

**RESOLUTION NO. 2015-19**

**A RESOLUTION OF THE MAYOR AND VILLAGE COUNCIL OF THE VILLAGE OF PALMETTO BAY, FLORIDA; RELATING TO THE STORMWATER MASTER PLAN UPDATE REPORT, ACCEPTING THE FINAL REPORT DOCUMENTS AND RECOMMENDATIONS; FURTHER AUTHORIZING THE VILLAGE MANAGER TO PROCEED WITH IMPLEMENTATION OF THE REPORT FINDINGS, FOLLOWING IDENTIFICATION AND AVAILABILITY OF APPROPRIATE FUNDING SOURCES; AND PROVIDING FOR AN EFFECTIVE DATE.**

**WHEREAS**, in February 2004 as per Resolution No. 04-21, the Village of Palmetto Bay contracted with Kimley-Horn and Associates (KH&A) for the Development of a Stormwater Master Plan (SWMP); and,

**WHEREAS**, in December 2004, KH&A completed the Village's SWMP which was accepted per Resolution No. 04-102 in December 2004; and,

**WHEREAS**, the original SWMP is over nine (9) years old and numerous stormwater sub-basin and localized drainage improvement projects have been constructed to enhance and improve the Village's stormwater system; and,

**WHEREAS**, having completed the original SWMP as well as implementing four (4) of the Village's Stormwater Capital Improvement Projects, the Village of Palmetto Bay contracted with Kimley-Horn and Associates to prepare the SWMP Update as they have extensive information and local knowledge to better serve the Village during the data collection and reporting required for preparation of the SWMP Update document; and,

**WHEREAS**, approximately 60% of the drainage deficiencies identified in the Village's original SWMP have been removed and replaced with new priority sub-basins as sub-basins identified in the original SWMP have been corrected by either improved maintenance by the Village, completion of CIP's, or completion of localized drainage improvement projects; and,

**WHEREAS**, in November 2012 as per Resolution No. 2012-83, the Village of Palmetto Bay contracted with KH&A to update the Village of Palmetto Bay's SWMP; and,

**WHEREAS**, KH&A used Geographic Information System (GIS) data, performed field reviews and reviewed stormwater complaints of stormwater problem areas and performed hydraulic modeling to evaluate the performance of existing stormwater systems, as well as to evaluate the performance of the stormwater systems following implementation of proposed improvements; and,

**WHEREAS**, The SWMP Update will enable the Village to examine the effectiveness of the ongoing operation and maintenance program, and to identify additional capital improvement projects (CIP) for future reduction of flooding and improvement of water quality within the Village of Palmetto Bay; and,

**WHEREAS**, this report summarizes the performance against goals for each of the ten (10) priority sub-basins including two (2) from the original SWMP and eight (8) new priorities identified as part of the SWMP Update; and,

**WHEREAS**, the 2014 SWMP Update will become a component of the Village's 5-Year Capital Improvement Element of the Comprehensive Plan and provide a measure to fund different improvement projects within the Stormwater infrastructure and address sites that have been identified to be in need of improvement; and,

**WHEREAS**, funding for the prioritized improvements will be provided through revenue from the Village's Stormwater Utility Fee and also through available grant funding; and,

**WHEREAS**, a copy of the 2014 SWMP Update is attached as Exhibit "A"; and,

**WHEREAS**, The Administration is recommending that the Village Council adopt the 2014 SWMP Update final report and authorize the Village Manager to proceed with implementing the prioritized SWMP projects identified in the report following identification and availability of appropriate funding sources; and,

**WHEREAS**, the Village Council finds that adopting the 2014 SWMP Update is in the best interest of the Village.

**NOW, THEREFORE, BE IT RESOLVED BY THE MAYOR AND VILLAGE COUNCIL OF THE VILLAGE OF PALMETTO BAY, FLORIDA, AS FOLLOWS:**

**Section 1.** The 2014 SWMP Update and the Capital Improvement Plan included in the update, a copy attached hereto as Exhibit "A" is hereby adopted by the Village Council, further authorizing the Village Manager to proceed with implementing the prioritized SWMP projects identified in the report following identification and availability of appropriate funding sources.

**Section 2.** This resolution shall take effect immediately upon approval.

PASSED and ADOPTED this 2<sup>nd</sup> day of February, 2015.

Attest:

  
Meighan Alexander  
Village Clerk

  
Eugene Flinn  
Mayor

APPROVED AS TO FORM AND LEGAL SUFFICIENCY FOR THE  
USE AND RELIANCE OF THE VILLAGE OF PALMETTO BAY ONLY:

  
\_\_\_\_\_  
Dexter W. Lehtinen  
Village Attorney

FINAL VOTE AT ADOPTION:

Council Member Karyn Cunningham	<u>YES</u>
Council Member Tim Schaffer	<u>YES</u>
Council Member Larissa Siegel Lara	<u>YES</u>
Vice-Mayor John DuBois	<u>YES</u>
Mayor Eugene Flinn	<u>YES</u>

RAINING

Prepared For  
Village of Palmetto Bay, Florida



# Stormwater Master Plan Update



Prepared By  
**Kimley»Horn**

## EXECUTIVE SUMMARY

The Village of Palmetto Bay was incorporated in September 2002. Prior to this date the area within the Village boundaries was part of unincorporated Miami-Dade County. In December 2004, Kimley-Horn completed a Stormwater Master Plan for the Village in preparation of the Village assuming the responsibility for stormwater management within its boundaries. In May 2006, the Village adopted Ordinance 06-07 which established the Village's Stormwater Utility.

In the nine years since the original Stormwater Master Plan was completed, the Village of Palmetto Bay 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 Stormwater Utility. This Stormwater Master Plan Update will enable the Village 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 Village of Palmetto Bay.

To measure the performance of each drainage sub-basin, performance goals were identified in the Village's original Stormwater Master Plan. This report summarizes the performance against goal for each of the ten priority sub-basins (two sub-basins from the original Stormwater Master Plan and eight new priority sub-basins identified as a part of this Stormwater Master Plan Update). This report also recommends improvements that will improve performance in the priority sub-basins. The recommended improvements are the basis for the Capital Improvement Program contained at the end of the report.

The Capital Improvement Program contains approximately \$552,000 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 Village's desire to improve drainage conditions. The Capital Improvement Program also contains \$8,000,000 worth of major Capital Improvement Projects recommended for implementation over the next ten years.

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## INTRODUCTION

The Village of Palmetto Bay is located in southeastern Miami-Dade County, Florida and was incorporated in 2002. Figure 1 illustrates the location of the Village of Palmetto Bay.

*Figure 1: Village of Palmetto Bay Location Map*



In December 2004, Kimley-Horn completed a Stormwater Master Plan for the Village of Palmetto Bay in preparation of the Village assuming responsibility for stormwater management within its boundaries. In May 2006, the Village adopted Ordinance 06-07 which established the Village's Stormwater Utility.

The first section of the original Stormwater Master Plan described existing conditions within the Village of Palmetto Bay. Existing information on stormwater 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 the Village of Palmetto Bay was compiled in this section. In addition, the section included field information on the existing condition of Village drainage infrastructure and locations where street flooding was occurring.

The second section of the original Stormwater Master Plan contained drainage analysis of 17 sub-basins that were selected as priority areas for improvement as part of the Village-wide stormwater performance review. Drainage improvements for the priority sub-basins were recommended to meet performance goals associated with both reducing flooding and improving water quality. The third section of the original Stormwater Master Plan outlined a Capital Improvement/Operations and Maintenance Program for the Village's Stormwater Utility.

In the nine years since the original Stormwater Master Plan was completed, the Village of Palmetto Bay 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 Stormwater Utility. This Stormwater Master Plan Update will enable the Village 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 Village of Palmetto Bay.

## DATA COLLECTION AND EXISTING CONDITIONS

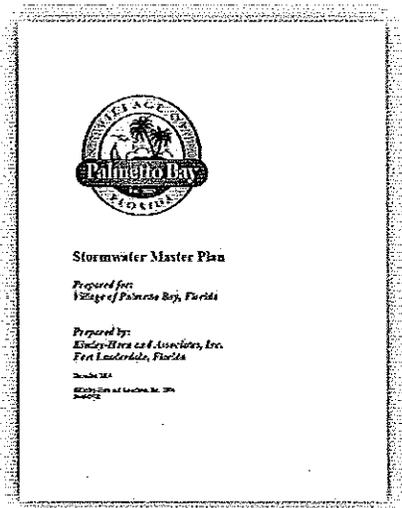
Available stormwater management information for the Village of Palmetto Bay was reviewed to provide a baseline for this Stormwater Master Plan Update. The information reviewed included the following:

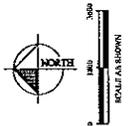
- The original Village of Palmetto Bay Stormwater Master Plan
- Village ordinances, regulations, and guidelines for stormwater management
- Stormwater management GIS coverage
- Design and record drawings of completed and proposed stormwater management and local drainage improvement projects
- Village records related to drainage and stormwater management issues
- Field review of the Village during storm events to identify stormwater problem areas

### Village of Palmetto Bay Stormwater Master Plan

The original Village of Palmetto Bay Stormwater Master Plan was completed in December 2004. The first section described existing conditions within the Village of Palmetto Bay at the time the Village assumed responsibility for the drainage system from Miami-Dade County.

Figure 2 shows the location of stormwater problem areas identified in the original Stormwater Master Plan. The various types of drainage and flood related complaints or observations were identified with color coded dots.





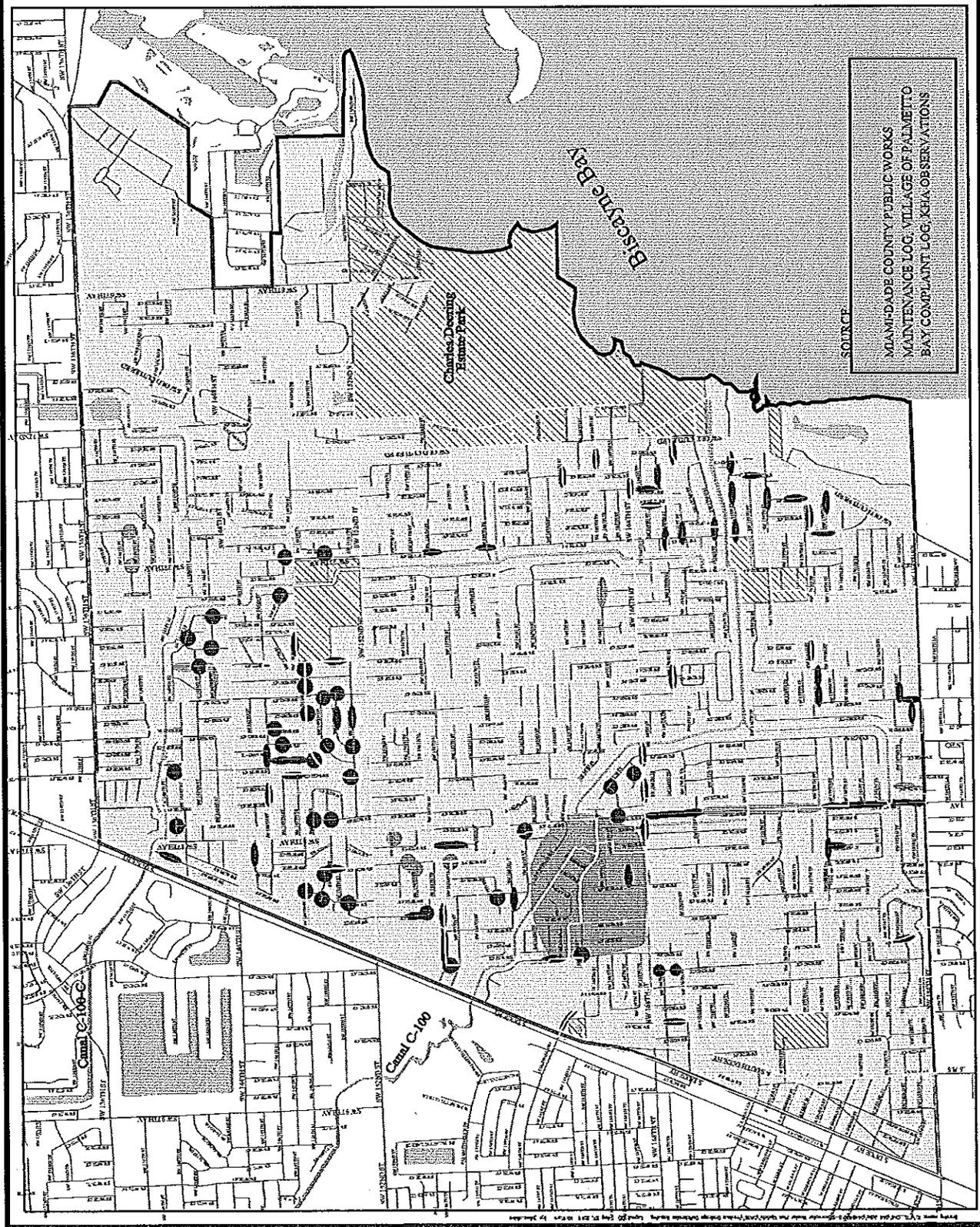
**Figure 2:  
Village of Palmetto Bay  
Drainage Deficiencies  
Original 2004 Plan**

**Legend**

- COMPLAINT RECORDED BY MIAMI-DADE PUBLIC WORKS
- FLOODING REPORTED BY VILLAGE OF PALMETTO BAY STAFF
- FLOODING ACROSS ROADWAY OBSERVED BY KHA STAFF
- LOCALIZED PONDING IN ROADWAY OBSERVED BY KHA STAFF
- FLOODING TO BE MITIGATED BY PROJECTS UNDER DESIGN OR CONSTRUCTION
- SUB-BASIN BOUNDARY



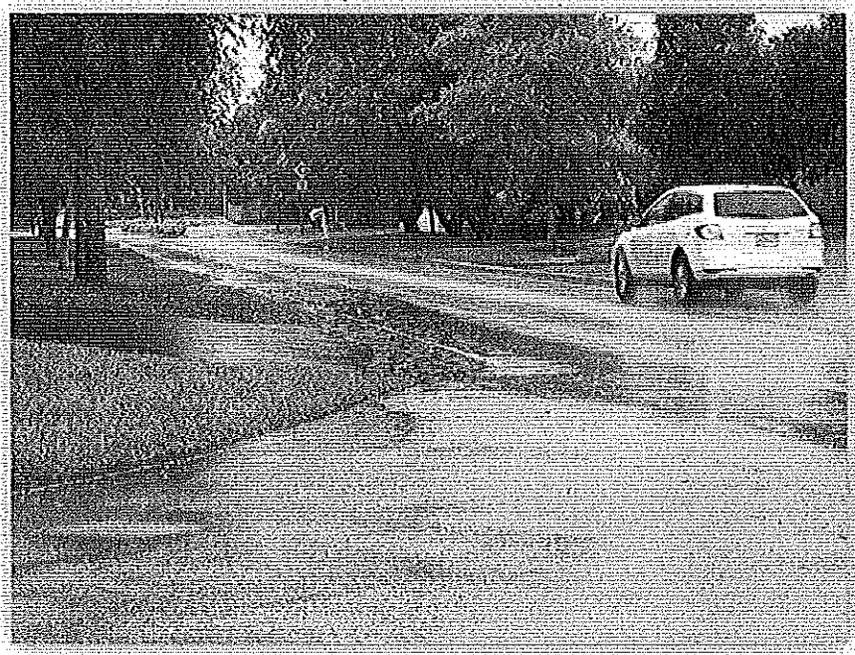
**Kimley-Horn  
and Associates, Inc.**

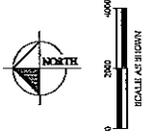


SOURCE:  
MIAMI-DADE COUNTY PUBLIC WORKS  
MAINTENANCE LOG, VILLAGE OF PALMETTO  
BAY COMPLAINT LOG, KHA OBSERVATIONS

Small text at the bottom of the page, likely containing project details or a disclaimer.

The second section of the original Stormwater Master Plan contained drainage analysis of 17 sub-basins that were selected as priority areas for improvement. Drainage improvements for the priority sub-basins were recommended to meet performance goals associated with both reducing flooding and improving water quality. The location of the priority sub-basins (shaded grey) identified in the original Stormwater Master Plan can be seen in Figure 3.

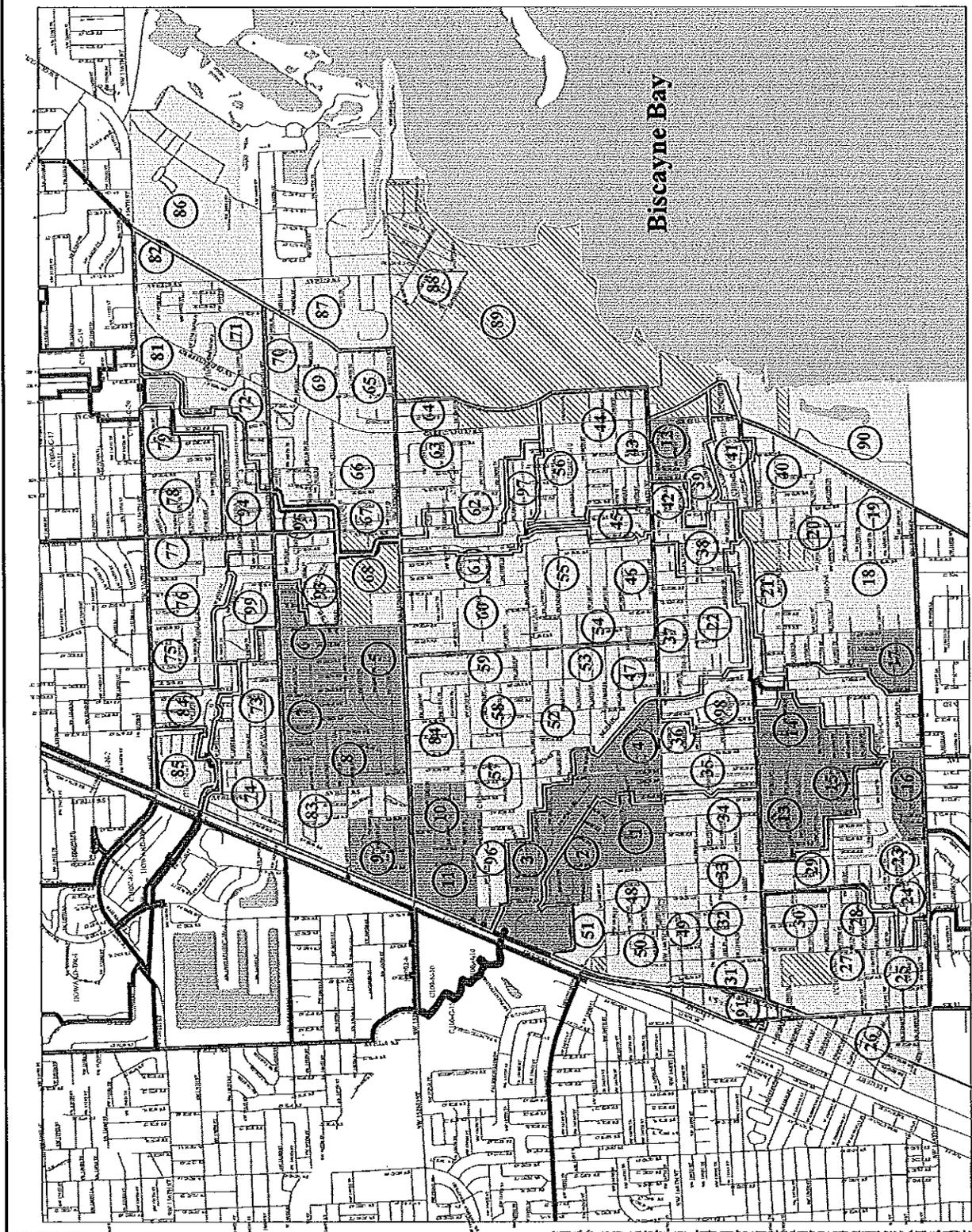
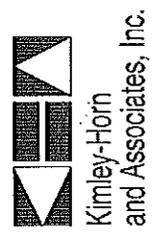




**Figure 3:**  
**Village of Palmetto Bay**  
**Priority Sub-basins**  
**Original 2004 Plan**

**LEGEND**

- Basin Boundary
- Sub-basin Boundary
- Village Boundary
- Basin Name
- Sub-basin no.
- Priority Basin



C-1 Basin

The third section of the original Stormwater Master Plan outlined a Capital Improvement/Operations and Maintenance Program for the Village's Stormwater Utility. The capital improvement projects included in the original Stormwater Master Plan that have been completed will be discussed later in the report. The report will also provide a summary of area specific or localized drainage improvements that have been completed by the Village. The localized drainage improvement projects can range from limited infrastructure projects at intersections or along roadways to swale grading to address ponding.

