/customer demands (see **Figure 2**) specific to the Lower West Coast (LWC) Planning Area for the period of 2005 to 2025 include:

- Regionwide, Public Water Supply demands are expected to increase by 97 million gallons per day (MGD) or 76 percent by Year 2025, at which time this water supply category will represent approximately 27 percent of the region's total water demands.
- Agricultural water use, which is projected to increase by about 17 MGD or 4 percent, will remain the largest consumer of water in the LWC Planning Area.
- Thermoelectric Power Generation Self-Supply is a rapidly growing water use category. Future demand projections reflect the nearly 67 MGD required to serve new power generation facilities planned by Florida Power & Light (FPL).
- The remaining water use categories—Domestic Self-Supply, Commercial and Industrial, Recreational and Landscape—will also experience increased demands totaling 16 MGD by 2025.

DISTRICT

Water Use Categories

Agricultural water is used for crop irrigation, livestock watering and aquaculture.

Public Water Supply refers to all potable (drinking quality) water supplied by water treatment facilities with projected average pumpages for 2025 greater than 100,000 gallons per day (GPD) for all types of customers. The remaining water use categories are all self-supplied.

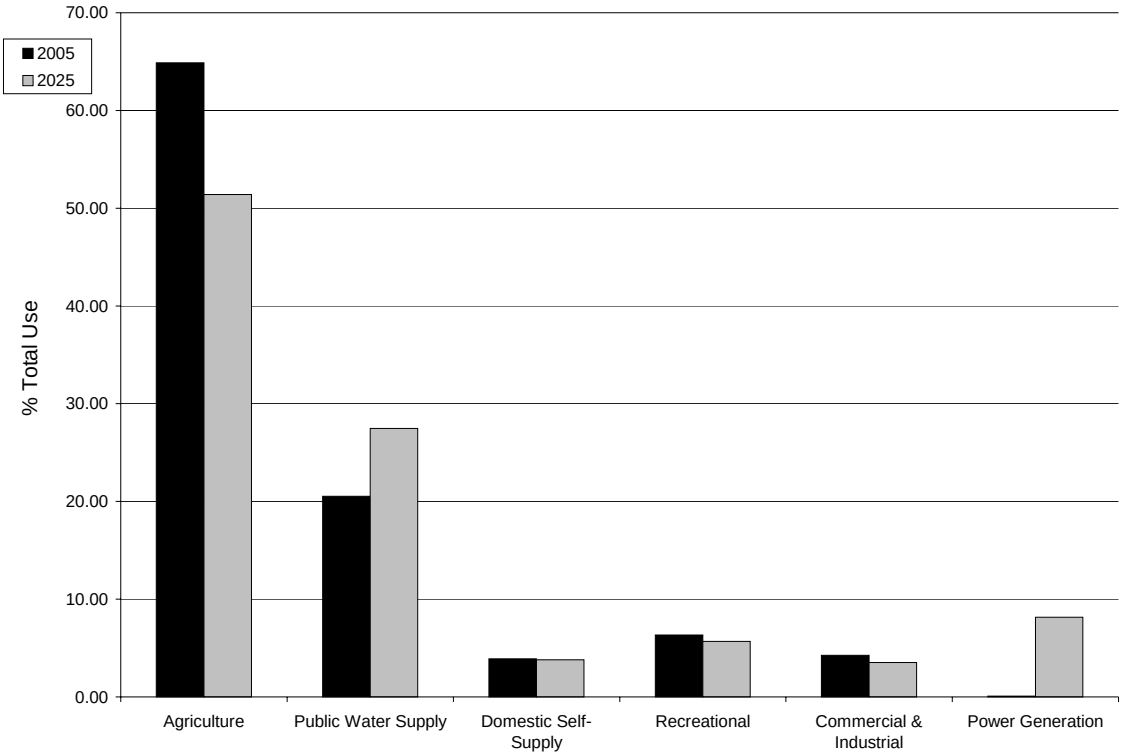
Domestic Self-Supply reflects households served by small utilities (less than 100,000 GPD) and/or private wells.

Recreational water use includes golf course irrigation demand. The Landscape subcategory includes water used for parks, cemeteries and other self-supplied irrigation uses with demands greater than 100,000 GPD.

Commercial and Industrial water uses are business operations using a minimum water quantity of 100,000 GPD.

Thermoelectric Power Generation water is consumed by power plants in the production of electricity.

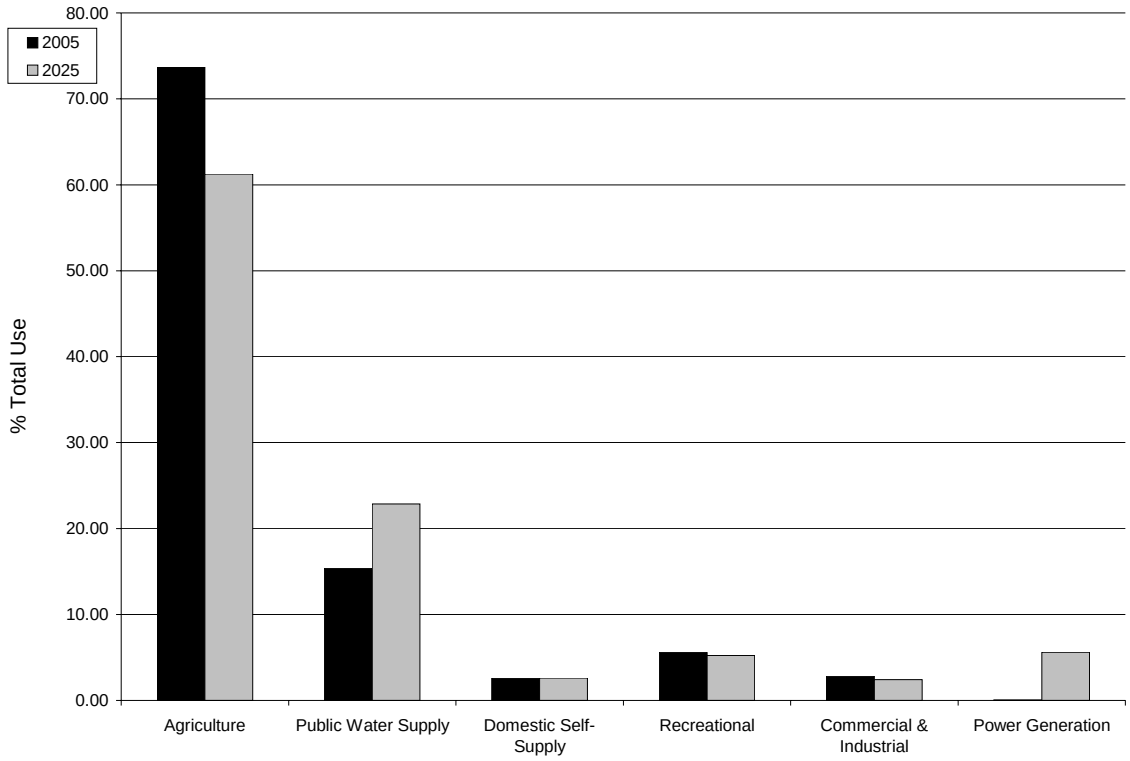
Providing for these increased demands requires a commitment to a coordinated water planning effort. **Figure 2** shows the user/customer water demands by use category.



	Agriculture	Public Water Supply	Domestic Self-Supply	Recreation	Commercial & Industrial	Power Generation	Total
Estimated 2005 MGD	404.8	128.1	24.4	39.5	26.6	0.5	623.9
Projected 2025 MGD	421.8	225.5	31.1	46.6	28.9	66.9	820.8
% Change MGD	4.2%	76%	27%	18%	9%	13,280%	32%

Figure 2. User/Customer Demands – Water Categories as a Percentage of Total Demand in Bar Chart and Average Year Demands and Percentage of Growth in Tabular Chart.

Figure 3 shows the associated withdrawal demands as developed in **Appendix D**. The withdrawal demands are comparable to the demand estimates presented in previous Lower West Coast water supply plans. The water withdrawal demands differ from the user/customer demands for Public Water Supply, Recreational Self-Supply and Agricultural uses. The differences are caused by inefficiencies in delivery or treatment that prevent all the water being withdrawn from being available to meet the user/customer demands.



	Agriculture	Public Water Supply	Domestic Self-Supply	Recreation	Commercial & Industrial	Power Generation	Total
Estimated 2005 MGD	698.1	145.3	24.4	52.6	26.6	0.5	947.5
Projected 2025 MGD	729.2	272.2	31.1	62.2	28.9	66.9	1190.5
% Change MGD	4%	87%	27%	18%	9%	13,280%	26%

Figure 3. Water Withdrawal Demands – Water Categories as a Percentage of Total Demand in Bar Chart and Average Year Demands and Percentage of Growth in Tabular Chart.

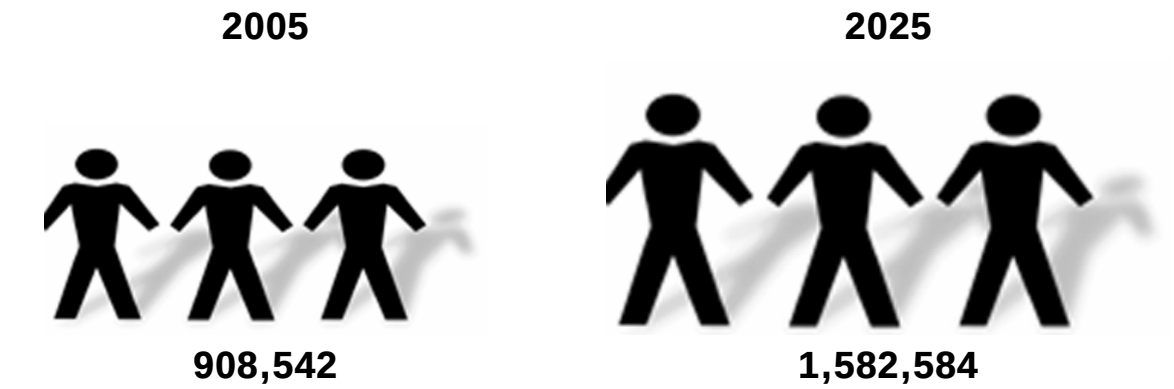
POPULATION AND WATER USE TRENDS

The region's population is expected to increase by 74 percent from 2005 to 2025, with Collier and Lee counties experiencing the greatest growth. **Table 1** provides a summary of the population estimates for the counties or portions of counties located in the LWC Planning Area. The distribution of population estimates to individual utilities is based on historical data and projected distributions of population to traffic zone analyses and utility service areas. **Figure 2** provides a summary of the projected water demands under average year conditions between 2005 and 2025 for all water supply use categories.

Table 1. Population in the LWC Planning Area, 2005–2025.

	2005			2025		
County Area	**Population[a]**	**Public Water Supply**	**Domestic Self-Supply**	**Projected Population**	**Public Water Supply**	**Domestic Self-Supply**
Collier	317,601	272,130	45,471	608,002	532,037	75,965
Lee	541,398	457,634	83,764	906,199	828,383	77,816
Hendry (Portion in LWC Planning Area)[b]	37,097	26,697	10,400	51,821	41,393	10,428
Glades (Portion in LWC Planning Area)[b]	6,283	3,156	3,127	7,889	3,947	3,942
Charlotte (Portion in SFWMD)[b]	6,163	0	6,163	8,673	0	8,673
Total	908,542	759,617	148,925	1,582,584	1,405,760	176,824

a. Source: U.S. Bureau of the Census, 2001, and University of Florida Bureau of Economic and Business Research, 2006.
b. See following discussion and Chapter 4 concerning potential urbanization in these counties.



Agricultural Water Use

Sugarcane in the LWC

Agricultural acreage in the LWC Planning Area is expected to increase by about 13,400 acres between 2005 and 2025, with local declines in cultivated acreage in Lee and Collier counties and increases in Hendry and Glades counties. The overall water use in this category is projected to increase by about 4 percent during this planning period. Relative to the total water use in the LWC Planning Area, the agricultural water use category is projected to decrease from 74 percent of current water withdrawal demands to 61 percent by 2025, reflecting the projected substantial increase in urban sector water uses.

Agricultural water demand reflects projected irrigated acreage, crop and soil types, growing seasons, and irrigation system types and strategies.

Acreage projections are based on the data and methods contained in the land use projection analysis completed by the South Florida Water Management District (SFWMD or District) to support the 2000 LWC Plan and the Southwest Florida Feasibility Study (SWFFS). The agricultural acreage estimates also considered input provided by representatives of the agricultural community.

Agricultural Self-Supply demand calculations for this 2005–2006 LWC Plan Update were made using the Agricultural Field Scale Irrigation Requirement Simulation (AFSIRS) Model. This is a change from the 2000 LWC Plan, which used a modified Blaney-Criddle Model to estimate supplemental requirements for irrigation. Use of the Blaney-Criddle Model generally results in a higher per acre irrigation estimate than the AFSIRS Model. This chapter presents the net irrigation demands for agriculture because the net demands estimate the amount of water farmers need to place into the root zone of crops. Gross irrigation requirements reflect the efficiency of delivery of that water and are affected by the projects discussed in **Chapter 7**. Both net and gross irrigation demands by crop type are presented in **Appendix D**.

Public Water Supply and Domestic Self-Supply

The LWC Planning Area includes all populations of Collier and Lee counties and portions of Hendry, Glades and Charlotte counties. The population of Collier County is expected to almost double over the next two decades, and Lee County's population will increase 67 percent during the same period (**Table 1**). Public Water Supply customer demands grow significantly through the projection period, primarily due to the expected population increase. Domestic Self-Supply demand growth is less significant as most new potable water demand will be served by public water systems.

LWC Urban Development

The permanent resident populations used in this update are consistent with the 2000 Census of population and medium population projections from the University of Florida, Bureau of Economic and Business Research (BEBR 2001). The District used medium-BEBR county populations, except in the case of Collier County for which the District used alternative projections approved by the Florida Department of Community Affairs (FDCA) and supported by its local government's comprehensive plan. These projections are higher than the medium-BEBR projections.

Estimates of Public Water Supply and Domestic Self-Supply water use were made based on 2000 per capita use rates by utility and the distribution of the county level population estimates and projections into utility service areas. For Lee and Collier counties, the distribution of population relied primarily on traffic analysis zone (TAZ) projections, which are used for transportation planning within each county. For the portions of Charlotte, Glades and Hendry counties in the LWC Planning Area, the amount and locations of growth are subject to considerable uncertainty because of rapidly evolving development plans and proposals. However, these plans and proposals have not progressed to the point where alternatives to the medium-BEBR population projections and historical patterns of location of growth within the counties have been approved. For these reasons, the projections for these counties in this plan update use medium-BEBR and historical patterns of development in assigning the growth to utilities and self-supplied users. **Chapter 4** provides a further discussion of potential growth in these areas. Additionally, these projections were coordinated with the utilities

that resulted in some adjustments, such as reducing growth for the Island Water Association, which serves the City of Sanibel.

Conservation measures were not factored into the demand projections used in this chapter. Rather, conservation is considered a water source option and discussed in **Chapter 5**.

Recreational Self-Supply

Recreational water use is projected to exceed 46 MGD by 2025, a nearly 20 percent increase over the 2005 estimated use. Recreational Self-Supply water usage projections primarily include water demands for golf course irrigation and are typically identified through consumptive use permits. The acreages for this use were developed as part of the overall geographic information system (GIS) land use analysis supporting the 2005–2006 LWC Plan Update and the Southwest Florida Feasibility Study (SWFFS). Landscape irrigation demand projections are included within this Recreational category.

Commercial and Industrial Self-Supply

Demands for Commercial and Industrial Self-Supply are based on 2000 demands developed and reported by the U.S. Geological Survey (USGS). Because this demand category is small and historical data fail to support any trends in use, the levels are generally held constant through the projection period. The one exception is that industrial use by U.S. Sugar in Clewiston is included with the water utility use in 2005, and is classified as Commercial and Industrial in projection years as a separate utility being established to serve the potable water supply needs of Clewiston.

Thermoelectric Power Generation Self-Supply

The need for additional power supplies is expected to grow as the population in the LWC Planning Area and other portions of south Florida grows. In addition, the major power supplier, FPL, expects that much of the additional generating capacity to be installed will use fresh or brackish water sources and cooling tower technology as a heat rejection method. To date, most of the generating capacity has used flow through cooling, and much of this has been ocean water, the use of which is not covered by the water supply plans.

Florida Power & Light expects to construct five additional power generation facilities in the LWC Planning Area. None of these plants have been sited other than to identify general locations within the LWC Planning Area. As shown in **Figure 2** and **Figure 3**, power generation water use demands are expected to increase to 67 MGD by 2025. These estimates represent the water needed to

support power generating capacity proposed to be located in the LWC Planning Area.

DEMAND PROJECTIONS IN PERSPECTIVE

The demand projections presented in this 2005–2006 LWC Plan Update are based on the best information available at this time. However, these projections reflect trends, circumstances and industry intentions that change over time. For example, this plan update expects much greater population growth than what the 2000 LWC Plan anticipated. The growth is large enough that accommodating this population will require infill and development of existing urban areas, as well as development outside of current urban service boundaries. Where this new development will occur and the extent to which it may include historically rural portions of the LWC Planning Area, especially Charlotte, Glades and Hendry counties, are important issues. The potential for rapid development of new urban areas in Charlotte and Hendry counties is such that this LWC Plan Update may require interim amendments. The District will continue to work closely with local governments and monitor growth decisions in these areas.

The agricultural land use projections are also uncertain, first because agriculture is highly dependent on global market conditions, and second, because it is subject to real estate pressures from urban development and ecosystem restoration efforts. Furthermore, factors, such as citrus canker and greening, may have major effects on the future of agriculture within the study area.

In summary, the major driving force behind the significant growth in water demands reflected in this 2005–2006 LWC Plan Update is the region's anticipated population growth. Most of this growth, in absolute terms, is expected to take place in Lee and Collier counties.

The LWC Planning Area's population growth of about 674,000 residents for the 20-year period from 2005 to 2025 is significantly higher than the absolute growth in population of 402,000 residents expected for the 25-year period from 1995 to 2020 in the 2000 LWC Plan. The net result is that the 20-year growth in urban withdrawal demands (all demand sectors except agriculture) in this plan update is 212 MGD, whereas it was forecasted to be only about 63 MGD in the previous plan.

In contrast, gross agricultural demands are projected to increase by 31 MGD between 2005 and 2025, which is similar in magnitude to the 26 MGD growth projected in the previous plan.

3
Resource Analysis

Regional water supply plans provide strategies designed to assure adequate water availability to meet the future urban, agricultural and natural systems demands for at least a 20-year planning horizon. To implement these strategies, an analysis is used to identify water resource conditions that may affect the use of existing resources and development of new supplies to meet Year 2025 projected water demands in the Lower West Coast (LWC) Planning Area. Information in this chapter summarizes previous and ongoing analyses that support this *2005–2006 Lower West Coast Plan Update* (2005–2006 LWC Plan Update), as well as the tools under state law that can be used to protect water resources.

THE WATER RESOURCE

Water for urban and agricultural uses in the LWC Planning Area comes from surface water and three major aquifer systems: the Surficial Aquifer System (SAS), the Intermediate Aquifer System (IAS) and the Floridan Aquifer System (FAS). The Caloosahatchee River (C-43) is a major source of water for agricultural users in the canal basin and for one public water supply system. The SAS and IAS provide most of the fresh water for public water supply and agriculture within the LWC Planning Area. The upper portion of the FAS provides brackish supply.

Caloosahatchee River/C-43 Canal

The SAS is typically divided into two aquifers, the water table and Lower Tamiami. The IAS also includes two aquifers in much of the LWC Planning Area, the Mid-Hawthorn and the Sandstone. The upper portion of the FAS in the LWC Planning Area includes the Lower Hawthorn and the Suwannee aquifers. Zones in the FAS below the

Suwannee typically contain more saline water than upper zones and are not often used for water supply in the planning area.

Within an individual aquifer, hydraulic properties (i.e., ability to yield water to wells) and water quality may vary both vertically and horizontally. Because of this heterogeneity, groundwater supply potential varies greatly from one place to another. Chapter 8 of the *Consolidated Water Supply Plan Support Document* (SFWMD 2005–2006) provides additional information about the aquifer systems, hydrogeologic units and typical aquifer yields in this region. **Figure 4** depicts the generalized geologic cross-section of the LWC Planning Area.

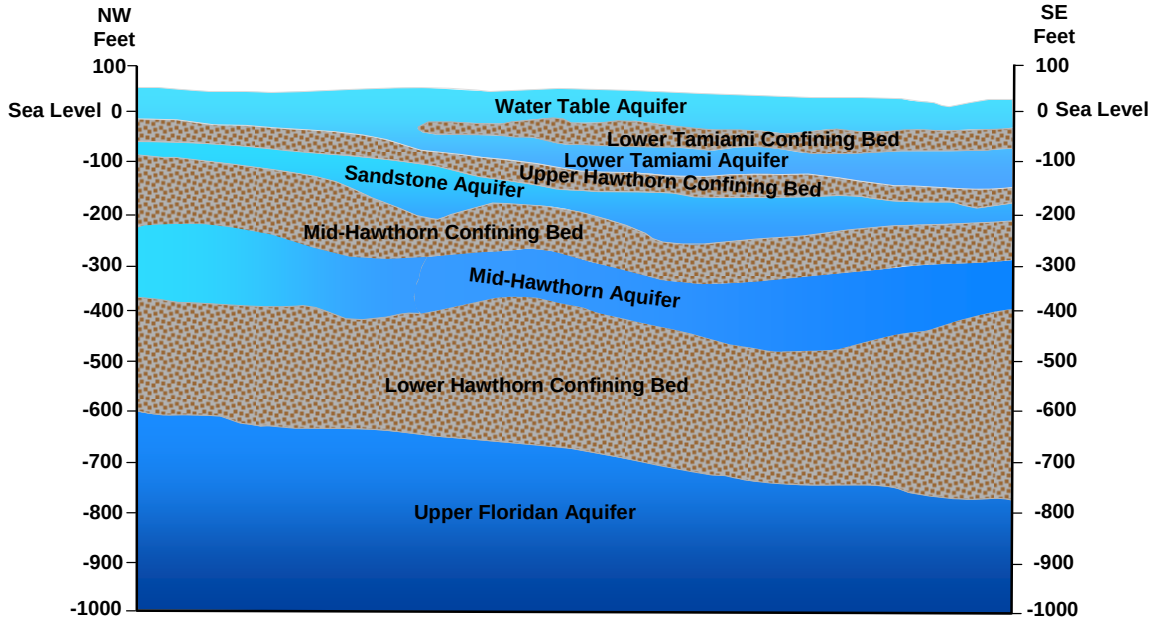


Figure 4. Generalized Geologic Cross-Section of the Lower West Coast Planning Area.

PROTECTION TOOLS AND WATER RESOURCE CONDITIONS

Water resource protection tools are used to protect water supplies for natural systems and human needs. Among these tools are minimum flows and levels (MFLs), maximum developable limits (MDLs), saltwater intrusion criteria and wetland drawdown restrictions. If the MFLs established for priority surface water bodies and aquifers cannot be achieved under existing conditions or may not be achieved in the future, recovery or prevention strategies for those water bodies and resources must be developed. The following section discusses specific resource protection tools and the conditions of historically used fresh water in the LWC Planning Area. Resource conditions and issues are discussed in greater detail in **Chapters 4** and **5**.

LAW / CODE

The South Florida Water Management District (SFWMD or District) is responsible for implementing the statutory provisions in Section 373.042, Florida Statutes, (F.S.), requiring the establishment of minimum flows and levels (MFLs) for surface waters and aquifers at which further withdrawals would be significantly harmful to the water resources of the area. The minimum flow is defined as the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area. The minimum level is defined as the limit at which further withdrawals would be significantly harmful to the resources of the area.

Section 40E-8.021(29), Florida Administrative Code (F.A.C.), defines significant harm to be the temporary loss of water resource functions that takes more than two years to recover.

Section 373.0421, F.S., further requires that once the MFL technical criteria have been established, the District must develop and expeditiously implement a recovery and prevention strategy for those water bodies that are currently exceeding, or are expected to exceed, the MFL criteria.

Chapter 40E-8, F.A.C., contains the MFLs and criteria for specific water bodies and aquifers within the District and also includes the recovery and prevention strategies for each MFL. Additional MFL protection is identified in Chapter 40E-2, F.A.C., as consumptive use permitting criteria for MFLs, and in Chapters 40E-21 and 40E-22, F.A.C., as water shortage criteria for MFLs.

Surficial and Intermediate Aquifers

Minimum Aquifer Levels

Minimum aquifer levels have been developed for the Lower Tamiami Aquifer in the SAS, and the Mid-Hawthorn and Sandstone aquifers in the IAS. The proposed minimum water level criteria for the Lower West Coast aquifer system (SFWMD 2000) concluded that the proposed minimum water levels, which reflect the structural top of the aquifers, were not being exceeded and were not expected to be exceeded during the next 20 years. Therefore, a recovery strategy was not needed. A minimum level prevention strategy is detailed in the *Proposed Minimum Water Level Criteria for the Lower West Coast Aquifer System* (SFWMD 2000) and in Rule 40E-8.421(5).

Maximum Developable Limits

The South Florida Water Management District (SFWMD or District) adopted rules in 2003 for maximum developable limits (MDLs, Section 3.2.4 of the 2003 *Basis of Review for Water Use Permit Applications*) for the LWC Planning Area. The rule states that reasonable assurances shall be provided and that the proposed use

shall not cause harmful drawdowns so as to mine semi-confined freshwater aquifers in the LWC Planning Area. The potentiometric head within the Lower Tamiami, Sandstone and Mid-Hawthorn aquifers shall not be allowed to drop to less than 20 feet above the top of the uppermost geologic strata that comprises the aquifer at any point during a 1-in-10 year drought condition. These criteria must be met, except in areas closer than 50 feet from any existing pumping well. The MDL criteria represent a prevention strategy for keeping the SAS and IAS confined aquifer levels above the MFL.

Two notable areas where MDLs are becoming an issue are Cape Coral and Lehigh Acres in Lee County. The Mid-Hawthorn/Sandstone aquifer water levels are declining rapidly in the Cape Coral area and may reach MDLs (about -95 feet mean sea level in well L-4820) within about three years (see **Figure 5**). The Sandstone Aquifer in Lehigh Acres shows a declining water level trend and seasonal water level fluctuations that now average nearly 20 feet, where historical seasonal swings were less than half that (see **Figure 6**). During the spring dry season, the water level in many of the domestic wells that draw water from the aforementioned aquifers in these areas drops to the point where the wells or pumps fail. Alternatives to the continued development of these resources for high-density domestic self-supply must be considered and implemented in the near-term. Accelerating the extension of public water supply lines to communities experiencing dry wells may be part of the solution.

