TOWN OF MELBOURNE BEACH
STORMWATER MASTER PLAN
2007 UPDATE

Jones Edmunds Project No. 13190-006-01

Owner:

THE TOWN OF MELBOURNE BEACH
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GLOSSARY OF TERMS

ACOE..... Army Corps of Engineers
BMP ..... Best Management Practice
CIB ..... Curb Inlet Basket
CMP ..... Corrugated Metal Pipe
DO..... Dissolved Oxygen
FDEP ..... Florida Department of Environmental Protection
FDOT ..... Florida Department of Transpiration
FEMA ..... Federal Emergency Management Agency
HDPE ..... High Density Polyethylene
Jones Edmunds ..... Jones Edmunds & Associates, Inc.
MS4..... Phase II Municipal Separate Storm Sewer System Permit
NPDES..... National Pollutant Discharge Elimination System
NSBB ..... Nutrient Separating Baffle Box
RCP ..... Reinforced Concrete Pipe
SHWT ..... Seasonal High Water Table
SJRWMD ..... St. Johns River Water Management District
SMP ..... Stormwater Master Plan
Town ..... The Town of Melbourne Beach
Update ..... Stormwater Master Plan Update

EXECUTIVE SUMMARY

This report evaluates the Melbourne Beach Stormwater Master Plan (SMP). The report also serves as the update to the SMP with current costs for budget planning purposes. The report does not recreate the SMP. The original basin boundaries and pollutant-load determinations are retained and understood to be generally accurate. This report is designed to allow the Town of Melbourne Beach (Town) to create a realistic budget, validate proposed projects, prioritize those projects, track the previous 5 years of progress, and maintain current status.

View of Melbourne Beach Pier

BACKGROUND

The Town's SMP was published in 2002. The SMP outlines the condition of the stormwater system and serves as the guidance document for prioritizing and budgeting stormwater system improvements. The SMP is also an important part of the Town's Phase II Municipal Separate Storm Sewer System (MS4) permit. The SMP divided the Town into 19 sub-basins and evaluated each basin for flooding, water quality, and infrastructure issues. The SMP included a stormwater infrastructure inventory of existing and proposed conditions that was used in conjunction with the modeling results to plan a prioritized approach to reduce flooding and improve water quality treatment within the Town. Generalized budgets were developed for prioritized projects within each basin. This provided a simple approach for updating the stormwater infrastructure and

improving flood control and water quality treatment. Those basins contributing higher pollutant loadings and greater flood concerns were identified as the highest priority areas.

In November 2005, Jones Edmunds & Associates, Inc. (Jones Edmunds) presented several recommendations to the Town, including updating the SMP. In March 2007, the Town contracted Jones Edmunds to update the SMP (Update). Any discrepancies noted during the field investigation between the SMP and actual conditions have been identified on the revised Existing Conditions Map in Appendix A. However, the Update does not include the evaluation of underground conditions and relies on the accuracy of the existing plan unless obvious discrepancies were found.

EVALUATION

The typical Master Plan is considered a 'living document' and, in accordance with National Pollutant Discharge Elimination System (NPDES) rules, should be reviewed annually and updated to reflect changes in budgets, stormwater infrastructure, staff procedures, and regulatory priorities.

Jones Edmunds conducted a community workshop, staff interviews, records review, and a field visit to document the community priorities and existing conditions. The next phase of the Update included the review of improvements proposed by the SMP and re-evaluation of the recommended actions. In general, the recommendations are reasonable. However, several changes in the proposed projects listed in the SMP are recommended.

Jones Edmunds representative at Community Workshop

The most significant changes to the recommended projects include the application of nutrient separating baffle boxes (NSBBs) and curb inlet baskets (CIBs). The SMP recommended placing NSBBs at every outfall to the Indian River and CIBs in 208 inlets throughout the system. Jones Edmund recommends NSBBs at most outfalls and limited use of CIBs. The reasons for this change are listed below:

- In general, CIBs and NSBBs perform the same function.

- In basins with more inlets, floating solids and vegetative debris can be captured in the NSBB upstream of the outfall. The benefit for the Town is reduced initial cost and reduced maintenance cost with comparable treatment results.

- In basins with relatively low pollutant loads and fewer inlets, the CIBs are more cost effective. The CIBs will capture floating solids and vegetative debris.

Nutrient Separating Baffle Box (NSBB)

- NSBBs are not recommended in Basin 4 (Riverside Drive and Sunset Boulevard) and Basin 6 (Riverside Drive and Avenue A). These basins are configured with three inlets surrounding one intersection immediately upstream of the outfall. Jones Edmunds recommends the use of CIBs in these inlets. This will reduce the initial installation cost and future maintenance cost and, with proper maintenance, will provide a comparable level of treatment to *NSBBs.*

Curb Inlet Basket (CIB)

The SMP proposed exfiltration systems at nearly every intersection in the Town. The Update recommends the following application of exfiltration:

- The primary application of exfiltration systems would be constructed generally in the center of the Town from north to south. This Best Management Practice (BMP) works best with higher elevations and more separation of the seasonal high water table (SHWT).

- This will allow the exfiltration trenches to capture and attenuate a portion of the stormwater runoff flowing from the east before it accumulates to a nuisance flood level in the center and west side of the Town.

- This will also provide some water quality treatment while reducing stormwater discharge to the Indian River Lagoon.

In addition to pipe replacement, NSBBs, CIBs, and exfiltration systems, the SMP recommends over 0.5 mile of swale. The construction of swales is an important BMP for Melbourne Beach, but they are recommended in a more limited role.

REGULATORY COMPLIANCE

The SMP proposed various modifications to the existing storm sewer system including the increase in pipe sizes, the addition of weirs and orifices in various inlets, and the addition of exfiltration trenches and roadside swales. However, the SMP did not discuss the regulatory implications of the proposed changes. At a minimum, these system modifications will require permitting with the St. Johns River Water Management District (SJRWMD). Some areas are also subject to Florida Department of Transportation (FDOT) permitting. Table 1 presents the prioritized list of projects with estimated costs.

Basin 8 Outfall at Third Avenue Community Park

SMP DOCUMENTATION

Part of the Update was to understand and document the Town's progress towards SMP goals over the past 5 years. The Town has made consistent efforts to upgrade the stormwater infrastructure. In 2004, the Oak Street Pedway project constructed an exfiltration system along the east side of Oak Street to provide water quality treatment and flood storage. Exfiltration and NSBBs were installed on Anchor Key and Pelican Key, and an NSBB was installed on Neptune Drive. The Oak Street Pedway Improvements, Revision A project is installing additional swales, exfiltration trench, and an NSBB in Basin 9.

To track future progress, this Update includes two new forms to assist the Town. Form I, Record of Updates, to be used to track the Town's progress in meeting SMP goals, and Form 2, Master Plan Project Status, are located in Appendix B.

The Update should be integrated into the Town's maintenance and operations schedule. The primary contact for the SMP should maintain ongoing updates to the SMP as projects are accomplished and priorities are adjusted. The updates can be as simple as redlines on the existing conditions map with supporting notes. The SMP should be reviewed for usefulness by the Town annually or after any major changes to the system. Any adjustments to the SMP should be documented and incorporated into the Town's SMP.

RECOMMENDATIONS

Table 1 lists the prioritized projects and their associated costs. The Opinion of Probable Costs for each project can be found in Section 4.4. The cost estimates include a 4% per year escalation adjustment and a construction contingency of 20%. The Update identifies additional project-related costs such as engineering design, environmental permitting, construction administration, and grant administration, in addition to construction contingency.

The highest priority is placed on the basins with reported flooding concerns, relatively extensive pipe networks, and large areas that discharge directly to the Indian River Lagoon. These basins provide the best opportunity to meet the Town's goals and the intent of the MS4 permit regulations.

The prioritization is based on several factors that include flood control, water quality treatment, and system maintenance.

Table 1

PRIORITIZED CONSTRUCTION BUDGET MELBOURNE BEACH STORMWATER MASTER PLAN

Project Number	Basin	Project Name	Water Quality	Flood Mitigation/ System Maintenance	2007	2008	2009	2010	2011	2012	2013	2014	2015 and beyond
1	9	Sixth Avenue/Oak Street *	x	x	$212,000								
2	1	Harland Avenue**	x	x		$527,000							
3	9	West Side Oak Street**	x	x		$444,000							
4	1	South Palm Avenue**		x		$463,000							
5	8	Pine Street	x	x			$271,000						
6	3	Andrews Drive	x	x				$305,000					
7	5	Ocean Avenue		x					$676,000				
8	2	Riverside Drive	x	x						$235,000			
9	11	Driftwood Avenue	x								$219,000		
10	7	Avenue A	x	x								$468,000	
11	4	Sunset and Riverside	x	x									$276,000
12	9	Orange Street Exfiltration	x	x									$568,000
13	6	Riverside Drive - Avenue B	x										$18,000
14	12	Riverview Lane	x										$183,000
15	13	Sandy Key	x										$173,000
16	1	Shannon Avenue Exfiltration	x	x									$567,000
17	1	Magnolia Road	x	x									$425,000
18	1	Poinsettia Avenue		x									$499,000
19	10	Rosewood/Cherry		x									$627,000
ROM estimate for annual paving associated with SMP upgrades						$111,000	$108,000	$81,000	$125,000	$81,000	$46,000	$23,000	$651,000
Additonal Evaluation - Clean and TV ~ 10,000 LF of pipe @ $2/LF						$20,000							
Estimated Annual Maintenance Costs (based on two cleanings per year, intial 7 NSBBs, 19 CIBs, 4% annual escalation and additional units as constructed)					$14,000	$16,700	$18,400	$20,300	$21,100	$21,900	$24,100	$26,400	$30,200
All cost include 20% construction contingency, survey/geotechnical, engineering, permitting, construction administration, grant administration				**Total Annual Budget**	$226,000.00	$1,581,700	$397,400	$406,300	$822,100	$337,900	$289,100	$517,400	$4,017,200
* Sixth Avenue/Oak Street actual cost of engineering and bid amount for current project.												**Grand total**	$8,369,000
** Harland Avenue, South Palm Avenue, and West Side Oak Street/Sixth Avenue to be designed and constructed under a HMGP funded project.							**Assumed 4% annual escalation (2008 and beyond)**						

1.0 INTRODUCTION

1.1 BACKGROUND

Melbourne Beach is Brevard County's oldest beachfront community. The Town covers an area of 1.3 square miles. The Town's SMP was published in 2002 by Outlaw Jones (Appendix D). The SMP documents the condition of the stormwater system and serves as the guidance document for prioritizing and budgeting stormwater system improvements. The SMP is also an important part of the Town's MS4 permit.

1.2 NEED FOR UPDATE

In accordance with the Town's MS4 Permit ID # FLR04E041, the SMP must be developed and reviewed annually with updates and revisions performed as needed. In addition, during a review of the existing SMP, the Town identified the need for updated project costs. Since the development of the SMP, design and construction costs have risen. The SMP has not been updated since its original release in 2002. The budget estimates for the projects proposed required updating to provide accurate budgeting goals for the Town. In addition, the Town's storm sewer system has changed, as noted in the revised Existing Conditions Map in Appendix A.

View of Sixth Avenue's 300 Block

1.3 SCOPE OF UPDATE

The Town retained Jones Edmunds to update the SMP. The Update consists of a review of the SMP, a review of the proposed projects, an evaluation of the progress made on the proposed projects, and an update of the SMP's cost estimates to be used in developing the Town's budget. The Update also includes markups of the SMP Maps to reflect the basic stormwater system layout. Due to budget contraints this Update does not include subsurface investigation, survey, or water resource modeling.

2.0 EXISTING CONDITIONS

2.1 GENERAL

In 2001, the Town contracted Outlaw Jones Engineering, Inc. to create a Stormwater Master Plan. The SMP documented the conditions of the stormwater system for the Town and was intended to serve as the guidance document for the prioritization and budgeting of stormwater system improvements. The SMP provides background data on the stormwater system, a configuration of typical stormwater improvements, general construction cost information including contingencies, a prioritized Table of Projects, and additional supporting information (see Appendix D).

2.2 DATA COLLECTION AND INVESTIGATION

2.2.1 WORKSHOP

Jones Edmunds attended a community workshop, interviewed members of the Town Staff, reviewed the Town's records, and conducted a field investigation to determine the implementation of the SMP to date. The Town scheduled a workshop on April 11, 2007 in the Community Center on Ocean Avenue to solicit input regarding stormwater issues. For its role in the workshop, Jones Edmunds provided an agenda, a large-scale aerial photo of the Town, a stormwater questionnaire, and technical support to answer citizens' questions. The Consultant and Town Staff managed the workshop. Eight people attended the workshop.

Community Workshop in Progress

Jones Edmunds provided an overview of the purpose for updating the Town's SMP and the method which would be used to accomplish this. Following the introduction and background discussion, the workshop proceeded with input by several citizens regarding the Town's stormwater system. The input mainly involved identifying historically flood-prone areas. There was additional discussion regarding budget issues and the ability to fund future stormwater improvements. Each citizen attending signed in and completed a questionnaire. Meeting minutes, the

questionnaires, the agenda, and the sign-in sheet are included in Appendix C.

2.2.2 STAFF INTERVIEWS

Jones Edmunds interviewed staff members from the Town to gather pertinent information regarding implementation of the SMP. The interviews were conducted in the conference room at the Melbourne Beach Town Hall. Interviews included the Town Manager, the Building Official, the Town Accountant, and the Superintendent of Public Works. The interviews revealed that the Town has had significant turnover in staff over the past several years. The primary staff members for the Town have served the Town in their current positions from 6 months to approximately 30 months. The Public Works Superintendent is one of the longest serving Town employees with 10 years of service. The interviews generally supported the citizens' input regarding problem areas in the Town. The staff all expressed eagerness to initiate a plan of action that will minimize flooding, improve water quality, and maintain compliance with the existing NPDES MS4 permit.

Sixth Avenue

According to the Staff interviews, the main area of flooding lies along Sixth Avenue in Basin 9. Additional areas have been repaired as the aging infrastructure gradually failed.

The staff hopes that the SMP produces an updated and prioritized capital improvements budget, a schedule to update and maintain the existing infrastructure, and construction compliance requirements to help keep contractors accountable.

The interview forms are attached in Appendix C.

2.2.3 FIELD INVESTIGATIONS

Jones Edmunds and the Superintendent toured the Town's stormwater infrastructure with an emphasis on known problem areas and recent repairs. The tour covered most of Melbourne Beach and pointed out several examples of failed infrastructure that have been repaired. The system includes a significant amount of old corrugated metal pipe (CMP) and some reinforced concrete pipe (RCP). The Superintendent discussed the consistent undermining of aged underground utilities. The Public Works Department has overseen several repairs and prefers to use High Density Polyethylene (HDPE) to replace CMP and RCP materials. The limited field investigations included a visit to Sixth Avenue. Sixth Avenue has been consistently cited as the worst flooding area in the Town. The storm sewer on the 300 block of Sixth Avenue lies on the north side of the road. A portion of the storm sewer has failed in the middle of the 300 block. The Town has attempted to repair the line, but the excavated pipe was collapsed and corroded and the Town determined that the deterioration was too severe to patch. The Town has contracted with a local utility contractor to replace this system.

Old Corrugated Metal Pipe

Jones Edmunds and Town Staff visited the sites of the projects completed since 2002 that were designed to improve the treatment of stormwater runoff. The sites include Anchor, and Pelican Key where exfiltration trenches and a baffle box were installed at the cul-de-sac of each street.

Anchor Key Field Visit

Additional baffle boxes are located as follows:

- The intersection of Oak Street at Riverview West in Basin 10.

- On the west side of Neptune Drive between Pelican Key and Driftwood Avenue in Basin 15.

- On the north side of Riverview Lane in Basins 17 and 18.

- On the west end of Ocean Avenue in Ryckman Park in Basin 5.

The Town is in the process of constructing a corrective action for several exfiltration trenches along the Oak Street Pedway project. The corrective action will also replace inlets and pipe along the 300 block of Sixth Avenue and install a baffle box upstream of the outfall at Sixth Avenue and replace pipe along Sixth Avenue from Pine Street to the Indian River Lagoon in Basin 9.

Oak Street Pedway

The tour continued along Ocean Avenue and points on the north side of Melbourne Beach. Several areas of storm sewer on Andrews Drive and Harland Avenue have been excavated and repaired after failing pipe joints caused the undermining of surface areas in the right-of-way.

The field investigations were limited to visual, above-ground observations. Generally speaking, it appears the SMP accurately depicted existing drainage pipe connectivity in 2002. Surveying, geotechnical investigation, or underground inspections were not performed as part of the field investigations. Any discrepancies or areas of repair observed during this field investigation are noted on the updated stormwater maps (Appendix A).

2.2.4 RECORDS REVIEW

On April 12, 2007, Jones Edmunds reviewed the Town's records regarding stormwater system upgrades and repair. The records included information on the Anchor and Pelican Key Projects.

The Town is also constructing stormwater infrastructure improvements along the east side of Oak Street to add capacity to treat stormwater runoff and reduce the potential discharge of groundwater into the Indian River Lagoon.

The records also included the maintenance cost to repair storm sewer pipes that have failed during the past year. Over $72,000 worth of work was performed by an underground utility contractor for the emergency repair of failed storm sewers in 2006. The stormwater utility fee brings in approximately $55,000 annually to the Town for the maintenance of the stormwater system. This does not account for the cost of additional maintenance and repair work that has been performed in-house by the Public Works Department.

The purpose of the records review was to identify projects that have been completed since the SMP was issued. This information was used to update the SMP with projects that have been designed, contracted, are in construction, or have been completed since the original document was prepared in 2002 (see Table 2).

Stormwater Master Plan Project Status

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Table 2

Basin	Basin Size	Project Name	Pipe Replacement	Exfiltration Trench	Nutrient Separating Baffle Box	Curb Inlet Basket	Other BMPs	Project phase			Planned Completion
								Funded	Designed	Complete	
1	88.63	Harland Avenue	x	x	x			Y	N		2008
1	-	South Palm Avenue		x				Y	N		2008
1	-	Magnolia Avenue	x					N			2015
1	-	Poinsettia Road	x					N			2015
1	-	Shannon Avenue Exfiltration		x				N			2015
2	15.48	Riverside Drive	x		x			N			2012
3	51.69	Andrews Drive	x	x				N			2010
4	23.63	Sunset and Riverside	x	x		x		N			2015
5	63.62	Ocean Avenue		x				N			2011
5	-	Oak Street Exfiltration		x				N			2015
6	9.84	Riverside Drive - Avenue B				x		N			2015
7	7.97	Avenue A	x	x				N			2014
8	50.15	Pine Street	x	x			x	N			2009
9	91.36	Sixth Avenue/Oak Street	x	x			x	Y	Y	N	2008
9	-	West Side Oak Street	x	x				Y	N		2008
9	-	Orange Street Exfiltration		x				N			2015
10	88.25	Rosewood/Cherry	x					N			2015
11	19.04	Driftwood Avenue	x					N			2013
12	4.72	Riverview Lane			x			N			2015
13	6.08	Sandy Key			x			N			2015
14	3.96	Pelican Key		x	x					Y	complete
10	88.25	Rosewood/Cherry				x				Y	complete
15	5.67	Neptune Drive			x					Y	complete
16	6.59	Anchor Key		x	x					Y	complete
17	3.62	Riverview Lane			x					Y	complete
18	13.98	Riverview Lane			x					Y	complete

Project Phase: Y = Yes, N = No

Other BMPs include swales and ponds.

3.0 PERMITTING

An important consideration of the SMP program is regulatory permitting. The Town falls under the jurisdiction of several regulatory bodies including the FDOT, the Florida Department of Environmental Protection (FDEP), the Army Corp of Engineers (ACOE), and the SJRWMD.

Water resource projects such as those proposed in the SMP are commonly governed by the SJRWMD. The SMP proposes the increase in pipe size in many areas to better handle heavy rain and associated flooding. The following excerpt from the SJRWMD rule number 40C-42 identifies the need for permitting in this case:

> ***40C-42.022 Permits Required.***
>
> *(2) A permit is required under this chapter for alteration, removal, reconstruction, or abandonment of existing stormwater management systems which serve a project which may be expected to result in any of the following:*
>
> *(a) increase pollutant loadings (including sediment) in stormwater runoff from the project,*
>
> *(b) increase in peak discharge rate,*
>
> *(c) decrease in onsite or instream detention storage,*
>
> *(d) replacement of roadside swales with curb and gutter,*
>
> *(e) construction of 4,000 square feet or more of impervious or semi-impervious surface area subject to vehicular traffic, such as roads, parking lots, driveways, and loading zones,*
>
> *(f) construction of 9,000 square feet of impervious surface, or*
>
> *(g) construction of 5 acres or more of recreational area. Recreational areas include but are not limited to golf courses, tennis courts, putting greens, driving ranges, or ball fields.*

Sixth Avenue Outfall

On May 29, 2007, Jones Edmunds contacted Fariborz Zanganeh, P.E. with the SJRWMD in Palm Bay to discuss the permitting policy for retrofit projects that improve the reliability of the overall stormwater system. Mr. Zanganeh indicated that SJRWMD has some flexibility in enacting its rules. Each project must be evaluated on an individual basis. In general, if the project will increase pollutant loadings (including sediment) in stormwater runoff from the project and/or increase the peak discharge rate, a permit will be required. If the project provides additional treatment to runoff that is currently discharging to the Indian River Lagoon, some percentage increase in peak flow may be permitted.

4.0 PROPOSED STORMWATER SYSTEM IMPROVEMENTS

4.1 BEST MANAGEMENT PRACTICES

BMPs are defined as devices, practices, or methods for removing, reducing, retarding, or preventing targeted stormwater runoff constituents, pollutants, and contaminants from reaching receiving waters (*ASCE/EPA Determining Urban Stormwater Best Management Practice (BMP) Removal Efficiencies – May 14, 1999*). The types of BMPs used in Melbourne Beach include structural BMPs such as a dry detention stormwater pond, grass swales, exfiltration pipes, baffle boxes and inlet baskets, and non-structural BMPs such as maintenance, source control (erosion and sediment control), recycling, and education.

The primary impairment to the Indian River Lagoon in the vicinity of Melbourne Beach is dissolved oxygen (DO). The pollutants of concern are nitrogen and phosphorous. The most likely source of these pollutants is fertilizer used for residential landscaping. In addition to the recommended projects, Melbourne Beach would benefit from a community program to sample local soils and adjust the use of high-concentration fertilizers to minimize fertilizer waste and improve the quality of stormwater runoff.

4.2 GENERAL PROJECT DESCRIPTION

The recommended project list is based on the primary goals of the Town and the focus of the SMP. The small basins with limited pipe and inlets will receive inlet treatment baskets to improve water quality. In the Update, the basins employing

the inlet basket BMPs will not employ baffle boxes. This will reduce the number of BMPs to maintain throughout the Town, while providing water quality treatment to the smaller basins for a reasonable cost. In the larger basins with more inlets and a larger pipe network, the treatment will be provided with a pollution-reduction train. The typical treatment will include exfiltration trenches or swales in the upstream reaches of the basin with baffle boxes at the outfalls. The east side of the Town is better suited for exfiltration while the west side of the Town will rely more on swales and baffle boxes to treat contaminated runoff.

4.3 COST ESTIMATES

The project cost estimates provided in the Update have been provided to help develop a long-term budget to address the Town's stormwater planning needs. The long-term budget is a critical element for future planning and funding of the SMP projects.

The unit costs used in the project cost estimates are based on the FDOT Basis of Estimates. The unit costs for some items include elements of tasks that are also accounted for in the demolition and restoration categories of the project cost estimates. This will generate a more conservative opinion of project cost. The project cost estimates also include the following rule of thumb percentages:

- Construction Contingency 20%
- Survey/Geotechnical 2%
- Engineering 10%
- Permitting 3%
- Construction Administration 4%
- Grant Administration/Monitoring 3%

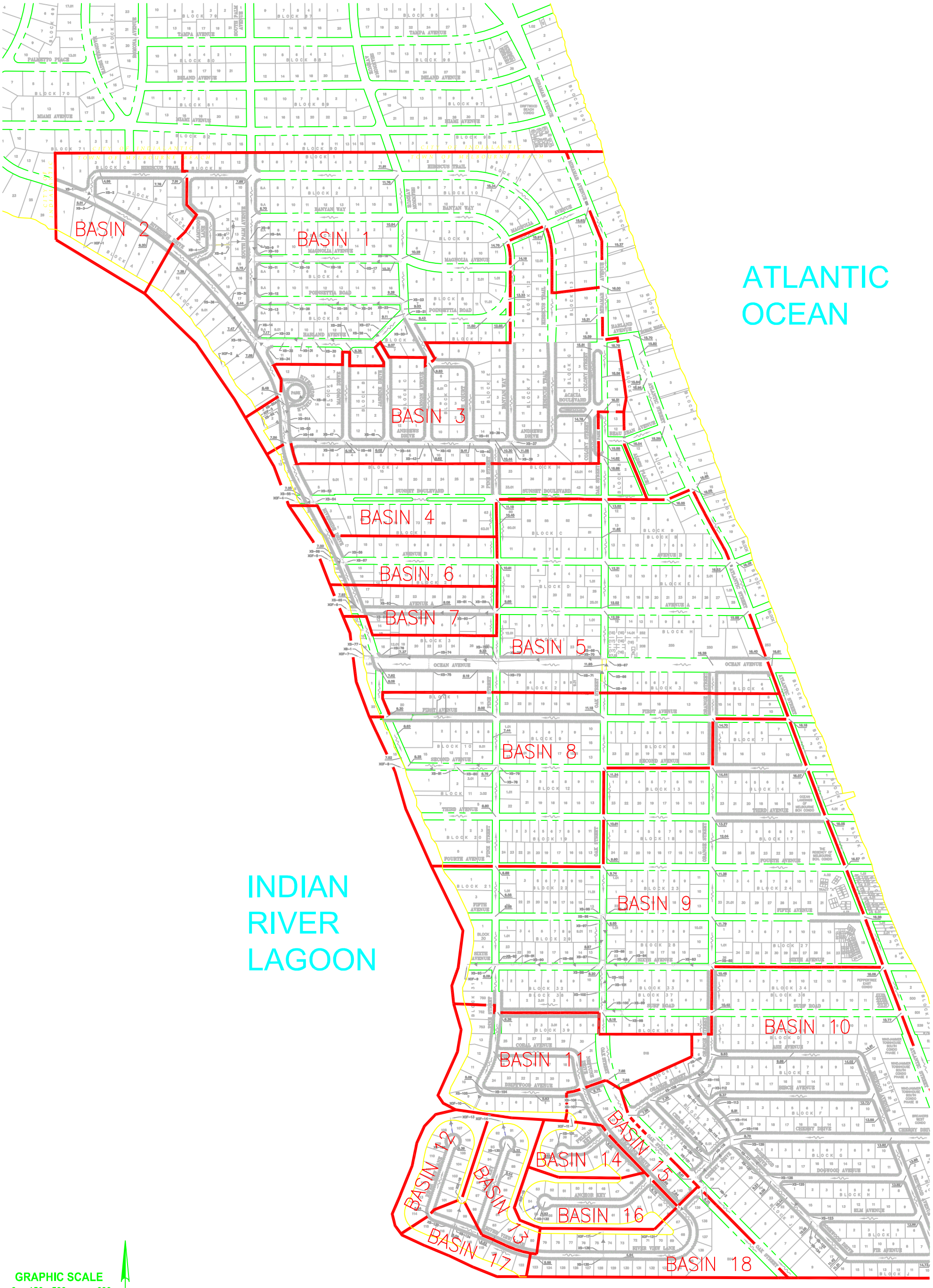
These items add up to roughly 42% of the budget. These percentages are based on generally accepted industry standards. However, these are still estimates and may be higher or lower than actual costs incurred by the Town. Other factors that may affect the project cost is the overall economy, the bidding climate, and the ability to consolidate projects.

In addition, all estimates are based upon 2007 values and are escalated at 4% per year. These items have been included to provide a more accurate estimate of the Town's funding needs in the future.

4.4 PRIORITIZATION

The Town has three interrelated goals that are all essential. The three goals are flood control, water quality, and infrastructure improvement. The primary goals of flood control and water quality treatment depend upon infrastructure replacement. The existing storm sewer system has generally reached the end of

its useful life. Meanwhile, some areas of the Town are subject to flooding associated with failed pipes, as well as the gradual build-out of the Town. Finally, the increase in pollutant loading and regulatory oversight require any solution to flooding and infrastructure to consider water quality treatment as well. The following sections describe the general needs of each basin as noted in the Key Map and subsequent Basin Map. The recommended priority of projects is listed in Table 1.



GRAPHIC SCALE
0 150 300 600
SCALE IN FEET

N

KEY MAP

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4.4.1 BASIN 1

Basin 1 drains 88.63 acres and contains a relatively extensive pipe network with aged corrugated metal pipe. Due to the size of the basin, recommended upgrades have been broken into five separate projects.

a. The Harland Avenue project addresses all of the essential needs for stormwater system upgrades, including replacement of aged pipe, flood reduction, and the installation of an NSBB to provide water quality treatment at the outfall of the basin.

b. The South Palm Avenue project, including Flamingo Lane, will address minor flooding and replace aging infrastructure.

c. The addition of exfiltration along Shannon Avenue and areas east will provide some flood relief in addition to providing water quality treatment.

d. The replacement of storm sewer on Magnolia Avenue.

e. The replacement of storm sewer on Poinsettia Road.

While the attached cost estimates for items d. and e. show replacement costs for the storm sewer, the storm sewer systems might actually provide a satisfactory level of service with fewer pipes. The work on Magnolia Avenue and Poinsettia Road should be performed when the budget allows and the highest priority projects are complete. Projects a. and b. are included in a flood mitigation design project partially funded by the Federal Emergency Management Agency (FEMA).

South Palm Avenue

Magnolia Avenue

CONCEPTUAL COST ESTIMATE

STORMWATER MASTER PLAN UPDATE

JONES EDMUNDS

Basin 1 - Harland Avenue

					Current Cost	4% annual escalation
					2007	2008
	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	TOTAL COST
General	Mobilization (10% of construction)	LS	1	$ 40,100.00	$ 40,100.00	
	Maintenance of Traffic	LS	1	$ 15,000.00	$ 15,000.00	
	Dewatering	LS	1	$ 10,000.00	$ 10,000.00	
	Staking / Testing	LS	1	$ 10,000.00	$ 10,000.00	
Erosion Control	Floating Turbidity Barrier	LF	100	$ 12.00	$ 1,200.00	
	Staked Silt Fence	LF	1300	$ 2.00	$ 2,600.00	
	Misc. Erosion Control	LS	1	$ 2,500.00	$ 2,500.00	
Demolition	Removal of Existing Structures	LS	8	$ 2,500.00	$ 20,000.00	
	Pipe Removal (18" or less)	LF	506	$ 25.00	$ 12,650.00	
	Misc. Demolition	LS	1	$ 5,000.00	$ 5,000.00	
Drainage	24" Exfiltration Trench	LF	20	$ 100.00	$ 2,000.00	
	FDOT Type C Inlets	EA	6	$ 5,000.00	$ 30,000.00	
	FDOT Type J-4 Inlets	EA	2	$ 11,000.00	$ 22,000.00	
	18" HDPE PIPE	LF	840	$ 80.00	$ 67,200.00	
	18" RCP	LF	40	$ 90.00	$ 3,600.00	
	24" RCP	LF	40	$ 100.00	$ 4,000.00	
	36" HDPE	LF	240	$ 125.00	$ 30,000.00	
	36" RCP	LF	20	$ 140.00	$ 2,800.00	
	Headwall / Outfall Structure	EA	1	$ 3,000.00	$ 3,000.00	
	Nutrient Separating Baffle Box	EA	1	$ 30,000.00	$ 30,000.00	
Restoration	Driveway Repair - 4" Thick Conc	SY	130	$ 50.00	$ 6,500.00	
	Sodding	SY	590	$ 3.00	$ 1,770.00	
	Curb & Valley Gutter	LF	300	$ 43.00	$ 12,900.00	
	Asphalt Overlay / Resurfacing	SY	50	$ 15.00	$ 750.00	
	Misc. Landscaping Restoration	LS	1	$ 10,000.00	$ 10,000.00	
	Subtotal				$ 345,570.00	
	CONSTRUCTION CONTINGENCY		20%		$ 69,114.00	
	OPINION OF PROBABLE CONSTRUCTION COST (ROUNDED)				$ 415,000	
	SURVEYING / GEOTECHNICAL		2%		$ 8,300.00	
	ENGINEERING		10%		$ 41,500.00	
	PERMITTING		3%		$ 12,450.00	
	CONSTRUCTION ADMINISTRATION		4%		$ 16,600.00	
	GRANT ADMINISTRATION / MONITORING		3%		$ 12,450.00	
	PROJECT BUDGET (ROUNDED)				$ 506,000	$527,000.00

Cost Estimate Notes:

Excludes utility relocation.
Budgets rounded to $1000.
Unit Costs from FDOT Basis of Estimates - 2006 +20%.
All quantities are estimated.