### **NPDES Permit and CRS Application Information**

The Village of Palmetto Bay is a co-permittee on the Miami-Dade County Multiple Separate Storm Sewer System 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 stormwater treatment facilities to conducting public awareness events to publicize the environmental consequences of illegal dumping. The permit is now entering Year 3 of Cycle 3 which covers the time period between June 2013 and June 2014. The deadline for submitting the annual report for Year 3 of Cycle 3 is December 2014. MS4 permit mandated activities are reflected in the Village's Stormwater Utility Operation and Maintenance Budget.

The Village of Palmetto Bay was accepted into the National Flood Insurance Program (NFIP) in 2008 and submitted a request to join the Community Rating System (CRS) program in 2011. As part of the CRS program, the NFIP offers flood insurance at more affordable rates than are generally available from private insurers. A better rating with the CRS will provide additional savings to Village residents on their flood insurance. The CRS rating is determined by activities implemented by the Village ranging from stormwater infrastructure maintenance to public outreach programs. Prior to submitting the application to become a member of the CRS, the Village needs a letter of compliance with the NFIP. Prior to the NFIP preparing that letter, a FEMA regional coordinator will require satisfactory completion of a Community Assistance Visit

(CAV) with the Village. The CAV occurred in 2012. The FEMA representative met with the Village and reviewed the Village's Floodplain Management ordinance and the Building Department's enforcement of the ordinance. The Village is currently working with FEMA to obtain their letter of compliance from FEMA. CRS activities should be included in the Village's Stormwater Utility Operation and Maintenance Budget.

### **Village Ordinances, Regulations, and Guidelines**

Upon incorporation, the Village of Palmetto Bay adopted the entire Miami-Dade County Code. Since that time, the Village has passed additional ordinances pertaining to stormwater management. In May of 2006, the Village passed Ordinances 06-07 which established the Village's Stormwater Utility and set the Stormwater Utility rate at \$4.00 per Equivalent Residential Unit. This ordinance established the Village's Stormwater Utility as a source of funding for Stormwater-related projects and maintenance activities within the Village.

In 2009, the Village adopted Ordinance 09-20, updating their original Floodplain Management Ordinance (incorporated in to the Village's Land Development Code in 2008 and codified in Muni Code as Chapter 18) to comply with changes made by FEMA. A newer version of a floodplain ordinance was later developed with the intent of being more compliant with the Florida Building Code. In 2012, the Village adopted the new Floodplain Management Ordinance as Ordinance 2012-16. The Floodplain Management Ordinance sets flood protection minimum standards for new and substantially improved properties within the Village.

In March 2011, the Village adopted Ordinance 2011-31. This ordinance is a 5-year interlocal agreement with Miami-Dade County for canal maintenance. The agreement resulted in the Village owning the SW Maral Estates canal and the Bel Aire Section canal. Miami-Dade County currently maintains the SW 160th Street ditch in the Village.

In December 2003, the Village adopted their Comprehensive Plan as Ordinance 03-46. The Comprehensive Plan contains a section on Stormwater Management which sets stormwater

management Level of Service standards for development within the Village. More recently, Kimley-Horn prepared, in conjunction with Village staff, the Village's Evaluation and Appraisal Report (EAR) Based Comprehensive Plan amendments; these amendments were transmitted to the Florida Department of Economic Opportunity (DEO) in July 2014 and are anticipated to be adopted by the Village in October 2014. The Village's Comprehensive Plan includes Goals, Objectives and Policies (GOPs) relating to stormwater planning within the Infrastructure Element, Stormwater Management Sub-Element, Conservation Element, Capital Improvements Element, Level of Service Standards, and the Water Supply Facilities Element. These Elements and their respective GOP establish stormwater management policies for development within the Village.

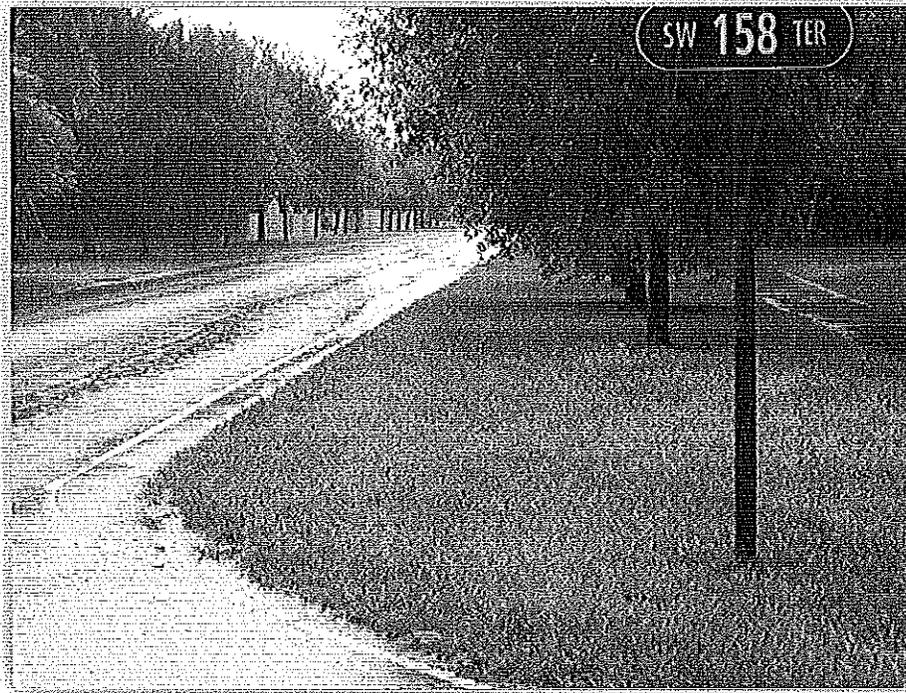
#### **Stormwater Management GIS Coverage**

As part of the original Village of Palmetto Bay Stormwater Master Plan, Kimley-Horn obtained Geographic Information System (GIS) information on existing stormwater systems from Miami-Dade County 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 this Stormwater Master Plan Update, Kimley-Horn used the GIS data to analyze the amount of pervious versus impervious areas on each of the priority stormwater sub-basins that were hydraulically modeled. The hydraulic modeling was required to evaluate the performance of the existing stormwater systems, as well as the performance of the stormwater systems after implementing proposed improvements.

#### **Field Review of Stormwater Problem Areas**

Based on field reviews and review of stormwater complaints, it appears that several of the drainage deficiencies identified in the Village's original Stormwater Master Plan have been corrected by either improved maintenance by the Village, completion of capital improvements projects, or completion of localized drainage improvements. As a result, several of the original priority sub-basins have been removed and replaced with new priority sub-basins.

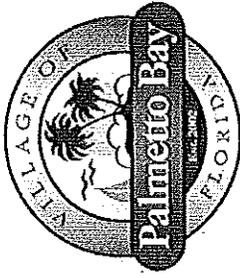
Figure 4 illustrates the updated drainage deficiency map. Based on sub-basin area, Figure 4 as compared to Figure 2 reflects that approximately 60% of the drainage deficiencies identified in the original Stormwater Master Plan have been addressed by the Village.





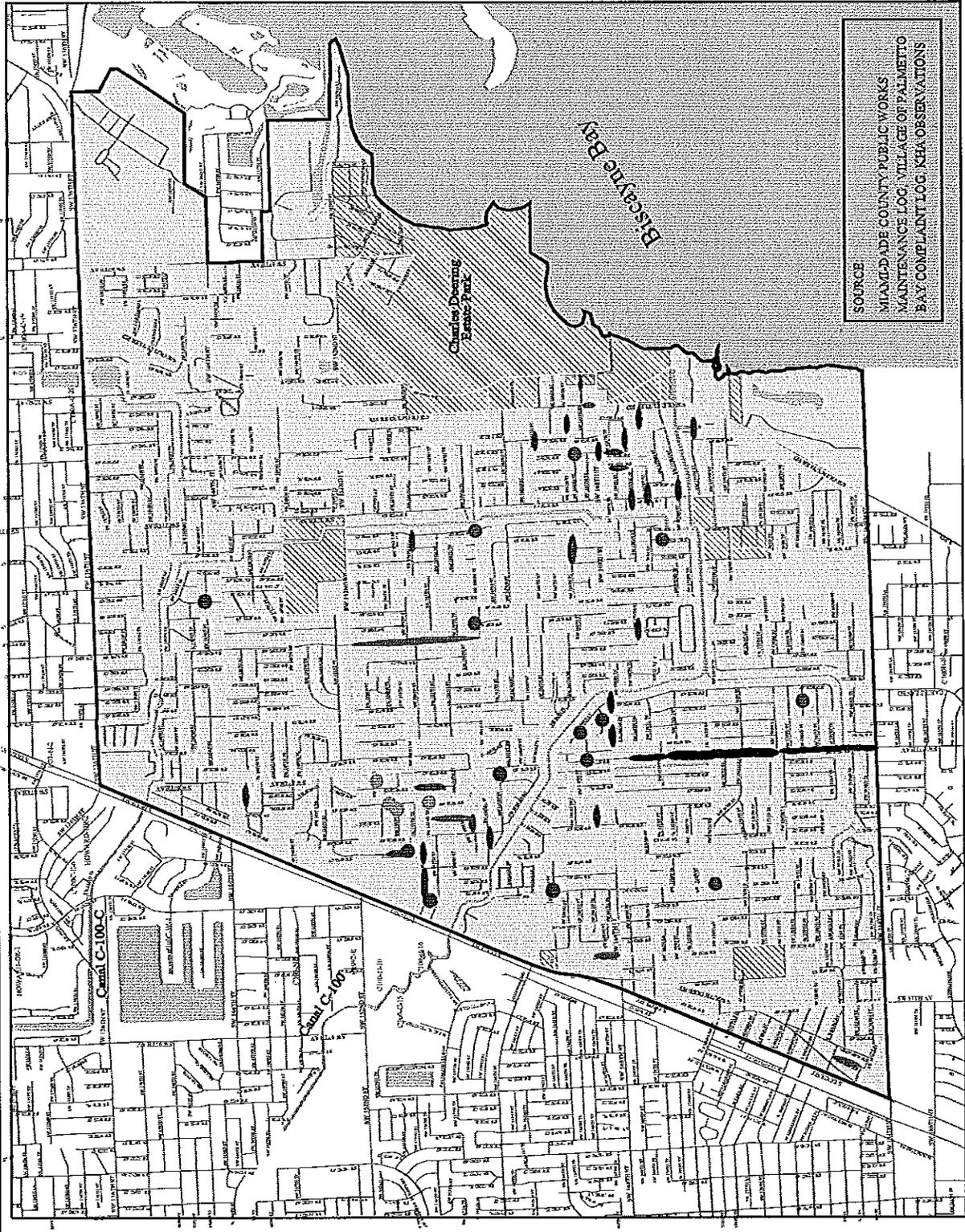
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SCALE AS SHOWN



**Figure 4:**  
**Village of Palmetto Bay**  
**Drainage Deficiencies**  
**Updated 2014 Plan**

Legend	
	VILLAGE BOUNDARY
	SUB-BASIN BOUNDARY
	PRIVATELY OWNED COMMUNITY ROAD
	BASIN NAME
	FLOODING ON MIAMI-DADE COUNTY ROADWAYS
	FLOODING REPORTED BY VILLAGE OF PALMETTO BAY
	FLOODING ACROSS ROADWAY OBSERVED BY KHA STAFF
	LOCALIZED PONDING IN ROADWAY OBSERVED BY KHA STAFF
	FLOODING TO BE MITIGATED BY PROJECTS UNDER DESIGN OR CONSTRUCTION



SOURCE:  
 MIAMI-DADE COUNTY PUBLIC WORKS  
 MAINTENANCE LOG, VILLAGE OF PALMETTO  
 BAY COMPLAINT LOG, KHA OBSERVATIONS

**Kimley»Horn**

## Summary of Completed Stormwater Management Projects

Kimley-Horn obtained and reviewed design and record drawings for priority sub-basin capital improvement projects as well as localized drainage improvement projects that have been completed for incorporation into the report. The following two sections provide an update to the sub-basin prioritization and a summary of the localized projects completed by the Village.

## Updated Sub-basin Prioritization

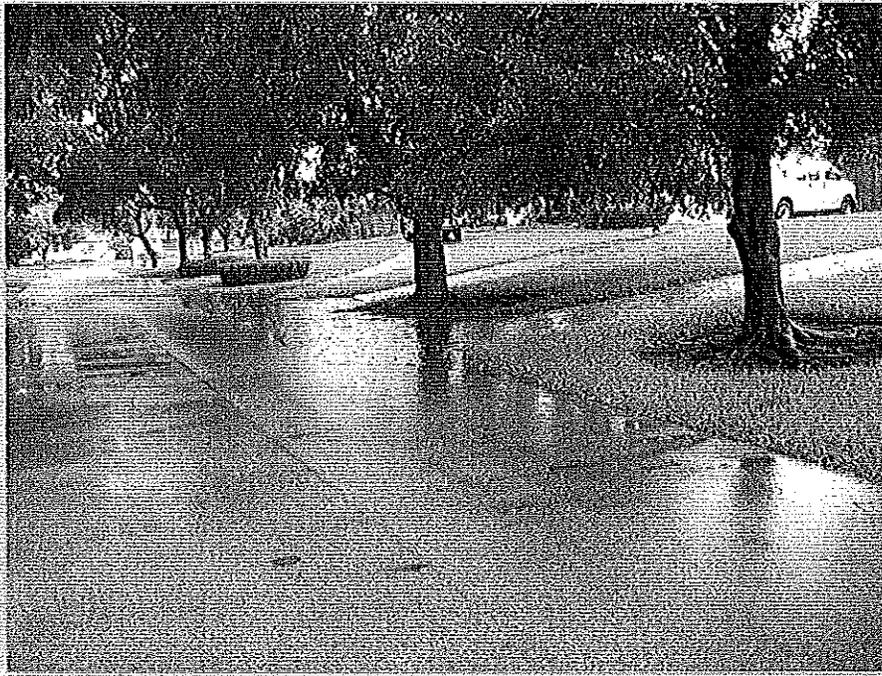
Based on observed flooding, complaints, road conditions, and the other parameters noted above, the Village selected 17 sub-basins for more in-depth study under the original Stormwater Master Plan. Since the original Stormwater Master Plan was finalized, the Village of Palmetto Bay has implemented capital improvement projects in four of the original seventeen priority sub-basins:

- 1) Sub-basin 2 – SW 164th Street Drainage Improvements
- 2) Sub-basin 7 - SW 148th Street Drainage Improvements
- 3) Sub-basin 5 - SW 146th Street Drainage Improvements
- 4) Sub-basin 9 - SW 89th Avenue Drainage Improvements

The completed projects have substantially improved conditions in the areas that they serve. The Village has also completed the design and permitting of sub-basin 10 – SW 88th Avenue Drainage Improvements and anticipates advertising that project for construction in early 2015. Therefore, these five sub-basins have been removed from the drainage sub-basin analysis section of this Stormwater Master Plan Update.

Of the 12 remaining priority sub-basins from the original Stormwater Master Plan, ten have been removed based on either improved maintenance by the Village or completion of localized drainage improvements that resolved the flooding issues; those sub-basins are 1, 3, 4, 6, 8, 13, 14, 15, 16, and 17. As part of this Stormwater Master Plan Update, eight new priority sub-basins have been identified and sub-basins 11 and 12 from the original Stormwater Master Plan have stayed on the priority list. Selection of the eight new priority sub-basins was a function of

flooding complaints, site observations, and coordination with Village staff. The eight new priority sub-basins are 39, 41, 42, 43, 44, 57/96, 59/60, 61. The sub-basin names with a "/" represent addressing areas that include portions of two adjacent sub-basins. These ten priority sub-basins are the subject of hydraulic and hydrologic modeling as part of this Stormwater Master Plan Update. The four completed and one designed capital improvement projects and the ten priority sub-basins to be analyzed as part of this Stormwater Master Plan Update are highlighted in Figure 5.

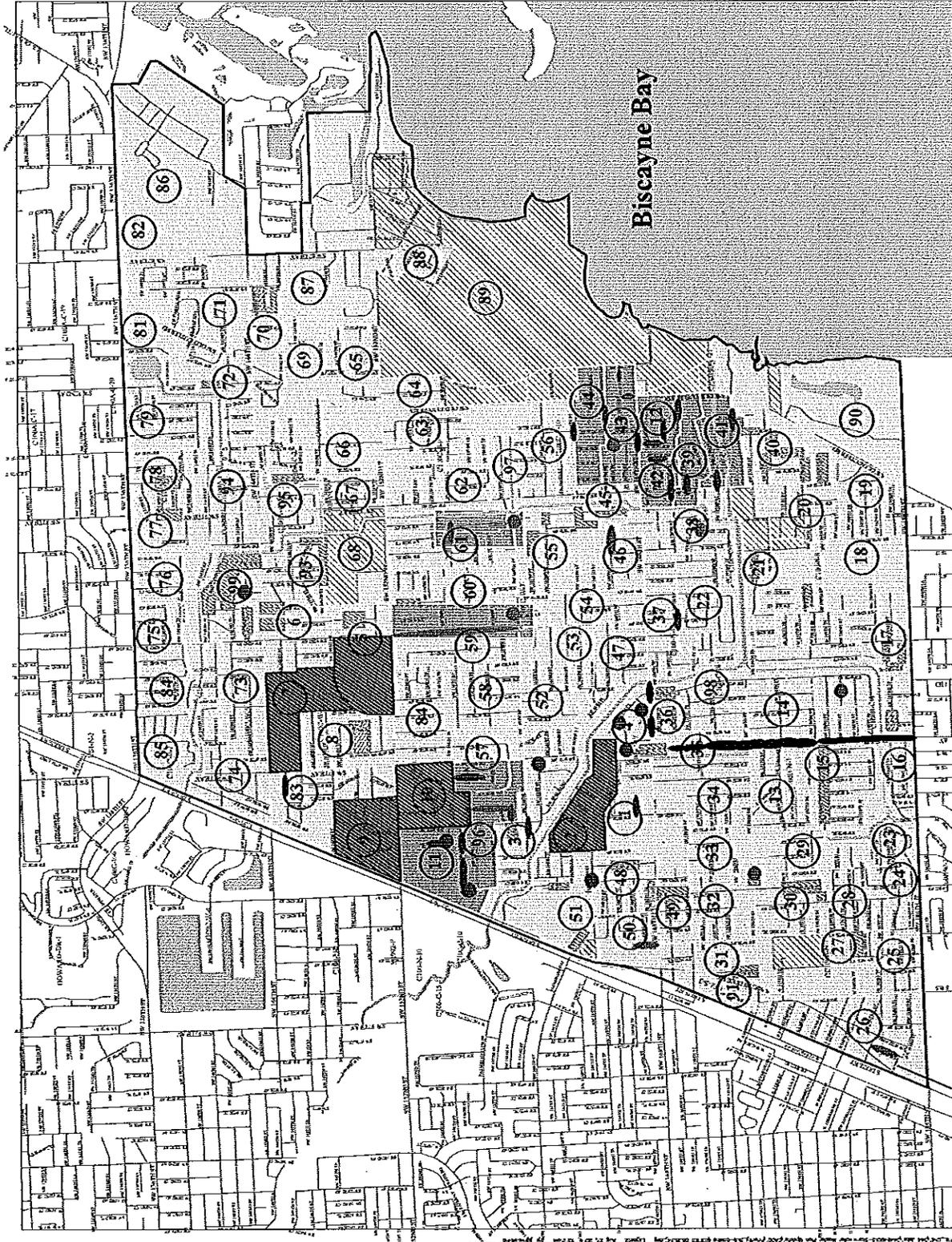




**Figure 5:**  
Village of Palmetto Bay  
Priority Sub-basins  
Updated 2014 Plan

**Legend**

- VILLAGE BOUNDARY
- SUB-BASIN BOUNDARY
- BASIN NAME
- SUB-BASIN NO. (#)
- PRIORITY BASIN
- BASIN CONSTRUCTION COMPLETE
- BASIN DESIGN COMPLETE
- LOCAL DRAINAGE IMPROVEMENTS COMPLETE
- VILLAGE PARK OR PRESERVE



**Kimley»Horn**

C-1 Basin

Hydraulic and hydrologic analysis of these ten priority sub-basins will result in Capital Improvement Project recommendations for these sub-basins which will be incorporated into an updated Stormwater Capital Improvement Program (CIP).

