



# City of Boca Raton Stormwater Management Master Plan Task 3 - Master Plan Development **Final Report**

April 2008



Prepared by

**MOCK • ROOS**  
ENGINEERS • SURVEYORS • PLANNERS

and

 **MATHEWS**  
**CONSULTING INC.**  
Civil and Environmental Engineers



## Engineer's Signature Page

I hereby state, as a Professional Engineer in the State of Florida, that this report titled "City of Boca Raton Stormwater Management Master Plan Task 3 – Master Plan Development" and dated April 2008, was prepared and assembled under my direct responsible charge.

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Date

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**Table of Contents**

**Engineer’s Signature Page** ..... *i*

**Part 1 – Task 3 Report**..... *1*

**A. Introduction** ..... **1**

**B. Problem Areas** ..... **1**

**C. Field Observations**..... **1**

**D. Conceptual Projects Development/Cost Estimates/Water Quality Impacts**.....**2**

    New Floresta Stormwater Management System Improvements .....5

    NW 36th Court Stormwater System Improvements .....9

    Old Floresta Area Stormwater Management Improvements .....13

    NW 5th Avenue Stormwater System Improvements .....17

    NE 25th Terrace Stormwater Management Improvements .....23

    NE 6th Drive Stormwater System Improvements .....27

    University Heights Stormwater System Improvements.....31

    Por La Mar Stormwater Management System Improvements.....35

    University Gardens Stormwater System Improvements .....39

    NE 5th Avenue Stormwater Management Improvements .....43

    Palm Beach Farms Stormwater Management Improvements.....47

    Spanish River Road Stormwater Management System Improvements .....51

    New Pines Stormwater Community Improvement Project.....55

**E. Meetings with Advisory Boards** .....**59**

**F. Prioritization of Proposed Projects**.....**59**

**G. Other System Improvements** .....**62**

**Part 2 – Stormwater Management Master Plan** ..... **63**

**A. Soft Projects**.....**63**

**B. Capital Projects** .....**66**

**C. Summary** .....**67**

### ***List of Figures***

Conceptual Project Locations Map

### ***List of Tables***

Scoring Criteria

Prioritized List of Projects

Final Recommendations

### ***List of Appendices***

Appendix A – Task 1 Existing Conditions Documentation

Appendix B – Task 2 Regulatory Information Summary

## Part 1 – Task 3 Report

### A. Introduction

This Technical Memorandum Number 3 constitutes the final report and deliverable, completing the services authorized for Mock•Roos to prepare a Stormwater Management Master Plan for the City of Boca Raton (“City”).

The previously completed Technical Memoranda Numbers 1 and 2 which document the Task 1 and Task 2 services, are included here for completeness and reference, in Appendices A and B, respectively.

Task 3 of the Scope of Services included conducting field observations of the areas identified by the City as more significant problem areas; identifying conceptual projects to address the problems; preparing conceptual cost estimates for construction of the conceptual projects; identifying the anticipated water quality impacts of the proposed projects; meeting(s) with the Environmental, Finance, and Marine Advisory Boards to review the conceptual projects; prioritizing the conceptual projects using a ranking matrix; and preparing a Stormwater Management Master Plan.

### B. Problem Areas

The initial effort in identifying potential future stormwater system improvement projects was to review and map the outstanding drainage complaints from residents of the City. To this, City staff added other known flood-prone areas. Many of the resident complaints were evaluated in a drainage complaint study completed by Williams, Hatfield & Stoner (“WHS”) in 1998 and the observations documented in that report were considered during the review process for this effort. Neighborhoods where there were multiple complaints and areas identified by the City as recurrent or more widespread problem areas were identified as potential project areas. Fifteen project areas were initially identified. It was agreed with the City that each area would undergo field observation to identify potential conceptual solutions to alleviate the problem(s). Because of their isolated nature, the balance of the outstanding drainage complaints will be addressed on a case-by-case basis, rather than as larger-scale projects that are being conceptualized here.

### C. Field Observations

The initial field observations were conducted in dry weather, which allowed the identification of obvious drainage problems. Each of the identified problem areas was visited and documented with notes and photographs. It was evident that many of the individual resident complaints were the result of inoperative swale systems. The loss of swale function was observed in most cases to be the result of landscaping that had been planted by adjacent homeowners, or simply sod, grass, and/or soil accumulation that resulted in the swales being at a higher elevation than the adjacent driveways. These conditions cause the drives and roads to flood before the elevated swales. Another common observation was of older systems consisting of dry wells, that is, inlets that have no outfall. Dry wells serve as holes for the storage of runoff until it seeps into the ground below them. Inlets with very small grates, possibly too small to accommodate their drainage area were also observed, as were other inlets in need of cleaning and/or maintenance. High

water marks were observed in some locations, indicating that ponding had occurred to that observed level during a prior rainfall event.

For the areas where swale degradation on individual lots appeared to be the primary cause of the ponding complaints, it was discussed and agreed with the City that no conceptual project development was necessary. Several of the initially identified areas were eliminated for this reason or because the problem had already been addressed by the City or a resident.

The next occurrence of field observations occurred during a rainfall event in February 2008, when the City received approximately 3”- 4” of rain. Again, the identified problem areas were visited and documented with notes and photographs. In all cases the rainfall confirmed the reported problem(s). While driving from one location to another, two additional problem areas were identified, documented, and after discussion with the City, were added to the list of potential project areas.

#### **D. Conceptual Projects Development/Cost Estimates/Water Quality Impacts**

A team of three engineers conducted the field observations, reviewed the documentation, and discussed possible solutions to the observed problems. This approach allowed informed discussion of viable corrective measures that were ultimately developed into a conceptual project for each area. It was noted, due to missing information (location of other utilities, specific topographic data, pipe conditions (in some cases), soil conditions, drainage areas, etc.), that projects being proposed should be considered only conceptual at this time.

It is anticipated that the preliminary engineering for most of these projects will include geotechnical testing of the soils, surveying (including other existing utility information) and proposed system analyses. This information is necessary to determine if the conceptual project is viable given specific site conditions. It is not unusual for this additional information to result in the modification of some of the proposed conceptual improvements, in order to accommodate site conditions. In many cases, additional information will allow for an improved design that may not have been considered before the confirmation of the facts. It is important that the City recognize this possibility and be open to future solutions that may be offered for the problem areas. It is anticipated that during the preliminary engineering phase, calculations will be performed on the level of service provided by the existing system and the level that will be achieved by the proposed system. These analyses will indicate whether the proposed improvements will achieve the level of service targeted by the City for that particular use (parking lot, local street, collector road, etc.) or whether additional improvements are needed.

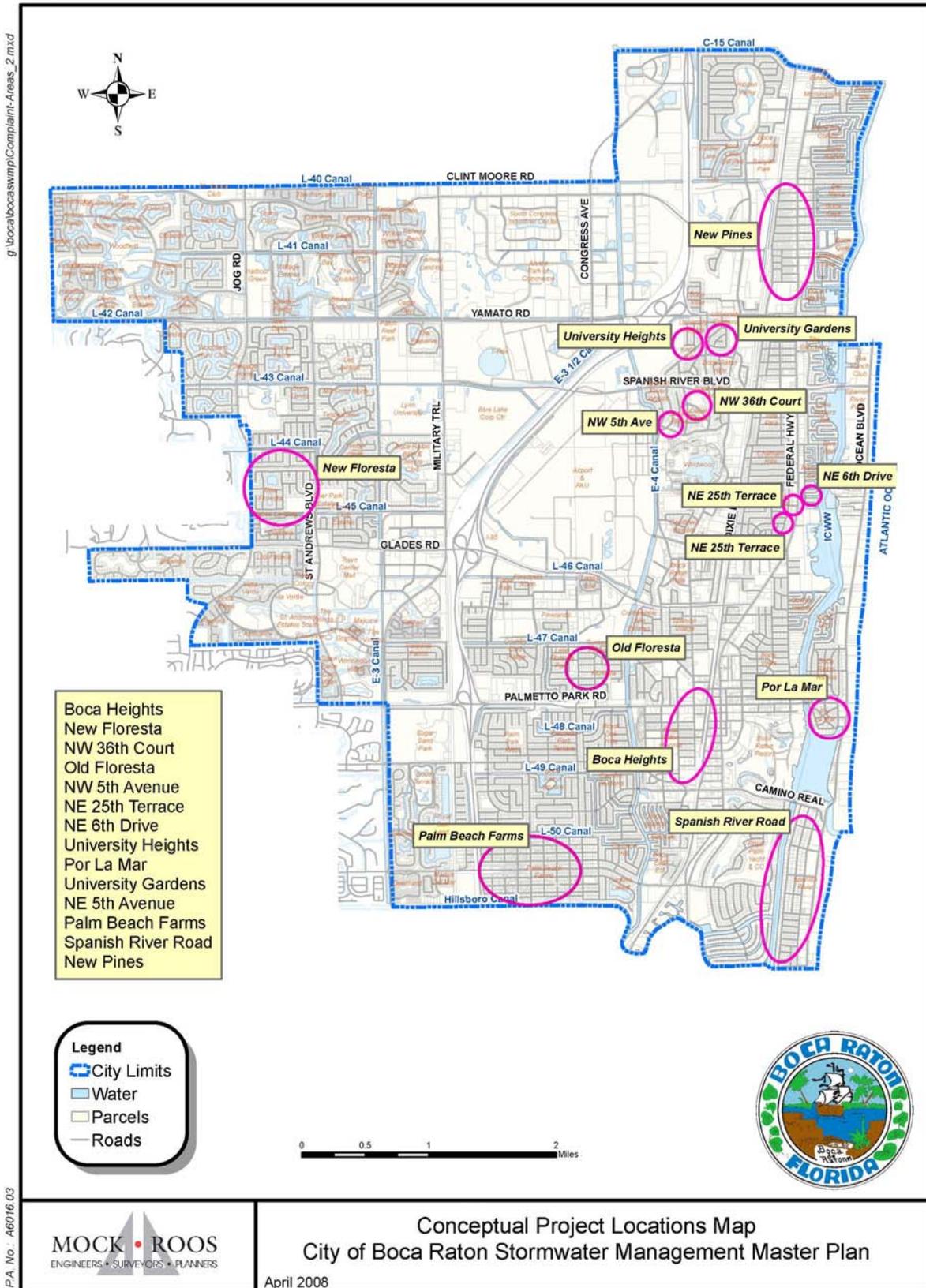
Based upon the conceptual nature of the proposed improvements, conceptual-level opinions of construction cost were prepared. Unit prices were based on information available for recently bid and constructed stormwater projects and/or information gathered from contractors and their suppliers. This conceptual level of accuracy represents an “order of magnitude” estimate which will allow the City to budget for completion of the design and construction.

During the development of the conceptual projects, an effort was made to incorporate water quality improvements to each project. In general, dry retention/detention areas and exfiltration trench were the

water quality systems initially considered. In the majority of areas, no positive outfall currently exists; the runoff is intended to infiltrate the ground. This type of stormwater management system inherently includes a water quality improvement mechanism by allowing runoff to be filtered by the soil before reaching the ground water surface, or by allowing nutrients to be taken up by the vegetation. In many cases, the conceptual projects do not provide additional water quality, but they do maintain or enhance the stormwater runoff's ability to infiltrate the ground, rather than pond in streets and drives.

The conceptual project locations are shown and listed on the following figure. A description, photographs, an exhibit of the conceptual project, and the conceptual cost estimate for each conceptual project follow. The existing City-owned utilities shown on the exhibits were provided by the City during the Task 1 phase.

The Boca Heights neighborhood has had historic flooding problems. The City Utility Department has been negotiating with its water/sewer consulting engineer for a water and sewer rehabilitation project in the Boca Heights neighborhood that will also include stormwater improvements. Although this project is entering the design phase, the City requested that it be included in the Stormwater Management Master Plan. The location of the project area is shown on the following map.



## **New Floresta Stormwater Management System Improvements**

*Reported Problem(s):* A portion of the system experiences flooding, which is sometimes quite severe, along the west end of Potomac Road and at the intersection of Potomac Road and NW 27<sup>th</sup> Avenue.

*System Description:* The stormwater management system serving New Floresta and the adjacent Potomac Road is permitted by SFWMD under Permit No. 50-00645-S. The system consists of a series of inlets and pipes discharging to two, inter-connected lakes within the development. A control structure from the south lake to the L-45 Canal provides ultimate discharge from the system. It appears that the flooding along Potomac Road is a result of insufficient conveyance to the lake system that is designed to serve it. There are also some reports of internal roads that have flooded when the lakes are high.

*Conceptual Solution(s):* The recommended conceptual solution for the current flooding problem is to add inlets, manholes, piping, and exfiltration trench along the south side of Potomac Road between Jog Road and entrance to the development. The trench system will be inter-connected with the balance of the system on Potomac Road and within the development. As an additional improvement, to reduce the duration of ponding in the lakes and streets, it is also recommended that an operable control structure be installed to replaced the existing structure. An operable structure would allow authorized (by Lake Worth Drainage District) pre-storm and post-storm discharge.

It is recommended that the preliminary engineering for this project include a re-evaluation of the existing pipe sizing calculations to verify that the protection provided meets at least the 3-year/1-day protection standard.

*Water Quality Impacts:* The proposed conceptual solution is anticipated to have a positive impact on water quality. Runoff will more readily enter the ground water system than it currently does. This results in less travel time over potentially contaminated roadway surface.

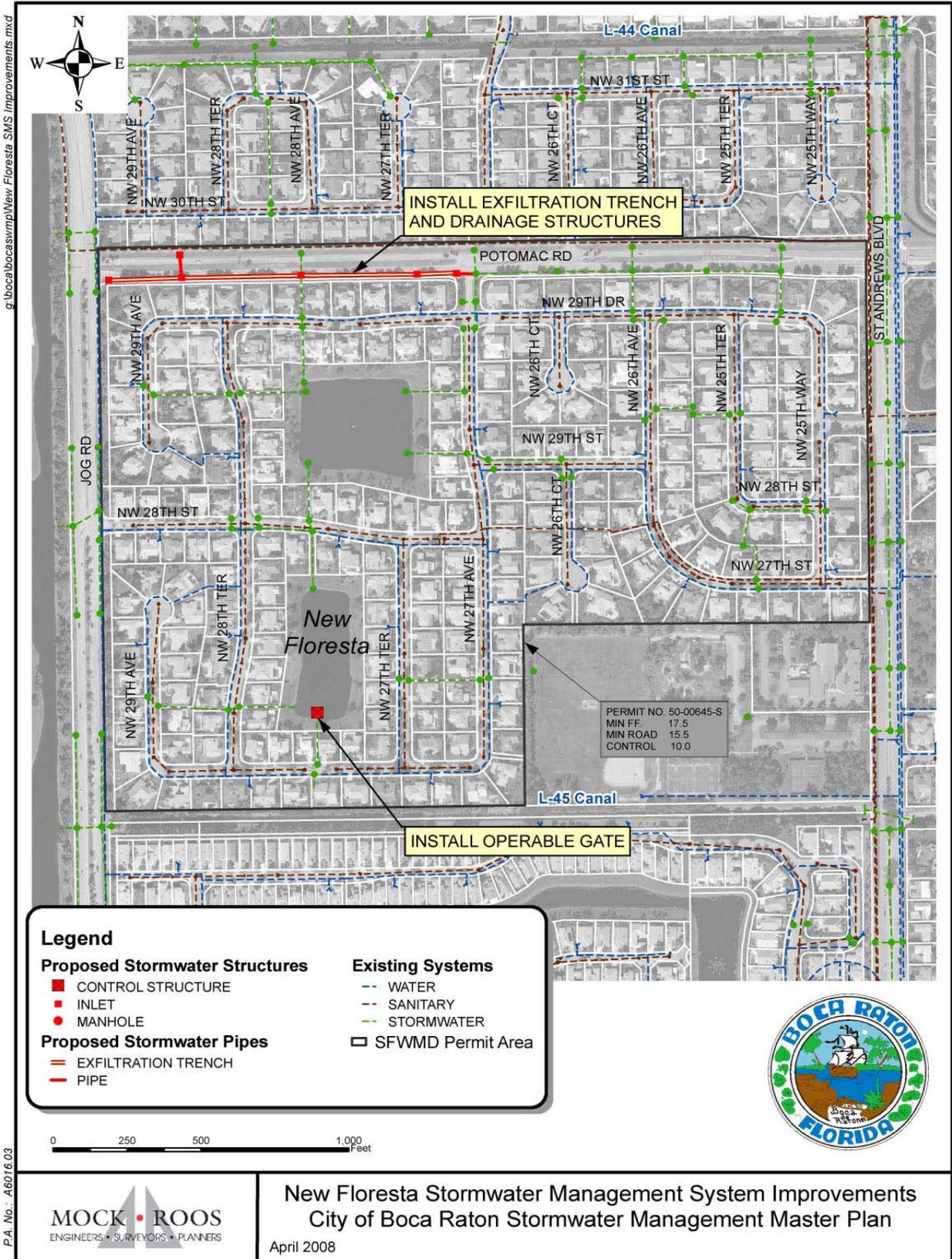
## New Floresta Stormwater Management System Improvements



Potomac Road, looking east (from near western-most inlet)



Potomac Road, looking west (from intersection with NW 27<sup>th</sup> Ave.)



**New Floresta Stormwater Management System Improvements**  
**Engineer's Opinion of Conceptual Costs**  
**City of Boca Raton Stormwater Management Master Plan**

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
1.	Mobilization	1	LS	\$25,000	\$25,000
2.	Maintenance of Traffic	1	LS	\$10,000	\$10,000
3.	Preconstruction Video	1	LS	\$1,500	\$1,500
4.	Survey & Layout	1	LS	\$5,000	\$5,000
5.	Record Drawings	1	LS	\$1,500	\$1,500
6.	Clearing & Grubbing	1	LS	\$10,000	\$10,000
7.	Remove Exist. Sidewalk	6200	SF	\$2	\$12,400
8.	Remove Exist. Header Curb	30	LF	\$10	\$300
9.	Inlet, Type C	6	EA	\$4,000	\$24,000
10.	Connect to Exist. Inlet	1	EA	\$2,500	\$2,500
11.	Exfiltration Trench, 18" RCP	1200	LF	\$120	\$144,000
12.	Reinforced Concrete Pipe, 18"	150	LF	\$60	\$9,000
13.	Concrete Sidewalk	700	SY	\$40	\$28,000
14.	Header Curb	30	LF	\$15	\$450
15.	Pavement Restoration (Pipe Crossings)	275	SY	\$35	\$9,625
16.	Pavement Restoration (South Lane)	1500	SY	\$25	\$37,500
17.	Sodding (Floritam)	1350	SY	\$6	\$8,100
18.	Remove & Replace Traffic Sign	1	EA	\$250	\$250
19.	Replace Pavement Markings	1	LS	\$200	\$200
20.	Irrigation Restoration	1	LS	\$6,075	\$6,075
Subtotal					\$335,400
Contingency (15%)					\$50,310
<b>Construction Total</b>					<b>\$385,710</b>
Engineering, Legal, & Misc. Costs (20%)					\$77,142
<b>Rounded Project Total</b>					<b>\$470,000</b>
	Add Operable Control Structure	1	EA	\$30,000	\$30,000
<b>Alternate Project Total</b>					<b>\$500,000</b>

**Note:** The above costs are based on a conceptual layout of the stormwater system for this area. As such, they are subject to change depending on the final scope of the project that is designed and constructed as well as other factors. Estimate is in 2008 dollars.

## **NW 36th Court Stormwater System Improvements**

*Reported Problem(s):* The reported problems are road, yard, and driveway flooding along the southwest side of the road, particularly severe at house number 370.

*System Description:* There is no apparent stormwater management system along NW 36<sup>th</sup> Court between NW 3<sup>rd</sup> and NW 4<sup>th</sup> Avenues. Site observation indicates that the road cross slopes to the southwest side, and along the alignment, slopes to low point at or near house number 370. The adjacent house to the west, has a paved swale area in the right-of-way.

*Conceptual Solution(s):* The recommended conceptual improvement is to install inlets and exfiltration trench along the southwest side of the road, re-grade the grassed area on the northeast side of the road as a retention area, and connect the exfiltration trench to the retention area via a pipe under the road.

*Water Quality Impacts:* The proposed conceptual solution is anticipated to have a positive impact on water quality. Runoff will more readily enter the ground water system than it currently does. This results in less travel time over potentially contaminated ground surface.

### NW 36th Court Stormwater System Improvements



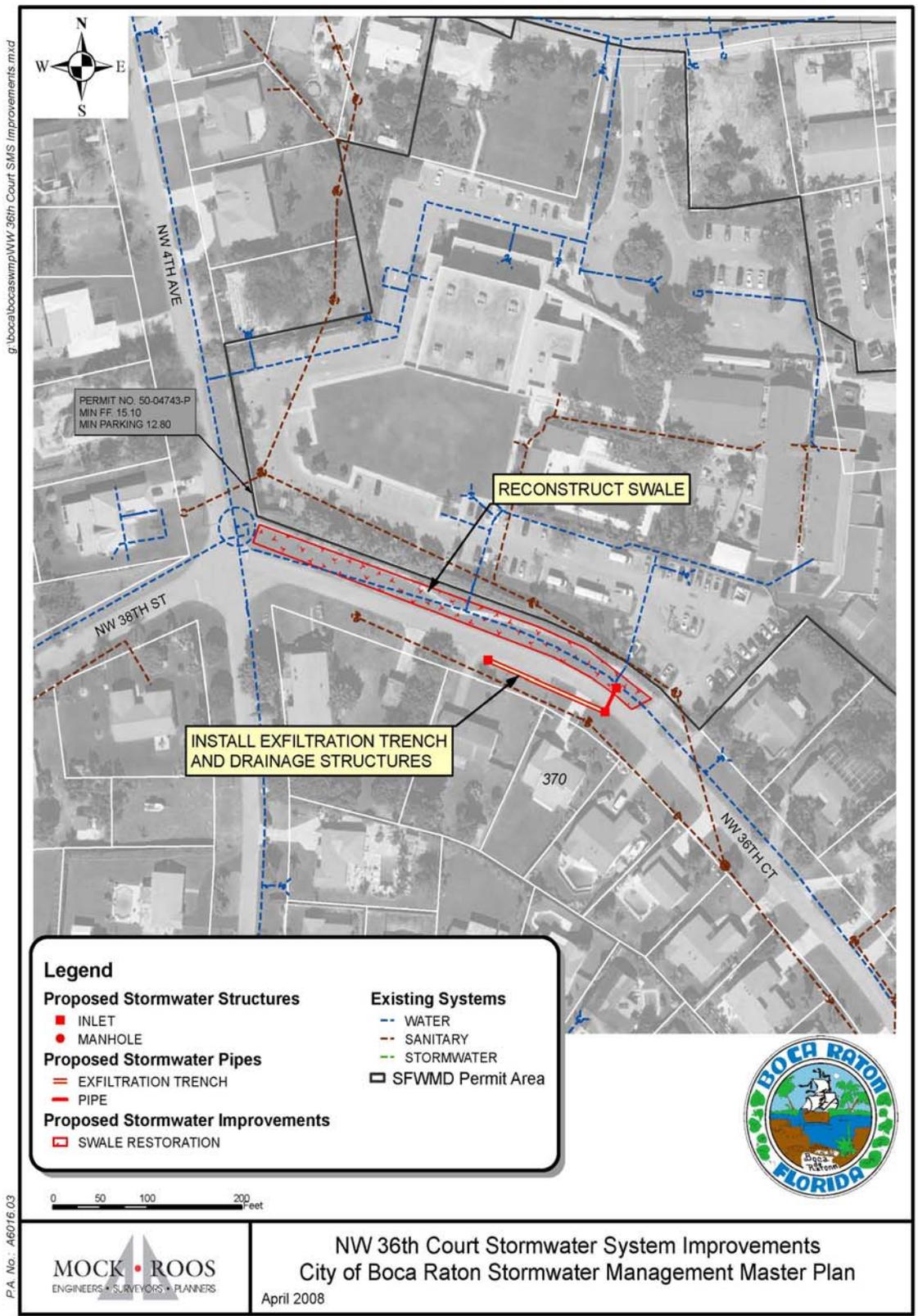
Looking south at flooding



Homeowner photo of flooding



Grass area on northeast side of NW 36<sup>th</sup> Court (area proposed for retention area)



**NW 36th Court Stormwater System Improvements  
Engineer's Opinion of Conceptual Costs  
City of Boca Raton Stormwater Management Master Plan**

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
1.	Mobilization	1	LS	\$5,000	\$5,000
2.	Maintenance of Traffic	1	LS	\$3,000	\$3,000
3.	Preconstruction Video	1	LS	\$200	\$200
4.	Survey & Layout	1	LS	\$600	\$600
5.	Record Drawings	1	LS	\$200	\$200
6.	Clearing & Grubbing	1	LS	\$5,000	\$5,000
7.	Remove Exist. Sidewalk	550	SF	\$2	\$1,100
8.	Inlet, Type C	3	EA	\$4,000	\$12,000
9.	Exfiltration Trench, 18" RCP	135	LF	\$120	\$16,200
10.	Reinforced Concrete Pipe, 18"	30	LF	\$60	\$1,800
11.	Concrete Sidewalk	60	SY	\$40	\$2,400
12.	Concrete Driveway	35	SY	\$50	\$1,750
13.	Pavement Restoration (Pipe Crossing)	30	SY	\$35	\$1,050
14.	Sodding (Floritam)	1150	SY	\$6	\$6,900
15.	Irrigation Restoration	1	LS	\$5,175	\$5,175
Subtotal					\$62,375
Contingency (15%)					\$9,356
<b>Construction Total</b>					<b>\$71,731</b>
Engineering, Legal, & Misc. Costs (20%)					\$14,346
<b>Rounded Project Total</b>					<b>\$87,000</b>

**Note:** The above costs are based on a conceptual layout of the stormwater system for this area. As such, they are subject to change depending on the final scope of the project that is designed and constructed as well as other factors. Estimate is in 2008 dollars.

## Old Floresta Area Stormwater Management Improvements

*Reported Problem(s):* The complaints on Aurelia Street (a/k/a NW 5th Street) and Hibiscus Street have been many since 1994. Severe ponding was also noted at the east end of these two streets during a February 2008 rainfall event.

*System Description:* There is no drainage system in this area. It appears that the original intent was for swales to accommodate the stormwater runoff. The City's right-of-way along these two streets has almost entirely been encroached upon by the adjacent homeowners with extensive amounts of landscaping.

*Conceptual Solution(s):* It is recognized that reclamation and restoration of the intended swales along these two streets would significantly alter the character of the streets and neighborhood. Furthermore, Aurelia and Hibiscus Streets, as well as NW 8<sup>th</sup> and 9<sup>th</sup> Avenues have existing utilities beneath them that severely restrict the addition of any additional utility lines, such as for stormwater collection. Given these limitations, the recommended conceptual improvement for this area is the consideration of a pervious pavement system for Aurelia and Hibiscus Streets, as well as the right-of-way along NW 8<sup>th</sup> Avenue, between Periwinkle and Oleander Streets. Pervious pavement technology has been used successfully for many years and is gaining popularity in Florida as a stormwater management tool.

*Water Quality Impacts:* The proposed conceptual solution is anticipated to have a positive impact on water quality. Runoff will more readily enter the ground water system than it currently does. This results in less travel time over potentially contaminated ground surface.

### Old Floresta Area Stormwater Management Improvements



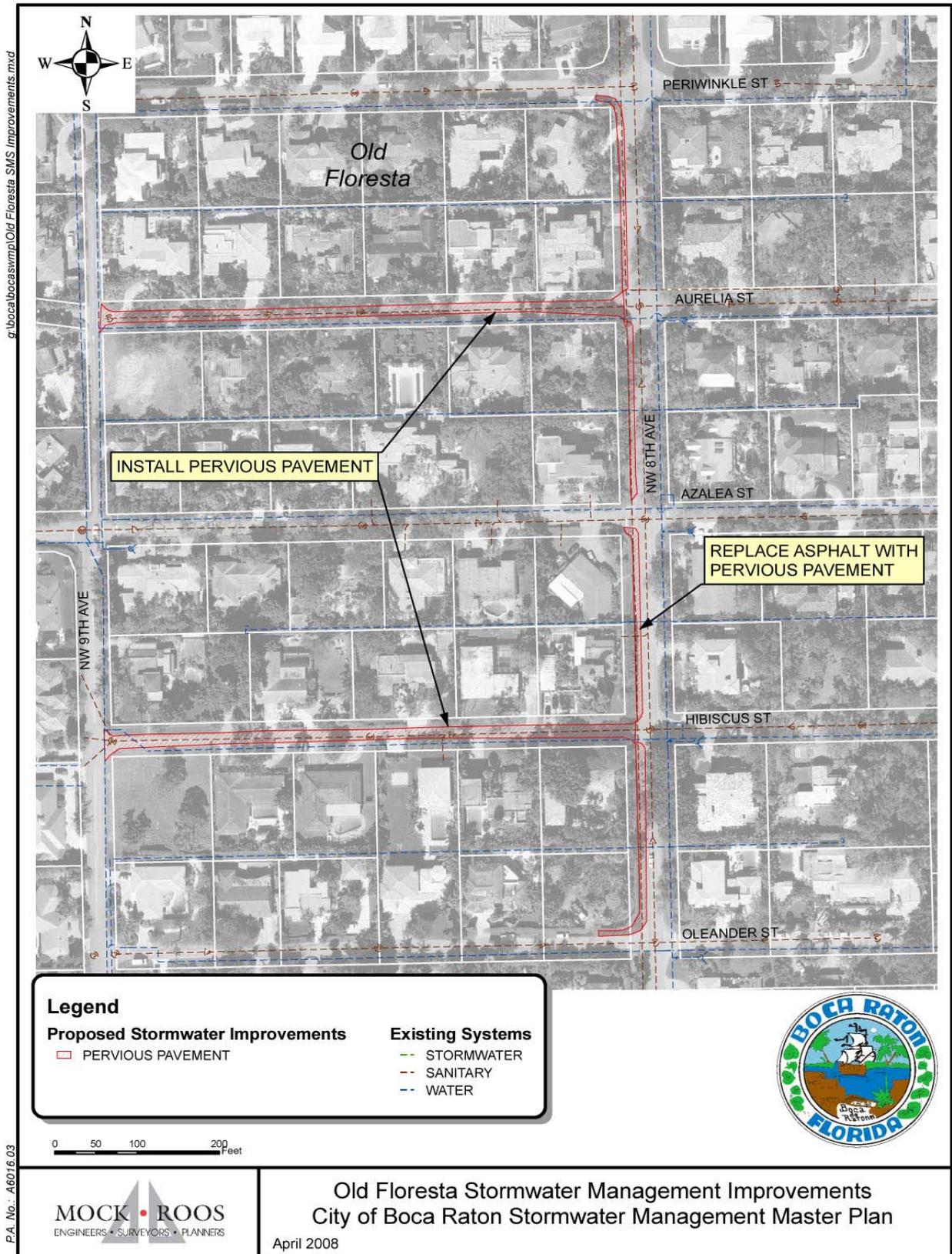
Flooding on Hibiscus Street, looking east



Flooding at intersection of Aurelia Street and NW 8<sup>th</sup> Avenue, looking west



NW 8<sup>th</sup> Avenue, looking south (from near Periwinkle Street)



**Old Floresta Area Stormwater Management Improvements  
Engineer's Opinion of Conceptual Costs  
City of Boca Raton Stormwater Management Master Plan**

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
1.	Mobilization	1	LS	\$15,000	\$15,000
2.	Maintenance of Traffic	1	LS	\$5,000	\$5,000
3.	Preconstruction Video	1	LS	\$1,500	\$1,500
4.	Survey & Layout	1	LS	\$5,000	\$5,000
5.	Record Drawings	1	LS	\$1,500	\$1,500
6.	Clearing & Grubbing	1	LS	\$15,000	\$15,000
7.	Pervious Pavement	2950	SY	\$60	\$177,000
8.	Remove & Replace Traffic Sign	4	EA	\$200	\$800
9.	Replace Pavement Markings	1	LS	\$400	\$400
Subtotal					\$221,200
Contingency (15%)					\$33,180
<b>Construction Total</b>					<b>\$254,380</b>
Engineering, Legal, & Misc. Costs (20%)					\$50,876
<b>Rounded Project Total</b>					<b>\$310,000</b>

**Note:** The above costs are based on a conceptual layout of the stormwater system for this area. As such, they are subject to change depending on the final scope of the project that is designed and constructed as well as other factors. Estimate is in 2008 dollars.

## **NW 5th Avenue Stormwater System Improvements**

*Reported Problem(s):* Ponding occurs regularly at the corner of NW 5<sup>th</sup> Avenue and the short connector road considered part of NW 4<sup>th</sup> Court.

*System Description:* There is an inlet on the southeast corner of this intersection. This structure has a pipe connection to the west; but across the street, where a second inlet would be expected, there is a newly reconstructed driveway and small landscaped island. It is presumed that an inlet in this area has been filled or covered over. The ultimate outfall, if any, is unknown.

*Conceptual Solution(s):* The recommended conceptual project is to construct a dry retention area along the northwest side of NW 5<sup>th</sup> Avenue, just north of NW 35<sup>th</sup> Street. (The City has a 100-foot right-of-way for NW 5<sup>th</sup> Avenue and currently uses only about 20 feet for the existing road.) A pair of new inlets at the problem intersection is proposed to be connected, via a bubble-up structure, to the dry retention area.

*Water Quality Impacts:* The proposed conceptual solution is anticipated to have a positive impact on water quality. Runoff will more readily enter the ground water system than it currently does. This results in less travel time over potentially contaminated ground surface.

### NW 5th Avenue Stormwater System Improvements



Ponding along NW 5<sup>th</sup> Avenue, looking south



Flooding at inlet adjacent to the intersection of NW 5<sup>th</sup> Avenue and NW 4<sup>th</sup> Court



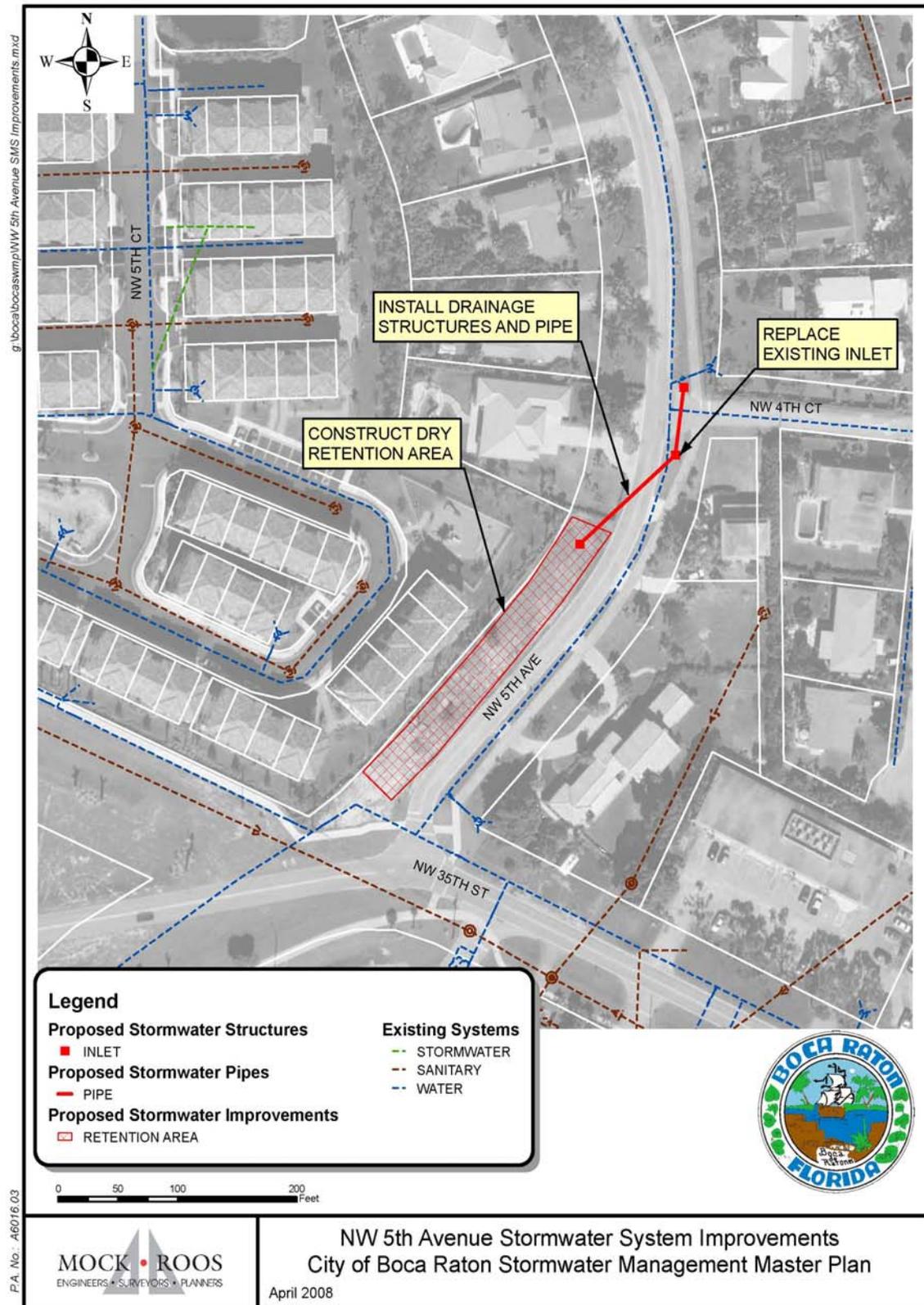
Flooding at the intersection of NW 5<sup>th</sup> Avenue and NW 4<sup>th</sup> Court, looking west



Grassed area at the intersection of NW 5th Avenue and NW 35<sup>th</sup> Street, looking south



Grassed area at the intersection of NW 5<sup>th</sup> Avenue and NW 35<sup>th</sup> Street, looking north



**NW 5th Avenue Stormwater System Improvements  
Engineer's Opinion of Conceptual Costs  
City of Boca Raton Stormwater Management Master Plan**

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
1.	Mobilization	1	LS	\$4,000	\$4,000
2.	Maintenance of Traffic	1	LS	\$3,000	\$3,000
3.	Preconstruction Video	1	LS	\$400	\$400
4.	Survey & Layout	1	LS	\$1,600	\$1,600
5.	Record Drawings	1	LS	\$400	\$400
6.	Clearing & Grubbing	1	LS	\$5,000	\$5,000
7.	Excavation	1000	CY	\$15	\$15,000
8.	Inlet, Type C	3	EA	\$4,000	\$12,000
9.	Reinforced Concrete Pipe, 18"	125	LF	\$60	\$7,500
10.	Sodding (Floritam)	1275	SY	\$6	\$7,650
11.	Irrigation Restoration	1	LS	\$5,738	\$5,738
Subtotal					\$62,288
Contingency (15%)					\$9,343
<b>Construction Total</b>					<b>\$71,631</b>
Engineering, Legal, & Misc. Costs (20%)					\$14,326
<b>Rounded Project Total</b>					<b>\$86,000</b>

**Note:** The above costs are based on a conceptual layout of the stormwater system for this area. As such, they are subject to change depending on the final scope of the project that is designed and constructed as well as other factors. Estimate is in 2008 dollars.

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## **NE 25th Terrace Stormwater Management Improvements**

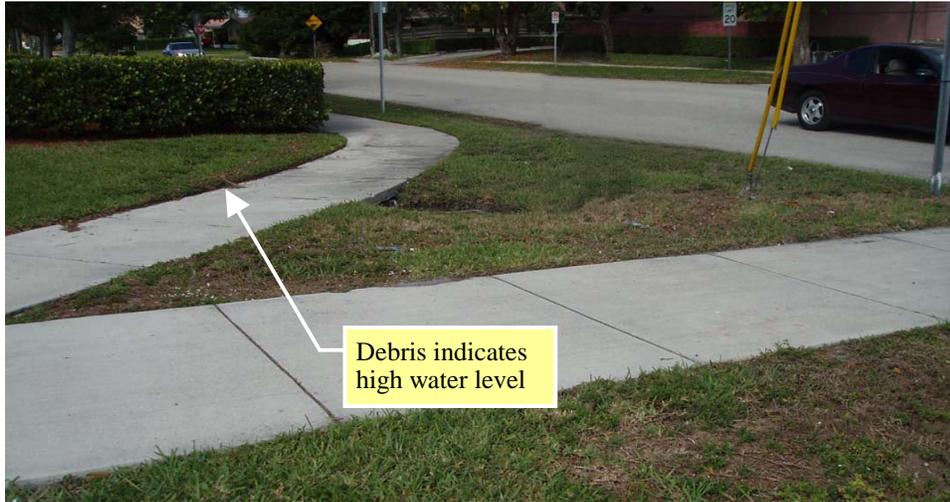
*Reported Problem(s):* NE 25th Terrace experiences severe flooding at the east end near the intersection with Federal Highway. This was evident from the high water marks that extended beyond the back of sidewalk on the southwest corner of the intersection.

