SOUTH FLORIDA WATER MANAGEMENT DISTRICT

2005–2006 Update
August 2006

Lower West Coast Water Supply Plan Update APPENDICES

Water Supply Department
South Florida Water Management District

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APPENDIX A

Water Supply Development Projects

WATER SUPPLY DEVELOPMENT PROJECTS

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 adequate new traditional supplies sufficient to meet the increasing water demand in the planning area. Although some new limited traditional supply development may be practicable given appropriate local conditions and reductions in historical water use, and opportunities for addressing adverse impacts, the availability and permittability of such new traditional supplies to meet projected demands through 2025 has 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. **Tables 1** through **3** present the LWC Planning Area's alternative water supply development projects.

Table 1. Lower West Coast Planning Area Utility Proposed Alternative Water Supply Projects.

County	Utility	Project	Water Source	Project Capacity (MGD)	Year Water is First Produced	Total Est. Capital Costs ($M)	Annual O&M Costs ($M)	Eligible for AWS Funding?
Collier	Collier County PUED	North County Regional Water Treatment Plant (NCRWT)	Brackish	1.00	2007	$1.74	$0.00	Y
Collier	Collier County PUED	Four New Brackish Reliability Wells in the South	Brackish	3.00	2009	$3.85	$0.00	Y
Collier	Collier County PUED	Eighteen New Brackish Reliability Wells in the North	Brackish	12.00	2009	$27.67	$0.36	Y
Collier	Collier County PUED	Brackish Water Supply Reliability Improvements Hawthorn	Brackish	3.50	2007	$0.80	$0.00	Y
Collier	Collier County PUED	North County Regional Water Treatment Plant (NCRWT)	Brackish	2.00	2008	$6.56	$0.00	Y
Collier	Collier County PUED	North East Regional Water Treatment Plant (NERWTP)	Brackish	15.00	2011	$77.21	$0.00	Y
Collier	Collier County PUED	North County Regional Water Treatment Plant (NCRWT)	Brackish	1.50	2008	$2.62	$0.00	Y
Collier	Collier County PUED	North East Regional Water Treatment Plant (NERWTP) Construction – Brackish Component	Brackish	20.00	2009	$50.90	$0.78	Y
Collier	Collier County PUED	North East Regional Water Treatment Plant (NERWTP) Wellfield Phase 1.A	Brackish	15.00	2008	$46.59	$0.50	Y
Collier	Collier County PUED	South County Regional Water Treatment Plant (SCRWTP) 12 MGD Reverse	Brackish	12.00	2007	$7.00	$0.46	Y
Collier	Collier County PUED	South County Regional Water Treatment Plant (SCRWTP) Wellfield Expansion	Brackish	15.00	2007	$8.50	$0.46	Y
Collier	Collier County PUED	South East Regional (SERWTP) RO Constr.	Brackish	20.00	2016	$80.31	$9.13	Y

Table 1. Lower West Coast Planning Area Utility Proposed Alternative Water Supply Projects (Continued).

County	Utility	Project	Water Source	Project Capacity (MGD)	Year Water is First Produced	Total Est. Capital Costs ($M)	Annual O&M Costs ($M)	Eligible for AWS Funding?
Collier	Collier County PUED	South East Regional (SERWTP) Wellfield	Brackish	25.00	2011	$68.08	$0.60	Y
Collier	Naples	Reverse Osmosis Plant/Water Supply Wells/Injection Wells	Brackish	10.00	2010	$55.00	$0.50	Y
Hendry	Clewiston	City of Clewiston Reverse Osmosis Water treatment Plant	Brackish	3.00	2007	$14.00	$0.80	Y
Hendry	LaBelle	City of LaBelle Water Treatment Plant	Brackish	8.00	2009	$45.40	$4.34	Y
Hendry	Port LaBelle	Northwest Hendry County Water Supply	Brackish	5.00	2009	$12.00	$0.70	Y
Lee	Bonita Springs Utilities, Inc.	Brackish Wellfield Phase II – 3 Wells (3 MGD)	Brackish	3.00	2008	$3.80	$0.25	Y
Lee	Bonita Springs Utilities, Inc.	RO WTP Phase II – 3 MGD	Brackish	3.00	2009	$10.00	$1.00	Y
Lee	Bonita Springs Utilities, Inc.	Brackish Wellfield Phase III – 4 Wells (4 MGD)	Brackish	4.00	2011	$3.40	$0.04	Y
Lee	Bonita Springs Utilities, Inc.	RO WTP Phase III – 3 MGD	Brackish	3.70	2011	$5.00	$0.20	Y
Lee	Cape Coral	North Reverse Osmosis (RO) Water Treatment Plant	Brackish	36.00	2009	$106.00	$0.00	Y
Lee	Fort Myers	Water Treatment Plant Expansion	Brackish	4.00	2011	$4.21	$0.18	Y
Lee	Fort Myers	Wellfield Expansion	Brackish	17.50	2007	$11.25	$0.01	Y
Lee	Lee County Utilities	Corkscrew Lower Hawthorne Wells Phase II	Brackish	0.75	2007	$0.35	$0.01	Y
Lee	Lee County Utilities	Green Meadows Lower Hawthorne Wells	Brackish	2.00	2007	$0.80	$0.01	Y

Table 1. Lower West Coast Planning Area Utility Proposed Alternative Water Supply Projects (Continued).

County	Utility	Project	Water Source	Project Capacity (MGD)	Year Water is First Produced	Total Est. Capital Costs ($M)	Annual O&M Costs ($M)	Eligible for AWS Funding?
Lee	Lee County Utilities	North Lee County Lower Hawthorne Wellfield and Water Plant Expansion	Brackish	5.00	2008	$20.00	$0.07	Y
Lee	Lee County Utilities	Pinewoods WTP Expansion Phase II	Brackish	3.00	2007	$6.67	$1.65	Y
Collier	Naples	City of Naples Exploratory ASR Well	Captured ASR	10.00	2007	$1.20	$0.10	Y
Collier	Collier County PUED	Carica Road ASR	Captured ASR	5.00	2007	$5.90	$0.00	Y
Collier	Collier County PUED	Construction of Four Additional ASR Wells at the M	Captured ASR	4.00	2007	$5.40	$0.00	Y
Collier	Marco Island	ASR wells 8, 9, 10, 11 and 12	Captured ASR	3.60	2011	$4.50	$0.02	Y
Collier	Marco Island	ASR Wells on Marco Island	Captured ASR	2.60	2009	$4.50	$0.02	Y
Collier	Marco Island	ASR–RO Blending	Captured ASR	0.70	2009	$8.60	$0.02	Y
Lee	Fort Myers	Winkler ASR Well	Captured ASR	1.00	2007	$0.40	$0.02	Y
Lee	Island Water Assoc., Inc.	New 1.2 MGD ASR Well	Captured ASR	1.20	2008	$1.50	$0.35	Y
Lee	Lee County Utilities	Green Meadows ASR	Captured ASR	0.37	2008	$7.00	$0.09	Y
Collier	Ave Maria	Wastewater Reclaimed Water System	Reclaimed	4.67	2007	$12.14	$0.09	Y
Collier	Collier County PUED	Reclaimed Water Transmission Pipeline from North E	Reclaimed	8.50	2009	$7.17	$3.29	Y
Collier	Collier County PUED	Construction of Five Reclaimed Water ASR Wells	Reclaimed	5.00	2009	$6.86	$0.91	Y

Table 1. Lower West Coast Planning Area Utility Proposed Alternative Water Supply Projects (Continued).

County	Utility	Project	Water Source	Project Capacity (MGD)	Year Water is First Produced	Total Est. Capital Costs ($M)	Annual O&M Costs ($M)	Eligible for AWS Funding?
Collier	Collier County PUED	Reclaimed Water Booster Pump Station	Reclaimed	10.00	2007	$1.20	$0.02	Y
Collier	Collier County PUED	North East Water Reclamation Facility (NEWRF) Constr	Reclaimed	10.20	2009	$42.60	$6.57	Y
Collier	Collier County PUED	North County Water Reclamation Facility (NCWRF) Expansion	Reclaimed	5.30	2016	$15.00	$3.29	Y
Collier	Collier County PUED	East Central Water Reclamation Facility (ECWRF) Construction	Reclaimed	6.80	2010	$83.00	$4.38	Y
Collier	Collier County PUED	Southeast Water Reclamation Facility (SEWRF) Const	Reclaimed	6.80	2010	$50.00	$3.29	Y
Collier	Collier County PUED	Pelican Bay WWTP Conversion to Reclaimed Water Storage	Reclaimed	1.00	2007	$1.20	$0.20	Y
Collier	Marco Island	Regional Irrigation Distribution System (RIDS) Pump Station & Pipeline	Reclaimed	6.00	2009	$7.50	$0.06	Y
Collier	Marco Island	RIDS Specific to Fiddler's Creek & Other Nearby Developments	Reclaimed	1.00	2008	$3.00	$0.01	Y
Collier	Marco Island	Reuse/Reclaimed Water Storage Tank at Windward Road Facility (North)	Reclaimed	2.00	2016	$3.50	$0.02	Y
Collier	Marco Island	Reuse/Reclaimed Water Distribution System Expansion – On Island	Reclaimed	1.00	2010	$6.02	$0.01	Y
Collier	Marco Island	Reuse/Reclaimed Water Production Facility Expansion	Reclaimed	4.00	2007	$66.00	$0.08	Y
Collier	Naples	City of Naples Reclaimed Water Expansion	Reclaimed	1.50	2007	$12.00	$0.06	Y

Table 1. Lower West Coast Planning Area Utility Proposed Alternative Water Supply Projects (Continued).

County	Utility	Project	Water Source	Project Capacity (MGD)	Year Water is First Produced	Total Est. Capital Costs ($M)	Annual O&M Costs ($M)	Eligible for AWS Funding?
Hendry	Clewiston	City of Clewiston Sewer Plant and Reclaimed Water treatment Facility Expansion	Reclaimed	3.00	2008	$6.00	$0.35	Y
Hendry	Clewiston	City of Clewiston to Bonita Bay Reclaimed Water Pipeline	Reclaimed	1.00	2008	$1.50	$0.05	Y
Hendry	Clewiston	Satellite Membrane Bioreactor Reclaimed Water Treatment Facility – Lennar Development	Reclaimed	0.50	2009	$0.75	$0.06	Y
Hendry	LaBelle	City of LaBelle Public Access Reuse Improvements	Reclaimed	1.75	2011	$5.90	$0.12	Y
Hendry	Port LaBelle	PLUS Reclaimed Water System	Reclaimed	2.00	2010	$12.00	$0.54	Y
Hendry	Hendry County Util	Northwest Hendry County Reclaimed Water Supply System	Reclaimed	3.00	2010	$15.00	$0.70	Y
Lee	Bonita Springs Utilities, Inc.	East WRF Transmission Main (East Phase)	Reclaimed	0.00	N/A	$8.30	$0.00	Y
Lee	Bonita Springs Utilities, Inc.	Reuse Interconnect to Collier County	Reclaimed	2.00	2011	$2.50	$0.04	Y
Lee	Cape Coral	Aquifer Storage and Recovery	Reclaimed	76.00	2007	$77.00	$0.22	Y
Lee	Cape Coral	Utility Expansion – Reclaimed Water Irrigation – Southwest Areas	Reclaimed	10.65	2007	$46.25	$0.04	Y
Lee	Cape Coral	Utility Expansion – Reclaimed Water Irrigation – North Areas	Reclaimed	57.70	2007	$286.00	$0.07	Y
Lee	Cape Coral	Everest Water Reclamation Facility Expansion	Reclaimed	4.90	2009	$48.00	$1.70	Y
Lee	Cape Coral	Southwest Water Reclamation Facility Expansion	Reclaimed	8.40	2009	$50.00	$2.91	Y

Table 1. Lower West Coast Planning Area Utility Proposed Alternative Water Supply Projects (Continued).

County	Utility	Project	Water Source	Project Capacity (MGD)	Year Water is First Produced	Total Est. Capital Costs ($M)	Annual O&M Costs ($M)	Eligible for AWS Funding?
Lee	Cape Coral	North Water Reclamation Facility	Reclaimed	24.00	2010	$145.00	$0.00	Y
Lee	Fort Myers	Reuse at South WWTP	Reclaimed	9.00	2011	$11.01	$2.90	Y
Lee	Fort Myers	East Water Reclamation Facility	Reclaimed	6.00	2011	$45.20	$3.64	Y
Lee	Fort Myers	Reclaimed Water Transmission Line	Reclaimed	0.00	N/A	$12.00	$0.00	Y
Lee	Fort Myers	Central AWWT Plant Reclaimed Water Expansion	Reclaimed	4.00	2007	$5.52	$1.46	Y
Lee	Lee County Utilities	Three Oaks Parkway Reclaimed Water Transmission Sy	Reclaimed	1.00	2007	$1.22	$0.00	Y
Lee	Lee County Utilities	Fort Myers Beach WWTP Reclaimed Water Elevated Storage Tank	Reclaimed	1.20	2007	$1.50	$0.01	Y
Lee	Lee County Utilities	Health Park Reclaimed Water ASR Wells Phase II	Reclaimed	1.00	2010	$0.80	$0.01	Y
Lee	Lee County Utilities	Health Park Reclaimed Water ASR Wells Phase I	Reclaimed	1.00	2008	$1.20	$0.01	Y
Lee	Lee County Utilities	FGCU/Miromar Lakes Reclaimed Water Main	Reclaimed	1.00	2007	$0.30	$0.00	Y
Lee	Lee County Utilities	RCS Reclaimed Water Interconnection	Reclaimed	1.00	2007	$0.55	$0.00	Y
Collier	Marco Island	Conversion of Two RO Skids to Nanofiltration	Surface Supplies	6.00	2009	$12.00	$0.08	Y
Collier	Marco Island	Pipeline from Surface Water Source Facility to Marco Island	Surface Supplies	10.00	2009	$9.00	$0.01	Y
Collier	Marco Island	Surface Water Source Pipeline on Marco Island	Surface Supplies	10.00	2008	$6.00	$0.01	Y

Table 1. Lower West Coast Planning Area Utility Proposed Alternative Water Supply Projects (Continued).

County	Utility	Project	Water Source	Project Capacity (MGD)	Year Water is First Produced	Total Est. Capital Costs ($M)	Annual O&M Costs ($M)	Eligible for AWS Funding?
Lee	Bonita Springs Utilities, Inc.	Kehl Canal Raw Water ASR	Surface Supplies	2.00	2011	$9.00	$0.18	Y
Lee	Cape Coral	Canal Weirs Improvement Program	Surface Supplies	1.50	2007	$1.40	$0.00	Y
Lee	Cape Coral	CRA District Stormwater Master Plan	Surface Supplies	12.60	2008	$18.50	$0.00	Y

Table 2. Lower West Coast Planning Area District Proposed Alternative Water Supply Projects to Meet Projected Supply Shortfalls.

County	Utility	Project	Water Source	Project Capacity (MGD)	Year Water is First Produced	Total Est. Capital Costs ($M)	Annual O&M Costs ($M)	Eligible for AWS Funding?
Collier	Ave Maria Utilities	4.0 MGD Brackish Water Supply	Brackish	4.00	2015	$20.50	$1.70	Y
Collier	Immokalee Water & Sewer Dist.	4.5 MGD RO Facility	Brackish	4.50	2009	$22.30	$1.90	Y
Lee	FGUA Lehigh	5.5 MGD Brackish Supply, in 2 Phases	Brackish	5.50	2009	$27.00	$2.30	Y
Lee	Pine Island Water Assoc.	2.0 MGD Brackish Supply Increase	Brackish	2.00	2009	$9.10	$0.90	Y

Table 3. FY 2006 Alternative Water Supply Funded Projects in the LWC Planning Area and the Big Cypress Basin.

County	Utility	Project	Water Source	Project Capacity (MGD)	Year Water is First Produced	Total Est. Capital Costs ($M)	Annual O&M Costs ($M)	Eligible for AWS Funding?
Collier	Ave Maria	2006 Project 0.9 MGD Reclaimed Water Production Facilities	Reclaimed	0.90	2006	$0.00	$0.00	Y
Lee	Bonita Springs Utilities	Chlorine Contact Basin for Reclaimed	Reclaimed	0.00	2006	$0.00	$0.00	Y
Lee	Bonita Springs Utilities	East Reclaimed Transmission Main	Reclaimed	0.00	2006	$0.00	$0.00	Y
Lee	Cape Coral	2006 Project 3.10 MGD RO Expansion	Brackish	3.10	2006	$0.00	$0.00	Y
Lee	Cape Coral	2006 Project Southwest Floridan Aquifer Wells (8)	Brackish	5.76	2006	$0.00	$0.00	Y
Lee	Cape Coral	2006 Project Floridan Aquifer Monitoring Equipment	GM	0.00	N/A	$0.00	$0.00	Y
Lee	Cape Coral	2006 Project Reclaimed Water Transmission for SE-1 Southwest Area	Reclaimed	0.41	2006	$0.00	$0.00	Y
Hendry	C&B Farms	Tailwater Recovery Demonstration Project	Surface Supplies	0.00	2006	$0.00	$0.00	Y
Hendry	Clewiston Util.	Four Floridan Aquifer Production Wells	Brackish	3.00	2006	$0.00	$0.00	Y
Collier	Collier County PUED	Club Pelican Bay Reclaimed Water ASR	Reclaimed	0.90	2006	$0.00	$0.00	Y
Collier	Collier County PUED	2006 Project Floridan Wells 101N, 102N	Brackish	1.00	2006	$0.00	$0.00	Y
Collier	Collier County PUED	2006 Project Floridan Wells 18N, 19N, 20N	Brackish	3.00	2006	$0.00	$0.00	Y
Collier	Collier County PUED	2006 Project Hawthorne Zone 1 & Lower Hawthorne Test Production Wells	GM	0.00	2006	$0.00	$0.00	Y

Table 3. FY 2006 Alternative Water Supply Funded Projects in the LWC Planning Area and the Big Cypress Basin (Continued).

County	Utility	Project	Water Source	Project Capacity (MGD)	Year Water is First Produced	Total Est. Capital Costs ($M)	Annual O&M Costs ($M)	Eligible for AWS Funding?
Collier	Collier County PUED	2006 Project 12th Ave Tamiami Interconnect to Blend Tamiami and Floridan Water	GM	5.90	2006	$0.00	$0.00	Y
Collier	Collier County PUED	2006 Project Pelican Bay Conversion to Reclaimed Water Storage & Repump Ph1	Reclaimed	1.00	2006	$0.00	$0.00	Y
Collier	Collier County PUED	2006 Project Reclaimed Water Main Rd. to Davis Blvd.	Reclaimed	1.00	2006	$0.00	$0.00	Y
Collier	Collier County PUED	2006 Project Reclaimed Water ASR	Reclaimed	1.00	2006	$0.00	$0.00	Y
Collier	Collier County PUED	Reclaimed Pump Station	Reclaimed	0.00	2006	$0.00	$0.00	Y
Lee	Fort Myers	2006 Project 4 MGD Reclaimed Water Treatment Expansion	Reclaimed	4.00	2006	$0.00	$0.00	Y
Lee	Lee County Utilities	2006 Project Pinewoods Floridan Wells (4) & 3.2 MGD RO Plant	Brackish	3.20	2006	$0.00	$0.00	Y
Lee	Lee County Utilities	2006 Project Waterway Estates - Lochmoor Reclaimed Storage Tank	Reclaimed	1.00	2006	$0.00	$0.00	Y
Lee	Lee County Utilities	Olga ASR Well # 2	ASR	0.17	2006	$0.00	$0.00	Y
Collier	Marco Island	2006 Project 2 MGD WWTF Expansion – Convert to Membrane Bioreactor - Project under Evaluation	Reclaimed	0.00	N/A	$0.00	$0.00	Y
Collier	Naples	2006 Project Reclaimed Water Expansion	Reclaimed	2.50	2006	$0.00	$0.00	Y
Collier	Collier County PUED	NE 10-MGD RO Construction	Brackish	0.00	2008	$0.00	$0.00	Y

Table 3. FY 2006 Alternative Water Supply Funded Projects in the LWC Planning Area and the Big Cypress Basin (Continued).

County	Utility	Project	Water Source	Project Capacity (MGD)	Year Water is First Produced	Total Est. Capital Costs ($M)	Annual O&M Costs ($M)	Eligible for AWS Funding?
Collier	Collier County PUED	South 12 MGD RO Construction	Brackish	12.00	2007	$0.00	$0.00	Y
Collier	Collier County PUED	Floridan Aquifer 12 MGD Expansion	Brackish	3.50	2006	$0.00	$0.00	Y
Collier	Collier County PUED	N. Naples Regional Park Irrigation System	Reclaimed	0.00		$0.00	$0.00	Y
Collier	Everglades City	WTP Modification	Other	0.00		$0.00	$0.00	Y
Collier	Marco Island	ASR Wells 4, 5, 6	ASR	3.00	2006	$0.00	$0.00	Y
Collier	Marco Island	ASR Wells 7, 8, 9	ASR	3.00	2006	$0.00	$0.00	Y
Collier	Marco Island	South Collier Reuse System	Reclaimed	0.00		$0.00	$0.00	Y
Collier	Marco Island	Raw-water TM from Marco Lakes to Island	Surface Supplies	0.00	2006	$0.00	$0.00	Y
Collier	Naples	Naples ASR Expl. Well	ASR	0.00	2007	$0.00	$0.00	Y
Collier	Naples	Naples Reclaimed Water System Expans. Ph 1	Reclaimed	0.05	2006	$0.00	$0.00	Y

APPENDIX B

Information for Local Government Comprehensive Plans

The water supply plan updates contain a variety of water supply-related information useful to local governments in the preparation and amendment of their comprehensive plans. Much of that information is contained within other appendices or chapters of this Lower West Coast (LWC) Plan Update and can be found in the following locations:

Water Sources	Chapter 5 and 7 and Appendix A
Utility Areas Served (2005 & 2025)	Appendix B and D
Population Projections (2005–2025)	Chapter 2 and Appendix D
Demand Projections (2005–2025)	Chapter 2 and Appendix D
Water Supply Projects (2005–2025)	Chapter 7 and Appendix A

Other information useful for comprehensive plans is provided as follows:

1. The South Florida Water Management District's (SFWMD or District) checklist of needed comprehensive plan data.
   a. Cited statutory provisions.
2. Tables showing which utilities serve which jurisdiction.
3. Maps of utility areas currently served (2005) and to-be-served (2025).

1. CHECKLIST OF NEEDED COMPREHENSIVE PLAN DATA

This section provides a general checklist of the type of data and information that the SFWMD will be looking for to review water supply issues in local government comprehensive plans. This listing is not all-inclusive, but provides a broad, general framework that should be used in combination with the more detailed, related guidelines developed by the Florida Department of Community Affairs (FDCA), and case-by-case comments made by the SFWMD on specific water supply issues.

Checklist guidance is given for three water supply aspects of comprehensive plans:

A. Plan Amendments (Future Land Use Change).
B. 10-Year Water Supply Facilities Work Plan and Other Potable Water Sub-Element Revisions
C. Evaluation & Appraisal Report (EAR) Reporting Requirements.

A. Plan Amendments (Future Land Use Change)

Water Supply Demand Projections

- Address both raw and finished (i.e., after any losses due to water treatment) water supply needs for both potable and nonpotable (i.e., irrigation) demands, using professionally acceptable methodologies.

- Address existing and future conservation and reuse commitments, and levels of service, for both the proposed future land use change and the comprehensive plan.
- Address both the build-out time frame for a proposed future land use change, and the established planning time frame for the comprehensive plan.

Water Source Identification

- For existing demands, reflect water source(s) from supplier's consumptive use permit (CUP).
- For future demands covered by a supplier's commitment to provide service under remaining available capacity of an existing consumptive use permit, reflect the source(s) from the supplier's CUP.
- For future demands not covered by an existing CUP, provide sufficient planning level data and analysis to demonstrate the availability of a sustainable water source as identified in the appropriate District regional water supply plan.

Availability of Water Supply and Public Facilities

- Demonstrate that there is an availability of raw water supply from the proposed source(s) of raw supply for the future land use change, given all other approved land use commitments within the local government's jurisdiction over both the proposed amendment's build-out, and the established planning period of the comprehensive plan. (See Section 163.3167(13), F.S., and Subsection 163.3177(6)(a), F.S.)
- Demonstrate that there is an availability of both treatment facility capacity and permitted, available finished water supply for the future land use change, given all other commitments for that capacity and supply over the proposed build-out time frame.
- If the availability of either water supply and/or public facilities is not currently demonstrable, this will require either phasing of the future land use (see Subsection 163.3177(10)(h), F.S.), and/or appropriate amendments to the Capital Improvements Element, or to the Potable Water Sub-Element, to ensure the necessary capital planning and timely availability of the needed infrastructure and water supply. (See Subsections 163.3177(3)(a) and (6)(c), F.S.)

Related Comprehensive Plan Amendments

- Addressing a future land use change may also require amendments to other specific elements within the comprehensive plan if it requires an adjustment to either the plan's future population or demand projections; the comprehensive plan's established planning period; or, the water supply sources required to be addressed in the comprehensive plan. (See Section 163.3167(13), F.S. and Subsections 163.3177(5)(a), 163.3177(6)(a), 163.3177(6)(c), and 163.3177(6)(d), F.S.)

B. 10-Year Water Supply Facilities Work Plan and Other Potable Water Sub-Element Revisions

(Within 18 months following this update of the LWC Water Supply Plan)

Water Supply Demand Projections

- Coordinate with the regional water supply plan's demand projections. Address both raw and finished (i.e., after any losses due to water treatment) water supply needs for both potable and nonpotable (i.e., irrigation) demands within the jurisdiction

(regardless of supplier) for at least five-year intervals out to the established planning time frame of the comprehensive plan.

- Address existing and future conservation and reuse commitments and levels of service for the established planning time frame of the comprehensive plan.
- Identify existing and future utility service areas (i.e., areas to be actually served) for each provider within the jurisdiction.
- Identify areas and amounts of any self-supply (i.e., supply by single-family individual wells) separately.

Water Source Identification

- Address the water supply sources necessary to meet and achieve the existing and projected water use demand for the established planning period, considering the regional water supply plan.

Water Supply Project Identification and Selection

- Identify sufficient conservation, reuse, alternative water supply projects and traditional water supply projects necessary to meet projected demands.
- Select and incorporate into the comprehensive plan alternative water supply project(s) selected by the local government from those identified in the regional water supply plan, or propose alternatives.
- Based upon projected demands, include a water supply facilities work plan, covering at least a 10-year planning period, but preferably out to the established planning period, for building all public, private and regional water supply facilities that will provide water supply service within the local government's jurisdiction (e.g., if it is a water provider to land uses within the jurisdiction, its facility planning must be addressed in the work plan).
- Appropriate amendments to the Capital Improvements Element may be required. (See Subsection 163.3177(3)(a), F.S.)

C. Evaluation & Appraisal Report (EAR) Subsection 163.3191(2)(L), F.S.

(Submitted after the adoption of a 10-Year Water Supply Facilities Work Plan)

Water Supply Project Identification and Selection

- Identify the extent to which the local government has been successful in identifying alternative water supply projects and traditional water supply projects, including conservation and reuse, necessary to meet projected demands.
- Evaluate the degree to which the 10-Year Water Supply Facilities Work Plan has been implemented for building all public, private and regional water supply facilities within the jurisdiction necessary to meet projected demands.

1a. CITED STATUTORY PROVISIONS (RELEVANT PORTIONS)

163.3167(13), F.S.: Each local government shall address in its comprehensive plan, as enumerated in this chapter, the water supply sources necessary to meet and achieve the existing and projected water use demand for the established planning period, considering the applicable plan developed pursuant to s. 373.0361.

163.3177(3)(a), F.S.: The comprehensive plan shall contain a capital improvements element designed to consider the need for and the location of public facilities in order to encourage the efficient utilization of such facilities and set forth:

1. A component which outlines principles for construction, extension or increase in capacity of public facilities, as well as a component which outlines principles for correcting existing public facility deficiencies, which are necessary to implement the comprehensive plan. The components shall cover at least a 5-year period.

2. Estimated public facility costs, including a delineation of when facilities will be needed, the general location of the facilities, and projected revenue sources to fund the facilities.

3. Standards to ensure the availability of public facilities and the adequacy of those facilities including acceptable levels of service.

4. Standards for the management of debt.

5. A schedule of capital improvements which includes publicly funded projects, and which may include privately funded projects for which the local government has no fiscal responsibility, necessary to ensure that adopted level-of-service standards are achieved and maintained. For capital improvements that will be funded by the developer, financial feasibility shall be demonstrated by being guaranteed in an enforceable development agreement or interlocal agreement pursuant to paragraph (10)(h), or other enforceable agreement. These development agreements and interlocal agreements shall be reflected in the schedule of capital improvements if the capital improvement is necessary to serve development within the 5-year schedule. If the local government uses planned revenue sources that require referenda or other actions to secure the revenue source, the plan must, in the event the referenda are not passed or actions do not secure the planned revenue source, identify other existing revenue sources that will be used to fund the capital projects or otherwise amend the plan to ensure financial feasibility.

6. The schedule must include transportation improvements included in the applicable metropolitan planning organization's transportation improvement program adopted pursuant to s. 339.175(7) to the extent that such improvements are relied upon to ensure concurrency and financial feasibility. The schedule must also be coordinated with the applicable metropolitan planning organization's long-range transportation plan adopted pursuant to s. 339.175(6).

163.3177(5)(a), F.S.: Each local government comprehensive plan must include at least two planning periods, one covering at least the first 5-year period occurring after the plan's adoption and one covering at least a 10-year period.

163.3177(6)(a), F.S.: A future land use plan element designating proposed future general distribution, location, and extent of the uses of land for residential uses, commercial uses, industry, agriculture, recreation, conservation, education, public buildings and grounds, other public facilities, and other categories of the public and private uses of land… . The future land use plan shall be based upon surveys, studies, and data regarding the area, including the amount of land required to accommodate anticipated growth; the projected population of the area; the character of undeveloped land; the availability of water supplies, public facilities, and services; … .

163.3177(6)(c), F.S.: A general sanitary sewer, solid waste, drainage, potable water, and natural groundwater aquifer recharge element correlated to principles and guidelines for future land use, indicating ways to provide for future potable water, drainage, sanitary sewer, solid waste, and aquifer recharge protection requirements for the area. The element may be a detailed engineering plan including a topographic map depicting areas of prime groundwater recharge. The element shall describe the problems and needs and the general facilities that will be required for solution of the problems and needs. The element shall also include a topographic map depicting any areas adopted by a regional water management district as prime groundwater recharge areas for the Floridan or Biscayne aquifers. These areas shall be given special consideration when the local government is engaged in zoning or considering future land use for said designated areas. For areas served by septic tanks, soil surveys shall be provided, which indicate the suitability of soils for septic tanks. Within 18 months after the governing board approves an updated regional water supply plan, the element must incorporate the alternative water supply project or projects selected by the local government from those identified in the regional water supply plan pursuant to s. 373.0361(2)(a) or proposed by the local government under s. 373.0361(7)(b). If a local government is located within two water management districts, the local government shall adopt its comprehensive plan amendment within 18 months after the later updated regional water supply plan. The element must identify such alternative water supply projects and traditional water supply projects and conservation and reuse necessary to meet the water needs identified in s. 373.0361(2)(a) within the local government's jurisdiction and include a work plan, covering at least a 10-year planning period, for building public, private and regional water supply facilities, including development of alternative water supplies, which are identified in the element as necessary to serve existing and new development. The work plan shall be updated, at a minimum, every 5 years within 18 months after the governing board of a water management district approves an updated regional water supply plan. Amendments to incorporate the work plan do not count toward the limitation on the frequency of adoption of amendments to the comprehensive plan. Local governments, public and private utilities, regional water supply authorities, special districts and water management districts are encouraged to cooperatively plan for the development of multijurisdictional water supply facilities that are sufficient to meet projected demands for established planning periods, including the development of alternative water sources to supplement traditional sources of groundwater and surface water supplies.

163.3177(6)(d), F.S.: A conservation element for the conservation, use and protection of natural resources in the area, including air, water, water recharge areas, wetlands, waterwells, estuarine marshes, soils, beaches, shores, flood plains, rivers, bays, lakes, harbors, forests, fisheries and wildlife, marine habitat, minerals, and other natural and environmental resources. Local governments shall assess their current, as well as projected, water needs and sources for at least a 10-year period, considering the appropriate regional water supply plan approved pursuant to s. 373.0361, or, in the absence of an approved regional water supply plan, the district water management plan approved pursuant to s. 373.036(2). This information shall be submitted to the appropriate agencies… .

163.3177(10)(h), F.S.: It is the intent of the Legislature that public facilities and services needed to support development shall be available concurrent with the impacts of such development in accordance with s. 163.3180. In meeting this intent, public facility and service availability shall be deemed sufficient if the public facilities and services for a development are phased, or the development is phased, so that the public facilities and those related services which are deemed necessary by the local government to operate the facilities necessitated by that development are available concurrent with the impacts of the development. The public facilities and services, unless already available, are to be consistent with the capital improvements element of the local comprehensive plan as required by paragraph (3)(a) or guaranteed in an enforceable development agreement. This shall include development agreements pursuant to this chapter or in an agreement or a development order issued pursuant to chapter 380. Nothing herein shall be construed to require a local government to address services in its capital improvements plan or to limit a local government's ability to address any service in its capital improvements plan that it deems necessary.

163.3191(2)(l), F.S.: The extent to which the local government has been successful in identifying alternative water supply projects and traditional water supply projects, including conservation and reuse, necessary to meet the water needs identified in s. 373.0361(2)(a) within the local government's jurisdiction. The report must evaluate the degree to which the local government has implemented the work plan for building public, private and regional water supply facilities, including development of alternative water supplies, identified in the element as necessary to serve existing and new development.

2. TABLES SHOWING WHICH UTILITIES SERVE WHICH JURISDICTIONS

This portion of Appendix B contains two tables showing local government jurisdictions and the utilities that provide raw or finished water to those local governments. **Table 1** is listed by local governments within the LWC Planning Area. **Table 2** is listed by utilities serving specific local government jurisdictions within the LWC Planning Area.

Table 1. Local Governments and the Utilities That Serve Them in the LWC Planning Area.

Local Government	County	Local Government Utility	Other Utility Serving Local Government
Charlotte County (unincorporated)	Charlotte	Yes	
Collier County (unincorporated)	Collier	Yes	Florida Governmental Utility Assoc.; Immokalee Water & Sewer District; Orangetree Utilities
Everglades City	Collier	Yes	U.S Water (contract water provider for Everglades City)
Marco Island	Collier	Yes	
Naples	Collier	Yes	
Glades County (unincorporated)	Glades		Port LaBelle Utilities (Hendry County)
Moore Haven	Glades	Yes	
Hendry County (unincorporated)	Hendry	Port LaBelle Utilities	City of LaBelle Utilities, Department of Corrections
Clewiston	Hendry	Yes	U.S. Sugar (until summer 2008)
LaBelle	Hendry	Yes	
Lee County (unincorporated)	Lee	Yes	Greater Pine Island Water Assoc.; Island Water Assoc. (private utility); Florida Governmental Utility Assoc. Bonita Springs Utilities (private utility); Fort Myers, Cape Coral
Bonita Springs	Lee	No	Bonita Springs Utilities (private utility)
Cape Coral	Lee	Yes	Greater Pine Island Water Association
Fort Myers	Lee	Yes	
Fort Myers Beach	Lee	Yes	Lee County
Sanibel	Lee	No	Island Water Association (private utility)
Monroe County (unincorporated)	Monroe		

Table 2. Utilities and the Local Governments They Serve in the LWC Planning Area.

Utility Name	County	Local Government Utility	Local Governments Served (raw & finished)
Charlotte County Utilities	Charlotte	Yes	Charlotte County
City of Naples Utility Dept.	Collier	Yes	City of Naples
Collier County Public Utilities	Collier	Yes	Collier County
Florida Governmental Utility Authority (FGUA)	Collier	No	Golden Gate (unincorporated Collier)
Immokalee Water & Sewer District	Collier	Yes	Town of Immokalee (unincorporated Collier)
Marco Island Utilities	Collier	Yes	City of Marco Island
Orangetree Utilities	Collier	No	Collier County
U.S. Water	Collier	No	Everglades City
Moore Haven Utilities	Glades	Yes	Moore Haven
City of LaBelle Dept. of Public Works	Hendry	Yes	City of LaBelle, Hendry County
Department of Corrections	Hendry	Yes	Hendry Correctional Institution (unincorporated Hendry)
Port LaBelle Utilities	Hendry	Yes	Hendry County, Glades County
U.S. Sugar Corp.	Hendry	No	City of Clewiston (supply until summer 2008)
Bonita Springs Utilities, Inc.	Lee	No	City of Bonita Springs, Lee County (unincorporated)
City of Cape Coral Util. Dept.	Lee	Yes	City of Cape Coral, Lee County (unincorporated)
City of Fort Myers Public Util.	Lee	Yes	City of Fort Myers, Lee County (unincorporated)
Florida Governmental Utility Authority (FGUA)	Lee	No	Lehigh Acres (unincorporated)
Greater Pine Island Water Assoc.	Lee	No	Pine Island (unincorporated) and a portion of Cape Coral
Island Water Association, Inc.	Lee	No	Sanibel & Little Captiva Islands (unincorporated)
Lee County Division of Utilities	Lee	Yes	Unincorporated Lee Co., Fort Myers Beach

3. MAPS OF UTILITY AREAS CURRENTLY SERVED (2005) AND TO-BE-SERVED (2025)

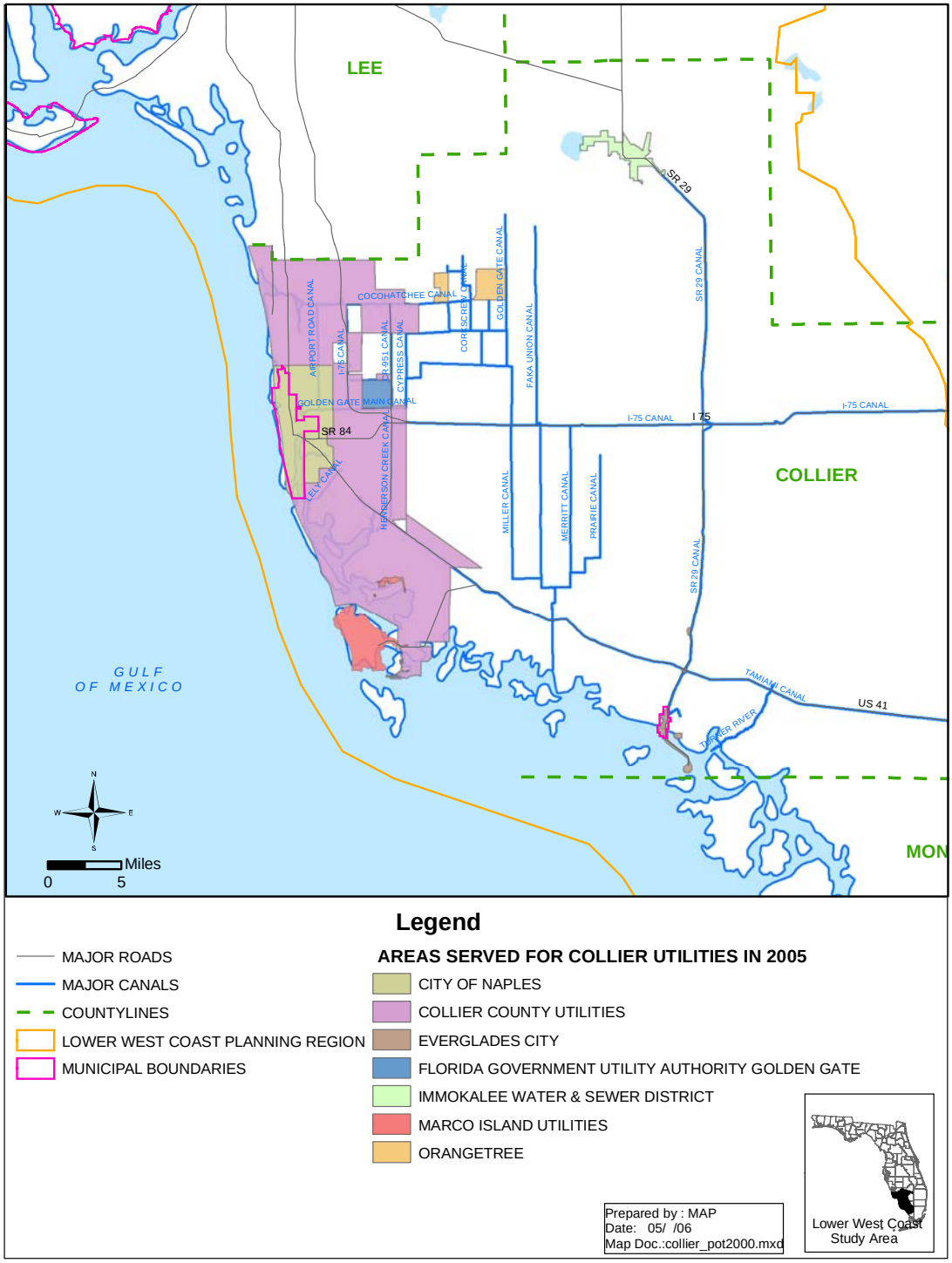

Figure 1. 2005 Utility Areas Served in the Collier County.

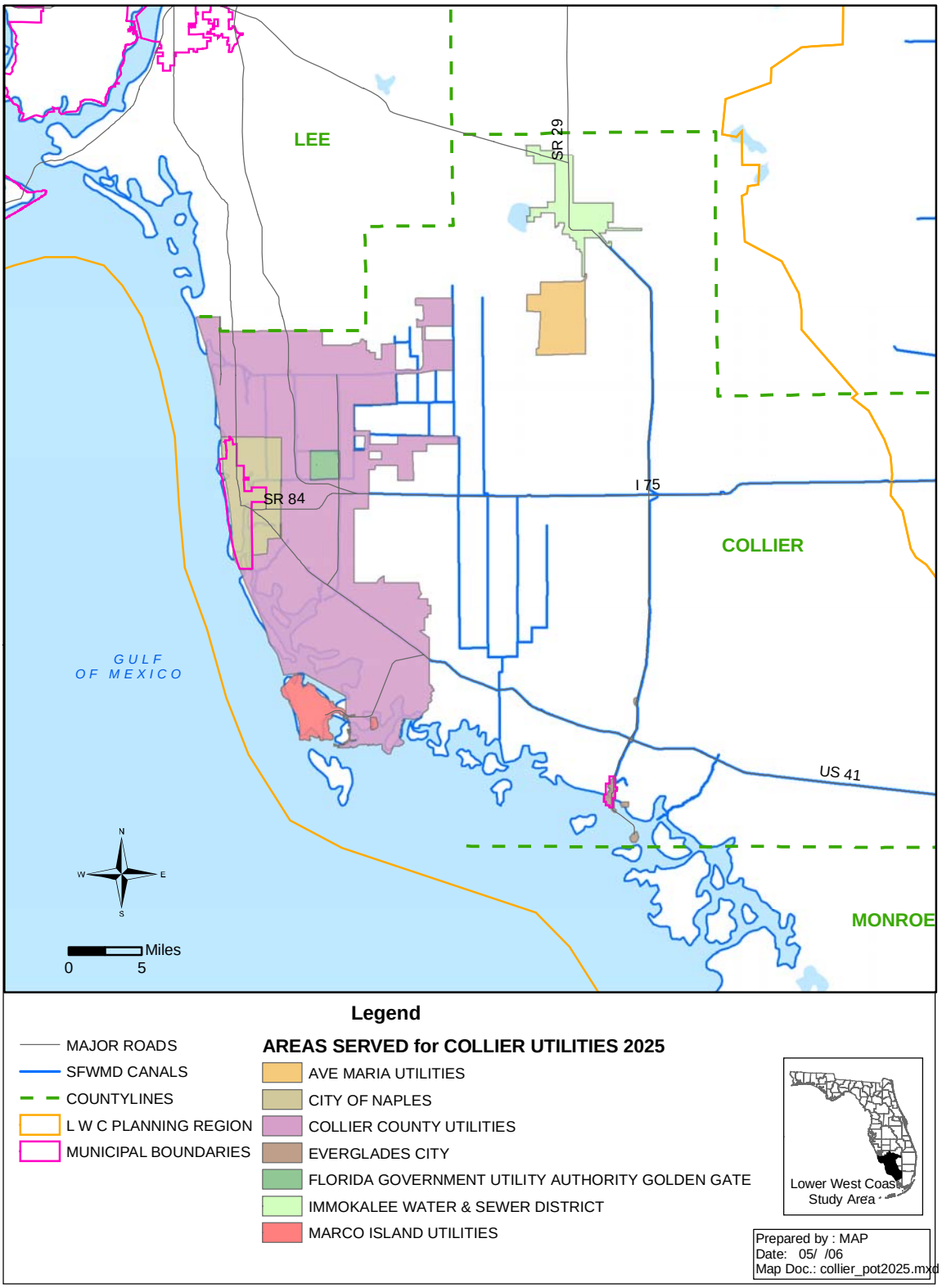

Figure 2. 2025 Utility Areas To-Be-Served in Collier County.

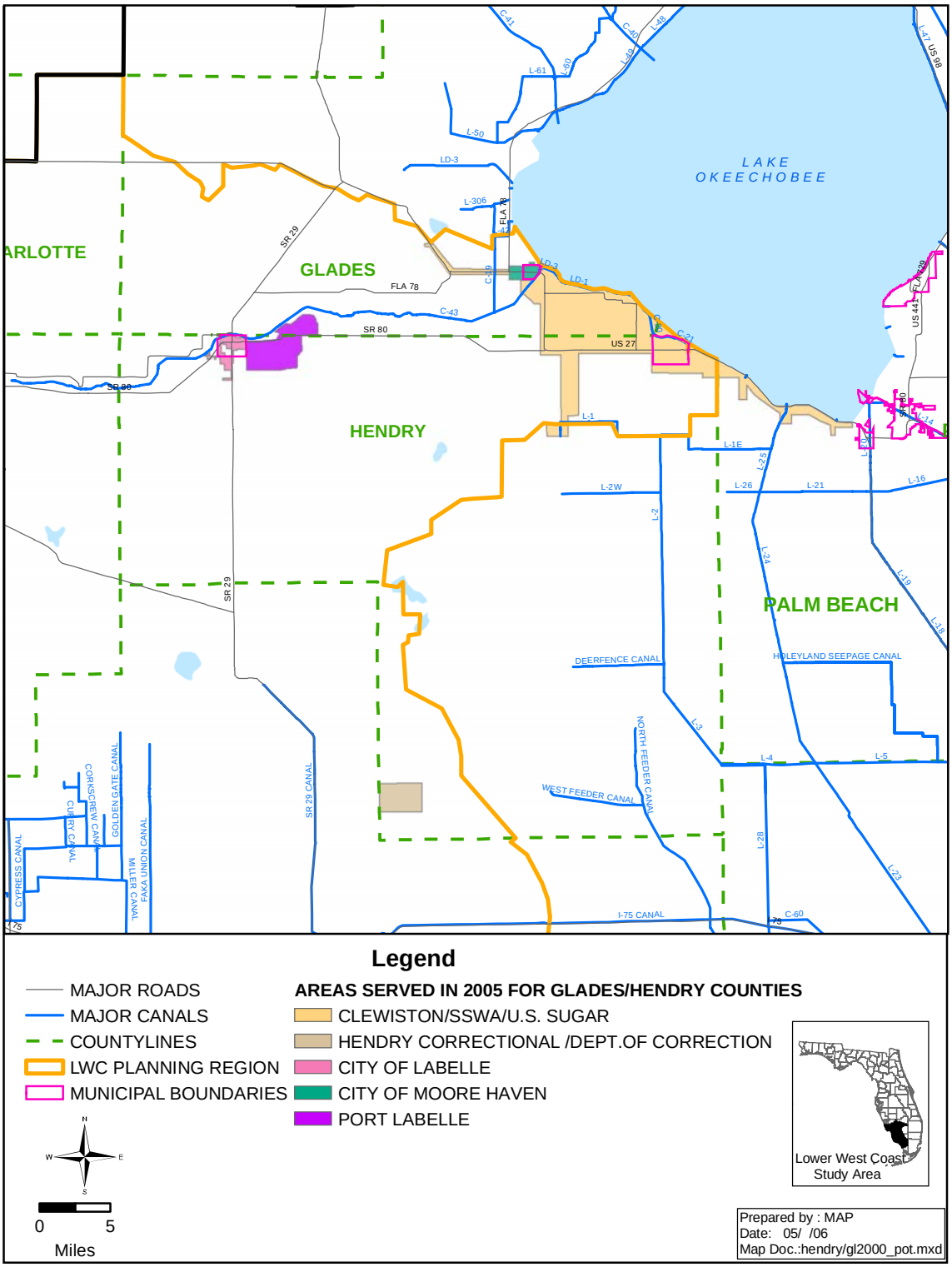

Figure 3. 2005 Utility Areas Served in the Hendry and Glades Counties.