### **Summary of Localized Drainage Improvements**

As part of a Village-wide Drainage Improvement Program, the following is a list of localized drainage improvements that have been implemented by the Village since completion of the original Stormwater Master Plan:

#### **Referenced as Phase II locations**

SW 141st Terrace and SW 79th Avenue  
SW 92nd Court and SW 176th Street  
SW 93rd Avenue and SW 178th Street  
SW 94th Court and SW 180th Street

#### **Referenced as Phase III locations**

SW 84th Avenue and SW 168th Street  
SW 179th Terrace and SW 77th Avenue  
SW 79th Avenue and SW 141st Terrace  
SW 140th Terrace and SW 80th Avenue  
SW 79th Court and SW 142nd Street  
SW 174th Street and SW 92nd Court  
SW 80th Avenue and SW 144th Street  
SW 144th Terrace and SW 68th Avenue

#### **Referenced as Phase IV locations**

SW 159th Terrace and SW 89th Avenue  
SW 150th Terrace and SW 86th Avenue  
SW 149th Terrace and SW 86th Avenue

SW 85th Avenue and SW 144th Street

SW 81st Avenue and SW 144th Street

**Referenced as Phase V locations**

SW 174th Street and SW 77th Avenue

SW 74th Court and SW 175th Street

SW 176th Street and SW 76th Avenue

SW 74th Place and SW 176th Street

SW 75th Avenue and SW 178th Terrace

SW 178th Terrace and SW 77th Avenue

SW 92nd Avenue and SW 161st Lane

SW 91st Avenue and SW 164th Street

SW 81st Avenue and SW 151st Street

SW 73rd Court and SW 154th Terrace

SW 74th Avenue and SW 145th Terrace

SW 68th Court and SW 145th Terrace

SW 68th Court and SW 144th Terrace

SW 148th Street and SW 78th Avenue

SW 72nd Avenue and SW 144th Street

SW 161st Street and SW 78th Avenue

**Additional locations**

SW 75th Avenue and SW 139th Street

SW 77th Avenue and SW 139th Street

SW 86th Avenue and SW 182nd Terrace

SW 178th Terrace and SW 89<sup>th</sup> Avenue

SW 95th Avenue between US1 and SW 174th Street

SW 183rd Terrace and SW 83rd Place

SW 182nd Terrace and SW 83rd Place

SW 178th Street and SW 82nd Avenue  
SW 175th Street and SW 79th Court  
SW 77th Court and SW 167th Terrace  
SW 78th Avenue and SW 164th Street  
SW 162nd Street and SW 77th Court  
SW 160th Street east of S. Dixie Highway  
SW 80th Avenue and SW 152nd Street  
SW 75th Avenue and SW 147th Street  
SW 92<sup>nd</sup> Court and SW170th Street

The areas referenced above that received localized drainage improvements were based on observed flooding, citizen complaints, and road conditions that did not warrant a full capital improvement project, but required attention to address public health and safety issues. The localized drainage improvement projects can range from limited infrastructure projects along roadways and at intersections to swale grading at specific locations to address ponding. The scope of work varies for each project and while the roadways listed above provide a general project location, the actual drainage improvements can extend beyond the specific roadways listed. The localized drainage improvements projects are highlighted in Figure 5.

Localized drainage improvements associated with the installation of two new traffic circles also occurred at SW 168th Street and SW 87th Avenue and at SW 160th Street and SW 82nd Avenue.

## DRAINAGE SUB-BASIN ANALYSIS

### Methodology

To measure the performance of each drainage sub-basin, performance goals were identified in the Village's original Stormwater Master Plan.

**Water Quality Treatment Performance Goal:** Drainage sub-basins discharging into lakes should have minimum water quality pre-treatment equal to the volume of 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 Regulatory and Economic Resources (DRER) formerly the Department of Environmental Resource Management (DERM) requirements for water quality pre-treatment.

**Water Quantity Treatment Performance Goals:** As part of the original Stormwater Master Plan process, the Village adopted several water quantity treatment performance goals designed to reduce the potential for flooding within the Village.

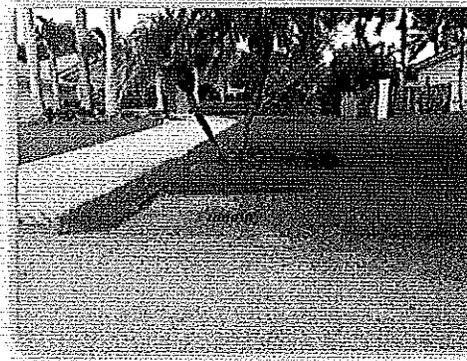
- During the five-year, 24-hour design storm event, flooding should not exceed the crown of the local roadways located within the sub-basin.
- During the ten-year, 24-hour design storm event, flooding should not exceed the crown of the arterial or collector roadways located within the sub-basin.
- During 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 be below the building finish floor elevation.

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

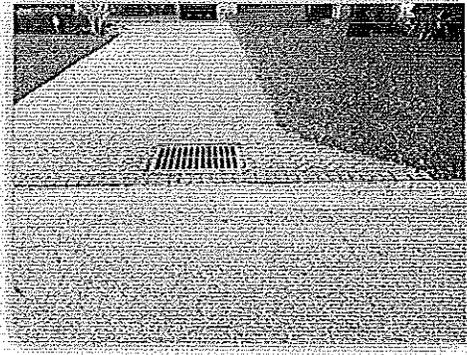
met within a sub-basin, stormwater management improvements were proposed for the sub-basin to bring it into compliance with the performance goal.

For each priority sub-basin, the amount of existing paved area, building area, and pervious area was determined using existing aerial photographs and GIS data. Elevation information contained in the GIS data was used to estimate the average high and low elevation of the paved area, building area, and pervious area associated with the sub-basin. The available GIS elevation information was very limited for the sub-basins areas, but adequate for developing proposed schematic or conceptual improvements. This information along with information on existing drainage infrastructure located within the sub-basin was incorporated into a computer model. Existing flood routing and maximum flood stage produced by 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. SFWMD and DRER require stormwater runoff to be pretreated to minimize pollution prior to discharging into any water body. Typically, water quality pre-treatment in the Village of Palmetto Bay is provided by exfiltration trench (underground perforated pipes in a gravel bed, also known as French drain) 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.

Based on the priority sub-basins that were designed and permitted as part of the original Stormwater Master Plan, it was determined that the storm events



most applicable to public right-of-way stormwater improvement projects include the 5-year, 24-hour and 100-year, 72-hour. The stormwater system performance results associated with those two storm events provided the required information for permitting through DRER for water quantity and water quality. The 10-year, 24-hour and 25-year, 72-hour storm events are not required for public sector permitting and are more applicable for retaining stormwater onsite for private development projects. As a result, the stormwater event modeling for this Stormwater Master Plan Update only includes the 5-year, 24-hour and 100-year, 72-hour events.

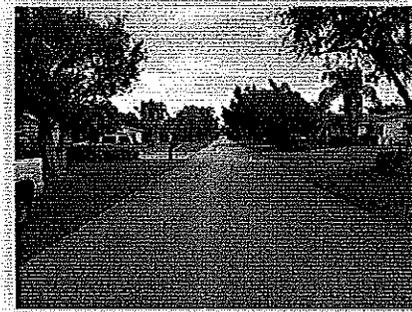


The following is a summary of the findings for each of the ten priority sub-basins (two sub-basins from the original Stormwater Master Plan and eight new priority sub-basins).

### Drainage Sub-basin #11

**Location:** Drainage sub-basin 11 is generally located south of SW 152nd Street, north of SW 156nd Street, west of SW 89th Avenue, and east of Dixie Highway (US 1). Drainage sub-basin 11 is part of the C100C-N-11 Miami-Dade County basin along SW 152<sup>nd</sup> Street. Drainage sub-basin 11 was analyzed as part of the original Stormwater Master Plan. This report includes an updated improvement approach and budget for the proposed improvements.

**Existing and Future Conditions:** Figure 6 shows existing conditions for drainage sub-basin 11. The sub-basin consists of approximately 48.37 acres of existing residential and commercial development with approximately 6,470 linear feet of roadway, including SW 92nd Avenue, SW 89th Court, SW 89th Avenue, SW 157th Street, SW 156th Street, and SW 155th Street. The drainage system in this sub-basin is a closed system with catch basins connected to exfiltration trench located in the vegetated swales along the sides of the roadways.



No complaints were reported in this area by the Village as part of this update or from Miami-Dade County as part of the original master plan. In our investigation, Kimley-Horn found flooding extending across the entire roadway width on SW 156th Street, SW 92nd Avenue, SW 89th Court, and SW 155th Street. The location of these deficiencies can be seen in Figure 6. The entire sub-basin area was modeled based on data collected as part of the Stormwater Master Plan process.

Based on available GIS data, the existing crown of road elevations ranges from a low of approximately 9.00 feet to a high of approximately 9.90 feet NGVD. It was assumed that the building finish elevations range from 9.67 feet (eight inches above the lowest crown of road) to 10.67 feet (eight inches above highest crown of



road). The lowest edge of road is 8.75 feet. Pervious area elevations were assumed to range from 8.85 feet (one inch above the lowest edge of road) to 10.00 feet (highest edge of road).

**Performance Goal Analysis:** Based on the available information described above, calculations were made for drainage sub-basin 11 to compare the existing conditions with the previously stated performance goals. The detailed calculations can be found in Appendix A. Based on the detailed hydrologic and hydraulic calculations for drainage sub-basin 11, the sub-basin is subject to flooding during all design storm events. The table below shows the performance of the sub-basin versus performance goals.

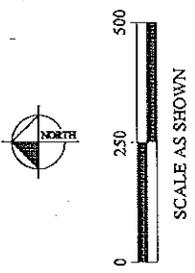
*Table 1: Drainage Sub-basin 11 – Performance Goal Analysis for Existing Conditions*

Design Storm Event	Flood Stage Elevation Above Performance Goal Criteria
5-year, 24-hour	0.76 feet above lowest crown of road for collector and local roadways
100-year, 72-hour	0.94 feet above lowest finish floor elevation (FFE.)
Total Above Goal	1.70 feet above performance goal criteria

The flood stages shown for drainage sub-basin 11 exceed allowable levels and the sub-basin does not meet the performance goal criteria.

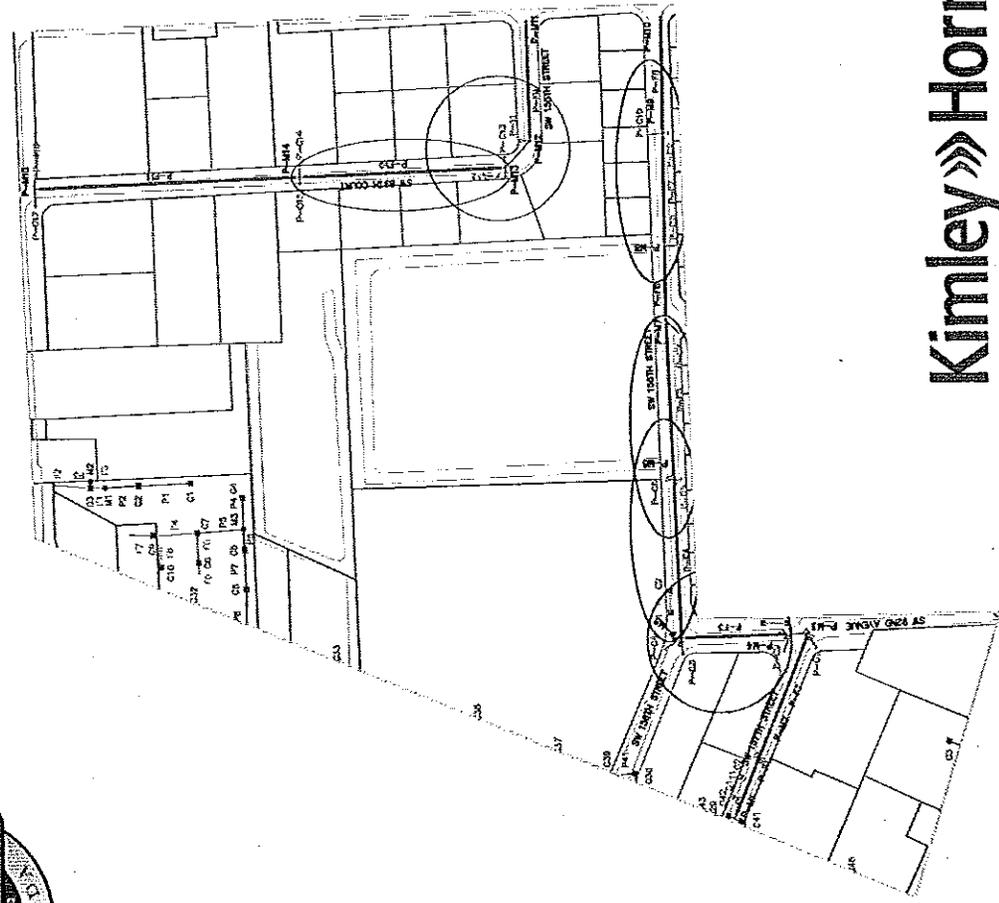


**FIGURE 6:  
DRAINAGE SUB-BASIN #11  
PROPOSED CONDITIONS**



**PROPOSED MODIFICATIONS**  
 Add 2,600 LF 18" French Drain / Exfiltration Trench  
 Add 500 LF of 18" Storm Sewer Pipe (HDPE)  
 Add 500 LF of 15" Storm Sewer Pipe (HDPE)  
 Add 17 Catch Basins  
 Add 15 Manholes

**PERFORMANCE GOAL CRITERIA**  
 Min. Roadway EOP Elevation 8.75  
 Min. Roadway Centerline Elevation 9.00  
 Min. Building FFE 9.67



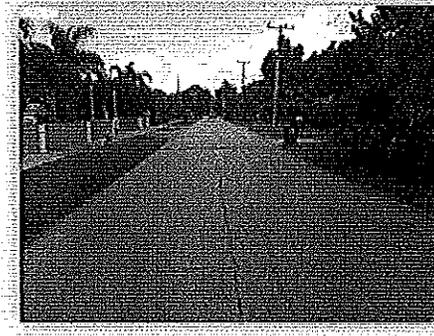
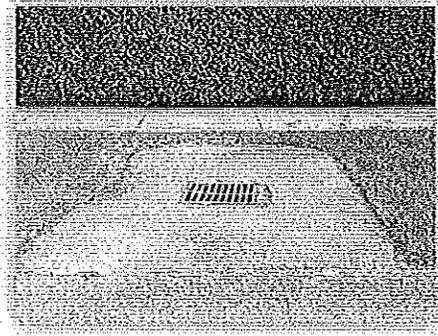
**LEGEND**

	Catch Basin (C1)
	French Drain (F1)
	Trench (T1)
	Pipe (P1)
	Outfall (O1)
	Sub-Basin Boundary
	Manhole (M1)
	Elevation
	Proposed Catch Basin (P-C1)
	Proposed French Drain (P-F1)
	Proposed Manhole (P-M1)
	Proposed Pipe
	Flooding across roadway observed by KHA

**Kimley»Horn**

Last Revised September 17, 2014

**Storm Drainage Deficiencies:** The catch basins inspected in this sub-basin were observed to be clean, with only limited debris and sediment. As a result, drainage deficiency issues are likely to be a function of limited system capacity and infrastructure age and or condition. Hydrologic and hydraulic calculations for this sub-basin confirmed the existing drainage infrastructure does not discharge adequate runoff to meet the desired performance criteria. The capacity of the existing swales and French drains is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. Pavement condition within the sub-basin area is generally average and in need of resurfacing or rehabilitation. Improvements to drainage infrastructure will be needed to address these inadequacies.



**Recommended Drainage Improvements:** Clean and flush all sediment and debris from existing catch basins and pipes and adjust catch basin elevations and locations to minimize accumulation of sediment and debris. Install the additional infrastructure depicted in Figure 6. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench. Constructing additional catch basins, manholes, culverts, and exfiltration trench is recommended to interconnect the catch basins.

**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 using a spreadsheet developed for this purpose (see Appendix B). The table 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 2: Drainage Sub-basin 11 – Pollutant Loading Analysis*

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	28.75	26.64	2.11
Total Nitrogen	226.51	202.73	23.78
Total Suspended Solids	2,715.24	2,458.65	256.59

**Capital Improvement Budget:** An updated budget was developed for the proposed stormwater capital improvements.

*Table 3: Drainage Sub-basin 11 – Capital Improvement Budget*

Item	Description	Qty	Units	Unit Price	Sub-total
1	Maintenance of Traffic	1	L.S.	\$18,345	\$19,000
2	Mobilization	1	L.S.	\$61,150	\$62,000
3	Stormwater Pollution Prevention Plan (SWPPP)	1	L.S.	\$6,115	\$7,000
4	Asphalt Concrete Surface Course	11,000	S.Y.	\$8	\$88,000
5	Inlet Apron (Asphalt)	55	S.Y.	\$8	\$500
6	15" Diameter Polyethylene Pipe	500	L.F.	\$70	\$35,000
7	18" Diameter Polyethylene Pipe	300	L.F.	\$85	\$26,000
8	18" French Drain Exfiltration Trench	2,600	L.F.	\$100	\$260,000
9	Manhole	15	EA.	\$5,500	\$83,000
10	Catch Basin Inlet	17	EA.	\$6,000	\$102,000
11	Pollution Retardant Baffle	20	EA.	\$240	\$5,000
12	Utility Adjustments	1	L.S.	\$11,990	\$12,000
13	Professional Services	1	L.S.	\$118,915	\$119,000
14	Contingency	1	L.S.	\$69,950	\$70,000
<b>TOTAL</b>					<b>\$890,000</b>

**Notes:**

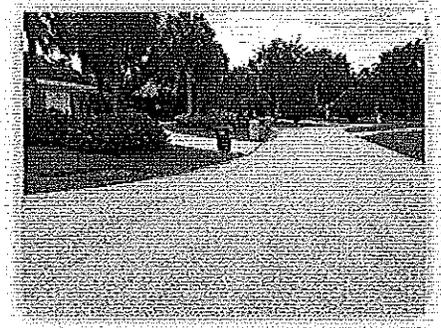
1. The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.
2. Costs do not include inflation or interest costs.
3. Sequence of improvements should be coordinated with roadway CIP.