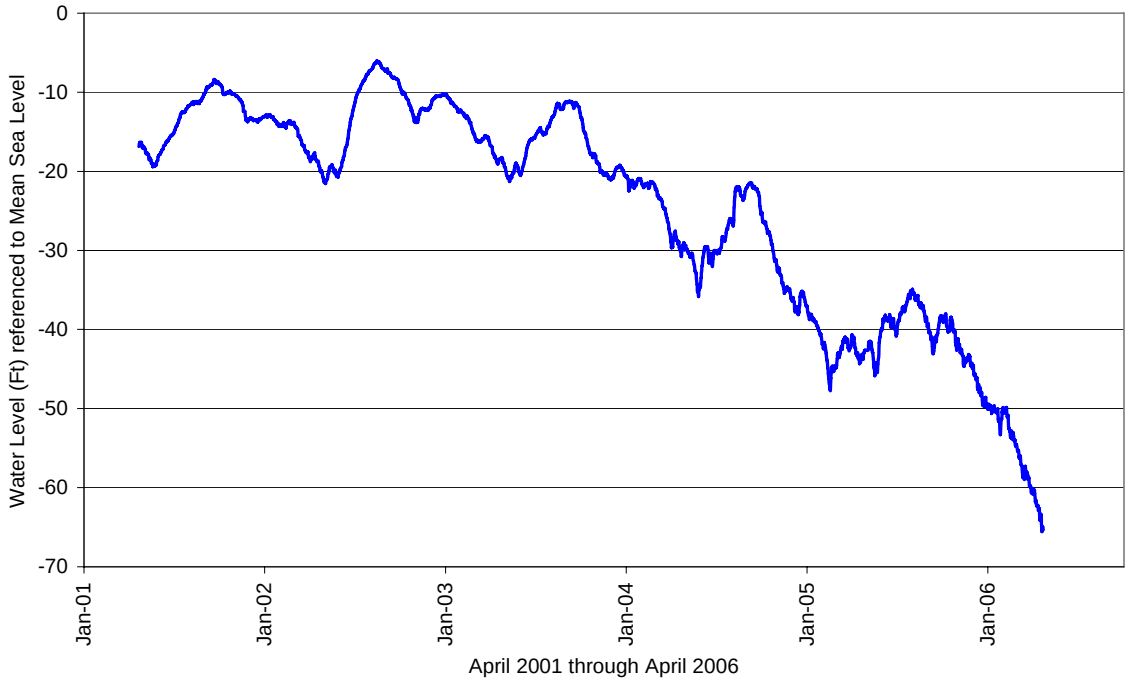


Figure 5. Mid-Hawthorn Well L-4820 Water Levels, Cape Coral (USGS).

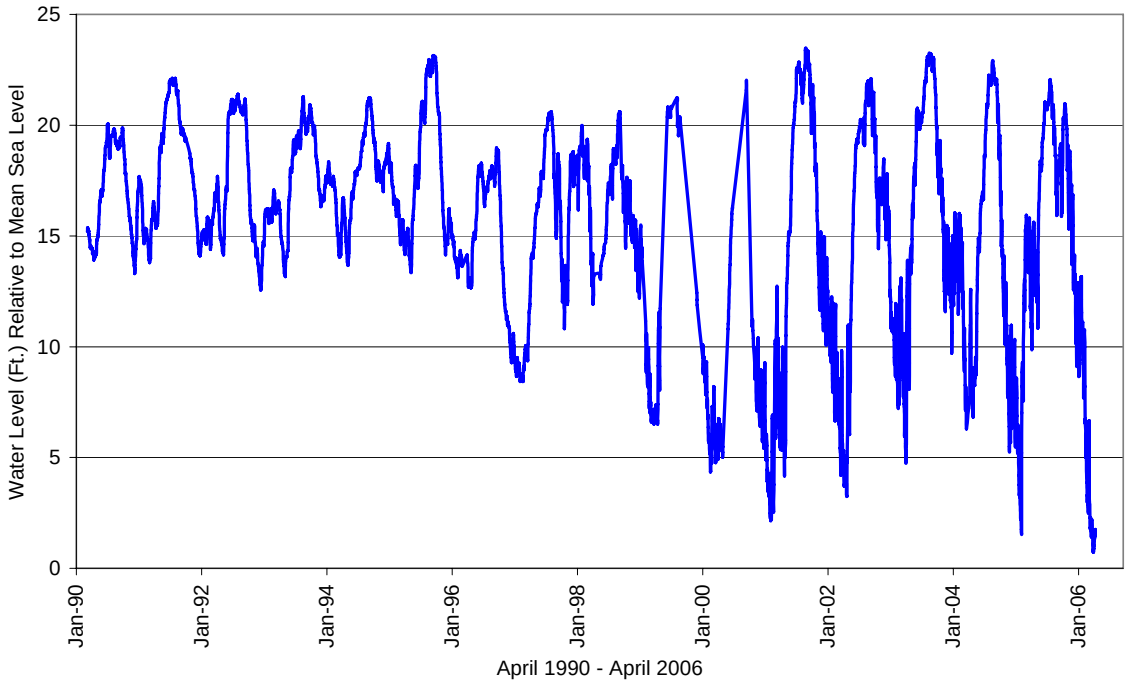


Figure 6. Sandstone Aquifer Monitor Well L-729, Lehigh Acres Area (USGS).

Saltwater Intrusion and Wetland Drawdown Restrictions

Installation of Saltwater Monitoring Wells

Saltwater intrusion, wetland drawdown, aquifer mining and pollution prevention criteria in Chapter 40E-2, Florida Administrative Code (F.A.C.), together define the harm standard for purposes of consumptive use allocation. These harm criteria are currently applied using climate conditions that represent an assumed 1-in-10 year level of certainty. The District's *Basis of Review for Water Use Permit Applications* (SFWMD 2003) outlines narrative standards, numeric standards and assessment methodologies used by the District to determine if a proposed consumptive use meets the conditions of issuance in Chapter 40E-2.301, F.A.C., and therefore, will not cause harm to the resource.

Saltwater intrusion in the SAS (Lower Tamiami Aquifer) and IAS (Sandstone and Mid-Hawthorn aquifers) is a continuing concern, and the SFWMD and U.S. Geological Survey (USGS) cost-shared two recent investigations of saltwater intrusion in portions of the LWC Planning Area (Schmerge 2001, and

Shoemaker and Edwards 2003). These investigations of saltwater intrusion in coastal Lee and Collier counties indicate that the intrusion is an issue along much of the coast, and that the source of the saline water in the SAS and IAS aquifers is probably the Floridan Aquifer. Upward saltwater movement is facilitated by reduced water levels, potentially associated with pumping from these upper aquifers, and open pathways for saline water migration, such as cross-connected wells and karst features.

Caloosahatchee River and Estuary

The MFL Rule established for the Caloosahatchee Estuary states that a minimum mean monthly flow of 300 cubic feet per second (cfs) is required to maintain sufficient salinities at the Franklin Lock and Dam, or S-79 Structure, in order to prevent a MFL exceedance that would cause significant harm to downstream submerged aquatic vegetation communities. A MFL exceedance occurs during a 365-day period when: a) a 30-day average salinity concentration exceeds 10 parts per thousand at the Fort Myers salinity station, or b) a single, daily average salinity exceeds a concentration of 20 parts per thousand at the Fort Myers salinity station. Exceedance of either "a" or "b" for two consecutive years is a violation of the MFL.

Caloosahatchee MFL Recovery and Prevention Strategies

The Caloosahatchee River MFL reports indicated that proposed criteria for the Caloosahatchee River and Estuary (SFWMD 2000, 2003) will be exceeded on a regular and continuing basis until additional storage is provided in the basin to supply the water needed. Therefore, the MFL documents include a recovery and prevention strategy.

The structural and operational features of the recovery plan will be implemented through ongoing SFWMD water supply development efforts, including the development of regional water supply plans, the Comprehensive Everglades Restoration Plan (CERP) and the District's Acceler8 projects. The SFWMD has completed the *2000 Lower West Coast Water Supply Plan* (SFWMD 2000) and a *Caloosahatchee Water Management Plan* (SFWMD 2000), pursuant to Section 373.0361, Florida Statutes (F.S.), which included projects needed to implement the MFL recovery and prevention strategy. The MFL assumes that local basin stormwater contribution downstream of S-79 Structure will not be diminished during dry times.

The CERP includes features that will increase storage in the Caloosahatchee Basin through the construction of a reservoir and aquifer storage and recovery (ASR) wells (USACE and SFWMD 2002). Modeling studies using discharge scenarios, which included the CERP and Lower East Coast (LEC) Plan projects,

indicate that the MFLs will be met by 2020 when these facilities in the Caloosahatchee Basin are completed and fully operational.

The MFL Rule, in Section 40E-8.011(3), F.A.C., also states that the minimum flow criteria for the Caloosahatchee River and Estuary should be reviewed and amended as needed within one year of the effective date of the rule. The purpose of this review is to re-examine the technical and scientific basis of the Caloosahatchee MFLs in light of comments by a scientific peer review committee and results obtained from additional field observations, laboratory experiments and numerical model development. The review, contained in the *Technical Documentation to Support Development of Minimum Flows and Levels for the Caloosahatchee River and Estuary 2003 Status Update Report* (SFWMD 2003), specifically evaluated the ability of the 300 cfs discharge at the S-79 Structure to protect the submerged aquatic vegetation.

This study concluded that the 300 cfs target for flows across the S-79 Structure, by itself, probably does not provide sufficient flow to fully protect water resources from significant harm. Additional or improved storage facilities may need to be provided in the watershed, including downstream of S-79. The MFL should incorporate local basin runoff west of the S-79 Structure. Flows higher and lower than the average of 300 cfs should be considered based on the downstream impact. However, before any decisions are made to modify the CERP projects or the MFL criteria, estuarine and biological models need to be completed and fully calibrated, and improved flow measurements need to be obtained, especially for downstream tidal basin inflows.

Franklin Lock and S-79 Structure – Caloosahatchee River

Since establishing the MFL criteria for the Caloosahatchee River, the criteria have been exceeded during three of four years, resulting in one MFL violation (two consecutive years). The expectation is that periodic to frequent exceedances and violations of these criteria will continue to occur until the recovery plan, which includes projects, such as the C-43 West Reservoir Project (discussed under "Other Related Studies and Projects" in this chapter), are constructed and become operational, providing additional flow to the estuary during dry periods. Despite difficulties in meeting the MFL, high-volume flows during 2004, 2005 and 2006 were a much greater concern.

ADDITIONAL RESOURCE PROTECTION TOOLS

Allocating Water through Consumptive Use Permitting

The SFWMD's Consumptive Use Permitting (CUP) Program protects the supply and quality of groundwater and surface water resources by ensuring that water use is reasonable, beneficial and consistent with the public interest, and that it does not interfere with existing legal uses. (Chapter 40E-2, F.A.C., and Section 373.223, F.S.) Applicants for a CUP must provide reasonable assurances that withdrawals will not harm the environment, degrade the resources or adversely affect other existing legal users. Under Florida law, permitted uses and domestic water uses (which are exempt from requirements to obtain a permit) have the legal status of an "existing legal use."

LAW / CODE

The *Water Resources Act* (Chapter 373, F.S.) defines reasonable-beneficial uses as, "…the use of water in such quantity as is necessary for economic and efficient utilization for a purpose and in a manner which is both reasonable and consistent with the public interest." (Sections 373.223 and 373.019(13), F.S.)

Consumptive use permitting has a pivotal role in resource protection, as the criteria used for CUP are based on the level of impact that is considered harmful to the water resource. These criteria are applied to various resource functions to establish the range of hydrologic change that can occur without incurring harm. The hydrologic criteria include water level, duration and frequency components, and are used to define the amount of water that can be allocated from the resource.

Water Shortage Declarations

Pursuant to Section 373.246, F.S., water shortage declarations are designed to prevent serious harm from occurring to water resources. Serious harm, the ultimate harm to the water resource contemplated under Chapter 373, F.S., can be interpreted as long-term, irreversible or permanent impacts to the water resource. Declarations of water shortages by the District Governing Board can be used as a tool to prevent serious harm.

Regionwide Watering Limitations

In 2003, because of resource conditions and increased demand, the District adopted the year-round "Three-Day-A-Week Watering Plan," which imposes outdoor watering limits throughout southwest Florida. Special limitations (40E-24, F.A.C.) were adopted for Lee and Collier counties and the SFWMD portion of Charlotte County, allowing these counties to place additional restrictions on outdoor water use.

Wetland Protection Standards

Wetland protection standards and thresholds have been established in Section 3.3 of the *Basis of Review for Water Use Permit Applications* (SFWMD 2003) to protect wetlands and other surface waters from harm caused by consumptive use withdrawals of water. This rule was based on analysis of wetland monitoring data.

Protections Afforded Through Reservations of Water

The Florida Legislature has defined water reservations as one of several tools that can be used by water management districts to protect water resources potentially threatened by consumptive use activities. Specifically, Section 373.223(4), F.S., provides the basis for establishing reservations as a means to protect fish and wildlife resources.

Water reserved under this statute is not available for allocation for consumptive uses. Under Florida law, permitted uses and domestic water uses (which are exempt from requirements to obtain a permit) have the legal status of an "existing legal use." All presently existing legal uses of water shall be protected so long as such use is not contrary to the public interest.

LAW / CODE

Section 373.223(4), Florida Statutes (F.S.), provides:

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. Such reservations shall be subject to periodic review and revision in the light of changed conditions. However, all presently existing legal uses of water shall be protected so long as such use is not contrary to the public interest.

There are two types of water reservations being developed by the SFWMD. The first is an *initial water reservation*. Development of initial reservations focuses on determining the volume, duration and timing of existing flows required to protect fish and wildlife resources. The first draft of the initial water reservation criteria for the Caloosahatchee River and Estuary is expected by early 2007.

The second type of water reservation, known as a *project reservation,* will be used in the implementation of CERP-related projects. Project reservations determine the appropriate quantity, timing and distribution of water that is generated by individual CERP projects for the protection of fish and wildlife. Project reservations protect water anticipated to be available in the future through implementation of a project for the protection of fish and wildlife. The water is reserved in advance, ensuring that when a project is completed, those quantities

remain available for the protection of fish and wildlife or public health and safety (see *Guidance Memorandum Number 4,* USACE 2005).

ASSESSING WATER RESOURCES WITH MODELING TOOLS

Federal, state and local agencies are currently involved in numerous environmental restoration and water resource development projects that are needed to sustain the quality of life throughout the rapidly growing south Florida region. Since these projects can potentially cost billions of dollars, cost/benefit analysis is crucial. The SFWMD employs several modeling tools to assess water resource conditions and supply availability. Simulation models are used to assess systemwide impacts of proposed modifications to the water resource system.

Previous Modeling Results Indicated Potential Exceedance of Resource Protection Criteria

Modeling submitted as part of CUP applications has consistently supported the analyses and conclusions of the 1994 and 2000 LWC plans, as well as this plan update. Issues identified in past analyses included potential wetland impacts, saltwater intrusion and aquifer drawdowns approaching MDLs.

Modeling was also used to analyze water availability and water demands in the Caloosahatchee Basin. These modeling efforts are described in the *Caloosahatchee Water Management Plan* (SFWMD 2000). Analytical tools used in this analysis included the Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS) Model, the Water Management Optimization Model and the MIKE SHE Model.

Current and Future Modeling Efforts

Computer models are used to simulate the hydrologic system and to aid our understanding of how water supply and water management projects affect natural and managed systems. Two subregional hydrologic modeling efforts are under way for the LWC Planning Area. One involves creation of a calibrated model of the Surficial Aquifer System (SAS), and the other involves implementation of a groundwater model for the Floridan Aquifer System (FAS). A private engineering firm under contract to the SFWMD is conducting the SAS Model implementation using the USGS modular three-dimensional groundwater flow (MODFLOW) code. The model boundary for the SAS Model is displayed in **Figure 7**, and includes Lee, Collier and Hendry counties and portions of Glades, Charlotte, Palm Beach, Broward, Miami-Dade and Monroe counties.

The SAS Model consists of surface water, the water table aquifer and Lower Tamiami Aquifer of the SAS, and the Sandstone Aquifer of the IAS.

The model was discretized into 765 rows and 622 columns using a square grid with a uniform row and column spacing of 704 feet. The total area of the model is about 5.4 million acres; however, for modeling purposes, about 61 percent of the area is active. The model grid is oriented north-south.

The FAS Model uses the SEAWAT Program and is a joint effort between the SFWMD and Florida Atlantic University. The FAS Model focuses primarily on the Mid-Hawthorn Aquifer of the IAS and the various production zones that comprise the FAS. The model study area, including the active/inactive areas, is shown in **Figure 8**. This area encompasses Lee, Hendry, Collier, Glades and Charlotte counties in the LWC Planning Area, but was extended for modeling purposes to include all or part of Highlands, Hardee, DeSoto, Palm Beach, Broward, Monroe and Miami-Dade counties. Nevertheless, the focus of the study area lies within Charlotte, Glades, Lee, Hendry and Collier counties.

The main advantage of this model, besides its high detail of the geology, is its ability to represent the head, flow and chloride in the system on a daily, weekly or monthly basis, including boundary interactions and the effects of sources and sinks. The model calibration period was from January 1997 to December 2001.

The model was discretized into 575 rows and 300 columns using a square grid with a uniform row and column spacing of 1,500 feet. The total area of the model is about 9 million acres; however, for modeling purposes, about 66 percent of the area is active. The model grid is rotated 30 degrees counterclockwise from the north to align model rows with the principal direction of flow in the Floridan Aquifer.

The FAS has not been used as extensively as fresh groundwater sources within the LWC Planning Area, but its use is anticipated to expand over the next decade as a result of improvements in reverse osmosis (RO) and aquifer storage and recovery (ASR) technologies, and limitations on the use of fresh groundwater resources in many areas.

These models will be available to the public for planning purposes once calibration, documentation and peer review are completed.

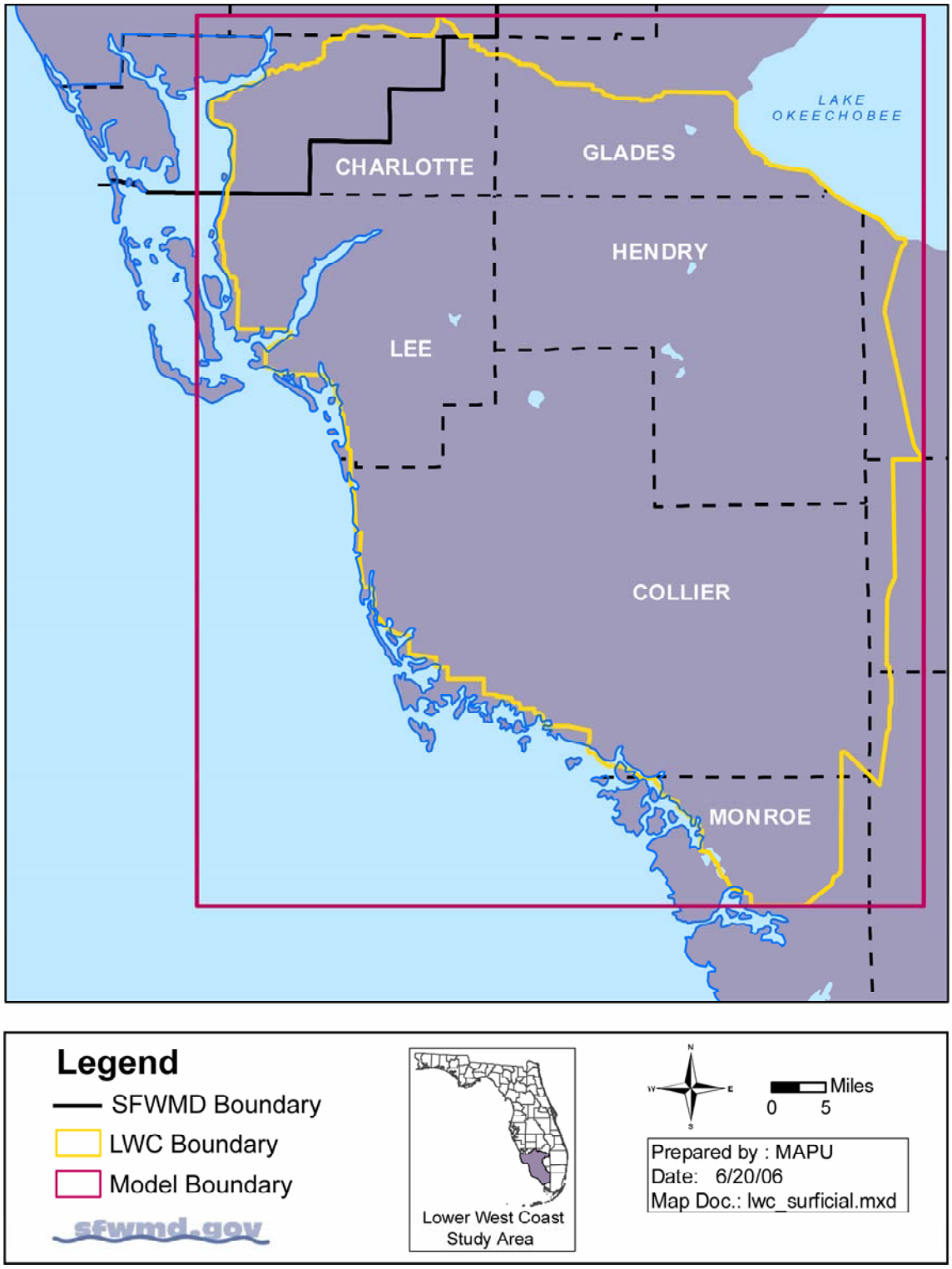


Figure 7. Model Boundary for Surficial Aquifer System Model.

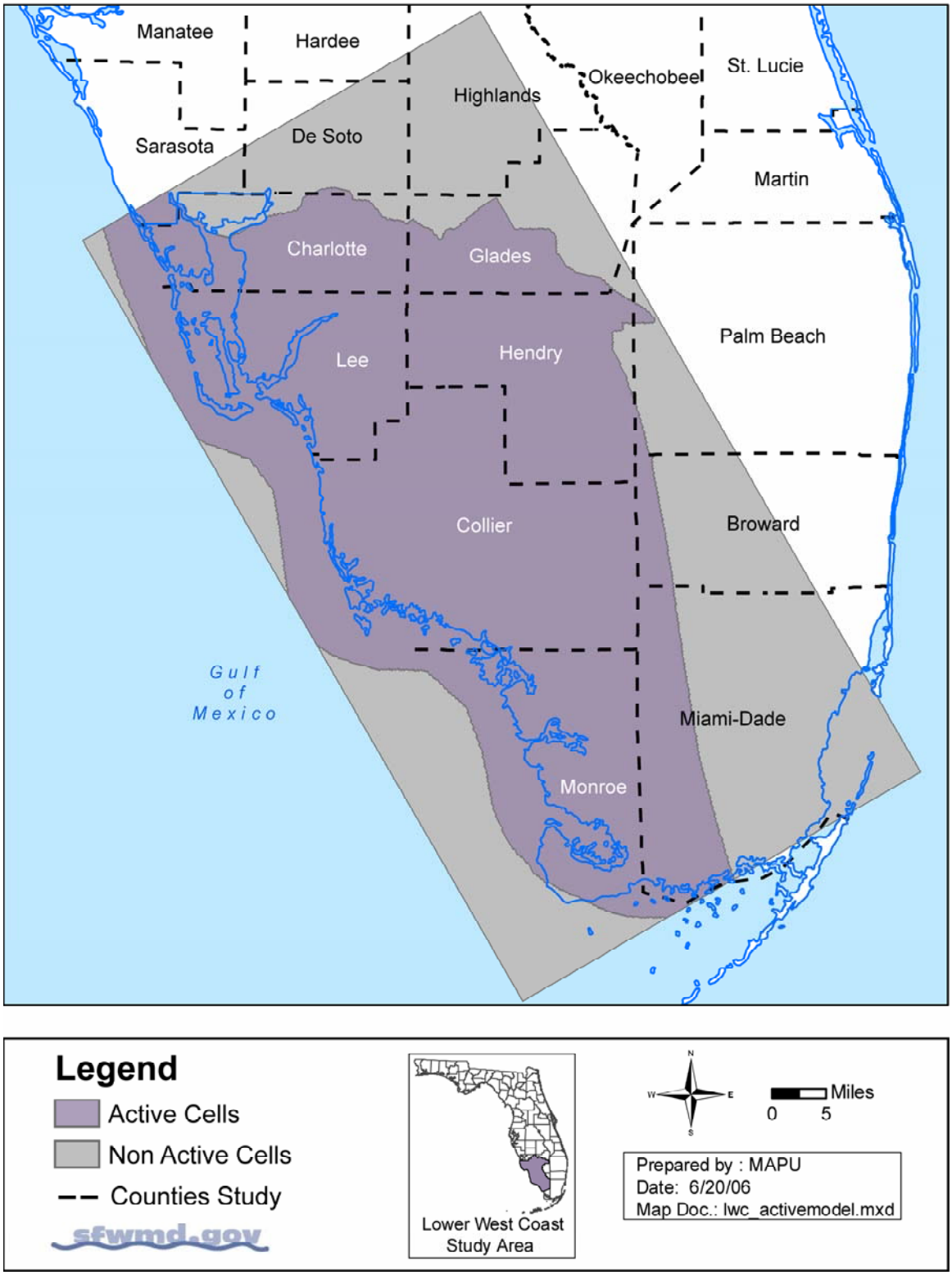


Figure 8. Active Area (shown in purple) and Model Boundary (shown in gray) for Floridan Aquifer System Model.

OTHER RELATED STUDIES AND PROJECTS

Several related studies and projects pertaining to the analysis of resources in the LWC Planning Area are under way to meet future environmental and human demands.

Southwest Florida Feasibility Study

The Southwest Florida Feasibility Study (SWFFS) was authorized by Congress in the *2000 Water Resources Development Act* as part of the Comprehensive Everglades Restoration Plan (CERP). The SWFFS is being conducted by the U.S. Army Corps of Engineers (USACE) and the SFWMD.

The study area includes all of Lee County, most of Collier and Hendry counties, and portions of Charlotte, Glades and Monroe counties, encompassing approximately 4,300 square miles and two major drainage basins. The northern boundary corresponds to the Caloosahatchee River watershed, which is also the SFWMD/Southwest Florida Water Management District (SWFWMD) jurisdictional boundary in Charlotte County. The eastern boundary delineates the divide between the Big Cypress Swamp and the Everglades system.

Big Cypress Swamp

The planning process that resulted in the CERP was known as the "Restudy," and investigated operational and structural changes to the Central and Southern Florida (C&SF) Project. The Restudy concluded that southwest Florida needed a separate assessment of all the water issues it faces, not only those related to the C&SF Project. Water quality and hydrologic data do not exist for much of the region and this lack of information, assessments and monitoring data is a fundamental gap that hinders southwest Florida's long-term water resources management opportunities.

The SWFFS, however, is an important first step and offers the opportunity to use USACE and SFWMD resources to plan for appropriate infrastructure either before or as development occurs. The study will develop a water resources plan

for the entire southwest Florida area and provide for ecosystem and marine/estuary restoration and protection, environmental quality, flood protection, water supply, and other water-related purposes. In addition, it will provide a framework to address the health of aquatic ecosystems, water flows, water supply, wildlife, biological diversity and natural habitats, the region's economic viability, and property rights.

The following activities for this study have been completed: a predevelopment vegetation map; development of four subregional MIKE SHE models; a 2000 and 2050 land use map and demand projections; water quality data assessment; identified ecological-estuarine performance measures and targets, and hydrologic stages and flows; and, identification of an initial array of alternatives. It is anticipated that this study will be completed by late 2008.

The LWC Plan Update process used the future land use map from the SWFFS to determine future agricultural acreages, from which future agricultural demands were generated. While the study boundaries of the SWFFS and the LWC Plan Update are the same, the acreage totals for agriculture may be slightly different. This is because the agricultural acreage totals in the SWFFS reflect the model boundaries for that study, which are based on hydrologic boundaries occasionally extending slightly outside of the LWC Planning Area boundary. **Appendix D** provides additional information about future agricultural acreages and demands.

DISTRICT

Comprehensive Everglades Restoration Plan and Acceler8

The Comprehensive Everglades Restoration Plan (CERP) is a framework for the restoration, preservation and protection of the natural systems that also provides for other water-related needs of the region, including water supply and flood protection, and is the centerpiece of the restoration effort to get the water right in south Florida. The CERP's 68 components are forecast to be implemented over a 30-year period. Together, these components are expected to benefit the ecological functioning of more than 2.4 million acres of the south Florida ecosystem, while improving regional water quality conditions, deliveries to coastal estuaries, urban and agricultural water supply, and maintaining existing levels of flood protection.

The CERP was designed as a 50-50 partnership between the state and federal governments. Since the *Water Resources Development Act of 2000*, authorization of projects for the federal partner, the U.S. Army Corps of Engineers (USACE), to move ahead with major storage projects, has not occurred as anticipated. In 2004, the state chose to fund $1.5 billion for eight restoration projects, called Acceler8, through SFWMD's issuance of "Certificates of Participation" bond revenue to expedite the funding, design and construction of 14 restoration components consistent with the CERP Master Implementation Sequencing Plan.