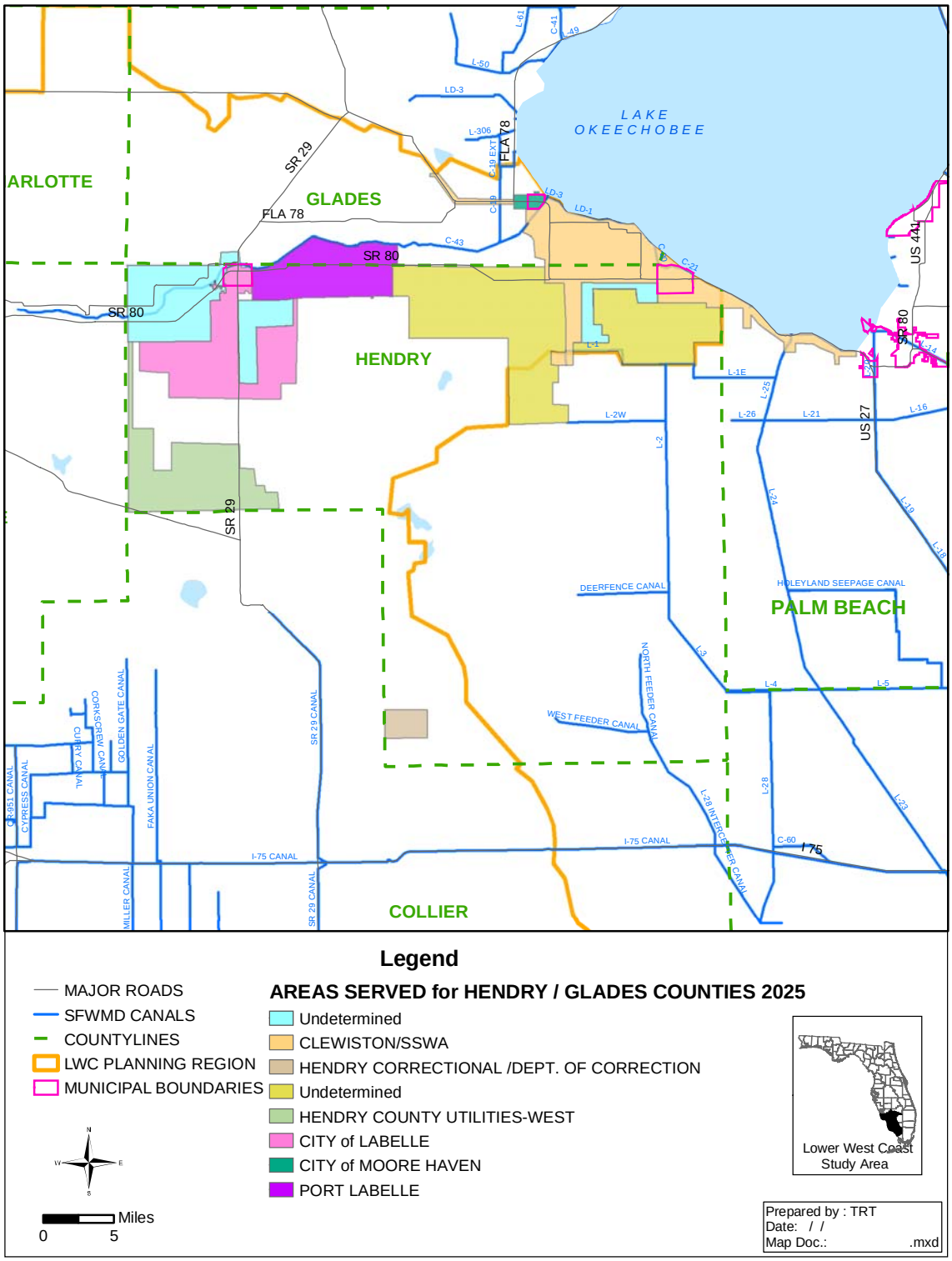

Figure 4. 2025 Utility Areas To-Be-Served in Hendry and Glades Counties.

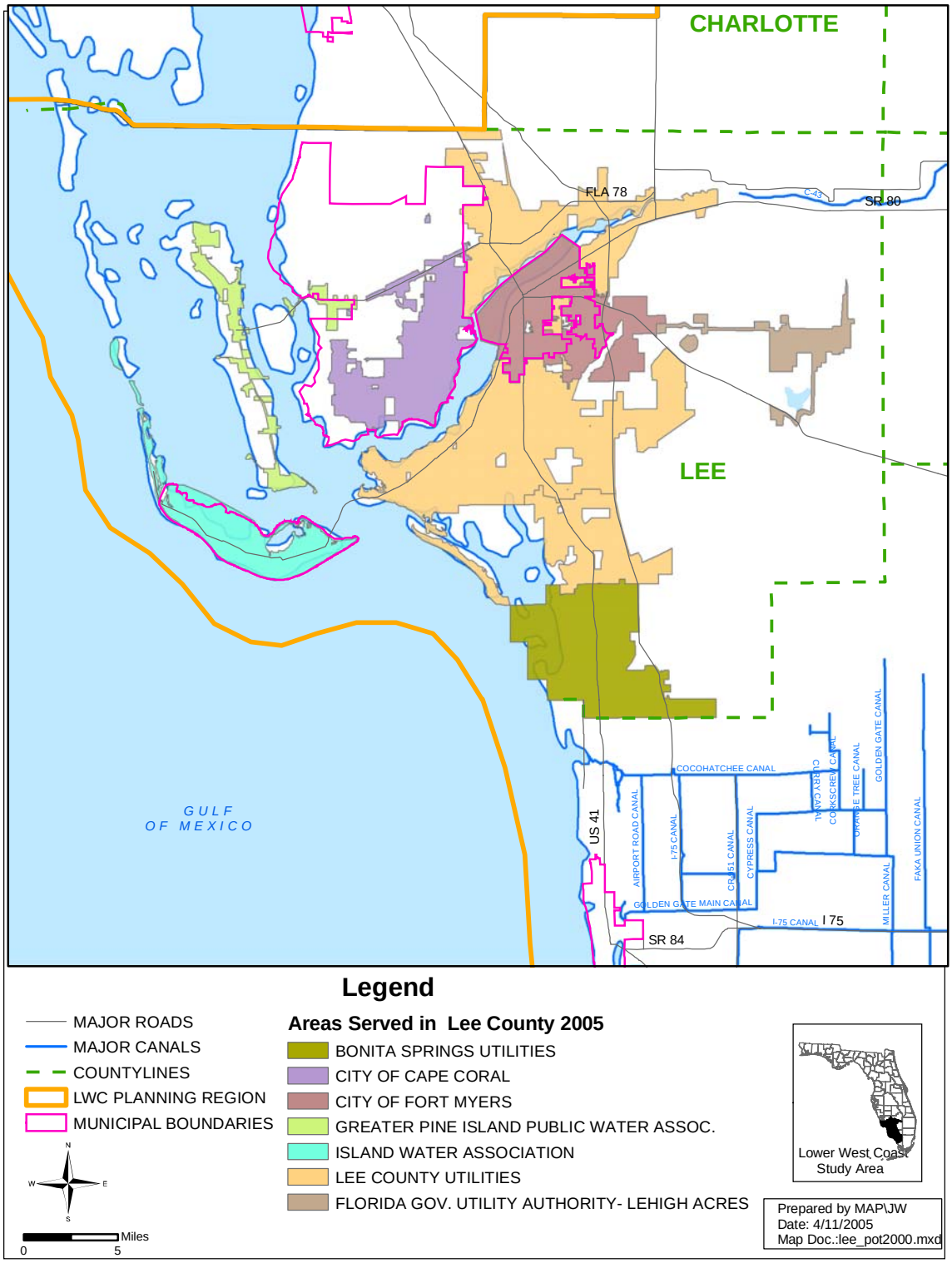

Figure 5. 2005 Utility Areas Served in the Lee County.

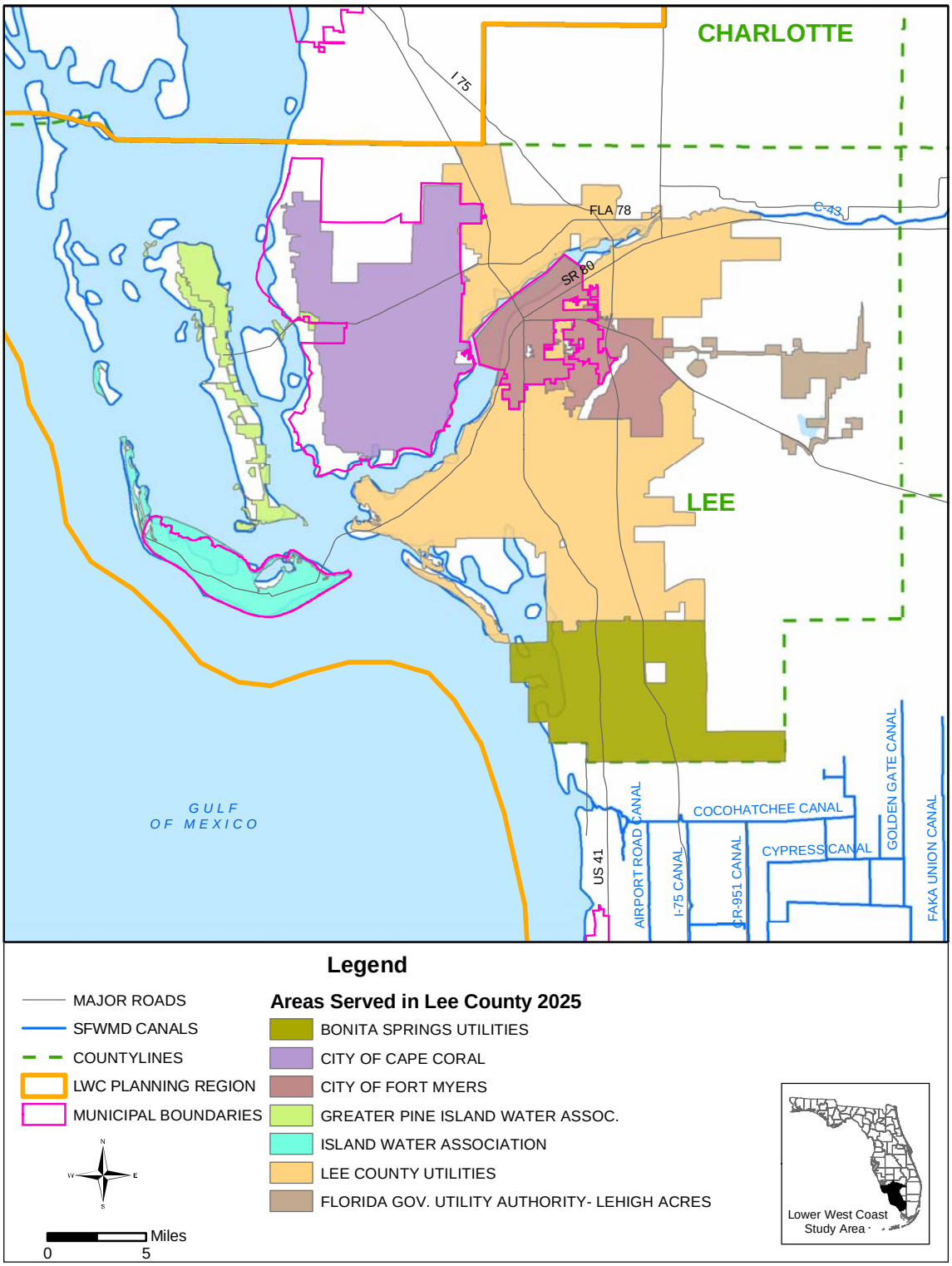

Figure 6. 2025 Utility Areas To-Be-Served in Lee County.

APPENDIX C
Accomplishments

OVERVIEW

In preparing the 2000 Lower West Coast Plan (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 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.

Twenty-seven of the 29 recommendations in the 2000 LWC Plan 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 Plan, contained in the SFWMD's annual *South Florida Environmental Report, Volume II*, summarizes the progress of these recommendations.

Implementation of 2000 LWC Plan Recommendations

1. Conservation

1.1 Develop a Conservation Program

Recommendation: The South Florida Water Management District (SFWMD or District) will develop and implement a comprehensive Water Conservation

Program to cultivate a conservation ethic in cooperation with water users, utilities and local governments to promote water conservation and more efficient use of water resources in the LWC Planning Area. Provisions for fiscal incentives are envisioned as potential tools to establish this program.

Progress: The conservation effort has been strongly supported by local governments and represents a major accomplishment of the 2000 LWC Plan. In 2003, the District adopted year-round mandatory water conservation measures for landscape irrigation (Rule 40E-24) for all of Lee and Collier counties and applicable portions of Charlotte County. In addition, the Districtwide campaign regarding landscape irrigation (the "Three-Day-A-Week Watering Plan") was completed in FY 2004. These measures ensure the long-term sustainability of water resources in these counties, which make up a significant portion of the LWC Planning Area.

District staff continues to work with local governments, property owners, landscape professionals and other interested parties to incorporate Xeriscape™ standards into applicable codes.

The District provides funding assistance to water users for development of alternative water supplies and water conservation through the following cost-sharing programs:

The alternative water supply funding program funds capital projects of utilities and others. The District assisted in creating 112 million gallons per day (MGD) additional water from 2000 to 2004 at a cost to the District of $4.8 million for this region. The alternative water supply projects that received funding include reuse and reverse osmosis. Since the enactment of Senate Bill 444 in 2005, this program has been restructured to meet new guidelines under the Water Protection and Sustainability Program.

The District established the Water Savings Incentive Program (WaterSIP) in 2002 to provide cost-share funding for the implementation of water saving projects that would reduce urban water usage. The District participated in 50-50 cost-sharing with water providers for water-saving technologies, such as indoor plumbing retrofits, showerhead and toilet replacements and outdoor irrigation retrofits. From 2000 to 2004, an additional 147,000 gallons per day (GPD) was created in the LWC Planning Area at a cost to the District of $160,000.

1.2 Mobile Irrigation Labs

Recommendation: The District will support maintaining the existing (one agricultural and one urban) Mobile Irrigation Labs (MILs) and encourage establishment of two additional MILs (one agricultural, one urban) in the LWC Planning Area through identification of dedicated non-District funding sources for existing and additional MILs.

Progress: The District has maintained the two existing MILs and added another urban MIL, which is funded through the SFWMD's Big Cypress Basin. The three MILs serve the District as follows: one MIL performs urban evaluations in Collier County (Big Cypress Basin), one MIL provides urban evaluations in Lee County and one MIL provides agricultural evaluations for all of the counties in the LWC Planning Area. Each urban MIL conducts approximately 140 evaluations per year, while the agricultural MIL conducts roughly 110 evaluations per year. The potential water savings from the three MILs for the past five years was 0.9 MGD. The estimated savings assume that each participant fully implemented all of the MIL recommendations. Two additional urban MILs have been established, but are not District-funded.

2. Groundwater Resources

2.1.1 Surficial Aquifer Monitoring

Recommendation: Maintain existing monitoring program for the SAS and expand the program where appropriate following the evaluation of well locations and parameters relative to current and projected land uses, aquifer use, existing saltwater intrusion, and areas of potential saltwater intrusion.

Progress: The initiative for building this monitoring program has been completed, and the program is being maintained. Activities included the installation of 13 water table and Lower Tamiami monitoring wells in the Big Cypress Basin, as well as the completion of a potentiometric mapping project for the IAS, which defined and delineated the water table, Lower Tamiami, Sandstone and Mid-Hawthorn aquifers and provided greater interpretations of the LWC Planning Area's regional hydrogeology. 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.

2.1.2 Surficial Aquifer Rulemaking

Recommendation: To promote consistency, the SAS concepts and criteria used in the 2000 LWC Plan should be incorporated into the District's Consumptive Use Permitting (CUP) Program and other components of the District's overall water supply management responsibilities through rulemaking.

Progress: Water use revisions were completed in 2003 that addressed this recommendation.

2.1.3 Surficial Aquifer Modeling

Recommendation: By no later than the five-year update of the 2000 LWC Plan, conduct a regional evaluation (using finer grid models for CUP renewal applications) of the effects the projected demands might have on the SAS and associated water resources. Revise the plan to address any identified problems.

Progress: A private engineering firm under contract to the SFWMD is conducting the SAS Model implementation using the United States Geological Survey (USGS) modular three-dimensional groundwater flow (MODFLOW) code. The model boundary for the SAS Model 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. This model will be available to the public for planning purposes once calibration, documentation and peer review are completed.

2.2.1 Intermediate Aquifer Monitoring

Recommendation: Maintain existing monitoring program and expand where appropriate following evaluation of well locations and parameters relative to current and projected land uses, aquifer use, existing saltwater intrusion, and areas of potential saltwater intrusion. Emphasis should be placed on monitoring and analysis of water and salinity levels.

Progress: The initiative for building this monitoring program has been completed, and the program is being maintained. Activities included the installation of 13 water table and Lower Tamiami monitoring wells in the Big Cypress Basin, as well as the completion of a potentiometric mapping project for the IAS, which defined and delineated the water table, Lower Tamiami, Sandstone and Mid-Hawthorn aquifers and provided greater interpretations of the LWC Planning Area's regional hydrogeology. Ongoing monitoring efforts continued in the SAS and IAS.

2.2.2 Intermediate Aquifer Rulemaking

Recommendation: To promote consistency, incorporate the IAS concepts and criteria of the 2000 LWC Plan into the District's CUP Program and other components of the District's overall water supply management responsibilities through rulemaking, such as MFLs; coastal saltwater intrusion prevention; wetland protection; aquifer protection from excessive drawdowns; aquifer monitoring; and, protection from contamination.

Progress: Water use revisions were completed in 2003 that addressed this recommendation.

2.2.3 Intermediate Aquifer Modeling

Recommendation: By no later than the five-year update of the 2005 LWC Plan, conduct a regional evaluation (using finer grid models developed for CUP

renewal applications) of the effects projected demands might have on the IAS and associated water resources. Revise the plan if any potential problems are identified, and identify specific water resource and water supply development projects to meet the projected demands.

Progress: This recommendation has been folded into Recommendation 2.1.3, which now encompasses modeling efforts for both the SAS and IAS.

2.3.1 Floridan Aquifer Model

Recommendation: Develop a comprehensive Floridan Aquifer System (FAS) groundwater model, focusing on Lee, Collier and possibly Hendry counties to conduct predictive analysis for the future. The District and public will use this model to evaluate both water withdrawals and storage via aquifer storage and recovery (ASR).

Progress: The District entered into a cooperative agreement with Florida Atlantic University to implement and document a Floridan Aquifer System Model using the SEAWAT Code. The FAS Model study 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 interaction and sources/sinks effect. 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. This model will be available to the public for planning purposes once calibration, documentation and peer review are completed.

2.3.2 Floridan Aquifer Monitoring

Recommendation: Expand the FAS groundwater monitoring network to collect the data necessary to establish the relationship between water use, water levels and water quality in the LWC Planning Area.

Progress: Groundwater level and water quality monitoring in the LWC Planning Area was expanded between 2000 and 2005. 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.

2.3.3 Floridan Aquifer Data Partnerships

Recommendation: Develop partnerships with water users and utilities that are developing or planning to develop the FAS for water supply, ASR or wastewater effluent disposal.

Progress: This recommendation has been folded into Recommendation 2.3.1, whereby a cooperative agreement between the District and FAU has been established to implement the FAS Model.

2.3.4 Floridan Aquifer Government Cooperation

Recommendation: Continue to work with other governmental entities, including the Florida Legislature, Florida Department of Environmental Protection (FDEP) and U.S. Environmental Protection Agency (USEPA), to explore environmentally acceptable alternative desalination concentrate disposal options.

Progress: While utilities in the LWC Planning Area continue to rely on deep injection wells for concentrate disposal; efforts continue to move forward in developing the FAS as a potable water supply. The District and FDEP have held discussions concerning alternative desalination concentrate disposal options, and the District also participated in a workshop with the St. Johns River Water Management District (SJRWMD), FDEP and United States Department of Agriculture (USDA) to discuss potential options. The subject of reclassifying concentrate as an industrial waste to facilitate disposal has also been discussed.

3. Reclaimed Water

3.0 Reclaimed Water

Recommendation: The 2000 LWC Plan recommended the development of a regional irrigation system to increase the potential volume of reclaimed water that could be made available in the LWC Planning Area. The plan also contained recommendations for local governments and utilities to incorporate additional measures regarding the use of reclaimed water.

Progress: The LWC Planning Area continues to be a leader in the state, with 21 of 22 wastewater facilities using reclaimed water. The LWC Planning Area reuses 93 percent of treated wastewater, or 72 MGD.

4. Regional Irrigation System

4.1 Regional Irrigation Distribution System Study

Recommendation: Evaluate, with the assistance of local governments, water users and utilities, the feasibility of constructing a subregional irrigation water distribution system(s) using reclaimed water and other options to meet the growing urban irrigation demands of the LWC Planning Area.

Progress: The RIDS Project included three phases: Phase 1, Feasibility Analysis (completed in 2002); Phase 2, Subregional Analysis (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 (AWS) Grant Program, which provides cost-sharing opportunities for AWS projects.

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) for storage and four involved interconnects. It was estimated that these projects could provide 221 MGD of urban irrigation water by 2020 at an estimated total capital cost of $208 million.

5. Seawater

5.0 Seawater

Recommendation: The 2000 LWC Plan identified the option of using seawater from the Gulf of Mexico as a raw water source.

Progress: The plan concluded that seawater is a potential source of water, 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.

6. Storage

6.1.1 Aquifer Storage and Recovery Water Quality

Recommendation: Continue working with other government entities, including the Florida Legislature, Congress, USEPA and FDEP to explore changes to state

and federal rules that regulate the Underground Injection Control Program to allow for (and encourage) injection of untreated or partially treated groundwater or surface water with Aquifer Storage and Recovery (ASR).

Progress: The SFWMD is committed to conducting scientific studies to determine the impact of such injections on the aquifer system before it proceeds with any requests for legislative or rule changes that may affect the storage of partially treated water via ASR. To date, no legislation or rulemaking has been initiated.

6.1.2 Aquifer Storage and Recovery Rulemaking

Recommendation: The SFWMD should develop CUP rules to address the use of the Floridan Aquifer for ASR and water use to assure compatibility between concepts.

Progress: Rules concerning ASR were incorporated into the *Basis of Review for Water Use Permit Applications within the South Florida Water Management District* in 2003 (SFWMD 2003). 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.

6.2.1 Regional and Local Retention

Recommendation: Regional retention projects that raise water levels through either system modifications or operational changes and benefit water supply without causing environmental harm should be considered for cost-sharing from the District's Water Resource Development funds.

Progress: The Big Cypress Basin, which encompasses all of Collier County and part of Monroe County, is responsible for the operation, maintenance, planning and capital improvements to 169 miles of canals and 44 water control structures. As part of the Big Cypress Basin 10-Year Capital Improvement Program, several retention projects have been completed, creating 365 acre-feet of additional annual retention volume.

6.3 Reservoirs

Although reservoir projects are considered storage options, they are discussed under Surface Water, which follows.

7. Surface Water

7.1 Caloosahatchee River ASR Pilot Project

Recommendation: The SFWMD should work cooperatively with the United States Army Corps of Engineers (USACE) to site, design, construct and operate a regional ASR pilot project.

Progress: The Caloosahatchee River (C-43) Basin ASR Pilot is a project being conducted to assist in the implementation of the Comprehensive Everglades Restoration Plan (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.

7.2 C-43 Storage Project

Recommendation: Cooperate with the USACE to develop the project implementation Report (PIR), design, construction and operation of a regional reservoir and ASR project within the Caloosahatchee Basin.

Progress: The C-43 (Caloosahatchee River) West Reservoir Project is one of the District's Acceler8 projects, as well as 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 may 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. Construction of the full-scale reservoir is scheduled to begin in the summer of 2007 and finish in late 2010.

7.3 Southwest Florida Feasibility Study – Complete Study

Recommendation: The SFWMD should work in cooperation with the USACE to initiate and complete the Southwest Florida Feasibility Study (SWFFS) by the Year 2005 as recommended in the CERP.

Progress: 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.

7.4 Minimum Flows and Levels

Recommendation: Establish Minimum Flows and Levels (MFLs) for the Caloosahatchee River and Estuary by December 2000, in accordance with Section 373.042, Florida Statutes (F.S.).

Progress: The MFLs have been incorporated into Recommendations 8.1.1 and 8.1.2. The MFL for the Caloosahatchee River and Estuary was established in 2000 and an update was initiated in 2003 (SFWMD 2003).

7.5 Well Abandonment Program

Recommendation: The Well Abandonment Program administered by the District was a voluntary program that identified abandoned artesian wells, performed geophysical logging, and plugged or rehabilitated the wells, as needed, to prevent deterioration of the SAS through upland leakage or discharge to the land surface.

Progress: The District closed 3,300 Floridan wells in the LWC Planning Area between 1979 and 1991. Although the District continues to assist with state or local initiatives, presently there is no sponsored program in the region.

7.6 Saltwater Influence

Recommendation: Saline water has been a recurring problem for the potable water intakes in the Caloosahatchee River. The potable water intakes are located approximately 1 mile upstream of the S-79 Structure. During extended periods of low flow, the chloride content of the surface water increases well beyond the recommended limit of 250 milligrams per liter (mg/L) for drinking water. The SFWMD should coordinate additional analysis of the saltwater influence problem at the S-79 Structure.

Progress: Two ongoing projects have the potential to mitigate the recurring salinity problems for Lee County's Olga Water Treatment Plant, which withdraws water from the Caloosahatchee River, about 1 mile upstream of the S-79 Structure. Salinities increase at that location during periods of very low flow in the river. In 2005, the SFWMD began constructing the C-43 West Reservoir in Hendry County. The reservoir will have the potential to store up to 55 billion gallons of water captured during high-flow periods from the river for release back into the river during low-flow periods to meet environmental needs. These environmental needs are directly associated with maintaining reduced salinity in the river below the S-79 Structure. In addition, Lee County is currently working on Phase II of an ASR project at the Olga Water Treatment plant. This District co-funded project involves installation of a second ASR well for high-volume storage for treated supply from the Olga facility, which would enable the county to reduce or suspend withdrawals from the river when salinities increase above the potable range.

7.7 Permitting Issues Associated with Aquifer Storage and Recovery

Recommendation: Continue working with the Florida Legislature, USEPA and FDEP to explore rule changes to the federal and state Underground Injection Control Program to allow for (and encourage) injection of untreated or partially treated groundwater or surface water with ASR.

Progress: The SFWMD is committed to conducting scientific studies to determine the impact of such injections on the aquifer system before it proceeds with any requests for legislative or rule changes that may affect the storage of partially treated water via ASR. To date, no legislation or rulemaking has been initiated.

7.8 Southwest Florida Feasibility Study – Evaluate Surface Water Body Needs

Recommendation: The Southwest Florida Feasibility Study should evaluate estuary and other environmental needs for the flows from surface water bodies. The results of this evaluation should be incorporated into future plan updates.

Progress: The SFWMD and USACE approved a Project Management Plan for this study in January 2002. The following activities for this study have been completed: 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.

8. Related Implementation Strategies

8.1.1 Rulemaking

Recommendation: The SFWMD will conduct a public rulemaking process in accordance with Chapter 120, F.S., for the purpose of incorporating salient portions of this plan into the CUP Program and other components of the District's overall water supply management responsibilities. Matters recommended for rulemaking consideration include: a) level of certainty; b) resource protection criteria; c) water shortage triggers; d) the MFLs for the Caloosahatchee River and Estuary and aquifers within the LWC Planning Area; and, e) special designation area amendments, including reduced threshold areas and water resource caution areas.

Progress: In June 2003, the Governing Board adopted the "B-List" of rule amendments (including ASR rules), which establish the criteria for the level of certainty, resource protection, water shortage triggers and special designation areas. The "B-List" of rule amendments went into effect September 2003.

The MFLs for the Caloosahatchee River and Estuary and aquifer system within the LWC Planning Area, excluding the water table and Floridan Aquifer, were established in 2000 and 2001, respectively. An update was initiated in 2003 for the Caloosahatchee River and Estuary MFL. This is addressed in Recommendation 8.1.2.

8.1.2 Minimum Flows and Levels

Recommendation: Establish the MFLs for the Caloosahatchee River and Estuary and aquifer systems within the LWC Planning Area by December 2000.

Progress: 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 LWC Aquifer MFL Study (SFWMD 2000) concluded that the proposed minimum 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 report (SFWMD 2000) and in Rule 40E-8.0421(5).

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. The MFL Study for the Caloosahatchee River indicated that proposed criteria for the Caloosahatchee River and Estuary 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 document included 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 a LWC Plan (SFWMD 2000) and a Caloosahatchee Water Management Plan (SFWMD 2000), pursuant to Section 373.0361, F.S., which include 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 1999). 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), Florida Administrative Code, (F.A.C.), also states that the minimum flow criteria for the Caloosahatchee River and Estuary should be reviewed and amended as necessary within one year of the effective date of the rule. The purpose of this review was 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 S-79. Flows higher and lower than the average of 300 cfs should be considered based on the downstream. 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.

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.

8.2 Government Cooperation

Recommendation: The SFWMD should continue working with other government entities including the Florida Legislature, USEPA and FDEP, to accomplish changes in ASR and desalination disposal regulations.

Progress: The SFWMD is committed to conducting scientific studies to determine the impact of such injections on the aquifer system before it proceeds with any requests for legislative or rule changes that may affect the storage of partially treated water via ASR. To date, no legislation or rulemaking has been initiated.

8.3 Wetlands Drawdown Study

Recommendation: The District should continue the Wetlands Drawdown Study and use the knowledge gained during the rulemaking process as outlined in Recommendation 8.1.1 for the CUP Program.

Progress: 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.

8.4 Public Information

Recommendation: The District will make the groundwater models, data and other relative information referenced in the 2000 LWC Plan available to the public.

Progress: The District abides by all applicable public records rules and statutes, making available any applicable data or other information.

REFERENCES CITED

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APPENDIX D

Urban and Agricultural Demand Projections

OVERVIEW

Water demands in this 2005–2006 LWC Plan Update are considered both in terms of the water needed to meet the demands of the users/customers (net demand) and the withdrawal demands (gross demands) on the water resources. This appendix explains and presents projections for both the user/customer demands and the demands on the water resources.

In previous water supply plans, the net demands and water withdrawal demands were identified together. This approach, however, had to be modified to address the situations in which net and gross demands differ. For instance, in the LWC Planning Area, a large percentage of new utility demands are being met using brackish water sources, and withdrawals from these sources are 20 percent to 25 percent higher than those from freshwater sources using conventional treatment processes. This is due to the water treatment process at reverse osmosis (RO) plants, which yields both potable water (about 75 percent to 80 percent) of water entering the plant and a concentrate containing the salts (about 20 percent to 25 percent) of water entering the plant.

Demand assessments for 2000 and projections through 2025 in five-year time frames are presented in this appendix for the following water use categories:

- Public Water Supply.
- Domestic Self-Supply and Small Public Supply Systems.
- Commercial and Industrial Self-Supply.
- Recreational Self-Supply.
- Thermoelectric Power Generation Self-Supply.
- Agricultural Self-Supply.

The Public Water Supply category encompasses potable water supplied by water treatment facilities with projected average pumpages greater than 100,000 gallons per day (GPD) in 2025 to all types of customers, not just residential. Within this water use category, net demands which reflect customer demands are referred to as “finished water demands” since they are measured by the treated water leaving the plants. The other five water use categories are self-supplied. The Domestic Self-Supply category includes households whose sources of domestic water are private wells, as well as small utilities. Commercial and Industrial Self-Supply refers to self-supplied business operations. Recreational Self-Supply includes irrigation demands for golf courses and other large landscaped areas, such as parks and cemeteries. Thermoelectric Power Generation Self-Supply water primarily represents replacement water for evaporative losses from cooling water and boiler make-up water at power plants. Agricultural water use includes demands for crop irrigation.

GENERAL DESCRIPTION OF METHODOLOGY AND DATA SOURCES

This section describes the data, information and procedures used to develop the water demand estimates for this 2005–2006 LWC Plan Update. The demands are those of the people of the LWC Planning Area and their activities, especially as reflected in land use. Therefore, estimates and projections of population and land use are basic to estimating water demands. These estimates and projections need to reflect appropriate breakdowns by location and type of use (e.g., crop type for agricultural use). Another key is to develop appropriate use factors that can be applied to the population and land use information as appropriately defined and broken down by location and use type.

The water demand projections include analyses during average rainfall conditions and 1-in-10 year drought demand conditions, as mandated by Subsection 373.0361(2)(a)l, Florida Statutes (F.S.).

Activity Factors

Population

Of the six use categories, population is the chief independent variable for projection purposes for public water supplies and domestic self-supplies.

2000 Population

U.S. Census data was used as the basis for the 2000 population and the distribution of that population to sub-county areas. Census block level information from the census count was used as the basic unit of analysis. Total population, occupied housing units and persons per occupied housing unit were obtained from the Census for blocks within each county.

Information from District permit files and data from utilities were used to define the areas served by each utility. The utilities' data was especially important in identifying the areas actually served by each utility because, in many cases, these areas were somewhat smaller than the franchised and permitted service areas. The focus on areas actually served by utilities allowed for a closer correspondence between the estimated population and the population served. While data from the 1990 and earlier Censuses had identified the source of water for households, this was no longer included in the 2000 Census. Populations in areas not served by utilities were included as self-supplied population.

The geographic areas represented by the census blocks and utility-served areas were input as polygon layers into the SFWMD Geographic Information System (GIS). The two layers were overlaid to determine if census blocks were inside or outside the

area served by each utility. Imagery was used to review decisions when necessary. The populations by census block for each Public Water Supply utility and for Domestic Self-Supply users were then calculated. The populations for each utility-served area were then totaled.

In Glades, Hendry and Charlotte counties, portions of the population were assigned to the Kissimmee Basin (KB) Planning Area, the Lower East Coast (LEC) Planning Area and the Southwest Florida Water Management District (SWFWMD), respectively. These shares were based on detailed analyses from the 2000 Census distributions of population. The split of Charlotte County's population between the SFWMD and the SWFWMD was obtained from a detailed study conducted for the SWFWMD (GIS Associates 2004).

Population Projections

The goal of water supply planning is to use the best available data to estimate future populations. For estimating county populations, the latest medium county population projections published by the Bureau of Economics and Business Research (BEBR) of the University of Florida are primarily used. In preparing this plan update, the BEBR's county level projections were used for Lee, Hendry, Glades and Charlotte counties. These projections are updated on an annual basis, and the projections used were issued in February 2006 (BEBR 2006). For Collier County, alternative projections, which were approved for use by the Florida Department of Community Affairs (FDCA), show higher growth than the latest medium BEBR projections. The BEBR projections and the alternative projections used for Collier County provided county level controls in five-year increments from 2000 to 2025. For Glades, Hendry and Charlotte counties, the portions of the population assigned to the KB Planning Area, the LEC Planning Area and the SWFWMD were the same as those developed for 2000, based on Census of Population data.

For Collier and Lee counties, the projected share of total county population growth for each utility service area was based on the projected traffic analysis zone (TAZ) population growth in each county. Traffic zone analyses are useful in projecting distribution of population because they analyze relatively small population areas and are integrated into each county's transportation planning process. In Collier County, there are 439 TAZs, while in Lee County there are 1,318 TAZs.

In addition, GIS information on the areas each utility expects to serve in the future was obtained from the utilities. The two layers were overlaid to determine if traffic analysis zones were inside or outside the area served by each utility. Population estimates were then calculated for each utility by deciding which polygons were inside or outside of utility-served boundaries. The populations for each utility-served area were then totaled. For Hendry, Glades and Charlotte counties, TAZ projections were not available and the future distribution of population estimates generally followed the historic shares of population.

The projections used in this plan update are believed to represent a reasonable balance of long- and short-term factors affecting the development of the LWC Planning Area. However, recent proposals for the development of large communities in Charlotte and Hendry counties, which are not anticipated in the recent growth trends, and the continuing high growth rate in Collier and Lee counties emphasize the uncertainties associated with 20-year population projections.

As a new requirement of state law, specific Water Supply Development projects are included in this plan update to address projected needs for the next 20 years. The District recognizes that 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 future needs. In addition, other large water users, especially thermoelectric utilities and agricultural users, will require time to identify the specific water supply projects intended to meet water needs for the next 20 years. 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 that at the end of the three-year period, that this annual plan amendment process would be re-evaluated.

Land Use Projections

Land use projections were developed jointly for the LWC Plan Update and Southwest Florida Feasibility Study (SWFFS). The two study areas differ in only a few areas. The 2005–2006 LWC Plan Update has a planning horizon through 2025 and the SWFFS has a planning horizon through 2050. In order to support hydrologic modeling and the development of project alternatives, the spatial distribution of land use was estimated for 2025 and 2050 conditions. Additional details on this effort can be found in *Estimation of Spatially Distributed Future Land Use in a Rapidly Developing Area* (Liebermann 2006).

The spatial distribution method used the most current GIS datasets of land use categories, public and conservation lands, and county growth plans. County and municipal planners verified the growth plans. Agricultural experts provided verification of the current and build-out acreages expected by the major producers. These and other GIS layers were combined for analysis. Logical rules were developed to resolve the combination of layers and competing future uses, and to differentiate between 2025 and 2050 conditions. It is recognized that the projections resulting from these rules simply represent one “best estimate” out of many possible scenarios. It is quite possible that urban growth will exceed these estimates and will supplant agriculture in additional areas. This appendix does not use the geographic location detail provided in this analysis. The total acreages by crop type presented here are consistent with the total acreage by basin and county in the GIS analysis.

The information used directly to develop the demand estimates includes:

- Irrigated land use by county or sub-county area.
- Land use details (such as crop type) consistent with those used in water supply plans.

However, some lands currently used for citrus will be removed from agricultural use to become part of the Caloosahatchee (C-43) West Reservoir Project, one of the District's Acceler8 projects. Therefore, future irrigated citrus acreage has already been adjusted for this site-specific loss.

Estimates and Projections of Water Use Factors

Public Water Supply and Self-Supply Demands

For public water supply and self-supply demands, the finished water demands per capita for each utility are based on historical data and held constant into the future.

Per capita water use rates in 2000 for each utility were calculated by dividing finished water demands by the permanent resident population served by public water supply utilities. These per capita rates include: total use (incorporating use by seasonal residents and tourists); commercial and industrial utility supplied use; losses incurred in water delivery; and, use by permanent residents. Some utilities use a planned level of service, which is different from the 2000 estimate. For those utilities, the planned level of service, finished water demand per capita estimates were used.

Domestic Self-Supply per capita rates were based on the average Public Water Supply per capita for the county. For Public Water Supply and Domestic Self-Supply use, 1-in-10 year demand conditions are represented by a use that is 6 percent higher than the average demands.

To determine the gross demands, information regarding the sources and efficiency factors are needed. Conventional treatment processes for freshwater sources generally show insignificant differences between raw water withdrawals and finished water demands. On the other hand, for nanofiltration of fresh water, finished water production is generally 85 percent to 90 percent of raw water withdrawals. For reverse osmosis treatment of brackish water, freshwater production is generally about 75 percent to 80 percent of raw water withdrawals. Aquifer storage and recovery (ASR) systems generally recover about 75 percent of water placed into storage. Reuse of reclaimed water substitutes for water resource withdrawals that would otherwise be required by irrigators, some of whom may have alternatively used potable water. These factors are typical for applications in determining water withdrawal demands; however, when specific information was available as to the expected factor for a particular utility or project, this information was used.

Irrigation Demands

The Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS) Model was used to estimate net irrigation demands for agricultural and recreational uses. Irrigation requirements were calculated for average and 1-in-10 year drought demands. To estimate agricultural and recreational irrigation demands, the 2000 and projected irrigated acreages were evaluated using 36 years of rainfall and potential evapotranspiration climatic data from appropriate meteorological stations. The analyses also considered growing seasons, soil types, irrigation methods and strategies.

Agricultural 1-in-10 year drought demands are higher than demands under average conditions, with the difference depending somewhat on soil and crop type. Recreational use has similar differences between average and drought demand estimates.

Irrigation application efficiencies reflect the ability of each type of irrigation system to place water into the root zone of the crop, directly meeting the needs of farmers. The result of applying the efficiencies to the net irrigation demand estimates provides estimates of gross irrigation demands, which are typically the withdrawal demands (demands on the water resource). Efficiencies for irrigation systems are typically 85 percent for low-volume systems, 75 percent for overhead sprinkler systems, 50 percent for flood systems and 35 percent for sprinkler systems on containerized nurseries.

DEMAND ESTIMATES AND PROJECTIONS BY CATEGORY OF WATER USE

(1 & 2) Public Water Supply and Domestic Self-Supply Demands

Public Water Supply and Domestic Self-Supply demand estimates and projections were developed from 2000 through 2025 in five-year increments. The Domestic Self-Supply category includes small public supply systems with projected demands of less than 0.1 million gallons per day (MGD), as well as residents who supply their own indoor domestic water needs. Water demands were forecast by multiplying population projections by per capita finished water demand use rates.

The finished water demands (net demands) are the demands of each utility's customers, which include permanent residents, seasonal residents, tourists, commercial, government and industrial users. The concept of customer demands as applied to public water suppliers is essentially equivalent to finished water leaving the water treatment plants. While utility finished water production includes unaccounted for water, as well as water whose use is eventually metered, the finished water production is still a good measure of utility customer demands. This is because a significant portion of the unaccounted for water is used, but simply is unmetered. The rest of the water, while not

ultimately used by customers, is limited through the consumptive use permitting (CUP) process.

In some cases, the finished water demands met by each utility are not significantly different from the raw water withdrawals, but the differences are becoming more important and many of the differences arise from the decisions made regarding source and treatment methods. The finished water demands of any utility's customers do not include water used in treatment processes, the effects of ASR systems, or the effects of bulk sales and purchases. However, in order to produce the finished water provided to utility customers, there is a larger water withdrawal demand, reflecting what is withdrawn from the water resource, including all of the supply necessary to overcome process inefficiencies and bulk deliveries.

Projection Methodology

The basic finished water projection methodology for the Public Water Supply and Domestic Self-Supply users was to estimate populations served by each utility and apply a per capita consumption based on finished water demands per capita for each user. The raw water withdrawals are projected based on the finished water demand projections and the source and treatment methods capacities identified through the projects in Chapter 7 and the expected efficiencies and utilization of those capacities.

Projection Results

Table 1 shows the projected Public Water Supply population by planning sub-area. **Table 2** provides finished water demands under average conditions by utility, while **Table 3** provides the finished water needs for 1-in-10 year drought demands. In the same manner, **Table 4** provides estimated raw water withdrawals under average conditions, while **Table 5** provides raw water withdrawals under 1-in-10 year drought conditions.

Table 1. Public Water Supply and Domestic Self-Supply Projections of Population Served by Utility.

Utility	2000	2005	2010	2015	2020	2025
Collier County						
Ave Maria Utility	0	5,608	11,208	17,142	23,507	30,200
Collier County Utilities	113,102	155,739	198,311	243,426	291,824	342,711
Everglades City	1,173	1,367	1,561	1,767	1,987	2,219
FGUA (Golden Gate)	12,677	14,001	15,322	16,723	18,226	19,805
Immokalee	18,164	22,572	26,973	31,637	36,640	41,901
Marco Island	15,333	16,121	16,908	17,741	18,636	19,576
Naples	52,411	56,722	61,026	65,587	70,480	75,625
Self-Supplied	38,517	45,471	52,414	59,772	67,666	75,965
Collier County Total	251,377	317,601	383,723	453,795	528,966	608,002
Glades County						
Glades Self-Supplied	3,020	3,127	3,414	3,612	3,777	3,942
Moore Haven	3,052	3,156	3,435	3,627	3,787	3,947
Glades County Total	6,072	6,283	6,849	7,239	7,564	7,889
Hendry County						
Clewiston	14,928	15,881	17,403	18,677	19,916	20,949
Future Western Hendry County	0	820	2,130	3,225	4,291	5,179
Hendry County Correctional	1,267	1,362	1,514	1,640	1,763	1,865
Hendry Self-Supplied	10,395	10,400	10,408	10,416	10,422	10,428
LaBelle	4,641	5,279	6,298	7,150	7,979	8,671
Port LaBelle	3,096	3,355	3,768	4,113	4,450	4,729
Hendry County Total	34,327	37,097	41,521	45,221	48,821	51,821
Lee County						
Boca Grande Supplied	0	919	1,919	2,788	3,596	4,318
Bonita Springs Utilities	34,415	45,446	57,287	67,534	77,067	85,850
Cape Coral, City of	61,650	104,118	149,844	189,739	226,898	260,035
Fort Myers, City of	48,314	56,287	64,830	72,301	79,260	85,465
Greater Pine Island W/A	9,064	12,024	15,202	17,978	20,564	22,870
Island Water Association	6,522	7,751	8,071	8,300	8,423	8,547
Lee County Utilities	176,681	201,286	227,637	250,687	272,157	291,302
Lehigh Acres (FGUA)	18,850	29,803	41,587	51,873	61,453	69,996
Self-Supplied	85,392	83,764	82,024	80,500	79,081	77,816
Lee County Total	440,888	541,398	648,400	741,700	828,499	906,199
Charlotte County						
Charlotte County Self-Supplied	5,438	6,163	6,865	7,525	8,132	8,673
Charlotte County Total	5,438	6,163	6,865	7,525	8,132	8,673
LWC Planning Area Total	738,102	908,542	1,087,358	1,255,480	1,421,982	1,582,584

Table 2. Public Water Supply and Domestic Self-Supply Finished Water Demand Projections by Utility (Average Demands).

