



**FINAL**  
**AUGUST 2019**

# Stormwater 10-Year Work Plan

City of Cocoa, FL



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## **1. Executive Summary**

The City of Cocoa (City) is located in Brevard County, Florida between the eastern shore of the Indian River Lagoon (IRL) and the St. Johns River (SJR). The City employs the Stormwater Utility as part of its Public Works Department in order to ensure the capacity and functionality of the overall stormwater management system. It is the task of this division to protect public health and safety by maintaining and upgrading drainage systems such that potential blockages are removed (Flood Mitigation) and nutrient loads to water bodies are reduced (Water Quality) as required by the City's Comprehensive Plan.

In order to properly plan and budget for the City's future Stormwater Utility needs, Mead & Hunt was tasked with developing a 10-Year Stormwater Capital Plan. The work plan needed to address single year capital improvements as well as improvements spread out over the course of the 10-year plan. The types of projects have been categorized under 3 general types: Flood Mitigation (FM), Water Quality (WQ), and Major Equipment (ME).

This effort is being conducted in coordination with a utility rate study being performed by Stantec. The rate study also includes the proposal to shift the funding source for the Stormwater Utility from one based upon utility billing along with the property's water and sewer bill to one that is attached to the Property Appraiser's tax assessment. Stantec's effort also incorporated a shift in the method of measuring a property's impact on the Stormwater Utility and infrastructure. This shift is in the direction of calculating the property's impervious area which more properly predicts stormwater runoff and therefore load to the City's infrastructure.

Over the course of this evaluation, meetings with City Staff and Stantec have resulted in the various conversations pertaining to the impacts to future funding based upon project scheduling and implementation. Various alternatives pertaining to scheduling of the projects, borrowing money and increased utility fees were discussed and presented to the City Manager and the City Council.

Among the various funding sources available for the implementation of the projects discussed below include direct budgeting from the Stormwater Utility funding source directly. Additionally, various grant and loan programs are available to fund portions of projects depending on their particular requirements. These include Save Our Indian River Lagoon (SOIRL) grants for water quality improvements and nutrient reduction. St Johns River Water Management District (SJRWMD) cost share grants. Programs offered by the Florida Department of Environmental Protection include; State Water-quality Assistance Grant (SWAG), Federal Clean Water Act Section 319(h) Grants, and Clean Water State Revolving Fund (SRF) Loan Program. Funds from these programs can often be utilized in intricate schemes that are beyond the scope of this report. Going forward, as the projects are developed and the Stormwater Utility revenue stream are defined and delineated, a careful look will need to be taken with respect to re-prioritizing along this line. Programs gain or lose support from one year to the next, or one administration to the next, and careful and consistent monitoring is required to implement them for best advantage.

Because of the various sources of funding, certain projects may be moved up or down the schedule, or even deferred from the planned list based upon funding availability.

### Flood Mitigation

In the case of Flood Mitigation issues, the City maintains a Stormwater Capital Work Plan (SCWP) where it both, identifies the existing conditions of its infrastructure, and project improvements necessary to address any deficiencies in the system. This plan includes projects that aim to identify and prioritize flooding situations witnessed during significant storm events and contains alternatives that make use of non-structural methods wherever possible, as required by the Comprehensive Plan.

Flood mitigation projects address a variety of issues from ageing infrastructure to sea level rise. Included in this report are projects that aim to address recurring flooding issues as well as general improvements to the overall stormwater system. Some topics include:

- Ditch piping projects
- Elevating roadways
- Stormwater retention structures

### Water Quality

The Stormwater Utility must also fulfill the Water Quality requirements of the National Pollutant Discharge Elimination System (NPDES) and Total Maximum Daily Loads (TMDLs) established as part of the Florida Department of Environmental Protection's (FDEP) Basin Management Action Plan (BMAP). Following a series of algal superblooms between 2010-2012, the North IRL BMAP was created as part of a State-wide program to restore the quality of water bodies in Florida. The BMAP established water quality targets, or TMDLs, for specific pollutants including Total Nitrogen (TN) and Total Phosphorous (TP). The original 2013 document (FDEP 2013) required the City of Cocoa reduce TN and TP loadings by 16,063 lbs/yr and 3,714 lbs/yr respectively.

In the latest available Progress Report for the North IRL BMAP (FDEP 2017), the City of Cocoa was estimated to have met 50% of its required Total Nitrogen (TN) reductions, or 8,063 lbs/yr as well as 104% of its required Total Phosphorous (TP) reductions, 3,868 lbs/year. The City had submitted 20 projects to be considered for their calculation of TMDL reductions, with 14 projects listed as completed, and the other 6 underway. Some of those projects have since been completed, while others are still in their planning stages.

As of May 2019, recent County-provided information from Brevard County indicated that TMDL credit shares via the Save Our Indian River Lagoon (SOIRL) program would cover Cocoa's remaining BMAP reductions. However, City staff recommended including Water Quality projects to their 10-Year Plan to address nutrient removal issues specific to the City. Included in this report are some alternatives for projects in this category, including:

- Nutrient removal structures
- Pond aeration
- Low Impact Development (LID) systems

Major Equipment

A smaller but important portion of this report is dedicated to maintenance of the fleet of vehicles and machinery used by the Stormwater Utility staff. Major Equipment projects seek to answer the question of whether to make necessary repairs to equipment currently in inventory, or to replace them with new equipment which may also have designs and features which will allow the Utility to more effectively maintain its infrastructure.

Costs

As required by the 10-year SCWP, the City must perform a comprehensive and comparative analysis of all capital, operational, and maintenance costs associated with the identified improvements necessary to reduce flooding and nutrient loading. The estimated costs of each individual alternative, including a proposed prioritized plan of implementation, and a recommended time schedule for performing each chosen project are necessary elements, all of which are discussed in this document.

**A. Selected Projects**

The following tables contain the projects that were selected by the City and this study to be considered as part of their 10-Year Stormwater Work Plan. The selection process involved a prioritization system developed by City officials and outlined in Section 5 of this document.

**B. Selected Flood Mitigation Projects**

The following list is the final selection of Flood Mitigation projects as determined by City staff in conjunction with their consultants and the City Council to be considered. The projects are ranked to motivate the completion of some projects ahead of others based on the parameters described later in this document.

*Table 1: Selected Flood Mitigation Projects Prioritization and Ranking.*

Project #	Project Name	Rank	Total Project Cost
FM-6	Replace or Line Corrugated Metal Pipe (CMP) Piping	1	\$968,750
FM-3	Pineda St. Drainage Improvements - Peachtree to Dixon Upgrade Sidewalks & Swales	2	\$1,167,075
FM-12	Fairfax Ln. Exfiltration Expansion, Highpoint Subdivision	2	\$353,808
FM-15	Annual Curb & Gutter R&M Program	2	\$500,000
FM-7	Driveway Culvert Replacements (Cox Road)	5	\$509,418
FM-10	Provost Park / Pinegrove Park Ditch Piping	5	\$244,125
FM-18	iWorQ Integration Between GIS and Operations & Maintenance	5	\$77,777
FM-19	Comprehensive System Model	5	\$125,000
FM-17	West Dixon Blvd. Stormwater Facility	9	\$291,564
FM-20	Mud Lake Improvements	9	\$77,770
FM-1	Range Road Ditch Piping	12	\$387,000
FM-13	Cocoa North Rear Yard Ditch Piping (London Blvd. to West Minister)	13	\$999,180
FM-2	Junction Structure at Plaza Parkway & Highland Drive Open Pit	14	\$165,848
FM-5	Bracco Pond Outfall and Discharge Structure	14	\$536,445
<b>TOTAL</b>			<b>\$6,403,760</b>

**C. Selected Water Quality Projects**

The following list contains the selected water quality projects to be completed as determined by City staff in conjunction with their consultants and the City Council. These projects were chosen following several discussions and cost/benefit determinations involving members of the Mead & Hunt team, Stantec staff, and City managers. The prioritization process detailed subsequently was utilized to identify which project should take precedence.

*Table 2: Selected Water Quality Projects Prioritization and Ranking.*

Project #	Project Name	Rank	Total Project Cost
<b>WQ-12</b>	Verizon Stormwater Pond in Diamond Square	1	\$549,643
<b>WQ-16</b>	Riverfront Park In-Lagoon Nutrient Removal	2	\$1,500,000
<b>WQ-28*</b>	Septic to Sewer: Broadview Manor, Carleton Terrace, Indian River Drive Frontage, River Heights and Grandview	3	\$4,338,360
<b>WQ-10</b>	72" Outfall Baseflow Capture/Treatment	4	\$1,216,663
<b>WQ-29*</b>	Expand Reclaimed Water Usage and Distribution	5	\$2,528,011
<b>WQ-15</b>	Add Floating Wetlands to Existing Stormwater Ponds	5	\$818,635
<b>WQ-11</b>	Horseshoe Ponds (North & South) Vegetation Removal	6	\$236,670
<b>WQ-20</b>	De-muck/Dredge SR520 Relief Channel	6	\$282,900
<b>TOTAL</b>			\$11,470,882
<b>WQ-18**</b>	SR 520 Runoff Treatment to Downtown	-	\$611,270
<b>WQ-17**</b>	Riverfront Park Stormwater Capture Modification	-	\$369,369
<b>TOTAL**</b>			\$10,951,521

\* Projects are anticipated to be funded and conducted by other Departments, i.e. SOIRL/Public Utilities.

\*\* In the event that WQ-16 Riverfront Park In-Lagoon Nutrient Removal cannot be permitted, Projects WQ-17 and WQ-18 would substitute it.

## D. Selected Major Equipment

The following is the list of major equipment purchases to be included as determined by City staff. Based upon current maintenance requirements and depreciation value it has been determined that these pieces of equipment will be replaced in the following order on alternating years of the upcoming ten-year cycle. The actual expenditure schedule for Major Equipment purchases is shown in Section 6 of this document.

*Table 3: Proposed Major Equipment replacements.*

Equipment #	Year	Equipment Name	Description	Replacement Cost
<b>131</b>	2008	Isuzu FVR TYMCO 500X	Street Sweeper	\$338,592
<b>137</b>	2009	Ford F150	Pickup Truck	\$25,989
<b>146</b>	1999	Ford 350SD	Pickup Truck	\$74,991
<b>158</b>	2014	International TYMCO 600X	Street Sweeper	\$395,953
<b>167</b>	2006	Sterling Acterra	Truck	\$178,459
<b>91</b>	1995	Ford VAC-CON	Vac-Con	\$599,999
<b>TOTAL</b>				\$1,013,984

**E. Overall Projects List**

The following tables show the overall projects list for the projects outlined in this document including their costs. As this list was being developed (see Section 2, Part C.) a number of projects were singled out and removed from consideration from the prioritization process and thus, not included in the overall list, or in the project description portion of this report (Sections 3 and 4).

In the tables below, the “Project Cost” column portrays the cost for implementing each individual project as described in Sections 3 and 4 of this document. The “Project Total” column portrays the overall cost of constructing, operating, and maintaining each project over the entire 10-year period being evaluated.

Flood Mitigation

*Table 4: Proposed Flood Mitigation projects and cost estimates.*

<b>Project #</b>	<b>Project Name</b>	<b>Project Cost</b>	<b>Project Total</b>
<b>FM-1</b>	Range Road Ditch Piping	\$387,000	\$387,000
<b>FM-2</b>	Junction Structure at Plaza Parkway & Highland Drive	\$165,848	\$165,848
<b>FM-3</b>	Pineda St. Drainage Improvements - Peachtree to Dixon Upgrade Sidewalks & Swales	\$1,167,075	\$1,167,075
<b>FM-4</b>	Broadmoor Acres Rear Yard Swales Piping	\$1,026,383	\$1,026,383
<b>FM-5</b>	Bracco Pond Outfall and Discharge Structure	\$536,445	\$536,445
<b>FM-6</b>	Replace or Line Corrugated Metal Pipe (CMP) Piping	\$193,750	\$968,750
<b>FM-7</b>	Driveway Culvert Replacements (Cox Road)	\$509,418	\$509,418
<b>FM-8</b>	Complete Drainage System on Dixon Blvd.	\$1,193,283	\$1,193,283
<b>FM-10</b>	Provost Park / Pinegrove Park Ditch Piping	\$244,125	\$244,125
<b>FM-11</b>	Elevate Indian River Dr.	\$967,395	\$967,395
<b>FM-12</b>	Fairfax Ln. Exfiltration Expansion, Highpoint Subdivision	\$353,808	\$353,808
<b>FM-13</b>	Cocoa North Rear Yard Ditch Piping (London Blvd. to West Minister)	\$999,180	\$999,180
<b>FM-14</b>	Diamond Square Pond & Piping Improvements	\$235,872	\$235,872
<b>FM-15</b>	Annual Curb & Gutter R&M Program	\$50,000	\$500,000
<b>FM-16</b>	Bracco Pond 72” Outfall (Rehabilitation/Replacement)	\$402,675	\$402,675
<b>FM-17</b>	West Dixon Blvd. Stormwater Facility	\$291,564	\$291,564
<b>FM-18</b>	iWorQ Integration between GIS and Operations & Maintenance	\$77,777	\$77,777
<b>FM-19</b>	Comprehensive System Model	\$125,000	\$125,000
<b>FM-20</b>	Mud Lake Investigation & Retrofit	\$77,777	\$77,777

Water Quality

*Table 5: Proposed Water Quality projects and cost estimates.*

<b>Project #</b>	<b>Project Name</b>	<b>Project Cost</b>	<b>Project Total</b>
<b>WQ-1</b>	Baffle Boxes on Smaller Basins Outfalls	\$227,088	\$1,135,440
<b>WQ-2</b>	Baffle Boxes on Larger Basins Outfalls	\$282,240	\$564,480
<b>WQ-3</b>	BAM Filter Retrofits for Existing Baffle Boxes	\$241,605	\$241,605
<b>WQ-4</b>	Living Shoreline Along Lagoon	\$117,000	\$117,000
<b>WQ-5</b>	Circle Drive Dry Retention Pond, Carlton Terrace & Broadview Manor Swales	\$421,667	\$421,667
<b>WQ-7</b>	Bracco Pond Aerators	\$51,534	\$51,534
<b>WQ-8</b>	Divert Bracco Pond Baseflow to St. Johns River Basin via Diamond Square Pond	\$1,960,793	\$1,960,793
<b>WQ-10</b>	72" Outfall Baseflow Capture/Treatment	\$1,216,663	\$1,216,663
<b>WQ-11</b>	Horseshoe Ponds (North & South) Vegetation Removal	\$236,670	\$236,670
<b>WQ-12</b>	Verizon Stormwater Pond in Diamond Square	\$549,643	\$549,643
<b>WQ-13</b>	Pond Aeration at North Fiske and other Stormwater Treatment Facilities	\$65,482	\$65,482
<b>WQ-14</b>	Scarborough Park & Water Tower Pond Expansion	\$160,272	\$160,272
<b>WQ-15</b>	Add Floating Wetlands to Existing Stormwater Ponds	\$206,635	\$818,635
<b>WQ-16</b>	Riverfront Park In-Lagoon Nutrient Removal	\$1,500,000	\$1,500,000
<b>WQ-17</b>	Riverfront Park Stormwater Capture Modifications	\$369,369	\$369,369
<b>WQ-18</b>	SR 520 Runoff Treatment to Downtown	\$611,270	\$611,270
<b>WQ-19</b>	Install BAM Treatment for AT&T Dry Retention Pond	\$168,714	\$168,714
<b>WQ-20</b>	De-muck/Dredge SR520 Relief Channel	\$282,900	\$282,900
<b>WQ-21</b>	Downtown Area Treatment System - Urban Planters, LID Improvements	\$145,080	\$725,400
<b>WQ-22</b>	Reduce Impervious Area (PaveDrain, Reduce Roadway) Near IRL	\$209,469	\$1,047,345
<b>WQ-23</b>	Inspection Program for HOA-Owned Treatment Ponds	\$57,492	\$57,492
<b>WQ-24</b>	Enhanced Stormwater Quality Education Programs	\$10,000	\$100,000
<b>WQ-25</b>	Update LDR's to Encourage LID and Provide Incentives for Overtreatment on Redevelopment	\$44,000	\$44,000
<b>WQ-26</b>	Bracco Pond Irrigation Repair/Replace for increased Reuse & Bank Stabilization	\$100,000	\$100,000
<b>WQ-27</b>	North Fiske Pond Irrigation Repair/Replacement	\$100,000	\$100,000
<b>WQ-28</b>	Septic to Sewer	\$4,338,360	\$4,338,360
<b>WQ-29</b>	Expand Reclaimed Water Usage and Distribution	\$1,264,006	\$2,528,011

## **2. Background**

The City of Cocoa, located at latitude 28°22'13.43"N and longitude 80°44'47.68"W, covers an area of about 15.4 square miles between the City of Rockledge and Port St. John. The City has a population of about 19,286 according to 2018 estimates by the Bureau of Economic and Business Research (BEBR). Land use throughout the City is a mix of residential and commercial usages, including a downtown area of high intensity commercial usage known as Cocoa Village. Most of the soils in the City are well-drained soils, classified as hydrologic Type-A or A/D soils.

### **A. Stormwater Utility**

Although some elements of the stormwater system date back to the 1920s, the City of Cocoa's current Stormwater Utility System was created in 1992. An implementation plan funding the program was developed following an evaluation of the stormwater utility which found that the level of funding at the time could not address the water quality and quantity issues the City was facing.

Today, the City maintains nearly 3,000 structures throughout its system including manholes, stormwater control structures, end structures, baffle boxes, and more. The system is connected by way of about 65 miles of stormwater piping ranging in size from 12-inches to 72-inches in some of the larger structures. The utility is also in charge of maintaining about 77-acres of stormwater retention and detention ponds, including 5 large ponds in the center of the City known as the Bracco Ponds.

The Stormwater Utility accounted for \$1.48M in funding for fiscal year 2019 through their Stormwater Utility Fee. This funding is necessary in order to maintain the numerous stormwater management structures that the City actively maintains. At the current level of funding, less than \$400,000 can be dedicated to maintenance functions. The City, therefore, is looking at revising the Stormwater Utility revenue generating structure and associated rates.

### **B. Scope of Work**

This report aims to provide a comprehensive list of projects that may be included in the City's Stormwater Utility 10-year work plan. The types of projects have been categorized under 3 general types: Water Quality (WQ), Flood Mitigation (FM), and Major Equipment (ME).

Flood Mitigation projects are focused on meeting City-wide stormwater level of service goals, and various stormwater infrastructure and maintenance projects needed to be evaluated. Examples of these types of projects include:

- Replacing or stabilizing ageing and deteriorating pipes.
- Reducing maintenance requirements by piping open ditches.
- Installing or completing drainage systems.
- Establishing comprehensive City-wide initiatives.

Water Quality projects are primarily focused on meeting the City's Indian River Lagoon (IRL) Basin Management Action Plan (BMAP) requirements to reduce Total Maximum Daily Loading (TMDL) of nutrients to the lagoon. Capital projects include items like:

- Construction of nutrient removing baffle boxes
- Establishing living shorelines
- Augmentation of existing stormwater treatment facilities such as Bracco Ponds
- Expanding public education programs
- Updating the Land Development Regulations (LDRs) to require and/or incentivize stormwater treatment measures

These projects were presented to City staff with the aim of populating their 10-year work plan in conjunction with a stormwater utility rate study and potential change in utility funding structure being performed by Stantec, and in coordination with City staff.

### **C. Origin of Projects**

The projects outlined in this report were developed as a result of a collective effort from the project team at Mead & Hunt and the City's Stormwater Utility. The origins of these conceptual designs vary from existing projects found within the City's Fiscal Year (FY) 2018 Capital Improvements Projects (CIP) list, an existing Stormwater TMDL Compliance Report (QLH 2016) prepared by Quentin L. Hampton, and a collaboration of ideas between the City engineers and the team of engineers at Mead & Hunt. The scopes of the projects range from straightforward adaptations of BMPs in specified locations, to comprehensive City-wide initiatives.

#### **From CIP:**

- **Project FM-1:** Range Road Ditch Piping
- **Project FM-6:** Replace or Line Corrugated Metal Pipe (CMP) Piping
- **Project FM-15:** Annual Curb & Gutter R&M Program
- **Project FM-20:** Mud Lake Investigation & Retrofit
- **Project WQ-1:** Baffle Boxes on Smaller Basins Outfalls
- **Project WQ-10:** 72" Outfall Baseflow Capture/Treatment

#### **From TMDL:**

- **Project FM-14:** Diamond Square Pond & Piping Improvements
- **Project WQ-5:** Circle Drive Dry Retention Pond, Carlton Terrace & Broadview Manor Swales
- **Project WQ-10:** 72" Outfall Baseflow Capture/Treatment
- **Project WQ-14:** Scarborough Park & Water Tower Pond Expansion
- **Project WQ-21:** Downtown Area Treatment System - Urban Planters, LID Improvements
- **Project WQ-28:** Septic to Sewer

## **D. Sources of Data**

City staff provided GIS shape files which included stormwater basins, pipes and structure information. Additionally, staff provided stormwater monitoring data and information on observed flooding and actions taken. This data assisted in the development of conceptual designs as well as with the evaluation of nutrient loading and load reductions.

In order to evaluate nutrient loading and BMP analysis for load reductions, a variety of sources were utilized. BMPTRAINS which was developed by the University of Central Florida Stormwater Academy takes inputs such as basin size and land use categories to predict nutrient runoff and annual average nutrient loads to receiving water bodies (Wanielista et al.2017). The program then allows the user to input various types and sizes of treatment mechanisms in a parallel manner, or in series, in a treatment train approach. Utilizing data from multiple studies by various agencies, it then applies a nutrient reduction factor which was then utilized in our analysis of load reductions (FDEP 2018).

Anticipated project cost and annual maintenance of the projects was largely performed based on recent project costs for similar projects designed and administered by Mead & Hunt, or utilizing quotes provided to the City, along with their recent project costing data.

For the flood mitigation projects, the GIS information provided by the City also included parcel data which was utilized to estimate the number of properties affected by the flooding potential and project benefit. Although the Brevard County Property Appraiser's website was utilized in evaluating the project costing where it may be necessary to purchase property to accomplish a project, this tool was not implemented for evaluating the flood mitigation projects. It was felt that in order to impartially determine a project's benefit, that the relative property value might skew the evaluation in favor of more well to do areas to the detriment of lower income neighborhoods.

### **3. Recommended Flood Mitigation Projects**

The following projects have been identified for the purposes of flood mitigation, reduction in nuisance flooding, and reduction in the required maintenance of stormwater conveyance systems. Projects range from improved stormwater conveyance, upgrading deteriorating piping, roadway elevation and additional basin storage to reduce runoff downstream.

#### **A. Project List**

- Project FM-1:** Range Road Ditch Piping
- Project FM-2:** Junction Structure at Plaza Parkway & Highland Drive
- Project FM-3:** Pineda St. Drainage Improvements - Peachtree to Dixon Upgrade Sidewalks & Swales
- Project FM-4:** Broadmoor Acres Rear Yard Swales Piping
- Project FM-5:** Bracco Pond Outfall and Discharge Structure
- Project FM-6:** Replace or Line Corrugated Metal Pipe (CMP) Piping
- Project FM-7:** Driveway Culvert Replacements (Cox Road)
- Project FM-8:** Complete Drainage System on Dixon Blvd.
- Project FM-10:** Provost Park / Pinegrove Park Ditch Piping
- Project FM-11:** Elevate Indian River Dr.
- Project FM-12:** Fairfax Ln. Exfiltration Expansion, Highpoint Subdivision
- Project FM-13:** Cocoa North Rear Yard Ditch Piping (London Blvd. to West Minister)
- Project FM-14:** Diamond Square Pond & Piping Improvements
- Project FM-15:** Annual Curb & Gutter R&M Program
- Project FM-16:** Bracco Pond 72" Outfall (Rehabilitation/Replacement)
- Project FM-17:** West Dixon Blvd. Stormwater Facility
- Project FM-18:** iWorQ Integration between GIS and Operations & Maintenance
- Project FM-19:** Comprehensive System Model
- Project FM-20:** Mud Lake Investigation & Retrofit

**B. Recommended Flood Mitigation Projects.**

**(1) FM-1: Range Road Ditch Piping**

Location

Project FM-1 focuses on the open ditch that runs along the eastern boundary of Range Rd. between SR520 and Cocoa Bay Blvd. N Range Rd. is a well-traveled corridor that extends southward with its open ditch stormwater conveyance system joining a larger open channel near the intersection with Lake Dr.

Proposed Improvements

Public Works proposes the installation of 3000 feet of Surplus 48" Ductile Iron Pipe (DIP) and inlets on Range Road from Hooper Rd. north to Cocoa Bay Blvd. This work to be done in three phases with the first phase being engineering, then two construction phases consisting of 1,500 feet each.

Benefits

Open ditch conveyance systems are often put in place as they are cost effective methods of transporting runoff from rainfall events. They have water quality improvement capabilities and help reduce flow rates as they attenuate flow rates. However, they also present safety hazards as they are usually near roadways, may be unsightly, and usually incur maintenance costs due to sediment accumulation and vegetation growth.

Benefits to changing from open ditch conveyance systems to closed piping systems include a reduction in maintenance costs as well as an increase to public safety as this possible hazard is removed.

Cost Estimate

Total costs for all phases of this project are estimated to be \$387,000.

**Section 3**  
**Recommended Flood Mitigation Projects**

Table 6: Cost Estimate Table – Project FM-1: Range Road Ditch Piping.

Project FM-1: Range Road Ditch Piping						
Item Number	Location	Proposed Retrofit Improvements				
	Range Rd.	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Demolition	1	LS	\$20,000.00	\$20,000.00
	- Site preparation	Dewatering and flow diversion	1	LS	\$30,000.00	\$30,000.00
	- Construction management	Maintenance of traffic, signage	1	LS	\$15,000.00	\$15,000.00
	- Storm Pipe	Install Owner Furnished 48" DIP Pipe	3,000	LF	\$75.00	\$225,000.00
	- Roadway/Driveway Restoration	Asphalt, base and subgrade	500	SY	\$25.00	\$12,500.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	\$20,000.00	\$20,000.00
<b>Qualifications (if applicable)</b>			<b>SUB-TOTAL</b>			<b>\$322,500.00</b>
1						
				- Mobilization @	10%	\$32,250.00
				- Contingencies @	10%	\$32,250.00
			<b>SUB-TOTAL OF CONSTRUCTION COST</b>			<b>\$387,000.00</b>
				- Eng Design & Permitting @	0%	\$0.00
				- Subconsultants @	0%	\$0.00
				- Constr Admin and Insp @	0%	\$0.00
			<b>TOTAL PROJECT COST</b>			<b>\$387,000</b>

Section 3  
Recommended Flood Mitigation Projects



**(2) FM-2: Junction Structure at Plaza Parkway & Highland Drive**

Location

Project FM-2 is focused on the confluence of two existing pipes between the Bracco retention water ponds. Presently, there is an open ditch on the intersection where Plaza Pkwy. /W Highland Dr. turns northward from N Cocoa Blvd. This structure is unsightly and is fenced off to the public as it poses a safety risk. There have been documented episodes of people driving into this pit. Water pooling in the open ditch may be plagued by algal blooms that happen as a result in eutrophication.

Proposed Improvements

This project proposes the installation of a precast junction box along with all necessary piping to make the connections that would replace the current open ditch.

Benefits

This project removes a potential hazard, improves the general aesthetics of this location, and protects an important stormwater asset. Installation of a junction box would remove the ditch and leave a manhole in its place.

Cost Estimate

The cost to furnish and install the structure and all necessary piping for this project is estimated to be \$165,848 including all engineering and construction costs.

**Section 3**  
**Recommended Flood Mitigation Projects**

*Table 7: Cost Estimate Table – Project FM-2: Junction Structure at Plaza Parkway & Highland Drive.*

Project FM-2: Junction Structure at Plaza Parkway & Highland Drive						
Item Number	Location	Proposed Retrofit Improvements				
	Plaza Parkway & Highland Dr.	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Demolition	1	LS	\$20,000.00	\$20,000.00
	- Site preparation	Dewatering and flow diversion	1	LS	\$30,000.00	\$30,000.00
	- Construction management	Maintenance of traffic, signage	1	LS	\$5,000.00	\$5,000.00
	- Furnish & Install	18" RCP	25	LF	\$85.00	\$2,125.00
	- Furnish & Install	36" RCP	25	LF	\$115.00	\$2,875.00
	- Furnish & Install	72" RCP	25	LF	\$250.00	\$6,250.00
	- Furnish & Install	Precast Junction Box	1	EA	\$15,000.00	\$15,000.00
	- Restoration	Sodding, landscaping, etc.	1	LS	\$20,000.00	\$20,000.00
<b>Qualifications (if applicable)</b>			<b>SUB-TOTAL</b>			<b>\$101,250.00</b>
1				- Mobilization @	10%	\$10,125.00
				- Contingencies @	20%	\$20,250.00
			<b>SUB-TOTAL OF CONSTRUCTION COST</b>			<b>\$131,625.00</b>
			- Eng Design & Permitting @		15%	\$19,743.75
			- Subconsultants @		5%	\$6,581.25
			- Constr Admin and Insp @		6%	\$7,897.50
			<b>TOTAL PROJECT COST</b>			<b>\$165,848</b>



**(3) FM-3: Pineda St. Drainage Improvements – Peachtree to Dixon Upgrade Sidewalks & Swales**

Location

Project FM-3 focuses on the drainage structures along Pineda St., a heavily traveled corridor used by all types of traffic, including school buses. The roadway has deteriorated to the point that the base is failing, and the sidewalks are currently in poor condition including non-Americans with Disabilities Act (ADA) compliant handicap ramps.

Proposed Improvements

This project proposes an augmentation of existing plans for the reconstruction of Pineda Street. Improvements include the restoration of sidewalks as well as excavation of about 4,000 ft of swales and installation of about 5,000 ft of piping and approximately 30 inlet structures and junction boxes.

Benefits

Improvements to this heavily used corridor will bring increased public safety for the communities immediately adjacent to the roadway, including increased access to Endeavour Elementary School. Restoration of sidewalks along this street will provide a walkway and thus address trip hazards for pedestrians.

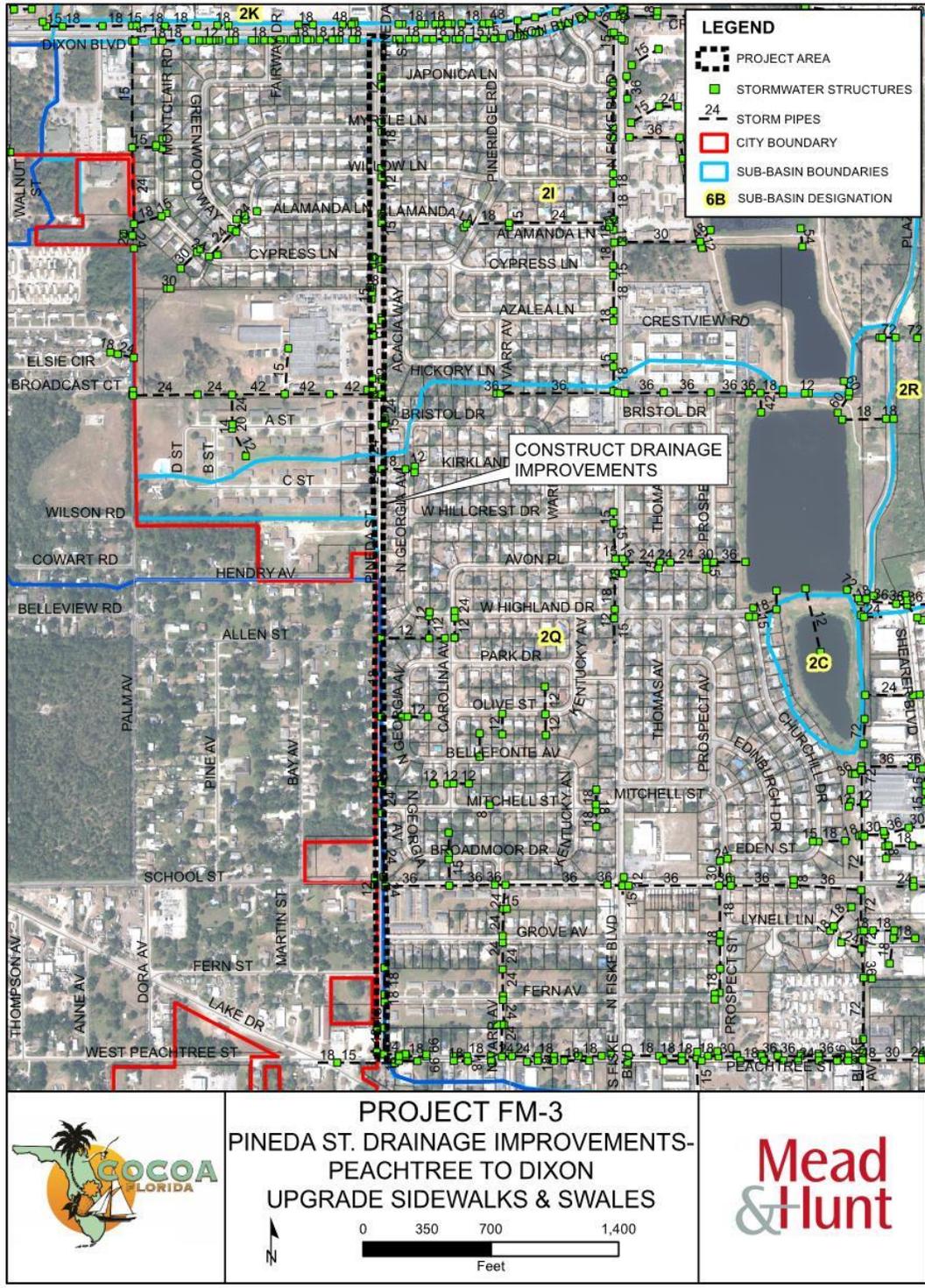
Restoration of swales and new piping will also bring drainage improvements to this corridor, as well as solving issues related to the deterioration of the roadway.

Cost Estimate

Estimated design and construction costs for this project are estimated to be \$1,167,075 including all piping, and necessary stormwater structures.



Section 3  
Recommended Flood Mitigation Projects



**(4) FM-4: Broadmoor Acres Rear Yard Swales Piping**

Location

Project FM-4 is focused on the Broadmoor Acres subdivision, pictured below. The overall drainage area is approximately 39 acres of ¼ acre lots and impervious road. Past projects in the area have been implemented to improve the drainage abilities of this area, including the excavation of swales in a corridor across the rear yards of homes between W Highland Dr. and Park Dr.

Proposed Improvements

This project aims to replace existing swales that were put in place to divert the flow of water towards the Bracco Ponds and N Fiske Blvd. with stormwater piping. Assuming the reuse of all existing stormwater structures and piping that already exists at some intersections, an additional 7700 ft of storm piping is to be installed.

Benefits

Benefits of this project include overall improvements to the general drainage of Broadmoor Acres, as well as alleviation or prevention of localized flooding issues that may exist. Ultimately, stormwater conveyed via this improved system will end up in the Bracco reservoir.

Cost Estimate

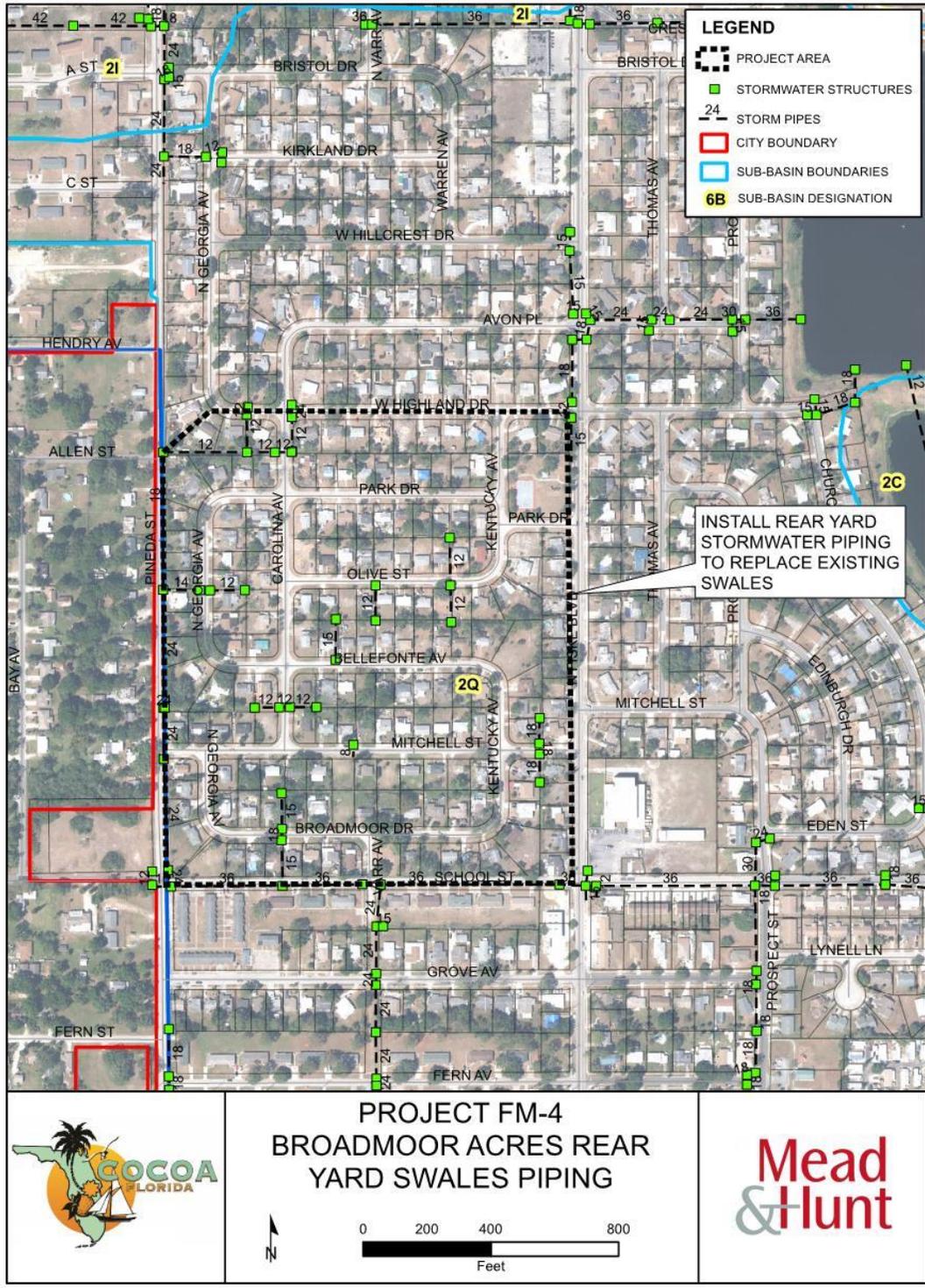
This project is estimated to cost \$1,026,383. Costs include about 7,700 feet of piping. However, the City determined that the cost of this project far exceeded the cost of maintaining the existing swales. In addition, there is a N Fiske /Broadmoor Acres Subdivision Drainage Improvement Project that is budgeted and anticipated to be performed in FY 2020. Therefore, this project was removed from consideration.

