Town of Miami Lakes

Storm Water Master Plan

Update #3

May 2019

Prepared For:
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Executive Summary

The Town of Miami Lakes is located in northwestern Miami-Dade County, Florida and was incorporated in December 2000. In January 2003, Kimley-Horn and Associates, Inc. (KHA) completed a Storm Water Master Plan for the Town in preparation of the Town assuming responsibility for storm water management within its boundaries. In March 2003, the Town adopted Ordinance 03-31 which established the Town's Storm Water Utility and assumed maintenance responsibility from Miami-Dade County for drainage facilities located within the Town boundary. In April 2006, KHA completed Storm Water Master Plan Update #1 in order to enable the Town to examine the effectiveness of the ongoing Storm Water Operation and Maintenance and Capital Improvement Programs. Subsequently, KHA completed Storm Water Master Plan Update #2 in April 2012 to continue the efforts and now this 3rd update.

In the six years since Storm Water Master Plan Update #2 was completed, the Town of Miami Lakes has implemented the recommended Operations and Maintenance Program and constructed several of the drainage projects included in the Capital Improvement Program utilizing grant funding and revenue from the Storm Water Utility. This Storm Water Master Plan Update #3 will enable the Town to examine the effectiveness of the ongoing Operation and Maintenance Program, to evaluate progress in implementing the Capital Improvement Program, and to identify additional Capital Improvement Projects for future reduction of flooding and improvement of water quality within the Town of Miami Lakes.

In order to measure the performance of each drainage sub-basin, performance goals were identified in the Town's original Storm Water Master Plan. This report summarizes the performance against goals established in the original plan for ten (10) priority sub-basins. The report also recommends drainage improvements that will improve storm water management in the selected priority sub-basins. Recommended locations of improvement were identified using the Town's existing GIS files identifying the locations of existing infrastructure. The recommended improvements are the basis for the Capital Improvement Program contained at the end of the report.

In addition to a review of the performance criteria and improvements recommended to reduce flooding in the analyzed sub-basins, an analysis was performed to estimate the impacts on construction cost to the estimated capital improvements if there should be a 6-inch and 12-inch raise in groundwater elevations due to anticipated sea level raise.

The Capital Improvement Program contains approximately an average of $850,000 in annual expenses related to ongoing operation and maintenance of the existing system in conformance with the mandates of Federal and State government agencies and the Town's desire to improve drainage conditions. The Capital Improvement Program also contains approximately $13,700,000 worth of major Capital Improvement Projects recommended to be implemented over the next ten years.

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Introduction

The Town of Miami Lakes is located in northwestern Miami-Dade County, Florida and was incorporated in December 2000. Figure 1 illustrates the location of the Town of Miami Lakes. In January 2003, Kimley-Horn and Associates, Inc. (KHA) completed a Storm Water Master Plan for the Town in preparation for the Town assuming responsibility for storm water management within its boundaries. In March 2003, the Town adopted Ordinance 03-31 which established the Town's Storm Water Utility and assumed maintenance responsibility from Miami-Dade County for drainage facilities located within the Town's boundary. As a co-permittee with Miami-Dade County under the Florida Department of Environmental Protection's (FDEP) Municipal Separate Storm Sewer System (MS4) permit number FLS 000003, the Town was required to prepare a comprehensive storm water management program, prompting the development of the Storm Water Master Plan. In order to continue the Town's efforts to improve its storm water management, the master plan was updated with Storm Water Master Plan Update #1 completed in April 2006 and Storm Water Master Plan Update #2 in April 2012. This allowed the Town to examine the effectiveness of the ongoing Operation and Maintenance Program, to evaluate progress in implementing the Capital Improvement Program, and to identify additional Capital Improvement Projects for future reduction of flooding and improvement of water quality within the Town of Miami Lakes.

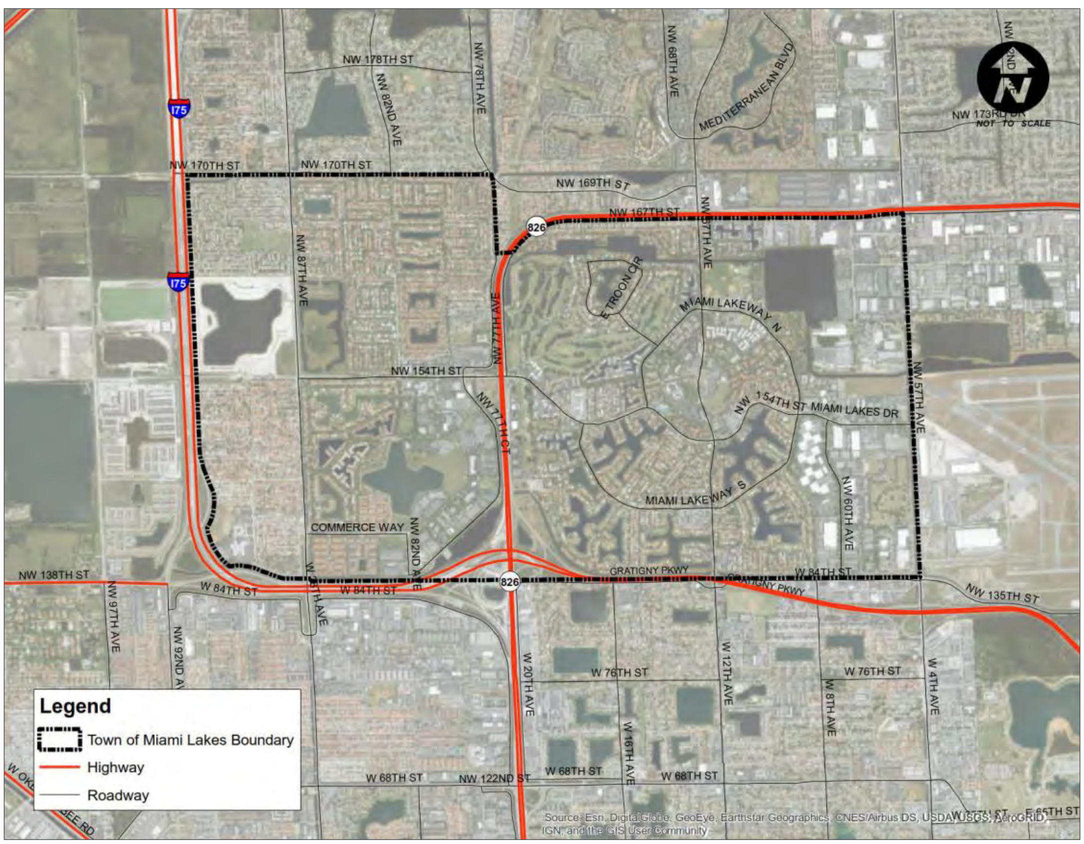


Figure 1-Town of Miami Lakes Location Map

This Storm Water Master Plan Update #3 will enable the Town to examine the effectiveness of the ongoing Operation and Maintenance Program, to evaluate progress in implementing the Capital Improvement Program, and to identify additional Capital Improvement Projects for future reduction of flooding and improvement of water quality as a part of the Town of Miami Lakes continued efforts to improve storm water management.

The first section of this Storm Water Master Plan update consists of research for the data collection phase of the plan. Research included a review of previous storm water master plans, regulatory requirements and permits, GIS coverage, completed projects since the last update, current deficiencies, and priority sub-basins identified for the study. Existing information of storm water management available from various sources including the Miami-Dade County Department of Environmental Resource Management (DERM), the Miami-Dade County Department of Public Works, the South Florida Water Management District (SFWMD), the Federal Emergency Management Agency (FEMA), the Florida Department of Environmental Protection (FDEP), and Town of Miami Lakes records was compiled in this section.

The second section of this Storm Water Master Plan contains drainage analysis of ten (10) sub-basins that were selected as priority areas for improvement by the Town. Proposed drainage improvements along with estimated cost for the priority sub-basins are recommended to meet performance goals associated with both reducing flooding and improving water quality.

The third section of this Storm Water Master Plan outlines a Capital Improvement and an Operations and Maintenance Program for the Town's Storm Water Utility.

In the six years since Storm Water Master Plan Update #2 was completed, the Town of Miami Lakes has implemented the recommended Operations and Maintenance Program update recommended in Storm Water Master Plan Update #2 and constructed several of the drainage projects included in the Capital Improvement Program utilizing grant funding and revenue from the Storm Water Utility.

As a part of the Town's strategic planning initiative to improve efficiency of stormwater infrastructure as well as develop standards for infrastructure, the effects of groundwater rise were examined. Rising groundwater will reduce efficiencies of the storm water systems and therefore additional infrastructure will be required to provide the same protections in the future. Additional analyses were performed to establish expected improvement cost increases to prepare the Town for future conditions.

Data Collection and Existing Conditions

Available storm water management information for the Town of Miami Lakes was reviewed to provide a baseline for this Storm Water Master Plan Update. The information reviewed included the following:

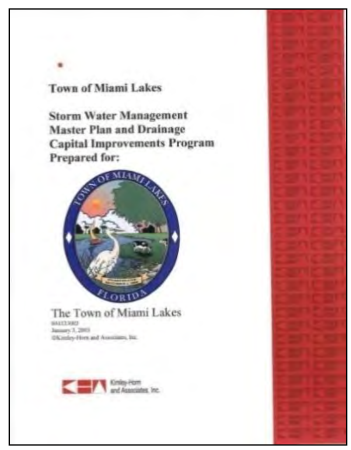
1. Town of Miami Lakes Storm Water Master Plan, Storm Water Master Plan Update #1, and Storm Water Master Plan #2.
2. Town permits, ordinances, regulations and guidance for storm water management.
3. Storm water management GIS coverage.
4. Design and record drawings of completed and proposed drainage projects.
5. Review of citizen complaints identify existing drainage deficiency areas.

The following sections contain summaries of the gathered information.

Town of Miami Lakes Storm Water Master Plan, Update #1, and Update #2

The Town's original Storm Water Master Plan was issued in January 2003. The first update was issued in April 2006 and the second update was issued in April 2012.

Storm Water Master Plan (2003)



In order to address adequate environmental protection and adequate flood protection, the Town of Miami Lakes created the Storm Water Utility to enable the Town to take ownership and operational responsibilities of it's storm water management system. As a part of the Storm Water Utility creation, the Town selected Kimley-Horn and Associates, (KHA) to conduct a Storm Water Management Plan.

The Storm Water Management Plan identified areas of concern (Figure 2) as well as analyzed sixteen (16) sub-basins (Figure 3) for drainage analysis. The analysis consisted of the establishment of performance goals to reduce flooding and improve water quality. All of the performance goals identified have been the basis of all subsequent storm water management update analysis.

The priority sub-basins analyzed in the original Storm Water Master Plan for improvements included:

- Loch Ness
- Lake Glenn Ellen
- Lake Sandra
- Lake Cynthia Sections 1, 2, and 3
- Lake Carol Sections 1, 2, 3, and 4
- Lake Elizabeth Sections 1 and 2

- Bull Run Road
- Miami Lakeway North
- NW 154th Street
- NW 82nd Avenue

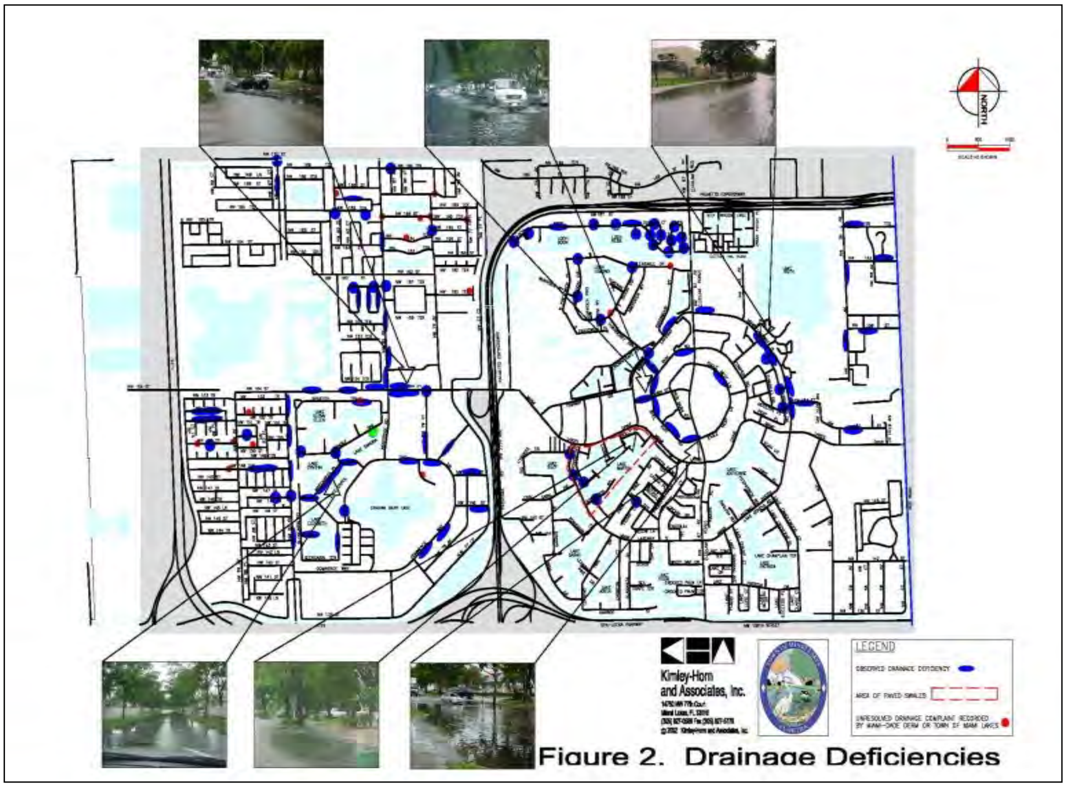


Figure 2-Storm Water Master Plan (2003) Drainage Deficiencies Identified

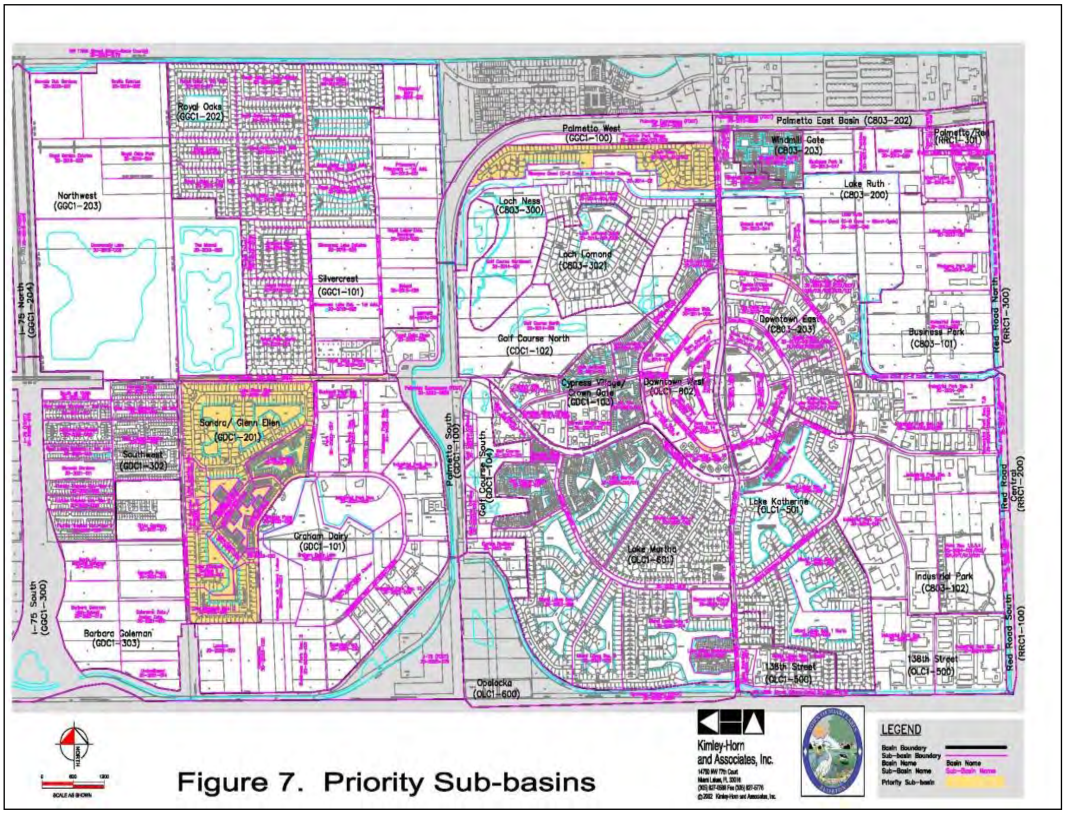
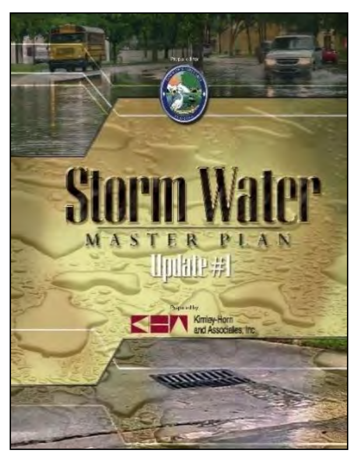


Figure 3-Storm Water Master Plan (2003) Priority Sub-Basins Identified

A Capital Improvement and Operations and Maintenance Program was developed for the Town's Storm Water Utility to help plan and implement the proposed improvements identified in the original Storm Water Master Plan. Many of the projects identified have been constructed with the remaining improvements no longer needed due to a significant reduction in flooding due to the implementation of the Operations and Maintenance Program.

Storm Water Master Plan Update #1 (2006)

Storm Water Master Plan Update #1 was issued in April 2006. The update enabled the Town to examine the effectiveness of the ongoing Operation and Maintenance Program, to evaluate progress in implementing the Capital Improvement Program, and to identify additional Capital Improvement Projects for future reduction of flooding and improvement of water quality within the Town of Miami Lakes.



The first section noted improved drainage conditions within the Town following the Town assuming responsibility for the drainage system from Miami-Dade County.

The second section contained drainage analysis of eighteen (18) priority sub-basins, ten (10) from the original Master Plan and eight (8) new ones. Drainage improvements for the priority sub-basins were recommended to meet performance goals for reducing flooding and improving water quality. An exhibit from the update showing the location of the priority sub-basins identified in Storm Water Master Plan Update #1 can be seen in Figure 4. The new priority sub-basins identified for analysis in the first update include:

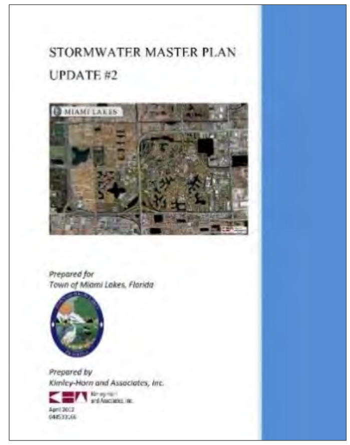
- Lake Patricia
- NE Industrial
- Business Park East
- Industrial Areas
- Lake Martha
- Olivia Gardens
- South Miami Lakeway North
- Lake Sarah

The third section outlined an updated Capital Improvement and Operations and Maintenance Programs for the Town's Storm Water Utility. Again, many of the projects identified in the 2006 Storm Water Master Plan Update #1 Capital Improvement Program had been implemented utilizing grant funding and the proceeds of the Town's Storm Water Utility.

Figure 4-Storm Water Master Plan Update #1 (2006) Priority Sub-Basins and Drainage Deficiencies Identified

Storm Water Master Plan Update #2 (2012)

Storm Water Master Plan Update #2 was issued in April of 2012 to review improvements that were done since the previous update and analyze additional priority sub-basins for improvements. The update identified seven (7) new priority sub-basins:



- West Lakes A
- West Lakes C
- West Lakes D
- West Lakes E
- Royal Oaks A
- Royal Oaks B
- Royal Oaks C

Additionally, West Lakes B (Olivia Gardens) was re-evaluated for inclusion into the entire West Lakes drainage system.

The Capital improvement and Operations and Maintenance Programs were updated to include improvements identified for the priority sub-basins as well as the previously analyzed Lake Sarah and Lake Martha sub-basins which were remaining from Update #1. Priority sub-basins analyzed and identified drainage deficiencies are shown in Figure 5.

A prioritization matrix along with a Capital Improvement Program timeline were developed to assist the Town in planning projects and spending from the 2011/12 fiscal year to the 2020/2021 fiscal year. Improvements have been made to all of the priority sub-basins identified in the second update since it's issuance.

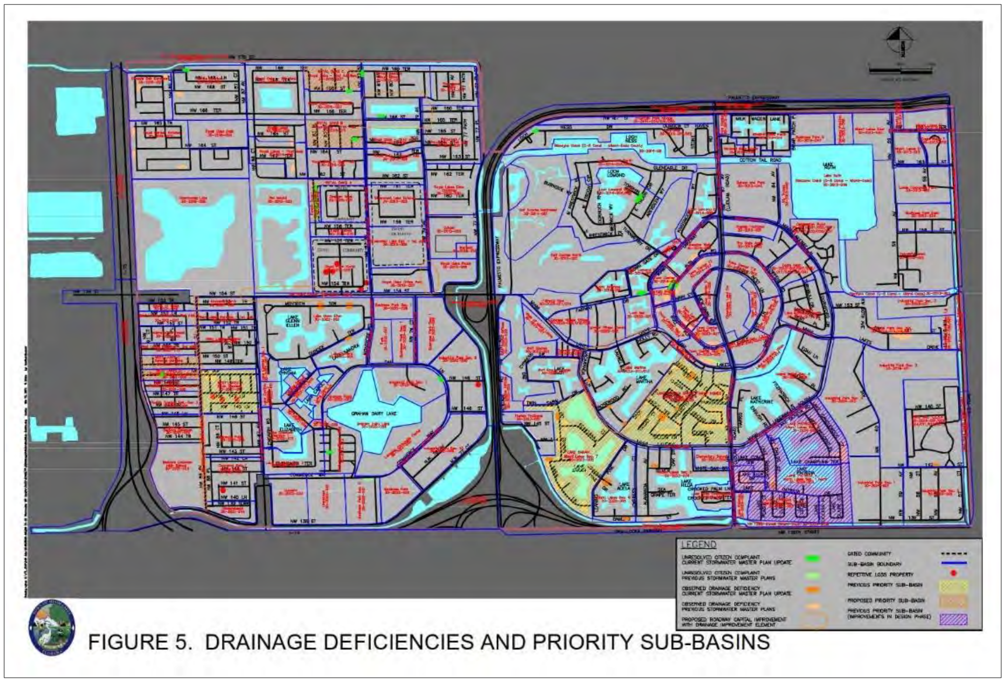


Figure 5-Storm Water Master Plan Update #2 (2012) Priority Sub-Basins and Drainage Deficiencies Identified

Town Permits, Ordinances, Regulations and Guidance

Storm water management in the Town must consider the requirements associated with multiple permits, ordinances, regulations and guidelines.

NPDES Permit

The Town is a co-permittee on the Miami-Dade County Multiple Separate Storm Sewer System (MS4) Permit through the EPA's National Pollutant Discharge Elimination System (NPDES). The permit is administered by the Florida Department of Environmental Protection (DEP). Each year, the co-permittees are required to submit an annual report to DEP detailing progress on permit mandated activities. These activities range from inspecting storm water treatment facilities to conducting public awareness events to publicizing the environmental consequences of illegal dumping. An annual report form was submitted for Year 6 in February 2018 which covered the time period between June 2016 through June 2017. MS4 permit mandated activities should be included in the Town's Storm Water Utility Operation and Maintenance Budget. As per Year 6's Annual Report Form for Individual NPDES Permits for Municipal Separate Storm Sewer Systems (DEP Form 62-624.600(2)) submitted to FDEP by the Town of Miami Lakes no areas of new development nor significant redevelopment have been reported.

CRS Application

The Town of Miami Lakes was the first of a few of incorporated Miami-Dade municipalities to join the National Flood Insurance Program (NFIP) Community Rating System (CRS) program with an initial rating of Class 6. This rating entitled residents in the Special Flood Hazard Area (SFHA) to a 20% flood insurance premium discount. As of Storm Water Master Plan Update #2 (April 2012) the Town had upgrade to a Class 5. However, as of May 2017 the CRS for the Town has been downgraded back to a Class 6 allowing for a 20% flood insurance premium discount. Maintaining the Town's CRS rating requires inter-departmental teamwork because it includes activities implemented by the Building Department, the Planning Department, the Parks Department and the Public Works Department. CRS activities such as Public Outreach, Flood Map Reading Service, Flood Information Website, Flood Protection Assistance, Flood Data Maintenance, and Drainage System Maintenance should be included in the Town's Storm Water Utility Operation and Maintenance Budget.

Floodplain Management Ordinance and Regulations

Upon incorporation, the Town of Miami Lakes adopted the Miami-Dade County Code. Since that time, the Town has passed additional ordinances pertaining to storm water management. In March of 2003, the Town passed Ordinances 03-31 and 03-32 which established the Town's Storm Water Utility and set the Storm Water Utility rate at $4.50 per Equivalent Residential Unit. These ordinances established the Town's Storm Water Utility as a source of funding for storm water related projects and maintenance activities within the Town. In April 2003, the Town adopted Ordinance 03-34-B which revised the Town's Floodplain Management Regulations. This Ordinance was subsequently revised by Ordinance 05-67 in March 2005 and Ordinance 10-122 in May 2010. The Floodplain Management Ordinance sets minimum flood protection standards for new and substantially improved properties within the Town. There have been no other ordinances adopted as of the publication of this update.

In December 2003, the Town adopted the Comprehensive Plan for the Town of Miami Lakes under Ordinance 03-46. The Comprehensive Plan contains a section on Storm Water Management which sets storm water management Level of Service standards for development within the Town. These standards and modifications to date will be applied to the storm water improvement recommendation for this master plan update.

Storm Water Management GIS Coverage

As part of the original Town of Miami Lakes Storm Water Master Plan, KHA obtained Geographic Information System (GIS) information on existing storm water systems from Miami-Dade County Department of Environmental Resource Management (DERM). This information was in the form of an AutoCAD file showing the location of drainage infrastructure and several hard copy data sheets showing additional information on each drainage structure. As part of the Town's Storm Water Master Plan Update #1, KHA converted this information to ArcGIS format. To date the Town has not updated the database with infrastructure information from completed drainage improvement projects. The Town has recently added the requirement to provide as-built information in GIS as part of new Capital Improvement Projects

(CIPs). It is recommended that the database be updated for all projects completed to date for an improved Operations and Maintenance program.

Summary of Completed Storm Water Projects

The previous Storm Water Master Plan Update #2 identified seven (7) priority sub-basins for Capital Improvement Projects. Capital Improvement Projects for four (4) of these priority sub-basins have been constructed:

- West Lakes A (NW 89th Ave.)
- Royal Oaks A
- Royal Oaks B
- Royal Oaks C

In addition, improvements for the following three (3) previous priority sub-basins are currently in the design phase:

- West Lakes C
- West Lakes D
- West Lakes E

All priority sub-basins from Storm Water Master Plan #2 have either been constructed through Capital Improvement Projects or are currently in design. However, the improvements to Miami Lakeway North identified in Storm Water Master Plan #1 have not been completed and will be included in the Capital Improvement Program of this update.

Prior to this update, the Town of Miami Lakes has identified and analyzed 31 priority sub-basins with improvements implemented to 26 of them. Issues in four (4) previous priority sub-basins have been resolved by implementation of the Operations and Maintenance Program, and one (1) previous priority sub-basin still requires improvements.

Table 1 includes a list of all previous priority sub-basins identified as well as their status. Exhibit 1 in Appendix A shows the locations of all of the Town’s sub-basins as well as those previously identified for analysis.

Table 1-Previously Identified Priority Sub-Basins

Priority Sub-Basin	SWMP	Status
Lock Ness	SWMP (2003)	Project Completed
Lake Glenn Ellen	SWMP (2003)	Project Completed
Lake Sandra	SWMP (2003)	Resolved with Maintenance
Lake Cynthia Section 1	SWMP (2003)	Project Completed
Lake Cynthia Section 2	SWMP (2003)	Project Completed
Lake Cynthia Section 3	SWMP (2003)	Resolved with Maintenance
Lake Carol Section 1	SWMP (2003)	Resolved with Maintenance
Lake Carol Section 2	SWMP (2003)	Project Completed
Lake Carol Section 3	SWMP (2003)	Project Completed
Lake Carol Section 4	SWMP (2003)	Resolved with Maintenance
Lake Elizabeth Section I	SWMP (2003)	Project Completed
Lake Elizabeth Section 3	SWMP (2003)	Project Completed
Bull Run Road	SWMP (2003)	Project Completed
Miami Lakeway N	SWMP (2003)	Project Completed
NW 154th Street	SWMP (2003)	Project Completed
NW 82nd Avenue	SWMP (2003)	Project Completed
Lake Patricia	SWMP Update 1 (2006)	Project Completed
NE Industrial	SWMP Update 1 (2006)	Project Completed
Business Park East	SWMP Update 1 (2006)	Project Completed
Industrial Areas	SWMP Update 1 (2006)	Project Completed
Lake Martha	SWMP Update 1 (2006)	Project Completed
Olivia Gardens	SWMP Update 1 (2006)	Project Completed
South Miami Lakeway North	SWMP Update 1 (2006)	
Lake Sarah	SWMP Update 1 (2006)	In Construction
West Lakes A (NW 89th Ave.)	SWMP Update 2 (2012)	Project Completed
West Lakes C	SWMP Update 2 (2012)	In Design
West Lakes D	SWMP Update 2 (2012)	In Design
West Lakes E	SWMP Update 2 (2012)	In Design
Royal Oaks A	SWMP Update 2 (2012)	Project Completed
Royal Oaks B (Olivia Gardens)	SWMP Update 2 (2012)	Project Completed
Royal Oaks C	SWMP Update 2 (2012)	Project Completed

Identification of Drainage Deficiency Areas

Citizen Complaint Records

KHA obtained copies of unresolved citizen storm water related complaints from Town staff. The areas represented by these complaints are shown in Figure 6 as well as Exhibit 1 in Appendix A.

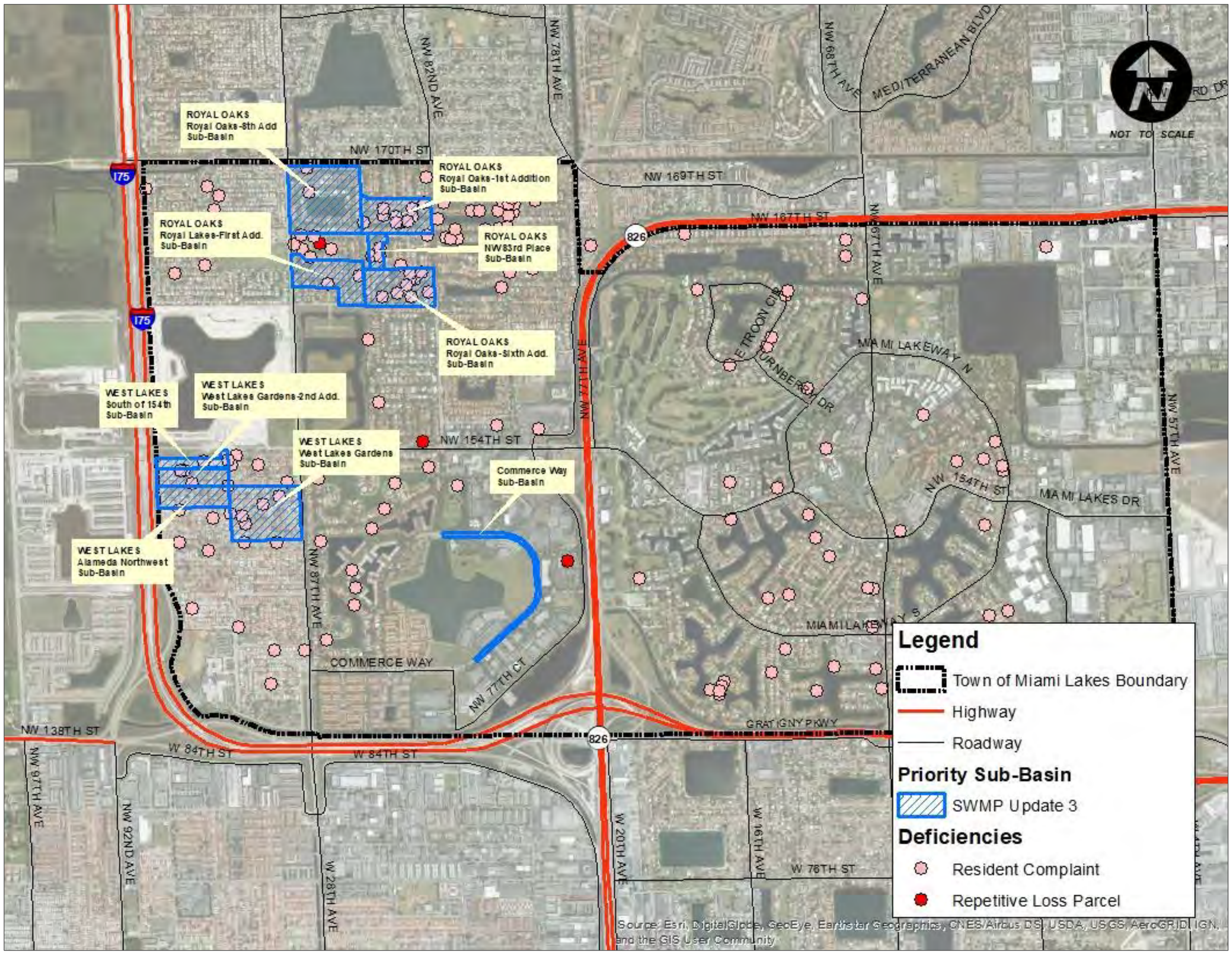


Figure 6-Drainage Deficiencies and Priority Sub-Basins

Updated Sub-Basin Prioritization

Based on observed flooding, complaints, road conditions and the other parameters noted above, the Town selected priority sub-basins for more in-depth study under the original Storm Water Master Plan, Storm Water Master Plan Update #1, and Storm Water Master Plan Update #2. Only one (1) of those priority sub-basins remain to be addressed through capital improvement projects. Therefore, the Town has identified ten (10) new priority sub-basins for review as part of this Storm Water Master Plan Update #3. These priority sub-basins are the subject of hydraulic and hydrologic analysis as part of this report. The locations of the new priority sub-basins are depicted in Figure 6. They include:

- Royal Oaks-8th Add.
- Royal Oaks-1st Addition
- Royal Lakes-First Add.
- Royal Oaks-Sixth Add.
- Northwest 83rd Place (a part of Royal Oaks B, Royal Oaks-Fifth Add.)

- South of 154th
- West Lakes Gardens-2nd Add.
- Alameda Northwest
- West Lakes Gardens
- Commerce Way

Hydraulic and hydrologic analysis of these new priority sub-basins will result in Capital Improvement Project recommendations for these sub-basins which will be incorporated into an updated Storm Water Capital Improvement Program (CIP). Updated budget information associated with the one remaining Capital Improvement Projects from Storm Water Master Plan Update #1 (Miami Lakeway North) will also be incorporated into the new Storm Water CIP.

Additional analyses were performed to determine added improvement costs needed to mitigate the anticipated rise of groundwater.

Drainage Sub-Basin Analysis

Methodology

In order to measure the performance of each drainage sub-basin, performance goals were identified in the Town's original Storm Water Master Plan. These goals consist of minimum water quality and water quantity goals.