Utility	2000	2005	2010	2015	2020	2025
Collier County						
Ave Maria Utility	0.00	0.62	1.23	1.89	2.59	3.32
Collier County Utilities	22.28	29.48	36.69	45.03	53.99	63.40
Everglades City	0.37	0.43	0.49	0.56	0.63	0.70
FGUA (Golden Gate)	1.33	1.47	1.61	1.75	1.91	2.08
Immokalee	2.60	3.23	3.86	4.53	5.24	6.00
Marco Island	5.23	6.60	7.96	8.35	8.77	9.21
Naples	19.43	19.63	19.83	21.32	22.91	24.58
Self-Supplied	8.90	10.50	12.11	13.81	15.63	17.55
Collier County Total	60.14	71.96	83.78	97.23	111.67	126.84
Glades County						
Glades Self-Supplied	0.42	0.43	0.47	0.50	0.53	0.55
Moore Haven	0.40	0.41	0.45	0.48	0.50	0.52
Glades County Total	0.82	0.85	0.92	0.98	1.02	1.07
Hendry County						
Clewiston	3.40	3.03	2.00	2.15	2.29	2.41
Future Western Hendry County	0.00	0.11	0.28	0.42	0.56	0.67
Hendry County Correctional	0.22	0.23	0.26	0.28	0.30	0.32
Hendry Self-Supplied	1.40	1.40	1.40	1.40	1.40	1.40
LaBelle	0.63	0.71	0.85	0.97	1.08	1.17
Port LaBelle	0.24	0.26	0.29	0.32	0.34	0.37
Hendry County Total	5.88	5.74	5.08	5.54	5.98	6.34
Lee County						
Boca Grande Supplied	0.00	0.12	0.26	0.38	0.48	0.58
Bonita Springs	5.90	7.79	9.82	11.58	13.21	14.72
Cape Coral	8.31	14.03	20.20	25.58	30.58	35.05
FGUA (Lehigh)	1.58	3.01	4.20	5.24	6.21	7.07
Fort Myers	6.76	7.88	9.07	10.12	11.09	11.96
Greater Pine Island	1.11	1.47	1.86	2.20	2.52	2.80
Island Water	3.21	3.82	3.97	4.09	4.15	4.21
Lee County Utilities	20.83	23.73	26.84	29.56	32.09	34.34
Lee County Self-Supplied	11.49	11.27	11.04	10.83	10.64	10.47
Lee County Total	59.19	73.12	87.26	99.56	110.97	121.20
Charlotte County						
Charlotte County Self-Supplied	0.71	0.80	0.89	0.98	1.06	1.13
Charlotte County Total	0.71	0.80	0.89	0.98	1.06	1.13
LWC Planning Area Total	126.74	152.47	177.93	204.29	230.70	256.58

Table 3. Public Water Supply and Domestic Self-Supply Finished Water Demand Projections by Utility (1-in-10 Year Drought Demands).

Utility	2000	2005	2010	2015	2020	2025
Collier County						
Ave Maria Utility	0.00	0.66	1.30	2.00	2.75	3.52
Collier County Utilities	23.62	31.24	38.89	47.73	57.23	67.20
Everglades City	0.39	0.46	0.52	0.59	0.67	0.74
FGUA (Golden Gate)	1.41	1.56	1.71	1.86	2.02	2.20
Immokalee	2.76	3.42	4.09	4.80	5.55	6.36
Marco Island	7.65	8.05	8.44	8.85	9.30	9.76
Naples	20.60	20.81	21.02	22.60	24.28	26.05
Self-Supplied	9.43	11.13	12.84	14.64	16.57	18.60
Collier County Total	65.86	77.31	88.81	103.07	118.37	134.43
Glades County						
Glades Self-Supplied	0.45	0.46	0.50	0.53	0.56	0.58
Moore Haven	0.42	0.44	0.48	0.50	0.53	0.55
Glades County Total	0.87	0.90	0.98	1.04	1.08	1.13
Hendry County						
Clewiston	3.60	3.21	2.12	2.28	2.43	2.55
Future Western Hendry County	0.00	0.11	0.29	0.44	0.59	0.71
Hendry County Correctional	0.23	0.25	0.27	0.30	0.32	0.34
Hendry Self-Supplied	1.48	1.48	1.49	1.49	1.49	1.49
LaBelle	0.67	0.76	0.90	1.03	1.14	1.24
Port LaBelle	0.25	0.28	0.31	0.34	0.37	0.39
Hendry County Total	6.24	6.09	5.39	5.87	6.34	6.72
Lee County						
Boca Grande Supplied	0.00	0.13	0.27	0.40	0.51	0.62
Bonita Springs	6.25	8.26	10.41	12.27	14.00	15.60
Cape Coral	8.81	14.88	21.41	27.11	32.42	37.15
FGUA (Lehigh)	1.67	3.19	4.45	5.55	6.58	7.49
Fort Myers	7.17	8.35	9.62	10.72	11.76	12.68
Greater Pine Island	1.18	1.56	1.97	2.33	2.67	2.97
Island Water	3.40	4.04	4.21	4.33	4.39	4.46
Lee County Utilities	22.08	25.15	28.45	31.33	34.01	36.40
Lee County Self-Supplied	12.18	11.95	11.70	11.48	11.28	11.10
Lee County Total	62.74	77.51	92.49	105.53	117.63	128.47
Charlotte County						
Charlotte County Self-Supplied	0.75	0.85	0.95	1.04	1.12	1.20
Charlotte County Total	0.75	0.85	0.95	1.04	1.12	1.20
LWC Planning Area Total	136.46	162.66	188.62	216.55	244.54	271.96

Table 4. Public Water Supply and Domestic Self-Supply Raw Water Withdrawals by Utility (Average Demands).

Utility	2000	2005	2010[b]	2015[b]	2020[b]	2025[b]
Collier County						
Ave Maria Utility	0.00	0.70	1.37	2.16	3.04	3.95
Collier County Utilities	24.39	35.30	44.91	56.11	67.98	80.52
Everglades City	0.37	0.43	0.50	0.57	0.64	0.71
FGUA (Golden Gate)	1.36	1.53	1.68	1.83	2.00	2.17
Immokalee	2.65	3.30	4.00	4.84	5.73	6.70
Marco Island	6.14	7.87	9.89	10.83	11.12	11.56
Naples	19.80	20.03	21.80	23.50	25.20	27.10
Collier Self-Supplied	8.90	10.50	12.11	13.81	15.63	17.55
Collier County Total	63.61	79.66	96.26	113.65	131.34	150.26
Glades County						
Glades Self-Supplied	0.42	0.43	0.47	0.50	0.53	0.55
Moore Haven	0.41	0.42	0.46	0.49	0.52	0.53
Glades County Total	0.83	0.85	0.93	0.99	1.05	1.08
Hendry County						
Clewiston[a]	3.46	3.10	2.60	2.80	3.00	3.20
Future Western Hendry County	0.00	0.11	0.35	0.53	0.70	0.84
Hendry County Correctional	0.22	0.23	0.28	0.30	0.32	0.34
Hendry Self-Supplied	1.40	1.40	1.40	1.40	1.40	1.40
LaBelle	0.64	0.71	1.13	1.25	1.38	1.50
Port LaBelle	0.24	0.27	0.32	0.38	0.40	0.44
Hendry County Total	5.96	5.82	6.08	6.66	7.20	7.72
Lee County						
Boca Grande Supplied	0.00	0.15	0.35	0.48	0.60	0.73
Bonita Springs	6.00	8.90	11.40	13.70	15.60	17.30
Cape Coral	12.50	16.70	24.40	30.00	35.60	43.90
FGUA (Lehigh)	1.61	3.06	4.44	5.74	6.96	8.03
Fort Myers	8.45	9.90	11.40	12.60	13.90	15.00
Greater Pine Island	1.74	1.88	2.32	2.75	3.15	3.50
Island Water	4.01	4.78	5.00	5.10	5.20	5.30
Lee County Self-Supplied	11.49	11.27	11.04	10.83	10.64	10.47
Lee County Utilities	21.70	25.92	30.37	33.45	36.31	38.85
Lee County Total	67.50	82.56	100.72	114.65	127.96	143.08
Charlotte County						
Charlotte County Self-Supplied	0.71	0.80	0.89	0.98	1.06	1.13
Charlotte County Total	0.71	0.80	0.89	0.98	1.06	1.13
LWC Planning Area Total	138.61	169.69	204.88	236.93	268.61	303.27

a. Water through 2008 supplied by US Sugar and includes industrial/commercial component. See Section 3 for additional detail. This also applies to Table 5.

b. Raw water projections are blank where future supplies were not identified and demand projections showed deficit conditions. The District will propose future supply projects for these areas if none are provided by local governments. This also applies to Table 5.

Table 5. Public Water Supply and Domestic Self-Supply Raw Water Withdrawals by Utility (1-in-10 Year Drought Demands).

Utility	2000	2005	2010[b]	2015[b]	2020[b]	2025[b]
Collier County						
Ave Maria Utility	0.00	0.74	1.45	2.29	3.22	4.19
Collier County Utilities	25.85	37.42	47.60	59.48	72.06	85.35
Everglades City	0.39	0.46	0.53	0.60	0.68	0.75
FGUA (Golden Gate)	1.44	1.62	1.78	1.94	2.12	2.30
Immokalee	2.81	3.50	4.24	5.13	6.07	7.10
Marco Island	6.51	8.34	10.48	11.48	11.79	12.25
Naples	20.99	21.23	23.11	24.91	26.71	28.73
Collier Self-Supplied	9.43	11.13	12.84	14.64	16.57	18.60
Collier County Total	67.43	84.44	102.04	120.47	139.22	159.28
Glades County						
Glades Self-Supplied	0.45	0.46	0.50	0.53	0.56	0.58
Moore Haven	0.43	0.45	0.49	0.52	0.55	0.56
Glades County Total	0.88	0.90	0.99	1.05	1.11	1.14
Hendry County						
Clewiston[a]	3.67	3.29	2.76	2.97	3.18	3.39
Future Western Hendry County	0.00	0.12	0.37	0.56	0.74	0.89
Hendry County Correctional	0.23	0.24	0.30	0.32	0.34	0.36
Hendry Self-Supplied	1.48	1.48	1.48	1.48	1.48	1.48
LaBelle	0.68	0.75	1.20	1.33	1.46	1.59
Port LaBelle	0.25	0.29	0.34	0.40	0.42	0.47
Hendry County Total	6.32	6.17	6.44	7.06	7.63	8.18
Lee County						
Boca Grande Supplied	0.00	0.16	0.37	0.51	0.64	0.77
Bonita Springs	6.36	9.43	12.08	14.52	16.54	18.34
Cape Coral	13.25	17.70	25.86	31.80	37.74	46.53
FGUA (Lehigh)	1.71	3.24	4.71	6.08	7.38	8.51
Fort Myers	8.96	10.49	12.08	13.36	14.73	15.90
Greater Pine Island	1.84	1.99	2.46	2.92	3.34	3.71
Island Water	4.25	5.07	5.30	5.41	5.51	5.62
Lee County Self-Supplied	12.18	11.95	11.70	11.48	11.28	11.10
Lee County Utilities	23.00	27.48	32.19	35.46	38.49	41.18
Lee County Total	71.55	87.51	106.76	121.53	135.64	151.66
Charlotte County						
Charlotte County Self-Supplied	0.75	0.85	0.94	1.04	1.12	1.20
Charlotte County Total	0.75	0.85	0.94	1.04	1.12	1.20
LWC Planning Area Total	146.93	179.87	217.17	251.15	284.73	321.47

a. Water through 2008 supplied by US Sugar and includes industrial/commercial component. See Section 3 for additional detail. This also applies to Table 5.

b. Raw water projections are blank where future supplies were not identified and demand projections showed deficit conditions. The District will propose future supply projects for these areas if none are provided by local governments. This also applies to Table 5.

(3) Commercial and Industrial Self-Supply

This category includes Commercial and Industrial demands not supported by a public utility. Water used for commercial and industrial purposes supplied by utilities is included with other utility demands.

Projection Methodology

These water uses were estimated for 2000 by the U.S. Geological Survey (USGS 2004), which directly contacted the users. In the LWC Planning Area, the largest uses are associated with mining and food processing. Inspection of data for earlier years assembled by the USGS indicates that the levels of use and changes in use are not related to population and general economic development, but they had remained small and changed erratically. For these reasons, the 2000 Commercial and Industrial demands were held constant through 2025. The one exception is that in 2000, U.S. Sugar supplied both its own needs and the Public Water Supply needs of the City of Clewiston and the use was classified as Public Water Supply. This will continue through the summer of 2008, at which time U.S. Sugar will supply only its own needs and its use classification will become Commercial and Industrial Self-Supply. A separate utility is being established to serve the City of Clewiston. Commercial and Industrial demands are also not estimated to change between average and 1-in-10 year drought demand conditions and the withdrawal demands are considered to be the same as the user demands.

Projection Results

Table 6 summarizes the Commercial and Industrial Self-Supply demand estimates and projections in the LWC Planning Area.

Table 6. Commercial and Industrial Self-Supply Demand (MGD).

County Area	2000	2005	2010	2015	2020	2025
Charlotte - SFWMD Portion	0.0	0.0	0.0	0.0	0.0	0.0
Collier	5.8	5.8	5.8	5.8	5.8	5.8
Glades - Southern	4.1	4.1	4.1	4.1	4.1	4.1
Hendry - Western Hendry	0.7	0.7	3.1	3.1	3.1	3.1
Lee	16.0	16.0	16.0	16.0	16.0	16.0
LWC Planning Area Total	26.6	26.6	28.9	28.9	28.9	28.9

(4) Recreational Self-Supply

The Recreational Self-Supply water use category includes self-supplied irrigation demands for golf courses and other large landscaped areas, such as parks and cemeteries.

Projection Methodology

Landscape and recreational uses were identified as a specific land use in the previously described GIS land use analysis. These uses have a significant impact on urban water use and reclaimed water use; therefore, patterns of golf course development in urbanized areas were thoroughly evaluated. A database of more than 160 golf courses was compiled for southwestern Florida, and these golf courses were correlated to existing water-use permits. The best estimate is that the irrigated area of golf courses will grow from 18,500 acres to 28,000 acres by about 2030, with an average of 120 irrigated acres per 18-hole course. Using existing patterns of urban development and the locations of water-use permits, both existing and proposed (likely future) locations for about 80 new golf courses were mapped.

Recreational irrigation demand estimates during average and l-in-10 year drought conditions were made using the AFSIRS Model. The irrigation requirements were calculated similarly to other irrigation requirements, using a representative irrigation system/rainfall station/soil type combinations for each county.

Projection Results

Recreational Self-Supply acreage projections are shown in **Table 7**. These acreages include the golf course acreage discussed above and estimated acreage of other large landscaped areas. The projected net irrigation (user) demands are shown in **Table 8** for both average conditions and for 1-in-10 year drought conditions. Gross irrigation demands (withdrawal demands) for average and for 1-in-10 year drought conditions are shown in **Table 9**. At present, and in the future, a substantial portion of the Recreational Self-Supply demands is or will be met by the reuse of reclaimed water. This will not only reduce withdrawal demands on the water resources, but also provide additional recharge of the Surficial Aquifer.

Table 7. Recreational Self-Supply Acreage in the LWC Planning Area.

Sub-County Area	2000	2005	2010	2015	2020	2025
Glades - Southern	322	421	521	620	720	819
Hendry - Western Hendry	499	584	669	755	840	925
Lee	11,193	11,594	11,995	12,396	12,797	13,199
Charlotte - SFWMD Portion	1	1	1	1	1	1
Collier	11,392	11,964	12,536	13,108	13,680	14,252
Total LWC Planning Area	23,406	24,564	25,723	26,881	28,039	29,197

Table 8. Net Irrigation Demands for Recreational Self-Supply Users in the LWC Planning Area.

Sub-County Area	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	0.0	0.0	0.0	0.0	0.0	0.0
Collier	15.9	16.7	17.5	18.3	19.1	19.9
Glades - Southern	0.3	0.5	0.6	0.7	0.8	0.9
Hendry - Western Hendry	0.8	1.0	1.1	1.3	1.4	1.5
Lee	20.6	21.3	22.0	22.8	23.5	24.2
LWC Planning Area Total	37.7	39.5	41.3	43.0	44.8	46.6
Net Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	0.0	0.0	0.0	0.0	0.0	0.0
Collier	19.2	20.2	21.2	22.1	23.1	24.1
Glades - Southern	0.5	0.6	0.8	0.9	1.1	1.2
Hendry - Western Hendry	1.0	1.2	1.3	1.5	1.7	1.8
Lee	24.0	24.8	25.7	26.6	27.4	28.3
LWC Planning Area Total	44.7	46.8	49.0	51.1	53.3	55.4

Table 9. Gross Irrigation Demands for Recreational Self-Supply Users in the LWC Planning Area.

Sub-County Area	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	0.0	0.0	0.0	0.0	0.0	0.0
Collier	21.2	22.3	23.4	24.4	25.5	26.6
Glades - Southern	0.5	0.6	0.7	0.9	1.0	1.2
Hendry - Western Hendry	1.1	1.3	1.5	1.7	1.9	2.1
Lee	27.4	28.4	29.4	30.4	31.3	32.3
LWC Planning Area Total	50.2	52.6	55.0	57.4	59.8	62.2
Gross Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	0.0	0.0	0.0	0.0	0.0	0.0
Collier	25.6	26.9	28.2	29.5	30.8	32.1
Glades - Southern	0.7	0.9	1.1	1.3	1.5	1.7
Hendry - Western Hendry	1.3	1.6	1.8	2.0	2.2	2.5
Lee	32.0	33.1	34.3	35.4	36.6	37.7
LWC Planning Area Total	59.6	62.5	65.3	68.2	71.0	73.9

(5) Thermoelectric Power Generation Self-Supply

The major use of water at thermoelectric power plants is for cooling purposes. In the LWC Planning Area, and in most of south Florida, this use has until recently been met by flow-through cooling using tidal and not fresh or brackish aquifer water. This is the case for FPL's Fort Myers plant, which uses water from the tidal Caloosahatchee for cooling. The other power plant uses are boiler make-up water and ancillary uses, such as domestic type use by employees. As an example, for these uses FPL's Fort Myers Plant relies on water from the Sandstone Aquifer. In the 2000 LWC Plan, the estimated Thermoelectric Power Generation Self-Supply freshwater demands for 1995 were only 0.8 MGD. The USGS estimate of these demands in 2000 was 0.2 MGD. This pattern is changing as a significant percentage of new power plants are expected to use evaporative cooling towers and fresh water for cooling.

Projection Methodology

Projections were made in conjunction with Florida Power & Light (FPL), the major electric supplier in south Florida, and reflect growth expectations in power demands; strategies for obtaining the electricity to meet those demands (which leads to estimation of power plant construction); types and locations of power plants; types of cooling facilities; and, ability to achieve efficiencies in water use. Most of these factors are subject to considerable uncertainty, and the efficacy of meeting demands from freshwater sources vs. saltwater sources needs further consideration, as does the cost-effectiveness of design and operational strategies that could significantly reduce water use below the amounts estimated.

The estimates presented in **Table 10** include only the generating capacity expected to be located in the LWC Planning Area. Significant additional capacity has been proposed for areas within the Lake Okeechobee Service Area, which are outside the LWC Planning Area. Those demands are included in the 2005–2006 KB, LWC and UEC plan updates. Thermoelectric Power Generation demands are estimated to be the same for average and 1-in-10 year drought conditions.

Projection Results

Projections of fresh and brackish water for Thermoelectric Power Demands are presented in **Table 10**. These projections are the same for average and 1-in-10 year drought demands and for user/customer demands and water withdrawal demands.

Use of the Sandstone Aquifer at the Ft. Myers Plant at quantities presently permitted accounts for the use in Lee County. The remaining projections account for five planned plants, which will use cooling towers as the heat rejection method. None of these plants has been sited other than to identify their general location within the LWC Planning Area. The efficacy and availability of water sources will be a consideration in the site selection and the primary source of water for the plants will be alternative water supplies, including captured excess stormwater, Floridan Aquifer water and reclaimed water.

Table 10. Projected Thermoelectric Power Demands (MGD).

Sub-County	2000	2005	2010	2015	2020	2025
Lee County	0.2	0.5	0.5	0.5	0.5	0.5
LWC Area (location unspecified)	0.0	0.0	7.6	51.2	58.8	66.4
Total	0.2	0.5	8.1	51.7	59.3	66.9

(6) Agricultural Self-Supply

Agricultural water use includes irrigated commercially grown crop categories as developed by the Water Demand Projection Subcommittee, composed of representatives from Florida's five water management districts. These categories are: 1) citrus, 2) other fruits and nuts, 3) vegetables, melons and berries, 4) field crops, 5) sod, 6) greenhouse/nursery, 7) pasture and 8) miscellaneous.

Projection Methodology

The agricultural demand assessment uses acreage estimates developed as part of the overall GIS land use analysis. To estimate the demands associated with the acreage for each crop, information from District Water Supply Assessments and previous hydrologic modeling efforts was used to identify soil types, growing seasons, irrigation system types and irrigation system efficiencies.

The actual Agricultural Self-Supply demand calculations for this LWC Plan Update were made using the AFSIRS Model. This is a change from the 2000 LWC Plan, which used a modified Blaney-Criddle Model to estimate supplemental requirements for irrigation.

The AFSIRS Model calculates both net and gross irrigation requirements. A crop's net irrigation requirement is the amount of water delivered to the root zone of the crop, while gross irrigation requirement includes both the net irrigation requirement and the losses incurred in getting irrigation to the crop's root zone. Irrigation efficiency refers to the average percent of total water applied that is delivered to the plant's root zone. This relationship is expressed as follows:

Gross Irrigation Requirement = Net Irrigation Requirement / Irrigation Efficiency

Agricultural alternative water supply projects are likely to target changes in the sources and efficiencies of water delivery in order to meet the crop net irrigation demands. For instance, tailwater recovery could capture some of the water not effectively delivered to the root zone, and by recapturing and reusing this water, withdrawals from the water resource could ultimately be reduced.

Average and 1-in-10 year drought irrigation requirements were calculated using the District's AFSIRS Model. Historical weather data from the rainfall station was considered to best represent the crop/county combination used to calculate irrigation requirements.

Projections of irrigation system type and the effect of the corresponding irrigation efficiencies (shown in parentheses) were based on the interpretation of current ratios and trends. There are three basic types of irrigation systems currently used in south Florida crop production. These are seepage (50 percent), sprinkler (75 percent) and low-volume (85 percent) systems.

Available water capacity and depth of soil have a direct effect on effective rainfall. Another factor the AFSIRS Model considered explicitly is on-farm irrigation management strategy, which was combined with soil properties. The AFSIRS Model defines eight "generic" soil types representing the major kinds of soils found in Florida. Runs for each crop for each basin were made using the most appropriate generic soil, as defined by the AFSIRS Model.

Improved pasture is defined by the SFWMD as pasture that has the facilities in place to carry out irrigation. Irrigation of pastureland is believed to be limited and based more on sales opportunities and extreme drought maintenance, and not as part of regular crop management. The water supply planning assumption that improved pasture is not irrigated does not preclude ranchers from acquiring SFWMD consumptive use permits or carrying out pasture irrigation.

Projection Results

Citrus

Overall, citrus acreage in the LWC Planning Area is expected to remain about the same, with modest declines expected in Collier County and increases in Glades County. Water use in the planning area is expected to show very little change through 2025. **Table 11** presents the acreage projections, while **Table 12** shows the projected net irrigation demands under average and 1-in-10 year drought conditions. **Table 13** shows the projected gross irrigation demands (water withdrawal demands) under average and 1-in-10 year drought conditions.

Table 11. Citrus Acreage in the LWC Planning Area.

County	2000	2005	2010	2015	2020	2025
Glades – Southern	8,056	9,979	11,902	13,825	15,748	17,671
Hendry - Western Hendry	92,017	91,723	91,430	91,136	90,843	90,549
Lee	16,373	16,276	16,179	16,083	15,986	15,889
Charlotte - SFWMD Portion	10,373	10,373	10,373	10,373	10,373	10,373
Collier	40,638	39,766	38,895	38,023	37,152	36,280
Total LWC Planning Area	167,457	168,118	168,779	169,440	170,101	170,762

Table 12. Net Irrigation Demands for Citrus in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net Irrigation Demands For Average Conditions (MGD)						
Charlotte - SFWMD Portion	9.5	9.5	9.5	9.5	9.5	9.5
Collier	38.3	37.4	36.6	35.8	35.0	34.2
Glades – Southern	9.7	11.8	13.8	15.6	17.4	19.1
Hendry - Western Hendry	106.4	106.0	105.7	105.3	105.0	104.7
Lee	21.5	21.4	21.3	21.1	21.0	20.9
LWC Planning Area Total	185.4	186.1	186.8	187.4	187.9	188.3
Net Irrigation Demands For 1-in- 10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	13.0	13.0	13.0	13.0	13.0	13.0
Collier	53.6	52.4	51.3	50.1	49.0	47.8
Glades – Southern	13.6	16.7	19.6	22.5	25.2	27.9
Hendry - Western Hendry	141.6	141.2	140.7	140.3	139.8	139.4
Lee	28.9	28.7	28.5	28.4	28.2	28.0
LWC Planning Area Total	250.7	252.0	253.2	254.3	255.3	256.2

Table 13. Gross Irrigation Demands for Citrus in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands For Average Conditions (MGD)						
Charlotte - SFWMD Portion	11.2	11.2	11.2	11.2	11.2	11.2
Collier	53.9	52.7	51.6	50.4	49.3	48.1
Glades – Southern	14.1	16.7	19.0	21.1	22.9	24.6
Hendry - Western Hendry	156.4	155.9	155.4	154.9	154.4	153.9
Lee	31.6	31.4	31.3	31.1	30.9	30.7
LWC Planning Area Total	267.2	267.9	268.4	268.6	268.7	268.5
Gross Irrigation Demands For 1-in- 10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	15.3	15.3	15.3	15.3	15.3	15.3
Collier	75.4	73.8	72.2	70.6	69.0	67.4
Glades – Southern	19.8	23.6	27.1	30.3	33.2	36.0
Hendry - Western Hendry	208.3	207.6	206.9	206.3	205.6	204.9
Lee	42.5	42.2	42.0	41.7	41.5	41.2
LWC Planning Area Total	361.3	362.5	363.5	364.2	364.6	364.8

Other Fruits and Nuts

The major crops in this category are avocados and mangos. Total acreage of "Other Fruits and Nuts" in the LWC Planning Area is small and concentrated in Lee and Collier counties. Modest declines in acreage are expected due to urbanization pressures. Water use is expected to decline as well. Overall, the acreage and water use declines are small. **Table 14** presents the acreage projections, while **Table 15** shows the projected net irrigation demands under average and 1-in-10 year drought conditions. **Table 16** shows the projected gross irrigation demands (water withdrawal demands) under average and 1-in-10 year drought conditions.

Table 14. Acres of Other Fruits and Nuts in the LWC Planning Area.

County	2000	2005	2010	2015	2020	2025
Glades – Southern	8	8	8	8	8	8
Hendry - Western Hendry	65	63	61	59	57	55
Lee	139	124	109	93	78	63
Charlotte - SFWMD Portion	76	76	76	76	76	76
Collier	194	186	178	171	163	155
Total LWC Planning Area	482	457	432	407	382	357

Table 15. Net Irrigation Demands for Other Fruits and Nuts in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	0.1	0.1	0.1	0.1	0.1	0.1
Collier	0.2	0.1	0.1	0.1	0.1	0.1
Glades – Southern	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Hendry	0.1	0.1	0.1	0.1	0.1	0.1
Lee	0.2	0.2	0.1	0.1	0.1	0.1
LWC Planning Area Total	0.5	0.5	0.4	0.4	0.4	0.3
Net Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	0.1	0.1	0.1	0.1	0.1	0.1
Collier	0.2	0.2	0.2	0.2	0.2	0.2
Glades – Southern	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Hendry	0.1	0.1	0.1	0.1	0.1	0.1
Lee	0.2	0.2	0.2	0.2	0.1	0.1
LWC Planning Area Total	0.7	0.6	0.6	0.6	0.5	0.5

Table 16. Gross Irrigation Demands for Other Fruits and Nuts in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	0.1	0.1	0.1	0.1	0.1	0.1
Collier	0.2	0.2	0.2	0.2	0.1	0.1
Glades – Southern	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Hendry	0.1	0.1	0.1	0.1	0.1	0.1
Lee	0.3	0.2	0.2	0.2	0.2	0.1
LWC Planning Area Total	0.7	0.6	0.6	0.5	0.5	0.5
Gross Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	0.1	0.1	0.1	0.1	0.1	0.1
Collier	0.3	0.3	0.2	0.2	0.2	0.2
Glades – Southern	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Hendry	0.1	0.1	0.1	0.1	0.1	0.1
Lee	0.4	0.3	0.3	0.2	0.2	0.2
LWC Planning Area Total	0.9	0.8	0.8	0.7	0.7	0.6

Vegetables, Melons and Berries

The chief crops in this category include tomatoes, peppers, eggplant, squash, watermelons and tropical vegetables. Vegetable acreage through the projection period is expected to increase significantly in Hendry County and show some decline in most other sub areas of the LWC Planning Area. Water use changes parallel the changes in acreage.

Table 17 presents the acreage projections, while **Table 18** shows the projected net irrigation demands under average and 1-in-10 year drought conditions. **Table 19** shows the projected gross irrigation demands (water withdrawal demands) under average and 1-in-10 year drought conditions.

Table 17. Vegetables, Melons and Berries Acreage in the LWC Planning Area.

County	2000	2005	2010	2015	2020	2025
Glades – Southern	1,699	1,769	1,839	1,908	1,978	2,048
Hendry - Western Hendry	9,485	10,842	12,198	13,555	14,911	16,268
Lee	15,793	15,318	14,843	14,367	13,892	13,417
Charlotte - SFWMD Portion	6,239	5,830	5,421	5,013	4,604	4,195
Collier	43,676	42,315	40,953	39,592	38,230	36,869
Total LWC Planning Area	76,892	76,073	75,254	74,435	73,616	72,797

Table 18. Net Irrigation Demands for Vegetables, Melons and Berries in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	7.5	7.0	6.5	6.0	5.5	5.0
Collier	48.6	47.1	45.6	44.1	42.6	41.1
Glades – Southern	1.4	1.4	1.5	1.6	1.6	1.7
Hendry - Western Hendry	11.4	13.0	14.6	16.2	17.9	19.5
Lee	21.5	20.8	20.2	19.5	18.9	18.3
LWC Planning Area Total	90.3	89.4	88.4	87.4	86.5	85.5
Net Irrigation Demands for 1-in- 10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	9.4	8.8	8.2	7.6	7.0	6.3
Collier	61.0	59.1	57.2	55.3	53.4	51.5
Glades – Southern	2.0	2.1	2.2	2.2	2.3	2.4
Hendry - Western Hendry	14.3	16.4	18.4	20.5	22.5	24.6
Lee	26.4	25.6	24.8	24.0	23.2	22.4
LWC Planning Area Total	113.1	111.9	110.7	109.6	108.4	107.2

Table 19. Gross Irrigation Demands for Vegetables, Melons and Berries in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	14.9	14.0	13.0	12.0	11.0	10.0
Collier	93.5	90.6	87.7	84.8	81.9	79.0
Glades – Southern	1.9	1.9	2.0	2.1	2.2	2.2
Hendry - Western Hendry	22.7	26.0	29.2	32.5	35.7	39.0
Lee	41.3	40.1	38.8	37.6	36.3	35.1
LWC Planning Area Total	174.4	172.5	170.7	168.9	167.1	165.3
Gross Irrigation Demands for 1-in- 10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	18.8	17.6	16.4	15.1	13.9	12.7
Collier	117.3	113.6	110.0	106.3	102.6	99.0
Glades – Southern	2.7	2.8	2.9	3.0	3.1	3.2
Hendry - Western Hendry	28.6	32.7	36.8	40.9	45.0	49.1
Lee	50.7	49.2	47.7	46.2	44.6	43.1
LWC Planning Area Total	218.2	215.9	213.7	211.5	209.3	207.1

Field Crops - Sugarcane

Sugarcane is the principal field crop grown within the LWC Planning Area. Other field crops grown include rice, corn and soybeans. Because of its dominance in terms of acreage, sugarcane and “other field crops” are discussed separately.

Sugarcane is initially propagated by planting stalk cuttings. The first harvest takes place approximately 13 months after planting. Sugar production per unit of land surface declines gradually with each additional rotation, and in approximately four years, (one planting and three ratoons) the increased yields associated with replanting outweigh the costs. Because land may lay fallow for several months between crop rotation cycles, approximately 20 percent of the land associated with sugarcane production will not be harvested in any given year.

While the largest percentage of sugarcane acreage in south Florida is grown in the muck soils of the Everglades Agricultural Area (EAA), significant acreage occurs on the “sand lands” in portions of Hendry and Glades counties in the LWC Planning Area. Through the projection period, sugarcane acreage in Glades County is expected to grow by about 10,000 acres, while acreage in Hendry County is expected to remain relatively constant in the mid-60,000 acre-range. Water use per acre within each basin also remains the same, and therefore, water use parallels the changes in acreage.

Table 20 presents the acreage projections, while **Table 21** shows the projected net irrigation demands under average and 1-in-10 year drought conditions. **Table 22**

shows the projected gross irrigation demands (water withdrawal demands) under average and 1-in-10 year drought conditions.

Table 20. Sugarcane Acreage in the LWC Planning Area.

County	2000	2005	2010	2015	2020	2025
Glades - Southern	29,115	31,037	32,959	34,882	36,804	38,726
Hendry - Western Hendry	63,364	64,105	64,846	65,587	66,328	67,069
Lee	0	0	0	0	0	0
Charlotte - SFWMD Portion	0	0	0	0	0	0
Collier	0	0	0	0	0	0
Total LWC Planning Area	92,479	95,142	97,805	100,469	103,132	105,795

Table 21. Net Irrigation Demands for Sugarcane in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	0.0	0.0	0.0	0.0	0.0	0.0
Collier	0.0	0.0	0.0	0.0	0.0	0.0
Glades - Southern	37.2	39.7	42.2	44.6	47.1	49.5
Hendry - Western Hendry	76.4	77.2	78.1	79.0	79.9	80.8
Lee	0.0	0.0	0.0	0.0	0.0	0.0
LWC Planning Area Total	113.6	117.0	120.3	123.7	127.0	130.4
Net Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	0.0	0.0	0.0	0.0	0.0	0.0
Collier	0.0	0.0	0.0	0.0	0.0	0.0
Glades - Southern	49.8	53.1	56.4	59.7	63.0	66.3
Hendry - Western Hendry	103.2	104.4	105.6	106.8	108.0	109.3
Lee	0.0	0.0	0.0	0.0	0.0	0.0
LWC Planning Area Total	153.0	157.5	162.0	166.5	171.0	175.5

Table 22. Gross Irrigation Demands for Sugarcane in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	0.0	0.0	0.0	0.0	0.0	0.0
Collier	0.0	0.0	0.0	0.0	0.0	0.0
Glades - Southern	74.5	79.4	84.3	89.3	94.2	99.1
Hendry - Western Hendry	152.7	154.5	156.3	158.1	159.9	161.6
Lee	0.0	0.0	0.0	0.0	0.0	0.0
LWC Planning Area Total	227.2	233.9	240.6	247.3	254.0	260.7
Gross Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	0.0	0.0	0.0	0.0	0.0	0.0
Collier	0.0	0.0	0.0	0.0	0.0	0.0
Glades - Southern	99.6	106.2	112.8	119.4	125.9	132.5
Hendry - Western Hendry	206.4	208.9	211.3	213.7	216.1	218.5
Lee	0.0	0.0	0.0	0.0	0.0	0.0
LWC Planning Area Total	306.1	315.1	324.0	333.0	342.0	351.0

Field Crops – Other Field Crops

Other field crops in the LWC Planning Area include primarily rice, seed corn and soybeans. Declines in acreage and water use are projected. **Table 23** presents the acreage projections, while **Table 24** shows the projected net irrigation demands under average and 1-in-10 year drought conditions. **Table 25** shows the projected gross irrigation demands (water withdrawal demands) under average and 1-in-10 year drought conditions.

Table 23. Other Field Crops Acreage in the LWC Planning Area.

County	2000	2005	2010	2015	2020	2025
Glades - Southern	1,193	1,132	1,071	1,011	950	889
Hendry - Western Hendry	218	204	190	175	161	147
Lee	1,172	1,094	1,017	939	862	784
Charlotte - SFWMD Portion	1,055	939	822	706	589	473
Collier	222	222	222	222	222	222
Total LWC Planning Area	3,860	3,591	3,322	3,053	2,784	2,515

Table 24. Net Irrigation Demands for Other Field Crops in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	1.3	1.2	1.0	0.9	0.7	0.6
Collier	0.2	0.2	0.2	0.2	0.2	0.2
Glades - Southern	1.6	1.5	1.5	1.4	1.3	1.2
Hendry - Western Hendry	0.3	0.3	0.2	0.2	0.2	0.2
Lee	1.7	1.6	1.5	1.3	1.2	1.1
LWC Planning Area Total	5.1	4.7	4.4	4.0	3.6	3.3
Net Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	1.7	1.5	1.3	1.1	0.9	0.7
Collier	0.3	0.3	0.3	0.3	0.3	0.3
Glades - Southern	2.1	2.0	1.9	1.8	1.7	1.6
Hendry - Western Hendry	0.3	0.3	0.3	0.3	0.3	0.2
Lee	2.1	1.9	1.8	1.6	1.5	1.4
LWC Planning Area Total	6.4	6.0	5.5	5.1	4.6	4.2

Table 25. Gross Irrigation Demands for Other Field Crops in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	2.6	2.3	2.0	1.7	1.5	1.2
Collier	0.3	0.3	0.3	0.3	0.3	0.3
Glades - Southern	3.2	3.1	2.9	2.7	2.6	2.4
Hendry - Western Hendry	0.5	0.5	0.5	0.4	0.4	0.4
Lee	3.3	3.1	2.9	2.7	2.5	2.2
LWC Planning Area Total	10.0	9.3	8.6	7.9	7.2	6.5
Gross Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	3.3	2.9	2.6	2.2	1.9	1.5
Collier	0.4	0.4	0.4	0.4	0.4	0.4
Glades - Southern	4.2	4.0	3.7	3.5	3.3	3.1
Hendry - Western Hendry	0.7	0.6	0.6	0.6	0.5	0.5
Lee	4.1	3.8	3.6	3.3	3.0	2.8
LWC Planning Area Total	12.7	11.8	10.9	10.0	9.1	8.2

Sod Production

Sod projections presented here refer to irrigated sod. Some sod may be harvested from pastureland, which is not irrigated. Pasture supporting cow-calf operations is typically not irrigated because it is not economical. Some pasture in the coastal areas may

include horse farms, ranchettes, etc., which may be irrigated and may have been included with the sod production.

Significant growth in sod production and associated water use is expected in Hendry and Charlotte counties. This production will help meet the demands for sod for urban landscaping. Irrigation requirements are similar to those for recreational uses and on a per acre basis do not change over the projection period.

Table 26 presents the acreage projections, while **Table 27** shows the projected net irrigation demands under average and 1-in-10 year drought conditions. **Table 28** shows the projected gross irrigation demands (water withdrawal demands) under average and 1-in-10 year drought conditions

Table 26. Sod Acreage in the LWC Planning Area.

County	2000	2005	2010	2015	2020	2025
Glades - Southern	9	9	9	9	9	9
Hendry - Western Hendry	475	1,195	1,915	2,635	3,355	4,075
Lee	665	567	469	372	274	176
Charlotte - SFWMD Portion	296	890	1,485	2,079	2,674	3,268
Collier	115	113	110	108	105	103
Lower West Coast Total	1,560	2,774	3,988	5,203	6,417	7,631

Table 27. Net Irrigation Demands for Sod in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	0.5	1.4	2.3	3.2	4.1	5.0
Collier	0.2	0.2	0.2	0.2	0.2	0.2
Glades - Southern	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Hendry	0.7	1.8	2.9	4.0	5.1	6.2
Lee	1.0	0.9	0.7	0.6	0.4	0.3
LWC Planning Area Total	2.4	4.2	6.1	7.9	9.8	11.6
Net Irrigation Demands for 1-in- 10 Conditions (MGD)						
Charlotte - SFWMD Portion	0.6	1.7	2.9	4.1	5.3	6.4
Collier	0.2	0.2	0.2	0.2	0.2	0.2
Glades - Southern	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Hendry	0.9	2.3	3.8	5.2	6.6	8.0
Lee	1.3	1.1	0.9	0.7	0.5	0.3
LWC Planning Area Total	3.1	5.4	7.8	10.2	12.6	15.0

Table 28. Gross Irrigation Demands for Sod in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	0.9	2.7	4.5	6.3	8.2	10.0
Collier	0.4	0.3	0.3	0.3	0.3	0.3
Glades - Southern	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Hendry	1.4	3.6	5.8	8.0	10.2	12.4
Lee	2.0	1.7	1.4	1.1	0.8	0.5
LWC Planning Area Total	4.8	8.5	12.2	15.9	19.6	23.3
Gross Irrigation Demands for 1-in- 10 Conditions (MGD)						
Charlotte - SFWMD Portion	1.2	3.5	5.8	8.2	10.5	12.8
Collier	0.5	0.4	0.4	0.4	0.4	0.4
Glades - Southern	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Hendry	1.9	4.7	7.5	10.3	13.2	16.0
Lee	2.6	2.2	1.8	1.5	1.1	0.7
LWC Planning Area Total	6.1	10.9	15.7	20.4	25.2	30.0

Greenhouse/Nursery

Estimated greenhouse/nursery acreage and irrigation requirements in the LWC Planning Area decline over the projection period, especially in the more urbanized counties of Lee and Collier.

Table 29 presents the acreage projections, while **Table 30** shows the projected net irrigation demands under average and 1-in-10 year drought conditions. **Table 31** shows the projected gross irrigation demands (water withdrawal demands) under average and 1-in-10 year drought conditions.

Table 29. Greenhouse/Nursery Acreage in the LWC Planning Area.

County	2000	2005	2010	2015	2020	2025
Glades - Southern	60	55	50	46	41	36
Hendry - Western Hendry	144	144	144	144	144	144
Lee	756	725	694	663	632	601
Charlotte - SFWMD Portion	81	81	81	81	81	81
Collier	631	596	561	526	491	456
Total LWC Planning Area	1,672	1,601	1,530	1,460	1,389	1,318

Table 30. Net Irrigation Demands for Greenhouse/Nursery in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	0.1	0.1	0.1	0.1	0.1	0.1
Collier	1.1	1.0	1.0	0.9	0.8	0.8
Glades - Southern	0.1	0.1	0.1	0.1	0.1	0.1
Hendry - Western Hendry	0.2	0.2	0.2	0.2	0.2	0.2
Lee	1.5	1.5	1.4	1.3	1.3	1.2
LWC Planning Area Total	3.1	2.9	2.8	2.7	2.6	2.4
Net Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	0.2	0.2	0.2	0.2	0.2	0.2
Collier	1.2	1.2	1.1	1.0	1.0	0.9
Glades - Southern	0.1	0.1	0.1	0.1	0.1	0.1
Hendry - Western Hendry	0.3	0.3	0.3	0.3	0.3	0.3
Lee	1.7	1.7	1.6	1.5	1.5	1.4
LWC Planning Area Total	3.6	3.4	3.3	3.1	3.0	2.8

Table 31. Gross Irrigation Demands for Greenhouse/Nursery in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	0.4	0.4	0.4	0.4	0.4	0.4
Collier	2.1	2.0	1.9	1.7	1.6	1.5
Glades - Southern	0.3	0.3	0.2	0.2	0.2	0.2
Hendry - Western Hendry	0.7	0.7	0.7	0.7	0.7	0.7
Lee	2.1	2.0	1.9	1.8	1.7	1.7
LWC Planning Area Total	5.6	5.4	5.1	4.9	4.7	4.5
Gross Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	0.5	0.5	0.5	0.5	0.5	0.5
Collier	2.4	2.3	2.1	2.0	1.9	1.7
Glades - Southern	0.3	0.3	0.3	0.3	0.2	0.2
Hendry - Western Hendry	0.9	0.9	0.9	0.9	0.9	0.9
Lee	2.4	2.3	2.2	2.1	2.0	1.9
LWC Planning Area Total	6.5	6.2	6.0	5.7	5.5	5.2

Improved Pasture

Improved pasture is generally not irrigated and no irrigation demands are estimated since they would only relate to some of the acres some of the time.

Other Agricultural Uses

This plan update does not present estimates for cattle watering or aquaculture, the former because of its small size and the latter because most of the use represents localized flow-through, in which the water returns to the source from which it was taken.

Summary of Agricultural Results

Although estimates and projections for the agricultural subsections have been discussed in terms of crop/use categories, it is also important to summarize the results in terms of total acreage and use by subbasin. The acreage by subbasin is presented in **Table 32**, while total agricultural net irrigation demands are presented **Table 33**. Gross irrigation demands (water withdrawal demands) are presented in **Table 34**.

Table 32. Total Irrigated Agricultural Acreage in the LWC Planning Area.

County	2000	2005	2010	2015	2020	2025
Glades – Southern	40,140	43,989	47,839	51,688	55,538	59,387
Hendry – Western Hendry	165,768	168,276	170,784	173,291	175,799	178,307
Lee	34,898	34,104	33,311	32,517	31,724	30,930
Charlotte – SFWMD Portion	18,120	18,189	18,258	18,328	18,397	18,466
Collier	85,476	83,198	80,920	78,641	76,363	74,085
Total	344,402	347,757	351,111	354,466	357,820	361,175

Table 33. Net Irrigation Demands for Total Irrigated Agricultural Acreage in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	18.9	19.2	19.5	19.7	20.0	20.3
Collier	88.5	86.1	83.7	81.3	78.9	76.5
Glades - Southern	50.1	54.6	59.0	63.3	67.5	71.6
Hendry - Western Hendry	195.4	198.6	201.9	205.1	208.4	211.7
Lee	47.4	46.3	45.2	44.0	42.9	41.8
Total	400.3	404.8	409.2	413.5	417.7	421.8
Net Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	25.0	25.3	25.7	26.1	26.4	26.8
Collier	116.5	113.4	110.2	107.1	104.0	100.9
Glades - Southern	67.7	74.0	80.2	86.3	92.3	98.3
Hendry - Western Hendry	260.8	265.0	269.2	273.4	277.6	281.8
Lee	60.6	59.2	57.9	56.5	55.1	53.7
Total	530.6	536.9	543.2	549.3	555.4	561.4

Table 34. Gross Irrigation Demands for Total Irrigated Agricultural Acreage in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	30.1	30.7	31.2	31.8	32.3	32.9
Collier	150.4	146.2	142.0	137.7	133.5	129.3
Glades - Southern	94.0	101.4	108.5	115.4	122.1	128.5
Hendry - Western Hendry	334.6	341.3	348.0	354.7	361.4	368.1
Lee	80.7	78.6	76.5	74.5	72.4	70.3
Total	689.8	698.1	706.2	714.1	721.7	729.2
Gross Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	39.3	40.0	40.7	41.5	42.2	43.0
Collier	196.3	190.8	185.4	180.0	174.5	169.1
Glades - Southern	126.6	136.8	146.8	156.5	165.9	175.0
Hendry - Western Hendry	446.9	455.5	464.1	472.7	481.4	490.0
Lee	102.7	100.1	97.6	95.0	92.4	89.9
Total	911.7	923.3	934.6	945.7	956.4	967.0

TOTAL PLANNING AREA DEMAND AND PLAN COMPARISONS

Total Planning Area Demands

This section summarizes both the total user/customer demands and the water withdrawal demands in the LWC Planning Area. The net demands are the demands that the projects identified in the plan update will be designed to meet. They are presented for both average and 1-in-10 year drought conditions. **Table 35** shows user/customer demands and **Table 36** shows estimated water withdrawal demands from 2000 to 2025 for the LWC Planning Area for average and 1-in-10 year drought demands, respectively.

Table 35. Net Water Demands 2000 through 2025 by Water Use Category in the LWC Planning Area (MGD).

