2023-2024
LOWER EAST COAST
WATER SUPPLY PLAN UPDATE

PLANNING DOCUMENT

Cover Photos

Front Top: Sugarcane
Front Bottom: Miami Beach, Biscayne Bay
Back: Miami Beach, Biscayne Bay

Acknowledgments

The South Florida Water Management District (SFWMD) recognizes and thanks the regional water supply workshop participants for their contributions, comments, advice, information, and assistance throughout the development of this *2023–2024 Lower East Coast Water Supply Plan Update.*

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

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Executive Summary

The South Florida Water Management District's (SFWMD or District) strategic goal for its water supply plans is to identify sufficient water supply sources and projects to meet existing and future reasonable-beneficial uses during 1-in-10-year drought conditions while sustaining water resources and related natural systems. This *2023–2024 Lower East Coast Water Supply Plan Update* (2023–2024 LEC Plan Update) is the fourth update to the *2000 Lower East Coast Regional Water Supply Plan* (2000 LEC Plan), which previously was updated in 2006, 2013, and 2018. This plan update is consistent with the water supply planning requirements of Chapter 373, Florida Statutes (F.S.), and presents population and water demand projections through 2045, a review of water supply issues and evaluations, and a list of water source options. It also examines local and regional water supply efforts and describes water resource and water supply development projects completed since the 2018 update.

This 2023–2024 LEC Plan Update was developed in an open, public forum (**Chapter 1**). Meetings and workshops were held with water users, local and tribal governments, utilities, as well as agricultural industry and environmental representatives to solicit input, provide information about planning results, and receive comments on draft sections of the plan update. The SFWMD held three virtual public workshops for this water supply plan update.

The LEC Planning Area covers more than 6,500 square miles of southeastern Florida, including all of Palm Beach, Broward, and Miami-Dade counties, most of Monroe County, and the eastern portions of Hendry and Collier counties. The LEC Planning Area includes unique and critical ecosystems, such as the Everglades, Lake Okeechobee, Florida Bay, Biscayne Bay, Florida Keys, Loxahatchee River, and Lake Worth Lagoon. These ecosystems coexist with large agricultural areas around Lake Okeechobee and in southern Miami-Dade County, and with expansive urban areas that comprises 30% of the state's population.

Typically, the LEC Planning Area receives abundant rainfall seasonally, with volumes exceeding human and natural system needs during wet periods. Annual precipitation averages 57 inches, with three-quarters of rainfall occurring between May and October. Water availability varies annually with periodic drought years. There is an extensive network of canals and waterworks used for water supply and flood control in the LEC Planning Area. The regional water management system plays a critical role in capturing wet season stormwater for use during dry times, moving water between natural systems, delivering water to agricultural areas and urban coastal communities, and moving excess water to tide to provide flood protection. Fresh groundwater from the surficial aquifer system (SAS) and surface water from Lake Okeechobee are the primary water sources for urban, agricultural, and industrial uses in the LEC Planning Area.

Climate change and sea level rise are issues of concern, especially in coastal regions. South Florida is particularly vulnerable to potential changes in climate and sea level because of its location, regional variability in climate, hydrology, geology, low topography, natural resources, and dense population in coastal areas. To plan and prepare for regional climate change and sea level rise, the SFWMD is conducting research and computer modeling to better predict and reduce uncertainties, analyzing vulnerabilities in the current water

management system, and developing effective adaptation strategies for the future. Coordination with other resource management entities and governments is vital to ensuring a common approach and shared information moving forward.

DEMAND ESTIMATES AND PROJECTIONS

As described in **Chapter 2** and **Appendix A**, the LEC Planning Area has one of the fastest growing populations in the country. The region is home to approximately 6.2 million people and supports a large seasonal population, tourism and golf, and a substantial agricultural industry. The permanent population is projected to reach approximately 7.3 million people by 2045, a 17% increase from the 2021 base year estimate for this plan update. Details about Public Supply (PS) utilities, including the populations within their service areas, are provided in **Appendix B**.

Current and future water demands are heavily influenced by the existing and projected population. Population growth will lead to increases in water demands for public supply, landscape irrigation, power generation, and mining operations in the region. Irrigated agricultural acres are projected to remain relatively stable, declining 3% over the planning horizon.

Total water demands under average rainfall conditions for all water use categories are projected to increase 11%, from a total water use of approximately 1,854.52 million gallons per day (mgd) in 2021 to 2,063.36 mgd in 2045 (**Table ES-1**). Projected demands under 1-in-10-year drought conditions are 348 mgd (17%) higher than the average demands in 2045.

The PS water use category is projected to remain the largest in the LEC Planning Area accounting for approximately 51% of the total 2045 projected demand. Agriculture (AG) is the second largest water use category, representing 31% of the total 2045 projected demand. Landscape/Recreational (L/R) is the third largest water use category representing approximately 10% of the total 2045 projected demand. Domestic Self-Supply (DSS), Commercial/Industrial/Institutional (CII), and Power Generation (PG) collectively account for approximately 8% of the total 2045 projected demand.

Table ES-1. Estimated (2021) and projected (2045) gross water demands under average rainfall conditions in the LEC Planning Area.

Water Use Category	2021 Estimated Use (mgd)	2045 Projected Demand (mgd)	Percent Change	Percent of Projected 2045 Total*
Public Supply	890.57	1,047.19	18%	51%
Domestic Self-Supply	10.55	14.45	37%	<1%
Agriculture	645.20	637.65	-1%	31%
Commercial/Industrial/Institutional	87.35	102.56	17%	5%
Landscape/Recreational	178.65	199.18	11%	10%
Power Generation	42.20	62.33	48%	3%
LEC Planning Area Total	**1,854.52**	**2,063.36**	**11%**	**100%**

LEC = Lower East Coast; mgd = million gallons per day.
*May not equal 100% due to rounding.

DEMAND MANAGEMENT: WATER CONSERVATION

Water conservation by all water use categories continues to be a priority to help meet future water needs. Conservation programs often are among the lowest-cost solutions to meet future demands and can reduce costs over the long term if properly planned and implemented (**Chapter 3**). Conservation efforts in the LEC Planning Area have effectively lowered the net (finished) water per capita use rate for PS over the past two decades, from 176 gallons per capita per day (gpcd) in 2000 to approximately 131 gpcd per day in 2021. Analyses suggest that Palm Beach, Broward, Miami-Dade, Hendry, and Monroe counties collectively can save an additional 62.13 mgd by 2045 if various urban and agricultural conservation options are implemented.

NATURAL SYSTEMS AND RESOURCE PROTECTION

The LEC Planning Area encompasses extensive natural systems, including the Everglades, Lake Okeechobee, Florida Bay, Biscayne Bay, Florida Keys, Loxahatchee River, and Lake Worth Lagoon (**Chapter 5**). The region has two national parks and five national wildlife refuges. Natural systems are protected and addressed through regulatory mechanisms, restoration efforts, and water resource development projects.

In the LEC Planning Area, minimum flows and minimum water levels (MFLs) with their associated recovery strategies have been previously adopted for Lake Okeechobee, the Everglades, and the Northwest Fork of the Loxahatchee River. The Lake Okeechobee MFL recovery strategy has been revised as part of this plan with consideration of the Herbert Hoover Dike repairs, new lake regulation schedule, and additional storage projects (**Appendix C**). MFLs with prevention strategies have been adopted for Florida Bay, the Biscayne aquifer, and the Lower West Coast aquifers. A re-evaluation of the adopted MFL criteria for Florida Bay was completed in 2014. A water reservation, another resource protection regulatory mechanism, was established for Nearshore Central Biscayne Bay in 2013 and for the proposed Everglades Agricultural Area (EAA) Reservoir in 2021. Restricted allocation areas (RAAs), another resource protection regulatory mechanism, were established for the L-1, L-2, and L-3 canal system in 1981; the North Palm Beach County/Loxahatchee River Watershed Waterbodies and LEC Everglades Waterbodies in 2007 (amended in 2022); the Lake Okeechobee Service Area (LOSA) in 2008; and the water stored via aquifer storage and recovery (ASR) wells at the C-18W Reservoir site in 2022.

There are numerous large ecosystem restoration projects under way in the LEC Planning Area (**Table ES-2**, **Chapter 7**) that are vital to improving and maintaining the viability of the region's natural systems and water resources, including elements identified in MFL recovery and prevention strategies. The Comprehensive Everglades Restoration Plan (CERP), a partnership between the United States Army Corps of Engineers (USACE) and the SFWMD, is a critical component of ecosystem restoration and water supply. CERP includes numerous capital projects needed to protect and restore natural systems and increase water availability. An Integrated Delivery Schedule organizes the implementation of capital projects and is updated every year.

Table ES-2. Water resource development projects within the LEC Planning Area by region.

Region	Project	Status
Lake Okeechobee	CERP Lake Okeechobee Watershed Restoration Project (LOWRP)	Planning/Construction
	USACE Herbert Hoover Dike Major Rehabilitation	Construction Complete
	Lake Okeechobee Component A Storage Reservoir (LOCAR)	Planning
	Central Everglades Planning Project (CEPP) A-2 Reservoir and Stormwater Treatment Area (STA)	Planning/Construction
Everglades	Restoration Strategies Regional Water Quality Plan	Construction
	Modified Water Deliveries to Everglades National Park	Operational
	CERP Water Conservation Area 3A Decompartmentalization Physical Model	Operational
	CERP Central Everglades Planning Project (CEPP)	Construction
	C-111 South Dade Project	Construction
	CERP C-111 Spreader Canal Western Project	Planning
Western Basins	CERP Western Everglades Restoration Project	Planning
	C-139 Annex Restoration	Construction
LEC Service Areas	Restoration Plan for the Northwest Fork of the Loxahatchee River	Planning
	CERP Loxahatchee River Watershed Restoration Project	Planning/Design
	CERP Environmental Preserve at the Marjorie Stoneman Douglas Everglades Habitat	Operational
	CERP Fran Reich Preserve Reservoir Levee	Operational
	CERP Broward County Water Preserve Areas	Planning/Design
	CERP Biscayne Bay Coastal Wetlands Project	Planning/Construction
	CERP Biscayne Bay and Southern Everglades Ecosystem Restoration	Planning

WATER SOURCE OPTIONS

Water users in the LEC Planning Area rely on surface water, groundwater (fresh and brackish), and reclaimed water (**Chapter 5**) to meet urban and agricultural demands. Surface water from canals and lakes, and fresh groundwater from the SAS are considered traditional water sources. Alternative water supply sources include brackish groundwater from the Floridan aquifer system (FAS), reclaimed water, seawater, and excess surface water and groundwater captured and stored in ASR wells, reservoirs, and other storage features. Use of alternative water supplies is an integral part of the current and future water supply strategy.

PS utilities within the LEC Planning Area primarily rely on fresh groundwater from the SAS, with limited use of the FAS, and one utility uses surface water. Groundwater sources can meet 2045 PS demands; however, increases in fresh groundwater allocations are limited to comply with resource protection criteria. Of the 54 PS utilities in the LEC Planning Area, 11 will need to construct new projects to meet their projected 2045 demands. These new projects include expanded use of the FAS and use of the C-51 Reservoir, both of which are alternative water sources; SAS aquifer recharge offsets; and interconnections with nearby utilities for bulk water purchases.

Fresh groundwater from the SAS supplies 100% of the estimated demand for DSS in the LEC Planning Area. Although DSS demand is expected to increase by 37% over the planning horizon, groundwater from the SAS can continue to meet the 2045 DSS demands in most areas.

Approximately three-quarters of the total agricultural acreage in the LEC Planning Area is in the EAA, which relies exclusively on surface water. There are two other agricultural areas in the LEC Planning Area that rely on fresh groundwater: southern Miami-Dade County and the eastern portion of Hendry County. In those areas, groundwater sources can meet 2045 AG demands; however, increases in fresh groundwater allocations are limited by resource protection criteria.

L/R irrigation users, including golf courses, rely primarily on surface water, fresh groundwater, and reclaimed water in nearly equal amounts. In addition, eight L/R users meet their demands with treated brackish groundwater from the FAS for golf course irrigation. Increases in L/R demands are expected to be met primarily through the expansion of reclaimed water systems in Palm Beach and Broward counties and with fresh groundwater in Miami-Dade County.

For CII users, the 2021 demands for the LEC Planning Area were distributed evenly with half between surface water and reclaimed water and the other half fresh groundwater. Increases in the CII category through 2045 are expected to be met by fresh groundwater and surface water. There are 12 major power generation facilities within the LEC Planning area, and 7 of them have demands met from groundwater or reclaimed water. No new power generation facilities requiring water supply are planned for construction or operation through 2045. **Table ES-3** summarizes the variety of water source options that typically are used by each water use category.

Table ES-3. Typical water source options for the water use categories in the LEC Planning Area.

Water Use Category	Fresh Surface Water	Fresh Groundwater	Brackish Groundwater	Reclaimed Water
Public Supply	✓	✓	✓	
Domestic Self-Supply		✓		
Agriculture	✓	✓		
Commercial/Industrial/Institutional	✓	✓		✓
Landscape/Recreational	✓	✓	✓	✓
Power Generation		✓	✓	✓

Surface Water

Surface water supply sources for the LEC Planning Area include Lake Okeechobee, water conservation areas, Central and Southern Florida (C&SF) Project canals, county and water control district canals, reservoirs, and on-site ponds. Water availability from Lake Okeechobee and connected surface water bodies is limited due to concerns regarding protection of existing legal users, limited storage, and environmental needs. Specific surface water volumes in eastern Hendry County are identified for the Seminole Tribe of Florida Big Cypress Reservation in addition to a secondary irrigation supply from Lake Okeechobee. As discussed earlier, use of several surface water bodies is limited by RAA rules and MFLs. The City of West Palm Beach is the only PS utility using surface water as its primary water supply; however, application has been made to the SFWMD for authorization to withdraw groundwater from the FAS, reducing the utility's reliance on surface water. Future surface water demands are expected to decrease slightly for AG and remain relatively static for PS, CII, L/R, and PG. Additional water storage features and tailwater recovery systems could enhance water availability.

For surface water users in LOSA, additional water can be stored in Lake Okeechobee resulting from the completion of the dike repairs and the revised regulation schedule, known as the Lake Okeechobee System Operating Manual (LOSOM). The USACE made available the Final Draft LOSOM Water Control Plan in 2023. The USACE final Record of Decision is anticipated by the end of 2024. The revised LOSOM will result in minor improvements to water supply, but it does not result in a sufficient increase in storage volumes to allow the lake to return to an MFL prevention strategy at this time. As such, the Lake Okeechobee MFL recovery strategy has been revised as part of this 2023–2024 LEC Plan Update. The environmental enhancement, regulatory criteria, and water shortage components of the MFL recovery strategy will not change. The SFWMD will continue to allocate water for existing and future reasonable-beneficial uses pursuant to its regulatory rules and criteria. The capital projects component has been revised. Additional details about the MFL and updated recovery strategy are provided in **Appendix C**. For increases in surface water use other than within LOSA, water availability would have to be determined based on local conditions.

Fresh Groundwater

The SAS, including the Biscayne and Lower Tamiami aquifers, is the primary source of fresh groundwater in the LEC Planning Area and is used by all water use categories. Further development of the SAS is limited by potential impacts on the regional system, wetlands, and existing legal users as well as proximity to contamination sources and the potential for saltwater intrusion or upconing of relict seawater. Specifically, use of the SAS in coastal areas is restricted 1) by the Biscayne Aquifer MFL prevention strategy, which specifies no further inland movement of salt water, and 2) near C&SF Project canals by the LEC Regional Water Availability criteria, which prohibits increased allocations that induce increased seepage from the canals.

Available water supplies for allocation in eastern Hendry County from the Lower Tamiami aquifer are constrained by the presence of isolated wetlands and the Lower West Coast Aquifers MFL. AG water demands in the portion of Hendry County within the LEC Planning Area are expected to increase by 5% over the planning horizon; water levels will require close monitoring where they are approaching the maximum developable limit. Water availability from the SAS will be determined locally in these areas, considering the quantities required, local resource conditions, existing legal users, and viability of other supply options.

In 2021, the SAS accounted for approximately 90% of PS use and 100% of DSS use in the LEC Planning Area. SAS use for PS is projected to increase from 824.41 mgd in 2021 to 939.33 mgd by 2045, as utilities maximize their permitted allocations from this source. The utilization of surface water from the C-51 Reservoir as an alternative source will allow certain PS utilities to increase withdrawals from the SAS by up to 35 mgd as an offset specified in those permits. Most PS utilities in the LEC Planning Area have been proactive in permitting and constructing water supply systems that anticipate demand increases and have proposed projects to meet future growth (**Chapter 8**).

The SFWMD is currently developing a density-dependent groundwater model for the SAS (i.e., East Coast Surficial Model [ECSM]) to evaluate the ability of this resource to sustainably meet future demands. Results of the model simulations will provide guidance for developing water management strategies, support periodic updates to the regional water supply plans, evaluate resiliency, and be used in regulatory applications. The current version of the model is being calibrated to water level and water quality (total dissolved solids observations for

transient conditions. Following completion of model calibration and verification as well as incorporation of peer review comments, the ECSM will be applied through the development of the planning demands for 2021 and 2045 model scenarios. Model results should be available in 2025, and the effects of these future demands on the SAS will be evaluated in support of this 2023–2024 LEC Plan Update.

For SAS water users, the most recent mapping of saltwater intrusion in Palm Beach, Broward, and Miami-Dade counties indicates the saltwater interface has remained relatively stable, but some inland movement has occurred. These maps are being updated based on 2024 dry season data and are scheduled to be published in fall 2024. Surface water canals and salinity control structures are operated to maintain water levels that minimize inland saltwater movement, and no regional declines in water levels have been observed. However, sea level rise is likely to accelerate the inland movement of the saltwater interface.

Brackish Groundwater

Brackish groundwater from the FAS is utilized by 24 PS utilities, 8 golf courses, and 3 power generation facilities. Additionally, seven utilities are proposing wellfield and reverse osmosis (RO) water treatment plant (WTP) projects to begin treating brackish water from the FAS to meet a portion of their 2045 projected demands. The 15 operating RO WTPs have a combined capacity of approximately 79.50 mgd. In 2021, the FAS and associated RO WTPs supplied water to meet 6% of PS demand and are expected to meet the same by 2045. Current and future FAS demands were previously simulated using the East Coast Floridan Model (ECFM), which is a peer-reviewed, calibrated regional FAS groundwater model. ECFM was used to assess the potential impacts of withdrawals on water quality and the viability of the source through the planning horizon in support of the 2018 LEC Plan Update. Since the 2045 projected FAS water demands are of a similar magnitude to the 2040 FAS water demands simulated and presented in the 2018 LEC Plan Update, it was determined that the results are still representative for 2045 in this 2023–2024 LEC Plan Update, and additional ECFM simulations were not needed. Review of historical chloride data and model results indicates properly managed FAS wellfields can meet projected demands through 2045.

Current groundwater level and quality data for the FAS are discussed in **Chapter 6** and **Appendix D**. Review and analyses of FAS water level and quality data indicate there have not been substantial regional changes; however, some local changes in water quality have been observed, which may be the result of localized pumping stresses or hydrologic conditions. FAS users may need to spread out withdrawal facilities or reduce individual well pumping rates to mitigate water quality changes. These areas should continue to be monitored through a coordinated effort with utilities and other FAS stakeholders.

Reclaimed Water

Use of reclaimed water is an important component of managing water supplies in the LEC Planning Area. In 2021, 28 of the 45 wastewater treatment facilities provided at least a portion of the treated wastewater for reuse in other areas. Including supplemental water sources, 14% (97.47 mgd) of the region's treated wastewater was reused for golf course and landscape irrigation, industrial uses, power generation facility cooling purposes, wetland hydration, and groundwater recharge. However, 601.90 mgd of potentially reusable wastewater was disposed, mainly through deep well injection and ocean outfall. Wastewater

flows are projected to increase to 849.62 mgd by 2045. Many utilities have constructed the required treatment facilities to produce reclaimed water for public access irrigation in anticipation of increased reclaimed water demand in the future. The volume of reclaimed water used for irrigation is projected to more than double by 2045 as a result of population growth and compliance with the Ocean Outfall Law pursuant to Section 403.086, F.S., requirements.

Water Storage

Capturing surface water and groundwater during wet conditions for use during dry conditions increases the amount of available water. In the LEC Planning Area, water storage options include ASR and reservoirs, which are considered alternative water supplies. As of 2021, there are two active ASR wells, three idle and available for operation, and one abandoned. Several others were repurposed as FAS supply wells.

Regional reservoirs (e.g., flow equalization basins and EAA A-2, C-51, and C-18W reservoirs) will attenuate stormwater, provide water quality treatment in conjunction with stormwater treatment areas, and store seasonally available water. Local agricultural reservoirs can store recycled irrigation water or collect stormwater runoff.

Seawater

There are two RO seawater desalination treatment plants in the LEC Planning Area. Both plants are in the lower Florida Keys and operated for emergencies. The Stock Island plant—the first desalination plant built in Florida—can produce up to 2 mgd of potable water, and the Marathon plant can produce another 1 mgd. Also, three power generation facilities in the LEC Planning Area use seawater for cooling purposes.

FUTURE DIRECTION

Chapter 9 contains guidance to help focus future efforts in the region to meet projected water needs. Some of the key suggestions to regional stakeholders, including the SFWMD, utilities, other government agencies, agricultural interests, and environmental groups, are as follows:

- Continue implementation of water conservation programs throughout the LEC Planning Area to increase water use efficiency and reduce the amount of water needed to meet future demands.
- Continue implementation of MFL prevention and recovery strategies, and review and update these strategies, as appropriate, in conjunction with future water supply plan updates.
- Evaluate future versions of LOSOM with consideration of capital projects being designed and constructed, such as ASR systems and aboveground storage reservoirs to increase storage capacity.
- Continue development of alternative water supplies, including maximizing the use of reclaimed water.

- Design new FAS wellfields to maximize withdrawals while minimizing water level and quality changes. This likely will require a combination of additional wells with greater spacing between wells, lower-capacity wells, and continued refinement of wellfield operational plans.
- Develop regional and local reservoirs and other storage systems (e.g., ASR systems), where possible, to increase surface water availability for environmental, agricultural, and urban water supply needs.
- Continue supporting ecosystem restoration efforts, including the Restoration Strategies Regional Water Quality Plan and CERP.
- Identify wells critical to long-term monitoring and modeling to ensure they are constructed, maintained, or replaced, as necessary.
- Continue mapping the saltwater interface and identify areas of concern that might require enhanced monitoring or changes in wellfield operations.
- Continue characterizing, monitoring, and designing adaptation solutions in response to climate change and sea level rise and their impacts to water supply and continue participating in the Southeast Florida Regional Climate Change Compact.

CONCLUSIONS

Building on the findings and conclusions of previous LEC water supply plan updates, this 2023–2024 LEC Plan Update assesses water supply demand and available sources through 2045. This plan update concludes that future water needs of the region during average and 1-in-10-year drought conditions can be met through the 2045 planning horizon with appropriate management, conservation, and implementation of projects identified herein.

Meeting future water needs through 2045 in the LEC Planning Area depends on the following:

- Construction of potable water supply development projects by PS utilities.
- Implementation of CERP Restoration Strategies and other water resource development projects to provide additional storage.
- Implementation of LOSOM and construction of CERP capital projects identified in MFL prevention and recovery strategies.

Successful implementation of this 2023–2024 LEC Plan Update requires close collaboration with agricultural interests, local and tribal governments, utilities, and other stakeholders. Coordination efforts should ensure that water resources in the LEC Planning Area continue to be prudently managed and available to meet future demands while also protecting natural systems.

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Acronyms and Abbreviations

2008 LORS	2008 Lake Okeechobee Regulation Schedule
AFSIRS	Agricultural Field Scale Irrigation Requirements Simulation
AG	Agriculture
APPZ	Avon Park permeable zone
ASR	aquifer storage and recovery
AWE	Alliance for Water Efficiency
AWS	alternative water supply
BBCW	Biscayne Bay Coastal Wetlands
BBSEER	Biscayne Bay and Southeastern Everglades Ecosystem Restoration
BCWPA	Broward County Water Preserve Areas
BEBR	Bureau of Economic and Business Research
bls	below land surface
BMP	best management practice
C&SF Project	Central and Southern Florida Project
CCS	cooling canal system
CEPP	Central Everglades Planning Project
CERP	Comprehensive Everglades Restoration Plan
CFP	Cooperative Funding Program
cfs	cubic feet per second
CII	Commercial/Industrial/Institutional
Compact	Southeast Florida Regional Climate Change Compact
District	South Florida Water Management District
DSS	Domestic Self-Supply
EAA	Everglades Agricultural Area
ECFM	East Coast Floridan Model
ECSM	East Coast Surficial Model
EQIP	Environmental Quality Incentives Program
F.A.C.	Florida Administrative Code
F.S.	Florida Statutes
FAS	Floridan aquifer system
FAWN	Florida Automated Weather Network

FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FEB	flow equalization basin
FKAA	Florida Keys Aqueduct Authority
FPL	Florida Power & Light
FSAID	Florida Statewide Agricultural Irrigation Demand
FY	Fiscal Year
gpcd	gallons per capita per day
gpm	gallons per minute
IAS	intermediate aquifer system
L/R	Landscape/Recreational
LEC	Lower East Coast
LFA	Lower Floridan aquifer
LOCAR	Lake Okeechobee Component A Storage Reservoir
LOSA	Lake Okeechobee Service Area
LOSOM	Lake Okeechobee System Operating Manual
LOWPP	Lake Okeechobee Watershed Protection Plan
LOWRP	Lake Okeechobee Watershed Restoration Project
LTA	Lower Tamiami aquifer
LWCSIM	Lower West Coast Surficial and Intermediate Aquifer Systems Model
MDL	maximum developable limit
MDWASD	Miami-Dade Water and Sewer Department
MFL	minimum flow and minimum water level
mg/L	milligrams per liter
mgd	million gallons per day
MIL	mobile irrigation lab
ModWaters	Modified Water Deliveries to Everglades National Park
MRZ	mandatory reuse zone
NGVD29	National Geodetic Vertical Datum of 1929
OOL	Ocean Outfall Law
PCUR	per capita use rate
PG	Power Generation
PS	Public Supply
RAA	restricted allocation area

RO	reverse osmosis
SAS	surficial aquifer system
SFER	South Florida Environmental Report
SFWMD	South Florida Water Management District
STA	stormwater treatment area
TDS	total dissolved solids
UF/IFAS	University of Florida Institute of Food and Agricultural Sciences
UFA	Upper Floridan aquifer
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WCA	water conservation area
WERP	Western Everglades Restoration Project
Work Plan	Water Supply Facilities Work Plan
WPP	watershed protection plan
WRDA	Water Resources Development Act
WSVA	Water Supply Vulnerability Assessment
WTP	water treatment plant
WWTF	wastewater treatment facility

1

Introduction

The South Florida Water Management District (SFWMD or District) develops and updates regional water supply plans to assess current and future water needs while protecting central and southern Florida's water resources. This *2023–2024 Lower East Coast Water Supply Plan Update* (2023–2024 LEC Plan Update) assesses existing and projected water demands as well as water sources to meet those demands through 2045.

TOPICS

- 2023–2024 LEC Plan Update
- Goal and Objectives
- Legal Authority and Requirements
- Tribal Governments
- Regional and Local Planning Linkage
- Plan Development Process
- Progress Since the 2018 LEC Plan Update

The LEC Planning Area includes all of Palm Beach, Broward, and Miami-Dade counties, most of Monroe County, and the eastern portions of Hendry and Collier counties. In addition, it includes the Seminole Tribe of Florida reservations and the Miccosukee Tribe of Indians of Florida reservations (**Figure 1-1**). The 2023–2024 LEC Plan Update presents population estimates and associated water demands and projections (**Chapter 2**), water resource and water supply development projects (**Chapters 7** and **8**, respectively), and related water supply planning information for the 2021 to 2045 planning horizon. Designed to be a planning guide for local and tribal governments, utilities, agricultural operations, and other water users, the 2023–2024 LEC Plan Update provides a framework for local and regional water supply planning and management decisions in the LEC Planning Area.

The boundaries of the LEC Planning Area follow the north-to-south sheetflow pattern of the historical Everglades, draining into Florida Bay at the southern tip of the peninsula, and encompassing the Florida Keys island chain. As shown in **Figure 1-2**, the LEC Planning Area encompasses the LEC Service Areas and a large part of the Lake Okeechobee Service Area (LOSA). Lake Okeechobee borders four water supply planning areas and is formally included in this plan. The LEC Service Areas include major metropolitan areas from West Palm Beach to Miami. Portions of Palm Beach, Broward, and Miami-Dade counties as well as the Seminole Tribe of Florida's Brighton and Big Cypress reservations depend on surface water from Lake Okeechobee and its connected conveyance canals for supplemental water supply and aquifer recharge. The Everglades Agricultural Area (EAA), which comprises a large portion of LOSA, is located within the LEC Planning Area and also relies on surface water from Lake Okeechobee for irrigation water supply. Surface water from Lake Okeechobee is conveyed south through stormwater treatment areas (STAs) and water conservation areas (WCAs), which comprise the Everglades Protection Area, for storage and water quality treatment before going into Everglades National Park.

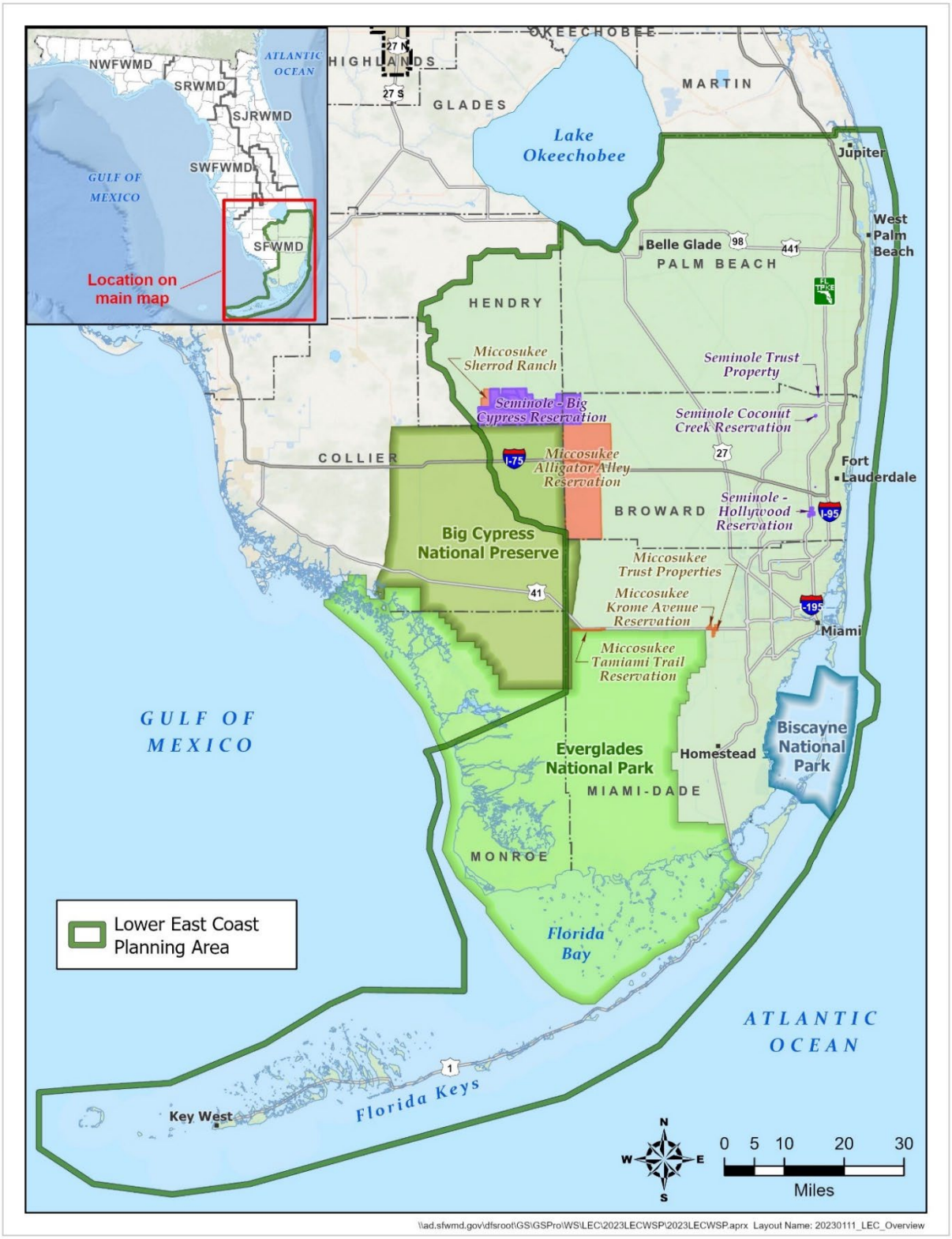

Figure 1-1. LEC Water Supply Planning Area.

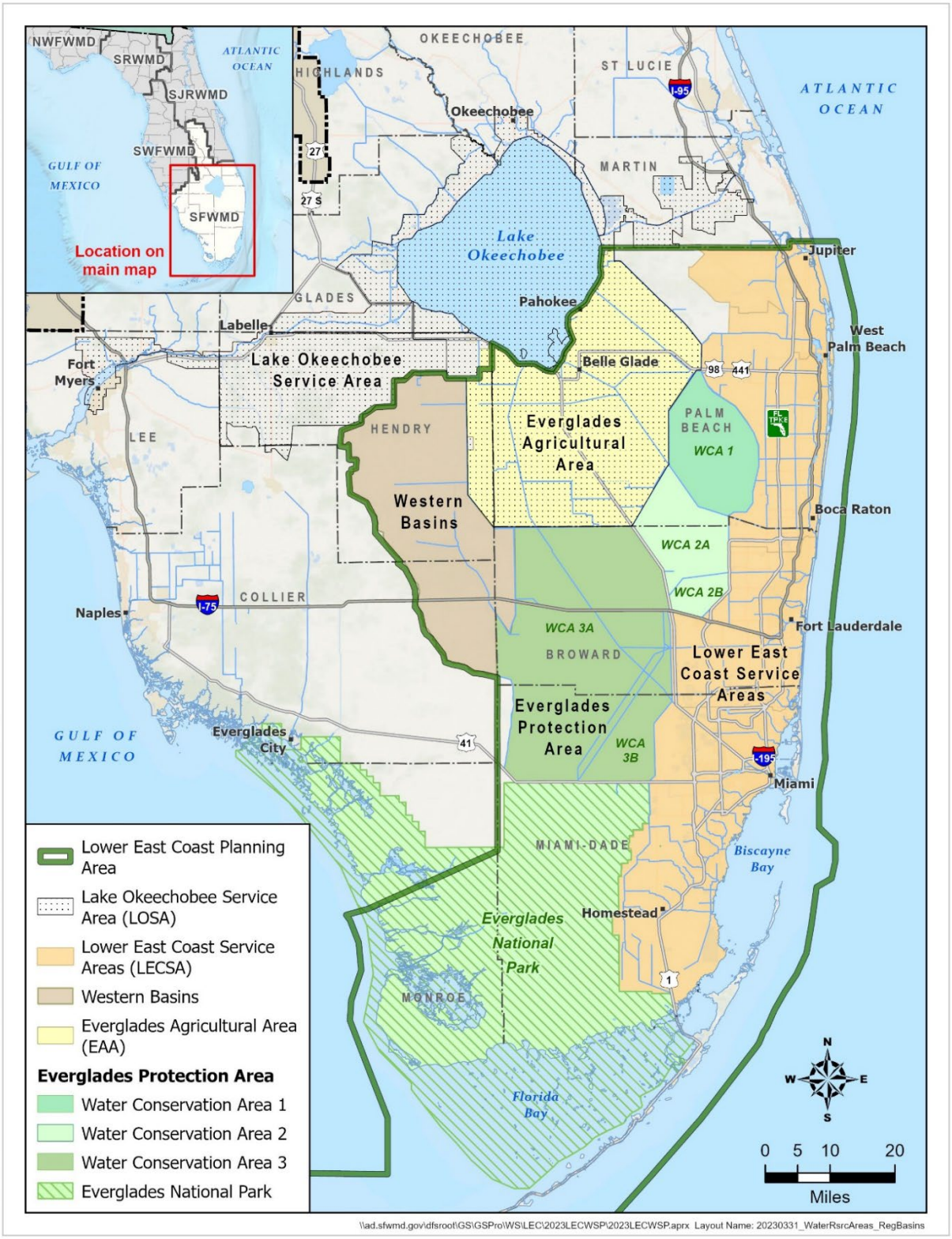

Figure 1-2. Location of major water resource areas and regulatory basins within the LEC Planning Area.

Unique and critical ecosystems, such as the Everglades, Lake Okeechobee, Florida Bay, Biscayne Bay, and the Loxahatchee River, are located in the LEC Planning Area. Two national parks (Everglades and Biscayne), a federally designated Wild and Scenic River (Northwest Fork of the Loxahatchee River), and five national wildlife refuges are also located within the LEC Planning Area boundaries. Because the LEC Planning Area depends on surface water from Lake Okeechobee and the Everglades—especially the WCAs—for a portion of its water supply, the LEC planning efforts are tightly linked with restoration efforts and management decisions concerning those water resources. Most restoration projects are part of the Comprehensive Everglades Restoration Plan (CERP), a joint effort between the SFWMD and the United States Army Corps of Engineers (USACE). In addition to important natural areas, the LEC Planning Area includes an extensive agricultural industry, several major urban communities, and the Seminole Tribe of Florida and Miccosukee Tribe of Indians of Florida reservations.

The primary sources of fresh water throughout the LEC Planning Area are surface water and groundwater from shallow aquifers. To a much lesser extent, reclaimed water is also used for nonpotable uses like irrigation. Major surface water resources include Lake Okeechobee, the WCAs, and their hydraulically connected water bodies. The availability of surface water and fresh groundwater in the LEC Planning Area is limited, primarily due to water resource protection criteria (**Chapter 4**). Groundwater resources in the LEC Planning Area include the surficial and Floridan aquifer systems (SAS and FAS). Further information about water source options is provided in **Chapter 5**.

2023–2024 LEC PLAN UPDATE

The 2023–2024 LEC Plan Update reflects the changes experienced in the LEC Planning Area since 2018, describes the effects these changes have had on water use, and provides updates to projected water demands from 2040 to 2045. This update consists of three documents: 1) the planning document, 2) the appendices, and 3) the *2021–2024 Support Document for Water Supply Plan Updates* (2021–2024 Support Document; SFWMD 2021b). The planning document and appendices focus on the LEC Planning Area. The 2021–2024 Support Document discusses aspects common to four of the SFWMD regional planning areas, including the legal authority and requirements for water supply planning. The Upper Kissimmee Basin is not included in the Support Document because it is part of the Central Florida Water Initiative, which has its own support documents. Additional supporting information for the District's planning areas is available in the recent publication titled *Physical Features and Water Resources of the South Florida Water Management District* (SFWMD 2022b).

GOAL AND OBJECTIVES

The goal of the 2023–2024 LEC Plan Update is to identify sufficient water supply sources and future projects to meet existing and future reasonable-beneficial uses during 1-in-10-year drought conditions through 2045 while also sustaining the water resources and related natural systems. The objectives in the *2018 Lower East Coast Water Supply Plan Update* (2018 LEC Plan Update; SFWMD 2018) were reviewed and modified for this 2023–2024 LEC Plan Update as follows:

1. **Water Supply** – Quantify sufficient volumes of water and water supply projects to meet reasonable-beneficial consumptive uses projected through 2045 under 1-in-10-year drought conditions.

2. **Natural Systems** – Protect natural systems and water resources, including the Everglades, estuarine and riverine systems, and other federal, state, and local natural resource areas.

3. **Water Conservation and Alternative Source Development –** Encourage water conservation measures to improve water use efficiency. Continue to encourage development of the FAS as an alternative water supply (AWS) and monitor the aquifers to enhance understanding of the relationships among water use, water levels, and water quality. Develop water storage options, including aquifer storage and recovery (ASR) systems and reservoirs, and promote projects that increase use of reclaimed water.

4. **Linkage with Local and Tribal Governments** – Provide information to support local government Comprehensive Plans. Promote compatibility of the 2023–2024 LEC Plan Update with local and tribal government land use decisions.

5. **Compatibility and Linkage with Other Efforts** – Achieve compatibility and integration with the following planning-related activities within the region:
    - CERP and other environmental restoration projects
    - Other state and local water resource initiatives
    - Existing and proposed environmental projects
    - Modifications to operating schedules for the regional system, including Lake Okeechobee
    - Water use permitting process, minimum flow and minimum water level (MFL) criteria, water reservations, and restricted allocation areas (RAAs)
    - Local, District, and state resiliency efforts addressing the impacts of climate change, including rising sea levels and changing rainfall and flood patterns

LEGAL AUTHORITY AND REQUIREMENTS

The legal authority and requirements related to water supply planning are included in Chapters 163, 187, 373, and 403, Florida Statutes (F.S.) with Chapter 373, F.S. establishing the District's legal authority. In accordance with Florida's Water Protection and Sustainability Program, regional water supply plans and local government Comprehensive Plans must ensure that adequate potable water facilities are constructed and concurrently available to meet the demands of new development. The water supply planning region identified in this plan shall be considered a Water Resource Caution Area under Rule 62-40.520(2), Florida Administrative Code and for purposes of Section 403.064, F.S., and affected parties may challenge the designation pursuant to Section 120.569, F.S.

In addition to water supply planning, the SFWMD is required by statute to provide updates for a variety of resource development, restoration, and monitoring programs implemented within the District's boundaries. Such updates are provided in the annual publication of the *South Florida Environmental Report* (https://www.sfwmd.gov/sfer), which is referenced as needed in this plan update.

TRIBAL GOVERNMENTS

The Seminole Tribe of Florida is a federally recognized Indian Tribe organized pursuant to Section 16 of the Indian Reorganization Act of 1934 and recognized by the State of Florida pursuant to Chapter 285, F.S. The Seminole Tribe of Florida's Big Cypress, Coconut Creek, and Hollywood reservations are located in the LEC Planning Area in Hendry and Broward counties (**Figure 1-1**). The Big Cypress reservation land use is primarily agricultural and residential. The Coconut Creek reservation land use is commercial, and much of the Hollywood reservation land use is residential and commercial.

The Miccosukee Tribe of Indians of Florida is a federally recognized Native American tribe, who was part of the Seminole Nation until they were established as a sovereign nation in 1962. The tribe is recognized by the State of Florida pursuant to Chapter 285, F.S. and has several reservations located in the LEC Planning Area in Broward, Miami-Dade, and Hendry counties (**Figure 1-1**). Much of the reservation land use is residential, commercial, and recreational.

REGIONAL AND LOCAL PLANNING LINKAGE

The SFWMD's regional water supply planning process is closely coordinated and linked to the local water supply planning of municipal/county governments and utilities. Coordination and collaboration among all water supply planning entities is needed throughout the regional water supply plan development and approval process.

While this 2023–2024 LEC Plan Update addresses regional and Districtwide water supply issues, local governments are required to plan for their water and wastewater needs (as well as other infrastructure and public service elements) through their Comprehensive Plans. These Comprehensive Plans also include Water Supply Facilities Work Plans (Work Plans), which are required by statute. Local governments are required by Chapter 163, F.S. to update their Work Plans and adopt revisions to their Comprehensive Plans within 18 months following approval of this 2023–2024 LEC Plan Update. Revisions may include population projections, established planning periods, existing and future water resource projects, intergovernmental coordination activities, conservation and reuse measures, and the capital improvements element. More information on Comprehensive Plan and Work Plan requirements is provided in the 2021–2024 Support Document (SFWMD 2021b).

To assist local governments in updating their Comprehensive Plans and Work Plans, the SFWMD has developed technical assistance tools and informational documents, which are available on the SFWMD website (https://www.sfwmd.gov/doing-business-with-us/work-plans). Additional information about developing a Work Plan is available from the Florida Department of Economic Opportunity website (https://www.floridajobs.org/community-planning-and-development/programs/community-planning-table-of-contents/water-supply-planning).

This 2023–2024 LEC Plan Update describes how anticipated water supply needs will be met in the LEC Planning Area through 2045. The planning process used to develop this plan update is outlined below.

PLAN DEVELOPMENT PROCESS

PLAN DEVELOPMENT PROCESS

1	2	3	4
Planning and Assessment	**Data Collection, Analyses, and Issue Identification**	**Evaluation of Water Resources and Water Source Options**	**Identification of Water Resource and Water Supply Development Projects**
The process incorporated public participation and coordination with local stakeholders, including water supply utilities, agricultural operations, nongovernmental environmental groups, local and tribal governments, the Florida Department of Environmental Protection, the Florida Department of Agriculture and Consumer Services, and other appropriate state and federal agencies. A review of previous planning efforts in the region and documentation of activities since the approval of the *2018 Lower East Coast Water Supply Plan Update* (SFWMD 2018) were key starting points.	Using the *2018 Lower East Coast Water Supply Plan Update* (SFWMD 2018) as a foundation, developing this plan update involved collecting the latest information on current and projected population and water demands (**Chapter 2**), water conservation (**Chapter 3**), water resource protection (**Chapter 4**), water source options (**Chapter 5**), and water resource analyses (**Chapter 6**).	This phase of the planning process involved reviewing existing monitoring data and updated regional modeling used for evaluation of water resources to identify issues. Where projected demands exceed available supplies, water supply project options were identified, including alternative water supplies and water conservation.	Where resource conditions warranted, water resource development projects were identified (**Chapter 7**). Water supply development projects intended to meet water needs over the planning horizon were identified, compiled, and evaluated by the SFWMD with input from stakeholders, the public, and other agencies. The SFWMD also considers water supply projects in local government Work Plans, Tribal Work Plans, and adopted Sector Plans, which are required to identify needed water supplies and available water sources pursuant to Section 163.3245(3)(a)2., F.S. Additionally, the projects were screened for permitting feasibility (**Chapter 8**).

Public Participation

Public participation is a key component of the water supply plan development process to ensure the plan addresses the issues and concerns of stakeholders and that the future direction and projects are appropriate for future water needs. The SFWMD held three virtual workshops for this water supply plan update. Stakeholders representing a variety of interests in the region, such as agriculture, industry, environment, utilities, local government planning departments, tribal representatives, and state and federal agencies as well as the general public, were invited to attend the workshops. The workshops provided participants with an opportunity to review and comment on projected demands, water supply issues, the condition of regional water resources, water source options, groundwater modeling, and other key aspects of the water supply plan update.

Individual meetings were held throughout the planning process with public supply utilities, the Seminole Tribe of Florida, other planning agencies, local government planning departments, and agricultural representatives to discuss water demand projections and coordinate planning efforts. During meetings with the region's major utilities and local governments, population and demand estimates and projections were reviewed and verified, and the condition of regional water resources and AWS development efforts were discussed. Additionally, presentations were made to the District's Governing Board, providing overviews of the plan update and soliciting comments. Following the public comment period, the final version of the plan update was brought to the District's Governing Board for consideration of approval.

PROGRESS SINCE THE 2018 LEC PLAN UPDATE

Since the *2018 Lower East Coast Water Supply Plan Update* (SFWMD 2018), the following activities have improved the understanding of and are supporting the sustainability of the region's water resources, water supply, and natural systems.

Hydrologic Studies, Monitoring, and Modeling

- **Updated Delineation of the Saltwater Interface** – The SFWMD reviewed 2019 water quality data from Broward and Palm Beach counties and prepared updated maps comparing the 2009, 2014, and 2019 extent of saltwater intrusion within the SAS (**Appendix D**). Miami-Dade County contracts with the United States Geological Survey (USGS) to maintain and update its monitoring network and its saltwater interface maps. The USGS published the 2011 interface line in 2014 (Prinos et al. 2014) and a 2018 interface map of southern Miami-Dade County in 2019 (Prinos 2019). Further information on the updated delineation of the saltwater interface efforts is provided in **Chapter 6**.
- **FAS Monitoring Network** – The SFWMD continues to maintain and update a network of more than 108 FAS monitor wells, 24 of which are within the LEC Planning Area. Water level data from the monitor wells help manage use of the FAS as a water supply source. In addition, water quality sampling and analyses are conducted periodically to observe any trends that might signal overuse of the resource.

- **Hydrogeologic Studies** – Between 2018 and 2023, the SFWMD and its partners completed the following hydrogeologic investigations in the LEC Planning Area:
  - Saltwater interface monitoring and mapping program (Shaw and Zamorano 2020)
  - Groundwater chemistry of the Lower Floridan aquifer – upper permeable zone in Central and South Florida (Geddes et al. 2020)
  - Hydrogeology and groundwater salinity of Water Conservation Area 2A (Janzen and Baker 2020)
  - Hydrogeologic investigation and aquifer performance testing at Morikami Park, southeastern Palm Beach County, Florida (Lindstrom 2020)
  - Cycle testing summary report Hillsboro Canal aquifer recharge, storage, and recovery system (Verrastro 2018)
  - Geochemistry of the Upper Floridan aquifer and Avon Park permeable zone within the South Florida Water Management District (Geddes et al. 2018)
  - Installation of a monitoring well cluster at the S-356 Pump Station (Smith 2018a)
  - Installation of monitor wells at three sites in Miami-Dade County (Smith 2018b)

- **USGS/SFWMD Cooperative Monitoring** – Water level and water quality monitoring at existing monitor wells provides critical information to develop groundwater models, assess groundwater conditions, and manage groundwater resources. The SFWMD maintains extensive groundwater monitoring networks and partners with the USGS to provide additional support and funding for ongoing monitoring. Well details and monitoring data are provided in various SFWMD technical publications and in the District's corporate environmental database, DBHYDRO. Data from sites monitored by the USGS are archived in a USGS database and published annually.
- **Lower West Coast Surficial and Intermediate Aquifer Systems Model** – The Lower West Coast Surficial and Intermediate Aquifer Systems Model (LWCSIM) was designed and constructed to evaluate changes in water levels in the SAS and intermediate aquifer system (IAS) for the 2014 and 2040 withdrawal scenarios. The model was completed and simulations were conducted during 2020. Information about this modeling effort, including model results, are provided in the *2022 Lower West Coast Water Supply Plan Update* (SFWMD 2022a). The LWCSIM model boundary incorporates western portions of the LEC Planning Area.
- **East Coast Floridan Model** – The East Coast Floridan Model (Giddings et al. 2014) was updated and used for the *2021 Upper East Coast Water Supply Plan Update* (SFWMD 2021a) to identify potential changes in water quality, flows, and water levels in the FAS for the 2019 and 2045 withdrawal scenarios (Billah et al. 2021).
- **East Coast Surficial Model** – The East Coast Surficial Model, a density dependent groundwater model under development by the District, will have the ability to evaluate changes in water levels and water quality in the SAS for the 2021 and 2045 withdrawal scenarios. The model is under development and is expected to be completed in 2024 (**Chapter 6**).
- **Monitor Well Installations in Broward County** – The SFWMD installed Biscayne aquifer monitor wells (BS-2 and BS-3) in southeastern and northeastern Broward County to evaluate the movement of salt water in 2021 and 2023, respectively.

Water Supply Studies

- **Annual Estimated Water Use Reports** – The SFWMD prepared annual reports that summarize estimated use (based on reported withdrawals) for the water use categories: Public Supply, Domestic Self-Supply, Agriculture, Commercial/Industrial/Institutional, Landscape/Recreational, and Power Generation. A copy of the annual reports can be found at https://www.sfwmd.gov/our-work/water-supply.
- **2023 Water Supply Cost Estimation Study** – The SFWMD funded an engineering evaluation of the capital and operational costs of various water supply facilities including groundwater wellfields, surface facilities, water treatment processes, storage, piping and distribution facilities, and other ancillary components that was completed in 2023. A copy of the report can be found at https://www.sfwmd.gov/our-work/water-supply.

Regulations and Operations

- **Aquifer Storage and Recovery Storage Horizon Restricted Allocation Area Near the C-18W Reservoir** – The SFWMD established water use permitting criteria for an RAA in 2022 for the underground storage horizon of the ASR wells associated with the CERP Loxahatchee River Watershed Restoration Project.
- **Lake Okeechobee System Operating Manual (LOSOM)** – A re-evaluation of the lake regulation schedule by the USACE began in 2019 to coincide with the Herbert Hoover Dike repairs which were completed in 2023. The process is ongoing, and the water control plan is anticipated to be completed in 2024.

Water Storage, Construction, and Restoration Projects

- **C-51 Reservoir Phase 1** – In January 2017, the SFWMD designated the C-51 Reservoir Phase 1 as a pilot alternative water supply development project, pursuant to Section 373.037, F.S. The reservoir and connection to the L-8 flow equalization basin is expected to be completed by the end of 2023 and is expected to provide up to 35 million gallons per day (mgd) for Public Supply (**Chapter 5**).
- **Herbert Hoover Dike/Lake Okeechobee** – In 2006, the USACE designated the Herbert Hoover Dike as a Level 1 risk, the highest risk for dam failure. Twenty-eight water control structures were replaced with new structures, one culvert was removed, and three were filled in. Construction of all works are completed, and the Dam Safety Action Classification rating improved from a Level 1 to a Level 4 (lowest risk of dam failure).

Herbert Hoover Dike

- **Lake Okeechobee Watershed Restoration Project** – Part of CERP, the purpose of the Lake Okeechobee Watershed Restoration Project (LOWRP) is to improve the ecology of Lake Okeechobee, decrease regulatory releases to the St. Lucie and Caloosahatchee estuaries, restore freshwater wetlands in the watershed, and improve water supply for existing legal users. Although this project and its components are located outside of the LEC Planning Area, improvements to water supply of Lake Okeechobee are critical to the region. The LOWRP Final Integrated Project Implementation Report and Environmental Impact Statement was released for public and agency review in 2020. The recommended plan included aboveground storage, underground storage with 80 ASR wells, and two wetland restoration sites. Concerns related to the acceptability and cost of the plan received during state, agency, and tribal review resulted in direction to refine the recommended plan by removing the aboveground storage component and its 25 associated ASR wells. The LOWRP Final Report of the USACE Chief of Engineers is pending and is anticipated to be received in 2024–2026 for the wetland restoration and 55 ASR well components. Planning, design, and test/exploratory wells for the ASR well program have been initiated, and the design of a 10 mgd Demonstration Facility at the C-38S location is under way. A feasibility study has been initiated for other reservoir locations in the watershed that may add up to 200,000 acre-feet of additional storage.
- **Central Everglades Planning Project Everglades Agricultural Area (CEPP EAA)** – Designed to reduce damaging discharges from Lake Okeechobee to the northern estuaries, the CEPP EAA project consists of a combination of canals, a 6,500-acre STA (A-2 STA), and a 10,500-acre reservoir (A-2 Reservoir) to reduce harmful discharges from Lake Okeechobee to the northern estuaries and to send more water south to the Everglades. The A-2 STA and the A-2 Reservoir construction has commenced and is anticipated to be completed by December of 2024 and September of 2034, respectively. North New River Conveyance and Miami Canal Improvements are currently in design and scheduled to be completed in November of 2025 and May of 2027, respectively. All aspects of the A-2 Reservoir are anticipated to be completed in 2034 with a 240,000-acre-foot storage capacity.
- **Modified Water Deliveries to Everglades National Park** – Modifications to the Central and Southern Florida (C&SF) Project have been completed and are operational to improve natural water flows to Shark River Slough in Everglades National Park.
- **C-111 South Dade Project** – Completed in 2018, this project was designed to restore natural hydrologic conditions in Taylor Slough and the eastern panhandle of Everglades National Park while also preserving the current level of flood protection for agricultural lands in southern Miami-Dade County. Pump replacements at S-332B and S-332C are expected to be completed in 2026.
- **Combined Operational Plan** – The Combined Operational Plan defines operations for the constructed features of the Modified Water Deliveries (ModWaters) to Everglades National Park and Canal 111 (C-111) South Dade project components to convey water from WCA-3A to Everglades National Park. The construction components have been completed, and the updated Combined Operational Plan has been implemented since 2020.

- **C-111 Spreader Canal Western Project** – The goal of this project is to establish more natural flows in Taylor Slough, which will improve the timing, distribution, and quantity of water flowing into Florida Bay. The canal operating range was lowered to capture more seepage, and seasonal variation was added in March 2016. In 2018, the capacities of two pump stations were increased to deliver more water to Taylor Slough. Phase 2 is in the planning phase. The project is anticipated to be completed parallel to the Biscayne Bay and Southeastern Everglades Ecosystem Restoration (BBSEER) Project in 2026.
- **Biscayne Bay and Southeastern Everglades Ecosystem Restoration Project** – The current drainage system and development of wetlands have altered the deliveries of fresh water to Biscayne Bay. The BBSEER Project will restore depth and duration of freshwater flow to the bay, improve diversity of plants and animals, and increase the ecological resiliency of coastal vegetation habitats in southeastern Miami-Dade County to sea level change. The project also will restore the ecological and hydrological connectivity between the bay coastal wetlands, the Model Lands, and Southern Glades. The project is currently in the planning and modeling stages with a tentatively selected plan decision anticipated in 2024.
- **Western Everglades Restoration Project** – This project aims to improve the quantity, quality, timing, and distribution of water in the western Everglades by making alterations to existing canals. Authorization for the construction of the project is anticipated in 2024.
- **Sam Jones/Abiaki Prairie C-139 Annex Restoration Project** – The goal of this project is to restore historical Everglades hydrologic conditions to 7,800 acres of former citrus grove. Within the project footprint, a 2,800-acre Phase 1 construction effort was completed which included citrus removal, farm bed leveling, and initial replanting of native vegetation. The remaining project footprint will be completed in the Phase 2 construction effort, which began January 2021 after additional citrus removal within its footprint was performed. Construction is expected to be completed by 2027 and biological restoration will be implemented through 2032.
- **Biscayne Bay Coastal Wetlands L-31E Flow-way** – This component of CERP is meant to rehydrate coastal wetlands and reduce point source discharges from the C-102, C-103, and Military canals. The SFWMD constructed the final four culverts in 2018. The USACE will construct the remaining features of the L-31 East Flow-way (five pump stations) with anticipated completion by 2024.

Biscayne Bay Coastal Wetlands

Alternative Water Supply and Water Conservation Cost-Share Funding

As part of the regional water supply plans' water resource development component (**Chapter 7**), and to assist local water users in implementation of the water supply development component (**Chapter 8**), the SFWMD periodically provides funding assistance to public water suppliers, local governments, special districts, homeowners' associations, water users, and other public and private organizations for AWS and water conservation projects that are consistent with the SFWMD's core mission. In 2019, the Florida Department of Environmental Protection and SFWMD initiated annual funding for the construction and

implementation of AWS and water conservation projects to qualified applicants through the AWS Funding Program.

- **Alternative Water Supply** – From Fiscal Year (FY) 2018 through FY2022, the SFWMD provided approximately $7.8 million for eight AWS projects that have been completed or are under construction in the LEC Planning Area, generating 16 mgd of additional reclaimed water capacity and 2.6 mgd of additional reclaimed distribution or storage.
- **Water Conservation** – From FY2018 through FY2022, the SFWMD provided approximately $1.04 million for 20 water conservation projects that were completed or are being implemented in the LEC Planning Area. The projects are estimated to save 413.60 million gallons per year (1.13 mgd).

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2

Demand Estimates and Projections

This chapter summarizes the water demand estimates and projections for the Lower East Coast (LEC) Planning Area of the South Florida Water Management District (SFWMD or District) through the planning horizon (2021 to 2045). Estimates and projections are presented by water use category and were developed in coordination with various stakeholder groups, including agriculture, utilities, industry, local and tribal governments, and other interested groups. A detailed discussion of data collection and analyses methods is provided in **Appendix A**.

TOPICS

- Water Demand
- Water Use Categories
- Population Estimates and Projections
- Public Supply
- Domestic Self-Supply
- Agriculture
- Commercial/Industrial/Institutional
- Landscape/Recreational
- Power Generation
- Summary of Demand Estimates and Projections
- Demand Projections in Perspective

Current and future water demands in the LEC Planning Area are heavily influenced by existing and projected population. Population growth will lead to increases in water demands for public supply, landscape irrigation, power generation, and mining operations in the region. Demands associated with irrigated agriculture in the LEC Planning Area are anticipated to decrease due to conversion of farmland to residential developments and environmental restoration projects. The increased pace of population growth and economic expansion, which is projected to continue through 2045, places greater demands on regional water resources in the LEC Planning Area. According to estimates from the University of Florida's Bureau of Economic and Business Research (BEBR), the permanent population in the LEC Planning Area is expected to increase by more than 1 million people by 2045 (Rayer and Wang 2021).

WATER DEMAND

Water demands can be described and analyzed in two ways: gross demand and net demand. Gross demand is the volume of water withdrawn or diverted from a groundwater or surface water source. This definition serves as the basis for water allocations established through water use permits issued by the SFWMD. Further information on water use permitting is provided in the *2021–2024 Support Document for Water Supply Plan Updates* (2021–2024

Support Document; SFWMD 2021). Net demand refers to the volume of water delivered to end users after accounting for treatment losses and delivery system inefficiencies. For Public Supply (PS) and Domestic Self-Supply (DSS), demands commonly are referred to as raw and finished demands rather than gross and net demands, respectively. In this *2023–2024 Lower East Coast Water Supply Plan Update* (2023–2024 LEC Plan Update), gross demand is equal to net demand for all water use categories except PS.

This 2023–2024 LEC Plan Update presents demands for average rainfall and 1-in-10-year drought conditions (**Appendix A**). Section 373.709, Florida Statutes (F.S.), states the level-of-certainty planning goal associated with identifying water demands contained in water supply plans shall be based on meeting demands during 1-in-10-year drought conditions for at least a 20-year period. Although not quantified in this plan, environmental demands are addressed through resource protection criteria (**Chapter 4**).

INFO

Average Rainfall and 1-in-10-Year Drought

An **average rainfall year** is defined as a year having rainfall with a 50% probability of being exceeded in any other year.

A **1-in-10-year-drought** is defined as a year in which below normal rainfall occurs with a 90% probability of being exceeded in any other year. It has an expected return frequency of once in 10 years.

WATER USE CATEGORIES

Water demands for this 2023–2024 LEC Plan Update are estimated in 5-year increments for the six water use categories listed below, which were established by the Florida Department of Environmental Protection (FDEP) in coordination with the state's water management districts. The water use category names and acronyms have been updated for this plan to align with other water supply planning efforts across the state.

- **Public Supply (PS)** – Potable water supplied by water treatment plants with a current allocation of 0.10 million gallons per day (mgd) or greater.
- **Domestic Self-Supply (DSS)** – Potable water used by households served by small utilities (less than 0.10 mgd) or self-supplied by private wells.
- **Agriculture (AG)** – Self-supplied water used for commercial crop irrigation, greenhouses, nurseries, livestock watering, pasture irrigation, and aquaculture.
- **Commercial/Industrial/Institutional (CII)** – Self-supplied water associated with the production of goods or provision of services by commercial, industrial, or institutional establishments.
- **Landscape/Recreational Irrigation (L/R)** – Self-supplied and reclaimed water used to irrigate golf courses, sports fields, parks, cemeteries, and large common areas, such as land managed by homeowners' associations and commercial developments.
- **Power Generation (PG)** – Self-supplied and reclaimed water used for cooling, processing, and potable water by power generation facilities.

Table 2-1 presents a comparison of the estimated (2021) and projected (2045) average gross water demands, by category, in the LEC Planning Area. The largest water use category is PS, followed by AG, L/R, CII, PG, and DSS. PS demands reflect the regional population growth over the planning horizon, while AG demands decrease primarily due to conversion of agricultural land to other uses. An overall increase in total demands is projected through the planning horizon.

Table 2-1. Estimated (2021) and projected (2045) average gross water demands (in mgd) for the LEC Planning Area by use category.

Water Use Category	2021	2045
Public Supply	890.57	1,047.19
Domestic Self-Supply	10.55	14.45
Agriculture	645.20	637.65
Commercial/Industrial/Institutional	87.35	102.56
Landscape/Recreational	178.65	199.18
Power Generation	42.20	62.33
LEC Planning Area Total	**1,854.52**	**2,063.36**

LEC = Lower East Coast; mgd = million gallons per day.

POPULATION ESTIMATES AND PROJECTIONS

Population estimates and projections were used to develop demands for all water use categories except AG and PG. Developing population estimates and projections required multiple sources of information, including county-level data from the University of Florida's BEBR (Rayer and Wang 2021), consistent with Section 373.709(2)(a), F.S., data from the 2020 Decennial Census (United States Census Bureau 2020), and data from local government Comprehensive Plans. **Appendix A** provides further details on the development of population estimates and projections. Draft results were presented to the region's PS utilities to ensure accuracy and obtain agreement with final 2045 population projections in the plan update.

> **NOTE**
>
> All population estimates and projections are for permanent residents, as defined by the United States Census Bureau. However, the per capita use rate, which is used to calculate water demands, reflects use by seasonal residents as well.

In 2021, the estimated population within the LEC Planning Area was 6,222,707 permanent residents (**Table 2-2**). BEBR projections indicate the LEC Planning Area population will grow to 7,294,265 permanent residents in 2045, an increase of approximately 17%. Nearly half of the LEC Planning Area population resides in Miami-Dade County, while Broward County accounts for approximately one-third followed by Palm Beach County with less than a quarter, and this trend is expected to continue. As explained in **Appendix A**, BEBR medium projections were used for all counties to develop detailed population projections for PS utilities and county DSS areas (Rayer and Wang 2021).

Table 2-2. Permanent resident population served by PS and DSS in the LEC Planning Area in 2021 and 2045.

County	2021 Population			2045 Population		
	PS	DSS	**Total**	PS	DSS	**Total**
Broward[a]	1,947,447	4,190	**1,951,637**	2,233,517	4,283	**2,237,800**
Hendry[a,b]	948	3,933	**4,881**	1,729	3,357	**5,086**
Miami-Dade	2,693,688	9,052	**2,702,740**	3,179,658	33,021	**3,212,679**
Monroe	78,267	0	**78,267**	80,200	0	**80,200**
Palm Beach	1,430,447	54,736	**1,485,183**	1,698,451	60,049	**1,758,500**
LEC Planning Area Total	**6,150,796**	**71,911**	**6,222,707**	**7,193,554**	**100,711**	**7,294,265**

DSS = Domestic Self-Supply; LEC = Lower East Coast; PS = Public Supply.

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[b] Values listed for Hendry County are only for the areas within the LEC Planning Area boundaries.

PUBLIC SUPPLY

The PS category includes potable water supplied by water treatment plants with a current allocation of 0.10 mgd or greater. Developing PS demand projections in the LEC Planning Area was a multistep process that included determining utility service area and DSS populations, calculating per capita use rates (PCURs), and projecting future water needs.

NOTE

Perceived discrepancies in table totals are due to rounding.

Per Capita Use Rates

For each PS utility, a net (finished) water PCUR was developed using past population estimates and finished water data as reported to the FDEP. The PCUR for each utility is a 5-year (2017 through 2021) average, calculated by dividing annual net (finished) water volumes by the corresponding service area populations for each year. For PS demand projections, PCURs were assumed to remain constant through 2045. To calculate gross (raw) demands, the treatment efficiency for each utility, based on treatment process type(s) expected in 2045, was applied as a finished-to-raw ratio. Any demand reductions due to historical conservation practices are implicitly factored into the projections by using the 5-year average PCUR. Future water conservation savings (**Chapter 3**) were not factored into the demand projections used in this plan update due to water savings uncertainties. PS service area and water treatment plant maps are provided in **Appendix A**. Utility profiles containing population and finished water use data and projections as well as permitted allocations are provided in **Appendix B**.

PS Demand Estimates and Projections

Tables 2-3 and **2-4** present PS gross (raw) and net (finished) water demands, respectively, in 5-year increments (including the current base year of 2021) by county. The results indicate PS gross (raw) water demands will increase 18%, from 890.56 mgd in 2021 to 1,047.17 mgd in 2045, under average rainfall conditions. Calculation of 1-in-10-year demand is based only on the outdoor portion of PS use, and the methodology is explained in **Appendix A**.

Table 2-3. PS gross (raw) water demands in the LEC Planning Area by county.

County	Gross (Raw) Demand – Average Rainfall Conditions (mgd)							2045 1-in-10-Year Demand
	2020	2021	2025	2030	2035	2040	2045	
Broward[a]	238.38	241.09	249.57	263.46	271.55	278.92	285.45	313.99
Hendry[a,b]	0.26	0.28	0.36	0.42	0.43	0.48	0.56	0.59
Miami-Dade	375.77	377.83	390.66	406.15	420.69	434.20	446.30	477.54
Monroe	19.20	19.31	19.44	19.59	19.69	19.74	19.79	20.38
Palm Beach	249.29	252.05	260.98	270.99	280.03	287.49	295.07	324.58
LEC Planning Area Total	**882.90**	**890.56**	**921.01**	**960.61**	**992.39**	**1,020.83**	**1,047.17**	**1,137.09**

LEC = Lower East Coast; mgd = million gallons per day; PS = Public Supply.

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[b] Values listed for Hendry County are only for the areas within the LEC Planning Area boundaries.

Table 2-4. PS net (finished) water demands in the LEC Planning Area by county.

County	Net (Finished) Demand – Average Rainfall Conditions (mgd)							2045 1-in-10-Year Demand
	2020	2021	2025	2030	2035	2040	2045	
Broward[a]	215.47	217.92	225.41	233.87	241.00	247.43	253.24	278.56
Hendry[a,b]	0.25	0.27	0.35	0.41	0.42	0.47	0.54	0.57
Miami-Dade	346.62	348.59	360.48	374.66	388.04	400.47	411.54	440.35
Monroe	18.29	18.39	18.52	18.66	18.75	18.80	18.85	19.41
Palm Beach	220.68	223.16	231.00	239.81	247.86	254.51	261.30	287.43
LEC Planning Area Total	**801.31**	**808.33**	**835.76**	**867.41**	**896.07**	**921.68**	**945.47**	**1,026.33**

LEC = Lower East Coast; mgd = million gallons per day; PS = Public Supply.

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[b] Values listed for Hendry County are only for the areas within the LEC Planning Area boundaries.

DOMESTIC SELF-SUPPLY

The DSS category includes potable water used by households that are served by small utilities with water withdrawals less than 0.10 mgd or that are self-supplied by private wells. Permanent resident populations within DSS areas were developed simultaneously with the PS population estimates and projections. All permanent residents outside of PS utility service area boundaries were considered DSS population. Population projection methodology and results are provided in the previous section and further described in **Appendix A**.

Table 2-5 contains the LEC Planning Area DSS demand estimates and projections under average rainfall conditions. The average PCUR of PS utilities in each county was used to calculate DSS demands. For DSS demands, the finished-to-raw water ratio is assumed to be 1.00. Therefore, no distinction is made between gross (raw) and net (finished) water demands. Average estimated DSS demands in 2021 were 10.55 mgd for 71,911 permanent residents (**Table 2-2**). DSS demands are expected to increase 37% by 2045. This increase can be attributed to high anticipated growth in DSS areas without expansion of PS utility service within those areas.

Table 2-5. DSS gross (raw) water demands in the LEC Planning Area by county.

County	Gross (Raw) Demand – Average Rainfall Conditions (mgd)							2045 1-in-10-Year Demand
	2020	2021	2025	2030	2035	2040	2045	
Broward[a]	0.53	0.47	0.58	0.58	0.53	0.54	0.48	0.53
Hendry[a,b]	0.37	0.37	0.36	0.35	0.33	0.32	0.31	0.33
Miami-Dade	2.64	1.18	2.06	2.61	3.00	3.24	4.29	4.59
Monroe	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Palm Beach	8.11	8.54	9.23	9.57	9.75	9.98	9.37	10.30
LEC Planning Area Total	**11.66**	**10.55**	**12.23**	**13.10**	**13.61**	**14.07**	**14.45**	**15.76**

DSS = Domestic Self-Supply; LEC = Lower East Coast; mgd = million gallons per day.

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[b] Values listed for Hendry County are only for the areas within the LEC Planning Area boundaries.

AGRICULTURE

Agricultural Land in Homestead

The AG category includes self-supplied water used for commercial crop irrigation, nurseries, greenhouses, livestock watering, pasture, and aquaculture. AG is the second largest water use category in the LEC Planning Area, accounting for 35% of the region's total estimated water demand in 2021. Agricultural production in the LEC Planning Area is of regional and national significance, with 566,162 acres of crops under irrigation (**Figure 2-1**).

Agricultural acreage data published by the Florida Department of Agriculture and Consumer Services (FDACS 2022) were used to determine water demands for this 2023–2024 LEC Plan Update. Pursuant to Section 373.709(2)(a), F.S., water management districts are required to consider FDACS water demand projections. Any adjustments or deviations from the projections published by FDACS, "…must be fully described, and the original data must be presented along with the adjusted data." A detailed description of the analyses and adjustments is provided in **Appendix A**.

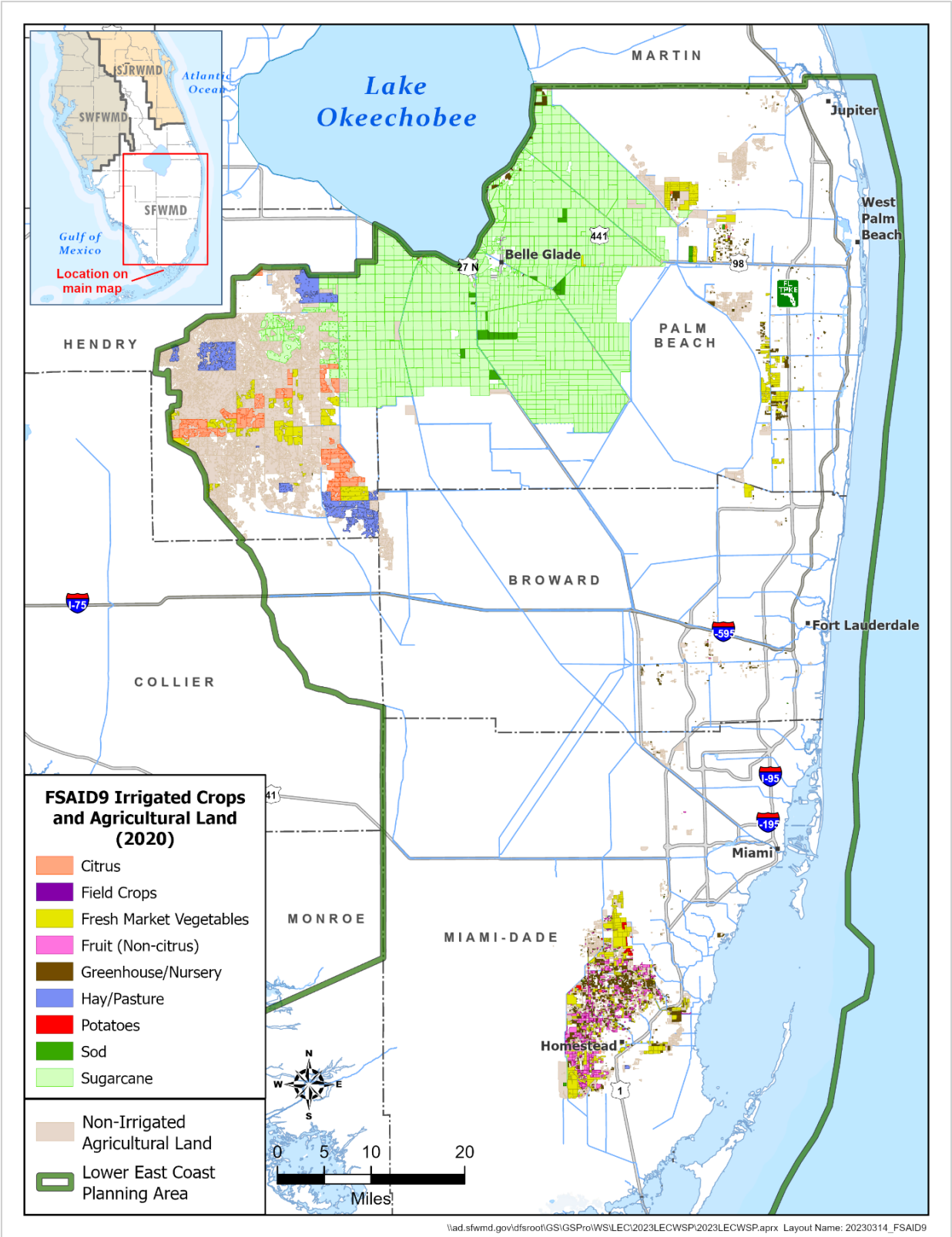

Figure 2-1. Agricultural irrigated land in the LEC Planning Area (Data from FDACS 2022).

Agricultural water demand was determined using the Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS) model (Smajstrla 1990). No distinction was made between gross and net water demands. The FDACS irrigated crop acres, soil types, growing seasons, and irrigation methods were used as input data for the AFSIRS model. AG demand estimates and projections are based on the commercially grown crop categories in **Table 2-6.**

Table 2-6. Summary of average and 1-in-10-year water demands (in mgd) for all agricultural acreage, livestock, and aquaculture in the LEC Planning Area.

Crop	2021			2045		
	Acres	Average Demand	1-in-10-Year Demand	Acres	Average Demand	1-in-10-Year Demand
Sugarcane	454,157	479.74	661.75	442,922	467.71	645.13
Fresh Market Vegetables	40,102	41.44	49.17	39,362	40.33	47.93
Citrus	19,564	20.41	24.62	22,112	21.04	25.39
Hay/Pasture	19,795	23.53	28.15	20,253	24.07	28.80
Greenhouse/Nursery	15,016	40.27	43.60	12,841	33.92	36.79
Fruits (excluding citrus)	10,856	25.09	27.80	9,654	22.02	24.33
Sod	5,944	10.21	13.45	5,944	10.21	13.45
Potatoes	677	0.66	0.78	626	0.62	0.75
Field Crops	50	0.01	0.02	983	0.94	1.14
Livestock	N/A	0.64	0.64	N/A	0.64	0.64
Aquaculture	N/A	3.19	3.19	N/A	16.16	16.16
LEC Planning Area Total	**566,162**	**645.19**	**853.17**	**554,697**	**637.65**	**840.51**

LEC = Lower East Coast; mgd = million gallons per day.

Total irrigated acres are projected to remain relatively stable, declining approximately 2% by 2045. Sugarcane currently is the dominant crop in the LEC Planning Area, covering 454,157 acres (**Table 2-6**). More than 95% of the region's sugarcane acreage and water demands are within the Everglades Agricultural Area, and the remainder is in Hendry County (**Appendix A**). Demands associated with the production of fresh market vegetables, citrus, greenhouse/nursery stock, fruits, and sod are much smaller than sugarcane; however, they account for a substantial amount of the remaining AG demands and are vital industries in terms of economic impact.

INFO

Examples of crop categories used in this report include the following:

Fresh Market Vegetables:
- Tomatoes
- Green beans
- Sweet corn
- Peppers
- Melons

Fruits (excluding citrus):
- Avocados
- Mangos

Relatively little change is anticipated in AG water demands for nearly all crops within the LEC Planning Area. Mirroring the projected changes in irrigated acreage, AG demands are projected to decrease in Palm Beach and Miami-Dade counties due to conversion of agricultural land to residential and other land uses. By 2045, AG demands in Miami-Dade County are projected to decrease by approximately 10%.

Overall, total AG gross water demands under average rainfall conditions in the LEC Planning Area are estimated to decrease approximately 1%, from 645.20 mgd in 2021 to 637.65 mgd

in 2045 (**Table 2-7**). These totals include demands from livestock and aquaculture in addition to the demands from crop irrigation shown in **Table 2-7**.

Table 2-7. AG gross water demands for all agricultural acreage, livestock, and aquaculture in the LEC Planning Area by county.

County	Gross Demand – Average Rainfall Conditions (mgd)							2045 1-in-10-Year Demand
	2020	2021	2025	2030	2035	2040	2045	
Broward[a]	2.90	2.82	2.65	2.43	2.23	2.04	1.85	2.13
Hendry[a,b]	104.73	105.05	106.01	107.74	109.79	110.98	110.76	141.57
Miami-Dade	73.98	73.03	84.11	81.51	78.87	75.86	73.20	79.20
Monroe	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03
Palm Beach	470.51	464.28	451.83	451.83	451.83	451.83	451.82	617.58
LEC Planning Area Total	**652.14**	**645.20**	**644.62**	**643.53**	**642.74**	**640.73**	**637.65**	**840.52**

AG = Agriculture; LEC = Lower East Coast; mgd = million gallons per day.

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[b] Values listed for Hendry County are only for the areas within the LEC Planning Area boundaries.

COMMERCIAL/INDUSTRIAL/INSTITUTIONAL

The CII water use category includes water demands associated with commercial and industrial operations for processing, manufacturing, and technical needs (e.g., concrete, citrus processing, and mining operations). CII demands only include self-supplied users and do not include commercial or industrial users that receive water from PS utilities; those users are included in the PS category. All CII demand estimates and projections are presumed to be the same for average rainfall and 1-in-10-year drought conditions, and withdrawal demand is assumed to be equal to user demand. Therefore, no distinction is made between gross and net water demands. Growth within the CII category is expected to be driven by regional population growth. Estimated CII demands for 2021 were 87.35 mgd, with projected growth resulting in demands of 102.56 mgd in 2045 (**Table 2-8**).

Table 2-8. CII gross water demands in the LEC Planning Area by county.

County	Gross Demand (mgd)						
	2020	2021	2025	2030	2035	2040	2045
Broward[a]	2.82	2.85	2.94	3.04	3.13	3.20	3.27
Hendry[a,b]	1.69	1.69	1.69	1.69	1.69	1.69	1.69
Miami-Dade	73.25	73.92	75.92	79.02	81.91	84.56	87.09
Monroe	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Palm Beach	8.77	8.89	9.24	9.64	9.98	10.27	10.52
LEC Planning Area Total	**86.53**	**87.35**	**89.79**	**93.39**	**96.70**	**99.72**	**102.56**

CII = Commercial/Industrial/Institutional; LEC = Lower East Coast; mgd = million gallons per day.

[a] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Broward and Hendry counties. However, for discussion purposes, information relating to the Seminole Tribe of Florida Hollywood Reservation and the Seminole Tribe of Florida Big Cypress Basin Reservation is included in the calculations for Broward and Hendry counties, respectively.

[b] Values listed for Hendry County are only for the areas within the LEC Planning Area boundaries.