CONCEPTUAL COST ESTIMATE

STORMWATER MASTER PLAN UPDATE

JONES EDMUNDS

Basin 1 - South Palm Avenue

					Current Cost	4% annual escalation
					2007	2008
	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	TOTAL COST
General	Mobilization (10% of construction)	LS	1	$ 38,900.00	$ 38,900.00	
	Maintenance of Traffic	LS	1	$ 5,000.00	$ 5,000.00	
	Dewatering	LS	1	$ 10,000.00	$ 10,000.00	
	Staking / Testing	LS	1	$ 10,000.00	$ 10,000.00	
Erosion Control	Staked Silt Fence	LF	500	$ 2.00	$ 1,000.00	
	Misc. Erosion Control	LS	1	$ 2,500.00	$ 2,500.00	
Demolition	Removal of Existing Structures	LS	10	$ 2,500.00	$ 25,000.00	
	Pipe Removal (18" or less)	LF	704	$ 25.00	$ 17,600.00	
	Pipe Removal (20" or more)	LF	983	$ 50.00	$ 49,150.00	
	Misc. Demolition	LS	1	$ 5,000.00	$ 5,000.00	
Drainage	FDOT TypeP-8 Manholes	EA	2	$ 5,000.00	$ 10,000.00	
	FDOT Type C Inlets	EA	8	$ 5,000.00	$ 40,000.00	
	18" HDPE PIPE	LF	280	$ 80.00	$ 22,400.00	
	14"X23" ERCP	LF	80	$ 90.00	$ 7,200.00	
	19"X30" ERCP	LF	80	$ 110.00	$ 8,800.00	
Restoration	Driveway Repair - 4" Thick Conc	SY	90	$ 50.00	$ 4,500.00	
	Sodding	SY	750	$ 3.00	$ 2,250.00	
	Misc. Landscaping Restoration	LS	1	$ 10,000.00	$ 10,000.00	
	Curb & Valley Gutter	LF	700	$ 43.00	$ 30,100.00	
	Pavement Markings	LS	1	$ 2,500.00	$ 2,500.00	
	Asphalt Overlay / Resurfacing	SY	150	$ 15.00	$ 2,250.00	
	Subtotal				$ 304,150.00	
	CONSTRUCTION CONTINGENCY		20%		$ 60,830.00	
	OPINION OF PROBABLE CONSTRUCTION COST (ROUNDED)				**$ 365,000**	
	SURVEYING / GEOTECHNICAL		2%		$ 7,300.00	
	ENGINEERING		10%		$ 36,500.00	
	PERMITTING		3%		$ 10,950.00	
	CONSTRUCTION ADMINISTRATION		4%		$ 14,600.00	
	GRANT ADMINISTRATION / MONITORING		3%		$ 10,950.00	
Cost Estimate Notes:		**PROJECT BUDGET (ROUNDED)**			**$ 445,000**	**$463,000.00**
Excludes utility relocation.						
Budgets rounded to $1000.						
Unit Costs from FDOT Basis of Estimates - 2006 +20%.						
All quantities are estimated.						

CONCEPTUAL COST ESTIMATE

STORMWATER MASTER PLAN UPDATE

JONES EDMUNDS

Basin 1 - Magnolia Avenue

					Current Cost	4% annual escalation
					2007	2015
	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	TOTAL COST
General	Mobilization (10% of construction)	LS	1	$ 25,400.00	$ 25,400.00	
	Maintenance of Traffic	LS	1	$ 5,000.00	$ 5,000.00	
	Dewatering	LS	1	$ 10,000.00	$ 10,000.00	
	Staking / Testing	LS	1	$ 5,000.00	$ 5,000.00	
Erosion Control	Staked Silt Fence	LF	800	$ 2.00	$ 1,600.00	
	Misc. Erosion Control	LS	1	$ 2,500.00	$ 2,500.00	
Demolition	Removal of Existing Structures	LS	4	$ 2,500.00	$ 10,000.00	
	Pipe Removal (18" or less)	LF	1025	$ 25.00	$ 25,625.00	
	Misc. Demolition	LS	1	$ 5,000.00	$ 5,000.00	
Drainage	24" Exfiltration Trench	LF	20	$ 100.00	$ 2,000.00	
	FDOT Type C Inlets	EA	4	$ 5,000.00	$ 20,000.00	
	18" HDPE PIPE	LF	1040	$ 80.00	$ 83,200.00	
Restoration	Driveway Repair - 4" Thick Conc	SY	100	$ 50.00	$ 5,000.00	
	Sodding	SY	500	$ 3.00	$ 1,500.00	
	Misc. Landscaping Restoration	LS	1	$ 10,000.00	$ 10,000.00	
	Subtotal				$ 211,825.00	
	CONSTRUCTION CONTINGENCY		20%		$ 42,365.00	
	OPINION OF PROBABLE CONSTRUCTION COST (ROUNDED)				$ 254,000	
	SURVEYING / GEOTECHNICAL		2%		$ 5,080.00	
	ENGINEERING		10%		$ 25,400.00	
	PERMITTING		3%		$ 7,620.00	
	CONSTRUCTION ADMINISTRATION		4%		$ 10,160.00	
	GRANT ADMINISTRATION / MONITORING		3%		$ 7,620.00	
Cost Estimate Notes:		PROJECT BUDGET (ROUNDED)			$ 310,000	$425,000.00
Excludes utility relocation.						
Budgets rounded to $1000.						
Unit Costs from FDOT Basis of Estimates - 2006 +20%.						
All quantities are estimated.						

CONCEPTUAL COST ESTIMATE

STORMWATER MASTER PLAN UPDATE

JONES EDMUNDS

Basin 1 - Poinsettia Road

						4% annual escalation
					2007	2015
	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	TOTAL COST
General	Mobilization (10% of construction)	LS	1	$ 29,800.00	$ 29,800.00	
	Maintenance of Traffic	LS	1	$ 5,000.00	$ 5,000.00	
	Dewatering	LS	1	$ 10,000.00	$ 10,000.00	
	Staking / Testing	LS	1	$ 5,000.00	$ 5,000.00	
Erosion Control	Staked Silt Fence	LF	800	$ 2.00	$ 1,600.00	
	Misc. Erosion Control	LS	1	$ 2,500.00	$ 2,500.00	
Demolition	Removal of Existing Structures	LS	6	$ 2,500.00	$ 15,000.00	
	Pipe Removal (18" or less)	LF	1200	$ 25.00	$ 30,000.00	
	Misc. Demolition	LS	1	$ 5,000.00	$ 5,000.00	
Drainage	18" HDPE PIPE	LF	1100	$ 80.00	$ 88,000.00	
	FDOT Type C Inlets	EA	6	$ 5,000.00	$ 30,000.00	
	18" RCP	LF	100	$ 90.00	$ 9,000.00	
Restoration	Driveway Repair - 4" Thick Conc	SY	100	$ 50.00	$ 5,000.00	
	Asphalt Overlay / Resurfacing	SY	60	$ 15.00	$ 900.00	
	Sodding	SY	500	$ 3.00	$ 1,500.00	
	Misc. Landscaping Restoration	LS	1	$ 10,000.00	$ 10,000.00	
	Subtotal				$ 248,300.00	
	CONSTRUCTION CONTINGENCY		20%		$ 49,660.00	
	OPINION OF PROBABLE CONSTRUCTION COST (ROUNDED)				$ 298,000	
	SURVEYING / GEOTECHNICAL		2%		$ 5,960.00	
	ENGINEERING		10%		$ 29,800.00	
	PERMITTING		3%		$ 8,940.00	
	CONSTRUCTION ADMINISTRATION		4%		$ 11,920.00	
	GRANT ADMINISTRATION / MONITORING		3%		$ 8,940.00	
Cost Estimate Notes:		PROJECT BUDGET (ROUNDED)			$ 364,000	$499,000.00
Excludes utility relocation.						
Budgets rounded to $1000.						
Unit Costs from FDOT Basis of Estimates - 2006 +20%.						
All quantities are estimated.						

CONCEPTUAL COST ESTIMATE

STORMWATER MASTER PLAN UPDATE

JONES EDMUNDS

Basin 1 - Shannon Avenue Exfiltration

				Current Cost	4% annual escalation
				2007	2015
	DESCRIPTION	QUANTITY	UNIT COST	TOTAL COST	TOTAL COST
General	Mobilization (10% of construction)	1	$ 33,900.00	$ 33,900.00	
	Maintenance of Traffic	1	$ 5,000.00	$ 5,000.00	
	Dewatering	1	$ 10,000.00	$ 10,000.00	
	Staking / Testing	1	$ 10,000.00	$ 10,000.00	
Erosion Control	Staked Silt Fence	500	$ 2.00	$ 1,000.00	
	Misc. Erosion Control	1	$ 2,500.00	$ 2,500.00	
Demolition	Misc. Demolition	1	$ 5,000.00	$ 5,000.00	
Drainage	24" Exfiltration Trench	680	$ 100.00	$ 68,000.00	
	24" RCP	440	$ 100.00	$ 44,000.00	
	FDOT Type C Inlets	17	$ 5,000.00	$ 85,000.00	
Restoration	Driveway Repair - 4" Thick Conc	100	$ 50.00	$ 5,000.00	
	Sodding	400	$ 3.00	$ 1,200.00	
	Asphalt Overlay / Resurfacing	150	$ 15.00	$ 2,250.00	
	Misc. Landscaping Restoration	1	$ 10,000.00	$ 10,000.00	
	Subtotal			$ 282,850.00	
	CONSTRUCTION CONTINGENCY	20%		$ 56,570.00	
	OPINION OF PROBABLE CONSTRUCTION COST (ROUNDED)			$ 339,000	
	SURVEYING / GEOTECHNICAL	2%		$ 6,780.00	
	ENGINEERING	10%		$ 33,900.00	
	PERMITTING	3%		$ 10,170.00	
	CONSTRUCTION ADMINISTRATION	4%		$ 13,560.00	
	GRANT ADMINISTRATION / MONITORING	3%		$ 10,170.00	
Cost Estimate Notes:		PROJECT BUDGET (ROUNDED)		$ 414,000	$567,000.00
Excludes utility relocation.					
Budgets rounded to $1000.					
Unit Costs from FDOT Basis of Estimates - 2006 +20%.					
All quantities are estimated.					

Figure 1
Basin 1

Legend

- Existing Inlet
- New/Replacement Inlet
- Existing Manhole
- New Baffle Box
- Existing Pipe
- Exfiltration System
- Replacement Pipe
- Basin

0 150 300 Feet 1:3,600

N

JONES EDMUNDS

Site Location

Ramona
Palm
Deland
Miami
Miramar
Hibiscus
Flamingo
Magnolia
Basin 1
Poinsettia
Riverside
Harland
XOF-1
Mango
Jasmine
Shannon
Citrus
Banyan
Acacia
Colony
Oak
Andrews
Beau Jean
Alden
Pine

13190-006-01 Figure 1.mxd RPJ 8/10/07

For Informational Purposes Only

4.4.2 BASIN 2

Basin 2 is one of the smaller basins in the Town at 15.48 acres. The recommended improvements in this basin consist of installing an NSBB and replacing the outfall pipe and headwall. The original SMP recommended inlet baskets. However, the NSBB will provide adequate treatment for this basin without the additional maintenance required for the inlet baskets. This basin has a limited storm sewer system and a relatively minor impact on water quality in relation to the entire Town. However, the outfall pipe is corrugated metal that has exceeded its useful life. The Town has performed patchwork on the pipe but the potential for failure still exists. The Town considers the replacement of the outfall pipe to be a high priority. The Update has scheduled this project for 2012, but if the Town can acquire funding, the project should be done sooner.

CONCEPTUAL COST ESTIMATE

STORMWATER MASTER PLAN UPDATE

JONES EDMUNDS

Basin 2 - Riverside Drive

ROM		CONCEPTUAL			Current Cost	4% annual escalation
					2007	2012
	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	TOTAL COST
General	Mobilization (10% of construction)	LS	1	$ 13,700.00	$ 13,700.00	
	Maintenance of Traffic	LS	1	$ 5,000.00	$ 5,000.00	
	Dewatering	LS	1	$ 10,000.00	$ 10,000.00	
	Staking / Testing	LS	1	$ 5,000.00	$ 5,000.00	
Erosion Control	Floating Turbidity Barrier	LF	100	$ 12.00	$ 1,200.00	
	Staked Silt Fence	LF	400	$ 2.00	$ 800.00	
	Misc. Erosion Control	LS	1	$ 2,500.00	$ 2,500.00	
Demolition	Pipe Removal (20" or more)	LF	300	$ 50.00	$ 15,000.00	
	Removal of Existing Structures	LS	1	$ 2,500.00	$ 2,500.00	
	Misc. Demolition	LS	1	$ 5,000.00	$ 5,000.00	
Drainage	Nutrient Separating Baffle Box	EA	1	$ 30,000.00	$ 30,000.00	
	24" HDPE PIPE	LF	300	$ 90.00	$ 27,000.00	
	Headwall / Outfall Structure	EA	1	$ 3,000.00	$ 3,000.00	
Restoration	Sodding	SY	200	$ 3.00	$ 600.00	
	Misc. Landscaping Restoration	LS	1	$ 10,000.00	$ 10,000.00	
	Subtotal				$ 131,300.00	
	CONSTRUCTION CONTINGENCY		20%		$ 26,260.00	
	OPINION OF PROBABLE CONSTRUCTION COST (ROUNDED)				**$ 158,000**	
	SURVEYING / GEOTECHNICAL		2%		$ 3,160.00	
	ENGINEERING		10%		$ 15,800.00	
	PERMITTING		3%		$ 4,740.00	
	CONSTRUCTION ADMINISTRATION		4%		$ 6,320.00	
	GRANT ADMINISTRATION / MONITORING		3%		$ 4,740.00	
Cost Estimate Notes:		**PROJECT BUDGET (ROUNDED)**			**$ 193,000**	**$235,000.00**
Excludes utility relocation.						
Budgets rounded to $1000.						
Unit Costs from FDOT Basis of Estimates - 2006 +20%.						
All quantities are estimated.						

Figure 2
Basin 2

Legend

- Existing Inlet
- Existing Pipe
- Replacement Pipe
- New Baffle Box
- Basin

0 100 200
Feet 1:2,400

N

JONES EDMUNDS

Site Location

13190-006-01 Figure 2.mxd RPJ 8/10/07

For Informational Purposes Only

4.4.3 BASIN 3

Basin 3 is 51.69 acres in size. This basin is a high priority due to the high pollutant loading estimated in the SMP. The recommendation for this basin addresses the replacement of infrastructure and water quality. The stormwater pipe draining Riverside Circle should be upsized to improve function and reliability and a NSBB will be installed to provide treatment at the outfall.

CONCEPTUAL COST ESTIMATE

STORMWATER MASTER PLAN UPDATE

Basin 3 - Andrews Drive

JONES EDMUNDS

ROM		CONCEPTUAL			Curent Cost	4% annual escalation
					2007	2010
	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	TOTAL COST
General	Mobilization (10% of construction)	LS	1	$ 22,100.00	$ 22,100.00	
	Maintenance of Traffic	LS	1	$ 5,000.00	$ 5,000.00	
	Dewatering	LS	1	$ 10,000.00	$ 10,000.00	
	Staking / Testing	LS	1	$ 10,000.00	$ 10,000.00	
Erosion Control	Floating Turbidity Barrier	LF	100	$ 12.00	$ 1,200.00	
	Staked Silt Fence	LF	900	$ 2.00	$ 1,800.00	
	Misc. Erosion Control	LS	1	$ 2,500.00	$ 2,500.00	
Demolition	Removal of Existing Structures	LS	4	$ 2,500.00	$ 10,000.00	
	Pipe Removal (18" or less)	LF	170	$ 25.00	$ 4,250.00	
	Pipe Removal (20" or more)	LF	112	$ 50.00	$ 5,600.00	
	Misc. Demolition	LS	1	$ 5,000.00	$ 5,000.00	
Drainage	FDOT Type C Inlets	EA	1	$ 5,000.00	$ 5,000.00	
	FDOT Type P-4 Inlets	EA	1	$ 8,000.00	$ 8,000.00	
	FDOT Type P-8 Manhole	EA	1	$ 5,000.00	$ 5,000.00	
	18" RCP	LF	170	$ 90.00	$ 15,300.00	
	24" HDPE PIPE	LF	112	$ 90.00	$ 10,080.00	
	Headwall / Outfall Structure	EA	1	$ 3,000.00	$ 3,000.00	
	Nutrient Separating Baffle Box	EA	1	$ 30,000.00	$ 30,000.00	
Restoration	Sodding	SY	750	$ 3.00	$ 2,250.00	
	Misc. Landscaping Restoration	LS	1	$ 10,000.00	$ 10,000.00	
	Curb & Valley Gutter	LF	100	$ 43.00	$ 4,300.00	
	Asphalt Overlay / Resurfacing	SY	1000	$ 15.00	$ 15,000.00	
	Subtotal				$ 185,380.00	
	CONSTRUCTION CONTINGENCY		20%		$ 37,076.00	
	OPINION OF PROBABLE CONSTRUCTION COST (ROUNDED)				**$ 222,000**	
	SURVEYING / GEOTECHNICAL		2%		$ 4,440.00	
	ENGINEERING		10%		$ 22,200.00	
	PERMITTING		3%		$ 6,660.00	
	CONSTRUCTION ADMINISTRATION		4%		$ 8,880.00	
	GRANT ADMINISTRATION / MONITORING		3%		$ 6,660.00	
Cost Estimate Notes:		**PROJECT BUDGET (ROUNDED)**			**$ 271,000**	**$305,000.00**
Excludes utility relocation.						
Budgets rounded to $1000.						
Unit Costs from FDOT Basis of Estimates - 2006 +20%.						
All quantities are estimated.						

Figure 3
Basin 3

Legend

- Existing Inlet
- New/Replacement Inlet
- Existing Pipe
- New Baffle Box
- Replacement Pipe
- Exfiltration System
- Basin

0 100 200 Feet 1:2,400

N

JONES EDMUNDS

Site Location

Palm
Poinsettia
Harland
Magnolia
Poinsettia
Banyan
Hibiscus
Mango
Jasmine
Basin 3
Shannon
Citrus
Acacia
Andrews
XOF-3
Riverside
Pine
Sunset
Sunset

13190-006-01 Figure 3.mxd RPJ 8/10/07

For Informational Purposes Only

4.4.4 BASIN 4

Basin 4 collects runoff from 23.63 acres along Sunset Boulevard and discharges directly to the Indian River Lagoon. The work in this basin is a relatively low priority. There has been no documented flooding and the storm sewer network consists of three inlets and three pipes. The majority of flow in this basin travels overland from the east to the west.

The proposed improvements include replacing the three inlets and a storm sewer pipe at the end of Sunset Boulevard to improve reliability, adding curb inlet baskets in the new inlets, and constructing exfiltration trenches at the intersection of Pine Street and Sunset Boulevard to provide water quality treatment. No additional pipe replacement is proposed for this basin.

Sunset Boulevard and Riverside Drive

CONCEPTUAL COST ESTIMATE

STORMWATER MASTER PLAN UPDATE

JONES EDMUNDS

Basin 4 - Sunset Boulevard and Riverside Drive

ROM		CONCEPTUAL			Current Cost	4% annual escalation
					2007	2015
	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	TOTAL COST
General	Mobilization (10% of construction)	LS	1	$ 14,300.00	$ 14,300.00	
	Maintenance of Traffic	LS	1	$ 5,000.00	$ 5,000.00	
	Dewatering	LS	1	$ 10,000.00	$ 10,000.00	
	Staking / Testing	LS	1	$ 5,000.00	$ 5,000.00	
Erosion Control	Floating Turbidity Barrier	LF	100	$ 12.00	$ 1,200.00	
	Staked Silt Fence	LF	400	$ 2.00	$ 800.00	
	Misc. Erosion Control	LS	1	$ 2,500.00	$ 2,500.00	
Demolition	Removal of Existing Structures	LS	3	$ 2,500.00	$ 7,500.00	
	Pipe Removal (18" or less)	LF	45	$ 25.00	$ 1,125.00	
	Misc. Demolition	LS	1	$ 5,000.00	$ 5,000.00	
Drainage	24" Exfiltration Trench	LF	120	$ 100.00	$ 12,000.00	
	24" RCP	LF	80	$ 100.00	$ 8,000.00	
	FDOT Type J-4 Inlets	EA	3	$ 11,000.00	$ 33,000.00	
	FDOT Type C Inlets	EA	3	$ 5,000.00	$ 15,000.00	
	Curb Inlet Baskets	EA	3	$ 2,000.00	$ 6,000.00	
	18" RCP	LF	60	$ 90.00	$ 5,400.00	
Restoration	Sodding	SY	200	$ 3.00	$ 600.00	
	Misc. Landscaping Restoration	LS	1	$ 5,000.00	$ 5,000.00	
	Subtotal				$ 137,425.00	
	CONSTRUCTION CONTINGENCY		20%		$ 27,485.00	
	OPINION OF PROBABLE CONSTRUCTION COST (ROUNDED)				**$ 165,000**	
	SURVEYING / GEOTECHNICAL		2%		$ 3,300.00	
	ENGINEERING		10%		$ 16,500.00	
	PERMITTING		3%		$ 4,950.00	
	CONSTRUCTION ADMINISTRATION		4%		$ 6,600.00	
	GRANT ADMINISTRATION / MONITORING		3%		$ 4,950.00	
Cost Estimate Notes:		**PROJECT BUDGET (ROUNDED)**			**$ 201,000**	**$276,000.00**
Excludes utility relocation.						
Budgets rounded to $1000.						
Unit Costs from FDOT Basis of Estimates - 2006 +20%.						
All quantities are estimated.						

Figure 4
Basin 4

Legend

- Existing Inlet
- Existing Pipe
- Replacement Pipe
- Replacement Inlet Basket
- New/Replacement Inlet
- Exfiltration System
- Basin

0 100 200 Feet 1:2,400

N

Basin 4

XOF-4

JONES EDMUNDS

Site Location

13190-006-01 Figure 4.mxd RPJ 8/10/07

For Informational Purposes Only

4.4.5 BASIN 5

Basin 5 is the fourth largest basin in the Town at 63.62 acres. The basin contains Ocean Avenue which serves as the main east-west thoroughfare and business district for the Town. Currently flow from this basin is treated at the outfall with a NSBB located near the Melbourne Beach Pier on Ocean Avenue. This basin has not been identified as a flood prone area, but it will benefit from more reliable storm sewer infrastructure.

The basin is not currently listed as a high priority. However, the Town should pursue pipe replacement along Ocean Avenue to improve the reliability of the sewer network.

The FDOT has constructed several improvements on Ocean Avenue and Oak Street north of Ocean Avenue including the addition of a turn lane, storm sewer inlets, pipes, swales, and underdrains. No additional projects are proposed for Basin 5 in this Update.

Any work in the right-of-way of Oak Street North and Ocean Avenue East in this basin will require FDOT review in addition to the permit requirements of SJRWMD.

Basin 5

CONCEPTUAL COST ESTIMATE

STORMWATER MASTER PLAN UPDATE

JONES EDMUNDS

Basin 5 - Ocean Avenue

ROM		CONCEPTUAL			Current Cost	4% annual escalation
					2007	2011
	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	TOTAL COST
General	Mobilization (10% of construction)	LS	1	$ 49,400.00	$ 49,400.00	
	Maintenance of Traffic	LS	1	$ 15,000.00	$ 15,000.00	
	Dewatering	LS	1	$ 10,000.00	$ 10,000.00	
	Staking / Testing	LS	1	$ 10,000.00	$ 10,000.00	
Erosion Control	Staked Silt Fence	LF	500	$ 2.00	$ 1,000.00	
	Misc. Erosion Control	LS	1	$ 2,500.00	$ 2,500.00	
Demolition	Removal of Existing Structures	LS	3	$ 2,500.00	$ 7,500.00	
	Pipe Removal (20" or more)	LF	1200	$ 50.00	$ 60,000.00	
	Misc. Demolition	LS	1	$ 5,000.00	$ 5,000.00	
Drainage	24" RCP	LF	180	$ 100.00	$ 18,000.00	
	FDOT Type P-6 Inlets	EA	3	$ 5,000.00	$ 15,000.00	
	36"RCP	LF	1020	$ 140.00	$ 142,800.00	
Restoration	Driveway Repair - 4" Thick Conc	SY	90	$ 50.00	$ 4,500.00	
	Misc. Landscaping Restoration	LS	1	$ 5,000.00	$ 5,000.00	
	Curb & Valley Gutter	LF	700	$ 43.00	$ 30,100.00	
	Pavement Markings	LS	1	$ 2,500.00	$ 2,500.00	
	Asphalt Overlay / Resurfacing	SY	1070	$ 15.00	$ 16,050.00	
	Subtotal				$ 394,350.00	
	CONSTRUCTION CONTINGENCY		20%		$ 78,870.00	
	OPINION OF PROBABLE CONSTRUCTION COST (ROUNDED)				$ 473,000	
	SURVEYING / GEOTECHNICAL		2%		$ 9,460.00	
	ENGINEERING		10%		$ 47,300.00	
	PERMITTING		3%		$ 14,190.00	
	CONSTRUCTION ADMINISTRATION		4%		$ 18,920.00	
	GRANT ADMINISTRATION / MONITORING		3%		$ 14,190.00	
Cost Estimate Notes:		**PROJECT BUDGET (ROUNDED)**			$ 577,000	$676,000.00
Excludes utility relocation.						
Budgets rounded to $1000.						
Unit Costs from FDOT Basis of Estimates - 2006 +20%.						
All quantities are estimated.						

Figure 5
Basin 5

Legend

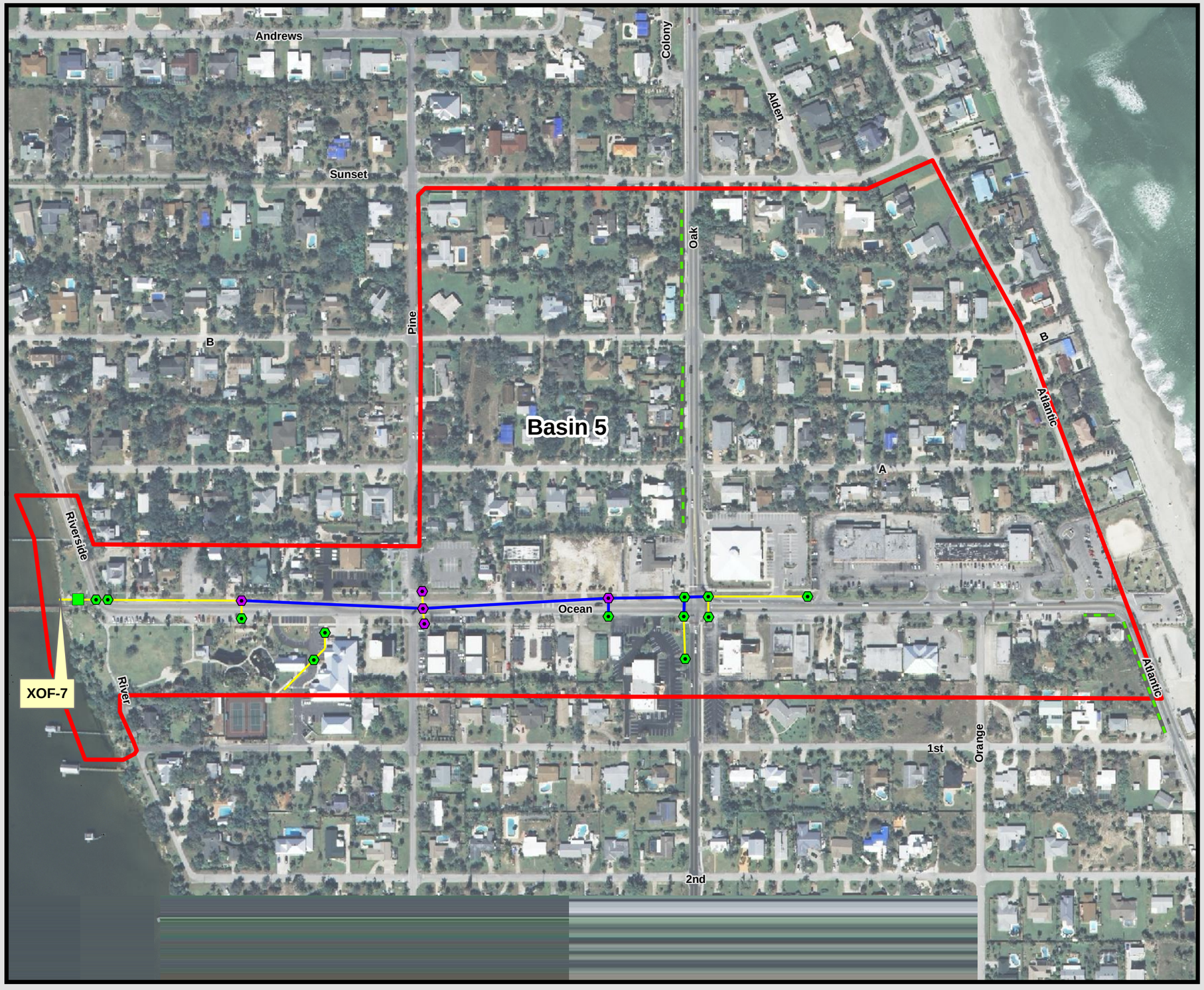
- Existing Baffle Box
- Existing Inlet
- Existing Pipe
- Replacement Pipe
- New/Replacement Inlet
- Exfiltration Pipe
- FDOT Underdrain
- Basin

0 100 200
Feet
1:3,246

N

JONES EDMUNDS

Site Location



13190-006 Figure 5.mxd RPJ 8/10/07

For Informational Purposes Only

4.4.6 BASIN 6

Basin 6 consists of 9.84 acres of residential area along the western portion of Avenue B. Based on the three essential goals, this basin is a low priority for improvements. There are no reported flooding issues and the infrastructure is limited. The main goal in this basin is water quality treatment.

The recommended Basin 6 improvements consist of installing three curb inlet baskets. The SMP recommended exfiltration and a baffle box. However, a NSBB is not recommended for this basin because of the limited pipe network and the lack of curb and gutter. Exfiltration can be added later if flooding or water quality issues require it. Due to the limited nature of this project, it should be combined with another project or performed in-house if the Town's resources allow.

CONCEPTUAL COST ESTIMATE

STORMWATER MASTER PLAN UPDATE

Basin 6 - Riverside Drive - Avenue B

JONES EDMUNDS

ROM		CONCEPTUAL			Current Cost	4% annual escalation
					2007	2015
	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	TOTAL COST
General	Mobilization (10% of construction)	LS	1	$ 1,200.00	$ 1,200.00	
	Maintenance of Traffic	LS	1	$ 5,000.00	$ 5,000.00	
Drainage	Curb Inlet Baskets	EA	3	$ 2,000.00	$ 6,000.00	
	Subtotal				$ 12,200.00	
	OPINION OF PROBABLE CONSTRUCTION COST (ROUNDED)				$ 12,000	
	CONSTRUCTION ADMINISTRATION		4%		$ 480.00	
	GRANT ADMINISTRATION / MONITORING		3%		$ 360.00	
Cost Estimate Notes:		PROJECT BUDGET (ROUNDED)			$ 13,000	$18,000.00
Excludes utility relocation.						
Budgets rounded to $1000.						
Unit Costs from FDOT Basis of Estimates - 2006 +20%.						
All quantities are estimated.						