*System Description:* The east end of NE 25<sup>th</sup> Terrace (at the intersection) is the low point and water must pond to reach either of the swales (north or south) on Federal Highway. A pair of inlets and exfiltration trench was installed along the south side of NE 25<sup>th</sup> Terrace (presumably when the southwest corner property was developed). It appears that this system is inadequate to handle the volume of runoff that collects in this location.

*Conceptual Solution(s):* The recommended conceptual project is the installation of additional inlets and exfiltration trench along the north side of NE 25<sup>th</sup> Terrace. It appears that the trench could extend all the way west to NE 5<sup>th</sup> Avenue, which would provide a greater level of service than a shorter run of trench.

*Water Quality Impacts:* The proposed conceptual solution is anticipated to have a positive impact on water quality. Runoff will more readily enter the ground water system than it currently does. This results in less travel time over potentially contaminated ground surface.

### NE 25th Terrace Stormwater Management Improvements



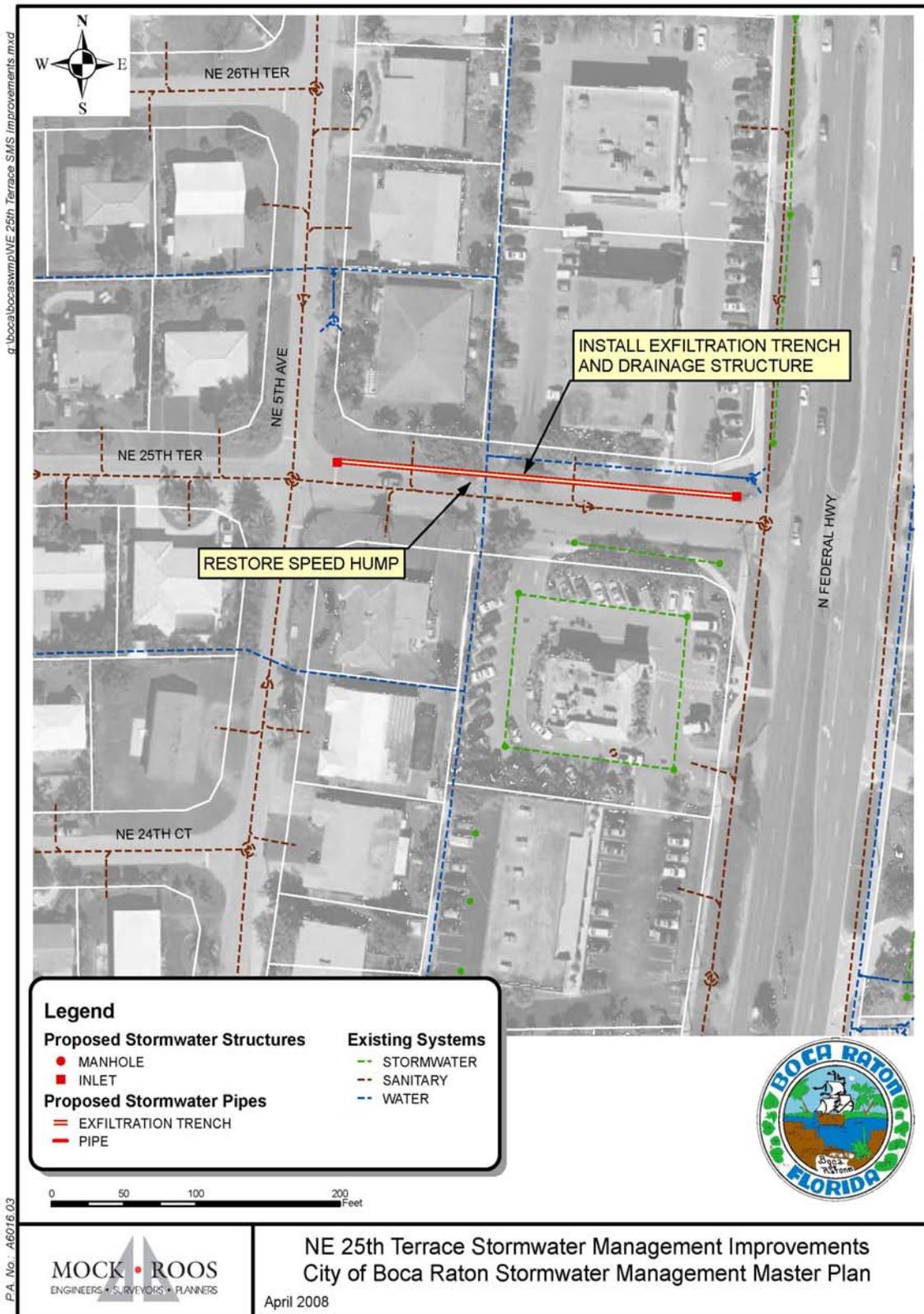
Southwest corner at intersection of NE 25<sup>th</sup> Terrace and Federal Highway, looking west



Southwest corner at intersection of NE 25<sup>th</sup> Terrace and Federal Highway, looking north



NE 25<sup>th</sup> Terrace just west of Federal Highway, looking northeast



**NE 25th Terrace Stormwater Management Improvements  
Engineer's Opinion of Conceptual Costs  
City of Boca Raton Stormwater Management Master Plan**

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
1.	Mobilization	1	LS	\$7,500	\$7,500
2.	Maintenance of Traffic	1	LS	\$5,000	\$5,000
3.	Preconstruction Video	1	LS	\$400	\$400
4.	Survey & Layout	1	LS	\$1,500	\$1,500
5.	Record Drawings	1	LS	\$400	\$400
6.	Clearing & Grubbing	1	LS	\$7,500	\$7,500
7.	Inlet, Type C	2	EA	\$4,000	\$8,000
8.	Exfiltration Trench, 24" RCP	300	LF	\$140	\$42,000
9.	Reinforced Concrete Pipe, 24"	10	LF	\$80	\$800
10.	Asphalt Driveway	100	SY	\$40	\$4,000
11.	Pavement Restoration (North Lane)	500	SY	\$25	\$12,500
12.	Sodding (Floritam)	5	SY	\$6	\$30
13.	Remove & Replace Traffic Sign	1	EA	\$250	\$250
14.	Replace Pavement Markings	1	LS	\$200	\$200
15.	Irrigation Restoration	1	LS	\$23	\$23
Subtotal					\$90,103
Contingency (15%)					\$13,515
<b>Construction Total</b>					<b>\$103,618</b>
Engineering, Legal, & Misc. Costs (20%)					\$20,724
<b>Rounded Project Total</b>					<b>\$130,000</b>

**Note:** The above costs are based on a conceptual layout of the stormwater system for this area. As such, they are subject to change depending on the final scope of the project that is designed and constructed as well as other factors. Estimate is in 2008 dollars.

## **NE 6th Drive Stormwater System Improvements**

*Reported Problem(s):* No problems have been reported on this street; however, during a February 2008 rainfall event, ponding was observed on the street between Broadview and Harbour Drives.

*System Description:* The City's GIS indicates that there are inlets and piping that outfall to the Intracoastal Waterway ("ICWW") on the east side of the street; however, field observation indicates that the ponding at the intersections can not reach the inlets.

*Conceptual Solution(s):* The recommended conceptual improvement is the addition of inlets at the intersections and piping and exfiltration trench that connect to the existing outfall.

*Water Quality Impacts:* The proposed conceptual solution includes the use of exfiltration trench to provide added water quality to the system.

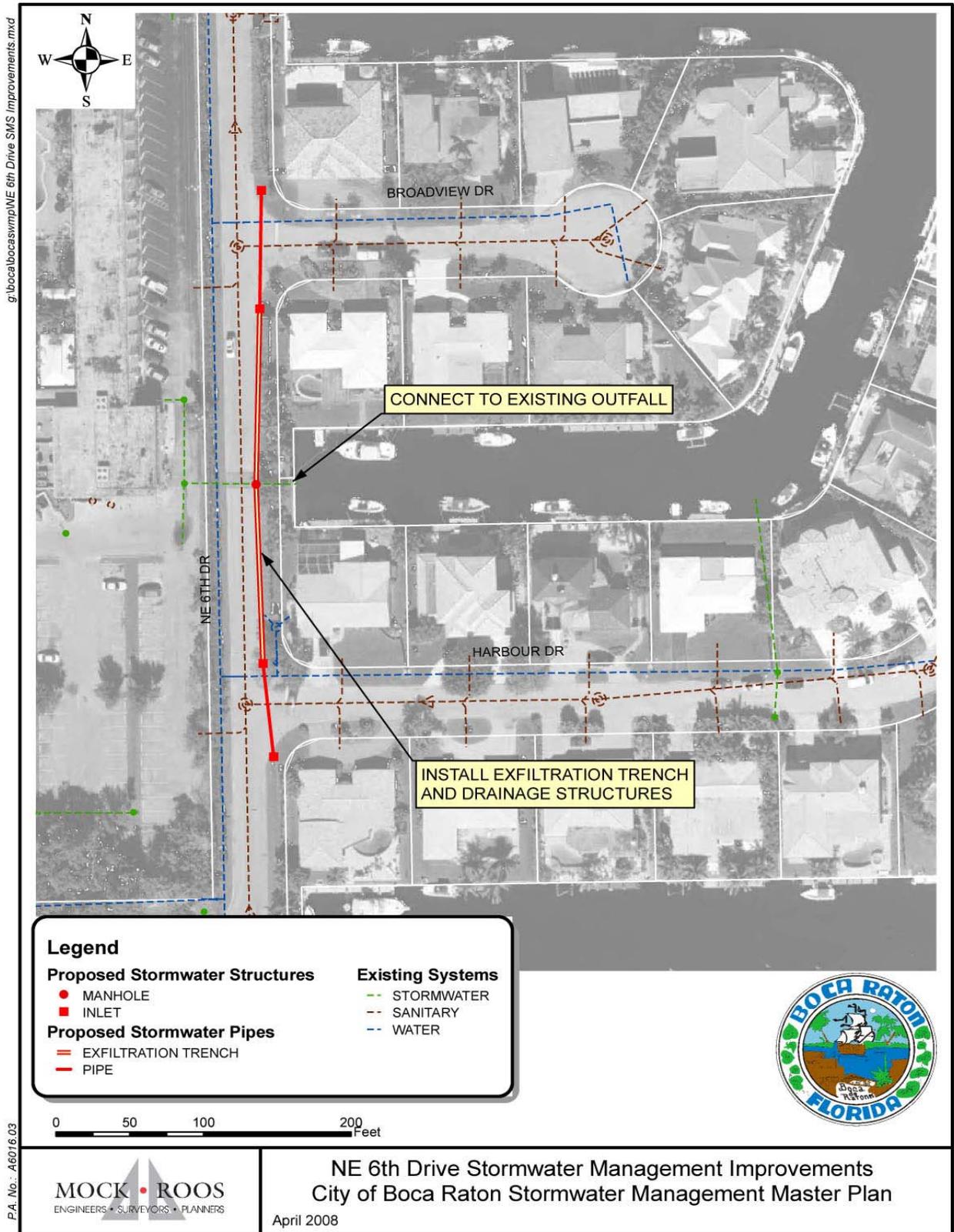
### NE 6th Drive Stormwater System Improvements



Flooding at intersection of Broadview Drive and NE 6<sup>th</sup> Drive, looking west



NE 6<sup>th</sup> Drive, looking south



**NE 6th Drive Stormwater System Improvements  
Engineer's Opinion of Conceptual Costs  
City of Boca Raton Stormwater Management Master Plan**

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
1.	Mobilization	1	LS	\$10,000	\$10,000
2.	Maintenance of Traffic	1	LS	\$5,000	\$5,000
3.	Preconstruction Video	1	LS	\$350	\$350
4.	Survey & Layout	1	LS	\$1,400	\$1,400
5.	Record Drawings	1	LS	\$350	\$350
6.	Clearing & Grubbing	1	LS	\$7,500	\$7,500
7.	Inlet, Type C	4	EA	\$4,000	\$16,000
8.	Manhole, Type 7	1	EA	\$5,000	\$5,000
9.	Exfiltration Trench, 18" RCP	250	LF	\$120	\$30,000
10.	Reinforced Concrete Pipe, 18"	200	LF	\$60	\$12,000
11.	Pavement Restoration (Pipe Crossings)	464	SY	\$35	\$16,240
12.	Pavement Restoration (East Lane)	150	SY	\$25	\$3,750
13.	Sodding (Floritam)	500	SY	\$6	\$3,000
14.	Remove & Replace Traffic Sign	2	EA	\$250	\$500
15.	Replace Pavement Markings	1	LS	\$200	\$200
16.	Irrigation Restoration	1	LS	\$2,250	\$2,250
Subtotal					\$113,540
Contingency (15%)					\$17,031
<b>Construction Total</b>					<b>\$130,571</b>
Engineering, Legal, & Misc. Costs (20%)					\$26,114
<b>Rounded Project Total</b>					<b>\$160,000</b>

**Note:** The above costs are based on a conceptual layout of the stormwater system for this area. As such, they are subject to change depending on the final scope of the project that is designed and constructed as well as other factors. Estimate is in 2008 dollars.

## **University Heights Stormwater System Improvements**

*Reported Problem(s):* There was no reported problem in this area, however, during a February, 2008 rainfall event, significant flooding was observed at the intersection of NW 5<sup>th</sup> Lane and NW 46<sup>th</sup> Street.

*System Description:* There is no stormwater management system in this neighborhood. Site observation appears to indicate that the intention was for roadway runoff to drain from the pavement to the adjacent grassed areas.

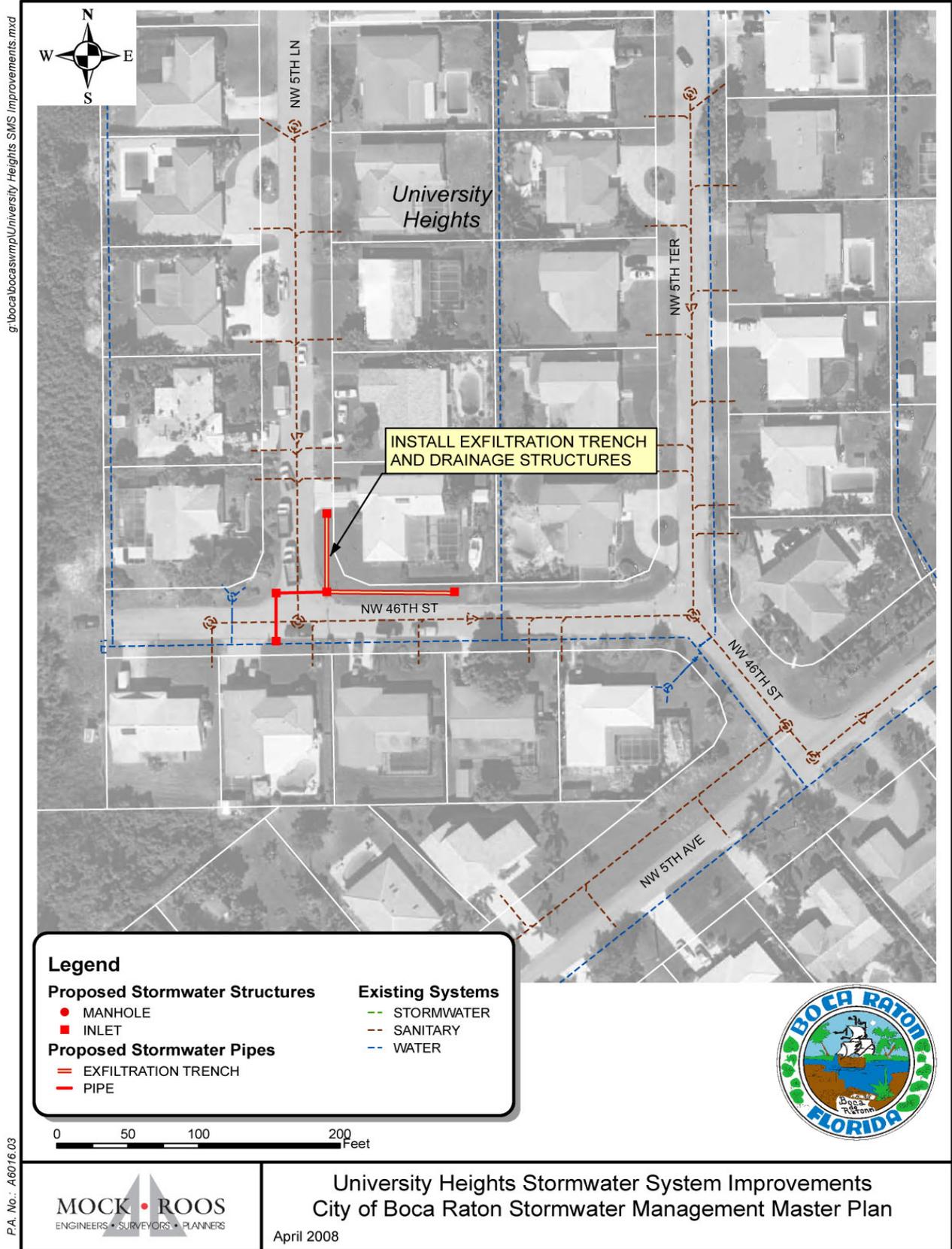
*Conceptual Solution(s):* The recommended conceptual improvement is to add inlets, manholes, and exfiltration trench at the corner of NW 5<sup>th</sup> Lane and NW 46<sup>th</sup> Street to minimize roadway ponding.

*Water Quality Impacts:* The proposed conceptual solution is anticipated to have a positive impact on water quality. Runoff will more readily enter the ground water system than it currently does. This results in less travel time over potentially contaminated ground surface.

## University Heights Stormwater System Improvements



Flooding at the intersection of NW 46th Street and NW 5th Lane, looking west



**University Heights Stormwater System Improvements  
Engineer's Opinion of Conceptual Costs  
City of Boca Raton Stormwater Management Master Plan**

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
1.	Mobilization	1	LS	\$5,000	\$5,000
2.	Maintenance of Traffic	1	LS	\$3,000	\$3,000
3.	Preconstruction Video	1	LS	\$200	\$200
4.	Survey & Layout	1	LS	\$800	\$800
5.	Record Drawings	1	LS	\$200	\$200
6.	Clearing & Grubbing	1	LS	\$5,000	\$5,000
7.	Inlet, Type C	5	EA	\$4,000	\$20,000
8.	Exfiltration Trench, 18" RCP	150	LF	\$120	\$18,000
9.	Reinforced Concrete Pipe, 18"	75	LF	\$60	\$4,500
10.	Pavement Restoration (Pipe Crossings)	100	SY	\$35	\$3,500
11.	Sodding (Floritam)	200	SY	\$6	\$1,200
12.	Remove & Replace Traffic Sign	1	EA	\$250	\$250
13.	Replace Pavement Markings	1	LS	\$200	\$200
14.	Irrigation Restoration	1	LS	\$900	\$900
Subtotal					\$62,750
Contingency (15%)					\$9,413
<b>Construction Total</b>					<b>\$72,163</b>
Engineering, Legal, & Misc. Costs (20%)					\$14,433
<b>Rounded Project Total</b>					<b>\$87,000</b>

**Note:** The above costs are based on a conceptual layout of the stormwater system for this area. As such, they are subject to change depending on the final scope of the project that is designed and constructed as well as other factors. Estimate is in 2008 dollars.

## **Por La Mar Stormwater Management System Improvements**

*Reported Problem(s):* City staff has indicated that there is repeated flooding at the intersection of Palm Avenue and Wavecrest Way. During a rainfall event in February 2008, ponding was also observed along Wavecrest from the intersection south to the corner of the road.

*System Description:* From field observation, it appears that this intersection was intended to drain south along the roadway to inlets at the south end that outfall into the ICWW.

*Conceptual Solution(s):* The recommended conceptual project for this area is to add inlets at the intersection of Palm and Wavecrest, construct exfiltration trench along Wavecrest to the south, and connect to the outfall to the ICWW.

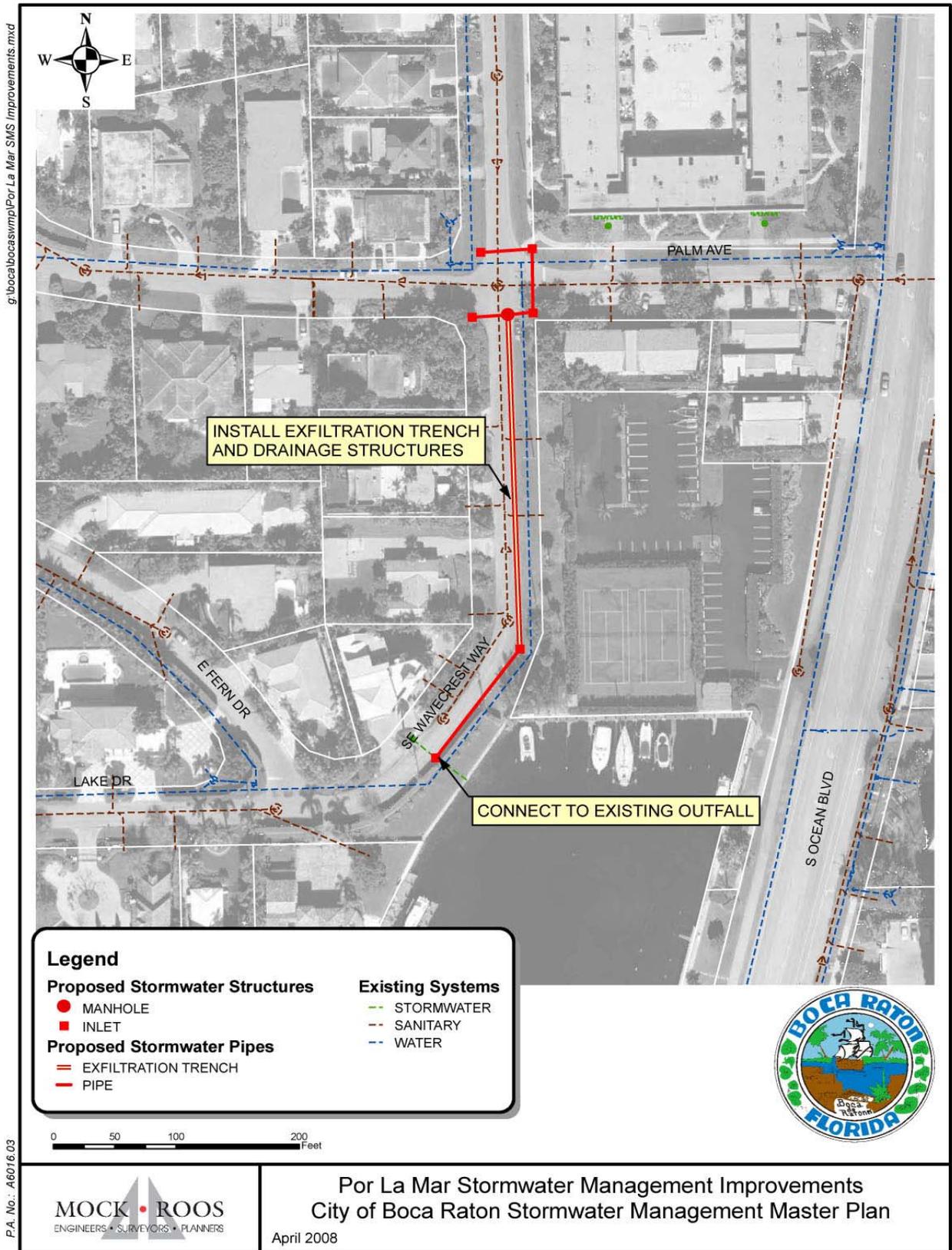
*Water Quality Impacts:* The proposed conceptual solution is anticipated to have a positive impact on water quality. Runoff will more readily enter the ground water system than it currently does. This results in less travel time over potentially contaminated ground surface.

### Por La Mar Stormwater Management System Improvements



Flooding at intersection of SE Wavecrest Way and Palm Avenue, looking southwest





**Por La Mar Stormwater Management System Improvements  
Engineer's Opinion of Conceptual Costs  
City of Boca Raton Stormwater Management Master Plan**

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
1.	Mobilization	1	LS	\$10,000	\$10,000
2.	Maintenance of Traffic	1	LS	\$5,000	\$5,000
3.	Preconstruction Video	1	LS	\$500	\$500
4.	Survey & Layout	1	LS	\$2,000	\$2,000
5.	Record Drawings	1	LS	\$500	\$500
6.	Clearing & Grubbing	1	LS	\$5,000	\$5,000
7.	Inlet, Type C	6	EA	\$4,000	\$24,000
8.	Manhole, Type 7	1	EA	\$5,000	\$5,000
9.	Clean Existing Outfall Pipe	50	LF	\$30	\$1,500
10.	Connect to Exist. Pipe	1	EA	\$2,500	\$2,500
11.	Exfiltration Trench, 18" RCP	275	LF	\$120	\$33,000
12.	Reinforced Concrete Pipe, 18"	275	LF	\$60	\$16,500
13.	Pavement Restoration (Pipe Crossings)	125	SY	\$35	\$4,375
14.	Pavement Restoration (East Lane)	400	SY	\$25	\$10,000
15.	Sodding (Floritam)	300	SY	\$6	\$1,800
16.	Remove & Replace Traffic Sign	2	EA	\$250	\$500
17.	Replace Pavement Markings	1	LS	\$400	\$400
18.	Irrigation Restoration	1	LS	\$1,350	\$1,350
Subtotal					\$123,925
Contingency (15%)					\$18,589
<b>Construction Total</b>					<b>\$142,514</b>
Engineering, Legal, & Misc. Costs (20%)					\$28,503
<b>Rounded Project Total</b>					<b>\$180,000</b>

**Note:** The above costs are based on a conceptual layout of the stormwater system for this area. As such, they are subject to change depending on the final scope of the project that is designed and constructed as well as other factors. Estimate is in 2008 dollars.

## University Gardens Stormwater System Improvements

*Reported Problem(s):* The problems reported in the area indicate ponding of stormwater runoff in the vicinity of the intersection of NW 46<sup>th</sup> Street and NW 2<sup>nd</sup> Terrace. This ponding was confirmed by observation during rainfall in February, 2008.

*System Description:* The existing stormwater management system in this area consists of degraded grass swale areas and isolated dry-wells with small inlet tops.

*Conceptual Solution(s):* The recommended conceptual project is to replace the existing inlets with new ones with larger tops, and connect them together via exfiltration trench under the grassed swale area in the road right-of-way, along the west side of NW 2<sup>nd</sup> Terrace and along the south side of NW 46<sup>th</sup> Street.

*Water Quality Impacts:* The proposed conceptual solution is anticipated to have a positive impact on water quality. Runoff will more readily enter the ground water system than it currently does. This results in less travel time over potentially contaminated ground surface.

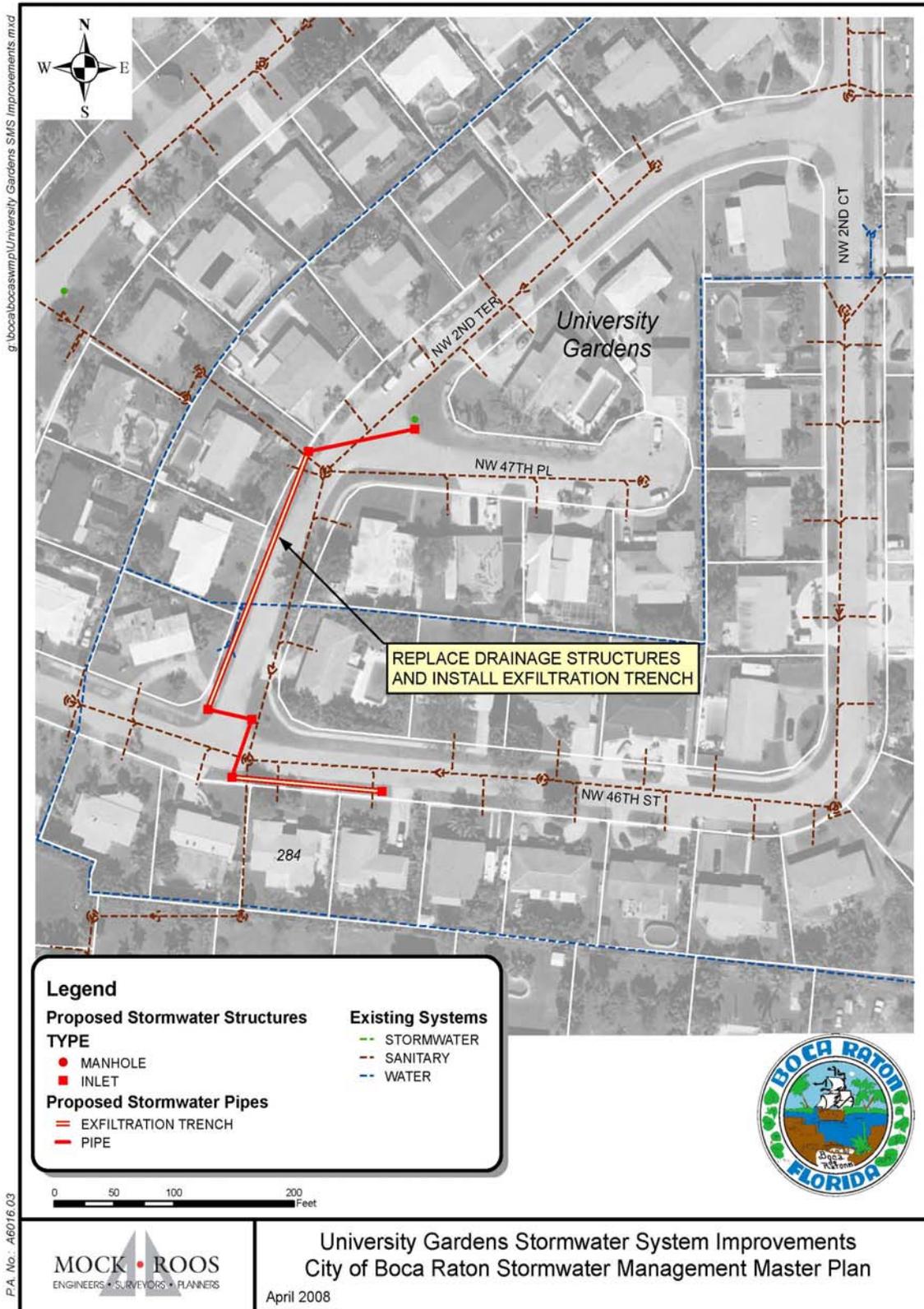
### University Gardens Stormwater System Improvements



Flooding in front of 284 NW 46<sup>th</sup> Street, looking east



NW 2<sup>nd</sup> Terrace, looking south



**University Gardens Stormwater System Improvements  
Engineer's Opinion of Conceptual Costs  
City of Boca Raton Stormwater Management Master Plan**

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
1.	Mobilization	1	LS	\$10,000	\$10,000
2.	Maintenance of Traffic	1	LS	\$5,000	\$5,000
3.	Preconstruction Video	1	LS	\$500	\$500
4.	Survey & Layout	1	LS	\$2,000	\$2,000
5.	Record Drawings	1	LS	\$500	\$500
6.	Clearing & Grubbing	1	LS	\$5,000	\$5,000
7.	Remove Exist. Sidewalk	900	SF	\$2	\$1,800
8.	Inlet, Type C	6	EA	\$4,000	\$24,000
9.	Exfiltration Trench, 18" RCP	375	LF	\$120	\$45,000
10.	Reinforced Concrete Pipe, 18"	150	LF	\$60	\$9,000
11.	Concrete Sidewalk	170	SY	\$40	\$6,800
12.	Concrete Driveway	70	SY	\$50	\$3,500
13.	Pavement Restoration (Pipe Crossings)	200	SY	\$35	\$7,000
14.	Sodding (Floritam)	475	SY	\$6	\$2,850
15.	Remove & Replace Traffic Sign	2	EA	\$250	\$500
16.	Replace Pavement Markings	1	LS	\$200	\$200
17.	Irrigation Restoration	1	LS	\$2,138	\$2,138
Subtotal					\$125,788
Contingency (15%)					\$18,868
<b>Construction Total</b>					<b>\$144,656</b>
Engineering, Legal, & Misc. Costs (20%)					\$28,931
<b>Rounded Project Total</b>					<b>\$180,000</b>

**Note:** The above costs are based on a conceptual layout of the stormwater system for this area. As such, they are subject to change depending on the final scope of the project that is designed and constructed as well as other factors. Estimate is in 2008 dollars.

## **NE 5th Avenue Stormwater Management Improvements**

*Reported Problem(s):* The intersection of NE 5th Avenue and NE 23rd Way experiences repeated flooding.

*System Description:* There is no stormwater management system in the area. It appears that swales were originally intended to accommodate stormwater runoff. However, in many locations along NE 5<sup>th</sup> Avenue, the swale areas have been paved, presumably to facilitate parking. It appears that the intersection is a low spot in the area.

*Conceptual Solution(s):* The recommended conceptual project for this area is the installation of inlets and exfiltration trench. The inlets will be located at the intersection, while the exfiltration trench will be placed in the grass areas along the north and south side of NE 23<sup>rd</sup> Way.

*Water Quality Impacts:* The proposed conceptual solution is anticipated to have a positive impact on water quality. Runoff will more readily enter the ground water system than it currently does. This results in less travel time over potentially contaminated ground surface.

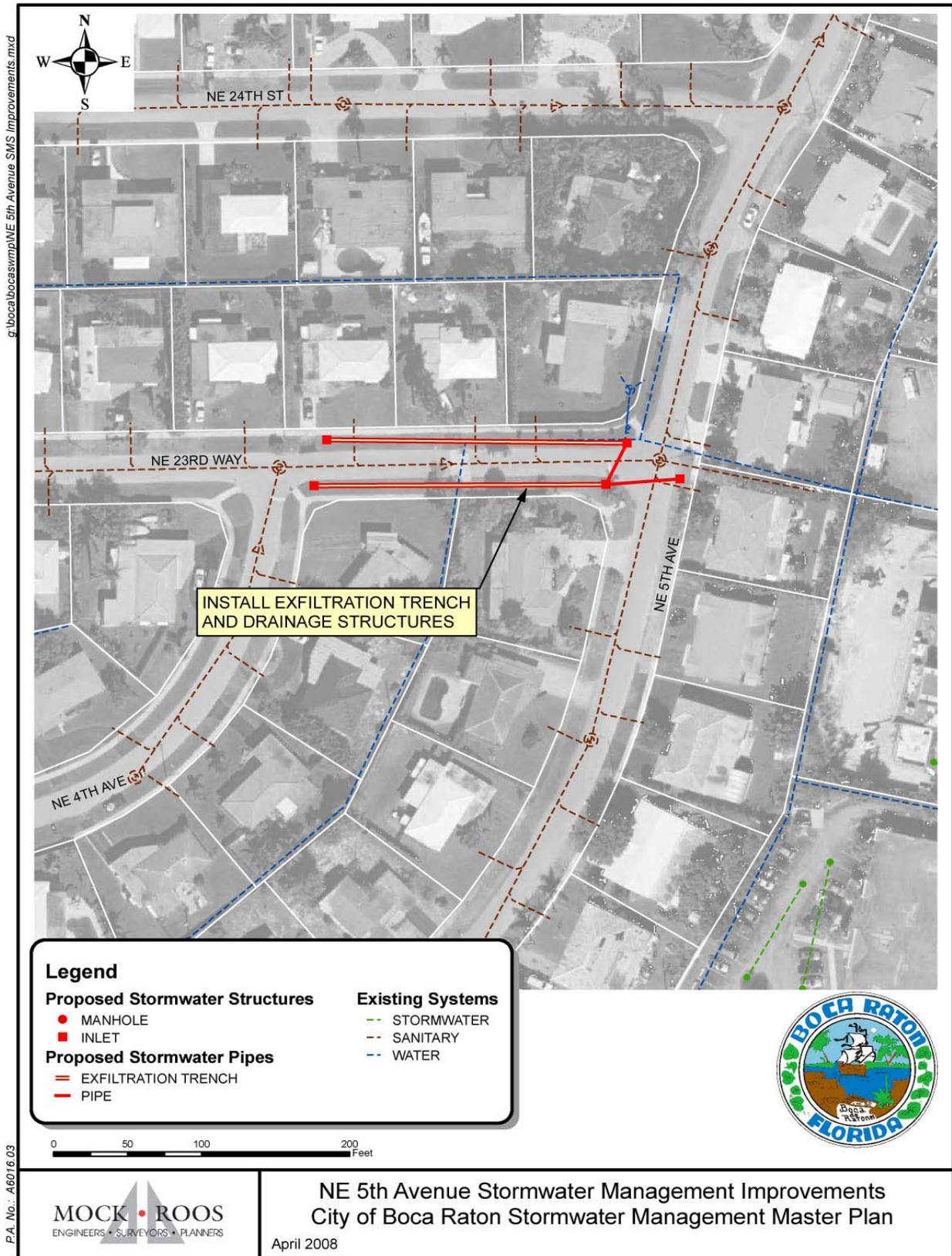
### NE 5th Avenue Stormwater Management Improvements



Flooding at intersection of NE 5<sup>th</sup> Avenue and NE 23<sup>rd</sup> Way, looking south



NE 23<sup>rd</sup> Way, looking west



**NE 5th Avenue Stormwater Management Improvements  
Engineer's Opinion of Conceptual Costs  
City of Boca Raton Stormwater Management Master Plan**

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
1.	Mobilization	1	LS	\$10,000	\$10,000
2.	Maintenance of Traffic	1	LS	\$5,000	\$5,000
3.	Preconstruction Video	1	LS	\$200	\$200
4.	Survey & Layout	1	LS	\$800	\$800
5.	Record Drawings	1	LS	\$200	\$200
6.	Clearing & Grubbing	1	LS	\$5,000	\$5,000
7.	Remove Exist. Sidewalk	2000	SF	\$2	\$4,000
8.	Inlet, Type C	5	EA	\$4,000	\$20,000
9.	Exfiltration Trench, 18" RCP	400	LF	\$120	\$48,000
10.	Reinforced Concrete Pipe, 18"	100	LF	\$60	\$6,000
11.	Concrete Sidewalk	225	SY	\$40	\$9,000
12.	Concrete Driveway	25	SY	\$50	\$1,250
13.	Pavement Restoration (Pipe Crossings)	50	SY	\$35	\$1,750
14.	Sodding (Floritam)	475	SY	\$6	\$2,850
15.	Remove & Replace Traffic Sign	1	EA	\$250	\$250
16.	Replace Pavement Markings	1	LS	\$200	\$200
17.	Irrigation Restoration	1	LS	\$2,138	\$2,138
Subtotal					\$116,638
Contingency (15%)					\$17,496
<b>Construction Total</b>					<b>\$134,133</b>
Engineering, Legal, & Misc. Costs (20%)					\$26,827
<b>Rounded Project Total</b>					<b>\$170,000</b>

**Note:** The above costs are based on a conceptual layout of the stormwater system for this area. As such, they are subject to change depending on the final scope of the project that is designed and constructed as well as other factors. Estimate is in 2008 dollars.

## **Palm Beach Farms Stormwater Management Improvements**

*Reported Problem(s):* Reports of street flooding in several locations have been received from residents, and City staff has confirmed recurring flooding at the intersections of Juana Road/SW 21<sup>st</sup> Street and Montezuma Road/SW 21<sup>st</sup> Street.