Some of the benefits of Acceler8 are achieving restoration goals sooner, increasing storage capacities for additional flood control and water supply options, providing water flows and hydrology, and improving water quality.

Acceler8 Projects

Of the eight Acceler8 projects, two are located in the LWC Planning Area: the C-43 (Caloosahatchee River) West Reservoir and the Picayune Strand (Southern Golden Gate Estates) Restoration.

Acceler8 Test Cell Pilot Project
C-43 West Storage Reservoir

The C-43 (Caloosahatchee River) West Reservoir, located in Hendry County, is a component of a larger restoration project for the Caloosahatchee River and Estuary. The purpose of the project is to capture water from the Caloosahatchee River (C-43) during high-flow times for storage and dry-season use. The wet-season capture of water benefits the system by reducing high-volume flows that impact the estuary and improving water quality through storage and biological treatment. Stored water will be released at environmentally appropriate rates back into the Caloosahatchee River during dry periods to help meet minimum flows and provide water supply benefits.

The C-43 West Reservoir will have a total storage capacity of about 170,000 acre-feet (55 billion gallons), on a land area of about 8,000 acres and with a water storage depth of up to 20 feet. Current project activities include construction of test cells at the site and completion of the preliminary design (30 percent). Construction of the full-scale reservoir is scheduled to begin in the summer of 2007 and finish in late 2010.

The Picayune Strand Restoration Project will restore approximately 55,000 acres of partially developed property in southwestern Collier County to a more natural predevelopment condition. This will be accomplished by filling approximately 47 miles of drainage canals; removing over 220 miles of roadways and associated ditches; the construction of over 20 miles of protection levees for private properties; and, the installation of large pump stations with spreader canals to return current canal flows to predevelopment sheet flow conditions across the site.

The project is currently in the design stage. Design of the three major pump stations is in the preliminary stage, while the design of protection levees, canal plugs and road removal/improvements are in the development stage and are awaiting the results of new modeling efforts. These results will determine the

location and size of the protection levees, as well as allow the design to progress for other site features.

A more detailed, time-phased modeling effort is beginning for use in evaluating environmental effects and impacts to threatened and endangered species.

Caloosahatchee River (C-43) ASR Pilot Project

Construction of the Acceler8 C-43 Project

The Caloosahatchee River (C-43) Basin ASR Pilot is a project being conducted to assist in the implementation of the CERP. This pilot project is designed to address technical and regulatory uncertainties associated with regional implementation of aquifer storage and recovery (ASR) projects. In the Caloosahatchee River (C-43) Basin ASR Pilot Project, ASR technology continues to be tested and evaluated. The Caloosahatchee River Basin ASR Pilot Project will provide information regarding the characteristics of the aquifer system within the Caloosahatchee River Basin, as well as determine the specific characteristics and acceptability of the Upper Floridan Aquifer System in that area as a storage zone.

Big Cypress Basin

The Big Cypress Basin is one of two administrative units in the SFWMD. In the LWC Planning Area, the Big Cypress Basin encompasses all of Collier County and part of Monroe County. It is responsible for the operation, maintenance, planning and capital improvements to 169 miles of canals and 44 water control structures.

The Big Cypress Basin Capital Improvement Program (Fiscal Years 2005–2014) includes projects on the Golden Gate Canal System, Henderson Creek and the Baron River, among others, which provide water resource benefits through reduction of overdrainage and restoring groundwater and surface water levels to more natural conditions. In addition to providing environmental benefits, these improvements serve to enhance water supply opportunities by increasing groundwater storage and improving the timing and duration of surface water discharges.

Lake Okeechobee & Estuary Recovery

The Lake Okeechobee & Estuary Recovery (LOER) Plan has been developed to improve water quality, expand water storage, facilitate land acquisition and enhance the ecological health of Lake Okeechobee and the St. Lucie and Caloosahatchee estuaries. State agencies charged with carrying out this plan include the SFWMD, the Florida Department of Environmental Protection (FDEP), the Florida Department of Agriculture and Consumer Services (FDACS) and the Florida Department of Community Affairs (FDCA).

Governor Bush Unveils LOER Program

The LOER Plan includes five "Fast-Track" capital projects and numerous interagency initiatives to provide short-term relief and long-term protection. Planned construction projects include the S-154 Basin, S-133 Basin, Taylor Creek Reservoir and Nubbin Slough Stormwater Treatment Area (STA) Expansion, and Lakeside Ranch STA. Additional components of LOER include revisions to environmental resource permit (ERP) criteria for new development in the Upper and Lower Kissimmee basins, Lake Okeechobee, and St. Lucie and Caloosahatchee estuary basins; establishment of total maximum daily loads (TMDLs) for the St. Lucie and Caloosahatchee tributaries and estuaries; mandatory fertilizer best management practices (BMPs); alternative storage/disposal of excess surface water; innovative land use planning; and, revisions to the Lake Okeechobee Regulation Schedule. The LOER Plan also involves the continued implementation of the Lake Okeechobee Protection Program (LOPP) and the CERP's Lake Okeechobee Watershed Project (LOWP).

The USACE is expediting modifications to the Lake Okeechobee Regulation Schedule and developing rules to modify its water shortage plans. The Critical Project Pilot STAs at Nubbin Slough and Taylor Creek are complete. Four pilot projects are moving forward to store water on private land, and a water storage assessment on public land in northern and southern Lake Okeechobee watersheds has been completed. Information from this assessment is being used to develop preliminary designs, costs and schedules for implementation. Temporary pumps are being purchased to address water supply concerns associated with low Lake Okeechobee levels, while permanent forward pumps and structures are under design. The rule revision process to develop additional water quality and quantity criteria for ERP is also under way.

Additionally, in April 2006, an engineering study assessing the condition of the Herbert Hoover Dike around Lake Okeechobee was completed for the District. The study's findings included an opinion that the dike does not meet current dam safety standards, and that internal erosion caused by seepage through the earthen structures is affecting the dike. High lake levels are believed to significantly increase this internal erosion. Recommendations for addressing these conditions include fast-tracking repairs to the dike by the USACE, and lowering lake levels to minimize seepage. Although lowered lake levels have the potential to improve water quality and habitat conditions in the lake, the levels also reduce the water supply available from the lake for agriculture and public supply.

SUMMARY

Resource protection tools, such as MFLs, water reservations, CUP and general aquifer protection criteria, assist in ensuring adequate supplies of water for natural systems and human needs. However, previous and ongoing analyses of historically used water resources in the LWC Planning Area have identified resource development issues that affect the availability of conventional freshwater supplies to meet new demands projected for the next 20 years. These issues are discussed in **Chapter 4**.

Great Egret

It is important to understand the relationship between the different levels of harm referred to in statutes and the various programs the District has to protect the resources. The overall purpose of Chapter 373 of the Florida Statutes is to ensure the sustainability of water resources of the state (Section 373.016, F.S.). To carry out this responsibility, Chapter 373 provides the District with several tools, with varying levels of resource protection standards. Protection programs include the District's consumptive use permitting program, minimum flows and levels (MFLs), MFL recovery and prevention strategies, minimum aquifer levels, maximum developable limits (MDLs), saltwater intrusion and wetland drawdown restrictions, reservations of water, and the District's Water Shortage Program. Determination of the role of each of these and the protection they offer are discussed in Chapter 4 of the Consolidated Water Supply Plan Support Document.

4
Issue Identification

The mission of the South Florida Water Management District (SFWMD or District) is to manage and protect the water resources of the Lower West Coast (LWC) Planning Area by balancing and improving water quality, flood control, natural systems and water supply. Pursuing this mission requires the District to assess the water resources, identify where and when environmental limits may be reached, and take actions to prevent harm to the resources. Rapid growth in southwest Florida has created challenges for water suppliers for years. It was recognized more than a decade ago, in the *1994 Lower West Coast Water Supply Plan*, that the area was approaching the safe supply limits for traditional sources, including fresh groundwater and surface water from the Caloosahatchee River. As a result, the primary new supplies for public water systems in the LWC Planning Area have been developed from alternative water sources. Considering the projected increase of approximately 674,000 residents by 2025, water users and suppliers in the LWC Planning Area must continue to look primarily to alternative supplies, such as brackish water, reclaimed water, and the capture and storage of seasonal surface water supplies, to meet the majority of new water supply needs.

CONSIDERING THE PROJECTED INCREASE OF APPROXIMATELY 674,000 RESIDENTS BY 2025, WATER USERS AND SUPPLIERS IN THE LWC PLANNING AREA MUST CONTINUE TO LOOK PRIMARILY TO ALTERNATIVE SUPPLIES...

Key issues identified in the *1994 and 2000 LWC Water Supply plans* (SFWMD 1994, 2000) and the *2000 Caloosahatchee Water Management Plan* (SFWMD 2000) were that existing conventional supplies, primarily fresh groundwater and surface water from the Caloosahatchee River, would not be adequate to meet future water demands in the LWC Planning Area. The plans proposed alternative supply development to help meet future needs. These and other key issues are confirmed in this *2005–2006 Lower West Coast Plan Update* (2005–2006 LWC Plan Update) and are summarized as follows:

- Saltwater intrusion, wetland protections, and interference with existing users and other concerns will continue to significantly limit increased supplies from these resources.

- Changes to the operational schedule for Lake Okeechobee associated with efforts to lower the lake level for lake and estuarine protection, as well as levee protection, will affect supply availability from the Caloosahatchee River.
- Freshwater high-flow discharges from the Caloosahatchee River and other altered surface water systems in the LWC Planning Area are impacting coastal resources and estuaries. Capturing some of the excess surface and storm water for water supply purposes would improve water supply availability and benefit the environment.
- Additional water storage is needed to create opportunities to fully use reclaimed water and seasonal surface water resources to meet urban irrigation needs.

LIMITED TRADITIONAL SOURCES REQUIRE DEVELOPMENT OF ALTERNATIVE WATER SOURCES

Increasing demand coupled with resource limitations in the LWC Planning Area require the development of alternative water supplies and improved management of traditional supplies. As described in **Chapter 2**, the LWC Planning Area's population is projected to grow to about 1.6 million by 2025. This represents an estimated 74 percent increase in population or approximately 674,000 additional residents from 2005 to 2025. Urban water demands, which include Public Water Supply, Domestic Self-Supply, Recreational, Commercial and Industrial, and Power Generation uses, are projected to increase by 180 million gallons per day (MGD) during this 20-year period, while agricultural water use is expected to increase by 17 MGD, from the current 405 MGD to 422 MGD in 2025.

Multiple Issues Limit New Traditional Supplies

Multiple factors, including water quality deterioration, interference with other existing users and protection of wetlands, continue to limit development of additional fresh groundwater supplies. New supplies from the Caloosahatchee River may be limited by efforts to protect the lake from high water levels and concerns for the integrity of the Herbert Hoover Dike.

Water quality deterioration is occurring in the Surficial Aquifer System (SAS) and Intermediate Aquifer System (IAS) in coastal Lee and Collier counties, and in various inland areas where pumping from the Mid-Hawthorn and Sandstone aquifers is concentrated. The water table and Lower Tamiami aquifers are the primary producing zones in the SAS, while the Sandstone and Mid-Hawthorn aquifers are the primary producing zones in the IAS. A natural upward head (water level) gradient from the more saline FAS exists in most of the LWC

Planning Area, creating the potential for more saline water to flow from the higher pressure FAS into shallower, lower pressure aquifers. Head reductions in the shallower aquifers that typically occur as a result of pumping and drought allow increased leakage from the FAS to the shallower aquifers and contribute to the deterioration in water quality in the freshwater aquifer systems (Schmerge 2001, and Shoemaker and Edwards 2003).

Aquifer water levels in the Sandstone/Mid-Hawthorn aquifers in Cape Coral are declining rapidly, and, if present trends continue, could reach maximum developable limits (MDLs) within about three years. Water levels in the Sandstone Aquifer in Lehigh Acres show a declining trend and significantly increased seasonal water level fluctuations associated with increased pumpage. Chronic water shortage conditions develop during dry periods for users of the SAS and IAS, particularly in the Cape Coral and Lehigh Acres areas. Concentrations of domestic wells producing from the same aquifers in these areas result in seasonally low water levels, contributing to well failures and water quality deterioration. Increasing population resulting in construction of additional domestic wells each year exacerbates these problems. Alternatives to the continued development of these resources for high-density domestic self-supply must be considered by local governments. Accelerating the extension of public water supply lines to such communities coupled with mandatory hook-up to available municipal lines and required proper abandonment of domestic wells should be considered. Modifications to existing landscape ordinances to further minimize outdoor water needs should also be evaluated.

Water levels in the Lower Tamiami Aquifer in the Bonita Springs area are beginning to increase due to reduction of pumpage. The rising water levels reflect the successful development of brackish water supplies in Bonita Springs from the deeper Lower Hawthorn Aquifer and a corresponding reduction in pumpage from the Lower Tamiami Aquifer. Sustained increases in Lower Tamiami water levels will reduce saline water intrusion and aid in managing and preserving this groundwater resource.

Consumptive use permitting (CUP) regulations were revised in 2003 and included a better definition of wetland protection from pumping-related drawdown to wetland systems. The CUP criteria restrict development of new fresh groundwater supplies that may adversely affect wetlands. Additional freshwater supplies may be available in some portions of the LWC Planning Area, but finding permittable sites has been and will continue to be challenging. Site-specific investigations will be needed. Opportunities may also be created by retiring existing nonpotable uses when land uses change or when reclaimed water is supplied, and by designing dry season recharge systems that rely on supplies of reclaimed water or surface water captured during the wet season.

Caloosahatchee River and Estuary

The Caloosahatchee River currently supplies a large percentage of agricultural water to meet demand in the Hendry and Glades county portions of the LWC Planning Area. Minimum flows and levels were established in 2002 for the Caloosahatchee River and Estuary that restrict withdrawals in the low range of flows. Initial water reservations and Comprehensive Everglades Restoration Plan (CERP) project reservations that will be developed for the Caloosahatchee River will be designed to protect the environment and existing users, but create considerable uncertainty about the availability of water to support new withdrawals directly from the system, or new withdrawals that indirectly affect the system. In addition, maintaining lower management levels on Lake Okeechobee due to the condition of the Herbert Hoover Dike will further reduce water availability from the Caloosahatchee River, particularly in the dry season. The combination of environmental protections, protecting existing legal users and ensuring public safety will significantly reduce opportunities for new withdrawals from the Caloosahatchee River.

Constraints to Optimal Use of Reclaimed Water

Reclaimed Water Facility

Additional storage, primarily aquifer storage and recovery (ASR), for reclaimed water and surface water would significantly improve opportunities to make optimal use of these resources. Reclaimed water use in the LWC Planning Area currently averages about 72 MGD. Although only about 80 MGD is available from reuse facilities on an annual average basis in this region, the timing of reclaimed availability is problematic and, in fact, is one of the factors that limit the number of reclaimed water customers that can be connected. During the wet season, large quantities of reclaimed water are available, but demand is typically low, resulting in the need to discharge some of the reclaimed supply. During the dry season,

demand for reuse water increases significantly, often exceeding the available supply from wastewater treatment facilities, and resulting in the need to augment the reclaimed supply using surface and groundwater water withdrawals.

One issue affecting development of additional ASR is the potential localized mobilization of arsenic in the aquifer associated with the injection and storage of water. Although this has not been shown to be an issue in all ASR situations, it has occurred in some storage zones in Florida. Developing regulatory and scientific means to address the arsenic mobilization issue that will protect public health and safety, while enabling the development of this critical storage, will help ensure a sustainable and economical water supply for the region in the future.

Collectively, urban irrigation demands are met using reclaimed water, the municipal potable system, private domestic wells, other permitted wells (for golf courses, etc.), surface water withdrawals, or any combination of these options. Additional ASR would allow more optimal use of the reclaimed and surface water resources; enable the connection of additional users to the reclaimed system; and, reduce the need to use other freshwater sources to meet urban irrigation demands.

Maximizing Reclaimed Water Efficiencies

The LWC Planning Area has been a leader in the development of reclaimed water supplies, but must continue to make improvements to the region's system. Such improvements will enhance the system's effectiveness to meet urban irrigation demands and lessen the need for pumping fresh groundwater for urban irrigation. These improvements should include, but not be limited to:

- Implementation of additional ASR to enable storage of reclaimed water during low-demand periods and facilitate the capture of seasonal surface water resources.
- Retrofit of all wastewater treatment facilities to produce reclaimed water. Such retrofits are currently planned at four existing wastewater treatment facilities.
- Continue interconnection of reclaimed water systems through the Regional Irrigation Distribution System (RIDS) Project. Interconnection would also promote regional ASR opportunities.
- Continue reclaimed water distribution system expansion, and require lawn/landscape/turf irrigation permit holders within a reasonable distance of reclaimed lines to connect and use that supply when available.
- Improve efficiency of reclaimed water use for irrigation, especially by domestic users.

Alternatives

Alternatives to development of additional traditional sources to meet increased water needs include development of brackish groundwater in the Lower Hawthorn Aquifer; expansion of the reclaimed distribution and supply system; the capture of seasonally available surface water; and, improved storage opportunities for surface and reclaimed water. Additional details about these alternative source options are provided in **Chapter 5**.

ENVIRONMENTAL PROTECTION FOR NATURAL SYSTEMS

Wetland Protection

Consumptive Use Permitting Rule 40E-2.301, Florida Administrative Code (F.A.C.), requires that permitted withdrawals not cause harm to wetlands or surface waters. In 2003, the SFWMD adopted rule revisions that better defined wetland protections in the *Basis of Review for Water Use Permit Applications* (SFWMD 2003) for presumption of harm. Because of the large number of wetland systems in the LWC Planning Area, these protections reduce opportunities to develop additional supplies in the Surficial Aquifer, and, depending on local geologic conditions, may also affect new supply development in portions of the IAS.

Purple Gallinule

Regulatory and Environmental Efforts to Protect the Caloosahatchee River

The Caloosahatchee River currently supplies a large percentage of agricultural water demand in the Hendry and Glades county portions of the LWC Planning Area. In 2002, the District adopted a minimum flow and level (MFL) for the Caloosahatchee River—300 cubic feet per second (cfs) at S-79 Structure. The MFL provides a measure of resource protection for existing submerged aquatic vascular plant communities located downstream from the S-79 Structure (Rule 40-8.221(2), F.A.C.). Currently, during dry periods, flows delivered to the river from the S-79 Structure do not meet the established MFL. Consistent with Section 373.042(1), Florida Statutes (F.S.), the District developed a MFL recovery plan.

The District's proposed MFL recovery and prevention strategy for the Caloosahatchee River and Estuary consists of the construction of reservoirs and other projects in the C-43 Basin being completed under the CERP and Acceler8 projects. This includes construction of the 170,000 acre-foot, off-stream C-43 West Reservoir, which is discussed in **Chapter 3**. The C-43 West Reservoir Project is intended to improve both the high-flow and low-flow conditions of the river by attenuating some of the high-flow discharges to the estuary, storing these waters temporarily within the reservoir, and then releasing water to the estuary during dry periods to meet the MFL and proposed CERP environmental targets.

The SFWMD is also in the process of establishing an initial water reservation for the Caloosahatchee River and Estuary. This effort will focus on determining the volume, duration and timing of existing flows required to protect fish and wildlife resources within the Caloosahatchee River and Estuary. Under this program, all presently existing legal uses of water will be protected so long as the use is not contrary to the public interest (Section 373.223(4), F.S.). The first draft of the initial water reservation criteria is expected by early 2007.

Freshwater Discharges Affecting Coastal Resources

Existing freshwater flow regimes are affecting the health of the Caloosahatchee River and Estuary, Estero Bay, and the Naples Bay and Rookery Bay areas. Urbanization in the bay watersheds has changed the timing, quality and distribution of freshwater discharges to these systems. Urbanization, water withdrawals, flood control activities and conditions in Lake Okeechobee have affected the timing and quality of fresh water in the Caloosahatchee River and its estuary. In recent years, high flows and associated water quality impacts to the coastal resources have overshadowed the low-flow events.

On an annual basis, the Caloosahatchee River system typically experiences lower flows during the spring and higher flows during the summer and fall due to local rainfall conditions and releases from Lake Okeechobee. These seasonal swings are occasionally accentuated by severe drought or extreme rainfall conditions that upset the system by either reducing freshwater availability for urban and agricultural demands and the environment, or providing overwhelming volumes of fresh water. Both ends of this spectrum can be harmful to the environment and human use of the resource.

Since 2003, high-flow events have dominated the system. These events are characterized by large volume releases from Lake Okeechobee and high runoff volumes from the agricultural and urban watershed that can overwhelm the estuary with fresh water. Studies have indicated that freshwater discharges at the S-79 Structure in the 300 to 800 cfs range are optimal for the health of the

Caloosahatchee River and Estuary, and that extended periods of flow above 2,800 cfs appear to be detrimental to most biota any time of the year.

The Lake Okeechobee & Estuary Recovery (LOER) Plan includes projects intended to improve environmental and water quality conditions in Lake Okeechobee and its tributaries and estuaries. This program focuses on improved land management practices and environmental protections within the areas contributing water to Lake Okeechobee, as well as the Caloosahatchee River and St. Lucie River basins, which receive water from the lake. Specific projects include the development of 48,000 acre-feet of storage for improvement of water quality flowing into Lake Okeechobee; revision of the lake regulation schedule to maintain lower water levels; and, identification of options for storing and/or disposing of excess surface water within the greater Lake Okeechobee watershed. This program offers direct benefits to the Caloosahatchee River in terms of water quality, timing and volume.

Urbanization in the Estero Bay watershed, which was estimated at 11 percent in 1995, is projected to be in excess of 35 percent by 2025. Deterioration of water quality in the Estero and Imperial rivers and Mullock Creek, all of which are in the Estero watershed, are adversely affecting conditions in Estero Bay.

Coastal rivers and streams in Collier County, including Gordon River, Rock Creek and Haldeman Creek, as well as the historic flowways to Naples Bay and Rookery Bay, have been altered by road and urban development over the past 40 years. Large freshwater discharges through a network of man-made canals and stormwater outlets cause fluctuation in the salinity levels, current flow patterns, as well as increased pollution loading to these coastal bays.

NEW CONNECTIONS TO LOCAL GOVERNMENT COMPREHENSIVE PLANS

During the 2002 through 2005 Florida legislative sessions, the statutory direction to link the water supply planning conducted by water management districts and the land use planning carried out by local governments throughout the state was clarified and strengthened. In general, the changes coordinate local government land use with regional water supply plans, and establish a closer link between development decisions and the availability of water and public facility planning and funding.

Besides a general requirement to coordinate with regional water supply plans, some of the specific water supply-related connections under the new law that now must be addressed in local government comprehensive plans include:

GENERAL REQUIREMENT / Identify water supply sources needed to meet existing and projected water use demands for the established planning period of the comprehensive plan. (Section 163.3167(13), F.S.)

FUTURE LAND USE ELEMENT / Future land uses are to be based on the availability of water supplies, population projections and associated public facilities. (Subsection 163.3177(6)(a), F.S.)

POTABLE WATER ELEMENT / This element must identify alternative and traditional water supply projects, conservation and reuse needed to meet the water needs identified in the regional water supply plan for the local government's jurisdiction. Within 18 months following an approved update of the regional water supply plan, comprehensive plans must: a) incorporate water supply projects from those identified in the regional water supply plan, or propose alternatives; and, b) include a minimum 10-year work plan for building all public, private and regional water supply facilities needed to serve existing and new development. (Subsection 163.3177(6)(c), F.S.)

EVALUATION AND APPRAISAL REPORT (EAR) / Include an analysis of the implementation of the 10-year work plan for building all water supply facilities within the local government's jurisdiction. (Section 163.3191(2)(1), F.S.)

ADDITIONAL ISSUES

Need for Integrated Planning and Water Supply Efforts in Western Hendry and Glades Counties

Hendry County is projecting double-digit growth in annual population and water demand associated with large-scale residential and commercial development in the western portion of the county. Similar conditions are developing in western Glades County. Growth projections used by both counties are inconsistent with the University of Florida, Bureau of Economic and Business Research (BEBR) medium projections. Florida law directs the District to use BEBR in the absence of a ruling to the contrary from the Florida Department of Community Affairs (FDCA). The situation requires an integrated planning effort and discussions with the FDCA on the part of Hendry and Glades counties, and the City of LaBelle. Mounting development pressures will likely require a much more significant water supply initiative in this area than the demand projections within the 2005–2006 LWC Plan Update would indicate. The counties may want to consider forming a regional authority or other multijurisdictional organization to develop water and wastewater facilities to meet these growing needs.

Growth in Eastern Charlotte County

A 13,500-acre new town has been proposed in eastern Charlotte County on a portion of Babcock Ranch. As with growth in western Glades and Hendry counties, this development is not reflected in BEBR projections and therefore is not shown in **Chapter 2**. Large-scale development in remote areas creates challenges for providing adequate infrastructure for governmental services, including water supply. Limited data are available for the Babcock Ranch area, and water supply development would be focused on the use of brackish water from the Floridan Aquifer. This will be addressed in future amendments and/or updates of the LWC Plan Update as additional information becomes available.

Transferring Water between Water Management Districts

Interdistrict transfer is an important issue facing the LWC Planning Area between the SFWMD and Southwest Florida Water Management District (SWFWMD). The issue has been addressed by law under Section 373.2295, F.S., but has had limited implementation. Under Section 373.2295, F.S., interdistrict transfers are defined to include proposed withdrawals of groundwater from one water management district for use outside that district's boundaries; however, interdistrict transfers do not include withdrawals within a single county. If a cross water management district boundary transfer occurs within a single county, then the following public interest test applies, but the procedures do not.

Section 373.2295, F.S., requires the water management district in which the withdrawal is proposed to occur to review the consumptive use permit application. In addition to meeting the typical requirements related to reasonable-beneficial use and interference with existing legal users, users are required to satisfy a unique public interest test. In determining whether such a proposed transfer is consistent with the public interest, the reviewing water management district is to refer to the projected populations, as contained in future land use elements of the comprehensive plans of both the withdrawal and use areas together with other evidence on future needs of both areas. Section 373.2295(4), F.S., states that the proposed interdistrict transfer of groundwater will meet the public interest test: "…if the needs of the area where the use will occur and the specific area from which the groundwater will be withdrawn can be satisfied…."

A second significant definition of the consumptive use permit "public interest" test affecting long distance transport of water was adopted with the amendment of Section 373.223(3), F.S., which became known as the "local sources first" statute. It applies when transport of either ground or surface water across county boundaries is proposed, but not when crossing water management district boundaries. In such applications, the water management district is to consider a variety of public interest factors. For example, the factors include consideration

of sources that are closer to the area of use; alternatives to the proposed source, including alternative technologies, such as desalination; potential environmental impacts; and, whether sources are adequate to supply water for existing legal uses and reasonably anticipated future needs of the planning region where the proposed source is located.

The Florida Department of Environmental Protection (FDEP) regulations require that both the sending and the receiving water management districts approve a proposed interdistrict transfer of surface water. The special public interest considerations that must be met include: water conservation measures and reuse implementation in the receiving area; the costs and benefits and environmental impacts that may occur in both areas; and, the present and future needs of the supplying area and whether these needs can be expected to be met.

As Florida's population continues to grow, the development of consensus on resource issues and conditions, and projected future needs along District boundaries are expected to become increasingly important.

SUMMARY

Projections show that the LWC Planning Area population will increase by approximately 674,000 people by 2025. Area water demand will increase by 197 MGD by 2025, with the bulk of that increase in the urban demand sector. The continued growth will require increased efficiencies in water use and alternative water supply development.