LANDSCAPE/RECREATIONAL

L/R is the third largest water use category in the LEC Planning Area, encompassing irrigation of golf courses and other landscaped areas, such as parks, sports fields, and common areas of residential developments. L/R demands are met with the use of groundwater, surface water, and reclaimed water. L/R acreages reflect only the acres under water use permits and do not include acres irrigated solely with reclaimed water that do not have a water use permit for a supplemental or backup supply. For L/R, acreage and demands are disaggregated into landscape and golf irrigation subcategories. Details regarding development of the L/R demands are provided in **Appendix A**.

Within the L/R category in 2021, 49,998 permitted acres were attributed to landscape irrigation. These landscaped areas are expecting growth of 17% to 58,466 acres by 2045. In 2021, there were 159 golf courses irrigating 21,032 acres under water use permits in the LEC Planning Area (SFWMD 2023), and this is projected to increase by 315 acres by 2045.

Under average rainfall conditions, total estimated L/R gross water demands are projected to increase from 178.65 mgd in 2021 to 199.18 mgd in 2045 (**Table 2-9**). Groundwater and surface water supply sources met approximately 74% of the 2021 L/R water demands, with reclaimed water supplementing the remaining 26%. The ratio of reclaimed water to groundwater/surface water used to meet future landscape demands is assumed to remain constant through 2045. Golf course acreage is projected to remain relatively stable over the planning period and, as a result, water demand for golf is held relatively constant over the planning horizon, with a slight increase in Palm Beach County. Reclaimed water use accounts for 26% of the water use for golf courses. See **Chapter 5** for a discussion of reclaimed water as an alternative water supply source.

Table 2-9. L/R gross water demands (in mgd) in the LEC Planning Area.

Land Use	Demand – Average Rainfall Conditions (mgd)							2045 1-in-10-Year Demand
	2020	2021	2025	2030	2035	2040	2045	
Broward County[a]								
Landscape	33.25	33.60	34.65	35.86	36.87	37.74	38.52	48.54
Golf	11.80	11.80	11.80	11.80	11.80	11.80	11.80	15.34
Broward County Total	**45.05**	**45.40**	**46.45**	**47.66**	**48.67**	**49.54**	**50.32**	**63.88**
Hendry County[a,b]								
Landscape	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Golf	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hendry County Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Miami-Dade County								
Landscape	11.13	11.23	11.54	12.01	12.45	12.85	13.23	16.67
Golf	3.51	3.51	3.51	3.51	3.51	3.51	3.51	4.56
Miami-Dade County Total	**14.64**	**14.74**	**15.05**	**15.52**	**15.96**	**16.36**	**16.74**	**21.23**
Monroe County								
Landscape	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.15
Golf	2.36	2.36	2.36	2.36	2.36	2.36	2.36	3.07
Monroe County Total	**2.58**	**2.58**	**2.58**	**2.58**	**2.58**	**2.58**	**2.58**	**3.22**

Table 2-9. Continued.

Land Use	Demand – Average Rainfall Conditions (mgd)							2045 1-in-10-Year Demand
	2020	2021	2025	2030	2035	2040	2045	
Palm Beach County								
Landscape	67.93	68.84	71.56	74.68	77.29	79.53	81.45	102.63
Golf	47.09	47.09	47.59	48.09	48.09	48.09	48.09	62.52
Palm Beach County Total	**115.02**	**115.93**	**119.15**	**122.77**	**125.38**	**127.62**	**129.54**	**165.14**
LEC Planning Area Total								
Landscape	**112.53**	**113.89**	**117.97**	**122.77**	**126.83**	**130.34**	**133.42**	**167.98**
Golf	**64.76**	**64.76**	**65.26**	**65.76**	**65.76**	**65.76**	**65.76**	**85.49**
LEC Planning Area Total	**177.29**	**178.65**	**183.23**	**188.53**	**192.59**	**196.10**	**199.18**	**253.47**

L/R = Landscape/Recreational; LEC = Lower East Coast; mgd = million gallons per day.

[a] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Broward and Hendry counties. However, for discussion purposes, information relating to the Seminole Tribe of Florida Hollywood Reservation and the Seminole Tribe of Florida Big Cypress Basin Reservation is included in the calculations for Broward and Hendry counties, respectively.

[b] Values listed for Hendry County are only for the areas within the LEC Planning Area boundaries.

POWER GENERATION

Demands under the PG category include use of groundwater, fresh surface water, or reclaimed water by thermoelectric power generation facilities. PG demands do not include the use of surface water returned to its withdrawal source, harvested rainfall, city water or seawater. Demands under average rainfall and 1-in-10-year drought conditions are assumed to be equal in the PG category; no distinction is made between gross and net water demands.

There are 12 power generation facilities operating in the LEC Planning Area (**Figure 2-2**). However, only seven of these facilities have demands that are addressed in this plan update: Florida Power & Light (FPL) Riviera Beach Next Generation Clean Energy Center, FPL Turkey Point Clean Energy Center, FPL West County Energy Center, Homestead G.W. Ivey Power Plant, Miami-Dade County Resources Recovery Facility, Okeelanta Cogeneration Facility, and Palm Beach County Solid Waste Authority Renewable Energy Park.

No new power generation facilities requiring water supply are planned for construction or operation through 2045. New solar power facilities are in development, but these do not have PG water demands. However, PG demands are projected to increase by 20.13 mgd from 2021 to 2045 (**Table 2-10**) mainly due to the potential future use at the FPL Turkey Point Clean Energy Center. The other six facilities with water supply demands are projected to remain relatively stable over the planning period. All PG demand estimates and projections are presumed to be the same for average rainfall and 1-in-10-year drought conditions.

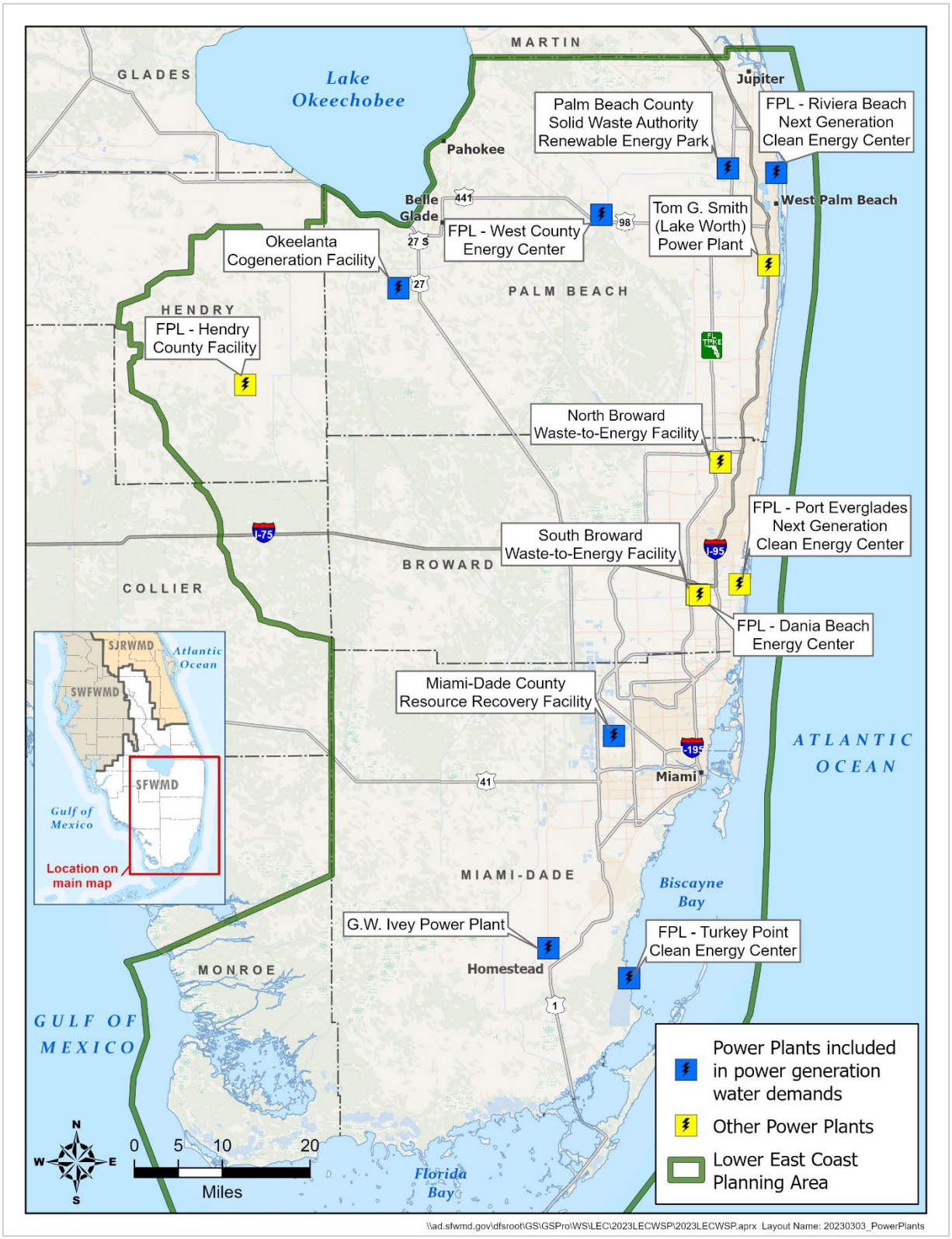

Figure 2-2. Power Generation facilities in the LEC Planning Area.

Table 2-10. PG water demands in the LEC Planning Area.

Facilities	Gross Demand (mgd)[a]						
	2020	2021	2025	2030	2035	2040	2045
FPL – Riviera Beach Clean Energy Center	0.09	0.02	0.10	0.10	0.10	0.10	0.10
FPL – Turkey Point Clean Energy Center [b,c]	17.49	21.86	42.60	42.60	42.60	42.60	42.60
FPL – West County Energy Center[d]	13.02	14.22	13.53	13.53	13.53	13.53	13.53
Homestead G.W. Ivey Power Plant	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Miami-Dade County Resources Recovery Facility	1.76	1.76	1.76	1.76	1.76	1.76	1.76
Okeelanta Cogeneration Facility	1.17	1.17	1.17	1.17	1.17	1.17	1.17
Palm Beach County SWA Renewable Energy Park	1.08	1.77	1.77	1.77	1.77	1.77	1.77
LEC Planning Area Total	**36.01**	**42.20**	**62.33**	**62.33**	**62.33**	**62.33**	**62.33**

FPL = Florida Power & Light; LEC = Lower East Coast; mgd = million gallons per day; PG = Power Generation; SWA = Solid Waste Authority.

[a] Includes groundwater from the surficial and Floridan aquifer systems, reclaimed water, and surface water; Does not include harvested rainwater, seawater, city water, or surface water returned to the source.

[b] The FPL Turkey Point Clean Energy Center has an allocation of 12.6 mgd from the Upper Floridan aquifer and reclaimed water combined.

[c] FPL and Miami-Dade Water and Sewer Department are coordinating future use of reclaimed water at the Turkey Point Clean Energy Center.

[d] The West County Energy Center has a backup allocation from the Upper Floridan aquifer and the L-10/L-12 canals when reclaimed water is unavailable.

SUMMARY OF DEMAND ESTIMATES AND PROJECTIONS

Total gross water demands under average rainfall conditions in the LEC Planning Area are projected to be 2,063.36 mgd by 2045, an 11% increase from 2021 demands (1,854.52 mgd). **Table 2-11** provides 5-year incremental summaries of gross demands for all water use categories in the LEC Planning Area under average rainfall and 1-in-10-year drought conditions. Gross demands under average rainfall conditions are used to demonstrate projected trends, including the following key highlights:

- PS and DSS average gross (raw) demands combined are expected to increase 18% from 901.12 mgd in 2021 to 1,061.62 mgd in 2045. PS will remain the largest water use category in the LEC Planning Area.
- AG average gross demands are projected to decrease from 645.20 mgd in 2021 to 637.65 mgd by 2045. This reduction is primarily due to the conversion of farmland in Palm Beach and Miami-Dade counties to other uses. AG will remain the second largest water use category in the LEC Planning Area through 2045.
- CII gross demands are projected to increase by 15.21 mgd over the planning period. The projected demand growth is related to regional population growth.
- L/R demands are projected to increase by 20.53 mgd over the planning period due to expansion of landscaped areas commensurate with population growth. Golf course acres are expected to remain relatively stable from 2021 to 2045.
- PG demands are projected to increase from 42.20 mgd in 2021 to 62.33 mgd in 2025 and then remain stable up to 2045.

Table 2-11. Summary of gross water demands under average rainfall and 1-in-10-year drought conditions in the LEC Planning Area by water use category.

Water Use Category	2020	2021	2025	2030	2035	2040	2045
Demand – Average Rainfall Conditions (mgd)							
PS	882.91	890.57	921.01	960.63	992.37	1,020.82	1,047.19
DSS	11.66	10.55	12.23	13.10	13.61	14.07	14.45
AG	652.14	645.20	644.61	643.52	642.73	640.72	637.65
CII	86.53	87.35	89.79	93.39	96.70	99.72	102.56
L/R	177.29	178.65	183.23	188.53	192.59	196.10	199.18
PG	36.01	42.20	62.33	62.33	62.33	62.33	62.33
LEC Planning Area Total	**1,846.55**	**1,854.52**	**1,913.20**	**1,961.50**	**2,000.33**	**2,033.76**	**2,063.36**
Demand – 1-in-10-Year Drought Conditions (mgd)							
PS	958.59	966.93	1,000.01	1,043.12	1,077.59	1,108.47	1,137.11
DSS	12.73	11.56	13.38	14.32	14.87	15.37	15.76
AG	862.50	853.17	847.87	846.90	846.10	844.00	840.51
CII	86.53	87.35	89.79	93.39	96.70	99.72	102.56
L/R	225.99	227.70	233.48	240.18	245.17	249.58	253.47
PG	36.01	42.20	62.33	62.33	62.33	62.33	62.33
LEC Planning Area Total	**2,182.35**	**2,188.91**	**2,246.86**	**2,300.24**	**2,342.76**	**2,379.47**	**2,411.75**

AG = Agriculture; CII = Commercial/Industrial/Institutional; DSS = Domestic Self-Supply; L/R = Landscape Recreational; LEC = Lower East Coast; mgd = million gallons per day; PG = Power Generation; PS = Public Supply.

DEMAND PROJECTIONS IN PERSPECTIVE

Demand projections presented in this 2023–2024 LEC Plan Update are based on the best available information. **Table 2-12** shows the 2040 average gross demands projected in the *2018 Lower East Coast Water Supply Plan Update* (2018 LEC Plan Update; SFWMD 2018) compared to the 2045 demands projected in this 2023–2024 LEC Plan Update. The projections reflect trends, economic circumstances, and industry intentions that will change over time. Like any predictive tool based on past assumptions, there is uncertainty and a margin for error. Although the estimated total demand is for 5 years later, the projection for 2045 in this 2023–2024 LEC Plan Update is 3% more than the estimated 2040 demand projected in the 2018 LEC Plan Update (SFWMD 2018).

Table 2-12. Comparison of gross water demands under average rainfall conditions at the end of the respective planning horizons in the 2018 LEC Plan Update and this 2023–2024 LEC Plan Update.

Water Use Category	2018 LEC Plan Update	2023–2024 LEC Plan Update	Percent Difference
	2040 Demand (mgd)	2045 Demand (mgd)	
Public Supply	1,089.34	1,047.19	-4%
Domestic Self-Supply	15.76	14.45	-8%
Agriculture	625.27	637.65	2%
Commercial/Industrial/Institutional	66.96	102.56	53%
Landscape/Recreational	156.46	199.18	27%
Power Generation	52.75	62.33	18%
LEC Planning Area Total	**2,006.54**	**2,063.36**	**3%**

LEC = Lower East Coast; mgd = million gallons per day.

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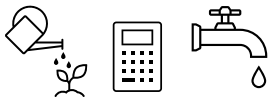
3

Demand Management: Water Conservation

An important element of water supply planning is accounting for the reduction in water demands that can be achieved through water conservation efforts. Water conservation entails reducing the quantity of water required to meet demands through water use efficiency improvements, the prevention or reduction of unnecessary uses, or the cessation of water losses contributing to the sustainability of water supply resources. Section 373.709(2), Florida Statutes (F.S.), requires that water conservation be considered when determining if the total capacity of the water supply development project options included in a water supply plan (**Chapter 8**) exceeds the increase in projected demands for the planning horizon (**Chapter 2**).

TOPICS

- Conservation Measures
- Conservation Programs
- Regulatory Initiatives
- Potential for Water Conservation Savings
- Conclusions



All water sources are finite; therefore, conservation and efficiency measures should be maximized, regardless of the water source, before more costly development options are implemented. Water conservation can reduce, defer, or eliminate the need to develop new water supply sources to meet current or future demands, which has the same effect as expanding the existing water supply. Moreover, conservation and demand management have been shown to reduce costs to utilities and customers over the long term (Feinglas et al. 2013, Chesnutt et al. 2018). Improving water use efficiency can reduce operational costs for most other users as well.

This chapter describes water conservation measures and programs and provides an estimate of potential water savings (demand reduction) achievable by 2045 in the Lower East Coast (LEC) Planning Area of the South Florida Water Management District (SFWMD or District). Additional conservation information can be found in the *2021–2024 Support Document for Water Supply Plan Updates* (2021–2024 Support Document; SFWMD 2021), in *Water Conservation: A Comprehensive Program for South Florida* (SFWMD 2008), and on the SFWMD webpage (https://www.sfwmd.gov/conserve).

CONSERVATION MEASURES

The average per capita water use rate in the LEC Planning Area has decreased from approximately 176 gallons per capita per day (gpcd) in 2000 to about 131 gpcd in 2021 (**Figure 3-1**).

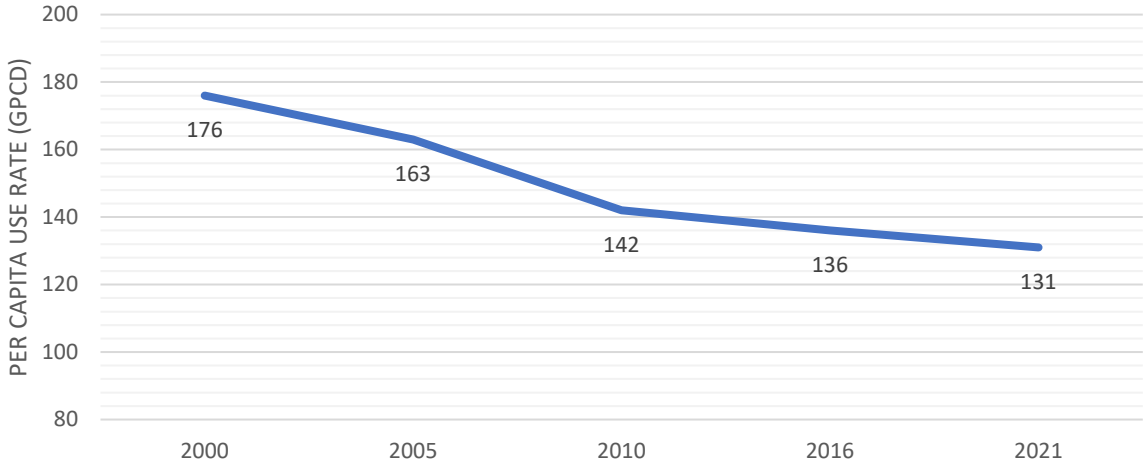


Figure 3-1. Finished Public Supply per capita use rate (in gallons per capita per day) in Palm Beach, Broward, Miami-Dade, and Monroe counties within the LEC Planning Area.

Although the reduction of per capita water use is in part due to implemented conservation measures like irrigation restrictions, it is thought to be largely due to passive water savings, which result from replacing older appliances and fixtures with more water-efficient models, and designing new homes with less irrigated green space. Federal, state, and local codes and standards promote the development and use of more efficient devices, increasing passive savings.

However, depending solely on passive savings will delay or exclude substantial conservation savings potential. Therefore, additional proactive conservation measures and programs are necessary to encourage the use of high-efficiency equipment or improved water use behaviors that yield water savings, including increased outreach, education, and messaging to water users. Local governments, utilities, and large water users are encouraged to research which types of programs would be most appropriate and cost-effective for their residents and specific user groups and to develop goal-based water conservation plans that include development and deployment of public education and outreach materials. Cost-share funding and other collaborative opportunities may be available to help implement conservation measures and programs. The following subsections include a brief description of outdoor and indoor water conservation measures that can be implemented.

Outdoor Water Use (Irrigation)

A significant share of water used outdoors in the LEC Planning Area is for irrigation. Lawns and landscapes are irrigated by residential and commercial property owners, while irrigation of food and other commodity crops is practiced by agricultural water users. Many irrigation

efficiency principles are common across these user groups; however, patterns and scales of use, system design, hardware and components, and operator knowledge can vary widely.

Agriculture

Many alternatives for improving irrigation efficiency and conserving water in agricultural operations are available and should be considered for implementation when economically feasible. Typically, agricultural water conservation measures fall under three categories: 1) converting from one irrigation method (or system type) to a more efficient one; 2) improving the precision irrigation management capabilities of the system; and 3) implementing best management practices (BMPs). Real-time information on soil moisture and weather conditions, along with remote operation to allow quick irrigation changes in response to changing weather, can help adjust when water is delivered to precisely meet crop needs. Hardware and technology that can improve system management, reduce water quantities required to meet crop needs, and minimize water losses include the following:

- Flowmeters
- Weather stations
- Soil moisture sensors
- Variable-frequency pump drives
- Automated control systems
- Best management practices (e.g., laser leveling, irrigation system maintenance)

Urban

In South Florida, where irrigation occurs year-round, the largest portion of water used by urban water users often is for irrigation. Moreover, the United States Environmental Protection Agency (USEPA) estimates approximately 50% of water used outdoors is wasted due to inefficient watering methods and systems. Therefore, improvements to irrigation efficiency are considered a primary target for conserving water used by urban water users.

Irrigation efficiency improvements can be achieved at single- and multi-family residences, commercial and institutional properties, recreational areas (e.g., parks, athletic fields), and other landscaped areas (e.g., roadway medians) by replacing outdated irrigation systems and timers. Automatic controllers should be tested and shown to meet the USEPA's WaterSense program specifications for water efficiency and performance. More information on the WaterSense program and labeled irrigation controllers is available at https://www.epa.gov/watersense. In Florida, all automatic lawn and landscape irrigation systems must be properly equipped with technology that inhibits or interrupts the system's operation during periods of sufficient rainfall (Section 373.62, F.S.) and should be programmed to irrigate only as necessary to supplement rainfall following any mandatory irrigation restrictions.

Golf courses typically are irrigated with a high degree of efficiency. However, opportunities to improve efficiency may exist using the same types of hardware and technology as described above. Additional practices for efficient golf course water use can be found in *Best Management Practices for the Enhancement of Environmental Quality on Florida Golf Courses*

published by the Golf Course Superintendents Association of America (2021) for golf course managers https://www.gcsaa.org/environment/bmp-planning-guide.

Indoor Water Use

Another area of potential conservation savings is indoor water use in single- and multi-family residences and commercial/institutional buildings (e.g., office buildings, restaurants, movie theaters, long-term care facilities, and hospitals). Feasible measures include detecting and repairing water leaks and replacing older, inefficient plumbing fixtures (e.g., toilets, urinals, faucets, showerheads) with models that have been tested and shown to meet the USEPA's WaterSense program specifications for water efficiency and performance. For more information on the WaterSense program and to find labeled products, visit https://www.epa.gov/watersense. Older, inefficient appliances can be replaced with water-efficient models that have received the ENERGY STAR label. For more information on the ENERGY STAR program and to find labeled products, visit https://www.energystar.gov.

Common water efficiency improvement measures for commercial and industrial users are outlined in the SFWMD's (2013) *Water Efficiency Audit Guide*, which is discussed in greater detail in the 2021–2024 Support Document (SFWMD 2021). Measures for improving water efficiency in nonresidential settings may be applicable to specific operations or facilities, such as autoclaves in hospitals; pre-rinse spray valves, food steamers, and waste grinders in restaurants; heating, ventilation, and air conditioning (HVAC) system efficiency upgrades; converting water-based cooling devices to air-based; and water reuse/recycling in industrial operations. Other applicable measures may exist for specific industrial processes.

CONSERVATION PROGRAMS

Conservation programs help educate water users and facilitate the adoption of effective water conservation measures (e.g., specific actions or hardware that improve water use efficiency). Utilities and local governments are the primary entities that develop and implement conservation programs. Other regional and state agencies may also assume a leadership role in promoting and providing cost-share funding for water conservation. Utilities and local governments are encouraged to analyze their service areas and jurisdictions to determine potential user groups and programs that may be most suitable for them. The following subsections contain brief descriptions of established conservation programs that may be applicable to different water use categories.

Education, Outreach, and Marketing

Although water savings attributed to education, outreach, and marketing campaigns are difficult to quantify, such campaigns are essential to reducing water use and instilling a lasting conservation ethic in businesses and communities. Developing a conservation ethic and educating water users enable people to understand why conservation is important and necessary, what conservation measures are available, and how they can implement them. Campaigns usually are conducted by regional/local agencies or utilities and are designed to

reach specific user groups (e.g., residents, schools, commercial properties), providing consistent and regular messaging.

The SFWMD maintains its commitment to water conservation education through distributing educational materials, conducting speaking engagements, and utilizing social media platforms to raise awareness about the necessity of saving water.

Cost-Share Funding Programs

SFWMD Cooperative Funding Program

The Water Conservation component of the SFWMD Cooperative Funding Program (CFP) seeks to financially support projects that improve water use efficiency and conservation. The CFP provides financial incentives to local governments and utilities, homeowners' associations, commercial entities, and agricultural operations to implement technology and hardware-based water conservation projects. Historically, funding for the CFP has come from both ad valorem taxes and the Florida Legislature through the Florida Department of Environmental Protection. CFP funding is considered annually during the SFWMD's budget development process. Since the *2018 Lower East Coast Water Supply Plan Update* (SFWMD 2018), the SFWMD has provided approximately $2.5 million in water conservation funding for 43 projects Districtwide. Over the same period (Fiscal Year [FY] 2018 through FY2022), 20 water conservation projects were funded in the LEC Planning Area for a total of $1.04 million with 1.13 million gallons per day (mgd) of water saved. Projects supported by the CFP between FY2018 to FY2022 are listed in **Chapter 8**. The CFP is expected to continue although future funding levels are uncertain. Beginning in FY2023, the District's Governing Board requires that local governments must have an adopted year-round irrigation ordinance that fully comports with the SFWMD's Mandatory Year-Round Landscape Irrigation Conservation Measures Rule (Chapter 40E-24, Florida Administrative Code [F.A.C.]) in order to be eligible for alternative water supply or water conservation funding through the CFP. Additional information regarding the CFP can be found on the SFWMD's webpage (https://www.sfwmd.gov/doing-business-with-us/coop-funding).

Environmental Quality Incentives Program

The Environmental Quality Incentives Program (EQIP), implemented through the United States Department of Agriculture – Natural Resources Conservation Service, promotes agricultural production and environmental quality. Financial and technical assistance is offered to participants to address natural resource concerns and deliver environmental benefits, such as improved water and air quality, conserved groundwater and surface water, reduced soil erosion and sedimentation, and improved or created wildlife habitat. From FY2018 through FY2022, EQIP has provided more than $1.9 million in funding for irrigation projects covering a total of 1,211 acres. EQIP is expected to continue although future funding levels are uncertain.

Certification and Recognition Programs

There are several national and statewide certification and recognition programs that direct builders, property owners, and building managers toward meeting environmentally friendly standards. Such programs include the Florida Green Building Coalition's green certification programs, the Florida Department of Environmental Protection's Green Lodging Program, the United States Green Building Council's Leadership in Energy and Environmental Design (LEED), and the Green Building Initiative's Green Globes Certification. These holistic programs typically include criteria affecting water use, energy efficiency, climate-adaptive landscaping, sustainable building material, site selection, indoor environmental quality, and greenhouse gas emissions.

INFO ⓘ

Florida-Friendly Landscaping means using low-maintenance plants and environmentally sustainable landscaping practices to conserve water, reduce pollution and erosion, and create wildlife habitat.

With respect to growing development and finite water resources, there are single-focus programs that target water use efficiency. These programs often are less expensive for builders and property managers than holistic ones. Two single-focus programs endorsed by all Florida water management districts are Florida Water Star and Florida-Friendly Landscaping Recognition. More information on these programs can be found on their individual program webpages and on the SFWMD's water conservation webpage (https://www.sfwmd.gov/conserve).

Other Programs

Agricultural Best Management Practices Program

The Florida Department of Agriculture and Consumer Services (FDACS) develops and adopts agricultural BMPs by rule for different types of agricultural operations. As of November 2022, there are 627,733 acres within the LEC Planning Area enrolled in the FDACS BMP program. All agricultural water users are encouraged to enroll in the FDACS BMP program and to learn about the FDACS Agricultural-Environmental Leadership Award which recognizes environmentally innovative farming practices. Local governments and agencies should consider promoting these programs to agricultural operations.

Agricultural Mobile Irrigation Labs

The FDACS Mobile Irrigation Lab (MIL) program performs free evaluations of irrigation system efficiency on agricultural lands and makes recommendations for physical and operational improvements. Such recommendations may include modification of irrigation systems and equipment, alteration of irrigation scheduling, and other aspects of system management. FDACS has MIL service available for all counties within the LEC Planning Area, except Monroe County.

Two agricultural MILs serve Miami-Dade, Broward, and Palm Beach counties, operated by the Palm Beach Soil and Water Conservation District. Since the last plan update, these

agricultural MILs conducted initial evaluations on participating agricultural properties, covering a total of 4,450 acres. A potential water savings of 2,696 million gallons per year (7.39 mgd) was estimated by these MILs if all recommended irrigation improvements were implemented.

During the period from 2018 to 2022, FDACS performed follow-up evaluations of the participating agricultural properties. Based on the improvements that were made to the properties following their initial evaluations, there was an estimated actual water savings of 579 million gallons per year (1.59 mgd) for those properties.

Urban Irrigation Audit Programs

There are two urban irrigation audit programs currently operating in the LEC Planning Area: one operated by Broward County's Natural Resources Division and the other operated by Miami-Dade County through the Miami-Dade Water and Sewer Department. These local programs are not affiliated with the FDACS MIL network. The goal of these programs is to increase irrigation water use efficiency in parks, government-owned facilities, commercial properties, and multi- and single-family homes. Both programs evaluate irrigation systems and replace irrigation controllers and other hardware to produce greater water use efficiency. Since 2018, Broward County, through its NatureScape Irrigation Service program, provided assessment services to 525 single-family homes resulting in an estimated savings of more than 260,000 gallons of water per day. Since 2018, Miami-Dade County provided assessment services to 247 single-family homes and 70 large properties, resulting in an estimated savings of more than 282,000 gallons of water per day.

Florida Automated Weather Network

The Florida Automated Weather Network (FAWN), operated by the University of Florida – Institute of Food and Agricultural Sciences (UF/IFAS), provides weather information throughout the state at 15-minute intervals. FAWN management tools provide decision support functions to growers using historical and real-time weather data as well as crop modeling technology to help with short- and long-term planning, thereby maximizing the efficiency of irrigation practices (UF/IFAS 2022). Currently, there are five FAWN stations (Fort Lauderdale, Clewiston, Wellington, Belle Glade, and Homestead) supported by the SFWMD in the LEC Planning Area. Additional information for these stations is available at http://www.fawn.ifas.ufl.edu.

REGULATORY INITIATIVES

Regulations are useful tools to assist in the implementation of better practices and more efficient devices. The SFWMD requires that water conservation measures and programs be considered for users with water use permits. For a proposed use of water to be deemed reasonable-beneficial, water users requiring a permit must include a water conservation plan in the permit application. Section 2.3.2 of the *Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District* (SFWMD 2022a) includes specific water conservation requirements for various water use categories.

The SFWMD's Mandatory Year-Round Landscape Irrigation Conservation Measures Rule (Chapter 40E-24, F.A.C.) was adopted to help protect South Florida's water resources by addressing landscape irrigation (the largest portion of residential water use and the greatest opportunity for viable water use reduction). In short, the rule limits landscape irrigation to 2 or 3 days per week, depending on location and local circumstances; restricts irrigation between the hours of 10 am and 4 pm; and contains provisions for new landscaping and other situations that require a deviation from the rule requirements.

Adoption of local ordinances that comport with Chapter 40E-24, F.A.C., and associated outreach and education to residents, is crucial to reducing landscape irrigation water use. When local governments implement irrigation ordinances, it demonstrates a commitment to water resource protection through conservation.

To assist local governments in adopting such an ordinance, the SFWMD has created a model ordinance, a model code, and several customizable outreach materials designed to educate residents on their local irrigation ordinance. As of March 2023, 69 of 116 local governments within the LEC Planning Area, which includes approximately 84% of the population, had adopted a year-round irrigation ordinance. Additional information and example documents for local implementation are on the SFWMD's webpage Local Government Model Ordinances and Codes available at https://www.sfwmd.gov/conserve.

POTENTIAL FOR WATER CONSERVATION SAVINGS

Potential water savings of 62.13 mgd for the LEC Planning Area were estimated for the following water use categories: Agriculture (AG), Public Supply (PS), Domestic Self-Supply (DSS), and Landscape/Recreational (L/R). **Table 3-1** summarizes prospective savings for each category. For the Commercial/Industrial/Institutional (CII) and Power Generation (PG) water use categories, potential water savings were estimated only for potable indoor water use, which was assumed to be provided by a PS utility. Therefore, those potential savings are accounted for under PS. The methods used to estimate the savings for each category are discussed in each subsection.

Public Supply and Domestic Self-Supply

PS is the largest water use category in the LEC Planning Area, and water use demands are projected to increase through the planning horizon. PS accounted for an estimated 807.52 mgd of finished water demands in 2021 and 944.70 mgd of projected demands in 2045 (**Chapter 2**). DSS is estimated to have demands of 9.98 mgd in 2021 and projected to have 13.59 mgd in 2045. Historical conservation efforts in PS are reflected in the per capita use rate, which has declined 26% between 2000 and 2021. This decline likely is the result of new construction using higher-efficiency fixtures and/or designed for more efficient water use, the SFWMD's Mandatory Year-Round Landscape Irrigation Conservation Measures Rule (Chapter 40E-24, F.A.C.), the adoption of local ordinances modeled on this rule, conservation rate structures, public education, and other conservation factors.

Estimates of active and passive water conservation potential for each county in the LEC Planning Area were made for residential and nonresidential users (in both PS service areas and DSS areas) using the Alliance for Water Efficiency Conservation Tracking Tool (AWE Tool), Version 4.0 (AWE 2021). The AWE Tool calculates active water savings for user-selected conservation measures based on the number of measures implemented annually over the planning horizon, and the per unit savings and service lives of each measure. Passive savings are generated by the AWE Tool based on natural replacement of toilets, showerheads, and water-using appliances at the end of their service lives, whose current or future minimum efficiency is dictated by national, state, or local code requirements. Baseline data include Florida Department of Revenue parcel information, University of Florida Bureau of Economic and Business Research household data and population projections, and Florida Department of Environmental Protection finished water monthly operating reports (as used in this plan update for demand projections; **Appendix A**). Conservation potential for DSS was analyzed along with PS users and extracted in proportion to its percentage of the total population in each county.

For this *2023–2024 Lower East Coast Water Supply Plan Update*, seven frequently implemented measures were selected and quantified to generate the potential water savings for the PS and DSS user groups. Conservation measures utilized in the estimates for residential users supplied by PS utilities and DSS users were as follows: high-efficiency toilets, showerheads, clothes washers, irrigation audits, landscape evaluations, advanced irrigation controllers, and water use audits. For many types of permit holders, including CII and PG, indoor potable water use often is provided by a PS utility. Conservation measures for nonresidential users served by PS utilities were limited to high-efficiency toilets and urinals.

For all measures, the conservation (demand reduction) estimate assumes a participation rate of 10% of the total annual potential implementations for each applicable measure. This assumption means 10% of all possible implementations would be accomplished over the planning horizon (2021 to 2045), which is thought to be an achievable participation rate for most conservation measures. The combined estimated conservation potential by PS and DSS (active and passive savings) in the LEC Planning Area in 2045 is 39.59 mgd. However, while

a 10% participation rate is achievable, a review of conservation projects funded by the SFWMD's Cooperative Funding Program reveals local governments in the LEC Planning Area have reached fewer than 10% of the prospective participants. Assuming the same participation rate as previously implemented programs, the combined expected savings for PS and DSS would be around 18.55 mgd over the planning horizon.

Agriculture

AG is the second largest water use category in the LEC Planning Area, accounting for an estimated 645.19 mgd of the total demand in 2021, which is projected to decrease to 637.65 mgd in 2045.

As discussed in **Chapter 2** and **Appendix A**, the annual Florida Statewide Agricultural Irrigation Demand (FSAID) report published by FDACS (2022) includes 20-year estimates and projections of agricultural acreage and water demands. Estimated efficiency improvement (i.e., conservation estimate) is one of the parameters calculated by the FSAID model, and the spatially based data that contribute to the water demand estimates and projections are available by water management district planning area. The potential AG conservation savings within the LEC Planning Area were determined using the FSAID geodatabase (https://www.fdacs.gov/Agriculture-Industry/Water/Agricultural-Water-Supply-Planning). The methodology for calculating the potential AG conservation savings is more fully described in Appendix E of the FSAID IX report (FDACS 2022), but generally is based on estimated historical use determined from the United States Department of Agriculture's Farm and Ranch Irrigation Surveys and actual water savings data from MILs. The projected conservation savings are based primarily on irrigation system changes, changes in scheduling, and sensor-based automation.

The total savings calculated by the FSAID model for any given year depends on the crops produced, the acreage of each crop, and the irrigation systems employed, as projected to exist in that year. Because these variables change over the planning horizon (2021 to 2045), projected savings also change and may be nonlinear. The estimated conservation potential for the AG water use category in 2045 is 16.15 mgd (**Table 3-1**).

Landscape/Recreational

The L/R use category is the third largest water use category in the LEC Planning Area and includes irrigation of landscaped areas, such as parks, athletic fields, roadway medians, commercial spaces, large private residential properties, and golf courses. Because their projected demands are estimated in different ways, golf course potential water savings are discussed separately from other permitted landscape irrigation.

L/R irrigation is projected to use a total of 199.18 mgd in 2045. There are approximately 8,000 active landscape irrigation water use permits in the LEC Planning Area, which were estimated to have used approximately 100 mgd in 2020 (SFWMD 2022b). To estimate the potential water conservation savings for landscaped areas, the average water use per permit

by county was determined. Then the average water savings attributed to installing a smart controller (16% savings) was applied to 30% (participation rate) of the available permits by county. This yields an estimated conservation potential for landscape irrigation of 4.69 mgd over the planning horizon.

Golf Courses

There are 159 active water use permits for golf courses in the LEC Planning Area (101 in Palm Beach, 33 in Broward, 24 in Miami-Dade, and 1 in Monroe counties) for golf course irrigation. Indoor potable water use at golf courses is assumed to be provided by a PS utility. There are no active golf course permits in the portion of Hendry County within the LEC Planning Area boundary.

Irrigation demands for golf courses in the LEC Planning Area are projected to increase by 2% as acreage devoted to golf courses is projected to rise from 21,032 acres in 2021 to 21,347 acres in 2045. Most golf courses are irrigated with a high degree of efficiency. According to a 2019 statewide survey of Florida Golf Course Superintendents Association members, 55% of golf courses use advanced irrigation controllers (Irwin and Wanvestraut 2020). A conservation program would therefore aim to affect the golf courses not yet using advanced irrigation controllers.

To estimate the potential water conservation savings for golf courses, 45% of the active permits were assumed not to be using advanced irrigation controllers. Then the average water use per permit by county was determined. Applying the average water savings attributed to installing a smart controller (16% savings) to 30% (participation rate) of the available permits by county yielded an estimated conservation potential for golf courses of 1.70 mgd over the planning horizon. Those savings combined with the potential savings for landscape irrigation (4.69 mgd) is a total savings of 6.39 mgd for the L/R use category (**Table 3-1**).

Commercial/Industrial/Institutional

For CII permit holders, indoor potable water use is assumed to be provided by a PS utility. Therefore, conservation savings estimates were captured during the PS analysis by the measures targeting nonresidential users (i.e., high-efficiency restroom fixtures). CII permitted water use was not analyzed for conservation potential as those uses were assumed to be process-specific and, therefore, difficult to estimate within the scope of a regional analysis.

Power Generation

PG facilities use large quantities of water for cooling, but most of the water is returned to the source from which it was obtained. As a result, there are minimal efficiency gains to be had from the cooling process. Potential savings for PG were not estimated as part of this analysis. As with the CII use category, indoor potable water use at PG facilities is assumed to be

provided by a PS utility. Therefore, conservation savings estimates were captured during the PS analysis in the AWE Tool by the measures specifically targeting nonresidential users (i.e., high-efficiency restroom fixtures).

CONCLUSIONS

Table 3-1 summarizes potential water savings for the LEC Planning Area in all use categories using common water conservation measures. Greater conservation savings may be possible if additional measures are implemented or if increased participation rates are realized. Participation rates can be influenced by ineffective marketing and high implementation costs. The estimates presented in this report are conservative and not intended to represent the full conservation potential utilizing all measures available. Studies have found adoption of demand-side water conservation is highly variable (Rasoulkhani et al. 2018). A comprehensive list of conservation measures and applicable water use categories can be found in the 2021–2024 Support Document (SFWMD 2021).

Table 3-1. Potential water saved (in mgd) in the LEC Planning Area based on demand reduction estimates achievable by 2045.

Use Category	County					2045 Total by Sector
	Broward	Hendry[a]	Miami-Dade	Monroe	Palm Beach	
Public Supply[b]	12.20	0.04	16.93	1.67	8.03	**38.88**
Agriculture	0.27	1.96	9.43	0.00	4.49	**16.15**
Landscape/Recreational[c]	1.76	0.00	0.80	0.01	3.82	**6.39**
Domestic Self-Supply[b]	0.07	0.20	0.13	0.00	0.32	**0.71**
Total	**14.30**	**2.20**	**27.29**	**1.68**	**16.66**	**62.13**

LEC = Lower East Coast; mgd = million gallons per day.
[a] Values listed for Hendry County are only for the areas within the LEC Planning Area boundaries.
[b] Includes passive savings.
[c] Includes golf and landscape/recreational savings.

The largest projected savings were identified for the PS (utilities) sector. Utilities should develop, fund, and implement comprehensive water conservation plans, particularly in areas where water demands are projected to exceed the available supply of traditional sources of water. Reducing demands through water conservation is almost always less expensive than developing new alternative water supply sources and associated treatment facilities. Utilities should consider the use of conservation planning tools, develop a robust public outreach and education component, and target high water users with water conservation messaging and measures. Lastly, utilities should take advantage of funding opportunities like the District's Cooperative Funding Program to assist individual users to make the necessary investments in conservation. Agricultural and landscape users should perform water use audits to identify leaks, poor design, and inefficient irrigation equipment and methods. Domestic users should identify opportunities, both outdoors and indoors, to replace inefficient, outdated hardware with more efficient WaterSense labeled equipment. All landscape irrigation should be conducted while following watering restrictions for both times and days. Finally, District staff are available to assist conservation program developers with technical support, collaborative program implementation, ordinance review, and long-term demand management planning.

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4

Water Resource Protection

This chapter provides an overview of protections afforded to water resources in the Lower East Coast (LEC) Planning Area of the South Florida Water Management District (SFWMD or District) through statutory and regulatory criteria. The ability to meet the water demands described in **Chapter 2** largely depends on the future availability of water resources. Understanding the relationship between projected water demands, water sources, and limitations imposed on withdrawals is critical to water supply planning.

TOPICS

- Regulatory Protection of Water Resources
- Summary of Water Resource Protection

Past analyses indicated that fresh water from the surficial aquifer system and from surface water in Lake Okeechobee and hydraulically connected canals was insufficient to meet the growing needs of the LEC Planning Area during 1-in-10-year drought conditions. Increased use of these water bodies as water sources is limited in much of the region due to potential impacts on wetlands, the saltwater interface, and other existing uses. Previous water supply plans identified a variety of alternative water supply development projects to minimize water resource impacts, avoid competition between water users, and provide a sustainable supply of water through the targeted planning horizon (SFWMD 2000a, 2006, 2013, 2018). Implementation of these projects is ongoing and includes increased water conservation, use of reclaimed water, surface water storage and management, and use of brackish water as a treated water supply. Active water supply development projects are discussed in **Chapter 8**.

NOTE

The MFL and prevention strategy for Lower West Coast aquifers affect a portion of the LEC Planning Area but are included in the Lower West Coast water supply plan updates.

To further protect water resources in the LEC Planning Area, minimum flows and minimum water levels (MFLs) were adopted for Lake Okeechobee, the Everglades, the Northwest Fork of the Loxahatchee River, Florida Bay, the Biscayne aquifer, and the Lower West Coast aquifers. A water reservation for the protection of fish and wildlife was adopted for Nearshore Central Biscayne Bay in 2013, and in 2021, a water reservation was adopted for the Everglades Agricultural Area (EAA) Reservoir. Restricted allocation areas (RAAs) were established for the L-1, L-2, and L-3 canal system in 1981; the North Palm Beach County/Loxahatchee River Watershed Waterbodies and LEC Everglades Waterbodies in 2007 (amended in 2022); the Lake Okeechobee Service Area (LOSA) in 2008; and the water stored via aquifer storage and recovery (ASR) wells at the C-18W Reservoir site in 2022.

REGULATORY PROTECTION OF WATER RESOURCES

Water Use Permitting

Unless exempt by statute or identified in the Water Rights Compact of 1987, the right to use water is authorized by permit, which allows for the use of water for reasonable-beneficial uses while protecting natural systems from harm. Water use permit applicants must provide assurances that the proposed water use 1) is reasonable-beneficial, 2) will not interfere with any existing legal use of water, and 3) is consistent with the public interest as required by Section 373.223(1), Florida Statutes (F.S.). The proposed water use must comply with the water resource protection criteria (see Rule 40E-2.301, Florida Administrative Code [F.A.C.], and the *Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District* [Applicant's Handbook; SFWMD 2022]), including 1) implementation criteria for regulatory components of an adopted MFL prevention or recovery strategy, 2) implementation criteria for water reservations, and 3) RAA criteria. Additional information about water use permitting can be found in the *2021–2024 Support Document for the Water Supply Plan Updates* (2021–2024 Support Document; SFWMD 2021).

INFO

The Seminole Tribe of Florida has surface water entitlement pursuant to the 1987 Water Rights Compact among the Seminole Tribe of Florida, the State of Florida, and the SFWMD (Public Law 100-228, 101 Statute 1556, and Chapter 87-292, Laws of Florida, as codified in Section 285.165, F.S.). The Miccosukee Tribe was established as a sovereign nation in 1962.

Minimum Flows and Minimum Water Levels

MFL criteria are the minimum flows or minimum water levels at which water resources, or the ecology of the area, would experience significant harm from further withdrawals. MFL criteria are applied individually to affected water bodies and define the minimum flow or minimum water level for surface water bodies, or minimum water level for groundwater in aquifers. Adopted MFLs in the SFWMD are contained in Chapter 40E-8, F.A.C. The SFWMD adopts a prevention or recovery strategy when an MFL is initially adopted (Rule 40E-8.421, F.A.C.) and, if needed, when an MFL is reevaluated or revised. The SFWMD fulfills its statutory obligation to identify key water bodies for which MFLs should be developed or reevaluated by providing a Priority Water Body List and Schedule in Chapter 3 of the annual updates to the *South Florida Environmental Report – Volume II* per Section 373.042(3), F.S. More information about MFLs, including prevention and recovery strategies, is provided in the 2021–2024 Support Document (SFWMD 2021). Additional information about MFLs can be found on the SFWMD webpage (http://www.sfwmd.gov/mfls) and in Chapter 40E-8, F.A.C.

Within the LEC Planning Area, MFLs and prevention and recovery strategies have been adopted for Lake Okeechobee, the Everglades, the Northwest Fork of the Loxahatchee River, Florida Bay, and the Biscayne aquifer (**Figure 4-1**). Recovery strategies have been adopted for Lake Okeechobee, the Everglades, and the Northwest Fork of the Loxahatchee River, and prevention strategies have been adopted for Florida Bay and the Biscayne aquifer. Brief summaries of the MFLs are provided here; additional information, including prevention and recovery strategies, can be found in **Appendix C**.

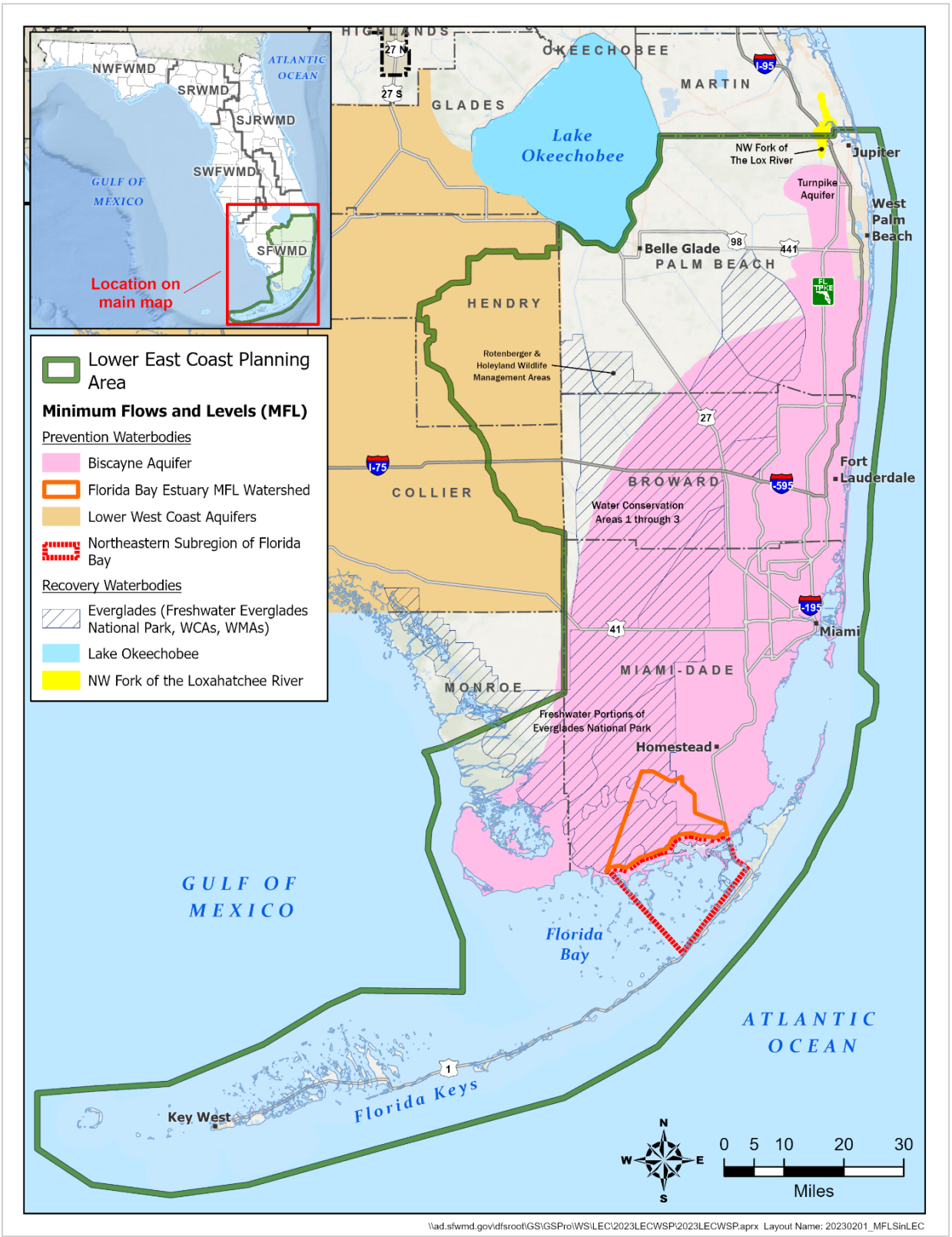

Figure 4-1. Adopted minimum flows and minimum water levels in the LEC Planning Area.

Lake Okeechobee

The SFWMD adopted an MFL of 11 feet National Geodetic Vertical Datum of 1929 (NGVD29) for Lake Okeechobee in 2001 pursuant to Subsection 40E-8.221(1), F.A.C. A prevention strategy was adopted for the lake simultaneously with MFL adoption, but it was changed in 2008 to a recovery strategy in Subsection 40E-8.421(2), F.A.C., while maintaining the MFL at 11 feet NGVD29. This change was made in anticipation of lowered lake levels and resulting MFL violations from implementation of the 2008 Lake Okeechobee Regulation Schedule (2008 LORS) by the United States Army Corps of Engineers (USACE). Additional water can be stored in Lake Okeechobee resulting from the completion of the dike repairs and the revised regulation schedule, known as the Lake Okeechobee System Operating Manual (LOSOM). Capital projects may also be implemented to provide additional storage in the basin. Additional details about the MFL and updated recovery strategy are provided in **Appendix C**.

Everglades

To protect water supplies for the Everglades, the SFWMD adopted an MFL for the region in 2001 as set forth in Subsection 40E-8.221(3), F.A.C. The Everglades MFL covers the lands and waters of the water conservation areas (WCAs), Holey Land and Rotenberger wildlife management areas, and freshwater portions of Everglades National Park as provided by Subsection 40E-8.021(7), F.A.C. The MFL criteria for the Everglades are a set of minimum water levels and return frequencies for peat- and marl-forming wetlands. A recovery strategy was adopted simultaneously with MFL adoption under Subsection 40E-8.421(2), F.A.C. Additional details about the MFL and recovery strategy are provided in **Appendix C**.

Northwest Fork of the Loxahatchee River

The SFWMD adopted an MFL for the Northwest Fork of the Loxahatchee River in 2003 as set forth in Subsection 40E-8.221(4), F.A.C. The MFL criteria are a minimum flow of 35 cubic feet per second over Lainhart Dam and an average daily salinity of less than 2 at river mile 9.2. Because the Northwest Fork was not meeting the MFL at the time of adoption, a recovery strategy as described in Subsection 40E-8.421(6), F.A.C. was adopted simultaneously with MFL adoption. Additional details about the MFL and recovery strategy are provided in **Appendix C**.

Lainhart Dam

Florida Bay

To protect the salinity regimes needed for flora and fauna in Florida Bay, the SFWMD adopted an MFL for the bay in 2006 as required by Subsection 40E-8.221(5), F.A.C. The MFL is a flow criterion with a salinity performance indicator. It includes a net minimum flow into Florida Bay over a 365-day period of 105,000 acre-feet, which was found through analyses to be needed to maintain a salinity of no greater than 30 at the Taylor River salinity monitoring station. A prevention strategy under Subsection 40E-8.421(8), F.A.C. was adopted simultaneously with MFL adoption. The MFL was reevaluated in 2014 based on several years

of additional research. Results of the 2014 reevaluation indicated the existing MFL criterion was an adequate threshold of significant harm to Florida Bay. Additional details about the MFL and prevention strategy are provided in **Appendix C**.

Biscayne Aquifer

The SFWMD adopted an MFL for the Biscayne aquifer in 2001 in accordance with Subsection 40E-8.231, F.A.C. based on analyses of the relationships between groundwater and regional canal water levels and the potential for saltwater intrusion (SFWMD 2000b). The MFL criterion is the water level in the aquifer that results in movement of the saltwater interface landward to the extent that groundwater quality at an established withdrawal point is insufficient to serve as a water supply source. Maintaining sufficient water levels (stages) in coastal canals is crucial for recharging the aquifer and maintaining the necessary water level in the aquifer to meet the MFL. A prevention strategy under Subsection 40E-8.421(3), F.A.C. was adopted simultaneously with the MFL adoption. Additional details about the MFL and prevention strategy are provided in **Appendix C**.

Water Reservations

Section 373.709, F.S., requires regional water supply plans to include reservations of water for the planning area, which are defined and adopted by rule. A water reservation sets aside a volume of water for the protection of fish and wildlife or public health and safety. Water reservations can be developed based on existing water availability or in consideration of future water supplies made available by water resource development projects. Reserved volumes of water are unavailable for allocation to consumptive uses (Section 373.223, F.S.). Additionally, water reservations may be components of MFL prevention or recovery strategies or be adopted to protect water for Comprehensive Everglades Restoration Plan (CERP) projects prior to their construction. More information about water reservations is provided in the 2021–2024 Support Document (SFWMD 2021).

Nearshore Central Biscayne Bay

The SFWMD adopted a water reservation for Nearshore Central Biscayne Bay in 2013 under Subsections 40E-10.061(1) and (2), F.A.C. (**Figure 4-2**) to protect the water needed for the CERP Biscayne Bay Coastal Wetlands Project – Phase 1. Nearshore Central Biscayne Bay is defined in Subsection 40E-10.021(4), F.A.C., as the area within Biscayne Bay up to 1,640 feet (500 meters) of the shoreline, beginning south of Shoal Point and extending southward to north of Turkey Point. The water reservation reserves from allocation all surface water contained within and flowing into Nearshore Central Biscayne Bay (**Figure 4-3**). Supporting documentation is available on the SFWMD webpage http://www.sfwmd.gov/reservations.

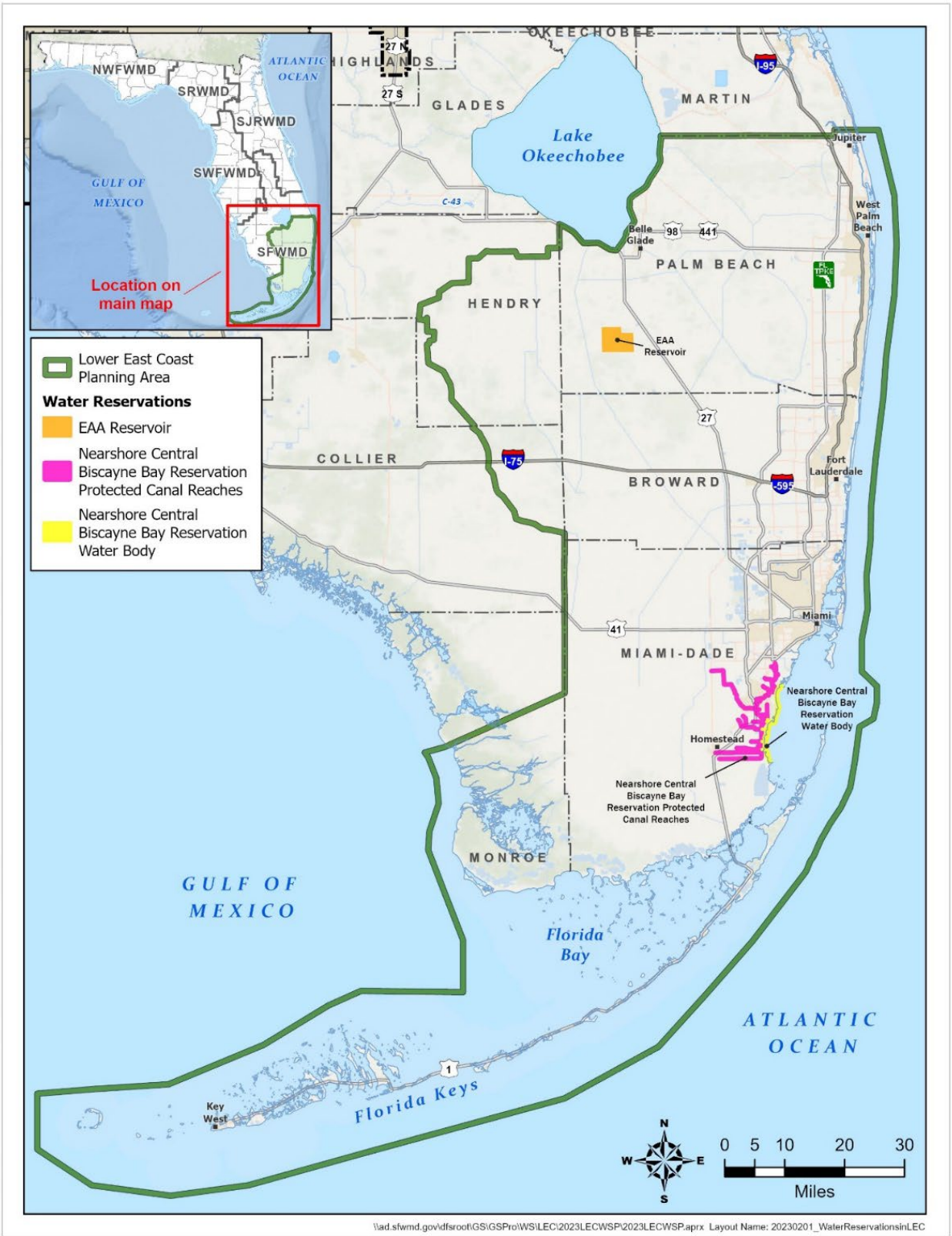

Figure 4-2. Adopted water reservations in the LEC Planning Area.

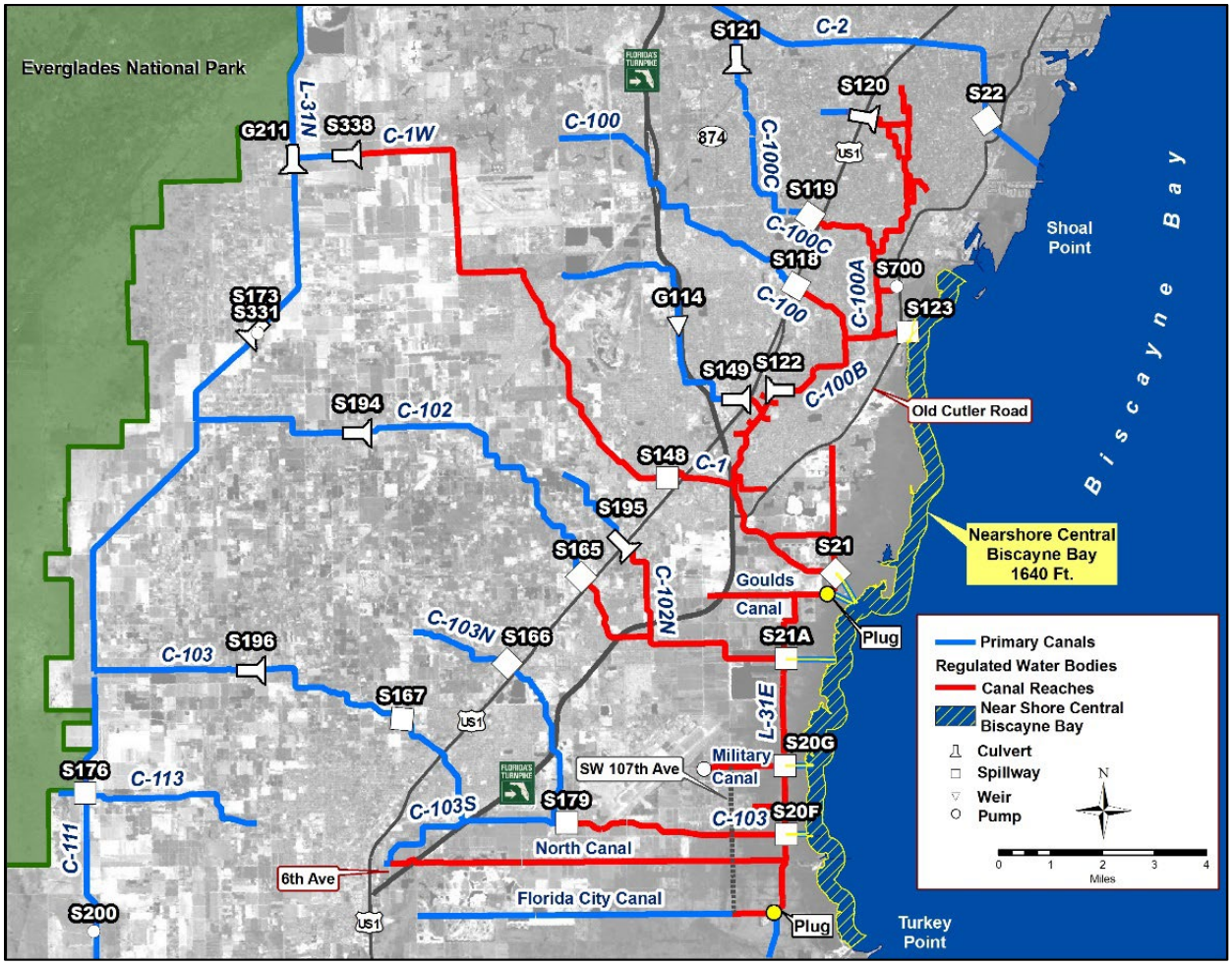

Figure 4-3. Nearshore Central Biscayne Bay reservation water body (includes yellow crosshatching along the coast and red canal reaches extending west).

EAA Reservoir

The SFWMD adopted a water reservation for the EAA Reservoir in 2021 as set forth in Subsection 40E-10.061(3), F.A.C. for all surface water released through structures S-624, S-625, and S-626 to the LEC Everglades Waterbodies. Water released through structure S-628 is not reserved from allocation (**Figure 4-4**). The EAA Reservoir is defined in Subsection 40E-10.021(7), F.A.C., as a reservoir located in Palm Beach County, Florida, south of the City of South Bay between the Miami and North New River canals. Construction began in 2023, and the USACE anticipates completion of construction in 2030. Additional details of the project description are included in **Chapter 5**.

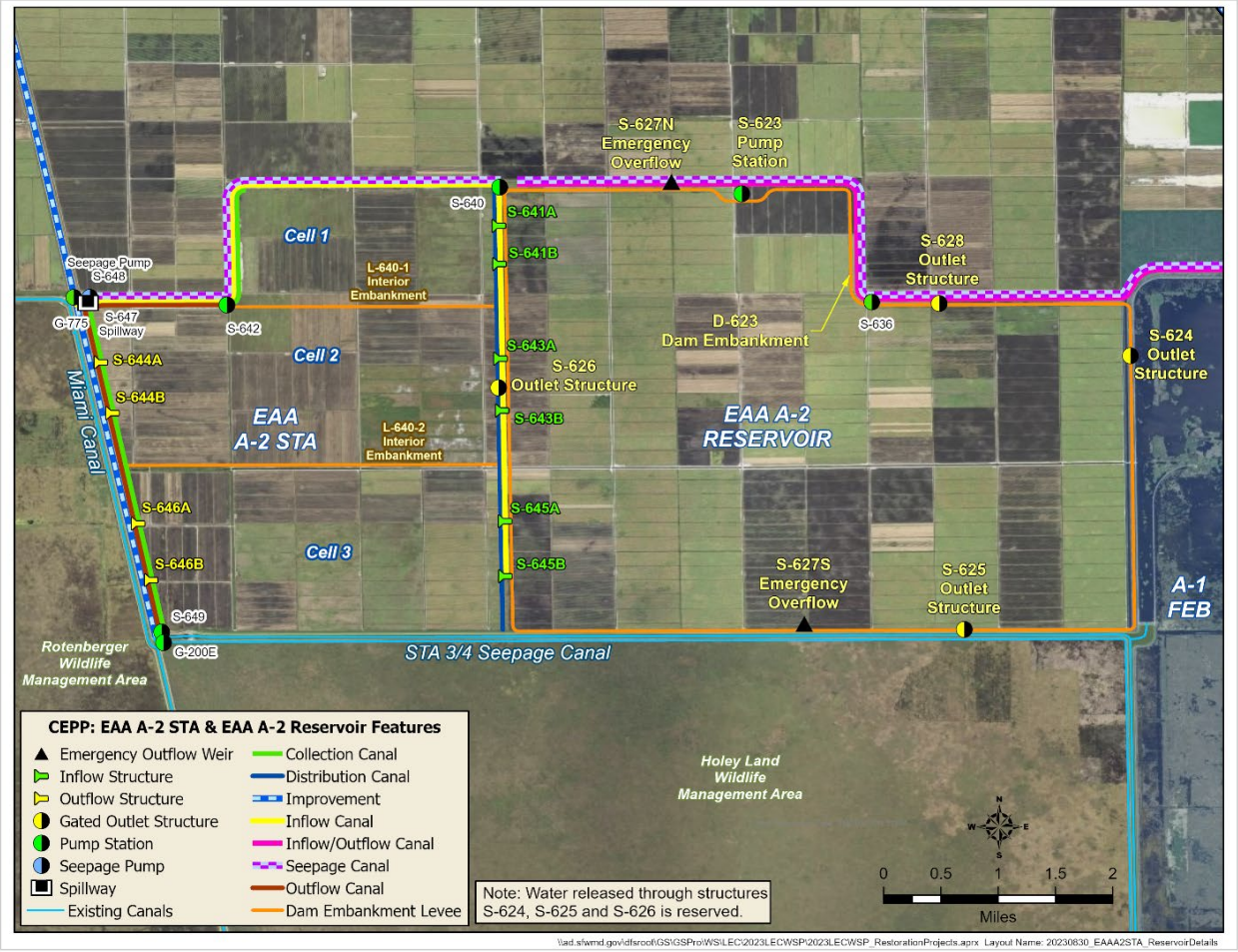

Figure 4-4. Location of the EAA Reservoir and associated structures.

Restricted Allocation Areas

RAAs are defined geographic areas where water allocations from water resources (e.g., lakes, rivers, wetlands, canals, aquifers) are limited. Additional allocations beyond the established limitation are restricted or prohibited. RAAs are established for a variety of reasons, including 1) where there is a lack of available water to meet the projected needs of a region, 2) to protect water for natural systems and future restoration projects (e.g., CERP), or 3) as part of MFL prevention or recovery strategies. RAA criteria are listed in Section 3.2.1 of the Applicant's Handbook (SFWMD 2022), which is incorporated by reference in Rule 40E-2.091, F.A.C. **Figure 4-5** shows the locations of established RAAs wholly or partially within the LEC Planning Area.

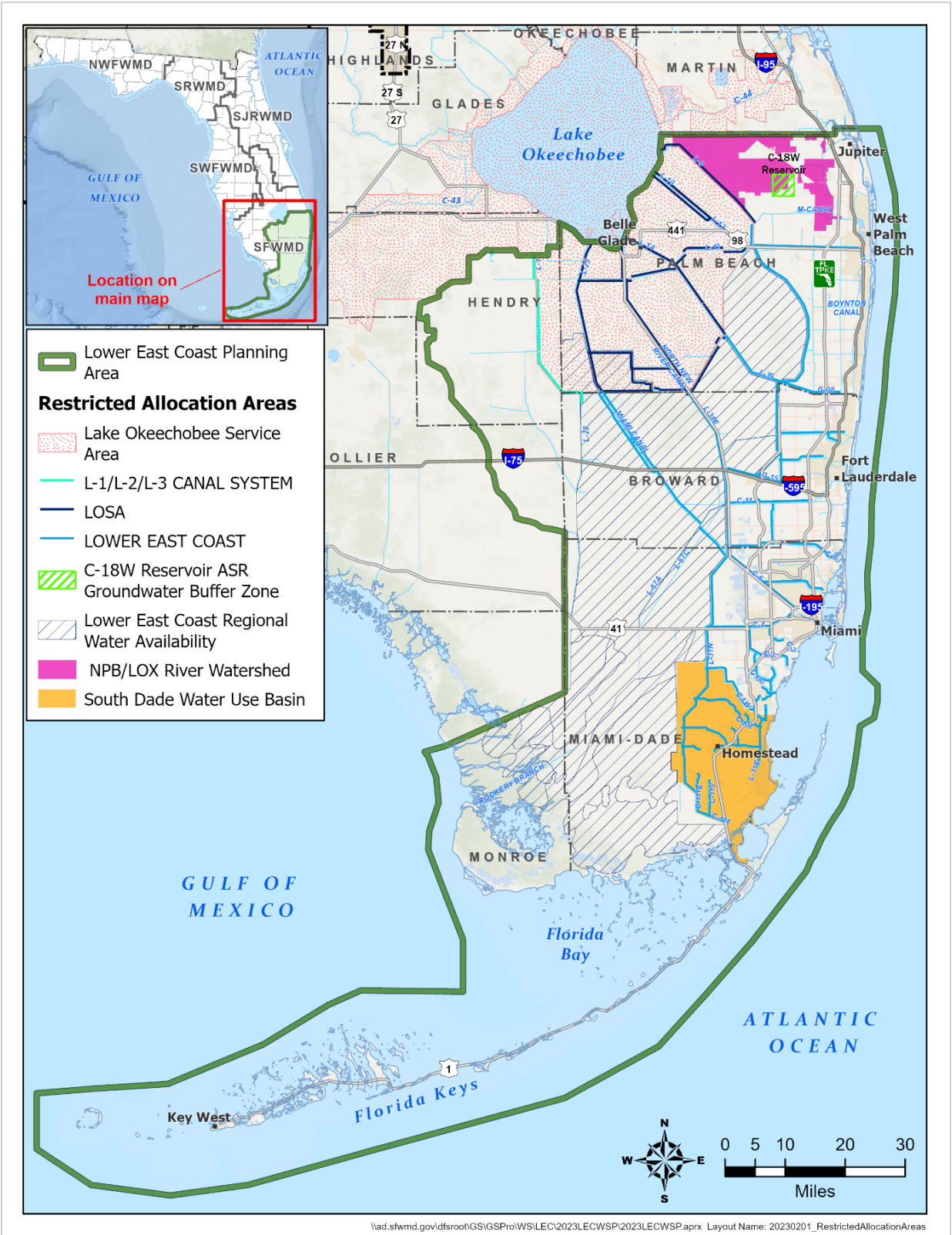

Figure 4-5. Adopted restricted allocation areas in the LEC Planning Area.

L-1, L-2, and L-3 Canal System

In 1981, an RAA was established for the L-1, L-2, and L-3 canal system (Subsection 3.2.1.C of the Applicant's Handbook [SFWMD 2022]), which lies along the western boundary of LOSA. This canal system is a limited surface water network that is not connected to Lake Okeechobee. The RAA prohibits increases in surface water pump capacity and additional surface water allocations from the L-1, L-2, and L-3 canals above existing allocations.

North Palm Beach County/Loxahatchee River Watershed Waterbodies

In 2007, the SFWMD established an RAA for the North Palm Beach County/Loxahatchee River Watershed Waterbodies (Subsection 3.2.1.E of the Applicant's Handbook [SFWMD 2022]). The RAA originally included surface water and shallow groundwater in the City of West Palm Beach's Water Catchment Area and Grassy Waters Preserve, Pal-Mar, J.W. Corbett Wildlife Management Area, Loxahatchee Slough, Loxahatchee River, Riverbend Park, Dupuis Reserve, Jonathan Dickinson State Park, Kitching Creek, Moonshine Creek, Cypress Creek, and Hobe Grove Ditch. In 2022, the RAA was amended to include additional lands in the Hungryland Slough, Cypress Creek, Pine Glades, and Sweetbay natural areas as well as the land for the C-18W Reservoir. These additional lands are within the CERP Loxahatchee River Watershed Restoration Project footprint. The RAA also includes the integrated conveyance systems that are hydraulically connected to and receive water from the North Palm Beach County/Loxahatchee River Watershed Waterbodies, such as Central and Southern Florida Project (C&SF Project) primary canals and the secondary and tertiary canals that derive water from the primary canals.

Net increases in the volume or changes in timing on a monthly basis of direct surface water and indirect groundwater withdrawals from the RAA are prohibited over that resulting from base condition uses permitted as of April 1, 2006 or April 1, 2022, whichever is applicable. Allocations over the base condition water use are only allowed through sources detailed in Subsection 3.2.1.E.5 of the Applicant's Handbook (SFWMD 2022), such as certified project water; implementation of offsets; alternative water supply; terminated or reduced base condition water use that existed as of April 1, 2006 or April 1, 2022, whichever is applicable; or available wet season water. The RAA is part of the MFL recovery strategy for the Northwest Fork of the Loxahatchee River.

Lower East Coast Everglades Waterbodies

In 2007, an RAA was established for the Lower East Coast Everglades Waterbodies (Subsection 3.2.1.E of the Applicant's Handbook [SFWMD 2022]). The RAA covers more than 1.5 million acres and includes WCAs 1, 2A, 2B, 3A, and 3B; the Holey Land and Rotenberger wildlife management areas; and the freshwater portions of Everglades National Park. The RAA also includes the integrated conveyance systems that are hydraulically connected to and receive water from the Lower East Coast Everglades Waterbodies, such as C&SF Project primary canals and the secondary and tertiary canals that derive water from the primary canals. Net increases in the volume or changes in timing on a monthly basis of direct surface water and indirect groundwater withdrawals from the RAA are prohibited over that resulting from base condition uses permitted as of April 1, 2006. Allocations over the base condition water use are only allowed through sources detailed in Subsection 3.2.1.E.5 of the RAA, such as certified project water, implementation of offsets, alternative water supply, terminated or

reduced base condition water use that existed as of April 1, 2006, or available wet season water. The Lower East Coast Everglades Waterbodies RAA is part of the MFL recovery strategy for the Everglades.

Lake Okeechobee Service Area

In 2008, the SFWMD adopted RAA criteria for LOSA, which spans more than 1.8 million acres (Subsection 3.2.1.F of the Applicant's Handbook [SFWMD 2022]). The criteria limit surface water withdrawals from Lake Okeechobee and all surface water hydraulically connected to the lake, such as the C-43 Canal, the C-44 Canal, and secondary canal systems that receive Lake Okeechobee water for water supply purposes via gravity flow or pump. Net increases in the volume of surface water withdrawn from the RAA are prohibited over that resulting from base condition water uses occurring from April 1, 2001 to January 1, 2008. Allocations over the base condition water use are only allowed through sources detailed in Subsection 3.2.1.F.3.c of the Applicant's Handbook (SFWMD 2022), such as certified project water, implementation of offsets, alternative water supply, available and unassigned base condition water use, or base condition water use that was terminated or reduced after January 1, 2008. The RAA has been and will continue to be part of the MFL recovery strategy for Lake Okeechobee.

ASR Storage Horizon Near the C-18W Reservoir

The SFWMD established an RAA in 2022 for the underground storage horizon of the ASR wells associated with the CERP Loxahatchee River Watershed Restoration Project (Subsection 3.2.1.G of the Applicant's Handbook [SFWMD 2022]). The ASR component of the project will store excess surface water in the Upper Floridan aquifer (UFA) or Avon Park permeable zone (APPZ) via four ASR wells adjacent to the C-18W Reservoir. Based on information from previous ASR investigations and modeling performed for the project, a 1-mile buffer from the boundaries of the C-18W Reservoir parcel was determined as the extent necessary to protect the project water stored via ASR. The RAA prohibits withdrawals from the same storage horizon, UFA or APPZ, as the C-18W Reservoir ASR wells that adversely impact the applicable groundwater buffer zone (**Figure 4-6**). Supporting documentation for the development of this RAA is available on the SFWMD webpage http://www.sfwmd.gov/raas.

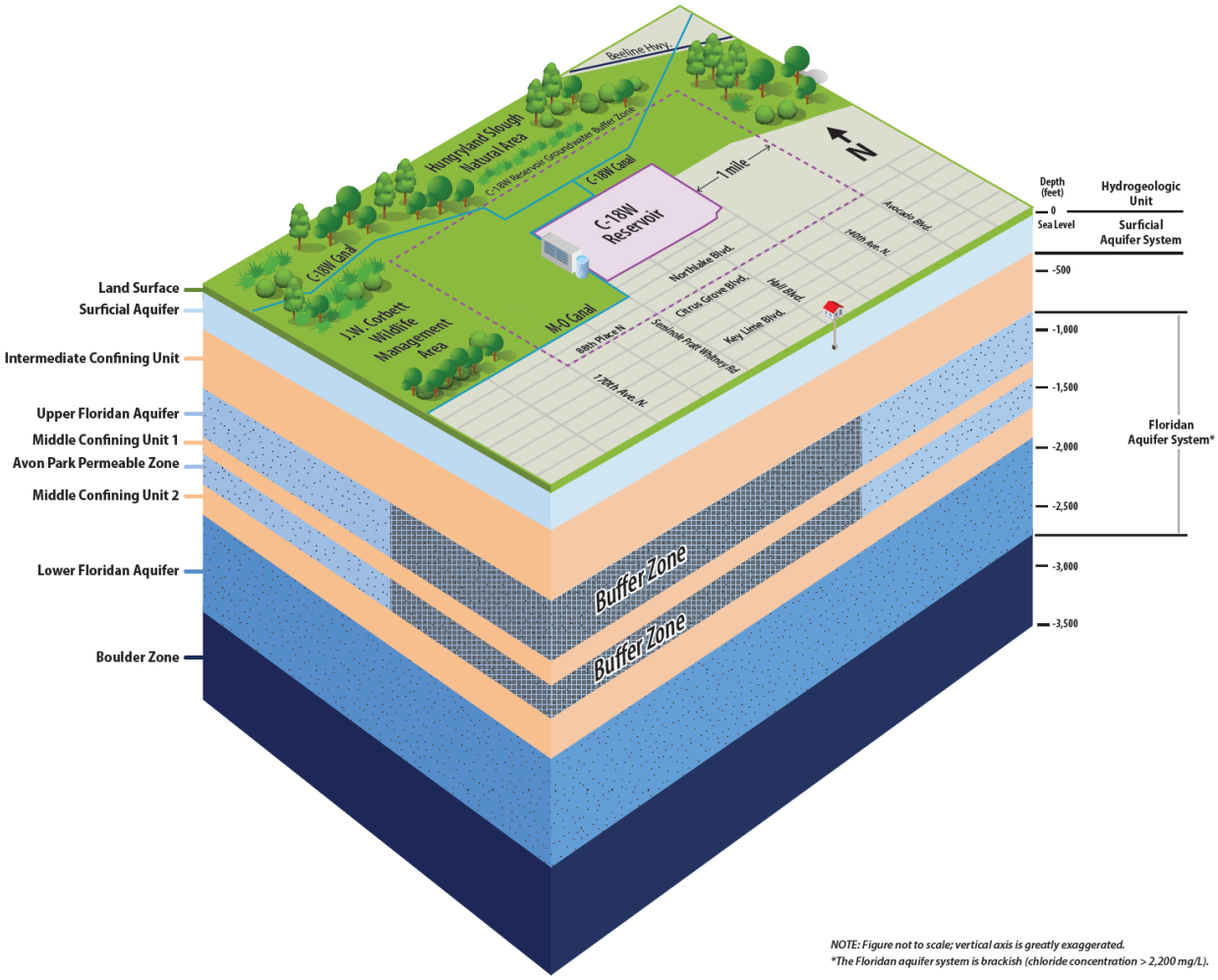

Figure 4-6. Protected areas in the Upper Floridan aquifer and Avon Park permeable zone related to the aquifer storage and recovery wells at the C-18W Reservoir.

