2020 Ten-Year Water Supply Facilities Work Plan (DRAFT)

Report Date July 31, 2020

Prepared for: City of Oakland Park

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1.0 CHAPTER 1 - INTRODUCTION

1.1 GENERAL

The State of Florida has passed legislation over the past few years with the purpose of strengthening the linkage between growth and water availability based on specific demands identified in the water supply planning process. Section 373.709 and Section 163.3177(6) (c)3 of Florida Statutes (F.S.) requires that the "Water Supply Work Plan" be updated within 18 months after a water management district's governing board approves an updated regional water supply plan to reflect whatever changes in the regional plan affect their local water supply and work plan. The City's last Water Supply Facilities Work Plan (WSFWP) was prepared and adopted in 2015.

The South Florida Water Management District (SFWMD) performed an update to the Lower East Coast Regional Water Supply Plan Update (2018 LEC Plan) on November 8, 2018. Therefore, local governments within the Lower East Coast Region are required to amend their comprehensive plans and include an updated Ten-Year Water Supply Facilities Work Plan and related planning elements by May 8, 2020.

As a result, local governments located within an area that has a Regional Water Supply Needs and Sources Plan, must prepare a Ten-Year Water Supply Facilities Work Plan that ensures linkage between the Regional Water Supply Plan and their individual comprehensive plans. Each Work plan is required to address infrastructure, conservation, capital improvements and intergovernmental coordination in addition to water supplier coordination.

This 2020 Ten-Year Water Supply Facilities Work Plan has been prepared for the City of Oakland Park (City), located within Broward County (County). It has been prepared in response to the requirements for local governments to revise their Comprehensive Plan within 18 months after the Regional Water Supply Plan (RWSP) is adopted.

1.2 BACKGROUND

The Florida Legislature enacted bills in 2002, 2004, 2005, 2011, 2012, 2015, and 2016 sessions to help address the state's water supply needs. These bills, in particular Senate Bills 360 and 444 (2005 legislative session), significantly changed Chapters 163 and 373, F.S., by strengthening the statutory links between the regional water supply plans prepared by the water management districts and the comprehensive plans prepared by local governments. In addition, these bills established the basis for improving coordination between local land use and water supply planning. This strengthened coordination and started requiring local governments to prepare a Ten-Year Water Supply Facilities Work Plan, if the local government was located within an area that had a Regional Water Supply Plan. These local governments are required to submit a Work Plan to ensure linkage between the Regional Water Supply Plan and their individual comprehensive plans. Each Work Plan should address infrastructure and conservation requirements, needed capital improvements, and intergovernmental and water supplier coordination. The City of Oakland Park is a "Receiver" and not a "Supplier" of potable water to other water purveyors.

Appendix A, herein; Relevant Portion of Cited Florida Statute Provisions, provides a summary of regulatory requirements that impact local governments and their water supply planning efforts. It should be noted that the Rule 9J-5, Minimum Criteria for Review of Local Government Comprehensive Plans and Plan Amendments, Evaluation and Appraisal Reports, Land Development Regulations and Determinations of Compliance, Florida Administrative Code (FAC) was repealed in 2011. As a result of their required regional water supply planning efforts, the South Florida Water Management District (SFWMD) evaluated the adequacy of existing water supplies to meet existing and future water demands and determined that traditional water supply resources from the Biscayne Aquifer will not be adequate to meet future demands. The 2018 Lower East Coast Water Supply Plan Update indicates most future water supply needs will need to be met by the implementation of alternative water supply sources. All local governments located within the Lower East Coast regional area are now required to develop a Work Plan to ensure linkage between the regional water supply plan and their individual comprehensive plans by May 8, 2020.

1.3 SERVICES PROVIDED BY OAKLAND PARK

The City of Oakland Park supplies retail treated water services to approximately 30,300 residents in the City. The City does not operate and maintain any water supply wells or treatment facilities. However, the City is able to provide such service to all its residents by purchasing wholesale potable water from the City of Fort Lauderdale and having portions of its incorporated area provided retail service by Broward County and Fort Lauderdale.

In addition to the roughly 30,300 citizens provided retail service by the City, another 14,600 citizens receive retail service directly via the City of Fort Lauderdale and Broward County. The City of Oakland Park no longer provides either bulk or retail sales outside of its City Limits. In addition to providing normal potable water service to customers within the City Limits, it is the City's intent to provide adequate fire flow to both residential and non-residential customers. The location of Oakland Park is shown in **Figure 1-1**.

The City currently does not provide reuse water service to its customers.

1.4 RELEVANT REGIONAL ISSUES

This part is a brief description or narrative discussing the overarching regional issues impacting water supply planning at the local level. The regional issues identified in the 2018 Lower East Coast Water Supply Plan Update (2018 LEC Plan) and outlined in The Broward County Water Supply Facilities Work Plan (2020 Work Plan), dated April 21, 2020 and adopted as Broward County Comprehensive Plan Amendment No. 19-8ESR with Broward County Ordinance No. 2020-19, are briefly described below:

1. Climate Impacts and Future Water Supply Conditions: Climate impacts and future water supply conditions need to be integrated into water resources resilience planning efforts;
2. Water Use Limitation: Limitation of fresh surface water and groundwater use by the SFWMD's Regional Water Availability Rule and Everglades and Lake Okeechobee Minimum Flow and Levels (MFL);
3. Alternative Water Supply: The need to develop diverse water sources to meet current and future water needs, including C-51 Reservoir, Floridan Aquifer, and reuse as mandated by the Ocean Outfall law; and,

4. Comprehensive Everglades Restoration Plan (CERP) Implementation: Construction of additional storage systems (e.g. CERP's reservoirs, aquifer storage, and recovery systems) to capture wet season flow volumes will be necessary to increase se water availability during dry conditions and attenuate damaging peak flow events from Lake Okeechobee.

The regional issues identified in the 2018 Lower East Coast Water Supply Plan Update and outlined in the City of Fort Lauderdale Ten-Year Water Supply Facilities Work Plan 2020 Update, dated June 16, 2020 and was adopted as City of Fort Lauderdale Comprehensive Plan Amendment No. 20-1ESR with Fort Lauderdale Ordinance No. C-20-01, are also provided below:

1. Climate Change
2. Regional Water Availability Rule
3. Participation in the C-51 Reservoir Project
4. Regional Climate Action Plan
5. Lake Okeechobee Surface Water Allocation Limitations
6. Lowering Lake Okeechobee Level
7. Infrastructure Planned to Attenuate Damaging Peak Flow Events from Lake Okeechobee
8. Expanded Use of Reclaimed Water to Meet Future Water Supply Demands
9. Wellfield Management to Prevent Undesirable Changes in Floridan Aquifer Water Quality

The regional issues identified in the 2018 LEC Plan Update and considered by the City of Oakland Park are provided below:

- Climate Change
  - The City of Oakland Park understands the need to take actions in light of the climate change considerations. The City has adopted a Climate Action Plan, January 2019 in an effort to reduce the greenhouse gas emissions (GHSs) and increase the resilience of its community.
- Increased withdrawals from the SAS are limited due to potential impacts on the regional system, wetlands, and existing legal water uses and due to the potential for saltwater intrusion.
  - The City is committed to lower the potable water demand by implementing various conservation measures. The City has water restriction ordinances (Section 22-19 and Section 22-20) and policies (such as Policy 4.8.3, 4.12.6, 4.12.10) that are aligned with water conservation measures. The City is committed to collaborate with its Water Suppliers and work to meet the South Florida Water Management District's requirements to decrease the potable water demand.
  - The City has plans to prepare the Evaluation and Appraisal Report (EAR) Based Amendments to reinforce conservation measures applicable to the City.
- Surface water allocations from Lake Okeechobee and hydraulically connected surface waters are limited by the Lake Okeechobee Service Area RAA criteria.
  - Not applicable to the City of Oakland Park

- Construction of additional storage systems (e.g., reservoirs, aquifer storage and recovery systems) to capture wet season flow volumes will be necessary to increase water availability during dry conditions and attenuate damaging peak flow events from Lake Okeechobee.
    - Not applicable to the City of Oakland Park.
- Expanded use of reclaimed water is necessary to meet future water supply demands and the Ocean Outfall Law.
    - Not applicable to the City of Oakland Park.
- Expanded use of brackish groundwater from the Floridan aquifer system requires careful planning and wellfield management to prevent undesirable changes in water quality.
    - Not applicable to the City of Oakland Park.

1.4.1 Surficial Aquifer System and Limited Water Availability

The Surficial Aquifer System (SAS), known as the Biscayne Aquifer, in the southeastern Florida peninsula is the primary source of freshwater to residents of Broward County, Miami-Dade County, and southeastern Palm Beach County. Withdrawals from the SAS are managed by the SFWMD through the issuance of Consumptive Use Permits (CUP). In order to secure and maintain a CUP; applicants, consisting of water utilities, developers, agricultural operations, and water control districts must meet the permitting criteria of: 1) being a reasonable and beneficial use of the resource; 2) demonstration of no adverse impact to other existing legal uses of water; and 3) assurance that the use of the requested quantity of water is necessary for economic and efficient use and is both reasonable and consistent with the public interest (including harm to the environment, saltwater intrusion, wetlands, and movement of pollution). To prevent wasteful uses, consumptive use permits require water conservation such as the use of reuse water (treated wastewater/ reuse water). All water supply utilities applying for an individual permit are required to develop and implement a water conservation plan.

Water can be used for public supply (drinking water), agricultural and nursery plant irrigation, golf course irrigation, commercial use, dewatering/mining activities and power. Water uses not covered by these consumptive use permits include domestic uses, home irrigation and water used for firefighting. These uses must include compliance with the Minimum Flow and Levels (MFLs) established for surface water and groundwater sources, Chapter 373, (F.S.). In the implementation of prevention strategy for the Everglades and Lake Okeechobee MFLs, the Governing Board of the District adopted Restricted Allocation Areas in 2007 and 2008. For the LEC planning region, this mandated that new water demands requiring recharge from the Everglades system be met through the development of alternative water supply (AWS).

The following are considered as AWS sources: salt water; brackish water; surface water captured during wet-weather flows; sources made available through the addition of new storage capacity for surface or groundwater; water that has been reused after one or more public water supply, municipal, industrial, commercial, or agricultural uses; the downstream augmentation of water bodies with reuse water; stormwater; and any other water supply source that is designated as nontraditional for a water supply region in the applicable water supply plan. Opportunities for assistance for these AWS projects occurred in 2005 with the passage of Senate Bill 444 creating a funding and incentives program to encourage the

development of alternative water. Since this program, funding has been severely limited within the Lower East Coast region and has directly impacted the ability of local water supply entities to advance the development of AWS projects through their own individual efforts.

1.4.2 2008 Ocean Outfall Program and Reuse Water Options

In 2008, the Florida Legislature enacted an ocean outfall legislation which required the elimination of the use of six ocean outfalls in southeastern Florida as the primary means for disposal of treated domestic wastewater, influencing the Broward County North Regional (BCNR) Wastewater Treatment Plant (WWTP) The objectives of this statute were to reduce nutrient loadings to the environment and to achieve the new use of water for water supply needs.

This statute requires BCNR WWTP to reuse at least 60 percent of the historic outfall flows by 2025 and follow the below outfall program:

- Discharge through ocean outfalls must meet either advanced wastewater treatment and management by December 31, 2018, or an equivalent reduction in outfall nutrient loading.
- A functioning reuse system that reuses a minimum of 60 percent of the facility's actual flow on an annual basis installed no later than December 31, 2025.
- Timely submission of certain progress and planning summary documents.
- Inclusion of projects that promote the elimination of wastewater ocean outfalls in SFMWD's regional water supply plans.
- State or SFWMD funding assistance must give first consideration to water supply development projects that replace existing sources or implement reuse projects to eliminate ocean outfalls.
- The Broward County Water Supply Facilities Work Plan (2020 Work Plan) states that "The County continues to work towards meeting the requirements of the 2008 Ocean Outfall statute before 2025."

Important considerations when developing reuse water projects are rising sea levels and increasing salt concentrations in coastal wastewater collection systems that could impact cost-effective reuse water opportunities. Related infrastructure impacts from sea level rise include accelerated physical degradation of the built environment, increased Operations and Maintenance (O&M) and engineering design costs to support long-term public water and wastewater capital projects. In addition, significant and strategic monitoring and financial programming will be needed to support adaptation strategies. These options might include lining or armoring the sanitary sewer collection systems, redesigning or relocating collection systems, and building additional water quality treatment capacity such as membrane filtration.

1.5 PURPOSE

The purpose of this Work Plan is to present an implementation plan that will guide the City's efforts to develop and maintain sustainable sources of water for its overall service area in coordination with the 2018 LEC Plan. A description of the City's existing and proposed transmission and distribution facilities to satisfy projected water demands is included. The City of Oakland Park does not have raw water or treatment facilities; thus, treated water for the citizens of Oakland Park comes from the City of Fort Lauderdale and Broward County (Suppliers). Part of the City's purpose is to assure that the "Suppliers" have adequate plans to enable Oakland Park to progress and grow without water supply and treatment issues. As required, it is anticipated that this Work Plan will be updated every five years or within 18 months of a revision to the LEC Plan.

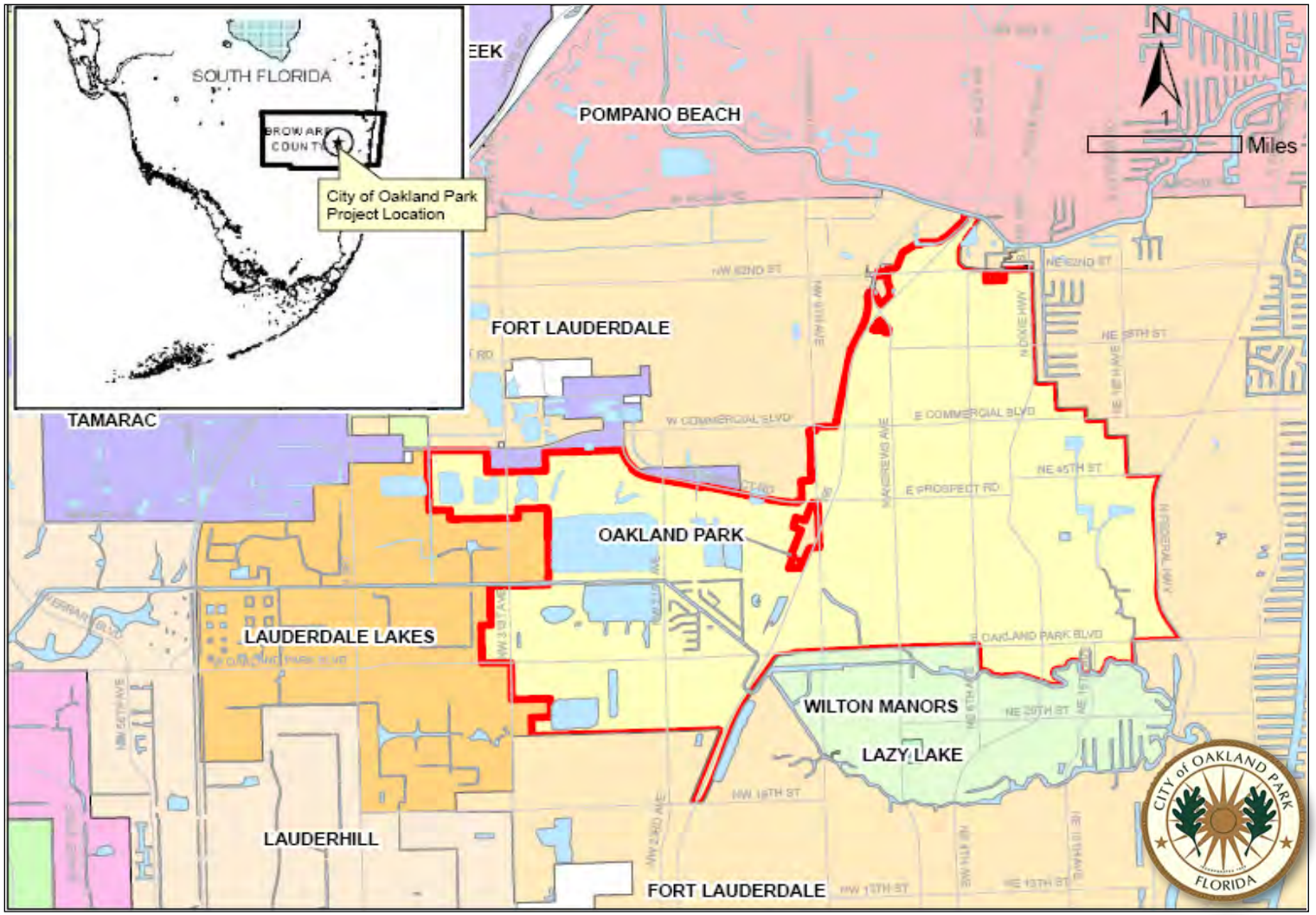

Figure 1-1. City of Oakland Park Location Map (Source: City of Oakland Park, 2014 WSFWP)

2.0 CHAPTER 2 – WATER SERVICE AREA

2.1 WATER SERVICE AREA

The City of Oakland Park (City) was established approximately 90 years ago with the abolishment of the Town of Floranada, reestablishing the water service area boundaries to approximately the west side of U.S. 1 west to N.W. 31st Avenue and the north fork of Middle River north to what is now Prospect Road. The City currently provides potable water service to approximately 30,300 people in the City's retail water service area. Another 14,600 people within the City Limits receive retail water service from Broward County and the City of Fort Lauderdale. The City Limits covers approximately 5,143 acres. **Figure 2-1** shows the City Limits and Retail Services provided by the City, the City of Fort Lauderdale, and Broward County.

2.2 LOCATION DESCRIPTION

The City has been in a transition period since 2000 with annexation and service area changes primarily taking place between 2005 and 2007. Pressures within the County to gradually incorporate all the unincorporated areas have led the City to annex several adjacent areas. Some of the annexed areas had previous water service from the City, while other areas had water service from Broward County. There have also been "neighborhood improvement projects" completed within some annexed areas. Part of the neighborhood improvement areas in the area north of Prospect Rd, East of Interstate 95, and south of Commercial Blvd had previously been provided service by Oakland Park as retail customers. This area is now within the City of Oakland Park City Limits but is now being provided potable water service from Broward County. The current City potable water service area is comprised roughly of the area bounded by Commercial Blvd and Prospect Rd to the north, North Federal Highway to the east, Oakland Park Blvd and NW 26 St to the south, and NW 31st Avenue to the west.

2.3 WATER SERVICE PROVIDERS

The City is supplied with potable water from the City of Fort Lauderdale and Broward County Water and Wastewater Services (BCWWS). Within the City Limits the retail service is subdivided into three areas by retail service providers: the City retail service area, the City of Fort Lauderdale retail service area, and Broward County retail service area. The City retail service area receives potable water via wholesale purchases of treated water from the City of Fort Lauderdale.

2.3.1 Service Agreements

The City has an agreement with the City of Fort Lauderdale for them to provide wholesale (bulk) potable water service to the residents within the City retail service area. The service agreement between the City and City of Fort Lauderdale was signed in 1994 and extends until 2023. The City of Oakland Park is planning to renew the service agreement with the City of Fort Lauderdale.

The City does not normally have an involvement in the planning, construction, and operation of the water supply and water treatment facilities maintained, operated, and owned by the City of Fort Lauderdale. The City could be financially involved in the installation of additional water lines or water meters if required to convey water from the City of Fort Lauderdale. Currently, and as projected, there does not appear to be a need for any such additional wholesale service connections from the Fort Lauderdale to the Oakland Park System. The City has sole responsibility over the transmission and distribution system within the City's retail service area.

Broward County Water & Wastewater Services (BCWWS) provides retail potable water service to some of the areas within the City. Currently, the City does not have an agreement with BCWWS as the City does not buy wholesale (bulk) water from BCWWS.

While not normally being involved in the water resource and treatment planning, the City has been actively coordinating and cooperating with both Broward County and the City of Fort Lauderdale in the major annexation, service area, and neighborhood improvement projects that have taken place over the past years. The annexations added about 40 percent to the City's population. Since both parties have retail services within the City of Oakland Park City Limits and the City of Fort Lauderdale provides wholesale (bulk) water service to the City, the Ten-Year Water Supply Facilities Work Plan 2020 Updates for each of these public water "Suppliers" has been included herein in the appendices.

Neither the City of Fort Lauderdale nor Broward County reserve specific plant capacity for the City, but both plan to meet the water demands of their retail service areas, as well as the wholesale water needs by the City of Fort Lauderdale for the City of Oakland Park.

2.4 PRIVATE SUPPLIERS

There are no known sources of potable water being served within the City Limits other than the primary providers mentioned above. There is only one non-potable water service provider within the City which is the City's Wimberly Field Park. The City's athletic complex at the Wimberly Field Park is located at the corner of NE 3rd Ave and NE 38 St and up to NE 41 St. and it runs on a non-potable well water supply. The park water use is considerably less than 100,000 gpd and therefore is not required to obtain a withdrawal permit. **Figure 2-1** shows the location of the non-potable water service providers as points within the water service area. There are no other potable water purveyors than the City, Broward County, and City of Fort Lauderdale.

2.5 FUTURE SERVICE AREA

The existing residential areas at the Oak Tree Country Club are currently served by the City of Fort Lauderdale which will remain the same in the future. However, there is a new development under construction at the Oak Tree Country Club Site which will be served by the City of Oakland Park. This area is shown as part of the Future Service Area for the City of Oakland Park in **Figure 2-1**. Population projections resulting from the new development is further described in **Chapter 4**.

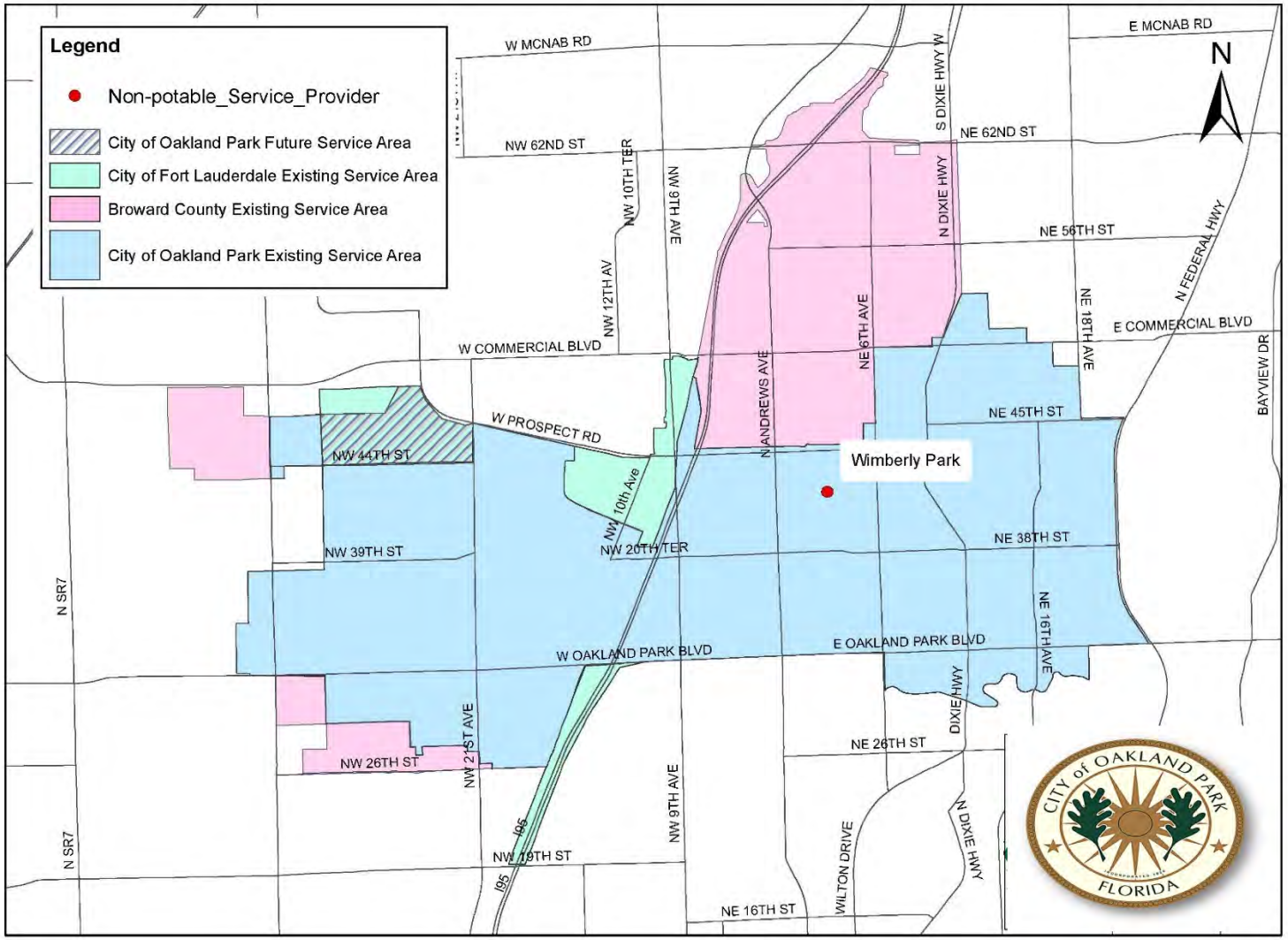

Figure 2-1. City of Oakland Park City Limits and Retail Service Providers (Source: City of Oakland Park, 2020)

3.0 CHAPTER 3 – EXISTING FACILITIES

3.1 INTRODUCTION

The City of Oakland Park (City) does not own or operate any water supply, treatment, or storage facilities. This Chapter summarizes the existing water supply and treatment facilities owned, operated, and maintained by the City of Fort Lauderdale and by Broward County. These facilities include wellfields, treatment plants, storage tanks and transmission and distribution systems. This report Chapter also addresses the City's transmission and distribution system.

It should be noted that the City has neither wastewater treatment facilities nor access currently to any wastewater effluent treated for reuse. Wastewater collected within the City is transmitted to the City of Fort Lauderdale and Broward County for treatment and disposal. Additional information on the City of Fort Lauderdale and the Broward County facilities can be found in their Water Supply Facilities Work Plans in the Appendices A and B, respectively.

3.2 WATER SUPPLY FACILITIES

The City of Fort Lauderdale maintains two (2) active wellfields: the Dixie Wellfield and the Prospect Wellfield, which withdraw water supply from the Surficial Aquifer System (SAS). Both wellfields are permitted by the SFWMD under Water Use Permit (WUP) No. 06-00123-W, allowing a combined annual average daily withdrawal of 52.55 million gallons per day (MGD), and a combined equivalent average day based on a maximum month withdrawal of 59.90 MGD. This WUP was issued by the SFWMD on September 11, 2008 and expires on September 11, 2028.

The Dixie wellfield is located west of the Peele-Dixie Water Treatment Plant (WTP) on N State Road 7, north of SW 24th street and south of Broward Blvd. The wellfield is comprised of eight wells and they are located within the Fort Lauderdale Country Club golf course. The total installed capacity of all wells is approximately 20 MGD. The wellfield withdrawal permit limits the maximum withdrawal to 15 MGD on an equivalent average day for maximum month.

The Prospect wellfield is located near the intersection of Florida Turnpike and NW 62nd St surrounding Prospect Lake and has an installed capacity of 87 MGD. The wellfield withdrawal permit limits the maximum withdrawal to 43.43 MGD on an annual average day basis and 49.5 MGD on an equivalent average day for maximum month.

The WUP No. 06-00123-W also allows withdrawal from the Floridan Aquifer with an Annual Allocation of 3,153 million gallons (MG) and Maximum Month Allocation of 300.6 MG. **Appendix B** consists of the City of Fort Lauderdale Water Supply Facilities Work Plan 2019 Update.

Broward County Water & Wastewater Services (BCWWS) owns and operates two (2) regional wellfields: the District 1 wellfield and the District 2 wellfield. BCWWS supplies raw water from the SAS to a variety of raw water large users. The Broward County retail service area within the City of Oakland Park City Limits receives water supply from the Broward County District 1 wellfield, which has a total design capacity of 23.5

MGD, with a total firm capacity of 19.6 MGD. The current SFWMD Consumptive Use Permit (CUP) No 06-00146-W, issued on 2008 until 2028, for the District 1 wellfield allows the Maximum Month and Average Annual Daily withdrawal of 333 million gallons per month (MGM) and 10.03 MGD, respectively. Broward County Water Supply Facilities Work Plan (2020 Work Plan) shows that two (2) Floridan Aquifer test wells were completed in 2014. Water quality test results suggested that raw water from these wells would require high pressure RO treatment. Broward County does not have any current plans to build an RO WTP at the District 1 site and does not plan to convert these test wells to production wells. The current SFWMD CUP allows for a Maximum Month and Average Annual Daily withdrawal of 128 MGM and 3.86 MGD, respectively, from the upper Floridan aquifer. Broward County Water Supply Facilities Work Plan (2020 Work Plan) is provided in **Appendix C**.

3.3 WATER TREATMENT FACILITIES

The City of Fort Lauderdale owns two water treatment plants: the Fiveash WTP and the Peele-Dixie WTP.

The Fiveash WTP is the City of Fort Lauderdale's largest WTP. It is located at Powerline Road and NW 38th Street and withdraws source water from the Prospect Wellfield. The service area for this plant includes the jurisdictions of the City of Fort Lauderdale, City of Wilton Manors, Town of Lauderdale-by-the-Sea, Port Everglades, and portions of City of Tamarac, Town of Davie, City of Oakland Park and Broward County. The plant was originally constructed in 1950 and has undergone several expansions allowing a permitted capacity of 70 MGD. However, plant staff indicated the plant capacity maybe limited to 60 MGD. The plant provides conventional lime softening treatment, followed by filtration and disinfection.

The Peele-Dixie WTP is located at S.R. 7/U.S. 441 and SW 16th Street and withdraws source water from the Dixie Wellfield. The plant used to be a lime softening facility, now retired and was replaced by a nanofiltration treatment plant in 2007. The plant has a maximum installed treated water treatment capacity of 12 MGD. The facility was designed to be expanded by the addition of three Reverse Osmosis (RO) trains that would utilize the Floridan Aquifer with an ultimate future capacity of 18 million gallons per day. The City of Fort Lauderdale Ten-Year Water Supply Facilities Work Plan 2020 Update shows that Fiveash WTP and Peele-Dixie WTP have sufficient plant capacity combined in order to meet the maximum day demand by 2040. However, in order to maintain the projected deficit from Biscayne Aquifer before 2035, the City has committed to purchase 3 mgd of C-51 allocation from the C-51 reservoir project.

The City has planned the following major improvements at its water treatment plant:

- Reliability Upgrades and Disinfection System Replacement: This project includes new backup power generators, replacement of chlorine gas with sodium hypochlorite, a carbon dioxide system to control finished water pH and a series of improvements to automate the function of certain equipment. This project will begin construction in late 2019 and likely be completed in 2023.

- Granular Activated Carbon Pilot Study & Plant Evaluation: This project includes evaluation of treatment technologies to achieve the City's color goal at the Fiveash WTP. The results of this study is a report recommending a new Water Treatment Plant at Prospect Site.

- Comprehensive Utility Strategic Master Plan (CUSMP) Projects: The City completed its CUSMP in 2017. This document master planned a series of water and sewer improvements. The City continuously evaluates the efficacy of the projects recommended in the CUSMP in planning its investment decisions.

The portion of the City with retail service by Broward County receives water supply from Broward County's District 1 WTP located in the City of Lauderdale Lakes. The service area for this plant includes portions of the cities of Fort Lauderdale, Lauderdale Lakes, Lauderhill, North Lauderdale, Oakland Park, Plantation, Pompano Beach, and Tamarac, as well as certain unincorporated areas in central Broward County. The plant was originally constructed in 1960 and has undergone several expansions to achieve a current design capacity of 16.0 MGD and a firm capacity of 15.3 MGD. The plant is a lime softening treatment facility that uses up-flow clarifiers and multimedia filtration systems.

3.4 FINISHED WATER STORAGE

The City of Oakland Park does not have any storage tanks or high service booster pump stations within the City's transmission and distribution system.

The City of Fort Lauderdale has two on-site storage and high service pumping facilities and two offsite storage and high service pumping facilities. The two on-site storage and high service pumping facilities are located at the Fiveash and the Peele-Dixie Water Treatment Plants, with storage capacities of 17 million gallons (MG) and 8 MG, respectively. The two offsite facilities are the Poinciana Park Water Tank and Pump Station and the Northwest Second Avenue Water Tank and Pump Station. The Poinciana Park facility was upgraded in 2006 with a new 2.0 MG pre-stressed concrete tank, a new pumping facility, and standby power on-site. The Northwest Second Avenue Water Tank is an elevated 1 MG steel tank located between NW 6th Street and NW 7th Street and was refurbished in 2012 with a new pump, electrical supply, and automated control system. The total storage capacity for City of Fort Lauderdale is 28 MG.

The Broward County District 1 WTP has two on-site water storage facilities at the plant site and four remote tanks within the distribution system. The total District 1 storage capacity is 7.1 MG. All but one of the storage facilities are ground storage tanks, meaning pumps are required to feed the distribution system.

3.5 WATER TRANSMISSION AND DISTRIBUTION SYSTEM

The City maintains over 83 miles of water mains in sizes ranging from 4 to 12 inches in diameter. There are many miles of smaller water mains, typically 2 inch. The transmission and distribution system have been modeled in 1992 and again in 2005. With the number and location of the bulk meters from the City of Fort Lauderdale, there has not been shown to be any system-wide problems under normal operating conditions. See **Figure 3-1** for a map of the Oakland Park Transmission and Distribution System. There has been an issue relative to the need for additional fire hydrants to provide more uniform and better fire hydrant coverage with looped water lines, but pressure in the system historically has been excellent under peak hour flow conditions.

The City purchases treated water from the City of Fort Lauderdale through master meters at twelve (12) separate interconnect locations throughout the distribution system. All interconnects are currently open and active. See **Figure 3-2** for a location map showing the transmission and distribution system along with the Fort Lauderdale interconnection locations. See **Table 3-1** below for exact interconnection locations.

Table 3-1. Oakland Park (OKP) Master Meter Connections with Fort Lauderdale (FLL)

OKP Meter #	FTL ID #	FTL Account #	Meter Size	Location of Master Meters
1	7200284	370-3800-7002	6”	1001 East Oakland Park Blvd
2	635595	370-40003007	6”	2054 East Oakland Park Blvd
3	70685360	370-4500-2004	6”	1601 NE 45 Street
4	700961700	370-5000-2006	8”	4500 NW 31 Avenue
5	70632140	370-5250-3001	8”	3500 NW 31 Avenue
6	4210594000	370-6200-7001	6”	1690 West Prospect Road
7	10722622	370-6300-5004	6”	1600 NW 41 Street
8	6906501	370-6500-0003	6”	499 West Prospect Road
9	802680100	370-7000-0006	6”	2 NE 38 Street
10	72230820	370-7800-3002	8”	2604 NW 21 Avenue
11	72359770	370-8000-9005	6”	2610 NW 26 Avenue
12	49504078	370-3700-9009	8”	1300 NE 38 Street

Source: City of Oakland Park, 2020

The City has many interconnections with the City of Fort Lauderdale and two interconnections with Broward County. The Interconnections with Broward County are located near the addresses below:

- N.W. 29th Street, near N.W. 30th Avenue off West Oakland Park Boulevard
- South of Oakland Park Blvd. between N.W. 29th Avenue and N.W. 31st Avenue

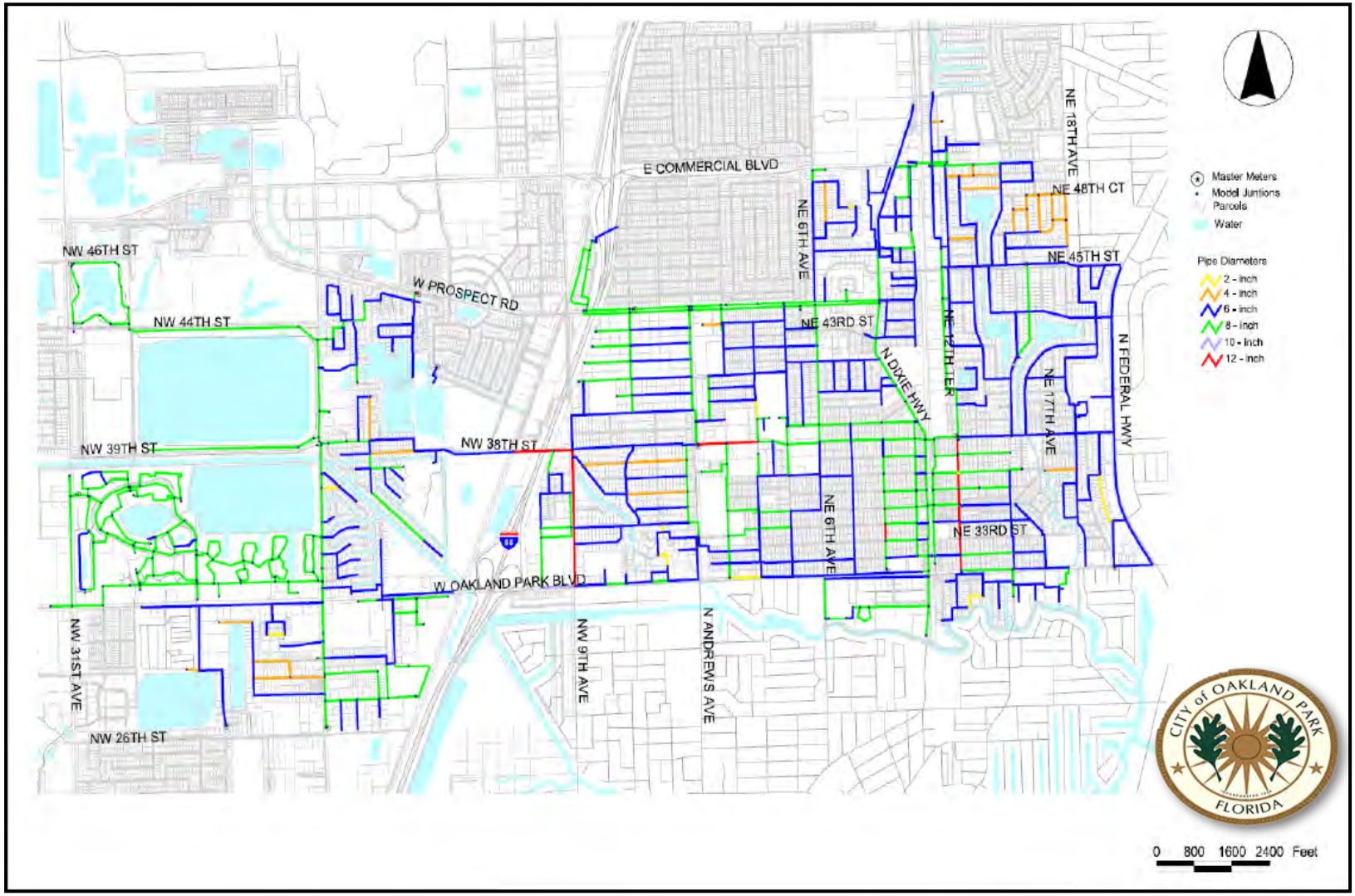

Figure 3-1. Oakland Park Transmission and Distribution System Map (Source: City of Oakland Park, 2014 WSFWP)

Figure 3-2. Transmission and Distribution System Including Fort Lauderdale Interconnection Locations

(Source: City of Oakland Park, 2014 WSFWP)

To verify the ability of the transmission and distribution system to adequately address fire flow events, a number of hydrant flow tests were performed between April 20 and June 02, 2018. **Table 3-2** below indicates the results of said flow tests at the locations indicated:

Table 3-2. Fire Hydrant Flow Test Results

Test Location	Hydrant Static (psi)	Residual (psi)	Pitot (psi)	Hydrant Flow (gpm)
E Commercial Blvd	75	N/A	43	1104
E Oakland Park Blvd	76	N/A	47	1145
E Prospect Rd	76	N/A	56	1248
N Andrews Ave	79	N/A	44	1107
N Dixie Highway	77	N/A	47	1142
N Federal Hwy	78	N/A	43	1102
N Oakland Forest Dr	80	N/A	48	1164
NE 10th Ter	79	N/A	45	1127
NE 17th Ave	75	N/A	50	1188
NE 2nd Ave	80	N/A	40	1062
NE 32nd Ct	80	N/A	40	1062
NE 32nd St	78	N/A	40	1062
NE 38th St	80	N/A	46	1138
NE 5th Ter	75	N/A	40	1062
NE 8th Ter	80	N/A	55	1246
NE 9th Ave	75	N/A	40	1062
NW 10th Ter	80	N/A	48	1165
NW 17th Ter	76	N/A	41	1078
NW 18th Ave	74	N/A	40	1062
NW 21st Ave	70	N/A	43	1095
NW 21st St	78	N/A	40	1062
NW 27th St	78	N/A	40	1062
NW 29th Pl	75	N/A	40	1062
NW 29th St	70	N/A	37	1015

Test Location	Hydrant Static (psi)	Residual (psi)	Pitot (psi)	Hydrant Flow (gpm)
NW 31st Ave	79	N/A	40	1062
NW 32nd Ct	75	N/A	40	1062
NW 33rd St	78	N/A	40	1062
NW 34th St	75	N/A	40	1062
NW 38th St	80	N/A	49	1169
NW 3rd Avenue	80	N/A	41	1069
Nw 3rd Ct	75	N/A	40	1062
NW 44th St	72	N/A	43	1104
NW 6th Avenue	80	N/A	50	1188
NW 8th	65	N/A	40	1062
NW 8th Lane	80	N/A	45	1127
NW 8th Ln	75	N/A	40	1062
NW 8th Terr	71	N/A	39	1049
Oakland Park Blvd	78	N/A	40	1062
Oakland Shores Drive	74	N/A	40	1062
Powerline Road	79	N/A	52	1214
Prospect Rd	75	N/A	49	1172
S Oakland Forest Drive	73	N/A	40	1110
W Oakland Park Blvd	75	N/A	41	1068
W Prospect Rd	72	N/A	45	1123

Source: City of Oakland Park, 2020

Static pressures ranged between 65 to 80 psi. Hydrant flows recorded ranged between 1062 to 1248 gpm. Residual pressures were not available. The computer model was modeled in 2005 using peak hour flows and a Fort Lauderdale pressure at the interconnections of 70 psi. The actual fire flow test revealed that static pressures in the system were normally 5 to 10 psi higher than the assumed 70 psi with just one of the hydrants showing 5 psi lower than the assumed 70 psi. **Figure 3-3** indicates that during peak hour flow conditions, pressure loss in the City's transmission and distribution system was only 5 to 6 psi.

The City has completed an analysis of the ability of this distribution system to continue to provide adequate service to City residents. The analysis found that the existing distribution system is adequate to handle average daily, maximum daily, and peak hourly demands.

The City of Fort Lauderdale conveys water to the City through the 12 interconnects located within its water distribution system consisting of over 770 miles of 2 to 54-inch diameter water mains.

The transmission and distribution system for BCWWS District 1 contains approximately 248 miles of 12-inches and larger finished water distribution main within its service area the County maintains interconnection with the Cities of Fort Lauderdale, Tamarac, Plantation, and Lauderhill for emergency purposes.

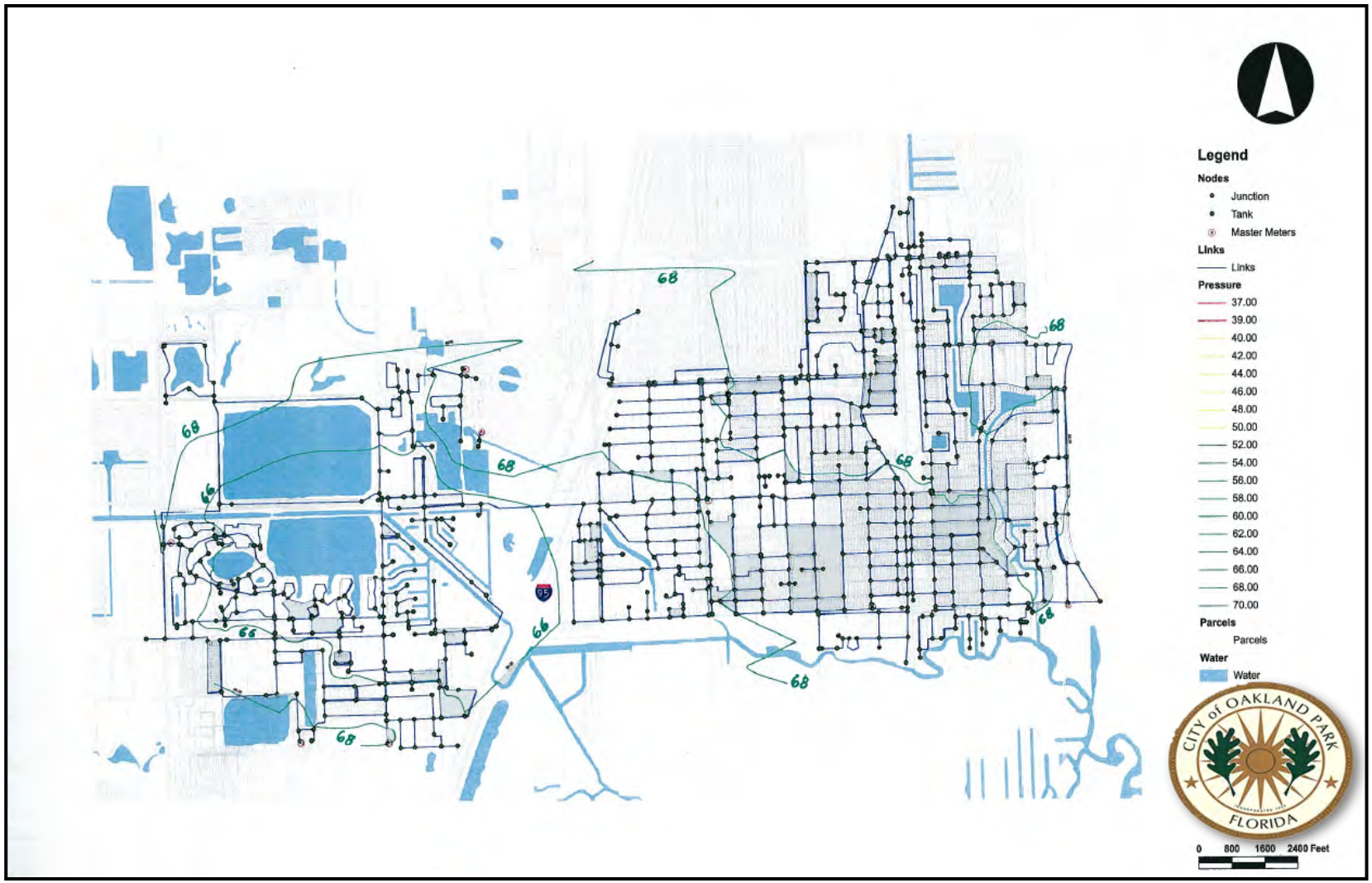

Figure 3-3. Peak Hour Flow Conditions; Pressure Contours (Source: City of Oakland Park, 2014 WSFWP)

4.0 CHAPTER 4 – POPULATION PROJECTIONS

4.1 HISTORIC POPULATION DATA

The City population grew from approximately 41,300 to nearly 44,500 between 2010 and 2019. Recent population estimate from Bureau of Economic and Business Research (BEBR) indicates that the City's population is 45,576 as of April 01, 2020.

Currently, the City uses population projections provided by Broward County, which are based on the published Broward County Population Forecasting and Allocation Model 2017 (PFAM 2017). In 2005, the City had annexation in North Andrews Gardens, Twin Lakes South, Mira Lago and Montage by the Lake/Sartori Plat Area adding approximately 11,000 people for a total population of approximately 42,000 people. Due to the annexations and transfer of service areas between 2005 and 2007, it has been difficult to ascertain population base and water demand differentiation between retail and wholesale areas for the past few years. The City has worked closely with the City of Fort Lauderdale and Broward County to develop their population projections using the Traffic Analysis Zone (TAZ) population data. **Table 4-1** presents the estimated historical population within the current City Limits.

Table 4-1. Estimated Historical Population: Within Current City Limits

Retail Service Provider Area	Year									
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
City of Oakland Park	28,265	28,453	28,640	28,828	29,016	29,203	29,421	29,638	29,855	30,072
City of Fort Lauderdale	1,520	1,569	1,619	1,668	1718	1,767	1,763	1,758	1,754	1,749
Broward County	11,470	11,513	11,557	11,600	11,644	11,687	11,925	12,163	12,401	12,639
TOTAL	41,300	41,500	41,800	42,100	42,400	42,700	43,100	43,600	44,000	44,500

1) 2010 populations are from the City of Oakland Park, 2014 WSFWP. 2015 populations are from Broward County PFAM 2017. Populations between 2010 and 2015 were interpolated.

2) Populations between years 2015 to 2019 were projected using populations provided in Broward County PFAM 2017 for years 2015 and 2020.

3) Total population numbers are rounded up to the nearest hundred.

4.2 POPULATION PROJECTIONS

The City's Service Area population projections were carried out using the TAZ population projections from Broward County PFAM 2017. Linear Interpolation was conducted to project intermediate year populations that were not included in the TAZ projections. **Table 4-2** shows the future population projections for the entire City.

The retail service area shown as “City of Oakland Park” is the area where consumers receive direct service from the City, which purchases wholesale potable water from the City of Fort Lauderdale. However, since the City of Fort Lauderdale supplies both wholesale and retail service within the City’s City Limits, the City of Fort Lauderdale Ten-Year Water Supply Facilities Work Plan 2020 Update population forecast for “Oakland Park” is a combination of both “City of Oakland Park” and “City of Fort Lauderdale” retail service population in this report. For example; **Appendix B**, Table 3-5 of the City of Fort Lauderdale’s Water Supply Facilities Work Plan 2019 Update shows the 2015 Oakland Park population of 31,111, which is a close match to the sum of population from “City of Oakland Park” and “City of Fort Lauderdale” retail service areas in this report at 30,970.

Table 4-2. Future Population Projections

Retail Service Provider Area	Year					
	2015	**2020**	**2025**	**2030**	**2035**	**2040**
City of Oakland Park	29,203	30,289	31,461	33,488	34,852	35,846
City of Fort Lauderdale	1,767	1,745	1,717	1,751	1,880	1,970
Broward County	11,687	12,876	12,692	13,189	13,410	13,544
TOTAL	42,700	44,900	45,900	48,400	50,100	51,400

Source: Broward County PFAM 2017; Calculated by Stantec, 2020

1) Total population numbers are rounded up to the nearest hundred.

The total population from **Table 4-2** will be served in three ways. Those provided retail service with the City as their Service Provider will be receiving potable water that the City purchases through the metered interconnections with the City of Fort Lauderdale. Those receiving retail potable water service from the City of Fort Lauderdale as their Service Provider will be receiving water directly from the Fort Lauderdale transmission and distribution system. Those receiving retail potable water service from Broward County as their Service Provider will be receiving their potable water directly from the Broward County’s transmission and distribution system.

The City of Oakland Park is expecting new developments listed in **Table 4-3** either approved or pending approval since 2018. **Table 4-3** shows the new development projects within the TAZs, number of units and associated population projections. The Oak Tree Site is the only new development within the City to be under Land Use Plan Amendment (LUPA) designation. This project entails the conversion of the Oak Tree Site from Open Space to Irregular Density at 2.88 du/ac. The existing residential areas at the Oak Tree Country Club are currently served by the City of Fort Lauderdale which will remain the same in the future. However, the new development at the Oak Tree Country Club Site will be served by the City of Oakland Park. This area is shown as part of the Future Service Area for the City of Oakland Park in **Figure 2-1**. These new development projects will result in additional 3,500 people in the service area.

Table 4-3. New Development Projects

TAZ	Project Name	Address	Number of Dwelling Units	Population per TAZ	Service Area
425	Round Corner LLC	3101 & 3201 Federal Hwy.	274	685	City of Oakland Park
425	3411 North Federal, LLC	3411 & 3363 N Federal Hwy.	165	413	City of Oakland Park
909	43 East LLC	670,680,746 NE 43rd St.	8	20	City of Oakland Park
909	Villa Savona	4200 NE 7 Terrace	8	20	City of Oakland Park
426	Itall Luxxe LLC	1302 NE 32nd St	4	10	City of Oakland Park
400	Blackwood Partners LLC.	2400 Oak Tree Land	405	1013	City of Oakland Park
921	Robert Saporiti	1027-1047 NE 34 Court	10	25	City of Oakland Park
906	Adam Bedzow	1000 NE 58 St	106	265	City of Oakland Park
426	Guevara Townhomes	1298 NE 35 St.	8	20	City of Oakland Park
428	Ram Redevelopment	670 E Oakland Park Blvd	298	745	City of Oakland Park
432	Jonathan Guerrero	396 NW 41st St	4	10	City of Oakland Park
909; 921	Integra	3700-3855 N. Dixie Hwy	99	248	City of Oakland Park
			TOTAL	**3,500**	

Source: City of Oakland Park, 2020

The water demand projections based on these population projections are presented in the **Chapter 5**.

5.0 CHAPTER 5 – WATER DEMAND PROJECTIONS

5.1 DEMAND PROJECTIONS

The future treated water needs for the City are compiled in this Chapter. The population projections presented in the previous Chapter were utilized to ascertain potable water needs for the future. Actual historical population estimates, and real treated water supply numbers are used herein to establish per capita needs.

5.2 HISTORICAL WATER USE

A compilation of the total annual water purchased from the City of Fort Lauderdale for past 10 years for resale in the City service area was conducted and is presented in **Table 5-1**. No major unincorporated areas remain in the surrounding areas that could materially increase the City Limits. Only a few small unincorporated parcels remain near the City.

Table 5-1. Summary of Oakland Park Wholesale Water Purchased from Fort Lauderdale (FTL)

Year	From FTL (gal)
2010	1,300,649,000
2011	1,200,574,000
2012	1,127,683,000
2013	1,195,054,000
2014	1,164,570,000
2015	1,174,352,000
2016	1,000,975,000
2017	827,641,000
2018	907,671,000
2019	1,105,248,000

Source: City of Oakland Park, 2020

Historically, Broward County has sent its retail customers, now in the City of Oakland Park City Limits, about 1.30 to 1.36 MGD on an average day basis. The City of Fort Lauderdale was not able to provide the historic water demand data for their retail service area within the City of Oakland Park City Limits.

5.3 PER CAPITA USAGE

The historic per capita usage will be a major factor in projecting future treated water needs. **Table 5-2** below indicates the historic per capita demands for the City's Retail Service Area based on treated water purchased from the City of Fort Lauderdale:

Table 5-2. Per Capita Usage in Oakland Park Retail Service Area (RSA)

Year	2014	2015	2016	2017	2018	Average
Oakland Park RSA Population	29,016	29,203	29,421	29,638	29,855	29,426
Wholesale Water Purchased from Fort Lauderdale in Thousand Gallons	164,570	1,174,352	1,000,975	827,641	907,671	1,015,042
Per Capita Usage (gpcd)	110	110	93	77	83	95

Source: City of Oakland Park, 2020

The average per capita usage over the recent 5 years is 95 gpcd within the City Retail Service Area. Both the Broward County and Fort Lauderdale data for their small retail service area provider section are not broken into area level for the City, but the services provided within the City Limits are similar to that of City's retail service area.

With the average historic usage hovering at 95 gpcd, this indicates a significantly lower average than the last reported 119 gpcd in the 2014 WSFWP. The lower per capita usage may be attributable to greater amount of rainfall and the City's conservation efforts.

Table 5-3 shows the potable water purchased by the City from City of Fort Lauderdale and water sold in the service area by the City. A rolling 12-month average is computed to obtain relatively normalized data. Data shows that water consumption appeared higher than the water purchased from the City of Fort Lauderdale. The City of Oakland park has advised that the water meters have been upgraded by the City of Fort Lauderdale which lead to higher consumption readings. The negative losses have been reducing as also shown on **Table 5-3**.

Table 5-3. Potable Water Loss Oakland Park Service Provider Area

Water Purchased (Thousand Gallons)			**Water Sold** (Thousand Gallons)		**Water Loss**
	Monthly	**12 Mon Avg***	**Monthly**	**12 Mon Avg***	**%**
Oct-13	100,127		157,418		
Nov-13	91,996		157,506		
Dec-13	101,553		167,869		

Water Purchased (Thousand Gallons)			Water Sold (Thousand Gallons)		Water Loss
	Monthly	12 Mon Avg*	Monthly	12 Mon Avg*	%
Jan-14	95,156		171,148		
Feb-14	87,434		161,212		
Mar-14	89,250		173,920		
Apr-14	108,644		164,650		
May-14	111,206		171,383		
Jun-14	88,913		178,709		
Jul-14	102,365		167,069		
Aug-14	90,235		140,800		
Sep-14	97,691	97,048	162,581	164,522	-69.5%
Oct-14	93,381	96,485	77,809	157,888	-63.6%
Nov-14	92,236	96,505	86,028	151,932	-57.4%
Dec-14	79,775	94,691	84,363	144,973	-53.1%
Jan-15	106,445	95,631	97,504	138,836	-45.2%
Feb-15	89,318	95,788	85,104	132,493	-38.3%
Mar-15	96,675	96,407	87,612	125,301	-30.0%
Apr-15	110,660	96,575	93,327	119,357	-23.6%
May-15	96,796	95,374	92,382	112,774	-18.2%
Jun-15	104,336	96,659	93,730	105,692	-9.3%
Jul-15	111,568	97,426	99,869	100,092	-2.7%
Aug-15	91,678	97,547	95,604	96,326	1.3%
Sep-15	101,484	97,863	100,638	91,164	6.8%
Oct-15	86,773	97,312	89,817	92,165	5.3%
Nov-15	79,087	96,216	85,482	92,119	4.3%
Dec-15	106,396	98,435	95,860	93,077	5.4%
Jan-16	91,682	97,204	89,330	92,396	4.9%
Feb-16	90,182	97,276	92,704	93,030	4.4%
Mar-16	81,706	96,029	89,560	93,192	3.0%
Apr-16	69,918	92,634	96,717	93,474	-0.9%
May-16	75,576	90,866	95,505	93,735	-3.2%
Jun-16	91,229	89,773	98,742	94,152	-4.9%
Jul-16	83,613	87,444	91,068	93,419	-6.8%
Aug-16	77,210	86,238	100,859	93,857	-8.8%
Sep-16	67,603	83,415	93,048	93,224	-11.8%
Oct-16	59,563	81,147	84,298	92,764	-14.3%
Nov-16	65,783	80,038	85,423	92,760	-15.9%
Dec-16	75,582	77,471	104,319	93,464	-20.6%
Jan-17	65,108	75,256	97,767	94,168	-25.1%
Feb-17	64,154	73,087	95,104	94,368	-29.1%
Mar-17	73,292	72,386	96,403	94,938	-31.2%
Apr-17	66,684	72,116	99,570	95,176	-32.0%
May-17	61,569	70,949	101,308	95,659	-34.8%

Water Purchased (Thousand Gallons)			Water Sold (Thousand Gallons)		Water Loss
	Monthly	12 Mon Avg*	Monthly	12 Mon Avg*	%
Jun-17	82,610	70,231	92,001	95,097	-35.4%
Jul-17	73,737	69,408	90,166	95,022	-36.9%
Aug-17	72,676	69,030	102,638	95,170	-37.9%
Sep-17	66,883	68,970	95,744	95,395	-38.3%
Oct-17	69,244	69,777	84,369	95,401	-36.7%
Nov-17	77,333	70,739	84,583	95,331	-34.8%
Dec-17	64,596	69,824	106,127	95,482	-36.7%
Jan-18	67,606	70,032	97,114	95,427	-36.3%
Feb-18	66,928	70,263	101,347	95,948	-36.6%
Mar-18	72,445	70,193	100,337	96,275	-37.2%
Apr-18	116,226	74,321	92,934	95,722	-28.8%
May-18	70,868	75,096	87,395	94,563	-25.9%
Jun-18	66,596	73,762	84,434	93,932	-27.3%
Jul-18	67,343	73,229	75,735	92,730	-26.6%
Aug-18	92,469	74,878	78,912	90,753	-21.2%
Sep-18	76,017	75,639	100,140	91,119	-20.5%
Oct-18	80,653	76,590	94,800	91,988	-20.1%
Nov-18	113,631	79,615	98,611	93,157	-17.0%
Dec-18	112,590	83,614	94,323	92,174	-10.2%
Jan-19	115,552	87,610	96,796	92,147	-5.2%
Feb-19	90,028	89,535	98,688	91,925	-2.7%
Mar-19	79,019	90,083	91,643	91,201	-1.2%
Apr-19	79,257	87,002	93,358	91,236	-4.9%
May-19	94,765	88,993	99,850	92,274	-3.7%
Jun-19	75,796	89,760	100,755	93,634	-4.3%
Jul-19	83,116	91,074	95,609	95,290	-4.6%
Aug-19	96,396	91,402	96,818	96,783	-5.9%
Sep-19	84,445	92,104	91,925	96,098	-4.3%

*Because water purchased billings and water sold billings are not on the same time frame, a 12-month running average was used to give more meaningful results.

Source: City of Oakland Park, 2020

Water conservation corrective actions are outlined in **Chapter 6**. Such corrective actions should help reduce the system loss and maintain the per capita needs within the City Limits to the 95 gpcd level during normal rainfall years.

5.4 WATER DEMAND PROJECTIONS

The per capita need for the City's City Limits has been projected to a threshold of 95 gpcd. Broward County Water Supply Facilities Work Plan (2020 Work Plan) shown in **Appendix C** reported 96 gpcd for its finished water demand projections in District 1 which is very close to the City of Oakland Park Service area per capita needs as provided in this Chapter. The City of Fort Lauderdale Ten-Year Water Supply Facilities Work Plan 2020 Update reported 164 gpcd for its finished water demand projections. **Table 5-4** shows the City's treated water demand projections.

Table 5-4. City of Oakland Park Treated Water Average Annual Day Demand (AADD, mgd) Projections City Wide

	2020	2025	2030	2035	2040
City of Oakland Park*	2.88	2.99	3.18	3.31	3.41
City of Fort Lauderdale*	0.17	0.16	0.17	0.18	0.19
Broward County*	1.22	1.21	1.25	1.27	1.29
Total	**4.27**	**4.36**	**4.60**	**4.76**	**4.88**

* Demand projections were calculated by multiplying population projections in Table 4-2 by 95 gpcd.

Source: City of Oakland Park, 2020

5.5 CUSTOMER TYPES

Within the City Service Area there are 5 categories of service in the billing system: Commercial, Government, Hotel, Multi-family Residential, and Residential. The split of the demand per billing type is shown in **Table 5-5** below:

Table 5-5. Billing Service Types

Customer Type	Percentage of Total Flow
City	3.82%
Commercial	29.32%
Hotel Motel	2.29%
Multi-Family	34.77%
Residential	5.56%
Single Family	24.25%
Total	100.00%

Source: City of Oakland Park, 2020

5.6 SEASONAL DEMAND

The City's water system has a very low seasonal demand peak. The City, while adjacent to the City of Fort Lauderdale, is not a tourist destination. The marginal (0.8 percent above annual average) extra seasonal demand does not indicate a seasonal demand peak. **Table 5-6** provides the average monthly percentages of water sold to the City's customers within the City Retail Service Area.

Table 5-6. City of Oakland Park Water Consumption

Month	Water Billed in Thousands of Gallons						Monthly Average	% of Annual Average
	2014	2015	2016	2017	2018	2019		
Jan	171,148	97,504	89,330	97,767	97,114	96,796	108,277	8.8%
Feb	161,212	85,104	92,704	95,104	101,347	98,688	105,693	8.6%
Mar	173,920	87,612	89,560	96,403	100,337	91,643	106,579	8.7%
Apr	164,650	93,327	96,717	99,570	92,934	93,358	106,759	8.7%
May	171,383	92,382	95,505	101,308	87,395	99,850	107,971	8.8%
Jun	178,709	93,730	98,742	92,001	84,434	100,755	108,062	8.8%
Jul	167,069	99,869	91,068	90,166	75,735	95,609	103,253	8.4%
Aug	140,800	95,604	100,859	102,638	78,912	96,818	102,605	8.4%
Sep	162,581	100,638	93,048	95,744	100,140	91,925	107,346	8.7%
Oct	77,809	89,817	84,298	84,369	94,800	N/A	86,219	7.0%
Nov	86,028	85,482	85,423	84,583	98,611	N/A	88,025	7.2%
Dec	84,363	95,860	104,319	106,127	94,323	N/A	96,998	7.9%
Total	**1,739,672**	**1,116,929**	**1,121,573**	**1,145,780**	**1,106,082**	**865,442**	**1,227,787**	**100.0%**

Source: City of Oakland Park, 2020

In Broward County, the rainfall season is from late May to Late October. The peak seasonal water demand in Southeast Florida is normally in March, April, and May. However, as indicated in **Table 5-6**, the City does not have a significant peak seasonal demand. The normal dry season's peak three months (March, April and May) does not show much increase in demand compared to an annual monthly average of 8.3%. A small increase is noted from January to June. This very minor demand comes primarily from lack of rainfall during the winter and spring months when water demand for irrigation and commercial activities increases.

The hotel motel establishments within the City Service Area do have a separate billing category and constitute a minor percentage of the City's total sales in recent years, as shown in **Table 5-7** below:

Table 5-7. City of Oakland Park Hotel / Motel Water Consumption

Year	Percent of Total Water Consumed
2015	2.54%
2016	2.10%
2017	2.42%
2018	2.35%
2019	2.04%

Source: City of Oakland Park, 2020

Additionally, the City's agreement with the City of Fort Lauderdale does not include a seasonal or peak factor limitation on the water provided. This is a further indication of the lack of a seasonal demand within the City. The City is able to meet its maximum water demands through the current treated water supplies.

6.0 CHAPTER 6 – WATER SUPPLY FACILITIES WORK PLAN

6.1 WORK PLAN

The treated water needs and population projections for the City presented in previous Chapters were utilized to ascertain potable water needs for the future. **Table 6-1** shows the current and projected water supply needs for the City of Oakland Park. The agreement between the City and the City of Fort Lauderdale does not allocate plant capacity. However, Fort Lauderdale agrees to meet water demands from the City. **Appendix D,** herein**;** indicates the Agreement between the City and City of Fort Lauderdale. The City of Fort Lauderdale has predicted a deficit from Biscayne Water Supply by the beginning of 2035 through their Water Supply Facilities Work Plan 2019 Update. The City of Fort Lauderdale is planning to address this deficit by participating in C-51 Reservoir project. The City has committed for 3 mgd participation allocation for the C-51 reservoir project.

Since there is no wholesale service from Broward County, therefore no agreement exists with Broward County. However, since Broward County provides retail service to a portion of the City.

6.2 INFRASTRUCTURE ELEMENT

The essential infrastructure elements required for developmental approval and for subsequent certificate of occupancy are required per the City's Land Development Code. Sign off on adequacy of water supply and treatment is coordinated with Suppliers, Broward County and the City of Fort Lauderdale. On-site retention of storm water and impervious limitations are coordinated with Broward County Environmental Protection Division and for large projects with SFWMD. Some key Goals, Objectives, and Policies (G.O.P's) and proposed amendments to these are included in Goal 4, Objective 4.1,Policy 4.1.1, Policy 4.8.3, Policy 4.12.10, Policy 9.2.5 and Policy 9.2.6; whereas, the complete G.O.P.'s are included in Volume I of the City's 2019 Comprehensive Plan. Proposed amendments to the Comprehensive Plan affect the following elements: Future Land Use, Infrastructure, Conservation, Coastal Management, Capital Improvements and Intergovernmental Coordination.

Discussion is included, herein, regarding both Traditional Water Supply Facilities as well as Alternative Water Supply Projects being proposed by the Suppliers, Broward County and the City of Fort Lauderdale.

The City's ongoing conservation program will continue and be enhanced further as included in this section. While "Reuse" is included, herein, there are no substantive plans for implementation of reuse projects within the 2020 Ten-Year Water Supply Facilities Work Plan schedule.

The City of Oakland Park has also adopted a Climate Action Plan in January 2019. There are mainly two goals of the Action Plan as follows:

1) Mitigation of the effects of climate change by reducing greenhouse gas emissions (GHGs) by 1% annually through 2028.

2) Increasing community resiliency without impacting efficiency and cost effective business operations.

6.3 TRADITIONAL WATER SUPPLY PROJECTS

The City does not have any raw water supply facilities and relies on its wholesale supplier of treated water, the City of Fort Lauderdale.

6.3.1 City of Fort Lauderdale

The City of Fort Lauderdale has recently completed the **'**Granular Activated Carbon Pilot Study & Plant Evaluation' Report prepared by Carollo Engineers, Inc. and Stantec Consulting Services, Inc. This project includes evaluation of treatment technologies to achieve the City's strategic goal for the Fiveash WTP. The results of this study is a report recommending a new Water Treatment Plant at Prospect Site. For details on the City of Fort Lauderdale Ten-Year Water Supply Facilities Work Plan 2020 Update, please refer to **Appendix B**

6.3.2 Broward County

According to the Broward County Water Supply Facilities Work Plan (2020 Work Plan), there are no traditional water supply projects associated with the District 1 SAS wellfield. The District 1 wellfield supplies raw water to District 1 WTP from which the treated water is distributed to their retail service area within the City. The District 1 SAS has excess capacity to meet the current and future needs of their District 1 Service Area, which includes their retail Service Area in the City. The Broward County Water Supply Facilities Work Plan (2020 Work Plan) states that the projected raw water demand comprises 56% of the current District 1 WTP capacity. For details on the Broward County Water Supply Facilities Work Plan (2020 Work Plan), please refer to **Appendix C**.

6.4 ALTERNATIVE WATER SUPPLY PROJECTS

6.4.1 City of Fort Lauderdale

The City of Fort Lauderdale plans on the following actions relative to water supply planning over the next Ten-years:

1. The demand projections in the Water Supply Facilities Work Plan 2019 Update revealed that demand is projected to exceed the Biscayne Aquifer supply starting 2035. The City is planning to address this projected deficit by participating in C-51 Reservoir project for 3 mgd additional allocation to address the 2035 demand needs. Additionally, the City has planning documents in place for Floridan wells and 6 mgd RO WTP since 2008.

2. The City of Fort Lauderdale had provided a commitment letter for purchasing water from the C-51 reservoir regional stormwater capture project; partnered with the Broward County Water Resources Task Force Technical Team.

3. The City of Fort Lauderdale will continue to implement its ongoing conservation programs as outlined in Section 3.6 of its Ten-Year Water Supply Facilities Work Plan 2020 Update.

4. The City of Fort Lauderdale developed a Comprehensive Utility Strategic Master Plan (CUSMP) for the water and wastewater systems in 2017. The City is evaluating and prioritizing the recommended improvements for the aging water supply, treatment and distribution infrastructure from the CUSMP.

6.4.2 Broward County

The projected 2040 District 1 annual average day demand is 9.14 mgd and the raw water allocation is 10.03 mgd on annual average day basis. This leads to sufficient allocation to meet the projected demand using lime softening treatment process. Broward County Water Supply Facilities Work Plan (2020 Work Plan) puts emphasis on the importance of developing diverse water sources to meet current and future water needs. C-51 Reservoir project, Floridan Aquifer and Reclaimed Water are recognized as AWSs. This plan also shows that the County is not planning to construct the RO WTP at the District 1 WTP site. The County has committed to participate in the C-51 reservoir project for future additional Biscayne allocation and has obtained a water use permit from the SFWMD for additional six (6) mgd of Biscayne water supply.

6.5 CONSERVATION PROGRAMS

The City's 1998 Comprehensive Plan included the objective to reduce its per capita water consumption rates by at least 5 percent through 2001. The City will continue to have water conservation practices through the long-range planning horizon and will coordinate with City of Fort Lauderdale and Broward County on the incorporation of other water conservation techniques.

As previously mentioned, the City has projected its treated water supply needs at 95 gpcd. Several conservation measures will be utilized to keep the per capita demands close to the projected level. The following conservation programs are ongoing which helped the City to achieve reducing the Potable Water demand successfully to 95 gpcd.

6.5.1 Water Meter Replacement Program

The City's water meter replacement program has been very efficient in promoting water conservation.

- All water meters in the City were replaced with smart water meters by January 2019. The new smart meters have a leak detection capability to alert City Staff as well as residents. For residents to be alerted to the leak, they must log into the 'Eye on Water' website to monitor water usage.

6.5.2 Monitoring of Conservation Practices Implemented

The City has been diligently monitoring the losses and benefits of conservation practices implemented within the last five years.

- The City has a toilet rebate program providing residents $100 per toilet up to 2 toilets per house to replace existing toilets with a low volume flush toilet.
- The City has given out 12 water conservation kits between 2014 and 2016.

6.5.3 Water Restriction Enforcement

The City of Oakland Park practices year-round water conservation. The City has ordinances that support this effort by adhering the conservation mandates from the South Florida Water Management District. These ordinances are provided below:

- The City has adopted an ordinance (Section 22-19) called as “Water Shortage; water shortage emergency; curtailment, restriction on certain uses of water”. The City supports compliance with the water shortage or water shortage emergency declarations made by the Governing Board or the Executive Director of the South Florida Water Management District pursuant to Chapter 373, F.S.

- The City has adopted an ordinance (Section 22-20) called as “Mandatory water restriction surcharge”. This ordinance helps promote water conservation through an increased pricing incentive, which meets the overall interests of the South Florida Water Management District water restrictions. It also ensures that the City maintains the financial and revenue sufficiency of its utility system.

The City adheres to the lawn watering restrictions. The South Florida Water Management District’s Governing Board adopted the Year-Round Irrigation Rule 40E-24, F.A.C. in 2010. The Rule restricts the times and number of days landscape irrigation is allowed within the SFWMD’s jurisdiction and follows recommendations for lawn irrigation.

The City of Oakland Park’s Irrigation Restrictions are part of its Landscape and Streetscape Design Standards which is refenced in the City’s Zoning code. The City’s Landscape and Streetscape Design Standards are provided in **Appendix F.**

All water conservation programs and incentives, current and future, implemented by the City will support the goals and objectives of the 2018 Lower East Coast Water Supply Plan Update implemented by the South Florida Water Management District. The City’s water conservation program will also conform to anticipated amendments to Section 62-40.412, Florida Statutes (F.S.) – Water Resource Implementation Rule: Water Conservation.

The City will continue to monitor the benefits of the above programs from the system operations and maintenance budget.

6.5.4 City of Fort Lauderdale

The City of Fort Lauderdale has actively pursued a conservation strategy that enforces water restriction during drought. The City established a goal to reduce its finished water demand to 170 gpcd by 2028, this goal has been met as of year 2020. The current average finished water demand over past five years reported in the Water Supply Facilities Work Plan 2019 Update is 164 gpcd. The ongoing conservation initiatives implemented by the City of Fort Lauderdale are listed below:

- Broward Water Partnerships
- ConservationPay$ Program
- NatureScape Irrigation Services
- Water Matters Day

- Conservation Rate Structure
- Water Shortage Restriction
- Florida-Friendly Landscaping
- Green Infrastructure Development Guidelines
- Green Infrastructure Design Details and Specification
- Irrigation System Design Code
- Landscape Irrigation Restrictions
- Water for Heating or Process Water
- Water Used for Cooling Including Condensate
- Commercial Power Washing
- Water for Decorative Features
- Lakes and Ponds
- Leak Detection
- Meter Replacement Program
- Plumbing Code Changes
- Water Conservation Education Program
- Sustainability Action Plan 2011 Update
- 2035 Fast Forward Vision Plan
- Press Play Fort Lauderdale Strategic Plan
- Identify and Local Financial Responsibilities

6.5.5 Broward County

Broward County has implemented a conservation program that includes the follow initiatives:

- Water Use Restriction/Initiatives
- Use of Florida-Friendly Landscape Principles
- Water Conservation Based Rate Structure
- Rain Sensor Overrides for New Lawn Sprinkler System
- Public Information Program

6.6 REUSE PROGRAMS

The City has no wastewater treatment facilities within its city limits or access to treated wastewater effluent for reuse. Should either Broward County or The City of Fort Lauderdale make treated effluent available for reuse, Oakland Park would consider taking benefit of such service.

6.6.1 City of Fort Lauderdale

The City of Fort Lauderdale has previously conducted studies that have demonstrated the practical, logistical, and economic infeasibility of instituting most options to reuse reclaimed water. The City of Fort Lauderdale continues to assess water reuse opportunities that can be used to help other municipalities and collaborate with Broward County to identify and assess cost effective alternative water supply opportunities. Indirect potable reuse systems are under consideration because of the dual benefits of providing more disposal capacity and augmenting local water supplies.

6.6.2 Broward County

Broward County operates the Broward County North Regional Wastewater Treatment Plant (WWTP) located in the City of Pompano Beach. The facility has an FDEP-permitted capacity of 95.00 MGD. The plant provides wastewater services for northern Broward County. In 2018, the annual average daily wastewater flow at the facility was 71.8 MGD. Approximately 3.6 MGD of the treated wastewater is reused at the facility or at adjacent facilities for irrigation, process, or cooling water. Around 0.2 MGD of the reclaimed water generated at the North Regional WWTP is sent to residential and public access area irrigation.

Treated wastewater was disposed of via deep injection wells (44.0 MGD) and ocean outfall (24.0 MGD). Of the water sent to the ocean outfall, an average 3 MGD was captured by the City of Pompano Beach in 2010 for further treatment and reuse. Overall, water reuse at the facility was approximately 5 percent of the wastewater treated at the facility.

The primary users include: Broward County Septage Receiving Facility, Broward County North Regional WWTP, Fedex, Pompano Business Center, Freshpoint Pompano and Pompano Center.

Based on historic flows to the ocean outfall, the facility is required to reuse 21.45 MGD of treated wastewater by 2025 to comply with the 2008 Ocean Outfall statute (Section 403.086(9), F.S.). The BCWWS is promoting collaborative regional water supply strategies to meet the required 60 percent water reuse by 2025. BCWWS has developed a regional reuse master plan. The BCWWS has also implemented a County Ordinance No.2017-05 created mandatory reuse under Chapter 34, Article XI, Reclaimed Water, in the Broward County Code of Ordinances. BCWWS continues to investigate means to increase its reclaimed water usage, both as a method to meet future water needs and the requirements of the 2008 Ocean Outfall Program requirements. BCWWS has partnered with Palm Beach County Water Utilities Department to send reclaimed water into southern Palm Beach County for irrigation. BCWWS installed reclaimed water pipelines over the past years and City of Pompano Beach agreed to provide reclaimed water for residential irrigation from the City of Pompano Beach Oasis Reclaimed WTP. This Reclaimed WTP draws secondary treatment effluent from a North Regional WWTP pipeline. The City of Coconut Creek entered into an interlocal agreement with BCWWS in April 2016. The agreement includes receiving up to 1.4 MGD

reclaimed water from the County with a long-term expectation of 3 MGD reclaimed water purchase. There are now two connections to serve the City of Coconut Creek.

BCWWS continues its efforts to meet the 2008 Ocean Outfall statute requirements before 2025. The BCWWS is expanding the North Regional WWTP reclaimed water system by extending a 42-inch diameter reclaimed water pipeline over a five-mile stretch to serve the users in both Broward and Palm Beach Counties base. The Water Supply Facilities Work Plan states that the County identified around 20 MGD of potential reclaimed water users in a report titled “Broward County Outfall Rule Detailed Plan North Regional Wastewater Treatment Plant Report “prepared in 2013.

6.7 CAPITAL IMPROVEMENTS ELEMENT

The City does not have any Capital Improvement Plans (C.I.P.) related to water supply and treatment. The treated water supply needs for the entire City indicated in Table 6-1 will be provided by the City of Fort Lauderdale (retail and wholesale) and Broward County (retail). Even though the City does not have any immediate need, some expenditure will be made to benefit the transmission and distribution system. As indicated previously, the City continues to place emphasis on replacement of old meters, plus conservation measures to reduce system demand. The City’s Five-Year Capital Improvements Plan for traditional water supply, treatment, and storage and distribution system is presented in **Table 6-2**.

As required by the state law, the City is including the AWS plans of both its suppliers in its Capital Improvements Element. See **Table 6-3** for details of Broward County water and wastewater capital funds projections. Please see **Table 6-4** for details of City of Fort Lauderdale Water Supply, Treatment and Distribution Community Investment Plan. Please see **Appendix B** City of City of Fort Lauderdale Ten-Year Water Supply Facilities Work Plan 2020 Update and **Appendix C** Broward County Water Supply Facilities Work Plan (2020 Work Plan) for the relevant capital improvement fund projections for the City of Fort Lauderdale and Broward County, respectively.

Table 6-1. Current and Projected Treated Water Supply Needs

Year	2020	2025	2030	2035	2040
Population per Retail Service Area					
City of Oakland Park	30,289	31,461	33,488	34,852	35,846
City of Fort Lauderdale	1,745	1,717	1,751	1,880	1,970
Broward County	12,876	12,692	13,189	13,410	13,544
Total Population	44,900	45,900	48,400	50,100	51,400
Per Capita Needs (gpcd)	95	95	95	95	95
Potable Water Demands (MGD)					
City of Oakland Park	2.88	2.99	3.18	3.31	3.41
City of Fort Lauderdale	0.17	0.16	0.17	0.18	0.19
Broward County	1.22	1.21	1.25	1.27	1.29
Total Potable Water Demands (MGD) (daily average annual)	4.27	4.36	4.60	4.76	4.88
Volume from SAS* (MGD)	—	—	—	—	—
Volume from Floridan* (MGD)	—	—	—	—	—
Combination of SAS & Floridan Volume* (MGD)	4.27	4.36	4.60	4.76	4.88
Volume from Other	0	0	0	0	0
Volume from Reclaimed	0	0	0	0	0
Additional Potable Water Needed	0	0	0	0	0

*The division of treated water source has not been determined. This will depend upon Suppliers operation

Source: Calculated by Stantec, 2020

Table 6-2. City of Oakland Park Capital Improvement Plan Revenue Projections

		Expenditure					Five-Year Total
Funds		**FY 2020**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	
Alternative Water Supply Projects		-	-	-	-	-	-
External Sources							
Grant Revenue (1)		$ 1,809,068	$ 1,600,000	$ 4,893,275	$ 1,022,748	$ 7,413,121	$ 16,738,212
	FUND TOTAL	**$ 1,809,068**	**$ 1,600,000**	**$ 4,893,275**	**$ 1,022,748**	**$ 7,413,121**	**$ 16,738,212**
Internal Sources							
General - CIP Fund Balance (Unfunded*) (2)		$ -	$ 994,921	$ 1,285,426	$ 282,396	$ 760,055	$ 3,322,798
General Fund Transfer		$ 386,593	$ -	$ -	$ -	$ -	$ 386,593
Water/Sewer Fund		$ 1,560,000	$ 8,250,000	$ 650,000	$ 400,000	$ 300,000	$ 11,160,000
Stormwater Fund		$ 8,947	$ 169,369	$ -	$ -	$ 150,000	$ 328,316
Special Revenue and Other Funding		$ 43,932	$ -	$ -	$ -	$ 503,750	$ 547,682
FUND TOTAL		**$ 1,999,472**	**$ 9,414,290**	**$ 1,935,426**	**$ 682,396**	**$ 1,713,805**	**$ 15,745,389**
Financing							
None							
FINANCING TOTAL		$ -	$ -	$ -	$ -	$ -	$ -
TOTAL		**$ 3,808,540**	**$ 11,014,290**	**$ 6,828,721**	**$ 1,705,144**	**$ 9,126,926**	**$ 32,483,601**

(1) Grant Revenues are funds committed by other entities to the City and do not reflect unfunded sources. Some future year represents grant funding applied, but not awarded.

(2) CIP Fund Balance - Funds carried over from prior years for current year projects.

Source: City of Oakland Park, Adopted from FY2020 – FY 2024 Capital Improvement Program

Table 6-3. Broward County Water and Wastewater Capital Funds

Project Name		Expenditure				
		FY19	FY20	FY21	FY22	FY23
REVENUES						
User Fees		33,000,000	37,598,090	37,932,580	36,947,580	19,763,580
Capital Recovery Charges		2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Future Bond Proceeds		86,589,200	45,000,000	9,000,000	65,000,000	0
TOTAL REVENUES		**$121,589,200**	**$84,598,090**	**$48,932,580**	**$103,947,580**	**$21,763,580**
APPROPRIATIONS						
Retail Water & Wastewater						
	Water Treatment Plant Expansion 2A	-	-	-	500,000-	-
	Other Projects	46,287,040	76,362,990	31,997,480	43,448,480	18,328,480
	Subtotal	$ 46,287,040	$ 76,362,990	$ 31,997,480	$ 43,958,480	$18,328,480
Regional Treatment Projects						
	All Projects	67,521,520	6,468,810	2,468,810	40,968,810	2,468,810
	Subtotal	$ 67,521,520	$ 6,468,810	$ 2,468,810	$ 40,968,810	$ 2,468,810
Regional Transmission						
	All Projects	7,780,640	1,766,290	14,466,290	19,020,290	966,290
	Subtotal	$ 7,780,640	1,766,290	14,466,290	19,020,290	966,290
Total Appropriations		**$ 121,589,200**	**$ 84,598,090**	**$48,932,580**	**$103,947,580**	**$21,763,580**

Source: Adapted from Broward County Water Supply Facilities Work Plan (2020 Update) (Appendix C)

Table 6-4. City of Fort Lauderdale Water Supply, Treatment and Distribution Community Investment Plan

Project No.	Project Title	Unit	Funded Total (Through FY2024)
P11901	Victoria Pk Sth Sm Watermains Improvement	$	2,595,712
P11887	NW Second Ave Tank Restoration	$	148,159
P12485	Fiveash WTP Filters Rehabilitation	$	1,999,817
P12462	Coral Ridge Small Watermain Improvements	$	4,197,500
P12294	Fiveash WTP Electrical Voltage Upgrade	$	1,497,954
P12190	Utilities Asset Management System	$	3,708,938
P12463	Coral Shores Small Watermain Improvements	$	655,382
P12484	Refurb Fiveash WTP MG Steel Tank (North)	$	747,883
P11247	Distribution&Collection Repair&Replace	$	718,892
P12180	Croissant Park Small Water Mains	$	132,506
P12429	Reno 6300 NW 21 Ave Meter Shop Relocation	$	599,416
P12295	Peele Dixie Air Strippers & Hypochlorite	$	500,705
P12476	Fiveash Wellfield Pump Replacement	$	500,000
P12431	Peele Dixie Membrane Replacement	$	236,224
P12181	WTP Facilities Concrete Restoration	$	219,153
P12182	Lake Estates Small Water Mains	$	196,359
P11275	Peele Dixie WTP Renewal & Replacement	$	-
P11246	Water Treatment Plant Repair/Replacement	$	198,050
P12372	Fiveash Skylights and Re-roofing	$	157,006
P12179	Tanbark Lane Sml Water Main Replacement	$	127,337
P11905	Annual Utilities Restoration 2014	$	104,598
P10850	Victoria Park A North Small Watermains	$	57,773
P11685	Water Monitoring System (SCADA)	$	48,088
P11589	Fiveash WTP Disinfection Improvements	$	36,322
P11080	Port Condo Small Water Main Improvements	$	17,330
P11932	Aeration Basin Rehab at Fiveash WTP	$	11,653
FY20200842	Fiveash Wellfield West Generator Replacement	$	650,000
FY20200834	Peele Dixie WTP - Geological Planning Document	$	225,000
P12296	New Utilities Central Laboratory – Peele Dixie Water	$	1,138,500
FY20200882	Soil Mitigation at Sludge Pit Property	$	300,000
P12401	Prospect Wellfield Bonding and Grounding Testing	$	99,000
FY20190721	Conversion of Backwash Pump	$	90,000
FY20200835	Peele Dixie WTP Injection Well Mechanical Integrity	$	60,000
FY20200833	Fiveash WTP-Sluice Gates Replacement	$	420,000
FY20200832	Fiveash WTP-Diesel Bldg Sound Proof Ceiling Panel	$	520,000
P12393	Fiveash Electrical System Replacements (2015-2020)	$	7,316,502

Project No.	Project Title	Unit	Funded Total (Through FY2024)
P12399	Fiveash WTP PCCP Replacement	$	1,135,894
P12403	Peele-Dixie WTP Chemical Storage Improvements	$	950,000
FY20150184	Coral Ridge Country Club Small Water Main	$	3,660,000
FY 20150185	Sea Ranch Lakes Small Water Mains	$	3,596,958
FY 20150187	Lauderdale By the Sea Small Water Main Improvements	$	2,202,000
FY 20190722	Wellfield Communications	$	800,000
FY 20150189	Lake Aire Palm View Small Water Mains	$	1,040,316
FY 20190720	Conversion of Four High Service Pumps to VFD	$	600,000
P12417	Miscellaneous Water Quality Improvements	$	67,000
FY 20190735	Membrane Cleaning System Upgrade	$	100,000
FY 20150190	Bay Colony Small Water Main Improvements	$	2,720,460
FY 20150191	Laudergate Isles Small Water Main Improvements	$	795,835
FY 20190748	Small Water Main Replacement – NE 51st Street	$	1,920,000
FY20190739	SW 11 Street & SW 30 Avenue Small Water Main Replacement	$	1,069,795
FY 20200840	Fiveash Wellfield East Generator Fuel Tank Replacement	$	735,000
FY 20200838	Riverland Road Watermains	$	350,000
FY 20200836	Cordova Road Watermain	$	200,028
FY 20190746	Small Water Main Replacement – Seabreeze Blvd	$	3,318,000
P12398	Fivesh WTP GST and Clearwell Upgrades	$	800,000
FY 20150175	Twin Lakes (NW) Watermain	$	611,310
FY 20150176	SW 29 Street Small Watermains	$	397,353
FY 20190747	Small Water Main Replacement – SW 10th Court	$	338,000
P11465	17th Street Causeway – Large Watermain Replacement	$	337,960
FY 20190749	Small Water Main Replacement – Hendricks Isle	$	300,000
FY 20200837	Pier Sixty-Six Water Main	$	140,020
P12416	Watermain Improvements Area 1	$	99,276
P11589	Fiveash WTP Disinfection Improvements	$	31,438,571
P12391	Bermuda Riviera Sml Wtrmn Improvements	$	4,736,881
P11901	Victoria Pk Sth Sm Watermains Improvement	$	4,992,728
P12404	Excavate & Dispose of Dry Lime Sludge	$	4,584,639
P12399	Fiveash WTP PCCP Replacement	$	3,985,685
P10850	Victoria Park A North -Small Watermains	$	3,599,381
P10814	Central New River W/Main River Crossing	$	1,621,095
P12180	Croissant Park Small Water Mains	$	633,523
P11080	Port Condo Small Water Main Improvements	$	540,459
P12184	Davie Blvd 18” WM Aban I-95 to SW 9 Ave	$	2,068,491
P12395	Peele Dixie Electrical Studies	$	206,496

Project No.	Project Title	Unit	Funded Total (Through FY2024)
P12400	Prospect Wellfield Elc Studies & Testing	$	183,832
P12402	Peele Dixie Wellfield Elc Studies & Testing	$	148,540
P12396	Peele Dixie Surge Protection Upgrades	$	98,540
P12463	Coral Shores Sml Watermain Improvements	$	1,118,998
TOTAL		**$**	**120,867,017**

Source: Adopted from the City of Fort Lauderdale Ten-Year Water Supply Facilities Work Plan 2020 Update, dated June 16, 2020

6.8 INTERGOVERNMENTAL COORDINATION ELEMENT

The City, in preparation of this document, has coordinated with a number of governmental agencies so that the findings and conclusions were the result of information exchange and an understanding of the implications associated with this plan. The City received the Ten-Year Water Supply Facilities Work Plan 2020 Update from Broward County and the City of Fort Lauderdale. Through these documents, the City conveyed its water service areas, population projections, its water demand projections and the need for continued communication as future growth occurs. As part of its EAR-based amendments, the City included policies to continue future coordination with its water suppliers in the Intergovernmental Coordination Element (Policy 8.3.5). Several additional policies are proposed in Section **6.9** below to reflect other items in the 2020 Ten-Year Water Supply Facilities Work Plan.

The City shall coordinate with its water suppliers through existing agreements, the Broward County Water Resources Task Force, and at an annual meeting (prior to adoption of each fiscal year budget), to collaborate on water supply planning issues such as: population projections; the development of efficient, cost-effective, and technically feasible water supply sources that will supplement future demands; without causing adverse impacts to water quality; wetlands and aquatic systems. Consideration and coordination efforts for each major water project shall be noted in the Work Plan.

The City does not have a dedicated page or Section in the Lower East Coast Plan as adopted in November, 2018. Both Fort Lauderdale and Broward County, District 1, which provide service within the City's City Limits, do have Utility Summaries within said 2018 LEC Plan. The plans of Fort Lauderdale call for future supplies from the alternative source, C-51 reservoir project, using existing treatment process at existing plants.

The City has been coordinating and cooperating with both Suppliers for many years as exemplified by the following actions:

- January, 1994 Agreement with Fort Lauderdale as well as recent amendment dated January, 2007 to revise service area boundaries based on annexation and service area changes with Broward County.
- New interconnection location #12 with Fort Lauderdale to have improved flow into the central east area of the City Service Area where new water main improvements were implemented.
- Coordination and cooperation with Broward County with regards to annexation, neighborhood improvement program (includes water main improvements), and service area boundary shifts within the City Limits.
- Utilization of the Broward County Mobile Irrigation Lab to reduce irrigation losses. The Interlocal Government agreement between the County and the City will support an additional 5-year term of providing landscape and irrigation system evaluations. Within this 5-year term the City has realized an overall water savings of approximately 1,630,485 gallons.

- Procedures adopted by the City for notification to City Residents of both voluntary and mandatory water restrictions in conjunction with SFWMD. When changes occur that require notifications the City of Oakland Park utilizes social media, e-mail blasts, Code Red (Reverse 911), Public Access TV Station, Newspaper, water bills and regular mail outs.

The City, even though not a Supplier, will continue to coordinate and cooperate with the Suppliers, regulatory agencies, and planning departments to help in demand management, reduction in system losses, conservation practices, and utilization of alternative raw water sources. Previous implementation of Land Development Regulations by the City assures that adequate water supply and treatment facilities will be in place to serve existing and proposed new developments prior to issuance of a building permit or certificate of occupancy.

6.9 GOALS, OBJECTIVES, AND POLICIES AND PROPOSED AMENDMENTS TO INCORPORATE IN THE 2020 TEN-YEAR WATER SUPPLY FACILITIES WORK PLAN

6.9.1 Existing Goals Objectives and Policies

The following are the existing goals, objectives and policies compiled from the Comprehensive Plan, Revision March 2015 supporting the goal of the City related to potable water supply. Few proposed additions to the GOPs are shown with an underlined format while proposed deletions were shown with a strike through format in the text below.

General

The Local Government Comprehensive Planning Act of 1975 (LGCPA) requires each governmental jurisdiction to prepare and adopt a comprehensive plan. Significant revisions to the LGCPA in 1985 and 1986 (known as the Growth Management Act) have added additional requirements for a more detailed and systematic approach to local planning. In 2005, revisions to the Growth Management Act established a "pay-as-you-grow" plan through Senate Bills 360, 444 and 362 to ensure the roads; schools and water are available to meet the needs of communities. In 2011, the 1985 Local Government Comprehensive Planning and Land Development Act, sometimes referred to as the "Growth Management Act", was substantially amended and the new title is the "The Community Act", as specified in Section 163.3161(1), Florida Statues (F.S.). In addition to the State Acts, the State of Florida Department of Community Affairs issued minimum criteria for plan compliance in Rule 9J-5 of the Florida Administrative Code.

The Comprehensive Plan for the City of Oakland Park has been prepared ~~relative to the State Growth Management Act and Rule 9J-5. It is designed~~ to provide a guide for the future physical, economic, and social development of the City of Oakland Park. Rule 9J-5, Minimum Criteria for Review of Local Government Comprehensive Plans and Plan Amendments, Evaluation and Appraisal Reports, Land Development Regulations and Determinations of Compliance, Florida Administrative Code (FAC) was repealed in 2011.

In ~~2008~~2020, the City adopted a Ten– Year Water Supply Facilities Work Plan (Exhibit 1) and in accordance with state law, portions of this Work Plan have been incorporated into the Comprehensive Plan and was updated in ~~2015~~2020. Affected sections include the Future Land Use, Infrastructure, Conservation, ~~Coastal Management,~~ and Capital Improvements and Intergovernmental Coordination Elements. To be consistent with ~~the~~ this Ten – Year Water Supply Facilities Work Plan, information for the years 2025 and 2030 was updated in ~~2015~~ 2020.

Future Land Use Element

Goal 1 Protect and enhance the single-family residential, multiple-family residential, nonresidential, open space, parks/recreation, golf course and natural resource areas/habitats of Oakland Park.

Objective 1.1 The City shall continue to enforce the Land Development Code in order to assure that all new development connects to public sewer and water, addresses traffic problems, and respects its soil and terrain characteristics.

Policy 1.1.1 As new development and redevelopment occurs, require a tie-in to public sanitary sewer and potable water systems, wherever feasible.

Policy 1.1.5 The City shall continue to provide a Concurrency Management System (CMS) as incorporated within the land development code. The CMS provides procedures and criteria to assess future development approval requests relative to impacts to the adopted level of service standards. The procedures establish mechanisms such that development impacts can be phased concurrently with the level of service standards for roadways, recreation and open space and infrastructure facilities (i.e., sanitary sewer, drainage, solid waste, potable water and natural aquifer recharge). Development applications that are not consistent with the adopted level of service standards or cannot be phased concurrently with available facilities will be denied.

The Concurrency Management System includes the following guidelines.

- The City shall not grant a development permit for a proposed development unless the City has determined that public facilities are adequate to serve the needs of the proposed development or unless the developer agrees in writing that no certificate of occupancy shall be issued for the proposed development until public facilities meet the LOS Standards as specified in the Land Development Code. Transportation facilities must be in place or under construction within three years of building permit, or functional equivalent, approval.

- A preliminary concurrency determination shall be made at the earliest stage of development permit review process. Final concurrency should be determined at site plan or final plat stage.

- The prescribed service needs must be met upon completion of construction and prior to issuance of a certificate of occupancy.
- The burden of indicating compliance is upon the developer. Sufficient and verifiable information showing compliance is required for approval.
- The City shall be responsible for monitoring development activity to ensure the development is consistent with the City Comprehensive Plan. Monitoring shall include monthly reports of all new or amended land development regulations including changes in zoning districts, building permits, demolition permits, certificates of occupancy and an annual summary of land use acreage.
- Compliance will be finally calculated and capacity reserved at the time of final action of an approved site plan or an enforceable developer's agreement. Applications for development permits shall be chronologically logged upon approval to determine rights to available capacity.
- A building permit application must be submitted within 18 months of site plan approval to preserve the concurrency reservation.

Policy 1.1.9 Adequate water supplies and potable water facilities shall be in place and available to serve new development or redevelopment that increases density or intensity no later than the issuance by the City of a certificate of occupancy or its functional equivalent. Prior to approval of a building permit or its functional equivalent that allows an increase in density or intensity, the City shall consult with the applicable water supplier to determine whether adequate water supplies to serve the new development will be available no later than the anticipated date of issuance of a certificate of occupancy or its functional equivalent. The Land Development Regulations shall be updated to reflect this change by 2009.

Policy 1.7.5 Proposed amendments to the Future Land Use Map shall provide data and analysis demonstrating that adequate water supply and associated public facilities will be available to meet projected growth demands.

Sanitary Sewer, Solid Waste, Drainage, Potable Water and Natural Groundwater Aquifer Recharge (Infrastructure) Element

Goal 4 To ensure that basic urban services of potable water, sanitary sewer and solid waste disposal, and land drainage capabilities are available and adequate to meet the needs of all City residents and businesses.

Objective 4.1 The City shall continue to provide local infrastructure services in accord with the following Level of Service Standards:

a) Average and peak flow per capita rates for sanitary sewer.

b) Pickup frequency/per capita generation rate for solid waste.

c) Storm drainage design criteria, and

d) Minimum design flow and fire pressure and per capita consumption rate for potable water.

Policy 4.1.1 Adopt the local level of service standards for infrastructure services as follows:

- For sanitary sewer – ~~150~~ 86 gallons per day per resident;
- For potable water - ~~119~~ 95 gallons per day per resident;
- For fire flow - as required by the Fire Marshall;
- For solid waste - 8 pounds per capita per day with bi-weekly pickup;
- For drainage (Roadway Crown) – 10-year 3-day storm.
- For drainage (Finished Floor) - floor elevation above 100 yr~~. years~~ 3 day storm. Finished floor shall be no lower than the highest of:

  1. One (1) foot above the FEMA Flood Insurance Rate Base Flood Elevation; or
  2. The 100-year flood elevation as determined by the Broward County100-year Flood Criteria Map; or
  3. Twelve (12) inches above the adjacent road crown for residential development and six (6) inches above the adjacent road crown for nonresidential development.

Policy 4.1.4 Maintain the level of service standards through perpetuation of the existing or future inter-local retail service agreements with Fort Lauderdale and Broward County

Policy 4.1.5 Review and, if appropriate, consider the adoption of revised level of service standards based on planning efforts of outside service providers to the City.

Policy 4.1.7 ~~By 2017, establish an implementation program to~~ The City shall continue to increase the number of fire hydrants and improve fire flow as identified in the water distribution system analysis undertaken in 2005.

~~Policy 4.1.8 By 2015 the City will evaluate the feasibility of establishing a potable water level of service standard for non-residential users.~~

Objective 4.2 The City shall continue to implement land development regulations to assure that new development or redevelopment occurs concurrently with the adopted level of service standards.

Policy 4.2.1 Approval of all City development and redevelopment plans shall be conditioned on service availability at the adopted standards concurrently with development.

Objective 4.4 To provide for the continued maintenance of the City's potable water distribution and sanitary sewer collection facilities.

Policy 4.4.1 In concert with Broward County and Fort Lauderdale, the City should annually perform and periodically update inventories of water and wastewater facility conditions.

Policy 4.4.2 The City shall annually prioritize water and sanitary sewer rehabilitation, replacement or expansion needs.

Policy 4.4.3 On an annual basis, the City shall modify the capital improvement program to include funding for water and wastewater system rehabilitation, replacement or expansion based on the established criteria for prioritizing system needs.

Objective 4.8 ~~Through~~ Beyond the Year 2018, correct existing water distribution system deficiencies and extend water service to non-serviced areas as appropriate.

Policy 4.8.1 Include in the annual modification of the Capital Improvement Program funding for correcting existing water distribution system deficiencies.

Policy 4.8.2 Through implementation of the Land Development Regulations the City shall continue to require extension of water services to new developments.

Policy 4.8.3 Retain a procedure including utilization of social media, email blasts, Code Red (Reverse 911), Public Access TV Station, Newspaper, water bills and regular mail outs, in conjunction with water suppliers and the South Florida Water Management District, to notify City residents of voluntary and mandatory water conservation practices during drought periods.

Objective 4.10 Prior to Plat approval, ensure that the public facilities and services necessary to meet the level of service standards established within the City of Oakland Park Comprehensive Plan will be available concurrent with the impacts of the development, consistent with Chapter 163.3202(g) Florida Statutes and the concurrency management policies included within Goal 1 of the Oakland Park Comprehensive Plan.

Objective 4.11 Coordinate with Broward County and the City of Fort Lauderdale to address the City's water supply and wastewater treatment needs for 2030.

Policy 4.11.1 The City shall coordinate with Broward County and the City of Fort Lauderdale to ensure potable water and wastewater service is provided to all areas of the City.

Objective 4.12 The City shall coordinate land use planning with the management of water source and supply plans through the Comprehensive Plan, coordination with the City's water providers, and the South Florida Water Management District's Lower East Coast Water Supply Plan.

Policy 4.12.1 The City shall maintain a Water Supply Facilities Work Plan (Work Plan) for at least a ten (10) year planning period addressing water supply facilities necessary to serve existing and future development within the City and support other local and regional water supply plans. The Work Plan shall be incorporated wholly into the Infrastructure Element of the Comprehensive Plan. Other elements of the Comprehensive Plan shall be amended as necessary to support and be consistent with the Work Plan.

Policy 4.12.2 Capital projects scheduled in the first five years of the Ten-Year ~~ten year~~ Work Plan shall be included in the Capital Improvements Element which is to be financially feasible. This schedule shall be updated annually as necessary to maintain consistency with the capital projects listed in the Work Plan and within 18 months following updates to the Lower East

Coast Water Supply Plan, the City of Fort Lauderdale Water Supply Plan, or the Broward County Water Supply Plan.

Policy 4.12.3 The City shall coordinate the Ten-Year Water Supply Facilities Work Plan with the adopted Future Land Use Map and the socio-economic data projections of the Comprehensive Plan. This coordination will occur in two ways:

- Long range water supply planning to meet future service demand shall be based upon Broward County's socio-economic data projections for the City. The City shall update its socio-economic data every seven years with the Evaluation and Appraisal Report or more frequently as needed. Coordination with the City of Fort Lauderdale and Broward County regarding their service areas will be completed as part of these updates.
- Prior to issuing a building permit that increases density or intensity, the City shall continue to require a concurrency review finding that the calculated water service demand can be met by available and uncommitted facility capacity and water supply.

Policy 4.12.5 The City shall coordinate with its water suppliers through existing agreements, the Broward County Water Resources Task Force, and at an annual meeting (prior to adoption of each fiscal year budget), to collaborate on water supply planning issues; such as population projections, water conservation practices, the development of efficient, cost-effective, and technically feasible water supply sources that will supplement future demands, without causing adverse impacts to water quality, wetlands and aquatic systems. Consideration and coordination efforts made for each major water project shall be noted in the Work Plan.

Policy 4.12.6 The City shall seek to maximize the use of existing potable water facilities, when financially and technically feasible, through the implementation of conservation techniques as described in the Work Plan, including but not limited to reducing per capita water consumption rates through education, incentive programs (promoting utilization of water conservation kits, pre-rinse valves, and leak detection kits), the replacement of outdated water meters, and water conservation techniques (~~xeriscaping~~ Florida-friendly landscaping).

Policy 4.12.7 ~~By 2020~~ Beyond 2025 the City shall continue to implement a water conservation type rate structure for the City's retail service area.

Policy 4.12.8 ~~By 2020~~ Beyond 2025 the City shall continue to reduce losses in the water system to ten percent or less.

Policy 4.12.9 The City will apply for a Water Savings Incentive Program (SIP) grant from the South Florida Water Management District to assist with the purchase and distribution of pre-rinse valves and water conservation kits.