Development of alternative water supplies in the LWC Planning Area is well established, as it has long been recognized that historical fresh groundwater and Caloosahatchee River water resources cannot support the ongoing growth in this region. Meeting the water demands associated with future growth will require an even greater focus on alternative water supplies and conservation than in the past. Efforts to develop traditional freshwater resources may be possible in some areas considering local hydrologic conditions, demand on the resource, and management options, such as rehydration opportunities and seasonal pumping schedules.

Other resource issues facing the area are also tied to the growing population in the LWC Planning Area and other parts of south Florida. Urbanization of watersheds in the Lee and Collier county areas is resulting in deterioration of water quality in streams discharging to coastal waters, such as Estero Bay and Naples Bay. The Caloosahatchee River and Estuary are similarly affected by urban and agricultural runoff, flood control discharges from Lake Okeechobee, and also from saltwater migration up the river during low-flow periods associated with drought and high water use.

Resource protection strategies and projects are under way to address these issues, including establishment of initial reservations for the Caloosahatchee River and construction of the C-43 West Reservoir to capture a portion of high flows for release during dry periods. Ongoing watershed protection projects in Lee and Collier counties include the 55,000-acre Picayune Strand Restoration Project, which will hold more water on the land, thereby improving the timing and dispersion of discharge to coastal waters.

These issues will require constant attention to ensure that the water resources and the environment that depends on these resources remain protected, while the needs of a growing population are met.

Urban Development in the LWC

As populations and the demand for available water supplies increase in South Florida, there is an increased need to balance the protection of the natural systems with efficient use of current and future water resources.

5

Evaluation of Water Source Options

Florida's 2005 legislative session created the Water Protection and Sustainability Program, which strengthens the link between water supply plans and local government comprehensive plans. In addition, the new legislation provides state and water management district cost-sharing funds for alternative water supply development. The bill adds new requirements for the water supply development component of the regional water supply plans by making the plans more specific. The intent is to make the plans more useful to local water suppliers in developing alternative water supplies, and then provide permitting and funding incentives to local water suppliers if they choose a project included in the plan.

As prescribed by Section 373.0361(2), Florida Statutes (F.S.), water supply options, including traditional and alternative water supplies, as well as conservation and reuse projects were evaluated to meet the future urban, agricultural and natural systems needs of the

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Section 373.0361(2), Florida Statutes (F.S.), provides:

A list of water supply development project options, including traditional and alternative water supply project options, from which local government, government-owned and privately owned utilities, regional water supply authorities, multijurisdictional water supply entities, self-suppliers and others may choose for water supply development. In addition to projects listed by the district, such users may propose specific projects for inclusion in the list of alternative water supply projects. If such users propose a project to be listed as an alternative water supply project, the district shall determine whether it meets the goals of the plan, and, if so, it shall be included in the list. The total capacity of the projects included in the plan shall exceed the needs identified in subparagraph 1. and shall take into account water conservation and other demand management measures, as well as water resources constraints, including adopted minimum flows and levels and water reservations. Where the district determines it is appropriate, the plan should specifically identify the need for multijurisdictional approaches to project options that, based on planning level analysis, are appropriate to supply the intended uses and that, based on such analysis, appear to be permittable and financially and technically feasible.

Lower West Coast (LWC) Planning Area. Traditional sources in the LWC Planning Area include the Surficial Aquifer System (SAS) and Intermediate Aquifer System (IAS), and fresh water from surface sources, such as the Caloosahatchee River. Alternative water supplies or nontraditional sources include seawater or brackish water, surface water captured during wet-weather flows, new storage capacity, reclaimed water, storm water for consumptive uses, and any other nontraditional source used by the planning region. These options may make additional water available from historically used sources by providing improved management of the resource, or there may be a new source of water specific to that service area.

The following evaluations of water source options for the LWC Planning Area are made within the context of the issues previously identified in **Chapter 4** and are specific to this region. Each water supply option includes a brief discussion on the sustainability of the resources, potential impacts to the natural systems and economic costs. The *Consolidated Water Supply Plan Support Document* (SFWMD 2005–2006) provides additional information pertinent to the estimated costs of each option. The costs presented in this chapter and the *Consolidated Water Supply Plan Support Document* are intended primarily to enable comparison of the general costs of one type of supply relative to another. These costs must not be viewed as a substitute for the detailed evaluation that should accompany site- and utility-specific feasibility and design studies necessary to make decisions about, and to construct, such facilities.

TRADITIONAL SOURCES

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Traditional sources include those sources that have historically been used as the primary source of water. Traditional sources can change from region to region based upon the ease of source availability and water quality. Where traditional sources have been determined to have limited availability, alternative sources of water must be identified and developed.

In the LWC Planning Area, traditional sources of water have typically included the SAS, IAS, fresh surface water from the Caloosahatchee River, and, to a limited extent, other fresh coastal surface water systems.

As discussed in earlier chapters, the SAS and IAS are the primary sources of fresh groundwater for urban and agricultural use in the LWC Planning Area. However, any significant increase in withdrawals from these aquifer systems will continue to be constrained by resource protections limiting saltwater intrusion, wetland impacts, and impacts to existing legal users and other regulatory considerations. Additional supplies may be developed and permitted from these traditional sources depending on the quantities required, local resource conditions and the viability of other supply options. Opportunities may also exist to capture additional freshwater resources for public supply through expansion of the reclaimed system and retirement of existing irrigation or

domestic wells. Wetland rehydration efforts using reclaimed or stored surface water to mitigate pumpage impacts may also allow limited increases in freshwater production.

Costs for individual components of water supply projects, such as wells, pumping equipment, pipeline and treatment facilities, are discussed in the *Consolidated Water Supply Plan Support Document*. In order to provide an estimate of fresh groundwater supply development costs for comparative purposes with other supplies, a hypothetical fresh groundwater supply project was evaluated based on component costs in the *Consolidated Water Supply Plan Support Document,* and personal communications with District engineering design consultants. The project presumed development of a new 5-MGD water supply. The project employed lime softening followed by chlorination as the treatment process.

Project costs include facility design, construction, general operation and maintenance, land costs, and raw and finished water storage (at the treatment facility site). No high-service pumping or connection costs for finished water transmission mains were included in the estimate. It was assumed all pipelines required a 35-foot permanent easement. Property requirements include 1 acre per MGD for treatment capacity, and 1 acre per production well site. Unit costs (per acre or per square foot) are identified in **Appendix H**. Storage needs were presumed at 50 percent of treatment capacity, with design and construction costs for storage estimated at $0.32/gallon. Annual operation and maintenance of storage and pipelines was assumed at 2 percent of the capital cost of installation. Source water is presumed to be provided by six, 1-MGD wells arranged in a linear pattern extending 2.5 miles out from the treatment facilities. Unit costs ($/1,000 gallons) reflect capital amortized at 5.65 percent for 20 years. **Table 2** summarizes the results of this exercise.

Table 2. Estimated Project Costs for Development of Fresh Groundwater.

Treatment	Total Capital	Capital $ per gallon of Capacity	Annual O & M	Unit Cost ($/1,000 gallons)
5 MGD Lime Softening	$14,700,000	$2.90	$1,100,000	$1.28

The Caloosahatchee River is a significant water source for agricultural use in Hendry and Glades counties. Water withdrawals support sugarcane, citrus and row crop operations, and other agricultural uses. Capture of public supply water from the river is limited to about 5 MGD by Lee County. The reliability of existing supplies from the Caloosahatchee River should be improved through the construction of the C-43 West Reservoir in Hendry County. The reservoir will capture water at high-flow times from the system and release water to meet environmental requirements and existing user demands in the low-flow periods.

Caloosahatchee River

Future increases in supply from the Caloosahatchee River may be constrained by a revised management schedule for Lake Okeechobee, which is designed to maintain lower levels in the lake; the MFLs established in 2002; initial water reservations that are currently being developed for the system; and, the environmental requirements associated with the Comprehensive Everglades Restoration Plan (CERP) and Acceler8 projects. The viability of the Caloosahatchee River to meet new water supply needs will be determined after the new lake management schedule is selected and the effects of the other regulatory and project constraints on this system are evaluated.

ALTERNATIVE WATER SUPPLY SOURCES

Each alternative water supply source option is discussed in this section to identify its potential for use in the LWC Planning Area.

Seawater

North Lee County Water Treatment Plant
Reverse Osmosis Membrane Unit

This source option involves using seawater (typically 35,000 milligrams per liter (mg/L) total dissolved salt) from the Atlantic Ocean or the Gulf of Mexico as a raw water source for desalination. The ocean is an unlimited source of water (salt water) from a quantitative perspective; however, removal of salts (desalination) is required before potable and irrigation uses are feasible. To accomplish salt removal, a desalination treatment technology would have to be used, such as distillation, reverse osmosis (RO) or electrodialysis reversal (EDR).

As part of the 2005–2006 water supply planning process, it was concluded that seawater desalination is a potential alternative supply that merits future consideration. At this time, water cost data for seawater desalination facilities range from $2.49/1,000 gallons for the 25-MGD Tampa Bay Water desalination plant in Hillsborough County to $8.77/1,000 gallons for water from the new 36-MGD facility in the country of Singapore. Co-location of seawater desalination facilities with power plants appears to reduce costs. The SFWMD will be conducting a Co-Located Desalination Feasibility Study and a Pilot Saltwater Desalination Project during the next three years. The study location for the feasibility and pilot work has yet to be determined. Based on pilot study results and data from Tampa Bay Water's 25-MGD Seawater Desalination Plant, which is expected to be operational in the fall of 2006, seawater desalination will receive additional consideration in the next LWC Plan Update.

Brackish Surface Water and Groundwater

The Upper Floridan Aquifer is the principal source of brackish supply in the LWC Planning Area. Supply from the Floridan Aquifer is not considered to be a limited resource in the LWC Planning Area. It is expected that a majority of new municipal quantities for the region will be met using the Floridan Aquifer System (FAS). Water from the FAS throughout the planning area is generally nonpotable due to salinity and requires desalination or blending to meet potable standards. Utilities in the LWC Planning Area using the FAS as a drinking water source typically employ reverse osmosis (RO) or an electrodialysis (ED) process to purify the water for distribution and use.

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Brackish groundwater is typically defined as water with a total dissolved salt concentration between 1,000 milligrams per liter (mg/L) and 10,000 mg/L. The terms fresh, brackish, saline and brine are used to describe the quality of the water. Although brackish supplies in the low range of these salinities may be used for some agricultural purposes, they do not meet public drinking water standards. Advanced treatment technologies, such as reverse osmosis (RO), electrodialysis (ED) or electrodialysis reversal (EDR), must be employed before this type of supply is suitable for human consumption.

Agricultural operations in the LWC Planning Area use water from the FAS primarily as a supplemental irrigation or blending source when surface water or supplies from the SAS or IAS are limited, and as a primary source in areas where the salinity of the resource is acceptable for irrigation. Although some water quality deterioration in the Floridan Aquifer has been associated with pumping, no other environmental impacts have been identified in association with use of this resource.

In order to provide an estimate of brackish groundwater supply development costs for comparative purposes with other supplies, a hypothetical brackish groundwater supply project was evaluated based on component costs in the *Consolidated Water Supply Plan Support Document,* and personal communications with District engineering design consultants. The project presumed development of a new 5-MGD finished water supply from a brackish groundwater source and water treatment through RO followed by disinfection using chlorine.

Project costs include facility design, construction, general operation and maintenance, land costs, raw and finished water storage (at the treatment facility site), and concentrate disposal (via deep well injection). No high-service pumping or connection costs for finished water transmission mains were included in the estimate. All other project costs and assumptions relative to property requirements and water storage needs are the same as in the fresh groundwater example. Source water is presumed to be brackish (less than 10,000 mg/L total dissolved solids (TDS), delivered by eight, 1-MGD wells arranged in a linear pattern extending 3.5 miles out from the treatment facilities. Treatment recovery is assumed to be approximately 80 percent. **Table 3** summarizes the results of this exercise.

Table 3. Estimated Project Costs for Development of Brackish Groundwater.

Treatment	Total Capital	Capital $ per gallon of Capacity	Annual O & M	Unit Cost ($/1,000 gallons)
5 MGD Brackish Groundwater RO	$25,400,000	$5.08	$2,100,000	$2.33

Surface Water Captured Predominately During Wet-Weather Flows

The capture of surface water, primarily during wet-weather conditions and storage either aboveground or underground for future use, can provide a stable water supply for municipalities, agricultural uses and environmental management. Typically, the six-month, summer rainy season provides more than 65 percent of the annual rainfall in southwest Florida, creating the opportunity for such withdrawals.

Often these systems are designed around a flow-based withdrawal schedule (Tampa Bay Water, Alafia River, Water Use Permit 2011794). This enables initiation of withdrawals when flow in the river/canal systems rises above a specified environmental level and allows the capture of a percentage of flow from the system above that environmental level. Systems such as these capture only an environmentally sustainable percentage of flow, ensuring the freshwater needs of the river and estuary are not adversely affected by the withdrawals. Yields will depend primarily on the seasonal flow characteristics of the surface

water system, the freshwater requirements of the estuary and the availability of storage.

C-43 West Reservoir Construction

In the LWC Planning Area, the District is designing and testing such a system for the Caloosahatchee River. The C-43 West Reservoir, which is under construction in Hendry County and one of the District's Acceler8 projects, will capture a portion of the river's flow during wet-weather conditions and store it in an off-stream reservoir. During dry periods, water will be released from the reservoir to meet environmental requirements in the Caloosahatchee River and to sustain existing water withdrawals on the river. Opportunities to capture seasonal surface water resources also exist in a number of the canal and river systems in the Big Cypress Basin.

In order to provide an estimate for the development of potable surface water supplies for comparison with other sources, a hypothetical fresh surface water supply project was evaluated based on component costs in the *Consolidated Water Supply Plan Support Document,* and data from Tampa Bay Water's Master Water Plan projects. The project estimate presumed development of a new 5-MGD supply from a surface water source, and the associated raw water aquifer storage and recovery (ASR) system needed to ensure the 5-MGD project yield. The withdrawal facility was sized at 15 MGD to enable harvest of a full year's supply within 153 days from June through October. Water not immediately processed for distribution at the surface water treatment facility was filtered, disinfected and placed in a raw water ASR system. Recoveries from the ASR system were presumed to be 75 percent.

Treatment for the finished water supply includes conventional surface water treatment (coagulation, flocculation, sedimentation, filtration and disinfection). The finished water treatment and disinfection system was sized to operate at 5 MGD. A separate 10-MGD filtration and disinfection system was included on-site for the raw water ASR system.

Project costs include facility design, construction, general operation and maintenance, land costs, and raw and finished water storage. No high-service pumping or connection costs for finished water transmission mains were included in the estimate. Property needs were presumed to be 2 acres for the intake and pump station. Capital costs for treatment facilities included land costs for a 5-acre treatment plant site, and an additional 10 acres (same location) for

the ASR system. It was presumed the surface water intake would be located within 1 mile of treatment facilities and that all 10 ASR wells would be located adjacent to the treatment facility. Pipeline assumptions, including easement requirements, and required ground storage are the same as in the fresh groundwater and brackish examples. **Table 4** summarizes the results of this exercise, with costs for the associated raw water ASR system shown separately in the table.

Table 4. Estimated Project Costs for Development of Finished Water.

Project	Total Capital	Capital $ per gallon of Capacity	Annual O & M	Unit Cost ($/1,000 gallons)
5 MGD Finished Surface Water, coagulation/sedimentation/ filtration	$17,600,000	$3.52	$770,000	$1.24
Raw Water ASR (10 wells, 1.53 billion gallon storage plus filtration/disinfection)	$9,900,000	$1.98	$1,100,000	$1.02
Total	$27,500,000	$5.50	$1,870,000	$2.26

New Storage Capacity for Surface Water or Groundwater

Storage is an essential component of any supply system experiencing variability in the availability of supply. In Florida, the most common types of water storage include in-ground reservoirs, aboveground impoundments and ASR.

Aquifer Storage and Recovery Technology

Aquifer storage and recovery technology shows promise both for treated and untreated water by providing a storage option during periods of water availability. This technology is currently being used by several utilities at the local level. The level of treatment required after storage and recovery depends on the use of the water, whether it's for public consumption, surface water augmentation, wetlands enhancement, irrigation or a barrier for saltwater intrusion. Because ASR provides for the storage of water that would otherwise be lost to

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Aquifer storage and recovery (ASR) is the underground storage of storm water, surface water or reclaimed water, which is appropriately treated to potable standards and injected into an aquifer through wells during wet periods. The aquifer (typically the Floridan Aquifer System in south Florida) acts as an underground reservoir for the injected water, reducing water loss to evaporation. The water is stored with the intent to later recover the water for treatment and reuse in the future during dry periods.

tide or evaporation, it represents a crucial water supply management strategy for Florida's future.

To date, a total of 28 ASR wells have been constructed within the District. Most of these wells store potable water, although other source waters include raw groundwater, and raw or treated surface water. Approximately 25 percent of the 28 existing ASR wells are operational, while 43 percent are in various stages of operation or testing. The remaining wells are categorized as inactive. In addition to urban uses for ASR, the District, in cooperation with the U.S. Army Corps of Engineers (USACE), is pursuing regional ASR systems as part of the CERP. More than 300 ASR wells are planned as part of the CERP, and most of these are planned around Lake Okeechobee. In the LWC Planning Area, there are currently 14 ASR wells, six of which are operational, seven are in operational testing and one is inactive.

Aquifer Storage and Recovery Well

Project costs for two ASR systems were evaluated in the *Consolidated Water Supply Plan Support Document*, including a 2-MGD potable ASR system and a 5-MGD raw surface water ASR system. Unit cost estimates ranged from $0.44/1,000 gallons for the potable system to $1.02/1,000 gallons for the surface water system. The unit cost difference between the potable ASR and the raw water ASR system reflects a remote location, and pipeline costs for the surface water ASR well and a microfiltration treatment system for the injected raw surface water.

Local and Regional Reservoirs

Surface reservoirs provide storage of seasonably available resources for use during dry times, improve irrigation efficiency and can be used to improve stormwater quality. For example, small-scale (local) reservoirs are used by individual farms for storage of recycled irrigation water or the collection of local stormwater runoff. These reservoirs are also useful in providing water quality treatment before off-site discharge. Large-scale reservoirs (regional) are used for stormwater attenuation, water quality treatment in conjunction with stormwater treatment areas and for storage of seasonally available supplies for use during dry times.

Due to environmental and topographical considerations in south Florida, new surface reservoir storage is generally off-stream, meaning no damming of the river is involved to create the reservoir. Water is typically pumped from rivers

and canals during wet-weather conditions and stored in an aboveground or at-grade reservoir for use in the dry season. The previously mentioned C-43 West Reservoir in Hendry County will operate in such a manner. The C-43 West Reservoir's design includes up to 52 billion gallons of off-stream storage for water captured from the Caloosahatchee River during high flows. Reservoir releases will be made to meet environmental requirements and sustain the resource for existing permitted users.

Off-stream reservoirs recently completed in Florida include the Tampa Bay Reservoir in southern Hillsborough County, which began operation in spring 2005. This system has the capacity to store up to 15 billion gallons of water from the Alafia and Hillsborough rivers and the Tampa Bypass Canal. Based on the pumping and treatment system installed, the annual average water supply yield of the two rivers and the Tampa Bypass Canal without the reservoir is about 40 MGD. Adding the reservoir to that system increased the average annual yield to over 60 MGD.

Reservoir construction costs are discussed in Chapter 3 of the *Consolidated Water Supply Plan Support Document*. Based on that information, capital costs per gallon of storage for a 5 billion gallon reservoir range from about $0.015/gallon to $0.017/gallon depending on the reservoir footprint. Analysis suggests land costs affect the total project costs more than berm height for reservoirs designed to accommodate water depths less than 12 feet. The only data readily available on reservoir operation and maintenance costs in southwest Florida are from Tampa Bay Water's C.W. "Bill" Young Reservoir in Hillsborough County (Tampa Bay Water 2005). The contracted annual reservoir operation and maintenance costs for this 1,200-acre, 15 billion gallon reservoir averages $867,000/year, including an optional algaecide application, which comprises about 40 percent of that average annual cost. Calculated per acre of water surface, this represents an annual operation and maintenance estimate of $722/acre. Calculated per gallon of storage volume, the cost is $0.0001/gallon. These annual costs reflect general operations, water quality maintenance and preventative maintenance. Annual costs do not reflect any significant capital repairs that may be periodically required.

Reclaimed Water

Reclaimed water is a key component of Florida's regional water supply plans for both wastewater management and water resource management. Reclaimed water strategies in the regional water supply plans can include such measures as further development of urban reclaimed water systems, reclaimed water system interconnections, and ASR for storage and groundwater recharge. In the LWC Planning Area, over 80 percent of wastewater is beneficially reused.

DISTRICT

Reclaimed water is water that has received at least secondary treatment and basic disinfection, and is reused after flowing out of a domestic wastewater treatment facility. Reuse is the deliberate application of reclaimed water for a beneficial purpose, in compliance with the Florida Department of Environmental Protection (FDEP) and water management district rules.

Potential uses of reclaimed water include landscape irrigation (e.g., residential lots and golf courses), agricultural irrigation, groundwater recharge, industrial uses, environmental enhancement and fire protection.

IN THE LWC PLANNING AREA, ACCORDING TO THE 2004 REUSE INVENTORY, OVER 80 PERCENT OF WASTEWATER IS BENEFICIALLY REUSED.

Reclaimed water offers an environmentally sound means for managing wastewater that dramatically reduces environmental impacts associated with discharge of secondary treated effluent. In addition, use of reclaimed water provides an alternative water supply for many activities that do not require potable quality water, such as irrigation, which serves to conserve available supplies of potable quality water. Finally, some types of reclaimed water offer the ability to recharge and augment available water supplies with high quality reclaimed water.

In addition to costs for transmission and distribution system installation, reclaimed water capital costs typically include upgrading wastewater treatment facilities to advanced secondary treatment by adding filtration and high-level disinfection. Additional upgrades to "advanced wastewater treatment," which reduce nitrogen and phosphorous, may be needed if rehydration or wellfield recharge projects are contemplated. A generalized cost example for adding 5 MGD in high-level disinfection and filtration (i.e., conversion to advanced secondary treatment) at a wastewater treatment plant (WWTP) currently using secondary treatment is provided in **Table 5**. To ensure consistency with other comparative cost estimates in this chapter, it was presumed an additional 5 acres of property adjacent to the existing facility would be required (1 acre per MGD

of capacity) for this installation. Assumptions relative to debt service are consistent with the other examples in this chapter. The costs shown do not include capital costs for installation, and operation and maintenance costs for reclaimed transmission and distribution pipelines, which would be significant. It must also be noted that these costs also do not reflect the capital investment, and operation and maintenance costs for the original secondary treatment wastewater treatment plant, as these costs would have been necessary regardless of whether or not the facility provides reclaimed water. A listing of reclaimed water facilities and capacities is provided in the Potable and Wastewater Treatment Facilities **Appendix E**.

Table 5. Estimated Project Costs for Upgrade from Secondary to Advanced Secondary Treatment.

Treatment	Total Capital	Capital $ per gallon of Capacity	Annual O & M	Unit Cost ($/1,000 gallons)
Addition of 5 MGD filtration and high-level disinfection to existing secondary treatment WWTP	$5,100,000	$1.02	$113,000	$0.30

Reclaimed Water System Interconnects

Reclaimed interconnects are connections between two or more reclaimed water distribution systems (which may be owned or operated by different utilities), or between two or more domestic wastewater treatment facilities that provide reclaimed water for reuse activities. Reclaimed water system interconnects offer a means to increase both the efficiency and reliability of reclaimed systems. When two or more reclaimed water systems are interconnected, additional system flexibility and reliability are often developed. For example:

- One system may be newer with fewer customers and be adjacent to a more mature system that could use additional reclaimed water to meet the needs of its customers.
- An interconnect between a mature reclaimed water system and a system that has no reclaimed water, or limited reclaimed water customers, can help avoid (or limit) the need for a supplemental groundwater or surface water supply to meet seasonal demands in the more mature system.
- If one reclaimed water facility experiences a temporary problem with supplying reclaimed water of acceptable quality, the interconnect with another facility can provide a means to enable continued delivery of reclaimed water to system customers, while the problem is resolved.
- Interconnects may offer the ability to share system storage facilities, which would increase flexibility, while maximizing use of existing storage facilities. As ASR becomes more common as a means for storing

reclaimed water, reuse system interconnects could provide opportunities for development of shared ASR systems as key components of regional reclaimed water programs.

As recommended in the *2000 Lower West Coast Water Supply Plan* (2000 LWC Plan), the District initiated the Regional Irrigation Distribution System (RIDS) Project. This project included feasibility studies to evaluate and support the interconnection of reclaimed water systems in the LWC Planning Area. The intent of the interconnections is to make reclaimed water available to a wider customer base, as well as improve opportunities for storage of reclaimed water and seasonally available surface water that might be used to supplement the reclaimed system. **Appendix G** provides more detailed information regarding the RIDS feasibility studies and project implementation.

DISTRICT

Reclaimed water is also emphasized in policy documents, such as the April 2002 *Florida Water Conservation Initiative* and the *2001 Florida Water Plan*. The Water Resources Implementation Rule (Chapter 62-40, Florida Administrative Code) as amended in 2005, requires the Florida Department of Environmental Protection (FDEP) and water management districts to advocate and direct the reuse of reclaimed water as an integral part of water management programs, rules and plans. The South Florida Water Management District (SFWMD or District) requires all applicants for water use permits to use reclaimed water unless the applicant can demonstrate it is not available or it is not technically and environmentally feasible to do so.

Additional guidance relating to the implementation of water reuse in Florida is given in the 2003 FDEP *Water Reuse for Florida – Strategies for Effective Use of Reclaimed Water* report. The following strategies, identified in the report, are the ones most directly related to the development of regional water supply plans:

- Encourage groundwater recharge and indirect potable reuse.
- Encourage metering and volume-based rate structures.
- Encourage use of reclaimed water in lieu of other water sources.
- Encourage use of supplemental water supplies.
- Facilitate seasonal reclaimed water storage.
- Encourage reuse system interconnects.
- Encourage integrated water education.
- Link reuse to regional water supply planning.
- Implement viable funding programs.

The report provides a road map for the State of Florida's Water Reuse Program into the 21st century. The *Water Reuse for Florida Report* (Reuse Coordinating Committee 2003) is available from the FDEP Web site: http://www.floridadep.org/water/reuse/techdocs.htm.

Nontraditional

Strategically located surface water storage (primarily storage in combination with improved stormwater management systems) could improve stormwater quality, recharge Surficial Aquifer wellfields, reduce the potential for saltwater intrusion and reduce wetland drawdowns. On-site storage in agricultural areas may reduce the need for water from other freshwater source options. Stormwater reservoirs could be located with ASR facilities and provide a water source for the facility.

CONSERVATION

Water conservation is regarded as an important component in integrated water resource management and vitally important for the LWC Planning Area. Measures to use water more efficiently can be less expensive than projects that increase supply. Other important advantages of conservation include reducing stress on natural systems. Water conservation projects are often easier to implement than supply projects due to less complex permitting, lower costs and acceptance by the public.

Increased use of reclaimed water and increased water conservation and research were recommended in the 2000 LWC Plan to meet the region's projected water demands and to reduce the potential for harm to wetlands and water resources. The various definitions of harm are provided in **Chapter 3**.

A Statewide Effort

In response to growing water demands, water supply problems and one of the worst droughts in Florida's history, the FDEP led a statewide Water Conservation Initiative to find ways to improve efficiency in all categories of water use. Hundreds of stakeholders participated in the initiative, which addressed all water use classes and subsequently offered alternatives to save water. Fifty-one cost-efficient alternatives were published in *The Florida Water Conservation Initiative* (FDEP 2002). These alternatives can be found in the *Consolidated Water Supply Plan Support Document* (SFWMD 2005–2006). The conservation methods best suited to the scope of the 2005–2006 LWC Plan Update are presented in **Appendix I**.