SUMMARY OF WATER RESOURCE PROTECTION

- The LEC Planning Area has the following resource protections in place:
  - Water use permitting criteria
  - MFLs for Lake Okeechobee, the Everglades, the Northwest Fork of the Loxahatchee River, Florida Bay, the Biscayne aquifer, and the Lower West Coast aquifers
  - Water reservations for the Nearshore Central Biscayne Bay and EAA Reservoir
  - RAAs for the L-1, L-2, and L-3 canal system; the North Palm Beach County/Loxahatchee River Watershed Waterbodies and Lower East Coast Everglades Waterbodies; LOSA; and the ASR storage horizon near the C-18W Reservoir.
- A new RAA was established in 2022 for the same storage horizon, UFA or APPZ, as the ASR wells at the C-18W Reservoir site to protect this groundwater component of the CERP Loxahatchee River Watershed Restoration Project.
- The North Palm Beach County/Loxahatchee River Watershed Waterbodies RAA was amended in 2022 to fully protect the surface water components of the CERP Loxahatchee River Watershed Restoration Project.
- Further information on water shortage management and water use permitting is available in the 2021–2024 Support Document (SFWMD 2021).

NAVIGATE

Detailed information about MFLs is available on the SFWMD webpage http://www.sfwmd.gov/mfls.

Detailed information about water reservations is available on the SFWMD webpage http://www.sfwmd.gov/reservations.

Detailed information about RAAs is available in the Applicant's Handbook (SFWMD 2022), which can be accessed through the SFWMD webpage http://www.sfwmd.gov/raas.

MFL, water reservation, and RAA status updates are provided annually in Chapter 3 of the *South Florida Environmental Report – Volume II*, available at http://www.sfwmd.gov/sfer.

Further information can be found in the 2021–2024 Support Document (SFWMD 2021) and **Appendix C**.

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5

Water Source Options

TOPICS

- Surface Water
- Groundwater
- Reclaimed Water
- Water Storage
- Seawater
- Summary of Water Supply Source Options

This chapter of the *2023–2024 Lower East Coast Water Supply Plan Update* (2023–2024 LEC Plan Update) presents water supply source options that could be available through 2045 to accommodate urban and agricultural demands in the LEC Planning Area while sustaining the natural systems. Descriptions of these sources, current and projected uses, and factors that affect availability for water supply purposes are provided. **Chapter 6** presents the South Florida Water Management District's (SFWMD or District) analyses of the surface water and groundwater conditions in the region. Information about water treatment technologies and their related costs is provided in the *2021–2024 Support Document for Water Supply Plan Updates* (2021–2024 Support Document; SFWMD 2021) and the recently updated *Water Supply Cost Estimation Study* (Kimley Horn 2023).

In the LEC Planning Area, fresh groundwater from the surficial aquifer system (SAS) and surface water from canals and lakes are considered traditional water sources. Alternative water supply (AWS) or nontraditional water source options include brackish groundwater from the Floridan aquifer system (FAS), reclaimed water, water stored in aquifer storage and recovery (ASR) wells or in aboveground reservoirs, and seawater.

To meet water supply needs, water users primarily rely on fresh groundwater and surface water (**Figures 5-1** and **5-2**). However, withdrawals from these sources have approached sustainable limits because of aquifer productivity, environmental concerns, resource protection criteria, and regulatory limitations (**Chapter 4**). As a result, over the last two decades, brackish groundwater from the FAS and reclaimed water have become vital to urbanized areas to meet increased demands. AWS source use is an integral part of current and future water supply strategies. Fresh groundwater and surface water combined currently supply 94% of Public Supply (PS) and 99% of Agriculture (AG) needs in the LEC Planning Area (**Figure 5-2**).

Of the 54 PS utilities in the LEC Planning Area, 51 utilities use fresh groundwater from the SAS to supply the majority of the potable water demand, 24 utilities use or plan to use brackish groundwater for a portion of or all their needs, and two utilities have standby FAS wells. Agricultural operations in the Everglades Agricultural Area (EAA) rely on surface water, while growers in eastern Palm Beach and Miami-Dade counties and in the LEC Planning Area portion of Hendry County use a combination of fresh groundwater and surface water. Existing allocations and infrastructure can meet a substantial portion of the 2045

water needs for PS and AG. However, most of the increased demands for PS will be met with proposed AWS projects using brackish groundwater and surface water offsets. New withdrawals from traditional groundwater sources that induce seepage from regional surface water sources are limited by restricted allocation area (RAA) permitting criteria (**Chapter 4**).

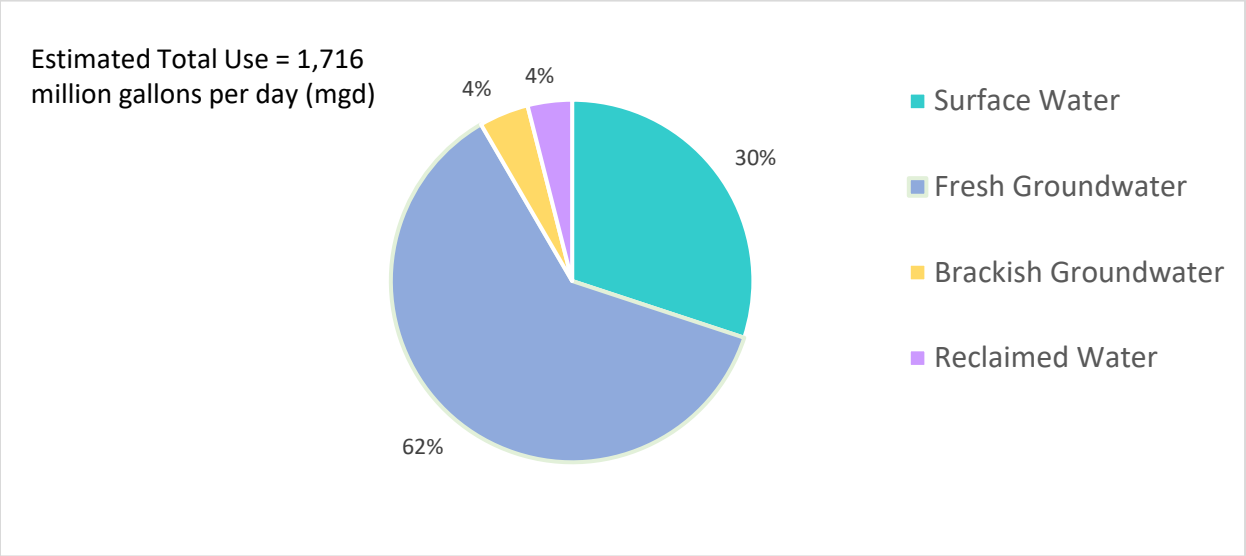

Figure 5-1. Water use percentage of the estimated total use of 1,716 mgd in the LEC Planning Area in 2021 by source (Data from SFWMD 2023).

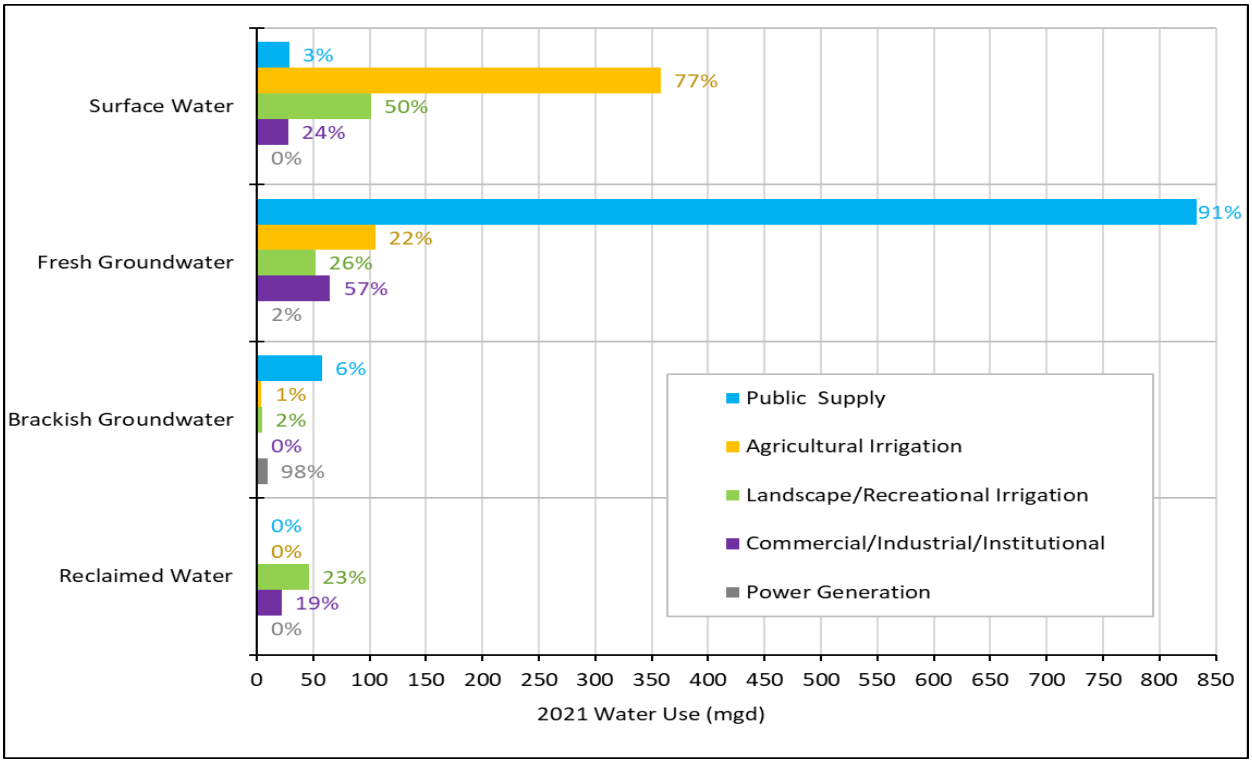

Figure 5-2. Water use in the LEC Planning Area in 2021 (Data from SFWMD 2023) by source and use type. (Notes: Fresh groundwater supplies 100% of Domestic Self-Supply demand. Percentages may not equal 100% due to rounding.)

SURFACE WATER

Surface water sources, primarily used for urban and agricultural irrigation, include rivers, canals, lakes, and reservoirs. Although the LEC Planning Area has multiple surface water sources, most are limited by regulatory protections (**Chapter 4**). Primary surface water sources are Lake Okeechobee and its connected canals, water conservation areas (WCAs), and diversion and impoundment systems. Local canals, lakes, and reservoirs also provide a considerable amount of surface water supply in the LEC Planning Area.

As discussed in **Chapter 4**, the SFWMD adopted RAA criteria in 2008 for the Lake Okeechobee Service Area as part of the minimum flow and minimum water level (MFL) recovery strategy for Lake Okeechobee. The criteria limit allocations from Lake Okeechobee and integrated conveyance systems that are hydraulically connected to and receive water from the lake, including the C-43 and C-44 canals, to base condition water uses that occurred from April 1, 2001 to January 1, 2008 (Section 3.2.1.F of the *Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District* [Applicant's Handbook; SFWMD 2022]). Following adoption of the RAA, all irrigation users in the Lake Okeechobee Service Area were required to renew their water use permits. The unique water management activities within the EAA result in more efficient use of water (75% efficiency) compared to other agricultural areas using similar seepage irrigation systems (50% efficiency) and result in lower water needs for the basin. By changing the efficiency applied to water use permit renewals in the EAA, there was a 33% decrease in the renewal allocation for the basin.

In 2007, the SFWMD adopted the LEC Regional Water Availability criteria to prohibit increases in surface water and groundwater withdrawn from the North Palm Beach County/Loxahatchee River Watershed Waterbodies and Lower East Coast Everglades Waterbodies above base condition water uses permitted as of April 1, 2006 (Section 3.2.1.E of the Applicant's Handbook [SFWMD 2022]). This also includes canals that are connected to and receive water from these water bodies. New direct surface water withdrawals are prohibited from the Everglades and Loxahatchee River watersheds and from the integrated conveyance systems. These criteria are components of the MFL recovery strategies for the Everglades and the Northwest Fork of the Loxahatchee River (Section 3.2.1.E of the Applicant's Handbook [SFWMD 2022]).

An RAA was adopted for the L-1, L-2, and L-3 canals in eastern Hendry County in 1981. The limited network of surface water drainage canals within this area does not receive water from Lake Okeechobee. The RAA prohibits allocation of additional surface water from the L-1, L-2, and L-3 canals beyond existing allocations, and it also prohibits increases in surface water pump capacity (Section 3.2.1.C of the Applicant's Handbook [SFWMD 2022]). More information about MFLs, associated prevention and recovery strategies, and RAAs is provided in **Chapter 4**, **Appendix C**, and the Applicant's Handbook (SFWMD 2022]).

Lake Okeechobee and Water Conservation Areas

Lake Okeechobee, its connected conveyance system, and the WCAs are the most important surface water sources for the LEC Planning Area. These sources supply surface water to the regional system via canals and recharge the SAS, which prevents saltwater intrusion along the coast. Lake Okeechobee serves multiple purposes, including flood control during the wet

season and water supply during the dry season. AG is the predominant user of surface water from Lake Okeechobee, which serves as a supplemental water supply source when rainfall is insufficient to meet demands. At lower lake levels, the SFWMD can use supplemental pumps to meet water supply needs in the EAA and the Seminole Tribe of Florida Big Cypress and Brighton reservations. Water from the lake is used as a backup source for urban users in the LEC Service Areas during dry times primarily to recharge PS wellfields and, depending on availability, may provide pass-through water to the WCAs in accordance with their regulation schedules. The 2008 Lake Okeechobee Regulation Schedule (2008 LORS) resulted in an average reduction of approximately 430,000 acre-feet of water storage in the lake.

In 2019, the United States Army Corps of Engineers (USACE) initiated development of the new Lake Okeechobee System Operating Manual (LOSOM) that reevaluates and defines operations for the lake taking into account the additional infrastructure, including the Herbert Hoover Dike rehabilitation and Kissimmee River Restoration Project as well as the Comprehensive Everglades Restoration Plan (CERP) C-43 West Basin Storage Reservoir and C-44 Reservoir and Stormwater Treatment Area (STA). The resulting LOSOM, which is expected to be finalized in 2024, includes a new lake regulation schedule addressing the congressionally authorized purposes that include flood risk management; water supply for agricultural irrigation, municipalities and industry, environment, and Native American Tribes; navigation; enhancement of fish and wildlife; and recreation. Analyses conducted as part of LOSOM indicate the LOSOM selected plan schedule modestly improves water supply performance. The MFL recovery strategy is being revised as part of this plan update to determine the appropriate projects needed to create additional storage volumes to return the lake to an MFL prevention strategy. A storage assessment analysis is being performed as part of this 2023–2024 LEC Plan Update to determine the additional storage needed.

Canals connected to the lake will continue to provide fresh surface water for supplemental agricultural and urban irrigation in the future, consistent with water use permits.

Local Surface Water Sources

Local surface water sources that provide water supply in the LEC Planning Area include the following:

- **Central and Southern Florida Project (C&SF Project) Canals** – These primary regional canals move water from Lake Okeechobee to coastal areas to recharge the SAS during the dry season and to prevent saltwater intrusion (**Figure 5-3**). Water for AG and Landscape/Recreational irrigation (L/R) is withdrawn directly from the canals or diverted to local canal systems for additional storage and use. However, regulatory constraints (RAA criteria) restrict new or increased permit allocations from these regional canals.
- **Water Control (298) Districts** – Several water control districts, established under Chapter 298, Florida Statutes (F.S.), are operated for flood control and water supply in the LEC Planning Area. Stormwater from the interconnected lakes and canals can be held in the water control district canal systems for irrigation. Some of the water control districts divert water from C&SF Project canals to maintain specific water levels within their boundaries (**Figure 5-4**). In the LEC Service Areas, diversions are for recharging PS wellfields and managing saltwater intrusion. In the EAA, water control districts provide water supply for AG.

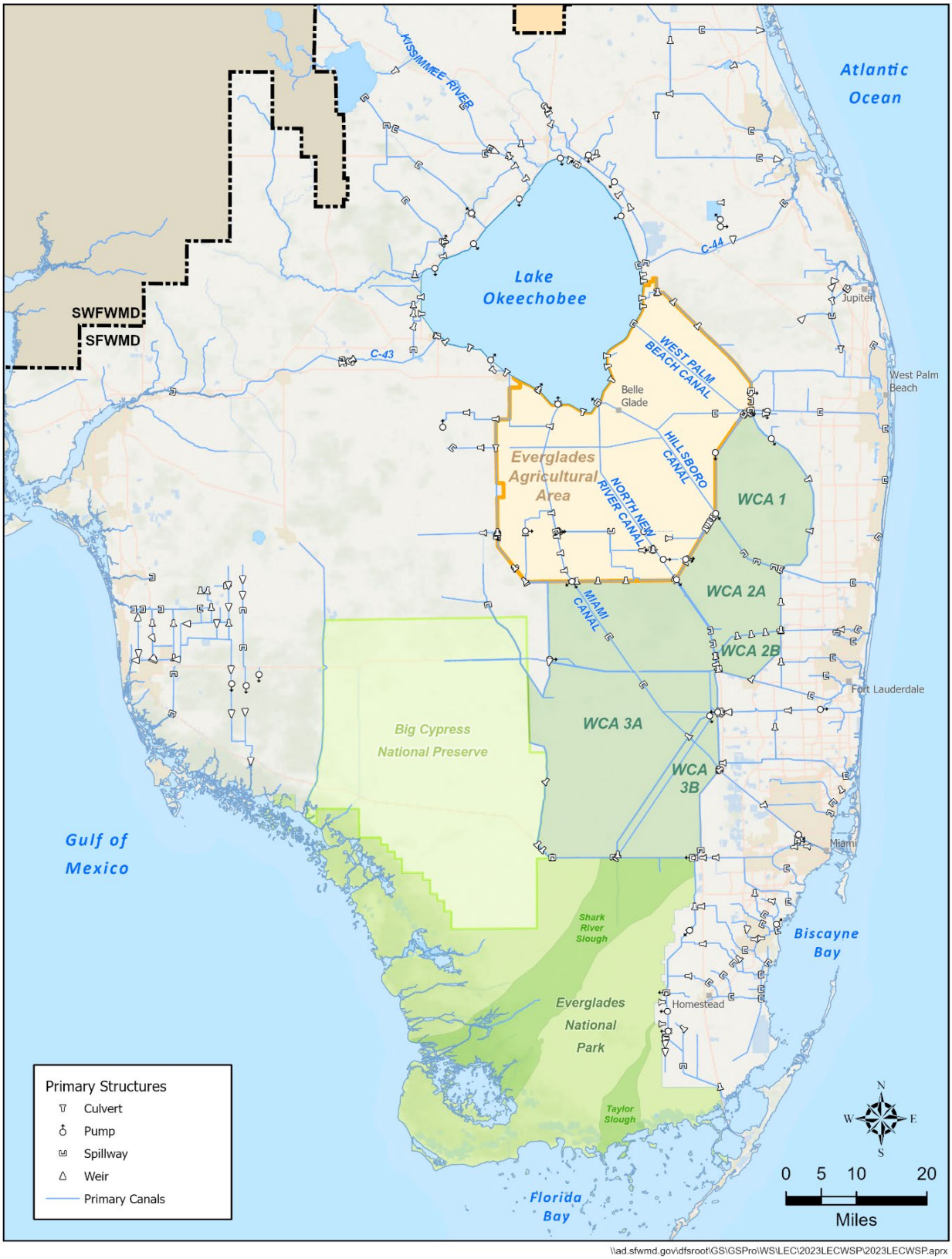

Figure 5-3. Central and Southern Florida Project canal system.

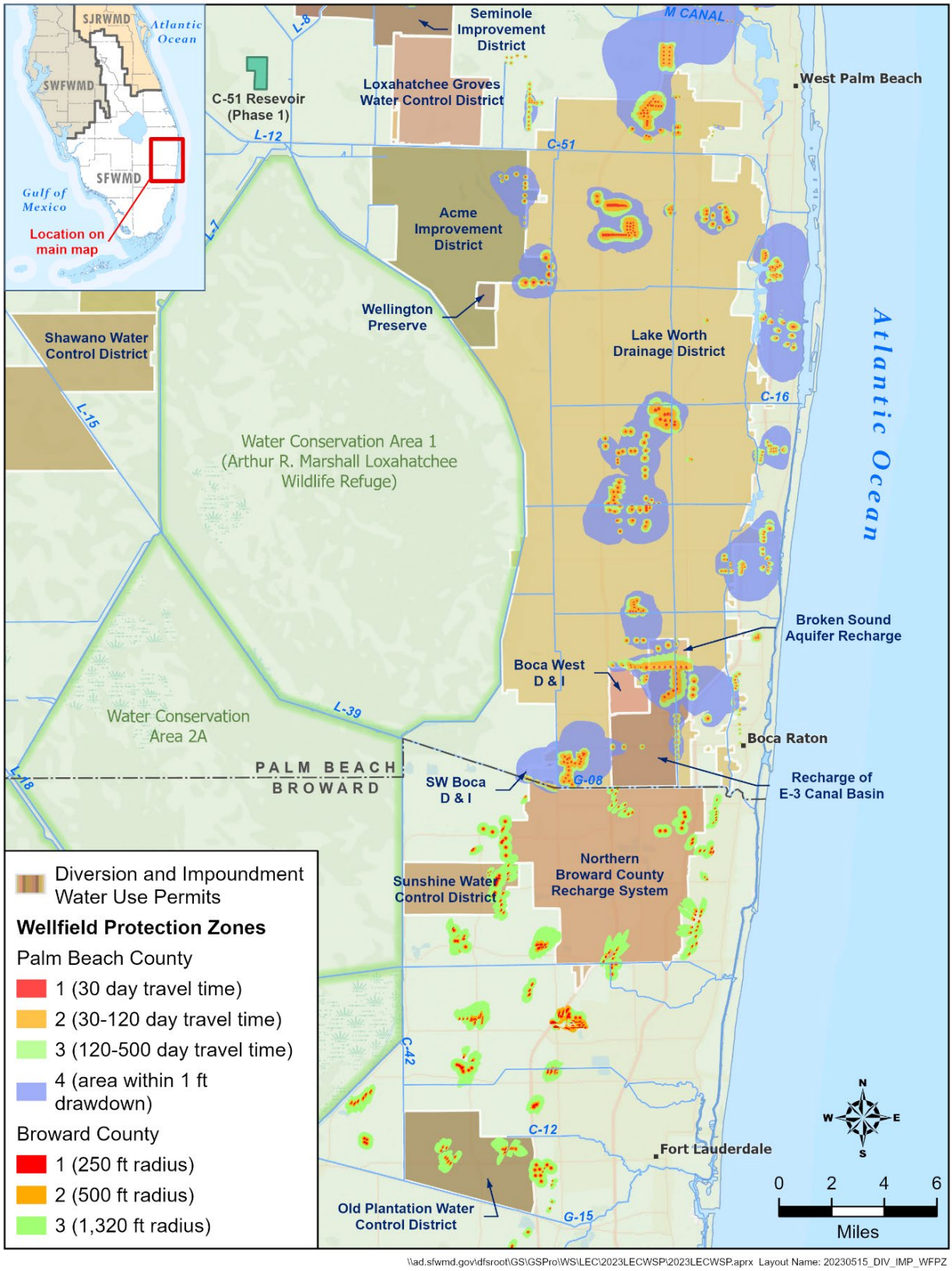

Figure 5-4. Water control districts that divert regional water to recharge Public Supply wellfields in the LEC Planning Area.

Existing and Future Use of Surface Water

AG is the largest user of surface water in the LEC Planning Area. In 2021, approximately 77% of AG demands were met with surface water (**Figure 5-2**) and this percentage is expected to remain the same through 2045. Most AG acreage is in the EAA (**Chapter 2**), and supplemental irrigation is supplied by surface water from canals connected to Lake Okeechobee. AG users in eastern Palm Beach County also rely on surface water from the regional canal network, WCA-1, and Lake Okeechobee for supplemental irrigation. Some smaller agricultural uses, including nurseries and aquaculture in Broward and Miami-Dade counties, use surface water from adjacent local canals or on-site lakes. Projected water demands for the EAA have declined due to a reduction in irrigated acres associated with the construction of the EAA A-2 Reservoir and STA. A slight decrease in AG demands is projected from 2021 to 2045. Permitted AG surface water withdrawal locations in the LEC Planning Area are shown in **Figure 5-5**.

Approximately 50% of L/R irrigation demands in the LEC Planning Area, including golf courses, were met with surface water in 2021 (**Figure 5-2**). Withdrawals primarily are from on-site ponds or adjacent local canals. L/R use is expected to increase approximately 11% by 2045; however, surface water withdrawals may decrease as new demands and some existing demands are met with reclaimed water. Permitted L/R surface water withdrawal locations in the LEC Planning Area are shown in **Figure 5-6**.

In 2021, surface water was used to meet 24% of Commercial/Industrial/Institutional (CII) demands in the LEC Planning Area (**Figure 5-2**). Surface water supplied 31% of CII demand in Palm Beach County, 3% in Broward County, and 24% in Miami-Dade County. Sand, gravel, and stone mining operations account for most of the CII water demands. For the CII category, some surface water withdrawals may be replaced with reclaimed water if available.

The City of West Palm Beach is the only PS utility in the LEC Planning Area that uses surface water as its primary source. The city withdraws water from Clear Lake, which is connected to Lake Okeechobee via tie-back canals (L-8 Canal and M-Canal) and Grassy Waters Preserve, a water impoundment area.

Surface water is used primarily for AG and to a lesser extent L/R, CII, and PS uses. Based on the revised demand projections for this plan update, which are 3% higher than the previously projected 2040 demands in the *2018 Lower East Coast Water Supply Plan Update* (SFWMD 2018), surface water sources appear sufficient to meet the projected 2045 demands.

Surface Water Supplies to the Seminole Tribe of Florida

The Seminole Tribe of Florida has two reservations in the LEC Planning Area: Big Cypress and Hollywood (**Figure 1-1**). At the Big Cypress Reservation, surface water is delivered via the G-409 Structure, at the junction of the L-3 and L-4 canals, and via the North and West Feeder canals (**Figure 5-5**). Lake Okeechobee, via the Miami Canal and the G-404 water control structure, is a secondary supplemental irrigation supply source, with specific volumes of water identified for delivery to the Big Cypress Reservation. The Seminole Tribe of Florida also owns other facilities and land within the LEC Planning Area (such as the Coconut Creek Casino). Demands, if any, associated with these other properties and the Hollywood

Reservation are included within the AG, L/R, and PS water use categories and are met primarily with groundwater.

The Seminole Tribe of Florida has surface water entitlement rights pursuant to the 1987 Water Rights Compact between the Seminole Tribe of Florida, State of Florida, and SFWMD (Public Law 100-228, 101 Statute 1566, and Chapter 87-292, Laws of Florida, as codified in Section 285.165, F.S.). The parties executed subsequent documents addressing the compact entitlement provisions. One such document is the 1996 agreement addressing the SFWMD's mitigation responsibilities regarding impacts to the Seminole Tribe of Florida's ability to obtain surface water supplies at the Brighton (northwest of Lake Okeechobee beyond the LEC Planning Area boundaries) and Big Cypress reservations.

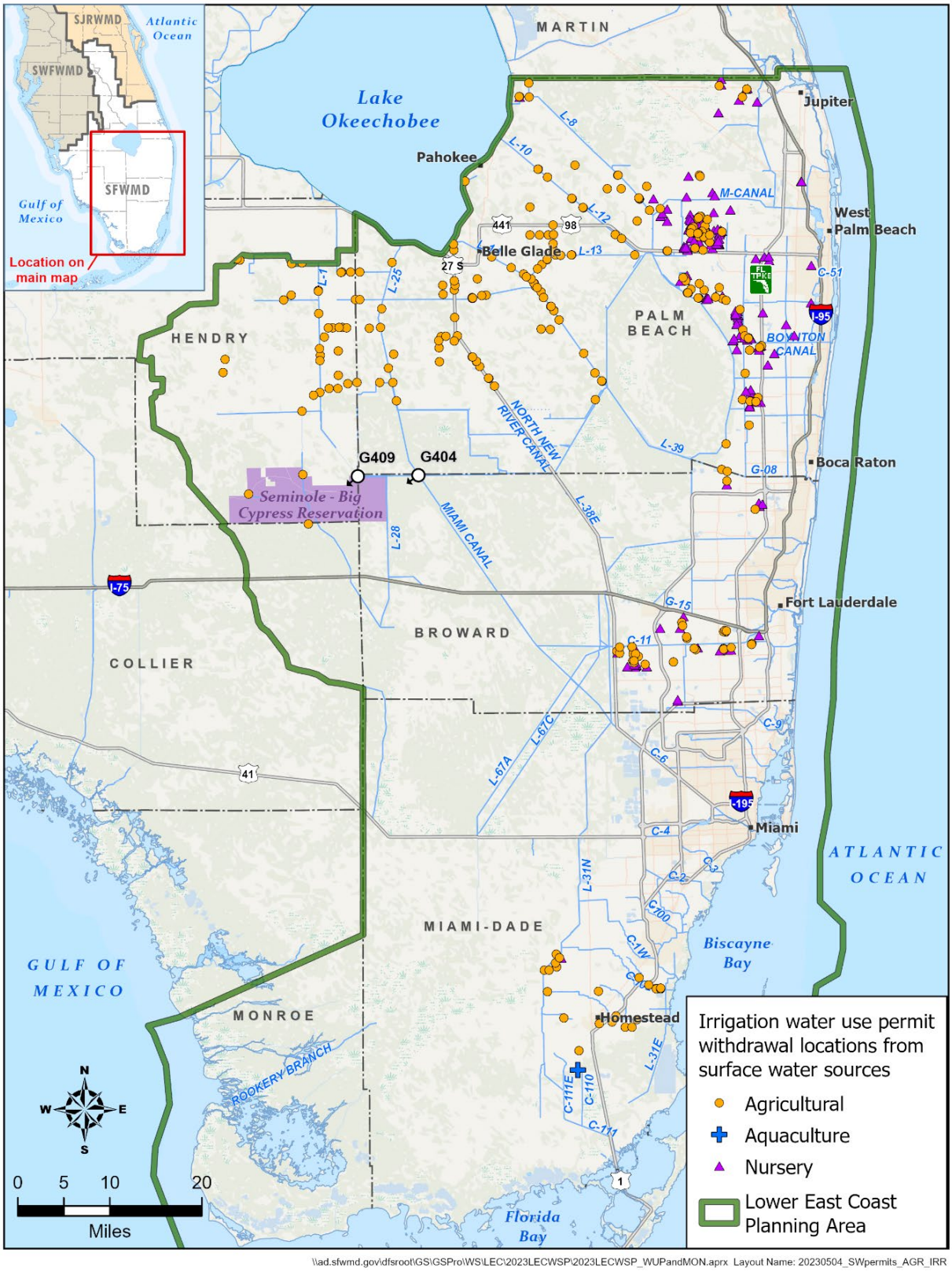

Figure 5-5. Agricultural irrigation water use permit withdrawal locations from surface water within the LEC Planning Area.

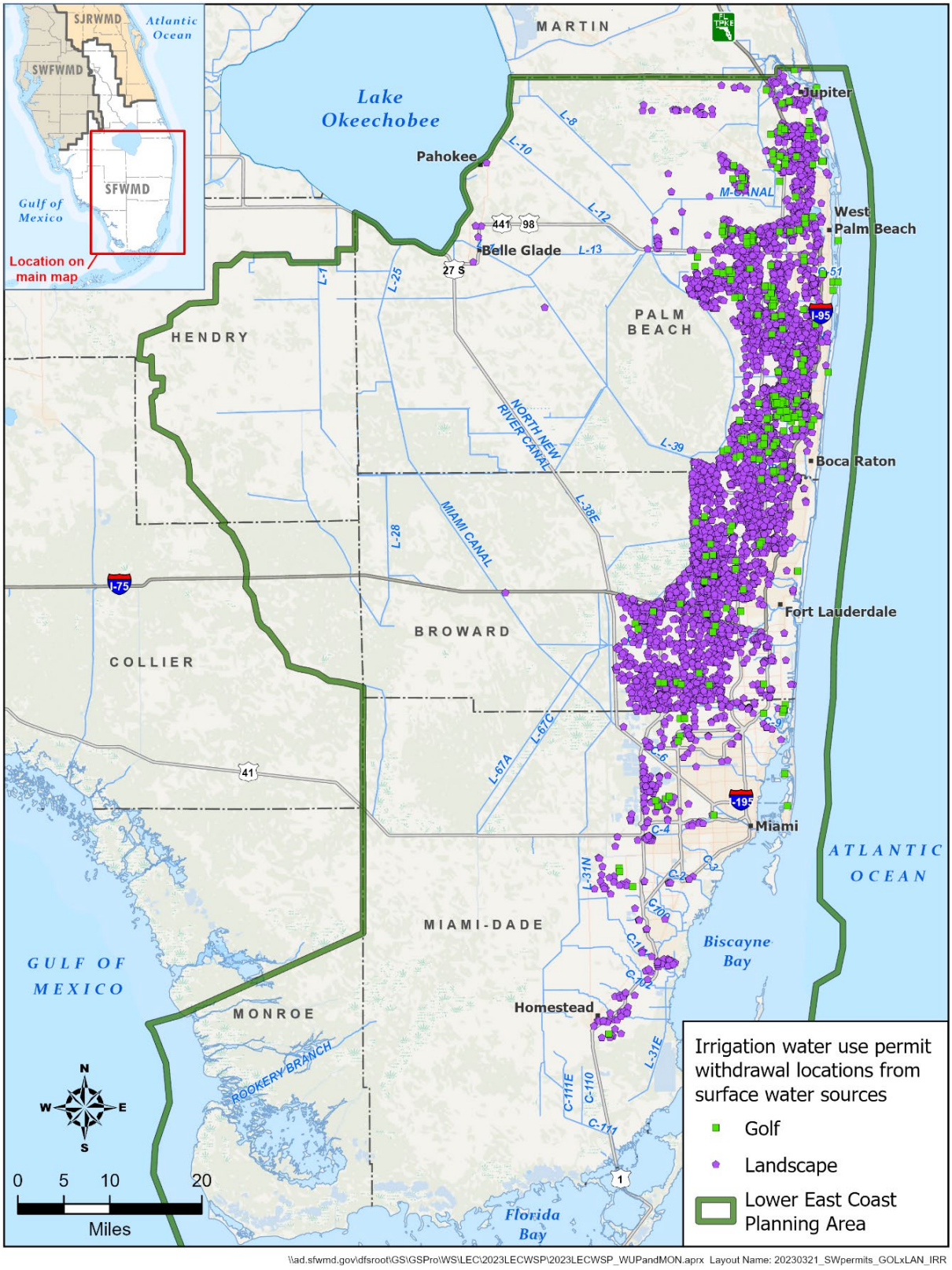

Figure 5-6. Golf and landscape irrigation water use permit withdrawal locations from surface water within the LEC Planning Area.

GROUNDWATER

Groundwater is produced from two major aquifer systems in the LEC Planning Area: the SAS and the FAS (**Figure 5-7**). The SAS provides fresh groundwater from the Biscayne aquifer underlying Broward and Miami-Dade counties, undifferentiated surficial aquifers underlying Palm Beach County, and the Lower Tamiami aquifer (LTA) underlying Hendry County. The FAS provides brackish groundwater from the Upper Floridan aquifer (UFA) throughout the region.

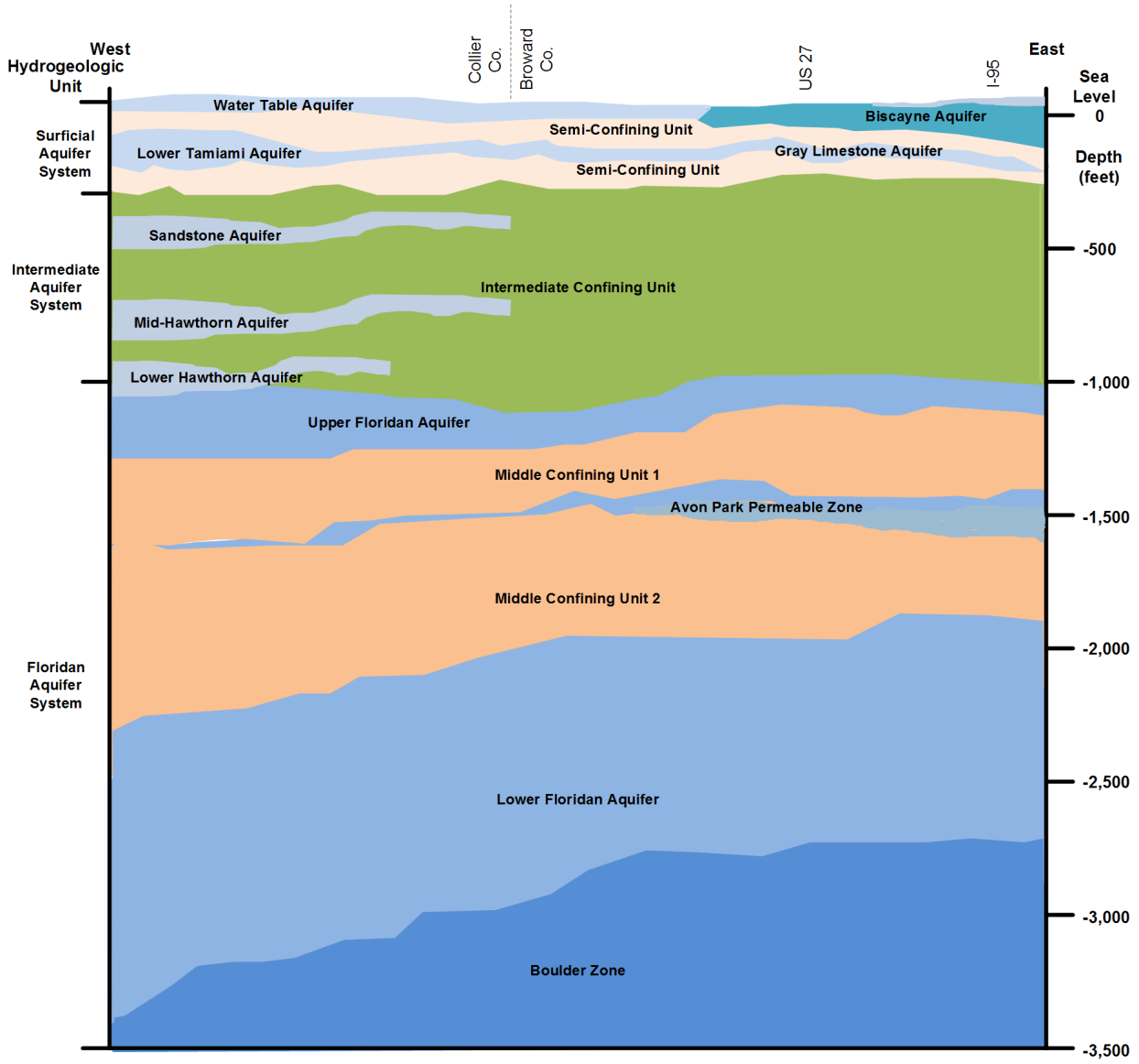

Figure 5-7. Generalized hydrogeologic cross section of the LEC Planning Area.

Fresh Groundwater

Surficial Aquifer System

Fresh groundwater from the SAS has chloride concentrations less than 250 milligrams per liter (mg/L), which meets the United States Environmental Protection Agency secondary drinking water standards (USEPA 2023). Fresh groundwater is the primary source of supply for PS, Domestic Self-Supply (DSS), AG, L/R, and CII uses in the LEC Planning Area. Water availability from the SAS is limited by the rate of groundwater recharge, potential wetland impacts, proximity to contamination sources, saltwater intrusion, and other existing legal users in the area.

Lower East Coast Service Areas

In the LEC Service Areas, the SAS includes the Water Table aquifer, Biscayne aquifer, and undifferentiated surficial sediments, separated by less permeable semiconfining units. The SAS is an unconfined to semiconfined aquifer system composed of solutioned limestone, sandstone, sand, shell, and clayey sand. Recharge to the SAS is by local rainfall, canals, groundwater seepage from the WCAs and Everglades National Park, and surface water deliveries from the WCAs. When sufficient water is available, surface water from Lake Okeechobee also can be routed to the WCAs, then to regional canals and local water control districts to maintain water levels and recharge the SAS. During droughts, lower regional groundwater levels may cause inland movement of the saltwater interface in the SAS. In this case, water shortage restrictions may be declared by the SFWMD Governing Board to conserve freshwater supplies and reduce the risk of saltwater intrusion.

The SAS produces high-quality fresh water from relatively shallow wells in most of the LEC Planning Area. In some cases, the ambient water quality meets primary and secondary drinking water quality standards. However, in central and western Palm Beach and Broward counties, high salinities in the SAS are attributed to relict seawater (connate water) in less transmissive and deeper portions of the SAS (Fish 1988, Reese and Wacker 2009). This underlying saline water affects some PS wellfields and irrigation well withdrawals. Higher salinities also are found in EAA canals where portions of the canals are within the SAS. Development of new SAS groundwater sources may be feasible in some areas; however, permitting new water supplies will depend on local resource conditions.

Western Basins – Lower Tamiami Aquifer

The SAS is composed of the Water Table aquifer and LTA in the Western Basins. It is an unconfined to semiconfined aquifer system composed of limestone, sandstone, sand, shell, and clayey sand. The Water Table aquifer generally is 20 feet or less in thickness and does not produce substantial quantities of water. An intermittent clayey layer (leaky confining zone) separates the Water Table aquifer from the underlying LTA. Below the LTA, the Sandstone and Mid-Hawthorn aquifers in the intermediate aquifer system are not productive in the Western Basins.

The LTA is the major source of groundwater in eastern Hendry County and extends east into the LEC Service Areas as the gray limestone aquifer (Reese and Cunningham 2000). The aquifer is composed of shelly sand, course-grained sandy limestone, and sandstone 25 to 200

feet below land surface. Transmissivities of the LTA increase from north to south in eastern Hendry County.

The SAS produces high-quality fresh water from relatively shallow wells in the Western Basins. With moderate transmissivities and substantial AG withdrawals, water levels in the LTA are monitored for potentially harmful declines below the top of the aquifer. LTA monitor well locations and hydrographs are provided in **Appendix D**.

Existing and Future Use of Groundwater

PS is the largest user of fresh and brackish groundwater in the LEC Planning Area, with relatively consistent withdrawals for the past 15 years (**Figure 5-8**). The reduction in demands starting in 2008 reflects a combination of water shortage restrictions, new irrigation rules, the economic downturn, and increased water conservation awareness.

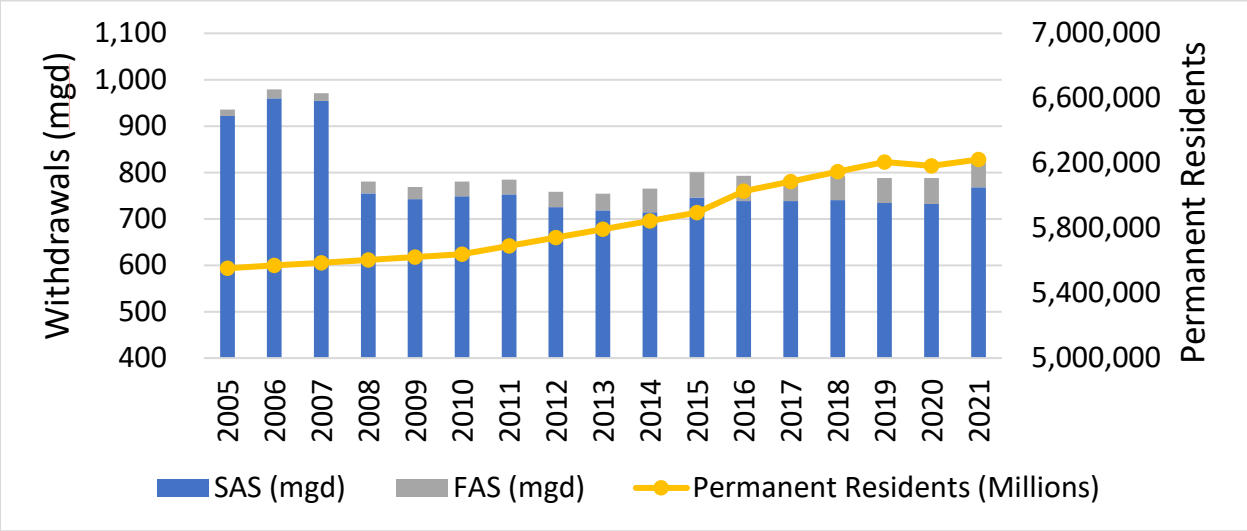

Figure 5-8. Public Supply withdrawals from the surficial and Floridan aquifer systems in the LEC Planning Area (2005 to 2021).

In 2021, fresh groundwater supplied 91% of the region's total PS demand (**Figure 5-2**). However, existing allocations of fresh groundwater will not meet projected 2045 demands for 22 of the 54 PS utilities in the LEC Planning Area (**Chapter 8**). By 2045, approximately 91% of PS demand will continue to be met with fresh groundwater from the SAS, and the remainder will be supplied by surface water and brackish groundwater from the FAS. **Appendix E** contains information about actual and permitted withdrawals from each source as well as wellfield maps by county. Permitted PS and small utilities with fresh groundwater withdrawal locations in the LEC Planning Area are shown in **Figure 5-9**.

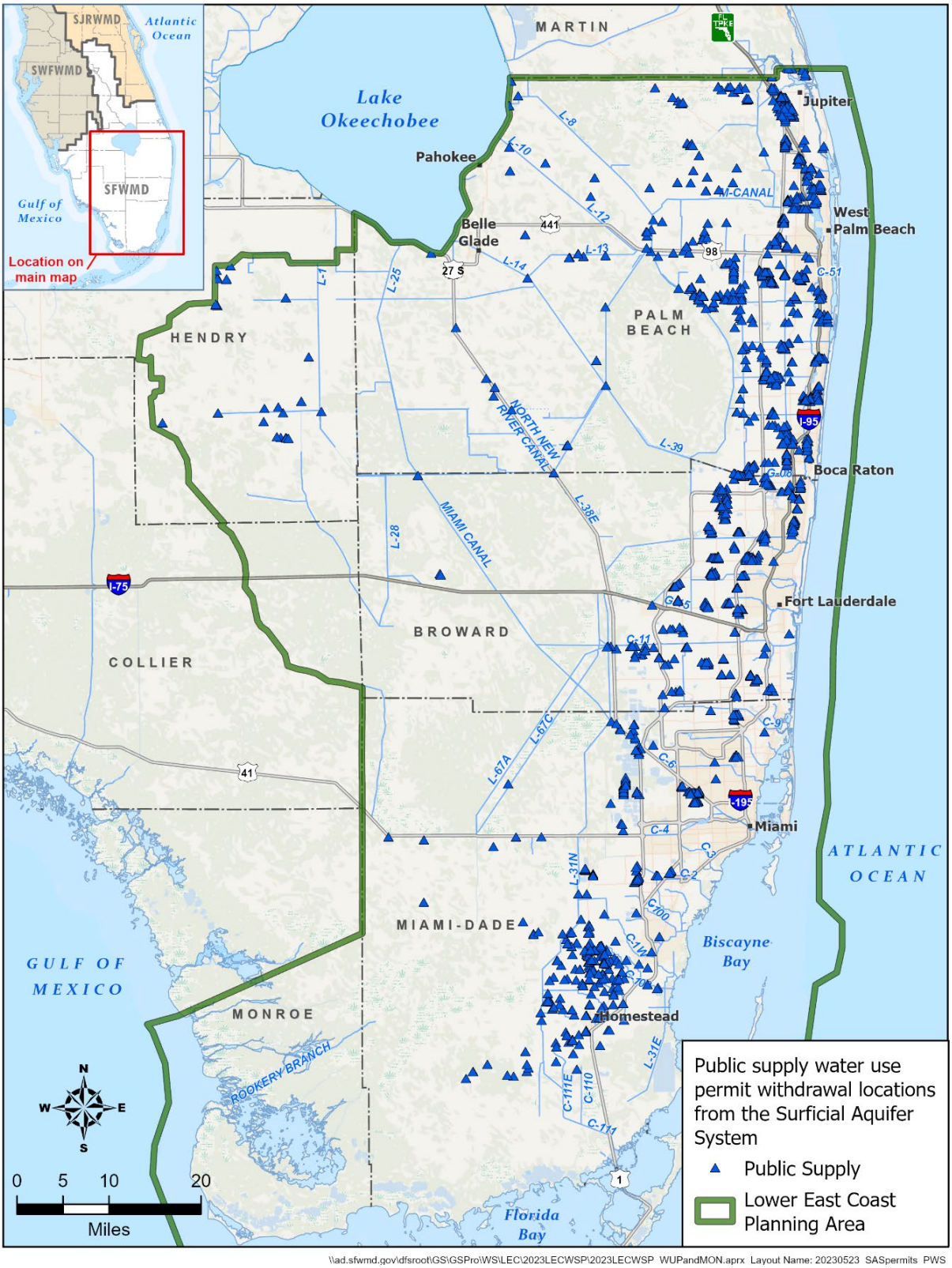

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Figure 5-9. Public Supply and small utilities with water use permit withdrawal locations from the surficial aquifer system within the LEC Planning Area.

In the LEC Planning Area, fresh groundwater supplied 100% of the estimated demand (approximately 10 million gallons per day [mgd]) for DSS users in 2021. By 2045, DSS demand is expected to increase to 14.45 mgd. Fresh groundwater from the SAS will continue to supply 100% of the DSS demands through 2045.

CII is currently the second largest user of fresh groundwater. In 2021, approximately 57% of the CII demand was met with fresh groundwater (**Figure 5-2**). For the CII category, some fresh groundwater withdrawals may be replaced with reclaimed water if available. Permitted CII fresh groundwater withdrawal locations in the LEC Planning Area are shown in **Figure 5-10**.

In 2021, approximately 105 mgd of AG demand (22% of total AG demand) in the LEC Service Areas was met using fresh groundwater from the SAS (**Figure 5-2**). Use of fresh groundwater for AG is projected to decrease slightly over the planning period. Permitted AG fresh groundwater withdrawal locations in the LEC Planning Area are shown in **Figure 5-11**.

The Seminole Tribe of Florida and Miccosukee Tribe of Indians of Florida have reservations in the Western Basins (**Figure 1-1**) and require water for residents, agriculture, and wetlands. The LTA is used for PS, DSS, and AG in the Seminole Tribe of Florida Big Cypress Reservation. The SAS provides water for DSS in the Miccosukee Federal Reservation and for PS in the Miccosukee Tamiami Trail Reservation.

In 2021, approximately 26% of L/R demand, including golf courses, was met with fresh groundwater (**Figure 5-2**). L/R demands are expected to increase 24% by 2045, based on population growth. Fresh groundwater is expected to meet approximately 20% of the increased demand, depending on availability at specific locations. It is anticipated that some fresh groundwater withdrawals may be replaced with reclaimed water if available for the L/R category. Permitted L/R fresh groundwater withdrawal locations in the LEC Planning Area are shown in **Figure 5-12**.

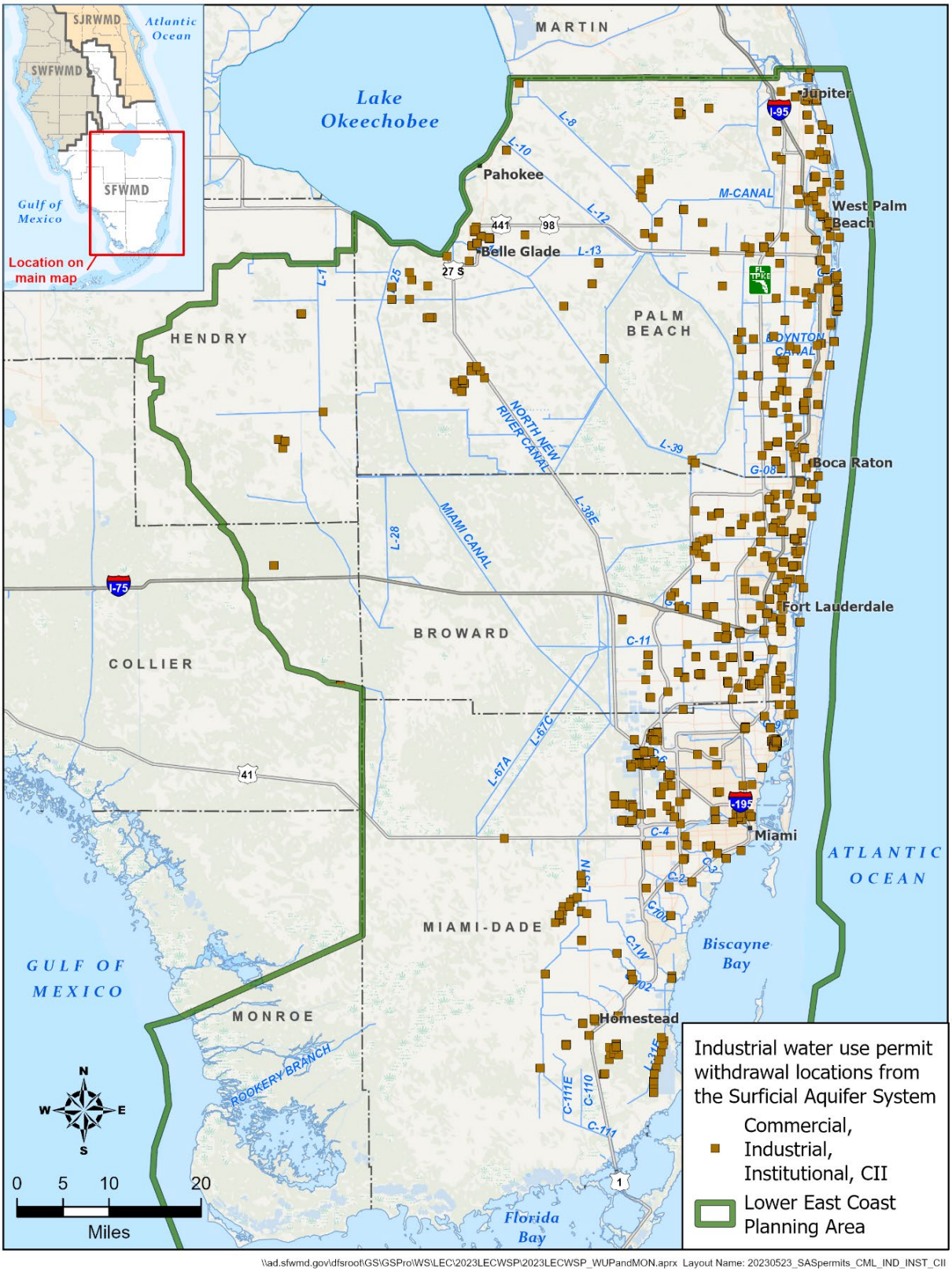

Figure 5-10. Commercial/Industrial/Institutional water use permit withdrawal locations from the surficial aquifer system within the LEC Planning Area.

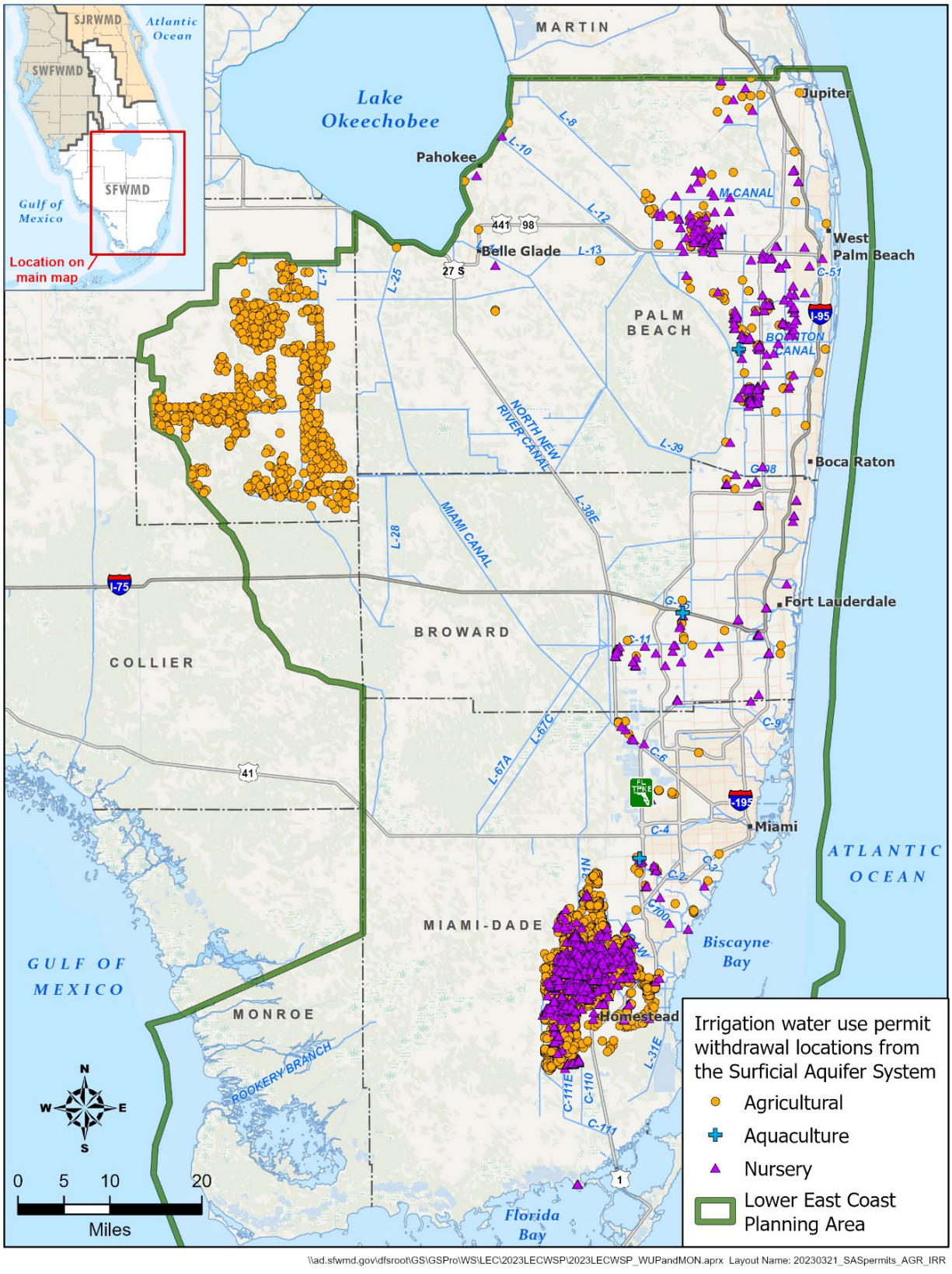

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Figure 5-11. Agricultural irrigation water use permit withdrawal locations from the surficial aquifer system within the LEC Planning Area.

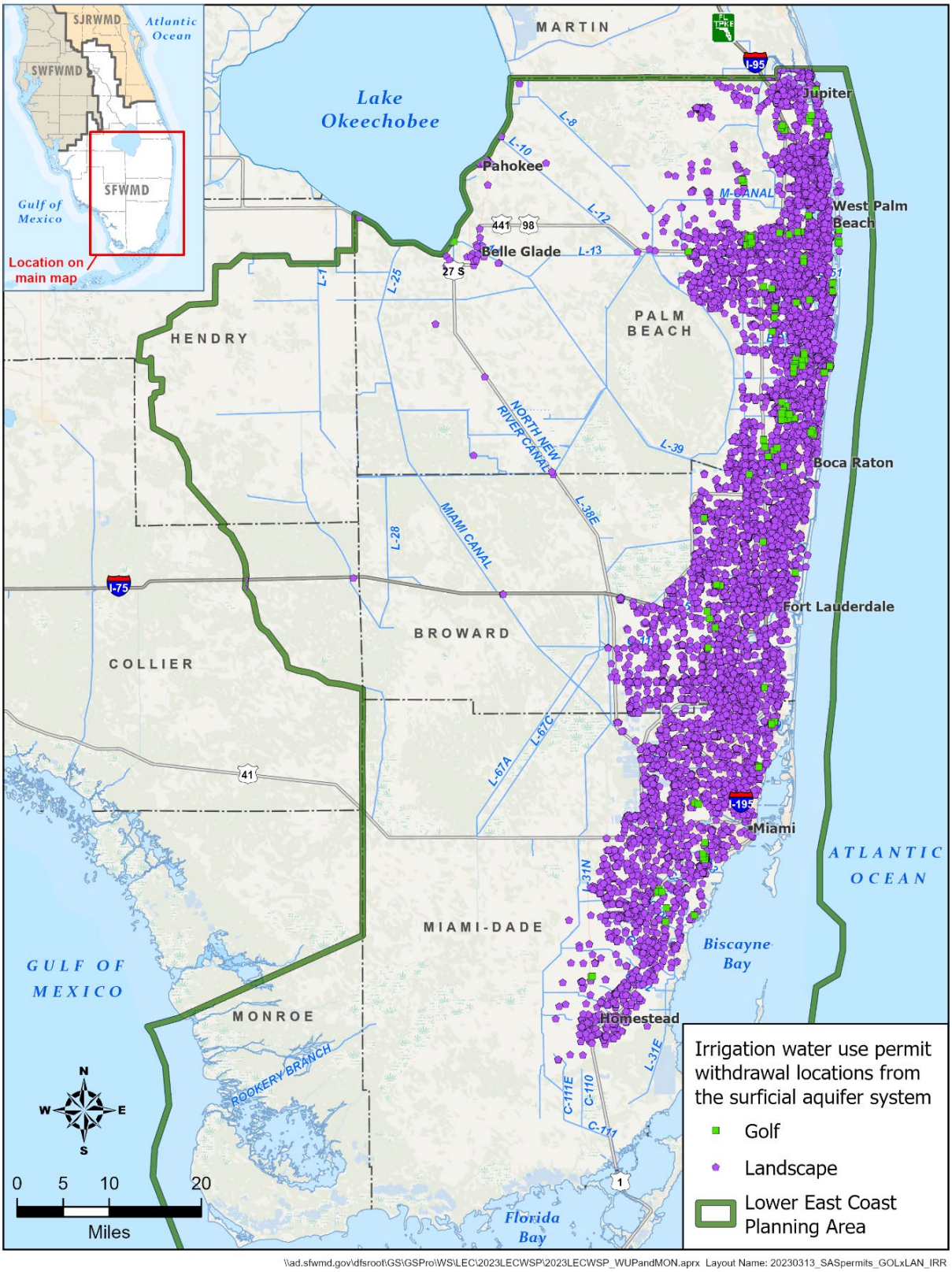

Figure 5-12. Golf and landscape irrigation water use permit withdrawal locations from the surficial aquifer system within the LEC Planning Area.

Increased allocations from the SAS are generally limited by water resource restrictions due to potential impacts on wetlands and existing legal water uses, including DSS and the potential for saltwater intrusion. Therefore, traditional freshwater sources in the LEC Planning Area may not be sufficient to meet 2045 projected water use demands and alternative sources need to be developed to meet increased demands. Water availability from the SAS is further discussed in **Chapter 6** and **Appendix D**. In addition, the Biscayne aquifer also is an MFL water body, and withdrawals cannot cause further inward movement of the saltwater interface. Potential impacts on the regional system are addressed by the RAA criteria for withdrawals within the LEC Service Areas and Northern Palm Beach County Service Areas as discussed earlier. Future strategies to address limits on availability are provided in **Chapter 9**.

Brackish Groundwater

Floridan Aquifer System

In the LEC Planning Area, water from the FAS typically has chloride concentrations greater than 1,000 mg/L and is considered brackish. Desalination or blending with fresh water is required before this water supply source is suitable for most uses, including irrigation and human consumption. Water quality in the FAS degrades substantially from central to southern Florida, with increasing hardness, chlorides, and salinity. Salinity also increases with depth, making the deeper producing zones less desirable for development than shallower parts of the system. The FAS is productive in the LEC Planning Area; however, use of this brackish water source is limited by water quality concerns and treatment costs (**Chapter 6**).

The FAS is a confined, high-yield aquifer system that provides substantial volumes of water. Overall, the productivity of the FAS is considerably greater than that of the SAS, except for the highly transmissive Biscayne aquifer, in the region. The top of the FAS is separated from the SAS by the low-permeability sediments of the intermediate confining unit that is several hundred feet in thickness. The FAS has several discrete aquifers separated by low-permeability confining units, including the brackish UFA and Avon Park permeable zone and the more saline Lower Floridan aquifer (**Figure 5-7**). Though generally not considered useful as a water supply source in the LEC Planning Area due to high salinity, the Lower Floridan aquifer includes the Boulder Zone (approximately 2,100 to 3,500 feet below mean sea level), a cavernous and highly transmissive interval used for disposal of wastewater effluent and concentrate from reverse osmosis (RO) treatment facilities through the use of deep injection wells.

The SFWMD partners with other agencies (e.g., the United States Geological Survey) to monitor the FAS through regional monitor well networks and through permittees as part of reporting requirements for water use (SFWMD) and deep injection wells (Florida Department of Environmental Protection [FDEP]). Data from these wells indicate some seasonal variations in water levels; however, overall, levels have remained stable over the period of record. Nearly all PS utilities in the LEC Planning Area that use the UFA have had one or more production wells experience degraded (increasing salinity) water quality. **Chapter 6** and **Appendix D** contain monitor well location information and data from the regional FAS network as well as water quality graphs from several PS utility wellfields.

Existing and Future Use of Brackish Groundwater

In the LEC Planning Area, the UFA provides brackish groundwater for PS, L/R, and Power Generation (PG) demands. From 2005 to 2021, FAS withdrawals for PS increased from 13.33 to 57.86 mgd (**Figures 5-8** and **5-13**) and are expected to increase to 113.78 mgd by 2045. In the LEC Planning Area, 24 PS utilities have UFA allocations, totaling 176.01 mgd (without C-51 offset, an alternative supply for PS as described in **Chapter 8**). The UFA is not used for PS in the portions of Collier and Hendry counties within the LEC Planning Area. The Florida Keys Aqueduct Authority uses the UFA to meet a portion of the PS demands in Monroe County, but the UFA wellfield is located in Miami-Dade County.

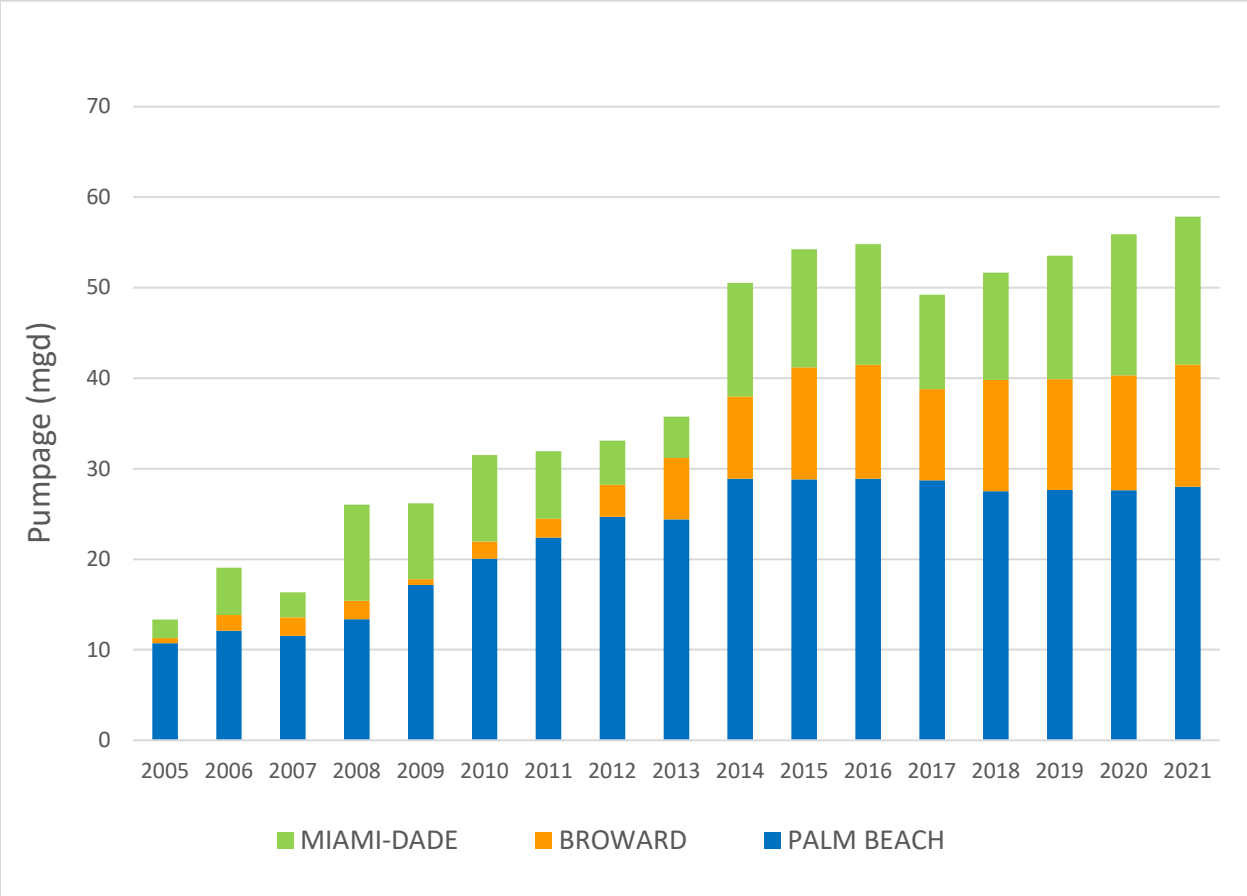

Figure 5-13. Public Water Supply withdrawals from the Floridan aquifer system in the LEC Planning Area (2005 to 2021).

In some limited cases, brackish groundwater from the FAS is used by L/R (2%), AG (1%), and CII (less than 1%) as an AWS source (**Figure 5-2**) and provides the majority of the demands for PG (98%). L/R FAS users include eight golf courses (Seminole, Lost Tree, Everglades Club, Breakers, Palm Beach Country Club, and Palm Beach Par 3 in Palm Beach County; North Key Largo [Ocean Reef Club] in Monroe County; and Gulfstream Park in Broward County) and three power generation facilities (Florida Power & Light [FPL] Turkey Point Clean Energy Center in Miami-Dade County; and FPL West County Energy Center [backup wells], and Okeelanta Cogeneration Facility in Palm Beach County). L/R demands from the FAS are expected to increase slightly, and PG demands from the FAS are expected to decrease with

the increased use of reclaimed water. Permitted withdrawal locations from the FAS for AG, CII, L/R, and PS are shown in **Figure 5-14**.

PS utilities use RO to remove or reduce excess salinity to acceptable drinking water quality. The approximate production efficiency, or recovery, for brackish water RO facilities Districtwide is between 75% and 85%, depending on the membrane technology employed and the salinity of the source water (Carollo Engineers 2009). There currently are 15 PS utilities using RO water treatment plants with a combined treatment capacity of 79.50 mgd. To some extent, saline groundwater can be blended with fresh water from other sources and treated with lime softening or membrane softening technology to meet chloride drinking water standards. The ability to use blending depends on the water quality of the saline source and other raw water used for blending by the utility.

Several FAS wellfields in the LEC Planning Area have experienced some water quality degradation, but current operations have shown this can be managed by PS utilities through appropriate wellfield design and operating protocols, including the following activities:

- Increasing well spacing (more than 1,000 feet) to minimize interference effects and to reduce stress on the FAS.
- Rotating the operation of individual wells, thereby reducing overall pumping stress on the well's production zone.
- Plugging and abandoning individual wells experiencing increases in chloride concentration and replacing them with new wells elsewhere within the wellfield area.
- Reducing pumping rates at individual wells to minimize water level declines, which increase the potential for poor-quality water to enter the well's production zone from below.
- Installing monitor wells to provide early warning of the need for changes to wellfield operations to minimize upconing or lateral movement of poor-quality water.

Future strategies to address limits on availability are provided in **Chapter 9**.

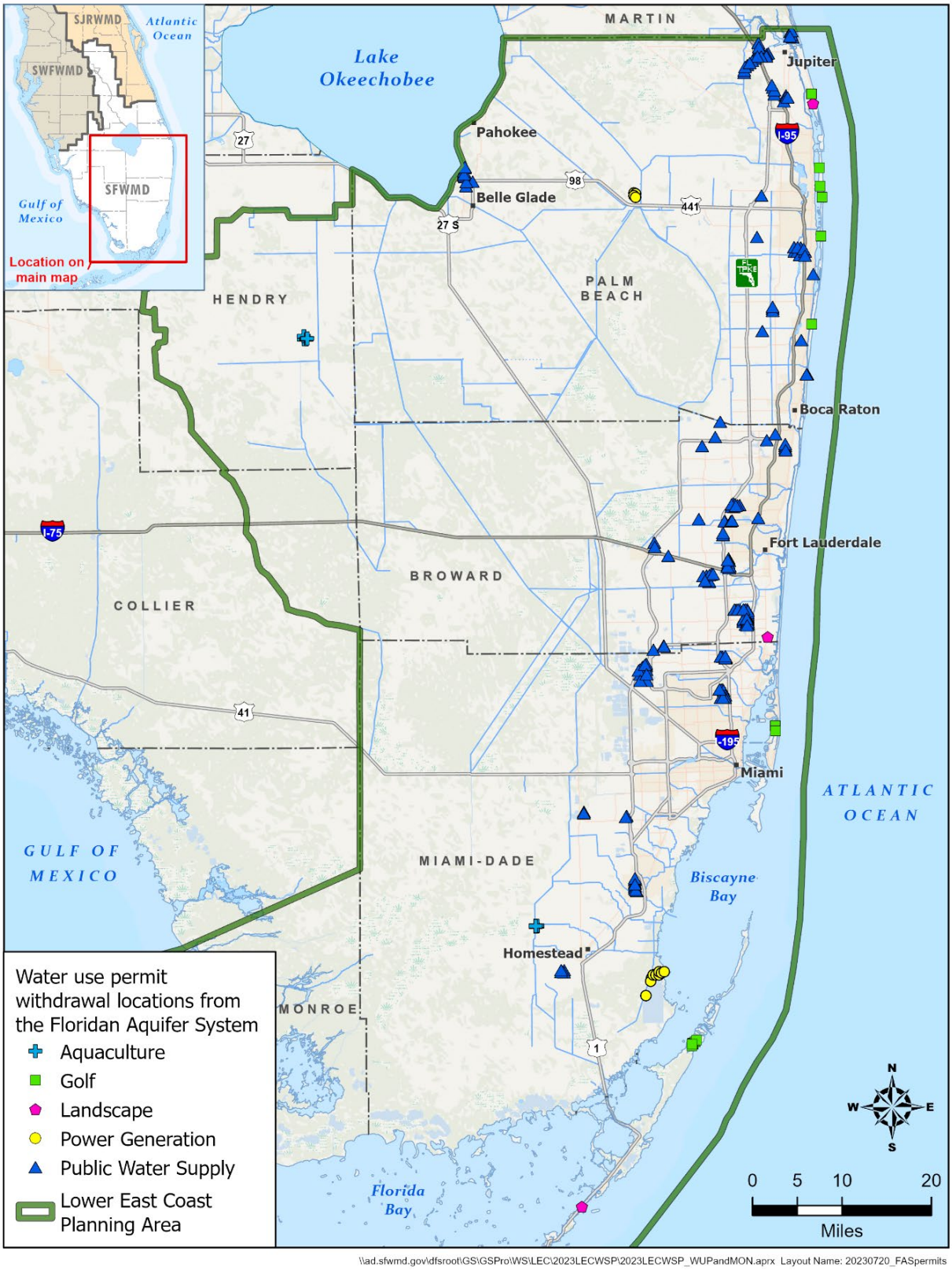

Figure 5-14. Water use permit withdrawal locations from the Floridan aquifer system within the LEC Planning Area.

RECLAIMED WATER

Reclaimed water is wastewater that has received at least secondary treatment and basic disinfection and is reused after leaving a domestic wastewater treatment facility (WWTF) in accordance with Rule 62-600.200, Florida Administrative Code (F.A.C.). Reuse is the deliberate application of reclaimed water for a beneficial purpose. Criteria used to classify projects as "reuse" or "effluent disposal" are contained in Rule 62-610.810, F.A.C.

Section 373.250, F.S., identifies reclaimed water as an AWS, including declaring reclaimed water supply projects as eligible for AWS funding. The Water Resource Implementation Rule (Chapter 62-40, F.A.C.) requires the FDEP and water management districts to advocate and direct the use of reclaimed water as an integral part of water management programs, rules, and plans. The SFWMD requires all water use permit applicants proposing to use more than 0.10 mgd of water and applicants within a mandatory reuse zone, as designated by local governments through ordinance, to use reclaimed water if feasible. In addition, substitution credits and impact offsets, resulting from use of reclaimed water, may be included in a water use permit. A substitution credit is the use of reclaimed water to replace a portion, or all, of an existing permitted use of a limited surface water or groundwater resource, allowing a different user to initiate or increase withdrawals from the resource. Impact offsets are derived from the use of reclaimed water to reduce or eliminate a harmful impact that has occurred or would occur due to a surface water or groundwater withdrawal.

Wastewater reuse conserves water resources by reducing reliance on traditional freshwater sources for many uses, like irrigation, often at a lower cost. Because wastewater is generated year-round, reclaimed water is considered a highly reliable water source and an environmentally sound alternative to traditional wastewater disposal methods, such as ocean outfalls and deep well injection. However, some utilities may require backup disposal methods during wet periods when irrigation demand is low.

Existing Reuse

Wastewater, reuse, and related flows for 2021 were analyzed for the 45 treatment facilities in the LEC Planning Area with a capacity of 0.10 mgd or greater. Flow data for the 28 facilities permitted to produce reclaimed water were obtained from the individual reuse inventory reports submitted to the FDEP for the year 2021 (FDEP 2022). For the remaining 17 facilities not permitted to produce reclaimed water (wastewater treatment permitted only), flow data for 2021 were obtained through direct communications with the utility or facility staff.

Reclaimed water used for a beneficial purpose (e.g., landscape irrigation, golf course irrigation, cooling water, and other industrial uses) has increased almost tenfold between 1994 and 2021 (**Figure 5-15**). Annual fluctuations in the volume of reclaimed water used are due to the addition of new users and variable amounts of rainfall.

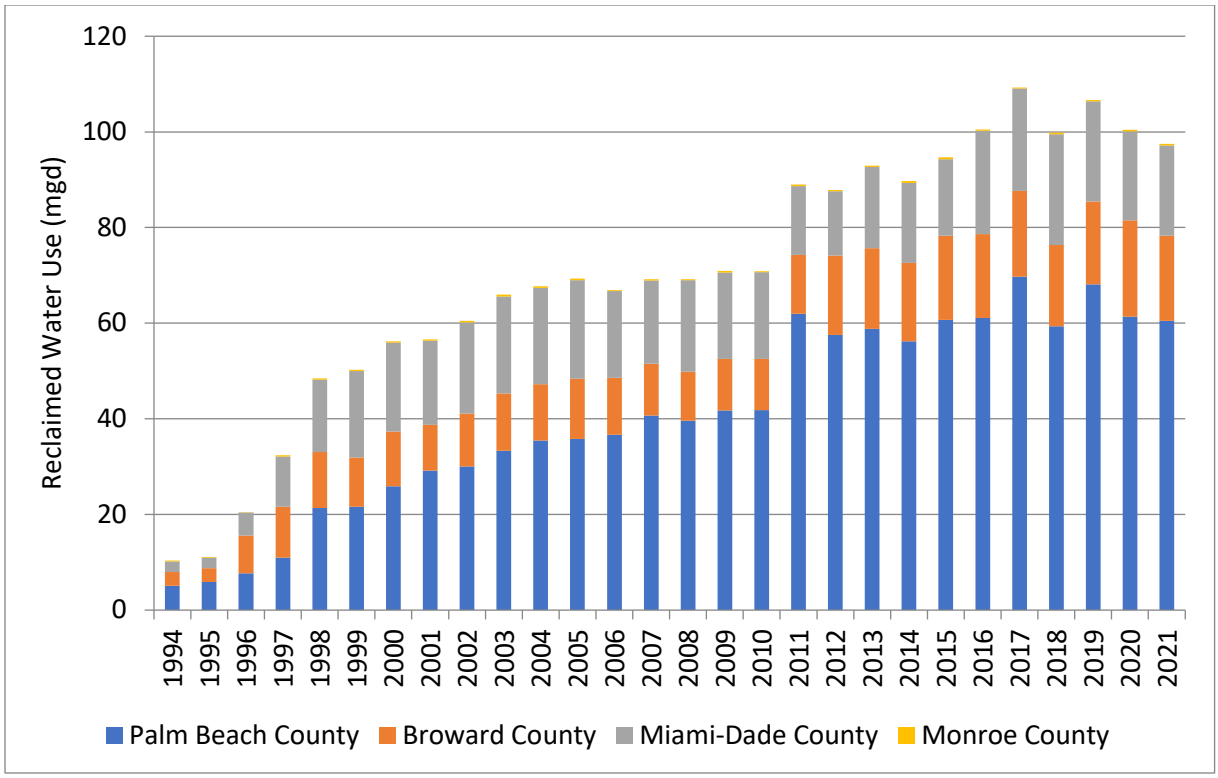

Figure 5-15. Annual average reclaimed water used in the LEC Planning Area from 1994 to 2021.

In 2021, the 45 facilities analyzed for this update treated an annual daily average wastewater flow of 675.66 mgd. Of that total, approximately 97.47 mgd was reused (including 4.31 mgd of supplemental water flows). The county data indicated 7.9% of wastewater generated in Broward, 5.9% in Miami-Dade, 3.3% in Monroe, and 48.1% in Palm Beach was reused for irrigation, industrial applications, wetland hydration, and aquifer recharge (**Figure 5-16**).