*System Description:* There is no formal stormwater management system in this area. However, moderately well maintained and expansive swale areas along both sides of most streets appear to manage the stormwater runoff from most rainfall events. There appear to be three intersections where the roadway is low and ponding occurs before water enters the swale areas; Montezuma/SW 21<sup>st</sup> Street, Juana/SW 19<sup>th</sup> Street, and Juana/SW 21<sup>st</sup> Street.

*Conceptual Solution(s):* The recommended conceptual improvements to address the intersection flooding occurrences are to overlay the intersections at Montezuma/SW 21<sup>st</sup> Street and Juana/SW 19<sup>th</sup> Street so that positive flow occurs into the adjacent swales. City staff felt that a positive outfall for this neighborhood could provide an increased level of service for the streets. Therefore, this conceptual solution includes the recommendation of an inlet and exfiltration trench system along the south side of SW 21<sup>st</sup> Street. This system will be connected via additional exfiltration trench along Juana Road, to a new outfall to the Hillsborough Canal. During preliminary design, the estimated costs and calculated benefits can be used in determining whether or not to include the positive outfall connection.

*Water Quality Impacts:* The proposed conceptual solution includes the use of exfiltration trench to provide added water quality to the system.

### Palm Beach Farms Stormwater Management Improvements



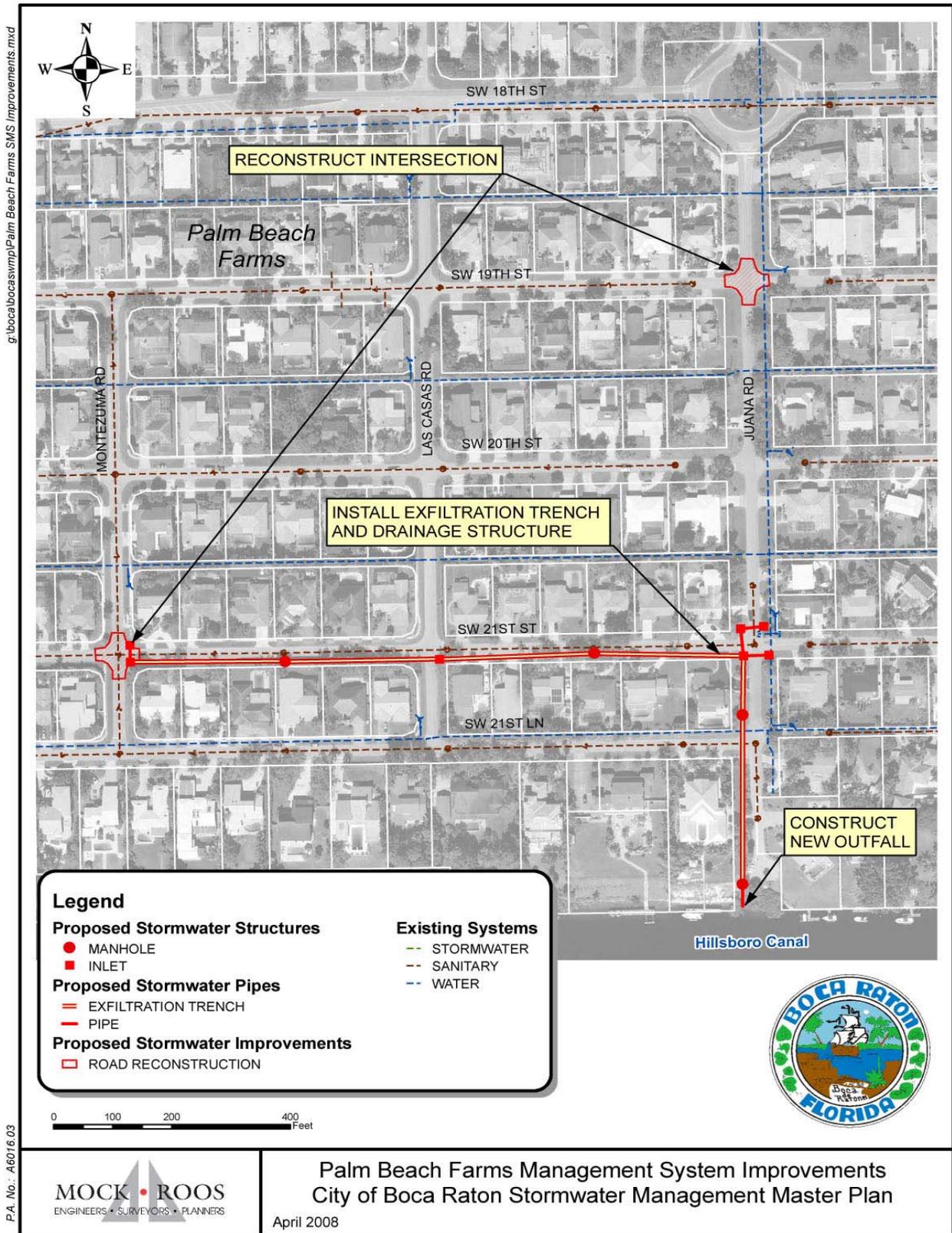
Intersection of SW 21<sup>st</sup> Street and Juana Road, looking east



Intersection of SW 21<sup>st</sup> Street and Montezuma Road, looking west



Intersection of SW 21<sup>st</sup> Lane and Juana Road, looking south



**Palm Beach Farms Stormwater Management Improvements**  
**Engineer's Opinion of Conceptual Costs**  
**City of Boca Raton Stormwater Management Master Plan**

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
1.	Mobilization	1	LS	\$25,000	\$25,000
2.	Maintenance of Traffic	1	LS	\$10,000	\$10,000
3.	Preconstruction Video	1	LS	\$1,700	\$1,700
4.	Survey & Layout	1	LS	\$6,800	\$6,800
5.	Record Drawings	1	LS	\$1,700	\$1,700
6.	Clearing & Grubbing	1	LS	\$10,000	\$10,000
9.	Inlet, Type C	7	EA	\$4,000	\$28,000
10.	Manhole, Type 7	4	EA	\$5,000	\$20,000
11.	Exfiltration Trench, 18" RCP	1500	LF	\$120	\$180,000
12.	Reinforced Concrete Pipe, 18"	175	LF	\$60	\$10,500
13.	Penetrate Existing Seawall	1	LS	\$5,000	\$5,000
14.	Concrete Driveway Restoration	250	SY	\$50	\$12,500
15.	Asphalt Driveway Restoration	100	SY	\$40	\$4,000
16.	Pavement Restoration (Pipe Crossings)	225	SY	\$35	\$7,875
17.	Pavement Overbuild (Intersections)	10	TN	\$200	\$2,000
18.	Sodding (Floritam)	2300	SY	\$6	\$13,800
19.	Remove & Replace Traffic Sign	4	EA	\$250	\$1,000
20.	Replace Pavement Markings	1	LS	\$500	\$500
21.	Irrigation Restoration	1	LS	\$10,350	\$10,350
Subtotal					\$350,725
Contingency (15%)					\$52,609
<b>Construction Total</b>					<b>\$403,334</b>
Engineering, Legal, & Misc. Costs (20%)					\$80,667
<b>Rounded Project Total</b>					<b>\$490,000</b>

**Note:** The above costs are based on a conceptual layout of the stormwater system for this area. As such, they are subject to change depending on the final scope of the project that is designed and constructed as well as other factors. Estimate is in 2008 dollars.

## **Spanish River Road Stormwater Management System Improvements**

*Reported Problem(s):* This road has been reported numerous times over the years for ponding and roadway flooding.

*System Description:* The road is relatively flat, but does appear to be positively sloped to drain to the existing inlets, which are piped to outfalls in the adjacent ICWW. Several “traffic calming” devices (speed humps) have been installed that prevent the flow of the stormwater runoff to the inlets. There are low points that have presumably occurred as a result of resurfacing of the roadway.

*Conceptual Solution(s):* The recommended conceptual improvements for this area include re-grading the roadway (by overlaying it) from Ponce de Leon Road to SE 31<sup>st</sup> Street to achieve a center crown so that stormwater will runoff to adjacent properties and not pond in the roadways; reconstructing the traffic calming devices to allow runoff to flow around them; and adding inlets on the northeast and northwest corners of Spanish River Road and Via Cabana Drive and connecting those inlets to those at the west end of Via Cabana Drive.

*Water Quality Impacts:* Since the ponding that occurs in the roadway eventually either drains into the ground or evaporates, the proposed improvements will not change water quality level for this area.

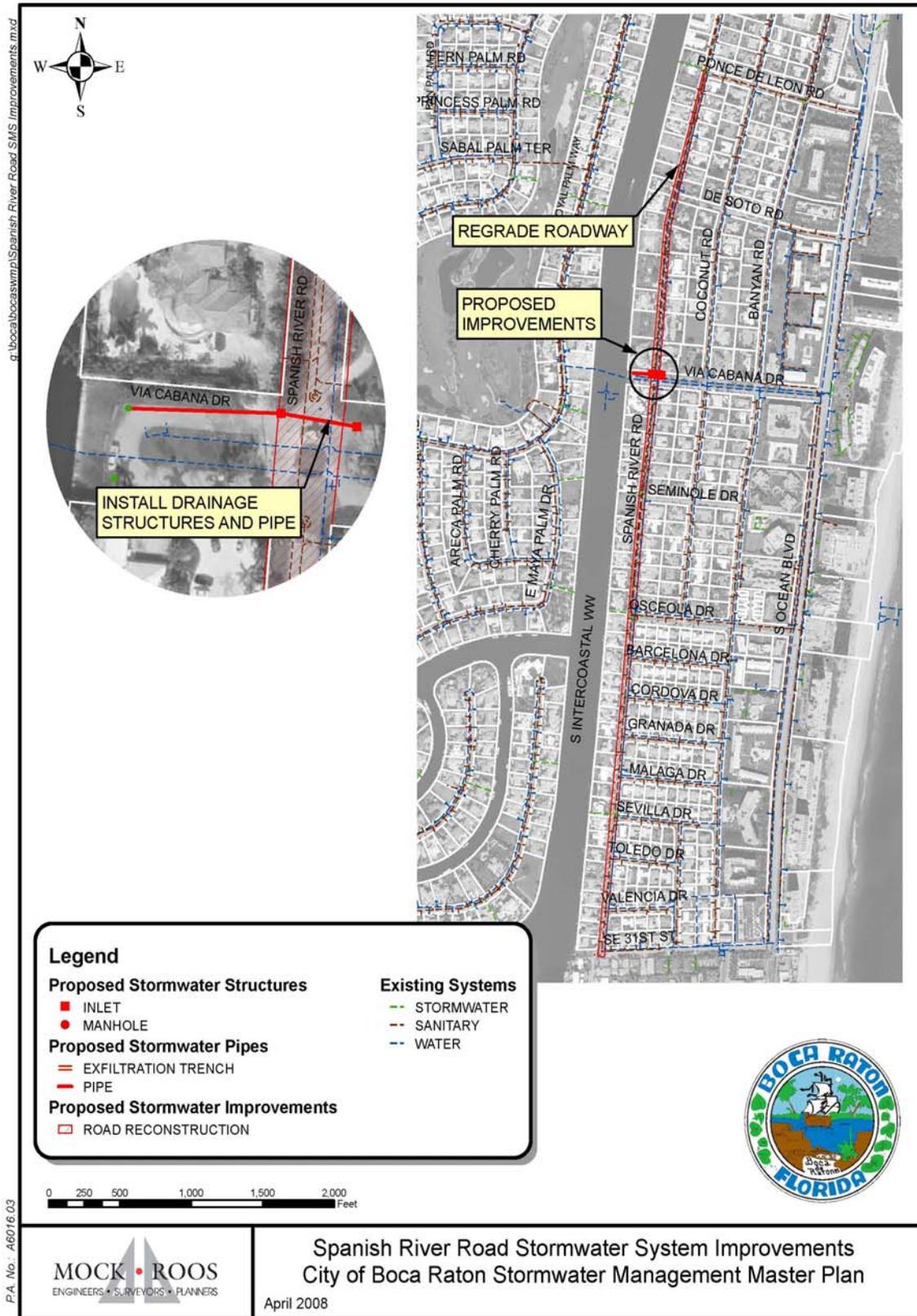
### Spanish River Road Stormwater Management System Improvements



Spanish River Road, looking south. Speed bump is preventing runoff from draining to inlets.



Intersection of Via Cabana and Spanish River Road, looking northwest



**Spanish River Road Stormwater Management System Improvements**  
**Engineer's Opinion of Conceptual Costs**  
**City of Boca Raton Stormwater Management Master Plan**

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
1.	Mobilization	1	LS	\$25,000	\$25,000
2.	Maintenance of Traffic	1	LS	\$20,000	\$20,000
3.	Preconstruction Video	1	LS	\$6,000	\$6,000
4.	Survey & Layout	1	LS	\$24,000	\$24,000
5.	Record Drawings	1	LS	\$6,000	\$6,000
6.	Clearing & Grubbing	1	LS	\$10,000	\$10,000
7.	Remove Type D Curb	50	LF	\$10	\$500
8.	Inlet, Type C	2	EA	\$4,000	\$8,000
9.	Manhole, Type 7	1	EA	\$5,000	\$5,000
10.	Connect to Exist. Inlet	1	EA	\$2,500	\$2,500
11.	Reinforced Concrete Pipe, 18"	225	LF	\$60	\$13,500
12.	Concrete Type D Curb	50	LF	\$15	\$750
13.	Pavement Restoration (Pipe Crossings)	280	SY	\$35	\$9,800
14.	Pavement Overbuild (2.3" Avg.)	1675	TN	\$120	\$201,000
15.	Restore Paver Brick Driveway	125	SF	\$10	\$1,250
16.	Reconstruct Speed Humps	8	EA	\$1,000	\$8,000
17.	Sodding (Floritam)	75	SY	\$6	\$450
18.	Remove & Replace Traffic Sign	1	EA	\$250	\$250
19.	Replace Pavement Markings	1	LS	\$200	\$200
20.	Irrigation Restoration	1	LS	\$338	\$338
Subtotal					\$342,538
Contingency (15%)					\$51,381
<b>Construction Total</b>					<b>\$393,918</b>
Engineering, Legal, & Misc. Costs (20%)					\$78,784
<b>Rounded Project Total</b>					<b>\$480,000</b>

**Note:** The above costs are based on a conceptual layout of the stormwater system for this area. As such, they are subject to change depending on the final scope of the project that is designed and constructed as well as other factors. Estimate is in 2008 dollars.

## **New Pines Stormwater Community Improvement Project**

*Reported Problem(s):* There was only one complaint, in 2000, of flooding in a driveway on Coventry Street. However, because the City intends a community improvement project in the area, it is advisable to take the opportunity to ensure that adequate stormwater runoff protection is provided.

*System Description:* The City's community improvement project will include new sidewalks, lighting and drainage. The residential portion of the area currently has no formal stormwater system, although it appears that the original intent was for stormwater runoff to infiltrate the ground in the grassed portion of the road rights-of-way.

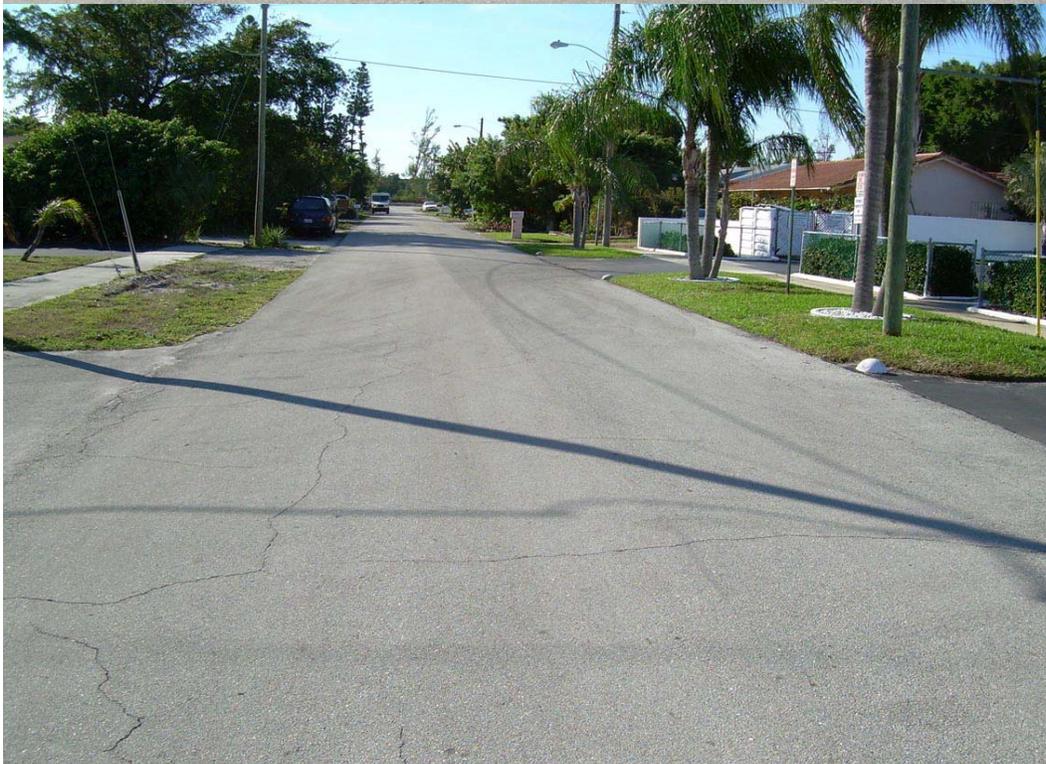
*Conceptual Solution(s):* The recommended conceptual project is to restore the grassed swale system along each of the roadways in the area. It is further recommended that the project include a public education program for the residents, advising them of the City code requiring maintenance of, and restrictions on the use of, the swales adjacent to their properties.

*Water Quality Impacts:* The proposed conceptual solution is anticipated to have a positive impact on water quality. Runoff will more readily enter the ground water system than it currently does. This results in less travel time over potentially contaminated ground surface.

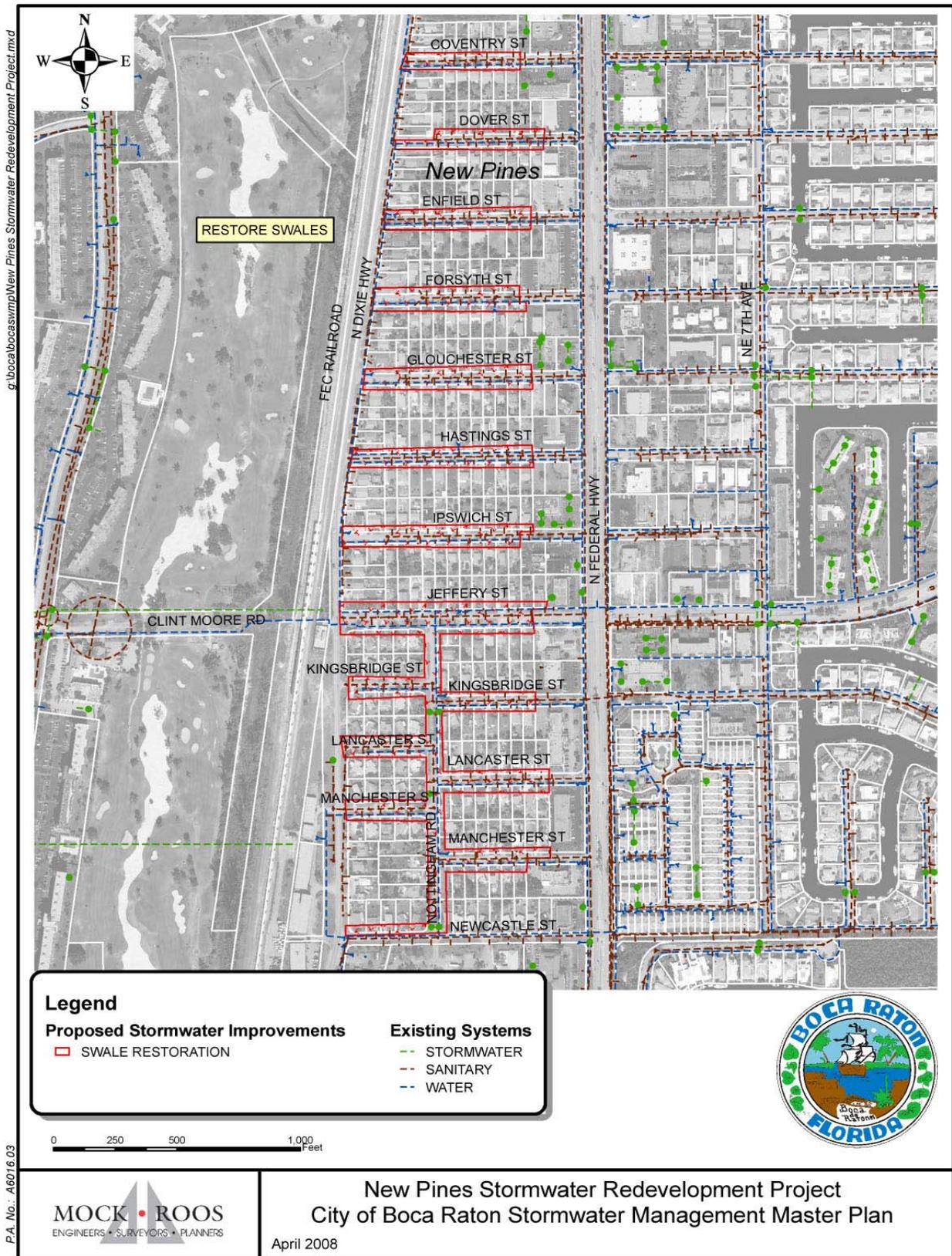
## New Pines Stormwater Community Improvement Project



Forsyth Street,  
looking east  
(typical)



Jeffery Street,  
looking west  
(typical)



**New Pines Stormwater Community Improvement Project**  
**Engineer's Opinion of Conceptual Costs**  
**City of Boca Raton Stormwater Management Master Plan**

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
1.	Mobilization	1	LS	\$20,000	\$20,000
2.	Maintenance of Traffic	1	LS	\$20,000	\$20,000
3.	Preconstruction Video	1	LS	\$3,550	\$3,550
4.	Survey & Layout	1	LS	\$14,200	\$14,200
5.	Record Drawings	1	LS	\$3,550	\$3,550
6.	Clearing & Grubbing	1	LS	\$10,000	\$10,000
7.	Final Grading	16700	SY	\$3	\$50,100
8.	Excavation	2350	CY	\$15	\$35,250
9.	Sodding (Floritam)	16700	SY	\$6	\$100,200
19.	Remove & Replace Traffic Sign	8	EA	\$250	\$2,000
20.	Replace Pavement Markings	1	LS	\$1,000	\$1,000
21.	Irrigation Restoration	1	LS	\$75,150	\$75,150
22.	Relocate Mailbox	250	EA	\$50	\$12,500
Subtotal					\$347,500
Contingency (15%)					\$52,125
<b>Construction Total</b>					<b>\$399,625</b>
Engineering, Legal, & Misc. Costs (20%)					\$79,925
<b>Rounded Project Total</b>					<b>\$480,000</b>

**Note:** The above costs are based on a conceptual layout of the stormwater system for this area. As such, they are subject to change depending on the final scope of the project that is designed and constructed as well as other factors. Estimate is in 2008 dollars.

## **E. Meetings with Advisory Boards**

City Staff contacted the Environmental, Financial and Marine advisory boards to schedule meetings to present the draft stormwater management master plan (including the conceptual improvement projects). The Environmental Advisory Board decided not to conduct a meeting at this time. The Financial Advisory Board also made the decision that at this stage, there was no need to review the plan with them. A meeting with the Marine Advisory Board was held on March 5, 2008. A presentation of the draft stormwater management master plan was made, questions were answered, and there was discussion regarding water quality improvement programs by the City.

## **F. Prioritization of Proposed Projects**

One of the tasks requested by the City was the prioritization of the proposed conceptual projects. In order to accomplish this, a criteria list and associated scoring system was developed. The system was developed based on methods and systems created by other entities around the country (primarily municipalities) that carried out the same task of ranking planned stormwater improvement projects. The scoring system was reviewed with City staff and modified as requested to best meet the City's needs. The City will use the prioritized conceptual projects list in conjunction with the conceptual cost estimates, and an understanding of the funding and resources available, to determine an implementation schedule for the conceptual projects.

Each criterion in the list was assigned a weight from 1 to 5, based on its relative importance to the other criteria on the list. The weight value factors into the total score that each project receives.

Within each criterion, possible descriptions for existing conditions (pre-improvement) were listed and assigned a relative value from 1 to 10, based on relative significance to the other descriptions. The criteria and scoring values are presented in the following table:

### SCORING CRITERIA

<b>Public Safety Issue (Weight = 5)</b>	
High risk of serious injury/death	10
Limited access for emergency services	10
Moderate risk of injury/illness	6
Mosquito breeding potential	2
Low risk of injury/illness	0 – 2
<b>Property Damage Issue (Weight = 4)</b>	
Complete structural loss	10
Moderate structural damage	6 – 7
Content damage	4 – 5
Landscaping loss on private property	2 – 3
Landscaping loss on City right-of-way	1
<b>Infrastructure Damage (Weight = 4)</b>	
Major Road (minimal to extensive loss)	8 – 10
Local Road (minimal to extensive loss)	6 – 7
Public Parking (minimal to extensive loss)	4 – 5
Private Road (minimal to extensive loss)	2 – 3
Recreational area (minimal to extensive loss)	0 – 1
<b>Environmental Damage Issue (Weight = 4)</b>	
(erosion, loss of habitat, etc.)	
Severe	10
Moderate	6
Minimal	2
<b>Duration (Weight = 3)</b>	
Standing water remains after 72 hours	10
Standing water gone within 72 hours	5
Standing water gone within 24 hours	0
<b>Water Quality Issue (Weight = 3)</b>	
Severe water quality degradation	10
Moderate water quality degradation	7
Minimal water quality degradation	4
No water quality degradation	0
<b>Permit Compliance Issue (Weight = 5)</b>	
High risk from non-compliance	10
Moderate risk from non-compliance	8
Low risk from non-compliance	6
No risk from non-compliance	0
<b>Frequency (Weight = 3)</b>	
Constant	10
Every rain (> 5 times/year)	8
Moderate rains (3-5 times/year)	5
Heavy rains (1-3 times/year)	3
<b>Impact (Weight = 4)</b>	
20 res. units/major employer (100+ people)	10
1-20 res. units/small employer (<100 people)	7
Major Road	5
Collector	3
Residential street	1
<b>System Condition (Weight = 2)</b>	
No system/failed	10
Poor	8
Average	3
Good	1
<b>City Responsibility (Weight = 5)</b>	
Total	10
Partial	5
None, "good neighbor policy"	1
None	0

The existing condition for each proposed project area was then reviewed and assigned values for each criterion. The values and the weight factor were used to determine a score for each project area. The first round of values and scoring was completed by a team of engineers at Mock•Roos. The information was then provided to City staff for its review and assessment. The final scoring and prioritization matrix is provided below:

### PRIORITIZED LIST OF PROJECTS

	Public Safety Issue	Property Damage Issue	Infrastructure Damage	Environmental Damage	Duration	Water Quality Issue	Permit Compliance	Frequency	Impact	System Condition	City Responsibility	SCORE	PRIORITY
<b>Weight</b>	<b>5</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>3</b>	<b>3</b>	<b>5</b>	<b>3</b>	<b>4</b>	<b>2</b>	<b>5</b>		
Boca Heights*	-	-	-	-	-	-	-	-	-	-	-	-	N/A
New Floresta	10	2	8	0	1	0	0	8	7	3	10	<b>18.3</b>	<b>1</b>
NW 36th Court	6	3	6	0	5	0	0	8	3	10	10	<b>17.0</b>	<b>2</b>
Old Floresta	10	1	6	0	5	0	0	5	1	10	10	<b>16.5</b>	<b>3</b>
NW 5th Avenue	6	2	6	0	5	0	0	8	3	8	10	<b>16.3</b>	<b>4</b>
NE 25th Terrace	6	1	7	0	5	0	0	8	3	8	10	<b>16.3</b>	<b>5</b>
NE 6th Drive	6	1	6	0	5	0	0	8	3	8	10	<b>15.9</b>	<b>6</b>
University Heights	6	2	6	0	5	0	0	8	1	10	10	<b>15.9</b>	<b>6</b>
Por La Mar	6	2	6	0	5	0	0	8	1	10	10	<b>15.9</b>	<b>6</b>
University Gardens	6	2	6	0	5	0	0	8	1	8	10	<b>15.5</b>	<b>9</b>
NE 5th Avenue	6	1	6	0	0	0	0	5	1	10	10	<b>13.4</b>	<b>10</b>
Palm Beach Farms	2	1	6	0	5	0	0	5	1	10	10	<b>12.9</b>	<b>11</b>
Spanish River Road	2	2	6	0	0	0	0	8	1	8	10	<b>12.4</b>	<b>12</b>
New Pines	2	1	6	0	0	0	0	3	0	10	10	<b>10.6</b>	<b>13</b>

\* Project Underway

## **G. Other System Improvements**

The drainage complaint log and discussions with the City included a number of reports of isolated ponding, driveway flooding, and cul-de-sac flooding. Many of these were evaluated in the WHS report of 1998. Review of the WHS report, confirmed by field observation, indicated that in some instances, property owners have simply failed to maintain the swale that serves them, or otherwise altered the swale area or driveway in such a manner as to cause the ponding that generated the complaint. In many cul-de-sac areas, redevelopment has eliminated the overland flow routes that stormwater runoff once used, thereby trapping water in the streets. It is recommended that these issues be evaluated and addressed on a case-by-case basis. In order to allow for these efforts, two additional, annually recurring, capital improvement programs are recommended below. These recurring projects will allow the City to plan for and address new problem areas on a continuing basis.

### ***Swale Restoration Program***

Because the swale degradation issue is widespread in location, and because experience reveals that many swales will continue to become non-functional as a result of homeowner activities (landscaping, lack of maintenance, etc.), an ongoing, systematic swale restoration program is proposed as a recurring improvement project for the City. It is further recommended that this program include an annual review of outstanding drainage complaints to determine which swales will be restored in the upcoming year. This planning activity should be carried out at the start of the calendar year, in order to be included as a specific annual improvement project in the budget for the subsequent fiscal year.

### ***Cul-de-sac Rehabilitation Program***

Field observation of a number of cul-de-sacs indicated that either when they were constructed, or as a result of repaving/resurfacing, no positive drainage exists for these areas. The optimum solution for each of these cul-de-sacs must be considered on a case-by-case basis. It is again recommended that a recurring annual budget line item be included in the stormwater utility budget. This planning activity should be carried out at the start of the calendar year, in order to be included as a specific annual improvement project in the budget for the subsequent fiscal year.

## Part 2 – Stormwater Management Master Plan

The objective of the tasks authorized was the development of a stormwater management master plan providing guidance to City staff and administration to plan and budget for upcoming stormwater services for City residents. While Tasks 1 and 2 evaluated the City's existing Stormwater Management inventory and programs in comparison to state and federal requirements (resulting in recommended "soft" improvement projects), Task 3 focused on stormwater management system improvements from a capital ("hard") projects perspective. Both types of improvements are necessary in the effort to enhance the quality of life for the residents of the City.

### A. Soft Projects

Recommendations 1-15 below were previously provided in the Task 2 Interim Report (included in its entirety in Appendix B.) They have been restated here (in italics) with additional comments for planning purposes.

1. *Add a requirement to Land Development Code, Chapter 23 Planning and Development, Article V, Land Clearing, Dredging and Filling and to Chapter 19 Buildings and Building Regulations, Division 3 Permits, that all development projects, regardless of size, are required to provide site erosion and sedimentation control measures to prevent polluted runoff from leaving the site. The cost of carrying out this recommendation should be minimal; staff could develop the code language themselves, or request the assistance of its consultant. For the long term, staffing must be sufficient to ensure that the new code requirement is being met. Discussions with current City Staff have indicated that additional staff hours may be needed to carry out the inspections necessary to enforce the new code.*
2. *Formalize in written format, the construction site inspection program for all construction projects within the City in order to comply with the MS4 NPDES permit. The minimum frequency is not specified in the permit; however, the number of construction site inspections should be tracked for annual reporting purposes and copies of all inspection reports must be maintained for possible review by the DEP. This effort by the City is required under the MS4 NPDES permit, while the site operator's inspections are required under the Generic Construction Permit NPDES program. The cost of completing this recommendation should be negligible. However, staffing must be sufficient to ensure that the requirement will be met. Discussions with current City Staff have indicated that additional staff hours may be needed to carry out the required inspection program.*
3. *In the past, the Building Department performed construction site inspections for single-family and duplex residential projects. These inspections, as required under the City's MS4 NPDES permit, are no longer being done. It is recommended that a program be staffed for the construction site inspections of these residential projects as well as for the*

*review of construction plans and surface water management calculations at the time of permit application. These inspections must be done to meet the requirements of the City's MS4 NPDES permit. Discussions with current City Staff have indicated that additional staff hours may be needed to carry out the required inspection program.*

4. *Implement a program for the training and certification of the Building Department inspectors and the Code Enforcement inspectors with regards to inspection of high risk facilities, awareness and identification of illicit connections, and the inspections and best management practices of construction site controls related to the City's comprehensive stormwater program and the MS4 NPDES permit. The cost of developing the program will be minimal; staff could develop a program themselves, or contract for its development. Once developed, implementation costs should be negligible, if any.*
5. *Develop a program in written format requiring that inspections and maintenance of private stormwater management systems be reported to the City on a regular basis, possible annually, every two years or every five years. This would require a change to the code. Alternately, the City could undertake an inspection program of private systems on a regular interval for inspection/maintenance of exfiltration, trenches, inlets/catch basins, lakes and dry detention area. The cost of developing the reporting program should be minimal. It will, however, require staff time to implement on a continual basis. Discussions with current City Staff have indicated that additional staff hours may be needed to monitor and manage the inspection reporting program.*
6. *New or significant re-development activities - propose changes to code that promote/require reduction of impervious surfaces, use of swales, the incorporation of low impact development principles, stormwater reuse, and adherence to the principles of Florida Yard and Neighborhood Program in new landscaping. The cost to implement this recommendation should be minimal. It will primarily require education of relevant staff and the modification of land development code. Staff could develop the code language themselves, or request the assistance of its consultant.*
7. *Consider modifying the Level Of Service (LOS) for roadways, to be consistent with the SFWMD minimum design storm for local roads. The City's current LOS for roadways is that the minimum local roadway (entire paved area) be at or above the 3-year, 1-day flood elevation. The SFWMD requires the roadway centerline be at or above the 5-year, 1-day flood elevation. LOS is typically required of new and significantly redeveloped areas. It must be incorporated into the City Land Development Code to be enforced. The cost to comply with this requirement should be nominal, but it will require some staff education for the review process.*
8. *Increase public education activities for stormwater awareness, illicit discharge identification and reporting, grass clippings, pet waste pick-up, etc. This is a requirement of the City's MS4 NPDES permit. As such, there have been some efforts*

made on educating the public on these topics in the past. The City shares the MS4 NPDES Permit with all the other Palm Beach County co-permittees and is currently participating in the evaluation of whether a county-wide public education program might be more efficient than individual municipal efforts.

9. *Prohibit disposal of grass clippings/yard waste in stormwater management system, swales, and roadways. This would require a change to the code.* Subsequent discussion with staff resulted in the understanding that the existing City code's prohibition of anything but stormwater in the MS4 (with listed exceptions) already meets this recommendation. No code modification is needed. However, a staff education program and a professional landscaper notification program are recommended.
10. *Educate the public regarding the benefits of restricting the use of fertilizers containing phosphorus. Consider making use of existing public education programs and tailor them for use specifically to the City of Boca Raton.* This is also a requirement of the City's MS4 NPDES permit. Likewise, it is being considered for inclusion in a county-wide education program. The cost, if any, to the City should be negligible.
11. *Implement a tracking mechanism for maintenance of exfiltration trench which is separate from the current method of tracking exfiltration trench inspections. This is recommended for the purposes of annual reporting and to address a comment received from the FDEP on the last Annual Report submittal.* The cost of development of a tracking mechanism should be minimal; but it will require the training of staff and additional staff time to implement.
12. *Implement a tracking method within the Fire Rescue Department for hazardous material spills responded to and for non-hazardous material spills responded to for purposes of annual reporting.* Again, the development of the tracking mechanism should be minimal. It will require cooperation from the Fire Rescue Department for education of staff and implementation.
13. *Implement an annual inspection of all high risk facilities within the City and confirm that there are no facilities with a potential to discharge to the City's MS4 for purposes of annual reporting.* The development of a program should require a small effort. The program could be developed by staff or be completed by its consultant. The implementation of the inspection program will require staff time and training.
14. *Complete the replacement of the MP2 Database system and training of the appropriate personnel to enter and access the data. Develop a connection between this database and the City's stormwater GIS.* This recommendation is being carried out by staff.
15. *Hire and assign a staff person within the Municipal Services Department, dedicated to the coordination of the stormwater utility and the MS4 NPDES related issues, including*

*record keeping, database upkeep and reporting.* This additional staff member should be able to cover the additional staff hours mentioned in the above recommendations.

The following recommendations are also offered:

- 16. Consider adopting the following:

Minimum levels of service are to be met or exceeded by all new and/or significant redevelopment projects, and strived for in all retrofit projects:	
<u>Development Feature</u>	<u>Level of Service</u>
Buildings, residential or non-residential	100-year/3-day/zero discharge, or FEMA Flood Insurance Rate Map, or SFWMD 100-year flood elevation, whichever is more restrictive.
Streets and Road	5-year/24-hour rainfall (for full width of paved surface)
Parking	3-year/24-hour rainfall (for minimum elevation)

It is recommended that this change be made to the Comprehensive Plan in the next available EAR cycle.

- 17. Develop and put into practice a formalized permitting process for the review of stormwater sufficiency of all construction projects. The process should include review of the proposed water quality and water quantity improvements, as well as the provisions that will be used to protect offsite property, while the project is under construction.
- 18. Develop a stormwater section for the City’s Engineering/Design Standards Manual.

**B. Capital Projects**

The capital improvement projects were presented in Part 1. It is recommended that each of the conceptual projects be undertaken, approximately in the order in which they were prioritized. The annual swale and cul-de-sac improvement programs should be planned and budgeted each year.

## C. Summary

The recommendations listed below, and detailed above, summarize the SMMP as recommended.

Code change to required all projects to have PPP	Staff time
Code change for new/significant re-development requirements related to stormwater	Staff time
Code change to make local roadway design storms the same as SFWMD	Staff time
Formalize construction site inspection program	Staff time
Formalize/document site plan review process	Staff time
Formalize training program for inspectors/code enforcement personnel	Staff time
Formalize program for certification/reporting for private surface water management systems	Staff time
Formalize tracking mechanism for inspection/maintenance of exfiltration trench	Staff time
Formalize tracking method for the number of Haz-Mat spills & responses	Staff time
Formalize the inspection program for “high risk” facilities	Staff time
Commit to annual education program regarding stormwater	Staff time
Formalize education program for staff/professional landscape companies	Staff time
Comprehensive Plan change for minimum levels of service	Staff time
Establish/implement stormwater permitting program	Staff time
Develop Stormwater section for Engineering/Design Standards Manual	Staff time
Add staff position dedicated to coordination of stormwater utility	annual
Annual Swale Restoration Program	annual
Annual Cul-de-sac Rehabilitation Program	annual
New Floresta	\$500,000
NW 36th Court	\$87,000
Old Floresta	\$310,000
NW 5th Avenue	\$86,000
NE 25th Terrace	\$130,000
NE 6th Drive	\$160,000
University Heights	\$87,000
Por La Mar	\$180,000
University Gardens	\$180,000
NE 5th Avenue	\$170,000
Palm Beach Farms	\$490,000
Spanish River Road	\$480,000
New Pines	\$480,000

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## **Appendix A**

### **Task 1 – Existing Conditions Documentation**





# City of Boca Raton Stormwater Management Master Plan Task 1 - Existing Conditions Documentation

November 2007



Prepared by

**MOCK • ROOS**  
ENGINEERS • SURVEYORS • PLANNERS

and

 **MATHEWS**  
**CONSULTING INC.**  
Civil and Environmental Engineers



## Engineer's Signature Page

I hereby state, as a Professional Engineer in the State of Florida, that this report titled "City of Boca Raton Stormwater Management Master Plan - Task I - Interim Existing Conditions Documentation" and dated November 2007, was prepared and assembled under my direct responsible charge.