In addition to policy and regulatory measures, the following conservation measures were the highest ranked of the Water Conservation Initiative alternatives:

Agricultural Water Conservation

Agricultural irrigation accounts for one of the largest water uses in the LWC Planning Area. Improvements in the recovery and recycling of irrigation water and greater use of reclaimed water for irrigation have already resulted in significant water savings throughout the region.

Over 66 percent of the citrus acreage in the LWC Planning Area is now irrigated using low-volume technology or microirrigation, while the remaining acreage is irrigated by flood irrigation. Much of the acreage currently irrigated by flood irrigation is located in Chapter 298 Districts (Chapter 298, F.S.), where several growers use a method of rain harvesting, which recycles water after each use and moves it from one citrus grove to another. Conversion of citrus acreage from flood irrigation to microirrigation will continue to increase water savings. The U.S. Department of Agriculture–Natural Resources Conservation Service (USDA–NRCS) has promoted water conservation through conversion of flood irrigation systems to low-volume technology with its Environmental Quality Improvement Program (EQIP) cost-sharing program.

Urban Water Conservation

Landscape Irrigation

Landscape irrigation for watering lawns, ornamental plants and golf courses can be significantly reduced through more efficient irrigation system design, installation and operation, and by reducing the amount of landscape requiring intensive irrigation. Rain sensors can save an average of 27,000 gallons per year per home irrigation system. If 75 percent of homes in the LWC Planning Area were to install rain sensors, the region could annually save an estimated 9.9 MGD.

Indoor Water Use

Indoor water use accounts for a major portion of demands on public water supply. The greatest potential for conserving water in this sector is through increasing the number of Florida homes and businesses using water efficient toilets, clothes washers, showerheads, faucets and dishwashers. Plumbing retrofit programs were one of the Water Conservation Initiative's highest ranked alternatives and were recommended in the 2000 LWC Plan.

If 75 percent of homes built before 1984 were to retrofit at least one toilet and one showerhead, the LWC Planning Area could potentially achieve a total annual savings exceeding 12 MGD. Whenever indoor water use is reduced, there is also a reduction in wastewater. Achieving this savings is highly dependent on cooperating utilities, and several utilities have conducted small-scale retrofit projects.

The SFWMD will continue to devise programs for retrofits, provide Water Savings Incentive Program (WaterSIP) funding, technical assistance and outreach. The District's WaterSIP is tailored to assist the community to partially fund projects, such as large-scale retrofits, as recommended by this LWC Plan Update. Water pricing rate structures (including drought rates) and informative utility billing are effective techniques to encourage water users to conserve water. Each year the District sets parameters for WaterSIP proposals that stress water conservation options recommended in the regional water supply plans.

Industrial, Commercial and Institutional

Industrial, commercial and institutional users can improve water use efficiency through certification programs for businesses implementing industry-specific best management practices and through water use audits, improved equipment design and installation, and greater use of reclaimed water.

General Policy Considerations

Reuse of reclaimed water can be used more efficiently through pricing and metering. Metering of reclaimed water use and implementation of volume-based rates for reclaimed water is a major strategy contained in the *Water Reuse for Florida – Strategies for Effective Use of Reclaimed Water Report* (Reuse Coordinating Committee 2003) to promote efficient use of reclaimed water.

The role of education and outreach programs and the effect of cooperative funding programs, such as the Mobile Irrigation Lab (MIL) and other agricultural irrigation programs, were also reviewed to assess the potential for water conservation in the LWC Planning Area. Cooperative funding, cost-sharing, WaterSIP and other incentives to support cost-effective projects within all sectors of water use promoting increased efficiency have been effective.

Technician Collecting Discharge Volume from Microirrigation Spray Jet Emitter

The MIL Program began in south Florida in 1989 with an agricultural lab in the LWC Planning Area. The mission of the program is to educate and demonstrate to agricultural and urban water users how to irrigate efficiently. Currently, there

are 15 operational labs in the SFWMD. Ten are District-funded and five are funded by other sources. Twelve counties are served by the labs Districtwide. Funding is provided by a multiagency partnership between federal, state, regional and local levels of government.

In addition to the agricultural lab, which provides evaluations in Collier, Lee, Hendry, Glades and Charlotte counties, two of the four urban labs in the LWC Planning Area are District-funded. The Collier County urban lab has been in operation since 2002, and the Lee County urban lab has been in operation since 1994.

In the past two years (2004 and 2005), recommendations for improvements to irrigation systems in the LWC Planning Area have yielded average potential water savings of 0.9 MGD (900,000 gallons per day). Districtwide, each urban MIL saves an average of 0.08 MGD (80,000 gallons per day) and each agricultural MIL saves an average of 0.41 MGD (410,000 gallons per day). Plans to start additional labs within the District's boundaries are under way.

More information on conservation efforts and plan recommendations for the LWC Planning Area can be found in **Appendix I**.

DISTRICT

Conserve Florida Program

During finalization of this plan update, legislation was passed incorporating and codifying the development of the statewide Water Conservation Program for public water supply (Section 373.227, F.S.). The law provides goals that must be addressed as part of the program, called "Conserve Florida," which encourages conservation by utilities and stresses accountability.

As provided in Section 373.227(4), F.S., a water management district must approve a goal-based water conservation plan as part of a consumptive use permit if a utility provides reasonable assurance that the plan will achieve effective water conservation, at least as well as the water conservation requirements adopted by the appropriate water management district, and is otherwise consistent with the statute.

Also required by Florida House Bill 293, and included in the Conserve Florida Program, are guidelines that address Xeriscape™ landscaping and the development of a statewide model ordinance to increase landscape irrigation efficiency. In addition, the 2004 legislation allows water management districts to require the use of reclaimed water, if feasible, and to encourage metering of newly implemented reuse projects, enabling utilities to charge for the actual volume of water used. See Chapters 367, 373, 403, 570 of the Florida Statutes for specific legislative authority on the statewide Water Conservation Program.

SUMMARY

Rapid growth in the LWC Planning Area will add 197 MGD in new water demand by 2025. Demand will increase in all six major use categories with the largest increase in Public Water Supply. Additional supplies must be developed and conservation measures must be improved to meet future needs. Since the amount of additional freshwater supplies to meet 2025 demand is limited, development of new alternative supplies is essential. Viable alternative sources include brackish water, expansion of the reclaimed system and the capture of seasonally available surface water.

Aquifer Storage and Recovery Drill Rig

The addition of storage, most likely ASR, will be critical to expansion and maximum use of the reclaimed system, as well as augmentation of the system using wet-weather surface water flows. The expansion of storage also holds promise in providing new potable supply opportunities and potentially providing water that could be used to mitigate wetland impacts and improve freshwater wellfield yields.

ALTERNATIVE WATER SOURCE OPTIONS

Section 373.019, Florida Statutes (F.S.) provides:

"Alternative water supplies" means salt water; brackish surface and groundwater; surface water captured predominately during wet-weather flows; sources made available through the addition of new storage capacity for surface or groundwater; 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 nontraditional for a water supply planning region in the applicable regional water supply plan.

BRACKISH WATER / SEAWATER Water containing significant amounts or concentrations of dissolved salts or total dissolved solids (TDS) that is treated for use as an alternative water source.

CAPTURED STORMWATER / SURFACE WATER Water captured predominantly during wet weather flow and stored aboveground or underground for future beneficial use.

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

OTHER Water from nontraditional sources identified in the water supply plans, or water from conveyance facilities or operable structures for water supply.

6

Water Resource Development Projects

Florida water law identifies two types of projects to meet water needs: Water Resource Development projects and Water Supply Development projects. Water Resource Development projects are generally the responsibility of a water management district, and are intended to assure the availability of an adequate supply of water for all competing uses deemed reasonable and beneficial, and to maintain the functions of natural systems. Water Supply Development projects are generally the responsibility of local users, such as utilities, and involve the water source development options described in **Chapter 5** to provide water to users.

LAW / CODE

Water resource development is defined in Section 373.019(22), Florida Statutes (F.S.), as the formulation and implementation of regional water resource management strategies, including the collection and evaluation of surface water and groundwater 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 groundwater recharge augmentation; and related technical assistance to local governments and to government-owned and privately owned water utilities.

This chapter addresses the role of the South Florida Water Management District (SFWMD or District) and other parties in Water Resource Development projects, and provides a summary of the Water Resource Development projects in the Lower West Coast (LWC) Planning Area, including schedules and costs for Fiscal Years 2006–2010. Water Supply Development projects are addressed in **Chapter 7**.

Water Resource Development projects support and enhance Water Supply Development projects, but often by themselves do not yield specific quantities of water. For example, hydrologic investigations and groundwater monitoring and modeling provide important information on aquifer characteristics, such as hydraulic properties and water quality. All of these efforts are useful in developing an appropriate facility design, identifying the safe yield and evaluating the economic viability of Water Supply Development projects. The Water Resource Development projects described in this chapter—drilling and testing, groundwater and wetland monitoring, groundwater and evapotranspiration assessments, Districtwide feasibility studies, minimum flows

and levels, and reservations—do not produce water, but serve an important role in supporting the Water Supply Development projects described in the next chapter. The Water Conservation Program, which makes water available, is discussed in this chapter, and encourages measures to use water more efficiently so the water saved can be used to meet new needs. In effect, conservation expands current water supplies.

The following water resource efforts are organized according to the current budget categories the District uses for funding both new and ongoing Water Resource Development projects. The status of these projects and identification of implementing entities are included in project discussions.

Table 6 at the end of the chapter summarizes the estimated costs and time frames for completion of these projects. The District's Water Resource Development projects presented in this chapter encompass more than one region and are therefore considered Districtwide. Aspects of these Districtwide projects specifically pertaining to the LWC Planning Area are identified.

DRILLING AND TESTING PROGRAM

A Districtwide Drilling and Testing Program is providing an improved understanding of the geology and hydrology of the aquifers in south Florida as new exploratory/test wells are constructed during the next five years. Efforts will continue to evaluate conditions in the Floridan Aquifer System (FAS) as a brackish water supply source for the LWC Planning Area, and well construction activities at each site are yielding additional information on the aquifers and confining units above the FAS. These efforts will develop a more complete understanding of the hydrology and potential yields of the aquifer system, as well as support consumptive use permitting (CUP) and water supply development efforts.

GROUNDWATER AND WETLAND MONITORING

Well construction and monitoring efforts provide information on geology, aquifer characteristics and water level conditions to aid the SFWMD in the development of groundwater models, assessing groundwater conditions and management of this resource. Aquifer monitoring is an ongoing effort.

Groundwater Monitoring

Groundwater level and water quality monitoring in the LWC Planning Area was expanded between 2000 and 2005. Ongoing monitoring efforts continued in the

Surficial Aquifer System (SAS) and Intermediate Aquifer System (IAS), and an additional 23 recorders were installed on SAS wells in Hendry County to evaluate local water level trends. The FAS network was expanded to 12 sites within the LWC Planning Area. Continuous water-level recorders have been installed at these sites, and periodic water quality assessments are available.

Wetlands Monitoring Network

Wetlands serve a vital role in providing habitat for many species of plants and animals. Within the SFWMD, consumptive uses, drainage or other diversions of water may impact the hydrologic system supporting these wetlands. To better understand these systems, the District has expanded its network of wetland monitoring sites Districtwide.

GROUNDWATER AND EVAPOTRANSPIRATION ASSESSMENTS

A number of specialized hydrogeologic studies were completed by the U.S. Geological Survey (USGS) in cooperation with the District. The information learned from these studies is needed to enhance the understanding of aquifers and evapotranspiration (ET) rates across the District. Typically, each project requires several years of focused effort by the USGS professionals, giving a continuity and focus unique to the USGS. Some projects have the cooperation of other water management districts or other governmental agencies. The USGS reports, maps and data are peer reviewed and highly respected in the industry, making them invaluable references for District groundwater models, assessments and policy-making.

Current USGS projects include development of a water quality module for a new District model and a project to measure ET in five specific vegetation communities that occur throughout the District. In addition, a study of the salinity patterns and sediment runoff in Estero Bay is being conducted in the LWC Planning Area.

COMPREHENSIVE WATER CONSERVATION PROGRAM

The SFWMD's overall water conservation goal is to prevent and reduce wasteful, uneconomical, impractical or unreasonable uses of water resources. In addition to improving efficiency of water use, the statewide Water Conservation Program, known as "Conserve Florida," strives to improve management of traditional supplies and encourage development of alternative or diverse water supply

sources. To better promote the conservation goal, the SFWMD funds outreach and educational programs to encourage water users to make efficient use of water resources through conservation and reuse.

Through the Water Savings Incentive Program (WaterSIP), the SFWMD provides matching funds up to $50,000 to water providers, such as utilities and homeowners associations, for water-saving technologies. These technologies include low-flow plumbing fixtures, rain sensors, fire hydrant flushing devices and other hardware. During Fiscal Years 2002–2006, 41 projects were funded Districtwide and cumulatively made 2.5 MGD of water available. For Fiscal Year 2007, 14 projects are proposed for funding and are anticipated to make 0.9 MGD (900,000 gallons per day) of water available. Based on the actual and proposed water savings for Fiscal Years 2002–2007, it is anticipated that a cumulative total of 3.4 MGD of water will be made available Districtwide. Since the program's inception in 2002 through 2011, it is estimated that 4.25 MGD of water will be made available by WaterSIP.

Mobile Irrigation Lab Program

The Mobile Irrigation Laboratory (MIL) Program consists of specialized labs on wheels designed to conduct irrigation audits of agricultural and urban irrigation systems. The MILs are operated by the Soil and Water Conservation Districts and provide recommendations to water users who implement the water savings recommendations. It is anticipated the MIL Program will make a cumulative total of 10 MGD available Districtwide between Fiscal Years 2007–2011. Since the program's inception in 1989 through 2006, it is estimated that 106 MGD of water has been made available by the MIL program.

Districtwide, there are 15 MILs serving 12 counties. Ten MILs are District-funded and five are funded by other sources. In the LWC Planning Area, there are five MILs, three of which are funded by the District. These include an urban lab in Collier County, an urban lab in Lee County, and an agricultural lab that provides evaluations in Collier, Lee, Hendry, Glades and Charlotte counties. See **Appendix I**: Conservation for more information about the MIL Program in the LWC Planning Area.

Rulemaking efforts are under way at the SFWMD to consider goal-based conservation as a permit condition. Workshops are being held concerning revisions to Chapter 40E-2, Florida Administrative Code (F.A.C.), and the *Basis of Review for Water Use Permit Applications* (SFWMD 2003) that would require individual water utilities to develop goal-based conservation programs. Goal-based conservation allows utilities to achieve a water management district agreed-upon conservation goal, such as a reduction in per capita or overall reduction in pumpage, using any method from a suite of methods the utility chooses, to satisfy CUP conservation requirements.

FEASIBILITY STUDIES

The SFWMD is performing feasibility studies to determine the viability of water resource development options in order to increase water supply through water resource alternatives. This effort involves collecting and analyzing data and modeling.

Water User and Supply Cost Relationships Feasibility Study

The objective of the Water User and Supply Cost Relationships Project is to develop engineering cost estimation relationships for evaluating water supply alternatives for the SFWMD's four planning regions. This effort will include options using groundwater, surface water, seawater, aquifer storage and recovery (ASR), and reclaimed water for reuse.

Co-Located Desalination Feasibility Study

Desalination Plant

As discussed in **Chapter 5**, saltwater desalination is a potential alternative source meriting future consideration. Seawater has been identified as a significant drought-proof and available resource. Recommended technologies for use or further study in the treatment of brackish water or seawater include reverse osmosis (RO). Advances in membrane technologies have substantially reduced the cost of RO treatment, creating recent interest in the implementation of RO in the coastal United States, including Florida, Texas and California. The 25-MGD Tampa Bay Water RO plant, co-located with the Tampa Electric Company's Big Bend

Power Plant, is expected to start producing water by December 2006. In California, the City of San Diego is implementing a 50-MGD co-located seawater RO facility in Carlsbad, based on the results of its successful demonstration project.

To demonstrate the feasibility of coastal water desalination and the benefits of co-locating large desalination plants with existing power plants in south Florida, the current study builds on the results obtained from the 2002 Desalination Feasibility Study. The study area will be streamlined to a small number of site-specific demonstration projects throughout the District, and final site selection will be based on the availability of willing partners, future water demand, and technical, regulatory and economic criteria. The study, which will be completed in October 2006, is expected to recommend specific demonstration projects and provide conceptual designs.

MODELING

The SFWMD funds modeling efforts supporting the establishment of minimum flows and levels (MFLs), water reservations and projects in the District's four regional planning areas.

Modeling for Minimum Flows and Levels

Minimum flows and levels are being developed pursuant to the requirements contained within the *Water Resources Act* and Sections 373.042 and 373.0421, Florida Statutes (F.S.), as part of a comprehensive water resources management approach to assure the sustainability of south Florida's water resources. As part of the MFL process, the SFWMD develops models to assist in determining the hydrologic relationships between MFL criteria and the water resources that need to be protected from significant harm.

Modeling for Regional Irrigation Distribution System (RIDS)

A recommendation of the *2000 Lower West Coast Water Supply Plan* (2000 LWC Plan) included conducting a feasibility and design study for a regional irrigation water distribution system (RIDS) to help meet the growing urban irrigation demands of the LWC Planning Area. Reclaimed water was to be used where available to serve the irrigation distribution systems. The RIDS Study was completed in 2004, and implementation began in 2005 with the District providing $500,000.

The RIDS Project is now funded through the SFWMD's Alternative Water Supply Program, and projects are managed by local governments and utilities.

The District's role is analysis, oversight and intergovernmental coordination, which potentially includes modeling efforts. The expected completion of RIDS is 2020. **Appendix G** provides more detailed information on the analyses and implementation of RIDS.

Surficial, Intermediate and Floridan Aquifer Model Development

In 2001, based on the recommendations in the 2000 LWC Plan, the District began development of regional groundwater models for the SAS, IAS and FAS in the LWC Planning Area. This ongoing effort involves the implementation of two new groundwater models: one for the SAS, including the water table, Lower Tamiami and Sandstone aquifers, and another for the IAS and FAS. Both models include finer grid resolution than previous regional efforts and the most current geologic, hydrologic and pumping data.

The SAS Model is a groundwater flow model developed using the USGS MODFLOW Program. The SAS Model implementation is being conducted by a private engineering firm under contract to the District. The FAS modeling is being conducted using the SEAWAT Program, which simulates variable density flow and transport conditions. The FAS Model is a joint effort between the District and Florida Atlantic University.

Due to time constraints imposed upon the water supply plan schedules from the adoption of state growth-management legislation in late 2005, the modeling efforts are on a parallel, but separate path from the production of the five-year update for the LWC Plan. The following model items will be completed after the update of the LWC Plan: calibration, documentation of the models and peer review.

MINIMUM FLOWS AND LEVELS ACTIVITIES

As part of the process of establishing and maintaining MFLs, the SFWMD is developing and implementing an electronic tracking system to determine whether MFL criteria are being met. Other efforts include producing documents and conducting scientific and peer reviews.

RESERVATIONS ACTIVITIES

The process of establishing water reservations for resource protection involves preparing documents, conducting scientific peer reviews, holding public workshops and providing administrative support. In some cases, the District assembles a team of experts to assist with analysis, interpretation, and

presentation of technical issues and information needed to develop and implement a standardized methodology/approach for water reservations.

OTHER EFFORTS

Other efforts may be funded by District departments other than Water Supply and could include cofunding by local, state and federal agencies. Several efforts initially cited in the 2000 LWC Plan now fall under the auspices of the Comprehensive Everglades Restoration Plan (CERP) and Acceler8. These projects are discussed in **Chapter 3**.

SUMMARY

Water Resource Development projects serve various purposes in support of water supply development. The beneficial outcomes of the resource development projects discussed in this chapter include:

- Improved understanding of the hydrologic system that is the source of both traditional and alternative water supplies for the LWC Planning Area.
- Prevention of loss of natural resources.
- Preservation of existing supplies through better resource understanding, and management and implementation of regional resource improvement programs.
- Avoidance of potentially greater future expenditures associated with additional restoration of environmental degradation.
- Cost savings, including those savings associated with appropriate supply facilities design and use of existing resources.
- Increased future supply availability through testing or program implementation.

Table 6. Implementation Schedule and Costs for Districtwide Water Resource Development Projects Fiscal Years 2006–2010.

Project	Plan Implementation Schedule and Costs ($1,000s)					
	FY06	FY07	FY08	FY09	FY10	Total
	$	$	$	$	$	$
Drilling and Testing Est. start date: 1990 Est. finish date: ongoing	1,736	109	115	121	127	2,208
Groundwater and Wetland Monitoring Est. start date: 2002 Est. finish date: ongoing	810	581	610	640	627	3,268
Groundwater and ET Assessments Est. start date: 1954 and 2002, respectively Est. finish date: ongoing	385	270	284	298	313	1,550
Water Conservation Program Est. start date: 1977/2000 Est. finish date: ongoing	1,650	1,248	1,248	1,248	1,248	6,642
Districtwide Feasibility Studies Est. start date: 2001 Est. finish date: ongoing	950	550	600	600	600	3,300
Modeling Est. start date: 1998 Est. finish date: ongoing	100	195	205	215	226	941
MFLs Activities Est. start date: 1995 Est. finish date: ongoing	105	160	200	200	200	865
Reservations Activities Est. start date: 2004 Est. finish date: ongoing	425	195	200	200	200	1,220
Total	$6,161	$3,308	$3,462	$3,522	$3,541	$19,994

LAW / CODE

Section 373.196(3), Florida Statutes (F.S.), provides:

The primary roles of the water management districts in water resource development as it relates to supporting alternative water supply development are:

(a) The formulation and implementation of regional water resource management strategies that support alternative water supply development;

(b) The collection and evaluation of surface water and groundwater data to be used for a planning level assessment of the feasibility of alternative water supply development projects;

(c) The construction, operation, and maintenance of major public works facilities for flood control, surface and underground water storage, and groundwater recharge augmentation to support alternative water supply development;

(d) Planning for alternative water supply development as provided in regional water supply plans in coordination with local governments, regional water supply authorities, multijurisdictional water supply entities, special districts, and publicly owned and privately owned water utilities and self-suppliers;

(e) The formulation and implementation of structural and nonstructural programs to protect and manage water resources in support of alternative water supply projects; and

(f) The provision of technical and financial assistance to local governments and publicly owned and privately owned water utilities for alternative water supply projects.

7

Water Supply Development Projects

The population in the Lower West Coast (LWC) Planning Area is expected to increase by about 74 percent, growing to about 1.6 million by 2025. Net water demand for all users is projected to increase by approximately 197 million gallons per day (MGD) between 2005 and 2025 to 821 MGD. Water to serve increased future urban demand is expected to be developed primarily from alternative water supplies, including brackish groundwater resources, surface water captured during wet weather and expansion of reclaimed water systems. Agriculture, the largest water user in the LWC Planning Area, must continue to improve irrigation practices to conserve water and, where feasible, use alternative supplies, such as blended sources and tailwater/stormwater recovery systems.

WATER TO SERVE INCREASED FUTURE URBAN DEMAND IS EXPECTED TO BE DEVELOPED PRIMARILY FROM ALTERNATIVE WATER SUPPLIES, ...

This chapter provides a summary of the Water Supply Development projects anticipated to meet the needs of the LWC Planning Area for the next 20 years. Information is provided for each water use category, with a particular emphasis on the fast-growing Public Water Supply sector. Additional details about individual users, projects, quantities developed and project costs can be found in **Appendices A**, **B** and **D**.

LAW / CODE

Water supply development is defined in Section 373.019(24), Florida Statutes (F.S.), 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.

Local governments, government-owned and privately owned utilities, regional water supply authorities, multijurisdictional water supply entities, self-suppliers, and other water users are primarily responsible for Water Supply Development projects.

Water Supply Development projects selected for inclusion in this *2005–2006 Lower West Coast Water Supply Plan Update* (2005–2006 LWC Plan Update) primarily include alternative water supplies. As part of the

planning process in preparing this plan update, the South Florida Water Management District (SFWMD or District) circulated a questionnaire to solicit information from municipal, agricultural and other water suppliers regarding the traditional and alternative water supply projects planned to meet their needs for the next 20 years. This process allowed local governments, water suppliers and water users to provide input on the proposed water supply projects included in the plan update.

Not all projects presented in the questionnaires are included in this plan update. Several factors were evaluated to determine a project's inclusion in the plan update, such as resource constraints, and whether a project actually contributes new water supply. Many projects submitted reflect such practices as maintenance of existing facilities and improvements in the distribution system. While these projects reflect good utility practice, they do not represent alternative water supply projects.

Furthermore, a project identified for inclusion in this plan update may not necessarily be selected for development by the utility. In accordance with Section 373.0361(6), Florida Statutes (F.S.), nothing contained in the water supply component of a regional water supply plan should be construed to require local governments, public or privately owned utilities, special districts, self-suppliers, multijurisdictional entities and other water suppliers to select that identified project. If the projects identified in this plan update are not selected by a utility, the utility will need to identify another method to meet its needs and advise the District of the alternate project(s), and a local government will need to include such information in its 10-Year Water Supply Facilities Work Plan.

Alternative water supply projects listed in this 2005–2006 LWC Plan Update include alternative water supply projects submitted by local suppliers specifically for consideration in this plan update; projects submitted and approved for cost-sharing funds from the District (and the Big Cypress Basin) in Fiscal Year 2006 under the alternative water supply portion of the new Water Protection and Sustainability Program; and, projects recommended by the District for utilities that showed an unmet future need. Thirty-five of the Fiscal Year 2006 alternative water supply projects were in the LWC Planning Area and received over $11.2 million in District allocated cost-share funding, and $5.8 million in Big Cypress Basin allocated funding. These funds are for construction of alternative water supply projects, and applicants must pay at least 60 percent of a project's construction costs.

The fact that an alternative water supply project has been included in this LWC Plan Update makes that project eligible for funding consideration, but does not guarantee District funding of that project. Inclusion in the plan update does not serve by itself as an application for funding. The alternative water supply funding requires completion and submittal (by the project owner) of a separate application for each project for which funding is requested on an annual basis.

The application for alternative water supply funding, as well as submittal time frames and requirements are available from the District's Web site at http://www.sfwmd.gov/watersupply. Detailed information about all projects can be found in **Appendix A**.

Demand and supply conditions for the six major water use categories are evaluated in this chapter. Because the majority of growth in demand during the next 20 years will occur in the urban sector, and more specifically within the public water systems, particular emphasis is placed on evaluating future needs and recommending water supply projects within the Public Water Supply category.

PUBLIC WATER SUPPLY

Public Water Supply (PWS) includes all potable uses served by municipal and private utilities. Public Water Supply demand is projected to grow from the current 128 MGD to 225 MGD in 2025. Public water demand is currently met through a combination of traditional groundwater and fresh surface water supplies, as well as alternative supplies, such as brackish groundwater.

Table 7 shows the comparison between projected Public Water Supply demand and future supply for each county in the LWC Planning Area for Year 2025. Regionwide, **Table 7** shows a surplus 2025 supply condition of about 99 MGD. Countywide information shows a range of surplus supply conditions. Utility summaries providing individual service area data are included later in this chapter. On a countywide basis, the largest projected surpluses occur in Lee and Collier counties, which account for about 98 percent of the Public Water Supply demands in the LWC Planning Area. **Chapter 2** and **Appendix D** provide additional details on the Public Water Supply demand and supply conditions.

The projected supplies in **Table 7** are based on existing permitted supplies; alternative water supply potable water projects submitted and approved for the District's 2006 alternative water supply funding; eligible potable water projects submitted by local water suppliers specifically for the 2005–2006 LWC Plan Update; and, District-recommended projects for those entities that did not supply project information and showed an unmet future need.

Table 7. Public Water Supply Demand and Supply Projections for 2025.