Water Use Category	2000	2005	2010	2015	2020	2025
Net Demands for Average Conditions (MGD)						
Public Water Supply	103.8	128.1	152.0	176.8	201.4	225.5
Domestic Self-Supply	22.9	24.4	25.9	27.5	29.3	31.1
Commercial & Industrial Self-Supply	26.6	26.6	28.9	28.9	28.9	28.9
Recreational Self-Supply	37.7	39.5	41.3	43.0	44.8	46.6
Thermoelectric Power Generation Self-Supply	0.2	0.5	8.1	51.7	59.3	66.9
Agricultural Self-Supply	400.3	404.8	409.2	413.5	417.7	421.8
Total Water Demands	591.5	623.9	665.4	741.4	781.4	820.8
Net Demands for 1-in-10 Year Drought Conditions (MGD)						
Public Water Supply	112.2	134.8	161.1	187.4	213.5	239.0
Domestic Self-Supply	24.3	25.9	27.5	29.2	31.0	33.0
Commercial & Industrial Self-Supply	26.6	26.6	28.9	28.9	28.9	28.9
Recreational Self-Supply	44.7	46.8	49.0	51.1	53.3	55.4
Thermoelectric Power Generation Self-Supply	0.2	0.5	8.1	51.7	59.3	66.9
Agricultural Self-Supply	530.6	536.9	543.2	549.3	555.4	561.4
Total Water Demands	738.6	771.5	817.8	897.6	941.4	984.6

Table 36. Gross Water Demands 2000 through 2025 by Water Use Category in the LWC Planning Area (MGD).

Water Use Category	2000	2005	2010	2015	2020	2025
User/Customer Demands for Average Conditions (MGD)						
Public Water Supply	115.7	145.3	179.0	209.4	239.4	272.2
Domestic Self-Supply	22.9	24.4	25.9	27.5	29.3	31.1
Commercial & Industrial Self-Supply	26.6	26.6	28.9	28.9	28.9	28.9
Recreational Self-Supply	50.2	52.6	55.0	57.4	59.8	62.2
Thermoelectric Power Generation Self-Supply	0.2	0.5	8.1	51.7	59.3	66.9
Agricultural Self-Supply	689.8	698.1	706.2	714.1	721.7	729.2
Total Water Demands	905.4	947.5	1003.1	1089.0	1138.4	1190.5
User/Customer Demands for 1-in-10 Year Drought Conditions (MGD)						
Public Water Supply	122.6	151.3	189.7	222.0	253.7	288.5
Domestic Self-Supply	24.3	25.9	27.5	29.2	31.0	33.0
Commercial & Industrial Self-Supply	26.6	26.6	28.9	28.9	28.9	28.9
Recreational Self-Supply	59.6	62.5	65.3	68.2	71.0	73.9
Thermoelectric Power Generation Self-Supply	0.2	0.5	8.1	51.7	59.3	66.9
Agricultural Self-Supply	911.7	923.3	934.6	945.7	956.4	967.0
Total Water Demands	1145.0	1190.1	1254.1	1345.7	1400.3	1458.2

Changes Compared to the 2000 LWC Plan

There were several changes made to the demand assessment and projection methodology from the 2000 LWC Plan to the 2005–2006 LWC Plan Update. These are summarized as follows:

Census blocks vs. Census block groups: The population analysis conducted in this 2005–2006 LWC Update used census blocks; whereas block groups were used for the 2000 LWC Plan. A Census block is the smallest Census geographic area, normally bounded by streets and other prominent physical features. A Census block has a higher resolution than a group of blocks (Census block group); therefore, use of blocks rather than block groups provide a higher level of precision.

A lower water use threshold for public water supply utilities from 500,000 to 100,000 gallons per day: This had the effect of increasing the number of Public Water Supply utilities analyzed in the 2005–2006 LWC Plan Update.

Supplemental irrigation needs determined use of the AFSIRS Model vs. a modified Blaney-Criddle Model: Both of these models estimate evapotranspiration (ET) in order to derive supplemental irrigation requirements for agricultural crops and outdoor irrigation. However, in south Florida, the Blaney-Criddle Model tends to overestimate ET, which is the driving component of supplemental irrigation. As a result, the Blaney-Criddle Model has the potential to overestimate supplemental irrigation requirements. To address this, District staff began using the AFSIRS Model as the regional water supply plans were updated. The AFSIRS Model yields supplemental irrigation requirements that better reflect historic use patterns, and are generally lower than the modified Blaney-Criddle Model on an annual basis.

Comparison of 2005–2006 LWC Plan and 2000 LWC Plan

Projected Water Demands

Table 37 compares the projected average gross water demands estimated in the 2000 LWC Water Supply Plan with those estimated for the 2005–2006 LWC Update. **Table 38** does the same for the 1-in-10 year drought projected demands.

Table 37. End Point Projections of Average Water Demands in the 2000 LWC Plan and 2025 LWC Plan Update using Gross Demand.

Water Use Category	2000 LWC Plan Average Demands for 2020 (MGD)	2006 LWC Plan Average Demands for 2025 (MGD)	% Change 2000 LWC Plan (2020) vs. 2005–2006 LWC Update (2025)
Public Water Supply	155.1	272.2	75%
Domestic Self-Supply and Small Public Supply Systems	17.6	31.1	77%
Commercial & Industrial Self-Supply	20.0	28.9	45%
Recreational Self-Supply (Golf Course)	197.7	62.2	-69%
Thermoelectric Power Generation Self-Supply	0.8	66.9	8263%
Agricultural Self-Supply	709.0	729.2	3%
Total Water Use	1100.1	1190.5	8%

a. Gross average demand projections totals to be determined when all project information is complete. See Table 4.

Table 38. End Point Projections of 1-in-10 Year Drought Demands in the 2000 LWC Plan and 2005–2006 LWC Plan Update using Gross Demand.

Water Use Category	2000 LWC Plan 1-in-10 Year Demands for 2020 (MGD)	2006 LWC Plan 1-in-10 Year Demands for 2025 (MGD)	% Change 2000 LWC Plan (2020) vs. 2005–2006 LWC Plan Update (2025)
Public Water Supply	165.9	288.5	74%
Domestic Self-Supply and Small Public Supply Systems	18.7	33.0	76%
Commercial & Industrial Self-Supply	20.0	28.9	45%
Recreational Self-Supply	229.0	73.9	-68%
Thermoelectric Power Generation Self-Supply	0.8	66.9	8262
Agricultural Self-Supply	841.0	967.0	15%
Total Water Use	1275.3	1458.2	14%

The most significant differences between the 2000 LWC Plan demand estimates and the demands estimated in this plan update occur for the following reasons:

- Population projections for the 2005-2006 LWC Plan Update show much larger growth than projections in the 2000 LWC Plan Update. This has a large effect on both Public Water Supply and Domestic Self-Supply demands.
- In the Thermoelectric Power Generation category, the 2000 LWC Plan did not project any additional power generation needs for the planning area. The current plan update projects five new power generation facilities to be located in the LWC Planning Area.

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APPENDIX E

Potable and Wastewater Treatment Facilities

POTABLE WATER TREATMENT FACILITIES

Potable water used in the Lower West Coast (LWC) Planning Area is produced by large water treatment facilities, smaller "package" water treatment plants and self-supply (i.e., private wells supplying individual users). This section focuses on the larger regional facilities (equal to or greater than 0.10 million gallons per day or MGD), which due to their existing or future design capacities, could have an impact on the water resource.

There are 34 existing water treatment facilities with a capacity of 0.10 MGD or greater in the planning area. These water treatment facilities are mostly located in the urbanized areas throughout the LWC Planning Area, as shown in **Figure 1** through **Figure 6**. The facilities and other information are tabulated in **Table 1**.

Summary Descriptions of Existing Water Facilities

Eleven facilities use the Surficial Aquifer as their only supply source; two facilities use surface waters as their source; five use the Floridan Aquifer as their source; and, the remainder use a combination of these sources.

Summary descriptions for each of the water treatment facilities located in the LWC Planning Area are presented in this section for each utility. The following information is presented:

Raw Water Supply – This section provides a summary of withdrawal facilities, supply sources and 2003 (October 2002–September 2003) pumpage. The annual allocations are expressed in million gallons per year (MGY) and the maximum daily allocations are expressed in MGD.

Treatment – This section presents the current Florida Department of Environmental Protection (FDEP)-rated capacity, the method of treatment and the average daily flow (ADF).

Proposed/Future – This section states any current construction or permitting underway, future treatment facility expansions/plans and projected utility flows (as provided by the utility).

Collier County Potable Water Treatment Facilities

City of Marco Island

Raw Water Supply

The City of Marco Island's three treatment facilities are supplied by raw water withdrawn from 18 Floridan Aquifer wells and surface water from Marco Lakes. The wells are 10 inches or 12 inches in diameter, range in total depth from 460 feet to 580 feet, and have cased depths ranging from 336 feet to 415 feet. Each well is equipped with a pump rated by the FDEP at 500 gallons per minute (GPM). Raw surface water is withdrawn from Marco Lakes using four 200-horsepower pumps rated by the FDEP at 2,300 GPM. In addition to being sent to two treatment plants, raw water withdrawn from Marco Lakes is also injected into seven, 16-inch diameter aquifer storage and recovery (ASR) wells, each with a total depth of about 790 feet and a cased depth of about 745 feet. Each well is equipped with a pump rated by FDEP at 1,100 GPM.

Withdrawals are authorized under Consumptive Use Permit (CUP) 11-00080-W, which was renewed on February 8, 2006, and expires on February 8, 2016.

Surface Water

Annual Allocation:	1,600 MGY (4.38 MGD) to ASR System
	1,935 MGY (5.30 MGD) from Marco Lakes to surface water treatment
Maximum Daily Allocation:	12.70 MGD (based on max month of 381 MG from all sources)

Floridan Aquifer

Annual Allocation:	1,460 MGY (4.0 MGD)
Maximum Daily Allocation:	See above

The 2003 average daily pumpage from the Floridan Aquifer was 3.30 MGD. The 2003 average daily pumpage from surface water was 5.50 MGD.

Treatment

The City of Marco Island operates two lime softening plants and one reverse osmosis (RO) facility. The RO facility is rated by the FDEP at 6.00 MGD and receives raw water from the Floridan wells. One of the city's lime softening plants (the Marco Shores Plant) is rated by FDEP at 0.70 MGD, and is scheduled to be retired within the next year and replaced by an interconnection that will enable the purchase of bulk water

from Collier County to supply this portion of the Marco Island Service Area. The other (referred to as the Marco Island Lime Plant) is rated by FDEP at 6.67 MGD. Both lime softening plants receive raw water from Marco Lakes.

Proposed/Future

To accommodate anticipated growth, the City of Marco Island is planning to install 6 MGD of new nanofiltration capacity to its existing RO facility and pipe surface water, primarily from the ASR system, for treatment at that facility. To supply raw water for this expanded capacity, the city now has seven operational ASR wells and is planning to install up to five additional raw water ASR wells. The recently issued CUP for the city allows increased seasonal stage-dependant withdrawals from Marco Lakes to charge the ASR system. In order to conserve its Floridan Aquifer source and help prevent increasing chlorides, the city is also investigating the possibility of converting two of its RO trains to nanofiltration to treat a portion of the additional raw water from Marco Lakes.

Information Source

Information was provided by Marco Island Utilities and SFWMD water use files.

City of Naples Water Treatment Facility

Raw Water Supply

Raw water is withdrawn from 51 Lower Tamiami Aquifer wells at the Naples facility. These wells range from 8 inches to 14 inches in diameter in two wellfields (East Golden Gate and Coastal Ridge). The wells have total depths between 71 feet and 137 feet and are cased to depths ranging from 37 feet to 64 feet. The well pumping capacities are between 350 GPM and 1,000 GPM.

The current SFWMD permit (11-00017-W) was issued on June 12, 2003, and expires on June 12, 2008.

Annual Allocation:	6,724 MGY (18.42 MGD)
Maximum Daily Allocation	22.84 MGD

The 2003 average daily pumpage from the East Golden Gate Wellfield was 12.50 MGD and 4.86 MGD from the Coastal Ridge Wellfield.

Treatment

The City of Naples operates a lime softening plant rated by the FDEP at 30.00 MGD to treat raw water withdrawn from the Lower Tamiami Aquifer, followed by chlorination and fluoridation.

Proposed/Future

The CUP authorizes the construction of two, 16-inch diameter wells, each having a total depth of 80 feet, a cased depth of 50 feet and a pump rated at 1,000 GPM. These wells are currently in design. The City of Naples anticipates continued use of existing facilities, and future development of a 10 MGD brackish groundwater supply to meet projected needs.

Information Source

Information was obtained from the City of Naples and SFWMD files.

Collier County North Regional Water Treatment Facility

Raw Water Supply

Raw water to supply the Collier County North facility is withdrawn from 16 Lower Hawthorn Aquifer wells. The wells are all 16 inches in diameter with total depths ranging from 784 feet to 1,070 feet, and are cased between 700 feet and 790 feet. These wells are all equipped with pumps rated at 1,000 GPM.

The North Hawthorn wellfield is regulated pursuant to the SFWMD Permit 11-01447-W, which was issued on May 30, 2002, and expires on December 12, 2016. On March 9, 2005, Collier County received a permit modification to allow five additional Mid-Hawthorn wells to the North Hawthorn wellfield without increasing the annual total allocation.

Annual Allocation:	5 MGY (15.40 MGD)
Maximum Daily Allocation:	21.60 MGD

The 2003 average daily pumping pursuant was 8.64 MGD from the Lower Hawthorn to the North Water Plant.

Treatment

The North County Water Treatment Plant is permitted by the FDEP to treat 12.00 MGD using membrane softening (used to treat water supplied from the Golden Gate wellfield), and 8.00 MGD using RO from the North Hawthorn wellfield.

Proposed/Future

Collier County is in the process of expanding its water treatment capacity as provided in its 10-Year Water Supply Facilities Work Plan. In 2008, the county intends to install 2 MGD of additional high-pressure RO capacity at this facility to treat wells with degraded water quality. Numerous other reliability well and transmission main projects are proposed for this facility between now and 2025.

Information Source

Information was provided by the Collier County Public Utilities and SFWMD water use permit files.

Collier County South Regional Water Treatment Facility

Raw Water Supply

Raw water is withdrawn from 32 Lower Tamiami Aquifer wells at the Collier County South facility. These wells are either 12 inches or 16 inches in diameter, with total depths between 96 feet and 150 feet and cased between 50 feet and 92 feet. All of the 16-inch wells are equipped with pumps rated at 700 GPM. The pumps on the remaining wells (all are 12 inches in diameter) have pumping capacities of either 700 GPM or 1,000 GPM.

The SFWMD permit (11-00249-W) was issued on September 13, 2001, and expires on September 13, 2006.

Annual Allocation:	6,868 MGY (18.81 MGD)
Maximum Daily Allocation:	31.77 MGD

The 2003 average daily pumpage from the Lower Tamiami Aquifer wells was 17.79 MGD.

Treatment

The South County Water Treatment Plant is permitted by the FDEP to treat 12.00 MGD using lime softening (in operation since 1984) to treat water supplied from the Golden Gate wellfield, and has just completed a FDEP-rated expansion to treat 8.00 MGD using RO.

Proposed/Future

Collier County is in the process of expanding its water treatment capacity as provided in its 10-Year Water Supply Facilities Work Plan. According to this plan, the South County Regional Water Treatment Plant will be expanded to treat an additional 12.00 MGD using RO. The South County wellfield will be expanded with an additional 23 wells to provide the needed raw water. This expanded RO capacity is expected to be completed in 2007. In addition to the expansion of the South County Regional Plant, two additional water treatment plants, the Northeastern Regional Water Treatment Plant and the Southeastern Regional Plant, are scheduled to come on-line between 2009 and 2025. Both of these plants will use an RO treatment process, and each, when completed, will be capable of producing 20.00 MGD.

Information Source

Information was provided by the Collier County Public Utilities, the Collier County 10-Year Water Supply Facilities Work Plan and SFWMD water use permit files.

Everglades City Water Treatment Plant

Raw Water Supply

At the Everglades City facility, raw water is withdrawn from three Water Table Aquifer wells, each with a diameter of 8 inches, and each having a total depth of 25 feet and a cased depth of 15 feet. The wells' pumps are all rated at 220 GPM.

The current SFWMD permit (11-00160-W) was issued on August 5, 2003, and expires on September 27, 2008.

Annual Allocation:	105 MGY (0.29 MGD)
Maximum Daily Allocation	0.46 MGD

The 2003 average daily pumpage from the Lower Tamiami Aquifer was 0.27 MGD.

Treatment

Everglades City uses aeration and iron filtration to treat water withdrawn from its wells. The water treatment plant is permitted by the FDEP at 0.50 MGD.

Proposed/Future

Everglades City is in the process of switching from free chlorine to ammonia to provide the required levels of disinfection for its finished water. If requested, the city is prepared to extend potable water to the community of Copeland, which is currently served by the Lee-Cypress Cooperative. Everglades City has the existing capacity to provide this service (Copeland has only 54 houses), though as of this writing there are no firm plans for such extension.

Information Source

Information was obtained from the Everglades City, Anchor Engineering and SFWMD files.

Florida Government Utility Authority (FGUA) – Golden Gate Facility

Raw Water Supply

Raw water is withdrawn from eight Water Table Aquifer wells at the Golden Gate facility. These wells range from 6 inches to 10 inches in diameter, have total depths between 22 feet and 45 feet, and are cased to depths between 15 feet and 35 feet. The well pumping capacities are between 160 GPM and 250 GPM.

The current SFWMD permit (11-00148-W) was issued on September 11, 2003, and expires on September 11, 2008.

Annual Allocation:	702 MGY (1.92 MGD)
Maximum Daily Allocation	2.38 MGD

The 2003 average daily pumpage from the Water Table Aquifer was 1.50 MGD.

Treatment

The Golden Gate Treatment Plant is permitted by the FDEP to treat 1.22 MGD using lime softening and 0.50 MGD using RO.

Proposed/Future

The FGUA has initiated permitting to expand the capacity of the Golden Gate Water Treatment Plant's RO facility by an additional 0.25 MGD. This will bring the total treatment capacity to 1.97 MGD. No new wells are proposed; rather, FGUA is contemplating applying for a permit to deepen its current Well 9 to supply additional water for the RO process without an increase in allocation.

Information Source

Information was obtained from the Florida Government Utility Authority and SFWMD files.

Immokalee Water and Sewer District

Raw Water Supply

Raw water is drawn from 13 Lower Tamiami Aquifer wells at the Immokalee facility. Two of the wells are 6 inches in diameter, with the remainder being 8 inches in diameter. The wells have total depths ranging from 175 feet to 315 feet, and cased depths ranging from 95 feet to 250 feet. The well pumping capacities are between 200 GPM and 400 GPM.

The current SFWMD permit (11-00013-W) was issued on July 8, 2004, and expires on June 15, 2010.

Annual Allocation:	1,227 MGY (3.36 MGD)
Maximum Daily Allocation	4.71 MGD

The 2003 average daily pumpage from the Lower Tamiami Aquifer was 2.44 MGD.

Treatment

The Immokalee Water and Sewer District uses three lime softening facilities to treat the raw water withdrawn from the Lower Tamiami Aquifer. The largest is the Jerry V. Warden Plant, which is rated by the FDEP at 2.25 MGD, followed by the Airport Plant, which is FDEP-rated at 1.35 MGD, and lastly the Carson Road Plant, which is currently rated by the FDEP at 0.90 MGD.

Proposed/Future

The FDEP has issued the permits to allow the expansion of the Carson Road facility to 2.10 MGD. This project is progressing through Collier County's site plan approval process. To provide additional raw water for this facility, the Immokalee Water and Sewer District intends to construct two additional Lower Tamiami Aquifer wells at the Carson Road facility, along with one additional well at the Jerry V. Warden Plant.

Information Source

Information was obtained from the Immokalee Water and Sewer District and SFWMD files.

Orangetree Utilities

Raw Water Supply

Raw water is withdrawn from two Lower Tamiami Aquifer wells located within the Orangetree community. These wells are 12 inches in diameter, are cased to 70 feet, have total depths of 180 feet and are each equipped with a pump rated at 300 GPM.

The current SFWMD permit (11-00419-W) was issued on February 9, 2005, and expires on February 9, 2010. The approved allocations are:

Annual Allocation:	473 MGY (1.29 MGD)
Maximum Daily Allocation:	1.90 MGD

The 2003 average daily pumpage was 0.25 MGD.

Treatment

Orangetree Utilities uses membrane softening technology to treat raw water withdrawn from the Lower Tamiami Aquifer. The membrane softening plant is rated by the FDEP at 0.75 MGD.

Proposed/Future

In order to meet future anticipated demands, Orangetree Utilities has requested and received from the SFWMD a modification to its permit to allow four additional Lower Tamiami Aquifer wells and the allocations previously stated (473 MGY with 1.29 MGD Daily Average). Each of the new wells will be 12 inches in diameter, cased to 70 feet with total depths of 180 feet and equipped with wells rated at 300 GPM. Of the six wells, one will be a reserve well to provide backup capability. The membrane softening equipment was installed in 2004, prior to which Orangetree Utilities had used a lime softening plant rated at 0.44 MGD. This improvement, and the wells to supply the new system, nearly doubles Orangetree's capacity.

According to Collier County's Water Supply Facilities Work Plan, the area served by Orangetree Utilities will become part of the Collier County Water and Sewer District by 2012.

Information Source

Information was provided by AM Engineering, Water Resource Solutions, the Collier County Water Supply Facilities Work Plan and SFWMD water use files.

Port of the Islands Community Improvement District

Raw Water Supply

Raw water is withdrawn from two Surficial Aquifer System wells. Each well is 6 inches in diameter, with a total depth of 40 feet. The cased depth is uncertain; however, each well is equipped with a pump rated at 200 GPM.

The current SFWMD permit (11-00271-W) was issued on March 9, 1995, and expires on March 9, 2005. The permit is currently in for renewal.

Annual Allocation:	109 MGY (0.29 MGD)
Maximum Daily Allocation	0.45 MGD

The 2003 average daily pumpage from the Surficial Aquifer was 0.08 MGD.

Treatment

Raw water is treated through lime softening at this facility, which is rated by the FDEP at 0.44 MGD.

Proposed/Future

There are no plans to enlarge or modify this facility at this time.

Information Source

Information was obtained from the Port of the Islands Community Improvement District and SFWMD files.

Glades County Potable Water Treatment Facilities

City of Moore Haven Water Treatment Plant

Raw Water Supply

Raw water is withdrawn from four Surficial Aquifer wells at the Moore Haven facility. These wells are all 10 inches in diameter. One is cased to 55 feet with a total depth of 110 feet, while the remaining three are all cased to 60 feet and have a total depth of 120 feet. All four wells are equipped with a pump rated at 400 GPM.

The current SFWMD permit (22-00045-W) was issued on July 15, 1999, and expires on July 15, 2009.

Annual Allocation: 146 MGY (0.40 MGD)

Maximum Daily Allocation: 0.70 MGD

The 2003 average daily pumpage from the Surficial Aquifer was 0.34 MGD.

Treatment

The City of Moore Haven treats raw water at a lime softening facility rated by the FDEP at 0.75 MGD.

Proposed/Future

Future plans are not available at this time.

Information Source

Information was obtained from SFWMD permit files.

Hendry County Potable Water Treatment Facilities

City of LaBelle Water Treatment Plant

Raw Water Supply

At the LaBelle facility, raw water is withdrawn from five Water Table Aquifer wells. Three of the wells are 6 inches in diameter, and range in total depth from 24 feet to 47 feet with cased depths ranging from 20 feet to 25 feet. Of these three, two are equipped with pumps rated at 140 GPM, and the third has a pump rated at 150 GPM. The remaining two wells are both 8 inches in diameter with total depths of 45 feet and are cased to 20 feet. Both are equipped with pumps rated by the FDEP at 225 GPM.

The current SFWMD permit (26-00105-W) was issued on February 9, 2005, and expires on February 9, 2010.

Annual Allocation:	237 MGY (0.65 MGD)
Maximum Daily Allocation:	0.81 MGD

The 2003 average daily pumpage from the Water Table Aquifer was 0.61 MGD.

Treatment

Lime softening, followed by sand filtration, fluoridation and gas chlorination, is used to treat raw water at this facility, which is rated by the FDEP at 1.00 MGD.

Proposed/Future

In anticipation of increased growth and development, the City of LaBelle is proposing the staged development of an 8 MGD brackish RO supply. The first phase of RO capacity (5 MGD) is schedule to be completed in 2009, with the remaining capacity to be completed in the 2016–2020 time frame. When the new facility is operational, the existing lime softening facility will be decommissioned.

Information Source

Information was provided by the City of LaBelle and SFWMD permit files.

Clewiston Water Treatment Plant (U.S. Sugar Corporation)

Raw Water Supply

Six pipelines provide raw water at the Clewiston facility. These pipelines withdraw Surface Water from Lake Okeechobee. Four of the pipelines are 14 inches in diameter and equipped with pumps rated between 2,100 GPM and 5,600 GPM. One pipeline is 16 inches in diameter and equipped with a pump rated at 5,000 GPM, and the other pipeline is 12 inches in diameter and equipped with a pump rated at 5,000 GPM.

The current SFWMD permit (26-00024-W) was issued on October 9, 1997, and expires on May 9, 2006. The permit is currently in for renewal.

Annual Allocation:	2,106 MGY (5.77 MGD)
Maximum Daily Allocation:	10.38 MGD

The 2003 average daily pumpage from Lake Okeechobee was 6.17 MGD.

Treatment

The Clewiston Plant uses enhanced lime softening, followed by carbon filtration, to treat raw water. This facility is rated by the FDEP at 6.00 MGD.

Proposed/Future

The U.S. Sugar Corporation is currently a bulk supplier of potable water to the City of Clewiston, as well as the South Shore Water Association. However, in 2008, U.S. Sugar will cease providing water to these two entities, as it will need all of its water production for its own operations. As part of its re-allocation to provide additional water to its mill operations, U.S. Sugar is investigating the possibility of switching its treatment to coagulation and carbon filtration.

The City of Clewiston and the South Shore Water Association are jointly developing a 3 MGD brackish water supply (Upper Floridan Aquifer) and RO water treatment plant. The facility is scheduled to be operational in the summer of 2008.

Information Source

Information was provided by the U.S. Sugar Corporation and SFWMD permit files.

Hendry Correctional Institution (Florida Department of Corrections)

Raw Water Supply

Raw water is withdrawn from two Lower Tamiami Aquifer wells at the Hendry Correctional Institute. Both of these wells are 10 inches in diameter with total depths of 125 feet and cased depths of 97 feet each. Each well is equipped with a pump rated by the FDEP at 400 GPM.

The current SFWMD permit (26-00164-W) was issued on July 13, 2005, and will expire on July 13, 2010.

Annual Allocation:	486.44 MGY (1.33 MGD)
Maximum Daily Allocation:	1.88 MGD

The 2003 average daily pumpage from the Lower Tamiami Aquifer was 0.14 MGD.

Treatment

Lime softening is used to treat raw water at this facility, which is rated by the FDEP at 0.60 MGD.

Proposed/Future

Hendry Correctional Institution has had a variable inmate population depending on the needs and financial situation of the Department of Corrections. While the population has averaged roughly 1,200 inmates, the number dropped to approximately 200 in the early 2000s, including 2003, which accounts for the low pumpage rate. In addition, only two of the five wells authorized under the SFWMD permit have been constructed. The Department of Corrections has recently chosen to fulfill its maximum population count of 4,914, as noted in the permit renewal application (040810-19). As part of the plan to increase the inmate population, the Department of Corrections intends to construct the remaining three wells to provide the needed water. The Department of Corrections is also considering switching to membrane filtration, though there are no firm plans or timelines as of this writing.

Information Source

Information was provided by the McDonald Group International (consultant for the Department of Corrections/Hendry Correctional Institution) and SFWMD permit files.

Port LaBelle (Hendry County) Water Treatment Plant

Raw Water Supply

At Port LaBelle, raw water is withdrawn from two Sandstone Aquifer wells. The first well is 8 inches in diameter with a total depth of 300 feet and a cased depth of 250 feet. It is equipped with a pump rated by the FDEP at 450 GPM. The second well is 14 inches in diameter with a total depth of 283 feet and cased to 220 feet. It is equipped with a pump rated by FDEP at 500 GPM.

The current SFWMD permit (26-00096-W) was issued on November 13, 1997, and expires on November 13, 2007.

Annual Allocation:	117 MGY (0.32 MGD)
Maximum Daily Allocation:	0.93 MGD

The 2003 average daily pumpage from the Sandstone Aquifer was 0.25 MGD.

Treatment

Lime softening is used by Hendry County to treat raw water at its Port LaBelle Plant, which is rated by FDEP at 0.50 MGD.

Proposed/Future

Hendry County has initiated the design and procurement process for a 0.90 MGD membrane softening plant. When the new plant is completed (scheduled for spring 2007), the existing lime softening facility will be decommissioned. The new membrane softening plant will require additional production well capacity, which would require modification of the county's existing CUP.

Information Source

Information was provided by Hendry County Utilities and SFWMD water use files.

Lee County Potable Water Treatment Facilities

Bonita Springs Utilities

Raw Water Supply

Bonita Springs Utilities, Inc. withdraws supply from 24 Lower Tamiami Aquifer wells and eight Floridan (Lower Hawthorn) wells located in two wellfields in southern Lee County. The Lower Tamiami wells are between 8 inches and 12 inches in diameter, and range in total depth from 80 feet to 100 feet, with cased depth ranging from 58 feet to 91 feet. The Floridan Aquifer wells are between 12 inches and 14 inches in diameter, and range in total depth from 701 feet to 1,120 feet with cased depths ranging from 650 feet to 900 feet.

The current SFWMD permit (36-00008-W) for the Lower Tamiami wells was issued on November 15, 2001, and expires on November 15, 2006. The SFWMD permit (36-04062-W) for the Floridan wells was issued on January 7, 2005, and expires on January 7, 2025. The approved allocations are:

Lower Tamiami

Annual Allocation:	2,094 MGY (5.74 MGD)
Maximum Daily Allocation:	8.01 MGD

Floridan Aquifer

Annual Allocation:	4,769 MGY (13.07 MGD)
Maximum Daily Allocation:	16.00 MGD

The 2003 average daily pumpage was 6.54 MGD entirely from the Lower Tamiami Aquifer, as the Floridan wells were not completed until 2004.

Treatment

Bonita Springs Utilities employs two methods of treatment: lime softening and RO. The RO system was completed in 2004 and rated by the FDEP at 6.25 MGD, with the plant being designed to accommodate expansion to 12.00 MGD. The lime softening system, which treats water from the Lower Tamiami Aquifer, has a FDEP-rated capacity of 8.00 MGD.

Proposed/Future

The CUP 36-04062-W authorizes construction of seven additional 16-inch diameter Floridan Aquifer wells with total depths of 900 feet cased to 700 feet. Bonita Springs Utilities is proposing expansion of production and RO plant capacity by 3 MGD in the 2006–2010 time frame and another 3 MGD in the 2011–2016 time frame.

Information Source

Information was provided by SFWMD permit files.

Citrus Park RV Park

Raw Water Supply

Raw water is withdrawn from four Lower Tamiami Aquifer wells and one Water Table Aquifer well at the Citrus Park facility. Two of the Lower Tamiami wells are 8 inches in diameter, and two are 4 inches in diameter. The 8-inch wells are both cased to 75 feet and equipped with pumps rated by the FDEP at 250 GPM. These wells are 112 feet and 17 feet in total depth. The two, 4-inch diameter wells are both cased to 84 feet, have total depths of 95 feet and are equipped with pumps rated by the FDEP at 250 GPM. The Water Table Aquifer well is 8 inches in diameter, equipped with a pump rated by the FDEP at 250 GPM, cased to 17 feet with a total depth of 32 feet.

The current SFWMD permit (36-00208-W) was issued on November 15, 2001, and expires on November 15, 2006. The approved allocations are:

Annual Allocation:	88 MGY (0.24 MGD)
Maximum Daily Allocation:	0.51 MGD
Lower Tamiami Aquifer	
Annual Allocation:	42 MGY (0.12 MGD)
Maximum Daily Allocation:	0.47 MGD

The average daily pumpage in 2003 was 0.18 MGD.

Treatment

Treatment is provided by an aeration and chlorination facility rated by the FDEP at 0.25 MGD.

Proposed/Future

There are no plans to expand this facility. Bonita Springs Utilities may one day provide potable water service to this RV park, though there are no definite plans or timelines to do so as of this writing.

Information Source

Information was provided by the FDEP, Bonita Springs Utilities and SFWMD water use files.

City of Cape Coral Utilities

Raw Water Supply

Raw water is withdrawn from 27 Floridan (Lower Hawthorn) Aquifer wells at the Cape Coral facility. Twenty-six wells are 12 inches in diameter and range in total depth from 642 feet to 1,100 feet. The cased depths are from 345 feet to 782 feet, and are equipped with pumps rated by the FDEP from 425 GPM to 600 GPM. The city also has a 10-inch diameter well with a total depth of 745 feet, a cased depth of 362 feet and a pump rated by the FDEP at 540 GPM. In addition, the city has a separate irrigation system, including 44.3 MGD in surface water withdrawal capacity from local canals, to supply an extensive reclaimed water system. The irrigation system also serves fire protection services.

The current SFWMD permit (36-00046-W) was re-issued on June 8, 2005, and expires on January 14, 2019. The approved allocations are:

Annual Allocation:	6,179 MGY (16.93 MGD)
Maximum Daily Allocation:	22.46 MGD

The average daily pumpage in 2003 was 9.95 MGD.

Treatment

Treatment is provided by a RO facility currently rated by the FDEP at 15.00 MGD.

Proposed/Future

The City of Cape Coral is in the process of adding an additional membrane train to its water treatment plant. This will increase the plant's capacity by 1.00 to 2.00 MGD. Raw water for this expansion is to be supplied through the construction of eight new Floridan (Lower Hawthorn) Aquifer wells. The allocations in the city's SFWMD permit accommodate this expansion.

The city has also acquired property and is in the design phase of a new, North Cape Coral Water Treatment Plant, which, like the existing facility, will use RO to treat water from the Floridan (Lower Hawthorn) Aquifer. While the new facility's initial treatment capacity will be 12 MGD, the city is anticipating an ultimate capacity of up to 36 MGD. The city is also proposing to separate the surface water withdrawals supporting its local reclaimed system from its existing CUP. A separate CUP covering the surface withdrawals would then be applied for and include development of a 76-well ASR network to increase reuse water storage capacity. A pilot ASR project has been undertaken at the Everest Parkway Water Reclamation facility. The SFWMD has awarded the city an Alternative Water Supply Grant to assist in this pilot project.

Information Source

Information was provided by the City of Cape Coral Utility Department and SFWMD water use files.

Florida Government Utility Authority (FGUA) – Lehigh Acres Facility

Raw Water Supply

Raw water is withdrawn from 14 Sandstone Aquifer wells at the Lehigh Acres facility. These wells range from 6 inches to 10 inches in diameter, have total depths between 62 and 220 feet, and casing to depths between 50 feet and 190 feet. The well pumping capacities range from 100 GPM and 500 GPM.

The current SFWMD permit (36-00166-W) was issued (modified) on March 11, 2004, and expires on December 11, 2006.

Annual Allocation:	1,206 MGY (3.3 MGD)
Maximum Daily Allocation	112.5 MG (3.75 MGD)

The 2003 average daily pumpage from the Sandstone Aquifer was 2.1 MGD.

Treatment

The Lehigh Acres Treatment Plant is permitted by the FDEP to treat 3.61 MGD using lime softening.

Proposed/Future

The FGUA received a permit modification in March 2004 to install three additional Sandstone Aquifer production wells for reliability (no increased quantities).

Information Source

Information was obtained from the Florida Government Utility Authority and SFWMD files.

City of Fort Myers Utilities

Raw Water Supply

The City of Fort Myers withdraws water from 11 Floridan Aquifer (brackish) wells. The wells are 16 inches in diameter, range in total depth from 553 feet to 800 feet, and have cased depths ranging from 455 feet to 475 feet. All but one are equipped with pumps rated by the FDEP at 1,750 GPM; the remaining well is equipped with a pump rated at 1,400 GPM.

The current SFWMD permit (36-00035-W) was issued on March 9, 2000, and expires on March 9, 2020. The approved allocations are:

Annual Allocation:	4,363 MGY (11.95 MGD)
Maximum Daily Allocation:	16.14 MGD

The average daily pumpage in 2003 was 8.50 MGD.

Treatment

Treatment is provided by a RO facility rated by the FDEP at 16.00 MGD. Prior to April 2002, raw water to supply the City of Fort Myers was withdrawn from the Caloosahatchee River and used to recharge a city-owned wellfield producing from the Water Table Aquifer. Water from the wellfield was treated at a membrane softening plant. Due to concerns over potential contamination at the Water Table wellfield and increasing concern over the sensitivity of the Caloosahatchee River and Estuary, the city developed a Floridan Aquifer source at this location and converted the membrane softening facility to a RO facility.

Proposed/Future

Beginning with the 2006–2010 time frame, the city will expand its production facilities by 5 MGD by adding 5 MGD of production capacity approximately every 5 years, or as needed. During the 2011–2015 time frame, the city has proposed to expand this plant's treatment capacity to 20.00 MGD

Information Source

Information was provided by the City of Fort Myers Utilities and SFWMD water use files.

The Greater Pine Island Water Association

Raw Water Supply

Raw water is withdrawn from four Floridan (Lower Hawthorn) Aquifer wells at the Greater Pine Island Water facility. The wells are 12 inches in diameter and range in total depth from 737 feet to 770 feet. The cased depths are from 563 feet to 598 feet. Each is equipped with a pump rated by the FDEP at 700 GPM.

The current SFWMD permit (36-00045-W) was issued on November 14, 1996, and expires on November 14, 2006. The approved allocations are:

Annual Allocation:	616 MGY (1.69 MGD)
Maximum Daily Allocation:	2.21 MGD

The average daily pumpage in 2003 was 1.42 MGD.

Treatment

Treatment is provided by a RO facility currently rated by the FDEP at 2.25 MGD based on the disposal capacity of the facility's percolation ponds.

Proposed/Future

The Greater Pine Island Water Association has constructed and is in the process of finalizing the FDEP operational permits for a deep injection well. This well will be used for the disposal of reject water produced by its RO plant. The association is simultaneously obtaining FDEP permits to increase the RO plant's capacity to 2.70 MGD. While there are no definite plans beyond these modifications, the Greater Pine Island Water Association is assessing future demands, and is considering potential wellfield sites to accommodate future expansions. The RO facility itself was designed to accommodate additional membrane tubes to allow *in situ* expansion, though there are no timelines for doing so as of this writing.

Information Source

Information was provided by the Greater Pine Island Water Association and SFWMD water use files.

The Island Water Association

Raw Water Supply

At the Island Water Association facility, raw water is withdrawn from 16 existing Floridan Aquifer wells. The wells are 6 inches to 10 inches in diameter, have an average total depth of 700 feet and cased depths ranging from 502 feet to 668 feet. The wells are equipped with pumps with capacities rated by the FDEP from 250 GPM to 600 GPM.

The current SFWMD permit (36-00034-W) was issued on November 13, 1997, and expires on November 13, 2017. The approved allocations are:

Annual Allocation:	1,809 MGY (4.96 MGD)
Maximum Daily Allocation:	8.08 MGD

The average daily pumpage in 2003 was 4.10 MGD.

Treatment

Treatment is provided by a RO facility rated by the FDEP at 5.20 MGD.

Proposed/Future

There are currently no plans to expand the RO facility. Island Water has proposed installation of a 1.2 MGD finished water ASR system in 2008 to assist in meeting peak seasonal water demands.

Information Source

Information was provided by the Island Water Association and SFWMD water use files.

Lee County Utilities – Corkscrew Water Treatment Facility

Raw Water Supply

Raw water is withdrawn from 31, 12-inch diameter wells (21 Surficial Aquifer and 10 Sandstone Aquifer wells) located at the Corkscrew wellfield. The wells range in total depth from 80 feet to 300 feet and have cased depths ranging from 30 feet to 210 feet. The 10 Sandstone Aquifer wells are equipped with pumps rated by the FDEP at 350 GPM, while the 21 Surficial Aquifer wells are equipped with pumps rated by the FDEP at 500 GPM.

The current SFWMD permit (36-00003-W), which includes allocations for Lee County's Green Meadows, Olga and College Parkway plants, was issued on May 15, 2003, and expires on April 10, 2008. The approved allocations for all sources, including surface water (C-43 Canal), the Lower and Mid-Hawthorn aquifers, the Water Table Aquifer, the Sandstone Aquifer and the Surficial Aquifer System, are:

Annual Allocation:	7,749 MGY (21.20 MGD)
Maximum Daily Allocation:	30.37 MGD

The average daily pumpage for the Corkscrew Plant in 2003 was 8.49 MGD. Stipulations on the CUP limit pumpage from the SAS in the Corkscrew Wellfield to 6.0 MGD. Stipulations on the Sandstone Aquifer in Corkscrew similarly limit production to 8.0 MGD.

Treatment

The Corkscrew facility uses a lime softening treatment rated by the FDEP at 10.00 MGD.

Proposed/Future

Lee County is proposing to expand the treatment capacity at this facility to 15.00 MGD in the 2006–2010 time frame, add 4 MGD in new freshwater production capacity and 1 MGD of additional brackish supply for blending.

Information Source

Information was provided by Lee County Utilities and SFWMD water use files.

Lee County Utilities – Cypress Lakes College Parkway Water Treatment Facility

Raw Water Supply

This facility uses raw water withdrawn from 11 Mid-Hawthorn Aquifer wells located at the County Cypress Lakes wellfield. The wells are all 8 inches in diameter and have total depths ranging from 220 feet to 285 feet, with cased depths ranging from 100 feet to 220 feet.

The current SFWMD permit (36-00003-W), which includes allocations for Lee County's Green Meadows, Olga and Corkscrew plants, was issued on May 15, 2003, and expires on April 10, 2008. The approved allocations for all sources, including surface water (C-43 Canal), the Lower and Mid-Hawthorn aquifers, the Water Table Aquifer, the Sandstone Aquifer and the Surficial Aquifer System, are:

Annual Allocation:	7,749 MGY (21.20 MGD)
Maximum Monthly Allocation:	30.37 MGD

The current CUP limits withdrawals from the Cypress Lakes wellfield to 0.75 MGD.

The average daily pumpage in 2003 for the College Parkway Plant was 1.48 MGD.

Treatment

This is a lime softening facility rated by the FDEP to treat 1.50 MGD. The facility is currently used for peaking.

Proposed/Future

The water treatment facility and wellfield are scheduled to be decommissioned in 2007.

Information Source

Information was provided by Lee County Utilities and SFWMD water use files.

Lee County Utilities – Green Meadows Water Treatment Facility

Raw Water Supply

Raw water is withdrawn from 14 Surficial Aquifer wells and 13 Sandstone Aquifer wells at the Green Meadows facility. These wells are located at Lee County's Green Meadows wellfield. The Surficial Aquifer wells are all 10 inches in diameter, and range in total depth from 20 feet to 43 feet, with cased depths from 10 feet to 22 feet. Eight of these wells are equipped with pumps rated by the FDEP at 200 GPM, while the remaining six are equipped with pumps rated by the FDEP at 500 GPM. Twelve of the 13 Sandstone Aquifer wells are 16 inches in diameter, with one having a diameter of 18 inches. These wells range in total depth from 90 feet to 235 feet, with cased depths from 90 feet to 170 feet. All but one well is equipped with pumps rated by the FDEP at 500 GPM; the remaining pump is rated by the FDEP at 350 GPM.

The current SFWMD permit (36-00003-W), which includes allocations for Lee County's Cypress Lakes, Olga and Corkscrew plants, was issued on May 15, 2003, and expires on April 10, 2008. The approved allocations for all sources, including surface water (C-43 Canal), the Lower and Mid-Hawthorn aquifers, the Water Table Aquifer, the Sandstone Aquifer and the Surficial Aquifer System, are:

Annual Allocation:	7,749 MGY (21.20 MGD)
Maximum Daily Allocation:	30.37 MGD

The current CUP limits withdrawals from the Water Table Aquifer at the Green Meadows wellfield to 4.20 MGD.

The average daily pumpage in 2003 at the Green Meadows wellfield was 9.30 MGD.

Treatment

Treatment is provided by a lime softening facility permitted by the FDEP at 9.00 MGD.

Proposed/Future

Lee County is scheduled to expand this plant to 15.00 MGD by 2010. The county also proposes to increase freshwater production by 4 MGD and install 2 MGD of brackish supply for blending at this facility.

Information Source

Information was provided by Lee County Utilities and SFWMD water use files.

Lee County Utilities – Olga Water Treatment Facility

Raw Water Supply

The Olga facility uses surface water from the Caloosahatchee River (C-43 Canal). Three pumps set at 5.4 feet elevation withdraw surface water. One pump is rated at 1,750 GPM, the second at 3,000 GPM and the third at 3,850 GPM. The Olga Plant also treats water from an on-site ASR well, which has a diameter of 8 inches, a total depth of 945 feet and a cased depth of 864 feet.

The current SFWMD permit (36-00003-W), which includes allocations for Lee County's Cypress Lakes, Green Meadows and Corkscrew plants, was issued on May 15, 2003, and expires on April 10, 2008. The approved allocations for all sources, including surface water (C-43 Canal), the Lower and Mid-Hawthorn aquifers, the Water Table Aquifer, the Sandstone Aquifer and the Surficial Aquifer System, are:

Annual Allocation:	7,749 MGY (21.20 MGD)
Maximum Daily Allocation:	30.37 MGD

The average daily pumpage in 2003 for the Olga Plant was 4.21 MGD.

Treatment

The Olga Plant is a lime softening facility rated by the FDEP to treat 5.00 MGD.

Proposed/Future

The Olga Plant will be expanded to 10.00 MGD (peak) and receive additional water withdrawn from the Caloosahatchee River, in accordance with the Minimum Flows and Levels Rule (Chapter 40E-8, Florida Administrative Code), via three additional pumps. Additional water is proposed to be stored in an expanded ASR system on-site.

Information Source

Information was provided by Lee County Utilities and SFWMD water use files.

Lee County Utilities – Pinewoods Water Treatment Facility

Raw Water Supply

At the Pinewoods facility, raw water is withdrawn from 11 Water Table Aquifer and three Sandstone Aquifer wells. The Water Table Aquifer wells are all 16 inches in diameter, have total depths between 30 feet and 42 feet and cased depths from 16 feet to 22 feet. Each well is equipped with a pump rated by FDEP at 450 GPM. Two of the Sandstone Aquifer wells are 8 inches in diameter with total depths of 171 feet and 138 feet. Both are cased to 85 feet and equipped with pumps rated at 75 GPM. The remaining Sandstone Aquifer well has a total depth of 123 feet, a cased depth of 83 feet and is equipped with a well rated at 75 GPM.

The current SFWMD permit (36-00122-W) was issued on September 9, 2004, and expires on September 9, 2014. The SFWMD permit allocating the raw water also provides the allocations for Lee County's San Carlos Plant. The approved allocations are:

Annual Allocation:	2,225 MGY (6.09 MGD)
Maximum Daily Allocation:	7.23 MGD

The current CUP limits withdrawals from the Sandstone Aquifer at the Pinewoods wellfield to 0.75 MGD and withdrawals from the Water Table Aquifer to 2.33 MGD.

The average daily pumpage in 2003 from the Pinewoods wellfield was 2.12 MGD.

Treatment

This is a RO facility rated by the FDEP at 1.80 MGD.

Proposed/Future

This facility is currently undergoing to 5.00 MGD. Additional raw water will be provided by four new Lower Hawthorn wells, which have already received SFWMD approval.

Information Source

Information was provided by Lee County Utilities and SFWMD water use files.

Lee County Utilities – San Carlos Water Treatment Facility

Raw Water Supply

Raw water is withdrawn from four Water Table Aquifer wells at the San Carlos facility. These wells are all 8 inches in diameter, have total depths between 40 feet and 45 feet and cased depths from 18 feet to 22 feet. Three wells are equipped with pumps rated by FDEP at 500 GPM, while the fourth is equipped with a pump rated by FDEP at 375 GPM.

The current SFWMD permit (36-00122-W) was issued on September 9, 2004, and expires on September 9, 2014. It should be noted that the SFWMD permit allocating the raw water also provides the allocations for Lee County's Pinewoods Plant. The approved allocations are:

Annual Allocation:	2,225 MGY (6.09 MGD)
Maximum Daily Allocation:	7.23 MGD

The current CUP limits withdrawals from the Water Table Aquifer at the San Carlos wellfield to 2.50 MGD.