Policy 4.12.10 The City has successfully reduced the Potable Water demand to 95 gallons per capita per day through conservation strategies. Water demand rates will be maintained at that rate and to be consistent with Infrastructure Element Policy 4.1.1 and Capital Improvements

Element Policy 9.2.4. ~~Reduce water demand to 119~~ 95 ~~gallons per capita per day through conservation strategies by the year 2028.~~

Coastal Management

Goal 5 To develop and maintain the coastal area of the City in a manner which protects human life, limits public expenditures in areas subject to destruction by natural disasters and perpetuates existing upland uses while best preserving local shoreline and tidewater resources.

Objective 5.6 Provide for urban services consistent with the level of service standards of each Comprehensive Plan Element.

Policy 5.6.1 The City will continue to maintain existing interlocal agreements for provision of potable water and wastewater collection with the City of Fort Lauderdale and Broward County.

Policy 5.6.2 Adequately fund continued local maintenance and operation needs with respect to storm drainage, roadway surfacing and parks and recreation.

Policy 5.6.3 Support and, where applicable, participate in water supply projects identified by the City of Fort Lauderdale, Broward County and the South Florida Water Management District to ensure adequate potable water for future development.

Conservation

Goal 6 The development and maintenance of a high quality natural environment based on the preservation, improvement and wise use of local existing open space sites, natural resources areas/habitats wetlands and conservation areas.

Objective 6.4 Promote water conservation by advocating reduced consumption and encouraging development and redevelopment to include ~~Xeriscape~~ Florida-friendly landscaping and other water conservation techniques in its design.

Policy 6.4.1 The City shall continue to utilize standardized procedures to notify City residents of voluntary and mandatory (when requested by the South Florida Water Management District) water conservation practices during drought periods.

Policy 6.4.2 The City shall distribute information on water conservation techniques through water service bills and at City-owned civic locations such as City Hall and the Public Works Department.

Policy 6.4.3 The City shall continue to participate in the National "~~Xeriscape~~ Florida-friendly landscaping" Council and continue to plant drought tolerant species, where feasible.

Policy 6.4.4 The City shall continue to encourage green building in the Federal Highway Mixed Use Business and Entertainment Overlay District, and shall consider including similar incentives for green building in other redeveloping areas of the City.

Policy 6.4.6 The City shall implement the water conservation techniques identified in the 10-Year Water Supply Facilities Work Plan including but not limited to reducing per capita water consumption rates through education, incentive programs (promoting utilization of water conservation kits, pre-rinse valves, leak detection kits, and the replacement of outdated water meters), and water conservation techniques (~~xeriscaping~~ Florida-friendly landscaping).

Policy 6.4.7 The City will apply for a Water Savings Incentive Program (SIP) grant from the South Florida Water Management District to assist with the purchase and distribution of pre-rinse valves and water conservation kits.

Intergovernmental Coordination

Goal 8 To maintain a cooperative and effective local environment of communication and participation with other governments and government agencies in the overall best interest of City residents and businesses.

Objective 8.3 The City shall continue to review local level of service (LOS) standards for sanitary sewer, potable water and solid waste for consistency with those of outside providers of City infrastructure services such as Fort Lauderdale and Broward County and amend the City's adopted LOS standards as necessary to ensure consistency and facilitate execution and renewal of interlocal agreements and service contracts, as deemed appropriate by the City Commission.

Policy 8.3.1 When negotiating or renewing interlocal service agreements with Fort Lauderdale and/or Broward County, the City shall provide for contractual recognition of adopted local level of service standards.

Policy 8.3.2 The City shall review the level of service standards subsequently adopted by other government service providers (Fort Lauderdale and Broward County) to the City through continued monitoring of the actions of the Broward County Planning Council and Board of County Commissioners with respect to the amendment of adjacent jurisdictional Comprehensive Plans. To identify consistency with local level of service standards, the City will annually contact all service providers to obtain current information, and evaluate if future modifications to either the service agreements or level of service standards should be included in subsequent Comprehensive Plan amendments.

Policy 8.3.5 The City shall coordinate with the SFWMD and the City's potable water providers, Broward County and the City of Fort Lauderdale, in implementing the regional water supply plan as it applies to the City of Oakland Park, including identified traditional and alternate water supply projects.

Policy 8.3.6 The City will work with Broward County on establishing emergency water main interconnections within their franchise area.

Policy 8.3.7 As a means to achieve the adopted level of service for potable water, the City will coordinate with Broward County, the City of Fort Lauderdale, and the South Florida Water Management District on improving water conservation practices. ~~Specific coordination mechanisms include the City's participation in the National Xeriscape Council, involvement on the Broward County Water Resources Task Force, participation in the Water Management District's Water Savings Incentive Program, and through its website, printed materials available at City Hall, and information included with the City's water Bills.~~Water conservation best practices will also be discussed during the annual meeting with the City's water suppliers.

Policy 8.3.8 To assist commercial and residential landowners with water conservation, the City will apply for a Water Savings Incentive Program (SIP) grant from the South Florida Water Management District to assist in the purchase and distribution of pre-rinse valves and water conservation kits.

Capital Improvements

Goal 9 To ensure the orderly and efficient provision of all public services and facilities necessary to serve existing and future local population needs.

Objective 9.2 The City shall continue to implement a Concurrency Management System that ensures development or redevelopment proposals are approved consistent with the programmed provision of additional services at the adopted level of service standards and meets existing and future facility needs.

Policy 9.2.1 The City shall continue to review development proposals cognizant of the City's adopted level of service standards, existing levels of service and where appropriate, the timeframe for implementation of additional facility improvements.

Policy 9.2.2 The approval of proposed development or redevelopment projects shall be conditioned on the basis of project related service needs being concurrently available at the adopted level of service standards specified in Policy 9.2.4. Transportation facilities needed to serve development or redevelopment projects shall be in place or under construction within three (3) years after the building permit, or functional equivalent, is approved.

Policy 9.2.3 Subject to Policy 9.2.2., the City shall allow for phasing of development related infrastructure improvements concurrently with project impacts on public facilities.

Policy 9.2.4 The level of service standards (LOS) for capital facilities shall be:

- For sanitary sewer –~~150~~ 86 gallons per day per resident;
- For potable water – ~~119~~ 95 gallons per day per resident;
- For fire flow - as required by the Fire Marshall;
- For solid waste - 8 pounds per capita per day with bi-weekly pickup;

- For drainage (Roadway Crown) - 10 year 3 day storm;
- For drainage (Finished Floor) - floor elevation above 100 year 3 day storm. Finished floor shall be no lower than the highest of:

    1. One (1) foot above the FEMA Flood Insurance Rate Base Flood Elevation; or
    2. The 100-year flood elevation as determined by the Broward County 100-year Flood Criteria Map; or
    3. Twelve (12) inches above the adjacent road crown for residential development and six (6) inches above the adjacent road crown for nonresidential development.

- For parks and recreation facilities – three (3) acres per 1,000 residents, with two (2) acres per 1,000 population provided by neighborhood parks or mini-parks and one (1) acre per 1,000 population provided by community parks; and
- For transportation facilities:
    - I-95 (a SIS corridor) - LOS E;
    - Cypress Creek Road from I-95 to Andrews Avenue and Andrews Avenue from Cypress Creek Road to the Tri-Rail station entrance (a SIS connector) - LOS D;
    - As part of the Broward County Central District using transit oriented concurrency – coordinate with the county to achieve headways of 30 minutes or less on 80% of routes (non-contract BCT routes), establish at least one neighborhood transit center, and establish at least two additional community bus routes, increase bus shelters by 30%, and maintain the peak hour two-way maximum service volumes on arterial roads as listed below:
        - Two-lane arterials 2,555
        - Four-lane arterials 5,442
        - Six-lane arterials 8,190
        - Eight-lane arterials 10,605; and
    - For Local Roadways - LOS C ADT, PSDT and PKHR

Policy 9.2.5 ~~By 2015-2025~~ Within one year after submission of the Comprehensive Plan or revised Comprehensive Plan for review, the City shall review and modify as necessary the land development regulations to be consistent with the level of service standards and the requirements of Florida Statutes regarding the timing of development and the provision of facilities and infrastructure consistent with the requirements of Section 163.3202, F.S.

Policy 9.2.6 ~~By 2015 2025~~ Within one year after submission of the Comprehensive Plan or revised Comprehensive Plan for review, the City shall modify the Concurrency Management System to require written approval from water suppliers regarding available capacity to support new development as described in Policy 1.1.9 of the Future Land Use Element consistent with the requirements of Section 163.3202, F.S..

Objective 9.4 Provide a capital program that can be adequately accommodated by projected revenues or other available financial resources.

Policy 9.4.4 Capital projects scheduled in the first five years of the Ten -Year Work Plan shall be included in the Capital Improvements Element which is to be financially feasible. This schedule shall be updated annually as necessary to maintain consistency with the capital projects listed in the Work Plan and within 18 months following updates to the Lower East Coast Water Supply Plan, the City of Fort Lauderdale Water Supply Plan, or the Broward County Water Supply Plan

Policy 9.4.5 The following list identifies improvements the City would like to undertake. They are not specified in the City's Five-Year Capital Improvement Program.

Project	**Costs ($)**
Downtown Traffic Circulator	TBD
NE 13th Avenue Sidewalk Improvements	TBD
Public Works Operations Facilities	TBD
Fire Station 20	TBD
Fire Station 87	TBD
Fire Station 9	TBD
North Andrews Gardens Community Center	TBD
Library Building	TBD
Sphier Recreation Center	TBD
Collins Community Center	TBD
Park Place (L Shaped Building)	TBD
Downtown Parking	TBD

Note: The tables below contain the City's Capital Improvements Program. The City of Oakland Park is almost fully developed. No specific infrastructure improvements to achieve level of service standards are identified in the City's comprehensive plan. There are improvements identified in Table 12 related to Water Supply Planning. Those are projects being undertaken by the City's water suppliers, the City of Fort Lauderdale and Broward County, and are included as a separate table to comply with state law. Projects included in the capital improvements program are designed to ensure operational capacity and efficiency to maintain level of service standard.

City of Oakland Park
Capital Improvements Program – FY19 to FY23
"Tables 1 through 12 have been repealed and will be replaced in its entirety with new tables adopted by Ordinance O-2020-009"

6.9.2 Proposed Amendments to Incorporate in the 2020 Ten-Year Water Supply Facilities Work Plan

There has been no change to Goals, Objectives, and Policies (GOPs) since March 2015 revision of the Comprehensive Plan. Additionally, there are no GOPs related to the recently adopted Climate Action Plan.

There is one proposed amendment to the upcoming Comprehensive Plan which is a requirement by the SFWMD. It is described as below:

"Section 163.3177(1)(b), F.S. The Statute states: "The reference must identify the title and author of the document and indicate clearly what provisions and edition of the document is being adopted." Following draft policy is recommended to be included for use in adopting Work Plans by reference:"

Therefore, following draft policy is proposed to be included to the Comprehensive Plan by the City:

Policy XX "City of Oakland Park (City) hereby adopts by reference the 2020 Ten-Year Water Supply Facilities Work Plan, dated 2020, prepared by Stantec Consulting Inc. for a planning period of not less than 10 years. The Work Plan addresses issues that pertain to water supply facilities and requirements needed to serve current and future development within the City's water service area. The City shall review and update the Work Plan at least every five (5) years within 18 months after the governing board of the water management district approves an updated regional water supply plan. Any changes affecting the Work Plan shall be included in the annual Capital Improvements Plan update to ensure consistency between the Work Plan and the Capital Improvements Element."

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Appendix A - RELEVANT PORTION OF CITED FLORIDA STATUTE PROVISIONS

CITED FLORIDA STATUTE PROVISIONS (RELEVANT PORTIONS ONLY)

Source: Chapter 163, Part II, Florida Statutes (2019) – Growth Policy; County and Municipal Planning; Land Development Regulation

163.3167(9): Each local government shall address in its comprehensive plan, as enumerated in this chapter, the water supply sources necessary to meet and achieve the existing and projected water use demand for the established planning period, considering the applicable plan developed pursuant to s. 373.709.

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

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

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

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

4. A schedule of capital improvements which includes any publicly funded projects of federal, state or local government, and which may include privately funded projects for which the local government has no fiscal responsibility. Projects necessary to ensure that any adopted level-of-service standards are achieved and maintained for the 5-year period must be identified as either funded or unfunded and given a level of priority for funding.

163.3177(4)(a): Coordination of the local comprehensive plan with the comprehensive plans of adjacent municipalities, the county, adjacent counties, or the region; with the appropriate water management district's regional water supply plans approved pursuant to s. 373.709; and with adopted rules pertaining to designated areas of critical state concern shall be a major objective of the local comprehensive planning process. To that end, in the preparation of a comprehensive plan or element thereof, and in the comprehensive plan or element as adopted, the governing body shall include a specific policy statement indicating the relationship of the proposed development of the area to the comprehensive plans of adjacent municipalities, the county, adjacent counties, or the region, as the case may require and as such adopted plans or plans in preparation may exist.

163.3177(5)(a): Each local government comprehensive plan must include at least two planning periods, one covering at least the first 5-year period occurring after the plan's adoption and one covering at least a 10-year period. Additional planning periods for specific components, elements, land use amendments, or projects shall be permissible and accepted as part of the planning process.

163.3177(6)(a): A future land use plan element designating proposed future general distribution, location, and extent of the uses of land for residential uses, commercial uses, industry, agriculture, recreation, conservation, education public facilities, and other categories of the public and private uses of land. The approximate acreage and the general range of density or intensity of use shall be provided for the gross land area included in each existing land use category. The element shall establish the long-term end toward which land use programs and activities are ultimately directed.

163.3177(6)(a)2.: The future land use plan and plan amendments shall be based upon surveys, studies, and data regarding the area, as applicable including:

a. The amount of land required to accommodate anticipated growth.
b. The projected permanent and seasonal population of the area.
c. The character of undeveloped land.
d. The availability of water supplies, public facilities, and services.
e. The need for redevelopment, including the renewal of blighted areas and the elimination of nonconforming uses which are inconsistent with the character of the community.
f. The compatibility of uses on lands adjacent to or closely proximate to military installations.
g. The compatibility of uses on lands adjacent to an airport as defined in s. 330.35 and consistent with s. 333.02.
h. The discouragement of urban sprawl.
i. The need for job creation, capital investment, and economic development that will strengthen and diversify the community's economy.
j. The need to modify land uses and development patterns within antiquated subdivisions.

163.3177(6)(c): A general sanitary sewer, solid waste, drainage, potable water, and natural groundwater aquifer recharge element correlated to principles and guidelines for future land use, indicating ways to provide for future potable water, drainage, sanitary sewer, solid waste, and aquifer recharge protection requirements for the area. The element may be a detailed engineering plan including a topographic map depicting areas of prime groundwater recharge.

1. Each local government shall address in the data and analyses required by this section those facilities that provide service within the local government's jurisdiction. Local governments that provide facilities to serve areas within other local government jurisdictions shall also address those facilities in the data and analyses required by this section, using data from the comprehensive plan for those areas for the purpose of projecting facility needs as required in this subsection. For shared facilities, each local government shall indicate the proportional capacity of the systems allocated to serve its jurisdiction.

2. The element shall describe the problems and needs and the general facilities that will be required for solution of the problems and needs including correcting existing facility deficiencies. The element shall address coordinating the extension of, or increase in the capacity of, facilities to meet future needs while maximizing the use of existing facilities and discouraging urban sprawl; conserving potable water resources; and protecting the functions of natural groundwater recharge areas and natural drainage features.

3. Within 18 months after the governing board approves an updated regional water supply plan, the element must incorporate the alternative water supply project or projects selected by the

local government from those identified in the regional water supply plan pursuant to s. 373.709(2)(a) or proposed by the local government under s. 373.709(8)(b). If a local government is located within two water management districts, the local government shall adopt its comprehensive plan amendment within 18 months after the later updated regional water supply plan. The element must identify such alternative water supply projects and traditional water supply projects and conservation and reuse necessary to meet the water needs identified in s. 373.709(2)(a) within the local government's jurisdiction and include a work plan, covering at least a 10-year planning period, for building public, private, and regional water supply facilities, including development of alternative water supplies, which are identified in the element as necessary to serve existing and new development. The work plan shall be updated, at a minimum, every five years within 18 months after the governing board of a water management district approves an updated regional water supply plan. Local governments, public and private utilities, regional water supply authorities, special districts, and water management districts are encouraged to cooperatively plan for the development of multijurisdictional water supply facilities that are sufficient to meet projected demands for established planning periods, including the development of alternative water sources to supplement traditional sources of groundwater and surface water supplies.

163.3177(6)(d): A conservation element for the conservation, use, and protection of natural resources in the area, including air, water, water recharge areas, wetlands, water wells, estuarine marshes, soils, beaches, shores, flood plains, rivers, bays, lakes, harbors, forests, fisheries and wildlife, marine habitat, minerals, and other natural and environmental resources, including factors that affect energy conservation.

1. The following natural resources, where present within the local government's boundaries, shall be identified and analyzed and existing recreational or conservation uses, known pollution problems, including hazardous wastes, and the potential for conservation, recreation, use, or protection shall also be identified:

    a. Rivers, bays, lakes, wetlands including estuarine marshes, groundwaters, and springs, including information on quality of the resource available.
    b. Floodplains.
    c. Known sources of commercially valuable minerals.
    d. Areas known to have experienced soil erosion problems.
    e. Areas that are the location of recreationally and commercially important fish or shellfish, wildlife, marine habitats, and vegetative communities, including forests, indicating known dominant species present and species listed by federal, state, or local government agencies as endangered, threatened, or species of special concern.

2. The element must contain principles, guidelines, and standards for conservation that provide long-term goals and which:

    a. Protects air quality.
    b. Conserves, appropriately uses, and protects the quality and quantity of current and projected water sources and waters that flow into estuarine waters or oceanic waters and protect from activities and land uses known to affect adversely the quality and quantity of identified water sources, including natural groundwater recharge areas, wellhead protection areas, and surface waters used as a source of public water supply.
    c. Provides for the emergency conservation of water sources in accordance with the plans of the regional water management district.

d. Conserves, appropriately uses, and protects minerals, soils, and native vegetative communities, including forests, from destruction by development activities.
e. Conserves, appropriately uses, and protects fisheries, wildlife, wildlife habitat, and marine habitat and restricts activities known to adversely affect the survival of endangered and threatened wildlife.
f. Protects existing natural reservations identified in the recreation and open space element.
g. Maintains cooperation with adjacent local governments to conserve, appropriately use, or protect unique vegetative communities located within more than one local jurisdiction.
h. Designates environmentally sensitive lands for protection based on locally determined criteria which further the goals and objectives of the conservation element.
i. Manages hazardous waste to protect natural resources.
j. Protects and conserves wetlands and the natural functions of wetlands.
k. Directs future land uses that are incompatible with the protection and conservation of wetlands and wetland functions away from wetlands. The type, intensity or density, extent, distribution, and location of allowable land uses and the types, values, functions, sizes, conditions, and locations of wetlands are land use factors that shall be considered when directing incompatible land uses away from wetlands. Land uses shall be distributed in a manner that minimizes the effect and impact on wetlands. The protection and conservation of wetlands by the direction of incompatible land uses away from wetlands shall occur in combination with other principles, guidelines, standards, and strategies in the comprehensive plan. Where incompatible land uses are allowed to occur, mitigation shall be considered as one means to compensate for loss of wetlands functions.

3. Current and projected needs and sources for at least a 10-year period based on the demands for industrial, agricultural, and potable water use and the quality and quantity of water available to meet these demands shall be analyzed. The analysis shall consider the existing levels of water conservation, use, and protection and applicable policies of the regional water management district and further must consider the appropriate regional water supply plan approved pursuant to s. 373.709, or, in the absence of an approved regional water supply plan, the district water management plan approved pursuant to s. 373.036(2). This information shall be submitted to the appropriate agencies.

163.3177(6)(h)1.: An intergovernmental coordination element showing relationships and stating principles and guidelines to be used in coordinating the adopted comprehensive plan with the plans of school boards, regional water supply authorities, and other units of local government providing services but not having regulatory authority over the use of land, with the comprehensive plans of adjacent municipalities, the county, adjacent counties, or the region, with the state comprehensive plan and with the applicable regional water supply plan approved pursuant to s.373.709, as the case may require and as such adopted plans or plans in preparation may exist. This element of the local comprehensive plan must demonstrate consideration of the particular effects of the local plan, when adopted, upon the development of adjacent municipalities, the county, adjacent counties, or the region, or upon the state comprehensive plan, as the case may require.

a. The intergovernmental coordination element must provide procedures for identifying and implementing joint planning areas, especially for the purpose of annexation, municipal incorporation, and joint infrastructure service areas.

b. The intergovernmental coordination element shall provide for a dispute resolution process, as established pursuant to s. 186.509, for bringing intergovernmental disputes to closure in a timely manner.

c. The intergovernmental coordination element shall provide for interlocal agreements as established pursuant to s. 333.03(1)(b).

163.3177(6)(h)3.b.: Ensure coordination in establishing level of service standards for public facilities with any state, regional, or local entity having operational and maintenance responsibility for such facilities.

163.3180: Concurrency. –

163.3180(1): Sanitary sewer, solid waste, drainage, and potable water are the only public facilities and services subject to the concurrency requirement on a statewide basis. Additional public facilities and services may not be made subject to concurrency on a statewide basis without approval by the Legislature; however, any local government may extend the concurrency requirement so that it applies to additional public facilities within its jurisdiction.

163.3180(1)(a): If concurrency is applied to other public facilities, the local government comprehensive plan must provide the principles, guidelines, standards, and strategies, including adopted levels of service, to guide its application. In order for a local government to rescind any optional concurrency provisions, a comprehensive plan amendment is required. An amendment rescinding optional concurrency issues shall be processed under the expedited state review process in s. 163.3184(3), but the amendment is not subject to state review and is not required to be transmitted to the reviewing agencies for comments, except that the local government shall transmit the amendment to any local government or government agency that has filed a request with the governing body and, for municipal amendments, the amendment shall be transmitted to the county in which the municipality is located. For informational purposes only, a copy of the adopted amendment shall be provided to the state land planning agency. A copy of the adopted amendment shall also be provided to the Department of Transportation if the amendment rescinds transportation concurrency and to the Department of Education if the amendment rescinds school concurrency.

163.3180(1)(b): The local government comprehensive plan must demonstrate, for required or optional concurrency requirements, that the levels of service adopted can be reasonably met. Infrastructure needed to ensure that adopted level-of-service standards are achieved and maintained for the 5-year period of the capital improvement schedule must be identified pursuant to the requirements of s. 163.3177(3). The comprehensive plan must include principles, guidelines, standards, and strategies for the establishment of a concurrency management system.

163.3180(2): Consistent with public health and safety, sanitary sewer, solid waste, drainage, adequate water supplies, and potable water facilities shall be in place and available to serve new development no later than the issuance by the local government of a certificate of occupancy or its functional equivalent. Prior to approval of a building permit or its functional equivalent, the local government shall consult with the applicable water supplier to determine whether adequate water supplies to serve the new development will be available no later than the anticipated date of issuance by the local government of a certificate of occupancy or its functional equivalent.

163.3180(3): Governmental entities that are not responsible for providing, financing, operating, or regulating public facilities needed to serve development may not establish binding level-of-service standards on governmental entities that do bear those responsibilities.

163.3191: **Evaluation and appraisal of comprehensive plan. –**

163.3191(1): At least once every 7 years, each local government shall evaluate its comprehensive plan to determine if plan amendments are necessary to reflect changes in state requirements in this part since the last update of the comprehensive plan, and notify the state land planning agency as to its determination.

163.3191(2): If the local government determines amendments to its comprehensive plan are necessary to reflect changes in state requirements, the local government shall prepare and transmit within 1 year such plan amendment or amendments for review pursuant to s. 163.3184.

163.3191(3): Local governments are encouraged to comprehensively evaluate and, as necessary, update comprehensive plans to reflect changes in local conditions. Plan amendments transmitted pursuant to this section shall be reviewed pursuant to s. 163.3184(4).

163.3191(4): If a local government fails to submit its letter prescribed by subsection (1) or update its plan pursuant to subsection (2), it may not amend its comprehensive plan until such time as it complies with this section.

163.3191(5): The state land planning agency may not adopt rules to implement this section, other than procedural rules or a schedule indicating when local governments must comply with the requirements of this section.

Appendix B - CITY OF FORT LAUDERDALE TEN-YEAR WATER SUPPLY FACILITIES WORK PLAN 2020 UPDATE

Water Supply Facilities Work Plan 2020 Update

June 16, 2020

Hazen

CITY OF FORT LAUDERDALE

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Executive Summary

Introduction

This executive summary provides a brief summary of the key findings in the City of Fort Lauderdale Water Supply Facilities Work Plan 2020 Update.

Background

Chapter 163, Part II, Florida Statutes (F.S.), requires local governments to prepare and adopt 10-Year Water Supply Facilities Work Plans into their comprehensive plans within 18 months after the South Florida Water Management District (SFWMD) approves a regional water supply plan or its update. The 2018 Lower East Coast Water Supply Plan Update (2018 LECWSP Update) was adopted by the District's Governing Board on November 8, 2018. Therefore, local governments within the Lower East Coast Region are required to amend their comprehensive plans and include an updated 10-year Water Supply Facilities Work Plan and related planning elements by May 8, 2020.

The State of Florida requires that the 10-year Water Supply Facilities Work Plan 2020 Update address the development of traditional and alternative water supplies and management strategies, including conservation and reuse. The data and analyses, including population projections and water demands must span at least a 10-year planning period and be consistent with the 2018 LECWSP Update. The data presented herein are for the planning period through the year 2040.

Water Service Area

The City of Fort Lauderdale is the single largest purveyor of potable water in Broward County. This includes retail customers residing in the Roosevelt Gardens, Franklin Park, Washington Park, and Boulevard Gardens communities of unincorporated Broward County. These communities are expected to become incorporated by the end of the planning period. The utility's service area encompasses a total area of 43 square miles, approximately one-tenth the total area of urban Broward County. Other retail customers include residential, commercial, and industrial properties within the City of Fort Lauderdale, Lazy Lake, and a portion of Lauderdale-by-the-Sea. The utility also maintains wholesale agreements for potable water supply with Broward County Water and Wastewater Services; Cities of Oakland Park, Wilton Manors, and Tamarac; Town of Davie and Port Everglades. Figure ES-1 depicts the water service area (inclusive of all retail and wholesale customers).

Figure ES-1 also depicts the location of key City water supply assets including the following: 1) Dixie Wellfield; 2) Prospect Wellfield; 3) Peele-Dixie Water Treatment Plant; 4) Fiveash Water Treatment Plant; 5) 2nd Avenue Water Tank and Pump Station; 6) Poinciana Park Water Tank and Pump Station; and 7) George T. Lohmeyer Wastewater Treatment Plant.

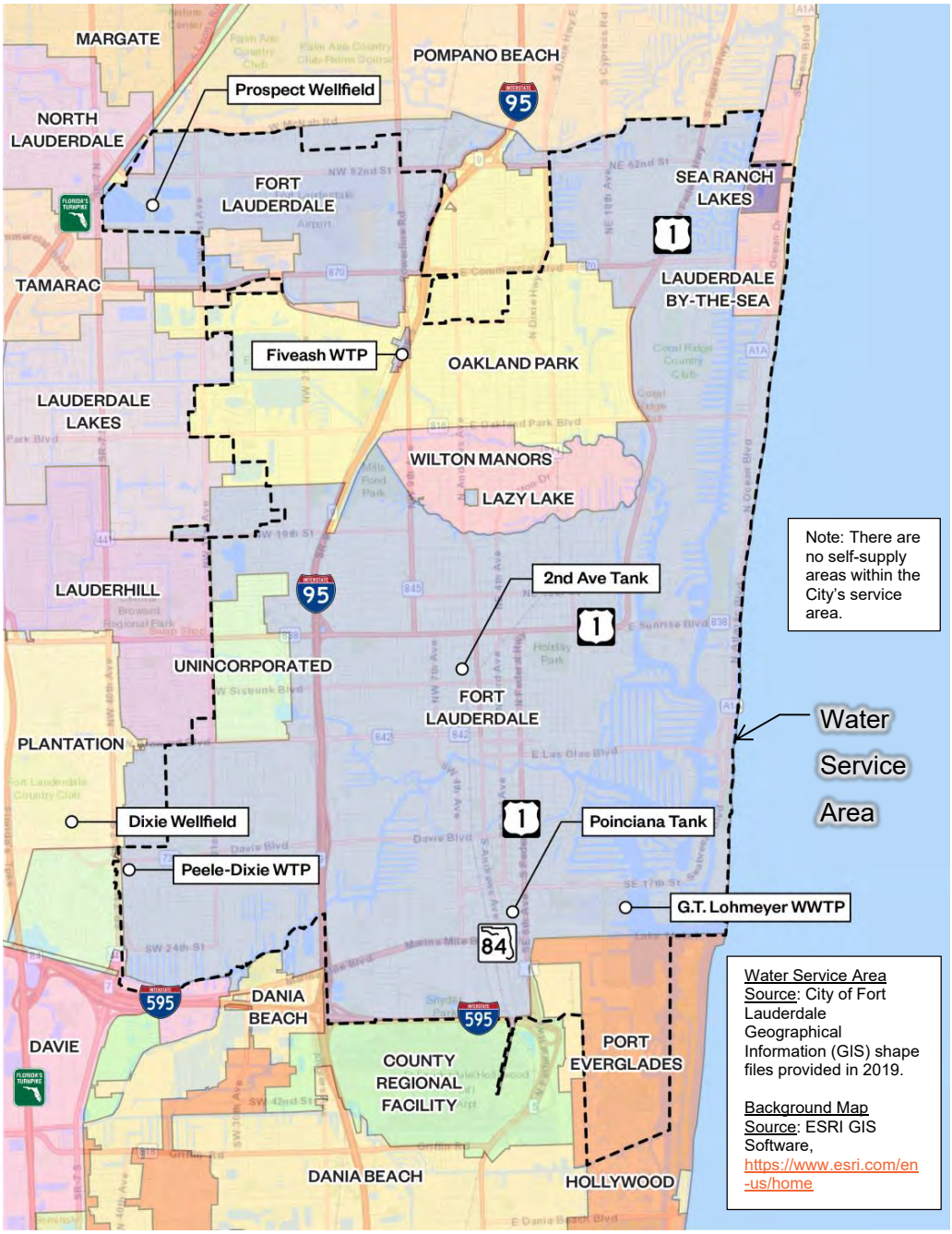

Figure ES-1: Water Service Area

Population Forecast

The population forecast was based on University of Florida's Bureau of Economic and Business Research (BEBR) data. Figure ES-1 presents the population forecast for the City of Fort Lauderdale's water service area through the year 2040. It is noted that the year 2040 population data presented herein is 1.3 percent higher than the year 2040 population presented in the SFWMD's 2018 LECWSP Update.

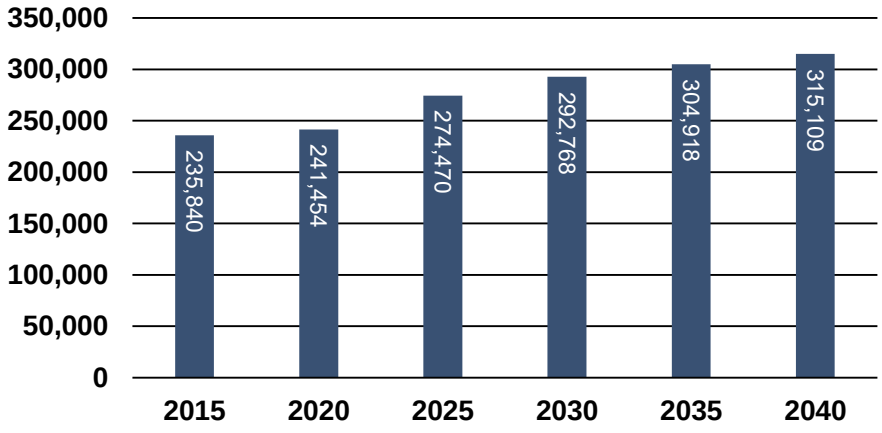

Figure ES-2: Population Forecast

Source: Population data are based on University of Florida's Bureau of Economic and Business Research (BEBR) as processed by The Corradino Group and provided to Hazen on May 24, 2019.

Water Supply

The City's traditional source of water has been the Biscayne Aquifer. The Biscayne Aquifer is a shallow, surficial aquifer that is highly porous, and transmissive. It is the traditional supply in Southeast Florida. The City's existing Fiveash and Peele-Dixie water treatment plants are designed to treat the Biscayne Aquifer. Peele-Dixie has space and power supply for the installation of additional infrastructure to treat water from the Floridan Aquifer System (FAS).

The City has also drilled two full-size FAS wells to collect data needed for planning purposes. Chloride and total dissolved solids (TDS) data from these wells are presented in Figure ES-3 (Hazen and Sawyer, 2008a). Based on modeling presented in the 2018 LECWSP Update, the TDS is estimated to increase to 8,000 mg/L by the year 2040 (South Florida Water Management District, 2018a). The Peele-Dixie WTP was designed with space available to add reverse osmosis (RO) to treat water from the FAS. Space is available for 6-mgd of finished water capacity RO and electrical capacity to treat water with a TDS up to approximately 8,000-mg/L and chloride concentration of 4,300 mg/L (Hazen and Sawyer, 2008b).

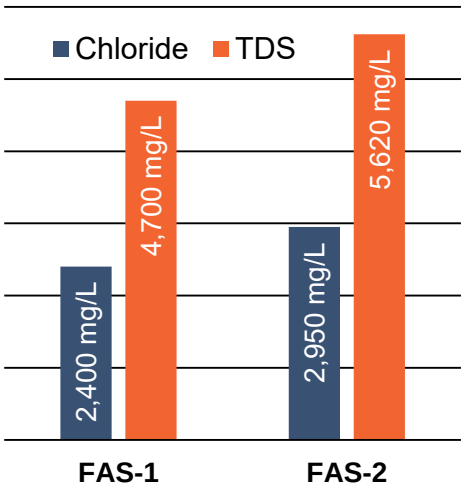

Figure ES-3: Floridan Aquifer Well Data

Source: (Hazen and Sawyer, 2008a).

The SFWMD issued the City's Water Use Permit (No. 06-00123-W) on September 11, 2008; the permit expires on September 11, 2028. The permit limits withdrawal from the Biscayne Aquifer and the FAS as follows, on Annual Average Day (AAD) basis:

- Biscayne Aquifer Withdrawal Limit: 52.55 mgd (AAD)
- FAS Withdrawal Limit: 8.64 mgd (AAD)

Raw Water Demand Forecast

Figure ES-4 graphically illustrates the raw water demand forecast on an annual average day (AAD) basis for the City's water service area. A water supply deficit is forecasted begin in the year 2035. Figure ES-4 is based upon the City operating the Peele-Dixie WTP to produce approximately 6-mgd of finished water indefinitely. Furthermore, this figure assumes that lime softening is continued at the Fiveash WTP indefinitely. If the City increases finished water produced at the Peele-Dixie WTP or decides to change the treatment technology at the Fiveash WTP to a lower efficiency technology, then the demand curve would increase – resulting in a water supply deficit earlier than currently forecasted.

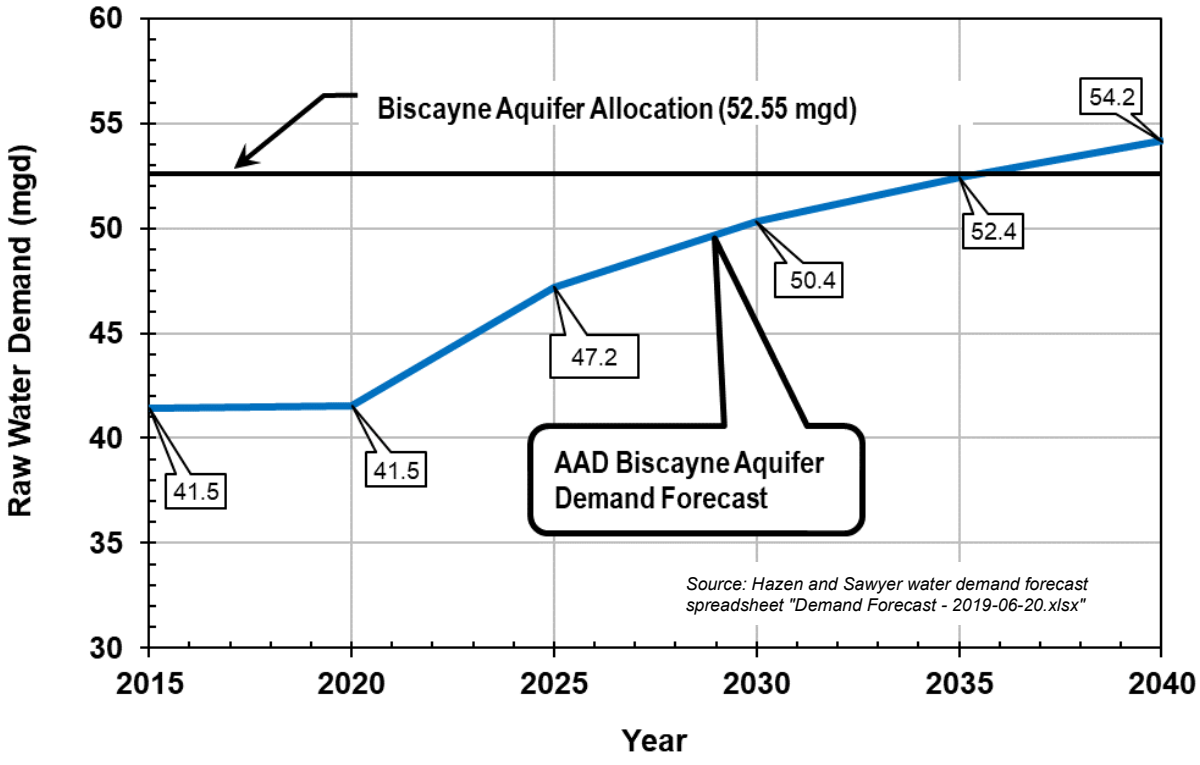

Figure ES-4: Biscayne Aquifer Raw Water Demand Forecast Annual Average Day (mgd)

Finished Water Demand Forecast

Figure ES-5 graphically illustrates the finished water demand forecast on an annual average day basis for the City's water service area.

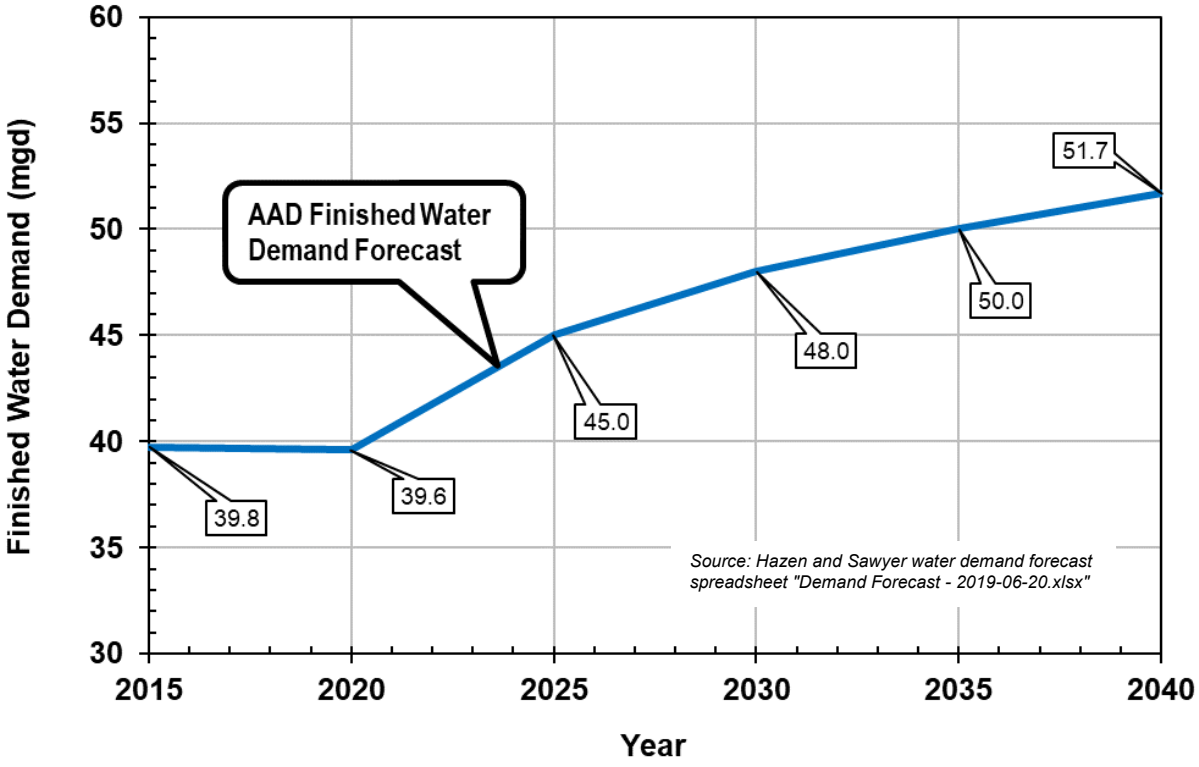

Figure ES-5: Finished Water Demand Forecast Annual Average Day (mgd)

Comprehensive Utility Strategic Master Plan (CUSMP)

The City's Comprehensive Utility Strategic Master Plan (CUSMP), completed by Reiss Engineering, Inc., in 2017 is a planning document that evaluated the City's water and wastewater systems and recommends improvements to maintain or improve levels of service over a 20-year period ending in 2035. The CUSMP aligned its recommendations with the City's long-term goals identified in the City's Fast Forward Fort Lauderdale 2035 Strategic Plan and the Southeast Florida Regional Climate Action Plan.

As indicated in the CUSMP, the City's existing water supply, treatment and distribution infrastructure is aging. The City recognizes that significant investment is necessary to sustain the reliability of its infrastructure. The City is actively planning the necessary investment decisions to ensure maintaining its level-of-service. For example, the City has begun a project titled "Granular Activated Carbon Pilot and Plant Evaluation at the Fiveash Water Plant". This project includes evaluation of treatment technologies

to achieve the City's color goal at the Fiveash WTP. The project is ongoing and is expected to be completed in late 2019. This study will recommend to either replace all or part of the Fiveash WTP and includes evaluation of alternative water supply technologies. The City will use this report to inform future CIP scheduling decisions.

Alternative Water Supply Plan

The data in Figure ES-4 indicate that demand is projected to exceed the Biscayne Aquifer supply in the year 2035. The City plans that this supply deficit will be addressed via RO treatment of the FAS. The City reserves the right to alter this plan based on the findings of ongoing City studies and future CUSMP updates. Additionally, this plan may be altered as additional data becomes available regarding the risks presented by unexpected changes to water quality in the FAS.

In 2008, the City completed conceptual plans for implementing 6-mgd of finished water capacity RO at the Peele-Dixie WTP. Five FAS wells were also conceptually planned. The planning documents (illustrated in Figure ES-6) are titled "Floridan Aquifer Conceptual Plan for the Dixie Wellfield" and "Peele-Dixie Reverse Osmosis Basis of Design Report".

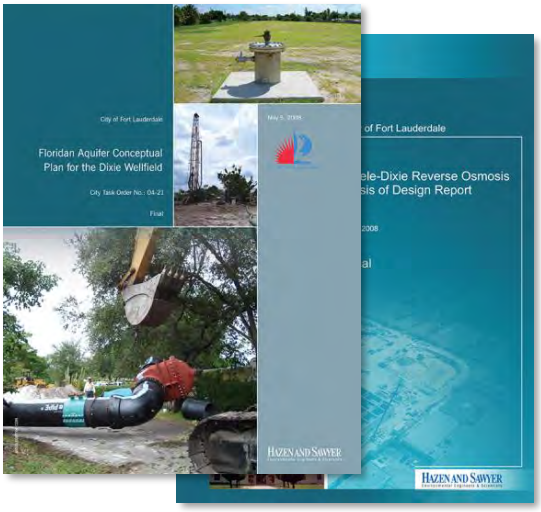

Figure ES-6: Alternative Water Supply Planning Documents

These plans provide the City with a roadmap to quickly implement this alternative water supply in advance of demand exceeding its traditional Biscayne Aquifer supply. It is estimated that it would require approximately five years to implement FAS wells and RO treatment at the Peele-Dixie WTP.

The costs for implementing 6-mgd of finished water capacity RO at the Peele-Dixie WTP along with five FAS wells are presented in the reports titled "Floridan Aquifer Conceptual Plan for the Dixie Wellfield" and "Peele-Dixie Reverse Osmosis Basis of Design Report". The cost total from these reports is $36.7 in 2008 dollars. Escalating the cost to 2019 dollars amounts to $49.1 million using Engineering News-Record Construction Cost Indexes of 8,310 for 2008 and 11,118 for 2019. This cost includes construction cost plus contingency along with engineering services (Engineering News-Record, 2019). This is a Class 5 estimate as defined by Association for the Advancement of Cost Engineering (AACE) International. The expected accuracy of this estimate is +50% to -30%.

1. Introduction

1.1 Scope of This Report

The City of Fort Lauderdale's Water Supply Facilities Work Plan 2020 Update identifies water supply sources, availability and facilities needed to serve existing and new development within the local government's jurisdiction. Chapter 163, Part II, Florida Statutes (F.S.), requires local governments to prepare and adopt 10-Year Water Supply Facilities Work Plans into their comprehensive plans within 18 months after the South Florida Water Management District (District) approves a regional water supply plan or its update.

The 2018 Lower East Coast Water Supply Plan Update (2018 LECWSP Update) was adopted by the District's Governing Board on November 8, 2018. Therefore, local governments within the Lower East Coast Region are required to amend their comprehensive plans and include an updated 10-year Water Supply Facilities Work Plan and related planning elements by May 8, 2020.

The State of Florida requires that the 10-year Water Supply Facilities Work Plan 2020 Update address the development of traditional and alternative water supplies and management strategies, including conservation and reuse. The data and analyses, including population projections, water demands and service areas must cover at least a 10-year planning period and be consistent to the LECWSP and the updated comprehensive plan amendment.

The City of Fort Lauderdale's 10-year Water Supply Facilities Work Plan 2020 Update is divided into five sections:

1.0 – Introduction

2.0 – Background Information

3.0 – Data and Analysis

4.0 – Capital Improvements

5.0 – Goals, Objectives, and Policies.

1.2 Location Map

The City of Fort Lauderdale is located on the southeastern coast of Florida within Broward County. Figure 1-1 illustrates a location map of the City.

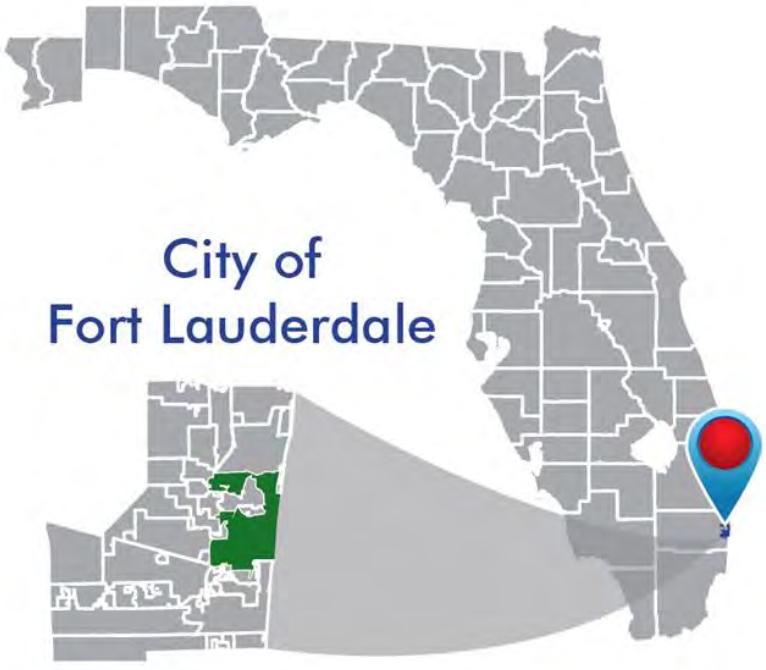

Figure 1-1: Fort Lauderdale Location Map

Source: City of Fort Lauderdale

1.3 Statutory History

The Florida Legislature enacted bills during the 2002, 2004, 2005, 2011, 2012, 2015, and 2016 sessions to address the state's water supply needs. These bills, particularly Senate Bills 360 and 444 enacted during the 2005 legislative session, strengthened the statutory links between the regional water supply plans (RWSPs) prepared by water management districts and the Comprehensive Plans prepared by local governments through changes to Chapters 163 and 373, F.S. These changes improved coordination between local land use planning and regional water supply planning.

1.4 Statutory Requirements

The City of Fort Lauderdale has considered the following statutory provisions in updates to this Water Supply Facilities Work Plan.

1. Coordinate appropriate aspects of its comprehensive plan with the 2018 LECWSP [163.3177(4) (a), F.S.].

2. Ensure the future land use plan is based upon availability of adequate water supplies and public facilities and services [s.163.3177 (6) (a), F.S.]. Data and analysis demonstrating that adequate water supplies and associated public facilities will be available to meet projected growth demands must accompany all proposed Future Land Use Map amendments submitted for review.

3. Ensure that adequate water supplies and potable water facilities are available to serve new development no later than the issuance by the local government of a certificate of occupancy or its functional equivalent and consult with the applicable water supplier to determine whether adequate water supplies will be available to serve the development by the anticipated issuance date of the certificate of occupancy [s.163.3180 (2), F.S.].

4. Revision of the related comprehensive planning elements within 18 months after the water management district approves an updated regional water supply plan, to:

    a. Identify and incorporate the alternative water supply project(s) selected by the local government from projects identified in the 2013 LECWSP, or alternative project(s) proposed by the local government under s. 373.709(8)(b), F.S. [s. 163.3177(6)(c), F.S.];

    b. Identify the traditional and alternative water supply projects and the conservation and reuse programs necessary to meet water needs identified in the 2013 LECWSP [s. 163.3177(6)(c)3, F.S.]; and

    c. Update the 10-year Water Supply Facilities Work Plan for at least a 10-year planning period for constructing the public, private, and regional water supply facilities identified in the element as necessary to serve existing and new development [s. 163.3177(6)(c)3, F.S.].

5. Revise the Five-Year Schedule of Capital Improvements to include water supply, reuse, and conservation projects and programs to be implemented during the five-year period [s. 163.3177(3)(a)4, F.S.].

6. To the extent necessary to maintain internal consistency after making changes described in Paragraph 1 through 5 above, revise the Conservation Element to assess projected water needs and sources for at least a 10-year planning period, considering the 2018 LECWSP, as well as applicable consumptive use permit(s) [s.163.3177 (6) (d), F.S.]. The plan must address the water supply sources necessary to meet and achieve the existing and projected water use demand for the established planning period, considering the applicable regional water supply plan [s.163.3167(9), F.S.].

7. To the extent necessary to maintain internal consistency after making changes described in Paragraphs 1 through 5 above, revise the Intergovernmental Coordination Element to ensure coordination of the comprehensive plan with the 2018 LECWSP [s.163.3177 (6) (h) 1., F.S.].

8. Evaluation and Appraisal Report are required once every 7 years. Local governments are encouraged to comprehensively evaluate, and as necessary, update comprehensive plans to reflect changes in local conditions. The evaluation could address the extent to which the local government has implemented the need to update their 10-year Water Supply Facilities Work Plan, including the development of alternative water supplies, and determine whether the identified alternative water supply projects, traditional water supply projects, and conservation and reuse programs are meeting local water use demands [s.163.3191 (3), F.S.].

2. Background Information

2.1 Introduction

This section includes the following:

- An overview of the City of Fort Lauderdale's water service area; and
- A description of regional water supply planning issues that impact the City of Fort Lauderdale, including the following:
    - Climate Change
    - Regional Water Availability Rule
    - Participation in the C-51 Reservoir Project
    - Regional Climate Action Plan
    - Lake Okeechobee Surface Water Allocation Limitations
    - Lowering Lake Okeechobee Level
    - Infrastructure Planned to Attenuate Damaging Peak Flow Events from Lake Okeechobee
    - Expanded Use of Reclaimed Water to Meet Future Water Supply Demands
    - Wellfield Management to Prevent Undesirable Changes in Floridan Aquifer Water Quality

2.2 Service Area

2.2.1 Introduction

The City of Fort Lauderdale is the single largest purveyor of potable water in Broward County. This includes retail customers residing in the Roosevelt Gardens, Franklin Park, Washington Park, and Boulevard Gardens communities of unincorporated Broward County. These communities are expected to become incorporated by the end of the planning period. The utility's service area encompasses a total area of 43 square miles, approximately one-tenth the total area of urban Broward County. Other retail customers include residential, commercial, and industrial properties within the City of Fort Lauderdale, Lazy Lake, and a portion of Lauderdale-by-the-Sea. The utility also maintains wholesale agreements for potable water supply with Broward County Water and Wastewater Services; Cities of Oakland Park, Wilton Manors, and Tamarac; Town of Davie and Port Everglades.

2.2.2 Water Service Area Map

Figure 2-1 depicts the water service area (inclusive of all retail and wholesale customers). Figure 2-1 also depicts the location of key City assets including the following: 1) Dixie Wellfield; 2) Prospect Wellfield; 3) Peele-Dixie Water Treatment Plant; 4) Fiveash Water Treatment Plant; 5) 2nd Avenue Water Tank and Pump Station; 6) Poinciana Park Water Tank and Pump Station; and 7) George T. Lohmeyer Wastewater Treatment Plant.

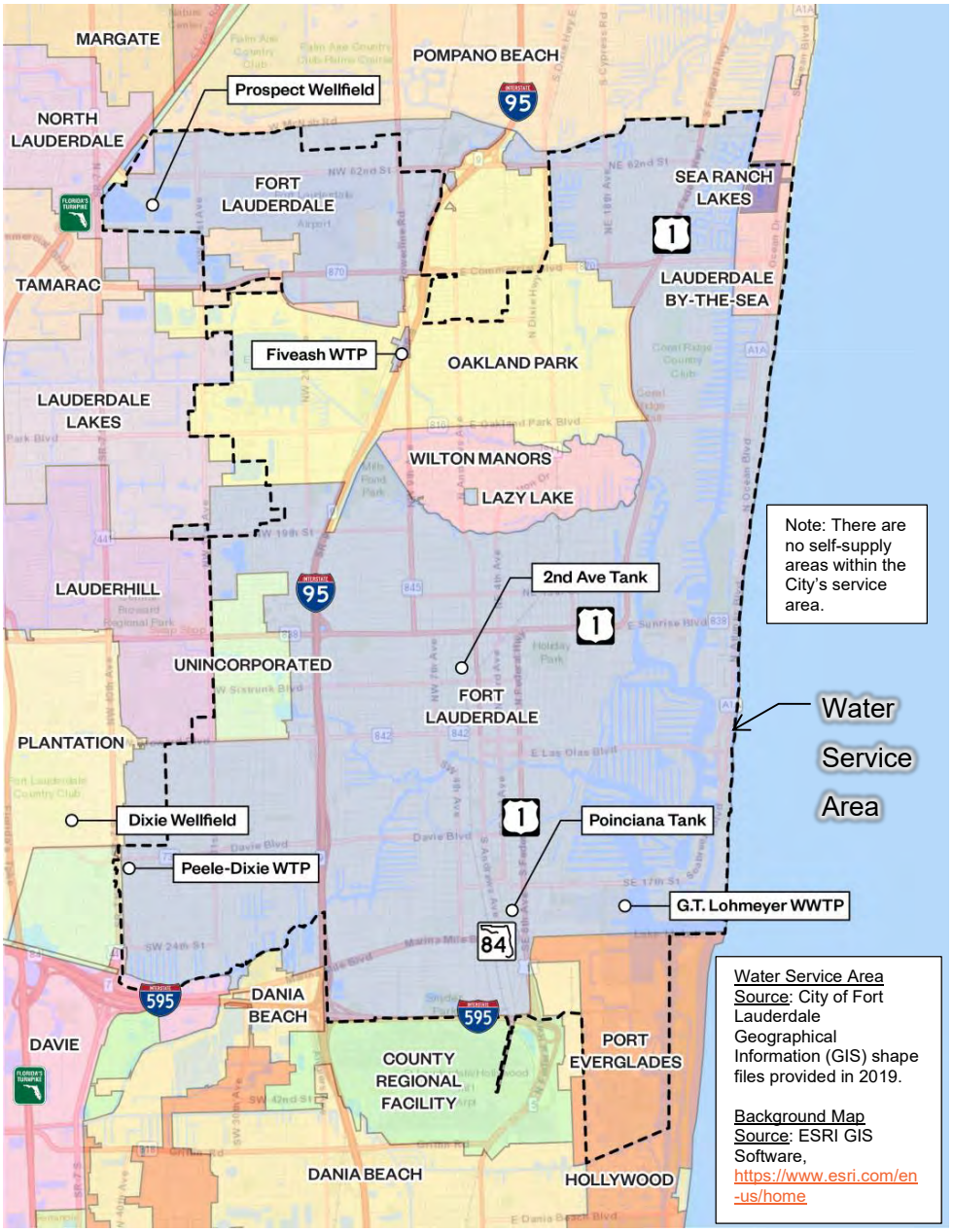

Figure 2-1: Water Service Area

2.2.3 Areas of Self-Supply

There are no existing areas within the City of Fort Lauderdale's water service area that self-supply potable water. There are no plans for future domestic self-supplied systems.

2.3 Climate Change

Investigations and evaluations conducted at the national, regional, and local levels have reinforced the need to plan for the predicted impacts of more frequent and severe drought, increases in tidal and storm-related flooding, and ensuring that future planning efforts are flexible to adapt to changes to ensure a sustainable water supply infrastructure.

The City of Fort Lauderdale, together with its municipal and regional partners, understands that it is imperative that local governments and water utilities begin to formalize the integration of water supply and climate change considerations as part of coordinated planning efforts and work to provide relevant updates to the 10-year Water Supply Facilities Work Plan and enhance Goals, Objectives and Policies (GOPs) of its comprehensive plan.

The City is a leader in developing planning tools and identifying achievable and cost-effective goals that meet the needs of its community. The City has recently signed a resolution endorsing the Mayor's Climate Action Pledge; affirming support for the Southeast Florida Regional Climate Change Compact; and agreeing to consider implementation of the Regional Climate Action Plan (2012) in whole or in part as appropriate for the City.

Key considerations relative to climate change include: 1) Sea level rise and 2) saltwater intrusion. These topics are presented in the following subsections.

2.3.1 Sea Level Rise

The City of Fort Lauderdale is a participant in the Southeast Florida Regional Climate Change Compact. The Compact is an ongoing collaborative effort among the participants (local communities, regulatory agencies, along with Broward, Miami-Dade, Monroe and Palm Beach Counties) to foster sustainability and climate resilience on a regional scale.

Development of cost-effective sea level rise adaptation strategies to ensure the sustainability of the City's water supply is critical to all ongoing planning efforts. To facilitate planning, the Southeast Florida Regional Climate Change Compact developed the sea level rise graphic illustrated in Figure 2-2. This sea level rise projection is now being used as the basis for planning throughout the region.

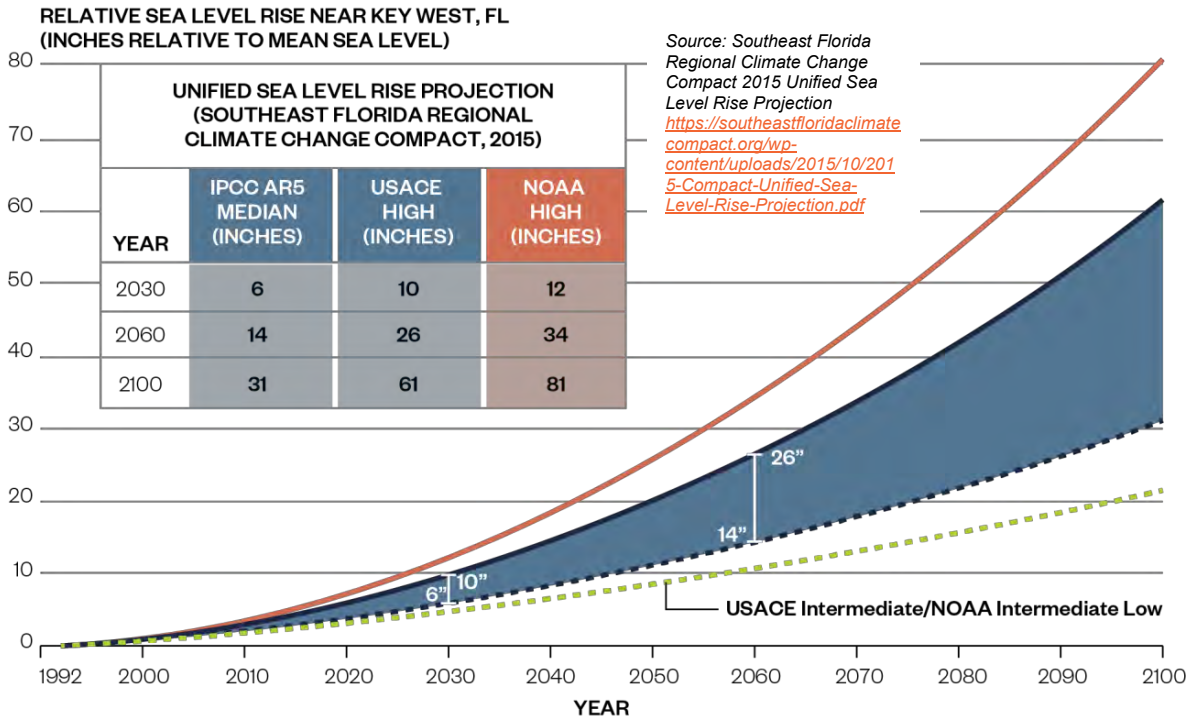

Figure 2-2: Sea Level Rise

The City contributed funding for Broward County and the United States Geological Survey (USGS) to develop a SEAWAT Saltwater Intrusion Model to evaluate various sea level rise scenarios. According to USGS Report titled "*Potential Effects of Alterations to the Hydrologic System on the Distribution of Salinity in the Biscayne Aquifer in Broward County"* under the high sea level rise scenario, the Dixie Wellfield will experience a slight increase in salinity to 50 milligrams per liter (mg/L) in 2060 (Hughes, 2016). However, as explained in the following subsection, high levels of chloride (greater than 1,000-mg/L) have been measured at the Dixie wellfield. No impact to the Prospect Wellfield is expected (Hughes, 2016).

The City is cautioned that model accuracy and use are limited by uncertainty in the physical properties and boundary conditions of the system, uncertainty in historical and future conditions, and generalizations made in the mathematical relationships used to describe the physical processes of groundwater flow and transport. Because of these limitations, model results should be considered in relative rather than absolute terms. Nonetheless, model results do provide useful information on the relative scale of response of the system to changes in pumping distribution, sea-level rise, and mitigation activities (Hughes, 2016).

The City collects data from 10 saltwater monitoring wells (MWs). The data from the saltwater MWs is presented in the follow subsection.

2.3.2 Saltwater Intrusion

The Biscayne Aquifer which serves as the City's primary water supply is a shallow, surficial aquifer characterized by limestone karst geology which is highly porous and transmissive. Coastal saltwater intrusion of the aquifer has occurred in eastern parts of Broward County. The mapping of the saltwater intrusion front (i.e., the depth and location of the 250 mg/L chloride concentration toe) is supported by local governments throughout the region, USGS, and the South Florida Water Management District (SFWMD). The current Saltwater Intrusion Line for Broward County is illustrated in Figure 2-3 (South Florida Water Management District, 2018b).

At the toe of the saltwater front, chloride concentrations exceed drinking water standards of 250 mg/l and thus restrict and/or require abandonment of wellheads located east of the saltwater intrusion line. The City has been proactively managing saltwater intrusion risk through a combination of managing wellfield pumpage and the collection of data from 10 saltwater monitoring wells constructed in 2002.

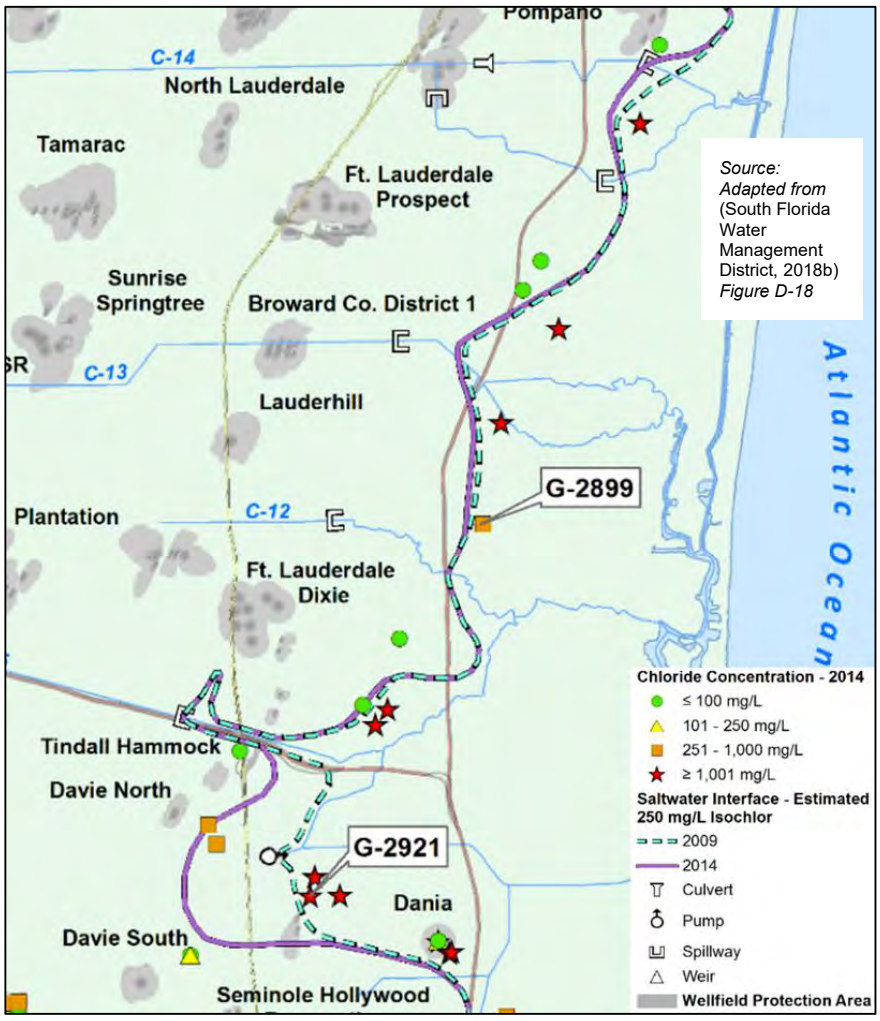

Figure 2-3: 250 mg/L Isochlor

The City operates a Saline Intrusion Monitoring Program (the "SALT Program"). The goal of the SALT Program is to locate and monitor the saltwater interface in and around the City's wellfields. The purpose of the Program is to provide an early warning monitoring system to assist wellfield managers in tracking the location and to manage withdrawals to limit the inland movement of the salt front. The City currently has 10 saltwater monitoring wells (MWs).

The City measures conductivity at its saltwater MWs on a monthly basis. The latest data available are presented in the City's report titled "2018 Annual Saltwater Intrusion Monitoring Report". The data indicate no evidence of saltwater instruction at the Prospect Wellfield. Additionally, the report documents evidence of high chlorides at the Dixie Wellfield, as presented below.

MW-10 is located at the Dixie Wellfield. The 2018 conductivity data (the latest available) for MW-10 is presented in Figure 2-4 (City of Fort Lauderdale, 2018).

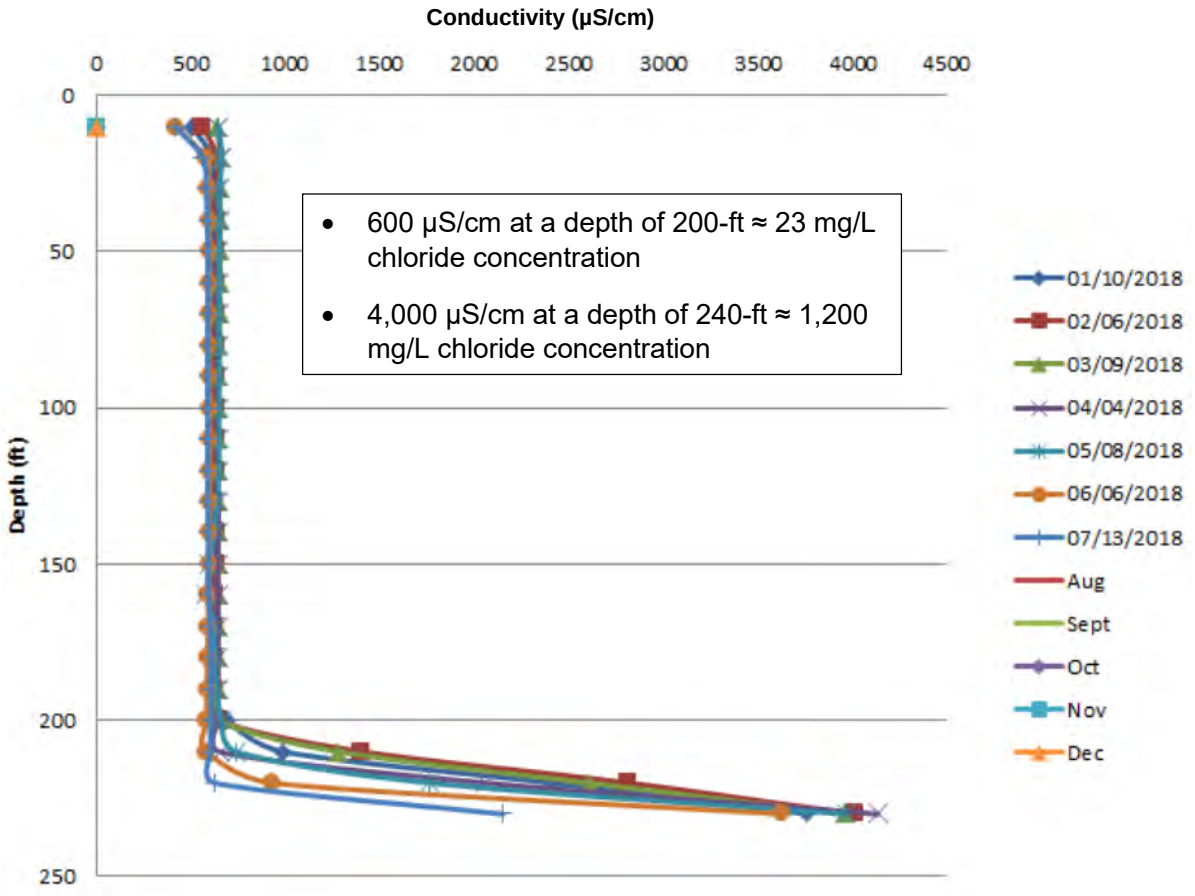

Figure 2-4: Conductivity (µS/cm) Measured at Saltwater Monitor Well 10

The City's 2018 data for MW-10 indicates conductivity of approximately 600 µS/cm at a depth of 200-feet below land surface and approximately 4,000 µS/cm at a depth of 240-feet below land surface (City of Fort Lauderdale, 2018). These conductivity value correlates to a calculated chloride level of

approximately 23 mg/L at a depth of 200-feet below land surface and 1,200 mg/L at a depth of 240-feet below land surface. The 1,200 mg/L chloride concentration is at a depth much lower than the water production zone of 80-feet to 125-feet below-land-surface. Given the depth of the high chloride concentration below the production depth, upconing is not likely to be a concern currently. It is recommended that the City collect temperature, conductivity and chloride concentrations once per week at each Dixie well for one year to assess if upconing is occurring.

The City reports that in late July of 2018, saltwater MW-10 (located within the Dixie Wellfield) was accidentally abandoned as part of a larger remediation project occurring on Fort Lauderdale Country Club (FLCC) property (City of Fort Lauderdale, 2018). The Dixie wellfield is located within the FLCC property. The City roughly estimates that saltwater MW-10 would be replaced by the end of August 2020.

The Comprehensive Utility Strategic Master Plan (CUSMP) (Reiss Engineering, 2017) recommended continued monitoring of salinity along with development of variable density model in the short term. Section 5.A.9 of the CUSMP indicated that it may be appropriate to add saline monitoring wells based on the findings of the variable density model; the number and location of the wells would be determined based on the model findings (Reiss Engineering, 2017). The City continues to monitor its wells for saltwater intrusion.

2.4 Regional Water Availability Rule

The Regional Water Availability (RWA) rule was passed by the SFWMD on February 16, 2007. The RWA limits water withdrawals from the Biscayne Aquifer to the maximum quantity during any consecutive five years preceding April 2006. Water utilities needing additional water supplies are required to seek sources that are not dependent upon the Everglades for recharge. These alternative water supply solutions include recycling water, using reclaimed water to recharge the Biscayne Aquifer, or drawing water from the deeper Floridan Aquifer (which requires high energy consumption treatment methods). The RWA and the approval of the City's Water Use permit limited the City's Biscayne Aquifer withdrawal to the following (South Florida Water Management District, 2008):

- Peele-Dixie is 5,475 MGY (15 MGD)
- Prospect is 15,851 MGY (43.43 MGD)
- Total from both wellfields is limited to 19,181 MGY (52.55 MGD)

Demands in excess of the above amount would be met via conservation and alternative water supplies.

2.5 C-51 Reservoir Project

The capture of excess stormwater is considered an alternative water supply project as defined in Section 373.707, F.S. One such project, the proposed C-51 reservoir, was evaluated in 2009 by a group of seven utilities located in Broward and Palm Beach Counties (including the City of Fort Lauderdale). The location of this proposed reservoir is adjacent to the SFWMD's existing L-8 Reservoir in Palm Beach County and is expected to share the same impermeable geologic formation that facilitates storage.

The C-51 reservoir would capture stormwater in the wet season and release it during the dry season to recharge the Biscayne Aquifer. To benefit from this recharge, a utility must execute an agreement with the owner of the C-51 reservoir to pay for the capital cost and operations and maintenance costs of the reservoir and conveyance infrastructure. Upon execution of a C-51 capacity allocation agreement, the utility's Biscayne Aquifer allocation could be increased through issuance of a water use permit by the SFWMD (with allocation dependent upon groundwater modeling results).

The C-51 reservoir, owned and operated by Palm Beach Aggregates (PBA), is planned for development in two phases. Phase 1 would consist of 14,000 acre-feet of storage capacity; equivalent to approximately 35-mgd. Phase 2, if developed, would consist of an additional 46,000 acre-feet of storage capacity. Media reports indicate environmental group opposition to utilizing Phase 2 for water supply benefit.

Phase 1 been designed and permitted. PBA has executed agreements with the following utilities:

- Broward County: 6-mgd
- Sunrise: 5-mgd
- Dania Beach: 1-mgd
- Hallandale Beach: 1-mgd
- Fort Lauderdale: 3-mgd

As of the date of this report, construction of C-51 reservoir Phase 1 has not begun. It is currently scheduled to start September 2020 and with a two year construction window, it should be operational by September 2022.

The City executed a Capacity Allocation Agreement (CAA) with PBA on December 23, 2019 for 3 MGD. The one time capital cost is $13,800,000 and the annul O&M cost is $109,654.

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2.6 Regional Climate Action Plan

Southeast Florida is widely considered one of the most vulnerable regions with respect to the impacts of climate change and sea level rise. This is largely the result of several unique geographic characteristics which include low land elevations, flat topography, a porous geology, and dense coastal development. In combination, climate change and sea level rise are expected to present significant challenges relating to water resource planning, management and infrastructure for communities throughout the region, which includes Palm Beach, Broward, Miami-Dade and Monroe Counties. These communities have agreed to partner in regionally-coordinated climate mitigation and adaptation strategies as part of the Southeast Florida Regional Climate Change Compact (Compact) and have jointly developed and adopted a Regional Climate Action Plan (RCAP) including 110 recommendations in seven primary focal areas, with 18 specific to the focal area of "Water Supply, Management, and Infrastructure". Table 2-1 presents the water supply related recommendations from the Regional Climate Action Plan (Southeast Florida Climate Compact, 2019).

Table 2-1: Water Supply Recommendations from the Regional Climate Action Plan

Item	Recommendations
WS-1	Develop local and, where appropriate, regional inventories of existing potable water supply delivery and collection systems, vulnerable wellfields, wastewater collection and/or treatment infrastructure, septic tanks/drainfields, and stormwater drainage and treatment facilities; assess the potential impact from climate change of each component; and develop different climate change scenarios and adaptation strategies for high-risk utilities and/or infrastructure which may require replacement, reinforcement, or relocation to ensure the long-term viability of the system (e.g., modified site, depth, elevation, materials, or connection requirements).
WS-2	Develop a regional saltwater intrusion baseline and utilize saltwater intrusion models to identify wellfields and underground infrastructure at risk of contamination/ infiltration by saltwater with increases in sea level.
WS-3	Utilize existing and refined inundation maps and stormwater management models to identify areas and infrastructure at increased risk of flooding and tidal inundation with increases in sea level, to be used as a basis for identifying and prioritizing adaptation needs and strategies.
WS-4	Evaluate the impacts of rising sea and groundwater levels on soil storage, infiltration rates and inflow to stormwater and wastewater collection and conveyance systems; consider longer-term influences on water quality; and develop strategies for implementing reclaimed water and stormwater reuse projects that account for current and future conditions.
WS-5	Develop and apply appropriate hydrologic and hydraulic models to further evaluate the efficacy of existing water management systems and flood control/ drainage infrastructure under variable climate conditions. Quantify the capacity and interconnectivity of the surface water control network and develop feasible adaptation strategies.

Table 2-1: Water Supply Recommendations from the Regional Climate Action Plan

Item	Recommendations
WS-6	Coordinate with the South Florida Water Management District, Drainage/Water Control Districts, and utilities/public works officials to identify flood control and stormwater management infrastructure already operating below the design capacity. Further examine water control structures to ensure that they can provide for inland or upstream migration of riparian species as freshwater habitats become more saline.
WS-7	Develop Integrated Water Management Plans that present a joint assessment and planning strategy involving local water utilities, wastewater service providers, water managers, and partners to the Southeast Florida Regional Climate Change Compact, for coordinated consideration of stormwater use and disposal, traditional and alternative water supplies, wastewater disposal and reuse, and water conservation measures for use by local leadership to guide planning decisions as well as amendments to applicable codes and regulations.
WS-8	Develop and test water management and drainage system adaptation improvements needed to maintain existing levels of service relating to drainage, flood control, and water supply, and use cost-benefit analyses to prioritize potential improvements.
WS-9	Incorporate and prioritize preferred climate adaptation improvement projects in capital improvement plans and pursue funding.
WS-10	Encourage, foster, and support investigative work and scientific research that improves the understanding of local and regional climate change impacts specific to Southeast Florida, including: • Improved down-scaling of global climate models for representation of precipitation at the regional/local scales, • Identification and targeting of gaps in monitoring to improve quantification of the hydrologic system and its response to climate change, such as evapotranspiration, groundwater levels, and precipitation, and local sea level, and • Development of risk-based decision support tools and processes for application in analysis of infrastructure design, water resource management, natural systems management, and hazard mitigation alternatives. Tools should provide for consideration of potential economic costs of comparative planning scenarios, management decisions, and infrastructure investments and the evaluation of potential tradeoffs.
WS-11	Undertake efforts to fill identified data gaps through local program efforts, agency collaborations, and advocacy for additional state/federal resources, as needed.
WS-12	Foster the development and exchange of new information, methods and technical capabilities to address key questions of concern related to climate variability and sea level rise to support management decisions: • Assess impacts of observed and predicted climate variability and sea level rise on the frequency, duration, and intensity of flooding as a result of extreme tidal excursions, storm surge, and 100-year storm events, and where impacts are likely to be greatest, • Examine the effects of climate change on water availability and groundwater vulnerability due to sea level rise, and predicted changes in precipitation and evapotranspiration patterns and rates,and • Establish a venue for a periodic exchange of ideas between resource managers, policy makers, and researchers.

Table 2-1: Water Supply Recommendations from the Regional Climate Action Plan

Item	Recommendations
WS-13	Develop agency capabilities to provide rapid deployment of resources in immediate response to intense precipitation and storm events through use of Next RAD technology.
WS-14	Cultivate partnerships with federal and state agencies and professional associations with expertise in integrated water resource planning (such as the U.S. Army Corps of Engineers Institute for Water Resources, the United States Geological Survey, and Water Foundations) as sources of important research, reports, and information regarding climate change, and efforts being undertaken in other communities.
WS-15	Monitor changes in rainfall patterns, temperature means and extremes and sea level rise through coordination with NOAA and other key organizations/partners to better predict future wet-season and dry-season rainfall. Monitor emerging science in order to assess the adequacy of regional climate models. Choose an annual conference or other venue at which such trends can be reviewed at regular intervals.
WS-16	Manage water storage in the region's publicly-owned uplands and wetlands and in other land uses compatible with water storage, including wetland restoration, certain agricultural operations and certain renewable energy production facilities. This will further serve to protect high quality drinking water supply, increase aquifer recharge, and as a means for managing saltwater intrusion.
WS-17	Support complete implementation and funding for the Comprehensive Everglades Restoration Plan (CERP) and its updated versions as fundamental to Everglades restoration, to include increased freshwater flows to the Everglades system, thereby improving water quality, maximizing regional freshwater storage and aquifer recharge, and providing potential to abate saltwater intrusion, which will become increasingly important under variable climate conditions and in the face of sea level rise.
WS-18	Combine existing and develop new land acquisition priorities in a regional setting to protect high quality drinking water supply.

Source: (Southeast Florida Climate Compact, 2019)

These recommendations are intended to meet the goals of advancing water management strategies and infrastructure improvements needed to mitigate adverse impacts of climate change and sea level rise on water supplies, water and wastewater infrastructure, and water management systems. It is the City's policy to implement these recommendations.

2.7 Lake Okeechobee Surface Water Allocation Limitations

Surface water allocations from Lake Okeechobee and the Water Conservation Areas are limited in accordance with the Lake Okeechobee Service Area Restricted Allocation Area (RAA) criteria. In 2008, the SFWMD adopted RAA criteria 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 hydraulically connected to the lake to base condition water uses that occurred from April 1, 2001 to January 1, 2008. After adoption of the RAA, all irrigation users in the Lake Okeechobee Service Area were required to renew their water use permits (South Florida Water Management District, 2018a).

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. 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 (South Florida Water Management District, 2018a).

While the City is not directly impacted by the Lake Okeechobee surface water allocation limitations, the City is directly impacted by the LEC Regional Water Availability criteria as it applies to the Lower East Coast Everglades Waterbodies. These criteria impact the amount of permitted water quantities available to the City from the Biscayne Aquifer. The City's Biscayne Aquifer water consumption was limited to 52.55-mgd on an annual average day basis by this rule.

2.8 Lowering Lake Okeechobee Level

In January 2019, Florida's Governor announced his promotion of a plan to lower the minimum level of the Lake Okeechobee Regulation Schedule to 10.5 feet. The current Lake Okeechobee Regulation Schedule (LORS) ranges from a minimum level of 12.5 feet to a maximum of 15.5 feet. (Elsken, 2019).

While lowering Lake levels could provide environmental benefits to the Lake and the coastal estuaries, dropping the minimum level to 10.5 feet would reduce the amount of water stored in Lake Okeechobee, potentially reducing the amount of water available to recharge the Biscayne Aquifer. Should this happen, the risk of water shortages in the LEC, including the City of Fort Lauderdale, would increase. The City continues to monitor this issue and, when appropriate, will develop a policy to address any potential impacts to its water utility.

2.9 Infrastructure Planned to Attenuate Damaging Peak Flow Events from Lake Okeechobee

Construction of additional storage systems (e.g., reservoirs, aquifer storage and recovery systems) to capture wet season flow volumes may be needed to increase water availability during dry conditions and attenuate damaging peak flow events from Lake Okeechobee. The C-51 Reservoir project located in southwestern Palm Beach County is one such project and was described in Section 2.5.

The infrastructure planned to attenuate damaging peak flows to surface water bodies and coastal ecosystems located near the City are those underway in Broward County by the SFWMD and the US Army Corps of Engineers under the Comprehensive Everglades Restoration Project (CERP) (South Florida Water Management District, 2018a).

The CERP Broward County Water Preserve Areas project was designed to perform three primary functions:

1. Reduce seepage loss from WCA-3A/3B to developed areas (i.e., the C-11 and C-9 basins).

2. Capture, store, and distribute surface water runoff from the western C-11 Basin.

3. Restore wetlands, recharge groundwater, improve hydroperiods in WCA-3A/3B, and maintain flood protection.

The following major infrastructure features will be constructed as part of the project.

- C-11 Impoundment – A 1,168-acre impoundment to capture and store runoff from the C-11 Basin, reduce pumping of surface water into the WCAs, and provide releases for other regional uses.
- WCA-3A/3B Seepage Management Area – A 4,353-acre seepage management area that would establish a buffer to reduce seepage from WCA-3A/3B, connect the C-11 and C-9 impoundments via conveyance canal, and maintain flood protection.
- C-9 Impoundment – A 1,641-acre impoundment to capture and store surface runoff from the C-9 Basin, store C-11 Impoundment overflow, manage seepage, and provide releases for regional benefit.

These infrastructure features will provide various functions such as reducing seepage from WCA-3A, reducing phosphorus loading to WCA-3A, capturing stormwater otherwise lost to tide, and providing conveyance features for urban and natural system water deliveries. The preserve areas will benefit federally listed threatened and endangered species and many wading birds. This project provides water supplies identified in the Everglades MFL recovery strategy. The project received congressional authorization in 2014. Design efforts are under way for the C-11 Impoundment, and construction began in October 2017 on a portion of the mitigation area. Construction of the C-11 Impoundment is expected to be completed in 2027. The WCA-3A/3B Seepage Management Area is anticipated to begin construction in 2027. Construction of the C-9 Impoundment is expected to begin in 2030. The City continues to monitor the status of environment restoration projects in the LEC.

2.10 Expanded Use of Reclaimed Water to Meet Future Water Supply Demands

The City's Sewer System service area is in a critical water supply area, as designated by the SFWMD. As such, FAC Section 62-40.416 requires a reasonable amount of reuse of reclaimed water unless it is not economically, environmentally, or technically feasible. Section 403.064 of the Florida Statutes also requires domestic wastewater treatment plant permit applicants in a critical water supply problem area to submit a reuse feasibility study as part of their permit applications. Reuse feasibility studies were completed in 1994, 2008, 2012 for the City. Reclaimed water projects have been deemed non-economical. The City plans to continue to assess reclaimed water opportunities that are beneficial to community.

2.11 East Coast Floridan Aquifer System Groundwater Model

The SFWMD developed the East Coast Floridan Aquifer System (FAS) Model. East Coast FAS Model is a density-dependent groundwater flow and solute transport model of the FAS covering the Upper East Coast and Lower East Coast planning areas of the SFWMD. The East Coast FAS Model simulates regional groundwater levels, flows, and quality changes (total dissolved solids) in the FAS in response to withdrawals. The model was designed with seven layers as illustrated in 2-5. The Upper Floridan Aquifer (UFA) and Avon Park Permeable Zone (APPZ) are the two layers used as water supply sources in the Lower East Coast Planning Area.

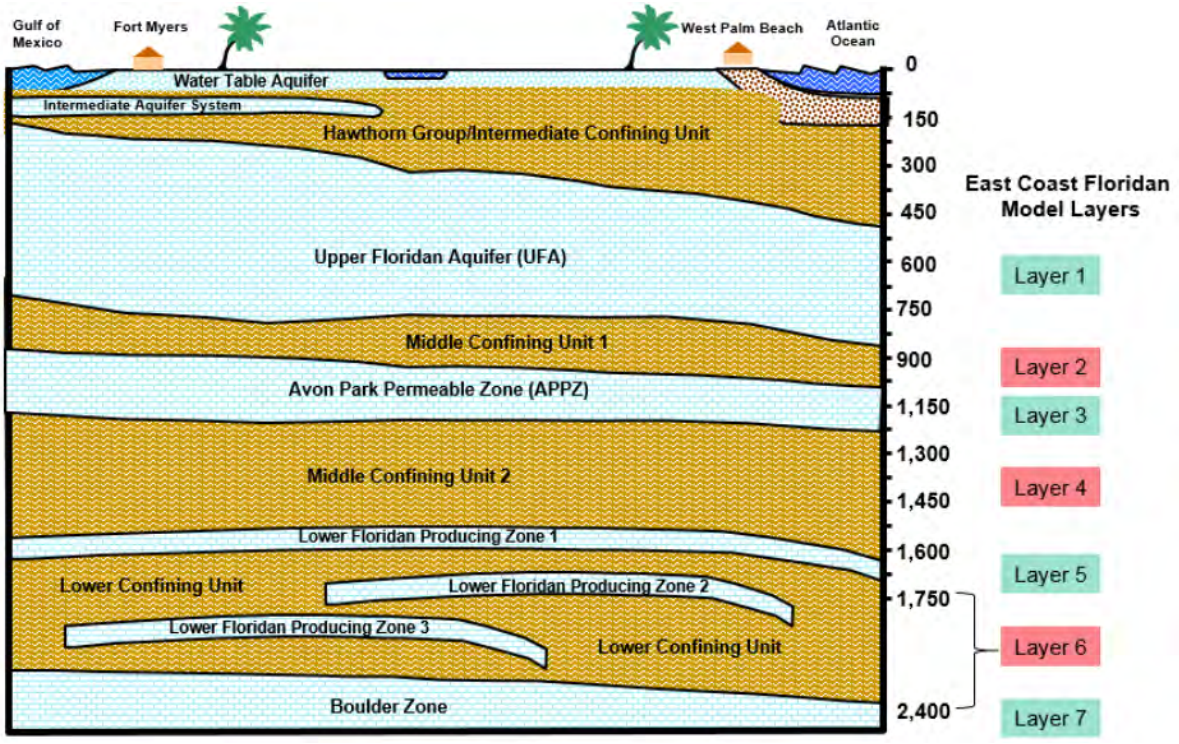


Figure 2-5: East Coast Floridan Model Layers

Adapted from South Florida Water Management District Lower East Coast Water Supply Plan 2018 Update Figure D-52

The 2018 LECWSP Update indicates that model runs were performed for years 2016 and 2040. The FAS withdrawals during those years were estimated at 65-mgd and 146-mgd. The model results are briefly summarized below (South Florida Water Management District, 2018a).

- The model predicted stable total dissolved solids (TDS) of 6,000 to 8,000-mg/L in the UFA in the vicinity of the Dixie Wellfield from 2016 through 2040.
- The model predicted that TDS in the APPZ in the vicinity of the Dixie Wellfield would increase from 8,000-mg/L to approximately 9,000-mg/L from 2016 to 2040.

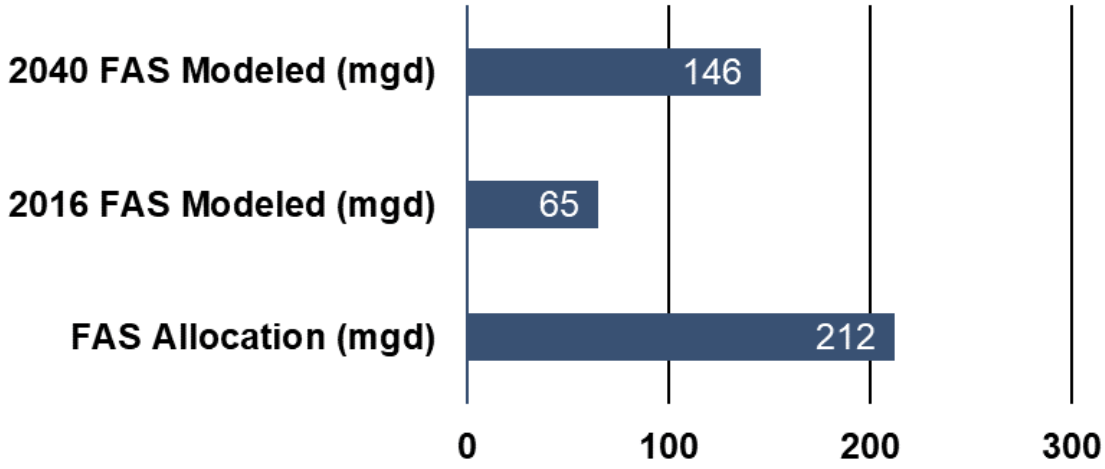
- The model predicts that the UFA ground water elevation would drop from approximately 40-ft National Geodetic Veridical Datum of 1929 (NGVD-29) to approximately 35-ft NGVD-29 in the vicinity of the Dixie Wellfield from 2016 to 2040.
- The model predicts that the APPZ ground water elevation would drop from approximately 45-ft National Geodetic Veridical Datum of 1929 (NGVD-29) to approximately 40-ft NGVD-29 in the vicinity of the Dixie Wellfield from 2016 to 2040.
- The most significant TDS increase predicted by the modeling was at the South Miami Heights wellfield in Miami-Dade; the model predicted a 2,900-mg/L increase in TDS in the UFA.

While the modeling did not predict significant water quality degradation, the regional nature of the model limits the ability to account for specific wellfield operations used by utilities. Certain utilities have experienced significant water quality degradation in its Floridan Aquifer wells. For example, the Palm Beach County Utilities Department Western Regional Floridan Aquifer wells "TP-1" and "PW-6" had chloride increase from 1,600-mg/L to nearly 5,000-mg/L over a two-year period. Construction of additional wells and subsequent reductions in individual well pumping rates reducing the interference between wells resulted in distributing aquifer stress. Within two years the chloride concentration in "PW-6" decreased to 3,500-mg/L and remained steady. The chloride concentration has continued to increase in "TP-1", exceeding 6,000-mg/L in 2018 (South Florida Water Management District, 2018a).

To avoid undesirable changes in FAS water quality, it is critical that a Floridan Aquifer wellfield be designed and operated to minimize the risk of upconing (vertical migration) of lower quality water from lower depths into the production zone. Suggested wellfield design and operating protocols to minimize the risk of upconing are described in the subsection 2.14.

2.12 Conclusions of the East Coast Floridan Aquifer System Groundwater Model May Not Represent the Actual Risk of Future Water Quality Degradation

The conclusions of the modeling prepared for the 2018 LECWSP were based on FAS withdrawals in year 2016 of 65-mgd and year 2040 of 146-mgd (South Florida Water Management District, 2018a). The SFWMD indicated that the FAS withdrawal allocation is 212-mgd as illustrated in Figure 2-6 (South Florida Water Management District, 2018c). Hence, the model results presented in the 2018 LECWSP do not include 66-mgd of potential FAS withdrawals. If the 212-mgd of FAS withdrawal allocation is fully realized it may result in increased FAS water quality degradation and reduced FAS water elevation with resultant risk of upward movement of lower quality water over the long-term. Hence, it is recommended that the City continue to support SFWMD water supply planning to produce refined modeling results going forward along with regulatory policy to restrict FAS withdrawals to protect utilities that invest in the FAS from unexpected changes in FAS water quality. Additionally, it is recommended that the City support the SFWMD in collection of additional FAS well construction, aquifer test and lithologic data from new and existing FAS wells for the SFWMD to use in future refinements of its East Coast FAS Model.



Source: August 22, 2018 presentation by the South Florida Water Management District titled "East Coast Florida Model Overview and Results Lower East Coast Planning Region"

Figure 2-6: Lower East Coast FAS Demand Summary

2.13 Other Potential Floridan Aquifer Risk Factors

The USGS has developed a seismic stratigraphic mapping technique to identify "vertical collapse features", which is a structural anomaly in the aquifer that might allow high salinity water from lower depths, such as the Boulder Zone, to migrate vertically into upper levels the aquifer, such as the UFA (United States Geological Survey, 2017). The USGS has utilized this tool on several transects within Broward County, Florida, but has not attempted comprehensive regional characterization. If present, a vertical collapse feature could result in an unexpected decline in water quality in a new FAS water supply. This risk that "vertical collapse features" represent relative to development of the FAS in South Florida remains undefined. It is recommended that the City consider this potential risk factor as it proceeds with development of alternative water supplies.

2.14 Wellfield Management to Prevent Undesirable Changes in Floridan Aquifer Water Quality

The City is planning to install 6.0-mgd of finished water RO capacity at the Peele-Dixie WTP to treat water from the FAS. This alternative water supply is projected to be needed by the year 2035, when water demand is forecast to reach the City's permitted Biscayne Aquifer withdrawal limit. Using the FAS requires careful design and wellfield management to prevent undesirable changes in water quality.

Several FAS wellfields in the LEC Planning Area have experienced some water quality degradation. The SFWMD asserts that water quality degradation risks can be managed by utilities through appropriate

wellfield design and operating protocols. The SFWMD recommended the following risk reduction strategies (South Florida Water Management District, 2018a):

1. Increasing well spacing between wells to more than 1,000 feet to minimize interference effects and to reduce stress on the FAS
2. Rotating the operation of individual wells, thereby reducing overall pumping stress on the well's production zone
3. Plugging and abandoning individual wells experiencing increases in chloride concentration and replacing them with new wells elsewhere within the wellfield area
4. 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 (i.e., upconing)
5. 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
6. Utilities should use an incremental approach to install and test production wells due to geologic variability within the FAS. Wellfields should be designed and monitored to prevent over-stressing production zones and to minimize changes in water quality.
7. Public water supply utilities developing FAS sources are encouraged to share water quality, water level, and hydrologic data to increase understanding of the FAS and improve regional groundwater models.
8. The SFWMD should continue to use the East Coast FAS Model to address regional resource questions. Refinements to and recalibration of the model should be made as new data become available.
9. FAS users and SFWMD staff should evaluate the effects of water quality degradation and coordinate on related permitting, modeling, and planning strategies to maintain the viability of the FAS as a water supply source.

The 2018 LECWSP Update utilized the East Coast FAS Model to evaluate the impact of increasing FAS withdrawals of 65-mgd in 2016 to 146-mgd by 2040. Based on this modeling, SFWMD concluded that increased utilization of the FAS will tend to increase the risk of water quality degradation. However, the 2018 LECWSP Update noted that "water quality should remain adequate for all users with RO treatment…" (South Florida Water Management District, 2018a).

The City has long recognized the risks of changes in water quality and quantity in the FAS. The City's planning documents recommended addressing this risk through the following design features (Hazen and Sawyer, 2008b):

1. Design the RO system to treat water with a TDS up to approximately 8,000-mg/L and chloride concentration of 4,300-mg/L
2. Size the skids to allow for installation of future pressure vessels to decrease flux rate

3. Size variable frequency drives and main electrical feed for higher feed pump pressure, but only install the motor horsepower initially required
4. Size feed pump can for additional pump stage, but only add it if required later
5. Install piping and valves at higher pressure rating
6. Design the energy recovery turbine for a compromise that optimizes boost over most of the operating range at the expense of performance at the extremes of feed water salinity
7. Select wellfield pumps and size wellfield power facilities to suit the horsepower requirements of the future estimated salinity and total dissolved solids

The City will monitor the issue of FAS water quality degradation and factor this risk into its investment decision making process relative to alternative water supply opportunities.

2.15 Intergovernmental Coordination

2.15.1 Introduction

This subsection describes the City's intergovernmental coordination activities with the jurisdictions outside of the City of Fort Lauderdale that it supplies with finished water. Additionally, this subsection describes City coordination activities relative to long-range water supply planning with the SFWMD.

2.15.2 The City of Fort Lauderdale Actively Coordinates With the Agencies it Supplies With Finished Water

The City of Fort Lauderdale coordinates with the agencies it supplies with finished water on many levels. Examples of coordination between the City of Fort Lauderdale and its bulk finished water customers follows:

- The City of Fort Lauderdale monitors wholesale water use through monthly meetings with users and monthly reports.
- The City of Fort Lauderdale maintains agreements with all its customers within its service area. The agreements with certain bulk finished water customers requires periodic coordination by each party to the agreement to review issues related to water quality, quantity and technological advancements relevant to each party.
- The City's agreements with its bulk finished water customers require the bulk customers to coordinate with the City of Fort Lauderdale in advance of allowing developments to connect that are estimated to consume in excess of 100,000 gallons of water per day.
- The City coordinates with its bulk finished water customers on a monthly basis for billing for water purchases.
- The City's Utilities Division's Environmental Laboratory coordinates with its customers to provide water quality sampling and analyses for certain utilities it provides water to.

- The City's Utilities Division provides operational coordination with its bulk finished water customers on an as-needed basis to ensure effective delivery of water
- The City leads the development of financial analyses to establish water rate adjustments and coordinates the acceptance of these adjustments with its customers.
- The City temporarily switches to free chlorination and flushes its water distribution at least once per year and up to two times per year to maintain distribution water quality. The City of Fort Lauderdale coordinates this maintenance activity with all its water customers and encourages its bulk customers to flush the distribution systems that they own and operate.
- The bulk finished water customers that are supplied with water by the City of Fort Lauderdale own and operate their water distribution pipe network. The City of Fort Lauderdale assists these utilities on an as-requested basis.

2.15.3 Need for Additional Coordination Activities

Historically, there has been little need for additional coordination activities (beyond those described above) with the City's bulk finished water customers relative to planning future water supply. As the City's agreements with its bulk customers near expiration, the City may include requirements for additional coordination activities if the City determines it is needed for planning purposes.

2.15.4 Bulk Finished Water Agreements

The City maintains agreements with the following jurisdictions for sale of bulk finished water through master meters:

- Broward County Water and Wastewater Services (serving Unincorporated Broward County)
- City of Oakland Park
- City of Tamarac
- City of Wilton Manors
- Port Everglades
- Town of Davie

2.15.5 The City of Fort Lauderdale Actively Coordinates With the SFWMD During LECWSP Updates

Since 2017 the City of Fort Lauderdale's Assistant Public Works Director – Utilities, Environmental Compliance Supervisor and the Environmental Resource Supervisor have been responsible for coordinating with the SFWMD relative to the LEC Plan Update. These City personnel participated in workshops with the SFWMD during the LEC Plan Update development. Additionally, these City personnel are responsible for providing responses to the SFWMD's requests for information relative to the LEC Plan Update.

3. Data and Analyses

3.1 Introduction

This section provides the following data and analyses.

- Summary of Existing Water Treatment Facilities
- Summary of Existing Wastewater Treatment Facilities
- Population Forecast
- Historical Raw and Finished Water Demand Data
- Forecast of Raw and Finished Water Demand through the Year 2040

3.2 Summary of Existing Water Treatment Facilities

3.2.1 Water Use Permit

The City of Fort Lauderdale obtains all its raw water supply from the surficial Biscayne Aquifer system via two active wellfields. These wellfields, which are commonly known as the Dixie Wellfield and the Prospect Wellfield, operate independently of each other, the former serving the Peele-Dixie WTP and the latter serving the Fiveash WTP. Both wellfields are permitted by the South Florida Water Management District under Water Use Permit (WUP) No. 06-00123-W. The permit was issued September 11, 2008 with an expiration date of September 11, 2028.

3.2.2 Raw Water Allocation

The WUP allows withdrawal from the Biscayne Aquifer within the limitations presented in Table 3-1.

Table 3-1: Biscayne Aquifer Withdrawal Limits from WUP 06-00123-W

Category	Limitation		
	Million Gallons per Year	Million Gallons per Month	Million Gallons per Day
Biscayne Aquifer Annual Withdrawal	19,181	--	52.55
Biscayne Aquifer Maximum Month Withdrawal	--	1,857	59.90
Dixie Wellfield Biscayne Withdrawal	5,475	465.0	15.00
Prospect Wellfield Biscayne Withdrawal	15,851	1,534.5	43.43

Source: (South Florida Water Management District, 2008)

WUP Limiting Condition No. 4 indicates that the City's ground water sources are the Biscayne Aquifer and the Floridan Aquifer System (FAS). Additionally, WUP Limiting Condition No. 5 indicates an annual allocation of no more than 22,334 million gallons with a Biscayne Aquifer limitation of 19,181 million gallons per year (mgy). A reasonable interpretation of these limiting conditions is that the difference between the annual allocation and the Biscayne Aquifer Annual Withdrawal limitation would be supplied by the Floridan Aquifer, as follows:

Floridan Aquifer Allocation Limit = Annual Allocation Limit - Biscayne Aquifer Annual Withdrawal Limit

Where:

- Annual Allocation Limit = 22,334 mgy = 61.19 mgd (on an annual average day basis)
- Biscayne Aquifer Annual Withdrawal Limit = 19,181 mgy = 52.55 mgd
- Floridan Aquifer Allocation Limit = 22,334 mgy - 19,181 mgy = 3,153 mgy
- Floridan Aquifer Allocation Limit = 3,153 mgy = 8.64 mgd

In 2007, the City completed the construction of two Floridan Aquifer test wells at the Dixie Wellfield site under SFWMD Water Well Construction Permit #SF030907A issued March 30, 2007. These wells are currently idle and not equipped with pumping facilities. Based upon the permit conditions these wells are approved for testing purposes only. Withdrawals for public water supply from these wells is not currently permitted. The City would apply for a WUP modification prior to utilizing these existing wells for public water supply.

3.2.3 Fiveash Water Treatment Plant

The Fiveash WTP design capacity is permitted at 70 million gallons per day. Plant staff indicated the plant capacity may be limited to 60 million gallons per day. The plant uses conventional lime softening, followed by filtration. Polymer is added for turbidity removal and a polymer blend is added to assist in color removal. Disinfection is achieved by chloramination. The plant produces safe, reliable potable water which complies with current regulations. Figure 3-1 illustrates a simplified schematic of the Fiveash WTP.