---

Alan D. Wertepny, P.E.  
Project Manager,  
Mock•Roos  
Florida P.E. No. 32350

---

Date

Mock, Roos & Associates, Inc.  
5720 Corporate Way  
West Palm Beach, FL 33407  
Florida E.B. No. 48



## Table of Contents

*Engineer’s Signature Page*..... *i*

**1. Introduction** ..... **1**

**A. Scope of Services** ..... **1**

**B. Background** ..... **1**

**2. Inventory of Stormwater System** ..... **5**

**A. SFWMD Permit Information**..... **5**

**B. City’s Stormwater System**..... **6**

**C. Palm Beach County & FDOT Stormwater Systems** ..... **7**

**D. Drainage Complaints Summary** ..... **7**

**3. Drainage Basin** ..... **9**

**A. Basin Delineations**..... **9**

**B. Major Outfalls**..... **10**

**4. Other Relevant Data** ..... **11**

**A. High Risk Facilities** ..... **11**

**B. Septic Service Areas**..... **12**

**C. Private Stormwater Systems**..... **12**

**D. Light Detection and Ranging (LiDAR) Information** ..... **12**

**5. Existing Levels of Service**..... **15**

**A. Permitted Finished Floor Elevations and Minimum Road Protection Levels**..... **15**

**B. Water Quality Provided** ..... **16**

**6. Information Maintenance Plan Recommendations** ..... **17**

**7. Summary** ..... **19**

## ***List of Appendices***

Appendix A – Scope of Services

## ***List of Figures***

1. Aerial Photograph
2. SFWMD Permitted Area Map
3. Stormwater System Map
4. Drainage Complaints Map
5. Watersheds Delineation Map
6. Watersheds Delineation Comparison Map
7. MS4 Major Outfall Map
8. MS4 NPDES High Risk Facilities Map
9. Septic System Service Area Map
10. LiDAR Information
11. Minimum Finished Floor Elevation Map
12. Roadway Level of Protection Map
13. Water Quality Map

## ***List of Tables***

1. SFWMD Permit Data Base Sample
2. Drainage Complaint Log
3. Major Outfall Information
4. High Risk Facility Inventory

## 1. Introduction

In May 2007, the City of Boca Raton (“City”) contracted Mock•Roos to provide Services for the development of a Stormwater Management Master Plan (“SMMP”) for the City.

This current report is the hardcopy deliverable of Task 1 – Interim Existing Conditions Documentation. The electronic deliverables accompany the finalized report on CD.

### A. Scope of Services

As negotiated, the development of the SMMP was broken down into three tasks. Task 1 services include the acquisition of information relevant to the stormwater management within the City. Task 2 services include a review of the policies that govern stormwater management in the City and recommendations for modifications to City codes, ordinances, and programs. Task 3 services include the identification of improvement projects, the prioritization of those projects, and an estimation of the associated costs of those projects. The Task 3 final deliverable also incorporates the deliverables from Task 1 and 2.

A copy of the authorized Scope of Services is provided in **Appendix A**.

The City provided the following information to assist in completing Task 1:

- current City stormwater GIS shapefiles and associated databases
- current City land use GIS shapefile and associated database
- current City Resident Complaint Log MS Excel spreadsheet
- copy of the City’s “Septic System Service” map
- hard copy of the Drainage Complaint Evaluation and Improvement Priorities report, 1999

### B. Background

Some basic information regarding the City and its existing stormwater management program is provided below.

#### *Geography*

The City is just less than 30 square miles in size. It geographically extends from the Atlantic Ocean on the east to approximately 3 miles west of I-95 and from the South Florida Water Management District (“SFWMD”) C-15 Canal on the north to the SFWMD Hillsboro Canal on the south. It is the southern-most municipality in Palm Beach County. The Coastal Ridge runs north-south approximately 1.5 miles inland of the Atlantic Ocean. The Coastal Ridge is an elevated geographic feature consisting mostly of fast-draining sandy soils, and generally separates

tidally influenced surface waters from the freshwater portion of the surface water management system. The City includes approximately 5 linear miles of the Intracoastal Waterway (“ICWW”) and the communities to the east of the ICWW, from the Hillsboro Canal to approximately Yamato Road. Refer to **Figure 1**.

### ***Stormwater Management***

Stormwater is essentially rain water that does not percolate into the ground and is commonly referred to as runoff. In an urban environment, with extensive areas of impermeable surface, quantities of runoff can be substantial, and its management very challenging. The City owns and maintains approximately 7,500 stormwater structures (inlets, catch basins, stormwater manholes, outfalls) as well as the pipes that connect them. The City’s system primarily serves roadways and older areas of the City that were not constructed around localized stormwater management systems. The City’s stormwater network, along with other public and private stormwater networks within the City, collects and conveys runoff to canals and lakes. The City has jurisdiction over approximately 280 acres of canals and lakes. In addition, the Lake Worth Drainage District (“LWDD”) E-3, E-3 ½, E-4 (although the City owns and maintains from Palmetto Park Road to Clint Moore Road), and twelve lateral canals (spaced at one-half mile intervals), receive runoff and are inter-connected with the SFWMD’s C-15 and Hillsboro Canals. Ultimately, the ICWW and the Atlantic Ocean receive the discharged urban runoff from the City.

Historically, stormwater management has focused on keeping water from flooding homes and streets. While that is still a top priority, improvement in the quality of stormwater runoff has increasingly become both a legal requirement and a public issue for stormwater managers.

### ***Policy***

The City has set forth, in several documents, its intent to provide excellent stormwater management as a component of enhancing the quality of life in the City. The management of stormwater is the responsibility of the City’s Stormwater Utility (which is a division of Municipal Services). The City’s Comprehensive Plan, its Strategic Plan, and its Codes & Ordinances all make reference to providing established levels of service for both stormwater quantity and quality.

Stormwater quantity refers to the protection of buildings and roadways from persistent flooding. Stormwater quality refers to minimizing the amount of pollutants in stormwater runoff. The City’s Comprehensive Plan established levels of service for quantity are as follows:

<u>DEVELOPMENT FEATURE</u>	<u>LEVEL OF SERVICE</u>
Lowest floor – residential & Nonresidential	100-year, 3-day zero discharge or FEMA Flood Insurance rate maps requirements for 100-year flood elevation established by SFWMD whichever is more restrictive
Local Streets	3-year, 24-hour rainfall
Parking Lots	3-year, 24-hour rainfall

For streets with traffic volumes which classify them above the definition of “local streets” consideration shall also be made in regards to the roadway classification.

For all development projects within the City’s jurisdiction, a minimum 3-year, 1-hour storm shall be retained prior to any discharge offsite. Beyond that, post development discharge shall not exceed pre-development discharge based on a 25-year, 3-day storm event.

The LOS standards for stormwater drainage quality are as follows:

<u>DEVELOPMENT FEATURE</u>	<u>LEVEL OF SERVICE</u>
New or Redeveloped Development	Retainage and/or detention requirements Drainage Systems shall as a minimum be the first one-inch of runoff from the development project or the total of 2.5 inches times the percent impervious area to meet minimum water quality criteria or shall meet the minimum requirements of the SFWMD criteria. <sup>1</sup>

The Drainage, Coastal Management, Conservation, and Capital Improvement Elements of the City’s Comprehensive Plan each contain policies that support development guidelines for meeting the levels of service, as well as for improving the level of service in existing developed areas.

***MS4 NPDES Permit***

The National Pollutant Discharge Elimination System (“NPDES”) is a federal program designed to eliminate stormwater pollutant discharges to receiving waters of the United States. In 1987, the U.S. Environmental Protection Agency (“EPA”) was required under Section 402 (p) of the Clean Water Act (N40CFR Part 112.26) to establish final regulations governing stormwater discharge permit application requirements. In 1990, the Federal Register indicated that Palm Beach County (“PBC”) was to begin compliance with the program under Phase I. The affected parties within PBC made the decision to join together to manage the requirements that would be established in the forthcoming permit and in 1991, a Steering Committee was formed to coordinate and facilitate joint activities regarding the NPDES compliance program. Northern Palm Beach County Improvement District (“NPBCID”) continues to act as lead permittee for the PBC group and the City continues to hold a seat on the Steering Committee. In 1991/92, Part I and Part II of the permit application were submitted and in 1997, the first 5-year permit (No. FLS000018) was issued to PBC’s forty Municipal Separate Storm Sewer System (“MS4”) co-permittees. In 2000, the EPA delegated responsibility for the permit program to the State of Florida Department of Environmental Protection (“DEP”). In November 2002, the second term

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<sup>1</sup> City of Boca Raton Comprehensive Plan, 1989.

5-year permit was issued. The permit is set to expire on November 10, 2007, but will continue in effect until a new permit has been issued. Application for a new permit was made in early 2007.

Associated with the MS4 NPDES permit is the requirement for a comprehensive stormwater management program to control the quality of stormwater discharged from the MS4. The permit also requires annual reporting of activities conducted for permit compliance.

Through the years, some of the required programs have received less emphasis by EPA and/or the DEP. However, our experience with the DEP leads us to anticipate that all the required programs will eventually be scrutinized and co-permittees will be expected to improve their programs to the maximum extent practicable. There have been instances within the State of Florida (outside of PBC) where DEP has issued fines and penalties against permittees that failed to comply with the requirements of their permit.

The City developed new codes to respond to some of the changes required under the MS4 NPDES permit and established programs within City Departments to comply with other requirements. Task 2 of the Stormwater Management Master Plan will provide recommendations on other possible modifications to the City's stormwater management program to improve compliance with its MS4 NPDES permit.

The State of Florida's Total Maximum Daily Load ("TMDL") program is a federally mandated program to establish loading limits for selected pollutants for which a water body is found to be impaired (i.e. in excess of the State's Water Quality Standards). The State has indicated that the TMDL program will be tied to the MS4 NPDES permit requirements in future permits. Should a waterbody within the City be found to have an impairment, and a TMDL established for that impairment, the City would become a stakeholder in the development of a Basin Management Action Plan ("BMAP"). The BMAP allows all the potential pollutant contributors to play a role in determining the plan for the reduction of the load of that pollutant to the impaired waterbody. Current and accurate information about the City's Stormwater System and its management will be extremely helpful to the City when participating in the BMAP process.

### ***Stormwater Utility***

In 1994, the City established a Stormwater Utility to provide funding for the operation and maintenance of the City's stormwater management system, for improvement projects to enhance the level of service provided to its residents, and for the stormwater improvement programs required under the City's MS4 NPDES permit. The estimated revenue associated with the Stormwater Utility for fiscal year 2007-2008 is approximately \$2.2 million.<sup>2</sup> It is anticipated that a formalized Stormwater Management Master Plan will assist the City in its effort to improve the level of service provided to its stormwater customers by documenting a prioritized plan of action.

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<sup>2</sup> City of Boca Raton Stormwater Utility Fund Report, City Website 2007.

## 2. Inventory of Stormwater System

As outlined in the Scope of Services, an inventory of the City's stormwater management system was completed. In order to compile relevant information, several sources were researched. Below is a summary of the inventory effort.

### A. SFWMD Permit Information

To begin the research on the areas within the City that are permitted by SFWMD, GIS coverages and/or shapefiles of the Surface Water Management and Environmental Resource Permits were downloaded from the SFWMD website (<http://spatial1.sfwmd.gov/sfwmdxwebdc/dataview.asp>). **Figure 2** depicts the areas of the City for which SFWMD permits have been issued as of the May 23, 2007 download date. Approximately forty-seven percent of the land area in the City is permitted with SFWMD. Other areas of the City were developed prior to the permitting requirement.

Additional data fields were added to the downloaded database associated with the permit shapefile and populated with information available from SFWMD permit records.

Permit file review included research at SFWMD Headquarters in West Palm Beach, as well as on-line at the SFWMD website. The permit files contain all the modification applications, in addition to the original permit. Modifications to a permit may cover the same, overlapping, or completely new geographic areas as the original permit. Subsequent applications may modify the values in the original permit by: extending or reducing the project area; raising or lowering the minimum finished floor, minimum roadway, and control elevations; and/or creating, removing or modifying connections, control structures, points of discharge and receiving waters. Some permits include more than 50 modifications. Extracting accurate representative information from these files was time-consuming. In some cases, where information was not found, assumptions were made, and this is noted in the "notes" field of the database.

The records researched include several types of documentation in addition to the actual permits, including but not limited to:

- Staff Reports
- Permit Summaries
- Construction Completion Certifications
- Record Drawings
- Reviewer Comments
- Permit Applications
- Design Calculations
- Design Drawings
- Correspondence between permittee and SFWMD
- Notices of Noncompliance

Data used to populate the database was prioritized in the order of the list given above. In an effort to provide the most reliable interpretation of this information, files were reviewed and data was acquired beginning with the most recent application.

**Table 1** provides a sample of a portion of the database of information developed for the permits within the City. Due to the size of the database, access is best achieved electronically.

## B. City's Stormwater System

The City's stormwater system consists of a network of pipes, structures (inlets, manholes, weirs, gates, etc.), canals, and lakes. The City has identified over 6,200 linear feet of pipe that is its responsibility, 27 linear feet the responsibility of FDOT, 186 linear feet the responsibility of private entities, and 527,000 linear feet not attributed to an owner. The City claims over 7,000 structures in its system and has identified 2,771 private structures, 886 State/County structures, and over 800 structures not attributed to an owner. While the City's claim to ownership indicates maintenance of those components, the City considers the entire stormwater system within the City limits to be part of its MS4. The knowledge of which system components are and which are not the responsibility of the City is important for work scheduling, budgeting, and responding to resident concerns. A comprehensive geographic information system ("GIS") of the stormwater system within the City would be a valuable tool for staff and residents.

The City has already taken the first steps toward the development of a GIS for its stormwater system. The City provided two GIS coverages of its stormwater system; one includes the location of the structures (catch basins, inlets, manholes, and headwalls), the other includes the line geometry of the stormwater pipes connecting the structures. Each coverage has an associated database of information. City staff used Environmental Systems Research Institute (ESRI) software (ArcGIS) to create files known as shapefiles from the spatial information, and populated the associated databases with information about components of the existing system. The structure database includes fields for the type, status, right-of-way type, owner, rim elevation, and up to four invert elevations. The pipe database includes fields for the size, length, shape, material, owner, and up to four invert elevations. **Figure 3** displays the provided stormwater system information.

To move this initial GIS effort to the next level, additional information to populate the databases should be gathered and input. Additional fields in the databases that would be useful to City staff include: date of installation, last inspection/maintenance date; and the source of the information reported. Identification of the source will be important when work is being done to update the data fields as newer/more accurate information becomes available (from completed projects and/or surveys of existing conditions).

A fully developed stormwater GIS will enable staff to better manage the stormwater programs required by permit and code. It is recommended that the City undertake the advancement of its

stormwater GIS as a stormwater system improvement project that could be phased over several fiscal periods.

### **C. Palm Beach County & FDOT Stormwater Systems**

Several major roadways traverse the City, and associated with them are stormwater management systems that in some locations are connected to the City's system. In addition, larger roadway systems, such as I-95, often incorporate drainage areas adjacent to the roadway that are outside the road right-of-way. In order to understand and document these systems, a records search was conducted with PBC Engineering and Public Works Department, the Florida Department of Transportation ("FDOT") District IV Office, and FDOT West Palm Beach Operations Center.

A search of the PBC Project List (updated February 12, 2007) was conducted and copies of the record or construction drawings of the projects within the City were requested from the Reprographics Department. Current project drawings, not available from the Reprographics Department, were obtained from the Roadway Production Division.

A formal records request was submitted to FDOT's District IV Office for projects located within the City. This resulted in electronic and hard copies of roadway improvement projects, including the respective drainage design. A search of the drawings on site at the Operations Center was also conducted to locate additional record information. Maps containing FDOT outfall locations were obtained from the Operations Center.

PBC and FDOT stormwater system components were added to the stormwater network shapefiles, based on the design and record drawings received. The components' jurisdiction and the source of the information were added to the associated databases. This information is shown, along with the City's information, in **Figure 3**.

### **D. Drainage Complaints Summary**

The City provided a hard copy of the Drainage Complaint Evaluation and Improvement Priorities report that was completed by Williams, Hatfield & Stoner, Inc. ("WHS") in July 1999. This report evaluated and ranked each of the complaints in the City's Resident Complaint Log through an unspecified date in 1998. The City indicated that many of these complaints are still relevant. In addition, the City provided an electronic copy of its Resident Complaint Log spreadsheet. This file included complaints in addition to those evaluated in the WHS report. There are 109 complaint entries in the log. WHS evaluated 48 locations; the remainder have not been evaluated by the process used in the WHS report.

Using the address and description fields for each of the complaints, a shapefile of the location and approximate extent of each drainage complaint was developed. The Complaint Log database was converted to an associated database for the shapefile that was created. **Figure 4** depicts the shapefile and **Table 2** is the associated database that was developed. The complaint map and

database will be used in Task 3 to identify areas in the City where improvement projects will address recurring or widespread drainage problems.

### 3. Drainage Basin

In general, current stormwater management policies rely heavily on a watershed or drainage basin approach. Historically, the City has been interested in five major watersheds associated with the following water bodies: The C-15 Canal, the Hillsboro Canal, the E-3 Canal, the E-4 Canal, and the ICWW. Several drainage basin delineations have previously been made: specifically, those done by SFWMD and DEP. In addition, drainage basins were established when the original MS4 NPDES permit application was made in the early 1990s. The watershed boundaries do not coincide with one another. Therefore, with the information currently available, updated basin delineations have been made for the five major watersheds within the City.

#### A. Basin Delineations

SFWMD permits, FDOT and PBC project construction drawings, the GIS coverage of the City's stormwater system, aerial photographs, terrain elevations, and the LWDD Elevation Map were all used as sources of information to define the five major drainage basins within the City.

##### *ICWW Watershed*

The ICWW is a tidally influenced water body. Any system that discharges into the ICWW or an uncontrolled tributary of it is considered part of its drainage area. While this is somewhat consistent with the DEP drainage delineations, it varies from SFWMD and the previous NPDES delineations. The decision behind the chosen delineation is that the Hillsboro Canal control structure (G-56) is west of the E-3 Canal. This means that, like the ICWW, the Canal east of the structure and any tributary discharging into it, are tidally influenced; essentially one with ICWW. The ICWW drainage basin includes those drainage areas that discharge into any canal, or portion thereof, that is tidally influenced. Similarly, areas discharging to the C-15 downstream of its control structure (S-40) are considered part of the ICWW drainage basin.

##### *E-3 Watershed*

The E-3 Canal discharges to the Hillsboro Canal, however, its water level is controlled by a control structure (CS No.16) near the confluence with the Hillsboro Canal. The E-3 Basin includes all the drainage areas discharging into LWDD L-43 to L-50 Canals, west of Military Trail, or those that discharge directly to the E-3 Canal south of Yamato Road.

##### *E-4 Watershed*

The E-4 Canal also discharges to the Hillsboro Canal downstream of the G-56 structure. Areas draining to the portion of the E-4 Canal south of the salinity structure are in the ICWW drainage basin. The E-4 drainage basin includes all the drainage areas that discharge into LWDD L-40 to L-46 Canals, east of Military Trail, or those that discharge directly to the E-4 between Control Structure No. 15 (near the City's northern limits) and the salinity control structure north of Glades Road.

### ***C-15 Watershed***

A portion of the City is within the SFWMD C-15 Basin. The drainage areas discharging into the L-40, L-41, and L-42 Canals west of Military Trail, or that discharge directly into the C-15 Canal upstream of the S-40 structure are within the C-15 Basin.

### ***Hillsboro Watershed***

The Hillsboro Watershed within the City is that area that ultimately drains to the freshwater portion of the Hillsboro Canal (upstream of the G-56 Structure). This area is in the west central area of the City and discharges to the Hillsboro Canal via the LWDD E-2 Canal outside the City limits (not shown).

**Figure 5** provides the graphic representation of the delineated watersheds. Please note that the watersheds extend beyond the City limits, but were only reviewed and revised within the City limits.

Once the five major watersheds were delineated, a comparison was made to previous/other delineations (SFWMD, NPDES, and DEP). **Figure 6** shows the five major basins, overlaid with the previous basin delineations. The two areas where the SFWMD drainage basin delineation differs most notably are: between Military Trail and Dixie Highway, north of Yamato Road; and, west of Dixie Highway, south of Glades Road. The area most notably difference from the NPDES basin delineation is the area west of Dixie Highway, south of Glades Road. Finally, the most notable difference from the DEP delineation is the north-south boundary between the ICWW and E-4 basins and the C-15 and E-3 basins.

The DEP uses their basin delineations in the water quality modeling that is conducted as part of the TMDL program. Therefore, we recommend that the City provide the updated watershed delineations for DEP's consideration in the very near future.

## **B. Major Outfalls**

A requirement of the City's MS4 NPDES permit is the identification of major outfalls to Waters of the State and their associated drainage areas. A major outfall is defined as a discharge pipe of 36" or larger, or a discharge pipe that serves a drainage area 50 acres or larger in size. The City's major outfalls were determined by first identifying the pipes within the City's stormwater network that are 36" or larger. Following this, drainage areas that discharge to Waters of the State were delineated. There were no drainage areas of 50 acres or larger discharging from a pipe less than 36" in size. There are 23 major outfalls within the City; shown on **Figure 7**. Eight of the 23 outfalls discharge stormwater from only PBC roadways; however, they have been included because the City's stormwater network information identifies the City as the owner of the outfall structures. The identification number shown for each outfall basin in **Figure 7** corresponds to the entries in **Table 3**. This table provides a summary of the outfall basin information.

## 4. Other Relevant Data

### A. High Risk Facilities

The City's MS4 NPDES permit requires that it "identify and control pollutants in stormwater discharges to the MS4 from any municipal landfill(s); hazardous waste treatment, storage, disposal and recovery facilities; facilities that are subject to EPCRA [Emergency Planning and Community Right-to-know Act] Title III, Section 313; and any other industrial or commercial discharge which the permittee(s) determine is contributing, or has the potential to contribute, a substantial pollutant loading to the MS4."<sup>3</sup> The permit further requires that in addition to identifying facilities, the City determine priority, develop a schedule for and carry out inspections.

To develop the initial list of potential high risk facilities, both the EPA Envirofacts Database (<http://www.epa.gov/enviro/>) and the DEP Solid Waste Database (<http://ca.dep.state.fl.us/imf/caFrameset.jsp?browser=IE5up>) were searched to identify facilities located within the City limits. The Envirofacts website allows searching of multiple information systems, including the Resource Conservation and Recovery Information System (RCRIS), the Comprehensive Environmental Response, Compensation, and Liability Information System ("CERCLIS") – also known as Superfund, and the Toxic Release Inventory System ("TRIS").

It has been the methodology of many PBC municipalities to prioritize the list of high risk facilities by the information system in which they are found. The CERCLIS and TRIS listed facilities are considered to be a higher risk, as unauthorized discharge(s) has already occurred from those facilities.

The latitude and longitude of the facilities (rather than street address) were used to map the locations. **Figure 8** shows the locations of the identified facilities. Those facilities located within the City limits were then selected, and the associated database information was exported to an MS Excel spreadsheet as the High Risk Facility Inventory (See **Table 4**).

From the information gathered, it appears that five (5) facilities located in the City are high priority. The City should conduct additional research and inspections to determine if these facilities/sites are in fact high risk for the discharge of pollutants into its MS4.

This information should be updated on an annual basis as fulfillment of the requirements of the MS4 NPDES permit. In addition, the inventory and map information may be helpful in locating the potential source of contamination in the event that an illegal discharge is detected in the City's MS4.

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<sup>3</sup> FLS0000018 MS4 NPDES Permit

## B. Septic Service Areas

The City provided an AutoCAD file outlining areas of the City that are currently served by septic systems. The information was converted into a shapefile and is presented in **Figure 9**. Less than 1% of the City's land area ( $\pm 160$  acres) is served by septic systems; however, the City is making an effort to convert service of these areas to the public sewer collection system as other underground improvements are made.

From a stormwater perspective, septic systems are often considered a source of pollution (fecal coliform, nitrogen, etc.) to nearby waterways. PBC Health Department provided information for calendar year 2006 that indicated a 0.93% incidence of septic tank failure in the County. Boca's minimal number of septic systems, may indicate this is a minor concern for the City.

## C. Private Stormwater Systems

A review of the private stormwater systems within the City was done using the information provided in the stormwater system database, the SFWMD permits database, and the jurisdictional roadway information. Some areas, as discussed with City, are considered semi-private which means that the roadway and possibly the drainage structures are under the jurisdiction of the City, while the lake system and discharge structure are not. According to this review, approximately 27% of the City is served by private stormwater systems, and approximately 4% is served by semi-private systems.

While the City has the ability to investigate, plan for, and make improvements to systems under its jurisdiction, it may have more challenges achieving improvement in private systems. The City may consider revising codes and ordinances to address future redevelopment of private areas as a means to achieve higher levels of service and increased water quality. Future requirements by other government entities may impose requirements that the City develop codes that affect even private systems discharging into Waters of the State.

## D. Light Detection and Ranging (LiDAR) Information

LiDAR is an optical remote sensing technology used to collect topographic data. The information typically has a precision of approximately 6 inches. While not accurate enough for design purposes, it has proven very useful in drainage basin delineation, and computer modeling. In 2001, the International Hurricane Research Center at Florida International University was awarded grant funding from the Federal Emergency Management Agency ("FEMA") for a program entitled the Windstorm Simulation and Modeling project. As a component of this effort, LiDAR information was gathered for the southern portion of PBC, which included the entire City. In 2007, the SFWMD updated the data to correct some areas of error that were identified.

The updated LiDAR information from SFWMD was acquired and translated into the ArcGrid seen in **Figure 10**. The LiDAR data is available as a Digital Elevation Model (“DEM”), which is essentially a collection of points that each contains three-dimensional spatial information. The point information is extremely dense making its use cumbersome and slow on the computer and illegible on any map printed at a useful scale. To facilitate using the data, the point data was converted into a grid. In this case, a 10-foot by 10-foot area represents one grid unit. The elevation values for all points within each grid unit area are averaged and the average value is assigned to the grid unit. The resulting grid of average elevation values can be used to estimate elevations in a given area or to visualize elevation variations. The vertical datum of the original point data is NAVD 1988. The elevation information was converted to the NGVD 1929 datum (by adding the approximate difference of 1.5’) in order to correspond more readily to other available elevation information.

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## 5. Existing Levels of Service

### A. Permitted Finished Floor Elevations and Minimum Road Protection Levels

SFWMD permit files provided information on minimum finished floor elevations and minimum road crown elevations. In the case of some permit modification applications, where no specific information was provided on these values, it was assumed that the values established in the original permit for the area were still in effect. The minimum finished floor elevation for a project is typically set above the calculated maximum flood stage resulting from a 100-year/3-day rainfall event. In some cases, the minimum finished floor may be set according to FEMA flood elevations, or in relation to other nearby finished floor elevations or road crown elevations.

**Figure 11** displays the minimum finished floor elevations for the permitted areas within the City. The information is overlaid atop the GIS coverage of the FEMA flood zones provided by the City. It's worth mention that FEMA is in the process of updating their flood insurance rate maps to reflect more current information. Preliminary reviews have suggested that these changes could have a significant economic impact on the communities being updated (the entire City, less the C-15 drainage basin). It is recommended that the City keep informed about the progress of the map updates and review any preliminary documents made available.

Minimum road crown elevations are designed to be at or above the peak flood elevation resulting from a specified design rainfall event, when established according to SFWMD regulations. The rainfall event is considered to be the "level of protection" or "level of service" for the roadway. SFWMD has increased its minimum level of protection for roadways to the 5-year/1-day event. As stated earlier, the design storm event specified to meet the City's level of service for roadways is the 3-year/1-day event. The City's LOS requirement pertains to areas of new development or significant re-development, where the adjustment of a minimum road elevation would not create negative impacts within or adjacent to the project. When minimum road elevations are established using more intense rainfall events, the road provides a higher level of service. Major roadways are typically designed to provide a higher level of protection than local or neighborhood roads. For example, FDOT and Palm Beach County roadways may provide levels of protection from a 10-year/1-day rainfall event. **Figure 12** is a map of the design rainfall events for which the minimum road elevation was provided in the SFWMD permits. Many areas within the City were developed prior to permitting requirements and the level of service on the roadways in those areas is not documented.

While the specific rainfall amount for the permitted design storm was not recorded during permit file review, it could be added to the database at a later date. Design rainfall amounts (typically obtained from the SFWMD Vol. IV Permit Manual) have changed over time. They are also subject to interpretation, as the selected value is read off rainfall curves shown over an outline of the South Florida area. This presents a complication to directly comparing established levels of roadway protection. In addition, while rainfall volume increases with return frequency (a 100-year event has a greater rainfall volume than a 3-year event), intensity decreases with storm

duration (a 3-day event may have lower peak one-hour intensity than a 1-day or 1-hour event). Therefore, care should be taken when comparing the level of protection provided to one road versus another.

We recommend the additional effort be made to determine if the permitted design storm events, and resulting minimum road (or parking) elevations meet the City's minimum level of protection. We also recommend, for consistency, that the City establish a corresponding rainfall volume associated with this design storm event. The City should also consider increasing the minimum level of protection for roadways to the 5-year/1-day event for new development; this would be consistent with current SFWMD requirements.

## B. Water Quality Provided

Information researched in the SFWMD permit files included the level of water quality provided for each permitted project. For areas of new development, SFWMD requires that a project provide either 1" times the permitted area or 2.5" times the percent impervious of the permitted area, whichever is greater. (The percent impervious for this calculation is not straightforward; SFWMD has a specific formula for percent impervious for determining required water quality volume.) It can safely be stated that if a project for new development received a SFWMD permit, it provides some level of water quality. In addition to the basic water quality requirement, SFWMD requires that commercial and/or industrial landuse projects include a dry pre-treatment retention volume equal to ½" times the project area. From the review of the SFWMD permit files, it appears that in the City, this requirement is frequently met with the use of exfiltration trench.

For the City's use, it is valuable to know what level of water quality is provided by the various permitted areas. **Figure 13** depicts the level of water quality provided as 1" over the entire permitted area, 2.5" times the percent impervious, or that the information was unavailable. Areas that have no designation are not permitted through SFWMD and/or did not have designated water quality volume specified in the permit. SFWMD permits issued for areas that were developed prior to permitting regulations are not currently subject to the water quality requirement.

The actual volume of water quality provided is harder to extract from the permit files. Although SFWMD Staff Reports have a location for reporting this value, it is often filled in with the same value as the required water quality volume; any additional water quality volume provided by the project goes undocumented. However, additional information about water quality for permitted areas is available in the database associated with the SFWMD permit shapefile. This includes fields for the required volume and the type of water quality provided (wet detention, exfiltration trench, etc.).

## 6. Information Maintenance Plan Recommendations

Each database of information that has been acquired or developed under this task has value to the City in managing their stormwater system. It is therefore recommended that the City budget for annual upkeep of this information. It will be necessary to assign responsibility for the updates to specific staff positions. The City should document the responsibilities in the job descriptions for those positions, so that the updates continue, regardless of the individual filling the position.

### *SFWMD Permit Information*

The updating of the SFWMD permit information may be carried out in several ways. A periodic search of the SFWMD on-line permit information could generate a list of permits issued for the Townships and Ranges within Boca, for a specified range of dates. This permit information could then be researched to extract the database information desired. Alternatively, the City could require the submittal of a copy of the SFWMD permit and Staff Report for any project required to obtain one.

### *Stormwater System GIS*

As construction projects within the City are completed (by the City, State, County, or private entities), the City should establish the requirement that a copy of the record information be submitted to the City. The record information can be used to supplement and/or update the information that exists in the current stormwater GIS. Furthermore, the City could undertake a project to review archived record drawing information to supplement the database information in the existing stormwater GIS.

Fields could be added to the database for scheduled and completed maintenance activities. A user interface could be developed so that work orders could be generated from the database. This system could also be used to generate a summary of the activities that have been conducted during a specified period of time, and could be used for annual NPDES reporting.

### *Citizen Complaints*

A user interface could be developed so that the staff position responsible for receiving the citizen complaints could enter the information into the database associated with a shapefile representing the area of the complaint. The fields of information could be configured so that a work order report could be generated for use by staff conducting the initial investigation. After the initial investigation, the work order could be returned and the results entered into the database. Again, a report could be generated if a subsequent work order were required to address a specific maintenance or repair issue. With appropriate planning of the database fields, this GIS could be used to generate the citizen complaint information required by the City's NPDES annual report.

### *Drainage Basins*

In conjunction with the 1<sup>st</sup> year reporting for each 5-year MS4 NPDES permit term, an update of the City's major outfalls is required. In conjunction with this a review of the City's drainage

basins should occur. Interim changes should be made if information becomes available to the City; but in all cases, a comprehensive review should be conducted once every five years.

#### ***MS4 High Risk Facilities***

As required by the MS4 NPDES permit, the high risk facility inventory must be updated annually. At a minimum, annual searches of the EPA's Envirofacts database and the DEP's Solid Waste database should be conducted. Additional refinement of the list may be completed by staff, using documented guidelines for the determination of what constitutes a high risk facility. We recommend documenting these guidelines, as the MS4 NPDES permit is not specific enough to ensure consistency over the years. In addition, the documentation serves as a record that the City has a protocol for completing the high risk facility requirement of the MS4 NPDES permit.

#### ***Areas Served by Septic Systems***

City staff should annually review the map of areas served by septic systems, and update the map as needed. Updates can occur as improvement projects are completed, however, an annual review is the recommended minimum.

#### ***Private Stormwater Systems***

City staff should annually review the map of private stormwater systems and research relevant files and/or council meeting minutes to determine if any systems previously designated as private have been taken over by the City for operation and maintenance. The City reserves the right to take over operational responsibilities if it determines that a private system is not being maintained properly. This may become a more significant issue when and if a BMAP is developed and adopted (under the TMDL program), that requires the City to improve discharges from areas served by private systems.

## 7. Summary

The assembly of information about the existing condition of the City's stormwater management system is the first step in developing an improvement program. This has been completed with the Task 1 services. In Task 2, a review of the regulatory framework supporting the stormwater program will provide additional necessary information for suggested modifications. Task 1 and 2 together provide the foundation upon which the Stormwater Management Master Plan will be built.



## **APPENDIX A**

### **SCOPE OF SERVICES**



**Work Order No. 001**  
**City of Boca Raton**  
**and**  
**Mock•Roos**  
**Consulting Services Work Order**  
**for**  
**STORMWATER MANAGEMENT MASTER PLAN**

This Work Order, when executed, shall be incorporated in and become a part of the Agreement for professional services between the City of Boca Raton (CITY), Florida and Mock•Roos (CONSULTANT), dated \_\_\_\_\_, hereafter referred to as the “Agreement.”

**PURPOSE:** The purpose of this Work Order is to develop a Stormwater Management Master Plan (SMMP) for the CITY. The SMMP will identify, on a city-wide basis, conceptual improvements needed in the CITY’s stormwater system, and programs necessary to meet the requirements of the CITY’s municipal separate storm sewer system (MS4) National Pollutant Discharge Elimination System (NPDES) permit. The NPDES is a Federal program developed by the Environmental Protection Agency (EPA) for compliance with the Clean Water Act. In October 2000, EPA authorized the Florida Department of Environmental Protection (FDEP) to administer the NPDES Program in the State of Florida. The City’s MS4 NPDES permit regulates point source discharges of stormwater into surface waters of the State of Florida by requiring the City to implement a comprehensive Stormwater Management Program that includes prevention measures, treatment or removal techniques, stormwater monitoring, public education, regulation and enforcement.

***SCOPE OF SERVICES***

***TASK 1 – EXISTING CONDITIONS DOCUMENTATION***

**Task 1.A – Inventory Stormwater System**

Task 1.A.1 The CONSULTANT will review South Florida Water Management District (SFWMD) permit records and create a Geographic Information System (GIS) representing the permitted projects within the CITY with a database containing the following information:

- Name of Project
- Drainage Area
- Storage Area
- Control Elevation
- Minimum Road Elevation
- Level of Protection for Roads
- Minimum Building Pad Elevation
- Level of Protection for Buildings

Impervious Area  
Water Quality Volume Required  
Water Quality Volume Provided  
Additional Best Management Practices (swales, aeration, other)  
Discharge structure description

The GIS will be developed using the basemap provided by the CITY. The vertical data will be the National Geodetic Vertical Datum (NGVD 1929) and the horizontal coordinate system will be NAD-83 Florida State Plane, East Zone.

Task 1.A.2 The CONSULTANT will prepare an exhibit showing areas served by the CITY's stormwater collection system. The CITY will provide its GIS files of available stormwater collection facilities within the CITY.

Task 1.A.3 The CONSULTANT will request in writing paving and drainage plans (record drawings and/or design drawings) from Palm Beach County and Florida Department of Transportation (FDOT) for roadway projects within the CITY. These stormwater facilities, if obtained, will be added to the CITY's stormwater GIS.

Task 1.A.4 The CONSULTANT will prepare an exhibit showing the location of unresolved citizen stormwater system complaints. The CITY will provide to the CONSULTANT a copy of the complaints for this purpose.

Task 1.A.5 The CONSULTANT will coordinate with the CITY on the stormwater system needs identified by the CITY and prepare an exhibit showing the areas in need of improvement.

### **Task 1.B – Identify Drainage Basins**

Task 1.B.1 The CONSULTANT will verify the delineation of the following five drainage basins: El Rio Canal; the Intracoastal Waterway; the C-15 Canal, the Hillsboro Canal, and the E-3 Canal. The CONSULTANT will use the base map and jurisdictional boundary provided by the CITY, as well as the following items:

- SFWMD Permits
- Lake Worth Drainage District (LWDD) Studies for the Hillsboro and C-15 Basins
- Palm Beach County (PBC) Light Detection And Ranging (LIDAR) Data
- PBC 2005 Aerial Photography

Task 1.B.2 The CONSULTANT will compare the drainage basins to SFWMD sub-basins, PBC NPDES Drainage Areas, and FDEP Total Maximum Daily Load (TMDL) Watersheds.

Task 1.B.3 The CONSULTANT will determine the CITY's MS4 major outfall drainage areas.

### **Task 1.C – Compile Other Relevant Data**

Task 1.C.1 The CONSULTANT will map high risk facilities as defined by the CITY's NPDES permit and confirmed by the CITY. High risk facilities will be cursorily evaluated and summarized.

Task 1.C.2 The CONSULTANT will map the areas currently served by septic systems and evaluate their potential to impact the CITY's MS4. The CONSULTANT will contact PBC Health Department for available information on the septic tank failure rate within PBC and the CITY.

Task 1.C.3 The CONSULTANT will map stormwater management areas currently served by private stormwater systems based on information provided by the CITY and SFWMD permit information.

### **Task 1.D – Summarize Existing Levels of Service (“LOS”)**

Task 1.D.1 The CONSULTANT will identify the design storm level of protection for roadways and the minimum finished floor elevation for buildings as indicated by SFWMD permits. Areas of the CITY not covered by a SFWMD permit will not reflect a LOS unless the CITY provides additional information or requests that an analysis be conducted as additional services.

Task 1.D.2 The CONSULTANT will identify the rainfall quantity associated with the water quality volume as indicated by SFWMD permits. Areas of the CITY not covered by a SFWMD permit will not reflect a LOS unless the CITY provides additional information or requests that an analysis be conducted as additional services.

### **Task 1.E – Existing Information Upkeep**

Task 1.E.1 The CONSULTANT will develop, with the CITY's assistance, a written plan for maintaining the integrity of the existing conditions information assembled by the CONSULTANT.

### **Task 1.F – Meetings**

Task 1.F.1 The CONSULTANT will meet with the CITY monthly (up to 2 hours each meeting) to discuss progress and the current status of the Task.