The average daily pumpage in 2003 for the San Carlos Plant was 0.86 MGD.

Treatment

Treatment is provided by a lime softening facility permitted by the FDEP at 2.40 MGD.

Proposed/Future

There are no plans to expand or modify this facility.

Information Source

Information was provided by Lee County Utilities and SFWMD water use files.

Lee County Utilities – Waterway Estates Treatment Facility

Raw Water Supply

At the Waterway Estates facility, raw water is withdrawn from six Surficial Aquifer wells, 10 Mid-Hawthorn Aquifer wells and one Lower Hawthorn Aquifer well. The Surficial Aquifer wells are 43 feet to 80 feet in total depth, and have cased depths from 13 feet to 50 feet. Six of the wells are 8 inches in diameter; the remaining two are 10 inches in diameter. The Surficial Aquifer wells are equipped with pumps ranging from a FDEP-rated capacity of 30 GPM to 75 GPM. The Mid-Hawthorn Aquifer wells range from 6 inches to 10 inches in diameter and have total depths ranging from 130 feet to 240 feet. They are cased from 124 feet to 164 feet and equipped with pumps rated by the FDEP from 30 GPM to 110 GPM. The Lower Hawthorn Aquifer well is 4 inches in diameter with a total depth of 600 feet. It is cased to 300 feet and equipped with a pump rated by the FDEP at 100 GPM.

The current SFWMD permit (36-00152-W) was issued on January 15, 2004, and expires on January 15, 2024. The permit covers both the Waterway Estates and North Lee County Water Treatment facilities. The approved allocations are:

Annual Allocation:	2,276 MGY (6.23 MGD)
Maximum Daily Allocation:	8.45 MGD

The average daily pumping in 2003 was 0.81 MGD.

Treatment

This is a lime softening facility rated by the FDEP to treat 1.50 MGD.

Proposed/Future

There are no expansions planned for the treatment capacity of this facility. However, an additional Lower Hawthorn Aquifer well is authorized by the CUP. Lee County has also entered into an agreement with the SFWMD to provide additional storage capacity at the Waterway Estates Plant for reuse water. The reuse water will be distributed in the north Lee County area, including the City of Cape Coral, which has an interconnect and an interlocal agreement with Lee County.

Information Source

Information was provided by Lee County Utilities and SFWMD water use files.

Lee County Utilities – North Lee County Water Treatment Facility

Raw Water Supply

The North Lee County facility will use raw water withdrawn from the Lower Hawthorn Aquifer at the County's North Wellfield. These wells, which are in testing, will be 16 inches in diameter and will be equipped with pumps rated by FDEP at 580 GPM. They range in total depth from 592 feet to 700 feet, with cased depths from 441 feet to 500 feet.

The current SFWMD permit (36-00152-W) was issued on January 15, 2004, and expires on January 15, 2024. The permit allocates raw water for both this facility and the Waterway Estates Plant. The approved allocations are:

Annual Allocation:	2,276 MGY (6.24 MGD)
Maximum Daily Allocation:	8.45 MGD

Since this plant is not yet in operation, there is no average daily pumping data for 2003.

Treatment

This is a RO facility rated by the FDEP to treat 5.00 MGD.

Proposed/Future

The North Lee County Water Treatment Plant is scheduled for expansion to 10.00 MGD during the 2006–2010 time frame. The CUP authorizes eight additional Lower Hawthorn wells to provide raw water for this expansion.

Information Source

Information was provided by Lee County Utilities and SFWMD water use files.

Table 1. Potable Water Treatment Facilities in the Lower West Coast Planning Area – 2003.

Facility	SFWMD		2003 Average Daily Raw Water Pumped (MGD)	Withdrawal Source				FDEP Rated Capacity (MGD)	Treatment Method		
	Permit Number	Annual Allocation (MGD)		Surface Water (MGD)	Surficial Aquifer System (MGD)	Intermediate Aquifer System (MGD)	Floridan Aquifer System (MGD)		Lime Softening (MGD)	Membrane Technology (MGD)	Aeration (MGD)
Collier County											
City of Marco Island Reverse Osmosis Plant	11-00080-W	Average – 4.0 Maximum Daily – 12.7	3.30				3.30	6.00		6.00	
City of Marco Island Marco Shores Plant and Marco Island Lime Plant	11-00080-W	Average – 9.68 Maximum Daily – 12.70 (Max day combined with RO WF)	5.50	5.50				7.37 total (6.67 MGD at Marco Island Lime Plant, 0.70 MGD at Marco Shores Plant)	7.37		
City of Naples (Coastal Ridge Wellfield)	11-00017-W	Average – 18.42 Maximum Daily – 22.84	4.86		4.86			30.00	30.00		
City of Naples (East Golden Gate Wellfield)			12.50		12.50						

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Table 1. Potable Water Treatment Facilities in the Lower West Coast Planning Area – 2003 (Continued).

Facility	SFWMD		2003 Average Daily Raw Water Pumped (MGD)	Withdrawal Source				FDEP Rated Capacity (MGD)	Treatment Method		
	Permit Number	Annual Allocation (MGD)		Surface Water (MGD)	Surficial Aquifer System (MGD)	Intermediate Aquifer System (MGD)	Floridan Aquifer System (MGD)		Lime Softening (MGD)	Membrane Technology (MGD)	Aeration (MGD)
Collier County North Regional Water Treatment Plant (North Hawthorn Wellfield)	11-01447-W	Average – 15.40 Maximum Daily – 21.60	8.64				8.64	20.00		20.00	
Collier County South Regional Water Treatment Plant (Golden Gate Wellfield)	11-00249-W	Average – 18.81 Maximum Daily – 31.77	17.79		17.79			20.00	12.00	8.00	
Everglades City	11-00160-W	Average – 0.29 Maximum Daily – 0.46	0.27		0.27			0.50			0.50
Florida Government Utility Authority (Golden Gate Service Area)	11-00148-W	Average – 1.92 Maximum Daily – 2.38	1.50		1.50			1.72	1.22	0.50	

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Table 1. Potable Water Treatment Facilities in the Lower West Coast Planning Area – 2003 (Continued).

Facility	SFWMD		2003 Average Daily Raw Water Pumped (MGD)	Withdrawal Source				FDEP Rated Capacity (MGD)	Treatment Method		
	Permit Number	Annual Allocation (MGD)		Surface Water (MGD)	Surficial Aquifer System (MGD)	Intermediate Aquifer System (MGD)	Florida Aquifer System (MGD)		Lime Softening (MGD)	Membrane Technology (MGD)	Aeration (MGD)
Immokalee Water and Sewer District	11-00013-W	Average – 3.36 Maximum Daily – 4.71	2.44		2.44			4.50 (at 3 plants)	4.50		
Orangetree Utilities	11-00419-W	Average – 1.29 Maximum Daily – 1.90	0.25		0.25			0.75		0.75	
Port of the Islands	11-00271-W	Average – 0.29 Maximum Daily – 0.45	0.08		0.08			0.44	0.44		
Collier County Subtotals			57.13	5.50	39.69	0	11.94	91.28	55.53	35.25	0.50

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Table 1. Potable Water Treatment Facilities in the Lower West Coast Planning Area – 2003 (Continued).

Facility	SFWMD		2003 Average Daily Raw Water Pumped (MGD)	Withdrawal Source				FDEP Rated Capacity (MGD)	Treatment Method		
	Permit Number	Annual Allocation (MGD)		Surface Water (MGD)	Surficial Aquifer System (MGD)	Intermediate Aquifer System (MGD)	Floridan Aquifer System (MGD)		Lime Softening (MGD)	Membrane Technology (MGD)	Aeration (MGD)
Glades County											
City of Moore Haven	22-00045-W	Average – 0.40 Maximum Daily – 0.70	0.34		0.34			0.75	0.75		
Glades County Subtotals			0.34	0.00	0.34	0.00	0.00	0.75	0.75	0.00	0.00
Hendry County											
City of LaBelle	26-00105-W	Average – 0.65 Maximum Daily – 0.81	0.61		0.61			1.00	1.00		
Clewiston Water Treatment Plant (U.S. Sugar Corporation)	26-00024-W	Average – 5.77 Maximum Daily – 10.38	6.17	6.17				6.00	6.00		
Hendry Correctional Institute	26-00164-W	Average – 1.33 Maximum Daily – 1.88	0.14		0.14			0.60	0.60		
Port LaBelle (Hendry County)	26-00096-W	Average – 0.32 Maximum Daily – 0.93	0.25			0.25		0.50	0.50		
Hendry County Subtotals			7.17	6.17	0.75	0.25	0.00	8.10	8.10	0.00	00.0

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Table 1. Potable Water Treatment Facilities in the Lower West Coast Planning Area – 2003 (Continued).

Facility	SFWMD		2003 Average Daily Raw Water Pumped (MGD)	Withdrawal Source				FDEP Rated Capacity (MGD)	Treatment Method		
	Permit Number	Annual Allocation (MGD)		Surface Water (MGD)	Surficial Aquifer System (MGD)	Intermediate Aquifer System (MGD)	Floridan Aquifer System (MGD)		Lime Softening (MGD)	Membrane Technology (MGD)	Aeration (MGD)
Lee County											
Bonita Springs Utilities	36-00008-W	*Lower Tamiami Aquifer:* Average – 5.74 Maximum Daily – 8.01	6.54		6.54			14.25	8.00		
Bonita Springs Utilities	36-04062-W	*Floridan Aquifer:* Average– 13.07 Maximum Daily – 16.00	RO Plant on line 2004				13.07			6.25	
Citrus Park RV Resort	36-00208-W	Average- 0.24 Maximum Daily- 0.51 Lower Tamiami Aquifer: Average – 0.12 Maximum Daily – 0.47	0.18		0.18			0.25			0.25

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Table 1. Potable Water Treatment Facilities in the Lower West Coast Planning Area – 2003 (Continued).

Facility	SFWMD		2003 Average Daily Raw Water Pumped (MGD)	Withdrawal Source				FDEP Rated Capacity (MGD)	Treatment Method		
	Permit Number	Annual Allocation (MGD)		Surface Water (MGD)	Surficial Aquifer System (MGD)	Intermediate Aquifer System (MGD)	Floridan Aquifer System (MGD)		Lime Softening (MGD)	Membrane Technology (MGD)	Aeration (MGD)
City of Cape Coral	36-00046-W	Average – 16.93 Maximum Daily – 22.46	9.95				9.95	15.00		15.00	
City of Fort Myers	36-00035-W	Average – 11.95 Maximum Daily – 16.14	8.50				8.50	16.00		16.00	
Florida Government Utility Authority (Lehigh Acres Service Area)	36-00166-W	Average- 3.30 Maximum Daily- 3.75	2.10			2.10		3.61	3.61		
Greater Pine Island Water Association	36-00045-W	Average – 1.69 Maximum Daily – 2.21	1.42				1.42	2.25		2.25	
Island Water Association	36-00034-W	Average – 4.96 Maximum Daily – 8.08	4.10				4.10	5.20		5.20	

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Table 1. Potable Water Treatment Facilities in the Lower West Coast Planning Area – 2003 (Continued).

Facility	SFWMD		2003 Average Daily Raw Water Pumped (MGD)	Withdrawal Source				FDEP Rated Capacity (MGD)	Treatment Method		
	Permit Number	Annual Allocation (MGD)		Surface Water (MGD)	Surficial Aquifer System (MGD)	Intermediate Aquifer System (MGD)	Floridan Aquifer System (MGD)		Lime Softening (MGD)	Membrane Technology (MGD)	Aeration (MGD)
Lee County Corkscrew Water Treatment Plant	36-00003-W	Average – 21.20 Maximum Daily – 30.37	8.49			8.49		10.00	10.00		
Lee County Cypress Lakes College Parkway Water Treatment Plant			1.48			1.48		1.50	1.50		
Lee County Green Meadows Water Treatment Plant			9.30		9.30			9.00	9.00		
Lee County Olga Water Treatment Plant			4.21	4.21				5.00	5.00		

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Table 1. Potable Water Treatment Facilities in the Lower West Coast Planning Area – 2003 (Continued).

Facility	SFWMD		2003 Average Daily Raw Water Pumped (MGD)	Withdrawal Source				FDEP Rated Capacity (MGD)	Treatment Method		
	Permit Number	Annual Allocation (MGD)		Surface Water (MGD)	Surficial Aquifer System (MGD)	Intermediate Aquifer System (MGD)	Floridan Aquifer System (MGD)		Lime Softening (MGD)	Membrane Technology (MGD)	Aeration (MGD)
Lee County Pinewoods Water Treatment Plant	36-00122-W	Average – 6.09 Maximum Daily – 7.23	2.12		2.12			1.80		1.80	
Lee County San Carlos Water Treatment Plant			0.86		0.86			2.40	2.40		
Lee County Waterway Estates Treatment Plant	36-00152-W	Average – 6.23 Maximum Daily – 8.45	0.81		0.29	0.52		1.50	1.50		
North Lee County Water Treatment Plant		Average – 6.24 Maximum Daily – 8.45		Proposed				5.00		5.00	
Lee County Subtotals			60.06	4.21	19.29	12.59	37.04	92.76	41.01	51.5	0.25
All County Totals			124.70	15.88	60.07	12.84	48.98	192.14	105.39	86.75	0.75

1a. Allocation is incorporated into previous permit references

2a. Allocation is incorporated into previous permit references

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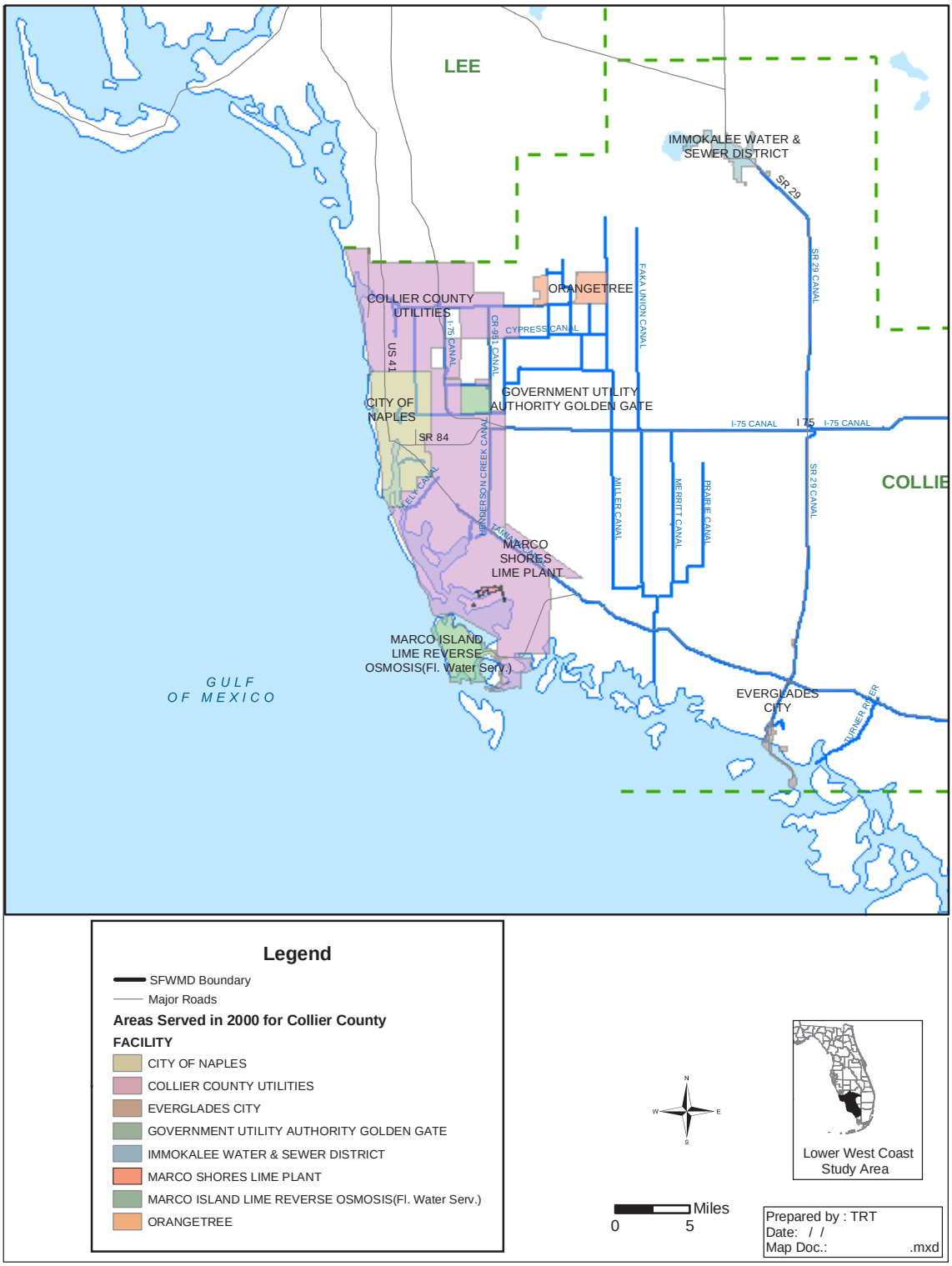

Figure 1. Potable Water Treatment Service Areas for Collier County – 2000.

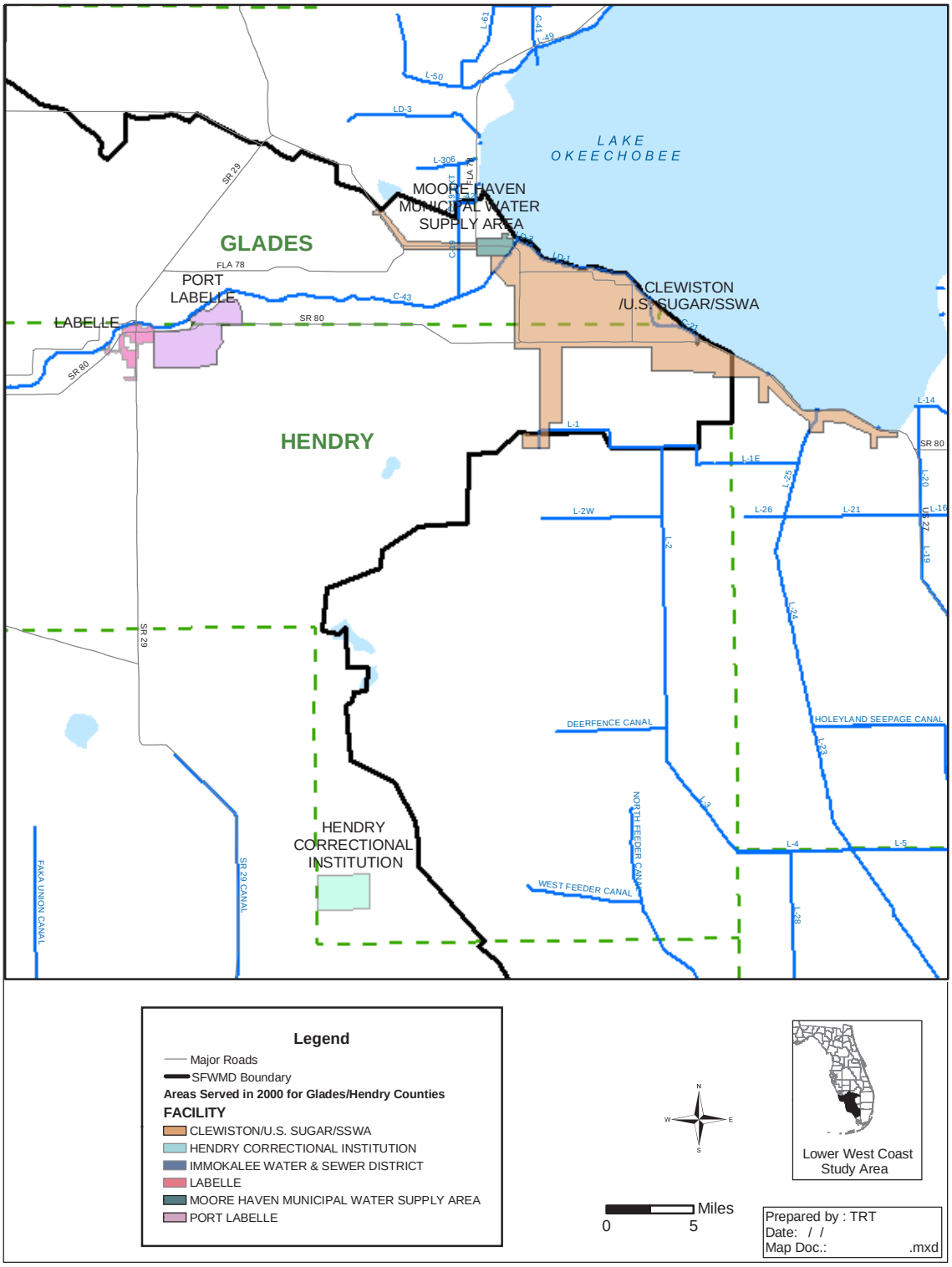

Figure 2. Potable Water Treatment Service Areas for Hendry / Glades Counties – 2000.

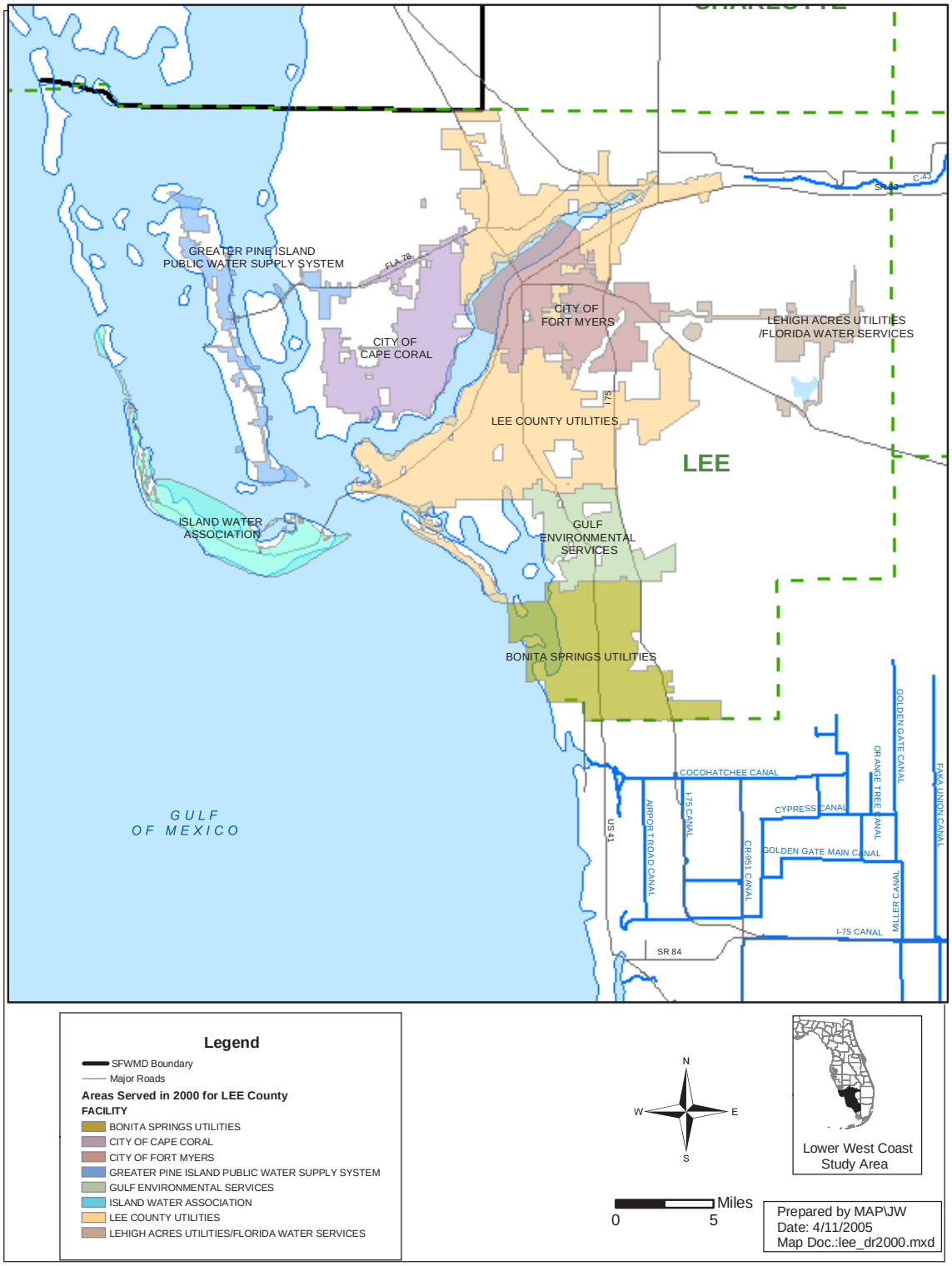

Figure 3. Potable Water Treatment Service Areas for Lee County – 2000.

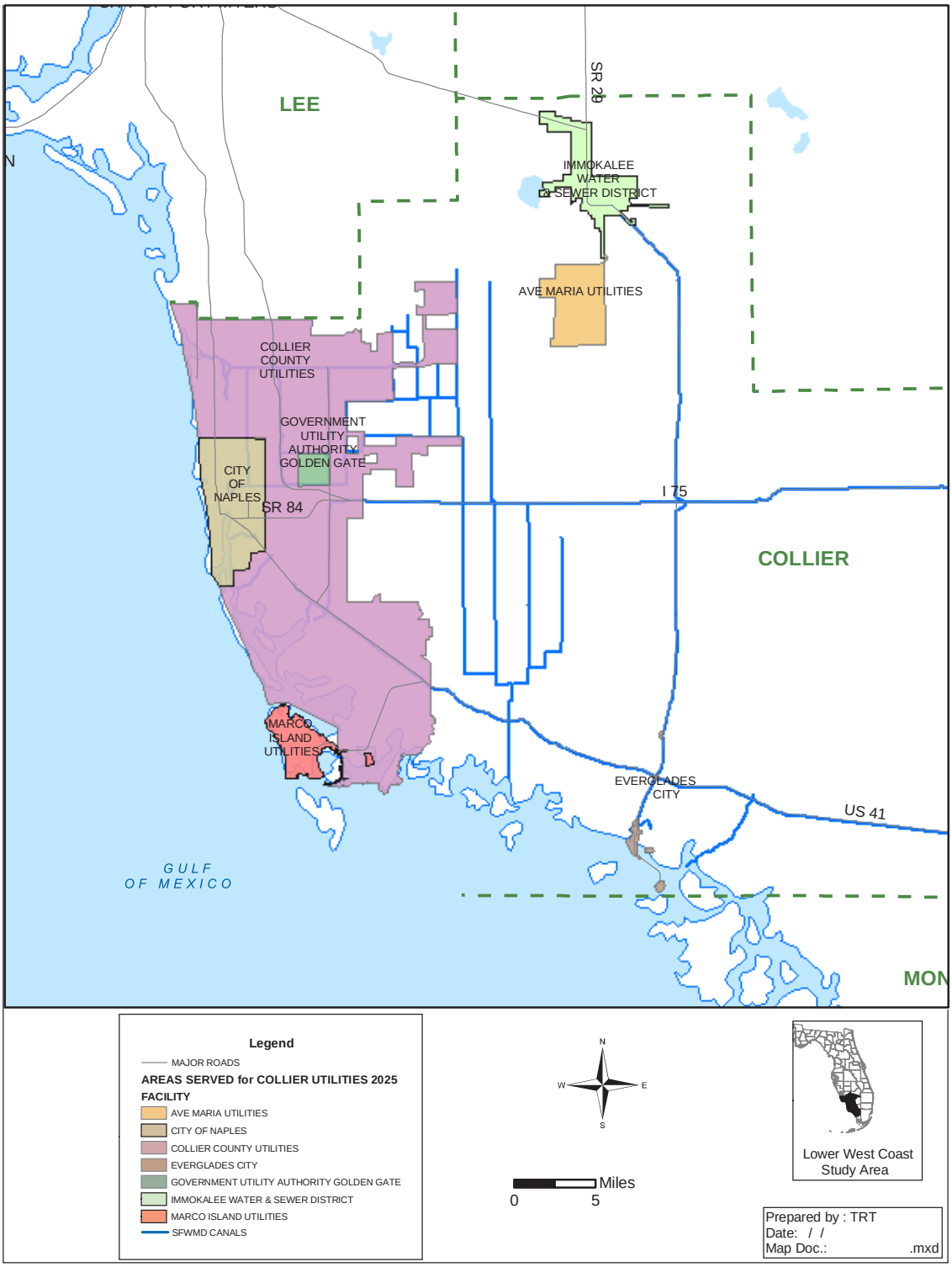

Figure 4. Water Treatment Service Areas for Collier County – 2025.

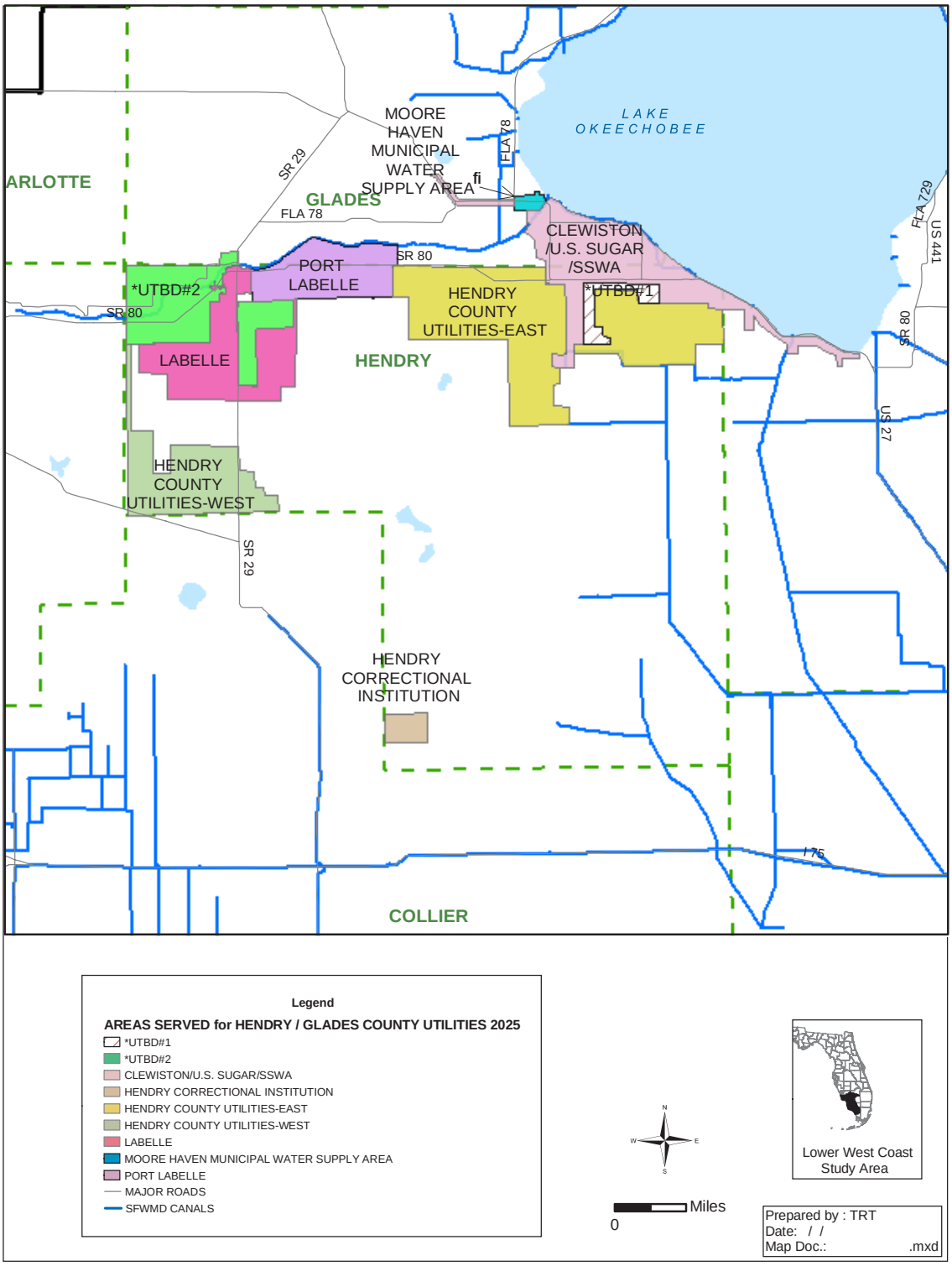

Figure 5. Treatment Service Areas for Hendry / Glades Counties – 2025.

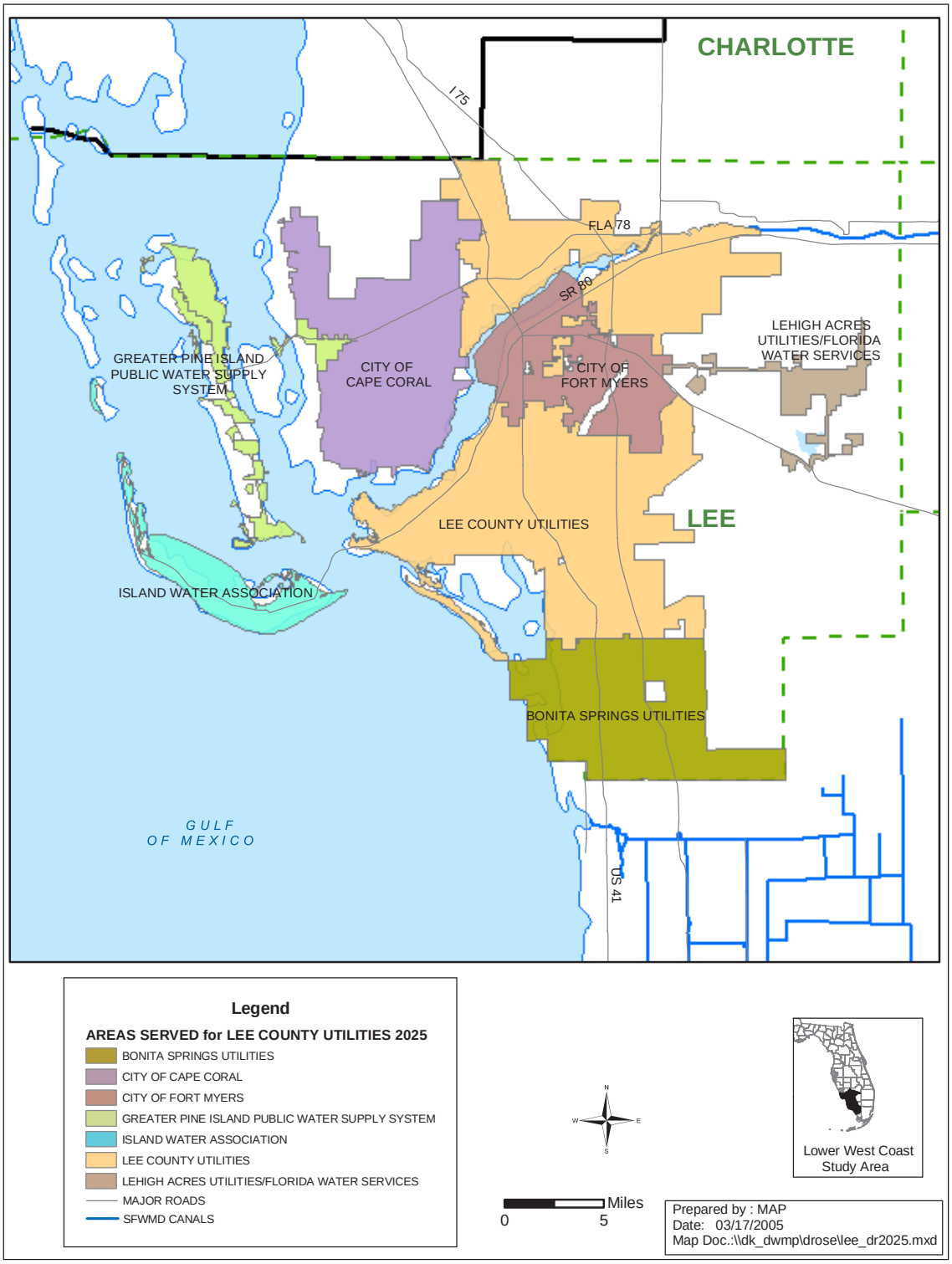

Figure 6. Water Treatment Service Areas for Lee County – 2025.

WASTEWATER TREATMENT FACILITIES

Wastewater treatment in the LWC Planning Area is provided by regional wastewater treatment facilities, smaller "package plants," and on-site treatment and disposal systems (primarily septic tanks). This plan focuses on the regional facilities because they are large enough to allow economy of operation, could have a positive impact on the water resources through reuse due to the volume of their flows, and could support a regional reuse program. Many are also located in areas close to potential reclaimed water users.

There are 44 wastewater treatment facilities with a capacity of 0.10 MGD or greater in the LWC Planning Area as indicated in **Table 2**. These facilities have a total capacity of 126.54 MGD, treating 76.48 MGD in 2003. The location of these utilities and their associated service areas is shown in **Figure 7**. Disposal methods used in 2003 included reuse, discharge to surface waters and deep well injection. Over 65 percent of the wastewater was reused via irrigation of golf courses, residential lots and other green spaces, or recharged groundwater through a rapid infiltration basin system (RIBS), commonly referred to as percolation, or "perc," ponds.

These wastewater facilities and proposed/future facilities are located in most of the urbanized areas throughout the LWC Planning Area as indicated in **Figure 7,** with slightly more than half in public ownership. The activated sludge treatment process is the most common method of treating raw effluent, though others are used as well. Treated wastewater is disposed of through a variety of methods, including discharge to surface waters, reuse and deep well injection.

Wastewater Management Methods

Three wastewater management methods are used in the LWC Planning Area: surface water discharge, deep well injection and reuse.

Surface Water Discharge

This method of wastewater management involves disposing of the effluent through a pipeline to a receiving surface water. Prior to disposal, effluent is required to receive at least secondary treatment (20 milligrams per liter (mg/L) carbonaceous biochemical oxygen demand, 20 mg/L total suspended solids or 90 percent removal, whichever is more stringent) and basic level disinfection. Additional levels of treatment may be required and are based on the characteristics of the effluent and the receiving water, as well as other regulatory requirements and standards. Effluent standards from this method are known as water quality based effluent limitations (WQBELs). The WQBELs are a means of determining the available assimilative capacity of a water body

and setting effluent limits using appropriate procedures for simulation and prediction of water quality impacts.

As regulatory requirements become more stringent, utilities may choose to find alternative means for effluent disposal. In addition, any new discharge or expansion of an existing discharge must justify compliance with the state's anti-degradation requirements prior to issuance of a permit for such a discharge. The anti-degradation rule requires a utility proposing to construct a new discharge or expanding an existing discharge to demonstrate that an alternate disposal method, such as reuse, is not feasible in lieu of a discharge to surface water, and that such a discharge is clearly in the public interest.

Deep Well Injection Class I Wells

This method of wastewater management consists of injecting secondary treated effluent (no disinfection required) through a cased well to the boulder zone, a fractured carbonate sequence formation found at depths ranging from 1,900 feet to 3,600 feet below the ground surface. Deep wells also serve as an alternative means of disposal for a reuse system. Eight wastewater facilities in the LWC Planning Area used deep well injection for all or part of their disposal needs in 2003.

Reuse

Reuse consists of using treated wastewater (reclaimed water) for a beneficial purpose. Reclaimed water is used for the irrigation of golf courses, residential lawns, parks and other green spaces, and for groundwater recharge via RIBS. Some of the facilities use reclaimed water for plant process water, and some for irrigation of the utility site, which also could be considered reuse.

Forty-two of the facilities use reuse for all or a portion of their wastewater management needs. Two-thirds (about 65 percent or about 50 MGD) of the wastewater treated in the planning area in 2003 was reused for a beneficial purpose, including irrigation for golf courses, residential lots, parks and schools. This high level of reuse helps offset demand on the potable water system, as well as provides resource benefits through the reduced need for freshwater pumping at facilities, such as golf courses, that receive reclaimed water. About 4.50 MGD was used for groundwater recharge and the remainder was used for agricultural irrigation, industrial uses and other purposes. This high level of reuse helps offset demand on the potable water system, as well as provides resource benefits through the reduced need for freshwater pumping at facilities, such as golf courses, that receive reclaimed water.

Summary Descriptions of Existing Wastewater Facilities

Summary descriptions for each of the wastewater treatment facilities (equal to or greater than 0.10 MGD) located in the LWC Planning Area, from which the previously summarized information was obtained, are presented in the following section. Each utility capsule contains the following information:

Treatment/Disposal: This section presents the current FDEP-rated capacity, the method of treatment and disposal; the average daily flow (ADF) (October 2002–September 2003); and, the reclaimed water/effluent chloride concentration.

Proposed/Future: This section presents any current construction or permitting that is under way, as well as known future treatment facility expansions and plans, including new additional facilities.

Collier County Wastewater Treatment Facilities

City of Marco Island Wastewater Treatment Facility

Treatment/Disposal

The City of Marco Island operates this contact stabilization plant. This plant has been rated by the FDEP to operate at 3.50 MGD three-month average daily flow, which disposes of treated effluent via reuse, and through a deep injection well rated by the FDEP to dispose of 5.76 MGD. This well is also used by the city's drinking water utility to dispose of RO concentrate[1].

In 2003, this wastewater treatment facility operated at an annual average daily flow of 2.01 MGD[1], of which 1.07 MGD was used to irrigate the Marco Island Country Club, Hideaway Beach golf courses, parks, one school and road median plantings[2, 3]. The remaining 0.94 MGD was disposed of through deep well injection[2].

Proposed/Future

There are currently no plans to expand or modify this facility; however, Marco Island Utilities is currently considering the addition of small outlying residential areas to its system.

Information Source

1. FDEP File Number FL014167-002-DW1P.
2. 2003 FDEP Water Reuse Inventory.
3. Marco Island Utilities, Personal Communication, January 21, 2005.

City of Marco Island - Marco Shores Wastewater Treatment Facility

Treatment/Disposal

The Marco Shores facility, operated by Marco Island Utilities[1],consists of an activated sludge wastewater treatment plant. This facility has a FDEP-rated 0.30 MGD annual average daily flow. Reuse will be primarily via RIBS and spray irrigation in limited quantities at the Marco Shores golf course.

In 2003, the annual average daily flow was 0.07 MGD[2].

Future/Proposed

The service area associated with Marco Shores (but not the facility itself) is scheduled to be transferred to Collier County. The county will connect the area to one of its regional plants. It is uncertain at this time what will happen to this facility if the transfer is made[2, 3].

Information Source

1. FDEP File Number FLA014174-002-DW2P.
2. Marco Island Utilities, Personal Communication, September 7, 2004.
3. Marco Island Utilities, Personal Communication, January 21, 2005.

City of Naples Wastewater Treatment Facility

Treatment/Disposal

Rated by the FDEP to operate at 10.00 MGD maximum month average daily flow[1], the City of Naples Wastewater Treatment Facility disposes of treated effluent through a combination of reuse and surface water discharge. Surface discharge occurs directly into the Gordon River (Class III marine waters) upstream of Naples Bay. In 2003, the annual average daily flow was 7.44 MGD, which includes 4.99 MGD of reuse throughout the City of Naples' service area. The reuse water was used for irrigation of landscaped road medians, golf courses, lawn irrigation and a variety of other uses[2].

Proposed/Future

The City of Naples is currently expanding its reuse program to serve an additional 2,111 residential customers in the Port Royale subdivision south of Central Avenue. If this expansion proves cost-effective, an additional 1,000 residential customers north of Central Avenue will be provided reuse as a second phase of this expansion[3]. There are no plans to expand the treatment capacity of this facility, which is designed to meet the demands at build-out of its service area.

Information Source

1. FDEP File Number FL0026271-001-DW1P.
2. 2003 FDEP Water Reuse Inventory.
3. City of Naples Utilities, Personal Communication, January 21, 2005.

Collier County North Regional Wastewater Treatment Facility

Treatment/Disposal

The Collier County North Regional facility is a modified activated sludge wastewater treatment facility rated by the FDEP to operate at a capacity of 24.1 MGD[1]. Disposal is provided through a combination of reuse and deep well injection. Deep well injection occurs via twin injection wells located on-site, each rated by the FDEP at 18.65 MGD maximum month average daily flow[1]. These wells are currently in use for operational testing[3].

In 2003, the annual average daily flow was 8.90 MGD. Approximately 3.60 MGD was used for irrigating 569 residences; 3.40 MGD provided irrigation for 1,510 acres for three golf courses at the Vineyards and Pelican Marsh developments; and, 0.90 MGD was used for irrigating various parks, medians and other public areas[1], with the remaining 1.00 MGD being deep well injected[2].

Proposed/Future

The plant permitted treatment capacity is 24.10 MGD maximum month average daily flow. Disposal during periods of wet weather, when demand for reuse water is low, is provided through the deep well injection.

Information Sources

1. FDEP File Number FL0141399-013-DW1P.
2. 2003 FDEP Water Reuse Inventory.
3. Collier County North Regional Wastewater Treatment Facility, Personal Communication, January 21, 2005.

Collier County South Regional Wastewater Treatment Facility

Treatment/Disposal

Collier County operates this modified activated sludge facility rated by FDEP at 8.00 MGD annual average daily flow, which is being upgraded to 16.00 MGD annual average daily flow[1]. Effluent management is provided via reuse (land application) or deep well injection[1].

Land application consists primarily of golf course irrigation at various developments within the South Regional Wastewater Treatment Plant's service area, which is also a reuse service area. There is also limited irrigation of medians and other public green spaces. The FDEP currently permits 8.96 MGD annual average daily flow to be used as landscape irrigation. However, this rated capacity will be expanded to 19.01 MGD annual average daily flow concurrent with the treatment capacity expansion for use throughout the facility's approved general reuse service area[1]. There is currently a waiting list of golf courses and other potential users of reclaimed water from this facility[2]. Reclaimed water from the county's South Regional facility is also used to maintain the hydrology of isolated, man-made wetlands at Collier County's Eagle Lake Park. These wetlands have a combined capacity of 100 million gallons, which provide both storage and filtration/recharge to the groundwater. Finally, land application of 0.25 MGD annual average daily flow also occurs via RIBS, which is being converted to lined storage ponds with a storage volume of 4.00 million gallons as part of the facility's modifications[1].

During wet-weather conditions and periods of low reuse demand, treated effluent from this facility may be deep injected into the Floridan Aquifer via a well rated by the FDEP at 9.25 MGD maximum month average daily flow. A second deep injection well, also rated at 9.25 MGD maximum month average daily flow, is currently under development[1].

In 2003, this facility treated an annual average daily flow of 7.12 MGD, of which 1.70 MGD was reused to irrigate 10 golf courses (1,261 acres); 2.90 MGD for wetland recharge; 1.20 MGD to irrigate 717 residences; 0.10 MGD for other purposes (parks, medians); and, 0.02 via the RIBS[3]. The remaining 1.20 MGD was deep well injected.

Proposed/Future Use

This facility will continue to provide wastewater treatment and reuse throughout its service area into the near future. There are currently no plans for expansion beyond the improvements discussed previously.

Information Sources

1. FDEP File Number FL0141356-005-DW1P-PD.
2. Collier County Utilities, Personal Communication, September 15, 2004.
3. 2003 FDEP Water Reuse Inventory.

Everglades City Wastewater Treatment Facility

Treatment/Disposal

Everglades City operates this extended aeration facility rated by the FDEP at 0.12 MGD. This facility disposes of treated effluent via an on-site RIBS (two percolation ponds)[1]. The 2003 annual average daily flow was 0.11 MGD[2].