Figure 6
Basin 6

Legend

- Existing Pipe
- Replacement Pipe
- New Inlet Basket
- Basin

0 66.6 133.2
Feet 1:1,600

N

JONES EDMUNDS

Site Location

Sunset Blvd
Sunset Blvd
Pine St
Ave B
Basin 6
XOF-5
Riverside Dr
Ave A

13190-006-01 Figure 6.mxd RPJ 8/10/07

For Informational Purposes Only

4.4.7 BASIN 7

Basin 7 is approximately 8 acres in size. While this basin is relatively small, it is served by curb and gutter and a storm sewer network throughout which has the potential to transport more pollutants to the Indian River Lagoon. Recommended improvements include upgrading the storm sewer system with new pipe and inlets for increased function and reliability and installing exfiltration and a NSBB to improve water quality discharge into the Indian River Lagoon. Due to the relatively low pollutant loading estimate and the lack of reported flooding issues, this basin is a medium to low priority.

CONCEPTUAL COST ESTIMATE

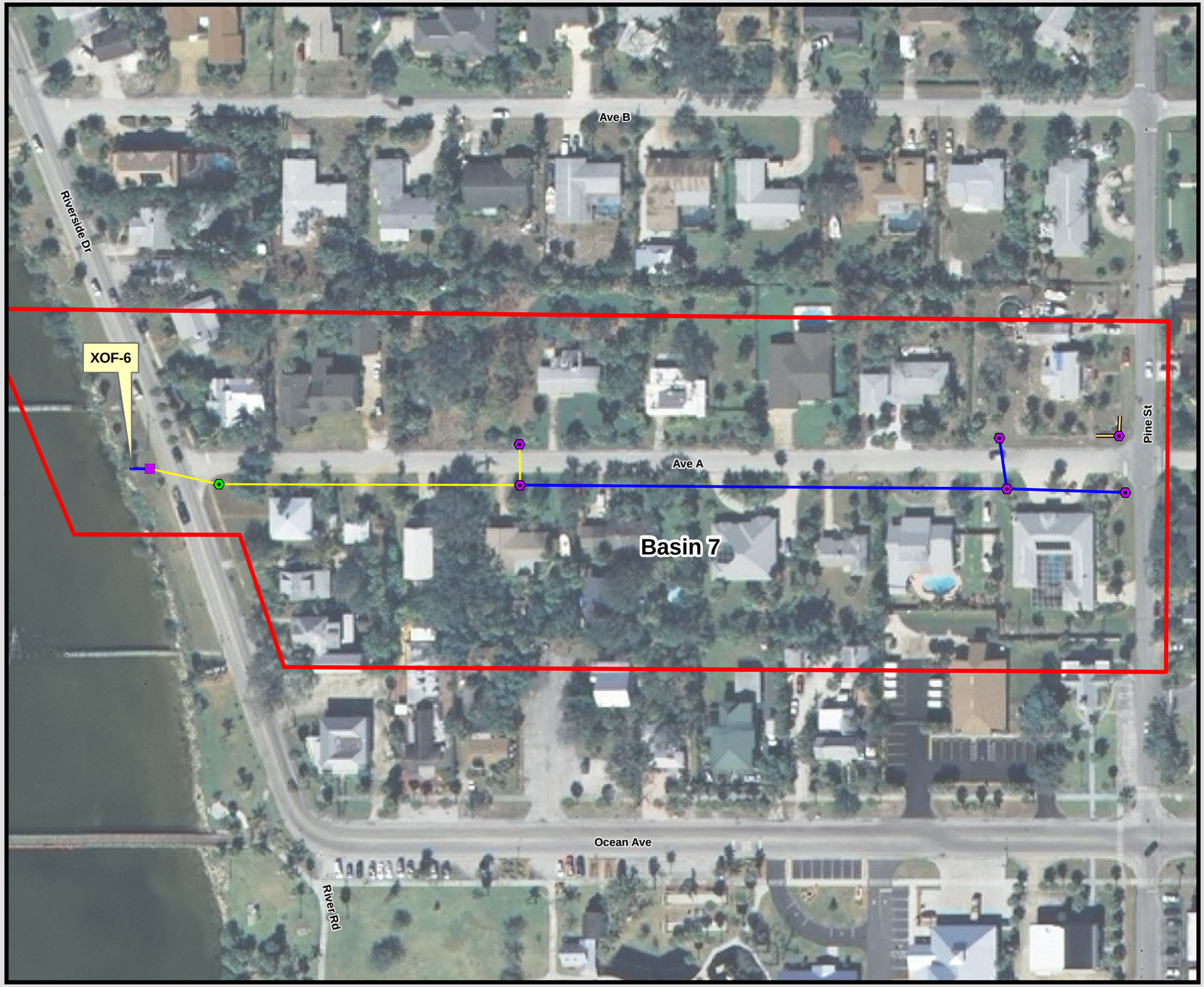
STORMWATER MASTER PLAN UPDATE

Basin 7 - Avenue A

JONES EDMUNDS

ROM		CONCEPTUAL			Current Cost	4% annual escalation
					2007	2014
	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	TOTAL COST
General	Mobilization (10% of construction)	LS	1	$ 26,500.00	$ 26,500.00	
	Maintenance of Traffic	LS	1	$ 5,000.00	$ 5,000.00	
	Dewatering	LS	1	$ 10,000.00	$ 10,000.00	
	Staking / Testing	LS	1	$ 10,000.00	$ 10,000.00	
Erosion Control	Staked Silt Fence	LF	800	$ 2.00	$ 1,600.00	
	Floating Turbidity Barrier	LF	100	$ 12.00	$ 1,200.00	
	Misc. Erosion Control	LS	1	$ 2,500.00	$ 2,500.00	
Demolition	Removal of Existing Structures	LS	4	$ 2,500.00	$ 10,000.00	
	Pipe Removal (18" or less)	LF	30	$ 25.00	$ 750.00	
	Pipe Removal (20" or more)	LF	650	$ 50.00	$ 32,500.00	
	Misc. Demolition	LS	1	$ 5,000.00	$ 5,000.00	
Drainage	24" Exfiltration Trench	LF	40	$ 100.00	$ 4,000.00	
	FDOT Type C Inlets	EA	6	$ 5,000.00	$ 30,000.00	
	18" RCP	LF	30	$ 90.00	$ 2,700.00	
	24" HDPE PIPE	LF	650	$ 90.00	$ 58,500.00	
	Nutrient Separating Baffle Box	EA	1	$ 30,000.00	$ 30,000.00	
Restoration	Driveway Repair - 4" Thick Conc	SY	100	$ 50.00	$ 5,000.00	
	Asphalt Overlay / Resurfacing	SY	20	$ 15.00	$ 300.00	
	Sodding	SY	600	$ 3.00	$ 1,800.00	
	Misc. Landscaping Restoration	LS	1	$ 5,000.00	$ 5,000.00	
	Subtotal				$ 242,350.00	
	CONSTRUCTION CONTINGENCY		20%		$ 48,470.00	
	OPINION OF PROBABLE CONSTRUCTION COST (ROUNDED)				**$ 291,000**	
	SURVEYING / GEOTECHNICAL		2%		$ 5,820.00	
	ENGINEERING		10%		$ 29,100.00	
	PERMITTING		3%		$ 8,730.00	
	CONSTRUCTION ADMINISTRATION		4%		$ 11,640.00	
	GRANT ADMINISTRATION / MONITORING		3%		$ 8,730.00	
Cost Estimate Notes:		**PROJECT BUDGET (ROUNDED)**			**$ 355,000**	**$468,000.00**
Excludes utility relocation.						
Budgets rounded to $1000.						
Unit Costs from FDOT Basis of Estimates - 2006 +20%.						
All quantities are estimated.						

Figure 7
Basin 7



Legend

- Existing Inlet
- Existing Pipe
- Replacement Pipe
- New/Replacement Inlet
- New Baffle Box
- Exfiltration System
- Basin

0 50 100 Feet 1:1,200

N

JONES EDMUNDS

Site Location

13190-006-01 Figure 7.mxd RPJ 8/10/07

For Informational Purposes Only

4.4.8 BASIN 8

Basin 8 collects runoff from roughly 50 acres. In the SMP, the recommended improvements in this basin were ranked as a medium priority. However, at the Town workshop and during subsequent site visits it was noted that the area long Pine Street from Second Avenue to Fourth Avenue was subject to flooding. This basin also has the potential to generate high pollutant loads to the Indian River Lagoon. Proposed improvements include replacing and upgrading existing pipes, installing an NSBB, and constructing small swales to store and treat stormwater runoff in the flood-prone area. In addition, the Town has noted nuisance flooding on First Avenue near the municipal complex. This flooding might be improved by regrading the 200-300 linear foot section where flooding occurs. However, additional evaluation, including survey data, is required before a firm recommendation can be made.

Exfiltration trenches providing water quality treatment and flood mitigation have been constructed on Oak Street at First and Second Avenues as part of the Oak Street Pedway project.

Third Avenue Outfall

Basin 8 Park

CONCEPTUAL COST ESTIMATE

STORMWATER MASTER PLAN UPDATE

Basin 8 - Pine Street

JONES EDMUNDS

ROM		CONCEPTUAL			Current Cost	4% annual escalation
					2007	2009
	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	TOTAL COST
General	Mobilization (10% of construction)	LS	1	$ 21,100.00	$ 21,100.00	
	Maintenance of Traffic	LS	1	$ 5,000.00	$ 5,000.00	
	Dewatering	LS	1	$ 10,000.00	$ 10,000.00	
	Staking / Testing	LS	1	$ 10,000.00	$ 10,000.00	
Erosion Control	Staked Silt Fence	LF	400	$ 2.00	$ 800.00	
	Floating Turbidity Barrier	LF	100	$ 12.00	$ 1,200.00	
	Misc. Erosion Control	LS	1	$ 2,500.00	$ 2,500.00	
Demolition	Removal of Existing Structures	LS	3	$ 2,500.00	$ 7,500.00	
	Pipe Removal (18" or less)	LF	360	$ 25.00	$ 9,000.00	
	Misc. Demolition	LS	1	$ 5,000.00	$ 5,000.00	
Drainage	14"X23" ERCP	LF	360	$ 90.00	$ 32,400.00	
	Mitered End Section	EA	2	$ 1,300.00	$ 2,600.00	
	FDOT Type C Inlets	EA	3	$ 5,000.00	$ 15,000.00	
	Final Grading (14-foot swale)	SY	300	$ 4.00	$ 1,200.00	
	Nutrient Separating Baffle Box	EA	1	$ 30,000.00	$ 30,000.00	
	Asphalt Overlay / First Avenue Regrade (2-inch)	SY	530	$ 15.00	$ 7,950.00	
Restoration	Driveway Repair - 4" Thick Conc	SY	35	$ 50.00	$ 1,750.00	
	Asphalt Overlay / Resurfacing	SY	40	$ 15.00	$ 600.00	
	Sodding	SY	800	$ 3.00	$ 2,400.00	
	Misc. Landscaping Restoration	LS	1	$ 5,000.00	$ 5,000.00	
	Subtotal				$ 171,000.00	
	CONSTRUCTION CONTINGENCY		20%		$ 34,200.00	
	OPINION OF PROBABLE CONSTRUCTION COST (ROUNDED)				**$ 205,000**	
	SURVEYING / GEOTECHNICAL		2%		$ 4,100.00	
	ENGINEERING		10%		$ 20,500.00	
	PERMITTING		3%		$ 6,150.00	
	CONSTRUCTION ADMINISTRATION		4%		$ 8,200.00	
	GRANT ADMINISTRATION / MONITORING		3%		$ 6,150.00	
Cost Estimate Notes:		**ROJECT BUDGET (ROUNDED)**			**$ 250,000**	**$271,000**
Excludes utility relocation.						
Budgets rounded to $1000.						
Unit Costs from FDOT Basis of Estimates - 2006 +20%.						
All quantities are estimated.						

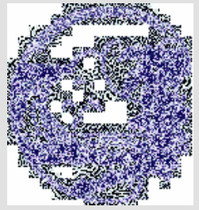
Figure 8
Basin 8

Legend

- Existing Inlet
- Existing Pipe
- Replacement Pipe
- New/Replacement Inlet
- New Baffle Box
- Mitered End Section
- Exfiltration System
- Existing Ditch
- Pond
- Swale
- Basin

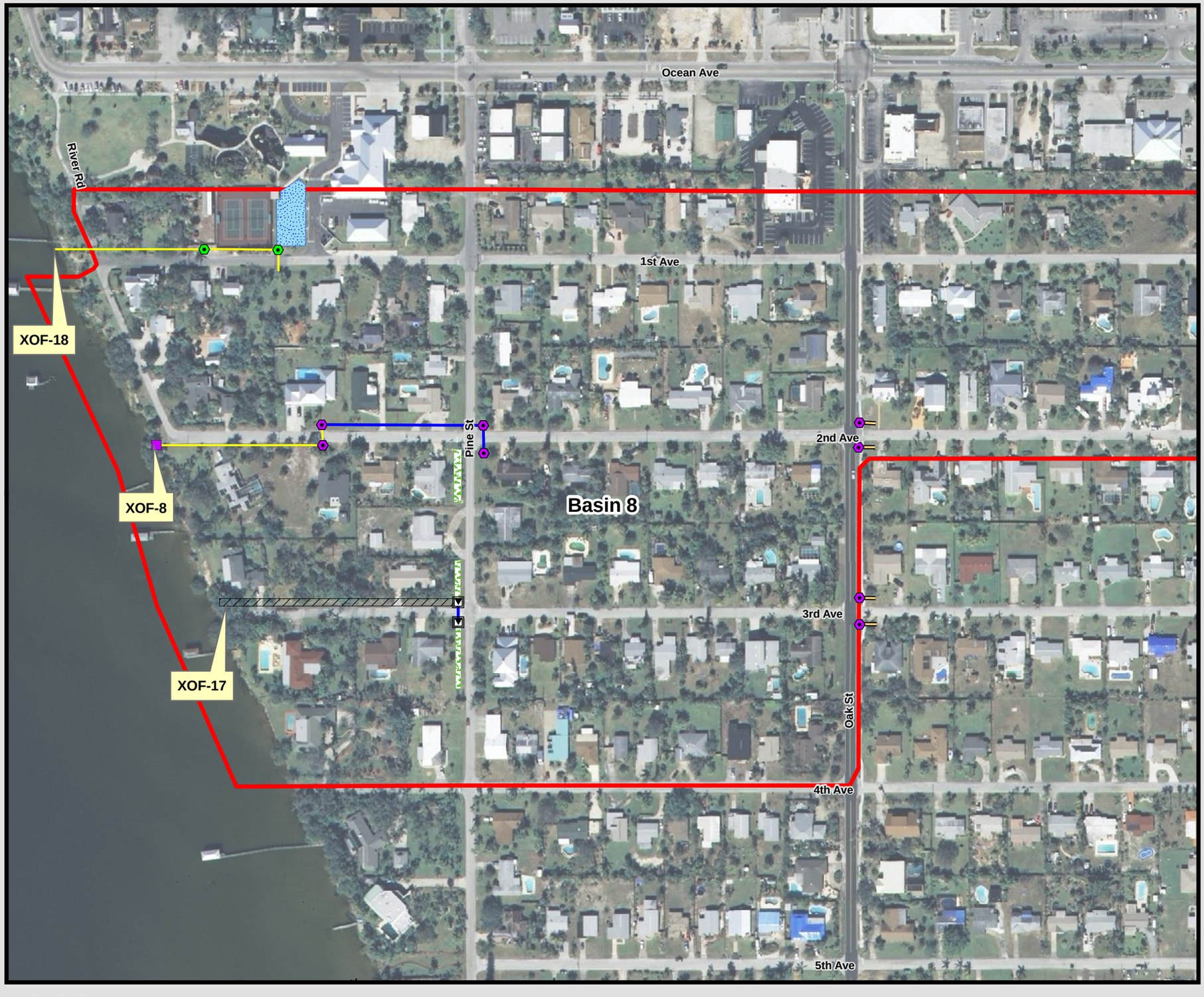
0 100 200 Feet 1:2,400

N



JONES EDMUNDS

Site Location



13190-006-01 Figure 8.mxd RPJ 8/10/07

For Informational Purposes Only

4.4.9 BASIN 9

Basin 9 is the largest basin in the Town with over 91 acres draining to the Indian River Lagoon. This basin has all three essential needs making it a top priority basin. The general area along the east side of Oak Street and portions of Sixth Avenue experience frequent flooding, the infrastructure is outdated and has failed in some cases, and the pollutant loading potential is high. The Oak Street Pedway Improvements project alleviated some of the flooding along Oak Street and improvements under construction on Sixth Avenue should help prevent nuisance flooding. The Oak Street Pedway Improvements project will also install a NSBB at the basin outfall to provide some level of water quality treatment. The construction project began in July 2007. The estimated completion date is January 2008, and the construction costs for this project is included in Table 1.

Additional work in Basin 9 includes a flood mitigation design project partially funded by FEMA.

The flood mitigation work includes replacing outdated pipe, constructing swales on the west side of Oak Street from Fifth Avenue to Sixth Avenue, and replacing the storm sewer system on the 400 block of Sixth Avenue.

There is additional potential for constructing exfiltration trenches along Orange Street for flood attenuation and water quality treatment. The work on Orange Street is a low priority for the Town.

Sixth Avenue Outfall

CONCEPTUAL COST ESTIMATE

STORMWATER MASTER PLAN UPDATE

Basin 9 - Oak Street and Sixth Avenue

JONES EDMUNDS

ROM		CONCEPTUAL			Current Cost	4% annual escalation
					2007	2007
	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	TOTAL COST
General	Mobilization (10% of construction)	LS	1	$ 46,500.00	$ 46,500.00	
	Maintenance of Traffic	LS	1	$ 15,000.00	$ 15,000.00	
	Dewatering	LS	1	$ 10,000.00	$ 10,000.00	
	Staking / Testing	LS	1	$ 10,000.00	$ 10,000.00	
Erosion Control	Staked Silt Fence	LF	400	$ 2.00	$ 800.00	
	Floating Turbidity Barrier	LF	100	$ 12.00	$ 1,200.00	
	Misc. Erosion Control	LS	1	$ 2,500.00	$ 2,500.00	
Demolition	Removal of Existing Structures	EA	6	$ 2,500.00	$ 15,000.00	
	Pipe Removal (18" or less)	LF	845	$ 25.00	$ 21,125.00	
	Misc. Demolition	LS	1	$ 5,000.00	$ 5,000.00	
Drainage	10" HDPE	LF	400	$ 55.00	$ 22,000.00	
	12" HDPE	LF	200	$ 75.00	$ 15,000.00	
	30" HDPE PIPE	LF	200	$ 120.00	$ 24,000.00	
	FDOT Type C Inlets	EA	10	$ 5,000.00	$ 50,000.00	
	Final Grading (swale)	SY	800	$ 4.00	$ 3,200	
	Excavation (Haul and Compact, 14-foot swale)	CY	150	$ 30.00	$ 4,500	
	18" Exfiltration Trench	LF	240	$ 90.00	$ 21,600.00	
	24" Exfiltration Trench	LF	322	$ 100.00	$ 32,200.00	
	Nutrient Separating Baffle Box	EA	1	$ 30,000.00	$ 30,000.00	
	Headwall / Outfall Structure	EA	1	$ 3,000.00	$ 3,000.00	
Restoration	Driveway Repair - 4" Thick Conc	SY	150	$ 50.00	$ 7,500.00	
	Asphalt Overlay / Resurfacing	SY	50	$ 15.00	$ 750.00	
	Sodding	SY	450	$ 3.00	$ 1,350.00	
	Misc. Landscaping Restoration	LS	1	$ 5,000.00	$ 5,000.00	
	Subtotal				$ 347,225.00	
	CONSTRUCTION CONTINGENCY		20%		$ 69,445.00	
	OPINION OF PROBABLE CONSTRUCTION COST (ROUNDED)				$ 417,000	
	SURVEYING / GEOTECHNICAL		2%		$ 8,340.00	
	ENGINEERING		10%		$ 41,700.00	
	PERMITTING		3%		$ 12,510.00	
	CONSTRUCTION ADMINISTRATION		4%		$ 16,680.00	
	GRANT ADMINISTRATION / MONITORING		3%		$ 12,510.00	
Cost Estimate Notes:		PROJECT BUDGET (ROUNDED)			$ 509,000	$509,000
Excludes utility relocation.						
Budgets rounded to $1000.						
Unit Costs from FDOT Basis of Estimates - 2006 +20%.						
All quantities are estimated.						
This work is under construction. This is an estimate of the capital investment into the stormwater infrastructure						

CONCEPTUAL COST ESTIMATE

STORMWATER MASTER PLAN UPDATE

JONES EDMUNDS

Basin 9 - West Side Oak Street

BUDGET		CONCEPTUAL			Current Cost	4% annual escalation
					2007	2008
	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	TOTAL COST
General	Mobilization (10% of construction)	LS	1	$ 41,600.00	$ 41,600.00	
	Maintenance of Traffic	LS	1	$ 15,000.00	$ 15,000.00	
	Dewatering	LS	1	$ 10,000.00	$ 10,000.00	
	Staking / Testing	LS	1	$ 5,000.00	$ 5,000.00	
Erosion Control	Staked Silt Fence	LF	300	$ 2.00	$ 600.00	
	Misc. Erosion Control	LS	1	$ 2,500.00	$ 2,500.00	
Demolition	Removal of Existing Structures	EA	9	$ 2,500.00	$ 22,500.00	
	Pipe Removal (18" or less)	LF	400	$ 25.00	$ 10,000.00	
	Pipe Removal (20" or more)	LF	750	$ 50.00	$ 37,500.00	
	Misc. Demolition	LS	1	$ 5,000.00	$ 5,000.00	
Drainage						
	24" RCP	LF	780	$ 100.00	$ 78,000.00	
	FDOT Type C Inlets	EA	5	$ 5,000.00	$ 25,000.00	
	Final Grading (swale)	SY	180	$ 4.00	$ 720	
	Excavation (Haul and Compact, 10-foot swale)	CY	20	$ 25.00	$ 500	
Restoration	Driveway Repair - 4" Thick Conc	SY	30	$ 50.00	$ 1,500.00	
	Asphalt Overlay / Resurfacing	SY	2000	$ 15.00	$ 30,000.00	
	Sodding	SY	200	$ 3.00	$ 600.00	
	Misc. Landscaping Restoration	LS	1	$ 5,000.00	$ 5,000.00	
	Subtotal				$ 291,020.00	
	CONSTRUCTION CONTINGENCY		20%		$ 58,204.00	
	OPINION OF PROBABLE CONSTRUCTION COST (ROUNDED)				$ 349,000	
	SURVEYING / GEOTECHNICAL		2%		$ 6,980.00	
	ENGINEERING		10%		$ 34,900.00	
	PERMITTING		3%		$ 10,470.00	
	CONSTRUCTION ADMINISTRATION		4%		$ 13,960.00	
	GRANT ADMINISTRATION / MONITORING		3%		$ 10,470.00	
Cost Estimate Notes:		PROJECT BUDGET (ROUNDED)			$ 426,000	$444,000
Excludes utility relocation.						
Budgets rounded to $1000.						
Unit Costs from FDOT Basis of Estimates - 2006 +20%.						
All quantities are estimated.						

CONCEPTUAL COST ESTIMATE

STORMWATER MASTER PLAN UPDATE

JONES EDMUNDS

Basin 9 - Orange Street Exfiltration

ROM		CONCEPTUAL			Current Cost	4% annual escalation
					2007	2015
	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	TOTAL COST
General	Mobilization (10% of construction)	LS	1	$ 37,300.00	$ 37,300.00	
	Maintenance of Traffic	LS	1	$ 5,000.00	$ 5,000.00	
	Dewatering	LS	1	$ 10,000.00	$ 10,000.00	
	Staking / Testing	LS	1	$ 10,000.00	$ 10,000.00	
Erosion Control	Staked Silt Fence	LF	500	$ 2.00	$ 1,000.00	
	Misc. Erosion Control	LS	1	$ 2,500.00	$ 2,500.00	
Demolition	Misc. Demolition	LS	1	$ 5,000.00	$ 5,000.00	
Drainage	24" Exfiltration Trench	LF	640	$ 100.00	$ 64,000.00	
	24" RCP	LF	520	$ 100.00	$ 52,000.00	
	FDOT Type C Inlets	EA	16	$ 5,000.00	$ 80,000.00	
Restoration	Sodding	SY	400	$ 3.00	$ 1,200.00	
	Asphalt Overlay / Resurfacing	SY	350	$ 15.00	$ 5,250.00	
	Misc. Landscaping Restoration	LS	1	$ 10,000.00	$ 10,000.00	
	Subtotal				$ 283,250.00	
	CONSTRUCTION CONTINGENCY		20%		$ 56,650.00	
	OPINION OF PROBABLE CONSTRUCTION COST (ROUNDED)				$ 340,000	
	SURVEYING / GEOTECHNICAL		2%		$ 6,800.00	
	ENGINEERING		10%		$ 34,000.00	
	PERMITTING		3%		$ 10,200.00	
	CONSTRUCTION ADMINISTRATION		4%		$ 13,600.00	
	GRANT ADMINISTRATION / MONITORING		3%		$ 10,200.00	
Cost Estimate Notes:		PROJECT BUDGET (ROUNDED)			$ 415,000	$568,000
Excludes utility relocation.						
Budgets rounded to $1000.						
Unit Costs from FDOT Basis of Estimates - 2006 +20%.						
All quantities are estimated.						

Figure 9
Basin 9

Legend

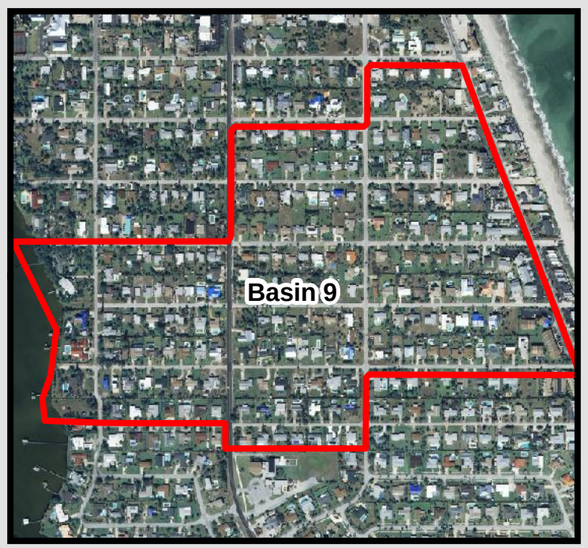
- Existing Inlet
- Existing Pipe
- Replacement Pipe
- New/Replacement Inlet
- New Baffle Box
- Exfiltration System
- Swale
- Basin

0 150 300 Feet 1:3,600

N

JONES EDMUNDS

Site Location



1st Ave
2nd Ave
3rd Ave
4th Ave
5th Ave
6th St
6th Ave
Oak St
Pine St
Basin 9
XOF-9
Atlantic St
Surf Rd
Orange St
Coral Ave
Neptune Dr
Driftwood Ave
Driftwood Ave
Cedar Ln
Rosewood Dr
Ash Ave
Birch Ave
Redwood Ave

13190-006-01 Figure 9.mxd RPJ 8/10/07

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4.4.10 BASIN 10

Basin 10 covers an area of 88 acres. This basin currently receives water quality treatment in the form of 19 CIBs and a NSBB. There are no reports of flooding in this basin. The SMP recommends upgrading the storm sewer system in the areas of Rosewood Drive and Cherry Drive to improve the system's reliability. However, the pipe system improvements in this area are considered a low priority for the Town for budgeting purposes.

Oak Street and Riverview

CONCEPTUAL COST ESTIMATE

STORMWATER MASTER PLAN UPDATE

Basin 10 - Rosewood/Cherry

JONES EDMUNDS

ROM		CONCEPTUAL			Current Cost	4% annual escalation
					2007	2015
	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	TOTAL COST
General	Mobilization (10% of construction)	LS	1	$ 34,100.00	$ 34,100.00	
	Maintenance of Traffic	LS	1	$ 5,000.00	$ 5,000.00	
	Dewatering	LS	1	$ 10,000.00	$ 10,000.00	
	Staking / Testing	LS	1	$ 10,000.00	$ 10,000.00	
Erosion Control	Staked Silt Fence	LF	1300	$ 2.00	$ 2,600.00	
	Misc. Erosion Control	LS	1	$ 2,500.00	$ 2,500.00	
Demolition	Removal of Existing Structures	LS	11	$ 2,500.00	$ 27,500.00	
	Pipe Removal (18" or less)	LF	506	$ 25.00	$ 12,650.00	
	Pipe Removal (20" or more)	LF	280	$ 50.00	$ 14,000.00	
	Misc. Demolition	LS	1	$ 5,000.00	$ 5,000.00	
Drainage	FDOT Type C Inlets	EA	14	$ 5,000.00	$ 70,000.00	
	18" HDPE PIPE	LF	360	$ 80.00	$ 28,800.00	
	18" RCP	LF	200	$ 90.00	$ 18,000.00	
	36" HDPE PIPE	LF	200	$ 125.00	$ 25,000.00	
	36" RCP	LF	80	$ 140.00	$ 11,200.00	
Restoration	Driveway Repair - 4" Thick Conc	SY	60	$ 50.00	$ 3,000.00	
	Sodding	SY	260	$ 3.00	$ 780.00	
	Curb & Valley Gutter	LF	470	$ 43.00	$ 20,210.00	
	Asphalt Overlay / Resurfacing	SY	140	$ 15.00	$ 2,100.00	
	Misc. Landscaping Restoration	LS	1	$ 10,000.00	$ 10,000.00	
	Subtotal				$ 312,440.00	
	CONSTRUCTION CONTINGENCY		20%		$ 62,488.00	
	OPINION OF PROBABLE CONSTRUCTION COST (ROUNDED)				**$ 375,000**	
	SURVEYING / GEOTECHNICAL		2%		$ 7,500.00	
	ENGINEERING		10%		$ 37,500.00	
	PERMITTING		3%		$ 11,250.00	
	CONSTRUCTION ADMINISTRATION		4%		$ 15,000.00	
	GRANT ADMINISTRATION / MONITORING		3%		$ 11,250.00	
Cost Estimate Notes:		**PROJECT BUDGET (ROUNDED)**			**$ 458,000**	**$627,000**
Excludes utility relocation.						
Budgets rounded to $1000.						
Unit Costs from FDOT Basis of Estimates - 2006 +20%.						
All quantities are estimated.						

Figure 10
Basin 10

Legend

- Existing Baffle Box
- Existing Inlet
- Existing Inlet Basket
- Existing Manhole
- Existing Pipe
- Replacement Pipe
- New/Replacement Inlet
- Exfiltration Pipe
- Basin
- Swale

0 100 200 Feet

1:3,246

N

JONES EDMUNDS

Site Location

13190-006-01 Figurer 10.mxd RPJ 8/10/07

For Informational Purposes Only

4.4.11 BASIN 11

Basin 11 is a 19 acre basin that discharges to the Harbor East canal. This basin collects the runoff from Coral Avenue, Driftwood Avenue, and the south end of Pine Street. The recommended improvements consist of replacing inlets and pipe to improve reliability and installing a NSBB at the outfall to improve water quality. This project is a medium priority because of the opportunity to improve water quality entering the canal system and the relatively low cost of the project.