**Section 3**  
**Recommended Flood Mitigation Projects**

Table 9: Cost Estimate Table – Project FM-4: Broadmoor Acres Rear Yard Swales Piping.

Project FM-4: Broadmoor Acres Rear Yard Swales Piping						
Item Number	Location	Proposed Retrofit Improvements				
	Broadmoor Acres	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	\$20,000.00	\$20,000.00
	- Site preparation	Demolition	1	LS	\$30,000.00	\$30,000.00
	- Storm Piping	18" - 24" RCP	7,700	LF	\$75.00	\$577,500.00
	- Restoration	Sodding, landscaping, etc.	1	LS	\$25,000.00	\$25,000.00
<b>Qualifications (if applicable)</b>			<b>SUB-TOTAL</b>			\$652,500.00
1	Assumes the reuse of existing stormwater structures and piping at road crossings.					
					- Mobilization @ 10%	\$65,250.00
					- Contingencies @ 20%	\$130,500.00
					<b>SUB-TOTAL OF CONSTRUCTION COST</b>	<b>\$848,250.00</b>
					- Eng Design & Permitting @ 12%	\$101,790.00
					- Subconsultants @ 3%	\$25,447.50
					- Constr Admin and Insp @ 6%	\$50,895.00
					<b>TOTAL PROJECT COST</b>	<b>\$1,026,383</b>

Section 3  
Recommended Flood Mitigation Projects



**(5) FM-5: Bracco Pond Outfall and Discharge Structure**

Location

Project FM-5 deals with the Bracco Ponds outfall structure located between “Pond B” and “Pond C” and extends underneath W Highland Dr. towards the 72” pipe that conveys water beneath U.S. 1 and eastward to the IRL. The Bracco Ponds provide treatment of stormwater runoff to nearly 1,060 acres of land, meaning this outfall is an important component of a major drainage and stormwater treatment system.

Proposed Improvements

This project proposes the replacement of the existing open ditch with all of the piping, junctions, and structures necessary to complete the project.

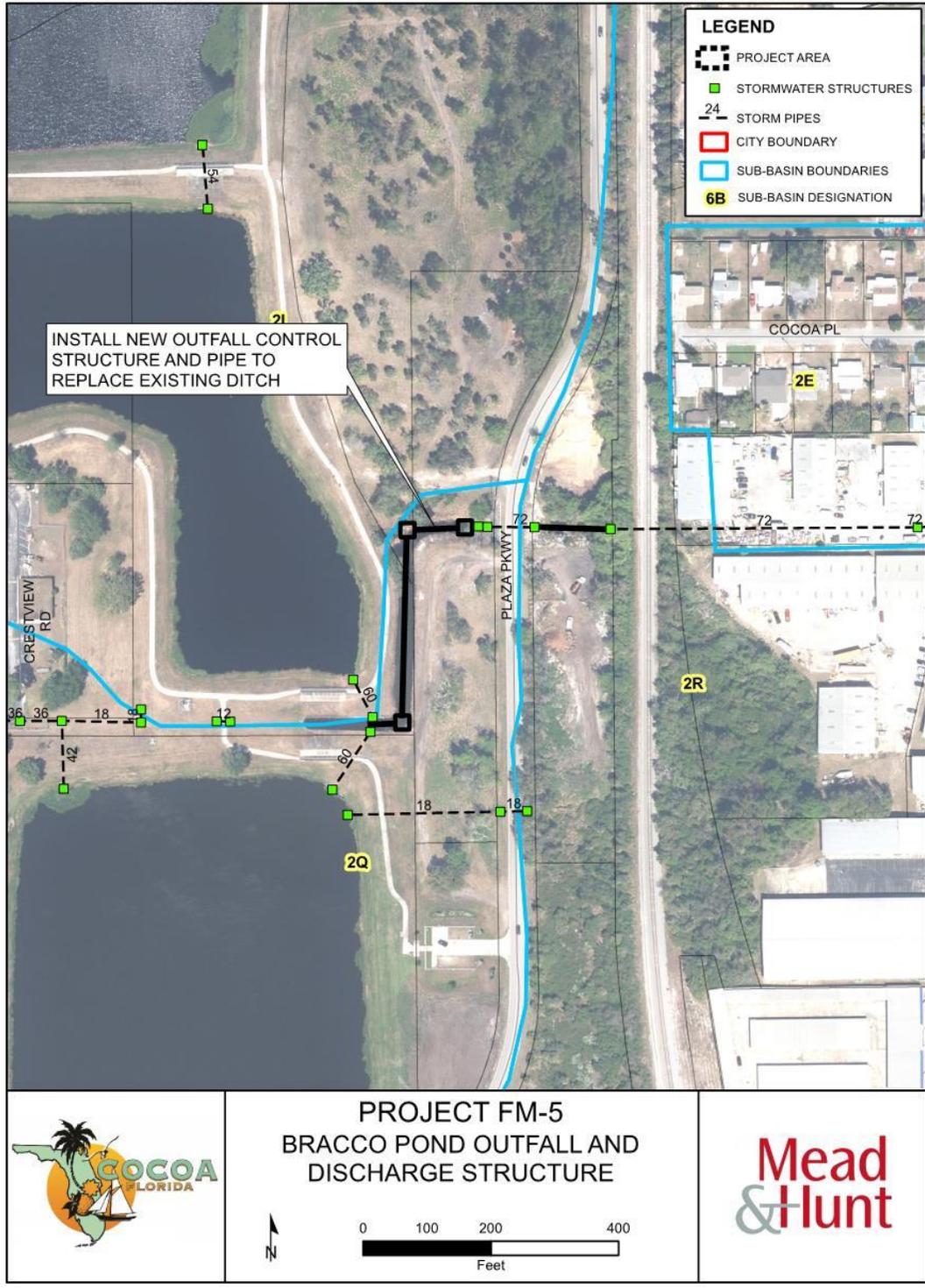
Benefits

Like other ditch piping projects, this project will improve the efficiency of this outfall as maintenance operations are usually associated with removing vegetation and other solids that may cause blockages at junction structures such as culverts, intakes and outfalls. It is important to ensure the reliability of this outfall structure to prevent any negative consequences to the Bracco system due to a major storm event.

Cost Estimate

It is anticipated that the cost of furnishing about 750 ft of 72” RCP piping as well as junction boxes at each location where connections to the new pipe will be made will be \$536,445.





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**(6) FM-6: Replace or Line Corrugated Metal Pipe (CMP) Piping**

Location

Project FM-6 is part of a City-wide effort to replace or restore some of the old corrugated metal piping (CMP) around the City. The City stormwater drainage system currently employs the following amounts of different sizes of CMP:

<b>Pipe Size (in)</b>	<b>Length of Pipe (Ft)</b>
12-18	15,242
19-30	4,325
31-42	1,282
43-54	502
55+	365
<b>Total</b>	<b>21,716</b>

Proposed Improvements

This project proposes the replacement or lining of these old metal pipes in order to address current localized flooding issues, and to prevent issues from arising in the future as corroding and decaying metal pipes fail.

It is proposed that an annual program be established to replace or line piping, assuming that about 25% of all piping currently being employed by the City will need attention.

Benefits

Replacing or lining these pipes reduces the amount of silt entering the pipe which can cause a blockage and potentially flood an area. Furthermore, this would reduce the potential for pipe failures along with the attendant driveway and roadway failures. When these pipes fail, flow is blocked, and flooding results. A failed pipe also allows soil to enter the pipe, causing damage to roads, structures and yards.

Cost Estimate

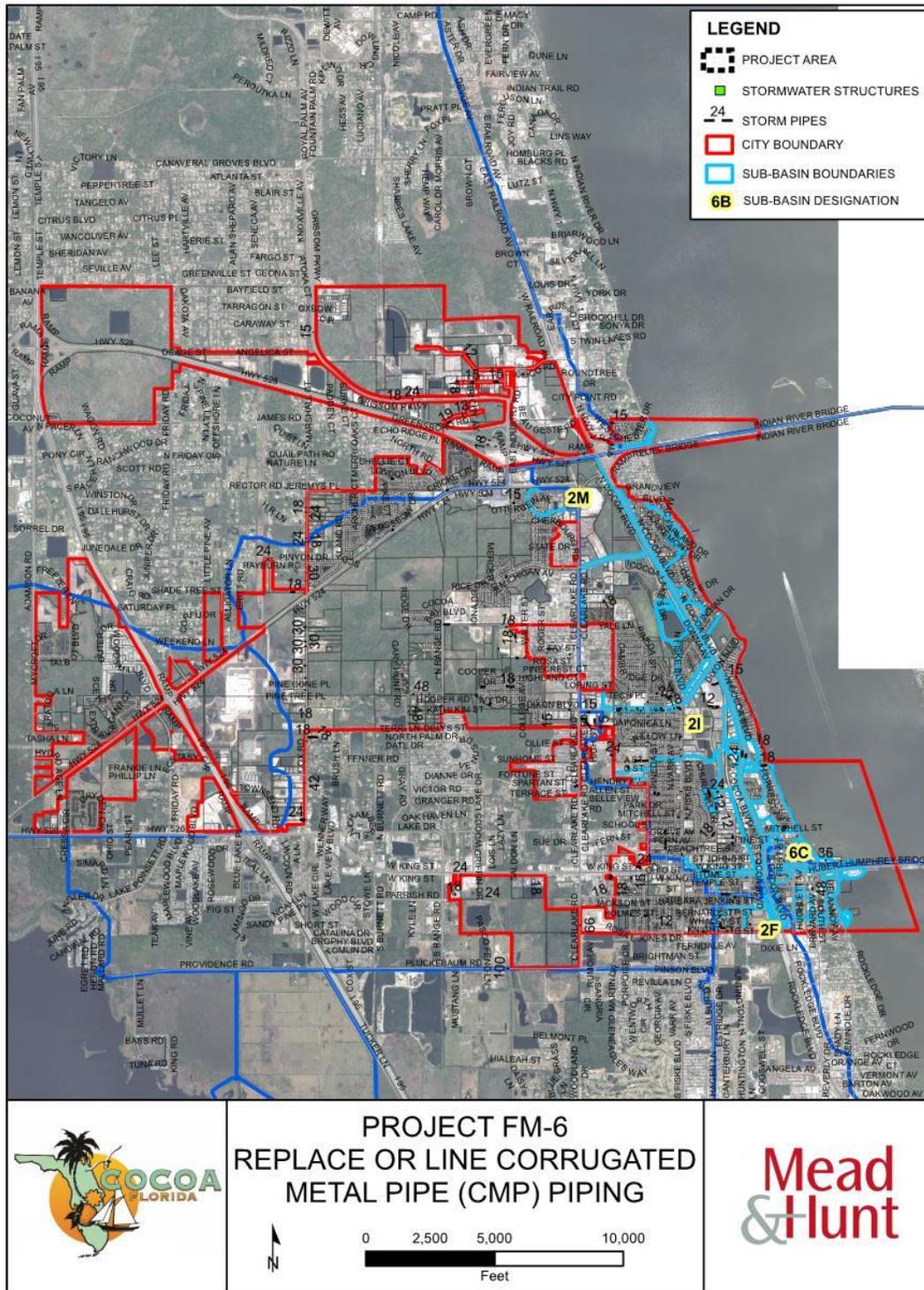
Cost estimates for this project were made assuming that this project would ultimately be an annual project that would gradually address different sections of the City's CMP. It was assumed that the annual program would look at about 1,000 feet of piping every year. Each pipe is approximately 100 feet in length and the average price per foot ranges from \$50 to \$150 per foot, depending on pipe size and condition, therefore, annual costs for this project are estimated to be \$193,750.

**Section 3**  
**Recommended Flood Mitigation Projects**

Table 11: Cost Estimate Table – Project FM-6: Replace or Line Corrugated Metal Pipe (CMP) Piping.

Project FM-6: Replace or Line Corrugated Metal Pipe (CMP) Piping						
Item Number	Location	Proposed Retrofit Improvements				
	City of Cocoa	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Construction management	Maintenance of traffic, signage	1	EA	\$15,000.00	\$15,000.00
	- Line CMP Piping	Average cost per foot	1,000	LF	\$140.00	\$140,000.00
<b>Qualifications (if applicable)</b>			<b>SUB-TOTAL</b>			<b>\$155,000.00</b>
1						
				- Mobilization @	10%	\$15,500.00
				- Contingencies @	15%	\$23,250.00
				<b>SUB-TOTAL OF CONSTRUCTION COST</b>		<b>\$193,750.00</b>
				- Eng Design & Permitting @	0%	\$0.00
				- Subconsultants @	0%	\$0.00
				- Constr Admin and Insp @	0%	\$0.00
				<b>TOTAL PROJECT COST</b>		<b>\$193,750</b>

Section 3  
Recommended Flood Mitigation Projects



**(7) FM-7: Driveway Culvert Replacements (Cox Road)**

Location

Project FM-7 aims to replace culverts under the driveways on Cox Rd. in the area south of SR-524. There is an open ditch conveyance system on the western boundary of Cox Road that must intersect several driveways and side streets on its course. Culverts of different sizes are installed at these locations to allow water to pass freely and without obstruction.

Proposed Improvements

It is proposed that these culverts be replaced due, in part, to a need for allowing a greater flow of water through the ditch. It is possible that some culverts may be clogged and in need of replacement. To achieve this, new larger pipes and headwalls will need to be installed depending on the nature of each driveway or intersection.

Benefits

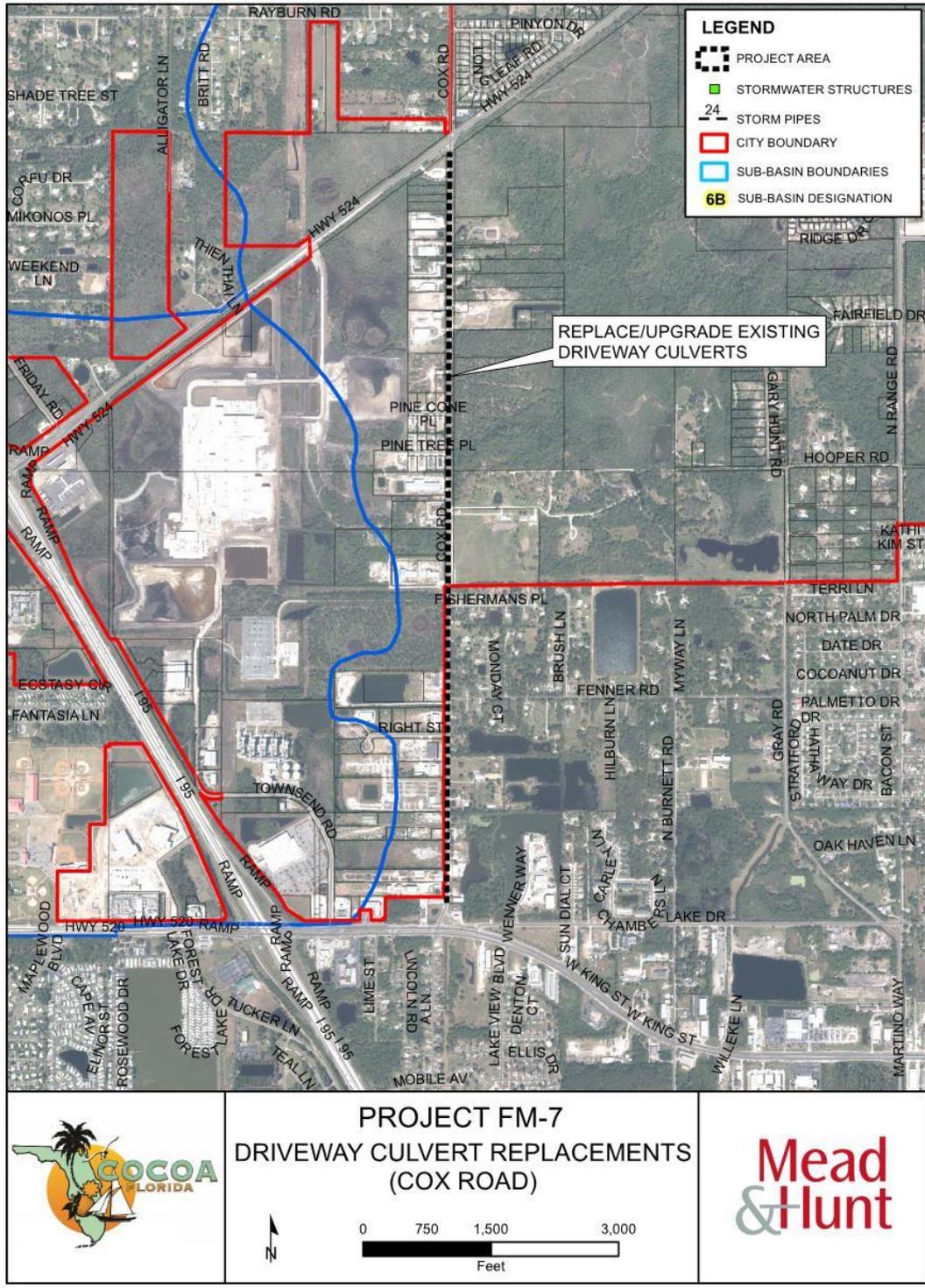
Open ditch systems are important elements of stormwater management. They provide effective conveyance of stormwater through the system and may also provide some storage and attenuation of larger flows. However, there is a constant need for maintenance to the system to ensure that there are no blockages that may cause flooding upstream. Thus, replacing culverts is a necessary task in maintaining the effectiveness of these open ditch systems to allow the free flow of water without having flooding issues.

Cost Estimate

It is anticipated that this project will cost \$509,418 including all necessary piping, headwalls, and driveway restorations necessary.



Section 3  
Recommended Flood Mitigation Projects



**(8) FM-8: Complete Drainage System on Dixon Blvd.**

Location

Project FM-8 is focused on the drainage system along Dixon Blvd. Dixon Blvd is a heavily traveled roadway that extends eastward from Clearlake Middle School to the IRL. Piping has been installed from Pineridge Rd. to N Fiske Blvd. connecting the roadway to outfalls in Bracco Pond. The rest of the corridor, the sections extending eastward and westward, have swales installed that direct water towards the current piping system.

Proposed Improvements

Plans have been drawn up to overhaul the drainage system on this corridor. Work has been completed on that part of the network west from N Fiske Blvd. up to Pineridge Rd. and that there is an unfinished section east from N Fiske Blvd. to the Florida East Coast Railroad, and west of Pineridge Rd.

The plans propose installing about 1,800 ft of piping and all associated inlet structures on the remaining eastern section of the road from N Fiske Blvd. to the FEC Railroad. Additionally, it is proposed that a similar drainage system be constructed west of Pineridge Rd. with about 2,700 ft of piping to be installed along with all necessary stormwater structures. An overlying system of swales would aid in attenuating flows from smaller rain events.

Benefits

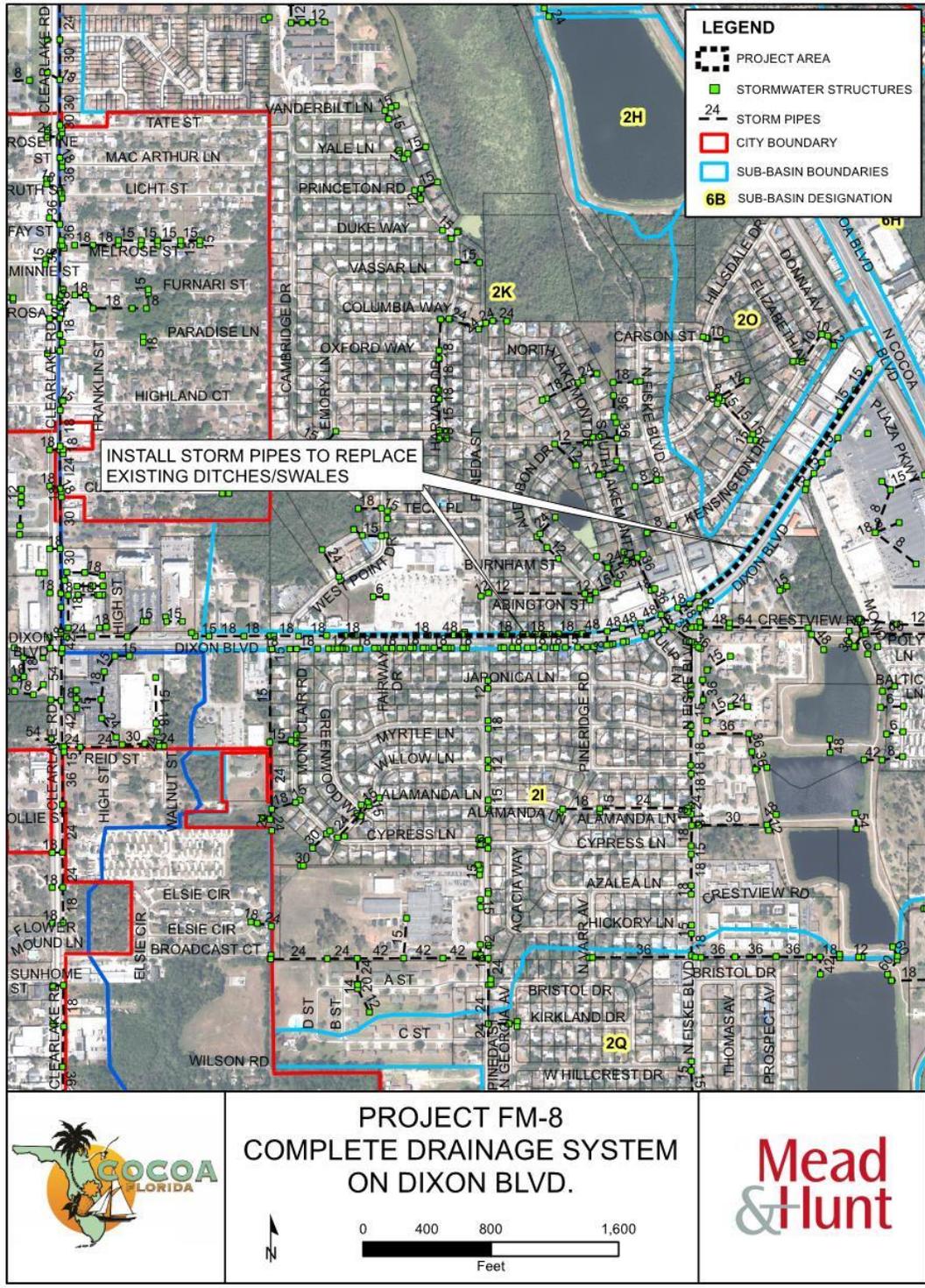
Upgrades to drainage systems are necessary as development of an area intensifies. This section of Dixon Blvd. is within the boundaries of the 836-acre US1 Community Redevelopment Area (CRA).

Cost Estimate

It is anticipated that this project will cost \$1,193,283. It is possible to consider this a multi-phase project separating the excavation of swales and the installation of the remaining piping.



Section 3  
Recommended Flood Mitigation Projects



**(9) FM-10: Provost Park / Pinegrove Park Ditch Piping**

Location

Project FM-10 is located on the west of Provost Park, a 9-acre multi-use park located on S Varr Ave., just south of W King St. There is an open field bounded by a pine grove on the western section of the park, Pinegrove Park, with an open ditch that is used to convey stormwater runoff. This open ditch is a section of a larger conveyance system that is transporting runoff from the drainage basin south to a retention pond on Pluckebaum Rd.

Proposed Improvements

It is proposed that the existing open ditch be replaced by piping in order to complete the section extending from W King St. to the wet pond south.

Benefits

Open ditch systems require constant maintenance in order to sustain their ability to transport stormwater runoff effectively. Therefore, piping of these ditches reduces maintenance costs to the City in the long run. Apart from important benefits provided by covering up of this ditch, this project would complete the final section piping the runoff from W King St. southward.

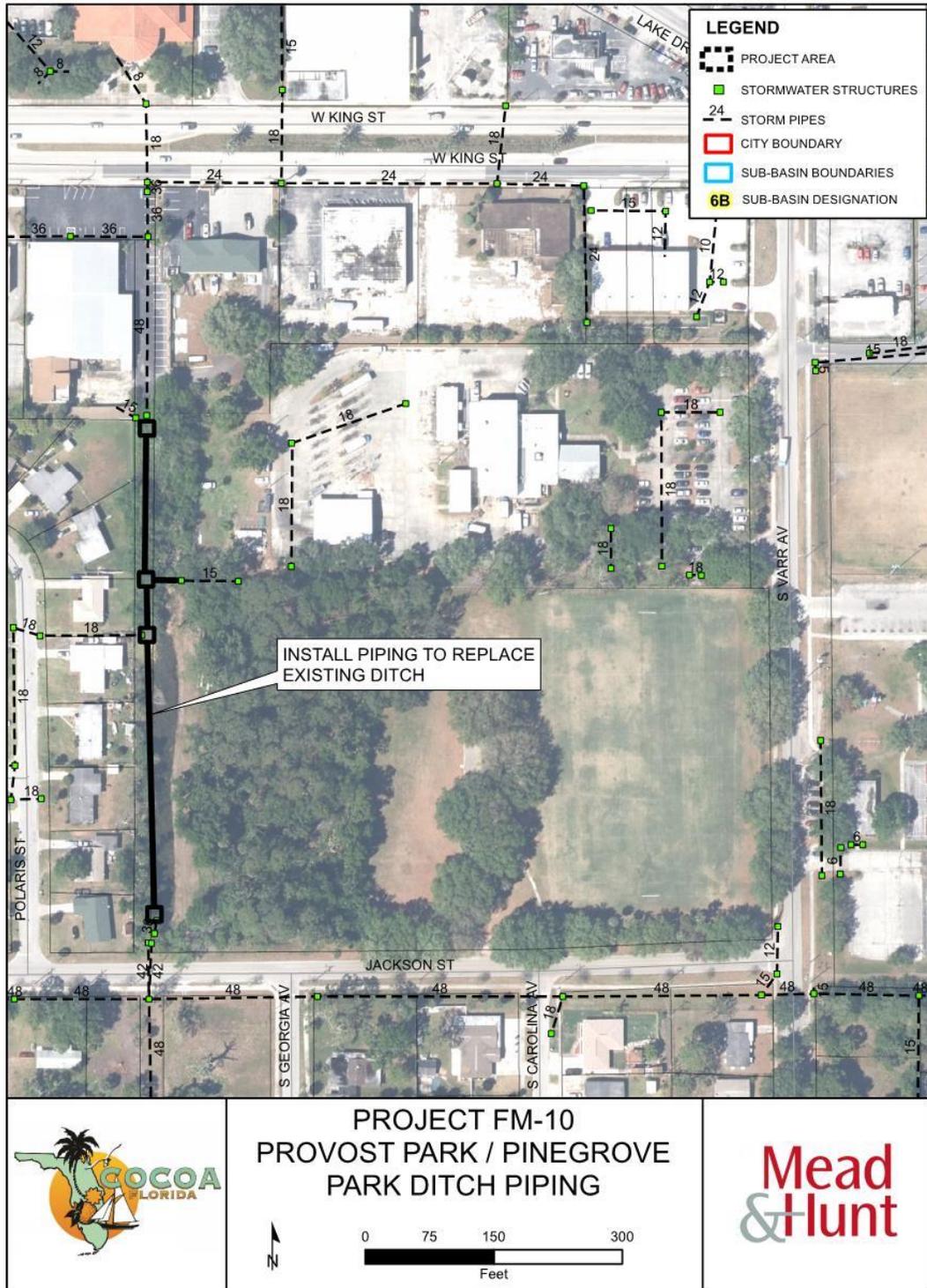
Cost Estimate

This project is anticipated to cost \$244,125 to install about 600 ft of storm piping and the necessary structures to connect this new system to the existing piping.

**Section 3**  
**Recommended Flood Mitigation Projects**

Table 14: Cost Estimate Table – Project FM-10: Provost Park / Pinegrove Park Ditch Piping.

Project FM-10: Provost Park / Pinegrove Park Ditch Piping						
Item Number	Location	Proposed Retrofit Improvements				
	Provost Park / Pinegrove Park	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site Preparation	Dewatering and Flow Control	1	LS	\$15,000.00	\$15,000.00
	- Furnish & Install	Stormwater Structures	5	EA	\$5,000.00	\$25,000.00
	- Storm Piping	48" RCP	600	LF	\$175.00	\$105,000.00
	- Right of Way Restoration	Sodding, Landscaping, etc.	1	LS	\$10,000.00	\$10,000.00
<b>Qualifications (if applicable)</b>			<b>SUB-TOTAL</b>			\$155,000.00
1						
					10%	\$15,500.00
					15%	\$23,250.00
					<b>SUB-TOTAL OF CONSTRUCTION COST</b>	\$193,750.00
					15%	\$29,062.50
					5%	\$9,687.50
					6%	\$11,625.00
					<b>TOTAL PROJECT COST</b>	<b>\$244,125</b>



**(10) FM-11: Elevate Indian River Dr.**

Location

Project FM-11 focuses on a 2300 ft length of roadway on Indian River Dr., a scenic, residential road extending northward from SR520 past the northern boundary of the City. The roadway essentially delineates the eastern boundary of the City of Cocoa where it meets the IRL. With heavy storm events bringing record rain, such as those witnessed in an October 2017 rain event, water levels in the roadway have risen to dangerous levels forcing partial shutdowns of the area.

Proposed Improvements

The reconstruction of this section of roadway at a higher elevation is proposed. Elevating this roadway entails the total reconstruction of the roadway and its intersections to the new desired elevation without negatively impacting nearby or adjacent properties.

Benefits

Elevating this vulnerable roadway protects it from the effects of heavy storm events eroding or destroying structure, as well as from the long-term effects of sea level rise. Projects of this nature are intended to reduce the overall flood risk to the area including any properties in the vicinity. Roadway elevation projects may be coupled with drainage improvements, such as those proposed in the Water Quality Projects WQ-1 and WQ-2 which propose the installation of discharge structures on the smaller and larger sub-basins that discharge stormwater to the IRL.

Cost Estimate

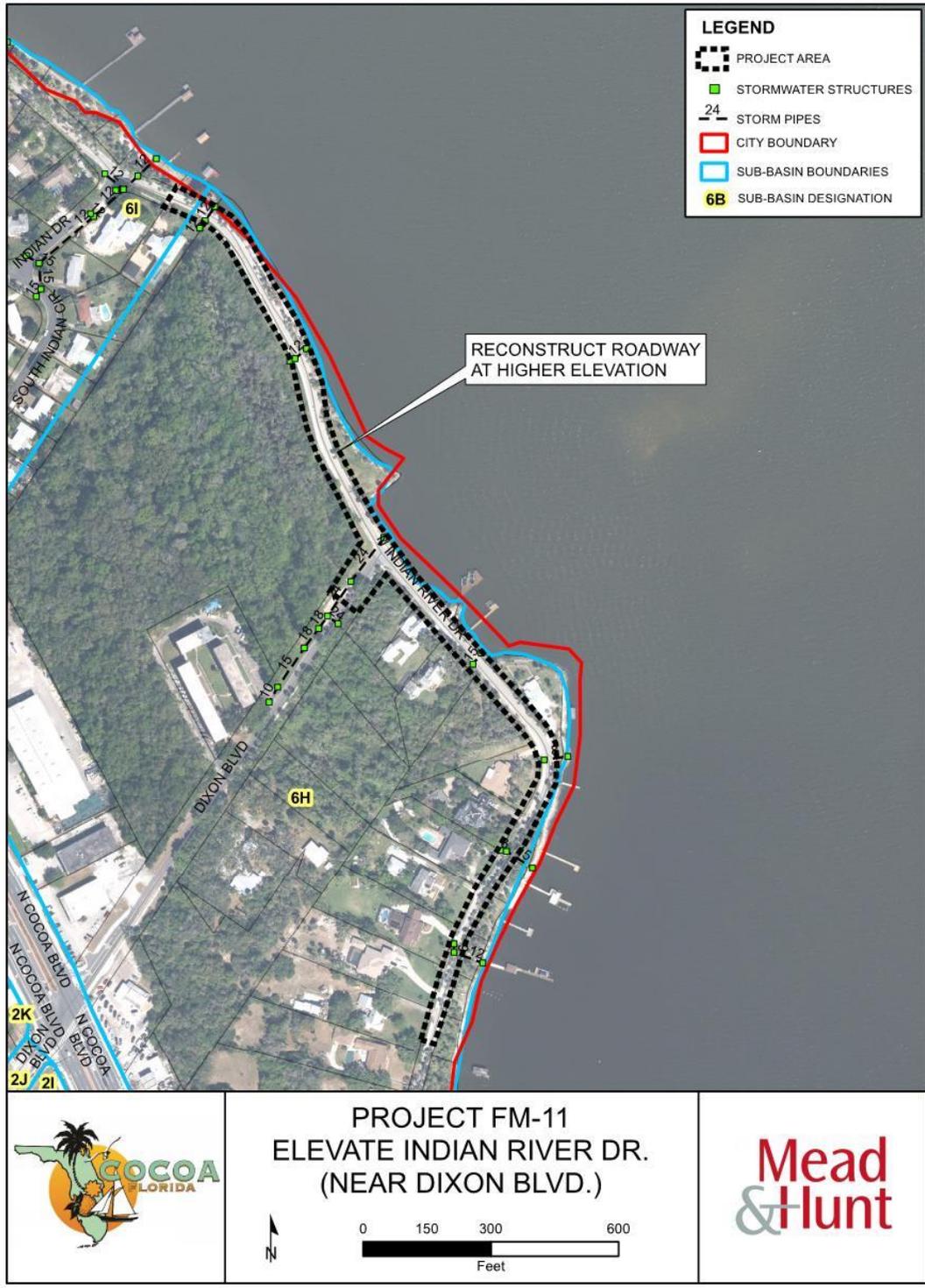
This project is anticipated to cost \$967,395.

**Section 3**  
**Recommended Flood Mitigation Projects**

Table 15: Cost Estimate Table – Project FM-11: Elevate Indian River Dr.

Project FM-11: Elevate Indian River Dr.						
Item Number	Location	Item Description	Quantity	Unit	Unit Cost	Amount
1	Indian River Dr. (near Dixon Blvd.)					
	Construction activities					
	- Roadway Construction	R & R Indian River Drive	3,000	LF	\$322.47	\$967,395.00
<b>Qualifications (if applicable)</b>				<b>SUB-TOTAL</b>		\$967,395.00
1	Assumes reconstruction of approximately 3,000 LF of two lane roadway, driveways and 1 intersection.				0%	\$0.00
2	Based on FDOT Long Range Estimates				0%	\$0.00
3	Accounts for roadway elevation of approximately 3 feet.					
				<b>SUB-TOTAL OF CONSTRUCTION COST</b>		\$967,395.00
				- Eng Design & Permitting @		0% \$0.00
				- Subconsultants @		0% \$0.00
				- Constr Admin and Insp @		0% \$0.00
				<b>TOTAL PROJECT COST</b>		<b>\$967,395</b>

Section 3  
Recommended Flood Mitigation Projects



**(11) FM-12: Fairfax Ln. Exfiltration Expansion, Highpoint Subdivision**

Location

Project FM-12 is located on a small roadway in the Highpoint Subdivision on the northern part of the City of Cocoa. There are reports of localized flooding issues in this subdivision, and it is anticipated that high groundwater conditions contribute to the standing water and flooding. Due to high property costs and little options for installing retention systems to transport and store this floodwater, alternative measures must be employed to address the problem. Fairfax Ln. is within a 30.3-acre drainage basin with outfalls to the IRL.

Proposed Improvements

This project proposes to install an underdrain type of system where appropriate in order to lower the groundwater table and improve the standing water situations. Currently, there is a pipe network connecting the streets on the North and South ends of Fairfax Ln. to an outfall located along River Point Dr. The underdrain system proposed would connect to this pipe network and ultimately enhance the flood mitigation abilities within this 30.3-acre sub-basin.