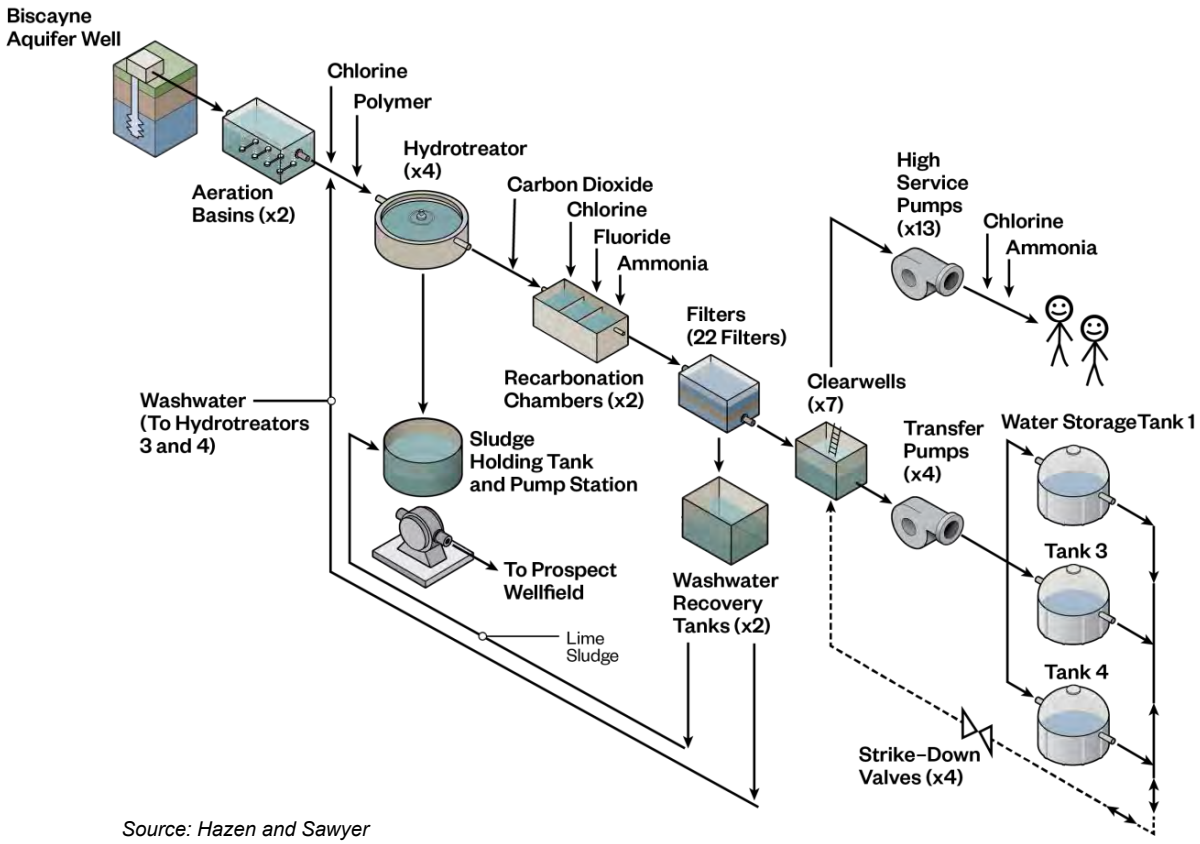
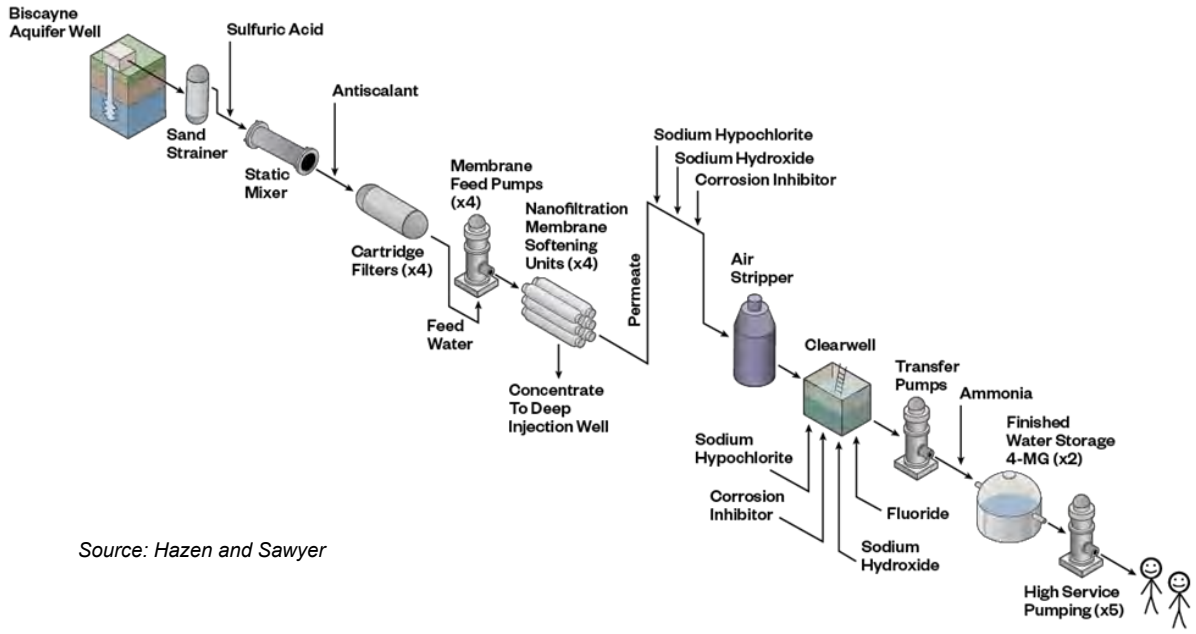


Figure 3-1: Fiveash WTP Schematic

3.2.4 Peele-Dixie Water Treatment Plant

The existing Peele-Dixie WTP is a nanofiltration treatment plant on the same site as the retired lime softening facilities. The nanofiltration treatment plant was placed into service the second quarter of 2008. The nanofiltration treatment plant has a maximum installed finished water treatment capacity of 12 million gallons per day with all units in service. The facility was designed to be expanded by the addition of three Reverse Osmosis (RO) trains that would utilize the Floridan Aquifer. If the RO system is constructed, the total installed potable water production capacity at the Peele Dixie WTP site would be 18 million gallons per day. Figure 3-2 illustrates a simplified schematic of the Peele-Dixie WTP.



Source: Hazen and Sawyer

Figure 3-2: Peele-Dixie WTP Schematic

3.2.5 Prospect Wellfield

Raw water to the Fiveash WTP used to be supplied from groundwater wells that surround Prospect Lake plus wells that surround the Fort Lauderdale Executive Airport. The wells at the executive airport are not in use. As a result, all the raw water supplied to the Fiveash WTP is pumped from wells around Prospect Lake. This site is known as the Prospect Wellfield.

The Prospect Wellfield has 29 active production wells (Well Numbers 25 through 28, 30 through 49 and 50 through 54) that were constructed from 1969 through 2006. The wells have pumping capacities of approximately 2,100 gallons per minute (gpm) each, which equates to a total wellfield capacity of approximately 87 million gallons per day.

3.2.6 Dixie Wellfield

Raw water to the Peele-Dixie WTP is supplied from groundwater from the Dixie Wellfield. The Dixie Wellfield includes eight wells. The wells and pumping equipment where constructed in 2008. Each well has an approximate capacity of 2.5 million gallons per day. The wells are located within the Fort Lauderdale County Club golf course. The total capacity of all wells is approximately 20 million gallons per day. The wellfield withdrawal permit limits the maximum withdrawal to 15 million gallons per day on a maximum day basis.

In 2007, the City completed the construction of two Floridan Aquifer test wells at the Dixie Wellfield site. The purpose of these wells was to collect water quality and drawdown data for the planning the addition of reverse osmosis treatment at the Peele-Dixie WTP.

3.2.7 Saline Intrusion Monitoring (SALT) Program

The City of Fort Lauderdale operates a SALT program. The goal of the SALT program is to locate and monitor the saltwater interface in and around the City's wellfields. The purpose of the program is to provide an early warning monitoring system to assist wellfield managers in tracking the location and to manage withdrawals to limit the inland movement of the salt front. The City currently has 10 saltwater monitor wells.

3.2.8 Distribution System Water Storage Facilities

The City has two distribution system storage sites. These sites are known as the Poinciana Park Water Tank and Pump Station and the Northwest Second Avenue Water Tank and Pump Station. In 2006, the existing tank and pump station at the Poinciana Park Water Tank and Pump Station site were replaced with a 2.0-million-gallon pre-stressed concrete ground storage tank and pumping station with backup power diesel engine generator. The Poinciana Park pump station also includes remote monitoring and control at the Fiveash WTP.

The existing elevated steel water tank at the Northwest Second Avenue site is 1.0 million gallons. The pump station was refurbished in 2012 with a new pump, electrical supply and automated controls system that included remote monitoring and control at the Fiveash WTP. The interior and exterior of the water tank was rehabilitated and painted in 2019.

3.2.9 Raw Water Aquifer Storage and Recovery

The City's existing Aquifer Storage and Recovery (ASR) well is located at the Fiveash WTP. The ASR well was constructed in 1998. Performance testing to date has shown less than anticipated water recovery rates. The ASR well currently has a "no flow" permit.

3.2.10 Finished Water Distribution System

The City of Fort Lauderdale's water distribution system consists of over 770 miles of 2 to 54-inch diameter water mains that convey the finished water from the treatment facilities to the individual customers. In general, the larger diameter transmission mains radiate from the treatment facilities and decrease in size as they extend throughout the service area. The major transmission mains travel east from the WTPs to the populated portions of the service area and the two systems are interconnected along major north-south avenues.

3.2.11 Interlocal Agreements and Bulk Sales

The City of Fort Lauderdale sells finished water in bulk to the jurisdictions listed below. The water sold is measured via master meters.

- Broward County Water and Wastewater Services (serving Unincorporated Broward County)
- City of Oakland Park
- City of Tamarac

- City of Wilton Manors
- Port Everglades
- Town of Davie

The City neither buys nor sells raw water.

3.2.12 Areas of Self-Supply

There are no existing areas within the City of Fort Lauderdale's water service area that self-supply potable water. There are no plans for future domestic self-supplied systems.

3.2.13 Distribution System Interconnects

The City of Fort Lauderdale maintains distribution system interconnects with other utilities. Table 3-2 identifies the location and size of each interconnect. The isolation valves on all interconnects are closed.

Table 3-2: City of Fort Lauderdale Water System Interconnects

Item	Area Serviced	Location	Size	Meter	Status
1	Broward County	NW 9 AVE / 62 ST	10"	No	Operable
2	Broward County	SW 35 AVE / W Broward BLVD	10"	No	Operable
3	Broward County	SW 34 ST / 9 AVE	8"	No	Operable
4	Broward County	SW 34 ST/ 2 AVE	6"	005014099	Operable
5	Broward County	SW 20 ST / SR 7 (Broadview)	6"	004237769	Operable
6	Broward County	NW 24 AVE / 19 ST	6"	No	Interconnect is capped and will be removed
7	Plantation	Peters RD / SR 7	8"	No	Operable
8	Pompano	5450 N Ocean DR	10"	No	Operable
9	Pompano	NE 68 ST/ 20 TERR	6"	No	Operable
10	Pompano	McNab & Lyons (NW 31 AVE)	12"	No	Operable

Source: City of Fort Lauderdale spreadsheet titled "Emergency Interconnects.xlsx" provided to Hazen on February 14, 2019.

3.2.14 Treatment Losses

Treatment losses, for the purpose of this report, is defined as the difference between raw water pumped and finished water pumped. The terminology "treatment loss" may be misleading since the water is not actually "lost" but is repurposed for ground water recharge or other beneficial use.

Treatment losses vary with the efficiency of the treatment technology utilized. The treatment loss for the Fiveash WTP, which uses lime softening technology, is roughly one to three percent of the raw water pumped. The treatment loss for the Peele-Dixie WTP, which uses nanofiltration softening technology, is roughly 15 percent of the raw water pumped. The historic amount of raw water pumped and finished water produced in mgd and the overall treatment loss in mgd and as a percent of raw water pumped from 2010 to 2018 is summarized in Table 3-3. The overall average water treatment loss over the nine-year period was 4.0 percent of raw water pumped.

Table 3-3: Raw Water, Finished Water and Overall Treatment Loss, 2010 to 2018

Water Use Category	Annual Average Day Flow (mgd)								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
(1) Raw Water (Biscayne Wellfields)	41.71	41.39	39.75	39.18	39.25	41.45	40.64	40.24	41.49
(2) Finished Water Pumped from WTPs	40.20	40.17	38.36	37.78	37.45	39.75	38.95	38.44	39.49
(3) Treatment Loss = (1) - (2)	1.51	1.22	1.39	1.40	1.80	1.70	1.68	1.80	2.00
(4) Loss as % of Raw Water Pumped = [(3) / (1)] x 100	3.6%	3.0%	3.5%	3.6%	4.6%	4.1%	4.1%	4.5%	4.8%

Source: City of Fort Lauderdale spreadsheet titled "wtrhist2.xlsx". Data provided to Hazen on May 24, 2019.

3.2.15 Distribution System Losses

Distribution system losses are presented in Table 3-4. The percent distribution system loss is based on a percent of finished water pumped. The distribution system losses have averaged 11.4 percent over the last nine years (2010 to 2018).

Table 3-4: Calculation of Historical Distribution System Water Loss, 2010 to 2018

Water Use Category	Annual Average Day Flow (mgd)								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
(1) Raw Water (Biscayne Wellfields)	41.71	41.39	39.75	39.18	39.25	41.45	40.64	40.24	41.49
(2) Finished Water Pumped from WTPs	40.20	40.17	38.36	37.78	37.45	39.75	38.95	38.44	39.49

Table 3-4: Calculation of Historical Distribution System Water Loss, 2010 to 2018

Water Use Category	Annual Average Day Flow (mgd)								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
(3) Billed Authorized Consumption	39.08	34.71	32.33	33.17	33.04	35.23	32.44	33.53	32.92
(4) Unmetered Authorized Consumption (1.25% estimated for flushing) = 0.0125 x (2)	0.50	0.50	0.48	0.47	0.47	0.50	0.49	0.48	0.49
(5) Total Authorized Consumption = (3) + (4)	39.58	35.21	32.81	33.64	33.51	35.73	32.93	34.01	33.41
(6) Distribution System Loss = (2) – (5)	0.62	4.96	5.55	4.14	3.94	4.03	6.03	4.42	6.07
(7) % Distribution System Loss = [(6) / (2)] x 100	1.5%	12.3%	14.5%	11.0%	10.5%	10.1%	15.5%	11.5%	15.4%

Source: City of Fort Lauderdale spreadsheet titled "wtrhist2.xlsx". Data provided to Hazen on May 24, 2019.

Authorized unmetered water consumption at the WTPs and the distribution system are included in the distribution system loss reported in Table 3-4. City staff believe this consumption is significant. However, no data on unmetered water consumption within the WTPs or in the distribution system are currently available. Hence, the actual distribution system loss is believed to be lower than that indicated in the table. The City is planning to implement improvements to incorporate meters to measure water consumption at the WTPs.

3.2.16 Outstanding Compliance Issues

There are no outstanding regulatory compliance issues related to the City of Fort Lauderdale's water facilities.

3.2.17 Planned Upgrades or Expansions

The City has planned the following major improvements at its water treatment plant:

- Reliability Upgrades and Disinfection System Replacement: This project was bid in 2019 and the scope is being reevaluated to align with the City's desire to construct a replacement water treatment facility elsewhere. This project's scope will likely be adjusted to focus on critical short term repairs.

- Plant Evaluation at the Fiveash Water Plant: This project evaluated the treatment plant with recommendations for meeting treatment quality as well as reliability requirements into the foreseeable future and has a recommendation to build a new water treatment facility to replace the Fiveash Water Treatment Plant.
- CUSMP Projects: The City completed its Comprehensive Utility Strategic Master Plan (CUSMP) in 2017. Each fiscal year, the City incorporates recommendations from the CUSMP for future year utility projects into the City's Community Investment Plan through the budgeting process.

3.3 Summary of Existing Wastewater Treatment Facilities

3.3.1 Introduction

The City owns and operates the George T. Lohmeyer (GTL) Wastewater Treatment Plant (WWTP). The GTL WWTP is located on a 9.6-acre site near Southeast 17th Street and Eisenhower Boulevard. The plant provides secondary treatment followed by deep-well injection via five injection wells located approximately one-quarter mile south of the site. The WWTP treats wastewater generated in a region encompassing the following areas:

- City of Fort Lauderdale
- City of Wilton Manors
- City of Oakland Park
- Port Everglades
- A portion of the City of Tamarac
- A portion of unincorporated Broward County
- A portion of the Town of Davie

3.3.2 Treatment Capacity

The facility has been expanded several times over the years. It was converted from a small trickling filter plant to a 22 million gallon per day facility in 1978, with effluent disposal via an outfall to the Intracoastal Waterway. In 1984, four deep injection wells were constructed for effluent disposal and the plant was converted and expanded to a permitted capacity of 38 million gallon per day. New clarifiers and biosolids dewatering facilities were added to the existing treatment train.

In 1994, the Florida Department of Environmental Protection (FDEP) issued a permit with a capacity of 43 million gallon per day, on a maximum three-month average daily flow (M3MADF) basis. In 2001, FDEP issued a permit modification that increased the design capacity of the plant to 54.0 MGD, pending

approval of the increase in disposal capacity of the underground injection well system. The FDEP issued a permit that re-rated the plant to 56.6 million gallon per day on a M3MADF basis.

3.3.3 Deep Well Injection Wells

The GTL WWTP effluent pump station discharges to five deep injection wells via 3,500 feet of 54-inch-diameter force main. The wells are permitted to operate at up to 10 feet per second (fps) flow velocity on a sustained basis and 12 fps during emergencies. These velocities yield total injection well capacities of 93.25 and 112 MGD, respectively. The existing deep injection wells do not require high level disinfection (HLD) under the United Stated Environmental Protection Agency Underground Injection Control (UIC) Program. If a new injection well is required it would require HLD under the UIC program. HLD is not required for the existing injection wells under current regulations.

3.3.4 Reclaimed Water

The existing facility does not currently include reclaimed water treatment facilities. However, on average the plant uses about 4 MGD of its own secondary effluent as in-plant re-use instead of potable water.

3.4 Population and Water Demand Forecasts

3.4.1 Population Forecast

The population forecast was prepared by the City based on University of Florida's Bureau of Economic and Business Research (BEBR) data. Table 3-5 presents the population forecast for the City of Fort Lauderdale's water service area from 2020 through the year 2040. Historical population for the year 2015 is also included.

Table 3-5: Population by Jurisdiction, Actual 2015 and Forecasted 2020 to 2040

Jurisdiction	2015	2020	2025	2030	2035	2040
Fort Lauderdale	175,228	179,997	208,747	222,915	232,419	240,134
Lauderdale-by-the-Sea	4,147	3,689	3,996	3,940	3,890	3,850
Sea Ranch Lakes	700	693	680	715	734	746
Unincorporated Broward County	6,457	7,060	7,854	8,561	8,854	9,486
Davie	529	526	700	821	919	1,016
Lauderdale Lakes	381	383	378	386	386	390
Lauderhill	2,917	2,862	3,085	3,306	3,450	3,571
Lazy Lake	26	25	27	29	30	31

Table 3-5: Population by Jurisdiction, Actual 2015 and Forecasted 2020 to 2040

Jurisdiction	2015	2020	2025	2030	2035	2040
North Lauderdale	358	352	1,145	1,145	1,133	1,123
Oakland Park	31,111	31,952	32,719	34,693	36,114	37,145
Tamarac	2,054	2,037	2,007	2,032	2,054	2,041
Wilton Manors	11,932	11,878	13,132	14,225	14,935	15,576
Port Everglades	Population is included in Unincorporated Broward County					
Total	**235,840**	**241,454**	**274,470**	**292,768**	**304,918**	**315,109**

Source: Population data are based on University of Florida's Bureau of Economic and Business Research (BEBR) as processed by The Corradino Group and provided to Hazen on May 24, 2019.

3.4.2 Comparison With 2018 LECWSP Update Population Forecast

Figure 3-3 compares the BEBR population forecast presented above with the population forecast in the 2018 LECWSP Update.

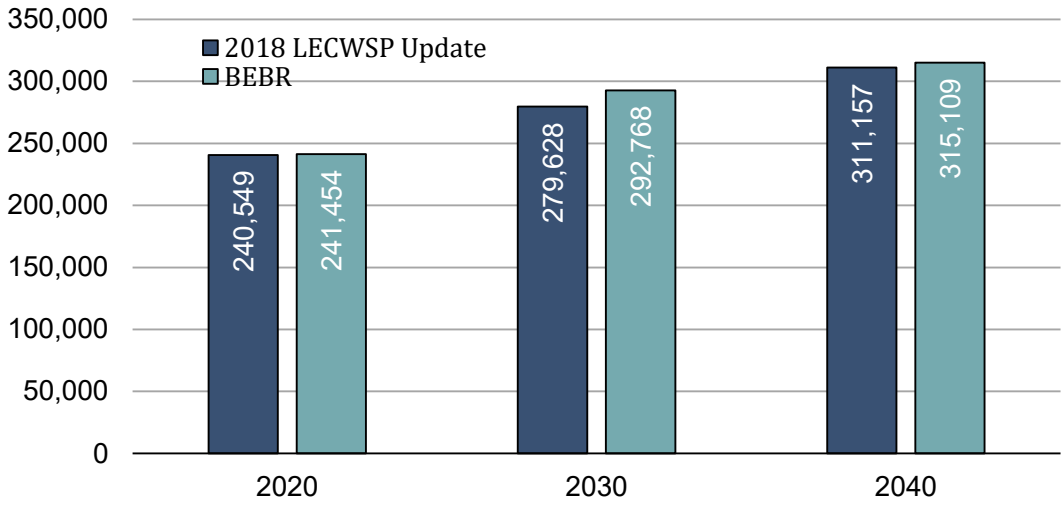


Figure 3-3: Population Forecast Comparison

Source 1: "BEBR" population data are based on University of Florida's Bureau of Economic and Business Research (BEBR) as processed by The Corradino Group and provided to Hazen on May 24, 2019.

Source 2: "2018 LECWSP Update" population data based on South Florida Water Management District 2018 Lower East Coast Water Supply Plan Update – Appendices, pg. E-37.

The BEBR population forecast is 3,952 persons higher in the year 2040 than that presented in the 2018 LECWSP Update. The BEBR population forecast is used to develop the water demand forecast presented in this report.

3.4.3 Areas of Self-Supply

There are no existing areas within the City of Fort Lauderdale's water service area that self-supply potable water. There are no plans for future domestic self-supplied systems.

3.4.4 Maps of Current and Future Served Areas

Figure 3-4 depicts the City of Fort Lauderdale water service area. The City of Fort Lauderdale provides water within the Fort Lauderdale as well as the following jurisdictions:

- Entirety of the City of Lauderdale-by-the Sea
- Entirety of the Village of Sea Ranch Lakes
- Small areas of Unincorporated Broward County (i.e., Roosevelt Gardens, Franklin Park, Washington Park, and Boulevard Gardens communities)
- Small area of the Town of Davie
- Small area of the City of Lauderdale Lakes
- Small area of the City of Lauderhill
- Entirety of the Village of Lazy Lake
- Small area of the City of North Lauderdale
- Entirety of the City of Oakland Park
- Portions of the City of Tamarac
- Entirety of the City of Wilton Manors
- Port Everglades

Certain jurisdictions are fed through master meter accounts of an upstream consecutive user, as follows:

- Lauderdale Lakes is fed through an Oakland Park Master Meter;
- Lazy Lake is a village contained entirely within the borders of the City of Wilton Manors and is fed through a Wilton Manors master meter.

The balance of the City's customers are supplied with water through individual retail customer water meters (multifamily, single family, commercial and irrigation accounts), including the following:

- City of Fort Lauderdale
- City of Lauderdale-by-the Sea
- Village of Sea Ranch Lakes
- Unincorporated Broward County

- City of Lauderhill

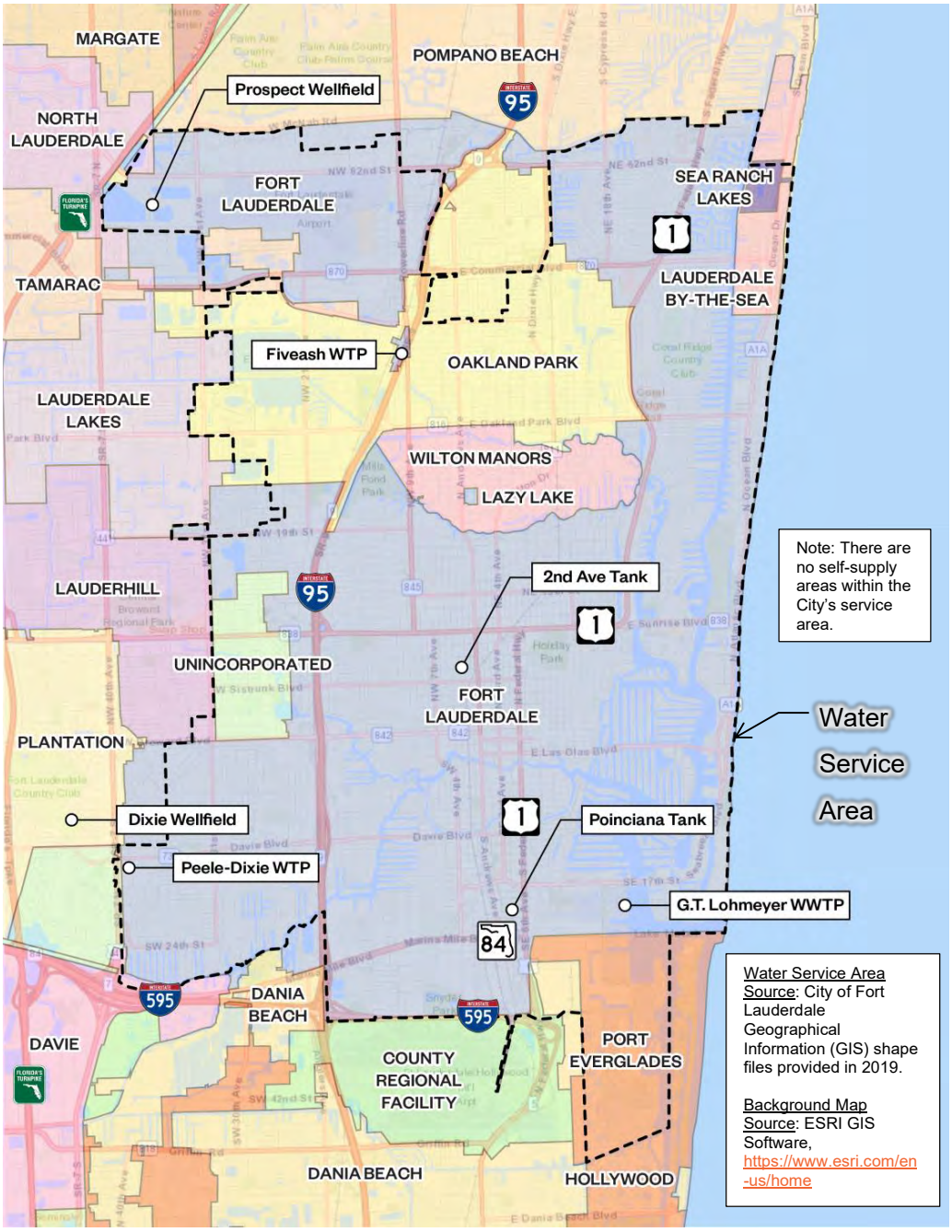


Figure 3-4: Water Service Area

The City has no plans to alter the water service area in the future.

3.4.5 Potable Water Level-of-Service Standard

The City of Fort Lauderdale has set level-of-service standards for its water system as summarized in Table 3-6. This table is based upon the CUSMP (Reiss Engineering, 2017) unless noted otherwise in the table.

Table 3-6: Water System Level-of-Service Standards

Component	Level-of-Service Standard / Goal	Does the City meet this LOS Goal?
Raw Water Supply	Maximum Day Demand with 20 percent of wells out of service for maintenance *Source: City of Fort Lauderdale standard design criteria.*	Yes
Treatment Capacity	Maximum day demand with all units in service *Source:* (Committee of the Great Lakes-Upper Mississippi River Board of State Sanitary Engineers, 2018)*; Article 2.1.*	Yes
Minimum system pressure during peak hour demand with largest pump out of service during non-fire flow conditions	Maintain a minimum of 40 psi in the distribution system *Source:* (Reiss Engineering, 2017)*; Table WA4-1.*	Yes
Minimum system pressure during maximum day demand plus fire flow	Maintain a minimum of 30 psi in the distribution system *Source:* (Reiss Engineering, 2017)*; Table WA4-1.*	Yes
Finished Water Pumped Per Capita – City Goal	It is the City's goal to reduce the finished water pumped level of service to 170 gallons per capita per day through conservation by the year 2028 according the City's Comprehensive Plan Evaluation Measures SWS 3.1.2 and SWS 3.2.1. *Source:* (City of Fort Lauderdale, 2019a).	Yes
Finished Water Storage	Comply with FAC 62-555.320(19): minimum requirement of 25 percent of maximum day demand plus maximum fire flow volume with all tanks in service. Maximum fire flow storage based upon a 5,000 gallons per minute (gpm) fire over a four-hour period. *Source: Florida Administrative Code, Rule 62-555.320(19).*	Yes
Maximum Distribution System Water Loss	10 Percent of Finished Water Pumped *Source:* (South Florida Water Management District, 2015)*; Article 4.1.2.*	No

3.4.6 Historical Annual Average Raw Water and Finished Water Use

Table 3-7 presents historical Annual Average Daily Flow (AADF) pumping data from the City's WTPs (finished water) and wellfields (raw water) along with the estimated service area population from 2014 to 2018. The historical per capita water use during this time frame are also presented.

Table 3-7: Historical Raw and Finished Water Average Annual Daily Flow (AADF) Data, 2014 to 2018

Year	Water Service Area Population	AADF Raw Water Pumped		AADF Finished Water Produced	
		Raw Water Pumping Rate (mgd)	Per Capita (Gallons per person per day)	Finished Water Pumping Rate (mgd)	Per Capita (Gallons per person per day)
2014	233,289	39.25	168	37.45	161
2015	235,840	41.45	176	39.75	169
2016	236,938	40.64	172	38.95	164
2017	238,048	40.24	169	38.44	161
2018	239,166	41.49	173	39.49	165
2014 to 2018 Average:		40.61	172	38.82	164

Source 1: Population data were based on University of Florida's Bureau of Economic and Business Research (BEBR) as processed by The Corradino Group and provided to Hazen on May 24, 2019.

Source 2: Raw water and finished water pumping rate data were provided by the City of Fort Lauderdale in a spreadsheet titled "wtrhist2.xlsx". Data provided to Hazen on May 24, 2019.

The City has established a finished water per capita goal of 170 gallons per person per day by the year 2028 which appears to have been met as of 2018.

3.4.7 Maximum Day Factor

Table 3-8 presents the data used to determine the maximum day factor.

Table 3-8: Maximum Day Factor

Year	Finished Water Pumped (millions of gallons)	Annual Avg Day (mgd)	Maximum Day (mgd)	Maximum Day Factor
2014	13,843	37.9	49.4	1.30
2015	14,507	39.7	50.8	1.28
2016	14,213	38.9	47.2	1.21
2017	14,912	40.9	45.3	1.11
2018	14,414	39.5	50.0	1.27
Maximum Day Factor (averaged from 2014 to 2018)				**1.23**

Source: Data were provided by the City of Fort Lauderdale in a spreadsheet titled "wtrhist2.xlsx". Data provided to Hazen on May 24, 2019.

Based on the above data, a maximum day factor of 1.23 was used to forecast future maximum day flows.

3.4.8 Overall Water Demand Forecast

Table 3-9 presents the overall water demand forecast for the City of Fort Lauderdale's water service area through the year 2040. The table also presents historical data for the year 2015. Forecasts are presented for the Biscayne Aquifer raw water and finished water demands on an AADF basis. Additionally, the maximum day water demand is provided based upon the historical maximum day to annual average day ratio of 1.23 (based upon water pumping data from 2014 to 2018). The data in the table below assumes that the City future finished water per capita water demand will be 164-gallons-per-capita-per-day (gpcd) which is the average per capita water use from 2014 to 2018. It is below the goal established in 2008 of 170-gpcd by the year 2028.

Table 3-9: Overall Water Demand Forecast

Year	Population	Biscayne Aquifer Raw Water			Finished Water		
		Per Capita (gpcd)	AADF Demand (mgd)	Max Day Demand (mgd)	Per Capita (gpcd)	AADF Demand (mgd)	Max Day Demand (mgd)
2015	235,840	176	41.5	51.0	169	39.8	48.9
2020	241,454	172	41.5	51.1	164	39.6	48.7
2025	274,470	172	47.2	58.1	164	45.0	55.4
2030	292,768	172	50.4	61.9	164	48.0	59.1
2035	304,918	172	52.4	64.5	164	50.0	61.5
2040	315,109	172	54.2	66.7	164	51.7	63.6

Source: Population data were based on University of Florida's Bureau of Economic and Business Research (BEBR) as processed by The Corradino Group and provided to Hazen on May 24, 2019.

Source: Per Capita values for year 2015 come from Table 3-7.

Source: Per Capita values for 2020 through 2040 assumes that the City future finished water per capita water demand will be 164-gallons-per-capita-per-day (gpcd) which is the average per capita water use from 2014 to 2018 as indicated in Table 3-7.

Source: Per Capita values for 2020 through 2040 assumes that the City future raw water per capita water demand will be 172-gallons-per-capita-per-day (gpcd) which is the average per capita water use from 2014 to 2018 as indicated in Table 3-7.

Note: The above analysis assumes no change in treatment technology. As of the writing of this plan, the City has made no plans to change treatment technologies.

3.4.9 Biscayne Aquifer Water Supply Deficit is Predicted by the Year 2035

The Biscayne Aquifer allocation is limited to 52.55 mgd on an annual average day basis. Figure 3-5 and Figure 3-6 illustrate the forecasted Biscayne Aquifer raw water demand and finished water demand, respectively, on an AADF basis. Based on these projections, a Biscayne Aquifer water supply deficit is predicted beginning in the year 2035. By the year 2040, an estimated 1.6 mgd water supply deficit is

expected that will need to be addressed through alternative water sources. The City plans and expects that this deficit will be addressed through reverse osmosis of water pumped from the Floridan Aquifer.

Figure 3-6 is based upon the City operating the Peele-Dixie WTP to produce approximately 6-mgd of finished water indefinitely. Furthermore, this figure assumes that lime softening is continued at the Fiveash WTP indefinitely. If the City increases finished water produced at the Peele-Dixie WTP or decides to change the treatment technology at the Fiveash WTP to a lower efficiency technology, then the demand curve would increase – resulting in a water supply deficit earlier than currently forecasted.

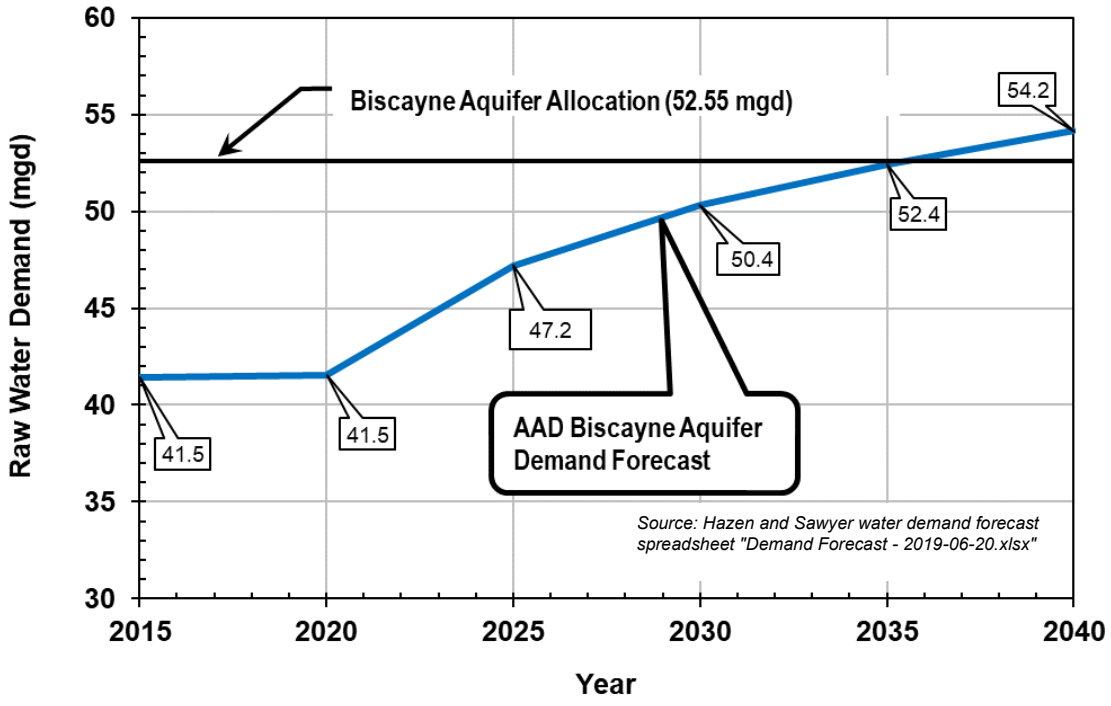


Figure 3-5: Biscayne Aquifer Raw Water Demand Forecast Annual Average Day (mgd)

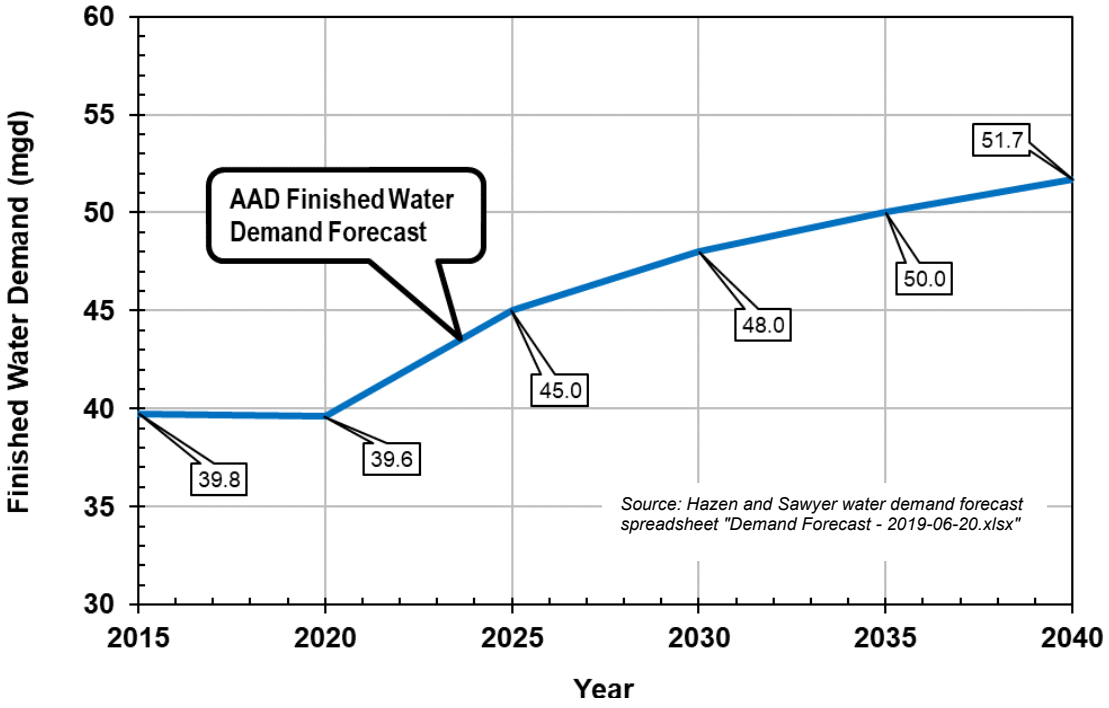


Figure 3-6: Finished Water Demand Forecast Annual Average Day (mgd)

3.4.10 Maximum Day Finished Water Demand Forecast

The Fiveash WTP treats the Biscayne Aquifer via lime softening. The Peele-Dixie WTP treats the Biscayne Aquifer via nanofiltration softening. The designed treatment capacity of these existing facilities are as follows:

- Peele-Dixie WTP Finished Water Designed Capacity: 12-mgd
- Fiveash WTP Finished Water Designed Capacity: 70-mgd

The above capacities are based on the permits for each WTP. The overall treatment capacity (Fiveash plus Peele-Dixie) is 82-mgd. A prior study indicates that the Fiveash WTP capacity may be limited to 60-mgd due to a hydraulic "bottleneck" (Montgomery Watson, 1996). If this limitation exists, the overall treatment capacity (Fiveash plus Peele-Dixie) would be 72-mgd.

Figure 3-7 illustrates the finished water demand forecast on a maximum day basis based on the data in Table 3-9. The maximum day demand for 2020 through 2040 is based on a 164-gpcd times the max day factor of 1.23, which equals 201.72-gpcd. The existing lime softening and nanofiltration treatment technology at the Fiveash WTP and the Peele-Dixie WTP has adequate capacity to meet the maximum day demand with all treatment units in service.

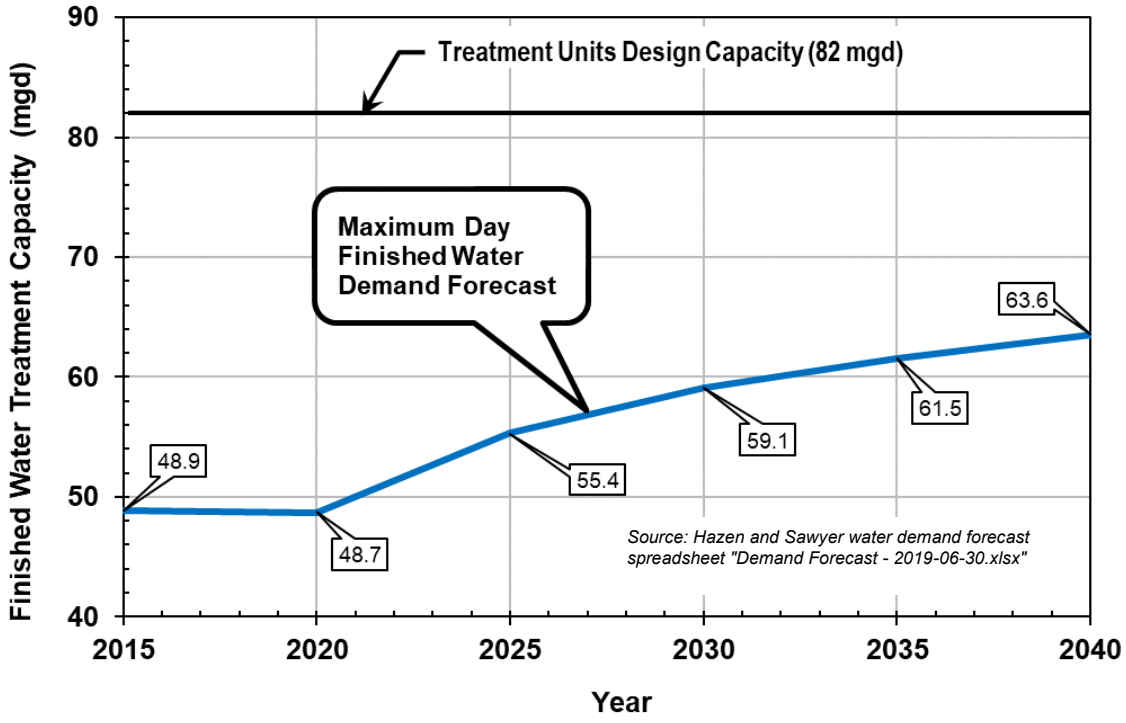


Figure 3-7: Maximum Day Finished Water Demand Forecast (mgd)

3.4.11 Raw Water Demand by Jurisdiction AADF

Table 3-10 presents the Biscayne Aquifer raw water demands on an AADF basis broken down by municipal jurisdictions within the City of Fort Lauderdale's water service area.

Table 3-10: Biscayne Aquifer Raw Water Demand AADF (mgd) by Jurisdiction

Jurisdiction	2015	2020	2025	2030	2035	2040
Fort Lauderdale	29.4	29.4	34.2	36.4	38.0	39.2
Lauderdale-by-the Sea	0.70	0.60	0.65	0.64	0.64	0.63
Sea Ranch Lakes	0.12	0.11	0.11	0.12	0.12	0.12
Unincorporated Broward plus Port Everglades	2.94	3.21	3.57	3.90	4.03	4.32
Davie	0.09	0.09	0.11	0.13	0.15	0.17
Lauderdale Lakes	0.06	0.06	0.06	0.06	0.06	0.06
Lauderhill	0.49	0.47	0.50	0.54	0.56	0.58

Table 3-10: Biscayne Aquifer Raw Water Demand AADF (mgd) by Jurisdiction

Jurisdiction	2015	2020	2025	2030	2035	2040
Lazy Lake	0.004	0.004	0.004	0.005	0.005	0.005
North Lauderdale	0.06	0.06	0.19	0.19	0.19	0.18
Oakland Park	5.22	5.22	5.35	5.67	5.91	6.06
Tamarac	0.34	0.33	0.33	0.33	0.34	0.33
Wilton Manors	2.00	1.94	2.15	2.33	2.44	2.54
Total	**41.5**	**41.5**	**47.2**	**50.4**	**52.4**	**54.2**

Source: The values in this table are calculated valves based on the population and per capita rate. These calculations were prepared in the Hazen and Sawyer spreadsheet titled "Demand Forecast - 2019-06-30.xlsx".

3.4.12 Finished Water Demand by Jurisdiction

Table 3-11 presents the finished water demands on an AADF basis broken down by municipal jurisdictions within the City of Fort Lauderdale's water service area.

Table 3-11: Finished Water Demand AADF (mgd) by Jurisdiction

Jurisdiction	2015	2020	2025	2030	2035	2040
Fort Lauderdale	28.2	28.1	32.6	34.7	36.2	37.4
Lauderdale-by-the Sea	0.67	0.58	0.62	0.61	0.61	0.60
Sea Ranch Lakes	0.11	0.11	0.11	0.11	0.11	0.12
Unincorporated Broward plus Port Everglades	2.82	3.06	3.41	3.71	3.84	4.12
Davie	0.09	0.08	0.11	0.13	0.14	0.16
Lauderdale Lakes	0.06	0.06	0.06	0.06	0.06	0.06
Lauderhill	0.47	0.45	0.48	0.52	0.54	0.56
Lazy Lake	0.004	0.004	0.004	0.005	0.005	0.005
North Lauderdale	0.06	0.05	0.18	0.18	0.18	0.17
Oakland Park	5.01	4.98	5.11	5.41	5.63	5.78
Tamarac	0.33	0.32	0.31	0.32	0.32	0.32
Wilton Manors	1.92	1.85	2.05	2.22	2.33	2.42
Total	**39.8**	**39.6**	**45.0**	**48.0**	**50.0**	**51.7**

Source: The values in this table are calculated valves based on the population and per capita rate. These calculations were prepared in the Hazen and Sawyer spreadsheet titled "Demand Forecast - 2019-06-30.xlsx".

3.5 Alternative Water Supply Plan

The data in Figure 3-5 indicate that demand is projected to exceed the Biscayne Aquifer supply in the year 2035. The City plans that this supply deficit will be addressed via RO treatment of the FAS. The City reserves the right to alter this plan based on the findings of ongoing City studies and future CUSMP updates. Additionally, this plan may be altered as additional data becomes available regarding the risks presented by unexpected changes to water quality in the FAS.

In 2008, the City completed conceptual plans for implementing 6-mgd of finished water capacity RO at the Peele-Dixie WTP. Five FAS wells were also conceptually planned. The planning documents (illustrated in Figure 3-8) are titled "Floridan Aquifer Conceptual Plan for the Dixie Wellfield" and "Peele-Dixie Reverse Osmosis Basis of Design Report".

Figure 3-8: Alternative Water Supply Planning Documents

These plans provide the City with a roadmap to quickly implement this alternative water supply in advance of demand exceeding its traditional Biscayne Aquifer supply. It is estimated that it would require approximately five years to implement FAS wells and RO treatment at the Peele-Dixie WTP. The cost for implementing this project is presented in Section 4.

3.6 Seawater Desalination

The use of desalinated seawater from the Atlantic Ocean is an Alternative Water Supply source option for the Lower East Coast Planning Area. The SFWMD does not require water use permits for seawater. Three power plants in the Lower East Coast Planning Area use seawater from tidally influenced water bodies for cooling purposes: Florida Power and Light (FPL) Riviera Beach Next Generation Clean Energy Center, FPL Port Everglades Next Generation Clean Energy Center, and FPL Dania Beach Energy Center. 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 in the Lower East Coast Planning Area. There are two RO seawater desalination facilities in the Lower East Coast Planning Area. Both plants are in Monroe County (Stock Island and Marathon) and operated by the Florida Keys Aqueduct Authority (South Florida Water Management District, 2018a).

The City is currently preparing a study titled "Granular Activated Carbon Pilot and Plant Evaluation at the Fiveash Water Plant". The study will evaluate treatment technology changes at the Fiveash WTP to achieve the City's color water quality goal. Seawater desalination will be one of many treatment technologies evaluated in the study to recommend a long-term plan for achieving the City's water supply and treatment goals.

3.7 Conservation

The City of Fort Lauderdale has been promoting water conservation for more than 25 years. Conservation is a proven strategy for delaying implementation of expensive alternative water supply technologies. In 2008, the City established a goal of reducing finished water demand to 170-gpcd by the year 2028. This goal has been met. The annual average day finished water produced averaged 164-gpcd from 2014 to 2018. The following subsections summarize the City of Fort Lauderdale's ongoing conservation initiatives.

3.7.1 Broward Water Partnerships

The City of Fort Lauderdale is a member of the Broward Water Partnership, which is a government service consisting of 19 municipalities and water utilities that collaborate on water conservation implementation.

3.7.2 ConservationPay$ Program

The City of Fort Lauderdale participates in a water conservation incentive program through an interlocal agreement (ILA) with Broward County marketed under the program name "Conservation Pay$". The City of Fort Lauderdale became partners with Broward County in the program on June 21, 2011.

The program provides rebates and free water-conserving devices to qualifying water customers, and it has a focused outreach and education component. Rebate dollars are used for the replacement of older, wasteful toilets in addition to the distribution of other water efficient fixtures and devices such as aerators and commercial pre-rinse spray valves. A consistent marketing and media campaign advances water conservation efforts. The program goal is to reach a sustained minimum 10 percent reduction in water use county-wide over 20 years.

3.7.3 NatureScape Irrigation Services

Broward County's NatureScape Irrigation Service (NIS) is a water conservation program offered in partnership with 18 local water utilities. The goal of the NIS is to reduce urban water consumption and improve the quality of surface waters through efficient irrigation and environmentally-friendly landscape practices. The NIS program targets large properties, such as government facilities, parks, schools, and multi-family residential complexes, where water conservation efforts can produce the greatest water savings.

Table 3-12 presents the historical water savings from completed contract years under the NatureScape program.

Table 3-12: Historical NatureScape Program Water Savings

Contract Year	Water Saved (gallons)
FY 2010 - 2011	11,599,796
FY 2011 - 2012	24,378,385

Table 3-12: Historical NatureScape Program Water Savings

Contract Year	Water Saved (gallons)
FY 2012 - 2013	7,431,746
FY 2013 - 2014	27,152,112
FY 2014 - 2015	7,662,119
FY 2015 - 2016	8,266,284
FY 2016 - 2017	5,761,938
FY 2017 - 2018	7,019,896
Total	**99,272,276**

Source: Data supplied by the City of Fort Lauderdale.

3.7.4 Water Matters Day

The City of Fort Lauderdale is a sponsor of Broward County's Water Matters Day program. Water Matters Day is a one-day water conservation event where participants learn about our local and regional water resources, how water is managed and how utilities are planning for future water needs. Participants receive tips and information on water conservation, receive rebates and incentives for upgrading to water-conserving devices, and learn how to create "Florida friendly" and drought tolerant landscapes. The goal of the program is to promote long-term water demand reductions.

3.7.5 Conservation Rate Structure

A conservation rate ordinance was originally enacted by the City in 1996 and has been in continuous use. A conservation rate structure provides progressively higher rates as water usage increases. The Fiscal Year 2020 water and sewer rate structure is provided in Table 3-13. These rates became effective on October 1, 2019.

Table 3-13: Fiscal Year 2020 Water and Sewer Rate Structure

Customer Type	Tier	Consumption Per Month in Gallons	Water Rate	Sewer Rate
Single-Family Rates in 1,000 gallons per month	Tier 1	0 – 3,000	$2.45	$4.16
	Tier 2	4,000 – 8,000	$5.41	$9.19
	Tier 3	9,000 – 12,000	$6.77	
	Tier 4	13,000 – 20,000	$9.13	
	Tier 5	> 20,000	$13.25	

Table 3-13: Fiscal Year 2020 Water and Sewer Rate Structure

Customer Type	Tier	Consumption Per Month in Gallons	Water Rate	Sewer Rate
Multifamily Residential (1,000 gallons per month X number of dwelling units X 0.55)	Tier 1	0 – 3,000	$2.45	$4.16
	Tier 2	4,000 – 8,000	$5.41	$9.19
	Tier 3	9,000 – 12,000	$6.77	
	Tier 4	13,000 – 20,000	$9.13	
	Tier 5	> 20,000	$13.25	

Source: City of Fort Lauderdale utility billing website: https://www.fortlauderdale.gov/departments/finance/utility-billing/new-utility-rates

3.7.6 Water Shortage Restrictions

Section 28-1A of the Code of Ordinances (in effect since 2009) requires that in the event the South Florida Water Management District declares a drought and mandates water restrictions in one of the four established drought phases (Phase I, II, II or IV), the City of Fort Lauderdale implements a surcharge on water usage. The amount of the surcharge is based on the level of water restrictions (Phase I, II, II or IV) and the number of gallons used. The surcharge is applied to water, wastewater and sprinkler meter accounts.

3.7.7 Florida-Friendly Landscaping

Per Section 28-1A of the Code of Ordinances (in effect since 2009), it is the City's policy to encourage use of Florida-friendly drought resistant plants and trees within the City. Following Florida-Friendly Landscaping™ principles, conservation of 40 to 60 percent of the water that traditional landscapes require may be feasible. The City's Code of Ordinances requires Florida-Friendly Landscaping for new development and re-development.

3.7.8 Green Infrastructure Development Guidelines

The City has embraced the concept of green and blue infrastructure. It has established Policy CC 1.2.2 in its draft Comprehensive Plan to investigate and implement innovative stormwater capture techniques within the public right-of-way, including permeable surfaces, etc (City of Fort Lauderdale, 2019a).

In addition, the City adopted an update to the City's Downtown Master Plan on February 4, 2014 to include transit-oriented development (TOD) guidelines. The adopted TOD guidelines aim to create pedestrian-friendly, vibrant station areas to support the continued growth of the Downtown as a live, work, and play environment.

The TOD guidelines also included green building, green site design and green infrastructure guidelines that apply to new residential development in the Downtown Regional Activity Center (RAC). The TOD guidelines recommend that new residential projects should comply with the County's Comprehensive Plan – Climate Change Element, and recommend that projects incorporate green infrastructure and green landscaping into site design, such as the use of porous pavement, bioswales, raingardens, green roofs, drip irrigation, drought tolerant and native landscaping, and Florida-Friendly Landscaping.

3.7.9 Green Infrastructure Design Details and Specification

The City has developed engineering specifications and engineering details for certain green infrastructure, including: bioswales, sidewalk subsurface storage, precast porous pavement, porous pavers, porous asphalt, and rain gardens. The drawings and specifications facilitate implementation of the City's commitment to stormwater capture and aquifer recharge. Additionally, the City is developing a "Green Design Manual".

3.7.10 Irrigation System Design Code

Per Section 28-1A of the Code of Ordinances (in effect since 2009), all new irrigation systems permitted after 2009 require rain sensors to automatically shutdown if rain is detected.

3.7.11 Landscape Irrigation Restrictions

On June 16, 2009, the City adopted City Ordinance 09-13, which created Section 28-1 in the City of Fort Lauderdale Code of Ordinances to restrict landscape irrigation to three days per week. The City of Fort Lauderdale recognizes the SFWMD promulgated Rule 40E-24 of the Florida Administrative Code (Mandatory Year-Round Landscape Irrigation Conservation Measures), which limits landscape irrigation water use to two days per week. Furthermore, the City recognizes in 2010 that Broward County adopted an ordinance that limits landscape irrigation water use to two days per week.

The City promotes compliance with Broward County's two days per week irrigation limits as evidenced by its "Green-Your-Routine" website "water-efficiently" content at the following link: https://gyr.fortlauderdale.gov/greener-government/natural-resources-preservation/florida-friendly-landscaping/the-nine-principles-of-florida-friendly-landscaping/2-water-efficiently. The City supports progressive irrigation and conservation policies. The City is working with the SFMWD staff to review the City's current irrigation ordinance to determine any necessary revisions to comply with the SFWMD's Year-Round Irrigation Rule.

3.7.12 Water for Heating or Process Water

Per Section 28-1A of the Code of Ordinances (in effect since 2009), a water conservation device conforming to such specifications as may be required by the City, shall be installed on heating, processing or other industrial or commercial uses of water whenever the City determines in its discretion that recycling of the water without treatment is practical. A water conservation device is any equipment, process or procedure whereby all water used for heating or processing is either consumed in the intended use, or is recycled for the same purpose until it is unusable.

3.7.13 Water Used for Cooling Including Condensate

Per 28-1B of the City's Code of Ordinances (in effect since 2009), all new construction and replacements of cooling equipment whose function is evaporative or refrigerated cooling uses and air conditioning facilities that deliver water or condensate to a drain or other discharge facility are prohibited. This includes any equipment, process or procedure which relies upon the temperature of the water supply for cooling purposes.

3.7.14 Commercial Power Washing

Per 28-1B of the City's Code of Ordinances (in effect since 2009), commercial enterprises for which cleaning with water is an essential element of their business shall use only high efficiency equipment that uses 1.6 gallons per minute or less and is certified by the manufacturer.

3.7.15 Water for Decorative Features

Per 28-1B of the City's Code of Ordinances (in effect since 2009), decorative water features or similar water operating devices using potable or recycled water shall recirculate water within the device. Each device connected to the water system must have an approved back-flow prevention assembly.

3.7.16 Lakes and Ponds

Per 28-1B of the City's Code of Ordinances (in effect since 2009), potable water shall not be used to fill or maintain water levels in lakes and ponds.

3.7.17 Leak Detection

The City initiated a leak detection program in 1990 which was completed in 1992. The entire main distribution system was surveyed and the City continues to perform visual checks by field personnel.

3.7.18 Meter Replacement Program

The City implemented an improved compound meter testing program and changes out all water meters 10 years old or older.

3.7.19 Broward County Adopts Low-Flow Plumbing Fixtures

During each update of the Florida Building Code (FBC), the Broward County Board of Rules and Appeals adopts a revised version of FBC-Plumbing Table 604.4 that requires new construction within Broward County (which includes the City of Fort Lauderdale) to use "low-flow" plumbing fixtures. Table 3-14 documents the most recently adopted 2017 FBC (Florida Department of Business and Professional Regulation, 2019) flow requirements and the "low-flow" Broward County requirements (Broward County, 2019) of key fixtures. The "low-flow" plumbing fixtures promote water conservation within all of Broward County.

Table 3-14: Maximum Flow Rates and Consumption for Key Fixtures in New Construction

Fixture	2017 FBC	Broward County
Lavatory, Private	2.2-gpm	1.5-gpm
Shower Head	2.5-gpm	2.0-gpm
Urinal	1.0 gallon per flush	0.5 gallon per flush
Toilet	1.6 gallon per flush	1.28 gallon per flush

Source 1: The data in the column labeled "2017 FBC" is based on the Florida Building Code – Plumbing (2017 Edition), Table 604.4.

Source 2: The data in the column labeled "Broward County" is based on the Florida Building Code – Plumbing, Table 604.4 as amended by the Broward County Board of Rules and Appeals and accessible at the following link: https://www.broward.org/CodeAppeals/AboutUs/Documents/FBC%206th%20Edition%20(2017)%20Amendments%20-%20Plumbing.pdf

3.7.20 Water Conservation Education Program

The City publishes a variety of brochures and literature, promoting water conservation that are available to members of the public upon request. The City also maintains an active public information campaign on water conservation and restrictions on irrigation using Environmental Inspectors, Code Enforcement Officers, and Police Officers. In addition, the City maintains a website (http://www.fortlauderdale.gov) that includes water conservation information.

3.7.21 Sustainability Action Plan 2011 Update

The City's Sustainability Action Plan 2011 Update identified the following actions to reach the 170 gallons per capita per day (gpcd) goal (the action numbers identified in the Sustainability Action Plan 2011 Update are shown for consistency):

- Action 1.1.1 - Expedited, Continuing Escalation of High-User Potable Water Fees in Single-Family Zoning.
- Action 1.1.2 - Implement and enforce landscape ordinance requiring low volume / avoidance watering.

- Action 1.1.3 - Directly engage all large water users in long-range water resource planning and conservation.
- Action 1.1.4 - Consider innovative projects including water reuse and harvesting rainwater.

Table 3-14 provides a summary of the current status of implementing the actions described in the Sustainability Action Plan 2011 Update.

Table 3-14: Water Conservation Action Status

Action	Status
Action 1.1.1 - Expedited, Continuing Escalation of High-User Potable Water Fees in Single-Family Zoning.	The City of Fort Lauderdale continues to establish a conservation rate structure (progressively higher rates as water usage increases) to encourage a water conservation ethic.
Action 1.1.2 - Implement and enforce landscape ordinance requiring low volume / avoidance watering.	Per Section 28-1A of the Code of Ordinances (in effect since 2009), it is the City's policy to encourage use of Florida-friendly drought resistant plants and trees within the City.
Action 1.1.3 - Directly engage all large water users in long-range water resource planning and conservation.	The City of Fort Lauderdale continues to conduct ongoing discussions with its wholesale customers relative to opportunities to reduce water consumption.
Action 1.1.4 - Consider innovative projects including water reuse and harvesting rainwater.	The City of Fort Lauderdale was part of a partnership with Broward County that explored the feasibility of regional wastewater reuse opportunities. Additionally, the City is collaborating with other utilities in exploring the feasibility of harvesting rainwater via the proposed C-51 Reservoir project. The City evaluates water reuse and rainwater harvesting projects as the opportunities are identified.

Source: City of Fort Lauderdale document titled "Sustainability Action Plan 2011 Update" accessible at the following link: https://gyr.fortlauderdale.gov/home/showdocument?id=5733

3.7.22 2035 Fast Forward Vision Plan

The City has developed a planning document titled Fast Forward Fort Lauderdale that envisions the City through the year 2035. The document is also known as the Fast Forward Fort Lauderdale Vision for 2035. The Fast Forward Plan is a compilation of ideas/goals that are used to guide the City's decision making. A key aspect of the 2035 Vision Plan is ensuring that the City enhance water conservation efforts to ensure a sustainable water supply (City of Fort Lauderdale, 2019b).

3.7.23 Press Play Fort Lauderdale Strategic Plan: Our City, Our Strategic Plan 2024

This document complements the Fast Forward Fort Lauderdale Vision for 2035. Fast Forward

establishes the overarching goals of the City, while Press Play establishes specific initiatives to be completed over the next 5 years to make progress at reaching the goals. Key objectives related to water supply included in the 2024 Strategic Plan are as follows (City of Fort Lauderdale, 2019c):

- Proactively maintain our water, wastewater, stormwater, road, and bridge infrastructure
- Secure our community's water supply and support water conservation measures

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3.7.24 Identify any Local Financial Responsibilities

The City of Fort Lauderdale participates in a water conservation incentive program through an interlocal agreement (ILA) with Broward County marketed under the program name "Conservation Pay$". The City of Fort Lauderdale became partners with Broward County in the program on June 21, 2011. Under this program, City residents can receive a $100 rebate when they replace an older toilet with a Water Sense® High Efficiency Model.

3.8 Reuse

3.8.1 Introduction

Florida law supports reuse efforts. Florida's utilities, local governments, and water management districts have led the nation in the quantity of reclaimed water reused and public acceptance of reuse programs. Section 373.250(1) F.S. provides "the encouragement and promotion of water conservation and reuse of reclaimed water, as defined by the department, are state objectives and considered to be in the public interest." In addition, Section 403.064(1), F.S., states "reuse is a critical component of meeting the state's existing and future water supply needs while sustaining natural systems."

3.8.2 Local Government Specific Actions, Programs, Regulations, or Opportunities

This section describes the City of Fort Lauderdale's ongoing assessment of reuse opportunities within the City's service area. The City of Fort Lauderdale's GTL WWTP is a regional facility used to treat wastewater in a region encompassing the following:

- City of Fort Lauderdale
- City of Wilton Manors
- City of Oakland Park
- Port Everglades

- A portion of the City of Tamarac
- A portion of unincorporated Broward County
- A portion of the Town of Davie

The facility does not currently treat effluent to reclaimed water standards for public irrigation or other off-site uses. However, on average the plant uses about 4-mgd of its own secondary effluent as in-plant re-use instead of potable water. Additionally, the City is participating in the County-wide Integrated Water Resources Plan Grants for feasibility studies related to potential beneficial reuse. These have included a 2008 feasibility study for selected reclaimed water projects within the City for a 50% cost share for $125,000. A second feasibility study in 2009 was for the reclaimed water in the area of the Convention Center Broward County provided a 50% cost share for $5,000.

The City of Fort Lauderdale prepared a report assessing reclaimed water opportunities in November 2008 titled "Feasibility Study for the Implementation of Selected Reclaimed Water Projects with the City of Fort Lauderdale". Key conclusions of the report were (CDM, 2008):

- The GTL WWTP is located far from any significant users of reclaimed water, such as golf courses. Therefore, the construction of an irrigation-quality reclaimed water production facility at or near the plant to provide further treatment of effluent to public reuse standards is not feasible. There is little available space on the plant site or plant vicinity to construct the required treatment facilities. In addition, due to high levels of infiltration into gravity sewer piping located near coastal areas and waterways, the chloride concentration in the treated effluent over 1,100-mg/L, resulting in unaffordable levels of treatment to reuse standards at the GTL WWTP site. Therefore, the only practical alternatives for implementing reuse systems are off-site and near potential beneficial uses of reclaimed water;
- Two options studied (reclaimed water facilities at the E-Repump Station and the Former Composting Facility[1]) are technically feasible but are not be economically viable.

The City of Fort Lauderdale continues to assess water reuse opportunities to identify and assess cost-effective alternative water supply opportunities. Indirect potable reuse systems have been evaluated by the City; none have emerged as economically feasible. However, due to the dual benefits of providing more disposal capacity and augmenting local water supplies, the City continues to contemplate indirect potable reuse opportunities when assessing alternative water supply investment decisions.

3.8.3 Identify any Local Financial Responsibilities

The City of Fort Lauderdale does not have any financial responsibilities relative to reuse. Hence, this section is not applicable to the City of Fort Lauderdale.

[1] In 2018, ten years after completion of above referenced report, the City of Fort Lauderdale sold the Former Composting Facility land.

3.9 Sector Plans

This section is not applicable to the City of Fort Lauderdale.

4. Capital Improvements

4.1 Introduction

This section provides a brief description of the City of Fort Lauderdale Capital Improvements Program (Fort Lauderdale uses the term "Community Investment Plan") for Water Supply.

4.2 Water Supply, Treatment and Distribution Capital Improvements Schedule for FY2020 through FY2024

Table 4-1 presents City of Fort Lauderdale's Community Investment Plan (CIP) for fiscal year 2020 – 2024 schedule for traditional water supply, treatment, storage, and distribution system infrastructure projects. The CIP costs include engineering services along with construction costs. The projects are intended to be implemented over the next five years to maintain the City's existing level of service standards. The CIP projects do not expand or diversify water supply capacity over the next five years.

4.3 Unfunded Amounts in Table 4-1

Projects costs presented in Table 4-1 that are within the fiscal year 2020 to 2024 columns are funded. Project costs in the column labeled "Unfunded Amount (Beyond FY 2024)" are not funded. All unfunded amounts are considered by the City as a high priority for receiving funding given that that water projects are fundamental to maintaining the health and welfare of the community.

4.4 Dixie Floridan Water Supply / Treatment Project

4.4.1 Introduction

In 2008, the City completed conceptual plans for implementing 6-mgd of finished water capacity reverse osmosis at the Peele-Dixie WTP along with five FAS wells. The planning documents are titled "Floridan Aquifer Conceptual Plan for the Dixie Wellfield" and "Peele-Dixie Reverse Osmosis Basis of Design Report". This alternative water supply project was designated the "Dixie Floridan Water Supply / Treatment Project" in Exhibit 9A of the Water Use Permit Staff Report (South Florida Water Management District, 2008).

4.4.2 Schedule

These plans provide the City with a roadmap to quickly implement this alternative water supply in advance of demand exceeding its traditional Biscayne Aquifer supply. It is estimated that it would require approximately five years to implement FAS wells and RO treatment at the Peele-Dixie WTP. It is estimated that pilot testing and design for this project would need to begin in 2029.

4.4.3 Cost

The costs for implementing 6-mgd of finished water capacity RO at the Peele-Dixie WTP along with five FAS wells are presented in the reports titled "Floridan Aquifer Conceptual Plan for the Dixie Wellfield" and "Peele-Dixie Reverse Osmosis Basis of Design Report". The cost total from these reports is $36.7 in 2008 dollars. Escalating the cost to 2019 dollars amounts to $49.1 million using Engineering News-Record Construction Cost Indexes of 8,310 for 2008 and 11,118 for 2019. This cost includes construction cost plus contingency along with engineering services (Engineering News-Record, 2019). This is a Class 5 estimate as defined by Association for the Advancement of Cost Engineering (AACE) International. The expected accuracy of this estimate is +50% to -30%.

4.4.4 Coordination With the 2018 LECWSP Update

The City has coordinated with the SFWMD to include this project in the 2018 Lower East Coast Water Supply Plan Update.

4.4.5 Funding

The cost for the Dixie Floridan Water Supply / Treatment Project is not currently included in the City's CIP. The City will incorporate this project into future CIPs in its budgeting process. Furthermore, the City will escalate the cost of the project to future years using standard cost indexing practices. The City will determine the funding source for this project during future CIP budgeting.

4.5 Projects Needed Beyond the Five-Year CIP

The City's Comprehensive Utility Strategic Master Plan (CUSMP), completed by Reiss Engineering, Inc., in 2017 is a planning document that evaluated the City's water and wastewater systems and recommends improvements to maintain or improve levels of service over a twenty-year period ending in 2036. The CUSMP recommended approximately $1.2 billion in projects. The City continues to evaluate the recommendations of the CUSMP and prioritize the recommended projects for inclusion in its CIP.

The City has begun a project titled "Granular Activated Carbon Pilot and Plant Evaluation at the Fiveash Water Plant". This project includes evaluation of treatment technologies to achieve the City's color goal at the Fiveash WTP. The project is ongoing and is expected to be completed in late 2019. This study will recommend to either replace all or part of the Fiveash WTP and includes evaluation of alternative water supply technologies. The City will use this report to inform future CIP scheduling decisions.

Table 4-1: Five Year (FY2020 to FY2024) Water Supply, Treatment and Distribution Community Investment Plan

Project #	Project Title	Unspent Balance as of September 17, 2019	Available Balance as of September 17, 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Funded Total (Through FY2024)	Unfunded Amount (Beyond FY 2024)	Priority for Funding
P11901	VICTORIA PK STH SM WATERMAINS IMPROVEMNT	2,895,712	566,234	(300,000)	-	-	-	-	2,595,712	-	
P11887	NW SECOND AVE TANK RESTORATION	848,159	690,097	(700,000)	-	-	-	-	148,159	-	
P12485	FIVEASH WTP FILTERS REHABILIATION	1,999,817	1,999,817	-	-	-	-	-	1,999,817	-	
P12462	CORAL RIDGE SMALL WATERMAIN IMPROVEMENTS	1,897,500	1,886,315	(1,800,000)	4,100,000	-	-	-	4,197,500	-	
P12294	FIVEASH WTP ELECTRICAL VOLTAGE UPGRADE	1,497,954	552,591	-	-	-	-	-	1,497,954	-	
P12190	UTILITIES ASSET MANAGEMENT SYSTEM	841,938	441,393	573,400	573,400	573,400	573,400	573,400	3,708,938	2,238,677	High
P12463	CORAL SHORES SML WATERMAIN IMPROVEMENTS	819,084	809,199	(163,702)	-	-	-	-	655,382	-	
P12484	REFURB FIVEASH WTP MG STEEL TANK (NORTH)	747,883	747,883	-	-	-	-	-	747,883	-	
P11247	DISTRIBUTION & COLLECTION REPAIR/REPLACE	718,892	718,892	-	-	-	-	-	718,892	-	
P12180	CROISSANT PARK SMALL WATER MAINS	632,506	632,506	(500,000)	-	-	-	-	132,506	-	
P12429	RENO 6300 NW 21 AVE METER SHOP RELOCATIO	599,416	599,416	-	-	-	-	-	599,416	-	
P12295	PLE DIXIE AIR STRIPPERS & HYPOCHOLORITE	500,705	374,210	-	-	-	-	-	500,705	-	
P12476	FIVEASH WELLFIELD PUMP REPLACEMENT	500,000	13,610	-	-	-	-	-	500,000	2,400,000	High
P12431	PEELE DIXIE MEMBRANE REPLACEMENT	236,224	236,224	-	-	-	-	-	236,224	-	
P12181	WTP FACILITIES CONCRETE RESTORATION	219,153	198,885	-	-	-	-	-	219,153	-	
P12182	LAKE ESTATES SMALL WATER MAINS	196,359	193,357	-	-	-	-	-	196,359	-	
P12275	PEELE DIXIE WTP RENEWAL & REPLACEMENT	200,000	200,000	(200,000)	-	-	-	-	-	-	
P11246	WATER TREATMENT PLANT REPAIR/REPLACEMENT	198,050	198,050	-	-	-	-	-	198,050	-	
P12372	FIVEASH SKYLIGHTS AND RE-ROOFING	157,006	157,006	-	-	-	-	-	157,006	-	
P12179	TANBARK LANE SML WATER MAIN REPLACEMENT	127,337	65,572	-	-	-	-	-	127,337	-	
P11905	ANNUAL UTILITIES RESTORATION 2014	104,598	97,366	-	-	-	-	-	104,598	-	

Table 4-1: Five Year (FY2020 to FY2024) Water Supply, Treatment and Distribution Community Investment Plan

Project #	Project Title	Unspent Balance as of September 17, 2019	Available Balance as of September 17, 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Funded Total (Through FY2024)	Unfunded Amount (Beyond FY 2024)	Priority for Funding
P10850	VICTORIA PARK A NORTH-SMALL WATERMAINS	57,773	57,773	-	-	-	-	-	57,773	-	
P11685	WATER MONITORING SYSTEM (SCADA)	48,088	48,088	-	-	-	-	-	48,088	-	
P11589	FIVEASH WTP DISINFECTION IMPROVEMENTS	36,322	36,322	-	-	-	-	-	36,322	-	
P11080	PORT CONDO SMALL WATER MAIN IMPROVEMENTS	17,330	-	-	-	-	-	-	17,330	-	
P11932	AERATION BASIN REHAB AT FIVEASH WTP	11,653	11,653	-	-	-	-	-	11,653	-	
FY 20200842	FIVE-ASH WELLFIELD WEST GENERATOR REPLACEMENT	-	-	650,000	-	-	-	-	650,000		
FY 20200834	PEELE DIXIE WTP - GEOLOGICAL PLANNING DOCUMENT	-	-	225,000	-	-	-	-	225,000		
P12296	NEW UTILITIES CENTRAL LABORATORY-PEELE DIXIE WATER	-	-	179,500	959,000	-	-	-	1,138,500		
FY 20200882	SOIL MITIGATION AT SLUDGE PIT PROPERTY	-	-	100,000	200,000	-	-	-	300,000		
P12401	PROSPECT WELLFIELD BONDING AND GROUNDING TESTING	-	-	99,000	-	-	-	-	99,000		
FY 20190721	CONVERSION OF BACK WASH PUMP	-	-	90,000	-	-	-	-	90,000		
FY 20200835	PEELE DIXIE WTP INJECTION WELL MECHANICAL INTEGRITY	-	-	60,000	-	-	-	-	60,000		
FY 20200833	FIVEASH WTP-SLUICE GATES REPLACEMENT	-	-	20,000	200,000	200,000	-	-	420,000		
FY 20200832	FIVEASH WTP-DIESEL BLDG SOUND PROOF CEILING PANEL	-	-	20,000	-	-	500,000	-	520,000		
P12393	FIVEASH ELECTRICAL SYSTEM REPLACEMENTS (2015-2020)	-	-	-	2,438,834	2,438,834	2,438,834	-	7,316,502	500,000	High
P12399	FIVEASH WTP PCCP REPLACEMENT	-	-	-	1,135,894	-	-	-	1,135,894	-	
P12403	PEELE-DIXIE WTP CHEMICAL STORAGE IMPROVEMENTS	-	-	-	950,000	-	-	-	950,000	-	
FY 20150184	CORAL RIDGE COUNTRY CLUB SMALL WATERMAIN	-	-	-	300,000	3,360,000	-	-	3,660,000	-	

Table 4-1: Five Year (FY2020 to FY2024) Water Supply, Treatment and Distribution Community Investment Plan

Project #	Project Title	Unspent Balance as of September 17, 2019	Available Balance as of September 17, 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Funded Total (Through FY2024)	Unfunded Amount (Beyond FY 2024)	Priority for Funding
FY 20150185	SEA RANCH LAKES SMALL WATER MAINS	-	-	-	300,000	3,296,958	-	-	3,596,958	-	
FY 20150187	LAUDERDALE BY THE SEA SMALL WATER MAIN IMPROVEMENTS	-	-	-	300,000	1,902,000	-	-	2,202,000	-	
FY 20190722	WELLFIELD COMMUNICATIONS	-	-	-	300,000	400,000	100,000	-	800,000	-	
FY 20150189	LAKE AIRE PALM VIEW SMALL WATER MAINS	-	-	-	280,000	760,316	-	-	1,040,316	-	
FY 20190720	CONVERSION OF FOUR HIGH SERVICE PUMPS TO VFD	-	-	-	250,000	250,000	100,000	-	600,000	-	
P12417	MISCELLANEOUSE WATER QUALITY IMPROVEMENTS	-	-	-	67,000	-	-	-	67,000	-	
FY 20190735	MEMBRANE CLEANING SYSTEM UPGRADE	-	-	-	20,000	80,000	-	-	100,000	-	
FY 20150190	BAY COLONY SMALL WATER MAIN IMPROVEMENTS	-	-	-	-	320,000	2,400,460	-	2,720,460	-	
FY 20150191	LAUDERGATE ISLES SMALL WATER MAIN IMPROVEMENTS	-	-	-	-	280,000	515,835	-	795,835	-	
FY 20190748	SMALL WATER MAIN REPLACEMENT - NE 51ST STREET	-	-	-	-	-	1,920,000	-	1,920,000	7,680,000	High
FY 20190739	SW 11 STREET & SW 30 AVENUE SMALL WATER MAIN REPLACEMENT	-	-	-	-	-	1,069,795	-	1,069,795	-	
FY 20200840	FIVE-ASH WELLFIELD EAST GENERATOR FUEL TANK REPLACEMENT	-	-	-	-	-	735,000	-	735,000	-	
FY 20200838	RIVERLAND ROAD WATERMAINS	-	-	-	-	-	350,000	-	350,000	4,496,842	High
FY 20200836	CORDOVA ROAD WATERMAIN	-	-	-	-	-	200,028	-	200,028	769,340	High
FY 20190746	SMALL WATER MAIN REPLACEMENT - SEABREEZE BLVD	-	-	-	-	-	-	3,318,000	3,318,000	7,742,000	High
P12398	FIVEASH WTP GST AND CLEARWELL UPGRADES	-	-	-	-	-	-	800,000	800,000	-	

Table 4-1: Five Year (FY2020 to FY2024) Water Supply, Treatment and Distribution Community Investment Plan

Project #	Project Title	Unspent Balance as of September 17, 2019	Available Balance as of September 17, 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Funded Total (Through FY2024)	Unfunded Amount (Beyond FY 2024)	Priority for Funding
FY 20150175	TWIN LAKES (NW) WATERMAIN	-	-	-	-	-	-	611,310	611,310	4,132,946	High
FY 20150176	SW 29 STREET SMALL WATERMAINS	-	-	-	-	-	-	397,353	397,353	-	
FY 20190747	SMALL WATER MAIN REPLACEMENT - SW 10TH COURT	-	-	-	-	-	-	338,000	338,000	792,500	High
P11465	17TH STREET CAUSEWAY - LARGE WATER MAIN REPLACEMENT	-	-	-	-	-	-	337,960	337,960	3,319,510	High
FY 20190749	SMALL WATER MAIN REPLACEMENT - HENDRICKS ISLE	-	-	-	-	-	-	300,000	300,000	1,450,400	High
FY 20200837	PIER SIXTY-SIX WATER MAIN	-	-	-	-	-	-	140,020	140,020	538,538	High
P12416	WATERMAIN IMPROVEMENTS AREA 1	-	-	-	-	-	-	99,276	99,276	546,013	High
P11589	FIVEASH WTP DISINFECTION IMPROVEMENTS	32,907,569	32,686,867	(1,468,998)	-	-	-	-	31,438,571	-	
P12391	BERMUDA RIVIERA SML WTRMN IMPROVEMENTS	5,036,881	482,348	(300,000)	-	-	-	-	4,736,881	-	
P11901	VICTORIA PK STH SM WATERMAINS IMPROVEMNT	4,992,728	2,115	-	-	-	-	-	4,992,728	-	
P12404	EXCAVATE & DISPOSE OF DRY LIME SLUDGE	4,584,639	75,549	-	-	-	-	-	4,584,639	-	
P12399	FIVEASH WTP PCCP REPLACEMENT	3,985,685	3,976,628	-	-	-	-	-	3,985,685	-	
P10850	VICTORIA PARK A NORTH-SMALL WATERMAINS	3,799,381	220,269	(200,000)	-	-	-	-	3,599,381	-	
P10814	CENTRAL NEW RIVER W/MAIN RIVER CROSSING	1,621,095	1,613,791	-	-	-	-	-	1,621,095	-	
P12180	CROISSANT PARK SMALL WATER MAINS	1,033,523	375,780	(400,000)	-	-	-	-	633,523	-	
P11080	PORT CONDO SMALL WATER MAIN IMPROVEMENTS	540,459	432,949	-	-	-	-	-	540,459	-	
P12184	DAVIE BLVD 18" WM ABAN I-95 TO SW 9 AVE	518,491	195,215	1,550,000	-	-	-	-	2,068,491	-	
P12395	PEELE DIXIE ELECTRICAL STUDIES	206,496	206,496	-	-	-	-	-	206,496	-	
P12400	PROSPECT WELLFIELD ELC STUDIES & TESTING	183,832	183,832	-	-	-	-	-	183,832	-	

Table 4-1: Five Year (FY2020 to FY2024) Water Supply, Treatment and Distribution Community Investment Plan

Project #	Project Title	Unspent Balance as of September 17, 2019	Available Balance as of September 17, 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Funded Total (Through FY2024)	Unfunded Amount (Beyond FY 2024)	Priority for Funding
P12402	PEELE DIXIE WELLFIELD ELC STUD & TESTING	148,540	148,540	-	-	-	-	-	148,540	-	
P12396	PEELE DIXIE SURGE PROTECTION UPGRADES	98,540	98,540	-	-	-	-	-	98,540	-	
P12463	CORAL SHORES SML WATERMAIN IMPROVEMENTS	-	-	1,118,998				-	1,118,998		
	TOTAL	**$78,159,512**	**$54,544,215**	**($1,346,802)**	**$12,374,128**	**$13,861,508**	**$10,903,352**	**$6,915,319**	**120,867,017**	**$286,056,921**	

Source: City of Fort Lauderdale Adopted FY 2020 - 2024 Community Investment Plan; accessible at the following link: https://www.fortlauderdale.gov/home/showdocument?id=42638

5. Goals, Objectives and Policies

The City of Fort Lauderdale Comprehensive Plan addresses the needs and aspirations of the community. This has tremendous implications regarding the importance of community input in the development and implementation of the Comprehensive Plan.

The Comprehensive Plan also plays a significant role within Florida's growth management system. The Comprehensive Plan is required to be consistent with the State Comprehensive Plan (Chapter 187, Florida Statutes), and to be consistent with the Regional and County Comprehensive Plans. In short, the Comprehensive Plan provides a critical link between the City of Fort Lauderdale, State of Florida, Regional, and Broward County plans. The Comprehensive Plan establishes long-term direction of goals as well as short-term objectives and policies to guide implementation efforts.

The City of Fort Lauderdale's comprehensive plan goals, objectives, and policies (GOPs) relevant to water supply have been reviewed and are consistent with the 10-year Water Supply Facilities Work Plan 2020 Update.

References

Broward County. (2019). *Broward County Code Appeals.* Retrieved September 27, 2019, from Broward County Amendments to the FBC: https://www.broward.org/CodeAppeals/Pages/AmendmentsInterpretations.aspx

CDM. (2008). *Feasibility Study for the Implementation of Selected Reclaimed Water Projects with the City of Fort Lauderdale.*

City of Fort Lauderdale. (2018). *2018 Annual Saltwater Intrusion Monitoring Report.*

City of Fort Lauderdale. (2019a, September 27). *Fort Lauderdale Comprehensive Plan (Draft).*

City of Fort Lauderdale. (2019b, June 19). *Fast Forward Fort Lauderdale 2035.* Retrieved June 14, 2019, from https://www.fortlauderdale.gov/home/showdocument?id=4202

City of Fort Lauderdale. (2019c, June 20). *Press Play Fort Lauderdale Strategic Plan: Our City, Our Strategic Plan 2024.* Retrieved June 8, 2020, from https://www.fortlauderdale.gov/departments/city-manager-s-office/structural-innovation-division/strategic-plan

City of Hallandale Beach. (2018). *Agreement for Capacity Allocation in Phase 1 of the C-51 Reservoir City of Hallandale Beach*. Retrieved September 26, 2019, from http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=2ahUKEwi7--38ve7kAhXmzVkKHf6aDtQQFjAAegQIARAC&url=http%3A%2F%2Fapps.sfwmd.gov%2Fentsb%2Fdocdownload%3Fobject_id%3D0900eeea8aac3958&usg=AOvVaw0pbn2e-aIwUclI46we53fh

Committee of the Great Lakes-Upper Mississippi River Board of State Sanitary Engineers. (2018). *Recommended Standards for Water Works.*

Elsken, K. (2019, February 1). *Lake Okeechobee News.* Retrieved from https://lakeokeechobeenews.com/lake-okeechobee/governor-calls-for-lower-lake/

Engineering News-Record. (2019, 06 20). Retrieved from https://www.enr.com/economics/historical_indices/construction_cost_index_history

Florida Department of Business and Professional Regulation. (2019). *Florida Building Code.* Retrieved September 27, 2019, from https://www.floridabuilding.org/bc/bc_default.aspx

Hazen and Sawyer. (2008a). *Floridan Aquifer Conceptual Plan for the Dixie Wellfield.*

Hazen and Sawyer. (2008b). *Peele-Dixie Reverse Osmosis Basis of Design Report.*

Hazen and Sawyer in association with MacVicar, Federico & Lamb, Inc. (2009). *Conceptual Feasibility of a Sub-Regional Lower East Coast Water Supply Solution.*

Hughes, J. S. (2016). *Potential Effects of Alterations to the Hydrologic System on the Distribution of Salinity in the Biscayne Aquifer in Broward County.* United States Geological Survey Scientific Investigations Report 2016-5022. Retrieved June 25, 2019, from http://dx.doi.org/10.3133/sir20165022

Montgomery Watson. (1996). *Fiveash WTP Filtration and Aeration Treatment Evaluations Final Report.*

Reiss Engineering. (2017). *City of Fort Lauderdale Comprehensive Utility Strategic Master Plan.*

South Florida Water Management District. (2008). *Water Use Permit No. 06-00123-W Staff Report.*

South Florida Water Management District. (2015). *Applicant's Handbook for Water Use Permit Applications.*

South Florida Water Management District. (2018a). *2018 Lower East Coast Water Supply Plan Update - Planning Document.*

South Florida Water Management District. (2018b). *2018 Lower East Coast Water Supply Plan Update - Appendicies.*

South Florida Water Management District. (2018c, August). *East Coast Floridan Model Overview and Results Lower East Coast Planning Region*.

Southeast Florida Climate Compact. (2019, June 19). Retrieved from http://southeastfloridaclimatecompact.org/regional-climate-action-plan/

United States Geological Survey. (2017). *Sequence Stratigraphy, Seismic Stratigraphy, and Seismic Structures of the Lower Intermediate Confining Unit and Most of the Floridan Aquifer System, Broward County, Florida.*

Appendix C - BROWARD COUNTY WATER SUPPLY FACILITIES WORK PLAN (2020 WORK PLAN)

BROWARD COUNTY
FLORIDA

Water Supply Facilities Work Plan

The associated BrowardNEXT2.0 Comprehensive Plan was adopted on March 28, 2019 (Ordinance No. 2019-11) by the Board of County Commissioners.

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ASR	Aquifer Storage and Recovery
AWS	Alternative Water Supply
BCWWS	Broward County Water and Wastewater Services
BCPDMD	Broward County Planning and Development Management Division
BEBR	Bureau of Economic and Business Research
BMP	Best Management Practice
BMSD	Broward County Municipal Services Districts
CADA	Central Aquifer Drainage Assessment
CEPP	Central Everglades Planning Project
CERP	Comprehensive Everglades Restoration Plan
CIE	Capital Improvements Element
CUP	Consumptive Use Permit
DSS	Domestic Self Supply
EPA	Environmental Protection Agency
EPGMD	Environmental Protection and Growth Management Department
EPCRD	Environmental Planning and Community Resilience Division
FDEP	Florida Department of Environmental Protection
FPL	Florida Power and Light Corporation
F.S.	Florida Statutes
GOP	Goals, Objectives, and Policies
gpcd	Gallons Per Capita Per Day
IWRP	Integrated Water Resources Plan
LEC	Lower East Coast
LECWSP	Lower East Coast Water Supply Plan
LORS	Lake Okeechobee Regulation Schedule
LOS	Level of Service
LOSS	Level of Service Standard
LOSOM	Lake Okeechobee System Operating Manual
MFL	Minimum Flow and Minimum Water Level
MG	Million Gallons
MGD	Million Gallons Per Day
mg/L	Milligrams per Liter
MGM	Million Gallons Per Month
NADA	North Aquifer Drainage Assessment
NCA	National Climate Assessment
NIS	NatureScape Irrigation Services
PFAM	Population Forecast and Allocation Model
ppb	Parts per billion

RCAP	Regional Climate Action Plan
RO	Reverse Osmosis
SADA	South Aquifer Drainage Assessment
SAS	Surficial Aquifer System
SEFRCCC	Southeast Florida Regional Climate Change Compact
SFWMD	South Florida Water Management District
SRW	South Regional Wellfield
STA	Stormwater Treatment Area
SWR	Surface Water Routing
TAZ	Traffic Analysis Zones
TIP	Transportation Improvement Program
UAZ	Utility Analysis Zones
URO	Urban Runoff
USACE	U.S. Army Corps of Engineers
USGCRP	United States Global Change Research Program
USGS	United States Geological Survey
WCA	Water Conservation Areas
WPA	Water Preserve Areas
WRRDA	Water Resources Reform and Development Act
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

Water Supply Facilities Work Plan

EXECUTIVE SUMMARY

This Broward County Water Supply Facilities Work Plan (2020 Work Plan) addresses traditional and alternative water supply (AWS) source development and management strategies to meet existing and projected water use demand. The 2020 Work Plan primarily focuses on Broward County's Public Works Water and Wastewater Services (BCWWS) service areas and unincorporated Broward County neighborhoods entitled the Broward County Municipal Services Districts (BMSD). It also contains updates about the implementation of the urban water resource management strategies, including water conservation programs, prioritized at the 2019 Broward Countywide Integrated Water Resources Plan (IWRP), coordinated by Broward County Environmental Planning and Community Resilience Division (EPCRD). Overall, approximately 240,000 people receive water and wastewater services in these areas and the population is expected to be 281,000 by 2040. The BMSD's water and wastewater services are provided by BCWWS and the City of Fort Lauderdale's utilities. BCWWS' southernmost service area receives potable water through connections with the City of Hollywood.

Florida Law (Section 163.3177(6)(c)3., Florida Statutes [F.S.]) requires local governments to adopt water supply facilities work plans into their comprehensive plans within eighteen months after the South Florida Water Management District (SFWMD) approves a regional water supply plan update. The SFWMD approved the 2018 Lower East Coast Water Supply Plan Update (LECWSP, SFWMD, 2018) on November 8, 2018, with final administrative order on January 11, 2019. The 2020 Work Plan is Broward County's required update based on that plan's adoption. In addition, Broward County integrated its comprehensive plan's water resources elements and the new version is included in the 2020 Work Plan.

Like most Southeast Florida water utilities, BCWWS' primary public water supply source water is the Surficial Aquifer System (SAS) located from ground surface to approximately 240 feet underground. BCWWS' groundwater withdrawal wells range between 75 to 130 feet below ground. Broward County's primary SAS feature is the Biscayne Aquifer and it provides the vast majority of BCWWS and BMSD populations' water supply needs.

However, the Biscayne Aquifer is considered a finite water resource by the SFWMD. In 2007, the SFWMD mandated through a Regional Water Availability Rule that AWS will be used to serve future population growth (SFWMD, 2007). For example, the brackish Upper Floridan Aquifer (approximately to 1000 – 1700 feet underground) can be withdrawn and treated with more complex processes than used for the Biscayne Aquifer water. Other AWS options include, but are not limited to, water conservation, water reuse, and surface water storage development. The 2020 Work Plan outlines future BCWWS AWS projects to serve future populations as well as projects that maintain and optimize BCWWS' current systems. Similar projects are covered for the City of Fort Lauderdale and the City of Hollywood.

The regional C-51 Reservoir project is the primary BCWWS AWS project to meet future population growth demands. Located in Central Palm Beach County, the C-51 Reservoir project is a public-private partnership to construct 60,000 acre-feet (equal to almost 20 billion gallons) of surface water storage. Captured stormwater from the C-51 watershed will be stored in the reservoir and moved across the region via canal systems to recharge local aquifers. BCWWS is planning to use up to six million gallons a day from the C-51 Reservoir project.

The Broward County and Palm Beach County water reuse partnership is another important regional AWS initiative. This beneficial reuse water project is BCWWS' strategy to comply with Florida's Ocean Outfall Law (Section 403.086(9), F.S). The project also provides beneficial water reuse supply to the Southern Palm Beach County region as well as portions of the North Springs Improvement District, Coconut Creek, Deerfield Beach, and Pompano Beach. BCWWS is currently increasing its water reuse production capacity to twenty-six million gallons a day from the current ten million gallons a day to implement this project.

Additional regional drivers for Broward County's water supply include regional climate impacts such as sea level rise, saltwater intrusion, and extreme weather events. Sea level rise threatens future South Florida water conveyance that could negatively impact aquifer recharge and flood control management practices. Due in large part to a porous aquifer, future sea level rise also will increase saltwater intrusion's negative effect on public water supplies. Saltwater intrusion from the ocean will likely move further inward and pose contamination risk for freshwater aquifers. Future extreme weather events may include longer dry weather patterns that could decrease public water supply levels and, may also increase saltwater intrusion's landward extent.

Broward County, together with its municipal and regional partners, supports and facilitates water supply and climate change planning integration and implementation including:

- The Broward County Climate Action Plan's water supply actions (Broward County, 2015) to maintain adequate water supply through conservation and adaptation, and integrated water resource management.
- The Southeast Florida Regional Climate Change Compact's (SEFRCCC) Southeast Florida Regional Climate Action Plan's (RCAP) critical water supply planning components (SEFRCCC, 2017).
- The goals of the Resilient Utility Coalition - an outgrowth from the Compact –to "operationalize resilience" in common water utility practices.

A major regional plan to restore Florida's Everglades – the Comprehensive Everglades Restoration Plan (CERP) – will also change future water resource conditions. CERP will construct additional water storage systems to capture wet season flow volumes and provide critical natural system water needs as well as maintain public water supply. CERP features within Broward County and in other SFWMD regions should collectively benefit local water supply sustainability throughout South Florida.

The 2019 IWRP Update provides key planning, assessment and coordination tools to optimally manage water resources. Its five main objectives are to:

- Make the most of local water resources, so that Broward's long-term water supply needs are met;
- Coordinate a diverse water management community, ensuring the efficient and effective management of Broward's water resources;
- Match up local water sources and users to ensure that water supplies are available when and where they're needed;
- Diversify water supplies so that the needs of urban and natural systems are met under wet and dry conditions; and,
- Promote water resource resiliency by evaluating future conditions, including potential climate impacts and adopt strategies, to mitigate, adapt, and prevent disruptions to our overall goal of more efficient and effective water management.

Additionally, the IWRP program developed, and continues to develop, several numerical hydrologic models used in decision making and to assist sustainable investments. Optimizing integrated secondary canal management is one hallmark success for the IWRP modeling. Broward County's Water Reuse Master Plan was developed to facilitate more projects Countywide and its implementation is greatly assisted with the IWRP's AWS grant investments.

Water conservation remains a critical AWS strategy in the 2020 Work Plan. In 2010, the Broward County Board of County Commissioners passed an irrigation ordinance adopting year-round irrigation restrictions limiting landscape watering to two days per week. In addition, Broward

County implements a broad set of water conservation programs that are designed to produce long-term demand reductions along with water quality improvements. These programs, targeted at various user groups, including Broward Water Partnership Conservation Pays, NatureScape Irrigation Services (NIS), NatureScape Broward, Know the Flow, Water Matters Day, and the NatureScape Broward School Board Environmental Partnership Agreement. The current IWRP goal of Broward County's water conservation programs combined is 10 gallons per day per capita reduction in water use Countywide by 2028.

Finally, the 2020 Work Plan data analysis demonstrates BCWWS will continue to meet its "Retail Potable Water Level of Service Standards". Special recommendations and a ten-year work plan outline the major C-51 Reservoir Project (27.6 million dollars) and Palm Beach County Reuse Partnership (104 million dollars) investments and components. In addition, water treatment plant (WTP) upgrades and water conservation projects are described. BCWWS' robust 5-year Capital Improvement Program is scheduled to spend over 123 million dollars on over sixty components to maintain and optimize the current system as well as build new features. All the 2020 Work Plan projects contribute towards BCWWS successfully managing future challenges to provide excellent water and wastewater services for its service areas.

INTRODUCTION

Broward County is located on the Southeastern coast of Florida and is adjacent to the Atlantic Ocean to the east, Miami-Dade County to the south, Collier County to the west and Palm Beach County to the north as shown in Figure WS1 below. This Broward County Water Supply Facilities Work Plan Update (2020 Work Plan) identifies water supply sources, availability and facilities needed to serve existing and new development within the local government's jurisdiction. Chapter 163, Part II, F.S., requires local governments to prepare and adopt work plans into their comprehensive plans within 18 months after the South Florida Water Management District (SFWMD) approves a regional water supply plan update. The 2018 Lower East Coast Water Supply Plan (LECWSP) Update was adopted by the SFWMD's Governing Board on November 8, 2018. Therefore, local governments within the Lower East Coast (LEC) region are required to amend their comprehensive plans and include an updated Water Supply Facilities Work Plan and related planning elements by May 8, 2020.

BCWWS produces potable water for its northern and central service areas. BCWWS' southernmost service area receives potable water through connections, with the City of Hollywood. BMSD areas receive water and wastewater services from BCWWS and the city of Fort Lauderdale's utilities. BCWWS and both cities are responsible for ensuring enough capacity is available for existing and future customers.

This 2020 Work Plan will reference the initiatives already identified to ensure adequate water supply for BCWWS and BMSD. According to state guidelines, the work plan and comprehensive plan must address the development of traditional and alternative water supplies, service delivery and conservation and reuse programs necessary to serve existing and new development for at least a 10-year planning period. The work plan will have a planning time schedule consistent with the comprehensive plan and the 2018 LECWSP update. The Broward County 2020 Work Plan is divided into seven sections:

Section 1 – Introduction
Section 2 – Regional Issues
Section 3 – Broward County
Section 4 – Data and Analysis
Section 5 – Special Recommendations and Actions
Section 6 – BCWWS Capital Improvements
Section 7 – Goals, Objectives and Policies

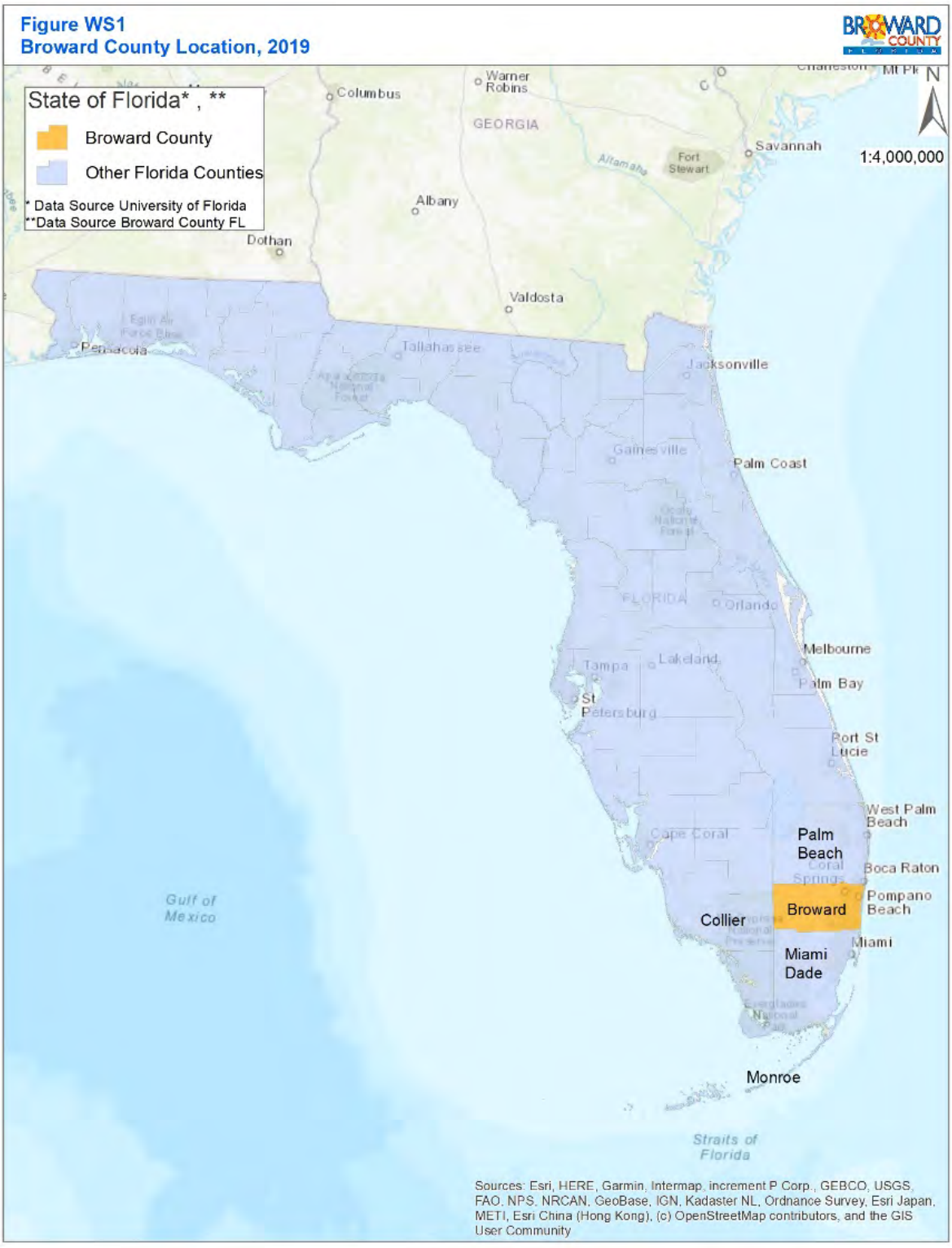


Figure WS1 Broward County Location

A. Statutory History

The Florida Legislature enacted bills in the 2002, 2004, 2005, 2011, 2012, 2015 and 2016 sessions to address the state's water supply needs. Two of these bills, Senate Bills 360 and 444 (2005 legislative session), significantly changed Chapters 163 and 373, F.S., by strengthening the statutory links between the regional water supply plans prepared by the water management districts and the comprehensive plans prepared by local governments. In addition, these bills established the basis for improving coordination between local land use and water supply planning.

B. Statutory Requirements

Broward County has considered the following statutory provision in updates to this 2020 Work Plan.

1. Coordinate appropriate aspects of its comprehensive plan with the LECWSP [Section 163.3177(4)(a), F.S.].
2. Ensure the future land use plan is based upon availability of adequate water supplies and public facilities and services [Section 163.3177(6)(a), F.S.]. Data and analysis demonstrating that adequate water supplies and associated public facilities will be available to meet projected growth demands must accompany all proposed Future Land Use Map amendments submitted for review.
3. Ensure that adequate water supplies and potable water facilities are available to serve new development no later than the issuance by the local government of a certificate of occupancy or its functional equivalent and consult with the applicable water supplier to determine whether adequate water supplies will be available to serve the development by the anticipated issuance date of the certificate of occupancy [Section 163.3180(2), F.S.].
4. For local governments subject to a regional water supply plan, revise the General Sanitary Sewer, Solid Waste, Drainage, Potable Water and Natural Groundwater Aquifer Recharge Element (the "Infrastructure Element") within 18 months after the water management district approves an updated regional water supply plan, to:
    a. Identify and incorporate the AWS project(s) selected by the local government from projects identified in the LECWSP, or alternative projects(s) proposed by the local government under Section 373.709(8)(b), F.S. [Section 163.3177(6)(c), F.S.];
    b. Identify the traditional and AWS projects and the conservation and reuse programs necessary to meet water needs identified in the LECWSP [Section 163.3177 (6) (c) 3, F.S.]; and

c. Update the work plan for at least a 10-year planning period for constructing the public, private, and regional water supply facilities identified in the element as necessary to serve existing and new development [Section 163.3177(6)(c) 3, F.S.].

5. Revise the Five-Year Schedule of Capital Improvements to include water supply, reuse, and conservation projects and programs to be implemented during the five-year period [Section 163.3177 (3)(a)4, F.S.].
6. To the extent necessary to maintain internal consistency after making changes described in Paragraph 1 through 5 above, revise the Conservation Element to assess projected water needs and sources for at least a 10-year planning period, considering the LECWSP, as well as applicable consumptive use permit(s) [Section 163.3177(6)(d), F.S.]. The plan must address the water supply sources necessary to meet and achieve the existing and projected water use demand for the established planning period, considering the applicable regional water supply plan [Section 163.3167(9), F.S.].
7. To the extent necessary to maintain internal consistency after making changes described in Paragraphs 1 through 5 above, revise the Intergovernmental Coordination Element to ensure coordination of the comprehensive plan with the LECWSP [Section 163.3177(6)(h) 1, F.S.].
8. While an Evaluation and Appraisal Report is not required, local governments are encouraged to comprehensively evaluate and, as necessary, update comprehensive plans to reflect changes in local conditions. The evaluation could address the extent to which the local government has implemented the need to update its work plan, including the development of alternative water supplies, and determine whether the identified AWS projects, traditional water supply projects and conservation and reuse programs are meeting local water use demands [Section 163.3191(3), F.S.].