Basin 11 Inlets

Basin 11

CONCEPTUAL COST ESTIMATE

STORMWATER MASTER PLAN UPDATE

Basin 11 - Driftwood Avenue

JONES EDMUNDS

BUDGET		CONCEPTUAL			Current Cost	4% annual escalation
					2007	2013
	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	TOTAL COST
General	Mobilization (10% of construction)	LS	1	$ 13,100.00	$ 13,100.00	
	Maintenance of Traffic	LS	1	$ 5,000.00	$ 5,000.00	
	Dewatering	LS	1	$ 10,000.00	$ 10,000.00	
	Staking / Testing	LS	1	$ 5,000.00	$ 5,000.00	
Erosion Control	Floating Turbidity Barrier	LF	100	$ 12.00	$ 1,200.00	
	Staked Silt Fence	LF	60	$ 2.00	$ 120.00	
	Misc. Erosion Control	LS	1	$ 2,500.00	$ 2,500.00	
Demolition	Removal of Existing Structures	LS	2	$ 2,500.00	$ 5,000.00	
	Pipe Removal (18" or less)	LF	40	$ 25.00	$ 1,000.00	
	Misc. Demolition	LS	1	$ 5,000.00	$ 5,000.00	
Drainage	FDOT Type P-4 Inlets	EA	2	$ 8,000.00	$ 16,000.00	
	18" RCP	LF	40	$ 90.00	$ 3,600.00	
	Nutrient Separating Baffle Box	EA	1	$ 30,000.00	$ 30,000.00	
Restoration	Sodding	SY	30	$ 3.00	$ 90.00	
	Misc. Landscaping Restoration	LS	1	$ 5,000.00	$ 5,000.00	
	Curb & Valley Gutter	LF	100	$ 43.00	$ 4,300.00	
	Asphalt Overlay / Resurfacing	SY	25	$ 15.00	$ 375.00	
	Subtotal				$ 107,285.00	
	ESCALATION (2009)		12%		$ 12,874.20	
	CONSTRUCTION CONTINGENCY		20%		$ 21,457.00	
	OPINION OF PROBABLE CONSTRUCTION COST (ROUNDED)				**$ 142,000**	
	SURVEYING / GEOTECHNICAL		2%		$ 2,840.00	
	ENGINEERING		10%		$ 14,200.00	
	PERMITTING		3%		$ 4,260.00	
	CONSTRUCTION ADMINISTRATION		4%		$ 5,680.00	
	GRANT ADMINISTRATION / MONITORING		3%		$ 4,260.00	
Cost Estimate Notes:		**PROJECT BUDGET (ROUNDED)**			**$ 173,000**	**$219,000**
Excludes utility relocation.						
Budgets rounded to $1000.						
Unit Costs from FDOT Basis of Estimates - 2006 +20%.						
All quantities are estimated.						

Figure 11
Basin 11

Legend

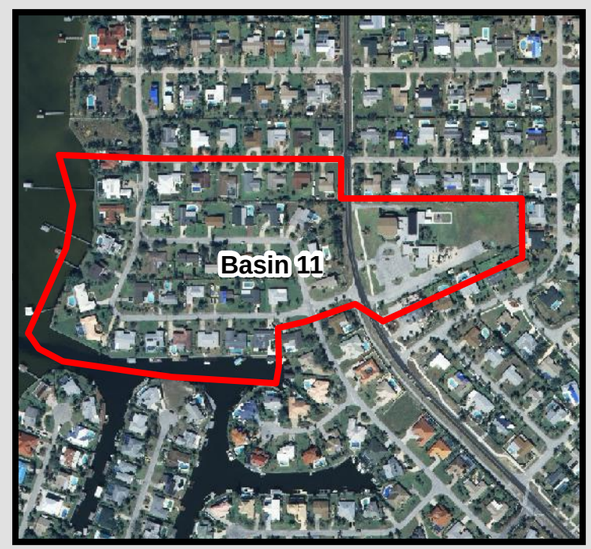
- Existing Baffle Box
- New/Replacement Inlet
- Existing Inlet
- New Baffle Box
- Existing Pipe
- Exfiltration System
- Replacement Pipe
- Basin

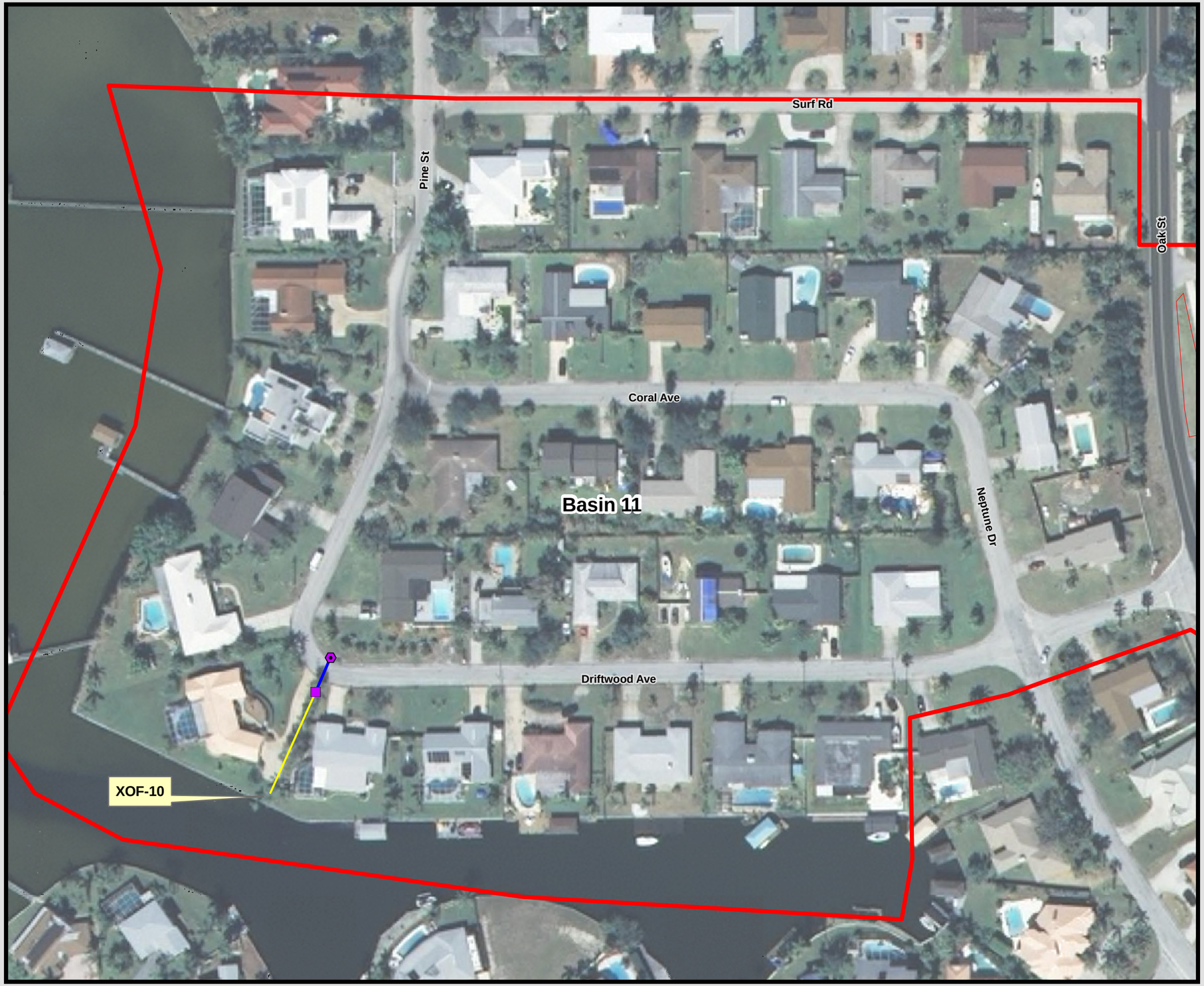
0 50 100 Feet 1:1,200

N

JONES EDMUNDS

Site Location





13190-006-01 Figure 11.mxd RPJ 8/10/07

For Informational Purposes Only

4.4.12 BASINS 12 and 13

Riverview Lane and Sandy Key make up Basins 12 and 13. Each basin is approximately 4.7 and 6 acres respectively. These basins capture runoff from residential lawns and streets and discharge directly to the local canal. The recommended modifications consist of installing a NSBB at the end of each cul-de-sac.

Typical Canal Outfall

Basin 13

CONCEPTUAL COST ESTIMATE

STORMWATER MASTER PLAN UPDATE

JONES EDMUNDS

Basin 12 - Riverview Lane

BUDGET		CONCEPTUAL			Current Cost	4% annual escalation
					2007	2015
	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	TOTAL COST
General	Mobilization (10% of construction)	LS	1	$ 12,000.00	$ 12,000.00	
	Dewatering (small)	LS	1	$ 5,000.00	$ 5,000.00	
	Staking / Testing	LS	1	$ 5,000.00	$ 5,000.00	
Erosion Control	Staked Silt Fence	LF	300	$ 2.00	$ 600.00	
	Floating Turbidity Barrier	LF	50	$ 12.00	$ 600.00	
	Misc. Erosion Control	LS	1	$ 2,500.00	$ 2,500.00	
Demolition	Removal of Existing Structures	LS	1	$ 2,500.00	$ 2,500.00	
	Pipe Removal (20" or more)	LF	110	$ 50.00	$ 5,500.00	
	Misc. Demolition	LS	1	$ 5,000.00	$ 5,000.00	
Drainage	Nutrient Separating Baffle Box	EA	1	$ 30,000.00	$ 30,000.00	
	FDOT Type P-4 Inlets	EA	1	$ 8,000.00	$ 8,000.00	
	24" HDPE PIPE	LF	100	$ 90.00	$ 9,000.00	
Restoration	Sodding	SY	120	$ 3.00	$ 360.00	
	Misc. Landscaping Restoration	LS	1	$ 5,000.00	$ 5,000.00	
	Subtotal				$ 91,060.00	
	CONSTRUCTION CONTINGENCY		20%		$ 18,212.00	
	OPINION OF PROBABLE CONSTRUCTION COST (ROUNDED)				$ 109,000	
	SURVEYING / GEOTECHNICAL		2%		$ 2,180.00	
	ENGINEERING		10%		$ 10,900.00	
	PERMITTING		3%		$ 3,270.00	
	CONSTRUCTION ADMINISTRATION		4%		$ 4,360.00	
	GRANT ADMINISTRATION / MONITORING		3%		$ 3,270.00	
Cost Estimate Notes:		ROJECT BUDGET (ROUNDED)			$ 133,000	$183,000

Excludes utility relocation.
Budgets rounded to $1000.
Unit Costs from FDOT Basis of Estimates - 2006 +20%.
All quantities are estimated.

CONCEPTUAL COST ESTIMATE

STORMWATER MASTER PLAN UPDATE

JONES EDMUNDS

Basin 13 - Sandy Key

ROM		CONCEPTUAL			Current Cost	4% annual escalation
					2007	2015
	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	TOTAL COST
General	Mobilization (10% of construction)	LS	1	$ 11,300.00	$ 11,300.00	
	Dewatering (small)	LS	1	$ 5,000.00	$ 5,000.00	
	Staking / Testing	LS	1	$ 5,000.00	$ 5,000.00	
Erosion Control	Staked Silt Fence	LF	300	$ 2.00	$ 600.00	
	Floating Turbidity Barrier	LF	100	$ 12.00	$ 1,200.00	
	Misc. Erosion Control	LS	1	$ 2,500.00	$ 2,500.00	
Demolition	Removal of Existing Structures	LS	1	$ 2,500.00	$ 2,500.00	
	Pipe Removal (20" or more)	LF	110	$ 50.00	$ 5,500.00	
	Misc. Demolition	LS	1	$ 5,000.00	$ 5,000.00	
Drainage	Nutrient Separating Baffle Box	EA	1	$ 30,000.00	$ 30,000.00	
	FDOT Type P-4 Inlets	EA	1	$ 8,000.00	$ 8,000.00	
	24" HDPE PIPE	LF	100	$ 90.00	$ 9,000.00	
Restoration	Sodding	SY	120	$ 3.00	$ 360.00	
	Misc. Landscaping Restoration	LS	0	$ 5,000.00	$ -	
	Subtotal				$ 85,960.00	
	CONSTRUCTION CONTINGENCY		20%		$ 17,192.00	
	OPINION OF PROBABLE CONSTRUCTION COST (ROUNDED)				$ 103,000	
	SURVEYING / GEOTECHNICAL		2%		$ 2,060.00	
	ENGINEERING		10%		$ 10,300.00	
	PERMITTING		3%		$ 3,090.00	
	CONSTRUCTION ADMINISTRATION		4%		$ 4,120.00	
	GRANT ADMINISTRATION / MONITORING		3%		$ 3,090.00	
Cost Estimate Notes:		ROJECT BUDGET (ROUNDED)			$ 126,000	$173,000

Excludes utility relocation.
Budgets rounded to $1000.
Unit Costs from FDOT Basis of Estimates - 2006 +20%.
All quantities are estimated.

Figure 12
Basin 12 & 13

Legend

- Existing Pipe
- Replacement Pipe
- New Baffle Box
- Exfiltration System
- Basin

0 50 100 Feet 1:1,200

N

JONES EDMUNDS

Site Location

13190-006-01 Figure 12.mxd RPJ 8/10/07

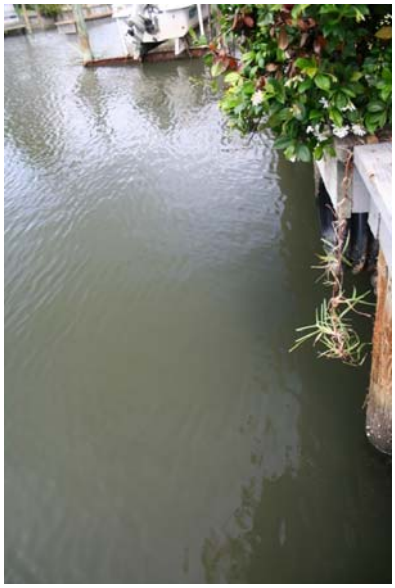
For Informational Purposes Only

4.4.13 BASINS 14, 15, and 16

The stormwater systems in Basins 14, 15, and 16 cover areas of approximately 4, 5.7, and 6.6 acres respectively. These basins were subjected to frequent flooding in the past. However, the Town installed exfiltration trenches and baffle boxes to alleviate the flooding in each cul-de-sac. The Town has received a commitment of additional funds from FEMA to further reduce flooding in these basins, but the original improvements provide adequate mitigation of flooding in these basins.

The improvements shown in Basin 15 were funded by a Brevard County Project that also funded improvements in Basins 10, 17, and 18. The cost estimate sheets are included to help demonstrate the Town's financial commitment to flood mitigation, water quality, and system maintenance. There are no additional projects proposed for these basins.

Anchor Key



Anchor Key

CONCEPTUAL COST ESTIMATE

STORMWATER MASTER PLAN UPDATE

JONES EDMUNDS

Basins 14, 15 and 16 - Pelican Key and Anchor Key

ROM		CONCEPTUAL			Current Cost	4% annual escalation
					2007	2003
	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	TOTAL COST
General	Mobilization (10% of construction)	LS	1	$ 29,900.00	$ 29,900.00	
	Maintenance of Traffic	LS	1	$ 5,000.00	$ 5,000.00	
	Dewatering	LS	1	$ 10,000.00	$ 10,000.00	
	Staking / Testing	LS	1	$ 5,000.00	$ 5,000.00	
Erosion Control	Staked Silt Fence	LF	800	$ 2.00	$ 1,600.00	
	Floating Turbidity Barrier	LF	100	$ 12.00	$ 1,200.00	
	Misc. Erosion Control	LS	1	$ 2,500.00	$ 2,500.00	
Demolition	Removal of Existing Structures	LS	1	$ 2,500.00	$ 2,500.00	
	Pipe Removal (20" or more)	LF	110	$ 50.00	$ 5,500.00	
	Misc. Demolition	LS	1	$ 5,000.00	$ 5,000.00	
Drainage	Nutrient Separating Baffle Box	EA	3	$ 30,000.00	$ 90,000.00	
	Curb Inlet Baskets	EA	2	$ 2,000.00	$ 4,000.00	
	24" HDPE PIPE	LF	200	$ 90.00	$ 18,000.00	
	FDOT Type C Inlets	EA	8	$ 5,000.00	$ 40,000.00	
	18" Exfiltration Trench	LF	300	$ 90.00	$ 27,000.00	
Restoration	Sodding	SY	300	$ 3.00	$ 900.00	
	Misc. Landscaping Restoration	LS	1	$ 5,000.00	$ 5,000.00	
	Subtotal				$ 253,100.00	
	CONSTRUCTION CONTINGENCY		20%		$ 50,620.00	
	OPINION OF PROBABLE CONSTRUCTION COST (ROUNDED)				**$ 304,000**	
	SURVEYING / GEOTECHNICAL		2%		$ 6,080.00	
	ENGINEERING		10%		$ 30,400.00	
	PERMITTING		3%		$ 9,120.00	
	CONSTRUCTION ADMINISTRATION		4%		$ 12,160.00	
	GRANT ADMINISTRATION / MONITORING		3%		$ 9,120.00	
Cost Estimate Notes:		ROJECT BUDGET (ROUNDED)			**$ 371,000**	**$318,000**

Excludes utility relocation.
Budgets rounded to $1000.
Unit Costs from FDOT Basis of Estimates - 2006 +20%.
All quantities are estimated.
This work is complete. This is an estimate of the capital investment into the stormwater infrastructure.

Figure 13
Basin 14, 15, & 16

Legend

- Existing Baffle Box
- Existing Inlet
- Existing Inlet Basket
- Existing Pipe
- Replacement Pipe
- Exfiltration System
- Basin

0 50 100 Feet

1:1,731

N

JONES EDMUNDS

Site Location

XOF11

XOF-12

XOF-15

Basin 15

Basin 14

Basin 16

Pine St

Driftwood Ave

Orange St

Rosewood Dr

Cedar Ln

Pelican Ky

Neptune Dr

Cherry Dr

Oak St

Sandy Ky

Anchor Ky

Riverview Ln

13190-006-01 Figure 13.mxd RPJ 8/10/07

For Informational Purposes Only

4.4.14 BASINS 17 and 18

Basins 17 and 18 are approximately 3.6 and 14 acres respectively. Each basin collects runoff from Riverview Lane. The storm sewer systems in Basins 17 and 18 were upgraded during a Brevard County project that included the installation of curb inlet baskets and NSBBs. The Brevard County project also included improvements in Basins 10 and 15.

The cost estimate is included to demonstrate the Town's financial commitment to the reduction of flooding, improved water quality, and system maintenance. There are no additional projects proposed for these basins.

Basin 17

Basin 18

CONCEPTUAL COST ESTIMATE

STORMWATER MASTER PLAN UPDATE

JONES EDMUNDS

Basins 17, and 18, Brevard County Project

ROM		CONCEPTUAL			Current Cost	4% annual escalation
					2007	2003
	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	TOTAL COST
General	Mobilization (10% of construction)	LS	1	$ 13,900.00	$ 13,900.00	
	Maintenance of Traffic	LS	1	$ 5,000.00	$ 5,000.00	
	Dewatering	LS	1	$ 10,000.00	$ 10,000.00	
	Staking / Testing	LS	1	$ 5,000.00	$ 5,000.00	
Erosion Control	Staked Silt Fence	LF	60	$ 2.00	$ 120.00	
	Floating Turbidity Barrier	LF	100	$ 12.00	$ 1,200.00	
	Misc. Erosion Control	LS	1	$ 2,500.00	$ 2,500.00	
Demolition	Removal of Existing Structures	LS	1	$ 2,500.00	$ 2,500.00	
	Misc. Demolition	LS	1	$ 5,000.00	$ 5,000.00	
Drainage	Nutrient Separating Baffle Box	EA	2	$ 30,000.00	$ 60,000.00	
	Curb Inlet Baskets	EA	2	$ 2,000.00	$ 4,000.00	
Restoration	Sodding	SY	300	$ 3.00	$ 900.00	
	Misc. Landscaping Restoration	LS	1	$ 10,000.00	$ 10,000.00	
	Subtotal				$ 120,120.00	
	CONSTRUCTION CONTINGENCY		20%		$ 24,024.00	
	OPINION OF PROBABLE CONSTRUCTION COST (ROUNDED)				$ 144,000	
	SURVEYING / GEOTECHNICAL		2%		$ 2,880.00	
	ENGINEERING		10%		$ 14,400.00	
	PERMITTING		3%		$ 4,320.00	
	CONSTRUCTION ADMINISTRATION		4%		$ 5,760.00	
	GRANT ADMINISTRATION / MONITORING		3%		$ 4,320.00	
Cost Estimate Notes:		PROJECT BUDGET (ROUNDED)			$ 176,000	$151,000
Excludes utility relocation.						
Budgets rounded to $1000.						
Unit Costs from FDOT Basis of Estimates - 2006 +20%.						
All quantities are estimated.						
This work is complete. This is an estimate of the capital investment into the stormwater infrastructure.						

Figure 14
Basin 17 & 18

Legend

- Existing Baffle Box
- Existing Inlet
- Existing Pipe
- Basin

0 50 100
Feet

1:2,164

N

JONES EDMUNDS

Site Location

Pelican Ky
Neptune Dr
Cedar Ln
Cherry Dr
Sandy Ky
Anchor Ky
Cherry Dr
Oak St
Riverview Ln
Basin 17
Basin 18
Dolphin St
S River Rd
Bonita Ave

13190-006-01 Figure 13.mxd RPJ 8/10/07

For Informational Purposes Only

APPENDIX A

MAPS

ATLANTIC OCEAN

INDIAN RIVER LAGOON

FLAG NOTES:

POST 2002 SYSTEM REPAIRS/ PROPSED UPGRADES:

1. PIPE REPLACEMENT
2. JOINTS EXCAVATED, RE-SEATED, WRAPPED AND PATCHED
3. FRENCH DRAIN INSTALLED
4. EXFILTRATION
5. MUNICIPAL COMPLEX STORMWATER SYSTEM
6. SWALES
7. NUTRIENT SEPARATING BAFFLE BOX
8. CURB INLET BASKET
9. FDOT SWALE W/ UNDERDRAIN

OBSERVED CONDITIONS:

10. FLOOD PRONE AREAS
11. SUBSIDENCE PONDING
12. PIPE REPLACEMENT
13. PIPE ABANDONMENT

GRAPHIC SCALE

0 150 300 600

SCALE IN FEET

-N-

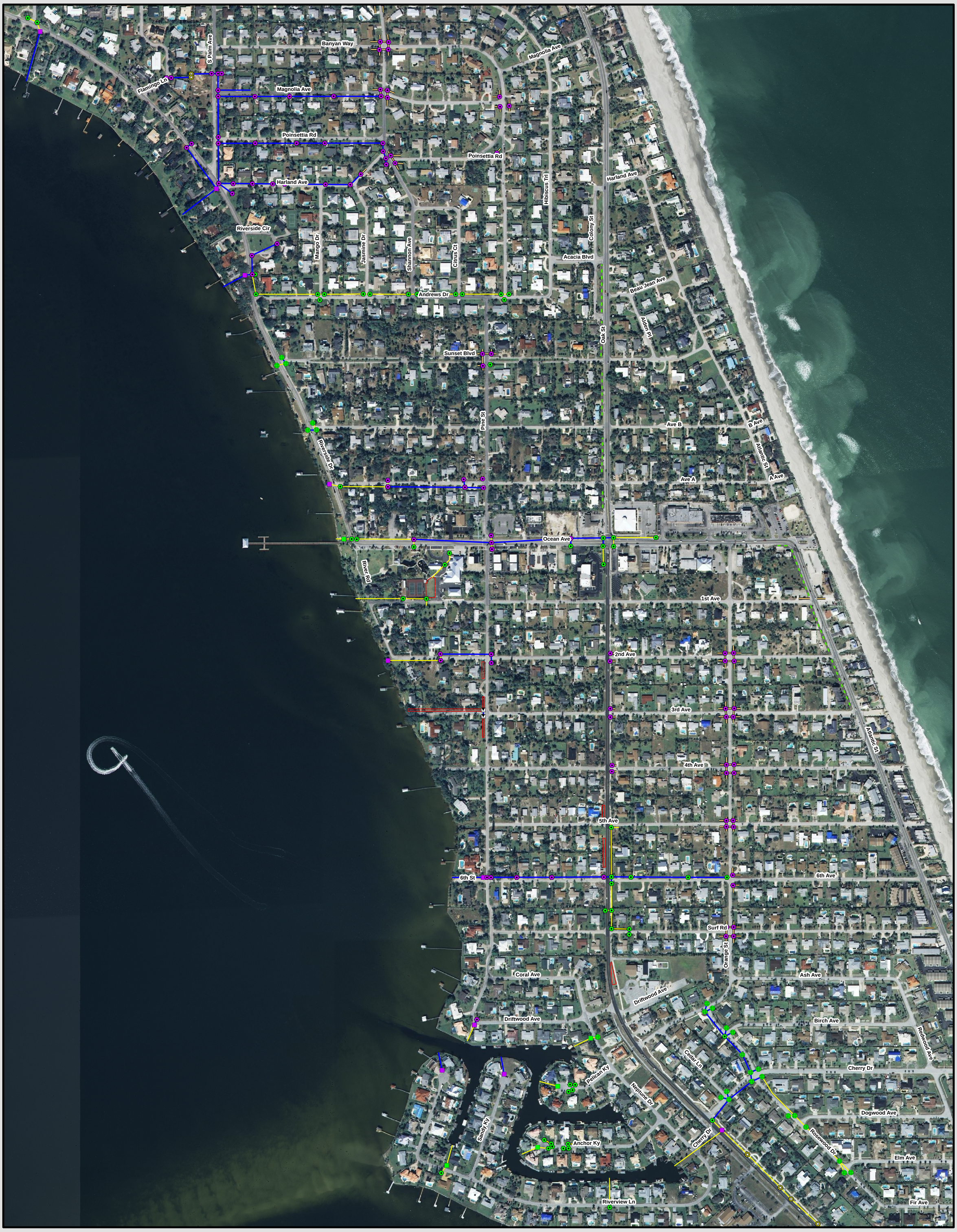
LEGEND

EXISTING PIPE

EXISTING CONDITIONS MAP

JONES EDMUNDS

Proposed Stormwater Master Plan



Legend

- Existing Baffle Box
- Existing Inlet
- Existing Inlet Basket
- Existing Manhole
- Existing Pipe
- Replacement Pipe
- New Baffle Box
- New/Replacement Inlet
- New Mitered End Section
- Exfiltration System
- FDOT Underdrain
- Swale

N

0 300 600 900 1,200

Feet

JONES EDMUNDS

APPENDIX B

RECOMMENDED RECORD KEEPING FORMS

FORM 1					
RECORD OF UPDATES - MELBOURNE BEACH STORMWATER MASTER PLAN					
Name	Official Title	Initials	Plan changes	Review Date(s)	Comment

FORM 2					
MASTER PLAN PROJECT STATUS					
Project Number	**Basin**	**Project Name**	**Status**	**Date**	**Comment**
N/A	10, 15, 17, 18	Rosewood Drive, Cherry Drive, Oak Street, Neptune Drive, Riverview Lane	A	2002-2003	Brevard County project
N/A	14, 16	Anchor Key, Pelican Key	A	2002-2003	Cost share with SJRWMD Grant
1	9	Sixth Avenue/Oak Street	C	7/16/2007	NTP - Watauga/A-CAR Trucking, SJRWMD
2	1	Harland Avenue	F		FEMA
3	9	West Side Oak Street - Sixth Avenue	F		FEMA
4	1	South Palm			
5	8	Pine Street	F		FEMA
6	3	Andrews Drive			
7	5	Ocean Avenue			
8	2	Riverside Drive			
9	11	Driftwood Avenue			
10	7	Avenue A			
11	4	Sunset and Riverside			
12	9	Orange Street Exfiltration			
13	6	Riverside Drive			
14	12	Riverview Lane			
15	13	Sandy Key			
16	1	Shannon Exfiltration			
17	1	Magnolia			
18	1	Poinsettia Avenue			
19	5	Exfiltration			
20	10	Rosewood/Cherry			
Status -P - Proposed, F - Funding, D - Design, C - Construct, A - Accomplished					

APPENDIX C

WORKSHOP AND TOWN INTERVIEW DOCUMENTATION

WORKSHOP DOCUMENTS

Town Meeting

Wednesday, April 11, 2007
6:30 P.M.
Community Center

Stormwater Master Plan Update

The Town Commission has awarded a contract to Jones Edmunds to update the existing Stormwater Master Plan. A Town Meeting will be held on Wednesday, April 11, 2007 at 6:30p.m.in the Community Center to give Town residents an opportunity to discuss this project. This will also be a chance for residents to voice their thoughts and concerns regarding the Town's stormwater management program, and to let us know of problem areas throughout the Town. Public input is important to the success of this project and providing solutions to this issue.

Town of Melbourne Beach

Stormwater Master Plan Update Workshop

Introduction

(6:30-6:35 pm)

- **Purpose of Workshop**
- **Purpose of Stormwater Master Plan Update**

Project Overview

(6:35-6:45 pm)

- **Assess Stormwater Master Plan Improvements**
- **Develop Proposed Projects**
- **Update Cost Estimates and Re-prioritize Projects**
- **Prepare Stormwater Master Plan Report**

Community Input

(6:45-8:00 pm)

- **Questionnaire**
- **Open Discussion**

JONES EDMUNDS

Melbourne Beach Update Stormwater Master Plan Workshop Sign-in Sheet		
Name	Address (optional)	Phone (optional)
Terry Black	310 S. 4th A	727 7978
Henry Nix	10 Pine Ave	725 1159
Also in attendance:		
Rich Davis	~	
Steve Seabo	Jones Edmunds	
Lauren Holman	/	
Jim Burside	Town Manager	
Billy Both	Suntree Tech.	

Melbourne Beach Update Stormwater Master Plan Workshop Sign-in Sheet		
Name	Address (optional)	Phone (optional)
Steve Walters	416 6th Ave	676.2537
Tom Davis	318 6th Ave	403 6626
Kathy Emerson	512 Ocean Ave	
Sandy Wilson	410 Sunset Blvd	768-2002
Chad Rowan	801 Pine St	676-0660
Paul S Goldsmith	404 Surf Rd	676-6536

Melbourne Beach, Florida **April 11, 2007**
Stormwater Questionnaire

The Town of Melbourne Beach (Town) is in the process of updating the Stormwater Master Plan. This questionnaire will assist the Town in addressing the most pressing needs of the community. Participation in this survey is voluntary. Your cooperation is greatly appreciated.

RESPONDENT'S NAME (Optional): STEVE WALTERS

PHONE NUMBER (Optional): 676.2539

ADDRESS (Please include): 1116 6TH AVE

1. How many years at the above address?
   ☐ 0-2 years ☐ 2-5 years ☒ 5-10 years ☐ 10 + years

2. Have you experienced flooding at this location?
   ☒ Yes ☐ No

3. Type and Duration of flooding (Check all that apply).
   - Yard ☐ Major ☐ Minor ☐ Extended (24+ hour) ☐ Brief
   - Street ☒ Major ☐ Minor ☐ Extended (24+ hour) ☐ Brief
   - Other: _____

4. Approximate dates of flooding event. If you don't remember leave blank.
   EVERY TIME THERE IS A STORM W/ 3 OR MORE INCHES OF RAIN

5. What do you feel is the cause or major contributing factor to the flooding in your area?
   FAILURE OF STORM DRAIN

6. What is your most important outcome of the Stormwater Master Plan Update?
   ☒ Reduce Flooding ☒ Repair System ☒ Improve Water Quality
   ☐ Other _____

7. Would you be willing to participate in a citizen's volunteer program to assist in the implementation of the Stormwater Master Plan?
   ☐ Yes ☐ No ☒ Maybe

8. Please provide any additional comments regarding drainage, flooding and/or water quality issues that you believe are of concern in your area. Include any ideas for improvements

Melbourne Beach, Florida **April 11, 2007**
Stormwater Questionnaire

The Town of Melbourne Beach (Town) is in the process of updating the Stormwater Master Plan. This questionnaire will assist the Town in addressing the most pressing needs of the community. Participation in this survey is voluntary. Your cooperation is greatly appreciated.

RESPONDENT'S NAME (Optional): Terry Block

PHONE NUMBER (Optional): 727-7978

ADDRESS (Please include): 310 Sixth Ave Melb Bchc. FL 32951

1. How many years at the above address?
   ☐ 0-2 years ☐ 2-5 years ☐ 5-10 years ☒ 10 + years

2. Have you experienced flooding at this location?
   ☒ Yes ☐ No

3. Type and Duration of flooding (Check all that apply).
   - Yard ☒ Major ☐ Minor ☒ Extended (24+ hour) ☐ Brief
   - Street ☒ Major ☐ Minor ☒ Extended (24+ hour) ☐ Brief
   - Other: Orange Ave

4. Approximate dates of flooding event. If you don't remember leave blank.

5. What do you feel is the cause or major contributing factor to the flooding in your area?
   Rain

6. What is your most important outcome of the Stormwater Master Plan Update?
   ☒ Reduce Flooding ☐ Repair System ☐ Improve Water Quality
   ☐ Other

7. Would you be willing to participate in a citizen's volunteer program to assist in the implementation of the Stormwater Master Plan?
   ☐ Yes ☐ No ☒ Maybe

8. Please provide any additional comments regarding drainage, flooding and/or water quality issues that you believe are of concern in your area. Include any ideas for improvements

Melbourne Beach, Florida **April 11, 2007**
Stormwater Questionnaire

The Town of Melbourne Beach (Town) is in the process of updating the Stormwater Master Plan. This questionnaire will assist the Town in addressing the most pressing needs of the community. Participation in this survey is voluntary. Your cooperation is greatly appreciated.