## Drainage Sub-basin 12

**Location:** Drainage sub-basin 12 is generally located south of Richmond Drive (SW 168th Street), north of SW 170st Terrace (private road), west of Old Cutler Road, and east of SW 76th Avenue. Drainage sub-basin 12 is part of the C100C-E-11 Miami-Dade County basin. It includes portions of the Banyan Woods subdivision. Drainage sub-basin 12 was analyzed as part of the original Stormwater Master Plan. This report includes an updated improvement approach and budget for the proposed improvements.

**Existing and Future Conditions:** Figure 7 shows existing conditions for Drainage sub-basin 12. The sub-basin consists of approximately 25.26 acres of existing detached single-family residential development with approximately 2,290 linear feet of roadway, including SW 76th Avenue, SW 74th Court, SW 168th Terrace, SW 169th Terrace, SW 73rd Court, and SW 169th Street. The drainage system in this sub-basin is a closed system with catch basins connected to exfiltration trench located in the vegetated swales along the sides of the roadways.

No complaints were reported in this area by the Village, but complaints from Miami-Dade County were identified as part of the original master plan. In our investigation, Kimley-Horn found flooding extending across the entire roadway width on SW 169th Terrace, SW 75th Avenue, and SW 74th Court. The location of these deficiencies can be seen in Figure 7. The entire sub-basin area was modeled based on data collected as part of the Stormwater Master Plan process.



Based on available GIS data, the existing crown of road elevations ranges from a low of approximately 6.94 feet to a high of approximately 11.41 feet NGVD. It was assumed that the building finish elevations range from 7.61 feet (eight inches above the lowest crown of road) to 12.18 feet (eight inches above highest crown of road). The lowest edge of road is 6.69 feet.

Pervious area elevations were assumed to range from 6.79 feet (one inch above the lowest edge of road) to 11.51 feet (highest edge of road).

**Performance Goal Analysis:** Based on the available information described above, calculations were made for drainage sub-basin 12 to compare the existing conditions with the previously stated performance goals. The detailed calculations can be found in Appendix A. Based on the detailed hydrologic and hydraulic calculations for drainage sub-basin 12, the sub-basin is subject to flooding during all design storm events. The table below shows the performance of the sub-basin versus performance goals.

*Table 4: Drainage Sub-basin #12 – Performance Goal Analysis for Existing Conditions*

Design Storm Event	Flood Stage Elevation Above Performance Goal Criteria
5-year, 24-hour	1.27 feet above lowest crown of road for collector and local roadways
100-year, 72-hour	2.09 feet above lowest finish floor elevation (FFE)
Total Above Goal	3.36 feet above performance goal criteria

The flood stages shown above for drainage sub-basin 12 exceed allowable levels and the sub-basin does not meet the performance goal criteria.



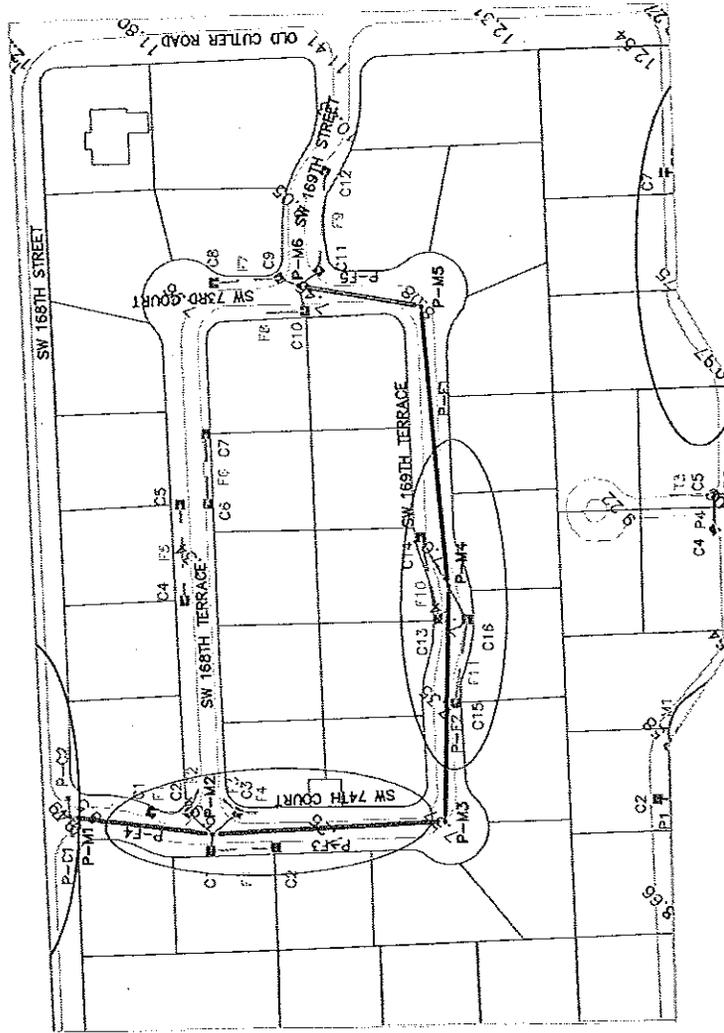
## FIGURE 7: DRAINAGE SUB-BASIN #12 PROPOSED CONDITIONS



- PROPOSED MODIFICATIONS**
- Add 1,200 LF 18" French Drain / Exfiltration Trench
  - Add 50 LF of 18" Storm Sewer Pipe (HDPE)
  - Add 400 LF of 15" Storm Sewer Pipe (HDPE)
  - Add 2 Catch Basins
  - Add 6 Manholes

**PERFORMANCE GOAL CRITERIA**

- Min. Roadway EOP Elevation 6.69
- Min. Roadway Centerline Elevation 6.94
- Min. Building FFE 7.61



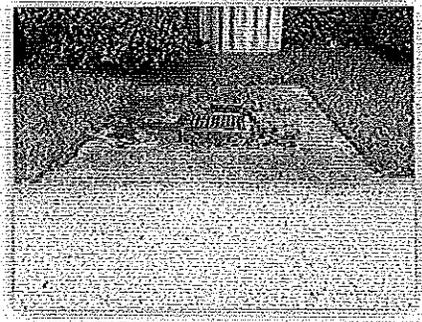
**LEGEND**

- Catch Basin (C1)
- French Drain (F1)
- Trench (T1)
- Pipe (P1)
- Outfall (O1)
- Sub-Basin Boundary
- Manhole (M1)
- Elevation
- Proposed Catch Basin (P-C1)
- Proposed French Drain (P-F1)
- Manhole (P-M1)
- Proposed Pipe
- Flooding across roadway observed by KEHA
- Flooding on Miami-Dade County roadways

**Storm Drainage Deficiencies:** The catch basins inspected in this sub-basin were observed to be clean, with only limited debris and sediment. As a result, drainage deficiency issues are likely to be a function of limited system capacity and infrastructure age and or condition. Hydrologic and hydraulic calculations for this sub-basin confirmed the existing drainage infrastructure does not discharge adequate runoff to meet the desired performance criteria. The capacity of the existing swales and French drains is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. Pavement condition within the sub-basin area is generally in good condition, but would benefit from resurfacing. Improvements to drainage infrastructure will be needed to address these inadequacies.

**Recommended Drainage Improvements:** Clean and flush all sediment and debris from existing catch basins and pipes and adjust catch basin elevations and locations to minimize accumulation of sediment and debris. Install the additional infrastructure depicted in Figure 7. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench. Constructing additional catch basins, manholes, culverts, and exfiltration trench is recommended to interconnect the catch basins.

**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 using a spreadsheet developed for this purpose (see Appendix B). The table 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 5: Drainage Sub-basin 12 – Pollutant Loading Analysis*

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	15.03	13.92	1.10
Total Nitrogen	118.40	105.97	12.43
Total Suspended Solids	1,419.33	1,285.20	134.13

**Capital Improvement Budget:** An updated budget was developed for the proposed stormwater capital improvements.

*Table 6: Drainage Sub-basin 12 – Capital Improvement Budget*

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Maintenance of Traffic	1	L.S.	\$8,610	\$9,000
2	Mobilization	1	L.S.	\$28,705	\$29,000
3	Stormwater Pollution Prevention Plan (SWPPP)	1	L.S.	\$2,871	\$3,000
4	Asphalt Concrete Surface Course	10,000	S.Y.	\$8	\$80,000
5	Inlet Apron (Asphalt)	6	S.Y.	\$8	\$50
6	15" Diameter Polyethylene Pipe	400	L.F.	\$70	\$28,000
7	18" Diameter Polyethylene Pipe	50	L.F.	\$85	\$5,000
8	18" French Drain Exfiltration Trench	1,200	L.F.	\$100	\$120,000
9	Manhole	6	EA.	\$5,500	\$33,000
10	Catch Basin Inlet	2	EA.	\$6,000	\$12,000
11	Pollution Retardant Baffle	10	EA.	\$240	\$3,000
12	Utility Adjustments	1	L.S.	\$5,621	\$6,000
13	Professional Services	1	L.S.	\$55,769	\$56,000
14	Contingency	1	L.S.	\$32,805	\$33,000
<b>TOTAL</b>					<b>\$420,000</b>

**Notes:**

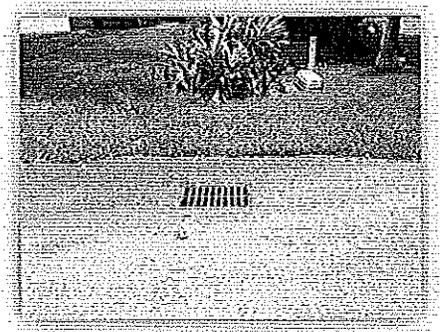
1. The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.
2. Costs do not include inflation or interest costs.
3. Sequence of improvements should be coordinated with roadway CIP.

### Drainage Sub-basin 39

**Location:** Drainage sub-basin 39 is generally located south of SW 170th Terrace (private road), north of SW 173rd Street, west of Old Cutler Road, and east of SW 77th Avenue (Palmetto Road). Drainage sub-basin 39 is part of the C100C-E-11 Miami-Dade County basin.

**Existing and Future Conditions:** Figure 8 shows existing conditions for drainage sub-basin 39. The sub-basin consists of approximately 21.22 acres of existing detached single-family residential development with approximately 3,260 linear feet of roadway, including SW 172nd Street, SW 171st Street, SW 171st Terrace, SW 77th Avenue (Palmetto Road), SW 76th Avenue, and SW 74th Avenue. The drainage system in this sub-basin is a closed system with catch basins connected to exfiltration trench located in the vegetated swales along the sides of the roadways.

No complaints were reported in this area by the Village as part of this update or from Miami-Dade County as part of the original master plan. In our investigation, Kimley-Horn found flooding extending across the entire roadway width on SW 171st Street and SW 77th Avenue. The location of these deficiencies can be seen in Figure 8. The entire sub-basin area was modeled based on data collected as part of the Stormwater Master Plan process.



Based on available GIS data, the existing crown of road elevations ranges from a low of approximately 6.19 feet to a high of approximately 13.83 feet NGVD. It was assumed that the building finish elevations range from 6.86 feet (eight inches above the lowest crown of road) to 14.60 feet (eight inches above highest crown of road). The lowest edge of road is 5.94 feet. Pervious area elevations were assumed to range from 6.04 feet (one inch above the lowest edge of road) to 13.93 feet (highest edge of road).

**Performance Goal Analysis:** Based on the available information described above, calculations were made for drainage sub-basin 39 to compare the existing conditions with the previously stated performance goals. The detailed calculations can be found in Appendix A. Based on the detailed hydrologic and hydraulic calculations for drainage sub-basin 39, the sub-basin is subject to flooding during all design storm events. The table below shows the performance of the sub-basin versus performance goals.

*Table 7: Drainage Sub-basin #39 – Performance Goal Analysis for Existing Conditions*

Design Storm Event	Flood Stage Elevation Above Performance Goal Criteria
5-year, 24-hour	1.96 feet above lowest crown of road for collector and local roadways
100-year, 72-hour	3.27 feet above lowest finish floor elevation (FFE)
Total Above Goal	5.23 feet above performance goal criteria

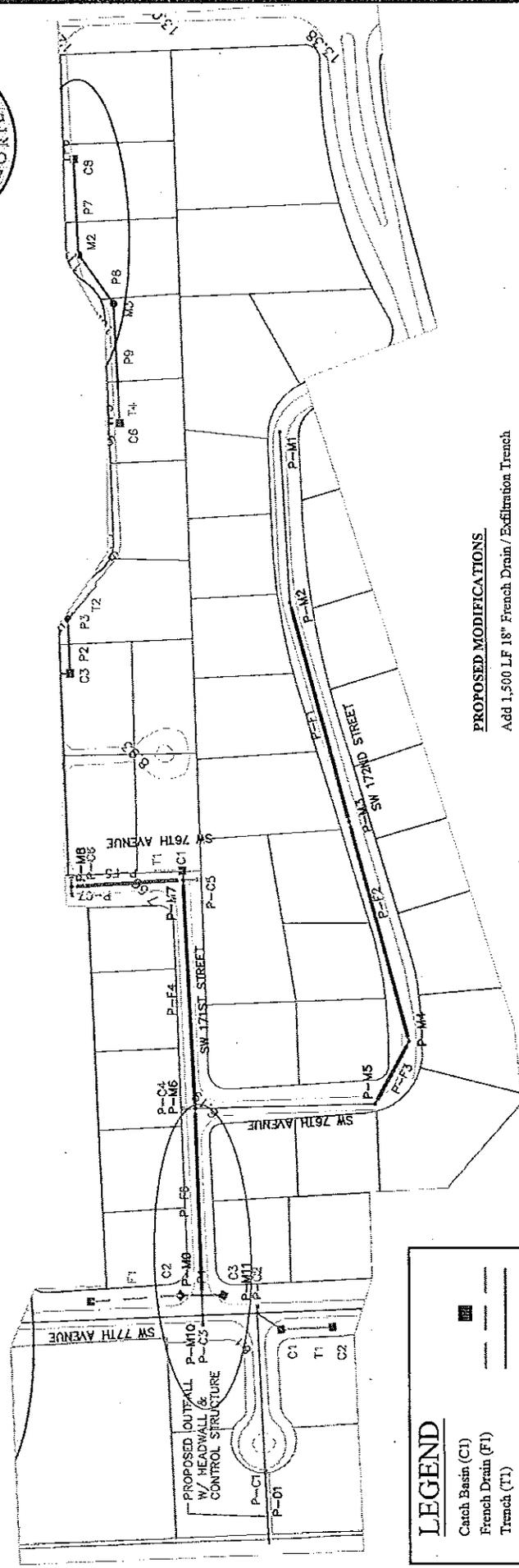
The flood stages shown above for drainage sub-basin 39 exceed allowable levels and the sub-basin does not meet the performance goal criteria.



# FIGURE 8: DRAINAGE SUB-BASIN #39 PROPOSED CONDITIONS



0 150 300  
SCALE AS SHOWN



### PROPOSED MODIFICATIONS

- Add 1,500 LF 18" French Drain / Exfiltration Trench
- Add 1,050 LF of 18" Storm Sewer Pipe (HDPE)
- Add 150 LF of 15" Storm Sewer Pipe (HDPE)
- Add 7 Catch Basins
- Add 11 Manholes
- Add 1 Headwall
- Add 1 Control Structure

### PERFORMANCE GOAL CRITERIA

- Min. Roadway EOP Elevation 5.94
- Min. Roadway Centerline Elevation 6.19
- Min. Building FFE 5.85

### LEGEND

- Catch Basin (C1)
- French Drain (F1)
- Trench (T1)
- Pipe (P1)
- Outfall (O1)
- Sub-Basin Boundary
- Manhole (M1)
- Elevation 0.00
- Proposed Catch Basin (P-C1)
- Proposed French Drain (P-F1)
- Proposed Manhole (P-M1)
- Proposed Pipe
- Flooding across roadway observed by KHA

# Kimley»Horn

Last Revised August 25, 2014

**Storm Drainage Deficiencies:** The catch basins inspected in this sub-basin were observed to be clean, with only limited debris and sediment. As a result, drainage deficiency issues are likely to be a function of limited system capacity and infrastructure age and or condition. Hydrologic and hydraulic calculations for this sub-basin confirmed the existing drainage infrastructure does not discharge adequate runoff to meet the desired performance criteria. The capacity of the existing swales and French drains is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. Pavement condition within the sub-basin area is generally in good condition, but would benefit from resurfacing. Roadway settlement at the intersection of SW 171st Street and SW 77th Avenue was observed. Improvements to drainage infrastructure will be needed to address these inadequacies. SW 171st Street is a cul-de-sac with an opportunity to install an outfall connection. No existing outfall was observed.

**Recommended Drainage Improvements:** Clean and flush all sediment and debris from existing catch basins and pipes and adjust catch basin elevations and locations to minimize accumulation of sediment and debris. Install the additional infrastructure depicted in Figure 8. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench. Constructing additional catch basins, manholes, culverts, and exfiltration trench is recommended to interconnect the catch basins. This sub-basin has the possibility of a new outfall connection as well.



**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 using a spreadsheet developed for this purpose (see Appendix B). The table 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 8: Drainage Sub-basin 39 – Pollutant Loading Analysis

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	12.59	11.67	0.93
Total Nitrogen	99.22	88.80	10.42
Total Suspended Solids	1,189.32	1,076.93	112.39

**Capital Improvement Budget:** A budget was developed for the proposed stormwater capital improvements.

*Table 9: Drainage Sub-basin 39 – Capital Improvement Budget*

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Maintenance of Traffic	1	L.S.	\$13,806	\$14,000
2	Mobilization	1	L.S.	\$46,020	\$47,000
3	Stormwater Pollution Prevention Plan (SWPPP)	1	L.S.	\$4,602	\$5,000
4	Asphalt Concrete Surface Course	8,500	S.Y.	\$8	\$68,000
5	Inlet Apron (Asphalt)	20	S.Y.	\$8	\$200
6	15" Diameter Polyethylene Pipe	150	L.F.	\$70	\$11,000
7	18" Diameter Polyethylene Pipe	1,050	L.F.	\$85	\$90,000
8	18" French Drain Exfiltration Trench	1,500	L.F.	\$100	\$150,000
9	Manhole	11	EA.	\$5,500	\$61,000
10	Catch Basin Inlet	7	EA.	\$6,000	\$42,000
11	Outfall Control Structure	1	EA.	\$10,000	\$10,000
12	Outfall Headwall	1	EA.	\$15,000	\$15,000
13	Pollution Retardant Baffle	12	EA.	\$240	\$3,000
14	Utility Adjustments	1	L.S.	\$9,004	\$10,000
15	Professional Services	1	L.S.	\$89,454	\$90,000
16	Contingency	1	L.S.	\$52,620	\$53,000
<b>TOTAL</b>					<b>\$670,000</b>

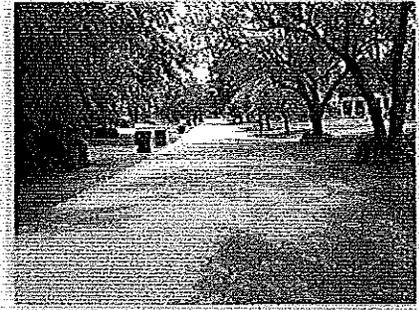
**Notes:**

1. The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.
2. Costs do not include inflation or interest costs.
3. Sequence of improvements should be coordinated with roadway CIP.