Water Quality Treatment Performance Goal

Drainage sub-basins discharging into lakes should have minimum water quality pre-treatment volume equal to the first one-half inch of runoff. Drainage sub-basins discharging into canals should have minimum water quality pre-treatment equal to the greater of the volume of the first one-inch of runoff or 2.5-inches over the impervious area contained within the sub-basin. This goal ensures that the drainage improvements meet South Florida Water Management District (SFWMD) and Miami-Dade County Department of Environmental Resource Management (DERM) requirements for water quality pre-treatment.

Water Quantity Treatment Performance Goals

The Town has adopted several water quantity treatment performance goals designed to reduce the potential for flooding within the Town. These goals set maximum flood elevations generated by various flood event to ensure that select features are protected within reason.

- During the 5-year, 24-hour design storm event, flooding should not exceed the crown of the local roadways located within the sub-basin.
- During the 10-year, 24-hour design storm event, flooding should not exceed the crown of the arterial or collector roadways located within the sub-basin.
- During the 25-year, 72-hour design storm event, flood depth should be less than 12-inches above the crown of the road.
- During the 100-year, 72-hour design storm event, flooding should not exceed building finish floor elevations.

Existing conditions in each of the priority sub-basins were modeled to determine the extent to which the performance goals are currently being met. When a performance goal was not being met within a sub-basin, storm water management improvements were proposed for the sub-basin to bring it into compliance with the performance goal.

For each priority sub-basin, the amount of existing paved area, building area, and pervious area was determined utilizing existing aerial photographs and Geographic Information System (GIS) data. Elevation information contained in the GIS data was utilized to estimate the average high and low elevation of the paved area, building area and pervious area associated with the sub-basin. This information along with information of existing drainage infrastructure located within the sub-basin was incorporated into a computer model. Existing flood routing and maximum flood stage produced by the four different design storm events for each sub-basin was analyzed within the computer model. In addition to flood routing analysis, each sub-basin was analyzed for water quality pre-treatment capacity if discharged to a lake or canal. SFWMD and DERM require storm water runoff to be pretreated to minimize pollution prior to discharging into any water body. Typically, water quality pre-treatment in the Town of Miami Lakes is provided by an exfiltration trench or by retention in roadside grass swale areas. The pre-treatment capacity of existing infrastructure within each sub-basin was estimated based on available data and compared with required pre-treatment volumes.

The following is a summary of the findings for each of the ten (10) priority sub-basins.

Model Assumptions

Various assumptions were made for developing the computer model as well as for the drainage calculations as follows:

- All elevations shown are in reference to the National Geodetic Vertical Datum of 1929 (NGVD).
- It was assumed that in residential areas, all private property contributed storm water runoff to the right-of-way.
- It was assumed that the groundwater throughout all sub-basins analyzed in this plan was at an elevation of 3.2 feet-NGVD.
- Typical soil storage values for soils found within South Florida were used in calculating the amount of storm water that is expected to infiltrate into the soil.

Royal Oaks

Location

The sub-basins analyzed in the Royal Oaks Basin includes areas in the Royal Oaks sub-division located between Northwest 82nd Avenue and Northwest 87th Avenue and between the Golden Glades Canal and Northwest 162nd Street in the northwestern residential area of the Town. It includes the sub-basins Royal Oaks-8th Add. (30-2015-007), Royal Oaks-1st Addition (30-2015-021), Royal Lakes First Add. (30-2015-018), Northwest 83rd Place (a part of 30-2015-011), and Royal Oaks-Sixth Add. (30-2016-011) and is part of the Royal Oaks (GGC1-202) Basin.

Existing and Future Conditions

Figure 7 shows existing conditions for the Royal Oaks priority sub-basins. The sub-basins consists of approximately 70.3 acres of single family residential development with approximately 11,600 linear feet of roadway. The existing drainage system in this basin consists of isolated catch basins connected to exfiltration trenches.

Figure 7-Royal Oaks Basin Area Delineation

Several resident complaints have been identified within these sub-basins and other sub-basins in the Royal Oaks area of the Town.

Based on available GIS and as-built information, the roadway centerline elevations within Royal Oaks range from a low of approximately 6.7 feet to a high of approximately 7.8 feet-NGVD. It was assumed that building finish elevations are 1.5 feet above crown of road elevations. Pervious area elevations were assumed to range from 0.1 feet above the minimum roadway elevation to flush with the finish floor elevations. Since the area is already developed, it is anticipated that future development conditions will not vary significantly from the existing conditions.

For the purposes of this analysis, each priority sub-basin within Royal Oaks was modeled separately. The delineation and identification of the sub-basin areas analyzed is shown in Figure 7.

Performance Goal Analysis

Based on the detailed hydrologic and hydraulic calculations for these sub-basins, which can be found in Appendix B, the majority of the modeled drainage areas within the sub-basins do not currently meet the Town of Miami Lakes performance goals. Table 2 shows the performance of the sub-basins versus performance goals. "Yes" means the given drainage area within the sub-basin meets the performance goal, and "No" means that the given drainage area within the sub-basin does not meet the performance goal.

Table 2-Royal Oaks Sub-Basin Performance Goal Analysis

Sub-Basin Area	Water Quality	5-Year Storm	10-Year Storm	25-Year Storm	100-Year Storm	Complaints
Royal Oaks-8th Add.	yes	no	no	no	no	yes
Royal Oaks-1st Addition	yes	no	no	no	no	yes
Royal Lakes-First Add.	yes	no	no	yes	yes	yes
Royal Oaks-Sixth Add.	yes	no	no	no	yes	yes
NW 83rd Place	yes	no	no	no	no	yes

Storm Drainage Deficiencies

Based on the hydrologic and hydraulic calculations for the sub-basins, the existing drainage infrastructure does not discharge adequate runoff to meet the desired performance criteria for any of the sub-basins. The capacity of the existing exfiltration trenches is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. Improvements to drainage infrastructure will be needed to address these inadequacies. These drainage sub-basins do not currently have a positive outfall.

Recommended Drainage Improvements

It is recommended that existing catch basins and pipes are cleaned and flushed of all sediment and debris and that catch basin elevations and locations are adjusted to minimize accumulation of sediment and debris. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps). In addition, additional exfiltration trench, catch basins, and/or manholes are proposed to provide water quality and water quantity treatment. Proposed improvements are shown Exhibits 2 through Exhibit 7 in Appendix A, as well as summarized in Table 3.

Table 3-Royal Oaks Improvements Summary

Description	Units	Royal Oaks-8th Add.	Royal Oaks-1st Addition	Royal Lakes-First Add.	Royal Oaks-Sixth Add.	NW 83rd Place	Total
Valley Gutter Restoration	L.F.	200	700	0	590	0	1,490
Driveway/Sidewalk Restoration	S.Y.	45	22	10	6	11	94
Asphalt Restoration	S.Y.	1,460	630	460	530	210	3,290
Inlet Apron	EA.	9	2	3	1	0	15
Drainage Pipe (18" HDPE)	L.F.	300	80	120	45	30	575
Exfiltration Trench	L.F.	1,300	575	420	1,750	170	4,215
Pollution Retardant Baffle	EA.	9	5	2	1	1	18
Catch Basin	EA.	0	0	0	0	0	0
Manhole	EA.	11	4	4	3	2	24
Core Drill Existing Structure	EA.	18	6	4	2	2	32

Environmental Impact of Proposed Improvements

A full analysis of the estimated pollutant loading for existing, future and proposed conditions was prepared for the priority sub-basins utilizing a spreadsheet developed for this purpose which can be found in Appendix C. Table 4 below shows how the proposed improvements will result in a significant reduction in the pollutant load contribution from this sub-basin to the Biscayne Aquifer for three major pollutants.

Table 4-Royal Oaks Sub-Basin Pollutant Analysis

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	59.10	54.76	4.34
Total Nitrogen	465.66	416.77	48.89
Total Suspended Solids	5581.95	5054.46	527.49

Capital Improvement Budget

Bases on the improvements identified in Exhibits 2 through Exhibit 7, a budget was developed for the proposed storm water capital improvements (see Table 5 thru Table 9). These improvements are bases on current conditions of the sub-basin areas.

Table 5-Royal Oaks-8th Add. Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Mobilization/ MOT/ Clearing & Grubbing	1	L.S.	$42,500	$43,000
2	Stormwater Pollution Prevention	1	L.S.	$4,250	$5,000
3	Valley Gutter Restoration	200	L.F.	$30	$6,000
4	Driveway/Sidewalk Restoration	45	S.Y.	$50	$3,000
5	Asphalt Restoration	1,460	S.Y.	$35	$52,000
6	Inlet Apron	9	EA.	$500	$5,000
7	Drainage Pipe (18" HDPE)	300	L.F.	$70	$21,000
8	Exfiltration Trench	1,300	L.F.	$200	$260,000
9	Pollution Retardant Baffle	9	EA.	$500	$5,000
10	Catch Basin	0	EA.	$5,000	$0
11	Manhole	11	EA.	$5,000	$55,000
12	Core Drill Existing Structure	18	EA.	$1,000	$18,000
13	Utility Sleeves and Adjustments	1	L.S.	$20,350	$21,000
14	Swale Restoration	1	L.S.	$20,350	$21,000
15	Professional Services	1	L.S.	$61,050	$62,000
16	Contingency	1	L.S.	$101,750	$102,000
TOTAL					$679,000

Table 6-Royal Oaks-1st Addition Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Mobilization/ MOT/ Clearing & Grubbing	1	L.S.	$19,700	$20,000
2	Stormwater Pollution Prevention	1	L.S.	$1,970	$2,000
3	Valley Gutter Restoration	700	L.F.	$30	$21,000
4	Driveway/Sidewalk Restoration	22	S.Y.	$50	$2,000
5	Asphalt Restoration	630	S.Y.	$35	$23,000
6	Inlet Apron	2	EA.	$500	$1,000
7	Drainage Pipe (18" HDPE)	80	L.F.	$70	$6,000
8	Exfiltration Trench	575	L.F.	$200	$115,000
9	Pollution Retardant Baffle	5	EA.	$500	$3,000
10	Catch Basin	0	EA.	$5,000	$0
11	Manhole	4	EA.	$5,000	$20,000
12	Core Drill Existing Structure	6	EA.	$1,000	$6,000
13	Utility Sleeves and Adjustments	1	L.S.	$9,850	$10,000
14	Swale Restoration	1	L.S.	$9,850	$10,000
15	Professional Services	1	L.S.	$29,550	$30,000
16	Contingency	1	L.S.	$49,250	$50,000
TOTAL					$319,000

Table 7-Royal Lakes-First Add. Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Mobilization/ MOT/ Clearing & Grubbing	1	L.S.	$13,800	$14,000
2	Stormwater Pollution Prevention	1	L.S.	$1,380	$2,000
3	Valley Gutter Restoration	0	L.F.	$30	$0
4	Driveway/Sidewalk Restoration	10	S.Y.	$50	$1,000
5	Asphalt Restoration	460	S.Y.	$35	$17,000
6	Inlet Apron	3	EA.	$500	$2,000
7	Drainage Pipe (18" HDPE)	120	L.F.	$70	$9,000
8	Exfiltration Trench	420	L.F.	$200	$84,000
9	Pollution Retardant Baffle	2	EA.	$500	$1,000
10	Catch Basin	0	EA.	$5,000	$0
11	Manhole	4	EA.	$5,000	$20,000
12	Core Drill Existing Structure	4	EA.	$1,000	$4,000
13	Utility Sleeves and Adjustments	1	L.S.	$6,900	$7,000
14	Swale Restoration	1	L.S.	$6,900	$7,000
15	Professional Services	1	L.S.	$20,700	$21,000
16	Contingency	1	L.S.	$34,500	$35,000
TOTAL					$224,000

Table 8-Royal Oaks-Sixth Add.

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Mobilization/ MOT/ Clearing & Grubbing	1	L.S.	$41,100	$42,000
2	Stormwater Pollution Prevention	1	L.S.	$4,110	$5,000
3	Valley Gutter Restoration	590	L.F.	$30	$18,000
4	Driveway/Sidewalk Restoration	6	S.Y.	$50	$1,000
5	Asphalt Restoration	530	S.Y.	$35	$19,000
6	Inlet Apron	1	EA.	$500	$1,000
7	Drainage Pipe (18" HDPE)	45	L.F.	$70	$4,000
8	Exfiltration Trench	1,750	L.F.	$200	$350,000
9	Pollution Retardant Baffle	1	EA.	$500	$1,000
10	Catch Basin	0	EA.	$5,000	$0
11	Manhole	3	EA.	$5,000	$15,000
12	Core Drill Existing Structure	2	EA.	$1,000	$2,000
13	Utility Sleeves and Adjustments	1	L.S.	$20,550	$21,000
14	Swale Restoration	1	L.S.	$20,550	$21,000
15	Professional Services	1	L.S.	$61,650	$62,000
16	Contingency	1	L.S.	$102,750	$103,000
TOTAL					$665,000

Table 9-NW 83rd Place

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Mobilization/ MOT/ Clearing & Grubbing	1	L.S.	$5,900	$6,000
2	Stormwater Pollution Prevention	1	L.S.	$590	$1,000
3	Valley Gutter Restoration	0	L.F.	$30	$0
4	Driveway/Sidewalk Restoration	11	S.Y.	$50	$1,000
5	Asphalt Restoration	210	S.Y.	$35	$8,000
6	Inlet Apron	0	EA.	$500	$0
7	Drainage Pipe (18" HDPE)	30	L.F.	$70	$3,000
8	Exfiltration Trench	170	L.F.	$200	$34,000
9	Pollution Retardant Baffle	1	EA.	$500	$1,000
10	Catch Basin	0	EA.	$5,000	$0
11	Manhole	2	EA.	$5,000	$10,000
12	Core Drill Existing Structure	2	EA.	$1,000	$2,000
13	Utility Sleeves and Adjustments	1	L.S.	$2,950	$3,000
14	Swale Restoration	1	L.S.	$2,950	$3,000
15	Professional Services	1	L.S.	$8,850	$9,000
16	Contingency	1	L.S.	$14,750	$15,000
TOTAL					$96,000

West Lakes

Location

The West Lakes basin includes the South of 154th (30-2021-018), West Lakes Gardens-2nd Add. (30-2021-007), Alameda Northwest (30-2021-005), and West Lakes Gardens (30-2021-002) sub-basins and is located between Northwest 87th Avenue and Northwest 92nd Avenue and between Northwest 148th Terrace and Northwest 153rd Terrace in the southwestern residential area of the Town known as West Lakes. It is part of the Southwest (GDCI-302) Basin.

Existing and Future Conditions

Figure 8 shows existing conditions for the West Lakes priority sub-basins. The sub-basins consist of approximately 54.9 acres of single family residential with approximately 13,500 linear feet of roadway. The drainage system in this basin consists of isolated catch basins connected to exfiltration trenches.

Based on available GIS and as-built information, the roadway centerline elevations within West Lakes priority sub-basins range from a low of approximately 6.7 feet to a high of approximately 8.9 feet-NGVD. It was assumed that building finish floor elevations are 1.5 feet above crown of road elevations. Pervious area elevations were assumed to range from 0.1 feet above the minimum roadway elevation to flush with the finish floor elevations. Since the area is already developed, it is anticipated that future development conditions will not vary significantly from the existing conditions.

Figure 8-West Lakes Basin Area Delineation

Performance Goal Analysis

Based on the detailed hydrologic and hydraulic calculations for these sub-basins, which can be found in Appendix B, the majority of the modeled drainage areas within the sub-basins do not currently meet the Town of Miami Lakes performance goals. Table 10 below shows the performance of the individual sub-basins analyzed versus performance goals. “Yes” means the given drainage area within the sub-basin meets the performance goal, and “No” means that the given drainage area within the sub-basin does not meet the performance goal.

Table 10-West Lakes Sub-Basin Performance Goal Analysis

Sub-Basin Area	Water Quality	5-Year Storm	10-Year Storm	25-Year Storm	100-Year Storm	Complaints
South of 154th	no	no	no	no	no	yes
West Lakes Gardens-2nd Add.	no	no	no	no	no	yes
Alameda Northwest	yes	no	no	no	no	no
West Lakes Gardens	yes	no	no	no	no	yes

Storm Drainage Deficiencies

Based on the hydrologic and hydraulic calculations for these sub-basins, the existing drainage infrastructure does not discharge adequate runoff to meet the desired performance criteria. The capacity of the existing exfiltration trenches is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. Improvements to drainage infrastructure will be needed to address these inadequacies. While Northwest 89th Avenue discharges to a canal to the south, none of the sub-basins analyzed have piped connections to the Northwest 89th Avenue pipeline and do not discharge to a lake or canal.

Recommended Drainage Improvements

It is recommended that existing catch basins and pipes are cleaned and flushed of all sediment and debris and that catch basin elevations and locations are adjusted to minimize accumulation of sediment and debris. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps). In addition, additional exfiltration trench, catch basins, and/or manholes are proposed to provide water quality and water quantity treatment. Proposed improvements are shown Exhibits 8 through Exhibit 10 in Appendix A, as well as summarized in Table 11.

Table 11-West Lakes Improvements Summary

Description	Units	South of 154th	West Lakes Gardens-2nd Add.	Alameda Northwest	West Lakes Gardens	Total
Valley Gutter Restoration	L.F.	650	1,820	400	5,960	8,830
Driveway/Sidewalk Restoration	S.Y.	0	3,450	0	5,340	8,790
Asphalt Restoration	S.Y.	3,100	3,770	1,600	7,950	16,420
Inlet Apron	EA.	4	2	6	6	18
Drainage Pipe (18" HDPE)	L.F.	270	50	130	200	650
Exfiltration Trench	L.F.	1,700	2,200	1,400	4,800	10,100
Pollution Retardant Baffle	EA.	12	10	14	21	57
Catch Basin	EA.	3	0	0	0	3
Manhole	EA.	6	6	10	11	33
Core Drill Existing Structure	EA.	9	2	4	5	20

Environmental Impact of Proposed Improvements

A full analysis of the estimated pollutant loading for existing, future and proposed conditions was prepared for the priority sub-basins utilizing a spreadsheet developed for this purpose which can be found in Appendix C. Table 12 below shows how the proposed improvements will result in a significant reduction in the pollutant load contribution from this sub-basin to the Biscayne Aquifer for three major pollutants.

Table 12-West Lakes Sub-Basin Pollutant Loading Analysis

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	28.54	26.44	2.10
Total Nitrogen	224.83	201.22	23.61
Total Suspended Solids	2695.04	2440.36	254.68

Capital Improvement Budget

The following budgets were developed for the proposed storm water capital improvements (see Table 13 thru Table 16).

Table 13-South of 154th Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Mobilization/ MOT/ Clearing & Grubbing	1	L.S.	$55,000	$55,000
2	Stormwater Pollution Prevention	1	L.S.	$5,500	$6,000
3	Valley Gutter Restoration	650	L.F.	$30	$20,000
4	Driveway/Sidewalk Restoration	0	S.Y.	$50	$0
5	Asphalt Restoration	3,100	S.Y.	$35	$109,000
6	Inlet Apron	4	EA.	$500	$2,000
7	Drainage Pipe (18" HDPE)	270	L.F.	$70	$19,000
8	Exfiltration Trench	1,700	L.F.	$200	$340,000
9	Pollution Retardant Baffle	12	EA.	$500	$6,000
10	Catch Basin	3	EA.	$5,000	$15,000
11	Manhole	6	EA.	$5,000	$30,000
12	Core Drill Existing Structure	9	EA.	$1,000	$9,000
13	Utility Sleeves and Adjustments	1	L.S.	$27,500	$28,000
14	Swale Restoration	1	L.S.	$27,500	$28,000
15	Professional Services	1	L.S.	$82,500	$83,000
16	Contingency	1	L.S.	$137,500	$138,000
TOTAL					$888,000

Table 14-West Lakes Gardens-2nd Add. Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Mobilization/ MOT/ Clearing & Grubbing	1	L.S.	$78,700	$79,000
2	Stormwater Pollution Prevention	1	L.S.	$7,870	$8,000
3	Valley Gutter Restoration	1,820	L.F.	$30	$55,000
4	Driveway/Sidewalk Restoration	3,450	S.Y.	$50	$173,000
5	Asphalt Restoration	3,770	S.Y.	$35	$132,000
6	Inlet Apron	2	EA.	$500	$1,000
7	Drainage Pipe (18" HDPE)	50	L.F.	$70	$4,000
8	Exfiltration Trench	2,200	L.F.	$200	$440,000
9	Pollution Retardant Baffle	10	EA.	$500	$5,000
10	Catch Basin	0	EA.	$5,000	$0
11	Manhole	6	EA.	$5,000	$30,000
12	Core Drill Existing Structure	2	EA.	$1,000	$2,000
13	Utility Sleeves and Adjustments	1	L.S.	$39,350	$40,000
14	Swale Restoration	1	L.S.	$39,350	$40,000
15	Professional Services	1	L.S.	$118,050	$119,000
16	Contingency	1	L.S.	$196,750	$197,000
TOTAL					$1,325,000

Table 15-Alameda Northwest Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Mobilization/ MOT/ Clearing & Grubbing	1	L.S.	$41,000	$41,000
2	Stormwater Pollution Prevention	1	L.S.	$4,100	$5,000
3	Valley Gutter Restoration	400	L.F.	$30	$12,000
4	Driveway/Sidewalk Restoration	0	S.Y.	$50	$0
5	Asphalt Restoration	1,600	S.Y.	$35	$56,000
6	Inlet Apron	6	EA.	$500	$3,000
7	Drainage Pipe (18" HDPE)	130	L.F.	$70	$10,000
8	Exfiltration Trench	1,400	L.F.	$200	$280,000
9	Pollution Retardant Baffle	14	EA.	$500	$7,000
10	Catch Basin	0	EA.	$5,000	$0
11	Manhole	10	EA.	$5,000	$50,000
12	Core Drill Existing Structure	4	EA.	$1,000	$4,000
13	Utility Sleeves and Adjustments	1	L.S.	$20,500	$21,000
14	Swale Restoration	1	L.S.	$20,500	$21,000
15	Professional Services	1	L.S.	$61,500	$62,000
16	Contingency	1	L.S.	$102,500	$103,000
TOTAL					$675,000

Table 16-West Lakes Gardens Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Mobilization/ MOT/ Clearing & Grubbing	1	L.S.	$177,300	$178,000
2	Stormwater Pollution Prevention	1	L.S.	$17,730	$18,000
3	Valley Gutter Restoration	5,960	L.F.	$30	$179,000
4	Driveway/Sidewalk Restoration	5,340	S.Y.	$50	$267,000
5	Asphalt Restoration	7,950	S.Y.	$35	$279,000
6	Inlet Apron	6	EA.	$500	$3,000
7	Drainage Pipe (18" HDPE)	200	L.F.	$70	$14,000
8	Exfiltration Trench	4,800	L.F.	$200	$960,000
9	Pollution Retardant Baffle	21	EA.	$500	$11,000
10	Catch Basin	0	EA.	$5,000	$0
11	Manhole	11	EA.	$5,000	$55,000
12	Core Drill Existing Structure	5	EA.	$1,000	$5,000
13	Utility Sleeves and Adjustments	1	L.S.	$88,650	$89,000
14	Swale Restoration	1	L.S.	$88,650	$89,000
15	Professional Services	1	L.S.	$265,950	$266,000
16	Contingency	1	L.S.	$443,250	$444,000
TOTAL					$2,857,000

Commerce Way

Location

The Commerce Way sub-basin (30-2029-SCom) consist of the right-of-way for Commerce Way between Northwest 80th Avenue and Montrose Road in the southwestern commercial area of the Town. It is part of the Graham Dairy (GDC1-101) Basin.

Existing and Future Conditions

Figure 9 shows existing conditions for Commerce Way. The sub-basin consists of approximately 6.7 acres of roadway with approximately 4,100 linear feet of roadway. The drainage system in this sub-basin consists of isolated catch basins connected to exfiltration trenches. Since this sub-basin is surrounded by commercial property, it is assumed that none of the surrounding parcels contribute runoff to the roadway.

Based on available GIS and as-built information, the roadway centerline elevations within Commerce Way range from a low of approximately 6.8 feet to a high of approximately 7.7 feet-NGVD. It was assumed that building finish elevations are 1.5 feet above crown of road elevations. Pervious area elevations were assumed to range from 0.1 feet above the minimum roadway elevation to flush with the finish floor elevations. To allow for the possibility of future development along the roadway, the impervious area was adjusted to include an additional 10%. Increasing the impervious area in the model will allow for possible future expansion of the existing pavement or sidewalks.

Figure 9-Commerce Way Sub-Basin Area Delineation

Performance Goal Analysis

Based on the detailed hydrologic and hydraulic calculations for this sub-basin, which can be found in Appendix B, the majority of the modeled drainage areas within the sub-basin do not currently meet the Town of Miami Lakes performance goals. Table 17 below shows the performance of the basin versus performance goals. “Yes” means the given drainage area within the sub-basin meets the performance goal, and “No” means that the given drainage area within the sub-basin does not meet the performance goal.

Table 17-Commerce Way Sub-Basin Performance Goal Analysis

Sub-Basin Area	Water Quality	5-Year Storm	10-Year Storm	25-Year Storm	100-Year Storm	Complaints
Commerce Way	no	no	no	no	no	no

Storm Drainage Deficiencies

Based on the hydrologic and hydraulic calculations for this sub-basin, the existing drainage infrastructure does not discharge adequate runoff to meet the desired performance criteria. The capacity of the existing exfiltration trenches is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. Improvements to drainage infrastructure will be needed to address these inadequacies.

Recommended Drainage Improvements

It is recommended that existing catch basins and pipes are cleaned and flushed of all sediment and debris and that catch basin elevations and locations are adjusted to minimize accumulation of sediment and debris. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps). In addition, additional exfiltration trench, catch basins, and/or manholes, and an outfall to Graham Dairy Lake are proposed to provide water quality and water quantity treatment. Proposed improvements are shown in Exhibits 11 through Exhibit 13 in Appendix A, as well as summarized in Table 18.

Table 18-Commerce Way Improvements Summary

Description	Units	Commerce Way
Curbing Restoration	L.F.	8,400
Driveway/Sidewalk Restoration	S.Y.	40
Asphalt Restoration	S.Y.	11,200
Inlet Apron	EA.	4
Drainage Pipe (18" HDPE)	L.F.	100
Exfiltration Trench	L.F.	900
Pollution Retardant Baffle	EA.	4
Outfall Pipe (36" HDPE)	L.F.	600
Concrete Endwall	EA.	1
Control Structure	EA.	1
Catch Basin	EA.	0
Manhole	EA.	5
Core Drill Existing Structure	EA.	4

Environmental Impact of Proposed Improvements

A full analysis of the estimated pollutant loading for existing, future and proposed conditions was prepared for the priority sub-basins utilizing a spreadsheet developed for this purpose which can be found in Appendix C. Table 19 below shows how the proposed improvements will result in a significant reduction in the pollutant load contribution from this sub-basin to the Biscayne Aquifer for three major pollutants.

Table 19-Commerce Way Sub-Basin Pollutant Loading Analysis

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	3.94	3.65	0.29
Total Nitrogen	31.03	27.77	3.26
Total Suspended Solids	371.94	336.79	35.15

Additionally, pre-treatment volume equal to ½-inch of rainfall will need to be provided in the form of dry detention prior to discharge to the lake. Approximately 0.28 acre-feet of storage within the exfiltration trenches will be required to meet this South Florida Water Management District requirement. As proposed, the exfiltration trench provides approximately 5.8 acre-feet of storage, which far exceeds the minimum pre-treatment volume required.

Capital Improvement Budget

A budget was developed for the proposed storm water capital improvements (see Table 20).

Table 20-Commerce Way Sub-Basin Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Mobilization/ MOT/ Clearing & Grubbing	1	L.S.	$94,100	$95,000
2	Stormwater Pollution Prevention	1	L.S.	$9,410	$10,000
3	Curbing Restoration	8,400	L.F.	$30	$252,000
4	Driveway/Sidewalk Restoration	40	S.Y.	$50	$2,000
5	Asphalt Restoration	11,200	S.Y.	$35	$392,000
6	Inlet Apron	4	EA.	$500	$2,000
7	Drainage Pipe (18" HDPE)	100	L.F.	$70	$7,000
8	Exfiltration Trench	900	L.F.	$200	$180,000
9	Pollution Retardant Baffle	4	EA.	$500	$2,000
10	Outfall Pipe (36" HDPE)	600	L.F.	$100	$60,000
11	Concrete Endwall	1	EA.	$5,000	$5,000
12	Control Structure	1	EA.	$10,000	$10,000
13	Catch Basin	0	EA.	$5,000	$0
14	Manhole	5	EA.	$5,000	$25,000
15	Core Drill Existing Structure	4	EA.	$1,000	$4,000
16	Utility Sleeves and Adjustments	1	L.S.	$47,050	$48,000
17	Swale Restoration	1	L.S.	$47,050	$48,000
18	Professional Services	1	L.S.	$141,150	$142,000
19	Contingency	1	L.S.	$235,250	$236,000
TOTAL					$1,520,000

Capital Improvement Program

Background

Kimley-Horn and Associates (KHA) prepared this Capital Improvement Program (CIP) for storm water improvements to prioritize and set budgets required to plan, construct, operate and maintain the Town's Storm Water Management Program. The CIP is a tool intended to provide an order of magnitude for the Town's yearly funding for the implementation of the Storm Water Utility.

The proposed CIP is based on the findings of the assessment of existing drainage conditions within the Town and the detailed analysis of the ten (10) drainage sub-basins which were identified as priority basins. The CIP also includes one (1) priority sub-basin identified in Storm Water Master Plan Update #1 that has not been improved as of this update. Two components of the CIP were identified. These are the operation and maintenance component and the capital improvements component.

The operation and maintenance component is based on the general assessment of the existing drainage conditions within the Town limits. Recommended operation and maintenance procedures were identified. The preliminary budget estimates are based on the implementation of these procedures over the next several years.

The Capital Improvement component is based on the findings of the analysis of the priority sub-basins. Recommended improvements to achieve the stated performance goals were identified for each sub-basin. The recommended improvements where quantified based on the available data and preliminary opinions of probable costs (preliminary budgets) where prepared for each sub-basin. Based on the preliminary budgets, the priority sub-basin improvements were grouped and phased to provide the proposed Capital Improvement Program. The following is a detailed explanation and summary of each component of the Capital Improvement Program.

Operation and Maintenance Plan

The intent of the operation and maintenance plan is to maintain the integrity of the storm water management system. This is accomplished by maintaining the existing storm water management system to provide the level of service that was originally designed. To achieve this goal, periodic observations, routine maintenance, and general improvements are required. This section of the overall report is not intended to provide a complete operation and maintenance manual, but to provide some of the key components and allow sufficient budget to implement these items. Unit costs associated with these items are taken from the Town's most recent Storm Water Utility Budget and/ or existing contracts with service providers.

Street Sweeping

The Town should continue to invest resources in street sweeping. This activity cleans intake structures, reduces debris deposition within the pipe network, and contributes to the aesthetics of the Town. Generally, street sweeping is a positive maintenance activity that provides measurable benefits. Because pollutants such as hydrocarbons and metals adhere to dirt particles, removing this dirt from the street system will remove the pollutants before they are allowed to discharge into the Town's lakes.

Catch Basin Maintenance

Catch basin maintenance is a two-step process. This task includes cleaning the external grate to allow storm water to enter the system and removing sand, silt and debris from the sedimentation chamber of the intake structure. The catch basins will be cleaned using mechanical and manual methods. In the majority of cases, catch basins will be cleaned and maintained in response to observations following significant rain events. Upon making such observations, the Town should evaluate the general area and perform the required maintenance on the inlets and pipes within a sub-basin. Under normal conditions, catch basin maintenance is recommended every 12 months. However, because of foliage and other debris entering the system, the Town should consider conducting catch basin maintenance more frequently in some areas.

Pipe Flushing and Exfiltration Trench Cleaning

Pipe flushing and exfiltration trench cleaning are typically performed in conjunction with catch basin cleaning and are usually performed by the Town on an annual basis. During this activity, a high-pressure water hose is inserted into the pipe network. This process flushes debris into the catch basin where it can then be removed.

Swale Inspection, Maintenance and Restoration

Grassed swales and landscaped medians play an important role in storm water disposal. Consistent mowing, inspection and restoration of such features promote storm water retention and efficient percolation. The Town maintains swales and medians within public roadways. Individual business owners and residents are mandated through local codes to maintain their facilities. This activity should continue on a scheduled basis.

Canal Maintenance

Local canals play an important role in storm water disposal. The Town maintains the Golden Glades Canal on the south side of Northwest 170th Street, the Red Road Canal along the west side of Northwest 57th Avenue, the Graham Dairy Canal along the north side of I-75 and the Peter's Pike Canal along the west side of the southbound Palmetto Expressway while the South Florida Water Management District maintains the C-8 (Biscayne Canal). The Town should continue efforts of maintaining these canals as well as any outfalls that connect to them.

Lake Inspection and Water Quality Monitoring

Given its name, the Town is blessed with many lakes. Consistent inspection and water quality monitoring procedures for the lakes should be established to ensure that they continue to provide both the flood protection and water quality treatment for which they were designed and to ensure the continued enjoyment of the lakes by Town residents.

Minor Repairs and Improvements

Maintaining the storm water collection system requires routine improvements and repairs. This task covers a significant spectrum of activities ranging from the repair of collapsed pipes and manholes to the replacements of catch basin grates. Maintenance activities are performed in response to an immediate problem using the best methods available. These tasks often cannot be foreseen or scheduled.

MS4 and CRS Program Activities

In order to remain in good standing in the National Flood Insurance Program's Community Rating System (CRS) and to comply with the Miami-Dade County Multiple Separate Storm Sewer System Permit (MS4) administered by the U.S. Environmental Protection Agency and Florida Department of Environmental Protection, the Town must perform certain activities on an annual basis. The preceding maintenance activities all qualify for credit under CRS and the MS4 Permit. In addition, these maintenance activities, the Town is required to monitor water quality in the canals and prepare a pollutant loading study as part of the MS4 Permit. The Town pays an annual fee to the Miami-Dade County Department of Environmental Resource Management (DERM) for water quality monitoring in the canals. The Town will need to contract with an outside engineering firm to prepare the pollutant loading study. Both the MS4 Permit and the CRS Program require annual public outreach activities on water quality and the dangers associated with flooding such as mailings to residents and workshops for the general public, pesticide applicators and construction contractors.

WASD Utility Fee Collection

The Town has an agreement with the Miami-Dade County Water and Sewer Department (WASD) to include the Town's Storm Water Utility Fee on bills for water and sewer service within the Town. WASD bills customers on a quarterly basis and charges the Town a fee to collect the Town's Storm Water Utility Fee.

Currently the Town collects \$4.50 per Equivalent Residential Unit (ERU). However, this rate has been in effect for 15 years and it is recommended that the Town evaluate expected budgets and anticipate population growth over the next ten years to determine that this rate is sufficient for system cost. With an estimated 21,155 ERU currently being charged for in the Town, and an addition 883 ERU's anticipated, the following unit increases are recommended depending on level of groundwater rise planned for in developing the Capital Improvement Budgets (see Table 25, Table 26, and Table 27 for Capital Improvement Budgets used for ERU calculations).