Benefits

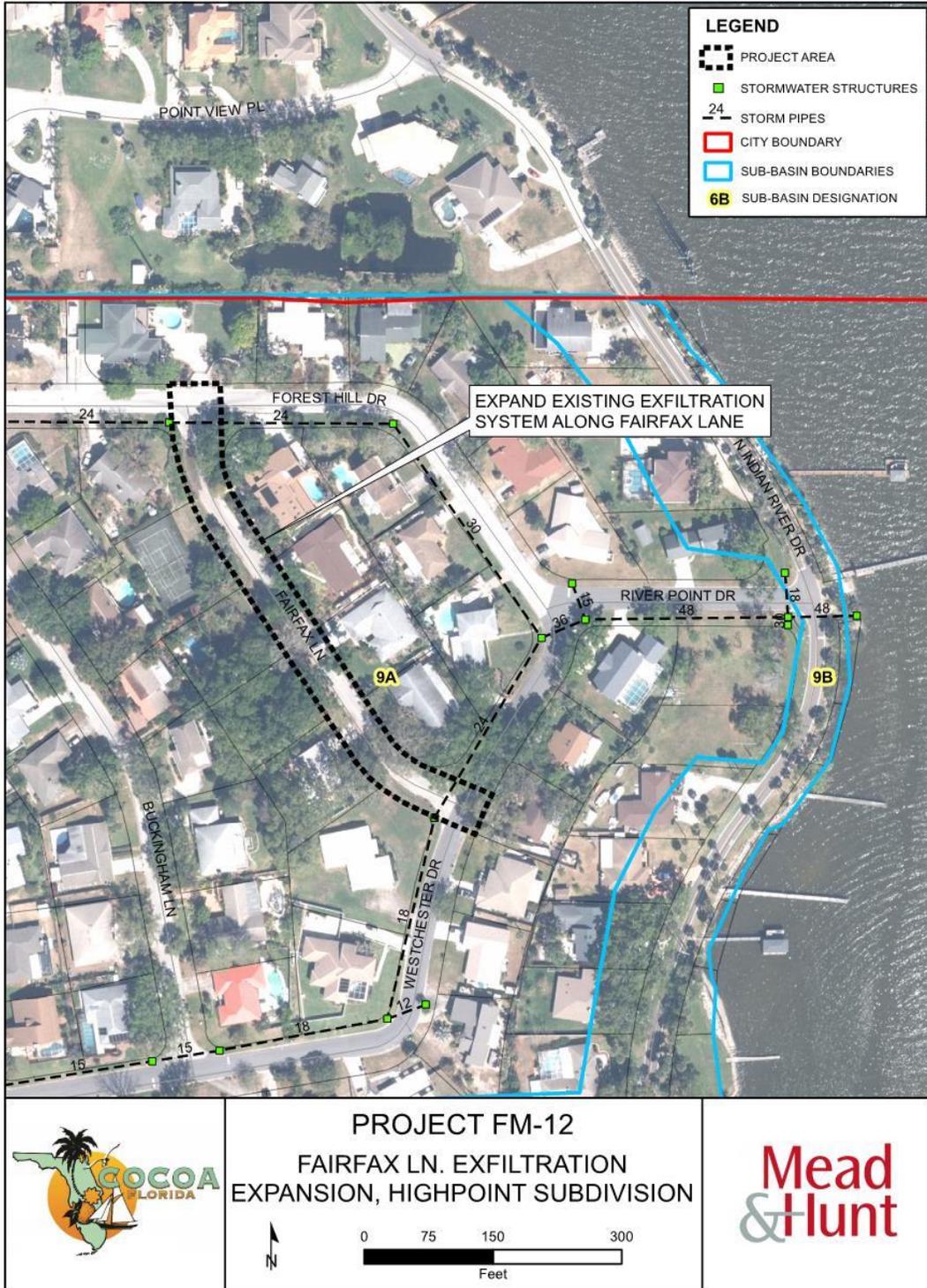
This project proposes a practical method of improving the ability of this locale to mitigate flooding issues. Additionally, seeping groundwater can cause street deterioration so this project will help protect the existing roads.

Cost Estimate

It is anticipated that this project will cost \$353,808 including the installation of a 600 ft underdrain system and all necessary structures associated with it.



Section 3  
Recommended Flood Mitigation Projects



**(12) FM-13: Cocoa North Rear Yard Ditch Piping (London Blvd. to West Minister)**

Location

Project FM-13 is yet another project aiming to transform the cities stormwater conveyance systems into an underground piping network. In this case, the location being addressed is the open ditch that extends between Westminster Dr. and SR-524, parallel to London Blvd. This stretch of about 3,000 ft is surrounded primarily by single family residential parcels, and it continues westward of Westminster Dr., outside the City boundaries.

Proposed Improvements

This project proposes the replacement of the existing open ditch with all necessary piping, junctions, and discharge structures. The project may include a possible amenity of a walking path.

Benefits

Open ditch systems require constant maintenance in order to sustain their ability to transport stormwater runoff effectively, therefore piping of these ditches reduces maintenance costs to the City in the long run.

Cost Estimate

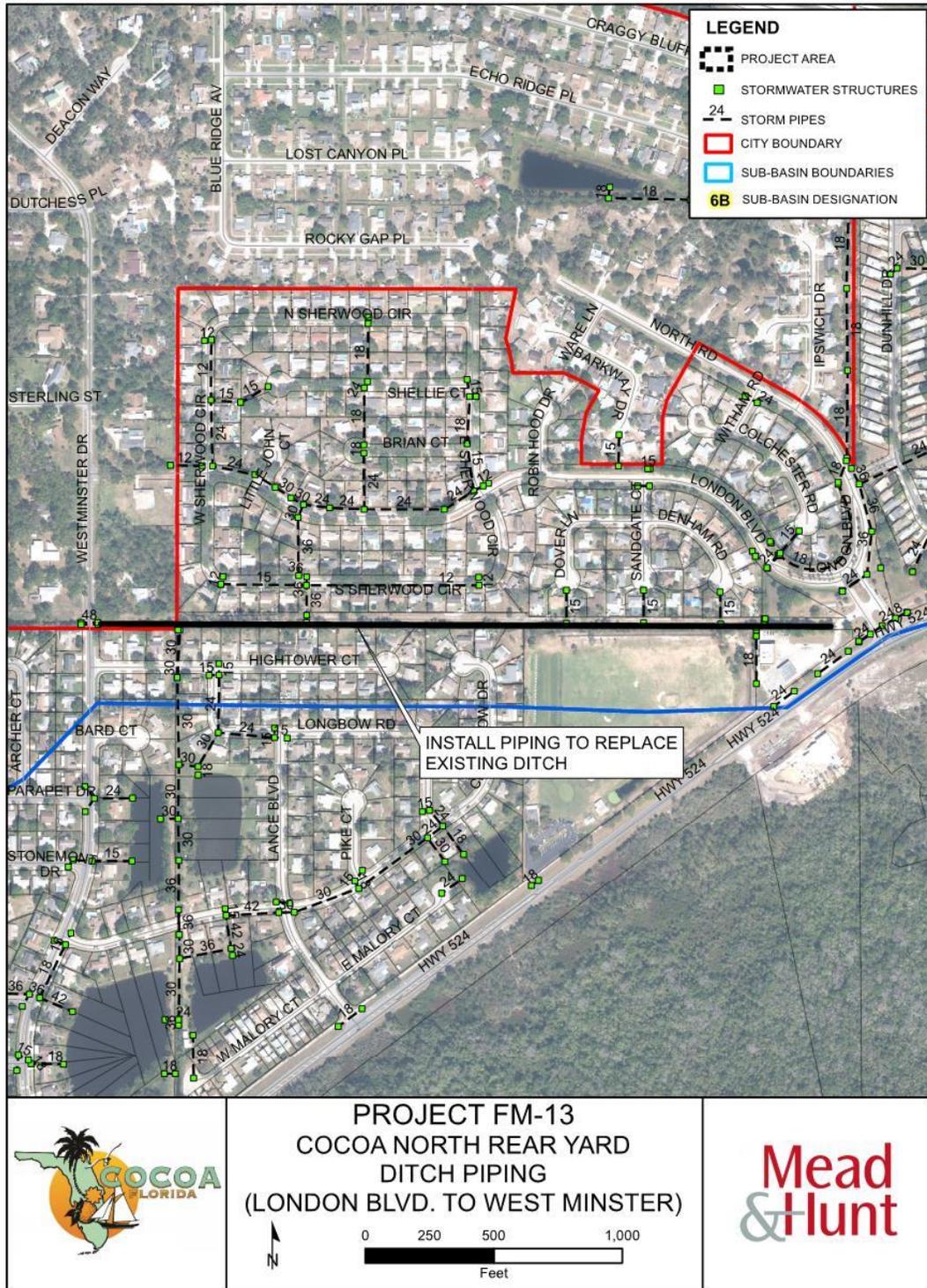
It is anticipated that this project will cost \$999,180. Cost estimates for this 2,800 ft corridor were made assuming about 3,000 ft of piping and 30 stormwater junction boxes are to be necessary.

**Section 3**  
**Recommended Flood Mitigation Projects**

Table 17: Cost Estimate Table – Project FM-13: Cocoa North Rear Yard Ditch Piping (London Blvd. to West Minister).

Project FM-13: Cocoa North Rear Yard Ditch Piping (London Blvd. to West Minister)						
Item Number	Location	Proposed Retrofit Improvements				
	London Blvd. to West Minister	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Dewatering and flow diversion	1	LS	\$30,000.00	\$30,000.00
	- Storm Piping	36" RCP	1,500	LF	\$115.00	\$172,500.00
	- Storm Piping	48" RCP	1,500	LF	\$185.00	\$277,500.00
	- Storm Piping	Stormwater Junction Boxes	30	EA	\$3,500.00	\$105,000.00
	- Restoration	Sodding, landscaping, etc.	1	LS	\$25,000.00	\$25,000.00
<b>Qualifications (if applicable)</b>				<b>SUB-TOTAL</b>		<b>\$610,000.00</b>
1				- Mobilization @	10%	\$61,000.00
				- Contingencies @	20%	\$122,000.00
				<b>SUB-TOTAL OF CONSTRUCTION COST</b>		<b>\$793,000.00</b>
				- Eng Design & Permitting @	15%	\$118,950.00
				- Subconsultants @	5%	\$39,650.00
				- Constr Admin and Insp @	6%	\$47,580.00
				<b>TOTAL PROJECT COST</b>		<b>\$999,180</b>

Section 3  
Recommended Flood Mitigation Projects



**(13) FM-14: Diamond Square Drainage Improvements**

Location

Project FM-14 is part of the greater Diamond Square CRA, a 430-acre community redevelopment area. The area of interest is approximately 100 acres between SR-520/King St. and Rosa L. Jones Blvd, and between Blake Ave. and the Florida East Coast (FEC) Railroad. The land use in the surrounding Diamond Square area is made up of mostly residential parcels with some commercial activity near the main roadway north of the project site, SR520.

Proposed Improvements

This project proposes improvements to the drainage of the Diamond Square CRA. Past studies suggested drainage improvements in the following categories:

- Conveyance Improvements
- Storage Improvements
- Mitigation Improvements

Project WQ-12 is an element of this drainage improvement plan, as it intends to excavate a 0.94-acre pond in a vacant property on W Railroad Ave.

Benefits

These efforts to improve the drainage of the Diamond Square CRA are an important element in attenuating the flows of stormwater for the changing land use landscape that is Diamond Square. As part of the greater redevelopment plan, this project is an essential component in reducing the physical and environmental impact on water resources.

Cost Estimate

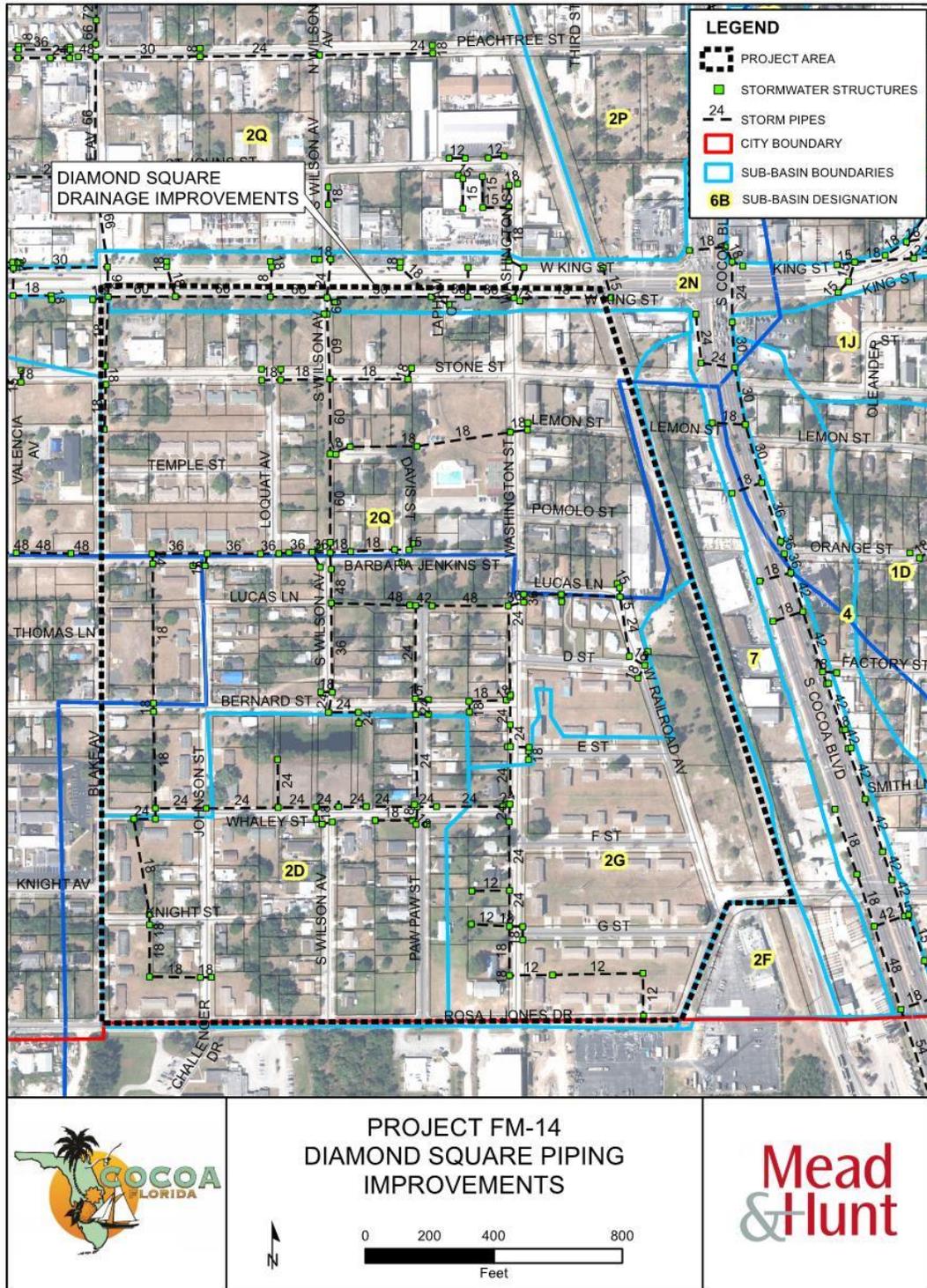
Preliminary cost estimates associated with drainage improvements to the Diamond Square area assume about 800 ft of piping and several stormwater structures are to be put in place to channel stormwater flows to existing outfalls in Bracco Pond or in the future Verizon stormwater pond. It is anticipated that this would cost \$235,872. However, further study and understanding of localized flooding in the area may change the scope of this project.

**Section 3**  
**Recommended Flood Mitigation Projects**

Table 18: Cost Estimate Table – Project FM-14: Diamond Square Drainage Improvements.

Project FM-14: Diamond Square Pond & Piping Improvements						
Item Number	Location	Proposed Retrofit Improvements				
	Diamond Square	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Demolition	1	LS	\$30,000.00	\$30,000.00
	- Site preparation	Pond Excavation	1	LS	\$15,000.00	\$15,000.00
	- Storm Piping	15" - 24" RCP	800	LF	\$85.00	\$68,000.00
	- Furnish & Install	Stormwater Structures	4	EA	\$4,000.00	\$16,000.00
	- Landscaping	Sodding, landscaping, etc.	1	LS	\$15,000.00	\$15,000.00
<b>Qualifications (if applicable)</b>			<b>SUB-TOTAL</b>			<b>\$144,000.00</b>
1						
				- Mobilization @	10%	\$14,400.00
				- Contingencies @	20%	\$28,800.00
				<b>SUB-TOTAL OF CONSTRUCTION COST</b>		<b>\$187,200.00</b>
				- Eng Design & Permitting @	15%	\$28,080.00
				- Subconsultants @	5%	\$9,360.00
				- Constr Admin and Insp @	6%	\$11,232.00
				<b>TOTAL PROJECT COST</b>		<b>\$235,872</b>

Section 3  
Recommended Flood Mitigation Projects



**(14) FM-15: Annual Curb & Gutter R&M Program**

Location

Project FM-15 is part of a City-wide effort to maintain stormwater facilities in working order. This project scrutinizes the network of curbs & gutters and focuses on the annual maintenance and replacement of sub-standard, deteriorated and non-existing curbs around the City.

Proposed Improvements

This project proposes establishing an annual program to analyze, replace, and/or, maintain curbs and gutters around the City. Some survey services from outside contractors may be included with this item for proper installation of new curb to the proper slope.

Benefits

Curbs and gutters are important elements ensuring proper conveyance of runoff to inlets and other stormwater structures. This project will help protect and maintain the stormwater assets of the City. Additionally, this program would ensure all structures are adequate and thus prevent or alleviate localized flooding issues associated with deteriorated structures.

Cost Estimate

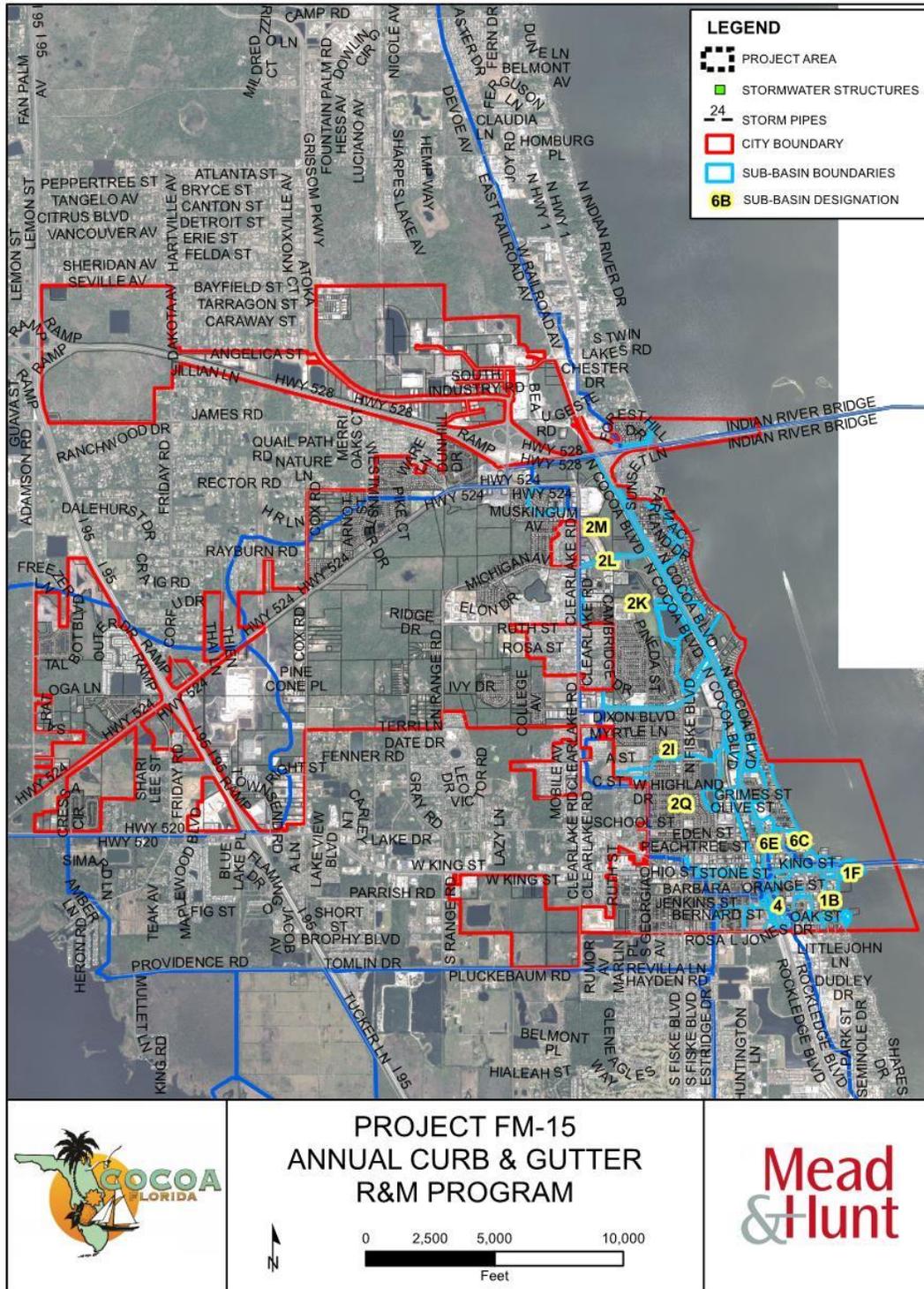
The City has previously allocated a yearly amount of \$50,000 to this annual program.

**Section 3**  
**Recommended Flood Mitigation Projects**

*Table 19: Cost Estimate Table – Project FM-15: Annual Curb & Gutter R&M Program.*

Project FM-15: Annual Curb & Gutter R&M Program							
Item Number	Location		Proposed Retrofit Improvements				
	City of Cocoa		Item Description	Quantity	Unit	Unit Cost	Amount
1	Annual Program						
	- Curb & Gutter Replacement		Concrete Curbing	2,500		\$20.00	\$50,000.00
<b>Qualifications (if applicable)</b>				<b>SUB-TOTAL</b>			\$50,000.00
1	Previously allocated amount per year.						
					- Mobilization @	0%	\$0.00
					- Contingencies @	0%	\$0.00
				<b>SUB-TOTAL OF CONSTRUCTION COST</b>			\$50,000.00
					- Eng Design & Permitting @	0%	\$0.00
					- Subconsultants @	0%	\$0.00
					- Constr Admin and Insp @	0%	\$0.00
				<b>TOTAL PROJECT COST</b>			<b>\$50,000</b>

Section 3  
Recommended Flood Mitigation Projects



**(15) FM-16: Bracco Pond 72” Outfall (Rehabilitation/Replacement)**

Location

Project FM-16 is related to the 72” outfall that extends eastward of Bracco Pond to the IRL. There is a large 72” pipe about 1,500 ft long from the Bracco Ponds outfall crossing beneath U.S. 1 and out to the IRL. This outfall is also associated to project FM-5 that intends to replace the open ditch that is the outfall structure of the reservoirs with piping.

Proposed Improvements

The purpose of this project is to rehabilitate or replace the 72” outfall as it is an important element of several other projects related to this structure. As such, it is an important part of the general maintenance projects that the City must execute continuously. Project WQ-10 addresses water quality and improved water storage issues related to this same outfall.

Benefits

By rehabilitating this pipe, you are ensuring the structural integrity of this outfall to guarantee the longevity and effectiveness of all current and planned structures associated with it.

Cost Estimate

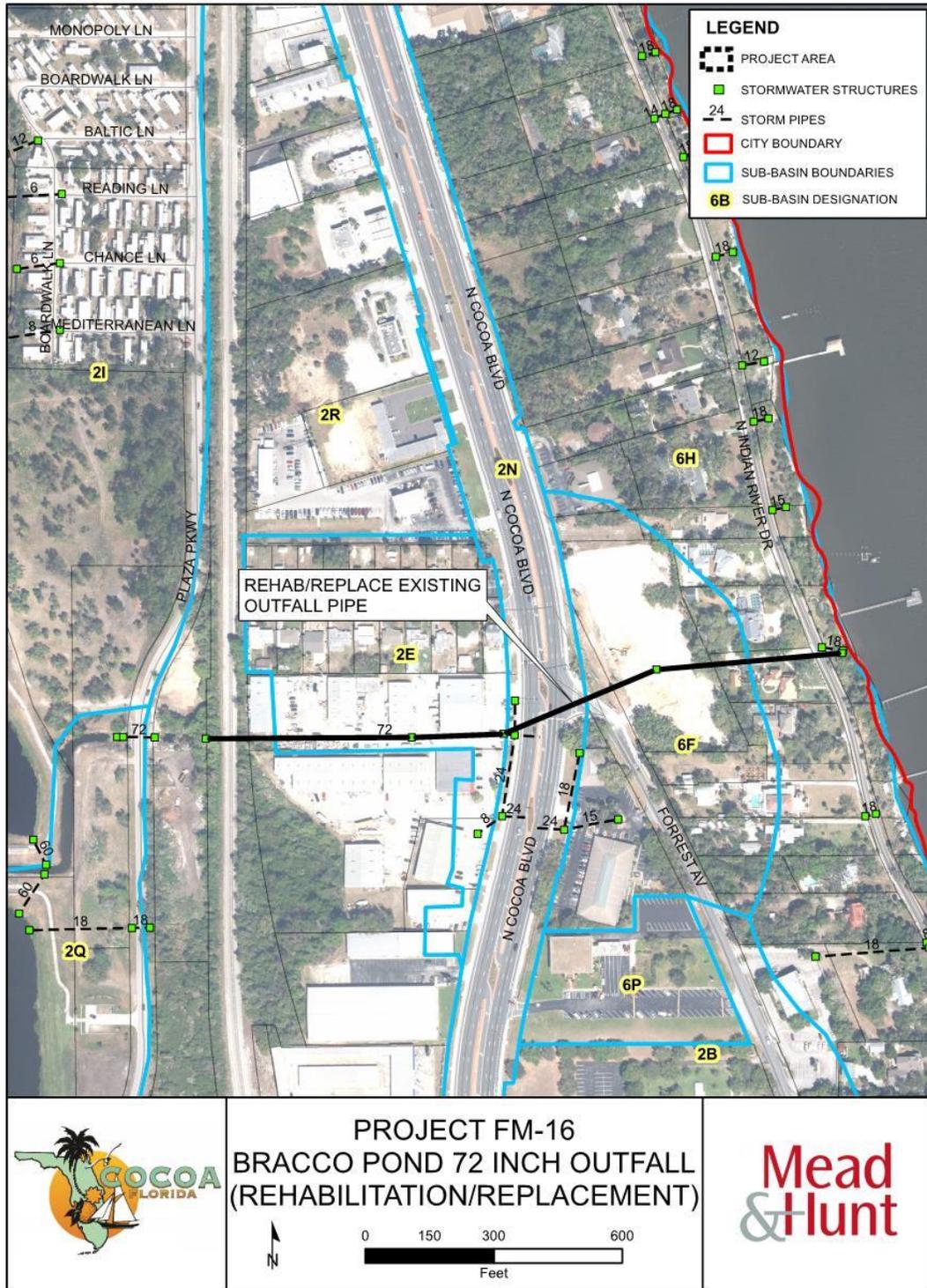
It is anticipated that this project will cost \$402,675 assuming all 1,500 ft of 72” piping is to be installed. Further analysis of the condition of this pipe is necessary to establish a more precise estimate.

**Section 3**  
**Recommended Flood Mitigation Projects**

Table 20: Cost Estimate Table – Project FM-16: Bracco Pond 72” Outfall (Rehabilitation/Replacement).

Project FM-16: Bracco Pond 72” Outfall (Rehabilitation/Replacement)						
Item Number	Location	Proposed Retrofit Improvements				
	Bracco Pond Outfall	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction Activities					
	- Site Investigation	Pre-Design Inspection	1	LS	\$50,000.00	\$50,000.00
	- Construction Activities	Dewatering & Flow Control	1	LS	\$25,000.00	\$25,000.00
	- Furnish & Install	72” RCP Storm Piping	1,500	LF	\$125.00	\$187,500.00
<b>Qualifications (if applicable)</b>			<b>SUB-TOTAL</b>			\$262,500.00
1						
					10%	\$26,250.00
					20%	\$52,500.00
			<b>SUB-TOTAL OF CONSTRUCTION COST</b>			\$341,250.00
					10%	\$34,125.00
					3%	\$10,237.50
					5%	\$17,062.50
			<b>TOTAL PROJECT COST</b>			<b>\$402,675</b>

Section 3  
Recommended Flood Mitigation Projects



**(16) FM-17: West Dixon Blvd. Stormwater Facility**

Location

Project FM-17 is related to a planned, off-line, stormwater facility to be built behind the Dixon Fire Station. The parcel of land is located between Clearlake Middle School and W Dixon Blvd. There are currently some inlets west of the area of interest that convey runoff from the College Manor neighborhood south to some vacant lots.

Proposed Improvements

This project proposes the installation of a stormwater facility in the available open lot as well as inlet structures from the College Manor neighborhood. This project could be developed in phases, that is, separating the excavation of the stormwater pond and the connections to the drainage system from the College Manor neighborhood.

Benefits

Stormwater structures, such as wet ponds, are elemental in ensuring a City's ability to mitigate floods. Furthermore, depending on the characteristics of the site, it may even provide some type of treatment to the water to prevent it from outflowing without treatment. Additional value could be given to the site by incorporating some community amenities such as benches, a pathway, and educational signage.

Cost Estimate

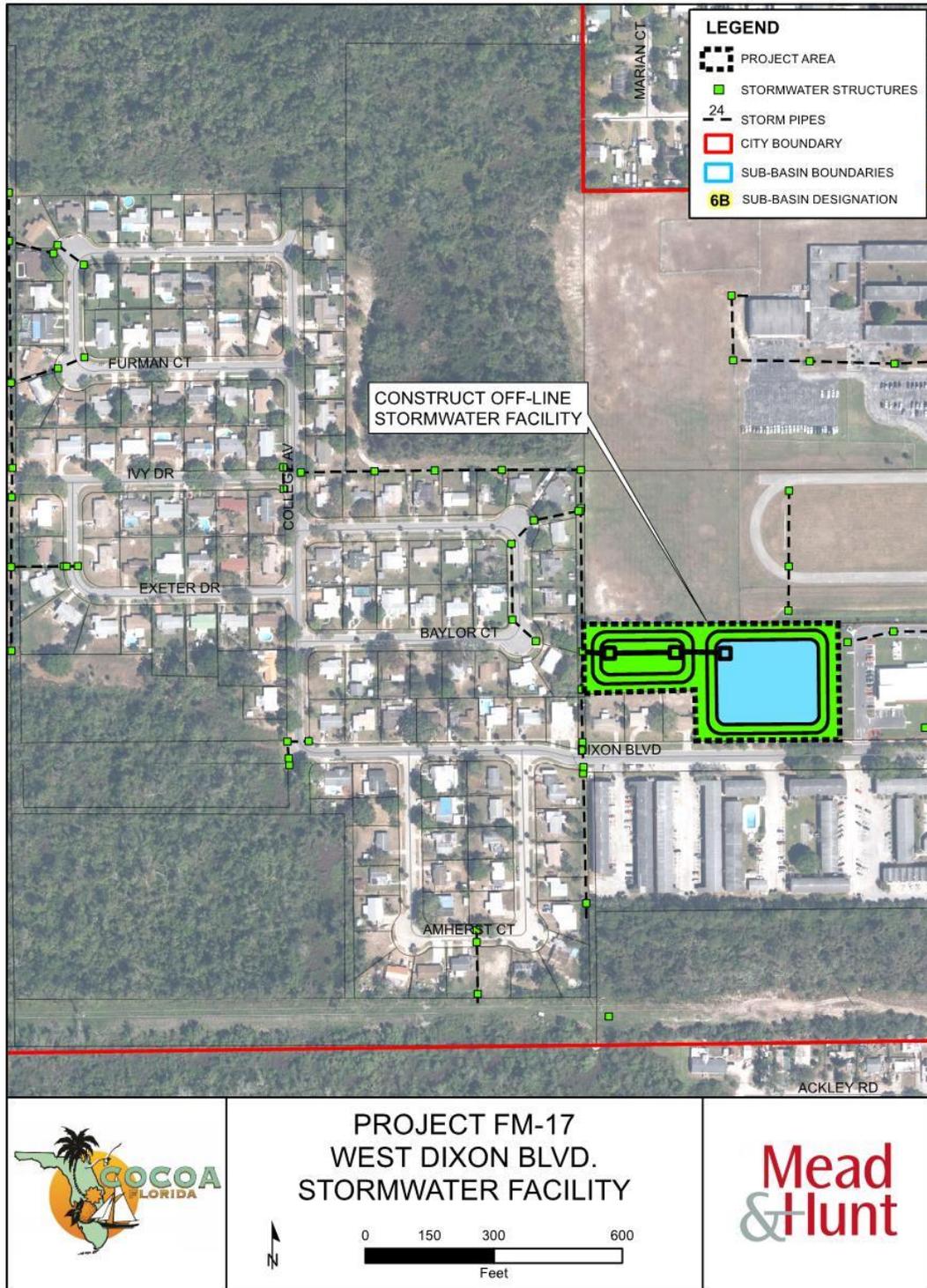
It is anticipated that this project will cost \$291,564 to complete.

**Section 3**  
**Recommended Flood Mitigation Projects**

Table 21: Cost Estimate Table – Project FM-17: West Dixon Blvd. Stormwater Facility.

Project FM-17: West Dixon Blvd. Stormwater Facility							
Item Number	Location	Proposed Retrofit Improvements					
		Item Description	Quantity	Unit	Unit Cost	Amount	
1	W Dixon Blvd.	Construction activities					
		- Site preparation	Dewatering and flow diversion	1	LS	\$15,000.00	\$15,000.00
		- Site preparation	Pond Excavation	1	LS	\$75,000.00	\$75,000.00
		- Stormwater Structures	Junction Boxes & Inlets	3	EA	\$3,500.00	\$10,500.00
		- Stormwater Structures	Discharge Structure w Skimmer	1	EA	\$5,000.00	\$5,000.00
		- Stormwater Structures	36" RCP	500	LF	\$115.00	\$57,500.00
		- Landscaping	Sodding, landscaping, etc.	1	LS	\$15,000.00	\$15,000.00
<b>Qualifications (if applicable)</b>				<b>SUB-TOTAL</b>			\$178,000.00
1							
						10%	\$17,800.00
						20%	\$35,600.00
				<b>SUB-TOTAL OF CONSTRUCTION COST</b>			\$231,400.00
						15%	\$34,710.00
						5%	\$11,570.00
						6%	\$13,884.00
				<b>TOTAL PROJECT COST</b>			<b>\$291,564</b>

Section 3  
 Recommended Flood Mitigation Projects



**(17) FM-18: iWorQ Integration between GIS and Operations & Maintenance**

Location

Project FM-18 has no specified location.

Proposed Improvements

This project proposes the integration of the iWorQ Systems Inc. to the City's operation and maintenance. iWorQ is a web-based public works software that helps cities with anything from tracking and managing fleets and assets, within a user-friendly interface.

Benefits

The iWorQ website lists the following capabilities for the software:

- Work Management
- Fleet Management
- Facilities
- Citizen Engagement
- Stormwater
- Sewer
- Water
- Capital Assets
- Etc.

The software provides for better communication between engineering, operations and maintenance by inputting all GIS information in the hands of everyone. Logging and tracking of flood information, rainfall, pipe condition, age, material, etc. Ultimately, this project will improve the operation and maintenance of the stormwater system.

Cost Estimate

It is anticipated that this project will cost \$77,777. However, cost estimates associated with the integration of this software into the City's current action plan are merely order of magnitude estimates as to what integration of this software might entail.



**(18) FM-19: Comprehensive System Model**

Location

Project FM-19 has no specified location.

Proposed Improvements

This project proposes the development of an overall model of the hydraulic and hydrologic features of the City of Cocoa. As of now, several portions of the City have been modeled as required by different projects. This project, therefore, aims to bring together any of these past studies and fill any holes still present in the overall model in order to have a better overview of the effects of different storm events and be able to prepare for them.

To do so, the City must:

- Assess available basin, node, link information and deficiencies.
- Obtain survey quality information on unaccounted for structures, pipes, etc.
- Combine new and old information into a new complete model.
- Verify model results by running known storm events and observe results.
- Adjust model to conform with reality.

Benefits

It is important that the City have an accurate and continuously updated model of the overall stormwater system in order to develop resiliency strategies for the future. As the nature, intensity, and duration of storms change due to issues such as climate change, cities need to come up with innovative solutions to address the possible negative effects. Similar to project FM-18, this project will improve the operation and maintenance of the stormwater system.

Cost Estimate

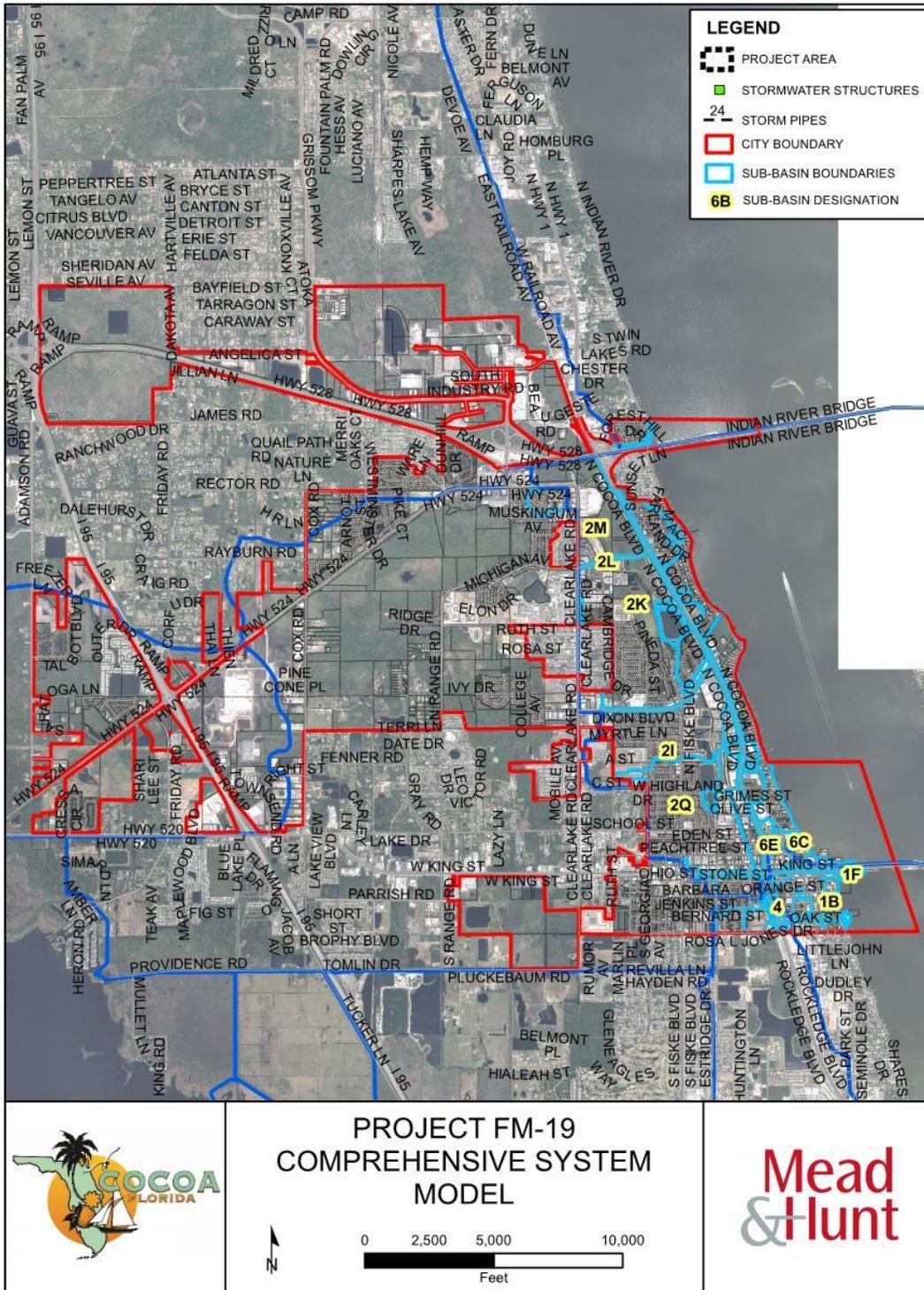
It is anticipated that all consultant work associated with the development of this overall model would cost \$125,000.