**Task 1 Deliverables** – The CONSULTANT will prepare an interim report summarizing the existing conditions of the CITY’s stormwater system. The report will include the following exhibits:

- SFWMD permit map within the CITY
- CITY’s stormwater system map (including FDOT & PBC systems)
- Identified problem areas (from citizen complaints & CITY information)
- LIDAR map
- Land Use map
- Drainage Basin map (overlaid with SFWMD sub-basins, NPDES basin areas, and/or FDEP TMDL watersheds)
- MS4 major outfall drainage areas map
- High risk facilities location map
- Septic system service map
- Existing water quantity levels of service
- Existing water quality levels of service
- Private system stormwater management areas

A draft of the interim report (four copies) will be provided to the CITY. The CONSULTANT will meet with CITY (one meeting up to two hours in duration) to receive and discuss comments. All comments will be incorporated into a final interim report on existing conditions. Four hard copies and one electronic (PDF) file on CD will be provided.

The CONSULTANT will also provide to the CITY any GIS shapefile and associated database that is created as a result of Task 1 services.

## **TASK 2 – REGULATORY INFORMATION SUMMARY**

### **Task 2.A – Summarize Current Stormwater Policy**

Task 2.A.1 The CONSULTANT will evaluate the following policies/regulations and summarize the requirements, goals, and policies which are currently used to evaluate the performance (water quantity and water quality) of new stormwater management systems:

- CITY’s Comprehensive Plan Drainage Sub-Element
- CITY’s Land Development Code
- SFWMD regulatory requirements
- LWDD requirements including LOS provided by LWDD canals
- PBC MS4 NPDES permit

Task 2.A.2 The CONSULTANT will summarize any issues that could result from applying these additional/revised development standards to existing infrastructure.

## **Task 2.B – Summarize MS4 NPDES Permit Requirements**

Task 2.B.1 The CONSULTANT will summarize the CITY's current MS4 NPDES program. This will include meetings with the CITY (two meetings, each up to two hours in duration) and reviewing existing logs and documentation.

Task 2.B.2 The CONSULTANT will review with the CITY the 4<sup>th</sup> Year Second Permit Term Annual Report to FDEP.

Task 2.B.3 The CONSULTANT will summarize the water quality monitoring efforts currently being completed to fulfill MS4 NPDES requirements. The draft annual report which includes the monitoring efforts, is anticipated to be available in early 2007.

Task 2.B.4 The CONSULTANT will identify elements of the CITY's MS4 NPDES program that could be improved upon.

Task 2.B.5 The CONSULTANT will determine if there is a need to amend CITY code to allow for inspection and code enforcement activities on private stormwater systems which may not be meeting water quality requirements.

## **Task 2.C – Summarize Impaired Waters Information or TMDL**

Task 2.C.1 The CONSULTANT will summarize the current information available on FDEP's program for the establishment of TMDL limits for the Intracoastal Waterway and E-4 Canal. The summary will include FDEP's Watershed Body Identification number, water segment name, water quality parameters of concern, the concentration causing impairment, projected year for TMDL development, and potential sources of contaminants.

## **Task 2.D – Discuss Proposed Levels of Service**

Task 2.D.1 The CONSULTANT will meet with the CITY to discuss current regulations and minimum LOS that the CITY may wish to establish.

## **Task 2.E – Meetings**

Task 2.E.1 The CONSULTANT will meet with the CITY monthly (up to 2 hours each meeting) to discuss progress and the current status of the Task.

**Task 2 Deliverable** – The CONSULTANT will prepare an interim report summarizing Tasks 2.A through 2.D. A draft of the interim report (four copies) will be provided to the CITY. The CONSULTANT will meet with CITY (one meeting up to two hours in duration) to receive and discuss comments. All comments will be incorporated into a final interim report on policies and identified needs. Four hard copies and one electronic (PDF) file on CD will be provided.

### **TASK 3 – SMMP DEVELOPMENT**

#### **Task 3.A – Identify Improvement Projects**

Task 3.A.1 The CONSULTANT will conduct a field observation of the problem areas identified by the CITY.

Task 3.A.2. The CONSULTANT will identify conceptual improvement projects and programs for problem areas or regulatory needs. The CONSULTANT will meet with the CITY (two meetings, each up to two hours in duration) to discuss the proposed projects. Because the proposed projects will not be analyzed, they will be conceptual in nature. If the CITY requests, analysis of the proposed improvements can be performed as additional services.

Task 3.A.3 The CONSULTANT will prepare conceptual cost estimates for identified projects and programs.

Task 3.A.4 The CONSULTANT will identify anticipated water quality impacts of conceptual improvements projects.

Task 3.A.5 The CONSULTANT will meet (two meetings with each, up to two hours per meeting) with key members of the Finance Advisory Board, the Marine Advisory Board, and the Environmental Advisory Board to obtain their input on the proposed projects.

#### **Task 3.B – Establish Prioritized Project List**

Task 3.B.1 The CONSULTANT will prepare a ranking matrix to prioritize the conceptual improvement projects.

Task 3.B.2 The CONSULTANT will meet with the CITY (two meetings, each up to two hours in duration) to review and discuss the ranking matrix and modify the list of prioritized projects as needed.

#### **Task 3.C – Meetings**

Task 3.C.1 The CONSULTANT will meet with the CITY monthly (up to 2 hours each meeting) to discuss progress and the current status of the Task.

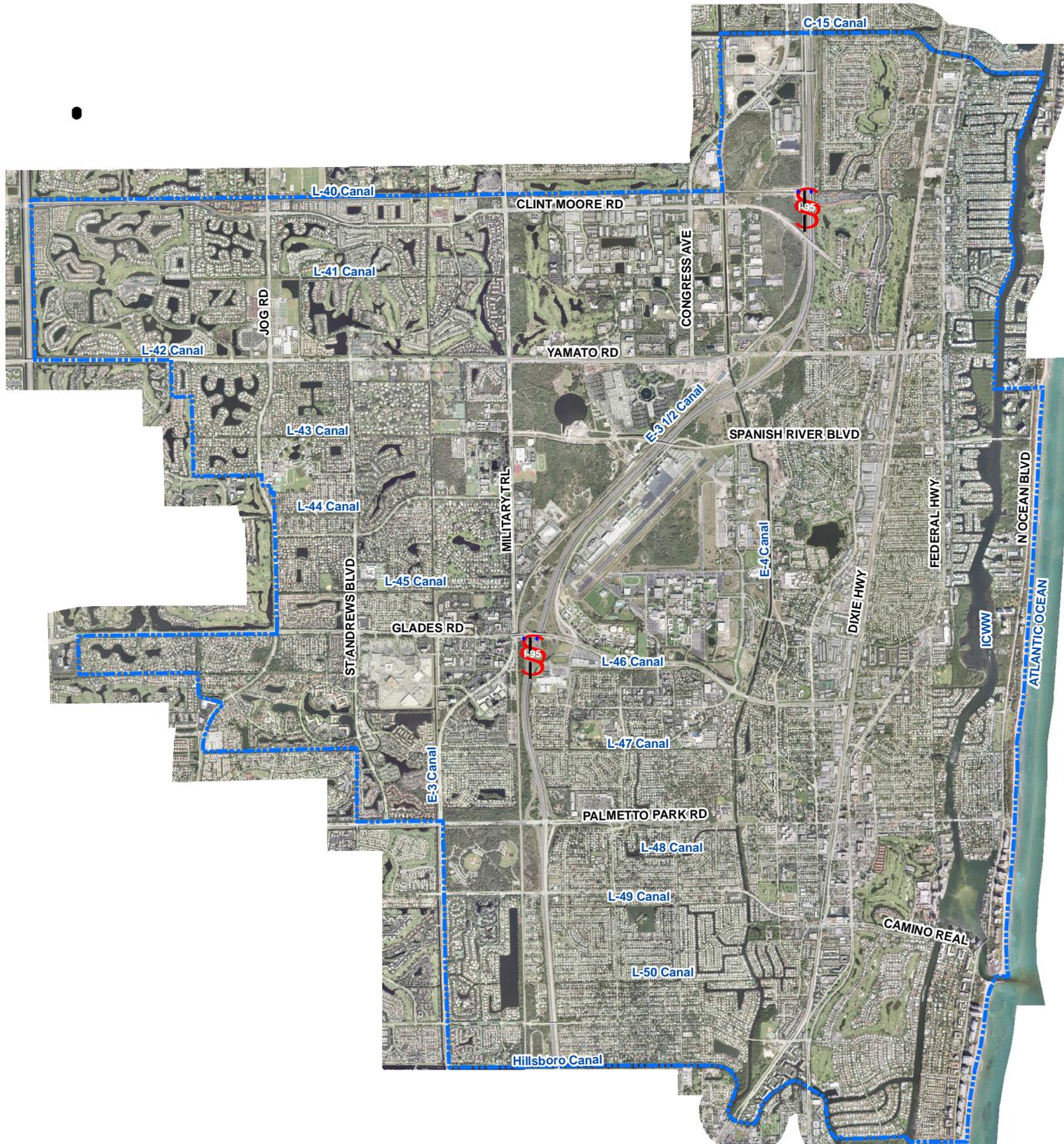
**Task 3 Deliverables** – The CONSULTANT will prepare and submit a draft SMMP. The SMMP will include the information provided in the Task 1 and Task 2 interim reports as well as a discussion on the proposed improvement projects, and the prioritized improvement project list, including costs. A draft of the SMMP (four copies) will be provided to the CITY. The CONSULTANT will meet with CITY (one meeting up to two hours in duration) to receive and discuss comments. All comments will be incorporated into the final SMMP. Four hard copies and one electronic (PDF) file on CD will be provided.

### **CITY Responsibilities**

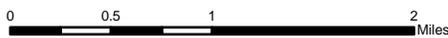
The CITY will provide, at a minimum, prior to Notice to Proceed, the following information:

- Current stormwater GIS shapefile(s) and associated databases
- Current land use GIS shapefile(s) and associated databases
- Most recent, adopted, Comprehensive Plan Drainage/Aquifer Recharge Element and any other Comp Plan elements relevant to development of the SMMP
- All Land Development Regulations referencing stormwater
- Contact information for Financial, Environmental, and Marine Advisory Board members
- NPDES documentation records (summary) for October 1, 2005 through September 30, 2006
- Copy of the latest Resident Complaint Log
- Copy of the City's "Septic System Service" map
- Previously Developed Drainage Ranking Matrix

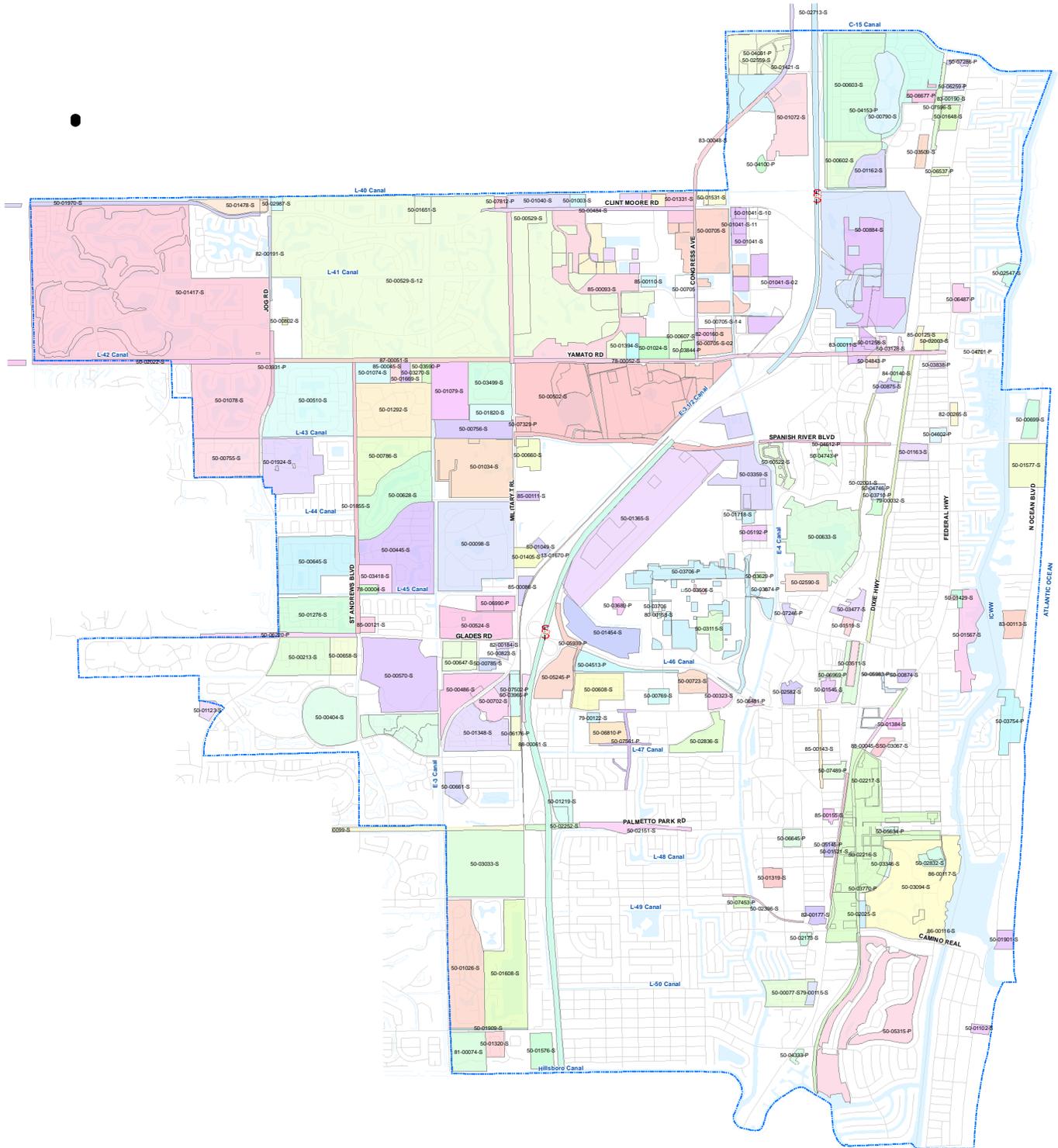




**Legend**  
 City Limits

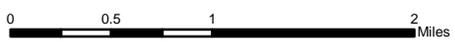




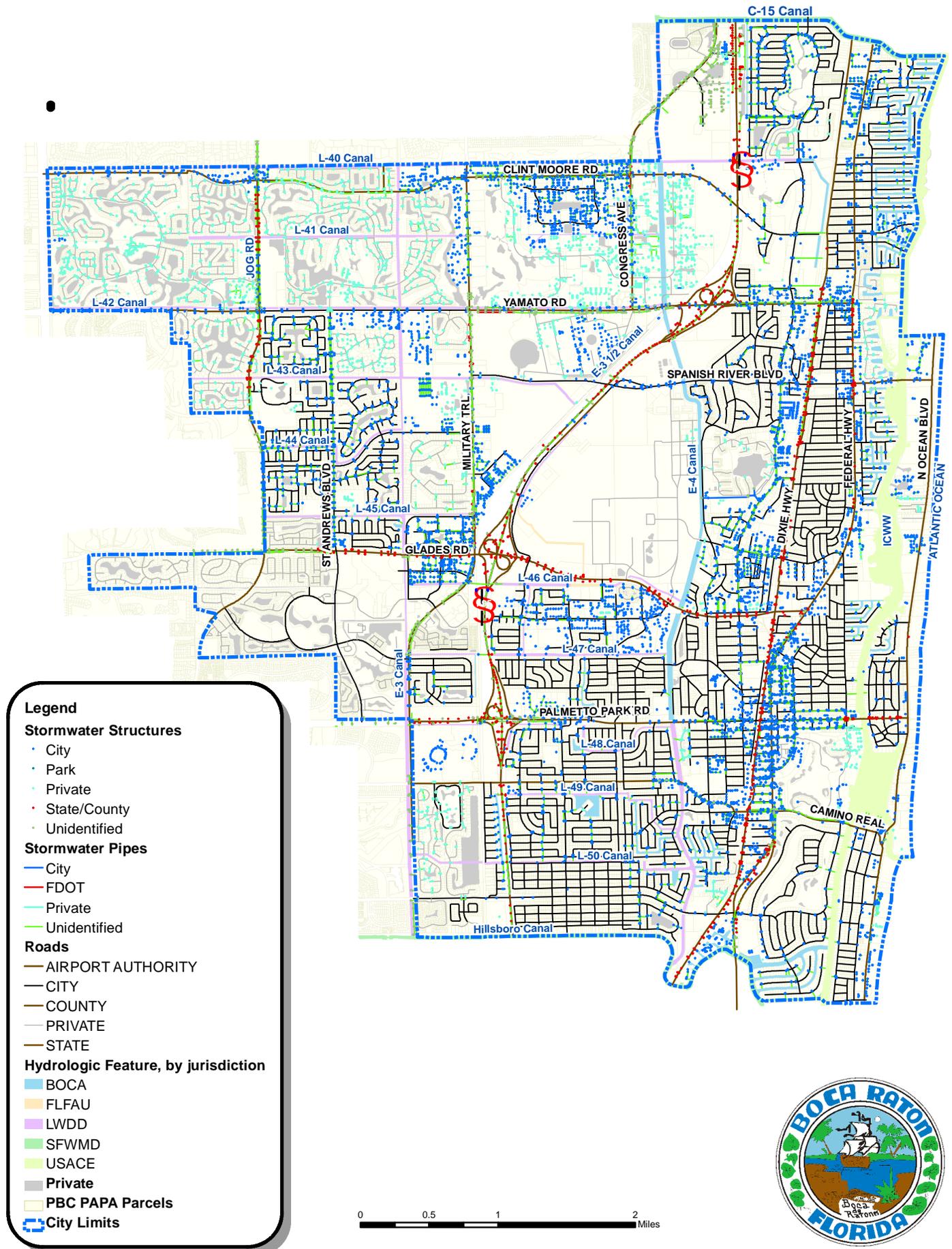


**Legend**

- SFWMD Permitted Areas
- Water
- Roads
- City Limits







**Legend**

**Stormwater Structures**

- City
- Park
- Private
- State/County
- Unidentified

**Stormwater Pipes**

- City
- FDOT
- Private
- Unidentified

**Roads**

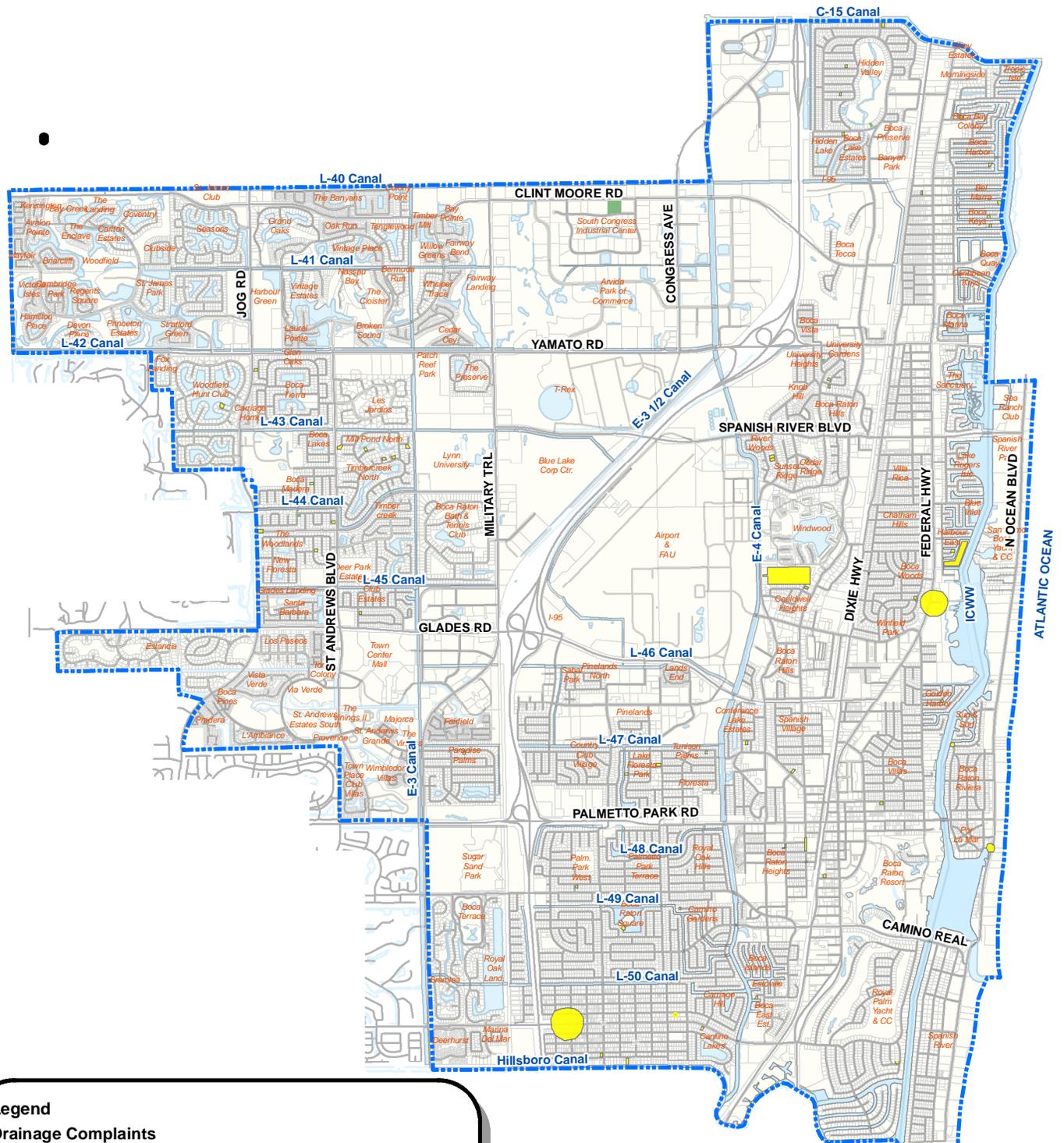
- AIRPORT AUTHORITY
- CITY
- COUNTY
- PRIVATE
- STATE

**Hydrologic Feature, by jurisdiction**

- BOCA
- FLFAU
- LWDD
- SFWMD
- USACE
- Private
- PBC PAPA Parcels
- City Limits





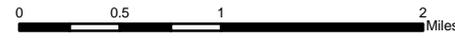


**Legend**

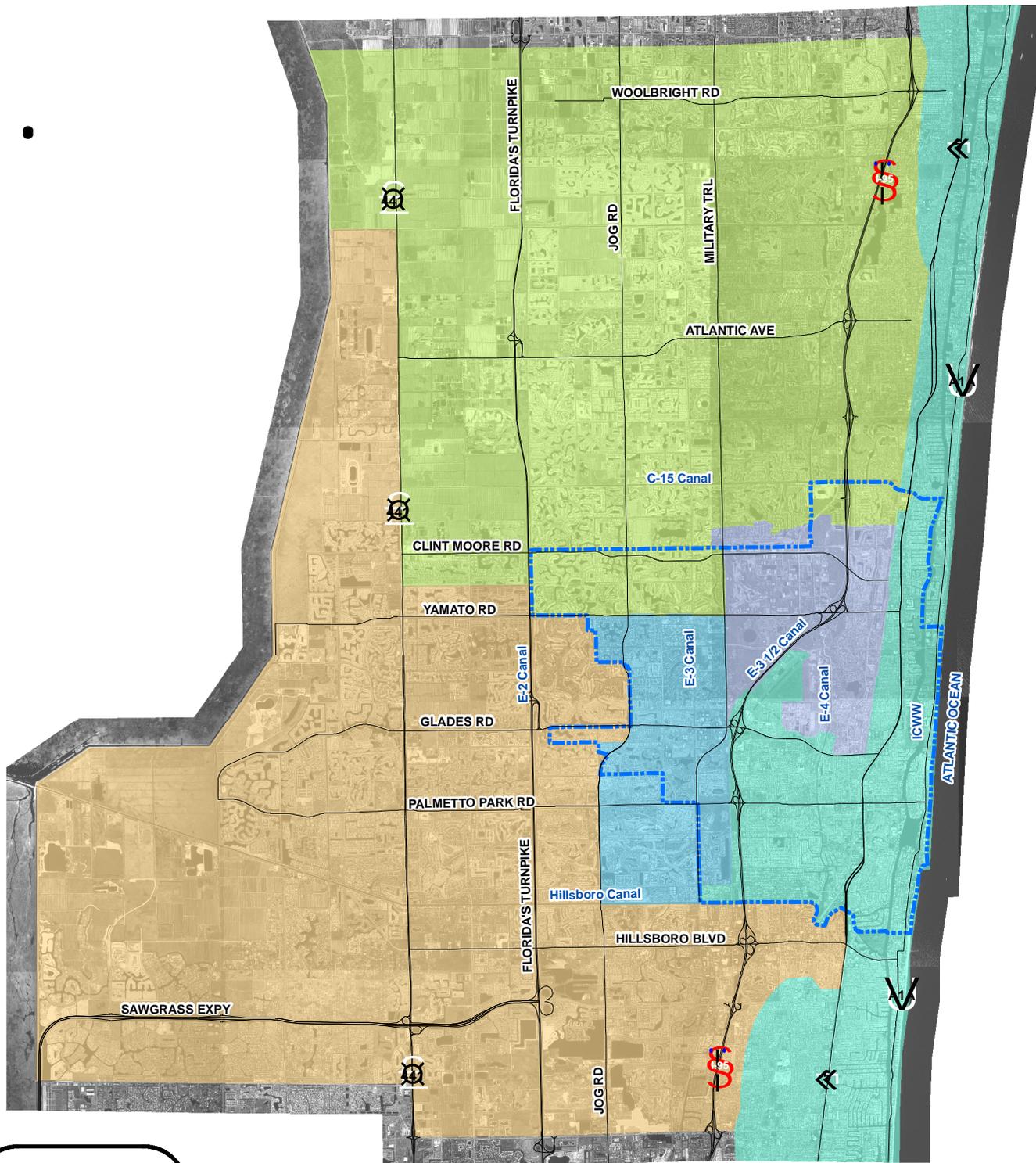
**Drainage Complaints**

**Evaluation Category - Status as of Sept.2007**

- Corrected/No flooding obs. - Not Resolved
- Corrected/No flooding obs. - Not Resolved, BIG PROBLEM
- Not Evaluated - Not Resolved
- Localized Problem - Not Resolved
- Non-localized Problem - Not Resolved
- Public Safety Hazard - Not Resolved
- Public Safety Hazard - Not Resolved, BIG PROBLEM
- Water
- Roads
- City Limits







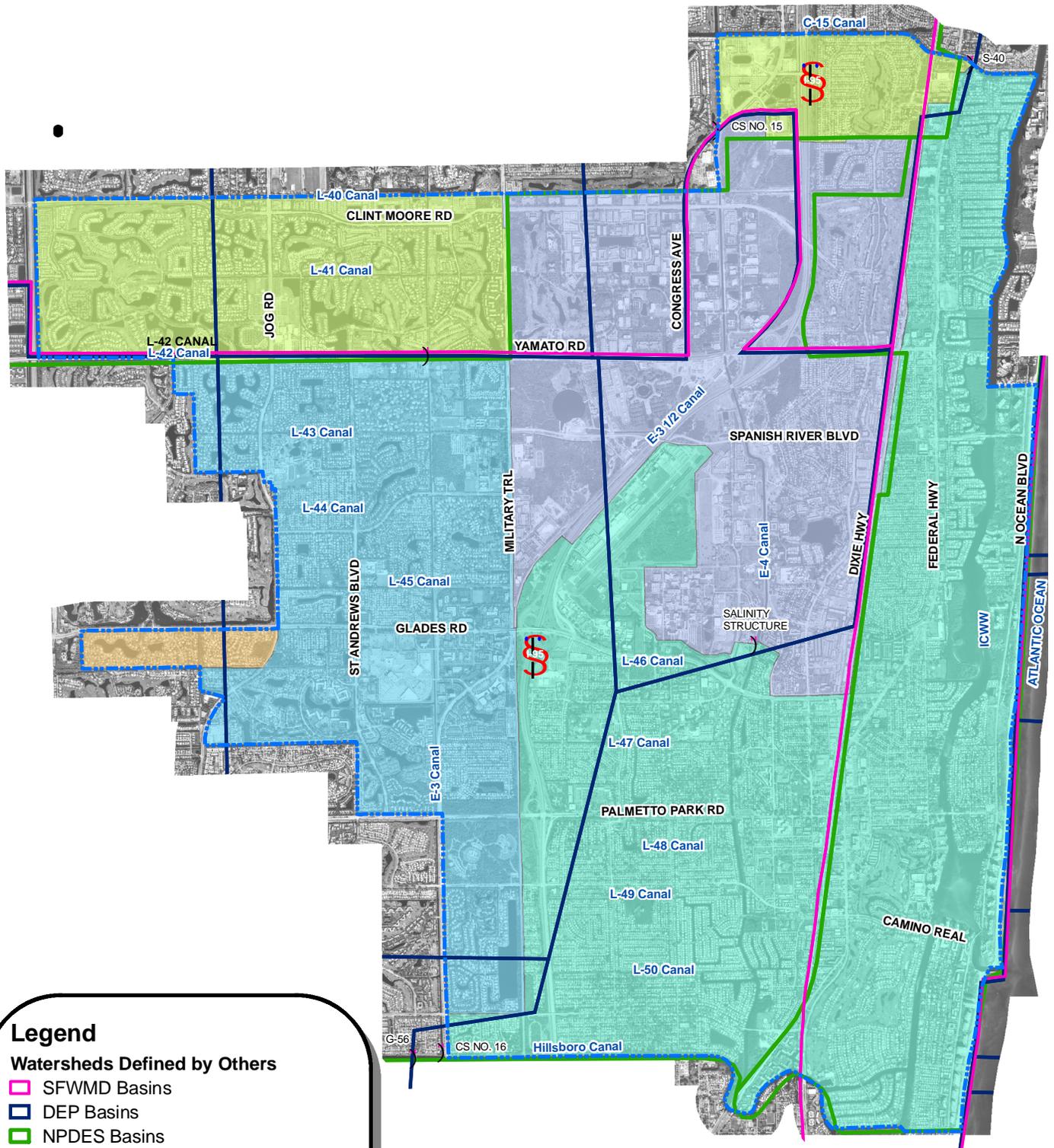
**Legend**

**Major Watersheds**

- C-15
- E-3
- E-4
- ICWW
- Hillsboro
- City Limits







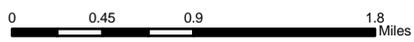
**Legend**

**Watersheds Defined by Others**

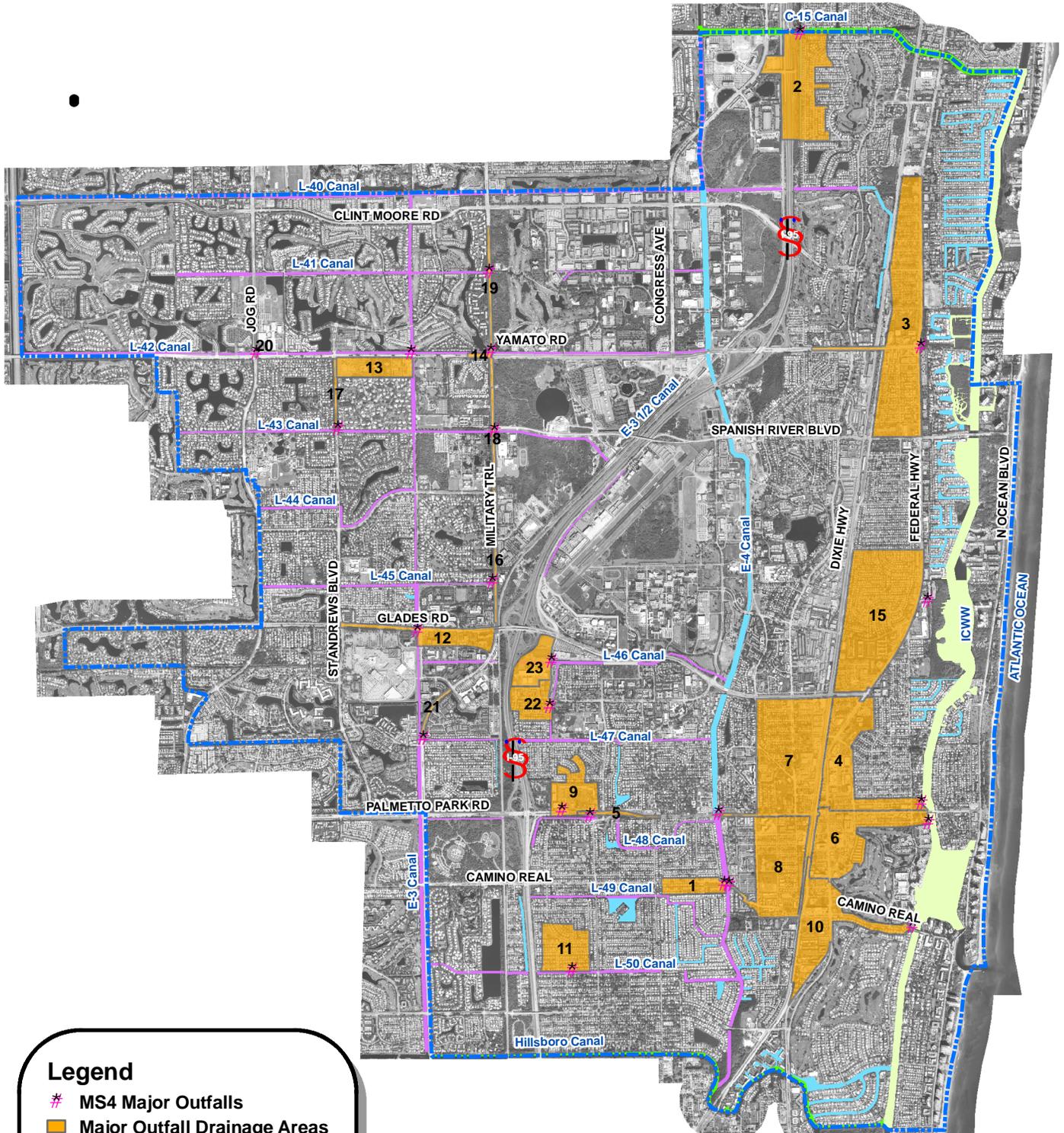
- SFWMD Basins
- DEP Basins
- NPDES Basins

**Watersheds Revised within City Limits**

- C-15
- E-3
- E-4
- ICWW
- Hillsboro
- Control Structures
- City Limits







**Legend**

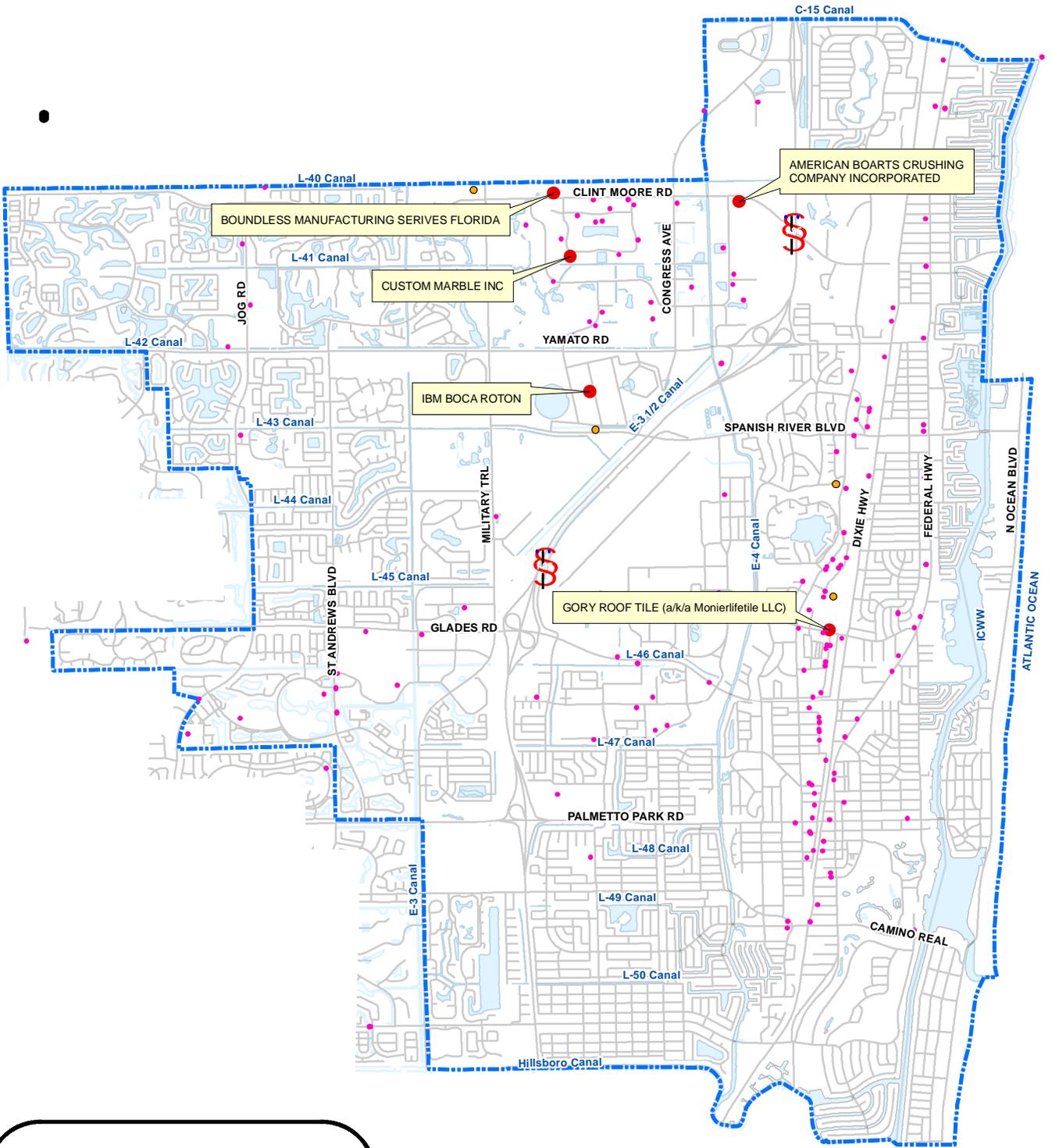
- \* MS4 Major Outfalls
- Major Outfall Drainage Areas