Table 21-Recommended ERU Updates

	Current Groundwater Elevation	6" Rise in Groundwater Elevation	12" Rise in Groundwater Elevation
Future ERU's Anticipated	22,038	22,038	22,038
Average Yearly CIP Budget	$2,058,785.44	$2,277,605.44	$2,605,835.44
Average Monthly CIP Budget	$171,565.45	$189,800.45	$217,152.95
Recommended ERU Rate	$7.78	$8.61	$9.85

Administrative Expenses

There are two items noted in the budget to provide personnel to oversee the operation and maintenance of the storm water system. These items are: "Professional Services" and "Storm Water Utility Administration". The Professional Services item will include the preparation and oversight of contracting services such as pipe and inlet cleaning and street sweeping. The Storm Water Utility Administration item includes general administration, clerical support, program planning and public awareness. Table 22 details the operations and maintenance budget. These prices were based on current cost to maintain the system. For the development of the Capital Improvement Budgets, a 3% increase will be added each year to account for anticipated increases in cost.

Table 22-Storm Water Utility Operations and Maintenance Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Stormwater Utility Administration	1	L.S.	$118,400	$118,400
2	Professional Services	1	L.S.	$0	$0
3	Clean Catch basins & Manholes - Annually	1	L.S.	$59,400	$59,400
4	Street Sweeping and Litter Collection	1	L.S.	$122,300	$122,300
5	Canal Maintenance	1	L.S.	$303,600	$303,600
6	MS4 Permit Monitoring Fee to DERM	1	L.S.	$19,900	$19,900
7	NPDES - Computer Discharge Model	1	L.S.	$1,200	$1,200
8	Inspection Services	1	L.S.	$60,000	$60,000
9	WASD Utility Fee Collection	1	L.S.	$43,500	$43,500
10	Minor Repairs and Improvements	1	L.S.	$24,000	$24,000
11	Community Rating System - FEMA Program	1	L.S.	$2,400	$2,400
12	Public Outreach and Workshops for MS4 Permit	1	L.S.	$3,600	$3,600
13	QNIP Debt Service Payment	1	L.S.	$83,200	$83,200
TOTAL					**$841,500**

Green Initiatives

Green infrastructure describes practices that allows stormwater runoff to filter through vegetation and soil rather than running directly into storm drains. Bioswales, rain gardens, pervious pavement, and stormwater harvesting are examples of green infrastructure. These infrastructure practices can improve water quality, reduce flash flooding in small, intense storm events, and enhance community aesthetics. Some of these practices, such as bioswales, can be implemented in areas where an otherwise standard grassed swale would be implemented. Green infrastructure sites can also include informational signs or displays, which educate the public about the importance of water quality and native plantings. The Town should encourage green infrastructure practices for new and rehabilitated developments, and consider implementing these practices for roadway rehabilitation and expansion projects.

Storm Water Capital Projects

The Capital Improvement Program (CIP) is based on the findings of the analysis of the priority sub-basins. Recommended improvements to achieve the stated performance goals were identified for each sub-basin. The recommended improvements were quantified based on the available data and preliminary opinions of probable costs (preliminary budgets) were prepared for each basin. Prior to each individual project being implemented, professional services such as surveying, engineering, and permitting will be required and are included within the budgets. The budget figures were developed by reviewing recent costs from similar projects.

Proposed improvements were based on the models prepared for this analysis, which provide adequate flood reduction to meet performance goals based on current conditions including the current groundwater elevation. However, anticipated increases in groundwater levels will reduce capacity of the proposed systems in coming years and therefore larger systems will be needed to meet performance goals in future conditions. Should the Town wish to design for future conditions in lieu of current conditions, it is expected that improvement cost will increase by an additional 20% for a 6-inch rise in groundwater elevations and by 50% for a 12-inch rise in groundwater elevation. This basis was developed by analyzing the West Lakes basin with a 6-inch and a 12-inch rise in the groundwater and determining improvements needed to meet performance criteria with the two scenarios. The average cost difference in improvements was used for the anticipated improvement cost increase.

Table 23-Anticipated Improvement Cost Increase Associated with Groundwater Increase

Groundwater Elevation Increase	Anticipated Percent Increase in Improvement Cost
6-inches	20%
12-inches	50%

The following assumptions have been made in the formulation of the budgets for the drainage improvements:

- The budgets include the recommended improvements identified in this analysis of the ten (10) priority sub-basins.
- The budget includes recommended improvements identified in Update #1 that have not been constructed. Total cost have been updated to reflect current unit cost.
- Projects were grouped by sub-basin.
- The budgets include restoration of the roadway impacted by the proposed trenching, but do not include any additional roadway resurfacing.

- The budgets do not include any costs of obtaining drainage or construction easements.
- The budgets assume a 10% allowance for mobilization, maintenance of traffic, and clearing and grubbing for each project.
- The budgets assume a 25% contingency for each project.
- The budgets assume a 15% allowance for surveying, engineering, permitting, and limited construction phase assistance (site observations).
- The budgets assume a 5% allowance for swale restoration for each project.
- The budgets do not include any landscape costs for improvements or restoration.
- Improvements needed to meet performance goals assume current groundwater elevations.

The budgetary numbers are an opinion of probable construction costs in the current marketplace. Unit pricing for similar projects constructed by the Town of Miami Lakes within the last few years was used as the basis for the construction budgets. Based on the preliminary budgets, the priority sub-basin proposed improvements were grouped and phased to provide the capital improvement program.

Sub-Basin Prioritization

Each project was given a score between 1 and 5 in each of the six categories: hydraulic analysis, repetitive loss properties, complaints, roadway condition and traffic volumes. The scores were then totaled, and the projects were ranked from highest to lowest to determine the priority of the proposed improvements.

Hydraulic Analysis:

- All water quantity performance goals met by existing conditions = 1
- Water quantity performance goals failed in less than 1/3 of drainage areas in sub-basin = 2
- Water quantity performance goals failed in1/3 to 1/2 of drainage areas in sub-basin = 3
- Water quantity performance goals failed in 1/2 to all but one drainage area in sub-basin = 4
- Water quantity performance goals failed in all of the drainage areas in the sub-basin = 5

Repetitive Loss Properties:

- No repetitive loss properties = 1
- One or two repetitive loss properties = 3
- Three or more repetitive loss properties = 5

Complaints:

- No complaints recorded = 1
- Complaints recorded for less than 1/3 of drainage areas within sub-basin = 2
- Complaints recorded for 1/3 to 1/2 of drainage areas within sub-basin = 3

- Complaints recorded for 1/2 to all but one drainage area within sub-basin = 4
- Complaints recorded for all drainage areas within the sub-basin = 5

Roadway Condition/ Traffic Volumes: The ratings for this category are based on the existing pavement condition as described in the Town's Road Assessment Report.

- Pavement conditions classified as Excellent in Roadway CIP = 1
- Pavement conditions classified as Excellent and Good in Roadway CIP = 2
- Pavement conditions classified rated as Good in Roadway CIP = 3
- Pavement conditions classified rated as Good and Fair in Roadway CIP = 4
- Pavement conditions classified rated as Fair in Roadway CIP = 5

Traffic Volumes: The ratings for this category are based on a percentage of roadway length classified as local, collector, or arterial roadways throughout the sub-basin according to the Town's Comprehensive Plan.

- The majority of roadways in sub-basin are local roadways = 1
- The majority of roadways in sub-basin are collector roadways = 3

The majority of roadways in the sub-basin are local roadways = 5

The proposed CIP summary and schedule of work is contained in Table 24. Further budget detail for each of the proposed CIP projects can be found in the Drainage Sub-Basin Analysis section of this report. Budget detail for the operations and maintenance component can be found in the preceding section. The projects are recommended to be coordinated with the roadway CIP project scheduling to ensure that the drainage improvements are complete before or at the same time as the roadway improvements in the same area.

Table 24-Sub-Basin Prioritization Matrix

Priority Ranking	Sub-Basin Name	Hydraulic Analysis	Repetitive Loss	Resident Complaint	Roadway Conditions	Traffic Volumes	**Total Score**
1	Commerce Way	5	1	1	2	5	14
1	Royal Oaks-1st Addition	5	1	5	2	1	14
1	Royal Oaks-Sixth Add.	5	1	5	2	1	14
2	Royal Oaks-8th Add.	4	1	2	3	3	13
2	West Lakes Gardens	5	1	2	2	3	13
2	Miami Lakeway North (Southern)	5	1	1	3	3	13
3	West Lakes Gardens-2nd Add.	5	1	2	3	1	12
4	Royal Lakes-First Add.	3	1	2	2	3	11
4	South of 154th	5	1	2	2	1	11
5	Alameda Northwest	4	1	1	3	1	10
5	NW 83rd Place	4	1	2	2	1	10

Table 25-Proposed CIP Budgets and Schedule (Current Groundwater Elevation)

Proposed Project	FY 19-20	FY 20-21	FY 21-22	FY 22-23	FY 23-24	FY 24-25	FY 25-26	FY 26-27	FY 27-28	FY 28-29	**TOTALS**
Commerce Way	$1,520,000										$1,520,000
Royal Oaks-1st Addition		$319,000									$319,000
Royal Oaks-Sixth Add.			$665,000								$665,000
Royal Oaks-8th Add.				$679,000							$679,000
West Lakes Gardens					$2,857,000						$2,857,000
Miami Lakeway North (Southern)						$1,693,000					$1,693,000
West Lakes Gardens-2nd Add.							$1,325,000				$1,325,000
Royal Lakes-First Add.								$224,000			$224,000
South of 154th									$888,000		$888,000
Alameda Northwest										$675,000	$675,000
NW 83rd Place										$96,000	$96,000
Operations and Maintenance	$841,500	$866,745	$892,747	$919,530	$947,116	$975,529	$1,004,795	$1,034,939	$1,065,987	$1,097,967	$9,646,854
TOTALS	$2,361,500	$1,185,745	$1,557,747	$1,598,530	$3,804,116	$2,668,529	$2,329,795	$1,258,939	$1,953,987	$1,868,967	$20,587,854

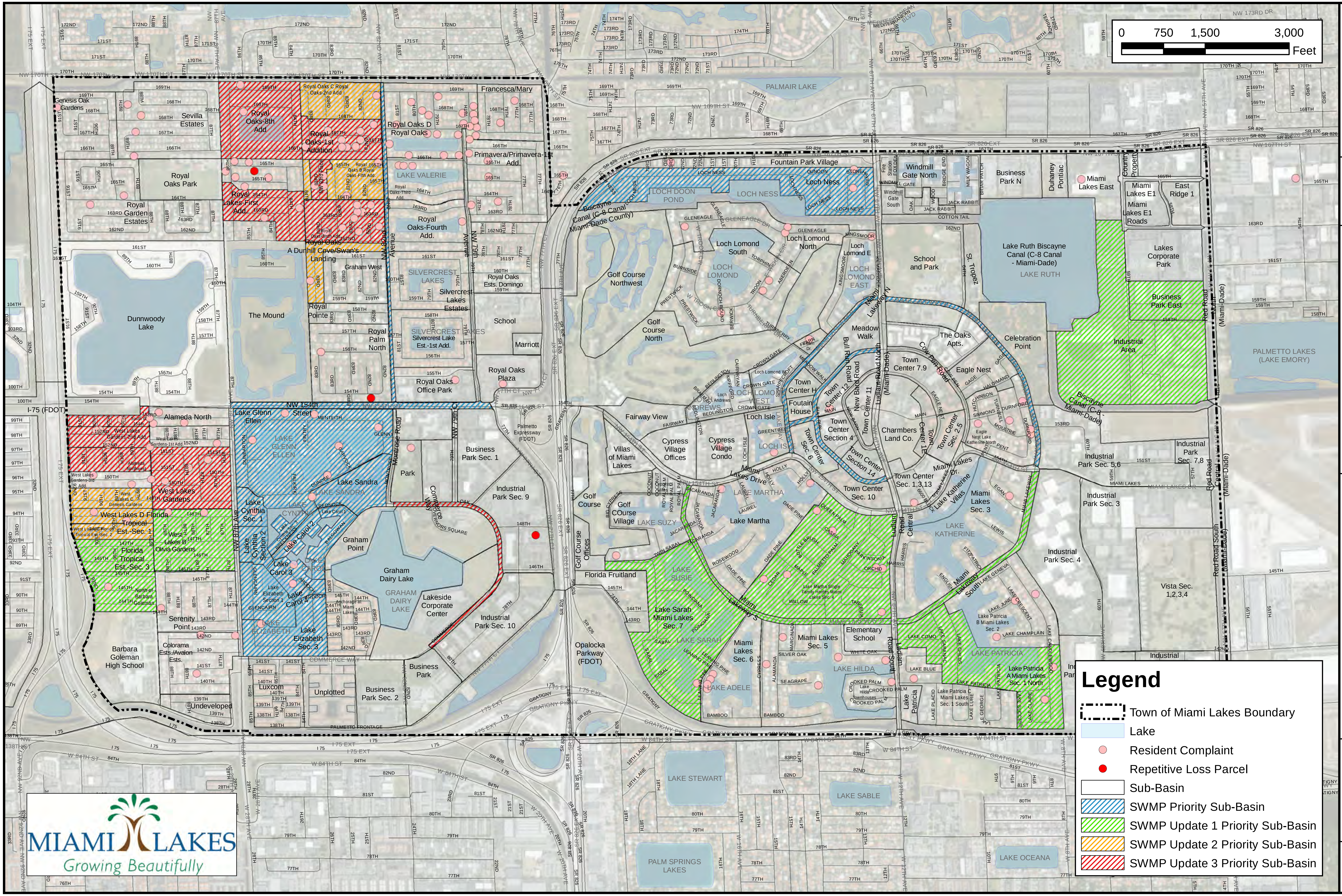
Table 26-Proposed CIP Budgets and Schedule (6-inch Groundwater Elevation @ 20% CIP Increase)

Proposed Project	FY 19-20	FY 20-21	FY 21-22	FY 22-23	FY 23-24	FY 24-25	FY 25-26	FY 26-27	FY 27-28	FY 28-29	**TOTALS**
Commerce Way	$1,824,000										$1,824,000
Royal Oaks-1st Addition		$382,800									$382,800
Royal Oaks-Sixth Add.			$798,000								$798,000
Royal Oaks-8th Add.				$814,800							$814,800
West Lakes Gardens					$3,428,400						$3,428,400
Miami Lakeway North (Southern)						$2,031,600					$2,031,600
West Lakes Gardens-2nd Add.							$1,590,000				$1,590,000
Royal Lakes-First Add.								$268,800			$268,800
South of 154th									$1,065,600		$1,065,600
Alameda Northwest										$810,000	$810,000
NW 83rd Place										$115,200	$115,200
Operations and Maintenance	$841,500	$866,745	$892,747	$919,530	$947,116	$975,529	$1,004,795	$1,034,939	$1,065,987	$1,097,967	$9,646,854
TOTALS	$2,665,500	$1,249,545	$1,690,747	$1,734,330	$4,375,516	$3,007,129	$2,594,795	$1,303,739	$2,131,587	$2,023,167	$22,776,054

Table 27-Proposed CIP Budgets and Schedule (12-inch Groundwater Elevation @ 50% CIP Increase)

Proposed Project	FY 19-20	FY 20-21	FY 21-22	FY 22-23	FY 23-24	FY 24-25	FY 25-26	FY 26-27	FY 27-28	FY 28-29	**TOTALS**
Commerce Way	$2,280,000										$2,280,000
Royal Oaks-1st Addition		$478,500									$478,500
Royal Oaks-Sixth Add.			$997,500								$997,500
Royal Oaks-8th Add.				$1,018,500							$1,018,500
West Lakes Gardens					$4,285,500						$4,285,500
Miami Lakeway North (Southern)						$2,539,500					$2,539,500
West Lakes Gardens-2nd Add.							$1,987,500				$1,987,500
Royal Lakes-First Add.								$336,000			$336,000
South of 154th									$1,332,000		$1,332,000
Alameda Northwest										$1,012,500	$1,012,500
NW 83rd Place										$144,000	$144,000
Operations and Maintenance	$841,500	$866,745	$892,747	$919,530	$947,116	$975,529	$1,004,795	$1,034,939	$1,065,987	$1,097,967	$9,646,854
TOTALS	$3,121,500	$1,345,245	$1,890,247	$1,938,030	$5,232,616	$3,515,029	$2,992,295	$1,370,939	$2,397,987	$2,254,467	$26,058,354

Appendix A – Exhibits



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TOWN OF MIAMI LAKES STORMWATER MASTER PLAN UPDATE #3

DRAINAGE DEFICIENCIES AND PRIORITY SUB-BASINS

DATE:	MAY 2019
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CHECKED:	SV
KH NO.:	044533204

EXHIBIT

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TOWN OF MIAMI LAKES
STORMWATER MASTER PLAN
UPDATE #3

DRAINAGE SYSTEM KEY MAP
SUB-BASIN: Royal Oaks

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DRAWN:	JU
CHECKED:	SV
KH NO.:	044533204

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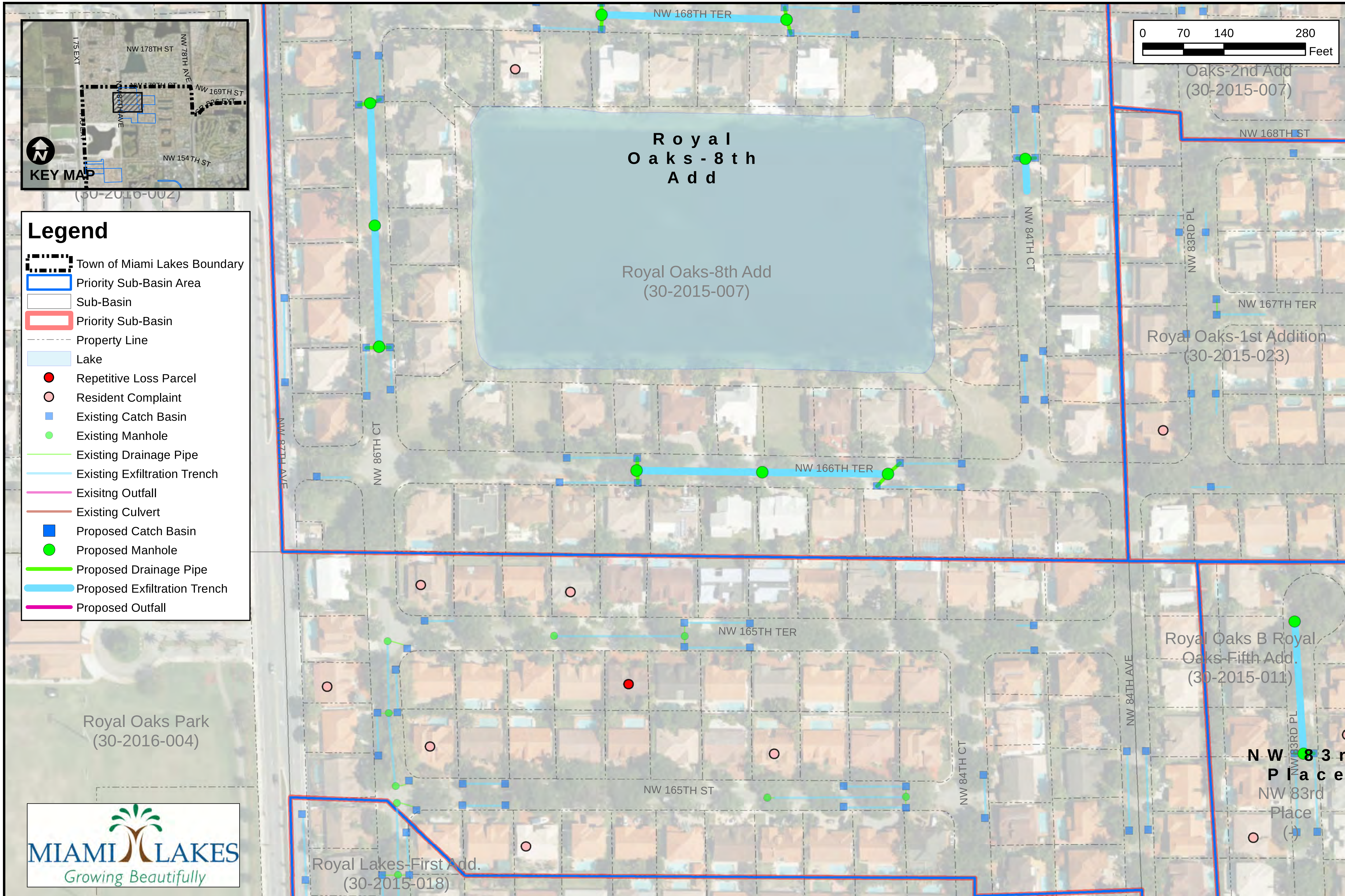

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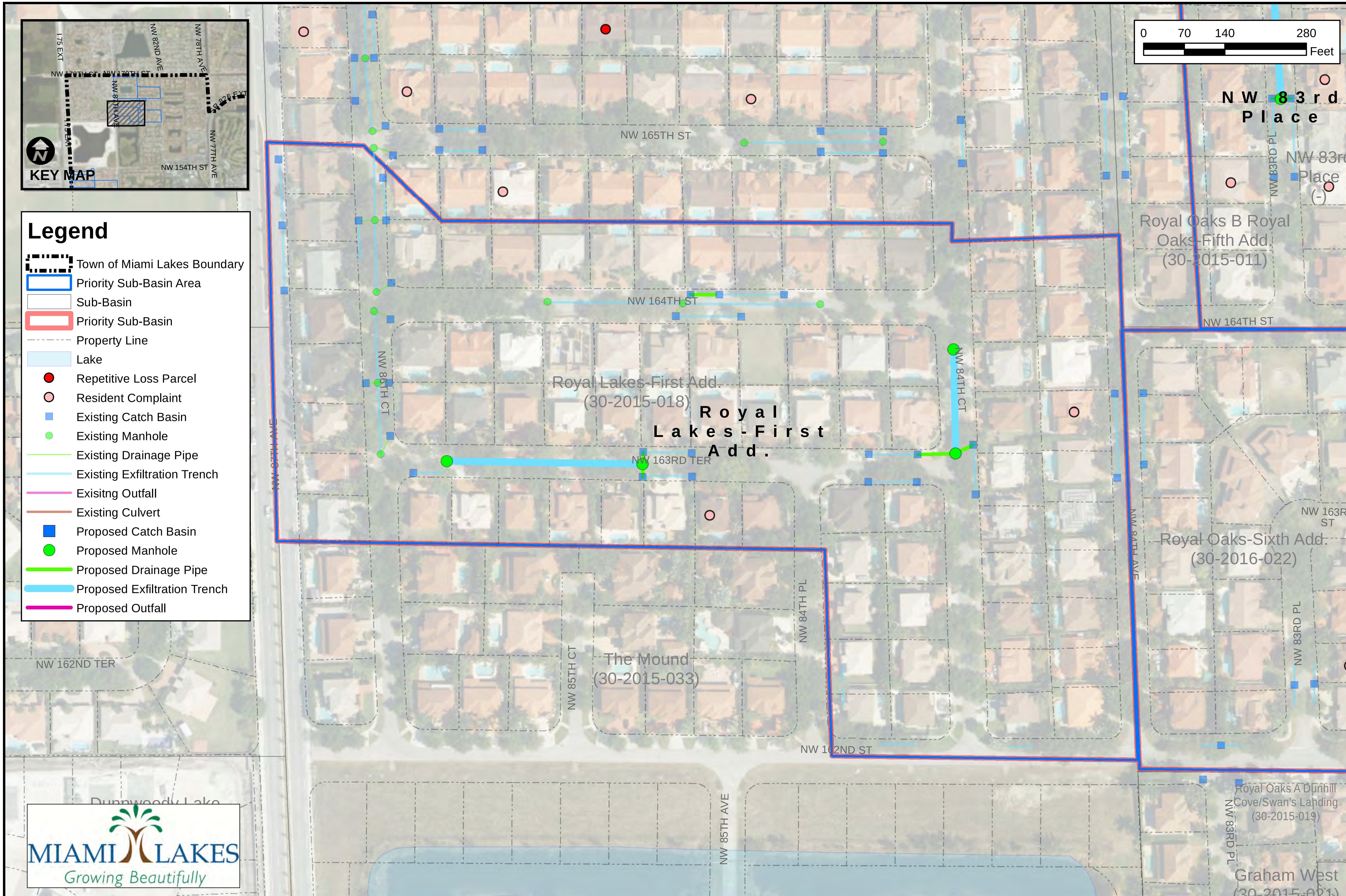

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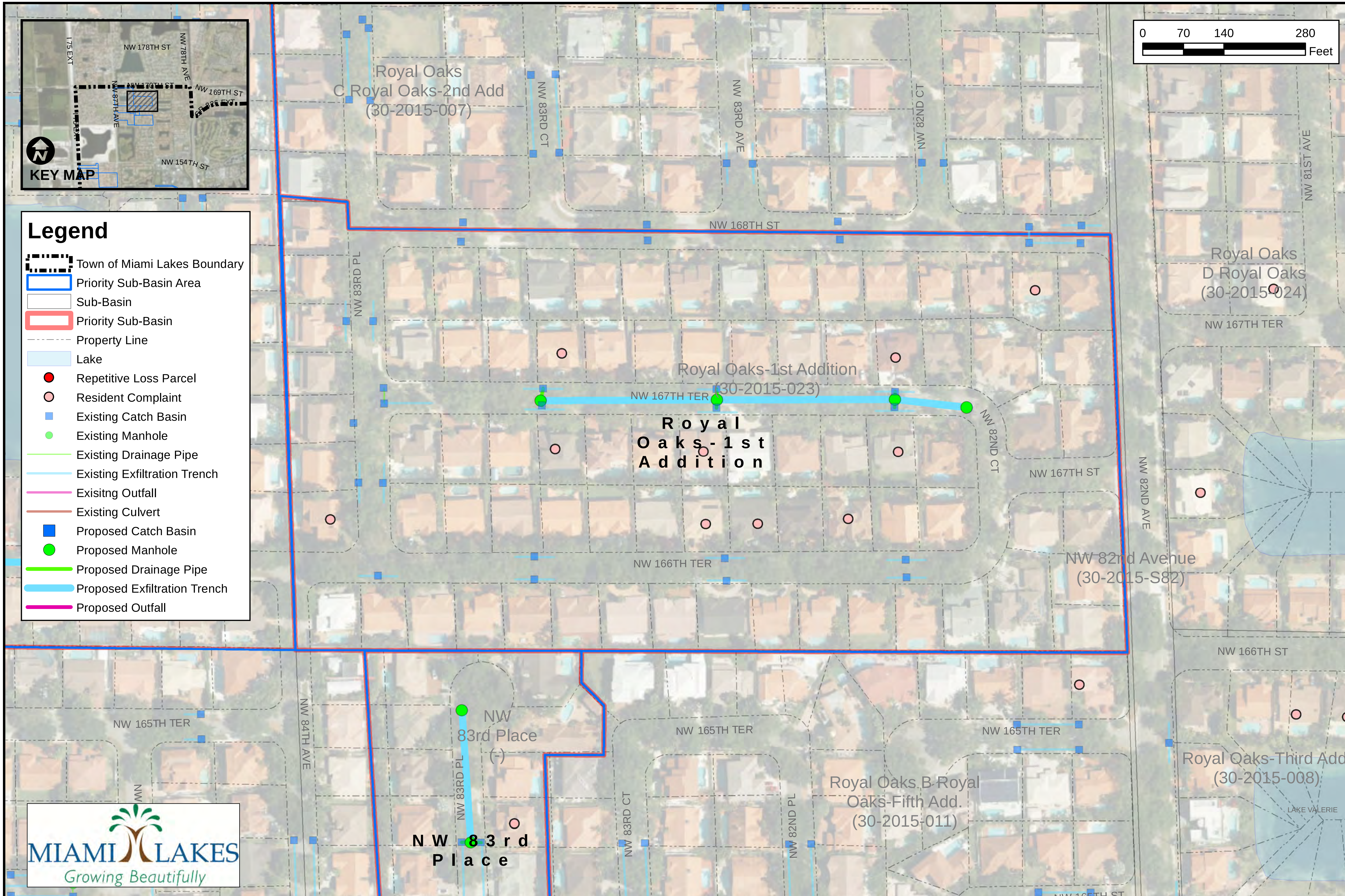

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TOWN OF MIAMI LAKES
STORMWATER MASTER PLAN
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DRAINAGE SYSTEM KEY MAP
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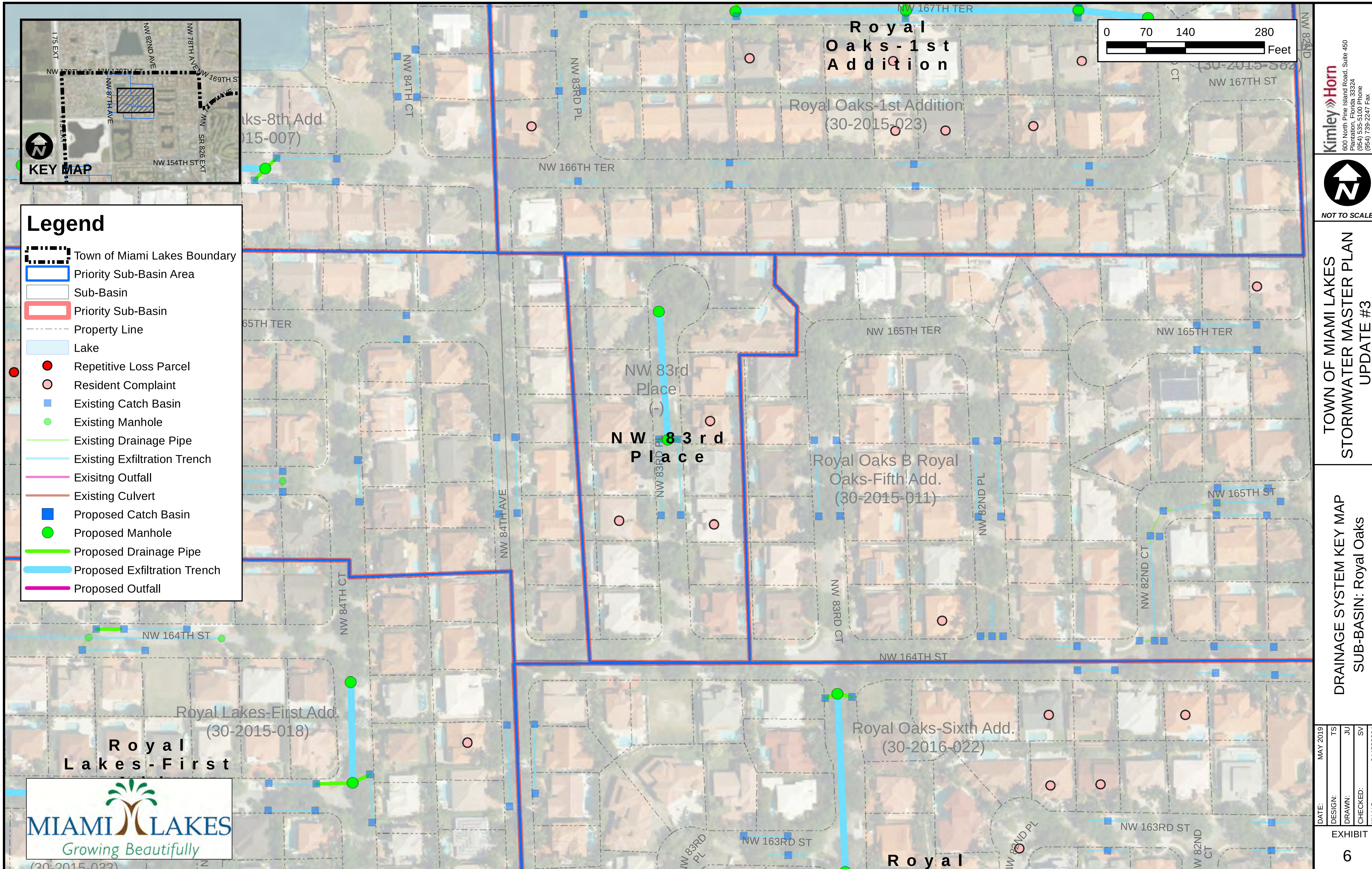

KEY MAP
Legend
Town of Miami Lakes Boundary
Priority Sub-Basin Area
Sub-Basin
Priority Sub-Basin
Property Line
Lake
Repetitive Loss Parcel
Resident Complaint
Existing Catch Basin
Existing Manhole
Existing Drainage Pipe
Existing Exfiltration Trench
Exisitng Outfall
Existing Culvert
Proposed Catch Basin
Proposed Manhole
Proposed Drainage Pipe
Proposed Exfiltration Trench
Proposed Outfall
0 70 140 280 Feet
Royal Oaks-1st Addition
Royal Oaks-1st Addition (30-2015-023)
NW 83rd Place (-)
NW 83rd Place
Royal Oaks B Royal Oaks-Fifth Add. (30-2015-011)
Royal Lakes-First Add (30-2015-018)
Royal Oaks-Sixth Add. (30-2016-022)
NW 167TH TER
NW 167TH ST
NW 166TH TER
NW 165TH TER
NW 165TH ST
NW 164TH ST
NW 163RD ST
NW 84TH AVE
NW 84TH CT
NW 83RD PL
NW 83RD CT
NW 82ND PL
NW 82ND CT
MIAMI LAKES
Growing Beautifully
NOT TO SCALE
TOWN OF MIAMI LAKES
STORMWATER MASTER PLAN
UPDATE #3
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SUB-BASIN: Royal Oaks
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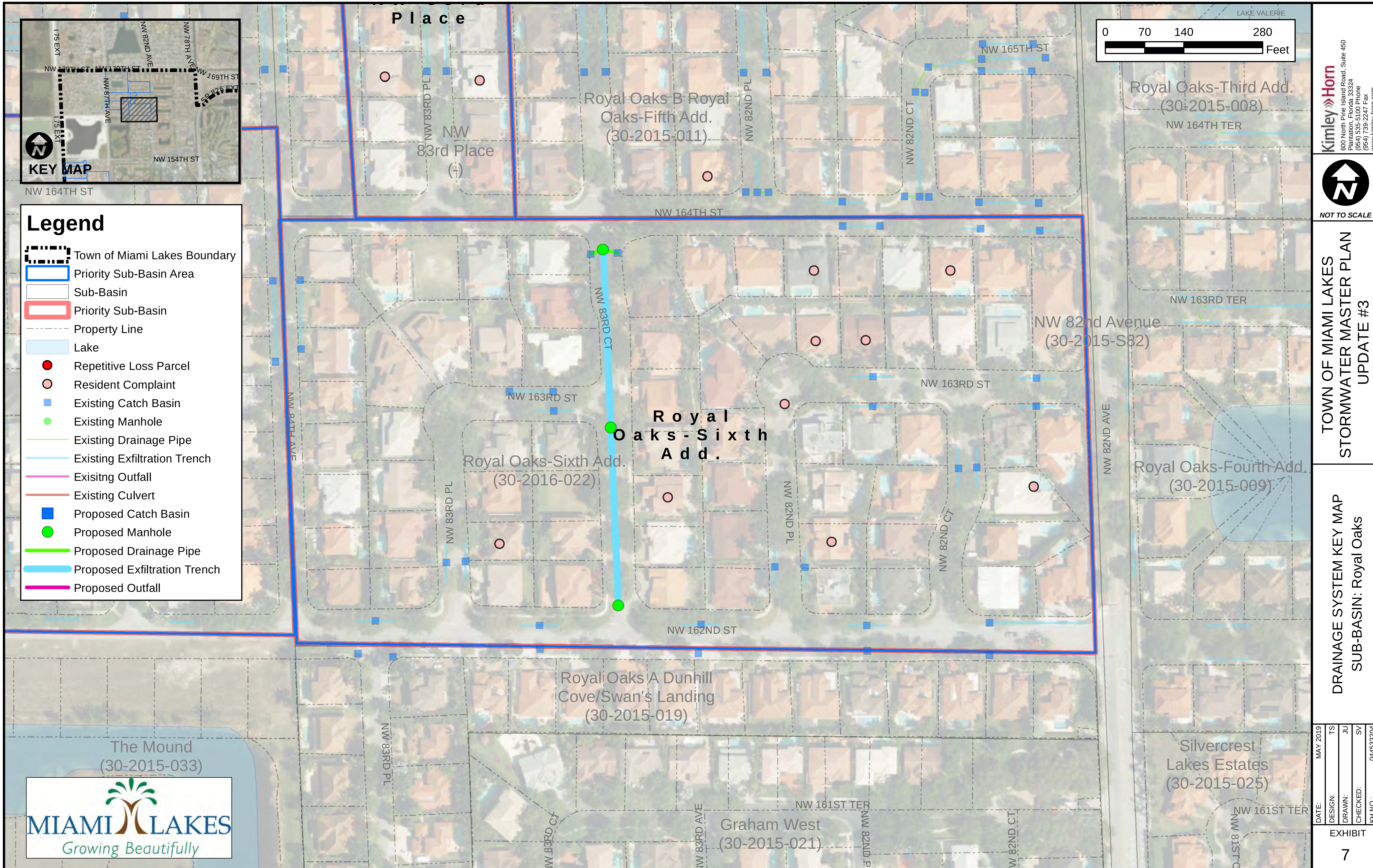