REGIONAL ISSUES

The regional issues impacting Broward County include:

1. Climate Impacts and Future Water Supply Conditions: Climate impacts and future water supply conditions need to be integrated into water resources resilience planning efforts;
2. Water Use Limitation: Limitation of fresh surface water and groundwater use by the SFWMD's Regional Water Availability Rule and Everglades and Lake Okeechobee Minimum Flow and Minimum Water Levels (MFL);
3. Alternative Water Supply: The need to develop diverse water sources to meet current and future water needs, including C-51 Reservoir Project, Floridan Aquifer, and reuse as mandated by the Ocean Outfall law; and,
4. CERP Implementation: Construction of additional storage systems (e.g. CERP's reservoirs, aquifer storage, and recovery systems) to capture wet season flow volumes will be necessary to increase water availability during dry conditions and attenuate damaging peak flow events from Lake Okeechobee.

A. Climate Impacts and Future Water Supply Conditions

Investigations and evaluations conducted at the national, regional, and local levels have reinforced the need to plan for the predicted impacts of different rainfall patterns and more frequent and severe drought, increases in tidal and storm-related flooding, and the loss of coastal wellfield capacity due to saltwater contamination. In the absence of proactive planning, these impacts will present liabilities for coastal and inland communities with implications for urban water supplies, water and wastewater infrastructure, and both regional and local drainage/flood control systems.

Broward County, together with its municipal and regional partners, understands that it is imperative that local governments and water utilities begin to formalize the integration of water supply and climate change considerations as part of their coordinated planning efforts. Water resource resilience can be achieved with relevant updates to Water Supply Facilities Work Plans and focused, actionable enhancements to comprehensive planning Goals, Objectives, and Policies (GOP). Key considerations for communities within the Southeast Florida planning areas include: 1) sea level rise, 2) saltwater intrusion, 3) extreme weather, and 4) infrastructure investments to support diversification and sustainability of water supply sources, and adaptive stormwater and wastewater systems.

The 2019 IWRP Report states that it is necessary to understand future conditions, particularly as related to potential climate impacts including extreme droughts and rainfall events, along

with sea level rise and related saltwater intrusion, in order to ensure that Broward's water resources will be sustainable and promote more effective and efficient water resources management. The Broward County water management community works with many groups, including the state and federal government, academia, and the private sector to study the impacts that a changing climate brings and to develop plans for mitigation and adaptation.

Among 2019 IWRP objectives, there is: "to promote water resources resiliency by evaluating future conditions, including potential climate impacts and adopt strategies to mitigate, adapt, and prevent disruptions to Broward's overall goal of more efficient and effective water management."

In addition, the Water Supply Actions within the Broward County Climate Action Plan (2015) are intended to maintain adequate water supply through conservation and adaptation, development of decision support tools necessary to build community resilience and increase the resilience of natural systems through integrated water resource management. The 11 actions that are proposed include:

- Continue local water conservation programs
- Include climate change in updates of LECWSP
- Investigate regionalization of water supply
- Monitor and protect wellfields
- Develop AWS strategies
- Model the sustainable use of the aquifer
- Evaluate impacts of flooding of contaminated sites
- Evaluate reuse water interaction with and impacts to the natural systems
- Implement reuse strategies
- Evaluate reuse considering sea level rise
- Increase percentage of pervious areas

Both the 2019 IWRP Update and Broward's Climate Action Plan support the work of the Southeast Florida Regional Climate Change Compact (SEFRCCC) to develop the Regional Climate Action Plan (RCAP) (SEFRCCC 2017), which is the four-County Southeast Florida Regional Climate Compact's guiding tool for coordinated climate action in Southeast Florida. Broward County has taken a lead role as a compact partner in organizing the water section of the Water Goal of the document, which is designed to "advance the water management strategies and infrastructure improvements needed, in parallel with existing water conservation efforts, to mitigate the potential adverse impacts of climate change and sea level rise on water supplies, water and wastewater infrastructure, and water management systems, inclusive of regional canal networks, pumps, control structures, and

operations." Twenty-one actions are included within this goal. Compact documents produced to assist policymakers, administrators, and program staff include "Integrating Climate Change and Water Supply Planning in Southeast Florida" and "Regional Impacts of Climate Change and Issues for Stormwater Management" (SEFRCCC, 2019).

Sea Level Rise

Sea level rise has significant implications for water management and water supply planning in Southeast Florida, the rate of which is accelerating. During the previous century, the global rate of sea level rise averaged approximately 1.6 mm per year. The rate of rise increased to an average of 1.7 mm per year during the second half of the last century, followed by a more significant increase to 3.3 mm per year measured during the last decade. This trend of rising sea level is reinforced by local tide data which documents an increase in regional sea level of about 9 inches during the last 100 years. While there continues to be uncertainty about the overall extent of sea level rise that might be realized in the coming century, the Fourth National Climate Assessment (NCA, USGCRP, 2018) report presents a probable range of 1 to 6 feet by 2100. In Southeast Florida, partner counties in the Southeast Florida Regional Climate Change Compact, inclusive of Broward, Palm Beach, Miami-Dade, and Monroe counties, have collectively agreed to use modified guidance developed by the U.S. Army Corps of Engineers (USACE) and a planning scenario of 9 to 24 inches additional sea level rise by 2060, consistent with projections presented in the 2014 NCA, Figure WS2 below. This unified sea level rise projection has been formally adopted by Palm Beach, Broward, Miami-Dade and Monroe Counties and is now being used to inform planning processes and project design throughout the region. As the impacts of historic sea level rise are already being realized and acceleration of the rate of rise is expected to compound local impacts and vulnerabilities, it is prudent that planning processes begin to formally reflect consideration of sea level rise as a future condition with recognized implications for near-term and longer-term planning decisions.

Sea level rise produces varied challenges with the respect to water resources sustainability, water management, and water/wastewater facilities and infrastructure. Impacts include saltwater contamination of coastal wellfields, infiltration of groundwater with chloride levels into wastewater collection systems, impairing normal operations and maintenance, as well as opportunities for beneficial use of reclaimed water as an AWS. Water management systems are also at risk with systems constrained by rising groundwater and tail water elevations which reduce soil storage and discharge capacity, with increased potential for both inland and coastal flooding and less opportunity for long-term storage of stormwater for beneficial reuse.

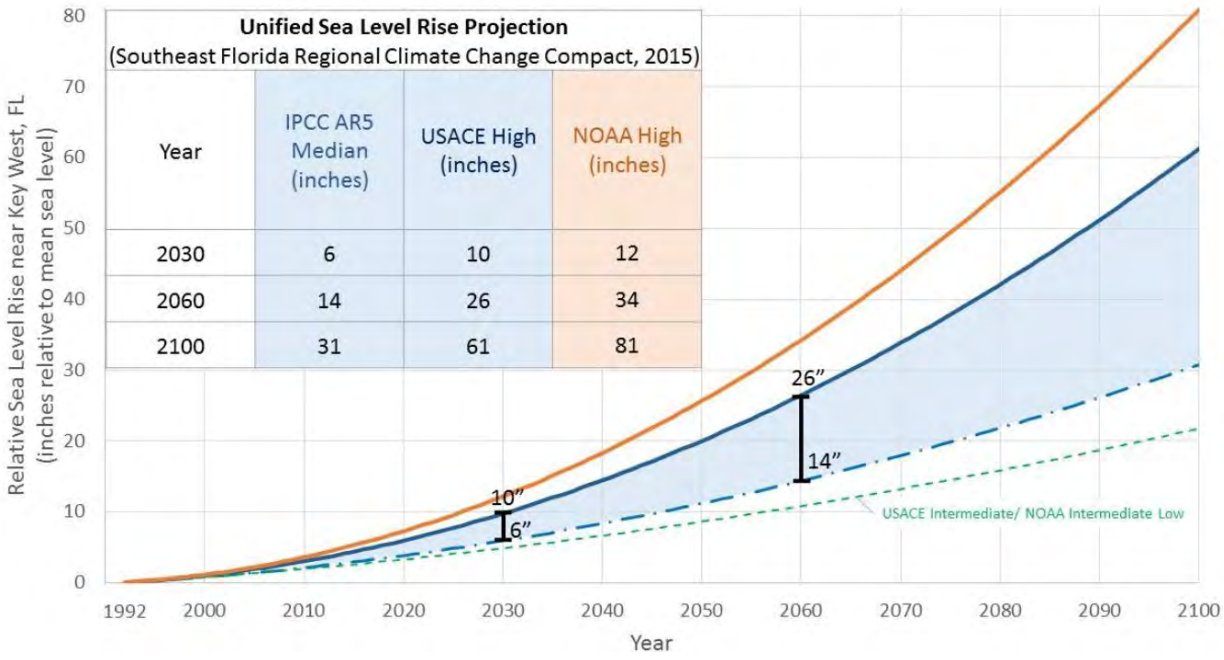


Figure WS2 Southeast Florida Regional Climate Change Compact Unified Sea Level Rise Projection[1]

These realities necessitate consideration of plans and investments that may be needed to compensate for loss of existing water supplies through relocation of wellfields and the development of AWS sources, while also seeking opportunities to expand regional water storage opportunities. These investments and considerations are in addition to concurrency planning for population growth and water demands that are typical requirements for water supply planning.

Saltwater Intrusion

Along the coast of Southeast Florida, and several miles inland, groundwater supplies and potable wells are vulnerable to saltwater contamination. The Biscayne Aquifer, which serves as the regional's primary water supply, is a shallow, surficial aquifer characterized by limestone karst geology, which is highly porous and transmissive. As a result, coastal saltwater intrusion of the aquifer has begun to restrict coastal water supplies and necessitated the development of western wellfields, changes in wellfield in water management operations, and investments in reclaimed water projects to enhance aquifer recharge. At the toe of the saltwater front, chloride concentrations exceed drinking water

[1] The unified sea level rise projection is updated every 5 years, having its next one anticipated to be released at the Southeast Florida Regional Climate Change Compact Summit, in December 2019. Link to current 2015 version shown above: https://southeastfloridaclimatecompact.org/wp-content/uploads/2015/10/2015-Compact-Unified-Sea-Level-Rise-Projection.pdf

standards of 250 milligrams per liter (mg/L) and thus restrict and/or require abandonment of wellheads located east of the saltwater intrusion line.

While impacts and planning efforts have historically focused on the most at risk utilities and wellfield, the accelerated rate of sea level rise and advancements in modeling and planning tools provide support and justification for a more holistic review of anticipated trends and necessary responses on both a local and regional scale.

As early as the 2000 LECWSP, these impacted water supply entities were classified as:

- Utilities at Risk – Utilities with wellfields near the saltwater interface that do not have an inland wellfield, have not developed adequate alternative sources of water, and have limited ability to meet user needs through interconnects with other utilities; and
- Utilities of Concern – Utilities having wellfields near the saltwater interface, the ability to shift pumpages to an inland wellfield, or an alternative source that is not impacted by the drought.

Technical assessments have further identified changes in land use, drainage of the Everglades, wellfield operations, and sea level rise as contributing factors to the historical movement and current location of the saltwater front within the productive layer of the aquifer.

Hydrologic modeling has revealed that sea level rise, when combined with coastal wellfield pumping, has accelerated the movement of the front, doubling the rate at which the front has progressed during the last several decades at certain locations. It is expected that sea level rise will constitute an increasingly significant influence on the rate of saltwater migration during the decades to come and that critical wellfield capacity will be lost with an additional 2-foot increase in sea level, the extent of which will vary along the coast. Conditions will be further influenced by temporal hydrologic conditions and responses in water management operations. It is therefore prudent for water utilities throughout the region (both inland and coastal) to consider adaptation plans that might include wellfield relocation or expansion of western wellfields as part of planned efforts to meet shared regional water demands. Continuation of groundwater monitoring and modeling efforts will be critical to predicting the movement of the front under sea level rise scenarios anticipated over the next several decades and adaptation efforts should continue to be refined in accordance with predicted and realized trends. Regional and local data will be important in informing decision-making.

In 2006, Broward County's EPCRD contracted with the United States Geological Survey (USGS) to develop a numerical model to evaluate various influencing factors on the saltwater movement within the Biscayne Aquifer in the northern third of the County. This tool was proven to be effective in representing historic and future conditions and was demonstrated to have utility as a planning tool for future water resources projects and development of resilience strategies. This modeling effort was subsequently expanded to the central and southern portions of the County to simulate historic saltwater intrusion and to test the extent to which wellfield pumpage, surface water management, and sea level rise contribute to and influence the movement of saltwater and how the aquifer can be expected to respond to future climate conditions. The tool will also investigate the implications on the viability of water supplies and be used to identify and test possible adaptive strategies. This model was published and publicly released in March 2016.

The County is also enhancing this investment with concurrent development of a Climate Vulnerability/Inundation model focused on coupled hydrologic impacts of saltwater intrusion, surface water/groundwater elevations, and stormwater inundation. This model, also developed in cooperation with USGS, builds upon the County's Variable Density Model to assess the influence of changing climatic conditions on urban water resources and infrastructure. The current initial effort integrates bias-corrected, dynamically downscaled data from Global Circulation models into the updated surface/groundwater model that will be used for predictions Countywide. Refinements such as Surface Water Routing (SWR) and Urban Runoff (URO) components offer more detailed conceptualization of the surface water/groundwater interactions that can be then used to assess the predictive scenarios and comparison of alternative water resource strategies in a smaller study area of the County. This model was published and publicly released in February 2019. Initial results of the implementation of the SWR and URO packages in the study area were successful and, as such, expansion of the two packages throughout the entire urban extents of the County are currently underway.

In the recent restudy of Flood Insurance Rate Maps completed in 2014 by FEMA, the County's MIKE SHE/MIKE 11 model was utilized and updated. The County is updating this map to anticipate 100-year flood elevations that are expected to occur by 2060-2070, accounting for sea level rise and more intense rainstorms. The effort includes data collection of recent or previously not included drainage infrastructure, refined model grid and associated LiDAR, land use updates, roughness coefficient improvements, addition of detention storage and ponded drainage routines, and incorporation of future tide levels. It is anticipated the Future Conditions 100-Year Flood Elevation Map will be completed in Fall of 2019, when approval process will be initiated.

The mapping of the current saltwater intrusion front is elaborated based on the end of dry season data available at 93 monitoring stations supported by local governments throughout the region, the USGS, and the SFWMD. The current Saltwater Intrusion Line for Broward County, Figure WS3 was last updated in 2014 and the SFWMD is currently working to advance, with an anticipated publishing date of December 2019.

Extreme Weather Events

As extreme events increase in frequency and severity, comprehensive planning should consider impacts and risks associated with drought, water shortages and reduced groundwater tables, all of which can hasten saltwater intrusion and exacerbate water supply impacts. Conversely, more intense rainfall will cause flooding, increased runoff, impacts to the natural systems and provide less recharge potential for wellfields. Integrated water resource management strategies will help to mitigate for these impacts, particularly those projects that can serve to provide additional long-term storage of stormwater runoff and redistribution of excess rainfall during dry periods and drought. Regional surface water reservoirs and below ground aquifer storage and recovery (ASR) systems are potentially viable AWS projects and climate adaptation strategies.

Infrastructure Development

With increasing climate disruptions, there is a need to diversify water supply sources, improve treatment technologies and to support the development of adaptive stormwater and wastewater infrastructure design criteria to ensure long-term sustainability of key facilities. Conversely, alternative water treatment technologies generally have a high energy demand and carbon footprint that can exacerbate climate change impacts. Strategic infrastructure planning should incorporate these constraints and work within with the GOP of the Comprehensive Planning process and Water Supply Facilities Work Plans to provide for long-term sustainability and a balanced approach to future development.

Increases in groundwater deviations, as both direct and indirect response to sea level, will challenge the function of drainage systems and is expected to exacerbate flooding, for even mild storm events. Conditions will be more severe with extreme rainfall events increasing damage to low-lying utility infrastructure and contribution to prolonged surface water flooding. Planning for the combined influences of storm events, high tides and sea level rise on drainage system functions and other public infrastructure is a critical need as is the assessment of viable water supplies and impacts to the natural systems from prolonged droughts.

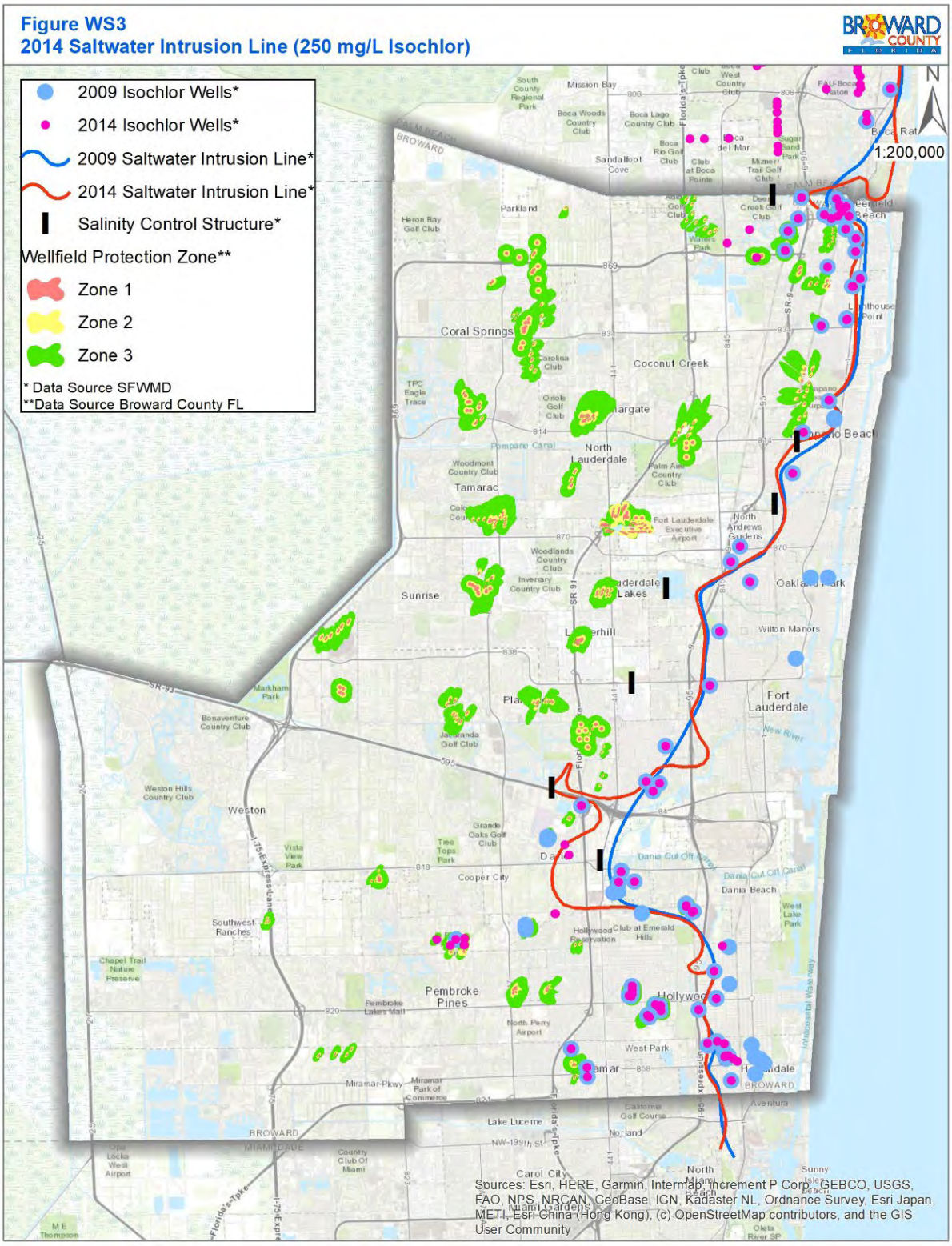


Figure WS3 Saltwater Intrusion Line (2014 SFWMD Isochlor Line – 250mg/L) for Broward County

Options that provide for a diversification of water projects and protection of resources will be fundamental and may include: regional water storage such as the C-51 Reservoir Project; ASR; the development and use of highly treated wastewater (reverse osmosis - RO) for recharge as hydrodynamic barriers; the relocation and/or regionalization of wellfields and treatment facilities away from low-lying areas; and enhancing operational flexibility.

B. Water Use Limitation

The MFLs outlined in the Florida State Statutes are defined as the "limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area" (Section 373.042(1), F.S.). They serve to protect the SAS from saltwater intrusion, ensure adequate groundwater levels for maintenance of natural systems, and prevent excessive groundwater seepage or surface water flows from the regional (Everglades) system.

As part of the establishment of MFLs, the regional water management district must determine whether the existing flow or level in the water body is below or projected to fall below the MFL criteria within the next 20 years. If so, then the district must develop a recovery or prevention strategy and, when appropriate, include development of additional water supplies, water conservation, and other efficiency measures consistent with the provisions in Sections 373.0421 and 373.709, F.S., and provide the information and timelines for these strategies within the regional water supply plans. The 2005-2006 LECWSP Update (2005-2006, LECWSP) included MFLs for the Everglades and Biscayne aquifer identifying key water resource development projects in the CERP as recovery and prevention strategies to meet MFL criteria.

In 2001, an MFL was adopted for the Biscayne Aquifer, which exists beneath south eastern Florida. The MFL was based on the relationship between Everglades surface water and groundwater levels and their ability to inhibit the movement of saline water inland from the Atlantic Ocean. The primary MFL study (SFWMD 2000c) concluded that groundwater levels in the Biscayne were not endangered by present nor future year 2020 conditions. However, since the Biscayne aquifer and Everglades are supported by surface water from the Regional System and, since Everglades MFL is under recovery strategies, it was determined that any projected increase in allocations from the Biscayne would cause the Everglades MFL to be unobtainable. Additionally, the regional system was designated by the SFWMD in 2003 as a source of limited availability, leading to the limitation of consumptive use allocations in both the Everglades and Loxahatchee River Watersheds in 2006 under the Regional Water Availability Rule. The Regional Water Availability Rule is codified in the Applicant's Handbook for Water Supply Permitting within the South Florida Water Management District (SFWMD, 2015) in Section 3.2.1.E.3. Due to the limitation of

groundwater from the Biscayne aquifer in order to maintain MFL, Broward County is required to meet additional demands with alternative water supplies.

After the approval of the 2005-2006 LECWSP, continued concern over the safety of Lake Okeechobee's dike and ecological impacts warranted that the USACE set a new regulation schedule for lake water releases. The Lake had historically provided water supplies directly to a few rural utilities, irrigation water for the Everglades agricultural area, and backup water source for urban users in the coastal basins during droughts and dry times as 'pass through' water to the Water Conservation Areas (WCAs). With the 2008 Lake Okeechobee Regulation Schedule and lower stage levels, an average loss of approximately 430,000 acre-feet of storage diminished the level of certainty for existing legal users (SFWMD, 2013). This mandated that a prevention and recovery strategy be implemented with water resources strategies identified to meet the MFL criteria, as was done for the Everglades and Biscayne MFL. Therefore, in August 2008 the 2005-2006 LECWSP, Appendix J was amended to include a recovery strategy for the Lake Okeechobee MFL and, as with the other MFLs, the Lake MFL recovery strategy relies upon key CERP projects to be completed in addition to the completion of the Herbert Hoover Dike repairs.

In 2019, USACE initiated the development of the new Lake Okeechobee System Operating Manual (LOSOM) with the purpose to reevaluate and define operations for the Lake Okeechobee regulation schedule that to account for additional infrastructure that will soon be operational. The additional infrastructure that are being taken into consideration include the Herbert Hoover Dike rehabilitation, Kissimmee River Restoration Project, as well as the CERP C-43 West Basin Storage Reservoir and C-44 Reservoir and Stormwater Treatment Area.

The SAS in the Southeastern Florida peninsula, which includes the Biscayne Aquifer, is one of the most productive aquifers in the world and is currently the primary source of freshwater to residents of Broward County, Miami-Dade County, and Southeastern Palm Beach County. In 1979, it was designated a sole source aquifer by U.S. Environmental Protection Agency (EPA), under the Safe Drinking Water Act (1974). The SFWMD is the state agency responsible for water supply planning in the LEC planning area, which includes all of Broward County.

Withdrawals from the SAS are managed by the SFWMD through the issuance of Consumptive Use Permits (CUPs). In order to secure and maintain a CUP, applicants, consisting of water utilities, developers, agricultural operations, and water control districts, must meet the permitting criteria of: 1) being a reasonable and beneficial use of the resource; 2) demonstration of no adverse impact to other existing legal uses of water; and 3) assurance

that the use of the requested quantity of water is necessary for economic and efficient use and is both reasonable and consistent with the public interest.

These uses must include compliance with the MFLs established for surface water and groundwater sources, Chapter 373, F.S. In the implementation of prevention strategy for the Everglades, Lake Okeechobee and Biscayne aquifer MFLs, the Governing Board of the SFWMD adopted Restricted Allocation Areas in 2007 and 2008. For the LEC planning region, this mandated that new water demands requiring recharge from the Everglades regional system be met through the development of AWS. The numerous (115) AWS projects that were recommended as part of the 2005-2006 LECWSP Update were driven largely by these Restricted Allocation Areas and the concurrent consumptive use restriction for future water supply withdrawals from the surficial aquifer to historic levels (prior to April 1, 2006).

Opportunities for assistance for these AWS projects occurred in 2005 with the passage of Senate Bill 444, creating a funding and incentives program to encourage the development of alternative water projects as defined in Section 373.019, F.S. The projects were defined as from the following sources: saltwater; brackish water; surface water captured during wet-weather flows; sources made available through the addition of new storage capacity for surface or groundwater; water that has been reclaimed after one or more public water 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 region in the applicable water supply plan.

This program funding has since been severely limited within the LEC region and has directly impacted the ability of local water supply entities to advance the development of AWS projects through their own individual efforts.

C. Alternative Water Supply

Reclaimed Water

In 2008, the Florida Legislature enacted an ocean outfall statute (Section 403.086(9), F.S.). This requires the elimination of the use of six ocean outfalls in Southeastern Florida as the primary means for disposal of treated domestic wastewater, two of which are in Broward County, one of which is operated by Broward County Water and Wastewater Services. The affected wastewater utilities must reuse at least 60 percent of the historic outfall flows by 2025. The objectives of this statute are to reduce nutrient loadings to the environment and to achieve the more efficient use of water for water supply needs. South Florida utilities are working to advance reuse projects to meet the requirements.

Upper Floridan Aquifer

On occasions when local utilities seek use of the Floridan Aquifer to supplement their Biscayne Aquifer-sourced water, they are faced with higher energy costs associated with treatment of the Floridan Aquifer water in South Florida, which has elevated chloride concentrations above those that are found elsewhere in Northern and Central Florida. Typically, the utilities in Broward County that utilize the Floridan Aquifer mix that water with Biscayne water supplies, thereby diluting the chlorides and subsequently providing a finished water requiring less treatment than water that is derived solely from the Floridan Aquifer.

C-51 Reservoir Project

The C-51 Reservoir project is a public-private partnership for the construction of 60,000 acre-feet of storage for use as an AWS source in Southeastern Florida. Diversion and improved management of freshwater flows was formally identified as a priority restoration strategy for the Lake Worth Lagoon dating to the 1992 Restudy of the C & SF Flood Control Project. Coordination between Broward and Palm Beach water utilities and Counties was initiated in 2006. The C-51 Reservoir Project is presented at the 2018 LECWSP as an AWS source to meet with regional projected 2040 water demands. Beyond water supply, the reservoir will contribute to capture excess flows and enhance stormwater management, reduce harmful discharges and associated nutrient loads to Lake Worth Lagoon. It should also mitigate saltwater intrusion by maintaining higher canal stages and recharging coastal wellfields along the LEC. These potential environmental enhancements are being studied as part of the Phase 2 feasibility analysis currently underway.

D. Comprehensive Everglades Restoration Plan Implementation

The CERP is the blueprint for refitting the region's outdated water management infrastructure. By addressing the needs of the natural system with those of the urban areas and agriculture, the plan provides considerable benefits throughout the system and is a first step towards a sustainable South Florida. The CERP is designed to capture, store, or convey water now discharged to tide, making it available for all users and yielding benefits for both the regional system and local partners. The USACE and the SFWMD are partners in the re-plumbing of the Everglades with the objective of "getting the water right". This watershed plan is linked to the SFWMD's LECWSP, which addresses water supply issues in Miami-Dade, Broward, and Palm Beach Counties over the next twenty years.

In October 2011, the South Florida Ecosystem Restoration Task Force endorsed a state-federal initiative to speed up planning for key restoration projects in the heart of the Everglades. The Central Everglades Planning Project (CEPP) incorporates updated science

and technical information gained over the last decade to allow more water to be directed south to the central Everglades, Everglades National Park, and Florida Bay while protecting coastal estuaries. The USACE led the CEPP planning effort in partnership with the SFWMD.

The Broward County Water Preserve Areas (WPA) project, part of CERP, was authorized by Congress as part of the 2014 Water Resources Reform and Development Act (WRRDA). The two primary functions of the project is to reduce seepage losses from the WCA 3A/3B to the C-11 and C-9 basins and to capture, store, and distribute surface water runoff from the western C-11 basin that has discharged into the WCA 3A/3B. Indirectly this will help to buffer the local water system against drought. The stormwater that was previously discharged via the S-9 pump station westward to the WCA will now be stored in the C-11 impoundment and slowly released into the canal system to be discharged via the S-9A structure eastward. Maintaining those canals at the control elevation will help maintain recharge to the aquifer and wellfields such as the Broward County South Regional in the area.

BROWARD COUNTY

This section identifies the future water supply needs of those areas serviced by either BCWWS or other BMSD water suppliers to ensure that water supply allocations and projects will be enough to meet projected demands. The role of the EPCRD and BCWWS are to identify the future water supply needs and available supplies of the BCWWS service area (see Data and Analysis Section) as well as for those served within the BMSD. Currently, water service is provided by BCWWS to the BMSD areas of Broadview Park and Hillsboro Pines. The City of Fort Lauderdale utility serves the BMSD areas of Washington Park, Franklin Park, Boulevard Gardens, and Roosevelt Gardens. In coordination with the Fort Lauderdale's Planning and Zoning Department and Water utilities, the EPCRD has identified current and future water supply needs and water supplies as detailed below.

A. Broward County Settings

Broward County (County) is located along the lower east coast of Florida, between Miami-Dade County to the south, Palm Beach County to the north, and Collier and Hendry Counties to the west. The County was formed from parts of Palm Beach and Dade Counties in 1915. At that time, the population was 4,763 (Florida State Census). In 2010, the Census estimated the population of the County to be 1,748,066 making it the second most populated county in the State after Miami-Dade (2010 Census Data). The University of Florida's Bureau of Economic and Business Research (BEBR), 2018 estimate lists the County's population at 1,873,970.

In land size, the County contains more than 1,225 square miles, however, only the eastern third of the County (approximately 422 square miles) is urbanized. The remaining two-thirds of the County is composed of wetlands that constitute a large part of the Everglades WCAs. This portion of the County is actively undergoing the planning and construction related to restoration of the Everglades, the largest natural system restoration effort in the world. With a population of nearly 1.8 million living on approximately 422 square miles of relatively low-lying developable urban land, the population density of the County is approximately 4,200 people per square mile.

Balancing Everglades restoration efforts and climate change impacts with our growing communities presents the County with significant water resource planning challenges. However, Broward has long recognized that water is a shared regional resource and that effective and efficient water management requires Countywide and regional coordination. To this end, the County is a founding member of the Southeast Florida Regional Climate

Change Compact and board member of the Resilient Utility Coalition to ensure sustainability of the water resources in our region.

Southeast Florida is widely considered one of the most vulnerable regions with respect to the impacts of climate change and sea level rise. This is largely the result of several unique geographic characteristics, which include low land elevations, flat topography, a porous geology, and dense coastal development. In combination, climate change and sea level rise are expected to present significant challenges relating to water resource planning, management, and infrastructure for communities throughout the region, which includes Palm Beach, Broward, Miami-Dade, and Monroe Counties. These communities have agreed to partner in regionally-coordinated climate mitigation and adaptation strategies as part of the Southeast Florida Regional Climate Change Compact (SEFRCCC) and have jointly developed and adopted a Regional Climate Action Plan (RCAP 2.0), including 142 recommendations in twelve primary focal areas, with 21 specific to the focal area of "Water", Table WS1 below. These recommendations are intended to meet the goals of advancing water management strategies and infrastructure improvements needed to mitigate for adverse impacts of climate change and sea level rise on water supplies. Recommendations are incorporated throughout this 2020 Work Plan and related comprehensive planning element updates.

Table WS1 **Water Supply Recommendations from the Regional Climate Action Plan 2.0** [1]

[1]WS-1	Develop and share new water management information, methods, technical capabilities, and trends addressing key climate variability and sea level rise concerns through the Compact's collaborations with state and federal agency partners and academic institutions, as well as through the RCAP. Establish a method for a periodic exchange of ideas between water resource managers, policymakers, stakeholders, scientists, and researchers in collaboration with the Compact, the South Florida Water Management District, and local academic partners.
WS-2	Ensure all water resource policy, planning, and management decisions in the Lower East Coast Water Supply Planning Area are consistently aligned with: a) the latest Southeast Florida unified sea level rise projections; b) regional climate scenarios for planning (e.g., storm surge, design storm events); and, c) hydrologic models used in adaptation planning, from local to regional scales. Ensure all water resource policies consider regional water management issues, including flooding and water variability. For flooding, use impact assessments for observed and predicted climate variability on the frequency, duration, and intensity of flooding connected to sea level rise, extreme tidal excursions, storm surges, and 100-year rainfall events. Use impact assessments to determine where impacts will likely be greatest. For water availability, examine the effects of climate change and sea level rise on water availability and groundwater vulnerability to saltwater intrusion, based on potential changes in precipitation and evapotranspiration patterns and associated extreme drought and flood events.
WS-3	Encourage the South Florida Water Management District to integrate potential future climate conditions, sea level rise scenarios, and potential impacts to water quality and supply into the regional water management models used to support the Lower East Coast Water Supply Plan, environmental resource permitting, and consumptive use permitting.

WS-4	Ensure consistency in efforts to map saltwater intrusion across the region to create better information and improve management decisions for protecting regional freshwater aquifers. Coordinate the methodology and schedule for the saltwater intrusion mapping used to maintain and update the regional saltwater intrusion baseline mapping conducted by the South Florida Water Management District and the U.S. Geological Survey, at a minimum of every five years. Utilize saltwater intrusion models and validated data to identify wellfields and underground infrastructure at risk of contamination or infiltration by saltwater due to rising sea levels.
WS-5	Coordinate among city and county government public works agencies, water utilities, and other operators of water infrastructure to develop and maintain local and regional inventories of existing potable water supply wellfields, treatment and distribution systems, wastewater treatment and collection infrastructure, and septic tanks and drain fields. Assess the potential for climate change impacts on each component of water infrastructure under different climate change scenarios and develop adaptation strategies for affected systems, including infrastructure that may require replacement, reinforcement, or relocation to ensure the long-term viability of the system.
WS-6	Track the climate resilience projects for water infrastructure being designed and built by local governments and utility districts across Southeast Florida to aid local peer learning. Develop a regionally coordinated geodatabase to illustrate and catalog local and regional resilience projects, planning tools, and infrastructure investments, and a formal data management strategy for water infrastructure projects that could be scaled in the future to include other infrastructure (e.g., communications, transportation, and energy).
WS-7	Modernize permitting, planning, and design standards for development and infrastructure improvements to drainage systems, surface water management systems, and finished floor elevations based on updates to groundwater table maps, flood elevation maps, and tidal elevations. Prioritize design standards that maintain project compatibility, infrastructure connectivity, and level of service under potential future climate conditions.
WS-8	Coordinate with the South Florida Water Management District and local public officials to request a comprehensive assessment of the Central and South Florida flood control system by the U.S. Army Corps of Engineers. Determine the regional flood control system's performance under potential future climate conditions based on the U.S. Army Corps of Engineers' comprehensive assessment. Develop a resilience strategy that will ensure existing levels of service are maintained or improved under future conditions.
WS-9	Advocate for an update of the Florida Department of Environmental Protection's Stormwater Management Rule, "SFWMD Environmental Resource Permit Applicant's Handbook – Volume II," through the Southeast Florida Regional Climate Collaborative Policy advocacy process. Advocate for rule changes that integrate potential future climate conditions and stormwater harvesting initiatives in permitting criteria at all levels, including average wet season groundwater elevations; unified sea level rise projections; and intensity, duration, and frequency curves.
WS-10	Continue to utilize a combination of inundation maps and stormwater models to identify areas and infrastructure at increased risk of flooding. Evaluate the potential impacts of changes in groundwater levels on wastewater and stormwater systems (including septic systems, wastewater collection, and conveyance and storage systems), with consideration of water quantity and quality (including public health-related metrics). Use the results of the above-stated analyses as the basis for site planning and regulation, and for identifying and prioritizing adaptation needs and strategies.

WS-11	Promote the development of green infrastructure and alternative, net-zero greenhouse gas emission strategies for water supply, stormwater, and wastewater management focused on achieving a balance between water availability and consumption, limiting energy use to the amount produced on-site via renewable energy, and eliminating solid waste sent to landfills. Create comprehensive strategies to advance the multiple benefits and sustainability of services provided by net-zero practices.
WS-12	Coordinate across regional, state, and federal agencies to develop and apply appropriate hydrologic and hydraulic models to further evaluate the efficacy of existing water management systems and flood control and drainage infrastructure under variable climate conditions. Quantify the capacity and interconnectivity of the surface water control network and develop feasible adaptation strategies. Develop common data standards and database protocol for maintaining water management system components.
WS-13	Convene forums to promote a joint assessment and planning strategy involving local water utilities, wastewater service providers, water managers, and partners to the Southeast Florida Regional Climate Change Compact for coordinated consideration of: a) stormwater use and disposal; b) rainfall-derived inflow and infiltration; c) traditional and alternative water supplies; d) wastewater disposal; e) expansion of reuse and water conservation measures (e.g., maintaining adequate aquifer levels and minimizing the use of potable water for irrigation purposes); and, f) amendments to applicable development codes and regulations. Develop local integrated water management plans based on joint assessment and planning strategies.
WS-14	Undertake a comprehensive evaluation of stormwater improvements necessary to expand surface water storage, enhance water quality treatment, and reduce stormwater discharges in the delivery of flood protection needs and environmental priorities for the Everglades and estuarine and coastal ecosystems. Improve stormwater management through distributed storage, integrated stormwater systems, and additional best management practices.
WS-15	Encourage collaborative programs with local universities—including the Compact's partnership with the Florida Climate Institute—to improve community and stakeholder communication and education efforts regarding potential local and regional climate change impacts. Build partnerships and technology exchanges with public, private, academic, domestic, and international partners to bring additional experience and innovation to resilience planning, projects, and decision support. Continue to encourage, foster, and support collaborative investigative work and scientific research that improves water resource management, including: a) downscaling global climate models to represent precipitation patterns at the regional and local scale and to develop standardized precipitation scenarios for the region; b) identifying and targeting gaps in monitoring and data availability (e.g., light detection and ranging, environmental and water quality data, or data supporting regional climate indicators) to improve the quantification of the hydrologic system and its response to climate change (e.g., evapotranspiration, surface and groundwater levels, water quality, precipitation, and local sea level) through local program efforts, agency collaborations, and advocacy for additional state and/or federal resources, as needed; and c) developing integrated risk-based decision-support tools and processes for application in the analysis and selection of infrastructure design, water resource management, natural systems management, and hazard mitigation alternatives. Tools should facilitate the consideration of the potential economic costs of comparative planning scenarios, management decisions, and infrastructure investments, as well as the evaluation of potential trade-offs.

WS-16	Cultivate partnerships with regional, federal, and state agencies and professional associations with expertise in integrated water resource planning as sources of important research, including: a) the U.S. Army Corps of Engineers Institute for Water Resources; b) the United States Geological Survey; c) the Environmental Protection Agency; d) the National Oceanic and Atmospheric Administration; and, e) water foundations..
WS-17	Identify, incorporate, and prioritize preferred climate adaptation improvement projects pertaining to water supply, wastewater systems, stormwater management, and flood protection as part of capital improvement plans. Develop projects, pursue funding options (including independent funding mechanisms), and implement projects.
WS-18	Coordinate the implementation of innovative water management technologies across multiple jurisdictions as part of piloted solutions to foster shared investments. Facilitate knowledge sharing about the results, costs, and savings from management technologies. Scale successful cross-jurisdictional technologies to reduce the potential for redundant investments and achieve economies-of-scale while fairly distributing costs and benefits across multiple project beneficiaries.
WS-19	Identify existing underperforming infrastructure and implement adaptable infrastructure strategies that facilitate targeted investments, allow managed performance, and achieve greater flexibility in system operations.
WS-20	Continue to support the Comprehensive Everglades Restoration Plan (CERP) and its updated versions as fundamental to Everglades restoration. Contribute to the ongoing implementation of CERP and updates to implementation plans (such as the Integrated Delivery Schedule) through the South Florida Ecosystem Restoration Task Force and relevant working groups. Publicize the role of CERP as a regional climate resilience strategy, particularly as a way to increase freshwater flows to the Everglades system, which improves water quality, maximizes regional freshwater storage and aquifer recharge, and creates the potential to abate saltwater intrusion, an increasingly important effort under variable climate conditions and in the face of sea level rise.
WS-21	Develop new and combine existing land acquisition priorities in a regional setting to protect, preserve, and enhance water storage. Develop regional and distributed surface water storage (e.g., C-51 Reservoir Project and interconnected urban systems) to increase the potential for stormwater capture and reuse for water supply, aquifer recharge, flood management, and environmental benefits.

1. Source: Water Supply Recommendations from the Regional Climate Action Plan 2.0 https://southeastfloridaclimatecompact.org/recommendation-category/ws/)

The Resilient Utility Coalition established in 2016 seeks to advance utility infrastructure resiliency efforts and provide essential value to its members and partners. The Resilient Utility Coalition provides leadership in assessing and adapting utility operations to address risks and improve water management decision-making in the face of climate uncertainty. In its strategic plan, it has also prioritized the concept of One Water including the development of the One Water Academy.

Recognizing that water is a shared resource, the One Water approach, promoted by the U.S. Water Alliance, is essentially an expanded version of integrated water resources planning and envisions managing all water in an integrated, inclusive, and sustainable manner to secure a bright, prosperous future for our children, our communities, and our

country. One Water approaches are progressing in multiple arenas: from using advanced technologies to recover nutrients and energy from wastewater; to using green stormwater techniques to mitigate flooding while beautifying neighborhoods; to undertaking watershed-level planning and collaboration to address water quality issues; to implementing innovative financing and partnership models.

B. Broward County-Wide Integrated Water Resource Plan

In 1997, Broward County initiated its IWRP to improve the effectiveness and efficiency of local water management. The principle of the IWRP is that water should be viewed as a regional resource, independent of municipal and utility service area boundaries.

Broward's IWRP, approved by the County Commission in 2010, has four main objectives:

- To make the most of local water resources, so that Broward's long-term water supply needs are met;
- To coordinate a diverse water management community, ensuring the efficient and effective management of Broward's water resources;
- To match up local water sources and users to ensure that water supplies are available when and where they're needed; and
- To diversify water supplies so that the needs of urban and natural systems are met under wet and dry conditions.

A fifth objective was added in the 2019 IWRP Update: Promote water resources resiliency by evaluating future conditions, including potential climate impacts, and adopt strategies to mitigate, adapt, and prevent disruptions to our overall goal of more efficient and effective water management.

Successful implementation of the plan requires coordination amongst a diversity of stakeholders including water managers, utility directors, drainage districts, and state and local government entities. The water management community in Broward County consists of 27 water providers, 23 special districts and 15 wastewater providers across 31 municipalities, Table WS2 below.

Table WS2 Lists of Municipalities, Utilities, and Districts in Broward County

Broward County Municipalities (https://en.wikipedia.org/wiki/Broward_County,_Florida)				
City of Coconut Creek	City of Cooper City	City of Coral Springs	City of Dania Beach	Town of Davie
City of Deerfield Beach	City of Fort Lauderdale	City of Hallandale Beach	Town of Hillsboro Beach	City of Hollywood
City of Lauderdale Lakes	Town of Lauderdale-by-the-Sea	City of Lauderhill	Village of Lazy Lake Village	City of Lighthouse Point

City of Margate	City of Miramar	City of North Lauderdale	City of Oakland Park	City of Parkland
Town of Pembroke Park	City of Pembroke Pines	City of Plantation	City of Pompano Beach	Village of Sea Ranch Lakes
Town of Southwest Ranches	City of Sunrise	City of Tamarac	City of Weston	City of West Park
City of Wilton Manors				
Potable Water Providers (SFWMD 2018 LEC Update-Appendix A)				
Broward County-District 1	Broward County District 2	Broward County District 3	Cooper City	Coral Springs
Coral Springs Improvement District	Dania Beach	Davie	Deerfield Beach	Fort Lauderdale
Hallandale	Hillsboro Beach	Hollywood	Lauderhill	Margate
Miramar	North Lauderdale	North Springs Improvement District	Oakland Park	Parkland Utilities, Inc.
Pembroke Pines	Plantation	Pompano Beach	Royal Utility	Seminole Tribe of Florida
Sunrise	Tamarac	Tindall Hammock Irrigation and Soil Conservation District		
Drainage / Water Control Districts				
Bonaventure Development District	Broward County Water Control District #2	Broward County Water Control District #3	Broward County Water Control District #4	Central Broward Water Control District
Cocomar Water Control District	Coral Bay Community Development District	Cypress Cove Community Development District	Indian Trace Development District	Lauderdale Isles Water Management District
North Lauderdale Water Control District	North Springs Improvement District	Oakridge Community Development District	Old Plantation Water Control District	Pine Tree Water Control District
Plantation Acres Improvement District	South Broward Drainage District	Sunshine Water Control District	Tindall Hammock Irrigation and Soil Conservation District	Turtle Run Community Development District
Twin Lakes Water Control District	West Lake Community Development District			
Wastewater Providers				
Broward County North Regional	Cooper City	Coral Springs Improvement District	Town of Davie	Ferncrest
Fort Lauderdale – G.T. Lohmeyer	Hollywood	Margate	City of Miramar	City of Pembroke Pines
Plantation Regional	Sunrise No. 1 (Springtree)	Sunrise No. 3 (Sawgrass)	Sunrise Southwest	

The work of the Water Resources Assessment Program within Broward County's EPCRD provides vital information and guidance that support the programs in the Broward County IWRP and the development of AWS sources such as water reuse, harvesting of excess

stormwater (C-51 Reservoir Project), the use of the Upper Floridan Aquifer, ASR, and secondary canal integration. Among these urban water strategies, Broward County has prioritized water conservation as the least costly effort to offset future water demands. The technical assessment of these projects and planning for future mitigation strategies against climate change are investigated through several robust hydrologic models, developed over many years and with significant municipal partner support.

Water Reuse in Broward

Broward County has focused on the advancement of beneficial reuse and, in 2014, developed the Regional Reuse Master Plan in coordination with its regional partners. This effort included the active participation of local municipalities, water managers, water and wastewater utilities, local planning agencies, Florida Department of Transportation, and other state and regional agencies. This plan sets the foundation for the long-term implementation strategy to further regional reclaimed water development through several innovative and dynamic planning tools. The plan data was updated in 2018 and report design was modernized from a paper document to digitally interactive. The plan is now delivered to our regional partners in the new interactive online format. The Regional Reuse Master Plan and Implementation Strategy support a cost-effective, regional approach for the development of beneficial reuse throughout the County's water and wastewater providers.

The objective is to advance cost-effective development of reclaimed water initiatives through coordinated planning and implementation. The Plan is designed to:

1. Provide coordination and support among Broward County, state agencies, water and wastewater treatment providers, and municipalities to deliver, update, and maintain a comprehensive database of existing and planned reclaimed water infrastructure.
2. Coordinate the installation of reclaimed water lines for recommended projects with public works projects such as transportation improvements, stormwater and other wastewater improvement projects that may be necessitated through local, state, and federal permitting requirements.

To support this strategy, IWRP grant funds provide preferential funding consideration for those projects that are contained within and are consistent with the Reuse Master Plan. Feasibility and design projects as well as construction projects are granted bi-annually as available funds allow. Permitting incentives include the potential reuse credit that the SFWMD could allow as an offset to increase traditional water sources withdrawals in a CUP.

Additional financial incentives may be available through state funding as indicated in Section 373.1961(3)(f)(6), F.S., that provides encouragement for projects in which the construction and delivery to end users of reuse water is a major component. This statute requires governing boards to give such projects significant weight when selecting AWS projects for funding under Section 403.89, F.S.; Water Protection and Sustainability Program (Florida Department of Environmental Protection [FDEP], 2016).

Requirements of the outfall program include a functioning reuse system that reuses a minimum of 60 percent of the facility's actual flow on an annual basis installed no later than December 31, 2025. State or the SFWMD funding assistance must give first consideration to water supply development projects that replace existing sources or implement reuse projects to eliminate ocean outfalls. Broward County is planning to meet the 60 percent reuse requirement by expanding its public access irrigation in Northern Broward and Southern Palm Beach Counties, including expanding reuse systems in the Cities of Pompano Beach and Coconut Creek and North Springs Improvement District which is described in more detail below under the Data and Analysis section of this report.

C-51 Reservoir Project

Over the past decade, the SFWMD, Lake Worth Drainage District, Palm Beach Aggregates, local governments, water managers, and public water supply utilities from Broward and Palm Beach County jointly investigated the feasibility of a regional reservoir to capture and store excess surface water runoff discharged to Lake Worth Lagoon, primarily during wet weather conditions, and release into the C-51 Canal during dry periods to meet water demands.

The C-51 Reservoir project is a public-private partnership for the construction of 60,000 acre-feet of storage for use as an AWS source in Southeastern Florida. Diversion and improved management of freshwater flows was formally identified as a priority restoration strategy for the Lake Worth Lagoon dating to the 1992 Restudy of the C & SF Flood Control Project. C-51 Reservoir Project is presented at the 2018 LECWSP as an AWS source to meet with regional projected 2040 water demands.

C-51 Reservoir Project location is adjacent to the SFWMD's existing L-8 Flow Equalization Basin in Palm Beach County and is expected to share the same impermeable geologic formation that provides for significant inground ground storage capacity with limited seepage losses or additional construction requirements. The initial intended purpose was to capture excess stormwater discharged to the Lake Worth Lagoon via the C-51 Canal. Currently, the benefits of this proposed project include:

- Reduces harmful water quality and quantity discharges to the Lake Worth Lagoon via the S-155 structure.
- Supports water quality improvements in the Everglades Protected Areas by offering additional storage and, in conjunction with the L-8 Flow Equalization Basin, optimizing flows to the Stormwater Treatment Areas (STAs).
- Operated in conjunction with the L8 Flow Equalization Basin, could aid the SFWMD in meeting objectives of the Loxahatchee River Watershed Restoration Project.
- Opportunity to improve water quality delivered to the STAs via blending with the L8 Flow Equalization Basin water.
- Mitigates stormwater impacts and flooding for Western and Central Palm Beach County.
- Mitigates for saltwater intrusion and protects wellfields in coastal communities.
- Serves as a regional AWS source.
- Supports water resource protection and potential adaptations strategies considering sea level rise and during drought.

Among economic benefits, there are:

- Provides "Economies-of-Scale" as a regional water resource development project providing diverse benefits to the region.
- Capitalizes on the current construction and engineering work on the existing L-8 Flow Equalization Basin, including the use of the L-8 Flow Equalization Basin's intake structure and pumping facilities.
- The SFWMD will operate and maintain the C-51 Reservoir Project in conjunction with the L-8 Flow Equalization Basin, resulting in operational coordination and reduced costs.
- Provides a cost-competitive solution relative end-of-pipe water quality treatment, environmental degradation and economic losses, impacts of flooding, and the costs of alternative water supplies and treatment technologies.
- Capitalizes on current mining activities and construction of rock pit.
- Relies largely upon existing conveyance infrastructure.
- Reduces longer-term need for new water infrastructure and energy-intensive treatment technologies.

Hydrologic modeling indicates the ability to capture enough basin runoff to reduce excess stormwater flows from the western C-51 Basin flows to the Lake Worth Lagoon by approximately 40% with a concomitant reduction in associated nutrient loads. Excess stormwater capture in the C-51 Reservoir Project can be later redistributed through the

existing canal network for the benefit of providing aquifer recharge and helping to sustain regional water resources. The C-51 Reservoir Project is modeled to support approximately 150 million gallons per day (MGD) in stormwater reuse for beneficial purposes while achieving critical water quality improvements in the Lake Worth Lagoon.

In January 2017, the SFWMD designated the C-51 Reservoir Project Phase 1 as a pilot AWS development project, pursuant to Section 373.037, F.S. public water supply utilities have executed agreements with the property owners to purchase capacity as part of total reservoir storage. The utilities have received or are processing modifications to their water use permits to reflect this AWS source as a means for meeting future demands.

The mining operation for Phase 1 is complete and designed to store an estimated 14,000 acre-feet of surface water and provide 35 MGD of canal/SAS recharge near public water supply withdrawals. The FDEP has issued a diversion and impoundment consumptive use permit and an environmental resource permit for construction and operation of Phase 1. Phase 2 of the project could provide an additional 46,000 acre-feet of storage, most likely for natural systems [Section 373.4598, F.S.]. The FDEP has issued a conceptual environmental resource permit for Phase 2.

Additionally, water routed south to the Hillsboro Canal could be redistributed to recharge local canals and drainage districts in Broward County, pursuant to an operations and maintenance agreement between the SFWMD and Palm Beach Aggregates and implemented through an operating plan with the SFWMD (under development) or other local water control districts.

To date, agreements have been executed for 20 MGD of storage capacity out of the available 35 MGD of storage capacity in Phase 1: Broward County (6 MGD); Sunrise (5 MGD); Hallandale Beach (1 MGD), Dania Beach (1 MGD), Margate (2 MGD), Fort Lauderdale (3 MGD) and Pompano Beach (2 MGD). Palm Beach Aggregates has indicated that construction financing will move forward based on the signed agreements for 20 MGD of storage capacity. Construction financing is anticipated to be available by August 31, 2020 with construction completed within approximately 24 months following financing. Permitting for each of these participants is in various stages but not yet complete. In 2017, the Florida Legislature approved the project as a priority water supply project under enabling legislation Senate Bill 10. Phase 2 would expand the project area to include 46,000 acre-feet of storage and potentially another 115 MGD, which is envisioned for environmental purposes. Senate Bill 92 (2019) clarified language and the intent of the project and allowed the SFWMD to negotiate for any portion of the project not already committed to partners for water supply.

Floridan Aquifer

As an AWS, the expanded use of the Floridan Aquifer system is currently being investigated with respect to its long-term viability as a water supply resource through additional

modeling and studies. Broward County has, in cooperation with USGS, completed Phase 1 Feasibility Study of the Upper Floridan Aquifer in March 2014. The study compiled all available well information and commissioned a new well (G-2984) to be drilled, cored, and logged. Using borehole and core sample data (84 wells at 33 sites), the hydrogeologic framework of the Floridan Aquifer system in Eastern Broward County was delineated. This effort helped to construct unique cross-sections and maps representing the stratigraphic and hydrogeologic units of the Floridan Aquifer system in urban Broward County. An additional component of the project was to complete seismic profiling along approximately 14 miles of the Hillsboro Canal, which resulted in seismic reflection data that were then correlated to the borehole geophysical data (Reese et al., 2014).

The results offer better definition of the stratigraphic and hydrogeologic characteristics of the aquifer, which will improve upon the selection of new well locations or for water storage options, such as ASR. Building on the successful use of seismic profiling in the first study, Phase 2 of this Feasibility Study was commissioned and completed in 2017 (Cunningham et al., 2018). It further refined the hydrogeologic framework and regional extent of information by collecting 80 miles of high-resolution seismic profiles from canals in Broward County along with well logs and cores or cutting from 44 wells. Mapping of the Oldsmar, Avon Park, and Arcadia formations was completed over the 425-square mile study area. In addition, many unconformities that might identify faults that are either near-vertical reverse faults or karst collapse structures throughout the County. Water utilities in these areas may consider further studies around these features when planning project near their vicinities.

The SFWMD also completed limited water supply modeling of the Floridan aquifer as part of the 2018 LEC plan update. The model included an allocation of 3.0 MGD for BC 2A/NR by the year 2040. This pumping stress and other pumping in the region resulted in a drop of 5.1-10 ft in groundwater levels over 2016 levels but no impact to water quality (chloride levels) in the Upper Floridan region where the wells would be placed. Although initially positive for Floridan development, model results would have to be rerun with current planned rates and well sites should BC go forward with the utilization of the Floridan which is not necessary at this time.

District 2A Aquifer Storage & Recovery (ASR)

In 1993, a permit to construct an ASR well at Broward County District 2A WTP was submitted to FDEP. The system was designed to inject treated water into the upper Floridan aquifer at approximately 1,100 feet below land surface. Water Quality Criteria Exemptions for color, iron and total dissolved solids were obtained. Five testing cycles were completed as shown in Table WS3 beginning in 1998 and completing six years later. Cycle test results provided

in Table WS4 are varied but, generally average around 30 percent in the larger cycles (Hazen & Sawyer, 2004).

Table WS3 District 2A ASR Cycle Testing [1]

Cycle	Recharge (days)	Storage (days)	Recovery (days)
Cycle 1: July 9, 1998 to July 21, 1998	11	0	1.5
Cycle 2: July 27, 1998 to November 12, 1998	91	0	17
Cycle 3: November 13, 1998 to	87	9	21
Cycle 4: November 12, 2003 to December 31, 2003	30	0	20
Cycle 5: January 1, 2004 to March 3, 2004	33	0	29

1. Source: Hazen & Sawyer Technical Memorandum Broward County Office of Environmental Services 2A Water Treatment Plan – Aquifer Storage and Recovery, dated October 6, 2004.

Table WS4 District 2A ASR Cycle Testing Results [1]

Cycle	Rate In (MGD)	Volume In (MG)	Rate Out (MGD)	Volume Out (MG)	Percent Recovery (%)
1	2.01	22.13	1.00	1.50	6.8
2	2.15	195.84	2.16	36.65	18.7
3	2.14	185.94	2.98	56.62	30.5
4	1.79	53.74	0.61	12.18	22.7
5	1.85	61.19	0.59	18.27	29.9

1. Source: Hazen & Sawyer Technical Memorandum Broward County Office of Environmental Services 2A Water Treatment Plan – Aquifer Storage and Recovery, dated October 6, 2004.

According to the Hazen & Sawyer 2004 Technical Memorandum, percent recoveries of between 75 and 90 percent are needed for an ASR well to be viable for use. The memorandum cites the casing setting depth as one of the possible causes for low recovery percentages during cycle testing. Additionally, the District 2A ASR well was limited by the Broward County Health Department to an initial recovery chloride concentration of 225 milligrams per liter (mg/L) which limited the recovery volume significantly. The chloride limitation was later increased to 1,000 mg/L but, the well was no longer in use. When the well came up for Class V permitting with FDEP in 2013, Broward County made the decision based on the ASR well percent recovery and permitting costs to abandon the ASR well.

Site 1 Hillsboro ASR

ASR is a recognized AWS technology and can serve as an effective component of an integrated water management system. The Site 1 Hillsboro Aquifer ASR project was originally designed, constructed, and tested over an 18-year period as a potential component of CERP. The project required the collaboration of a multiagency, multidisciplinary team of hydrogeologists, engineers, and environmental scientists. The Hillsboro ASR system was built to capture excess surface water from the Hillsboro Canal, store it in the Upper Floridan Aquifer, and recover stored water back into the Hillsboro Canal when surface water levels are low. The ASR well was constructed in 1999/2000 and consisted of a 24-inch diameter casing completed to a depth of 1,015 feet below land surface in the Upper Floridan Aquifer. The surface facilities were constructed between 2006 and 2007 and consisted of an intake/discharge structure, screen filters, UltraViolet disinfection units, pumps, piping, valves, electrical controls, and meters. The well was designed to recharge and recover approximately 5 MGD of surface water.

Initial background water quality was collected and analyzed in 2008 prior to cycle testing. Cycles 1, 2, and 3 were performed between 2010 and 2012. The well remained inactive between 2012 and 2016. A second background water quality sampling was performed in 2016 and Cycle Test 4 (SFWMD 2018) was completed in 2017. The below is a summary of the testing conclusions.

- During recovery, the ASR well was to flow freely back to the Hillsboro Canal under artesian pressure at a flow rate of 2 MGD.
- The recovery efficiency for Cycle 4 was approximately 60 percent, greater than previous cycles.
- Water quality data indicated that recharge water mixed and diffused with Upper Floridan Aquifer groundwater at distances of 330 and 1,010 feet away from the ASR well.
- Recovered water had an initial arsenic concentration of 25 parts per billion (ppb), which decreased to less than 10 ppb after 3 weeks.
- Arsenic was not detected at distance from the ASR well during the recovery period.

The SFWMD approached BCWWS following the completion of Cycle 4 to suggest a limited operation of the well facilities to support urban water supply demands. Due to the age and required maintenance of the surface facilities, the permit requirements, and the need to continue building a storage zone with hope of improving the well recovery efficiency, BCWWS declined the offer of limited operation.

Secondary Canal Integration

Secondary canal integration remains a relatively attractive urban water management strategy given the vast network of canals that exist in Broward County and the relatively inexpensive infrastructure (culverts, pumps, etc.) required to implement greater integration of the system. Although progress has been made on the Northern Broward County Recharge System, it has not yet been completed. There are three identified projects that need to be completed to integrate the system:

- The C-1/C-2 Interconnect near Sample Road and the CSX Railroad. The project has been designed and construction funding is being sought.
- The study of a potential C-4 Interconnect between north and south Tradewinds Park was completed and it was determined that the environmentally friendly directional drilling project is not financially feasible at the present time.
- The C-7 Interconnect just north of Sample Road in the Coconut Creek Main Street Project will coincide with development of the area. The basin divide control structure is being constructed with the development of the parcel just to the north of Sample Road. The interconnect will be complete when the final canal segment is built with the development of the remaining farmland.

Depending upon the final routing of water deliveries associated with development of the C-51 reservoir project, additional construction may be required in the central and southern parts of the County to further integrate the system.

Water Use Efficiency/Conservation

The County has implemented diverse water conservation initiatives to protect the quantity and quality of Broward's existing and future water resources to help meet our current and projected demands. Consistent with this objective, the County has implemented a broad set of water conservation programs under the "Water Matters" campaign which are designed to produce long-term demand reductions along with improvements in water quality. These programs, targeted at various user groups, include: NatureScape Broward, Know the Flow, Water Matters Day, Conservation Pays, NIS, and the NatureScape Broward School Board Environmental Partnership Agreement. The overall goal of the Water Matters programs is to reach a sustained minimum 10% reduction in water use Countywide over 20 years. Further support for water conservation is found in other conservation-oriented measures, including changes to the Florida Building Code for cooling towers and high efficiency plumbing devices, year-round irrigation measures, model irrigation codes, Go Green Sustainability Programs, and other water conservation policies and regulations. The water conservation initiatives are listed below.

- Conservation Pays Program. This effort was launched in 2011 in collaboration with 18 partners to provide a coordinated regional campaign focused on water conservation and the distribution of rebates and other incentives. Rebate dollars are used for the replacement of older, wasteful toilets in addition to the distribution of other water efficient fixtures and devices such as aerators and commercial pre-rinse spray valves. A consistent marketing and media campaign advances water conservation efforts as part of the Commission's value of encouraging investments in renewable energy, sustainable practices, and environmental protection. Additional Commission support is promoted by the goal to increase water quality protection efforts and lead creative approaches to water storage and aquifer recharge, as well as diversification of water supplies regionally. To date, the program has saved more than two billion gallons of water.
- NatureScape Irrigation Services. Launched in 2005, the NIS is implemented by the EPCRD with cost-share provided by BCWWS and 18 local water utilities. The program targets large water users, including government facilities, parks, schools, and homeowner associations, where the greatest potential exists for significant water savings. To date, water savings exceed one and a half billion gallons with over 3,000 irrigation system evaluations. Best management practices that encourage the 'right plant in the right place' and smart irrigation help to promote water conservation messaging that adds to long-term water savings.
- NatureScape Broward Program. Launched in 2003, the NatureScape Broward program promotes water conservation, water quality protection, and the creation of wildlife habitat through Florida-friendly landscape practices that encourage the prudent use of water resources, and the planting of native, non-invasive and other drought-tolerant plants in Broward County. Broward County was the first county in the U.S. to be certified under the Community Wildlife Habitat program. In addition, there are 14 certified and 9 registered County municipalities and over 4,500 landscapes that have been certified to date.

Technical Water Resources Assessment

The numerical hydrologic models developed within the IWRP program provide for informed decisions and sustainable investments essential for comprehensive and integrated water resource management strategies throughout Broward County and the LEC planning region.

In 2006, Broward County's EPCRD contracted with the USGS to develop a numerical model to evaluate to various influencing factors on the saltwater movement within the Biscayne Aquifer in the northern third of the County. This tool was proven to be effective in

representing historic and future conditions and was demonstrated to have utility as a planning tool for future water resources projects and development of resilience strategies. This modeling effort was subsequently expended to the central and southern portions of the County to simulate historic saltwater intrusion and to test the extent to which wellfield pumpage, surface water management and sea level rise contribute to and influence the movement of saltwater and how the aquifer can be expected to respond to future climate conditions. The tool also investigates the implications on the viability of water supplies and can be used to identify and test possible adaptive strategies.

The County is also enhancing this investment with concurrent development of an Inundation Climate vulnerability model focused on coupled hydrologic impacts of saltwater intrusion, surface and groundwater elevations, and stormwater inundation. This model, developed in cooperation with USGS, builds upon the County's Variable Density Model to assess the influence of changing climatic conditions on urban water resources and infrastructure. The initial effort integrated bias-corrected, dynamically downscaled data from Global Circulation models into the updated surface/groundwater model for predictions Countywide. A smaller study of the County was later refined using SWR and URO components that offered more detailed conceptualization of the surface/groundwater interactions, used to assess the predictive scenarios and comparison of alternative water resource strategies. Based on the successful implementation of the SWR and URO packages, Broward County is currently partnering with USGS to advance the expansion of the two packages throughout the entire urban extent of the County.

In February 2017, Broward County approved the creation of a Future Conditions Map Series in the Broward County Code of Ordinances and, effective July 01, 2017, adopted the first regulatory map of the series, the Future Conditions Average Wet Season Groundwater Elevations Map. The approved map ensures that future climate conditions are accounted for in the design and construction of local surface water management systems and that future investments will deliver the necessary level of flood protection and water quality treatment necessary for the duration of the expected useful life of both public and private investments. This map provides an important basis for advancing the resiliency standards and investments needed across our entire region, as it provides a model for the establishment and application of modernized standards based on the integration of science and technology in policy and planning and community buy-in achieved through a comprehensive public process.

The calculated average groundwater elevation is based on model outputs for the wet season months of May through October over a ten-year period of 2060-2069. The models used to simulate average future conditions were the Broward County Inundation Model

and the Broward County Northern Variable Density model, both developed in cooperation with the USGS. The future conditions applied in the modeling process consist of both precipitation and sea level rise. The future precipitation pattern is based on the Center for Ocean-Atmospheric Prediction Studies downscaled Community Climate System Model global model and represents an increase of 9.1% rainfall from the base case of 1990-1999 (53.4 inches/year to 58.2 inches/year). Sea level rise was based on the USACE National Research Council Curve 3, which equates to an increase of 26.6 to 33.9 inches to the future period from 1992 levels.

In the recent restudy of Flood Insurance Rate Maps completed in 2014 by FEMA, the County's MIKE SHE/MIKE 11 model was utilized and updated. The MIKE SHE platform was originally developed to look at surface water groundwater interaction issues beginning with the North Aquifer Drainage Assessment (NADA), which was then extended to the Central Aquifer Drainage Assessment (CADA [2000-2002]) and South Aquifer Drainage Assessment (SADA [2003-2005]). The County then combined the NADA, CADA, and SADA to form the Consolidated Broward County MIKE SHE model. As part of the 2011 Integrated Water Resources Master Management Plan, the consolidated model was updated to run additional water recharge projects to test whether demands for future population projections could be sustained without adverse conditions to the Biscayne Aquifer. In 2018, Broward County began using the results of the FEMA study to calculate 100-year flood elevations that are anticipated to occur in 2070, accounting for sea level rise and more intense rainstorms. The effort includes data collection of recent or previously not included drainage infrastructure, refined model grid and associated LiDAR, land use update, addition of detention storage and ponded drainage routine, model calibration to a recent flooding storm event, and incorporation of future tide levels and a 100-year rainstorm event. It is anticipated the modeling will be completed in the Fall of 2019 and, once approved, will be formalized as the second map of the Future Conditions Map Series.

C. Comprehensive Everglades Restoration Plan

Among the over 60 CERP components, the Central Everglades Planning Project, Broward Water Preserve Areas (WPAs), and Secondary Canal Interconnect.

Central Everglades Planning Project

The USACE states that CEPP "will identify and plan for projects on land already in public ownership to allow more water to be directed south to the central Everglades, Everglades National Park, and Florida Bay." The full project's design will send an approximately 210,000 acre-feet of water south from Lake Okeechobee each year. The WCAs are a major resource affected by this future project. Thus, this regional CERP project is very important locally to

Broward County as its water supply is critically linked to the WCAs. The CEPP was authorized in the 2016 Water Resources Development Act 2016. Currently, the USACE is working on a validation study to implement Phase 1 in the southernmost area that will increase flows to Everglades National Park.

(http://discover.pbcgov.org/wrtf/PDF/Documents/LOSOM_Broward_scoping_comments_17Apr2019.pdf)

Water Preserve Areas

The WPAs are a series of marshes, reservoirs, and groundwater recharge areas along the eastern side of the WCAs in Broward, Palm Beach, and Miami-Dade Counties. In Broward County, the WPA extends along the western urban limits, adjacent to Levees 37 and 68A. The projects within the WPAs are intended to serve multiple uses such as increasing the spatial extent of wetlands, reducing seepage losses from the WCAs, improving water supply and quality, and establishing a buffer between the Everglades and developed areas. The benefits to the County's urban area include: the storage of stormwater runoff; groundwater recharge; management of saltwater intrusion; and increased urban water supplies. The WPAs are in the CERP and were authorized in the 2014 Water Resources Reform and Development Act. The current USACE schedule projects the C-11 component to be constructed by 2023.

(https://usace.contentdm.oclc.org/utils/getfile/collection/p16021coll11/id/2552

The USACE forecasts the WPAs' remaining construction timelines beyond 2023.

Secondary Canal Improvement Project

The Broward County Secondary Canal Improvement Project, as part of the CERP, is a water management project to optimize the integration and operation of the County's secondary canal system and support Everglades restoration by reducing the County's reliance on water from the regional system.

Authorized and to be funded by the U.S. Congress, State of Florida, and local government, the goals of the Broward County Secondary Canal Improvement Project are to capture as much annual rainfall as possible for storage and recharge of the Biscayne Aquifer, to maintain water levels in wetlands, and to stabilize saltwater intrusion. Additionally, through more efficient management of the local water resources, urban demand on the regional system is expected to be reduced, as well as seepage losses from the WCAs, as the project has the potential to raise groundwater levels on the east side of the levee.

DATA AND ANALYSIS

The following section provides information in support of the requirements of Section 163.3177(1)(f), F.S., as outlined:

- All mandatory and optional elements of the comprehensive plan and plan amendments must be based upon relevant and appropriate data and an analysis by the local government that may include, but not be limited to, surveys, studies, community goals and vision, and other data available at the time of adoption of the comprehensive plan or plan amendment. (Section 163.3177(1)(f), F.S.).
- Data must be taken from professionally accepted sources (Section 163.3177(1)(f)2., F.S.) and reacted to in an appropriate way, to the extent necessary as indicated by the data available on that subject at the time of adoption of the plan or plan amendment at issue. (Section 163.3177(1)(f), F.S.).

The planning horizon for the 2020 Work Plan spans 20 years, covering 2020 to 2040.

A. County-Wide Population Analysis

This 2020 Work Plan identifies and analyzes the future water supply needs for the BMSD areas of Broward County, and those areas serviced by BCWWS. The role of the EPCRD is to identify the future water supply needs of BMSD areas of Broward County and to present regional strategies supporting Countywide water supply needs and water resource management. The role of BCWWS is to identify the future water supply needs of their service areas, which include both BMSD areas and incorporated areas, and to determine strategies to meet any unmet demands.

Several of the BMSD areas Figure WS4 are provided water service by BCWWS; hence these areas were included in the BCWWS analysis. For the remaining BMSD neighborhoods, the City of Fort Lauderdale is the largest of the water utility providers while the City of Sunrise is only providing for six residential units. EPCRD has coordinated with the Fort Lauderdale Planning and Zoning Department and the water utility in identifying the current and future water supply needs within their water utility's service area.

Needs assessments were developed based on current utility operations and the existing customer base, compared to population projections through 2040. The population modeling was performed by Broward County Planning and Development Management Division (BCPDMD) using the Broward County Traffic Analysis Zones (TAZ) and municipal forecasts updated in 2017 to develop the projected populations based on the University of Florida's BEBR Bulletin 175, "Detailed Population Projections by Age, Sex, Race, and Hispanic

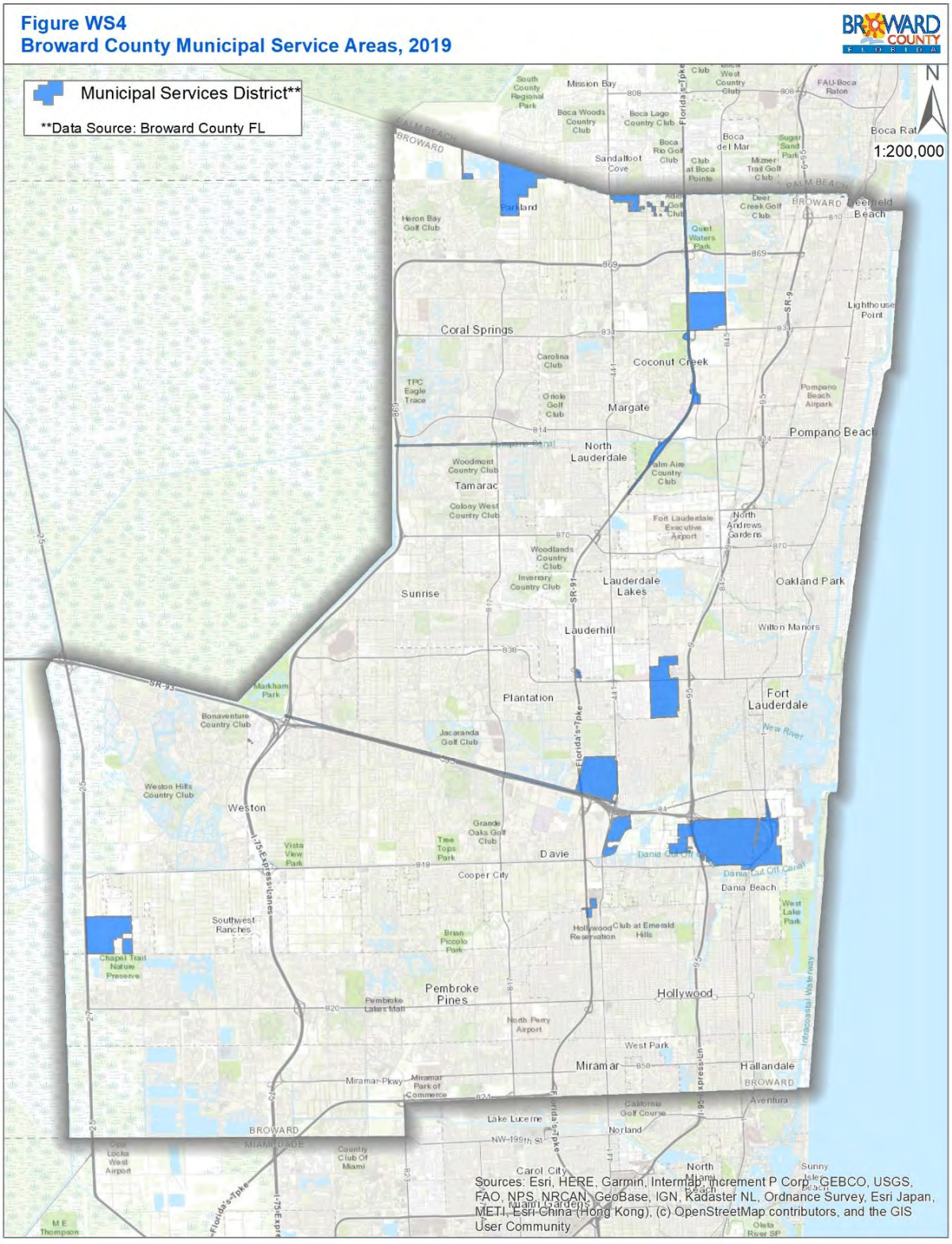


Figure WS4 **Broward County Municipal Service Areas**

Origin, for Florida and Its Counties, 2020-2045, With Estimates for 2015" to Broward County's 2017 Traffic analysis Zones (TAZ) and municipalities. The demographic forecast model update is detailed in, "Broward County and Municipal Population Forecast and Allocation Model (PFAM), 2017 (BCPDMD, 2017) based on the original PFAM developed in 2012 and updated in 2014.

This 2020 Work Plan includes analysis of existing water facilities, current and projected water demands versus water availability and the presentation of the water supply plan for the Fort Lauderdale water utility. Future water demands prepared for this analysis are compared to projected demands presented in the 2018 LECWSP Update, with discussion of any deviations.

BCPDMD is responsible for providing updated population forecasts throughout the County. The Broward County PFAM 2017 update was used to develop County population by jurisdiction. Updated population projections from University of Florida's BEBR Bulletin 178 and the Broward County PFAM 2017 update are summarized below in 5-year increments through 2040, Table WS5 below.

Table WS5 **Broward County Population Projections 2020-2040**

Year	BEBR Population Estimates [1]	BCPDMD Population Estimates [2]	SFWMD Population Estimates [3]
2020	1,914,498	1,894,285	1,931,057
2025	1,989,753	1,990,171	2,029,704
2030	2,052,432	2,051,056	2,109,543
2035	2,111,652	2,110,602	2,175,718
2040	2,158,080	2,156,835	2,232,397

1. BEBR Medium Populations from "Detailed Population Projections by Age, Sex, Race, and Hispanic Origin for Florida and its Counties 2020-2045, with Estimates for 2015, June 2016," 2016
2. BCPDMD Broward County and Municipal Population Forecast and Allocation Model, 2017
3. SFWMD, Lower East Coast Water Supply Plan, November 2018

The percent difference between the BEBR and the BCPDMD projections is no more than one percent. The percent difference between the BCPDMD and the SFWMD projections ranges between 2 and 3 percent from 2020 through 2040. The PFAM is structured using 953 TAZ within 31 municipalities in the County. The BEBR forecasts by age are converted to household using a weighted average of the households by age group data from the 2000 and 2010 Census. The household forecasts are then assigned to TAZ based on: (1) the change in household size distribution; (2) TAZ level distribution of households; and (3) the capacity of each TAZ to absorb additional housing units. BCPDMD also obtained input from the local planning and service delivery entities and referenced the Broward County Land Use Plan to estimated household distributions within TAZ and municipal boundaries (BCPDMD, 2017).

B. Current and Future Served Areas

The current and future served areas for BCWWS and the Cities of Fort Lauderdale and Hollywood are described in the sections below.

BCWWS

BCWWS is one of 25 utilities that provide potable water service within the urbanized area of the County. The utility was created on January 31, 1962, with the County's purchase of a small, investor-owned water and wastewater utility. Between 1962 and 1975, the County acquired several investor-owned systems. Under the County Code of Ordinances, the Broward County Board of County Commissioners exercises exclusive jurisdiction, control, and supervision of the utility system. BCWWS is the County organizational unit directly responsible for the utility.

The water utility delivers potable water to customers in service areas in north, mid, and south County and to one bulk water user. The water utility has grown to serve a population of approximately 239,000. The bulk water user, City of Coconut Creek, accounts for a population of approximately 56,000. Including the City of Coconut Creek, the utility serves about 12 percent of the County's total population. For the year 2017, treated water sold to retail customers equaled about 19 MGD on an annual average basis. Metered water sales to Coconut Creek equaled an additional 5 MGD. Notably, finished water production (treated water at point of delivery) has decreased in recent years. This may be attributable to a downturn in the economy, slowdown in population growth, and the County's water conservation efforts, including year-round irrigation conservation measures. Water conservation became increasingly important following a series of significant drought years, coupled with limitations to the County's traditional water source, and remains a critical initiative.

BCWWS also operates two regional wellfields that provide bulk raw Biscayne aquifer water to Deerfield Beach in north county and Dania Beach, Hallandale Beach, Hollywood and Florida Power and Light in south county through large user agreements.

BCWWS operates three service districts known as District 1, District 2, and District 3. These service districts are shown on Figure WS5 below and cover about 43 square miles. The three service districts are operated as independent entities, but are supported by BCWWS Operations as a single entity:

- District 1 service area contains all of Lauderdale Lakes and portions of the Cities of Fort Lauderdale, Lauderhill, North Lauderdale, Oakland Park, Plantation, Pompano Beach, and Tamarac;

- District 2 service area contains portions of the Cities of Deerfield Beach, Lighthouse Point, and Pompano Beach and provides water to portions of the City of Coconut Creek as described below; and
- District 3 service area contains portions of the Cities of Dania Beach, Davie, Fort Lauderdale, Miramar, West Park, Pembroke Park, Pembroke Pines, and Hollywood and provides water to the Fort Lauderdale-Hollywood International Airport.

All three service districts also include some small BMSD as highlighted on previously shown Figure WS4. Within these BMSD areas, some domestic self-supply (DSS) exists accounting for half of one present of the total County population. Based on the 2018 LEC Water Supply Plan Update, "All permanent residents outside of PWS [Public Water Supply] utility service area boundaries were considered DSS population." Current raw water usage for the estimated DSS population is approximately 1 MGD and is expected to decrease by 2040 to approximately 0.5 MGD (SFWMD, 2018). There are no immediate plans for BMSD neighborhoods like Hillsboro Ranches which consists of 23 single family homes on domestic self-supply to be provided potable water service by WWS.

BCWWS supplies water primarily to retail customers, but also provides water to the City of Coconut Creek under a bulk water resale agreement. Without prior approval from the County, the City is prohibited from buying or otherwise providing water within its service area from any source other than the County.

To plan and coordinate water supply utility activities within its three service areas, BCWWS uses utility analysis zones (UAZ) which divide service districts into smaller units by UAZ. Pulling TAZ information into UAZ involves allocating populations based on the split in residential units between the TAZ-UAZ subsections using the Broward County Property Appraiser parcel shapefile. The parcel shapefile permits the calculation of single-family and multi-family units within each TAZ-UAZ subsection.

A TAZ-UAZ subsection is a portion of a UAZ sits within a TAZ. The calculation method sums up the total residential units (single family and multi-family) within each TAZ-UAZ subsection. The population is allocated based on the percent of residential units in a TAZ-UAZ subsection out of the total TAZ dwelling units count. The projected BCWWS populations by district are shown in Table WS6 below and populations within Districts 1, 2, 3A and 3BC by municipality served are shown in Tables WS7, WS8, WS9 and WS10, respectively. are based on the results of an update to the AWS Conceptual Master Plan produced by Brown and Caldwell (Brown & Caldwell, 2019).

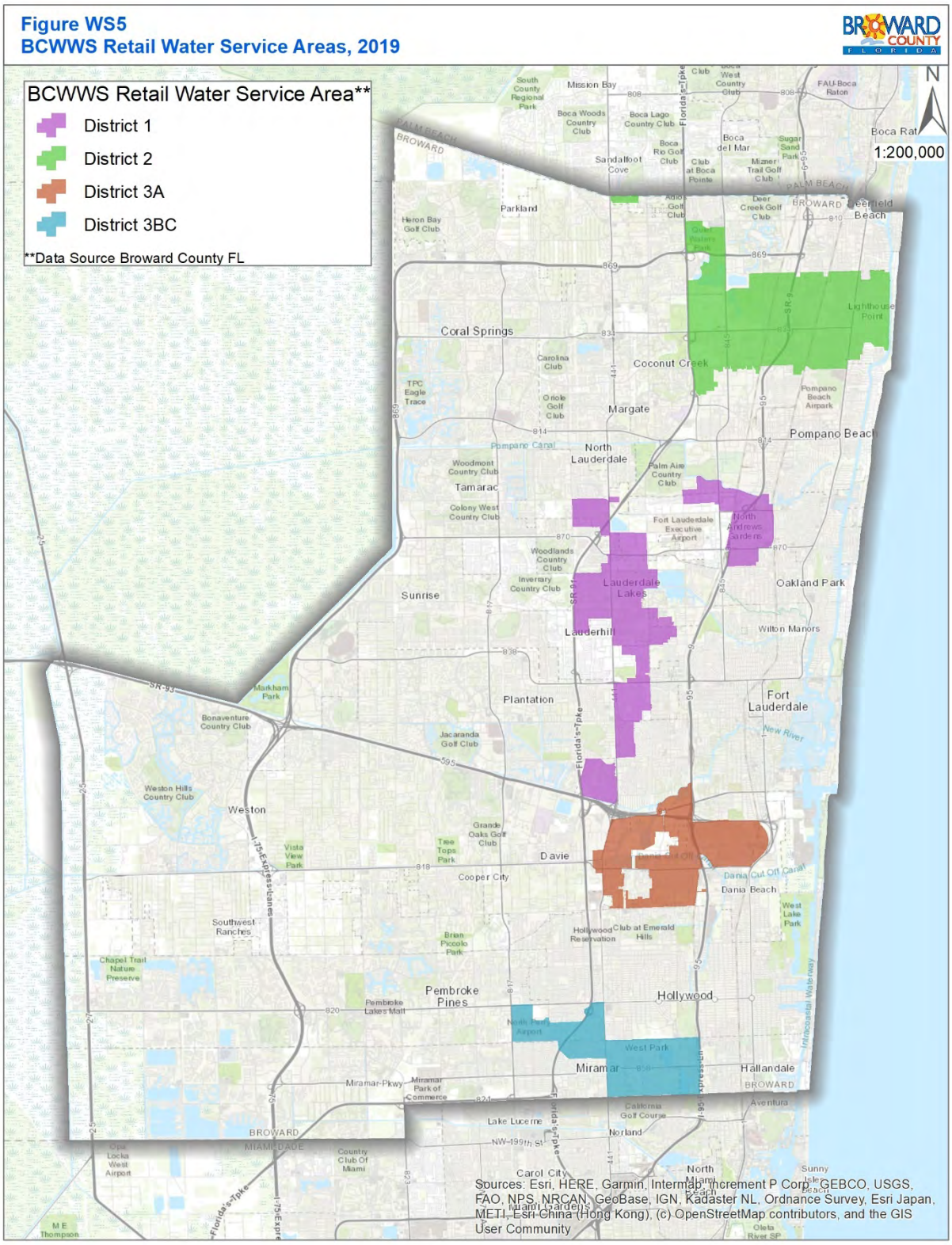


Figure WS5 BCWWS Retail Water Service Areas

Table WS6 BCWWS Service Area Population Projections 2015-2040[1]

BCWWS Service Area	2015	2020	2025	2030	2035	2040
District 1	75,931	78,718	84,292	89,479	92,895	95,299
District 2 Total	110,278	113,023	114,814	119,226	121,410	122,631
D2	55,052	54,510	55,702	57,779	58,493	58,672
Coconut Creek	55,226	58,513	59,112	61,447	62,917	63,959
District 3A	16,321	16,908	18,083	19,075	19,686	20,109
District 3BC	36,263	37,486	38,889	41,146	42,639	43,625
BCWWS Total	238,793	246,135	256,078	267,859	276,630	281,278

1. Based on 2017 BCPDMD TAZ estimate translation to UAZ populations performed by Brown and Caldwell for BCWWS, 2019

Table WS7 District 1 - Population Projection by Municipality [1]

Municipality	2015	2020	2025	2030	2035	2040	2045
DISTRICT 1 TOTAL	75,931	78,718	84,292	89,479	92,895	95,299	97,665
FORT LAUDERDALE	7,306	7,856	8,830	9,311	9,670	9,962	10,293
LAUDERHILL	8,376	8,237	9,116	10,714	11,664	12,411	13,180
LAUDERDALE LAKES	31,928	32,479	33,305	35,327	36,650	37,554	38,398
NORTH LAUDERDALE	6,844	6,719	8,213	8,236	8,358	8,350	8,325
OAKLAND PARK	12,113	13,109	12,914	13,374	13,545	13,639	13,680
POMPANO BEACH	521	561	586	632	660	682	705
PLANTATION	184	263	591	803	973	1,133	1,315
TAMARAC	1,423	2,382	2,444	2,508	2,604	2,662	2,709
BMSD	7,236	7,112	8,293	8,574	8,771	8,906	9,060

1. Based on 2017 BCPDMD TAZ estimate translation to UAZ populations performed by Brown and Caldwell for BCWWS, 2019

Table WS8 District 2 - Population Projection by Municipality [1]

Municipality	2015	2020	2025	2030	2035	2040	2045
DISTRICT 2 TOTAL	55,052	54,510	55,702	57,779	58,493	58,672	58,677
COCONUT CREEK	66	65	65	66	66	65	64
DEERFIELD BEACH	22,823	22,467	23,085	24,193	24,617	24,820	24,925
LIGHTHOUSE POINT	8,970	8,871	8,743	8,908	8,969	8,981	8,956
POMPANO BEACH	23,193	23,107	23,809	24,612	24,841	24,806	24,732

1. Based on 2017 BCPDMD TAZ estimate translation to UAZ populations performed by Brown and Caldwell for BCWWS, 2019

Table WS9 District 3A - Population Projection by Municipality [1]

Municipality	2015	2020	2025	2030	2035	2040	2045
DISTRICT 3A TOTAL	16,321	16,908	18,083	19,075	19,686	20,109	20,504
DANIA BEACH	15,307	15,888	16,808	17,379	17,680	17,824	17,950
DAVIE	60	60	325	538	710	874	1,033
FORT LAUDERDALE	721	713	705	906	1,044	1,161	1,271
HOLLYWOOD	233	247	245	252	252	250	250

1. Based on 2017 BCPDMD TAZ estimate translation to UAZ populations performed by Brown and Caldwell for BCWWS, 2019

Table WS10 District 3BC - Population Projection by Municipality [1]

Municipality	2015	2020	2025	2030	2035	2040	2045
DISTRICT 3ABC TOTAL	52,584	54,394	56,972	60,221	62,325	63,734	65,235
DANIA BEACH	15,307	15,888	16,808	17,379	17,680	17,824	17,950
DAVIE	60	60	325	538	710	874	1,033
FORT LAUDERDALE	721	713	705	906	1,044	1,161	1,271
HOLLYWOOD	4,698	4,922	5,266	5,603	5,840	6,036	6,250
MIRAMAR	6,615	6,623	7,359	8,291	8,858	9,310	9,832
PEMBROKE PINES	4,040	4,384	4,334	4,294	4,417	4,477	4,520
PEMBROKE PARK	6,940	6,922	6,792	7,127	7,292	7,355	7,412
WEST PARK	14,203	14,882	15,383	16,083	16,484	16,697	16,967

1. Based on 2017 BCPDMD TAZ estimate translation to UAZ populations performed by Brown and Caldwell for BCWWS, 2019

City of Fort Lauderdale

Broward County works closely with the City of Fort Lauderdale through involvement in the County Commission's Water Advisory Board and its Technical Advisory Committee, Southeast Florida Utility Council, Broward Water Partnership and other area technical and policy groups. The City's populations were obtained from the City's DRAFT Water Supply Facility Work Plan 2020 Update. The municipal utility owned and operated by the City of Fort Lauderdale is one of the largest purveyors of potable water in Broward County in terms of total water delivery, providing service to approximately 240,000 customers in 2017. The utility's service area, shown in Figure WS6, encompasses a total area of 43 square miles, approximately one-tenth the total area of urban Broward County. Customers include residential, commercial and industrial properties within the Cities of Fort Lauderdale, Lauderdale Lakes, North Lauderdale, Oakland Park, and Wilton Manors; portions of BMSD and the Cities of Tamarac, and Lauderhill; Port Everglades; Towns of Lauderdale-By-The-Sea and Davie; and Villages of Lazy Lake and Sea Ranch Lakes. Emergency potable water interconnections are maintained with the Cities of Dania Beach, Pompano Beach, and

Plantation and BCWWS service area. The population of Fort Lauderdale and the other municipalities in the water service area was forecasted based on 2017 BCPDMD TAZ estimate translation to UAZ populations performed by EPCRD using 2018 SFWMD LECWSP Service Area Boundaries. The City of Fort Lauderdale Utility Service Area population projections for 2015-2040 are shown in Table WS11 and were obtained from the City's Draft Water Supply Facilities Work Plan Update for 2020.

Table WS11 **City of Fort Lauderdale Utility Service Area Population by Jurisdiction, Actual 2015 and Forecasted 2020 to 2040**

Jurisdiction	2015	2020	2025	2030	2035	2040
TOTAL	235,840	241,454	274,470	292,768	304,918	315,109
Fort Lauderdale	175,228	179,997	208,747	222,915	232,419	240,134
Lauderdale by The Sea	4,147	3,689	3,996	3,940	3,890	3,850
Sea Ranch Lakes	700	693	680	715	734	746
BMSD	6,457	7,060	7,854	8,561	8,854	9,486
Davie	529	526	700	821	919	1,016
Lauderdale Lakes	381	383	378	386	386	390
Lauderhill	2,917	2,862	3,085	3,306	3,450	3,571
Lazy Lake	26	25	27	29	30	31
North Lauderdale	358	352	1,145	1,145	1,133	1,123
Oakland Park	31,111	31,852	32,719	34,693	36,114	37,145
Tamarac	2,054	2,037	2,007	2,032	2,054	2,041
Wilton Manors	11,932	11,878	13,132	14,225	14,935	15,576
Port Everglades	Population is included in BMSD					

Source: City of Fort Lauderdale Draft Water Supply Facilities Work Plan Update for 2020 - Based on BEBR data.

City of Hollywood

Broward County works closely with the City of Fort Lauderdale through involvement in the County Commission's Water Advisory Board and its Technical Advisory Committee, Southeast Florida Utility Council, Broward Water Partnership and other area technical and policy groups. The City's populations were obtained from the City's DRAFT Water Supply Facility Work Plan 2020 Update. The City of Hollywood's service area includes population projection of approximately 230,000 in year 2040, Table WS12 below. Through the bulk sales agreements with BCWWS, the City of Hollywood provides treated water to BCWWS

to serve its southernmost service areas (District 3A, 3B/C). The City of Hollywood utility service area include the Cities of Hollywood and West Park, portions of the City of Dania Beach, Town of Davie, City of Fort Lauderdale, and Seminole Tribe of Florida Hollywood Reservation. No population breakdown by municipality was available when this plan was written.

Table WS12 City of Hollywood Utility Service Area Population Projections 2015-2040

Service Area	2015	2020	2025	2030	2035	2040
TOTAL Hollywood	194,411	200,574	207,352	216,861	223,595	228,166
City of Hollywood Retail	141,827	146,180	150,380	156,640	161,270	164,432
BCWWS District 3A Wholesale	16,321	16,908	18,083	19,075	19,686	20,109
BCWWS District 3B/C Wholesale	36,263	37,486	38,889	41,146	42,639	43,625

Source: City of Hollywood 2015 Water Supply Plan Potable Water Sub-Element, January 2015. Table 2-3 and Broward County Water Supply Facilities Work Plan 2020.

C. Potable Water Level of Service Standard

The potable water level of service standards for BCWWS and the Cities of Fort Lauderdale and Hollywood are detailed in the sections below.

BCWWS

BCWWS has the responsibility to determine if it can adequately serve existing and potential customers. To that end, BCWWS has set a potable water level of service in gallons per person per day or gallons per capita day (gpcd) to a maximum of 150 gpcd. Table WS13 summarizes the five-year average (2013-2017) gallons per capita day for each WWS utility service area that is used to project water use into the future. Annually calculated values of gallons per capita day will fluctuate based on environmental, socioeconomical, physical, operational and other service area characteristics or changes.

The following is the current available information.

Table WS13 BCWWS Retail Potable Water Level of Service Standards [1]

District of BCWWS	Finished Water Level of Service (gpcd)
District 1	96
District 2	112
District 3A and 3BC	127

1. Based on demand development in Section D - Water Supply Provided by Local Governments of this plan.

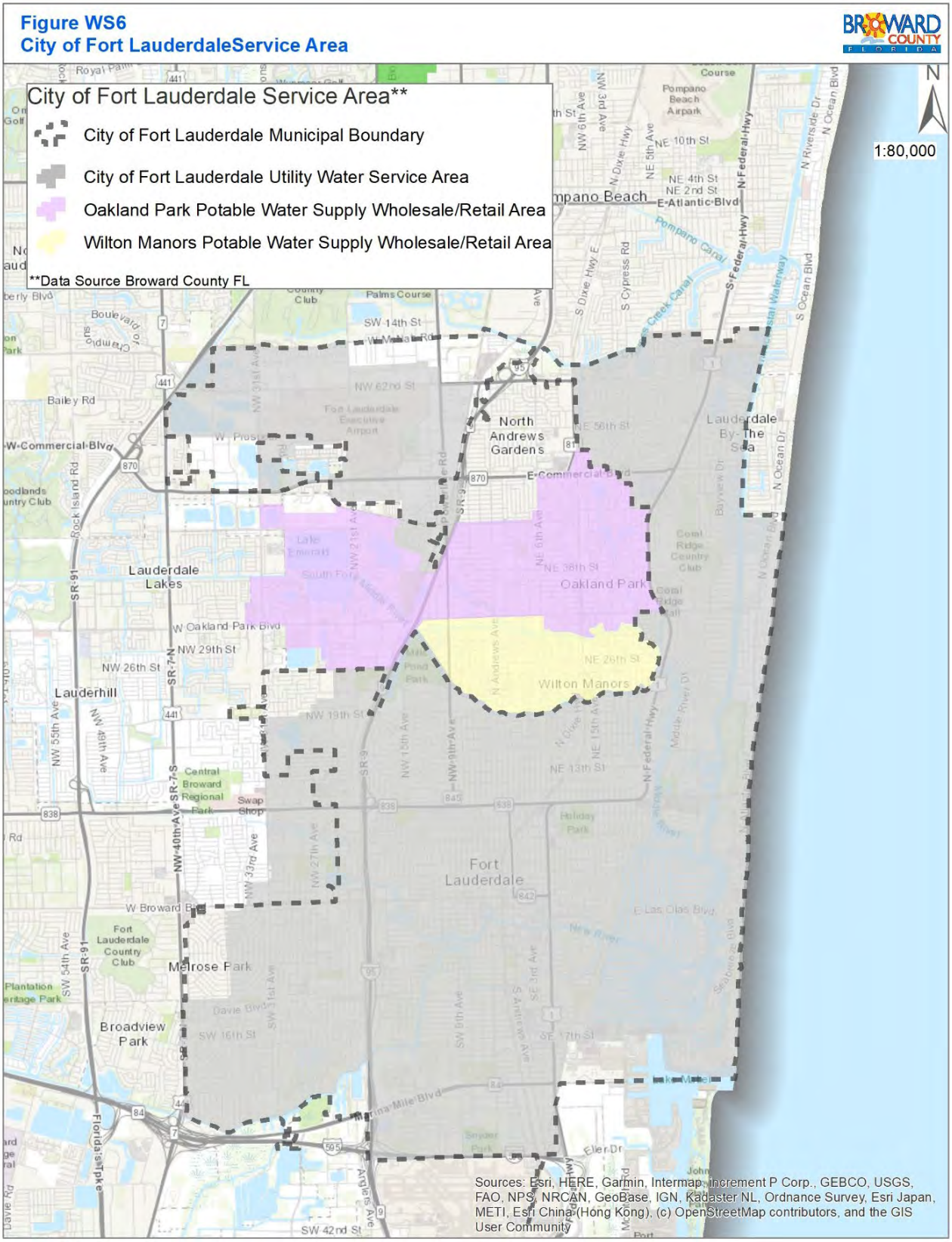


Figure WS6 City of Fort Lauderdale Service Area

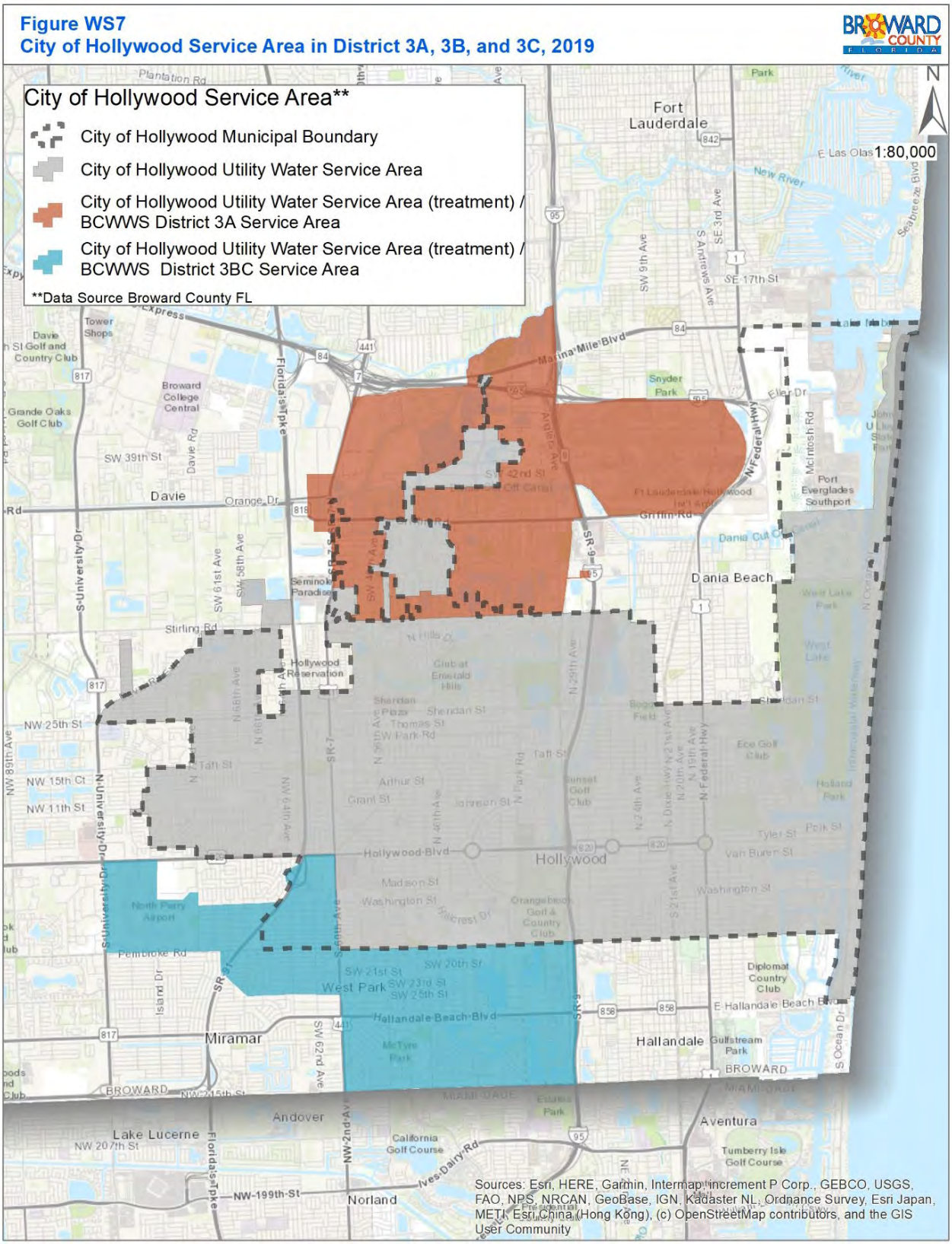


Figure WS7 City of Hollywood Service Area in District 3A, 3B, and 3C

City of Fort Lauderdale

The City of Fort Lauderdale has the responsibility to determine if it can adequately serve existing and potential customers. To that end, Fort Lauderdale has adopted their level of service for finished water at 170 gallons per day finished water per person (SFWMD LECWSP, 2018). In 2016, the average day demand throughout their service area was 41.4 MGD. The finished water per capita demand averaged 173 gallons per person per day from 2013 to 2016.

City of Hollywood

The City of Hollywood has the responsibility to determine if it can adequately serve the existing and potential customers within their service areas. To that end, Hollywood has adopted a level of service of 116 gallons per day finished water per person (2016). In 2016, the average day demand throughout their service area was 22.79 MGD. The finished water per capita demand averaged 113 gallons per person per day from 2013 to 2016.

D. Water Supply Provided by Local Governments

Water supply provided by local governments is summarized in the sections below.

BCWWS District 1

District 1 has a combined service area of 11.9 square miles with 248 miles of water distribution and transmission mains. BCWWS maintains water system interconnections with the City of Fort Lauderdale, the City of Tamarac, the City of Plantation, and the City of Lauderhill to provide for emergency water supply. In District 1, raw water is treated at the District 1 WTP located in the City of Lauderdale Lakes prior to distribution to retail customers. The plant was expanded in 1994 to its current capacity of 16.0 MGD to treat Biscayne Aquifer raw water using lime softening treatment. Figure WS8 shows the location of the District 1 WTP, storage tanks, and finished water distribution pipe 12-inches and larger within the District 1 service area.

The District 1 wellfield is in the area surrounding the WTP and is comprised of nine Biscayne Aquifer wells, all of which are currently in service. The total design capacity of the wellfield is approximately 23.5 MGD. Two Floridan Aquifer test wells were completed in 2014; one well is located on the WTP site and one is in an easement northeast of the WTP. Test results from the Floridan well construction revealed that upper Floridan Aquifer production zone chloride concentrations are approximately 4,000 mg/L and total dissolved solids concentrations are 7,500 mg/L (MWH, 2013). Based on the water quality test results, water produced from the

well will likely require high pressure RO treatment. Currently, BCWWS has no plans to build a RO WTP at the District 1 site nor to convert the Floridan test wells to production wells.