RESPONDENT'S NAME (Optional): HENRY WALLEN JR.

PHONE NUMBER (Optional): 723-1129

ADDRESS (Please include): 406 First Ave / 2035 N. Shannon Av. Indialantic, Fla 32903

1. How many years at the above address?
   ☒ 0-2 years ☐ 2-5 years ☐ 5-10 years ☐ 10 + years

2. Have you experienced flooding at this location?
   ☐ Yes ☒ No

3. Type and Duration of flooding (Check all that apply).
   - Yard ☐ Major ☐ Minor ☐ Extended (24+ hour) ☒ Brief
   - Street ☐ Major ☐ Minor ☐ Extended (24+ hour) ☐ Brief
   - Other: _____

4. Approximate dates of flooding event. If you don't remember leave blank.
   _____

5. What do you feel is the cause or major contributing factor to the flooding in your area?
   _____
   _____

6. What is your most important outcome of the Stormwater Master Plan Update?
   ☐ Reduce Flooding ☐ Repair System ☒ Improve Water Quality
   ☒ Other Stop Stormwater from entering Indian River Lagoon

7. Would you be willing to participate in a citizen's volunteer program to assist in the implementation of the Stormwater Master Plan? Refer to #8
   ☐ Yes ☐ No ☒ Maybe

8. Please provide any additional comments regarding drainage, flooding and/or water quality issues that you believe are of concern in your area. Include any ideas for improvements
   Reroute to sewer system
   _____

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RESPONDENT'S NAME (Optional): Tom Davis

PHONE NUMBER (Optional): 403 6626

ADDRESS (Please include): 318 6TH Ave

1. How many years at the above address?
   ☐ 0-2 years ☒ 2-5 years ☐ 5-10 years ☐ 10 + years

2. Have you experienced flooding at this location?
   ☒ Yes ☐ No

3. Type and Duration of flooding (Check all that apply).
   - Yard ☐ Major ☑ Minor ☐ Extended (24+ hour) ☐ Brief
   - Street ☐ Major ☐ Minor ☐ Extended (24+ hour) ☐ Brief
   - Other: Driveway entrance from Street

4. Approximate dates of flooding event. If you don't remember leave blank.
   - Rain season

5. What do you feel is the cause or major contributing factor to the flooding in your area?
   - Clogged & crushed underground pipe.
   & Reportedly part of damage from previous construction

6. What is your most important outcome of the Stormwater Master Plan Update?
   ☑ Reduce Flooding ☑ Repair System ☐ Improve Water Quality
   ☐ Other

7. Would you be willing to participate in a citizen's volunteer program to assist in the implementation of the Stormwater Master Plan?
   ☑ Yes ☐ No ☐ Maybe

8. Please provide any additional comments regarding drainage, flooding and/or water quality issues that you believe are of concern in your area. Include any ideas for improvements

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RESPONDENT'S NAME (Optional): Ann Ewers

PHONE NUMBER (Optional): _____

ADDRESS (Please include): 512 Ocean Ave

1. How many years at the above address?
   ☐ 0-2 years ☒ 2-5 years ☐ 5-10 years ☐ 10 + years

2. Have you experienced flooding at this location?
   ☐ Yes ☒ No

3. Type and Duration of flooding (Check all that apply).
   - Yard ☐ Major ☐ Minor ☐ Extended (24+ hour) ☐ Brief
   - Street ☐ Major ☐ Minor ☐ Extended (24+ hour) ☐ Brief
   - Other: _____

4. Approximate dates of flooding event. If you don't remember leave blank.
   _____

5. What do you feel is the cause or major contributing factor to the flooding in your area?
   _____
   _____

6. What is your most important outcome of the Stormwater Master Plan Update?
   ☐ Reduce Flooding ☒ Repair System ☐ Improve Water Quality
   ☐ Other _____

7. Would you be willing to participate in a citizen's volunteer program to assist in the implementation of the Stormwater Master Plan?
   ☐ Yes ☒ No ☐ Maybe

8. Please provide any additional comments regarding drainage, flooding and/or water quality issues that you believe are of concern in your area. Include any ideas for improvements
   _____
   _____

Melbourne Beach, Florida **April 11, 2007**
Stormwater Questionnaire

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RESPONDENT'S NAME (Optional): _____

PHONE NUMBER (Optional): _____

ADDRESS (Please include): _____

1. How many years at the above address?
   ☐ 0-2 years ☐ 2-5 years ☐ 5-10 years ☒ 10 + years

2. Have you experienced flooding at this location?
   ☐ Yes ☒ No

3. Type and Duration of flooding (Check all that apply).
   - Yard ☐ Major ☐ Minor ☐ Extended (24+ hour) ☐ Brief
   - Street ☐ Major ☐ Minor ☐ Extended (24+ hour) ☐ Brief
   - Other: _____

4. Approximate dates of flooding event. If you don't remember leave blank.
   _____

5. What do you feel is the cause or major contributing factor to the flooding in your area?
   _____
   _____

6. What is your most important outcome of the Stormwater Master Plan Update?
   ☐ Reduce Flooding ☐ Repair System ☐ Improve Water Quality
   ☐ Other _____

7. Would you be willing to participate in a citizen's volunteer program to assist in the implementation of the Stormwater Master Plan?
   ☐ Yes ☐ No ☐ Maybe

8. Please provide any additional comments regarding drainage, flooding and/or water quality issues that you believe are of concern in your area. Include any ideas for improvements
   _____
   _____

Melbourne Beach, Florida **April 11, 2007**
Stormwater Questionnaire

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RESPONDENT'S NAME (Optional): Sandy Wilson

PHONE NUMBER (Optional): 768-2002

ADDRESS (Please include): 410 Sunset Blvd

1. How many years at the above address?
   ☐ 0-2 years ☐ 2-5 years ☐ 5-10 years ☑ 10 + years

2. Have you experienced flooding at this location?
   ☑ Yes ☐ No

3. Type and Duration of flooding (Check all that apply).
   - Yard ☐ Major ☐ Minor ☑ Extended (24+ hour) ☐ Brief
   - Street ☐ Major ☐ Minor ☑ Extended (24+ hour) ☐ Brief
   - Other: _____

4. Approximate dates of flooding event. If you don't remember leave blank.
   Past Hurricanes

5. What do you feel is the cause or major contributing factor to the flooding in your area?
   Low spots along Street

6. What is your most important outcome of the Stormwater Master Plan Update?
   ☑ Reduce Flooding ☑ Repair System ☐ Improve Water Quality
   ☐ Other _____

7. Would you be willing to participate in a citizen's volunteer program to assist in the implementation of the Stormwater Master Plan?
   ☑ Yes ☐ No ☐ Maybe

8. Please provide any additional comments regarding drainage, flooding and/or water quality issues that you believe are of concern in your area. Include any ideas for improvements
   Fix Basin 9

Do we have Large Grant $ 600K?

Melbourne Beach, Florida **April 11, 2007**
Stormwater Questionnaire

The Town of Melbourne Beach (Town) is in the process of updating the Stormwater Master Plan. This questionnaire will assist the Town in addressing the most pressing needs of the community. Participation in this survey is voluntary. Your cooperation is greatly appreciated.

RESPONDENT'S NAME (Optional): PAUL S GUGLIOTTI

PHONE NUMBER (Optional): _____

ADDRESS (Please include): 404 SURF ROAD & 318 4/4 AVE

1. How many years at the above address?
   ☐ 0-2 years ☐ 2-5 years ☒ 5-10 years ☐ 10 + years

2. Have you experienced flooding at this location?
   ☒ Yes ☐ No

3. Type and Duration of flooding (Check all that apply).
   - Yard ☐ Major ☐ Minor ☐ Extended (24+ hour) ☐ Brief
   - Street ☐ Major ☐ Minor ☐ Extended (24+ hour) ☐ Brief
   - Other: _____

4. Approximate dates of flooding event. If you don't remember leave blank.
   April 9, 2007

5. What do you feel is the cause or major contributing factor to the flooding in your area?
   OLD SYSTEM THAT IS OUT OF DATE

6. What is your most important outcome of the Stormwater Master Plan Update?
   ☒ Reduce Flooding ☐ Repair System ☒ Improve Water Quality
   ☐ Other _____

7. Would you be willing to participate in a citizen's volunteer program to assist in the implementation of the Stormwater Master Plan?
   ☒ Yes ☐ No ☐ Maybe

8. Please provide any additional comments regarding drainage, flooding and/or water quality issues that you believe are of concern in your area. Include any ideas for improvements

STAFF INTERVIEWS

Melbourne Beach - SMP Interview Sheet

Project Number - 13190-006-01

Name	Job Title	Date
JIM BURSICK	TOWN MANAGER	4-12-07

	Question	Response
1	How long have you worked for the Town?	1+ yr
2	Identify stormwater problems areas.	• Sixth Ave. • HAGAMAN/ANDREWS • Pine St. 1st – 4th • 1st behind Town Hall • OCEAN AVE - AGED PIPE • Discharge into Canals/Lagoon losing depth of canals. (10-15 was 45 is)
3	Do you have a system for documenting problem areas, citizen comments and follow-up?	• Staff ID's problem & eval. repair/funding • Respond directly to citizens concerns
4	Provide information regarding the cost to maintain the stormwater system and to respond and follow-up to citizen issues.	• Jane Antonsen • Larry Hosmer - good source - Stormwater Utility used for maint + upgrades.
5	What is your impression of the usefulness of the current Stormwater Master Plan?	• Useful • Cost outdated, • Accuracy unknown.
6	What do you want out of a Stormwater Master Plan?	• Current costs of necessary improvements • Prioritization - maximize function - meet state req. • Set up to address TMDL's.
7	Is the NPDES Phase II permit being followed?	• To certain extent • Compliance improved •
8	What is your impression of the Stormwater Utility Rate?	• On low end. •
9	How is the Stormwater Utility Fee being used and adjusted?	• Some operating costs in past • Strictly repairs to system, accum. as matching funds.
10	Describe Stormwater Utility maintenance schedule and procedures.	• Larry Hosmer • Baffle Boxes - Brevard County + catch basins.
11	General feedback.	• Heading in right direction. •

Melbourne Beach - SMP Interview Sheet

Project Number - 13190-006-01

Name	Job Title	Date
Bill Whitelock	Building Official	4.12.07

	Question	Response
1	How long have you worked for the Town?	6 months
2	Identify stormwater problems areas.	• Sixth Ave • Anchor Key
3	Do you have a system for documenting problem areas, citizen comments and follow-up?	• Possibly Larry H • Report citizen concerns to Public Works.
4	Provide information regarding the cost to maintain the stormwater system and to respond and follow-up to citizen issues.	• N/A
5	What is your impression of the usefulness of the current Stormwater Master Plan?	• Not very • Could more practical
6	What do you want out of a Stormwater Master Plan?	• Help keep contractors accountable. • Easily ID problems • Simple monitor of effluent. • Possibly in-house.
7	Is the NPDES Phase II permit being followed?	• Not sure. • Documenting constr. household •
8	What is your impression of the Stormwater Utility Rate?	• N/A
9	How is the Stormwater Utility Fee being used and adjusted?	• N/A
10	Describe Stormwater Utility maintenance schedule and procedures.	• N/A
11	General feedback.	• Constr. site compliance •

Melbourne Beach - SMP Interview Sheet

Project Number - 13190-006-01

Name	Job Title	Date
JANE ANTONSEN	ACCOUNTANT	4/12/07

	Question	Response
1	How long have you worked for the Town?	2½ yrs.
2	Identify stormwater problems areas.	•6th Ave, Pine St, Street in the North Part of Town OCEAN AVE.
3	Do you have a system for documenting problem areas, citizen comments and follow-up?	PUBLIC WORKS/TOWN MANAGER
4	Provide information regarding the cost to maintain the stormwater system and to respond and follow-up to citizen issues.	
5	What is your impression of the usefulness of the current Stormwater Master Plan?	NOT ACQUAINTED WITH CURRENT PLAN Prioritize work to be done and do work in a way that only needs to be done once.
6	What do you want out of a Stormwater Master Plan?	An ability to identify remedies & costs so that we can come up w/appropriate methods of financing
7	Is the NPDES Phase II permit being followed?	•I think so
8	What is your impression of the Stormwater Utility Rate?	•Inadequate
9	How is the Stormwater Utility Fee being used and adjusted?	•Has been used for storm drain repairs. Used appropriately
10	Describe Stormwater Utility maintenance schedule and procedures.	.See Public works.
11	General feedback.	

Melbourne Beach - SMP Interview Sheet

Project Number - 13190-006-01

Name	Job Title	Date
LARRY HOSMER	Superintendent of PW	4/12/07

	Question	Response
1	How long have you worked for the Town?	8+ yrs. 1½ yr+ as superintendant of PW
2	Identify stormwater problems areas.	• Field visit 6th, Pine St. (low priority)
3	Do you have a system for documenting problem areas, citizen comments and follow-up?	• Notebook • log complaints, investigate, follow-up.
4	Provide information regarding the cost to maintain the stormwater system and to respond and follow-up to citizen issues.	• Respond to issues as they are reported. • Town staff does not differentiate stormwater work other than log. • Work done by contractors
5	What is your impression of the usefulness of the current Stormwater Master Plan?	• Inaccurate • Really not utilized.
6	What do you want out of a Stormwater Master Plan?	• Scheduled maintenance/upgrading. • Affordable options of PVC vs concrete pipe. (concrete seams move w/sand)
7	Is the NPDES Phase II permit being followed?	• Yes • Larry Hosmer maintains significant amount of documentation. •
8	What is your impression of the Stormwater Utility Rate?	• N/A • Possibly inadequate.
9	How is the Stormwater Utility Fee being used and adjusted?	• Repairs • Saved for matching funds.
10	Describe Stormwater Utility maintenance schedule and procedures.	• Budget precludes maintaining a maint. schedule • Clean inlets regularly and documentation •
11	General feedback.	• PVC vs concrete - joint issues. 70% of problems - shifting sand/joints CMP deteriorating.

• County pumped out pipe.

APPENDIX D

2002 MELBOURNE BEACH MASTER STORMWATER PLAN EXCERPTS

EXCERPTS FROM

MASTER STORMWATER PLAN

FOR

TOWN OF MELBOURNE BEACH

MELBOURNE BEACH TOWN OFFICIALS

Bob Wille	Mayor
Connie Smith	Vice Mayor
Mark Crispen	Commissioner
Paul Guglietta	Commissioner
Steve Walters	Commissioner
Bill Hoskovec	Town Manager
Cynthia Masny	Town Clerk
Vincent Powers	Public Works Director

MARCH 29, 2002
PROJECT NO. E 109-CC2001-4

BOOK 1 OF 2

OUTLAW & JONES ENGINEERS, INC.
Consulting Civil Engineers
Since 1953

1222 North Harbor City Boulevard · Melbourne, Florida 32935
(321) 254-9721 · FAX (321) 242-7854 · Email: ORS1@earthlink.net

TABLE OF CONTENTS

PROJECT

GOALS

PROJECT GOALS

The master stormwater plan was developed for the Town of Melbourne Beach to deal with two existing basic problems. The first of these basic problems was the elimination of standing water at various intersections. This situation will be remedied by the installation of intermittent swales, inlets, exfiltration pipes, baffle boxes and the replacing of deteriorating or undersized culverts. The second basic problem was to reduce the discharge of the sediment, pollutants and other deleterious materials. These conditions will be handled by the same processes as used in the elimination of standing water as stated above. The quality of effluent being discharged to Indian River will be improved using these proposals.

Another objective of the project was to set priorities for portions of the total project in order that a manageable sized project could be undertaken. This would also make it possible to complete the most pressing problem area in an efficient manner. In addition, small projects could be undertaken so that it would be in accordance with the plan and would be compatible in the future when further projects are constructed.

EXISTING

STORMWATER

MANAGEMENT

SYSTEM

EXISTING STORMWATER MANAGEMENT SYSTEM

The Town of Melbourne Beach is the oldest beach front community in Brevard County, Florida. The Town is approximately one square mile in area. The Town of Melbourne Beach has a drainage infrastructure which is approximately 60 years old, and has 18 outfalls to the Indian River Lagoon and a canal system in Harbor East Subdivision. Basin 19 outfalls to the Atlantic Ocean. The system contains CMP (Corrugated Metal Pipe) and RCP (Reinforced Concrete Pipe), curbs and gutters, inlets, baffle boxes, and roadside swales. Table I provides a breakdown of information for each basin.

The Town of Melbourne Beach is located on the barrier island in South Brevard County, Florida. The City limits consists of single-family residences averaging 3,000 ± square feet, multi-family residences, commercial businesses along Ocean Avenue and State Route A1A (Miramar Avenue and Atlantic Avenue). The town is approximately 98% built out which leaves a few small, scattered, undeveloped parcels.

Three typical types of street cross sections exist in Town. The first being a section without curb and gutter, the second being a section with standard curb and gutter, and a third being a modified curb and gutter section. Figure 1 shows the three typical cross sections.

The existing stormwater management system for the Town of Melbourne Beach is shown in EXHIBIT 1-1 through 1-5 - Existing Conditions and EXHIBIT 3 - Existing Drainage Structure and Pipe Data Table. The existing stormwater management system is further detailed in APPENDIX "B" - Existing System Input Data and APPENDIX "C" - Existing System Model Output.

TABLE I
Town of Melbourne Beach
Stormwater Master Plan
Prepared By: Outlaw, Rice and Jones, Inc.
Basin Data
Project Number E109-CC2001-4

Basin Name	Total Area		Impervious Area						Pervious Area		Existing Development Breakdown					
			House	Roadway	Driveways	Sidewalk	Total				Residential		Commercial		Instutional	
	Square Feet	Acres	SF	SF	SF	SF	SF	Acre	SF	Acre	Area Acres	Percent	Area Acres	Percent	Area Acres	Percent
Basin 1	3,860,868	88.63	576,000	342,400	312,000	0	1,230,400	28.25	2,630,468	60.39	88.63	100.00	0.00	0.00	0.00	0.00
Basin 2	674,325	15.48	78,000	42,550	39,000	0	159,550	3.66	514,775	11.82	15.48	100.00	0.00	0.00	0.00	0.00
Basin 3	2,251,712	51.69	309,000	204,640	159,000	0	672,640	15.44	1,579,072	36.25	51.69	100.00	0.00	0.00	0.00	0.00
Basin 4	1,029,202	23.63	99,000	92,200	45,000	0	236,200	5.42	793,002	18.20	23.63	100.01	0.00	0.00	0.00	0.00
Basin 5	2,771,253	63.62	222,000	341,230	74,000	22,080	659,310	15.14	2,111,943	48.48	35.05	55.10	24.11	37.90	4.45	7.00
Basin 6	428,493	9.84	63,000	35,900	21,000	0	119,900	2.75	308,593	7.08	9.84	100.00	0.00	0.00	0.00	0.00
Basin 7	347,060	7.97	54,000	52,900	19,000	200	126,100	2.89	220,960	5.07	7.97	100.00	0.00	0.00	0.00	0.00
Basin 8	2,184,671	50.15	312,000	184,810	110,000	0	606,810	13.93	1,578,061	36.23	45.84	91.40	2.36	4.70	1.98	3.90
Basin 9	3,979,732	91.36	639,000	342,030	230,000	0	1,211,030	27.80	2,768,702	63.56	91.36	100.00	0.00	0.00	0.00	0.00
Basin 10	3,844,071	88.25	582,000	365,100	204,000	77,360	1,228,460	28.20	2,815,611	80.05	88.25	100.00	0.00	0.00	0.00	0.00
Basin 11	829,200	19.04	123,000	60,400	42,000	0	225,400	5.17	603,800	13.86	19.04	100.00	0.00	0.00	0.00	0.00
Basin 12	205,442	4.72	42,000	17,030	15,000	0	74,030	1.70	131,412	3.02	4.72	100.00	0.00	0.00	0.00	0.00
Basin 13	264,818	6.08	57,000	10,030	18,000	0	85,030	1.95	179,788	4.13	6.08	100.00	0.00	0.00	0.00	0.00
Basin 14	172,509	3.96	36,000	10,030	12,000	0	58,030	1.33	114,479	2.63	3.96	100.00	0.00	0.00	0.00	0.00
Basin 15	246,915	5.67	15,000	16,200	5,000	4,000	40,200	0.92	206,715	4.75	5.67	100.00	0.00	0.00	0.00	0.00
Basin 16	286,969	6.59	60,000	22,790	19,000	0	101,790	2.34	185,179	4.25	6.59	100.00	0.00	0.00	0.00	0.00
Basin 17	157,823	3.62	27,000	14,160	9,000	0	50,160	1.15	107,663	2.47	3.62	100.00	0.00	0.00	0.00	0.00
Basin 18	609,028	13.98	96,000	35,520	32,000	0	163,520	3.75	445,508	10.23	13.98	100.00	0.00	0.00	0.00	0.00
TOTALS	**24,144,091**	**554.27**	**3,390,000**	**2,189,720**	**1,366,000**	**103,640**	**7,048,360**	**161.81**	**17,095,731**	**392.46**	**521.39**	**94.07**	**26.47**	**4.78**	**6.41**	**1.16**

EXISTING CONDITIONS
TYPICAL SECTIONS

NO CURB

CURB AND GUTTER

MODIFIED CURB

FIGURE 1

Stormwater outfalls exist throughout the Town and discharge into the Indian River Lagoon. TABLE II indicates the location, outfall size, capacity each is limited to, tributary drainage area and estimated limiting discharge for the 5-year 24-hour storm of 5.5" rainfall.

Stormwater outfalls are located at South Palm Avenue and Riverside Drive, Hibiscus Trail and Riverside Drive, Riverside Circle and Riverside Drive, Sunset Boulevard and Riverside Drive, Avenue "B" and Riverside Drive, Avenue "A" and Riverside Drive, Ocean Avenue and Riverside Drive, Second Avenue at River, Sixth Avenue at the river, 410 block of Driftwood Avenue, 450 block of River View Lane, Sandy Key at cul-de-sac, Pelican Key at cul-de-sac, 1900 block of Neptune Drive, Anchor Key at cul-de-sac, 430 Riverview Lane and 400 River View Lane.

See EXHIBIT 1 and TABLE II for location and pertinent information.

TABLE II

Location of Outfall along Indian River	Existing Outfall Size	Available Outfall Culvert Capacity in CFS	Drainage Area	Basin Existing Discharge Capacity
(1) South Palm Trail	36" RCP	103.22	88.63	16.73
(2) Hibiscus Trail	24" CMP	8.87	15.48	11.13
(3) Riverview Circle	18" RCP	19.45	51.69	15.26
(4) Sunset Blvd.	48" RCP	225.6	23.63	18.62

Location of Outfall along Indian River	Existing Outfall Size	Available Outfall Culvert Capacity in CFS	Drainage Area	Basin Existing Discharge Capacity
(5) Ocean Avenue	48" RCP	142.86	63.62	53.11
(6) Avenue "B"	24" RCP	41.04	9.84	7.71
(7) Avenue "A"	24" RCP	37.81	7.97	7.99
(8) Second Avenue	24" RCP	17.46	50.15	0.31
(9) Sixth Avenue	24" CMP	14.362	91.36	3.45
(10) Oak Street	48" RCP	37.78	88.25	54.99
(11) Driftwood Avenue	24" RCP	33.97	19.04	25.59
(12) 450 River View Lane	24" RCP	26.12	4.72	3.70
(13) Sandy Key	24" RCP	11.66	6.08	4.37
(14) Pelican Key	None	3.96	2.58	
(15) Neptune Drive	24" RCP	37.58	5.67	11.71
(16) Anchor Key	None	6.59	0.53	
(17) 430 River View Lane	18" RCP	11.72	3.62	9.45
(18) 400 River View Lane	24" RCP	18.05	13.98	15.13

WATER TABLE

The water table follows the profile of the land, from east to west, with the depth to seasonal high water table ranging from 40 to 60 inches in the western areas to greater than 120 inches along the beaches in the east. Generally, at the Indian River side of the barrier island, the water table depth is shallow with the deeper water table occurring in the eastern portions of the Town. It is known that the deeper the water table, the better the exfiltration of stormwater will function. Thus, the majority of the exfiltration of stormwater will be located in the easternmost reaches of the watershed.

BASINS

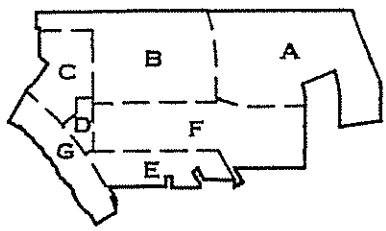
The Town of Melbourne Beach between Riverside Drive and State Route A1A contains approximately 602 acres in 19 basins. See EXHIBIT 1-1

Basins 1-18 discharge through outfall pipes into the Indian River Lagoon or into the Harbor East canal system that in turn empties into the Indian River Lagoon. Basin 19 discharges to the Atlantic Ocean.

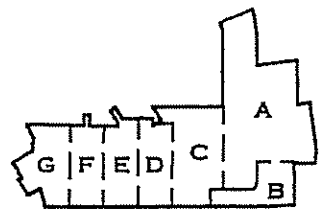
Sub-basins were created in five of the nineteen basins in order to better represent actual conditions in the stormwater model. Figure 2 provides a general diagram of the sub-basin relationship.

Hydrographic studies of the Indian River Lagoon have identified degradation of groundwater quality due to development. The degradation is the result of irrigation wells, wells for water to cool air-conditioning, and a continued increase in run-off due to development. Therefore, the Town of Melbourne Beach, in conjunction with St. Johns River Water Management District have authorized this study in an effort to improve the water quality of the stormwater discharge conditions of the drainage outfalls to the Indian River Lagoon System as much as is reasonably possible

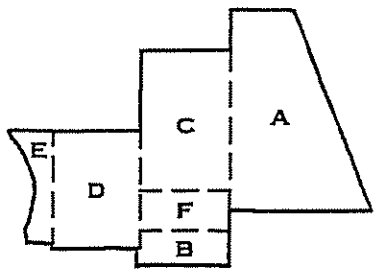
EXISTING SUB-BASINS



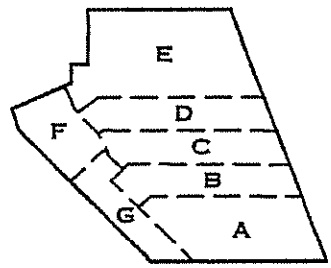
BASIN 1



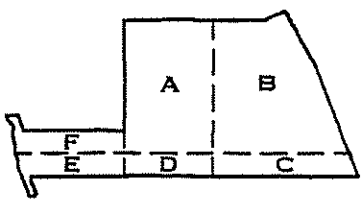
BASIN 3



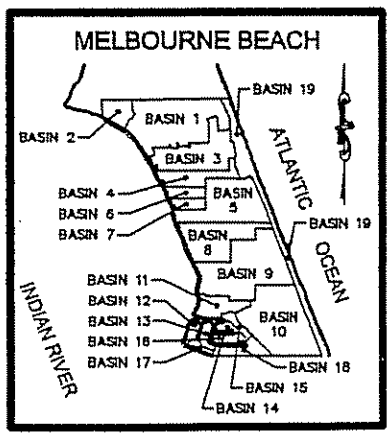
BASIN 9



BASIN 10



BASIN 5



KEYMAP

NOT TO SCALE

FIGURE 2

The following is a basin by basin summary of the existing stormwater management system for the Town of Melbourne Beach.

Basin 1

This basin consists of one hundred ninety residential lots. The outfall for this basin is a thirty six inch reinforced concrete pipe installed between Lots 6 and 7, The River Colony, West Section, Block "K".

The stormwater management system has standing water in locations where the existing pipes are too small or a deteriorated condition exists. Further, the stormwater management system discharges suspended solids, nitrogen, phosphorous, heavy metals, etc. per the model in Appendix "A".

Basin 2

This basin consists of twenty six residential lots. The outfall for the basin is a twenty four inch corrugated metal pipe installed between Lots 2 and 3, Sunset Shores, Block "A".

The stormwater management system function is an acceptable manner hydraulically. However, the stormwater management system discharges pollutants such as suspended solids, nitrogen, phosphorous, etc. to the Indian River Lagoon.

Basin 3

This basin consists of one hundred thirty eight residential lots. The outfall for the basin is an eighteen inch reinforced concrete pipe installed at the south part of Lot 2 in The Indian River Colony, West Section, Block "K".

The stormwater management system does not function well hydraulically. The stormwater management system has undersized pipe and deteriorated pipes and inlets. This system connects to the Indian River Lagoon without detention/retention and thus transmits suspended solids and other pollutants.

Basin 4

This basin consists of forty nine residential lots. The outfall for the basin is a forty eight inch reinforced concrete pipe located on the south side of Sunset Boulevard.

The stormwater management system functions well hydraulically. Also, this stormwater management system connects to the Indian River Lagoon and thus transmits pollutants.

Basin 5

The basin consists of eighty eight residential lots, thirty four business lots, two commercial lots, and three industrial lots. The outfall for this basin is a forty eight inch reinforced concrete pipe situated on the north side of Ocean Avenue. A baffle box is located just west of Riverside Drive on the outfall pipe.

The stormwater management system has pockets of standing water due to undersized pipes and deteriorated pipes and inlets. The existing baffle box reduces the transmission of suspended solids. Other pollutants (nitrogen, phosphorous, etc.) are still transported to the Indian River Lagoon.

Basin 6

This basin consists of twenty five residential lots. The outfall for the basin is a twenty four inch reinforced concrete pipe which is located in Avenue "B" right-of-way.

The stormwater management system functions well hydraulically. However, there are not any treatment facilities within this basin and therefore, pollutants are transported to the Indian River Lagoon.

Basin 7

This basin consists of twenty two residential lots. The outfall for the basin is a twenty four inch reinforced concrete pipe which is located in Avenue "A" right-of-way.

This basin's stormwater management system also functions well hydraulically. The stormwater management system transports pollutants such as suspended solids, nitrogen and phosphorous to the Indian River Lagoon.

Basin 8

This basin consists of one hundred eight residential lots, six business lots, and two industrial lots. The outfall for this basin is a twenty four inch reinforced concrete pipe which is located on the south side of Second Avenue.

The stormwater management system is functioning well hydraulically. As with previous basins, there are not any treatment facilities and thus pollutants are transported to the Indian River Lagoon.

Basin 9

This basin consists of two hundred thirty six residential lots plus four multi-family unit lots. The outfall for this basin is a twenty four inch corrugated metal pipe and is located on the north side of Sixth Avenue.

The stormwater management system is not functioning well hydraulically. There are areas of standing water due to undersized pipe and deteriorated pipes and inlets. As with other basins, the system transports pollutants to the Indian River Lagoon due to a lack of retention, detention or other similar facilities.

Basin 10

This basin consists of one hundred ninety five residential lots and nine multi-family residence properties. The outfall for this basin is a forty eight inch corrugated metal pipe which outfalls into

the canal between Lots 66 and 67 located in Harbor East Subdivision. A baffle box is in this system located on the east side of Oak Street just to the south of Cherry Drive.

The stormwater management system functions well hydraulically. The existing baffle box reduces the quantity of suspended solids being transported to the Indian River Lagoon. However, there are no treatment facilities and thus, nitrogen, phosphorous and other pollutants are transported to the Indian River Lagoon.

Currently, Brevard County is evaluating a portion of this basin for possible improvements. The design plans, permit and documentation will be on file at the Town of Melbourne Beach Town Hall when completed.

Basin 11

This basin consists of thirty nine residential lots. The outfall for this basin is a twenty four inch reinforced concrete pipe and lays between Lots 8 and 9 of Harbor East Subdivision.

The stormwater management system functions well hydraulically. However, as with other basins, the pollutants are transported to the Indian River Lagoon due to an absence of treatment facilities.

Currently, Brevard County is evaluating a portion of this basin for possible improvements. The design plans, permit and documentation will be on file at the Town of Melbourne Beach Town Hall when completed.

Basin 12

This basin contains fourteen residential lots. The outfall for this basin is a twenty four inch reinforced concrete pipe that outfalls to the canal between Lots 107 and 108 in the Harbor East Subdivision

The stormwater management system is functioning well hydraulically. The stormwater management system lacks treatment facilities and thus transports pollutants to the Indian River Lagoon.