County	PWS Demand (MGD)	Projected Supplies (MGD)[a]	Projected Surplus or Deficit (MGD)
Charlotte[b]	0.0	0.0	0.0
Collier	109.3	147.0	37.7
Glades[c]	0.5	0.7	0.2
Hendry[c]	4.9	19.8	14.9
Lee[b]	110.7	156.7	46.0
Monroe[d]	0.0	0.0	0.0
Total	225.4	324.2	98.8

a. Projected supplies include only potable water in Public Water Supply systems. Projected finished water yields from only those PWS projects that have been included in the utility summaries later in this chapter are shown. Areas served by Domestic Self-Supply shown as "zero" values.
b. State BEBR projections did not capture proposed development at Babcock Ranch in Charlotte and Lee counties. Proposed development of this 17,800 acres and associated water supply lacked data and sufficient analysis to support inclusion of projects in this plan update.
c. Counties have projected growth beyond that projected by BEBR, but have not sought FDCA approval for an exception to the use of BEBR projections. Such exception data will be considered by the District when available.
d. No development expected in the mainland portion of Monroe County.

Traditional public water supplies in the LWC Planning Area have included fresh groundwater from the Surficial and Intermediate aquifer systems and fresh surface water, primarily from the Caloosahatchee River. Approximately 60 percent of the region's current public water demand is met using traditional supplies. Existing demand and environmental constraints will continue to limit development of new traditional supplies sufficient to meet the increasing water demand in the planning area. Although some new traditional supply development may be practicable given appropriate local conditions, reductions in historical water use and opportunities for addressing adverse impacts, the availability and permittability of new traditional supplies to meet projected demands through 2025 have not been demonstrated. As such, the yield from most proposed new traditional supply projects has not generally been included in this plan update as a component of supply available to meet future demand.

The decision not to include most new traditional supply development projects in the plan update should not be interpreted as precluding development of these sources so long as that development is done in compliance with the District rules. In fact, some traditional freshwater projects have been included in this plan update. These projects reflect expansion of small systems currently relying on fresh groundwater to meet their needs. Inclusion of these freshwater projects in the plan update does not confer any special permitting status or relieve the permit applicant for such systems from meeting all District rule criteria in order to qualify for a permit.

The availability of new supply from the freshwater aquifers in the LWC Planning Area is limited due to resource issues, including wetland protection, saltwater intrusion and aquifer protection criteria. Land use changes anticipated in the

region include the reduction in agricultural acreage in Collier and Lee counties, but increased agricultural acreage in Hendry and Glades counties. These changes, especially the reduction in agricultural lands in Lee and Collier counties, may create opportunities for other water users to seek new freshwater allocations. Such opportunities should be addressed on a case-by-case basis due to the site-specific variations that occur in aquifer confining units and other factors.

Operational differences between use types (such as Agricultural and Public Water Supply) may play a major role in determining the availability of water for allocation. Existing agricultural uses are generally seasonal, retain water on-site, and frequently use flood irrigation systems, which tend to raise the water table. On the other hand, most urban uses, including Public Water Supply, are year-round and distribute the water for use in remote locations. Such uses do not result in recharge of groundwater in the immediate area of the wellfield and are prone to have greater resource impacts in the immediate area.

Thus, careful analysis will continue to be required in this rapidly growing region when considering proposals for new water uses to ensure the resource protection criteria can be met by the new use.

Combining the projects submitted for the LWC Plan Update, the 2006 projects in the LWC Planning Area that received funding, and the projects developed by the District, a total of 153 water supply projects were evaluated as part of this plan update development.

Fourteen traditional supply projects were evaluated, including 11 submitted by local utilities and three projects developed by the District to support an unmet future need by small local utilities. In total, if all of these projects were permittable and developed as proposed, they represent about 25 MGD in new supply capacity.

One hundred seventeen alternative water supply projects were evaluated in this process. The alternative sources these projects propose to use include the following:

- Brackish Water: 41 projects yielding a potential 231 MGD (finished water).
- Reclaimed Water: 55 projects with a total constructed capacity of 307 MGD.

- Aquifer Storage and Recovery (ASR): 13 projects with a total dry-season capacity of 32 MGD.
- Surface Water: 8 projects with a total design capacity of 42 MGD.

Water conservation is a critical part of the District's efforts to protect and preserve the region's water resources. Although individual water conservation projects are not included in this chapter, the District's Water Conservation Program and local components are discussed in **Chapter 5**. The SFWMD's programs include an annual funding initiative for water conservation efforts.

Other types of water supply projects submitted for consideration in this LWC Plan Update include monitoring systems, wastewater disposal wells and distribution system improvements, such as potable water interconnections between local governments, finished water storage tanks, pipelines, booster stations, pump upgrades and backup power supplies. While these types of projects are appropriate for utility management and maintenance, they do not generate new water supply and were not included in this plan update.

Individual summary pages are provided herein that identify demand and supply projections for the major utilities in the LWC Planning Area. Yield from existing supplies and new alternative water supply projects is compared with projected water demand for each service area in Years 2015 and 2025. Reclaimed and other nonpotable alternative water supply projects are shown, but not counted toward meeting future potable demand. The reuse of reclaimed water is widespread in the LWC Planning Area, and 55 additional projects have been proposed by major utilities to expand their systems during the next 20 years. The benefits of different reuse applications vary not only in terms of the project, but also in terms of location. For example, installing and mandating hook-ups to a reuse irrigation system in an area using treated drinking water from a municipal utility will lower the utility's per capita consumption and allow the utility to serve more customers with the same volume of potable water.

On the other hand, supplying reclaimed water to self-supplied operations, such as golf courses or other large users, can reduce competition for limited freshwater resources, but does not result in a reduction in demand on the potable water system. The replacement of a self-supplied withdrawal with reuse will not necessarily result in an additional freshwater allocation for the utility.

Other reuse projects, such as wetland or canal recharge, can be designed to support additional allocations by offsetting resource impacts that might preclude permitting of additional wells.

The SFWMD strongly supports reuse projects, and recognizes reuse applications have multiple benefits for the implementing utility. At the planning level, however, it is difficult to predetermine the potential offset without defining and

analyzing the distribution of the reuse. Such offsets will be quantified on a case-by-case basis in the consumptive use permitting process based on the reclaimed water plans developed by the provider.

In the LWC Planning Area, 15 utilities had adequate supplies to meet future demand considering the combination of projects they submitted and existing supplies. Seven utilities in the planning area showed an unmet need in future supply and did not submit projects appropriate for consideration in the plan. In the case of unmet needs, the District has recommended projects for the local utilities to be included in the 2005–2006 LWC Plan Update.

Reclaimed Water Treatment Facility

UTILITY SUMMARY

CHARLOTTE COUNTY

Supply Entity: Charlotte County Utilities

Service Area: Charlotte County

Population and Supply Summary:

Proposed supply projects by 2015: Adequate

Proposed supply projects by 2025: Adequate

Water supplies in this area of Charlotte County are all Domestic Self-Supply, composed of traditional fresh groundwater. Future supplies shown for the area are also projected to be Domestic Self-Supply. The county has proposed development of a 40-MGD brackish supply on the Babcock Ranch to meet demand in its service area, but outside of the SFWMD. Projects that supply water outside of the SFWMD have not been included in the plan update and are not eligible for SFWMD funding. A proposed 17,800-acre development on the Babcock Ranch has not been considered in these projections.

Item	2005 (Existing)	2015 (Projected)	2025 (Projected)
Population[a]	6,163	7,525	8,673
Per Capita (gallons per day finished water)	127	127	127
(Note: All potable volumes are finished water unless noted.)		MGD	
Potable Water Demand (average annual)	0.8	1.0	1.1
Volume from Traditional Sources[b]	0.0	0.0	0.0
Volume from Alternative Sources	0.0	0.0	0.0
Volume of Reclaimed Water Made Available	0.0	0.0	0.0
Additional Potable Water Needed	0.0	0.0	0.0

a. Population within the portion of Charlotte County inside of the SFWMD.
b. All current and projected supply in this portion of the county is Domestic Self-Supply.

Project Summary:

Project Type	Gross Capacity (MGD) 2015	Gross Capacity (MGD) 2025	Est. Capital Cost ($ M)
Traditional	0.0	0.0	N/A
Alternative[a]			$0.0
Captured Storm Water / Surface Water	0.0	0.0	
Brackish Water	0.0	0.0	
Seawater	0.0	0.0	
Reclaimed Water[a]	0.0	0.0	
Other	0.0	0.0	
Total	0.0	0.0	$0.0

a. Reclaimed water in some applications may reduce per capita demands or offset some limitations on resource availability. This will be examined on a case-by-case basis during the permitting process.

UTILITY SUMMARY

COLLIER COUNTY

Supply Entity: Ave Maria Utilities

Service Area: Ave Maria

Population and Supply Summary:

Proposed supply projects by 2015: Adequate

Proposed supply projects by 2025: Adequate

Ave Maria Utilities has a current permit for 1.3 MGD and proposes future water supplies from fresh groundwater. Proposals for increased withdrawals for fresh groundwater have generally not been included in this plan update due to uncertainties about resource issues. Exclusion of new freshwater proposals from this plan update does not limit or influence the permittability of these supply projects. Supporting studies will be needed to determine availability of traditional sources, which are limited by resources and other constraints. Due to the uncertainty of availability of the resource, the SFWMD recommends a brackish water supply project to meet future needs for this development.

Item	2005 (Existing)	2015 (Projected)	2025 (Projected)
Population	0	17,142	30,200
Per Capita (gallons per day finished water)	109	109	109
(Note: All potable volumes are finished water unless noted.)		**MGD**	
Potable Water Demand (average annual)	0.0	1.9	3.3
Volume from Traditional Sources	1.3	1.3	1.3
Volume from Alternative Sources	0.0	2.0	4.0
Reclaimed Capacity Available	0.0	2.3	4.7
Additional Potable Water Needed	0.0	0.0	0.0

Project Summary:

Project Type	Gross Capacity (MGD) 2015	2025	Est. Capital Cost ($ M)
Traditional[a]	0.0	0.0	N/A
Alternative			$20.6
Captured Storm Water / Surface Water	0.0	0.0	
Brackish Water[b]	2.0	4.0	
Seawater	0.0	0.0	
Reclaimed Water	2.3	4.7	
Other	0.0	0.0	
Total	4.3	8.7	20.6

a. Traditional project not shown included expansion of membrane softening plant and installation of additional Lower Tamiami production well capacity.

b. SFWMD proposed brackish water supply project totals 4 MGD RO capacity, six new production wells.

UTILITY SUMMARY

COLLIER COUNTY

Supply Entity: Collier County Public Utility Department

Service Area: Portions of Unincorporated Collier County

Population and Supply Summary:

Proposed supply projects by 2015: Adequate

Proposed supply projects by 2025: Adequate

Water supplies are currently about 50 percent traditional fresh groundwater and 50 percent alternative water supplies. The county proposal to develop approximately 15 MGD in new traditional project capacity by 2025 has not been included here. Exclusion of freshwater projects from this plan update does not limit or influence the permittability of these supply projects. Supporting studies will be needed to determine availability of traditional sources, which are limited by resources and other constraints.

Item	2005 (Existing)	2015 (Projected)	2025 (Projected)
Population	155,739	243,426	342,711
Per Capita (gallons per day finished water)	185	185	185
(Note: All potable volumes are finished water unless noted.)		**MGD**	
Potable Water Demand (average annual)	29.5	45.0	63.4
Volume from Traditional Sources	17.1	17.1	17.1
Volume from Alternative Sources	16.0	40.0	74.0
Reclaimed Capacity Available	21.6	33.5	50.8
Additional Potable Water Needed	0.0	0.0	0.0

Project Summary:

Project Type	Gross Capacity (MGD) 2015	Gross Capacity (MGD) 2025	Est. Capital Cost ($ M)
Traditional[a]	0.0	0.0	$0.0
Alternative			$580.0
Captured Storm Water / Surface Water	0.0	0.0	
Brackish Water	24.0	58.0	
Seawater	0.0	0.0	
Reclaimed Water[b]	11.9	29.2	
Other (finished water ASR)[c]	9.0	9.0	
Total	44.9	96.2	$580.0

a. Freshwater quantities associated with five projects submitted by the county not included.
b. Reclaimed water in some applications may reduce per capita demands or offset some limitations on resource availability. This will be examined on a case-by-case basis during the permitting process.
c. Finished water ASR capacity is a seasonal capacity. Quantity not included in Population & Supply Summary table above.

UTILITY SUMMARY

COLLIER COUNTY

Supply Entity: U.S. Water Corporation

Service Area: Everglades City

Population and Supply Summary:

Proposed supply projects by 2015: Adequate

Proposed supply projects by 2025: Adequate

Water supplies are currently 100 percent traditional fresh groundwater. U.S. Water Corp. operates and maintains the water and wastewater facilities under a contract with the city. Since no projects were submitted by the city or U.S. Water for the LWC Plan Update, the project listed below reflects a SFWMD-proposed project for the city to meet future water demand. Although the project contemplates fresh groundwater development, site-specific conditions evaluated during the permitting process will determine actual resource availability. The city should contemplate a back-up plan for supply, including additional conservation and alternative water supply development, in the event that local conditions do not support the project below.

Item	2005 (Existing)	2015 (Projected)	2025 (Projected)
Population	1,367	1,767	2,219
Per Capita (gallons per day finished water)	315	315	315
(Note: All potable volumes are finished water unless noted.)		**MGD**	
Potable Water Demand (average annual)	0.4	0.6	0.7
Volume from Traditional Sources	0.3	1.0	1.0
Volume from Alternative Sources	0.0	0.0	0.0
Reclaimed Capacity Available	0.1	0.1	0.1
Additional Potable Water Needed	0.0	0.0	0.0

Project Summary:

Project Type	Gross Capacity (MGD) 2015	2025	Est. Capital Cost ($ M)
Traditional	0.7	0.7	$0.9
Alternative[a]			$0.0
Captured Storm Water / Surface Water	0.0	0.0	
Brackish Water	0.0	0.0	
Seawater	0.0	0.0	
Reclaimed Water[a]	0.0	0.0	
Other	0.0	0.0	
Total	0.7	0.7	$0.9

a. Reclaimed water in some applications may reduce per capita demands or offset some limitations on resource availability. This will be examined on a case-by-case basis during the permitting process.

UTILITY SUMMARY

COLLIER COUNTY

Supply Entity: Florida Governmental Utility Authority (FGUA)

Service Area: Golden Gate

Population and Supply Summary:

Proposed supply projects by 2015: Adequate

Proposed supply projects by 2025: Adequate

Water supplies are currently 100 percent traditional fresh groundwater. A supply deficit condition is projected between 2011 and 2015. The FGUA did not provide any projects for the LWC Plan Update. The project listed below reflects a SFWMD-recommended project for FGUA to meet future demand. Although the project contemplates fresh groundwater development, site-specific conditions evaluated during the permitting process will determine actual resource availability. The FGUA should contemplate a back-up plan for supply, including additional conservation and alternative water supply development, in the event that local conditions do not support the project below.

Item	2005 (Existing)	2015 (Projected)	2025 (Projected)
Population	14,001	16,723	19,805
Per Capita (gallons per day finished water)	105	105	105
(Note: All potable volumes are finished water unless noted.)		**MGD**	
Potable Water Demand (average annual)	1.5	1.8	2.1
Volume from Traditional Sources	1.7	2.9	2.9
Volume from Alternative Sources	0.0	0.0	0.0
Reclaimed Capacity Available	0.9	0.9	0.9
Additional Potable Water Needed	0.0	0.0	0.0

Project Summary:

Project Type	Gross Capacity (MGD) 2015	2025	Est. Capital Cost ($ M)
Traditional[a]	1.2	1.2	$3.9
Alternative			$0.0
Captured Storm Water / Surface Water	0.0	0.0	
Brackish Water	0.0	0.0	
Seawater	0.0	0.0	
Reclaimed Water	0.0	0.0	
Other	0.0	0.0	
Total	1.2	1.2	$3.9

a. Project includes 1.2 MGD WTP increase, 0.2 MGD increase in permitted ADF and 0.5 MGD increase in permitted peak withdrawals.

UTILITY SUMMARY

COLLIER COUNTY

Supply Entity: Immokalee Water and Sewer District

Service Area: City of Immokalee

Population and Supply Summary:

Proposed supply projects by 2015: Adequate

Proposed supply projects by 2025: Adequate

The present supplies are composed of 100 percent traditional groundwater. A supply deficit condition is projected beginning in the 2006 to 2010 time frame. Since the Immokalee Water and Sewer District has not submitted any projects to address future demand increases, the project listed below represents a SFWMD-proposed project for the Immokalee Water and Sewer District to meet future demands.

Item	2005 (Existing)	2015 (Projected)	2025 (Projected)
Population	22,572	31,637	41,901
Per Capita (gallons per day finished water)	143	143	143
(Note: All potable volumes are finished water unless noted.)		MGD	
Potable Water Demand (average annual)	3.2	4.5	6.0
Volume from Traditional Sources	3.3	3.3	3.3
Volume from Alternative Sources	0.0	3.0	4.5
Reclaimed Capacity Available	2.5	2.5	2.5
Additional Potable Water Needed	0.0	0.0	0.0

Project Summary:

Project Type	Gross Capacity (MGD) 2015	2025	Est. Capital Cost ($ M)
Traditional	0.0	0.0	$0.0
Alternative[a]			$22.8
Captured Storm Water / Surface Water	0.0	0.0	
Brackish Water	3.0	4.5	
Seawater	0.0	0.0	
Reclaimed Water[a]	0.0	0.0	
Other	0.0	0.0	
Total	3.0	4.5	$22.8

a. Reclaimed water in some applications may reduce per capita demands or offset some limitations on resource availability. This will be examined on a case-by-case basis during the permitting process.

UTILITY SUMMARY

COLLIER COUNTY

Supply Entity: City of Marco Island Public Works Department

Service Area: City of Marco Island

Population and Supply Summary:

Proposed supply projects by 2015: Adequate

Proposed supply projects by 2025: Adequate

The present supplies are composed of about 60 percent traditional fresh surface water and 40 percent alternative water supplies. The majority of new potable supplies for Marco Island rely on harvest of wet season supply from Marco Lakes/Henderson Creek with ASR storage, and installation of new treatment capacity on the island.

Item	2005 (Existing)	2015 (Projected)	2025 (Projected)
Population	16,121	17,741	19,576
Per Capita (gallons per day finished water)	470	470	470
(Note: All potable volumes are finished water unless noted.)		MGD	
Potable Water Demand (average annual)	8.0	8.4	9.2
Volume from Traditional Sources[a]	5.2	5.2	5.2
Volume from Alternative Sources[a]	3.6	5.9	5.9
Volume of Reclaimed Water Made Available	1.4	3.9	3.9
Additional Potable Water Needed	0.0	0.0	0.0

a. Projected capacities reflect current CUP quantities.

Project Summary:

Project Type	Gross Capacity (MGD) 2015	Gross Capacity (MGD) 2025	Est. Capital Cost ($ M)
Traditional	0.0	0.0	N/A
Alternative[a]			$38.6
Captured Storm Water / Surface Water	2.3	2.3	
Brackish Water	0.0	0.0	
Seawater	0.0	0.0	
Reclaimed Water[a]	2.5	2.5	
Other	0.0	0.0	
Total	4.8	4.8	$38.6

a. Reclaimed water in some applications may reduce per capita demands or offset some limitations on resource availability. This will be examined on a case-by-case basis during the permitting process.

UTILITY SUMMARY

COLLIER COUNTY

Supply Entity: City of Naples Public Utility Department

Service Area: City of Naples

Population and Supply Summary:

Proposed supply projects by 2015: Adequate

Proposed supply projects by 2025: Adequate

The present supplies are composed of 100 percent traditional fresh groundwater. New potable supplies for the city will be developed from brackish groundwater.

Item	2005 (Existing)	2015 (Projected)	2025 (Projected)
Population	56,722	65,587	75,625
Per Capita (gallons per day finished water)	321	321	321
(Note: All potable volumes are finished water unless noted.)		MGD	
Potable Water Demand (average annual)	19.6	21.3	24.6
Volume from Traditional Sources	18.1	18.1	18.1
Volume from Alternative Sources	0.0	10.0	10.0
Reclaimed Capacity Available[a]	9.0	11.7	11.7
Additional Potable Water Needed	0.0	0.0	0.0

a. Reclaimed capacity available for 2015 and 2025 includes 2.7 MGD from stormwater capture project below.

Project Summary:

Project Type	Gross Capacity (MGD) 2015	2025	Est. Capital Cost ($ M)
Traditional	0.0	0.0	N/A
Alternative[a]			$68.2
Captured Storm Water / Surface Water	2.7	2.7	
Brackish Water	10.0	10.0	
Seawater	0.0	0.0	
Reclaimed Water[a]	0.0	0.0	
Other (potable water ASR)	0.0	0.0	
Total	12.7	12.7	$68.2

a. Reclaimed water in some applications may reduce per capita demands or offset some limitations on resource availability. This will be examined on a case-by-case basis during the permitting process.

UTILITY SUMMARY

GLADES COUNTY

Supply Entity: Moore Haven Utilities

Service Area: City of Moore Haven

Population and Supply Summary:

Proposed supply projects by 2015: Adequate

Proposed supply projects by 2025: Adequate

The present supplies are composed of 100 percent traditional fresh groundwater. A deficit supply condition is projected beginning in the 2006–2010 time frame. Since Moore Haven Utilities did not submit any projects for the LWC Plan Update, the project listed below reflects a SFWMD-proposed project for the city to meet future demand. Although the project contemplates fresh groundwater development, site-specific conditions evaluated during the permitting process will determine actual resource availability. The city should contemplate a back-up plan for supply, including additional conservation and alternative water supply development, in the event that local conditions do not support the project below.

Item	2005 (Existing)	2015 (Projected)	2025 (Projected)
Population	3,156	3,627	3,947
Per Capita (gallons per day finished water)	127	127	127
(Note: All potable volumes are finished water unless noted.)		MGD	
Potable Water Demand (average annual)	0.4	0.5	0.5
Volume from Traditional Sources	0.4	0.7	0.7
Volume from Alternative Sources	0.0	0.0	0.0
Volume of Reclaimed Water Made Available	0.0	0.0	0.0
Additional Potable Water Needed	0.0	0.0	0.0

Project Summary:

Project Type	Gross Capacity (MGD) 2015	2025	Est. Capital Cost ($ M)
Traditional	0.3	0.3	$0.5
Alternative[a]			$0.0
Captured Storm Water / Surface Water	0.0	0.0	
Brackish Water	0.0	0.0	
Seawater	0.0	0.0	
Reclaimed Water[a]	0.0	0.0	
Other	0.0	0.0	
Total	0.3	0.3	$0.5

a. Reclaimed water in some applications may reduce per capita demands or offset some limitations on resource availability. This will be examined on a case-by-case basis during the permitting process.

UTILITY SUMMARY

HENDRY COUNTY

Supply Entity: Clewiston Public Utilities

Service Area: City of Clewiston

Population and Supply Summary:

Proposed supply projects by 2015: Adequate

Proposed supply projects by 2025: Adequate

Water supplies are currently 100 percent traditional fresh surface water provided by U.S. Sugar Corp. The city's new brackish water facilities are expected to be completed by the summer of 2008, at which time U.S. Sugar water deliveries will be terminated and future water supplies will be 100 percent alternative water supplies. The new alternative water supply facilities will also serve demand (formerly served by U.S. Sugar) in the South-Shore Water Association (SSWA) service area adjacent to Clewiston. The SSWA is within the Lower East Coast Planning Area.

Item	2005 (Existing)	2015 (Projected)	2025 (Projected)
Population	15,881	18,677	20,949
Per Capita (gallons per day finished water)	115	115	115
(Note: All potable volumes are finished water unless noted.)		MGD	
Potable Water Demand (average annual)	1.8	2.1	2.4
Volume from Traditional Sources[a]	5.8	0.0	0.0
Volume from Alternative Sources	0.0	3.0	3.0
Reclaimed Water Capacity	1.5	2.5	2.5
Additional Potable Water Needed	0.0	0.0	0.0

a. Clewiston is currently supplied water by U.S. Sugar. Existing traditional source data reflect total permitted capacity of U.S. Sugar withdrawals.

Project Summary:

Project Type	Gross Capacity (MGD) 2015	Gross Capacity (MGD) 2025	Est. Capital Cost ($ M)
Traditional	0.0	0.0	N/A
Alternative[a]			$22.3
Captured Storm Water / Surface Water	0.0	0.0	
Brackish Water	3.0	3.0	
Seawater	0.0	0.0	
Reclaimed Water[a]	1.0	1.0	
Other	0.0	0.0	
Total	4.0	4.0	$22.3

a. Reclaimed water in some applications may reduce per capita demands or offset some limitations on resource availability. This will be examined on a case-by-case basis during the permitting process.

UTILITY SUMMARY

HENDRY COUNTY

Supply Entity: Florida Department of Corrections

Service Area: Hendry Correctional Institution

Population and Supply Summary:

Proposed supply projects by 2015: Adequate

Proposed supply projects by 2025: Adequate

Water supplies are currently 100 percent traditional fresh groundwater. Future supplies are projected to remain 100 percent fresh groundwater.

Item	2005 (Existing)	2015 (Projected)	2025 (Projected)
Population	1,362	1,640	1,865
Per Capita (gallons per day finished water)	161	161	161
(Note: All potable volumes are finished water unless noted.)		MGD	
Potable Water Demand (average annual)	0.2	0.3	0.3
Volume from Traditional Sources	0.6	0.6	0.6
Volume from Alternative Sources	0.0	0.0	0.0
Reclaimed Capacity Available	0.4	0.4	0.4
Additional Potable Water Needed	0.0	0.0	0.0

Project Summary:

Project Type	Gross Capacity (MGD) 2015	2025	Est. Capital Cost ($ M)
Traditional	0.0	0.0	N/A
Alternative[a]			$0.0
Captured Storm Water / Surface Water	0.0	0.0	
Brackish Water	0.0	0.0	
Seawater	0.0	0.0	
Reclaimed Water[a]	0.0	0.0	
Other	0.0	0.0	
Total	0.0	0.0	$0.0

a. Reclaimed water in some applications may reduce per capita demands or offset some limitations on resource availability. This will be examined on a case-by-case basis during the permitting process.

UTILITY SUMMARY

HENDRY COUNTY

Supply Entity: LaBelle Utilities

Service Area: City of LaBelle

Population and Supply Summary:

Proposed supply projects by 2015: Adequate

Proposed supply projects by 2025: Adequate

The present supplies are composed of 100 percent traditional fresh groundwater. Future supplies are projected to be 100 percent alternative water supplies. Once the brackish supply system is completed (2009), the current fresh groundwater facilities will be decommissioned. Future supply capacities projected by LaBelle Utilities reflect growth well beyond BEBR projections. The city should work with FDCA to reconcile growth projections.

Item	2005 (Existing)	2015 (Projected)	2025 (Projected)
Population	5,279	7,150	8,671
Per Capita (gallons per day finished water)	135	135	135
(Note: All potable volumes are finished water unless noted.)		MGD	
Potable Water Demand (average annual)	0.7	1.0	1.2
Volume from Traditional Sources	0.6	0.0	0.0
Volume from Alternative Sources	0.0	5.0	8.0
Volume of Reclaimed Water Made Available	0.2	0.8	1.8
Additional Potable Water Needed	0.6	0.0	0.0

Project Summary:

Project Type	Gross Capacity (MGD) 2015	Gross Capacity (MGD) 2025	Est. Capital Cost ($ M)
Traditional	0.0	0.0	$0.0
Alternative[a]			$51.3
Captured Storm Water / Surface Water	0.0	0.0	
Brackish Water	5.0	8.0	
Seawater	0.0	0.0	
Reclaimed Water[a]	0.8	1.8	
Other	0.0	0.0	
Total	5.8	9.8	$51.3

a. Reclaimed water in some applications may reduce per capita demands or offset some limitations on resource availability. This will be examined on a case-by-case basis during the permitting process.