BCWWS was issued a SFWMD CUP (No. 06-00146-W) in April 2008 for a 20-year permit duration to withdraw water from the Biscayne Aquifer and Floridan Aquifer. The permit allocates an annual withdrawal from the Biscayne Aquifer of 3,664 million gallons (MG) with a maximum month of 333 MG and an annual withdrawal from the Floridan Aquifer of 1,410 MG with a maximum month of 128 MG. Water use demand projections are presented in Table WS14 below for finished water and Table WS15 for raw water through year 2040. Finished water projections are also shown by municipality within the District 1 service area. Municipal demand projections were estimated based on the actual 2015 use and the 5-year historic gallons per capita day of 96 gpcd was applied to 2020 through 2040 populations to calculate demand. Demand estimates are shown in Table WS16 below. The projected raw water use accounts for 56 percent of the WTP capacity in year 2040.

Table WS14 **District 1 Actual and Projected Finished Water Demands**

Planning Year	Population (UAZ Estimate)	Finished Water Demands		
		Annual (MG)	Average Day (MGD)	Per Capita Use
Actual Water Use [1]				
2010	75,091	2,596	7.11	95
2011	75,259	2,677	7.33	97
2012	75,427	2,669	7.31	97
2013	75,595	2,606	7.14	94
2014	75,763	2,617	7.17	95
2015	75,931	2,740	7.51	99
2016	76,488	2,681	7.35	96
2017	77,046	2,686	7.36	96
Projected Water Use [2]				
2020	78,718	2,755	7.55	96
2025	84,292	2,950	8.08	96
2030	89,479	3,132	8.58	96
2035	92,895	3,252	8.91	96
2040	95,299	3,336	9.14	96

1. BCWWS Monthly Operating Reports for Water Treatment Plant Finished Water Flow
2. Projected Water Use based on Finished Water Per Capita (5-Year Average) of 96 gallons per capita day

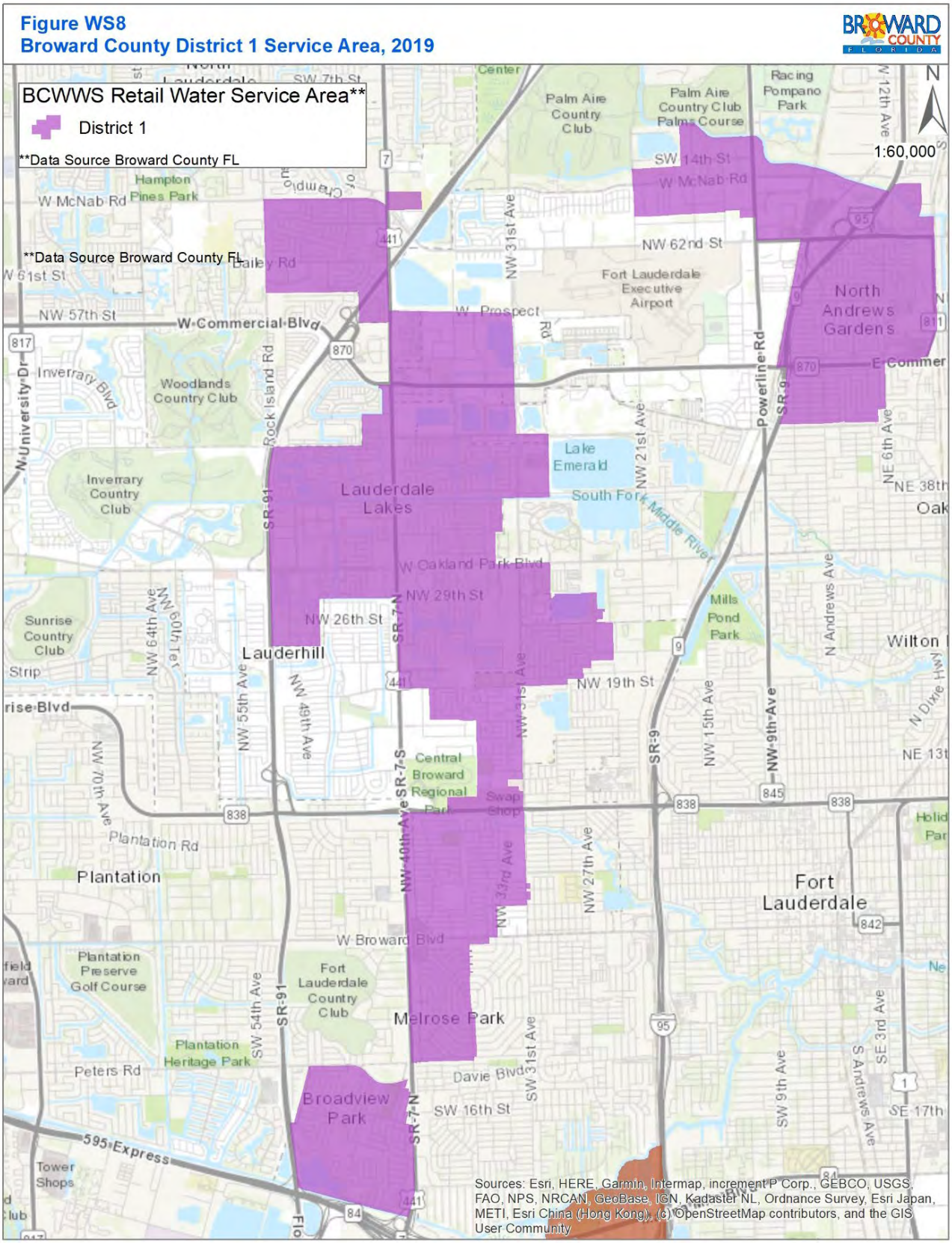


Figure WS8 BCWWS District 1 Service Area

Table WS15 District 1 Actual and Projected Raw Water Demands

Planning Year	Finished Water Annual Demand (MG)	Raw Water Demands			
		Raw : Finished Ratio	Annual (MG)	Average Day (MGD)	Maximum Month (MGM)
Actual Water Use [1]					
2010	2,596	1.08	2,794	7.65	247
2011	2,677	1.13	3,023	8.28	273
2012	2,669	1.10	2,946	8.07	258
2013	2,606	1.09	2,843	7.79	260
2014	2,617	1.06	2,763	7.57	246
2015	2,740	1.05	2,886	7.91	267
2016	2,681	1.06	2,849	7.81	253
2017	2,686	1.05	2,809	7.70	257
Projected Water Use [2, 3]					
2020	2,755	1.05	2,904	7.96	263
2025	2,950	1.05	3,110	8.52	282
2030	3,132	1.05	3,301	9.04	299
2035	3,252	1.05	3,427	9.39	311
2040	3,336	1.05	3,516	9.63	319

1. BCWWS Monthly Operating Reports for Individual Well Pumpages
2. Projected Raw Water based on Actual Raw Water to Finished Water Ratio (3-Year Average) of 1.05
3. Projected Maximum Month based on Actual Maximum Month to Average Day Ratio (5-Year Average) of 33.07

Table WS16 Projected Average Day Finished Water by Municipality within District 1 in MGD [1]

Municipality	2015 [2]	2020	2025	2030	2035	2040
FORT LAUDERDALE	0.72	0.75	0.85	0.89	0.93	0.96
LAUDERHILL	0.83	0.79	0.88	1.03	1.12	1.19
LAUDERDALE LAKES	3.16	3.12	3.20	3.39	3.52	3.61
NORTH LAUDERDALE	0.68	0.65	0.79	0.79	0.80	0.80
OAKLAND PARK	1.20	1.26	1.24	1.28	1.30	1.31
POMPANO BEACH	0.05	0.05	0.06	0.06	0.06	0.07
PLANTATION	0.02	0.03	0.06	0.08	0.09	0.11
TAMARAC	0.14	0.23	0.23	0.24	0.25	0.26
BMSD	0.72	0.68	0.80	0.82	0.84	0.85

1. Calculated using District 1 Finished Water 5-Year Average Gallons Per Capita Day of 96 gpcd2. 2015 demand Calculated using District 1 Finished Water Actual Gallons Per Capita Day of 99 gpcd

BCWWS District 2

District 2 has a service area of 14.8 square miles and contains 253 miles of water distribution and transmission mains. The facilities of District 2 are interconnected with the City of Deerfield Beach, the Town of Hillsboro Beach, the City of Pompano Beach, and Palm Beach County to provide for emergency water supply. In District 2, raw water is treated at the District 2 WTP located in the City of Pompano Beach prior to distribution to BCWWS retail customers and the City of Coconut Creek. The District 2 WTP was expanded in 1994 to its current capacity of 30.0 MGD to treat Biscayne Aquifer raw water using lime softening treatment. Figure WS9 shows the location of the District 2 WTP, storage tanks, and finished water distribution pipe 12-inches and larger with the District 2 service area.

The District 2 WTP treats raw water supplied by the District 2 and the North Regional Wellfields under SFWMD CUP No. 06-01634-W issued in March 2008 for a 20-year permit duration to withdraw water from the Biscayne and Floridan Aquifers. The District 2 wellfield has a design capacity of 27.1 MGD and is comprised of seven production wells. The North Regional wellfield has a design capacity of 20.2 MGD and is comprised of 10 production wells. The District 2 and North Regional Wellfields each provide approximately 50 percent of the raw water demand. While Floridan Aquifer production wells were planned as part of the original permit to provide AWS, no wells have been constructed to date. The permit allocates an annual withdrawal from the Biscayne Aquifer of 6,388 million gallons (MG) with a maximum month of 585 MG and an annual withdrawal from the Floridan Aquifer of 1,664 MG with a maximum month of 152 MG. Water use demand projections are presented in Table WS17 for finished water and Table WS18 for raw water through year 2040. Finished water projections are also shown by municipality within the District 2 service area. Municipal demand projections were estimated based on the actual 2015 use and the 5-year historic gallons per capita day of 112 gpcd was applied to 2020 through 2040 populations to calculate demand. Demand estimates are shown in Table WS19 below. The projected raw water use accounts for approximately 49 percent of the WTP capacity in year 2040.

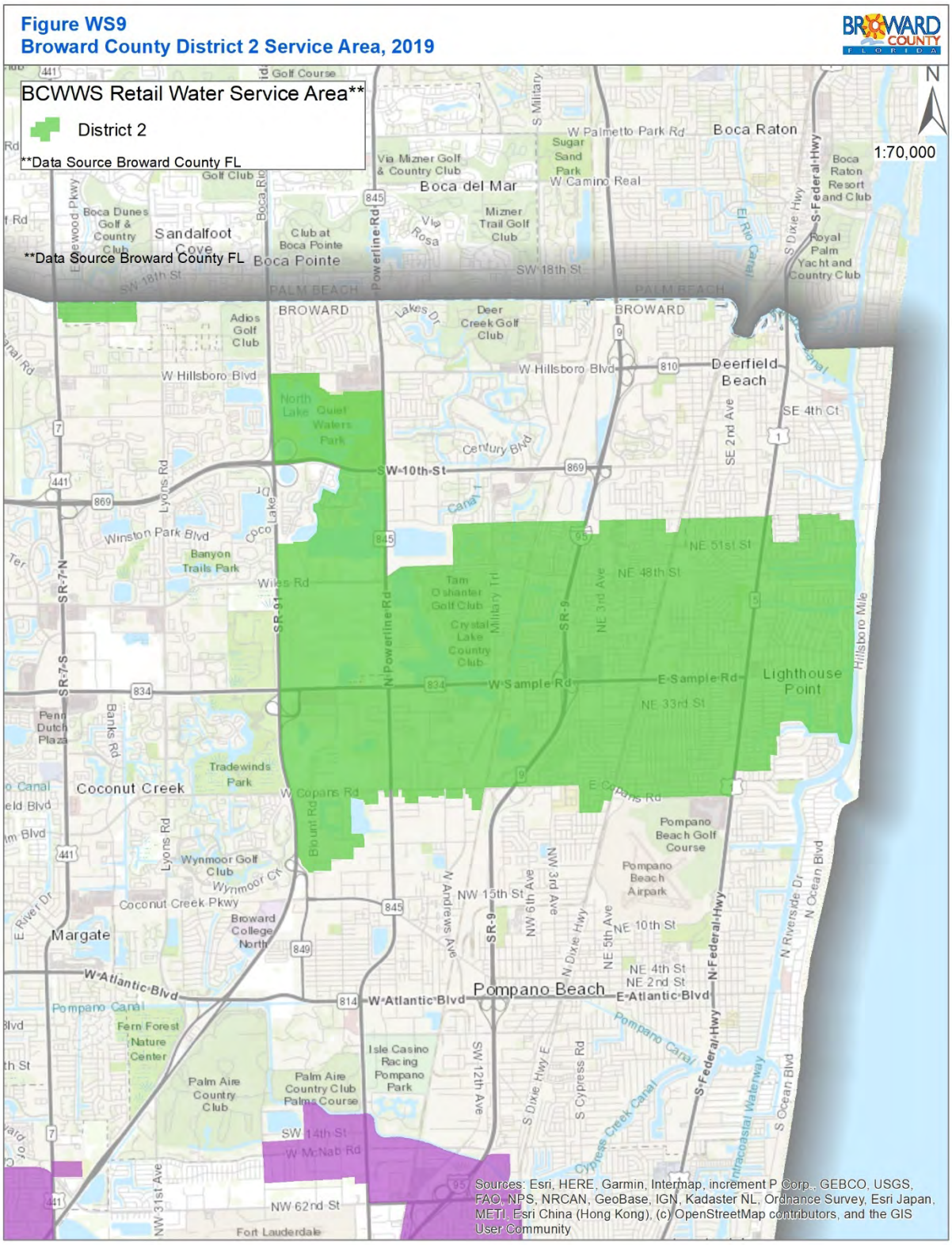


Figure WS9 BCWWS District 2 Service Area

Table WS17 District 2 Actual and Projected Finished Water Demands

Planning Year	Population (UAZ Estimate)	Finished Water Demands		
		Annual (MG)	Average Day (MGD)	Per Capita Use
Actual Water Use [1]				
2010	109,181	4,560	12.49	114
2011	109,400	4,496	12.32	113
2012	109,620	4,326	11.85	108
2013	109,839	4,496	12.32	112
2014	110,059	4,322	11.84	108
2015	110,278	4,599	12.60	114
2016	110,827	4,554	12.48	113
2017	111,376	4,661	12.77	115
Projected Water Use [2]				
2020	113,023	4,630	12.69	112
2025	114,814	4,704	12.89	112
2030	119,226	4,885	13.38	112
2035	121,410	4,974	13.63	112
2040	122,631	5,024	13.76	112

1. BCWWS Monthly Operating Reports for Water Treatment Plant Finished Water Flow
2. Projected Water Use based on Finished Water Per Capita (5-Year Average) of 112 gallons per capita day

Table WS18 District 2 Actual and Projected Raw Water Demands

Planning Year	Finished Water Annual Demand (MG)	Raw Water Demands			
		Raw: Finished Ratio	Annual (MG)	Average Day (MGD)	Maximum Month (MGM)
Actual Water Use [1]					
2010	4,560	1.08	4,942	13.54	440
2011	4,496	1.04	4,689	12.85	418
2012	4,326	1.04	4,488	12.30	415
2013	4,496	1.03	4,629	12.68	415
2014	4,322	1.05	4,520	12.38	413
2015	4,599	1.04	4,793	13.13	432
2016	4,554	1.03	4,709	12.90	423
2017	4,661	1.04	4,833	13.24	434
Projected Water Use [2, 3]					
2020	4,630	1.04	4,880	13.37	442
2025	4,704	1.04	4,957	13.58	449
2030	4,885	1.04	5,148	14.10	466
2035	4,974	1.04	5,242	14.36	475
2040	5,024	1.04	5,295	14.51	480

1. BCWWS Monthly Operating Reports for Individual Well Pumpages inclusive of the Deerfield Beach Raw Water Large User
2. Projected Raw Water based on Actual Raw Water to Finished Water Ratio (3-Year Average) of 1.04
3. Projected Maximum Month based on Actual Maximum Month to Average Day Ratio (5-Year Average) of 32.90

Table WS19 **Projected Average Day Finished Water by Municipality within District 2 in MGD** [1]

Municipality	2015 [2]	2020	2025	2030	2035	2040
COCONUT CREEK	0.01	0.01	0.01	0.01	0.01	0.01
DEERFIELD BEACH	2.60	2.52	2.59	2.71	2.76	2.78
LIGHTHOUSE POINT	1.02	0.99	0.98	1.00	1.00	1.01
POMPANO BEACH	2.64	2.59	2.67	2.76	2.78	2.78

1. Calculated using District 2 Finished Water 5-Year Average Gallons Per Capita Day of 112 gpcd
2. 2015 demand Calculated using District 2 Finished Water Actual Gallons Per Capita Day of 114 gpcd

BCWWS District 3A and 3BC:

District 3 service area is divided into two geographically separate subdistricts 3A, Figure WS10, and 3BC, Figure WS11. The County purchases bulk treated water primarily from the City of Hollywood and distributes the treated water through the County's distribution system. District 3 has a combined service area of approximately 14.3 square miles and contains 223 miles of transmission and distribution mains. Subdistrict 3A is contains the Fort Lauderdale-Hollywood International Airport which is approximately 20 percent of the total area of the district. District 3A has interconnects with the City of Hollywood, for is primary water supply, and with the City of Fort Lauderdale and the City of Dania Beach, to provide for emergency water supply. Subdistrict 3BC has interconnects with the City of Hollywood for its primary water supply, and the Cities of Pembroke Pines and Miramar to provide for emergency water supply.

The City of Hollywood is responsible for ensuring adequate raw water supply and treatment facilities to serve the County District 3 service areas. The City's existing CUP (Permit No. 06-00038-W) was issued by the SFWMD on April 9, 2008 and expires April 9, 2028. The Hollywood CUP raw water allocation for the subdistrict 3A/3BC areas is 13.16 MGD to meet demands through the year 2028.

BCWWS' current finished water demand for District 3 averages around 6.4 MGD and is projected to increase to 8.3 MGD by 2040 as shown Table WS20 below. District 3's raw water demand is anticipated to be around 9.0 MGD in 2045 as shown in Table WS21, based on historical raw to finished water ratio of 1.09. BCWWS continues to coordinate closely with the City to ensure that future demands for District 3 are adequately addressed.

Finished water demand was estimated as shown in Table WS22 (District 3A) and WS23(District 3BC) by using the finished water 5-year historical gallons per capita day of 127 and the municipal populations for District 3A and District 3BC. Year 2015 was calculated using the actual gallons per capita day of 130.

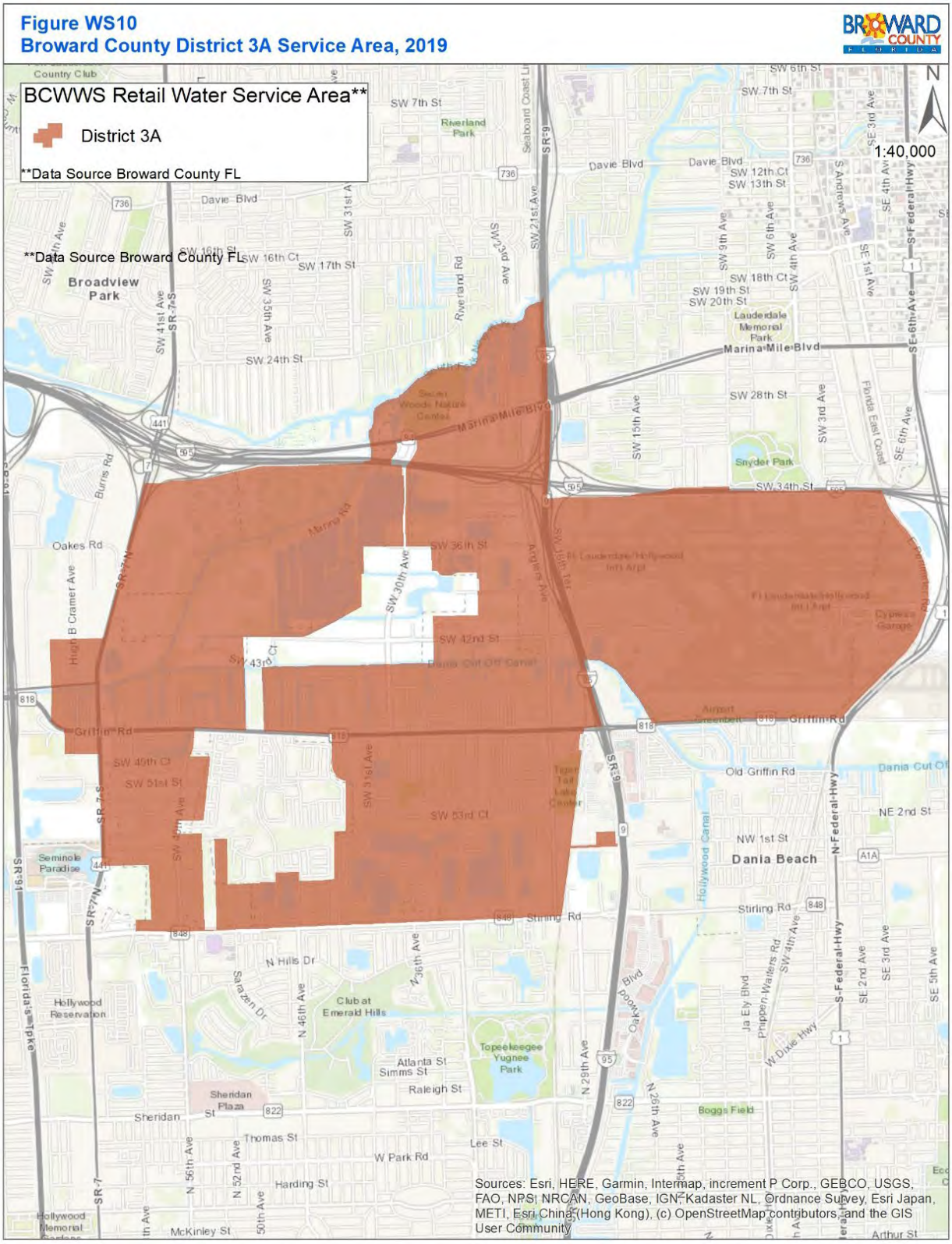


Figure WS10 **BCWWS District 3A Service Area**

Figure WS11
Broward County District 3BC Service Area, 2019

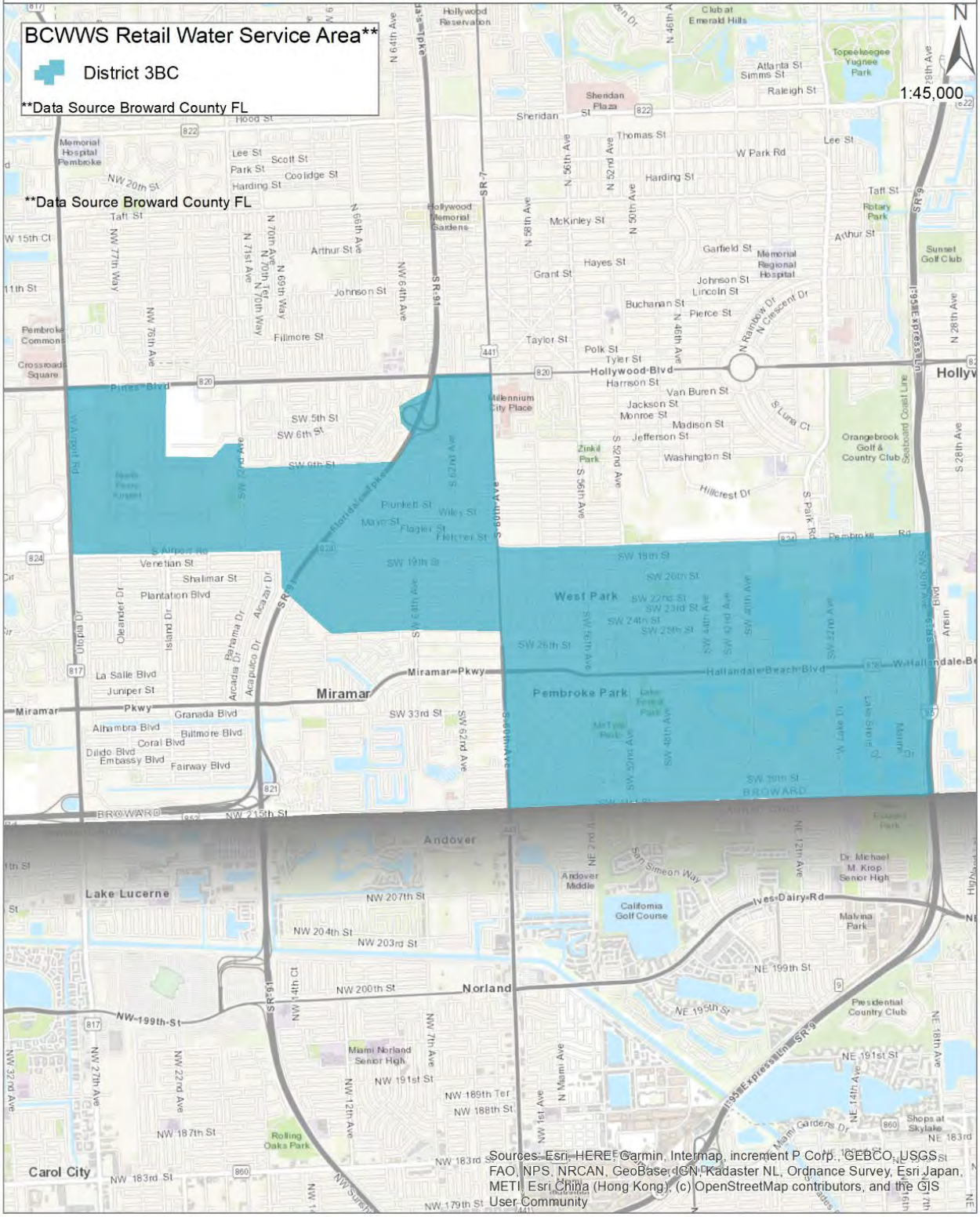


Figure WS11 BCWWS District 3BC Service Area

Table WS20 District 3A and 3BC Actual and Projected Finished Water Demands

Planning Year	Population (UAZ Estimate)	Finished Water Demands				
		Annual (MG)	Average Day (MGD)	Per Capita Use	Maximum Month (MGM)	Max Mo : Avg Day Ratio
Actual Water Use [1]						
2010	32,480	2,080	5.70	118	192	33.74
2011	49,158	2,210	6.05	126	196	32.42
2012	50,014	2,230	6.11	122	200	32.79
2013	50,871	2,362	6.47	127	204	31.59
2014	51,727	2,369	6.49	125	221	33.99
2015	52,584	2,490	6.82	130	222	32.51
2016	52,946	2,491	6.82	129	218	31.97
2017	53,308	2,383	6.52	122	212	32.48
Projected Water Use [2, 3]						
2020	54,394	2,523	6.91	127	244	32.51
2025	56,972	2,642	7.24	127	256	32.51
2030	60,221	2,793	7.65	127	270	32.51
2035	62,325	2,891	7.92	127	280	32.51
2040	63,734	2,956	8.09	127	286	32.51

1. BCWWS Monthly Operating Reports for 3A, 3B and 3C Finished Water Meters
2. Projected Water Use based on Finished Water Per Capita (5-Year Average) of 127 gallons per capita day
3. Projected Finished Water Maximum Month based on Actual Finished Maximum Month to Average Day Ratio (5-Year Average) of 32.51

Table WS21 District 3A and 3BC Actual and Projected Raw Water Demands

Planning Year	Finished Water Annual Demand (MG)	Raw Water Demands			
		Raw: Finished Ratio	Annual (MG)	Average Day (MGD)	Maximum Month (MGM)
Actual Water Use [1]					
2010	2,080	1.09	2,267	6.21	210
2011	2,210	1.09	2,409	6.60	214
2012	2,230	1.09	2,431	6.66	218
2013	2,362	1.09	2,575	7.05	223
2014	2,369	1.09	2,582	7.07	240
2015	2,490	1.09	2,714	7.44	242
2016	2,491	1.09	2,715	7.44	238
2017	2,383	1.09	2,599	7.12	231
Projected Water Use [2, 3]					
2020	2,523	1.09	2,743	7.52	244
2025	2,642	1.09	2,873	7.87	256
2030	2,793	1.09	3,037	8.32	270
2035	2,891	1.09	3,143	8.61	280
2040	2,956	1.09	3,214	8.81	286

1. BCWWS Monthly Operating Reports for 3A, 3B and 3C Finished Water Meters
2. Projected Raw Water based on SFWMD LECWSP 2018 Update, Appendix B, Table B-4 entry for Hollywood of 1.09
3. Actual and Projected Raw Water Maximum Month based on Actual Finished Maximum Month to Average Day Ratio (5-Year Average) of 32.51

Table WS22 **Projected Average Day Finished Water by Municipality within District 3A in MGD** [1]

Municipality	2015 [2]	2020	2025	2030	2035	2040
DISTRICT 3A TOTAL	2.12	2.15	2.30	2.42	2.50	2.55
DANIA BEACH	1.99	2.02	2.13	2.21	2.25	2.26
DAVIE	0.01	0.01	0.04	0.07	0.09	0.11
FORT LAUDERDALE	0.09	0.09	0.09	0.12	0.13	0.15
HOLLYWOOD	0.03	0.03	0.03	0.03	0.03	0.03

1. Calculated using District 1 Finished Water 5-Year Average Gallons Per Capita Day of 127 gpcd
2. 2015 demand Calculated using District 1 Finished Water Actual Gallons Per Capita Day of 130 gpcd

Table WS23 **Projected Average Day Finished Water by Municipality within District 3BC in MGD** [1]

Municipality	2015 [2]	2020	2025	2030	2035	2040
DISTRICT 3BC TOTAL	4.71	4.76	4.94	5.23	5.42	5.54
HOLLYWOOD	0.58	0.59	0.64	0.68	0.71	0.73
MIRAMAR	0.86	0.84	0.93	1.05	1.12	1.18
PEMBROKE PINES	0.53	0.56	0.55	0.55	0.56	0.57
PEMBROKE PARK	0.90	0.88	0.86	0.91	0.93	0.93
WEST PARK	1.85	1.89	1.95	2.04	2.09	2.12

1. Calculated using District 1 Finished Water 5-Year Average Gallons Per Capita Day of 127 gpcd
2. 2015 demand Calculated using District 1 Finished Water Actual Gallons Per Capita Day of 130 gpcd

South System Regional Wellfield (SRW):

BCWWS operates the SRW located in Cooper City, west of Pine Island Road, just north of Sheridan Street. The SRW supplies Biscayne Aquifer raw water from eight production wells to the Cities of Dania Beach, Hollywood, and Hallandale Beach and to the Florida Power and Light (FPL) Dania Beach Energy Center under large user agreements. The SRW CUP (06-01474-W) issued March 2018, and successfully modified July 10, 2019, reflects the complexities of providing regional raw water. The CUP allocation is divided into three portions that have individual expiration dates as shown in Table WS24 and Table WS25 details the individual large user allocation limitations.

Table WS24 SRW CUP Allocation Summary

Limitation	Duration	Average Day (MGD)	Maximum Month (MGM)
Temporary 5-Year Allocation	March 2018 to March 2023	15.64	533.17
Base Condition Allocation [1]	March 2023 to March 2038	11.62	396.13
TOTAL C-51 Offset Allocations [2]	March 2023-December 2065	5.00	170.33
TOTAL SR Wellfield Allocation	March 2023-December 2065 [2]	16.62	566.19

1. The Base Condition Allocation must be renewed every 20 years.
2. Broward County purchased 3.0 MGD of C-51 Reservoir Project storage to provide for demands in the BCWWS 3A/3BC service area through December 2065. The City of Dania Beach and the City of Hallandale Beach have purchased 1 MGD each of C-51 Reservoir Project storage to meet their projected demand with supply from SR Wellfield. Table WS16 summarizes the SRW raw water demands through 2040.

Table WS25 SRW Raw Water Large User Average Day Projections

Limitations	Dania Beach (MGD)	Hallandale Beach (MGD)	Hollywood-BCWWS 3A/3BC (MGD)	FPL (MGD)	TOTAL Allocation (MGD)
Temporary 5-Year Allocation (March 2018 - March 2023)	3.02	3.61	7.27	1.74	15.64
Base Condition Allocation [1] (March 2018 - March 2038)	1.58	3.26	5.78	1.00	11.62
C-51 Offset Allocations [2] (March 2023 - December 2065)	1.00	1.00	3.00	---	5.00
TOTAL SR Wellfield Allocation	2.58	4.26	8.78	1.00	16.62
C-51 Reservoir Project Allotments Under Agreements	1.00	1.00	3.00	---	5.00

1. Renewal of the Base Condition Allocation of 11.62 MGD is required every 20 years.
2. Broward County purchased 3.0 MGD of C-51 Reservoir Project storage to provide for demands in the BCWWS 3A/3BC service area through December 2065. The City of Dania Beach and City of Hallandale Beach have purchased 1 MGD each of C-51 Reservoir Project storage to meet their projected demand with supply from SR Wellfield.

City of Fort Lauderdale

Data indicate that City of Fort Lauderdale demands may exceed their Biscayne Aquifer supply in year 2035. The City's Water Supply Facility Work Plan 2020 Update outlines plans to address the potential deficit by investing in RO treatment of Floridan aquifer water (Hazen & Sawyer, 2019). In addition to the City's plans to develop 6 MGD of Floridan aquifer supply, the City signed an agreement in January 2020 for the purchase of 3 MGD of C-51 Reservoir water.

In 1926, the 6 MGD capacity Peele-Dixie lime softening WTP was opened in western Fort Lauderdale. Over the years, the plant has been expanded and modernized, increasing its capacity to 20 MGD. In 2008 the WTP was converted from a lime softening to membrane facility with a treatment capacity of 12 MGD at 85 percent treatment efficiency. The Fiveash lime softening WTP was built in 1954 to treat 8 MGD. Through a series of expansions, the plant has been able to keep pace with the rapid growth experienced in Fort Lauderdale and today has a designed capacity of 70 MGD. The Fiveash WTP is supplied raw groundwater for treatment from the Prospect Wellfield.

Raw water for the City of Fort Lauderdale is supplied by the Peele-Dixie and Prospect wellfields, which draw from the SAS. The raw water is treated at two water treatment facilities, the Peele-Dixie nanofiltration plant and the Fiveash lime softening plant. There are 37 active wells between the two. The Peele-Dixie and Prospect wellfields have a combined pumping capacity of approximately 107 MGD. The City constructed two Floridan aquifer test wells at the Peele Dixie wellfield location to collect water quality and drawdown information as part of their plans to move towards RO treatment of Floridan aquifer water.

The City of Fort Lauderdale's CUP (Permit No. 06-00123-W) issued on September 11, 2008, for 20 years, allows the City to pump a combined annual average daily allocation for the two wellfields of 52.55 MGD. In 2018, the combined pumpage from the Peele-Dixie and Prospect wellfields averaged 41.49 MGD (11.06 MGD below the permitted allocation). The City's SFWMD CUP limitations on Biscayne and Floridan aquifer withdrawals are the following:

- Annual Allocation Limit – 22,334 million gallons (MG) - 61.19 MGD
- Biscayne Aquifer Annual Withdrawal Limit – 19,181 MG – 52.55 MGD
- Floridan Aquifer Allocation Limit – 3,153 MG – 8.64 MGD.

(Hazen & Sawyer, 2019)

The City of Fort Lauderdale maintains a total of 10 water system interconnections with BCWWS District 1 (3), the Cities of Plantation (1), Tamarac (3), and Pompano Beach (1), and Town of Davie (1).

Fort Lauderdale has adopted its finished water level of service for potable water at 170 gpcd (SFWMD LECWSP, 2018). In 2015, the average per capita demand throughout the City's service area was 176 gpcd (Table WS26). Projected water use for each municipality in the City's service area is estimated in Table WS27 by applying the 5-year average gallons per capita day of 164 to the population projections for the individual municipalities.

Table WS26 **Fort Lauderdale Water Demand Forecast***

Year	Population	Overall Raw Water Per Capita (gpcd)	Finished Water Per Capita (gpcd)	Avg Day Biscayne Aquifer Raw Water Demand (MGD)	Avg Day Finished Water Demand (MGD)	Max Day Finished Water Demand (MGD)
2015	235,840	176	169	41.5	39.8	48.9
2020	241,454	172	164	41.5	39.6	48.7
2025	274,470	172	164	47.2	45.0	55.4
2030	292,768	172	164	50.4	48.0	59.1
2035	304,918	172	164	52.4	50.0	61.5
2040	315,109	172	164	54.2	51.7	63.6

Source: City of Fort Lauderdale Water Supply Facilities Work Plan 2020 Update DRAFT, November 7, 2019

Table WS27 **Fort Lauderdale Water Demand Forecast by Service Area Municipality**

Jurisdiction	2015	2020	2025	2030	2035	2040
TOTAL	39.86	39.60	45.01	48.01	50.01	51.68
Fort Lauderdale	29.61	29.52	34.23	36.56	38.12	39.38
Lauderdale by The Sea	0.70	0.60	0.66	0.65	0.64	0.63
Sea Ranch Lakes	0.12	0.11	0.11	0.12	0.12	0.12
BMSD	1.09	1.16	1.29	1.40	1.45	1.56
Davie	0.09	0.09	0.11	0.13	0.15	0.17
Lauderdale Lakes	0.06	0.06	0.06	0.06	0.06	0.06
Lauderhill	0.49	0.47	0.51	0.54	0.57	0.59
Lazy Lake	0.00	0.00	0.00	0.00	0.00	0.01
North Lauderdale	0.06	0.06	0.19	0.19	0.19	0.18
Oakland Park	5.26	5.22	5.37	5.69	5.92	6.09
Tamarac	0.35	0.33	0.33	0.33	0.34	0.33
Wilton Manors	2.02	1.95	2.15	2.33	2.45	2.55
Port Everglades	Population is included in BMSD					

Source: Calculation based on Hazen & Sawyer City of Fort Lauderdale Water Supply Facilities Work Plan 2020 Update Population and Demand Projections.

E. Conservation

Conservation practices for Broward County are presented in the sections below. The County actively solicits participation in its conservation programs through coordination with the Broward Water Advisory Board and its Technical Advisory Committee. It develops interlocal agreements in coordination with local municipalities and water management agencies and coordinates with local municipalities and their residents using email, Twitter,

Facebook, news releases and other methods that support and encourage participation in these County-wide programs which are outlined below.

Broward County

Within the County's Comprehensive Plan, policies within the Water Management Element that support and guide the County's water conservation initiatives include:

https://www.broward.org/BrowardNext/Documents/CompPlanDocs/WME%20GOPS-Adoption%20March%202019.pdf

POLICY WM3.27 Broward County will advocate for water conservation measures in building practices and will implement programs to support plumbing retrofits, toilet rebates, Florida-friendly landscaping and Florida Yards and Neighborhoods best management practices (BMP), and water conservation education.

POLICY WM3.33 Broward County will continue to enforce Chapter 39, "Zoning," Article VIII, "Landscaping for Protection of Water Quality and Quantity," of the Broward County Code of Ordinances, which reflects the NatureScape Broward program principles that promote the use of native and Florida Friendly landscaping and the preservation of native habitats in support of sustainable urban landscapes and the conservation of water resources.

POLICY WM4.17 Broward County, in partnership with local municipalities and water and wastewater entities, will continue to develop and implement programming for Countywide water conservation and initiatives, including the Conservation Pays Program, Water Matters education and outreach programs, NatureScape Broward, and the NatureScape Irrigation Services, to promote water and energy conservation.

The District's Comprehensive Water Conservation Program is organized into regulatory, voluntary, and education-based initiatives which are discussed in the 2018 LEC Water Supply Plan Update. As mentioned in this plan, regulatory initiatives in Broward County that have been adopted include local landscape and irrigation ordinances. In addition, the County has developed door hangers in English, Spanish, and Creole which cites these irrigation restrictions and distributed these to code enforcement agencies during their annual meetings. It has also developed a sticker with the irrigation restrictions that are placed within irrigation controller boxes at all public schools that are evaluated as part of the Environmental Partnership between the County and School Board of Broward County.

Voluntary and incentive-based initiatives are offered primarily through both the Broward Water Partnership's Conservation Pays and NatureScape Irrigation Service programs, which are partnerships between the County and multiple municipalities and/or utilities which

leverage their local funds to secure additional outside funds to realize additional water savings (e.g., Water Savings Incentive Program, Cooperative Funding Program).

Through the County's NatureScape/School Board of Broward County Environmental Partnership Agreement, water savings within Broward County Public Schools are recognized through the "How Low Can You Go Challenge", a contest in partnership with the Miami Heat, which challenges students and schools to reduce energy and water consumption over a three-month period. Winning schools receive plaques and are recognized during halftime at a Miami Heat game. In addition, beginning in 2019, the County has established a Conservation Partner of the Year Award to recognize local municipalities for their water conservation efforts. This award is made at Water Matters Day.

The County is particularly active in education, outreach, and marketing initiatives to help foster a stronger environmental conservation effort throughout the Broward community. All the programs and activities identified in the 2018 LEC update as part of the District's Comprehensive Conservation Program, and as listed below, are part of the County's initiatives to promote water conservation:

School educational programs. The County regularly promotes water conservation in the schools through classroom programs and teacher and staff trainings. During the 2018-2019 school year, County staff assisted the Global Scholars program in arranging for field trips and providing guest speakers to augment the "World of Water" focus which was the theme for the year.

Media campaigns. The Conservation Pays program promotes indoor water conservation through several media campaigns each year. The most recent campaign, "Play Conservation Pays and Win" used online gamification to educate the public on water conservation, sustainability, and climate change and had over 5,000 players.

Informative billing. The Conservation Pays program provides utility partners with blurbs to include in its billing.

Training staff and associates at facilities and operations that provide irrigation and landscaping materials, services, and supplies. The NatureScape Irrigation Services trains provides training to irrigation industry professionals on an annual basis on developments in water-saving devices. In addition, through the Environmental Partnership with Broward Schools, training is provided to facility managers on ways to save water. The NatureScape Broward program is working with big box stores to

promote water conservation by including more Florida-friendly plant selections within their stores.

Florida-Friendly Landscaping™ demonstration gardens are promoted through the NatureScape Broward program which works with Broward communities, garden clubs, and homeowner's associations to promote Florida-friendly™ landscaping and awards Emerald awards to a select group of homeowners/businesses/municipalities that exemplify excellent landscapes.

Workshops and exhibits. The County regularly offers workshops to promote water conservation and annually promotes water conservation to residents at Broward **Water Matters** Day, an event in March which draws attendance of approximately 4,000 residents.

Landscape design and irrigation education for residents is also promoted at Water Matters Day.

Irrigation water audits for residential and other users are conducted regularly by the NatureScape Irrigation Service and in the schools as part of the Environmental Partnership Agreement.

Indoor water use audits are conducted within Broward schools as part of the Environmental Partnership Agreement.

Retrofit and rebate programs for replacing inefficient water-using devices with efficient ones are promoted through the Conservation Pays program. A new rebate program promoting smart irrigation equipment has recently been implemented through the NatureScape Irrigation Service.

Through the County's water conservation initiatives, as of the end of September 2019, cumulative water savings of 4.44 billion gallons have been realized. Some draft results are presented in Table WS28 and the estimation of municipal participation across the County is presented in Table WS29.

Table WS28 **Water Savings Realized Through County Water Conservation Programs**

Name of Program	Metric	Cumulative gallons saved
NIS	3,508 evaluations	1,643,802,415
Environmental Partnership Irrigation Evaluations	199 evaluations	275,010,020
Conservation Pays Program	155,581 toilet rebates	2,497,634,300
NatureScape Broward	4,619 Florida-friendly habitats	26,850,000

Source: County Water Conservation Program. The information contained in this table is in draft and subject to change.

Table WS29 **Participation in County water conservation programs**

Muinicipality/Utility/Other	NIS (mobile irrigation lab)	Broward Water Partnership Conservation Pays (Indoor Conservation)	NatureScape Broward (Florida-Friendly Landscaping™)	Water Matters Education and Outreach
BMSD/WWS	X	X	X	X
Broward County Public Schools	X	X	X	X
Coconut Creek	X	X	X	X
Cooper City	X	X	X	X
Coral Springs	X	X	X	X
Coral Springs Improvement Dist.	X			
Dania Beach	X	X		X
Davie	X	X	X	X
Deerfield Beach	X	X	X	X
Fort Lauderdale	X	X	X	X
Hallandale Beach	X	X	X	X
Hillsboro Beach				X
Hollywood	X	X	X	X
Lauderdale-by-the-Sea			X	X
Lauderdale Lakes			X	X
Lauderhill		X	X	X
Lazy Lake				X
Lighthouse Point			X	X
Margate	X	X	X	X
Miramar	X	X	X	X
North Lauderdale	X		X	X
Oakland Park	X		X	X
Parkland			X	X
Pembroke Park			X	X
Pembroke Pines	X	X	X	X
Plantation	X	X	X	X
Pompano Beach	X		X	X
Sea Ranch Lakes				X
Southwest Ranches			X	X
Sunrise	X	X	X	X
Tamarac			X	X
West Park			X	X
Weston		X		X
Wilton Manors			X	X

Source: County Water Conservation Program. The information contained in this table is in draft and subject to change.

Water Use Restriction/Initiatives. As required in Chapter 40E-24, Florida Administrative Code, Broward County has enacted its own irrigation ordinance under Chapter 36, "Water Resources and Management," Article II, "Water Emergencies," Section 36-55 "Restrictions on landscape irrigation, Year-round landscape irrigation measures", of the Broward County Code of Ordinances. These measures mirror the measures found in Chapter 40E-24 and impose year-round, Countywide landscape 2-day per week irrigation restrictions. However, this only applies to BMSD areas. Municipalities within Broward County may adopt the provisions in Section 36-55 into their own municipal code. The County's mandatory irrigation restrictions are posted on the County's Water Resources website at:

https://www.broward.org/waterresources/Pages/IrrigationRestrictions.aspx

and in the Broward County Code of Ordinances at:

https://library.municode.com/fl/broward_county/codes/code_of_ordinances?nodeId=PTIICOOR_CH36WAREMA_ARTIIWAEM_S36-55YEUNLAIRMEVA

The County's service areas have been under either the SFWMD's mandatory Phase I and/or Phase II water restrictions or under the County's year-round ordinance since 2005. Since then, the overall per capita consumption has dropped in response to a combination of conservation messaging, financial incentives (High Efficiency Toilet rebates), and ordinance restrictions.

BCWWS has developed and implemented a successful strategy to systematically identify and eliminate, where possible, causes of lost water due to inaccurate flow metering and/or leaky pipes. This comprehensive strategy includes regular inspection, calibration and repair/ replacement of meters, and the replacement of aging infrastructure. These actions have significantly improved water losses by reducing leaks and per capita consumption.

An essential part of the Broward initiatives is the implementation of high efficiency plumbing requirements supported by the Broward County Board of County Commissioners, the Broward League of Cities, and the Broward Water Resources Task Force. Chapter 6, Section 604.4, of the Florida Building Code contains standards for ultra-low volume plumbing fixtures to be used in all new construction and Chapter 9, Section 908.8.1, requires a minimum of 8 cycles of concentration for cooling towers and contains requirements for reuse concentrate of cooling tower makeup water for air handling systems with a 4-ton BTU capacity air handling system or greater as a condition for the receipt of a certificate of occupancy.

Use of Florida-Friendly Landscape Principles. Pursuant to Section 373.228, F.S., Chapter 39, "Zoning," Article VIII, "Landscaping for Protection of Water Quality and Quantity," of the Broward County code of Ordinances, reflects the Florida-Friendly and NatureScape Broward program principles that promote water and energy conservation, while creating a climate resilient landscape. This is in effect for the BMSD areas of Broward County and individual municipalities are adopting as a model landscape code. The Florida-Friendly Landscaping™ program has developed nine principles for sustainable landscapes:

1. Right plant, right place
2. Water efficiently
3. Fertilize appropriately
4. Mulch
5. Attract wildlife
6. Manage yard pests responsibly
7. Recycle yard waste
8. Reduce stormwater runoff
9. Protect the waterfront

Water Conservation-Based Rate Structure. Rate structures that encourage water conservation reward consumers that have low rates of water consumption with the lowest per gallon charge and penalize those showing higher rates of water consumption with a higher per gallon charge. BCWWS adopted a tiered rate structure in 2012 to incentivize water conservation. More information on the rate structure may be found at the web address below:

http://www.broward.org/WaterServices/RatesAndFees/Pages/SingleFamily.aspx

Rain Sensor Overrides for New Lawn Sprinkler System. Broward County's "Landscaping for Protection of Water Quality and Quantity" ordinance is codified in the Broward County Code of Ordinances Sections 39-75 to 39-94. Subsection 39-79(b)(11) includes the requirement for the location and specification of controllers of rain shutoff devices and soil moisture sensors as part of the landscape plan.

Public Information Program. Broward County has several targeted outreach programs for Broward County residents including NatureScape Broward, Water Matters Day, Know the Flow, NIS, and the NatureScape Broward School Board Environmental Partnership Agreement. NatureScape Broward provides educational workshops and training on the need for water conservation, the principles of NatureScape, and assistance in the design of a NatureScape landscape. Residents are encouraged to

apply for NatureScape certification following adoption of NatureScape best management practices on their landscapes.

BCWWS has developed a public education program that includes the development and distribution of brochures, educational materials for elementary and high school students, and presentations to homeowner and condominium associations regarding water supply, treatment, and conservation. The utility also supports the Water Matters Program by purchasing and distributing rain gauges at the annual Broward Water Matters Day event.

City of Fort Lauderdale

The City of Fort Lauderdale has an active water conservation program, as detailed in the City's CUP, ordinances, and in their 2014 Water Supply Plan Update. In the 2008 CUP Renewal, the City used an aggressive approach to control its water demand by developing a conservation program through several initiatives. The first is the City's current efforts at retrofitting and upgrading significant portions of the water delivery systems, including leak detection. The City anticipates that the percentage of unaccounted for water loss will be reduced as this process is implemented. The second is the passage of an ordinance that the City estimated would meet a 10 percent reduction in the projected demands, compared to historical demands. The final initiative is the continued implementation of existing programs such as: limitation of irrigation hours, ultra-low volume plumbing in new developments, xeriscaping principles, conservation-based rate structure, rain sensor requirements, and the City's water conservation education program. More recently, the city is planning on implementing advanced metering infrastructure system wide to enable two-way communication between utilities and customers using smart meters, communication networks and data management systems. The City expects to achieve certain quantifiable goals in the implementation of this program and the City will provide data to the SFWMD on the progress of this demand management program. The City estimates this effort will result in an estimated per capita use rate of approximately 170 gallons per day, which was used for calculating the future demands for the service area.

The City also participates in the Broward Countywide Conservation Pays Program, in collaboration with 18 partners, to provide a coordinated regional campaign focused on water conservation and the distribution of rebates and other incentives.

As partners in the NIS with 18 local water utilities, the City annually selects a group of large water users, including government facilities, parks, schools, and homeowner associations, where the greatest potential exists for significant water savings. Tailored irrigation evaluations are performed by the NIS team of certified experts to capture measured water savings. Best management practices that encourage the 'right plant in the right place' and

smart irrigation are included in each report to help to promote water conservation messaging that adds to long-term water savings.

Fort Lauderdale is a registered County municipality in the community wildlife habitat program through NatureScape Broward. This program promotes water conservation, water quality protection, and the creation of wildlife habitat through Florida-friendly landscape practices that encourage the prudent use of water resources, and the planting of native, non-invasive, and other drought tolerant plants.

F. Reuse

Section 373.250(1), F.S., states that, "the encouragement and promotion of water conservation and reuse of reclaimed water, as defined by the department, are state objectives and considered to be in the public interest." In addition, Section 403.064(1), F.S., states, "reuse is a critical component of meeting the state's existing and future water supply needs while sustaining natural systems." This section highlights the current levels of reuse within each water supply entities' service area.

Broward County

BCWWS operates the Broward County North Regional Wastewater Treatment Plant (WWTP) located in the City of Pompano Beach. The facility has a FDEP-permitted capacity of 95.0 MGD. It provides wastewater services for northern Broward County. In 2018, the annual average daily wastewater flow at the facility was 71.8 MGD. Wastewater effluent is divided between deep injection well disposal and ocean outfall discharge. Approximately 3.8 MGD of the treated wastewater is reused at the facility or at adjacent facilities for irrigation, process or cooling water. Approximately 0.2 MGD of the reuse generated at the North Regional WWTP is delivered for residential and public access area irrigation (Annual Reuse Report to FDEP submitted on November 29, 2018). The primary users include Broward County Septage Receiving Facility, Broward County North Regional WWTP, Fedex, Pompano Business Center, Freshpoint Pompano, and Pompano Center.

Based on historic flows to the ocean outfall, the facility is required to reuse 21.45 MGD (60 percent) of treated wastewater by 2025 to comply with the 2008 Ocean Outfall statute (Section 403.086(9), F.S.). BCWWS is promoting collaborative regional water supply strategies to meet the required 60 percent water reuse by 2025. BCWWS has developed a regional reuse master plan and County Ordinance No.2017-05 created mandatory reuse under Chapter 34, Article XI, Reclaimed Water, in the Broward County Code of Ordinances.

Disposal of the treated wastewater is primarily via deep injection wells (44 MGD) and by ocean outfall (24 MGD). However, of the water sent to the ocean outfall, an average 3

MGD was captured by the City of Pompano Beach for further treatment and distribution for irrigation use. The City of Pompano Beach Oasis Reclaimed WTP has a capacity to treat 7.5 MGD of secondarily treated wastewater. Overall, water reuse at the facility and through the City of Pompano Beach accounts for approximately 5 percent of the wastewater treated at the facility.

The County has initiated several reclaimed pipeline projects over the past few years. Northeast of the North Regional WWTP is the City of Pompano Beach, Pompano Highlands neighborhood. BCWWS has installed reclaimed water pipelines as part of a neighborhood improvements program. The reclaimed system is complete, and the City of Pompano Beach has agreed to provide reclaimed water for residential landscape irrigation from the City of Pompano Beach Oasis Reclaimed WTP, which draws secondarily treated effluent for feed water from a North Regional WWTP pipeline. The City of Coconut Creek entered into an interlocal agreement with BCWWS in April 2016 to receive up to initially 1.4 MGD of reclaimed water with a long-term expectation of 3 MGD. Two connections were established to serve Coconut Creek.

BCWWS is proceeding with expansion of the North Regional WWTP Reclaimed System as well as extending a 42-inch diameter reclaimed pipeline to serve beneficial reuse users in both Broward and Palm Beach Counties. The expansion of the Reclaimed Water Treatment System at the North Regional WWTP is underway and a contract has been let for construction. Pre-construction activities are nearing completion and it is anticipated that construction of the pipeline will commence the first quarter of 2020. The project scope includes approximately 5 miles of 42-inch diameter reclaimed transmission main from the North Regional WWTP to the Palm Beach County line (Reclaimed Status Report submitted January 24, 2018). Approximately 20 MGD of potential reclaimed users have been identified in the, "Broward County Outfall Rule Detailed Plan North Regional Wastewater Treatment Plant Report," prepared by Hazen and Sawyer in 2013. County staff are also pursuing new potential users. The County continues to work towards meeting the requirements of the 2008 Ocean Outfall statute before 2025.

City of Fort Lauderdale

The City of Fort Lauderdale's George T. Lohmeyer Wastewater Treatment Facility is a central regional facility used to treat wastewater in a region encompassing Port Everglades, the Cities of Fort Lauderdale, Wilton Manors, and Oakland Park and parts of the City of Tamarac, Town of Davie, and BMSD. The facility has an FDEP-permitted capacity of 56.7 MGD. Treated effluent from the facility is disposed through five deep injection wells.

As stated in the City's Draft Water Supply Facilities Work Plan (November 7, 2019), "The facility does not currently treat effluent to reclaimed water standards for public irrigation or other offsite uses. However, on average the plant uses about 4-mgd of its own secondary effluent as in-plant re-use instead of potable water. Additionally, the City is participating in the County-wide Integrated Water Resources Plan Grants for feasibility studies related to potential beneficial reuse. These have included a 2008 feasibility study for selected reclaimed water projects within the City for a 50% cost share for $125,000. A second feasibility study in 2009 was for the reclaimed water in the area of the Convention Center Broward County provided a 50% cost share for $5,000. The City of Fort Lauderdale prepared a report assessing reclaimed water opportunities in November 2008 titled "Feasibility Study for the Implementation of Selected Reclaimed Water Projects with the City of Fort Lauderdale". Key conclusions of the report were (CDM, 2008):

- The GTL WWTP is located far from any significant users of reclaimed water, such as golf courses. Therefore, the construction of an irrigation-quality reclaimed water production facility at or near the plant to provide further treatment of effluent to public reuse standards is not feasible. There is little available space on the plant site or plant vicinity to construct the required treatment facilities. In addition, due to high levels of infiltration into gravity sewer piping located near coastal areas and waterways, the chloride concentration in the treated effluent over 1,100-mg/L, resulting in unaffordable levels of treatment to reuse standards at the GTL WWTP site. Therefore, the only practical alternatives for implementing reuse systems are off-site and near potential beneficial uses of reclaimed water;
- Two options studied (reclaimed water facilities at the E-Repump Station and the Former Composting Facility1) are technically feasible but are not be economically viable.

The City of Fort Lauderdale continues to assess water reuse opportunities to identify and assess cost effective alternative water supply opportunities. Indirect potable reuse systems have been evaluated by the City; none have emerged as economically feasible. However, due to the dual benefits of providing more disposal capacity and augmenting local water supplies, the City continues to contemplate indirect potable reuse opportunities when assessing alternative water supply investment decisions."

City of Hollywood

The City of Hollywood operates a regional WWTP that is subject to the requirements of the 2008 Ocean Outfall statute. The City of Hollywood implemented a reuse system that delivers up to 4 MGD of blended low-salinity reuse water for irrigation and an annual average of 4 MGD of high-salinity reuse water that is used internally at the City's Southern

Regional Wastewater Treatment Plant. The City is working towards having 10 MGD of reuse capacity by 2025 by the following methods:

- Credit for Existing Onsite Process Reuse – 4 MGD
- Reuse Water for Irrigation within the City – 1.5 MGD
- Contracted Reuse – 4.5 MGD

The City feels that the existing system may be expandable to additional contract, residential irrigation and commercial uses in the future up to an additional 0.3 MGD (Hollywood, 2020).

SPECIAL RECOMMENDATIONS AND ACTIONS

BCWWS, as a Water Supply Entity, is responsible for the implementation of the water supply development projects identified in the 2018 LECWSP Update, as approved by the SFWMD governing Board, in November 2018. The County projects listed in Chapter 6 and Appendix E of the 2018 LECWSP Update are listed below.

A. Broward County Water Reuse Projects

BCWWS, in compliance with the requirements of the ocean outfall legislation, developed the "Broward County Outfall Rule Detailed Plan North Regional Wastewater Treatment Plant Report", prepared by Hazen and Sawyer in 2013. This plan documents the County's intent to produce an additional 21.45 MGD of reclaimed water. Of the 21.45 MGD reclaimed water production, 19.7 MGD will be produced at North Regional WWTP. (The remaining reclaimed water will be produced through the Pompano Beach filter facility.) BCWWS reclaimed system projects are outlined below.

North Regional WWTP Capacity Improvements. The capacity improvements construction project will consist of a 16 MG reclaimed water filter capacity expansion with high level disinfection and associated pumping facilities for future expansion of the reclaimed water distribution system at the North Regional WWTP. The project will expand the use of reclaimed water for irrigation. The expansion will include a treatment module, pumping, piping and chemical modifications, emergency power, and related site improvements. Construction is anticipated to be complete by 2021 at an estimated cost of $59 million. As of September 2019, the project is 25 percent complete (Quarterly Report for Major Capital Projects in the Public Works Department Memorandum dated October 3, 2019).

North Regional WWTP Reclaimed Water Transmission System. The reclaimed water transmission system for new customers in Palm Beach County will be constructed through an Interlocal Reclaimed Water Agreement between Broward County and Palm Beach County. In this agreement, Broward County is tasked with construction of transmission and treatment facilities to provide approximately 15 MGD of reclaimed water to Palm Beach County and 3 MGD to North Springs Improvement District. In addition, potential new users along the transmission corridor in Broward County will be identified for service. The project will expand the use of reclaimed water for irrigation. The project construction is anticipated to be complete by 2021 at an estimated cost of $29 million (Quarterly Report for Major Capital Projects in the Public Works Department Memorandum dated October 3, 2019).

North Regional WWTP Reclaimed Water Transmission System Expansion. Approximately four miles of 24-inch diameter reclaimed water main will be constructed from NW 39th Avenue in Coconut Creek to North Springs Improvement District, to connect with approximately 4,000 linear feet of reclaimed water main that was constructed as part of the County's Hillsboro Pines Neighborhood Project. The project will expand the use of reclaimed water for irrigation. The project construction is anticipated to be complete by 2021 at an estimated cost of $6.4 million (Quarterly Report for Major Capital Projects in the Public Works Department Memorandum dated October 3, 2019).

B. C-51 Reservoir Project

BCWWS has associated 3 MGD of their total 6 MGD purchase with their SR Wellfield CUP to offset demands for raw water from their 3A/3BC service area. Construction is scheduled to begin in October 2019 with full operation anticipated by October 2021.

C. Technical Water Resources Assessments

Climate change and sea level rise pose significant threats to regional water supplies. Local impacts are accelerated by increased wellfield pumpage, rising sea level, and aging urban drainage infrastructure, leaving municipalities and water utilities grappling with how to balance the planning needs with the financial challenges.

The County is continuing to partner with USGS to advance the expansion of the Inundation Climate vulnerability model focused on coupled hydrologic impacts of saltwater intrusion, surface and groundwater elevations, and stormwater inundation, using the SWR and URO packages, throughout the entire urban extent of the County.

The County is also using the results of the 2014 FEMA study to calculate Future Conditions 100-year flood elevations that are anticipated to occur in 2070 accounting for sea level rise and more intense rainstorms. The effort includes data collection of recent or previously not included drainage infrastructure, refined model grid and associated LiDAR, land use update, addition of detention storage and ponded drainage routine, model calibration to a recent flooding storm event, and incorporation of future tide levels and a 100-year rainstorm event. It is anticipated the modeling will be completed in the Fall of 2019 and, once approved, will be formalized as the second map of the Future Conditions Map Series.

Upper Floridan Aquifer Geotechnical Study

Broward County, in cooperation with USGS, completed the Phase 1 Feasibility Study of the Upper Floridan Aquifer in March 2014. The study has compiled all available well information and commissioned a new well (G-2984) to be drilled, cored, and logged. Using borehole

and core sample data (84 wells at 33 sites), the hydrogeologic framework of the Floridan Aquifer system in Eastern Broward County was delineated. This effort helped to construct unique cross-sections and maps representing the stratigraphic and hydrogeologic units of the Floridan Aquifer system in urban Broward County. An additional component of the project was to complete seismic profiling along approximately 14 miles of the Hillsboro Canal, which resulted in seismic reflection data that were then correlated to the borehole geophysical data (Reese et al., 2014).

The results offer better definition of the stratigraphic and hydrogeologic characteristics of the aquifer, which will improve upon the selection of new well locations or for water storage options, such as ASR. Building on the successful use of seismic profiling in the first study, Phase 2 of this Feasibility Study was commissioned and completed in 2017 (Cunningham et al., 2018). It further refined the hydrogeologic framework and regional extent of information by collecting 80 miles of high-resolution seismic profiles from canals in Broward County along with well logs and cores or cutting from 44 wells. Mapping of the Oldsmar, Avon Park, and Arcadia formations was completed over the 425 square mile study area. In addition, many unconformities that might identify faults that are either near-vertical reverse faults or karst collapse structures throughout the County were identified. Water utilities in these areas may consider further studies around these features when planning project near their vicinities.

D. Broward County Water Partnership

The Broward County Water Partnership is an ongoing High Efficiency Toilet Replacement and Water Conservation Incentives Program. Broward Water and Wastewater Services are media partners in the Countywide Water Conservation Incentives Program, launched in 2011. This program has provided approximately 4,500 high efficiency toilets with an estimated water savings of 450 thousand gallons per day. The program utilizes monthly promotional material, public service announcements, radio adds, etc., to promote a consistent water conservation messaging throughout the partner service areas. This covers almost 80 percent of Broward County. Historically, this program has been supported, in part, through the SFWMD's Water SIP and Cooperative Funding Programs, which have provided $277,000 in matching funds through 2018. Neither of these programs are currently funding the partnership.

Additionally, BCWWS' High Efficiency Toilet Rebate Program has been in existence since 2010 and has offered over $250,000 in billing credits for replacing 2,500 water wasting toilets. This effort is supported by $30,750 of matching funds from the SFWMD. Promotion of this program throughout the BCWWS service area will continue through this next five-year planning period unchanged.

E. NatureScape Irrigation Service

The NIS water conservation program provides irrigation system evaluations for large properties in 20 cities and water districts. The NIS team conducts a test of the irrigation system and provides comprehensive recommendations for improving overall efficiency - saving water, reducing runoff of pollutants, and keeping canals and water bodies clean in our urban areas. The program has saved more than 1.5 billion gallons of water since 2005. In 2019, the program initiated a new residential incentive program to offer rebates for outdoor irrigation systems updates.

BCWWS CAPITAL IMPROVEMENTS

This section provides a brief description of the BCWWS Capital Improvements Program and Policies for Water Supply.

A. Work Plan Projects

The 2020 Work Plan includes the listing of public and regional water supply projects and programs over the next 10-year period (at a minimum) that may be necessary to serve the BCWWS service area and large users. The following sections include additional information related to the development of traditional and AWS sources, and conservation and reuse initiatives that are being advanced to support water resource and water supply protections.

Broward County, as a Water Supply Entity, is responsible for the implementation of the water supply development projects identified in the 2018 LECWSP Update, as approved by the SFWMD Governing Board in November 2018. BCWWS reviewed the information in the 2018 LECWSP Update pertaining to the AWS projects. BCWWS determined that, because additional water supply above what is currently permitted by the SFWMD is not needed in the next 20-year period, the District 1 and District 2A/North Regional WTP expansion and Floridan Aquifer development projects would be unfunded in the County's Capital Improvement Plan. These projects will be re-evaluated and re-established as funded projects when the need for additional water supply arises.

BCWWS continues to evaluate raw and finished water demands throughout their utility service areas and provide the SFWMD with annual progress reports regarding the status of the AWS projects. Table WS23 and Table WS24 below summarize the AWS and water conservation projects contained in the 2018 LECWSP Update that are directly related to BCWWS' water supply development. Table CI-F, excerpted from the 2019 Broward County Capital Improvement Plan, is provided below for comparison.

The County projects listed in Chapter 8, Table 8-1, of the 2018 LECWSP Update are described below with an update on the project status.

- District 1A Treatment Plant Expansion and Floridan Aquifer Development. (RO, WTP, Floridan Wells, and a Disposal Well) Two Floridan Test/Production wells were completed in 2014 and found to have a Total Dissolved Solids concentration greater than 7,000 mg/L. The County is re-assessing the potential production capacity and water quality of the Upper Floridan source for ASR use. The District 1A 3 MGD Treatment Plant

Expansion project has been unfunded and will be evaluated annually for future funding based on projected water demands.

- District 2A Treatment Plant Expansion and Floridan Aquifer Development. (RO, WTP, Floridan Wells, and a Disposal Well) The addition of 6 MGD of RO treatment, concentrate disposal, development of a Floridan Aquifer source, and raw water transmission piping and pumping facilities project has been unfunded and will be evaluated annually for future funding based on projected water demands.
- C-51 Reservoir Project Phase 1 – North Regional Wellfield. BCWWS has entered into an agreement for capacity allocation in Phase 1 of the C-51 Reservoir Project with Palm Beach Aggregates and may, in the future, modify the existing CUP to add 3 MGD of C-51 Reservoir Project offset water to create more operational flexibility between the District 2A and North Regional Wellfields.
- C-51 Reservoir Project Phase 1 – South Regional Wellfield. BCWWS has entered into an agreement for capacity allocation in Phase 1 of the C-51 Reservoir Project with Palm Beach Aggregates and has a CUP allocation for 3 MGD of C-51 Reservoir Project offset water to offset the SR Wellfield raw water demands for the 3A/3BC service area. The C-51 Reservoir Project is scheduled to begin construction in September 2019 and be operational by October 2021.
- Broward Water Conservation Programs. The conservation programs detailed in the previous sections have a water savings goal of reducing the per capita consumption by 10 gallons per day by 2029, as established in the 2019 IWRP update.

Table WS30 Proposed Potable and Non-Potable Public Water Supply Development Projects Listed in SFWMD 2018 LECWSP Update

Implementing Entity	Project Name	Project Description	Project Capacity (MGD)	Total Capital ($M)	Est. Date Complete
POTABLE - FLORIDAN AQUIFER SYSTEM					
BCWWS	District 1 Water Supply Improvement Alternatives	Construct Floridan Aquifer System water supply wells, connecting raw water transmission main, and RO treatment facility	3.00	5.6	2025
BCWWS	District 2 Water Treatment Plant Expansion	Construct Floridan Aquifer System water supply wells, connecting raw water transmission main, and RO treatment facility	6.00	33.3	2026
Fort Lauderdale	Dixie Floridan Aquifer System Water Supply/Treatment Facility	Expansion of the Peele-Dixie nanofiltration Water Treatment Plant to include RO treatment	6.00	22.9	2030
Hollywood	RO Train E	Installation of new RO train	2.00	2.0	2030
Hollywood	Floridan Aquifer System Wells F14 and F15	Construction of 2 Floridan Aquifer System wells	4.00	3.0	2034
NONPOTABLE - STORAGE/ASR					
BCWWS	South Regional Wellfield C-51 Reservoir Project Phase 1 Recharge Offset	BCWWS and PBA agreement for capacity allocation in C-51 Reservoir Project Phase 1 for BCWWS South Regional Wellfield (Authorized under Current CUP)	3.00	13.8	2020
BCWWS	District 2/ North Regional Wellfield C-51 Reservoir Project Phase 1 Recharge Offset	BCWWS and PBA agreement for capacity allocation in C-51 Reservoir Project Phase 1 for BCWWS North Regional Wellfield (not yet under CUP)	3.00	13.8	2026
Dania Beach	BCWWS South Regional Wellfield C-51 Reservoir Project Phase 1 Recharge Offset	Dania Beach and PBA agreement for capacity allocation in C-51 Reservoir Project Phase 1 for BCWWS South Regional Wellfield (Authorized under Current CUP)	1.00	4.6	2023
Hallandale Beach	BCWWS South Regional Wellfield C-51 Reservoir Project Phase 1 Recharge Offset	Hallandale Beach and PBA agreement for capacity allocation in C-51 Reservoir Project Phase 1 for BCWWS South Regional Wellfield (Authorized under Current CUP)	1.00	4.6	2023

Table WS31 **Water Conservation Projects Listed in SFWMD 2018 LECWSP Update**

Project Name	Entity Name	Project Type	Fiscal Year	Proposed Water Savings (MGY)
USEPA WaterSense HET Replacement/ Credit Program	Broward County Board of County Commissioners	Indoor Plumbing	2013 – 2017	18.3
HET Rebate Program	Broward Water Partnership	Indoor Plumbing	2013 – 2017	42.2
NIS Smart Irrigation Tech. Retrofit Program	Broward Water Partnership	Irrigation	2015 - 2017	66.8

B. Capital Improvements Element (CIE) /Schedule

The purpose of the CIE is to evaluate the need for public facilities as identified in other Comprehensive Plan elements. The CIE also includes cost estimates for improvements for which the County has fiscal responsibility; an analysis of the fiscal capacity of the County to finance and construct improvements; and financial policies to guide the funding of improvements to address needs identified in other Comprehensive Plan elements. The CIE also ensures that an adequate concurrency management system is implemented by the County pursuant to Section 163.3180, F.S. The CIE shows how infrastructure needs identified in other elements of the Comprehensive Plan will be funded. The Element contains a list of the various improvement projects for public infrastructure that are scheduled in the next five years, including the Transportation Improvement Program (TIP), potable water, sanitary sewer, drainage, recreation, aviation, Port Everglades, beach re-nourishment, transit, community development, and public school facilities.

The focus of the CIE Policies is to:

- Evaluate and proactively plan for the County's infrastructure needs
- Plan and implement adaptation strategies for short and long-term climate change events and impacts
- Implement and regulate infrastructure in a sustainable manner
- Monitor feasibility of construction of improvements
- Coordinate and collaborate with state, regional and local agencies and governments on infrastructure funding strategies

The Broward County Comprehensive Plan (Plan) describes how the County will provide required services to meet the current and future needs of the community and economic development, while protecting the natural environment. This policy document provides a coordinated approach to making many decisions regarding land use and the location of development, the extension of urban services, the placement of community facilities,

adaptation to climate change impacts and others. The Plan is composed of 18 Elements that contain GOP organized by topics. Each Elements' Support Document contains the data and analysis used in developing the GOP. The Plan also contains a map series that generally describes existing or future conditions related to the Plan's Elements. The principles and strategies contained in the GOP guide the County's future decisions to help ensure that we are prepared to meet challenges today and in the future. The Plan is a "living" document that is updated to respond to changing conditions in matters such as population, technology, organizational structure, the economy, and climate. The process of developing and updating the plan is a community-wide effort that requires compiling and analyzing new data, jointly developing coping strategies, and amending the GOP. The County's current Comprehensive Plan documents were adopted March 28, 2019 and are available on the web at:

https://www.broward.org/BrowardNext/Pages/ComPlanDocs.aspx

BCWWS planning is conducted on a 10-year cycle to identify system improvements necessary to accommodate future growth and to address regulatory changes. Comprehensive planning efforts were first initiated in 1988 with the "Water and Wastewater Master Plan", which was revised in 2004. The Plan addressed the need for facility improvements based upon anticipated build-out conditions in each of the BCWWS service areas over a 20-year planning horizon. The Alternative Water Supply and the Effluent Disposal and Reclaimed Water master plans were completed in 2010. The plans identify treatment plant improvements and/or expansions needed to accommodate the projected population and new regulatory requirements. The Retail Facilities Master Plan was completed in 2016 to analyze retail distribution and collection network improvements the through year 2040. A Regional Wastewater System Master Plan effort is underway and should be completed by 2021. Broward County CIP incorporates the various master plan recommendations into a 5-Year Capital Program. Projects are funded through BCWWS revenue bonds and pay-as-you-go funding supported with user fees.

The Adopted Broward County Capital Program FY19-23 outlines the anticipated capital projects for the Fiscal Year 2019 through 2024 planning period. Water and Wastewater Services projects are listed in the Enterprise Capital Section under Water & Wastewater Five Year Summary and Project Descriptions which can be accessed on the web at:

https://www.broward.org/Budget/Archives/Documents/EnterpriseFundsCapitalFY19Adopted.pdf

GOALS, OBJECTIVES AND POLICIES

Existing GOP of the recently adopted BrowardNEXT2.0 Comprehensive Plan (2019) were reviewed to determine if any updates would be needed to meet new and existing statutory requirements, as well as for consistency with the 2020 Work Plan. The following issues were considered:

- Implementation of the work plan
  - Policies implementing the work plan by incorporating the work plan into the Comprehensive Plan or adopting the work plan by reference
- When adopting the work plan by reference, the policy must identify the title and author of the document and clearly indicate what provisions and edition of the document are being incorporated [Section 163.3177(1)(b), F.S.]
- Concurrency provisions for water supply availability
- Water conservation programs and activities specific to the local government
- AWS projects
- Local governments must incorporate into the Sanitary Sewer, Solid Waste, Drainage, Potable Water, and Natural Groundwater Aquifer Recharge element AWS project(s) selected from the those identified in the applicable regional water supply plan, pursuant to Section 373.709(2)(a), F.S., or proposed by a local government under Section 373.709(8)(b), F.S. [Section 163.3177(6)(c)(3), F.S.]
- Reclaimed water programs
- Level of service standards specific to the local government
  - Update and/or review the level of service standards. The level of service standards need to be consistent throughout the Comprehensive Plan and work plan
- Population projections
- Update and/or review the population projections. The projections should be consistent throughout the Comprehensive Plan and work plan update. If they are not consistent, explain why
- Water supply/source needs and demands
- Intergovernmental coordination with the SFWMD, water suppliers, and other local governments, including areas that cross jurisdictional boundaries. Identify any joint planning areas and joint infrastructure service areas related to water supply
- Incorporation of the work plan into the Comprehensive Plan
- Incorporation of another local government's or water supplier's work plan into the Comprehensive Plan
- Sector Plan coordination and implementation

The BrowardNEXT 2.0 Comprehensive Plan Elements already includes several GOP that support the County's Water Supply Facilities Work Plan and the requirements of Chapters 163 and 373, F.S. The supporting GOP can be found within the following elements:

- Capital Improvements (CI)
- Climate Change (CC)
- Conservation (C)
- Coastal Management (CM)
- Intergovernmental Coordination (IC)
- Water Management (WM)

More specifically, the selected GOP reflect the County's commitment to water supply planning and water resource protections and are inclusive of any recommended changes that will be made. The GOP listed below are organized by issue topic, as discussed above.

Issue #1 – Implementation of the Work Plan

OBJECTIVE WM1 Water and Wastewater Services
Broward County's Water and Wastewater Services (WWS) will provide raw water, potable water, sanitary sewer, surface water, and storm water management services within the agency's designated service areas that are cost-effective, equitable, adequate, and sustainable, while meeting applicable federal, state, and local design, construction, and operational standards and regulations.

POLICY WM1.1 WWS will provide potable water and sanitary sewer to current and future customers of the WWS systems using cost-effective, equitable, and adequate potable water, and sanitary sewer infrastructure and facilities that meet applicable federal, state, and local standards.

POLICY WM1.2 WWS will maintain funding for systems improvements identified in the Broward County Capital Improvements Program (CIP) to alleviate potable water and sanitary sewer deficiencies within its service area.

POLICY WM2.1 Within eighteen (18) months of the adoption of an update to the SFWMD LECWSP, utilities located within Broward County will update and adopt their 10-Year Water Supply Facilities Work Plans, pursuant to Chapters 163 and 373 of the Florida Statutes, to incorporate the Regional Alternative Supply Plan and to evaluate water resource needs, identify water supply deficiencies, and plan for alternative water supply sources and projects to serve existing and new development within the County.

Issue #2 – Concurrency for Water Supply Availability

POLICY BMSD 1.1.5 Future land uses shall be coordinated with the availability of public facilities and services.

OBJECTIVE BMSD 1.2 Future Land Use Map Amendments

Proposed amendments to the BMSD Future Land Use Map shall be evaluated based on the availability of public facilities and services, site suitability, compatibility with surrounding uses, complete streets, transportation infrastructure, affordable housing, and potential impacts on natural resources.

POLICY BMSD 1.2.1 Future land use amendments shall include the minimum amount of land needed to ensure:

1. Adequate facilities and services are available to support the uses
2. The site is suitable for the proposed use
3. Mobility options of the site are suitable for the proposed use and are designed using Complete Streets Principles outlined in the Transportation Element
4. Urban Sprawl is discouraged
5. Sufficient affordable housing is provided to meet the needs of the area
6. The proposed use is compatible with surrounding uses

POLICY BMSD 1.2.2 Availability and capacity of the following public facilities and services shall be considered:

1. Potable water
2. Sanitary sewer
3. Solid waste
4. Roads, sidewalks, and bicycle facilities
5. Public transit
6. Drainage
7. Parks and recreation facilities
8. Hurricane shelters and evacuation routes
9. Public Schools

OBJECTIVE CI1 Evaluate and Proactively Plan for the County's Infrastructure Needs. The Capital Improvements Element (CIE) will be reviewed and updated annually to reflect the County's budget process to ensure it includes the resources and improvements required to address present infrastructure deficiencies and future infrastructure needs, as discussed in other Elements of this Comprehensive Plan. These deficiencies and needs are addressed in the Capital Improvements Program (CIP) on Tables CI-A through CI-N.

POLICY CI1.1 Capital projects will be evaluated using the following criteria:

1. Elimination of hazards that impact public health and safety,
2. Promotion of efficient development and prevention of urban sprawl,
3. Level of impact on operating budget,
4. Protection of prior infrastructure investments,
5. Consistency with County plans and the plans of other agencies,
6. Elimination of existing deficiencies,
7. Maintenance of adopted levels of service (LOS),
8. Availability of funds and reflection of sound fiscal policies,
9. Implementation of County Commission adopted goals,
10. Climate resilience.

POLICY CI1.2 Continue implementation of approved master plans as outlined within the Transportation, Water Management, Solid Waste, Public Schools Facilities, Airport, and other Comprehensive Plan Elements.

POLICY CI1.8 Continue to allocate funds for the replacement and renewal of infrastructure in an amount which will minimize operating costs and maximize the life of the infrastructure.

POLICY CC2.7 Broward County shall update the assessment of public investments and infrastructure at risk from sea level rise and other climate change related impacts every 5 years. Specifically, the County shall analyze vulnerability to facilities and services, including but not limited to: buildings; water and wastewater treatment plants, transmission lines and pumping stations; storm water systems; roads, rail, bridges, and all transportation and transit infrastructure; power generation facilities and power transmission infrastructure; critical airport and seaport infrastructure; hospitals; city halls; and police and fire stations.

POLICY WM2.8 Broward County will identify water infrastructure at risk from unified sea level rise projections of 9 to 26 inches (timeframe of 2010 to 2060) and other climate change related impacts by 2025 and update this assessment every 5 years.

Issue #3 – Water Conservation Programs

POLICY CC3.8 Broward County, in conjunction with its municipalities, shall promote species diversity, the planting of native and drought-tolerant landscapes, and sustainable urban forestry practices in order to protect the health and resiliency of our natural resources to the impacts of climate change.

POLICY CC3.9 Broward County shall continue to implement the NatureScape Broward program and encourage the use of native and non-invasive, subtropical, and rare native plants

in the urban landscape in order to promote water and energy conservation while creating a climate resilient landscape. Furthermore, these plants should be salt, wind, and drought tolerant, where appropriate, and maintained consistent with NatureScape Broward and Florida-Friendly Landscaping Best Management Practices.

POLICY CC5.9 Broward County, through the Master Partnership Agreement with the School Board of Broward County, shall continue to support existing County and municipal education and outreach programs including, but not limited to: energy efficiency and water conservation; waste reduction and recycling; urban forests and native landscaping; and air quality and GHG reduction. The County will also support education and outreach programs on other sustainable issues and work cooperatively to link these overlapping themes with local climate impacts in all educational materials and messages.

POLICY WM1.8 WWS will continue to implement a leak detection program, conservation-oriented utility service rate structure, and other conservation measures required by Broward County ordinance.

POLICY WM1.9 WWS will maintain comprehensive water use profiles for service area customers including customer class, utility rate profiles, water usage patterns, and seasonal variations to increase the effectiveness of conservation efforts by focusing methods on those elements with the greatest water savings potential. WWS will reference the water use profile to expand and/or implement programs that promote conservation of water resources such as toilet rebates and water use analyses.

POLICY WM2.2 In order to protect and conserve the Surficial Aquifer System and limit demands on the regional water management system, the Broward County Environmental Protection and Growth Management Department (EPGMD) will continue to investigate and promote the development of alternative water supply strategies such as: 1. Continued promotion of water conservation; 2. Brackish water aquifer development; 3. Storm water capture, storage, and reuse; 4. Aquifer recharge; 5. Aquifer Storage and Recovery (ASR); 6. Reclaimed water use; 7. Improvements to the secondary canal infrastructure; 8. Additional regional surface water storage; and 9. Other technologies and management strategies consistent with the goals of the most recently adopted LECWSP Update and Broward IWRP.

POLICY WM3.27 Broward County will advocate for water conservation measures in building practices and will implement programs to support plumbing retrofits, toilet rebates, Florida-friendly landscaping and Florida Yards and Neighborhoods best management practices (BMPs), and water conservation education.

POLICY WM3.32 Broward County will protect aquifers from depletion through water conservation and preservation of the functions of high recharge areas including, but not limited to, the water conservation areas and water preserve areas.

POLICY WM3.33 Broward County will continue to enforce Chapter 39, "Zoning," Article VIII, "Landscaping for Protection of Water Quality and Quantity," of the Broward County Code of Ordinances, which reflects the NatureScape Broward program principles that promote the use of native and Florida Friendly landscaping and the preservation of native habitats in support of sustainable urban landscapes and the conservation of water resources.

POLICY WM4.8 Broward County will coordinate with Broward County entities, FDEP, and EPA in the implementation of Florida's Ocean Outfall Law requirements, per Section 403.086, Florida Statutes, and support and promote collaborative regional and sub-regional water resource and supply strategies, water resource development, conservation, and reclaimed water projects that provide economies of scale and regional benefits, with special emphasis on those areas that currently contribute to the volume of wastewater being discharged through open ocean outfalls, with the goal of achieving 60% reuse of water currently discharged via outfalls by the year 2025.

POLICY WM4.17 Broward County, in partnership with local municipalities and water and wastewater entities, will continue to develop and implement programming for Countywide water conservation and initiatives, including the Conservation Pays Program, Water Matters education and outreach programs, NatureScape Broward, and the NatureScape Irrigation Services, to promote water and energy conservation.

Issue #4 – Alternative Water Supply Projects

POLICY WM1.4 WWS shall identify and plan for development of alternative water supplies by the year 2025 sufficient to meet public water supply needs through the year 2040.

POLICY WM2.1 Within eighteen (18) months of the adoption of an update to the SFWMD LECWSP, utilities located within Broward County will update and adopt their 10-Year Water Supply Facilities Work Plans, pursuant to Chapters 163 and 373 of the Florida Statutes, to incorporate the Regional Alternative Supply Plan and to evaluate water resource needs, identify water supply deficiencies, and plan for alternative water supply sources and projects to serve existing and new development within the County.

POLICY WM2.2 In order to protect and conserve the Surficial Aquifer System and limit demands on the regional water management system, the Broward County Environmental Protection and Growth Management Department (EPGMD) will continue to investigate and promote the development of alternative water supply strategies such as: 1. Continued promotion of water

conservation; 2. Brackish water aquifer development; 3. Storm water capture, storage, and reuse; 4. Aquifer recharge; 5. Aquifer Storage and Recovery (ASR); 6. Reclaimed water use; 7. Improvements to the secondary canal infrastructure; 8. Additional regional surface water storage; and 9. Other technologies and management strategies consistent with the goals of the most recently adopted LECWSP Update and IWRP.

POLICY WM3.25 Broward County will encourage the use of reclaimed water as an integral part of its wastewater management program and evaluate the costs and benefits of adaptation alternatives to increase efficiency and optimize the capacity of existing reclaimed water facilities where economically, environmentally, and technically feasible.

POLICY WM3.26 Broward County will continue public education, coordination, and program support for the expansion of beneficial use of reclaimed water, while encouraging regional reuse projects.

POLICY WM4.7 Broward County will coordinate regionally to advance the use of the IWRP and Regional Reuse Master Plan tools to increase flood protection, water quality treatment, water supply sources, storm water storage, wetland sustainability, ground water recharge, use of reclaimed water for irrigation, aquifer recharge, and environmental enhancement, where technically, environmentally, and economically feasible, to protect water resources and develop climate resilience.

POLICY WM4.8 Broward County will coordinate with Broward County entities, FDEP, and EPA in the implementation of Florida's Ocean Outfall Law requirements,¬ per Section 403.086, Florida Statutes, and support and promote collaborative regional and sub-regional water resource and supply strategies, water resource development, conservation, and reclaimed water projects that provide economies of scale and regional benefits, with special emphasis on those areas that currently contribute to the volume of wastewater being discharged through open ocean outfalls, with the goal of achieving 60% reuse of water currently discharged via outfalls by the year 2025.

Issue #5 – Reclaimed water programs

POLICY CC2.17 Broward County should develop, in conjunction with local municipalities and businesses, a sustainable and energy-efficient materials economy through cooperative materials management systems and infrastructure, in order to maximize the recovery and reuse of waste, water, wastewater, and other materials in ways that capture their economic value, conserve embedded energy, and minimize net life-cycle emissions of GHG and other pollutants.

GOAL WATER MANAGEMENT

Broward County will manage its water resources and infrastructure using a collaborative, equitable, and cost-effective integrated approach that optimizes potable water supplies, wastewater, reclaimed water, storm water, existing infrastructure, and natural systems to meet the short- and long-term needs of the County's residents, businesses, visitors, tribal communities, and the environment while addressing water management challenges associated with climate change.

POLICY WM1.6 WWS will continue to use the development review process outlined in the Broward County Land Development Code to require applicants for development permits within the Broward County utility districts to enter into an agreement to connect to existing potable water, sanitary sewer, and reclaimed facilities. When adequate facilities, based on the adopted level of service (LOS) standards, are not available and no fiscally feasible plan to construct or expand facilities is proposed, Broward County may require the developer to construct improvements to the potable water, sanitary sewer, and reclaimed water reuse systems, as necessitated by the proposed development.

POLICY WM1.11 WWS will encourage the coordination and development of North Regional Wastewater Treatment Plant regional reclaimed water projects in accordance with Florida's Ocean Outfall Law requirements, Section 403.086, F.S.

POLICY WM2.2 In order to protect and conserve the Surficial Aquifer System and limit demands on the regional water management system, the Broward County Environmental Protection and Growth Management Department (EPGMD) will continue to investigate and promote the development of alternative water supply strategies such as:

1. Continued promotion of water conservation;
2. Brackish water aquifer development;
3. Storm water capture, storage, and reuse;
4. Aquifer recharge;
5. Aquifer Storage and Recovery (ASR);
6. Reclaimed water use;
7. Improvements to the secondary canal infrastructure;
8. Additional regional surface water storage; and
9. Other technologies and management strategies consistent with the goals of the most recently adopted LECWSP Update and Countywide IWRP.

Issue #6 – Level of service standards

OBJECTIVE CI3 Implement and Regulate Infrastructure in a Sustainable Manner. Land use decisions and development orders will be issued based on the planned availability of resources to provide sufficient improvements to maintain adopted LOS.

POLICY CI3.1 Future development will bear a proportionate share of the cost of providing infrastructure required to maintain adopted LOS standards contained in other elements of this Comprehensive Plan.

POLICY CI3.2 Recommendations on proposed land use changes will be based on an analysis of infrastructure planned to support the area.

POLICY CI3.3 Development orders will be issued based on the availability of infrastructure required to maintain the adopted LOS discussed in other elements of this Comprehensive Plan.

POLICY CI3.5 Public facilities required to eliminate existing deficiencies for which the County is financially responsible will be included in the County's annually adopted five-year CIP.

POLICY CI3.6 The County will construct infrastructure necessary to maintain the adopted LOS standards as identified in the respective elements of the Broward County Comprehensive Plan.

POLICY WM1.6 WWS will continue to use the development review process outlined in the Broward County Land Development Code to require applicants for development permits within the Broward County utility districts to enter into an agreement to connect to existing potable water, sanitary sewer, and reclaimed facilities. When adequate facilities, based on the adopted LOS standards, are not available and no fiscally feasible plan to construct or expand facilities is proposed, Broward County may require the developer to construct improvements to the potable water, sanitary sewer, and reclaimed water reuse systems, as necessitated by the proposed development.

Broward County staff proposes to amend Policy WM3.1 to meet the requirements of Section 163.3164(28), F.S. regarding establishment of Level of Service Standards (LOSS). Proposed text changes appear underlined; proposed deletions appear as strikethroughs.

POLICY WM3.1 LOS standards for potable water and sanitary sewer facilities will be the FDEP permitted capacity of the facilities. The LOS standard for water treatment plants will be expressed as maximum monthly flow and the LOS standard for wastewater treatment plants will be expressed as average daily flow. Facility per person levels of service standards (LOSS) may vary due to water treatment type, demographics, irrigation acreage, and age and condition of the system. For planning purposes, the maximum LOSS for any County facility shall be 150 gallons/person/day.

POLICY WM3.2 Prior to approval of a building permit, Broward County Environmental Engineering and Permitting Division (EEPD) will require the appropriate water and sanitary sewer supplier(s) to submit a signed form that states whether adequate water supplies and sanitary sewer collection services will exist and be available to serve the new development no later than the anticipated date of issuance of a certificate of occupancy.

Water Management Element Support Document

Table WM-1

BCWWS Retail Potable Water Level of Service Standards

Facility	Level of Service Standard
Raw Water Supply	Maximum Day Plus In-Plant Uses
Treatment Plant	Maximum Day
Finished Water Storage	40% of Maximum Day demand to cover operational (10%) and emergency (30%) storage; plus fire protection storage of 630,000 gallons (3500 GPM for 3 hours)
Transmission/Distribution System	The most stringent of: (1) Peak Hour at 45 psi residual pressure, or (2) Maximum Day Plus Fire Flow at 25 psi residual pressure.

BCWWS Land Development Standards contain the methodology currently used to determine if the level of service standard can be met. BCWWS changes the methodology administratively from time to time as new information becomes available.

Issue #7 – Population Projections

The following policies exist in the BrowardNEXT2.0 Comprehensive Plan:

> Policy WM1.5 Retail Water and Wastewater Master Plan will be updated to establish projected water and wastewater needs. (no mention of population projections)
>
> Also, references are included in WME Support Document by supplier.

Other related policies include:

> POLICY IC4.2 Broward County will utilize the Public Schools Staff Working Group and the School Oversight Committee to collaborate with the School Board of Broward

County, Florida, and Broward County municipalities to plan and make decisions pertaining to:

1. Population projections

2. [...]

POLICY IC5.1 Broward County shall coordinate its Potable Water Element with the South Florida Water Management District's Lower East Coast Water Supply Plan.

The 1989 Broward County Comprehensive Plan originally included policies that were located in Administration Element (Policies 1.2.1, 1.2.2.) were inadvertently deleted with the repeal of the Administration Element as part of BrowardNEXT2.0 adoption. This included the following policies:

Policy 1.2.1 The Planning Services Division (PSD) shall continue to use the Broward County Population Forecasting Model as the methodology for generating population estimates and projections and assigning the population.

Policy 1.2.2 The PSD shall, on at least an annual basis, provide population estimates and projections for Broward County, including the Unincorporated Area.

Broward County is in the process of adding a new Objective and related policies in the Intergovernmental Element that is anticipated to be adopted prior to the adoption of the WSFWP and states as follows:

OBJECTIVE IC10 Coordinate Broward County's Population Forecasts and Municipal Allocations with County Municipalities and Relevant Agencies.

Broward County shall continue to coordinate the allocation of population and demographic data and forecasts with County municipalities and relevant state and regional agencies.

POLICY IC10.1 Broward County's Planning and Development Management Division (PDMD) shall continue to use the Broward County Population Forecast and Allocation Model to distribute County forecasts published by University of Florida's Bureau of Economic and Business Research (BEBR) to develop local municipal and Transportation Analysis Zones (TAZs) population estimates and projections.

POLICY IC10.2 PDMD shall continue to regularly coordinate the allocation of population and demographic data and forecasts with County municipalities and relevant state and regional agencies and publish on the County's demographic data website.

POLICY IC10.3 PDMD shall, on at least an annual basis, provide population estimates for Broward County and its municipalities, including the Broward Municipal Services District, from official sources such as the US Census and BEBR.

Issue #8 – Water Supply/Source Needs and Demands

POLICY CC2.19 Broward County shall encourage local municipalities to develop policies to improve resilience to coastal and inland flooding, salt water intrusion, and other related impacts of climate change and sea level rise in their Comprehensive Plans, Sustainability Action Plans, Vision Plans, Storm Water Master Plans, Adaptation Action Areas Plans, Climate Change Plans, and other city-wide plans.

POLICY CC3.7 Broward County shall continue to support local environmental restoration, mitigation, and adaptive management initiatives, including those related to Everglades restoration, and coordinate with other State, regional, and national strategic planning efforts to improve the resiliency of natural lands and systems to climate variability and change.

POLICY CC4.8 Broward County shall create and maintain the Broward County Green Infrastructure Map Series to illustrate elements of green infrastructure identified as critical for meeting the County's goals for GHG reduction, renewable energy production, aquifer protection and surface water management, coastal habitat protection, enhanced green spaces, healthy food access, and other resource protection and health and safety goals shared by the greater Broward community.

POLICY CM1.1 Broward County shall limit the specific and cumulative impacts of development or redevelopment upon wetlands, water quality, water quantity, wildlife habitat, living marine resources, and the beach dune system through the review of development applications.

OBJECTIVE C3 Protect and Maintain Water Quality. To improve the water quality and supply throughout Broward County by protecting the County's Water Conservation Areas.

POLICY C3.5 Broward County will support projects within the Water Conservation Areas that reduce seepage losses from the Water Conservation Areas, improve water supply and quality, and establish a buffer between the Everglades and developed areas.

POLICY C6.12 Broward County shall appropriate adequate funds to provide for the enhancement, maintenance, and conservation of publicly-owned natural lands, wetland mitigation areas, and water recharge areas.

POLICY C6.13 Broward County shall pursue opportunities for the restoration and/or enhancement of degraded natural areas, including but not limited to, reforestation, restoration of shorelines or dunes, restoration of natural hydrology, or removal of non-native vegetation and prescribed burning.

POLICY C8.2 Broward County shall integrate wetlands into regional stormwater drainage/water management practices to provide necessary hydrology.

POLICY WM1.5 WWS will update the Retail Water and Wastewater Master Plan by 2026 to establish projected potable water and sanitary sewer infrastructure and facility needs through 2040 and, if required, update approximately every ten (10) years to meet state and local requirements.

OBJECTIVE WM2 Planning for Water Resources and Infrastructure. Broward County's water resources planning will be guided by the goals, objectives, and recommendations provided in Broward County's Countywide Integrated Water Resources Plan (IWRP), along with related plans that provide support for climate resilience and the long-term water resource needs of the Broward community and which further support the Comprehensive Everglades Restoration Plan (CERP), SFWMD Lower East Coast Water Supply Plan (LECWSP), and South East Florida Climate Compact's Regional Action Plan (RCAP), as updated.

POLICY WM2.5 Broward County will continuously update the future conditions map series, including wet season groundwater elevation and future condition flood elevation maps, to reflect impacts of projected sea level rise and climate change for planning and regulatory purposes.

POLICY WM2.7 Broward County will support ongoing and enhanced development of regional hydrologic models, the integration of downscaled climate data, and continuous data collection to help predict and track the impacts of sea level rise and changing rainfall patterns on groundwater levels, saltwater intrusion, and drainage infrastructure to support local planning and projects.

POLICY WM3.3 Potable water facilities will be designed, constructed, maintained, and operated with consideration given to sea level rise and in such a manner as to protect the functions of natural groundwater recharge areas, natural drainage features, and groundwater levels, without inducing the inland movement or upwelling of saline water into Underground Sources of Drinking Water (USDW), as defined in Chapter 62-528, F.A.C., and SFWMD Basis of Review for Water Use, as referenced in Chapter 40E-2, F.A.C.

POLICY WM3.4 Broward County will work to protect existing wellfields, water supplies, surface or subsurface storage facilities, control structures, water and wastewater treatment plants, and transmission infrastructure from increased coastal flooding, sea level rise, saltwater intrusion, and other potential future climate change impacts, and support utility efforts to plan infrastructure replacement and relocation, as needed.

POLICY WM3.5 Broward County will continue to coordinate with municipalities and other agencies on source-water (wellfield) monitoring and protection programs, and proactively address potential impacts on the coastal aquifer from increased chlorides due to flooding of

coastal and tidally influenced bodies of water that may occur with more intense storms, rising sea levels, increased drought, and other impacts of climate change.

POLICY WM3.6 Broward County will continue to maintain, implement, and enforce the County Wellfield Protection Ordinance (Wellfield Protection, Article XIII, Chapter 27, Broward County Code of Ordinances), will conduct wellfield inspections to locate possible contamination sources, and ensure abatement of identified sources. The County will also revise, as necessary, its Wellfield Protection Ordinance to reflect results from modeling studies and revisions to delineation criteria.

POLICY WM3.7 Broward County will continue to implement regulations governing storm water management in conjunction with the Wellfield Protection Regulations and prohibit direct storm water discharges to surface and ground water within Zone 1 and Zone 2 of wellfield zones of influence, as designated on the Wellfield Protection maps.

Issue #9 – Intergovernmental coordination with the District, water suppliers, and other local governments. Identify any joint planning areas and joint infrastructure service areas related to water supply.

POLICY IC1.1 Broward County will coordinate with the Broward League of Cities and the Broward Legislative Delegation, as appropriate, for the following purposes: 1. Develop and implement joint infrastructure service or planning areas, especially to address issues associated with climate change and sea level rise; 2. Establish a permanent funding mechanism to support affordable housing; and 3. Support the implementation of the Low Tax Opportunity Zones, as established in the federal Tax Cut and Jobs Act of 2017, to encourage long-term investment and job creation in targeted communities by reducing taxes for many job creators. Low Tax Opportunity Zones enhance local communities' ability to attract businesses, developers and financial institutions to invest in targeted areas by allowing investors to defer capital gains taxes through investments in federally established Opportunity Funds.

OBJECTIVE IC5 Ensure Adequate Water Supply and Maintain Nature Systems Broward County shall continue to coordinate its Comprehensive Plan with the plans of other local and regional agencies to ensure adequate water supply and maintenance of natural systems.

POLICY IC5.1 Broward County shall coordinate its Potable Water Element with the South Florida Water Management District's Lower East Coast Water Supply Plan.

POLICY IC7.8 Broward County shall continue to collaborate with and support local and regional planning entities to ensure that local municipal comprehensive plans, regional strategic plans, disaster mitigation plans, water management plans, and transportation plans are updated to

provide for a sustainable environment and reflect the best available data and strategies for adapting to future climate change impacts.

OBJECTIVE IC8 Coordinate the Establishment, Maintenance, and Implementation of Capacity and Quality Level of Service Standards, Broward County shall continue to coordinate the establishment, maintenance, and implementation of capacity and quality level of service standards.

POLICY IC8.4 Broward County will participate in the Water Advisory Board, including its Technical Advisory Committee and Surface Water Coordinating Committee, to coordinate potable water, wastewater, and water management level of service standards.

POLICY WM1.3 WWS will work to provide potable water and sanitary sewer service to incorporated areas contiguous to the WWS service area when service is not anticipated to be provided by others and in the absence of legal constraints on the use of revenues.

POLICY WM2.3 Broward County will work with the SFWMD, municipalities, independent drainage districts, and neighboring counties to plan and support the development of additional regional surface water storage, including the C-51 Storage Reservoir in Palm Beach County and the water preserve areas in western Broward County under the CERP.

POLICY WM2.6 To guide and support local water resources planning, management, and investments for climate resilience, Broward County will work with local, State, and federal water management agencies and others to create, develop, and implement a suite of water resources and infrastructure planning tools, including the IWRP, the Countywide Reuse Master Plan, and regional and local hydrologic models of surface water and groundwater.

Issue #10 – Incorporate Work Plan into Comprehensive Plan

Broward County staff proposes to amend Policy WM2.1 to meet the requirements of Chapters 163 and 373, F.S., and in this manner incorporate the Water Supply Plan by reference into the Comprehensive Plan. Proposed text changes appear underlined; proposed deletions appear as strikethroughs.

POLICY WM2.1 ~~Within eighteen (18) months of the adoption of an update to the SFWMD LECWSP, utilities located within Broward County will update and adopt their 10-Year Water Supply Facilities Work Plans, pursuant to Chapters 163 and 373 of the Florida Statutes, to incorporate the Regional Alternative Supply Plan and to evaluate water resource needs, identify water supply deficiencies, and plan for alternative water supply sources and projects to serve existing and new development within the County~~. Broward County hereby adopts by reference the Broward County Water Supply Facilities Work Plan (2020 Work Plan), dated April

21, 2020 (see Attachment A of the Water Management Element), for a planning period of not less than 10 years. The 2020 Work Plan addresses issues that pertain to water supply facilities and requirements needed to serve current and future development within the County's water service area. The County shall review and update the work plan at least every 5 years, within eighteen (18) months after the adoption of an update to the SFWMD LECWSP. Any changes to occur within the first 5 years of the work plan shall be included in the annual Capital Improvements Plan update to ensure consistency between the Water Management Element and the Capital Improvements Element.

Additional Supportive Comprehensive Plan Policies

GOAL CAPITAL IMPROVEMENTS ELEMENT

The County will provide sufficient and efficient infrastructure within its service areas to meet the standards set forth within the Comprehensive Plan elements by preserving, modifying, and replacing existing infrastructure and providing new infrastructure when required due to growth, development, and climate change impacts.

POLICY CI2.1 Broward County, in conjunction with its municipalities and partner agencies, will work to ensure that adaptation to climate change impacts, especially sea level rise, is incorporated into the planning, siting, construction, replacement, and maintenance of public infrastructure in a manner that is cost-effective and that maximizes the use of the infrastructure throughout its expected life span.

POLICY CC2.12 Broward County, in conjunction with its municipalities and partner agencies, shall make the practice of adapting the built environment to the impacts of climate change an integral component of all planning processes, including but not limited to: comprehensive planning, building codes, life-safety codes, emergency management, land development and zoning regulations, water resource management, flood control and storm water management, coastal management, and community development.

POLICY CC4.5 Broward County, in cooperation with local academic and governmental agencies, should perform a green roof pilot study to evaluate the feasibility of green roofs in Broward County and determine the appropriate plant palette, maintenance requirements, and potential water conservation benefits.

POLICY CC5.9 Broward County, through the Master Partnership Agreement with the School Board of Broward County, shall continue to support existing County and municipal education and outreach programs including, but not limited to: energy efficiency and water conservation; waste reduction and recycling; urban forests and native landscaping; and air quality and GHG reduction. The County will also support education and outreach programs on other sustainable

issues and work cooperatively to link these overlapping themes with local climate impacts in all educational materials and messages.

POLICY IC5.2 Broward County shall coordinate its Conservation Element with the Comprehensive Everglades Restoration Plan.

REFERENCES

Broward County Planning and Development Management Division. 2017. Broward County and Municipal Population Forecast and Allocation Model (PFAM).

Broward County Climate Action Plan. Local Strategy to Address Global Climate Change. 2015. Access on July 2019: http://www.broward.org/Climate/Documents/BrowardCAPReport2015.pdf.

BROWARD NEXT 2.0. 2019. 2018 Broward County Comprehensive Plan. Broward County Board of County Commissioners. Environmental Protection and Growth Management Department. Planning and Development Management Division. Adopted March 2019.