Currently, Brevard County is evaluating a portion of this basin for possible improvements. The design plans, permits and documentation will be on file at the Town of Melbourne Beach Town Hall when completed.

Basin 13

This basin contains nineteen residential lots. The outfall for this basin is a twenty four inch reinforced concrete pipe that outfalls to the canal between Lots 91 and 92 in the Harbor East Subdivision.

The stormwater management system functions well hydraulically. Due to a lack of treatment facilities, the stormwater management system transports pollutants to the Indian River Lagoon.

Currently, Brevard County is evaluating a portion of this basin for possible improvements. The design plans, permits and documentation will be on file at the Town of Melbourne Beach Town Hall when completed.

Basin 14

This basin consists of twelve residential lots. This basin does not have a formal outfall. The runoff is intended to percolate to the groundwater table by an existing exfiltration system which does not function due to siltation. Currently, an independent engineering study is being completed by others for the improvement of the stormwater management system for this basin. When available, this report will be at the Town of Melbourne Beach Town Hall.

Basin 15

This basin consists of twelve residential lots. The outfall for this basin is a twenty four inch reinforced concrete pipe located between Lots 2 and 33 in Harbor East Subdivision.

The stormwater management system functions well hydraulically. This system also has a lack of treatment facilities and thus, is transporting pollutants to the Indian River Lagoon.

Currently, Brevard County is evaluating a portion of this basin for possible improvements. The design plans, permits and documentation will be on file at the Town of Melbourne Beach Town Hall when completed.

Basin 16

This basin consists of twenty one residential lots. The stormwater management system functions poorly from a hydraulic perspective. The stormwater management system consists of an undersized, resident installed pipe and a plugged exfiltration system. Currently, an independent engineering study is being completed by others for the improvement of the drainage system. When available, this independent design study will be at the Town of Melbourne Beach Town Hall.

Basin 17

This basin contains 10 residential lots. The outlet for this basin is an eighteen inch reinforced concrete pipe that outfalls to the canal system between Lots 99 and 100 in the Harbor East Subdivision.

The stormwater management system functions well hydraulically. This system also has no treatment facilities and transports pollutants to the Indian River Lagoon.

Currently, Brevard County is evaluating a portion of this basin for possible improvements. The design plans, permits and documentation will be on file at the Town of Melbourne Beach Town Hall when completed.

Basin 18

This basin contains 30 residential lots plus a lot that is occupied by a church. The outfall for this basin is a twenty four inch reinforced concrete pipe that outfalls to the canal system between Lots 72 and 73 in the Harbor East Subdivision.

The stormwater management system functions well hydraulically. As with most other basins, the system has no treatment facilities and transports pollutants to the Indian River Lagoon.

Currently, Brevard County is evaluating a portion of this basin for possible improvements. The design plans, permits and documentation will be on file at the Town of Melbourne Beach Town Hall when completed.

Basin 19

This basin is east of State Road A1A and extends from the south town limit to the north town limit. The runoff from this basin is percolated into the groundwater table through the existing well drained soils. Since this basin does not contribute runoff to the Indian River Lagoon, it will not be evaluated for this stormwater master plan.

EXISTING

SOILS

INFORMATION

EXISTING SOIL INFORMATION

The soils maps of Brevard County as published by USDA, Soil Conservation Service for Melbourne Beach, indicates the following soil types exist in Melbourne Beach. The SCS classification of hydrologic soil grouping is used to determine the runoff coefficient for modeling

TABLE III shows the soils that are existing in Melbourne Beach.

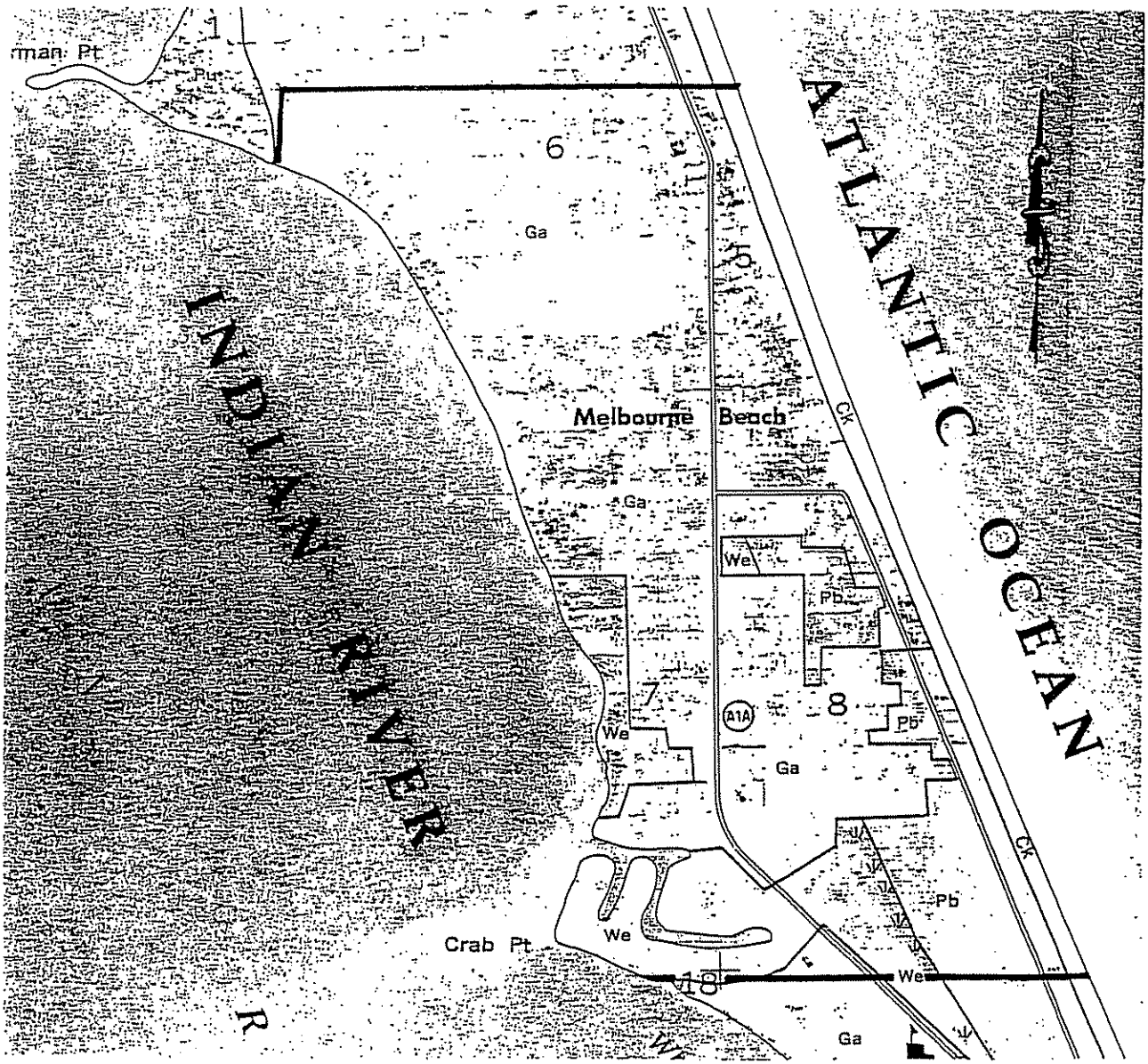
SOILS IN MELBOURNE BEACH

TABLE III

Pu - Pomello	Urban Land Complex C
Ga - Galveston Sand	Urban Land Complex A
We - Welaka Sand	Urban Land Complex A
Pb - Palm Bay Sand	Urban Land Complex A

The Pomello (Pu) Soil is an extremely small percentage of the soil in Melbourne Beach. Therefore, a SCS Type "A" hydrologic soil will be used for the entire area as shown in Figure 3.

SOIL SURVEY OF MELBOURNE BEACH, FLORIDA



SOIL SURVEY OF MELBOURNE, FLORIDA

PROVIDED BY: UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

ISSUED: NOVEMBER 1974

FIGURE 3

FEDERAL

INSURANCE

INFORMATION

FEDERAL INSURANCE INFORMATION

Federal Emergency Management Agency Maps showing the flood insurance rate map areas (Figure 4). The entire area is rated "X", unshaded, which is above the five hundred year flood . Other areas rated in the one hundred year flood are as follows:

Zone A - No base flood elevation determined.

Zone AE - Base flood elevation determined.

Zone AH - Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

Zone AO - Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

Zone A99 - To be protected from 100-year flood by Federal Flood Protection System under construction; no base elevations determined.

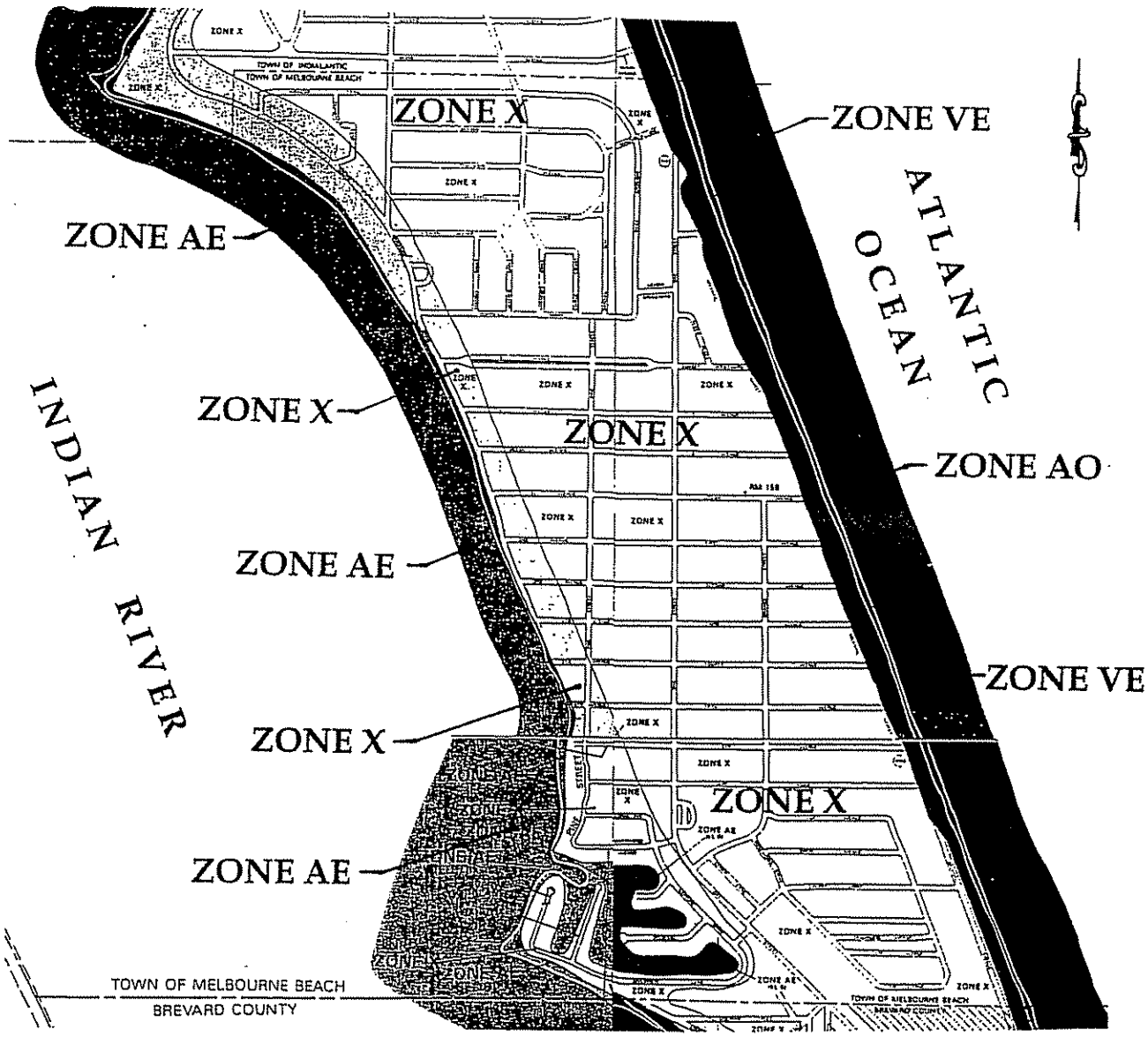
Zone V - Coastal flood with velocity hazard (wave action); no base flood elevations determined.

Zone VE - Coastal flood with velocity hazard (wave action); base flood elevations determined.

Zone X (shaded) - Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than one square mile; and areas protected by levees from 100-year flood.

The Town of Melbourne Beach has a minimal amount of properties that are in the AE flood zone and in the VE coastal flood velocity hazard zone as shown in Figure 4. Further, the flood zone elevations are used to determine the tailwater elevations in the Indian River Lagoon.

FLOOD MAP OF MELBOURNE BEACH, FLORIDA



PROVIDED BY: NATIONAL FLOOD INSURANCE PROGRAM

REVISED: APRIL 3, 1989 AND AUGUST 18, 1992

FIGURE 4

METHODOLOGY

OF

EVALUATION

METHODOLOGY OF EVALUATION

The drainage infrastructure for Melbourne Beach was constructed in the 50's and 60's which is prior to present stormwater treatment rules and current standards for water quality.

The following are the calculations of the overall basin curve numbers using SCS TR 55.

DCIA - Directly Connected Impervious Area

I_a - Impervious Area

T_a - Total Area

CN_s - Curve Number Impervious

CN_p - Curve Number Pervious

CN - Weighted Curve Number

The development of Melbourne Beach has continued over the last half of the 20th Century and yielded a condition where approximately 29 percent (29%) of the Town has impervious surfaces due to residential and commercial structures and improvements. There is an additional impervious area of approximately 29 percent (29%) in the Town that consists of paved highways, streets and sidewalks. All of the impervious areas drain into the existing stormwater drainage facilities. Using these impervious percentages, the runoff coefficient is calculated to be C = 69.8. The total impervious area in the Town is approximately 58 percent (58%).

CURVE NUMBER CALCULATION

	DCIA%	I_a/T_a	$(T_a-I_a)/I_a$	CN_s	CN_p	CN
1	27.83	.259	.741	98	61	70.6
2	26.67	.190	.810	98	57	64.8
3	30.42	.245	.755	98	61	70.1
4	39.03	.194	.806	98	54	62.5
5	51.75	.217	.783	98	61	69.0
6	29.94	.243	.757	98	61	70.0
7	41.95	.326	.674	98	61	73.1
8	30.43	.227	.773	98	61	69.4
9	44.76	.262	.738	98	61	70.7
10	29.72	.281	.719	98	61	71.4
11	26.80	.233	.767	98	61	69.6
12	23.00	.310	.690	98	61	72.5
13	11.80	.272	.728	98	61	71.1
14	17.28	.287	.713	98	61	71.6
15	40.30	.146	.854	98	61	66.4
16	22.39	.346	.654	98	61	73.8
17	13.91	.261	.739	98	61	70.7
18	21.72	.228	.772	98	61	69.4
(Average)	29.42				(Average)	69.8

TABLE IV provides a summary of total area, impervious area, pervious area and runoff coefficient for the Town of Melbourne Beach basins which outfall to the Indian River Lagoon.

TABLE IV

Basin	Total Acres	Impervious Area Ac.	PerviousArea Ac.	Runoff Coefficient
1	88.63	28.25	60.39	70.6
2	15.48	3.66	11.82	64.8
3	51.69	15.44	36.25	70.1
4	23.63	5.42	18.20	62.5
5	63.62	15.14	48.48	69.0
6	9.84	2.75	7.08	70.0
7	7.97	2.89	5.07	73.1
8	50.15	13.93	36.23	69.4
9	91.36	27.80	63.56	70.7
10	88.25	28.20	60.05	71.4
11	19.04	5.17	13.86	69.6
12	4.72	1.70	3.02	72.5
13	6.08	1.95	4.13	71.1
14	3.96	1.33	2.63	71.6
15	5.67	0.92	4.75	66.4

Basin	Total Acres	Impervious Area Ac.	Pervious Area Ac.	Runoff Coefficient
16	6.59	2.34	4.25	73.8
17	3.62	1.15	2.47	70.7
18	13.98	3.75	10.23	69.4
Average				69.8
TOTAL	**554.27**	**161.81**		

PIPE CAPACITY CALCULATIONS

TYPICAL CALCULATION

Mannings formula to determine Q.

$AV = (\pi d^2)/4 \times 1.486/n \times r^{2/3} \times s^{1/2}$

(for 1st Basin) $= (\pi(2)^2)/4 \times 1.486/.025 \times (2/4)^{2/3} \times (1.73/304)^{1/2}$

$= \pi \times 59.44 \times .629 \times .075$

$= 8.84$ CFS

n = Mannings Roughness Coefficient (0.025 CMP, 0.009 PVC, 0.011 RCP)

R = Hydraulic Radius (Area/Wetted Perimeter)

S = Slope in ft./ft.

A = Cross Sectional Area (s.f.) $Ft.^2$

V = Velocity (F.P.S.) Ft/Sec

Q = Flow (c.f.s.) Ft^3/Sec

PROPOSED

STORMWATER

MANAGEMENT

SYSTEM

PROPOSED STORMWATER MANAGEMENT SYSTEM IMPROVEMENTS

The proposed stormwater management system improvements to be installed will achieve the goals of the stormwater master plan and will include baffle boxes on every outfall, curb inlet baskets in all curb inlets, inlet baskets on all drop inlets, exfiltration pipe, swales and replacement of deteriorated piping and inlets. The new inlets will not have bottoms in order to facilitate the exfiltration of surface water. At various locations, weirs and orifices will be installed in the inlets with the top of the weir at the top of the outlet pipe and an orifice at the flow line of the outlet pipe.

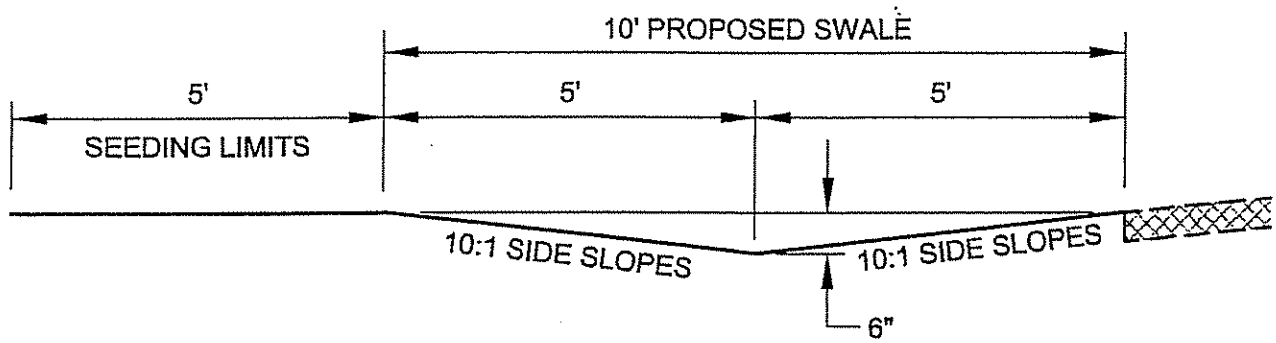
In order to improve water quality, several methods have been employed. First, inlets and exfiltration pipes will be installed at intersections so that water can flow into pipes rather than ponding prior to overflow intersecting streets. Second, swales will be graded at various locations in both non-curbed and curbed sections using flumes to conduct water to swales from curbed sections. Third, an exfiltration system in which inlets, flumes, and exfiltration pipes will be installed at intermediate locations between streets. Fourth, curb inlet baskets and grate inlet baskets will be installed in each inlet. Refer to Figures 5, 6, 7, and 8 for details. Figure 9 provides a general schematic drawing of a recommended baffle box.

The benefits to be derived by the proposed system are as follows: 1) the standing water will be reduced and/or eliminated; 2) the water quantity entering the Indian River Lagoon will be reduced;

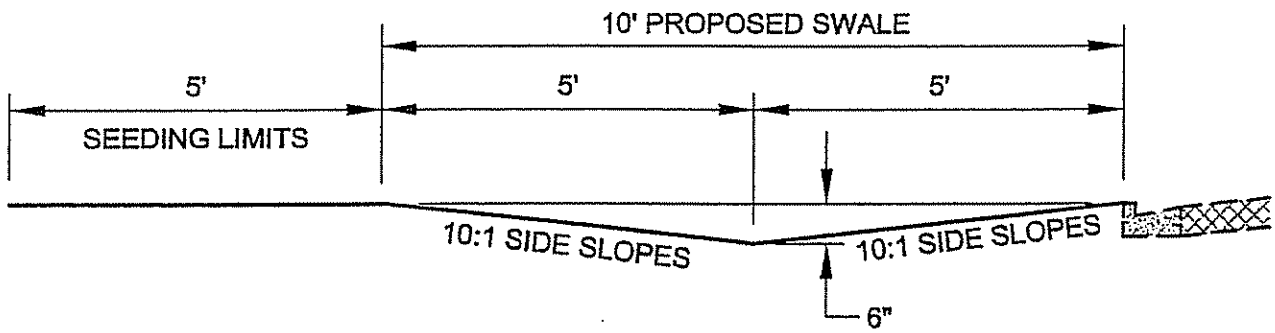
3) pollutants such as suspended solids, nitrogen, phosphorus, metals, etc. discharging to the Indian River Lagoon will be reduced; 4) discharges to the Indian River Lagoon will be spread over a long period of time allowing removal of pollutants.

Please see EXHIBITS 2-1 through 2-4 for the proposed Stormwater Master Plan and Improvements.