KEY MAP
I 75 EXT
NW 82ND AVE
NW 78TH AVE
NW 170TH ST
NW 169TH ST
NW 87TH AVE
NW 154TH ST
NW 164TH ST
Legend
Town of Miami Lakes Boundary
Priority Sub-Basin Area
Sub-Basin
Priority Sub-Basin
Property Line
Lake
Repetitive Loss Parcel
Resident Complaint
Existing Catch Basin
Existing Manhole
Existing Drainage Pipe
Existing Exfiltration Trench
Exisitng Outfall
Existing Culvert
Proposed Catch Basin
Proposed Manhole
Proposed Drainage Pipe
Proposed Exfiltration Trench
Proposed Outfall
0 70 140 280 Feet
Place
NW 83rd Place (-)
NW 83RD PL
Royal Oaks B Royal Oaks-Fifth Add. (30-2015-011)
NW 82ND PL
NW 82ND CT
NW 165TH ST
LAKE VALERIE
Royal Oaks-Third Add. (30-2015-008)
NW 164TH TER
NW 164TH ST
NW 163RD TER
NW 82nd Avenue (30-2015-S82)
NW 83RD CT
NW 163RD ST
NW 84TH AVE
Royal Oaks-Sixth Add.
Royal Oaks-Sixth Add. (30-2016-022)
NW 83RD PL
NW 82ND PL
NW 82ND CT
NW 82ND AVE
Royal Oaks-Fourth Add. (30-2015-009)
NW 162ND ST
Royal Oaks A Dunhill Cove/Swan's Landing (30-2015-019)
The Mound (30-2015-033)
NW 83RD PL
Silvercrest Lakes Estates (30-2015-025)
NW 161ST TER
NW 161ST TER
NW 83RD CT
NW 83RD AVE
Graham West (30-2015-021)
NW 82ND PL
NW 82ND CT
NW 81ST CT
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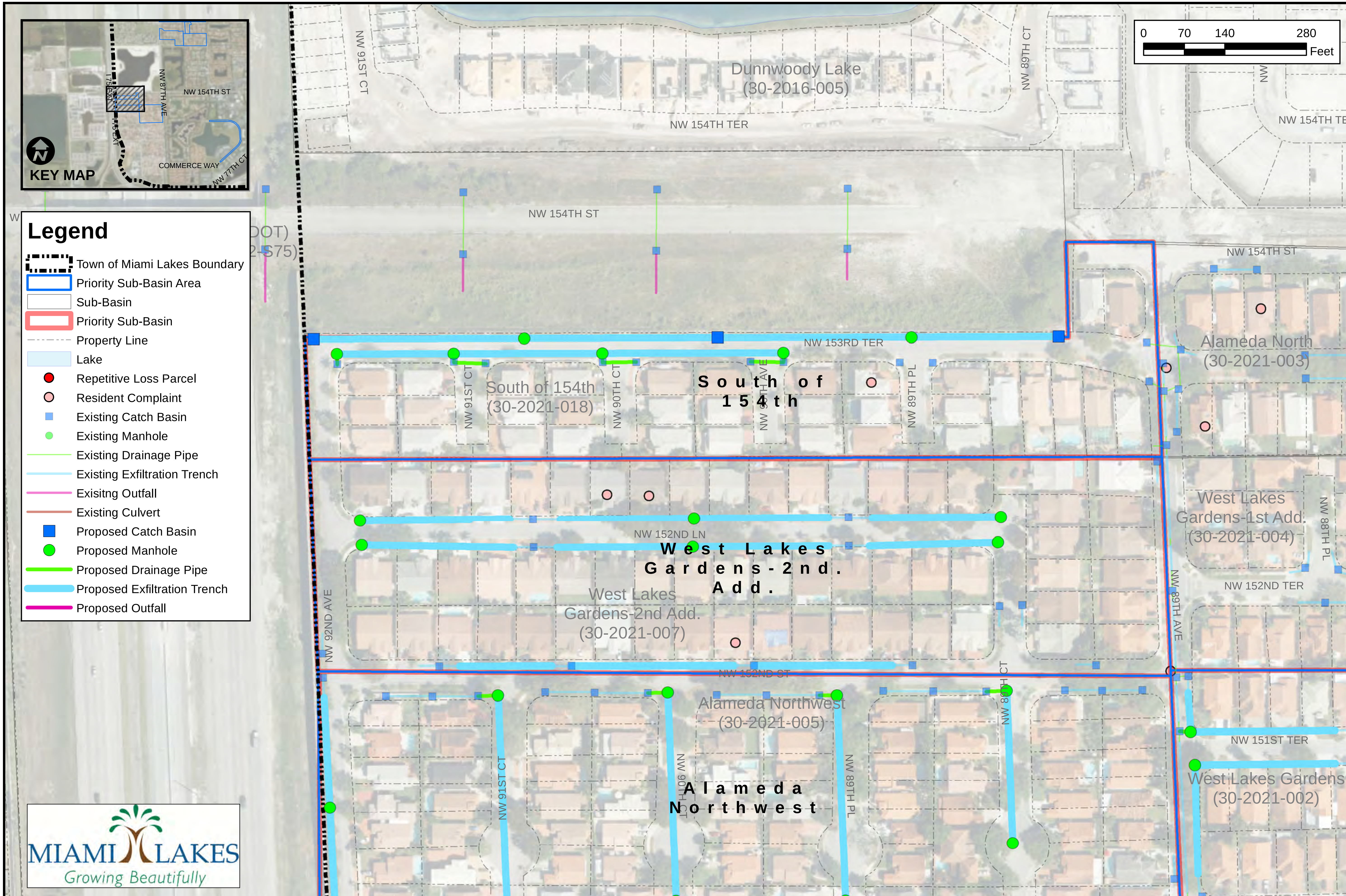

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TOWN OF MIAMI LAKES
STORMWATER MASTER PLAN
UPDATE #3

DRAINAGE SYSTEM KEY MAP
SUB-BASIN: West Lakes

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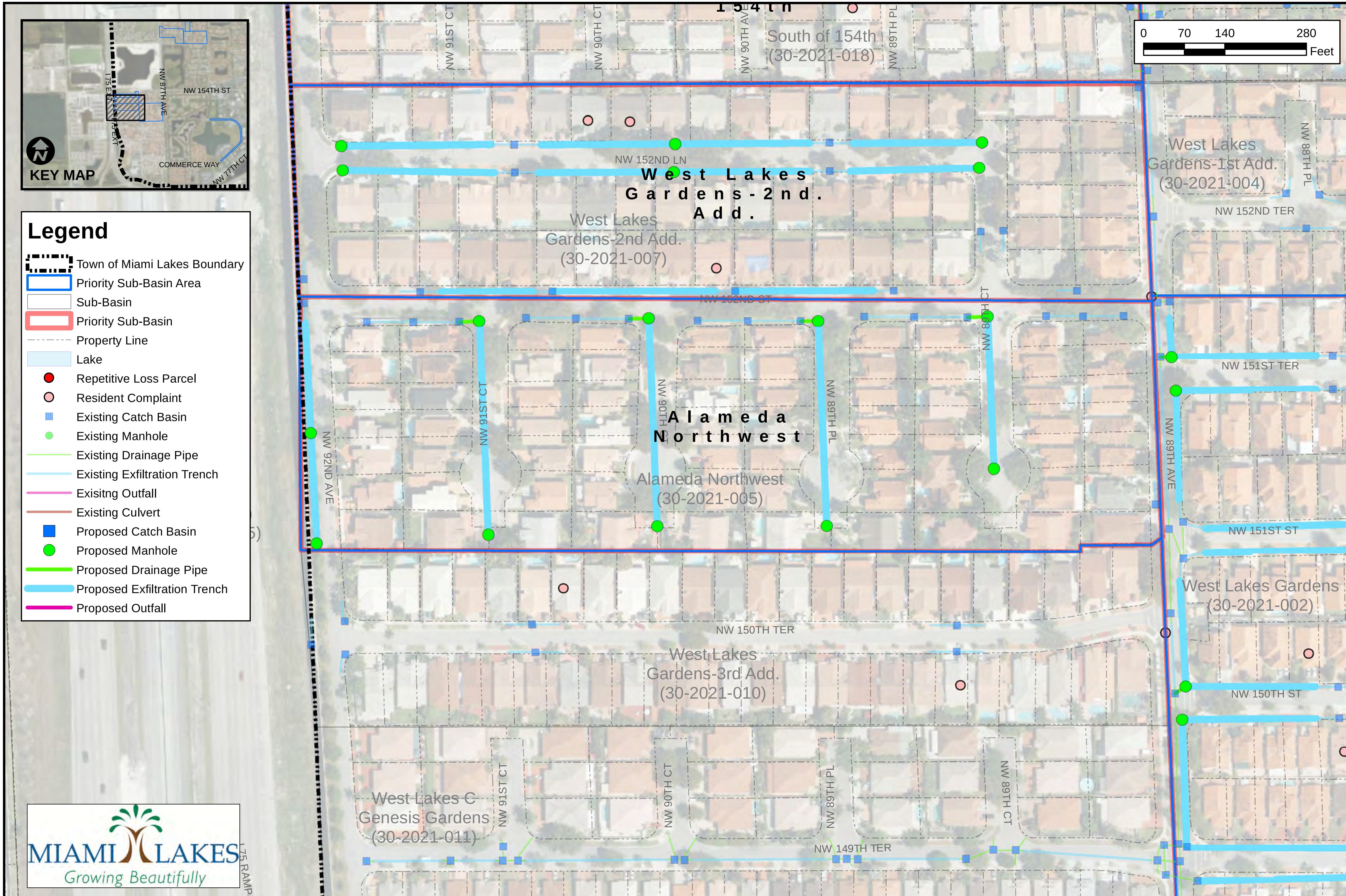

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TOWN OF MIAMI LAKES
STORMWATER MASTER PLAN
UPDATE #3

DRAINAGE SYSTEM KEY MAP
SUB-BASIN: West Lakes

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EXHIBIT
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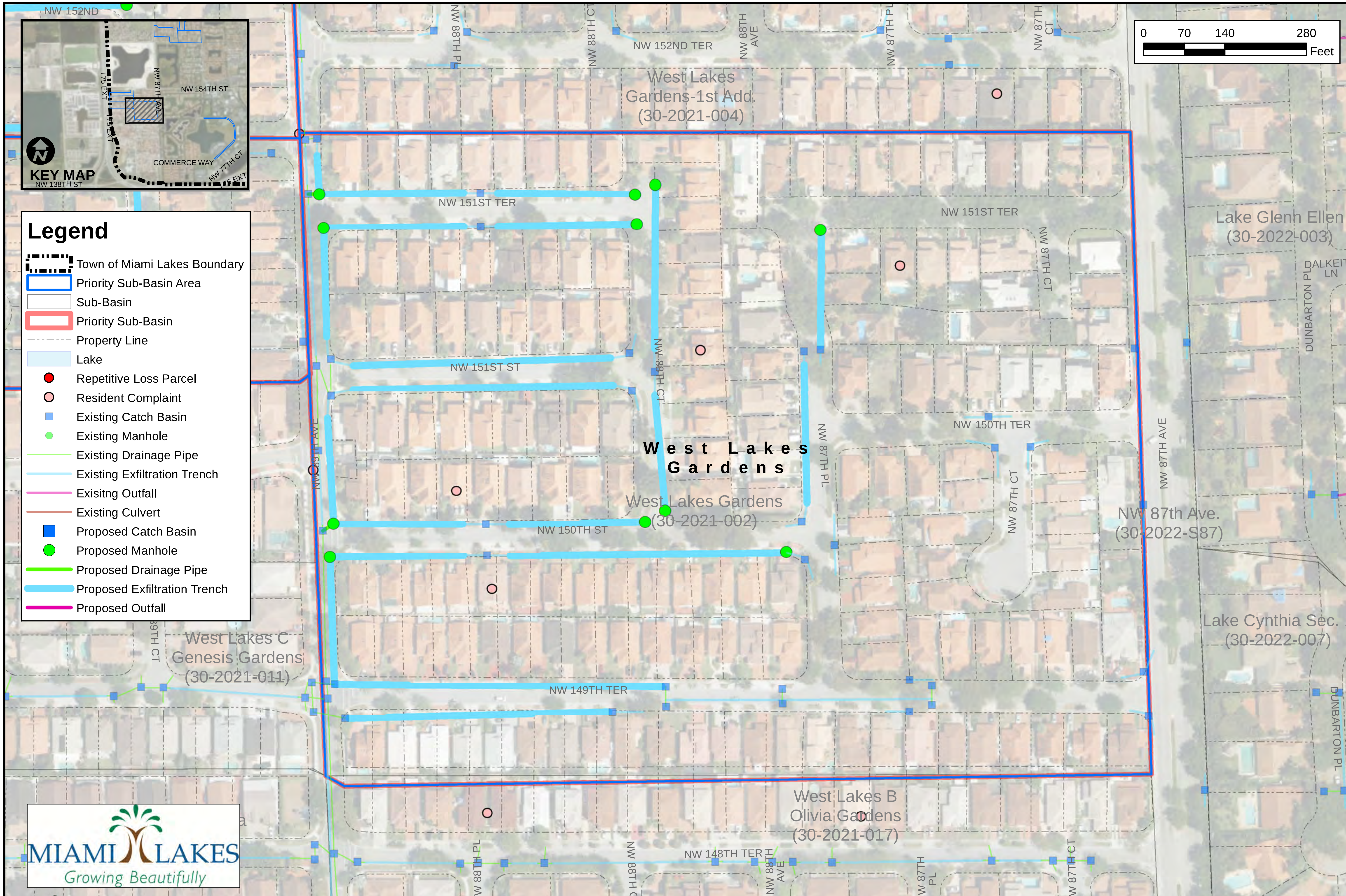

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TOWN OF MIAMI LAKES
STORMWATER MASTER PLAN
UPDATE #3

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SUB-BASIN: West Lakes

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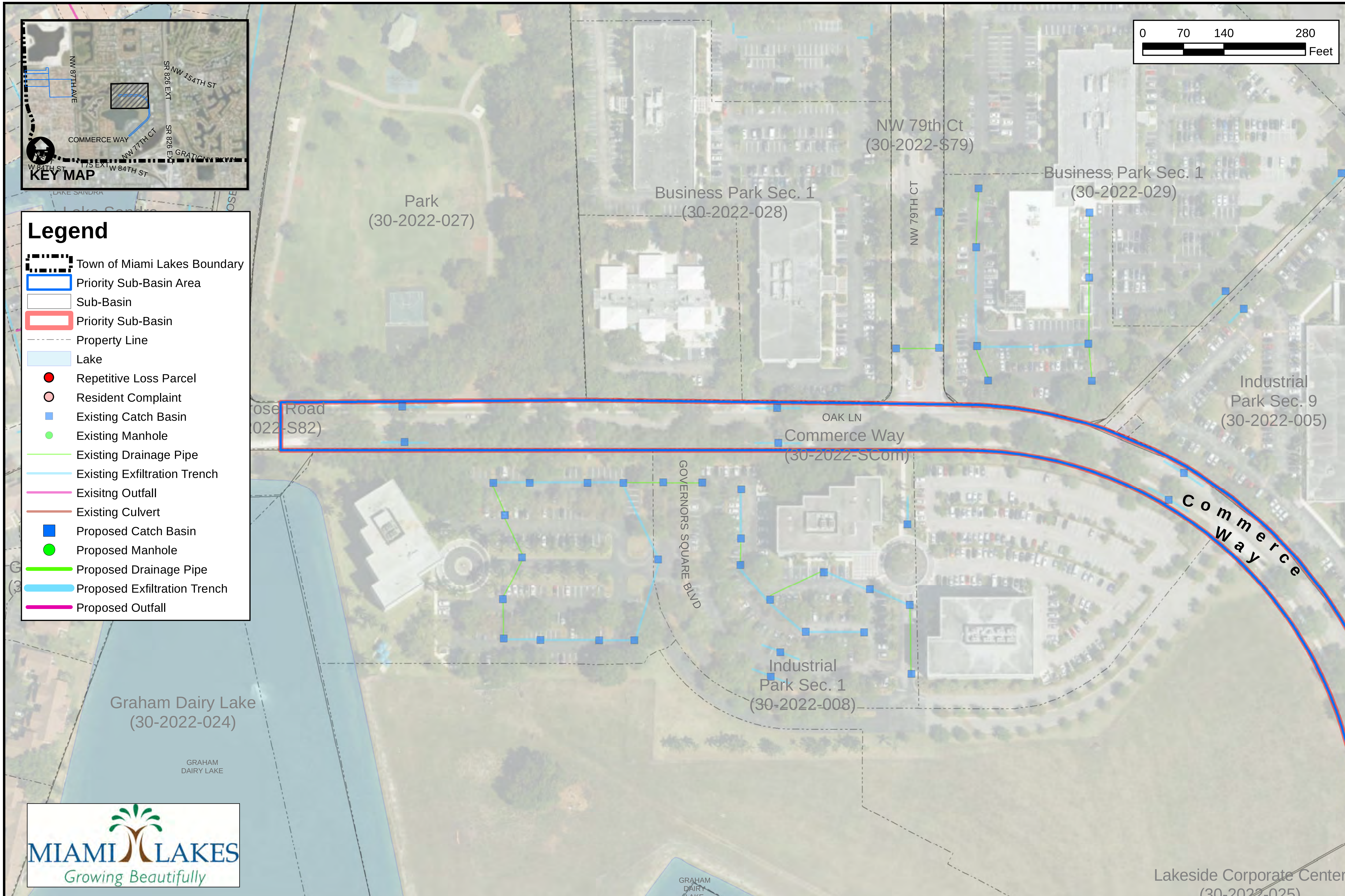

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NOT TO SCALE

TOWN OF MIAMI LAKES
STORMWATER MASTER PLAN
UPDATE #3

DRAINAGE SYSTEM KEY MAP
SUB-BASIN: Commerce Way

DATE:	MAY 2019
DESIGN:	TS
DRAWN:	JU
CHECKED:	SV
KH NO.:	044533204

EXHIBIT
11

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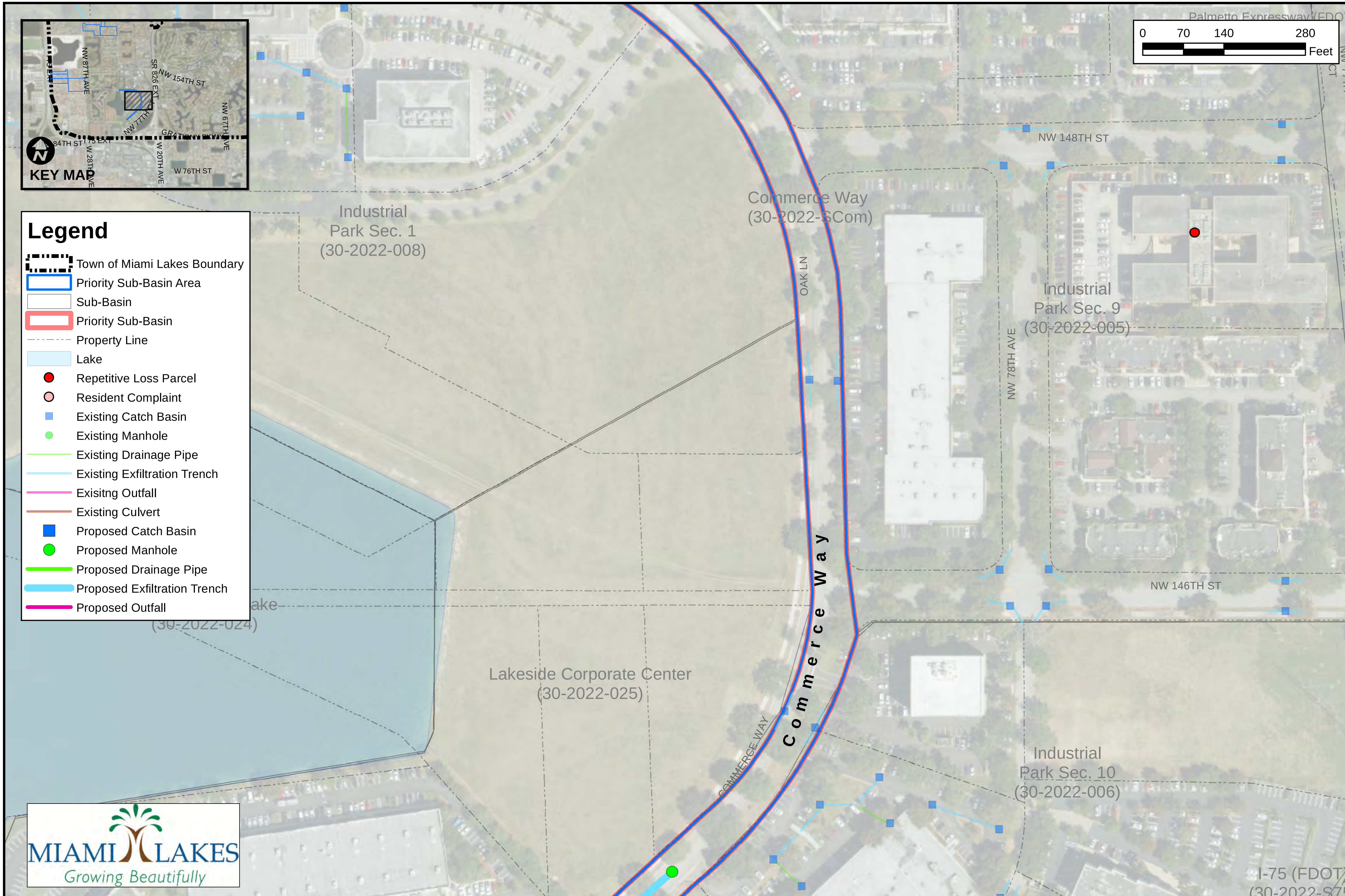

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NOT TO SCALE

TOWN OF MIAMI LAKES
STORMWATER MASTER PLAN
UPDATE #3

DRAINAGE SYSTEM KEY MAP
SUB-BASIN: Commerce Way

DATE:	MAY 2019
DESIGN:	TS
DRAWN:	JU
CHECKED:	SV
KH NO.:	044533204

EXHIBIT
12

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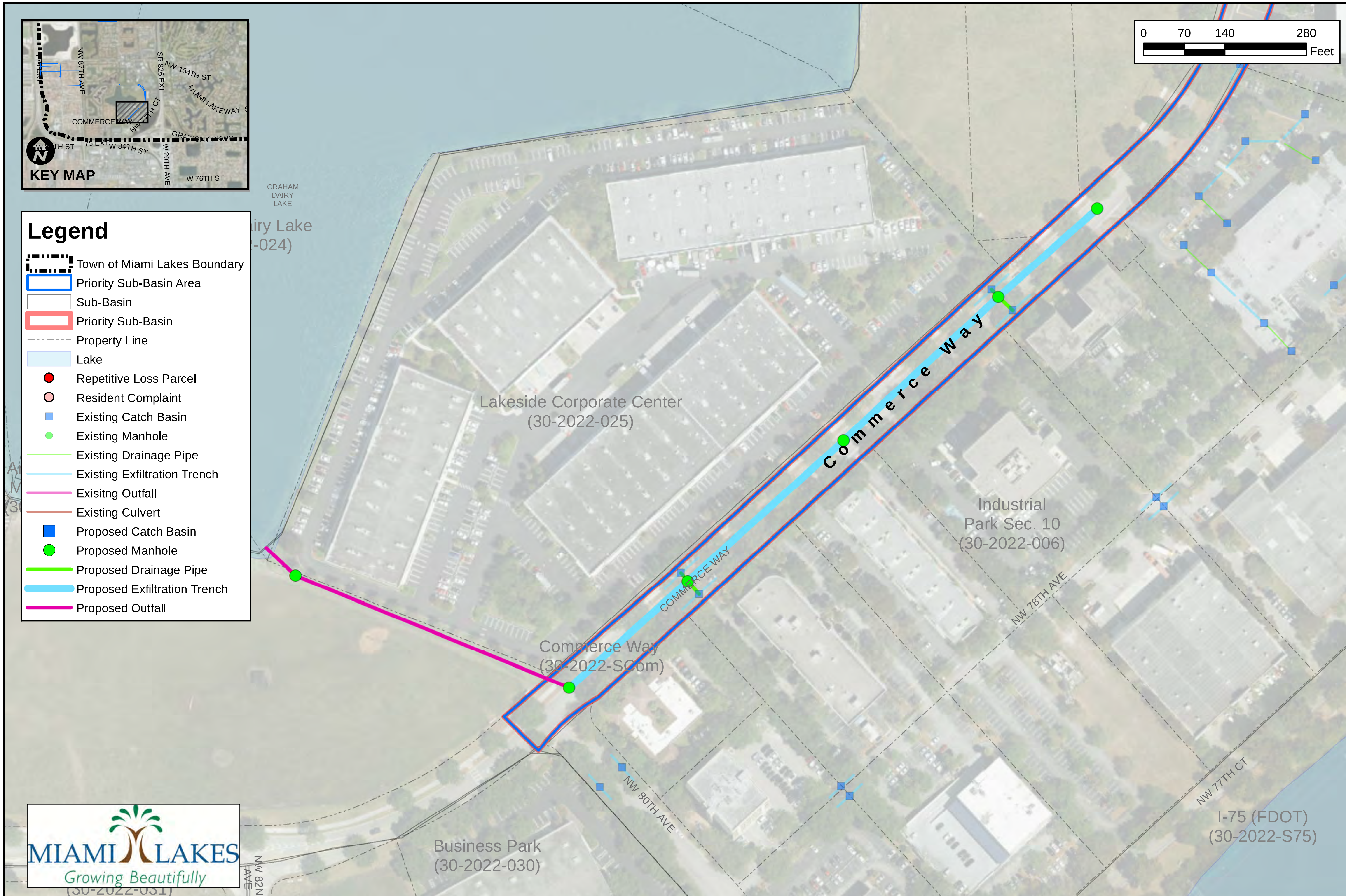

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NOT TO SCALE

TOWN OF MIAMI LAKES STORMWATER MASTER PLAN UPDATE #3

DRAINAGE SYSTEM KEY MAP
SUB-BASIN: Commerce Way

DATE:	MAY 2019
DESIGN:	TS
DRAWN:	JU
CHECKED:	SV
KH NO.:	044533204

EXHIBIT

13

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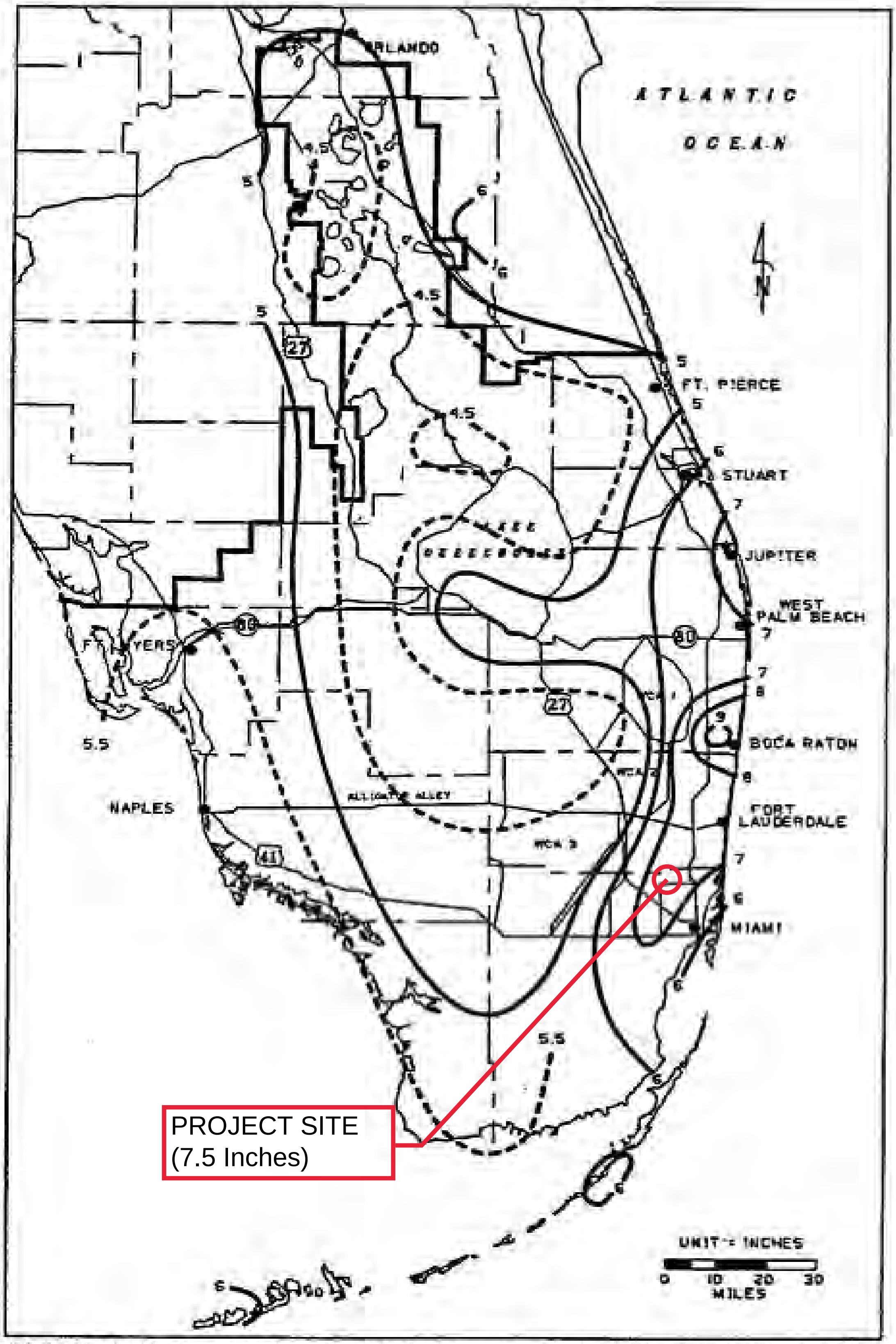