Broward County Water & Wastewater Services. 2018. Annual Reuse Report. Submitted November 29, 2018.

Broward County Water & Wastewater Services. 2018. Reclaimed Status Report Submitted January 24, 2018.

Broward County Public Works Department. 2019. Quarterly Report for Major Capital Projects in the Public Works Department Memorandum dated October 3, 2019.

Brown & Caldwell. 2019. Draft Alternative Water Supply Conceptual Master Plan Update Technical Memorandum.

Bureau of Economic and Business Research. 2017. "Detailed Population Projections by Age, Sex, Race, and Hispanic Origin, for Florida and Its Counties, 2020-2045, With Estimates for 2016." Bulletin 178.

Bureau of Economics and Business Research. 2016. Detailed Population Projections by Age, Sex, Race, and Hispanic Origin for Florida and its Counties 2020-2045, with Estimates for 2015, June 2016.

BEBR, Projections of Florida Population by county 2020-2045, with Estimates for 2017, Volume 51 Bulletin 180 (BEBR, 2018).

Bureau of Economics and Business Research. 2019. Projections of Florida Population by County 2020-2045, with Estimates for 2018, Florida Population Studies, Volume 52, Bulletin 183.

CDM. 2008. Feasibility Study for the Implementation of Selected Reclaimed Water Projects with the City of Fort Lauderdale.

Cunningham, K.J., Kluesner, J.W., Westcott, R.L., Robinson, Edward, Walker, Cameron, and Khan, S.A., 2018, Sequence stratigraphy, seismic stratigraphy, and seismic structures of the lower intermediate confining unit and most of the Floridan Aquifer system, Broward County, Florida (ver. 1.1, January 2018): U.S. Geological Survey Scientific Investigations Report 2017–5109, 71 p., 21 pls., https://doi.org/10.3133/sir20175109. ISSN: 2328-0328 (online).

Hazen and Sawyer. 2019. City of Fort Lauderdale Water Supply Facilities Work Plan 2020 Update, November 7, 2019.

Hazen and Sawyer. 2004. Broward county Office of Enviormental Services 2A Water Treatment Plant – Aquifer Storage and Recovery. Technical Memorandum.

Hollywood, City of and Hazen and Sawyer. 2020. Water Supply Plan, Potable Water Sub-Element, City of Hollywood, Florida, January, 2020.MWH. 2013. Broward County WTP 1A Expansion Floridan Test Wells FW-1 and FW-2 Construction and Testing Report, March 2013.

Reese, R.S., and Cunningham, Kevin, 2014, Hydrogeologic framework and salinity distribution of the Floridan Aquifer system of Broward County, Florida: U.S. Geological Survey Scientific Investigations Report 2014–5029, 60 p., http://dx.doi.org/10.3133/sir20145029. ISSN 2328–0328 (online).

South Florida Water Management District. 2000c. Minimum Flows and Levels for the Everglades, Lake Okeechobee and the Biscayne Aquifer. Water Supply Department, SFWMD, West Palm Beach, FL.

South Florida Water Management District. 2007. 2005–2006 Consolidated Water Supply Plan Support Document. Water Supply Department, SFWMD, West Palm Beach, FL.

South Florida Water Management District. 2007. Regional Water Availability Rule, February 2007.

South Florida Water Management District. 2013. Lower East Coast Water Supply Plan Update, October 2013.

South Florida Water Management District. 2015. Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District.

South Florida Water Management District. 2018. Lower East Coast Water Supply Plan Update, November 2018. Access on July 2019: https://www.sfwmd.gov/our-work/water-supply/lower-east-coast.

South Florida Water Management District. 2018. Cycle Testing Summary Report, Hillsboro Canal Aquifer Recharge, Storage, and Recovery System, Technical Publication WS-48.

South Florida Water Management District. 2019. CERP Project Planning. Access on May 2019: https://www.sfwmd.gov/our-work/cerp-project-planning.

Southeast Florida Regional Climate Change Compact. 2017. Regional Climate Action Plan RCAP 2.0. December 2017. Access on July 2019: http://southeastfloridaclimatecompact.org/regional-climate-action-plan/.

Southeast Florida Regional Climate Change Compact. 2019. Compact Documents. Access on July 2019: http://www.southeastfloridaclimatecompact.org/compact-documents/.

U.S. Global Change Research Program, 2018: *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 1515 pp. doi: 10.7930/NCA4.2018.

Appendix D - FIRST AMENDMENT TO AGREEMENT BETWEEN THE CITY OF FORT LAUDERDALE AND THE CITY OF OAKLAND PARK

FIRST AMENDMENT
TO
AGREEMENT BETWEEN THE CITY OF FORT LAUDERDALE AND THE CITY OF OAKLAND PARK

This First Amendment serves to amend and modify that certain Agreement dated January 5, 1994 ("Agreement") and entered into between the **City of Fort Lauderdale, a municipal corporation** ("Fort Lauderdale") and **City of Oakland Park, a municipal corporation** ("Oakland Park").

WHEREAS, the Agreement dated on January 5, 1994 between Fort Lauderdale and Oakland Park addressed the service of potable water by Fort Lauderdale to Oakland Park for a term of thirty (30) years;

WHEREAS, a portion of the service area identified in the Agreement was the unincorporated residential neighborhood of North Andrews Gardens;

WHEREAS, Broward County has committed to upgrade the water distribution system in North Andrews Gardens as part of a Neighborhood Improvement Project which included sewer lines and other improvements; and

WHEREAS, as a condition of the annexation agreement, the City of Oakland Park will no longer provide potable water to North Andrews Gardens, but Broward County, upon completion of water service improvements and certification from the Florida State Department of Health, will be responsible for the delivery of potable water into that area;

WHEREAS, the resultant effect of the annexation and the transfer of water service from Oakland Park to Broward County is that the service area governed by the Agreement dated January 5, 1994 has been reduced;

WHEREAS, this Amendment is necessary to accurately reflect the service area subject to the terms and provisions of the Agreement;

WHEREAS, Fort Lauderdale and Oakland Park desire to amend certain terms and provisions of the Agreement to accurately reflect the service area.

NOW THEREFORE, in consideration of the foregoing premises, mutual covenants and conditions herein contained, the parties hereto agree as follows:

1. Section 2 of the Agreement dated January 5, 1994 is hereby amended to modify the service area as previously reflected on Exhibit "A". Specifically, a new exhibit, attached hereto and made a part hereof, identified as "A-1" is substituted for Exhibit "A"

2. All of the terms and provisions of the Agreement, not otherwise amended or modified hereby, are ratified and confirmed and shall remain in full force and effect.

3. In the event of any conflict between the terms and provision of the Agreement and this First Amendment, the terms and provisions of this First Amendment shall control and prevail.

IN WITNESS OF THE FOREGOING, the parties have set their hands and seals the day and year first written above.

Signed, sealed and witnessed
in the presence of:

Robin Greco
Print Name

Sandra E. Williams
Print Name

(SEAL)

CITY OF OAKLAND PARK, FLORIDA

STEVEN R. ARNST, Mayor

JOHN STUNSON, City Manager

Attest:

NANCY BALL RICHTER, City Clerk

Approved as to Form:

D.J. DOODY, City Attorney

WITNESSES:

Maxine-A. Singh
Print Name

Katerina Skoundridakis
Print Name

(SEAL)

CITY OF FORT LAUDERDALE,
a municipal corporation.

By _____
JIM NAUGLE, Mayor

By _____
GEORGE GRETSAS, City Manager

ATTEST:

_____
JONDA K. JOSEPH, City Clerk

Approved as to form:

_____
VICTORIA F. MINARD
Assistant City Attorney

CITY OF OAKLAND PARK

BOUNDARY DESCRIPTION FOR WATER SERVICE AREA

The areas to be serviced by the Consumer are situated in Broward County, Florida, and are described as follows: Begin at the intersection of the west right-of-way line of U.S. Highway #1 (Federal Highway) and the north right-of-way line of Oakland Park Blvd. (N.E.31st Street); thence go westerly along said north right-of-way line to the east line of Section 23, T49S, R42E; thence southerly along said east line and along the east line of Section 26, T49S, R42E to the center line of North Fork Middle River; thence meander westerly along said center line to the east right-of-way line of N.E.6th Avenue; thence northerly along said line to the northerly extension intersection with the north line section 26, T49S, R42E; thence westerly along the north section lines of Sections 26, 27, 28, T49S, R42E; to the intersection with the west right-of-way line of the Department of Transportation's CSX Railroad; thence southwesterly along said line to the intersection with the south line of the N.W. 1/4 of Section 28, T49S, R42E, thence westerly along said south line to the intersection with the west line of section 28, T49S, R42E; thence north along said line to the intersection with the easterly projection of the south lot line of Lot 1, Block A, Ziladen Properties Misc. Tax-Appraiser's Map P.B. 2/Pg. 20, of the Public Records of Broward County, Florida; thence westerly to the N.E. corner of Lot 6, Block E, Ziladen Properties Map, P.B. 2/Pg. 20, of the Public Records of Broward County, Florida; thence south to N.E. corner of Lot 3, Block E, Ziladen Map; thence westerly to the N.W. corner of Lot 1, Block E, Ziladen Map, thence southerly to the intersection of the easterly extension of the north line of Lot 5, Block 4, Lake Tahoe Estates P.B. 57/Pg. 37, of the Public Records of Broward County, Florida; thence westerly along the extension of the north property line of Lot 5 to the N.E. corner of Lot

5; thence continue westerly along said line to the N.E. corner of Lot 1, Block 4 of said plat; thence southerly along the east property line to the north right-of-way of N.W. 26th Street; thence westerly to the west right-of-way line of N.W. 26th Avenue; thence continue west along the north right-of-way line of N.W. 26th Street to the intersection with the southerly extension of the west plat line, Lake Tahoe Estates; thence north along the southerly extension of the west plat line of Lake Tahoe Estates to the S.W. corner of Lot 1, Block 5, Lake Tahoe Estates; thence north along the west plat line of said plat to the N.W. corner of Lot 13, Block 1 of said plat; thence westerly along the extension of the south plat line of Carpenter's Plat, P.B. 85/Pg. 17, of the Public Records of Broward County, Florida, to the S.E. corner of Lot 20, Block 1, Orange Grove Manors P.B.50/Pg.30, of the Public Records of Broward County, Florida; thence northerly along the east plat line of said plat or east right-of-way line of N.W. 29th Avenue to the intersection of the projection of said line with the north right-of-way line of West Oakland Park Blvd.; thence westerly along said right-of-way to the S.W. corner of Strok Plat 2, P.B. 147/Pg. 22, of the Public Records of Broward County, Florida; thence northerly along west plat line to the N.W. corner of said plat thence easterly along said plat line to the intersection with the west plat line of Oakland Grove Commerce Park P. B.142/Pg. 23, of the Public Records of Broward County, Florida; thence northerly along said west plat line to the N.W. corner of Forest Commercial Center P.B. 142/Pg. 24, of the Public Records of Broward County, Florida; thence easterly along the north plat line to the intersection of west section line of Section 20, T49S, R42E; thence continue easterly along the south right-of-way line of Mid River Canal approximately 1315 feet; thence northerly across the C-13 canal right-of-way to the west right-of-way line of N.W. 29th Avenue; thence northerly along said line to the intersection with the south right-of-

way line of N.W. 44th Street; thence westerly along said line to the N.E. corner of Lake Pointe Plaza P.B. 128/Pg. 37, of the Public Records of Broward County, Florida; thence southerly along the east plat line to the S.E. corner of said plat; thence westerly to the S.W. corner of said plat; thence northerly along the west plat line and it's extension to the S.W. corner of M & S Properties plat P.B. 98/Pg. 29, of the Public Records of Broward County, Florida; thence northerly along said plat line to the N.W. corner of said plat; thence easterly along the north line of said plat to the N.E. corner of said plat; thence southerly along the east plat line to a point on the south section line of section 17, T49S, R42E, which is 1337 feet east of the S.W. corner of same section; thence easterly along the south line of section 17, T49S, R42E to the S.E. corner of the Section 17, T49S, R42E; thence northerly along the east line of said section to the extension of the south right-of-way line of Prospect Road; thence southeasterly along said right-of-way line to the east line of the S.W. 1/4 of section 16, T49S, R42E; thence southerly along said east line to the north line of section 21, T49S, R42E; thence westerly along said north line to the east line of the west 1/2 of the east 1/2 of the northeast 1/4 of the northwest 1/4 of Section 21, T49S, R42E,(being the same as the N.E. corner of Lot 34, Block 1, Tamarac Hills); thence southerly along said east line to the center line of the North Fork Middle River; thence meander southeasterly along said center line to the west right-of-way line of N. W.10 Avenue; thence northeasterly along said line to the S.E. corner of Twin Lakes Homes Parcel A, P.B. 47/Pg. 15, of the Public Records of Broward County, Florida; thence westerly along the south property line to the S.W. corner of said plat; thence northerly along said plat to the N.W. corner of said plat; thence easterly to the N.E. corner of said plat; thence northeasterly along the extension of the east property line of said plat to the intersection of the north section line of Section 21, T49S, R42E; thence

easterly to the N.E. corner of Section 21, T49S, R42E; thence northerly along the west section line of Section 15, T49S, R42E, to the intersection with the CSX Railroad east right-of-way Line; thence continue northerly along said right-of-way line to the northwest corner of Milbrand Industrial Park P.B. 54/Pg. 39, of the Public Records of Broward County, Florida; thence easterly and southerly along the plat line of said plat to the north right-of way line of Prospect Road; thence east along said line to the east right-of-way line of the 1-95 expressway; thence north and easterly along said right-of-way line to the easterly right-of-way line of I-95 on Commercial Boulevard, thence southerly along said right-of-way line to the south right-of-way line of Commercial Boulevard, thence westerly along the south right-of-way line of Commercial Boulevard contiguous with the I-95 right-of-way line to the east right-of-way line of I-95, thence southerly, thence westerly, thence southwesterly along the I-95 right-of-way line to a point 110 feet south of the south right-of way line of N.W. 45 Street; thence easterly to the to the west right-of-way line of N.W. 3 Avenue; thence northerly along the west right-of-way line of N.W. 3 Avenue to the north right-of-way line of N.W. 45 Street; thence easterly along the north right-of-way line of N.W. 45 Street to the east right-of way line of N.E. 1 Terrace; thence southerly along the east right of way line of N.E. 1 Terrace to the northwest corner of Lot 11, Block 8, of said North Andrews Gardens Second Addition; thence easterly along the north line of said Lot 11, Block 8, to the northeast corner of said Lot 11, Block 8; thence south and west to the northwest corner of Lot 46, Block 9, North Andrews Gardens Second Addition; thence east along a line parallel with and 100 feet north of the north right-of-way line of N.E. 44 Street to the west right-of-way line of N.E. 5 Avenue; thence south along the west right-of-way line of N.E. 5 Avenue to a point 75 feet north of the north right-of way line of N.E. 44 Street; thence east parallel with and 75 feet north of the

north right-of-way line of N.E. 44 Street to the west line of the Seminole Warehouse Plat Addition, Plat Book 39, Page 32, Broward County Records; thence northerly along the west line of said Seminole Warehouse Plat Addition and Seminole Warehouse Plat, Plat Book 38, Page 8, of the Broward County Records, to the north line of Seminole Warehouse Plat Addition, Plat Book 39, Page 32 of the Broward County Records; thence easterly along the north line of the of Seminole Warehouse Plat Addition, Plat Book 39, Page 32 of the Broward County Records for 305.80 feet to the west right-of-way line of N.E. 6 Avenue; thence northerly to the north line of the S.E. ¼ of Section 15, T49S, R42E; thence continue easterly along the north line of the S.W. ¼ of Section 14, T49S, R42E to the centerline of Dixie Highway; thence northeasterly along said centerline to the intersection of the north line of the south 1/2 of the N.W. ¼ of section 14, T49S, R42E; thence easterly along said north line to the northwest corner of the south ½ of the N.E. 1/4 of Section 14, T49S, R42E, thence continue easterly along said line to the west plat line Parcel "D", Coral Ridge Isles P.B. 45/Pg. 47, of the Public Records of Broward County, Florida; thence southerly along said plat line of Parcel "D" to the north right-of-way line of N. E. 50th Court; thence easterly along said line to the intersection with the northerly extension of the east plat line of Commercial Blvd. Plaza, P.B. 88/Pg.12 of the Public Records of Broward County, Florida; thence southerly along the east plat line extension to its intersection with the south quarter section line of the N.E. 1/4 of Section 14, T49S, R42E; thence easterly along said quarter section line to the northerly projection of the center line of N.E. 17th Avenue; thence continue southerly along said projected center line to the projected north right-of-way line of N.E. 48 Court; thence continue easterly along said line to the east line of Section 14, T49S, R42E; thence southerly along said line to the extension of the north right-of-way line of N.E. 45th Street; thence

easterly along said line to the west right-of-way line of U.S. Highway One (Federal Highway); thence southerly along said line to the north right-of-way line of Oakland Park Blvd. being the point of beginning.

LESS: Commencing at the intersection of the west right-of-way line of N.W. 9th Avenue and the south right-of-way line of N.W. 44th Street; thence southerly along said west line to the intersection with the west right-of-way line of 1-95; thence southwesterly along said line to a point approximately 275 feet north of the north right-of-way line of N.W. 38 street; thence westerly to the east right-of-way line of the CSX railroad; thence northeasterly along said line to it's intersection with the extension of a line 44 feet north and parallel to the south lot line of Lot 27A, Twin Lakes Section 2, P.B. 3O/Pg. 1, of the Public Records of Broward County, Florida; thence westerly along said line to the east right-of-way line of N.W. 10th Avenue; thence northerly 200 feet to a point; thence easterly along a line parallel to the north lot line of Lot 27 of said plat to the east right-of-way line of the CSX Railroad; thence north along said right-of-way to the south right-of-way line of N.W. 44th street; thence east along said line to the west right of-way line of N.W. 9th Avenue being the point of beginning. Said property being the City of Ft. Lauderdale's Fiveash Water Plant Complex.

AGREEMENT

THIS AGREEMENT, made and entered into this 5th day of January, 1994, by and between:

CITY OF FORT LAUDERDALE, a municipal corporation of the State of Florida, herein called the "Seller",

and

CITY OF OAKLAND PARK, a municipal corporation of the State of Florida, herein called the "Consumer".

Pursuant to Resolution No. 93-214, adopted at its meeting of December 21, 1993, the City Commission of the City of Fort Lauderdale authorized the proper officials of Seller to enter into this Agreement.

Pursuant to Resolution No. 93-154, adopted at its meeting of December 1, 1993, the City Council of the City of Oakland Park authorized the proper officials of Consumer to enter into this Agreement.

Seller and Consumer entered into a 30-year agreement in 1963 for the provision of potable water from Seller to Consumer.

The Agreement was amended in 1965 and in 1988 to modify the service area.

The parties hereto desire to continue the relationship experienced for those 30 years.

The Seller in its proprietary capacity owns and operates a municipal public water supply and is in a position to continue to provide service to the Consumer.

The Consumer in its proprietary capacity owns and operates a water distribution system, and Consumer desires to continue to purchase water from Seller to service Consumer's customers upon terms mutually agreeable.

In consideration of the mutual promises, covenants and agreements, and other good and valuable consideration, the receipt and adequacy of which are hereby acknowledged, the parties agree as follows:

1. Beginning October 30, 1993, and continuing for a period of thirty (30) years thereafter, the Seller agrees to sell to the Consumer and the Consumer agrees to buy from the Seller potable water for resale to the citizens and customers of the Consumer, under the terms and conditions set forth herein. The Utilities Directors of Consumer and Seller, or their designees, shall confer

6. The Seller shall not be required during periods of water shortage resulting from an emergency condition declared by any governmental entity with jurisdiction or resulting from an inadequacy of mains or other facilities, to do more than deliver water to Consumer's master meters in such quantities as are available for allocation by the Seller among all its consumers. In the event it should become necessary for the Seller to adopt regulations for conservation of water in case of emergency, the Consumer agrees that it will adopt and enforce similar regulations for conservation of water during such time of emergency.

7. There shall be one (1) or more master meters located at points mutually agreeable, through which all water supplied to customers of Consumer shall be supplied, and all water furnished by Seller shall be metered through such meters. Such meters shall be supplied and installed by the Seller at the expense of the Consumer as provided in Chapter 28 of the Code of Ordinances of the City of Fort Lauderdale. After installation, the Seller shall, at its own expense, maintain the meters. Title to the meters shall remain in the Seller. All master meters shall be tested annually by and at the expense of the Seller. All master meters shall be adjusted to the registration accuracy as specified in the American Water Works Association Standard for Cold Water Meters. The date and time of the test shall be coordinated with Consumer to allow Consumer to witness the test whenever possible. In addition to the annual test, the Consumer may at any time request that Seller conduct an additional test or that Seller arrange for such test by an independent qualified testing company. The request shall be made in writing and the date and time of the test shall be coordinated with Consumer to allow Consumer to witness the test whenever possible. If such test shows that the master meter has been over-registering by more than two percent (2%), there will be no charge for such test and the previous bill rendered based on the last reading of that master meter shall be adjusted accordingly. If such test shows that the master meter has not been over-registering by more than two percent (2%), the cost of such test shall be charged to Consumer. If such test shows that the master meter has been under-registering by more than two percent (2%), the previous bill rendered based on the last reading of that master meter shall be adjusted accordingly.

8. The Consumer shall be bound by the provisions of Chapter 28 of the Code of Ordinances of the City of Fort Lauderdale, now existing or as amended from time to time, insofar as same are applicable, as well as all applicable ordinances of the City of Fort Lauderdale now existing or hereafter adopted pertaining to water service and water regulations.

9. The water rates to be charged by the Seller to the Consumer shall be the rate provided to be charged to municipalities, political subdivisions and privately-owned utilities under the provisions of Section 28-143 of the Code of Ordinances of the City of Fort Lauderdale. It is the intention of the parties that the Seller shall not discriminate against the Consumer, vis-a-vis, the

consumers within the limits of the City of Fort Lauderdale. Any rate increases to Consumer during the life of this Agreement shall be based on increases in the cost of providing water to Consumer and others similarly situated.

10. The Seller shall render monthly or bimonthly statements for water furnished and the Consumer shall pay promptly all statements furnished. Should the Consumer fail or refuse to pay the amount of such statement within thirty (30) days after same has been submitted, the Seller shall have the right to enforce the provisions of Chapter 28 of the Code of Ordinances of the City of Fort Lauderdale providing for discontinuance of service until past due indebtedness is paid and any other legal remedies available to Seller.

11. Consumer and Seller shall cooperate in obtaining from or providing to the appropriate regulatory agencies such permits or other data as may be required for the performance of this Agreement. Consumer shall furnish to Seller plans and specifications of the existing water distribution system of Consumer and from time to time furnish copies of plans and specifications of any additions to or extension of Consumer's water distribution system.

12. To the extent provided by law, Consumer and Seller agree to indemnify and hold harmless each other from all costs, losses and expenses, including, but not limited to, damages to persons or property, judgments and attorneys' fees, arising out of and in connection with this Agreement.

13. The Seller shall have the right to install feeder mains, and necessary booster pumps and storage facilities in the existing City limits of Consumer and in any future incorporated areas. The Seller shall have the right to repair and replace such aforementioned mains, pumps and storage facilities, with the understanding that the Seller shall replace, repair or otherwise return the paving and right-of-way to its original condition when these installations and repairs are made. All such work shall comply with all applicable regulations of Consumer. All operational and maintenance expenses of such installations shall be the responsibility of the Seller.

14. This Agreement supersedes the previous agreements between the parties of August 16, 1955, March 7, 1961 and October 29, 1963, as amended. This Agreement may not be amended, except by the mutual consent of the parties in writing executed with the same dignity as this Agreement.

15. This Agreement shall not become effective until a Resolution has been adopted by the governing bodies of Seller and Consumer approving this Agreement and authorizing its execution.

16. This Agreement shall be governed by the laws of the State of Florida. The parties waive the privilege of venue and agree that all litigation between them in the state courts shall take place in Broward County, Florida, and that all litigation between them in the federal courts shall take place in the United States District Court for the Southern District of Florida.

IN WITNESS OF THE FOREGOING, the parties have set their hands and seals the day and year first written above.

SELLER

WITNESSES:

Patsey H. Adams

Dorothy O'Leary

(CORPORATE SEAL)

CITY OF FORT LAUDERDALE

By _____
Mayor

By _____
City Manager

ATTEST:

_____
City Clerk

Approved as to form:

_____
City Attorney

CONSUMER

WITNESSES:

CITY OF OAKLAND PARK

By _____
Mayor

By _____
City Manager

(CORPORATE SEAL)

ATTEST:

_____
City Clerk

Approved as to form:

_____
City Attorney

DF:lgeuser:OP
11/23/93

CITY OF OAKLAND PARK

BOUNDARY DESCRIPTION FOR WATER SERVICE AREA

The areas to be serviced by the Consumer are situated in Broward County, Florida, and are described as follows: Begin at the intersection of the west right-of-way line of U.S. Highway #1 (Federal Highway) and the north right-of-way line of Oakland Park Blvd. (N.E. 31st Street); thence go westerly along said north right-of-way line to the east line of Section 23, T49S, R42E; thence southerly along said east line and along the east line of Section 26, T49S, R42E to the center line of North Fork Middle River; thence meander westerly along said center line to the east right-of-way line of N.E. 6th Avenue; thence northerly along said line to the northerly extension intersection with the north line Section 26, T49S, R42E; thence westerly along the north section lines of Sections 26, 27, 28, T49S, R42E; to the intersection with the west right-of-way line of the Department of Transportation's CSX Railroad; thence southwesterly along said line to the intersection with the south line of the N.W. 1/4 of Section 28, T49S, R42E, thence westerly along said south line to the intersection with the west line of Section 28, T49S, R42E; thence north along said line to the intersection with the easterly projection of the south lot line of Lot 1, Block A, Ziladen Properties Misc. Tax Appraiser's Map P.B. 2/Pg. 20, of the Public Records of Broward County, Florida; thence westerly to the N.E.

corner of Lot 6, Block E, Ziladen Properties Map, P.B. 2/Pg. 20, of the Public Records of Broward County, Florida; thence south to N.E. corner of Lot 3, Block E, Ziladen Map; thence westerly to the N.W. corner of Lot 1, Block E, Ziladen Map, thence southerly to the intersection of the easterly extension of the north line of Lot 5, Block 4, Lake Tahoe Estates P.B. 57/Pg. 37, of the Public Records of Broward County, Florida; thence westerly along the extension of the north property line of Lot 5 to the N.E. corner of Lot 5; thence continue westerly along said line to the N.E. corner of Lot 1, Block 4 of said plat; thence southerly along the east property line to the north right-of-way of N.W. 26th Street; thence westerly to the west right-of-way line of N.W. 26th Avenue; thence continue west along the north right-of-way line of N.W. 26th Street to the intersection with the southerly extension of the west plat line, Lake Tahoe Estates; thence north along the southerly extension of the west plat line of Lake Tahoe Estates to the S.W. corner of Lot 1, Block 5, Lake Tahoe Estates; thence north along the west plat line of said plat to the N.W. corner of Lot 13, Block 1 of said plat; thence westerly along the extension of the south plat line of Carpenter's Plat, P.B. 85/Pg. 17, of the Public Records of Broward County, Florida, to the S.E. corner of Lot 20, Block 1, Orange Grove Manors P.B. 50/Pg. 30, of the Public Records of Broward County, Florida; thence northerly along east plat line of said plat or east right-of-way line of N.W. 29th Avenue to the intersection of the projection of said line with the north right-of-way line of West Oakland Park Blvd.; thence westerly along said right-of-way to

the S.W. corner of Strok Plat 2, P.B. 147/Pg. 22, of the Public Records of Broward County, Florida; thence northerly along west plat line to the N.W. corner of said plat; thence easterly along plat line to the intersection with the west plat line of Oakland Grove Commerce Park P.B. 142/Pg. 23, of the Public Records of Broward County, Florida; thence northerly along west plat line to the N.W. corner of Forest Commercial Center P.B. 142/Pg. 24, of the Public Records of Broward County, Florida; thence easterly along north plat line to the intersection of west section line of Section 20, T49S, R42E; thence continue easterly along south right-of-way line of Mid River Canal approximately 1315 feet; thence northerly across the C-13 canal right-of-way to the west right-of-way line of N.W. 29th Avenue; thence northerly along said line to the intersection with the south right-of-way line of N.W. 44th Street; thence westerly along said line to the N.E. corner of Lake Pointe Plaza P.B. 128/Pg. 37, of the Public Records of Broward County, Florida; thence southerly along east plat line to the S.E. corner of said plat; thence westerly to the S.W. corner of said plat; thence northerly along west plat line and it's extension to the S.W. corner of M & S Properties plat P.B. 98/Pg. 29, of the Public Records of Broward County, Florida; thence northerly along said plat line to the N.W. corner of said plat; thence easterly along plat line to the N.E. corner of said plat; thence southerly along plat line to a point on the south section line of Section 17, T49S, R42E, which is 1337 feet east of the S.W. corner of same section; thence easterly along south line of Section 17, T49S, R42E to the

S.E. corner of the Section 17, T49S, R42E; thence northerly along section line to the extension of the south right-of-way line of Prospect Road; thence southeasterly along said right-of-way line to the east line of the S.W. 1/4 of Section 16, T49S, R42E; thence southerly along said east line to the north line of Section 21, T49S, R42E; thence westerly along said north line to the east line of the west 1/2 of the east 1/2 of the northeast 1/4 of the northwest 1/4 of Section 21, T49S, R42E, (being the same as the N.E. corner of Lot 34, Block 1, Tamarac Hills); thence southerly along said east line to the center line of the North Fork Middle River; thence meander southeasterly along said center line to the west right-of-way line of N.W. 10 Avenue; thence northeasterly along said line to the S.E. corner of Twin Lakes Homes Parcel A, P.B. 47/Pg. 15, of the Public Records of Broward County, Florida; thence westerly along the south property line to the S.W. corner of said plat; thence northerly along said plat to the N.W. corner of said plat; thence easterly to the N.E. corner of said plat; thence northeasterly along the extension of the east property line of said plat to the intersection of the north section line of Section 21, T49S, R42E; thence easterly to the N.E. corner of Section 21, T49S, R42E; thence northerly along west section line of Section 15, T49S, R42E, to the intersection with the CSX Railroad east right-of-way line; thence continue northerly along said right-of-way line to the northwest corner of Milbrand Industrial Park P.B. 54/Pg. 39, of the Public Records of Broward County, Florida; thence easterly and southerly along the plat line of said plat to the north right-of-

way line of Prospect Road; thence east along said line to the east right-of-way line of the I-95 expressway; thence north and easterly along said right-of-way to the N.E. 1/4 corner of the S.W. 1/4 of Section 15, T49S, R42E; thence easterly along the north line of the S.E. 1/4 of Section 15, T49S, R42E to the N.W. 1/4 of the S.W. 1/4 of Section 14, T49S, R42E; thence continue easterly along the north line of the S.W. 1/4 of Section 14, T49S, R42E to the centerline of Dixie Highway; thence northeasterly along said centerline to the intersection of the north line of the south 1/2 of the N.W. 1/4 of Section 14, T49S, R42E; thence easterly along said north line to the northwest corner of the south 1/2 of the N.E. 1/4 of Section 14, T49S, R42E, thence continue easterly along said line to the west plat line Parcel "D", Coral Ridge Isles P.B. 45/Pg. 47, of the Public Records of Broward County, Florida; thence southerly along said plat line of Parcel "D" to the north right-of-way line of N.E. 50th Court; thence easterly along said line to the intersection with the northerly extension of the east plat line of Commercial Blvd. Plaza, P.B. 88/Pg. 12, of the Public Records of Broward County, Florida; thence southerly along the east plat line extension to its intersection with the south quarter section line of the N.E. 1/4 of Section 14, T49S, R42E; thence easterly along said quarter section line to the northerly projection of the center line of N.E. 17th Avenue; thence continue southerly along said projected center line to the projected north right-of-way line of N.E. 48 Court; thence continue easterly along said line to the east line of Section 14, T49S, R42E; thence southerly along said line to

the extension of the north right-of-way line of N.E. 45th Street; thence easterly along said line to the west right-of-way line of U.S. Highway One (Federal Highway); thence southerly along said line to the north right-of-way line of Oakland Park Blvd. being the point of beginning.

LESS: Commencing at the intersection of the west right-of-way line of N.W. 9th Avenue and the south right-of-way line of N.W. 44th Street; thence southerly along said west line to the intersection with the west right-of-way line of I-95; thence southwesterly along said line to a point approximately 275 feet north of the north right-of-way line of N.W. 38 Street; thence westerly to the east right-of-way line of the CSX railroad; thence northeasterly along said line to it's intersection with the extension of a line 44 feet north and parallel to the south lot line of Lot 27A, Twin Lakes Section 2, P.B. 30/Pg. 1, of the Public Records of Broward County, Florida; thence westerly along said line to the east right-of-way line of N.W. 10th Avenue; thence northerly 200 feet to a point; thence easterly along a line parallel to the north lot line of Lot 27 of said plat to the east right-of-way line of the CSX Railroad; thence north along said right-of-way to the south right-of-way line of N.W. 44th Street; thence east along said line to the west right-of-way line of N.W. 9th Avenue being the point of beginning. Said property being the City of Ft. Lauderdale's Fiveash Water Plant Complex.

Appendix E - MEETING MINUTES

Design with community in mind

Stantec

Meeting Minutes

City of Oakland Park Water Supply Facilities Work Plan Update
January 21, 2020
City of Oakland Park

Attendees: See Attached Sign-In Sheet

	Agenda Items	Action Items
1.	Purpose and project overview of the Water Supply Facilities Work Plan Update (WSFWP) were provided by Stantec.	
2.	Planning Horizon: The WSFWP will use the planning horizon same as those used by the Lower East Coast Water Supply Plan. Years 2020, 2025, 2030, 2035 and 2040 will be used. These planning horizons were determined to be consistent with those used by the City of Fort Lauderdale and Broward County draft WSFWP – 2019 Updates.	
3.	Communication Protocol: • Stantec Sangeeta Dhulashia – Area Manager – Point of Contact Zuhal Ozturk - Project Manager • City of Oakland Park Rick Buckeye – Project Manager - Planning and Zoning Department Chris Lips – Point of Contact - Public Works • City of Ft Lauderdale Todd Hiteshew – Point of contact • Broward County Susan Bodmann - Point of contact.	
4.	Policy Items: • The City informed that there have been no updates to the Conservation plan. • There has been no change to Goals, Objectives, and Policies (GOPs). Additionally, there are no GOPs related to the recently adopted Climate Action Plan. • Capital Improvement Plan is updated annually. Rick Buckeye emailed the 2020 - 2024 CIP (adopted on 09/18/2019) to Stantec on 01/21/2020.	1) City of Oakland Park adopted a "Climate Action Plan" in January 2019. Climate Action Plan was sent to Stantec. 2) A reference to Climate Action Plan will be included in the City's WSFWP – 2019 Update.

	Agenda Items	Action Items
5.	New Developments • City does not have existing DRIs. • EAR based amendments are ongoing. • The Oaktree Land Use Plan Amendments (LUPA) took place after the Broward County PFAM 2017. Therefore, demand projections resulting from this LUPA will be added to the computed demands from PFAM 2017.	1) City sent a list of all approved and proposed new development (residential projects) post 2015 to Stantec. 2) City will send Land Use Amendments to Stantec starting from 2015 to date.
6.	Data at Hand was discussed	
7.	Data Needs from the City was discussed in detail. Stantec mentioned that the service agreement with the City of Fort Lauderdale is valid up to year 2023, the City stated that they plan to renew this agreement with Fort Lauderdale. Service area discrepancy between the City map, LEC, City of Fort Lauderdale and Broward County maps were discussed.	Please see table below. The City will review the service area discrepancy and provide clarity to Stantec.
8.	Intergovernmental Coordination will be held if necessary, since the work plans from City of Fort Lauderdale and Broward County are at hand.	
9.	Adoption and Commission Agenda Process will require approximately four weeks. City prefers one of the Commission Meetings that will be held in May 2020.	
10.	Project Schedule - A tentative schedule was developed by the team as follows: • Preliminary draft WSFWP report for City review – February 28 • City review comments to Stantec – March 13 • Final draft Report to City – March 20 • Final Report to the City – TBD	

Status of Data Needs from the City:

	Action Items and Comments	Status
1.	Existing Capital Improvement Plan (CIP) and copies of other relevant reports.	1. Complete - 01/21/2020
2.	Can you please send most recent version for CIP?	2. Complete - 01/21/2020
3.	Any updates to service area?	3. Chris Lips to send shape files
4.	Any minor/major modification to CUP (FTL and Broward).	4. No modifications to CUP.
5.	Metering/billing data (2014, 2015, 2016, 2017, 2018 and 2019).	5. Rick Buckeye to provide
6.	Bulk water sales data (2014, 2015, 2016, 2017, 2018 and 2019).	6. Rick Buckeye to provide
7.	Conservation Plan and any updates?	7. No updates.
8.	Any reuse initiative and updates?	8. No updates.
9.	Any climate adaptation initiatives?	9. Chris Lips sent the Climate Action Plan on 01/22/2020
10.	Land Use Changes or Development of Regional Impact (DRI) applications.	10. No DRIs. City will provide Land Use Amendments. On 01/22/2020 Alexander Dambach sent a list of residential projects that have been approved or are pending since 2015.
11.	Please confirm if non-potable water service by Oak Tree County Club Golf Course has been reactivated for use and provide SFWMD withdrawal Permit if in use.	No. There is no non-potable water service by Oak Tree County Club Gold Course.
12.	Please confirm if non-potable water service by City's Wimberly Field Park is still ongoing.	Yes. There is well service at City's Wimberly Field Park. City will provide information.
13.	Is distribution of pre-rinse valves, water conservation kits, meter replacement, leak detection ongoing?	All water meters have been replaced with smart water meters. This task was completed on January 2019.
14.	How many pre-rinse valves were installed (2014, 2015, 2016, 2017, 2018 and 2019)? Realized Savings (gal)?	Pre-rinse valves were not installed.
15.	How many water conservation kits were installed (2014, 2015, 2016, 2017, 2018 and 2019)? Realized savings ($)?	Low flow toilets are used.
16.	Is mobile irrigation Lab program ongoing? If so, what is the realized water savings?	Yes, it is ongoing. City will provide information.
17.	Any distribution system update post 2014?	No major expansion to the distribution system.
18.	We have fire hydrant flow test and model data from 2005. Any recent updates?	City will send the most recent fire hydrant flow test results.
19.	Can you please verify if below master meter connections with the City of Ft. Lauderdale is still valid? Are there any new interconnects?	These master meter connections are still valid. There are no new interconnects.

	Action Items and Comments	Status
20.	2014 WSFWP shows below Interconnection Points with the Broward County? Any updates?	These interconnection points are still the same. There are no updates.
21.	Wholesale water purchased from City of Ft Lauderdale for the 2014-2019 period	City will provide this data.
22.	Customer service type with % flow	City will provide information
23.	Potable Water Loss Data	City will provide.
24.	Water Consumption	City will provide.

Attachments:

- Sign-In Sheet
- Meeting Agenda
- Service Area Map
- Data Request Tables

These Meeting Minutes represent Stantec's understanding of the meeting and are considered to be accurate and complete. If you have any comments and/or corrections, please email them to Zuhal Ozturk at Zuhal.Ozturk@stantec.com by ***January 31st, 2020****. Any corrections received will be incorporated into the Meeting Minutes and they will be re-issued. If no comments and/or corrections are received by said date, these notes will be considered accurate and complete*

Stantec
1551 Sawgrass Corporate Parkway
Suite 440
Sunrise, FL 33323

Meeting Attendance Record

Meeting Subject: City of Oakland Park - Water Supply Facilities Work Plan – 2019 Update

Date: 01/21/2020

Initial	Name	Organization	Phone	Email Address
RaB.	Rick Buckeye	City of Oakland Park	(954) 630 4345	rickb@oaklandparkfl.gov
CL	Chris Lips	City of Oakland Park	(954) 630 4441	chrisl@oaklandparkfl.gov
PS	Peter Schwarz	City of Oakland Park	(954) 630 4348	peter.schwarz@oaklandparkfl.gov
AC	Albert Carbon	City of Oakland Park	954.630.4458	albertc@oaklandparkfl.gov
	Melissa Alvarado	City of Oakland Park		melissaa@oaklandparkfl.gov
AD	Alexander Dambach	City of Oakland Park		alexander.dambach@oaklandparkfl.gov
	Fernanda Marx	City of Oakland Park		fernanda.marx@oaklandparkfl.gov
	Lorrainia Belle	City of Oakland Park		lorrainia.belle@oaklandparkfl.gov
SD	Sangeeta Dhulashia	Stantec	(954) 851 1572	sangeeta.dhulashia@stantec.com
Z.O.	Zuhal Ozturk	Stantec	(954) 851 1530	zuhal.ozturk@stantec.com

Meeting Agenda

Water Supply Facilities Work Plan – 2019 Update

1551 Sawgrass Corporate Parkway
Suite 440
Sunrise, FL 33323
(O) 954.851.1500 | (D) 954.851.1530

Water Supply Facilities Work Plan - 2019 Update - Kickoff Meeting

City of Oakland Park Municipal Building
5399 North Dixie Highway, Oakland Park FL 33334
January 21, 2020
13:30 - 14:30 PM
City of Oakland Park Water Supply Facilities Work Plan – 2019 Update

---

1. Purpose & Project Overview
2. Planning Horizon
3. Project Team & Communication Protocol
4. Policy Items
    - Conservation Plan
    - Goals, Objectives and Policy
    - Capital Improvements Plan
5. New Developments
6. Data at Hand
    - Draft City of Ft. Lauderdale and Broward County WSFWPs
    - Broward County PFAM Data – 2017
    - LEC Plan 2018
    - City of Oakland Park WSFWP – 2015 Update (Final) - (from City on 11/04/2019)
    - Comprehensive Plan – Volume I - Goals, Objectives and Policies – (March 2015 Revision) and (Draft Update June 2019 Revision) - (from City on 11/04/2019)
7. Data Needs from the City
8. Intergovernmental Coordination
9. Adoption and Commission Agenda Process
10. Project Schedule

Data Needs from the City of Oakland Park
for Water Supply Facilities Work Plan – 2019 Update

1. Existing Capital Improvement Plan (CIP) and copies of other relevant reports.
2. Can you please send most recent version for CIP?
3. Any updates to service area?
4. Any minor/major modification to CUP (FTL and Broward).
5. Metering/billing data (2014, 2015, 2016, 2017, 2018 and 2019).
6. Bulk water sales data (2014, 2015, 2016, 2017, 2018 and 2019).
7. Conservation Plan and any updates?
8. Any reuse initiative and updates?
9. Any climate adaptation initiatives?
10. Land Use Changes or Development of Regional Impact (DRI) applications.
11. Please confirm if non-potable water service by Oak Tree County Club Golf Course has been reactivated for use and provide SFWMD withdrawal Permit if in use.
12. Please confirm if non-potable water service by City's Wimberly Field Park is still ongoing.
13. Is distribution of pre-rinse valves, water conservation kits, meter replacement, leak detection ongoing?
14. How many pre-rinse valves were installed (2014, 2015, 2016, 2017, 2018 and 2019)? Realized Savings (gal)?
15. How many water conservation kits were installed (2014, 2015, 2016, 2017, 2018 and 2019)? Realized savings ($)?
16. Is mobile irrigation Lab program ongoing? If so, what is the realized water savings?
17. Any distribution system update post 2014?
18. We have fire hydrant flow test and model data from 2005. Any recent updates?
19. Can you please verify if below master meter connections with the City of Ft. Lauderdale is still valid? Are there any new interconnects?

City of Oakland Park, Master Meter Connections with Fort Lauderdale

OKP Meter #	Ft. Laud ID #	Ft. Laud. Account #	Meter Size	Location of Master Meters
1	7200284	370-3800-7002	6"	1001 East Oakland Park Blvd
2	635595	370-40003007	6"	2054 East Oakland Park Blvd
3	70685360	370-4500-2004	6"	1601 NE 45 Street
4	700961700	370-5000-2006	8"	4500 NW 31 Avenue
5	70632140	370-5250-3001	8"	3500 NW 31 Avenue
6	4210594000	370-6200-7001	6"	1690 West Prospect Road
7	10722622	370-6300-5004	6"	1600 NW 41 Street
8	6906501	370-6500-0003	6"	499 West Prospect Road

OKP Meter #	Ft. Laud ID #	Ft. Laud. Account #	Meter Size	Location of Master Meters
9	802680100	370-7000-0006	6”	2 NE 38 Street
10	72230820	370-7800-3002	8”	2604 NW 21 Avenue
11	72359770	370-8000-9005	6”	2610 NW 26 Avenue
12	49504078	370-3700-9009	8”	1300 NE 38 Street

20. 2014 WSFWP shows below Interconnection Points with the Broward County? Any updates?

- N.W. 29th Street, near N.W. 30th Avenue off Oakland Park Boulevard
- South of Oakland Park Blvd. between N.W. 29th Avenue and N.W. 31st Avenue

21. Can you please provide wholesale water purchased from City of Ft Lauderdale for the 2014-2019 period for us to prepare following table?

Summary Oakland Park
Wholesale Water Purchased from Fort Lauderdale

Year	From FTL (gal)
2014	
2015	
2016	
2017	
2018	
2019	

22. Can you please provide following information?

Billing Service Types

Customer Type	Percentage of Total Flow
Commercial	
Government	
Hotel	
Multi-family	
Residential	
Total	

City of Oakland Park Hotel/Motel Water Consumption

Year	Percent of Total Water Consumed
2014	
2015	
2016	
2017	
2018	
2019	

23. Can you please provide following information?

Potable Water Loss
Oakland Park Service Provider Area (2013 to 2019)

(000 Gallons)

Water Purchased			Water Sold		Water Loss
	Monthly		Monthly		%
Oct-13					
Nov-13					
Dec-13					
Jan-14					
Feb-14					
Mar-14					
Apr-14					
May-14					
Jun-14					
Jul-14					
Aug-14					
Sep-14					
Oct-14					
Nov-14					
Dec-14					
Jan-15					
Feb-15					
Mar-15					
Apr-15					
May-15					
Jun-15					
Jul-15					
Aug-15					
Sep-15					
Oct-15					
Nov-15					
Dec-15					
Jan-16					
Feb-16					
Mar-16					
Apr-16					
May-16					
Jun-16					
Jul-16					
Aug-16					
Sep-16					
Oct-16					
Nov-16					
Dec-16					
Jan-17					
Feb-17					
Mar-17					
Apr-17					
May-17					
Jun-17					
Jul-17					

Water Purchased			Water Sold		Water Loss
	Monthly		Monthly		%
Aug-17					
Sep-17					
Oct-17					
Nov-17					
Dec-17					
Jan-18					
Feb-18					
Mar-18					
Apr-18					
May-18					
Jun-18					
Jul-18					
Aug-18					
Sep-18					
Oct-18					
Nov-18					
Dec-18					
Jan-19					
Feb-19					
Mar-19					
Apr-19					
May-19					
Jun-19					
Jul-19					
Aug-19					
Sep-19					
Oct-19					
Nov-19					
Dec-19					

24. Can you please provide following information?

City of Oakland Park Water Consumption

Month	Water Billed in Thousands of Gallons						Monthly Average	% of Annual Average
	2014	2015	2016	2017	2018	2019		
Jan								
Feb								
Mar								
Apr								
May								
Jun								
Jul								
Aug								
Sep								
Oct								
Nov								
Dec								
Total								

City of Oakland Park WSFWP - 2019 Update

Project Schedule:

Kickoff Meeting	January 21, 2020
Preliminary Draft WSFWP Report for City's Review	February 28, 2020
City's Comments for the draft WSFWP to Stantec	March 13, 2020
Final Draft Report to the City	March 20, 2020
Final Report to the City	TBD

Notice to Proceed : January 15, 2020

2020

JANUARY

Su	Mo	Tu	We	Th	Fr	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

FEBRUARY

Su	Mo	Tu	We	Th	Fr	Sa
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

MARCH

Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

APRIL

Su	Mo	Tu	We	Th	Fr	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

MAY

Su	Mo	Tu	We	Th	Fr	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

JUNE

Su	Mo	Tu	We	Th	Fr	Sa
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

JULY

Su	Mo	Tu	We	Th	Fr	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

AUGUST

Su	Mo	Tu	We	Th	Fr	Sa
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

SEPTEMBER

Su	Mo	Tu	We	Th	Fr	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

OCTOBER

Su	Mo	Tu	We	Th	Fr	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

NOVEMBER

Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

DECEMBER

Su	Mo	Tu	We	Th	Fr	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

Project Milestones

City of Oakland Park Commission Meeting

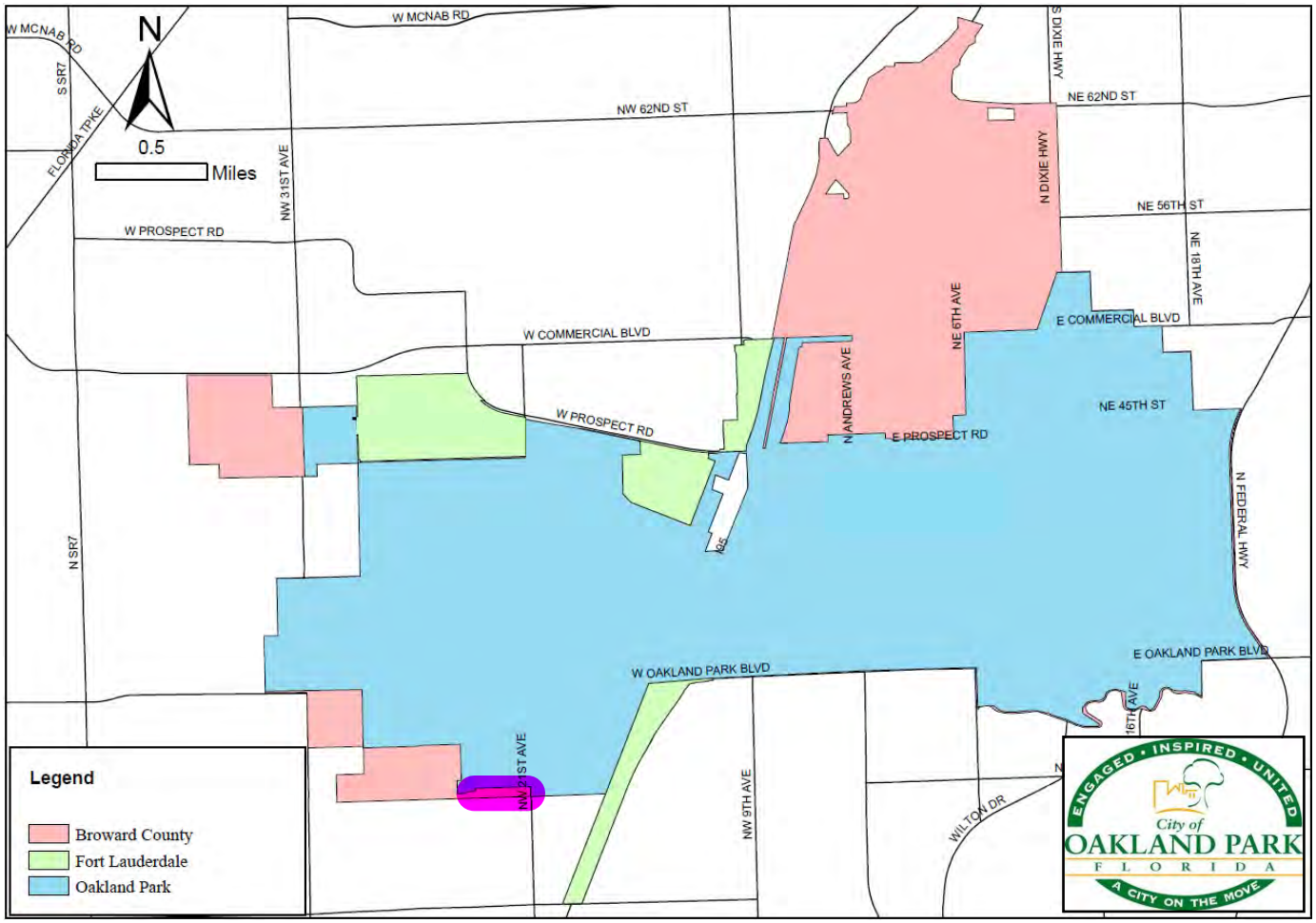


Figure 2-1 City of Oakland Park City Limits and Retail Service Providers

Please Confirm if area highlighted in pink above is under Broward County Service Area

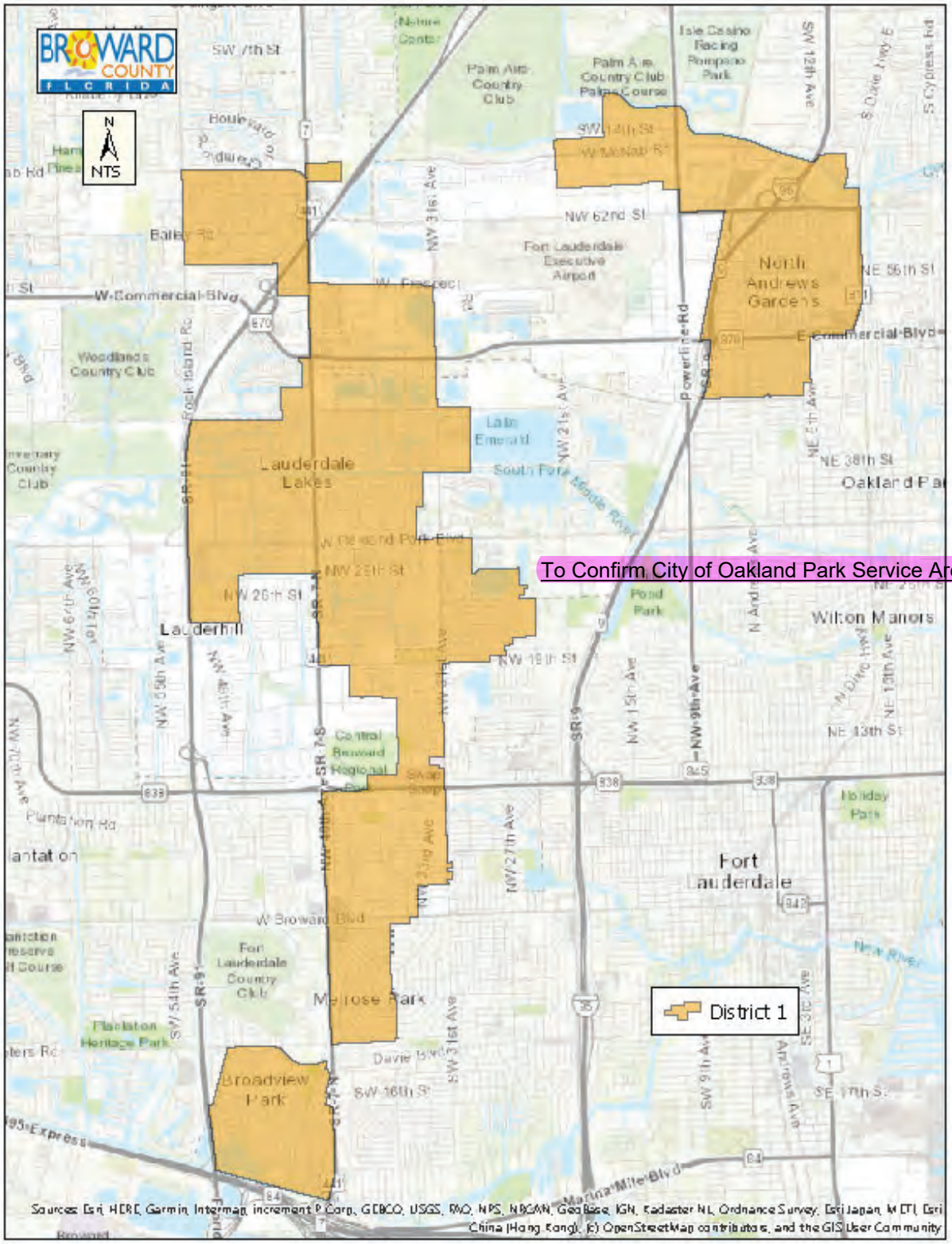


Figure WS8 BCWWS District 1 Service Area

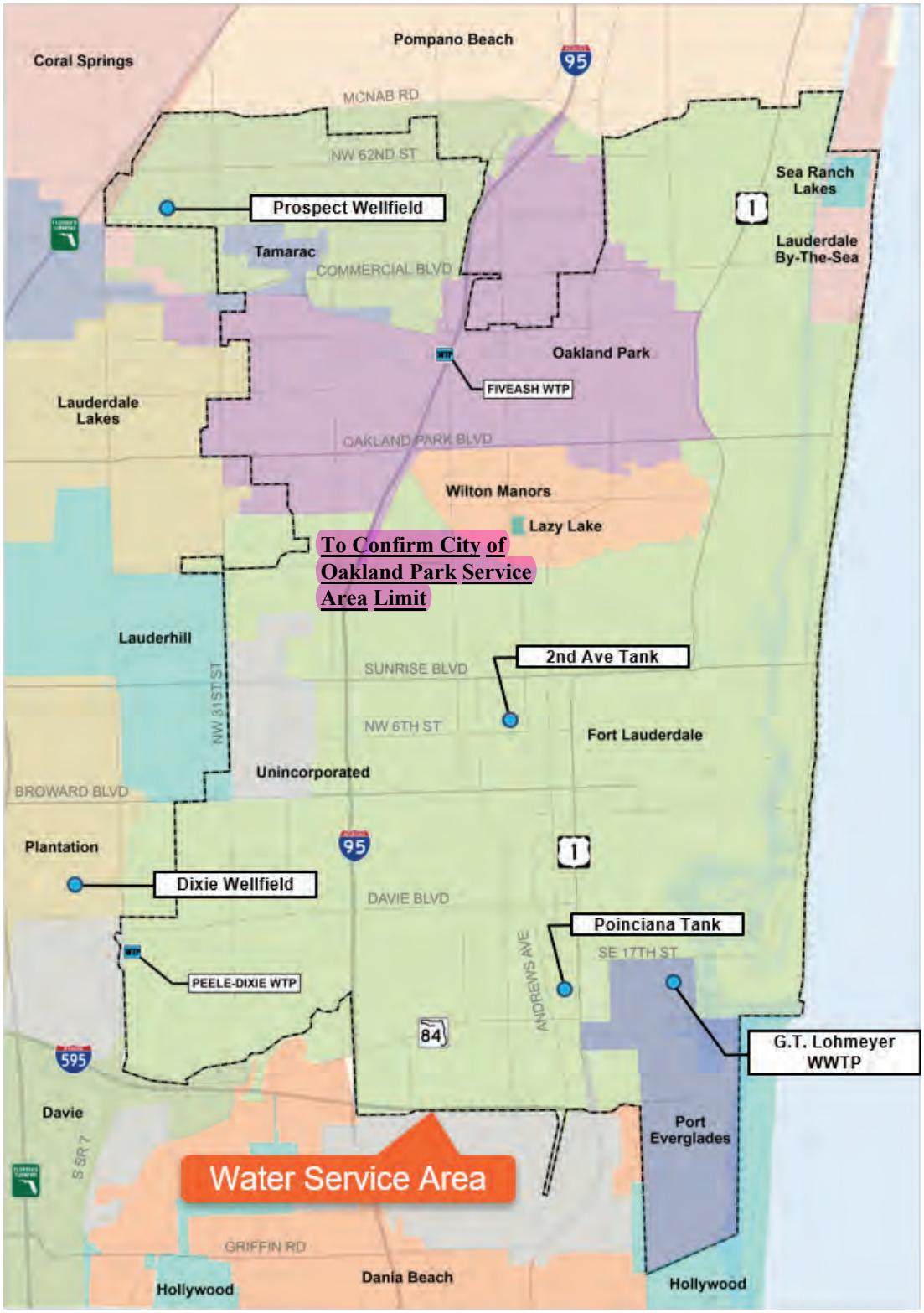


Figure ES-1: Water Service Area

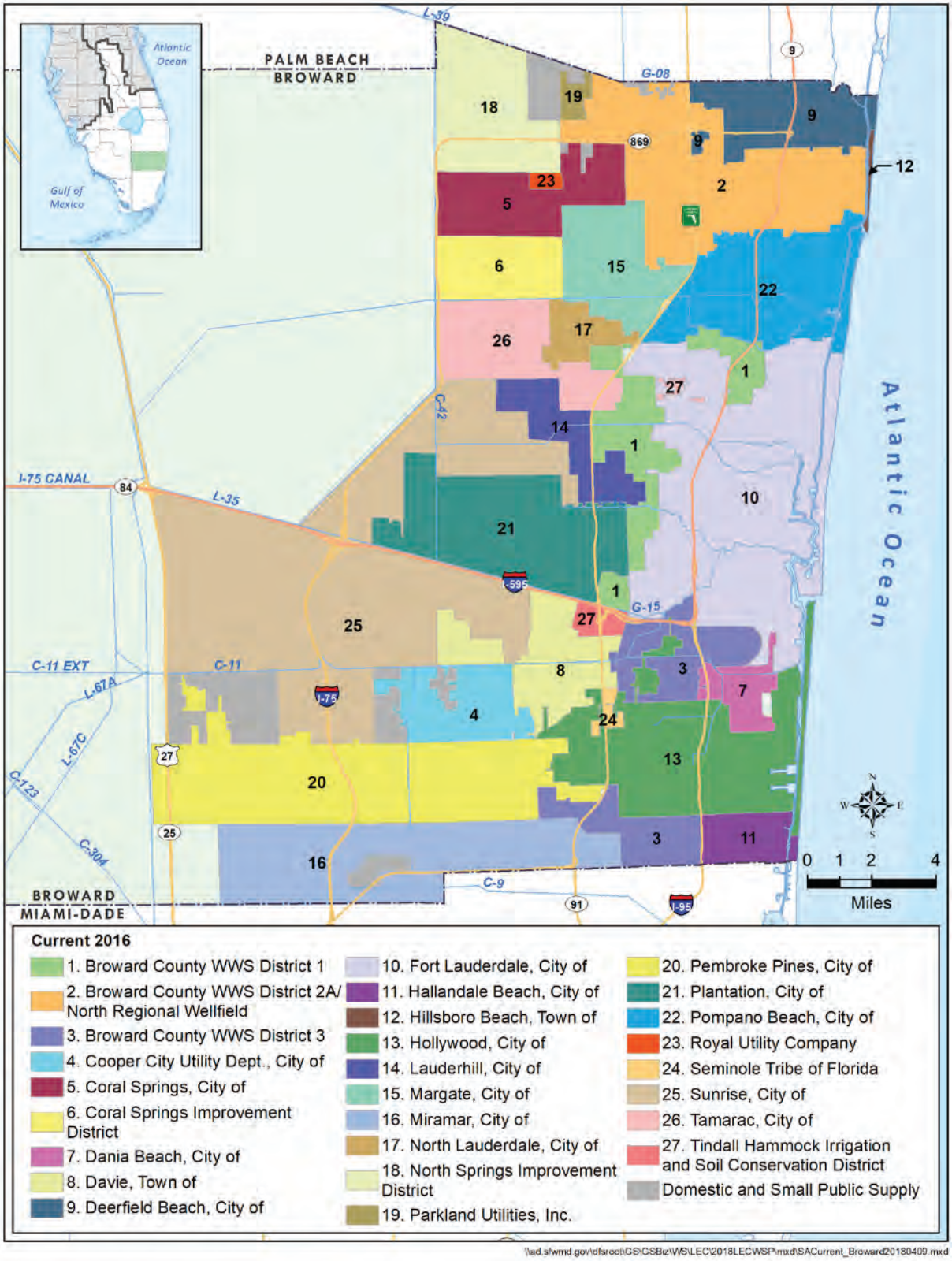


Figure A-3. Current (2016) public water supply utility service areas in Broward County.

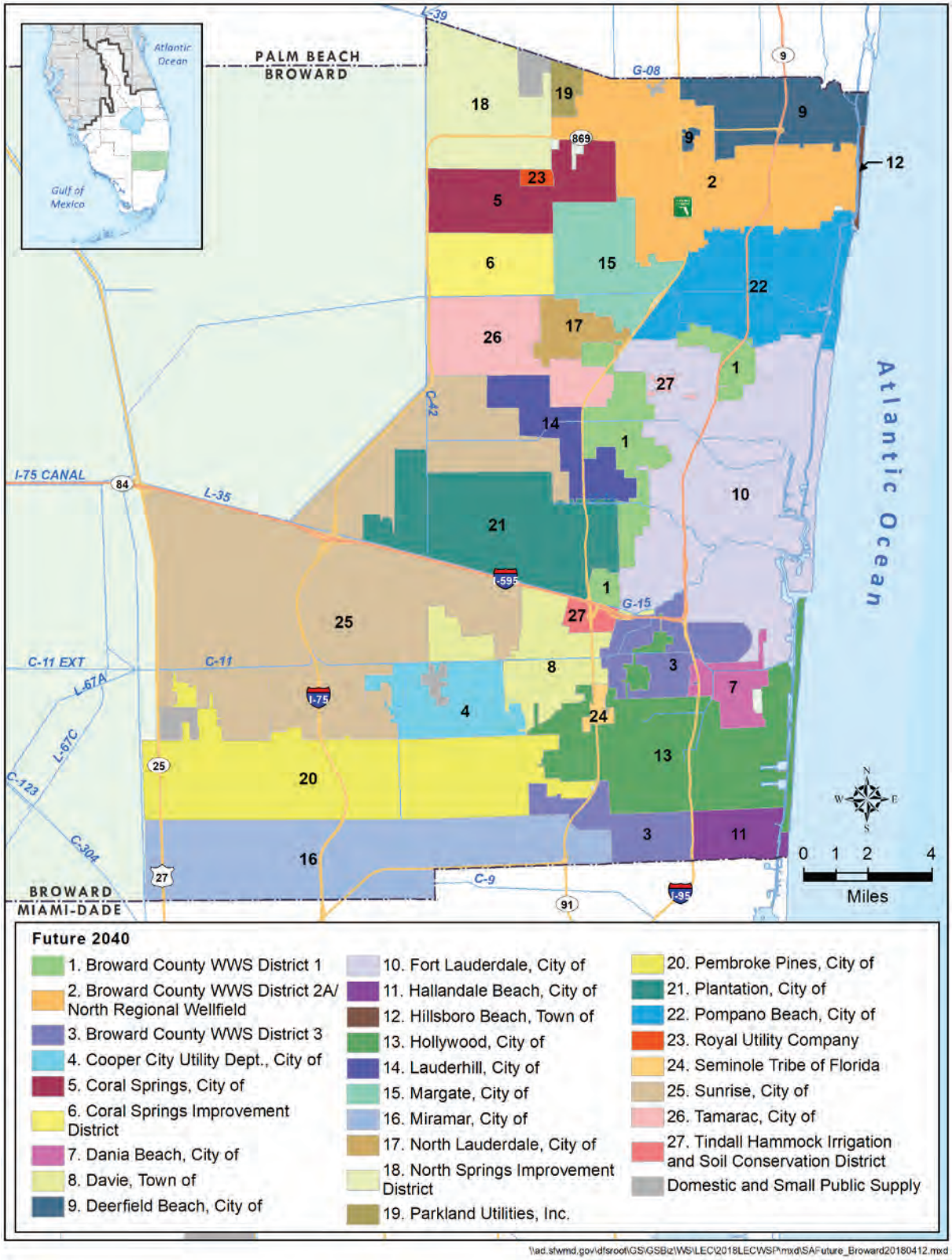


Figure A-4. Future (2040) public water supply utility service areas in Broward County.

Appendix F - CITY OF OAKLAND PARK LANDSCAPE AND STREETSCAPE DESIGN STANDARDS (2016)

Landscape and Streetscape Design Standards

City of Oakland Park

ENGAGED • INSPIRED • UNITED

City of
OAKLAND PARK
FLORIDA

A CITY ON THE MOVE

Appendices

Tables **Page**

Graphics and Photographs **Page**

Introduction

The City of Oakland Park is a well-established community in eastern Broward County. It contains a mix of residential neighborhoods, commercial and retail areas, as well as industrial/warehouse districts. Along with many older Cities in South Florida, Oakland Park is looking to re-invest in its aging infrastructure, expand its parks and recreation opportunities, and offer improved neighborhood services to re-invigorate the City. One of these efforts is the Proud Oakland Park initiative, or P.O.P and POP Too. This document is a tool to improve community appearance and to promote the development of a livable, walkable and sustainable community.

Statement of Intent

These standards replace the existing Landscape code and are adopted within the City Code of Ordinances by reference. These standards apply to all areas of the City. This document:

- consolidates scattered code sections to provide easier review
- provides consistency throughout codes sections
- modernizes the code criteria
- promotes the use of native and Florida Friendly plant materials
- promotes the use of low maintenance plant materials
- establishes 'Branding' standards for the entire City to improve community appearance
- provides needed flexibility

Goals and Objectives

Goals

- To use Florida-Friendly Landscaping principles to reduce water consumption.
- To expand the use of native species.
- To the use of appropriate landscape plants and sound landscape design as an integral part of the site and architectural design of our community.
- To reduce maintenance through the use of plant species that do not require an excessive amount of pruning, trimming, or shearing in order to be maintained at a desirable size within the landscape area.
- To promote the planting of more shade trees, primarily as street trees and in parking lots where appropriate.
- To encourage the planting of more native South Florida Slash Pine trees in order to re-establish the trees as a distinctive element in the landscape fabric of the City of Oakland Park.
- To support Community Wildlife Habitat.
- To preserve existing specimen trees, native vegetation (including canopy, understory, and ground cover) to the maximum extent possible.
- To preserve existing historic and environmentally significant trees.
- To make the City of Oakland Park more walkable.

Objectives

- Through landscape design, enhance architectural features, relate building design to the site, visually screen dissimilar uses and unsightly views, reduce noise impacts from major roadways and incompatible uses, strengthen important vistas, and reinforce neighborhood design and character.
- Landscape designs shall require an emphasis on the use of drought tolerant species, and plants with similar water requirements shall be grouped together to reduce the amount of water necessary for irrigation.
- Landscape designs shall require the use of native plant species to reestablish an aesthetic local quality, and highlight the diversity of native plant species and environmental ecosystems found in the City of Oakland Park.
- Where feasible, landscape designs shall incorporate native South Florida Slash Pines into the landscape plans to reestablish this species.
- Street trees shall be required to shade roadways and provide aesthetic qualities to our neighborhoods.
- Plant species appropriate to the particular site conditions shall be used. An emphasis shall be placed on plant species that require less maintenance and trimming. Special attention shall be given to the use of appropriate species under, or over, utility lines, and near native plant communities. Adequate growth area, above and below ground, shall be provided for all plant material.
- Landscaping shall be designed in such a way as to provide safe unobstructed views at intersections and driveways.
- Landscape design shall recognize and preserve historic and environmentally significant trees and landscape features as designated by local, state or federal agencies.
- Landscape designs shall include sidewalks as part of any new project when feasible.

SECTION 1: Landscaping Requirements

The objective of this section is to improve the appearance of certain setback and yard areas, including off-street vehicular parking and open lot sales and service areas, to protect and preserve the appearance, character, and value of the surrounding neighborhoods and thereby promote the general welfare by providing for installation and maintenance of landscaping and screening aesthetic qualities. This Section identifies development types, the general and specific standards for each, and provides example graphics demonstrating compliance.

A. General Standards for All Districts

1. Applicability
   a. The development Standards of Section 1 shall apply to all new construction and shall also apply to developed parcels when an addition or remodeling:
      i. Increases the gross floor area of the structure by twenty-five (25) percent or more; or
      ii. The cost of which exceeds twenty-five (25) percent of the assessed value of the structure.

   b. Any lot which is nonconforming shall be brought into conformity with the minimum requirements of this section upon occurrence of any of the following conditions:
      i. When a vehicular use area is expanded or enlarged by additional paving resulting in an increase of twenty-five (25) percent or more of the existing vehicular use area square footage; or
      ii. When there is an addition which increases the area of all existing buildings on the property by more than twenty-five (25) percent gross floor area.
      iii. When a change of use, as defined in the Land Development Code, involves more than twenty-five (25) percent of the gross floor area of the building or buildings on the property.

2. Plans
   Landscape plans shall be submitted to the City as part of the site development plan review and must be signed and sealed by a registered landscape architect, licensed to practice in the State of Florida. All landscape plans shall contain in a grid format a plant list or landscape legend containing the following information: 1) key to legend; 2) both common and botanical names of all plant material species; 3) quantities for all plant material species; 4) size and specifications; and 5) minimum spread, minimum four-foot clear trunk and caliper for all trees. All landscape architects shall provide a statement indicating the availability of all proposed plant materials shown on submitted landscape plans. See article XII of the Land Development Code.

3. Plant Material
   a. All plants must be Florida #1 or better, in accordance with the most current edition of the “Grades and Standards of Nursery Plants” published by the Division of Plant Industry, Florida Department of Agriculture.

b. Minimum height for trees shall be eight (8) feet in height for small species, ten (10) feet in height for medium and large species, and for palms a minimum of eight (8) foot clear trunk at time of planting.

c. All trees shall have a minimum four-foot spread, or based on the canopy characteristics of the tree species, and a minimum caliper of one and a half (1-1/2) inches.

d. All tree species will ultimately attain a spread of twenty (20) feet or more. In the event that palms are used that will not attain a twenty-foot spread, they shall be planted in groups of three (3) with at least eight (8) feet of clear wood per each tree. Their staggered heights shall be at least ten (10), twelve (12) and fourteen (14) feet with the average height used for the above percentage calculation. Such groups of palms shall be counted as one (1) tree.

e. Minimum of 50% of plant species selected for a project shall be native and a minimum of no less than three different (3) species shall be used.

f. Minimum of 40% of total shrub and ground cover materials on a project shall be native.

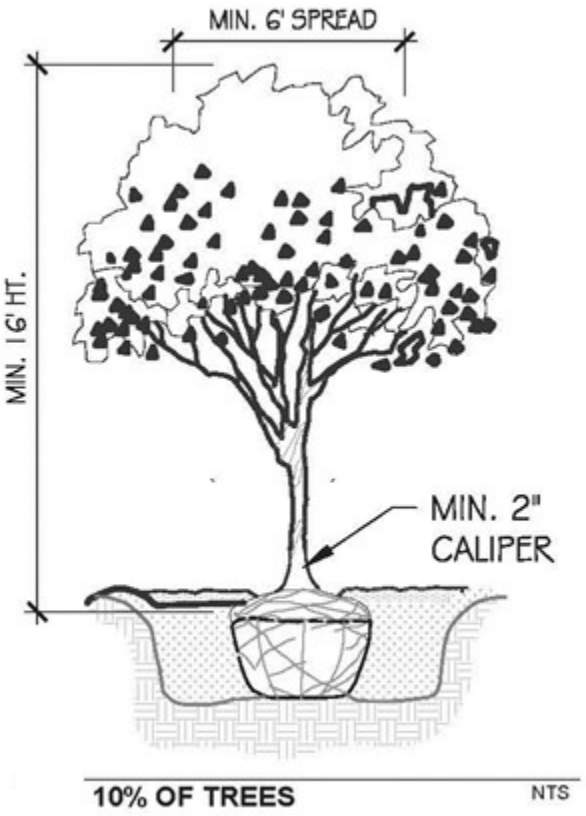
g. Minimum of 50% of total trees on a project shall be native. The planning and zoning division shall maintain a list of recommended tree and shrub species, including native or Florida-Friendly species. The Planning and Zoning Department shall review and update the list no less than every five (5) years.

h. Minimum height for required hedges shall be two (2) feet.

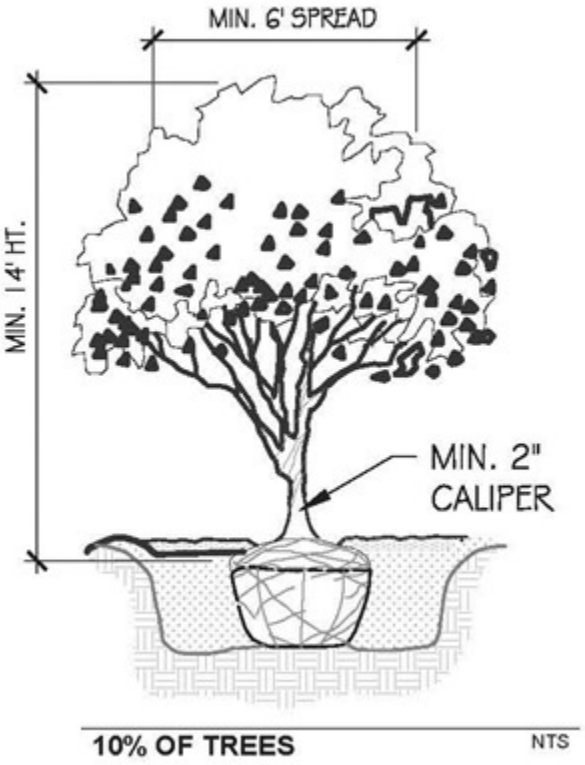
i. Maximum spacing for required hedges shall be two (2) feet on center.

j. All ground cover shall be planted with a minimum of seventy-five (75) percent coverage with one hundred (100) percent coverage occurring within six (6) months of installation.

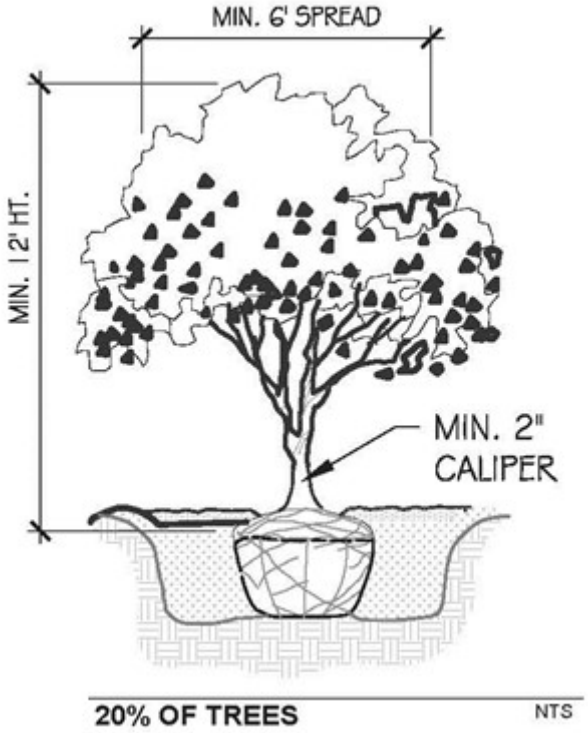
k. All planting beds shall be mulched. Mulch shall be organic material; however, Cypress mulch is not allowed in the City.
   i. Mulch shall be placed a minimum three (3) inch depth on planting beds.
   ii. Mulch shall be placed a maximum of one (1) inch depth on top of root balls.
   iii. Mulch shall be a minimum of six (6) inches away from a tree trunk.



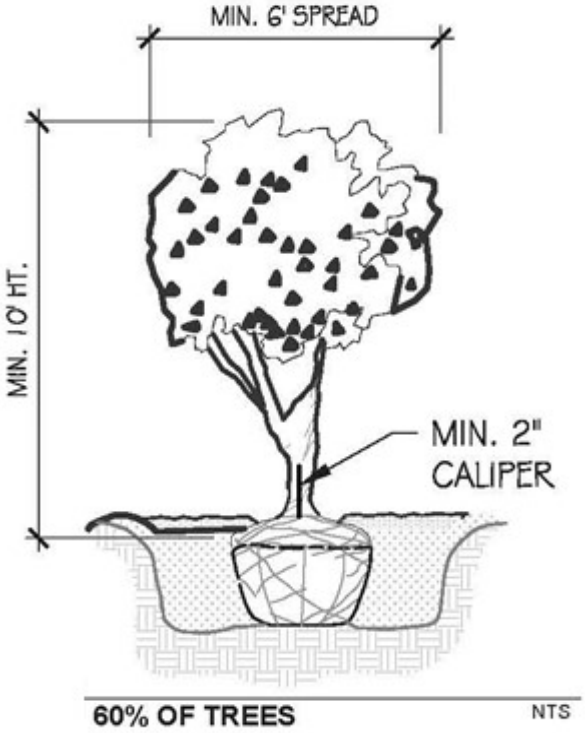
10% OF TREES NTS



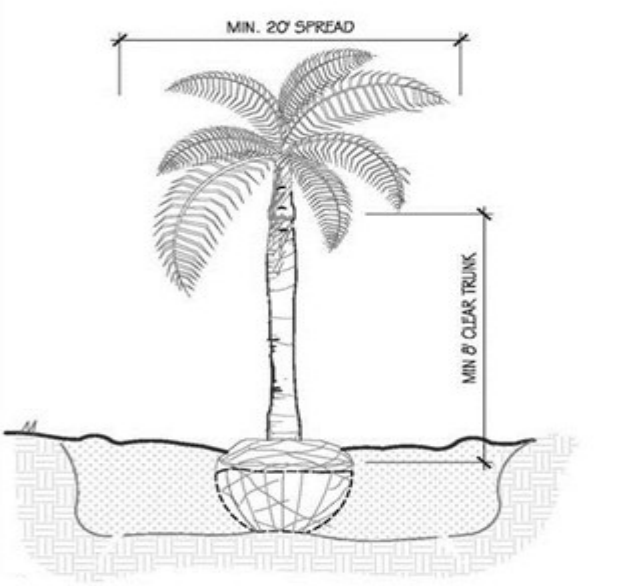
10% OF TREES NTS



20% OF TREES NTS

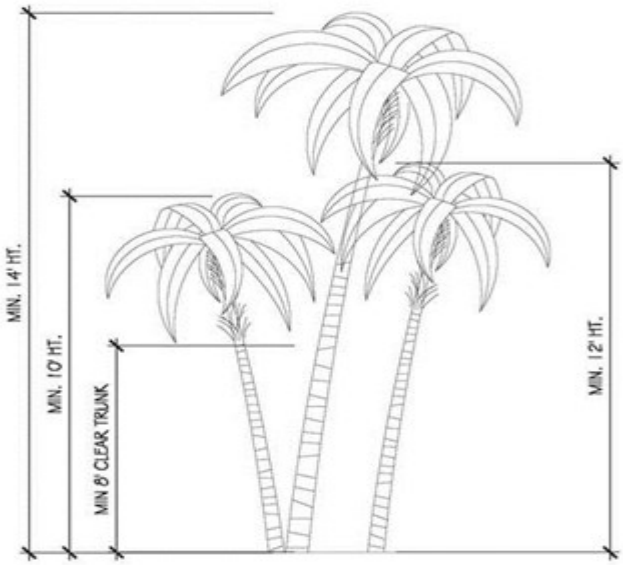


60% OF TREES NTS



PALMS GREATER THAN 20' SPREAD NTS

NOTE: 1 PALM EQUALS 1 TREE



PALMS LESS THAN 20' SPREAD NTS

NOTE: 3 PALMS EQUAL 1 TREE

(TREE HEIGHT IS AVERAGE OF THE 3 PALMS)

4. Irrigation
   a. All landscaped areas must have an automatic underground irrigation system which is designed to provide a minimum of 100% coverage with a 50% overlap. A lower level of coverage may be considered in those areas where all plant materials are native or Florida Friendly.

   b. Irrigation systems shall be designed so that lawn or turf areas, and other high water demand plants, are on separate zones and schedules than zones irrigating trees, shrubs and other low water demand plants.

   c. Irrigation systems shall not overspray onto roadways, driveways, or sidewalks, or unto building windows or doors.

   d. A non-potable water source must be used, if available.

   e. All irrigation systems shall be equipped with a rain sensing device.

   f. Bubblers shall be installed at all new tree installations on commercial and multi-family properties.

5. Maintenance Requirements
   a. All landscape areas shall be maintained in a healthy growing condition.

   b. All landscape areas shall be maintained free of refuse and debris.

c. The owner, tenant, and their agent, if any, shall jointly and severally be responsible for maintenance.

d. Maintenance shall include watering, weeding, mowing, fertilization, insect and disease control, mulching, pruning, removal and replacement of dead or diseased trees and shrubs, and removal of refuse and debris at all times.

e. Regular mowing of lawn so as to maintain grass at least no higher than six (6) inches.

f. All planting beds shall be mulched. Cypress Mulch is not allowed in the City.

g. Trees, branches, palm fronds, vines, bushes and any other vegetative matter shall be maintained and trimmed so that no tree branches, palm fronds, vines, bushes or other vegetative matter shall be situated at a point any closer than six (6) feet to any overhead electric utility facilities.

h. Trees, branches, palm fronds, vines, bushes and any other vegetative matter shall be maintained and trimmed so that no tree branches, palm fronds, vines, bushes or other vegetative matter shall obstruct passage on a public sidewalk or roadway.

i. Trees, branches, palm fronds, vines, bushes and any other vegetative matter shall be maintained so as not to block the view of any street sign or traffic regulation sign on public roadways.

j. In circumstances where existing tree roots are causing or potentially causing a trip hazard because of lifting of some portions of a public sidewalk, root barriers shall be installed. If the sidewalk should need to be replaced, the use of structural soils and/or in conjunction with root barriers where trees are present is recommended.

k. Removal of root systems which show evidence of destroying public or private property is required. Root barriers of appropriate depth shall be utilized in lieu of removal where upheavals do not create safety problems or structural damage to buildings.

l. The owner, tenant, and their agent, if any, shall jointly and severally be responsible for watering landscape materials by means of an automatic sprinkler system providing one-hundred (100) percent coverage, which shall be appropriately reflected on the landscape plans.

6. Permit and Inspection Requirement
   a. A tree removal permit must be obtained from the City of Oakland Park prior to removing or relocating any protected tree or palm. A protected tree is any tree not listed on the “Florida Exotic Pest Plant Council” current list of category 1 species and any plant not on the Noxious Weed list established by the State of Florida Department of Agriculture and adopted in the Florida Administrative Code.

b. Plumbing permit shall be obtained from the City prior to the installation of an irrigation system.

c. A Landscape permit is required for all landscape installations specified in Section 1 of this document with the exception of existing single family homes or duplex units that are not a part of a planned community on individual lots. Planned residential development must obtain a landscape permit for the individual lots, and a separate permit for the common areas including the street trees.

d. No trees or other plant material may be planted in public right of ways without a permit from the City.

e. The Landscape Architect of record shall provide a certification letter to the City certifying that the landscaping was installed according to the approved plans and specifications before the City's Landscape inspector makes a final inspection for all non-residential and planned community residential projects.

7. Prohibitions
   a. "Hat-racking" or trimming more than 50% of the foliage from a tree, or creating numerous branch stubs more than three (3) inches in diameter is prohibited.

   b. Cypress mulch is not allowed in the City.

   c. *Ficus Benjamina* is not allowed to be installed as required hedge material.

   d. No individual shall refuse to permit a utility or its designee ingress or egress to and from property for the purpose of pruning, trimming, maintaining or removing vegetation that may interfere with the delivery of electric service.

   e. Any species that are listed as Category 1 species on the most current 'Florida Exotic Pest Plant Council" list are prohibited to be planted in the City.

8. Offsets
   Any tree and/or palm planted after the effective date of this subsection shall comply with the following offsets.

   a. Overhead Utilities
      The distance from an overhead utility line is the determining factor in what size tree should be planted, or if a tree can be planted. The following distances apply:
      i. Only trees that grow to a height of 20' or less may be planted under overhead utility lines.
      ii. Trees and palms that grow to 20' to 30' in height at maturity shall be planted at least 20 feet away.

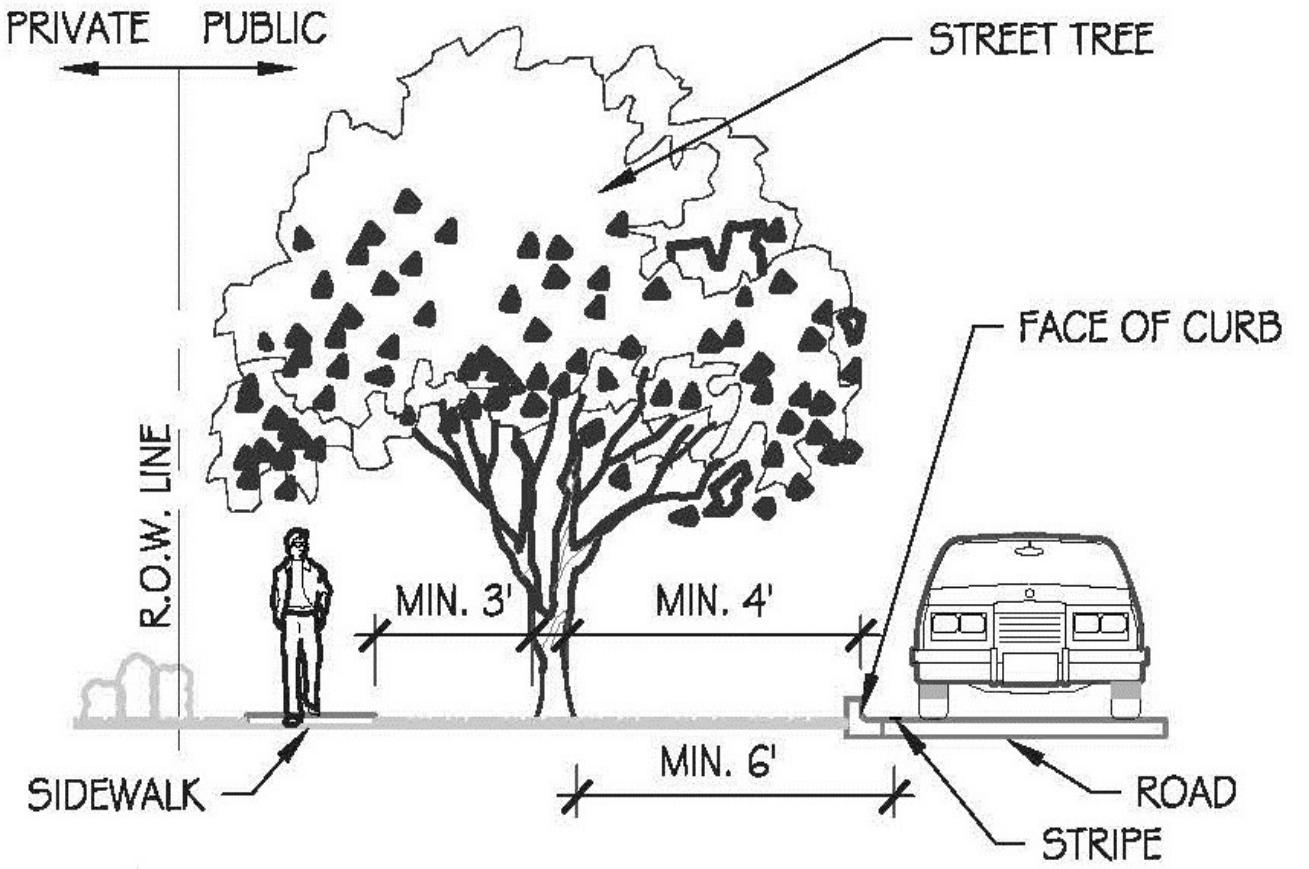
iii. Trees and palms that grow to over 30' in height at maturity shall be planted at least 30 feet away from overhead utility lines.

b. Underground Utilities

i. All trees and palms shall be planted at least five (5) feet away from any underground utility line.
ii. All trees and palms shall be planted at least five (5) feet from any other buried utility lines.
iii. All trees and palms shall be planted at least seven and a half (7.5) feet away from any fire hydrant.
iv. All trees and palms shall be planted at least five (5) feet away from any storm sewer catch basins.
v. When a six (6) foot setback from any underground public infrastructure is not feasible, root barriers shall be installed in accordance with the manufacturer's instructions when medium or large species of shade trees are planted.

c. Roadways and Sidewalks

i. Trees and palms planted on major arterial roadways must follow the standards set forth by F.D.O.T. or Broward County. Generally where there is a 6" high raised curb located between the roadway and the tree, the tree shall be planted a minimum four (4) feet from the face of the curb, or a minimum of six (6) feet from the edge of the closest travel lane (I.E. the centerline of the stripe on the edge of pavement). Where there is no curbing present and there is just a grassy swale area, the setback from the edge of the closest travel lane is generally a minimum of fourteen (14) feet to the nearest tree, but this is subject to the specific configuration of the swale and utility placement and will be reviewed by the City Engineering Department. The governing agency of each roadway must be consulted for the exact setback distance that shall be required.
ii. On City owned and maintained collector roads the offset may be reduced to 10 feet, or even 8 feet, or less, on some local residential streets, but this is subject to the specific configuration of the swale and utility placement and will be reviewed by the City Engineering Department.
iii. Trees and palms shall be planted a minimum of three (3) feet from all sidewalks.
iv. Root barriers shall be installed when it is necessary, due to site limitations, to plant medium or large tree species within three (3) feet of any hardscape, such as roads, driveways, sidewalks, parking lots, and curbing.



SETBACKS FROM ROADWAY AND SIDEWALK

d. Light Poles
   i. Large shade trees shall be planted a minimum of fifteen (15) feet away from light poles.
   ii. Medium and Small trees shall be planted a minimum of ten (10) feet away from light poles.
   iii. Palms shall be planted at an appropriate distance away from light poles based on the length of their fronds at maturity plus three (3) feet. For example, if the length of the frond is 5', than that palm species shall be planted a minimum of 8" from the light pole. See list below for the mature lengths of fronds for recommended palm species.
      - Large palms with 12' long fronds shall be planted a minimum of 15' from light poles.
      - Medium palms with 7' long fronds shall be planted a minimum of 10' from light poles.
      - Small palms with 4.5' long fronds shall be planted a minimum of 7.5' from light poles.

Table 1. Recommended Palms & Frond Lengths

Small Palms with 4.5' Fronds	Medium Palms with 7' Fronds	Large Palms with 12' Fronds
Silver Palm	Bottle Palm	Royal Palm
Florida Thatch Palm	Pindo Palm	Paurotis Palm
Pygmy Date Palm	Spindle Palm	Bismark Palm
Sabal /Cabbage Palm	Chinese Fan Palm	Canary Island Date Palm
MacArthur Palm	Foxtail Palm	"Sylvester' Date Palm
Montgomery Palm		"Medjool" Date Palm
Solitaire/Alexander Palm		Triangle Palm

e. Traffic Signs

All trees and shrubs shall be planted and maintained so as not to block the view of any street sign or traffic regulation sign on public roadways. The minimum requirement shall be fifty (50) feet in front of any stop sign and a minimum of twenty-five (25) feet in front of any other traffic sign.

f. Buildings Foundations and Masonry walls

i. Small trees and palms (based on frond length) shall be planted a minimum of five (5) feet from all building foundations and masonry wall structures.

ii. Medium trees and palms (based on frond length) shall be planted a minimum of seven (7) feet from all building foundations and masonry wall structures.

iii. Large trees and palms (based on frond length) shall be planted a minimum of ten (10) feet from all building foundations and masonry wall structures.

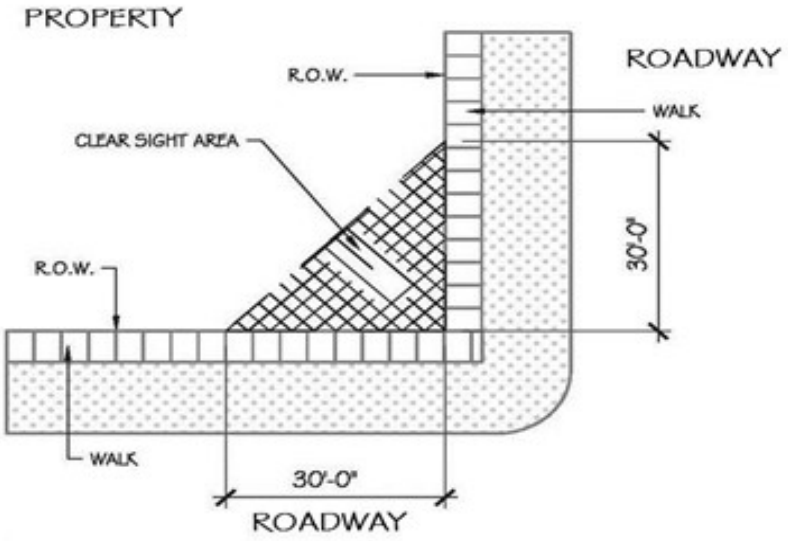
g. View Triangles

To enhance the safety of all vehicular traffic movement, a line of clear sight at all intersections shall be maintained. To maintain a line of clear sight for drivers of vehicles at intersections, the following requirements shall be met.

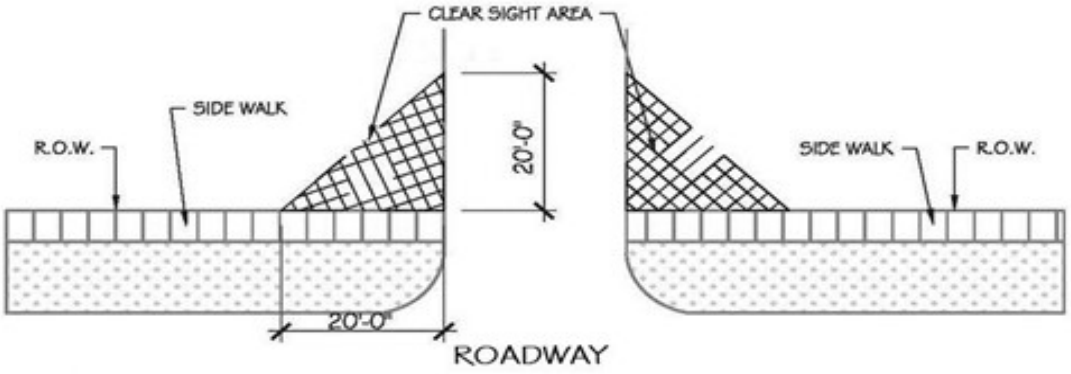
i. No hedge wall, fence, tree, structure, or parking space shall be erected or allowed to obstruct vision within a thirty-foot (30'x30') clear sight triangle at the intersection of any two (2) streets, or within a twenty-foot (20'x20') clear sight triangle on each side of a driveway. The clear sight triangles shall be measured from edge of the right of way of both streets or the right of way and closest edge of the driveway in all districts.

ii. Single family and duplex residence may be permitted to have the twenty-foot (20'x20') clear sight triangle measured from the edge of existing paved street.

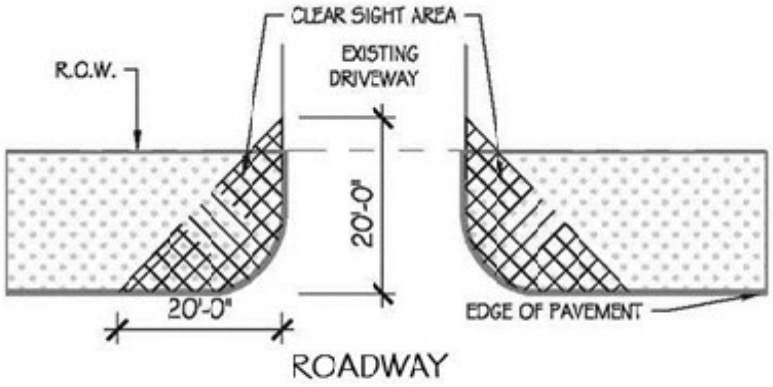
iii. All hedge, shrubs, or groundcovers located within any clear sight triangle must be maintained at less than thirty-six (36) inches in height.



INTERSECTION OF TWO(2) STREETS N.T.S



INTERSECTION OF DRIVEWAY AND A STREET N.T.S



EXCEPTION FOR EXISTING DRIVEWAYS TO EXISTING SINGLE FAMILY / DUPLEX RESIDENCE N.T.S

9. Mechanical Equipment Screening
   All mechanical equipment for new construction placed on the ground shall be screened with shrubs planted twenty-four (24) inches in height and spaced twenty-four (24) inches on center to form a solid hedge. A solid hedge shall not be required if the mechanical equipment is presently screened from the street view.

10. Reserved.

11. Waivers and Sustainable Design Incentives.
    All landscape plans shall be subject to the approval of the Development Review Committee of the City of Oakland Park before any building permit is issued. If the strict and full requirements of this Section and Section 3 of this document cannot be met due to lot size constraints or other extenuating circumstances, the Development Review Committee may grant a waiver or waivers to specific subsections provided the following criteria are met:

    a. The applicant shall clearly demonstrate the causative factor(s) why the code cannot be met.

    b. The applicant shall mitigate for the non-compliance by incorporating alternate mitigation features into the plan.

    c. Preservation or relocation of healthy trees, as certified by the City's Arborist, shall take precedence over removal.

    d. Required walls between residential and nonresidential areas are not eligible for a waiver.

    e. The mitigation features must increase the aesthetic appearance and implement sustainable building or development aspects of the plan beyond what the base code requires.

    f. The final approved plan must contain some landscape materials and cannot be devoid of any vegetation. At least a minimum of ten percent (10%) of the required plant materials and/or planting area must be included in the alternate mitigation plan.

    g. Alternate mitigation features may include, but are not limited to:

        i. Green roof in lieu of or to supplement a required buffering area.

        ii. Integrated Green Wall system in lieu of or to supplement a required buffer area.

        iii. Flexibility in locating required buffers or landscape materials provided the full required square footage or quantity is provided; for example, increasing the width of a buffer on one side of a parcel if the required width on another side is not feasible.

iv. Obtaining a LEED® rating system or Florida Green Building Coalition certification for the structure.

v. Reserved.

vi. Providing contributions to a complete streets project, any such contribution must be reviewed and approved by the Engineering Department and complement an on-going or planned project, and must be approved by the City Commission.

h. For all alternative mitigation plans, where a required tree cannot be planted, a donation of the equivalent value of the tree plus installation shall be made to the City's tree preservation trust fund in addition to the alternative mitigation option.

12. Enforcement

a. All landscaping shall be inspected by the code enforcement department upon completion. Landscaping shall be in conformance with approved plans and specifications before the certificate of occupancy is issued.

b. Landscaping may be inspected periodically by the code enforcement department to insure proper maintenance. The owner, tenant or their agent, shall be notified by the code enforcement officer, in writing, of any areas which are not being properly maintained and shall, with fifteen (15) calendar days from the time of notification, restore the landscape to a healthy condition.

c. It shall be unlawful for an owner, tenant or their agent, to fail to restore the landscaping within fifteen (15) calendar days after notice has been given, so that said landscaping conforms to the plan submitted to and approved by the code enforcement officer.

13. Street Trees

One of the most effective ways for a City to increase its tree canopy coverage is by planting more street trees within the right of ways along its roadways. While street trees have many benefits including providing character and much needed shade to sidewalks and neighborhoods, there are many factors that must be considered before selecting and installing a tree in a right of way. There may be both overhead and underground utilities to consider, as well as proper distances and setbacks from roadways and sidewalks, and drainage flows to considerations. In some cases, the presence of underground utilities may prohibit the planting of street trees all together. Where overhead or underground utilities, or other infrastructure would preclude the use of a large canopy tree, it is recommended that a small or medium tree, or a palm, be planted instead. A list of some appropriate street trees is included in Appendix B. Following are street tree installation standards.

a. Unless prohibited by existing site conditions, one (1) street tree shall be required for every forty (40) linear feet, or fraction thereof, and shall be planted no further than sixty (60) feet apart and no closer than fifteen (15) feet apart.

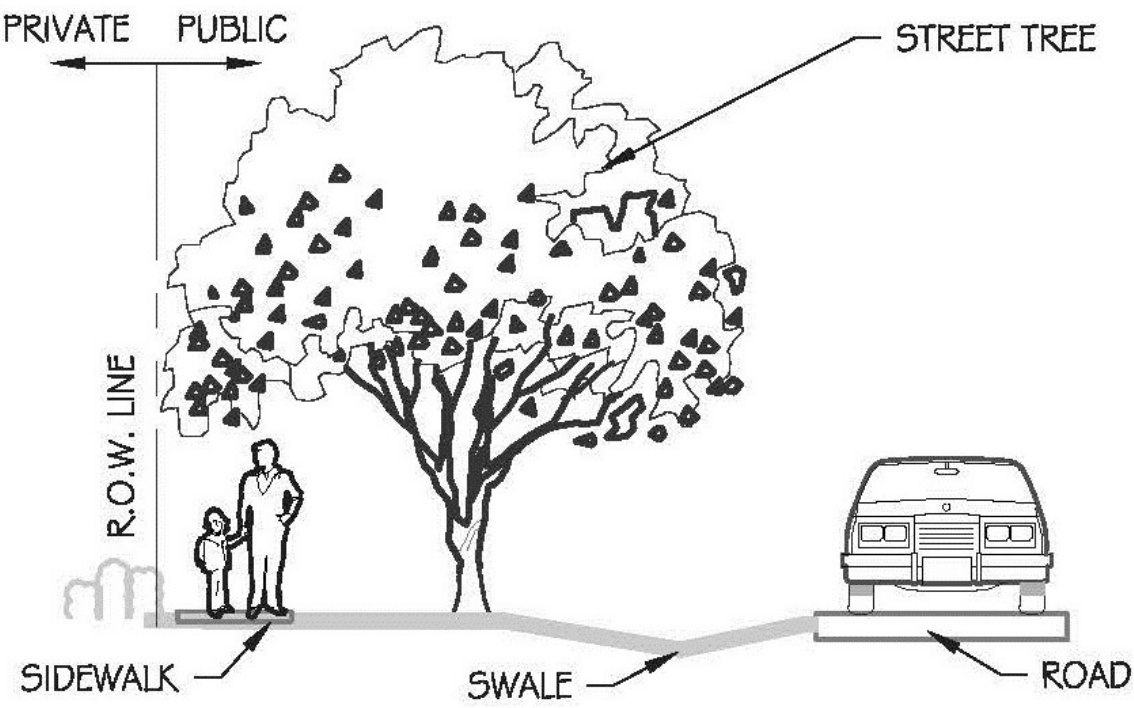
b. Street trees shall be shade trees unless otherwise approved by the development review committee based on best horticultural practices and planted in swales, as defined in section 24-79, along streets having a right-of-way of fifty (50) feet in width or greater.

c. All street trees are subject to the issuance of an engineering permit.

d. On many smaller streets without curbs and sidewalks, the grassy swale areas on either side of the roadway are important for drainage and may help to convey storm water runoff to the City's drainage system. Street trees along these types of streets should be planted to not impede the flow of storm water into the nearest catch basins or other drainage structure.

e. Street trees must meet all offsets established in this Section.

f. Where no swale or plantable areas occur, cut-outs in sidewalks and Tree Grates may be permitted. Tree grates must meet all applicable A.D.A. Accessibility Standards. The type and style of the tree grates must be approved by the City Engineering Department prior to installation.