**Section 3**  
**Recommended Flood Mitigation Projects**

*Table 23: Cost Estimate Table – Project FM-19: Comprehensive System Model.*

Project FM-19: Comprehensive System Model						
Item Number	Location	Proposed Retrofit Improvements				
	City of Cocoa	Item Description	Quantity	Unit	Unit Cost	Amount
1	Consultant Work	Stormwater Model Update	1	LS	\$125,000.00	\$125,000.00
<b>Qualifications (if applicable)</b>			<b>SUB-TOTAL</b>			\$125,000.00
1	Assess available basin, node, link information and deficiencies.					
2	Obtain survey quality information on unaccounted for structures, pipes, etc.		- Mobilization @		0%	\$0.00
3	Combine new and old information into a new complete model		- Contingencies @		0%	\$0.00
4	Verify model results by running known storm events and observe results.					
5	Adjust model to conform with reality					
			<b>SUB-TOTAL OF CONSTRUCTION COST</b>			\$125,000.00
			- Eng Design & Permitting @		0%	\$0.00
			- Subconsultants @		0%	\$0.00
			- Constr Admin and Insp @		0%	\$0.00
			<b>TOTAL PROJECT COST</b>			<b>\$125,000</b>

Section 3  
Recommended Flood Mitigation Projects



**(19) FM-20 Mud Lake Investigation and Retrofit**

Location

Project FM-20 focuses on the large vacant parcels of land located south of SR524. This vacant lot, generally referred to as Mud Lake has been the subject of several investigations by different entities such as Brevard County. Different proposals for the usage of this land have been offered including anything from stormwater structures to recreational facilities. The site is currently considered a wetland and contains a small water body called Mud Lake, encouraging the development of ideas that preserve or perhaps enhance the environmental services that wetlands are known to provide.

Proposed Improvements

This project aims to establish a City of Cocoa program to investigate their own future developments of the site. In particular, the City plans to develop the site to improve the overall stormwater management systems of the City to ensure all present and future stormwater flood mitigation needs are met. Coupled with stormwater improvements is the possibility of developing amenities for public use, such as nature trails.

Benefits

Carrying out this investigation would prepare the City for any future developments at the site. As cities continue to expand and develop, the need for flood attenuation structures such as stormwater ponds increases. It is in the best interest of the City to have studied several options for future flood mitigation projects.

Cost Estimate

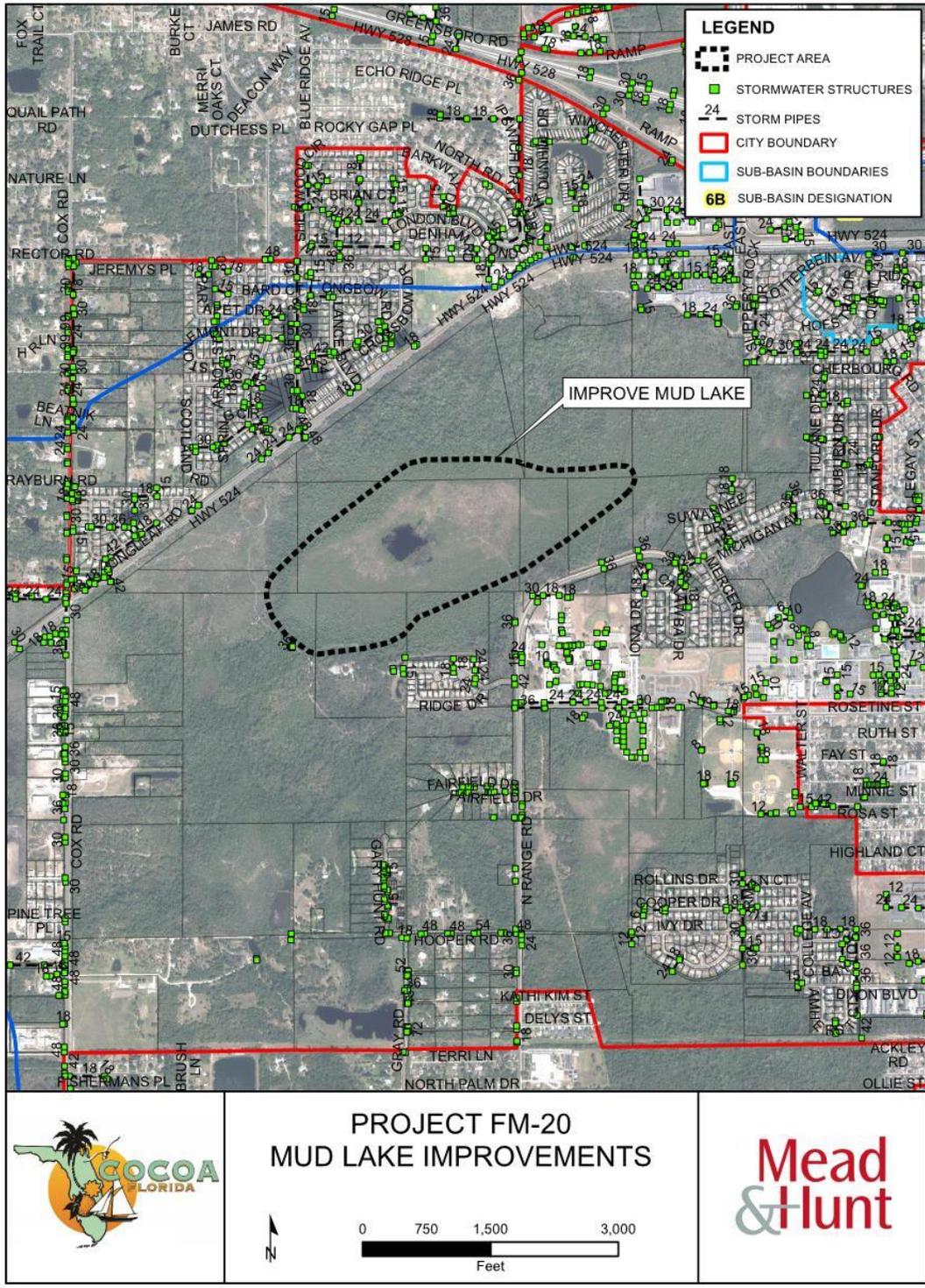
It is anticipated that any consulting associated this project will be \$77,770. This number is merely an estimate of the order of magnitude of what such a project may cost.

**Section 3**  
**Recommended Flood Mitigation Projects**

Table 24: Cost Estimate Table – Project FM-20: Mud Lake Investigation and Retrofit.

Project FM-20: Mud Lake Investigation & Retrofit						
Item Number	Location	Proposed Retrofit Improvements				
	Mud Lake Investigation & Retrofit	Item Description	Quantity	Unit	Unit Cost	Amount
1	Consultant Work	Investigation/Feasibility Study				\$70,000.00
<b>Qualifications (if applicable)</b>			<b>SUB-TOTAL</b>			\$70,000.00
1						
					- Mobilization @ 5%	\$3,500.00
					- Contingencies @ 5%	\$3,500.00
			<b>SUB-TOTAL OF CONSTRUCTION COST</b>			\$77,000.00
					- Eng Design & Permitting @ 1%	\$770.00
					- Subconsultants @ 0%	\$0.00
					- Constr Admin and Insp @ 0%	\$0.00
			<b>TOTAL PROJECT COST</b>			<b>\$77,770</b>

Section 3  
Recommended Flood Mitigation Projects



## **4. Recommended Water Quality Projects**

The projects listed below comprise recommended projects to address nutrient loading (primarily nitrogen and phosphorous) to the receiving water body. Many of these projects address the Total Maximum Daily Loading (TMDL's) assigned to the City by the Indian River Lagoon Basin Management Action Plan (BMAP).

### **A. Project List**

- Project WQ-1:** Baffle Boxes on Smaller Basins Outfalls
- Project WQ-2:** Baffle Boxes on Larger Basins Outfalls
- Project WQ-3:** BAM Filter Retrofits for Existing Baffle Boxes
- Project WQ-4:** Living Shoreline Along Lagoon
- Project WQ-5:** Circle Drive Dry Retention Pond, Carlton Terrace & Broadview Manor Swales
- Project WQ-7:** Bracco Pond Aerators
- Project WQ-8:** Divert Bracco Pond Baseflow to St. Johns River Basin via Diamond Square Pond
- Project WQ-10:** 72" Outfall Baseflow Capture/Treatment
- Project WQ-11:** Horseshoe Ponds (North & South) Vegetation Removal
- Project WQ-12:** Verizon Stormwater Pond in Diamond Square
- Project WQ-13:** Pond Aeration at North Fiske and other Stormwater Treatment Facilities
- Project WQ-14:** Scarborough Park & Water Tower Pond Expansion
- Project WQ-15:** Add Floating Wetlands to Existing Stormwater Ponds
- Project WQ-16:** Riverfront Park In-Lagoon Nutrient Removal
- Project WQ-17:** Riverfront Park Stormwater Capture Modifications
- Project WQ-18:** SR 520 Runoff Treatment to Downtown
- Project WQ-19:** Install BAM Treatment for AT&T Dry Retention Pond
- Project WQ-20:** De-muck/Dredge SR520 Relief Channel
- Project WQ-21:** Downtown Area Treatment System - Urban Planters, LID Improvements
- Project WQ-22:** Reduce Impervious Area (PaveDrain, Reduce Roadway) Near IRL
- Project WQ-23:** Inspection Program for HOA-Owned Treatment Ponds
- Project WQ-24:** Enhanced Stormwater Quality Education Programs
- Project WQ-25:** Update LDR's to Encourage LID and Provide Incentives for Overtreatment on Redevelopment
- Project WQ-26:** Bracco Pond Irrigation Repair/Replace for increased Reuse & Bank Stabilization
- Project WQ-27:** North Fiske Pond Irrigation Repair/Replacement
- Project WQ-28:** Septic to Sewer: Broadview Manor, Carleton Terrace, Indian River Drive Frontage, River Heights and Grandview
- Project WQ-29:** Expand Reclaimed Water Usage and Distribution

**B. Recommended Water Quality Projects**

**(1) WQ-1: Baffle Boxes on Smaller Basins Outfalls.**

Location

Project WQ-1 is located along the eastern boundary of the City of Cocoa where it meets the Indian River Lagoon (IRL). The project area shown covers an area of roughly 493 acres and is made up of individual drainage basins. Each of these basins contribute to outfalls along the IRL, many of which are currently discharging with little to no treatment. The region is predominantly made up of single-family residential parcels, becoming more and more commercial towards its southern boundary. There are currently between 25-30 outfalls on each smaller sub-basin within this project area.

Proposed Improvements

The proposed project recommends the installation of baffle boxes with filter media along the smaller basin outfalls. These would include discharges from basins with fewer than 10 inlets, and storm pipes 24" and smaller. Adding in the proposed baffle boxes will provide stormwater quality improvements with respect to nitrogen, phosphorus, and total suspended solids removal from the watershed area before entering the IRL. Incorporating filter media into the baffle box will boost the overall nutrient removal rates. Pollutant removal efficiencies for baffle boxes with filter media are currently estimated at 45% for both, total nitrogen and total phosphorus.

Due to limited property, installation of nutrient-removal baffle boxes is the only practical way to improve water quality in this area. Ultimately, the goal is to have all outfalls treated within the 10-year window of this plan, however, due to cost limitations, the proposed program would identify and install a total of 5 projects over the 10-year window.

Benefits

Installing baffle boxes has proven effectiveness in removing sediment and suspended solids from stormwater runoff. These simple structures are ideal solutions to retrofitting the stormwater systems immediately adjacent to the IRL. Implementation of the proposed project will capture approximately 130.5 pounds of nitrogen and 20.6 pounds of phosphorus on an annual basis, or 26.1 lbs/yr and 4.12 lbs/yr of total nitrogen and total phosphorous per project.

Cost Estimate

Cost to install each of the proposed baffle boxes is estimated at \$277,088. In order to construct the proposed 5 small baffle box projects in the 10-year CIP window, it is recommended that 1 project be implemented every other year. This would require an allocation of approximately \$1,135,440 in order to achieve the intended goal. If all 30 baffle boxes in the basin are installed, the total cost of the project would be \$6,812,624. It should be noted that this figure has not been adjusted for inflation.

**Section 4**  
**Recommended Water Quality Projects**

Although a conceptual design plan has been prepared, the overall locations of the baffle boxes will need to be evaluated during the design phase with respect to existing utilities, maintenance access, and the seasonal ground water or tidal affects. Baffle boxes typically have a higher efficiency when the invert is installed above the seasonal ground water table. The design phase of the project will also need to acquire FDOT permits. Due to the baffle boxes being designed with a high flow bypass, obtaining a permit should not be an issue, but funds for obtaining a permit have been incorporated into the conceptual project cost.

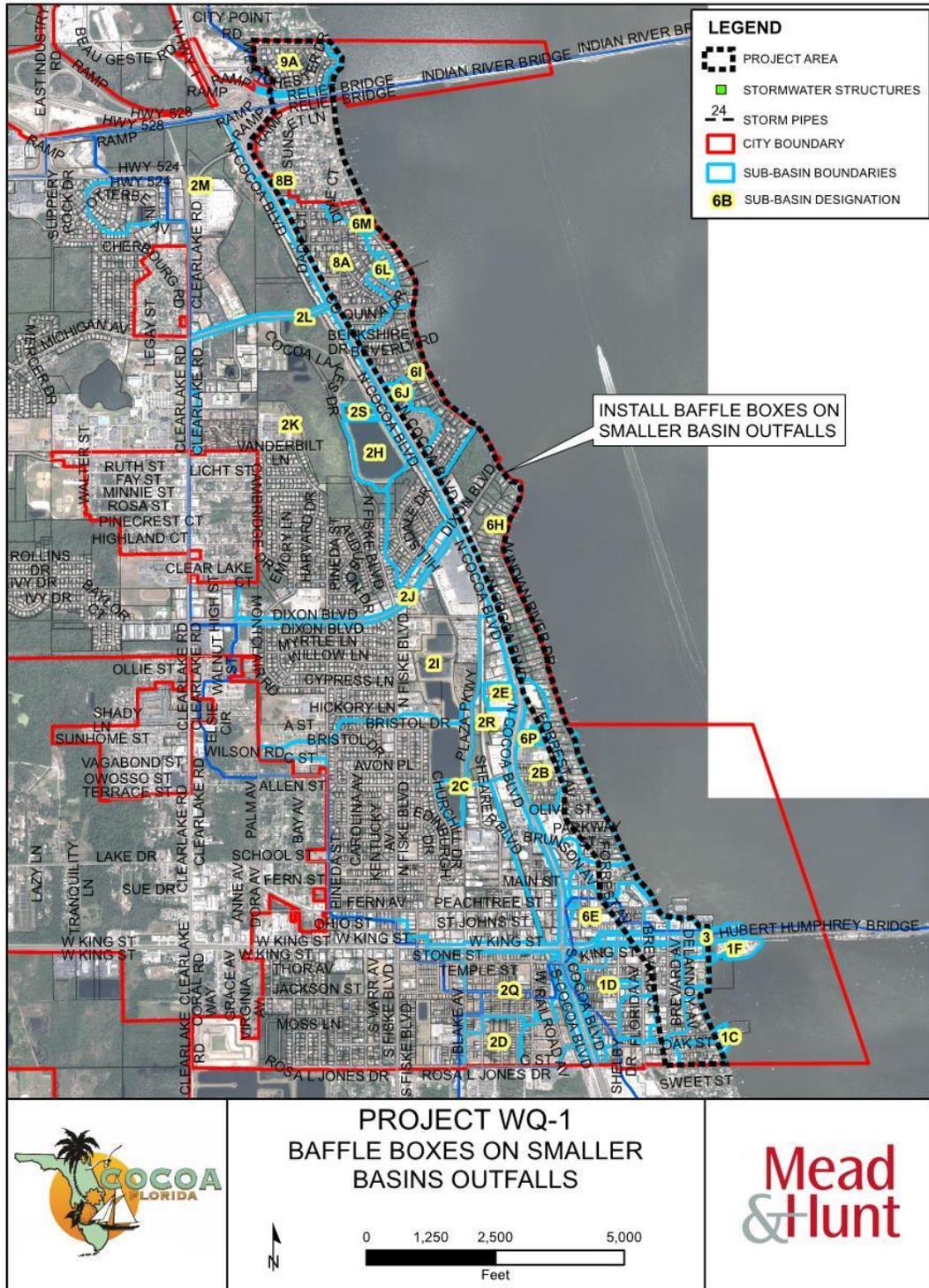
*Table 25: Cost Estimate Table – Project WQ-1: Baffle Boxes on Smaller Basins Outfalls.*

Project WQ-1: Baffle Boxes on Smaller Basins Outfalls							
Item Number	Location		Proposed Retrofit Improvements				
	IRL East of US-1		Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities						
	- Site preparation		Demolition & Flow Diversion	1	LS	\$30,000.00	\$30,000.00
	- Construction management		Maintenance of traffic, signage	1	LS	\$15,000.00	\$15,000.00
	- Pollutant Removal Structure		Baffle Box with Filter Media for 24"	1	LS	\$92,000.00	\$92,000.00
	- Storm Pipe		24" CMP	20	LF	\$135.00	\$2,700.00
	- Roadway open cut and restoration		Asphalt, base and subgrade	100	SY	\$105.00	\$10,500.00
	- Right-of-way restoration		Sodding, landscaping, etc.	1	LS	\$7,500.00	\$7,500.00
<b>Qualifications (if applicable)</b>			<b>SUB-TOTAL</b>				<b>\$157,700.00</b>
1	Estimated 30 Small discharge locations in need of retrofit.						
2	Individual Baffle Box Installation = \$230,000				- Mobilization @	10%	\$15,770.00
3	City desires to allocate \$125,000/year to the program allowing for about 5 projects to be completed, or about 1 project/2 years, based on present cost estimate				- Contingencies @	10%	\$15,770.00
4	5 Projects spread over 10 years = 1 project every 2 years.				<b>SUB-TOTAL OF CONSTRUCTION COST</b>		<b>\$189,240.00</b>
5	Total Program Cost (5 Projects) = \$ 1,135,440.00						
*	Total Cost (if 30 Projects) = \$6,812,640				- Eng Design & Permitting @	12%	\$22,708.80
					- Subconsultants @	2%	\$3,784.80
					- Constr Admin and Insp @	6%	\$11,354.40
					<b>TOTAL PROJECT COST</b>		<b>\$227,088</b>

*Table 26: Nutrient Removal Cost/Pound Table – Project WQ-1: Baffle Boxes on Smaller Basins Outfalls.*

Project WQ-1: Baffle Boxes on Smaller Basins Outfalls					
Project #	Improvement	Estimated TN Removal (lbs/year)	Estimated TP Removal (lbs/year)	Cost/TN Pound	Cost/TP Pound
WQ-1	Baffle Box	26.1	4.12	\$8,701	\$55,118
TOTAL	10-year totals	130.5	20.6	\$8,701	\$55,118
<b>Assumptions:</b>					
Drainage area: 7 ac, avg basin size for small basins					
Land-use: Single-family, TN=2.07 TP=0.327					
Soil type A, Non DCIA CN: 61					
DCIA (%): 40					
Pre-improvement load: TN=58.06 lb/yr, TP=9.17 lb/yr					
Assumes 45% TNTP removal using B&G ECT3 media					

Section 4  
Recommended Water Quality Projects



**(2) WQ-2: Baffle Boxes on Larger Basins Outfalls**

Location

Project WQ-2 is located along the eastern boundary of the City of Cocoa where it meets the Indian River Lagoon (IRL). The project area shown covers an area of roughly 493 acres and is made up of individual drainage basins. Each of these basins contribute to outfalls along the IRL, many of which are currently discharging with little to no treatment. The region is predominantly made up of single-family residential parcels, becoming more and more commercial towards its southern boundary. There are 2 identified outfalls on each large sub-basin within this project area.

Proposed Improvements

The proposed project recommends the installation of baffle boxes with filter media along the larger basin outfalls. These would include discharges from basins with more than 10 inlets, and storm pipes 30" and larger. Adding in the proposed baffle boxes will provide stormwater quality improvements with respect to nitrogen, phosphorus, and total suspended solids removal from the watershed area before entering the IRL. Incorporating filter media into the baffle box will boost the overall nutrient removal rates. Pollutant removal efficiencies for baffle boxes with filter media are currently estimated at 45% for both, total nitrogen and total phosphorus.

Due to limited property, installation of nutrient-removal baffle boxes is the only practical way to improve water quality in this area. Ultimately, the goal is to have all outfalls treated within the 10-year window of this plan, however, due to cost limitations, the proposed program would install a maximum of 2 baffle boxes over the 10-year window.

Benefits

Installing baffle boxes has proven effectiveness in removing sediment and suspended solids from stormwater runoff. These simple structures are ideal solutions to retrofitting the stormwater systems immediately adjacent to the IRL. Implementation of the proposed project will capture approximately 261.0 lbs/yr of nitrogen and 41.2 lbs/yr of phosphorus on an annual basis, or 130.5 lbs/yr and 20.6 lbs/yr of total nitrogen and total phosphorus per project.

Cost Estimate

Cost to install each of the proposed baffle boxes is estimated at \$282,240. In order to construct the proposed large baffle box projects in the 10-year CIP window, it is recommended that 1 project be implemented every 5 years. This would require an allocation of approximately \$564,480 in order to achieve the intended goal. If all 5 baffle boxes in the basin are installed, the total cost of the project would be \$1,411,200. It should be noted that this figure has not been adjusted for inflation.

**Section 4**  
**Recommended Water Quality Projects**

Although a conceptual design plan has been prepared, the overall locations of the baffle boxes will need to be evaluated during the design phase with respect to existing utilities, maintenance access, and the seasonal ground water or tidal affects. Baffle boxes typically have a higher efficiency when the invert is installed above the seasonal ground water table. The design phase of the project will also need to acquire FDOT permits. Due to the baffle boxes being designed with a high flow bypass, obtaining a permit should not be an issue, but funds for obtaining a permit have been incorporated into the project cost.

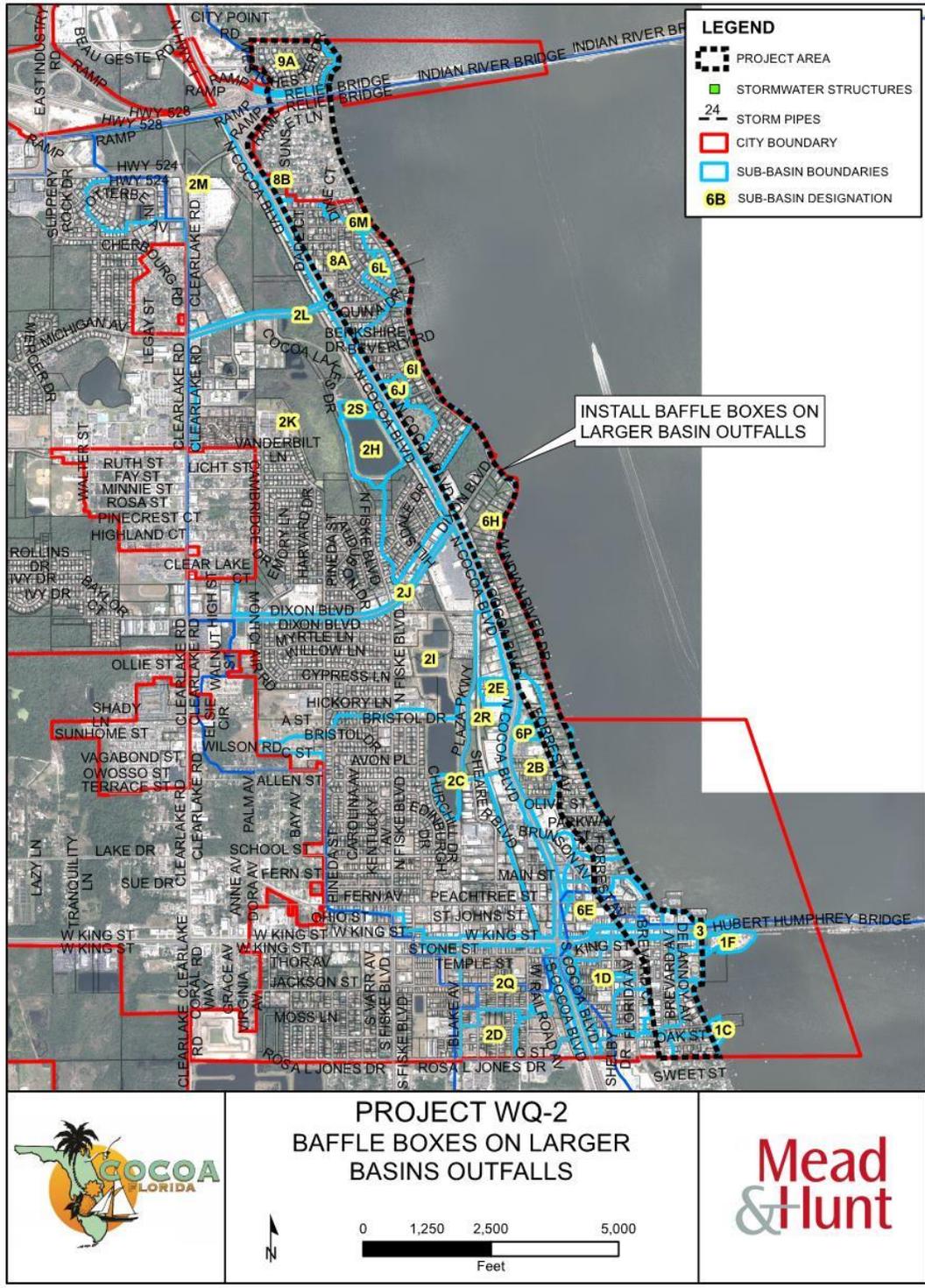
*Table 27: Cost Estimate Table – Project WQ-2: Baffle Boxes on Larger Basins Outfalls.*

Project WQ-2: Baffle Boxes on Larger Basins Outfalls							
Item Number	Location		Proposed Retrofit Improvements				
	IRL East of US-1		Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities						
		- Site preparation	Demolition & Flow Diversion	1	LS	\$30,000.00	\$30,000.00
		- Construction management	Maintenance of traffic, signage	1	LS	\$15,000.00	\$15,000.00
		- Pollutant Removal Structure	Baffle Box with Filter Media for 36"	1	LS	\$130,000.00	\$130,000.00
		- Storm Pipe	36" CMP	20	LF	\$150.00	\$3,000.00
		- Roadway open cut and restoration	Asphalt, base and subgrade	100	SY	\$105.00	\$10,500.00
		- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	\$7,500.00	\$7,500.00
<b>Qualifications (if applicable)</b>							
							<b>SUB-TOTAL</b>
1	Estimated 2 large discharge locations in need of retrofit.						\$196,000.00
2	Individual Baffle Box Installation = \$285,000						- Mobilization @ 10% \$19,600.00
3	2 Projects spread over 10 years = 1 project every 5 years.						- Contingencies @ 10% \$19,600.00
4	Total Program Cost = \$ 564,480.00						<b>SUB-TOTAL OF CONSTRUCTION COST</b> \$235,200.00
							- Eng Design & Permitting @ 12% \$28,224.00
							- Subconsultants @ 2% \$4,704.00
							- Constr Admin and Insp @ 6% \$14,112.00
							<b>TOTAL PROJECT COST</b> \$282,240

*Table 28: Nutrient Removal Cost/Pound Table – Project WQ-2: Baffle Boxes on Larger Basins Outfalls.*

Project WQ-2: Baffle Boxes on Larger Basins Outfalls					
Project #	Improvement	Estimated TN Removal (lbs/year)	Estimated TP Removal (lbs/year)	Cost/TN Pound	Cost/TP Pound
WQ-2	Baffle Box	130.52	20.62	\$2,162	\$13,688
TOTAL	10-year totals	261.04	41.24	\$2,162	\$13,688
<b>Assumptions:</b>					
Drainage area: 35 ac, avg basin size for small basins					
Land-use: Single-family, TN=2.07 TP=0.327					
Soil type A, Non DCIA CN: 61					
DCIA (%): 40					
Pre-improvement load: TN=290.30 lb/yr, TP=45.86 lb/yr					
Assumes 45% TNTP removal using B&G ECT3 media					

Section 4  
Recommended Water Quality Projects



**(3) WQ-3: BAM Filter Retrofits for Existing Baffle Boxes**

Location

Project WQ-3 focuses on several existing baffle boxes located across different parts of the City:

1. 2 Baffle Boxes N of Riverfront Park
2. Baffle Box on N Indian River Drive near Carlton Terrace area.

The project area and location of these baffle boxes is pictured below.

The baffle boxes on the lower portion of the study area serve a drainage area of about 71.9 acres of mostly commercial land use, and is also supported by a recently installed baffle box along Church St. The northernmost baffle box serves a drainage area of about 20 acres; however, this drainage area is also connected to an outfall that currently empties into the IRL untreated.

Proposed Improvements

The proposed project involves retrofitting the existing baffle boxes mentioned above using Bio-Activated Media (BAM) filters. The existing Type I baffle boxes have proven effectiveness reducing solids from stormwater runoff. However, BAM filter retrofit systems may be put in place to improve the removal of nutrients from runoff as well as further improving the physical filtration of solids. The media used on the filters can be made from recycled materials and is effective in capturing TN, TP, solids, and metals from water.

Benefits

Incorporating filter media into the design improvements will boost the overall nutrient removal rates. Pollutant removal efficiencies for baffle boxes with filter media are currently estimated at 45% for both total nitrogen and total phosphorus removal. Implementation of the proposed project will capture approximately 267.3 pounds of nitrogen and 53.0 pounds of phosphorus on an annual basis.

Cost Estimate

Anticipated cost to install each baffle box BAM retrofit is estimated at about \$81,000. The total cost of the project is \$241,605 for all 3 retrofit systems.

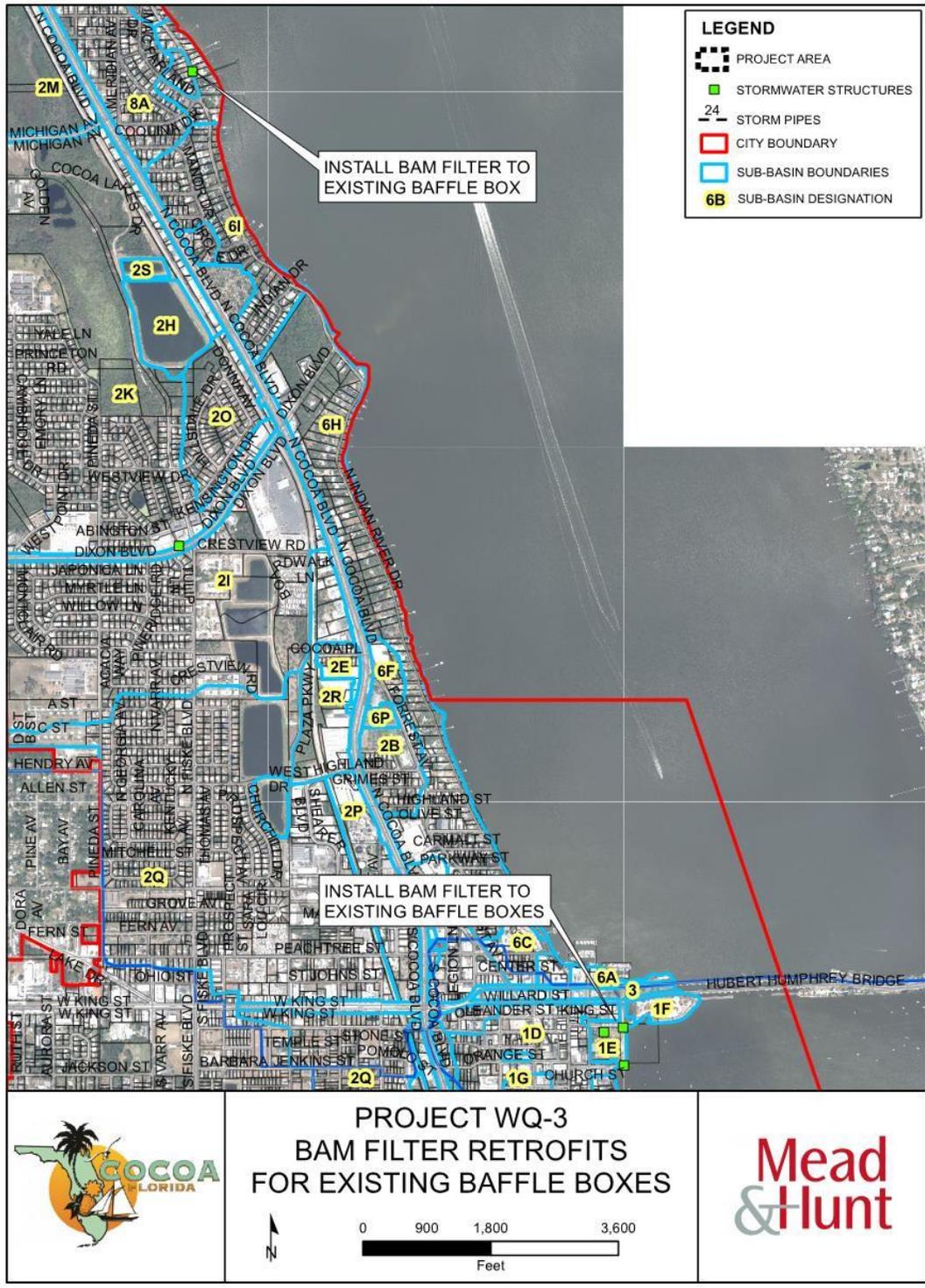
**Section 4**  
**Recommended Water Quality Projects**

Table 29: Cost Estimate Table – Project WQ-3: BAM Filter Retrofits for Existing Baffle Boxes.

Project WQ-3: BAM Filter Retrofits for Existing Baffle Boxes									
Item Number	Location			Proposed Retrofit Improvements					
	IRL East of US-1			Item Description	Quantity	Unit	Unit Cost	Amount	
1									
				- Site preparation	Dewatering and flow diversion	3	LS	\$15,000.00	\$45,000.00
				- Construction management	Maintenance of traffic, signage	3	LS	\$7,500.00	\$22,500.00
				- Pollutant Removal Structure	Baffle Box Retrofit w. BAM Filter	3	LS	\$30,000.00	\$90,000.00
<b>Qualifications (if applicable)</b>				<b>SUB-TOTAL</b>					<b>\$157,500.00</b>
1			Cost for one Baffle Box Retrofit =	\$80,535.00					
								- Mobilization @ 10%	\$15,750.00
								- Contingencies @ 20%	\$31,500.00
								<b>SUB-TOTAL OF CONSTRUCTION COST</b>	<b>\$204,750.00</b>
								- Eng Design & Permitting @ 10%	\$20,475.00
								- Subconsultants @ 2%	\$4,095.00
								- Constr Admin and Insp @ 6%	\$12,285.00
								<b>TOTAL PROJECT COST</b>	<b>\$241,605</b>

Table 30: Nutrient Removal Cost/Pound Table – Project WQ-3: BAM Filter Retrofits for Existing Baffle Boxes.

Project WQ-3: BAM Filter Retrofits for Existing Baffle Boxes					
Project #	Improvement	Estimated TN Removal (lbs/year)	Estimated TP Removal (lbs/year)	Cost/TN Pound	Cost/TP Pound
WQ-3	BAM Filter Retrofit	89.09	17.68	\$904	\$4,555
TOTAL		267.27	53.04	\$904	\$4,555
<b>Assumptions:</b>					
Locations vary, Riverfront Park Baffle box drainage basin used as an EXAMPLE					
Drainage area: 8 ac, avg basin size for small basins					
Land-use: High-intensity Commercial, TN=2.4 TP=0.345					
Soil type A, Non DCIA CN: 89					
DCIA (%): 85					
Pre-improvement load: TN=161.66 lb/yr, TP=23.24 lb/yr					
Assumes 45% TNTP removal using B&G ECT3 media					



**(4) WQ-4: Living Shoreline Along Lagoon**

Location

Project WQ-4 is planned for various locations along the shoreline of the IRL (See Figure). Coastal communities are constantly under the threat of losing valuable resources because of erosion, intense storms, or even sea-level rise.

Proposed Improvements

The proposed project aims to install a living shoreline consisting of oyster beds which create a form of natural breakwaters. As an alternative to installing a solid barrier between water and land, the idea of Living Shorelines has gained popularity thanks to their ability to reduce loss of resources while simultaneously providing ecosystem services to society including food production, nutrient and sediment removal, and water quality improvement. Reefs are built by adding material to the water, such as small bags of oyster shells, loose oyster or clam shells, riprap, marl, or other suitable substances. The material attracts oyster larvae, which settles and creates a live reef.