UTILITY SUMMARY

HENDRY COUNTY

Supply Entity: Hendry County

Service Area: Portions of Unincorporated NW Hendry County

Population and Supply Summary:

Proposed supply projects by 2015: Adequate

Proposed supply projects by 2025: Adequate

The present supplies in this area are all Domestic Self-Supply. Future service to the area is proposed by the county as part of an integrated regional services network, including water and wastewater. Future supplies are proposed to consist of alternative water supplies. Future supply capacities projected by Hendry County reflect growth well beyond BEBR projections. The county should work with FDCA to reconcile growth projections.

Item	2005 (Existing)	2015 (Projected)	2025 (Projected)
Population	5,279	7,150	8,671
Per Capita (gallons per day finished water)	135	135	135
(Note: All potable volumes are finished water unless noted.)		MGD	
Potable Water Demand (average annual)	0.0	0.4	0.7
Volume from Traditional Sources	0.0	0.0	0.0
Volume from Alternative Sources	0.0	2.7	5.0
Volume of Reclaimed Water Made Available	0.0	1.2	3.0
Additional Potable Water Needed	0.6	0.0	0.0

Project Summary:

Project Type	Gross Capacity (MGD) 2015	Gross Capacity (MGD) 2025	Est. Capital Cost ($ M)
Traditional	0.0	0.0	$0.0
Alternative[a]			$27.0
Captured Storm Water / Surface Water	0.0	0.0	
Brackish Water	2.7	5.0	
Seawater	0.0	0.0	
Reclaimed Water[a]	1.2	3.0	
Other	0.0	0.0	
Total	3.9	8.0	$27.0

a. Reclaimed water in some applications may reduce per capita demands or offset some limitations on resource availability. This will be examined on a case-by-case basis during the permitting process.

UTILITY SUMMARY

HENDRY COUNTY

Supply Entity: Port LaBelle Utilities

Service Area: Port LaBelle, Portions of Unincorporated Hendry and Glades Counties

Population and Supply Summary:

Proposed supply projects by 2015: Adequate

Proposed supply projects by 2025: Adequate

The present supplies are composed of 100 percent traditional fresh groundwater. Port LaBelle Utilities submitted three traditional projects to meet future demands. Only one of the projects, development of a 0.9 MGD membrane softening plant, is included in this utility summary. Although the project contemplates fresh groundwater development, site-specific conditions evaluated during the permitting process will determine actual resource availability.

Item	2005 (Existing)	2015 (Projected)	2025 (Projected)
Population	3,355	4,113	4,729
Per Capita (gallons per day finished water)	78	78	78
(Note: All potable volumes are finished water unless noted.)		**MGD**	
Potable Water Demand (average annual)	0.3	0.3	0.4
Volume from Traditional Sources	0.3	0.9	0.9
Volume from Alternative Sources	0.0	0.0	0.0
Volume of Reclaimed Water Made Available	0.3	0.8	2.3
Additional Potable Water Needed	0.0	0.0	0.0

Project Summary:

Project Type	Gross Capacity (MGD) 2015	Gross Capacity (MGD) 2025	Est. Capital Cost ($ M)
Traditional[b]	0.9	0.9	$5.6
Alternative[a]			$12.0
Captured Storm Water / Surface Water	0.0	0.0	
Brackish Water	0.0	0.0	
Seawater	0.0	0.0	
Reclaimed Water[a]	0.5	2.0	
Other	0.0	0.0	
Total	1.4	2.9	$17.6

a. Reclaimed water in some applications may reduce per capita demands or offset some limitations on resource availability. This will be examined on a case-by-case basis during the permitting process. Reclaimed water projects shown here reflect demand and facilities in excess of SFWMD projections.

b. Reflects proposed new 0.9 MGD membrane softening facility with net increase of 0.7 MGD in permitted ADF.

UTILITY SUMMARY

LEE COUNTY

Supply Entity: Bonita Springs Utilities, Inc.

Service Area: City of Bonita Springs, Portions of Unincorporated Lee County

Population and Supply Summary:

Proposed supply projects by 2015: Adequate

Proposed supply projects by 2025: Adequate

The present supplies are composed of about 46 percent traditional groundwater supplies and 54 percent brackish groundwater. New potable supplies developed by BSU will involve expansion of the existing brackish groundwater facilities.

Item	2005 (Existing)	2015 (Projected)	2025 (Projected)
Population	45,446	67,534	85,850
Per Capita (gallons per day finished water)	172	172	172
(Note: All potable volumes are finished water unless noted.)		MGD	
Potable Water Demand (average annual)	7.8	11.6	14.7
Volume from Traditional Sources	5.6	5.6	5.6
Volume from Alternative Sources	6.5	12.5	12.5
Volume of Reclaimed Water Made Available	10.3	10.3	10.3
Additional Potable Water Needed	0.0	0.0	0.0

Project Summary:

Project Type	Gross Capacity (MGD) 2015	2025	Est. Capital Cost ($ M)
Traditional	0.0	0.0	$0.0
Alternative[a]			$29.9
Captured Storm Water / Surface Water	0.6	0.6	
Brackish Water	6.0	6.0	
Seawater	0.0	0.0	
Reclaimed Water[a]	0.0	0.0	
Other	0.0	0.0	
Total	6.6	6.6	$29.9

a. Reclaimed water in some applications may reduce per capita demands or offset some limitations on resource availability. This will be examined on a case-by-case basis during the permitting process.

UTILITY SUMMARY

LEE COUNTY

Supply Entity: Cape Coral Public Utility Department

Service Area: Cape Coral

Population and Supply Summary:

Proposed supply projects by 2015: Adequate

Proposed supply projects by 2025: Adequate

Water supplies are currently 100 percent alternative water supplies. Future supplies are projected to remain 100 percent alternative water supplies. Projected reclaimed capacity includes captured storm water and reclaimed from the Project Summary below.

Item	2005 (Existing)	2015 (Projected)	2025 (Projected)
Population	104,118	189,739	260,035
Per Capita (gallons per day finished water)	135	135	135
(Note: All potable volumes are finished water unless noted.)		**MGD**	
Potable Water Demand (average annual)	14.0	25.6	35.1
Volume from Traditional Sources	0.0	0.0	0.0
Volume from Alternative Sources	14.4	39.0	50.4
Reclaimed Capacity Available[a]	25.3	71.2	83.3
Additional Potable Water Needed	0.0	0.0	0.0

Project Summary:

Project Type	Gross Capacity (MGD) 2015	2025	Est. Capital Cost ($ M)
Traditional (3 projects)	0.0	0.0	$0.0
Alternative[a]			$778.0
Captured Storm Water / Surface Water	1.5	1.5	
Brackish Water	24.6	36.0	
Seawater	0.0	0.0	
Reclaimed Water[a]	44.4	56.5	
Other	0.0	0.0	
Total	70.5	94.0	$778.0

a. Reclaimed water in some applications may reduce per capita demands or offset some limitations on resource availability. This will be examined on a case-by-case basis during the permitting process. Reclaimed projects in this particular case also include harvest of surface water from local canals and an extensive ASR system supporting the reuse system.

UTILITY SUMMARY

LEE COUNTY

Supply Entity: Florida Governmental Utility Authority

Service Area: Lehigh Acres

Population and Supply Summary:

Proposed supply projects by 2015: Adequate

Proposed supply projects by 2025: Adequate

Water supplies are currently 100 percent traditional fresh groundwater. A supply deficit condition is projected between 2006 and 2010. Since no projects were submitted by FGUA for the LWC Plan Update, the project below reflects a SFWMD-proposed project for FGUA to meet future water demand.

Item	2005 (Existing)	2015 (Projected)	2025 (Projected)
Population	29,803	51,873	69,996
Per Capita (gallons per day finished water)	101	101	101
(Note: All potable volumes are finished water unless noted.)		**MGD**	
Potable Water Demand (average annual)	3.0	5.2	7.1
Volume from Traditional Sources	3.3	3.3	3.3
Volume from Alternative Sources	0.0	3.0	5.5
Reclaimed Capacity Available	2.4	2.4	2.4
Additional Potable Water Needed	0.0	0.0	0.0

Project Summary:

Project Type	Gross Capacity (MGD) 2015	2025	Est. Capital Cost ($ M)
Traditional	0.0	0.0	$0.0
Alternative[a]			$27.5
Captured Storm Water / Surface Water	0.0	0.0	
Brackish Water	3.0	5.5	
Seawater	0.0	0.0	
Reclaimed Water[a]	0.0	0.0	
Other	0.0	0.0	
Total	3.0	5.5	$27.5

a. Reclaimed water in some applications may reduce per capita demands or offset some limitations on resource availability. This will be examined on a case-by-case basis during the permitting process.

UTILITY SUMMARY

LEE COUNTY

Supply Entity: Fort Myers Public Utility Department

Service Area: City of Fort Myers

Population and Supply Summary:

Proposed supply projects by 2015: Adequate

Proposed supply projects by 2025: Adequate

Water supplies are currently 100 percent alternative water supplies (brackish). Future supplies are projected to remain 100 percent alternative water supplies.

Item	2005 (Existing)	2015 (Projected)	2025 (Projected)
Population	56,287	73,301	85,465
Per Capita (gallons per day finished water)	140	140	140
(Note: All potable volumes are finished water unless noted.)		**MGD**	
Potable Water Demand (average annual)	7.9	10.1	12.0
Volume from Traditional Sources	0.0	0.0	0.0
Volume from Alternative Sources	9.6	17.6	20.0
Reclaimed Capacity Available	1.5	15.0	15.0
Additional Potable Water Needed	0.0	0.0	0.0

Project Summary:

Project Type	Gross Capacity (MGD) 2015	2025	Est. Capital Cost ($ M)
Traditional	0.0	0.0	N/A
Alternative[a]			$83.6
Captured Storm Water / Surface Water	0.0	0.0	
Brackish Water	8.0	10.4	
Seawater	0.0	0.0	
Reclaimed Water[a]	13.5	13.5	
Other (finished water ASR)[b]	1.0	1.0	
Total	22.5	24.9	$83.6

a. Reclaimed water in some applications may reduce per capita demands or offset some limitations on resource availability. This will be examined on a case-by-case basis during the permitting process.
b. Finished water ASR capacity is a seasonal capacity. Quantity not included in Population & Supply Summary table above.

UTILITY SUMMARY

LEE COUNTY

Supply Entity: Greater Pine Island Water Association

Service Area: Pine Island and Franchise Area within Cape Coral

Population and Supply Summary:

Proposed supply projects by 2015: Adequate

Proposed supply projects by 2025: Adequate

The present supplies are composed of 100 percent brackish groundwater. Since no projects were submitted by the Greater Pine Island Water Association (GPIWA) to address the projected increased demands, the project shown below reflects a SFWMD-proposed project for GPIWA to meet future demand. The GPIWA service area boundaries may be amended in the near future, which will affect the projected population and demand. These changes will be addressed in a subsequent LWC Plan Amendment or Update.

Item	2005 (Existing)	2015 (Projected)	2025 (Projected)
Population	12,024	17,078	22,870
Per Capita (gallons per day finished water)	122	122	122
(Note: All potable volumes are finished water unless noted.)		**MGD**	
Potable Water Demand (average annual)	1.5	2.2	2.8
Volume from Traditional Sources	0.0	0.0	0.0
Volume from Alternative Sources	1.3	3.3	3.3
Volume of Reclaimed Water Made Available	0.0	0.0	0.0
Additional Potable Water Needed	0.0	0.0	0.0

Project Summary:

Project Type	Gross Capacity (MGD) 2015	Gross Capacity (MGD) 2025	Est. Capital Cost ($ M)
Traditional	0.0	0.0	N/A
Alternative[a]			$9.3
Captured Storm Water / Surface Water	0.0	0.0	
Brackish Water	2.0	2.0	
Seawater	0.0	0.0	
Reclaimed Water[a]	0.0	0.0	
Other	0.0	0.0	
Total	2.0	2.0	$9.3

a. Reclaimed water in some applications may reduce per capita demands or offset some limitations on resource availability. This will be examined on a case-by-case basis during the permitting process.

UTILITY SUMMARY

LEE COUNTY

Supply Entity: Island Water Association

Service Area: City of Sanibel and Little Captiva Island

Population and Supply Summary:

Proposed supply projects by 2015: Adequate

Proposed supply projects by 2025: Adequate

The present supplies are composed of 100 percent brackish groundwater. Treatment capacity exists to meet future demands. Island Water will need to apply for an increase in permitted average daily withdrawals from the brackish supply to meet future demand conditions.

Item	2005 (Existing)	2015 (Projected)	2025 (Projected)
Population	7,751	8,300	8,547
Per Capita (gallons per day finished water)	493	493	493
(Note: All potable volumes are finished water unless noted.)		**MGD**	
Potable Water Demand (average annual)	3.7	4.1	4.2
Volume from Traditional Sources	0.0	0.0	0.0
Volume from Alternative Sources	5.2	5.2	5.2
Reclaimed Capacity Available	1.7	1.7	1.7
Additional Potable Water Needed	0.0	0.0	0.0

Project Summary:

Project Type	Gross Capacity (MGD) 2015	2025	Est. Capital Cost ($ M)
Traditional	0.0	0.0	$0.0
Alternative[a]			$1.5
Captured Storm Water / Surface Water	0.0	0.0	
Brackish Water	0.0	0.0	
Seawater	0.0	0.0	
Reclaimed Water[a]	0.0	0.0	
Other (finished water ASR)[b]	1.2	1.2	
Total	1.2	1.2	$1.5

a. Reclaimed water in some applications may reduce per capita demands or offset some limitations on resource availability. This will be examined on a case-by-case basis during the permitting process.

b. Finished water ASR capacity is a seasonal capacity. Quantity not included in Population & Supply Summary table above.

UTILITY SUMMARY

LEE COUNTY

Supply Entity: Lee County Utilities

Service Area: Portion of Unincorporated Lee County

Population and Supply Summary:

Proposed supply projects by 2015: Adequate

Proposed supply projects by 2025: Adequate

Present supplies are composed of 78 percent traditional fresh groundwater and 22 percent alternative water supplies. The county also purchases water from Bonita Springs Utilities, Fort Myers and Cape Coral.

Item	2005 (Existing)	2015 (Projected)	2025 (Projected)
Population	201,286	250,687	291,302
Per Capita (gallons per day finished water)	118	118	118
(Note: All potable volumes are finished water unless noted.)		MGD	
Potable Water Demand (average annual)	23.7	29.6	34.3
Volume from Traditional Sources	22.8	22.8	22.8
Volume from Alternative Sources	6.5	17.7	17.7
Volume of Reclaimed Water Made Available	14.3	18.8	19.8
Additional Potable Water Needed	0.0	0.0	0.0

Project Summary:

Project Type	Gross Capacity (MGD) 2015	2025	Est. Capital Cost ($ M)
Traditional	0.0	0.0	$0.0
Alternative[a]			$45.1
Captured Storm Water / Surface Water	0.0	0.0	
Brackish Water	11.2	11.2	
Seawater	0.0	0.0	
Reclaimed Water[a]	4.5	5.5	
Other (finished water ASR)[b]	0.4	0.4	
Total	16.1	17.1	$45.1

a. Reclaimed water in some applications may reduce per capita demands or offset some limitations on resource availability. This will be examined on a case-by-case basis during the permitting process.

b. Finished water ASR capacity is a seasonal capacity. Quantity not included in Population & Supply Summary table above.

AGRICULTURAL WATER USE

Agricultural water use includes supplies for crop irrigation. This plan update does not include estimates for livestock watering or aquaculture, the former because of its small size and the latter because most of the use represents a localized flow-through process in which the water returns to the source from which it was taken.

Citrus in the LWC Planning Area

Traditional water sources used for irrigation include fresh surface water and/or fresh groundwater. In the LWC Planning Area, overall agricultural acreage is expected to increase by about 13,400 acres to a total of 361,175 acres. Coastal counties, including Lee and Collier, will collectively lose about 12,300 acres of agricultural lands, primarily to urban development. Inland counties, such as Hendry and Glades, are projected to gain about 25,500 acres of agricultural production. Net water use by agriculture is expected to increase about 4 percent (17 MGD) to 422 MGD by 2025. Additional details about agricultural water use and projected demands are provided in **Appendix D**.

The shift in agricultural acreage from coastal counties to interior counties will produce a corresponding shift in the location of these demands. Traditional sources may or may not be available to meet all new irrigation requirements depending on the specific locations for new operations. Fresh groundwater may be available, but quantities will depend on local conditions, including other uses in the area. In summary, although freshwater resource conditions are expected to be adequate on a large scale to meet the projected future agricultural needs, site-specific conditions may affect availability. Under the circumstances, alternative water supply opportunities should be considered during planning of new agricultural operations in basins where water availability is limited.

As described earlier in this document, there are uncertainties in the availability of traditional water sources that cannot be resolved by this planning effort. This does not preclude agricultural water users from applying for and potentially acquiring consumptive use permits from traditional sources, so long as the conditions of permit issuance are satisfied.

Alternative water supply opportunities for agriculture include storage and application of reclaimed water, storm water, blending (brackish and fresh water),

and recapture and reuse of water normally lost to a farm's water management system (tailwater recovery). The type of irrigation system used for various agricultural operations has a significant effect on the amount of water needed to be withdrawn to meet crop demands. Although individual growers select the irrigation system used in their operations, their choice is influenced by the conservation and efficiency requirements in the District's consumptive use permitting (CUP) process as it applies to new installations and permit renewals. New permits for agricultural use generally are required to install low-volume irrigation systems, such as drip or under-tree spray irrigation. The District also offers irrigation audits through the mobile irrigation labs (MILs) serving the LWC Planning Area. These efforts are discussed in **Chapter 5** and **Appendix I**.

THERMOELECTRIC POWER GENERATION SELF-SUPPLY

Thermoelectric Power Generation water use in the LWC Planning Area is expected to grow by approximately 67 MGD during the next 20 years as Florida Power & Light (FPL), south Florida's major power generator, develops new facilities in the LWC Planning Area. Currently, the only power generation facility in the LWC Planning Area is the FPL facility east of Fort Myers. Cooling water for this facility is provided primarily through a brackish water intake on the Caloosahatchee River. The new projected quantity (67 MGD) represents the evaporative losses and boiler make-up water required each day to operate the future facilities, not the total water throughput for each plant. Cooling water sources were unspecified by FPL; however, cooling water needs at other power generation facilities in western and southern Florida are met through a variety of sources, including fresh groundwater, fresh surface water, brackish water and seawater.

No projects were submitted to meet future Thermoelectric Power Generation needs. Considering the expected net water demand for the proposed new FPL power plants (67 MGD), and the freshwater limitations in the LWC Planning Area, alternative water supplies, such as brackish water from the Lower Hawthorn Aquifer, surface water captured during high-flow events or a combination of these resources, are expected to provide the most feasible options to meet the cooling water needs at future power generation facilities.

RECREATIONAL SELF-SUPPLY

Golf Course in the LWC Planning Area

The Recreational Self-Supply category includes irrigation for large landscaped areas, such as parks, golf courses and cemeteries. Historically, irrigation supplies for this category include local fresh groundwater and surface water captured from canals or from ponds in stormwater management systems. In recent years, to meet CUP requirements, irrigation for new golf courses often includes blending brackish groundwater with surface water on-site to meet turf irrigation needs. In the LWC Planning Area, Recreational Self-Supply water demand is projected to increase from the current 39.5 MGD to 46.6 MGD in 2025.

Considering the projected modest increase for growth in this category, most future supplies will come from alternative water supplies and blended supplies (brackish groundwater and fresh surface water). Reclaimed water is primarily used for irrigating large landscaped areas, such as golf courses, parks and cemeteries, as well as for residential and commercial landscaping. Projects submitted by utilities and wastewater generators specify that significant additional reclaimed water will be made available in the future. In most cases, the specific users cannot be identified, but the overall annual average quantity of reclaimed water expected to be made available from new projects in the LWC Planning Area during the next 20 years is about 140 MGD. This includes quantities from reclaimed water treatment plants, and flows captured from seasonal surface water sources for use specifically in the reclaimed system. Of the total amount of new reclaimed supply, over 50 percent is estimated to be available for bulk distribution for such uses as recreational irrigation needs. This amount of newly generated reclaimed water supply is greater than the expected growth in Recreational Self-Supply demand in the LWC Planning Area, which will provide an opportunity to switch current users from traditional sources to reclaimed water.

COMMERCIAL AND INDUSTRIAL SELF-SUPPLY

Commercial and Industrial Self-Supply demand is estimated to grow from the current 26.6 MGD to 28.9 MGD in 2025. Many commercial and industrial water uses are met through public water supply utilities. Others are self-supplied small users located remotely from public water supply lines, and their use falls below the 0.1 MGD (100,000 gallons per day) limit for identification of individual users in this plan update. The estimates in this plan update include the larger self-supplied users, most of which have historically relied on fresh groundwater and, to a limited extent, fresh surface water.

Considering the minimal additional projected need and the lack of specific locations or projects submitted for future Commercial/Industrial Self-Supply, traditional supplies, such as fresh groundwater, are expected to be sufficient to meet future needs in this category. Although fresh groundwater supplies are generally considered adequate to meet the relatively small new demands projected for this use category, alternative water supply development may be warranted depending on local conditions. In addition, the availability and suitability of alternative water supplies, such as reclaimed water, to meet existing and new Commercial/Industrial demands will be evaluated in the CUP process.

DOMESTIC SELF-SUPPLY

Domestic Self-Supply demands in the LWC Planning Area are projected to increase from the current 24 MGD to 31 MGD in 2025. Domestic Self-Supply includes potable water from a private supply, typically a domestic well, serving a private residence. Typically, property owners relying on such systems own, operate and maintain their domestic wells. Domestic Self-Supply needs are met almost exclusively using fresh groundwater.

Considering the limited options for Domestic Self-Supply, all future needs in this use category are expected to be met using fresh groundwater supplies. However, areas of concentrated domestic wells, such as Cape Coral and Lehigh Acres, are experiencing chronic "dry well" problems each dry season. Continued urban development and the resulting increases in domestic well installations in those areas will exacerbate these problems and may eventually lead the District to consider limitations on new well installations to preserve resources. Potential solutions may include, but are not limited to, connection of such areas to the municipal supply system and adoption of additional landscape ordinances that serve to minimize outdoor irrigation needs. When municipal supply becomes available to a particular area, municipalities should consider requirements that Domestic Self-Supply be terminated, and that such wells be properly plugged and abandoned in that area.

CONCLUSION

Meeting the projected increase of 197 MGD in net water demand in the LWC Planning Area during the next 20 years will require continued emphasis on alternative water supply development, including development of brackish groundwater resources, reclaimed water and seasonally available surface water. Development of additional storage, such as ASR, will also be critical to improving access to seasonal supplies to help meet future needs. The District should focus resources on facilitating ASR and other large-scale storage opportunities to facilitate development of seasonal water supplies. Attention also must be focused on continued assessment of conditions in the brackish Floridan Aquifer to facilitate the most responsible development of this resource.

Traditional water supplies, including fresh groundwater and surface water from the Caloosahatchee River, are not expected be adequate to meet all projected demands. Although development may be practicable in some areas, permitting new traditional supplies will depend largely on local resource conditions.

The largest change in water demand during the next 20 years will be seen in the Public Water Supply sector, which will increase from the current 128 MGD to 225 MGD. Over 140 new public water supply projects were evaluated as part of this plan update. The result of this process is that proposed new public water supply project capacity exceeds the 2025 projected demand by 99 MGD. Projects specific to each major public water supplier are included and focus on development of alternative potable water supplies to meet future needs. Individual utilities may also find some component of their future need can be cost-effectively met through new demand management programs and/or reclaimed water projects.

Regionwide, traditional resources are expected to be sufficient to meet the projected 17 MGD increase in agricultural demand in the next 20 years. However, local conditions may limit the availability of freshwater resources for Agriculture (as well as other use categories). Agricultural users should also investigate and implement alternative supplies in basins where water availability is limited.

Domestic Self-Supply use is projected to increase by 7 MGD in the next 20 years. Concentrations of domestic wells in Cape Coral have resulted in rapidly declining Sandstone/Mid-Hawthorn aquifer levels. Similar concentrations of domestic wells in Lehigh Acres cause large, seasonal swings and a declining water level trend in the Sandstone Aquifer. The most obvious result of these conditions is the chronic well failures experienced in both areas during dry periods. These conditions are exacerbated each year with additional development of domestic wells. Local solutions, such as extending public water service to these areas, should be accelerated.

Thermoelectric Power Generation water supply needs are projected to increase by 67 MGD with the development of new power generation facilities in the LWC Planning Area. Specific locations for new facilities are unavailable. Investigation of water resource availability should factor heavily into site selection for these new facilities. Meeting these needs is likely to require use and/or development of alternative water supplies.

Other use categories, such as Recreational Self-Supply and Commercial/Industrial Self-Supply, are projected to grow by about 7.1 MGD and 2.3 MGD, respectively, in the next 20 years. These future needs are expected to be met largely through use and development of alternative water supplies.

The inclusion of specific Water Supply Development projects to address projected needs for the next 20 years is a new requirement of state law. The District recognizes there are public water supply utilities conducting detailed studies to estimate population and demand increases and identify the most appropriate water supply project options to meet those future needs. In addition, other large water users, especially thermoelectric utilities and agricultural users, will require time to identify the specific water supply projects to be developed once the locations of their water supply needs have been determined. For these reasons, the District will consider amending the regional water supply plans on an annual basis for the next three years to allow for the inclusion of additional, specific alternative water supply projects. Such amendments, if needed, are proposed to be done during January and February for the next three years. Only local governments that are affected by the additional alternative water supply projects would be required to amend their comprehensive plans, consistent with the requirements of Section 163.3177(6)(c), F.S. It is anticipated at the end of the three-year period, this annual plan amendment process would be re-evaluated.

This 2005–2006 LWC Plan Update contains a variety of water supply-related information useful to local governments in the preparation and amendment of their comprehensive plans. Within 18 months following the approval of this water supply plan update, local governments within the LWC Planning Area are required to revise their comprehensive plans and adopt revisions to their 10-Year Water Supply Facilities Work Plans to include specific water supply projects.

In addition, through the Water Protection and Sustainability Program, cost-sharing funds specifically for the construction of alternative water supply projects are provided on an annual basis through state revenues and matching District funds. Local governments whose alternative water supply projects are included in this plan update are eligible for consideration.

Glossary

1-in-10 Year Drought A drought of such intensity, that it is expected to have a return frequency of once in ten years. A drought, in which below normal rainfall, has a 90 percent probability of being exceeded over a twelve-month period. A drought event that results in an increase in water demand to a magnitude that would have a 10 percent probability of being exceeded during any given year**.**

1-in-10 Year Level of Certainty A water supply planning goal to assure at least a 90 percent probability, during any given year that all the needs of reasonable-beneficial water uses will be met while also sustaining water resources and related natural systems during a 1-in-10 year drought event.

Acceler8 Part of the Comprehensive Everglades Restoration Plan (CERP) program, Acceler8 accelerates eight restoration projects through SFWMD's issuance of "Certificates of Participation" bond revenue for construction finance. Acceler8 projects include: C-44 (St. Lucie Canal) Reservoir / Stormwater Treatment Area (STA), C-43 (Caloosahatchee River) West Reservoir, Everglades Agricultural Area (EAA) Reservoir - Phase 1 with Bolles & Cross Canals Improvements, Everglades Agricultural Area (EAA) Stormwater Treatment Areas (STAs) Expansion, Water Preserve Areas - Includes Site 1, C-9, C-11, Acme Basin B, WCA-3A/3B, Picayune Strand (Southern Golden Gate Estates) Restoration, Biscayne Bay Coastal Wetlands - Phase 1, and C-111 Spreader Canal.

Acre-foot The volume of water that covers one acre to a depth of one foot; 43,560 cubic feet; 1,233.5 cubic meters; 325,872 gallons.

Alternative Water Supply Salt water; brackish surface and groundwater; surface water captured predominately during wet-weather flows; sources made available through the addition of new storage capacity for surface or groundwater, 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 nontraditional for a water supply planning region in the applicable regional water supply plan. (Section 373.019, F.S.).

Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS) A simple water budget model for estimating irrigation demands that estimates demand based on basin specific data.