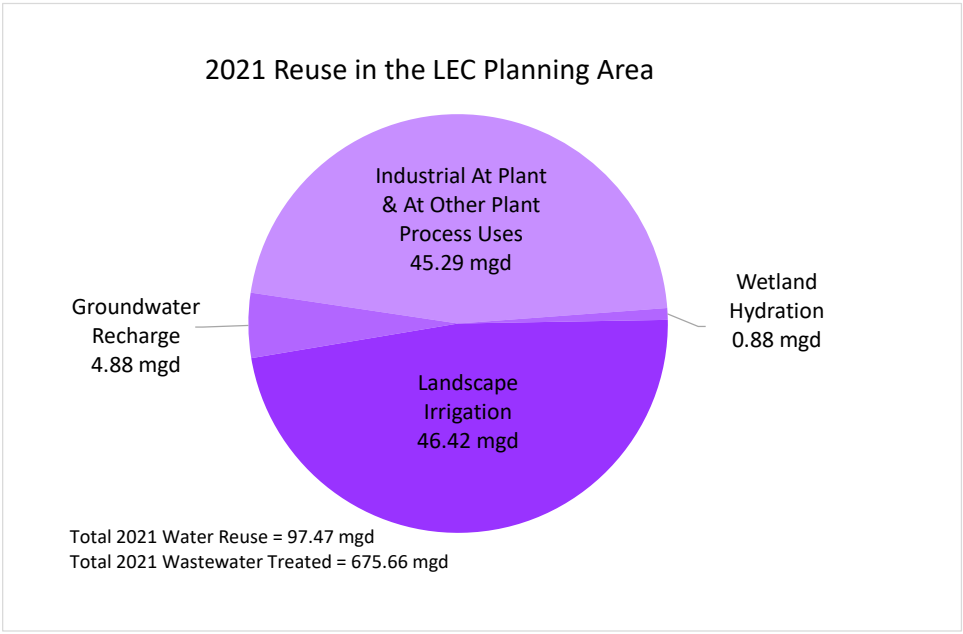

Figure 5-16. 2021 reuse in the LEC Planning Area.

Landscape irrigation at golf courses, residential lots, and other public access areas (e.g., parks, schools, and roadways) was the largest use. Industrial use at wastewater treatment plants (e.g., for cooling seals and filter backwashing) and at other industrial facilities for cooling, washing, and dust control was the second largest use (**Figure 5-16**).


Wakodahatchee Wetlands

The remainder of the total reuse provided groundwater recharge, either through rapid infiltration basins, absorption fields, and borrow pits (4.88 mgd), or wetland hydration projects (0.88 mgd), such as the Palm Beach County Water Utilities Department (Wakodahatchee and Green Cay wetlands) and Wellington Utilities (Peaceful Waters Sanctuary), which indirectly recharge the SAS.

Reported disposals of treated wastewater totaled 601.90 mgd in 2021, with 413.95 mgd being injected into deep wells, 4.10 mgd into shallow wells (limited to Monroe County), 0.14 mgd released to a soakage pit, and 183.71 mgd being disposed of via ocean outfalls.

As mentioned above, utilities can receive a substitution credit as part of their water use permit when use of groundwater or surface water is replaced with reclaimed water. In the LEC Planning Area, several utilities have substitution credits or impact offsets incorporated into their current water use permit.

Supplemental Sources to Meet Reclaimed Water Demand

The use of supplemental water supplies to meet peak demands for reclaimed water may enable a wastewater utility to maximize its use of reclaimed water. However, during times of drought, water sources (e.g., surface water, groundwater, and stormwater) may not be available to supplement reclaimed water supplies in some areas. Use of supplemental water supplies is subject to consumptive use permitting and water shortage restrictions by the SFWMD. Seven facilities from six utilities in the LEC Planning Area used a total of 4.31 mgd supplemental water to support their water reuse systems in 2021.

Leah Schad Memorial Ocean Outfall Program

The Florida Legislature enacted an Ocean Outfall Law (OOL) as defined in Section 403.086(10), F.S., requiring elimination of the use of six ocean outfalls in southeastern Florida as the primary means for disposal of treated domestic wastewater by December 31, 2025. The objectives of this statute were to reduce nutrient loadings to the environment and to more efficiently use treated wastewater to meet demands. In addition, affected wastewater utilities are required to reuse at least 60% of their baseline outfall flows by December 31, 2025. Beginning in 2026, ocean outfalls should be used only for backup disposal.

The Leah Schad Memorial Ocean Outfall Program applies to seven wastewater utilities (**Table 5-1**), six of which have direct ocean outfalls: South Central Regional (Delray Beach

and Boynton Beach), Boca Raton, Broward County North Regional, Hollywood Southern Regional, Miami-Dade Water and Sewer Department (MDWASD) (three facilities). Cooper City and the Town of Davie are permitted to discharge effluent through the Hollywood Southern Regional WWTF. Therefore, these two water departments have obligations to meet the ocean outfall requirements for their portion of wastewater contributions. The reuse requirements for Miami-Dade County WWTFs may be met countywide because the North, Central, and South District facilities are owned and operated by one utility (MDWASD), have interconnected transmission systems, and are therefore considered one system.

The OOL provides utilities an option to satisfy their reuse requirements by entering into a contract with another utility under provisions of Section 163.01, F.S., (i.e., Florida Interlocal Cooperation Act of 1969). Under these interlocal agreements, one city/utility can contribute financially to the development of the reuse system of another city/utility and receive credit for the subsequent reuse flows. The City of Miramar has entered into agreements with the cities of Hollywood and Cooper City for contractual water reuse, assisting these two cities to meet their functional reuse system development obligations. In **Table 5-1**, 2045 flows for some utilities may differ from 2045 flows for Broward County in **Appendix E** to avoid double counting of contractual reuse flows and reclaimed water deliveries and to properly represent these utilities' reuse system developments.

Table 5-1. Reuse flows for 2021, functional reuse requirement, and total, projected reuse flows for 2026 and 2045 for utilities affected by the Ocean Outfall Law.

Facility	2021 Reuse Flows (mgd)	Functional Reuse System Requirement[a] (mgd)	2026 Projected Reuse Flows (mgd)	2045 Projected Reuse Flows (mgd)
Boca Raton	11.10	11.80	11.10	11.49
Broward County – North Regional	3.55	25.95[b]	12.00	38.75[c]
Cooper City	0.00	0.90	1.00[d]	1.00[d]
Davie	0.67	1.10	1.00	1.48
Hollywood Southern Regional	5.45	12.30[e]	6.30	12.50[f]
MDWASD (three facilities)	13.68	131.50	29.55	116.68
South Central Regional[g]	5.94	13.30	7.06	7.06

MDWASD = Miami Dade Water and Sewer Department; mgd = million gallons per day.

[a] The total reuse amount required by December 31, 2025 is the sum of the reuse amount existing in 2008 and the additional 60% reuse baseline requirement.

[b] The total reuse system flow requirement was reduced by 0.94 mgd per flows taken by Pompano Beach for use in its reuse program.

[c] Includes reclaimed water deliveries of 10.51 mgd, 10.00 mgd, 2.49 mgd, 2.00 mgd, and 1.00 mgd to Palm Beach County Water Utilities Department, Pompano Beach, Coconut Creek, North Springs Improvement District, and Deerfield Beach, respectively, plus approximately 12.75 mgd reuse implemented to users within the Broward County service area.

[d] Includes 1.00 mgd of "virtual reuse," as allowed under Section 163.01, F.S., implemented through the City of Miramar's reuse program.

[e] The total December 31, 2025 reuse system flow was reduced by 10.4 mgd to reflect feasibility issues. However, the OOL requires Hollywood to continue to pursue the 60% reuse goal after December 31, 2025.

[f] Includes 2.00 mgd of "virtual reuse," as allowed under Section 163.01, F.S., implemented through the City of Miramar's reuse program and 2.50 mgd "virtual reuse" at other (yet to be determined) cities.

[g] Includes Delray Beach and Boynton Beach.

The City of Boca Raton is the only utility that has currently met the OOL reuse requirements. The remaining utilities are working toward meeting the requirements and the 2025 deadline. **Appendix E** provides further details on the status of each ocean outfall utility.

Reuse (including contractual flows) at the utilities and cities affected by the OOL is projected to increase by greater than 145 mgd, and decrease approximately 20 mgd in total disposals, and approximately 160 mgd in ocean outfall disposals from 2021 to 2045. During the same time period, those utilities and cities could see an estimated increase in treated wastewater of 100 mgd (**Figure 5-17**).

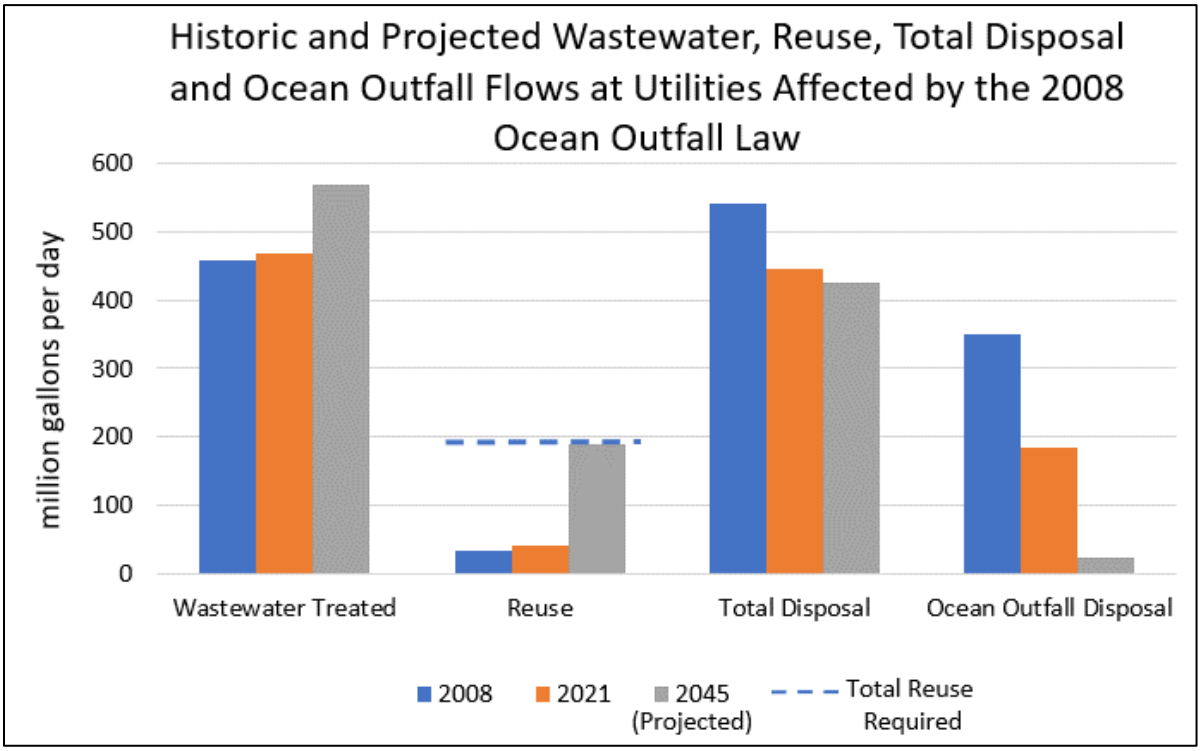

Figure 5-17. Historic and projected wastewater, reuse, total disposal and ocean outfall flows at utilities affected by the 2008 Ocean Outfall Law.

Future Reuse in the LEC Planning Area

Projections for 2045 annual average daily wastewater, reuse, discharges, and supplemental flows were obtained directly from the utilities for all 45 treatment facilities analyzed in this section (**Appendix E**).

While using reclaimed water for irrigation will continue to be an important part of reuse in the LEC Planning Area, industrial reuse (primarily in wastewater facility treatment processes and industrial cooling) is projected to become the largest reuse category by 2045. However, some cooling processes only increase the temperature of the reclaimed water, allowing it to be reused again. Innovative uses of reclaimed water may also increase to help meet water demands or offset potential impacts associated with future withdrawals. For example, Palm Beach County Water Utilities Department will be expanding the Green Cay wetland to include a 63-acre public access park, which will receive reclaimed water treated to potable standards, surrounded by up to four production wells to create an indirect potable reuse system.

Additionally, the Key Largo facility, which currently does not have a functioning reuse system, is planning to implement a direct potable reuse system. **Figure 5-18** shows the 2045 projected reuse in the LEC Planning Area.

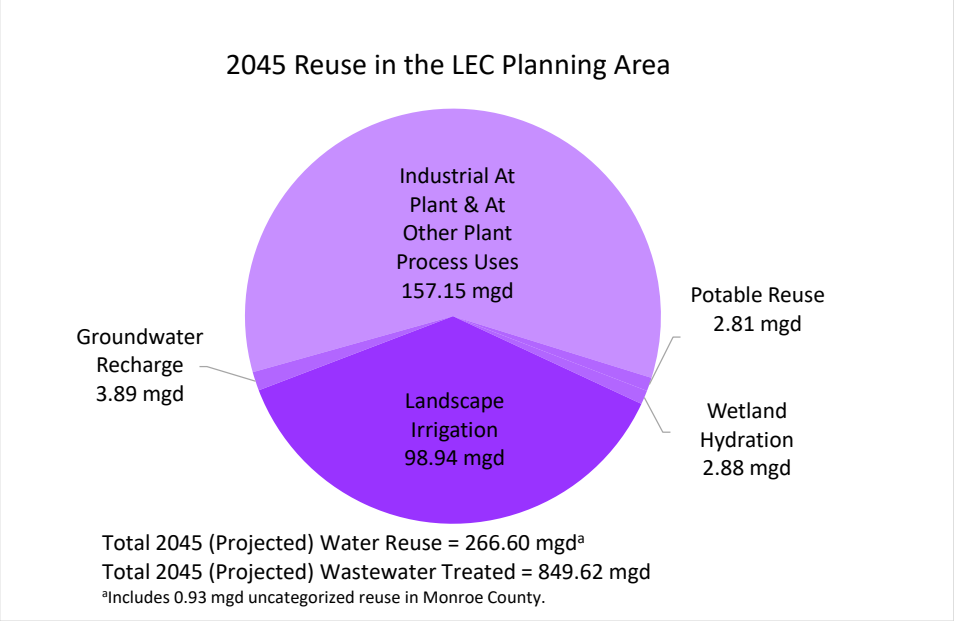

Figure 5-18. 2045 projected reuse in the LEC Planning Area.

Reuse as a percentage of treated wastewater, is projected to double from approximately 14% to 31%, and almost triple in flow volume from 97.47 mgd in 2021 to 266.60 mgd in 2045. The increase in reuse will largely be driven by utilities and cities affected by the OOL, which will account for more than two-thirds of the overall increase. In addition, the disposal of treated wastewater, as a percentage of total treated wastewater, could drop by more than 17% over the same time period as wastewater flows increase by approximately 25% (**Table 5-2**).

Table 5-2. Documented 2021 and projected 2045 annual average daily flows for reuse and related flows by county.

County	AAD Wastewater Flows (mgd)		AAD Disposal Flows (mgd)		AAD Supplemental Flows (mgd)		AAD Reuse (mgd)	
	2021	2045	2021	2045	2021	2045	2021	2045
Broward County Total	224.18	280.63	208.25	207.38	0.02	0.09	17.82	51.06
Miami-Dade County Total	320.83	395.04	317.88	310.29	0.00	0.00	18.84	125.68
Monroe County Total	9.06	10.94	8.73	6.84	0.02	0.02	0.32	4.10
Palm Beach County Total	121.59	163.02	67.03	87.02	4.27	2.11	60.49	85.76
LEC Planning Area Totals	**675.66**	**849.62**	**601.89**	**611.53**	**4.31**	**2.21**	**97.47**	**266.60**

AAD = annual average daily; mgd = million gallons per day.

Utilities currently distributing reclaimed water to customers intend to continue and expand their reuse systems as additional reclaimed water end users become available. Most major utilities in the region are planning to provide more reclaimed water and have begun or anticipate constructing the required treatment facilities by 2045. In many cases, future reuse will occur in new residential developments, which will decrease the demands needed from

other sources for irrigation. In some areas, local government development approval requires use of reclaimed water and extension of reclaimed water pipelines, increasing the projected volume of reuse by 2045. However, much of the LEC Planning Area is already developed, which presents challenges to utilities needing to expand reuse distribution systems to new end users.

There are 19 distribution expansion projects, 2 storage projects, 7 treatment capacity expansion projects, and 4 projects with both treatment and distribution components proposed to be completed by 2045. The full listing of these proposed projects can be found in **Chapter 8**.

WATER STORAGE

Capturing surface water and groundwater during wet conditions for use during dry conditions increases the amount of available water. Approximately three-quarters of South Florida's annual rainfall of 57 inches occurs during the wet season. Without sufficient storage capacity, much of this water discharges to the ocean through surface water management systems and natural drainage. In the LEC Planning Area, potential water storage options include ASR systems and reservoirs, both of which are considered AWS options.

Aquifer Storage and Recovery

ASR involves storing stormwater, surface water, fresh groundwater, drinking water, or reclaimed water in an aquifer that has appropriate attributes (e.g., modest transmissivity, intergranular porosity, overlain by a competent confining unit, low ambient water salinity) and subsequently recovering the water. In this process, an aquifer acts as an underground reservoir for recharged (injected) water. The injected water is treated to appropriate standards, which may vary depending on the water quality of the receiving aquifer, and then pumped into the aquifer through a well (i.e., stored). The water is pumped back out (i.e., recovered) at a later date for use. The amount of water recovered depends on subsurface conditions, storage time, and water quality. The level of treatment required during recovery depends on the intended use of the water (e.g., public consumption, irrigation, surface water augmentation, wetlands enhancement).

The volume of water made available through ASR depends on several factors, including well yield, water availability, aquifer characteristics, variability in water supply and demand, and use type. There are uncertainties that need to be addressed with the implementation of ASR systems, but this storage option has the potential to retain substantial quantities of water that otherwise would be lost to the ocean, deep well injection, or evaporation.

Most of the ASR systems in the SFWMD have been built by PS utilities to store potable water during periods of low seasonal demand for subsequent recovery during periods of high demand. The SFWMD, in cooperation with the USACE, is pursuing regional ASR systems as part of CERP. The Loxahatchee River Watershed Restoration project, in northern Palm Beach County, includes the construction of up to four ASR wells in the project plan. Further information about these projects is provided in **Chapter 7**.

Figure 5-19 shows the locations of the ASR systems constructed in the LEC Planning Area and the source type. As described below, two are active, three are idle and available for operation (Hillsboro and MDWASD), one was abandoned (Broward County Water and Wastewater Services District 2A), and several others were repurposed as FAS supply wells (City of Sunrise, City of Fort Lauderdale, and Palm Beach County Water Utilities Department).

- **SFWMD Hillsboro CERP Pilot Project** – The SFWMD constructed and initially tested the Hillsboro ASR pilot project through 2012 using treated surface water from the Hillsboro Canal. The system was inactive until 2016, when it was briefly reactivated to store water during an unusually wet period. The system is currently inactive although the Lake Worth Drainage District is evaluating the potential of operating the system through an interlocal agreement approved in 2022 with the SFWMD.
- **City of West Palm Beach** – In 1996, the City of West Palm Beach constructed an ASR system at the water treatment plant and tested it through 1998 using partially treated surface water from Clear Lake. The system was inactive until 2012, when the FDEP issued a permit to reactivate operational testing beginning in 2013. In 2015, the FDEP granted a limited aquifer exemption for the ASR system, allowing the city to eliminate the disinfection process. Since then, the city has continued operating the system although it has temporarily halted operation to conduct some upgrades to the filtration and pumping components.
- **City of Boynton Beach** – The City of Boynton Beach constructed its first ASR system at the East Water Treatment Plant in 1992 and has since stored treated drinking water in the UFA for recovery to meet peak demands. The city constructed a second ASR well in 2007 and since then has used both wells annually to meet peak seasonal demands.

Boynton Beach ASR System

- **Miami-Dade Water and Sewer Department** – The MDWASD has constructed two ASR systems at its West and Southwest wellfields, with the intention of recharging wet season groundwater from supply wells completed in the Biscayne aquifer. Both systems have remained largely dormant; however, the utility is considering activating the wells at the Southwest wellfield for cycle testing within the next year.

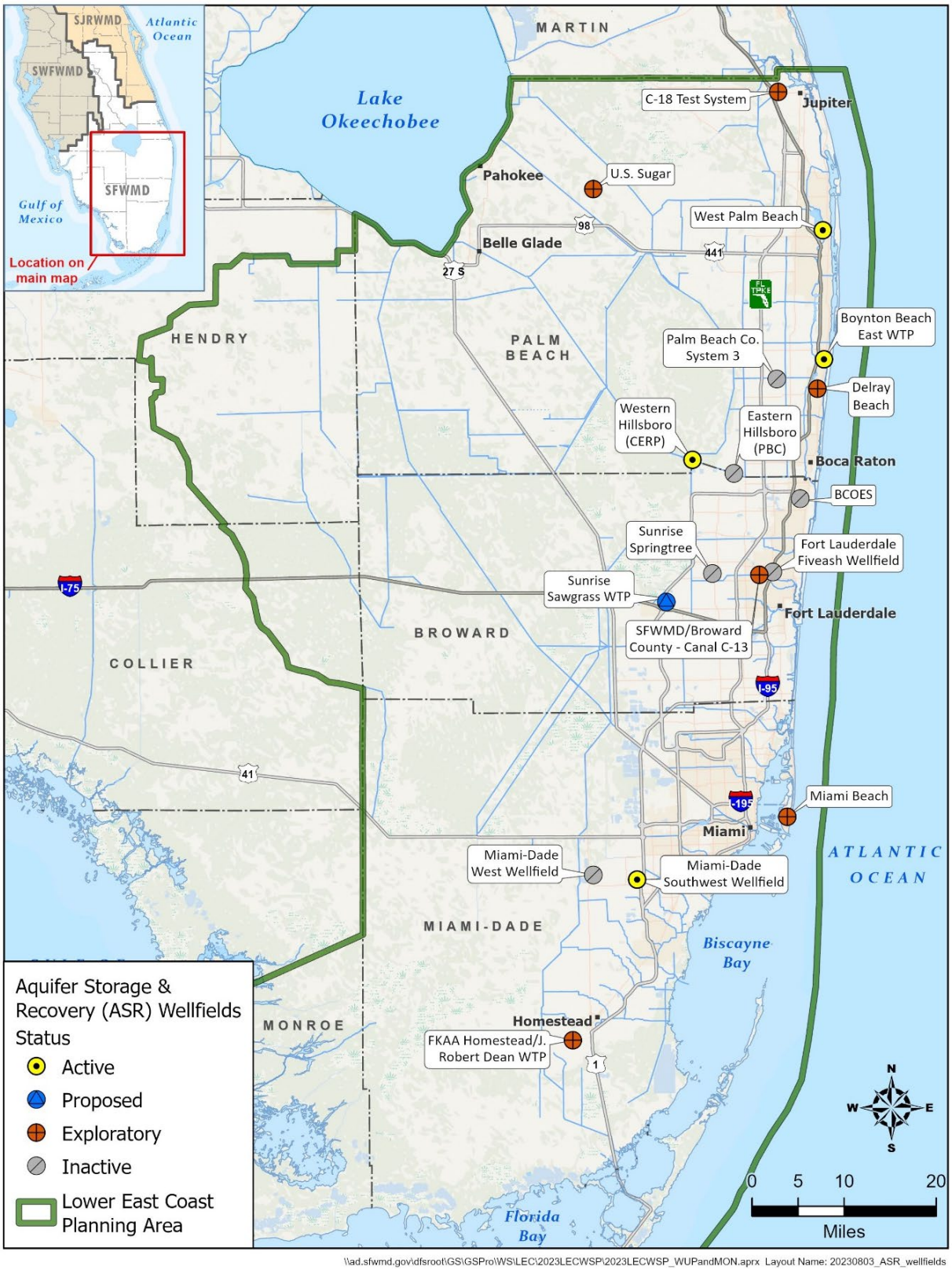

Figure 5-19. Floridan aquifer system aquifer storage and recovery systems within the LEC Planning Area.

Local and Regional Reservoirs

Surface water reservoirs allow storage of water, primarily captured during wet weather conditions, for use in the dry season and are considered an AWS source. Water typically is captured and pumped from rivers or canals and stored in aboveground or inground reservoirs, which are referred to as off-stream reservoirs. The C-51 Reservoir is an example of a large-scale, off-stream regional reservoir. Small-scale (local) reservoirs are used by agricultural operations for storage of recycled irrigation water or collection of stormwater runoff. These reservoirs also may provide water quality treatment before off-site discharge. Large-scale (regional) reservoirs are used for stormwater attenuation, water quality treatment in conjunction with STAs, and storage of seasonally available water. Examples include Grassy Waters Preserve, the C-51 Reservoir, and the EAA A-2 Reservoir and STA. Water supply development projects designed to capture, treat, and store water are discussed in **Chapter 7**.

C-51 Reservoir

The C-51 Reservoir project consists of two phases. The C-51 Reservoir Phase 1 project is a public-private partnership developed by Palm Beach Aggregates, LLC, in cooperation with PS utilities and water supply authorities for use as an AWS source by offsetting increased wellfield withdrawals. The C-51 Reservoir (**Figure 5-20**) is a former rock mine owned by Palm Beach Aggregates in central Palm Beach County, north of the C-51 Canal in Palm Beach County and adjacent to the SFWMD's L-8 flow equalization basin (FEB). Ten PS utilities have executed agreements with the property owners to purchase capacity as part of total reservoir storage. The utilities have modified their water use permits to reflect this AWS source as a means for meeting future demands. All 10 participating PS utilities have entered into capacity allocation agreements for the total of the available 35 mgd in Phase 1 as follows:

Table 5-3. Ten participating Public Supply utilities and total committed capacity.

Utility	Capacity (mgd)
BCWWS District 1	1.00
BCWWS District 2A	2.00
BCWWS SRW	3.00
Dania Beach	1.00
Fort Lauderdale	3.00
Hallandale Beach	1.00
Margate	2.00
MDWASD	15.00
Pompano Beach	2.00
Sunrise	5.00
Total Committed	**35.00**

BCWWS = Broward County Water and Wastewater Services; BCWWS–SRW = Broward County Water and Wastewater Services South Regional Wellfield; MDWASD = Miami-Dade Water and Sewer Department; mgd = million gallons per day.

The area that comprises Phase 1 has been designed to store an estimated 14,000 acre-feet of surface water and provide up to 35 mgd of canal/SAS recharge near PS withdrawals and was completed in 2023. The FDEP has issued a diversion and impoundment consumptive use permit and an environmental resource permit for construction and operation of Phase 1. A connection between the C-51 Reservoir Phase 1 and the L-8 FEB was completed in 2023.

Phase 2 of the project could provide an additional 46,000 acre-feet of storage, capable of producing 155 mgd of water during the dry season under 1-in-10-year drought conditions. The FDEP has issued a conceptual environmental resource permit for Phase 2. The design of Phase 2 has commenced.

The SFWMD continues to explore its operational role and was authorized by the FDEP in Consumptive Use Permit 50-301070-003 to withdraw 4,889 million gallons of water annually from the C-51 Canal to fill the reservoir during wet weather conditions. In 2011, a memorandum of understanding between the SFWMD and Palm Beach Aggregates was executed to identify the responsibilities of each entity for design, finance, construction, conveyance, assistance in permitting, and operation of the project. As part of this process, utilities and local governments approved creation of the C-51 Governance and Finance Work Group, which conducted a third-party review of the project (C-51 Governance and Finance Work Group 2015). Utilities have revised their water use permits to address applicable regulatory criteria to use the reservoir as a water source.

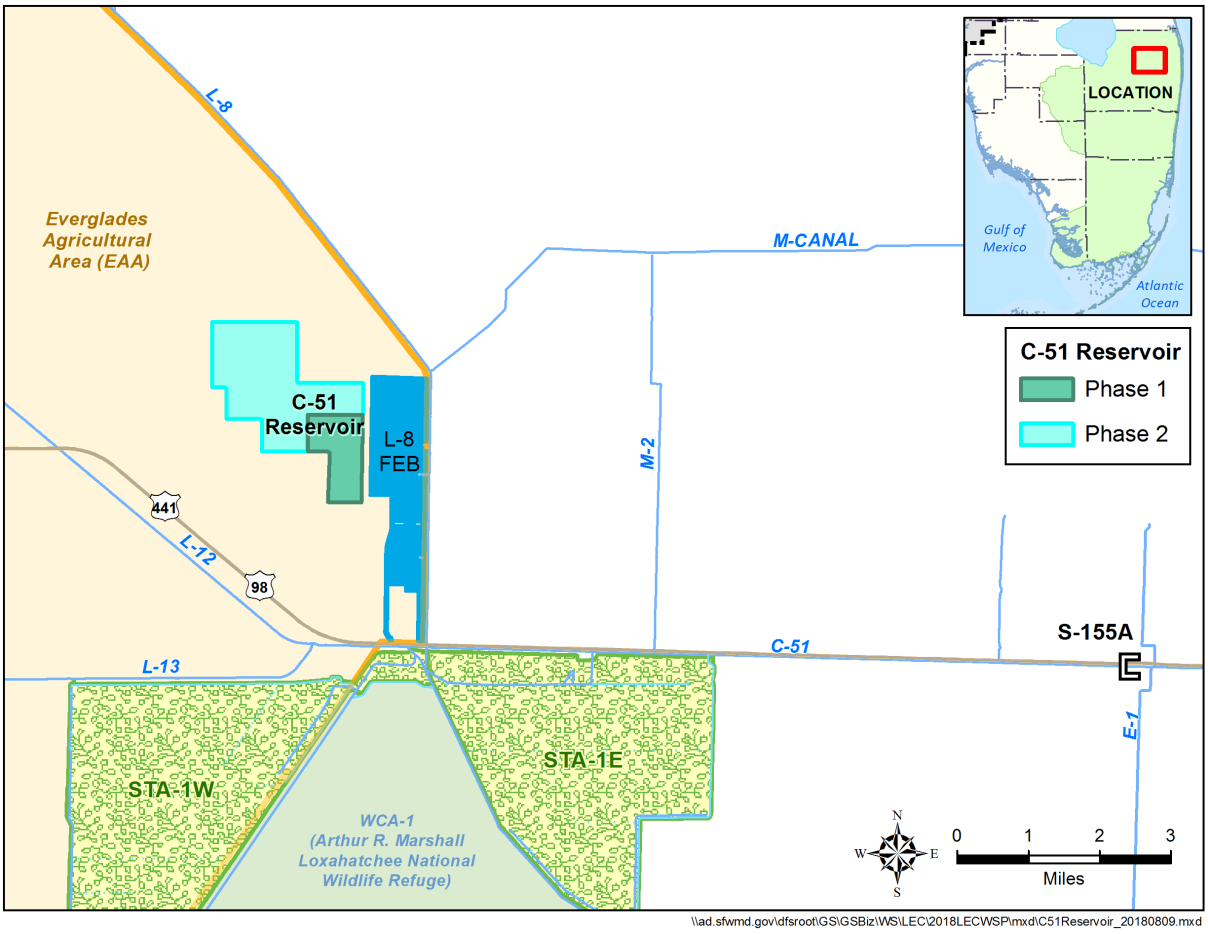

Figure 5-20. Proposed C-51 Reservoir in central Palm Beach County.

Everglades Agricultural Area A-2 Reservoir and Stormwater Treatment Area

The EAA A-2 Reservoir and STA is a joint Everglades restoration project between the SFWMD and the USACE and is part of the Central Everglades Planning Project (CEPP). The USACE is constructing the reservoir, which will be 10,500-acres, 23 feet deep, with 240,000 acre-feet of water storage. The SFWMD has constructed the EAA A-2 STA, which is a 6,500-acre treatment wetland. The treatment wetland has been scheduled with an initial hydration date of December 2024. The EAA A-2 STA will use three separate treatment cells of aquatic vegetation to naturally remove nutrients from the water before it flows south into the Everglades. This project, together with conveyance improvements to the North New River and Miami canals, will capture, store, treat, and deliver an additional annual average of 370,000 acre-feet of clean water to the Everglades and Florida Bay, while protecting the St. Lucie and Caloosahatchee estuaries from damaging releases from Lake Okeechobee. Based on the most recently approved Integrated Delivery Schedule, all aspects of the EAA A-2 Reservoir and STA should be completed in Fiscal Year 2034. **Figure 5-21** shows the locations of both the reservoir and STA.

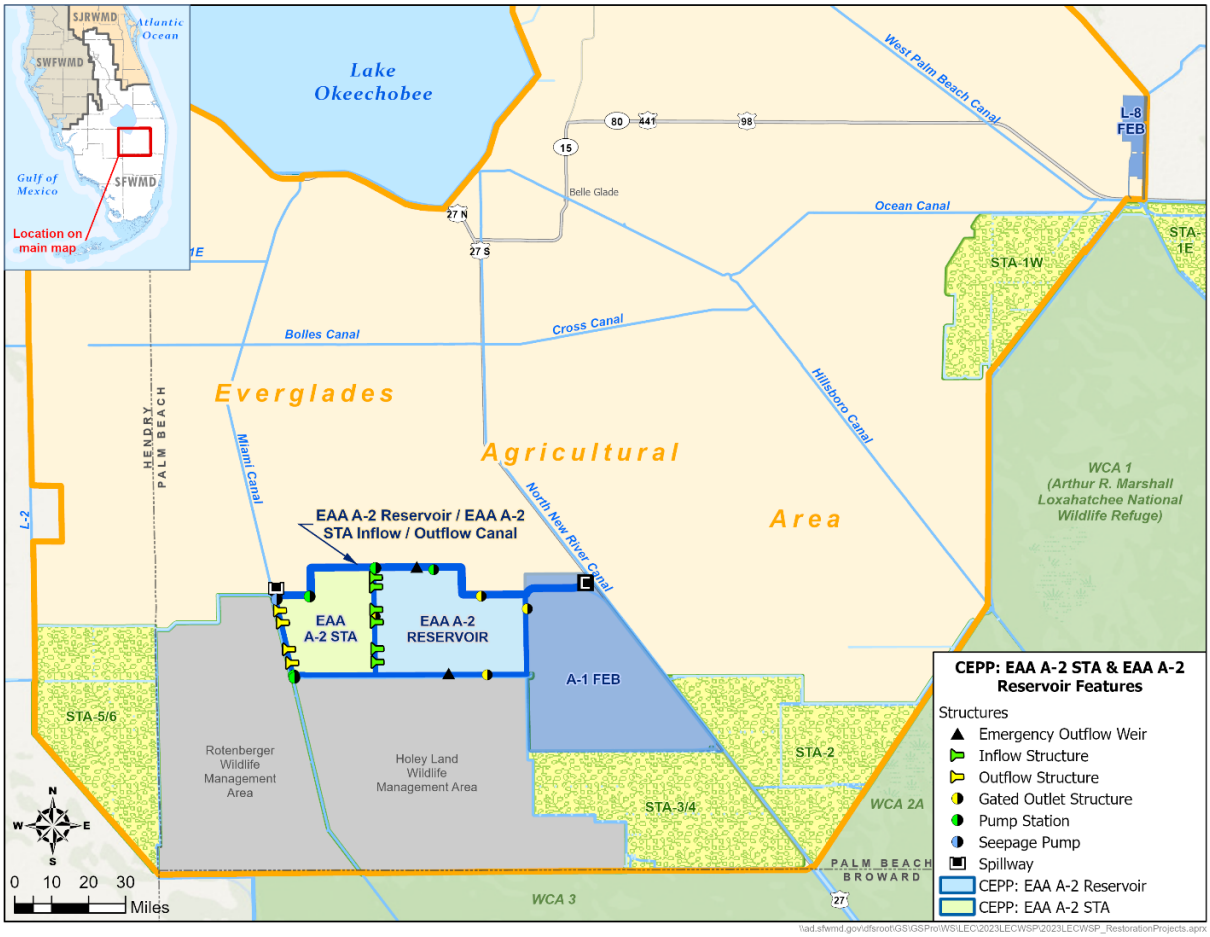

Figure 5-21. Everglades Agricultural Area A-2 Reservoir and Stormwater Treatment Area in Palm Beach County.

SEAWATER

The use of desalinated seawater from the Atlantic Ocean is an AWS source option for the LEC Planning Area. The SFWMD does not require water use permits for use of seawater. Three power plants use seawater from tidally influenced water bodies for cooling purposes: FPL Riviera Beach Next Generation Clean Energy Center, FPL Port Everglades Next Generation Clean Energy Center, and FPL Dania Beach Clean Energy Center (**Figure 2-2**). The ocean is an abundant source of water; however, desalination is required before seawater can be used for most water supply purposes. Desalination treatment technologies include distillation, RO, and electrodialysis reversal. RO is the most common desalination technology, and there are two RO seawater desalination facilities in the LEC Planning Area. Both plants are in Monroe County (Stock Island and Marathon) and operated by the Florida Keys Aqueduct Authority for emergencies. They have a combined supply capacity of 3.00 mgd to the lower Florida Keys.

Major advances in seawater desalination treatment and efficiencies have occurred over the past decade. As a result, seawater desalination costs are declining; however, the cost of standalone seawater desalination facilities remains higher than brackish water desalination. Co-locating seawater desalination facilities with coastal power plants results in cost savings, decreasing the cost difference compared to other AWS options. Additional information regarding seawater desalination is provided in the 2021–2024 Support Document (SFWMD 2021).

SUMMARY OF WATER SUPPLY SOURCE OPTIONS

Water users in the LEC Planning Area rely on fresh groundwater and surface water for urban, agricultural, and industrial uses. However, traditional freshwater sources are not sufficient to meet projected 2045 water demands; therefore, continued development of AWS sources is needed.

The Herbert Hoover Dike rehabilitation was completed in 2023. In 2019, the USACE initiated development of the new LOSOM that is expected to be finalized in 2024. Analyses conducted as part of LOSOM indicates the selected regulation schedule modestly improves water supply performance. A storage assessment analysis is being performed as part of this LEC Plan Update to determine the additional storage needed. The MFL recovery strategy is being updated as part of this 2023–2024 LEC Plan Update (**Appendix C**).

The SAS historically has served as the primary source of groundwater to meet PS demands in the LEC Planning Area. Large-scale expansion of SAS withdrawals is limited due to resource constraints, impacts to existing users, environmental impacts to natural systems, and water level decreases in the Western Basins.

Surface water bodies and the SAS will remain primary water sources for existing agricultural and landscape irrigation uses. Large-scale expansion of surface water and groundwater withdrawals is limited due to resource and regulatory constraints. As urban growth occurs, some agricultural land is expected to transition to urban community uses. Many existing agricultural areas have water use permits to use fresh groundwater for crop irrigation. While water use permits cannot be directly transferred from one land use type to another,

conversion of agricultural lands to another use may result in available fresh groundwater consistent with regulatory criteria.

In addition, the potential impacts of climate change and resulting sea level rise on water supply need to be better understood. Correspondingly, work on characterizing, monitoring, and designing adaption solutions should continue. See **Appendix D** for further details on climate change and sea level rise.

The following findings could increase the availability of water resources in the LEC Planning Area to meet the projected 2045 water demands:

- The FAS is a brackish water source that requires blending or desalination before use. Twenty-four PS utilities use the FAS as an AWS source to meet a portion of their demands. The FAS will provide an increasing portion of the water needed to meet 2045 projected demands. East Coast Floridan Model results, as discussed in **Chapter 6** and **Appendix D**, indicate the FAS will be able to meet demand in terms of volume and water quality.
- A decrease in 160 mgd of treated wastewater disposed of through ocean outfall and an increase in reuse of 145 mgd is expected from 2021 to 2045. Reclaimed water is primarily being reused for public access irrigation and PG cooling processes. Further development of reclaimed water as an AWS option is expected, mostly due to compliance with OOL requirements.
- Approximately three-quarters of the LEC Planning Area's annual rainfall of 57 inches occurs during the wet season; however, without sufficient storage capacity, much of this water discharges to tide. In the LEC Planning Area, potential types of needed water storage are under development, including ASR systems and reservoirs.
- Climate changes (e.g., increased air temperatures, changes in precipitation regimes, and increased storm frequencies) could result in greater evaporation, longer drought periods, and higher risk of flooding which could affect regional water resources. Therefore, climate changes need to be considered when evaluating the ability of water sources to meet future demands.

Water source options depend on location, use type, demand, regulatory requirements, and cost. As competition for limited water resources increases, development of AWS sources also will increase. The findings and conclusions of previous plan updates continue to represent the issues considered to meet the 2045 projected water demands within the LEC Planning Area.

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6

Water Resource Analyses

This chapter provides historical data and analyzes the current and future status of water resources in the Lower East Coast (LEC) Planning Area of the South Florida Water Management District (SFWMD or District) as well as their limitations and ability to meet the projected demands described in **Chapter 2**. The issues identified in this chapter may affect the use of existing water resources and the development of new supplies to meet projected water demands for 2045. **Appendix D** provides additional data and analyses regarding surficial aquifer system (SAS) groundwater elevations (levels), saltwater intrusion data and maps, electromagnetic induction logs, Floridan aquifer system (FAS) water quality, SAS groundwater modeling, climate change, and sea level rise. Understanding the effects of meeting water demands through withdrawals from water resources is critical to water supply planning.

TOPICS

- Summary of Issues Identified for 2045
- Evaluation and Analyses
- Surface Water Availability
- Groundwater Availability
- Groundwater Models
- Climate Change and Sea Level Rise
- Summary of Water Resource Analyses

SUMMARY OF ISSUES IDENTIFIED FOR 2045

Traditional freshwater sources in the LEC Planning Area are not sufficient to meet 2021 and 2045 projected water use demands. Past analyses indicate that fresh groundwater, in conjunction with currently permitted surface water, is not adequate to meet the growing needs of the LEC Planning Area during 1-in-10-year drought conditions. As a result, water users from several use categories are expanding their use of alternative water supply (AWS) sources. Several Public Supply (PS) utilities are using brackish water from the FAS to meet a portion of their current demands and to meet increased demands through 2045. Several other PS utilities are permitted to use surface water from the C-51 Reservoir Phase 1 totaling 35 million gallons per day (mgd) to offset increased SAS withdrawals to meet a portion of their demands. To meet greenspace irrigation demands, the use of reclaimed water is projected to increase in the LEC Planning Area. Several golf courses are also using brackish water from the FAS and reverse osmosis to meet their water needs. Additionally, continued decreases in irrigated agricultural acreage and associated demands have resulted in reduced demands on surface water sources. The following issues and considerations identified in this *2023–2024 Lower East Coast Water Supply Plan Update* (2023–2024 LEC Plan Update) are consistent with those in previous plan updates and continue to influence water supply planning efforts in the LEC Planning Area:

- Increased withdrawals from the SAS are limited by the Biscayne aquifer minimum flow and minimum water level (MFL), LEC Regional Water Availability criteria, potential impacts on the regional system, wetlands, pollution, and existing legal users as well as the potential for saltwater intrusion or upconing of relict seawater in the western portions of the planning area.
- Available water supplies for allocation in eastern Hendry County from the Lower Tamiami aquifer are constrained by the presence of isolated wetlands and the Lower West Coast Aquifers MFL, which is discussed in detail in the *2022 Lower West Coast Water Supply Plan Update* (SFWMD 2022a).
- Specific surface water volumes in eastern Hendry County are identified for the Seminole Tribe of Florida Big Cypress Reservation in addition to a secondary irrigation supply from Lake Okeechobee.
- Withdrawals from the FAS are expected to increase to meet future demands. Continued monitoring of water levels and water quality in the FAS is necessary to ensure long-term sustainability of the resource.
- The C-51 Reservoir Phase 1 is envisioned to deliver 35 mgd of stored surface water to several PS utility wellfields to offset increased SAS withdrawals in Broward and Miami-Dade counties.
- Climate change and sea level rise are increasingly likely to negatively affect the availability of freshwater resources in the LEC Planning Area.
- The new Lake Okeechobee System Operating Manual, associated with completion of the Herbert Hoover Dike repairs, will have effects on water supply and the Lake Okeechobee MFL.

Previous LEC water supply plan updates identified a variety of AWS projects to avoid water resource impacts and competition among water users and to provide a sustainable supply of water. AWS projects include the use of reclaimed water, storage of water using aquifer storage and recovery wells and reservoirs, storage of surface water otherwise discharged to tide (e.g., C-51 Reservoir), and development and use of brackish water sources.

While the development of fresh groundwater is limited in many areas of the LEC Planning Area, it may be available in portions of the region. As population growth increases pressure for urban expansion, some agricultural land is expected to transition to urban community uses. While water use permits cannot be directly transferred from one land use type to another, conversion of agricultural lands to another use may result in available fresh groundwater and surface water.

EVALUATION AND ANALYSES

Data and information from many sources were considered in developing this water supply plan update. The following information sources were used to evaluate water resources in the LEC Planning Area, including their availability and ability to meet projected demands considering the issues listed above:

- Water use permits and permit applications
- Water supply demand projections for 2045

- Groundwater levels and groundwater quality data for the SAS and FAS
- Updated (2019) saltwater interface maps for Broward, Palm Beach, and Miami-Dade counties
- Input from planning area stakeholders and the public
- Updated Water Supply Facilities Work Plans and capital improvement elements from local governments
- Activities and progress since the *2018 Lower East Coast Water Supply Plan Update* (2018 LEC Plan Update; SFWMD 2018), including AWS project implementation
- Data and information from the Comprehensive Everglades Restoration Plan (CERP), including status of CERP projects from the associated Integrated Delivery Schedule
- Lake Okeechobee System Operating Manual
- FAS groundwater modeling

Based on information from these data sources, issues identified in the 2018 LEC Plan Update (SFWMD 2018) were determined to be applicable for this 5-year plan update. The projected 2045 gross water demands for all water use categories in this plan update are more than the projected 2040 demands in the 2018 LEC Plan Update (**Chapter 2**). Total projected demand is estimated to increase by 3% primarily due to the Commercial/Industrial/Institutional (CII) and Landscape/Recreational (L/R) categories. As a result, the findings and conclusions of previous plan updates are still representative of current and projected scenarios.

SURFACE WATER AVAILABILITY

In the LEC Planning Area, surface water is primarily used for agricultural and urban irrigation and to a much lesser extent direct withdrawal for public supply. Notable surface water sources for the region are divided into five hydrologically related areas that include the Lake Okeechobee Service Area (LOSA), Everglades Protection Area (encompassing the water conservation areas), Everglades National Park and Florida Bay, Western Basins in eastern Hendry and Collier counties, and the Lower East Coast Service Areas, which are fully described in the 2018 LEC Plan Update (SFWMD 2018) and the 2022 *Physical Features and Water Resources of the South Florida Water Management District* (SFWMD 2022b) documents. Resource protection criteria (**Chapter 4**) must be considered when determining the availability of water sources. Surface water use is limited by restricted allocation area (RAA) criteria adopted for Lake Okeechobee and LOSA; North Palm Beach County/Loxahatchee River Watershed Waterbodies; and the L-1, L-2, and L-3 canal system (**Chapter 4**). The RAA for Lake Okeechobee and LOSA restricts additional allocations of surface water from Lake Okeechobee and the integrated conveyance systems that are hydraulically connected to and receive water from Lake Okeechobee, such as the Hillsboro, North New River, and Miami canals. The RAA for the North Palm Beach County/Loxahatchee River Watershed Waterbodies limits net increases in the volume (or changes in timing) on a monthly basis of direct surface water and indirect groundwater withdrawals from the RAA above existing allocations. The RAA for the L-1, L-2, and L-3 canal system prohibits additional surface water allocations above existing allocations. Therefore, these water bodies cannot be relied upon to meet additional future demands. However, use of these surface water bodies has decreased with the decline in agricultural acreage. In the future, some surface water use may be replaced with AWS sources, such as reclaimed water, if it becomes available.

In addition to water supply, canals and other surface water bodies are used for flood control, groundwater recharge, and preventing saltwater intrusion among other uses. Depending on location, water elevations in canals are controlled to meet one or more objectives. Surface water level monitoring is a key component in managing surface water sources and is performed for a variety of reasons including the following:

- Evaluating saltwater intrusion potential by measuring freshwater head at coastal canal structures.
- Monitoring hydroperiods in natural and man-made water bodies (i.e., wetlands) by measuring surface water gauges.
- Guiding operations for flood control and water supply by measuring surface water levels in lakes, reservoirs, and canals.
- Establishing MFL criteria and monitoring compliance using surface water levels.

Several factors were considered when evaluating surface water availability to meet current and future demands in the LEC Planning Area. Based on monitoring data and resource protection criteria (i.e., RAAs, MFLs), surface water use for water supply is limited and is expected to remain so throughout the planning horizon. Increased future demands in the region likely will be met using groundwater sources.

GROUNDWATER AVAILABILITY

In the LEC Planning Area, approximately 70% of the total water demand is being met with groundwater, including 97% of PS demands. Monitoring programs are used to guide operations, provide early warning of threats to water supply, protect existing users and natural systems, and provide data for regional surface water and groundwater models. Monitoring programs associated with environmental restoration are identified in **Chapter 7**, and monitoring results can be found in the annual *South Florida Environmental Report* available at https://www.sfwmd.gov/sfer. Real-time and long-term climate monitoring information obtained by the SFWMD is available on the Resilience Metrics Hub (SFWMD 2023). Historical and current hydrologic, meteorologic, hydrogeologic, and water quality data for the 16 counties within the District's boundaries are available from the SFWMD's corporate environmental database, DBHYDRO, at https://www.sfwmd.gov/science-data/dbhydro.

The SAS and FAS are the major groundwater sources in the LEC Planning Area (**Chapter 5**). Historically, the SAS has served as the major source of fresh groundwater for the six use types (i.e., Public Supply, Domestic Self-Supply, Agricultural irrigation, Landscape/Recreational irrigation, Commercial/Industrial/Institutional, and Power Generation). However, past and present analyses of the SAS indicate that it is a limited source in many areas and, therefore, cannot be the primary source for all the projected water demands in the LEC Planning Area without harming the environment or the resource. The FAS has been and continues to be developed as an AWS source to meet increased demands for PS in the LEC Planning area. The SFWMD has previously developed a regional groundwater model for the FAS (i.e., East Coast Floridan Model [ECFM] and is currently developing a groundwater model for the SAS (i.e., East Coast Surficial Model [ECSM]) to evaluate the ability of these resources to sustainably meet future demands.

The following sections provide data and analyses of groundwater elevations and groundwater quality data in the SAS and FAS within the LEC Planning Area. Time-series graphs are plotted to evaluate these data, including identification of trends, if any. Water quality data in these time-series plots are provided by PS utilities as part of their water use permit monitoring requirements and from United States Geological Survey (USGS) monitor wells. Additional information about PS utilities, including permitted allocations, treatment facilities, and proposed projects, is available in **Appendix B**.

This chapter provides information on the following:

- Long-term trends in water levels and water quality at specific wells in the SAS (including Biscayne and Lower Tamiami aquifers)
- Location of the saltwater interface in the SAS for Palm Beach, Broward, and Miami-Dade counties and time-series graphs of chloride concentrations
- Historical water quality trends for FAS wells used by utilities and the regional FAS monitoring network
- Groundwater models
- Climate change and sea level rise

More detailed saltwater intrusion data and analyses, including electromagnetic logs from select wells and saltwater intrusion mapping and analyses, can be found in **Appendix D**.

Surficial Aquifer System Evaluation

In the coastal portions of the LEC Planning Area, a primary water supply concern for SAS users is saltwater intrusion, both laterally from the ocean and vertically from underlying salt water that has already intruded into the aquifer. Groundwater elevations and chloride concentrations are used to evaluate the rate and level of impact of saltwater intrusion. In the portions of Hendry and Collier counties within the LEC Planning Area, saltwater intrusion is not an issue; however, water levels are the principal concern regarding water supply availability in these areas. The SAS (and its associated wetlands) depend on local rainfall and lateral seepage from surface-water bodies and canals for aquifer recharge. During dry conditions, evapotranspiration increases, recharge diminishes, drainage persists, and irrigation and other demands increase, compounding stress on the SAS and wetland systems.

Surficial Aquifer System Groundwater Elevations

Historically, the SAS has been the primary source of potable water and urban irrigation water in the LEC Planning Area. PS utilities use both the SAS and FAS but are meeting increased demands with groundwater from the FAS. For water supply planning purposes, 12 monitor wells (locations labeled in **Figure 6-1**) in the LEC Planning Area were chosen to evaluate long-term trends in regional groundwater elevations (**Table 6-1; Figure 6-1**). These representative monitor wells generally show an annual wet-to-dry-season variation in groundwater elevations of approximately 2 to 4 feet, which is typical in rainfall-driven aquifers, such as the SAS, that are recharged by infiltration from rainfall and local surface water bodies. While the magnitude of these fluctuations may vary from year to year, the historical groundwater elevation time-series data shown in these hydrographs indicate relatively stable average groundwater elevation trends in the LEC Planning Area.

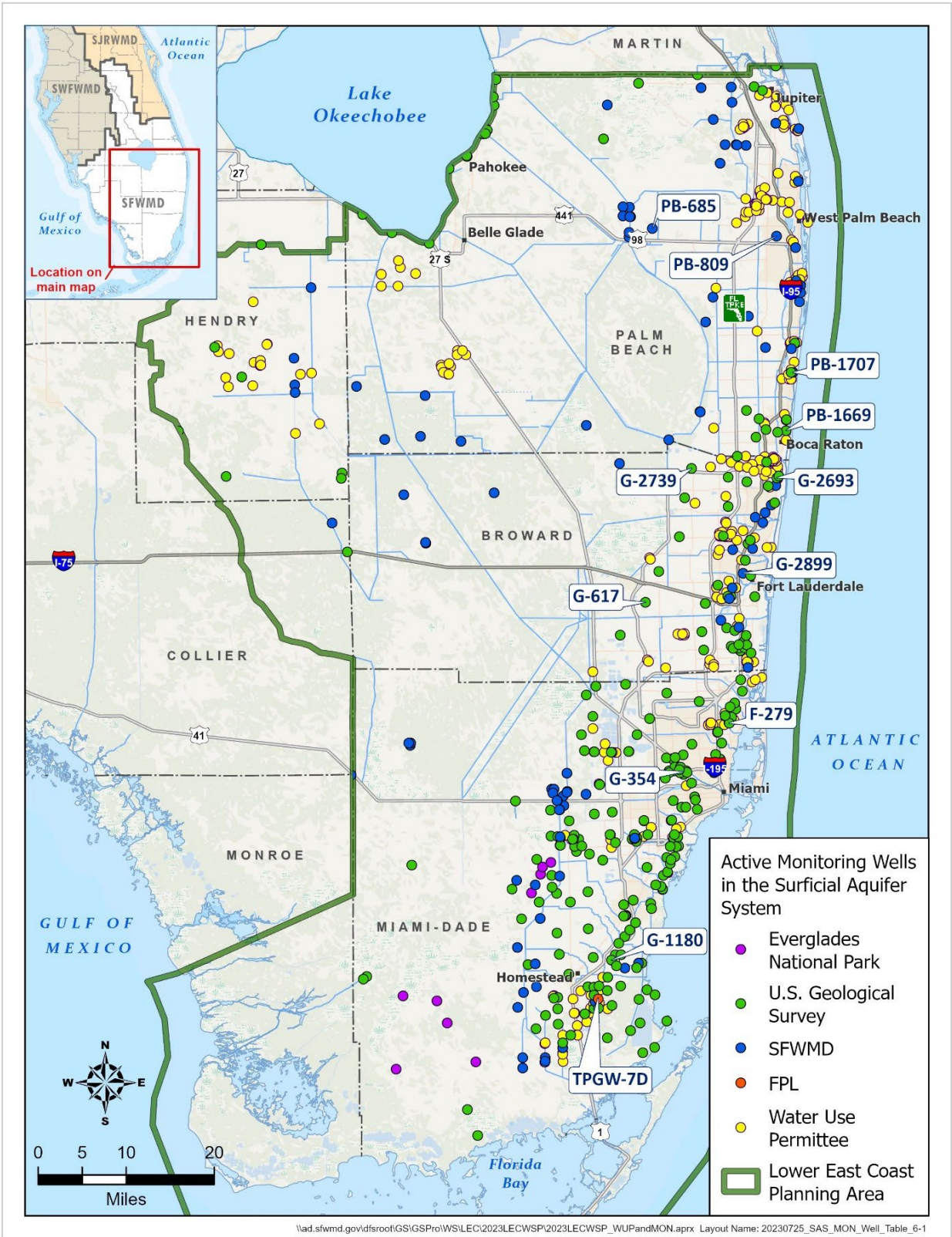

Figure 6-1. Locations of representative surficial aquifer system monitor wells and monitoring entities in the LEC Planning Area.

Table 6-1. Minimum, maximum, and average groundwater elevations for select surficial aquifer system monitor wells in the LEC Planning Area.

County	Well Name	Total Depth (ft bls)	Minimum Groundwater Elevation	Maximum Groundwater Elevation	Average Groundwater Elevation
Broward	**G-617**	29	2.98	4.85	3.89
	G-2693	229	1.94	7.13	4.50
	G-2739	21	5.60	9.16	7.80
	G-2899	165	0.65	3.74	1.82
Miami-Dade	**F-279**	117	0.99	3.91	1.65
	G-354	90	0.68	3.03	1.86
	G-1180	67	0.75	3.18	2.06
	TPGW-7D	114	-4.14	2.05	0.42
Palm Beach	**PB-685**	17	11.61	16.79	13.67
	PB-809	150	7.37	12.01	10.23
	PB-1669	131	2.84	9.17	4.95
	PB-1707	183	-0.90	5.25	2.42

bls = below land surface; ft = feet.
Notes: Groundwater elevations are in feet NGVD29 (National Geodetic Vertical Datum of 1929). The period of record is 1/01/2000 to 12/31/2022. Wells in bold font are presented here, with the remaining wells presented in **Appendix D**.

Figures 6-2 to **6-6** are long-term hydrographs for five shallow monitor wells located in inland Palm Beach, Broward, and Miami-Dade counties (**Figure 6-1**). These time-series hydrographs illustrate long-term seasonal fluctuations in groundwater elevations between each wet and dry season, as well as long-term trends in groundwater elevations. None of the time-series hydrographs in this section show long-term groundwater elevation trends. These monitor wells are near canal systems that can influence groundwater elevations in nearby wells, but only well G-617 is directly adjacent to a canal.

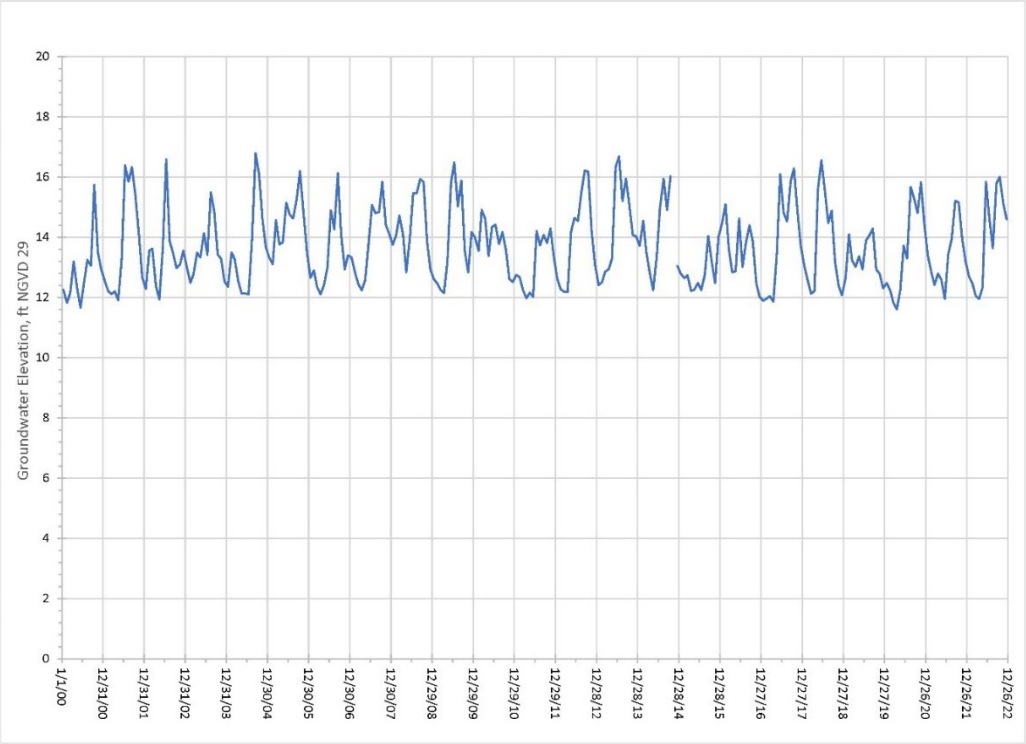

Figure 6-2. Groundwater elevations at surficial aquifer system well PB-685 (17 feet deep) in Loxahatchee, central Palm Beach County.

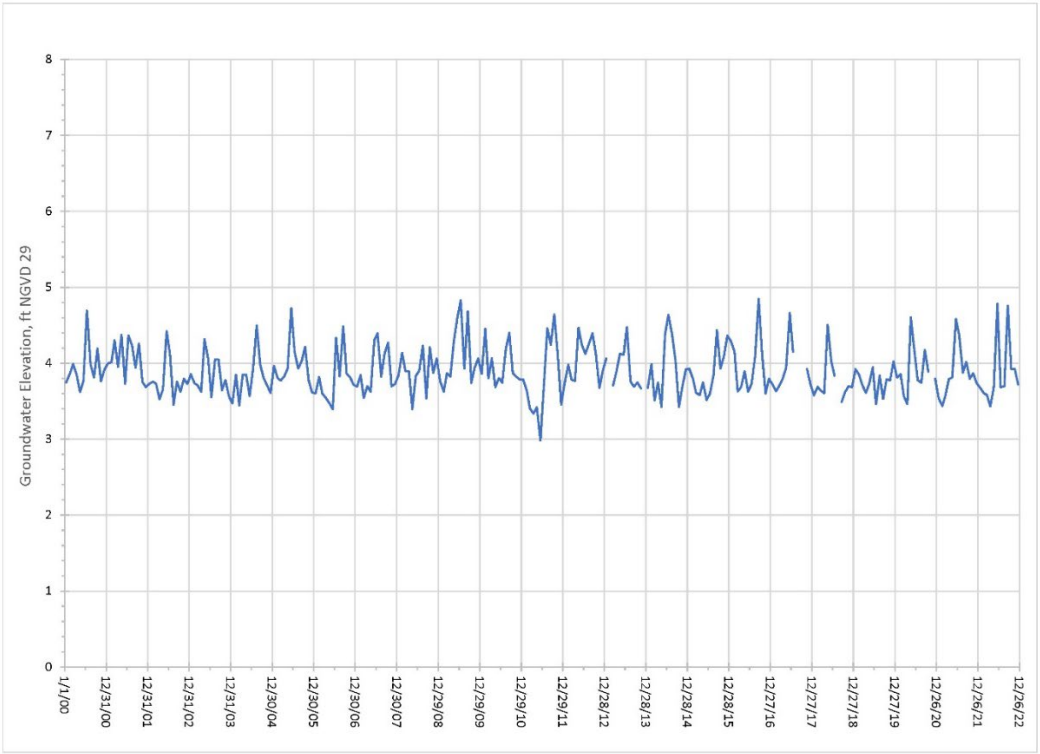

Figure 6-3. Groundwater elevations at surficial aquifer system well G-617 (29 feet deep) in Davie, central Broward County.

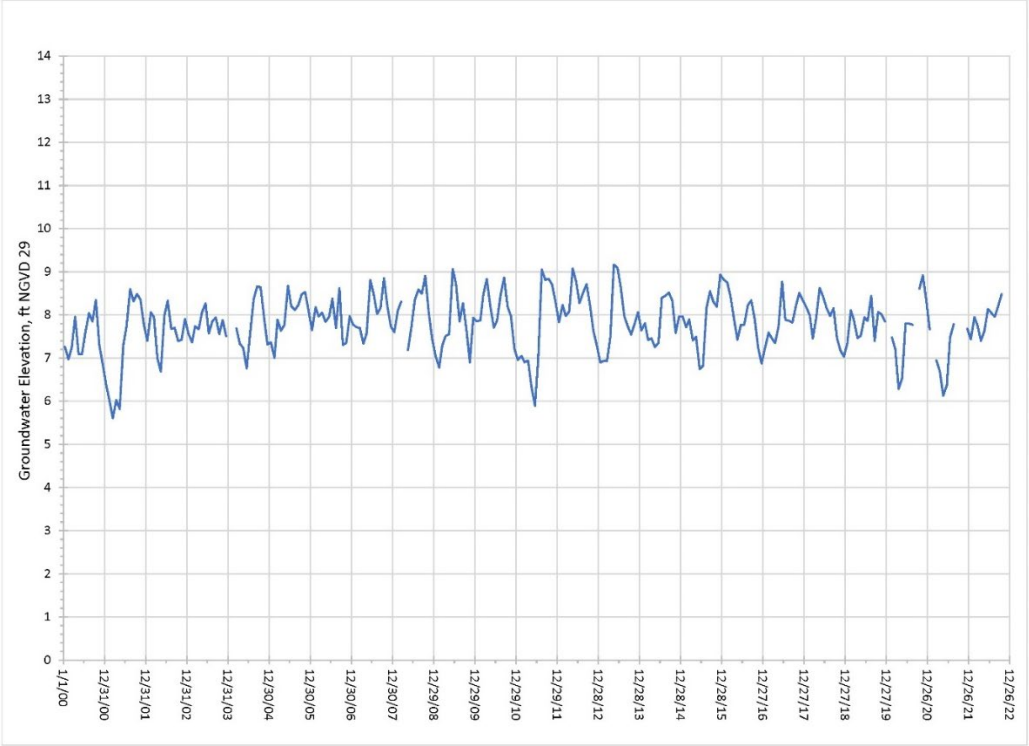

Figure 6-4. Groundwater elevations at surficial aquifer system well G-2739 (21 feet deep) in Parkland, northern Broward County.

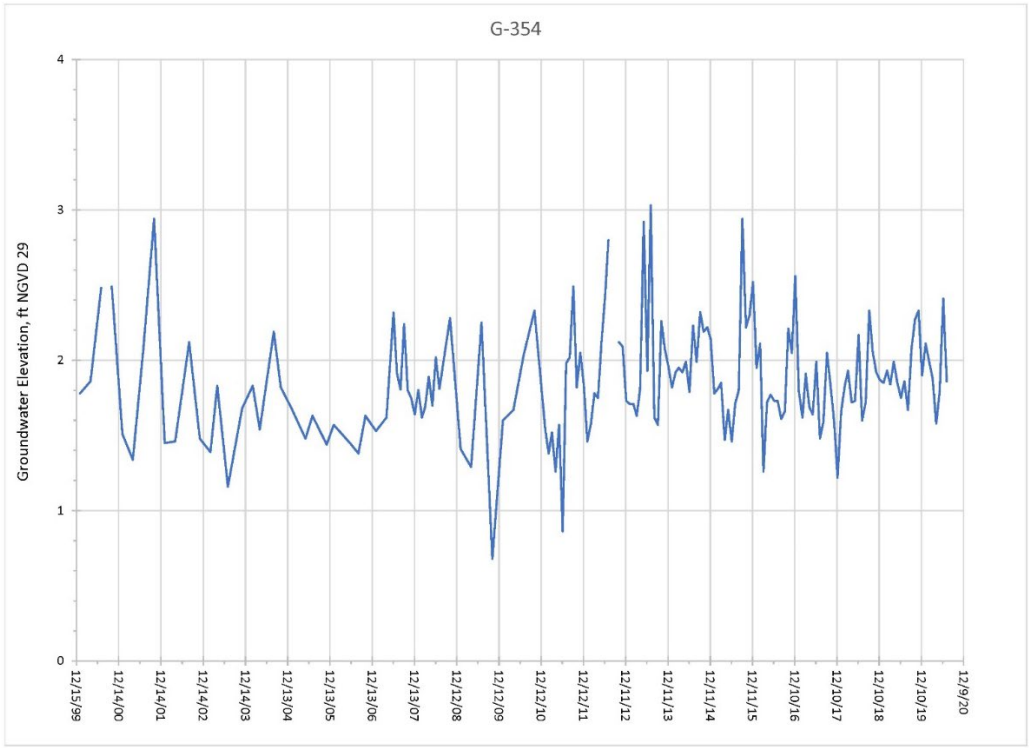

Figure 6-5. Groundwater elevations at surficial aquifer system well G-354 (90 feet deep) in Miami Springs, central Miami-Dade County.

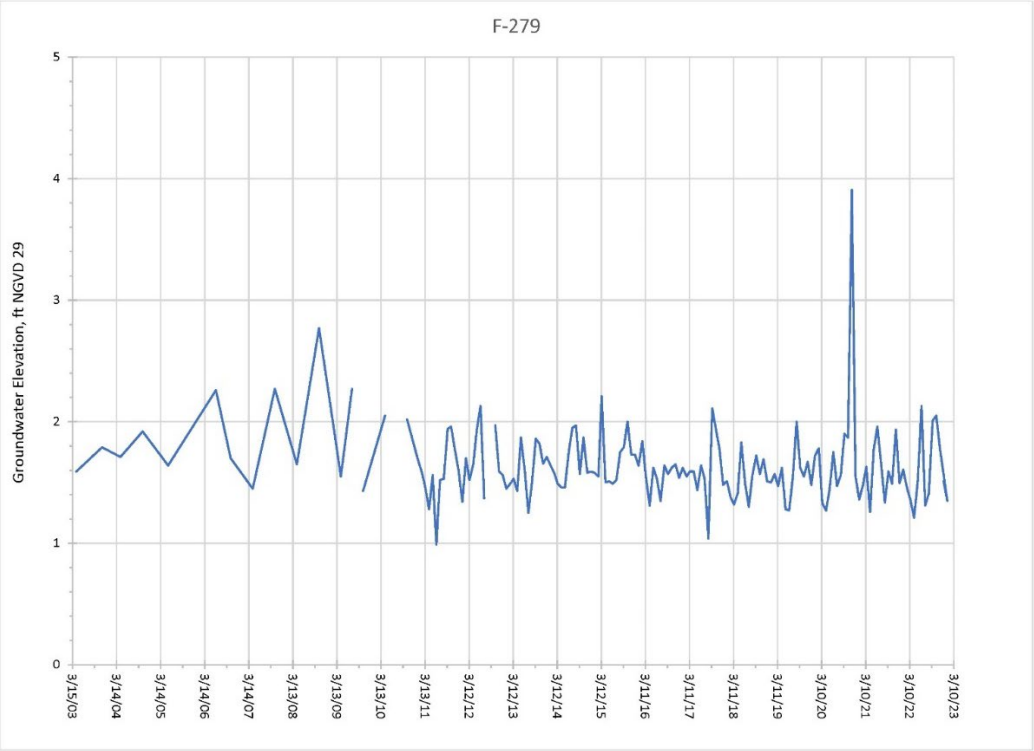

Figure 6-6. Groundwater elevations at surficial aquifer system well F-279 (117 feet deep) in North Miami, central Miami-Dade County.

Lower Tamiami Aquifer Maximum Developable Limit

In 2003, the SFWMD adopted maximum developable limit (MDL) permitting criteria for the Lower Tamiami aquifer (LTA), which underlies the portion of eastern Hendry County within the LEC Planning Area, as well as much of the Lower West Coast Planning Area. The MDL criteria limit withdrawals from the LTA in order to maintain the potentiometric head of the aquifer at an elevation that is at least 20 feet above the top of the aquifer at any point during 1-in-10-year drought conditions. LTA monitor wells are used to track regional groundwater elevations and ensure that the MDL is not exceeded (**Figure 6-7**).

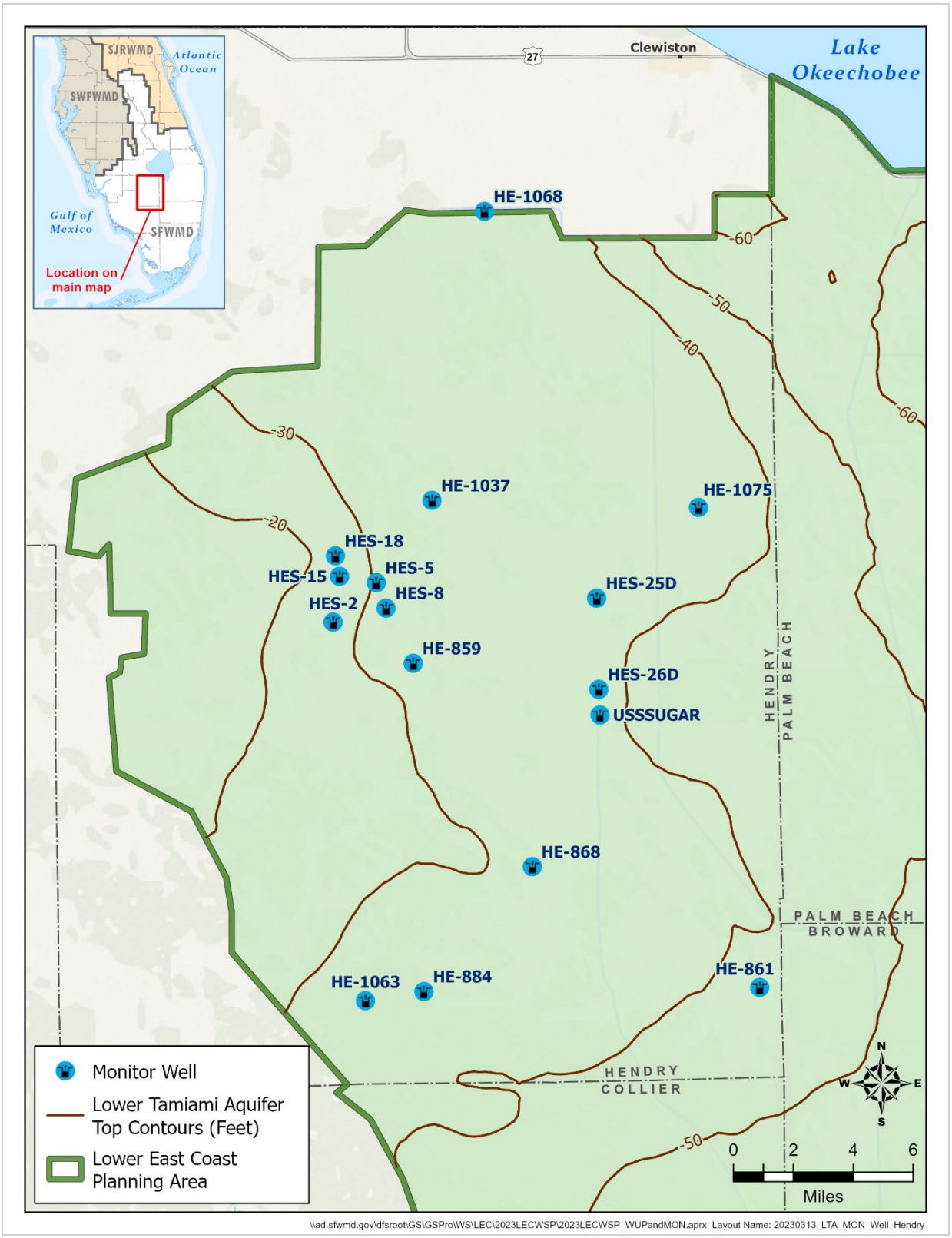

Figure 6-7. Contour map of the elevation of the top of the Lower Tamiami aquifer and locations of Lower Tamiami aquifer monitor wells, eastern Hendry County.

Figures 6-8 and **6-9** present hydrographs showing the MDL in relation to historical groundwater elevations in select monitor wells. The MDL for each well was determined based on the elevation of the top of the LTA as described in SFWMD's recent 2022-2023 hydrostratigraphic unit mapping update for the Lower West Coast aquifers (Zumbro et al. 2023).

Groundwater elevations in monitor well USSUGAR have come within 10 feet of the MDL in the past, with the most recent groundwater elevation low being recorded in spring of 2017. At HES-26D, groundwater elevations are generally 20 to 40 feet above the MDL, except for spring 2017, when the groundwater elevation briefly dropped below the MDL. Since that time, groundwater elevations at this well have fluctuated between approximately 14 and 36 feet above the MDL. Since 2017, the seasonally lowest groundwater elevations have been around -2 feet National Geodetic Vertical Datum of 1929 (NGVD29) as opposed to -5 to -16 feet NGVD29 prior to 2017.

Because agricultural water use in eastern Hendry County is expected to increase over the planning horizon (2021 to 2045), groundwater levels will require close monitoring, particularly in areas where the MDL has been reached or exceeded during 1-in-10-year drought conditions. AWS options may need to be developed in some areas to ensure adequate future supply and prevent harm to the aquifer (**Chapter 7**).

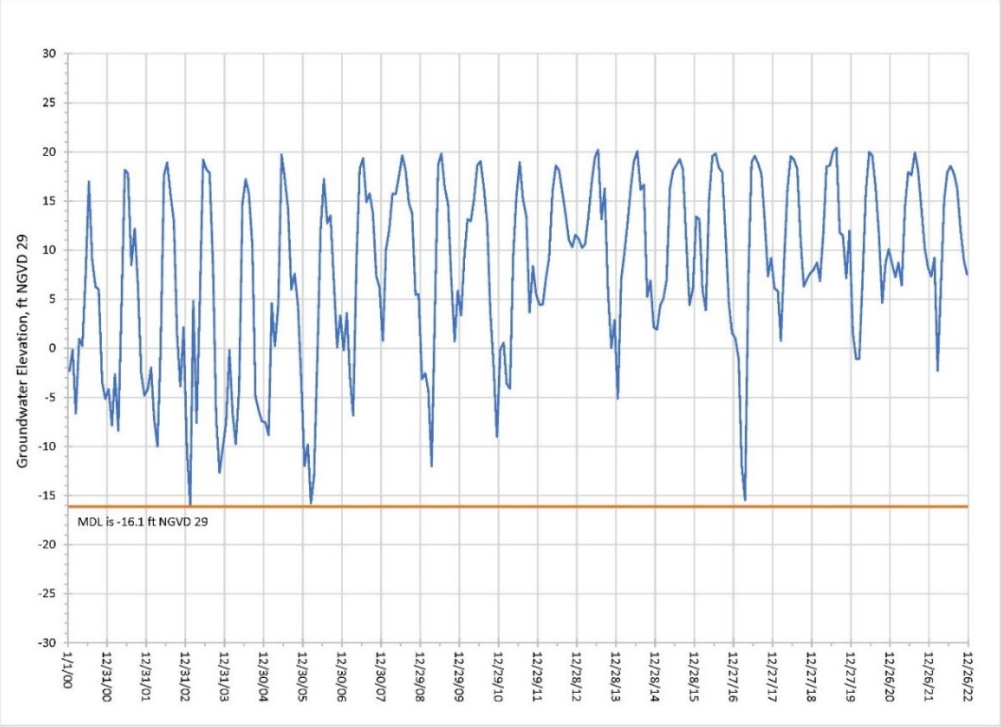

Figure 6-8. Groundwater elevations in Lower Tamiami aquifer well USSUGAR (100 feet deep), and associated maximum developable limit elevation, eastern Hendry County.

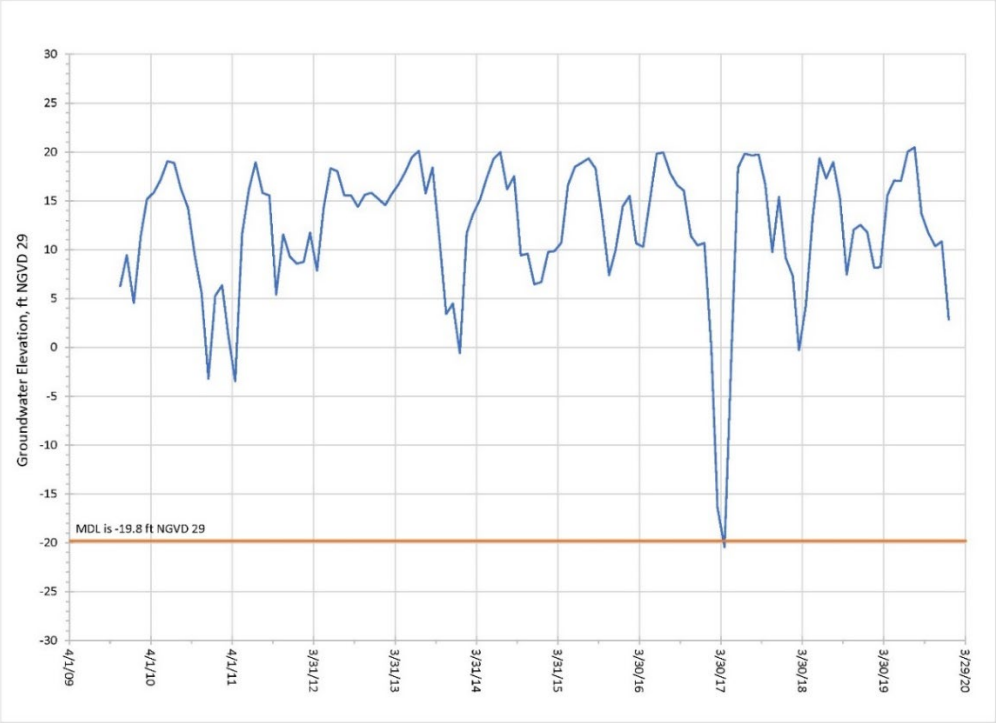

Figure 6-9. Groundwater elevations in Lower Tamiami aquifer well HES-26D (100 feet deep), and associated maximum developable limit elevation, eastern Hendry County.

Surficial Aquifer System Water Quality

Water quality monitoring is crucial to managing and protecting fresh groundwater sources, such as the SAS. Chloride concentration data are used to monitor saltwater intrusion, which can occur from the inland movement of the saltwater interface or the sustained upward movement of deeper saline groundwater (upconing). Chloride concentrations must be less than 250 milligrams per liter (mg/L) to meet the United States Environmental Protection Agency secondary drinking water standards (USEPA 2023).