**Water, by Jurisdiction**

- Boca
- FAU
- LWDD
- SFWMD
- USACE
- City Limits







**Legend**

**EPA Envirofacts Query 2006-07**

- CERCLIS, RCRAINFO
- RCRAINFO
- TRIS
- TRIS, RCRAINFO

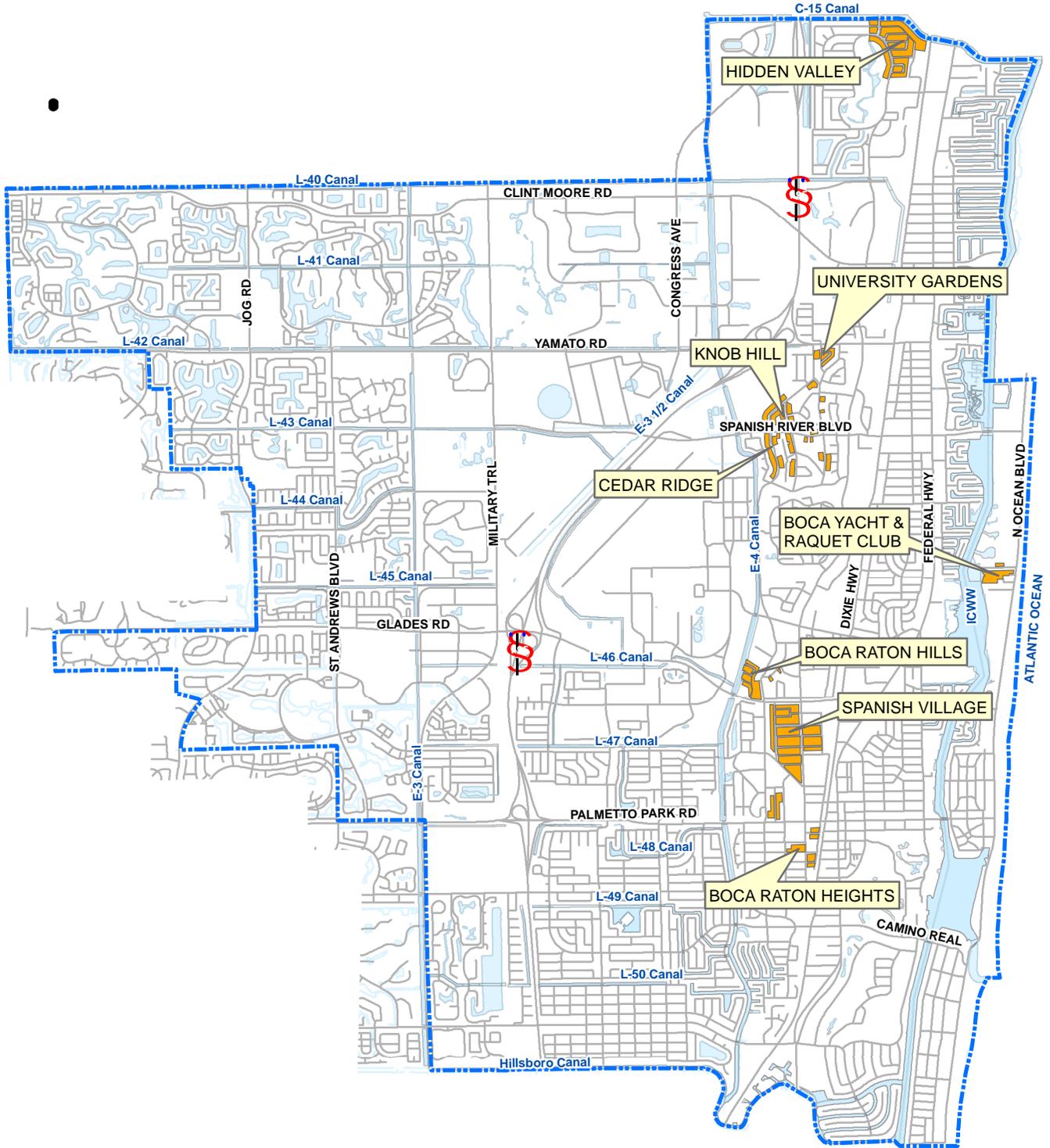
**DEP Waste Facilities Search 2007**

- 

**City Limits**





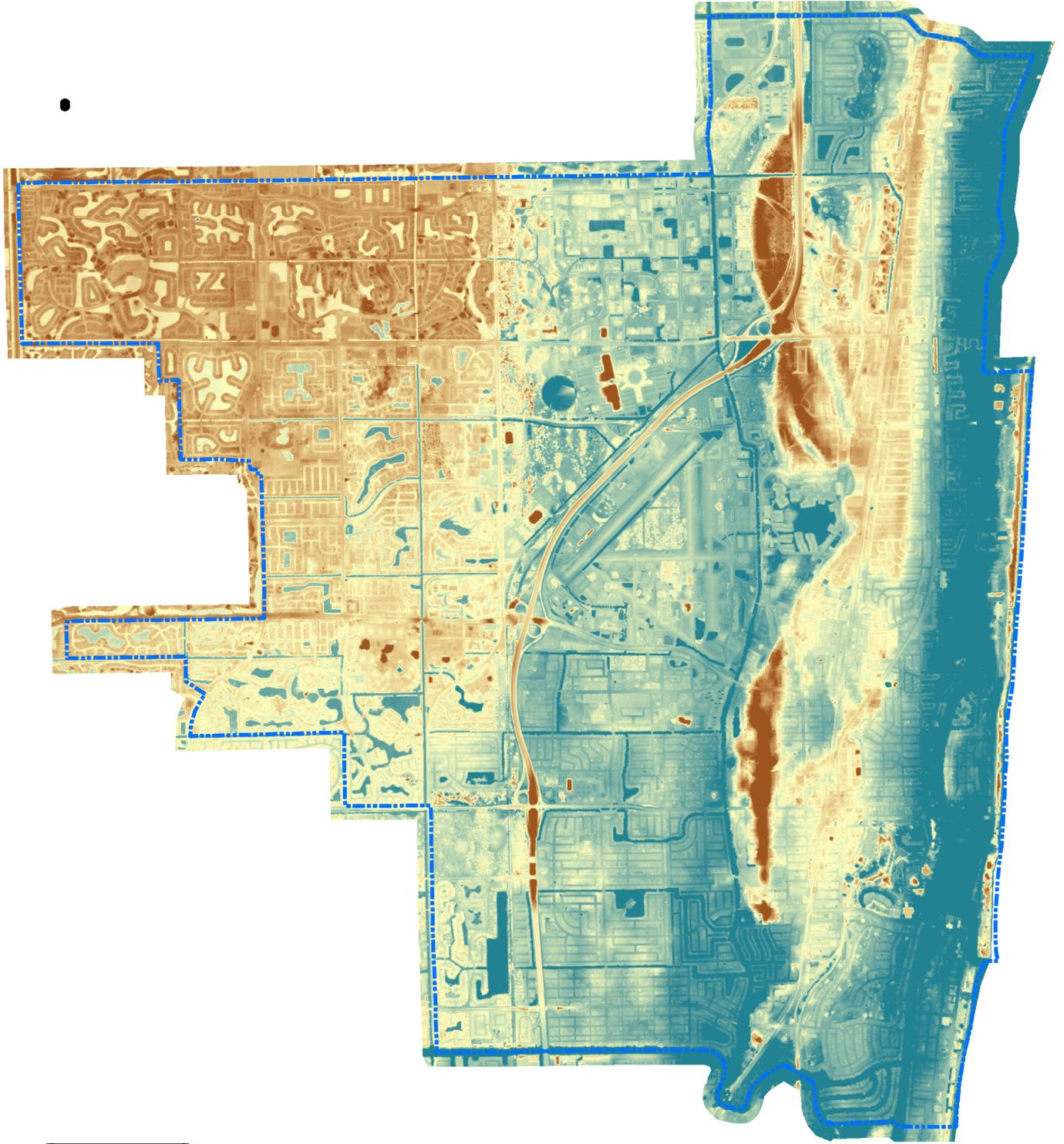


**Legend**

- City Limits
- Septic Systems
- Water
- Roads



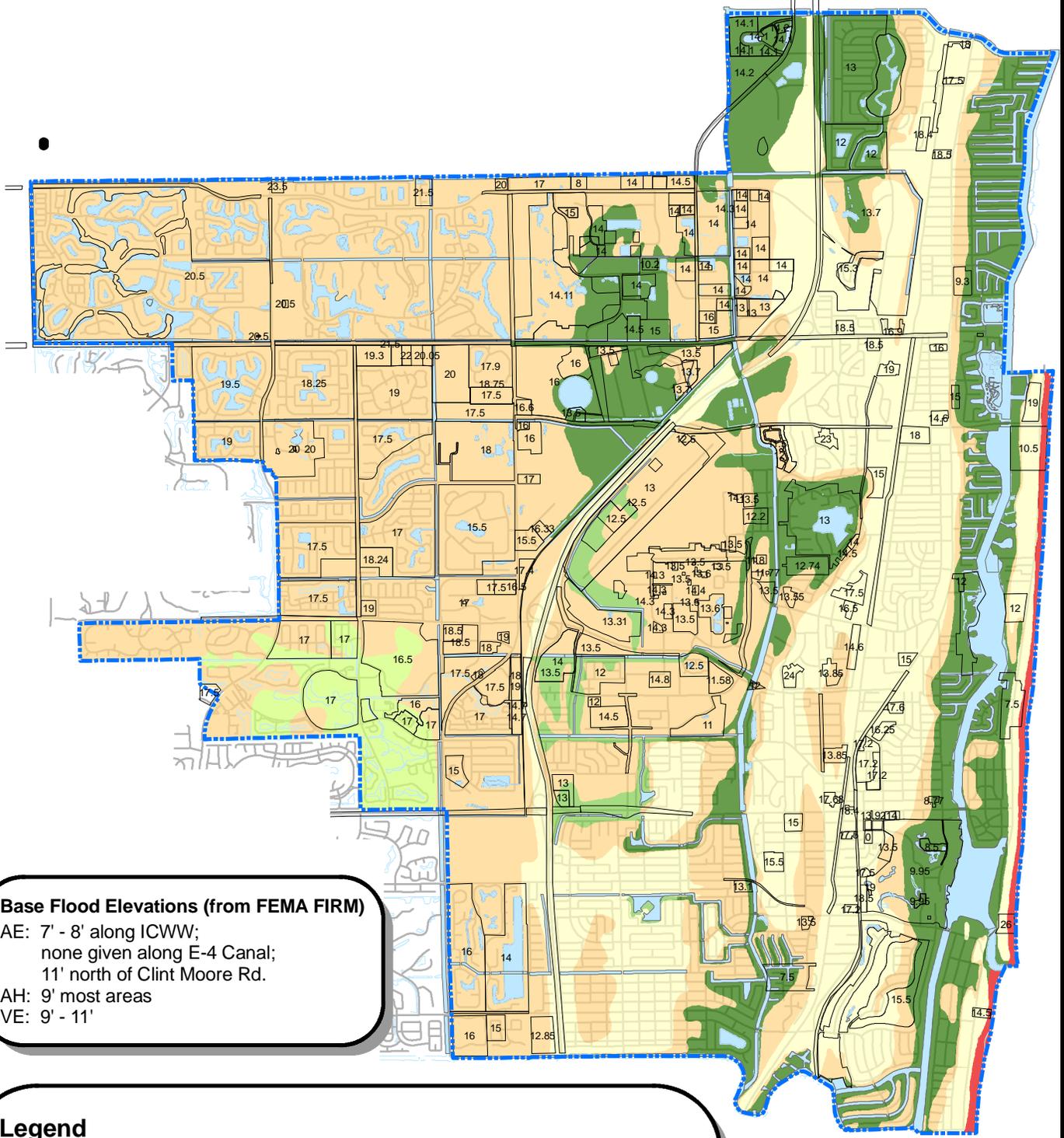




**Legend**  
Elevation, NGVD  
High : 43'  
Medium: 15-16'  
Low : 0'  
City Limits







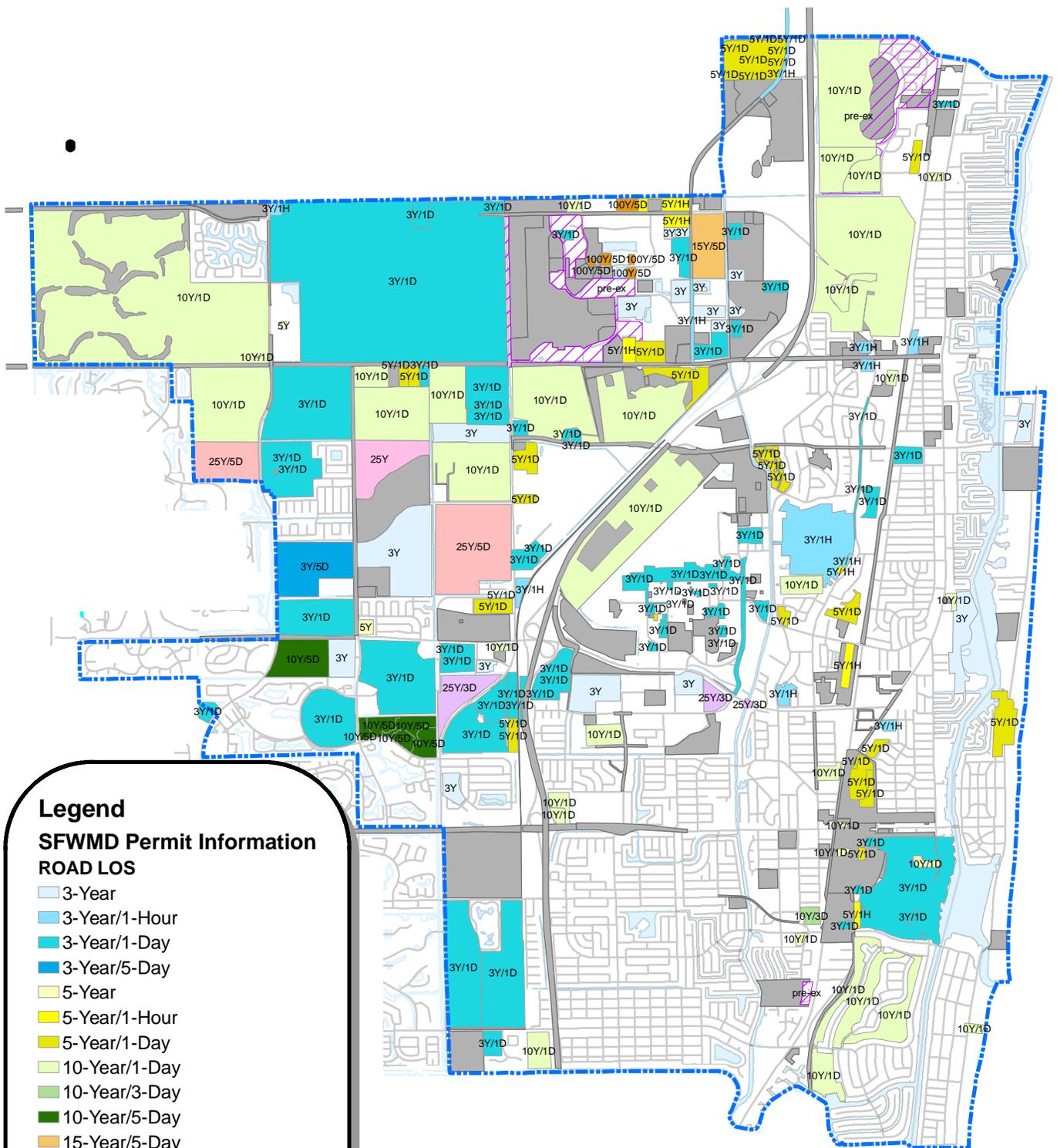
**Base Flood Elevations (from FEMA FIRM)**  
 AE: 7' - 8' along ICWW;  
       none given along E-4 Canal;  
       11' north of Clint Moore Rd.  
 AH: 9' most areas  
 VE: 9' - 11'

**Legend**

- ☐ SFWMD Permit Areas, with Min. Finished Floor Elev.
- FEMA Flood Zones**
- AE-100-YEAR FLOODPLAIN-DETAILED METHODS
- AH-100-YEAR SHALLOW FLOODING-CONSTANT WATER SURFACE ELEVATION-PONDING-1-3FT
- AO-100-YEAR SHALLOW FLOODING-SHEET FLOW SLOPING TERRAIN-1-3FT
- VE-100-YEAR COASTAL FLOODPLAIN-STORM WAVE HAZARDS-DETAILED METHODS
- X-AREAS PROTECTED FROM 100-YEAR FLOOD BY LEVEES
- X500-AREAS PROTECTED FROM 500-YEAR FLOOD BY LEVEES
- Water
- Roads
- City Limits







**Legend**

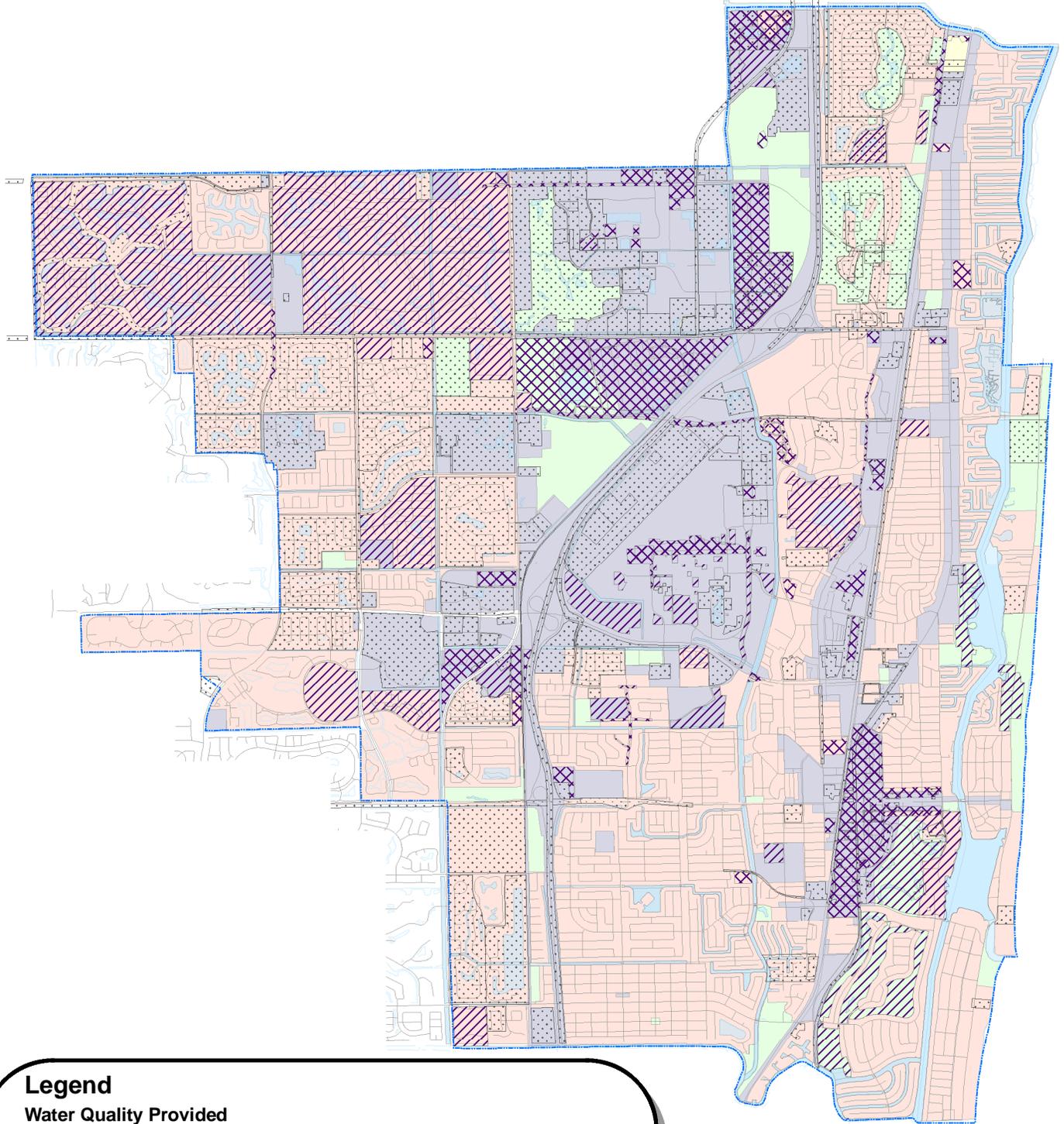
**SFWM D Permit Information**

**ROAD LOS**

- 3-Year
- 3-Year/1-Hour
- 3-Year/1-Day
- 3-Year/5-Day
- 5-Year
- 5-Year/1-Hour
- 5-Year/1-Day
- 10-Year/1-Day
- 10-Year/3-Day
- 10-Year/5-Day
- 15-Year/5-Day
- 25-Year
- 25-Year/3-Day
- 25-Year/5-Day
- 100-Year/5-Day
- Pre-existing to Permit
- Unavailable
- Water
- Roads
- City Limits







### Legend

#### Water Quality Provided

- Unknown
- 1" over permitted site
- 2.5" x % impervious

#### Landuse

- Commercial, Business, Institutional, Industrial, Utility, Transportation
- Mixed Use
- Recreational, Open Space
- Residential
- Water
- Roads
- City Limits





**Table 1**  
**SFWMD Permit Data**  
 (Selected Export from ArcGIS Database)

PERMIT NO.	APPL NO.	PERMIT YEAR	PROJECT NAME	ACRES BY PERMIT	ACRES SERVED	POLYGON	BLDG LOS	MINIMUM BLDG. EL. SHOWN	ROAD LOS	MIN ROAD EL.	IMPERV. AREA	STORAG E AREA	WQ LOS	WQ VOL REQ'D	WQ VOL PROV.
50-04701-P	000320-8		YAMATO ROAD OUTFALL	0.00	0.00	0.50				0.00	0.00	0.00		0.00	0.00
50-04743-P	000801-19		GRANDVIEW PREPARATORY SCHOOL	7.52	7.52	7.53				0.00	4.87	0.00		0.00	0.00
50-04746-P	970121-8		JONES PLAT PARCEL A	6.25	6.25	6.12				0.00	0.00	0.00		0.00	0.00
50-04843-P	001108-17		YAMATO CROSSING	4.06	4.06	4.03	100Y3D	18.5	3Y/1H	16.50	3.25	0.00	0.00	2.5" x % imperv.	0.00
50-05146-P	010612-9		BOCA RATON ELEMENTARY SCHOOL	3.90	3.90	3.83				0.00	2.18	0.00	0.00	2.5" x % imperv.	0.00
50-05192-P	010814-2		FAU SUPPORT FACILITY	9.70	9.70	9.79	100Y3D	12.2	3Y/1D	10.30	3.90	0.00		0.81	0.81
50-05245-P	011015-9	2001	BOCA RATON HIGH SCHOOL	36.15	36.15	36.58	100Y3D	14	3Y/1D	11.00	18.30	2.23		0.00	0.00
50-05245-P	060125-21	2006	BOCA RATON HIGH SCHOOL	36.15	36.15	36.58	100Y3D	14	3Y/1D	0.00	18.00	0.00		1.95	1.97
50-05315-P	040414-4	2004	ROYAL PALM YACHT AND COUNTRY CLUB	135.40	135.40	137.89	100Y3D	15.5	10Y/1D	10.65	13.77	7.62	1" over site	11.28	0.00
50-05634-P	020806-7	2002	WASHINGTON MUTUAL	3.09	3.09	3.07		14		12.00	2.62	0.00		0.00	0.00
50-05634-P-02	060331-18	2006	200 EAST PALMETTO PARK	1.79	1.79	2.34		13.92		12.17	0.00	0.00	0.00	2.5" x % imperv.	0.00
50-05983-P	030508-12	2003	PEARL CITY DRAINAGE IMPROVEMENTS	13.00	13.00	6.33				0.00	0.00	0.00		0.00	0.00
50-06176-P	030711-13	2003	FAIRFIELD GARDENS	8.53	8.53	8.72		15	5Y/1D	12.50	3.80	0.68		0.00	0.00
50-06176-P	051007-12	2005	FAIRFIELD GARDENS	8.53	8.53	8.72		15	5Y/1D	13.00	4.00	0.00		0.00	0.00
50-06259-P	030714-11	2004	TROPIC GARDEN LUXURY TOWNHOMES	5.00	5.00	3.56				0.00	0.00	0.00		0.00	0.00
50-06481-P	040402-16	2004	SR 808 BRIDGE OVER THE EL RIO CANAL	1.00	1.00	0.67	n/a			0.00	0.00	0.00		0.00	0.00
50-06487-P	040220-3	2004	TRIESTE AT BOCA RATON	12.49	12.49	12.47	see note	9.3		0.00	7.19	0.00	0.00	2.5" x % imperv.	1.10
50-06537-P	040218-7	2004	TUSCANY VILLAGE	3.95	3.95	3.98	100Y3D	18.5	10Y/1D	15.50	2.49	0.00	0.00	2.5" x % imperv.	0.41
50-06645-P	040714-7	2004	EDEN LUXURY APARTMENTS	8.35	8.35	8.21		15		0.00	6.21	0.00		1.08	1.08
50-06677-P	040614-5	2004	HIDDEN VALLEY TOWNHOMES (AKA ROYAL POINCIANA)	8.59	8.59	9.28				0.00	0.00	0.00		0.00	0.00
50-06810-P	040517-18	2005	BOCA MIDDLE SCHOOL MODERNIZATION	20.01	20.01	19.97	100Y3D	14.5	10Y/1D	12.50	9.27	1.94	1" over site	1.67	1.67
50-06869-P	040826-1	2005	AREA 2 DRAINAGE IMPROVEMENTS	7.93	21.82	21.99	pre-ex			0.00	6.26	0.00		3.82	3.82
50-06990-P	050322-1	2005	U.S EPPERSON UNDERWRITING COMPANY	6.02	15.00	14.99	100Y3D	17.5	5Y/1D	14.69	9.16	1.47	2.5" x % imperv.	1.31	1.31
50-07246-P	051021-3	2006	ADDISON PARK	4.67	4.67	4.66	100Y3D	13.55	5Y/1D	11.75	2.08	0.28	2.5" x % imperv.	0.40	0.00
50-07286-P	060117-11	2006	CALDWELL THEATRE	2.72	2.72	2.36		18		0.00	1.15	0.00	0.00	2.5" x % imperv.	0.00
50-07329-P	050920-18		RAVELLA TOWNHOMES	5.93	5.93	6.01	100Y3D	16.6	3Y/1D	14.60	3.16	0.00	1" over site	0.49	0.49
50-07453-P	060412-10	2006	FIRST PRESBYTERIAN CHURCH OF BOCA RATON	4.84	4.84	4.88	100Y3D	13.1	see note	8.00	2.35	0.00	2.5" x % imperv.	0.64	0.64
50-07469-P	060222-11		LIBRARY COMMONS	9.73	9.73	9.00	100Y3D	13.86	10Y/1D	12.16	6.25	0.00	2.5" x % imperv.	0.98	0.98
50-07502-P	060216-13		1800 NORTH MILITARY TRAIL PHASE 1	11.86	11.86	11.68	100Y3D	18	3Y/1D	17.00	4.80	0.00	2.5" x % imperv.	1.18	1.18
50-07812-P	060314-5		CVS PHARMACY - CLINT MOORE ROAD	3.47	3.47	3.48	100Y3D	20	3Y/1D	18.50	2.99	0.00	2.5" x % imperv.	0.51	0.51
78-00004-S	X000005916		DEER PARK ESTATES	5.00	0.00	4.97				0.00	2.00	0.00		0.00	0.00
81-00074-S	X000006656		BRAMALEA PLUD	36.43	0.00	40.25		16		14.00	21.00	2.00		3.00	0.00

**Table 1**  
**SFWM D Permit Data**  
 (Selected Export from ArcGIS Database)

PERMIT NO.	BMP	DISCHARGE STRUCTURE	CONTROL EL. PER PERMIT	CONTROL EL. PER STRUCT.	NOTES
50-04701-P			0.00		
50-04743-P	Exfiltration Trench, swales	into Hillisboro Canal	0.00		NEED BETTER PLAN - Two zones: min FF 18.00/15.10; min parking 16.00/12.80
50-04746-P	Exfiltration Trench		0.00		plan shows bldgs w/ FF of 16.5, 17.0, 17.5, 18.0
50-04843-P	649 LF Ex Trench	3' weir @ 17' into City system	8.50		
50-05145-P	Exfiltration Trench		0.00		NEED APPLICATION FOR FF & MIN PARKING
50-05192-P	1.18 ac Dry Retention		5.00		
50-05245-P			7.00		no info on-line
50-05245-P	4 dry retention ponds	(2) FDOT H inlets w/ top el. @ 9.75' each w/ 36" RCP into L-46 Canal	9.75		compliance letter mod
50-05315-P	7.62 wet retention and dry ret.	no disch up to 25y/3d; 6' Wide Sharp Crested Weir El. 11.06 (crest) to ICWW	2.50		4 basins
50-05634-P	Exfiltration Trench	into City system	4.00		original permit (no info on-line)
50-05634-P-02			4.00		plans in permit do not match what exists on aerial photo 2005; min bldg from plan in perm
50-05983-P			0.00		no info available on-line
50-06176-P			8.00		no info available on-line
50-06259-P		6"x6" tri or @ 8 to L-47	8.00		letter mod agrees w/ original permit
50-06481-P			0.00		no info available on-line
50-06487-P	780 LF Exfiltration Trench		0.00		no info available on-line
50-06537-P	507 LF Ex Trench + swales	8' weir @ 5.95' to ICWW	2.00	5.95	min FF read off of plan in permit appl.
50-06645-P	Exf.	no discharge	7.00		
50-06677-P		on-site retention	4.50		no info on-line
50-06810-P	dry detention	7.95' weir @ 14' + 6"x6" tri ori. @ 10' + 310 LF 48" RCP into LWDD L-47 Canal	0.00		no info on-line
50-06869-P	Ex trench	into City system, then to E-4 Canal	3.00	10	
50-06990-P	dry ret. (1.31 ac)	Ph 1: 5' weir @ 15.7' + 6"x6" tri ori. @ 9.3' into LWDD L-45 canal	4.50		development preceded permitted improvements; post meets pre discharge; 4.5 surround CE
50-07246-P	912 LF Exfiltration + dry retention (0.28 ac)	no discharge for 25-year/3-day event	9.30		Phase I is 6.02 acres;
50-07286-P	exfil. trench	no discharge for 25-year/3-day event; ICWW drainage basin	4.50		
50-07329-P	dry detention & exfiltration	(1) 6' x 6" tri. ori. @ 6.0 to LWDD L-43 Canal	8.50		min FF read off plans in permit appl.
50-07453-P	Ex trench	1.5x1.5' tri or @ 5.5' to E-4	6.00		
50-07489-P	swales & exfil. trench	5' x 5' tri. ori. @ 5.5' into City stormwater system	4.00	5.5	min parking extracted from calculations which indicates parking elevations between 8.0 and 12.90.
50-07502-P	Dry det, exf.	4' weir @ 16.38 + 6"x6" tri. ori. @ 9' to LWDD L-46 canal	4.50		
50-07812-P	Exfil trench	6' x 6" tri.ori. @ 16.0' into LWDD L-40 Canal	9.00		
78-00004-S		15" Outfall	16.00		
81-00074-S	Existing Lake	20 Deg. V-Notch Bleeder W EL. 12.5 Inv. EL. 10. 0.89' Weir @ 13.5	0.00		
			10.00		

# Table 2 Drainage Complaint Log (Selected Export from ArcGIS Database)

Complaint ID	Site Address	Subdivis	Date Received	Complaint	Date Inspected	Preliminary Recommendation	Rainfall	Describe	Evaluation Recommendation	Evaluation Category	Status	Source
01	8163 TEXAS TRL	Hidden Valley	9/10/1994	standing water in swale & drive	9/23/1994	ask golf course to regrade or pipe to lake	1.65"	ponding at drive, gone w/ 24 hours	Improvements proposed within Hidden Valley Drainage Improvements Project.	Corrected/No flooding obs.	resolved?	Complaint Log & 1998 Eval
02	7988 FAIRWAY TRL	Hidden Valley	9/19/1994	standing water in rear yard & golf course	9/23/1994	possibly install small yard drain	10.4"	entire golf course flooded; ponding behind house after 24 hrs	Improvements proposed within Hidden Valley Drainage Improvements Project.	Corrected/No flooding obs.	resolved?	Complaint Log & 1998 Eval
04	100 MOHGAN CIR	Hidden Valley	10/11/1994	street flooding during rain	10/12/1994	request town to excavate swale, backfill with clean fill, & sod	10.4"	driveway ponding; remains after 24 hours	Drainage Improvements Project.	Corrected/No flooding obs.	resolved?	Complaint Log & 1998 Eval
05	5989 N FEDERAL HWY	Boca Hills	10/12/1994	standing water in intersection	10/12/1994	advise that runoff is from p-201; landfill should excavate swale	1.65"	private lot drains to drive at street; some ponding > 24 hrs	None.	localized problem		Complaint Log & 1998 Eval
06	3988 NW 5TH AVE	Boca Hills	10/27/1994	ponding at driveway & street edge	10/27/1994		0.02"	ponding at driveway; gone w/ 24 hours	Install french drain east side of road & regrade swale.	localized problem		Complaint Log & 1998 Eval
07	1798 GONZALO RD	Palm Beach Farms	12/7/1994	flooding in front yard during rain	12/7/1994	no action, functioning as designed.	10.4"	no ponding observed	None.	Corrected/No flooding obs.	resolved?	Complaint Log & 1998 Eval
08	851 APPLEBY ST		12/7/1994	flooding in front yard during rain	12/7/1994		3.75"	driveway flooding; remains after 24 hours	Install french drain in swale, regrade swale.	localized problem		Complaint Log & 1998 Eval
10	171 S COUNTRY CLUB BLV	Hidden Valley	12/8/1994	standing water in drive	12/8/1994		3.75"	ponding in drive; gone w/ 24 hours	Improvements proposed within Hidden Valley Drainage Improvements Project.	Corrected/No flooding obs.	resolved?	Complaint Log & 1998 Eval
12	6200 N FEDERAL HWY	Daisy Manors	1/20/1995	water in front of property	1/20/1995	water in front of property	1.85"	ponding at drive; gone w/ 24 hours	Regrade swale in Fct. Hwy & replace drive from s.c.d. to s.b.w.c.	localized problem		Complaint Log & 1998 Eval
13	1100 NW 12TH ST	Pine Lands	1/20/1995	sod dying in swale	1/20/1995	no action, problem appears to be peat issue.	10.4"	driveway flooding; little remains > 24 hours	Install french drain along east side of road & regrade swale.	localized problem		Complaint Log & 1998 Eval
14	263 NW 46TH ST	Colonade	1/20/1995	standing water in swale	1/20/1995	install small yard inlet at low point	3.55"	no ponding initially; some exists in sidewalk after 24 hrs	Install french drain east & west of property & regrade swale.	localized problem		Complaint Log & 1998 Eval
15	4620 NW 28TH WAY	Colonade	6/16/1995	water in front yard swale	6/16/1995	install small yard inlet at low point	3.45"	swale ponding; remains > 24 hours	Install french drain east & west of drive & regrade swale.	localized problem		Complaint Log & 1998 Eval
17	2031 S CONCRENCE DR	Paradise Palms	2/17/1995	water collects at end of ?	1/14/1998		10.4"	driveway ponding; minor remains > 24 hrs	Regrade swale from property drive west of next drive & install french drain along east edge & connect to existing drain @ 679 & regrade swales.	localized problem		Complaint Log & 1998 Eval
18	879 BERKELEY ST	Bel Mara	2/17/1995	flooding in cur-de-sac	1/15/1998		10.4"	edge of road ponding; dry w/ 24 hours	Install french drain along east edge & connect to existing drain @ 679 & regrade swales.	localized problem		Complaint Log & 1998 Eval
20	NW 43rd St/ Oak Circle	Boca Raton Hills	2/5/1995	flooding at intersection	2/5/1995	install french drains	3.75"	reflexive intersection, swale, drive ponding; ponding remains	Install inlet & pipe along Oak Circle & connect to existing inlets at Spanish River Blvd., regrade swales on both side of Oak Circle.	public safety hazard		Complaint Log & 1998 Eval
23	225 NW 4TH DIAGONAL	Spanish Village	8/4/1995	street flooding	1/14/1998		10.4"	street ponding SW side; mostly gone w/ 24 hours	Regrade swale along SW side from NW 4th Ave to NW 210 St & regrade swale.	public safety hazard		Complaint Log & 1998 Eval
25	4 MOHGAN CIR	Hidden Valley	8/28/1995	street & swale flooding	9/17/1998	wait for study	3.75"	driveway ponding; remains after 24 hours	Drainage Improvements Project.	Corrected/No flooding obs.	resolved?	Complaint Log & 1998 Eval
26	3000 NW 23RD TER	Milbord	10/10/1995	ponding at drive	10/10/1995	no action.	3.75"	driveway ponding; remains after 24 hours	Drainage Improvements Project.	Corrected/No flooding obs.	resolved?	Complaint Log & 1998 Eval
27	3270 NW 20TH AVE	Boca Madera	10/13/1995	flooding in swale	9/15/1998	Ask for NIS assistance	3.45"	minor ponding; remains after 24 hrs.	Install french drain south of drive & regrade swale.	localized problem		Complaint Log & 1998 Eval
29	4761/986	5 Sun & Surf	4/16/1996	broken drainage pipe	1/15/1998	line pipe	n/a	complaint about condition of culvert to ICWW	None.	Corrected/No flooding obs.	resolved?	Complaint Log & 1998 Eval
30	NE 20th Street	Boca Sale	5/1/1996	street flooding	9/5/1998	correct	1.85"	background and median cut flooded; ponding after 24 hours	Regrade swales; install french drains, select some curb.	public safety hazard		Complaint Log & 1998 Eval
32	139 NW 16th St		5/16/1996	street flooding	9/5/1998	swale project	1.85"	road edge/parking flooding; remains after 24 hours	Regrade swales; install french drains, select some curb.	public safety hazard		Complaint Log & 1998 Eval
34	858 SW 17TH ST	Palm Beach Farms	6/27/1996	street flooding	2/1/1999	major drainage project	0.44"	no ponding observed	None.	Corrected/No flooding obs.	resolved?	Complaint Log & 1998 Eval
35	1401 SW 19th Street	River Forest	6/28/1996	street flooding	9/11/2002	no action.	0.44"	low point at intersection floods; ponding remains > 24 hours	Overlay existing intersection.	localized problem		Complaint Log & 1998 Eval
36	6451 NW 32ND WAY	Seasons	7/16/1996	standing water in gutter	n/a	call engineer of record.	10.4"	standing water in gutter	None.	Corrected/No flooding obs.	resolved?	Complaint Log
37	1421 SW 18th St.			water west side of house	1/15/1998		10.4"	no ponding observed	None.	Corrected/No flooding obs.	resolved?	Complaint Log & 1998 Eval
38	2705 NW 29TH DR	New Foresta		ponding in front of house	9/5/1998	drive lower than curb, owner should	10.4"	Extreme flooding (b.c.w. to b.o.w.); gone w/ 24 hours	Inspect system to determine distribution to flow & clean as necessary.	public safety hazard		Complaint Log & 1998 Eval
39	GLADES RD/10th Ave		8/27/1996	standing water at intersection	9/17/1998		10.4"	intersection reconstructed since complaint	None.	Corrected/No flooding obs.	resolved?	Complaint Log & 1998 Eval
40	1328 NW 7TH ST	County Club	10/1/1996	ponding in drive	1/14/1998	no action required, drive lower than street	10.4"	driveway ponding; remains after 24 hrs	Regrade swales between drives from 1455 to NW 12th Ave.	non-localized problem		Complaint Log & 1998 Eval
41	381 NW 35TH PL		12/9/1996	ponding in drive	1/15/1998	regrade swale.	10.4"	no ponding observed	None.	Corrected/No flooding obs.	resolved?	Complaint Log & 1998 Eval
42	857 HAVANA DR	Caribbean Keys	3/14/1997	inlet clogged at drive	9/5/1998	check for debris	1.85"	ponding in drive; gone w/ 24 hours	Install i.d. in yard between inlet & drive both sides of rd, regrade swales, lower grade of ex. inlet.	localized problem		Complaint Log & 1998 Eval
43	1081 HOLLAND DR	Rogers Circle	3/14/1997	flooding in parking lot	n/a	contact landscaper	1/14/1998	no ponding observed	None.	Corrected/No flooding obs.	resolved?	Complaint Log & 1998 Eval
46	3098 NW 27TH AVE	Boca Madera	4/14/1997	ponding in swale	4/19/1997	excavate swale, backfill with sand	3.55"	ponding in swale; remains after 24 hrs.	None.	Corrected/No flooding obs.	resolved?	Complaint Log & 1998 Eval
47	2573 SPANISH RIVER RD	Estates	4/16/1997	ponding in drive	4/19/1997	drive below edge of pavement.	10.4"	street, drive ponding/minor remains after 24 hrs	Regrade Spanish River Rd. from Camino Real to SE 31st St.	non-localized problem		Complaint Log & 1998 Eval
48	1030 CYPRESS WAY	Camino Gardens	4/17/1997	ponding in drive	4/19/1997	reconstruct drive	3.75"	ponding in drive; remains > 24 hrs.	Install french drain north & south of drive & regrade swale.	localized problem		Complaint Log & 1998 Eval
50	2289 Bahiel	Paradise Palms	5/15/1997	ponding in drive	4/19/1997	caused by Military Trn widening project	10.4"	driveway flooding from Military Tr.; remains > 24 hrs	Install inlet at curb return & direct to Military Tr.	localized problem		Complaint Log & 1998 Eval
51	909 NW 8TH ST	Pine Lands	6/13/1997	ponding in drive	1/14/1998	owner should rebuild drive or lower swale	10.4"	no ponding observed	None.	Corrected/No flooding obs.	resolved?	Complaint Log & 1998 Eval
52	3332 NW 26TH AVE	Boca Madera	6/16/1997	ponding in drive	7/16/1997	regrade swale (owner insists water or sewer leak; band to invert.)	3.55"	driveway flooding; remains > 24 hours	Install french drain between drives, regrade swales	localized problem		Complaint Log & 1998 Eval
53	899 NAFI, DR	Camino Gardens	5/14/1997	ponding in cur-de-sac	5/15/1997	install french drain or connect to inlet to west.	1.65"	ponding east end cur-de-sac; gone w/ 24 hrs	Install french drain between drives, regrade swales	localized problem		Complaint Log & 1998 Eval
56	841 Balaunel Ter.	Camino Gardens	7/29/1997	flooding in drive	1/14/1998		10.4"	driveway ponding; minor remains > 24 hrs.	Install french drain between drives, regrade swales	localized problem		Complaint Log & 1998 Eval
57	21 SE 5TH ST		8/5/1997	alley flooding				alley flooding				Complaint Log & 1998 Eval
59	2408 NW 40TH CIR	Wilbord	1/9/1998	flooding in drive	1/7/1998	regrade swale, install inlet or rebuild cur-de-sac.						Complaint Log
60	732 NW 7TH DR	Turkish Palm	1/15/1998	street flooding		restore swale						Complaint Log
61	3816 NW 24TH AVE	Milbord	3/9/1998	flooding in front yard		restore swale						Complaint Log
62	974 SW 11TH CT		3/29/1998	flooding in drive		restore swale, except trees are present.						Complaint Log