Future/Proposed

There are no firm plans for expansions or modifications at this time. However, the plant's design would allow expansion to allow treatment of 0.25 MGD.[3]

Information Source

1. FDEP 2002 City of Everglades City Wastewater Treatment Facility Compliance Evaluation Inspection Report.
2. 2003 FDEP Water Reuse Inventory Appendix B.
3. Everglades City, Personal Communication, January 20, 2005.

Florida Government Utility Authority - Golden Gate Wastewater Treatment Facility

Treatment/Disposal

Operated by the Florida Government Utility Authority, this is an activated sludge facility rated by the FDEP at 0.95 MGD annual average daily flow. Reuse is accomplished by the facility's on-site (7-acre, 4-pond) RIBS, which has a design capacity of 1.25 MGD, but which is currently rated by the FDEP to operate at 0.95 MGD[1]. The 2003 annual average daily flow was 1.27 MGD[2].

Proposed/Future

The FGUA has not announced plans for expansion or modification as of this writing.

Information Sources

1. FDEP File Number FLA142140-001-DW1P.
2. 2003 FDEP Water Reuse Inventory Appendix B.

Immokalee Wastewater Treatment Facility

Treatment/Disposal

This extended aeration wastewater treatment facility, operated by the Immokalee Water and Sewer District, is rated by the FDEP at 2.50 MGD annual average daily flow. This facility uses both reuse and underground injection to dispose of treated effluent. Reuse is achieved through land application at the wastewater treatment plant and at an off-site facility, known as the "Section 8 Sprayfield." Together, these sites have a combined disposal capacity of 1.13 MGD annual average daily flow, and both sites have storage ponds (combined total capacity of 69.73 million gallons) to hold water until it can be reused. Deep well injection provides 2.50 MGD (maximum daily flow as rated by the FDEP) of wet-weather disposal capacity[1]. In 2003, the annual average daily flow at the water treatment plant was 1.99 MGD[1], including 0.30 MGD of reuse at the Section 8 Sprayfield[2].

Proposed/Future

The Immokalee Water and Sewer District anticipates expanding this facility to 4.00 MGD based on a recently completed capacity analysis report. Preliminary planning and design will begin in the near future[3].

Information Source

1. FDEP File Number FLA014132-005-DW1P.
2. 2003 FDEP Water Reuse Inventory.
3. Immokalee Water and Sewer District, Personal Communication, January 21, 2005.

Orangetree Wastewater Treatment Facility

Treatment/Disposal

Orangetree Utilities operates this extended aeration process wastewater treatment facility. This facility is rated by the FDEP for 0.35 MGD monthly average flow, with reuse via RIBS at two locations[1]. In 2003, the annual average daily flow was 0.17 MGD[2].

Future/Proposed

Collier County is scheduled to take over the Orangetree Service Area in 2012[3].

Information Source

1. FDEP File Number FLA014165-003-DW2P.
2. AM Engineering, Personal Communication, February 7, 2005.
3. Collier County *Water Supply Facilities Work Plan,* Greeley and Hansen, 2004.

Port of the Islands Wastewater Treatment Facility

Treatment/Disposal

The Port of the Islands facility is a Bardenpho process advanced wastewater treatment facility rated by the FDEP for 0.20 MGD maximum month average daily flow operated by the Port of the Islands Community Improvement District. This facility reuses treated effluent via surface water discharge to a Receiving Wetlands Discharge Location[1]. The 2003 annual average daily flow was 0.05 MGD[2].

Proposed/Future

The Port of the Islands Community Improvement District is currently developing a reuse system to provide up to 0.31 MDG of irrigation for lawns, roadway medians and other landscape applications throughout the community. When completed, this system will serve as the primary disposal method, though the surface water discharge system will remain as a backup[1, 3].

Information Source

1. FDEP File Number FLA0141704-003-DW2P.
2. 2003 FDEP Water Reuse Inventory.
3. Port of the Islands Community Improvement District, Personal Communication, January 20, 2005.

Glades County Wastewater Treatment Facilities

Glades County Wastewater Treatment Facility

Treatment/Disposal

The Glades County facility uses an extended aeration wastewater treatment process and is operated by the City-County Public Works Authority. The facility is rated by the FDEP at 0.24 MGD annual average daily flow. Reuse is provided via land application at a 15.20-acre sprayfield, rated by the FDEP at 0.09 MGD annual average daily flow. In addition, a 52.25-acre man-made wetland site provides 0.23 MGD annual average daily flow of disposal as rated by the FDEP[1]. In 2003, the annual average daily flow was 0.18 MGD[2].

Future/Proposed

The plant is being expanded to provide treatment for up to 0.29 MGD annual average daily flow with disposal through the existing wetland and sprayfield facilities[2].

Information Source

1. FDEP File Number FLA016891-005-DW2P.
2. City-County Public Works Authority, Personal Communication, January 20, 2005.

Hendry County Wastewater Treatment Facilities

City of LaBelle Wastewater Treatment Facility

Treatment/Disposal

The City of LaBelle operates a sequencing batch reactor (SBR) process facility. This facility is rated by the FDEP at 0.75 MGD annual average daily flow. Reuse is provided through a 99-acre RIBS facility consisting of seven basins with a rated capacity of 0.75 MGD (annual average daily flow)[1]. In 2003, the annual average daily flow was 0.21 MGD[2].

Future/Proposed

The city completed the installation of lines to serve an additional 600 residences within its service area. The city anticipates adding additional customers in the near future, as several large developments have initiated the approval process. In addition, the City of LaBelle is working with Hendry County to expand its utility service area. It is anticipated that this plant will be expanded, or possibly a new facility constructed, to accommodate growth in the expanded service area.

Information Source

1. FDEP File Number FLA014283-002-DW1P.
2. 2003 FDEP Water Reuse Inventory.
3. City of LaBelle, Personal Communication, January 24, 2005.

Clewiston Wastewater Treatment Facility

Treatment/Disposal

This wastewater treatment facility operated by the City of Clewiston consists of an extended aeration plant rated by FDEP at 1.50 MGD annual average daily flow. Reuse is provided via land application at a 193-acre sprayfield also rated by the FDEP at 1.50 MGD (annual average daily flow). The sprayfield has under drains that lead to a perimeter ditch, from which water is pumped into the Sugarland Drainage District's Canal #3. Water from Sugarland Drainage Ditch #3 is typically discharged into the Caloosahatchee River, but can also be pumped into Lake Okeechobee as dictated by lake levels and irrigation needs[1].

In 2003, the annual average daily flow was 1.16 MGD[2].

Proposed/Future

There are no plans to expand this facility at the time of this writing[3].

Information Source

1. FDEP File Number FL0040665-004-DW1.
2. 2003 FDEP Water Reuse Inventory.
3. City of Clewiston Utilities, Personal Communication, January 13, 2005.

Hendry Correctional Institution

Treatment/Disposal

Operated by the Florida Department of Corrections, this wastewater treatment facility is rated by the FDEP to treat 0.36 MGD three-month average daily flow using an extended aeration process. Reclaimed water is reused via a slow-rate restricted public access land application system (56-acre sprayfield) or by RIBS (two ponds)[1]. The 2003 annual average daily flow was 0.11 MGD[2].

Proposed/Future

There are no expansions or modifications planned for this facility at this time.

Information Sources

1. FDEP File Number FLA014306-001-DW2P.
2. 2003 FDEP Water Reuse Inventory.

Hendry County Port LaBelle Wastewater Treatment Facility

Treatment/Disposal

The Port LaBelle Wastewater Treatment Facility, operated by Hendry County Utilities, consists of an extended aeration plant rated by FDEP at 0.25 MGD annual average daily flow. Reuse is provided via a RIBS rated at 0.50 MGD annual average daily flow[1]. In 2003, the annual average daily flow was 0.19 MGD[2].

Proposed/Future

Discussions with Hendry County Utilities indicate that both its potable water and wastewater systems and service areas will be expanded in the near future; however, there are no definitive plans. The exact boundaries of the expanded service areas are currently being discussed with the City of LaBelle.

Information Source

1. FDEP File Number FLA014290-001-DW1P.
2. 2003 FDEP Water Reuse Inventory.
3. Hendry County Utilities, Personal Communication, January 24, 2005.

Lee County Wastewater Treatment Facilities

Bonita Springs Country Club Utilities Wastewater Treatment Facility

Treatment/Disposal

Realnor Hallendale, Inc. had operated this extended aeration activated sludge secondary treatment facility. This facility is rated by the FDEP at 0.25 MGD maximum month average daily flow. Reuse is provided by two percolation RIBS ponds, also rated at 0.25 MGD maximum month average daily flow[1]. The 2003 annual average daily flow was 0.11 MGD[2].

Proposed/Future

Bonita Springs Utilities purchased this facility, and it is now off-line. Effluent from the area formerly served by this plant is processed at Bonita Springs Utilities' main facility and reused[3].

Information Source

1. FDEP File Number FLA014442-004-DW2P.
2. 2003 FDEP Water Reuse Inventory.
3. Bonita Springs Utilities, Personal Communication, January 24, 2005.

Bonita Springs Utilities

Treatment/Disposal

Bonita Springs Utilities' conventional activated sludge facility has a FDEP-rated capacity of 7.00 MGD maximum month average daily flow. Effluent management is provided via reuse for golf courses and residential developments within the Bonita Springs area[1]. As part of this irrigation system, reclaimed water is distributed to a series of holding ponds and lakes with a total wet-weather storage capacity of 14.69 million gallons. In addition, there is a 6.00 million gallon lined reject storage pond at the Bonita Springs Utilities site.

The 2003 annual average daily flow was 3.33 MGD[2], of which 100 percent was reused as irrigation water for the Creekside, Marsh and Bay Island golf courses (1.76 MGD), as well as for residential (2,366 units) and other irrigation uses[1] (1.57 MGD).

Proposed/Future

Bonita Springs Utilities has begun the permitting process for a membrane bioreactor facility to be known as the East Plant, which will come on-line by the end of 2007 or early 2008. Reuse for golf courses, lawns and similar applications in the rapidly growing Bonita Springs area will serve as the disposal method[3].

Information Source

1. FDEP File Number FL014443-011-DW1P.
2. 2003 FDEP Water Reuse Inventory.
3. Bonita Springs Utilities, Personal Communication, January 24, 2005.

City of Cape Coral Everest Parkway Wastewater Treatment Facility

Treatment/Disposal

Operated by the City of Cape Coral and rated by the FDEP to treat up to 8.50 MGD annual average daily flow, the Everest Parkway facility provides reclaimed water for irrigating residential lawns, parks, schools, roadway medians, churches and other landscaped areas throughout the city via its dual water system. As a backup for periods of "No Demand for Reuse Water," the city is also permitted to discharge treated effluent from its Everest Parkway facility into the Caloosahatchee River at a location rated by the FDEP at 15.10 MGD annual average daily flow. This surface water discharge site is shared with the Southwest Wastewater Treatment Plant[1], which is another facility operated by the City of Cape Coral.

The 2003 annual average daily flow was 6.67 MGD, which (along with reclaimed water from the Southwest facility) was used via the Water Independence for Cape Coral (WICC) Program to irrigate 10 parks, three schools, 32,171[3] residences and one decorative fountain. The reclaimed water is augmented by fresh water (12.81 MGD for the Everest Parkway and Southwest facilities combined) from the city's canal system. In addition, 0.76 MGD was discharged to the Caloosahatchee River[2].

Proposed/Future

The Cape Coral City Council has authorized the expansion of the Everest Parkway facility to 14.00 MGD, which is scheduled to be completed in 2008[3].

Information Source

1. FDEP File Number FL0030007-002-DW1P.
2. 2003 FDEP Water Reuse Inventory.
3. City of Cape Coral Utilities, Personal Communication, January 21, 2005.

Cape Coral Southwest Wastewater Treatment Facility

Treatment/Disposal

Operated by the City of Cape Coral, the Southwest facility is rated by the FDEP to treat up to 6.60 MGD annual average daily flow and is. As with its Everest Parkway Plant, the city reuses the treated effluent from its Southwest facility to irrigate residential lawns, parks, schools, roadway medians, churches and other landscaped areas throughout the city. As a backup for periods of low reuse demand, the city is also permitted to discharge treated effluent from the Southwest plant into the Caloosahatchee River at a location rated by the FDEP at 15.10 MGD annual average daily flow. As previously mentioned, this surface water discharge site is shared with the Everest Parkway Wastewater Treatment Plant, which is another facility operated by the City of Cape Coral.

The 2003 annual average daily flow was 4.96 MGD, of which 100 percent was used (in conjunction with reclaimed water from the Everest Parkway Plant) via the WICC Program to irrigate 10 parks, three schools, 31,171 residences and one decorative fountain[2].

Proposed/Future

The City Council has authorized the expansion of the Southwest facility to 14.00 MGD, which, like the Everest expansion, is scheduled to be completed in 2008[3]. The Southwest plant will also connect to the ASR well being developed at the Everest facility to store reclaimed water during periods of no demand, so it will not be discharged to the Caloosahatchee River.

Information Source

1. FDEP File Number FL0030007-002-DW1P.
2. 2003 FDEP Water Reuse Inventory.

Citrus Park Wastewater Treatment Facility

Treatment/Disposal

Citrus Park is an extended aeration treatment facility rated by the FDEP at 0.20 MGD three-month average daily flow. Treated effluent from this facility is reused through a RIBS consisting of five percolation ponds with 2.90 acres of bottom area[1].

The 2003 annual average daily flow was 0.07 MGD[2].

Proposed/Future

This utility service area is proposed for consolidation with the Bonita Springs Utilities service area sometime prior to 2025[3]. There are no plans for expansion of this facility.

Information Source

1. FDEP File Number FLA014477-002-DW3P.
2. 2003 FDEP Water Reuse Inventory.
3. Personal Communication with Bonita Springs Utilities.

City of Fort Myers Central Wastewater Treatment Facility

Treatment/Disposal

The Central Wastewater Treatment Facility is a Bardenpho process plant operated by the City of Fort Myers. The facility is rated by the FDEP at 11.00 MGD annual average daily flow. Effluent management for this facility includes surface water discharge to the Caloosahatchee River at a location approved by the FDEP for 11.00 MGD annual average daily flow, and reuse rated by the FDEP at 1.51 MGD annual average daily flow for landscape irrigation within the city's service area[1]. The 2003 annual average daily flow was 7.02 MGD, of which 6.23 MGD was discharged to the river and 0.79 MGD was reused primarily for irrigating a city-owned park[2].

Proposed/Future

The City of Fort Myers is currently in the design phase of a planned expansion of this facility's reclaimed water production to 6.00 MGD (currently 1.51 MGD). The reclaimed water will be used at parks, athletic fields and golf courses throughout the city. The SFWMD is providing financial assistance for this project through its Alternative Water Supply Grant Program[3].

Information Source

1. FDEP File Number FL0021261-002-DW1P.
2. 2003 FDEP Water Reuse Inventory.
3. SFWMD Alternative Water Supply Contract DG040635.

City of Fort Myers South Wastewater Treatment Facility

Treatment/Disposal

The City of Fort Myers operates this Bardenpho process facility rated by the FDEP at 12.00 MGD annual average daily flow. This facility disposes of treated effluent through a FDEP-rated discharge into the Caloosahatchee River[1]. The 2003 annual average daily flow was 7.40 MGD[2].

Proposed/Future

The City of Fort Myers is planning to upgrade this facility to provide 6.00 MGD of reuse water for use in new developments, such as Arborwood and Pelican Preserve, which are generally located east of Interstate 75 in the eastern portions of the incorporated area of the city[3].

Information Source

1. FDEP File Number FL0021270-002-DW1P.
2. 2003 FDEP Water Reuse Inventory.
3. Fort Myers Utilities, Personal Communication, January 13, 2005.

City of Sanibel Donax Water Reclamation Facility

Treatment/Disposal

The City of Sanibel operates the Donax Wastewater Treatment Facility, which uses a conventional activated sludge treatment process. The Donax facility is rated by the FDEP to operate at 2.38 MGD maximum month average daily flow with a permitted disposal capacity of 2.38 MGD maximum month average daily flow. Reuse and deep well injection at this facility is rated by the FDEP at 5.96 MGD. The deep well is shared with the Island Water Association (Sanibel's potable water provider), which allocates 3.31 MGD of the well's capacity[1].

The 2003 annual average daily flow was 1.15 MGD, of which 0.67 MGD was used to irrigate 227 acres of golf courses, primarily at the Dunes and Beachview courses, although some reclaimed water is also sent to the Wulfert Point course[2, 3].

Proposed/Future

The City of Sanibel is preparing to undertake a water balance report to determine whether additional reclaimed water (from both the Wulfert and Donax facilities) will be available to expand reuse into additional residential areas[2].

Information Source

1. FDEP File Number FLA014641-003-DW1P.
2. City of Sanibel Utilities, Personal Communication, December 2004 and January 2005.
3. 2003 FDEP Water Reuse Inventory.

City of Sanibel Wulfert Point Wastewater Treatment Facility

Treatment/Disposal

The City of Sanibel operates the Wulfert Point Wastewater Treatment Facility, which is rated by the FDEP to treat 0.13 MGD maximum month average daily flow using the extended aeration activated sludge treatment process. Reclaimed water from this facility is used to irrigate the Wulfert Point Golf Course, which also receives reclaimed water from the city's Donax Wastewater Treatment Plant[1].

The 2003 annual average daily flow was 0.03 MGD, which was used entirely for golf course irrigation[2].

Proposed/Future

The City of Sanibel is preparing to undertake a water balance report to determine whether additional reclaimed water (from both the Wulfert and Donax facilities) will be available to expand reuse into additional residential areas[3].

Information Source

1. FDEP File Number FLA014625-004-DW2P.
2. 2003 FDEP Water Reuse Inventory.
3. City of Sanibel Utilities, Personal Communication, January 15, 2005.

Cross Creek Wastewater Treatment Facility

Treatment/Disposal

Cross Creek, an extended aeration treatment facility run by the Utilities of Eagle Ridge, is rated by the FDEP to operate at 0.25 MGD maximum month average daily flow. Treated effluent from this facility is reused for landscape irrigation of 60 acres at the Cross Creek Country Club golf course[1].

The 2003 annual average daily flow was 0.08 MGD[2], which was used for golf course irrigation[2].

Proposed/Future

There are no changes or expansions planned for this facility, which will continue to serve the Cross Creek community[3].

Information Sources

1 FDEP File Number FLA014505-003-DW2P.

2 2003 FDEP Water Reuse Inventory.

3. Utilities of Eagle Ridge, Personal Communication, January 14, 2005.

Del Tura Wastewater Treatment Facility

Treatment/Disposal

This facility serves the Del Tura community and is rated by the FDEP to treat 0.20 MGD annual average daily flow of wastewater using the activated sludge extended aeration process. Treated effluent is disposed of by way of landscape irrigation (golf course) rated by the FDEP at 0.20 MGD annual average daily flow and via a RIBS rated by FDEP at 0.12 MGD annual average daily flow[1]. The 2003 annual average daily flow was 0.18 MGD, which was used to irrigate 81 acres (north nine holes) of the Del Tura golf course[2].

Proposed/Future

This facility is designed to support the Del Tura community at build-out, so there are no plans for expansion or modification[3].

Information Source

1. FDEP File Number FLA014563-002-DW2P.
2. 2003 FDEP Water Reuse Inventory.
3. Hometown America, Inc., Utilities Department, Personal Communication, January 27, 2005.

Eagle Ridge Wastewater Treatment Facility

Treatment/Disposal

Operated by Eagle Ridge, this facility is rated by the FDEP to operate as a 0.44 MGD three-month average daily flow contact stabilization plant, or as a 0.32 MGD three-month average daily flow extended aeration plant. Reuse will be via irrigation over 90 acres of the Eagle Ridge golf course[1].

The 2003 annual average daily flow was 0.25 MGD, which was used entirely for irrigation[2].

Proposed/Future

There are no plans to expand or modify this plant[3].

Information Source

1. FDEP File Number FLA014498-004-DW2P.
2. 2003 FDEP Water Reuse Inventory.
3. Utilities of Eagle Ridge, Personal Communication, January 15, 2005.

Fiddlesticks Golf and Country Club Wastewater Treatment Facility

Treatment/Disposal

The Fiddlesticks facility is an extended aeration treatment facility rated by the FDEP at 0.60 MGD annual average daily flow. This facility disposes of treated effluent via a RIBS rated by the FDEP at 0.15 MGD or land application (irrigation) at the Fiddlesticks golf course[1].

The 2003 annual average daily flow was 0.07 MGD, which was used entirely for golf course irrigation[2].

Proposed/Future

There are no planned changes or expansions of this facility, which will continue to provide reuse water for the Fiddlesticks golf course[3].

Information Source

1. FDEP File Number FLA014484-001-DW2P.
2. 2003 FDEP Water Reuse Inventory.
3. Fiddlesticks Wastewater Treatment Facility, Personal Communication, January 14, 2005.

Florida Government Utility Authority - Lehigh Acres Wastewater Treatment Facility

Treatment/Disposal

The Florida Government Utility Authority (FGUA) operates this contact stabilization facility. This facility has the capacity to treat 2.50 MGD annual average daily flow, but the FDEP limits it to 2.10 MGD annual average daily flow because of disposal capacity. Treated effluent is reused via golf course irrigation, as well as an on-site RIBS[1]. In 2003, the annual average daily flow was 2.22 MGD, of which 1.95 MGD was disposed via the utility's RIBS, with the remaining 0.27 MGD being reused for irrigating 220 acres at the Lehigh Acres North golf course[2].

Proposed/Future

The FGUA is currently planning to expand the treatment capacity of this plant by an additional 1.00 MGD, bringing its capacity to 3.50 MGD. As part of this expansion, the utility is analyzing the possibility of increasing its reclaimed water production in order to serve golf courses and residential areas within Lehigh Acres. A deep injection well is also being considered in order to provide wet-weather disposal capacity[3].

Information Source

1. FDEP File Number FLA014565-001-DW1P.
2. 2003 FDEP Water Reuse Inventory.
3. FGUA, Personal Communication, January 14, 2005.

Forest Utilities Wastewater Treatment Facility

Treatment/Disposal

This complete-mix, activated sludge process treatment plant operated by Forest Utilities, Inc. is rated by the FDEP at 0.50 MGD annual average daily flow. Forest Utilities reuses the water from this facility to irrigate 280 acres of golf courses. Water can also be sent to a 1.30 million gallon reclaimed water storage facility prior to land application[1]. The 2003 annual average daily flow was 0.24 MGD[2], of which 100 percent was used to irrigate the two golf courses at the Forest Country Club.

Proposed/Future

A recent capacity analysis by Forest Utilities indicates that its existing facility has adequate capacity through build-out of its franchise area. There are no plans to expand or modify the plant[3].

Information Source

1. FDEP File Number FLA014478-002-DW1P.
2. 2003 FDEP Water Reuse Inventory.
3. Forest Utilities, Personal Communication, January 20, 2005.

Gasparilla Island Water Association, Inc.

Treatment/Disposal

The Gasparilla Island Water Association can operate this facility using different processes depending on the wastewater flow and operating needs of the system for a maximum FDEP-rated capacity of 0.71 MGD annual average daily flow. Regardless of the treatment method used, treated effluent is disposed of through a deep injection well rated by the FDEP at 0.81 MGD annual average daily flow, or through land application as golf course irrigation rated by the FDEP at 0.71 MGD annual average daily flow[1].

The 2003 annual average daily flow was 0.32 MGD, of which 0.28 MGD was used to irrigate the Gasparilla Inn golf course (127 acres) and 0.04 MGD was deep well injected[2].

Proposed/Future

The Gasparilla Island Water Association is considering the possible expansion of its reuse system to include irrigation along its Rails-to-Trails bike path and other public green spaces for an additional 0.11 MGD of reuse[1, 3].

Information Source

1. FDEP File Number FLA014641-003-DW1P.
2. 2003 FDEP Water Reuse Inventory.
3. Personal Communication, Gasparilla Island Water Association, January 14, 2005.

Heron's Glen Wastewater Treatment Facility

Treatment/Disposal

Heron's Glen is an extended aeration treatment plant rated by the FDEP at 0.25 MGD three-month average daily flow. This facility disposes of treated effluent through reuse[1]. The 2003 annual average daily flow was 0.13 MGD, which was used to irrigate 32 acres at the Heron's Glen golf course. The plant has a 750 thousand gallon holding tank to store reclaimed water during periods of wet weather when it cannot be used for irrigation[1, 2].

Proposed/Future

Future plans are not available at this time.

Information Sources

1. FDEP File Number FLA014618-001-DW3P.
2. 2003 FDEP Water Reuse Inventory.

Hunter's Ridge Wastewater Treatment Facility

Treatment/Disposal

The Hunter's Ridge facility was rated by the FDEP at 0.10 MGD annual average daily flow. Treated effluent is reused for irrigation at the Hunter's Ridge golf course[1]. The 2003 annual average daily flow was 0.03 MGD; however, with groundwater supplements the Hunter's Ridge golf course received 0.21 MGD[2].

Proposed/Future

Expansion of this facility to a 0.20 MGD treatment plant will allow reclaimed water to be used for the golf course, greenbelts and common areas within the Hunter's Ridge community[1].

Information Source

1. FDEP File Number FLA014541-002-DW2P.
2. 2003 FDEP Water Reuse Inventory.

Jamaica Bay West Wastewater Treatment Facility

Treatment/Disposal

Jamaica Bay West is an extended aeration process facility rated by FDEP at 0.30 MGD annual average daily flow. This facility uses land application via an on-site RIBS rated at 0.30 MGD annual average daily flow[1]. In 2003, the annual average daily flow was 0.19 MGD[2].

Proposed/Future

There are no plans to expand or modify this facility. Jamaica Bay has discussed with Lee County the possibility of connecting to Lee County Utilities; however, there are no firm plans or agreements[3].

Information Source

1. FDEP File Number FLA014658-003-DW2P.
2. 2003 FDEP Water Reuse Inventory.
3. Jamaica Bay West, Personal Communication, January 20, 2005.

Lake Fairways/Pine Lakes Wastewater Treatment Facility

Treatment/Disposal

The Lake Fairways/Pine Lakes Wastewater Treatment Facility is an extended aeration facility operated by North Fort Myers Utility, Inc., rated by the FDEP at 0.30 MGD annual average daily flow. This facility disposes of treated effluent via land application at a 0.30 MGD annual average daily flow RIBS, as well as 57 acres of golf course and other landscape irrigation at the Pine Lakes golf course[1]. The 2003 annual average daily flow was 0.15 MGD, which includes 0.10 MGD for golf course other landscape irrigation, and 0.05 MGD via the RIBS[2].

Proposed/Future

This facility may be taken off-line in the future and its service area connected to North Fort Myers Utilities' regional plant[3].

Information Source

1. FDEP File Number FLA014463-001-DW2.
2. 2003 FDEP Water Reuse Inventory.
3. North Fort Myers Utilities, Personal Communication, January 24, 2005.

Lee County Fiesta Village Wastewater Treatment Facility

Treatment/Disposal

Lee County operates this extended aeration facility rated by the FDEP at 5.00 MGD annual average daily flow. This facility disposes of treated effluent via surface water discharge, as well as reuse. Major users of reclaimed water include the Cypress Lake Country Club, Myerlee Country Club, Landings Yacht and Golf Club, Crown Colony golf courses, surrounding residential developments and Cypress Lake High School. This facility is also permitted to discharge up to 5.00 MGD (maximum month average daily flow) to the Caloosahatchee River[1]. The 2003 annual average daily flow was 2.60 MGD, which includes 0.98 MGD of reuse at 436 acres of golf courses, 75 acres of residential development (0.16 MGD) and the high school (0.08 MGD)[2].

Proposed/Future

Lee County Utilities plans to expand reuse in the area served by this utility to 3.16 MGD annual average daily flow. Anticipated users include golf courses at the Golf View Country Club, the Village of Seven Lakes, the Caloosa Yacht and Racquet Club, and various residential and commercial developments[1].

Information Source

1. FDEP File Number FL0039829-010-DW1P.
2. 2003 FDEP Water Reuse Inventory.

Lee County Fort Myers Beach Wastewater Treatment Facility

Treatment/Disposal

Fort Myers Beach is a conventional activated sludge facility operated by Lee County Utilities. This facility is rated by the FDEP at 6.00 MGD annual average daily flow. Treated effluent is disposed of via reuse and deep well injection[1]. The 2003 annual average daily flow was 3.31 MGD[2], which includes 1.46 MGD of irrigation at the Gulf Harbor, Kelly Greens, Pine Ridge Road and Lexington golf courses; 0.53 MGD of residential irrigation and other reuse; 0.29 MGD of RIBS; and, 1.03 MGD of deep injection[2].

Proposed/Future

There are currently no plans to further expand or modify this facility[3].

Information Source

1. FDEP File Number FL0039829-010-DW1P.
2. 2003 FDEP Water Reuse Inventory.
3. Lee County Utilities, Personal Communication, January 24, 2005.

Lee County Gateway Wastewater Treatment Facility

Treatment/Disposal

Gateway is an extended aeration treatment facility rated by the FDEP for 0.50 MGD annual average daily flow. The plant also includes a 2.00 million gallon storage reuse tank where water is stored prior to reuse. The reuse water is used as irrigation throughout the 5,000-acre Gateway Services District Regional Reuse Service Area, which includes residential and common areas, such as parks, schools, roadway medians, etc. Additional reuse is provided by a RIBS rated at 0.08 MGD[1].

The treatment plant's annual average daily flow for 2003 was 0.30 MGD. Supplemented by groundwater, the treated water was used to irrigate 1,853 residences, three parks and one school. Groundwater accounted for 1.06 MGD of flow in 2003[2].

Proposed/Future

This facility, purchased by Lee County in 2003, is currently in the design phase of a 2.00 MGD expansion. This will bring its capacity to 2.50 MGD, of which 100 percent will be used for irrigation. This is the first of three intended expansions that will result in an ultimate capacity of 6.00 MGD, with disposal to be provided entirely via reuse. In addition, possible ASR may provide wet-weather storage[3, 4].

Information Source

1. FDEP File Number FLA014477-002-DW3P.
2. 2003 FDEP Water Reuse Inventory.
3. Gateway Services Community Development District, Personal Communication, January 14, 2005.
4. Lee County Utilities, Personal Communication, January 24, 2005.

Lee County Pine Island Wastewater Treatment Facility

Treatment/Disposal

This conventional activated sludge facility operated by Lee County Utilities has the ability to treat 0.50 MGD, but its permitted capacity is limited by the FDEP to 0.25 MGD to match its current disposal capacity. Treated effluent is disposed of via reuse (land application sprayfield rated at 0.25 MGD) with a deep injection well permitted at 0.13 MGD, providing wet-weather backup capacity[1]. The 2003 annual average daily flow was 0.10 MGD, which was disposed of entirely through an 83-acre sprayfield, without the need for deep well injection[2].

Proposed/Future

An additional 0.25 MGD sprayfield is under development to bring this facility's disposal capacity to 0.50 MGD to match its treatment capacity[1, 3].

Information Source

1. FDEP File Number FL0039829-010-DW1P.
2. 2003 FDEP Water Reuse Inventory.
3. Lee County Utilities, Personal Communication, January 24, 2005.
3. City of Cape Coral Utilities, Personal Communication, January 21, 2005.

Lee County San Carlos Park Wastewater Treatment Facility

Treatment/Disposal

The San Carlos facility may operate an extended aeration or contact stabilization facility depending on flows and needs of the system. Rated by the FDEP to operate at 0.30 MGD annual average daily flow, effluent treated at this facility is reused through land application on 95 acres of the San Carlos Park golf course[1].

The 2003 annual average daily flow was 0.19 MGD, which was used entirely for golf course irrigation[2].

Proposed/Future

This facility was purchased by Lee County to be interconnected with Lee County's wastewater utility system in the future[3].

Information Sources

1. FDEP File Number FLA014560-003-DW2P.
2. 2003 FDEP Water Reuse Inventory.
3. Lee County Utilities, Personal Communication, January 14, 2005.

Lee County Three Oaks Wastewater Treatment Facility

Treatment/Disposal

Lee County purchased the Three Oaks extended aeration process wastewater treatment plant from Gulf Environmental Services. Recently rated by FDEP to operate at 3.00 MGD annual average daily flow, golf course irrigation (reuse) provides the primary means of disposal via the Vines Country Club, Pelican Sound, West Bay Club and Villages of Country Creek golf courses (369 total golf course acres irrigated)[1]. During wet periods, when reclaimed water is not needed for irrigation, treated water may be discharged through a FDEP-rated outfall to the Estero River. The 2003 annual average daily flow was 1.54 MGD, of which 100 percent was used for golf course irrigation[2, 3].

Proposed/Future

In 2005, two additional golf courses (Stoneybrook and Grande Oaks) began using reclaimed water from the Three Oaks facility for irrigation, bringing the rated reuse total to 3.27 MGD annual average daily flow. Lee County Utilities is also investigating the possibility of providing reclaimed water for irrigation at the Miromar Lakes Golf Course, Florida Gulf Coast University and potentially selling reclaimed water to Resource Conservation Systems, Inc., a private firm that provides reclaimed water for irrigation in the Bonita Springs area. Lee County is in the process of selecting an engineering firm to begin the design work to expand this facility's treatment capacity to 6.00 MGD, with effluent management provided by reuse[3].

Information Source

1. FDEP File Number FLA0145190-011-DW1P.
2. 2003 FDEP Water Reuse Inventory.
3. Lee County Utilities, Personal Communication, January 24, 2005.

Lee County Waterway Estates Wastewater Treatment Facility

Treatment/Disposal

Lee County Utilities operates this extended aeration/activated sludge treatment facility. This facility is rated by the FDEP at 1.25 MGD annual average daily flow. Disposal is provided through 0.25 MGD of land application (golf course irrigation) and 1.00 MGD of surface water discharge at a location along the Caloosahatchee River permitted by the FDEP[1]. In 2003, the annual average daily flow was 1.05 MGD, of which 0.25 MGD was used to irrigate 118 acres at the Lochmoor Golf Course[1] and 0.80 was discharged to the Caloosahatchee River[3].

Proposed/Future

With financial assistance from the SFWMD, Lee County is constructing a new 0.5 million-gallon storage tank and associated pumping facilities that will enable the golf course to better use reclaimed water. The Waterway Estates facility will also be connected to Cape Coral's reclaimed water system. Cape Coral has agreed to accept up to 75 percent of the reclaimed water produced by the Waterway Estates facility, which will enable reuse even when the golf course does not need reclaimed water for irrigation[4].

Information Source

1. FDEP File Number FL0030325-001-DW1P.
2. 2003 FDEP Water Reuse Inventory.
3. Lee County Utilities, Personal Communication, January 24, 2005.
4. SFWMD Contract C-12123.

North Fort Myers Utilities Wastewater Treatment Facility

Treatment/Disposal

This is an extended aeration facility operated by North Fort Myers Utilities, Inc., and is rated by the FDEP to treat up to 3.50 MGD annual average daily flow. Disposal is primarily reuse via landscape irrigation at various golf courses and residential developments. In addition, treated effluent may be deep well injected as rated by the FDEP at 4.00 MGD[1]. The annual average daily flow for 2003 was 1.52 MGD[2], with the Six Lakes Golf and Country Club, Riverbend and Sabal Springs golf courses accounting for 0.43 MGD of reuse, while lawn irrigation (500 residences in Sabal Springs) accounted for another 0.19 MGD. The remaining 0.90 MGD was deep well injected[2].

Proposed/Future

North Fort Myers Utilities has initiated an engineering study to determine when and to what extent this facility (which is its main facility) should expand to accommodate growth on vacant lands within its service area. In addition, North Fort Myers Utilities has entered into a contract with the City of Cape Coral to treat up to 0.73 MGD of wastewater (including effluent from the new Entrada development) and provide up to 1.00 MGD of reclaimed water for use in the city's reuse system. As the facility's treatment capacity expands, it is likely that its deep injection well capacity will also have to be expanded to ensure wet-weather disposal capacity[3].

Information Source

1. FDEP File Number FLA014548-004-DW1P.
2. 2003 FDEP Water Reuse.
3. North Fort Myers Utilities, Personal Communication, January 24, 2005.

South Seas Plantation Wastewater Treatment Facility

Treatment/Disposal

The South Seas Plantation facility combines extended aeration with contact stabilization, and has the capacity to treat 0.45 MGD annual average daily flow, but the FDEP has limited its permitted capacity to 0.26 MGD annual average daily flow based on disposal capacity[1]. Disposal is achieved through land application of 0.26 MGD annual average daily flow on 32 acres of the South Seas Plantation golf course[2]. There are also two golf course ponds, which provide both storage (0.64 million gallons) and disposal through percolation[1]. The 2003 annual average daily flow was 0.13 MGD, of which 100 percent was used for golf course irrigation[2].

Proposed/Future

At this time, there are no plans to expand or modify this facility. However, as part of the reconstruction in the wake of the 2004 hurricane season, South Seas Plantation is considering the possibility of adding additional units, which could trigger the need to expand the treatment plant's capacity[3].

Information Source

1. FDEP File Numbers FLA014686-001-DWF and FLA014686-002-DW2.
2. 2003 FDEP Water Reuse Inventory.
3. Aqua Source Utilities, Personal Communication, January 25, 2005.

Table 2. Wastewater Treatment Facilities in the Lower West Coast Planning Area – 2003.

Facility	FDEP Permitted Capacity (MGD)	2003 Average Daily Flow (MGD)	Disposal Method				
			Deep Well (MGD)	Surface Water Discharge (MGD)	Reuse		
					Public Access Irrigation (MGD)	Rapid Infiltration Basins (MGD)	Other (MGD)
Collier County							
City of Marco Island Marco Island	3.50	2.01	0.94		1.07		
City of Marco Island Marco Shores	0.30	0.07			0.02	0.05	
City of Naples	10.00	7.44		2.45	4.99		
Collier County North Regional	24.1	8.90	1.00		7.90		
Collier County South Regional	8.00	7.12	1.20		5.90	0.02	
Everglades City	0.12	0.11				0.11	
Florida Government Utility Authority – Golden Gate	0.95	1.27				1.27	
Immokalee	2.50	1.99	1.69				0.30 for agricultural irrigation
Orangetree	0.35	0.17				0.17	
Port of the Islands	0.20	0.05		0.05			
Collier County Subtotals	50.02	29.13	4.83	2.50	19.88	1.62	0.30
Glades County							
Glades County	0.24	0.18	0.00	0.00	0.00	0.00	0.18 for agricultural irrigation
Hendry County							
City of LaBelle	0.75	0.21				0.21	
Clewiston	1.50	1.16					1.16 for agricultural irrigation
Hendry Correctional Institute	0.36	0.11					0.11 for agricultural irrigation
Port LaBelle	0.25	0.19				0.19	
Hendry County Subtotals	2.86	1.67	0.00	0.00	0.00	0.40	1.27

Table 2. Wastewater Treatment Facilities in the Lower West Coast Planning Area – 2003 (Continued).

Facility	FDEP Permitted Capacity (MGD)	2003 Average Daily Flow (MGD)	Disposal Method				
			Deep Well (MGD)	Surface Water Discharge (MGD)	Reuse		
					Public Access Irrigation (MGD)	Rapid Infiltration Basins (MGD)	Other (MGD)
Lee County							
Bonita Springs Country Club	0.25	0.11				0.11	
Bonita Springs Utilities	7.00	3.33			3.33		
Cape Coral – Everest and Southwest Combined	8.50 - Everest 6.60 - Southwest 15.10 total	6.67 - Everest 4.96 - Southwest 11.63 total		0.76	10.87		
Citrus Park	0.20	0.07				0.07	
City of Fort Myers Central	11.00	7.02		6.23	0.79		
City of Fort Myers South	12.00	7.40		7.40			
City of Sanibel Donax	2.38	1.15	0.48		0.67		
City of Sanibel Wulfert Point	0.13	0.03			0.03		
Cross Creek	0.25	0.08			0.08		
Del Tura Country Club	0.20	0.18			0.18		
Eagle Ridge	0.44	0.25			0.25		
Fiddlesticks	0.15	0.07			0.07		
Florida Government Utility Authority Lehigh Acres	2.10	2.22			0.27	1.95	

Table 2. Wastewater Treatment Facilities in the Lower West Coast Planning Area – 2003 (Continued).

Facility	FDEP Permitted Capacity (MGD)	2003 Average Daily Flow (MGD)	Disposal Method				
			Deep Well (MGD)	Surface Water Discharge (MGD)	Reuse		
					Public Access Irrigation (MGD)	Rapid Infiltration Basins (MGD)	Other (MGD)
Forest Utilities	0.50	0.24			0.24		
Gasparilla Island Water Assoc.	0.71	0.32	0.04		0.28		
Heron's Glen	0.25	0.13			0.13		
Hunter's Ridge Utility Company	0.10	0.03			0.03		
Jamaica Bay West	0.30	0.19				0.19	
Lake Fairways/Pine Lakes	0.30	0.15			0.10	0.05	
Lee County Fiesta Village	5.00	2.60		1.38	1.22		
Lee County Fort Myers Beach	6.00	3.31	1.03		1.99	0.29	
Lee County Gateway Services Community Development District	0.50	0.30			0.30		
Lee County Pine Island	0.25	0.10					0.10
Lee County San Carlos Park	0.30	0.19			0.19		
Lee County Three Oaks	3.00	1.54			1.54		
Lee County Waterway Estates	1.25	1.05		0.80	0.25		
North Fort Myers Utilities	3.50	1.52	0.90		0.62		
South Seas Plantation	0.26	0.13			0.13		
Lee County Subtotals	73.42	45.34	2.45	16.57	23.56	2.66	0.10
Totals	**126.54**	**76.32**	**7.28**	**19.07**	**43.44**	**4.68**	**1.85**

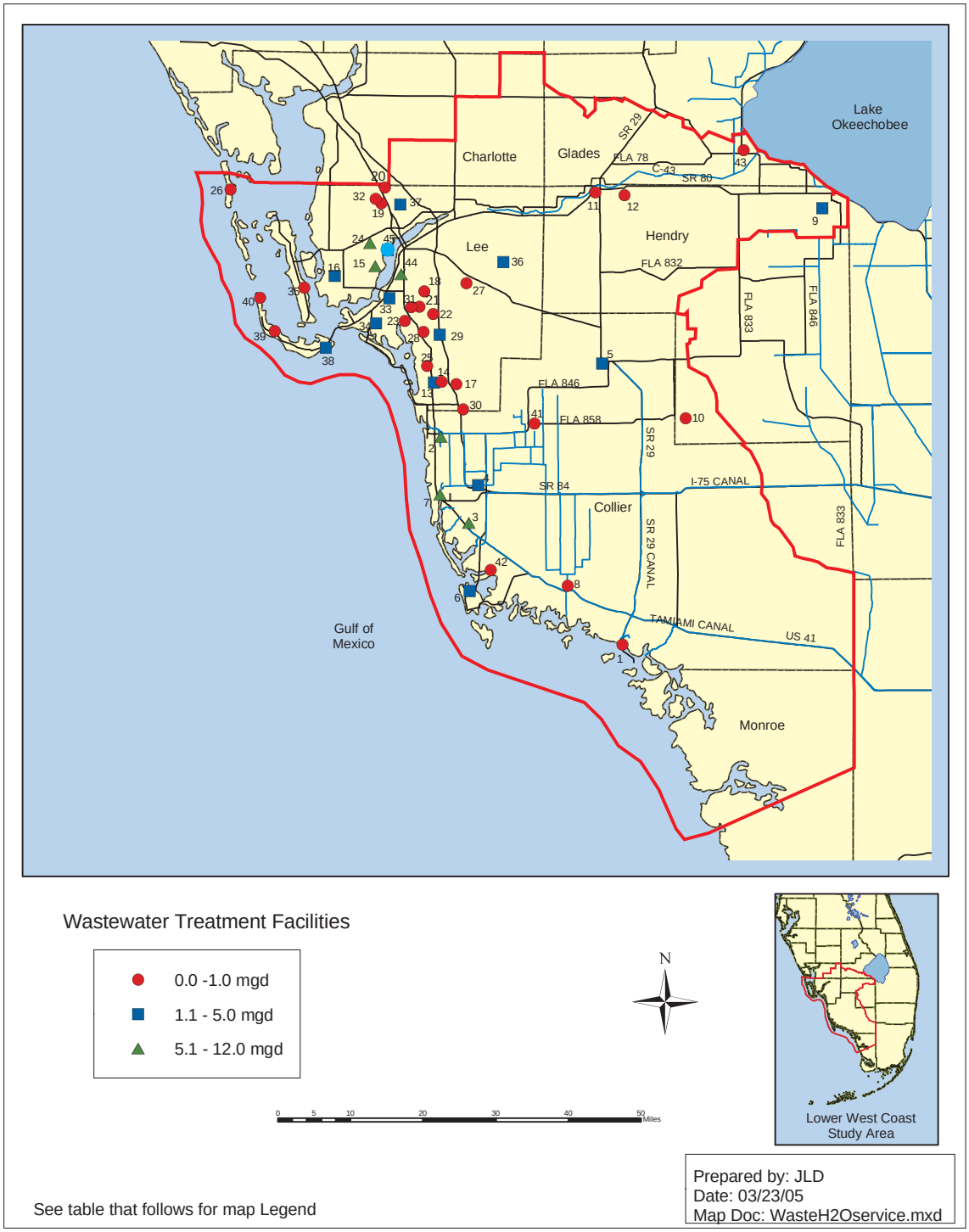

Figure 7. Treatment Facilities in the Lower West Coast Planning Area.

APPENDIX F
Rainfall Analysis

A goal of the Lower West Coast Water Supply Plan (LWC Plan) is to identify areas of potential water supply shortfalls and sufficient supply sources to meet the 1-in-10 year demand needs occurring over a 20-year planning horizon. Rainfall is responsible for nearly all surface water inflows and outflows in the LWC Planning Area, and is an important source of recharge to the Surficial Aquifer System, the Lower Tamiami Aquifer System and the Sandstone Aquifer System. As such, an understanding of the climatic conditions is an essential part of predicting the availability of certain water resources. Rainfall is also the single most important factor controlling the occurrence of water shortages in the planning region.

RAINFALL DISTRIBUTION

Rainfall varies from county to county within the Lower West Coast (LWC) Planning Area. Nine rainfall stations distributed throughout the planning area were used to assess mean rainfall conditions (**Figure 1**). The District chose these stations as they have a minimum of 36 years of reliable records. **Table 1** presents a summary of the data and lists the period of record for each station along with the database keys (DBKEYs) used to retrieve the data from the District's DBHYDRO database. Abtew and Ali (1999) performed the most recent Districtwide analysis of rainfall distribution.

The mean annual rainfall for the LWC Planning Area is 53 inches. **Figure 2** presents the mean monthly distribution of rainfall at the nine rainfall stations and **Table 2** lists the average monthly rainfall values. The wet period begins on June 1 and ends on October 31, with the heaviest rainfall usually occurring from June through August. The dry period begins on November 1 and ends on May 31. December is usually the month with the lowest rainfall.

RAINFALL DATA PREPARATION

The District has a network of rainfall stations that provide historical rainfall data. Long-term data were obtained from nine rainfall stations with relatively long and reliable records. These data are maintained in the DBHYDRO database. **Table 1** lists the DBKEY values for these stations, as well as the period of record for each rainfall station. **Table 3** through **Table 11** present the monthly rainfall for each rainfall station during the entire period of record. **Figure 3** shows the statistical 1-in-10 year drought event plots for the rainfall stations in the LWC Planning Area and **Table 12** lists the values for 1-in-10 year drought events. In some instances, not every daily value was available for each station location. In these occurrences, the inverse distance squared method was used to fill in daily missing values in each data set before calculating monthly averages.