STREET TREES SHADE SIDEWALKS AND NEIGHBORHOODS

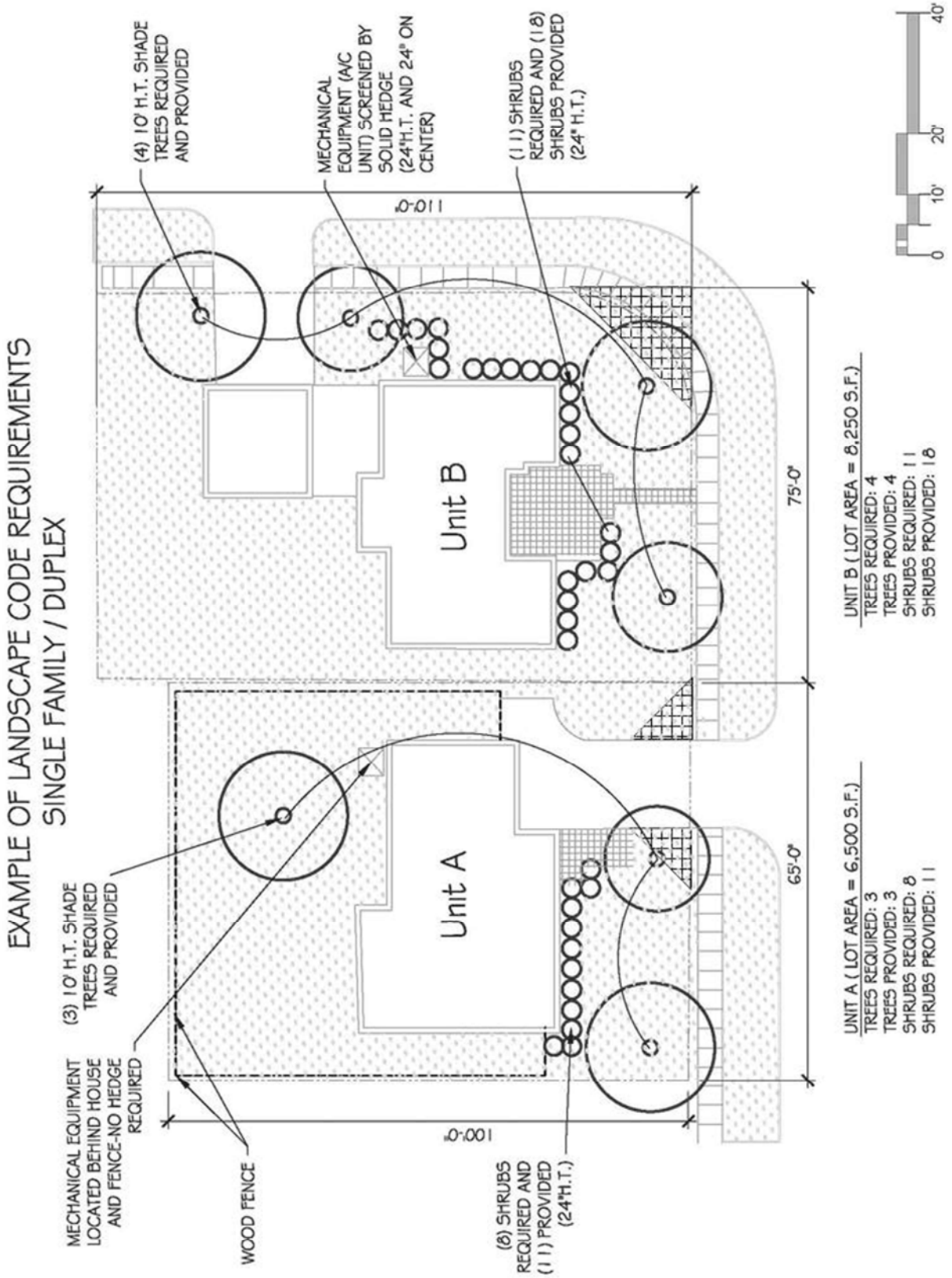
B. Single Family and Duplex Residence Requirements

In the R-1 and R-2 Districts where the subject property is utilized for residential purposes only, and RM-16 and RM-25 where the subject property is utilized for residential single-family and duplex residences, the requirements are that all areas which are to be pervious must be landscaped and that ten-foot tall shade trees be provided in accordance with the following minimum standards.

Table 2. Single Family and Duplex Residence Tree and Shrub Quantity Requirements

Lot Size in Square Feet	Number of Trees	Number of Shrubs
Less than 6,000	2	5
6,000 – 7,499	3	8
7,500 – 9,999	4	11
10,000 and over	5	15

The applicable requirements contained in section C below must also be complied with. Any permitted nonresidential use of property located within the R-1 or R-2 districts shall be subject to and adhere to all requirements of this article, including (C) below.


EXAMPLE OF LANDSCAPE CODE REQUIREMENTS
SINGLE FAMILY / DUPLEX
(4) 10' H.T. SHADE TREES REQUIRED AND PROVIDED
MECHANICAL EQUIPMENT (A/C UNIT) SCREENED BY SOLID HEDGE (24"H.T. AND 24" ON CENTER)
(11) SHRUBS REQUIRED AND (18) SHRUBS PROVIDED (24" H.T.)
110'-0"
Unit B
75'-0"
UNIT B (LOT AREA = 8,250 S.F.)
TREES REQUIRED: 4
TREES PROVIDED: 4
SHRUBS REQUIRED: 11
SHRUBS PROVIDED: 18
0
10'
20'
40'
(3) 10' H.T. SHADE TREES REQUIRED AND PROVIDED
MECHANICAL EQUIPMENT LOCATED BEHIND HOUSE AND FENCE-NO HEDGE REQUIRED
WOOD FENCE
Unit A
65'-0"
100'-0"
(8) SHRUBS REQUIRED AND (11) PROVIDED (24"H.T.)
UNIT A (LOT AREA = 6,500 S.F.)
TREES REQUIRED: 3
TREES PROVIDED: 3
SHRUBS REQUIRED: 8
SHRUBS PROVIDED: 11

C. Requirements for All Districts Other than R-1 and R-2

The minimum landscaping requirements below shall apply to off-street parking or other vehicular use areas, and certain yard areas in all zoning districts other than R-1 and R-2. The regulations applicable to the particular zoning district may contain additional requirements. See Section 3 for mandatory wall locations. Vehicular use areas shall include all areas used for the display or parking of vehicles, boats, or heavy construction equipment, whether self-propelled or not, plus the access drives thereto or on-site streets except parking under or within buildings.

1. Right-of-way edge requirements
   a. A landscaped strip at least ten (10) feet in depth shall be located between the abutting right-of-way and any vehicular use area not screened from the right-of-way by an intervening building.

   b. One (1) tree for each forty (40) linear feet or fraction thereof shall be located at least seven (7) feet from the right-of-way line, within the required landscaped strip. The specific spacing of installed materials to be reviewed and approved by the Development Review Committee.

   c. If there is a vehicular use area adjacent to the right-of-way, a decorative wall or hedge at least twenty-four (24) inches in height shall extend the entire length of the landscape strip, exclusive of any required vision triangle and shall be placed along the interior edge of the required landscape strip. If a decorative wall is erected, then one (1) shrub or vine is to be planted on the right of way side of the wall for each five (5) linear feet of wall and may be planted in groupings.

   d. In lieu of the above wall or hedge, an earthen berm may be provided along the right-of-way in the manner prescribed below:
      i. A rolled berm at least twenty (20) feet in depth and three (3) feet in height along at least one-half (½) of the frontage.
      ii. Plant materials shall be planted along the slope of the berm rather than the top.
      iii. No point of the berm may be greater than two and one-half (2½) feet in height within ten (10) feet of the right-of-way in order to ensure adequate visibility.
      iv. To assure that the berm may be properly maintained, the maximum slope should be approximately three to one (3:1).

   e. Any parcel zoned PCC, or any parcel with three hundred (300) feet or more of lot depth, which is located along an arterial or urban collector street, shall provide a berm meeting the requirements of subsection (d) above.

   f. Where the overhanging area in front of a vehicle is not paved, it cannot be considered as part of the right-of-way landscape requirements, but may be added to the building site open space requirements.

g. No hedge shall be located closer than seven (7) feet from the right-of-way line. Hedges in Jaco Pastorius Park and other public parks that have athletic activities utilizing hedges are exempt from this setback.

h. No fence, wall, hedge, tree, structure or parking space shall be erected or allowed to obstruct vision within a thirty-foot clear sight triangle at the intersection of any two (2) streets or within a twenty-foot clear sight triangle on each side of any driveway.

i. If back-out parking is utilized, as permitted in article VI, the required ten-foot landscaped strip shall be provided between the parking area and the building.

j. In the case of an alley right-of-way, the provisions of C.2 below shall apply rather than (a) through (j) above.

2. Perimeter Landscape Requirements Relating to Abutting Properties
   a. A landscape strip at least five (5) feet in width shall be located between the abutting property line and the off-street parking or other vehicular use area. See also C.2.b. which may necessitate a wider strip.
      i. One (1) tree shall be planted for each forty (40) linear feet or fraction thereof within this strip.
      ii. A hedge or other durable landscape barrier shall be planted or installed.
      iii. Where a wall is erected, one (1) shrub or vine for each five (5) feet of wall may be planted in lieu of a hedge. Shrubs may be placed in groupings. The wall shall be placed adjacent to the property line and the trees and shrubs installed interior to the wall.

   b. Where a nonresidential use abuts a residential use, a landscape buffer ten (10) feet in width must be placed and maintained between the two (2) properties.
      i. A masonry wall, eight (8) feet in height, shall be placed adjacent to the property line within the perimeter of such landscape buffer; and
      ii. One (1) tree shall be planted for each thirty (30) linear feet or fraction thereof within this strip;
      iii. One shrub or vine for each five (5) linear feet, or fraction thereof, of wall shall be planted within the landscape buffer.
      iv. The remainder of the required landscape area shall be landscaped with turf grass, groundcover or other landscape treatment, excluding vehicular use areas.

   c. Waterway frontage shall be landscaped. See article IX of the Land Development Code for specific requirements.

   d. A hedge or other durable landscape barrier shall be planted or installed along the perimeter of each plot other than a single-family residence or duplex. Nonresidential districts abutting a residential use shall comply with subsection C.2.b. above.

3. Parking Lot Interior Requirements
   a. Fifteen (15) square feet of landscaped area for each interior parking space even if the spaces abut a right-of-way or perimeter for which landscaping is required.

   b. The total required landscaped area is to be separated into smaller areas and located in such a manner as to break up the expanse of pavement. At least one (1) landscape island, ten (10) feet in width, measured from inside the curbs and the length of a parking space, shall be placed every twelve (12) spaces on average, parallel to such spaces and each row of parking shall be separated by at least a five-foot landscape strip.

   c. All landscaped areas adjacent to a paved surface of a vehicular use area, which are susceptible to vehicular encroachment, and at the intersection of any aisles or driveways shall be protected by curbing.

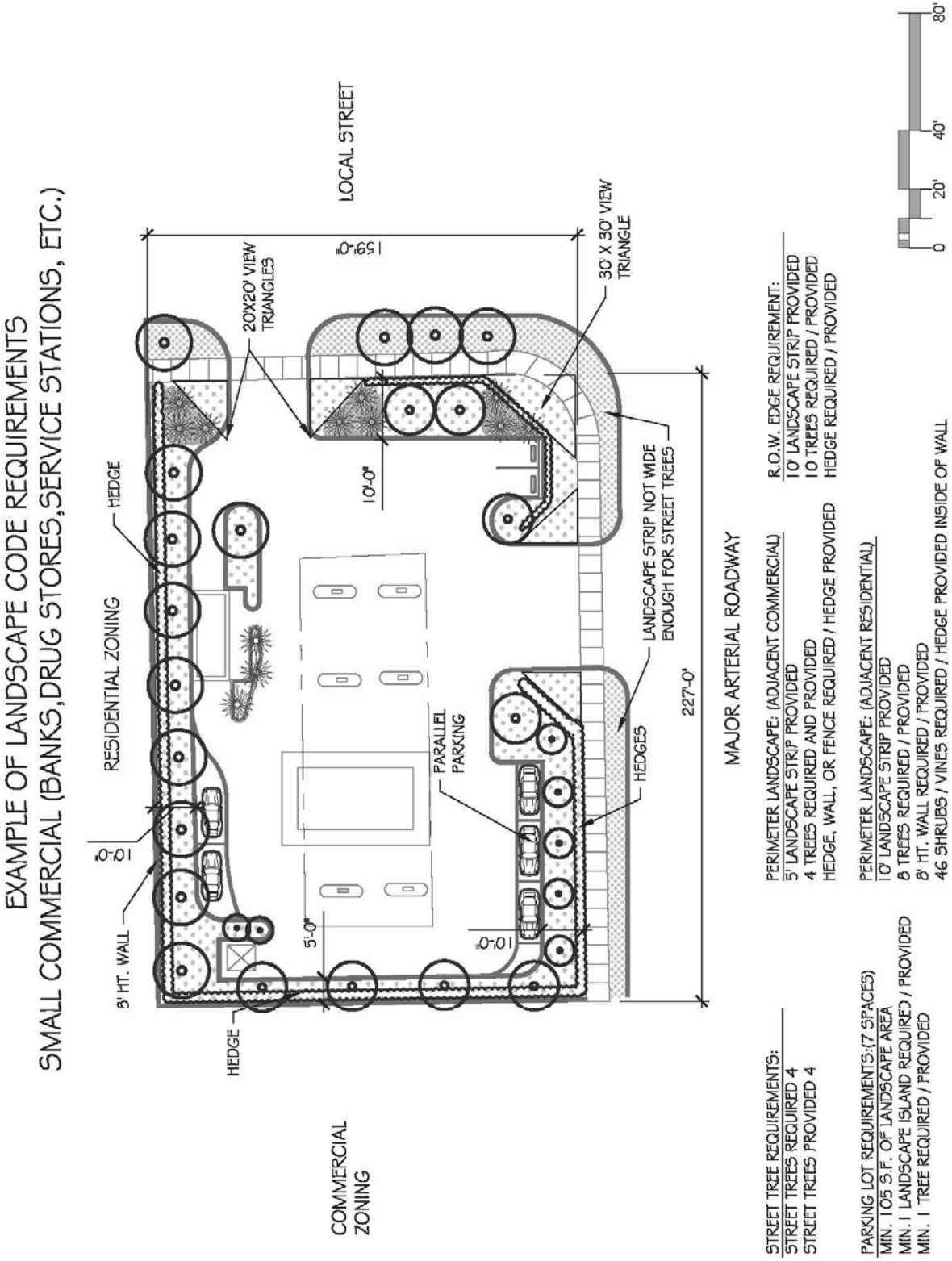
   d. One (1) tree is required for each ten (10) parking spaces, or fraction thereof, located within the perimeter of a parking area. A minimum of fifty (50) square feet is required for each landscaped area with a minimum of one (1) tree included.

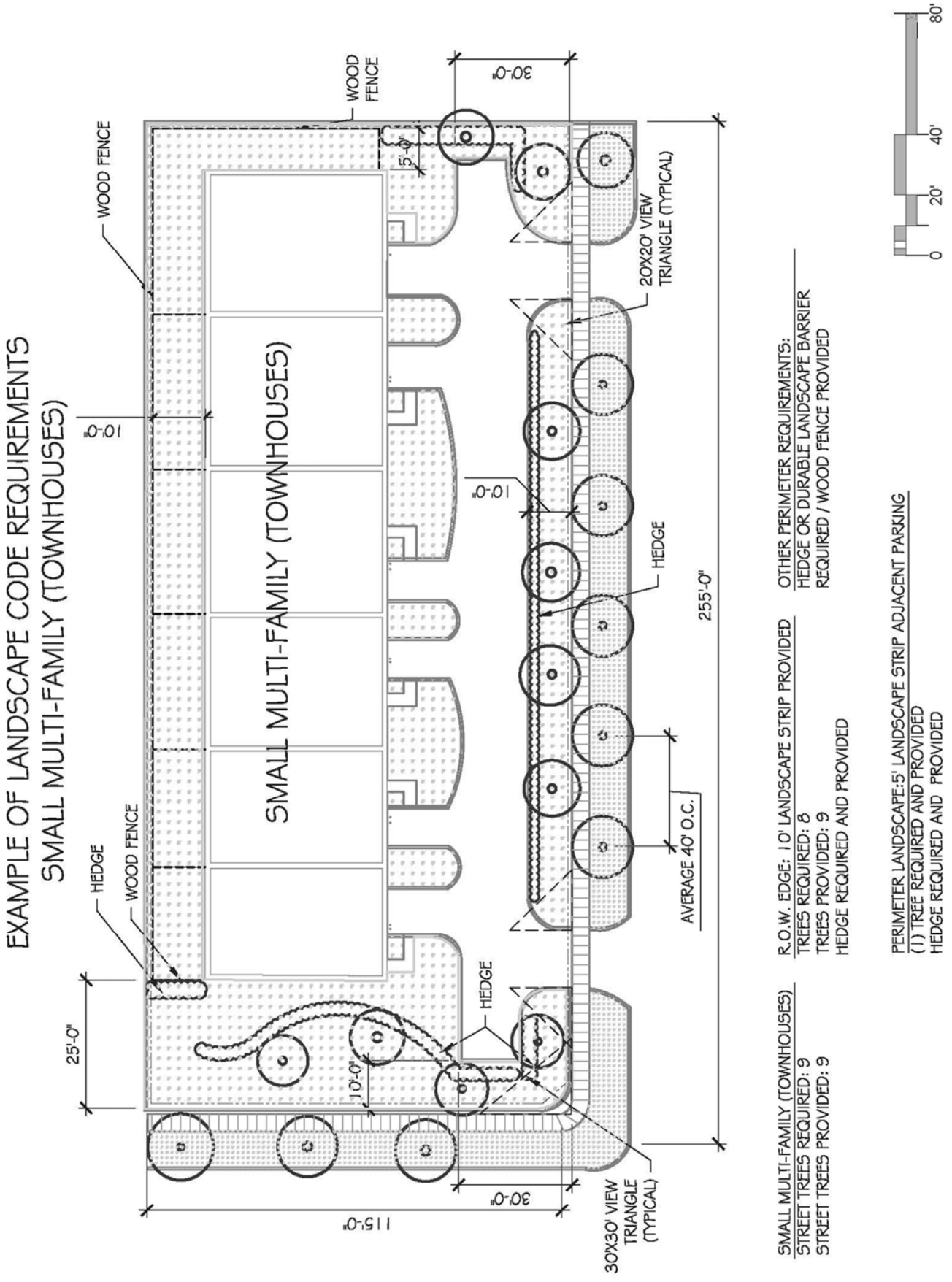
   e. In addition to trees, each landscaped area shall be fully landscaped with grass or plant material not to exceed three (3) feet in height.

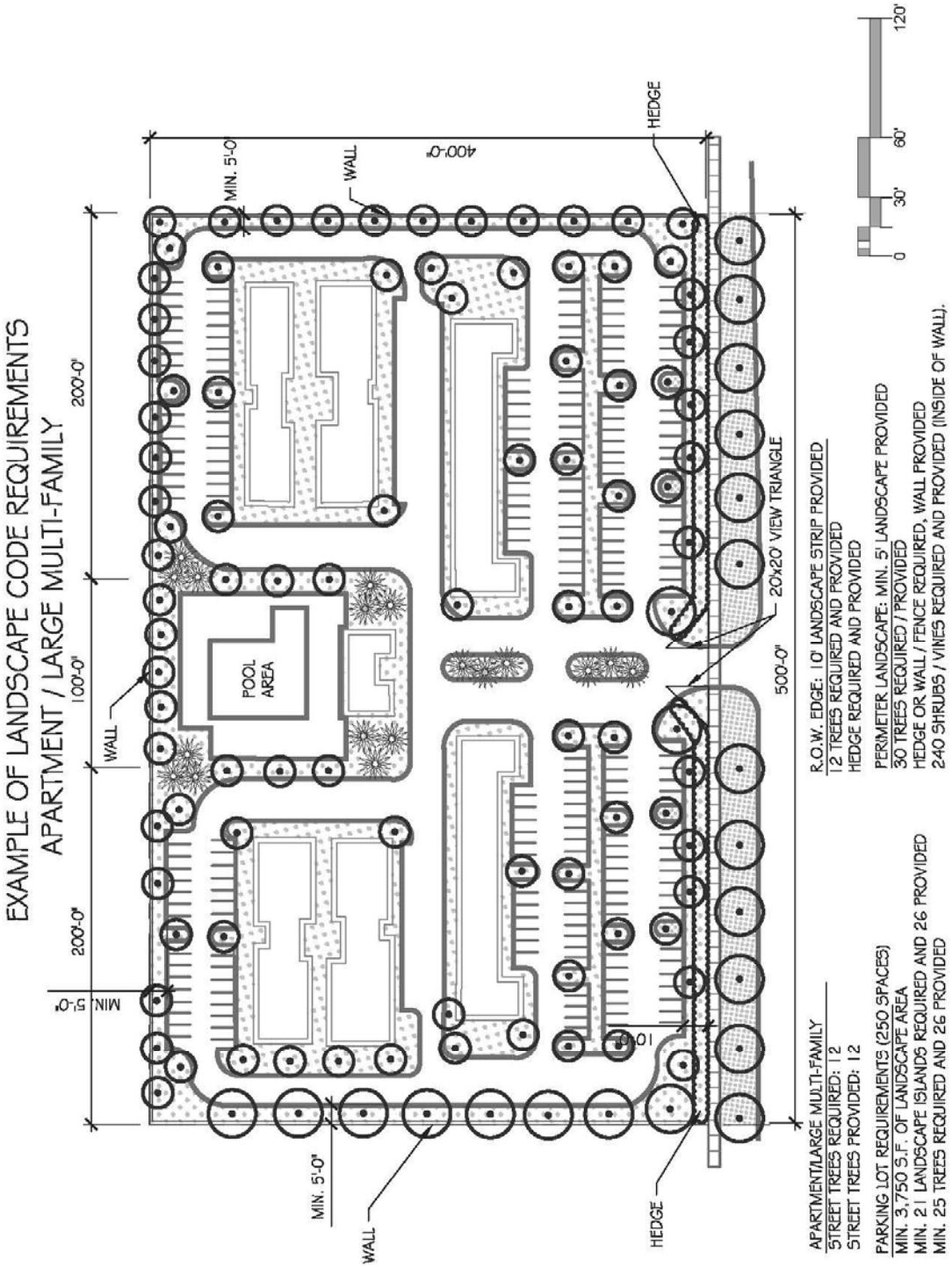
   f. Landscaped areas should achieve optimum drainage absorption; this will be reviewed as part of the site plan.

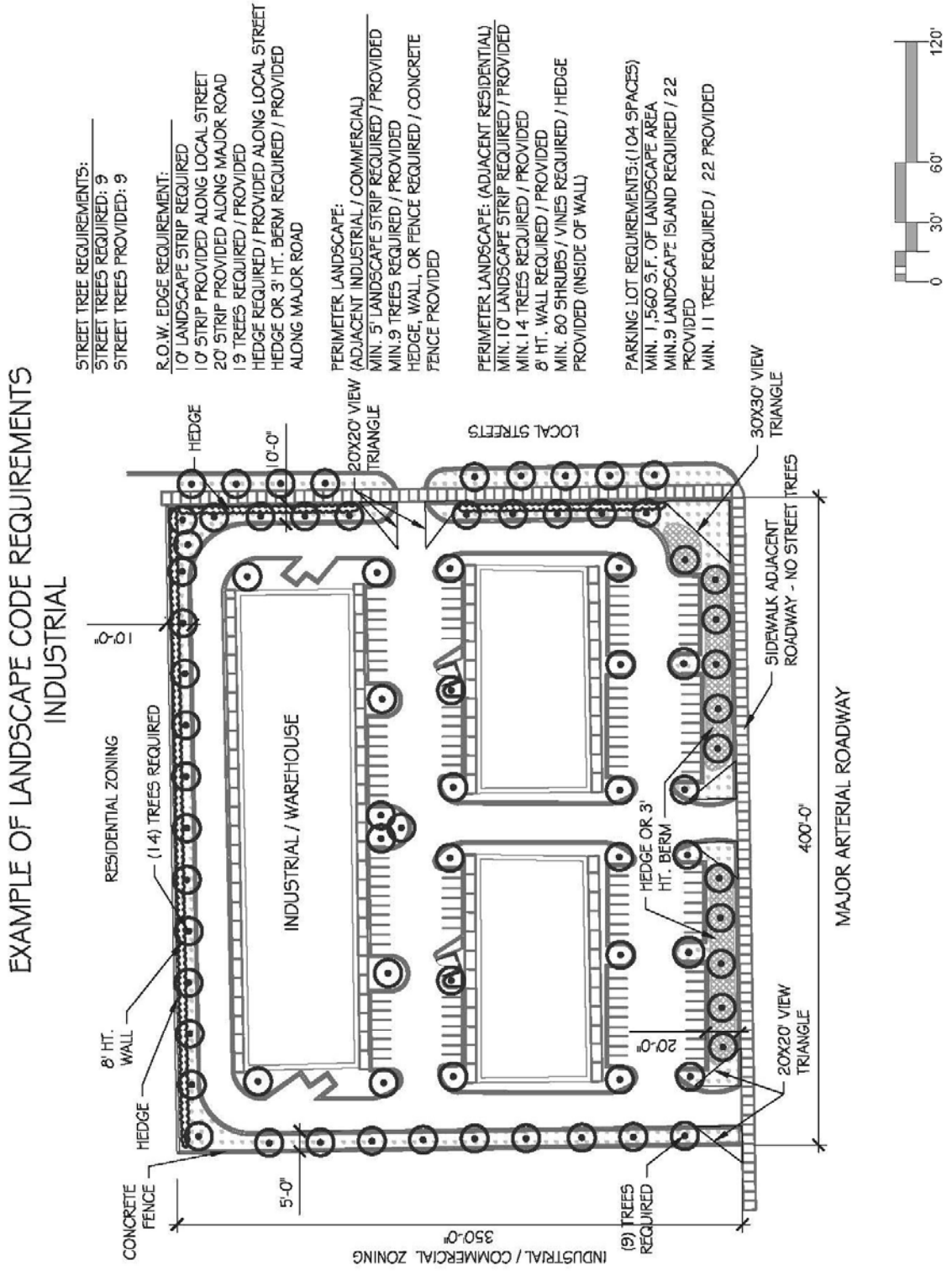
   g. The front of a vehicle may encroach on an interior landscaped area when protected by wheel stops or curbing.

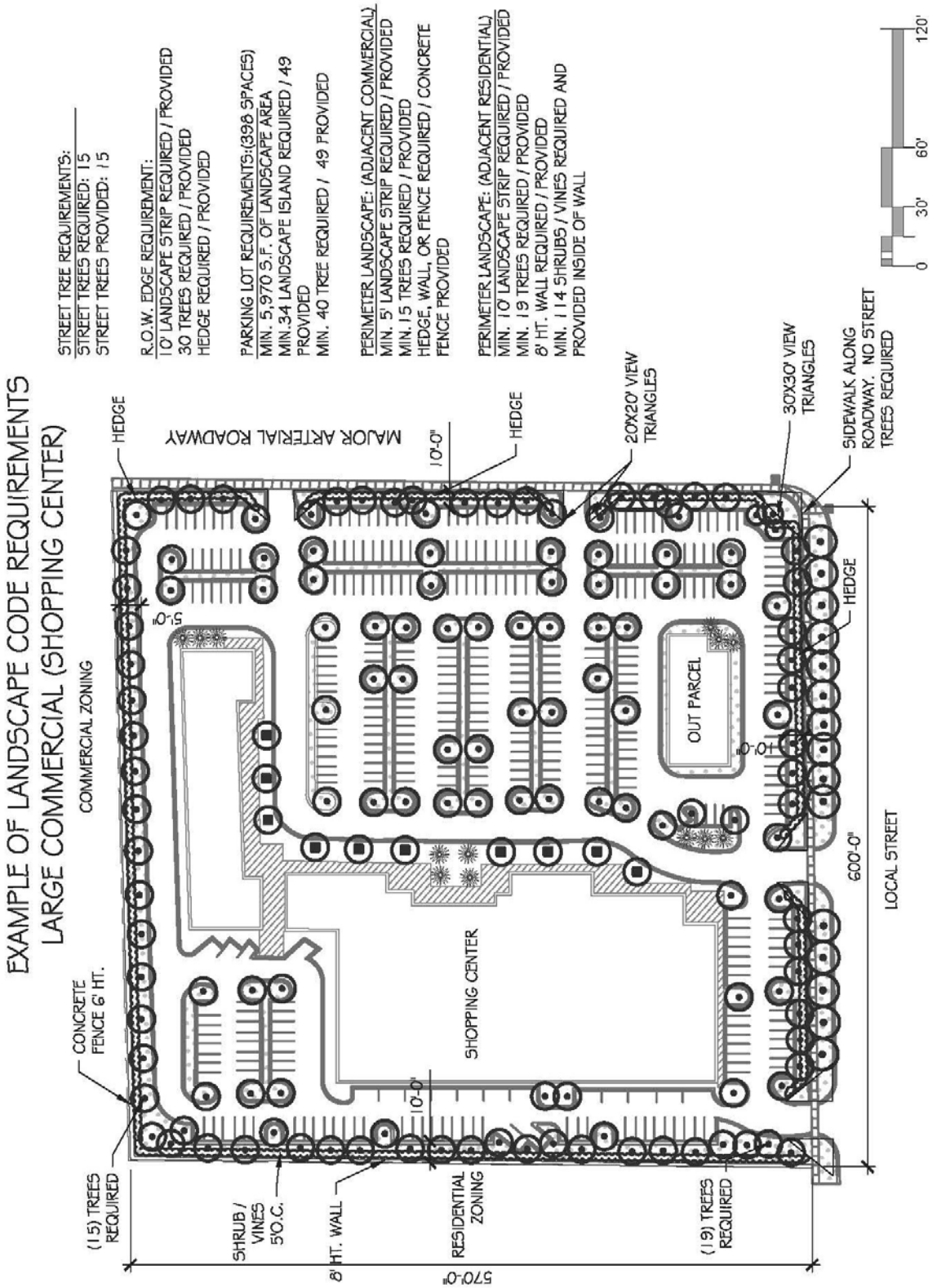
   h. A landscaped area having a minimum width of five (5) feet shall separate the vehicular use area from the walls of a building, with the exception of drive-through windows, automated teller machines, and when there is a raised sidewalk adjacent to the building. The minimum landscaped area required for vehicular use areas located adjacent to a public street shall increase by five feet for each additional story up to a maximum landscaped width of fifteen (15) feet. Five (5) shrubs shall be provided for each one hundred fifty (150) square feet of landscaped area.


EXAMPLE OF LANDSCAPE CODE REQUIREMENTS
SMALL COMMERCIAL (BANKS, DRUG STORES, SERVICE STATIONS, ETC.)
LOCAL STREET
RESIDENTIAL ZONING
HEDGE
8' HT. WALL
HEDGE
COMMERCIAL ZONING
20'X20' VIEW TRIANGLES
30' X 30' VIEW TRIANGLE
10'-0"
5'-0"
PARALLEL PARKING
LANDSCAPE STRIP NOT WIDE ENOUGH FOR STREET TREES
HEDGES
227'-0"
MAJOR ARTERIAL ROADWAY
STREET TREE REQUIREMENTS:
STREET TREES REQUIRED 4
STREET TREES PROVIDED 4
PERIMETER LANDSCAPE: (ADJACENT COMMERCIAL)
5' LANDSCAPE STRIP PROVIDED
4 TREES REQUIRED AND PROVIDED
HEDGE, WALL, OR FENCE REQUIRED / HEDGE PROVIDED
R.O.W. EDGE REQUIREMENT:
10' LANDSCAPE STRIP PROVIDED
10 TREES REQUIRED / PROVIDED
HEDGE REQUIRED / PROVIDED
PARKING LOT REQUIREMENTS:(7 SPACES)
MIN. 105 S.F. OF LANDSCAPE AREA
MIN. 1 LANDSCAPE ISLAND REQUIRED / PROVIDED
MIN. 1 TREE REQUIRED / PROVIDED
PERIMETER LANDSCAPE: (ADJACENT RESIDENTIAL)
10' LANDSCAPE STRIP PROVIDED
8 TREES REQUIRED / PROVIDED
8' HT. WALL REQUIRED / PROVIDED
46 SHRUBS / VINES REQUIRED / HEDGE PROVIDED INSIDE OF WALL
0
20'
40'
80'


EXAMPLE OF LANDSCAPE CODE REQUIREMENTS
SMALL MULTI-FAMILY (TOWNHOUSES)
SMALL MULTI-FAMILY (TOWNHOUSES)
WOOD FENCE
WOOD FENCE
HEDGE
WOOD FENCE
HEDGE
HEDGE
HEDGE
20'X20' VIEW TRIANGLE (TYPICAL)
30'X30' VIEW TRIANGLE (TYPICAL)
AVERAGE 40' O.C.
255'-0"
115'-0"
25'-0"
10'-0"
5'-0"
30'-0"
30'-0"
10'-0"
10'-0"
0
20'
40'
80'
SMALL MULTI-FAMILY (TOWNHOUSES)
STREET TREES REQUIRED: 9
STREET TREES PROVIDED: 9
R.O.W. EDGE: 10' LANDSCAPE STRIP PROVIDED
TREES REQUIRED: 8
TREES PROVIDED: 9
HEDGE REQUIRED AND PROVIDED
OTHER PERIMETER REQUIREMENTS:
HEDGE OR DURABLE LANDSCAPE BARRIER
REQUIRED / WOOD FENCE PROVIDED
PERIMETER LANDSCAPE:5' LANDSCAPE STRIP ADJACENT PARKING
(1) TREE REQUIRED AND PROVIDED
HEDGE REQUIRED AND PROVIDED


EXAMPLE OF LANDSCAPE CODE REQUIREMENTS
APARTMENT / LARGE MULTI-FAMILY
400'-0"
MIN. 5'-0"
WALL
HEDGE
200'-0"
100'-0"
POOL AREA
20'x20' VIEW TRIANGLE
500'-0"
MIN. 5'-0"
WALL
HEDGE
0
30'
60'
120'
APARTMENT/LARGE MULTI-FAMILY
STREET TREES REQUIRED: 12
STREET TREES PROVIDED: 12
PARKING LOT REQUIREMENTS (250 SPACES)
MIN. 3,750 S.F. OF LANDSCAPE AREA
MIN. 21 LANDSCAPE ISLANDS REQUIRED AND 26 PROVIDED
MIN. 25 TREES REQUIRED AND 26 PROVIDED
R.O.W. EDGE: 10' LANDSCAPE STRIP PROVIDED
12 TREES REQUIRED AND PROVIDED
HEDGE REQUIRED AND PROVIDED
PERIMETER LANDSCAPE: MIN. 5' LANDSCAPE PROVIDED
30 TREES REQUIRED / PROVIDED
HEDGE OR WALL / FENCE REQUIRED, WALL PROVIDED
240 SHRUBS / VINES REQUIRED AND PROVIDED (INSIDE OF WALL).


EXAMPLE OF LANDSCAPE CODE REQUIREMENTS
INDUSTRIAL
STREET TREE REQUIREMENTS:
STREET TREES REQUIRED: 9
STREET TREES PROVIDED: 9
R.O.W. EDGE REQUIREMENT:
10' LANDSCAPE STRIP REQUIRED
10' STRIP PROVIDED ALONG LOCAL STREET
20' STRIP PROVIDED ALONG MAJOR ROAD
19 TREES REQUIRED / PROVIDED
HEDGE REQUIRED / PROVIDED ALONG LOCAL STREET
HEDGE OR 3' HT. BERM REQUIRED / PROVIDED
ALONG MAJOR ROAD
PERIMETER LANDSCAPE:
(ADJACENT INDUSTRIAL / COMMERCIAL)
MIN. 5' LANDSCAPE STRIP REQUIRED / PROVIDED
MIN.9 TREES REQUIRED / PROVIDED
HEDGE, WALL, OR FENCE REQUIRED / CONCRETE
FENCE PROVIDED
PERIMETER LANDSCAPE: (ADJACENT RESIDENTIAL)
MIN.10' LANDSCAPE STRIP REQUIRED / PROVIDED
MIN.14 TREES REQUIRED / PROVIDED
8' HT. WALL REQUIRED / PROVIDED
MIN. 80 SHRUBS / VINES REQUIRED / HEDGE
PROVIDED (INSIDE OF WALL)
PARKING LOT REQUIREMENTS:(104 SPACES)
MIN. 1,560 S.F. OF LANDSCAPE AREA
MIN.9 LANDSCAPE ISLAND REQUIRED / 22
PROVIDED
MIN. 11 TREE REQUIRED / 22 PROVIDED
0
30'
60'
120'
HEDGE
10'-0"
20'X20' VIEW TRIANGLE
LOCAL STREETS
30'X30' VIEW TRIANGLE
10'-0"
RESIDENTIAL ZONING
(14) TREES REQUIRED
INDUSTRIAL / WAREHOUSE
SIDEWALK ADJACENT ROADWAY - NO STREET TREES
8' HT. WALL
HEDGE
HEDGE OR 3' HT. BERM
20'-0"
400'-0"
MAJOR ARTERIAL ROADWAY
20'X20' VIEW TRIANGLE
CONCRETE FENCE
5'-0"
350'-0"
INDUSTRIAL / COMMERCIAL ZONING
(9) TREES REQUIRED

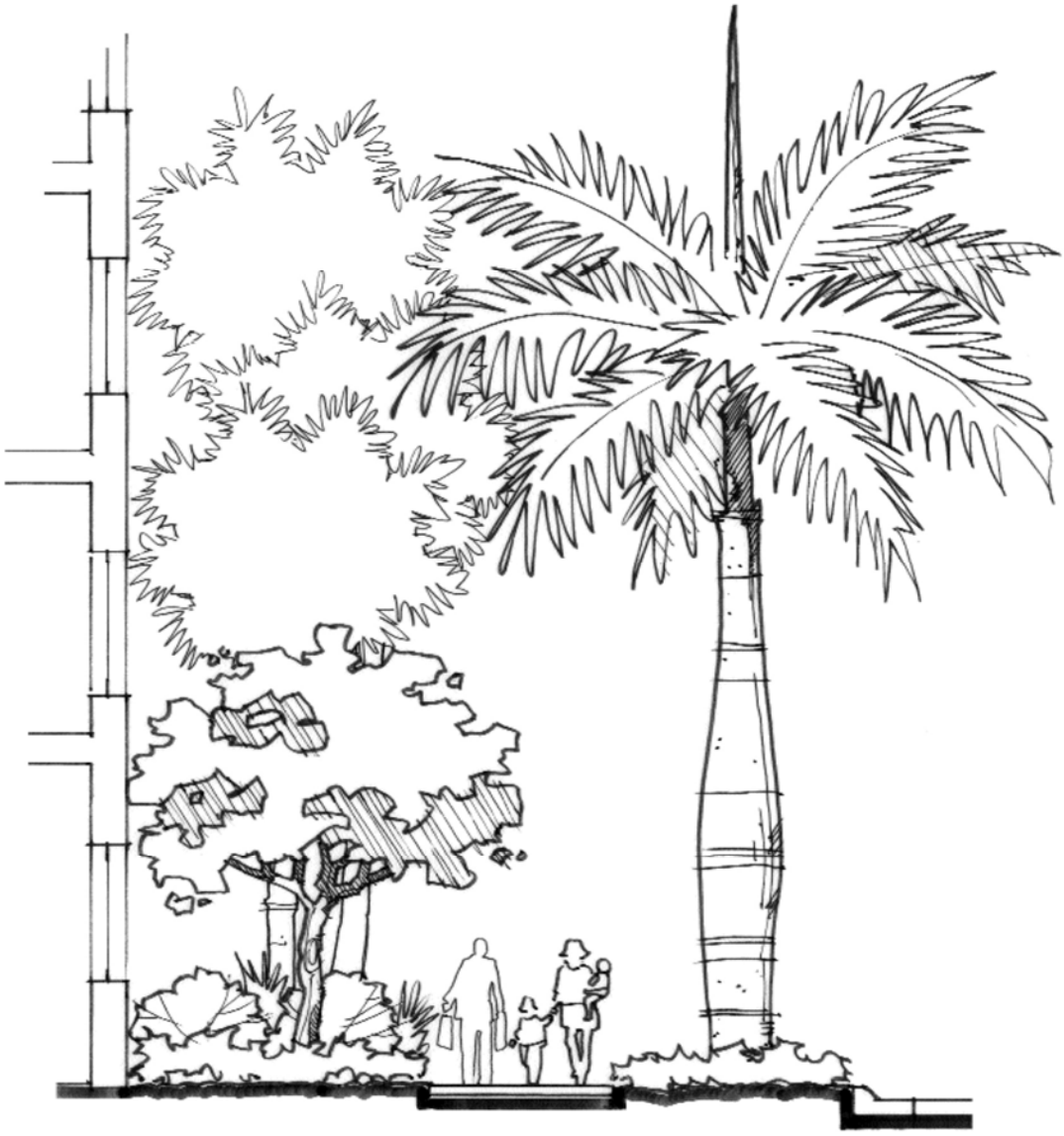

EXAMPLE OF LANDSCAPE CODE REQUIREMENTS
LARGE COMMERCIAL (SHOPPING CENTER)
STREET TREE REQUIREMENTS:
STREET TREES REQUIRED: 15
STREET TREES PROVIDED: 15
R.O.W. EDGE REQUIREMENT:
10' LANDSCAPE STRIP REQUIRED / PROVIDED
30 TREES REQUIRED / PROVIDED
HEDGE REQUIRED / PROVIDED
PARKING LOT REQUIREMENTS:(396 SPACES)
MIN. 5,970 S.F. OF LANDSCAPE AREA
MIN.34 LANDSCAPE ISLAND REQUIRED / 49 PROVIDED
MIN. 40 TREE REQUIRED / 49 PROVIDED
PERIMETER LANDSCAPE: (ADJACENT COMMERCIAL)
MIN. 5' LANDSCAPE STRIP REQUIRED / PROVIDED
MIN. 15 TREES REQUIRED / PROVIDED
HEDGE, WALL, OR FENCE REQUIRED / CONCRETE FENCE PROVIDED
PERIMETER LANDSCAPE: (ADJACENT RESIDENTIAL)
MIN. 10' LANDSCAPE STRIP REQUIRED / PROVIDED
MIN. 19 TREES REQUIRED / PROVIDED
8' HT. WALL REQUIRED / PROVIDED
MIN. 114 SHRUBS / VINES REQUIRED AND PROVIDED INSIDE OF WALL
COMMERCIAL ZONING
CONCRETE FENCE 6' HT.
HEDGE
MAJOR ARTERIAL ROADWAY
10'-0"
HEDGE
20'X20' VIEW TRIANGLES
30'X30' VIEW TRIANGLES
SIDEWALK ALONG ROADWAY. NO STREET TREES REQUIRED
5'-0"
OUT PARCEL
5'-0"
HEDGE
600'-0"
LOCAL STREET
SHOPPING CENTER
10'-0"
(15) TREES REQUIRED
SHRUB / VINES 5'O.C.
8' HT. WALL
RESIDENTIAL ZONING
(19) TREES REQUIRED
570'-0"
0
30'
60'
120'

D. Landscape Planting for the Downtown Mixed Use District

1. Introduction

To establish a strong image for the Oakland Park Downtown, the landscape treatments must be bold, layered and consistent. Plantings should provide a common framework and be governed by both the aesthetic qualities of the varying materials, and the functional concerns of the downtown. Landscape plantings must be of the highest caliber.

Landscape plantings will provide important spatial definitions to the downtown area. They will aid in establishing a strong identity for the downtown while visually unifying its streets, sidewalks, medians, open spaces and yards. Full and healthy landscape plantings will also help mitigate the South Florida climate and create year round habitable outdoor spaces, as well as, screen unsightly views of exposed utility areas, loading zones and parking garages. Proper use of landscape plantings will also aid in directing pedestrian traffic throughout the downtown area.



Landscape plantings will add character to the downtown district

2. General Requirements

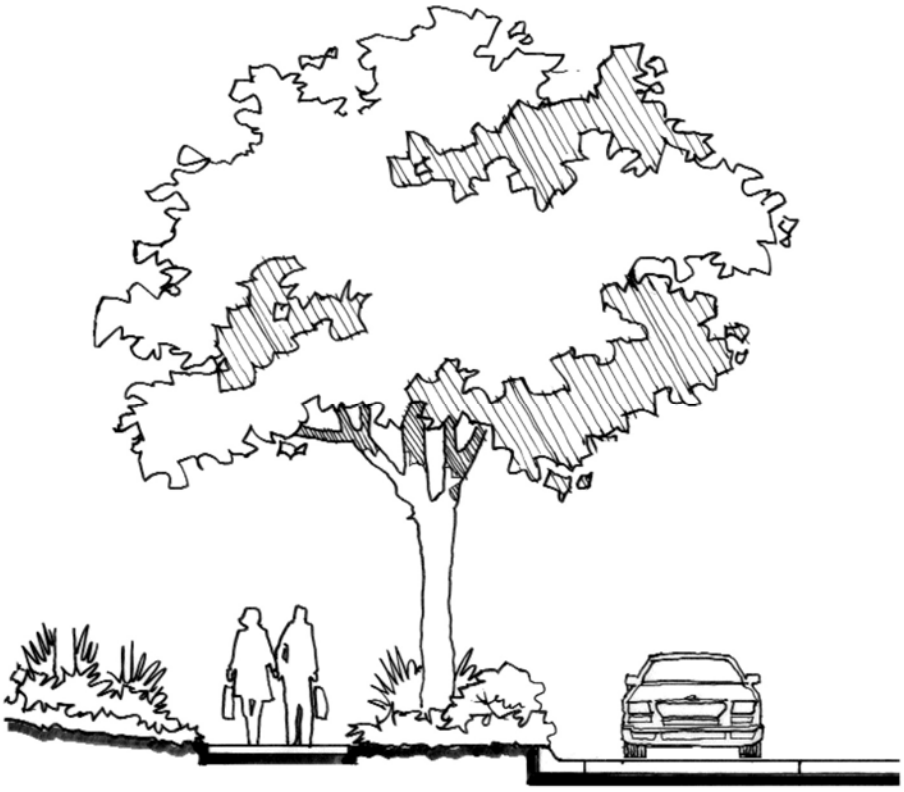
   All plant material must be Florida #1 or better, in accordance with "Grades and Standards of Nursery Plants," published by the Division of Plant Industry, Florida Department of Agriculture. The minimum overall height of a shade tree must be eighteen feet (18') at the time of installation. The minimum height of a palm used as a street tree must be twelve feet (12') of gray wood or clear trunk at the time of installation. Shrubs and groundcover must be full in size and true to form. The minimum height for all required hedge material must be twenty four (24") inches at the time of installation and the plants must be spaced twenty-four (24") inches on center to form a hedge. All groundcovers shall be from 3" to 23" in height at time of planting and spaced a maximum of 18" on center.

3. Streetscape Plantings

   Streetscape plantings will serve two major purposes in the Oakland Park Downtown; first, it will provide much needed shade along sidewalks and streets; and second, it will be an important visual element in creating the overall character in the downtown (See Appendix F). Trees and palms should be planted along major roadways, sidewalks and medians in a consistent distance from one another to create an organized and green urban environment. Trees and/or palms located along streets, adjacent to retail, must be single trunk. Multi-trunk species are not allowed in these areas. Streetscape planting must be Florida #1, in Plant Industry, accordance with "Grades and Standards of Nursery Plants," published by the Division of Florida Department of Agriculture. Below is a partial list of allowable shade trees. Please note, minimum height standards are eighteen (18') overall height with eight (8') to the lowest branch.

Table 3.Shade Trees Downtown Mixed Use District

Common Name	Species Name
Gumbo Limbo	*Bursera simaruba*
South Florida Slash Pine	*Pinus elliottii 'Densa'*
Live Oak	*Quercus virginiana*
Mahogany	*Swietenia mahagoni*
Wild Tamarind	*Lysiloma latisiliquum*



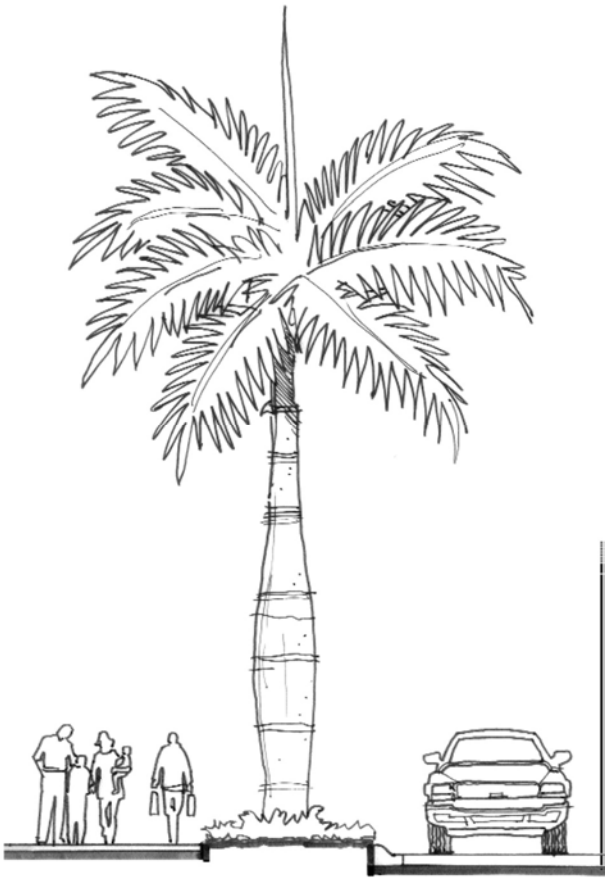
Street trees will unify the area and offer shade to pedestrians

4. Signature Trees

To establish a strong statement in the Park Place sub-area, signature trees are required as the standard street tree. The signature tree will take the place of streetscape plantings along roadways, sidewalks and medians (See Appendix F). The signature tree is required to be a Florida Royal Palm, planted at a minimum height of twelve (12') of gray wood. It is important that these signature trees are matched, therefore consistent in form and stature throughout the Park Place sub-area to make a strong statement and to create identity. It is recommended that these trees be spaced tightly on center along all roadways, sidewalks and medians. Other Palm species, such as Date Palms are allowable within the Park Place sub-area in public gathering spaces, such as plazas, parks and open spaces. Signature trees must be Florida #1, in accordance with "Grades and Standards of Nursery Plants," published by the Division of Plant Industry, Florida Department of Agriculture.

Table 4. Signature Trees Downtown Mixed Use District – Park Place sub-area

Common Name	Species Name
Date Palm, 'Medjool'	*Phoenix dactylifera*
Florida Royal Palm	*Roystonia elata*
Date Palm, 'Sylvester'	*Phoenix sylvestris*



The Florida Royal Palm is the Park Place sub-area signature tree

5. Open Space Plantings

   Open Space Plantings must be lush and layered with a variety of plant material. All reasonable efforts shall be to use native landscape material. When available, it is recommended that all open space plantings include, at a minimum, 35% of native plant materials. The following is a partial list of native plant materials which can be used:

Table 5. Native Palms

Common Name	Species Name
Florida Royal Palm	*Roystonia elata*
Florida Thatch Palm	*Thrinax radiata*
Paurotis Palm	*Acoelorraphe wrightii*
Sabal Palm	*Sabal palmetto*
Silver Palm	*Coccothrinax argentata*

Table 6. Native Trees

Common Name	Species Name
Bald Cypress	*Taxodium distichum*
Buttonwood	*Conocarpus erectus*
Gumbo Limbo	*Bursera simaruba*
Live Oak	*Quercus virginiana*
Mahogany	*Swietenia mahagoni*
Red Maple	*Acer rubrum*
Slash Pine	*Pinus elliottii*
Wild Tamarind	*Lysiloma latisiliqua*

Table 7. Native Shrubs and Ground Cover

Common Name	Species Name
Red Tip Cocoplum	*Chrysobalanus icaco 'Red Tip'*
Coontie	*Zamia pumila*
Dwarf Firebush	*Hamelia patens*
Lantana/Buttonsage	*Lantana involucrate*

Plant diversity is strongly recommended in open space planting areas. A palette of plant material will create interest and offer a strong aesthetic quality to the area.

6 Screening Plantings

Dense plantings along parking structures, the Florida East Coast (FEC) Railroad and busy streets can soften edges and buffer noise from habitable areas (i.e. residential neighborhoods, open spaces, schools, etc.). Proper placement of under story plantings, coupled with climbing vines, medium shrubs, palms and trees are strongly desired to minimize unsightly views (See Appendix F). Any proposed screening plantings adjacent to the Florida East Coast (FEC) corridor's right-of-way needs to be coordinated with Florida East Coast (FEC) Railway. Planting along the Florida East Coast (FEC) corridor should continue the design character of the existing plantings located between Oakland Park Boulevard and N.E. 38thStreet along the Florida East Coast (FEC) tracks. The following is a list of plant materials considered acceptable for screening purposes:

Table 8. Screening Plants - Understory Shrub and Ground Cover

Common Name	Species Name
African Bush Daisy	*Gamolepis chrysanthemoides*
Boston Fern	*Nephrolepis exaltata*
Wart Fern	*Microsorum scolopendria*

Table 9. Screening Plants - Climbing Vines

Common Name	Species Name
Bougainvillea	*Bougainvillea sp.*
Confederate Jasmine	*Trachelosperma jasminiodes*
Allamanda	*Allamanda cathartica*
Mexican Flame Vine	*Pseudogynoxys chenopodioides*

Table 10. Screening Plants - Palms

Common Name	Species Name
+Coconut Palm	*Cocos nucifera*
Paurotis Palm	*Acoelorraphe wrightii*
Sabal Palm	*Sabal palmetto*

Table 11. Screening Plants - Trees

Common Name	Species Name
*Wax Privet	*Ligustrum japonicum*

Table 12. Screening Plants - Ornamental Tree

Common Name	Species Name
**Crepe Myrtle	*Lagerstroemia indica*
Bridalveil	*Caesalpinia granadillo*
Bottlebrush	*Callistemon* sp.
Pink Tabebuia	*Tabebuia heterophylla*
Plumeria	*Plumeria acuminate*

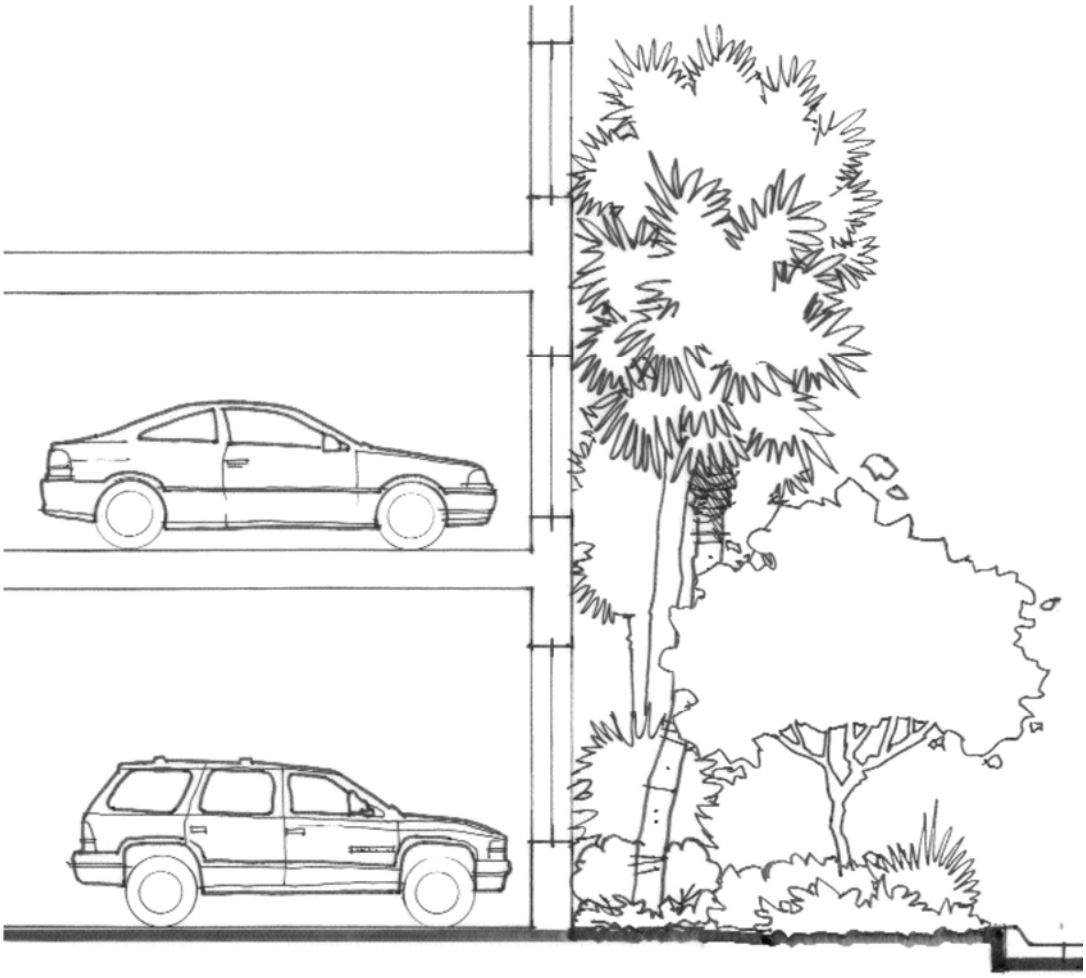
Table 13. Screening Materials - Tall/ Medium Shrubs

Common Name	Species Name
Red Tip Cocoplum	*Chrysobalanus icaco 'Red Tip'*
Dwarf Fakahatchee Grass	*Tripsacum dactyloides*
Indian Hawthorn	*Raphiolepis indica*
Philodendron	*Philodendron selloum*
Plumbago	*Plumbago auriculata*
Ixora 'Nora Grant'	*Ixora coccinea*
Dwarf Ixora	*Ixora chinensis*
Wax Jasmine	*Jasminum volubile*

+Must be certified 'Malayan' or 'Maypan' variety only

*Should not be planted in Medians or swales less than 8' in width

**Loses its leaves in winter months, do not use more than 10% of the total trees on a project



Varying landscape material screens a structured parking garage in the downtown

7. Perimeter Landscaping between Incompatible Uses
   Perimeter landscaping, composed of a landscaped strip and masonry wall, should be used to separate incompatible land uses from one another (i.e. residential and commercial, etc.) and/or screen unsightly areas and utility zones. Perimeter buffers shall be provided by the development that caused the incompatibility and installed along all lot lines, excluding front lot lines. The masonry wall shall be completely located within the development's property. In addition to the standards provided for in subsection C above, perimeter buffers shall be provided as listed below

   a. Between single family residential and multifamily residential use. Landscaping strip at a minimum of ten (10) feet in width is required, and a solid masonry wall at a minimum of six (6) feet in height is required if the adjacent multifamily exceeds more than two (2) stories.

   b. Between the FEC railroad and residential, commercial, and industrial uses: Landscaping strip at a minimum of ten (10) feet in width and a solid masonry wall at a minimum of eight (8) feet in height and a maximum of twenty (20) feet in height.

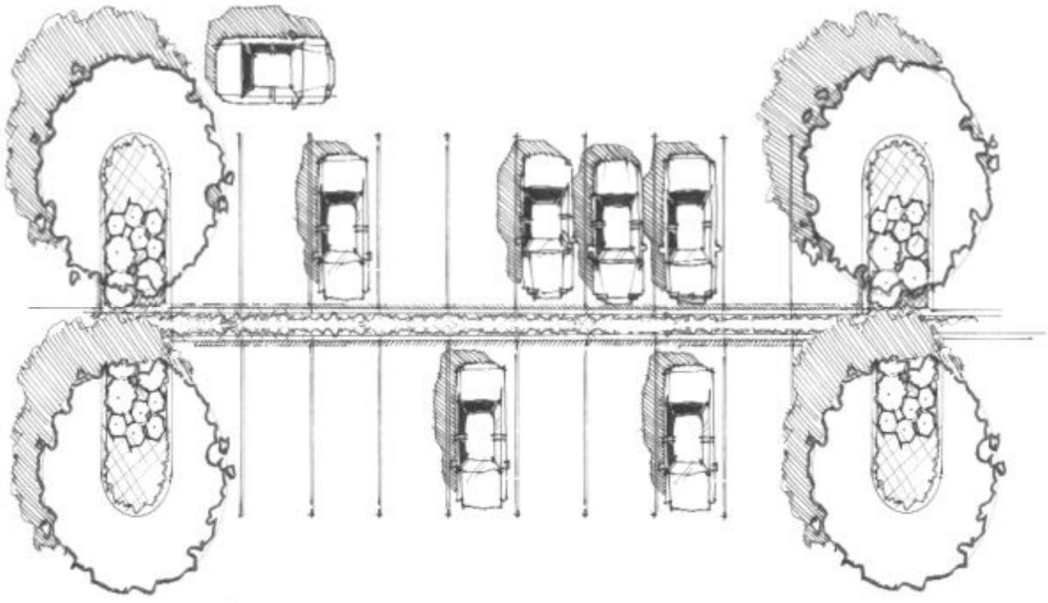
c. Between parks and open space uses and residential, commercial, and industrial uses. Not required. However, if installed a masonry wall at a maximum of four (4) feet in height and a landscaping strip at a minimum of the (10) feet in width on both sides of the wall.

8. Irrigation

All planted areas will require irrigation systems providing 100% coverage with “head to head” or 50% overlap throughout the Downtown. Irrigation systems should be capable of distributing 1 ½" of water per week during a maximum eight (8) hour watering cycle. All irrigation systems must be entirely automatic, with the ability to switch to manual operation in emergency situations. In high pedestrian areas, bubblers or drip irrigation is encouraged. Due to the intense pedestrian activity within the downtown zone, irrigation systems should be designed to avoid over spray into public and pedestrian areas. All irrigation systems should be equipped with automatic rain sensors for water conservation. Planting areas with native plant materials and xeriscape planting practices are encouraged.

9. Parking Lot Landscaping

Landscaping is required both within the interior area of a surface parking lot, as well as, along the perimeter of a surface parking lot to soften and screen the parking facility. A shade tree (see shade tree list) at a minimum height of twelve (12) feet must be planted in a planting bed island nine (9) feet in width, between every ten (10) parking spaces in a surface parking lot. Parking lot plantings are not required within a structured parking facility. One (1) tree and eight (8) shrubs must be planted in every planting bed.



A planted island is required between every ten parking spaces.

10. Residential Landscaping

Landscaping within the Neighborhoods zoning sub-area is intended to improve the appearance of certain yard areas. In the Neighborhoods, where properties are solely used for residential purposes, it is required that all lots under 6,000 square feet have a minimum of three (3) trees (overall heights over twelve [12'] feet). In lots between 6,000 to 7,499 square feet, properties are required to have a minimum of four (4) trees (overall heights over 12') feet. In lots between 7,500 and 9,999 square feet, properties are required to have a minimum of five (5) trees (overall heights over 12') feet. Lastly, in lots exceeding 10,000 square feet in area, properties are required to have a minimum of six (6) trees (overall heights over 12') feet; or two (2) trees per unit, whichever is greater.

In the North End Urban Residential area where single family or town homes are platted and introduced, landscape requirements shall be consistent with those described above. Where multifamily units are introduced in a condominium, or loft style, residential landscaping shall apply to off-street parking facilities, open space, entrance yards and buffer areas (see Perimeter Landscape). For every dwelling unit within a building structure, two trees and three shrubs must be introduced in the areas specified herein.

Section 2. Tree Preservation

A. Broward County Tree Preservation and Abuse Ordinance

1. Adoption by reference. Chapter 27, Article XIV, Sections 401 through 430 of the Broward County Code of Ordinances entitled "Broward County Tree Preservation and Abuse Ordinance" as it may be amended from time to time, is hereby adopted and made part of this article by reference. Provisions of the Broward County Tree Preservation Ordinance shall be administered by the City of Oakland Park Community Development Department.

2. Definitions.
   For the purposes of administration of the Broward County Tree Preservation Ordinance terms contained therein are redefined as follows:
   a. Broward County Board of County Commissioners (board) shall mean City Commission, City of Oakland Park.

   b. Department of natural resource protection (DNRP) shall mean City of Oakland Park Community Development Department.

   c. Tree removal license (license) shall mean tree removal permit.

3. Exemptions. Section 27-408(a)(3)(c) of the Broward County Tree Preservation and Abuse Ordinance is amended to read:
   A permit is required for the removal of any tree on owner occupied residential properties of one (1) acre or less developed for detached single-family usage except the following:
   a. Trees required as a condition of the issuance of development permit; or

   b. Trees having a diameter of breast height four and one-half (4½) feet (D.B.H.) of eight (8) inches or greater; or

   c. Previously preserved, relocated or replaced trees that were preserved, relocated or replaced as a condition of granting a tree removal permit; or

   d. Historical or special status category trees.

B. Permit Required

No person shall cut down, remove, relocate or destructively damage any tree as defined in section 27-404 of the Broward County Code of Ordinances without first obtaining a permit from the community development department.

C. Permit Fee

Tree removal and relocation permit applications shall be made on forms specified by the Community Development Director or his designee with accompanying fees as may from time to time be specified by the city commission in the land development fee schedule.

D. Site Plan Review and Native Vegetation

Site plans as required for all new development except single-family residential, shall show existing major vegetation including exotic species and the proposed landscaping plan. Such plan shall be adequate to calculate the size, number, species and canopy of all existing trees and shall identify those trees which are proposed to be retained, relocated or removed and replaced.

E. Exotic Species Removal

The following exotic species shall be removed from all sites undergoing development, shall not require a tree removal permit and shall not require replacement:

1. *Schinus terebinthinfolius* (Brazilian Pepper Tree/Florida Holly);
2. *Metopium toxiferum* (Poison Wood);
3. *Casurina equisetifolia* (Australian Pine);
4. *Melaleuca quinquenervia* (Melaleuca);
5. *Araucaria heterophylla* (Norfolk Island Pine);
6. *Schefflera actinophylla* (Schefflera);
7. *Acacia auriculaeformis* (Earleaf Acacia);
8. *Cupaniopsis anacardioides* (Carrotwood);
9. *Albizia lebbeck* (Women's Tongue Tree);
10. Any species that may be determined as an exotic by the state.

F. Tree Replacement

When allowed by a tree removal permit, any trees which are removed and not relocated shall be replaced in accordance with the requirements of this section. Except otherwise required trees removed from developed single-family and duplex properties which shall be replaced by a Florida grade #1 or better shade type tree of not less than ten (10) feet in height. As a condition of being granted permission to remove any tree, a developer, property owner or other applicant shall be required to replace such tree, unless it is demonstrated that replacement is not a viable alternative due to a lack of available space. Where replacement cannot be accomplished, the applicant shall pay a replacement fee in lieu of actual tree replacement costs into the City of Oakland Park Tree Preservation and Replacement Trust Fund. The current value of replacement trees including installation costs shall be used to calculate replacement fees. The community development department shall determine tree replacement fees based on surveys of area nurseries and landscaping contractors from time to time. Replacement fees paid in lieu of actual tree replacement costs for Natural Forest Communities shall be used exclusively for the creation or restoration of

Natural Forest Communities in areas designated by the city commission after recommendation by the beautification advisory board. This section shall not apply to specimen trees.

G. Canopy Replacement Values

Trees required pursuant to article VIII, section 24-105, shall provide the following canopy replacement values for the purposes of tree replacement calculations:

Table 14. Canopy Replacement Values

Height and Spread (in feet)	Canopy Value (in square feet)
16 × 8	525
14 × 7	400
12 × 6	300
10 × 6	225

H. Tree Preservation and Replacement Trust Fund

1. Establishment.
   There is hereby created the Oakland Park Tree Preservation and Replacement Trust Fund (the "Fund") for the purpose of accepting and disbursing fees paid to the city as part of tree removal permits and any other monies deposited into a non-lapsing trust fund established and maintained by the city for tree preservation or replacement purposes. The fund shall solely be used for purchase and payment of cost and expenses associated with the planting of trees in Oakland Park and any other ancillary costs associated with the planting of trees.

2. Term of existence.
   The fund shall be self-perpetuating from year to year unless specifically terminated by the city commission.

3. Fund assets.
   All funds received by the city pursuant to subsection 24-122(C) for tree removal permits, subsection 24-122(F) for tree replacement fees and subsection 24-105(C)(4)(b) shall be deposited in the fund. Any funds reserved by the city as of the effective date of this section for the purposes enumerated in this section shall be deposited into the fund forthwith. Any other funds donated or granted to the city by public or private concerns for the purposes enumerated in this section may be deposited in the fund.

4. Allowable Expenditures
   a. The city manager shall have the express authority to authorize expenditures of these funds from time to time in an amount not to exceed five thousand dollars ($5,000.00).
   b. Expenditures of more than five thousand dollars ($5,000.00) shall be recommended by the city manager and require city commission approval.
   c. Trust funds will be used to obtain trees, landscaping, sprinkler systems, and any other items or materials necessary and proper for the installation, preservation, maintenance and relocation of trees or the restoration of tree ecosystems on any public land in Oakland Park. Funds may also be used for the expense of periodically distributing saplings to the public.

I. Tree Abuse

Section 27-410 of the Broward County Tree Preservation and Abuse Ordinance as it may be amended from time to time, is hereby adopted in its entirety and made part of this article by reference, the provisions of which shall be enforced by the community development department.

J. Violations

A violation of this section shall be subject to a fine of five hundred dollars ($500.00) per tree removed, abused or damaged.

Section 3: Fences, Walls and Hedges

A. General Requirements

1. Height Measurement
   Height shall be measured from the average finished grade of the property.

2. Sight Visibility Triangles
   a. Corner lots: A thirty-foot clear sight triangle is required at the intersection of two (2) streets.

   b. Driveways: A twenty-foot clear sight triangle is required on each side of any driveway. Lots that contain single-family and duplex dwellings are permitted to have this clear sight triangle maintained along the edge of the existing paved street.

   c. Hedges: No hedge shall exceed thirty-six (36) inches in height in any sight visibility triangle.

3. Finished Side of Fences
   All fences shall have the finished side facing the outside of the property.
   a. Exceptions: Interior fences facing abutting properties where an existing fence or wall prevents the erection of the fence with the finished side facing out may have the finished side facing in.

4. Wall Finishes
   All concrete walls shall be covered with two (2) coats of stucco cement, finished and painted with anti-graffiti paint along the right of way. Decorative pre-cast concrete walls may be used in lieu of concrete block.
   a. Arterial or collector streets: Any wall erected along an arterial or collector street shall have a decorative finish, shall be designed in sections that off-set a minimum of two (2) feet every twenty (20) feet of wall length, and shall have landscaping as required by Section 1 of this document.

5. Prohibitions:
   a. Louvered concrete walls.

   b. Barbed wire, razor wire, or electrified wires are prohibited on any property zoned or used for residential purposes.

   c. Bird spike topped fences or walls are prohibited on any property zoned or used for residential purposes.

   d. In no instance shall any gate be permitted to open onto the existing road right-of-way.

6. Removal of existing buffer:
   When an existing required wall or natural buffer is removed, it shall be replaced by a new wall or hedge respectively in conformance with this section.

B. Residential Properties

Any property used for residential purposes is subject to the regulations of this subsection. The maximum height limit applies to fences, and walls, that are within required yards.

1. Front yard maximum height: Five (5) feet.

2. Side and rear yard maximum height: Six and one-half (6½) feet.

3. Corner properties: Properties having the front of their residences facing the corner side yard may elect to install a fence of six and one-half (6½) feet in height within the required front yard provided that the corner side yard fencing shall be limited to five (5) feet in height.

4. Abutting nonresidential: Where a R-1 or R-2 residential district abuts a nonresidential district or multi-family residential district, or the rear of a residential lot is separated by a street, alley or waterway from a nonresidential district or multi-family residential district, the maximum height along any side and rear lot line may be eight (8) feet.

5. Maximum height exceptions:
   a. Hedges shall be permitted to be eight (8) feet in height.

C. Nonresidential Properties

1. Maximum height: Eight (8) feet.

2. Abutting residential: Where a nonresidential district abuts a residential district or the rear of a nonresidential lot is separated by a street, alley or waterway from a residential district, the owner of the nonresidential lot shall be required to erect a solid, unpierced masonry wall at least eight (8) feet in height.
   a. Landscaping: Such wall shall also be landscaped as required in Section 1 of this document.

   b. Front or corner site areas: In any front or corner site areas the wall shall be setback ten (10) feet from the property line along any right-of-way where vehicular access is not permitted.

c. Location of landscape strip:
   i. The ten (10) foot landscape strip required in Section 1 shall be located between the wall and the property line/right of way line when abutting a non-alleyway public right of way.
   ii. The required landscape strip shall be located internal to the perimeter wall when abutting all other property lines other than a front public right of way and the wall shall be located on the property line adhering to required sight triangles and visibility clearance criteria.

d. Exceptions: An application may be made to the City Commission for the approval of an alternate screening method without applying for a variance.

3. Storage yards:
   All permitted storage yards shall be completely enclosed, except for necessary ingress and egress, by a six and one-half (6½) foot unpierced masonry wall. Any ingress and egress shall be completely enclosed with vision-obscuring gates.

Section 4: Public Roadway Landscape and Streetscape Standards

The following Section addresses consistency, uniformity and the aesthetic qualities of elements such as street trees, medians, round-a-bouts, specialty paving at crosswalks, intersection treatments, and traffic calming devices, as well as sidewalks, bikeways and benches in order to enhance the branding and identification of the City.

A. Public Roadways Types

The following identifies the hierarchical system of streets and roadways which occur within the City. Various design elements and features within the public right-of-way apply to each.

1. Major Arterial Roadways (F.D.O.T. / Broward County)
   The highest level of roadway types in the City are the major arterial roadways, these are usually classified as F.D.O.T. (state highway) or Broward County roadways. These include, but are not limited to, Oakland Park Boulevard, North Dixie Highway, Commercial Boulevard, Powerline Road, Prospect Road, North Andrews Avenue, NW 21st Avenue and NW 31st Avenue. While the landscape designs for these roadways must adhere to strict FDOT and/or Broward County design guidelines and standards which promote safety on our major roadways, the City does have an input on the overall design and look of the landscaping and the type of plant materials that will be used. In general, the City prefers to have a more natural look for the landscape designs on these roadways with a mix of native and tropical trees and palms, and shrubs and groundcovers that are native, drought tolerant and low maintenance, whenever possible.

2. Collector Roads (City of Oakland Park)
   The next level of roadway types in the City is classified as collector roads. These roadways accept or receive vehicular traffic from smaller streets and neighborhoods and funnel them to the major arterial roadways. Examples of these types of roadways are N.E. 38th Street, N.E. 45th Street, and 16th Avenue, (as well as N.E. 6th Avenue a Broward County ROW). These roads generally are owned and maintained by the City of Oakland Park, and as such, the city has control over the type and design of landscaping that gets installed on them. However, certain design standards and safety guidelines must still apply. Here, the City of Oakland Park exercises its intent to have a more naturally looking landscape design within the right-of-way areas, which are mostly native and drought tolerant species that require low maintenance.

3. Local and Residential Streets (City of Oakland Park)
   The smallest streets in the City roadway system are the local roads and neighborhood streets. These streets are almost entirely owned and maintained by the City. Since these streets are much smaller with narrower right-of-way widths, there is generally not as much room for landscape improvements. However, there is usually an opportunity to plant and maintain street trees along these streets. Along these local streets the City desires to plant more street trees in residential areas and commercial/business districts, where appropriate.

B. Street Trees

One of the most effective ways for a City to increase its tree canopy coverage is by planting more street trees along its roadways. While street trees have many benefits including providing character and much needed shade to sidewalks and neighborhoods, there are many factors that must be considered before selecting and installing a tree in a right of way. There may be both overhead and underground utilities to consider, as well as proper distances and setbacks from roadways and sidewalks, and drainage flows. In some cases, the presence of underground utilities may prohibit the planting of street trees all together. Where overhead or underground utilities, or other infrastructure would preclude the use of a large canopy tree, generally it is recommended that a small or medium tree, or a palm, be planted instead of a large shade tree which typically has a much more extensive root system. A list of some appropriate street trees is included at the end of this section. Following are street tree installation standards.

In order to help brand the City and create an identity for the City, an emphasis should be placed on the planting of the following signature street trees throughout the City: Live Oak, South Florida Slash Pine, Bulnesia/Verawood, Orange Geiger, Sylvester Date Palm, and Montgomery Palm.

Following is a list of approved street trees. For a complete list of all approved trees, including street trees, see Appendix B. Please also note that an engineering permit from the City is required prior to planting any tree or palm in the public right-of-way.

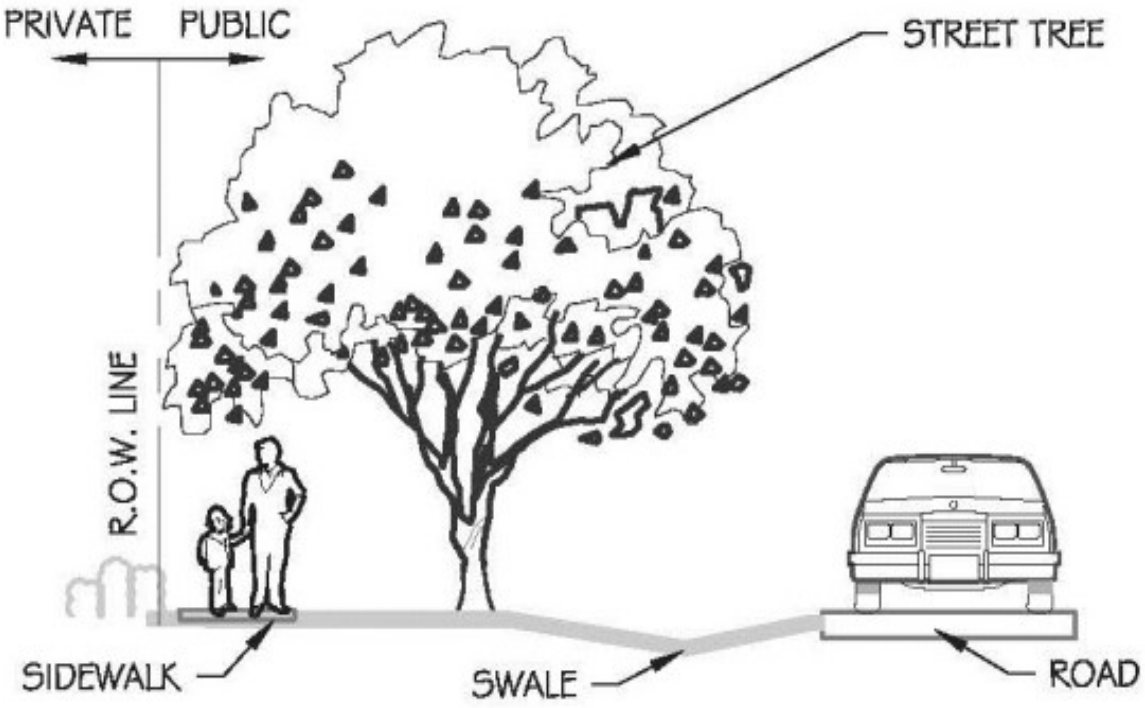
Table 15. Street Trees

Large Shade Trees	Medium Trees	Small Trees	Large Palms	Small Palms
++Live Oak	Green Buttonwood	**++Orange Geiger**	Sabal Palm/Cabbage Palm	Silver Palm
Gumbo Limbo	Pigeon Plum	Dahoon Holly	Royal Palm	Florida Thatch Palm
Mahogany	Satin Leaf	Fiddlewood	Alexander Palm	Bottle Palm
Paradise Tree	**++Bulnesia / Verawood**	Simpson Stopper	Bismarck Palm	
++South Florida Slash Pine	Madagascar Olive	Spanish Stopper	+Coconut Palm	Spindle Palm
Wild Tamarind	Pink Tabebuia	*Silver Buttonwood	**++Sylvester Date Palm**	
Bald Cypress	Red Maple	All Spice	Foxtail Palm	
Indian Tamarind	Pitch Apple	Bottlebrush	**++Montgomery Palm**	
Royal Poinciana	Queen Crape Myrtle	**Crape Myrtle	Date Palm 'Medjool'	
Rusty Fig	Purple Tabebuia	*Japanese Privet	MacArthur Palm	
Copperpod	***Yellow Tabebuia		Canary Island Date Palm	

Bridalveil	Jacaranda			

* Should not be planted in medians or swales less than 8' in width.
** Loses it leaves in winter months, do not use more than 10% of the total trees on project.
*** Not wind resistant, plant in sheltered areas.
\+ Must be certified 'Malayan' or 'Maypan' variety only.
++ Signature street to help brand and create an identity for the City

1. Street Trees and Swales
   On many smaller streets without curbs and sidewalks, the grassy swale areas on either side of the roadway are important for drainage and may help to convey storm water runoff to the City's drainage system. Street trees along these types of streets should be planted to not impede the flow of storm water into the nearest catch basins or other drainage structure.



STREET TREES SHADE SIDEWALKS AND NEIGHBORHOODS

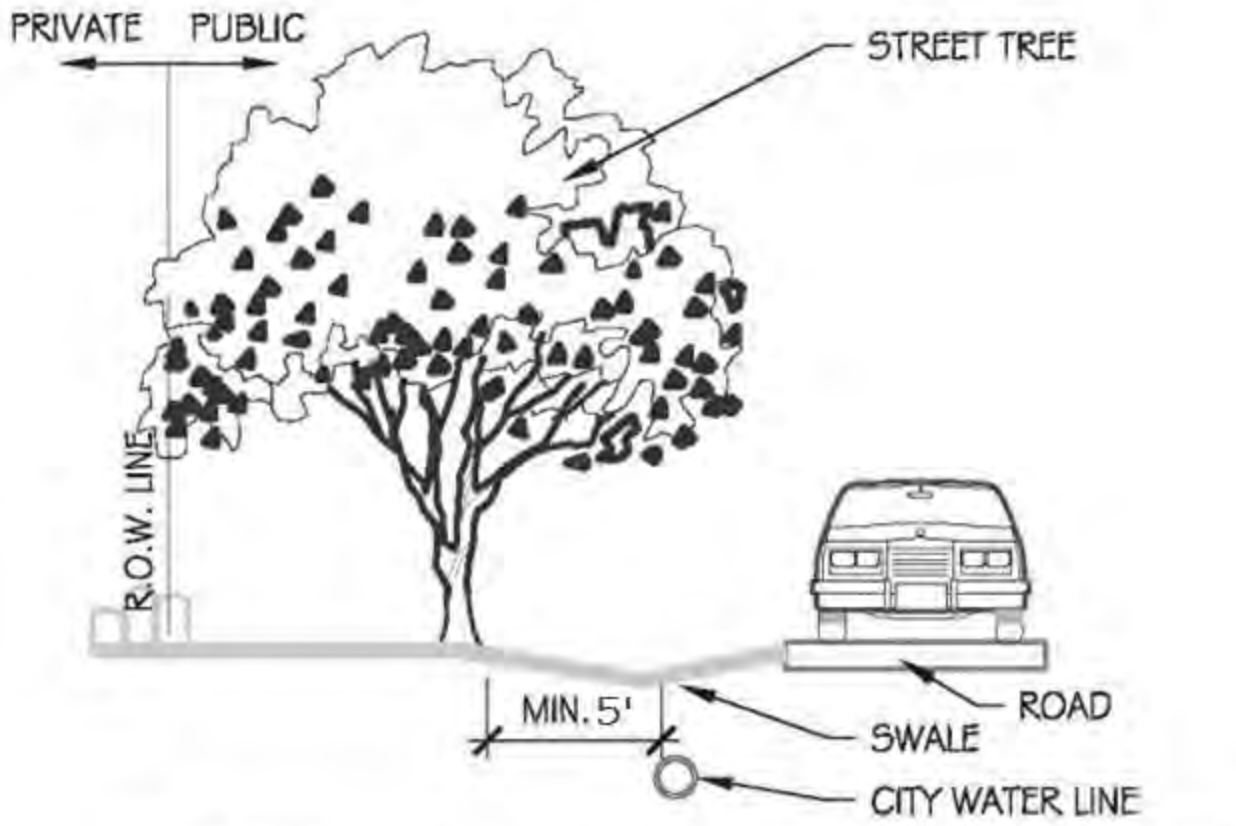
2. Street Trees and Underground Utilities
   Trees and palms should not be planted within five (5) feet of any underground public infrastructure and no closer than five (5) feet from any other buried utility lines.

   a. All trees and palms shall be planted at least five (5) feet away from any underground utility line.

b. All trees and palms shall be planted at least seven and a half (7.5) feet away from any fire hydrant.

c. All trees and palms shall be planted at least five (5) feet away from any storm sewer catch basins.

d. When a five (5) foot setback from any underground public infrastructure is not feasible, root barriers shall be installed in accordance with the manufacturer's instructions when medium or large species of shade trees are planted.



SETBACK FROM UNDERGROUND UTILITIES

3. Street Trees and Overhead Utilities
The distance away from an overhead utility line is the determining factor in what size tree should be planted, or if a tree can be planted.
   a. Only trees that grow to a height of 20' or less may be planted under overhead utility lines.

   b. Trees and palms that grow to 20' to 30' in height at maturity shall be planted at least 20 feet away.

   c. Trees and palms that grow to over 30' in height at maturity shall be planted at least 30 feet away from overhead utility lines.

The following graphic illustrates the planting distances near overhead power lines. The following table provides a list of native and non-native trees that stay approximately at or less than twenty (20) feet at maturity and are recommended for installation adjacent to overhead utilities.

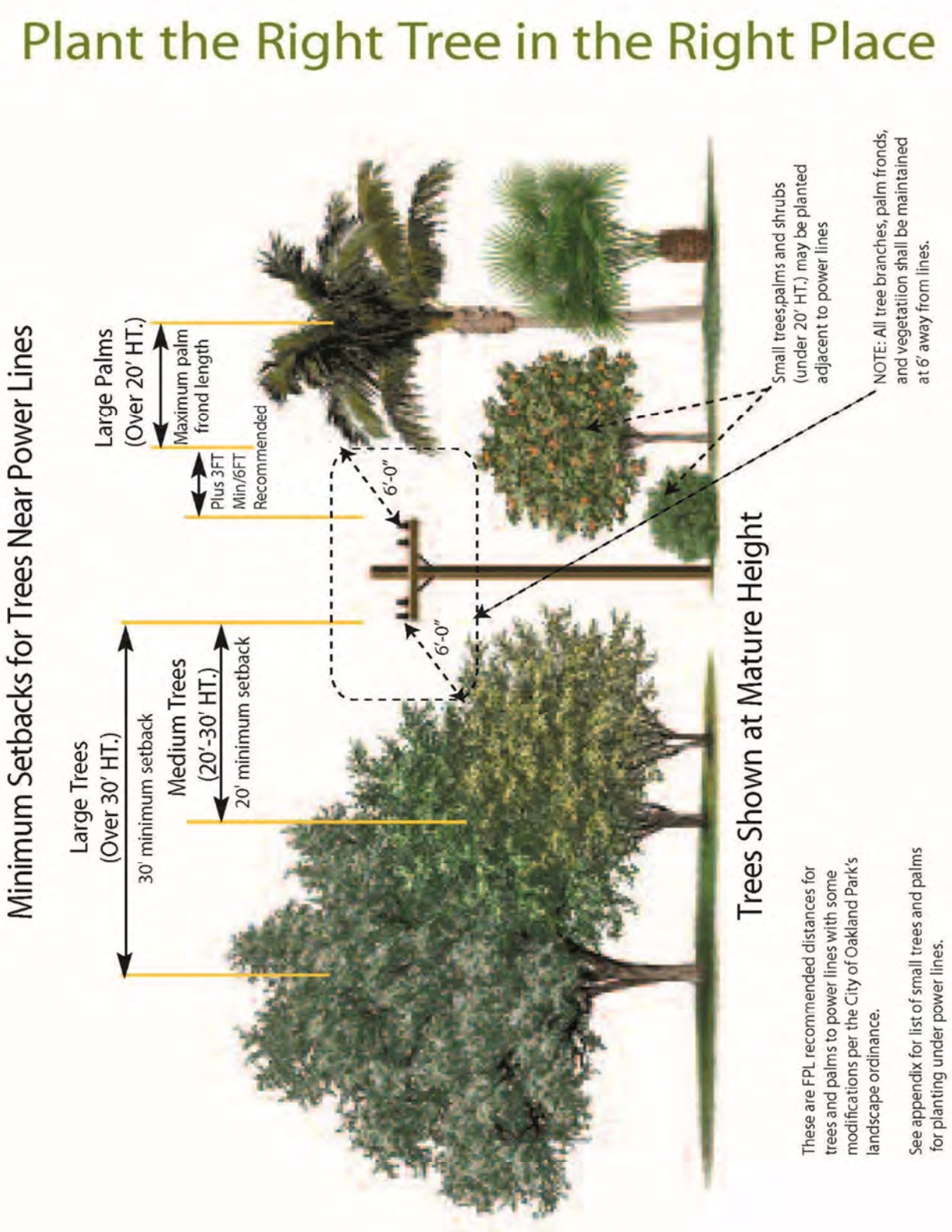
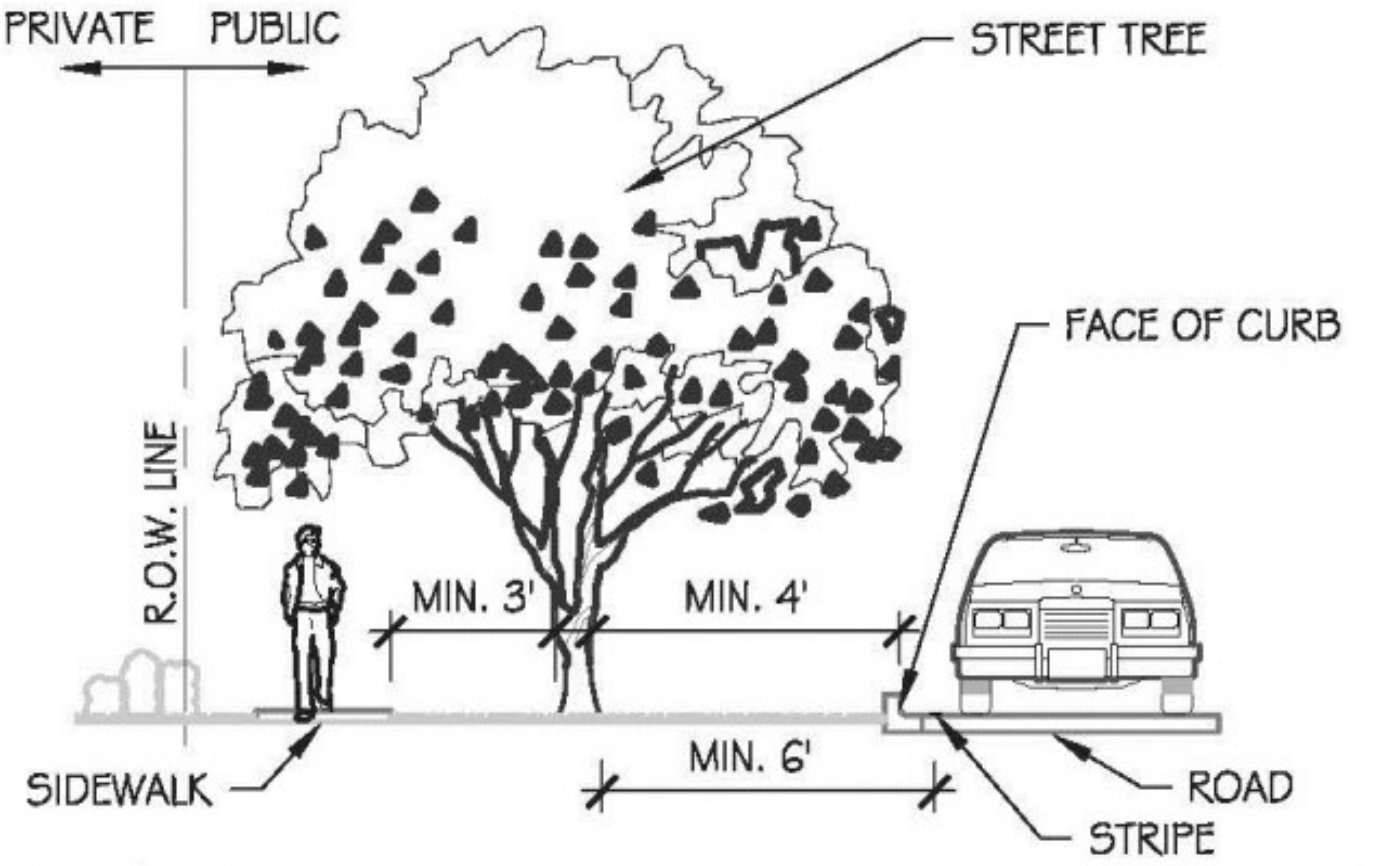


Table16. Trees and Palms Under 20' at Maturity

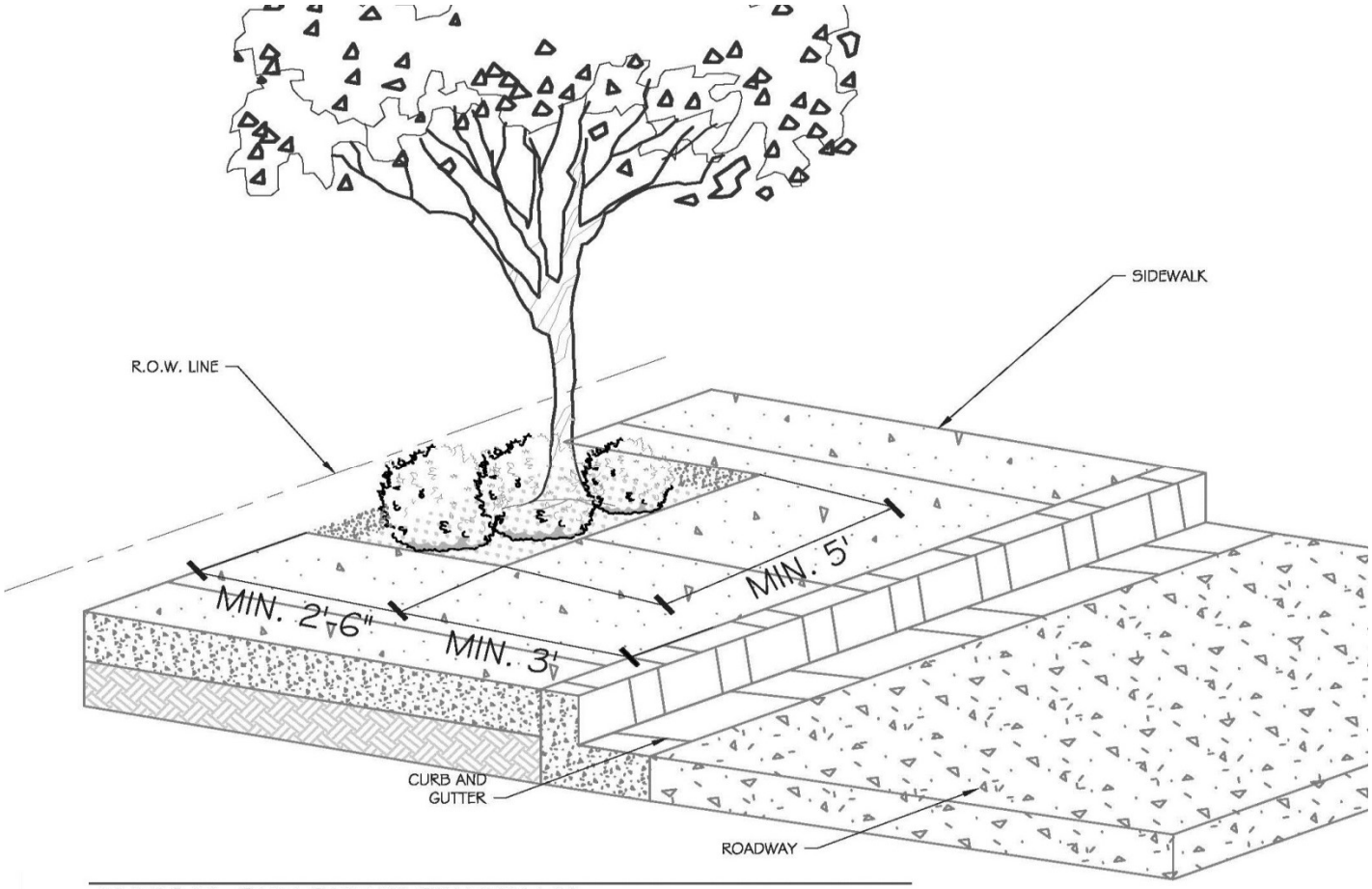
Trees under 20' in height at maturity	
Native	**Non- Native**
Orange Geiger	Weeping Bottlebrush
Fiddlewood	Crape Myrtle
Jamaica Caper	Dwarf Poinciana
Lignum Vitae	Japanese Privet
Spanish Stopper	
Simpson Stopper	
White Stopper	
Red Stopper	
Silver Buttonwood	
Palms under 20' in height at maturity	
Native	**Non- Native**
Florida Thatch Palm	Bottle Palm
Silver Palm	Spindle Palm
	Pindo Palm
	Pygmy Date Palm

4. Street Tree Offsets from Roadways and Sidewalks
   Trees and palms planted on major arterial roadways must follow the standards set forth by F.D.O.T. or Broward County. Generally where there is a 6" high raised curb located between the roadway and the tree, the tree shall be planted a minimum four (4) feet from the face of the curb, or a minimum of six (6) feet from the edge of the closest travel lane (I.E. the centerline of the stripe on the edge of pavement). Where there is no curbing present and there is just a grassy swale area, the setback from the edge of the closest travel lane is generally a minimum of six (6) feet to the nearest tree, but this is subject to the specific configuration of the swale and utility placement and will be reviewed by the City Engineering Department. The governing agency of each roadway must be consulted for the exact setback distance that shall be required.



SETBACKS FROM ROADWAY AND SIDEWALK

5. Cut-outs in Sidewalks and Tree Grates
   Sometimes there is no swale area or room to plant street trees along major arterial roadways or within business districts. In these areas, one option is to provide an open cut-out in the sidewalk to allow for the planting of street trees. The minimum size of the cut-out area shall be 5'X5' square, but 6'X6' is recommended. The minimum width of the remaining walkable sidewalk area shall be 3', however 4' is recommended. Sometimes, only half of a square cut-out area is needed. This may occur where there is still some plantable area in the right-of-way behind the sidewalk. In this case, the sidewalk can be notched to allow room for the tree or palm to be planted. If the cut-out area is large enough, the area may be planted with low shrubs or ground covers in addition to the tree. However, if the cut-out is closer to the minimum size and is completely surrounded by sidewalk on all sides, consideration shall be given to installing a tree grate. If used, tree grates shall be metal and have an appropriate size opening for the tree and palm size, and porous and portable for maintenance purposes. Tree grates must meet all applicable A.D.A. Accessibility Standards. The type and style of the tree grates, as well as tree selection, must be approved by the City of Oakland Park engineering Department prior to installation.



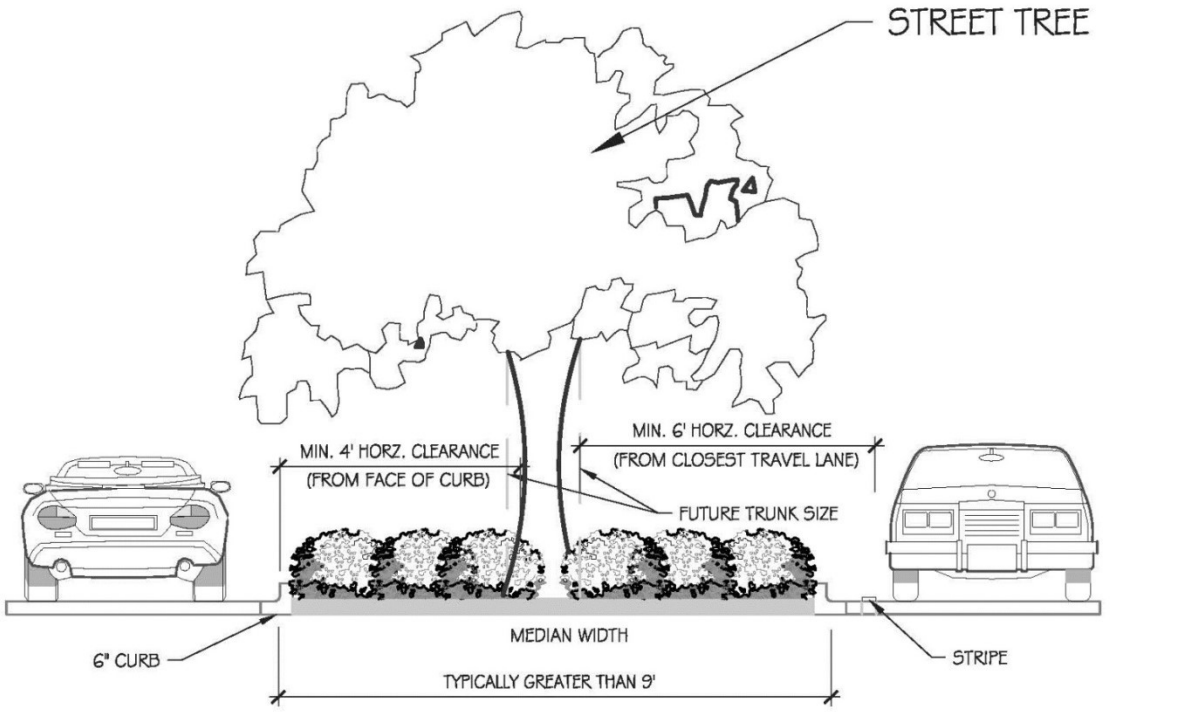
TYPICAL CUT-OUT IN SIDEWALK

C. Medians

Median islands on major arterial roadways and some local collector streets offer plantable area within the public right of way which can enhance the beautification of a roadway corridor. The landscape design for medians, especially on F.D.O.T. and Broward County roadways, are greatly regulated by state and county highway design standards and restrictions. For the purposes of this document, a general description of the standards regulating the design of landscaping in medians is provided. There are two (2) main factors influencing the planting of median islands. The first is the width of the median (Horizontal Clearance), and the second is the line of clear sight (or unobstructed visibility) from one vehicle to another when entering or exiting the roadway.

1. Horizontal Clearance

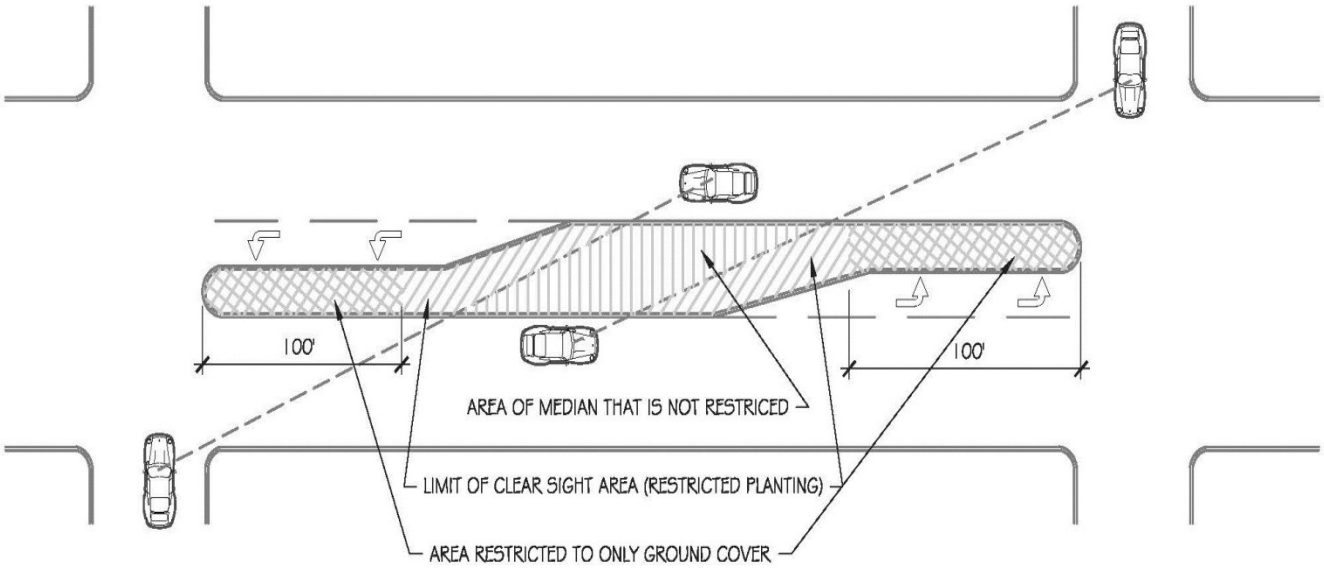
   Horizontal clearance is the distance from the face of the curb of the median island to the closest point of the trunk of the tree or palm. The ultimate size, or diameter of the trunk when fully grown, must be considered when measuring this requirement-not just the size of the trunk at the time of planting. The minimum distance is four (4) feet from the face of the curb, and six (6) feet from the closest travel lane as measured from the center line of the edge of pavement stripe. This setback is considered a minimum standard for all medians whether they are on a state, county, or local roadway. Therefore, medians less than eight (8) feet or nine (9) feet wide typically cannot be planted with trees. There are some exceptions which sometimes permit the planting of “frangible” trees, which have very slender trunks, in these narrow medians.