**Table 2**  
**Drainage Complaint Log**  
(Selected Export from ArcGIS Database)

Complaint ID	Site Address	Subdivis	Date Reported	Complaint	Date Inspected	Preliminary Recommendation	Dates Evaluated	Rainfall	Description	Evaluation Recommendation	Evaluation Category	Status	Source
64	2002 N CONFERENCE DR	Paradise Palms	5/12/1998	street flooding		restore swale			Cul-de-sac flooding parking lot flooding		Complaint Log	Complaint Log	Complaint Log
65	801 Apple Tree Lane	Camino Gardens	8/11/1998	parking lot flooding		call school to clean system					Complaint Log	Complaint Log	Complaint Log
66	JC Mitchell Elementary School	Sim & Surf	9/25/1998	flooding in drive & street		no problems noted	2/1/1999	0.4"	minor ponding gone w/ 24 hours	Corrected	No flooding obs.	resolved?	Complaint Log & 1998 Eval
67	701 MARBLE WAY	Sim & Surf	10/21/1998	flooding in drive & street									Complaint Log
68	4960 NW 4TH AVE	Boca Raton Hills	11/31/1998	street flooding	11/4/1999				street flooding				Complaint Log
69	298 NE 2ND ST	Boca Raton Hills	11/4/1998	street flooding	11/5/1998	have Spanish River Land clean system							Complaint Log
70	103 SW 2nd Avenue	Boca Raton Hills	11/4/1998	flooding in back yard & basement	11/5/1998	no action			street flooding				Complaint Log
71	3725 NW 5TH AVE	Boca Raton Hills	11/4/1998	flooding in back yard	11/5/1998	have Spanish River Land clean system							Complaint Log
72	2326 NW 3RD AVE	Boca Raton Hills	11/4/1998	flooding in back yard & basement	11/5/1998	have Spanish River Land clean system							Complaint Log
73	2700 NW 21ST ST	Boca Raton Hills	11/4/1998	street flooding	11/5/1998	part of Indian Valley							Complaint Log
74	601 NW 10TH CT	Lake Foresta	11/4/1998	street flooding in back yard									Complaint Log
75	Pomocae Road			street flooding east of Log Road					street flooding east of Log Road				Complaint Log
76	881 NE 9TH ST		11/12/1998	flooding in cul-de-sac	12/4/1998	rebuild cul-de-sac or install inlet & french drain							Complaint Log
77	SW 2nd Ave/Boca Raton Elem. School	Milwood	11/16/1998	street flooding		no action			street flooding				Complaint Log
78	2375 NW 38TH ST	Milwood	11/23/1998	flooding in drive & street		swale program							Complaint Log
79	844 FORDSHT ST		2/18/1999	flooding in drive	2/11/1999	swale program			backyard flooding & SW 2nd Ave/3rd St. intersection				Complaint Log
80	911 SW 2nd Street		3/24/1999	backyard flooding & SW 2nd Ave/3rd St. intersection		drainage project			backyard flooding & SW 2nd Ave/3rd St. intersection				Complaint Log
81	SW 2nd Ave/SW 3rd Street		3/24/1999	backyard flooding & SW 2nd Ave/3rd St. intersection		drainage project			backyard flooding & SW 2nd Ave/3rd St. intersection				Complaint Log
82	50 NW 9TH ST	New Florida	6/1/1999	flooding in drive & street									Complaint Log
83	1401 ENFIELD AVE	New Florida	6/1/1999	swale under in back yard		swale program							Complaint Log
84	388 COVENTRY ST	Boca Harbor	3/17/2000	driveway									Complaint Log
85	841 NE 6TH ST	Boca Harbor	4/11/2000	flooding in cul-de-sac									Complaint Log
86	1298 SW 5TH ST	Boca Raton Square	9/15/2000	flooding in drive	9/29/2000	rebuild drive or swale.							Complaint Log
87	245 NW 4TH DIAGONAL	Spanish Village	10/9/2000	flooding in drive									Complaint Log
88	329 NW 28TH AVE	Boca Modena	12/4/2000	no									Complaint Log
89	1000 NW 11TH ST	Boca Raton Hills	12/4/2000	street flooding									Complaint Log
90	2530 NE 2nd Avenue	Boca Raton Hills	7/6/2001	street flooding					street flooding				Complaint Log
91	289 E MAVA PALM DR	Royal Palm Country Club	8/2/2001	street flooding									Complaint Log
92	399 APACHE LN	Hidden Valley	8/9/2001	street flooding									Complaint Log
93	579 PHILLIPS DR	Golden Harbor	10/2/2001	street flooding									Complaint Log
94	2274 NW 39TH DR	Milwood	10/2/2001	flooding in drive & swale									Complaint Log
95	1000 NW 11TH ST	Spanish Village	10/2/2001	no									Complaint Log
96	875 DOLBY ST	Spanish Village	10/24/2001	street flooding									Complaint Log
97	1132 SW 28TH WAY	Coralinks @ Glen Oak	6/19/2003	street flooding									Complaint Log
100	1200 SW 214 Street	Palm Beach Farms	6/19/2003	driveway flooding					street flooding				Complaint Log
105	338 Sandalwood Lane	Woodford CC	1/6/2004	rear yard flooding					driveway flooding				Complaint Log
106	3055 Winsor Place	Harbor East	1/6/2004	street flooding					rear yard flooding				Complaint Log
108	707 NE Brookview Drive	Harbor East	8/22/2004	street flooding					street flooding				Complaint Log
110	172 NE 4th Street	Boca Bay Colony	6/9/2005	street flooding					street flooding				Complaint Log
111	272 NE 4th Street	Palm Beach Farms	6/9/2005	street flooding					street flooding				Complaint Log
112	1132 SW 214 Lane	Palm Beach Farms	6/9/2005	back yard house flooding					street flooding				Complaint Log
113	4635 NW 2nd Terrace	University Park	6/10/2005	street flooding					back yard house flooding				Complaint Log
114	1 Tam O Shanter Lane	Camino Lakes	9/18/2006	driveway flooding		no action			street flooding				Complaint Log
115	700 SW 18th Street	Camino Lakes	9/18/2006	driveway flooding		no action			driveway flooding				Complaint Log
116	139 Oregon Lane	Hidden Valley	9/18/2006	swale flooding					driveway flooding				Complaint Log
117	595 SW 18th Road	Estalpa	1/6/2006	Cul-de-sac flooding	1/12/2006	inlet & pipe			Cul-de-sac flooding				Complaint Log
03, 48, 84	801 & 874 Aurelia St.	Old Foresta	4/17/1987, 7/11/1999	standing water in intersection, flooding in swale, & at int. w Poloma	10/6/1994	provide drainage outlet to canal. french drains.	11/4/1988	10.4"	widespread neighborhood flooding, ponding remains after 24 hours	Drainage study for entire neighborhood.	public safety/hazard	Complaint Log & 1988 Eval	Complaint Log
09, 86	231 NE 5TH AVE	Winfield Park	12/8/1984	intersection & hallway in yard 3 times a year, flooding in street & drive					intersection & hallway in yard				Complaint Log
08b ?	NE 23th Terr/Federal Hwy						9/5/1988	1.85"	intersection floods, ponding remains after 24 hours	install inlets & french drain along north & south side of NE 23th Terrace & regraze swales.	public safety hazard	Complaint Log & 1988 Eval	Complaint Log
107, 109	911 NW 6th Terrace	Campus Heights	1/12/2004	street flooding, driveway flooding			9/5/1988		street flooding, driveway flooding				Complaint Log
11, 22	489 NW 53rd SW/500 NW 5th Ave		12/9/1984, 9/29/2004	flooding at intersection	7/31/1995	vacuum, may be blockage in line.	9/7/1988	3.75"	no ponding observed	None	Corrected	No flooding obs.	resolved?
16, 19	6 & 9 POLO CIR	University Park	2/27/1985, 2/28/1985	street flooding intersection Pine Hurst & Pine Circle	2/5/1995	swale to existing inlet to south.	9/15/1998	3.95"	ponding across street, remains after 24 hours	Install 2 inlets east side of Pinhurst @ inter. & pipe east to E.S Canal w/ contr. str.	non-localized problem	Complaint Log & 1998 Eval	Complaint Log & 1998 Eval
21, 33, 44, 56	1330/1317/1800/1900 Spanish River Rd.	Estalpa	6/21/1986	intersection floods, street flooding			11/4/1988	10.4"	some street flooding, remains after 24 hours	Install inlet south of existing inlet & pipe access to Mill. & resurface entire length of 73rd St.	non-localized problem	Complaint Log & 1988 Eval	Complaint Log & 1988 Eval
24, 54	800 & 801 NE 72nd St	Boca Harbor	8/24/1985	street flooding, street flooding in garage	9/24/1985	install inlet & connect to inlet across street	9/5/1988	1.85"	substantial ponding entire street, gone w/ 24 hours	Drainage study for entire neighborhood.	public safety hazard	Complaint Log & 1988 Eval	Complaint Log & 1988 Eval
28, 31, 92	HIBISCUS ST	Old Foresta	5/3/1986, 10/4/2000	street flooding, street flooding, flooding in garage	6/3/1986	entire subdivision, need drng study for subdiv.	11/4/1988	10.4"	widespread neighborhood flooding, ponding remains after 24 hours	Drainage study for entire neighborhood.	public safety hazard	Complaint Log & 1988 Eval	Complaint Log & 1988 Eval
45, 55	790 & 770 MARINE DR	Boca Harbor, Harbor East	7/16/1987, 7/16/1987	flooding at cul-de-sac, street flooding	7/16/1985, 7/16/1987	install inlet & pipe, no flooding after rain on 2nd inspection.	9/5/1988	1.85"	edge of road ponding, most ponding gone w/ 24 hours	install inlet & pipe west to existing inlet.	localized problem	Complaint Log & 1988 Eval	Complaint Log & 1988 Eval
58, 85	3048 NW 25TH WAY	Stratmore	10/12/1989	flooding in drive, flooding in drive			11/5/1988	10.4"	ponding in driveway, remains > 24 hours	Regrade swale.	localized problem	not evaluated	1988 Complaint Evaluation
	3899 NW 23RD TER	Harbour Drive											not evaluated
	NE 5th Ave/NE 23rd Way												not evaluated
	South Ocean Blvd												not evaluated
	SW 18th Street												not evaluated

**Table 3**  
**Major Outfall Information**

<b>Major Outfall No.</b>	<b>Drainage Area (ac.)</b>	<b>Pipe Size</b>	<b>Receiving Water Body</b>	<b>Watershed</b>
01	27.46	60"	E-4 Canal	ICWW
02	132.59	(3) 36"	C-15 Canal	C-15
03	247.79	48"	ICWW	ICWW
04	130.13	66"	ICWW	ICWW
05	8.48	48"	L-48 Canal	ICWW
06	115.01	66"	ICWW	ICWW
07	232.09	72"	E-4 Canal	ICWW
08	138.33	60"	E-4 Canal	ICWW
09	53.13	54"	L-48 Canal	ICWW
10	114.20	60"	ICWW	ICWW
11	59.90	42"	L-50 Canal	ICWW
12	48.14	36"	E-3 Canal	E-3
13	40.32	60"	L-42 Canal	E-3
14	6.55	7'X3' CBC	L-42 Canal	E-3
15	244.36	60"	ICWW	ICWW
16	12.23	48"	L-45 Canal	E-3
17	6.29	36"	L-43 Canal	E-3
18	9.51	42"	L-43 Canal	E-3
19	11.43	48"	L-41 Canal	C-15
20	2.26	36"	L-42 Canal	C-15
21	5.24	36"	L-47 Canal	E-3
22	37.29	36"	E-3 1/2 Canal	ICWW
23	40.02	60"	L-47 Canal	ICWW



**Table 4**  
**Potential High Risk Facility Inventory**

SYSTEM	PRIMARY NAME	LOCATION ADDRESS	CITY NAME	LATITUDE	LONGITUDE
RCRAINFO	60 MINUTES PHOTO DEV CTR EAST	2621 N FEDERAL HWY (A)	BOCA RATON	26.37	-80.07
RCRAINFO	ADVANCED CHEMICAL SENSORS	4901 N DIXIE HWY	BOCA RATON	26.39	-80.08
RCRAINFO	ALLIED AUTO BODY	2141 N W 1ST PLACE	BOCA RATON	26.36	-80.08
TRIS, RCRAINFO	AMERICAN BOARTS CRUSHING COMPANY INCORPORATE	6650 PARK OF COMMERCE BOULEVARD	BOCA RATON	26.39	-80.1
RCRAINFO	AMERICAN GATE & RAILING FABRICATORS	4453 N W OAK CIRCLE	BOCA RATON	26.38	-80.08
RCRAINFO	AMOCO SERVICE STATION #1746	1655 N FEDERAL HWY	BOCA RATON	26.36	-80.07
RCRAINFO	ASTRALTECH AMERICAS INC	5400 BROKEN SOUND PKWY	BOCA RATON	26.4	-80.11
RCRAINFO	BATTERY EXCHANGE	850 NORTH WEST 1ST AVENUE	BOCA RATON	26.35	-80.08
RCRAINFO	BLUMS OF BOCA	3595 N DIXIE HWY	BOCA RATON	26.38	-80.08
RCRAINFO	BOCA 1 HOUR CLEANERS	805 N FEDERAL HWY	BOCA RATON	26.35	-80.08
RCRAINFO	BOCA ADVANCE ENTERPRISES INCORPORATED	7400 NORTH FEDERAL HIGHWAY UNIT A1	BOCA RATON	26.41	-80.07
RCRAINFO	BOCA CLASSIC CLEANERS	507 NW 20TH ST	BOCA RATON	26.37	-80.09
RCRAINFO	BOCA CUSTOM PHOTO	6357 N FEDERAL HWY	BOCA RATON	26.4	-80.07
RCRAINFO	BOCA FLEET SERVICES INC	2645 NW 1ST AVE	BOCA RATON	26.37	-80.08
RCRAINFO	BOCA RATON CITY OF	2500 NW 1ST AVE	BOCA RATON	26.37	-80.08
RCRAINFO	BOCA SIGNS INC	1140 HOLLAND DRIVE #8	BOCA RATON	26.4	-80.11
RCRAINFO	BOCA'S PREMIER DRY CLEANERS INC	21073 POWERLINE ROAD	BOCA RATON	26.36	-80.15
TRIS	BOUNDLESS MANUFACTURING SERIVES FLORIDA	1377 CLINT MOORE ROAD	BOCA RATON	26.41	-80.1
RCRAINFO	BP OIL CO #02410	5440 GLADES RD	BOCA RATON	26.36	-80.13
RCRAINFO	CANDY APPLE CUSTOM	2550 BOCA RATON BLVD	BOCA RATON	26.37	-80.08
RCRAINFO	CENTRAL LAUNDRY SERVICE	1943 NORTH FEDERAL HIGHWAY	BOCA RATON	26.36	-80.07
RCRAINFO	CENTURA PAINT MFG INC	4300 NORTHWEST 1ST AVENUE	BOCA RATON	26.38	-80.08
RCRAINFO	CHAMPAGNE AUTOMOTIVE RPR	4201 OAK CIRCLE	BOCA RATON	26.38	-80.08
RCRAINFO	CISCO KID TACKLE	2630 NW 1ST AVE	BOCA RATON	26.37	-80.08
RCRAINFO	COILTRONICS INC	6000 PARK OF COMMERCE BLVD	BOCA RATON	26.39	-80.1
RCRAINFO	COUNTRY CLUB CLEANERS	21322 ST ANDREWS BLVD	BOCA RATON	26.36	-80.13
RCRAINFO	CRC PRESS	2000 CORPORATE BLVD NW	BOCA RATON	26.37	-80.12
TRIS, RCRAINFO	CUSTOM MARBLE INC	1160 S ROGERS CIRCLE #A	BOCA RATON	26.4	-80.11
RCRAINFO	DEM CLEANERS	3511 NORTH FEDERAL HIGHWAY	BOCA RATON	26.38	-80.07
RCRAINFO	DIESEL MECHANICS COOP INCORPORATED	2604 NW 2ND AVENUE	BOCA RATON	26.37	-80.08
RCRAINFO	DON GAGNON PAINTING & WATERPROOFING	1501 NW 1ST CT	BOCA RATON	26.36	-80.08
RCRAINFO	DRY CLEAN USA	7491 NORTH FEDERAL HIGHWAY	BOCA RATON	26.41	-80.07
RCRAINFO	ECKERD EXPRESS PHOTO 7568/0125	1966 NE 5TH AVE	BOCA RATON	26.36	-80.07
RCRAINFO	ECKERD EXPRESS PHOTO 7569/2809	21160 ST ANDREWS BLVD	BOCA RATON	26.36	-80.13
RCRAINFO	ECONO COLLISION & REFINISHING	170 NW 16TH ST	BOCA RATON	26.36	-80.08
RCRAINFO	ENVIRO PHOTO	7400 N FEDERAL HWY BAY 4C	BOCA RATON	26.41	-80.07
RCRAINFO	EXXON 44062	5101 N FEDERAL HWY	BOCA RATON	26.39	-80.07
RCRAINFO	FEDERAL EXPRESS CORP	5900 PARK OF COMMERCE BLVD	BOCA RATON	26.39	-80.1
RCRAINFO	FIFTH AVENUE CLEANERS	1942 NORTHEAST 5TH AVENUE	BOCA RATON	26.36	-80.07
RCRAINFO	FINE LINE OF BOCA INC	4040 NW 1ST AVE	BOCA RATON	26.38	-80.08
RCRAINFO	FINE PRINTING IMPRESSIONS INC	125 NW 13TH ST	BOCA RATON	26.36	-80.08
RCRAINFO	FLORIDA ATLANTIC UNIVERSITY	777 GLADES ROAD	BOCA RATON	26.37	-80.09
RCRAINFO	FOTO APEL INC	2151 N FEDERAL HWY	BOCA RATON	26.36	-80.07

**Table 4**  
**Potential High Risk Facility Inventory**

SYSTEM	PRIMARY NAME	LOCATION ADDRESS	CITY NAME	LATITUDE	LONGITUDE
RCRAINFO	FPL BOCA RATON SERVICE CENTER	21400 POWERLINE RD	BOCA RATON	26.35	-80.15
RCRAINFO	FULLMOON CLEANERS	7885 N FEDERAL HWY	BOCA RATON	26.42	-80.07
RCRAINFO	GAYLINS INTERIOR SERVICES	1117 NW 1ST COURT	BOCA RATON	26.36	-80.08
RCRAINFO	GEM AUTOMOTIVE DESIGN INC	1050 NW 1ST AVE (A)	BOCA RATON	26.35	-80.08
RCRAINFO	GLADES IMAGING INC	3350 NW BOCA RATON BLVD	BOCA RATON	26.38	-80.08
RCRAINFO	GLOBE COMMUNICATIONS CORP	5401 N W BROKEN SOUND BLVD	BOCA RATON	26.4	-80.11
TRIS, RCRAINFO	GORY ROOF TILE (a/k/a Monierlifetile LLC)	135 NW 20TH STREET	BOCA RATON	26.36	-80.08
RCRAINFO	GRAPHIC PRINTING CORP	4089 S ROGERS CIRCLE #2	BOCA RATON	26.4	-80.1
RCRAINFO	HP FURNITURE REFINISHING INC	5301 N DIXIE HWY	BOCA RATON	26.39	-80.08
RCRAINFO	HUNTER'S MOBIL INC.	1990 NORTH DIXIE HIGHWAY	BOCA RATON	26.36	-80.08
TRIS	IBM BOCA ROTON	1000 NW 51ST ST.	BOCA RATON	26.39	-80.11
RCRAINFO	IMI OF BOCA RATON	610 GLADES RD	BOCA RATON	26.36	-80.09
RCRAINFO	INTERIOR WOODCRAFT	2880 NW 2ND AVE	BOCA RATON	26.37	-80.08
RCRAINFO	ITW MIMA INC	1081 HOLLAND DR	BOCA RATON	26.4	-80.1
RCRAINFO	JD'S AUTO REPAIRS	160 NW 24TH STREET	BOCA RATON	26.37	-80.08
RCRAINFO	JKG PRINTING & GRAPHICS INC	1000 CLINT MOORE RD	BOCA RATON	26.4	-80.1
RCRAINFO	JOHN M HOOMANY INC	1000 NW 1ST AVE	BOCA RATON	26.35	-80.08
RCRAINFO	KALMUS MUSIC PUBLICATIONS	6403 W ROGERS CIRCLE	BOCA RATON	26.4	-80.11
RCRAINFO	LEVITZ FURNITURE CORP	6111 BROKEN SOUND PKWY NW	BOCA RATON	26.4	-80.11
RCRAINFO	MAURY ENTERPRISES INC	1625 NW 1ST CT	BOCA RATON	26.36	-80.08
RCRAINFO	METRIC AUTOWORKS LTD	127 NW 11ST	BOCA RATON	26.36	-80.08
RCRAINFO	MINIMATIC	1225 BROKEN SOUND PKWY NW (C)	BOCA RATON	26.4	-80.11
RCRAINFO	MOBIL OIL CORP SS# AP9	1001 N FEDERAL HWY	BOCA RATON	26.35	-80.08
RCRAINFO	MULTI IMAGE GROUP	1080 HOLLAND DR	BOCA RATON	26.4	-80.1
RCRAINFO	MURRAY VAN & STORAGE INC	900 NW 1ST AVENUE	BOCA RATON	26.35	-80.08
RCRAINFO	NATIONAL COUNCIL ON COMP INSURANCE	750 PARK OF COMMERCE DRIVE	BOCA RATON	26.39	-80.1
RCRAINFO	NEW DIMENSIONS CO	128 NW 20TH ST #50	BOCA RATON	26.36	-80.08
RCRAINFO	NORES PRECISION INC	1050 NW 1 AVE	BOCA RATON	26.35	-80.08
RCRAINFO	NORTH AMERICAN ACQUISTION CORP	21212 ST ANDREWS BLVD	BOCA RATON	26.36	-80.13
RCRAINFO	NORTH AMERICAN BIOLOGICALS INCORPORATED	5800 PARK OF COMMERCE BOULEVARD	BOCA RATON	26.39	-80.09
RCRAINFO	OMNI COMMUNITY SCHOOL	5775 JOG ROAD	BOCA RATON	26.4	-80.14
RCRAINFO	ONE HOUR MARTINIZING	4133 N FEDERAL HWY	BOCA RATON	26.38	-80.07
RCRAINFO	OWSL OSMOSIS WASTE SYSTEMS INC	1515 N FEDERAL HWY #300-42	BOCA RATON	26.36	-80.08
RCRAINFO	PALM BEACH CO MITCHELL ELEM	2401 N W 3RD AVENUE	BOCA RATON	26.37	-80.09
RCRAINFO	PALM BEACH CO SPANISH RIVER HIGH	5100 JOG ROAD	BOCA RATON	26.4	-80.14
RCRAINFO	PARIS AUTO REPAIR	1801 NW 1ST CT	BOCA RATON	26.36	-80.08
RCRAINFO	PEARL POLISHING PAINT & BODY INC	1050 NW 1ST AVE	BOCA RATON	26.35	-80.08
RCRAINFO	PHOTO ZOOM INC	21328 ST ANDREWS BLVD	BOCA RATON	26.36	-80.13
RCRAINFO	PHOTOGENIUS	7491 NORTH FEDERAL HIGHWAY C8	BOCA RATON	26.41	-80.07
RCRAINFO	PRECISION CASTINGS INC	3800 NW 2ND AVE	BOCA RATON	26.38	-80.08
RCRAINFO	PRODUCT INGREDIENT TECHNOLOGY	1160 CLINT MOORE RD	BOCA RATON	26.4	-80.1
RCRAINFO	RODIME INC US MFG DIV	901 BROKEN SOUND PARKWAY	BOCA RATON	26.39	-80.1
RCRAINFO	ROLANDO MESTRE	4800 NW 2ND AVE	BOCA RATON	26.39	-80.08

**Table 4**  
**Potential High Risk Facility Inventory**

SYSTEM	PRIMARY NAME	LOCATION ADDRESS	CITY NAME	LATITUDE	LONGITUDE
RCRAINFO	ROSS PRODUCTS INC	145 NW 20TH ST	BOCA RATON	26.36	-80.08
RCRAINFO	ROYAL CLEANERS	2621 NORTH FEDERAL HIGHWAY	BOCA RATON	26.37	-80.07
RCRAINFO	ROYAL PALM POLO SPORTS CLUB INC	6300 CLINT MOORE RD	BOCA RATON	26.4	-80.13
RCRAINFO	SANITARY ENVIRONMENTAL MANAGEMENT	4260 NW 1ST AVE #46	BOCA RATON	26.38	-80.08
RCRAINFO	SENORMATIC ELECTRONICS CORP	6600 CONGRESS AVE	BOCA RATON	26.41	-80.1
RCRAINFO	SETHCO INC	6760 E ROGERS CIRCLE	BOCA RATON	26.4	-80.1
RCRAINFO	SFHCA IMAGING CENTER	2900 N MILITARY TR #120	BOCA RATON	26.37	-80.12
RCRAINFO	SHELL OIL CO	198 NW 20TH ST	BOCA RATON	26.36	-80.08
RCRAINFO	SHERWIN WILLIAMS CO	455 SPANISH RIVER BLVD	BOCA RATON	26.38	-80.09
RCRAINFO	SIEMENS INFORMATION SYSTEMS INCORPORATED	5500 BROKEN SOUND BOULEVARD	BOCA RATON	26.4	-80.11
RCRAINFO	SIRS INC	1100 HOLLARD DR	BOCA RATON	26.4	-80.11
RCRAINFO	SOUND PLUS WOOD INC	2556 NW 2ND AVE	BOCA RATON	26.37	-80.08
RCRAINFO	SOUTHEAST WOODCRAFTERS INC	1800 NW 1ST CT	BOCA RATON	26.36	-80.08
RCRAINFO	SPANISH RIVER CHEVRON	4055 N. FEDERAL HIGHWAY	BOCA RATON	26.38	-80.07
RCRAINFO	ST ANDREWS ESTATE NORTH	6152 N VERDE TR	BOCA RATON	26.36	-80.13
RCRAINFO	STP CORPORATION	5300 BROKEN SOUND BOULEVARD NORTH	BOCA RATON	26.4	-80.11
RCRAINFO	SUNSHINE AUTO BODY INC	2700 NW 1ST AVE	BOCA RATON	26.37	-80.08
RCRAINFO	SUPREME AUTO BODY	1781 NW 1ST CT	BOCA RATON	26.36	-80.08
RCRAINFO	TEXACO #240210238	5899 N FED HWY	BOCA RATON	26.4	-80.07
RCRAINFO	TOMS AUTOMOTIVE	5471 N DIXIE HWY	BOCA RATON	26.39	-80.07
RCRAINFO	TRIAD SERVICES S INC	801 BROKEN SOUND PKWY N W	BOCA RATON	26.39	-80.1
RCRAINFO	US BIOSYSTEMS INC	3231 NW 7TH STREET	BOCA RATON	26.38	-80.09
RCRAINFO	VERDE ELEMENTARY SCHOOL	6590 VERDE TRAIL	BOCA RATON	26.36	-80.15
RCRAINFO	VERTISYS INC	6251B PARK OF COMMERCE BLVD NW	BOCA RATON	26.39	-80.1
RCRAINFO	VIEWSONICS INC	6454 E ROGERS CIRCLE	BOCA RATON	26.4	-80.1
RCRAINFO	VILLAGE SQUARE CLEANERS	21228 ST ANDREWS BLVD	BOCA RATON	26.36	-80.13
RCRAINFO	WALGREENS #1411	21290 ST ANDREWS	BOCA RATON	26.37	-80.13
RCRAINFO	WALGREENS #2664	3003 YAMATO RD	BOCA RATON	26.39	-80.13
RCRAINFO	WASTE PROTECTION ASSOCIATES INC	130 NW SPANISH RIVER BLVD	BOCA RATON	26.38	-80.08
RCRAINFO	WHIRLPOOL FACTORY SERVICE	7602 NW 6TH AVE	BOCA RATON	26.41	-80.09
RCRAINFO	ZIMMER CORP	5801 CONGRESS AVENUE	BOCA RATON	26.4	-80.1
DEP 67779	ROYAL PALMS POLO SLUDGE DISP (HES)	SOLID WASTE - INACTIVE	BOCA RATON	26.41	-80.12
DEP 94293	BOCA RATON ARMY AIRFIELD DUMP(COUNTY DATA)	SOLID WASTE - CLOSED NO MONITORING	BOCA RATON	26.37	-80.09
DEP 94294	BOCA RATON, NW 35TH ST DUMP(COUNTY DATA)	SOLID WASTE - CLOSED NO MONITORING	BOCA RATON	26.38	-80.09
DEP 94295	BOCA AIRPORT DUMP(COUNTY DATA)	SOLID WASTE - CLOSED NO MONITORING	BOCA RATON	26.39	-80.11

City of Boca Raton  
Stormwater Management Master Plan  
Task 1 - Interim Existing  
Conditions Documentation

Prepared by

**MOCK • ROOS**  
ENGINEERS • SURVEYORS • PLANNERS

and

 **MATHEWS**  
**CONSULTING** INC.  
Civil and Environmental Engineers

## **Appendix B**

### **Task 2 – Regulatory Information Summary**





# City of Boca Raton Stormwater Management Master Plan

## Task 2 - Regulatory Information Summary

December 2007



Prepared by

**MOCK • ROOS**

ENGINEERS • SURVEYORS • PLANNERS

and

 **MATHEWS  
CONSULTING INC.**  
Civil and Environmental Engineers



## Engineer's Signature Page

I hereby state, as a Professional Engineer in the State of Florida, that Sections 1, 2, and 4 of this report titled "Regulatory Information Summary" and dated January 2008, was prepared and assembled under my direct responsible charge.

---

M. Rebecca Travis, P.E.  
Principal  
Mathews Consulting, Inc.  
Florida P.E. No. 40988

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Date

Mathews Consulting, Inc.  
1475 Centrepark Boulevard, Suite 250  
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(Reproductions are not valid unless signed, dated  
and embossed with an Engineer's Seal)



## Engineer's Signature Page

I hereby state, as a Professional Engineer in the State of Florida, that Section 3 of this report titled "Regulatory Information Summary" and dated January 2008, was prepared and assembled under my direct responsible charge.

---

Alan D. Wertepny, P.E.  
Florida P.E. No. 32350

---

Date

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## Table of Contents

*Engineer’s Signature Page*..... *i*

**1. Current Stormwater Policy** ..... **1**

**A. Level of Service Standards** ..... **1**

**B. Enforcement**..... **2**

**C. Private stormwater system regulations and monitoring**..... **2**

**D. Development Review and Approval**..... **3**

**E. Surface Water Management Permitting Requirements** ..... **4**

**F. Issues related to applying development standards to existing infrastructure**..... **5**

**2. MS4 NPDES Permit Program** ..... **7**

**3. Total Maximum Daily Load Allocation Program**..... **19**

**4. Areas for Program Improvement** ..... **25**

**List of Figures**

1. Palm Beach County MS4 Watershed Boundaries and Water Quality Monitoring Stations
2. Group 3 Verified Impaired Waters

**List of Tables**

1. NPDES MS4 Water Quality Monitoring Station Information
2. Monitoring Parameters
3. State of Florida Numerical Surface Water Quality Standards
4. Group 3 Verified Impaired Waters in the Palm Beach Coast / Lake Worth Lagoon Basin

# 1. Current Stormwater Policy

The requirements specific to development and stormwater management issues are codified in the City’s municipal code primarily under Volume II, Land Development Code, Chapter 19 Buildings and Building Regulations, Chapter 23 Planning and Development, Chapter 25 Streets and Sidewalks, Chapter 26 Subdivision Regulations and under the City’s 1989 Comprehensive Plan, 1996 Evaluation and Appraisal Report (“EAR”) -Based Amendment Goals, Objectives, and Policies dated February 25, 2005, with text updates through 2/28/06, Ordinance No. 4927. These sections are referenced in this report, as applicable.

Chapter 17 Utilities of the City’s code, establishes the Stormwater Management Utility (SMU). This chapter identifies the type of projects, which may be funded by the SMU Enterprise Fund account, regulates stormwater discharges from industrial sites, prohibits illicit discharges and outlines the notification requirements for spills. The enforcement actions and inspection and monitoring rights are also outlined.

## A. Level of Service Standards

The City’s 1989 Comprehensive Plan 1996 EAR-Based Amendment Goals, Objectives, and Policies, updated through February 28, 2006, includes the required level of service requirements for drainage systems and flood protection.

The Level of Service (“LOS”) standards for stormwater drainage quantity are as follows:

<u>DEVELOPMENT FEATURE</u>	<u>LEVEL OF SERVICE</u>
Lowest floor – residential & Nonresidential	100-year, 3-day zero discharge or FEMA Flood Insurance rate maps requirements for 100-year flood elevation established by SFWMD whichever is more restrictive
Local Streets	3-year, 24-hour rainfall
Parking Lots	3-year, 24-hour rainfall

For streets with traffic volumes which classify them above the definition of “local streets” consideration shall also be made in regards to the roadway classification.

For all development projects within the City’s jurisdiction, a minimum 3-year, 1-hour storm shall be retained prior to any discharge offsite. Beyond that, post development discharge shall not exceed pre-development discharge based on a 25-year, 3-day storm event.

The LOS standards for stormwater drainage quality are as follows:

<u>DEVELOPMENT FEATURE</u>	<u>LEVEL OF SERVICE</u>
New or Redeveloped Development	Retainage and/or detention requirements Drainage Systems shall as a minimum be the first one-inch of runoff from the development project or the total of 2.5 inches times the percent impervious area to meet minimum water quality criteria or shall meet the minimum requirements of the SFWMD criteria.

## **B. Enforcement**

The code includes the requirement that proposed developments meet the adopted LOS standards and also meet the minimum concurrency management measures. (Sec. 23-37) It is the responsibility of the owner and permit holder to comply with and complete the work in accordance with the provisions of the codes and ordinances applicable to the permit (Sec. 19-97) (Sec. 19-127) (Sec. 23-58).

Typically, the enforcement of the permit conditions is through the Building Department's Code Enforcement Division, via withholding the Certification of Occupancy (except in the case of single family residences) until the building official receives approval and concurrence from the City's civil engineer that the permit conditions have been met (Sec. 19-147) (Sec. 23-141 (5)). In the event that land is cleared without a permit, the project will be deemed to be in violation and the permit will be denied until final disposition of the issue. If the applicant is found guilty of work without a permit, permission for continued land clearing of the site will be denied and future permits within the City will be denied for a period of one year. (Sec. 23-283).

Chapter 17 Utilities outlines the enforcement rights as they relate to addressing illicit connections to the City's MS4. This enforcement is typically via verbal or written notification requiring the immediate removal of the connection but may also result in enforcement by violation notice or fine issued by Code Enforcement personnel.

## **C. Private stormwater system regulations and monitoring**

The existing municipal code has a number of references to requirements for upkeep of privately owned stormwater systems. The private landowner has full responsibility for the maintenance and upkeep of its drainage system including swales and lakes (Sec. 23-141, Sec. 23-301(2)(d) and Sec. 25-252). In order to provide water quality treatment, the code requires that littoral zones be established within private water bodies and a management plan be developed (Sec. 23-301(2)(f)). So that the City may monitor the condition the code allows for the City to access private lakes. If a lake is found to be out of compliance

with its management plan, the City may either require the property owners' association to address the problem at their own expense, or the City may address the problem and assess the costs back to the property owners (Sec. 23-301(2)(e)).

The 1996 EAR-Based Amendment to the 1989 Comprehensive Plan added the requirement to the Drainage Sub-element (Policy DRAIN 5.2.1) that property owners or property owner associations of new or existing stormwater retention ponds provide the City with lake maintenance agreements which allow the City to perform all maintenance functions should the property owners fail to adequately maintain the drainage facilities.

Although the City has the right by code to access the private property and to compel the private communities to maintain their systems, there currently is no pro-active measures in place to bring the City's attention to any problems, which may arise. Therefore it is recommended that the City draft a code modification to require private property owners and property owner associations to provide a status and condition report of their stormwater management system, including inlets, pipes, lakes, detention areas, swales etc. on a specified cycle, perhaps every five years, to the City. Alternately, the City could implement an inspection program where City staff would perform the inspections and provide a report to the private property owner requiring them to address any problems found.

#### **D. Development Review and Approval**

The first step of review and approval for proposed development projects is to go through the Site Plan Approval process by application to the City's Development Services Department and the Planning and Zoning Board. Part of Development Services' mission statement is to help maintain the City's quality of life by securing compliance with the City codes and regulations, protecting the natural environment, and managing programs to support these objectives.

If the type of proposed development is a subdivision or a comprehensive plan amendment submittal, a preliminary grading and drainage plan is required. The adopted LOS standards are outlined for six types of public facilities: water, sewer, drainage, solid waste, parks and roadways. Concurrency with the comprehensive plan is tested for all six types of public facilities before the project is granted a development order approval. A representative from each applicable City department, reviews the Site Plan Approval application.

Once the Site Plan Approval is granted, the applicant must submit for Public Works Review Staff ("PWRS") approval. This application requires the submittal of technical drawings and calculations plus a copy of all permits required by outside agencies such as the South Florida Water Management District ("SFWMD"), the Lake Worth Drainage District ("LWDD"), the Florida Department of Transportation ("FDOT"), and others as applicable. A copy of all permits must be provided to the City before issuance of the PWRS approval.

In addition to the Site Plan Approval and the PWRS approval, the applicant must submit to the City for a Building Permit. A Building Permit is required when constructing, resurfacing, replacing asphalt or concrete driveways, parking areas or sidewalks (Sec.19-91) or when constructing multiple buildings (Sec. 19-93). Land clearing, filling, dredging work, etc., (including constructing water bodies or removing soil (Sec. 23-301)) require a permit from the environmental inspection division (Sec. 23-281). Single-family projects are required to obtain a Building Permit but are not required to go through the PWRS review process. A Building Permit application must include a site plan, a drainage plan signed and sealed by a registered engineer, specifications and supporting data (Sec. 19-94).

The developer is required to show compliance with the permit conditions during construction of the project. Inspections are conducted by the City to ensure this compliance. Prior to receipt of the final Certificate of Occupancy, the Engineer of Record is required to provide the certification of construction completion, which states that the project was constructed in substantial conformance with the approved plans and specifications. The permittee must also provide to the City, a copy of the close out documents for all other permits obtained for the project.

## **E. Surface Water Management Permitting Requirements**

Development projects with greater than two acres of impervious area or projects to be constructed over wetlands or water bodies, are required to file a Joint Application for Environmental Resource Permit. This program is administered by the SFWMD in conjunction with the Florida Department of Environmental Protection (“FDEP”) and the U.S. Army Corps of Engineers. The project’s surface water management system must be designed so as to not adversely impact the water quality of the receiving water and must not create flooding either on-site or off-site as a result of the project development. The water quality treatment volume requirement is the greater of 1-inch over the site or 2.5 inches times the percent of proposed impervious area. The treatment is typically provided in a detention area or within exfiltration trench.