Agricultural Self-Supplied Water Demand The water used to irrigate crops, to water livestock and for aquaculture (e.g., fish production) that is not supplied by a public water supply utility.

Annual Average Daily Flow The total volume of wastewater flowing into a wastewater facility during any consecutive 365 days, divided by 365 and expressed in units of MGD.

Aquifer A geologic formation, group of formations, or part of a formation that contains sufficient saturated, permeable material to yield significant quantities of water to wells and springs.

Aquifer Storage and Recovery (ASR) Stormwater, surface water, or reclaimed water is appropriately treated to potable standards and injected into an aquifer through approved Class V injection wells during wet periods with the intent to recover the water for treatment and reuse in the future during dry periods.

Aquifer System A heterogeneous body of intercalated permeable and less permeable material that acts as a water-yielding hydraulic unit of regional extent.

Area of Influence For groundwater systems the area of influence is defined by the cone of depression, and for surface water systems the area of influence is defined as the extent to which the withdrawal results in a measurable change in surface water levels or flows.

Artesian A commonly used expression, generally synonymous with Confined and referring to subsurface (ground) bodies of water which, due to underground drainage from higher elevations and confining layers of soil material above and below the water body (referred to as an Artesian Aquifer), result in underground water at pressures greater than atmospheric.

Available Supply The maximum amount of reliable water supply including surface water, groundwater and purchases under secure contracts.

Average Daily Demand A water system's average daily use based on total annual water production (total annual gallons or cubic feet divided by 365).

Average Rainfall Year A year having rainfall with a 50 percent probability of being exceeded over a twelve-month period.

Backpumping The practice of actively pumping water leaving an area back into a surface water body.

Basin (Groundwater) A hydrologic unit containing one large aquifer or several connecting and interconnecting aquifers.

Basin (Surface Water) A tract of land drained by a surface water body or its tributaries.

Basis of Review (BOR) From the District's publication, *Basis of Review for Water Use Permit Applications within the South Florida Water Management District*. Read in conjunction with Chapters 40E-2 and 40E-20, the Basis of Review further specifies the general procedures and information used by District staff for review of water use permit applications with the primary goal of meeting District water resource objectives.

Best Management Practices (BMPs) Agricultural management activities designed to achieve an important goal, such as reducing farm runoff or optimizing water use.

Biscayne Aquifer A portion of the Surficial Aquifer System, which provides most of the fresh water for public water supply and agriculture within Miami-Dade, Broward and southeastern Palm Beach County. It is highly susceptible to contamination due to its high permeability and proximity to land surface in many locations.

Blaney-Criddle A formula to calculate evapotranspiration (ET) based on mean temperature and number of daylight hours. The Water Supply Department allocates water using a version of the Blaney-Criddle that employs months as time increments. The 'Modified Blaney-Criddle' is a variation of Blaney-Criddle, which multiplies the ET from Blaney-Criddle by a coefficient that relates mean air temperature to the growth stage of a crop. Additionally, effective rainfall is calculated using the mean temperature and hours of daylight, the Blaney-Criddle ET, average monthly rainfall and a soil factor. Further calculations consider average rainfall to drought rainfall (1-in-10 year drought). The difference between monthly drought effective rainfall and monthly ET becomes the basis for water allocations.

Brackish Water, Saline Water or **Seawater** Water containing significant amounts or concentrations of dissolved salts or total dissolved solids (TDS). The concentration is the amount (by weight) of salt in water, expressed in "parts per million" (ppm) or milligrams per liter (mg/L). The terms fresh, brackish, saline and brine are used to describe the quality of the water. (~1 mg/L TDS = 0.5 mg/L of Chlorides.)

Capacity Capacity represents the ability to treat, move or reuse water. Typically, capacity is expressed in million gallons per day (MGD).

Captured Stormwater/Surface Water Water captured predominantly during wet weather flow and stored above ground or underground for future beneficial use.

Central and Southern Florida Project Comprehensive Review Study (C&SF Restudy) A five-year study effort that looked at modifying the current C&SF Project to restore the greater Everglades and south Florida ecosystem, while providing for the other water-related needs of the region. The study concluded with the Comprehensive Plan being presented to the Congress on July 1, 1999. The recommendations made within the Restudy, that is, structural and operational modifications to the C&SF Project, are being further refined and will be implemented in the Comprehensive Everglades Restoration Plan (CERP).

Central and Southern Florida Flood Control Project (C&SF Project) A complete system of canals, storage areas and water control structures spanning the area from Lake Okeechobee to both the east and west coasts and from Orlando south to the Everglades. It was designed and constructed during the 1950s by the United States Army Corps of Engineers (USACE) to provide flood control and improve navigation and recreation.

Commercial and Industrial Self-Supplied Water Demand Water used by commercial and industrial operations withdrawing a minimum water quantity of 100,000 gallons per day (GPD) from individual, on-site wells.

Comprehensive Everglades Restoration Plan (CERP) The framework and guide for the restoration, protection and preservation of the south Florida ecosystem. The CERP also provides for water-related needs of the region, such as water supply and flood protection.

Confining Unit A body of significantly less permeable material than the aquifer, or aquifers, that it stratigraphically separates. The hydraulic conductivity may range from nearly zero to some value significantly lower than that of the adjoining aquifers.

Conservation (See *Water Conservation.*)

Consumptive Use Any use of water which reduces the supply from which it is withdrawn or diverted

Consumptive Use Permitting (CUP) The issuance of permits by the SFWMD, under authority of Chapter 40E-2, F.A.C., allowing withdrawal of water for consumptive use.

Control Structure A man-made structure designed to regulate the level/flow of water in a canal or water body (e.g., weirs, dams).

Demand The quantity of water needed to be withdrawn to fulfill a requirement.

Demand Management Reducing the demand for water through activities that alter water use practices, improve efficiency in water use, reduce losses of water, reduce waste of water, alter land management practices and/or alter land uses.

Desalination A process that treats saline water to remove or reduce chlorides and dissolved solids, resulting in the production of fresh water.

Discharge The rate of water movement past a reference point, measured as volume per unit time (usually expressed as cubic feet or cubic meters per second).

Disinfection The process of inactivating microorganisms that cause disease. All potable water requires disinfection as part of the treatment process prior to distribution. Disinfection methods include chlorination, ultraviolet (UV) radiation and ozonation.

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

Domestic Self-Supplied (DSS) Water Demand The water used by households whose primary source of water is water treatment facilities and/or private wells with pumpages of less than 100,000 gallons per day (GPD).

Domestic Use Use of water for household purposes of drinking, bathing, cooking or sanitation.

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

Drainage District A locally constituted drainage, water management or water control district that is created by special act of the legislature and authorized under Ch. 298, F.S., to constrict, complete, operate, maintain, repair and replace any and all works necessary to implement an adopted water control plan.

Drawdown The vertical distance between the static water level and the surface of the cone of depression.

Drought A long period of abnormally low rainfall, especially one that adversely affects growing or living conditions.

Ecosystem Biological communities together with their environment, functioning as a unit.

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

Electrodialysis Dialysis that is conducted with the aid of an electromotive force applied to electrodes adjacent to both sides of the membrane.

Elevation The height in feet above mean sea level according to North American Vertical Datum (NAVD). May also be expressed in feet above mean sea level (MSL) as reference datum.

Environmental Resource Permit (ERP) A permit issued by the SFWMD under authority of Chapter 40E-4, F.A.C. to ensure that land development projects do not cause adverse environmental, water quality or water quantity impacts.

Estuary The part of the wide lower course of a river where its current is met by ocean tides or an arm of the sea at the lower end of a river where fresh and salt water meet.

Evapotranspiration (ET) The total loss of water to the atmosphere by evaporation from land and water surfaces and by transpiration from plants.

Everglades Agricultural Area (EAA) An area of histosols (muck) extending south from Lake Okeechobee to the northern levee of WCA-3A, from its eastern boundary at the L-8 Canal to the western boundary along the L-1, L-2 and L-3 levees. The EAA incorporates almost 3,000 square kilometers (1,158 square miles) of highly productive agricultural land.

Everglades Protection Area This area is composed of the Water Conservation Areas and Everglades National Park.

Existing Legal Use of Water A water use that is authorized under a District water use permit or is existing and exempt from permit requirements.

Fallow Land left unseeded during a growing season. The act of plowing land and leaving it unseeded. The condition or period of being unseeded.

Fiscal Year (FY) The South Florida Water Management District's fiscal year begins on October 1 and ends on September 30 the following year.

Florida Administrative Code (F.A.C.) The Florida Administrative Code is the official compilation of the administrative rules and regulations of state agencies.

Florida Department of Agricultural and Consumer Services (FDACS) FDACS communicates the needs of the agricultural industry to the Florida Legislature, the FDEP and the water management districts, and ensures participation of agriculture in the development and implementation of water policy decisions. FDACS also oversees Florida's soil and water conservation districts, which coordinate closely with the federal Natural Resources Conservation Service (NRCS).

Florida Department of Environmental Protection (FDEP) The SFWMD operates under the general supervisory authority of the FDEP, which includes budgetary oversight.

Florida Statutes (F.S.) The Florida Statutes are a permanent collection of state laws organized by subject area into a code made up of titles, chapters, parts and sections. The Florida Statutes are updated annually by laws that create, amend or repeal statutory material.

Florida Water Plan State-level water resource plan developed by the FDEP under Section 373.036, F.S.

Floridan Aquifer System (FAS) A highly-used aquifer system composed of the Upper Floridan and Lower Floridan Aquifers. It is the principal source of water supply north of Lake Okeechobee and the upper Floridan Aquifer is used for drinking water supply in parts of Martin and St. Lucie counties. From Jupiter to south Miami, water from the Floridan Aquifer System is mineralized (total dissolved solids are greater than 1,000 mg/L) along coastal areas and in southern Florida.

Flow The actual amount of water flowing by a particular point over some specified time. In the context of water supply, flow represents the amount of water being treated, moved or reused. Flow is frequently expressed in millions of gallons per day (MGD).

Fresh Water Water with less than 1,000 mg/L of TDS, but drinking water, by EPA standards, must have less than 500 mg/L of TDS. (~1 mg/L TDS = 0.5 mg/L of Chlorides.)

Geographic Information Systems (GIS) The abstract representation of natural (or cultural) features of a landscape into a digital database, geographic information system.

Governing Board Governing Board of the South Florida Water Management District.

Groundwater Water beneath the surface of the ground, whether or not flowing through known and definite channels. Specifically, that part of the subsurface water in the saturated zone, where the water is under pressure greater than the atmosphere.

Harm As defined in Rule 40E-8, F.A.C., the temporary loss of water resource functions that results from a change in surface or groundwater hydrology and takes a period of one to two years of average rainfall conditions to recover.

Heterogeneity The condition of a sample of matter that is composed of particles or aggregates of different substances of dissimilar composition.

Hydrology The scientific study of the properties, distribution and effects of water on the earth's surface, in the soil and underlying rocks and in the atmosphere.

Hydroperiod The frequency and duration of inundation or saturation of an ecosystem. In the context of characterizing wetlands, the term hydroperiod describes that length of time during the year that the substrate is either saturated or covered with water.

Infiltration The movement of water through the soil surface into the soil under the forces of gravity and capillarity.

Intermediate Aquifer System (IAS) This aquifer system consists of five zones of alternating confining and producing units. The producing zones include the Sandstone and Mid-Hawthorn aquifers.

Intrusion (See *Saline Water of Saltwater Intrusion*.)

Irrigation The application of water to crops and other plants by artificial means.

Irrigation Efficiency The average percent of total water pumped or delivered for use that is delivered to the root zone of a plant.

Karst A topography formed over limestone, dolomite or gypsum and characterized by sinkholes, caves and underground drainage.

Lake Okeechobee Largest freshwater lake in Florida. Located in central Florida, the lake measures 730 square miles and is the second largest freshwater lake wholly within the United States.

Landscape Irrigation The outside watering of shrubbery, trees, lawns, grass, ground covers, vines, gardens and other such flora, not intended for resale, which are planted and are situated in such diverse locations as residential and recreation areas, cemeteries, public, commercial and industrial establishments, and public medians and rights of way.

Levee An embankment to prevent flooding or a continuous dike or ridge for confining the irrigation areas of land to be flooded.

Level of Certainty A water supply planning goal to assure at least a 90 percent probability, during any given year that all the needs of reasonable-beneficial water uses will be met while also sustaining water resources and related natural systems during a 1-in-10 year drought event.

Load Concentration times flow.

Maximum Daily Allocation The maximum quantity permitted to be withdrawn in any single 24-hour period.

Maximum Monthly Allocation The maximum quantity of water assigned to the permit to be withdrawn during the month in the growing season when the largest supplemental crop requirement is needed by the specific crop for which the allocation is permitted.

Microfiltration A membrane separation process in which particles greater than about 20 nanometers in diameter are screened out of a liquid in which they are suspended.

Microirrigation The application of small quantities of water on or below the soil surface as drops or tiny streams of spray through emitters or applicators placed along a water delivery line. Microirrigation includes a number of methods or concepts such as bubbler, drip, trickle, mist or microspray and subsurface irrigation.

Minimum Flow and Level (MFL) The point at which further withdrawals would cause significant harm to the water resources.

Mobile Irrigation Laboratory (MIL) A vehicle furnished with irrigation evaluation equipment, which is used to carry out on-site evaluations of irrigation systems and to provide recommendations on improving irrigation efficiency.

MODFLOW A fine-scale model code created by the U.S. Geological Survey. The District uses it for subregional and groundwater modeling.

Monthly Average Daily Flow The total volume of wastewater flowing into a wastewater facility during a calendar month, divided by the number of days in that month and expressed in units of MGD.

Natural Resources Conservation Service (NRCS) An agency of the U.S. Department of Agriculture (USDA) that provides technical assistance for soil and water conservation, natural resource surveys and community resource protection. Formerly the U.S. Soil Conservation Service (SCS).

Net Water Demand The water demands of the end user, after accounting for treatment and process losses and inefficiencies (e.g. irrigation inefficiency). When discussing public water supply, the term "finished water demand" is commonly used.

North American Vertical Datum (NAVD) The official civilian vertical control datum (reference for elevation data) for surveying and mapping activities in the United States.

Nutrients Organic or inorganic compounds essential for the survival of an organism. In aquatic environments, nitrogen and phosphorus are important nutrients that affect the growth rate of plants.

Outflow The act or process of flowing out of.

Per Capita Use Total use divided by the total population served.

Performance Measure Performance measures quantify how well or how poorly an alternative meets a specific objective. Good performance measures are quantifiable, have a specific target, indicate when a target has been reached, and measure the degree to which the goal has been met.

Permeability Defines the ability of a substrate to transmit fluid.

Phosphorus (P) An element that is essential for life. In freshwater aquatic environments, phosphorus is often in short supply; increased levels can promote the growth of algae and other plants.

Potable Water Water that is safe for human consumption.

Potentiometric Head The level to which water will rise when a well is pierced in a confined aquifer.

Potentiometric Surface A surface, which represents the hydraulic head in an aquifer and is defined by the level to which water will rise above a datum plane in wells that penetrate the aquifer.

Public Water Supply (PWS) Water that is withdrawn, treated, transmitted and distributed as potable or reclaimed water.

Public Water Supply (PWS) Demand All potable (drinking quality) water supplied by water treatment facilities with projected average pumpages greater than 100,000 gallons per day to all types of customers, not just residential.

Ratoon A shoot sprouting from a plant base, as in the banana, pineapple, or sugarcane. A Ratoon Crop A crop cultivated from the shoots of a perennial plant.

Raw Water Demand The amount of water that must be withdrawn from the groundwater or surface water system to meet a particular need. Withdrawal demands are nearly always higher than User/Customer Demand because of inherent treatment and process losses, and inefficiencies associated with delivering water from the source to the end user.

Reasonable-Beneficial Use Use of water in such quantity as is necessary for economic and efficient utilization for a purpose, which is both reasonable and consistent with the public interest.

Reclaimed Water Water that has received at least secondary treatment and basic disinfection and is reused after flowing out of a domestic wastewater treatment facility (Chapter 62-610, F.A.C.).

Recreational Self-Supplied Water Demand The water used for landscape and golf course irrigation. The landscape subcategory includes water used for parks, cemeteries and other irrigation applications greater than 100,000 gallons per day. The golf course subcategory includes those operations not supplied by a public water supply or regional reuse facility.

Regional Irrigation Distribution System (RIDS) An interconnection pipeline system to deliver irrigation water, which considers reuse and alternative water supplies, such as supplemental surface water.

Regional Water Supply Plan Detailed water supply plan developed by the District under Section 373.0361, F.S., providing an evaluation of available water supply and projected demands, at the regional scale. The planning process projects future demand for 20 years and recommends projects to meet identified needs.

Reservations of Water (See *Water Reservations*.)

Reservoir A man-made or natural water body used for water storage.

Restudy Shortened name for C&SF Restudy.

Retention The prevention of stormwater runoff from direct discharge into receiving waters; included as examples are systems which discharge through percolation, exfiltration, filtered bleed-down and evaporation processes.

Retrofit The replacement of existing equipment with equipment of higher efficiency.

Retrofitting The replacement of existing water fixtures, appliances and devices with more efficient fixtures, appliances and devices for the purpose of conservation.

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

Reverse Osmosis (RO) A membrane process for desalting water using applied pressure to drive the feedwater (source water) through a semipermeable membrane.

Runoff That component of rainfall which is not absorbed by soil, intercepted and stored by surface water bodies, evaporated to the atmosphere, transpired and stored by plants, or infiltrated to groundwater, but which flows to a watercourse as surface water flow.

Saline Water Any water that contains more than 1,000 mg/L of TDS. This may be brackish water (1000 to 15,000 mg/L of TDS), seawater (15,000 to 40,000 mg/L of TDS), or brine (more than 40,000 mg/L of TDS). It is common in the literature to define coastal water that is very brackish simply as saline water. (~1 mg/L TDS = 0.5 mg/L of Chlorides.)

Saline Water or Saltwater Interface The hypothetical surface of chloride concentration between fresh water and seawater where the chloride concentration is 250 mg/L at each point on the surface.

Saline Water or Saltwater Intrusion The invasion of a body of fresh water by a body of salt water, due to its greater density. It can occur either in surface water or groundwater bodies. The term is applied to the flooding of freshwater marshes by seawater, the upward migration of seawater into rivers and navigation channels, and the movement of seawater into freshwater aquifers along coastal regions.

Salinity Of or relating to chemical salts (usually measured in parts per thousand, or ppt).

Seawater, Saline Water or **Brackish Water** Water containing significant amounts or concentrations of dissolved salts or total dissolved solids (TDS). The concentration is the amount (by weight) of salts in water, expressed in "parts per million" (ppm) or milligrams per liter (mg/L). The terms fresh, brackish, saline, and brine are used to describe the quality of the water. (~1 mg/L TDS = 0.5 mg/L of Chlorides.)

Self-Supplied The water used to satisfy a water need, not supplied by a public water supply utility.

Semi-Confined Aquifer A completely saturated aquifer that is bounded above by a semi-pervious layer, which has a low, though measurable permeability, and below by a layer that is either impervious or semi-pervious.

Semi-confining Layers Layers with little or no horizontal flow, restricting the vertical flow of water from one aquifer to another. The rate of vertical flow is dependent on the head differential between the aquifers, as well as the vertical permeability of the sediments in the semi-confining layer.

Serious Harm As defined in Rule 40E-8, F.A.C., the long-term loss of water resource functions resulting from a change in surface or groundwater hydrology.

Service Area The geographical region in which a water supplier has the ability and the legal right to distribute water for use.

Significant Harm As defined in Rule 40E-8, F.A.C., the temporary loss of water resource functions, which result from a change in surface or groundwater hydrology, that takes more than two years to recover, but which is considered less severe than serious harm. The specific water resource functions addressed by a MFL and the duration of the recovery period associated with significant harm are defined for each priority water body based on the MFL technical support document.

Slough A channel in which water moves sluggishly, or a place of deep muck, mud or mire. Sloughs are wetland habitats that serve as channels for water draining off surrounding uplands and/or wetlands.

Stage The height of a water surface above an established reference point (datum or elevation).

Storm Water Water that does not infiltrate, but accumulates on land as a result of storm runoff, snowmelt runoff, irrigation runoff or drainage from areas such as roads and roofs.

Stormwater Treatment Area (STA) A system of constructed water quality treatment wetlands that use natural biological processes to reduce levels of nutrients and pollutants from surface water runoff.

Submerged Aquatic Vegetation (SAV) Wetland plants that exist completely below the water surface.

Subregional Groundwater Model A computer model that is used to simulate impacts on a smaller scale than the SFWMM, such as effects within public water supply service areas and impacts of individual wellfields.

Supplemental Irrigation Requirement (SIR) The volume of water, usually expressed in acre-inches, representing the difference between the estimated evapotranspiration of a given crop and the effective rainfall available in a specific geographic area over some prescribed time period and climatic event.

Supply-side Management The conservation of water in Lake Okeechobee to ensure that water demands are met while reducing the risk of serious or significant harm to natural systems.

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

Surficial Aquifer System (SAS) Often the principal source of water for urban uses within certain areas of south Florida. This aquifer is unconfined, consisting of varying amounts of limestone and sediments that extend from the land surface to the top of an intermediate confining unit.

Swamp A frequently or continuously inundated forested wetland.

Thermoelectric Self-Supplied Water Demand The difference in the amount of water withdrawn by electric power generating facilities for cooling purposes and the water returned to the hydrologic system near the point of withdrawal.

Three-month Average Daily Flow The total volume of wastewater flowing into a wastewater facility during a period of three consecutive months, divided by the number of days in this three-month period and expressed in units of MGD. The three-month average daily flow also can be calculated by adding the three monthly average daily flows observed during this three-month period and dividing by three. The three-month average daily flow is a rolling average that is to be assessed for each month of the year.

Total Maximum Daily Load (TMDL) The maximum allowed level of pollutant loading for a water body, while still protecting its uses and maintaining compliance with water quality standards, as defined in the *Clean Water Act*.

Transmissivity A term used to indicate the rate at which water can be transmitted through a unit width of aquifer under a unit hydraulic gradient. It is a function of the permeability and thickness of the aquifer, and is used to judge its production potential.

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

Tributary A stream that flows into a larger stream or other body of water.

Upconing Process by which saline water underlying fresh water in an aquifer rises upward into the freshwater zone as a result of pumping water from the freshwater zone.

User/Customer Demand (See *Net Demand*.)

Utility Any legal entity responsible for supplying potable water for a defined service area.

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

Water Conservation Reducing the demand for water through activities that alter water use practices, e.g., improving efficiency in water use, and reducing losses of water, waste of water and water use.

Water Conservation Areas (WCAs) Part of the original Everglades ecosystem that is now diked and hydrologically controlled for flood control and water supply purposes. These are located in the western portions of Miami-Dade, Broward and Palm Beach counties, and preserve a total of 1,337 square miles, or about 50 percent of the original Everglades.

Water Preserve Areas (WPA) Multipurpose water-holding areas located along the western border of southeast Florida's urbanized corridor.

Water Reservations State law on water reservations, in Section 373.223(4), F.S., defines water reservations 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. Such reservations shall be subject to periodic review and revision in the light of changed conditions. However, all presently existing legal uses of water shall be protected so long as such use is not contrary to the public interest."

Water Resource Development The formulation and implementation of regional water resource management strategies, including the collection and evaluation of surface water and groundwater data; structural and nonstructural programs to protect and manage the 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 groundwater recharge augmentation; and related technical assistance to local governments and to government-owned and privately-owned water utilities. (Section 373.019, F.S.)

Water Reuse (See *Reuse*.)

Watershed A region or area bounded peripherally by a water parting and draining ultimately to a particular watercourse or body of water.

Water Shortage Declaration If there is a possibility that insufficient water will be available within a source class to meet the estimated present and anticipated user demands from that source, or to protect the water resource from serious harm, the governing board may declare a water shortage for the affected source class. (Rule 40E- 21.231, F.A.C.) Estimates of the percent reduction in demand required to match available supply is required and identifies which phase of drought restriction is implemented. A gradual progression in severity of restriction is implemented through increasing phases. Once declared, the District is required to notify permitted users by mail of the restrictions and to publish restrictions in area newspapers.

Water Supply Development 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. (Section 373.019(24), F.S.)

Water Supply Plan (See *Regional Water Supply Plan*.)

Water Table The surface of a body of unconfined groundwater at which the pressure is equal to that of the atmosphere; defined by the level where water within an unconfined aquifer stands in a well.

Water Use Any use of water, which reduces the supply from which it is withdrawn or diverted.

Water Well Any excavation that is drilled, cored, bored, washed, driven, dug, jetted, or otherwise constructed when the intended use of such excavation is for the location, acquisition, development, or artificial recharge of groundwater. This term does not include any well for the purpose of obtaining or prospecting for oil, natural gas, minerals, or products of mining or quarrying; for inserting media to dispose of oil brines or to repressure oil-bearing or natural gas-bearing formation; for storing petroleum, natural gas, or other products; or for temporary dewatering of subsurface formations for mining, quarrying or construction purposes. (373.303(7), F.S.)

Wetland An area that is inundated or saturated by surface water or groundwater with vegetation adapted for life under those soil conditions (e.g., swamps, bogs and marshes).

Wetland Drawdown Study Research effort by the South Florida Water Management District to provide a scientific basis for developing wetland protection criteria for water use permitting.

Withdrawal Demand (See *Raw Water Demand*.)

Xeriscape™ Landscaping that involves seven principles: proper planning and design; soil analysis and improvement; practical turf areas; appropriate plant selection; efficient irrigation; mulching; and appropriate maintenance.

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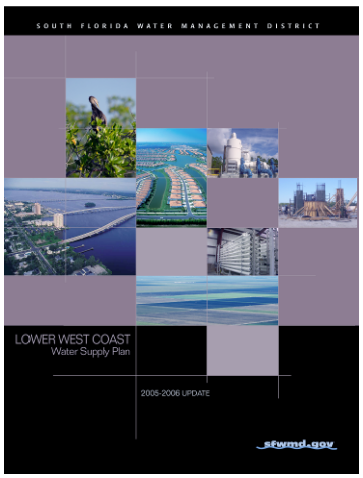

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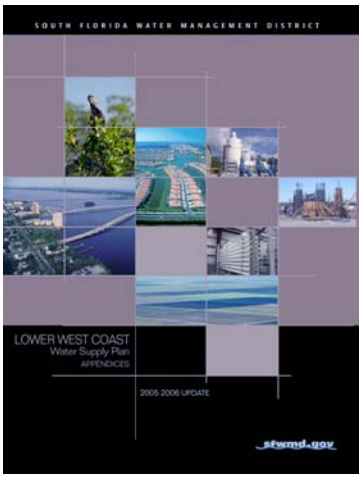

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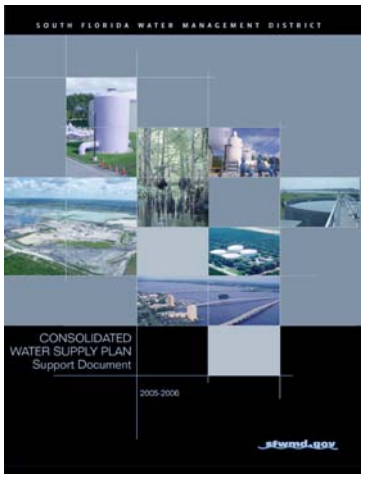

Support Document
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CD 1 – Contains the Lower West Coast Water Supply Plan Update including the Planning Document, Appendices and the Comprehensive Water Supply Plan Support Document

CD 2 – Contains the 2000 Lower West Coast Water Supply Plan Update

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MEETING SOUTH FLORIDA'S RAPIDLY GROWING WATER SUPPLY NEEDS WHILE SAFEGUARDING ITS NATURAL SYSTEMS REQUIRES INNOVATIVE SOLUTIONS, COHESIVE PLANNING AND A SHARED VISION FOR THE FUTURE.

South Florida Water Management District
Committed to managing and protecting our region's water resources

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