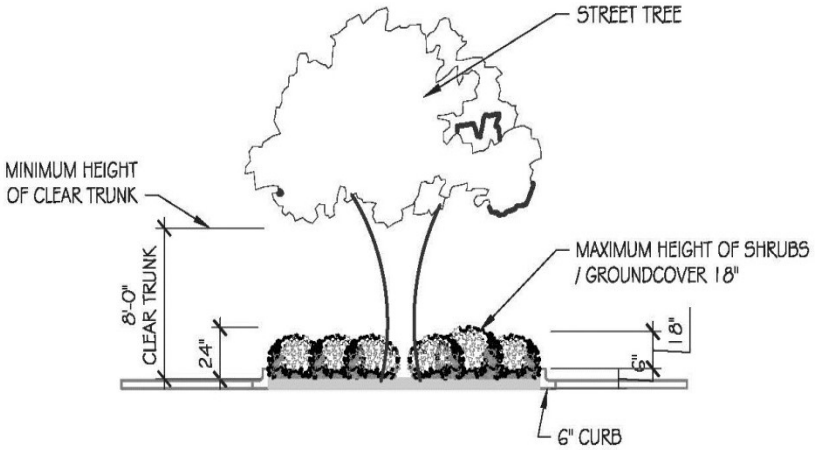
HORIZONTAL CLEARANCE FOR TREES IN MEDIANS

2. Lines of Clear Site

   The lines of clear sight requirements for medians generally dictate the size, type and location of plant materials along the length of a median. Trees and palms planted within a limit of clear sight area must first have a minimum clear trunk height of 8 feet. The spacing of these trees and palms is dependent upon the size of the tree at the time of maturity and the design speed of the roadway. There are many variables, of course, but generally speaking the typical on center spacing is from 25’ to 35’ for small trees and palms, which grow to have trunks less than 11” (inches) in diameter, and 90’ to 120’ for trees with trunks larger than 11” (inches). All trees and palms must also meet the horizontal clearance requirements, and all shrubs and ground covers shall be of a species that only grow to a maximum height of 18 inches at maturity. In addition, the first 100 feet of the end of a median island at any median opening is typically restricted to only ground covers. See illustrations below.



TYPICAL CLEAR SIGHT RESTRICTIONS ALONG A MEDIAN N.T.S.



PLANT HEIGHT REQUIREMENTS WITHIN CLEAR SIGHT AREAS

To further Brand the City and create a unified signature look, the landscape design for medians shall place an emphasis on the use of the following plant material: Live Oak, Pigeon Plum, Simpson Stopper, Orange Geiger, Bulnesia, Sylvester Date Palm, Sabal Palm, Fire Bush, Dwarf Schefflera 'Trinette', Muhly Grass, Dwarf Fakahatchee Grass, Spider Lily, Parsons Juniper and Trailing Lantana.

In addition, following is a list of suggested plant materials that are well suited for median islands. Since there are many variables and restrictions that apply, the governing agency of each roadway must be consulted for approval of any plant material prior to installation. For a more complete list of recommended trees, palms, and shrubs along with photographs, please see the Appendix B.

Table 17. Median Trees

Trees	Palms	Shrubs	Groundcovers
Gumbo Limbo	**++Sabal Palm / Cabbage Palm**	Gold Mound	Liriope / Variegated Liriope
++Live Oak	Royal Palm	Small Leaf Clusia	Wart Fern
South Florida Slash Pines	Alexander Palm	**++Dwarf Firebush**	Dwarf Podocarpus / Pringles
Indian Tamarind	Bismarck Palm	Bromeliad Species	Blanket Flower
++Pigeon Plum	Chinese Fan Palm	Walter's and Sandankwa Viburnum	**++Dwarf Juniper / Parson's**
Satin Leaf	+Coconut Palm	Red and White Fountain Grass	**++Trailing Lantana**
++Bulnesia / Verawood	**++Sylvester Date Palm**	Sand Cord Grass	Bromeliad Species
Madagascar Olive	Foxtail Palm	Blueberry Flax Lily	Boston Fern
Pink Tabebuia	Montgomery Palm	Indian Hawthorn	**++Spider Lily**
++Simpson Stopper	Silver Palm	Coco Plum	Pink Rain Lily
*Silver Buttonwood	Florida Thatch Palm	Silver Buttonwood	Carrisa/Emerald Blanket
*Japanese Privet / Ligustrum Tree	Spindle Palm	**++Muhly Grass**	
**Crepe Myrtle		**++Dwarf Fakahatchee Grass**	
++Orange Geiger		Crinum Lily	
		Wax Jasmine	
		Dwarf Ilex / Nana Schilling	
		Coontie	
		Green Island Ficus	
		Dwarf Ixora	
		++Dwarf Schefflera 'Trinette'	

* Should not be planted in medians or swales less than 8' in width.

**Loses its leaves in winter months, do not use more than 10% of the total trees on project.

+ Must be certified 'Malayan' or 'Maypan' variety only.

++Signature Branding Species

D. Pavement Treatments

Paving treatments are an important element within the urban environment in creating interest on the ground plane and establishing community identity. Well-marked pedestrian routes enhanced with specialty paving also aid in making pedestrian crossings safer. Most intersections outside of the downtown district will not require specialty paving or treatment. However, for those that do, extreme care must be taken in the coordination of these elements with the necessary functions of the intersection in a way that maximizes safety, function and aesthetics.

1. Intersection Treatments

   Entire treatments of intersections have already been used quite effectively in the City on local collector roads, such as N.E. 38th Street and N.E. 34th Court. These intersections utilized concrete unit pavers in an octagon shaped, interlocking pattern, with a blend of two (2) colors. (See photograph below). The crosswalks have a border of one (1) row of soldier course pavers adjacent to a twelve (12) inch wide concrete band. These intersection treatments have been so well received that the City has decided to make this one of their signature looks and design element. Therefore, it is highly recommended that any new intersections to receive specialty paving shall either be:

   a. Super Octo, 2-3/8" concrete unit pavers, By Oldcastle/Coastal with a blend of red and charcoal colors. The main intersection and crosswalks shall have a border of one (1) row of soldier course pavers adjacent to a twelve (12) inch wide concrete band. (as shown in the photograph below), or
   b. Be constructed with an alternate paving material of similar look and qualities that is approved by the City.

   It is not recommended to use stamped asphalt paving for entire intersections, but only for crosswalks. Entire intersection treatments are generally not recommended for major arterial roadways or most high traffic areas.

2. Specialty Paving at Crosswalks
   As deemed necessary by City staff, it is recommended that specialty paving be utilized at appropriate intersections and pedestrian crosswalks within the City. At intersections where only the crosswalks are receiving specialty paving, a second option of stamped asphalt shall be included. Please note that some arterial roadways that are regulated by F.D.O.T. or Broward County may require stamped asphalt to be used instead of pavers. Therefore, it is recommended that all specialty paving in crosswalks in the City of Oakland Park be constructed of one of the following materials:
   a. Concrete unit pavers: Concrete unit pavers shall be Super Octo, 2-3/8" concrete unit pavers, By Oldcastle/Coastal with a blend of red and charcoal colors in an interlocking pattern, with a border of one (1) row of soldier course pavers adjacent to a 12" wide concrete band.
   b. Stamped asphalt: Stamped asphalt shall be only one (1) color (Red) in a herringbone, or similar, pattern with a 12" wide border of the same or different color, in a smooth band or stamped soldier course pattern. NOTE: In some cases, the border may be the white stripe of the crosswalk area, see photograph next page, or
   c. Be constructed with an alternate paving material of similar look and qualities that is approved by the City.

E. Round-a-bouts

Round-a-bouts have become more popular in the South Florida region over the last ten (10) years as a way to enhance the aesthetic quality of an area as well as achieve some traffic calming benefits. The City has successfully introduced several round-a-bouts on collector roads, not only as a beautification of the surrounding neighborhood, but also as an effective traffic calming element. Round-a-bouts are currently located on N.E. 38th Street, N.E. 34th Court, and N.W. 38th Street. As with intersection and crosswalk treatments, these round-a-bouts include specialty paving in their design. They also include planting areas in the center circle and approaches, and sometimes landscape lighting, as well.

As a general rule, the larger the area for the design of a round-a-bout, the better it will function. For small round-a-bouts, the movement of traffic through them can be tight. While this is ideal for traffic calming purposes, it causes the designers to accommodate these turning movements with mountable curbs and drivable aprons around them, which are necessary for large vehicles and trucks to get around. These apron areas cannot be converted to planting areas. The City shall require these aprons have specialty paving along with the other median islands on the approaches to it, as well as the designated crosswalk areas. The concrete unit pavers in these islands shall be the same as described in the previous section 2.D.1 – Intersection Treatment. (See Photograph page 58.)

The planting designs of the existing round-a-bouts in the City have been a mix of native and non-native plants; some that need to be trimmed often, and others not at all; and some that require frequent watering, and others much less. The City would like to create a more uniform look and branding theme for the planting designs in the future. The circles, all relatively small so far, have all received some type of specimen palm, either a 'Medjool' Date, a Wild Date (Sylvester), or a Triangle Palm. Future round-a-bouts shall require the planting of a signature tree or palm along with native, or drought tolerant plants, that are low maintenance and do not require a lot of trimming and have similar maintenance and watering needs. The City would like to see landscape designs for their round-a-bouts that include a specimen Live Oak as the feature element when the diameter of the center circular planting area is 25' or greater. For all other round-a-bouts with a diameter of circle less than 25' a specimen Wild Date Palm (Sylvester) or 'Medjool' Date Palm should be planted. In addition, the signature look of each round-a-bout shall include Pink Muhly Grass at least two (2) of the following list of shrubs/ground covers.

Table 18. Round-a-bout Shrubs and Ground Covers

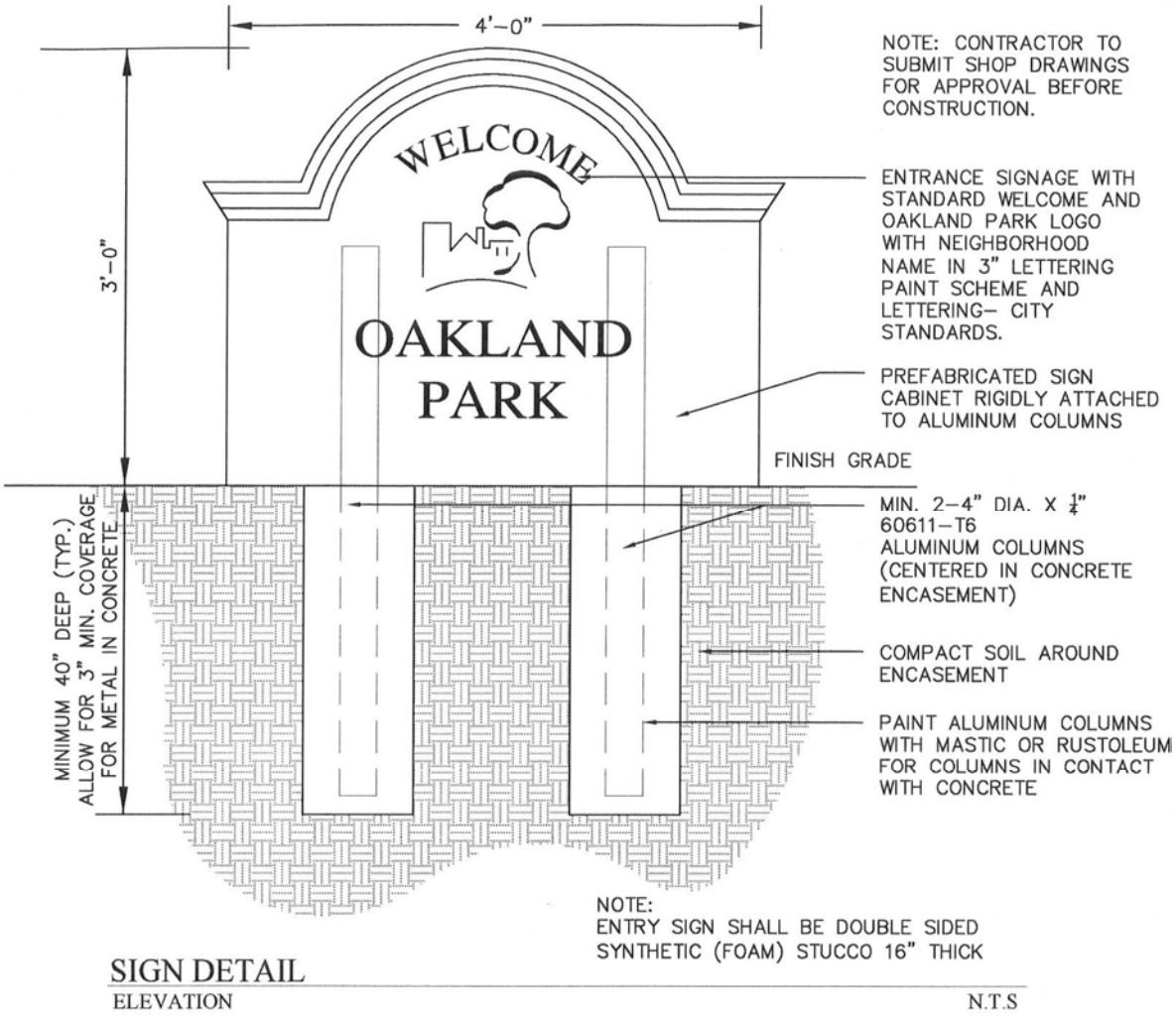
Common Name	Species Name	Native/Non-Native
++Muhly Grass	*Muhlenbergia capillaris*	Native
++Dwarf Fakahatchee	*Tripsicum floridanum*	Native
Dwarf Yaupon Holly	*Ilex vomitoria 'Nana'*	Native
Indian Hawthorn	*Rhaphiolepis indica*	Non-Native
Dwarf Ixora	*Ixora chinensis*	Non-Native
Ixora 'Nora Grant'	*Ixora coccinea*	Non-Native
++Dwarf Schefflera 'Trinette'	*Schefflera arboricola 'Trinette'*	Non-Native
Coontie	*Zamia pumila*	Native
Green Island Ficus	*Ficus microcarpa 'Green Island'*	Non-Native
++Parson's Juniper	*Juniperus chinensis 'Parsonii'*	Non-Native
Shore Juniper	*Juniperus conferta*	Non-Native
Lily Turf	*Liriope spp.*	Non-native

++Signature Species

Future round-a-bout lighting shall consist of a minimum of four (4) landscape up-lights focused on the upper trunk and canopy of the specimen tree or palm. The planting of the shrubs around the base of the tree/palm shall not block the lights from shining on the tree/palm. The intensity of the landscape up-lights in the round-a-bouts shall be no more than 50 watt MH or 16 watt LED lamps (or the equivalent), and a maximum output of 4,000 lumens each. The lighting may be either above ground fixtures, or recessed, in ground fixtures. If they are in ground fixtures, they must have an IP rating of 68.

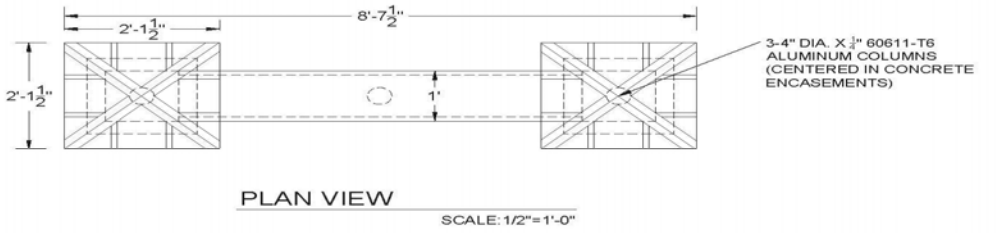
F. City Branding at Entranceways and Neighborhood Signs

In addition to street trees and median plantings in public roadways, one of the best opportunities for branding and creating a unique identity for the City is to create special, themed planting designs at the entrances into the City. This can be accomplished through the use of signature plants, such as specimen trees and palms, and a more uniformed treatment of the understory plant materials. This signature landscape design can be used in conjunction with one of the City's standard monument signs or without any signage. At major gateways into the City, the City's standard sign announcing entrance into the City shall be used. At other minor gateways and main entrances into neighborhoods, the City's slightly smaller standard neighborhood signs shall be used. Details and photos of these sign types are shown below.



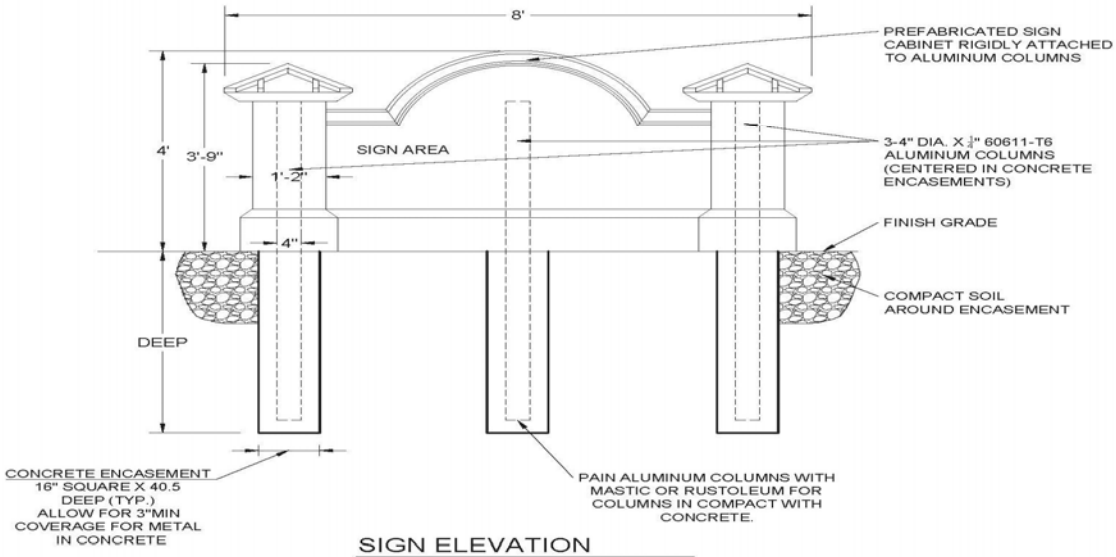
At all City entranceways outside of the Downtown area, the signature large trees shall be Live Oak, Gumbo Limbo, and Pink Tabebuia. In some instances, a cluster of South Florida Slash Pines can be introduced, if there is enough space at that location and the soil and planting conditions are adequate for them. The signature small, flowering trees shall be either Orange (or White) Geiger or Bulnesia trees. The signature palms shall be Royal Palms, Veitchia 'Montgomery' Palms, or Sabal (Cabbage) Palms. The understory plant material shall be divided into two (2) categories. The first

category being low plants that can be installed in front of the signs without blocking the sign letters, and the second category shall be medium to large shrubs that can be planted on either side of the sign as well as behind it. For ease of maintenance, the trunks of most, if not all, of the trees and palms shall be located within a landscape bed of shrubs and ground covers. For all future entranceways and sign features the signature shrubs and groundcovers shall be Blanket Flower or Trailing Lantana in front of the sign, and Pink Muhly Grass, Coontie, Indian Hawthorn, and Spider Lily for the areas on either side and behind the sign. In addition to these signature plants, the following list of shrubs and ground covers may also be planted in these entranceway areas. Alternative selections can be considered based on specific conditions and neighborhood considerations.



PLAN VIEW

SCALE: 1/2"=1'-0"



SIGN ELEVATION

SCALE: 1/2"=1'-0"

Table 19. Shrubs and Ground Covers for City and Neighborhood Signs Without Pedestals

Common Name	Species Name	Native/Non-Native
Powderpuff	*Mimosa strigillosa*	Native
++Blanket Flower	*Gaillardia pulchella*	Native
Ornamental (perennial) Peanut	*Arachis glabrata*	Non-Native
Mondo Grass	*Ophiopogon japonicas*	Non-Native
Parson's Juniper	*Juniperus chinensis 'Parsonii'*	Non-Native
Shore Juniper	*Juniperus conferta*	Non-Native
++Trailing Lantana	*Lantana montevidensis*	Non-Native
Purple Queen	*Tradescantia pallida*	Non-Native

Table 20. Shrubs and Ground Covers for City and Neighborhood Signs With Pedestals

Common Name	Species Name	Native/Non-Native
Dwarf Yaupon Holly	*Ilex vomitoria 'Nana'*	Native
Dwarf Fakahatchee	*Tripsicum floridanum*	Native
Bahama Wild Coffee	*Psychotria ligustrifolia*	Native
Sea Lavender	*Argusia gnaphalodes*	Native
++Coontie	*Zamia pumila*	Native
++Muhly Grass	*Muhlenbergia capillaris*	Native
++Spider Lily	*Hymenocallis latifolia*	Native
Green Island Ficus	*Ficus microcarpa 'Green Island'*	Non-Native
++Indian Hawthorn	*Rhaphiolepis indica*	Non-Native
Pittosporum	*Pittosporum spp.*	Non-Native
Dwarf Ixora	*Ixora chinensis*	Non-Native
Dwarf Schefflera 'Trinette'	*Schefflera arboricola 'Trinette'*	Non-Native
Ti Plant	*Cordyline terminalis*	Non-Native
Wax Jasmine	*Jasminum volubile*	Non-Native

++Signature Species

G. Traffic Calming Features

In addition to round-a-bouts and specialty paving at intersections and crosswalks, there are a variety of other traffic calming devices that may be used to slow traffic down in neighborhoods. These features are usually installed on City-owned and maintained streets in residential areas. When deemed appropriate, the City staff may require that any of the following features be implemented on a project. In addition, if a neighborhood wishes to have speed humps or other traffic calming devices instead, they must first contact the City and follow the procedures set forth in Chapter 18 of the municipal code.

1. Speed Tables

   A speed table is similar to a speed hump although usually much larger or wider. Unlike a speed hump, which goes up and then down fairly quickly, a speed table has a fairly large flat area in between the up and down ramps. Sometimes, a speed table can take up an entire intersection. Other times, a speed table can be installed in conjunction with a high traffic pedestrian crossing area. These features can be entirely made of regular asphalt, or they can be designed with concrete unit pavers. If they are made of specialty pavement shall be Super Octo, 2-3/8" concrete unit pavers by Oldcastle/Coastal with a blend of red and charcoal colors with a boarder of one (1) row of shoulder course pavers adjacent to a twelve (12) inch wide concrete band. In addition, all speed tables shall be appropriately marked and signed as per City and County requirements.

2. Speed Humps

   Speed "humps" differ from speed "bumps" in that they are more rounded in shape and much wider than speed bumps. They are usually somewhere between 10 feet and 18 feet wide. Speed humps are often grouped together on a long street to increase their effectiveness. This type of feature can be made entirely of regular asphalt, or it can be upgraded with stamped asphalt patterns and colors. If stamped asphalt is used, it shall be only one (1) color, red, in a herringbone pattern with a 12" wide boarder of the same or different color in a smooth band or stamped soldier course pattern. All speed humps shall be appropriately marked and signed as per City and County requirements.

3. Rumble Strips

   Rumble Strips are similar to speed humps except they are not elevated, they contain a texture surface. These are made of either concrete unit pavers or stamped asphalt, but they are flat and installed flush with the adjacent asphalt pavement. The sound of the vehicles tires going over the textured surface gives it its name, and it is that sound that involuntarily causes drivers to slow down. If concrete unit pavers are used they shall be as specified above in section G.1 Speed Tables. If stamped asphalt is provided, it shall be the same as specified above in Section G.2 Speed "humps". Since these features are not actually considered obstacles in the roadway, they do not require special signing and marking.

4. Roadway Narrowing (AKA Traffic “Choker”, or “Chicane”)
   A Roadway narrowing is very similar to a rumble strip in that it is not normally raised up. Often times, there is curbing installed on either side of a roadway narrowing feature in order to increase visibility of the feature and to physically direct vehicles through the narrowed section of road. Although these types of features can be made of regular asphalt, they are most often constructed of concrete unit pavers to add that rumble strip effect. If specialty paving is used it shall be the same as described in subsection G.1.Speed Tables, on the previous page. All roadway narrowing’s shall be appropriately marked and signed as per City and County requirements.

5. Traffic Delineators
   Sometimes traffic delineators are installed along a roadway in order to control the direction and flow of traffic, as well as to act as a traffic calming element. These are most often made of plastic and reflective materials, and are about 24”-30” in height. They are typically placed very close together in order to control the flow of traffic.

Speed Hump

Rumble Strip

Road Narrowing with Rumble Strip

H. Sidewalks

Safe and pleasant pedestrian circulation is one of the most important aspects of any City. Including sidewalks as part of any new projects is essential.

1. Sidewalks should be safe, shaded, and convenient.

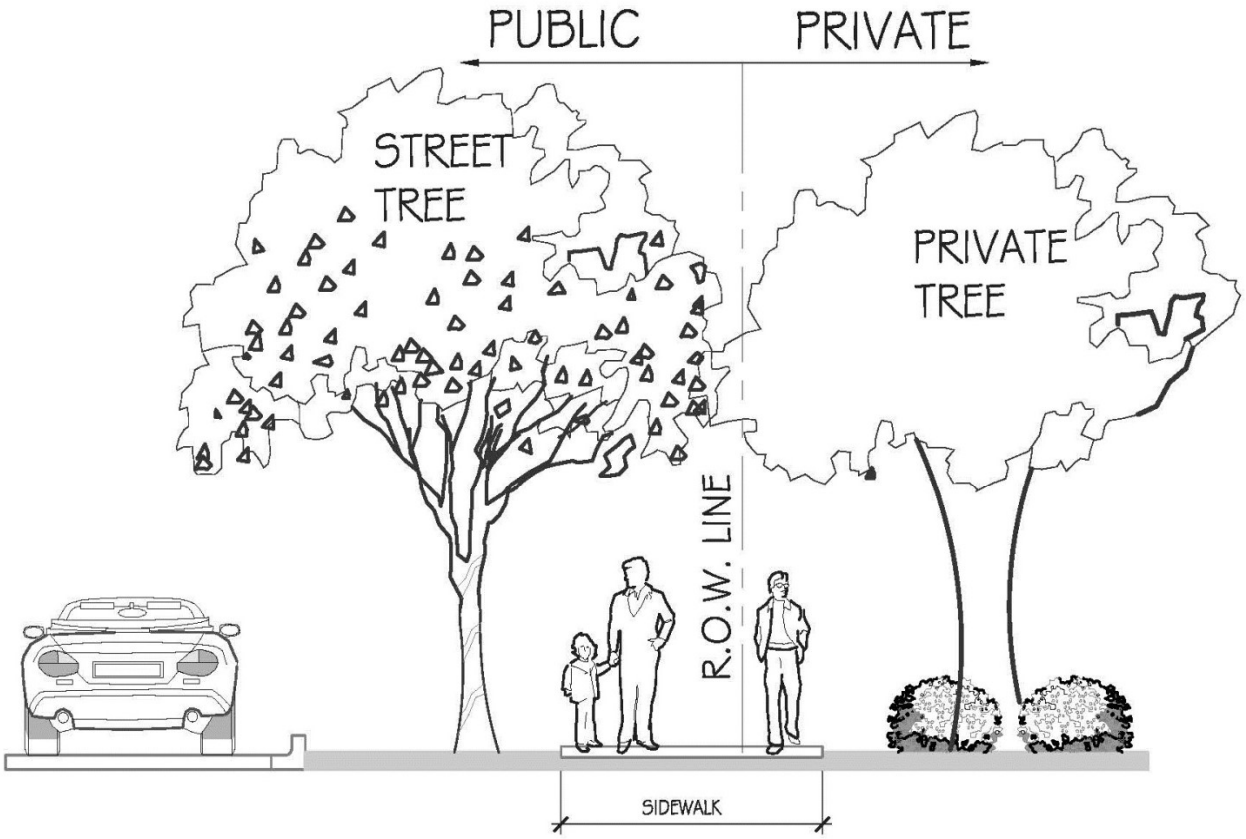
2. The sidewalk surface should be easily negotiated by all sidewalk users. It should not present any unnecessary obstructions and should not be composed of a material that will be dangerous or uncomfortable under any conditions.

3. Sidewalks should be a minimum of 5' in width and should be introduced along all roadways in the City, wherever possible.

4. All sidewalks and curb ramps at intersections, sidewalks at driveways, and sidewalks at transit stops must adhere to all A.D.A. accessibility requirements.

5. All sidewalks shall meet the standards of the City of Oakland Park's Engineering Department.

6. Mostly, sidewalks will be constructed of concrete. In some special cases, however, the City may require that certain sidewalk areas be constructed of specialty paving materials. When that is the case, then concrete unit pavers similar to that described in section 2.D.2.-Specialty Paving at Crosswalks shall be used. In addition, since there is no vehicular traffic on these areas, a clay brick paver may also be used.



SIDEWALKS OFFER A SHADED GATHERING SPACE FOR NEIGHBORS TO INTERACT

I. Bikeways

Roadway surfaces must be designed to accommodate bicyclists and should connect to the surrounding bicycle systems and link to parks, open spaces, schools, libraries, civic buildings and other adjacent neighborhoods. Bike lanes shall meet all local, County, and State transportation regulations. Bikeway improvements shall be made along collector and local streets connecting to existing, or proposed, bikeway systems. Accommodations for bicyclists should be primarily for the recreational or leisure cyclist.

Areas that are designated for bicyclists should use paving materials that are smooth and free of obstruction. There must be a clearly designated separation between bicycle zones and vehicular areas. This separation can visually be established by using varying colors, or materials, where possible.

Example of Bike Lane Separator from Roadway

J. Benches

For seating areas provided as part of any roadway project, the City requires a curved woven metal type bench. Benches may be any length, but shall have center arm rests to prevent overnight use. Benches shall not be placed in such a way as to obstruct the flow of pedestrian traffic. Benches shall be placed in shaded areas wherever possible. Commercial advertisements on benches are not permitted. This subsection does not apply to benches located within transit stops. The specified bench to use in the City is:
Manufacturer: Landscape Forms
Model Scarborough bench, woven metal
Color: Ivy Powdercoat

The Scarborough bench is available in 24", 48", 72", or 96" lengths with center arms available in the 72" or 96" lengths; the 96” length is available with two intermediate arms. It is also available as a bench without a back.

Section 5: City Facilities

These standards pertain to City parks, City buildings, and to other utility type uses such as lift stations. These planting standards address both the aesthetic qualities and functional requirements of the landscape treatments for these types of municipal facilities.

A. Parks

The landscape planting standards for City parks shall place an emphasis on using native or drought tolerant plants with fairly low maintenance needs. While parks need to be beautiful and nicely landscaped, there needs to be a balance achieved by reducing watering and maintenance costs. The landscape design for any park should take a minimalist approach. The use of trees and palms, and especially shrubs and groundcover, should be very well thought out and planted only in areas where they are most beneficial and highly visible to the public. Examples of these types of areas might be parking areas, entrance ways, and park signs, lining walkways and providing shade for benches.

1. Parks without Athletic Fields: These parks provide more opportunity for additional planting than parks with athletic fields which typically are a more intense use. Examples of these parks in the City include the N.W. 39th Street Greenway, Royal Palm Park, and Jaco Pastorius Park. These parks provide the best opportunity to plant more South Florida Slash Pine trees since these are large trees and require a fairly large area in which to be planted. Also, Slash Pines tend to look better and grow better when they can be planted in big groupings and mulched with pine straw which helps to lower the pH of the soil that they are planted in. Slash Pines prefer a lower pH of soil than our usually higher alkaline soils. In addition to South Florida Slash Pines, an emphasis shall be placed on adding more shade trees in the parks. While most of the trees should be native, there is an opportunity to incorporate some flowering and tropical trees into the design as well. The use of shrubs and groundcovers should not be extensive and should be located in entrance ways, gathering areas, and other highly trafficked areas of the park. Therefore, the signature trees and palms for Passive Parks in the City shall be Live Oak, South Florida Slash Pine, Gumbo Limbo, Bulnesia, Pink Tabebuia, and Sabal Palm.

2. Parks with Athletic Fields: These parks host more intensive recreational uses, such as ball fields, tennis courts, and basketball courts. Examples of these athletic field parks in the City are Stevens Field and Wimberly Field. Since a majority of the land area in these parks is dedicated to fields, courts, buildings, and parking, there is less opportunity to add more landscaping. The landscape designs for these types of parks are much more functional. The placement of trees and palms is almost strategic in nature. Every tree has a purpose, whether it is for shade or for screening. Again, the emphasis shall be on planting native or drought tolerant trees with fairly low maintenance requirements. There is less opportunity to introduce flowering or tropical trees, and very little opportunity to add South Florida Slash Pines trees. The planting of shrubs and groundcovers should also be well thought out and minimal in nature. The main purpose of these plants shall be to screen views, provide noise reduction, block spillover light, and enhance entrance areas and other high traffic areas. Therefore, the signature trees and palms for these

active, intense use Parks in the City shall be Live Oak, Silver Buttonwood, Simpson Stopper, Orange Geiger, Sabal Palm, and Foxtail Palms.

B. City Buildings

The landscape planting standards for city buildings, such as City Hall, Recreational Centers or Fire Stations, shall be even more structured and functional than for City parks. The available area around most City buildings for landscaping is very limited, so opportunities to provide extensive landscape designs are reduced. However, there are usually opportunities to plant trees and palms in parking areas, entrance ways, along walkways, and in other yard areas. Some municipal buildings, such as City Hall and the Fire Stations have a little more planting area in which to add landscaping then public works and utility facilities. Some general landscape themes have emerged at both of the Fire Stations and at the City Hall building. The predominant trees are Royal Palms, Live Oaks, and Sabal Palms. In addition, there is a nice mix of Bulnesia, Pink Tabebuia and Orange Geiger trees which add color to the landscape, along with understory plantings of mostly native, drought tolerant shrubs and groundcovers. In the future, the City would like to see even more native, low maintenance type of plants added to the landscape, or as replacements, to achieve an even greater reduction in water usage and maintenance costs. The City would also like to see some South Florida Slash Pines introduced into these landscapes, wherever possible. Therefore, the signature trees and palms for City buildings shall be Live Oak, South Florida Slash Pine, Bulnesia, Pink Tabebuia, Orange Geiger, Royal Palm, Montgomery Palm, and Sabal Palm.

The planting areas around most of the City recreation buildings, public works, and utility facilities are already landscaped, or offer very little opportunity for more planting. The landscaping for these types of buildings should be focused on screening trees, foundation shrubs, and possibly some entrance way beautification. The tree species shall primarily be that of medium to small trees, mostly native, for screening purposes, such as Stoppers, Green and Silver Buttonwood, and Pigeon Plum. The shrubs and groundcovers shall primarily be native or drought tolerant and very low maintenance. The use of these plants should be well thought out and have a very specific purpose and be located in highly visible areas. Therefore, the signature shrubs and groundcovers shall be Dwarf Firebush, Croton, Dwarf Ixora, Coontie, Muhly Grass, Jamaica Caper, Spider Lily, Green Island Ficus, Indian Hawthorne, and Parson's Juniper.

The following is an overall list of suggest plants for use at City facilities, such as parks and City buildings.

Table 21. Plant Materials for City Facilities

Trees	Palms	Shrubs	Ground Covers
++Bulnesia /Verawood	**++Royal Palm**	**++Dwarf Firebush**	**++Green Island Ficus**
Live Oak	**++Montgomery Palm**	Horizontal Cocoplum	Dwarf Yaupon Holly
++South Florida Slash Pine	**++Sabal Palm / Cabbage Palm**	**++Dwarf Schefflera 'Trinette'**	**++Parson's Juniper**
Silver Buttonwood	Foxtail Palm	Myrisine	Shore Juniper
++Pink Tabebuia		Silver Buttonwood	**++Coontie**
Simpson Stopper		Simpson's Stopper	**++Spider Lily**
++Orange Geiger		Wild Coffee	**++Muhly Grass**
Gumbo Limbo		**Croton**	
		Hibiscus	
		++Indian Hawthorne	
		Carrisa	
		++Jamaica Caper	
		Sandankwa Viburnum	
		Wax Jasmine	

++Signature Species

C. Utility Services (Public Works, Lift Stations, Easements)

The landscape planting standards for utility facilities in the City of Oakland Park shall place a strong emphasis on the use of very hardy plant materials, which are native or drought tolerant and that require very little trimming and maintenance. The biggest opportunity for additional planting in these areas is around lift stations. These facilities are located throughout the entire City and are often situated in residential neighborhoods. While wanting to screen and beautify these lift stations, the plantings must not interfere with the underground and overhead utility lines in the immediate area. They also must not require a lot of watering and maintenance. For this reason, the plant material for these areas shall consist of mainly native and ornamental grasses which do not have to be trimmed often. Other utility areas, storage yards, and easements may only have a need for screening. In that case, a planting of medium and small trees or palms along with some large shrubs that are native or drought tolerant shall be utilized.

The following is an overall list of suggest plants for use at Utility facilities, including Lift Stations.

Table 22. Plants for Utility Areas and Lift Stations

Lift Station Plants	
Silver Buttonwood	◦Sand Cordgrass
◦Simpson's Stopper	Blueberry Flax Lily
◦Pigeon Plum	Macho Fern
Bulnesia / Verawood	◦Wart Fern
◦Florida Thatch Palm	Gold Mound
Spanish Stopper	◦Dwarf Firebush
◦Small Leaf Clusia	◦Walter's Viburnum
*Cardboard Palm	◦Muhly Grass
Orange Geiger	Coontie
Sabal Palm	Red and White Fountain Grass
◦Cat Palm	Thryallis
Red Tip Cocoplum	

◦ Denotes plant materials which should be used most frequently

* Use as accent only.

Section 6. References

Betrock's Reference Guide to Florida Landscape Plants by Timothy K. Broschat and Alan W. Meerow as the source for the mature height of a tree.

Betrock's Guide to Landscape Palms by Alan W. Meerow for the average frond length of a palm tree.

Florida Department of Agriculture, published by the Division of Plant Industry for the "Grades and Standards of Nursery Plants".

Florida Exotic Pest Plant Council (FEPPC) for list of category 1 (most invasive) species.

State of Florida Department of Agriculture as adopted in the Florida Administrative Code 5B-57.007 for the Noxious Weed list.

Appendices

Appendix A. Planting Details

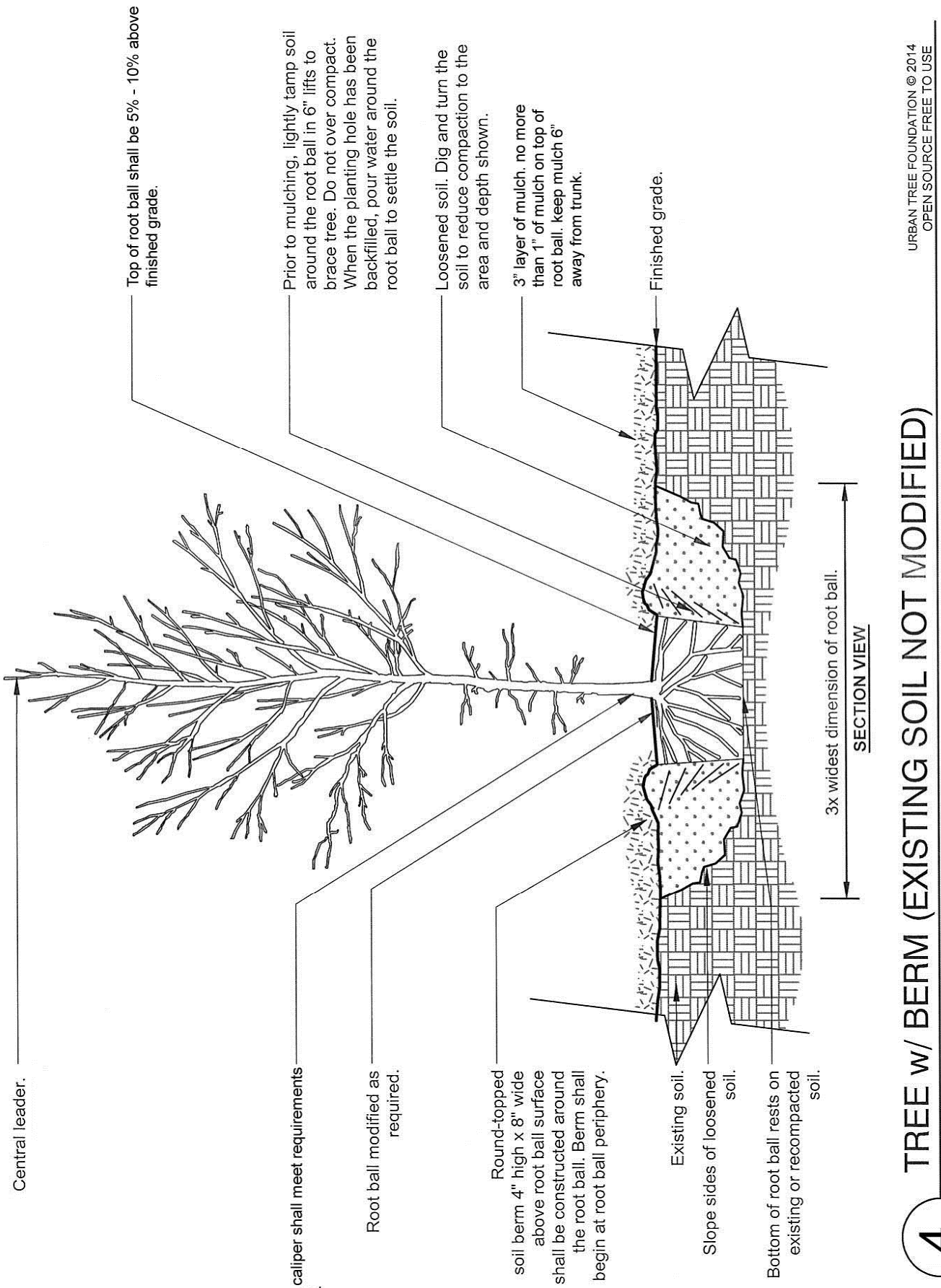
Appendix B. Recommend Plant List

Appendix C. Prohibited Plant List

Appendix D. Landscape Maintenance Best Management Practices

Appendix E. Home Owners Guide

1 PALM PLANTING DETAIL NTS
NO SCARS OR DAMAGE TO TRUNK
(5) LAYERS OF BURLAP AND (5) 2" X 4" X 18" LONG, EVENLY SPACED WOODEN BATTENS CONNECTED WITH 2-3/4" STEEL BANDS.
(3 MIN.) 2" X 4" STAKES, EVENLY SPACED, TOE NAIL TO BATTEN AND REINFORCE W/ STEEL BANDING. DO NOT NAIL TO TRUNK.
WATER RING (6" HEIGHT) PROVIDING A WATER COLLECTION BASIN
3" APPROVED MULCH LAYER, KEEP 6" CLEAR FROM TRUNK
TILLED AND LOOSENED NATIVE SOIL BACKFILL, DEPTH SAME AS HEIGHT OF ROOTBALL
UNDISTURBED SOIL TYP.
REMOVE BURLAP AND ALL TIE MATERIAL FROM 1/3 OF ROOTBALL
6"
6"
WIDTH OF ROOTBALL
NATIVE SOIL BACKFILL 3-5 TIMES WIDTH OF ROOTBALL
OVERALL HEIGHT
GREY WOOD
⅓ GREY WOOD OR 5' MIN.
⅓ OF ROOTBALL
HEIGHT OF ROOTBALL
2 GROUNDCOVER PLANTING DETAIL NTS
*REFER TO PLANT LAYOUT SPACING CHART FOR DISTANCES
3" APPROVED MULCH LAYER, KEEP 3" CLEAR FROM TRUNK
TILLED AND LOOSENED PLANTING SOIL BACKFILL, DEPTH SAME AS HEIGHT OF ROOTBALL (MIN. 12"), AND 6" MIN. ON ALL SIDES.
UNDISTURBED SOIL TYP.
O.C. SPACING*
3" 3"
3" 3"
WIDTH OF ROOTBALL
6" MIN.
FIN. GRADE
HEIGHT OF ROOTBALL
3 SHRUB PLANTING DETAIL NTS
*REFER TO PLANT LAYOUT SPACING CHART FOR DISTANCES
SET TOP OF ROOTBALL AT ORIGINAL PLANTING DEPTH
WATER RING/SAUCER (3" HEIGHT) PROVIDING A WATER COLLECTION BASIN
FIN. GRADE
TILLED AND LOOSENED PLANTING SOIL BACKFILL, DEPTH SAME AS HEIGHT OF ROOTBALL (MIN. 12"), AND 6" MIN. ON ALL SIDES.
UNDISTURBED SOIL TYP.
MOUND OF COMPACTED EARTH
O.C. SPACING*
3"
3"
3"
3" APPROVED MULCH LAYER, KEEP 3" CLEAR FROM TRUNK, OVER ENTIRE PLANTING BED.
SHRUB HEIGHT
HEIGHT OF ROOTBALL
WIDTH OF ROOTBALL
FULL WIDTH OF ROOTBALL (6" MIN.)


Top of root ball shall be 5% - 10% above finished grade.
Prior to mulching, lightly tamp soil around the root ball in 6" lifts to brace tree. Do not over compact. When the planting hole has been backfilled, pour water around the root ball to settle the soil.
Loosened soil. Dig and turn the soil to reduce compaction to the area and depth shown.
3" layer of mulch. no more than 1" of mulch on top of root ball. keep mulch 6" away from trunk.
Finished grade.
Central leader.
Trunk caliper shall meet requirements of city.
Root ball modified as required.
Round-topped soil berm 4" high x 8" wide above root ball surface shall be constructed around the root ball. Berm shall begin at root ball periphery.
Existing soil.
Slope sides of loosened soil.
Bottom of root ball rests on existing or recompacted soil.
3x widest dimension of root ball.
SECTION VIEW
URBAN TREE FOUNDATION © 2014
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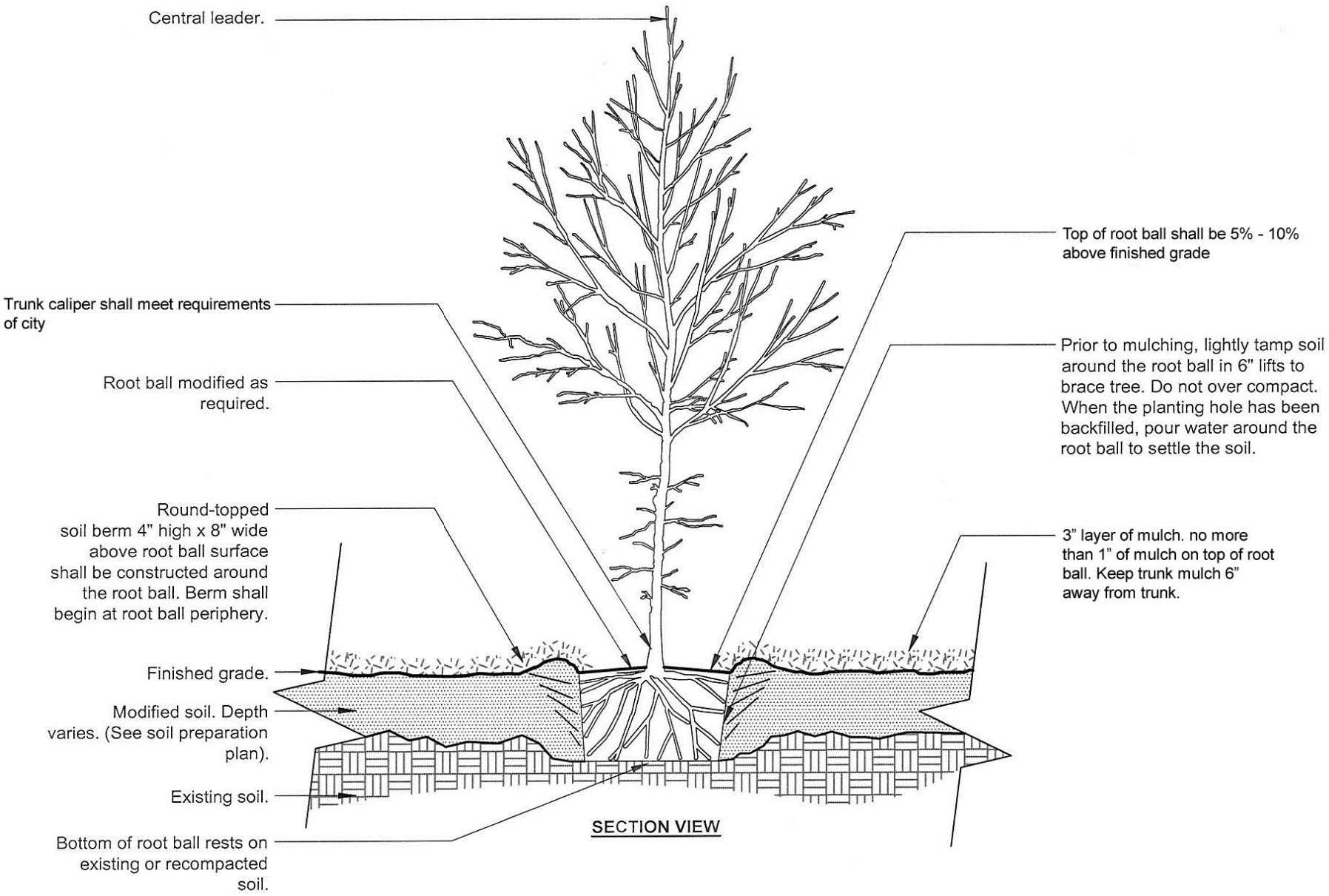
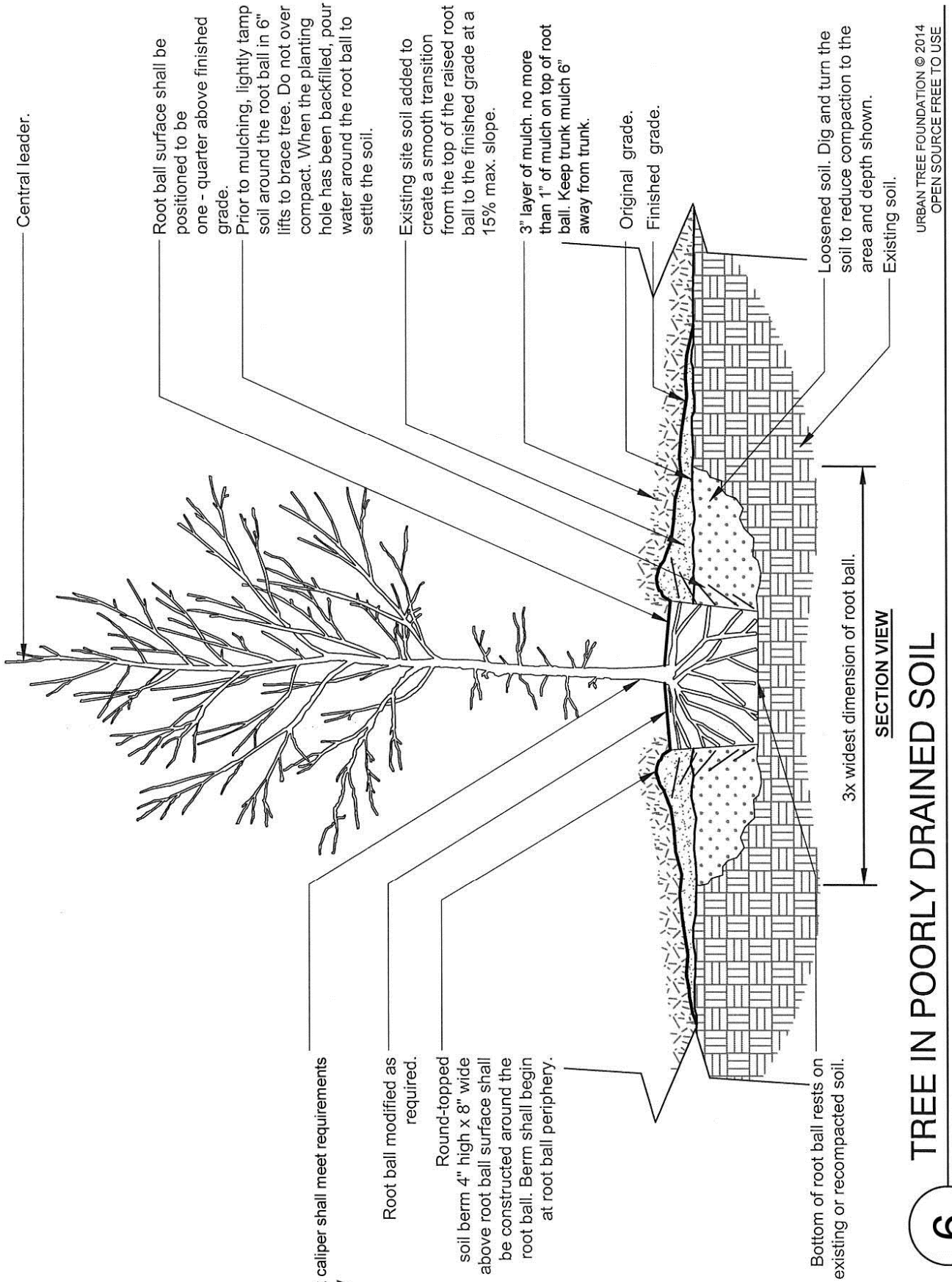
4
TREE w/ BERM (EXISTING SOIL NOT MODIFIED)



5 TREE w/ BERM (EXISTING SOIL MODIFIED)


Central leader.
Root ball surface shall be positioned to be one - quarter above finished grade.
Prior to mulching, lightly tamp soil around the root ball in 6" lifts to brace tree. Do not over compact. When the planting hole has been backfilled, pour water around the root ball to settle the soil.
Existing site soil added to create a smooth transition from the top of the raised root ball to the finished grade at a 15% max. slope.
3" layer of mulch. no more than 1" of mulch on top of root ball. Keep trunk mulch 6" away from trunk.
Original grade.
Finished grade.
Loosened soil. Dig and turn the soil to reduce compaction to the area and depth shown.
Existing soil.
Trunk caliper shall meet requirements of city
Root ball modified as required.
Round-topped soil berm 4" high x 8" wide above root ball surface shall be constructed around the root ball. Berm shall begin at root ball periphery.
Bottom of root ball rests on existing or recompacted soil.
3x widest dimension of root ball.
SECTION VIEW
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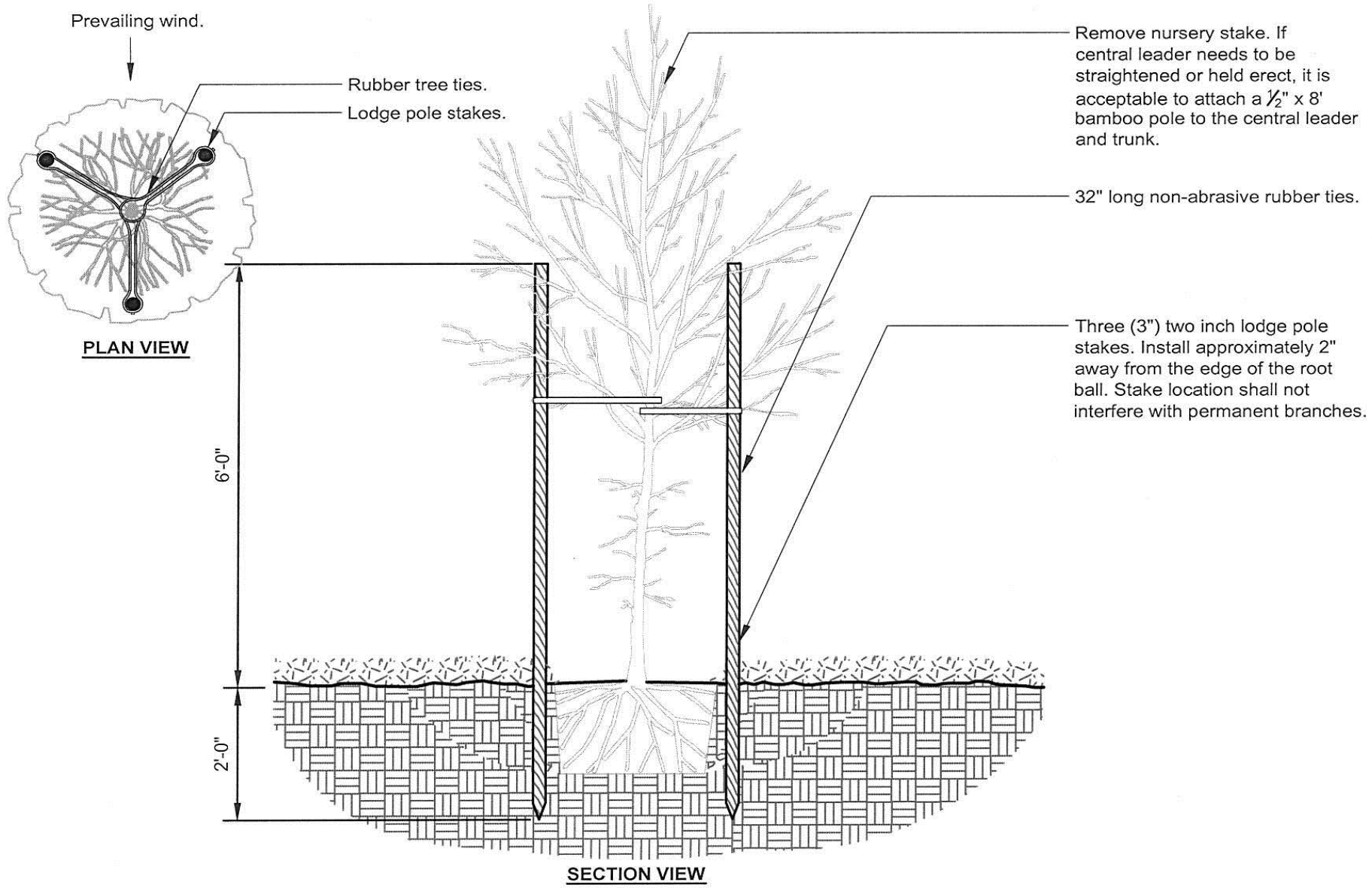
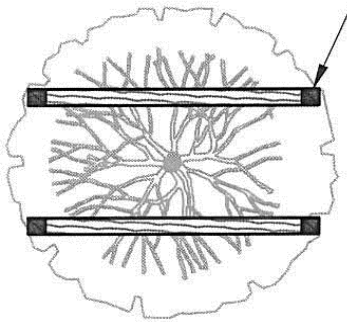
6
TREE IN POORLY DRAINED SOIL



7 TREE STAKING - LODGE POLES (3)



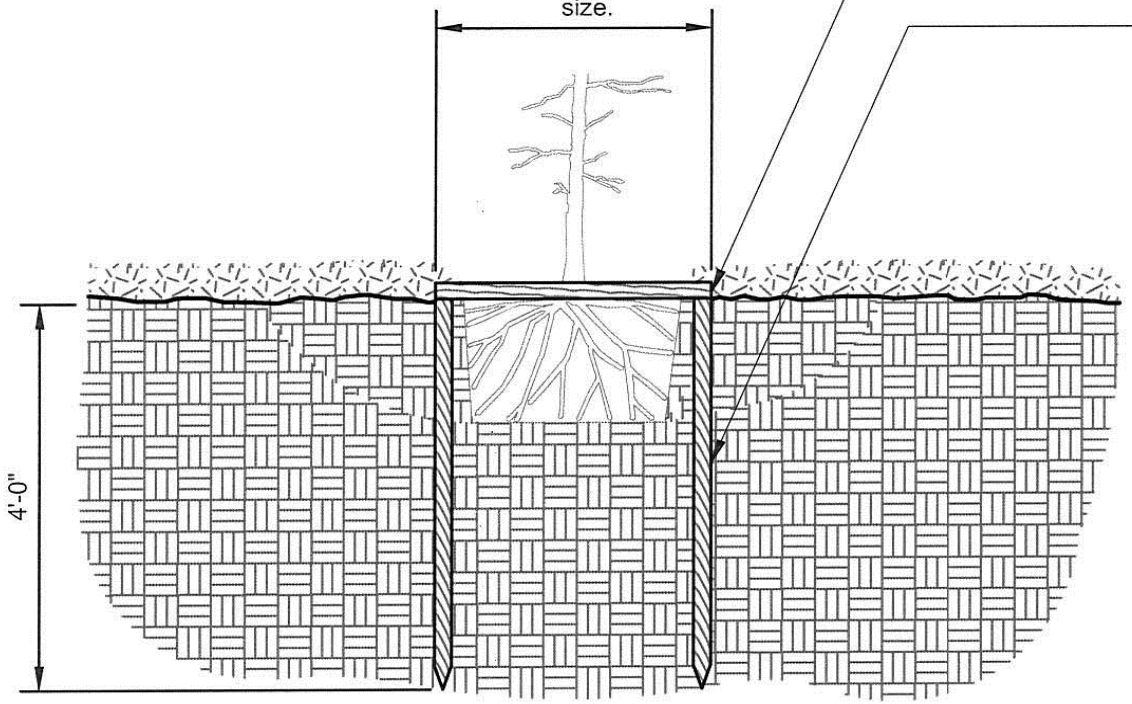
2" x 2" wooden stakes. Stakes shall be untreated pine or Douglas-Fir.

PLAN VIEW

Secure cross member to vertical stakes using three inch long wood screws.

Width shall vary depending on root ball size.

Two untreated pine or douglas fir stakes. Install 2" away from the edge of the root ball.



SECTION VIEW

8 TREE STAKING - STAPLE

Recommended Trees Species

***List must be renewed every five (5) years.**

Common Name	Scientific Name	Height Range	Tree Size	Tree Type	Growth Rate	Blooming Season	Special Needs/Comments
Allspice	*Pimenta dioica*	15'-30'	Medium	Shade	Slow	N/A	Leaves are leathery, aromatic and quite attractive. Has whitish gray bark peels in thin sheets. The leaves and fruit smell like a combination of cloves, black pepper, nutmeg, and cinnamon, hence the common name. Small white flowers. Wind tolerant.
Bahama Lysiloma	*Lysiloma sabicu*	20'-30'	Medium	Shade	Slow	N/A	Slow growing native shade tree with small leaves and reddish new growth.
Bald Cypress	*Taxodium distichum*	30'-60'	Large	Native	Moderate	N/A	Thrives in wet sites. Native deciduous tree. Loses all its leaves in winter. Wind tolerant.
Black Ironwood	*Krugiodendron fereum*	20'-30'	Medium	Native	Slow	N/A	Small native tree wind tolerant.
Bottlebrush	*Callistemon* sp.	20'-30'	Medium	Flowering	Moderate	Spring/Summer	A small evergreen tree. Easy to grow and loves warmth, moisture and sun. Mostly growing in moist soil in open or woodland sites.
Bridalveil	*Caesalpinia granadillo*	30'+	Large	Shade	Moderate	Summer/Fall	A large evergreen tree. Decorated with showy yellow blossoms. The bark peels off in thin strips showing an unusual green and grey mottling.

Bald Cypress
Taxodium distichum

Bottlebrush
Callistemon sp.

Allspice
Pimenta dioica

Black Ironwood
Krugiodendron fereum

Bridalveil
Caesalpinia granadillo

Bahama Lysiloma
Lysiloma sabicu

Recommended Trees Species

Common Name	Scientific Name	Height Range	Tree Size	Tree Type	Growth Rate	Blooming Season	Special Needs/Comments
Copperpod	*Peltophorum pterocarpum*	40'- 50'	Large	Flowering	Fast	Spring/Summer	Fast-growing evergreen tree. Produces fragrant, showy yellow flowers in the spring and summer. Seedpods turn to an attractive wine-brown color. Subject to wind damage. Needs space to develop adequate root system to reduce the likelihood of toppling.
Crepe Myrtle	*Lagerstroemia indica*	15'- 25'	Small	Flowering	Fast	Spring/Summer & Fall	Can be grown as either a shrub or small tree. Produces wide, showy flowers. Has thin, gray bark that exfoliates.
Dahoon Holly	*Ilex cassine*	20'-30'	Large	Native	Moderate	N/A	Wet areas; wind tolerant. Attractive red berries, attract birds.
Fiddlewood	*Citharexylum spinosum*	15'-25'	Small	Flowering Native	Moderate	Year-round	Moderate drought tolerance:. White flowers all year-round . Semi-showy spikes. Fragrant.
Orange Geiger	*Cordia sebestena*	20'-25'	Small	Flowering Native	Moderate	Spring/Summer & Fall	Moderate-growing with a dense rounded evergreen canopy. Orange flowers appear throughout the year with small white pear shaped fruit. Salt and wind tolerant.
Green Buttonwood	*Conocarpus erectus*	30'-50'	Large	Native	Moderate	N/A	Salt and Wind Tolerant

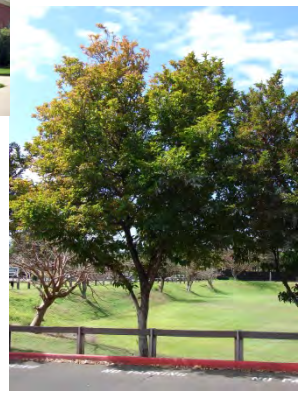
Dahoon Holly
Ilex cassine

Cooperpod
Peltophorum pterocarpum

Orange Geiger
Cordia sebestena

Green Buttonwood
Conocarpus erectus

Crepe Myrtle
Lagerstroemia indica



Fiddlewood
Citharexylum spinosum

Recommended Trees Species

Common Name	Scientific Name	Height Range	Tree Size	Tree Type	Growth Rate	Blooming Season	Special Needs/Comments
Gumbo Limbo	*Bursera simaruba*	40'-50'	Large	Native	Fast	N/A	Shiny red and peeling bark. Wind tolerant.
Hong Kong Orchid	*Bauhinia blakeana*	20'-30'	Medium	Flowering	Fast	Fall/Winter	Best suited for a large property. Fast growth and wide canopy.
Inkwood	*Exothea paniculata*	25' - 35'	Medium	Native	Moderate	Summer	Slender dense crown with glossy leaves and tiny fragrant blooms in spring and early summer. Produces red berries that ripen to deep purple. Native
Jacaranda	*Jacaranda mimosifolia*	40' - 50'	Large	Flowering	Fast	Spring and late Summer	Needs space to develop adequate root system to reduce the likelihood of toppling. Produce light purple flowers in fall and winter. Not always showy.
Japanese Fern	*Filicium decipiens*	20'- 30'	Medium	Shade	Moderate	N/A	Broad canopy. Decorative leaves.
Japanese Privet	*Ligustrum japonicum*	5' - 25'	Small	Flowering	Fast	Spring	An attractive and tough plant that requires little maintenance. Extremely fast growing and can add green to new landscapes quickly.
Krug's Holly	*Ilex krugiana*	25'-30'	Small	Native	Moderate	N/A	Attractive red berries in winter.

Gumbo Limbo
Bursera simaruba

Hong Kong Orchid
Bauhinia blakeana

Inkwood
Exothea paniculata

Jacaranda
Jacaranda mimosifolia

Japanese Fern
Filicium decipiens

Japanese Privet
Ligustrum japonicum

Krug's Holly
Ilex krugiana

Recommended Trees Species

Common Name	Scientific Name	Height Range	Tree Size	Tree Type	Growth Rate	Blooming Season	Special Needs/Comments
Lignum Vitae	*Guaiacum sanctum*	10' - 30'	Small	Flowering	Very Slow	Year-round	Purple blooms several times per year. Slow-growing but long-lived, it is adaptable to dry rocky areas in full sun to light shade Can be planted adjacent to Power Lines. Rare, small native tree.
Live Oak	*Quercus virginiana*	40' - 50'	Large	Native	Moderate	N/A	Wind tolerant, long-lived, large native shade tree.
Madagascar Olive	*Noronhia emarginata*	20'-30'	Small	Shade	Moderate	N/A	Salt tolerant. Can be planted adjacent to power lines.
Mahogany	*Swietenia mahagoni*	35'-60'	Large	Native	Fast	N/A	Low wind tolerance; needs space to develop adequate root system to reduce the likelihood of toppling; Large seed pods can be a nuisance.
Mexican Cassia	*Caesalpinia mexicana*	20'-25'	Small	Flowering	Moderate	Summer (May – September)	Fragrant, golden flowers. Needs full sun. Can be planted adjacent to power lines.
Myrsine	*Myrsine guianensis*	15'-25'	Small	Native	Slow	N/A	Can be planted adjacent to power lines.
Paradise Tree	*Simarouba glauca*	35'-50'	Large	Native	Moderate	N/A	Attractive reddish color on new foliage. Fast growing native. Female plant bears black berries that attract birds.

Lignum Vitae
Guaiacum sanctum

Live Oak
Quercus virginiana

Madagascar Olive
Noronhia emarginata

Myrsine
Myrsine guianensis

Mahogany
Swietenia mahagoni

Mexican Cassia
Caesalpinia mexicana

Paradise Tree
Simarouba glauca

Recommended Trees Species

Common Name	Scientific Name	Height Range	Tree Size	Tree Type	Growth Rate	Blooming Season	Special Needs/Comments
Pigeon Plum	*Coccoloba diversifolia*	25'-30'	Small	Native	Moderate	Spring	Moderate-growing with a dense, columnar canopy producing small white flowers in the spring. Attractive bark. Native. Fruits ripen in late summer/fall and attract birds.
Pink Tabebuia	*Tabebuia heterophilla*	20'-30'	Medium	Flowering	Moderate	Spring	Moderate-growing flowering tree. It has showy light pink flowers. Drought tolerant once established.
Pitch Apple	*Clusia rosea*	25'-35'	Medium	Native	Slow	N/A	Medium-sized tree with stiff, thick leaves, salt tolerant. Can be used to shade buildings or patios.
Purple Trumpet Tree	*Tabebuia impetiginosa*	20'-30'	Medium	Flowering	Moderate	Winter/Spring	Moderate-growing flowering tree. It has showy light purple flowers. Drought tolerant once established.
Queens Crepe Myrtle	*Lagerstroemia speciosa*	30'-45'	Large	Flowering	Moderate	Summer	Moderate-growing with leaves that turn red before falling in the winter. It has large showy pink or purplish flowers during the summer. Drops leaves during cold spells.

Pigeon Plum
Coccoloba diversifolia

Pink Tabebuia
Tabebuia heterophilla

Pitch Apple
Clusia rosea

Queens Crepe Myrtle
Lagerstroemia speciosa

Purple Trumpet Tree
Tabebuia impetiginosa

Red Stopper
Eugenia rhombea

Recommended Trees Species

Common Name	Scientific Name	Height Range	Tree Size	Tree Type	Growth Rate	Blooming Season	Special Needs/Comments
Red Maple	*Acer rubrum*	20'-30'	Medium	Native	Fast	N/A	Oval shape and is a fast grower. This native tree displays red coloring during different seasons of the year.
Red Stopper	*Eugenia rhombea*	15'-20'	Small	Native	Moderate	N/A	Can be planted adjacent to power lines.
Royal Poinciana	*Delonix regia*	35'-45'	Large	Flowering	Fast	Summer	Fast growing evergreen tree. Produces showy reddish, orange flowers in summer. Long seed pods can be a nuisance. Subject to wind damage. Needs space to develop adequate root system to reduce likelihood of toppling.
Rusty Fig	*Ficus rubignosa*	30'-35'	Medium	Shade	Slow	N/A	This species of ficus tree forms a nice medium-sized canopy and does not have aerial roots. The undersides of the leaves are reddish-brown and hairy, hence the common name.
Satinleaf	*Chrysophyllum oliviforme*	20'-30'	Small	Native	Slow	N/A	Wet and / or shady areas, Wind tolerant.
Sea Grape	*Coccoloba uvifera*	15' – 35'	Large	Native	Moderate	N/A	Salt tolerant, Needs to have multiple trunks for stability.
Simpson Stopper	*Myricanthes fragrans*	20'-30'	Small	Native	Slow	N/A	Hardy native; can be planted adjacent to power lines. Small fragrant flowers , small berries attractive to birds.

Red Maple
Acer rubrum

Red Stopper
Eugenia rhombea

Royal Poinciana
Delonix regia

Rusty Fig
Ficus rubignosa

Satinleaf
Chrysophyllum oliviforme

Sea Grape
Coccoloba uvifera

Recommended Trees Species

Common Name	Scientific Name	Height Range	Tree Size	Tree Type	Growth Rate	Blooming Season	Special Needs/Comments
Spanish Stopper	*Eugenia foetida*	15'-20'	Small	Native	Moderate	N/A	Small native evergreen tree. Moderate columnar growth; small leaves in tight formation; flowers; good salt-tolerance. Can be planted adjacent to power lines.
South Florida Slash Pine	*Pinus elliottii 'Densa'*	70'-80'	Large	Native	Slow	N/A	Large, native conifer tree that needs to be used more. Prefer more acidic soils, so try to plant away from roads and sidewalks. Use Pine Straw Mulch to help lower PH of soil. Often planted in groups to create a natural-like setting.
Tamarind	*Tamarindus indica*	40'-50'	Large	Native	Moderate	N/A	Large evergreen shade tree with small feathery leaves. Wind tolerant. Seed pods can be a nuisance.
Vera Wood	*Bulneisia arborea*	20'-30'	Large	Flowering	Moderate	Summer	Large flowering tree (yellow). Tall, slow growing with bright yellow flowers and shiny deep-green compound leaves. This tree is adapted to dry conditions and has very hard wood and flowers throughout the year. Needs space to develop adequate root system to reduce the likelihood of toppling.

Simpson Stopper
Myricanthes fragrans

South Florida Slash Pine
Pinus elliottii 'Densa'

Spanish Stopper
Eugenia foetida

Tamarind
Tamarindus indica

Vera Wood
Bulneisia arborea

Recommended Trees Species

Common Name	Scientific Name	Height Range	Tree Size	Tree Type	Growth Rate	Blooming Season	Special Needs/Comments
White Gieger	*Cordia boissieri*	15'-20'	Small	Flowering	Moderate	Year-round	Salt tolerant. Can be planted adjacent to power lines.
White Stopper	*Eugenia axillaris*	15' – 25'	Small	Native	Moderate	N/A	Drought tolerant. Can be planted adjacent to power lines. Often multi-stem, has attractive bark
Wild Tamarind	*Lysiloma latisiliqua*	40' – 50'	Large	Native	Fast	N/A	Salt tolerant, Large, native shade tree with feathery leaves. New leaves appear reddish
Willow Bustic	*Dipholis salicifolium*	20'-30'	Medium	Native	Moderate	N/A	Salt tolerant, Medium-sized shade tree.

White Cordia
Cordia boissieri

White Stopper
Eugenia axillaris

Wild Tamarind
Lysiloma latisiliqua

Willow Bustic
Dipholis salicifolium

Recommended Shrub / Groundcover Species

Common Name	Scientific Name	Size	Type	Drought Tolerance	Maintenance Needs
Gold Mound	*Duranta repens*	Medium	Color	Medium	Medium
Foxtail Fern	*Asparagus densiflorus 'Myers'*	Groundcover	Border	Medium	Medium
Small Leaf Clusia	*Clusia guttifera*	Large	Native	High	Medium
Dwarf Firebush	*Hamelia patens, Dwarf*	Large	Native	High	Medium
Variegated Liriope	*Liriope muscari 'Variegata'*	Groundcover	Border	Medium	Low
African Bush Daisy	*Gamolepis chrysanthemoides*	Large	Color	Medium	Medium

African Bush Daisy
Gamolepis chrysanthemoides

Gold Mound
Duranta repens

Foxtail Fern
Asparagus densiflorus 'Myers'

Small Leaf Clusia
Clusia guttifera

Dwarf Firebush
Hamelia patens, Dwarf

Variegated Liriope
Liriope muscari 'Variegata'

Recommended Shrub / Groundcover Species

Common Name	Scientific Name	Size	Type	Drought Tolerance	Maintenance Needs
Orange Bromeliad	*Aechmia blanchetiana 'Orange'*	Medium	Color	Low	Medium
Walters Viburnum	*Viburnum obovatum*	Large	Native	High	Medium
Coontie	*Zamia pumila*	Small	Native	High	Low
Blueberry Flax Lily	*Dianella tasmanica*	Small	Color	Low	Low
Red Fountain Grass	*Pennistum setaceum 'Rubra'*	Medium	Native	High	Low
Sand Cord Grass	*Spartina bakeri*	Medium	Native	High	Low

Orange Bromeliad
Aechmia blanchetiana 'Orange'

Coontie
Zamia pumila

Red Fountain Grass
Pennistum setaceum 'Rubra'

Walters Viburnum
Viburnum obovatum

Blueberry Flax Lily
Dianella tasmanica

Sand Cord Grass
Spartina bakeri

Recommended Shrub / Groundcover Species

Common Name	Scientific Name	Size	Type	Drought Tolerance	Maintenance Needs
Indian Hawthorn	*Rhaphiolepsis indica*	Medium	Flowering	High	Low
Cardboard Palm	*Zamia furfuracea*	Large	Native	High	Low
Copperleaf	*Acalypha wilkesiana*	Large	Color	Medium	Medium
Thryallis	*Galphimia gracillis*	Medium	Flowering	High	Low
Wart Fern	*Microsorum scolopendrium*	Groundcover	Native	High	Low
Silver Buttonwood Hedge	*Conocarpus erectus 'serius'*	Large	Native	High	Medium

Indian Hawthorn
Rhaphiolepsis indica

Copperleaf
Acalypha wilkesiana

Wart Fern
Microsorum scolopendrium

Cardboard Palm
Zamia furfuracea

Thryallis
Galphimia gracillis

Silver Buttonwood Hedge
Conocarpus erectus 'serius'

Recommended Shrub / Groundcover Species

Common Name	Scientific Name	Size	Type	Drought Tolerance	Maintenance Needs
Evergreen Giant Liriope	*Liriope muscari 'Evergreen Giant'*	Groundcover	Border	Medium	Low
Dwarf Ilex 'Nana Schillings'	*Ilex vomitoria 'Nana schillings'*	Small	Native	High	Low
Sandankwa Viburnum	*Viburnum suspensum*	Large	Hedge	Medium	Medium
Dwarf Podocarpus 'Pringles'	*Podocarpus macrophyllus 'Pringle's Dwarf'*	Small	Border	Medium	Medium
Blanket Flower	*Gaillardia pulchella*	Groundcover	Native	High	Low

Evergreen Giant Liriope
Liriope muscari 'Evergreen Giant'

Sandankwa Viburnum
Viburnum suspensum

Blanket Flower
Gaillardia pulchella

Dwarf Ilex 'Nana Schillings'
Ilex vomitoria 'Nana schillings'

Dwarf Podocarpus 'Pringles'
Podocarpus macrophyllus 'Pringle's Dwarf'

Recommended Shrub / Groundcover Species

Common Name	Scientific Name	Size	Type	Drought Tolerance	Maintenance Needs
Dwarf Juniper 'Parsonii'	*Juniperus chinensis 'Parsonii'*	Groundcover	Border	Medium	Medium
Trailing Lantana	*Lantana montevidensis*	Groundcover	Flowering	High	Medium
Green Island Ficus	*Ficus microcarpa 'Green Island'*	Small	Border	Medium	High
Pink Muhly Grass	*Muhlenbergia capillaris*	Medium	Native	High	Low
Dwarf Fakahatchee Grass	*Tripsacum floridanum*	Medium	Native	High	Medium
Crinum Lily	*Crinum asiqticum*	Medium	Flowering	Low	Medium

Dwarf Juniper 'Parsonii'
Juniperus chinensis 'Parsonii'

Green Island Ficus
Ficus microcarpa 'Green Island'

Dwarf Fakahatchee Grass
Tripsacum floridanum

Trailing Lantana
Lantana montevidensis

Pink Muhly Grass
Muhlenbergia capillaris

Crinum Lily
Crinum asiqticum

Recommended Shrub / Groundcover Species

Common Name	Scientific Name	Size	Type	Drought Tolerance	Maintenance Needs
Shore Juniper	*Juniperus conferta*	Groundcover	Border	High	Medium
Cat Palm	*Chamaedorea cataractarum*	Large	Accent	Medium	Medium
Red Tip Cocoplum	*Chrysobalanus icaco 'Red Tip'*	Large	Native	High	Medium
Horizontal Cocoplum	*Chrysobalanus icaco* 'Horizontal'	Medium	Native	High	Low
Croton Species	*Codiaeum variegatum*	Large	Color	Medium	High
Wax Jasmine	*Jasminum volubile*	Medium	Hedge	Medium	Medium

Shore Juniper
Juniperus conferta

Red Tip Cocoplum
Chrysobalanus icaco 'Red Tip'

Croton Species
Codiaeum variegatum

Cat Palm
Chamaedorea cataractarum

Horizontal Cocoplum
Chrysobalanus icaco
'Horizontal'

Wax Jasmine
Jasminum volubile

Recommended Shrub / Groundcover Species

Common Name	Scientific Name	Size	Type	Drought Tolerance	Maintenance Needs
Boston Fern	*Nephrolepis exaltata*	Groundcover	Border	High	Low
Spider Lily	*Hymenocallis latifolia*	Groundcover	Border	Medium	Medium
Saw Palmetto	*Serenoa repens*	Medium	Native	High	Low
Red Hawaiian Ti Plant	*Cordyline fruticosa*	Medium	Color	High	Medium
Jamaican Caper	*Capparis cynophallophora*	Medium	Flowering	High	Low
Simpson Stopper	*Myrcianthes fragrans*	Large	Native	High	Low

Boston Fern
Nephrolepis exaltata

Saw Palmetto
Serenoa repens

Jamaican Caper
Capparis cynophallophora

Spider Lily
Hymenocallis latifolia

Red Hawaiian Ti Plant
Cordyline fruticosa

Simpson Stopper
Myrcianthes fragrans

Recommended Shrub / Groundcover Species

Common Name	Scientific Name	Size	Type	Drought Tolerance	Maintenance Needs
White Indigo Berry	*Randia aculeata*	Medium	Native	High	Medium
Wild Coffee	*Psychotria nervosa*	Medium	Native	Medium	Low
Gardenia	*Gardenia augusta*	Medium	Flowering	Low	Medium
Green Pittosporum	*Pittosporum tobira*	Small	Hedge	Medium	Medium
Hibiscus	*Hibiscus spp*	Large	Flowering	Low	High
Natal Plum	*Carrisa macrocarpa*	Small	Flowering	High	Medium

White Indigo Berry
Randia aculeata

Gardenia
Gardenia augusta

Hibiscus
Hibiscus spp

Wild Coffee
Psychotria nervosa

Green Pittosporum
Pittosporum tobira

Natal Plum
Carrisa macrocarpa

Recommended Shrub / Groundcover Species

Common Name	Scientific Name	Size	Type	Drought Tolerance	Maintenance Needs
Plumbago	*Plumbago auriculata*	Small	Flowering	Medium	Medium
Podocarpus	*Podocarpus macrophyllus*	Large	Hedge	Medium	Medium
Ixora 'Nora Grant'	*Ixora coccinea*	Small	Flowering	Medium	High
Texas Sage	*Leucophyllum frutescens*	Small	Flowering	High	Low
Trinette	*Schefflera arboricola*	Medium	Foliage color	High	Low
Viburnum	*Viburnum suspensum*	Medium	Hedge	Medium	Medium

Plumbago
Plumbago auriculata

Ixora 'Nora Grant'
Ixora coccinea

Trinette
Schefflera arboricola

Podocarpus
Podocarpus macrophyllus

Texas Sage
Leucophyllum frutescens

Viburnum
Viburnum suspensum

Recommended Shrub / Groundcover Species

Common Name	Scientific Name	Size	Type	Drought Tolerance	Maintenance Needs
Dwarf Ixora	*Ixora chinensis*	Small	Flowering	Medium	Medium
Compact Jatropha	*Jatropha integerrima 'compacta'*	Large	Native	Medium	Medium
Purple Queen	*Tradescantia pallida*	Groundcover	Border	High	Low
Mondo Grass	*Ophiopogon japonicus*	Small	Border	Low	Low
Ornamental (Perennial) Peanut	*Arachis glabrata*	Groundcover	Groundcover	High	Low
Powderpuff (Sunshine Mimosa)	*Mimosa strigillosa*	Groundcover	Flowering	High	Medium

Dwarf Ixora
Ixora chinensis

Purple Queen
Tradescantia pallida

Ornamental (Perennial) Peanut
Arachis glabrata

Compact Jatropha
Jatropha integerrima 'compacta'

Mondo Grass
Ophiopogon japonicus

Powderpuff (Sunshine Mimosa)
Mimosa strigillosa

Recommended Palms

Common Name	Scientific Name	Size	Type	Drought Tolerance	Maintenance Needs
Silver Palm	*Coccothrinax argentata*	10’-20’ HT	Native	High	Low
Florida Thatch Palm	*Thrinax radiata*	5’-15’ HT	Native	High	Low
Bottle Palm	*Hyophorbe lagenicaulis*	15’-20’ HT	Single Trunk	Medium	Medium
Pindo Palm	*Butia capitata*	15’-20’ HT	Single Trunk	Medium	Medium
Pygmy Date Palm	*Phoenix roebelenii*	5’-15’ HT	Accent	Medium	High
Spindle Palm	*Hyophorbe verschaffeltii*	15’-20’ HT	Single Trunk	Medium	Medium

Silver Palm
Coccothrinax argentata

Bottle Palm
Hyophorbe lagenicaulis

Pygmy Date Palm
Phoenix roebelenii

Florida Thatch Palm
Thrinax radiata

Pindo Palm
Butia capitata

Spindle Palm
Hyophorbe verschaffeltii

Recommended Palms

Common Name	Scientific Name	Size	Type	Drought Tolerance	Maintenance Needs
Sabal Palm / Cabbage Palm	*Sabal Palmetto*	30'-40' HT	Native	High	Low
Royal Palm	*Roystonea regia*	50'-70' HT	Native	Medium	Medium
Paurotis Palm	*Acoelorrhaphe wrightii*	20'-30' HT	Native	Medium	High
Bismarck Palm	*Bismarckia nobilis*	30'-50' HT	Specimen	High	Medium
Canary Island Date Palm	*Phoenix canariensis*	30'-40' HT	Specimen	High	Medium
Chinese Fan Palm	*Livistona chinensis*	20'-30' HT	Single Trunk	High	Low
Coconut Palm	*Cocos nucifera*	50'-80' HT	Single Trunk	High	Low

Sabal Palm / Cabbage Palm
Sabal Palmetto

Paurotis Palm
Acoelorrhaphe wrightii

Chinese Fan Palm
Livistona chinensis

Royal Palm
Roystonea regia

Bismarck Palm
Bismarckia nobilis

Coconut Palm
Cocos nucifera

Canary Island Date Palm
Phoenix canariensis

Recommended Palms

Common Name	Scientific Name	Size	Type	Drought Tolerance	Maintenance Needs
Date Palm 'Sylvester'	*Phoenix sylvestris*	30'-40' HT	Specimen	High	Medium
Date Palm 'Medjool'	*Phoenix dactylifera 'Medjool'*	30'-40' HT	Specimen	High	Medium
Foxtail Palm	*Wodyetia bifurcata*	20'-30' HT	Single Trunk	Medium	Medium
MacArthur Palm	*Ptychosperma macarthurii*	20'-30' HT	Single/Multi Trunk	Medium	Medium
Montgomery Palm	*Veitchia montgomeryana*	25'-35' HT	Single/Multi Trunk	Medium	Medium
Solitaire / Alexander Palm	*Ptychosperma elegans*	20'-30' HT	Single/Multi Trunk	Medium	Medium
Triangle Palm	*Neodypsis decaryi*	20'-30' HT	Specimen	High	Low

Date Palm 'Sylvester'
Phoenix sylvestris

MacArthur Palm
Ptychosperma macarthurii

Solitaire / Alexander Palm
Ptychosperma elegans

Foxtail Palm
Wodyetia bifurcata

Montgomery Palm
Veitchia montgomeryana

Triangle Palm
Neodypsis decaryi

Date Palm 'Medjool'
Phoenix dactylifera 'Medjool'

Recommended Vines

Common Name	Scientific Name	Native/Non-Native	Type	Flower Color	Growth Rate
Coral honeysuckle	*Lonicera sempervirens*	Native	Flowering	Pink/Orange	Fast
Corkystem passionflower	*Passiflora suberosa*	Native	Flowering	Yellow-Green	Fast
Muscadine Grape	*Vitis rotundifolia*	Native	Fruit	-	Moderate
Passion Flower	*Passiflora incarnata*	Native	Flowering	Pink/Purple	Fast
Allamanda	*Allamanda cathartica*	Non-Native	Flowering	Yellow/Pink	Fast
Bougainvillea	*Bougainvillea spp.*	Non-Native	Flowering	Various	Moderate

Coral honeysuckle
Lonicera sempervirens

Muscadine Grape
Vitis rotundifolia

Allamanda
Allamanda cathartica

Corkystem passionflower
Passiflora suberosa

Passion Flower
Passiflora incarnata

Bougainvillea
Bougainvillea spp.

Recommended Vines

Common Name	Scientific Name	Native/Non-Native	Type	Flower Color	Growth Rate
Bower vine	*Pandorea jasminoides*	Non-Native	Flowering	Pink/Red/White	Fast
Bridal Bouquet	*Stephanotis floribunda*	Non-Native	Flowering	White	Slow
Confederate Jasmine	*Trachelospermum jasminoides*	Non-Native	Flowering	White	Fast
Queens Wreath	*Petrea volubilis*	Non-Native	Flowering	Purple	Fast
Sky Vine	*Thunbergia grandiflora*	Native	Flowering	Blue/Violet	Fast
Mexican Flame Vine	*Pseudogynoxys chenopodioides*	Non-Native	Flowering	Red/Orange/	Moderate

Bower vine
Pandorea jasminoides

Confederate Jasmine
Trachelospermum jasminoides

Sky Vine
Thunbergia grandiflora

Mexican Flame Vine
Pseudogynoxys chenopodioides

Bridal Bouquet
Stephanotis floribunda

Queens Wreath
Petrea volubilis

Recommended Trees/Palms/Shrub Species

Common Name	Scientific Name	Height Range	Tree Size	Tree Type	Growth Rate	Blooming Season	Special Needs/Comments
Coconut Palm	*Cocos nucifera*	50'-60' HT	Large	Specimen	Medium	N/A	Adapt well to exposed coastal locations and warm temperatures. * Must be certified 'Malayan' or 'Maypan' variety only.
Crape Myrtle	*Lagerstroemia indica*	15'-25'	Small	Flowering	Moderate	Spring/Summer	Showy flowers and attractive light brown exfoliating bark. *Loses leaves in winter, do not used to satisfy more than 10% of needs.
Glaucous Cassia	*Senna surattensis*	20'-30'	Medium	Flowering	Fast	Year-round	Small tree that produces large amounts of golden flowers. *Not wind resistant, plant in sheltered areas.
Japanese Privet	*Ligustrum japonicum*	10'-20'	Small	Flowering	Fast	Spring/Summer	An attractive and tough plant that requires little care. *Should not be planted in medians or swales less than 8' in width.
Ficus hedge	*Ficus benjamina*	-	-	Hedge	Fast	N/A	Fast growth and thick foliage which provides privacy.*Cannot be used to satisfy a hedge requirement.
Silver Buttonwood	*Conocarpus erectus 'sericeus'*	10'-25'	Small	Native	Moderate	N/A	Small native evergreen tree. Salt tolerant. Can be planted adjacent to powerlines. *Should not be planted in medians or swales less than 8' in width.
Yellow Tabebuia	*Tabebuia caraiba*	20'-30'	Medium	Flowering	Moderate	Spring	Showy bright yellow flowers with silver, green foliage. *Not wind resistant, plant in sheltered areas.

Coconut Palm
Cocos nucifera

Crape Myrtle
Lagerstroemia indica

Glaucous Cassia
Senna surattensis

Japanese Privet
Ligustrum japonicum

Ficus hedge
Ficus benjamina

Silver Buttonwood
Conocarpus erectus 'sericeus'

Yellow Tabebuia
Tabebuia caraiba

APPENDIX C. Prohibited Plant List

Scientific Name	Common Name
Abrus precatorius	rosary pea
Acacia auriculiformis	earleaf acacia
Albizia julibrissin	mimosa, silk tree
Albizia lebbeck	woman's tongue
Ardisia crenata (*A. crenulata* misapplied)	coral ardisia
Ardisia elliptica (*A. humilis* misapplied)	shoebutton ardisia
Asparagus aethiopicus (*A. sprengeri;*	asparagus-fern
Bauhinia variegata	orchid tree
Bischofia javanica	bishopwood
Calophyllum antillanum (*C. calaba* misapplied)	Santa Maria, mast wood, Antilles calophyllum
Casuarina equisetifolia	Australian-pine, beach sheoak
Casuarina glauca	suckering Australian-pine, gray sheoak
Cinnamomum camphora	camphor tree
Colocasia esculenta	wild taro
Colubrina asiatica	lather leaf
Cupaniopsis anacardioides	carrotwood
Deparia petersenii	Japanese false spleenwort
Dioscorea alata	winged yam
Dioscorea bulbifera	air-potato
Dolichandra unguis-cati (=Macfadyena unguis-cati)	cat's claw vine
Eichhornia crassipes	water-hyacinth
Eugenia uniflora	Surinam cherry
Ficus microcarpa (*F. nitida* and *F. retusa* var. *nitida* misapplied)	laurel fig
Hydrilla verticillata	hydrilla
Hygrophila polysperma	green hygro
Hymenachne amplexicaulis	West Indian marsh grass
Imperata cylindrical (*I. brasiliensis*	cogon grass
misapplied)	
Scientific Name	**Common Name**
Ipomoea aquatica	water-spinach
Jasminum dichotomum	Gold Coast jasmine
Jasminum fluminense	Brazilian jasmine
Lantana camara (*= L. strigocamara*)	lantana, shrub verbena
Ligustrum lucidum	glossy privet
Ligustrum sinense	Chinese privet, hedge privet
Lonicera japonica	Japanese honeysuckle
Ludwigia hexapetala	Uruguay waterprimrose
Ludwigia peruviana	Peruvian primrosewillow
Lumnitzera racemosa kripa;	white-flowered mangrove; black mangrove
Luziola subintegra	Tropical American water grass
Lygodium japonicum	Japanese climbing fern
Lygodium microphyllum	Old World climbing fern
Manilkara zapota	sapodilla
Melaleuca quinquenervia	melaleuca, paper bark
Melinis repens (*= Rhynchelytrum repens)*	Natal grass
Mimosa pigra	catclaw mimosa
Nandina domestica nandina,	heavenly bamboo
Nephrolepis brownie (*= N. multiflora)*	Asian sword fern
Nephrolepis cordifolia	sword fern
Neyraudia reynaudiana	Burma reed, cane grass
Nymphoides cristata	crested floating heart
Paederia cruddasiana	sewer vine, onion vine

Paederia foetida	skunk vine
Scientific Name	**Common Name**
Panicum repens	torpedo grass
Pennisetum purpureum	Napier grass, elephant grass
Phymatosorus scolopendria	serpent fern, wart fern
Pistia stratiotes	water-lettuce
Psidium cattleianum (= P. littorale)	strawberry guava
Psidium guajava	guava
Pueraria montana var. lobata (= P. lobata)	kudzu
Rhodomyrtus tomentosa	downy rose-myrtle
Rhynchelytrum repens (See Melinis repens)	
Ruellia simplex[1]	Mexican petunia
Salvinia minima	water spangles
Sapium sebiferum (= Triadica sebifera)	popcorn tree, Chinese tallow tree
Scaevola taccada (= Scaevola sericea, S. frutescens)	scaevola, half-flower, beach naupaka
Schefflera actinophylla (= Brassaia actinophylla)	schefflera, Queensland umbrella tree
Schinus terebinthifolius	Brazilian-pepper
Scleria lacustris	Wright's nutrush
Senna pendula var. glabrata (= Cassia coluteoides)	climbing cassia, Christmas cassia, Christmas senna
Solanum tampicense (= S. houstonii)	wetland nightshade, aquatic soda apple
Solanum viarum	tropical soda apple
Sporobolus jacquemontii (= S. indicus var. pyramidalis)*	West Indian dropseed
Syngonium podophyllum	arrowhead vine
Syzygium cumini	jambolan-plum,
	Java-plum
Scientific Name	**Common Name**
Tectaria incisa	incised halberd fern
Thespesia populnea	seaside mahoe
Tradescantia fluminensis	small-leaf spiderwort

[1]Does not include Ficus microcarpa subsp. fuyuensis, which is sold as "Green Island Ficus"

[2] Chinese privet is a FLDACS Noxious Weed except for the cultivar 'Variegatum'

*****Any species that are listed on the most current "Florida Exotic Pest Plant Council" list of category 1 (most invasive) species are prohibited to be planted in the City of Oakland Park.

This is a copy from the F.E.P.P.C's web site as of September, 2015. The current edition of the F.E.P.P.C's list of category 1 species shall supersede this list as it is amended and adopted/published in the future.

Landscape Maintenance Specifications, Best Management Practices

City – Owned Land / Large Properties

A. Example of Landscape Maintenance Specifications for Public Areas

These specifications could also be modified for large properties with contracted landscape maintenance services.

1. The landscape maintenance contractor shall provide the following scope of services:
   a. Location: The location of the work shall be publicly – owned and maintained landscape areas as prescribed by the City's representatives.
   b. Litter Control: The contractor shall retrieve and dispose of all litter and debris as needed including, but not limited to, palm fronds, tree limbs, branches, leaves, berries, etc. This shall include cleaning all areas prior to mowing, and monitoring of the grounds, sidewalks, curbs and gutters on an ongoing basis. Personnel shall be available at all times to remove liter / debris as needed.
   c. Turf Mowing: A monthly mowing schedule shall be provided to City's representative prior to service. Mowing wet grass shall be avoided when possible. Mower blades must be kept sharp so that the cut grass edge is clean and not ragged. Mowing patterns shall be changed frequently to avoid wear. Any grass clippings or other plant debris remaining on the grass surface shall be removed the same day as the mowing service is performed. Clippings, mulch or other plant debris must be prevented from entering ponds, lakes, water features, or drains. In the event that this occurs, the materials shall be removed immediately.

      St. Augustine Grass – Mow only with a rotary mower at the following frequencies for a total of 36 cuts per year: 2X monthly in November, December, January, and February; 3X monthly in March, April, May, June, July, August, September and October. The cutting height shall be a minimum 3 ½" to a maximum 4" above soil level.

      I-95 / Oakland Park Boulevard – Mow with a rotary mower or bush hog at the following frequencies: 1X monthly in October, November, December, January, February and March; 2X Monthly in April, May, June, July, August and September. The cutting height shall be a minimum 3 ½" to a maximum 4" above soil level.

   d. Edging / Cleaning: Contractor shall trim and properly edge all shrub and flowerbeds as well as tree rings, curbs, walks, lighting and all other obstacles in the landscape and remove clippings. Paved areas (hard edges) shall be edged every mowing with respect to the turf type adjacent to the edging. Edging of beds and tree rings (soft edging) shall be executed every mowing with respect to the turf type adjacent to the edge. Damage to property or existing vegetation caused by improper trimming or edging shall be repaired or replaced within 48 hours at the Contractor's expense. All walks and other paved

areas shall be vacuumed, swept or blown off, or vacuumed as needed to prevent accumulation of clippings and dead insects. Landscape areas shall be raked and cleaned of clippings, leaves, sticks, twigs, and all litter each time the soft edging is done. All mowing schedules shall be subject to approval by the City's representative.

e. Mulching: Mulch planting beds in such a manner as to prevent weed growth, retain moisture to the plants, protect against soil erosion and nutrient loss, maintain a more uniform soil temperature, and improve the appearance of the planting beds. Avoid mulch mounded up on the trunks of palms, trees and the base of shrubs to encourage air movement in this area which aids in lowering disease susceptibility. Cypress mulch is prohibited in The City of Oakland Park. The use of Melaleuca or recycled mulch is encouraged.

f. Shrubs, Trees and Palm Maintenance: All hedges that require shearing shall be pruned quarterly; all other shrubs and ground cover material shall be pruned monthly to insure the best shape, health and character of the individual plant. The entire top of hedges must be trimmed and this may require the use of a scissor lift or bucket truck. Mechanical trimming may only be utilized when the health or appearance of the plant will not be damaged by the mechanical trimmers. Ground cover plants shall be selectively cut back to encourage lateral growth and kept in bounds and out of other plantings, walkways, lighting, etc. Cuts should be made with sharp and proper tools. When cutting parts of branches leave a living bud at the end of the stub. Make cuts sufficiently close to parent stem so that the healing can readily start under normal conditions. Prune only at the time of season proper for the variety. Prune or trim at least once or twice each growing season to keep the natural shape of the individual plant.

   Removal of dead limbs, branches and fronds from all trees and palms shall be ongoing (up to a height of 10 feet only). No pruning should be performed to live wood that would affect the fullness or intended character of the planting.

   Remove all sucker growth from the base of trees on an as needed basis. Remove any limbs, which pose a threat to public safety (up to a height of 10 feet only).

   There must be at least one employee on site during all tree trimming who possesses a Class B Tree Trimmers license or better as required by Broward County.

g. Fertilization: A schedule of fertilization dates and fertilizer analysis shall be subject to approval by City's representative prior to application. The fertilizer used shall be a commercial grade product and recommended for use on each plant type. Specific requirements should be determined by soil test results, soil type and the time of year. Applications shall proceed continuously once begun until all areas have been completed. In the event fertilizer is thrown on hard surfaces, it shall be removed immediately to prevent

staining. Any plants damaged by over –fertilization shall be replaced at the Contractor's expense.

i. St. Augustine Grass - St Augustine turf shall be fertilized three (3) times per year at a rate of 1lb. of N/1000 square feet. The N, P, K ratio shall vary with the time of year of the application and the results of soil analysis. Fertilizer shall be applied in the month of January, April, and October. The October application shall include a weed control product.

ii. Shrubs and Groundcover – The fertilizer for all planted shrubs and groundcover shall meet appropriate horticultural standards with an N,P,K ratio of 3:1:2 unless soil conditions or plant species dictate differently. At least 60% of the nitrogen must be from a non-water soluble organic source. All shrubs and groundcovers shall be fertilized by broadcasting by hand over the beds three (3) times per year. Fertilizer should be applied in the spring, fall and winter at 1 ½ to 3 lbs. N/100 square feet. The Contractor shall establish a program that will fertilize all shrubs and groundcover, describing the type of fertilizer required for each type of plant and the time of year this work will be undertaken.

iii. Trees & Palms – The fertilizer for all the planted hardwood trees shall meet proper horticultural standards with an N, P, K ratio of 4:1:4 unless soil conditions or plant species dictate differently. At least 60% of the nitrogen must be from a non-water soluble source. Concentrated slow-release fertilizer tablets may be used on trees if approved by the City's representative. Hardwood trees shall be fertilized twice (2) yearly, spring and fall, in the following amounts: one (1) pound of fertilizer per inch of tree diameter, but no more than eight (8) pounds of fertilizer per tree. Palms shall be fertilized three (3) times yearly with an N, P, K ratio of 8-2-12+ (4) Mg plus micronutrients. No substitutions allowed and 100% of the N, K and Mg must be controlled release.

The Contractor shall establish a program that will fertilize all trees and palms, describing the type of fertilizer required for each type of tree and the time of year this work will be undertaken. The fertilization schedule shall be provided to the City's representative not less than one (1) month prior to application. Any trees damaged by over-fertilization or by the use of the wrong type of fertilizer shall be replaced at the Contractor's expense. Changes in fertilization rates, methods and composition shall be subject to approval by the City's representative in writing

h. Disease Management: The Contractor shall control or eradicate diseases and infestations by chewing or sucking insects, leaf miners, fire ants and other pests including white fly (except on trees) through organic methods first and then if required by spraying affected plants with chemical sprays and combinations of sprays suitable for that particular disease or pest when the infestation or infection becomes evident and as often thereafter as necessary. The Contractor shall respond within 72 hours after a request or notice from City's representative. The Contractor shall be fully licensed to spray pesticides, and shall

use sound cultural practices that aid in preventing the presence or proliferation of insects and diseases.

i. Application of Herbicides: All turf, planting beds and tree rings shall be maintained in a weed free condition. The Contractor may apply various herbicides by means of spray type devices to aid in the control of unwanted weeds and vegetation. All applications shall be performed by persons holding a valid herbicide application license as issued by the State of Florida and shall be done in accordance with the herbicide manufacturer's recommended rates and all applicable Federal, State, County and Municipal regulations. Herbicides may be used only with prior approval by the City's representative as to type, location and method of application. The Contractor shall exercise extreme care so as not to overspray and affect areas not intended for treatment. Areas adversely affected by such overspray shall be restored at the Contractor's expense. Do not spray on windy days.

j. Turf Renovations: Turf renovations may be required if conditions warrant such a procedure and will be an extra charge. Conditions which warrant renovation include areas thinned out or damaged turf resulting from natural burnouts, traffic, or any area which has become noticeably depressed below the average grade of the other turf, or if the area becomes unsightly. Proper watering, fertilization and pest management will be critical during and after renovation. Any irrigation damaged because of turf renovation shall be repaired at the Contractor's expense. The Contractor shall be responsible for repairing ruts caused by vehicles pulling onto the grassy swales within 72 hours of the damage. Tamping or filling with sand are acceptable methods of repair.

k. Irrigation: the Contractor shall be responsible for the operation and maintenance of automatic irrigation system, and for setting and adjusting the time clocks to insure proper watering of all plant material and turf in the landscape. Irrigation schedules must comply with City, Broward County and South Florida Water Management District watering restrictions

The Contractor shall be responsible for the labor and supervision to make minor irrigation repairs to the lateral lines, risers and sprinkler heads up to two (2' inches) in diameter as required to keep the system operating. The Contractor shall also be responsible for repairing all electrical wires from zone valves back to the clock and for replacing damaged or broken valve boxes. The City shall reimburse the cost of parts for said repairs. Major repairs to main lines, valves, pumps and intake piping shall be reimbursed by the City for both labor and materials. Reimbursable repair work shall require authorization by the City's representative prior to commencement.

Prior to the commencement of the maintenance program, the Contractor shall have forty-five (45) days from the start of contract to inspect the irrigation system and report existing damage or incorrect operation and coverage to the City. The Contractor shall be

responsible for the integrity of the system after this initial inspection report and subsequent repairs.

Time clocks shall be checked once a week or as may be required. The Contractor shall, at least once per month, fully operate all the irrigation zones and replace, repair or clean all irrigation heads, lines, valves, valve boxes and controllers as needed. Any equipment damaged by the Contractor's operation shall be replaced with the same equipment and by the same manufacturer unless otherwise approved by the City's representative.

The irrigation shall be capable of providing 1 ½ "of water to all turf and shrub beds each week or as often as required to provide for a uniform green landscape appearance. The system shall be adjusted during the various seasons. The Contractor shall be required to make all repairs within a minimum 24 hour time period or sooner as directed by the City's representative. Any form of damage to the irrigation system must be reported to the City's representative immediately upon discovery.

Irrigate as necessary during periods of little or no rainfall using the automatic irrigation system and any supplemental watering necessary to apply the proper amount of water to keep the plant material in optimum health. Supplemental watering may require a large portable watering tank, impact sprinklers or additional hose to be supplied by the Contractor.

The Contractor shall provide a written irrigation schedule to the City's representative. The Contractor shall be responsible for controlling the amount of water used for irrigation and any damage that result from over-watering or insufficient watering shall be the responsibility of the Contractor.

l. Contractor: shall be responsible for reporting the location of all graffiti on signs, utility cabinets, walkways and roadways to the City on a daily basis.