The maximum surface water discharge rate from the site depends on which SFWMD drainage basin the project is located within. Projects within the City are limited by the maximum discharge rates for either the C-15 Basin for areas generally north of Yamato Road and west of Dixie Highway, or by the discharge rate for the Hillsboro Basin for the area south of Yamato Road and west of Dixie Highway. The remainder of the City is within the drainage basin of the Intracoastal Waterway, which does not have a numeric discharge limitation; however, the post-development discharge rate is typically limited to the pre-development discharge rate. If the project proposes to discharge into a LWDD canal, a permit from the LWDD is also required. The LWDD maintains its canals at various water levels, typically based upon providing a 10 year, 1-day level of service in the canals. This requirement, along with the estimated rainfall for the area and the required level of service, determine the design requirements for proposed site surface water management systems.

In areas where a City-approved positive drainage system exists, projects for new single-family or duplex residences are required to submit a grading plan prepared by a registered engineer or architect, indicating the final direction of rainfall runoff. In areas where no City-approved positive drainage system exists, new multi-family residential, commercial and industrial projects must retain all runoff from the first one-inch of rainfall. Single-family or duplex residential projects must also retain the first one-inch of runoff but either on-site or within adjacent public road right-of-way swales (Land Development Code, Article III, Division 3 Drainage, Sec 23-141(3)).

For projects one acre and larger, the applicant must complete and submit to the Florida Department of Environmental Protection a Notice of Intent (“NOI”) to conduct activities under the Generic Permit for Stormwater Discharge from large and Small Construction Activities (“CGP”). For projects five acres and larger, a Pollution Prevention Plan is also required, which must be signed and sealed by a registered engineer and may be shown on the civil construction drawings at the time of PWRS submittal. In lieu of providing a Pollution Prevention Plan for projects between 1 and 5 acres, the applicant must complete the short-form checklist on the City’s website.

#### **F. Issues related to applying development standards to existing infrastructure**

Although it is desirable to apply the latest development standards to existing infrastructure, particularly the LOS Standards, it may be impossible to implement the required modifications to the existing system due to the lack of physical space for the improvements and/or lack of funding. It is also in all likelihood, legally impossible to compel a private owner of a surface water management system to comply. A program of identifying facilities which do not meet the standards and a schedule of systematic upgrades to City-owned facilities could be implemented as part of the stormwater utility.

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## **2. MS4 NPDES Permit Program**

### ***System Inventory and Inspections***

The City has a comprehensive system inventory of their structural controls (ponds, pump stations, swales, exfiltration trench and inlets) as well as their operations and maintenance efforts and other MS4 elements. The City has an inventory of all outfall pipes and control structures and the major outfalls and control structures are inspected annually. Required maintenance is scheduled and performed via issuance of a Work Order generated by the City's Maintenance MP2 Database System. The Work Order is completed by the field crew performing the work and the documented work results are input into the database system. There is currently a staff vacancy for the information system technician who was responsible for data entry into the City's current database system; consequently, there is a backlog which slows the access to the information. The City has budgeted for the purchase of a new work order database system in the 2007/2008 budget. The new system will require a learning and transition period, but implementation should result in improved data entry and reporting access.

### ***Flood Control Projects***

Drainage or flood control projects are identified in a number of ways. The City maintains a drainage complaint matrix which is based upon calls received from the community. Staff performs a field inspection of each complaint following a rain event and assigns a rating to quantify the level of impact to the community. If the problem is relatively small with regard to impacts and funding, City crews will address the problem. If the project is larger in scope or funding, the project may be included in the City's Capital Improvement Program. Drainage improvement projects may also be planned in conjunction with other utility work scheduled for an area; for example, swale improvements for a neighborhood where the roadway is being reconstructed. Another way that projects are identified is when staff and field crews discover a problem during an inspection. Improvement projects are typically funded by the Stormwater Utility Enterprise Fund or budgeted in the Capital Improvements Program if the program requires a larger amount of funding.

### ***Training and Certifications***

The City has been pro-active in training its personnel on the following topics: awareness of illicit connections, proper application of pesticides, herbicides and fertilizers, hazardous spill response, construction site inspections, and erosion and sedimentation control Best Management Practices ("BMPs").

### ***Public Education Programs***

The City participates in the stenciling of drainage inlets to note that they are “discharging to surface waters”, trash and beach clean-up events, and provides public education material and information via the City’s website. The website also has a link to the Palm Beach County MS4 NPDES website ([www.pbco-npdes.org](http://www.pbco-npdes.org)) which offers further downloads related to the proper maintenance of surface waters. The City also distributes brochures regarding swale maintenance.

### ***Illicit Connections***

City field crews have been trained to look for illicit discharges and/or connections to the drainage system. During the work being carried out under an assigned Work Order, the crew will make a notation on the Work Order form in the appropriate space for “Illicit Connection Found?: \_\_\_ Yes \_\_\_ No”. The illegal connection will be plugged or removed. A report is made to the City’s Stormwater Manager for tracking purposes. If the illicit connection problem cannot be resolved in the field by plugging or removal, the Stormwater Manager and/or Code Enforcement will get involved in determining the appropriate action to identify the source and remove the connection.

### ***High Risk Facilities Inspection and Monitoring***

The City identifies the High Risk Facilities within their MS4 on an annual basis using the EPA Envirofacts Data Warehouse. The City inspected the sites during the first permit term and determined that none of the High Risk Facilities were connected to the City’s MS4 system. Subsequently, these sites have not been inspected. The City is under permit obligation to perform an annual inspection of the identified sites in order to confirm that there have not been any connections or discharges made to its MS4.

### ***Construction Site Inspections:***

Upon issuance of the building permit for construction, Development Services notifies the PWRS that a pre-construction meeting is required. At the pre-construction meeting, the scope of the project is discussed and the responsibility for required inspections and reporting related to construction site activities is assigned. The owner and contractor are notified of the requirements under the NPDES permit program including filing the Florida Department of Environmental Protection Notice of Intent to Use Generic Permit for Stormwater Discharge from Large and Small Construction Activities (NOI) under Rule 62-621.304(4) F.A.C., the Notice of Termination (NOT) and the responsibility to adhere to the

Pollution Prevention Plan submitted during the PWRs application process and for the need to complete and submit to the City, the inspection reports as required of the construction site operator.

For City construction projects, the City's inspectors are certified for construction site inspections and they typically complete the inspections on a daily basis. The inspector's reports are maintained on file. The City's current policy on private development projects is for the contractor to maintain the logs and report files for the site inspection program and to turn the information over to the City prior to receipt of the Certificate of Occupancy. If the contractor cannot provide the inspection reports, the City requires the developer/owner to televise and vacuum the drainage structures and pipes prior to final acceptance.

### ***Water Quality Monitoring Program***

The water quality monitoring program was instituted by the Palm Beach County MS4 NPDES co-permittees pursuant to permit requirements. The intent of this program is to (1) support assessment of the effectiveness of individual municipal Surface Water Management Programs, (2) assist the FDEP in analyzing water quality impairments for the development and adoption of Total Maximum Daily Loads ("TMDLs") for waters verified as impaired, (3) support the programs being developed and implemented within the Comprehensive Everglades Restoration Plan ("CERP"), and (4) develop a cooperative program between FDEP, SFWMD, Palm Beach County Environmental Resources Management ("ERM"), and the permitted municipalities. Palm Beach County MS4s provide financial assistance to ERM to conduct ambient water quality monitoring activities.

The monitoring information can be used in conjunction with other methods of observation to characterize issues of concern related to water quality, but surface water quality conditions in Palm Beach County are affected by factors beyond MS4 discharges. Previous hydraulic modifications, agricultural activities and groundwater interaction may influence the composition or physical parameters of a water sample, but routine monitoring is an indispensable tool for tracking and evaluating the effects of activities which influence water quality. The monitoring program provides numerical scientific data for evaluating, documenting and communicating conditions believed to affect watershed health and lends additional support to both the ongoing TMDL development program and the CERP assessments.

The Palm Beach County MS4 NPDES permit monitoring program now includes 44 *core* ambient water quality monitoring sites which were selected after coordination among SFWMD, ERM, the Loxahatchee River District ("LRD") formerly known as ENCON (Environmental Control District), and the other Palm Beach County co-permittees.

**Table 1** provides the watershed, site designation, responsible agency, and the northing and easting coordinates of each of the 44 sites. Note that site designations are unique within the individual agencies,

but may be duplicated across agencies. Data for these sites are assigned a unique agency code and station identification in the State's database.

*Figure 1* depicts the site locations and shows the boundaries of the associated watersheds. Sites monitored by ERM are shown as circles, and those monitored by the LRD are shown as squares. Hollow symbols signify marine or tidal sites and solid symbols designate freshwater sites. The only monitoring conducted within the City for the MS4 NPDES program is along the C-15 canal. There is currently no monitoring for the Hillsboro Canal or its tributaries.

Since the initiation of the MS4 NPDES monitoring program in 1998, procedural modifications have resulted in the discontinuation of sampling at certain sites in close proximity to others. This change was made to prevent bias in the dataset caused by the inclusion of repetitive or very similar values which could compromise the representative distribution of the results. These changes appear in Table 1 as two values in the site designation column separated by a slash, with the first of the two values being the active (current) designation. This allows for easy reference when comparing data values within a watershed to those contained in previous reports.

In the last year, FDEP discontinued monitoring of eight marine sites located within the Lake Worth Lagoon/Intracoastal watershed. ERM assumed responsibility for sample collection and analysis of six of those sites (marked with an asterisk in the agency column of Table 1). In addition, twelve new freshwater sites along the Chain of Lakes and E-4 Canal (marked with an asterisk in the site designation column in Table 1) have been added to the program.

The LRD monitors four marine sites and one freshwater site. ERM now monitors ten marine sites, and twenty-three freshwater sites. ERM is also contracted by SFWMD to perform the sample collections for the upstream (freshwater) side of six SFWMD control structures which discharge freshwater to the Intracoastal.

For the 39 sites monitored by ERM, water samples are collected and water quality physical parameters are measured in-situ by ERM staff using a multi-parameter water quality monitoring instrument. Water samples are collected, preserved and stored according to the FDEP Standard Operating Procedures. Quality assurance/quality control measures include pre-cleaned equipment blanks, field cleaned equipment blanks, field spikes, and the collection of duplicate samples.

Analyses of freshwater samples (excluding metals) for all ERM sites are conducted by SFWMD at their laboratory facilities. Samples from these sites are analyzed for metals by an independent laboratory under contract with ERM. Analyses of marine samples for all ERM sites is by contract with a specialized

laboratory having the technical knowledge and experience needed to eliminate anomalies created by high sodium and chloride concentrations in salt water (matrix interference).

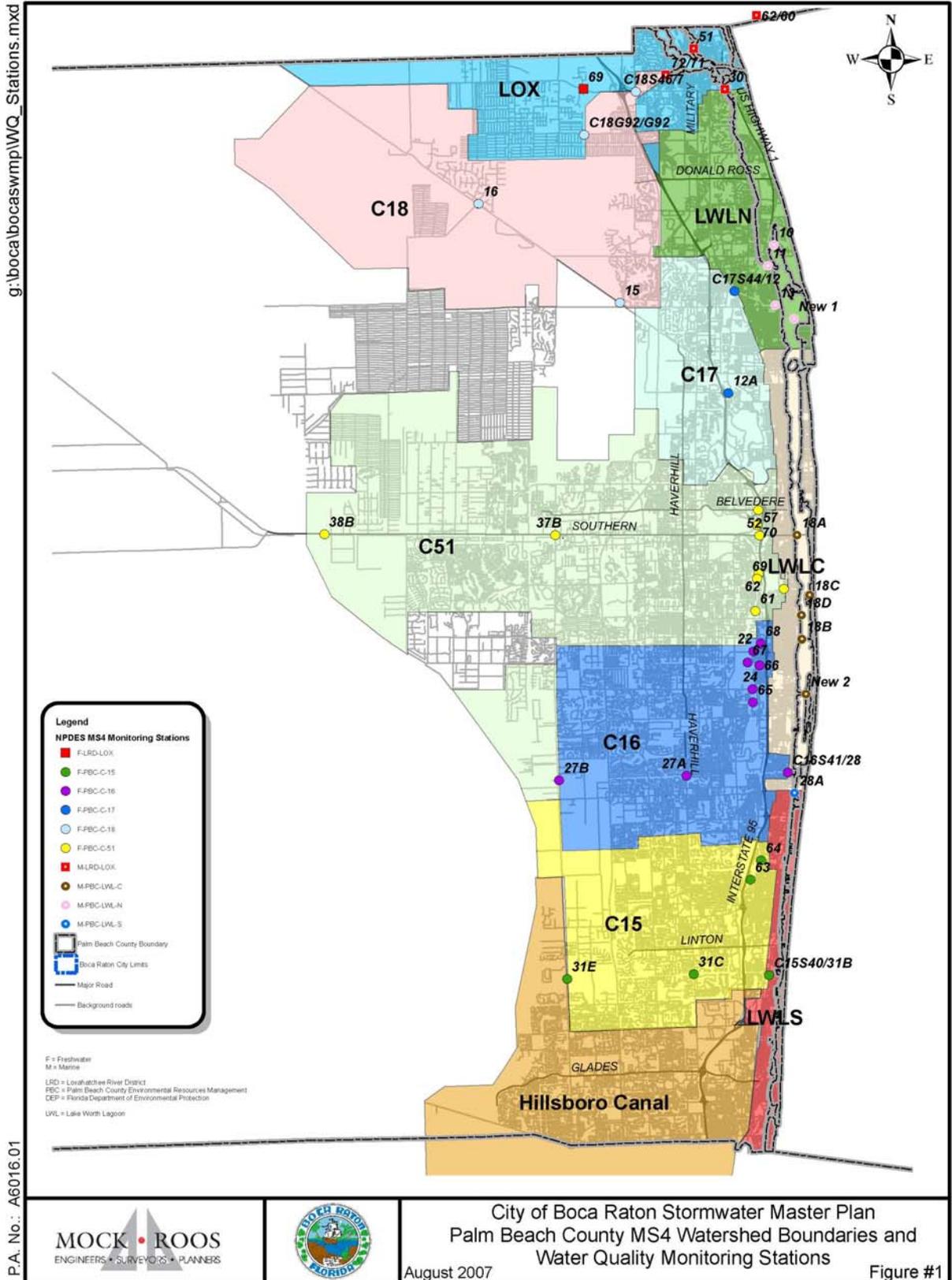
The frequency of monitoring for the marine sites is monthly and for the freshwater sites is bi-monthly. Sampling at the ERM marine sites for metals analysis is performed quarterly.

The water quality parameters being monitored by ERM are listed in **Table 2**. Monitoring by the LRD does not include testing for metals or total hardness. **Table 3** provides a list of the parameters and the Florida Surface Water Quality Standards (“WQ Standards”) as promulgated in Florida Administrative Code (F.A.C.) 62-302.

The water quality sampling program in Palm Beach County is a cooperative effort designed to incorporate desirable elements of existing monitoring programs being administered by various agencies throughout the County. Attempts to coordinate sampling frequencies, parameters, and methodologies are ongoing, but not all sampling programs produce results that are compatible for a combined analysis.

**Table 1  
NPDES MS4 Water Quality Monitoring Station Information**

Watershed	Surface Water Classification	Site Designation	Agency	Marine	Northing	Easting
				Freshwater		
Lox	III (Fresh)	69	LRD	Freshwater	947071.77	924822.40
		30	LRD	Marine	946223.78	954573.37
	III (Marine)	51	LRD	Marine	954939.97	948224.55
		62/60	LRD	Marine	961625.76	961625.76
	II	72/71	LRD	Marine	949558.67	942243.82
C-15	III (Fresh)	63*	PBC	Freshwater	780408.32	955816.19
		64*	PBC	Freshwater	784471.80	958205.48
		31C	PBC	Freshwater	760879.83	943443.02
		31E	PBC	Freshwater	760549.91	916736.89
		C15S40/31B	SFWMD	Freshwater	760236.00	959269.79
C-16	III (Fresh)	22	PBC	Freshwater	828280.34	957602.68
		24	PBC	Freshwater	820399.97	957270.70
		65*	PBC	Freshwater	817642.36	957294.06
		66*	PBC	Freshwater	825364.28	958879.56
		67*	PBC	Freshwater	826028.11	956338.81
		68*	PBC	Freshwater	829815.10	959241.37
		27A	PBC	Freshwater	802545.25	942880.04
		27B	PBC	Freshwater	802276.58	916052.08
		C16S41/28	SFWMD	Freshwater	802739.87	964316.28
C-17	III (Fresh)	12A	PBC	Freshwater	882520.57	953672.56
		C17S44/12	SFWMD	Freshwater	903830.19	955552.70
C-18	I	15	PBC	Freshwater	901986.07	931378.31
		16	PBC	Freshwater	923477.26	902076.42
		C18G92/G92	SFWMD	Freshwater	937389.78	924697.78
		C18S46/7	SFWMD	Freshwater	946198.14	935782.17
C-51	III (Fresh)	52*	PBC	Freshwater	852487.66	959528.86
		57*	PBC	Freshwater	857791.27	959379.72
		61*	PBC	Freshwater	836624.16	958301.41
		62*	PBC	Freshwater	844522.12	959176.55
		69*	PBC	Freshwater	843444.90	958801.48
		70*	PBC	Freshwater	854633.78	959084.73
		37B	PBC	Freshwater	853637.29	916592.84
		38B	PBC	Freshwater	854963.27	867962.99
		C51S155/20	SFWMD	Freshwater	841132.85	964349.43
LWL-C	III (Marine)	New 2	PBC*	Marine	819086.28	968516.09
		18B	PBC*	Marine	830580.53	967926.64
		18D	PBC	Marine	835593.23	967942.19
		18C	PBC	Marine	839740.15	969747.03
		18A	PBC*	Marine	852345.43	967405.24
LWL-N	III (Marine)	New 1	PBC*	Marine	897777.72	967926.64
		13	PBC	Marine	900706.79	964049.58
		11	PBC	Marine	908969.28	962655.71
		10	PBC*	Marine	913398.12	964095.22
LWL-S	III (Marine)	28A	PBC*	Marine	798402.11	965585.04



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**Table 2**  
**Monitoring Parameters**

Parameter
Alkalinity*
Arsenic
Cadmium
Chlorophyll-a (corrected)
Copper
Dissolved Oxygen
Fecal Coliform
Lead
Nitrogen, Ammonia
Nitrogen, Nitrate-Nitrite
Nitrogen, Total Kjeldahl
pH
Phosphorus, Orthophosphate
Phosphorus, Total
Salinity†
Specific Conductivity
Temperature
Total Hardness (as CaCO <sub>3</sub> )*
Total Suspended Solids*
Turbidity
Zinc*

\* Freshwater Sites Only

† Marine Sites Only

**Table 3**

State of Florida					
Numerical Surface Water Quality Standards					
Parameter	Units	Class I	Class II	Class III - Freshwater	Class III Marine - (Tidal)
PH		6.5 to 8.5	6.5 to 8.5	6.5 to 8.5	6.5 to 8.5
Dissolved Oxygen	mg/L	5.0	5.0	5.0	5.0
Turbidity	NTU	≤ 29 above background	≤ 29 above background	≤ 29 above background	≤ 29 above background
Chlorophyll-a (corrected)	mg/cuM	* - Annual means ≤ 20	* - Annual means ≤ 11	* - Annual means ≤ 20	* - Annual means ≤ 11
Fecal Coliform	#/100mL	800	800	800	800
Arsenic	mg/L	≤ 0.05		≤ 0.05	
Cadmium	mg/L	≤ [e(0.7852[lnH]-3.49)]10 <sup>-3</sup>	≤ 0.0093	≤ [e(0.7852[lnH]-3.49)]10 <sup>-3</sup>	≤ 0.0093
Copper	mg/L	≤ [e(0.8545[lnH]-1.465)]10 <sup>-3</sup>	≤ 0.0029	≤ [e(0.8545[lnH]-1.465)]10 <sup>-3</sup>	≤ 0.0029
Lead	mg/L	≤ [e(1.273[lnH]-4.705)]10 <sup>-3</sup>	≤ 0.0056	≤ [e(1.273[lnH]-4.705)]10 <sup>-3</sup>	≤ 0.0056
Zinc	mg/L	≤ [e(0.8473[lnH]+0.7614)]10 <sup>-3</sup>	≤ 0.086	≤ [e(0.8473[lnH]+0.7614)]10 <sup>-3</sup>	≤ 0.086

**Notes:**

(1) lnH means the natural logarithm of total hardness expressed as milligrams/L of CaCO<sub>3</sub>. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L. (2) This criterion is protective of human health not of aquatic life. (3) For application of dissolved metals criteria see 62-302.500(2)(d), F. A. C.

\* Florida Impaired Surface Waters Rule Interpretation of Narrative Nutrient Criteria.

As described in Rule 62-303, F.A.C., water quality sample values in exceedence of the applicable WQ Standards are the primary tool for the assessment of water body impairments.

Values exceeding the WQ Standard for pH are those less than 6.5 or greater than 8.5. Exceedence of the Standard for dissolved oxygen occurs at all values below 5.0 mg/L. Turbidity exceedences occur at all values above 29.0 nephelometric turbidity units (“NTU”). Background turbidity is conservatively assumed to be zero. The WQ Standard exceedence limits for fecal coliform and arsenic are 800 cfu/100 mL and 0.05 mg/L, respectively. This WQ Standard for arsenic applies only to Class I and Class III freshwater systems. There is no WQ Standard for arsenic in marine systems.

For Class I and Class III freshwater, exceedence limits for heavy metals (cadmium, copper, lead, and zinc) are based on a logarithmic function of the total hardness. In cases where a total hardness was not measured or was below the limits of detection, an exceedence limit was not calculated. For marine waters, the limits for heavy metals are constant and do not depend on the total hardness. Cadmium, copper, lead, and zinc exceed the surface WQ Standards at values above 0.0093 mg/L, 0.0029 mg/L, 0.0056 mg/L, and 0.086 mg/L respectively in marine waters.

Exceedence limits for chlorophyll-a (corrected for pheophytin) are determined by the annual mean of the samples taken at a given site, per the Impaired Waters Rule. In freshwater systems, the required annual mean is exceeded if the average of all sample values is greater than 20 mg/m<sup>3</sup>. In marine systems, exceedences occur when the average value of all sampling events is greater than 11.0 mg/m<sup>3</sup>. In lieu of numeric limits for nutrients, chlorophyll-a measurements are used as an indicator of elevated nitrogen and phosphorous levels.

Copper limits are related to total hardness in freshwater systems but are constant in marine systems. Limits for copper in freshwater systems typically vary within the range of 0.015 to 0.025 mg/L, an order of magnitude greater than that allowed by the 0.0029 mg/L limit applied to marine systems. Copper levels which may remain relatively constant from west to east in the freshwater watersheds will result in a greater occurrence of exceedences in the marine watershed due to the freshwater inflows to the marine watersheds and discrepancy in the value of the limits on which the determination of impairment is based.

Review of the water quality monitoring results from previous years has revealed that the highest occurrence of exceedences appears for the following five parameters:

- Dissolved Oxygen (w/ temperature)
- Total Nitrogen
- Total Phosphorus
- Chlorophyll-a (corrected for pheophytin)
- Copper

Dissolved oxygen is affected by factors such as macrobiotic life, photosynthetic activity of aquatic vegetation, metabolic functions of microscopic species such as coliform bacteria, the availability of sunlight (and therefore turbidity), and the mixing of separate water bodies having different indigenous oxygen levels, such as ground water. Ground water has very low to no measurable dissolved oxygen, so low oxygen values by themselves do not signify high levels of oxygen removal. Changes in the values for this parameter must be evaluated with consideration given to the nutrient composition and activity level of the inhabiting vegetative and microscopic species.

There are currently no specific numerical standards for nitrogenous or phosphoric nutrients other than the surrogate values obtained for chlorophyll-a; however, the State has adopted target levels for phosphorus in Lake Okeechobee (.040 mg/L) and the Everglades (0.01 mg/L). Additionally, scrutiny of the total nitrogen and total phosphorus levels is necessary to supplement information provided by chlorophyll-a and dissolved oxygen data and to assess the relationship of this data with aquatic vegetation, if any.

Previous data shows that, in general, dissolved oxygen levels increase from west to east and nutrient concentration (nitrogen and phosphorus) decrease from west to east. It is anticipated that water quality measurements in waters accepting discharges from the City's MS4 will exhibit trends similar to those noted in all of the currently monitored eastern watersheds and LWDD canals.

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### 3. Total Maximum Daily Load Allocation Program

Section 303(d) of the Federal Clean Water Act and the Florida Watershed Restoration Act require that total maximum daily loads (“TMDLs”) be established for all waters that are not meeting their designated uses and, consequently, are defined as “impaired waters.” A TMDL is the maximum daily amount of a given pollutant that a water body can absorb without exceeding the WQ Standard for that pollutant.

TMDLs are developed, allocated, and implemented through a watershed management approach that separates the State of Florida’s fifty-two major hydrological basins in five groups. Each group undergoes a five phase cycle on a rotating schedule:

Phase 1: Preliminary evaluation of water quality.

Phase 2: Strategic monitoring and assessment to verify water quality impairments.

Phase 3: Development and adoption of TMDLs for waters verified as impaired.

Phase 4: Development of a Basin Management Action Plan (“BMAP”) to achieve the TMDL.

Phase 5: Implementation of the BMAP and monitoring results.

The methodology for identification and assessment of impaired waters is established by Rule 62-303, F.A.C., which distinguishes between waters placed on the Planning List for further verification or the Verified List for development of TMDLs. Identification of impaired waters for inclusion on these lists is contingent upon the data collection and subsequent modeling analyses conducted by FDEP. Evaluations are divided into the following categories based on the surface water classification:

- Evaluation of Aquatic Life Use Support
- Exceedences of Aquatic Life-Based Water Quality Criteria
- Biological Assessment
- Interpretation of Narrative Nutrient Criteria
  - Nutrients in Streams
  - Nutrients in Lakes
  - Nutrients in Estuaries and Open Coastal Waters
- Primary Contact and Recreation Use Support
- Fish and Shellfish Consumption Use Support
- Drinking Water Use Support and Protection of Human Health

The Rule defines procedures and requirements for the determination of impairment or non-impairment under each of these categories, as well as specifics regarding data integrity, data set composition, and minimum exceedence thresholds for inclusion in either list. See the previous discussion on Water Quality Monitoring for more information about data collection efforts related to Palm Beach County's MS4 NPDES co-permittees.

### ***Current Status of Palm Beach County Basins***

Water bodies in Palm Beach County are contained within Groups 1-3.

The Lake Okeechobee Basin is in Group 1, currently in Phase 4 with an adopted TMDL for phosphorus. A draft TMDL has been posted for the Oklawaha River Basin in this Group.

Group 2 is in the third phase of the basin group rotation cycle and a Verified List of Impaired Waters has been developed. FDEP has posted final TMDLs for Group 2 waters in the Tampa Bay Basin and some of its major tributaries in the Alafia, Manatee River, and Hillsborough River Basins, as well as one final TMDL for the Apalachicola Basin. Draft TMDL documents for Group 2 waters have been posted for the Upper, Middle and Lower St. Johns River Basins. The St. Lucie/Loxahatchee Basin extending into the northern portion of Palm Beach County is in Group 2. No TMDLs have been adopted for the St. Lucie/Loxahatchee Basin.

Waters in proximity to Boca Raton are included in the Palm Beach Coast/ Lake Worth Lagoon Basin in Group 3. Waters included on the Verified List of Impaired Waters (per GIS coverage provided on the FDEP website dated May 17, 2007 and downloaded on August 1, 2007) for the Lake Worth Lagoon/Palm Beach Coast Watershed are shown in **Table 4**. The parameters of concern (impairments) for Group 3 waters in Palm Beach County are primarily copper and dissolved oxygen linked to excessive nutrients.

Group 3 is also currently in Phase 3. Final TMDL documents for the waters connecting to the Boca Raton municipal stormwater system, i.e. the E-4 and E-3 Canals, as well as for the Intracoastal waterway, are projected for 2010. Final TMDL documents have only been posted for Group 3 waters in the Sarasota Bay/Peace River/Myakka River Basin to date, but draft documents are available for waters in the Caloosahatchee River Basin, the Choctawhatchee-St. Andrew Basin, the Sarasota Bay Basin, and the Upper Peace River Basin.

Draft TMDL documents have also been posted for Group 4 waters in the Nassau/St. Mary's Basin and the Southeast Coast/Biscayne Bay Basin.

**Table 4**  
**Group 3 Verified Impaired Waters in the Palm Beach Coast / Lake Worth Lagoon Basin**

WBID	Planning Unit	Waterbody	Parameters	Priority	Projected Year for TMDL Development	Concentration
3226F	Intracoastal	ICCW AB POMPANO	COPPER	MEDIUM	2010	> 3.7 mg/L
3226F2	Intracoastal	LAKE WORTH LAGOON SOUTH SEG	COPPER	MEDIUM	2010	> 3.7 mg/L
8096B	Intracoastal	HILLSBORO INLET PARK	NUTRIENTS	MEDIUM	2010	Median TN
3233	L-8	L-8	DISSOLVED	HIGH	2005	
3262D	C-15	E-3 CANAL	DISSOLVED	MEDIUM	2010	< 5.0 mg/L
3245	C-51	C-51	DISSOLVED	MEDIUM	2010	< 5.0 mg/L
3264D	Hillsboro Canal	E-4 CANAL	NUTRIENTS	MEDIUM	2010	Median TN
3242A	C-17	PB STATIONS/D CANALS	DISSOLVED	MEDIUM	2010	< 5.0 mg/L
3245B	C-51	LAKE CLARKE	DISSOLVED	MEDIUM	2010	< 5.0 mg/L
3262A	C-15	LAKE IDA	NUTRIENTS	MEDIUM	2010	Median TN

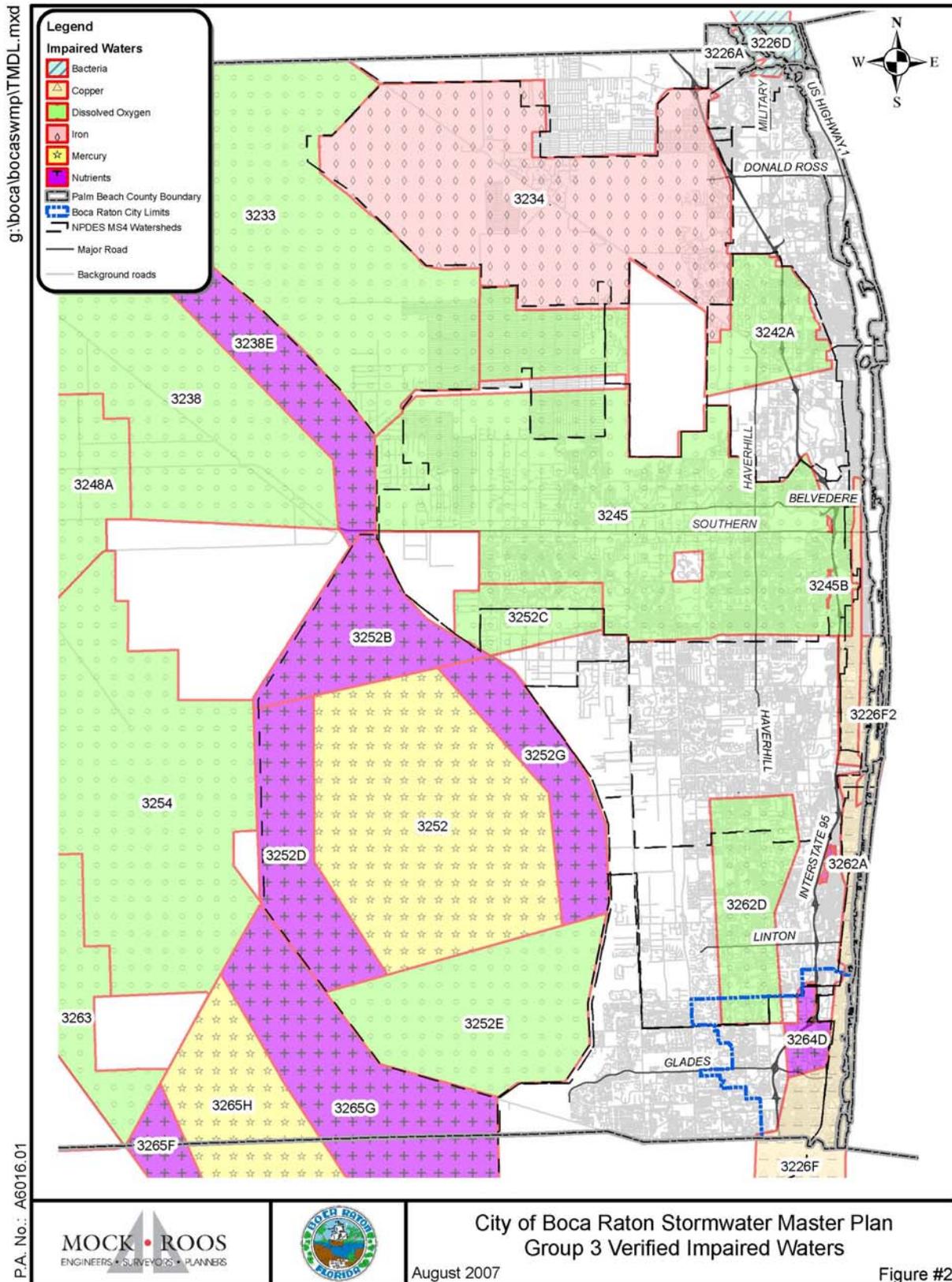
A map of Palm Beach County showing the MS4 NPDES watershed delineations and the boundaries of the Group 3 Impaired Waters from the Verified List (per GIS coverage provided on the FDEP website dated May 17, 2007 and downloaded on August 1, 2007) is provided as *Figure 2*.

Assessments of incoming water quality data to verify or dismiss findings of impairment are ongoing for Group 3 waters. The Verified List is periodically revised to reflect changes to the status of water bodies based on new modeling analyses as FDEP continues to evaluate additional information. As more of these assessments will occur prior to the 2010 TMDL development, this list of impaired waters is subject to change.

#### ***Additional Information***

Rule 62-303, F.A.C also outlines procedures for removal of a waterbody from the Planning or Verified Lists, and requirements for any scientific evidence used to do so. These requirements vary among the categories of assessment listed above, and are not necessarily the same for removal of a segment from either the Planning or Verified List. Some of the major reasons given for delisting (or not verifying) a waterbody segment are:

- Insufficient data
- Improperly sampled, analyzed, or reported data values
- Changes in FDEP's program or procedure which, following a reassessment, lead to the conclusion that the waterbody is not impaired
- Subsequent statistical assessments of data demonstrating that the minimum exceedence threshold for listing is no longer being met
- Significant scientific evidence that the designated use is being met
- Construction or installation of BMPs or other pollution reduction technologies provides a reasonable assurance that the designated use will be met or that the minimum exceedence threshold for listing will not be met, as accepted by FDEP



The Boynton Canal was included as an impaired water in the 1998 303(d) list for Dissolved Oxygen, Coliforms, Nutrients and Biochemical Oxygen Demand, but subsequent FDEP review of fisheries data collected and reported by the Florida Fish and Wildlife Commission (FWC) was found sufficient to demonstrate that aquatic life use support was being met. This determination has led to the delisting of the Boynton Canal. Coordination with the FWC and other existing agencies may prove beneficial due to the field experience, techniques, and reporting history of these agencies.

Although previous studies have been accepted by FDEP as evidence of non-impairment, FWC procedures do not necessarily coincide with the Rule established standard operating procedures for data acquisition. FDEP is therefore not obligated to accept the findings of reports of this type as justification for delisting but has demonstrated a willingness to do so. The Rule allows FDEP the discretion to make individual determinations depending on the reason for listing, but conducting these studies would provide necessary scientific indications of waterbody health.

Along with experience, facilities, techniques, and specialized equipment for sampling, state or other agencies performing these kinds of environmental evaluations may have an established impartiality which lends credibility to their conclusions. Cooperative partnerships with these agencies for the performance of additional studies may become useful for the delisting of water bodies where possible, and are far less expensive than contracting with private firms. The LWDD, FWC, City of Delray Beach, and the City of Boynton Beach are potential partners with the City for cooperative efforts of this nature.

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## 4. Areas for Program Improvement

A review of the City's comprehensive stormwater program resulted in the following comments and recommendations:

1. Add a requirement to Land Development Code, Chapter 23 Planning and Development, Article V, Land Clearing, Dredging and Filling and to Chapter 19 Buildings and Building Regulations, Division 3 Permits, that all development projects, regardless of size, are required to provide site erosion and sedimentation control measures to prevent polluted runoff from leaving the site.
2. Formalize in written format, the construction site inspection program for all construction projects within the City in order to comply with the MS4 NPDES permit. The minimum frequency is not specified in the permit; however, the number of construction site inspections should be tracked for annual reporting purposes and copies of all inspection reports must be maintained for possible review by the DEP. This effort by the City is required under the MS4 NPDES permit, while the site operator's inspections are required under the GCP NPDES program.
3. In the past, the Building Department performed construction site inspections for single-family and duplex residential projects. These inspections, as required under the City's MS4 NPDES permit, are no longer being done. It is recommended that a program be staffed for the construction site inspections of these residential projects as well as for the review of construction plans and surface water management calculations at the time of permit application.
4. Implement a program for the training and certification of the Building Department inspectors and the Code Enforcement inspectors with regards to inspection of high risk facilities, awareness and identification of illicit connections, and the inspections and best management practices of construction site controls related to the City's comprehensive stormwater program and the MS4 NPDES permit.
5. Develop a program in written format requiring that inspections and maintenance of private stormwater management systems be reported to the City on a regular basis, possible annually, every two years or every five years. This would require a change to the code. Alternately, the City could undertake an inspection program of private systems on a regular interval for inspection/maintenance of exfiltration, trenches, inlets/catch basins, lakes and dry detention area.

6. New or significant re-development activities - propose changes to code that promote/require reduction of impervious surfaces, use of swales, the incorporation of low impact development principles, stormwater reuse, and adherence to the principles of Florida Yard and Neighborhood Program in new landscaping.
7. Consider modifying the LOS for roadways, to be consistent with SFWMD. The City's current LOS for roadways is that the minimum local roadway be at or above the 3-year, 1-day flood elevation. The SFWMD requires the roadway centerline be at or above the 5-year, 1-day flood elevation.
8. Increase public education activities for stormwater awareness, illicit discharge identification and reporting, grass clippings, pet waste pick-up, etc.
9. Prohibit disposal of grass clippings/yard waste in stormwater management system, swales, and roadways. This would require a change to the code.
10. Educate the public regarding the benefits of restricting the use of fertilizers containing phosphorus. Consider making use of existing public education programs and tailor them for use specifically to the City of Boca Raton.
11. Implement a tracking mechanism for *maintenance* of exfiltration trench which is separate from the current method of tracking exfiltration trench *inspections*. This is recommended for the purposes of annual reporting and to address a comment received from the FDEP on the last Annual Report submittal.
12. Implement a tracking method within the Fire Rescue Department for hazardous material spills responded to and for non-hazardous material spills responded to for purposes of annual reporting.
13. Implement an annual inspection of all high risk facilities within the City and confirm that there are no facilities with a potential to discharge to the City's MS4 for purposes of annual reporting.
14. Complete the replacement of the MP2 Database system and training of the appropriate personnel to enter and access the data. Develop a connection between this database and the City's stormwater GIS.
15. Hire and assign a staff person within the Municipal Services Department, dedicated to the coordination of the stormwater utility and the MS4 NPDES related issues, including record keeping, database upkeep and reporting.

City of Boca Raton  
Stormwater Management Master Plan  
Task 2 - Regulatory Information  
Summary

Prepared by

**MOCK • ROOS**  
ENGINEERS • SURVEYORS • PLANNERS

and

 **MATHEWS**  
**CONSULTING** INC.  
Civil and Environmental Engineers



City of Boca Raton  
Stormwater Management Master Plan  
Task 3 - Master Plan Development  
**Final Report**

Prepared by

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