### Drainage Sub-basin 41

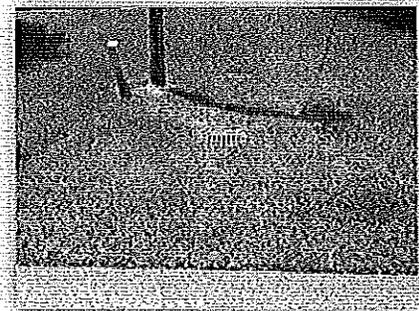
**Location:** Drainage sub-basin 41 is generally located south of SW 173rd Street, north of SW 174th Street, west of Old Cutler Road, and east of SW 77th Avenue. Drainage sub-basin 41 is part of the C100-C-20 Miami-Dade County basin.

**Existing and Future Conditions:** Figure 9 shows existing conditions for drainage sub-basin 41. The sub-basin consists of approximately 30.13 acres of existing detached single-family residential development with approximately 4,560 linear feet of roadway, including SW 173rd Street, SW 174th Street, SW 77th Avenue (Palmetto Road), SW 74th Avenue, SW 74th Court, and SW 73rd Court. The drainage system in this sub-basin includes two existing outfall connections on SW 174th Street, but the outfalls are only connected to local catch basins. Other areas of the sub-basin are closed system with catch basins connected to exfiltration trench located in the vegetated swales along the sides of the roadways.

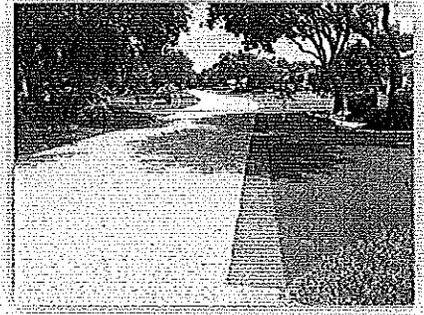


No complaints were reported in this area by the Village as part of this update or from Miami-Dade County as part of the original master plan. In our investigation, Kimley-Horn found flooding extending across the entire roadway width on SW 173rd Street, SW 174th Street, and SW 73rd Court. The location of these deficiencies can be seen in Figure 9.

The entire sub-basin area was modeled based on data collected as part of the Stormwater Master Plan process. The Village completed a local drainage repair on SW 174th Street just east of SW 77th Avenue (Palmetto Road).



Based on available GIS data, the existing crown of road elevations ranges from a low of approximately 7.92 feet to a high of approximately 13.83 feet NGVD. It was assumed that the building finish elevations range from 8.59 feet (eight inches above the lowest crown of road) to 14.60 feet (eight inches above highest crown of road). The lowest edge of road is 7.67 feet. Pervious area elevations were assumed to range from 7.77 feet (one inch above the lowest edge of road) to 13.93 feet (highest edge of road).



**Performance Goal Analysis:** Based on the available information described above, calculations were made for drainage sub-basin 41 to compare the existing conditions with the previously stated performance goals. The detailed calculations can be found in Appendix A. Based on the detailed hydrologic and hydraulic calculations for drainage sub-basin 41, the sub-basin is subject to flooding during all design storm events. The table below shows the performance of the sub-basin versus performance goals.

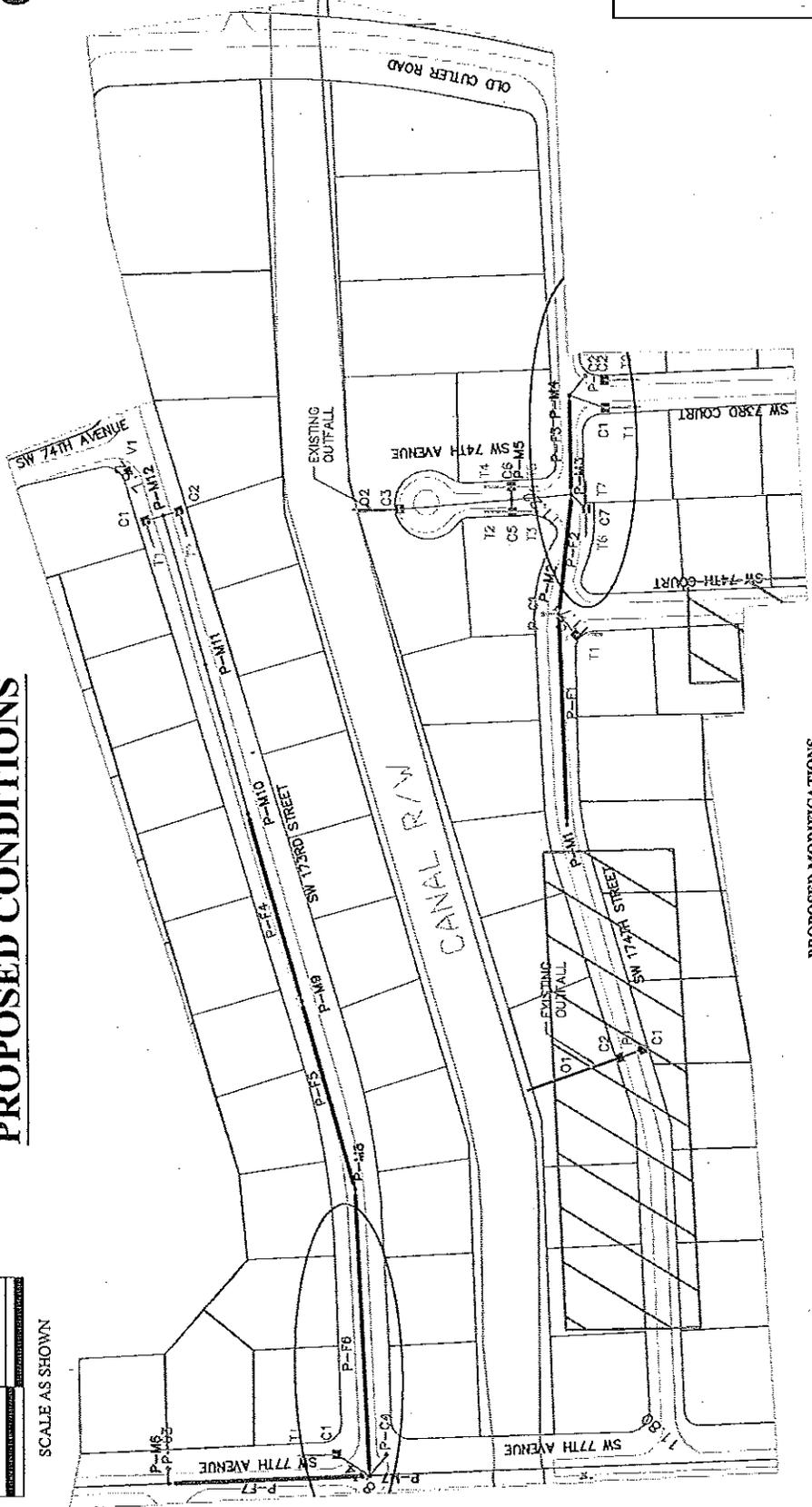
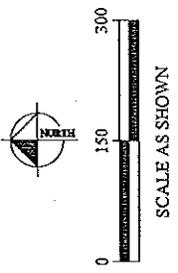
*Table 10: Drainage Sub-basin 41 – Performance Goal Analysis for Existing Conditions*

Design Storm Event	Flood Stage Elevation Above Performance Goal Criteria
5-year, 24-hour	1.69 feet above lowest crown of road for collector and local roadways
100-year, 72-hour	2.68 feet above lowest finish floor elevation (FFE)
Total Above Goal	4.37 feet above performance goal criteria

The flood stages shown above for drainage sub-basin 41 exceed allowable levels and the sub-basin does not meet the performance goal criteria.



**FIGURE 9:  
DRAINAGE SUB-BASIN #41  
PROPOSED CONDITIONS**



**LEGEND**

	Catch Basin (C1)
	French Drain (F1)
	Trench (T1)
	Pipe (P1)
	Outfall (O1)
	Sub-Basin Boundary
	Manhole (M1)
	Elevation
	Proposed Catch Basin (P-C1)
	Proposed French Drain (P-F1)
	Proposed Manhole (P-M1)
	Proposed Pipe
	Proposed Flooding (observed by KLA)
	Local drainage improvements (complan)

- PROPOSED MODIFICATIONS**
- Add 1,700 LF 18" French Drain / Exfiltration Trench
  - Add 2,000 LF of 18" Storm Sewer Pipe (HDPE)
  - Add 350 LF of 15" Storm Sewer Pipe (HDPE)
  - Add 4 Catch Basins
  - Add 12 Manholes
- PERFORMANCE GOAL CRITERIA**
- Min. Roadway EOP Elevation 7.67
  - Min. Roadway Centerline Elevation 7.92
  - Min. Building FFE 8.59

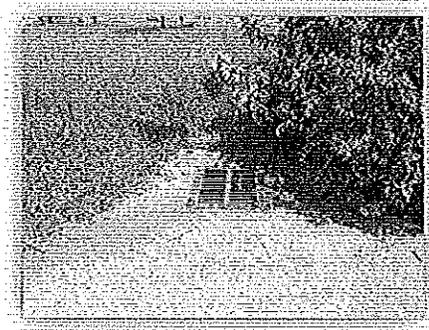
**Kimley»Horn**

Last Revised August 25, 2014

**Storm Drainage Deficiencies:** The catch basins inspected in this sub-basin were observed to be clean, with only limited debris and sediment. As a result, drainage deficiency issues are likely to be a function of limited system capacity and infrastructure age and or condition. Hydrologic and hydraulic calculations for this sub-basin confirmed the existing drainage infrastructure does not discharge adequate runoff to meet the desired performance criteria. The capacity of the existing swales, outfalls, and French drains is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. Pavement condition within the sub-basin area is generally in good condition, but would benefit from resurfacing. Improvements to drainage infrastructure will be needed to address these inadequacies. SW 77th Court is a cul-de-sac just west of the sub-basin 41 limits, but may provide an opportunity to install an outfall connection if needed. No existing outfall was observed.



**Recommended Drainage Improvements:** Clean and flush all sediment and debris from existing catch basins, pipes, outfalls, and adjust catch basin elevations and locations to minimize accumulation of sediment and debris. Install the additional infrastructure depicted in Figure 9. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench. An analysis of the existing outfall capacities should be performed to evaluate the need for potential outfall improvements as well as the benefits of an additional outfall on SW 77th Court. Constructing additional catch basins, manholes, culverts, and exfiltration trench is recommended to interconnect the catch basins.



**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

using a spreadsheet developed for this purpose (see Appendix B). The table 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 11: Drainage Sub-basin 41 – Pollutant Loading Analysis*

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	17.88	16.57	1.31
Total Nitrogen	140.87	126.08	14.79
Total Suspended Solids	1,688.61	1,529.04	159.57

**Capital Improvement Budget:** A budget was developed for the proposed stormwater capital improvements.

Table 12: Drainage Sub-basin 41 – Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Maintenance of Traffic	1	L.S.	\$17,253	\$18,000
2	Mobilization	1	L.S.	\$57,510	\$58,000
3	Stormwater Pollution Prevention Plan (SWPPP)	1	L.S.	\$5,751	\$6,000
4	Asphalt Concrete Surface Course	13,000	S.Y.	\$8	\$104,000
5	Inlet Apron (Asphalt)	11	S.Y.	\$8	\$100
6	15" Diameter Polyethylene Pipe	350	L.F.	\$70	\$25,000
7	18" Diameter Polyethylene Pipe	2,000	L.F.	\$85	\$170,000
8	18" French Drain Exfiltration Trench	1,700	L.F.	\$100	\$170,000
9	Manhole	12	EA.	\$5,500	\$66,000
10	Catch Basin Inlet	4	EA.	\$6,000	\$24,000
11	Pollution Retardant Baffle	14	EA.	\$240	\$4,000
12	Utility Adjustments	1	L.S.	\$11,262	\$12,000
13	Professional Services	1	L.S.	\$111,707	\$112,000
14	Contingency	1	L.S.	\$65,710	\$66,000
<b>TOTAL</b>					<b>\$840,000</b>

**Notes:**

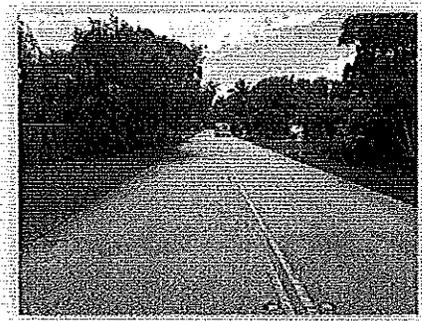
1. The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.
2. Costs do not include inflation or interest costs.
3. Sequence of improvements should be coordinated with roadway CIP.

**Drainage Sub-basin 42**

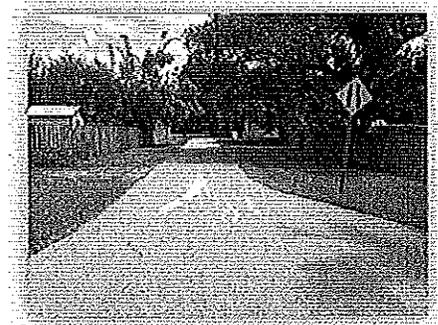
**Location:** Drainage sub-basin 42 is generally located south of SW 168th Street (Richmond Drive), north of SW 171st Street, west of SW 76th Avenue, and east of SW 77th Avenue Palmetto Road). Drainage sub-basin 42 is part of the C100C-E-11 Miami-Dade County basin.

**Existing and Future Conditions:** Figure 10 shows existing conditions for drainage sub-basin 42.

The sub-basin consists of approximately 17.37 acres of existing detached single-family residential development with approximately 3,160 linear feet of roadway, including SW 168th Terrace, SW 169th Street, SW 169th Terrace, SW 170th Street, SW 77th Avenue (Palmetto Road) and SW 76th Avenue. The drainage system in this sub-basin includes two existing outfall connections on the cul-de-sacs on SW 168<sup>th</sup> Terrace and SW 169<sup>th</sup> Terrace, but the outfalls are only connected to local catch basins. Other areas of the sub-basin are closed system with catch basins connected to exfiltration trench located in the vegetated swales along the sides of the roadways. This sub-basin includes a two-way single lane section on SW 76<sup>th</sup> Avenue.

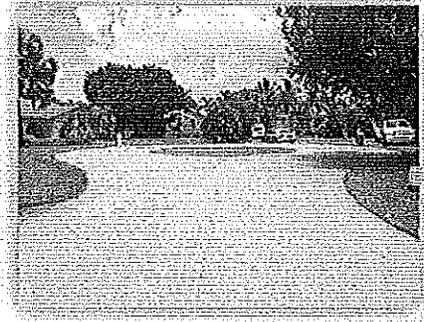


No complaints were reported in this area by the Village as part of this update or from Miami-Dade County as part of the original master plan. In our investigation, Kimley-Horn found flooding extending across the entire roadway width on SW 170th Street and SW 77th Avenue and on SW 169<sup>th</sup> Street and SW 76<sup>th</sup> Avenue. The location of these deficiencies can be seen in Figure 10. The entire sub-basin area was modeled based on data collected as part of the Stormwater Master Plan process.



Based on available GIS data, the existing crown of road elevations ranges from a low of approximately 6.32 feet to a high of approximately 9.60 feet NGVD. It was assumed that the

building finish elevations range from 6.99 feet (eight inches above the lowest crown of road) to 10.37 feet (eight inches above highest crown of road). The lowest edge of road is 6.07 feet. Pervious area elevations were assumed to range from 6.17 feet (one inch above the lowest edge of road) to 9.70 feet (highest edge of road).



**Performance Goal Analysis:** Based on the available information described above, calculations were made for drainage sub-basin 42 to compare the existing conditions with the previously stated performance goals. The detailed calculations can be found in Appendix A. Based on the detailed hydrologic and hydraulic calculations for drainage sub-basin 42, the sub-basin is subject to flooding during all design storm events. The table below shows the performance of the sub-basin versus performance goals.

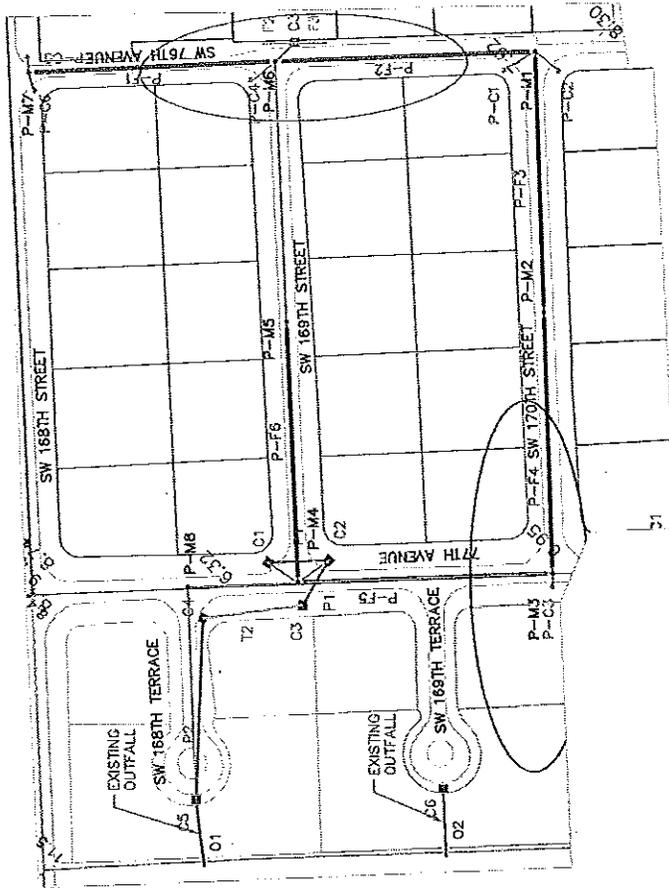
*Table 13: Drainage Sub-basin 42 – Performance Goal Analysis for Existing Conditions*

Design Storm Event	Flood Stage Elevation Above Performance Goal Criteria
5-year, 24-hour	1.23 feet above lowest crown of road for collector and local roadways
100-year, 72-hour	1.97 feet above lowest finish floor elevation (FFE)
Total Above Goal	3.20 feet above performance goal criteria

The flood stages shown above for drainage sub-basin 42 exceed allowable levels and the sub-basin does not meet the performance goal criteria.



## FIGURE 10: DRAINAGE SUB-BASIN #42 PROPOSED CONDITIONS



### LEGEND

	Catch Basin (CI)
	French Drain (FI)
	Trench (TI)
	Pipe (PI)
	Outfall (OI)
	Sub-Basin Boundary
	Manhole (MI)
	Elevation
	Proposed Catch Basin (P-CI)
	Proposed French Drain (P-FI)
	Proposed Manhole (P-MI)
	Proposed Pipe
	Flooding across roadway observed by KHA

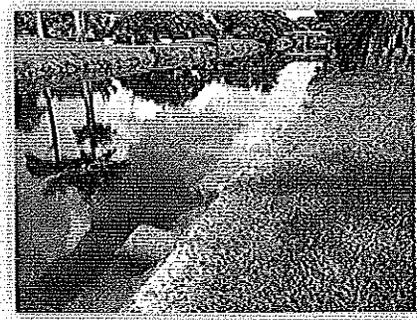
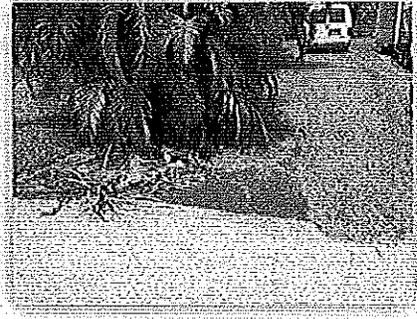
### PROPOSED MODIFICATIONS

- Add 1,800 LF 18" French Drain / Exfiltration Trench
- Add 800 LF of 18" Storm Sewer Pipe (HDPE)
- Add 300 LF of 15" Storm Sewer Pipe (HDPE)
- Add 6 Catch Basins
- Add 8 Manholes

### PERFORMANCE GOAL CRITERIA

- Min. Roadway EOP Elevation 6.07
- Min. Roadway Centerline Elevation 6.32
- Min. Building FFE 6.99

**Storm Drainage Deficiencies:** The catch basins inspected in this sub-basin were observed to be clean, with only limited debris and sediment. As a result, drainage deficiency issues are likely to be a function of limited system capacity and infrastructure age and or condition. Hydrologic and hydraulic calculations for this sub-basin confirmed the existing drainage infrastructure does not discharge adequate runoff to meet the desired performance criteria. The capacity of the existing swales, outfalls, and French drains is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. Pavement condition within the sub-basin area is generally average and in need of resurfacing or rehabilitation. Improvements to drainage infrastructure will be needed to address these inadequacies.