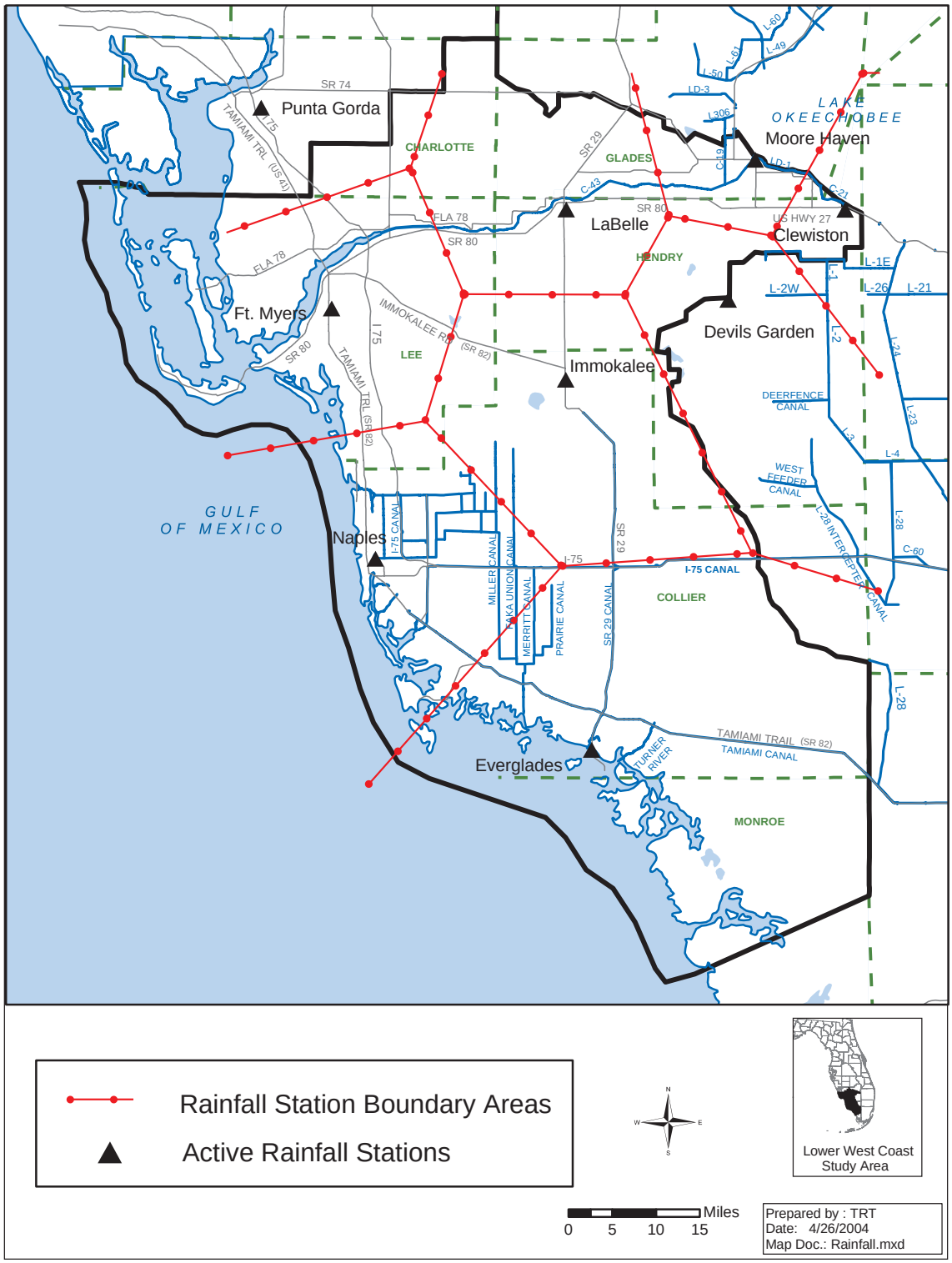

Figure 1. Rainfall Stations in the LWC Planning Area.

Table 1. Average Rainfall Data for Rainfall Stations in the LWC Planning Area.

County	Rainfall Station	Average Annual Rainfall	Period of Record[a]		Maximum Monthly Rainfall		Minimum Monthly Rainfall		% Rain Falling in Wet Season	Primary DBKEY[b]
			Number of Years	Years	inches	month	inches	month		
Charlotte	Punta Gorda	49.94	36	1965-2000	8.81	Jun.	1.72	Apr.	68%	PT376 - PT379
Collier	Everglades	55.29	36	1965-2000	10.89	Jun.	1.44	Dec.	73%	PT210, PT211
	Immokalee	53.21	36	1965-2000	9.25	Jun.	1.74	Dec.	66%	PT260, PT261
	Naples	53.34	36	1965-2000	8.61	Jun.	1.49	Dec.	70%	PT331, PT333
Glades	Moore Haven	48.37	36	1965-2000	7.84	Jun.	1.56	Dec.	65%	PT322, PT323
Hendry	Clewiston	49.45	36	1965-2000	8.07	Jun.	1.48	Dec.	64%	PT185, PT186
	Devils Garden	54.04	36	1965-2000	9.54	Jun.	1.53	Dec.	66%	PT201, PT202
	LaBelle	57.77	36	1965-2000	10.25	Jun.	1.67	Dec.	67%	PT287, PT288
Lee	Fort Myers	55.65	36	1965-2000	9.81	Jun.	1.62	Dec.	70%	PT236 - PT238
Overall Average		53.01			9.23		1.58			

a. Period of Record.
b. For those interested in accessing DBHYDRO. Missing daily data replaced by weighted averages of neighboring stations.

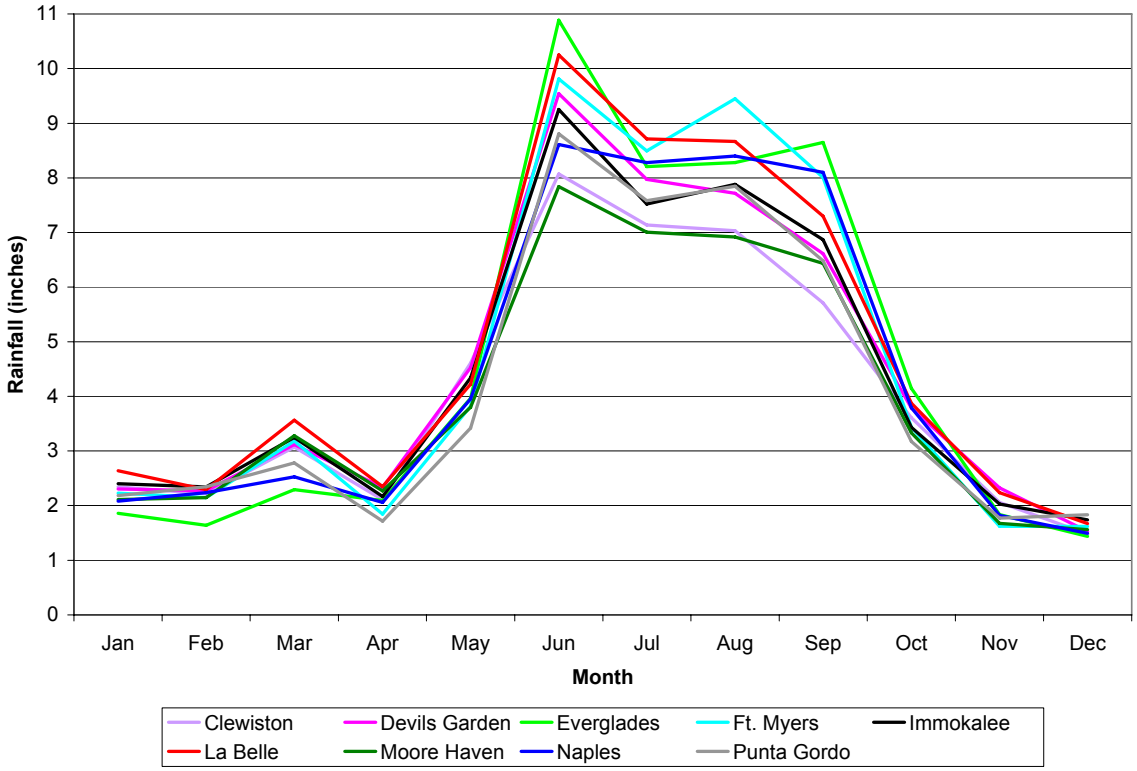

Figure 2. Mean Monthly Distribution of Rainfall at Stations in the LWC Planning Area.

Table 2. Average Rainfall (in inches) for Rainfall Stations in the LWC Planning Area.

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Clewiston	2.34	2.22	3.07	2.11	4.61	8.07	7.14	7.03	5.71	3.61	2.06	1.48	49.45
Devils Garden	2.30	2.27	3.12	2.33	4.53	9.54	7.97	7.72	6.61	3.79	2.33	1.53	54.04
Everglades	1.86	1.64	2.29	2.09	3.97	10.89	8.21	8.28	8.65	4.15	1.84	1.44	55.29
Ft. Myers	2.23	2.15	3.18	1.84	3.82	9.81	8.49	9.45	8.01	3.43	1.62	1.62	55.65
Immokalee	2.40	2.34	3.25	2.17	4.34	9.25	7.52	7.88	6.87	3.43	2.03	1.74	53.21
LaBelle	2.64	2.29	3.56	2.35	4.22	10.25	8.71	8.67	7.30	3.88	2.23	1.67	57.77
Moore Haven	2.11	2.14	3.28	2.27	3.80	7.84	7.00	6.92	6.43	3.33	1.68	1.56	48.37
Naples	2.08	2.24	2.52	2.06	3.96	8.61	8.28	8.40	8.10	3.79	1.82	1.49	53.34
Punta Gorda	2.18	2.34	2.78	1.72	3.42	8.81	7.58	7.85	6.48	3.17	1.77	1.83	49.94
Average	2.24	2.18	3.01	2.10	4.07	9.23	7.88	8.02	7.13	3.62	1.93	1.59	53.01

Table 3. Monthly and Mean Rainfall (inches) at Punta Gorda Rainfall Station.

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	SUM
1965	0.71	3.16	1.44	4.96	1.44	8.05	6.33	7.32	3.47	5.14	0.30	1.06	43.39
1966	5.18	3.50	0.64	4.30	4.53	14.79	3.09	6.95	6.67	3.28	0.24	1.01	54.18
1967	0.70	2.67	0.15	0.00	0.54	8.91	7.97	12.45	3.99	4.11	1.01	4.49	46.99
1968	0.11	1.88	0.50	0.58	8.24	14.66	9.68	8.90	5.33	2.95	4.54	0.46	57.83
1969	0.85	2.43	6.34	0.75	6.33	9.06	8.62	7.20	6.08	4.42	1.13	4.31	57.52
1970	4.86	1.41	9.26	0.09	6.52	7.78	3.86	7.96	5.24	0.79	0.30	0.69	48.76
1971	0.59	1.68	0.71	0.66	0.73	6.22	5.86	8.96	7.33	3.49	1.43	0.45	38.11
1972	0.66	2.16	3.70	0.80	7.77	8.33	5.51	10.59	3.71	2.68	4.40	2.55	52.86
1973	6.29	2.05	2.26	2.81	0.69	7.70	9.77	9.98	5.68	0.16	0.11	1.80	49.30
1974	0.10	0.18	0.43	0.63	2.49	23.99	7.89	9.92	4.63	0.56	0.68	2.34	53.84
1975	0.21	0.66	0.68	0.00	2.77	4.21	8.19	5.64	9.24	6.93	0.18	1.06	39.77
1976	0.30	1.33	0.53	0.63	5.79	8.38	5.14	3.36	5.94	2.26	1.83	1.38	36.87
1977	2.44	1.15	0.39	0.52	6.03	3.48	8.36	8.39	10.01	2.48	2.08	4.92	50.25
1978	3.06	3.78	2.76	0.30	5.46	8.92	8.19	3.82	1.23	1.97	3.42	3.45	46.36
1979	7.07	0.99	1.17	2.13	7.34	2.00	3.82	9.60	14.03	0.63	0.80	3.45	53.03
1980	2.66	1.11	2.99	2.07	2.88	6.41	9.13	9.33	6.96	2.63	2.96	0.84	49.97
1981	0.73	3.17	0.63	0.00	1.51	7.60	10.53	13.02	4.16	0.10	2.86	0.25	44.56
1982	1.45	5.61	4.72	1.67	1.59	7.45	13.15	7.60	10.07	3.33	1.89	0.36	58.89
1983	3.75	11.05	6.14	2.95	0.87	7.04	6.18	6.74	9.69	4.15	3.27	2.60	64.43
1984	0.58	3.31	5.35	3.22	3.74	6.89	10.79	3.50	6.99	2.18	1.04	2.15	49.74
1985	0.66	1.11	1.25	1.68	1.16	4.35	12.14	7.49	6.49	4.05	2.59	0.51	43.48
1986	1.44	0.73	5.42	0.47	2.96	11.26	6.00	9.02	3.74	5.77	0.90	4.00	51.71
1987	2.31	2.44	8.18	0.11	3.78	7.89	5.87	6.68	3.44	6.25	5.07	0.59	52.61
1988	2.48	2.02	4.21	2.11	1.27	8.28	8.48	8.41	7.92	1.80	3.25	1.80	52.03
1989	2.25	0.80	1.95	2.05	1.05	5.89	7.26	8.26	5.69	2.13	0.23	2.83	40.39
1990	0.08	2.52	1.96	1.35	3.93	5.21	3.52	7.02	3.33	3.50	0.05	0.38	32.85
1991	5.84	1.87	3.03	1.66	9.45	8.30	7.47	4.19	3.36	1.11	1.75	0.28	48.31
1992	0.96	3.59	3.05	1.18	0.27	19.75	7.89	6.26	5.74	1.97	2.17	1.20	54.03
1993	4.34	2.96	4.04	3.46	0.78	6.72	6.30	4.55	5.10	6.23	0.09	0.64	45.21
1994	1.50	0.84	2.20	5.80	0.75	6.02	7.46	9.18	10.18	1.23	1.34	2.20	48.70
1995	2.79	2.72	1.11	3.49	1.80	17.63	14.22	15.60	7.33	10.88	2.61	0.88	81.06
1996	2.23	0.49	3.24	3.10	6.54	8.60	4.91	4.15	6.76	8.86	0.27	1.07	50.22
1997	1.43	3.14	2.21	5.15	6.32	5.36	8.28	3.41	11.85	1.14	2.78	6.47	57.54
1998	3.72	5.26	5.54	0.46	1.56	6.37	8.46	9.05	5.36	1.05	4.23	1.03	52.09
1999	2.71	0.03	1.12	0.18	3.76	16.05	6.85	7.74	6.33	3.19	1.33	1.97	51.26
2000	1.51	0.60	0.84	0.47	0.46	7.46	5.73	10.21	10.15	0.87	0.69	0.53	39.52
Mean	2.18	2.34	2.78	1.72	3.42	8.81	7.58	7.85	6.48	3.17	1.77	1.83	49.94

Table 4. Monthly and Mean Rainfall (inches) at Everglades Rainfall Station.

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	SUM
1965	0.18	2.99	0.68	2.24	2.17	6.54	8.65	6.39	7.66	5.66	1.03	0.37	44.56
1966	4.06	2.09	0.46	4.81	5.01	14.06	14.19	3.38	6.63	4.20	0.17	0.18	59.23
1967	1.20	1.60	0.36	0.00	0.25	13.91	7.39	5.19	9.60	2.97	1.46	1.46	45.39
1968	1.65	3.24	1.14	0.50	6.45	16.52	6.35	8.52	14.33	9.03	1.15	0.24	69.12
1969	1.80	1.53	2.12	2.42	5.65	23.82	7.03	12.29	3.69	8.31	0.57	0.51	69.74
1970	2.37	1.24	8.05	0.00	4.26	3.59	11.61	3.93	6.18	4.79	0.43	0.02	46.46
1971	0.44	0.79	0.21	0.11	3.47	7.65	5.13	10.94	8.89	7.06	0.92	0.56	46.16
1972	1.71	3.03	6.52	2.74	5.31	16.08	4.56	11.15	11.74	1.65	5.00	1.20	70.70
1973	2.50	0.71	2.39	1.06	1.10	8.42	10.87	11.42	7.89	0.31	0.34	2.58	49.60
1974	0.35	0.00	0.00	2.27	6.79	16.31	10.52	6.22	6.26	0.11	1.02	4.15	54.00
1975	0.23	0.09	2.16	1.17	5.54	7.70	5.88	5.28	14.67	4.24	0.23	0.20	47.39
1976	0.34	1.40	1.11	3.21	6.86	7.32	6.04	5.97	5.94	4.44	0.88	2.15	45.67
1977	1.69	0.71	0.03	1.80	4.39	12.31	15.10	6.39	9.56	0.61	1.76	2.57	56.93
1978	2.17	3.92	3.87	1.79	3.63	10.70	7.61	5.93	9.92	3.41	2.91	1.62	57.48
1979	2.43	0.44	0.65	4.52	5.94	8.66	9.75	9.42	12.81	3.62	1.66	2.92	62.82
1980	1.30	1.11	2.28	2.76	4.55	3.61	8.79	8.09	5.63	0.49	2.61	1.06	42.27
1981	0.37	1.87	1.55	0.04	1.86	6.93	7.00	13.69	8.69	1.73	0.47	0.17	44.38
1982	0.35	1.21	1.72	4.67	8.47	17.71	9.72	10.98	6.48	4.80	1.42	0.70	68.24
1983	6.10	5.84	4.09	0.95	1.01	12.04	8.01	7.00	15.87	12.20	1.78	2.67	77.56
1984	0.45	0.80	3.39	1.19	4.83	6.35	14.74	9.09	7.21	4.17	1.35	0.18	53.74
1985	1.32	0.45	1.14	2.21	2.90	4.18	10.99	3.23	3.00	4.02	1.92	1.08	36.45
1986	2.09	2.09	1.66	1.23	0.49	17.55	4.54	11.51	4.23	5.33	1.18	6.51	58.41
1987	1.01	1.74	6.45	0.04	5.84	4.29	5.12	9.84	7.59	1.76	5.13	0.11	48.91
1988	1.16	1.44	0.95	0.69	1.99	5.55	3.27	6.68	5.63	1.66	1.59	0.98	31.58
1989	0.72	0.21	1.54	6.05	0.21	9.95	10.23	5.53	8.11	4.97	0.66	1.12	49.31
1990	0.08	0.40	2.65	0.88	4.37	8.62	8.46	12.07	7.40	4.18	0.70	0.11	49.93
1991	3.74	2.32	2.69	2.45	4.83	13.99	16.88	4.25	5.78	2.24	0.71	0.12	60.01
1992	0.43	5.30	2.69	3.29	0.47	19.00	5.24	13.72	7.19	1.59	1.33	0.09	60.34
1993	5.65	1.84	1.56	3.46	1.93	4.57	6.85	8.98	11.41	5.39	0.93	0.45	53.02
1994	4.49	1.19	1.08	6.54	3.94	9.90	5.53	6.68	13.01	5.37	3.75	4.25	65.71
1995	3.67	0.39	1.14	3.59	11.04	22.09	7.69	15.66	9.23	10.32	0.34	0.41	85.59
1996	3.41	0.58	3.25	1.54	7.75	15.58	4.01	4.63	6.02	1.80	0.07	0.29	48.94
1997	2.27	1.23	5.54	1.89	2.38	8.23	6.01	7.11	5.88	1.59	6.55	7.95	56.62
1998	1.29	4.58	6.46	0.09	2.10	8.01	8.69	12.15	7.14	2.73	10.45	2.04	65.74
1999	2.95	0.02	0.55	0.38	3.40	13.21	6.18	6.66	19.58	7.73	3.57	0.43	64.66
2000	0.86	0.63	0.44	2.75	1.63	6.99	6.77	8.04	10.50	4.80	0.10	0.27	43.79
Mean	1.86	1.64	2.29	2.09	3.97	10.89	8.21	8.28	8.65	4.15	1.84	1.44	55.29

Table 5. Monthly and Mean Rainfall (inches) at Immokalee Rainfall Station.

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	SUM
1965	0.61	3.13	2.48	0.97	2.12	9.82	9.90	8.59	4.60	4.68	0.77	1.41	49.07
1966	4.73	2.94	0.64	3.90	8.29	10.85	8.73	6.83	7.09	3.42	0.11	1.64	59.17
1967	2.56	3.80	0.62	0.01	0.68	19.57	5.98	6.61	5.48	7.35	0.42	2.50	55.56
1968	0.18	2.78	1.11	0.50	7.79	19.92	14.61	9.12	8.91	6.01	3.39	0.80	75.13
1969	2.82	2.42	5.35	2.39	3.69	13.17	11.29	13.09	11.19	13.57	1.25	3.81	84.04
1970	5.23	1.84	17.02	0.00	7.71	12.75	2.76	5.85	3.94	2.33	0.21	0.13	59.78
1971	1.23	1.05	0.31	0.39	3.45	11.18	5.89	5.95	7.32	3.04	0.53	0.93	41.28
1972	0.99	2.18	6.47	1.35	4.77	11.30	4.24	10.25	2.35	0.52	5.99	1.13	51.54
1973	3.07	2.85	4.72	1.40	1.28	7.96	9.22	16.01	5.19	1.28	0.36	1.41	54.74
1974	0.24	1.68	1.69	1.31	7.02	16.78	8.42	8.46	7.40	0.46	2.28	0.37	56.11
1975	0.15	0.61	1.04	4.35	4.76	13.97	6.00	5.66	10.44	2.83	0.62	0.36	50.79
1976	0.43	1.16	1.81	2.74	6.31	6.75	5.97	5.77	8.57	2.02	1.73	1.84	45.11
1977	4.33	1.15	0.06	0.20	2.81	6.01	6.89	6.06	6.95	1.35	4.87	2.47	43.14
1978	2.73	1.81	3.69	2.65	3.07	8.75	8.36	6.93	4.70	2.10	0.21	3.62	48.61
1979	4.87	0.52	2.86	4.27	8.68	1.87	5.78	5.04	14.29	1.34	2.80	5.02	57.33
1980	4.35	1.36	3.22	4.05	3.61	1.74	7.80	5.62	5.60	0.65	3.10	0.79	41.89
1981	0.54	1.95	1.34	0.32	0.76	7.51	6.21	10.66	5.15	1.80	1.86	0.25	38.35
1982	0.70	1.75	3.05	3.05	12.46	11.86	11.37	7.05	6.14	4.86	0.58	3.27	66.15
1983	3.81	11.37	5.22	1.57	0.48	8.23	8.27	7.69	7.24	3.17	1.89	5.65	64.59
1984	0.23	3.78	5.14	0.91	9.28	4.04	7.26	9.06	11.25	0.91	6.90	0.04	58.80
1985	0.47	0.37	1.79	4.44	0.35	4.25	6.80	5.28	7.12	3.21	1.44	0.84	36.35
1986	1.77	3.86	4.44	0.34	0.65	10.60	4.55	9.30	5.90	3.01	0.14	2.89	47.44
1987	3.25	3.39	8.05	0.07	8.30	3.49	6.09	4.51	5.85	4.97	9.12	0.14	57.22
1988	1.44	1.89	2.83	0.35	4.68	1.76	7.77	11.02	2.54	0.07	1.60	0.68	36.62
1989	1.28	0.40	4.20	6.48	1.06	10.84	10.69	5.31	3.50	2.00	0.43	1.94	48.12
1990	0.89	2.60	1.23	1.93	4.09	4.73	9.93	5.94	4.57	3.04	1.02	0.03	40.00
1991	8.12	1.81	3.02	2.01	8.87	8.88	9.84	9.65	2.73	5.30	0.91	0.10	61.25
1992	2.01	2.78	2.70	6.50	1.17	17.01	3.55	5.63	2.53	0.95	2.20	0.22	47.24
1993	8.18	3.09	4.01	3.32	2.53	5.69	6.03	5.20	11.56	2.82	0.70	1.28	54.41
1994	3.85	3.49	2.02	2.07	3.23	8.05	6.00	7.84	10.70	3.13	3.91	6.04	60.33
1995	3.21	1.25	1.02	3.05	1.03	11.32	10.48	15.40	12.27	17.11	0.91	0.70	77.75
1996	1.52	1.14	3.10	1.48	5.18	6.70	2.21	5.58	5.23	4.87	0.14	0.28	37.41
1997	1.48	0.34	2.85	6.11	5.45	3.72	12.99	5.44	6.15	0.52	2.38	7.06	54.50
1998	2.58	7.20	5.28	1.13	3.18	2.66	6.60	6.85	5.37	2.07	6.57	1.54	51.03
1999	1.56	0.49	0.32	1.23	7.44	20.69	3.83	12.03	12.89	4.11	1.41	0.48	66.46
2000	1.05	0.03	2.15	1.16	0.04	8.56	8.39	8.44	4.63	2.66	0.24	0.87	38.23
Mean	2.40	2.34	3.25	2.17	4.34	9.25	7.52	7.88	6.87	3.43	2.03	1.74	53.21

Table 6. Monthly and Mean Rainfall (inches) at Naples Rainfall Station.

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	SUM
1965	0.64	2.84	0.74	1.96	2.53	8.17	7.72	10.11	4.61	4.95	1.07	0.93	46.27
1966	3.02	2.30	0.26	4.32	2.82	12.51	7.34	10.87	4.00	3.72	0.18	0.70	52.04
1967	4.17	4.40	1.66	0.00	0.84	4.40	7.26	12.29	9.08	4.40	0.65	3.51	52.66
1968	0.19	3.04	0.54	0.24	2.93	14.25	14.15	9.28	8.78	5.04	1.49	0.54	60.47
1969	2.48	1.18	2.83	1.66	5.91	8.41	13.86	9.41	7.24	8.70	2.17	2.10	65.95
1970	2.50	1.97	13.56	0.00	4.05	6.69	5.63	4.56	11.75	3.58	0.43	0.04	54.76
1971	1.18	1.10	0.27	0.14	1.05	5.38	6.44	9.95	16.62	5.76	1.09	0.21	49.19
1972	0.68	4.55	6.88	2.86	6.63	13.67	4.06	12.06	4.96	1.65	3.69	1.12	62.81
1973	1.66	1.21	1.21	0.86	1.11	6.28	7.91	13.38	9.37	0.72	0.80	1.58	46.10
1974	0.12	0.41	0.00	0.03	6.82	13.04	7.19	5.82	8.13	0.02	1.99	1.14	44.71
1975	0.11	0.40	0.52	0.77	4.20	5.18	9.82	3.29	9.13	3.87	0.58	0.20	38.08
1976	0.70	1.62	0.22	1.27	11.89	14.68	7.78	6.54	6.34	3.21	1.11	1.70	57.07
1977	3.03	1.24	0.05	0.20	4.73	14.20	5.61	7.48	7.44	0.39	2.98	3.02	50.37
1978	2.48	3.51	5.29	2.54	4.58	6.48	6.98	12.04	6.40	0.99	0.18	3.77	55.25
1979	4.88	1.57	1.27	6.34	6.51	2.87	7.34	4.78	11.35	5.45	1.08	3.59	57.03
1980	3.72	1.49	2.06	2.47	3.04	3.45	10.95	10.30	10.86	1.55	2.87	0.77	53.52
1981	0.68	5.65	1.54	0.94	0.98	9.10	8.37	13.02	3.81	0.34	1.18	0.35	45.96
1982	0.63	2.18	2.34	6.77	6.54	14.09	8.06	7.84	8.47	3.22	1.95	2.82	64.90
1983	3.31	7.99	6.17	2.23	0.73	10.75	6.09	7.07	9.24	3.95	6.08	2.56	66.17
1984	0.49	2.41	4.41	0.87	5.18	7.82	7.34	5.23	9.83	0.56	0.87	0.49	45.48
1985	0.86	0.90	1.55	2.56	0.64	6.95	21.45	5.19	9.77	5.80	2.66	0.84	59.17
1986	1.75	1.94	2.41	0.80	4.98	11.04	3.47	7.83	7.41	4.38	1.78	3.92	51.72
1987	2.02	2.19	8.32	0.14	8.34	7.11	6.86	5.93	3.61	7.06	6.60	0.18	58.36
1988	1.08	0.99	2.57	0.82	2.12	2.40	8.81	8.09	6.25	0.84	1.72	0.35	36.03
1989	0.84	0.09	0.99	6.93	0.42	12.74	10.01	8.54	10.45	4.56	0.56	2.37	58.50
1990	0.16	2.21	2.08	2.25	4.94	8.53	5.74	3.60	8.70	5.13	1.06	0.09	44.49
1991	9.35	2.11	3.26	2.94	10.77	6.10	14.50	8.76	5.31	4.51	1.28	0.39	69.28
1992	0.59	3.69	2.72	2.55	0.90	13.13	7.47	9.19	9.04	0.69	0.58	0.05	50.59
1993	7.82	3.93	2.13	2.25	2.79	6.71	8.71	10.54	3.31	6.57	0.52	0.59	55.87
1994	1.63	1.67	1.19	1.21	0.93	10.80	11.28	7.15	9.46	3.77	2.54	3.58	55.21
1995	4.35	1.74	0.75	3.42	1.71	10.38	7.82	14.79	10.34	15.76	0.52	0.72	72.31
1996	2.14	0.01	2.26	1.46	5.53	2.60	3.46	5.56	2.26	7.40	0.26	0.30	33.25
1997	1.04	0.36	4.02	7.90	4.33	8.52	5.61	4.23	2.97	2.21	3.74	6.28	51.23
1998	1.52	6.09	2.52	0.57	5.63	5.66	7.67	6.87	11.39	3.05	6.66	1.86	59.50
1999	2.12	1.45	0.68	0.46	3.71	8.86	8.08	7.83	14.16	1.93	2.27	0.66	52.20
2000	0.95	0.05	1.63	1.34	1.58	7.00	7.15	12.85	9.80	0.79	0.31	0.36	43.82
Mean	2.08	2.24	2.52	2.06	3.96	8.61	8.28	8.40	8.10	3.79	1.82	1.49	53.34

Table 7. Monthly and Mean Rainfall (inches) at Moore Haven Rainfall Station.

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	SUM
1965	0.32	3.59	2.58	1.76	1.65	10.10	5.95	3.65	5.07	9.34	0.59	1.89	46.49
1966	5.78	3.67	0.32	4.70	6.50	11.94	9.60	10.85	6.94	2.62	0.10	0.39	63.42
1967	0.84	1.69	0.20	0.14	1.55	11.54	5.60	4.27	7.54	3.37	0.08	1.32	38.14
1968	0.58	2.11	1.03	0.82	8.07	10.18	9.34	4.86	6.81	3.21	2.25	0.19	49.46
1969	1.76	2.28	6.19	1.25	4.39	10.43	4.63	11.18	8.25	11.63	1.46	3.82	67.26
1970	4.05	2.40	12.63	0.02	2.18	8.39	6.50	7.35	2.06	4.12	0.13	0.30	50.12
1971	0.25	0.51	0.36	0.14	1.50	15.47	6.93	8.74	7.18	6.25	1.33	1.20	49.86
1972	0.56	1.55	6.97	2.76	7.13	10.50	3.16	9.27	1.03	0.43	2.31	1.39	47.07
1973	2.42	2.73	3.34	1.02	6.01	9.78	8.97	7.49	8.43	1.10	0.03	1.52	52.85
1974	0.14	1.36	0.08	0.97	3.93	14.57	19.16	7.92	6.41	1.24	2.19	1.71	59.67
1975	0.20	1.95	0.74	1.31	3.56	5.30	7.11	2.46	9.86	4.49	0.27	0.49	37.74
1976	0.65	1.41	1.59	1.81	5.87	3.22	10.64	12.33	6.54	0.80	1.94	1.92	48.73
1977	5.11	1.38	1.12	0.20	5.09	4.27	6.25	6.10	6.27	0.46	2.05	4.74	43.04
1978	1.78	1.39	2.68	2.06	8.95	5.59	9.28	2.79	7.11	2.32	2.13	2.60	48.69
1979	5.84	0.23	2.30	3.64	7.41	1.52	1.93	6.61	18.40	2.06	1.83	1.96	53.73
1980	2.80	1.12	2.58	5.29	2.23	5.09	6.85	7.67	6.33	1.52	2.04	0.64	44.17
1981	0.87	1.52	1.28	0.38	2.09	2.97	4.36	9.42	4.54	0.23	1.27	0.15	29.09
1982	0.59	2.81	5.59	2.57	11.18	11.07	10.00	3.38	5.28	5.45	0.26	0.80	58.99
1983	4.22	8.04	6.26	1.75	0.67	8.17	4.79	3.44	3.36	4.29	1.64	2.39	49.02
1984	0.33	4.06	5.22	2.91	6.75	5.06	11.79	5.45	3.14	0.46	2.95	0.09	48.20
1985	0.60	0.41	2.11	6.60	1.22	4.75	8.58	5.42	6.09	2.33	1.41	3.09	42.60
1986	2.34	0.99	6.48	0.24	1.59	12.89	3.81	8.15	6.08	3.48	0.44	3.55	50.04
1987	3.65	1.93	7.17	0.00	1.33	3.48	2.68	3.92	11.06	6.06	8.53	0.60	50.41
1988	1.44	2.57	2.92	1.38	2.74	2.88	6.66	6.76	1.62	0.80	4.17	0.72	34.67
1989	1.62	0.10	2.76	7.10	1.70	7.42	7.93	3.05	8.68	2.88	0.77	2.19	46.20
1990	0.11	2.79	2.22	2.37	1.63	5.16	9.08	9.21	3.01	3.02	0.88	0.38	39.85
1991	5.57	0.90	4.56	4.49	6.69	8.07	9.34	8.68	3.05	4.61	0.95	0.33	57.23
1992	1.04	3.73	3.65	2.89	0.71	20.77	3.57	8.32	1.40	1.31	1.62	0.68	49.71
1993	4.71	2.01	2.39	2.15	1.74	3.98	4.99	4.93	5.48	5.61	1.01	1.04	40.04
1994	3.86	3.12	3.55	2.23	3.96	6.92	5.63	3.63	12.34	2.78	3.79	4.99	56.81
1995	3.48	2.89	5.52	3.47	2.65	10.18	16.18	8.39	4.81	10.69	0.40	0.35	69.02
1996	3.04	0.87	3.00	1.25	5.20	7.58	4.42	5.57	1.00	3.19	0.38	0.73	36.23
1997	1.18	1.05	1.88	6.02	3.20	4.11	4.41	11.04	8.19	0.38	3.26	5.15	49.87
1998	1.02	7.59	4.59	0.16	1.66	4.50	2.88	14.32	8.43	2.18	4.15	1.02	52.50
1999	2.46	0.24	0.31	2.61	3.76	10.91	3.49	8.66	8.08	3.77	1.20	1.26	46.76
2000	0.79	0.19	1.87	3.22	0.27	3.54	5.69	3.74	11.72	1.44	0.50	0.55	33.53
Mean	2.11	2.14	3.28	2.27	3.80	7.84	7.00	6.92	6.43	3.33	1.68	1.56	48.37

Table 8. Monthly and Mean Rainfall (inches) at Clewiston Rainfall Station.

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	SUM
1965	0.44	5.33	2.41	2.92	1.61	12.32	4.82	3.88	5.96	8.12	0.46	1.13	49.40
1966	3.59	2.39	0.34	3.34	5.49	13.95	5.22	12.52	6.02	4.92	0.22	0.49	58.50
1967	0.86	3.70	1.38	0.02	0.35	11.09	6.11	7.06	3.77	3.84	0.12	1.15	39.45
1968	0.27	2.47	0.75	0.53	7.41	10.67	10.97	2.94	5.26	4.20	2.31	0.13	47.90
1969	2.56	1.86	6.59	0.83	5.27	5.29	4.35	8.28	4.66	9.99	1.45	2.24	53.35
1970	2.47	1.89	14.16	0.00	3.06	5.51	5.75	7.38	2.78	3.20	0.03	0.25	46.48
1971	0.45	1.15	0.37	0.13	4.15	5.14	10.96	5.12	4.87	2.67	3.02	0.45	38.47
1972	1.04	1.31	6.25	4.07	5.36	9.00	6.76	8.17	0.90	1.32	2.96	1.32	48.45
1973	1.90	2.76	2.68	0.83	3.90	5.41	8.00	8.90	5.39	1.04	0.21	1.59	42.62
1974	0.17	0.24	0.37	0.89	2.53	16.52	10.72	9.16	5.29	1.91	1.99	1.09	50.87
1975	0.46	2.19	0.55	2.19	7.09	5.80	8.17	4.21	7.60	1.80	0.22	0.30	40.59
1976	0.41	1.41	0.01	1.55	9.12	6.08	3.97	3.33	3.18	1.30	2.29	1.92	34.56
1977	3.24	1.59	2.37	0.24	8.96	5.70	5.39	7.86	8.40	1.00	9.80	4.06	58.62
1978	2.29	1.26	2.44	1.66	9.42	5.01	6.69	10.01	3.97	2.16	3.06	2.20	50.18
1979	5.36	0.16	0.84	3.72	4.14	2.07	3.00	5.38	15.89	1.60	5.74	1.68	49.57
1980	6.23	1.19	2.44	4.70	3.56	5.91	4.68	6.17	3.10	1.42	2.85	0.80	43.05
1981	0.68	1.53	2.17	0.20	2.21	4.59	3.10	11.15	3.31	1.04	2.09	0.10	32.18
1982	0.81	2.46	2.72	1.37	17.03	11.02	6.79	4.78	7.19	1.92	0.67	1.13	57.90
1983	3.97	8.09	5.54	1.16	0.93	10.58	8.30	4.23	3.83	6.69	1.67	3.08	58.06
1984	0.21	3.63	5.61	5.92	8.02	3.10	12.26	3.97	6.40	0.24	1.25	0.05	50.66
1985	0.52	0.36	2.74	2.56	4.74	4.39	10.06	7.47	7.71	5.07	1.50	2.06	49.19
1986	3.21	0.82	5.10	0.25	1.99	12.87	7.03	6.65	5.01	2.72	0.56	3.81	50.03
1987	3.04	1.67	5.11	0.03	0.86	2.47	3.15	7.13	4.23	5.17	9.86	0.32	43.04
1988	1.57	2.05	2.56	0.97	3.19	8.86	10.44	13.72	1.96	0.37	2.37	0.54	48.60
1989	1.12	0.01	3.10	8.45	2.56	6.82	6.89	8.01	8.79	2.86	0.72	1.80	51.14
1990	0.25	2.19	2.30	1.06	4.55	6.38	4.21	6.54	3.84	3.05	0.43	0.92	35.71
1991	5.30	2.35	3.68	4.99	5.72	8.43	7.96	6.88	0.58	2.36	2.62	0.03	50.90
1992	1.12	4.94	3.97	2.80	1.13	13.41	4.26	7.20	2.46	0.37	1.59	0.50	43.75
1993	5.86	2.62	3.89	1.55	1.58	5.33	8.57	4.26	3.78	7.31	1.28	0.76	46.80
1994	3.37	2.86	2.09	1.13	4.85	6.14	5.25	4.83	8.63	3.60	4.16	5.90	52.81
1995	3.14	2.88	2.75	2.66	4.94	8.98	14.36	10.67	6.54	15.91	1.05	0.87	74.74
1996	3.39	0.83	4.61	1.50	8.68	11.00	8.67	6.62	3.88	5.82	0.17	0.97	56.14
1997	1.38	1.22	0.96	5.72	2.36	8.12	5.21	5.46	8.87	1.81	3.84	7.03	51.99
1998	2.60	8.15	5.62	1.83	1.88	2.24	5.96	9.72	11.42	2.09	0.21	1.09	52.83
1999	2.83	0.22	0.56	0.99	5.95	23.59	13.01	8.43	10.44	9.17	1.02	1.08	77.27
2000	8.12	0.00	1.63	3.17	1.38	6.75	5.89	5.06	9.65	1.82	0.36	0.53	44.37
Mean	2.34	2.22	3.07	2.11	4.61	8.07	7.14	7.03	5.71	3.61	2.06	1.48	49.45

Table 9. Monthly and Mean Rainfall (inches) at Devils Garden Rainfall Station.

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	SUM
1965	0.71	3.50	4.26	1.15	2.67	12.37	11.19	9.13	5.77	6.38	1.02	1.23	59.38
1966	4.82	2.50	0.58	4.01	4.33	17.86	9.19	9.12	3.88	4.38	0.14	0.32	61.12
1967	1.48	4.68	0.73	0.05	0.71	14.95	9.20	2.94	9.10	3.20	0.19	1.77	49.01
1968	0.61	3.53	1.49	0.85	8.50	12.98	12.07	4.74	6.46	4.11	2.63	0.18	58.15
1969	2.14	1.98	5.30	1.37	2.57	15.54	8.75	5.68	3.29	10.24	1.12	3.25	61.22
1970	4.31	1.16	14.10	0.00	5.54	5.97	7.29	4.91	3.81	6.85	0.00	0.31	54.25
1971	0.25	1.35	0.21	0.25	4.40	10.42	6.51	6.58	7.00	4.70	1.39	0.76	43.81
1972	0.97	2.12	6.67	2.53	6.10	10.04	3.79	7.26	2.16	2.99	3.13	1.19	48.95
1973	2.62	1.52	1.58	0.61	6.35	5.66	7.99	5.42	6.38	1.32	0.20	1.86	41.51
1974	0.17	1.09	0.58	1.27	5.62	16.24	12.34	8.35	6.57	0.88	2.38	1.40	56.89
1975	0.24	1.12	1.14	1.51	4.49	10.46	8.29	4.54	9.65	4.93	0.52	0.43	47.33
1976	0.90	1.36	1.47	1.24	11.90	8.28	4.76	5.73	8.11	1.67	1.52	2.03	48.97
1977	3.39	1.10	0.39	0.16	5.10	6.19	9.20	12.15	10.68	0.68	3.43	3.25	55.74
1978	2.35	1.18	2.72	1.44	6.17	7.84	9.42	6.71	6.08	3.97	1.83	3.67	53.37
1979	3.70	0.61	1.44	3.88	7.20	3.83	4.69	9.68	14.30	1.31	5.27	2.15	58.05
1980	5.91	2.25	2.88	6.17	2.69	5.13	8.06	4.00	7.58	0.54	2.69	0.86	48.77
1981	0.48	1.94	1.82	0.25	1.55	8.51	3.25	9.48	6.02	0.22	5.50	0.13	39.16
1982	0.57	2.51	2.03	3.49	14.70	18.87	9.44	7.32	7.24	5.30	1.05	0.48	73.01
1983	3.69	8.68	5.65	2.07	0.52	9.88	4.02	8.31	4.98	4.89	2.17	3.48	58.33
1984	0.17	4.31	4.01	2.91	6.13	6.49	12.13	6.02	9.96	1.12	3.84	0.00	57.09
1985	0.72	0.60	1.48	4.41	2.08	9.95	8.91	3.72	6.15	2.54	1.00	2.01	43.58
1986	3.30	0.72	7.06	0.30	3.02	18.10	5.50	14.77	3.26	5.24	0.81	3.65	65.73
1987	4.80	2.50	7.36	0.00	2.10	3.71	3.41	6.80	9.04	5.30	9.40	0.31	54.73
1988	1.67	2.80	3.50	2.17	1.64	4.40	8.84	12.40	1.05	1.00	7.57	0.75	47.78
1989	0.95	0.00	4.58	4.90	5.29	9.40	5.32	8.17	7.74	1.39	0.50	1.90	50.15
1990	0.78	1.80	2.30	1.69	4.34	5.61	6.97	9.68	2.64	3.30	0.40	0.06	39.57
1991	6.90	1.16	4.16	4.10	8.05	11.31	11.22	5.85	3.70	3.12	1.32	0.06	60.94
1992	1.35	3.57	2.78	2.35	1.60	10.44	7.95	13.16	5.30	1.00	2.26	1.09	52.86
1993	4.60	1.20	3.28	2.60	2.13	4.27	12.95	7.81	8.08	9.34	2.40	1.20	59.87
1994	2.03	4.56	1.94	5.50	3.77	6.98	8.81	7.41	9.71	3.74	4.00	6.65	65.11
1995	4.94	1.10	2.20	3.47	1.62	9.40	11.70	8.49	6.23	13.57	0.46	0.63	63.82
1996	3.27	1.04	3.62	0.80	6.73	7.21	4.92	8.30	4.94	5.40	0.55	0.15	46.92
1997	1.23	2.30	2.57	6.29	2.65	8.28	10.65	6.76	6.11	1.00	3.24	6.53	57.61
1998	1.60	8.78	4.77	1.19	2.41	7.22	8.72	13.51	8.82	0.72	7.45	0.15	65.35
1999	2.83	0.21	0.62	4.75	4.33	14.67	4.38	9.27	9.66	7.39	2.23	0.57	60.90
2000	2.50	0.96	0.95	4.23	3.97	5.05	5.23	3.67	6.51	2.55	0.18	0.55	36.33
Mean	2.30	2.27	3.12	2.33	4.53	9.54	7.97	7.72	6.61	3.79	2.33	1.53	54.04

Table 10. Monthly and Mean Rainfall (inches) at LaBelle Rainfall Station.

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	SUM
1965	0.57	2.81	4.02	3.40	1.84	17.09	9.69	10.34	7.28	5.40	0.53	1.09	64.06
1966	3.05	2.91	0.84	5.30	7.78	16.30	6.20	8.24	15.07	3.04	0.14	0.96	69.83
1967	2.98	2.93	0.33	0.13	1.74	9.19	9.71	8.02	3.42	5.28	0.42	1.58	45.73
1968	0.10	2.18	2.22	0.46	9.12	11.34	14.75	7.62	4.29	4.82	2.84	0.12	59.87
1969	1.75	1.77	7.42	0.78	4.76	11.13	5.96	8.69	3.69	7.71	0.53	3.46	57.65
1970	4.92	1.78	14.07	0.02	5.19	9.55	5.34	6.06	4.63	3.42	0.18	0.26	55.42
1971	0.74	1.11	0.39	0.38	3.28	11.00	6.55	6.90	7.86	4.56	1.03	0.73	44.54
1972	0.98	2.33	6.32	1.93	6.08	11.16	4.56	10.44	2.65	1.42	4.39	1.42	53.67
1973	3.34	2.44	3.61	1.27	2.64	7.72	9.47	12.60	6.32	1.23	0.22	1.88	52.73
1974	0.18	1.17	0.70	1.23	5.97	17.25	11.29	8.34	6.65	0.59	2.24	1.15	56.76
1975	0.20	0.75	0.43	2.35	1.84	6.87	8.03	7.04	3.67	5.79	0.29	0.50	37.74
1976	0.17	1.30	3.16	0.99	8.04	4.68	9.33	4.29	7.71	2.15	2.54	1.75	46.11
1977	6.05	0.51	0.12	0.14	5.32	4.56	9.74	9.82	6.93	0.67	2.38	3.87	50.12
1978	2.47	1.97	3.30	0.95	5.69	6.90	10.05	4.62	9.15	0.84	1.74	3.25	50.93
1979	5.64	0.46	1.90	4.13	6.99	5.70	3.38	7.16	15.86	3.30	2.06	3.18	59.77
1980	2.19	1.81	2.76	3.47	3.81	4.12	9.26	9.87	5.42	1.36	4.50	0.78	49.33
1981	0.97	1.79	1.51	0.16	0.96	7.75	5.66	11.30	4.78	0.36	1.84	0.55	37.63
1982	0.75	1.14	2.76	2.40	9.19	11.70	5.17	6.87	5.36	1.68	0.22	1.12	48.34
1983	5.59	11.81	8.42	2.15	0.64	15.22	3.49	4.62	6.87	3.67	1.89	2.65	67.03
1984	0.47	2.52	5.31	2.26	5.82	10.74	13.04	3.18	5.69	1.17	5.18	0.59	55.95
1985	0.54	0.61	2.22	2.58	2.50	8.12	5.72	7.93	6.84	2.38	1.62	1.29	42.37
1986	3.24	0.91	5.26	0.27	1.14	11.75	5.79	14.06	6.29	3.38	0.38	4.57	57.04
1987	3.52	2.28	11.03	0.07	4.89	2.75	11.58	3.16	8.33	9.12	9.04	0.53	66.30
1988	2.70	1.84	4.40	1.42	3.21	3.80	6.21	8.80	1.66	0.82	6.48	1.83	43.17
1989	1.96	0.68	4.56	5.82	1.77	12.86	10.14	10.73	8.33	8.92	0.75	1.81	68.33
1990	0.15	3.18	1.95	2.45	1.79	12.36	8.99	11.61	3.39	2.76	0.72	0.18	49.53
1991	6.60	1.26	3.26	5.07	8.62	8.22	17.22	13.25	11.69	3.99	2.03	0.06	81.28
1992	1.46	4.35	3.27	3.81	1.35	15.34	5.61	7.32	5.51	1.24	0.72	0.90	50.88
1993	5.91	1.63	4.47	2.02	1.67	9.75	9.40	10.19	9.02	9.11	1.81	1.80	66.77
1994	3.46	4.46	2.60	4.34	3.36	12.06	6.42	12.22	13.65	6.69	5.92	4.34	79.52
1995	5.92	2.48	1.45	3.22	2.27	17.15	17.90	11.94	8.36	16.40	0.94	0.27	88.30
1996	4.65	1.64	2.99	1.42	6.49	13.59	5.87	9.47	4.28	5.99	1.12	0.19	57.71
1997	1.34	1.87	1.80	11.51	4.68	12.36	15.44	6.59	8.01	2.74	7.56	9.56	83.47
1998	3.75	8.41	6.53	1.48	4.31	3.69	15.60	9.52	10.33	2.78	5.01	0.16	71.58
1999	5.36	0.90	1.21	1.75	5.49	19.07	4.30	9.59	9.81	2.85	0.90	1.17	62.41
2000	1.38	0.50	1.62	3.43	1.81	6.13	6.74	9.56	13.93	1.88	0.26	0.59	47.83
Mean	2.64	2.29	3.56	2.35	4.22	10.25	8.71	8.67	7.30	3.88	2.23	1.67	57.77

Table 11. Monthly and Mean Rainfall (inches) at Ft. Myers Rainfall Station.