The inland movement of seawater primarily affects coastal communities, while the upward movement of brackish groundwater is a concern for some inland areas (e.g., western Palm Beach and Broward counties). The east coast of Florida is particularly susceptible to lateral saltwater intrusion due to the following factors:

- Proximity to the Atlantic Ocean, inlets, and lagoons
- A large number of coastal wellfields
- Low land-surface elevations (less than 10 feet above mean sea level)
- Drainage canals that lower the water table, which reduces the water pressure exerted against the saltwater interface
- Canals without coastal water control structures or structures that are located inland
- Rising sea levels

Groundwater with chloride concentrations greater than 250 mg/L is found in portions of central and western Palm Beach and Broward counties and is attributed to relict seawater (connate water) in less transmissive portions of the SAS (Miller 1988, Reese and Wacker

2009). This underlying brackish water limits the depths and withdrawal rates for some PS and L/R irrigation wells. Chloride concentrations in shallow groundwater wells less than 20 feet deep in the Everglades Agricultural Area (EAA) range from 100 to 300 mg/L. Chloride concentrations increase with depth and can exceed 1,000 mg/L below 50 feet and 9,000 mg/L at depths to 200 feet. Therefore, SAS wells typically are not used for irrigation in the EAA as the high chloride concentrations would impact crops and the water resources. Higher salinities also are found in agricultural and flood control canals in western Palm Beach County where some canals intersect brackish portions of the SAS. Chloride concentrations in SFWMD canals in the EAA generally fluctuate between 50 and 200 mg/L over the year. Data collected from 2000 to 2009 at culverts 12 and 12A near Pahokee on Lake Okeechobee have recorded chloride concentration fluctuations up to 600 mg/L.

Saltwater Interface Mapping

The SFWMD periodically develops saltwater interface maps to help visualize and understand the potential degradation of the coastal aquifers and water supply wellfields tapping the SAS due to saltwater intrusion. Salinity data from monitor wells were compiled from multiple sources (e.g., USGS, SFWMD, water use permittees) and contoured to estimate the position of the saltwater interface, defined as the isochlor line with a 250 mg/L chloride concentration. To date, three series of maps have been developed (2009, 2014, and 2019), with plans to update the maps every 5 years. This approach allows tracking of the position of the saltwater interface over time, can be used to identify areas of concern that may need additional monitoring, and may suggest the need for changes in wellfield operations. The SFWMD's saltwater interface monitoring and mapping program is described by Shaw and Zamorano (2020). The 2019 saltwater interface maps are available on the SFWMD's webpage https://www.sfwmd.gov/documents-by-tag/saltwaterinterface.

In general, the 2019 maps are similar to the 2014 maps; however, relatively small differences indicate that the interface is regionally dynamic, with inland movement in some areas and seaward movement in other areas. Local-scale investigation of the saltwater interface could be warranted in some areas, depending on the network of monitor wells available, the proximity of the saltwater interface to specific wellfields, and groundwater withdrawal rates at these wellfields. In addition to SFWMD efforts, the USGS (2017) maintains a saltwater intrusion mapping webpage that graphically depicts statistical analyses of water level and salinity data collected from USGS monitoring sites in South Florida. This mapping tool also shows the SFWMD salinity control structures, the 2019 saltwater interface location in Palm Beach and Broward counties, and the 2021 saltwater interface location in Miami-Dade County.

Below is a brief description of the saltwater interface position in Palm Beach, Broward, and Miami-Dade counties, including analyses of select monitor wells. More detailed analyses of saltwater intrusion maps, as well as the results of electromagnetic induction logging of select wells, are provided in **Appendix D**.

Palm Beach County

The 2009, 2014, and 2019 saltwater interface positions in Palm Beach County are shown in **Figure 6-10**. In many areas, these lines overlap, meaning the interface position is stable. Chloride concentrations at the monitor well locations were measured in 2019. For reference, the figure also includes PS wellfield areas, which identify the cone of influence of the

withdrawals. Several utilities with wellfields near the coast (e.g., Tequesta, Lake Worth, Lantana) have made wellfield operational changes in response to saltwater intrusion that have effectively moved the saltwater interface seaward or stabilized it (**Figure 6-10**, Inset A).

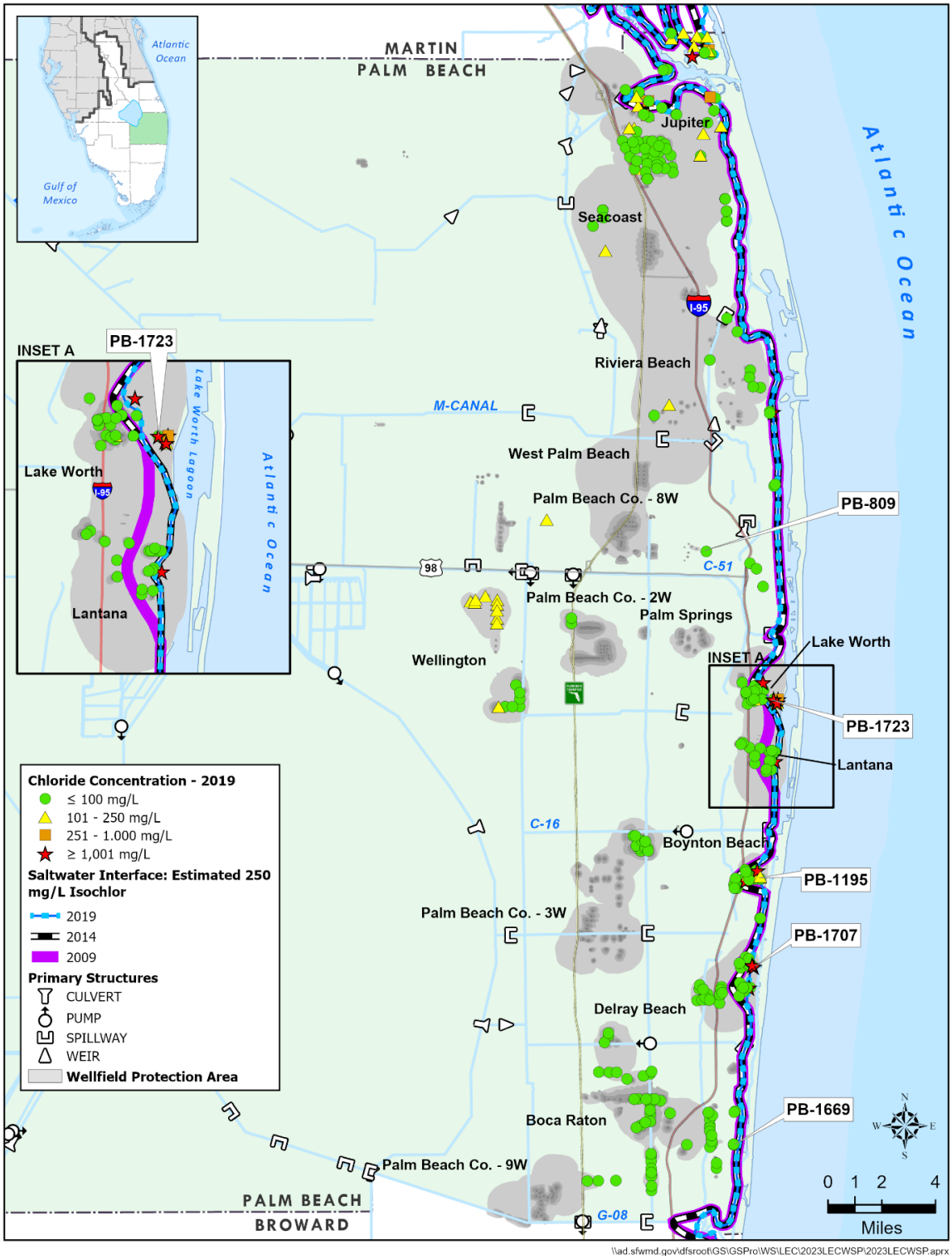

Figure 6-10. Surficial aquifer system chloride monitoring locations; chloride concentrations; and 2009, 2014, and 2019 saltwater interface positions in Palm Beach County.

Chloride concentrations in USGS well PB-809, located slightly inland, have increased from 40 to 80 mg/L over the past three decades (**Figure 6-11**). Groundwater elevations range between 9.5 to 11.5 feet NGVD. Data indicate the chloride concentrations and water levels are relatively stable at this location.

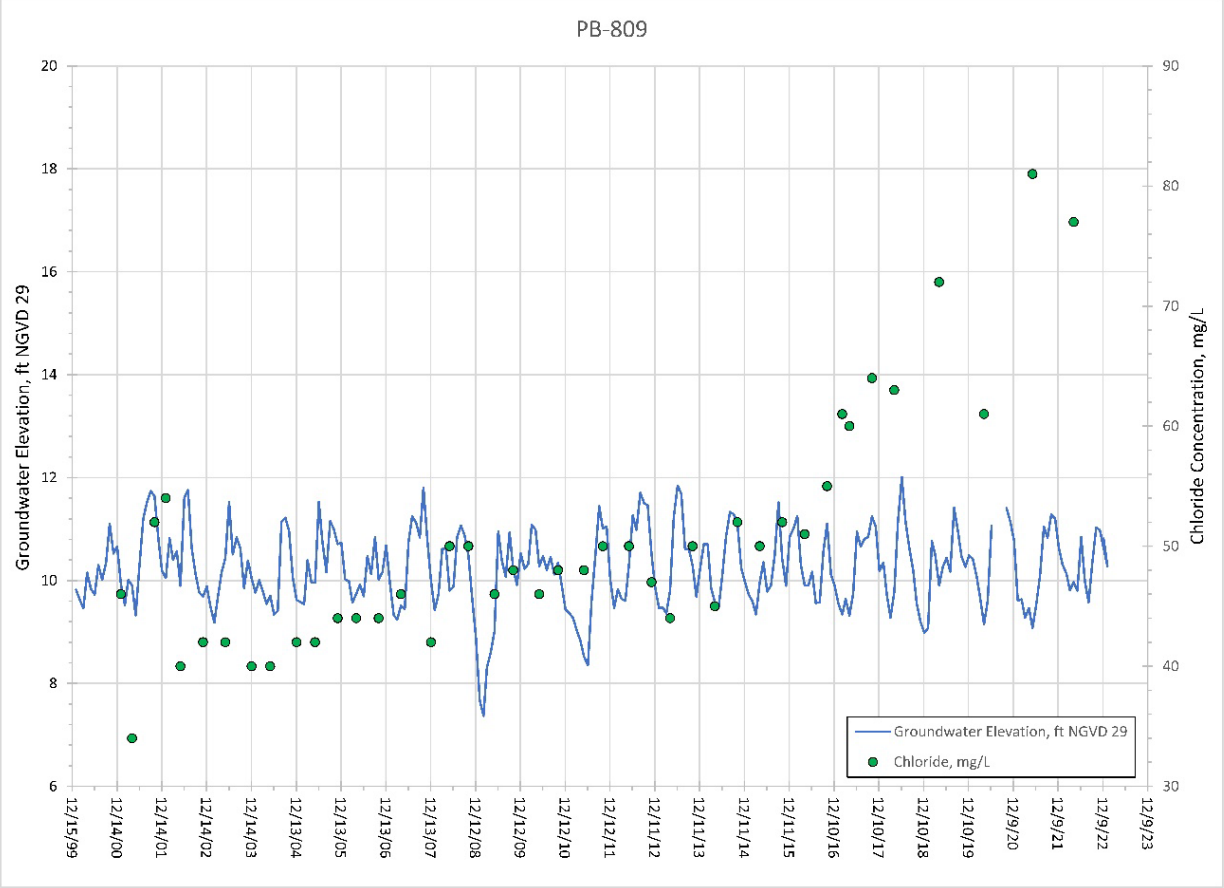

Figure 6-11. Chloride concentrations and groundwater elevations in monitor well PB-809 (150 feet deep) in West Palm Beach, east-central Palm Beach County.

Chloride concentrations in monitor well PB-1707, located east of the Delray Beach East wellfield, decreased from approximately 4,000 mg/L in 2014 to 3,000 mg/L in 2018 (**Figure 6-12**). Since 2018, chloride concentrations have rapidly increased to more than 14,000 mg/L, while groundwater elevations as low as -1 feet NGVD were recorded. A combination of temporarily increased reliance on the East wellfield and construction dewatering in the area is the likely cause of this condition. The City of Delray Beach should endeavor to maintain groundwater levels above +2 feet NGVD near this well by shifting more pumpage to its West wellfield to prevent further inland movement of the saltwater interface.

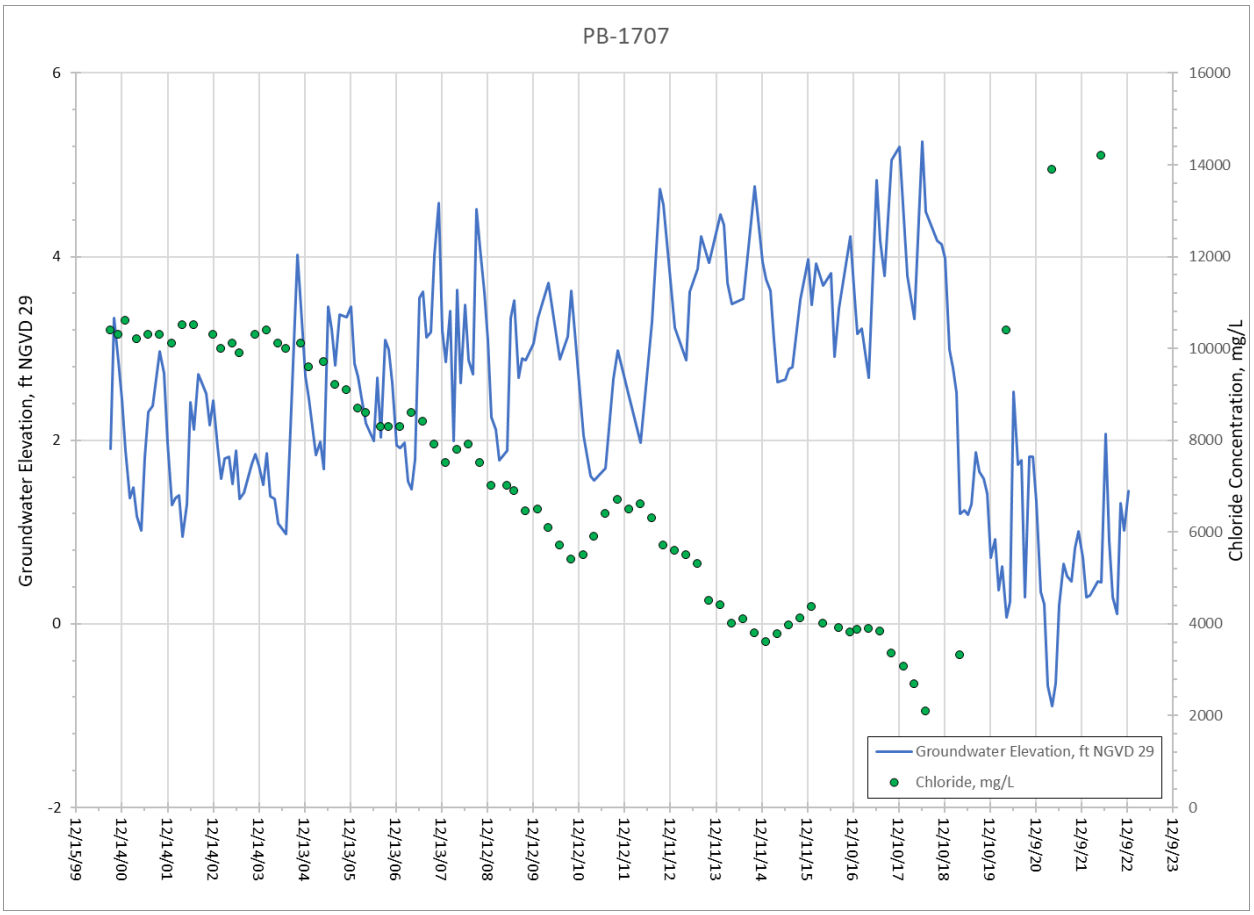

Figure 6-12. Chloride concentrations and groundwater elevations in monitor well PB-1707 (183 feet deep) in Delray Beach, southeastern Palm Beach County.

In the Boca Raton coastal area, chloride concentrations near the base of the aquifer remain around 45 mg/L as shown in USGS well PB-1669 (**Figure 6-13**). Because groundwater elevations rarely are below +4 feet NGVD, the saltwater interface has remained seaward of this well location.

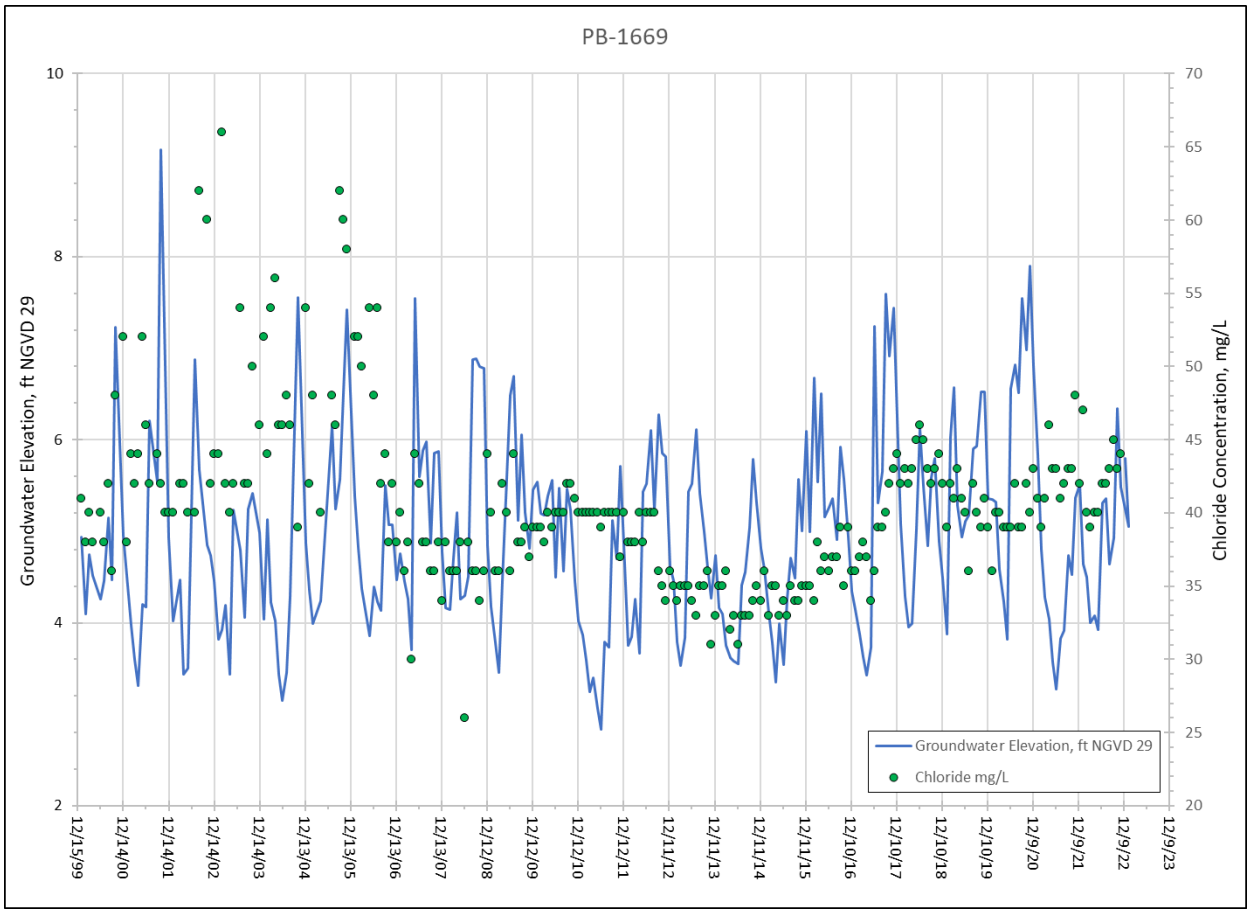

Figure 6-13. Chloride concentrations and groundwater elevations in monitor well PB-1669 (131 feet deep) in Boca Raton, southeastern Palm Beach County.

Broward County

The 2009, 2014, and 2019 saltwater interface positions and PS wellfield protection areas for Broward County are shown in **Figure 6-14**. Chloride concentrations were measured most recently in 2019. Changes in the extent of saltwater intrusion in 2014 and 2019 resulted from improved spatial information, particularly in the area of the C-11 and Hillsboro canals. In other areas, westward movement of the saltwater front is evident. However, the elevated chloride concentrations noted in the vicinity of the Broward County South Regional wellfield are the result of upconing of connate water from the base of the SAS and are not related to the movement of the saltwater interface.

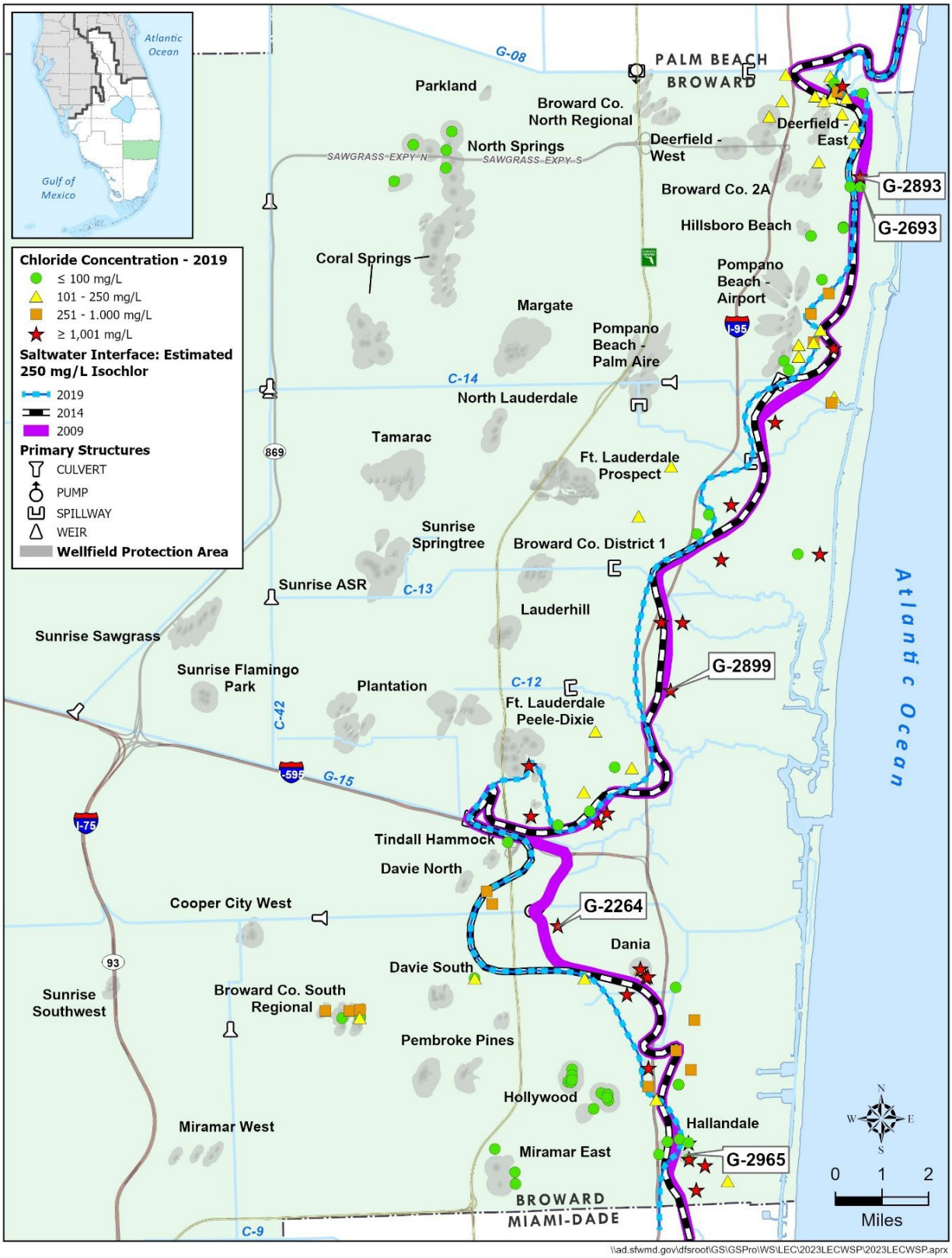

Figure 6-14. Surficial aquifer system chloride monitoring locations; chloride concentrations; and 2009, 2014, and 2019 saltwater interface positions in Broward County.

Monitor well G-2693 (**Figure 6-15**) is located less than 1 mile from the coast in the Town of Hillsboro Beach. Chloride concentrations are stable between 30 to 40 mg/L, and groundwater elevations range between 3.5 to 7.0 feet NGVD.

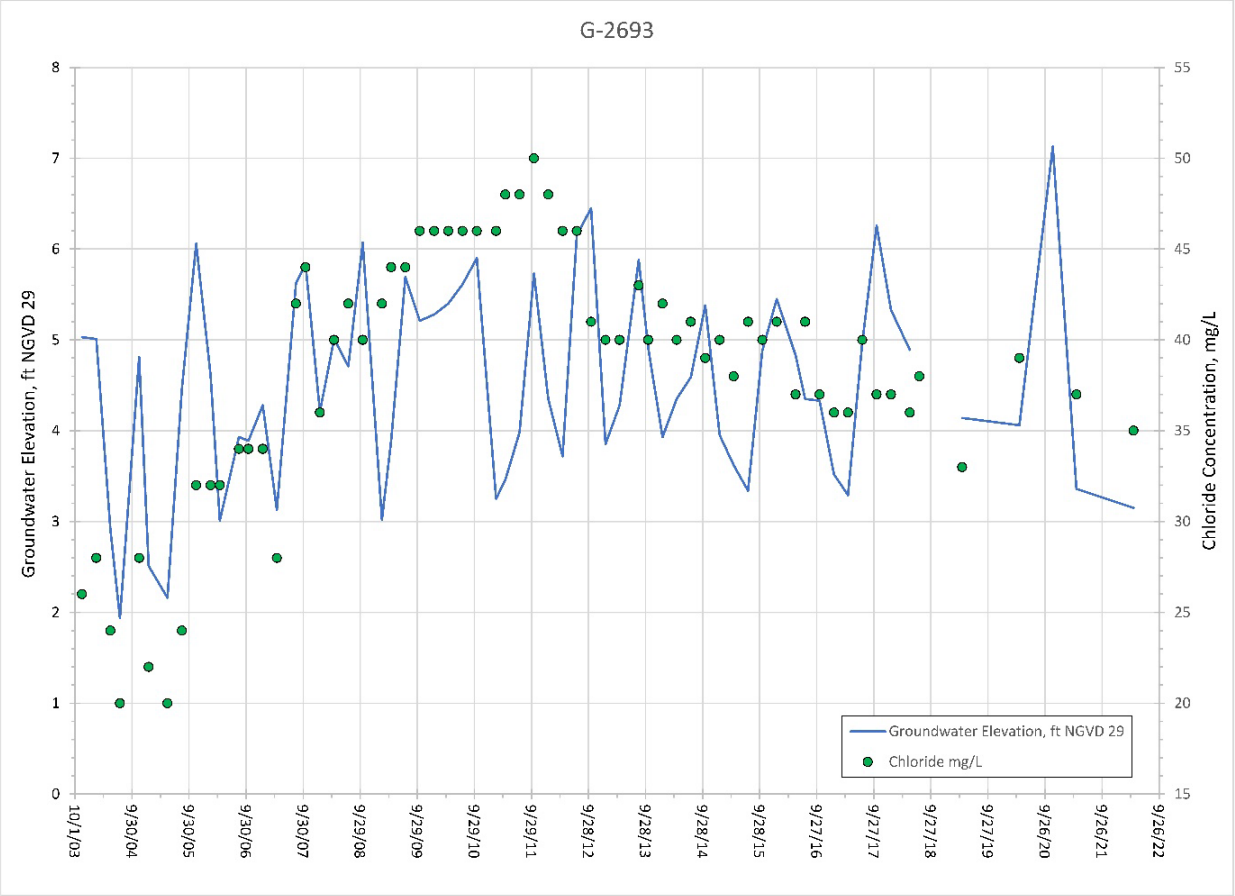

Figure 6-15. Chloride concentrations and groundwater elevations in monitor well G-2693 (229 feet deep) in Hillsboro Beach, northeastern Broward County.

Monitor well G-2899 is less than 1 mile east of Interstate 95 and just south of Sunrise Boulevard in Fort Lauderdale. Chloride concentrations in the well began exceeding 250 mg/L in 2005 and have steadily increased to 1,000 mg/L in 2018 and 1,350 mg/L in 2021 (**Figure 6-16**), suggesting inland movement of the saltwater interface at this location. There are no PS wellfields directly west of this monitor well.

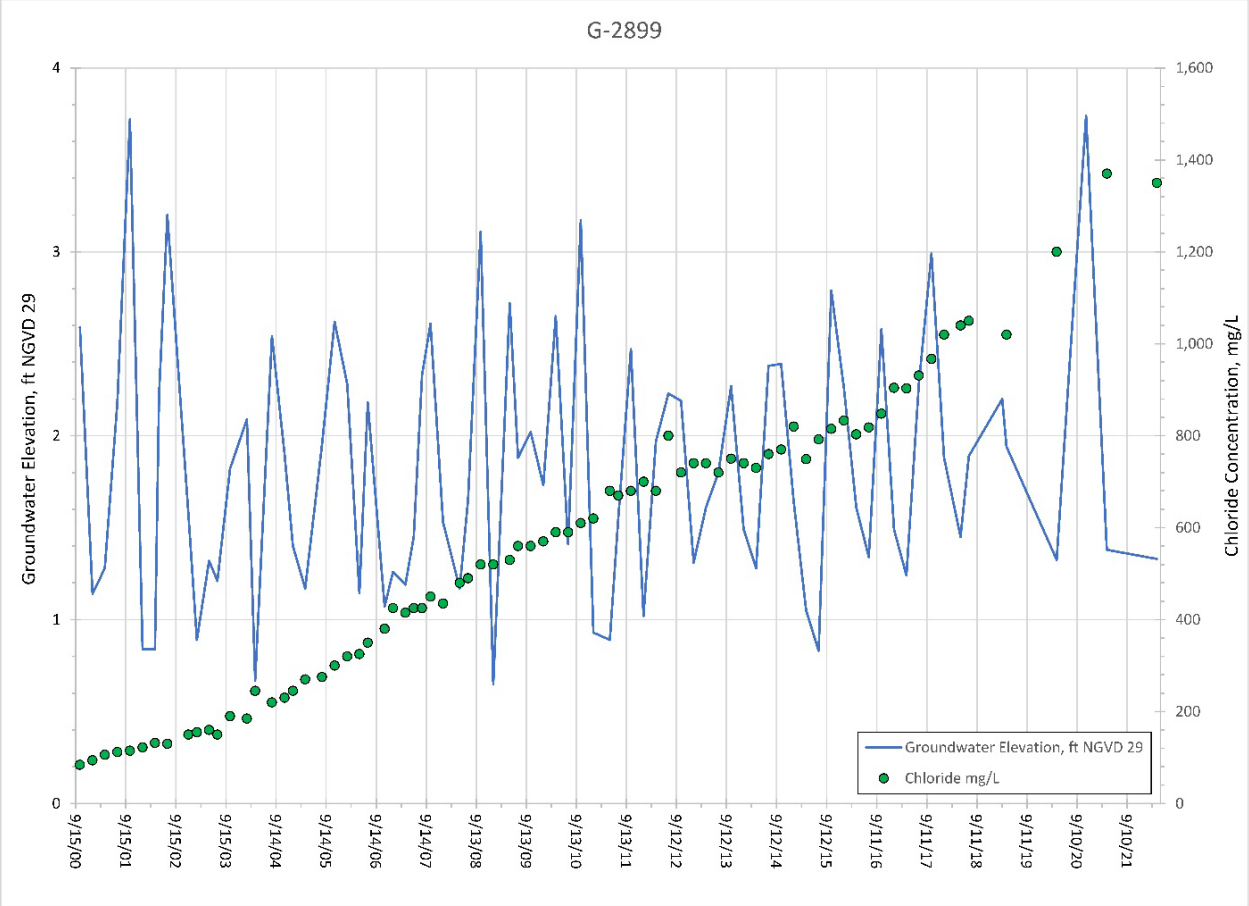

Figure 6-16. Chloride concentrations and groundwater elevations in monitor well G-2899 (165 feet deep) in Fort Lauderdale, eastern Broward County.

Miami-Dade County

The USGS 2008, 2011, 2016, and 2018 saltwater interface positions for Miami-Dade County are shown in **Figure 6-17** (Prinos et al. 2014; Prinos 2017). As with Broward County, some areas show inland movement of the saltwater interface along the coast, with the greatest historical movement in southern Miami-Dade County.

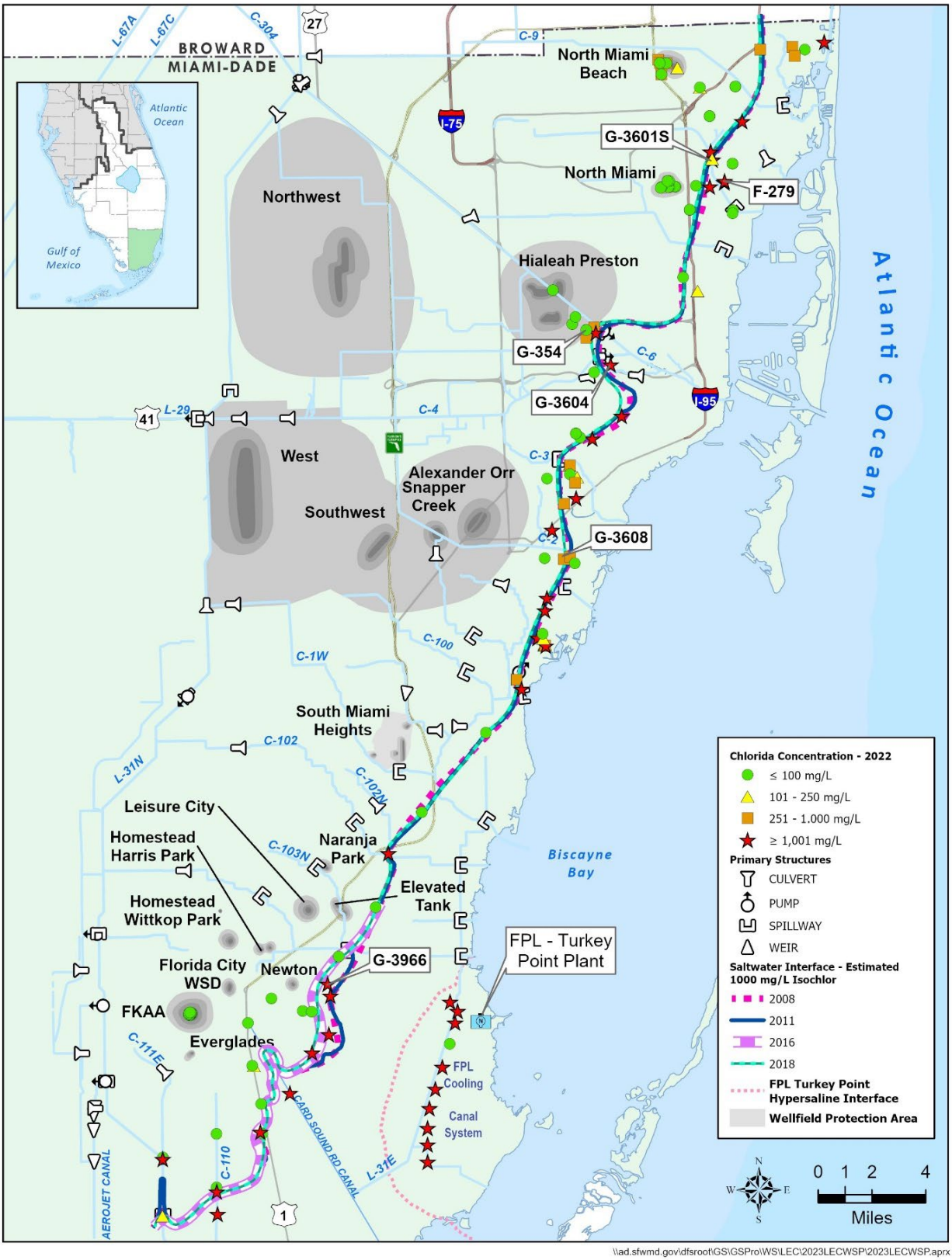

Figure 6-17. Surficial aquifer system chloride monitoring locations; chloride concentrations; and 2008, 2011, 2016, and 2018 saltwater interface positions in Miami-Dade County.

USGS monitor well F-279, located in eastern North Miami, has chloride concentration and groundwater elevation data from 1940 to present. Since 2018, chloride concentrations have increased from 4,500 to 6,000 mg/L, with concentrations moderating when water levels are above +2 feet NGVD (**Figure 6-18**). Although the saltwater interface has migrated inland beyond this monitor well, the data are valuable for determining the rate of inland movement.

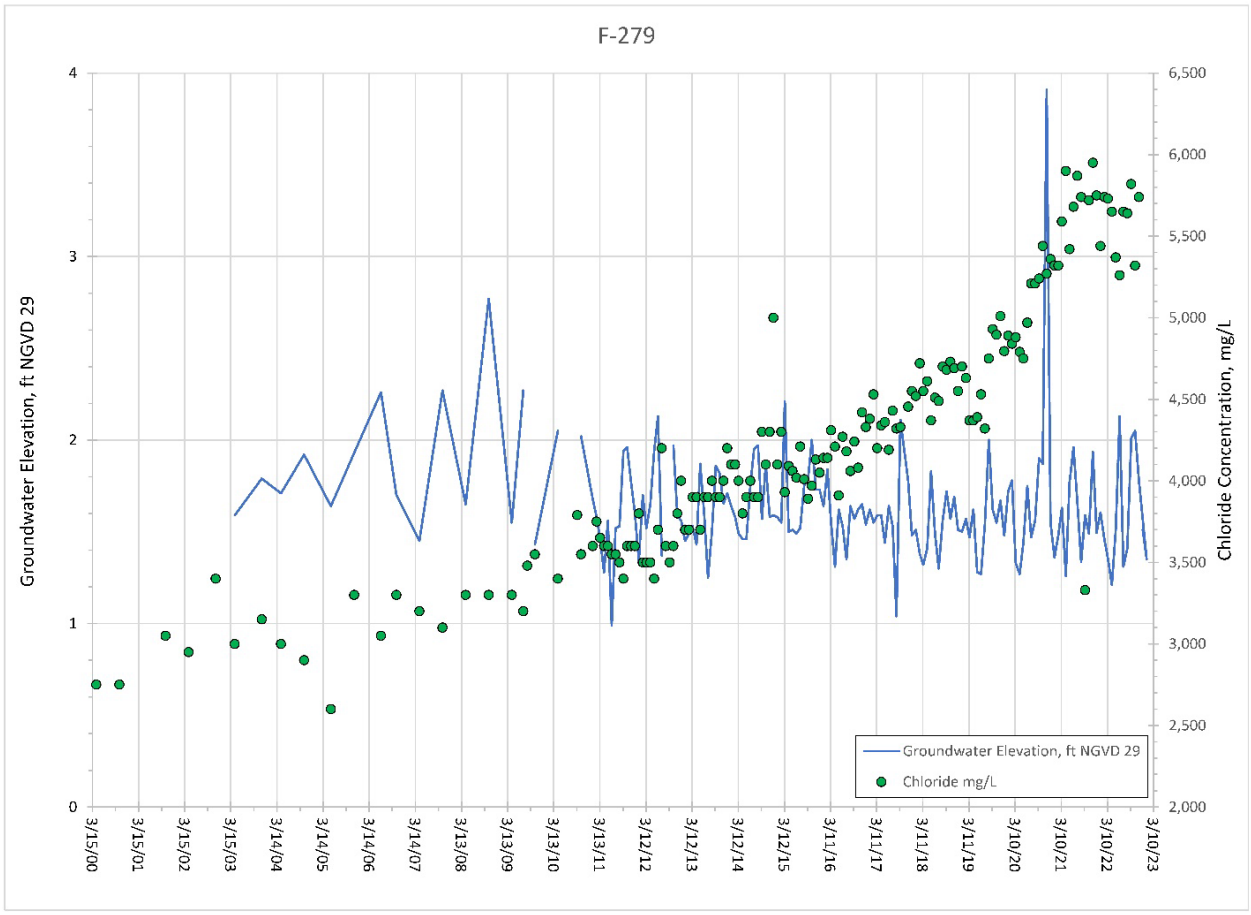

Figure 6-18. Chloride concentrations and groundwater elevations in monitor well F-279 (116 feet deep) in North Miami, northeastern Miami-Dade County.

The Miami-Dade Water and Sewer Department (MDWASD) saltwater interface monitor well G-354 (**Figure 6-19**) is upstream of the S-26 salinity control structure and east of the Hialeah, Preston, and Miami-Springs PS wellfields. Combined pumpage from these three wellfields has been capped since the early 1990s to prevent pollution from western sources. Well depths for the PS wells in these wellfields range from 107 to 115 feet below land surface (bls). Chloride concentrations have been decreasing and are less than 40 mg/L at well G-354 likely due to the S-26 Structure's ability to maintain water levels.

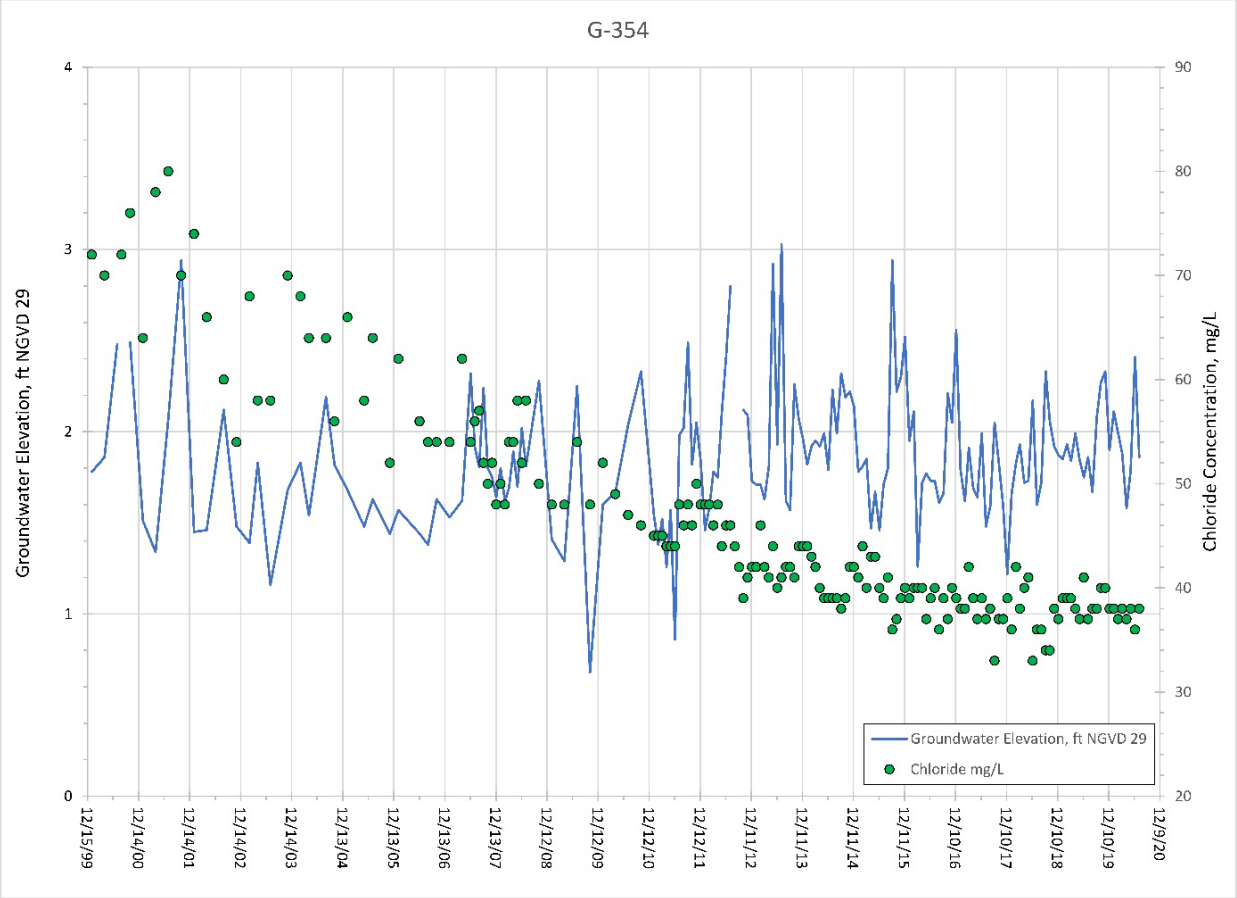

Figure 6-19. Chloride concentrations and groundwater elevations in monitor well G-354 (90 feet deep) in Hialeah, northwestern Miami-Dade County.

The Florida Power & Light (FPL) Turkey Point Plant, approximately 8 miles east of Florida City, operates a cooling canal system (CCS) that encompasses 5,900 acres and 160 miles of shallow canals in hydrologic contact with the Biscayne aquifer (**Figure 6-17**). Since the system began operating in the early 1970s, a hypersaline (salinity greater than ocean water) plume has formed beneath it that has migrated westward away from the CCS within the lower of two high-flow zones, not in the deepest (less permeable) part of the Biscayne aquifer. The approximate extent of the hypersaline plume was estimated by a controlled-source electromagnetic survey (Enercon 2016) and chloride concentration data from monitor wells. Additionally, a local groundwater flow and solute transport model was developed to evaluate historical conditions that contributed to the present configuration of the hypersaline plume. The model was used to simulate different aquifer remediation system designs (Tetra Tech 2016).

The Florida Department of Environmental Protection (FDEP), SFWMD, and Miami-Dade County monitor the hypersaline plume through an extensive network of monitor wells at varying depths. Approximately 5 miles west of the CCS is a cluster of three monitor wells (**Figure 6-17**): TPGW-7S (26 feet bls), TPGW-7M (52 feet bls), and TPGW-7D (114 feet bls). Historical water level and water quality data are from monitor well TPGW-7D. Chloride concentrations in monitor wells TPGW-7S and TPGW-7M are less than 50 mg/L and not shown due to scale. However, salinity in the lower high-flow zone began increasing in 2014 and was most recently at more than 5,000 mg/L (**Figure 6-20**). Remedial measures being implemented by FPL through regulatory agreements with the FDEP and Miami-Dade County include 1) Biscayne aquifer recovery wells along the western edge of the CCS, 2) a deep injection well system to dispose of the recovered hypersaline groundwater, and 3) brackish Upper Floridan aquifer (UFA) well water conveyed into the CCS to reduce salinity. These measures are meant to abate the hypersaline migration and retract the hypersaline conditions back to the FPL property boundary.

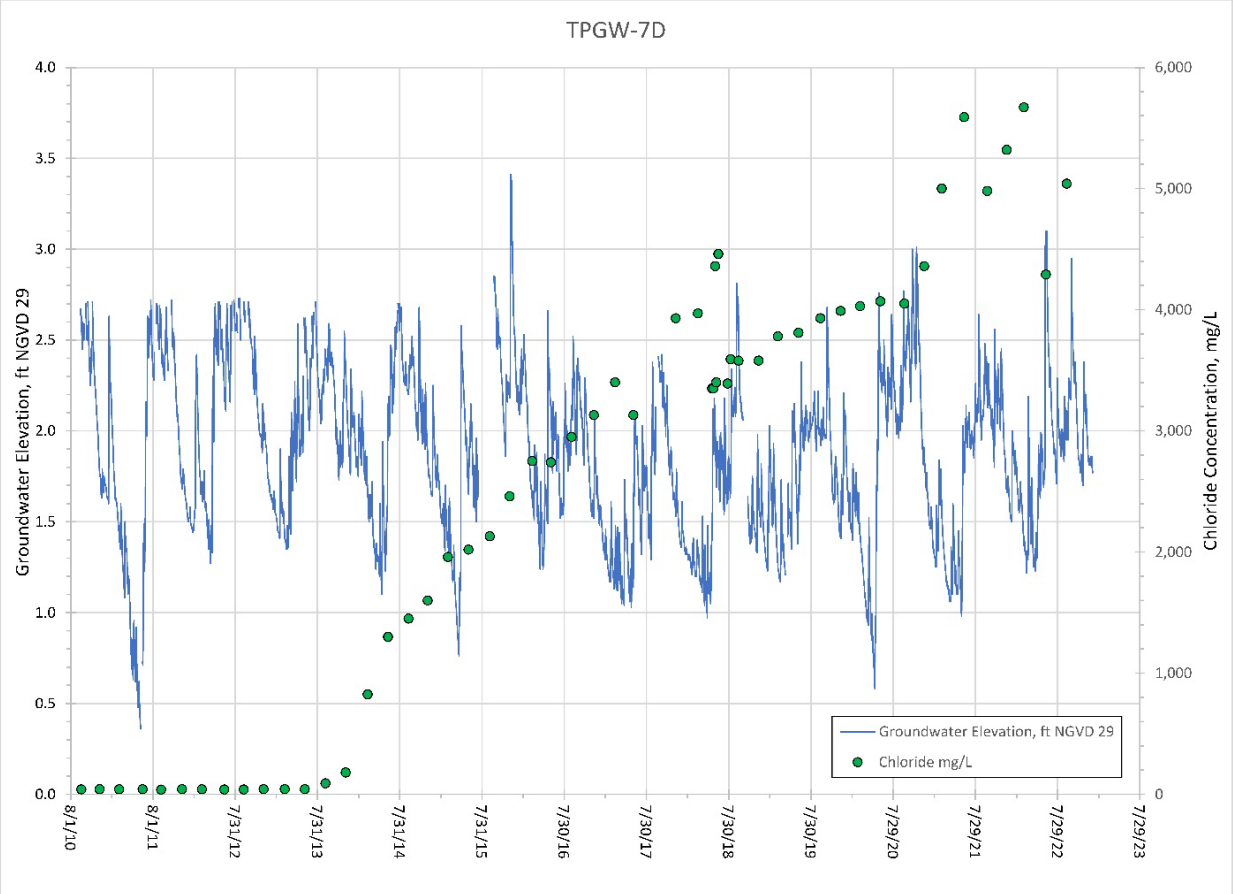

Figure 6-20. Chloride concentrations and groundwater elevations in monitor well TPGW-7D (114 feet deep) in Homestead, southeastern Miami-Dade County.

Surficial Aquifer System Conclusions

Analyses of the SAS indicate that water availability for increased water allocations is limited in many areas and cannot be the primary source for all projected water demands in the LEC Planning Area without harming the water resource, including related natural systems. Water levels and water quality in the SAS appear to be relatively stable with some exceptions at current withdrawal rates in Palm Beach County and northern Broward County. That said, central and southern Broward County and Miami-Dade County have definite locations where saltwater intrusion appears to be active based on monitoring data. The 2024 SFWMD saltwater interface mapping effort will provide further information on the extent of saltwater intrusion and identify additional monitoring and potential wellfield operational recommendations to address concerns. AWS sources (e.g., the C-51 Reservoir Phase 1, FAS, and reclaimed water) will need to be relied upon to meet increasing water demands in many urbanized areas.

Floridan Aquifer System Evaluation

The FAS is a productive and important aquifer used primarily by LEC PS utilities and seven golf courses, as an AWS. As development of the SAS has become maximized, several PS utilities currently use the FAS to meet a portion of their current demands, with a few new PS utilities proposing to tap the FAS to address water quality concerns and meet future demands (**Chapter 8**). The FAS is brackish in the LEC Planning Area and requires desalination prior to use. FAS wells primarily pump from the UFA. Currently, the Avon Park permeable zone (APPZ) and the Lower Floridan aquifer (LFA) are not widely used as water sources in the LEC Planning Area.

Water availability from the FAS is affected primarily by water quality degradation, which can be managed through appropriate wellfield design and operating protocols. One of the key objectives in this management strategy is to minimize upconing of higher saline water from deeper portions of the aquifer. To accomplish this, PS utilities can increase the spacing between newly installed wells to minimize interference effects and excessive drawdowns due to pumping, rotate the operation of individual wells to reduce pumping stress and excessive drawdowns, reduce pumping rates, and plug and abandon wells that have shown an increase in chloride concentrations or that were designed with open intervals intersecting multiple aquifer zones of varying water quality. Most PS utilities are required to monitor water quality at their wellfields as part of their water use permits. Future strategies to address managing withdrawals to minimize water quality degradation are provided in **Chapter 9**.

Groundwater monitoring provides water users with an understanding of the hydrogeologic system through long-term data collection, which is needed to evaluate current and expected future groundwater conditions, water supply potential, detect temporal trends in groundwater elevations and water quality, and develop and calibrate groundwater models.

Floridan Aquifer System Water Levels and Water Quality

The SFWMD and USGS monitor the FAS using a regional network of monitor wells. Additional data are collected by water use permittees as part of their water use permit monitoring requirements (issued by the SFWMD) and injection wells (issued by the FDEP) (**Figure 6-21**).

The SFWMD's Regional Floridan Groundwater monitoring program consists of a network of monitor wells (SFWMD wells on **Figure 6-21**) completed in the various producing zones of the FAS (i.e., UFA, APPZ, LFA) from which groundwater elevations and water quality samples are collected.

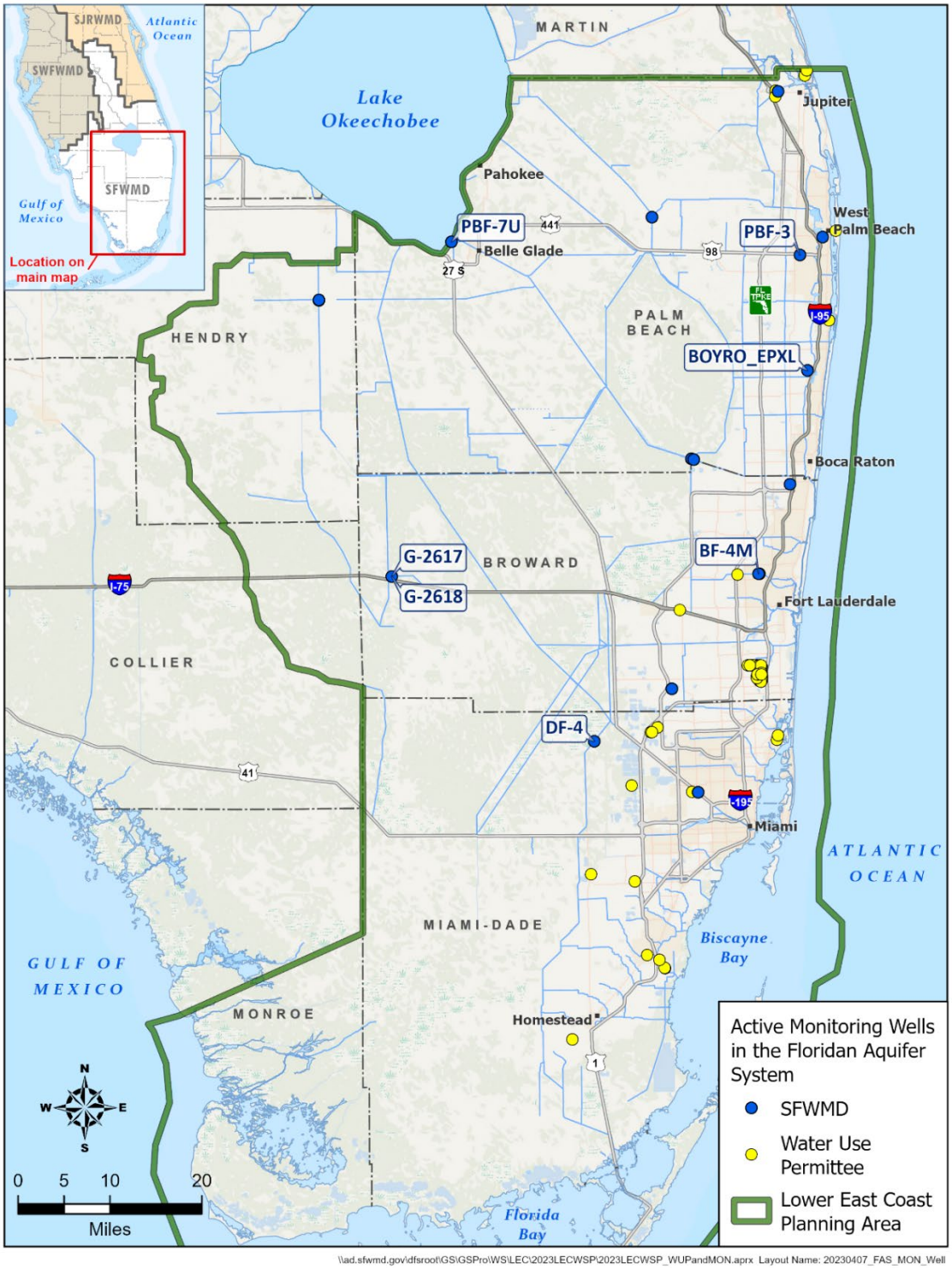

Figure 6-21. LEC Planning Area Floridan aquifer system monitor well locations and associated monitoring entities.

Upper Floridan Aquifer

In the LEC Planning Area, four wells completed in the UFA have long-term groundwater elevation and water quality data (chloride and total dissolved solids [TDS] concentrations) that were evaluated (**Tables 6-2** and **6-3**). Data from these wells indicate yearly, seasonal groundwater elevation fluctuations. Overall, groundwater elevations have remained relatively stable at UFA wells during their periods of record with the exception of well DF-4, which had a period of water level decline in 2012. Groundwater elevations at DF-4 returned to historical elevations in 2015 and have remained stable since 2015. Water quality data were reviewed and plotted for the same four UFA wells. Overall, the trend at each well is relatively stable, with chloride concentrations ranging from 557 to 2,800 mg/L for the period of record for all four wells (**Table 6-2** and **Figures 6-22** to **6-25**).

Several PS utilities in the LEC Planning Area use the UFA as an AWS source with reverse osmosis treatment. Nearly all PS utilities in the LEC Planning Area that use the UFA have experienced water quality degradation in one or more production wells. However, overall water quality of the UFA has remained relatively stable, and, with appropriate management, expanded use of this AWS source can help meet 2045 demands. More detailed information on PS utility FAS water elevation and quality can be found in **Appendix D**.

Table 6-2. Upper Floridan aquifer monitor wells in the LEC Planning Area with long-term groundwater elevation and water quality data.

Well Name	County	Open Hole Depth Interval (ft bls)	Chloride Concentration (mg/L)		Period of Record
			Minimum	Maximum	
DF-4	Miami-Dade	1,140 – 1,230	1,558	1,900	7/2002 to 12/2022
G-2618	Broward	1,104 – 1,164	557	1,100	7/2002 to 12/2022
PBF-3	Palm Beach	1,050 – 1,252	1,968	2,800	2/2003 to 12/2022
PBF-7U	Palm Beach	992 – 1,447	1,098	1,406	7/2002 to 12/2022

bls = below land surface; ft = feet; mg/L = milligrams per liter.

Table 6-3. Minimum, maximum, and average groundwater elevations for select Upper Floridan aquifer monitor wells in the LEC Planning Area.

Well Name	Minimum Groundwater Elevation	Maximum Groundwater Elevation	Average Groundwater Elevation
DF-4	31.93	53.70	50.19
G-2618	57.87	61.50	59.50
PBF-3	45.00	48.30	46.52
PBF-7U	51.85	56.12	53.50

Note: Elevations are in feet NGVD29 (National Geodetic Vertical Datum of 1929).

Chloride concentrations in well PBF-3, located in eastern Palm Beach County, fluctuate between 2,000 and 2,700 mg/L, with no discernable trend (**Figure 6-22**). However, only two samples have been collected since 2010. Groundwater elevations fluctuate seasonally by approximately 1 to 3 feet, but the long-term trend is stable with a slight trend of increasing average groundwater elevations since about 2012.

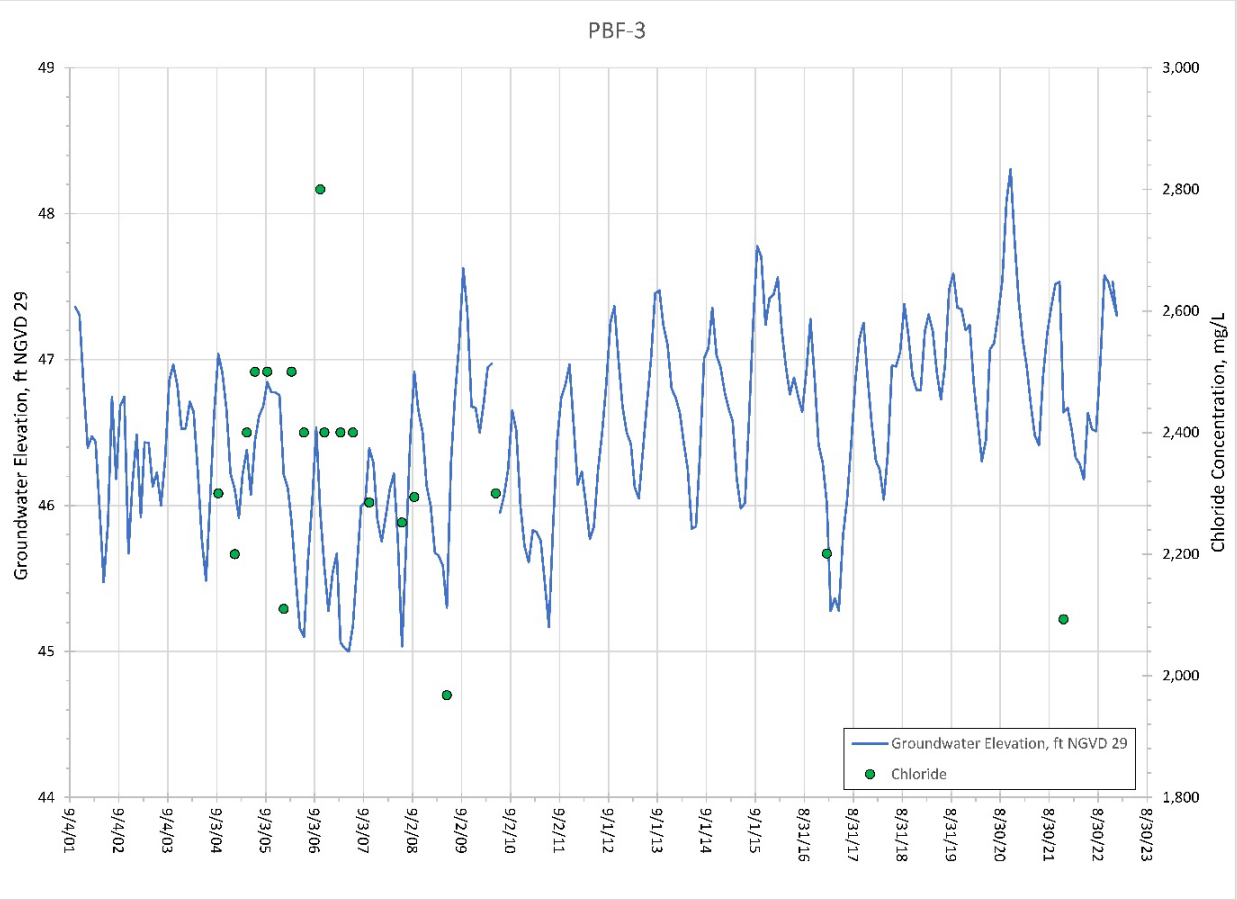

Figure 6-22. Chloride concentrations and groundwater elevations in Upper Floridan aquifer monitor well PBF-3 (1,252 feet deep), eastern Palm Beach County.

Chloride concentrations in well PBF-7U, in western Palm Beach County, are relatively stable, fluctuating between 100 to 200 mg/L (**Figure 6-23**). However, only two samples have been collected since 2010. Groundwater elevations show seasonal fluctuations of about 1 to 2 feet, but the long-term trend is also relatively stable.

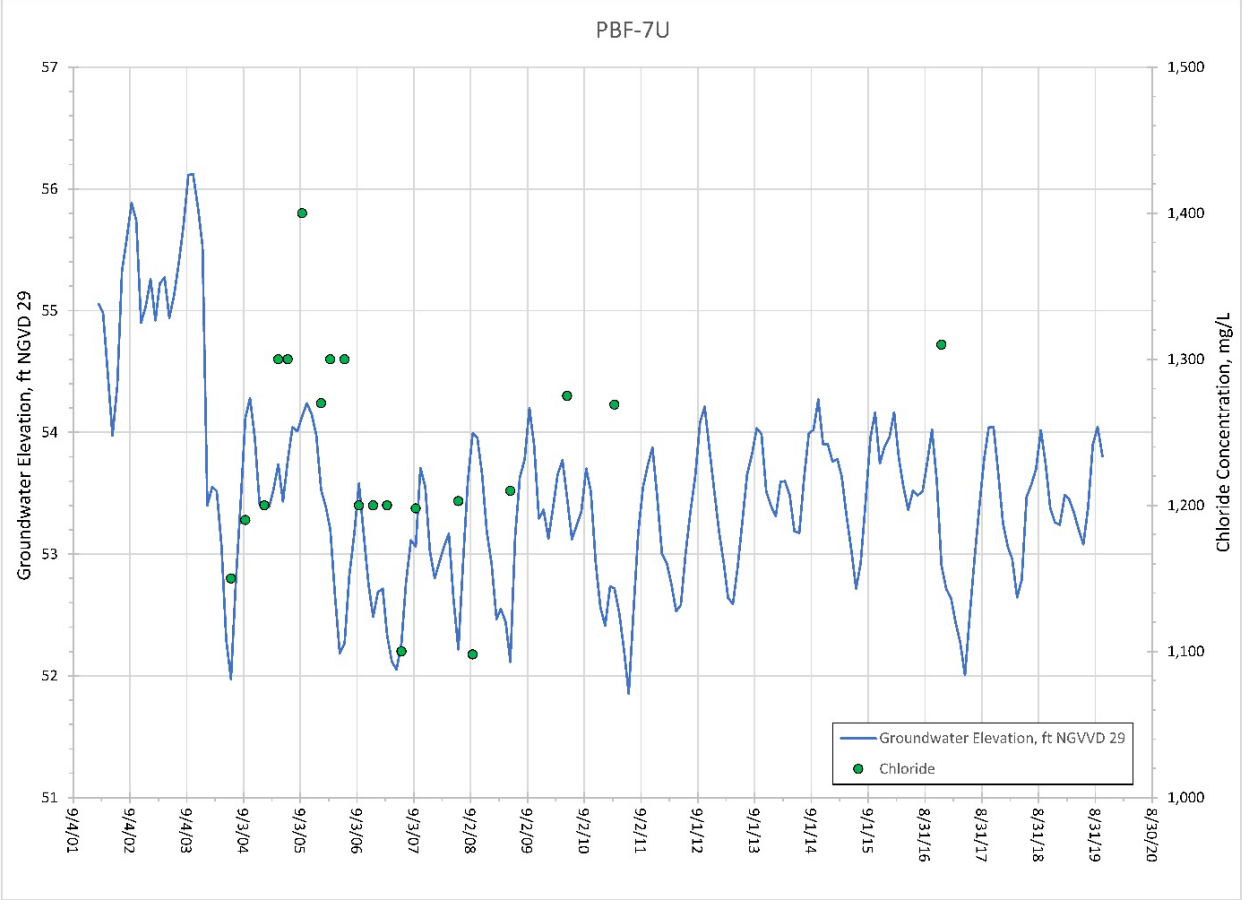

Figure 6-23. Chloride concentrations and groundwater elevations in Upper Floridan aquifer monitor well PBF-7U (1,447 feet deep), western Palm Beach County.

Chloride concentrations in well G-2618, located along Alligator Alley in Water Conservation Area 3A in western Broward County, have remained relatively stable at approximately 600 mg/L (**Figure 6-24**). However, only two samples have been collected since 2010. Groundwater elevations seasonally fluctuate approximately 3 feet, and there is variability over the long term. A slight increasing trend in groundwater elevations began in 2013.

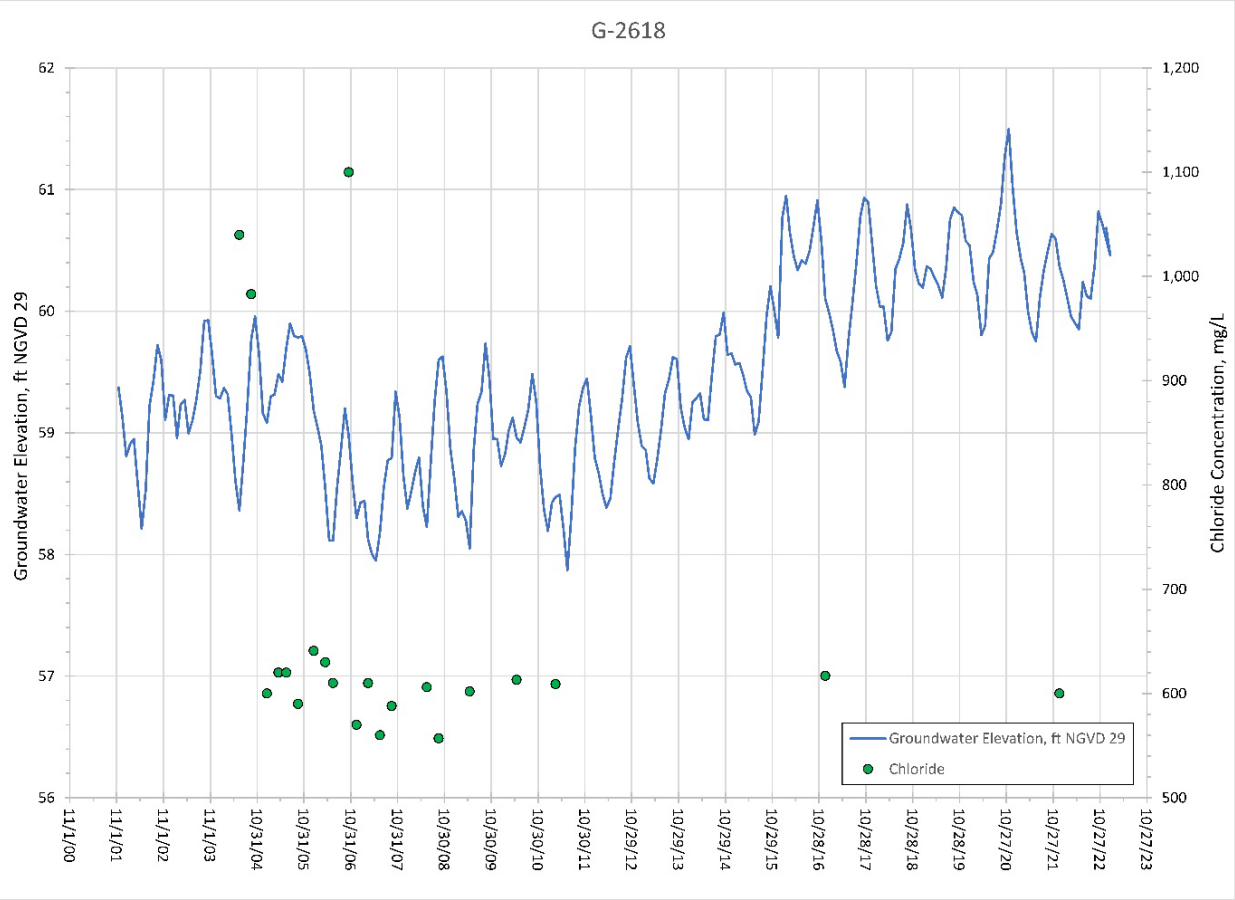

Figure 6-24. Chloride concentrations and groundwater elevations in Upper Floridan aquifer monitor well G-2618 (1,164 feet deep), western Broward County.

Chloride concentrations in well DF-4, in northern Miami-Dade County, have varied approximately 400 mg/L within a long-term stable trend (**Figure 6-25**). However, only two samples have been collected since 2015. Groundwater elevations seasonally fluctuate approximately 2 to 3 feet, and there is variability over the long term. A large (15 to 20 feet) groundwater elevation decrease occurred between 2012 and 2015, possibly due to a nearby pumping well. However, groundwater elevations returned to their previous elevations starting in 2015 and have remained stable until the present.

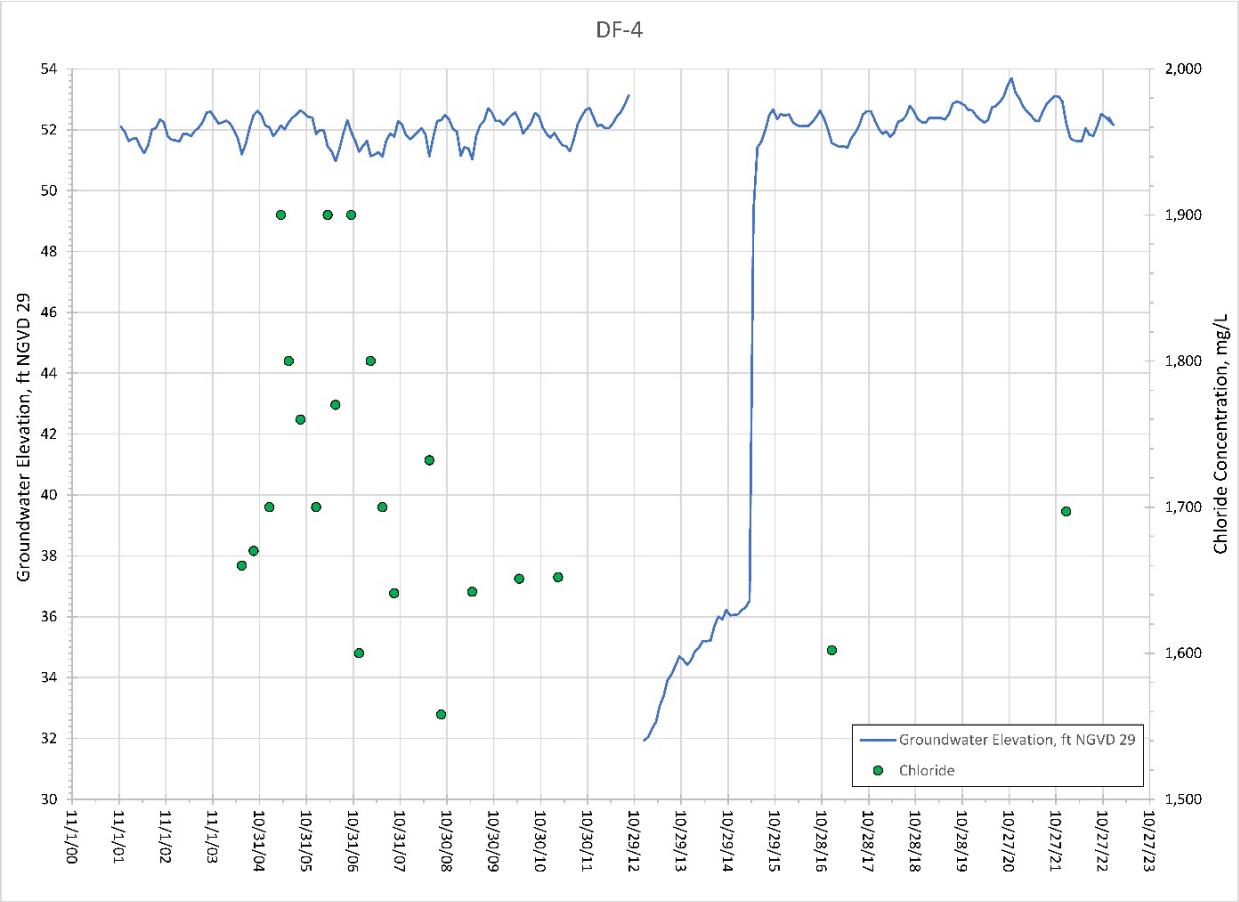

Figure 6-25. Chloride concentrations and groundwater elevations in Upper Floridan aquifer monitor well DF-4 (1,230 feet deep), northern Miami-Dade County.

Avon Park Permeable Zone

In the LEC Planning Area, three wells (BF-4M, G-2617, and BOYRO_EPXL) completed in the APPZ that have long-term groundwater elevation and water quality (chloride and TDS concentrations) data were evaluated for this plan update (**Tables 6-4** and **6-5**). Groundwater elevation data from these wells indicate seasonal variations, but overall, groundwater elevations have remained relatively stable over the period of record.

Water quality data trends for the same three APPZ wells (**Figures 6-26** to **6-28**) showed varying trends. Well BOYRO_EPXL showed relatively stable chloride concentrations between 2,200 and 2,400 mg/L. Wells BF-4M and G-2617 recently had increasing chloride concentrations but did not exceed their historical maximum concentrations.

Table 6-4. Summary of long-term water level and water quality data collected at Avon Park permeable zone monitor wells in the LEC Planning Area.

Well Name	County	Open Hole Depth Interval (ft bls)	Chloride Concentration (mg/L)		Period of Record
			Minimum	Maximum	
BF-4M	Broward	1,500 – 1,600	2,158	2,434	07/2002 to 12/2022
G-2617	Broward	1,648 – 1,726	576	1,190	07/2002 to 12/2022
BOYRO_EPXL	Palm Beach	1,320 – 1,470	2,209	2,506	02/2007 to 12/2022

bls = below land surface; ft = feet; mg/L = milligrams per liter.

Table 6-5. Minimum, maximum, and average groundwater elevations for Avon Park permeable zone monitor wells in the LEC Planning Area.

Well Name	Minimum Groundwater Elevation	Maximum Groundwater Elevation	Average Groundwater Elevation
BF-4M	43.64	48.73	46.75
G-2617	58.48	61.00	59.79
BOYRO_EPXL	46.63	50.10	48.41

Note: Elevations are in feet NGVD29 (National Geodetic Vertical Datum of 1929).

Chloride concentrations in well BOYRO_EPXL, located in eastern Palm Beach County, were relatively consistent (generally ranging between 2,209 mg/L and 2,332 mg/L) until September 2019 and November 2021, when chloride concentrations increased to 2,367 mg/L and 2,506 mg/L, respectively (**Figure 6-26**). Additional chloride samples should be collected and tested at this location to determine if this increasing chloride concentration trend continues. Groundwater elevations seasonally fluctuate by up to 2 feet. The long-term groundwater elevation trend shows an increase in the average groundwater elevation at this well since 2011. Notable dry seasons (e.g., 2007, 2009, 2011, 2017) are followed by rebounds in water levels to previous wet season levels.

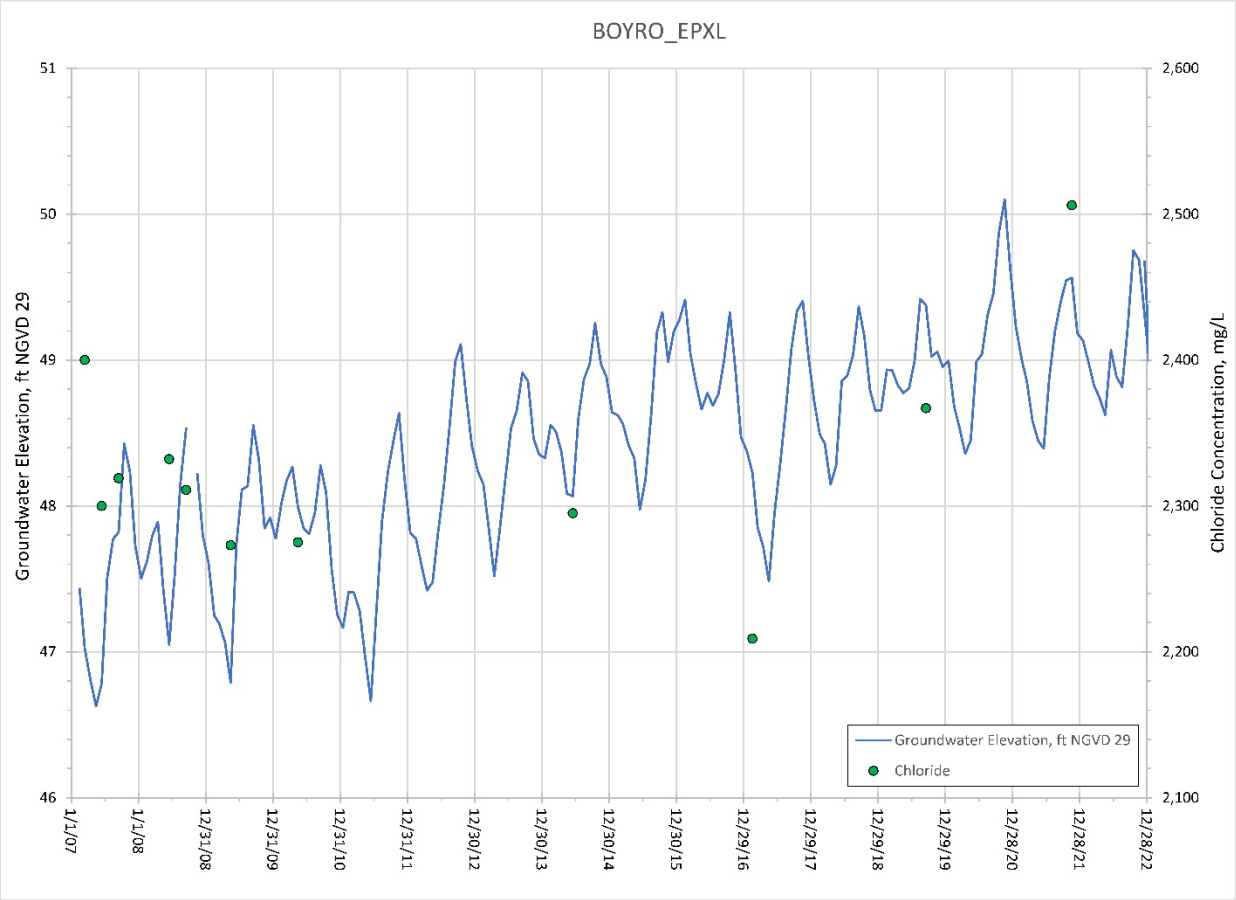

Figure 6-26. Chloride concentrations and groundwater elevations in Avon Park permeable zone monitor well BOYRO_EPXL, eastern Palm Beach County.