Benefits

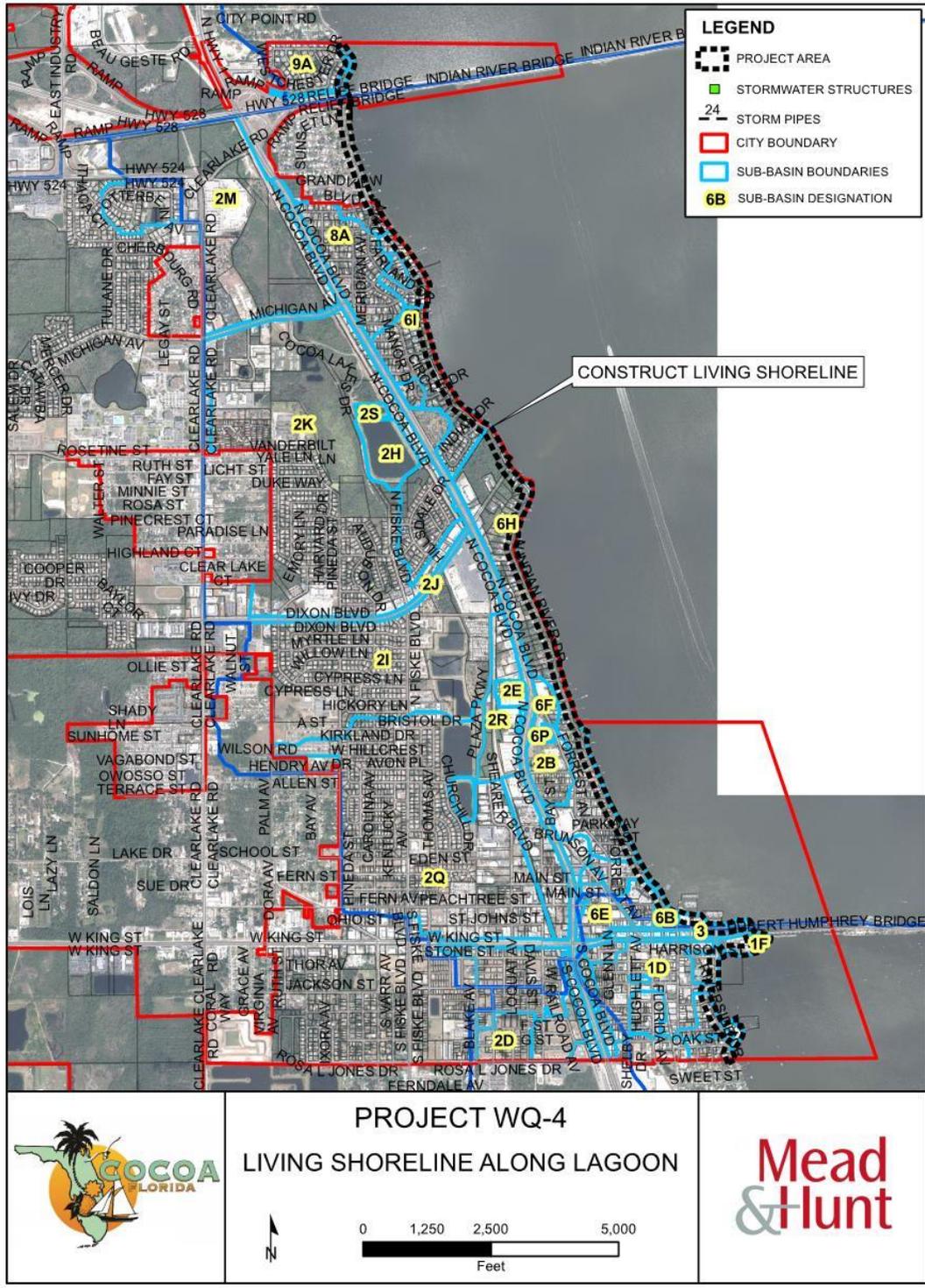
The installation of oyster beds along the shoreline of the IRL is another good example of LID applied to multiple issues simultaneously. Oyster beds dissipate wave action and trap sediments and can reduce the effects of erosion to a shoreline. Furthermore, oysters are known to filter runoff and improve water quality which would work symbiotically with the improvements to the discharge structures (see WQ-1 & WQ-2) along that entire corridor.

Cost Estimate

The cost to construct living shorelines varies significantly depending on the amount of site preparation necessary, and the elevation change between the lagoon bottom and the highest anticipated water level. Keeping this in mind, and assuming a single terrace with sea grass plantings, various species of appropriately selected mangrove and oyster shell bags, a 200-foot long section of living shoreline with the attendant design and permitting can be expected to cost approximately \$15,000. If significant grading should be required, or additional terracing, the prices could rise significantly. It should be noted that very often these projects are accomplished by volunteers as community projects. Depending on the amount of volunteer labor and donated materials, the costs could be reduced appreciably.



Section 4  
Recommended Water Quality Projects



**(5) WQ-5: Circle Drive Dry Retention Pond, Carlton Terrace & Broadview Manor Swales**

Location

**Circle Drive Dry Retention Pond:** Circle Drive is located in Broadview Manor, an older residential area between U.S. 1 and the IRL. Some roads have no curbs, gutters, or storm drain systems. The land elevation is high, approximately 36 feet above sea level, and the soil is Class A sand. There is a green space adjacent to Circle Drive that would be a good location for a dry retention pond.

**Carlton Terrace Swales:** Located in an older subdivision in the north section of the City, between U.S. 1 and the IRL. The streets are 20' wide, with no curbs, gutters or swales. Runoff flows westward to one small inlet and pipe that crosses U.S. 1 and the railroad. The pipe daylights south of Michigan, allowing water to sheet flows through sloughs before entering Bracco Pond. There are sidewalks 15 feet offset from the pavement, soils are Class A, ground elevations are 30 to 40 feet above sea level, and groundwater is low.

**Broadview Manor Swales:** Broadview Manor is an older residential area between U.S. 1 and the IRL. Three roads in this area, Manor Drive, Beverly Manor, and Bedford Place, have no curbs, gutters, or storm drain systems. The runoff from these streets flows to the IRL with no treatment. The land elevation is high, approximately 36 feet above sea level, and the soil is Class A sand.

Proposed Improvements

**Circle Drive Dry Retention Pond:** A shallow (1.25ft) retention pond could be excavated to capture 1.43in of runoff from the basin in order to obtain 100% removal credits for 51.82 lbs/yr of TN and 7.01 lbs/yr of TP

**Carlton Terrace Swales:** Proposed improvements include installing swales between the sidewalks and each side of the roads. This project consists of cutting 7,143 linear feet of 12" deep swales on each side of the roads, within the right-of-way, to provide 0.5 inches of runoff storage in the 59-acre subdivision. The swales will provide reductions of 203.25 lbs/yr of TN and 25.83 lbs/yr of TP.

**Broadview Manor Swales:** Construction of 2,050 feet of roadside retention swales along these streets, within existing road right-of-way, to capture 0.15 inches of runoff. The resultant pollutant removals would be 73 lbs/yr of TN and 8.52 lbs/yr of TP.

Benefits

All these improvements would provide increased flood control, and water quality management to the Broadview Manor/Carlton Terrace community. Implementation of the proposed projects will capture approximately 328.1 pounds of nitrogen and 41.36 pounds of phosphorus on an annual basis.

Cost Estimate

**Circle Drive Dry Retention Pond:** The estimated cost of the project is \$60,480.

**Carlton Terrace Swales:** Construction of the swales is estimated to cost \$261,394.

**Broadview Manor Swales:** Costs for swale construction are estimated to be \$99,792.

**Section 4**  
**Recommended Water Quality Projects**

The total for all of these projects, plus the engineering and permitting necessary to implement them is approximately \$421,667.

*Table 33: Cost Estimate Table – Project WQ-5: Circle Drive Dry Retention Pond, Carlton Terrace & Broadview Manor Swales.*

Project WQ-5: Circle Drive Dry Retention Pond, Carlton Terrace & Broadview Manor Swales						
Item Number	Location IRL East of US-1	Proposed Retrofit Improvements				
		Item Description	Quantity	Unit	Unit Cost	Amount
1	Circle Drive Dry Retention Pond Construction Activities					
	- Site Preparation	Clearing and grubbing	1	LS	\$5,000.00	\$5,000.00
	- Construction Management	Maintenance of traffic, signage	1	LS	\$3,000.00	\$3,000.00
	- Erosion control and pollution abatement	Silt fences, turbidity barriers, etc.	1	LS	\$2,000.00	\$2,000.00
	- Pond Construction	Excavation, exc.	1	LS	\$25,000.00	\$25,000.00
2	Carlton Terrace Swales Construction Activities					
	- Site Preparation	Clearing and grubbing	1	LS	\$5,000.00	\$5,000.00
	- Construction Management	Maintenance of traffic, signage	1	LS	\$10,000.00	\$10,000.00
	- Erosion control and pollution abatement	Silt fences, turbidity barriers, etc.	1	LS	\$5,000.00	\$5,000.00
	- Swale Construction	Excavation	7,144	LF	\$20.00	\$142,880.00
3	Broadview Manor					
	- Site Preparation	Clearing and grubbing	1	LS	\$5,000.00	\$5,000.00
	- Construction Management	Maintenance of traffic, signage	1	LS	\$3,000.00	\$3,000.00
	- Erosion control and pollution abatement	Silt fences, turbidity barriers, etc.	1	LS	\$2,000.00	\$2,000.00
	- Swale Construction	Excavation	2,050	LF	\$20.00	\$41,000.00
	- Storm Pipe	24" RCP	50	LF	\$100.00	\$5,000.00
	- Restoration	Sodding, landscpaing, etc.	1	LS	\$10,000.00	\$10,000.00
<b>Qualifications (if applicable)</b>			<b>SUB-TOTAL</b>			\$278,880.00
1				- Mobilization @	10%	\$27,888.00
				- Contingencies @	10%	\$27,888.00
			<b>SUB-TOTAL OF CONSTRUCTION COST</b>			\$334,656.00
			- Eng Design & Permitting @		15%	\$50,198.40
			- Subconsultants @		5%	\$16,732.80
			- Constr Admin and Insp @		6%	\$20,079.36
			<b>TOTAL PROJECT COST</b>			<b>\$421,667</b>

*Table 34: Nutrient Removal Cost/Pound Table – Project WQ-5: Circle Drive Dry Retention Pond, Carlton Terrace & Broadview Manor Swales.*

Project WQ-5: Circle Drive Dry Retention Pond, Carlton Terrace & Broadview Manor Swales					
Project #	Improvement	Estimated TN Removal (lbs/year)	Estimated TP Removal (lbs/year)	Cost/TN Pound	Cost/TP Pound
WQ-5	Various	328.07	41.36	\$1,285	\$10,195
<b>Assumptions:</b>					
From TMDL Report					

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**(6) WQ-7: Bracco Pond Aerators**

Location

Project WQ-7 focuses on the Bracco Reservoirs Stormwater Ponds, located between W Highland Dr. and N Fiske Blvd. These wet ponds provide treatment of stormwater runoff to nearly 1,060 acres of land. They provide sediment and nutrient removal, and a decrease in runoff rates before being discharged to the Indian River Lagoon. There are outflow structures to transport runoff to a reclaimed water pond with a usable volume of 7.2 million gallons, if needed. The reuse of this water can decrease the freshwater flows and nutrient loading into the IRL. However, in the moments when supply exceeds demand, further treatment may be needed.

Proposed Improvements

This project proposes the installation of surface aerators in the Bracco Ponds to assist in the control of toxic algae blooms. High nutrient levels from surface runoff can result in the conditions which might foster algal blooms which can cause nutrient levels to exceed requirements due to their toxic effects on biomass. Aerators have been shown to be a beneficial addition to wet detention ponds in order to keep dissolved oxygen levels high enough to improve aquatic life which can help keep the water column cleaner.

Benefits

In general, aerating ponds promotes biological activity which in turn reduces the available nutrients for algae to grow. Biological decomposition of muck de-stratifies thermal layers in water and improves the ecological health of the system. Benefits are also aesthetic because aerators generally resemble fountains. Implementation of the proposed project will capture approximately 173.8 pounds of nitrogen and 14.41 pounds of phosphorus on an annual basis.

Cost Estimate

The City received a quote from Vertex Water Features to furnish Ponds B-E for a total cost of \$41,534. An estimated annual cost of \$1,000 for maintenance was included into the cost estimate below, bringing the cost to \$51,534 for the 10-year work plan period.



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Table 36: Nutrient Removal Cost/Pound Table – Project WQ-7: Bracco Pond Aerators.

Project WQ-7: Bracco Pond Aerators						
Project #	Improvement	Estimated TN Removal (lbs/year)	Estimated TP Removal (lbs/year)	Cost/TN Pound	Cost/TP Pound	Cost/TNT P Pound
WQ-7	Pond Aeration	173.756	14.41	\$ 239.04	\$ 2,882.30	\$221
<b>BMPTRAINS analysis of Bracco Ponds as is</b>						
Pond E	Area = 129 ac, CN = 84, DCIA = 35%, RT = 34.5					
Ponds C&D	Area = 137 ac, CN = 67, DCIA = 35%, RT = 138					
Pond B	Area = 794.6 ac, CN = 70.6, DCIA = 35%, RT = 39.4					
<b>Loading to Ponds</b>						
TN	2712.77 kg/yr		5968.094 lbs/yr			
TP	446.43 kg/yr		982.146 lbs/yr			
<b>Removal Efficiency</b>		TN = 40%	TP = 68%			
<b>Discharge Load</b>						
TN	1638.76 kg/yr		3605.272 lbs/yr			
TP	144.99 kg/yr		318.978 lbs/yr			
<b>Load Removed</b>						
TN	1074.02 kg/yr		2362.844 lbs/yr			
TP	301.45 kg/yr		663.19 lbs/yr			
<b>WITH FLOATING AERATORS</b>						
Assume 2.5% credit						
<b>Removal Efficiency</b>		TN = 43%	TP = 69%			
<b>Discharge Load</b>						
TN	1559 kg/yr		3429.8 lbs/yr			
TP	138 kg/yr		303.6 lbs/yr			
<b>Load Removed</b>						
TN	1153 kg/yr		2536.6 lbs/yr			
TP	308 kg/yr		677.6 lbs/yr			



**(7) WQ-8: Divert Bracco Pond Baseflow to St. Johns River Basin via Diamond Square Pond**

Location

Project WQ-8 is focused on the baseflow of the Bracco Pond Reservoirs. This project is one of several alternatives for the management of baseflow in the Bracco Ponds. Alongside project WQ-12, this project aims to alter the discharge location of baseflow from the Bracco Ponds to a drainage basin that drains to the St. Johns River Basin instead of the IRL.

Proposed Improvements

As a way of reducing loading to the IRL, this project proposes diverting flow from the ponds that would normally discharge to the IRL to the St. Johns River Basin, via the proposed Verizon Stormwater Pond in Diamond Square (WQ-12). This would require transport structures routing water south of the Bracco reservoirs, and the completion of project WQ-12.

Proposed improvements include installation of 600 GPM pumps to transport baseflow from Bracco Pond to the Verizon Pond during dry days when the Verizon system is not receiving runoff. Flow projections were performed assuming the pumps would operate for about 18 hours/day for an average of 240 days/year. According to several weather sites, the City of Cocoa experiences about 130 days of rain every year.

Benefits

The immediate benefit is that stormwater discharge to the IRL would be reduced as water would instead be discharging to the St John's River. Storage of this diverted water in large wet ponds would mean much lower peak flow rates to the discharge structures in the IRL, as well as benefits from increased storage times of water, namely, nutrient treatment.

Implementation of the proposed project will capture approximately 954.3 pounds of nitrogen and 117.2 pounds of phosphorus on an annual basis. Before discharging to the SJR, the diverted baseflow proposed in this project would be routed through a series of retention ponds where it will undergo further treatment before its ultimate discharge.

Cost Estimate

Cost estimates were developed by choosing a reasonable amount of water that could be transported (pumped) from the Bracco reservoir to the Diamond Square Pond. Assuming a continuous flow of 600gpm, 18 hours a day, for 240 days of the year. The total cost of this project would be \$1,960,793, not accounting for any operating costs.

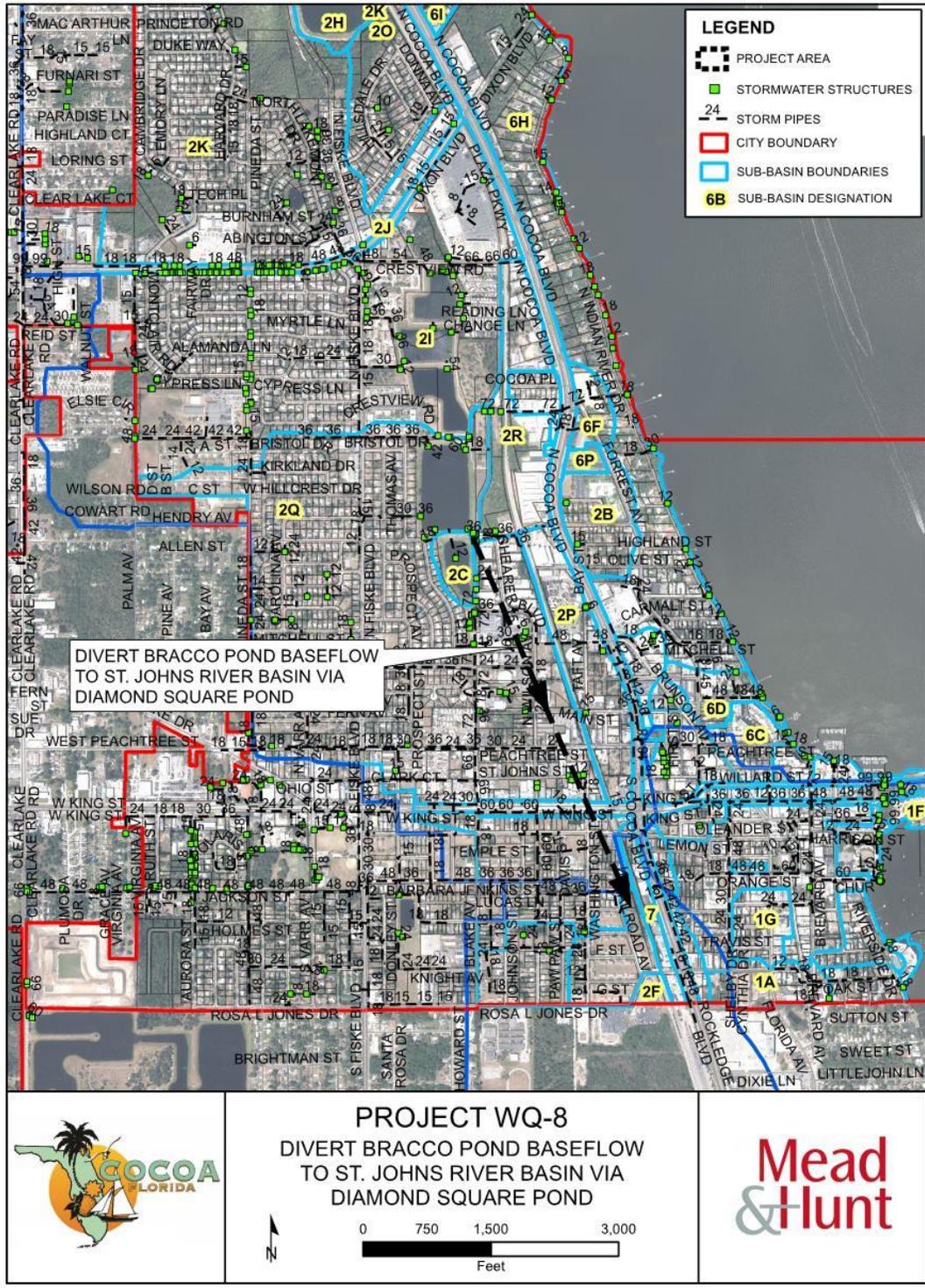
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*Table 37: Cost Estimate Table – Project WQ-8: Divert Bracco Pond Baseflow to St. Johns River Basin via Diamond Square Pond.*

Project WQ-8: Divert Bracco Pond Baseflow to St. Johns River Basin via Diamond Square Pond						
Item Number	Location	Proposed Retrofit Improvements				
	Bracco Ponds	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Construction management	Maintenance of traffic, signage	1	LS	\$30,000.00	\$30,000.00
	- Furnish & Install	12" PVC	5,500	LF	\$185.00	\$1,017,500.00
	- Furnish & Install	Pumps & Controls	1	LS	\$75,000.00	\$75,000.00
	- Furnish & Install	Wet Well	1	LS	\$35,000.00	\$35,000.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	\$50,000.00	\$50,000.00
<b>Qualifications (if applicable)</b>						
1	Note: Cost of pipe includes valves and appurtenances					
	Need to add operating costs					
<b>SUB-TOTAL</b>						\$1,207,500.00
					- Mobilization @ 10%	\$120,750.00
					- Contingencies @ 20%	\$241,500.00
<b>SUB-TOTAL OF CONSTRUCTION COST</b>						\$1,569,750.00
					- Eng Design & Permitting @ 12%	\$188,370.00
					- Subconsultants @ 5%	\$78,487.50
					- Constr Admin and Insp @ 6%	\$94,185.00
					- Annual Operating Cost for 10 yrs	\$30,000.00
<b>TOTAL PROJECT COST</b>						<b>\$1,960,793</b>

*Table 38: Nutrient Removal Cost/Pound Table – Project WQ-8: Divert Bracco Pond Baseflow to St. Johns River Basin via Diamond Square Pond.*

Project WQ-8: Divert Bracco Pond Baseflow to St. Johns River Basin via Diamond Square Pond					
Project #	Improvement	Estimated TN Removal (lbs/year)	Estimated TP Removal (lbs/year)	Cost/TN Pound	Cost/TP Pound
WQ-8	Flow Diversion	954.33	117.20	\$ 2,055	\$ 16,731
<b>Assumptions:</b>					
	1.71 mg/L TN =	1.43E-05 lbs/gal		Based on Grab Samples provided by City	
	0.21 mg/L TP =	1.75E-06 lbs/gal			
Assume pumping a continuous flow of 300 gpm @ 6 hrs / day for 180 days/year.					
Flow	600 gpm		1.3368 cfm		
Time Length	18 hrs/day				
Days / Yea	240 days/year				
Annual Flo	20,791,443.85 cf/yr				
	155,520,000.00 gal/yr				
Annual Load					
TN	2,219.4 lbs/yr				
TP	272.5 lbs/yr				
BAM Treat	43%				
Load Removed					
TN	954.3 lbs/yr				
TP	117.2 lbs/yr				



**(8) WQ-10: 72" Outfall Baseflow Capture/Treatment**

Location

Project WQ-10 is related to the City's plans to build a dry pond in a vacant lot on the intersection of Forrest Ave. and U.S. 1. There is currently a 72" outfall pipe that conveys untreated water from west of U.S. 1, under the highway, and eastward to the IRL. The drainage basin for this site is 16.39 acres of mixed-use land that is modeled to generate 219 lbs/yr of TN and 43 lbs/yr of TP, as modeled in the aforementioned TMDL Report (QLH, 2016).

The City has also expressed concern with infiltrating waters near the site causing damage to roadways.

Proposed Improvements

This is a multiphase project that aims to improve the quality of runoff from its adjacent drainage basin, as well as treat baseflow coming through the 72" outfall from the Bracco Reservoir.

- Phase 1: Excavate the pond and install a Bioactivated Media (BAM) underdrain filtration system to prevent infiltration of water in the area despite an increase in the volume of water being stored for treatment.
- Phase 2: Complete the project by installing the pumps and distribution manifold to control the flow and storage of water effectively. The plan is to install solar powered pumps which will operate in such a manner to capture the flows that seep into the pipe during non-rain events.

Benefits

This project would simultaneously treat baseflow from Bracco Pond as well as effluent from the adjacent drainage basin and reduce infiltration in the immediate area. Nutrient loads will be addressed by cycling them through a BAM system to reduce nitrogen and phosphorous. Implementation of the proposed project will capture approximately 94.3 pounds of nitrogen and 12.4 pounds of phosphorus from the drainage basin that discharges to the pond as well as an additional 122.1 pounds of nitrogen and 15.0 pounds of phosphorous from the baseflow being pumped out of Bracco Pond.

Cost Estimate

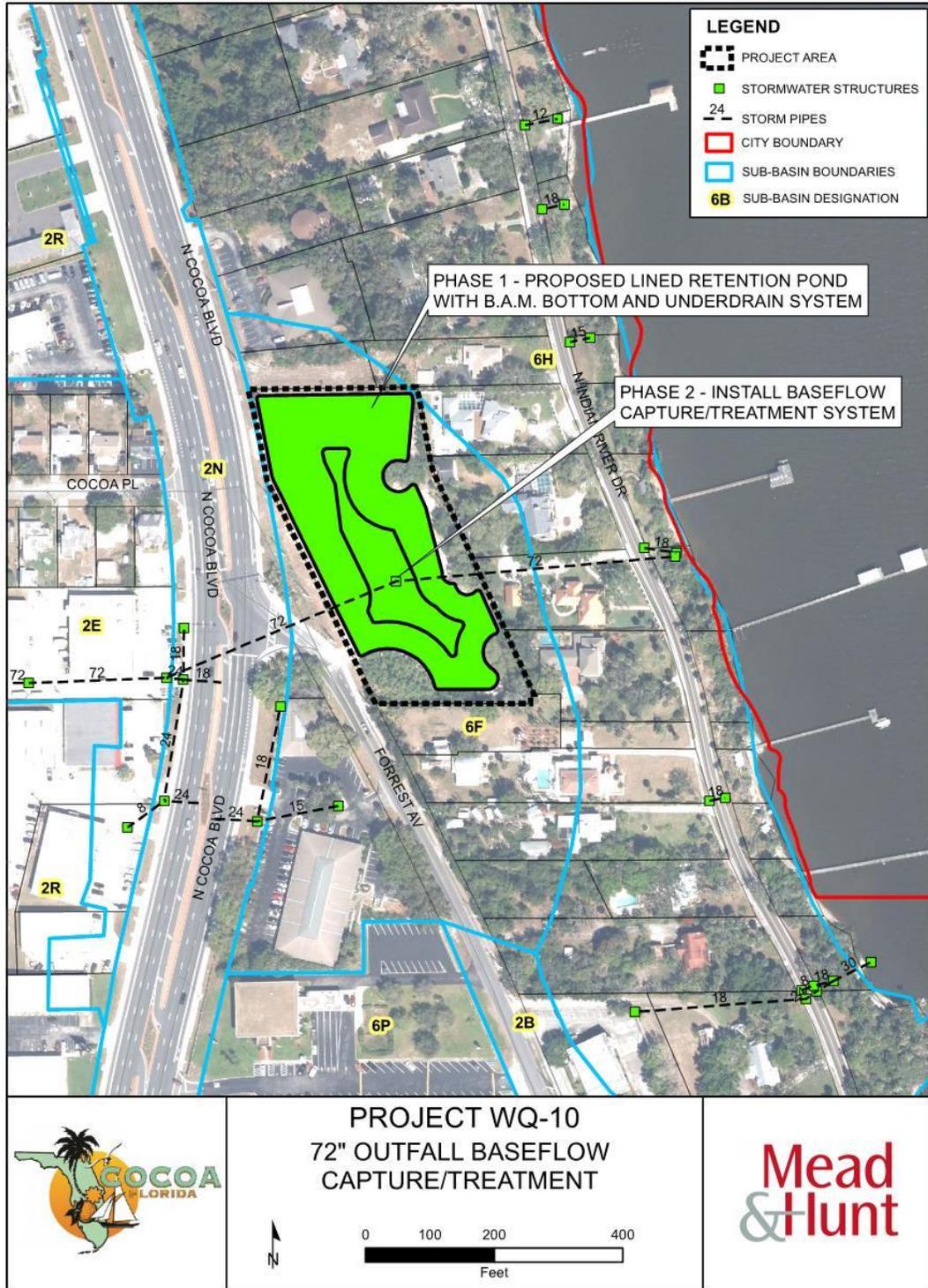
It is estimated that the total cost of the facilities to capture, pump and distribute the baseflow water into the pond will cost approximately \$1,216,663 including both phases of the project. The breakdown of each phase can be seen in the Cost Estimate Table below.



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*Table 40: Nutrient Removal Cost/Pound Table – Project WQ-10: 72" Outfall Baseflow Capture/Treatment.*

Project WQ-10: 72" Outfall Baseflow Capture/Treatment					
Project #	Improvement	Estimated TN Removal (lbs/year)	Estimated TP Removal (lbs/year)	Cost/TN Pound	Cost/TP Pound
WQ-10	Dry Pond	216.40	27.40	\$ 5,622.25	\$ 44,406.68
<b>Assumptions:</b>					
8000 SY	296 CY				
1.71 mg/L TN	=	1.43E-05 lbs/gal		Based on Grab Samples provided	
0.21 mg/L TP	=	1.75E-06 lbs/gal		Based on Grab Samples provided	
Assume pumping a continuous flow of 300 gpm @ 6 hrs / day for 180 days/year.					
Flow	300 gpm		0.6684 cfm		
Time Length	6 hrs/day				
Days / Year	180 days/year				
Annual Flow	2,598,930.48 cf/yr				
	19,440,000.00 gal/yr				
Annual Load					
TN	277.4 lbs/yr				
TP	34.1 lbs/yr				
BAM Treatment	44%				
Load Removed					
TN	122.1 lbs/yr				
TP	15.0 lbs/yr				
Phase 1 Pond					
US-1 Drainage Basin Area		5 ac			
CN		93			
DCIA		85 %			
Treatment Depth		3 inches			
<b>Loading to Pond</b>					
TN	97.5 kg/yr		214.5 lbs/yr		
TP	12.83 kg/yr		28.226 lbs/yr		
<b>Removal Efficiency</b>		TN =	44 %		
		TP =	44 %		
<b>Discharge Load</b>					
TN	54.62 kg/yr		120.164 lbs/yr		
TP	7.19 kg/yr		15.818 lbs/yr		
<b>Load Removed</b>					
TN	42.88 kg/yr		94.336 lbs/yr		
TP	5.64 kg/yr		12.408 lbs/yr		



**(9) WQ-11: Horseshoe Ponds (North & South) Vegetation Removal**

Location

Project WQ-11 is located in the Horseshoe Ponds, three small ponds (total area of 3.4 acres) located north of Dixon Blvd just west of N Fiske Blvd. They are surrounded by single family residential units, in a drainage basin of about 55-acres, and serve as stormwater retention facilities for the drainage basin.

Proposed Improvements

This project proposes the removal of vegetation in the Horseshoe Ponds to prevent the decay and ultimate deposition of nutrients to these systems. Nutrient rich sediments and clay accumulate over time as a result of algae and plants that inevitably grow along the banks of aquatic systems.

Access to the two southern ponds may be achieved via the two vacant lots located at the south end of South Lakemont Drive, however the northern pond will likely require property acquisition in order to access the pond and perform the work.

Benefits

This project aims to restore these water bodies which may be plagued by algal blooms by reducing vegetation which may become a source of nutrients. Overgrown vegetation contributes nutrient loading to the ponds which over time may decay and result in algal blooms which are unsightly and adversely impact the neighborhood as well as the plant and animal communities in or near the water bodies.

Although data is lacking in order to claim nutrient removal credits according to FDEP, an estimate was performed under the assumption that completion of this project would effectively restore the ability of these ponds to remove nutrients from the effluent. If removal of this excess vegetation restores 50% of the ability of these ponds to treat nutrients, then the ponds would be able to treat an additional 66.9 and 18.0 pounds of nitrogen and phosphorous respectively.

Cost Estimate

For the purpose of this cost estimate it is presumed that property acquisition will occur, and the County can negotiate a price 2 times higher than the BCPAO's Market Value of \$38,000 for the least expensive property with direct access to the pond. The total estimate for design, permitting and construction of this project is \$236,670.

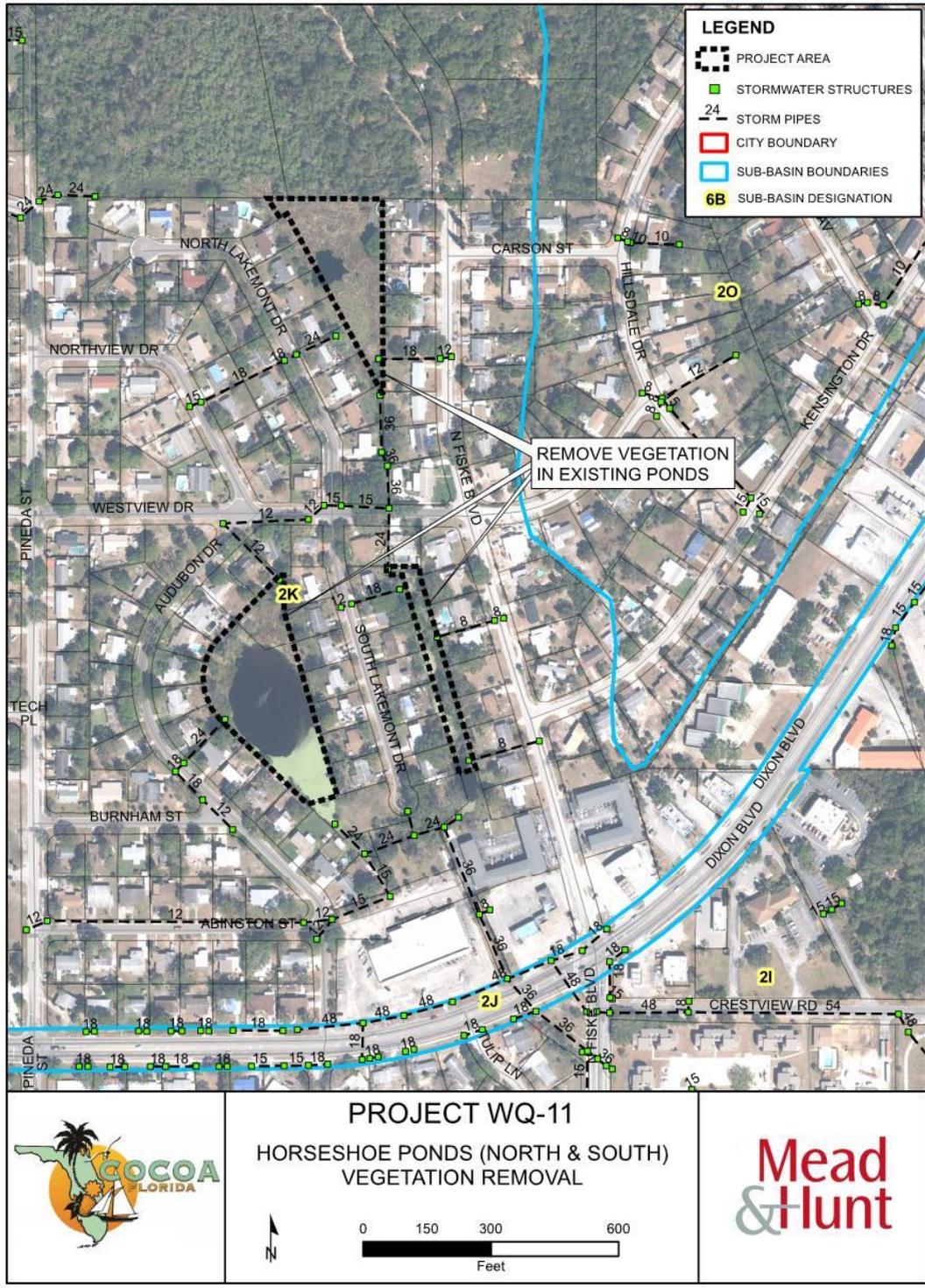


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*Table 42: Nutrient Removal Cost/Pound Table – Project WQ-11: Horseshoe Ponds (North & South) Vegetation Removal.*

<b>Project WQ-11: Horseshoe Ponds (North &amp; South) Vegetation Removal</b>					
<b>Project #</b>	<b>Improvement</b>	<b>Estimated TN Removal (lbs/year)</b>	<b>Estimated TP Removal (lbs/year)</b>	<b>Cost/TN Pound</b>	<b>Cost/TP Pound</b>
WQ-11	Vegetation Removal	66.86	18.00	\$ 3,540	\$ 13,151
<b>Assumptions:</b>					
Data lacking to assign credit according to FDEP					
Use \$60/CY for Excavation & Hauling					
Basin Area	55 ac				
Pond Areas	1.75 ac				
	1.85 ac				
	0.65 ac				
	4.25 ac				
Residence T	20 days				
<b>Loading to Pond</b>					
TN	183.55 kg/yr		403.81 lbs/yr		
TP	28.99 kg/yr		63.778 lbs/yr		
<b>Removal Efficiency</b>					
		TN =	36 %		
		TP =	61 %		
<b>Discharge Load</b>					
TN	108.58 kg/yr		238.876 lbs/yr		
TP	10.4 kg/yr		22.88 lbs/yr		
<b>Load Removed</b>					
TN	60.78 kg/yr		133.716 lbs/yr		
TP	16.36 kg/yr		35.992 lbs/yr		
Anticipate 50% Credit					
Load Reduction Credit					
TN	30.39 kg/yr		66.858 lbs/yr		
TP	8.18 kg/yr		17.996 lbs/yr		

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**(10) WQ-12: Verizon Stormwater Pond in Diamond Square**

Location

Project WQ-12 is a proposed wet pond from the May 2016 TMDL Report to be excavated East of the Diamond Square CRA. Specifically, the plot of land for this project is located between W Railroad Ave. and the railroad. A 2004 Preliminary Site Investigation Report by Ecology and Environment, Inc. (EE) confirmed the results of previous phase 1 and phase 2 analyses of the site which uncovered arsenic contamination at the site. The study found arsenic concentrations which exceeded the Residential Direct Exposure (RDE) Soil Cleanup Target Level (SCTL) of 2.1 mg/kg at soil boring locations 0-6 ft below the surface. Additionally, groundwater samples exceeding Groundwater Cleanup Target Levels (GCTL) were also collected.

Proposed Improvements

The project intends to construct an off-line 0.94-acre wet pond to retrofit an additional 20.66 acres of single and multifamily properties, as part of the larger Diamond Square redevelopment plan. However, the potential to disturb and mobilize the arsenic-impacted soils and groundwater to uncontaminated levels warrants consultation with FDEP and further assessment of the site in order to establish remediation options. Lining the pond has also been discussed.

Following the completion of this pond excavation, the City has suggested that further analysis be done to the drainage of the Diamond Square area. If this analysis shows that flooding issues are still present, an alternative phase could be added to the project scope. There is an 18" pipe going east along Orange Dr. on the other side of US-1. This pipe connects to a 48" pipe past Hughlett Ave. to Brevard Ave. where it travels south down an 48x 72 oval pipe and into the baffle box on Church Street before discharging to the IRL. To do this a pump station and piping would be needed to project the excess water that would have been treated on the Verizon pond, across to connect with the 18" pipe in Orange St.