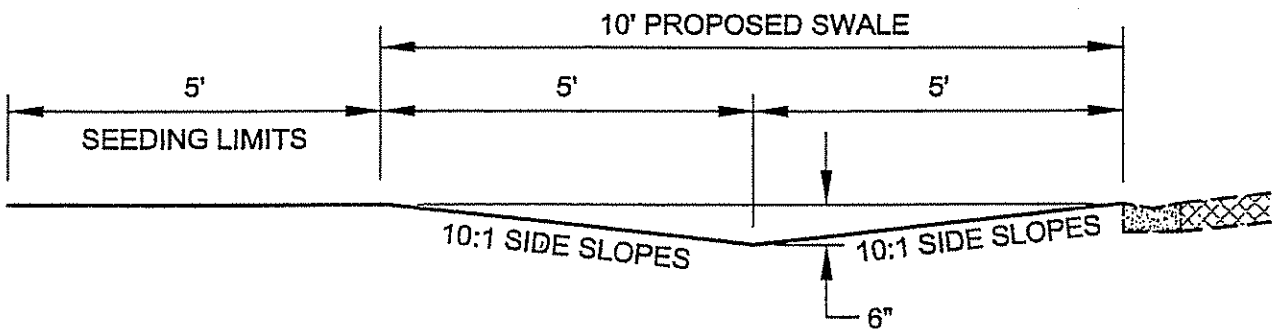
PROPOSED SWALE TYPICAL SECTIONS



NO CURB



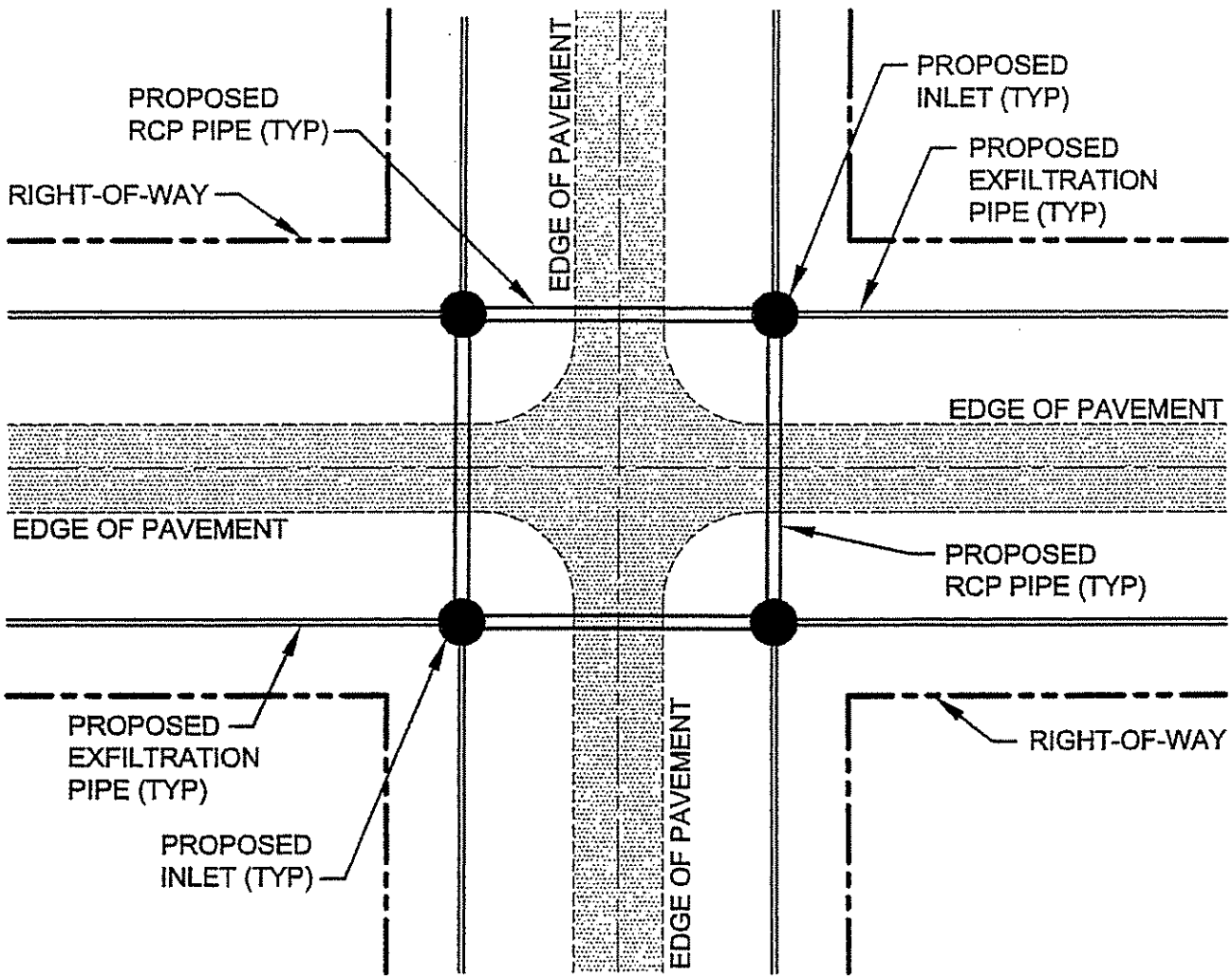
CURB AND GUTTER



MODIFIED CURB

FIGURE 5

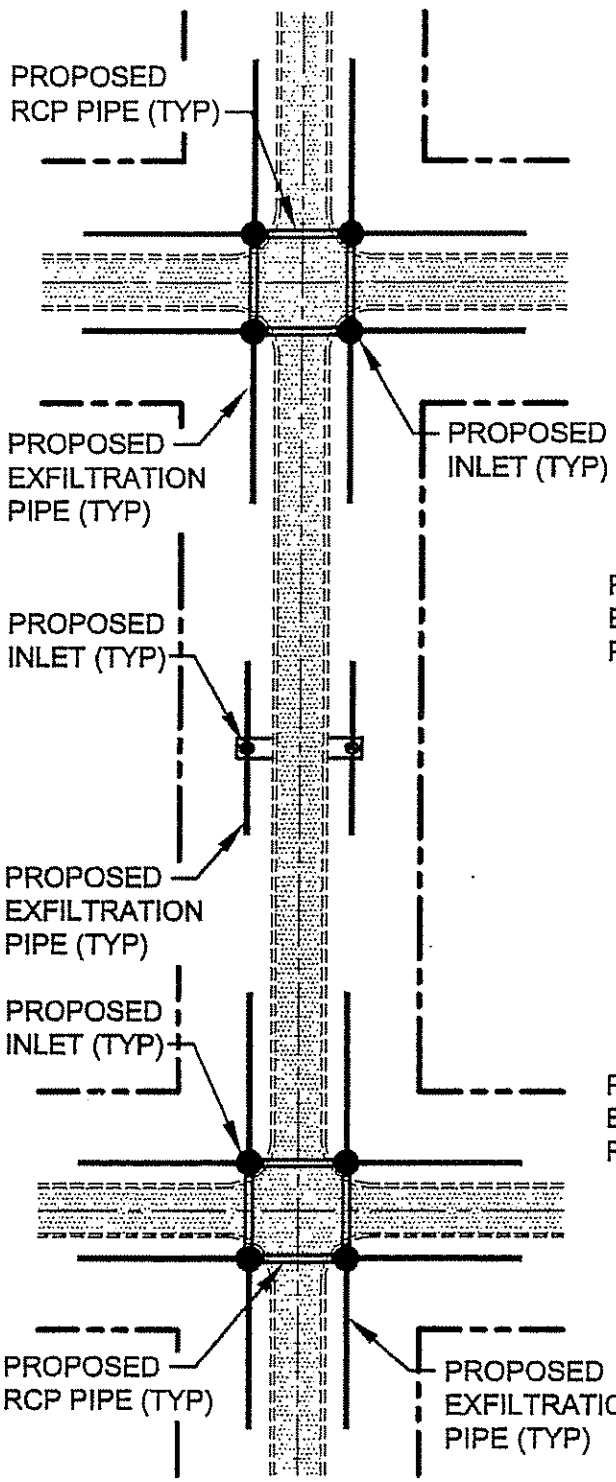
TYPICAL EXFILTRATION SYSTEM



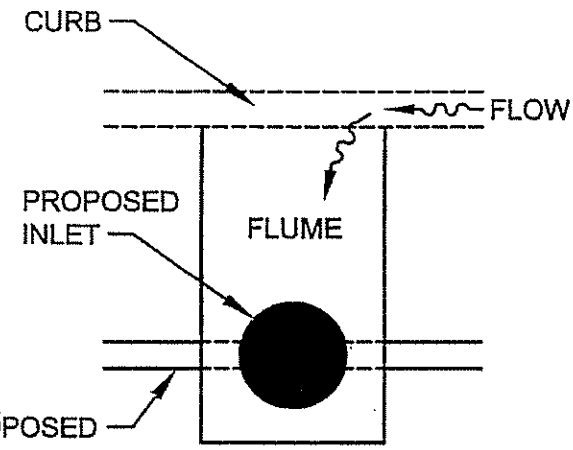
PLAN VIEW

FIGURE 6

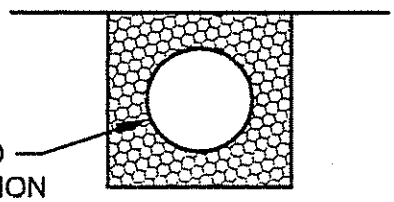
TYPICAL CURBED EXFILTRATION SYSTEM



PLAN VIEW



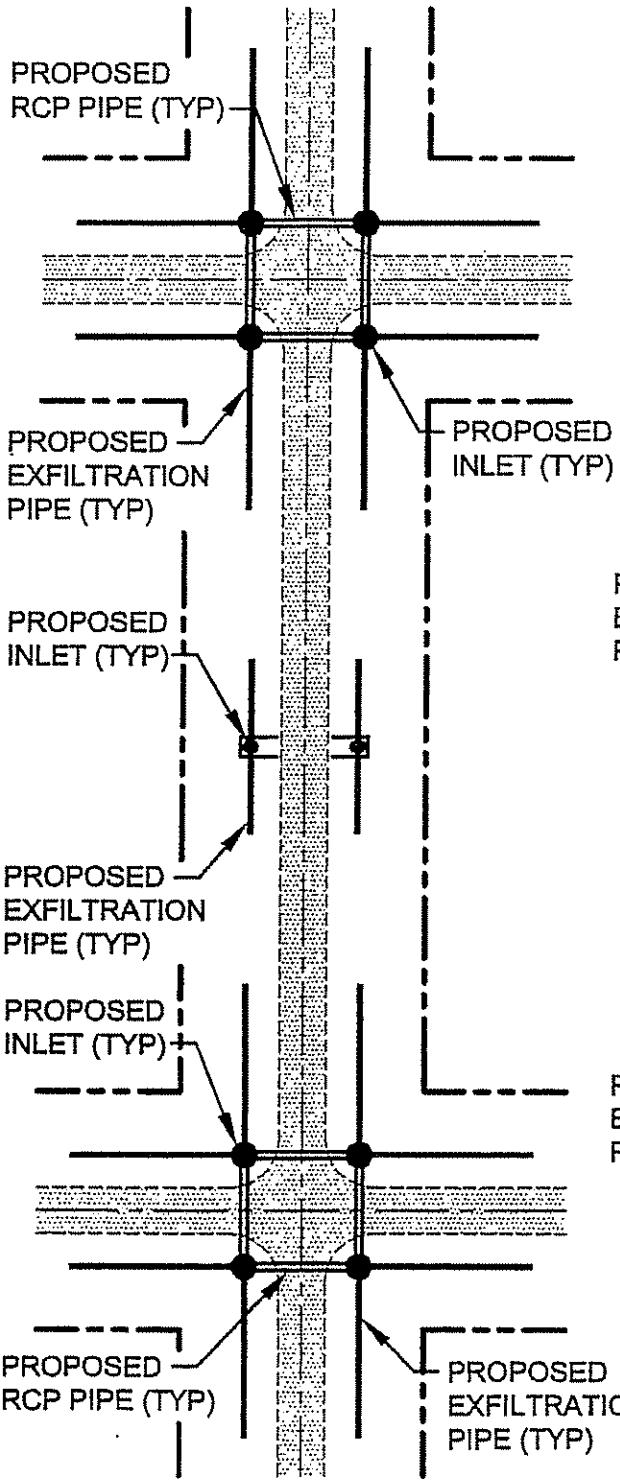
INLET DETAIL



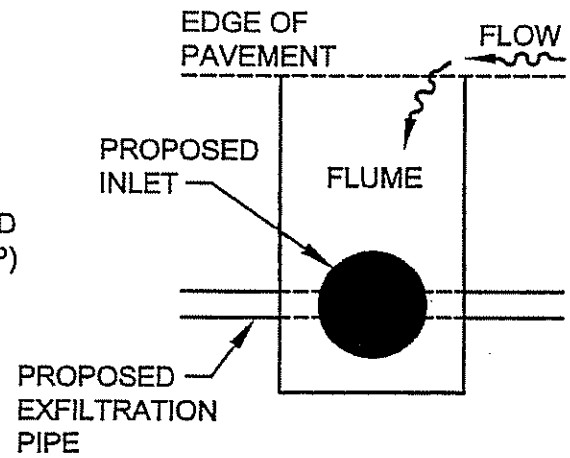
EXFILTRATION TRENCH DETAIL

FIGURE 7

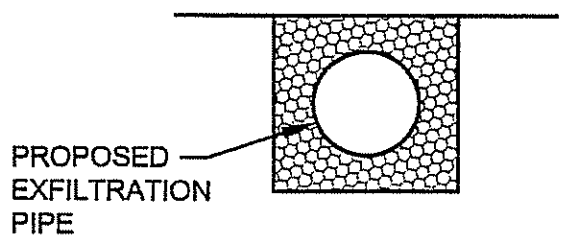
TYPICAL NON-CURBED EXFILTRATION SYSTEM



PLAN VIEW



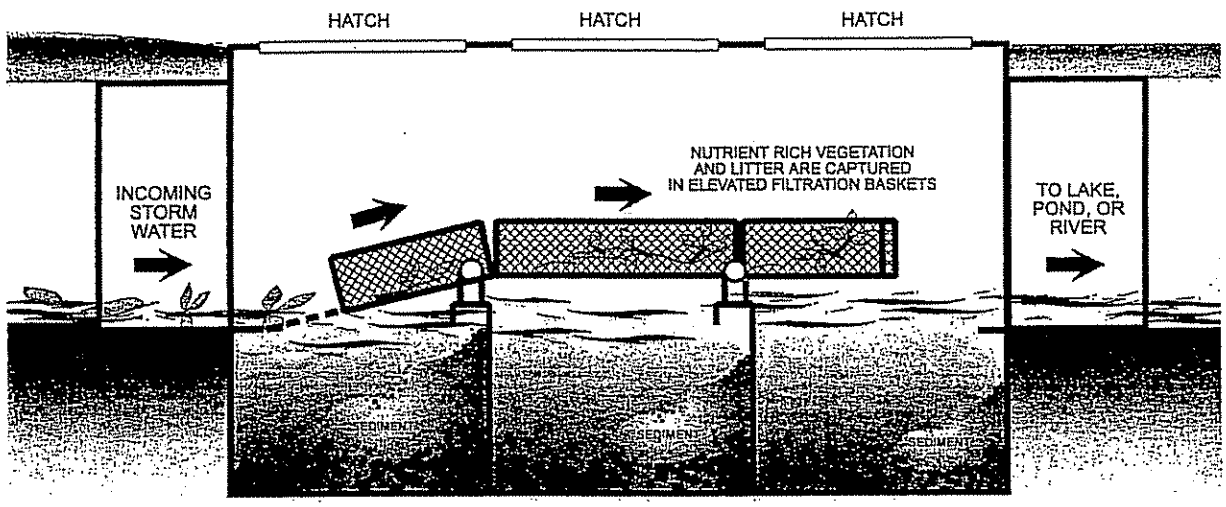
INLET DETAIL



EXFILTRATION TRENCH DETAIL

FIGURE 8

PROPOSED BAFFLE BOX



Advanced Baffle Box With Nutrient/Vegetation/Litter Separation

HEAVIER SEDIMENT GETS SEPARATED OUT AND FALLS TO BOTTOM

THE BAFFLE BOX DESIGN CAPTURES SEDIMENT, NUTRIENT RICH VEGETATION, AND LITTER WITHOUT HEAD LOSS, AND CAN MORE THAN HANDLE THE MAXIMUM FLOW OF THE DRAIN PIPE.

FIGURE 9

TABLE V demonstrates a basin by basin generalized list of planned improvements.

TABLE V

MELBOURNE BEACH MASTER STORM PROJECTS

Basin No.	Basin Size	Water Quality Improvements	Stormwater Management
1	88.63 Ac.	Curb Inlet Baskets, Baffle Box, Inlets, Exfiltration Systems	Pipe Replacements
2	15.48	Baffle Box, Curb Inlet Baskets	
3	51.69 Ac.	Curb Inlet Baskets, Inlets, Baffle Box, Exfiltration Systems	Pipe Replacement
4	23.63 Ac.	Curb Inlet Baskets, Baffle Box, Exfiltration Systems	Pipe Replacement
6	9.84	Curb Inlet Baskets, Baffle Box, Exfiltration Systems	
7	7.97	Curb Inlet Baskets, Inlets, Baffle Box, Exfiltration Systems	Pipe Replacement
5	63.62	Curb Inlet Baskets, Inlets, Baffle Box, Exfiltration Systems	Pipe Replacement
8	50.15	Curb Inlet Baskets, Inlets, Baffle Box, Exfiltration Systems	Pipe Replacements
9	91.36	Curb Inlet baskets, Inlets, Baffle Box, Exfiltration Systems	
10	88.25	Curb Inlet Baskets, Inlets, Exfiltration Systems	Pipe Replacements
11	19.04	Curb Inlet Baskets, Baffle Box	Pipe Replacement
12	4.72	Baffle Box, Curb Inlet Baskets	
13	6.08	Baffle Box, Curb Inlet Baskets	
14	3.96	By Others	By Others
15	5.67	By Others	By Others
16	6.59	By Others	By Others
17	3.62	By Others	By Others
18	13.69	By Others	By Others
19	N/A	N/A	N/A

See Figure 5 for typical cross section of the swales that will be constructed in the easternmost reaches of the basin as appropriate. The purpose of these swales will be to settle out solids and other deleterious material in flows during storm flows.

Figure 6, Figure 7 and Figure 8 provide a schematic detail of the proposed exfiltration system at intersections and mid-block for curbed and non-curbed sections. This innovative installation will slow down the discharge, maximize infiltration while reducing pollutant discharge and reduce/eliminate standing water. The overall net benefit is a reduction of freshwater entering the Indian River Lagoon.

This stormwater master plan proposes to install a baffle box at outfalls for the removal of nutrients, vegetation and litter on all outfalls which do not currently have a baffle box. The typical proposed baffle box is shown in Figure 9. Further, it is planned to install baskets in all curb inlets and drop inlets to enhance the collection of suspended solids, heavy metals, etc.

In each basin, the estimated cost of improvements was determined based on March 2002 costs. The proposed improvements for each phase of construction will require evaluation at the time of design to determine an updated cost estimate.

DISCUSSION & ESTIMATED COST OF EACH BASIN'S PROPOSED IMPROVEMENTS

BASIN 1

This basin is 88.63 acres consisting of one hundred ninety residential lots. The outfall for this basin is a thirty six inch reinforced concrete pipe between Lots 6 and 7 of the River Colony, West Section, Block "K".

TABLE V provides comparison between the existing standing water depth and the proposed depth of standing water for a 5 year 24 hour rainfall event.

TABLE V

Description/Location	Depth of Standing Water Existing System 5 Yr. 24 Hr.	Depth of Standing Water Master Plan 5 Yr. 24 Hr.
1. S.W. Corner Magnolia @ S. Palm	3"	0
2. N.E. Corner Poinsettia Rd. @ S. Palm	11"	0
3. S.E. Corner Poinsettia Rd. @ S. Palm	11"	0
4. S.W. Corner Magnolia @ Shannon	10"	0
5. S. Side Magnolia 300'± W.	1"	0
6. S. Side Magnolia 570'± W.	½"	0
7. S. Corner Harland & Shannon Ave.	8"	0
8. S. Corner Harland & Shannon Ave. 50' N.	1"	0
9. N. Side Harland & Shannon Ave.	3"	0
10. S.E. Poinsettia Rd. @ Shannon Ave.	2"	0

11. S. Side Poinsettia Rd. 350' W. Shannon Ave.	½"	0
12. S. Side Poinsettia Rd. 530' W Shannon Ave.	1"	0
13. S. Side Poinsettia Rd. 800' W Shannon Ave.	6"	0
14. N. Side Harland 200' S.W. Shannon Ave.	9"	0
15. N. Side Harland @ Jasmine Dr.	3"	0
16. N. Side Harland @ Mango Dr.	2"	0
17. W. Side Flamingo Ln.	6"	0
18. E. Side Flamingo Ln.	2"	0

The recommended construction to reduce the amount of standing water/flooding is to replace the infrastructure as follows:

1. Replace all pipes smaller than 18" in diameter with an appropriate sized pipe, but no smaller than18".
2. Replace all associated inlets.
3. Replace corrugated metal pipe with an equal diameter reinforced concrete pipe.

In addition, the upper portions of the watershed should have swales constructed between driveways as appropriate. The existing pipe that runs along the south side of Magnolia Avenue from Shannon Avenue to South Palm Avenue consists of 793 feet of pipe and should be replaced. The existing pipe that runs along the west side of Shannon Avenue on the south side of Poinsettia Road consists of 1,690 feet of pipe and should be replaced. The existing pipe that runs along the north side of Harland Avenue consists of 405 feet of pipe and should be replaced. The existing pipe that runs under Flamingo Lane consists of 30 feet of pipe and should be replaced. In replacing the above pipes, the basins/inlets by necessity will to be replaced.

Further, the planned improvements for this basin include a baffle box on the outfall, curb inlet baskets in all inlets, and an exfiltration systems at intersections and as shown in Figure 6, Figure 7 and Figure 8.

The following is a preliminary estimate of the cost to implement the proposed improvements.

1 Each	Furnish and Install Baffle Box @ $30,000/Each	= $ 30,000.00
249 L.F.	Furnish and Install 36" RCP @ $65.00/L.F.	= $ 16,185.00
1042 L.F.	Furnish and Install 24" RCP @ $37.00/L.F.	= $ 38,554.00
1500 L.F.	Furnish and Install 24" HDPE (Exfiltration) @ $50/L.F.	= $ 75,000.00
3120 L.F.	Furnish and Install 18" RCP @ $30.00/L.F.	= $ 93,600.00
47 Each	Inlets, Grates, Installed @ $2,000.00/Each	= $ 94,000.00
48 Each	Curb Inlet Baskets @ $2,000/Each	= $ 96,000.00
2200 L.F.	Grading of Swales @ $2.00/L.F.	= $ 4,400.00
3750 S.Y.	Sodding @ $4.00/S.Y.	= $ 15,000.00
		$462,739.00
	Contingency (15%)	$ 69,410.85
		$532,149.85
	15%Non Construction Contingency	$ 79,822.48
	TOTAL	**$611,972.33**

BASIN 2

This basin is 15.48 acres consisting of twenty six residential lots. The outfalls for the basin is a twenty four inch corrugated metal pipe installed between Lots 2 and 3, Sunset Shores, Block "A".

The proposed stormwater master plan improvements are a baffle box on the outfall, and curb inlet baskets.

The following is a preliminary estimate of the cost to implement the proposed improvements.

1 Each	Furnish and Install Baffle Box @ $30,000.00/Each	= $30,000.00
3 Each	Furnish and Install Curb Inlet Baskets @ $2,000/Each	= $ 6,000.00
		$36,000.00
	Contingency (15%)	$ 5,400.00
		$41,400.00
	15% Non Construction Contingency	$ 6,210.00
	TOTAL	**$47,610.00**

BASIN 3

This basin is 51.69 acres consisting of one hundred thirty eight residential lots. The outfall for the basin is an eighteen inch reinforced concrete pipe installed at the south part of Lot 2 in The River Colony, West Section, Block "K".

TABLE VI provides a comparison of the depth of standing water for the existing system and the proposed master plan improvements for a 5 year 24 hour rainfall event.

TABLE VI

Description/Location	Depth of Standing Water Existing System 5 Yr. 24 Hr.	Depth of Standing Water Master Plan 5 Yr. 24 Hr.
1. N.E. Corner Andrews Dr. @ Banyan Way	7"	0
2. N.W. Corner Andrews Dr. @ Banyan Way	1"	0
3. S. Side Andrews Dr. @ Banyan Way	3"	0
4. N.E. Corner Andrews Dr. @ Citrus Ct.	3"	0

5. N.W. Corner Andrews Dr. @ Citrus Ct.	13"	0
6. N.E. Corner Andrews Dr. @ Shannon Ave.	5"	0
7. N.W. Corner Andrews Dr. @ Shannon Ave.	11"	0
8. N.E. Corner Andrews Dr. @ Jasmine Dr.	7"	0
9. N.W. Corner Andrews Dr. @ Jasmine Dr.	10"	0
10. N.E. Corner Andrews Dr. @ Mango Dr.	9"	0
11. N.W. Corner Andrews Dr. @ Mango Dr.	8"	0
12. S. Side Andrews Dr. @ Mango Dr.	6"	0
13. N.E. Corner Andrews Dr. @ Riverside Dr.	7"	0
14. E. side Riverside, N. of Andrews	4"	0
15. M.H. @ Xing Riverside	6"	0
16. Back Side Riverside Cir.	7"	0
17. M.H. Side Riverside Cir.	6"	0

The recommended construction to reduce the amount of standing water/flooding is to replace the infrastructure as follows:

1. Replace the 18 inch RCP from the outfall to the point it becomes a 48" pipe with a 48" pipe.
2. Replace associated inlets.
3. Replace all pipes less than 18" in daimeter with 18" RCP as recommended by F.D.O.T.

It is recommended the pipe that runs across Circle Park be replaced with 170 feet of eighteen inch reinforced concrete pipe. The outfall pipe is undersized per the upstream pipes and the size of the watershed and should be replaced with 160 feet of 48" reinforced concrete pipe.

Further, planned improvements are a baffle box on the outfall, curb inlet baskets in all inlets and an exfiltration system as shown in Figure 6, Figure 7 and Figure 8.

The following is a preliminary estimate of the cost to implement the proposed improvements.

170 L.F.	Furnish and Install 18" RCP @ $30/L.F.	= $ 5,100.00
160 L.F.	Furnish and Install 48" RCP @ $92/L.F.	= $14,720.00
360 L.F.	24" HDPE (Exfiltration) @ $50.00/L.F.	= $18,000.00
4 Each	Furnish and Install Structures @ $2,000/Each	= $ 8,000.00
17 Each	Curb Inlet Baskets @ $2,000/Each	= $34,000.00
1 Each	Baffle Box @ $30,000.00/Each	= $30,000.00
1800 L.F.	Swale, Graded @ $2.00/L.F.	= $ 3,600.00
3000 S.Y.	Seeding and Mulching @ $4.00/S.Y.	= $12,000.00
		$125,420.00
	Contingency (15%)	$ 18,813.00
		$144,233.00
	15% Non Construction Contingency	$ 21,634.95
	TOTAL	**$165,867.95**

BASIN 4

This basin is 23.63 acres consisting of forty nine residential lots. The outfall for the basin is a forty eight inch reinforced concrete pipe located on the south side of Sunset Boulevard.

A baffle box will be constructed on the west side of Riverside Drive in Sunset Boulevard right-of-way. The cross-over pipe located at the east side of Riverside Drive should be replaced with the

minimum 18 inch RCP. This would require 45 feet of pipe and the replacement of the curb inlets associated with this pipe. Swale grading should be done along the right-of-way sides of Sunset Boulevard.

Also, the planned improvements include a baffle box on the outfall, curb inlet baskets in all inlets, inlets, grate inlet baskets, and an exfiltration system as shown in Figure 6, Figure 7 and Figure 8.

The following is a preliminary estimate of the cost to implement the proposed improvements.

1 Each	Furnish and Install Baffle Box @ $30,000/Each	= $ 30,000.00
45 L.F.	Furnish and Install 18" RCP @ $30.00/L.F.	= $ 1,350.00
7 Each	Curb Inlet Baskets @ $2,000.00/Each	= $ 14,000.00
7 Each	Structures @ $2,000.00/Each	= $ 14,000.00
300 L.F.	24" HDPE (Exfiltration) @ $50.00/L.F.	= $ 15,000.00
3500 L.F.	Grading @ $2.00/L.F.	= $ 7,000.00
60 L.F.	24" RCP @ $37.00/L.F.	= $ 2,220.00
5850 S.Y.	Seeding/Sodding @ $4.00/S.Y.	= $ 23,400.00
		$106,970.00
	Contingency	$ 16,045.50
		$123,015.50
	15% Non Construction Contingency	$ 18,452.33
	TOTAL	**$141,467.83**

BASIN 5

The basin is 63.62 acres consisting of eighty eight residential lots, thirty four business lots, two commercial lots, and three industrial lots. The outfall for this basin is a forty eight inch reinforced concrete pipe situated on the north side of Ocean Avenue. A baffle box is located just west of Riverside Drive.

TABLE VII provides a comparison in the depth of standing water for the existing system and with the planned improvements for a 5 year 24 hour rainfall event.

TABLE VII

Description/Location	Depth of Standing Water Existing System 5 Yr. 24 Hr.	Depth of Standing Water Master Plan 5 Yr. 24 Hr.
1. S.E. Corner Ocean Ave. @ Oak St.	12"	0
2. N.E. Corner Ocean Ave. @ Oak St.	12"	0
3. N.W. Corner Ocean Ave. @ Oak St.	8"	0
4. Oak St. South Ocean W. Side	13"	0
5. Ocean Ave. 210'± W. of Oak St. N. Side	9"	0
6. Ocean Ave. 210'± W. of Oak St. S. Side	3"	0
7. S.E. Corner Ocean Ave. @ Pine St.	3"	0
8. M.H. @ Ocean Ave. & Pine St.	3"	0

The recommended construction to reduce the amount of standing water/flooding is to replace the infrastructure as follows:

1. Replace the H. E. concrete pipe with a larger size, i.e. 24x38 elliptical pipe.
2. Replace inlet structures in conjunction with this pipe.

The existing pipe system is adequate, but improvements to the basin need to be made to reduce sediment and increase detention time. This can be accomplished by grading swales along the upper reaches of the basin. We estimate that 10,500 L.F. of swale could be constructed and there will be 17,500 S.Y. of seeding and sodding required to repair the graded areas.

Also, the planned improvements include curb inlet baskets in all inlets and exfiltration system as shown in Figure 6, Figure 7 and Figure 8.

The following is a preliminary estimate of the cost to implement the proposed improvements.

214 L.F.	Furnish and Install 24"x38" RCP @ $60.00/L.F.	= $ 12,840.00
18 Each	Furnish and Install Structures @ $2,000.00/Each	= $ 36,000.00
10,500 S.Y.	Grading @ $2.00/L.F.	= $ 21,000.00
17,500 S.Y.	Seeding/Sodding @ $4.00/S.Y.	= $ 70,000.00
1 Each	Baffle Box @ $30,000.00/Each	= $ 30,000.00
28 Each	Inlet Baskets @ $2,000.00/Each	= $ 56,000.00
1,140 Each	24" HDPE (Exfiltration Pipe) @ $50.00/L.F.	= $ 57,000.00
270 L.F.	24" RCP @ $37.00/L.F.	= $ 9,990.00
1043 L.F.	Furnish and Install 36" RCP @ $65.00/L.F.	= $ 67,795.00
244 L.F.	Furnish and Install 24" RCP @ $37.00/L.F.	= $ 9,028.00
		$369,653.00
	Contingency (15%)	$ 55,448.00
		$425,101.00
	15% Non Construction Contingency	$ 63,765.00
	Total	**$488,866.00**

BASIN 6

This basin is 9.84 acres consisting of twenty five residential lots. The outfall for the basin is a twenty four inch reinforced concrete pipe which is located in Avenue "B" right-of-way. A baffle box will be installed west of Riverside Drive in the Avenue "B" right-of-way. In addition, swales will be constructed between drives or other impervious surfaces. The pipe structures are sufficient at the present time. Improvements to the drainage swales should be made and would consist of 2400 L.F. of grading of swales and the seeding and/or sodding of the disturbed area.

The proposed improvements are a baffle box on the outfall, curb inlet baskets in all inlets, inlets, grate inlet baskets and exfiltration system as shown in Figure 6, Figure 7 and Figure 8.

The following is a preliminary estimate of the cost to implement the proposed improvements.

1 Each	Furnish and Install Baffle Box @ $30,000/Each	= $30,000.00
4 Each	Curb Inlet Baskets @ $2,000.00/Each	= $ 8,000.00
2400 L.F.	Grading Swales @ $2.00/L.F.	= $ 4,800.00
180 L.F.	24" HDPE (Exfiltration) @ $50.00/L.F.	= $ 9,000.00
4000 S.Y.	Seeding/Sodding @ $4.00/S.Y.	= $16,000.00
2 Each	Inlets @ $2,000.00/Each	= $ 4,000.00
		$71,800.00
	Contingency (15%)	$10,770.00
		$82,570.00
	15%Non Construction Contingency	$12,385.50
	TOTAL	**$94,955.50**

BASIN 7

This basin is 7.97 acres consisting of twenty two residential lots. The outfall for the basin is a twenty four inch reinforced concrete pipe which is located in Avenue "A" right-of-way.

A baffle box will be constructed west of Riverside Drive in Avenue "A" right-of-way. The 24" CMP will be replaced with a 24" RCP. The cross-over pipe west of Pine Street will be replaced with an 18" RCP. The associated structures will also be replaced. The pipe that crosses Avenue "A" west of Pine Street needs to be replaced to meet the minimum guidelines of Florida Department of Transportation and swales need to be graded on the west side of Pine Street. The pipe consists of 30 feet of 18 inch RCP and accompanying structures. The swale grading consists of 300 L.F. and the seeding/sodding of the disturbed areas which is 500 square yards.

The proposed improvements are a baffle box on the outfall, curb inlet baskets in all inlets, pipe replacement and exfiltration system as shown in Figure 6, Figure 7 and Figure 8.

The following is a preliminary estimate of the cost to implement the proposed improvements.

1 Each	Furnish and Install Baffle Box @ $30,000.00/Each	= $30,000.00
30 L.F.	Furnish and Install 18" RCP @$30/L.F.	= $ 900.00
523 L.F.	Furnish and install 24" RCP @ $37/L.F.	= $19,351.00
4 Each	Structures @ $2,000.00/Each	= $ 8,000.00
300 L.F.	Grading Swales @ $2.00/L.F.	= $ 600.00
500 S.Y.	Seeding/Sodding @ $4.00/S.Y.	= $ 2,000.00
7 Each	Curb Inlet Baskets @ $2,000.00/Each	= $14,000.00
120 L.F.	24" HDPE (Exfiltration) @$50.00/L.F.	= $ 6,000.00
		$80,851.00
	Contingency (15%)	$12,127.65
		$92,978.65
	Non Construction Contingency	$13,946.80
	Total	**$106,925.45**

BASIN 8

This basin is 50.15 acres consisting of one hundred eight residential lots, six business lots, and two industrial lots. The outfall for this basin is a twenty four inch reinforced concrete pipe which is located on the south side of Second Avenue.

TABLE VIII provides a comparison between the existing depth of standing water and with the proposed improvements for a 5 year 24 hour rainfall event.

TABLE VIII

Description/Location	Depth of Standing Water Existing System 5 Yr. 24 Hr.	Depth of Standing Water Master Plan 5 Yr. 24 Hr.
1. S.E. Corner Second Ave. @ Pine St.	18"	0
2. N.E. Corner Second Ave. @ Pine St.	9"	0
3. N. Side 270' W. of Pine St.	6"	0
4. S. Side 270' W. of Pine St.	13"	0

The recommended construction to reduce the amount of standing water/flooding is to replace the infrastructure as follows:

1. Replace any pipe smaller than 18".
2. Construct new inlet structure to replace existing.
3. Construct a baffle box on Second Avenue east of Riverside Drive

Further, in the eastern most reaches of the watershed will be swales graded between driveways. The pipes that are smaller than recommended minimum will be replaced; therefore, 360 feet of pipe will be replaced with 18" RCP. Three structures will be replaced in the process. Swales will be graded on 6,920 L.F. along the pavement.

Also, proposed improvements are a baffle box on the outfall, inlets, grate inlet baskets in all inlets, pipe replacements, and exfiltration system as shown in Figure 6, Figure 7 and Figure 8.

The following is a preliminary estimate of the cost to implement the proposed improvements.

1 Each	Furnish and Install Baffle Box @ $30,000.00/Each	= $ 30,000.00
360 L.F.	Furnish and Install 18" RCP @ $30.00/L.F.	= $ 10,800.00
22 Each	Structures @ $2,000.00/Each	= $ 44,000.00
6920 L.F.	Swale Grading @ $2.00/L.F.	= $ 13,840.00
11,535 S.Y.	Seeding/Sodding @ $4.00/S.Y.	= $ 46,140.00
23 Each	Furnish and Install Curb Inlet Baskets @ $2,000/Each	= $ 46,000.00
1050 L.F.	24" HDPE (Exfiltration Pipe) @ $50/L.F.	= $52,500.00
240 L.F.	24" RCP Pipe @ $37/L.F.	= $ 8,880.00
		$252,160.00
	Contingency (15%)	$ 37,824.00
		$289,984.00
	15%Non Construction Contingency	$ 43,497.60
	TOTAL	**$333,481.60**

BASIN 9

This basin is 91.36 acres consisting of two hundred thirty six (236) residential lots plus four (4) multi-family lots. The outfall for this basin is a twenty four inch corrugated metal pipe and is located on the north side of Sixth Avenue.

Table IX provides a comparison between the depth of standing water for the existing system and with the proposed improvements for a 5 year 24 hour rainfall event.

TABLE IX

Description/Location	Depth of Standing Water Existing System 5 Yr. 24 Hr.	Depth of Standing Water Master Plan 5 Yr. 24 Hr.
1. N.E. Corner Surf Rd. @ Oak St.	6"	0
2. E. Side Oak St. @ Mid Block	11"	0
3. W. Side Oak St. @ Mid Block	8"	0
4. S.E. Corner Sixth Ave. @ Oak St.	11"	0
5. N.W. Corner Sixth Ave. @ Orange	19"	0
6. N. Side Sixth Avenue	20"	0
7. N. Side Sixth Avenue	13"	0
8. N.E. Corner Sixth Avenue @ Oak St.	18"	0
9. 40' N. N.E. Corner Sixth Ave. @ Oak St.	3"	0
10. N.E. Corner Fifth Ave. @ Oak St.	14"	0
11. S. Side Surf Rd. @ Mid Block	12"	0

The recommended construction to reduce the amount of standing water/flooding is to replace the infrastructure as follows:

1. Replacing any pipe smaller than 18"
2. Construct new inlet structures to replace existing
3. Construct baffle box west of PineStreet
4. Replace 24" CMP with 24" RCP

Also, the upper reaches of the watershed should have swales graded between driveways. There are several undersized pipe to be replaced and one section of 18" that is placed in the middle of a 24" line of pipe. It would be our recommendation that eight hundred fifty five (855) feet of 30" RCP would be installed, three hundred twenty two (322) feet of 24" RCP would be installed, three hundred twenty three (323) feet of 18" RCP would be installed and an additional five hundred ninety seven (597) feet of 18" RCP. Further, 17 structures will need to be replaced. Swales will be graded on all uncurbed streets consisting of 13,950 L.F.

The additional proposed improvements are a baffle box on the outfall, inlets, exfiltration system as shown in Figure 6, Figure 7 and Figure 8, grate inlet baskets, curb inlet baskets on the outfall and pipe replacements.

The following is a preliminary estimate of the cost to implement the proposed improvements.

1 Each	Furnish and Install Baffle Box @ $30,000.00/Ea.	= $ 30,000.00
855 L.F.	Furnish and Install 30" RCP @ $60.00/L.F.	= $ 51,300.00
173 L.F.	Furnish and Install 24" RCP @ $37.00/L.F.	= $ 6,401.00
920 L.F.	Furnish and Install 18" RCP @ $30.00/L.F.	= $ 27,600.00
17 Each	Structures @ $2,000.00/Each	= $ 34,000.00
13,950 L.F.	Swale Grading @ $2.00/L.F.	= $ 27,900.00
23,250 S.Y.	Seeding/Sodding @ $4.00/S.Y.	= $ 93,000.00
62 Each	Furnish and Install Curb Inlet Basket @ $2,000/Each	= $124,000.00
40 Each	Furnish and Install Inlets @ $2,000/Each	= $ 80,000.00
2370 L.F.	24" Exfiltration Pipe W/Sock @ $50.00/L.F.	= $118,500.00
600 L.F.	24" RCP @ $37.00/L.F.	= $ 22,200.00
		$614,901.00
	Contingency (15%)	$ 92,235.15
		$707,136.15
	15% Non Construction Contingency	$106,070.42
	TOTAL	**$813,206.57**

BASIN 10

This basin is 88.25 acres consisting of one hundred ninety five residential lots and nine multi-family residences. The outfall for this basin is a forty eight inch corrugated metal pipe which outfalls into the canal system between Lots 66 and 67 located in Harbor East Subdivision. A baffle box is part of this system located on the east side of Oak Street just to the south of Cherry Drive.

TABLE X provides a comparison between the depth of standing water between the existing system and the proposed improvements.

TABLE X

Description/Location	Existing System 5-Year 24-Hour	Depth of Standing Water Master Plan 5 Yr.- 24 Hr.
North Side Orange Street at Rosewood Drive	15"	0
Southwest Corner Orange Street & Rosewood Drive	15"	0
Southeast Corner Orange Street & Rosewood Drive	22"	0
West Rosewood Drive & Birch Avenue	11"	0
Northeast Rosewood Drive & Birch Avenue	13"	0
Southeast Rosewood Drive & Birch Avenue	12"	0
West Rosewood Drive Mid Block	12"	0
West Corner Rosewood Drive at Cherry Drive	12"	0
North Corner Rosewood Drive at Cherry Drive	4"	0
South Corner Rosewood Drive at Cherry Drive	9"	0
North Corner Cherry Drive at Cedar Lane	23"	0
South Corner Rosewood Drive at Dogwood	7"	0
North Corner Rosewood Drive at Dogwood	9"	0

West Rosewood Drive at Dogwood	2"	0
Southeast Corner Rosewood Drive at Cherry Drive	12"	0

The recommended construction to reduce the amount of standing water/flooding is to replace the infrastructure as follows:

1. Replace any pipe smaller than 18" with that minimum recommended size per Florida Department of Transportation.
2. Construct new inlet structures to replace existing.
3. Exfiltration shall be accomplished by grading swales beyond the curb.

Much of the system in Basin 10 is corrugated metal pipe and is under sized. Swales will be graded along Surf Road and will require 2300 L.F. of grading as well as 3850 S.Y. of seeding/sodding of the disturbed area.

The design for the partial improvements of this basin was done by Brevard County. A copy of these plans are on file at the Town of Melbourne Beach Town Hall. In addition to these improvements inlets and exfiltration system will be added.