Chloride concentrations in monitor well BF-4M, in eastern Broward County, ranged over more than 250 mg/L during the past 11 years (**Figure 6-27**) but are currently at the highest historical concentration of 2,434 mg/L (December 15, 2021 sample). However, only two samples have been collected since 2014. Groundwater elevations have steadily increased since 2002.

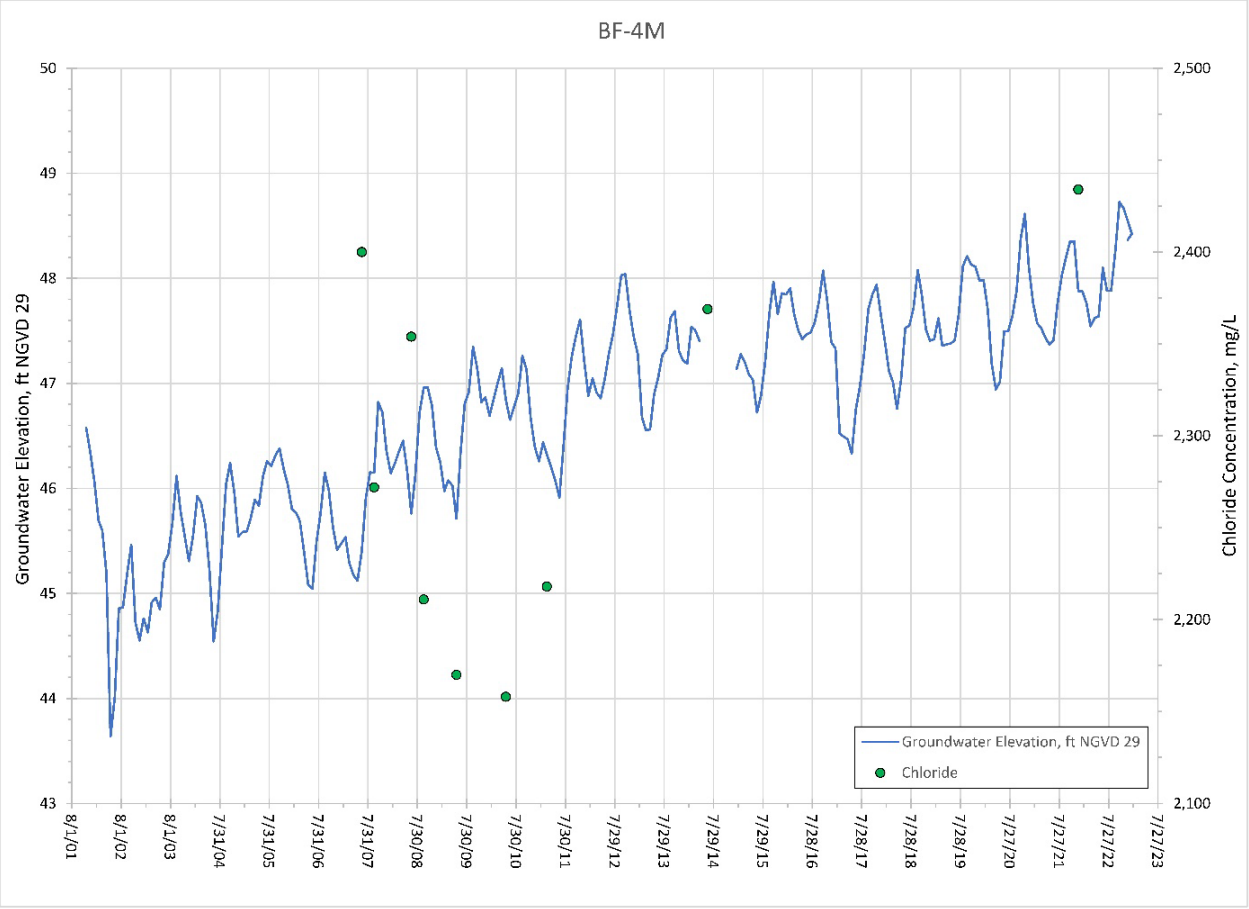

Figure 6-27. Chloride concentrations and groundwater elevations in Avon Park permeable zone monitor well BF-4M, eastern Broward County.

Chloride concentrations in well G-2617, in western Broward County, remain within their historical bounds (**Figure 6-28**). The most recent water quality sample collected in December 2021 had a chloride concentration of 1,067 mg/L. However, only two samples have been collected since 2016. Groundwater elevations seasonally fluctuate 1 to 2 feet, but the long-term trend is relatively stable. Notable dry season levels are followed by rebounds in water levels to previous wet season levels.

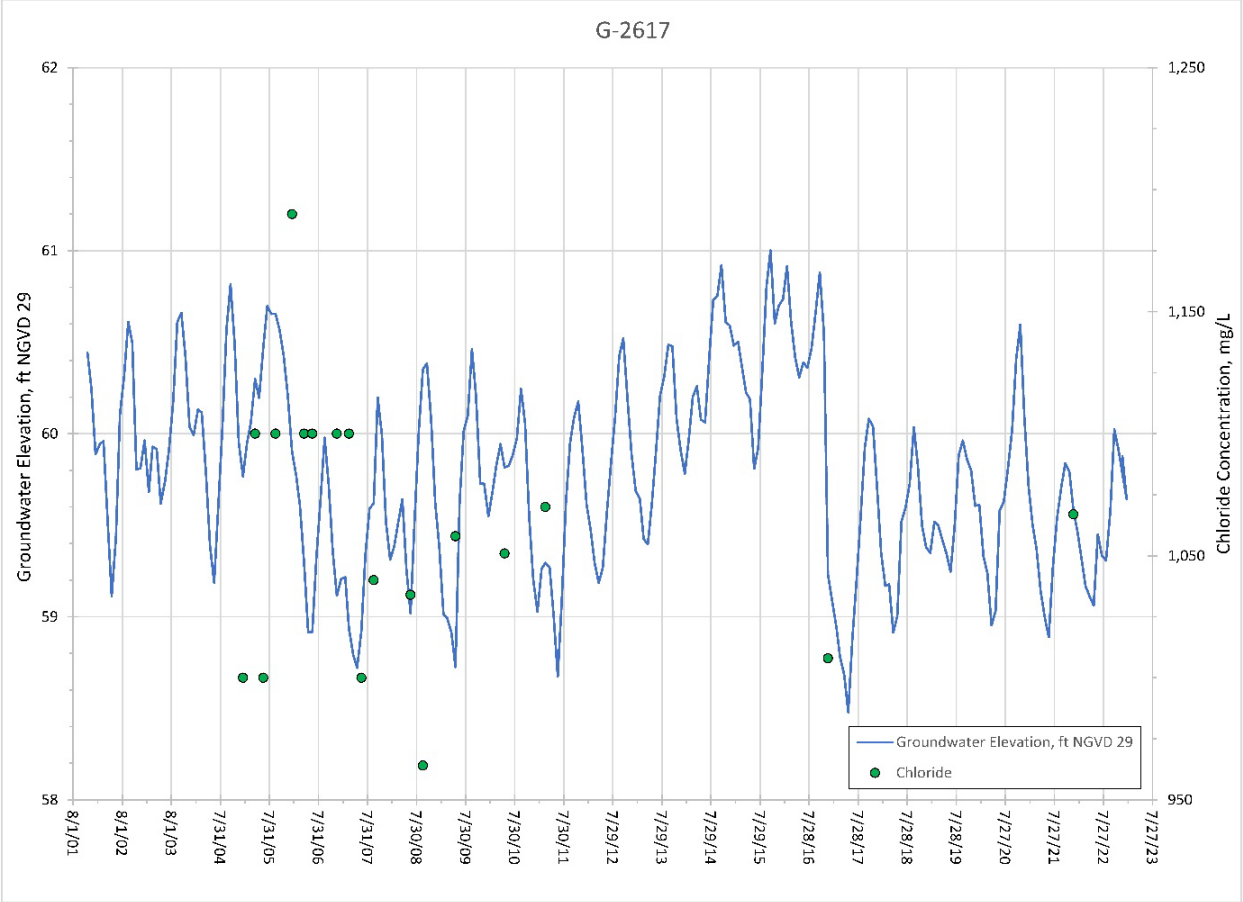

Figure 6-28. Chloride concentrations and groundwater elevations in Avon Park permeable zone monitor well G-2617, western Broward County.

Floridan Aquifer System Conclusions

Recent data and previous modeling results indicate the FAS can meet current and projected demands through 2045 with proper wellfield management. FAS water levels appear stable at current withdrawal rates. Where possible, more frequent sampling and analyses of FAS monitoring wells would aid in better defining the trends. Chloride concentration trends show PS FAS wellfields have experienced some water quality degradation after several years of operation, which is likely to continue. Water level reductions and water quality degradation can be minimized by PS utilities through the following activities:

- Maximizing well spacing to reduce interference effects and stress on the FAS
- Plugging and abandoning individual wells experiencing excessive chloride concentration increases and replacing them with new wells elsewhere in the wellfield area
- Partially back-plugging individual wells to isolate deeper poor-quality layers from overlying higher-quality layers
- Reducing pumping rates at individual wells to minimize the potential for poor-quality water to be pulled upward into the well's production zone from below
- Rotating the operation of individual wells to reduce pumping stress and the potential influx of poor-quality water from below
- Installing additional monitor wells to provide early warning of upconing or lateral movement of poor-quality water

As PS utilities expand use of the FAS, implementation of these wellfield management activities is important to minimize the effects of water level reductions and water quality degradation. If interference to existing legal users results from another user's withdrawals, the interference must be mitigated as described in the *Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District* (SFWMD 2022c).

GROUNDWATER MODELS

The SFWMD has two groundwater models that can be used in the LEC Planning Area: The East Coast Floridan Model (ECFM) and the East Coast Surficial Model (ECSM) (**Figure 6-29**).

East Coast Floridan Model

The ECFM was most recently used in the LEC Planning Area in support of the 2018 LEC Plan Update (SFWMD 2018). Since the 2045 projected FAS water demands were of a similar magnitude to the 2040 FAS water demands presented in the 2018 LEC Plan Update, it was determined that the model did not need to be run again. Therefore, the reader is referred to the 2018 LEC Plan Update or the Groundwater Modeling webpage at www.sfwmd.gov/science-data/gw-modeling for more detailed information regarding ECFM simulations and conclusions. The 2018 LEC Plan Update concluded based on review of historical chloride data and the ECFM results that properly designed and managed FAS wellfields appear able to meet projected demands through 2040 in the LEC Planning Area.

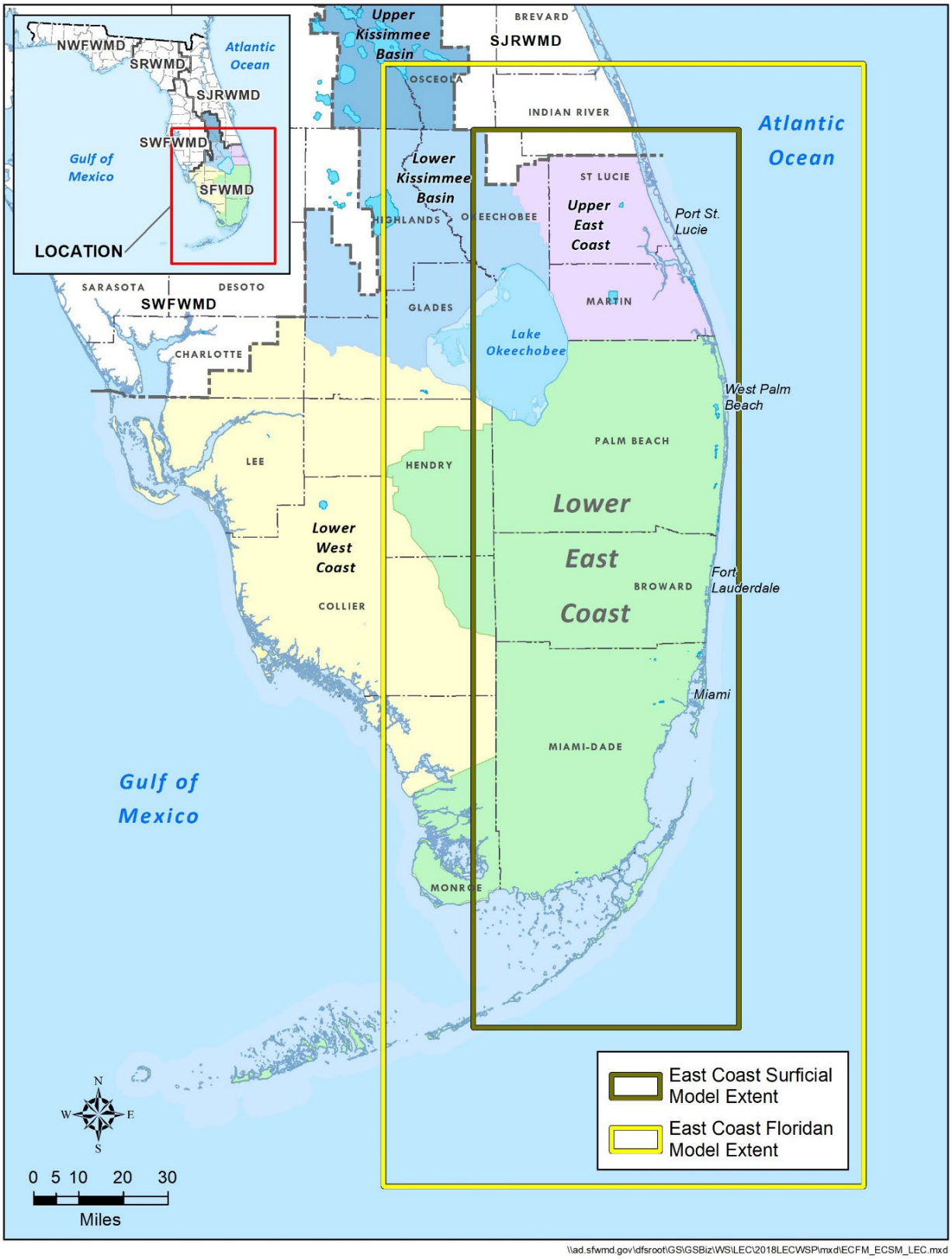

Figure 6-29. Model boundaries for the East Coast Surficial Model and East Coast Floridan Model.

East Coast Surficial Model

The ECSM is a three-dimensional, density-dependent groundwater model of the SAS that is currently under development. The ECSM is based upon the SFWMD's SEAWAT2022 (Rodberg 2022) computer code. SEAWAT2022 represents enhancements to a merger of the USGS's SEAWAT-2000 (Langevin et al. 2003) and SEAWAT-2000WMD (Restrepo and Montoya 2008) to accommodate density-dependent transport simulation options or packages previous code did not support. The ECSM is being calibrated to water levels and water quality (i.e., TDS concentrations) over thousands of wells, gauges, and stations within the model domain as shown in **Figure 6-29**. The model is simultaneously undergoing an independent peer review by a three-person panel of numerical modeling experts. The panel is providing input that staff are addressing as they proceed through the model's calibration and verification phase. Upon calibration completion, expected in 2024, the model will be utilized for predictive purposes. In particular, the ECSM will be used to evaluate the sustainability of existing and projected future demands from the SAS for the LEC and Upper East Coast planning areas and to identify areas where cumulative water use withdrawals may harm existing groundwater resources and natural systems (e.g., wetlands). The modeling effort will also investigate the potential for increased risk of saltwater intrusion in the SAS from water withdrawals and sea level rise.

CLIMATE CHANGE AND SEA LEVEL RISE

Climate change is an issue of concern globally and especially in coastal regions such as South Florida. Because of its location, regional variability in climate, hydrology, geology, topography, natural resources, and dense coastal populations, South Florida is particularly vulnerable to the effects of changes in climate, including sea level rise. The nature and rate of change are highly uncertain, but the effects are already being experienced in South Florida.

Sea level rise affects flood control operations at coastal structures and contributes to inland movement of salt water into aquifers. In addition, increased air temperatures and changes in precipitation regimes and storm frequency associated with climate change could result in greater evaporation, longer drought periods, and higher risk of flooding. These changes could affect regional water resources and planning and thus need to be considered when evaluating the ability of water supplies to meet future demands.

The SFWMD is responsible for managing and protecting water resources in South Florida by balancing and improving flood control, water supply, water quality, and natural systems. Over the last decade, the SFWMD has implemented strategies to adapt its operations and infrastructure to ensure this mission continues to be met under changing climate conditions. The SFWMD's approach focuses on assessing how sea level rise and extreme events, including flood and drought events, are likely to happen under current and future climate conditions.

In addition, the SFWMD is working to ensure its resiliency planning is based on the best available science. To plan and prepare for regional climate change and sea level rise, the SFWMD is conducting research and computer modeling to better predict and reduce uncertainties, analyzing vulnerabilities in the current water management system, and developing effective adaptation strategies for the future. Effective solutions and adaptations require action across multiple agencies and administrative boundaries, including local and tribal governments; other regional, state, and federal agencies; universities;

nongovernmental entities; a wide array of stakeholders; and concerned citizens throughout South Florida. Coordination is vital to ensuring a common approach and shared information moving forward. Additional information regarding climate change and sea level rise within the LEC Planning Area is provided in **Appendix D**.

SUMMARY OF WATER RESOURCE ANALYSES

The evaluations and analyses associated with this 2023–2024 LEC Plan Update support the findings and conclusions of the 2018 LEC Plan Update (SFWMD 2018). The following are findings regarding the availability of water resources to meet projected 2045 water demands:

- New or increased allocations of surface water from Lake Okeechobee and LOSA are limited in accordance with RAA criteria.
- Surface water will remain the primary source for agricultural irrigation, with fresh groundwater from the SAS as a supplemental source.
- The SAS historically has served as the primary source of fresh water for potable and urban demands. However, expansion of SAS withdrawals is limited due to the rate of recharge, potential impacts to wetlands and increased potential for saltwater intrusion, proximity to contamination sources, and LEC Regional Water Availability criteria. New or increased allocations of water from the SAS in coastal areas beyond those currently permitted will require evaluation on an application-by-application basis.
- Monitoring well networks have been established for the SAS and FAS and provide valuable data for evaluation of saltwater intrusion, aquifer assessment, and groundwater modeling.
- Several large PS utilities in the LEC Planning Area currently use the FAS to meet some of their demands and more PS utilities have indicated a desire to do so.
- Since the 2045 projected FAS demands were similar in magnitude to those projected for 2040 in the 2018 LEC Plan Update, no new modeling of the FAS demands was conducted. Therefore, the conclusion that the FAS could sustainably meet the projected future demands is the conclusion carried forward from the 2018 LEC Plan Update to this plan update.
- Saltwater intrusion monitoring and mapping indicate noticeable inland movement of the saltwater interface in the SAS, particularly in portions of Broward and Miami-Dade counties from 2009 to 2019. Additional monitor wells have been installed and additional monitoring is being implemented in these areas to better evaluate and plan to meet demands while protecting the resource. In 2024, the ECSM will be used to simulate the demands projected in this plan to provide additional insights regarding potential movement of the saltwater interface.

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7

Water Resource Development Projects

This chapter addresses the roles of the South Florida Water Management District (SFWMD or District) and other parties in implementing water resource development projects and provides a summary of projects in the Lower East Coast (LEC) Planning Area. The water resource development efforts presented in this chapter reflect the current budget categories the SFWMD uses for funding new and ongoing water resource development projects. The project summaries serve as an overview of water resource-related activities in the region. This chapter was created using the Fiscal Year (FY) 2022 Districtwide water resource budget and includes schedules and costs for FY2024 to FY2028. Additional details on the status of these projects can be found in Chapter 5A (Adams and Beerens 2023) of the *2023 South Florida Environmental Report – Volume II* (https://www.sfwmd.gov/sfer).

TOPICS

Florida water law identifies two types of projects to meet water needs: water resource development projects (subject of this chapter) and water supply development projects (**Chapter 8**). Water resource development is defined in Section 373.019(24), Florida Statutes (F.S.), as follows:

> *…the formulation and implementation of regional water resource management strategies, including the collection and evaluation of surface water and groundwater data; structural and non-structural programs to protect and manage water resources; development of regional water resource implementation programs; construction, operation, and maintenance of major public works facilities to provide for flood, surface, and underground water storage and groundwater recharge augmentation; and related technical assistance to local governments and to government-owned and privately-owned water utilities.*

Most water resource development activities in the SFWMD support and enhance water supply development but do not directly yield specific quantities of water. Instead, these projects are intended to assess the availability of an adequate water supply for existing and future uses, including maintaining the functions of natural systems. For example, project-related hydrologic investigations as well as groundwater monitoring and modeling provide important information about aquifer characteristics (e.g., hydraulic properties, water quality), which are useful for designing appropriate facilities, identifying safe aquifer yields, and evaluating the economic viability of projects, but do not increase water availability.

Water supply development projects (**Chapter 8**) generally are the responsibility of water users (e.g., utilities) and involve the water source options described in **Chapter 5** to meet specific needs. These projects typically include construction of wellfields, water treatment plants, distribution lines, reclaimed water facilities, and storage systems.

Water resource development in the LEC Planning Area is strongly influenced by the Comprehensive Everglades Restoration Plan (CERP), which is a component of the South Florida Ecosystem Restoration Program. Authorized by the United States Congress in 2000, CERP builds on and complements other state and federal initiatives to revitalize South Florida's ecosystems. These efforts have multiple implementation phases, which are supported by water resource development activities such as planning; land acquisition; design, including modeling; construction; and long-term operations and maintenance. CERP efforts (listed in **Table 7-1**) are described in this chapter and in the annual updates of the *South Florida Environmental Report* (https://www.sfwmd.gov/sfer).

Since 2005, the SFWMD has been working with a coalition of government agencies, nongovernmental organizations, farmers, ranchers, and researchers to enhance opportunities for storing excess surface water on private and public lands. The effort, known as dispersed water management, includes the former pilot project Florida Ranchlands Environmental Services Project (FRESP), Northern Everglades Payment for Environmental Services (NE-PES), water farming, storage on public lands, and Northern Everglades public-private partnerships. Dispersed water management projects are constructed and managed primarily to attenuate wet season water releases and improve water quality entering Lake Okeechobee and the coastal estuaries, with ancillary benefits including increased opportunities for groundwater recharge, hydrological enhancement, and habitat improvement. In some cases, dispersed water management projects with storage features are constructed and operated to offset irrigation demands and other water-related needs of the system. Additional information can be found at https://www.sfwmd.gov/storage.

Table 7-1. Water resource development projects within the LEC Planning Area by region.

Region	Project
Lake Okeechobee	CERP Lake Okeechobee Watershed Restoration Project (LOWRP)*
	Lake Okeechobee Component A Reservoir (LOCAR)*
	Northern Everglades and Estuaries Protection Program – Taylor Creek, Nubbin Slough, and Lakeside Ranch STAs
	USACE Herbert Hoover Dike Major Rehabilitation
Everglades	Everglades Forever Act projects, including Restoration Strategies Regional Water Quality Plan
	Modified Water Deliveries to Everglades National Park
	C-111 South Dade Project
	CERP WCA-3A Decompartmentalization Physical Model
	CERP Central Everglades Planning Project (CEPP)
	Florida Bay: S-197 Structure Replacement Project and Automation CERP C-111 Spreader Canal Western Project South Dade Study and Florida Bay Plan
Western Basins	CERP Western Everglades Restoration Project
	C-139 Annex Restoration Project
LEC Service Areas	Loxahatchee River: Restoration Plan for the Northwest Fork of the Loxahatchee River CERP Loxahatchee River Watershed Restoration Project Storage for the Loxahatchee River
	CERP Hillsboro Site 1 Impoundment/Fran Reich Preserve Reservoir
	CERP Broward County Water Preserve Areas (BCWPA)
	Biscayne Bay: CERP Biscayne Bay Coastal Wetlands (BBCW) Project CERP Biscayne Bay and Southeastern Everglades Ecosystem Restoration (BBSEER)

BBCW = Biscayne Bay Coastal Wetlands; BBSEER = Biscayne Bay and Southeastern Everglades Ecosystem Restoration; BCWPA = Broward County Water Preserve Areas; CEPP = Central Everglades Planning Project; CERP = Comprehensive Everglades Restoration Plan; LEC = Lower East Coast; LOCAR = Lake Okeechobee Component A Reservoir; LOWRP = Lake Okeechobee Watershed Project; SFWMD = South Florida Water Management District; STA = stormwater treatment area; USACE = United States Army Corps of Engineers; WCA = water conservation area.
*Project is located outside of the LEC Planning Area but provides water supply component to Lake Okeechobee.

REGIONAL GROUNDWATER MODELING

The SFWMD funds development and application of numerical models for evaluation of groundwater and surface water resources in the District's planning areas. The models support development of regional water supply plans, minimum flows and minimum water levels (MFLs), water reservations, restricted allocation areas (RAAs), and other projects benefiting water resources. Regional groundwater flow models simulate the rate and direction of water movement through the subsurface. Such models include the major components of the hydrologic cycle and the hydrogeologic system and are used in water supply planning to understand the effects of current and future water use. More recently, advances in groundwater modeling to incorporate density-dependency and solute transport have been incorporated to better analyze brackish aquifers, such as the Floridan aquifer system (FAS), and are being developed to analyze the effects of climate change and sea level rise on the surficial aquifer system (SAS).

East Coast Surficial Model

The East Coast Surficial Model (ECSM) is a regional groundwater model that is currently being developed and is undergoing contemporaneous peer review. It is a three-dimensional, density-dependent groundwater flow and transport model that simulates changes in SAS and wetland water levels, canal flows, and water quality (i.e., total dissolved solids [TDS]) along the east coast of the District. Developed to evaluate potential impacts of additional SAS demands, the ECSM can simulate the response of the aquifer to the projected demands through wellfield pumpage, changes in recharge and return flow, sea level rise, and climate change. Results of the model simulations can provide guidance for developing water management strategies, support periodic updates to the regional water supply plans, evaluate resiliency, and be used in regulatory applications.

The ECSM domain extends from Indian River County to the Florida Keys and from the approximate center line of the Florida peninsula to just offshore of the east coast. The model has five primary layers that represent the permeable and semiconfining layers that constitute the SAS.

The current version of the model is being manually calibrated to water level and water quality (TDS) observations for transient conditions. The transient model is being calibrated to the period from 1985 through 2014, with verification from 2015 to 2016. There are more than 1,000 water level and water quality targets, and the model will be deemed calibrated when simulated versus observed data meet pre-established calibration criteria, in addition to the model simulating known general groundwater flow patterns and the position of the mapped saltwater interface.

Following completion of model calibration and verification, as well as incorporation of peer-review comments, the ECSM will be applied through the development of the planning demands for 2021 and 2045 model scenarios. The effects of these future demands on the SAS will be evaluated in support of this *2023–2024 Lower East Coast Water Supply Plan Update*.

East Coast Floridan Model

The East Coast Floridan Model (ECFM) is a peer-reviewed, three-dimensional, density-dependent groundwater flow and transport model that simulates changes in FAS water levels and water quality along the east coast of the District. Developed to evaluate potential impacts of additional FAS demands, the ECFM can simulate the response of the aquifers to the projected demands through wellfield pumpage, aquifer storage and recovery (ASR) systems, reductions in recharge, and climate change. Results of the model simulations can provide guidance for developing water management strategies, support periodic updates to the regional water supply plans, and be used in regulatory applications.

The ECFM domain extends from Indian River County to the Florida Keys and from the approximate center line of the Florida peninsula to the Florida Straits and Atlantic Ocean. The model has seven primary layers representing the Upper Floridan aquifer, Ocala-Avon Park low-permeability zone, Avon Park permeable zone, middle confining unit, first permeable zone of the Lower Floridan aquifer, Boulder Zone confining unit, and Boulder Zone.

The ECFM originally was developed by HydroGeoLogic in 2006 and modified by Golder Associates in 2008. The model was peer reviewed in 2011, and the peer review panel's comments and suggestions were incorporated into the 2014 version of the model (Giddings et al. 2014). The current version of the model (2021) includes updated hydrostratigraphic (layer) information to synchronize the model layer elevations with the East-Central Florida Transient Expanded (ECFTX) Model where the two models overlap. In addition, new hydrogeologic data from aquifer tests were incorporated in localized areas across the model domain to improve model confidence.

The current version of the model was manually calibrated to water level and water quality (TDS) observations for transient conditions. The transient model was calibrated to the period from January 1989 through December 2012 using 143 water level targets and 208 water quality targets. Model calibration results indicated the simulated water levels and water quality values are in general agreement with field-observed measurements at most monitoring wells (targets). Simulated flow patterns and concentration distributions in major aquifers generally matched observed conditions. The recalibrated ECFM was used to evaluate the impacts of current (2019) and future proposed (2045) FAS demands within the Upper East Coast (UEC) Planning Area. Only demands in or near the UEC Planning Area were altered for the 2019 and 2045 simulations since the FAS demands for the Lower East Coast were similar in magnitude to the 2040 demands in the previous *2018 Lower East Coast Water Supply Update* (SFWMD 2018a). The ECFM results indicate the 2019 and 2045 FAS demands can be met without any widespread impacts to the aquifer system. For further information on the ECFM update and simulation results, see the *2021 Upper East Coast Water Supply Plan Update* (SFWMD 2021b).

Lower West Coast Surficial and Intermediate Aquifer Systems Model

The Lower West Coast Surficial Model was originally completed in 2006. The District completed a hydrostratigraphic reinterpretation report (Geddes et al. 2015) that incorporated new hydrostratigraphic, water level, water use, and saltwater interface data that cover both the surficial and intermediate aquifer systems (SAS and IAS). This report formed the basis for development of an updated groundwater flow model that incorporates both the SAS and IAS, now referred to as the Lower West Coast Surficial and Intermediate Aquifer Systems Model (LWCSIM). The model underwent contemporaneous peer review as it was being developed and calibrated (Bandara et al. 2020). This model was applied through development of the 2014 and 2040 simulations and used to evaluate regional water resources for this future condition. Additional information can be found in the *2022 Lower West Coast Water Supply Plan Update* (SFWMD 2022a).

DISTRICTWIDE WATER RESOURCE DEVELOPMENT PROJECTS

Water resource development projects encompassing more than one planning area are considered Districtwide projects. The SFWMD is the implementing agency for the projects described in this section. **Table 7-2** summarizes the estimated costs through 2028 of Districtwide water resource development projects and regional projects that benefit water supply. The following categories are types of ongoing Districtwide water resource development projects:

- MFLs, water reservation, and RAA rules
- Comprehensive Water Conservation Program
- Cooperative Funding Program
- Drilling and testing groundwater resources
- Groundwater assessment through data collection and modeling
- Groundwater, surface water, and wetland monitoring

MFL, Water Reservation, and RAA Rule Activities

MFLs, water reservations, RAAs, and other resource protection measures have been developed to ensure the sustainability of water resources within the District. **Chapter 4** and **Appendix C** provide further information on MFLs, water reservations, and RAAs in the LEC Planning Area. Additional information about water resource protection can be found in the *2021–2024 Support Document for the Water Supply Plan Updates* (2021–2024 Support Document; SFWMD 2021a).

Comprehensive Water Conservation Program

The long-standing conservation goal of SFWMD is to prevent and reduce wasteful, uneconomical, impractical, or unreasonable uses of water resources. This goal is addressed through planning; regulation; and use of alternative sources, including reclaimed water, public education, demand reduction through conservation technology, best management practices, and water-saving programs. The Comprehensive Water Conservation Program combines a series of implementation strategies designed to create an enduring conservation ethic and permanent reduction in water use. The program was developed in conjunction with stakeholders, and the program's planning document was approved by the District Governing Board in 2008. The program is organized into regulatory, voluntary, incentive-based, educational, and marketing initiatives. More detailed information is provided in *Water Conservation: A Comprehensive Program for South Florida* (SFWMD 2008) and on the SFWMD webpage (https://www.sfwmd.gov/conserve). Additional supporting information can be found in the 2021–2024 Support Document (SFWMD 2021a).

Cooperative Funding Program

Alternative water supply (AWS) projects and source diversification are important supplements and replacements to traditional water sources in order to meet current and future water needs Districtwide. The SFWMD has provided cost-share funding for AWS

development for more than two decades. In 2016, the SFWMD combined funding programs for stormwater, AWS, and water conservation projects into one streamlined program, the Cooperative Funding Program (**Chapter 8**). AWS funding helps water users develop reclaimed water projects, water reclamation facilities, brackish water wellfields, reverse osmosis treatment facilities, stormwater capture systems, and ASR well systems. A full description of AWS-related projects and associated funding is contained in the SFWMD's AWS annual reports, prepared pursuant to Section 373.707(7), F.S., and published in annual updates (Chapter 5A, Volume II) of the *South Florida Environmental Report* (https://www.sfwmd.gov/sfer). Further information about AWS options (e.g., reservoirs, ASR systems) is provided in **Chapter 5**.

Table 7-2. Fiscal Year 2024-2028 implementation schedule and projected expenditures (including salaries, benefits, and operating expenses) for water resource development activities within the SFWMD. All activities are ongoing unless noted otherwise (Modified from Adams and Beerens 2023).

Regional Water Activities	Plan Implementation Costs ($ thousands)					Total
	2024	2025	2026	2027	2028	
Water Supply Planning	1,155	1,155	1,155	1,155	1,155	**5,775**
CFWI Water Supply Planning Project	583	583	583	583	583	**2,915**
Comprehensive Plan, Documents Review, and Technical Assistance to Local Governments	208	208	208	208	208	**1,040**
Water Supply Implementation	264	264	264	264	264	**1,320**
MFL, Water Reservation, and RAA Rule Activities	170	170	170	170	170	**850**
Comprehensive Water Conservation Program	397	397	397	397	397	**1,985**
Cooperative Funding Program	22,121	0[a]	0[a]	0[a]	0[a]	**22,121**
Groundwater Monitoring	1,576	1,576	1,576	1,576	1,576	**7,880**
Groundwater Modeling	1,048	1,048	1,048	1,048	1,048	**5,240**
Estimated Portion of C&SF Project Operation & Maintenance Budget Allocated to Water Supply[b]	161,670	161,670	161,670	161,670	161,670	**808,350**
Subtotal	**189,192**	**167,071**	**167,071**	**167,071**	**167,071**	**857,476**
Regional Projects Benefiting Water Supply						
Lake Okeechobee Watershed Restoration[c]	50,000[d]	50,000[d]	50,000[d]	50,000[d]	50,000[d]	250,000
EAA Storage Conveyance Improvements and STA[c,e]	158,621	112,200	122,700	124,800	145,000	663,321
Other Projects Associated with MFL Prevention/Recovery Strategies[f]	160,520	364,618	379,937	363,737	394,614	1,663,426
C-25 Reservoir and STA	14,700	24,000	85,000	90,000	66,000	279,700
Subtotal	**383,841**	**550,818**	**637,637**	**628,537**	**655,614**	**2,856,447**
Total	**573,033**	**717,889**	**804,708**	**795,608**	**822,685**	**3,713,923**

C&SF Project = Central and Southern Florida Project; CFP = Cooperative Funding Program; CFWI = Central Florida Water Initiative; EAA = Everglades Agricultural Area; FY = Fiscal Year; MFL = minimum flow and minimum water level; RAA = restricted allocation area; SFWMD = South Florida Water Management District; STA = stormwater treatment area.

[a] A determination of what funds, if any, will be allocated for CFP projects will be made by the SFWMD Governing Board during the fiscal year budget development process.

[b] Approximated based on 50% of the FY2024 operation and maintenance budget, including resiliency funding.

[c] Project cost based on information contained in the draft FY2024-2028 SFWMD Five-Year Capital Improvement Plan.

[d] Funding contingent upon future state appropriations.

[e] Includes Reservoir Inflow Pump Station, Inflow Canal Reservoir/STA, A-2 Reservoir and STA, North New River and Miami Canal Improvements, and Bridges.

[f] Totals are from the Water Resources Development Work Program (WRDWP) Table A-3, less the funding for the Lake Okeechobee Watershed Restoration and EAA Storage Reservoir Conveyance Improvements and STA. Refer to WRDWP Table A-3 for additional information.

Drilling and Testing Groundwater Resources

Evaluation of groundwater resources involves the installation of wells for short- and long-term monitoring of aquifer water levels and water quality. This work includes drilling and well construction, geophysical logging, aquifer tests, sediment analysis, lithologic descriptions, and water quality sampling to determine if the water is fresh or brackish. Knowledge of South Florida hydrogeology is enhanced through construction of exploratory and test wells and has improved the accuracy of the SFWMD's groundwater modeling and decision-making regarding water use permits.

Groundwater Assessment

Groundwater assessment includes analyzing results of drilling and testing programs as well as development of hydrostratigraphic maps and saltwater interface maps. A variety of technical publications related to hydrogeology, groundwater quality, project investigations, and saltwater interface mapping have been completed since the 2018 LEC Plan Update, as summarized below:

- **Hydrogeologic Investigation and Aquifer Performance Testing at Morikami Park, Southeastern Palm Beach County, Florida** – This technical publication documents the findings of a hydrogeologic investigation and two aquifer performance tests of the surficial aquifer in southeastern Palm Beach County. The results were used as part of an assessment of groundwater resources in the county and in two United States Geological Survey (USGS) scientific investigations (Lindstrom 2020).
- **Hydrogeology and Groundwater Salinity of Water Conservation Area 2A (WCA-2A)** – This study includes a geophysical assessment to assess changes in groundwater quality over two decades between WCA-2A and WCA-1A near the S-10C Structure. During the study period, the brackish/saltwater interface increased in elevation in the wetland wells from 4 to 21 feet and average chloride concentrations increased from 7 to 27%. These changes are reflected in the vegetation communities near the structure (Janzen and Baker 2020).
- **Miami-Dade County Stormwater Detention Area Hydrogeologic Investigation** – The Miami-Dade Department of Environmental Resources Management proposed construction of a stormwater detention area in the vicinity of the Military Canal located by Homestead Air Reserve Base. In support of this project, SFWMD conducted a hydrogeologic investigation and subsequently monitored groundwater levels and groundwater quality. The stormwater detention area was never put into operation; however, the hydrogeologic data collected further refined the understanding of the Biscayne aquifer in this area and are used for regional groundwater modeling (Shaw 2020).
- **Saltwater Interface Monitoring and Mapping Program** – SFWMD evaluates the extent of seawater intrusion into surficial and intermediate aquifers along the South Florida coastal areas. Water quality data are collected and compiled from multiple sources, and saltwater interface maps are published every 5 years. The most recent maps were published in 2019. The report documents the data and methods used in the mapping process. The maps are used as part of the water use permitting review process by utilities for planning purposes, and the program is part of the SFWMD adaption strategies (Shaw and Zamorano 2020).

- **Groundwater Modeling** – As described above, the ECSM is being calibrated and undergoing peer review. Upon calibration completion in 2024, the model will be used to evaluate the impacts of existing and future LEC and UEC planning demands from the SAS and the potential for increased saltwater intrusion. The ECFM was recalibrated and used to evaluate the impacts of current (2019) and future proposed (2045) FAS demands within the UEC Planning Area. Only demands in or near the UEC Planning Area were altered for the 2019 and 2045 simulations due to the 2045 FAS demands being of similar magnitude to the 2040 FAS demands in the *2018 Lower East Coast Water Supply Plan Update* (SFWMD 2018a).

Groundwater, Surface Water, and Wetland Monitoring

Water level and water quality monitoring at existing wells provide critical information for developing groundwater models, assessing groundwater conditions, and managing groundwater resources. The SFWMD maintains extensive groundwater monitoring networks and partners with the USGS to provide additional support for ongoing monitoring. Data are archived in the SFWMD's corporate environmental database, DBHYDRO, which stores hydrologic, meteorologic, hydrogeologic, and water quality data. Data are available on the SFWMD webpage https://www.sfwmd.gov/science-data/dbhydro. The USGS monitors, archives, and publishes data annually. **Appendix D** provides maps of the groundwater well network in the LEC Planning Area. Districtwide monitoring activities related to the LEC Planning Area include the following:

- **USGS water level monitoring** – In an ongoing effort by the USGS, with funding support from the SFWMD, groundwater level monitoring data are collected at 280 stations. The project includes well and recorder maintenance as well as archiving data in a USGS database for sites throughout the SFWMD.
- **Groundwater level monitoring** – In an ongoing effort by the SFWMD, groundwater levels are monitored throughout the District. As of 2023, Districtwide monitoring includes 501 active SFWMD groundwater stations for the SAS, IAS (where present), and FAS. The network includes 108 FAS monitoring wells. Data are collected, analyzed, validated, and archived in DBHYDRO.
- **Groundwater quality monitoring** – Chloride and TDS samples are collected annually at 60 key SAS wells for saltwater intrusion monitoring with an additional 30 SAS wells every 5 years in support of saltwater intrusion mapping. FAS wells are sampled for major ions and field parameters on a 5-year rotating basis based on upcoming water supply plan updates. Samples are analyzed and validated by the SFWMD Laboratory and archived in DBHYDRO. Groundwater quality data are used for mapping and in support of density-dependent groundwater modeling.
- **Hydrogeologic database improvements** – A Hydrogeologic Data Lens is currently under development and will be live in DBHYDRO Insights in the near future. This interface will replace the DBHYDRO browser. Data and information are archived, available to the public, and miscellaneous database corrections are made.
- **Surface water monitoring** – The SFWMD monitors the water levels and water quality of several surface water bodies (e.g., L-8 Reservoir; Loxahatchee River; Lake Worth Lagoon; Nearshore Central Biscayne Bay; Florida Bay; A-1 Flow Equalization Basin [FEB]; WCAs 1, 2A, 2B, 3A, and 3B; L-3 canal system). Data are collected, analyzed, validated, and archived in DBHYDRO.

- **MFL-required monitoring** – In support of adopted MFL prevention and recovery strategies, the SFWMD monitors changes in surface water and groundwater levels, flows, and specific MFL-related constituents; the location of the saltwater interface; and the floral and faunal populations.

COMPREHENSIVE EVERGLADES RESTORATION PLAN

CERP provides a framework to restore, protect, and preserve the greater Everglades system. The United States Congress approved the restoration plan in the Water Resources Development Act (WRDA) of 2000. The lead federal agency is the United States Army Corps of Engineers (USACE), and the SFWMD is the local non-federal sponsor. CERP efforts are reported in annual updates of the *South Florida Environmental Report* (https://www.sfwmd.gov/sfer). CERP projects in the LEC Planning Area are summarized below.

Lake Okeechobee

The following water resource development projects discussed in this section are within the LEC Planning Area or are outside of the planning area but have an effect on the Lake Okeechobee region (**Figure 7-1**):

- CERP Lake Okeechobee Watershed Restoration Project (LOWRP)
- Lake Okeechobee Component A Reservoir (LOCAR)
- Northern Everglades and Estuaries Protection Program
  - Taylor Creek Stormwater Treatment Area (STA)
  - Nubbin Slough STA
  - Lakeside Ranch STA
- USACE Herbert Hoover Dike Major Rehabilitation (completed)

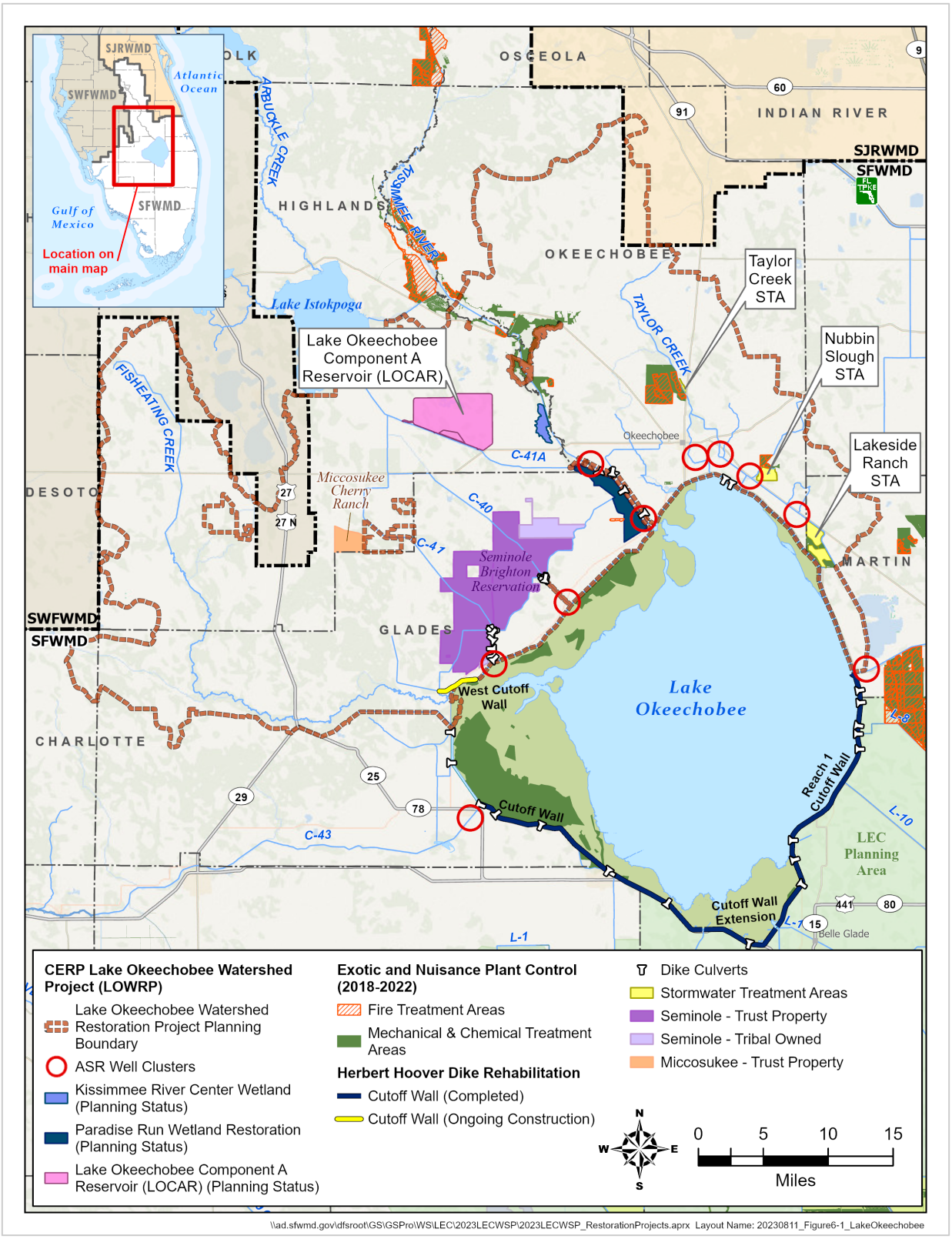

Figure 7-1. Water resource development projects in the Lake Okeechobee region.

CERP Lake Okeechobee Watershed Restoration Project

The CERP LOWRP area (**Figure 7-1**) covers approximately 920,000 acres, including the four major drainage basins that supply water to Lake Okeechobee: Fisheating Creek, Indian Prairie, Taylor Creek/Nubbin Slough, and Lower Kissimmee (S-65D and S-65E). In 2016, the USACE and SFWMD began planning efforts for the LOWRP, with the following goals and objectives:

- Improve the quantity, timing, and distribution of flows into Lake Okeechobee to maintain ecologically desired lake stages more often.
- Improve the quantity and timing of discharges to the St. Lucie and Caloosahatchee estuaries.
- Increase the extent and functionality of aquatic and wildlife habitat within Lake Okeechobee and the surrounding watershed.
- Increase the availability of water supply to existing legal water users of Lake Okeechobee.

Lake Okeechobee Component A Reservoir

To achieve these project goals and objectives, the LOWRP team evaluated various management measures, such as water storage features (e.g., aboveground reservoirs, ASR wells) and wetland restoration components. Since that time, the reservoir and wetland attenuation feature has been removed from the project design. To maintain the planned 200,000 acre-feet of aboveground storage in the basin, the SFWMD began a feasibility study pursuant to Section 203 of the WRDA of 1986, as amended, for the LOCAR. The LOCAR Section 203 Feasibility Study is anticipated to be finalized in January 2024 and is a distinctly separate project from the LOWRP and not formally considered a CERP project. By creating additional water storage north of Lake Okeechobee, the LOWRP ASR systems, in addition to the LOCAR reservoir, can improve flexibility in the timing and distribution of water in the lake to the estuaries and throughout the watershed. Water can be stored during wet times to reduce damaging high lake levels and be released into the lake during dry times to reduce adverse impacts of low lake levels. Wetland restoration components of the LOWRP are designed to improve the functionality and habitat value of degraded wetlands. After evaluating various project options, the LOWRP team identified a Tentatively Selected Plan in 2018 for further review and analysis prior to formal submittal for a USACE agency decision. The USACE Chief of Engineers Report for the first phase of the LOWRP, including only the wetland restoration components, is expected to be considered in the WRDA of 2024. There are uncertainties with ASR wells, and further technical studies are required prior to consideration in the LOWRP.

Northern Everglades and Estuaries Protection Program

The goals and objectives of CERP and the Northern Everglades and Estuaries Protection Program overlap considerably, and the projects often complement one another. Numerous efforts have been conducted as part of the Northern Everglades and Estuaries Protection Program, including completion of two pilot-scale STAs in Taylor Creek and Nubbin Slough as well as the Lakeside Ranch STA. The Lake Okeechobee Watershed Construction Project was developed to identify the issues that are affecting the water quality and quantity in each of the sub-watersheds and basins within the Lake Okeechobee Watershed. Analyses were

conducted to determine if projects, also known as management measures, were addressing those issues. The Lake Okeechobee Watershed Construction Project update is complete and was submitted to the Florida Department of Environmental Protection (FDEP) to be incorporated into the Lake Okeechobee Basin Management Action Plan.

Taylor Creek STA

The Taylor Creek STA was constructed by the USACE in central Okeechobee County in 2006 and is included in the Lake Okeechobee Basin Management Action Plan. The 142-acre STA, which diverts and treats runoff from the Upper Taylor Creek before it enters Lake Okeechobee, has an effective treatment area of 118 acres (**Figure 7-2**). Initial operations began in 2008, were subsequently suspended for repairs, and resumed in September 2010. The USACE and SFWMD co-sponsor the project and have a 50-50 cost-share agreement. The SFWMD is responsible for the operation, monitoring, and maintenance of the facility under a FDEP permit (as of May 2011).

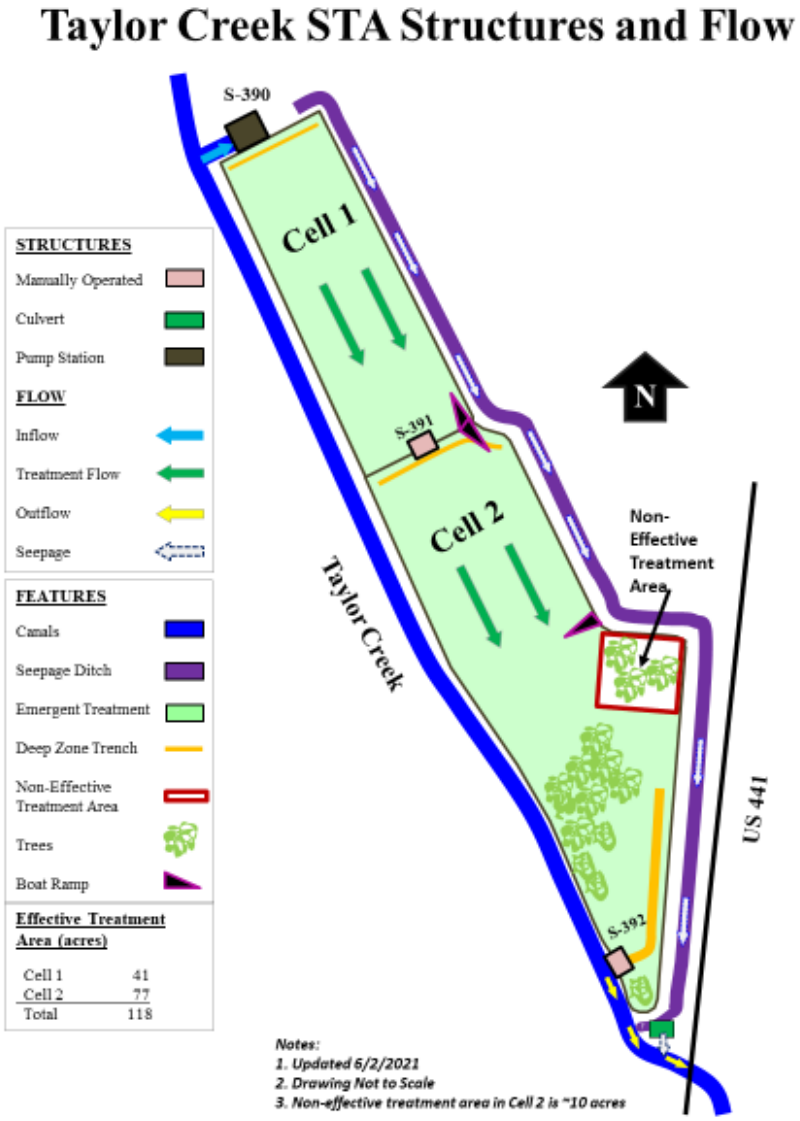

Figure 7-2. Taylor Creek STA structures, flows, and features.

Nubbin Slough STA

Under Phase 1 of the Lake Okeechobee Watershed Construction Project, the Nubbin Slough STA was constructed by the USACE in 2006. Located approximately 7 miles southeast of the City of Okeechobee, this 809-acre STA has two cells, with a total effective treatment area of 773 acres (**Figure 7-3**). The project began operations in 2012, and then underwent repairs through December 2014. The SFWMD is the project's local sponsor and has operated the facility under an FDEP operation and maintenance permit since March 2015. The STA was taken offline in 2020 for additional levee repairs which were completed in 2022. The STA remains in the post-construction vegetation grow-in phase as of 2023.

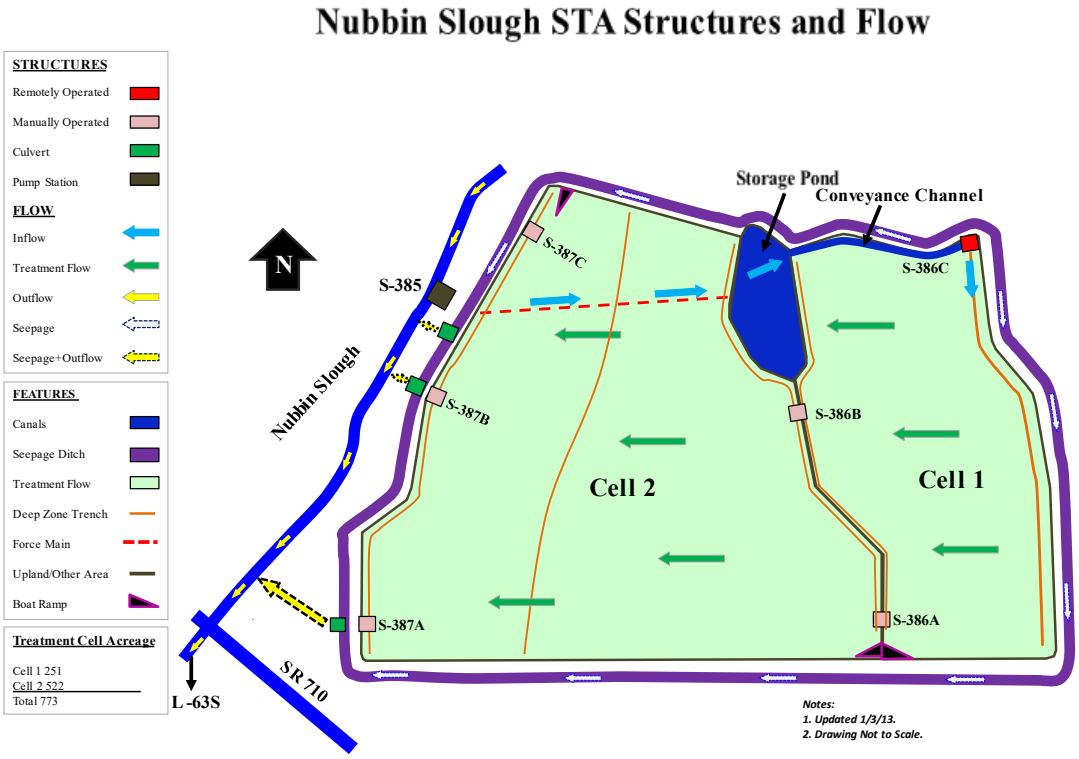

Figure 7-3. Nubbin Slough STA structures, flows, and features.

Lakeside Ranch STA

Located in western Martin County, the Lakeside Ranch STA plays a crucial role in restoring the Lake Okeechobee watershed by improving the quality of water flowing into the lake (**Figure 7-4**). The wetland area treats stormwater runoff from the Taylor Creek and Nubbin Slough basins to the north before that runoff enters Lake Okeechobee. The 2,700-acre project, with a total effective treatment area of 1,707 acres, is a component of the Lake Okeechobee Watershed Construction Project, which is designed to reduce phosphorus loads to Lake Okeechobee. Phase 1 (cells 1 to 3) became operational in 2014. Phase 2 (cells 4 to 8) included construction of the S-191A Pump Station to assist with S-135 Basin flood control as well as delivery of hydration water from the lake to the STA (and recirculation of STA discharges) to help prevent treatment cell dryout. Prior to the construction of S-191A, the STA experienced dryout leading to vegetation decline and performance issues. The Phase 2 project was completed in August 2021.

Figure 7-4. Lakeside Ranch STA structures, flows, and features.

USACE Herbert Hoover Dike Major Rehabilitation

Herbert Hoover Dike Rehabilitation Construction

The Herbert Hoover Dike, a 143-mile series of levees and structures surrounding Lake Okeechobee, was authorized in 1930 and constructed by hydraulic dredge and fill methods. In 2006, the USACE assigned the Herbert Hoover Dike a Dam Safety Action Classification of DSAC Level 1, representing the highest risk of failure and requiring remedial action.

Rehabilitation of the Herbert Hoover Dike to address structural integrity concerns began in 2005 and was completed in early 2023. The Dam Safety Action Classification rating improved from a Level 1 to a Level 4 (lowest risk of dam failure). A major component of the rehabilitation was the construction of a 56.2-mile seepage barrier including 52.1 miles between Port Mayaca to west of Moore Haven and 4.1 miles in the Lakeport area on the west side of the lake. In addition, 28 culverts were replaced, 4 were removed, and armoring was placed at the S-71, S-72, and Harney Pond Canal State Road 78 Bridge to reduce risk of failures due to storm surges (**Figure 7-5**).

Additional water can be stored in Lake Okeechobee resulting from the completion of the dike repairs and the revised Lake Okeechobee System Operating Manual (LOSOM). Capital projects to increase storage in the basin are being designed and constructed, such as ASR systems and aboveground storage reservoirs.

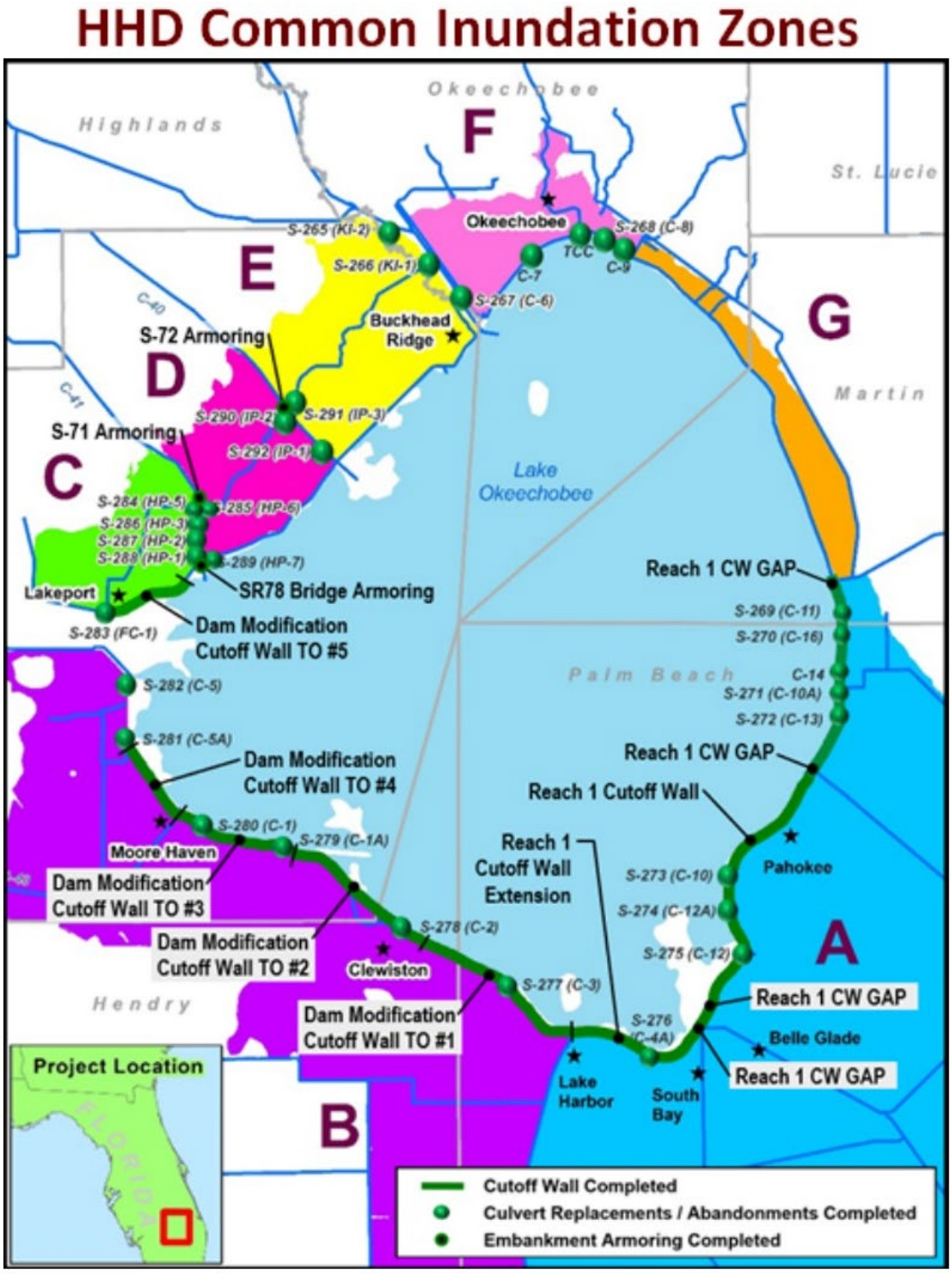

Figure 7-5. Herbert Hoover Dike rehabilitation components (From USACE 2023a)

Everglades

The following water resource development projects are within, have an effect on, or are affected by the Everglades region and are discussed in this section (shown in **Figure 7-6**):

- Everglades Forever Act projects, including the Restoration Strategies Regional Water Quality Plan
- Modified Water Deliveries (ModWaters) to Everglades National Park
- C-111 South Dade Project
- CERP WCA-3A Decompartmentalization Physical Model
- CERP Central Everglades Planning Project (CEPP)
    - CEPP Everglades Agricultural Area (EAA) Phase
    - CEPP North Phase
    - CEPP South Phase
    - CEPP New Water Phase
- Florida Bay projects
    - S-197 Structure Replacement Project and Automation
    - CERP C-111 Spreader Canal Western Project
    - South Dade Study and Florida Bay Plan

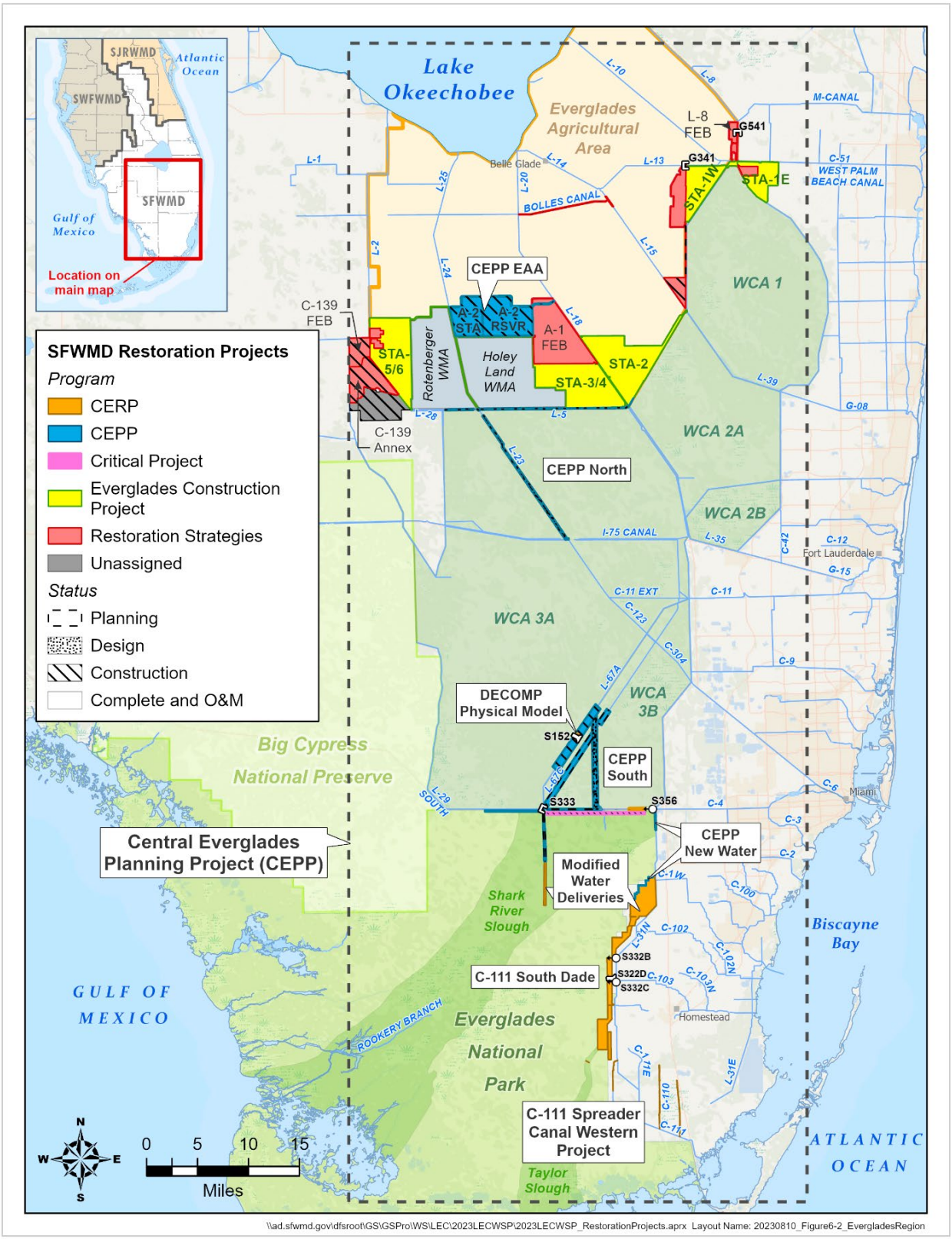

Figure 7-6. Water resource development projects in the Everglades region of the LEC Planning Area. (Note: Florida Bay projects are shown in greater detail in **Figure 7-10**).

Everglades Forever Act Projects

The Everglades Forever Act was passed in 1994 (Section 373.4592, F.S.) to ensure all water discharged to the Everglades Protection Area meets stringent water quality (phosphorus) standards. The status of the impacted areas, construction progress, best management practice implementation, and exotic species removal is updated annually in the *South Florida Environmental Report* (https://www.sfwmd.gov/sfer).

In 2012, the FDEP and SFWMD, in coordination with the United States Environmental Protection Agency, reached consensus on new restoration strategies to expand water quality improvement projects and achieve the water quality (phosphorus) standard established for the Everglades Protection Area. Under these strategies, the SFWMD implemented the Restoration Strategies Regional Water Quality Plan to complete and operate multiple water treatment and storage projects. The projects primarily consist of FEBs, STA expansions, and associated infrastructure and conveyance improvements, though some projects address pollution reduction at the source in the EAA. These restoration strategies provide for the addition of 116,000 acre-feet of storage in FEBs, 6,500 acres of new STAs, and nearly 2,000 acres of improved effective treatment areas. Approximately 1,800 acres of new STAs and 11,000 acre-feet of water storage is all that remains to be created by the restoration strategies projects (**Figure 7-6**). Construction of these projects is scheduled through 2025 (**Table 7-4**).

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Flow equalization basins are constructed storage features used to capture peak stormwater flows in order to provide a steadier flow of water to stormwater treatment areas, helping to maintain water levels needed to achieve optimal water quality treatment performance.

As part of the Restoration Strategies Regional Water Quality Plan, the SFWMD implemented the Science Plan in 2013 and updated it in 2018 (SFWMD 2018c). The Science Plan investigates the factors that influence performance of the Everglades STAs. As of 2023, 12 of the 21 Science Plan studies had been completed, 3 studies are nearing completion, and 6 are scheduled for completion in 2024.

Modified Water Deliveries to Everglades National Park

The United States Department of the Interior and USACE co-sponsored ModWaters, a foundation project for CERP completed in 2018 that was the first major restoration effort for Everglades National Park. The goal of ModWaters was to 1) restore natural flow into eastern Everglades National Park, which was altered by construction of roads, levees, and canals; and 2) control seepage eastward into urban areas. ModWaters was essential to provide the flow capacity necessary for future CERP projects and Everglades MFL recovery. All features of the ModWaters project have been constructed and are operational. These features include the Taylor Slough Bridge, 8.5-Square Mile Area Flood Mitigation Project Protection Features, Tamiami Trail Modifications and S-356 Pump Station.

C-111 South Dade Project

In 1995, the USACE and SFWMD executed a cost-share agreement to jointly implement the C-111 South Dade Project, a foundation project completed in 2018, that CERP builds upon to deliver essential restoration benefits to the Everglades. The objective of the C-111 South Dade project is to restore natural hydrologic conditions in Taylor Slough and the eastern panhandle of Everglades National Park while also preserving the current level of flood protection for agricultural lands in southern Miami-Dade County. The project, which works with the infrastructure constructed for ModWaters, created a hydraulic ridge to prevent groundwater from seeping out of Everglades National Park and allows additional water to flow into Florida Bay. This project provides environmental water supplies identified in the Florida Bay MFL prevention strategy.

The C-111 South Dade Project, composed of 12 contracts, began in 1994, with construction commencing in 1996. As of 2013, 7 of the 12 contracts had been executed, 3 contracts were deferred, and 2 are ongoing. In 2014, the cost-share agreement between the USACE and SFWMD was amended to enable the USACE and SFWMD to continue construction and complete the remaining features. The following work was completed:

- Two interim pump stations and one permanent pump station were constructed between 1997 and 2002.
- 4.75 miles of spoil mounds along the lower C-111 Canal were removed in 1997.
- Taylor Slough Bridge was replaced in 1999.
- Partial retention/detention zones were completed in 2000 and 2002.
- The S-331 Command and Control Center was constructed in 2009.
- The South Detention Area, linking previously separated pump station detention areas, was constructed in 2009.
- Construction of 10 plugs in the L-31W Canal as well as rebuilding of the L-31W Levee and the Taylor Slough integrated weir was completed in early 2018.
- Construction of the North Detention Area was completed in 2018.
- The L-359 and South detention areas were modified to create an eastern flow-way between the S-357 and S-332C pump stations (approximately 8 miles) in 2018.

The next step is to replace the interim pumps at the S-332B and S-332C pump stations with permanent ones. Congress authorized the replacement of the permanent pump stations in 2020. The SFWMD is designing both pump stations and will begin construction of S-332B in FY2024. The USACE is expected to start construction of S-332C in the near future.

The Combined Operational Plan (COP) is the last step to implement operational changes to convey water from WCA-3A to Everglades National Park using the constructed features of the pre-CERP foundation projects (i.e., ModWaters and C-111 South Dade projects) and would result in a change to the 2012 Water Control Plan for the WCAs, Everglades National Park, and Everglades National Park to the South Dade Conveyance System. The COP redistributes the existing water budget in WCA-3A and Everglades National Park to balance the ecological objectives of the ModWaters and C-111 South Dade projects while adhering to project constraints.

The ModWaters project was designed to provide a system of water deliveries to Everglades National Park across the full width of the historic Shark River Slough Flow-Way. The C-111 South Dade project was designed to control groundwater seepage out of Everglades National Park and reduce damaging freshwater discharges to Manatee Bay/Barnes Sound while maintaining flood risk management for agricultural lands east of the C-111 Canal. The COP defines operations for the constructed features of the ModWaters to Everglades National Park and C-111 South Dade project components. Under the COP, the Central and Southern Florida (C&SF) Project infrastructure is being operated to deliver hydrologic benefits to the environment.

CERP WCA-3A Decompartmentalization Physical Model

The CERP WCA-3A Decompartmentalization and Sheetflow Enhancement Project was designed to re-establish sheetflow in the Everglades by hydrologically reconnecting WCA-3A, WCA-3B, and northeastern Shark River Slough (**Figure 7-7**). Part of this project, the CERP WCA-3A Decompartmentalization Physical Model, is a field-scale test assessing the effects of pulsed flows on hydrology, sediment transport, vegetation, and wildlife as well as the ecological effects of backfilling canals and modifying levees. This project will help determine the water supplies needed to meet the Everglades MFL recovery strategy.

Figure 7-7. CERP WCA-3A Decompartmentalization Physical Model (From USACE 2021).

Installation of the CERP WCA-3A Decompartmentalization Physical Model was completed in October 2013. Project components included 10 gated culverts in the L-67A Levee (S-152) and a 3,000-foot gap in the L-67C Levee with three backfill treatments (no backfill, partial backfill, and complete backfill). The S-152 Structure allows for pulsed releases toward the various backfill treatments in the L-67C gap. Phase 1 operational testing periods have occurred between the November and January testing window from 2013 to 2017. Phase 2 operational testing has been under way since 2018. The CERP WCA-3A Decompartmentalization Physical Model was constructed as a temporary feature, but in 2023, the S-152 Structure and the L-67C backfill treatments were authorized as permanent features of the CEPP South Phase. These features will provide greater operational flexibility and additional opportunities for localized benefits in the WCAs.

CERP Central Everglades Planning Project

Authorized by Congress in 2016, CEPP combines a series of CERP components into one Project Implementation Report (PIR). The purpose of CEPP is to improve the quantity, quality, timing, and distribution of water flows to the northern estuaries, central Everglades (WCA-3A, WCA-3B, and Everglades National Park), and Florida Bay while increasing water supply for municipal, industrial, and agricultural users. In 2014, the USACE and SFWMD (2014) completed the *Comprehensive Everglades Restoration Plan: Central Everglades Planning Project: Final Integrated Project Implementation Report and Environmental Impact Statement*, which describes the project purpose and need, location, evaluation of alternatives, and Recommended Plan.

In 2018, the SFWMD prepared a Post Authorization Change Report (PACR; SFWMD 2018b) to CEPP under the authority provided by Section 203 of the WRDA of 1986, as amended. In section 1308(a) of the WRDA of 2018, Congress authorized the CEPP PACR. which included increasing the amount of water storage and treatment authorized in CEPP to reduce damaging discharges from Lake Okeechobee to the northern estuaries and allow more water to move to the central Everglades. The modifications to CEPP are 1) change the A-2 FEB to a 240,000-acre-foot reservoir with multipurpose operational flexibility and a 6,500-acre STA, and 2) increase conveyance in the North New River and Miami canals. The authorized project is currently divided into four phases: CEPP EAA, CEPP North, CEPP South, and CEPP New Water. The overall CEPP project will occur over multiple years due to the size and complexity of the project. The following CEPP components for storage and treatment, distribution and conveyance, and seepage management are included in the Recommended Plan (**Figure 7-8**). The four phases and their components are described in detail below.

According to the Restoration Coordination and Verification (RECOVER) Program system progress report (USACE and SFWMD 2019), water quality is generally improving, but there are still some localized issues which can be further improved upon completion and operation of CEPP EAA, North, South, and New Water components.

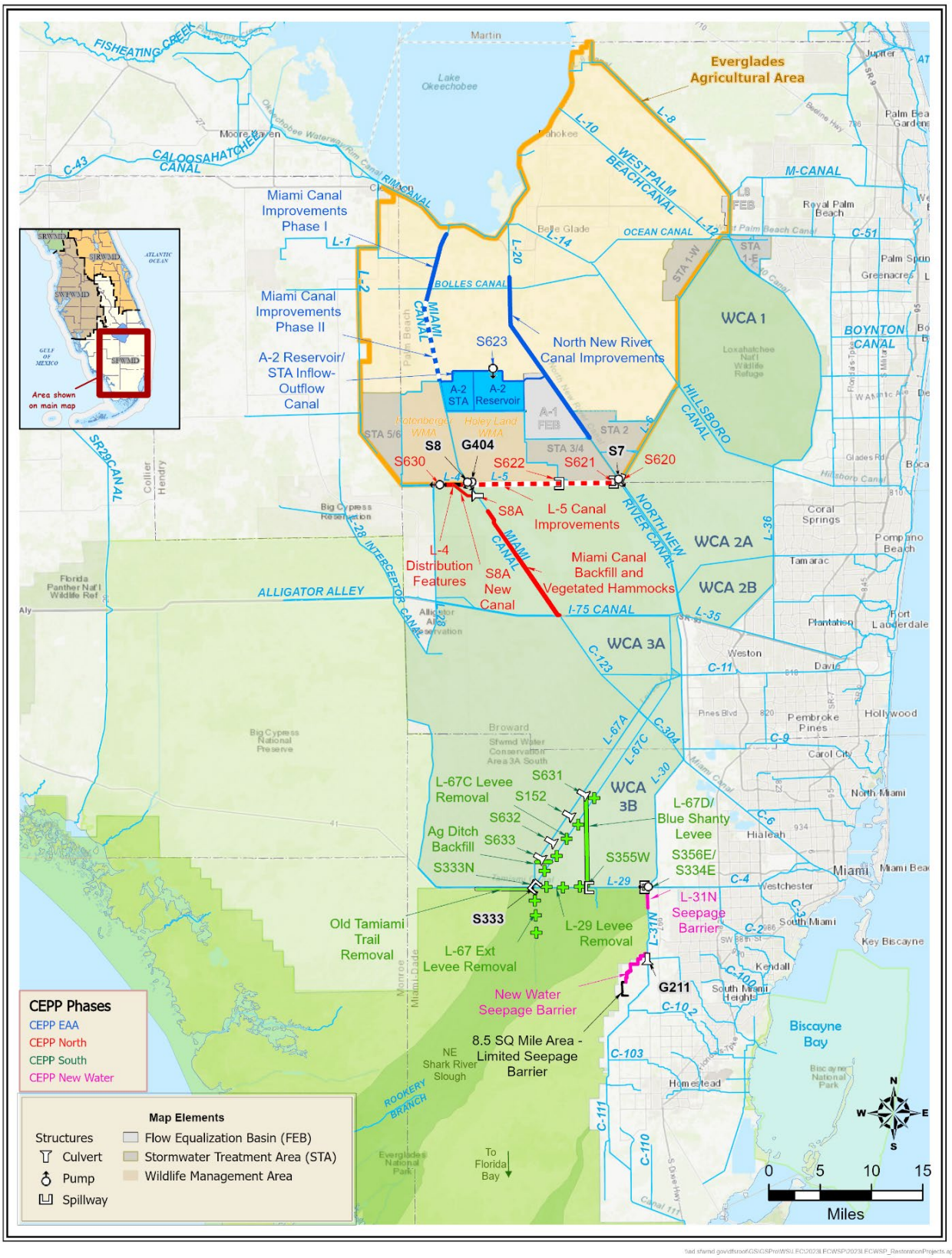

Figure 7-8. Central Everglades Planning Project features.

CEPP EAA Phase

The CEPP EAA Phase is an important part of restoring the Everglades and will dramatically reduce damaging discharges from Lake Okeechobee to the northern estuaries. The project includes a 10,500-acre aboveground storage reservoir (A-2 Reservoir), a 6,500-acre stormwater treatment area (A-2 STA), and canal conveyance improvements to the North New River and Miami canals (**Figure 7-9**). The CEPP EAA Phase project components will provide the water storage and water quality improvements to move an additional 370,000 acre-feet per year on average of water south to the Everglades.

Construction of the A-2 Reservoir, which will have a capacity to store approximately 240,000 acre-feet of water, has recently commenced with the USACE's award of a contract for the Inflow-Outflow Canal, which is scheduled to be completed in November 2024. Based on the most recently approved Integrated Delivery Schedule (USACE 2023b), all aspects of the A-2 Reservoir should be completed in FY2030.

Construction of the A-2 STA, which is being led by the SFWMD, is well under way and the initial hydration of the first of three cells occurred in January of 2024. The SFWMD led design of the Canal Conveyance Improvement projects which are also progressing, with completion of the North New River Conveyance Improvements scheduled for November 2025, and completion of the Miami Canal Improvements scheduled for May 2027.