FIGURE C-3. 1-DAY RAINFALL: 5-YEAR RETURN PERIOD

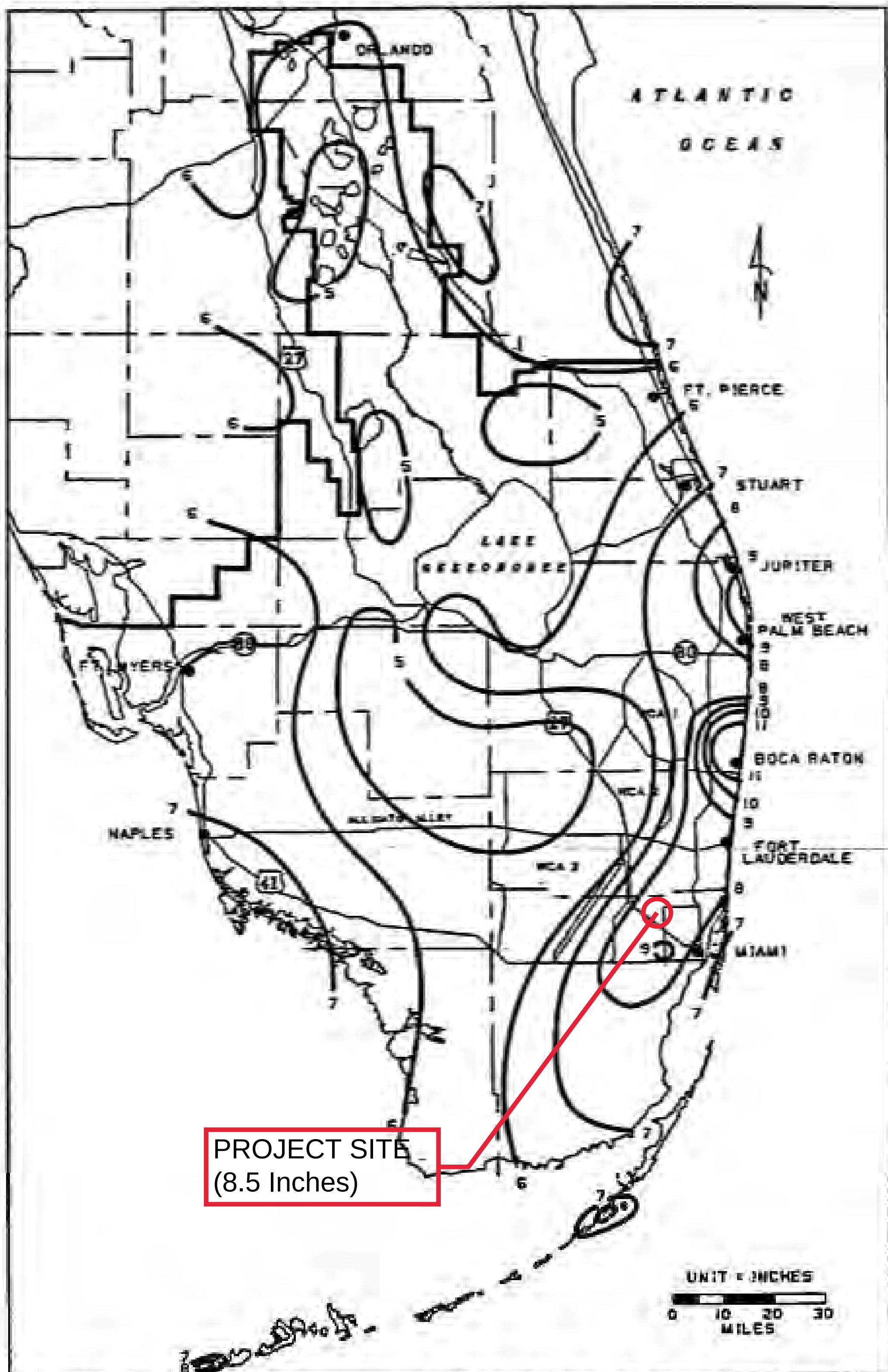


FIGURE C-4. 1-DAY RAINFALL: 10-YEAR RETURN PERIOD

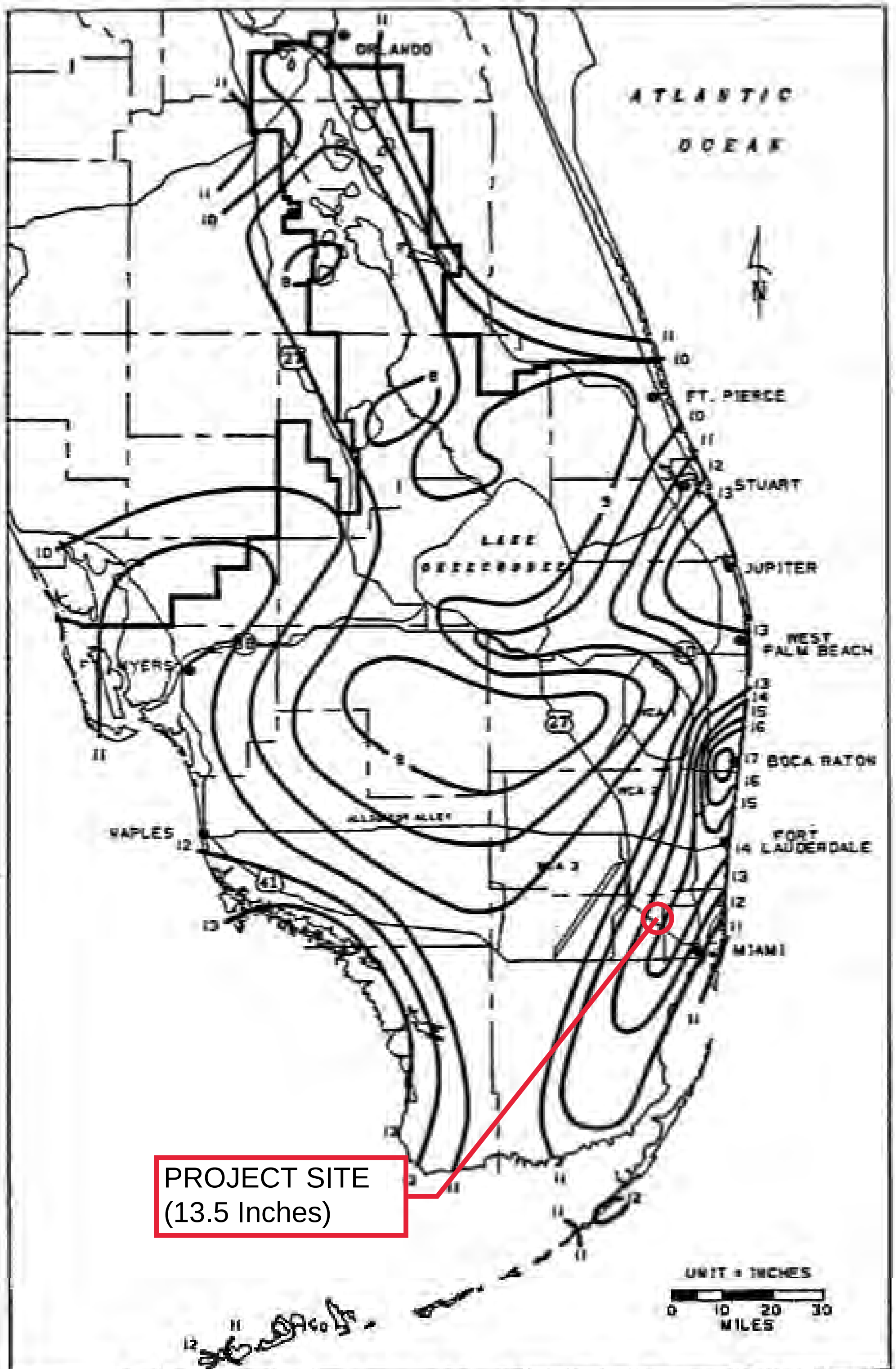


FIGURE C-8. 3-DAY RAINFALL: 25-YEAR RETURN PERIOD

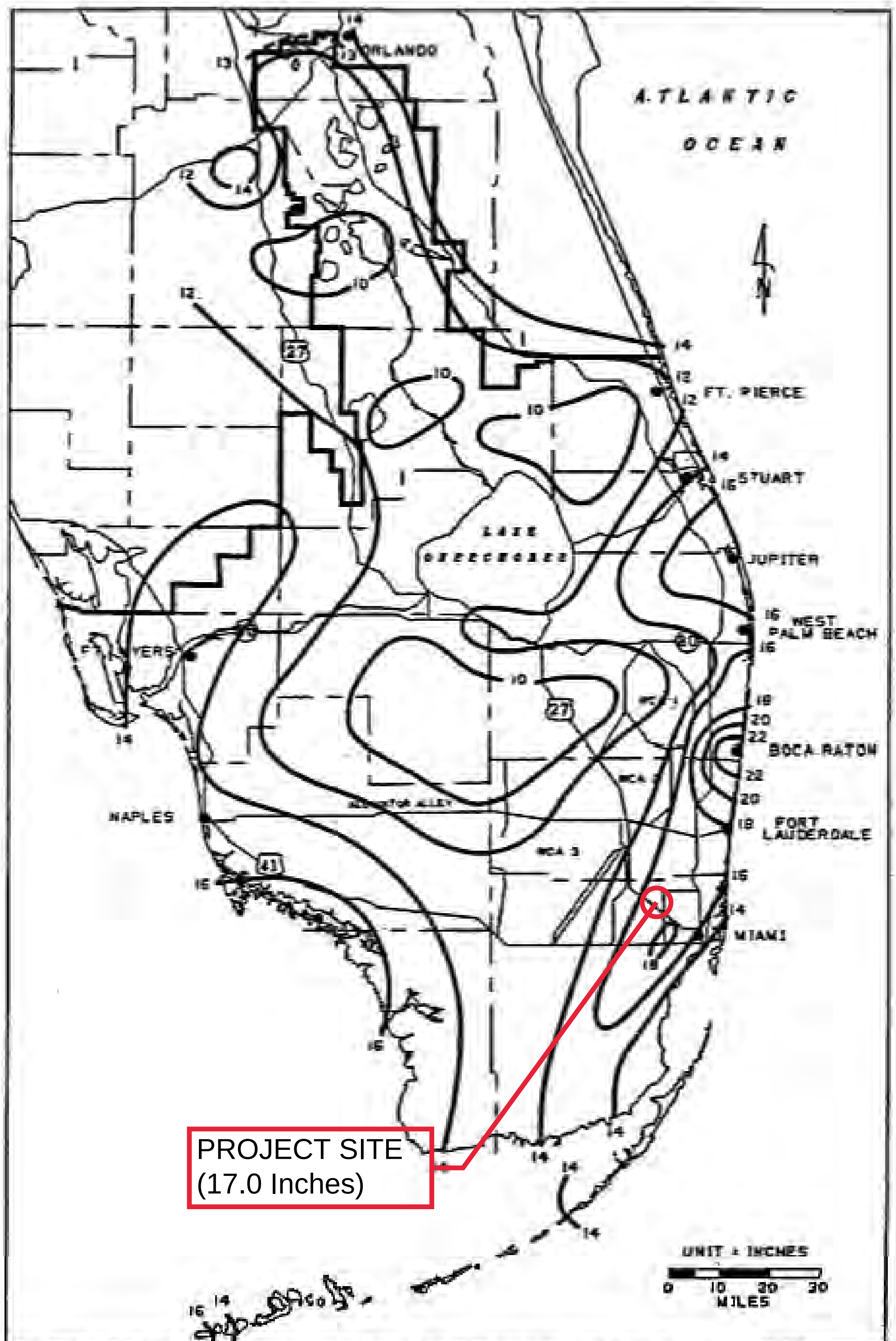
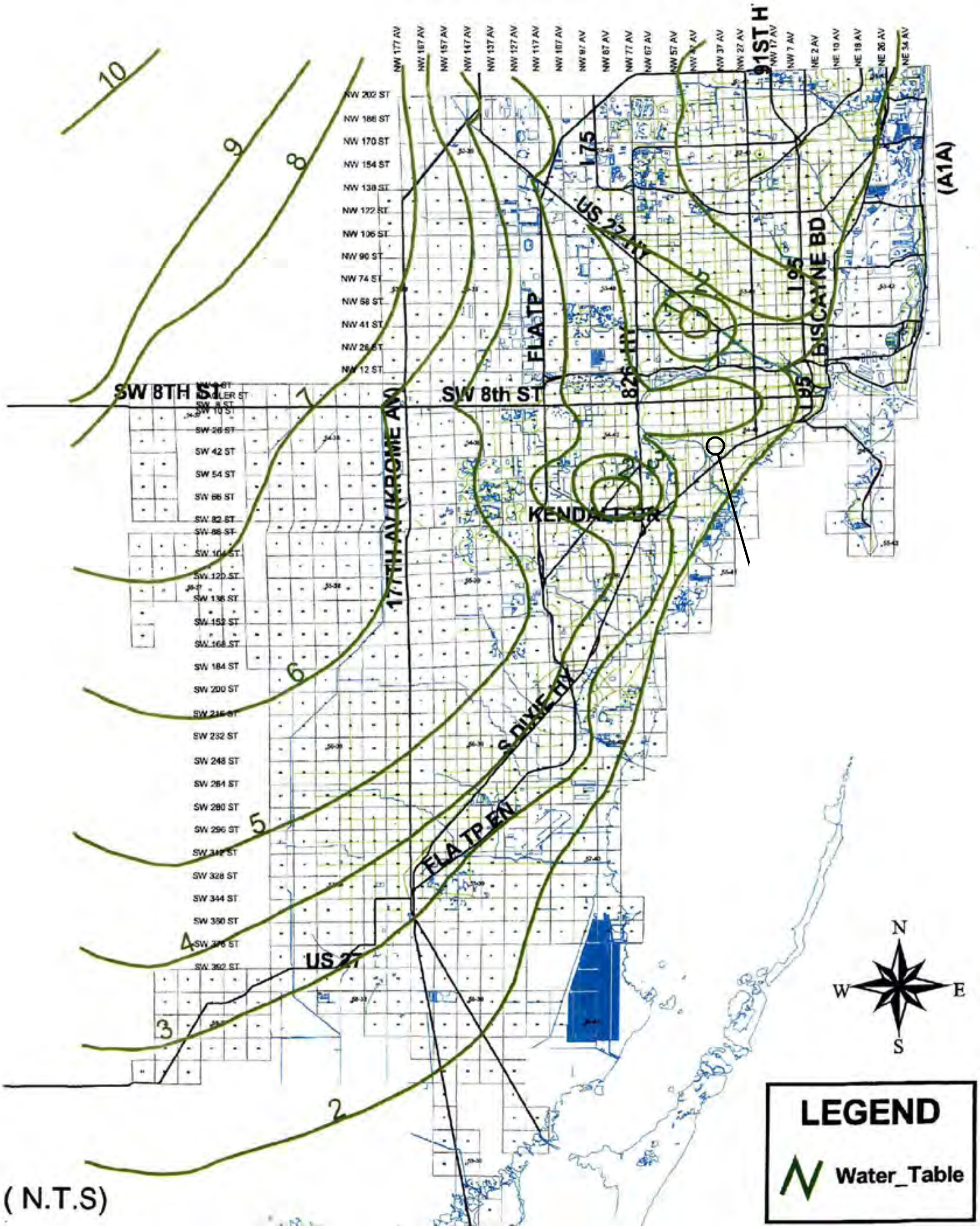


FIGURE C-9. 3-DAY RAINFALL: 100-YEAR RETURN PERIOD



MIAMI-DADE COUNTY AVERAGE
1999 OCTOBER WATER TABLE

Appendix B – Hydraulic/Hydrologic Calculations for Priority Sub-Basins

DRAINAGE CALCULATIONS

Miami Lakes Storm Water Master Plan-Update #3

Sub-Basin-Royal Oaks

Miami Lakes, Florida

2/4/2019

Site Development Data

					Right-of-Way Area							Lake		Contributing Areas						
Sub-Basin Area	**Sub-Basin Area Type**	**Water Table Elev. (feet)**	**Pavement Low Centerline (feet)**	**Pavement High Centerline (feet)**	**Paved Area (acres)**	**Paved Low Edge Elev. (feet)**	**Paved HighEdge Elev. (feet)**	**Green Area (acres)**	**Green Low Elev. (feet)**	**Green High Elev. (feet)**	**Total ROW Area (acres)**	**Lake Area (acres)**	**Lake Area Elev. (feet)**	**Pool Area (acres)**	**Building Area (acres)**	**Assumed Building Elevation (feet)**	**Paved Area (acres)2**	**Green Area (acres)2**	**Total Contributing Area (acres)**	**Total Sub-Basin Area (acres)**
Royal Oaks-8th Add.	Residential	3.20	6.70	7.60	5.88	6.45	7.70	1.04	6.55	7.70	**6.92**	7.42	4.00	0.93	9.28	8.20	6.49	6.00	**22.70**	**37.04**
Royal Oaks-1st Addition	Residential	3.20	6.70	7.60	3.44	6.45	7.70	0.68	6.55	7.70	**4.12**	-	-	0.59	7.15	8.20	3.71	3.61	**15.06**	**19.18**
Royal Lakes-First Add.	Residential	3.20	6.70	7.70	3.92	6.45	7.80	1.18	6.55	7.80	**5.10**	-	-	0.43	4.75	8.20	3.87	4.74	**13.79**	**18.89**
Royal Oaks-Sixth Add.	Residential	3.20	6.70	7.70	4.78	6.45	7.80	1.12	6.55	7.80	**5.90**	-	-	0.46	5.88	8.20	3.03	4.88	**14.25**	**20.15**
NW 83rd Place	Residential	3.20	6.70	7.30	0.83	6.45	7.40	0.10	6.55	7.40	**0.93**	-	-	0.19	1.49	8.20	1.06	0.57	**3.31**	**4.24**
TOTAL:					**18.85**			**4.12**			**22.97**	**7.42**		**2.60**	**28.55**		**18.16**	**19.80**	**69.11**	**99.50**

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DRAINAGE CALCULATIONS

Miami Lakes Storm Water Master Plan-Update #3

Sub-Basin-Royal Oaks

Miami Lakes, Florida

2/4/2019

Soil Storage and Water Quality Data

Sub-Basin Area	Avg. Elev. (feet)	Avg. Water Table Elev. (feet)	Avg. Depth to Water Table (feet)	Soil Storage Capability* (in.)	Basin Soil Storage Available** (in.)	(1) Water Quality-First 1" of Runoff (acre-ft)	(2) Water Quality-2.5" x's % Impervious (acre-ft)	Required Water Quality Volume*** (acre-ft)	Required 1/2" Pre-treatment Volume (acre-ft)
Royal Oaks-8th Add.	7.38	3.20	4.18	8.18	1.55	3.09	4.04	4.04	1.54
Royal Oaks-1st Addition	7.38	3.20	4.18	8.18	1.83	1.60	2.57	2.57	0.80
Royal Lakes-First Add.	7.38	3.20	4.18	8.18	2.56	1.57	2.29	2.29	0.79
Royal Oaks-Sixth Add.	7.38	3.20	4.18	8.18	2.44	1.68	2.43	2.43	0.84
NW 83rd Place	7.38	3.20	4.18	8.18	1.29	0.35	0.67	0.67	0.18
TOTAL:								**11.99**	**4.15**

DRAINAGE CALCULATIONS
Miami Lakes Storm Water Master Plan-Update #3
Sub-Basin-Royal Oaks
Miami Lakes, Florida
2/4/2019

Water Quality Provided

	Exfiltration Trench							Swale								TOTAL	
				Existing		Proposed		Existing				Proposed					
Sub-Basin Area	Width (feet)	Depth (feet)	Hydraulic Conductivity (cfs/ft2*ft head)	Existing Length (feet)	Existing Volume Provided (acre-feet)	Proposed Length (feet)	Proposed Volume Provided (acre-feet)	Existing Swale Width (feet)	Existing Swale Depth (feet)	Existing Swale Length (feet)	Existing Swale Volume (acre-feet)	Proposed Swale Width (feet)	Proposed Swale Depth (feet)	Proposed Swale Length (feet)	Proposed Swale Volume (acre-feet)	Total Existng Volume (acre-feet)	Total Proposed Volume (acre-feet)
Royal Oaks-8th Add.	4.00	13.50	1.21E-03	2,190	18.70	1,300	29.80	-	-	-	-	-	-	-	-	18.70	29.80
Royal Oaks-1st Addition	4.00	13.50	1.21E-03	1,175	10.03	575	14.94	-	-	-	-	-	-	-	-	10.03	14.94
Royal Lakes-First Add.	4.00	13.50	1.21E-03	1,200	10.24	420	13.83	-	-	-	-	-	-	-	-	10.24	13.83
Royal Oaks-Sixth Add.	4.00	13.50	1.21E-03	1,320	11.27	430	14.94	-	-	-	-	-	-	-	-	11.27	14.94
NW 83rd Place	4.00	13.50	1.21E-03	220	1.88	170	3.33	-	-	-	-	-	-	-	-	1.88	3.33
TOTAL:				**6,105**	**52.12**	**2,895**	**76.84**				-				-		

DRAINAGE CALCULATIONS

Miami Lakes Storm Water Master Plan-Update #3

Sub-Basin-Royal Oaks

Miami Lakes, Florida

2/4/2019

Existing Stage-Storage Input Data

	Right-of-Way		Contributing		Total					
Sub-Basin Area	Impervious Area (acres)	Pervious Area (acres)	Impervious Area (acres)2	Pervious Area (acres)2	Total Impervious Area (acres)	Impervious Low Elevation (feet)	Impervious High Elevation (feet)	Total Pervious Area (acres)	Pervious Low Elevation (feet)	Pervious High Elevation (feet)
Royal Oaks-8th Add.	5.88	1.04	6.49	6.00	12.37	6.45	7.70	7.04	6.55	7.70
Royal Oaks-1st Addition	3.44	0.68	3.71	3.61	7.15	6.45	7.70	4.29	6.55	7.70
Royal Lakes-First Add.	3.92	1.18	3.87	4.74	7.79	6.45	7.80	5.92	6.55	7.80
Royal Oaks-Sixth Add.	4.78	1.12	3.03	4.88	7.81	6.45	7.80	6.00	6.55	7.80
NW 83rd Place	0.83	0.10	1.06	0.57	1.89	6.45	7.40	0.67	6.55	7.40

Proposed Stage-Storage Input Data

	Right-of-Way		Contributing		Total					
Sub-Basin Area	Impervious Area (acres)	Pervious Area (acres)	Impervious Area (acres)2	Pervious Area (acres)2	Total Impervious Area (acres)	Impervious Low Elevation (feet)	Impervious High Elevation (feet)	Total Pervious Area (acres)	Pervious Low Elevation (feet)	Pervious High Elevation (feet)
Royal Oaks-8th Add.	5.88	1.04	6.49	6.00	12.37	6.45	7.70	7.04	6.55	7.70
Royal Oaks-1st Addition	3.44	0.68	3.71	3.61	7.15	6.45	7.70	4.29	6.55	7.70
Royal Lakes-First Add.	3.92	1.18	3.87	4.74	7.79	6.45	7.80	5.92	6.55	7.80
Royal Oaks-Sixth Add.	4.78	1.12	3.03	4.88	7.81	6.45	7.80	6.00	6.55	7.80
NW 83rd Place	0.83	0.10	1.06	0.57	1.89	6.45	7.40	0.67	6.55	7.40

Sub-Basin Royal Oaks-8th Add.
Existing Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

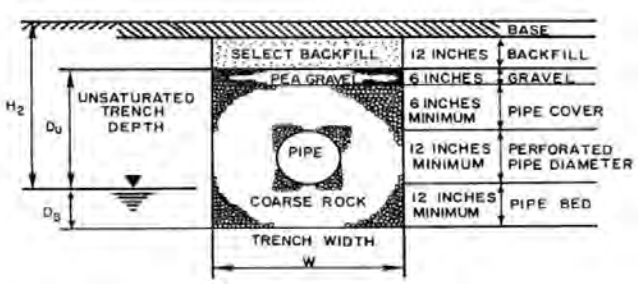
EQ. #1 $$V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$

EQ.#2 $$V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$
(If saturated depth of trench is greater than non-saturated depth of trench or if the trench width is greater than 2 times the total trench depth)

Manhole Rim Elevation (ft):	6.70	NGVD
Lowest Inlet Elevation (ft):	6.45	NGVD
Top of Trench Elev. (ft):	5.20	NGVD
Top of Pipe Elev. (ft):	4.20	NGVD
Pipe Invert Elev. (ft):	2.70	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-8.30	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	1.21E-03
H_2 (ft)=	3.25
W(ft)=	4.00
D_u(ft)=	2.00
D_s(ft)=	11.50
L(ft)=	2190
TD(ft)=	13.50

Equation used for this calculation:
V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)
V= 224.36 acre-in = 18.70 acre-ft



Equivalent Rainfall Calculations

$\frac{224.36 \text{ acre-in}}{37.04 \text{ acres}}$ = 6.06 inches equivalent storag

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 4.14'' 4.14'' / 1.359 = **3.04'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 5.49'' 5.49'' / 1.359 = **4.04'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **8.21'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **11.61'' (72 hr storm)**

Sub-Basin **Royal Oaks-1st Addition**
Existing Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

EQ. #1 $V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$

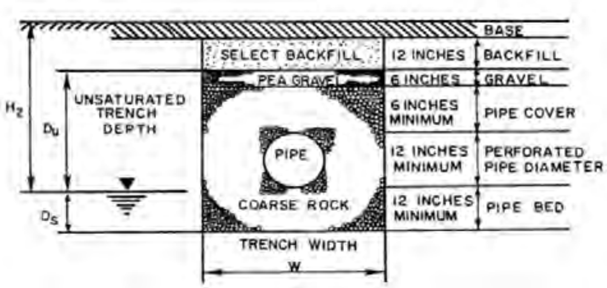
EQ.#2 $V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$
(If saturated depth of trench is greater than non-saturated depth of trench or if the trench width is greater than 2 times the total trench depth)

Manhole Rim Elevation (ft):	6.70	NGVD
Lowest Inlet Elevation (ft):	6.45	NGVD
Top of Trench Elev. (ft):	5.20	NGVD
Top of Pipe Elev. (ft):	4.20	NGVD
Pipe Invert Elev. (ft):	2.70	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-8.30	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	1.21E-03
H_2 (ft)=	3.25
W(ft)=	4.00
D_u(ft)=	2.00
D_s(ft)=	11.50
L(ft)=	1175
TD(ft)=	13.50

Equation used for this calculation:

V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)
V= 120.38 acre-in = 10.03 acre-ft



Equivalent Rainfall Calculations

$\frac{120.38 \text{ acre-in}}{19.18 \text{ acres}}$ = 6.28 inches equivalent storag

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 3.92'' 3.92'' / 1.359 = **2.88'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 5.28'' 5.28'' / 1.359 = **3.88'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **7.99'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **11.39'' (72 hr storm)**

Sub-Basin Royal Lakes-First Add.
Existing Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

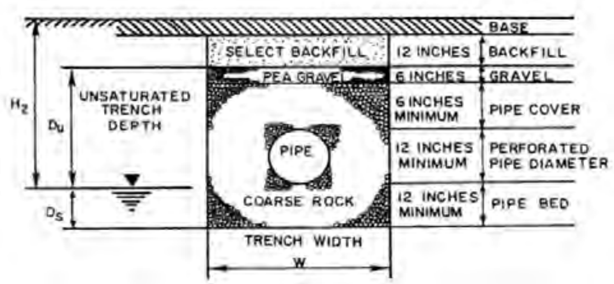
EQ. #1 $$V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$

EQ.#2 $$V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$
(If saturated depth of trench is greater than non-saturated depth of trench or if the trench width is greater than 2 times the total trench depth)

Manhole Rim Elevation (ft):	6.70	NGVD
Lowest Inlet Elevation (ft):	6.45	NGVD
Top of Trench Elev. (ft):	5.20	NGVD
Top of Pipe Elev. (ft):	4.20	NGVD
Pipe Invert Elev. (ft):	2.70	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-8.30	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	1.21E-03
H_2 (ft)=	3.25
W(ft)=	4.00
D_u(ft)=	2.00
D_s(ft)=	11.50
L(ft)=	1200
TD(ft)=	13.50

Equation used for this calculation:
V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)
V= 122.94 acre-in = 10.24 acre-ft



Equivalent Rainfall Calculations

$$\frac{122.94 \text{ acre-in}}{18.89 \text{ acres}} = 6.51$$ inches equivalent storag

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 3.68'' 3.68'' / 1.359 = **2.71'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 5.04'' 5.04'' / 1.359 = **3.71'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **7.76'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **11.16'' (72 hr storm)**

Sub-Basin Royal Oaks-Sixth Add.
Existing Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

EQ. #1 $V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$

EQ.#2 $V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$
(If saturated depth of trench is greater than non-saturated depth of trench
or if the trench width is greater than 2 times the total trench depth)

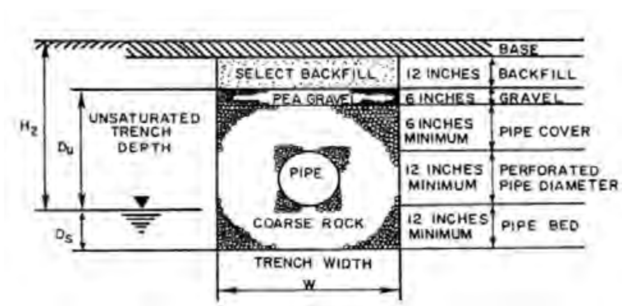
Manhole Rim Elevation (ft):	6.70	NGVD
Lowest Inlet Elevation (ft):	6.45	NGVD
Top of Trench Elev. (ft):	5.20	NGVD
Top of Pipe Elev. (ft):	4.20	NGVD
Pipe Invert Elev. (ft):	2.70	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-8.30	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	1.21E-03
H_2 (ft)=	3.25
W(ft)=	4.00
D_u(ft)=	2.00
D_s(ft)=	11.50
L(ft)=	1320
TD(ft)=	13.50

Equation used for this calculation:

V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)

V= 135.23 acre-in = 11.27 acre-ft



Equivalent Rainfall Calculations

$\frac{\text{135.23 acre-in}}{\text{20.15 acres}}$ = 6.71 inches equivalent storag

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 3.48'' 3.48'' / 1.359 = **2.56'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 4.84'' 4.84'' / 1.359 = **3.56'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **7.56'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **10.96'' (72 hr storm)**

Sub-Basin NW 83rd Place

Existing Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

EQ. #1 $$V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$

EQ.#2 $$V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$
(If saturated depth of trench is greater than non-saturated depth of trench or if the trench width is greater than 2 times the total trench depth)

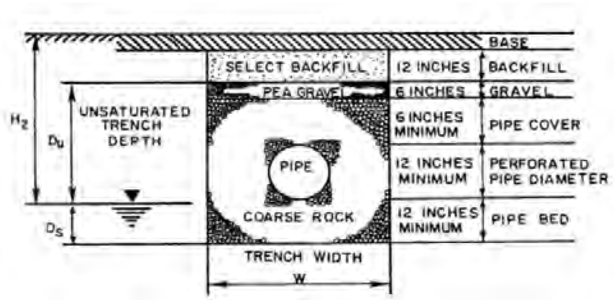
Manhole Rim Elevation (ft):	6.70	NGVD
Lowest Inlet Elevation (ft):	6.45	NGVD
Top of Trench Elev. (ft):	5.20	NGVD
Top of Pipe Elev. (ft):	4.20	NGVD
Pipe Invert Elev. (ft):	2.70	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-8.30	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	1.21E-03
H_2 (ft)=	3.25
W(ft)=	4.00
D_u(ft)=	2.00
D_s(ft)=	11.50
L(ft)=	220
TD(ft)=	13.50

Equation used for this calculation:

V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)

V= 22.54 acre-in = 1.88 acre-ft



Equivalent Rainfall Calculations

$\frac{\text{22.54 acre-in}}{\text{4.24 acres}}$ = 5.32 inches equivalent storag

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 4.88'' 4.88'' / 1.359 = **3.59'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 6.24'' 6.24'' / 1.359 = **4.59'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **8.95'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **12.35'' (72 hr storm)**

Sub-Basin Royal Oaks-8th Add.
Proposed Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

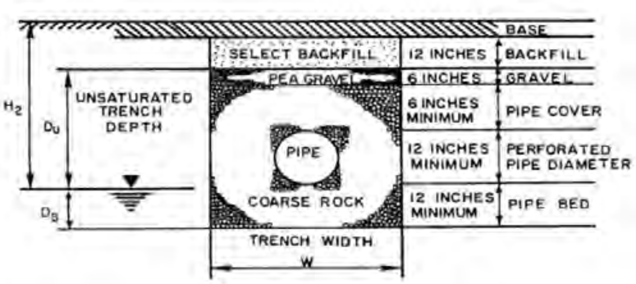
EQ. #1 $V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$

EQ.#2 $V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$
(If saturated depth of trench is greater than non-saturated depth of trench
or if the trench width is greater than 2 times the total trench depth)

Manhole Rim Elevation (ft):	6.70	NGVD
Lowest Inlet Elevation (ft):	6.45	NGVD
Top of Trench Elev. (ft):	5.20	NGVD
Top of Pipe Elev. (ft):	4.20	NGVD
Pipe Invert Elev. (ft):	2.70	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-8.30	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	1.21E-03
H_2 (ft)=	3.25
W(ft)=	4.00
D_u(ft)=	2.00
D_s(ft)=	11.50
L(ft)=	3490
TD(ft)=	13.50

Equation used for this calculation:
V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)
V= 357.55 acre-in = 29.80 acre-ft



Equivalent Rainfall Calculations

$\frac{357.55 \text{ acre-in}}{37.04 \text{ acres}}$ = 9.65 inches equivalent storag

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 0.54'' 0.54'' / 1.359 = **0.40'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 1.90'' 1.90'' / 1.359 = **1.40'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **4.62'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **8.01'' (72 hr storm)**

Sub-Basin   Royal Oaks-1st Addition
Proposed Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

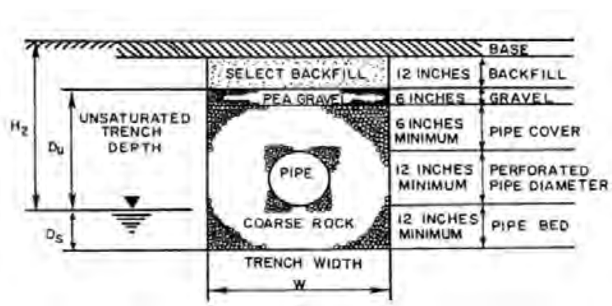
EQ. #1 $V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$

EQ.#2 $V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$
(If saturated depth of trench is greater than non-saturated depth of trench
or if the trench width is greater than 2 times the total trench depth)

Manhole Rim Elevation (ft):	6.70	NGVD
Lowest Inlet Elevation (ft):	6.45	NGVD
Top of Trench Elev. (ft):	5.20	NGVD
Top of Pipe Elev. (ft):	4.20	NGVD
Pipe Invert Elev. (ft):	2.70	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-8.30	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	1.21E-03
H_2 (ft)=	3.25
W(ft)=	4.00
D_u(ft)=	2.00
D_s(ft)=	11.50
L(ft)=	1750
TD(ft)=	13.50

Equation used for this calculation:
V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)
V= 179.29 acre-in = 14.94 acre-ft



Equivalent Rainfall Calculations

$\frac{\text{179.29 acre-in}}{\text{19.18 acres}}$ = 9.35 inches equivalent storag

5 year 24 hr storm event = 7.50''   72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 0.84''   0.84'' / 1.359 = **0.62'' (24 hr storm)**

10 year 24 hr storm event = 8.50''   72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 2.20''   2.20'' / 1.359 = **1.62'' (24 hr storm)**

25 year 24 hr storm event = 10.50''   72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **4.92'' (72 hr storm)**

100 year 24 hr storm event = 13.00''   72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **8.32'' (72 hr storm)**

Sub-Basin   Royal Lakes-First Add.
Proposed Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

EQ. #1 $$V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$

EQ.#2 $$V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$
(If saturated depth of trench is greater than non-saturated depth of trench or if the trench width is greater than 2 times the total trench depth)

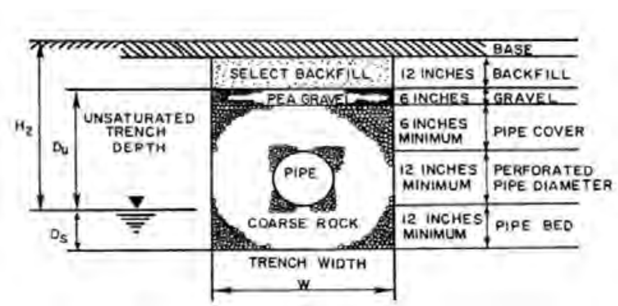
Manhole Rim Elevation (ft):	6.70	NGVD
Lowest Inlet Elevation (ft):	6.45	NGVD
Top of Trench Elev. (ft):	5.20	NGVD
Top of Pipe Elev. (ft):	4.20	NGVD
Pipe Invert Elev. (ft):	2.70	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-8.30	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	1.21E-03
H_2 (ft)=	3.25
W(ft)=	4.00
D_u(ft)=	2.00
D_s(ft)=	11.50
L(ft)=	1620
TD(ft)=	13.50

Equation used for this calculation:

V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)

V= 165.97 acre-in = 13.83 acre-ft



Equivalent Rainfall Calculations

$\frac{165.97 \text{ acre-in}}{18.89 \text{ acres}}$ = 8.79 inches equivalent storag

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 1.41'' 1.41'' / 1.359 = **1.03'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 2.77'' 2.77'' / 1.359 = **2.03'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **5.48'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **8.88'' (72 hr storm)**

Sub-Basin Royal Oaks-Sixth Add.
Proposed Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

EQ. #1 $V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$

EQ.#2 $V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$
(If saturated depth of trench is greater than non-saturated depth of trench
or if the trench width is greater than 2 times the total trench depth)

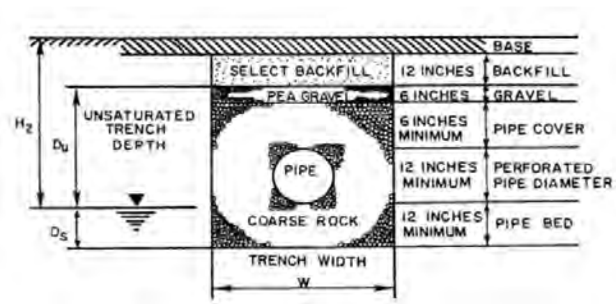
Manhole Rim Elevation (ft):	6.70	NGVD
Lowest Inlet Elevation (ft):	6.45	NGVD
Top of Trench Elev. (ft):	5.20	NGVD
Top of Pipe Elev. (ft):	4.20	NGVD
Pipe Invert Elev. (ft):	2.70	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-8.30	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	1.21E-03
H_2 (ft)=	3.25
W(ft)=	4.00
D_u(ft)=	2.00
D_s(ft)=	11.50
L(ft)=	1750
TD(ft)=	13.50

Equation used for this calculation:

V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)

V= 179.29 acre-in = 14.94 acre-ft



Equivalent Rainfall Calculations

$\frac{179.29 \text{ acre-in}}{20.15 \text{ acres}}$ = 8.90 inches equivalent storag

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 1.29'' 1.29'' / 1.359 = **0.95'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 2.65'' 2.65'' / 1.359 = **1.95'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **5.37'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **8.77'' (72 hr storm)**

Sub-Basin NW 83rd Place
Proposed Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

EQ. #1 $$V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$

EQ.#2 $$V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$
(If saturated depth of trench is greater than non-saturated depth of trench
or if the trench width is greater than 2 times the total trench depth)

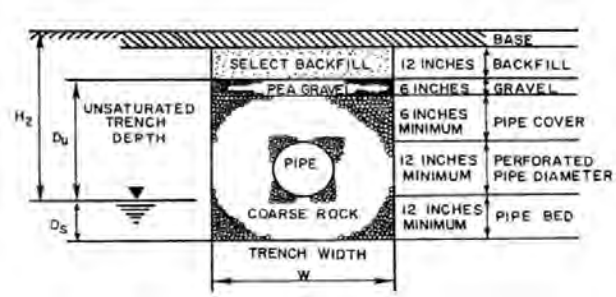
Manhole Rim Elevation (ft):	6.70	NGVD
Lowest Inlet Elevation (ft):	6.45	NGVD
Top of Trench Elev. (ft):	5.20	NGVD
Top of Pipe Elev. (ft):	4.20	NGVD
Pipe Invert Elev. (ft):	2.70	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-8.30	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	1.21E-03
H_2 (ft)=	3.25
W(ft)=	4.00
D_u(ft)=	2.00
D_s(ft)=	11.50
L(ft)=	390
TD(ft)=	13.50

Equation used for this calculation:

V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)

V= 39.96 acre-in = 3.33 acre-ft



Equivalent Rainfall Calculations

$\frac{\text{39.96 acre-in}}{\text{4.24 acres}}$ = 9.42 inches equivalent storag

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 0.77'' 0.77'' / 1.359 = **0.57'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 2.13'' 2.13'' / 1.359 = **1.57'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **4.85'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **8.24'' (72 hr storm)**

DRAINAGE CALCULATIONS

Miami Lakes Storm Water Master Plan-Update #3

Sub-Basin-Royal Oaks

Miami Lakes, Florida

2/4/2019

Maximum Stage Results

		PERFORMANCE GOALS				EXISTING CONDITIONS				PROPOSED CONDITIONS			
Sub-Basin Area	**Proposed Exfil. Trench (linear feet)**	**Paved Low Edge Elev. (feet)**	**Pavement Low Centerline /Crown (feet)**	**12" + Paved Low Edge Elev. (feet)2**	**Building Finished Floor Elevations (feet)**	**5-year, 24-hour Storm Stage (feet)**	**10-year, 24-hour Storm Stage (feet)**	**25-year, 72-hour Storm Stage (feet)**	**100-year, 72-hour Storm Stage (feet)**	**5-year, 24-hour Storm Stage (feet)**	**10-year, 24-hour Storm Stage (feet)**	**25-year, 72-hour Storm Stage (feet)**	**100-year, 72-hour Storm Stage (feet)**
Royal Oaks-8th Add.	1,300	6.45	6.70	7.70	8.20	7.21	7.39	8.14	8.67	6.01	6.66	7.49	8.11
Royal Oaks-1st Addition	575	6.45	6.70	7.70	8.20	7.12	7.27	7.94	8.41	6.04	6.66	7.43	8.00
Royal Lakes-First Add.	420	6.45	6.70	7.70	8.20	7.02	7.14	7.68	8.13	6.10	6.66	7.37	7.84
Royal Oaks-Sixth Add.	430	6.45	6.70	7.70	8.20	7.02	7.15	7.72	8.18	6.09	6.68	7.39	7.90
NW 83rd Place	170	6.45	6.70	7.70	8.20	7.20	7.34	7.98	8.45	6.06	6.61	7.38	7.88

Notes:

1. Flooding during a five-year, 24-hour storm event is to be below the roadway travel lanes, e.g. the lowest paved elevation of the roadway.
2. Flooding during a 10-year, 24-hour storm event is to be below the crown of roadway.
3. Flooding during a 25-year, 72-hour storm event is to be below 12 inches above the crown of roadway.
4. Flooding during the 100-year, 72-hour storm event is to be below building finished floor elevations.