**Recommended Drainage Improvements:** Clean and flush all sediment and debris from existing catch basins, pipes, outfalls, and adjust catch basin elevations and locations to minimize accumulation of sediment and debris. Install the additional infrastructure depicted in Figure 10. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench. An analysis of the existing outfall capacities should be performed to evaluate the need for potential outfall improvements. Constructing additional catch basins, manholes, culverts, and exfiltration trench is recommended to interconnect the catch basins.

**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 using a spreadsheet developed for this purpose (see Appendix B). The table 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 14: Drainage Sub-basin 42 – Pollutant Loading Analysis

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	10.34	9.58	0.76
Total Nitrogen	81.43	72.88	8.55
Total Suspended Solids	976.14	883.89	92.25

**Capital Improvement Budget:** A budget was developed for the proposed stormwater capital improvements.

Table 15: Drainage Sub-basin 42 – Capital Improvement Budget

Item	Description	Qty	Units	Unit Price	Sub-total
1	Maintenance of Traffic	1	L.S.	\$12,996	\$13,000
2	Mobilization	1	L.S.	\$43,320	\$44,000
3	Stormwater Pollution Prevention Plan (SWPPP)	1	L.S.	\$4,332	\$5,000
4	Asphalt Concrete Surface Course	9,000	S.Y.	\$8	\$72,000
5	Inlet Apron (Asphalt)	17	S.Y.	\$8	\$200
6	15" Diameter Polyethylene Pipe	300	L.F.	\$70	\$21,000
7	18" Diameter Polyethylene Pipe	800	L.F.	\$85	\$68,000
8	18" French Drain Exfiltration Trench	1,800	L.F.	\$100	\$180,000
9	Manhole	8	EA.	\$5,500	\$44,000
10	Catch Basin Inlet	6	EA.	\$6,000	\$36,000
11	Pollution Retardant Baffle	12	EA.	\$240	\$3,000
12	Utility Adjustments	1	L.S.	\$8,484	\$9,000
13	Professional Services	1	L.S.	\$84,184	\$85,000
14	Contingency	1	L.S.	\$49,520	\$50,000
<b>TOTAL</b>					<b>\$630,000</b>

**Notes:**

1. The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.
2. Costs do not include inflation or interest costs.
3. Sequence of improvements should be coordinated with roadway CIP.

### Drainage Sub-basin 43

**Location:** Drainage sub-basin 43 is generally located south of SW 165th Terrace, north of SW 168th Street (Richmond Drive), west of SW 72<sup>nd</sup> Avenue, and east of SW 77th Avenue (Palmetto Road). Drainage sub-basin 42 is part of the C100C-E-10 Miami-Dade County basin.

**Existing and Future Conditions:** Figure 11 shows existing conditions for drainage sub-basin 43.

The sub-basin consists of approximately 40.87 acres of existing detached single-family residential development with approximately 8,350 linear feet of roadway, including SW 165th Terrace, SW 166th Street, SW 166th Terrace, SW 167th Street, SW 77th Avenue (Palmetto Road), SW 74th Court, SW 74th Avenue, and SW 72<sup>nd</sup> Avenue. The drainage system in this sub-basin is a closed system with catch basins connected to exfiltration trench located in the vegetated swales along the sides of the roadways.



Complaints were reported in this area by the Village at SW 167<sup>th</sup> Street and on Old Cutler Road. Complaints from Miami-Dade County were identified in drainage sub-basin 43 as part of the original master plan. In our investigation, Kimley-Horn found flooding extending across the entire roadway width on SW 166th Street, SW 166<sup>th</sup> Terrace and



SW 74th Court. The location of these deficiencies can be seen in Figure 11. The entire sub-basin area was modeled based on data collected as part of the Stormwater Master Plan process.

Based on available GIS data, the existing crown of road elevations ranges from a low of approximately 7.10 feet to a high of approximately 12.80 feet NGVD. It was assumed that the building finish elevations range from 7.77 feet (eight inches above the lowest crown of road) to 13.57 feet (eight inches above highest crown of road). The lowest edge of road is 6.85 feet.

Pervious area elevations were assumed to range from 6.95 feet (one inch above the lowest edge of road) to 12.90 feet (highest edge of road).

**Performance Goal Analysis:** Based on the available information described above, calculations were made for drainage sub-basin 43 to compare the existing conditions with the previously stated performance goals. The detailed calculations can be found in Appendix A. Based on the detailed hydrologic and hydraulic calculations for drainage sub-basin 43, the sub-basin is subject to flooding during all design storm events. The table below shows the performance of the sub-basin versus performance goals.

*Table 16: Drainage Sub-basin 43 – Performance Goal Analysis for Existing Conditions*

Design Storm Event	Flood Stage Elevation Above Performance Goal Criteria
5-year, 24-hour	1.78 feet above lowest crown of road for collector and local roadways
100-year, 72-hour	2.83 feet above lowest finish floor elevation (FFE)
Total Above Goal	4.61 feet above performance goal criteria

The flood stages shown above for drainage sub-basin 43 exceed allowable levels and the sub-basin does not meet the performance goal criteria.



**Storm Drainage Deficiencies:** The catch basins inspected in this sub-basin were observed to be clean, with only limited debris and sediment. As a result, drainage deficiency issues are likely to be a function of limited system capacity and infrastructure age and or condition. Hydrologic and hydraulic calculations for this sub-basin confirmed the existing drainage infrastructure does not discharge adequate runoff to meet the desired performance criteria. The capacity of the existing swales and French drains is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. Pavement condition within the sub-basin area is generally average and in need of resurfacing or rehabilitation. Improvements to drainage infrastructure will be needed to address these inadequacies.



**Recommended Drainage Improvements:** Clean and flush all sediment and debris from existing catch basins and pipes and adjust catch basin elevations and locations to minimize accumulation of sediment and debris. Install the additional infrastructure depicted in Figure 11. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench. Constructing additional catch basins, manholes, culverts, and exfiltration trench is recommended to interconnect the catch basins.



**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 using a spreadsheet developed for this purpose (see Appendix B). The table 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 17: Drainage Sub-basin 43 – Pollutant Loading Analysis

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	24.29	22.51	1.79
Total Nitrogen	191.41	171.31	20.10
Total Suspended Solids	2,294.49	2,077.66	216.83

**Capital Improvement Budget:** A budget was developed for the proposed stormwater capital improvements.

Table 18: Drainage Sub-basin 43 – Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Maintenance of Traffic	1	L.S.	\$19,482	\$20,000
2	Mobilization	1	L.S.	\$64,940	\$65,000
3	Stormwater Pollution Prevention Plan (SWPPP)	1	L.S.	\$6,494	\$7,000
4	Asphalt Concrete Surface Course	17,500	S.Y.	\$8	\$140,000
5	Inlet Apron (Asphalt)	39	S.Y.	\$8	\$400
6	15" Diameter Polyethylene Pipe	400	L.F.	\$70	\$28,000
7	18" Diameter Polyethylene Pipe	850	L.F.	\$85	\$73,000
8	18" French Drain Exfiltration Trench	2,350	L.F.	\$100	\$235,000
9	Manhole	13	EA.	\$5,500	\$72,000
10	Catch Basin Inlet	14	EA.	\$6,000	\$84,000
11	Pollution Retardant Baffle	14	EA.	\$240	\$4,000
12	Utility Adjustments	1	L.S.	\$12,728	\$13,000
13	Professional Services	1	L.S.	\$126,038	\$127,000
14	Contingency	1	L.S.	\$74,140	\$75,000
<b>TOTAL</b>					<b>\$940,000</b>

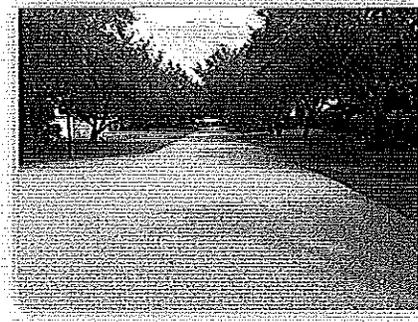
**Notes:**

1. The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.
2. Costs do not include inflation or interest costs.
3. Sequence of improvements should be coordinated with roadway CIP.

### Drainage Sub-basin 44

**Location:** Drainage sub-basin 44 is generally located south of SW 164th Street, north of SW 166th Street, west of SW 72<sup>nd</sup> Avenue, and east of SW 77th Avenue (Palmetto Road). Drainage sub-basin 44 is part of the C100C-E-10 Miami-Dade County basin.

**Existing and Future Conditions:** Figure 12 shows existing conditions for drainage sub-basin 44. The sub-basin consists of approximately 34.01 acres of existing detached single-family residential development with approximately 7,070 linear feet of roadway, including SW 164th Street, SW 164<sup>th</sup> Terrace, SW 165th Street, SW 165<sup>th</sup> Terrace, SW 77th Avenue (Palmetto Road), SW 76th Avenue, SW 75th Avenue, SW 74th Court, SW 74th Avenue, and SW 72<sup>nd</sup> Avenue. The drainage system in this sub-basin is a closed system with catch basins connected to exfiltration trench located in the vegetated swales along the sides of the roadways. SW 167th Street appears to be elevated compared to the adjacent roadways.



No complaints were reported in this area by the Village as part of this update or from Miami-Dade County as part of the original master plan. In our investigation, Kimley-Horn found flooding extending across the entire roadway width on SW 164th Street, and SW 74th Avenue. The location of these deficiencies can be seen in Figure 12. The entire sub-basin area was modeled based on data collected as part of the Stormwater Master Plan process.

Based on available GIS data, the existing crown of road elevations ranges from a low of approximately 5.90 feet to a high of approximately 12.80 feet NGVD. It was assumed that the building finish elevations range from 6.57 feet (eight inches above the lowest crown of road) to 13.57 feet (eight inches above highest crown of road). The lowest edge of road is 5.65 feet. Pervious area elevations were assumed to range from 5.75 feet (one inch above the lowest edge of road) to 12.9 feet (highest edge of road).

**Performance Goal Analysis:** Based on the available information described above, calculations were made for drainage sub-basin 44 to compare the existing conditions with the previously stated performance goals. The detailed calculations can be found in Appendix A. Based on the detailed hydrologic and hydraulic calculations for drainage sub-basin 44, the sub-basin is subject to flooding during all design storm events. The table below shows the performance of the sub-basin versus performance goals.

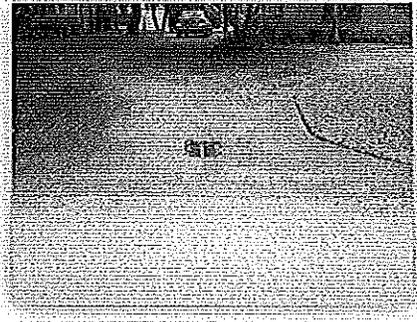
*Table 19: Drainage Sub-basin 44 – Performance Goal Analysis for Existing Conditions*

Design Storm Event	Flood Stage Elevation Above Performance Goal Criteria
5-year, 24-hour	1.58 feet above lowest crown of road for collector and local roadways
100-year, 72-hour	2.32 feet above lowest finish floor elevation (FFE)
Total Above Goal	3.90 feet above performance goal criteria

The flood stages shown above for drainage sub-basin 44 exceed allowable levels and the sub-basin does not meet the performance goal criteria.



**Storm Drainage Deficiencies:** The catch basins inspected in this sub-basin were observed to be clean, with only limited debris and sediment. As a result, drainage deficiency issues are likely to be a function of limited system capacity and infrastructure age and or condition. Hydrologic and hydraulic calculations for this sub-basin confirmed the existing drainage infrastructure does not discharge adequate runoff to meet the desired performance criteria. The capacity of the existing swales and French drains is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. Pavement condition within the sub-basin area is generally in good condition, but would benefit from resurfacing. Improvements to drainage infrastructure will be needed to address these inadequacies.



**Recommended Drainage Improvements:** Clean and flush all sediment and debris from existing catch basins and pipes and adjust catch basin elevations and locations to minimize accumulation of sediment and debris. Install the additional infrastructure depicted in Figure 12. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench. Constructing additional catch basins, manholes, culverts, and exfiltration trench is recommended to interconnect the catch basins.



**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 using a spreadsheet developed for this purpose (see Appendix B). The table 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 20: Drainage Sub-basin 44 – Pollutant Loading Analysis

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	20.20	18.71	1.48
Total Nitrogen	159.12	142.41	16.71
Total Suspended Solids	1,907.40	1,727.15	180.25

**Capital Improvement Budget:** A budget was developed for the proposed stormwater capital improvements.

Table 21: Drainage Sub-basin 44 – Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Maintenance of Traffic	1	L.S.	\$20,739	\$21,000
2	Mobilization	1	L.S.	\$69,130	\$70,000
3	Stormwater Pollution Prevention Plan (SWPPP)	1	L.S.	\$6,913	\$7,000
4	Asphalt Concrete Surface Course	20,000	S.Y.	\$8	\$160,000
5	Inlet Apron (Asphalt)	34	S.Y.	\$8	\$300
6	15" Diameter Polyethylene Pipe	550	L.F.	\$70	\$39,000
7	18" Diameter Polyethylene Pipe	1,350	L.F.	\$85	\$115,000
8	18" French Drain Exfiltration Trench	2,150	L.F.	\$100	\$215,000
9	Manhole	13	EA.	\$5,500	\$72,000
10	Catch Basin Inlet	12	EA.	\$6,000	\$72,000
11	Pollution Retardant Baffle	14	EA.	\$240	\$4,000
12	Utility Adjustments	1	L.S.	\$13,546	\$14,000
13	Professional Services	1	L.S.	\$134,181	\$135,000
14	Contingency	1	L.S.	\$78,930	\$79,000
<b>TOTAL</b>					<b>\$1,000,000</b>

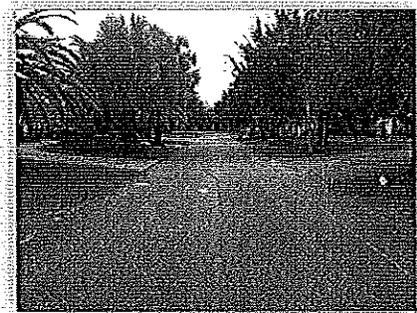
**Notes:**

1. The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.
2. Costs do not include inflation or interest costs.
3. Sequence of improvements should be coordinated with roadway CIP.

### Drainage Sub-basin 57/96

**Location:** Drainage sub-basin 57/96 is generally located south of SW 155th Terrace, north of SW 160th Street, west of SW 92nd Avenue, and east of SW 87th Avenue. Drainage sub-basin 57/96 is part of the C100C-N-11 Miami-Dade County basin.

**Existing and Future Conditions:** Figure 13 shows existing conditions for drainage sub-basin 57/96. The sub-basin consists of approximately 55.34 acres of existing residential development with approximately 8,820 linear feet of roadway, including SW 155th Terrace, SW 156th Terrace, SW 157th Street, SW 158th Street, SW 159th Street, SW 160th Street, 92nd Avenue, SW 90th Avenue, SW 89th Avenue, SW 88th Court, SW 88th Avenue, SW 87th Court, and SW 87th Avenue. The drainage system in this sub-basin is a closed system with catch basins connected to exfiltration trench located in the vegetated swales along the sides of the roadways.



The Village reported extensive flooding on SW 88th Court and SW 159th Street in drainage sub-basin 96. In our investigation, Kimley-Horn found flooding extending across the entire roadway width on SW 87th Court. The location of these deficiencies can be seen in Figure 13. The entire sub-basin area was modeled based on data collected as part of the Stormwater Master Plan process. The Village has a localized flooding project proposed at the intersection of SW 88th Avenue and SW 156th Terrace.

Based on available GIS data, the existing crown of road elevations ranges from a low of approximately 7.70 feet to a high of approximately 10.00 feet NGVD. It was assumed that the building finish elevations range from 8.37 feet (eight inches above the lowest crown of road) to 10.77 feet (eight inches above highest crown of road). The lowest



edge of road is 7.45 feet. Pervious area elevations were assumed to range from 7.55 feet (one inch above the lowest edge of road) to 10.10 feet (highest edge of road).

**Performance Goal Analysis:** Based on the available information described above, calculations were made for drainage sub-basin 57/96 to compare the existing conditions with the previously stated performance goals. The detailed calculations can be found in Appendix A. Based on the detailed hydrologic and hydraulic calculations for drainage sub-basin 57/96, the sub-basin is subject to flooding during all design storm events. The table below shows the performance of the sub-basin versus performance goals.

*Table 22: Drainage Sub-basin 57/96 – Performance Goal Analysis for Existing Conditions*

Design Storm Event	Flood Stage Elevation Above Performance Goal Criteria
5-year, 24-hour	1.10 feet above lowest crown of road for collector and local roadways
100-year, 72-hour	1.60 feet above lowest finish floor elevation (FFE)
Total Above Goal	2.70 feet above performance goal criteria

The flood stages shown above for drainage sub-basin 57/96 exceed allowable levels and the sub-basin does not meet the performance goal criteria.