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	SUM
1965	0.97	2.99	2.93	2.39	2.36	7.78	9.09	6.16	3.94	4.82	0.28	0.85	44.56
1966	3.88	1.06	0.33	4.04	1.95	15.86	6.04	8.10	3.95	2.14	0.18	0.28	47.81
1967	1.15	2.15	0.82	0.00	1.47	8.72	6.82	14.72	6.80	3.08	0.92	2.91	49.57
1968	0.40	2.33	0.65	0.45	7.18	15.71	11.19	12.22	8.92	7.99	2.86	0.22	70.11
1969	1.44	2.87	4.78	0.47	4.88	10.29	7.20	8.16	16.67	11.31	0.22	3.95	72.25
1970	4.55	2.20	18.58	0.00	6.22	8.12	4.01	4.82	9.06	1.86	0.46	0.23	60.12
1971	0.85	1.55	0.70	0.70	3.77	7.55	8.20	8.89	9.21	6.55	0.62	0.30	48.89
1972	0.95	2.14	4.75	0.71	5.20	7.86	8.31	19.02	2.22	2.28	3.89	1.43	58.76
1973	3.31	2.23	3.89	1.71	1.07	3.99	10.90	9.59	8.39	0.20	0.10	1.72	47.10
1974	0.36	0.81	0.03	0.11	3.20	21.03	13.10	7.73	4.84	0.19	1.01	0.89	53.30
1975	0.26	0.27	1.47	0.61	3.61	6.74	10.61	7.39	12.92	2.94	0.49	0.53	47.84
1976	0.21	1.20	0.91	0.90	4.00	10.22	6.73	8.78	8.21	1.96	2.03	1.41	46.56
1977	3.69	0.15	0.09	0.76	6.72	8.58	9.23	11.28	9.21	0.61	1.76	2.74	54.82
1978	2.48	3.36	3.46	2.35	2.09	6.59	10.62	10.73	5.66	1.68	0.04	4.35	53.41
1979	7.45	1.94	0.43	4.80	5.05	9.12	5.22	12.52	14.28	0.39	0.46	5.12	66.79
1980	2.47	1.07	4.25	1.52	8.73	4.73	6.74	10.22	4.73	1.65	3.15	0.56	49.81
1981	0.80	1.65	1.29	0.08	3.09	11.79	8.27	17.10	6.70	0.44	0.71	0.73	52.65
1982	0.81	3.34	4.06	3.97	4.56	15.01	10.79	10.60	9.28	4.95	1.11	0.30	68.78
1983	4.50	10.82	7.95	1.34	0.60	19.51	5.15	6.68	9.72	4.39	3.72	2.95	77.33
1984	0.15	3.15	6.39	1.28	2.78	8.75	7.97	5.79	8.30	0.65	0.73	0.02	45.95
1985	0.71	0.44	2.06	1.45	1.36	3.92	9.00	7.82	11.69	7.16	2.20	0.67	48.48
1986	0.90	1.01	3.59	0.53	4.01	14.99	6.64	11.64	5.54	4.83	0.30	4.56	58.54
1987	2.29	2.86	5.86	0.14	3.95	7.66	12.89	7.57	7.61	5.10	8.06	0.49	64.48
1988	2.19	1.47	2.44	1.58	1.56	7.23	5.08	9.92	1.93	0.40	2.84	0.26	36.90
1989	1.65	0.36	2.88	2.33	8.07	7.89	8.19	7.78	4.99	2.05	0.90	2.16	49.25
1990	0.05	3.37	1.88	0.45	3.27	7.06	6.62	13.28	8.62	2.28	0.01	0.25	47.13
1991	7.95	0.72	2.34	5.02	8.75	11.93	15.95	5.36	7.98	4.05	0.34	0.31	70.71
1992	1.83	3.89	4.58	2.08	0.97	19.01	7.10	7.45	3.82	1.24	1.20	0.85	54.01
1993	5.35	3.34	3.62	2.41	2.59	6.63	5.97	6.75	8.49	7.00	0.78	0.79	53.73
1994	3.15	2.18	1.22	5.65	2.15	4.75	9.02	10.10	7.74	2.89	2.49	3.83	55.18
1995	3.57	1.41	0.89	4.91	2.11	13.96	12.86	14.67	9.95	14.10	1.10	0.79	80.31
1996	2.35	0.85	3.16	1.98	6.45	8.43	4.43	5.90	5.08	7.11	0.59	0.63	46.96
1997	1.34	1.06	2.63	5.80	4.55	6.34	8.35	4.69	7.85	1.13	3.68	7.64	55.04
1998	2.59	6.73	5.40	1.22	2.73	6.15	9.86	8.84	13.62	0.57	7.58	1.14	66.44
1999	2.34	0.19	0.85	0.68	5.59	11.19	8.26	9.23	8.30	1.79	1.53	1.66	51.61
2000	1.27	0.11	3.39	1.91	0.92	8.14	9.36	8.59	12.02	1.78	0.00	0.68	48.15
Mean	2.23	2.15	3.18	1.84	3.82	9.81	8.49	9.45	8.01	3.43	1.62	1.62	55.65

FREQUENCY ANALYSIS

1-in-10 Year Drought Event

Water supply needs of existing and future reasonable-beneficial uses are estimated based upon demand requirements during a 1-in-10 year drought event (Section 373.0361, (2)(a)1 F.S.). A 1-in-10 year drought is a drought of such intensity that it is expected to have a return frequency of once in 10 years. This means that there is only a 10 percent chance that such a small amount of rain will fall in any given year.

Statistical Method

Because of correlations between rainfall amounts in different months, the sum of the 12 monthly 1-in-10 rainfall events will not equal the annual 1-in-10 rainfall event; in almost all cases a 1-in-10 annual drought will be less severe (have more rainfall) than 12 successive monthly 1-in-10 rainfall droughts. The sum of the monthly 1-in-10 drought rainfalls in all cases was less than the annual 1-in-10 drought rainfall.

Attempts to reconcile these 1-in-10 concepts depend upon the assumptions that one makes with respect to the starting month and patterns of serial correlation in rainfall. Based on the results of Abtew and Ali, the gamma distribution was used to estimate 1-in-10 drought levels of rainfall.

For more information on the use of the gamma distribution in engineering statistical analysis, see the Engineering Statistics Handbook, Section 1.3.6.6.11 available from: http://www.itl.nist.gov/div898/handbook/eda/section3/eda366b.htm.

Maximum likelihood estimates of annual and monthly 1-in-10 drought rainfalls based on the two-parameter gamma distribution were conducted using Number Cruncher Statistical™ software. This method consists of finding the values of the distribution parameters that maximize the log-likelihood of the data values. These values provide a high degree of probability that the current set of data values will occur. For a discussion of maximum likelihood estimation, see *Maximum Likelihood Estimation* by S. Purcell of the Statistical Genetics Group at Kings College, London.

Figure 3 shows the statistical 1-in-10 year drought event plots for the rainfall stations and **Table 12** lists the rainfall values for 1-in-10 year drought events**.**

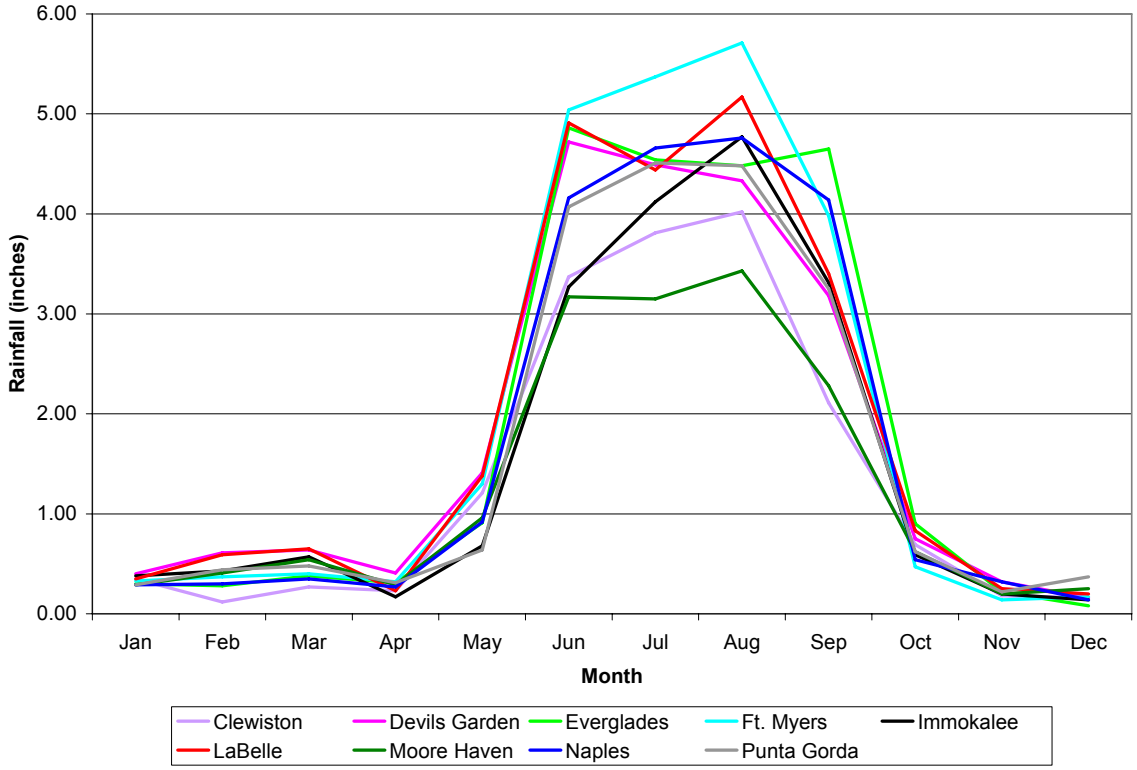

Figure 3. Statistical 1-in-10 Year Drought Event for Rainfall Stations in the LWC Planning Area.

Table 12. Statistical 1-in-10 Year Rainfall (in inches) for Stations in the LWC Planning Area.

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Sum	Annual
Clewiston	0.35	0.12	0.27	0.23	1.21	3.37	3.81	4.02	2.11	0.69	0.18	0.16	16.52	38.33
Devils Garden	0.40	0.61	0.64	0.41	1.41	4.72	4.49	4.33	3.18	0.75	0.32	0.16	21.42	43.27
Everglades	0.30	0.28	0.38	0.31	0.91	4.86	4.54	4.48	4.65	0.90	0.22	0.08	21.91	41.21
Ft. Myers	0.33	0.37	0.40	0.32	1.30	5.04	5.37	5.71	3.98	0.47	0.14	0.17	23.60	43.59
Immokalee	0.38	0.43	0.57	0.17	0.68	3.27	4.12	4.77	3.31	0.59	0.20	0.14	18.63	39.31
LaBelle	0.35	0.59	0.65	0.23	1.38	4.91	4.44	5.17	3.40	0.83	0.25	0.20	22.40	42.74
Moore Haven	0.29	0.41	0.54	0.29	0.96	3.17	3.15	3.43	2.28	0.62	0.20	0.25	15.59	37.17
Naples	0.29	0.30	0.35	0.27	0.92	4.16	4.66	4.76	4.14	0.54	0.32	0.14	20.85	34.96
Punta Gorda	0.29	0.44	0.48	0.31	0.64	4.07	4.51	4.48	3.25	0.62	0.22	0.37	19.68	39.61

Note: Based on Gamma Distribution.

REFERENCES CITED

Ali, A. and W. Abtew. 1999. *Regional Rainfall Frequency Analysis for Central and South Florida*. Technical Publication WRE-380. South Florida Water Management District, West Palm Beach, FL. vari. pag.

National Institute of Standards and Technology. 2004. *NIST /SEMATECH e-Handbook of Statistical Methods.* Available from: http://www.itl.nist.gov/div898/handbook/.

Purcell, S. 2000. *Maximum Likelihood Estimation*. Statistical Genetics Group at Kings College, London. Available from: http://statgen.iop.kcl.ac.uk/bgim/mle/sslike_1.html.

APPENDIX G

Regional Irrigation Distribution System Phases 1 (Feasibility Analysis), 2 (Subregional Analysis) & 3 (Implementation)

EXECUTIVE SUMMARY

The Regional Irrigation Distribution System (RIDS) project was one of the recommendations identified in the District's *2000 Lower West Coast Water Supply Plan* (2000 LWC Plan). The 2000 LWC Plan recommended the RIDS Feasibility Study to evaluate the "feasibility of constructing regional irrigation water distribution system(s) and other options to meet the growing urban irrigation demands of this area." Accordingly, the objective of the RIDS Feasibility Study is to develop the preliminary design information for a regional, interconnected irrigation system that enables the maximum use of non-potable water to meet all or a portion of the projected year (2020) urban irrigation demand.

The RIDS project was needed to address the following: the high rate of population growth in the region, to free up water from conventional sources for other uses; sharing of sources to meet demands over the region; and the increased demand for irrigation water. Some of the elements of the RIDS program is the interconnection of irrigation water, storage and the reduction of conventional sources.

There were three phases to the RIDS project: Phase 1, Feasibility Analysis (2001 to 2002)); Phase 2, Subregional Analysis (2003 to 2004); and Phase 3, Implementation (beginning in 2004). Phase one was completed in 2002 and phase 2 was completed in 2004. Phase 3, the implementation phase, is now being rolled into the State of Florida and the District's Alternative Water Supply (AWS) Funding Program which provides funding opportunities for AWS projects.

The Master Plan-Feasibility Analysis study area encompasses the coastal area (western portion) of the Lower West Coast Region. It includes the service areas of the Cities of Cape Coral, Fort Myers, Marco Island and Naples, and the franchise areas for Lee County Utilities, Collier County Utilities, Florida Water Services, Gulf Environmental Services and Bonita Springs Utilities.

Due to the scope and complexity of the issues involved, the historic development patterns and the fact that existing centralized irrigation systems are controlled by separate entities, the RIDS Feasibility Study recommended taking a subregional approach, with the ultimate goal of creating a regionally integrated network. Subregional feasibility studies enhance existing information, refine recommended projects, provide more detailed cost estimates and establish a basis of design information. The study area is divided into subregions as follows:

- *Subregion 1* covers the Bonita Spring Utilities / Collier County / City of Naples service areas.
- *Subregion 2* addresses the Cape Coral / North Fort Myers service areas.

- *Subregion 3* encompasses the City of Fort Myers and Lee County service areas.

The subregional analysis was completed in December 2004 and recommended a group of projects to be constructed during the implementation phase.

Although this area had been progressive in developing alternative supply sources including reclaimed water, these sources would not be adequate to meet future demands. In addition, because utilities in this sub-region have their own discrete infrastructure, there has been no optimization of the resource on a regional basis.

This analysis evaluated different scenarios and determined that a sub-regional series of inter-local agreements would work best and those individual utilities would manage and operate the system based on interlocal agreements.

To determine the amount of water from alternative sources needed for future urban irrigation water, an evaluation of water demands was performed. The demand analysis was determined on a temporal basis.

Alternative sources of supply were determined to address the urban irrigation demands. Additional allocations from resources that are currently stretched, such as groundwater, would be minimized. Therefore, an inventory of potential sources of supply was conducted and prioritized to address future irrigation water needs in the study area. These potential sources of supply were:

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Alternative sources of supply were determined to address the urban irrigation demands. Additional allocations from resources that are currently stretched, such as groundwater, will be minimized. Therefore, an inventory of potential sources of supply was conducted and prioritized to address future irrigation water needs in the study area. These potential sources of supply are:

- Reclaimed wastewater from municipal wastewater treatment plants.
- Water recovered during the dry season from reclaimed water aquifer storage and recovery (ASR) systems recharged during the wet season.
- Surface water from streams, rivers, abandoned borrow pits and canal systems having salinity control structures.
- Water recovered during the dry season from surface water ASR systems recharged during the wet season.

In order to develop a preliminary cost estimate associated with the projects, various potential projects were analyzed on a subregional basis. The estimates consider the financing of initial capital costs, including assumptions about potential grant funding, and annual operations and maintenance expenses. These costs are then divided by the expected production of irrigation water resources for the identified projects to determine the unit cost of the irrigation water resources for each subregion. In order to calculate the cost per gallon, the total annual production of each project was assumed to be approximately equal to 180 days of production based on the project capacity measured on an average daily basis. The unit costs for the development of the irrigation water resources as identified herein range from $0.50 to $1.50 per one thousand gallons depending on the project.

Thirty two projects were identified as preferred alternatives for the 3 subregions and twenty eight would use aquifer storage and recovery (ASR) for storage and four were interconnects. The potential water sources identified for the preferred alternatives were reclaimed water/ASR*, surface water/ASR* and other systems (*contingent upon regulatory considerations). It was estimated that 221 million gallons a day of urban irrigation water could be provided by 2020 and the total capital cost was estimated at $208 million dollars.

The implementation phase of this project has been rolled into the Alternative Water Supply Funding Program that has a projected $36 million dollars a year available from the State of Florida funding and the District match. Eighty percent of this funding is reserved for projects listed in the SFWMD water supply plans although the listing of the project does not guarantee funding. The SFWMD Governing Board approves the annual funding of the projects.

Conclusions of the RIDS project was that it provided a regional benefit; local utilities manage and operate the system with interlocal agreements; and that the use of conventional water use would be offset for the future.

REFERENCES CITED

Boyle Engineering Corporation. 2002. *Feasibility Study for the Regional Irrigation Distribution System Subregions 1, 2 and 3.* Prepared for the South Florida Water Management District. Water Supply Planning Department, SFWMD, West Palm Beach, FL.

APPENDIX H

Cost Estimating and Economic Criteria

This appendix contains information on the origination of several of the cost estimations for the water source options and treatment technologies presented in this plan.

A memo (**Exhibit 1**) summarizes the approach on the origination and updated cost information presented in the LWC Planning Document. The approach discussed in this memo is supported by the Florida Department of Environmental Protection (FDEP) and the water management districts. The cost information provides a consistent set of definitions and criteria for the development of comparable planning level, life cycle, cost estimates for water supply and wastewater treatment alternatives.

Exhibit 1. Cost Estimating and Economic Criteria for 2005 District Water Supply Plan.

TECHNICAL MEMORANDUM CH2MHILL

Cost Estimating and Economic Criteria for 2005 District Water Supply Plan

PREPARED FOR:	Beth Wilder/SJRWMD
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DATE:	June 16, 2004

Purpose

This technical memorandum (TM) provides cost definitions and cost estimating and economic criteria to be used in the development of water supply facilities costing for the 2005 District Water Supply Plan (DWSP). These criteria will be applied to all cost estimates and economic comparisons developed as part of the 2005 DWSP to ensure that all costs are directly comparable.

This TM provides a consistent set of definitions and criteria for the development of comparable planning level life cycle cost estimates for all water supply alternatives.

Definitions

The following definitions will be used in the 2005 DWSP project and should be adhered to when applicable. For the most part, these definitions are the same as used by SJRWMD, as well as by Southwest Florida Water Management District (SWFWMD), in the development of the initial DWSPs.

Construction Cost

The construction cost is the total amount expected to be paid to a qualified contractor to build the required facilities at peak design capacity.

Non-construction Capital Cost

Non-construction capital cost is an allowance for construction contingency, engineering design, permitting and administration associated with the constructed facilities.

Land Cost

The market value of the land required to implement the water supply option.

DWSP 2005 COST ESTIMATING CRITERIA TM 062404 FINAL.DOC 1

Exhibit 1. Cost Estimating and Economic Criteria for 2005 District Water Supply Plan (Continued).

Land Acquisition Cost

The estimated cost of acquiring the required land, exclusive of the land cost.

Total Capital Cost

Total capital cost is the sum of construction cost, non-construction capital cost, land cost, and land acquisition cost.

Operation and Maintenance Cost

The estimated annual cost of operating and maintaining the water supply option when operated at average day capacity.

Equivalent Annual Cost

Total annual life cycle cost of the water supply option based on service life and time value of money criteria established for this project. Equivalent Annual Cost accounts for Total Capital Cost and O&M costs with facility operating at average day design capacity.

Present Worth

The equivalent present value of current and future expenditures for a specified planning period.

Unit Production Cost

Equivalent Annual Cost divided by annual water production. The Unit Production Cost will be expressed in terms of dollars per 1,000 gallons.

Criteria

Cost estimating and economic criteria are guidelines for estimating costs associated with water supply options.

Peak Flow Ratio

Capital cost of water supply facilities will be based on maximum installed capacity designed to accommodate peak or maximum daily flow (MDF) requirements. O&M costs and annual water production are based on the average daily flow (ADF) produced. The peak flow ratio (MDF/ADF) for an individual water supply system depends on the demand characteristics of the service area. For public supply systems the peak ratio is generally at least 1.25 for large systems and can be greater than 2.0 for small systems.

For water supply options where the service area peak flow ratio is known, the known value can and should be used in the cost estimating and economic calculations. For regional planning applications, a peak ratio of 1.5 will be used. This MDF/ADF ratio was applied in the 2000 DWSP.

Exhibit 1. Cost Estimating and Economic Criteria for 2005 District Water Supply Plan (Continued).

Cost Index

Engineering News Record (ENR) publishes a Construction Cost Index (CCI) that can be used to adjust the cost basis of a given construction project for past and future times. The ENRCCI is based on the following construction items: 200 hours of common labor at the 20-city average of common labor rates, plus 2,500 pounds of standard structural steel shapes at the mill price prior to 1996 and the fabricated 20-city price from 1996, plus 1.128 tons of Portland cement at the 20-city price, plus 1,088 board-ft of 2 x 4 lumber at the 20-city price.

Cost estimates, for the 2005 DWSP, will be expressed in estimated year 2005 dollars. Because much of 2005 DWSP cost estimating work will be completed prior to 2005, projection of the current ENRCCI (June 2004 ENRCCI = 7,109) to mid-year 2005 ENRCCI is required.

Basic construction materials costs have increased significantly in the first 6 months of 2004 and this recent history is included in the mid-year 2005 ENRCCI projection. Exhibit 1 shows the recent monthly historic ENRCCI trend, as well as monthly projections through June 2005. The projected ENRCCI for June 2005 is approximately 7,420. This projection is based on the observed mean monthly growth rate (0.357%) for the 30-month period from January 2003 through June 2004.

EXHIBIT 1
ENRCCI Projection to 2005
Cost Estimating & Economic Evaluation Criteria

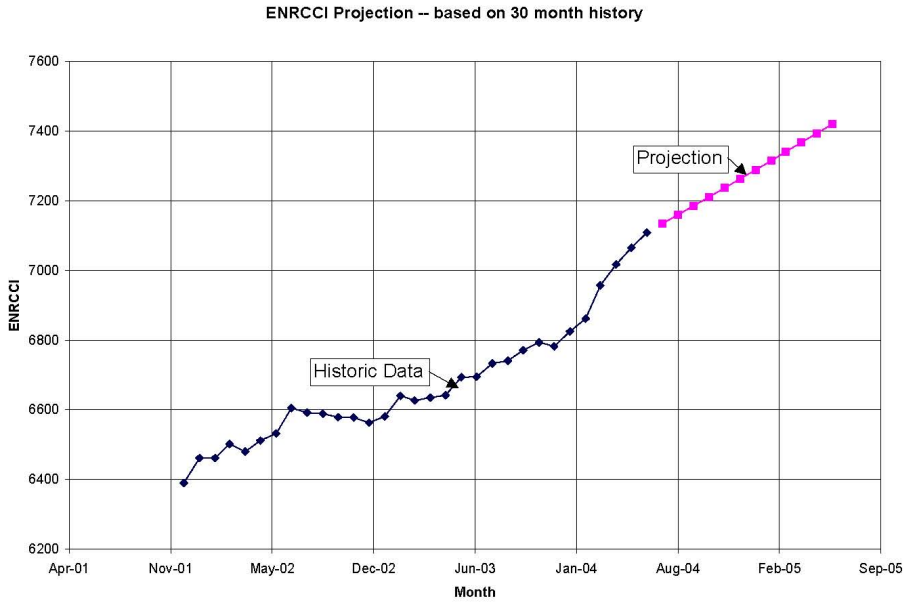

Exhibit 1. Cost Estimating and Economic Criteria for 2005 District Water Supply Plan (Continued).

The cost basis for the 2000 DWSP was March 1996 with a corresponding ENRCCI value of 5,537. Using the projected mid-year 2005 ENRCCI value of 7,420 represents an increase in the cost basis of about 34 percent.

The conceptual planning level cost estimates prepared for the 2004 Interim Update DWSP projects are expressed on an April 2003 cost basis with a corresponding ENRCCI value of 6,635. Therefore, the cost basis for the 2005 DWSP will be approximately 11.8 percent greater than the cost basis for the 2004 Interim Update.

Non-construction Capital Cost

Non-construction capital cost will equal 45% of the planning level estimated construction cost. This includes a 20% allowance for construction contingency and a 25% allowance for engineering design, permitting, and administration. This value is unchanged from the 2000 DWSP.

Land Cost

Unit land cost ($/acre) for each parcel are based upon land use classification and size as supplied by SJRWMD land acquisition staff for the 2000 DWSP. An evaluation of current land values, as per recent SJRWMD land purchases, did not provide an adequate basis for revising the 2000 DWSP values. If actual site-specific land values are available for a given parcel and water supply option the site-specific value should be used in lieu of these typical regional values.

General land use classifications include urban, suburban, and rural. Size is based on acreage, where *small* refers to parcels 50 acres or less in size and *large* refers to parcels greater than 50 acres in size. Exhibit 2 provides the unit land cost matrix for parcels located within SJRWMD.

EXHIBIT 2
Unit Land Cost for Parcels
Cost Estimating & Economic Evaluation Criteria

Land Use Classification	Parcel Size	
	Small (< or = 50 acres) ($/acre)	Large (> 50 acres) ($/acre)
Urban	$ 100,000	N/A
Suburban	$ 20,000	$ 10,000
Rural	$ 5,000	$ 3,000

Unit land costs ($/ft^2) for pipeline corridors vary based on the land use classification and whether or not the parcel is adjacent to public right of way (ROW) or in an undeveloped (new) area, and whether an easement or full ROW is required. Exhibit 3 provides the unit

Exhibit 1. Cost Estimating and Economic Criteria for 2005 District Water Supply Plan (Continued).

cost matrix for pipeline corridors located within SJRWMD. These values are the same as used in the 2000 DWSP.

EXHIBIT 3
Unit Land Cost for Pipeline Corridors
Cost Estimating & Economic Evaluation Criteria

Land Use Classification	Adjacent to Public ROW		New Area	
	Easement ($/ft^2)	ROW ($/ft^2)	Easement ($/ft^2)	ROW ($/ft^2)
Urban	$ 4.00	$ 6.00	$ 3.00	$ 5.00
Suburban	$ 1.50	$ 3.00	$ 1.00	$ 2.00
Rural	$ 0.75	$ 1.00	$ 0.50	$ 0.75

Land Acquisition Cost

Land acquisition cost estimates will vary as a function of condemnation requirements, as follows:

- 12% of land value for known non-condemnation parcels
- 25% of land value for know condemnation parcels
- 18% of land value where condemnation status is unknown

In most case, at the conceptual regional planning level of analysis, it is anticipated that condemnation status will be unknown and therefore the 18% value will apply. A single value of 25% was used in the 2000 DWSP.

Interest Rate

For the 2005 DWSP, the interest rate to be used in all economic analysis calculations will be the current (FY04) federal water resources planning rate. This rate, set annually by the US Bureau of Reclamation for use by all federal agencies, is based on US Treasury bond rates. Although it is adjusted annually, it cannot be changed by more than ¼ percent in any single year. The current (FY04) federal planning rate, as published in the Federal Register (April 26, 2004), is 5.625 % per annum. This value will be used in all economic calculations for the 2005 DWSP.

The interest rate used in the 2000 DWSP was 7 % per annum. A value of 6 % was used in the 2004 Interim Update DWSP. Since that time the Federal water resources planning discount rate has been chosen as the interest rate criterion for water supply planning.

Economic Life of Facilities

The economic service life of facilities is based on the criteria used in the 2000 DWSP. Exhibit 4 provides the economic service life, in years based on component type. These values will be used in all annual cost and present worth calculations.

Exhibit 1. Cost Estimating and Economic Criteria for 2005 District Water Supply Plan (Continued).

In all cases, land is considered a permanent resource and therefore has an infinite service life.

EXHIBIT 4
Economic Service Life
Cost Estimating & Economic Evaluation Criteria

Component Type	Service Life (years)
Water Conveyance Structures (pipelines, collection and distribution systems)	40
Other Structures (buildings, tankage, site improvements, etc.)	35
Wells	30
Process and Auxiliary Equipment (treatment equipment, pumps motors, mechanical equipment, etc.)	20
Reverse Osmosis Membranes	5

The non-construction capital costs associated with a given project, or major project component, will also be distributed in proportion to expected service life of the project. For example, if a given project, or major project component, has an economic service life of 20 years then the non-construction capital cost for that project, or major project component, also has an economic service life of 20 years.

Present Worth

A 20-year planning period will be used in present worth calculations. This present worth planning period was also used in the 2000 DWSP.

Summary

Generally, definitions and cost estimating and economic criteria applied to the 2005 DWSP will be the same as those applied to the 2000 DWSP. The main exceptions are the cost basis, the land acquisition cost factor and the interest rate.

All 2005 DWSP costs will be estimated year 2005 costs; whereas, the 2000 DWSP was developed using March 1996 costs. The cost basis for the 2004 Interim Update DWSP was April 2003.

The second change is the land acquisition factor. Land acquisition costs were estimated as 25% of land value for the 2000 DWSP. For the 2005 DWSP, this factor will vary depending upon condemnation status.

The final change is the interest rate used in the economic calculations. An interest rate of 7% was used for the 2000 DWSP and an interest rate of 6% was used for the 2004 Interim

Exhibit 1. Cost Estimating and Economic Criteria for 2005 District Water Supply Plan (Continued).

Update DWSP. An interest rate of 5.625% will be used for the 2005 DWSP. The 2005 DWSP interest rate is equal to the current (FY04) Federal water resources planning rate.

All other definitions and criteria remain unchanged.

REFERENCES CITED

St. Johns River Water Management District. 2004. *Cost Estimating and Economic Criteria for 2005 District Water Supply – Technical Memorandum*. CH2M Hill. Palatka, FL.

APPENDIX I
Conservation

OVERVIEW

The 2000 Lower West Coast (LWC) Regional Water Supply Plan recommended plumbing retrofits for both interior plumbing fixtures and rain sensors for automatic landscape irrigation systems; continuation/expansion of the Mobile Irrigation Laboratory (MIL) Program; and, voluntary conversion of agricultural seepage irrigation systems to microirrigation in the Lower West Coast (LWC) Planning Area. Based on consensus from stakeholders and the analysis associated with this plan, it was concluded that the 2000 plan recommendations remain valid and should continue to be implemented.

Water conservation options were selected from *The Florida Water Conservation Initiative's* (FDEP 2002) list of potential conservation measures. These are the methods best suited to the scope of the regional water supply plan. Options with the greatest potential water savings were identified; relevant information was assembled, such as laws, ordinances and District rules; and, age of housing stock in the LWC Planning Area were considered and analyzed. An analysis of potential conservation water savings was performed. Funding mechanisms for the recommended alternatives are also discussed in this appendix.

AGRICULTURE IRRIGATION CONSERVATION

Citrus is the dominant crop in the LWC Planning Area. Over 66 percent of the citrus acreage in the planning area uses low-volume technology or microirrigation, while the remaining acreage uses flood irrigation. Conversion of citrus acreage now using flood irrigation to microirrigation will continue to increase water savings

In 2004, the South Florida Water Management District (SFWMD or District) responded to a request from the Institute of Food & Agricultural Sciences (IFAS), University of Florida, to become a funding participant in the Florida Automated Weather Network (FAWN). This network of weather stations provides real-time and historical data to water users (agricultural, as well as urban landscape) for making informed irrigation decisions.

Agricultural Best Management Practices

The Best Management Practices (BMPs) Program, authorized by Section 403.067, Florida Statutes (F.S.), was developed to help farmers improve water quality. The BMPs programs are voluntary and were developed in cooperation with specific agricultural commodity groups. The commodity groups that presently have BMPs programs in place or under development are Cattle, Citrus (Indian River area and Ridge area), Green Industries (landscape, nurseries and golf courses), Horses, Silviculture (forestry) and Vegetables. In the LWC Planning area, Nursery BMPs mobile irrigation labs (MILs) are implementing the nursery BMPs.

Section 403.021, F.S., mandates the involvement of the SFWMD in the BMPs Program. Administered by the Florida Department of Agriculture and Consumer Services (FDACS), the BMPs Program involves several state, federal and local agencies. The Florida Department of Environmental Protection (FDEP) sets allowable pollution limits called Total Maximum Daily Loads (TMDLs) for nutrients. Resource Conservation and Development Corporations and Soil and Water Conservation Districts provide local support for BMP programs. The University of Florida IFAS evaluates individual grove owners' BMP compliance and has written the *Water Quality/Quantity BMPs for Indian River Area Citrus Groves*. The United States Department of Agriculture–Natural Resources Conservation Service (USDA–NRCS) provides technical assistance and some additional cost-sharing for the program.

One of the major incentives to join the BMPs Program is a cost-sharing arrangement with the Florida Department of Agriculture and Consumer Services (FDACS) on implementation costs. The SFWMD provides financial and technical assistance for the program startup.

Agricultural Mobile Irrigation Labs

The Mobile Irrigation Lab (MIL) Program began in south Florida in 1989 with an agricultural lab in the LWC Planning Area. Since then, the agricultural MIL in this region has been serving Collier, Lee, Hendry Glades and Charlotte counties.

The mission of the labs is to educate and demonstrate to agricultural and urban water users how to irrigate efficiently. Currently, there are 15 operational labs throughout the District. Twelve counties are served by the labs. Ten MILs are District-funded and five are funded by other sources. Four of these MILs provide agricultural evaluations. Funding is a multi-agency partnership between federal, state, regional and local levels of government. The agencies currently funding MILs are the USDA–NRCS, the SFWMD and the SFWMD's Big Cypress Basin Board, various Soil and Water Conservation Districts, the FDACS, and various county and local governments. Since 2001, recommendations for improvements to irrigation systems have yielded average annual potential water savings of 0.9 million gallons per day (MGD).

URBAN WATER CONSERVATION

Utilities in the LWC Planning Area have promoted water conservation through traditional methods, such as public outreach and customer information. The utilities in this region have implemented the Consumptive Use Permit (CUP) Program water conservation requirements, resulting in implementation of water conservation programs and adopted conservation ordinances.

The approach to evaluating the best conservation measures for the LWC Planning Area was a repetitive one. The evaluation process entailed identifying characteristics of

the planning area, such as age of housing stock, that would likely determine the type or respective age of technology of indoor plumbing devices, and characterizing use patterns by service area and per capita trends (**Table 1**).

Table 1. Examples of How Alternatives are Evaluated.

Planning Area Housing Characteristic	Best Opportunity	Conservation Measure
Indoor - older housing with inefficient indoor plumbing fixtures	Retrofits	Plumbing (e.g., toilets, showerheads, etc.)
Outdoor – irrigation systems that do not respond to rainfall	Retrofits	Rain shut-off switches
New development	Local ordinances/ codes/regulatory measures	Varies from code enforcement to landscape technology, such as Xeriscape™

Indoor Water Use

Two significant changes occurred in plumbing standards in 1983 and 1994, which affected residential water use. In 1983, Chapter 553, F.S., was modified, lowering the maximum allowable flow rates for water fixtures in new construction to a maximum use of 3.5 gallons per flush for toilets and a flow rate of 3.0 gallons per minute (GPM) for showerheads. Prior to this state legislation, the typical volume of water for toilet flushing was 6.0 gallons and showerhead flow was 6.0 GPM.

In 1994, new plumbing standards for water use were implemented under the Federal Energy Policy Act of 1992, setting national plumbing code standards of 1.6 gallon per flush for toilets, 2.5 GPM for showerheads and 2.0 GPM for faucets.

Methodology

In order to determine urban areas with the greatest potential for retrofits in the LWC Planning Area, a housing stock analysis was performed using age of housing as a determinate of the age and water use characteristics of plumbing fixtures. County property assessors parcel data for Charlotte, Collier, Glades, Hendry and Lee counties provided the number and age of residential units. The age of the residential units was compared to years when the plumbing code changed as described previously (pre-1984, 1984–1994, 1994–2000).

Table 2 shows the number of units and percentages of housing in each group for Charlotte, Collier, Glades, Hendry, and Lee counties.

Table 2. Age of Housing Stock in Lower West Coast Counties (Indoor Retrofit).

County	Housing Stock			
	Pre 1984	1985-1994	Post 1994	Total
Charlotte[a]	90 48%	70 37%	27 14%	187
Collier	28,282 43%	20,789 32%	16,925 26%	65,996
Glades[a]	1,383 68%	454 22%	200 10%	2,037
Hendry[a]	5,068 61%	2,389 29%	818 10%	8,275
Lee	87,506 55%	44,946 28%	26,619 17%	159,071
Grand Total	122,329 52%	68,648 29%	44,589 19%	235,566

a. Portions of these counties in the LWC Planning Area. Source: Tax assessors

Costs and Savings

Utilities that would benefit most from plumbing fixture retrofits are those with significant housing in the pre-1984 age category, and therefore have the most potential for indoor water savings.

Water savings derived from retrofitting pre-1984 housing to current standards is 4.4 gallons per flush for toilets, and 3.5 GPM for showerheads. Toilets are estimated to be flushed five times a day, while 10 minutes per shower is a standard estimate. According to the 2000 U.S. Census, number of persons-per-household was 2.18 in Charlotte County, 2.39 in Collier, 2.51 in Glades County, 3.09 in Hendry County and 2.31 in Lee County.

Annual savings from retrofitting one unit from the pre-1984 technology to current standards would be 32,000 gallons for each retrofitted showerhead and 20,075 gallons for each retrofitted toilet.

For the purposes of this approach, it is assumed that a retrofit program would include 75 percent of the pre-1984 housing stock. This percentage is typically used as an estimate of expected coverage in an urban retrofit program, as some retrofits have already been done, some units are vacant or on the market, or for other reasons will not be part of the program. Using the county housing age data in **Table 2**, and assuming the 75 percent retrofit, the total potential annual savings of a showerhead retrofit is 0.005 MGD for Charlotte County; 1.80 MGD for Collier County; 0.09 for Glades County; 0.41 MGD for Hendry County; and, 5.30 MGD for Lee County, for a total of 7.60 MGD in the LWC Planning Area.

Similarly, using the housing age data in **Table 2**, and assuming the 75 percent retrofit, total annual savings of a toilet retrofit is 15.003 MGD for Charlotte County; 1.12 MGD for Collier County; .006 MGD for Glades County; 0.26 MGD for Hendry County; and. 3.34 MGD for Lee County, for a total potential savings of 4.48 MGD in the planning area.

Total annual savings for both toilet and showerhead retrofits is 0.01 MGD for Charlotte County; 2.89 MGD for Collier County; 0.15 MGD for Glades County; 0.67 for Hendry County; and, 8.64 MGD for Lee County, for a total potential savings of 12.36 MGD. This estimate assumes one retrofit of each device per housing unit.

Whenever indoor water use is reduced, there is also a reduction in wastewater. Wastewater flows have been estimated to be as much as 50 percent of residential water use. Impacts to wastewater treatment facilities and the need for expansion and disposal can be reduced if water use is reduced.

Table 3 shows the estimated savings that could be accrued in the LWC Planning Area if the three retrofit measures are implemented, as well as the costs and assumptions used in the calculations. Costs for retrofits are $200 per toilet retrofit and $20 per showerhead, as described in the *Consolidated Water Supply Plan Support Document* (SFWMD 2006). Water conservation cost-efficiency is expressed in 1,000 gallons of water saved annually. Toilet retrofits cost $.25 per 1,000 gallons of water saved, and showerhead retrofits cost $.06 per 1,000 gallons of water saved.

The estimated amount of water that could potentially be conserved in the LWC Planning Area is 22.30 MGD for urban use within the 20-year planning horizon as a result of retrofit conservation measures. Achieving this savings, however, is highly dependent on cooperating utilities.

Table 3. Savings Achieved by Implementing the Recommended Measures for Conservation in the LWC Planning Area.

Housing Stock Characteristic	Conservation Measure	Water Savings per Retrofit Device	Cost per Device	Cost per 1,000 gallons	Planning Area Savings Based on Retrofit of 75% of Characteristic Housing Stock	Estimated total Cost in Millions
Housing Built before 1984	Showerhead retrofit	3.5 gallons/minute	$20	$.06/1,000	7.6 MGD	$1.83
Pre-1992 Outdoor Irrigation Systems Without Rain Sensors	Rain sensor installation	74 gallons/day	$68	$1.07 /1,000	9.9 MGD	$9.12
Housing Built before 1984	Toilet retrofit	4.4 gallons/flush	$200	$.25/1,000	4.8 MGD	$18.35
Planning Area Savings					22.3 MGD	$29.30

Note: Based on Housing Counts from Tax Assessors data.

Urban Landscape Irrigation

Methodology

Rain sensor cut-off devices have been demonstrated to be an effective means of reducing wasteful irrigation in automatic systems when local rainfall has met the immediate irrigation requirement. To determine housing with the greatest potential for outdoor retrofits, age of the housing unit was compared to the law related to rain sensor changes (pre-1992 and 1992–2000). The percentages of units constructed in the two time periods are described for each county. Data for **Table 4** were obtained from county property assessors parcel data as previously described.

For this evaluation, water savings derived from installing rain sensors for housing stock built prior to 1992 is estimated. Based on the county housing age data in **Table 4**, and assuming 75 percent of the housing units are retrofitted, a total savings of 9.93 MGD is estimated for the LWC Planning Area (0.01 MGD for Charlotte County; 2.52 MGD for Collier County; 0.10 MGD for Glades County; 0.39 MGD for Hendry County; and, 6.92 MGD for Lee County).

Installing rain sensors in irrigation systems of housing units constructed prior to the 1991 Xeriscape™ Landscaping law would result in the greatest savings. For those systems using reclaimed water, additional efficiencies can be realized using metering.

Table 4. Age of Housing Stock in Lower West Coast Counties (Rain Sensor).

County	Housing Stock		
	Pre 1992	Post 1992	Total
Charlotte[a]	143 76%	44 24%	187
Collier	45,443 69%	20,553 31%	65,996
Glades[*]	1,726 85%	311 15%	2,037
Hendry[*]	6,940 84%	1,335 16%	8,275
Lee	124,601 78%	34,470 22%	159,071
Grand Total	178,853 76%	56,713 24%	235,566

a. Portions of these counties in the LWC Planning Area. Source: Tax assessors

Costs and Savings

Rain sensors can provide a significant reduction in water use for nominal cost. The cost is estimated to average $68 per rain sensor, including installation, and can save 12,700 gallons per year. This equates to a cost of $1.07 per 1,000 gallons. The useful life of a rain sensor is estimated to be five years. Areas benefiting the most from a rain sensor retrofit program would be pre-1994 housing units with in-ground irrigation systems.

Urban Mobile Irrigation Labs

In the LWC Planning Area, there are four urban labs. Two of these labs, one in Collier and one in Lee County, are funded by the District Mobile irrigation lab personnel evaluate the effectiveness of irrigation systems and then make recommendations on how the systems can be made more efficient. The result is savings in water, energy, time and money for the user.

CONSERVATION MEASURES

Table 5 provides a general list of recommended conservation measures that would be effective in different types of utility service areas based on the population growth rate, housing stock and potential for growth.

The SFWMD actively engages in devising programs for retrofits, and has dedicated outreach specialists and intergovernmental representatives to assist utilities, local governments and water users to achieve the goals of this plan update. The District's Water Savings Incentive Program (WaterSIP) is tailored to assist the community to

partially fund projects, such as large-scale retrofits, as recommended by this plan update. Through the WaterSIP, the SFWMD will continue to provide matching funds up to $50,000 to water providers for water-saving technologies.

Table 5. Utility Characteristics and Conservation Methods.

Type of Utility	Characteristics of Utilities	Utility Specific Recommendations
Large Growth Potential	Considerable existing housing stock of intermediate to old age, significant land available for new development	Indoor retrofits, Xeriscape™ ordinance, irrigation hours ordinance, outreach and education
Moderate Growth Potential	Existing housing stock intermediate in age, moderate potential for development – limited by boundaries of other utility service areas and natural areas	Indoor retrofits, Xeriscape™ ordinance, irrigation hours ordinance, promote Mobile Irrigation Lab, outreach and education
Limited Growth Potential	Housing stock is older, service area is near build-out, very limited potential for growth	Indoor retrofits, rain sensor installation, promote Mobile Irrigation Lab, outreach and education

The SFWMD will also provide increased technical assistance, as well as outreach and education efforts in the LEC Planning Area. These efforts include annual conservation workshops held at the service center to showcase the District's funding programs for conservation and alternative water supplies; funding support for annual WaterFest events; support of Florida Yards and Neighborhoods; and, MIL educational efforts. Savings may vary from year to year as programs are implemented.

CONSERVATION – IMPLEMENTATION STRATEGIES

The following are potential strategies for water conservation that were developed in cooperation with the public:

- Landscape irrigation water conservation has the potential for significant water savings, and has the potential to reduce Surficial Aquifer System resource issues. This may be accomplished by expanding MIL activity in the planning area, and may involve local government funding partnerships to increase lab services, especially in newer urban communities.
- Local governments should consider developing ordinances to address water-conserving landscape installation for new construction to maximize water savings in initial design and operation of both residential and commercial sites.
- Implement cost-effective indoor and outdoor retrofits in the LWC Planning Area based on the preceding analyses.
- Complete water conservation rulemaking for Chapter 40E-2, F.A.C., and the *Basis of Review for Water Use Permit Applications*, emphasizing goal-based conservation programs for public water suppliers and major water users.
- Fund projects through the WaterSIP, including public/private partnerships, which further the preceding recommendations.
- Expand outreach and education through funding, public/private partnerships, the media, professional organizations and users.

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