DRAINAGE CALCULATIONS

Miami Lakes Storm Water Master Plan-Update #3

Sub-Basin-Royal Oaks

Miami Lakes, Florida

2/4/2019

Design Summary

	Royal Oaks-8th Add.	Royal Oaks-1st Addition	Royal Lakes-First Add.	Royal Oaks-Sixth Add.	NW 83rd Place
Total Area (acres)	37.0	19.2	18.9	20.2	4.2
Water Quality					
Control/Water Table Elevation (ft)	3.20	3.20	3.20	3.20	3.20
Water Quality Volume Required (ac-ft)	4.04	2.57	2.29	2.43	0.67
5 Year 1 Day Storm					
Rainfall (in)	7.50	7.50	7.50	7.50	7.50
Equivalent Rainfall (in)	0.40	0.62	1.03	0.95	0.57
Peak Stage (ft)	6.01	6.04	6.10	6.09	6.06
Min. Low Edge of Pavement Elev. (ft)	6.45	6.45	6.45	6.45	6.45
10 Year 1 Day Storm					
Rainfall (in)	8.50	8.50	8.50	8.50	8.50
Equivalent Rainfall (in)	1.40	1.62	2.03	1.95	1.57
Peak Stage (ft)	6.66	6.66	6.66	6.68	6.61
Min. Crown of Road Elev. (ft)	6.70	6.70	6.70	6.70	6.70
25 Year 3 Day Storm					
Rainfall (in)	10.50	10.50	10.50	10.50	10.50
Equivalent Rainfall (in)	4.62	4.92	5.48	5.37	4.85
Peak Stage (ft)	7.49	7.43	7.37	7.39	7.38
Min. Crown of Road + 12" Elev. (ft)	7.70	7.70	7.70	7.70	7.70
100 Year 3 Day Storm					
Rainfall (in)	13.00	13.00	13.00	13.00	13.00
Equivalent Rainfall (in)	8.01	8.32	8.88	8.77	8.24
Peak Stage (ft)	8.11	8.00	7.84	7.90	7.88
timated Min. Finished Floor Elevation (ft)	8.20	8.20	8.20	8.20	8.20

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 02, 2000;1200 hr Duration: 36 hr
Time Step: 0.2 hr,   Iterations: 10

Basin 1: Royal Oaks-8th Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 10 year
1 Day Rainfall: 4.04 inches
Area: 37.04 acres
Ground Storage: 1.55 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	2.12
8.00	17.60
9.00	37.01
10.00	56.42

Basin 2: Royal Oaks-1st Addition

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 10 year
1 Day Rainfall: 3.88 inches
Area: 19.18 acres
Ground Storage: 1.83 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.24
8.00	10.37
9.00	21.81
10.00	33.25

Basin 3: Royal Lakes-First Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 10 year
1 Day Rainfall: 3.71 inches
Area: 18.89 acres
Ground Storage: 2.56 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.35
8.00	11.70

9.00	25.41
10.00	39.12

Basin 4: Royal Oaks-Sixth Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 10 year
1 Day Rainfall: 3.56 inches
Area: 20.15 acres
Ground Storage: 2.44 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.36
8.00	11.78
9.00	25.59
10.00	39.40

Basin 5: NW 83rd Place

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 10 year
1 Day Rainfall: 4.59 inches
Area: 4.24 acres
Ground Storage: 1.29 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.38
8.00	2.72
9.00	5.28
10.00	7.84

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	3.20
100.00	3.20

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Royal Oaks-8th	7.39	25.60	3.00	0.20
Royal Oaks-1st	7.27	25.60	3.00	0.20
Royal Lakes-Fi	7.14	25.40	3.00	0.20
Royal Oaks-Six	7.15	25.60	3.00	0.20

NW 83rd Place	7.34	26.00	3.00	0.20

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Royal Oaks-8th	8.13	0.00	0.00	0.00	8.13	0.00
Royal Oaks-1st	3.69	0.00	0.00	0.00	3.69	0.00
Royal Lakes-Fi	2.80	0.00	0.00	0.00	2.80	0.00
Royal Oaks-Six	2.87	0.00	0.00	0.00	2.87	0.00
NW 83rd Place	1.18	0.00	0.00	0.00	1.18	0.00

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 05, 2000;0000 hr Duration: 96 hr
Time Step: 0.2 hr,   Iterations: 10

Basin 1: Royal Oaks-8th Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 25 year
3 Day Rainfall: 8.21 inches
Area: 37.04 acres
Ground Storage: 1.55 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	2.12
8.00	17.60
9.00	37.01
10.00	56.42

Basin 2: Royal Oaks-1st Addition

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 25 year
3 Day Rainfall: 7.99 inches
Area: 19.18 acres
Ground Storage: 1.83 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.24
8.00	10.37
9.00	21.81
10.00	33.25

Basin 3: Royal Lakes-First Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 25 year
3 Day Rainfall: 7.76 inches
Area: 18.89 acres
Ground Storage: 2.56 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.35
8.00	11.70

9.00	25.41
10.00	39.12

Basin 4: Royal Oaks-Sixth Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 25 year
3 Day Rainfall: 7.56 inches
Area: 20.15 acres
Ground Storage: 2.44 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.36
8.00	11.78
9.00	25.59
10.00	39.40

Basin 5: NW 83rd Place

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 25 year
3 Day Rainfall: 8.94999 inches
Area: 4.24 acres
Ground Storage: 1.29 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.38
8.00	2.72
9.00	5.28
10.00	7.84

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	3.20
100.00	3.20

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Royal Oaks-8th	8.14	73.40	3.00	0.20
Royal Oaks-1st	7.94	73.60	3.00	0.20
Royal Lakes-Fi	7.68	73.60	3.00	0.20
Royal Oaks-Six	7.72	73.60	3.00	0.20

NW 83rd Place	7.98	73.60	3.00	0.20

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Royal Oaks-8th	20.38	0.00	0.00	0.00	20.38	0.00
Royal Oaks-1st	9.82	0.00	0.00	0.00	9.82	0.00
Royal Lakes-Fi	8.43	0.00	0.00	0.00	8.43	0.00
Royal Oaks-Six	8.83	0.00	0.00	0.00	8.83	0.00
NW 83rd Place	2.67	0.00	0.00	0.00	2.67	0.00

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 05, 2000;0000 hr Duration: 96 hr
Time Step: 0.2 hr,   Iterations: 10

Basin 1: Royal Oaks-8th Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 100 year
3 Day Rainfall: 11.61 inches
Area: 37.04 acres
Ground Storage: 1.55 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	2.12
8.00	17.60
9.00	37.01
10.00	56.42

Basin 2: Royal Oaks-1st Addition

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 100 year
3 Day Rainfall: 11.39 inches
Area: 19.18 acres
Ground Storage: 1.83 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.24
8.00	10.37
9.00	21.81
10.00	33.25

Basin 3: Royal Lakes-First Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 100 year
3 Day Rainfall: 11.16 inches
Area: 18.89 acres
Ground Storage: 2.56 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.35
8.00	11.70

9.00	25.41
10.00	39.12

Basin 4: Royal Oaks-Sixth Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 100 year
3 Day Rainfall: 10.96 inches
Area: 20.15 acres
Ground Storage: 2.44 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.36
8.00	11.78
9.00	25.59
10.00	39.40

Basin 5: NW 83rd Place

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 100 year
3 Day Rainfall: 12.35 inches
Area: 4.24 acres
Ground Storage: 1.29 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.38
8.00	2.72
9.00	5.28
10.00	7.84

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	3.20
100.00	3.20

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Royal Oaks-8th	8.67	73.80	3.00	0.20
Royal Oaks-1st	8.41	73.80	3.00	0.20
Royal Lakes-Fi	8.13	73.40	3.00	0.20
Royal Oaks-Six	8.18	74.00	3.00	0.20

NW 83rd Place	8.45	73.80	3.00	0.20

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Royal Oaks-8th	30.66	0.00	0.00	0.00	30.66	0.00
Royal Oaks-1st	15.11	0.00	0.00	0.00	15.11	0.00
Royal Lakes-Fi	13.51	0.00	0.00	0.00	13.51	0.00
Royal Oaks-Six	14.26	0.00	0.00	0.00	14.26	0.00
NW 83rd Place	3.86	0.00	0.00	0.00	3.86	0.00

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 02, 2000;1200 hr Duration: 36 hr
Time Step: 0.2 hr,   Iterations: 10

Basin 1: Royal Oaks-8th Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 5 year
1 Day Rainfall: 0.4 inches
Area: 37.04 acres
Ground Storage: 1.55 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	2.12
8.00	17.60
9.00	37.01
10.00	56.42

Basin 2: Royal Oaks-1st Addition

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 5 year
1 Day Rainfall: 0.62 inches
Area: 19.18 acres
Ground Storage: 1.83 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.24
8.00	10.37
9.00	21.81
10.00	33.25

Basin 3: Royal Lakes-First Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 5 year
1 Day Rainfall: 1.03 inches
Area: 18.89 acres
Ground Storage: 2.56 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.35
8.00	11.70

9.00	25.41
10.00	39.12

Basin 4: Royal Oaks-Sixth Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 5 year
1 Day Rainfall: 0.95 inches
Area: 20.15 acres
Ground Storage: 2.44 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.36
8.00	11.78
9.00	25.59
10.00	39.40

Basin 5: NW 83rd Place

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 5 year
1 Day Rainfall: 0.57 inches
Area: 4.24 acres
Ground Storage: 1.29 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.38
8.00	2.72
9.00	5.28
10.00	7.84

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	3.20
100.00	3.20

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Royal Oaks-8th	6.01	25.20	3.00	0.20
Royal Oaks-1st	6.04	25.20	3.00	0.20
Royal Lakes-Fi	6.10	25.60	3.00	0.20
Royal Oaks-Six	6.09	25.80	3.00	0.20

NW 83rd Place	6.06	25.40	3.00	0.20

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Royal Oaks-8th	0.02	0.00	0.00	0.00	0.02	0.00
Royal Oaks-1st	0.05	0.00	0.00	0.00	0.05	0.00
Royal Lakes-Fi	0.14	0.00	0.00	0.00	0.14	0.00
Royal Oaks-Six	0.12	0.00	0.00	0.00	0.12	0.00
NW 83rd Place	0.02	0.00	0.00	0.00	0.02	0.00

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 02, 2000;1200 hr Duration: 36 hr
Time Step: 0.2 hr, Iterations: 10

Basin 1: Royal Oaks-8th Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 10 year
1 Day Rainfall: 1.4 inches
Area: 37.04 acres
Ground Storage: 1.55 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	2.12
8.00	17.60
9.00	37.01
10.00	56.42

Basin 2: Royal Oaks-1st Addition

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 10 year
1 Day Rainfall: 1.62 inches
Area: 19.18 acres
Ground Storage: 1.83 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.24
8.00	10.37
9.00	21.81
10.00	33.25

Basin 3: Royal Lakes-First Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 10 year
1 Day Rainfall: 2.03 inches
Area: 18.89 acres
Ground Storage: 2.56 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.35
8.00	11.70

9.00	25.41
10.00	39.12

Basin 4: Royal Oaks-Sixth Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 10 year
1 Day Rainfall: 1.95 inches
Area: 20.15 acres
Ground Storage: 2.44 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.36
8.00	11.78
9.00	25.59
10.00	39.40

Basin 5: NW 83rd Place

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 10 year
1 Day Rainfall: 1.57 inches
Area: 4.24 acres
Ground Storage: 1.29 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.38
8.00	2.72
9.00	5.28
10.00	7.84

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	3.20
100.00	3.20

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Royal Oaks-8th	6.66	25.60	3.00	0.20
Royal Oaks-1st	6.66	25.80	3.00	0.20
Royal Lakes-Fi	6.66	25.80	3.00	0.20
Royal Oaks-Six	6.68	25.80	3.00	0.20

NW 83rd Place	6.61	25.80	3.00	0.20

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Royal Oaks-8th	1.39	0.00	0.00	0.00	1.39	0.00
Royal Oaks-1st	0.81	0.00	0.00	0.00	0.81	0.00
Royal Lakes-Fi	0.89	0.00	0.00	0.00	0.89	0.00
Royal Oaks-Six	0.92	0.00	0.00	0.00	0.92	0.00
NW 83rd Place	0.23	0.00	0.00	0.00	0.23	0.00

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 05, 2000;0000 hr Duration: 96 hr
Time Step: 0.2 hr,   Iterations: 10

Basin 1: Royal Oaks-8th Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 25 year
3 Day Rainfall: 4.62 inches
Area: 37.04 acres
Ground Storage: 1.55 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	2.12
8.00	17.60
9.00	37.01
10.00	56.42

Basin 2: Royal Oaks-1st Addition

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 25 year
3 Day Rainfall: 4.92 inches
Area: 19.18 acres
Ground Storage: 1.83 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.24
8.00	10.37
9.00	21.81
10.00	33.25

Basin 3: Royal Lakes-First Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 25 year
3 Day Rainfall: 5.48 inches
Area: 18.89 acres
Ground Storage: 2.56 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.35
8.00	11.70

9.00	25.41
10.00	39.12

Basin 4: Royal Oaks-Sixth Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 25 year
3 Day Rainfall: 5.36999 inches
Area: 20.15 acres
Ground Storage: 2.44 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.36
8.00	11.78
9.00	25.59
10.00	39.40

Basin 5: NW 83rd Place

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 25 year
3 Day Rainfall: 4.85 inches
Area: 4.24 acres
Ground Storage: 1.29 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.38
8.00	2.72
9.00	5.28
10.00	7.84

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	3.20
100.00	3.20

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Royal Oaks-8th	7.49	73.60	3.00	0.20
Royal Oaks-1st	7.43	73.60	3.00	0.20
Royal Lakes-Fi	7.37	73.40	3.00	0.20
Royal Oaks-Six	7.39	73.80	3.00	0.20

NW 83rd Place	7.38	73.60	3.00	0.20

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Royal Oaks-8th	9.78	0.00	0.00	0.00	9.78	0.00
Royal Oaks-1st	5.19	0.00	0.00	0.00	5.19	0.00
Royal Lakes-Fi	5.16	0.00	0.00	0.00	5.16	0.00
Royal Oaks-Six	5.46	0.00	0.00	0.00	5.46	0.00
NW 83rd Place	1.27	0.00	0.00	0.00	1.27	0.00

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 05, 2000;0000 hr Duration: 96 hr
Time Step: 0.2 hr,   Iterations: 10

Basin 1: Royal Oaks-8th Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 100 year
3 Day Rainfall: 8.01 inches
Area: 37.04 acres
Ground Storage: 1.55 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	2.12
8.00	17.60
9.00	37.01
10.00	56.42

Basin 2: Royal Oaks-1st Addition

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 100 year
3 Day Rainfall: 8.32 inches
Area: 19.18 acres
Ground Storage: 1.83 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.24
8.00	10.37
9.00	21.81
10.00	33.25

Basin 3: Royal Lakes-First Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 100 year
3 Day Rainfall: 8.88 inches
Area: 18.89 acres
Ground Storage: 2.56 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.35
8.00	11.70

9.00	25.41
10.00	39.12

Basin 4: Royal Oaks-Sixth Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 100 year
3 Day Rainfall: 8.76999 inches
Area: 20.15 acres
Ground Storage: 2.44 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.36
8.00	11.78
9.00	25.59
10.00	39.40

Basin 5: NW 83rd Place

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 100 year
3 Day Rainfall: 8.24 inches
Area: 4.24 acres
Ground Storage: 1.29 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.38
8.00	2.72
9.00	5.28
10.00	7.84

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	3.20
100.00	3.20

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Royal Oaks-8th	8.11	73.40	3.00	0.20
Royal Oaks-1st	8.00	73.60	3.00	0.20
Royal Lakes-Fi	7.84	73.80	3.00	0.20
Royal Oaks-Six	7.90	73.60	3.00	0.20

NW 83rd Place	7.88	73.60	3.00	0.20

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Royal Oaks-8th	19.78	0.00	0.00	0.00	19.78	0.00
Royal Oaks-1st	10.33	0.00	0.00	0.00	10.33	0.00
Royal Lakes-Fi	10.08	0.00	0.00	0.00	10.08	0.00
Royal Oaks-Six	10.74	0.00	0.00	0.00	10.74	0.00
NW 83rd Place	2.43	0.00	0.00	0.00	2.43	0.00

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 02, 2000;1200 hr Duration: 36 hr
Time Step: 0.2 hr,   Iterations: 10

Basin 1: Royal Oaks-8th Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 5 year
1 Day Rainfall: 3.04 inches
Area: 37.04 acres
Ground Storage: 1.55 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	2.12
8.00	17.60
9.00	37.01
10.00	56.42

Basin 2: Royal Oaks-1st Addition

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 5 year
1 Day Rainfall: 2.88 inches
Area: 19.18 acres
Ground Storage: 1.83 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.24
8.00	10.37
9.00	21.81
10.00	33.25

Basin 3: Royal Lakes-First Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 5 year
1 Day Rainfall: 2.71 inches
Area: 18.89 acres
Ground Storage: 2.56 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.35
8.00	11.70

9.00	25.41
10.00	39.12

Basin 4: Royal Oaks-Sixth Add.

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 5 year
1 Day Rainfall: 2.56 inches
Area: 20.15 acres
Ground Storage: 2.44 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.36
8.00	11.78
9.00	25.59
10.00	39.40

Basin 5: NW 83rd Place

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 5 year
1 Day Rainfall: 3.59 inches
Area: 4.24 acres
Ground Storage: 1.29 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.38
8.00	2.72
9.00	5.28
10.00	7.84

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	3.20
100.00	3.20

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Royal Oaks-8th	7.21	25.40	3.00	0.20
Royal Oaks-1st	7.12	25.60	3.00	0.20
Royal Lakes-Fi	7.02	25.40	3.00	0.20
Royal Oaks-Six	7.02	25.60	3.00	0.20

NW 83rd Place	7.20	25.80	3.00	0.20

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Royal Oaks-8th	5.37	0.00	0.00	0.00	5.37	0.00
Royal Oaks-1st	2.32	0.00	0.00	0.00	2.32	0.00
Royal Lakes-Fi	1.60	0.00	0.00	0.00	1.60	0.00
Royal Oaks-Six	1.60	0.00	0.00	0.00	1.60	0.00
NW 83rd Place	0.85	0.00	0.00	0.00	0.85	0.00

DRAINAGE CALCULATIONS

Miami Lakes Storm Water Master Plan-Update #3

Sub-Basin-West Lakes

Miami Lakes, Florida

1/29/2019

Site Development Data

					Right-of-Way Area							Lake		Contributing Areas						
Sub-Basin Area	**Sub-Basin Area Type**	**Water Table Elev. (feet)**	**Pavement Low Centerline (feet)**	**Pavement High Centerline (feet)**	**Paved Area (acres)**	**Paved Low Edge Elev. (feet)**	**Paved HighEdge Elev. (feet)**	**Green Area (acres)**	**Green Low Elev. (feet)**	**Green High Elev. (feet)**	**Total ROW Area (acres)**	**Lake Area (acres)**	**Lake Area Elev. (feet)**	**Pool Area (acres)**	**Building Area (acres)**	**Assumed Building Elevation (feet)**	**Paved Area (acres)2**	**Green Area (acres)2**	**Total Contributing Area (acres)**	**Total Sub-Basin Area (acres)**
South of 154th	Residential	3.20	6.73	7.30	1.90	6.48	7.40	0.38	6.58	7.40	**2.28**	-	-	0.08	1.97	8.23	1.02	0.73	**3.81**	**6.09**
West Lakes Gardens-2nd Add.	Residential	3.20	6.77	8.07	2.28	6.52	8.17	0.25	6.62	7.00	**2.53**	-	-	0.11	4.02	8.27	1.34	2.03	**7.50**	**10.04**
Alameda Northwest	Residential	3.20	7.55	8.85	2.69	7.30	8.95	0.84	7.40	7.40	**3.53**	-	-	0.12	3.75	9.05	1.80	2.57	**8.23**	**11.76**
West Lakes Gardens	Residential	3.20	7.35	8.41	6.73	7.10	8.51	1.22	7.20	7.40	**7.96**	-	-	0.28	10.17	8.85	4.29	4.29	**19.03**	**26.99**
TOTAL:					**13.60**			**2.70**			**16.30**	**-**		**0.59**	**19.91**		**8.46**	**9.62**	**38.58**	**54.88**

DRAINAGE CALCULATIONS

Miami Lakes Storm Water Master Plan-Update #3

Sub-Basin-West Lakes

Miami Lakes, Florida

1/29/2019

Soil Storage and Water Quality Data

Sub-Basin Area	Avg. Elev. (feet)	Avg. Water Table Elev. (feet)	Avg. Depth to Water Table (feet)	Soil Storage Capability* (in.)	Basin Soil Storage Available** (in.)	(1) Water Quality-First 1" of Runoff (acre-ft)	(2) Water Quality-2.5" x's % Impervious (acre-ft)	Required Water Quality Volume*** (acre-ft)	Required 1/2" Pre-treatment Volume (acre-ft)
South of 154th	7.41	3.20	4.21	8.18	1.49	0.51	0.93	0.93	0.25
West Lakes Gardens-2nd Add.	7.45	3.20	4.25	8.18	1.86	0.84	1.30	1.30	0.42
Alameda Northwest	8.23	3.20	5.03	8.18	2.37	0.98	1.41	1.41	0.49
West Lakes Gardens	8.03	3.20	4.83	8.18	1.67	2.25	3.78	3.78	1.12
TOTAL:								**7.41**	**2.29**

DRAINAGE CALCULATIONS
Miami Lakes Storm Water Master Plan-Update #3
Sub-Basin-West Lakes
Miami Lakes, Florida
1/29/2019

Water Quality Provided

	Exfiltration Trench							Swale								TOTAL	
				Existing		Proposed		Existing				Proposed					
Sub-Basin Area	Width (feet)	Depth (feet)	Hydraulic Conductivity (cfs/ft2*ft head)	Existing Length (feet)	Existing Volume Provided (acre-feet)	Proposed Length (feet)	Proposed Volume Provided (acre-feet)	Existing Swale Width (feet)	Existing Swale Depth (feet)	Existing Swale Length (feet)	Existing Swale Volume (acre-feet)	Proposed Swale Width (feet)	Proposed Swale Depth (feet)	Proposed Swale Length (feet)	Proposed Swale Volume (acre-feet)	Total Existng Volume (acre-feet)	Total Proposed Volume (acre-feet)
South of 154th	4.00	13.50	3.45E-04	-	-	1,700	4.29	-	-	-	-	6.00	0.50		-	-	4.29
West Lakes Gardens-2nd Add.	4.00	13.50	3.45E-04	475	1.21	2,200	6.82				-	6.00	0.50		-	1.21	6.82
Alameda Northwest	4.00	13.50	3.45E-04	675	2.08	1,400	6.39				-	6.00	0.50		-	2.08	6.39
West Lakes Gardens	4.00	13.50	3.45E-04	1,412	4.16	4,800	18.31				-	6.00	0.50		-	4.16	18.31
TOTAL:				**2,562**	**7.45**	**10,100**	**35.82**				**-**				**-**		

DRAINAGE CALCULATIONS

Miami Lakes Storm Water Master Plan-Update #3

Sub-Basin-West Lakes

Miami Lakes, Florida

1/29/2019

Existing Stage-Storage Input Data

	Right-of-Way		Contributing		Total					
Sub-Basin Area	Impervious Area (acres)	Pervious Area (acres)	Impervious Area (acres)2	Pervious Area (acres)2	Total Impervious Area (acres)	Impervious Low Elevation (feet)	Impervious High Elevation (feet)	Total Pervious Area (acres)	Pervious Low Elevation (feet)	Pervious High Elevation (feet)
South of 154th	1.90	0.38	1.02	0.73	2.92	6.48	7.40	1.11	6.58	7.40
West Lakes Gardens-2nd Add.	2.28	0.25	1.34	2.03	3.62	6.52	8.17	2.29	6.62	7.00
Alameda Northwest	2.69	0.84	1.80	2.57	4.49	7.30	8.95	3.41	7.40	7.40
West Lakes Gardens	6.73	1.22	4.29	4.29	11.02	7.10	8.51	5.51	7.20	7.40

Proposed Stage-Storage Input Data

	Right-of-Way		Contributing		Total					
Sub-Basin Area	Impervious Area (acres)	Pervious Area (acres)	Impervious Area (acres)2	Pervious Area (acres)2	Total Impervious Area (acres)	Impervious Low Elevation (feet)	Impervious High Elevation (feet)	Total Pervious Area (acres)	Pervious Low Elevation (feet)	Pervious High Elevation (feet)
South of 154th	1.90	0.38	1.02	0.73	2.92	6.48	7.40	1.11	6.08	7.40
West Lakes Gardens-2nd Add.	2.28	0.25	1.34	2.03	3.62	6.52	8.17	2.29	6.12	7.00
Alameda Northwest	2.69	0.84	1.80	2.57	4.49	7.30	8.95	3.41	6.90	7.40
West Lakes Gardens	6.73	1.22	4.29	4.29	11.02	7.10	8.51	5.51	6.70	7.40

Sub-Basin South of 154th
Existing Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

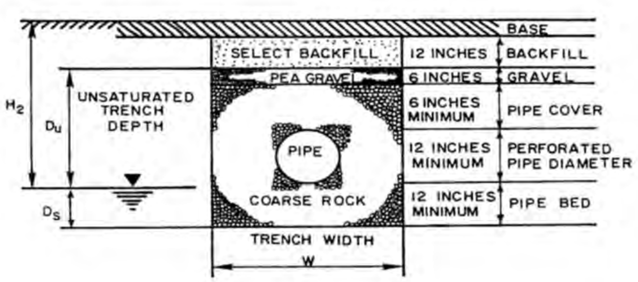
EQ. #1 $V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$

EQ.#2 $V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$
(If saturated depth of trench is greater than non-saturated depth of trench or if the trench width is greater than 2 times the total trench depth)

Manhole Rim Elevation (ft):	6.73	NGVD
Lowest Inlet Elevation (ft):	6.48	NGVD
Top of Trench Elev. (ft):	5.23	NGVD
Top of Pipe Elev. (ft):	4.23	NGVD
Pipe Invert Elev. (ft):	2.73	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-8.27	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	3.45E-04
H_2 (ft)=	3.28
W(ft)=	4.00
D_u(ft)=	2.03
D_s(ft)=	11.47
L(ft)=	0
TD(ft)=	13.50

Equation used for this calculation:
V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)
V= 0.00 acre-in = 0.00 acre-ft



Equivalent Rainfall Calculations

$\frac{0.00 \text{ acre-in}}{6.09 \text{ acres}}$ = 0.00 inches equivalent storage

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 10.19'' 10.19'' / 1.359 = **7.50'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 11.55'' 11.55'' / 1.359 = **8.50'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **14.27'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **17.67'' (72 hr storm)**

<u>Sub-Basin</u> **<u>West Lakes Gardens-2nd Add.</u>**
<u>Existing Exfiltration Trench Calculations</u>

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

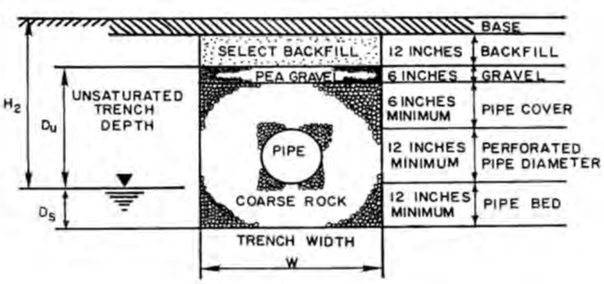
EQ. #1 $$V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$

EQ.#2 $$V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$
(If saturated depth of trench is greater than non-saturated depth of trench or if the trench width is greater than 2 times the total trench depth)

Manhole Rim Elevation (ft):	6.77	NGVD
Lowest Inlet Elevation (ft):	6.52	NGVD
Top of Trench Elev. (ft):	5.27	NGVD
Top of Pipe Elev. (ft):	4.27	NGVD
Pipe Invert Elev. (ft):	2.77	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-8.23	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	3.45E-04
H_2 (ft)=	3.32
W(ft)=	4.00
D_u(ft)=	2.07
D_s(ft)=	11.43
L(ft)=	475
TD(ft)=	13.50

Equation used for this calculation:
V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)
V= 14.53 acre-in = 1.21 acre-ft



<u>Equivalent Rainfall Calculations</u>

$\frac{14.53 \text{ acre-in}}{10.04 \text{ acres}}$ = 1.45 inches equivalent storage

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 8.74'' 8.74'' / 1.359 = **6.43'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 10.10'' 10.10'' / 1.359 = **7.43'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **12.82'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **16.22'' (72 hr storm)**

Sub-Basin Alameda Northwest
Existing Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

EQ. #1 $$V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$

EQ.#2 $$V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$
(If saturated depth of trench is greater than non-saturated depth of trench or if the trench width is greater than 2 times the total trench depth)

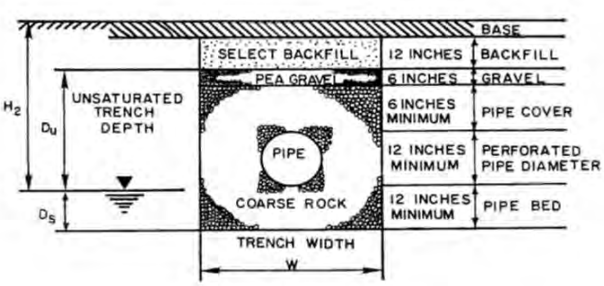
Manhole Rim Elevation (ft):	7.55	NGVD
Lowest Inlet Elevation (ft):	7.30	NGVD
Top of Trench Elev. (ft):	6.05	NGVD
Top of Pipe Elev. (ft):	5.05	NGVD
Pipe Invert Elev. (ft):	3.55	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-7.45	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	3.45E-04
H_2 (ft)=	4.10
W(ft)=	4.00
D_u(ft)=	2.85
D_s(ft)=	10.65
L(ft)=	675
TD(ft)=	13.50

Equation used for this calculation:

V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)

V= 24.96 acre-in = 2.08 acre-ft



Equivalent Rainfall Calculations

$\dfrac{24.96 \text{ acre-in}}{11.76 \text{ acres}}$ = 2.12 inches equivalent storage

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 8.07'' 8.07'' / 1.359 = **5.94'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 9.43'' 9.43'' / 1.359 = **6.94'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **12.15'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **15.55'' (72 hr storm)**

Sub-Basin West Lakes Gardens
Existing Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

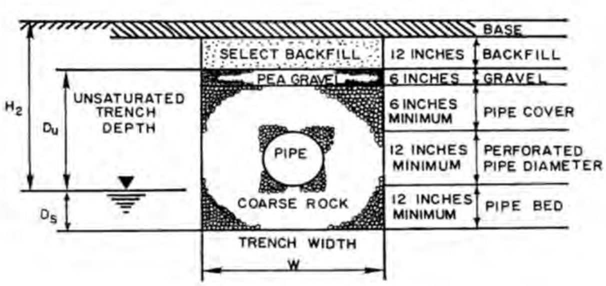
EQ. #1 $$V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$

EQ.#2 $$V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$
(If saturated depth of trench is greater than non-saturated depth of trench
or if the trench width is greater than 2 times the total trench depth)

Manhole Rim Elevation (ft):	7.35	NGVD
Lowest Inlet Elevation (ft):	7.10	NGVD
Top of Trench Elev. (ft):	5.85	NGVD
Top of Pipe Elev. (ft):	4.85	NGVD
Pipe Invert Elev. (ft):	3.35	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-7.65	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	3.45E-04
H_2 (ft)=	3.90
W(ft)=	4.00
D_u(ft)=	2.65
D_s(ft)=	10.85
L(ft)=	1412
TD(ft)=	13.50