# FIGURE 13: DRAINAGE SUB-BASIN #57/96 PROPOSED CONDITIONS



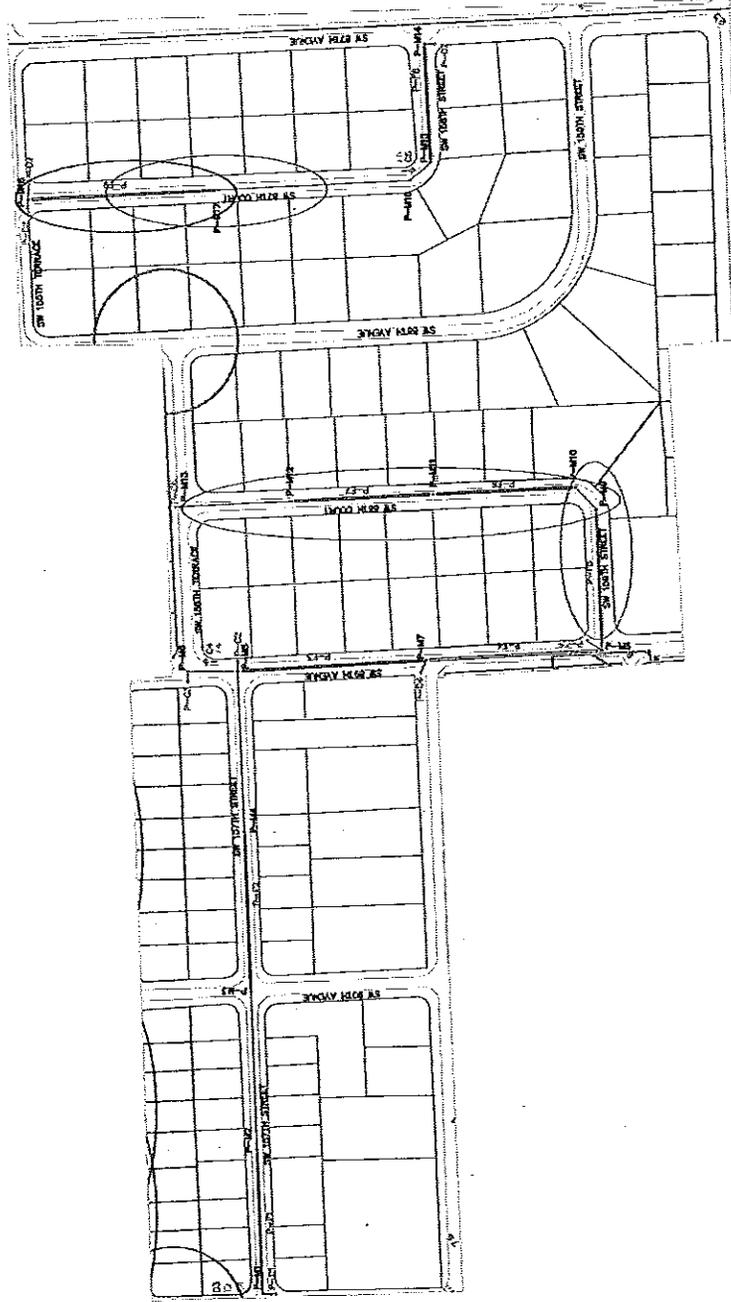
SCALE AS SHOWN

**PROPOSED MODIFICATIONS**

- Add 2,900 LF 18" French Drain / Exfiltration Trench
- Add 1,600 LF of 18" Storm Sewer Pipe (HDPE)
- Add 300 LF of 15" Storm Sewer Pipe (HDPE)
- Add 9 Catch Basins
- Add 18 Manholes

**PERFORMANCE GOAL CRITERIA**

- Min. Roadway EOP Elevation 7.45
- Min. Roadway Centerline Elevation 7.70
- Min. Building FFE 8.37



**LEGEND**

Catch Basin (C1)	
French Drain (F1)	
Trench (T1)	
Pipe (P1)	
Outfall (O1)	
Sub-Basin Boundary	
Manhole (M1)	
Elevation	
Proposed Catch Basin (P-C1)	
Proposed French Drain (P-F1)	
Proposed Manhole (P-M1)	
Proposed Pipe	
Flooding reported by the Village	
Flooding across roadway observed by KHA	
Flooding to be mitigated by projects under design or construction.	
Local drainage improvements complete	

**Kimley»Horn**

Last Revised August 25, 2014

**Storm Drainage Deficiencies:** The catch basins inspected in this sub-basin were observed to be clean, with only limited debris and sediment. As a result, drainage deficiency issues are likely to be a function of limited system capacity and infrastructure age and or condition. Hydrologic and hydraulic calculations for this sub-basin confirmed the existing drainage infrastructure does not discharge adequate runoff to meet the desired performance criteria. The capacity of the existing swales and French drains is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. SW 88th Avenue and SW 159th Street have recently been paved, but pavement condition within the remaining portions of the sub-basin area is generally average and in need of resurfacing or rehabilitation. Improvements to drainage infrastructure will be needed to address these inadequacies.

**Recommended Drainage Improvements:** Clean and flush all sediment and debris from existing catch basins and pipes and adjust catch basin elevations and locations to minimize accumulation of sediment and debris. Install the additional infrastructure depicted in Figure 13. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench. Constructing additional catch basins, manholes, culverts, and exfiltration trench is recommended to interconnect the catch basins.

**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 using a spreadsheet developed for this purpose (see Appendix B). The table 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 23: Drainage Sub-basin 57/96 – Pollutant Loading Analysis*

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	32.85	30.43	2.41
Total Nitrogen	258.80	231.63	27.17
Total Suspended Solids	3,102.33	2,809.16	293.17

**Capital Improvement Budget:** A budget was developed for the proposed stormwater capital improvements.

Table 24: Drainage Sub-basin 57/96 – Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Maintenance of Traffic	1	L.S.	\$22,686	\$23,000
2	Mobilization	1	L.S.	\$75,620	\$76,000
3	Stormwater Pollution Prevention Plan (SWPPP)	1	L.S.	\$7,562	\$8,000
4	Asphalt Concrete Surface Course	17,000	S.Y.	\$8	\$136,000
5	Inlet Apron (Asphalt)	25	S.Y.	\$8	\$200
6	15" Diameter Polyethylene Pipe	300	L.F.	\$70	\$21,000
7	18" Diameter Polyethylene Pipe	1,600	L.F.	\$85	\$136,000
8	18" French Drain Exfiltration Trench	2,900	L.F.	\$100	\$290,000
9	Manhole	18	EA.	\$5,500	\$99,000
10	Catch Basin Inlet	9	EA.	\$6,000	\$54,000
11	Pollution Retardant Baffle	18	EA.	\$240	\$5,000
12	Utility Adjustments	1	L.S.	\$14,824	\$15,000
13	Professional Services	1	L.S.	\$146,744	\$147,000
14	Contingency	1	L.S.	\$86,320	\$87,000
<b>TOTAL</b>					<b>\$1,100,000</b>

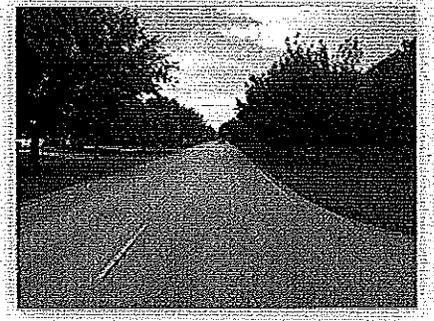
**Notes:**

1. The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.
2. Costs do not include inflation or interest costs.
3. Sequence of improvements should be coordinated with roadway CIP.

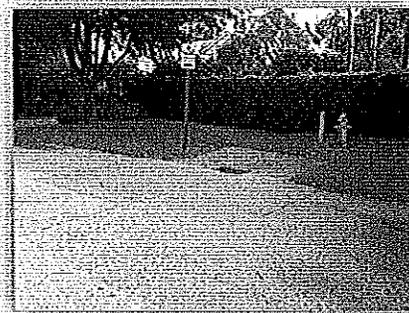
### Drainage Sub-basin 59/60

**Location:** Drainage sub-basin 59/60 is generally SW 82nd Avenue from NW 152nd Street to SW 160th Street and a localized improvement at the intersection of SW 160th Street and SW 81st Avenue. Drainage sub-basin 59/60 is part of the C100C-W-7 Miami-Dade County basin. It includes portions of the Cutler, Banyan Cove, Banyan Woods, and Old Cutler Palms subdivisions.

**Existing and Future Conditions:** Figure 14 shows existing conditions for drainage sub-basin 59/60. The sub-basin consists of approximately 40.97 acres of existing detached single-family residential development with approximately 7,520 linear feet of roadway, including SW 82nd Avenue, SW 81st Avenue, SW 155th Street, SW 156<sup>th</sup> Street, SW 158th Terrace, and SW 160th Street. The drainage system in this sub-basin is a closed system with catch basins connected to exfiltration trench located in the vegetated swales along the sides of the roadways.



The Village of Palmetto Bay reported severe flooding complaints on SW 82nd Avenue and localized flooding on SW 160th Street west of SW 80th Avenue. The location of these deficiencies can be seen in Figure 14. The entire sub-basin area was modeled based on data collected as part of the Stormwater Master Plan process. The Village installed a traffic circle with localized drainage improvements at the intersection of SW 160th Street and SW 82nd Avenue, as well as a second localized drainage improvement on SW 80th Avenue just south of SW 152nd Street.



Based on available GIS data, the existing crown of road elevations ranges from a low of approximately 9.40 feet to a high of approximately 11.00 feet NGVD. It was assumed that the building finish elevations range from 10.07 feet (eight inches above the lowest crown of road) to 11.77 feet (eight inches above highest crown of road). The lowest edge of road is 9.15 feet. Pervious area elevations were assumed to range from 9.25 feet (one inch above the lowest edge of road) to 11.10 feet (highest edge of road).

**Performance Goal Analysis:** Based on the available information described above, calculations were made for drainage sub-basin 59/60 to compare the existing conditions with the previously stated performance goals. The detailed calculations can be found in Appendix A. Based on the detailed hydrologic and hydraulic calculations for drainage sub-basin 59/60, the sub-basin is subject to flooding during all design storm events. The table below shows the performance of the sub-basin versus performance goals.

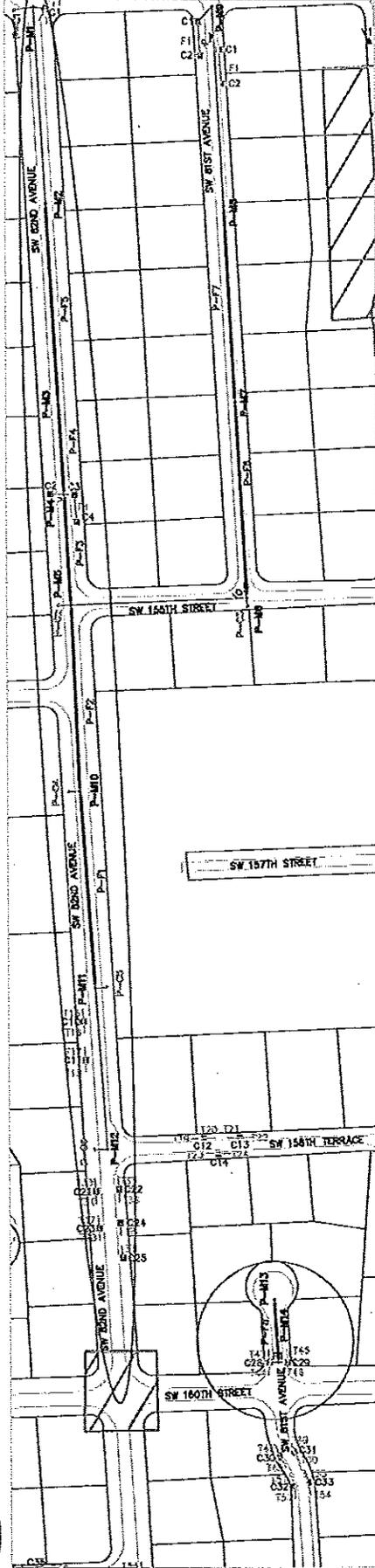
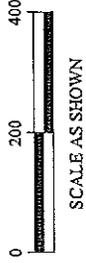
*Table 25: Drainage Sub-basin 59/60 – Performance Goal Analysis for Existing Conditions*

Design Storm Event	Flood Stage Elevation Above Performance Goal Criteria
5-year, 24-hour	0.93 feet above lowest crown of road for collector and local roadways
100-year, 72-hour	1.26 feet above lowest finish floor elevation (FFE)
Total Above Goal	2.19 feet above performance goal criteria

The flood stages shown above for drainage sub-basin 59/60 exceed allowable levels and the sub-basin does not meet the performance goal criteria.



**FIGURE 14:  
DRAINAGE SUB-BASIN #59/60  
PROPOSED CONDITIONS**



**LEGEND**

	Catch Basin (C1)
	French Drain (F1)
	Trench (T1)
	Pipe (P1)
	Outfall (O1)
	Sub-Basin Boundary
	Manhole (M1)
	Elevation
	Proposed Catch Basin (P-C1)
	Proposed French Drain (P-F1)
	Proposed Manhole (P-M1)
	Proposed Pipe
	Flooding reported by the Village
	Local drainage improvements complete

**PERFORMANCE GOAL CRITERIA**

- Min. Roadway EOP Elevation 9.15
- Min. Roadway Centerline Elevation 9.40
- Min. Building FFE 10.07

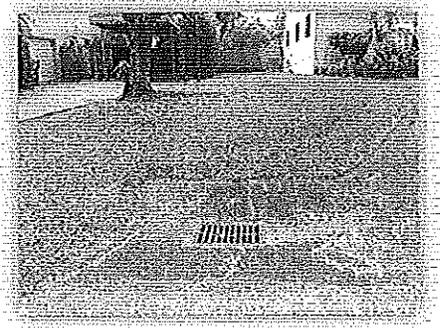
**PROPOSED MODIFICATIONS**

- Add 2,300 LF 18" French Drain / Excavation Trench
- Add 1,500 LF of 18" Storm Sewer Pipe (HDPE)
- Add 300 LF of 15" Storm Sewer Pipe (HDPE)
- Add 6 Catch Basins
- Add 14 Manholes

**Kimley»Horn**

Last Revised August 25, 2014

**Storm Drainage Deficiencies:** The catch basins inspected in this sub-basin were observed to be clean, with only limited debris and sediment. As a result, drainage deficiency issues are likely to be a function of limited system capacity and infrastructure age and or condition. Hydrologic and hydraulic calculations for this sub-basin confirmed the existing drainage



infrastructure does not discharge adequate runoff to meet the desired performance criteria. The capacity of the existing swales and French drains is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. Pavement condition within the sub-basin area is generally average and in need of resurfacing or rehabilitation. Improvements to drainage infrastructure will be needed to address these inadequacies.

**Recommended Drainage Improvements:** Clean and flush all sediment and debris from existing catch basins and pipes and adjust catch basin elevations and locations to minimize accumulation of sediment and debris. Install the additional infrastructure depicted in Figure 14. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench. Constructing additional catch basins, manholes, culverts, and exfiltration trench is recommended to interconnect the catch basins.

**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 using a spreadsheet developed for this purpose (see Appendix B). The table 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 26: Drainage Sub-basin 59/60 – Pollutant Loading Analysis*

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	24.35	22.56	1.79
Total Nitrogen	191.88	171.73	20.15
Total Suspended Solids	2,300.10	2,082.74	217.36

**Capital Improvement Budget:** A budget was developed for the proposed stormwater capital improvements.

Table 27: Drainage Sub-basin 59/60 – Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Maintenance of Traffic	1	L.S.	\$18,636	\$19,000
2	Mobilization	1	L.S.	\$62,120	\$63,000
3	Stormwater Pollution Prevention Plan (SWPPP)	1	L.S.	\$6,212	\$7,000
4	Asphalt Concrete Surface Course	14,000	S.Y.	\$8	\$112,000
5	Inlet Apron (Asphalt)	17	S.Y.	\$8	\$200
6	15" Diameter Polyethylene Pipe	300	L.F.	\$70	\$21,000
7	18" Diameter Polyethylene Pipe	1,500	L.F.	\$85	\$128,000
8	18" French Drain Exfiltration Trench	2,300	L.F.	\$100	\$230,000
9	Manhole	14	EA.	\$5,500	\$77,000
10	Catch Basin Inlet	6	EA.	\$6,000	\$36,000
11	Pollution Retardant Baffle	16	EA.	\$240	\$4,000
12	Utility Adjustments	1	L.S.	\$12,164	\$13,000
13	Professional Services	1	L.S.	\$120,734	\$121,000
14	Contingency	1	L.S.	\$71,020	\$72,000
<b>TOTAL</b>					<b>\$900,000</b>

## Notes:

1. The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.
2. Costs do not include inflation or interest costs.
3. Sequence of improvements should be coordinated with roadway CIP.

### Drainage Sub-basin 61

**Location:** Drainage sub-basin 61 is generally located south of SW 155th Street, north of SW 160th Street, west of SW 77th Court, and east of SW 79th Avenue. Drainage sub-basin 61 is part of the C100C-W-7 Miami-Dade County basin.

**Existing and Future Conditions:** Figure 15 shows existing conditions for drainage sub-basin 61. The sub-basin consists of approximately 26.29 acres of existing detached single-family residential development with approximately 4,770 linear feet of roadway, including SW 155th Street, SW 156th Street, SW 157th Street, SW 158th Street, SW 160th Street, SW 79th Avenue, SW 78th Place, SW 78th Avenue, and SW 77th Court. The drainage system in this sub-basin includes three outfall connections along SW 77th Court, but the outfalls are only connected to local catch basins. Other areas of the sub-basin are closed system with catch basins connected to exfiltration trench located in the vegetated swales along the sides of the roadways. Speed humps are also installed along SW 77th Court and the surrounding area.



The Village of Palmetto Bay reported flooding complaints on SW 156th Street, SW 160th Street, and SW 77th Court. The location of these deficiencies can be seen in Figure 15. The entire sub-basin area was modeled based on data collected as part of the Stormwater Master Plan process.

Based on available GIS data, the existing crown of road elevations ranges from a low of approximately 7.30 feet to a high of approximately 12.50 feet NGVD. It was assumed that the building finish elevations range from 7.97 feet (eight inches above the lowest crown of road) to 13.27 feet (eight inches above highest crown of road). The lowest edge of road is 7.05 feet. Pervious area elevations were assumed to



range from 7.15 feet (one inch above the lowest edge of road) to 12.60 feet (highest edge of road).

**Performance Goal Analysis:** Based on the available information described above, calculations were made for drainage sub-basin 61 to compare the existing conditions with the previously stated performance goals. The detailed calculations can be found in Appendix A. Based on the detailed hydrologic and hydraulic calculations for drainage sub-basin 61, the sub-basin is subject to flooding during all design storm events. The table below shows the performance of the sub-basin versus performance goals.

*Table 28: Drainage Sub-basin 61 – Performance Goal Analysis for Existing Conditions*

Design Storm Event	Flood Stage Elevation Above Performance Goal Criteria
5-year, 24-hour	1.81 feet above lowest crown of road for collector and local roadways
100-year, 72-hour	2.85 feet above lowest finish floor elevation (FFE)
Total Above Goal	4.66 feet above performance goal criteria

The flood stages shown above for drainage sub-basin 61 exceed allowable levels and the sub-basin does not meet the performance goal criteria.

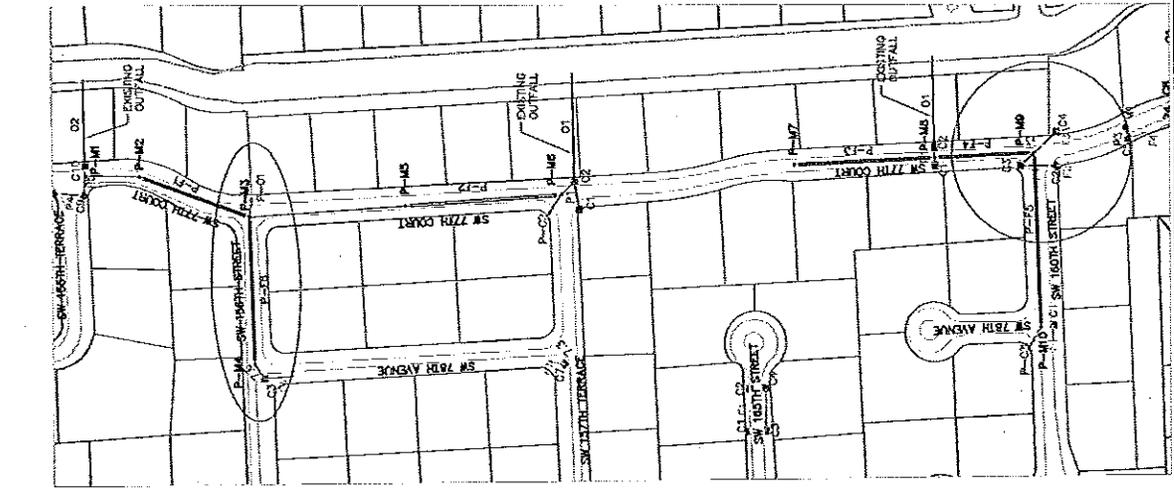
# FIGURE 15: DRAINAGE SUB-BASIN #61 PROPOSED CONDITIONS

## PROPOSED MODIFICATIONS

- Add 1,300 LF 18" French Drain / Exfiltration Trench
- Add 400 LF of 18" Storm Sewer Pipe (HDPE)
- Add 150 LF of 15" Storm Sewer Pipe (HDPE)
- Add 3 Catch Basins
- Add 10 Manholes

## PERFORMANCE GOAL CRITERIA

- Min. Roadway EOP Elevation 7.05
- Min. Roadway Centerline Elevation 7.50
- Min. Building FFE 7.97



SCALE AS SHOWN

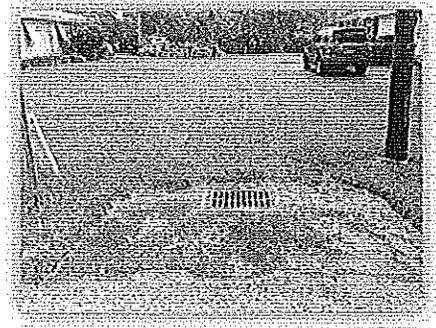


LEGEND	
Catch Basin (C1)	
French Drain (F1)	
Trench (T1)	
Pipe (P1)	
Outfall (O1)	
Sub-Basin Boundary	
Manhole (M1)	
Elevation	
Proposed Catch Basin (P-C1)	
Proposed French Drain (P-F1)	
Proposed Catch Basin (P-C1)	
Proposed Manhole (P-M1)	
Proposed Pipe	
Flooding reported by the Village	

# Kimley»Horn

Last Revised August 25, 2014

**Storm Drainage Deficiencies:** The catch basins inspected in this sub-basin were observed to be clean, with only limited debris and sediment. As a result, drainage deficiency issues are likely to be a function of limited system capacity and infrastructure age and or condition. Hydrologic and hydraulic calculations for this sub-basin confirmed the existing drainage infrastructure does not discharge adequate runoff to meet the desired performance criteria. The capacity of the existing swales, outfalls, and French drains is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. Pavement condition within the sub-basin area is generally average and in need of resurfacing or rehabilitation. Improvements to drainage infrastructure will be needed to address these inadequacies. It is assumed that any speed humps impacted will require replacement as well.