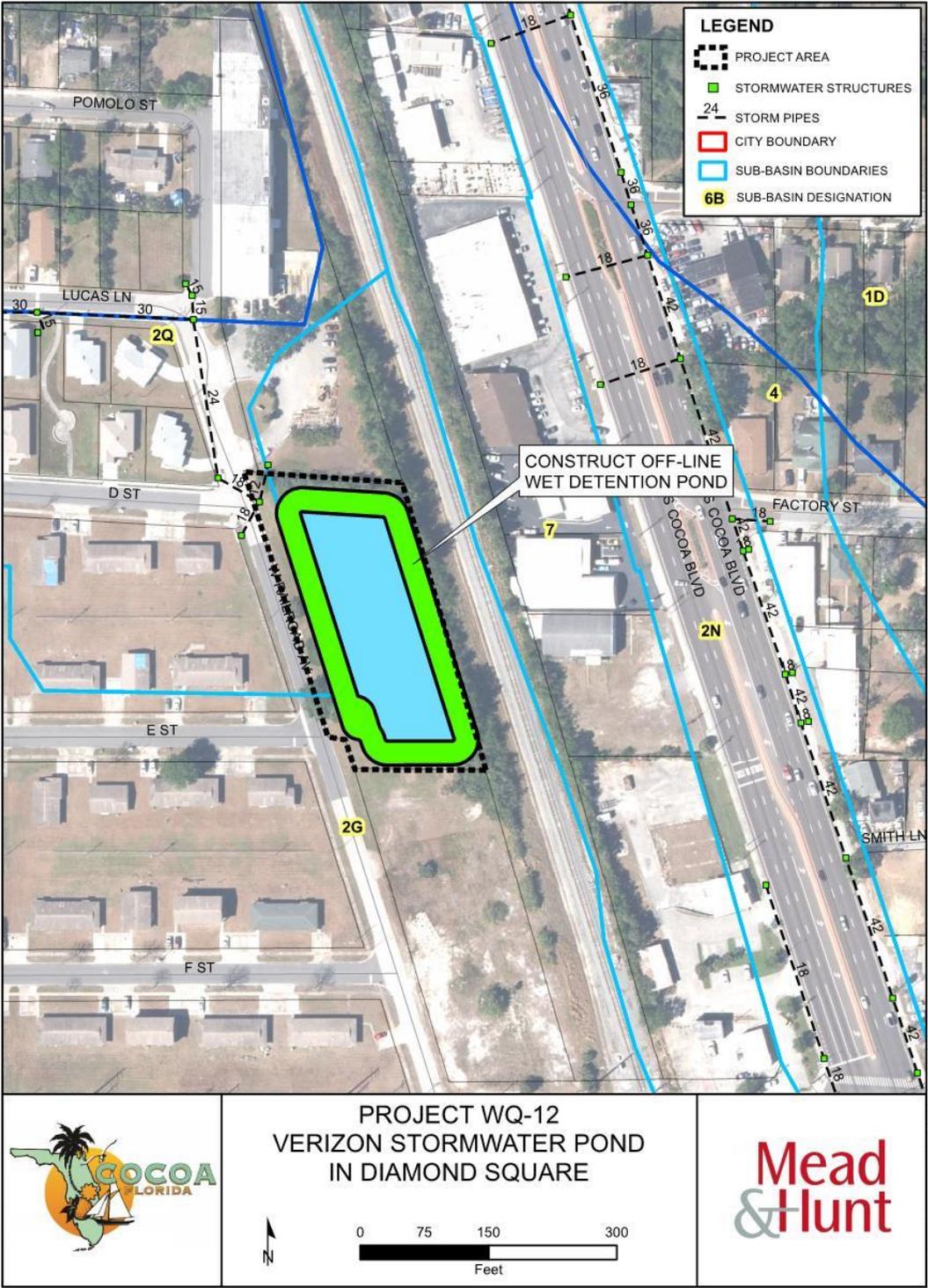
Benefits

The primary aims of this wet pond construction is to attenuate the flows of stormwater for the changing land use landscape that is Diamond Square. As part of the greater redevelopment plan mentioned in project FM-14, this project is an essential component for improving the drainage abilities of Diamond Square and thus addressing flooding issues that have been experienced in the past.

Furthermore, this wet pond will have a significant environmental impact on water resources. Because of the reduction of nutrient loading from attenuating flows, the project would provide 125.7 lbs/yr of TN credits and 45.6 lbs/yr of TP credits, as was calculated in the 2016 TMDL Report.



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**(11) WQ-13: Pond Aeration at North Fiske and Other Stormwater Treatment Facilities**

Location

Project WQ-13 focuses on the North Fiske Pond, an 18.8-acre freshwater pond located between Cocoa Blvd. and some vacant commercial land. The pond provides storage and treatment to stormwater flows from runoff in areas to the north. Additionally, the City operates an additional 8 ponds throughout the City with a total area of 11.8 acres.

Proposed Improvements

This project, like WQ-7, proposes the installation of an aeration system at the North Fiske pond and other stormwater facilities in order to prevent toxic algae blooms and to improve the general health and treatment capabilities of the pond systems.

Benefits

In general, aerating ponds promotes biological activity which in turn reduces the available nutrients for algae to grow. High nutrient levels from surface runoff can result in the conditions which might foster algal blooms which can cause nutrient levels to exceed requirements due to their toxic effects on biomass. Aerators have been shown to be a beneficial addition to wet detention ponds in order to keep dissolved oxygen levels high enough to improve aquatic life which can help keep the water column cleaner. Biological decomposition of muck de-stratifies thermal layers in water and improves the ecological health of the system.

Nutrient removal calculations were performed by specifying the parameters of an idealized "Standard Pond" with an area of 10-acres and the basin parameters listed below. This standard pond with the addition of aerators was able to remove 5.94 pounds of nitrogen and 0.66 pounds of phosphorous. Expanding this estimate to address all 30-acres of ponds around the City of Cocoa would estimate a nutrient capture capacity of approximately 17.80 pounds of nitrogen and 1.98 pounds of phosphorus on an annual basis.

Cost Estimate

The City received a quote from Vertex Water Features to furnish the North Fiske Pond with aerators for \$26,639. The additional 11.8-acres of ponds that the City operates would therefore cost an estimated \$20,000 to have aerators installed based on this Vertex quote. The total cost to install aeration systems in all stormwater treatment facilities would be \$65,482.

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Table 45: Cost Estimate Table – Project WQ-13: Pond Aeration at North Fiske and Other Stormwater Treatment Facilities.

Project WQ-13: Pond Aeration at North Fiske and other Stormwater Treatment Facilities						
Item Number	Location	Proposed Retrofit Improvements				
	Various Ponds	Item Description	Quantity	Unit	Unit Cost	Amount
1	Vertex Aeration Systems Quote					
	- LLHE33 Aeration System Wired 230 Volt	Vertex Water Features Quote	1	LS	\$26,639.32	\$26,639.32
2	Construction activities; Additional ponds					
	- Furnish & Install	City-operated ponds	1	LS	\$20,000.00	\$20,000.00
<b>Qualifications (if applicable)</b>			<b>SUB-TOTAL</b>			<b>\$46,639.32</b>
1	- Quote provided by Vertex Water Features at the request of City of Cocoa					
	- North Fiske pond = 18.8 acres				10%	\$4,663.93
	- <b>City operates additional 8 ponds throughout city = 11.8 acres</b>				10%	\$4,663.93
	- Cost estimate for additional ponds based on Vertex quote					
			<b>SUB-TOTAL OF CONSTRUCTION COST</b>			<b>\$55,967.18</b>
				- Eng Design & Permitting @	10%	\$5,596.72
				- Subconsultants @	2%	\$1,119.34
				- Constr Admin and Insp @	5%	\$2,798.36
			<b>TOTAL PROJECT COST</b>			<b>\$65,482</b>

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*Table 46: Nutrient Removal Cost/Pound Table – Project WQ-13: Pond Aeration at North Fiske and Other Stormwater Treatment Facilities.*

<b>Project WQ-13: Pond Aeration at North Fiske and other Stormwater Treatment Facilities</b>					
<b>Project #</b>	<b>Improvement</b>	<b>Estimated TN Removal (lbs/year)</b>	<b>Estimated TP Removal (lbs/year)</b>	<b>Cost/TN Pound</b>	<b>Cost/TP Pound</b>
WQ-13	Pond Aeration	17.82	1.98	\$3,675	\$33,072
<b>Assumptions:</b>					
<b>BMPTRAINS analysis of "Standard Pond"</b>					
Standard Pond	Basin Area =		65 ac		
	CN =		84		
	DCIA		65 %		
	Pond Area =		10 ac		
	Residence Time =		30 days		
<b>Loading to Ponds</b>					
TN	113.8 kg/yr		250.36 lbs/yr		
TP	18.9 kg/yr		41.58 lbs/yr		
<b>Removal Efficiency</b>					
	TN =		38 %		
	TP =		64 %		
<b>Discharge Load</b>					
TN	56.3 kg/yr		123.86 lbs/yr		
TP	5.41 kg/yr		11.902 lbs/yr		
<b>Load Removed</b>					
TN	34.8 kg/yr		76.56 lbs/yr		
TP	9.7 kg/yr		21.34 lbs/yr		
<b>WITH FLOATING AERATORS</b>					
Assume 2.5% credit					
<b>Removal Efficiency</b>					
	TN =		41 %		
	TP =		66 %		
<b>Discharge Load</b>					
TN	56.5 kg/yr		124.3 lbs/yr		
TP	5.15 kg/yr		11.33 lbs/yr		
<b>Load Removed</b>					
TN	37.5 kg/yr		82.5 lbs/yr		
TP	10 kg/yr		22 lbs/yr		
<b>Removal Difference</b>					
TN	2.7 kg/yr		5.94 lbs/yr		
TP	0.3 kg/yr		0.66 lbs/yr		
<b>Total Project w</b>					
			3 Aerators		
TN	8.1 kg/yr		17.82 lbs/yr		
TP	0.9 kg/yr		1.98 lbs/yr		

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**(12) WQ-14: Scarborough Park & Water Tower Pond Expansion**

Location

Project WQ-14 is located on Scarborough Park, a City-owned property on Brunson Blvd., north of Main Street, and on the property to the East of the Cocoa Water Tower, on N Cocoa Blvd. and Peachtree St. The basin areas for the Scarborough Park pond and the Water Tower pond are 3-acres and 7-acres, respectively.

Water from Main Street, 1<sup>st</sup> Street, and Brunson Blvd. is diverted by street flow and pipes into a shallow dry pond in Scarborough Park, motivating its expansion. While localized flooding in the intersection of Peachtree St. and 1<sup>st</sup> St. has called on the expansion and modification of the inlets at the water tower pond.

Proposed Improvements

The proposed projects plan to expand the ponds such that the increased capacity can reduce localized flooding and treat a greater volume of runoff from the 10-acre combined basins.

Benefits

Expansion of the ponds will provide increased flood control capabilities for the basins as well as increased TN and TP removal. The result will be the removal of 58.1 lbs/yr TN and 8.3 lbs/yr TP.

Cost Estimate

Project costs are estimated to be \$160,272.

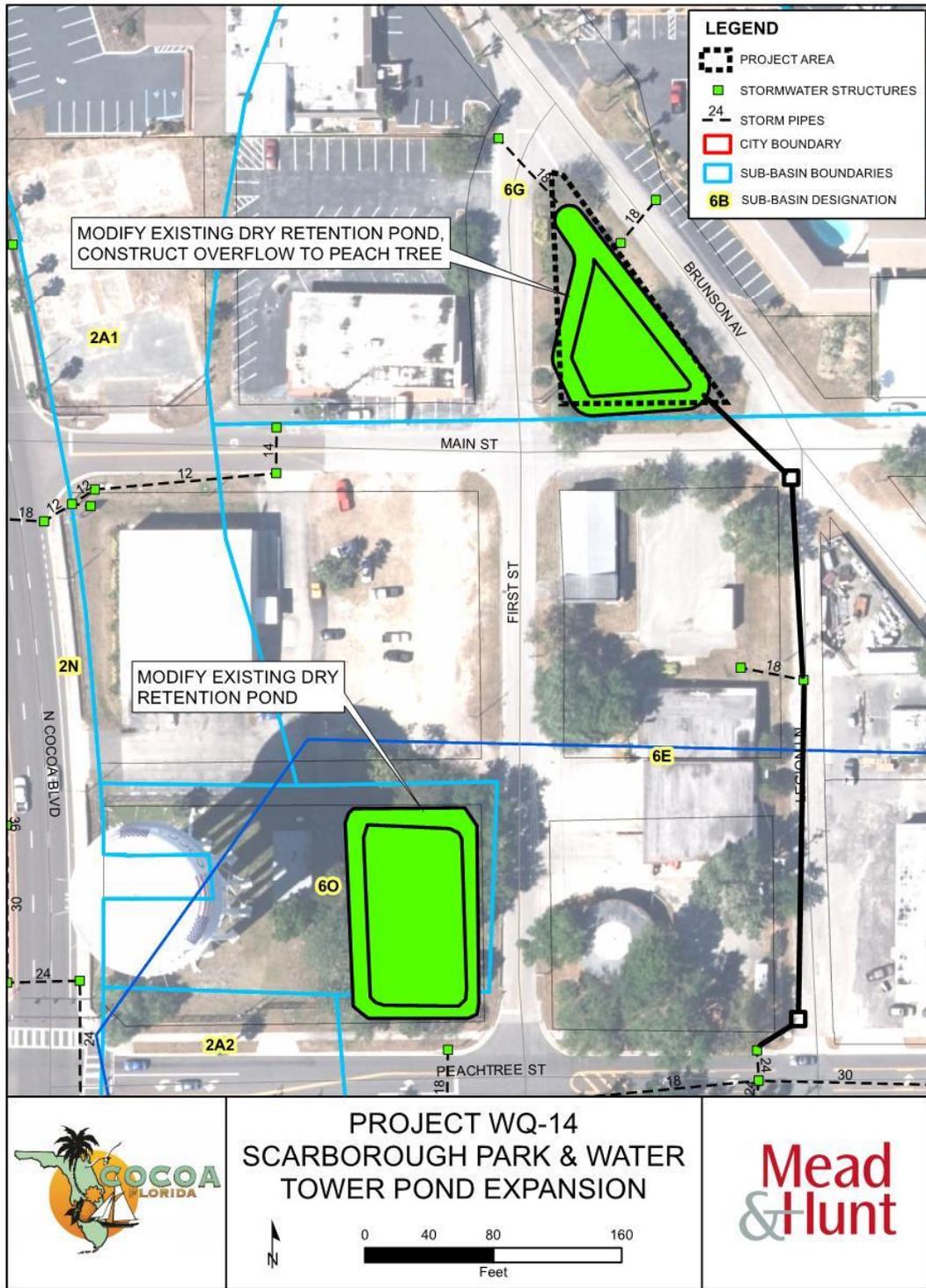


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Table 48: Nutrient Removal Cost/Pound Table – Project WQ-14: Scarborough Park & Water Tower Pond Expansion.

Project WQ-14: Scarborough Park & Water Tower Pond Expansion					
Project #	Improvement	Estimated TN Removal (lbs/year)	Estimated TP Removal (lbs/year)	Cost/TN Pound	Cost/TP Pound
WQ-14	Dry Ponds	58.08	8.338	\$2,759.50	\$19,221.88
<b>Assumptions</b>					
Scarborough Park Basin size = 3 ac					
Water tower (approximate) Basin Size = 7 ac					
City expanded scope to address localized flooding on Peachtree St.					
Drainage area: 10 ac sum of both basins					
Land-use: High-intensity Commercial, TN=2.4 TP=0.345					
Soil type A, Non DCIA CN: 89					
DCIA (%): 85					
Assumes 1/4" of runoff retention					
<b>Loading to Ponds</b>					
TN	94.66 kg/yr		208.252 lbs/yr		
TP	13.18 kg/yr		28.996 lbs/yr		
<b>Removal Efficiency</b>					
		TN =	29 %		
		TP =	29 %		
<b>Discharge Load</b>					
TN	66.26 kg/yr		145.772 lbs/yr		
TP	9.38 kg/yr		20.636 lbs/yr		
<b>Load Removed</b>					
TN	26.4 kg/yr		58.08 lbs/yr		
TP	3.79 kg/yr		8.338 lbs/yr		

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**(13) WQ-15: Add Floating Wetlands to Existing Stormwater Ponds**

Location

Project WQ-15 is located in various locations to be determined around the City of Cocoa on different stormwater ponds. There are several stormwater ponds located throughout the City that provide pollution reduction services thanks to their control structures, attenuation characteristics, and in some cases, innovative technologies. The most notable stormwater facility is the Bracco stormwater treatment ponds.

Proposed Improvements

As an element in LID stormwater nutrient reduction, the installation of an innovative technology known as a floating wetland is proposed. Commercially known as Bee-mats, these floating mats serve as a type of wetland, except the plants are suspended on artificial mats that create a sort of hydroponic environment that may be adapted to the needs of each specific project.

Benefits

The benefits of installing Bee-Mats on various existing stormwater ponds range from the reduction of nutrients from the effluent to the various aesthetic possibilities as a result of the great adaptability of the technology, lending itself to the posting of educational signage.

Nutrient removal calculations were performed by specifying the parameters of an idealized "Standard Pond" with an area of 10-acres and the basin parameters listed in the table below. Implementation of the proposed project will capture approximately 21.78 pounds of nitrogen and 2.42 pounds of phosphorus on an annual basis.

A total nutrient removal estimate could be calculated by extrapolating the estimates obtained using the 10-acre model described, to the total 77-acres of ponds being managed by the City's Stormwater Utility. Implementation of this project throughout the City of Cocoa's stormwater ponds would remove 167.7 lbs/year of nitrogen and 18.64 lbs/year of phosphorous.

It should be noted that nutrient calculations were performed assuming FDEP's 10% nutrient removal credit for 5% coverage reflects the actual nutrient removal capabilities of this technology. Past studies, however, have shown otherwise, with nutrient removal being as high as 40-48% (Lynch et al. 2014).

Cost Estimate

Anticipated cost to install floating wetlands in an idealized 10-acre wet pond in the City of Cocoa would be about \$818,635 over the course of 10 years. This can be broken down into first year installation costs of about \$206,635, followed by yearly maintenance costs of \$68,000.

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Table 49: Cost Estimate Table – Project WQ-15: Add Floating Wetlands to Existing Stormwater Ponds.

Project WQ-15: Add Floating Wetlands to Existing Stormwater Ponds								
Item Number	Location	Proposed Retrofit Improvements						
	Various Ponds	Item Description	Quantity	Unit	Unit Cost	Amount		
1	Bee-Mats							
	- Installation	Floating Wetland Installation	170	EA	\$450.00	\$76,500.00		
	- Annual Maintenance	Harvesting & Replanting	170	LS	\$400.00	\$68,000.00		
<b>Qualifications (if applicable)</b>			<b>SUB-TOTAL</b>				<b>\$144,500.00</b>	
1	Cost of Year 1 =	\$206,635						
	Costs calculated assuming 5% coverage of 10-acres=0.5-acres				- Mobilization @	10%	\$14,450.00	
	0.5-acres=21,780ft <sup>2</sup> and @ 128ft <sup>2</sup> /mat = 170 mats				- Contingencies @	20%	\$28,900.00	
	Cost estimated to \$38/m <sup>2</sup> and each mat or 11.89m <sup>2</sup> /mat				<b>SUB-TOTAL OF CONSTRUCTION COST</b>		<b>\$187,850.00</b>	
	Cost/mat = \$450							
2	Annual Maintenance Costs =	\$68,000			- Eng Design & Permitting @	10%	\$18,785.00	
3	Annual Costs for 10-year period =	\$680,000			- Subconsultants @	0%	\$0.00	
4	Cost of 10-acres for 10-years =	\$818,635			- Constr Admin and Insp @	0%	\$0.00	
					<b>TOTAL PROJECT COST</b>		<b>\$206,635</b>	

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*Table 50: Nutrient Removal Cost/Pound Table – Project WQ-15: Add Floating Wetlands to Existing Stormwater Ponds.*

<b>Project WQ-15: Add Floating Wetlands to Existing Stormwater Ponds</b>					
<b>Project #</b>	<b>Improvement</b>	<b>Estimated TN Removal (lbs/year)</b>	<b>Estimated TP Removal (lbs/year)</b>	<b>Cost/TN Pound</b>	<b>Cost/TP Pound</b>
WQ-15	Floating Wetlands	21.78	2.42	\$9,487.37	\$85,386.36
<b>Assumptions</b>					
<b>BMPTRAINS analysis of "Standard Pond"</b>					
Standard Pond		Basin Area =	65 ac		
		CN =	84		
		DCIA	65 %		
		Pond Area =	10 ac		
		Residence Time =	30 days		
<b>Loading to Ponds</b>					
TN	113.8 kg/yr		250.36 lbs/yr		
TP	18.9 kg/yr		41.58 lbs/yr		
<b>Removal Efficiency</b>					
		TN =	38 %		
		TP =	64 %		
<b>Discharge Load</b>					
TN	56.3 kg/yr		123.86 lbs/yr		
TP	5.4 kg/yr		11.88 lbs/yr		
<b>Load Removed</b>					
TN	34.8 kg/yr		76.56 lbs/yr		
TP	9.7 kg/yr		21.34 lbs/yr		
<b>WITH FLOATING WETLANDS</b>					
Assume 10% credit					
<b>Removal Efficiency</b>					
		TN =	49 %		
		TP =	71 %		
<b>Discharge Load</b>					
TN	46.4 kg/yr		102.08 lbs/yr		
TP	4.4 kg/yr		9.68 lbs/yr		
<b>Load Removed</b>					
TN	44.7 kg/yr		98.34 lbs/yr		
TP	10.8 kg/yr		23.76 lbs/yr		
<b>Removal Difference</b>					
TN	9.9 kg/yr		21.78 lbs/yr		
TP	1.1 kg/yr		2.42 lbs/yr		
<b>Total Project w</b>					
		7.7 X 10acres = 77 Acres			
TN	76.23 kg/yr		167.706 lbs/yr		
TP	8.47 kg/yr		18.634 lbs/yr		

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**(14) WQ-16: Riverfront Park In-Lagoon Nutrient Removal**

Location

Project WQ-16 focuses on the eastern boundary of Riverfront Park. Located in the historic Cocoa Village area, between Harrison St. and Church St., Riverfront Park is part of a 5-acre recreational area which includes the Civic Center and Taylor Park. This multi-use park is a hub for many of the stormwater treatment projects involving the commercial downtown district of Cocoa, and as such is an ideal location for innovative treatment solutions.

Proposed Improvements

This project aims to improve the treatment of stormwater runoff that flows through the Riverfront Park area. Installation of an in-lagoon nutrient removal system at the site will increase the ability to retain and treat stormwater runoff before it is ultimately discharged to the IRL. The project design has been provided by ISS and is pictured below.

In the event that this project cannot be executed, implementation of projects WQ-17 and WQ-18 would serve as a replacement.

Benefits

An in-lagoon nutrient removal system at this site would have a direct effect on the water quality immediately adjacent to Riverfront Park. This innovative project would showcase and educate the public on the City's initiative to provide effective water treatment technologies in its bid to improve water quality in the IRL. Nutrient load reductions, assuming a total basin of 109.9-acres, are 735.8 lbs/yr TN removal and 188.6 lbs/yr TP removal.

Cost Estimate

Cost calculations were carried out by ISS and estimated that the total cost of the project would be around \$1,500,000.

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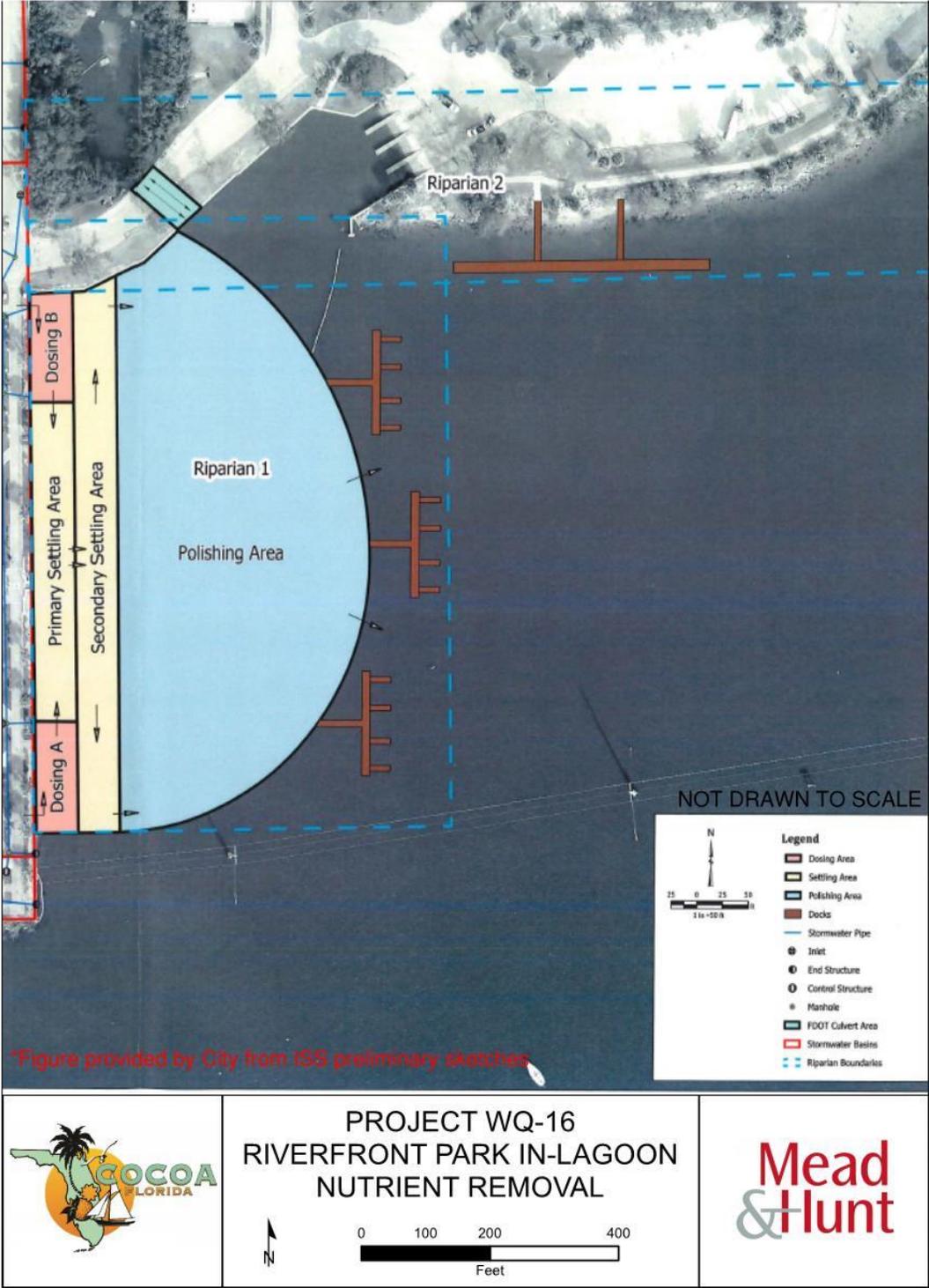
Table 51: Cost Estimate Table – Project WQ-16: Riverfront Park In-Lagoon Nutrient Removal.

Project WQ-16: Riverfront Park In-Lagoon Nutrient Removal						
Item Number	Location	Proposed Retrofit Improvements				
		Item Description	Quantity	Unit	Unit Cost	Amount
1	Riverfront Park	In-Lagoon Treatment System	1	LS	\$1,500,000.00	\$1,500,000.00
<b>Qualifications (if applicable)</b>			<b>SUB-TOTAL</b>			\$1,500,000.00
1	Estimate provided by ISS					
					- Mobilization @	0% \$0.00
					- Contingencies @	0% \$0.00
					<b>SUB-TOTAL OF CONSTRUCTION COST</b>	\$1,500,000.00
					- Eng Design & Permitting @	0% \$0.00
					- Subconsultants @	0% \$0.00
					- Constr Admin and Insp @	0% \$0.00
					<b>TOTAL PROJECT COST</b>	<b>\$1,500,000</b>

Table 52: Nutrient Removal Cost/Pound Table – Project WQ-16: Riverfront Park In-Lagoon Nutrient Removal.

Project WQ-16: Riverfront Park In-Lagoon Nutrient Removal					
Project #	Improvement	Estimated TN Removal (lbs/year)	Estimated TP Removal (lbs/year)	Cost/TN Pound	Cost/TP Pound
WQ-16	In-Lagoon Treatment	735.8	188.6	\$ 2,039	\$ 7,955
<b>Assumptions</b>					
Church St Basin =		63.9 ac			
SR 520 Basin =		38 ac			
Riverfront Park =		8 ac			
		109.9			
<b>Loading to Lagoon</b>					
TN	668.87 kg/yr		1471.514 lbs/yr		
TP	95.23 kg/yr		209.506 lbs/yr		
<b>Removal Efficiency</b>					
		TN =	50%		
		TP =	90%		
<b>Load Removed</b>					
TN	334.435 kg/yr		735.757 lbs/yr		
TP	85.707 kg/yr		188.5554 lbs/yr		

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**(15) WQ-17: Riverfront Park Stormwater Capture Modifications**

Location

Project WQ-17 focuses on another aspect of Riverfront Park's ability to capture stormwater. Located in the historic Cocoa Village area, between Harrison St. and Church St., Riverfront Park is part of a 5-acre recreational area which includes the Civic Center and Taylor Park. Stormwater captured at the Riverfront site is generally discharged to the IRL after some minor treatment in first-generation Baffle Boxes or stored in an underground pipe gallery that spans the center of the park.

Southwest of Riverfront Park, in the intersection of Factory St. and Florida Ave. there is a recently expanded dry retention pond, the AT&T dry pond. The dry pond was expanded and modeled using its 12.7-acre drainage basin.

Proposed Improvements

In order to reduce the amount of effluent discharging from Riverfront Park, this project proposes the rerouting of some of that captured stormwater during low flow events to the recently expanded AT&T pond. To achieve this, water will have to be pumped approximately 1,550 feet from the park back to the pond.

This project, along with WQ-18 could serve as a replacement for WQ-16 in the event that WQ-16 cannot be implemented.

Benefits

Redirecting the outflow to the dry retention pond will have benefits including the reduction of flow volumes from the Riverfront Park area, as well as pollutant loading reductions. It is anticipated that the additional elevation of this pond will allow for more and quicker percolation into the ground which will reduce the nutrient loading into the IRL. Nutrient load reductions were calculated by assuming that flow from storms with less than 1" of rain would be rerouted to the AT&T pond, whereas anything larger would bypass this system and be discharged. This would mean that at maximum capacity, 119.7 lbs/yr TN and 17.2 lbs/yr TP would be treated.

Cost Estimate

To avoid undue impacts to this commercial area, it is anticipated that horizontal directional drilling methods will be employed for the construction of the stormwater force main. It is estimated that this project would cost about \$369,369.

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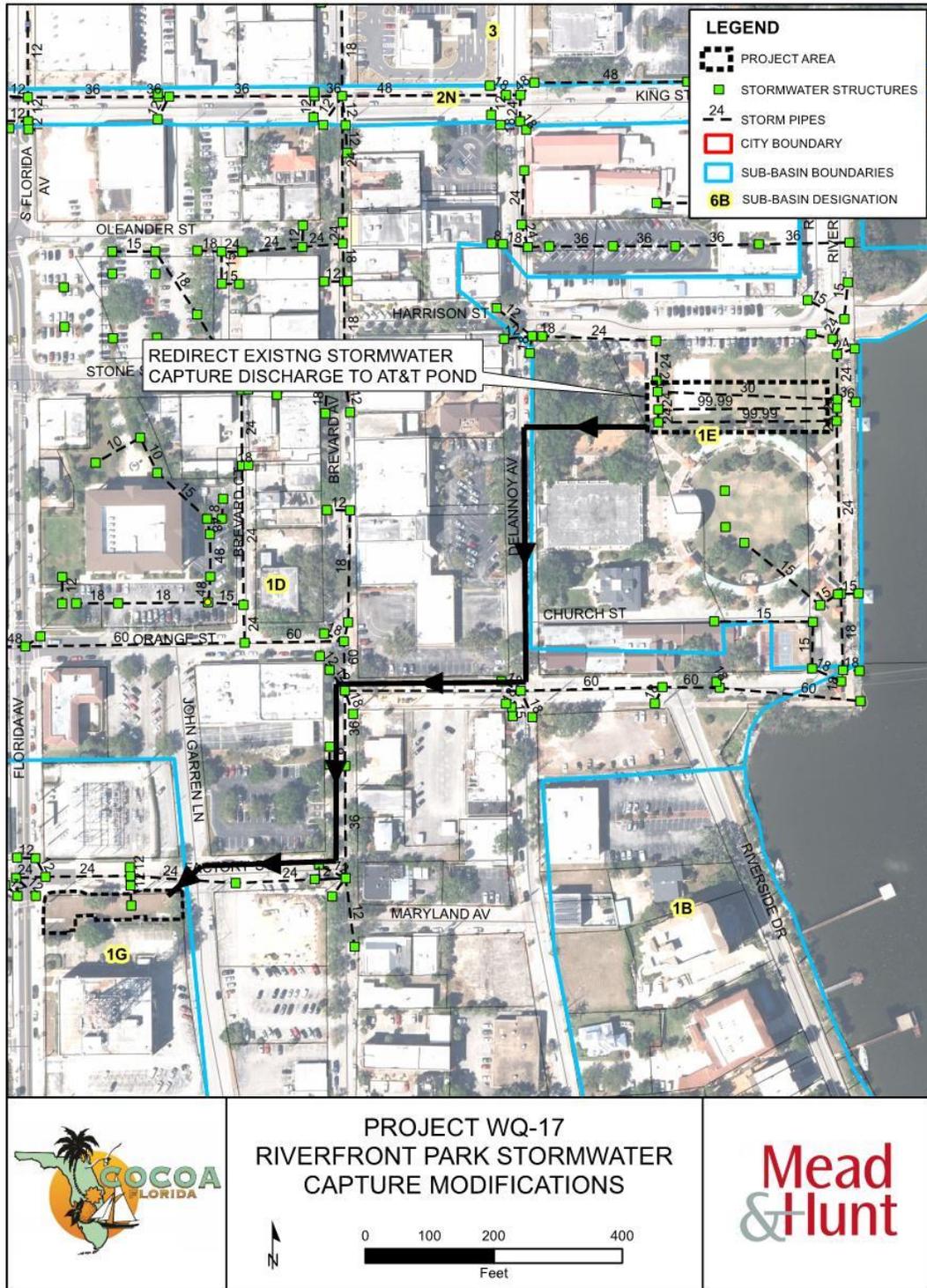
Table 53: Cost Estimate Table – Project WQ-17: Riverfront Park Stormwater Capture Modifications.

Project WQ-17: Riverfront Park Stormwater Capture Modifications							
Item Number	Location	Proposed Retrofit Improvements					
		Item Description	Quantity	Unit	Unit Cost	Amount	
1	Riverfront Park	Construction activities					
		- Site preparation	Clearing and grubbing	1	LS	\$10,000.00	\$10,000.00
		- Construction management	Maintenance of traffic, signage	1	LS	\$15,000.00	\$15,000.00
		- Pump Modifications	Pump Modifications	1	LS	\$20,000.00	\$20,000.00
		- Storm Pipe	6" HDPE installed by HDD	1,550	LF	\$90.00	\$139,500.00
		- Roadway open cut and restoration	Asphalt, base and subgrade	200	SY	\$105.00	\$21,000.00
		- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	\$20,000.00	\$20,000.00
<b>Qualifications (if applicable)</b>							
1							
<b>SUB-TOTAL</b>							\$225,500.00
- Mobilization @						10%	\$22,550.00
- Contingencies @						20%	\$45,100.00
<b>SUB-TOTAL OF CONSTRUCTION COST</b>							\$293,150.00
- Eng Design & Permitting @						15%	\$43,972.50
- Subconsultants @						5%	\$14,657.50
- Constr Admin and Insp @						6%	\$17,589.00
<b>TOTAL PROJECT COST</b>							<b>\$369,369</b>

Table 54: Nutrient Removal Cost/Pound Table – Project WQ-17: Riverfront Park Stormwater Capture Modifications.

Project WQ-17: Riverfront Park Stormwater Capture Modifications					
Project #	Improvement	Estimated TN Removal (lbs/year)	Estimated TP Removal (lbs/year)	Cost/TN Pound	Cost/TP Pound
WQ-17	Flow Diversion	119.658	17.204	\$ 2,450	\$ 17,040
<b>Assumptions</b>					
Assumes storms larger than 1" bypass and discharge to Lagoon.					
<b>Loading to Lagoon</b>					
TN		101.74 kg/yr		223.828 lbs/yr	
TP		14.63 kg/yr		32.186 lbs/yr	
<b>Removal Efficiency</b>		TN =		53 %	
		TP =		53 %	
<b>Discharge Load</b>					
TN		47.35 kg/yr		104.17 lbs/yr	
TP		6.81 kg/yr		14.982 lbs/yr	
<b>Load Removed</b>					
TN		54.39 kg/yr		119.658 lbs/yr	
TP		7.82 kg/yr		17.204 lbs/yr	
4,606,034	gallons per year				

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**(16) WQ-18: SR 520 Runoff Treatment to Downtown**

Location

Project WQ-18 is to be located somewhere along King St. in downtown Cocoa. There is a 48" outfall located between Brevard Ave. and Delannoy Ave. directly adjacent to the 9.3-acre drainage basin that is between King St. and Willard St. This basin along with the basin that makes up the two roadways (SR-520), have several inlet structures that generally discharge untreated runoff to the relief channel located to the east. The overall basin that drains towards the King St. location described above is approximately 37.8 acres according to an Oct. 2008 feasibility study.

The Florida Department of Transportation (FDOT) is planning on making improvements to SR 520 in this vicinity and the City is in discussions regarding coordination with this project.

Proposed Improvements

This project proposes the installation of a baffle box somewhere along this corridor where there is an existing 48" outfall. Incorporating filter media into the baffle box will boost the overall nutrient removal rates. Pollutant removal efficiencies for baffle boxes with filter media are currently estimated at 45% and 58% for total nitrogen and total phosphorus removal, respectively.

This project, along with WQ-17 could serve as a replacement for WQ-16 in the event that WQ-16 cannot be implemented.

Benefits

Installing baffle boxes has proven effectiveness in removing sediment and suspended solids from stormwater runoff. This simple but effective structure is ideal solutions to retrofitting the stormwater systems immediately adjacent to the IRL. Implementation of the proposed project will capture approximately 338 lbs/yr of nitrogen and 48.6 lbs/yr pounds of phosphorus on an annual basis.

Cost Estimate

It is anticipated that the costs associated with the construction and installation of a baffle box in this location is approximately \$611,270.