Equation used for this calculation:
V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)
V= 49.96 acre-in = 4.16 acre-ft



Equivalent Rainfall Calculations

$\frac{49.96 \text{ acre-in}}{26.99 \text{ acres}}$ = 1.85 inches equivalent storage

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 8.34'' 8.34'' / 1.359 = **6.14'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 9.70'' 9.70'' / 1.359 = **7.14'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **12.42'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **15.82'' (72 hr storm)**

Sub-Basin   South of 154th
Proposed Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

EQ. #1 $$V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$

EQ.#2 $$V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$
(If saturated depth of trench is greater than non-saturated depth of trench
or if the trench width is greater than 2 times the total trench depth)

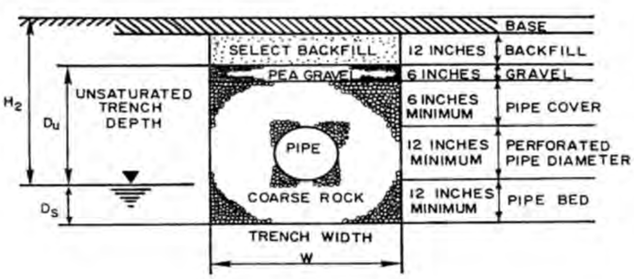
Manhole Rim Elevation (ft):	6.73	NGVD
Lowest Inlet Elevation (ft):	6.48	NGVD
Top of Trench Elev. (ft):	5.23	NGVD
Top of Pipe Elev. (ft):	4.23	NGVD
Pipe Invert Elev. (ft):	2.73	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-8.27	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	3.45E-04
H_2 (ft)=	3.28
W(ft)=	4.00
D_u(ft)=	2.03
D_s(ft)=	11.47
L(ft)=	1700
TD(ft)=	13.50

Equation used for this calculation:

V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)

V= 51.44 acre-in = 4.29 acre-ft



Equivalent Rainfall Calculations

$\dfrac{51.44 \text{ acre-in}}{6.09 \text{ acres}}$ = 8.45 inches equivalent storage

5 year 24 hr storm event = 7.50''   72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 1.74''   1.74'' / 1.359 = **1.28'' (24 hr storm)**

10 year 24 hr storm event = 8.50''   72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 3.10''   3.10'' / 1.359 = **2.28'' (24 hr storm)**

25 year 24 hr storm event = 10.50''   72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **5.82'' (72 hr storm)**

100 year 24 hr storm event = 13.00''   72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **9.22'' (72 hr storm)**

Sub-Basin   West Lakes Gardens-2nd Add.
Proposed Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

EQ. #1 $V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$

EQ.#2 $V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$
(If saturated depth of trench is greater than non-saturated depth of trench
or if the trench width is greater than 2 times the total trench depth)

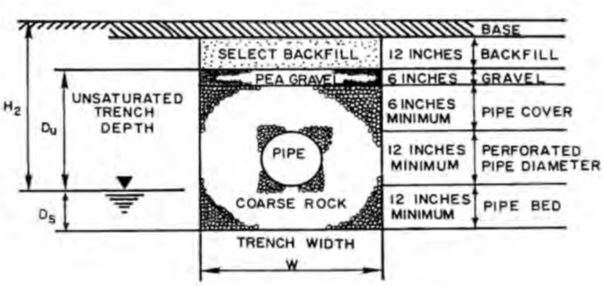
Manhole Rim Elevation (ft):	6.77	NGVD
Lowest Inlet Elevation (ft):	6.52	NGVD
Top of Trench Elev. (ft):	5.27	NGVD
Top of Pipe Elev. (ft):	4.27	NGVD
Pipe Invert Elev. (ft):	2.77	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-8.23	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	3.45E-04
H_2 (ft)=	3.32
W(ft)=	4.00
D_u(ft)=	2.07
D_s(ft)=	11.43
L(ft)=	2675
TD(ft)=	13.50

Equation used for this calculation:

V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)

V= 81.85 acre-in = 6.82 acre-ft



Equivalent Rainfall Calculations

$\frac{81.85 \text{ acre-in}}{10.04 \text{ acres}}$ = 8.15 inches equivalent storage

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 2.04'' 2.04'' / 1.359 = **1.50'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 3.40'' 3.40'' / 1.359 = **2.50'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **6.12'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **9.51'' (72 hr storm)**

Sub-Basin Alameda Northwest
Proposed Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

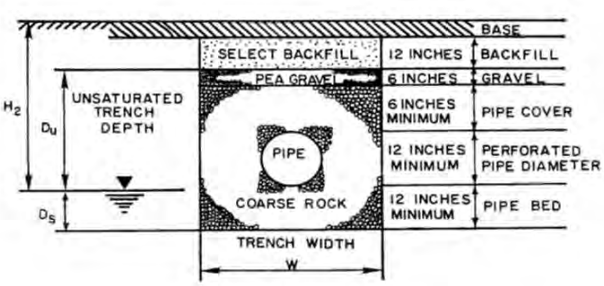
EQ. #1 $$V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$

EQ.#2 $$V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$
(If saturated depth of trench is greater than non-saturated depth of trench or if the trench width is greater than 2 times the total trench depth)

Manhole Rim Elevation (ft):	7.55	NGVD
Lowest Inlet Elevation (ft):	7.30	NGVD
Top of Trench Elev. (ft):	6.05	NGVD
Top of Pipe Elev. (ft):	5.05	NGVD
Pipe Invert Elev. (ft):	3.55	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-7.45	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	3.45E-04
H_2 (ft)=	4.10
W(ft)=	4.00
D_u(ft)=	2.85
D_s(ft)=	10.65
L(ft)=	2075
TD(ft)=	13.50

Equation used for this calculation:
V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)
V= 76.72 acre-in = 6.39 acre-ft



Equivalent Rainfall Calculations

$$\frac{76.72 \text{ acre-in}}{11.76 \text{ acres}} = 6.52$$ inches equivalent storage

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 3.67'' 3.67'' / 1.359 = **2.70'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 5.03'' 5.03'' / 1.359 = **3.70'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **7.75'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **11.14'' (72 hr storm)**

Sub-Basin   **West Lakes Gardens**
Proposed Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

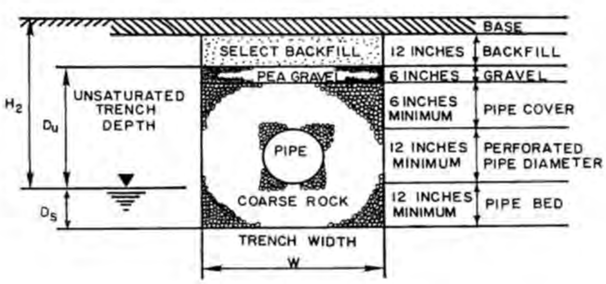
EQ. #1 $$V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$

EQ.#2 $$V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$
(If saturated depth of trench is greater than non-saturated depth of trench
or if the trench width is greater than 2 times the total trench depth)

Manhole Rim Elevation (ft):	7.35	NGVD
Lowest Inlet Elevation (ft):	7.10	NGVD
Top of Trench Elev. (ft):	5.85	NGVD
Top of Pipe Elev. (ft):	4.85	NGVD
Pipe Invert Elev. (ft):	3.35	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-7.65	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	3.45E-04
H_2 (ft)=	3.90
W(ft)=	4.00
D_u(ft)=	2.65
D_s(ft)=	10.85
L(ft)=	6212
TD(ft)=	13.50

Equation used for this calculation:
V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)
V= 219.78 acre-in = 18.31 acre-ft



Equivalent Rainfall Calculations

$\frac{219.78 \text{ acre-in}}{26.99 \text{ acres}}$ = 8.14 inches equivalent storage

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 2.05'' 2.05'' / 1.359 = **1.51'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 3.41'' 3.41'' / 1.359 = **2.51'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **6.13'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **9.52'' (72 hr storm)**

DRAINAGE CALCULATIONS

Miami Lakes Storm Water Master Plan-Update #3

Sub-Basin-West Lakes

Miami Lakes, Florida

1/29/2019

Maximum Stage Results

		PERFORMANCE GOALS				EXISTING CONDITIONS				PROPOSED CONDITIONS			
Sub-Basin Area	Proposed Exfil. Trench (linear feet)	Paved Low Edge Elev. (feet)	Pavement Low Centerline /Crown (feet)	12" + Paved Low Edge Elev. (feet)2	Building Finished Floor Elevations (feet)	5-year, 24-hour Storm Stage (feet)	10-year, 24-hour Storm Stage (feet)	25-year, 72-hour Storm Stage (feet)	100-year, 72-hour Storm Stage (feet)	5-year, 24-hour Storm Stage (feet)	10-year, 24-hour Storm Stage (feet)	25-year, 72-hour Storm Stage (feet)	100-year, 72-hour Storm Stage (feet)
South of 154th	1,700	6.48	6.73	7.73	8.23	7.68	7.81	8.54	8.97	6.36	6.73	7.38	7.83
West Lakes Gardens-2nd Add.	2,200	6.52	6.77	7.77	8.27	7.72	7.90	8.67	9.14	6.52	6.75	7.53	8.11
Alameda Northwest	1,400	7.30	7.55	8.55	9.05	8.15	8.29	9.02	9.43	7.39	7.51	8.27	8.75
West Lakes Gardens	4,800	7.10	7.35	8.35	8.85	8.07	8.21	8.95	9.40	7.09	7.30	8.11	8.59

Notes:

1. Flooding during a five-year, 24-hour storm event is to be below the roadway travel lanes, e.g. the lowest paved elevation of the roadway.
2. Flooding during a 10-year, 24-hour storm event is to be below the crown of roadway.
3. Flooding during a 25-year, 72-hour storm event is to be below 12 inches above the crown of roadway.
4. Flooding during the 100-year, 72-hour storm event is to be below building finished floor elevations.

DRAINAGE CALCULATIONS

Miami Lakes Storm Water Master Plan-Update #3

Sub-Basin-West Lakes

Miami Lakes, Florida

1/29/2019

Design Summary

	South of 154th	West Lakes Gardens-2nd Add.	Alameda Northwest	West Lakes Gardens
Total Area (acres)	6.1	10.0	11.8	27.0
Water Quality				
Control/Water Table Elevation (ft)	3.20	3.20	3.20	3.20
Water Quality Volume Required (ac-ft)	0.93	1.30	1.41	3.78
5 Year 1 Day Storm				
Rainfall (in)	7.50	7.50	7.50	7.50
Equivalent Rainfall (in)	1.28	1.50	2.70	1.51
Peak Stage (ft)	6.36	6.52	7.39	7.09
Min. Low Edge of Pavement Elev. (ft)	6.48	6.52	7.30	7.10
10 Year 1 Day Storm				
Rainfall (in)	8.50	8.50	8.50	8.50
Equivalent Rainfall (in)	2.28	2.50	3.70	2.51
Peak Stage (ft)	6.73	6.75	7.51	7.30
Min. Crown of Road Elev. (ft)	6.73	6.77	7.55	7.35
25 Year 3 Day Storm				
Rainfall (in)	14.27	14.27	14.27	14.27
Equivalent Rainfall (in)	5.82	6.12	7.75	6.13
Peak Stage (ft)	7.38	7.53	8.27	8.11
Min. Crown of Road + 12" Elev. (ft)	7.73	7.77	8.55	8.35
100 Year 3 Day Storm				
Rainfall (in)	17.67	17.67	17.67	17.67
Equivalent Rainfall (in)	9.22	9.51	11.14	9.52
Peak Stage (ft)	7.83	8.11	8.75	8.59
timated Min. Finished Floor Elevation (ft)	8.23	8.27	9.05	8.85

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 02, 2000;1200 hr Duration: 36 hr
Time Step: 0.2 hr,   Iterations: 10

Basin 1: South of 154th

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 5 year
1 Day Rainfall: 7.5 inches
Area: 6.09 acres
Ground Storage: 1.49 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.55
8.00	4.22
9.00	8.25
10.00	12.28

Basin 2: WLG-2nd Add

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 5 year
1 Day Rainfall: 6.43 inches
Area: 10.04 acres
Ground Storage: 1.86 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.69
8.00	5.13
9.00	11.01
10.00	16.92

Basin 3: Alameda Northwest

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 5 year
1 Day Rainfall: 5.94 inches
Area: 11.76 acres
Ground Storage: 2.37 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.00
8.00	2.71

9.00	9.38
10.00	17.28

Basin 4: WLG

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 5 year
1 Day Rainfall: 6.14 inches
Area: 26.99 acres
Ground Storage: 1.67 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.27
8.00	9.00
9.00	24.74
10.00	41.27

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	3.20
100.00	3.20

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
South of 154th	7.68	25.60	3.00	0.20
WLG-2nd Add	7.72	25.60	3.00	0.20
Alameda Northw	8.15	25.40	3.00	0.20
WLG	8.07	25.40	3.00	0.20

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
South of 154th	3.03	0.00	0.00	0.00	3.03	0.00
WLG-2nd Add	3.88	0.00	0.00	0.00	3.88	0.00
Alameda Northw	3.74	0.00	0.00	0.00	3.74	0.00
WLG	10.14	0.00	0.00	0.00	10.14	0.00

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 02, 2000;1200 hr Duration: 36 hr
Time Step: 0.2 hr, Iterations: 10

Basin 1: South of 154th

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 10 year
1 Day Rainfall: 8.5 inches
Area: 6.09 acres
Ground Storage: 1.49 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.55
8.00	4.22
9.00	8.25
10.00	12.28

Basin 2: WLG-2nd Add

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 10 year
1 Day Rainfall: 7.43 inches
Area: 10.04 acres
Ground Storage: 1.86 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.69
8.00	5.13
9.00	11.01
10.00	16.92

Basin 3: Alameda Northwest

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 10 year
1 Day Rainfall: 6.94 inches
Area: 11.76 acres
Ground Storage: 2.37 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.00
8.00	2.71

9.00	9.38
10.00	17.28

Basin 4: WLG

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 10 year
1 Day Rainfall: 7.14 inches
Area: 26.99 acres
Ground Storage: 1.67 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.27
8.00	9.00
9.00	24.74
10.00	41.27

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	3.20
100.00	3.20

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
South of 154th	7.81	26.00	3.00	0.20
WLG-2nd Add	7.90	25.80	3.00	0.20
Alameda Northw	8.29	25.60	3.00	0.20
WLG	8.21	25.40	3.00	0.20

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
South of 154th	3.52	0.00	0.00	0.00	3.52	0.00
WLG-2nd Add	4.67	0.00	0.00	0.00	4.67	0.00
Alameda Northw	4.64	0.00	0.00	0.00	4.64	0.00
WLG	12.29	0.00	0.00	0.00	12.29	0.00

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 04, 2000;1200 hr Duration: 84 hr
Time Step: 0.2 hr,   Iterations: 10

Basin 1: South of 154th

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 25 year
3 Day Rainfall: 14.27 inches
Area: 6.09 acres
Ground Storage: 1.49 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.55
8.00	4.22
9.00	8.25
10.00	12.28

Basin 2: WLG-2nd Add

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 25 year
3 Day Rainfall: 12.82 inches
Area: 10.04 acres
Ground Storage: 1.86 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.69
8.00	5.13
9.00	11.01
10.00	16.92

Basin 3: Alameda Northwest

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 25 year
3 Day Rainfall: 12.15 inches
Area: 11.76 acres
Ground Storage: 2.37 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.00
8.00	2.71

9.00	9.38
10.00	17.28

Basin 4: WLG

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 25 year
3 Day Rainfall: 12.42 inches
Area: 26.99 acres
Ground Storage: 1.67 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.27
8.00	9.00
9.00	24.74
10.00	41.27

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	3.20
100.00	3.20

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
South of 154th	8.54	73.40	3.00	0.20
WLG-2nd Add	8.67	73.60	3.00	0.20
Alameda Northw	9.02	73.60	3.00	0.20
WLG	8.95	73.40	3.00	0.20

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
South of 154th	6.41	0.00	0.00	0.00	6.41	0.00
WLG-2nd Add	9.06	0.00	0.00	0.00	9.06	0.00
Alameda Northw	9.51	0.00	0.00	0.00	9.51	0.00
WLG	23.88	0.00	0.00	0.00	23.88	0.00

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 04, 2000;1200 hr Duration: 84 hr
Time Step: 0.2 hr,   Iterations: 10

Basin 1: South of 154th

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 100 year
3 Day Rainfall: 17.67 inches
Area: 6.09 acres
Ground Storage: 1.49 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.55
8.00	4.22
9.00	8.25
10.00	12.28

Basin 2: WLG-2nd Add

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 100 year
3 Day Rainfall: 16.2199 inches
Area: 10.04 acres
Ground Storage: 1.86 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.69
8.00	5.13
9.00	11.01
10.00	16.92

Basin 3: Alameda Northwest

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 100 year
3 Day Rainfall: 15.5499 inches
Area: 11.76 acres
Ground Storage: 2.37 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.00
8.00	2.71

9.00	9.38
10.00	17.28

Basin 4: WLG

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 100 year
3 Day Rainfall: 15.82 inches
Area: 26.99 acres
Ground Storage: 1.67 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.27
8.00	9.00
9.00	24.74
10.00	41.27

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	3.20
100.00	3.20

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
South of 154th	8.97	73.60	3.00	0.20
WLG-2nd Add	9.14	73.40	3.00	0.20
Alameda Northw	9.43	73.60	3.00	0.20
WLG	9.40	73.60	3.00	0.20

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
South of 154th	8.12	0.00	0.00	0.00	8.12	0.00
WLG-2nd Add	11.86	0.00	0.00	0.00	11.86	0.00
Alameda Northw	12.76	0.00	0.00	0.00	12.76	0.00
WLG	31.43	0.00	0.00	0.00	31.43	0.00

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 02, 2000;1200 hr Duration: 36 hr
Time Step: 0.2 hr, Iterations: 10

Basin 1: South of 154th

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 5 year
1 Day Rainfall: 1.28 inches
Area: 6.09 acres
Ground Storage: 1.49 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.55
8.00	4.22
9.00	8.25
10.00	12.28

Basin 2: WLG-2nd Add

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 5 year
1 Day Rainfall: 1.5 inches
Area: 10.04 acres
Ground Storage: 1.86 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.69
8.00	5.13
9.00	11.01
10.00	16.92

Basin 3: Alameda Northwest

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 5 year
1 Day Rainfall: 2.7 inches
Area: 11.76 acres
Ground Storage: 2.37 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.00
8.00	2.71

9.00	9.38
10.00	17.28

Basin 4: WLG

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 5 year
1 Day Rainfall: 1.51 inches
Area: 26.99 acres
Ground Storage: 1.67 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.27
8.00	9.00
9.00	24.74
10.00	41.27

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	3.20
100.00	3.20

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
South of 154th	6.36	25.40	3.00	0.20
WLG-2nd Add	6.52	26.00	3.00	0.20
Alameda Northw	7.39	25.60	3.00	0.20
WLG	7.09	25.40	3.00	0.20

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
South of 154th	0.20	0.00	0.00	0.00	0.20	0.00
WLG-2nd Add	0.36	0.00	0.00	0.00	0.36	0.00
Alameda Northw	1.06	0.00	0.00	0.00	1.06	0.00
WLG	1.09	0.00	0.00	0.00	1.09	0.00

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 02, 2000;1200 hr Duration: 36 hr
Time Step: 0.2 hr, Iterations: 10

Basin 1: South of 154th

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 10 year
1 Day Rainfall: 2.28 inches
Area: 6.09 acres
Ground Storage: 1.49 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.78
8.00	4.49
9.00	8.52
10.00	12.55

Basin 2: WLG-2nd Add

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 10 year
1 Day Rainfall: 2.5 inches
Area: 10.04 acres
Ground Storage: 1.86 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.26
8.00	5.70
9.00	11.58
10.00	17.49

Basin 3: Alameda Northwest

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 10 year
1 Day Rainfall: 3.7 inches
Area: 11.76 acres
Ground Storage: 2.37 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.03
8.00	3.57

9.00	10.24
10.00	18.14

Basin 4: WLG

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 10 year
1 Day Rainfall: 2.51 inches
Area: 26.99 acres
Ground Storage: 1.67 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
2.00	0.00
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.35
8.00	8.40
9.00	23.91
10.00	40.44

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	3.20
100.00	3.20

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
South of 154th	6.73	25.60	3.00	0.20
WLG-2nd Add	6.75	25.60	3.00	0.20
Alameda Northw	7.51	25.60	3.00	0.20
WLG	7.30	25.60	2.00	0.20

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
South of 154th	0.57	0.00	0.00	0.00	0.57	0.00
WLG-2nd Add	0.95	0.00	0.00	0.00	0.95	0.00
Alameda Northw	1.82	0.00	0.00	0.00	1.82	0.00
WLG	2.77	0.00	0.00	0.00	2.77	0.00

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 04, 2000;1200 hr Duration: 84 hr
Time Step: 0.2 hr, Iterations: 10

Basin 1: South of 154th

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 25 year
3 Day Rainfall: 5.82 inches
Area: 6.09 acres
Ground Storage: 1.49 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.78
8.00	4.49
9.00	8.52
10.00	12.55

Basin 2: WLG-2nd Add

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 25 year
3 Day Rainfall: 6.12 inches
Area: 10.04 acres
Ground Storage: 1.86 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.26
8.00	5.70
9.00	11.58
10.00	17.49

Basin 3: Alameda Northwest

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 25 year
3 Day Rainfall: 7.75 inches
Area: 11.76 acres
Ground Storage: 2.37 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.03
8.00	3.57

9.00	10.24
10.00	18.14

Basin 4: WLG

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 25 year
3 Day Rainfall: 6.13 inches
Area: 26.99 acres
Ground Storage: 1.67 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.35
8.00	8.40
9.00	23.91
10.00	40.44

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	3.20
100.00	3.20

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
South of 154th	7.38	73.40	3.00	0.20
WLG-2nd Add	7.53	73.60	3.00	0.20
Alameda Northw	8.27	73.40	3.00	0.20
WLG	8.11	73.60	3.00	0.20

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
South of 154th	2.21	0.00	0.00	0.00	2.21	0.00
WLG-2nd Add	3.63	0.00	0.00	0.00	3.63	0.00
Alameda Northw	5.38	0.00	0.00	0.00	5.38	0.00
WLG	10.12	0.00	0.00	0.00	10.12	0.00

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 04, 2000;1200 hr Duration: 84 hr
Time Step: 0.2 hr, Iterations: 10

Basin 1: South of 154th

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 100 year
3 Day Rainfall: 9.22 inches
Area: 6.09 acres
Ground Storage: 1.49 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.78
8.00	4.49
9.00	8.52
10.00	12.55

Basin 2: WLG-2nd Add

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 100 year
3 Day Rainfall: 9.51 inches
Area: 10.04 acres
Ground Storage: 1.86 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	1.26
8.00	5.70
9.00	11.58
10.00	17.49

Basin 3: Alameda Northwest

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 100 year
3 Day Rainfall: 11.14 inches
Area: 11.76 acres
Ground Storage: 2.37 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.03
8.00	3.57

9.00	10.24
10.00	18.14

Basin 4: WLG

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 100 year
3 Day Rainfall: 9.52 inches
Area: 26.99 acres
Ground Storage: 1.67 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.35
8.00	8.40
9.00	23.91
10.00	40.44

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
South of 154th	7.83	73.80	3.00	0.20
WLG-2nd Add	8.11	73.60	3.00	0.20
Alameda Northw	8.75	73.40	3.00	0.20
WLG	8.59	73.40	3.00	0.20

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
South of 154th	3.88	0.00	0.00	0.00	3.88	0.00
WLG-2nd Add	6.35	0.00	0.00	0.00	6.35	0.00
Alameda Northw	8.55	0.00	0.00	0.00	8.55	0.00
WLG	17.48	0.00	0.00	0.00	17.48	0.00

DRAINAGE CALCULATIONS

Miami Lakes Storm Water Master Plan-Update #3

Sub-Basin-Commerce Way

Miami Lakes, Florida

1/29/2019

Site Development Data-Existing

					Right-of-Way Area							Lake		Contributing Areas						
Sub-Basin Area	Sub-Basin Area Type	Water Table Elev. (feet)	Pavement Low Centerline (feet)	Pavement High Centerline (feet)	Paved Area (acres)	Paved Low Edge Elev. (feet)	Paved HighEdge Elev. (feet)	Green Area (acres)	Green Low Elev. (feet)	Green High Elev. (feet)	Total ROW Area (acres)	Lake Area (acres)	Lake Area Elev. (feet)	Pool Area (acres)	Building Area (acres)	Assumed Building Elevation (feet)	Paved Area (acres)2	Green Area (acres)2	Total Contributing Area (acres)	Total Sub-Basin Area (acres)
Commerce Way	Commercial	3.20	6.80	7.70	4.66	6.55	7.80	2.06	6.65	7.80	**6.72**	-	-	-	-	8.30	-	-	-	**6.72**
TOTAL:					**4.66**			**2.06**			**6.72**	**-**		**-**	**-**		**-**	**-**	**-**	**6.72**

Site Development Data-Proposed

					Right-of-Way Area							Lake		Contributing Areas						
Sub-Basin Area	Sub-Basin Area Type	Water Table Elev. (feet)	Pavement Low Centerline (feet)	Pavement High Centerline (feet)	Paved Area (acres)	Paved Low Edge Elev. (feet)	Paved HighEdge Elev. (feet)	Green Area (acres)	Green Low Elev. (feet)	Green High Elev. (feet)	Total ROW Area (acres)	Lake Area (acres)	Lake Area Elev. (feet)	Pool Area (acres)	Building Area (acres)	Assumed Building Elevation (feet)	Paved Area (acres)2	Green Area (acres)2	Total Contributing Area (acres)	Total Sub-Basin Area (acres)
Commerce Way	Commercial	3.20	6.80	7.70	5.13	6.55	7.80	1.59	6.65	7.80	**6.72**	-	-	-	-	8.30	-	-	-	**6.72**
TOTAL:					**5.13**			**1.59**			**6.72**	**-**		**-**	**-**		**-**	**-**	**-**	**6.72**

DRAINAGE CALCULATIONS

Miami Lakes Storm Water Master Plan-Update #3

Sub-Basin-West Lakes

Miami Lakes, Florida

1/29/2019

Soil Storage and Water Quality Data

Sub-Basin Area	Avg. Elev. (feet)	Avg. Water Table Elev. (feet)	Avg. Depth to Water Table (feet)	Soil Storage Capability * (in.)	Basin Soil Storage Available** (in.)	(1) Water Quality- First 1" of Runoff (acre-ft)	(2) Water Quality- 2.5" x's % Impervious (acre-ft)	Required Water Quality Volume*** (acre-ft)	Required 1/2" Pre-treatment Volume (acre-ft)
South of 154th	7.41	3.20	4.21	8.18	1.49	0.51	0.93	0.93	0.25
West Lakes Gardens-2nd Add.	7.45	3.20	4.25	8.18	1.86	0.84	1.30	1.30	0.42
Alameda Northwest	8.23	3.20	5.03	8.18	2.37	0.98	1.41	1.41	0.49
West Lakes Gardens	8.03	3.20	4.83	8.18	1.67	2.25	3.78	3.78	1.12
TOTAL:								**7.41**	**2.29**

DRAINAGE CALCULATIONS

Miami Lakes Storm Water Master Plan-Update #3

Sub-Basin-West Lakes

Miami Lakes, Florida

1/29/2019

Water Quality Provided

	Exfiltration Trench							Swale								TOTAL	
				Existing		Proposed		Existing				Proposed					
Sub-Basin Area	Width (feet)	Depth (feet)	Hydraulic Conductivity (cfs/ft2*ft head)	Existing Length (feet)	Existing Volume Provided (acre-feet)	Proposed Length (feet)	Proposed Volume Provided (acre-feet)	Existing Swale Width (feet)	Existing Swale Depth (feet)	Existing Swale Length (feet)	Existing Swale Volume (acre-feet)	Proposed Swale Width (feet)	Proposed Swale Depth (feet)	Proposed Swale Length (feet)	Proposed Swale Volume (acre-feet)	Total Existng Volume (acre-feet)	Total Proposed Volume (acre-feet)
South of 154th	4.00	13.50	3.45E-04	-	-	1,700	4.29	-	-	-	-	6.00	0.50		-	-	4.29
West Lakes Gardens-2nd Add.	4.00	13.50	3.45E-04	475	1.21	2,200	6.82				-	6.00	0.50		-	1.21	6.82
Alameda Northwest	4.00	13.50	3.45E-04	675	2.08	1,400	6.39				-	6.00	0.50		-	2.08	6.39
West Lakes Gardens	4.00	13.50	3.45E-04	1,412	4.16	4,800	18.31				-	6.00	0.50		-	4.16	18.31
TOTAL:				**2,562**	**7.45**	**10,100**	**35.82**				**-**				**-**		

DRAINAGE CALCULATIONS

Miami Lakes Storm Water Master Plan-Update #3

Sub-Basin-West Lakes

Miami Lakes, Florida

1/29/2019

Existing Stage-Storage Input Data

	Right-of-Way		Contributing		Total					
Sub-Basin Area	Impervious Area (acres)	Pervious Area (acres)	Impervious Area (acres)2	Pervious Area (acres)2	Total Impervious Area (acres)	Impervious Low Elevation (feet)	Impervious High Elevation (feet)	Total Pervious Area (acres)	Pervious Low Elevation (feet)	Pervious High Elevation (feet)
South of 154th	1.90	0.38	1.02	0.73	2.92	6.48	7.40	1.11	6.58	7.40
West Lakes Gardens-2nd Add.	2.28	0.25	1.34	2.03	3.62	6.52	8.17	2.29	6.62	7.00
Alameda Northwest	2.69	0.84	1.80	2.57	4.49	7.30	8.95	3.41	7.40	7.40
West Lakes Gardens	6.73	1.22	4.29	4.29	11.02	7.10	8.51	5.51	7.20	7.40

Proposed Stage-Storage Input Data

	Right-of-Way		Contributing		Total					
Sub-Basin Area	Impervious Area (acres)	Pervious Area (acres)	Impervious Area (acres)2	Pervious Area (acres)2	Total Impervious Area (acres)	Impervious Low Elevation (feet)	Impervious High Elevation (feet)	Total Pervious Area (acres)	Pervious Low Elevation (feet)	Pervious High Elevation (feet)
South of 154th	1.90	0.38	1.02	0.73	2.92	6.48	7.40	1.11	6.08	7.40
West Lakes Gardens-2nd Add.	2.28	0.25	1.34	2.03	3.62	6.52	8.17	2.29	6.12	7.00
Alameda Northwest	2.69	0.84	1.80	2.57	4.49	7.30	8.95	3.41	6.90	7.40
West Lakes Gardens	6.73	1.22	4.29	4.29	11.02	7.10	8.51	5.51	6.70	7.40

Sub-Basin South of 154th
Existing Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

EQ. #1 $V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$

EQ.#2 $V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$
(If saturated depth of trench is greater than non-saturated depth of trench or if the trench width is greater than 2 times the total trench depth)

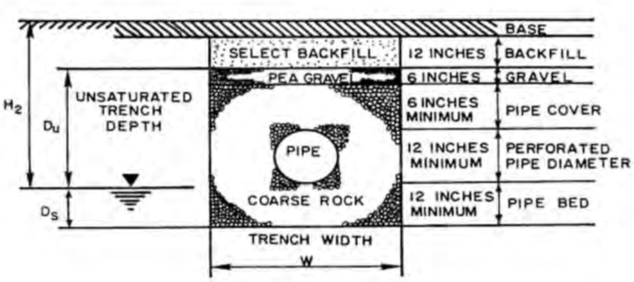
Manhole Rim Elevation (ft):	6.73	NGVD
Lowest Inlet Elevation (ft):	6.48	NGVD
Top of Trench Elev. (ft):	5.23	NGVD
Top of Pipe Elev. (ft):	4.23	NGVD
Pipe Invert Elev. (ft):	2.73	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-8.27	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	3.45E-04
H_2 (ft)=	3.28
W(ft)=	4.00
D_u(ft)=	2.03
D_s(ft)=	11.47
L(ft)=	0
TD(ft)=	13.50

Equation used for this calculation:

V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)

V= 0.00 acre-in = 0.00 acre-ft



Equivalent Rainfall Calculations

$\frac{0.00 \text{ acre-in}}{6.09 \text{ acres}}$ = 0.00 inches equivalent storage

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 10.19'' 10.19'' / 1.359 = **7.50'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 11.55'' 11.55'' / 1.359 = **8.50'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **14.27'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **17.67'' (72 hr storm)**

Sub-Basin West Lakes Gardens-2nd Add.
Existing Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

EQ. #1 $$V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$

EQ.#2 $$V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$
(If saturated depth of trench is greater than non-saturated depth of trench or if the trench width is greater than 2 times the total trench depth)

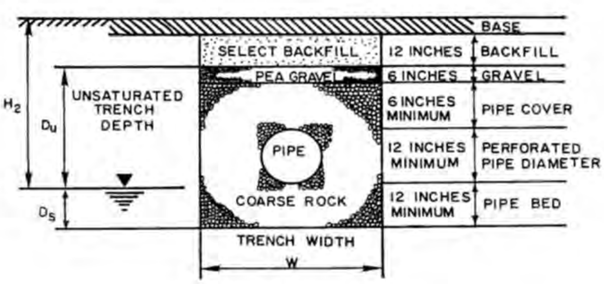
Manhole Rim Elevation (ft):	6.77	NGVD
Lowest Inlet Elevation (ft):	6.52	NGVD
Top of Trench Elev. (ft):	5.27	NGVD
Top of Pipe Elev. (ft):	4.27	NGVD
Pipe Invert Elev. (ft):	2.77	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-8.23	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	3.45E-04
H_2 (ft)=	3.32
W(ft)=	4.00
D_u(ft)=	2.07
D_s(ft)=	11.43
L(ft)=	475
TD(ft)=	13.50

Equation used for this calculation:

V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)

V= 14.53 acre-in = 1.21 acre-ft



Equivalent Rainfall Calculations

$\frac{14.53 \text{ acre-in}}{10.04 \text{ acres}}$ = 1.45 inches equivalent storage

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 8.74'' 8.74'' / 1.359 = **6.43'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 10.10'' 10.10'' / 1.359 = **7.43'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **12.82'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **16.22'' (72 hr storm)**

Sub-Basin   Alameda Northwest
Existing Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

EQ. #1 $$V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$

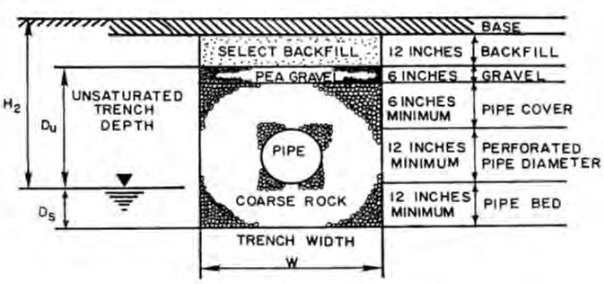
EQ.#2 $$V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$
(If saturated depth of trench is greater than non-saturated depth of trench or if the trench width is greater than 2 times the total trench depth)

Manhole Rim Elevation (ft):	7.55	NGVD
Lowest Inlet Elevation (ft):	7.30	NGVD
Top of Trench Elev. (ft):	6.05	NGVD
Top of Pipe Elev. (ft):	5.05	NGVD
Pipe Invert Elev. (ft):	3.55	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-7.45	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	3.45E-04
H_2 (ft)=	4.10
W(ft)=	4.00
D_u(ft)=	2.85
D_s(ft)=	10.65
L(ft)=	675
TD(ft)=	13.50