The following is a preliminary estimate of the cost to implement the proposed improvements.

710 L.F.	Furnish and Install 18" RCP @ $30.00/L.F.	=	$21,300.00
14 Each	Structures @ $2,000.00/Each	=	$28,000.00
2,300 L.F.	Swale Grading @ $2.00/L.F.	=	$24,600.00
20,500 S.Y.	Seeding/Sodding @ $4.00/S.Y.	=	$82,000.00
561 L.F.	Furnish and Install 36" RCP @ $65.00/L.F.	=	$36,465.00
270 L.F.	Furnish and Install 24" HDPE Exfiltration @ $50/L.F.	=	$13,500.00
210 L.F.	Furnish and Install 24" RCP @ $50.00/L.F.	=	$10,500.00
11 Each	Structures @ $2,000.00/Each	=	$22,000.00
5 Each	Curb Inlet Baskets @ $2,000/Each	=	$10,000.00
			$248,365.00
	Contingency (15%)		$ 37,255.00
			$285,620.00
	15% Non Construction Contingency		$ 42,843.00
	TOTAL		**$328,463.00**

BASIN 11

This basin is 19.04 acres consisting of thirty nine residential lots. The outfall for this basin is a twenty four inch reinforced concrete pipe and lays between Lots 8 and 9 of Harbor East Subdivision.

Basin 11 has a cross-over pipe that should be replaced with an eighteen inch pipe. Two structures will be replaced with the pipe replacement.

Further improvements are a baffle box on the outfall and curb inlet baskets in all inlets constructed.

The following is a preliminary estimate of the cost to implement the proposed improvements.

32 L.F.	Furnish and Install 18" RCP @ $30.00/L.F.	= $ 960.00
2 Each	Structures @ $2,000.00/Each	= $ 4,000.00
1 Each	Furnish and Install Baffle Box @ $30,000.00/Each	= $30,000.00
2 Each	Curb Inlet Baskets @ $2,000.00/Each	= $ 4,000.00
30 S.Y.	Pavement Repair @ $10.00/S.Y.	= $ 300.00
		$39,260.00
	Contingency (15%)	$ 5,889.00
		$45,149.00
	15% Non Construction Contingency	$ 6,772.35
	TOTAL	**$51,921.35**

BASIN 12

This basin is 4.72 acres consisting of fourteen residential lots. The outfall for this basin is a twenty four inch reinforced concrete pipe that outlets to the canal system between Lots 107 and 108 in the Harbor East Subdivision.

Further improvements are a baffle box on the outfall and curb inlet baskets in all inlets installed.

The following is a preliminary estimate of the cost to implement the proposed improvements.

1 Each	Furnish and Install Baffle Box @ $30,000.00/Each	= $30,000.00
1 Each	Curb Inlet Baskets @ $2,000.00/Each	= $ 2,000.00
		$32,000.00
	Contingency (15%)	$ 4,800.00
		$36,800.00
	15% Non Construction Contingency	$ 5,520.00
	TOTAL	**$42,320.00**

BASIN 13

This basin is 6.08 acres consisting of nineteen residential lots. The outfall for this basin is a twenty four inch reinforced concrete pipe that outlets to the canal system between Lots 91 and 92 in the Harbor East Subdivision.

Further improvements are a baffle box on the outfall and curb inlet baskets in all inlets installed.

The following is a preliminary estimate of the cost to implement the proposed improvements.

1 Each	Furnish and Install Baffle Box @ $30,000.00/Each	= $30,000.00
1 Each	Curb Inlet Baskets @ $2,000.00/Each	= $ 2,000.00
		$32,000.00
	Contingency (15%)	$ 4,800.00
		$36,800.00
	Non Construction Contingency	$ 5,520.00
	TOTAL	**$42,320.00**

BASIN 14

This basin is 3.96 acres consisting of twelve residential lots. There is no outfall for this system and the exfiltration system is plugged.

Even though the design, plans, permits and proposed construction of improvements in this basin are being performed by others, this data is included and made an integral part of the Master Stormwater Plan. The design, construction plans and permits will be on file for review and record in the Town of Melbourne Beach's Public Works Office.

BASIN 15

This basin is 5.67 acres consisting of twelve residential lost. The outfall for this basin is a twenty four inch reinforced concrete pipe located between Lots 2 and 33 in Harbor East Subdivision to canal system.

Even though the design, plans, permits and proposed construction of improvements in this basin are being performed by Brevard County, this data is included and made an integral part of the Master Stormwater Plans. The design, construction plans, and permits will be on file for review and record in the Town of Melbourne Beach's Public Works Office.

BASIN 16

This basin is 6.59 acres consisting of twenty one residential lots. The outfall for this basin is an undersized pipe and a plugged exfiltration system.

Even though the design, plans, permits and proposed construction of improvements in this basin are being performed by others, this data is included and made an integral part of the Master Stormwater Plans. The design, construction plans and permits will be on file for review and record in the Town of Melbourne Beach's Public Works Office.

BASIN 17

This basin is 3.62 acres consisting of 10 residential lots. The outfall for this basin is an eighteen inch reinforced concrete pipe that outlets to the canal system between Lots 99 and 100 in the Harbor East Subdivision.

Even though the design, plans, permits and proposed construction of improvements in this basin are being performed by Brevard County, this data is included and made an integral part of the Master Stormwater Plans. The design, construction plans and permits will be on file for review and record in the Town of Melbourne Beach's Public Works Office.

BASIN 18

This basin is 13.98 acres consisting of 30 residential lots plus a lot that is occupied by a church. The outfall for this basin is a twenty four inch reinforced concrete pipe that outlets to the canal system between Lots 72 and 73 in the Harbor East Subdivision.

Even though the design, plans, permits and proposed construction of improvements in this basin are being performed by Brevard County, this data is included and made an integral part of the Master Stormwater Plans. The design, construction plans and permits will be on file for review and record in the Town of Melbourne Beach's Public Works Office.

BASIN 19

The stormwater system in this basin is exclusively exfiltration. Therefore, no improvements are proposed.

SUMMARY OF BASINS' ESTIMATED COSTS

Basin Name	Cost of Water Quality Improvements	Cost of System Improvements	Total Cost
Basin 1	$376,119.00	$235,853.33	$611,972.33
Basin 2	$ 7,935.00	$ 39,675.00	$ 47,610.00
Basin 3	$ 99,981.00	$ 65,886.95	$165,867.95
Basin 4	$100,007.45	$ 41,460.38	$141,467.83
Basin 5	$330,611.78	$158,254.32	$488,866.10
Basin 6	$ 55,280.50	$ 39,675.00	$ 94,955.50
Basin 7	$ 40,468.50	$ 66,456.95	$106,925.45
Basin 8	$279,523.60	$ 53,958.00	$333,481.60
Basin 9	$660,721.00	$152,485.57	$813,206.57
Basin 10	$252,068.50	$ 76,394.21	$328,462.71
Basin 11	$ 5,290.00	$ 46,631.35	$ 51,921.35
Basin 12	$ 2,645.00	$ 39,675.00	$ 42,320.00
Basin 13	$ 2,645.00	$ 39,675.00	$ 42,320.00
Basin 14	0	0	0
Basin 15	0	0	0
Basin 16	0	0	0
Basin 17	0	0	0
Basin 18	0	0	0
Basin 19	0	0	0
Total	**$2,139,969.00**	**$1,129,408.39**	**$3,269,377.39**

SUMMARY AND RECOMMENDATIONS

OUTLAW AND JONES ENGINEERS, INC. has evaluated, modeled and analyzed the existing stormwater management system for the Town of Melbourne Beach in accordance with the Scope of Services. OJE developed a Master Stormwater Plan for infrastructure improvements and facilities to improve the stormwater water quality and reduce the quantity of freshwater discharging to the Indian River Lagoon. Based upon the findings outlined in this report and the developed Master Stormwater Plan, it is OJE's conclusion that the basins priorities shown on pages 64 and 65 be used as a guide to implement the improvement of stormwater quality discharge into the Indian River Lagoon. Also, the priorities outline infrastructure improvements that are needed for the stormwater drainage system.

The scheduling of the construction program can be implemented at the discretion of the Town Commission as funds are available.

The following Prioritization Table of Projects suggests a project priority on a basin by basin basis.

Priortization Table of Projects
Master Stormwater Plan
Melbourne Beach, Florida
E109-CC2001-4

Basin Name	Priority	Description	Estimated Cost	
			Water Quality (Pollutant Reduction)	Drainage Infrastructure
1	1	Construct Exfiltration, Curb Inlet Baskets, Swales and Sodding	$526,803.33	
	2	Construct 18"RCP, 24" RCP, 36" RCP and Inlets		$45,494.00
	3	Construct Baffle Box	$39,675.00	
		TOTAL	***$566,478.33***	***$45,494.00***
2	1	Construct Inlet Baskets & Baffle Box	$47,610.00	
		TOTAL	***$47,610.00***	***$0.00***
3	1	Construct Inlet Baskets, Exfiltration and Swales	$75,937.95	
	2	Construct 48" RCP, 18" RCP & Inlets		$50,255.00
	3	Construct Baffle Box	$39,675.00	
		TOTAL	***$115,612.95***	***$50,255.00***
4	1	Construct Inlet Baskets, Exfiltration and Sodding	$69,299.00	
	2	Construct 18"RCP, 24" RCP and Inlets		$32,493.83
	3	Construct Baffle Box	$39,675.00	
		TOTAL	***$108,974.00***	***$32,493.83***
5	1	Construct Inlet Baskets, Exfiltration, Swales and Sodding	$409,516.10	
	2	Construct 36" RCP, 24" RCP, 24"x38" RCP and Structures		$39,674.90
	3	Construct Baffle Box	$39,675.00	
		TOTAL	***$449,191.10***	***$39,674.90***
6	1	Construct Inlet Baskets, Exfiltration, Inlets and Sodding	$43,642.50	
	2	Construct Swales & Inlets	$11,638.00	
	3	Construct Baffle Box	$39,675.00	
		TOTAL	***$94,955.50***	***$0.00***

Basin Name	Priority	Description	Estimated Cost	
			Water Quality (Pollutant Reduction)	Drainage Infrastructure
7	1	Construct Inlet Baskets, Exfiltration, Inlets and Sodding	$29,095.00	
	2	Construct 18" RCP, 24" RCP and Inlets		$38,155.45
	3	Construct Baffle Box	$39,675.00	
		TOTAL	***$68,770.00***	***$38,155.45***
8	1	Construct Inlet Baskets, Exfiltration, Inlets and Sodding	$191,286.40	
	2	Construct 18" RCP, 24" RCP and Inlets		$102,520.20
	3	Construct Baffle Box	$39,675.00	
		TOTAL	***$230,961.40***	***$102,520.20***
9	1	Construct Inlet Baskets, Exfiltration, Inlets, Swales and Sodding	$509,956.00	
	2	Construct 18" RCP, 24" RCP, 30" RCP and Inlets		$263,575.57
	3	Construct Baffle Box	$39,675.00	
		TOTAL	***$549,631.00***	***$263,575.57***
10	1	Constuct Inlet Baskets, Exfiltration, Inlets, Swales and Sodding	$139,523.75	
	2	Construct 18" RCP, 24" RCP, 36 RCP and Inlets		$156,405.46
	3	Construct Baffle Box	$32,533.79	
		TOTAL	***$172,057.54***	***$156,405.46***
11	1	Construct Inlet Baskets & Baffle Box	$44,965.00	
	2	Construct 18" RCP & Inlets	$6,956.35	
		TOTAL	***$51,921.35***	***$0.00***
12		Construct Inlet Baskets & Baffle Box	$42,320.00	
		TOTAL	***$42,320.00***	***$0.00***
13		Construct Inlet Baskets & Baffle Box	$42,320.00	
		TOTAL	***$42,320.00***	***$0.00***

GRAND TOTAL **$2,540,803.17** **$728,574.41**

Basin Name	Priority	Description	Estimated Cost	
			Water Quality (Pollutant Reduction)	Drainage Infrastructure
14		Improvements designed by others	**********	**********
15		Improvements designed and constructed by Brevard County	**********	**********
16		Improvements designed by others	**********	**********
17		Improvements designed and constructed by Brevard County	**********	**********
18		Improvements designed and constructed by Brevard County	**********	**********
19		No Improvements are needed or planned	**********	**********

OUTLAW AND JONES ENGINEERS, INC. recommends the following phased sequences of proposed improvements projects to be constructed. This sequence of projects can be altered at the discretion of the Town Commission of Melbourne Beach.

Basin	Priorities	Estimated Costs
9	Priority 1, Priority 2 and Priority 3	$813,206.57
1	Priority 1, Priority 2 and Priority 3	$611,972.33
3	Priority 1, Priority 2 and Priority 3	$165,867.95
5	Priority 1, Priority 2 and Priority 3	$488,866.10
8	Priority 1, Priority 2 and Priority 3	$333,481.60
10	Priority 1, Priority 2 and Priority 3	$328,462.71

The remaining recommended improvements in Basin 6, Basin 7, Basin 2, Basin 4, Basin 11, Basin 12 and Basin 13 could be constructed in any order over the next several years.

OJE further recommends that the Town Commission accept this Master Stormwater Plan and begin implementation.

MASTER STORMWATER PLAN

FOR

TOWN OF MELBOURNE BEACH

MELBOURNE BEACH TOWN OFFICIALS

Bob Wille	**Mayor**
Connie Smith	**Vice Mayor**
Mark Crispen	**Commissioner**
Paul Guglietta	**Commissioner**
Steve Walters	**Commissioner**
Bill Hoskovec	**Town Manager**
Cynthia Masny	**Town Clerk**
Vincent Powers	**Public Works Director**

MARCH 29, 2002

PROJECT NO. E 109-CC2001-4

BOOK 2 OF 2

OUTLAW & JONES ENGINEERS, INC.

Consulting Civil Engineers

Since 1953

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(321) 254-9721 · FAX (321) 242-7854 · Email: ORS1@earthlink.net

TABLE OF CONTENTS

APPENDIX "A"

TECHNICAL MEMORANDUM

Town of Melbourne Beach Stormwater Masterplan
Water Quality Modeling
Phase I (Model Development)

INTRODUCTION

The Town of Melbourne Beach is located on the central Florida east coast. Stormwater is discharged to the Indian River. As part of the development of a stormwater masterplan for the City, the quality of the stormwater was investigated. The investigations were based on best available information, limited stormwater monitoring data from a nearby community, and the use of a simple stormwater model.

The primary objectives of the investigations and modeling were to estimate the current mass loading for selected pollutants, and to use the information and model to evaluate future actions, including the implementation of BMPs to improve water quality.

The overall project investigations and approach are outlined below.

- Characterize the basin.
- Evaluate literature-based water quality information for various land use types.
- Evaluate water quality monitoring data.
- Determine pollutant concentrations for use in the mass load analysis and modeling.
- Estimate current mass loads for total suspended solids, total nitrogen, and total phosphorus.
- Evaluate the impact of BMPs on water quality.

This phase of the project (Model Development) does not include the evaluation of BMP impacts.

BASIS FOR ANALYSIS

This section provides an overview of the information and data used in the analysis, and provides a limited amount of basin characterization information. A simple watershed model was used to determine annual mass loading from the stormwater basins. The model is suitable for a "screening-level" analysis.

Data and Information Sources

The following information was used in the analysis and modeling activities:

- Watershed Management Model Version 4.15.

- Model Local Government Stormwater Management Program, FDEP, 1993.
- Stormwater Loading Rate Parameters for the Central and South Florida, Harper, 1994.
- Water quality monitoring at the Grant Street Basin in the City of Satellite Beach from July 1999 to February 2000.
- Land Use and basin data from Outlaw, Rice, and Jones Inc.

Study Area Characterization

The Town of Melbourne Beach is divided into 18 stormwater basins. The basins vary in size from 3.6 to 88.6 acres, with a total area of about 554 acres. Drainage is accomplished using both swale, and curb and gutter systems. An inlet/culvert system is used to convey the stormwater to five outfalls that discharge to the Indian River. Table 1 provides information regarding basin outfalls and land use characteristics.

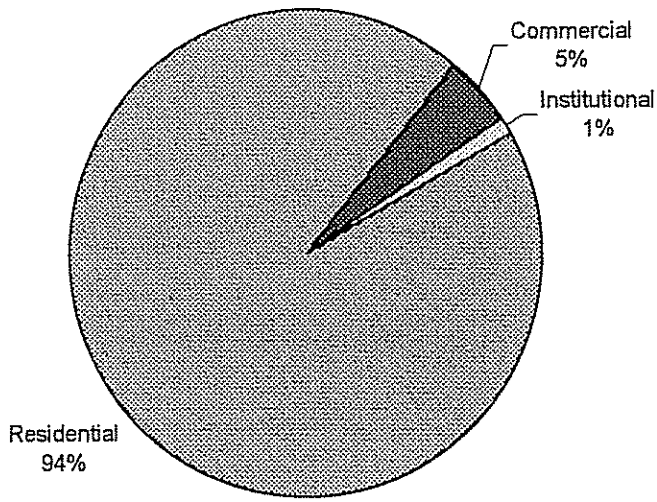
Table 1. Drainage Basin Characteristics

	Total Area (Acres)					Outfall Data	
Basin	**Total**	**Impervious**	**Residential**	**Commercial**	**Institutional**	**Pipe Size, in**	**Type**
1	88.6	28.3	88.6	0.0	0.0	36"	CMP
2	15.5	3.7	15.5	0.0	0.0	24"	CMP
3	51.7	15.4	51.7	0.0	0.0	18"	RCP
4	23.6	5.4	23.6	0.0	0.0	48"	RCP
5	63.6	15.1	35.1	24.1	4.5	48"	RCP
6	9.8	2.8	9.6	0.0	0.0	24"	RCP
7	8.0	2.9	8.0	0.0	0.0	24"	RCP
8	50.2	13.9	45.8	2.4	2.0	24"	RCP
9	91.4	27.8	91.4	0.0	0.0	24"	CMP
10	88.3	28.2	88.3	0.0	0.0	48"	CMP
11	19.0	5.2	19.0	0.0	0.0	24"	RCP
12	4.7	1.7	4.7	0.0	0.0	24"	RCP
13	6.1	2.0	6.1	0.0	0.0	24"	RCP
14	4.0	1.3	4.0	0.0	0.0	18"	ADS
15	5.7	0.9	5.7	0.0	0.0	24"	RCP
16	6.6	2.3	6.6	0.0	0.0	18"	ADS
17	3.6	1.2	3.6	0.0	0.0	18"	RCP
18	14.0	3.8	14.0	0.0	0.0	24"	RCP
Total	**554.3**	**161.9**	**521.2**	**26.5**	**6.4**	---	---

The watershed can be characterized as primarily residential, with a limited amount of light commercial (shopping and restaurants), institutional (schools and government) and light

industrial land use. As shown in Figure 1, which summarizes total land use for the area, residential comprises approximately 94 % of the basin area.

Figure 1. Land Use Distribution



Water Quality Data

Water quality data is available for various land use types. The USEPA has accumulated pollutant concentration data for the United States under the National Urban Runoff Program (NURP). More recently, studies were conducted in 1994 for communities in the Central and

South Florida Area. Table 2 summarizes the data from the NURP study, as well as the 1994 study.

Table 2. Comparison of Concentrations from NURP and 1994 Study

Parameter	Single-Family		Multi-Family		Commercial/ Institutional		Light Industrial	
	NURP	1994 Study	NURP	1994 Study	NURP	1994 Study	NURP	1994 Study
Study Parameters								
TSS	140	27	102	71	91	81	108	102
Total Kjeldahl Nitrogen	2.35	-	1.44	-	1.28	-	-	-
Nitrate/Nitrite	0.96	-	0.67	-	0.63	-	-	-
Total Nitrogen	-	2.29	-	2.42	0	1.18	2.53	1.42
Total Phosphorus	0.47	0.30	0.33	0.49	0.24	0.15	0.42	0.31
Additional Parameters								
BOD	10.8	7.4	8.8	11.0	9.7	8.2	10	9.1
Lead	0.18	0.048	0.19	0.087	0.13	0.136	0.115	-

From the period of July 1999 through February 2000 water quality monitoring was conducted for a basin in the City of Satellite Beach. Land use and basin characteristics area comparable to the basins in Melbourne Beach.

Data was compiled during two storm events for the Grant Street basin in Satellite Beach. Tables 3 and 4 summarize the data from the two storm events.

Table 3 Monitoring Data from Storm Event 1 (11/21/99)

Item	1	2	3	4	5	Total	Average, mg/L
Duration, Minutes	10.0	10.0	20.0	10.0	40.0	90	-
Average Flow, gpm	1006	1425	939	467	179.0	-	-
Volume, gallons	10060	14250	18780	4670	7160	54,920	-
Concentration, mg/L							
TSS	169	125	52.8	29.3	14.7	-	85.85
Total Phosphorus	0.53	0.489	0.336	0.296	0.2	-	0.39
NO3/NO2	0.136	0.13	0.162	0.177	0.1	-	0.15
TKN	1.94	1.54	1	0.823	0.684	-	1.26
Total Nitrogen	2.076	1.67	1.162	1	0.825	-	1.40

Table 4 Monitoring Data from Storm Event 2 (1/6/00)

Item	1	2	3	4	5	Total	Average, mg/L
Duration, Minutes	10.0	10.0	30.0	30.0	30.0	110	-
Average Flow, gpm	2,840	4,446	4,547	3,751	2,023.0	-	-
Volume, gallons	28,400	44,460	13,6410	11,2530	60,690	382,490	-
Concentration, mg/L							
TSS	176	91	58.2	55.2	50.7	-	68.69
Total Phosphorus	0.491	0.388	0.327	0.275	0.2	-	0.32
NO3/NO2	0.104	0.087	0.084	0.071	0.1	-	0.08
TKN	1.94	1.43	0.83	0.749	0.577	-	0.92
Total Nitrogen	2.044	1.517	0.914	0.82	0.64	-	1.00

Data Analysis

The monitoring conducted for the Satellite Beach basin consisted of a composite of flows from the land uses in the basin. Since the basin is primarily residential, analysis focused on compaision of the residential pollutant concentrations. Table 5 shows a comparison of literature and field monitoring data.

Table 5. Comparison of Literature and Field Monitoring Data

Item	Concentrations, mg/L		
	Total Suspended Solids	Total Nitrogen	Total Phosphorus
Monitoring Data			
Average	77	1.2	0.35
Maximum	176	2.1	0.53
Flow-Weighted	72	1.2	0.24
Literature Values			
NURP	140	3.3	0.47
1994 Study	27	2.3	0.03

Following a review and analysis of the data, the NURP value for TSS concentration of 140 mg/l was found to be high compared to the flow-weighted concentration from the monitoring data and the 1994 Study. The NURP value for total nitrogen was also found to be significantly higher that the flow-weighted average concentration.

It was concluded that concentration values closer to the monitoring data would be used for residential land use. For other land use types, the values from the 1994 report, which are specific to Florida communities, would be used for modeling purposes.

MODELING

Information regarding the Watershed Management Model is provided in Appendix A. The model uses annual precipitation data, event mean concentrations for land use types, and limited watershed information to compute average annual mass loading. The impact of BMPs can also be assessed using the model. Input data for the model is presented in Table 6.

Table 6 Model Input Data

Model Parameter,	Residential	Commercial	Institutional	General
TSS, mg/L	100	80	80	---
Total Nitrogen, mg/L	1.5	1.2	1.2	---
Total Phosphorus, mg/L	0.3	0.2	0.2	---
Runoff Correction Factor	---	---	---	0.9
Annual Rainfall, in	---	---	---	51

Based on the model input information, model scenarios were conducted for average annual conditions. The modeling results are shown on Table 7. Flow and mass loading for TSS, TN and TP are shown in Figures 2, 3 and 4.

Table 7 Modeled Mass Loading By Basin

Basin	Total Area, ac	Flow, ac-ft/yr	Total Nitrogen, lb/yr	Total Phosphorus, lb/yr	Total Suspended Solids, lb/yr
1	88.6	127	467	93	31,108
2	15.5	17	63	13	4,232
3	51.7	70	257	51	17,146
4	23.6	26	95	19	6,304
5	63.6	71	239	45	15,913
6	9.8	13	45	9	3,024
7	8.0	13	47	9	3,121
8	50.2	64	231	46	15,386
9	91.4	126	462	92	30,783
10	88.3	127	465	93	30,996
11	19.0	24	87	17	5,822
12	4.7	8	28	6	1,837
13	6.1	9	32	6	2,142
14	4.0	6	22	4	1,459
15	5.7	5	17	3	1,156
16	6.6	10	38	8	2,530
17	3.6	5	19	4	1,265
18	14.0	17	64	13	4,248
Total	**554.3**	**737**	**2,677**	**532**	**178,474**

Figure 2. Flow Per Basin

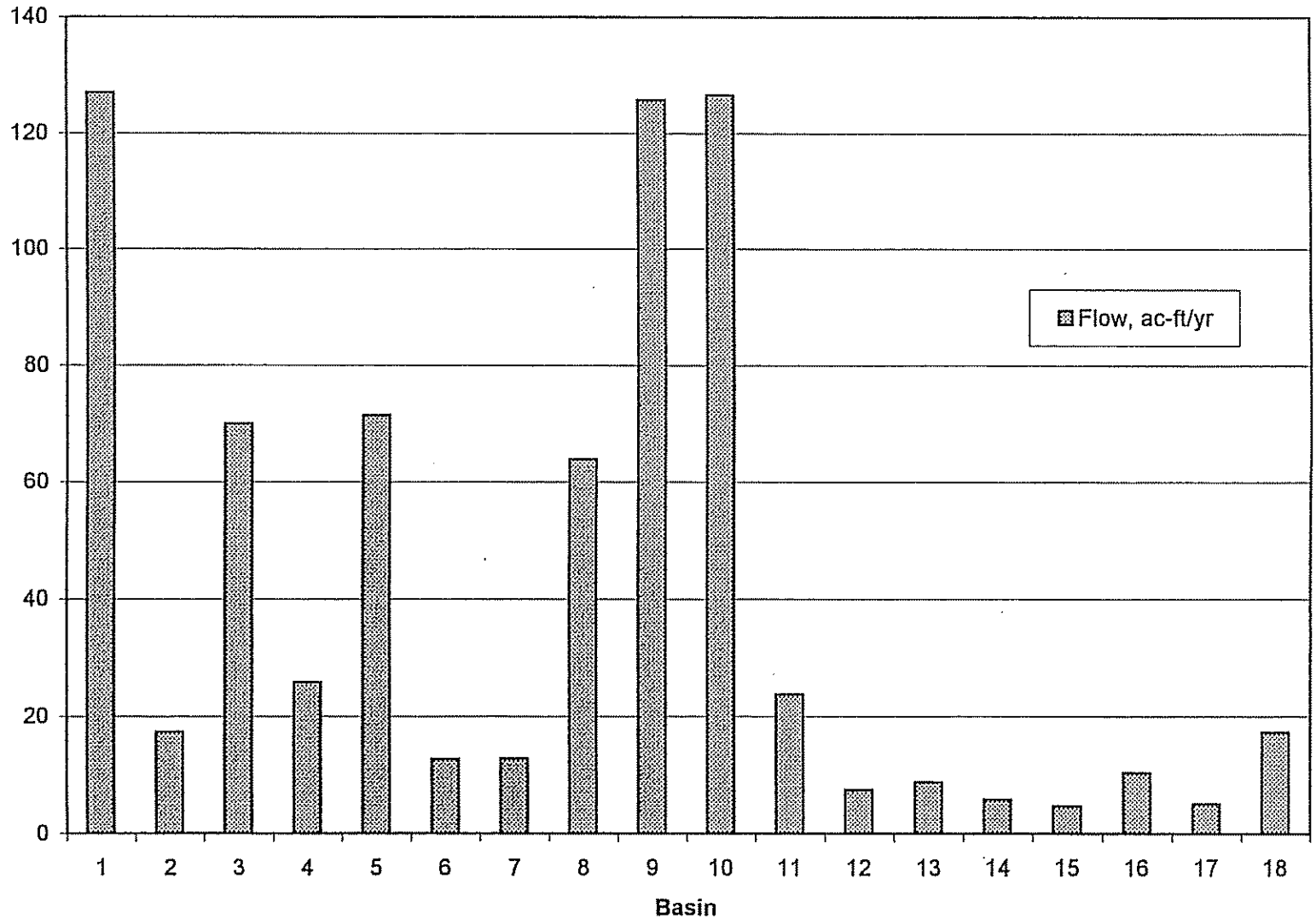


Figure 3. Annual Average TSS Loading By Basin

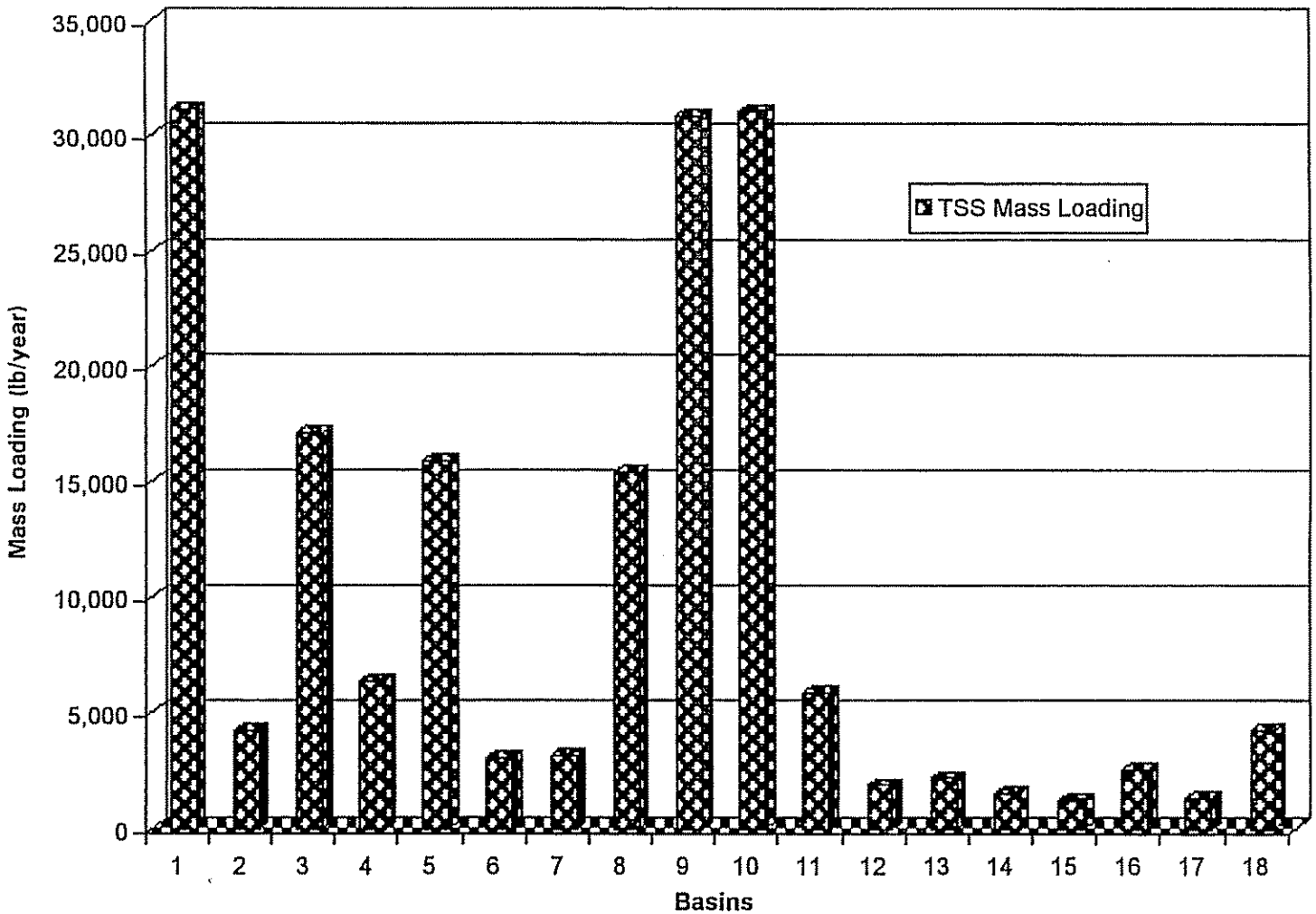


Figure 4. Annual Average Nitogen and Phosphorus Loading By Basin