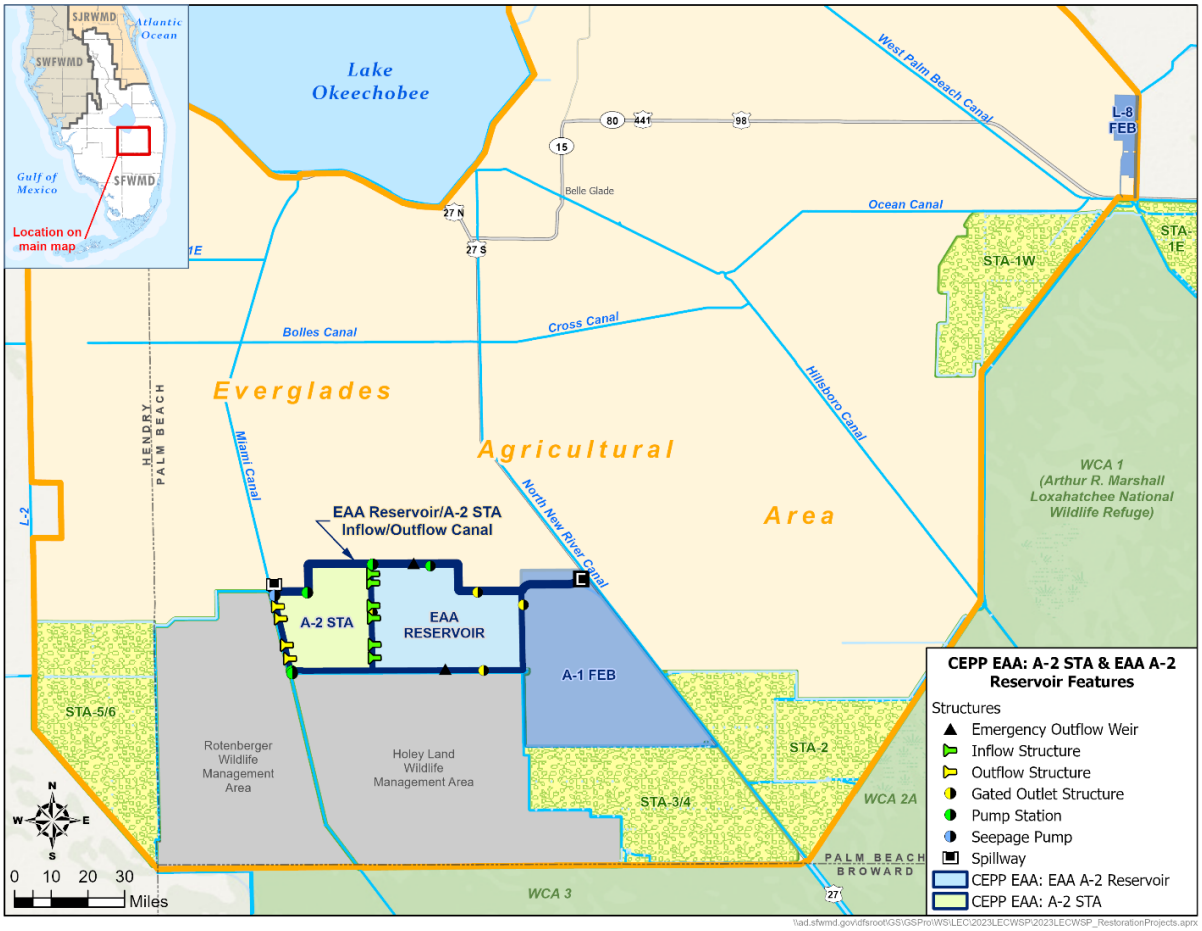

Figure 7-9. Key elements of the A-2 Reservoir and A-2 STA.

CEPP North Phase

The CEPP North Phase provides inflow needed to restore northern WCA-3A and move additional water south and consists of the following components:

- S-620 – 500 cubic feet per second (cfs) gated culvert to deliver water from the L-6 Canal to the L-5 Canal, and L-5 remnant Canal and L-5 conveyance improvements
- S-621 – 2,500 cfs gated spillway and S-622 500 cfs gated culvert to deliver water from east to west in the L-5 Canal
- L-4 Canal – improvement and distribution features to achieve effective distribution into WCA-3A
- S-8A – 2,000 cfs spillway and connecting canal and repurposing the existing S-8 Pump Station
- S-630 – 360 cfs gravity structure to maintain existing water supply deliveries
- Miami Canal – backfill and spoil mound removal (beginning 1.5 miles south of the S-8 Structure and ending at Interstate 75)

CEPP South Phase

The CEPP South Phase removes water flow barriers in the southern portion of the project area to allow more natural flow of water into Everglades National Park and consists of the following components:

- Increase S-333 capacity to 2,500 cfs (S-333N Gated Spillway) delivers water from the L-67A Canal to the L-29 Canal and supplements the existing S-333 Gated Spillway; Modify the S-333 Structure.
- Operate one 500 cfs gated structure (S-631) north of the L-67D Levee (Blue Shanty levee) and utilize a 6,000-foot gap in the L-67C Levee to deliver water from WCA-3A to WCA-3B, east of the L-67D Levee.
- Operate two 500 cfs gated structures in the L-67A Canal (S-632, S-633) and perform 0.5-mile spoil removal west of the L-67A Canal to deliver water from WCA-3A to WCA-3B, west of the L-67D Levee.
- Remove approximately 8 miles of the L-67C Levee in the Blue Shanty Flow-Way (no canal backfill) to allow a more natural flow of water from WCA-3A to WCA-3B.
- Construct approximately 8.5-mile L-67D Levee in WCA-3B, connecting the L-67A Canal to the L-29 Canal.
- Remove approximately 4.3 miles of the L-29 Levee in the Blue Shanty Flow-Way to allow water to move through WCA-3B Flow-Way.
- Divide structure (S-355W) to the east of Tamiami Trail Next Steps western bridge which will maintain water deliveries to the eastern L-29 Canal to aid in meeting Everglades National Park ecological objectives.
- Construct a gated structure along the L-67A Levee and a 6,000-foot gap in the L-67C Levee.

- Remove all 5.5 miles of the L-67 Extension Levee and backfill of the L-67 Extension Canal to allow a more natural flow of water and provide a direct hydrologic connection between waterways.
- Remove approximately 6 miles of Old Tamiami Trail road from the L-67 Extension Levee to Everglades National Park's Tram Road which provides increased wetland acreage.
- Replace the S-356 Pump Station with S-356E and increase its capacity to 1,000 cfs for seepage return to Everglades National Park.

CEPP New Water Phase

The CEPP New Water Phase includes the elimination of losses due to levee seepage to the east coast and includes the following components:

- Construction of a partial depth seepage barrier south of Tamiami Trail (along the L-31N Levee) has been replaced with an approximately 55-foot-deep, 5-mile-long seepage barrier located in the L-357W Levee.

Independent of CEPP, the SFWMD constructed a limited-length seepage wall within the existing L-357W Levee by trenching approximately 2.3 miles and installing a cement bentonite curtain wall along the L-357W Levee located northwest of the S-357 Pump Station. The curtain wall is designed to keep restoration flows in Everglades National Park while augmenting the current 8.5-Square Mile Area Flood Mitigation Project Protection Features to support meeting its flood mitigation requirements.

Florida Bay

Water resource development projects that affect Florida Bay are discussed in this section as shown in **Figure 7-10**.

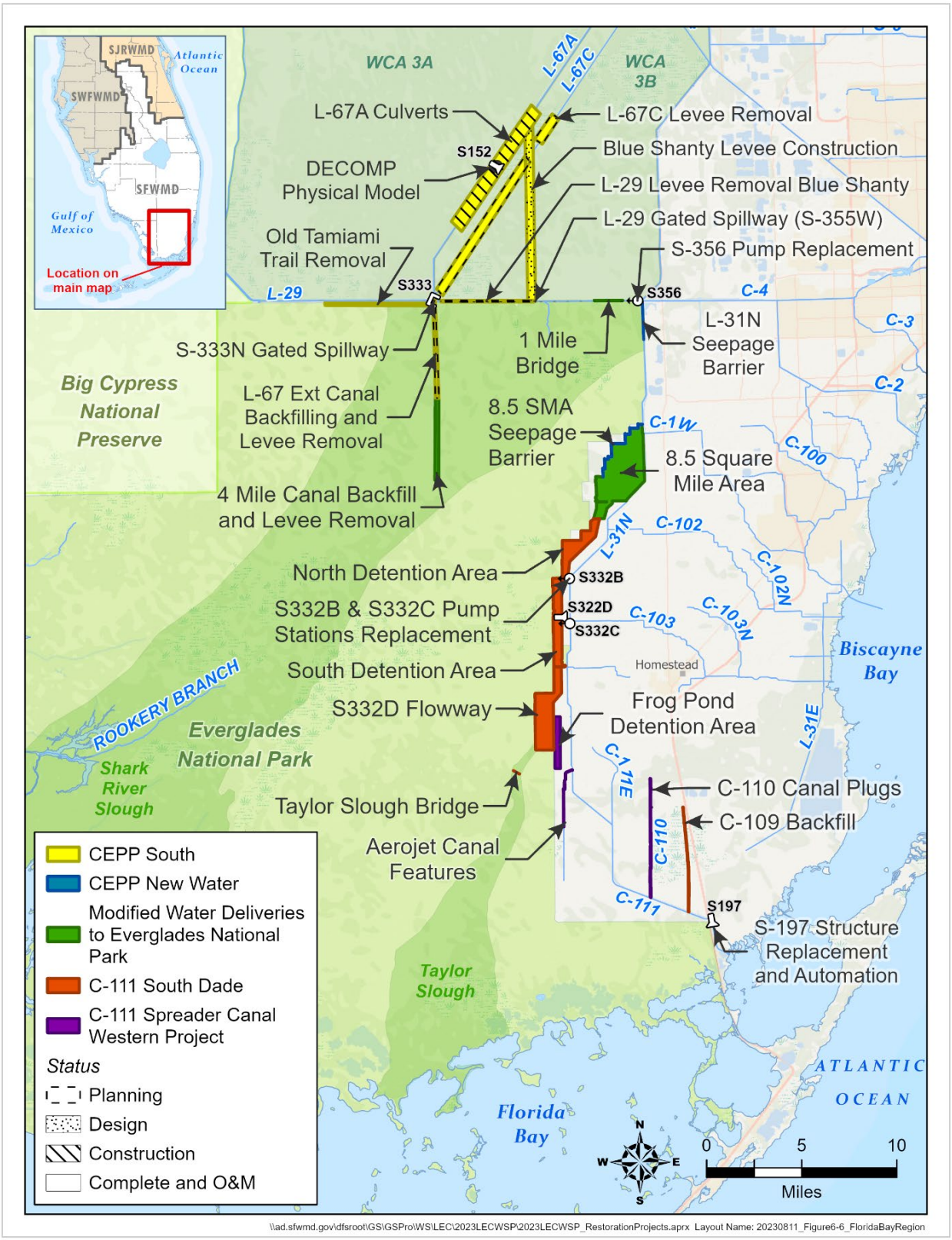

Figure 7-10. Water resource development projects in the Florida Bay region that support Everglades restoration.

S-197 Structure Replacement Project and Automation

Located in southern Miami-Dade County near Manatee Bay, the S-197 Structure is an important flood control component that also provides environmental benefits and water resource protection by preventing saltwater intrusion into coastal fresh waters. In 2013, the SFWMD replaced the S-197 Structure using the same operation criteria, location, and discharge capacity to ensure it continues to be an effective component of flood control operations in the C-111 Canal. In 2020, the SFWMD completed the project to automate operation of the S-197 Structure, allowing remote operation from SFWMD control centers.

CERP C-111 Spreader Canal Western Project

The CERP C-111 Spreader Canal Western Project (**Figure 7-11**) involves structural and operational changes to improve 1) the quantity, timing, and distribution of water delivered to Florida Bay via Taylor Slough; and 2) hydroperiods within the wetlands of the Southern Glades and Model lands. The project provides more natural sheetflow to Florida Bay and decreases damaging discharges to Manatee Bay and Barnes Sound without adversely impacting existing levels of flood protection to adjacent agricultural and urban lands. The project provides environmental water supplies identified in the Florida Bay MFL prevention strategy.

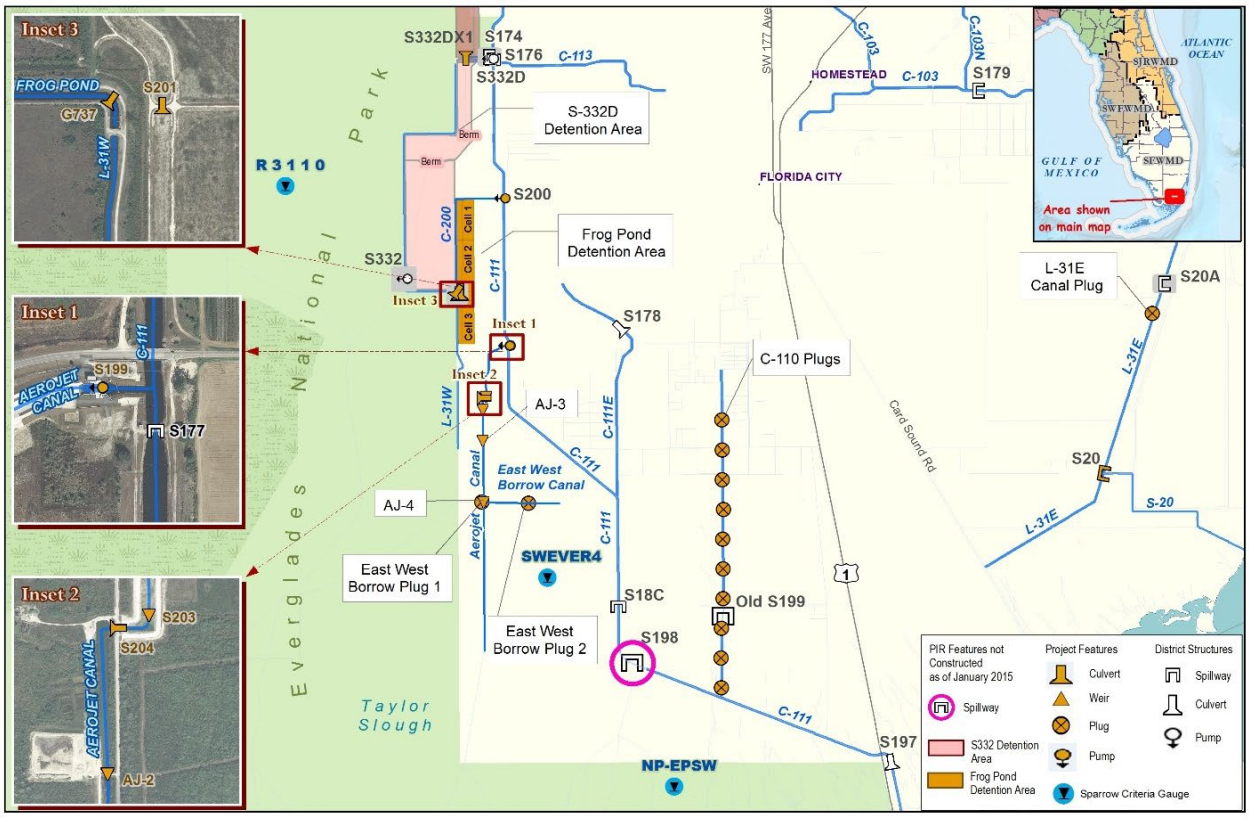

Figure 7-11. C-111 Spreader Canal Western Project – Phase 1.

The SFWMD completed construction of the CERP C-111 Spreader Canal Western Project in 2012 using state funds to create a 6-mile hydraulic ridge adjacent to Everglades National Park, which keeps more natural rainfall and water flows within Taylor Slough. Congress authorized the CERP C-111 Spreader Canal Western Project in 2014.

In 2015, the SFWMD sought to improve flows to Taylor Slough by expanding the capacity of the S-200 and S-199 pump stations to 300 cfs to move water from the C-111 Canal to the Frog Pond Detention Area and Aerojet Canal. The USACE and FDEP issued permits, and construction of both features was completed in 2018. The SFWMD also added culverts (G-737) in 2017 to connect the S-200 Pump Station to the L-31W Canal to deliver water to Taylor Slough.

Important changes in the hydrology and ecology of the southern Everglades wetlands, the mangrove ecotone, and Florida Bay are expected to occur as a result of the CERP C-111 Spreader Canal Western Project. The ecological effects of the project are being assessed by comparing baseline and post-implementation monitoring data. Previous monitoring efforts developed baseline data for operational and restoration planning, performance measures and targets, and simulation models. Post-implementation monitoring is ongoing and includes the following:

- Monitor changes in nutrient and organic matter transport and transformations in water flowing from canals and through the wetlands of the southern Everglades to Florida Bay.
- Document changes in salinity patterns within coastal wetlands and estuaries.
- Synthesize the findings from a large wetland monitoring network with complementary monitoring and research efforts in the region to assess status, trends, and causes of change.

According to the most recent Restoration Coordination and Verification (RECOVER) Program system progress report (USACE and SFWMD 2022), water quality is generally improving. However, some localized issues remain that can be further improved upon with the completion and operation of CEPP EAA, North, South, and New Water components.

The SFWMD is conducting additional long-term monitoring, including comprehensive ecological monitoring assessing hydrology, nutrients, water quality, vegetation and fauna and their interactions in the footprint and downstream of the C-111 Spreader Canal Western Project operations. The project will provide water quality and ecological data necessary for the CERP C-111 Spreader Canal Western Project as well as the following:

- Restoration Coordination and Verification (RECOVER) Program system status reports available at https://www.evergladesrestoration.gov/report-indexquick-links, System Status Report (CERP; RECOVER)
- Assessment of the southern Everglades and Florida Bay portions of the Everglades Protection Area pertaining to the Everglades Forever Act
- Assessment of ongoing operational plans and effects

South Dade Study and Florida Bay Plan

In July 2016, the District Governing Board implemented a plan to expedite additional operational and structural projects that would deliver fresh water to Florida Bay to help reduce salinity levels in the bay and promote the recovery of seagrasses. The plan for Florida Bay was developed out of the work from the South Dade Study. The SFWMD initiated the 6-month South Dade Study in September 2015 to examine water resource management in southern Miami-Dade County and its effects on Taylor Slough restoration, critical habitats of the Cape Sable Seaside Sparrow (*Ammodramus maritimus mirabilis*) in Everglades National Park, and active agricultural operations and urban areas. Water management in this area also affects the eastern panhandle of Everglades National Park, Biscayne Bay, and wetlands in southeastern Miami-Dade County. The study identified projects to reduce flood risks in urban and agricultural areas of Miami-Dade County while providing water to natural areas. Selected operational and structural projects were incorporated into ongoing and upcoming efforts in C-111 projects and were expedited by the SFWMD to deliver more freshwater to Taylor Slough, which connects to Florida Bay. **Figure 7-12** depicts the operational and structural changes implemented by the SFWMD between 2016 and 2018.

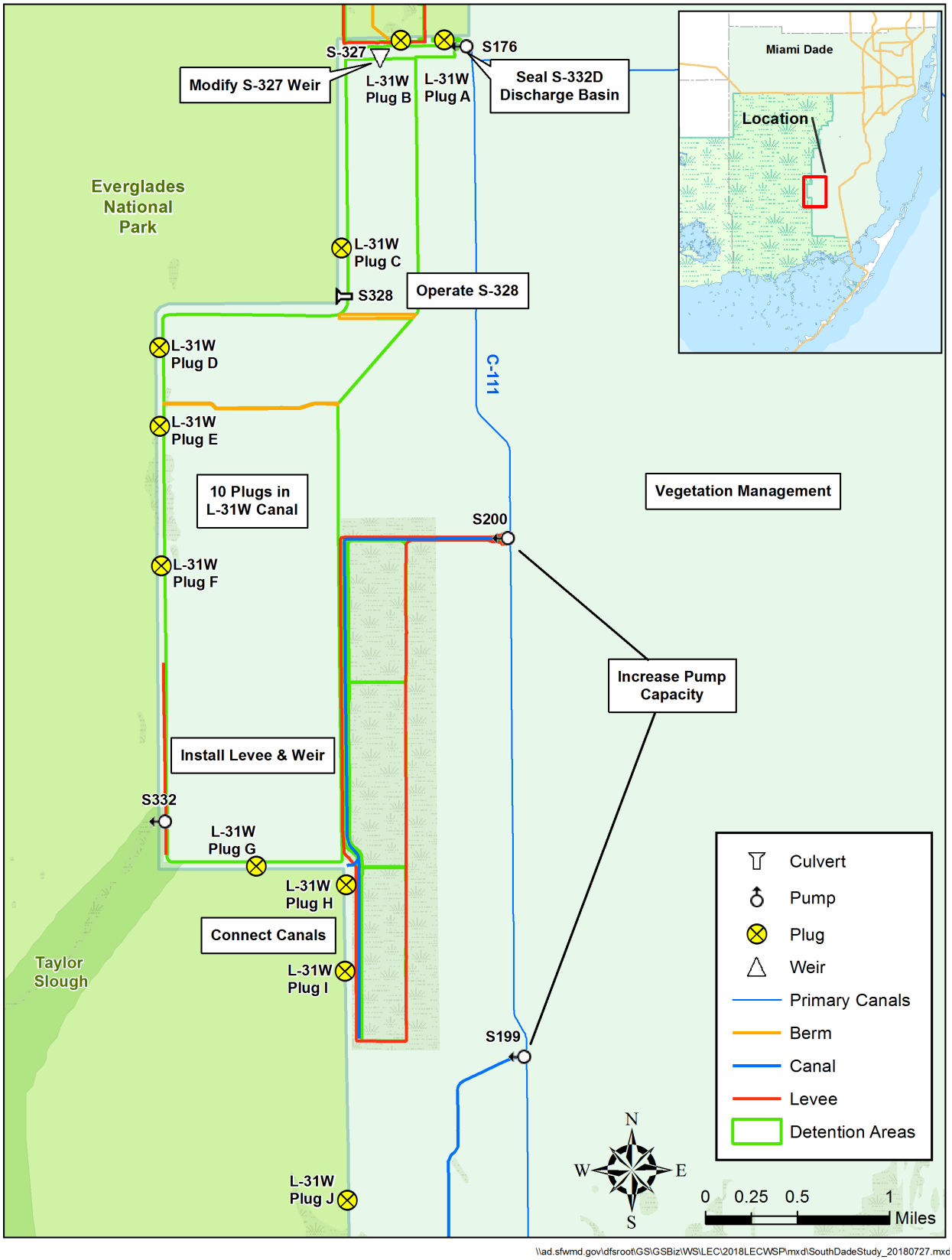

Figure 7-12. South Dade Study and Florida Bay Plan features with operational changes since 2016.

Western Basins

Encompassing approximately 440,000 acres, the C-139, Feeder Canal, L-28, and L-28 Gap drainage basins along the western edge of the Everglades are collectively known as the Western Basins. The following water resource development projects are within the Western Basins and are discussed in this section (shown in **Figure 7-13**):

- CERP Western Everglades Restoration Project
- C-139 Annex Restoration Project

CERP Western Everglades Restoration Project

The CERP Western Everglades Restoration Project (WERP) area encompasses approximately 772,700 acres west of the EAA and WCA-3A. Within the LEC Planning Area, WERP includes the Western Basins, Big Cypress National Preserve, western WCA-3A, Seminole Tribe of Florida Big Cypress Reservation, and Miccosukee Federal Reservation (**Figure 7-13**). Through the use of water management and water quality features, as well as canal and levee alterations, WERP is designed to achieve the following goals:

Big Cypress National Preserve

- Re-establish sheetflow across the Seminole Tribe of Florida Big Cypress Reservation and into Big Cypress National Preserve.
- Maintain existing levels of flood protection.
- Restore oligotrophic (low-nutrient) conditions to re-establish and sustain native flora and fauna.
- Re-establish ecological connectivity of wetland and upland habitats in the western Everglades with restored freshwater flow paths, flow volumes and timing, seasonal hydroperiods, and historical distributions of sheetflow.
- Reduce the frequency of intense wildfires that damage the underlying geomorphic condition of the western Everglades.
- Promote systemwide resilience considering future change (e.g., climate change, sea level rise).

WERP is currently in the planning phase. Based on the results of the project analyses, the USACE identified a Tentatively Selected Plan in August of 2023.

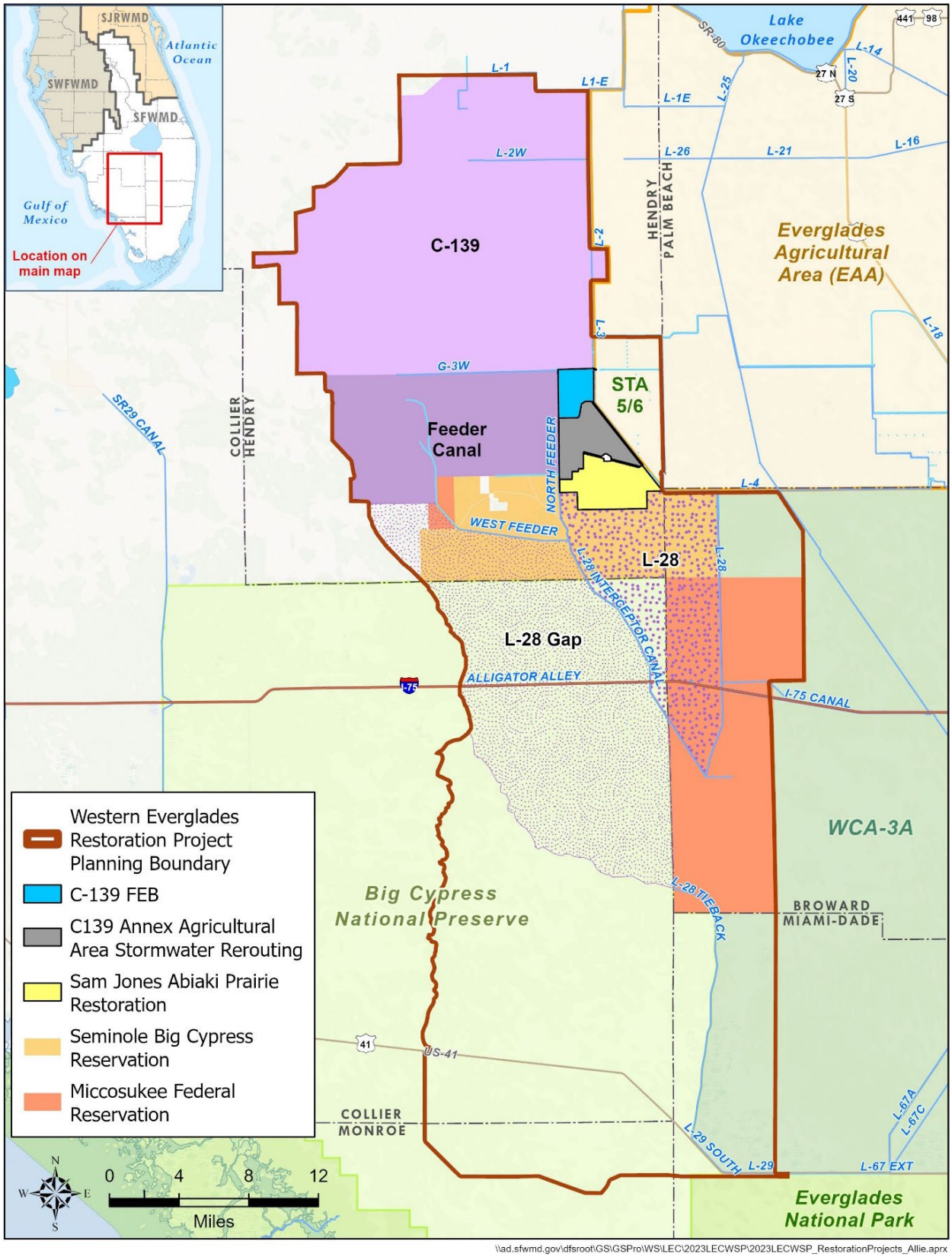

Figure 7-13. Western Everglades Restoration Project area including the C-139 Annex Restoration Project.

C-139 Annex Restoration Project

The C-139 Annex was purchased by the District in 2010 for water resource projects. It contains two projects currently under construction: the C-139 FEB at the north end and the Sam Jones/Abiaki Prairie restoration in the south (**Figure 7-13**). The C-139 FEB is a shallow reservoir with 11,000 acre-feet of storage and will store local basin runoff from the C-139 Basin and control the flow of water to the adjacent STA 5/6. This will help improve the performance of STA 5/6, removing nutrients from stormwater and improving the quality of the water before it flows south to Everglades National Park and Florida Bay. Construction of the FEB began in 2021 with an expected completion date of 2025.

Much of the central area of the property is available for use to construct the future WERP North Feeder STA. This STA, with 3,240 acres of treatment wetlands, would provide water quality improvement for North Feeder Canal water and redirect it to the northwest corner of WCA-3A. Design and construction of the STA is pending congressional authorization of WERP and funding.

The goal of the Sam Jones/Abiaki Prairie restoration is to restore the historical functions of the wet and dry prairies, sloughs, depression marshes, and tree islands of this former 7,800-acre citrus grove in Hendry County. The restoration is occurring in two phases, and upon completion in 2027, the smaller first phase will supply the native plant material for the larger second phase with implementation through 2032. The project is being implemented with mitigation funds from limestone mining activities in the Miami-Dade County Lake Belt region.

Lower East Coast Service Areas

The following water resource development projects are within the LEC Service Areas and are discussed in this section (**Figure 7-14**):

- Loxahatchee River projects
  - Restoration Plan for the Northwest Fork of the Loxahatchee River
  - CERP Loxahatchee River Watershed Restoration Project
  - Storage for the Loxahatchee River
- CERP Hillsboro Site 1 Impoundment/Fran Reich Preserve Reservoir (formerly Site 1 Reservoir)
- CERP Broward County Water Preserve Areas (BCWPA)
- Biscayne Bay projects
  - CERP Biscayne Bay Coastal Wetlands (BBCW) Project
  - CERP Biscayne Bay and Southeastern Everglades Ecosystem Restoration (BBSEER)

Loxahatchee River

Restoration Plan for the Northwest Fork of the Loxahatchee River

Loxahatchee River

In April 2003, an MFL and recovery strategy were adopted for the Northwest Fork of the Loxahatchee River. The recovery strategy included continued partnership with the FDEP and other partners to establish a practical restoration goal and plan for the Loxahatchee River watershed and restore flows to the Northwest Fork of the river, which was completed in 2006 (SFWMD et al. 2006). The restoration plan includes the MFL recovery strategy of achieving a sustained flow of 65 cfs to the Northwest Fork approximately 94% of the time. The restoration plan was updated in 2011 (SFWMD et al. 2012) to provide information on the latest vegetation monitoring, soil salinity, and groundwater well monitoring studies conducted by staff from the SFWMD, FDEP, Florida Park Service, and Loxahatchee River District. Initial modeling that established restoration flow targets for the Northwest Fork was re-examined using new flow, salinity, and biological data and were found to be valid. The flow targets are being used in the most recent CERP effort.

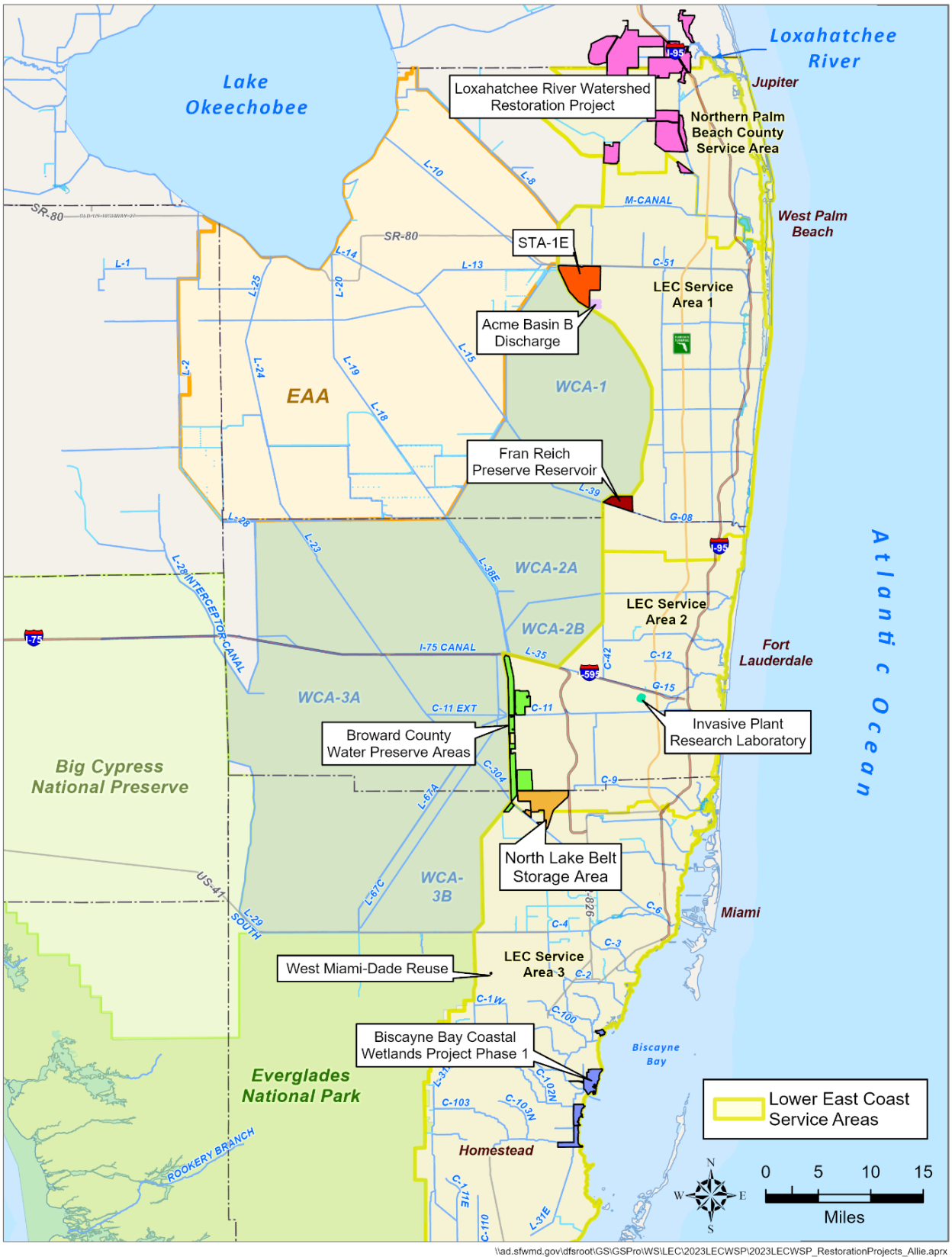

Figure 7-14. Water resource development projects in the LEC Service Areas.

The SFWMD acquired the following parcels of land for additional storage opportunities in support of the Northwest Fork of the Loxahatchee River restoration (**Figure 7-14**):

- Culpepper (1,282 acres)
- Cypress Creek (3,398 acres)
- Pal Mar East – Nine Gems (2,895 acres)
- Loxahatchee Slough (592 acres)
- Mecca Farms and associated easements (1,850 acres)

The following projects benefiting the Loxahatchee River have been constructed by the SFWMD or with SFWMD support:

- Installation of the G-160 (2004) and G-161 (2007) structures
- Widening of the M-Canal – initial section completed in 2007
- Nine Gems restoration – initial activities completed in 2010
- C-18 Project Culvert replacements – completed in 2011
- Culpepper hydrologic restoration – initial activities completed in 2011
- Lainhart and Masten dams refurbishments – completed in 2017
- Loxahatchee Slough Natural Area Hydrological Restoration Project – ongoing

The Lainhart and Masten dams, first built in the 1930s, regulate upstream flow stages in the Northwest Fork of the Loxahatchee River and maintain the hydrology of the riverine floodplain ecosystem. Without the dams, upstream water levels would be approximately 1.5 feet lower, draining the freshwater swamp and facilitating saltwater intrusion. Repairs were made to decayed areas of the dams where water was no longer being held back, and soil under and around the dams was stabilized to reduce seepage. Dam restoration work cost $2.5 million and was completed in 2017.

The Loxahatchee Slough encompasses almost 13,000 acres and, along with Hungryland Slough and Grassy Waters Preserve, forms the headwaters for the Loxahatchee River. Palm Beach County owns and manages the slough, with a small portion leased from the SFWMD. Extensive restoration activities have been conducted to restore areas impacted by overdrainage, agricultural uses, and invasion of non-native plant species.

CERP Loxahatchee River Watershed Restoration Project

The CERP Loxahatchee River Watershed Restoration Project (formerly known as the North Palm Beach County Project – Part 1) encompasses 481,000 acres between the C-44 and C-51 canals, from Lake Okeechobee to the Atlantic Coast. The project area includes extensive urban areas, limited agricultural areas, and large natural areas, such as J.W. Corbett Wildlife Management Area, DuPuis Reserve, Jonathan Dickinson State Park, Grassy Waters Preserve, and Loxahatchee Slough and River (**Figure 7-15**). The project objectives are as follows:

- Restore wet and dry season flows to the Northwest Fork of the Loxahatchee River.
- Restore or maintain estuarine communities (e.g., oysters, fish, seagrass).
- Increase natural areal extent of wetlands.
- Restore connections between natural areas.
- Restore native plant and animal species abundance and diversity.

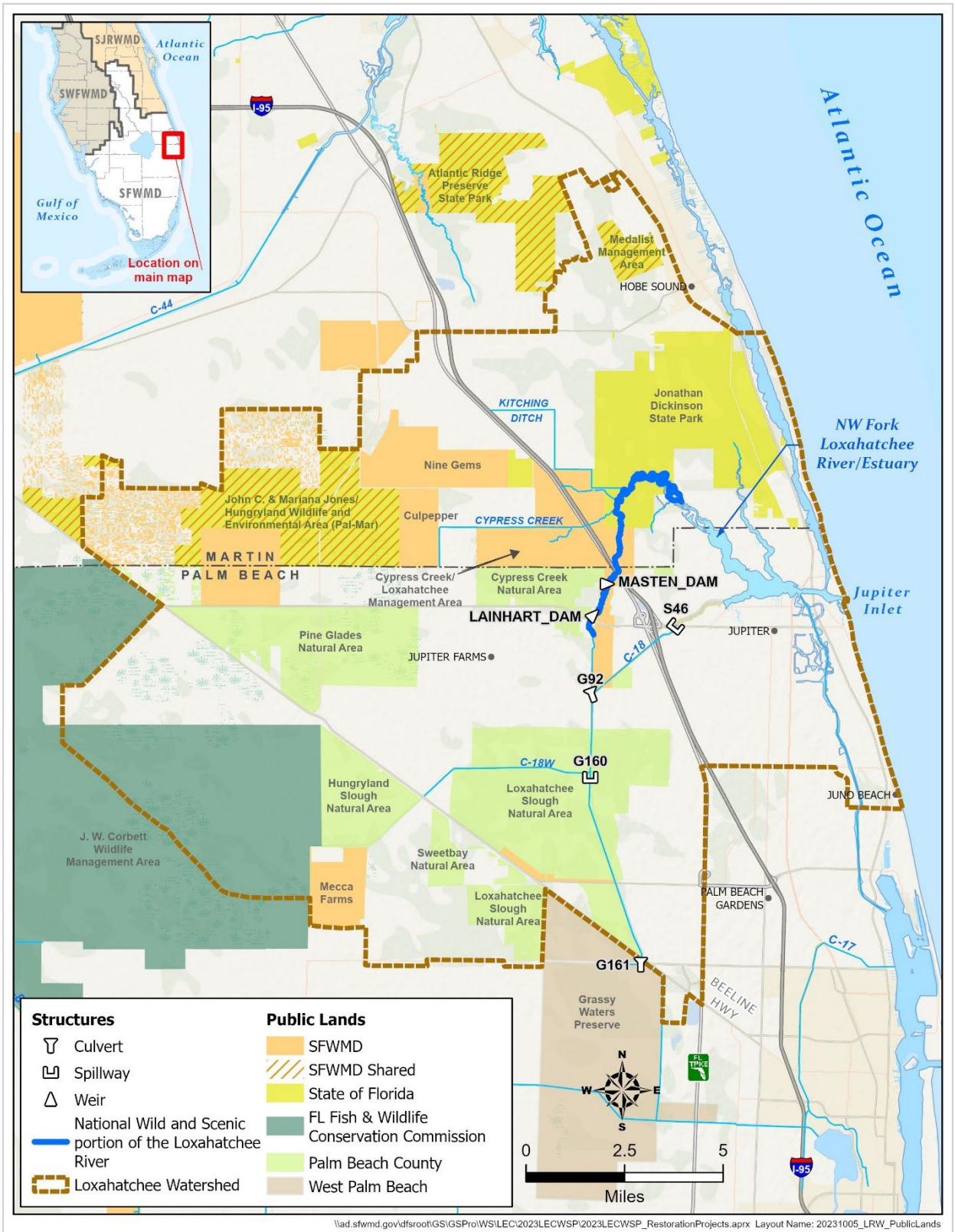

Figure 7-15. Major features of the Loxahatchee River and Estuary.

Management measures (e.g., storage impoundments, wetland restoration, reconnecting historical flow paths) to meet planning objectives were incorporated into the USACE Tentatively Selected Plan, which was identified in July 2018 (**Figure 7-16**; **Table 7-3**), and the Recommended Plan was approved in 2020.

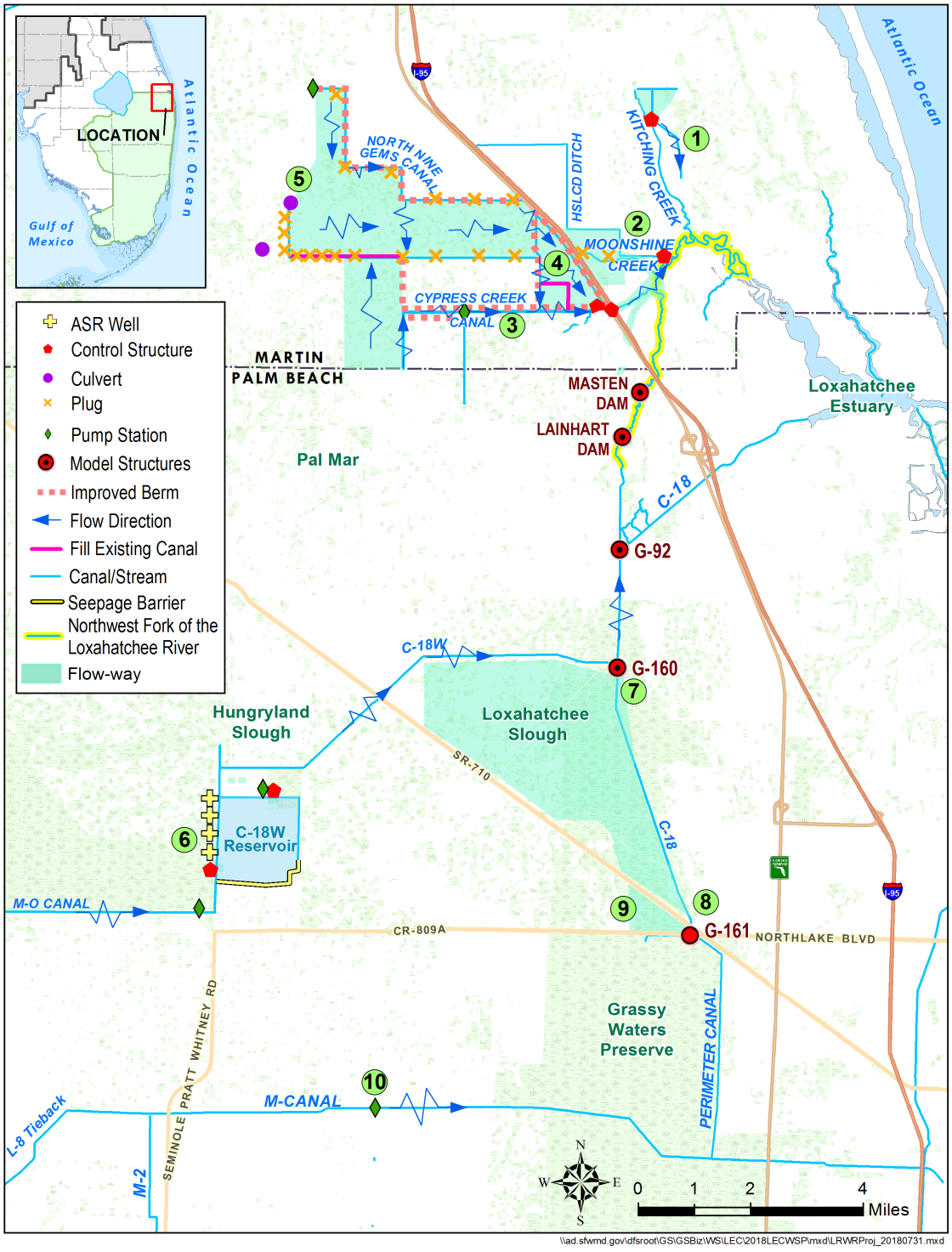

Figure 7-16. Loxahatchee River Watershed Restoration Project authorized plan components. **Table 7-3** provides details of these 10 projects.

Table 7-3. Loxahatchee River Watershed Restoration Project authorized components.

Figure 7-16 Map ID	Name	Description
1	Kitching Creek	Improve hydration with spreader canal and Jenkin's ditch weir/plug.
2	Moonshine Creek and Gulfstream East	Restore flow by connecting Hobe St. Lucie Conservancy District ditch to Moonshine Creek; install weir in Hobe Grove ditch, and regrade area to historical topography.
3	Cypress Creek Canal	Reduce overdrainage with new raised Cypress Creek Canal Weir and drainage improvements; regrade southern forks of canal.
4	Gulfstream West	Reduce overdrainage with Hobe St. Lucie Conservancy District Canal realignment. Restore flow with pump and flow-through marsh.
5	Pal Mar East	Restore flow and connection with berm improvements, pumps, and drainage redirection.
6	C-18W Reservoir/ASR Wells	Provide storage with 9,500-acre-foot aboveground reservoir and four ASR wells. Connect to M-O Canal and install pump.
7	G-160 Structure	Reduce overdrainage to improve hydroperiod in Loxahatchee Slough.
8	G-161 Structure	Connect Grassy Waters Preserve to Loxahatchee Slough and the Northwest Fork of the Loxahatchee River via the C-18 Canal.
9	Grassy Waters Preserve Triangle	Connect Grassy Waters Preserve to Loxahatchee Slough and the Northwest Fork of the Loxahatchee River via the C-18 Canal.
10	M-1 Pump Station	Convey lower M-1 basin water to M-Canal, Grassy Waters Preserve, and G-161 Structure.

ASR = aquifer storage and recovery.

Storage for the Loxahatchee River

The L-8 Reservoir originally was acquired to provide water storage as a component of the CERP North Palm Beach County Project – Part 1. In 2012, the Restoration Strategies Regional Water Quality Plan incorporated the L-8 Reservoir as one of its features, but it is now being used as an FEB to increase the water quality improvement capabilities of STA-1E and STA-1W.

In 2013, the SFWMD acquired approximately 1,850 acres in the western C-18 Basin (referred to as Mecca Farms). This property was identified under the Restoration Strategies Regional Water Quality Plan as a potential replacement facility for the L-8 Reservoir to store and deliver water to the Northwest Fork of the Loxahatchee River. The C-18W Reservoir (Mecca Farms) is included in the Loxahatchee River Watershed Restoration Project's authorized plan, along with adjacent ASR wells (**Figure 7-15**).

CERP Hillsboro Site 1 Impoundment/Fran Reich Preserve Reservoir

Located in Palm Beach County, the Fran Reich Preserve Reservoir (formerly called the Site 1 Reservoir) is a proposed 1,660-acre, 8-foot-deep, aboveground impoundment to capture and store excess surface water from the Hillsboro Basin and WCA-1 (Arthur R. Marshall Loxahatchee National Wildlife Refuge). With the reservoir in place, dry season water withdrawals from the refuge to meet water demands would be reduced, allowing more

natural and consistent water levels within the refuge. In addition, benefits to the downstream estuaries and reduced groundwater seepage from the refuge are expected. This project provides water supplies identified in the Everglades MFL recovery strategy.

In order to utilize funding from the American Recovery and Reinvestment Act of 2009, Phase 1 of the Fran Reich Preserve Reservoir, a standalone and usable portion of the project, was identified for construction. Phase 1 includes the embankment (L-40 modifications) and the S-530 Spillway, which reduce seepage loss from the adjacent wildlife refuge. Phase 1 construction was completed in December 2016.

Phase 2 includes additional site preparation, earthwork, construction of pump stations, canal improvements, embankment, placement of geocells on the embankment exterior, and placement of soil cement on the embankment interior. Phase 2 requires congressional authorization due to increased project cost.

CERP Broward County Water Preserve Areas

The objective of the CERP BCWPA project is to restore the ecological health of the Everglades. The BCWPA project addresses loss of ecosystem function within the Everglades as a result of 1) damaging discharges of runoff from developed areas in western Broward County into the Everglades (WCA-3A), 2) excessive nutrient loading to the Everglades, and 3) excessive seepage of water out of the Everglades to developed areas in western Broward County. The BCWPA project has three features: C-11 Impoundment, C-9 Impoundment, and WCA-3A/3B Seepage Management Area.

The BCWPA project, location depicted in **Figure 7-17**, is designed to perform two primary functions:

- Reduce seepage loss from WCA-3A/3B to the C-9 and C-11 basins.
- Capture, store, and distribute surface water runoff from the western C-11 Basin that has been discharged into WCA-3A/3B.

The C-11 Impoundment is the first feature of the BCWPA project to be designed and constructed. Final design is anticipated to be completed by early 2024 with a construction contract award in late 2024. The purpose of the C-11 Impoundment is to direct stormwater runoff from the western C-11 drainage basin into the impoundment instead of pumping untreated runoff into WCA-3A through the S-9 Pump Station. The impoundment pool will also assist in reducing seepage from WCA-3A and WCA-3A/3B Seepage Management Area (once built), thereby increasing groundwater recharge in the vicinity of the impoundment; providing an additional source of water for meeting the municipal and agricultural water supply demands; and preventing saltwater intrusion into drinking water aquifers. The C-11 Impoundment project is not considered flood control. Water will be released from the impoundment to the C-11 Canal to help maintain canal stages during the dry season, recharge the surficial aquifer, improve groundwater elevations in the eastern C-11 Canal Basin, and maintain water levels in the Pond Apple Slough (bordered by I-595 to the north and the C-11 Canal to the south). Water will be released from the C-11 Impoundment during the wet season to the C-9 Impoundment, once constructed, if storage is available there. Design for WCA-3A/3B Seepage Management Area and the C-9 Impoundment is anticipated to begin in 2024.

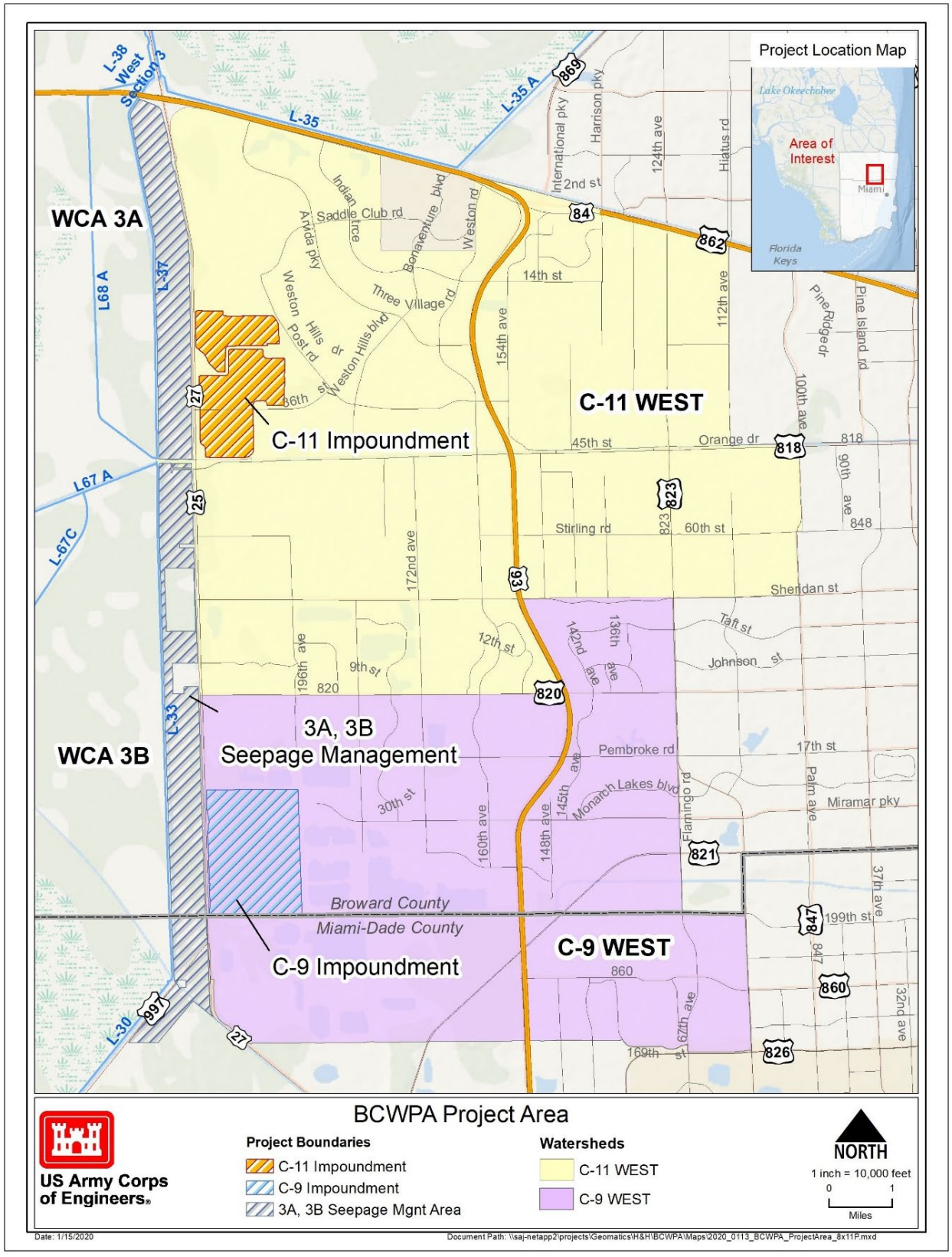

Figure 7-17. Broward County Water Preserve Areas project area and features.

Biscayne Bay

CERP Biscayne Bay Coastal Wetlands Project

Development of surface water drainage systems and groundwater withdrawals has altered the quantity, quality, timing, and distribution of freshwater flows to Biscayne Bay. Water quality in the bay has suffered due to rapid runoff from surface water drainage systems, and development has shifted the overall balance of freshwater inflows to Biscayne Bay altering the bay's salinity. The Water Quality Data Analysis (Migliaccio 2008) and Storm Event Sampling in the Biscayne Bay Watershed (Migliaccio 2009) projects were designed to further understand these impacts. The links between development, freshwater inflows, and the bay's ecology are complex. The Biscayne Bay Seepage Study (Langevin 2001) and Characterization of Nearshore Epifauna Study (Browder et al. 2011) were part of the effort to clarify these relationships.

The CERP (BBCW) Project is essential to the restoration of tidal wetlands and nearshore habitats within Biscayne Bay, including Biscayne National Park. The project will divert runoff that currently discharges directly to the bay through regional canals and redistribute the fresh water through a spreader canal system into the coastal wetlands adjoining Biscayne Bay to provide more natural overland flow. The slower, more natural delivery of fresh water over a broad area is expected to provide more stable salinity conditions and re-establish appropriate estuarine salinities for fish and shellfish nursery habitat in tidal wetlands and the nearshore bay.

Phase 1 of the CERP BBCW Project is composed of three flow-ways: Deering Estate, Cutler Wetlands, and L-31 East (**Figure 7-18**). In advance of congressional authorization and appropriations, the SFWMD constructed the Deering Estate Flow-way and a portion of the L-31E Flow-way.

- **Deering Estate Flow-way** – This flow-way redistributes excess freshwater runoff, directing it away from existing canal discharges and spreading it out as sheetflow prior to discharging into Biscayne Bay. The SFWMD completed construction of the flow-way in April 2012. The project became operational in November 2012.

Deering Estate Flow-Way
Pump Station (S-700)

- **Cutler Wetlands Flow-way** – This component includes construction of the S-701 Pump Station on the C-1 Canal, a lined conveyance canal, a spreader canal system, a box culvert, and a micro tunnel under roadways. The pump station will deliver water to the spreader canal in the saltwater wetlands via a concrete-lined conveyance canal. Construction of the pump station began in November 2022, while construction of the remaining features is expected to commence in early 2024. The SFWMD is expected to complete construction of the Cutler Wetlands Flow-way in 2025.

- **L-31 East Flow-way** – This flow-way is designed to partially re-establish historical sheetflow and wetland hydroperiods downstream of the project area by redirecting flow through a series of new culverts. The flow-way may provide the additional benefit of mitigating impacts from freshwater discharges via existing canals. By 2010, the SFWMD had constructed four of the ten culverts planned for the L-31 East Flow-way, and the USACE constructed two additional culverts in 2017. The SFWMD constructed the final four culverts in 2018. The USACE will construct the remaining features of the L-31 East Flow-way (five pump stations) with anticipated completion by 2025. In 2017, the SFWMD initiated interim pump operations at the temporary S-709 Structure. A temporary pump was installed to divert available fresh water from the C-103 Canal through project culverts and into the L-31E Canal. Interim operations provided early benefits to the coastal wetlands and nearshore Biscayne Bay prior to the USACE constructing the permanent S-709 Pump Station.

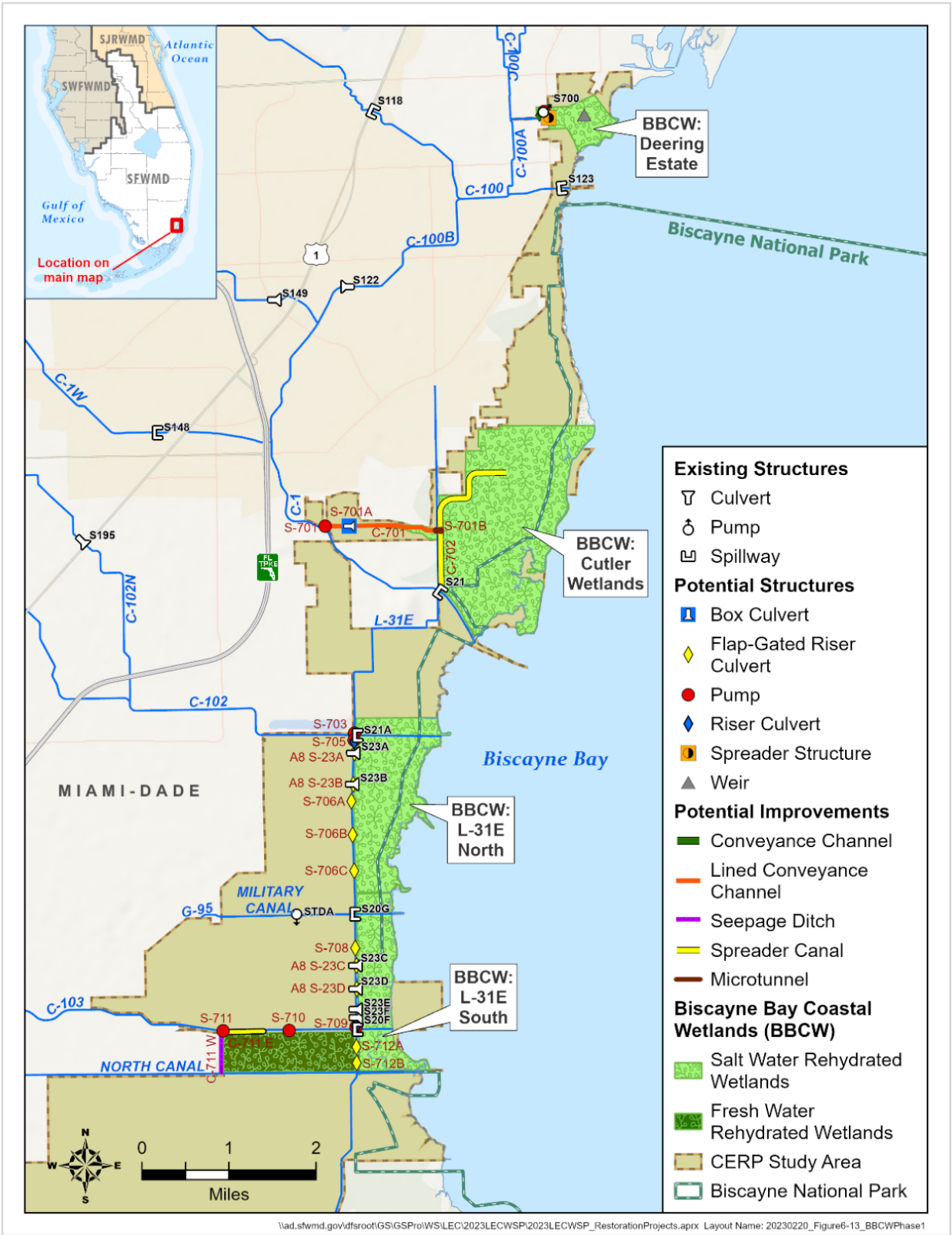

Figure 7-18. Biscayne Bay Coastal Wetlands Project – Phase 1.

In 2012, the USACE and SFWMD completed the final report for Phase 1 of the BBCW Project, which describes the project purpose and need, location, evaluation of alternatives, and Recommended Plan. The project was authorized by Congress in 2014.

Biscayne Bay

Staff from Miami-Dade County, Biscayne Bay National Park, Deering Estate Park, the National Oceanic and Atmospheric Administration, Fairchild Tropical Botanic Garden, and Florida International University contributed to project efforts. Routine compliance monitoring is conducted for water quality, including salinity, and ecological parameters for the BBCW Project. At one monitoring site, an increased abundance of bird species, amphibians, invertebrates, and fish was observed as well as a decrease in invasive exotic plant species. The SFWMD also tracks performance of the constructed components of the BBCW Project, including freshwater flow volumes to the wetlands. Updated BBCW Project monitoring data and analyses are reported annually in the *South Florida Environmental Report*.

CERP Biscayne Bay and Southeastern Everglades Ecosystem Restoration

The current drainage system and development of wetlands has altered the deliveries of fresh water to the bay. The CERP BBSEER Project is evaluating opportunities to incorporate water storage, active and passive water management features, water quality features, and alterations to existing canals and levees to improve the following:

- Quantity, timing, and distribution of fresh water to estuarine and nearshore subtidal areas, including mangrove and seagrass areas, of Biscayne National Park, Card Sound, and Barnes Sound to improve salinity regimes and reduce damaging pulse releases

- Freshwater wetland water depth, ponding duration, and flow timing within the Model Lands, Southern Glades, and eastern panhandle of Everglades National Park to maintain and improve habitat value
- Ecological and hydrological connectivity between Biscayne Bay coastal wetlands, the Model Lands, and Southern Glades
- Resiliency of coastal habitats in southeastern Miami-Dade County to sea level change

The project is in the planning stages with a USACE Tentatively Selected Plan anticipated in 2024.

SUMMARY

Water resource development projects serve various purposes in support of managing, protecting, and restoring water resources. Benefits of the water resource development projects discussed in this chapter include the following:

- Restoration of natural resources and prevention of further loss
- Support for MFL prevention or recovery strategies
- Protection of existing water supplies through better resource management and continued implementation of regional resource monitoring
- Water conservation as a demand management tool to expand current water supplies
- Improved understanding of the hydrogeologic system that provides traditional and alternative water supplies for the LEC Planning Area
- Increased future supply availability

Table 7-4 provides the status of the projects discussed in this chapter.

Table 7-4. Status of regional and Districtwide water resource projects in the LEC Planning Area by region.

Project	Completed Project Elements	Status of Ongoing/Uncompleted Elements
Lake Okeechobee Region		
CERP Lake Okeechobee Watershed Restoration Project	Planning efforts were implemented in 2016. A Tentatively Selected Plan was identified in 2018. PIR expected to be completed in 2023.	Planning is ongoing to increase storage. Drilling and testing of ASR wells and design of treatment systems.
Lake Okeechobee Component A Reservoir	Planning efforts for the Section 203 Feasibility Study were initiated in February 2023. The Recommended Plan was identified in August 2023, and the Draft Environmental Impact Statement (EIS) and Feasibility Study were posted for public review in October 2023.	The Final EIS and Section 203 Feasibility Study will be completed in 2024.
Northern Everglades and Estuaries Program – Taylor Creek, Nubbin Slough, and Lakeside Ranch STAs	All three STAs are complete and operational.	Monitoring and maintenance will continue.
USACE Herbert Hoover Dike Major Rehabilitation	A 56.2-mile seepage barrier was installed, 28 culverts replaced, 4 culverts abandoned, and armoring installed at the S-71, S-72, and Harney Pond Canal State Road 78 Bridge. Project is completed.	None
Everglades Region		
Everglades Forever Act Projects (including the Restoration Strategies Regional Water Quality Plan)	STA-1W Expansion #2 construction status report was completed in February 2022. G-341 Related Conveyance Improvements construction was completed in August 2023. STA-5/6 Internal Improvements construction was completed in May 2020.	STA-1W Expansion #2 construction is ongoing. The project is expected to be complete by December 2024. C-139 FEB construction is expected to be completed by December 2023. STA-5/6 Internal Improvements optimization period is expected to be complete by December 2025. Completion of all projects is expected by 2025.
Modified Water Deliveries to Everglades National Park	Taylor Slough Bridge, 8.5-Square Mile Area Flood Mitigation Project Protection Features, Tamiami Trail Modifications, and installation of S-356 Pump Station are complete.	None

Table 7-4. Continued.

Project	Completed Project Elements	Status of Ongoing/Uncompleted Elements
Everglades Region (continued)		
C-111 South Dade Project	Two interim pump stations and one permanent pump station were constructed between 1997 and 2002. 4.75 miles of spoil mounds along the lower C-111 Canal were removed in 1997. Taylor Slough Bridge was replaced in 1999. Partial retention/detention zones were completed in 2000 and 2002. The S-331 Command and Control Center was constructed in 2009. The South Detention Area, linking previously separated pump station detention areas, was constructed in 2009. Construction of 10 plugs in the L-31W Canal as well as rebuilding of the L-31W Levee and the Taylor Slough integrated weir was completed in early 2018. Construction of the North Detention Area was completed in 2018. The L-359 and South detention areas were modified to create an eastern flow-way between the S-357 and S-332C pump stations (approximately 8 miles) in 2018.	Replace the interim pumps at the S-332B and S-332C pump stations with permanent ones, which was authorized in 2020 by Congress. Construction of both pump stations is expected to begin in 2024.
CERP WCA-3A Decompartmentalization Physical Model	The final permit for model construction and interim operations was received in 2012. A construction contract was awarded in May 2012. Model construction was completed in 2013. Operational testing was completed between November and January of 2013 to 2017 for Phase 1. The S-152 Structure and L-67C backfill treatments were authorized as permanent features for CEPP.	Phase 2 operational testing has been ongoing since 2018.
CERP Central Everglades Planning Project (CEPP)	Modifications include 1) change the A-2 FEB to be constructed as a 240,000-acre-foot reservoir and 6,500-acre STA, and 2) increase conveyance in the North New River and Miami canals. The project is divided into four phases: CEPP EAA, CEPP North, CEPP South, and CEPP New Water.	Anticipated completion of A-2 Reservoir construction is 2034. Construction of the A-2 STA is ongoing and initial hydration date is scheduled for December of 2024. North New River Canal Conveyance improvements will be completed by November 2025 and Miami Canal improvements by 2027.
S-197 Structure Replacement Project and Automation	Replacement was completed in 2013.	None

Table 7-4. Continued.

Project	Completed Project Elements	Status of Ongoing/Uncompleted Elements
Everglades Region (continued)		
CERP C-111 Spreader Canal Western Project	All features were constructed and operational by 2012. Modifications were completed in 2018.	Monitoring is ongoing.
South Dade Study and Florida Bay Plan	Study was completed in 2015. Operational and structural projects were incorporated in C-111 projects.	None
South Florida Wading Bird Report	Most recent 2021 report was published in March 2023 (Cook and Baranski 2023).	Reports are completed annually to identify breeding colonies.
Western Basins		
CERP Western Everglades Restoration Project	Planning efforts began in 2016. Tentatively Selected Plan was identified in August 2023.	Final PIR is anticipated to be completed in 2024.
C-139 Annex Restoration Project	The Lake Belt Mitigation Committee approved the C-139 Annex for wetlands mitigation in 2012. Phase 1 construction began in 2016.	Sam Jones/Abiaki Prairie restoration (Phase 1) will progress as mitigation funds allow and is expected to be completed by 2027. Biological restoration (Phase 2) will be implemented through 2032.
Lower East Coast Service Areas		
Restoration Plan for the Northwest Fork of the Loxahatchee River	The SFWMD has acquired over 10,000 acres in support of the Northwest Fork of the Loxahatchee River restoration. Several projects were constructed from 2007 to 2017 to benefit the Loxahatchee River, including the installation of structures G-160 and G-161, widening of the M-Canal, Nine Gems restoration, C-18 Project culvert replacements, Culpepper hydrologic restoration, and Lainhart and Masten dams refurbishments.	Loxahatchee Slough Natural Area Hydrological restoration is ongoing. Additional restoration activities are expected to occur at Culpepper and Nine Gems sites.
CERP Loxahatchee River Watershed Restoration Project and Storage for the Loxahatchee River	A final PIR was approved in 2020. A new RAA was adopted in June 2022 to protect water associated with the four proposed ASR wells at the C-18W Reservoir site. Rule development was completed for the protection of water made available for the Loxahatchee River Watershed Restoration Project by amending the *Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District* (SFWMD 2022b) and the associated rule. Design of project features was started within Flow-way 3.	USACE project partnership agreement is expected to be executed by end of 2023. Commencement of design of project components is being planned.
CERP Hillsboro Site 1 Impoundment/Fran Reich Preserve Reservoir	Phase 1 L-40 modifications and S-530 Spillway construction were completed in 2016.	Additional funding authorization from Congress needed for Phase 2.

Table 7-4. Continued.

Project	Completed Project Elements	Status of Ongoing/Uncompleted Elements
Lower East Coast Service Areas (continued)		
CERP Broward County Water Preserve Areas	The PIR and Chief of Engineers report were completed in 2012. The project received congressional approval in 2014. The C-11 Impoundment Mitigation Area A Berm was completed in November of 2018.	The C-11 Impoundment design is anticipated to be completed by early 2024 with a construction contract award in late 2024. The C-11 Impoundment will be completed in 2027. The C-9 Impoundment design is expected in 2024, and construction is expected to begin in 2030. WCA-3A/3B Seepage Management Area construction is anticipated to begin in 2027.
CERP Biscayne Bay Coastal Wetlands Project	The PIR and Chief of Engineers report were completed in 2012. Deering Estate Flow-way construction was completed in 2012, and the flow-way is operational. The project received congressional approval in 2014. Ten culverts were completed in the L-31 East Flow-way by 2018.	The Cutler Wetlands Flow-way (to be constructed by the SFWMD) is anticipated to be completed by 2025. The remaining features of L-31 East Flow-way (to be constructed by the USACE) are anticipated to be completed by 2025.
CERP Biscayne Bay and Southeastern Everglades Ecosystem Restoration	None	The project is in the planning stages with a Tentatively Selected Plan expected in 2024.
Regional Groundwater Modeling		
East Coast Surficial Model	Model preparation, code changes, and documentation were initiated in 2022. The first and second peer reviews have been completed. Water level calibrations were completed in 2023.	The East Coast Surficial Model will be undergoing a third peer review and resource analyses in early 2024. Results are expected to be available in 2024.
East Coast Floridan Model	The East Coast Floridan Model was updated in 2021.	None
Lower West Coast Surficial and Intermediate Aquifer Systems Model	The Lower West Coast Surficial and Intermediate Aquifer Systems Model was completed in 2022.	None
Districtwide Water Resource Development Projects		
MFL, Water Reservation, and Restricted Allocation Area Rule Activities	Six MFLs and four RAAs were established prior to 2013 in the LEC Planning Area. The Nearshore Central Biscayne Bay Water Reservation was adopted in June 2013. The C-18W Reservoir ASR Groundwater Buffer Zone RAA was adopted in June 2022.	The SFWMD continues implementation of MFL prevention and recovery strategies. The LOSOM record of decision is expected in 2024. Additional capital projects are being planned and constructed. A storage assessment analysis is being conducted as part of this plan to determine the storage needed to support moving Lake Okeechobee to a prevention strategy.

Table 7-4. Continued.

Project	Completed Project Elements	Status of Ongoing/Uncompleted Elements
Districtwide Water Resource Development Projects (continued)		
Comprehensive Water Conservation Program	The program was approved in 2008. The year-round irrigation rule was adopted in 2010. From FY2018 through FY2022, 20 water conservation projects were funded, partially through the Cooperative Funding Program.	The SFWMD continues operation of recognition and certification programs, regulatory initiatives, education, and outreach.
Cooperative Funding Program	From FY2018 through FY2022, eight AWS projects were funded, partially through the Cooperative Funding Program.	The SFWMD continues support of AWS development through the Cooperative Funding Program.
Drilling and Testing Groundwater Resources	Monitor wells were installed in southeastern and northeastern Broward County in 2021 and 2023.	The SFWMD installs monitor wells and conducts subsurface testing as needed.
Groundwater Assessment	Saltwater interface maps were updated in 2019.	Saltwater interface maps will be updated in 2024.
Groundwater, Surface Water, and Wetland Monitoring	A hydrogeologic mapping update of the Lower West Coast aquifers was completed in 2023 (Zumbro et al. 2023). Hydrogeologic data archiving of Floridan aquifer system borehole video logs was completed in 2017.	Monitoring of 760 groundwater and numerous surface water stations is ongoing Districtwide.

ASR = aquifer storage and recovery; AWS = alternative water supply; CEPP = Central Everglades Planning Project; CERP = Comprehensive Everglades Restoration Plan; EIS = Environmental Impact Statement; FEB = flow equalization basin; FY = Fiscal Year; LEC = Lower East Coast; LOSOM = Lake Okeechobee System Operating Manual; MFL = minimum flow and minimum water level; PIR = Project Implementation Report; RAA = restricted allocation area; SFWMD = South Florida Water Management District; STA = stormwater treatment area; USACE = United States Army Corps of Engineers; WCA = water conservation area; WRDA = Water Resources Development Act.

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8

Water Supply Development Projects

TOPICS

- Projects Identified for This Plan Update
- Cooperative Funding Program
- Summary of Water Supply Development Projects

This chapter summarizes the proposed water supply development projects anticipated to meet water needs in the Lower East Coast (LEC) Planning Area of the South Florida Water Management District (SFWMD or District) for the 2021 to 2045 planning period. Water supply development projects include the planning, design, construction, operation, and maintenance of public or private facilities for water collection, production, treatment, transmission, or distribution for sale, resale, or end use and are proposed by water users to meet existing and future demands. Water users such as Public Supply (PS) utilities, local and tribal governments, and self-suppliers including Commercial/Industrial/Institutional (CII) and Agriculture (AG) users are primarily responsible for water supply development projects. For this *2023–2024 Lower East Coast Water Supply Plan Update* (2023–2024 LEC Plan Update), alternative water supply (AWS) development projects have been proposed by PS utilities that rely on nontraditional water sources.

Water use permits typically are required for most water supply development projects. Each proposed use of water must meet the conditions for permit issuance found in Section 373.223, Florida Statutes (F.S.), and the implementing criteria found in Chapter 40E-2, Florida Administrative Code (F.A.C.). Further information is provided in the *2021–2024 Support Document for Water Supply Plan Updates* (2021–2024 Support Document; SFWMD 2021). Regarding water supply development projects, local economic conditions and population growth may affect when water is needed, which projects are required, and how water use permits need to be obtained or modified to accommodate growing demand.

PROJECTS IDENTIFIED FOR THIS PLAN UPDATE

Projects proposed for inclusion in this plan update were evaluated based on factors discussed in the previous section, level of detail provided by the applicant (e.g., project scope, cost, schedule), and whether the project is expected to create new water supply, possibly increasing permit allocation(s).

Users are not required to select a project included in this 2023–2024 LEC Plan Update. In accordance with Section 373.709(6), F.S., nothing contained in the water supply component of a regional water supply plan should be construed to require local governments, public or privately owned utilities, special districts, self-suppliers, multijurisdictional entities, or other water suppliers to select the identified projects. In addition, an anticipated project may not be implemented or may be deferred if there is insufficient need.


Reverse Osmosis Water Treatment Plant

Public Supply

PS demand includes all potable uses served by public and private utilities with an allocation of 0.10 million gallons per day (mgd) or greater. In 2021, PS demand in the LEC Planning Area was met by fresh groundwater from the surficial aquifer system (SAS) (91%), brackish groundwater from the Floridan aquifer system (FAS) (6%), and surface water (3%), as shown in **Figure 5-2**. The PS average net (finished) water demand is projected to grow from 808.33 mgd in 2021 to 945.47 mgd by 2045, a 17% increase. A combination of existing and additional capacity created by water supply development projects will be used to meet the increased demand.

In addition to meeting demands, utilities may propose water supply development projects to address specific situations, such as accommodating a change in treatment process or source or optimizing distribution systems to match future demand locations. Although reuse and conservation of water do not produce potable water, they are demand management options to meet nonpotable demand or extend existing potable supplies to meet future demand. Proposed projects are listed in the utility profiles contained in **Appendix B** and summarized at the end of this chapter. In addition to proposed water supply development projects, each profile includes population and demand projections (**Chapter 2**, **Appendix A**), permitted water allocations, and permitted treatment capacities for potable water and reclaimed water. Based on planning-level screening, water supply projects are identified in this plan update to meet 2045 projected demands and generally have a likelihood of being permittable. However, each proposed use of water must meet the conditions for permit issuance found in Section 373.223, F.S., and the implementing criteria found in Chapter 40E-2, F.A.C., and will be reviewed on an application-by-application basis.

In the LEC Planning Area, 13 PS utilities have proposed 20 new potable projects to implement source diversification, changes in treatment technology, expansion of existing plants, and construction of new production wells. In total, the proposed PS projects could create 113.60 mgd of additional potable water treatment capacity (**Table 8-1**). Combined with existing capacity (1,495.15 mgd), the total treatment capacity including the proposed projects will exceed the projected 2045 PS total net (finished) demand of 945.47 mgd.

Table 8-1. Number and capacity of potable and nonpotable water supply development projects proposed by utilities for construction/implementation between 2021 and 2045.

Water Source	Number of Projects[a]	Capacity (mgd)	Cost ($ million)
Potable Projects			
Surficial Aquifer System[b]	5	17.65	$108.70
Floridan Aquifer System[b]	15	95.95	$1,349.18
Potable Total	**20**	**113.60**	**$1,457.88**
Nonpotable Projects			
Reclaimed Water[b]	11	32.35	$228.00
Surface Water[c]	11	38.00	$167.00
Nonpotable Total	**22**	**70.35**	**$395.00**
LEC Planning Area Total	**42**	**183.95**	**$1,852.88**

mgd = million gallons per day.

[a] Many of the projects are multiphased (e.g., more than one project at the same water treatment plant).

[b] Projects designed to expand distribution or storage of treated water and projects to repair or replace existing facilities are not included because they do not generate new water treatment capacity. Wellfield expansion projects are not included if they do not increase the capacity for production.

[c] The surface water projects listed here do not increase water supply treatment capacity.

In order to meet the projected 2045 demands, 11 of the 54 PS utilities in the LEC Planning Area need to modify their permitted allocations, construct projects, and/or establish bulk agreements with nearby utilities: Dania (2.07 mgd), Hallandale (3.86 mgd), Miramar (0.89 mgd), North Springs Improvement District (1.37 mgd), Pompano Beach (0.55 mgd), Florida City (1.46 mgd), Homestead (5.51 mgd), Lantana (0.28 mgd), Palm Springs (0.11 mgd), Riviera Beach (1.51 mgd), and Tequesta (0.21 mgd). The minimum amount of water needed by these utilities to meet their shortfall totals 17.83 mgd.

For the 11 utilities that need projects to meet their 2045 demands, the following projects have been proposed:

- The **City of Dania Beach** maintains a bulk water agreement to purchase up to 1.58 mgd from Broward County Water and Wastewater Services–South Regional Wellfield (BCWWS-SRW) and has also entered into a capacity allocation agreement with Palm Beach Aggregates, LLC for an additional 1.00 mgd from the C-51 Reservoir Phase 1 to be used to offset water pumped from the BCWWS-SRW, making 2.58 mgd of total raw water available from BCWWS-SRW.
- The **City of Hallandale Beach** maintains a bulk water agreement to purchase up to 3.26 mgd from BCWWS-SRW and has also entered into a capacity allocation agreement with Palm Beach Aggregates, LLC for an additional 1.00 mgd from the C-51 Reservoir Phase 1 to be used to offset water pumped from the BCWWS-SRW, making 4.26 mgd of total raw water available from BCWWS-SRW.
- The **City of Miramar** has proposed a reclaimed water distribution system expansion project to increase reclaimed water use by up to 3.50 mgd. A special condition of the city's water use permit allows an increase in the annual allocation of up to 18.87 mgd upon demonstrating an average total of 4.00 mgd of reclaimed water use for offsetting withdrawals from the SAS. However, the city will still need additional allocations from alternative sources, such as the FAS, to meet the projected 2045 raw water demands. A water use permit modification is currently under review by the SFWMD.

- **North Springs Improvement District** plans to construct a reverse osmosis (RO) water treatment plant (WTP) that will provide up to 2.00 mgd of additional water from the FAS.
- The **City of Pompano Beach** has purchased 2.00 mgd of C-51 Reservoir Phase 1 storage capacity to offset additional SAS raw water withdrawals above the base condition. Once the required volume of offset water is delivered, the city can withdraw up to 19.73 mgd from the SAS.
- **Florida City** is working to reduce unaccounted for water losses which will also reduce its per capita use rate. Additionally, the SFWMD suggests developing interconnections with the City of Homestead and the Florida Keys Aqueduct Authority and purchasing bulk water from either entity. Florida City Water and Sewer Department can implement this suggestion or determine an alternative source to meet its demands in excess of the permitted allocation.
- The **City of Homestead** plans to construct an aquifer recharge project that will use industrial cooling wastewater to recharge the SAS and offset increased withdrawals. Upon completion of this project and the reduction of the allocation for a nearby permittee, the base condition allocation can be increased from 11.00 to 16.28 mgd.
- The **Town of Lantana** will need to determine an alternative source prior to renewing its water use permit in 2028. Raw water demands are projected to exceed the permitted allocation by 2030.
- The **Village of Palm Springs** is projected to have raw water demands that exceed the permitted allocation by 0.11 mgd by 2045. The SFWMD suggests purchasing bulk water from Palm Beach County Water Utilities Department. The village can implement this suggestion or determine an alternative source to meet its demands in excess of the permitted allocation.
- The **City of Riviera Beach** is proposing to construct an FAS wellfield and 12.00 mgd RO WTP by 2026.
- The **Village of Tequesta** will need to request an increase in the permitted allocation from the FAS prior to renewing its water use permit in 2031. Demands are projected to exceed the permitted allocation by 2030.