Equation used for this calculation:

V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)
V= 24.96 acre-in = 2.08 acre-ft



Equivalent Rainfall Calculations

$\dfrac{\text{24.96 acre-in}}{\text{11.76 acres}}$ = 2.12 inches equivalent storage

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 8.07'' 8.07'' / 1.359 = **5.94'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 9.43'' 9.43'' / 1.359 = **6.94'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **12.15'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **15.55'' (72 hr storm)**

Sub-Basin West Lakes Gardens
Existing Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

EQ. #1 $$V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$

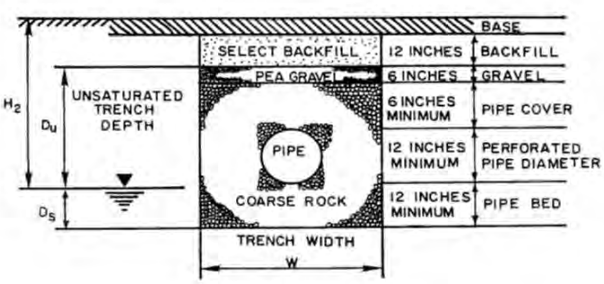
EQ.#2 $$V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$
(If saturated depth of trench is greater than non-saturated depth of trench
or if the trench width is greater than 2 times the total trench depth)

Manhole Rim Elevation (ft):	7.35	NGVD
Lowest Inlet Elevation (ft):	7.10	NGVD
Top of Trench Elev. (ft):	5.85	NGVD
Top of Pipe Elev. (ft):	4.85	NGVD
Pipe Invert Elev. (ft):	3.35	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-7.65	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	3.45E-04
H_2 (ft)=	3.90
W(ft)=	4.00
D_u(ft)=	2.65
D_s(ft)=	10.85
L(ft)=	1412
TD(ft)=	13.50

Equation used for this calculation:

V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)
V= 49.96 acre-in = 4.16 acre-ft



Equivalent Rainfall Calculations

$$\frac{49.96 \text{ acre-in}}{26.99 \text{ acres}} = 1.85$$ inches equivalent storage

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 8.34'' 8.34'' / 1.359 = **6.14'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 9.70'' 9.70'' / 1.359 = **7.14'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **12.42'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **15.82'' (72 hr storm)**

Sub-Basin South of 154th
Proposed Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

EQ. #1 $$V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$

EQ.#2 $$V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$
(If saturated depth of trench is greater than non-saturated depth of trench
or if the trench width is greater than 2 times the total trench depth)

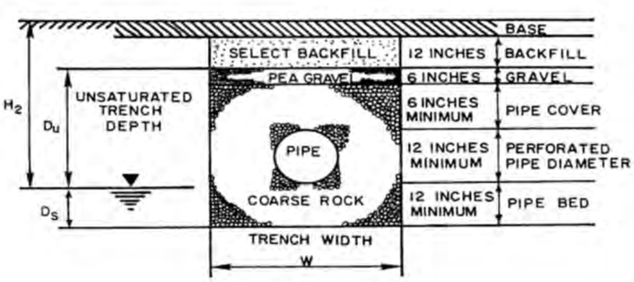
Manhole Rim Elevation (ft):	6.73	NGVD
Lowest Inlet Elevation (ft):	6.48	NGVD
Top of Trench Elev. (ft):	5.23	NGVD
Top of Pipe Elev. (ft):	4.23	NGVD
Pipe Invert Elev. (ft):	2.73	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-8.27	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	3.45E-04
H_2 (ft)=	3.28
W(ft)=	4.00
D_u(ft)=	2.03
D_s(ft)=	11.47
L(ft)=	1700
TD(ft)=	13.50

Equation used for this calculation:

V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)

V= 51.44 acre-in = 4.29 acre-ft



Equivalent Rainfall Calculations

$$\frac{51.44 \text{ acre-in}}{6.09 \text{ acres}} = 8.45 \text{ inches equivalent storage}$$

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 1.74'' 1.74'' / 1.359 = **1.28'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 3.10'' 3.10'' / 1.359 = **2.28'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **5.82'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **9.22'' (72 hr storm)**

Sub-Basin West Lakes Gardens-2nd Add.
Proposed Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

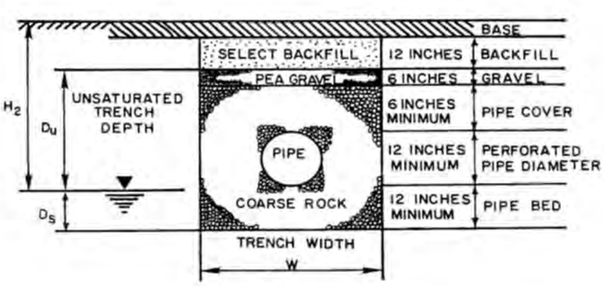
EQ. #1 $$V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4} W D_u]$$

EQ.#2 $$V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4} W D_u]$$
(If saturated depth of trench is greater than non-saturated depth of trench or if the trench width is greater than 2 times the total trench depth)

Manhole Rim Elevation (ft):	6.77	NGVD
Lowest Inlet Elevation (ft):	6.52	NGVD
Top of Trench Elev. (ft):	5.27	NGVD
Top of Pipe Elev. (ft):	4.27	NGVD
Pipe Invert Elev. (ft):	2.77	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-8.23	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	3.45E-04
H_2 (ft)=	3.32
W(ft)=	4.00
D_u(ft)=	2.07
D_s(ft)=	11.43
L(ft)=	2675
TD(ft)=	13.50

Equation used for this calculation:
V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)
V= 81.85 acre-in = 6.82 acre-ft



Equivalent Rainfall Calculations

$$\frac{81.85 \text{ acre-in}}{10.04 \text{ acres}} = 8.15$$ inches equivalent storage

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 2.04'' 2.04'' / 1.359 = **1.50'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 3.40'' 3.40'' / 1.359 = **2.50'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **6.12'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **9.51'' (72 hr storm)**

Sub-Basin Alameda Northwest

Proposed Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

EQ. #1 $$V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$

EQ.#2 $$V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$

(If saturated depth of trench is greater than non-saturated depth of trench or if the trench width is greater than 2 times the total trench depth)

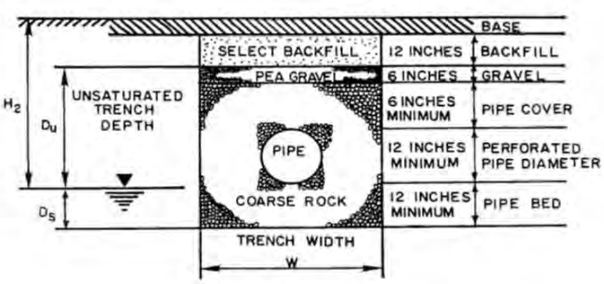
Manhole Rim Elevation (ft):	7.55	NGVD
Lowest Inlet Elevation (ft):	7.30	NGVD
Top of Trench Elev. (ft):	6.05	NGVD
Top of Pipe Elev. (ft):	5.05	NGVD
Pipe Invert Elev. (ft):	3.55	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-7.45	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	3.45E-04
H_2 (ft)=	4.10
W(ft)=	4.00
D_u(ft)=	2.85
D_s(ft)=	10.65
L(ft)=	2075
TD(ft)=	13.50

Equation used for this calculation:

V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)

V= 76.72 acre-in = 6.39 acre-ft



Equivalent Rainfall Calculations

$$\frac{76.72 \text{ acre-in}}{11.76 \text{ acres}} = 6.52$$ inches equivalent storage

5 year 24 hr storm event = 7.50'' 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 3.67'' 3.67'' / 1.359 = **2.70'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 5.03'' 5.03'' / 1.359 = **3.70'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **7.75'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **11.14'' (72 hr storm)**

Sub-Basin   West Lakes Gardens
Proposed Exfiltration Trench Calculations

K=Hydraulic Conductivity (cfs/ft^2*ft head)
H_2=Depth to Water Table (avg. grate el.-wet season avg. water level) (ft)
W=Width of Trench (ft)
D_u=Non-Saturated Trench Depth (ft)
D_s=Saturated Trench Depth (ft)
L=Length of Trench (ft)
TD=Trench Depth (ft)
V=Volume of Water Stored

The following equations are used to determine the storage of the exfiltration trench:

EQ. #1 $$V = L[K(H_2W + 2H^2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$

EQ.#2 $$V = L[K(2H_2D_u - D_u^2 + 2H_2D_s) + 1.39 \times 10^{-4}WD_u]$$
(If saturated depth of trench is greater than non-saturated depth of trench or if the trench width is greater than 2 times the total trench depth)

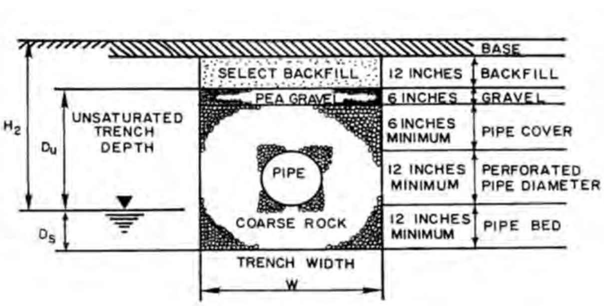
Manhole Rim Elevation (ft):	7.35	NGVD
Lowest Inlet Elevation (ft):	7.10	NGVD
Top of Trench Elev. (ft):	5.85	NGVD
Top of Pipe Elev. (ft):	4.85	NGVD
Pipe Invert Elev. (ft):	3.35	NGVD
Trench Depth (ft):	13.50	
Bottom of Trench Elev. (ft):	-7.65	NGVD
High Water Table Elev. (ft):	3.20	NGVD
Width of Trench (ft):	4.00	

	INPUT
K=	3.45E-04
H_2 (ft)=	3.90
W(ft)=	4.00
D_u(ft)=	2.65
D_s(ft)=	10.85
L(ft)=	6212
TD(ft)=	13.50

Equation used for this calculation:

V=(L)*(K*(2*H2*Du-Du^2+2*H2*Ds)+(1.39*10^-4)*W*Du)

V= 219.78 acre-in = 18.31 acre-ft



Equivalent Rainfall Calculations

$$\frac{219.78 \text{ acre-in}}{26.99 \text{ acres}} = 8.14 \text{ inches equivalent storage}$$

5 year 24 hr storm event = 7.50'' — 72 hour storm= 7.50'' X 1.359 = 10.19''
72hr storm-stored = 2.05'' — 2.05'' / 1.359 = **1.51'' (24 hr storm)**

10 year 24 hr storm event = 8.50'' — 72 hour storm= 8.50'' X 1.359 = 11.55''
72hr storm-stored = 3.41'' — 3.41'' / 1.359 = **2.51'' (24 hr storm)**

25 year 24 hr storm event = 10.50'' — 72 hour storm= 10.50'' X 1.359 = 14.27''
72hr storm-stored = **6.13'' (72 hr storm)**

100 year 24 hr storm event = 13.00'' — 72 hour storm= 13.00'' X 1.359 = 17.67''
72hr storm-stored = **9.52'' (72 hr storm)**

DRAINAGE CALCULATIONS

Miami Lakes Storm Water Master Plan-Update #3

Sub-Basin-West Lakes

Miami Lakes, Florida
1/29/2019

Maximum Stage Results

		PERFORMANCE GOALS				EXISTING CONDITIONS				PROPOSED CONDITIONS			
Sub-Basin Area	Proposed Exfil. Trench (linear feet)	Paved Low Edge Elev. (feet)	Pavement Low Centerline /Crown (feet)	12" + Paved Low Edge Elev. (feet)2	Building Finished Floor Elevations (feet)	5-year, 24-hour Storm Stage (feet)	10-year, 24-hour Storm Stage (feet)	25-year, 72-hour Storm Stage (feet)	100-year, 72-hour Storm Stage (feet)	5-year, 24-hour Storm Stage (feet)	10-year, 24-hour Storm Stage (feet)	25-year, 72-hour Storm Stage (feet)	100-year, 72-hour Storm Stage (feet)
South of 154th	1,700	6.48	6.73	7.73	8.23	7.68	7.81	8.54	8.97	6.36	6.73	7.38	7.83
West Lakes Gardens-2nd Add.	2,200	6.52	6.77	7.77	8.27	7.72	7.90	8.67	9.14	6.52	6.75	7.53	8.11
Alameda Northwest	1,400	7.30	7.55	8.55	9.05	8.15	8.29	9.02	9.43	7.39	7.51	8.27	8.75
West Lakes Gardens	4,800	7.10	7.35	8.35	8.85	8.07	8.21	8.95	9.40	7.09	7.30	8.11	8.59

Notes:
1. Flooding during a five-year, 24-hour storm event is to be below the roadway travel lanes, e.g. the lowest paved elevation of the roadway.
2. Flooding during a 10-year, 24-hour storm event is to be below the crown of roadway.
3. Flooding during a 25-year, 72-hour storm event is to be below 12 inches above the crown of roadway.
4. Flooding during the 100-year, 72-hour storm event is to be below building finished floor elevations.

DRAINAGE CALCULATIONS

Miami Lakes Storm Water Master Plan-Update #3

Sub-Basin-West Lakes

Miami Lakes, Florida

1/29/2019

Design Summary

	South of 154th	West Lakes Gardens-2nd Add.	Alameda Northwest	West Lakes Gardens
Total Area (acres)	6.1	10.0	11.8	27.0
Water Quality				
Control/Water Table Elevation (ft)	3.20	3.20	3.20	3.20
Water Quality Volume Required (ac-ft)	0.93	1.30	1.41	3.78
5 Year 1 Day Storm				
Rainfall (in)	7.50	7.50	7.50	7.50
Equivalent Rainfall (in)	1.28	1.50	2.70	1.51
Peak Stage (ft)	6.36	6.52	7.39	7.09
Min. Low Edge of Pavement Elev. (ft)	6.48	6.52	7.30	7.10
10 Year 1 Day Storm				
Rainfall (in)	8.50	8.50	8.50	8.50
Equivalent Rainfall (in)	2.28	2.50	3.70	2.51
Peak Stage (ft)	6.73	6.75	7.51	7.30
Min. Crown of Road Elev. (ft)	6.73	6.77	7.55	7.35
25 Year 3 Day Storm				
Rainfall (in)	14.27	14.27	14.27	14.27
Equivalent Rainfall (in)	5.82	6.12	7.75	6.13
Peak Stage (ft)	7.38	7.53	8.27	8.11
Min. Crown of Road + 12" Elev. (ft)	7.73	7.77	8.55	8.35
100 Year 3 Day Storm				
Rainfall (in)	17.67	17.67	17.67	17.67
Equivalent Rainfall (in)	9.22	9.51	11.14	9.52
Peak Stage (ft)	7.83	8.11	8.75	8.59
timated Min. Finished Floor Elevation (ft)	8.23	8.27	9.05	8.85

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 04, 2000;1200 hr Duration: 84 hr
Time Step: 0.2 hr, Iterations: 10

Basin 1: Commerce Way

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 100 year
3 Day Rainfall: 15.27 inches
Area: 6.71997 acres
Ground Storage: 1.94 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
6.55	0.00
7.00	0.50
8.00	5.46
9.00	12.18
10.00	18.90
11.00	25.62

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	3.20
100.00	3.20

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Commerce Way	8.28	73.40	3.20	0.00

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Commerce Way	7.37	0.00	0.00	0.00	7.37	0.00

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 02, 2000;1200 hr Duration: 36 hr
Time Step: 0.2 hr,   Iterations: 10

Basin 1: Commerce Way

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 5 year
1 Day Rainfall: 6.65 inches
Area: 6.72 acres
Ground Storage: 2.51 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.49
8.00	5.44
9.00	12.16
10.00	18.88

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Commerce Way	7.40	25.60	3.00	0.20

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Commerce Way	2.44	0.00	0.00	0.00	2.44	0.00

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 02, 2000;1200 hr Duration: 36 hr
Time Step: 0.2 hr,   Iterations: 10

Basin 1: Commerce Way

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 10 year
1 Day Rainfall: 7.65 inches
Area: 6.72 acres
Ground Storage: 2.51 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.49
8.00	5.44
9.00	12.16
10.00	18.88

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Commerce Way	7.50	25.60	3.00	0.20

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Commerce Way	2.96	0.00	0.00	0.00	2.96	0.00

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 04, 2000;1200 hr Duration: 84 hr
Time Step: 0.2 hr,   Iterations: 10

Basin 1: Commerce Way

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 25 year
3 Day Rainfall: 13.11 inches
Area: 6.72 acres
Ground Storage: 2.51 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.49
8.00	5.44
9.00	12.16
10.00	18.88

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Commerce Way	8.07	73.40	3.00	0.20

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Commerce Way	5.89	0.00	0.00	0.00	5.89	0.00

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 04, 2000;1200 hr Duration: 84 hr
Time Step: 0.2 hr,   Iterations: 10

Basin 1: Commerce Way

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 100 year
3 Day Rainfall: 16.51 inches
Area: 6.72 acres
Ground Storage: 2.51 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00
7.00	0.49
8.00	5.44
9.00	12.16
10.00	18.88

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Commerce Way	8.34	73.80	3.00	0.20

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Commerce Way	7.75	0.00	0.00	0.00	7.75	0.00

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 02, 2000;1200 hr Duration: 36 hr
Time Step: 0.2 hr, Iterations: 10

Basin 1: Commerce Way

Method: Generalized Unit Hydrograph
Rainfall Distribution: SFWMD - 5day
Design Frequency: 5 year
1 Day Rainfall: 5.74 inches
Area: 6.71997 acres
Ground Storage: 1.94 inches
Time of Concentration: 0.17 hours
Peak Rate Factor: 0
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
6.55	0.00
7.00	0.50
8.00	5.46
9.00	12.18
10.00	18.90
11.00	25.62

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	3.20
100.00	3.20

Structure: 1

From Basin: Commerce Way
To Basin: Offsite1
Structure Type: Gravity
Weir: None
Bleeder: None
Pipe: Diameter = 3 ft, Manning's n = 0.012, Length = 600 ft
US Invert Elev = 2.3 ft NGVD, DS Invert Elev = 1.3 ft NGVD, no flap gate

Time (hr)	Cumulative Rainfall (in)	Instant Runoff (cfs)	Current Discharge (cfs)	Cumulative Discharge (acre-ft)	Head Water Stage (ft NGVD)	Tail Water Stage (ft NGVD)
0.00	0.00	0.00	0.00	0.00	3.20	3.20
1.00	0.03	0.00	47.01	3.89	6.55	3.20
2.00	0.07	0.00	47.01	7.77	6.55	3.20
3.00	0.10	0.00	47.01	11.66	6.55	3.20
4.00	0.14	0.00	47.01	15.54	6.55	3.20
5.00	0.17	0.00	47.01	19.43	6.55	3.20
6.00	0.21	0.00	47.01	23.32	6.55	3.20
7.00	0.24	0.00	47.01	27.20	6.55	3.20
8.00	0.28	0.00	47.01	31.09	6.55	3.20
9.00	0.31	0.00	47.01	34.97	6.55	3.20
10.00	0.35	0.00	47.01	38.86	6.55	3.20
11.00	0.38	0.00	47.01	42.74	6.55	3.20
12.00	0.42	0.01	47.01	46.63	6.55	3.20
13.00	0.45	0.01	47.01	50.52	6.55	3.20
14.00	0.49	0.02	47.01	54.40	6.55	3.20
15.00	0.52	0.03	47.01	58.29	6.55	3.20
16.00	0.56	0.04	47.01	62.17	6.55	3.20
17.00	0.59	0.04	47.01	66.06	6.55	3.20
18.00	0.63	0.05	47.01	69.95	6.55	3.20
19.00	0.66	0.05	47.01	73.83	6.55	3.20
20.00	0.70	0.06	47.01	77.72	6.55	3.20
21.00	0.73	0.07	47.01	81.60	6.55	3.20

Time (hr)	Cumulative Rainfall (in)	Instant Runoff (cfs)	Current Discharge (cfs)	Cumulative Discharge (acre-ft)	Head Water Stage (ft NGVD)	Tail Water Stage (ft NGVD)
22.00	0.77	0.07	47.01	85.49	6.55	3.20
23.00	0.80	0.08	47.01	89.37	6.55	3.20
24.00	0.84	0.08	47.01	93.26	6.55	3.20
25.00	0.89	0.13	47.01	97.15	6.55	3.20
26.00	0.94	0.13	47.01	101.03	6.55	3.20
27.00	0.99	0.14	47.01	104.92	6.55	3.20
28.00	1.04	0.15	47.01	108.80	6.55	3.20
29.00	1.09	0.16	47.01	112.69	6.55	3.20
30.00	1.14	0.17	47.01	116.58	6.55	3.20
31.00	1.19	0.17	47.01	120.46	6.55	3.20
32.00	1.25	0.18	47.01	124.35	6.55	3.20
33.00	1.30	0.18	47.01	128.23	6.55	3.20
34.00	1.35	0.19	47.01	132.12	6.55	3.20
35.00	1.40	0.19	47.01	136.01	6.55	3.20
36.00	1.45	0.20	47.01	139.89	6.55	3.20

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)
1	47.01	0.20	0.00	0.00

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Commerce Way	6.55	0.20	3.20	0.00

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Commerce Way	0.21	0.00	139.48	0.00	-139.28	0.00

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 02, 2000;1200 hr Duration: 36 hr
Time Step: 0.2 hr, Iterations: 10

Basin 1: Commerce Way

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 24 hr
Design Frequency: 10 year
1 Day Rainfall: 6.74 inches
Area: 6.71997 acres
Ground Storage: 1.94 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
6.55	0.00
7.00	0.50
8.00	5.46
9.00	12.18
10.00	18.90
11.00	25.62

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	3.20
100.00	3.20

Structure: 1

From Basin: Commerce Way
To Basin: Offsite1
Structure Type: Gravity
Weir: None
Bleeder: None
Pipe: Diameter = 3 ft, Manning's n = 0.012, Length = 600 ft
US Invert Elev = 2.3 ft NGVD, DS Invert Elev = 1.3 ft NGVD, no flap gate

Time (hr)	Cumulative Rainfall (in)	Instant Runoff (cfs)	Current Discharge (cfs)	Cumulative Discharge (acre-ft)	Head Water Stage (ft NGVD)	Tail Water Stage (ft NGVD)
0.00	0.00	0.00	0.00	0.00	3.20	3.20
1.00	0.07	0.00	47.01	3.89	6.55	3.20
2.00	0.13	0.00	47.01	7.77	6.55	3.20
3.00	0.22	0.00	47.01	11.66	6.55	3.20
4.00	0.30	0.00	47.01	15.54	6.55	3.20
5.00	0.42	0.01	47.01	19.43	6.55	3.20
6.00	0.56	0.13	47.01	23.32	6.55	3.20
7.00	0.73	0.30	47.01	27.20	6.55	3.20
8.00	0.92	0.50	47.01	31.09	6.55	3.20
9.00	1.15	0.76	47.01	34.97	6.55	3.20
10.00	1.44	1.12	47.01	38.86	6.55	3.20
11.00	1.81	1.87	47.01	42.74	6.55	3.20
12.00	4.42	24.94	47.01	46.63	6.55	3.20
13.00	5.17	3.40	47.01	50.52	6.55	3.20
14.00	5.51	1.97	47.01	54.40	6.55	3.20
15.00	5.73	1.28	47.01	58.29	6.55	3.20
16.00	5.93	1.28	47.01	62.17	6.55	3.20
17.00	6.05	0.77	47.01	66.06	6.55	3.20
18.00	6.17	0.77	47.01	69.95	6.55	3.20
19.00	6.30	0.77	47.01	73.83	6.55	3.20
20.00	6.42	0.77	47.01	77.72	6.55	3.20
21.00	6.50	0.52	47.01	81.60	6.55	3.20
22.00	6.58	0.52	47.01	85.49	6.55	3.20

Time (hr)	Cumulative Rainfall (in)	Instant Runoff (cfs)	Current Discharge (cfs)	Cumulative Discharge (acre-ft)	Head Water Stage (ft NGVD)	Tail Water Stage (ft NGVD)
23.00	6.66	0.52	47.01	89.37	6.55	3.20
24.00	6.74	0.52	47.01	93.26	6.55	3.20
25.00	6.74	0.00	47.01	97.15	6.55	3.20
26.00	6.74	0.00	47.01	101.03	6.55	3.20
27.00	6.74	0.00	47.01	104.92	6.55	3.20
28.00	6.74	0.00	47.01	108.80	6.55	3.20
29.00	6.74	0.00	47.01	112.69	6.55	3.20
30.00	6.74	0.00	47.01	116.58	6.55	3.20
31.00	6.74	0.00	47.01	120.46	6.55	3.20
32.00	6.74	0.00	47.01	124.35	6.55	3.20
33.00	6.74	0.00	47.01	128.23	6.55	3.20
34.00	6.74	0.00	47.01	132.12	6.55	3.20
35.00	6.74	0.00	47.01	136.01	6.55	3.20
36.00	6.74	0.00	47.01	139.89	6.55	3.20

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)
1	47.01	0.20	0.00	0.00

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Commerce Way	6.55	0.20	3.20	0.00

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Commerce Way	2.72	0.00	139.48	0.00	-136.76	0.00

Project Name: Town of Miami Lakes-Stormwater Master Plan Update #3
Reviewer: Tiffany Stanton
Project Number: 044533204
Period Begin: Jan 01, 2000;0000 hr End: Jan 04, 2000;1200 hr Duration: 84 hr
Time Step: 0.2 hr, Iterations: 10

Basin 1: Commerce Way

Method: Santa Barbara Unit Hydrograph
Rainfall Distribution: SFWMD - 3day
Design Frequency: 25 year
3 Day Rainfall: 11.87 inches
Area: 6.71997 acres
Ground Storage: 1.94 inches
Time of Concentration: 0.17 hours
Initial Stage: 3.2 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
6.55	0.00
7.00	0.50
8.00	5.46
9.00	12.18
10.00	18.90
11.00	25.62

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	3.20
100.00	3.20

Structure: 1

From Basin: Commerce Way
To Basin: Offsite1
Structure Type: Gravity
Weir: None
Bleeder: None
Pipe: Diameter = 3 ft, Manning's n = 0.012, Length = 600 ft
US Invert Elev = 2.3 ft NGVD, DS Invert Elev = 1.3 ft NGVD, no flap gate

Time (hr)	Cumulative Rainfall (in)	Instant Runoff (cfs)	Current Discharge (cfs)	Cumulative Discharge (acre-ft)	Head Water Stage (ft NGVD)	Tail Water Stage (ft NGVD)
0.00	0.00	0.00	0.00	0.00	3.20	3.20
1.00	0.05	0.00	47.01	3.89	6.55	3.20
2.00	0.11	0.00	47.01	7.77	6.55	3.20
3.00	0.16	0.00	47.01	11.66	6.55	3.20
4.00	0.21	0.00	47.01	15.54	6.55	3.20
5.00	0.27	0.00	47.01	19.43	6.55	3.20
6.00	0.32	0.00	47.01	23.32	6.55	3.20
7.00	0.37	0.00	47.01	27.20	6.55	3.20
8.00	0.43	0.01	47.01	31.09	6.55	3.20
9.00	0.48	0.03	47.01	34.97	6.55	3.20
10.00	0.53	0.04	47.01	38.86	6.55	3.20
11.00	0.58	0.06	47.01	42.74	6.55	3.20
12.00	0.64	0.07	47.01	46.63	6.55	3.20
13.00	0.69	0.09	47.01	50.52	6.55	3.20
14.00	0.74	0.10	47.01	54.40	6.55	3.20
15.00	0.80	0.11	47.01	58.29	6.55	3.20
16.00	0.85	0.12	47.01	62.17	6.55	3.20
17.00	0.90	0.13	47.01	66.06	6.55	3.20
18.00	0.96	0.14	47.01	69.95	6.55	3.20
19.00	1.01	0.15	47.01	73.83	6.55	3.20
20.00	1.06	0.16	47.01	77.72	6.55	3.20
21.00	1.12	0.17	47.01	81.60	6.55	3.20
22.00	1.17	0.18	47.01	85.49	6.55	3.20

Time (hr)	Cumulative Rainfall (in)	Instant Runoff (cfs)	Current Discharge (cfs)	Cumulative Discharge (acre-ft)	Head Water Stage (ft NGVD)	Tail Water Stage (ft NGVD)
23.00	1.22	0.18	47.01	89.37	6.55	3.20
24.00	1.28	0.19	47.01	93.26	6.55	3.20
25.00	1.35	0.29	47.01	97.15	6.55	3.20
26.00	1.43	0.30	47.01	101.03	6.55	3.20
27.00	1.51	0.31	47.01	104.92	6.55	3.20
28.00	1.59	0.32	47.01	108.80	6.55	3.20
29.00	1.66	0.33	47.01	112.69	6.55	3.20
30.00	1.74	0.34	47.01	116.58	6.55	3.20
31.00	1.82	0.35	47.01	120.46	6.55	3.20
32.00	1.90	0.36	47.01	124.35	6.55	3.20
33.00	1.97	0.36	47.01	128.23	6.55	3.20
34.00	2.05	0.37	47.01	132.12	6.55	3.20
35.00	2.13	0.38	47.01	136.01	6.55	3.20
36.00	2.21	0.38	47.01	139.89	6.55	3.20
37.00	2.28	0.39	47.01	143.78	6.55	3.20
38.00	2.36	0.40	47.01	147.66	6.55	3.20
39.00	2.44	0.40	47.01	151.55	6.55	3.20
40.00	2.52	0.40	47.01	155.43	6.55	3.20
41.00	2.59	0.41	47.01	159.32	6.55	3.20
42.00	2.67	0.41	47.01	163.21	6.55	3.20
43.00	2.75	0.42	47.01	167.09	6.55	3.20
44.00	2.83	0.42	47.01	170.98	6.55	3.20
45.00	2.90	0.42	47.01	174.86	6.55	3.20
46.00	2.98	0.43	47.01	178.75	6.55	3.20
47.00	3.06	0.43	47.01	182.64	6.55	3.20
48.00	3.14	0.43	47.01	186.52	6.55	3.20
49.00	3.22	0.49	47.01	190.41	6.55	3.20
50.00	3.31	0.50	47.01	194.29	6.55	3.20
51.00	3.42	0.60	47.01	198.18	6.55	3.20
52.00	3.53	0.70	47.01	202.07	6.55	3.20
53.00	3.68	0.91	47.01	205.95	6.55	3.20
54.00	3.86	1.13	47.01	209.84	6.55	3.20
55.00	4.08	1.35	47.01	213.72	6.55	3.20
56.00	4.33	1.57	47.01	217.61	6.55	3.20
57.00	4.63	1.90	47.01	221.49	6.55	3.20
58.00	5.00	2.36	47.01	225.38	6.55	3.20
59.00	5.49	3.44	47.01	229.27	6.55	3.20
60.00	8.87	36.14	47.01	233.15	6.55	3.20
61.00	9.83	4.69	47.01	237.04	6.55	3.20
62.00	10.28	2.69	47.01	240.92	6.55	3.20
63.00	10.56	1.75	47.01	244.81	6.55	3.20
64.00	10.82	1.73	47.01	248.70	6.55	3.20
65.00	10.98	1.04	47.01	252.58	6.55	3.20
66.00	11.14	1.04	47.01	256.47	6.55	3.20
67.00	11.29	1.04	47.01	260.35	6.55	3.20
68.00	11.45	1.04	47.01	264.24	6.55	3.20
69.00	11.56	0.70	47.01	268.13	6.55	3.20
70.00	11.66	0.69	47.01	272.01	6.55	3.20
71.00	11.77	0.69	47.01	275.90	6.55	3.20
72.00	11.87	0.70	47.01	279.78	6.55	3.20
73.00	11.87	0.00	47.01	283.67	6.55	3.20
74.00	11.87	0.00	47.01	287.55	6.55	3.20
75.00	11.87	0.00	47.01	291.44	6.55	3.20
76.00	11.87	0.00	47.01	295.33	6.55	3.20
77.00	11.87	0.00	47.01	299.21	6.55	3.20
78.00	11.87	0.00	47.01	303.10	6.55	3.20
79.00	11.87	0.00	47.01	306.98	6.55	3.20
80.00	11.87	0.00	47.01	310.87	6.55	3.20
81.00	11.87	0.00	47.01	314.75	6.55	3.20
82.00	11.87	0.00	47.01	318.64	6.55	3.20
83.00	11.87	0.00	47.01	322.53	6.55	3.20
84.00	11.87	0.00	47.01	326.41	6.55	3.20

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)
1	47.01	0.20	0.00	0.00

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Commerce Way	6.55	0.20	3.20	0.00

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Commerce Way	5.50	0.00	325.98	0.00	-320.48	0.00

Appendix C – Pollutant Loading Calculations for Priority Sub-Basins

DRAINAGE CALCULATIONS

Miami Lakes Stormwater Master Plan-Update #3

Miami Lakes, Florida

1/29/2019

Pollutant Loading Estimates Future/ Existing vs. Proposed

Drainage Sub-Basin	Land Use	Area (acres)	Future/ Existing P (kg/yr)	Future/ Existing N (kg/yr)	Future/ Existing TSS (kg/yr)	Proposed P Reduction (kg/yr)	Proposed N Reduction (kg/yr)	Proposed TSS Reduction (kg/yr)	Proposed P (kg/yr)	Proposed N (kg/yr)	Proposed TSS (kg/yr)	Contributing Water Body
Royal Oaks-8th Add.	Residential	37.04	22.00	173.35	2,077.94	20.38	155.15	1,881.58	1.62	18.20	196.37	Biscayne Aquifer
Royal Oaks-1st Addition	Residential	19.18	11.39	89.76	1,076.00	10.56	80.34	974.32	0.84	9.43	101.68	Biscayne Aquifer
Royal Lakes-First Add.	Residential	18.89	11.22	88.41	1,059.73	10.40	79.12	959.58	0.82	9.28	100.14	Biscayne Aquifer
Royal Oaks-Sixth Add.	Residential	20.15	11.97	94.30	1,130.42	11.09	84.40	1,023.59	0.88	9.90	106.82	Biscayne Aquifer
NW 83rd Place	Residential	4.24	2.52	19.84	237.86	2.33	17.76	215.39	0.19	2.08	22.48	Biscayne Aquifer
South of 154th	Residential	6.09	3.62	28.50	341.65	3.35	25.51	309.36	0.27	2.99	32.29	Biscayne Aquifer
West Lakes Gardens-2nd Add	Residential	10.04	5.96	46.99	563.24	5.53	42.05	510.02	0.44	4.93	53.23	Biscayne Aquifer
Alameda Northwest	Residential	11.76	6.99	55.04	659.74	6.47	49.26	597.39	0.51	5.78	62.35	Biscayne Aquifer
West Lakes Gardens	Residential	26.99	16.03	126.31	1,514.14	14.85	113.05	1,371.05	1.18	13.26	143.09	Biscayne Aquifer
Commerce Way	Commercial	6.63	3.94	31.03	371.94	3.65	27.77	336.79	0.29	3.26	35.15	Biscayne Aquifer

Reduction Factors Calculation

Inlet Trap + Baffle Box + Exfiltration Trench (to treat 0.5" runoff)

Phosphorus: 100*(0.853) + (100-100*(0.853))*0.50 = 92.65%
Nitrogen: 100*(0.79) + (100-100*(0.79))*0.50 = 89.50%
TSS: 100*(0.811) + (100-100*(0.811))*0.50 = 90.55%