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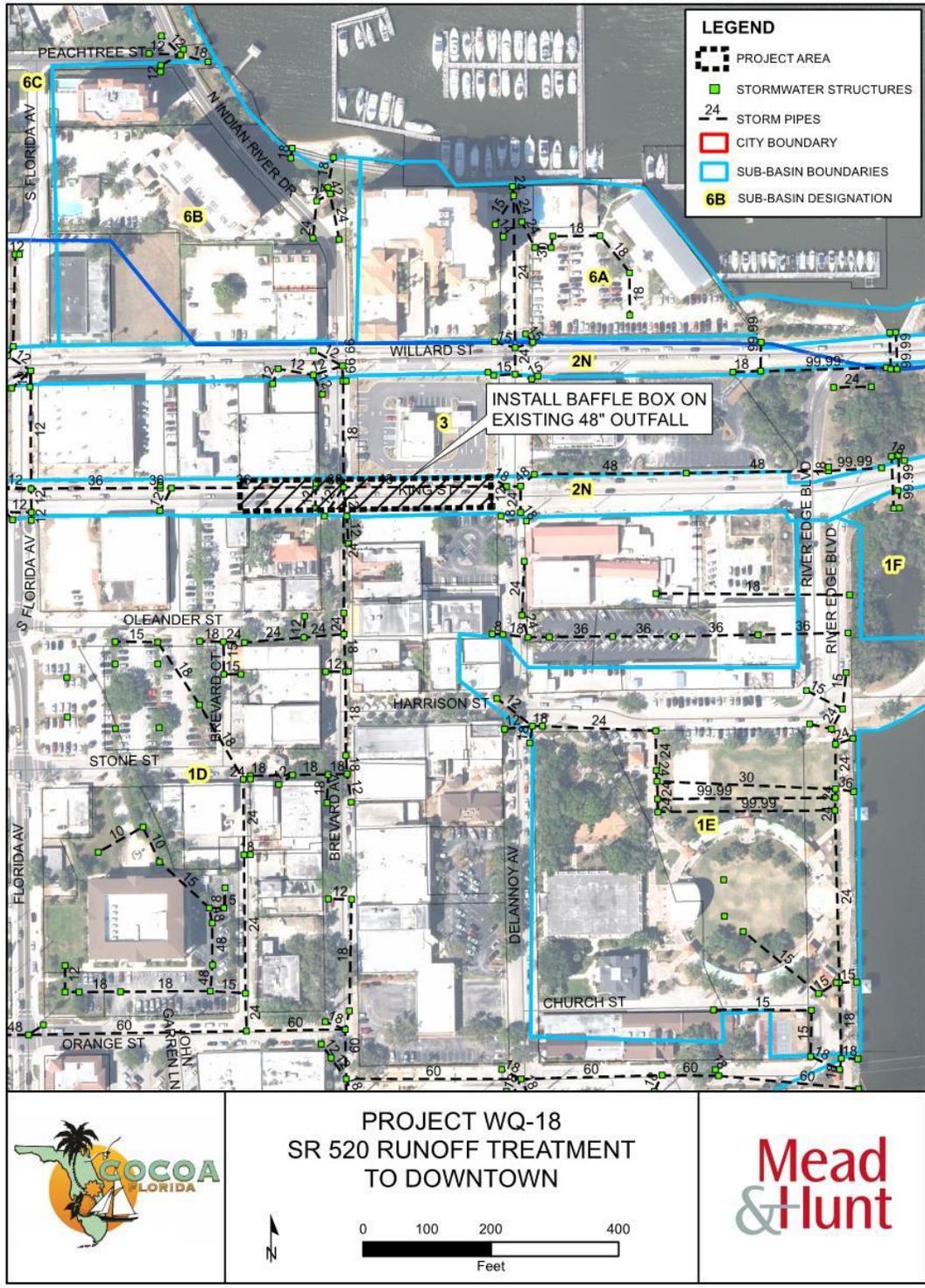
Table 55: Cost Estimate Table – Project WQ-18: SR 520 Runoff Treatment to Downtown.

Project WQ-18: SR 520 Runoff Treatment to Downtown							
Item Number	Location	Proposed Retrofit Improvements					
		Item Description	Quantity	Unit	Unit Cost	Amount	
1	Riverfront Park	Construction activities					
		- Site preparation	Clearing and grubbing	1	LS	\$20,000.00	\$20,000.00
		- Site preparation	Dewatering and flow diversion	1	LS	\$30,000.00	\$30,000.00
		- Construction management	Maintenance of traffic, signage	1	LS	\$45,000.00	\$45,000.00
		- Pollutant Removal Structure	Baffle Box with Filter Media for 48"	1	LS	\$250,000.00	\$250,000.00
		- Storm Pipe	48" RCP	20	LF	\$185.00	\$3,700.00
		- Roadway open cut and restoration	Asphalt, base and subgrade	100	SY	\$105.00	\$10,500.00
		- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	\$20,000.00	\$20,000.00
<b>Qualifications (if applicable)</b>				<b>SUB-TOTAL</b>			\$379,200.00
1							
						- Mobilization @ 10%	\$37,920.00
						- Contingencies @ 20%	\$75,840.00
				<b>SUB-TOTAL OF CONSTRUCTION COST</b>			\$492,960.00
						- Eng Design & Permitting @ 15%	\$73,944.00
						- Subconsultants @ 3%	\$14,788.80
						- Constr Admin and Insp @ 6%	\$29,577.60
				<b>TOTAL PROJECT COST</b>			<b>\$611,270</b>

Table 56: Nutrient Removal Cost/Pound Table – Project WQ-18: SR 520 Runoff Treatment to Downtown.

Project WQ-18: SR 520 Runoff Treatment to Downtown					
Project #	Improvement	Estimated TN Removal (lbs/year)	Estimated TP Removal (lbs/year)	Cost/TN Pound	Cost/TP Pound
WQ-18	Baffle Box	337.97	48.58	\$1,809	\$12,583
<b>Assumptions:</b>					
Drainage area: 38 ac from Oct. 2018 feasibility study					
Land-use: High-intensity Commercial, TN=2.4 TP=0.345					
Soil type A, Non DCIA CN: 89					
DCIA (%): 85					
Pre-improvement load: TN=751.73 lb/yr, TP=108.07 lb/yr					
Assumes 45% TNTP removal using B&G ECT3 media					

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**(17) WQ-19: Install BAM Treatment for AT&T Dry Retention Pond**

Location

Project WQ-19 focuses on the recently expanded dry retention pond at the intersection of Factory St. and Florida Ave., the AT&T dry pond. The dry pond was expanded and modeled to accommodate runoff from its 12.8-acre drainage basin.

Proposed Improvements

This project proposes to improve the pollutant reduction ability of the dry retention pond. By installing BAM filtration media on the bottom of the retention pond, as well as an underdrain system, nutrient removal and filtration of solids will be improved.

Benefits

BAM filter media may be put in place to improve the removal of nutrients from runoff as well as further improving the physical filtration of solids. The media used on the filters can be made from recycled materials and is effective in capturing TN, TP, solids, and metals from water. No removal credits can be assigned to this project as all credits possible are already applied to this dry retention pond. As a result, this project was not included in the ranking exercise.

Cost Estimate

It is estimated that costs associated with further excavation of the pond and installation of the BAM Line Filtration System total \$168,714.

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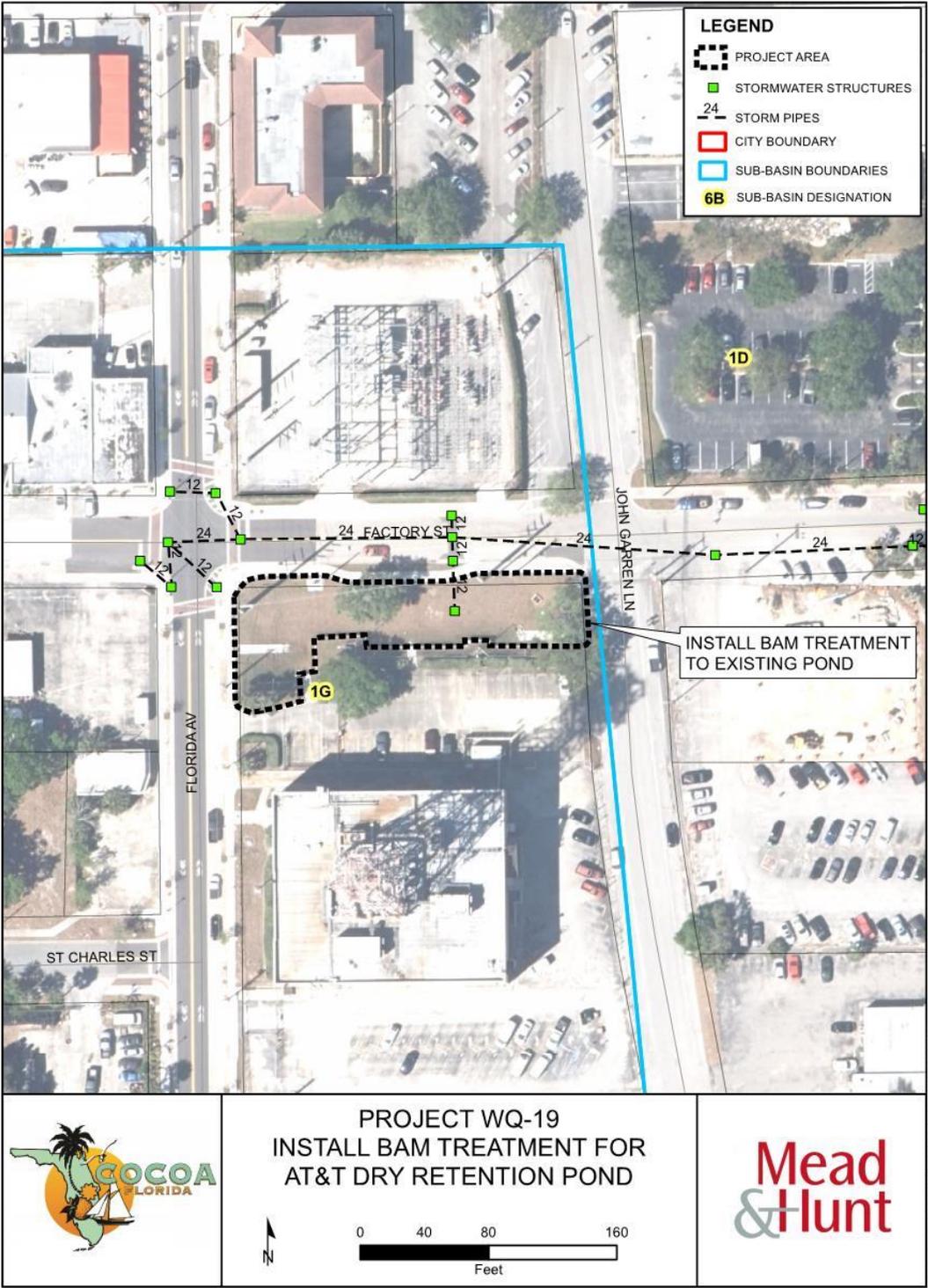
Table 57: Cost Estimate Table – Project WQ-19: Install BAM Treatment for AT&T Dry Retention Pond.

Project WQ-19: Install BAM Treatment for AT&T Dry Retention Pond							
Item Number	Location	Proposed Retrofit Improvements					
		Item Description	Quantity	Unit	Unit Cost	Amount	
1	Downtown	Construction Activities					
		- Site preparation	Clearing and grubbing	1	LS	\$15,000.00	\$15,000.00
		- Site preparation	Pond Excavation	1	LS	\$15,000.00	\$15,000.00
		- Pollutant Removal	BAM Liner Filtration System	315	SY	\$200.00	\$63,000.00
		- Landscaping	Sodding, plants and trees	1	LS	\$10,000.00	\$10,000.00
<b>Qualifications (if applicable)</b>				<b>SUB-TOTAL</b>			\$103,000.00
1		- Project without BAM Filtration System = \$75,000					
						- Mobilization @ 10%	\$10,300.00
						- Contingencies @ 20%	\$20,600.00
						<b>SUB-TOTAL OF CONSTRUCTION COST</b>	\$133,900.00
						- Eng Design & Permitting @ 15%	\$20,085.00
						- Subconsultants @ 5%	\$6,695.00
						- Constr Admin and Insp @ 6%	\$8,034.00
						<b>TOTAL PROJECT COST</b>	<b>\$168,714</b>

Table 58: Nutrient Removal Cost/Pound Table – Project WQ-19: Install BAM Treatment for AT&T Dry Retention Pond.

Project WQ-19: Install BAM Treatment for AT&T Dry Retention Pond					
Project #	Improvement	Estimated TN Removal (lbs/year)	Estimated TP Removal (lbs/year)	Cost/TN Pound	Cost/TP Pound
WQ-19	BAM Treatment				
<b>Assumptions</b>					
Project treats water from the 12.8 acre basin in which it resides					
BAM media underlying a dry pond to be constructed at the AT&T property.					
BAM Layer 1 ft thick					
Pond Size = 8500 sf 944 SY					
BAM Layer 8500 cf 315 CY					
Assume treatment of the first 2" of runoff					
<b>FDEP does not provide credits for improvements to a retention pond</b>					

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**(18) WQ-20: De-Muck/Dredge SR520 Relief Channel**

Location

Project WQ-20 focuses on the relief channel found along SR-520, in the area adjacent to Lee Werner Park. This channel receives some of the stormwater runoff from several drainage basins, including the well-traveled SR-520. Over time, the channel has accumulated muck in the fine-grained sediments and organic material settled at the bottom.

Proposed Improvements

It is proposed that the relief channel be dredged and de-mucked in order to remove accumulated muck in the fine-grained sediments and organic material that has settled at the bottom.

Benefits

Nutrient rich sediments and clay accumulate over time as a result of heavy nutrient loading from the surrounding basin which inevitably contributes to the uncontrolled growth of vegetation, including algae. The process of dredging/de-mucking a basin is an effective way to restore a water body's ability to treat surface water runoff. FDEP awards credits to dredging projects like this one on a case-by-case basis depending on the nutrient flux of muck.

Restoring this channel will also provide additional benefits related to flood mitigation as it is expected that this project will help alleviate flooding around the Cocoa Village area.

Cost Estimate

It is anticipated that the costs associated with the de-mucking and disposal of the dredged material is approximately \$282,900.

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Table 59: Cost Estimate Table – Project WQ-20: De-Muck/Dredge SR520 Relief Channel.

Project WQ-20: De-muck/Dredge SR520 Relief Channel						
Item Number	Location	Proposed Retrofit Improvements				
		Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction Activities					
	- Site preparation	Clearing and grubbing	1	LS	\$15,000.00	\$15,000.00
	- Flow Diversion	Sheetpile Wall Construction	2	EA	\$33,500.00	\$67,000.00
	- Construction	Muck Removal	2,000	CY	\$54.00	\$108,000.00
	- Restoration	Site Cleanup & Restoration	1	LS	\$15,000.00	\$15,000.00
<b>Qualifications (if applicable)</b>			<b>SUB-TOTAL</b>			\$205,000.00
1						
					10%	\$20,500.00
					10%	\$20,500.00
			<b>SUB-TOTAL OF CONSTRUCTION COST</b>			\$246,000.00
					7%	\$17,220.00
					3%	\$7,380.00
					5%	\$12,300.00
			<b>TOTAL PROJECT COST</b>			<b>\$282,900</b>

Table 60: Nutrient Removal Cost/Pound Table – Project WQ-20: De-Muck/Dredge SR520 Relief Channel.

Project WQ-20: De-muck/Dredge SR520 Relief Channel					
Project #	Improvement	Estimated TN Removal (lbs/year)	Estimated TP Removal (lbs/year)	Cost/TN Pound	Cost/TP Pound
WQ-20	Dredging				
<b>Assumptions:</b>					
Data lacking to assign credit according to FDEP					

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**(19) WQ-21: Downtown Area Treatment System - Urban Planters, LID Improvements**

Location

Project WQ-21 is based on a City-wide effort to implement Low Impact Development (LID) improvements throughout the City. Multiple locations around the area of downtown Cocoa will be selected for the installation of urban planters and bio-swales. (See figure below). Urban planters can be modified to fit almost any physical setting.

Proposed Improvements

This project proposes the installation of various combinations of urban planters, and bio-swales in order to provide an innovative way of treating stormwater as part of a treatment train approach. Because these LID improvements are able to accept runoff from most type of impervious surfaces, potential areas for installation include residential yards, parking lots, and under roof spouts. In order to reduce construction costs, these projects can be incorporated into street beautification projects in association with other public works projects.

Benefits

Urban planters and bio-swales are an excellent example of LID and Green Infrastructure projects. Depending on the type of planter being installed, it is possible to cleanse stormwater runoff and reduce runoff volumes if infiltration to surrounding soils is possible. Urban planters have storage capabilities, meaning that runoff is attenuated, and sediments and other solids in runoff can settle out. The Center for Watershed Protection estimated the event mean concentration phosphorus removal rate to be 25% to 50% and nitrogen removal 40% to 60% (CWP 2008).

Assuming 1-acre basins surrounding 500ft lengths of a “standard block”, 6 urban planters would be able to reduce 1.11 lbs/yr TN and 0.16 lbs/yr TP loading. This number, of course, varies greatly depending on the type of urban planter and system being installed.

Cost Estimate

It is anticipated that the costs associated with the construction and installation of a 500-foot long block with the above described elements is approximately \$145,080. Various elements may be incorporated as budget and design aesthetics dictate.

Recommended Water Quality Projects

Table 61: Cost Estimate Table – Project WQ-21: Downtown Area Treatment System - Urban Planters, LID Improvements.

Project WQ-21: Downtown Area Treatment System - Urban Planters, LID Improvements								
Item Number	Location		Proposed Retrofit Improvements					
	Downtown		Item Description	Quantity	Unit	Unit Cost	Amount	
1	Construction Activities							
		- Site preparation	Demolition	1	LS	\$30,000.00	\$30,000.00	
		- Construction management	Maintenance of traffic, signage	1	LS	\$15,000.00	\$15,000.00	
		- Furnish & Install	Urban Planter	6	EA	\$7,500.00	\$45,000.00	
<b>Qualifications (if applicable)</b>				<b>SUB-TOTAL</b>				
1		- Prices listed are for a 500 foot long block.					\$90,000.00	
						- Mobilization @ 10%	\$9,000.00	
						- Contingencies @ 20%	\$18,000.00	
				<b>SUB-TOTAL OF CONSTRUCTION COST</b>				
				- Eng Design & Permitting @ 15%				\$17,550.00
				- Subconsultants @ 3%				\$3,510.00
				- Constr Admin and Insp @ 6%				\$7,020.00
				<b>TOTAL PROJECT COST</b>				<b>\$145,080</b>

Table 62: Nutrient Removal Cost/Pound Table – Project WQ-21: Downtown Area Treatment System - Urban Planters, LID Improvements.

Project WQ-21: Downtown Area Treatment System - Urban Planters, LID Improvements					
Project #	Improvement	Estimated TN Removal (lbs/year)	Estimated TP Removal (lbs/year)	Cost/TN Pound	Cost/TP Pound
WQ-21	Urban Planters	1.11	0.16	\$ 130,702.70	\$ 906,750.00
<b>Assumptions:</b>					
There is a specific drainage area associated with a certain size of planter.					
Assuming 1 ac basins					
Over the 10 year period, plan on retrofitting 5 blocks.					



**(20) WQ-22: Reduce Impervious Area (PaveDrain, Reduce roadway) near IRL**

Location

Project WQ-22 is based on a City-wide effort to create Low Impact Development (LID) improvements. Multiple locations around the area of downtown Cocoa will be selected (See figure below). This project aims to put emphasis on identifying large roadways that may be reduced and areas where LID technologies such as PaveDrain may be used to increase the impervious area of downtown Cocoa.

Proposed Improvements

In order to reduce the impervious area of a highly developed commercial area such as downtown Cocoa, innovative technologies such as PaveDrain must be implemented. PaveDrain, also known as Permeable Articulating Concrete Block, has proven capabilities in improving the infiltration capabilities of an area as well as helping to reduce the impact of first flush pollutants from affecting groundwater or runoff to nearby water bodies. It is a highly adaptable example of LID. To improve the quantity of storage that this system can provide, other products like R-Tank can be added underneath.

Benefits

Porous pavement is primarily used with the purpose of reducing the volume of stormwater runoff, however, secondary functions include flow attenuation and nutrient reduction. The Center for Watershed Protection estimates the total amount of phosphorus removed for level 1 and 2 designs at 59 to 81 percent, and nitrogen removal at 59 to 81 percent. Runoff reduction was estimated at 45 to 75 percent (CWP&CSN 2008). It is estimated that these improvements would reduce nutrient loading by 9.45 lbs/yr TN and 1.36 lbs/yr TP, assuming a corridor of 500 SY of pervious pavers are installed.

Cost Estimate

It is anticipated that the costs associated with the construction and installation of a 500-foot long block with the above described elements is approximately \$209,469.

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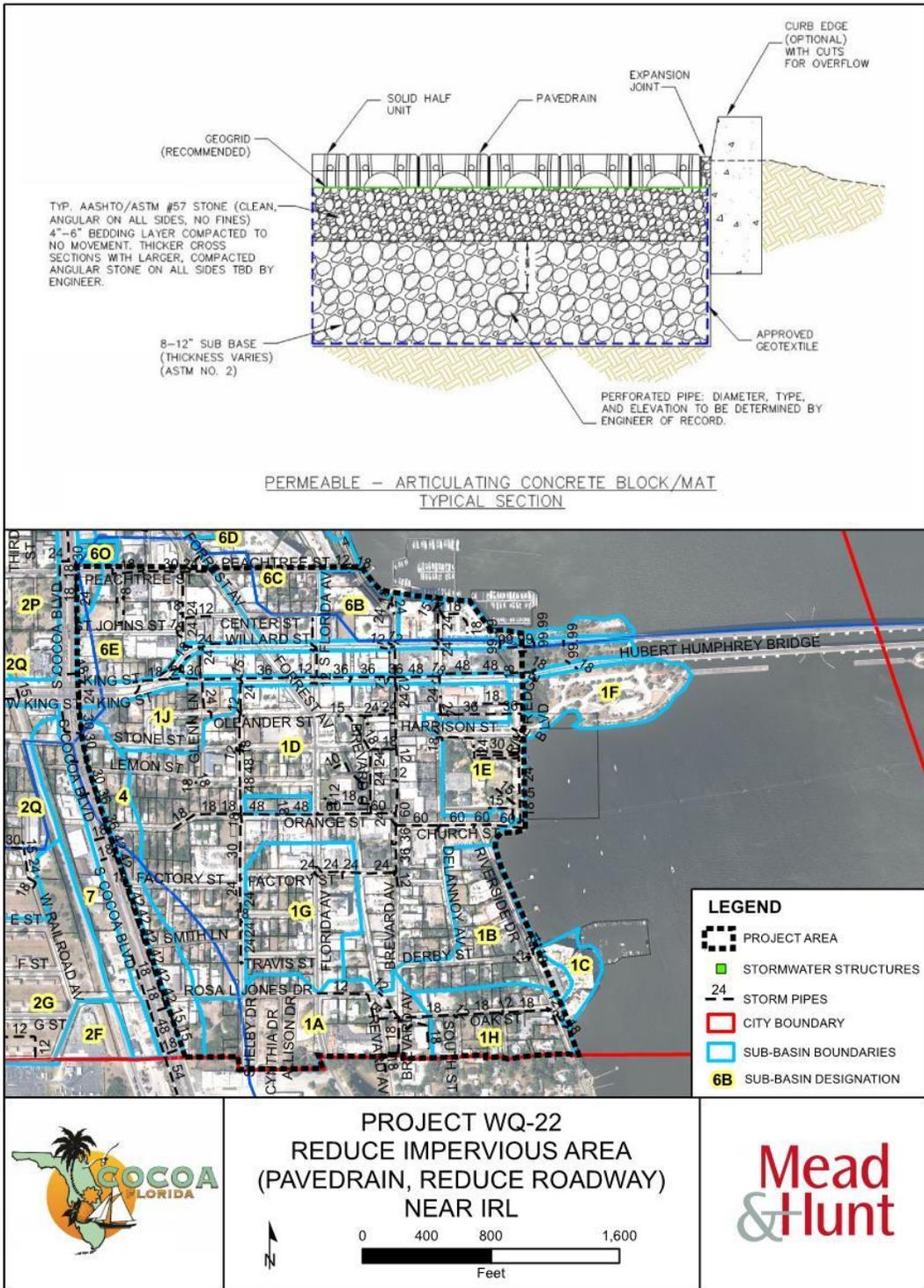
Table 63: Cost Estimate Table – Project WQ-22: Reduce Impervious Area (PaveDrain, Reduce roadway) near IRL.

Project WQ-22: Reduce Impervious Area (PaveDrain, Reduce Roadway) Near IRL						
Item Number	Location	Proposed Retrofit Improvements				
		Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction Activities					
	- Site preparation	Demolition	1	LS	\$30,000.00	\$30,000.00
	- Construction management	Maintenance of traffic, signage	1	LS	\$15,000.00	\$15,000.00
	- Furnish & Install	Pervious Pavers w Adtl Storage	500	SY	\$150.00	\$75,000.00
	- Furnish & Install	Concrete Curb	550	LF	\$20.00	\$11,000.00
<b>Qualifications (if applicable)</b>			<b>SUB-TOTAL</b>			\$131,000.00
1	- Prices listed are for a 500 foot long block.					
	- Pervious Pavers planned for Parking Spaces					
				- Mobilization @	10%	\$13,100.00
				- Contingencies @	20%	\$26,200.00
				<b>SUB-TOTAL OF CONSTRUCTION COST</b>		\$170,300.00
				- Eng Design & Permitting @	12%	\$20,436.00
				- Subconsultants @	5%	\$8,515.00
				- Constr Admin and Insp @	6%	\$10,218.00
				<b>TOTAL PROJECT COST</b>		<b>\$209,469</b>

Table 64: Nutrient Removal Cost/Pound Table – Project WQ-22: Reduce Impervious Area (PaveDrain, Reduce roadway) near IRL.

Project WQ-22: Reduce Impervious Area (PaveDrain, Reduce Roadway) Near IRL					
Project #	Improvement	Estimated TN Removal (lbs/year)	Estimated TP Removal (lbs/year)	Cost/TN Pound	Cost/TP Pound
WQ-22	Pervious Pavement	9.45	1.36	\$ 22,166.03	\$ 154,021.32
<b>Assumptions:</b>					
	Permeable Pavers Thickness (in)	5.5 in	5% porosity		
	Pvmnt SubBase Thickness (in)	6 in	25% porosity		
	#57 rock	12 in	21% porosity		
	BOLD & GOLD Layer	6 in	9% porosity		
Drainage area: 1 ac, avg basin size for 1 500ft block					
Land-use: High-intensity Commercial, TN=2.4 TP=0.345					
Soil type A, Non DCIA CN: 89					
DCIA (%): 85					
Pre-improvement load: TN=20.22 lb/yr, TP=2.91 lb/yr					

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**(21) WQ-23: Inspection & Repair Program for HOA-Owned Treatment Ponds**

Location

Project WQ-23 focuses on multiple treatment ponds in the City that are owned and managed by Homeowners Associations (HOAs).

Proposed Improvements

The aim of this project is to establish a program for inspecting and repairing treatment ponds owned and operated by HOAs to ensure the efficiency and utility of these. It is anticipated that a member of the City's Stormwater Utility staff would be engaged and trained in the various aspects of water quality treatment, stormwater treatment design and maintenance, along with monitoring erosion and sediment control measures. There would also be equipment and software such as sampling equipment, camera, handheld GPS unit, and laptop utilized to perform these functions and log data into the City's database.

Benefits

Most importantly, this ensures that treatment ponds and their respective structures remain in good working order, even when they are not under the jurisdiction of the City. This ensures the integrity of the overall stormwater management system of the City.

Cost Estimate

It is not anticipated that this work would require a new full-time position but would be a collateral duty which, when taken into consideration with the Stormwater Utilities other functions, could very well require the acquisition and training of a new full-time employee. For the purpose of this evaluation a Utility Field Inspector position with a starting salary of \$15.26 per hour, or \$31,780 per year is utilized. Considering customary municipal benefits of approximately 50% of base salary, that provides an annual cost to the utility of \$44,492 per year.

Additional equipment and training that would reasonably be expected to enable personnel to function in this role would likely have an initial investment of \$13,000 for a total of approximately \$57,492 for the first year. This initial investment would be followed by a recurring investment of \$44,492 for the recurring 10 years.

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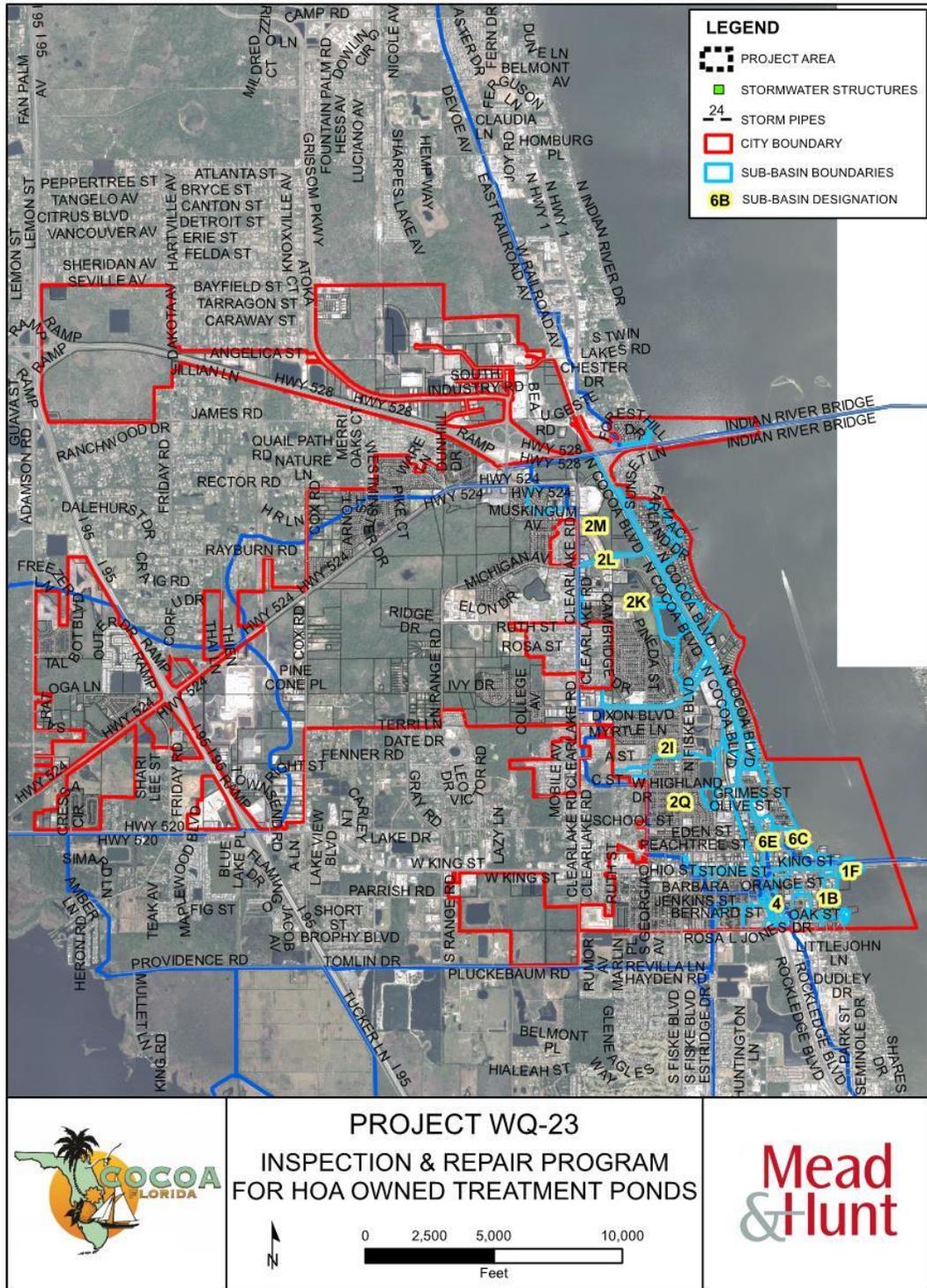
Table 65: Cost Estimate Table – Project WQ-23: Inspection & Repair Program for HOA-Owned Treatment Ponds.

Project WQ-23: Inspection Program for HOA-Owned Treatment Ponds						
Item Number	Location	Proposed Retrofit Improvements				
	City-Wide	Item Description	Quantity	Unit	Unit Cost	Amount
1	Personnel Costs	Salary + Benefits	1	EA	\$44,492.00	\$44,492.00
2	Equipment Costs					
	- Documentation	GPS Data Collector	1	LS	\$5,000.00	\$5,000.00
	- Computer	Laptop	1	LS	\$3,000.00	\$3,000.00
	- Equipment	Sampling & Measuring	1	LS	\$2,500.00	\$2,500.00
	- Training	Courses & Seminars	1	LS	\$2,500.00	\$2,500.00
<b>Qualifications (if applicable)</b>						
1 Total Program Cost after 10 Years = \$457,920						
<b>SUB-TOTAL</b>						<b>\$57,492.00</b>
- Mobilization @					0%	\$0.00
- Contingencies @					0%	\$0.00
<b>SUB-TOTAL OF CONSTRUCTION COST</b>						<b>\$57,492.00</b>
- Eng Design & Permitting @					0%	\$0.00
- Subconsultants @					0%	\$0.00
- Constr Admin and Insp @					0%	\$0.00
<b>TOTAL PROJECT COST</b>						<b>\$57,492</b>

Table 66: Nutrient Removal Cost/Pound Table – Project WQ-23: Inspection & Repair Program for HOA-Owned Treatment Ponds.

Project WQ-23: Inspection Program for HOA-Owned Treatment Ponds					
Project #	Improvement	Estimated TN Removal (lbs/year)	Estimated TP Removal (lbs/year)	Cost/TN Pound	Cost/TP Pound
WQ-23	Consulting				
<b>Assumptions:</b>					
Base Salar Benefits = 50%		Net Cost			
\$ 31,780	12712	44492			

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**(22) WQ-24: Enhanced Stormwater Quality Education Programs**

Location

Project WQ-24 has no specified location.

Proposed Improvements

An important element of improving stormwater management is educating those entities whose activities will directly and indirectly affect the quality of stormwater effluents. The IRL BMAP provides up to a 6% reduction in the baseline anthropogenic load for both TN and TP to the entities signed on to the plan. As of 2014, the City has already had credits applied as far as TMDL BMAP reductions.

Credit was given for the following applicable education activities:

1. Local funding to implement the Florida Yards and Neighborhoods (FYN) program in the City or county.
2. Local land development codes or ordinances that require Florida-friendly landscaping on all new developments.
3. Implementation of public service announcements (PSAs) on local cable or commercial television and radio stations.
4. Informational pamphlets on pollution prevention, fertilizer application, Florida-friendly landscaping, water conservation, septic tank maintenance, etc. Presentations on these topics to civic groups, local businesses, students, and the general public.
5. Websites to provide information on reducing nutrient pollution for homeowners and businesses.
6. Inspection program and public call-in number to address illicit discharges.

Benefits

Pursuing a public education program pertaining to the individual's ability to reduce nutrients from entering the waterways will not only have measurable benefits to the IRL and St Johns River, but it will also contribute to the City meeting their TMDL reductions according to the BMAP.

Cost Estimate

It is anticipated that these activities can be added to the duties of the City's Public Information Officer, who can coordinate the publication and inclusion of educational material at public events and in monthly utility bills. The anticipated costs associated with a public education and outreach program is about \$10,000. The research, publication materials, and public outreach are likely already accounted for in the City's fiscal budget.

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Table 67: Cost Estimate Table – Project WQ-24: Enhanced Stormwater Quality Education Programs.

Project WQ-24: Enhanced Stormwater Quality Education Programs							
Item Number	Location		Proposed Retrofit Improvements				
	Consulting		Item Description	Quantity	Unit	Unit Cost	Amount
1			- Printing, Publishing, Meetings, etc.				\$10,000.00
<b>Qualifications (if applicable)</b>				<b>SUB-TOTAL</b>			\$10,000.00
1							
						0%	\$0.00
						0%	\$0.00
				<b>SUB-TOTAL OF CONSTRUCTION COST</b>			\$10,000.00
						0%	\$0.00
						0%	\$0.00
						0%	\$0.00
				<b>TOTAL PROJECT COST</b>			<b>\$10,000</b>

Table 68: Nutrient Removal Cost/Pound Table – Project WQ-24: Enhanced Stormwater Quality Education Programs.

Project WQ-24: Enhanced Stormwater Quality Education Programs					
Project #	Improvement	Estimated TN Removal (lbs/year)	Estimated TP Removal (lbs/year)	Cost/TN Pound	Cost/TP Pound
WQ-24	Education				
<b>Assumptions:</b>					
City currently has a public education program, so credits have already been applied elsewhere.					

**(23) WQ-25: Update LDR's to Encourage LID and Provide Incentive for Overtreatment on Redevelopment**

Location

Project WQ-25 has no specified location.

Proposed Improvements

Land Development Regulations (LDR's) provide guidance to the City for growth, development, and redevelopment. They are policy documents that create a framework for how the City should grow. These policies are developed to ensure growth is environmentally conscious, fiscally responsible, and meets the needs of current and future residents.

As such, this project intends to add legislation to the Code of the City of Cocoa that encourages LID projects and provides incentives for overtreatment of stormwater flows as well as redevelopment and retrofitting of older systems.

Benefits

Incentives to furnish any future projects in the City of Cocoa with technologies, such as innovative LIDs, would enhance the City's overall ability to treat stormwater effluents and would encourage future projects centered around sustainable development. Incentives for overtreatment would help the City meet its long-term goals of nutrient load reductions.

Cost Estimate

Cost estimates for this project are simply a lump-sum cost for the consultant work necessary to find a basis and language for new additions to the City of Cocoa LDR, or City Code.