The following projects have been proposed by utilities that can meet their 2045 demand but want to diversify their water sources or improve current treatment methods to increase capacity:

- The **City of Sunrise** plans to abandon their RO treatment facility at Springtree and replace it with membrane softening, increasing the treatment capacity by 0.40 mgd.
- The **Miami-Dade Water and Sewer Department** is planning several projects to expand potable water treatment capacity:
    - A 2.50 mgd expansion of the Hialeah RO WTP
    - Construction of a new South Miami Heights membrane softening WTP and SAS wellfield with a capacity of 2.55 mgd
    - A two-phased project for constructing a new FAS wellfield and RO treatment trains at the South Miami Heights WTP with a total treatment capacity of 17.45 mgd for backup to the C-51 Reservoir offset water.

- The **Palm Beach County Water Utilities Department** plans to expand WTP 2 to add 12.50 mgd of membrane softening capacity for treating increased SAS withdrawals.
- The **Village of Wellington** plans to replace lime softening with a membrane softening treatment system that will increase overall treatment capacity by 0.70 mgd.
- **Broward County Water and Wastewater Services District 2A/North Regional** plans to add FAS wells and expand its WTP by adding 6.00 mgd of RO treatment as a backup to the C-51 Reservoir offset water.
- The **City of Fort Lauderdale** plans to expand its water treatment capacity by 6 mgd through the construction of additional FAS wells and RO treatment as a backup to the C-51 Reservoir offset water.
- The **City of Hollywood** plans to construct FAS wells and expand its RO treatment plant by 4.00 mgd.
- The **City of Lauderhill** plans to install FAS wells and construct an RO WTP adding 3.00 mgd of treatment capacity.
- The **City of Boynton Beach** plans to construct FAS wells and an RO WTP adding 8.00 mgd of treatment capacity.
- The **City of West Palm Beach** plans to construct FAS wells and an RO WTP adding 30.00 mgd of treatment capacity by 2043.
- In addition to the utilities listed above, several other utilities have also purchased C-51 Reservoir Phase 1 storage capacity to offset additional SAS raw water withdrawals above their base condition allocation. Please refer to **Table 8-2**, the utility profiles in **Appendix B**, and **Chapter 5** for further information.

Reclaimed Storage Pond and Pump Station

In addition, PS utilities have also proposed 22 nonpotable water supply projects using reclaimed water, surface water, and stormwater that could create up to 70.35 mgd of additional water supply for landscape and golf course irrigation as well as groundwater recharge (**Table 8-2**). The proposed nonpotable water projects include construction and expansion of reclaimed water production facilities and surface water storage projects. Although projects involving new nonpotable water distribution lines and other infrastructure may qualify for the Cooperative Funding Program (described later in this chapter), they are not included as projects generating new water supply capacity. The individual reuse inventory reports submitted to the Florida Department of Environmental Protection (FDEP) for the year 2021 (FDEP 2022) indicated 7.9% of wastewater generated in Broward, 5.9% in Miami-Dade, 3.5% in Monroe, and 49.7% in Palm Beach was reused (including supplemental flows) for irrigation, industrial applications, wetland hydration, and aquifer recharge.

Table 8-2. Proposed potable and nonpotable water supply development projects in the LEC Planning Area (2021 to 2045).

County	Potable Utility Name	Project Name[a]	Project Description	Project Capacity (mgd)	Total Capital ($M)	Estimated Completion Date
Nonpotable – Surface Water						
Broward	BCWWS D1	C-51 Reservoir Phase 1 - BCWWS D1	C-51 Reservoir offset water credits purchased	1.00	$4.60	2023
	BCWWS D2	C-51 Reservoir Phase 1 - BCWWS D2	C-51 Reservoir offset water credits purchased	2.00	$9.20	2023
	BCWWS-SRW	C-51 Reservoir Phase 1- BCWWS-SRW	C-51 Reservoir offset water credits purchased	3.00	$13.80	2023
	Dania	C-51 Reservoir Phase 1 - Dania	C-51 Reservoir offset water credits purchased	1.00	$4.60	2023
	Fort Lauderdale	C-51 Reservoir Phase 1 - Fort Lauderdale	C-51 Reservoir offset water credits purchased	3.00	$13.80	2023
	Hallandale	C-51 Reservoir Phase 1 - Hallandale	C-51 Reservoir offset water credits purchased	1.00	$4.60	2023
	Margate	C-51 Reservoir Phase 1- Margate	C-51 Reservoir offset water credits purchased	2.00	$9.20	2023
	Pompano	C-51 Reservoir Phase 1 - Pompano	C-51 Reservoir offset water credits purchased	2.00	$9.20	2023
	Sunrise	C-51 Reservoir Phase 1 - Sunrise	C-51 Reservoir offset water credits purchased	5.00	$23.00	2023
Miami-Dade	MDWASD	C-51 Reservoir Phase 1- MDWASD	C-51 Reservoir offset water credits purchased	15.00	$69.00	2023
Palm Beach	West Palm Beach	Grassy Waters Preserve Storage Improvements	Construct improvements to increase the water storage capacity of the existing Grassy Waters and Apoxee preserves	3.00	$6.00	2028
Potable – SAS						
Broward	Hallandale	SAS Well 9	Construction of SAS Well 9	3.03[b]	$1.80	2023
	Sunrise	Springtree RO Conversion to Membrane Softening Phase 1	Replace RO skids with membrane softening resulting in 0.20 mgd of additional capacity	0.20	$1.00	2025
	Sunrise	Springtree RO Conversion to Membrane Softening Phase 2	Second phase of RO to membrane softening conversion project adding 1.70 mgd of capacity	1.70	$7.00	2028
Miami-Dade	Homestead	JD Redd Park 1.67 mgd SAS Recharge for Offset	Construct a distribution line and recharge trench to use industrial cooling wastewater for recharging and offsetting SAS withdrawals	1.67	$0.40	2024
	MDWASD	South Miami Heights New 2.55 mgd SAS WTP	Construct new 2.55 mgd membrane softening WTP	2.55	$25.00	2026
	MDWASD	Cluster 10 SAS Wellfield	Construct Cluster 10 SAS Wellfield	15.00	$10.00	2031
	North Miami Beach	Norwood WTP – SAS Wells and Raw Water Mains – Phase 2	Construct an SAS well, wellhead, and raw water mains	3.70	$1.75	2026

Table 8-2. Continued.

County	Potable Utility Name	Project Name	Project Description	Project Capacity (mgd)	Total Capital ($M)	Estimated Completion Date
Potable – SAS (Continued)						
Palm Beach	PBCWUD	WTP 2 12.50 mgd Expansion – Membrane Softening	Expand WTP 2 to add 12.50 mgd of membrane softening treatment capacity	12.50	$65.00	2028
	Wellington	Membrane Softening Expansion and Decommissioning of Lime Softening WTP	Membrane softening treatment expansion and decommissioning of lime softening WTP resulting in 0.70 mgd capacity increase	0.70	$10.70	2028
Potable – FAS						
Broward	BCWWS D2	District 2A 6.00 mgd RO WTP Expansion	Expand existing RO WTP by 6.00 mgd	6.00	$33.34	2035
	Fort Lauderdale	Construct New 6.00 mgd RO Facility at Dixie WTP and FAS Wellfield	Construct 6.00 mgd new RO facility and FAS wells at Dixie WTP	6.00	$49.10	2034
	Hollywood	2.00 mgd RO Facility Expansion Train E and FAS Wells F14 and F15	Construct Train E to expand RO capacity by 2.00 mgd at the Hollywood WTP and construct FAS Wells F14 and F15	2.00	$5.00	2034
	Hollywood	2.00 mgd RO Facility Expansion Train F and FAS Wells F16 and F17	Construct Train F to expand RO capacity by 2.00 mgd and construct FAS Wells F16 and F17	2.00	$5.00	2042
	Lauderhill	New 1.00 mgd RO Facility and FAS Wells – Phase 1	Construct new 1.00 mgd RO facility and FAS wells – Phase 1	1.00	$25.00	2028
	Lauderhill	2.00 mgd Expansion of RO Facility – Phase 2	Expand RO facility by 2.00 mgd – Phase 2	2.00	$30.00	2030
	Miramar	2.50 mgd RO Train No. 2 (West WTP) for Standby	Construct backup 2.50 mgd RO train at West WTP	2.50	$7.59	2025
	Miramar	2.50 mgd RO Train No. 3 (West WTP) for Standby and FAS Wells 4 and 5	Construct additional 2.50 mgd backup RO skid and FAS Wells 4 and 5	2.50	$15.00	2030
	NSID	New 2.00 mgd RO WTP	Construct new 2.00 mgd RO WTP	2.00	$2.45	2023
Miami-Dade	MDWASD	Hialeah 2.50 mgd RO WTP Expansion and 4 FAS Wells – Phase 1b	Expand Hialeah RO treatment capacity by 2.50 mgd and construct 4 FAS wells – Phase 1b	2.50	$2.45	2023
	MDWASD	South Miami Heights: New 12.45 mgd RO WTP and Wells for FAS backup to C-51 – Phase 1	Construct new 12.45 mgd RO WTP and wells for FAS backup to C-51 – Phase 1 South Miami Heights	12.45	$264.25	2026
	MDWASD	South Miami Heights: 5.00 mgd RO facility Expansion for backup to C-51 – Phase 2	Expand RO treatment capacity by 5.00 mgd for backup to C-51 – Phase 2 South Miami Heights	5.00	Included Above	2029
	North Miami Beach	Norwood WTP – FAS Well, Lines, Mains – Phase 2	Construct an FAS well, wellhead, and mains	3.70	$1.75	2026

Table 8-2. Continued.

County	Potable Utility Name	Project Name	Project Description	Project Capacity (mgd)	Total Capital ($M)	Estimated Completion Date
Potable – FAS (Continued)						
Palm Beach	Boynton Beach	New 8.0 mgd RO Facility and 3 FAS Wells	Construct new 8 mgd RO treatment facility and 3 FAS wells	8.00	$20.00	2029
	Riviera Beach	New 12.00 mgd RO WTP and 12 FAS Wells	Construct new 12.00 mgd RO WTP and 12 FAS wells	12.00	$140.00	2026
	West Palm Beach	New 30.00 mgd RO WTP and FAS Wells	Construct a new 30.00 mgd RO WTP and FAS wells	30.00	$750.00	2043
Nonpotable – Reclaimed Water						
Broward	BCWWS D2	North Regional - 16.00 mgd WRF Expansion	Expand the North Regional WRF by 16.00 mgd	16.00	$54.20	2023
	Davie	Reclaimed Water System Extension – Bamford Sports Complex and along University Drive between SW 36th Street and SW 30th Street	Construct a reclaimed water main to Bamford Sports Complex and along University Drive between SW 36th Street and SW 30th Street adding up to 0.20 mgd of reclaimed water distribution capacity	0.20	$1.40	2023
	Davie	Reclaimed Water System Extension along SW 92nd Avenue from SW 36th Avenue to Griffin Road	Construct a reclaimed water main along SW 92nd Street from 36th Avenue to Griffin Road adding up to 1.00 mgd of reclaimed water distribution capacity	1.00	$2.30	2025
	Davie	Reclaimed Water System Extension along SW 30th Street from 75th Avenue to College Avenue	Construct a reclaimed water main along SW 30th Street from 75th Avenue to College Avenue adding up to 0.30 mgd of reclaimed water distribution capacity	0.30	$1.00	2025
	Deerfield	Reclaimed Water Distribution Line and Purchase Agreement with BCWWS	Construct a reclaimed water main and purchase agreement with BCWWS adding up to 1.00 mgd of reclaimed water distribution capacity	1.00	$11.00	2030
	Miramar	Reclaimed Water System Extension West of I-75	Construct a reclaimed water distribution main west of I-75 adding up to 3.50 mgd of reclaimed water distribution capacity	3.50	$8.60	2025
	Pompano	Pompano-Broward Reclaimed Water Trunk Main	Construct a reclaimed water trunk main of 10.00 mgd to replace the current diversion from Broward's ocean outfall pipeline	10.00	$50.00	2025

Table 8-2. Continued.

County	Potable Utility Name	Project Name	Project Description	Project Capacity (mgd)	Total Capital ($M)	Estimated Completion Date
Nonpotable – Reclaimed Water (Continued)						
Broward (Continued)	Pompano	3.5 mg Reclaimed Water Storage Tank with Booster Station	Construct a 3.50 mg reclaimed water storage tank with booster station	3.50	$15.00	2027
	Pompano	3.5 mg Reclaimed Water Storage Tank	Construct a 3.50 mg reclaimed water storage tank	3.50	$5.00	2035
	Pompano	5.00 mgd WRF Expansion	Construct 5.00 mgd WRF expansion	5.00	$15.00	2035
	Pompano	Reclaimed Water System Extension Program Phase VI+	Construct multiple reclaimed water distribution projects adding a total of 6.90 mgd of distribution capacity by 2030	6.90	$7.80	2030
Miami-Dade	Homestead	4.00 mgd Reclaimed Water Treatment Expansion	Construct 4.00 mgd expansion of WRF	4.00	$45.00	2030
	Miami-Dade	South District Reclaimed Water Main Extension to FPL Turkey Point	Construct a reclaimed water main extension to FPL Turkey Point with a distribution capacity of up to 15.00 mgd	15.00	$315.00	2025
	Miami-Dade	South District Effluent Energy Recovery System	Construct distribution system to direct up to 50.00 mgd of treated effluent for industrial cooling at WWTF prior to deep well injection	50.00	$22.00	2045
	Miami-Dade	Central District Effluent Energy Recovery System	Construct distribution system to direct up to 24.00 mgd of treated effluent for industrial cooling at WWTF prior to deep well injection	24.00	$19.50	2045
	Miami-Dade	North District Effluent Energy Recovery System	Construct distribution system to direct up to 35.00 mgd of treated effluent for industrial cooling at WWTF prior to deep well injection	35.00	$15.00	2045
	Miami-Dade	Zoo Miami Water Resource Recovery Facility	Construct a new wastewater treatment system at Zoo Miami to create up to 0.40 mgd of reclaimed water for onsite uses.	0.40	$24.00	2045
Monroe	FKAA	Key Largo Wastewater Treatment District and FKAA – Initial Direct Potable Reuse Demonstration Project	Key Largo Wastewater Treatment District to construct initial direct potable reuse demonstration project, expandable using RO, in conjunction with FKAA	0.50	$2.00	2026
	FKAA	Key Largo Wastewater Treatment District and FKAA – Direct Potable Reuse Demonstration Project Expansion	Expand initial direct potable reuse project to full capacity of Key Largo WWTF, FKAA participation required	3.45	$6.00	2030

Table 8-2. Continued.

County	Potable Utility Name	Project Name	Project Description	Project Capacity (mgd)	Total Capital ($M)	Estimated Completion Date
Nonpotable – Reclaimed Water (Continued)						
Monroe (Continued)	FKAA	City of Marathon – Reuse System Reactivation and Expansion	Reactivation of existing conventional reuse systems and extension of distribution mains, installation of irrigation systems on city property	1.40	$3.00	2024
	FKAA	City of Marathon and FKAA – Direct Potable Reuse RO	Install RO systems at 5 WWTFs to produce potable water from advanced wastewater treated reclaimed water to supplement existing FKAA water system, FKAA participation required		$16.00	2030
	FKAA	City of Marathon and FKAA – Indirect Potable Reuse with ASR and RO	Install pumping systems and conveyance force main from 5 WWTFs to Grassy Key ASR pumping system and wells, and construct 1.40 mgd of RO to provide advanced wastewater treatment, FKAA participation required		$14.00	2030
	FKAA	Key West Resort Utilities – Reuse Distribution Mains and Irrigation Systems	Construct extension of reclaimed water distribution mains to major users and installation of irrigation systems	0.85	$3.00	2027
	FKAA	Key West Resort Utilities and FKAA – Direct Potable Reuse Distribution Line	Extend a distribution main to the FKAA facility to convey advanced treated reclaimed water as source water for FKAA's RO facility, FKAA participation required	0.50	$1.00	2026
Palm Beach	Boynton Beach	Reclaimed Water System Extension – Phases 1-4	Construct multiple reclaimed water distribution projects adding a total of 3.30 mgd of distribution capacity by 2030	3.30	$40.00	2030
	Delray Beach	Reclaimed Water System Extension – Area 9	Construct a reclaimed water distribution main with a distribution capacity of 0.20 mgd	0.20	$1.50	2026
	Delray Beach	Reclaimed Water System Extension – Area 10	Construct a reclaimed water distribution main with a distribution capacity of 0.10 mgd	0.10	$2.70	2023
	Delray Beach	Reclaimed Water System Extension – Area 15	Construct a reclaimed water distribution main with a distribution capacity of 0.16 mgd	0.16	$1.70	2028
	Delray Beach	Reclaimed Water System Extension – Areas 2, 3, 5	Construct multiple reclaimed water distribution projects adding a total of 0.42 mgd of distribution capacity by 2026	0.42	$1.00	2026

Table 8-2. Continued.

County	Potable Utility Name	Project Name	Project Description	Project Capacity (mgd)	Total Capital ($M)	Estimated Completion Date
Nonpotable – Reclaimed Water (Continued)						
Palm Beach (Continued)	PBCWUD	Green Cay Wetlands Phase 2: 2.00 mgd Indirect Potable Reuse Project – WTP, 2.3 Miles Purified Water Pipeline, and 4 SAS Wells	Construct a 2.00 mgd potable reuse WRF, 2.3 miles of transmission lines, and 4 SAS Wells	2.00	$47.50	2025
	PBCWUD	Palm Beach-Broward Interconnect Phase 1B: South Reclaimed Water Transmission and System Extension in Southern Palm Beach County	Construct reclaimed water system extension in southern Palm Beach County adding up to 10.51 mgd of distribution capacity	10.51	$58.50	2028
	Wellington	0.20 mgd WRF Expansion – Phase 2	Expand WRF by 0.20 mgd	0.20	$1.30	2030

ASR = aquifer storage and recovery; BCWWS = Broward County Water and Wastewater Services; BCWWS-SRW = Broward County Water and Wastewater Services–South Regional Wellfield; FAS = Floridan aquifer system; FKAA = Florida Keys Aqueduct Authority; FPL = Florida Power & Light; LEC = Lower East Coast; MDWASD = Miami-Dade Water and Sewer Department; mg = million gallons; mgd = million gallons per day; NSID = North Springs Improvement District; PBCWUD = Palm Beach County Water Utilities Department; RO = reverse osmosis; SAS = surficial aquifer system; WRF=water reclamation facility; WTP = water treatment plant; WWTF = wastewater treatment facility.

[a] Based on planning-level screening, water supply projects are identified in this plan update to meet 2045 projected demands and have a likelihood of being permitted. However, each proposed use of water must meet the conditions for permit issuance found in Section 373.223, F.S., and the implementing criteria found in Chapter 40E-2, F.A.C., and will be reviewed on an application-by-application basis.

[b] The City of Hallandale has worked with SFWMD staff to permit a replacement well (Well 9) and modify a permit to increase its SAS allocation. The new well did not increase potable water treatment capacity.

Domestic Self-Supply

Domestic Self-Supply (DSS) includes potable water used by households served by small utilities (less than 0.10 mgd) or self-supplied by private wells. DSS average net (finished) demands in the LEC Planning Area are projected to increase from 10.55 mgd in 2021 to 14.45 mgd in 2045. All current and future needs in this use category are expected to be met from private wells using fresh groundwater from the SAS. As such, no water supply development projects have been proposed for this use category.

Agriculture

AG water use includes self-supplied water used for crop irrigation, greenhouses, nurseries, livestock watering, pasture irrigation, and aquaculture. AG is the second largest water use category in the LEC Planning Area and is projected to remain so over the planning horizon. However, AG is the only water use category projected to have a lower demand in 2045 than in 2021. Gross AG water demand is projected to decrease by 1%, from 645.20 mgd in 2021 to 637.65 mgd in 2045, and irrigated acreage is projected to decrease by 2% (11,465 acres). **Chapter 2** and **Appendix A** provide more information about AG water use and projected demands.

The majority of AG water demand in the LEC Planning Area is supplied by fresh surface water and groundwater. Water availability from most surface water and groundwater sources are limited by regulatory protections (**Chapter 4**).

Water supply opportunities for AG may be available in the future by capture and use of on-site water normally lost to a farm's water management system (tailwater recovery), capture and use of stormwater, and blending of brackish groundwater with fresh water. The storage and use of reclaimed water may be possible for a limited number of crops when meeting food safety and market standards, but there are no reclaimed water sources near AG areas in the region. More efficient irrigation systems could reduce the amount of water needed to meet future crop demands; however, implementation of such systems can be economically and technically challenging. No specific water supply development projects for this category were provided or identified for this 2023–2024 LEC Plan Update.

Continued use of best management practices (BMPs), including water conservation, could reduce the amount of water needed to meet crop demands (**Chapter 3**). The Florida Department of Agriculture and Consumer Services (FDACS) develops and adopts (by rule) agricultural BMPs addressing water quality. Some BMPs contain an implicit water conservation component. Growers who enroll in the FDACS BMP program and implement the BMPs demonstrate their commitment to water resource protection, have a presumption of compliance with state water quality standards, and are eligible for technical and financial assistance towards meeting water resource protection goals.

Commercial/Industrial/Institutional

The CII water use category includes self-supplied water associated with the production of goods or provision of services by commercial, industrial, and institutional establishments. Water demands for CII in the LEC Planning Area are met primarily using traditional supplies such as fresh surface water and groundwater and, to a limited extent, reclaimed water. The

projected average gross demand for this category is estimated to be 102.56 mgd by 2045, which is a slight increase from 2021 demands (87.35 mgd).

Although traditional water supplies generally are considered adequate to meet the relatively small demands projected for CII, AWS options should be considered based on local conditions. If reclaimed water is available to meet existing and/or new CII demands, the feasibility of such opportunities will be evaluated through the water use permitting process. No specific water supply development projects for this category were provided or identified for this 2023–2024 LEC Plan Update.

Landscape/Recreational

The Landscape/Recreational (L/R) category includes self-supplied water used to irrigate golf courses, sports fields, parks, cemeteries, and large common areas (e.g., land managed by homeowners' associations and commercial developments). Irrigation supplies for this category include fresh groundwater, surface water from local canals or stormwater management system ponds, and reclaimed water. In the LEC Planning Area, L/R average gross demand is projected to increase from 178.65 mgd in 2021 to 199.18 mgd in 2045.

The projected increase in growth for this category is expected to be partially met through currently proposed reclaimed water projects. In the LEC Planning Area, reclaimed water is used to irrigate large, landscaped areas, such as residential and commercial common areas. Historically, irrigation supplies for this category included local fresh groundwater and surface water from canals or stormwater management system ponds. Reclaimed water is used to meet approximately 26.3% of the irrigation demand for L/R.

Reclaimed water treatment capacity increases projected by wastewater treatment utilities indicate substantial volumes of additional reclaimed water will be made available in the future, primarily due to compliance with the Ocean Outfall Law pursuant to Section 403.086(10), F.S. More information can be found in **Chapter 5** and **Appendix E**. Reclaimed water projects proposed by PS utilities and WWTFs are expected to generate 32.35 mgd of additional reclaimed water treatment capacity by 2045. This additional volume may provide opportunities for current irrigation users to convert existing irrigation from traditional fresh water to reclaimed water. No specific water supply development projects for this category have been provided or identified for this 2023–2024 LEC Plan Update.

Power Generation

The Power Generation (PG) water demands, which includes water used for cooling, processing, and potable drinking water at power generation facilities is projected to increase from 42.20 mgd in 2021 to 62.33 mgd in 2045. There are seven PG sites located in the LEC Planning Area that utilize fresh and brackish groundwater and surface water to meet a portion of their demands. Of the seven sites, one, the Florida Power and Light's (FPL) West County Energy Center, utilizes close to 15 mgd of reclaimed water to meet a majority of its industrial cooling demands. However, by 2045, that facility may receive up to 20 mgd of reclaimed water for that purpose, and the FPL facility at Turkey Point Clean Energy Center may receive up to 15 mgd of reclaimed water to meet its demands for industrial cooling and processing water.

As stated above, PG water demands are expected to increase by approximately 20 mgd from 2021 to 2045. Because the availability of fresh water is limited in the LEC Planning Area, AWS sources may be the most feasible options to meet future PG use if a new use is proposed. No specific water supply development projects for this category were provided or identified for this 2023–2024 LEC Plan Update.

COOPERATIVE FUNDING PROGRAM

Funding for water supply development and water conservation at the local level is the shared responsibility of water suppliers and users. The State of Florida and the water management districts have provided funding to local water users to develop AWS sources and to implement water conservation programs. One criterion for funding consideration is that the project must be included in, or consistent with, a regional water supply plan update. Some projects not included in this 2023–2024 LEC Plan Update, but consistent with the plan's goals, may be funded. When the SFWMD deems appropriate, a plan may specifically identify the need for multijurisdictional approaches to projects based on technical, permit, and financial feasibility.

Boca Raton Membrane Concentrate Recycling

For nearly two decades, the SFWMD has provided funding to local governments, special districts, utilities, homeowners' associations, water users, and other public and private organizations for AWS, water conservation, and stormwater projects consistent with the SFWMD's core mission. In 2016, these efforts were combined under the Cooperative Funding Program (CFP), which provides financial incentives for local projects that complement ongoing regional restoration, flood control, water quality, and water supply efforts within the District's 16-county jurisdiction.

Each fiscal year, the District Governing Board will determine the amount of funding, if any, to allocate to the CFP, the project priorities for that year, and the cost share to be allocated. SFWMD staff will review the proposed projects based on guidelines and priorities established by the District's Governing Board. Program funding is subject to approval by the District Governing Board.

Alternative Water Supply

The AWS component of the CFP provides cost-share funding for projects that increase water supply. These projects include development of saltwater or brackish water, reclaimed or recycled water, surface water captured during heavy rainfalls, sources made available through addition of new storage capacity, and stormwater (for use by a water use permittee), among others. From Fiscal Year (FY) 2018 through FY2022, the SFWMD provided more than $24.2 million in AWS funding for 20 projects located throughout the District. Eight of these projects are in the LEC Planning Area, generating 16 mgd of AWS capacity and 2.6 mgd of additional reclaimed water distribution capacity (**Table 8-3**).

Table 8-3. Alternative water supply (reclaimed water) projects in the LEC Planning Area supported by the Cooperative Funding Program (FY2018 to FY2022).

Project Name	Entity Name	Fiscal Year	Capacity (mgd)
Palm Beach County			
Reclaimed Water Main Construction along SW 4th Street	Delray Beach, City of	2020	0.21[a]
Reclaimed Water Main Extension – Area 10 Phase 2	Delray Beach, City of	2021	0.12[a]
Broward County			
Broward-Palm Beach Reclaimed Water Main Interconnect	Broward County Board of County Commissioners	2020	16.00
Reclaimed Water Distribution System Expansion: NE 16th Street to NE 24th Street and NE 23rd Avenue to Intracoastal Waterway	Pompano Beach, City of	2020	0.34[a]
T.Y. (Topeekeegee Yugnee) Park Reclaimed Water Main Expansion	Broward County Board of County Commissioners	2020	0.46[a]
Reclaimed Water System Extension – Bamford Sports Complex and along University Drive between SW 36th Street and SW 30th Street	Davie, Town of	2021	0.20[a]
Reclaimed Water System Extension along SW 92nd Avenue from SW 36th Avenue to Griffin Road	Davie, Town of	2022	1.00[a]
Reclaimed Water System Extension along SW 30th Street from 75th Avenue to College Avenue	Davie, Town of	2022	0.30[a]
		Total Capacity	**16.00**

FY = Fiscal Year; LEC = Lower East Coast; mgd = million gallons per day.
[a] Project adds to the reclaimed water distribution system but does not increase actual water treatment capacity.

Water Conservation


Rain Sensor

The water conservation component of the Cooperative Funding Program or CFP, formerly known as the Water Savings Incentive Program or WaterSIP, provides cost-share funding for projects that reduce urban and agricultural water use. The SFWMD has provided matching funds up to 50% to water providers and users (e.g., local governments, utilities, agricultural operations, industrial groups, schools, hospitals, homeowners' associations) for water-saving technologies, such as low-flow plumbing fixtures, rain sensors, fire hydrant flushing devices, and other hardware. From FY2018 to FY2022, the SFWMD provided more than $2.5 million in funding towards 43 water conservation projects, with an estimated water savings of 1,108.1 million gallons per year (mgy), or 3.04 mgd. In the LEC Planning Area, 20 of these projects received $1.04 million in funding with an estimated water savings of 413.60 mgy or 1.13 mgd (**Table 8-4**). **Chapter 3** contains additional information on water conservation efforts.

Table 8-4. Water conservation projects in the LEC Planning Area supported by the Water Savings Incentive Program and the Cooperative Funding Program (FY2018 to FY2022).

Project Name	Entity Name	Project Type	Fiscal Year	Proposed Water Savings (mgy)
Palm Beach County				
Nursery Overhead Efficiency Project 2	Palm Beach Soil and Water Conservation District	Irrigation	2020	37.90
Community Water Conservation Strategies – Phase VII – HET	West Palm Beach, City of	Indoor Plumbing	2020	4.98
Belle Glade Celery Drip Ag Irrigation Retrofit (200 acres)	Duda Farm Fresh Foods, Inc.	Irrigation	2020	82.00
Automatic Line Flushing Devices	Delray Beach, City of	ALFD	2020	3.80
Nursery Overhead Efficiency Project 3	Palm Beach Soil and Water Conservation District	Irrigation	2021	53.60
Irrigation Controller Retrofit at 32 Facilities	School District of Palm Beach County	Irrigation	2021	49.40
Urban Irrigation Efficiency Improvement Program	West Palm Beach, City of	Irrigation	2022	8.70
Community Water Conservation Strategies Phase VIII – HET	West Palm Beach, City of	Indoor Plumbing	2022	3.53
Broward County				
NatureScape Residential Irrigation Rebate Program	Broward Water Partnership[a]	Irrigation	2020	27.10
Conservation Pays HET Rebate Program	Broward Water Partnership[a]	Indoor Plumbing	2020	16.80
USEPA WaterSense HET Replacement/Credit Program	Broward County Board of County Commissioners	Indoor Plumbing	2021	5.33
Water Conservation Software Technology	Davie, Town of	Software	2022	23.40
Miami-Dade County				
Residential HET Rebate Project FY20/21	MDWASD	Indoor Plumbing	2020	27.40
Landscape Irrigation Rebate Project FY20/21	MDWASD	Irrigation	2020	29.50
Residential HET Rebate Project FY21/22	MDWASD	Indoor Plumbing	2021	5.50
Residential High-Efficiency Showerhead and Faucet Rebate Project FY21/22	MDWASD	Indoor Plumbing	2021	7.00
Landscape Irrigation Rebate Project FY21/22	MDWASD	Irrigation	2021	6.21
Landscape Irrigation Rebate Project FY22/23	MDWASD	Irrigation	2022	11.65
Residential HET and High-Efficiency Fixture Rebate Projects FY22/23	MDWASD	Indoor Plumbing	2022	5.20
Monroe County				
HET Retrofit Rebate Program	Florida Keys Aqueduct Authority	Indoor Plumbing	2020	4.60
			Estimated Total Water Savings	**413.60**

ALFD = automatic line flushing device; CFP = Cooperative Funding Program; FY = Fiscal Year; HET = high-efficiency toilet; LEC = Lower East Coast; MDWASD = Miami-Dade Water and Sewer Department; mgy = million gallons per year; USEPA = United States Environmental Protection Agency.

[a] This project was completed by the Broward County Resilient Environment Department on behalf of the Broward Water Partnership.

SUMMARY OF WATER SUPPLY DEVELOPMENT PROJECTS

Total average gross water demands within the LEC Planning Area from all sources are projected to increase approximately 208.84 mgd (11%) by 2045. Meeting these demands requires continued demand reduction through water conservation and use of diverse water sources, including brackish groundwater, reclaimed water, seasonally available surface water, and ASR.

To meet projected 2045 demand, 11 of the 54 PS utilities need to construct projects to meet their projected 2045 demands. The proposed water supply development projects could generate 113.60 mgd of new water treatment capacity to meet the 2045 PS net (finished) demand of 945.47 mgd. New treatment capacity consists of 95.95 mgd of water produced by FAS projects and 17.65 mgd of water produced by SAS projects. Summaries of existing and proposed projects and capacities are provided in **Tables 8-1** and **8-5**.

Although users are not required to select a project included in this 2023–2024 LEC Plan Update, in accordance with Section 373.709(6), F.S., development and implementation of water supply projects, including AWS, is critical to ensure an adequate water supply is available for future growth while sustaining the natural systems.

Table 8-5. Existing and proposed increase in water supply treatment capacities (in mgd) for LEC Public Supply utilities.

County	Public Supply Utility	Surface Water/ Stormwater		SAS		FAS		ASR[a]		Reclaimed Water[b]	
		Existing	Proposed[c]	Existing	Proposed[c]	Existing	Proposed[c]	Existing	Proposed[c]	Existing	Proposed[c]
Broward	BCWWS District 1		1.00	16.00							
	BCWWS District 2A		2.00	30.00			6.00[d]			6.40	16.00
	BCWWS District 3		3.00								
	Cooper City			7.00							
	Coral Springs			16.00							
	CSID			7.40							
	Dania Beach		1.00	5.00							
	Davie			4.00		6.00				1.67	
	Deerfield Beach			20.60		3.00					
	Fort Lauderdale		3.00	82.75			6.00				
	Hallandale Beach		1.00	16.00							
	Hillsboro Beach			2.25							
	Hollywood			55.50		4.00	4.00			8.00	
	Lauderhill			16.00			3.00				
	Margate		2.00	13.50							
	Miramar			15.25		2.50	5.00			7.50	
	North Lauderdale			7.50							
	NSID			6.80			2.00				
	Parkland			0.58							
	Pembroke Pines			18.00							
	Plantation			24.00						2.00	
	Pompano Beach		2.00	50.00						7.50	5.00
	Royal Utility			1.00							
	STOF – Hollywood[e]			3.53							

Table 8-5. Continued.

County	Public Supply Utility	Surface Water/ Stormwater		SAS		FAS		ASR[a]		Reclaimed Water[b]	
		Existing	Proposed[c]	Existing	Proposed[c]	Existing	Proposed[c]	Existing	Proposed[c]	Existing	Proposed[c]
Broward (Continued)	Sunrise		5.00	50.00	1.90	1.50	-1.50			4.99	
	Tamarac			16.00							
	Tindall Hammock			1.00						0.60	-0.60
Hendry	STOF - Big Cypress[e]			2.00							
Miami-Dade	Americana Village			0.50							
	Florida City			4.00							
	Homestead			19.20						5.00	4.00
	MDWASD		15.00	451.93	2.55	7.50	19.95[d]	25.00		124.82	0.40
	North Miami			9.30							
	North Miami Beach			32.00		9.50					
Monroe	FKAA			23.80		6.00			1.40	1.93[f]	5.35
Palm Beach	Boca Raton			70.00						17.50	
	Boynton Beach			34.40			8.00	4.00		14.00	
	Delray Beach			26.00						10.00	
	Golf			0.86							
	Highland Beach					3.00					
	Jupiter			16.30		13.70				11.50[g]	
	Lake Worth Beach			12.90		4.50					
	Lantana			3.84							
	Manalapan			0.65		1.70					
	Mangonia Park			1.08							
	Maralago Cay			0.42							
	PBCWUD			103.28	12.50					25.89	2.00

Table 8-5. Continued.

County	Public Supply Utility	Surface Water/ Stormwater		SAS		FAS		ASR[a]		Reclaimed Water[b]	
		Existing	Proposed[c]	Existing	Proposed[c]	Existing	Proposed[c]	Existing	Proposed[c]	Existing	Proposed[c]
Palm Beach (Continued)	PBCWUD Western Region					10.00				0.68	
	Palm Springs			10.00							
	Riviera Beach			17.50			12.00				
	Seacoast			27.50		3.00				14.67	
	Tequesta			2.73		3.60				2.50[g]	
	Wellington			12.30	0.70					6.42	0.20
	West Palm Beach	47.00	3.00				30.00	8.00		28.00	
LEC Planning Area Total		**47.00**	**38.00**	**1,368.15**	**17.65**	**79.50**	**94.45**	**37.00**	**1.40**	**301.57**	**32.35**

ASR = aquifer storage and recovery; BCWWS = Broward County Water and Wastewater Services; CSID = Coral Springs Improvement District; FAS = Floridan aquifer system; FKAA = Florida Keys Aqueduct Authority; LEC = Lower East Coast; MDWASD = Miami-Dade Water and Sewer Department; mgd = million gallons per day; NSID = North Springs Improvement District; PBCWUD = Palm Beach County Water Utilities Department; SAS = surficial aquifer system; STOF = Seminole Tribe of Florida.

[a] Estimated recoverable storage capacity, not water supply capacity.

[b] Reclaimed water is not a potable water source; however, it is an AWS used to reduce reliance on traditional water sources.

[c] Distribution lines, wells, ASR wells, stormwater reservoirs, and other infrastructure or storage projects that do not generate additional water supplies are not counted as adding increased water supply treatment capacity.

[d] The expansion of the 2A WTP is postponed pending the status of the C-51 Reservoir Phase 1 project.

[e] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Broward and Hendry counties. However, for discussion purposes, information relating to the Seminole Tribe of Florida Hollywood and Big Cypress Reservations are included in the calculations.

[f] The total estimated reclaimed water treatment capacity of all WWTFs located within the FKAA service area.

[g] Based on the Loxahatchee River Water Control District's total reclaimed water treatment capacity of 14.00 mgd and the estimated portion of reclaimed water distribution lines located within the Jupiter and Tequesta potable water utility service areas.

[h] Supplemented with SAS backup.

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9

Conclusions and Future Direction

This chapter of the *2023–2024 Lower East Coast Water Supply Plan Update* (2023–2024 LEC Plan Update) provides conclusions and summarizes the future direction for water supply planning in the LEC Planning Area of the South Florida Water Management District (SFWMD or District). This plan update assesses the water demands from 2021 through 2045. Water demand is expected to increase by 208.81 million gallons per day (mgd) by 2045, primarily due to increases in the Public Supply (PS) and Landscape/Recreational (L/R) water use categories (**Chapter 2**). Water conservation is an important component of integrated water resource management and may reduce, defer, or eliminate the need to expand water supply infrastructure. Water conservation by all users reduces demands and is a component of meeting future water needs (**Chapter 3**).

TOPICS

- Demand Summary
- Demand Management: Water Conservation
- Natural Systems and Resource Protection
- Water Source Options
- Coordination
- Climate Change and Sea Level Rise
- Conclusions

There are several activities planned or under way to meet natural systems water needs, including Comprehensive Everglades Restoration Plan (CERP) projects and changes to lake regulation schedules, that can affect (enhance or limit) future water supplies within the LEC Planning Area (**Chapter 7**). In addition, regulatory criteria designed to protect water resources, including water reservations, restricted allocation areas, and elements identified in minimum flow and minimum water level (MFL) prevention and recovery strategies, place limitations on water available for allocation (**Chapter 4**, **Appendix C**).

Guidance in this 2023–2024 LEC Plan Update should be considered when developing water supply options to meet future needs. Statutory requirements, existing conditions, resource constraints (including protection tools and criteria), and the needs of all water users are addressed. All water users are encouraged to continue being prudent with water use decisions and use water efficiently. The SFWMD's recommendations for water supply planning in the LEC Planning Area include continued coordination with agricultural stakeholders, PS utilities, and other water users; protection of natural resources; diversification of water sources; and continued monitoring of water levels and water quality in surface water and groundwater.

DEMAND SUMMARY

Total average annual demand for all water use categories for 2045 is projected to be 2,061.83 mgd (**Table 9-1**). This is an 11% increase from the estimated 2021 demands (1,853.02 mgd) and 3% more than the projected 2040 demands (2,006.54) in the *2018 Lower East Coast Water Supply Plan Update* (SFWMD 2018).

Table 9-1. Change in water use demands in the LEC Planning Area from 2021 to 2045.

Water Use Category	2021 Estimated Use (mgd)	2045 Projected Demand (mgd)	Percent Change	Percent of Projected 2045 Total Demand
PS	889.64	1,046.52	17.63%	50.76%
DSS	9.98	13.59	36.17%	0.66%
AG	645.20	637.65	-1.17%	30.93%
CII	87.35	102.56	17.41%	4.97%
L/R	178.65	199.18	11.49%	9.66%
PG	42.20	62.33	47.70%	3.02%
LEC Planning Area Total	**1,853.02**	**2,061.83**	**11.27%**	**100.00%**

AG = Agriculture; CII = Commercial/Industrial/Institutional; DSS = Domestic Self-Supply; L/R = Landscape/Recreational; LEC = Lower East Coast; mgd = million gallons per day; PG = Power Generation; PS = Public Supply.

DEMAND MANAGEMENT: WATER CONSERVATION

Water conservation measures and programs for all water use categories offer the potential to reduce the amount of water needed to meet future demands (**Chapter 3**). All water users are urged to implement water conservation measures to reduce demands and defer construction of capital-intensive projects. The following conservation-related actions are recommended:

- The SFWMD should continue to implement its Comprehensive Water Conservation Program and its Cooperative Funding Program.
- Agricultural water users are encouraged to install or upgrade to high-efficiency irrigation systems, advanced irrigation technology (controllers), and when applicable, Florida Automated Weather Network (FAWN) irrigation tools. More efficient irrigation systems could substantially reduce the amount of water needed to meet future crop demands; however, implementation of such systems may be economically and technically challenging.
- PS utilities are encouraged to develop goal-based water conservation plans and proactively implement water-saving measures and programs, such as incentives to promote replacement of older water fixtures with new high-efficiency ones.
- Local governments should evaluate whether mandated water conservation measures, such as requirements for construction of water-efficient homes and commercial properties, are appropriate for their jurisdiction.

- Local governments should adopt a year-round irrigation ordinance that fully comports with the SFWMD's Mandatory Year-Round Landscape Irrigation Conservation Measures Rule (Chapter 40E-24, Florida Administrative Code). Although 71 of the 116 local governments have adopted acceptable ordinances, 45 in the LEC Planning area have not yet adopted irrigation ordinances.
- Local governments should develop and adopt ordinances to promote and be consistent with Florida-Friendly Landscaping provisions (Section 373.185, Florida Statutes).
- Public education programs can help instill a year-round conservation ethic. Local and tribal governments and PS utilities are encouraged to provide conservation-related information, messaging, and educational programs in cooperation with the SFWMD.
- All eligible water users are encouraged to seek cost-share funding opportunities that may be available for water conservation projects.
- L/R water users are encouraged to implement advanced irrigation technology, improve landscape design and best management practices, and participate in recognition programs (e.g., Florida-Friendly Landscaping program) to further increase landscape water use efficiency.
- Commercial/Industrial/Institutional (CII) entities are encouraged to use the *Water Efficiency and Self-Conducted Water Audits at Commercial and Institutional Facilities, A Guide for Facility Managers* (SFWMD 2013) to improve water use efficiency and reduce operating costs.

NATURAL SYSTEMS AND RESOURCE PROTECTION

STA-1 West Cell 3

In addition to the protection of water resources, a wide range of activities related to natural systems can affect future water supplies within the LEC Planning Area. Such activities include construction of CERP projects; changes by the United States Army Corps of Engineers (USACE) to regulation schedules for the Everglades, Lake Okeechobee, and other water bodies; and monitoring and research projects. In addition, regulatory criteria designed to protect water resources and related natural systems place limitations on water available for allocation (**Chapter 4**, **Appendix C**).

CERP includes regional projects to improve the quality, timing, volume, distribution, and delivery of water to the natural system. Future environmental restoration and water resource protection efforts include the following:

- The SFWMD and USCAE will continue to make progress towards completion of Restoration Strategies Program and CERP projects, including construction of flow restoration and equalization basins/stormwater treatment areas, Broward County Water Preserve Areas, Central Everglades Planning Project, Western Everglades Restoration Project, C-111 Spreader Canal Western project, Biscayne Bay Coastal Wetlands project, and Biscayne Bay Southeastern Everglades Ecosystem Restoration.

- The SFWMD will continue to partner with the USACE on planning for future CERP projects in the Lake Okeechobee, Loxahatchee River, and Western Everglades watersheds; Central Everglades; Biscayne Bay; and other coastal areas and in the Broward County Water Preserve Areas.
- The SFWMD will continue to synchronize CERP priorities with the USACE using the Integrated Delivery Schedule (USACE 2023), a sequencing strategy for planning, designing, and constructing cost-shared projects as part of the South Florida Ecosystem Restoration Program, based on ecosystem needs, benefits, costs, and available funding.
- The SFWMD will continue to develop and implement new regulatory rules and criteria, such as water reservations and restricted allocation areas, to protect water created for natural systems by CERP and other restoration projects.
- The SFWMD will continue to refine operations to achieve restoration benefits, including ongoing efforts in the Combined Operational Plan, Modified Water Deliveries to Everglades National Park, and Water Conservation Area-3A Decompartmentalization Physical Model projects.
- The SFWMD will continue to monitor and research natural areas, including Biscayne Bay, Florida Bay, the Loxahatchee River, and Lake Okeechobee and provide annual updates in the *South Florida Environmental Report* (https://www.sfwmd.gov/sfer) to track the health of the areas and meet regulatory requirements.
- The SFWMD will continue to implement, review, and update MFL prevention and recovery strategies, as appropriate, in conjunction with future water supply plan updates.
- The SFWMD will continue to re-evaluate the Biscayne aquifer monitoring network data on a regular basis to ensure water levels in coastal canals that recharge the aquifer are being maintained at the operation levels needed to meet the Biscayne Aquifer MFL.

WATER SOURCE OPTIONS

PS users rely primarily on fresh groundwater from the surficial aquifer system (SAS). Withdrawals from the SAS have been maximized in many areas, especially along the coast, due to potential impacts on wetlands, potential for saltwater intrusion into freshwater sources, and proximity to contamination sources. Therefore, PS utilities are projected to continue increasing use of the Floridan aquifer system (FAS) to meet future water demands.

Agricultural users in the LEC Planning Area rely primarily on surface water from Lake Okeechobee, water conservation areas, regional canals, and groundwater where surface water is not available. Based on projected declines in agricultural demands due to the conversion of agricultural lands to residential and other land uses in Palm Beach and Miami-Dade counties, the existing surface water and groundwater sources should be able to meet future landscape irrigation demands.

Alternative water supply (AWS) sources, such as reclaimed water, can be used to meet new uses or replace freshwater sources and potable water currently used for irrigation or industrial purposes. Additionally, water storage features, such as reservoirs, aquifer storage

and recovery (ASR) wells, and impoundments, can capture excess stormwater, groundwater, and surface water during wet-weather periods and provide supplemental water supply for AG, PS, natural systems, and other needs during dry periods. Seawater is a potential AWS source as membrane technology costs continue to decline; however, no seawater projects are proposed in this plan update.

Climate change and sea level rise can affect water resources and water demands in the LEC Planning Area. The District, local governments, and water users need to be diligent in proactively understanding potential impacts, develop tools to predict those potential impacts, and implement resiliency strategies in a coordinated effort.

The following sections offer guidance for consideration by local governments, water users, and the SFWMD as a basis for the future availability of water supply sources in the LEC Planning Area.

Surface Water

Surface water sources in the LEC Planning Area, including Lake Okeechobee, are integrally connected as part of the Kissimmee-Okeechobee-Everglades ecosystem and regional water supply system. Several local water control districts have connections with the regional system to divert water for water supply. In addition, many regional surface water bodies are part of current and future environmental restoration projects. Water availability in most of these systems is limited due to restricted allocation area criteria or other protective measures. Additional water storage features could enhance water availability. The following actions should be implemented:

- The USACE completed the rehabilitation of the Herbert Hoover Dike and revised the Lake Okeechobee System Operating Manual (LOSOM), expected to be finalized in 2024. Capital projects to increase storage in the basin, such as ASR systems and aboveground storage reservoirs, will continue being designed and constructed.

Herbert Hoover Dike

- The SFWMD and USACE will complete and implement the components identified in the Lake Okeechobee Watershed Restoration Project. Part of CERP, this project will increase the watershed's storage capacity and improve the quantity and timing of water deliveries to Lake Okeechobee.
- Local governments, agricultural operations, and utilities are encouraged to create additional storage capacity for excess surface water to use for water supply purposes, when feasible. Entities also are encouraged to investigate the potential storage capacity in local water control district systems.

Groundwater

Fresh groundwater is the primary source of water for potable use and agricultural irrigation in the LEC Planning Area coastal region. Approximately 91% of PS demand in 2021 was met with water from the SAS. Current permit allocations are sufficient to meet most utilities' demands through 2045. Additional allocation of fresh groundwater above currently permitted levels to meet future PS demand in the LEC Planning Area depends on the location and source limitations. Use of reclaimed water and water conservation measures can extend fresh groundwater supplies. The remaining 2045 PS demand is expected to be met using the brackish FAS.

Surficial Aquifer System

Withdrawals from the SAS are limited due to MFL rules, restricted allocation area criteria, saltwater intrusion concerns, potential impacts on wetlands, pollution, interference with existing legal users, and off-site land uses. Potential use of the SAS for new or increased allocations will be evaluated on an application-by-application basis to determine if a project meets water use permitting criteria. The following actions are suggested:

- Water users are encouraged to reduce reliance on the SAS by diversifying water sources and developing AWS sources to meet future water demands.
- PS utilities should design wellfield locations, configurations, and pumping regimes to avoid saltwater intrusion, pollution, harm to natural systems, or increased dependence on the regional system (as demonstrated through modeling).
- PS utilities should consider implementing groundwater recharge systems using reclaimed or excess surface water as an impact offset or substitution credit (see *Reclaimed Water* section).
- PS utilities should continue to expand interconnections with other utilities for supply reliability and assess existing interconnections to confirm they operate as intended.
- The SFWMD, United States Geological Survey (USGS), and local governments should continue coordinating saltwater intrusion monitoring efforts to delineate the location and movement of the saltwater interface and identify areas of concern. The SFWMD will continue to update saltwater interface maps every 5 years.
- The SFWMD will periodically review existing groundwater monitoring networks and enhance them, as appropriate.
- The SFWMD will work with appropriate local governments to identify long-term sustainable water supply solutions in Domestic Self-Supply (DSS) areas that are currently or projected to experience aquifer stress.

Floridan Aquifer System

The FAS is expected to be the primary water source to meet increased PS demands. Brackish groundwater from the FAS is considered an AWS source in the LEC Planning Area. The following future actions are suggested:

Floridan Aquifer System Monitor Well

- Local water users installing FAS wells are encouraged to collaborate with the SFWMD to gather and share hydrogeologic data. Additional data will increase knowledge of aquifer properties and could support updates to future groundwater modeling efforts of the FAS.
- The monitoring networks used to assess the SAS and FAS are a hybrid of regional monitoring by agencies, such as the SFWMD and USGS, and monitoring performed by water use permittees as part of their permit requirements. Efforts should be made to identify wells considered critical to long-term monitoring and modeling to ensure they are maintained or replaced, as necessary.
- Local water users, other agencies, local governments, and PS utilities are encouraged to coordinate with the SFWMD to improve ongoing water level and water quality monitoring of the FAS.
- PS utilities should use an incremental approach when installing and testing production wells due to geologic variability within the FAS. Wellfields should be designed with adequate separation between wells and monitored to prevent overstressing production zones to minimize harmful changes in water quality.
- The SFWMD will continue to work with FAS stakeholders to further refine assumptions and data used in groundwater model simulations.
- Landowners are encouraged to plug and abandon free-flowing, inactive, or nonfunctional FAS wells in accordance with existing rules and regulations. This will prevent loss of water via free-flowing wells and contamination of the overlying SAS with more saline water from the FAS.

Reclaimed Water

In the LEC Planning Area, reclaimed water is used for L/R irrigation, groundwater recharge, power generation (PG) cooling water, and environmental enhancement. Reclaimed water can be used to meet new uses or replace freshwater sources currently used for irrigation and industrial purposes, thereby decreasing the use of traditional freshwater sources. Opportunities to expand reclaimed water use include the following:

- Local governments should consider requiring construction of reclaimed water infrastructure in new development projects. Building codes, ordinances, and land development regulations are options to promote reclaimed water use.

- Local governments should consider establishing mandatory reuse zones, where reclaimed water use is required by ordinance. The SFWMD will provide technical assistance to local governments who wish to establish mandatory reuse zones.
- Local governments and PS utilities should support development of additional reclaimed water lines for green space irrigation (e.g., residential lots, medians, common areas, golf courses) to decrease reliance on traditional freshwater sources.

Water Reuse

- PS utilities should consider using substitution credits and impact offsets (Section 373.250, Florida Statutes) to promote increased availability and distribution of reclaimed water and decreased use of traditional water sources.
- PS utilities should extend their reclaimed water supply by implementing feasible options, such as increased storage, residential customer metering, tiered rate structures, limiting landscape irrigation frequency, and interconnects with other reclaimed water utilities.

New Storage Capacity for Surface Water or Groundwater

In the LEC Planning Area, water storage options include reservoirs, ASR wells, and surface water impoundments that capture excess groundwater or surface water for later use. In addition, ASR can be used to store excess potable water and reclaimed water for seasonal or longer-term drought resilience. Proposed projects that develop new storage and create additional water supply may be considered AWS sources. Opportunities for new storage capacity include the following:

West Palm Beach ASR System at Clear Lake

- Surface water storage systems (e.g., reservoirs) can help meet urban, agricultural, and environmental water supply needs.
- New or retrofitted surface water storage systems for agricultural operations could provide additional water supply for irrigation but may have limited availability during a 1-in-10-year drought.
- ASR systems can store water during periods of low demand and high-water levels (i.e., during the wet season) for subsequent recovery during dry periods, which could reduce withdrawals from the SAS wells.

Seawater

The ocean is an important source of water, but desalination is required before seawater can be used for water supply purposes. Where appropriate, utilities should consider the feasibility of desalinated seawater from the Atlantic Ocean as an additional water source option for the LEC Planning Area.

COORDINATION

Coordination and collaboration among regional and local government agencies and utility planning entities is essential to ensure the supply of water is sufficient and sustainable to meet urban, agricultural, and environmental needs. Examples of coordination activities include the following:

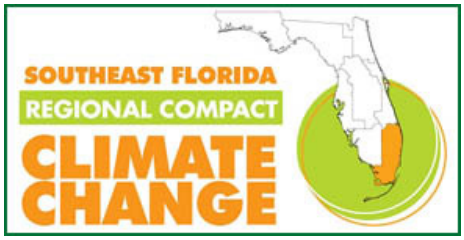
- Water Supply Facilities Work Plans are due within 18 months of approval of this 2023–2024 LEC Plan Update. Local governments must provide linkages and coordination between the SFWMD's plan update and the water supply-related components of their Comprehensive Plans.
- The SFWMD will continue to work with the Florida Department of Agriculture and Consumer Services and agricultural stakeholders to provide data for annual updates to the Florida Statewide Agricultural Irrigation Demand simulation for future crop acreage and water demand projections.
- The SFWMD will continue to coordinate with utilities, counties, and the USGS to review, recommend improvements, and provide data and analyses for saltwater intrusion monitoring networks.
- Where wellfields are at risk of saltwater intrusion, the SFWMD will work with utilities and counties to identify additional monitoring needs and potential solutions.
- The SFWMD will coordinate with stakeholders on the development and use of regional groundwater and surface water models to evaluate water resource availability.
- The SFWMD will support the development of multijurisdictional partnerships, where appropriate, to implement programs or projects that benefit a greater number of people than one entity might benefit by itself, such as the Broward Water Partnership and the C-51 Reservoir Project participants.
- The SFWMD will continue to coordinate with local governments, utilities, and private entities on resiliency efforts and development of adaptive strategies to address climate change and sea level rise.

CLIMATE CHANGE AND SEA LEVEL RISE

Climate change and sea level rise could affect hydrologic conditions, and thus water supply sources, as well as patterns of water demand. Recommendations related to climate change and sea level rise include the following:

- The SFWMD will continue to investigate climate change and sea level rise projection models for use in water supply planning and system operations.
- The SFWMD will continue to support AWS development and promote water conservation to increase the security and diversity of water sources, as withdrawing less water from aquifers helps prevent saltwater intrusion.
- The SFWMD, USACE, and coastal utilities and municipalities should identify methods to evaluate the consequences of climate change and sea level rise and use them to assess the cumulative impacts to existing structures and legal users.

- The SFWMD will continue to provide technical assistance to local governments as they develop climate change adaptation strategies.
- Local governments and utilities are encouraged to participate in the Southeast Florida Regional Climate Change Compact to support regional planning efforts and initiatives focused on adapting to rising sea levels in the LEC Planning Area.



Southeast Florida Regional Climate Change Compact

- Water users should periodically review irrigation schedules and consider installing weather-based controllers.
- PS utilities should plan for climate change and sea level rise by reducing withdrawals from the SAS and by using the FAS, employing water conservation measures to reduce overall water demands, and expanding reuse programs to reduce potable and self-supplied SAS withdrawals for irrigation.
- Local governments, utilities, and private entities should coordinate on resiliency efforts and development of adaptive strategies to address climate change and sea level rise (e.g., constructing defensive barriers, improving infrastructure, rezoning property threatened by inundation or transferring it to public ownership).

CONCLUSIONS

Building on the findings and conclusions of previous LEC water supply plan updates, this 2023–2024 LEC Plan Update assesses water supply demand and available sources through 2045. This plan update concludes that future water needs of the region during average and 1-in-10-year drought conditions can be met through the 2045 planning horizon with appropriate management, conservation, and implementation of projects identified herein.

Meeting future water needs through 2045 in the LEC Planning Area depends on the following:

- Construction of potable water supply development projects by PS utilities.
- Implementation of CERP Restoration Strategies and other water resource development projects to provide additional storage.
- Implementation of LOSOM and construction of CERP capital projects identified in MFL prevention and recovery strategies.

Successful implementation of this 2023–2024 LEC Plan Update requires close collaboration with agricultural interests, local and tribal governments, utilities, and other stakeholders. Coordination efforts should ensure that water resources in the LEC Planning Area continue to be prudently managed and available to meet future demands while also protecting natural systems.

REFERENCES

SFWMD. 2013. *Water Efficiency and Self-Conducted Water Audits at Commercial and Institutional Facilities, A Guide for Facility Managers*, *2nd Edition*. South Florida Water Management District, West Palm Beach, FL. July 2013.

SFWMD. 2018. *2018 Lower East Coast Water Supply Plan Update*. South Florida Water Management District, West Palm Beach, FL. November 2018.

USACE. 2023. *Integrated Delivery Schedule 2023 Update*. United States Army Corps of Engineers, Jacksonville, FL. November 2023.

Glossary

1-in-10-year drought A year in which below normal rainfall occurs with a 90% probability of being exceeded in any other year. It has an expected return frequency of once in 10 years.

1-in-10-year level of certainty (see *Level of Certainty*)

Acre-foot, acre-feet Volume of water that covers 1 acre (43,560 square feet) to a depth of 1 foot. The equivalent of 43,560 cubic feet, 1,233.5 cubic meters, or 325,872 gallons.

Agricultural best management practice (Agricultural BMP) A practice or combination of agricultural practices, based on research, field testing, and expert review, determined to be the most effective and practicable means of improving water quality or quantity while maintaining or even enhancing agricultural production.

Agricultural Field-Scale Irrigation Requirements Simulation (AFSIRS) A water budget model for calculating irrigation demands that estimates demand based on basin-specific data. The AFSIRS model calculates both net and gross irrigation requirements for average and 1-in-10-year drought irrigation requirements. A crop's net irrigation requirement is the amount of water delivered to the root zone of the crop, while the gross irrigation requirement includes both the net irrigation requirement and the losses incurred in the process of delivering irrigation to the crop's root zone.

Agriculture (AG) Self-supplied water used for commercial crop irrigation, greenhouses, nurseries, livestock watering, pasture, and aquaculture.

Alternative water supply Salt water; brackish surface water and groundwater; surface water captured predominately during wet-weather flows; sources made available through the addition of new storage capacity for surface water or groundwater; water that has been reclaimed after one or more public supply, municipal, industrial, commercial, or agricultural uses; the downstream augmentation of water bodies with reclaimed water; stormwater; and, any other water supply source that is designated as nontraditional for a water supply planning region in the applicable regional water supply plan (Section 373.019, Florida Statutes [F.S.]).

***Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District* (Applicant's Handbook)** Read in conjunction with Chapter 40E-2, Florida Administrative Code (F.A.C.), the Applicant's Handbook further specifies the general procedures and criteria used by SFWMD staff for review of water use permit applications to ensure water uses permitted by the SFWMD are reasonable-beneficial, do not interfere with existing legal users, and are in the public interest.

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

Aquifer storage and recovery (ASR) The underground storage of potable water, stormwater, surface water, fresh groundwater, or reclaimed water, which is appropriately treated to potable standards and injected into an aquifer through wells. The aquifer (typically the Floridan aquifer system in South Florida) acts as an underground reservoir for the injected water, reducing water loss to evaporation. The water is injected during the wet season or when water is readily available and stored with the intent to recover it for use during future dry periods.

Aquifer system A heterogeneous body of (interbedded or intercalated) permeable and less permeable material that functions regionally as a water-yielding hydraulic unit and may be composed of more than one aquifer separated at least locally by confining units that impede groundwater movement, but do not greatly affect the hydraulic continuity of the system.

Average rainfall year A year having rainfall with a 50% probability of being exceeded over a 12-month period.

Base condition A specified period of time during which collected data are used for comparison with subsequent data.

Basin There are two types of basins: 1) a groundwater basin is a hydrologic unit consisting of one large aquifer, or several connecting and interconnecting aquifers; and 2) a surface water basin is a tract of land drained by a surface water body or its tributaries.

Below land surface Depth below land surface regardless of land surface elevation.

Boulder Zone A highly transmissive, cavernous zone of dolomite within the Lower Floridan aquifer used to dispose of secondary-treated effluent from wastewater treatment facilities and concentrate from membrane water treatment plants via deep injection wells.

Brackish water Water with a chloride concentration greater than 250 milligrams per liter (mg/L) and less than 19,000 mg/L.

Canal A manmade waterway used for draining or irrigating land or for navigation by boat.

Capacity The ability to treat, move, or reuse water. Typically, capacity is expressed in millions of gallons per day (mgd).

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

Commercial/Industrial/Institutional (CII) Self-supplied water associated with the production of goods or provision of services by industrial, commercial, or institutional establishments.

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

Confined aquifer An aquifer containing groundwater that is confined under pressure and bounded between substantially less permeable materials such that water will rise in a fully penetrating well above the top of the aquifer. In cases where the hydraulic head is greater than the elevation of the overlying land surface, a fully penetrating well will naturally flow at the land surface without means of pumping or lifting.

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

Conservation (see *Water conservation*)

Consumptive use Any use of water that reduces the supply from which it is withdrawn or diverted**.**

Control structure An artificial structure designed to regulate the level/flow of water in a canal or other water body (e.g., weirs, dams).

Cubic feet per second (cfs) A rate of flow (e.g., in streams and rivers) equal to a volume of water 1 foot high and 1 foot wide flowing a distance of 1 foot in 1 second. One cfs is equal to 7.48 gallons of water flowing each second.

DBHYDRO The SFWMD's corporate environmental database, storing hydrologic, meteorologic, hydrogeologic, and water quality data.

Demand The quantity of water needed to fulfill a requirement.

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

Dike An embankment to confine or control water, especially one built along the banks of a river or lake to prevent overflow of lowlands; a levee.

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

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

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

Domestic Self-Supply (DSS) Potable water used by households served by small utilities (less than 0.10 mgd) or self-supplied by private wells.

Domestic wastewater Wastewater derived principally from residential dwellings, commercial buildings, and institutions; sanitary wastewater; sewage.

Drainage basin The land area where precipitation ultimately drains to a particular watercourse (e.g., river, stream) or body of water (e.g., lake, reservoir). Drainage basins in South Florida are defined by rule and periodically are redefined to reflect changes in the regional drainage network.

Drawdown 1) The vertical distance between the static water level and the surface of the cone of depression. 2) A lowering of the groundwater surface caused by pumping.

Drought A long period of abnormally low rainfall, especially one that reduces water supply availability.

Ecology The study of the inter-relationships of plants and animals to one another and to their physical and biological environment.

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

Ecosystem restoration The process of reestablishing to as near its natural condition as possible, the structure, function, and composition of an ecosystem.

Elevation The height in feet above mean sea level according to National Geodetic Vertical Datum of 1929 (NGVD29) or North American Vertical Datum of 1988 (NAVD88). May also be expressed in feet above mean sea level as reference datum.

Environmental impact statement An evaluation of the positive and negative environmental effects of a proposed agency action required under United States environmental law by the National Environmental Policy Act for federal government agency actions "significantly affecting the quality of the human environment."

Estuary A body of water found where a river meets the ocean that is characterized by fresh water mixing with salt water.

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

Exceedance The violation of the pollutant levels permitted by environmental protection standards.

Exceedance (MFL) As defined in Rule 40E-8.021(17), F.A.C., to fall below a minimum flow or level, which is established in Parts II and III of Chapter 40E-8, F.A.C, for a duration greater than specified for the MFL water body.

Finished water Water that has undergone a purification or treatment process; water that has passed through all the processes in a water treatment plant and is ready to be delivered to consumers. Contrast with *Raw water*.

Finished water demand (see *Net water demand*)

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

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

Florida Department of Agriculture and Consumer Services (FDACS) An executive department of the Government of Florida. FDACS supports and promotes Florida agriculture, protects the environment, safeguards consumers, ensures the safety and wholesomeness of food and implements agricultural best management practices, addressing water quality and water conservation.

Florida-Friendly Landscaping Quality landscapes that conserve water, protect the environment, are adaptable to local conditions, and are drought tolerant. The principles of such landscaping include planting the right plant in the right place, efficient watering, appropriate fertilization, mulching, attraction of wildlife, responsible management of yard pests, recycling yard waste, reduction of stormwater runoff, and waterfront protection.

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

Floridan aquifer system (FAS) A highly used, deep aquifer system composed of the Upper and Lower Floridan aquifers. It is the principal source of water supply north of Lake Okeechobee and is highly mineralized south of the lake, requiring membrane treatment prior to use.

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

Fresh water An aqueous solution with a chloride concentration less than or equal to 250 mg/L.

Geologic unit A geologic unit is a volume of rock or ice of identifiable origin and age range that is defined by the distinctive and dominant, easily mapped and recognizable petrographic, lithologic, or paleontologic features that characterize it.

Gross (raw) water demand The amount of water withdrawn from a water resource to meet a particular need of a water user or customer. Gross demand is the amount of water allocated in a water use permit. Gross or raw water demands are nearly always higher than net or user/customer water demands to account for treatment and distribution losses.

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

Groundwater recharge (see *Recharge*)

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

Headwater(s) 1) Water that is typically of higher elevation (with respect to tailwater) or on the controlled side of a structure. 2) The waters at the highest upstream point of a natural system that are considered the major source waters of the system.

Hydrogeologic unit Any rock unit or zone that because of its hydraulic properties has a distinct influence on the storage or movement of groundwater.

Hydrogeology The geology of groundwater, with emphasis on the chemistry and movement of water.

Hydrologic condition(s) The state of an area pertaining to the amount and timing of water present.

Hydrologic model A conceptual or physically based procedure for numerically simulating a process or processes that occur in a watershed.

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

Impoundment Any lake, reservoir, or other containment of surface water occupying a depression or bed in the earth's surface and having a discernible shoreline.

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

Inflow 1) The act or process of flowing in or into. 2) The measured quantity of water that has moved into a specific location.

Injection well Refers to a well constructed to inject treated wastewater directly into the ground. Wastewater is generally forced (pumped) into the well for dispersal or storage in a designated aquifer. Injection wells are generally drilled below freshwater levels, or into unused aquifers or aquifers that do not contain drinking water.

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

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

Landscape/Recreational (L/R) Self-supplied and reclaimed water used to irrigate golf courses, sports fields, parks, cemeteries, and large common areas, such as land managed by homeowners' associations and commercial developments.

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

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

Marsh A frequently or continually inundated unforested wetland characterized by emergent herbaceous vegetation adapted to saturated soil conditions.

Miccosukee Tribe of Indians of Florida A federally recognized Native American tribe, who was part of the Seminole Nation until they organized as an independent tribe in 1962. The Miccosukee Tribe of Indians of Florida is recognized by the State of Florida pursuant to Chapter 285, Florida Statutes.

Million gallons per day (mgd) A rate of flow of water equal to 133,680.56 cubic feet per day, 1.5472 cubic feet per second, or 3.0689 acre-feet per day. A flow of one million gallons per day for one year equals 1,120 acre-feet (365 million gallons).

Minimum flow and minimum water level (MFL) A flow or level established by the SFWMD pursuant to Sections 373.042 and 373.0421, F.S., for a given water body, at which further withdrawals would be significantly harmful to the water resources or ecology of the area.

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

Model A computer model is a representation of a system and its operations and provides a cost-effective way to evaluate future system changes, summarize data, and help understand interactions in complex systems. Hydrologic models are used for evaluating, planning, and simulating the implementation of operations within the SFWMD's water management system under different climatic and hydrologic conditions. Water quality and ecological models are also used to evaluate other processes vital to the health of ecosystems. Groundwater flow models are a numerical representation of water flow and water quality within an aquifer or aquifer system.

Monitor well Any human-made excavation by any method to monitor fluctuations in groundwater levels, quality of underground waters, or the concentration of contaminants in underground waters.

National Geodetic Vertical Datum of 1929 (NGVD29) A geodetic datum derived from a network of information collected in the United States and Canada. It was formerly called the "Sea Level Datum of 1929" or "mean sea level." As technology has improved and the demand for greater accuracy increased, inherent inaccuracies were uncovered in NGVD29. As a result, NGVD29 has been superseded by the North American Vertical Datum (NAVD) of 1988.

Natural system(s) A self-sustaining living system that supports an interdependent network of aquatic, wetland-dependent, and upland living resources.

Outflow The measured quantity of water that has left an area or water body (through pumping or gravity) during a certain period of time.

Per capita use 1) The average amount of water used per person during a standard time period, generally per day. 2) Total use divided by the total population served.

Permeability The capacity of a porous rock, sediment, or soil for transmitting a fluid.

Planning Area The SFWMD is divided into five areas within which planning activities are focused: Upper Kissimmee Basin (part of the Central Florida Water Initiative), Lower Kissimmee Basin, Upper East Coast, Lower West Coast, and Lower East Coast.

Potable water Water that is suitable for drinking, culinary, or domestic purposes.

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

Power Generation (PG) The difference in the amount of water withdrawn by electric power generating facilities for cooling purposes and the water returned to the hydrologic system near the point of withdrawal.

Priority Water Bodies List and Schedule Required in Section 373.042(2), F.S. of the state's five water management districts to provide the Florida Department of Environmental Protection with an annual list and schedule of specific surface waters and groundwaters with minimum flows and levels and water reservation rules that will be adopted to protect them from the effects of consumptive use allocations.

Process water Water used for nonpotable industrial use, e.g., mixing cement.

Public Supply (PS) Water supplied by water treatment facilities for potable use (drinking quality) with projected average pumpages greater than 0.10 million gallons per day.

Public Supply (PS) demand All potable (drinking quality) water supplied by water treatment plants with projected average pumpages of 0.10 million gallons per day or greater to all types of customers, not just residential.

Rapid infiltration basin A disposal method by which treated wastewater is applied in deep and permeable deposits of highly porous soils for percolation.

Raw water 1) Water that is direct from the source—groundwater or surface water—without any treatment. 2) Untreated water, usually that entering the first unit of a water treatment plant. Contrast with *Finished Water*.

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

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

Recharge (groundwater) The natural or intentional infiltration of surface water or reclaimed water into the ground to raise groundwater levels.

Reclaimed water Water that has received at least secondary treatment and basic disinfection and is reused after flowing out of a domestic wastewater treatment facility (Rule 62-610.200, F.A.C.).

Recovery The rate and extent of return of a natural population or community to some aspect(s) of its previous condition. Because of the dynamic nature of ecological systems, the attributes of a "recovered" system should be carefully defined.

Reservoir An artificial or natural water body used for water storage. Reservoirs can be above or below ground.

Restoration The recovery of a natural system's vitality and biological and hydrological integrity to the extent that the health and ecological functions are self-sustaining over time.

Restricted allocation area An area designated within the South Florida Water Management District boundaries for which allocation restrictions are applied regarding the use of specific sources of water. The water resources in these areas are managed in response to specific sources of water in the area for which there is a lack of water availability to meet the projected needs of the region from that specific source of water.

Retrofit 1) Indoor: The replacement of existing water fixtures, appliances, and devices with more efficient fixtures, appliances, and devices for the purpose of water conservation. 2) Outdoor: The replacement or changing out of an existing irrigation system with a more efficient irrigation system, such as a conversion from an overhead sprinkler system to a micro-irrigation system. May also include rain or soil moisture sensors to increase efficiency.

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

Reverse osmosis A treatment process for desalting water using applied pressure to drive the feed water (source water) through a semipermeable membrane.

Rule(s) Of or pertaining to the SFWMD's regulatory programs, which are set forth in various statutes, codes, and criteria.

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

Salinity Of or relating to chemical salts, usually measured in milligrams per liter (mg/L), or practical salinity units.

Salt water (see *Seawater or Salt water*)

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

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

Seawater or **Salt water** Water with a chloride concentration at or above 19,000 mg/L.

Seepage The passage of water or other fluid through a porous medium, such as the passage of water through an earth embankment or masonry wall. Groundwater emerging on the face of a stream bank; the slow movement of water through small cracks, pores, interstices, etc., of a material into or out of a body of surface or subsurface water. Seepage is generally expressed as flow volume per unit of time.

Seminole Tribe of Florida A federally recognized Indian Tribe organized pursuant to Section 16 of the Indian Reorganization Act of 1934 and recognized by the State of Florida pursuant to Chapter 285, Florida Statutes.

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

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

Significant harm As defined in Chapter 40E-8, F.A.C., the temporary loss of water resource functions that results from a change in surface water or groundwater hydrology and takes more than 2 years to recover, but which is considered less severe than serious harm.

Stormwater Water that does not infiltrate but accumulates on land as a result of storm runoff, snowmelt, irrigation, or drainage from impervious surfaces.

Stormwater discharge Precipitation runoff from roadways, parking lots, and roof drains that is collected in gutters and drains. A major source of nonpoint source pollution to water bodies and sewage treatment facilities in municipalities where stormwater is combined with the flow of domestic wastewater (sewage) before entering the wastewater treatment facility.

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

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

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

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

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

United States Army Corps of Engineers (USACE) As part of the Department of the Army, the USACE has responsibilities in civil and military areas. In civil works, the USACE has authority for approval of dredge and fill permits in navigable waters and tributaries thereof; the USACE enforces wetlands regulations, and constructs and operates a variety of water resource projects, mostly notably reservoirs, levee, dams, and locks.

United States Geological Survey (USGS) The federal agency chartered in 1879 by Congress to classify public lands, and to examine the geologic structure, mineral resources, and products of the national domain. As part of its mission, the USGS provides information and data on the nation's rivers and streams that are useful for mitigation of hazards associated with floods and droughts, including streamflow, groundwater, water quality, and water use and availability.

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

Violation (MFL) As defined in Rule 40E-8.021(18), F.A.C., to fall below an adopted minimum flow or level criterion for a duration and frequency greater than specified for the MFL water body. Unless otherwise specified herein, in determining the frequency with which water flows and levels fall below an established MFL for purposes of determining an MFL violation, a "year" means 365 days from the last day of the previous MFL exceedance.

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

Water conservation The permanent, long-term reduction of daily water use. Permanent water use reduction requires the implementation of water saving technologies and measures that reduce water use while satisfying consumer needs. Water conservation is considered a demand management measure because it reduces the need for future expansion of water supply infrastructure (see *Demand management*).

Water conservation rate structure A water rate structure designed to conserve water. Examples of conservation rate structures include increasing block rates, seasonal rates, and quantity-based surcharges.

Water management The general application of practices to obtain added benefits from precipitation, water or water flow in any of a number of areas, such as irrigation, drainage, wildlife and recreation, navigation, water supply, watershed management, and water storage in soil for crop production. Watershed management is the analysis, protection, development, operation, or maintenance of the land, vegetation, and water resources of a drainage basin for the conservation of all its resources for the benefit of its residents. Watershed management for water production is concerned with the quality, quantity and timing of the water which is produced.

Water quality 1) A term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose. 2) The physical, chemical, and biological condition of water as applied to a specific use. Federal and state guidelines set water quality standards based on the water's intended use, whether it is for recreation, fishing, drinking, navigation, shellfish harvesting, or agriculture.

Water reservation A legal mechanism to set aside water for the protection of fish and wildlife or the public health and safety from consumptive water use. The reservation is composed of a quantification of the water to be protected, which includes a seasonal and a location component.

Water resource development The formulation and implementation of regional water resource management strategies, including collection and evaluation of surface water and groundwater data; structural and nonstructural programs to protect and manage the water resources; development of regional water resource implementation programs; construction, operation and maintenance of major public works facilities to provide for flood control, surface and groundwater storage, and groundwater recharge augmentation; and related technical assistance to local governments and to government-owned and privately owned water utilities (Section 373.019, F.S.).

Water reuse (see *Reuse*)

Watershed A region or area bounded peripherally by a water parting and draining ultimately to a particular watercourse or body of water. Watersheds conform to federal hydrologic unit code standards and can be divided into subwatersheds and further divided into catchments, the smallest water management unit recognized by SFWMD Operations. Unlike drainage basins, which are defined by Rule, watersheds are continuously evolving as the drainage network evolves.

Water Shortage Plan(s) This effort includes provisions in Chapters 40E-21 and 40E-22, F.A.C., and identifies how water supplies are allocated to users during declared water shortages. The plan allows for supply allotments and cutbacks to be identified on a weekly basis based on the water level within Lake Okeechobee, demands, time of year, and rainfall forecasts.

Water supply development The planning, design, construction, operation, and maintenance of public or private facilities for water collection, production, treatment, transmission, or distribution for sale, resale, or end use (Section 373.019, F.S.).

Water Supply Plan Detailed water supply plan developed by the water management districts under Section 373.709, F.S., providing an evaluation of available water supply and projected demands at the regional scale. The planning process projects future demand for at least 20 years and recommends projects to meet identified needs.

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

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

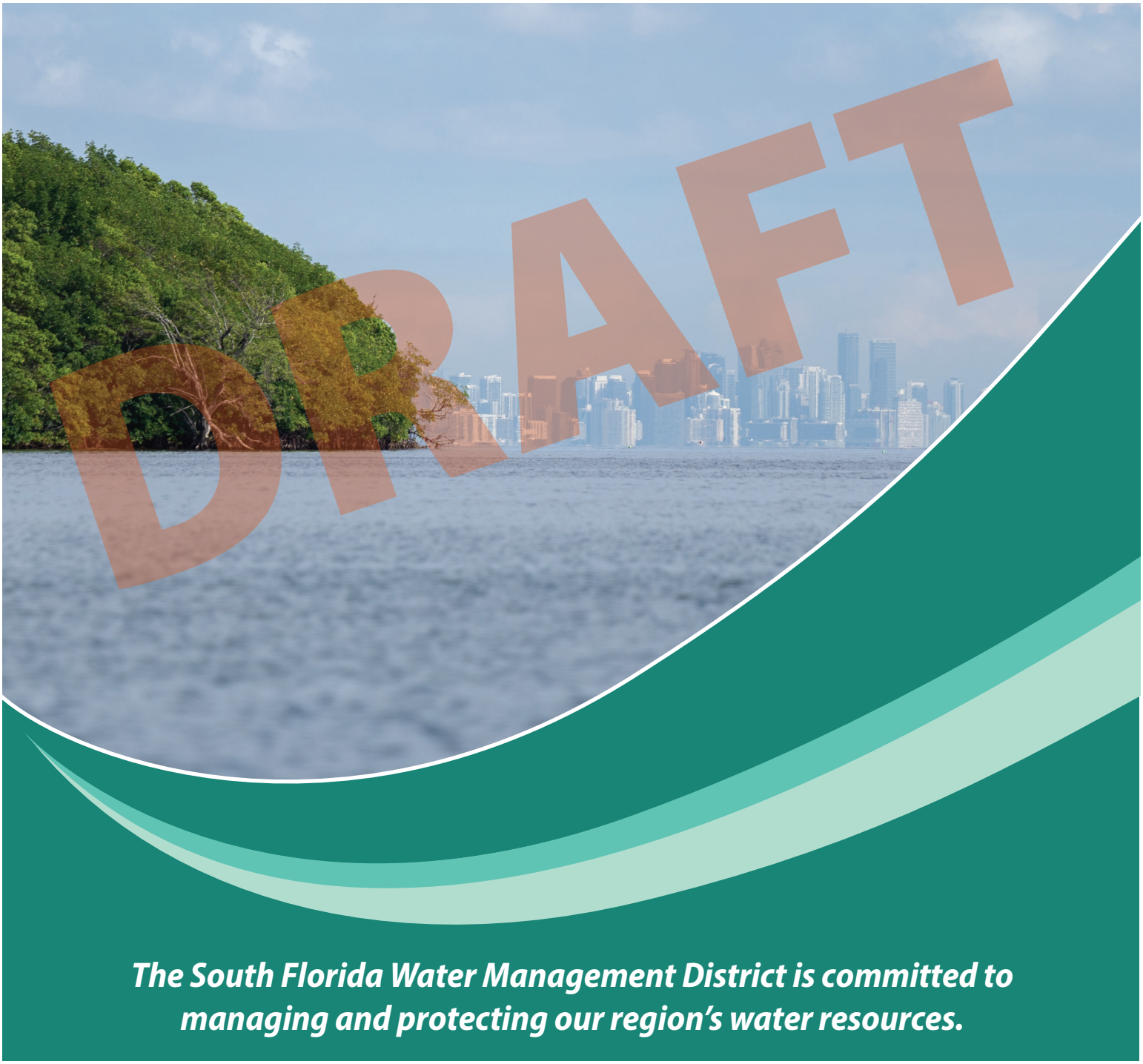
Water use permitting The issuance of permits by the South Florida Water Management District, under the authority of Chapter 40E-2, F.A.C., allowing a specified quantity of water withdrawal for consumptive use over a specified time period.

Wellfield One or more wells producing water from a groundwater source. A tract of land that contains a number of wells for supplying a large municipality or irrigation district.

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

Withdrawal Water removed from a groundwater or surface water source for use.

Yield The quantity of water (expressed as rate of flow or total quantity per year) that can be collected for a given use from surface or groundwater sources.



The South Florida Water Management District is committed to managing and protecting our region's water resources.

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