**Recommended Drainage Improvements:** Clean and flush all sediment and debris from existing catch basins, pipes, outfalls, and adjust catch basin elevations and locations to minimize accumulation of sediment and debris. Install the additional infrastructure depicted in Figure 15. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench. An analysis of the existing outfall capacities should be performed to evaluate the need for potential outfall improvements. Constructing additional catch basins, manholes, culverts, and exfiltration trench is recommended to interconnect the catch basins.

**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 using a spreadsheet developed for this purpose (see Appendix B). The table 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 29: Drainage Sub-basin 61 – Pollutant Loading Analysis

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	15.62	14.47	1.15
Total Nitrogen	123.04	110.12	12.92
Total Suspended Solids	1,474.87	1,335.49	139.38

**Capital Improvement Budget:** A budget was developed for the proposed stormwater capital improvements.

Table 30: Drainage Sub-basin 61 – Capital Improvement Budget

Item	Description	Qty	Units	Unit Price	Sub-total
1	Maintenance of Traffic	1	L.S.	\$10,623	\$11,000
2	Mobilization	1	L.S.	\$35,410	\$36,000
3	Stormwater Pollution Prevention Plan (SWPPP)	1	L.S.	\$3,541	\$4,000
4	Asphalt Concrete Surface Course	12,000	S.Y.	\$8	\$96,000
5	Inlet Apron (Asphalt)	8	S.Y.	\$8	\$100
6	15" Diameter Polyethylene Pipe	150	L.F.	\$70	\$11,000
7	18" Diameter Polyethylene Pipe	400	L.F.	\$85	\$34,000
8	18" French Drain Exfiltration Trench	1,300	L.F.	\$100	\$130,000
9	Manhole	10	EA.	\$5,500	\$55,000
10	Catch Basin Inlet	3	EA.	\$6,000	\$18,000
11	Pollution Retardant Baffle	12	EA.	\$240	\$3,000
12	Utility Adjustments	1	L.S.	\$6,942	\$7,000
13	Professional Services	1	L.S.	\$68,867	\$69,000
14	Contingency	1	L.S.	\$40,510	\$41,000
<b>TOTAL</b>					<b>\$520,000</b>

## Notes:

1. The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.
2. Costs do not include inflation or interest costs.
3. Sequence of improvements should be coordinated with roadway CIP.

## CAPITAL IMPROVEMENT PROGRAM

### Background

Kimley-Horn prepared this Capital Improvement Program (CIP) for stormwater improvements to prioritize and set the budgets required to plan, construct, operate, and maintain the Village's Stormwater Management Program. The CIP is a budgetary tool and is intended to provide an order of magnitude for the Village's yearly funding for the implementation of the Stormwater Utility.

The proposed CIP is based on the findings from the assessment of existing drainage conditions within the Village and the detailed analysis of the ten drainage sub-basins that were identified as priority sub-basins in this Stormwater Master Plan Update. The two primary components of the CIP include operation/maintenance and capital improvements.

The operation and maintenance component is based on the general assessment of the existing drainage conditions within the Village limits. Recommended operation and maintenance procedures were identified as part of the original Stormwater Master Plan and preliminary budgets were established at that time. With the operation and maintenance program implemented, the Village has current cost data for the various components, and the condition of the existing stormwater system indicates the program has been effective.

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 were quantified based on the available data and preliminary opinions of probable costs (preliminary budgets) were prepared for each sub-basin. Based on the preliminary budgets, the priority sub-basin improvements were prioritized to provide the proposed CIP. The following is an explanation and summary of each component of the CIP.

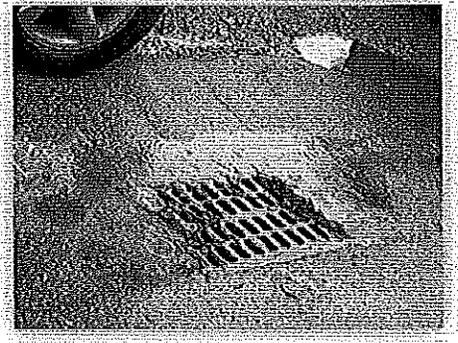
## Operation and Maintenance Plan

The intent of the operation and maintenance plan is to maintain the integrity of the stormwater management system. This is accomplished by maintaining the existing stormwater management system to provide the level of service as 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.

### Catch Basin Maintenance

Catch basin maintenance is a two-step process. This task includes cleaning the external grate to permit stormwater to enter the system and removing sand, silt, and debris from the sedimentation chamber of the intake structure.

The catch basins are cleaned using mechanical and manual methods. The Village is currently budgeting to clean 20% of all catch basins annually. However, the Village does monitor areas of heavy foliage and other debris to schedule catch basin maintenance more frequently if required.



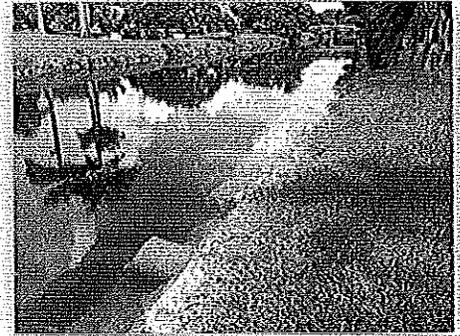
### Pipe Flushing and Exfiltration Trench Cleaning

Exfiltration trench is important in the storage, disposal, and water quality treatment of stormwater runoff. Maintenance of exfiltration trench includes removing the sediment, oil, and grease that accumulates in the bottom of the catch basins attached to exfiltration trench and pipes to reduce the amount of these pollutants entering the pipe system and adversely impacting the exfiltration or outfall rate. Even with removal of sediment from the catch basins, over time sediment will build up in drainage pipes. Therefore, the pipes should be cleaned and flushed on a regular basis. Pipe flushing and exfiltration trench cleaning are typically performed in conjunction with catch basin and manhole cleaning and are usually contracted out on an as-needed basis. During these activities, 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. The Village is currently budgeting to flush 20% of all piping, 20% of all exfiltration trench, 50% of all manholes, 50% of all outfall pipes, and 100% of all French drain annually.

### **Canal Maintenance**

Local canals play an important role in stormwater disposal. The Village has a five-year interlocal agreement with Miami-Dade County for canal maintenance. Miami-Dade County currently maintains the SW 160th Street Ditch. The Village owns the SW Maral Estates canal and the Bel Aire Section canal. The Village is currently budgeting for canal maintenance.



### **Swale Inspection, Maintenance, and Restoration**

Grassed swales and landscaped medians also play an important role in stormwater disposal. Consistent mowing, inspection, and restoration of such features promote stormwater retention and efficient percolation. The Village maintains swales and medians within public roadways and parking lots. Individual business owners and residents are mandated through local codes to maintain their facilities. The Village is currently budgeting for swale inspection, maintenance, and restoration.

### **WASD Utility Fee Collection**

All real properties within the jurisdictional boundaries of the Village shall be subject to Stormwater Utility Fee's unless specifically exempted. The Village has an agreement with the Miami Dade Water and Sewer Department (WASD) to include the Village's Stormwater Utility fee on bills for water and sewer service for properties within the Village. WASD bills customers on a monthly or quarterly basis on behalf of the Village and charges the Village a fee to collect the Village's Stormwater Utility Fee. Properties on well water within the Village are billed on an

annual basis by the Village's Finance Department to collect their fair share of Stormwater Utility Fee.

#### **Minor Repairs and Improvements**

Maintaining the stormwater collection system requires routine improvements and repairs. This task covers a significant spectrum of activities including limited infrastructure projects, repair of collapsed pipes and manholes, replacement of catch basins or catch basin grates, and swale grading to address ponding. As discussed earlier, these projects are typically classified as localized drainage improvements. Localized drainage improvement projects can range from design and permitted projects to maintenance activities in response to an immediate problem using the best methods available.

#### **MS4 Permit and CRS Program Activities**

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 Village must perform certain activities on an annual basis. The preceding maintenance activities are all required by the MS4 Permit. In addition to these maintenance activities, the Village is required to monitor water quality in the canals and prepare a pollutant loading study as part of the MS4 Permit. The Village pays an annual fee to Miami-Dade County DERM for water quality monitoring in the canals. The MS4 Permit also requires 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.

In addition to the MS4 permit, the Village of Palmetto Bay was accepted into the National Flood Insurance Program (NFIP) in 2008 and submitted a request to join the Community Rating System (CRS) program in 2011. Prior to submitting the application to become a member of the CRS, the Village needs a letter of compliance with the NFIP. Prior to the NFIP preparing that letter, a FEMA regional coordinator will require satisfactory completion of a Community

Assistance Visit (CAV) with the Village. The CAV occurred in 2012 and the Village is currently working with FEMA to obtain their letter of compliance from FEMA. Once the Village becomes a member of the CRS, it can receive credit for public outreach programs dedicated to informing the public about the risks of flooding and steps people can take to protect themselves and their property. Additionally, property owners within the Village can receive a discount on flood insurance. The more credit the Village receives in the CRS, the higher the flood insurance discount.

#### **Administrative Expenses**

There are two items noted in the budget to provide personnel to oversee the operation and maintenance of the stormwater system. These items are "Professional Services" and "Stormwater Utility Administration." The Professional Services item will include the engineering and legal services associated with developing contract documents and procuring services for drainage improvement projects. The Stormwater Utility Administration item includes general administration, clerical support, program planning, and public awareness.

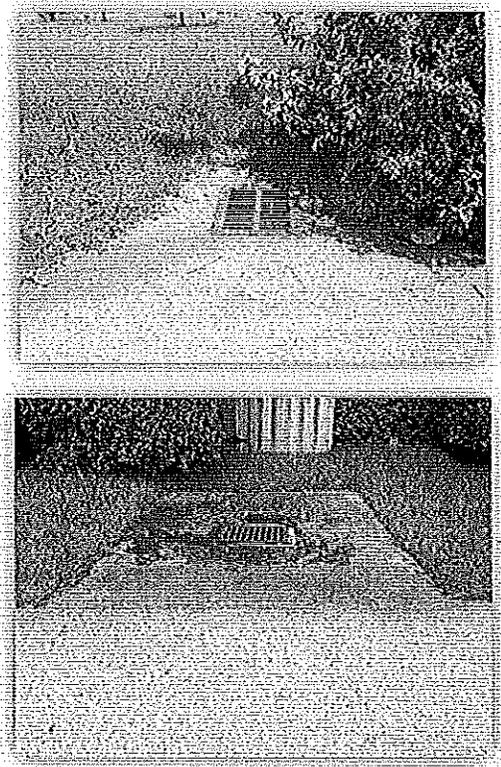
Unit costs associated with the components discussed throughout the operation and maintenance plan section were provided by Village staff. Table 31 details the Stormwater Utility Annual Operation and Maintenance Budget.

Table 31: Stormwater Utility Annual Operation and Maintenance Budget

Item	Quantity	Units	Unit Price	Amount
Storm water Utility Administration	1	L.S.	\$68,400	\$68,400
Clean Catchbasins – 1/5 Annually	315	EA.	\$69	\$21,700
Clean Manholes – 1/2 Annually	179	EA.	\$114	\$20,400
Clean Outfalls – 1/2 Annually	45	EA.	\$171	\$7,700
Clean French Drain and Slab Covered Trench – Annually	75	EA.	\$86	\$6,500
Pipe Flushing – 1/5 Annually	11,400	L.F.	\$2.30	\$26,200
Exfiltration Trench Cleaning – 1/5 Annually	18,580	L.F.	\$2.30	\$42,700
Canal Maintenance	1	L.S.	\$23,300	\$23,300
NPDES MS4 Permit Monitoring Fee to DERM	1	L.S.	\$6,300	\$6,300
Swale Maintenance	1	L.S.	\$30,000	\$30,000
WASD Fee Collection	1	L.S.	\$26,000	\$26,000
Professional Services – Engineering and Legal	1	L.S.	\$25,000	\$25,000
Minor Repairs and Improvements	1	L.S.	\$100,000	\$100,000
Community Rating System – FEMA Program	1	L.S.	\$10,000	\$10,000
Public Outreach and Workshop for MS4 Permit	1	L.S.	\$5,000	\$5,000
QNIP Debt Service Payment	1	L.S.	\$132,700	\$132,700
<b>Total</b>				<b>\$552,000</b>

### Stormwater Capital Improvement Projects

The Capital Improvement Program (CIP) is based on the findings from 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) that were prepared for each sub-basin. Prior to each individual project being implemented, professional services such as surveying, engineering, and permitting will be required and estimates are included within the budgets. The scope of the proposed improvements is subject to change based on actual field survey data and resulting stormwater design calculations necessary to permit the projects.



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

- The budgets include the recommended improvements identified in the analysis of the ten priority sub-basins.
- The budgets include restoration of the roadway impacted by the proposed trenching and a final asphalt overlay or surface course. Costs do not include any additional roadway improvements.
- The budgets do not include any costs of obtaining drainage or construction easements.
- The budgets include a 10% allowance for mobilization and a 3% allowance for maintenance of traffic for each project.
- The budgets include a 10% contingency for each project.

- The budgets include a 17% allowance for surveying, engineering, permitting, and limited construction phase assistance (site observations).
- The budgets do not include any landscape costs for improvements or restoration.

The capital improvement budgets are a preliminary opinion of probable construction costs in the current marketplace. Unit pricing for similar projects constructed by the Village of Palmetto Bay, as well as other nearby municipalities, were used as the basis for the construction budgets. Kimley-Horn has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. The preliminary opinions of probable costs provided herein are based on the information known to Kimley-Horn at this time and represent only the engineer's judgment as a design professional familiar with the construction industry. Kimley-Horn cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its preliminary opinions of probable costs. Based on the preliminary budgets, the priority sub-basin proposed improvements were prioritized to provide the capital improvement program.

Table 32: Sub-basin Prioritization Matrix

Priority Ranking	Area	Hydraulic Analysis	Observed Flooding	Complaints	Roadway Condition	Traffic Volumes	Total Score
1	Drainage Sub-basin #59/60	2.19	4	4	3	3	16.19
2	Drainage Sub-basin #61	4.66	2	2	3	1	12.66
3	Drainage Sub-basin #43	4.61	2	2	3	1	12.61
4	Drainage Sub-basin #57/96	2.70	2	2	3	1	10.70
5	Drainage Sub-basin #11	1.70	4	1	3	1	10.70
6	Drainage Sub-basin #41	4.37	3	1	1	1	10.37
7	Drainage Sub-basin #12	3.36	3	2	1	1	10.36
8	Drainage Sub-basin #39	5.23	2	1	1	1	10.23
9	Drainage Sub-basin #42	3.20	2	1	3	1	10.20
10	Drainage Sub-basin #44	3.90	2	1	1	1	8.9

Table 32 shows the priority ranking for the capital improvement projects. With the exception of the hydraulic analysis score, each project was given a score between 1 and 5 in each of the four categories: observed flooding, complaints, roadway condition, and traffic volumes. The scores

were then totaled and the projects were ranked from highest to lowest. The basis for the category scores is detailed below.

### Hydraulic Analysis

Based on the hydrologic and hydraulic analysis described in the Drainage Sub-basin Analysis section of this report, a number for "total flood stage above performance goal criteria" was determined for each of the sub-basins studied. This number was entered into the table above in the Hydraulic Analysis column.

### Observed Flooding

- 1 = No flooding observed in sub-basin
- 2 = Roadway flooding observed in less than 1/3 of drainage areas within sub-basin
- 3 = Roadway flooding observed in 1/3 to 1/2 of drainage areas within sub-basin
- 4 = Roadway flooding observed in 1/2 to all but one of the drainage areas within sub-basin
- 5 = Roadway flooding observed in all of the drainage areas within sub-basin

### Complaints

- 1 = No complaints recorded
- 2 = Complaints recorded for less than 1/3 of drainage areas within sub-basin
- 3 = Complaints recorded for 1/3 to 1/2 of drainage areas within sub-basin
- 4 = Complaints recorded for 1/2 to all but one of the drainage areas within sub-basin
- 5 = Complaints recorded for all drainage areas within the sub-basin

### Roadway Condition

The ratings for this category are based on a percentage of roadway length in good, average, or poor pavement condition throughout the sub-basin according to the Village's Roadway Analysis Report.

- 1 = Majority of roadways in sub-basin in "good" condition
- 3 = Majority of roadways in sub-basin in "average" condition
- 5 = Majority of roadways in sub-basin in "poor" condition

**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 Village’s Transportation Master Plan.

- 1 = Majority of roadways in sub-basin are local roadways
- 3 = Majority of roadways in sub-basin are collector roadways
- 5 = Majority of roadways in sub-basin are arterial roadways

The proposed CIP summary and schedule of work is contained in Table 33. 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 33: Stormwater Capital Improvement Program Budget Summary*

Project	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Total
Drainage Sub-basin #11					\$690,000	\$200,000					\$890,000
Drainage Sub-basin #12							\$420,000				\$420,000
Drainage Sub-basin #39								\$670,000			\$670,000
Drainage Sub-basin #41						\$620,000	\$220,000				\$840,000
Drainage Sub-basin #42									\$630,000		\$630,000
Drainage Sub-basin #43			\$940,000								\$940,000
Drainage Sub-basin #44									\$200,000	\$800,000	\$1,000,000
Drainage Sub-basin #57/96				\$880,000	\$220,000						\$1,100,000
Drainage Sub-basin #59/60	\$720,000	\$180,000									\$900,000
Drainage Sub-basin #61		\$520,000									\$520,000
Annual O&M	\$552,000	\$552,000	\$552,000	\$552,000	\$552,000	\$552,000	\$552,000	\$552,000	\$552,000	\$552,000	\$5,520,000
<b>Total</b>	<b>\$1,272,000</b>	<b>\$1,252,000</b>	<b>\$1,492,000</b>	<b>\$1,432,000</b>	<b>\$1,462,000</b>	<b>\$1,372,000</b>	<b>\$1,192,000</b>	<b>\$1,222,000</b>	<b>\$1,382,000</b>	<b>\$1,352,000</b>	<b>\$13,430,000</b>