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*Table 69: Cost Estimate Table – Project WQ-25: Update LDR's to Encourage LID and Provide Incentive for Overtreatment on Redevelopment.*

Project WQ-25: Update LDR's to Encourage LID and Provide Incentives for Overtreatment on Redevelopment							
Item Number	Location	Proposed Retrofit Improvements					
	Consulting	Item Description	Quantity	Unit	Unit Cost	Amount	
1	Consultant Work	Stormwater Model Update	1	LS	\$40,000.00	\$40,000.00	
<b>Qualifications (if applicable)</b>			<b>SUB-TOTAL</b>			<b>\$40,000.00</b>	
1							
					- Mobilization @	0%	\$0.00
					- Contingencies @	10%	\$4,000.00
					<b>SUB-TOTAL OF CONSTRUCTION COST</b>		<b>\$44,000.00</b>
					- Eng Design & Permitting @	0%	\$0.00
					- Subconsultants @	0%	\$0.00
					- Constr Admin and Insp @	0%	\$0.00
					<b>TOTAL PROJECT COST</b>		<b>\$44,000</b>

*Table 70: Nutrient Removal Cost/Pound Table – Project WQ-25: Update LDR's to Encourage LID and Provide Incentive for Overtreatment on Redevelopment.*

Project WQ-25: Update LDR's to Encourage LID and Provide Incentives for Overtreatment on Redevelopment					
Project #	Improvement	Estimated TN Removal (lbs/year)	Estimated TP Removal (lbs/year)	Cost/TN Pound	Cost/TP Pound
WQ-25	Consulting				

**(24) WQ-26: Bracco Pond Irrigation Repair/Replace for Increased Reuse & Bank Stabilization**

Location

Project WQ-26 focuses on the Bracco Reservoirs Stormwater Ponds, located between W Highland Dr. and N Fiske Blvd. These wet ponds provide treatment of stormwater runoff to nearly 1,060 acres of land. They provide sediment and nutrient removal, and a decrease in runoff rates before being discharged to the Indian River Lagoon.

There are outflow structures to transport runoff to a reclaimed water pond with a usable volume of 7.2 million gallons, if needed. Improvements/repairs to the irrigation systems in place will increase the City's ability to effectively reuse wastewater and stormwater effluents.

Proposed Improvements

This project aims to preserve the integrity of these water storage facilities by repairing and preserving the banks of the reservoirs to prevent property loss and storage reductions due to erosion and subsidence. Repairing irrigation structures in the ponds is essential to preserving the vegetation that protects the banks of the reservoirs. Pipes and other irrigation systems are vulnerable to damages such as impact by maintenance equipment, clogging, pipe separation, or corrosion. Vegetative stabilization of the banks of the reservoirs is proposed to further guarantee the structural integrity of the embankments and ensure safety of the reservoir will not be compromised.

Benefits

A well-maintained irrigation system in Bracco Pond will increase and preserve the City's supply of freshwater for reuse. This project will indirectly improve the Bracco Pond's ability to store and treat stormwater runoff before it is discharged.

Upon review of the objectives of this project, it was determined that it was to be considered a general maintenance project and was therefore removed from evaluation as a standalone project for the purpose of the ranking exercise in this report.

Cost Estimate

The costs for this project were estimated to be a lump-sum cost of \$100,000.

Recommended Water Quality Projects

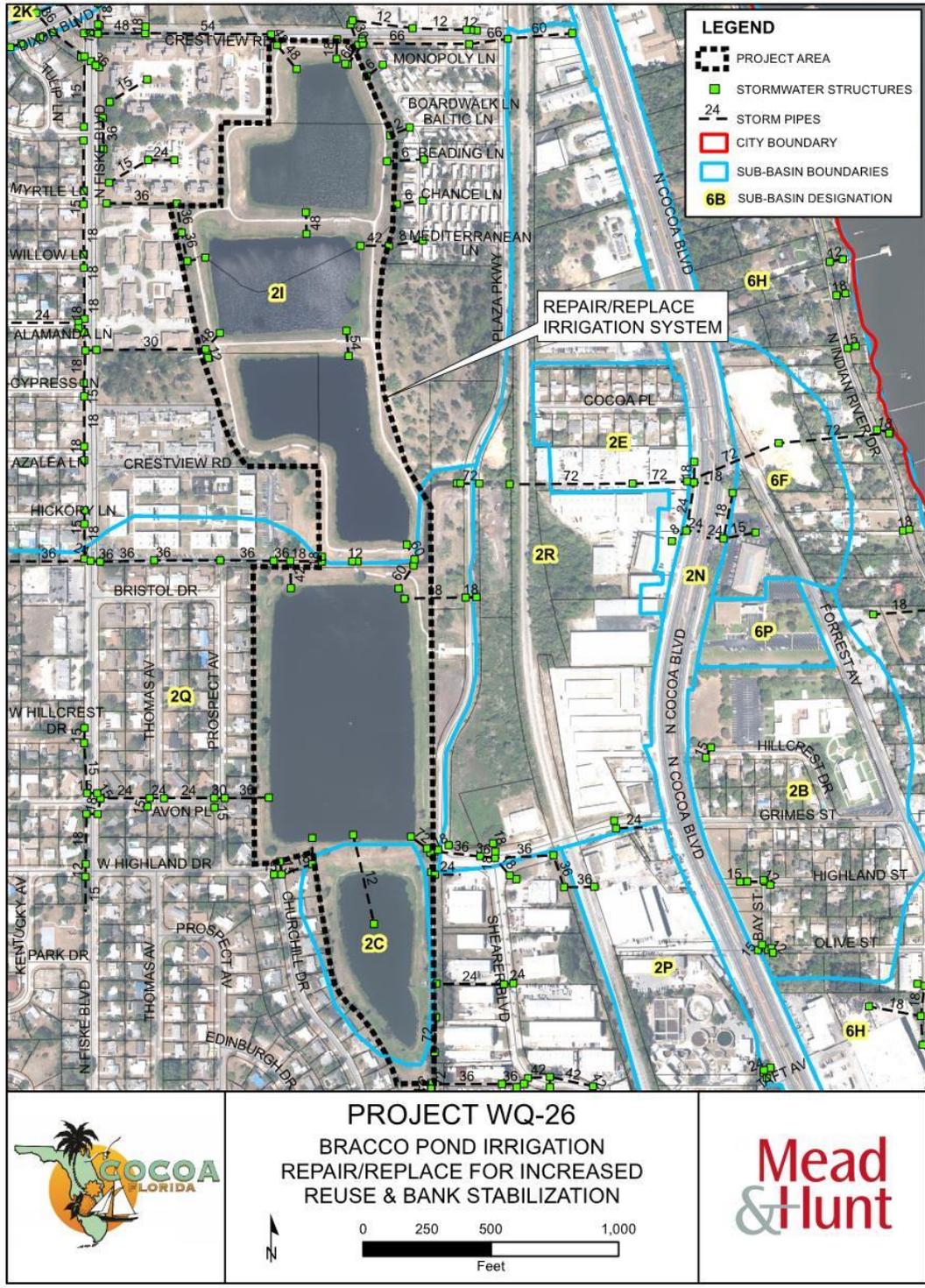
Table 71: Cost Estimate Table – Project WQ-26: Bracco Pond Irrigation Repair/Replace for Increased Reuse & Bank Stabilization.

Project WQ-26: Bracco Pond Irrigation Repair/Replace for increased Reuse & Bank Stabilization							
Item Number	Location	Proposed Retrofit Improvements					
	Bracco Pond	Item Description	Quantity	Unit	Unit Cost	Amount	
1	Construction Activities						
	- Furnish & Install	Irrigation System	100,000	LS	\$1.00	\$100,000.00	
<b>Qualifications (if applicable)</b>			<b>SUB-TOTAL</b>			\$100,000.00	
1	Project to be completed by another department						
					- Mobilization @	0%	\$0.00
					- Contingencies @	0%	\$0.00
					<b>SUB-TOTAL OF CONSTRUCTION COST</b>		\$100,000.00
					- Eng Design & Permitting @	0%	\$0.00
					- Subconsultants @	0%	\$0.00
					- Constr Admin and Insp @	0%	\$0.00
					<b>TOTAL PROJECT COST</b>		\$100,000

Table 72: Nutrient Removal Cost/Pound Table – Project WQ-26: Bracco Pond Irrigation Repair/Replace for Increased Reuse & Bank Stabilization.

Project WQ-26: Bracco Pond Irrigation Repair/Replace for increased Reuse & Bank Stabilization					
Project #	Improvement	Estimated TN Removal (lbs/year)	Estimated TP Removal (lbs/year)	Cost/TN Pound	Cost/TP Pound
WQ-26	Irrigation				
<b>Assumptions:</b>					
No additional use of reuse, or stormwater reuse, therefore no additional credits.					
It was determined that this project was a maintenance project and was no longer made part of the evaluation.					

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**(25) WQ-27: North Fiske Pond Irrigation Repair/Replacement**

Location

Project WQ-27 focuses on the North Fiske Pond, a 13.3-acre freshwater pond located between Cocoa Blvd. and some vacant commercial land. The pond provides storage and treatment to stormwater flows from runoff in areas to the north. There is a culvert that crosses south of Michigan Av. parallel to N Cocoa Blvd. that directs water from a 59-acre sub-basin to the east.

Proposed Improvements

This project aims to preserve the integrity of these water storage facilities by repairing and preserving the banks of the reservoirs to prevent property loss and storage reductions due to erosion and subsidence. Repairing irrigation structures in the ponds is essential to preserving the vegetation that protects the banks of the reservoirs. Pipes and other irrigation systems are vulnerable to damages such as impact by maintenance equipment, clogging, pipe separation, or corrosion. Vegetative stabilization of the banks of the reservoirs is proposed to further guarantee the structural integrity of the embankments and ensure safety that the reservoir will not be compromised.

Benefits

Maintenance of stormwater ponds is necessary to ensure their ability to remove pollutants, control flooding, and reduce flow rates. The efficiency and ability of a wet pond to do this decreases if the structural integrity of the embankment is reduced because vegetation that helps stabilize the embankments is lost. Thus, improvements and repairs to the irrigation systems protecting this vegetation are essentially helping to protect the structure and integrity of the ponds.

Upon review of the objectives of this project, it was determined that it was to be considered a general maintenance project and was therefore removed from evaluation as a standalone project for the purpose of the ranking exercise in this report.

Cost Estimate

The costs for this project were estimated to be a lump-sum cost of \$100,000.

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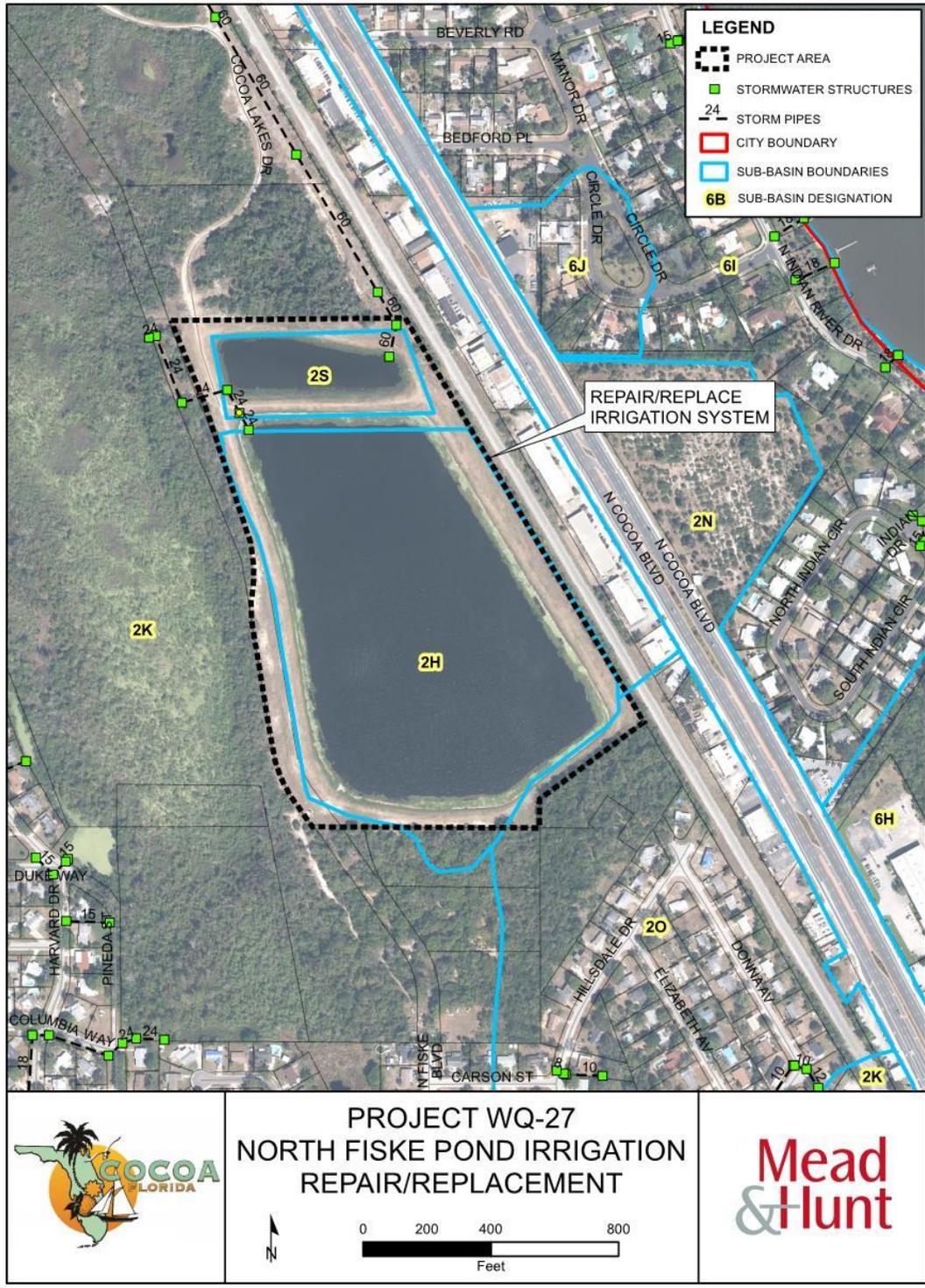
Table 73: Cost Estimate Table – Project WQ-27: North Fiske Pond Irrigation Repair/Replacement.

Project WQ-27: North Fiske Pond Irrigation Repair/Replacement						
Item Number	Location	Proposed Retrofit Improvements				
		Item Description	Quantity	Unit	Unit Cost	Amount
1	North Fiske Pond					
	Construction Activities					
	- Furnish & Install	Irrigation System	100,000	LS	\$1.00	\$100,000.00
<b>Qualifications (if applicable)</b>			<b>SUB-TOTAL</b>			\$100,000.00
1	Project to be completed by another department					
					0%	\$0.00
					0%	\$0.00
			<b>SUB-TOTAL OF CONSTRUCTION COST</b>			\$100,000.00
					0%	\$0.00
					0%	\$0.00
					0%	\$0.00
			<b>TOTAL PROJECT COST</b>			<b>\$100,000</b>

Table 74: Nutrient Removal Cost/Pound Table – Project WQ-27: North Fiske Pond Irrigation Repair/Replacement.

Project WQ-27: North Fiske Pond Irrigation Repair/Replacement					
Project #	Improvement	Estimated TN Removal (lbs/year)	Estimated TP Removal (lbs/year)	Cost/TN Pound	Cost/TP Pound
WQ-27	Irrigation				
<b>Assumptions:</b>					
No additional use of reuse, or stormwater reuse, therefore no additional credits.					
It was determined that this project was a maintenance project and was no longer made part of the evaluation.					

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**(26) WQ-28: Septic to Sewer: Broadview Manor, Carleton Terrace, Indian River Drive Frontage, River Heights and Grandview**

Location

A large portion of the City's potable water customers along the Indian River Lagoon are currently operating on septic tanks which have been shown to leach TN and TP throughout their service life. A recent TMDL Report (2016) estimated a 57 mg/L and 10 mg/L for TN and TP leakage, respectively, for each septic tank system. These values are from the final TMDL report for the Blue Springs, written by DEP, and from research conducted by the University of Florida.

Proposed Improvements

The improvements necessary to convert the existing residences to central sewer include the construction of sewer mains and lift stations which would pump to the existing water reclamation facility. Various options to accomplish this exist including vacuum sewer, grinder pump stations, and gravity sewers. The actual method employed depends on many factors including topography, groundwater table, existing municipal infrastructure, and land use density.

Benefits

A reduction of the number of septic tanks in the area would result in significant TMDL reductions. A proposed reduction of 130 septic tanks would result in the reduction of approximately 4,922 lbs/yr TN. Removal of septic tanks would increase the amount of water available to be reclaimed by the City. Reduction in TMDL loading to the IRL provides an environmental benefit, which, given the growing concerns by the County and State for the issue, could result in financial assistance from grants. It should be noted that the community in the area is highly supportive of this project.

Cost Estimate

The cost for each septic tank elimination/conversion varies by site characteristics, but a general estimate is that it will cost the City approximately \$33,372 per septic tank eliminated. This results in an anticipated construction cost of \$4,338,360 for removing 130 septic tanks.

Sewer projects are normally considered a public utility CIP function. Thus, this project is anticipated to be funded and conducted by another Department, i.e. Public Utilities.



**(27) WQ-29: Expand Reclaimed Water Usage and Distribution**

Location

Project WQ-10 is a City-wide effort to expand the availability of reclaimed water for usage in activities such as irrigation.

Proposed Improvements

It is the intention of this project to provide an annual budgetary allotment for the expansion of the City's reuse distribution system.

Benefits

The benefits of wastewater effluent reuse are well known to the City. Besides being able to eliminate the direct discharge of effluent from the water reclamation facility, the water can be land applied for the irrigation of yards, landscaping and golf courses, just to name a few. Although the wastewater has been treated, it still retains an elevated amount of nitrogen and phosphorous which would otherwise affect the health of the IRL. Utilizing this resource for irrigation, therefore, reduces the need for chemical fertilizer which also has a tendency to run off in stormwater if applied incorrectly. Thirdly, utilizing this quantity of water reduces the demand for raw water and the treatment costs that go along with the production and delivery of potable water.

It is possible to add value to this project by incorporating educational signage at visible locations of reclaimed water expansion stating the benefits of wastewater effluent reuse. Signage could be placed in subdivisions where reclaimed water is being used, as well as other public facilities.

Nutrient load reductions for this project were estimated by assuming that the usage of reclaimed water prevents all the nutrients in the volume of water used from being discharged. In this case, the reclaimed water being used is currently being stored in the Bracco Ponds. Grab samples from Bracco provided by the City allowed for the calculation of the total amount of nutrients removed per mile of reclaimed water currently available. Using this method, it was estimated that for every mile of additional reclaimed system installed, 135 lbs/yr TN and 17 lbs/yr TP would be removed. Or 270.6 lbs/yr TN and 33.2 lbs/yr TP assuming the reclaimed water distribution system is expanded by 2 miles.

Cost Estimate

Based upon recent bid opening information for similar reclaimed water distribution systems, and average of \$145/ft can be expected including appurtenances, connections, other construction related expenses, such as pavement repair, horizontal directional drilling of roadway crossings, etc. Therefore, if the City were to allocate the addition of 1 mile (5,280 ft) of new reuse watermain each year it is anticipated to cost approximately \$1,264,006 each year.

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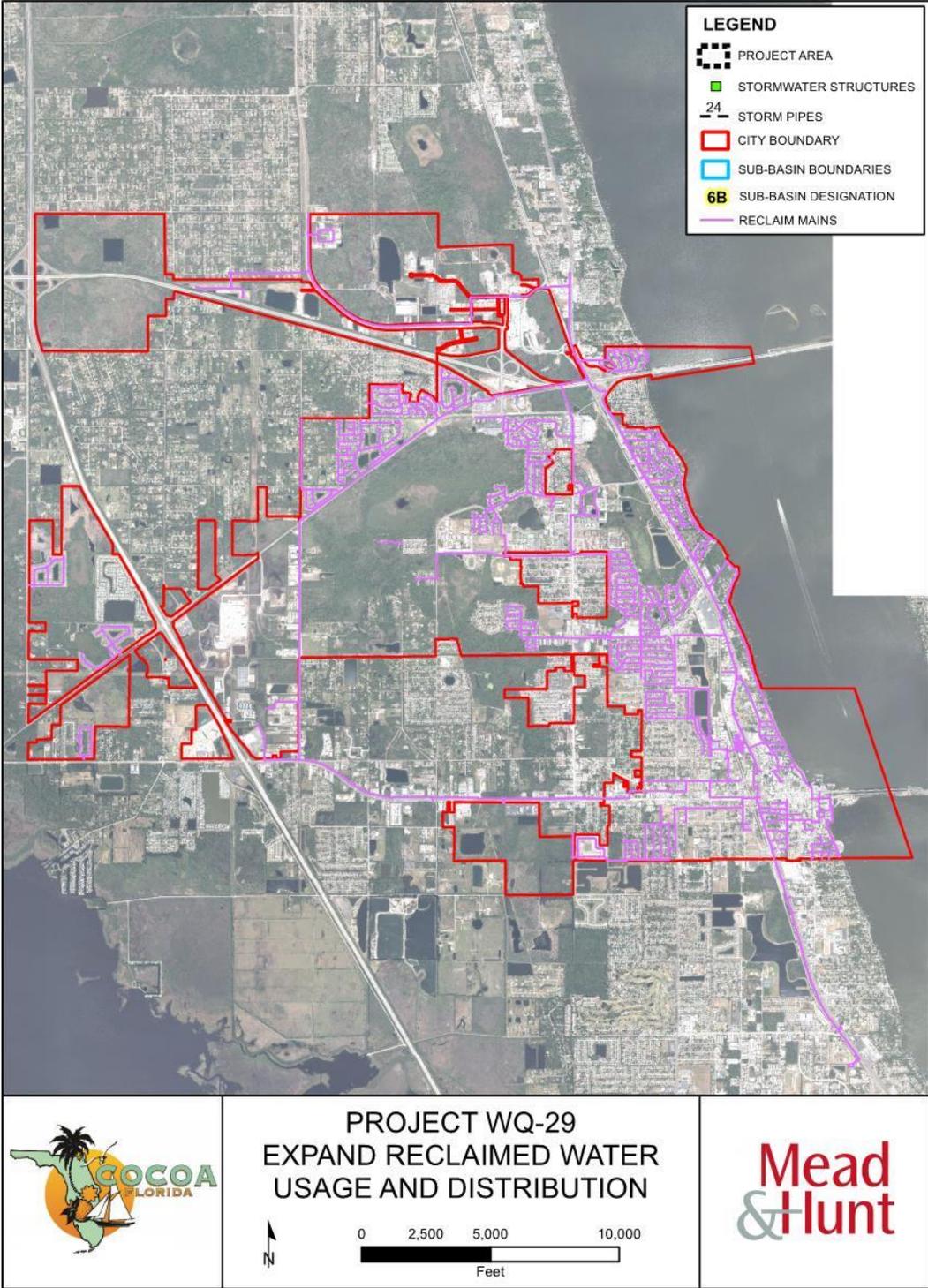
Table 77: Cost Estimate Table – Project WQ-29: Expand Reclaimed Water Usage and Distribution.

Project WQ-29: Expand Reclaimed Water Usage and Distribution						
Item Number	Location	Proposed Retrofit Improvements				
		Item Description	Quantity	Unit	Unit Cost	Amount
1	City-Wide					
	Construction Activities					
	- Furnish & Install	Reuse Watermain Distribution Sys	5,280	LF	\$145.00	\$765,600.00
<b>Qualifications (if applicable)</b>						
1	Project to be completed by another department					
	Total Program Cost for 2 miles	\$2,528,011				
<b>SUB-TOTAL</b>						\$765,600.00
					Mobilization @ 10%	\$76,560.00
					- Contingencies @ 20%	\$153,120.00
<b>SUB-TOTAL OF CONSTRUCTION COST</b>						\$995,280.00
					- Eng Design & Permitting @ 15%	\$149,292.00
					- Subconsultants @ 6%	\$59,716.80
					- Constr Admin and Insp @ 6%	\$59,716.80
<b>TOTAL PROJECT COST</b>						<b>\$1,264,006</b>

Table 78: Nutrient Removal Cost/Pound Table – Project WQ-29: Expand Reclaimed Water Usage and Distribution.

Project WQ-29: Expand Reclaimed Water Usage and Distribution					
Project #	Improvement	Estimated TN Removal (lbs/year)	Estimated TP Removal (lbs/year)	Cost/TN Pound	Cost/TP Pound
WQ-29	Reclaimed	135	17	\$ 9,342.72	\$ 76,077.96
TOTAL	10-year totals	270.6	33.2	\$9,343	\$76,078
<b>Assumptions:</b>					
2	MGD	Average Daily Reuse Flow per PW Utilities			
77	miles				
25,974	gal/mi-day	365 days/yr			
1.71	mg/L TN =	1.43E-05	lbs/gal	Based on Grab Samples provided by City	
0.21	mg/L TP =	1.75E-06	lbs/gal	Based on Grab Samples provided by City	
Removal per mile					
	0.371	lbs TN/mi-day			
	0.046	lbs TP/mi-day			
Removal per year per mile					
	135	lbs TN/mi-year			
	17	lbs TP/mi-year			
Assume expanding the reclaimed distribution system by 2.5%, or 2 miles over the 10 year period.					

Section 4  
 Recommended Water Quality Projects



## 5. Prioritization Evaluation

Projects have been prioritized by the City using a variety of metrics with the purpose of ranking projects by order of relative importance. A system for assigning points based on different criteria specific to the two different types of projects, Flood Mitigation and Water Quality, was developed. This analysis helped forecast the order in which these projects may be performed.

### A. Flood Mitigation Ranking Evaluation

For Flood Mitigation projects, points were assigned based on five different categories, or Rank Levels, that assessed various aspects of each individual project. Points were given based on the following criteria:

- Addresses an observed or potential flooding issue – 40 points.
- Provides additional benefits (i.e. water quality improvement, maintenance improvements, public safety, etc.) – 15 points.
- Number of properties impacted – 5 points for 1-100 properties, 10 points for 101-200 properties, or 15 points for >200 properties.
- Addresses protection of private property – 10 points.
- Previously identified in study or CIP – 10 points.

The criteria identified for this ranking helped to develop the final list of selected projects from Section 1 Part B of this document. At the highest-ranking level, projects that addressed areas of chronic or potential flooding were given the most points. Next points were given to projects with multiple benefits, that is, projects that simultaneously fixed multiple issues related to a site. The number of properties impacted by each project was estimated using parcel data provided by the City, and the majority of points in this category were given to projects whose benefits would impact 200 properties or more. Projects that were immediately adjacent to homes and thus safeguarded private property were also given points. Finally, weight was given to those projects that had been previously identified for completion in past projects or in the old City of Cocoa CIP.

The following table provides the overall results of the ranking system for Flood Mitigation projects.

*Table 79: Flood Mitigation Prioritization Ranking Results.*

Project #	Project Name	Addresses			Addresses		Project Identified in Previous Study or CIP	Total
		Observed or Potential Flooding	Multiple Benefits	Properties Impacted	Private Property	Erosion/Health		
FM-6	Replace or Line Corrugated Metal Pipe (CMP) Piping	40	15	0	10	10	75	
FM-3	Pineda St. Drainage Improvements - Peachtree to Dixon Upgrade Sidewalks & Swales	20	15	15	0	10	60	

**Section 5**  
**Prioritization Evaluation**

Project #	Project Name	Addresses			Addresses		Project Identified in Previous Study or CIP	Total
		Observed or Potential Flooding	Multiple Benefits	Properties Impacted	Private Property Erosion/Health			
FM-12	Fairfax Ln. Exfiltration Expansion, Highpoint Subdivision	20	15	5	10	10	60	
FM-15	Annual Curb & Gutter R&M Program	20	15	15	0	10	60	
FM-7	Driveway Culvert Replacements (Cox Road)	20	15	5	10	0	50	
FM-10	Provost Park / Pinegrove Park Ditch Piping	20	15	5	10	0	50	
FM-18	iWorQ Integration Between GIS and Operations & Maintenance	20	15	15	0	0	50	
FM-19	Comprehensive System Model	20	15	15	0	0	50	
FM-17	West Dixon Blvd. Stormwater Facility	20	15	10	0	0	45	
FM-20	Mud Lake Improvements	20	15	10	0	0	45	
FM-1	Range Road Ditch Piping	20	0	0	10	10	40	
FM-13	Cocoa North Rear Yard Ditch Piping (London Blvd. to Westminster)	0	15	10	10	0	35	
FM-2	Junction Structure at Plaza Parkway & Highland Drive Open Pit	0	15	5	0	10	30	
FM-5	Bracco Pond Outfall and Discharge Structure	0	15	5	10	0	30	
FM-14	Diamond Square Pond & Piping Improvements	20	0	15	10	0	45	
FM-4	Broadmoor Acres Rear Yard Swales Piping	0	0	10	10	10	30	
FM-11	Elevate Indian River Dr. (near Dixon Blvd.)	20	0	5	0	0	25	
FM-8	Complete Drainage System on Dixon Blvd.	0	0	10	0	10	20	
FM-16	Bracco Pond 72" Outfall (Rehabilitation/Replacement)	0	0	5	0	0	5	

NOTE: The dark lines indicate the cutoff for the projects that were chosen for the final selection of projects.

The final selection of Flood Mitigation projects from table 1 in Section 1 Part B of this report omitted several projects from this overall ranking table. Although Project FM-14 has a high ranking, it is being substituted by WQ-12 which will provide both flood mitigation and water quality benefits. Project FM-4, was excluded because it is part of a separate Fiske Blvd. improvement project that is already funded for

FY 2020. Projects FM-11, FM-8, and FM-16 are being deferred after the priority ranking evaluation singled them out as being lower priority projects than others and therefore not in the best interests of the City Stormwater Utility at this time based on funding availability.

**B. Water Quality Ranking Evaluation**

For Water Quality Projects, points were assigned based on four different categories that assessed various aspects of each individual project. Points were given based on the following criteria:

- Nutrient removal Cost/lb analysis – 20 points \$1,000-\$5,000/lb, 15 points \$5,001-\$10,000/lb, 10 points \$10,001-\$50,000/lb, 5 points > \$50,000/lb.
- Provides additional benefits (i.e. flood mitigation improvements, aesthetic improvements, etc.) – 25 points.
- Public education capabilities – 20 points.
- Community supported – 15 points.

The criteria identified for this ranking helped to develop the final list of selected projects from Section 1 Part C of this document. At the highest-ranking level, the cost of nutrient removal in Dollars spent per pounds of TN and TP removed was given the most weight. It was possible to model the nutrients prevented from discharging to the IRL for many Water Quality projects, and thus the cost/nutrients removed idea was used to consider the general cost effectiveness of each individual project. Similar to Flood Mitigation projects, projects that addressed a multiplicity of issues or that, in other words, provided multiple benefits were given points. Finally, points were given for those projects that had the ability to educate the public, and that were generally high-profile projects that the community would support.

The following table provides the overall results of the ranking system for Water Quality projects.

*Table 80: Water Quality Prioritization Ranking Results.*

Project #	Project Name	Cost/ TN-TP Pound Rank	Multiple Benefits Rank	Public Education Rank	High Profile Rank	Total
<b>WQ-12</b>	Verizon Stormwater Pond in Diamond Square	40	25	20	15	<b>100</b>
<b>WQ-16</b>	Riverfront Park In-Lagoon Nutrient Removal	40	0	20	0	<b>60</b>
<b>WQ-28</b>	Septic to Sewer: Broadview Manor, Carleton Terrace, Indian River Drive Frontage, River Heights and Grandview	20	0	20	15	<b>55</b>
<b>WQ-10</b>	72" Outfall Baseflow Capture Treatment	30	0	20	0	<b>50</b>
<b>WQ-29</b>	Expand Reclaimed Water Usage and Distribution	25	0	20	0	<b>45</b>
<b>WQ-15</b>	Add Floating Wetlands to Existing Stormwater Ponds	25	0	20	0	<b>45</b>
<b>WQ-11</b>	Horseshoe Ponds (North & South) Vegetation Removal	0	25	0	15	<b>40</b>
<b>WQ-20</b>	De-muck/Dredge SR 520 Relief Channel	0	25	0	15	<b>40</b>

**Section 5**  
**Prioritization Evaluation**

Project #	Project Name	Cost/ TN-TP Pound Rank	Multiple Benefits Rank	Public Education Rank	High Profile Rank	Total
WQ-18*	SR 520 Runoff Treatment to Downtown	40	0	0	0	40
WQ-17*	Riverfront Park Stormwater Capture Modification	35	0	0	0	35
WQ-2	Baffle Boxes on Larger Basins Outfalls	40	0	0	0	40
WQ-3	BAM Filter Retrofits for Existing Baffle Boxes	40	0	0	0	40
WQ-5	Circle Drive Dry Retention Pond, Carlton Terrace & Broadview Manor Swales	40	0	0	0	40
WQ-7	Bracco Pond Aerators	40	0	0	0	40
WQ-14	Scarborough Park & Water Tower Pond Expansion	35	0	0	0	35
WQ-8	Divert Bracco Pond Baseflow to St. Johns River Basin via Diamond Square Pond	35	0	0	0	35
WQ-1	Baffle Boxes on Smaller Basins Outfalls	25	0	0	0	25
WQ-4	Living Shoreline Along Lagoon	0	25	0	0	25
WQ-23	Inspection Program for HOA-Owned Treatment Ponds	0	0	20	0	20
WQ-24	Enhanced Stormwater Quality Education Programs	0	20	0	0	20
WQ-22	Reduce Impervious Area (PaveDrain, Reduce Roadway) Near IRL	15	0	0	0	15
WQ-25	Update LDR's to Encourage LID and Provide Incentives for Overtreatment on Redevelopment	-	-	-	-	0
WQ-26	Bracco Pond Irrigation Repair/Replace for Increased Reuse & Bank Stabilization	-	-	-	-	0
WQ-27	North Fiske Pond Irrigation Repair/Replacement	-	-	-	-	0

\* In the event that WQ-16 Riverfront Park In-Lagoon Nutrient Removal cannot be permitted, Projects WQ-17 and WQ-18 would substitute it.

NOTE: The dark lines indicate the cutoff for the projects that were chosen for the final selection of projects.

The final selection of Water Quality projects from table 2 in Section 1 Part C of this report included only a small selection of projects from this overall ranking table. The selected projects were deemed to provide the most benefits per the cost of each project based on the ranking criteria described above. The final selection of projects included only those projects that received points in at least 2 of the ranking criteria. That is, projects were selected because they offered a diverse set of benefits, ultimately making them more desirable.

One may notice that some water quality projects overlap and treat areas covered by another project, i.e. WQ-16, WQ-17, and WQ-18 all treat the same downtown core area. Each project was scored based on

its own individual merit and ranked accordingly. If WQ-16 is not able to be implemented for some reason, WQ-18 may be attempted. If that project falls short, WQ-17 may be initiated.

As may be noted, Projects WQ-25, WQ-26, and WQ-27 do not include metrics for nutrient removal as they cannot be quantified by the available methods. Updating Land Development Regulations to incentivize LID development can provide a net benefit to the lagoon, however the possible scenarios cannot be anticipated. Furthermore, the irrigation repair and replacement projects have been deemed to be maintenance projects and removed from consideration.

### **C. Major Equipment Evaluation**

As described above, the Major Equipment program portion is not only prioritized by the remaining lifespan of the current equipment, but an attempt to quantify the relative increase in efficiency and productivity of new equipment is included. Additionally, the critical nature of the existing equipment needing repairs is considered.

*Table 81: Major Equipment Prioritization Ranking.*

<b>Equipment #</b>	<b>Year</b>	<b>Equipment Name</b>	<b>Description</b>	<b>Replacement Cost</b>	<b>Purchase Year</b>
131	2008	Isuzu FVR TYMCO 500X	Street Sweeper	\$338,592	1
137	2009	Ford F150	Pickup Truck	\$25,989	3
146	1999	Ford 350SD	Pickup Truck	\$74,991	3
158	2014	International TYMCO 600X	Street Sweeper	\$395,953	5
167	2006	Sterling Acterra	Truck	\$178,459	7
91	1995	Ford VAC-CON	Vac-Con	\$599,999	9
<b>TOTAL</b>				<b>\$1,013,984</b>	

## 6. Schedule of Implementation

A preliminary schedule for the implementation of the projects described in this report over the 10-year period of this SCWP was developed. Section 5 of this document outlined the ranking system that was developed in order to determine which projects offered the most benefits based on several criteria. This ranking, in conjunction with utility rate analyses from Stantec, was then used to populate the following schedule. The cost analyses from Stantec helped establish which projects were assigned to be completed earlier in the 10-year period outlined in this document. It is important to mention that there may be a lag in the initial years of the implementation schedule due to efforts in securing debt and the design and engineering of the projects in Fiscal Years 2020 and 2021.

In the tables below, the “Project Cost” column indicates the individual cost to execute each project, while the “Total Cost” column indicates the total cost of implementing each project over the 10-year period, including all operations and maintenance costs as defined above in Sections 3 and 4. The “Year [1-10]” columns show the timeline for implementation of each project based on the expenditures necessary either for construction, operations, or maintenance.

### Flood Mitigation

The table below shows a potential schedule of implementation for projects addressing flood mitigation issues. The top five projects in the ranking table were given priority in the schedule of implementation and were all selected to be constructed or initiated within the first 3 years of this 10-year period.

Distinctively, projects FM-6 and FM-15 are projects that incur ongoing costs for some or all of the duration of this timeline. Project FM-6 is an annual program to replace or repair CMP piping around the City and will be employed for about 5 years after which another analysis may be done to decide whether or not the program needs to be continued. Project FM-15 is an annual program to maintain curbs and gutters around the City, a general maintenance task that ensures the effectiveness of the conveyance system of the City’s stormwater system. Project FM-18 and FM-19, although not highly ranked, offer overall improvements to the operation and execution of all future projects, and should therefore be implemented early in this period.

The rest of the projects are single projects whose annual expenditures are minimal, negligible, or already accounted for, and are therefore all projects that could be executed in smaller timeframes.

*Table 82: Flood Mitigation Projects 10-Year Schedule of Implementation*

Project #	Project Cost	Total Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
FM-1	\$387,000	\$387,000							\$387,000			
FM-2	\$165,848	\$165,848								\$165,848		
FM-3	\$1,167,075	\$1,167,075				\$233,415	\$933,660					
FM-5	\$536,445	\$536,445										\$536,445
FM-6	\$193,750	\$968,750	\$193,750	\$193,750	\$193,750	\$193,750	\$193,750					

**Section 6**  
**Schedule of Implementation**

<b>FM-7</b>	\$509,418	\$509,418		\$254,709	\$254,709								
<b>FM-10</b>	\$244,125	\$244,125							\$244,125				
<b>FM-12</b>	\$353,808	\$353,808		\$353,808									
<b>FM-13</b>	\$999,180	\$999,180							\$99,918	\$399,672	\$99,918	\$399,672	
<b>FM-15</b>	\$50,000	\$500,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000
<b>FM-17</b>	\$291,564	\$291,564											\$291,564
<b>FM-18</b>	\$77,777	\$77,777	\$77,777										
<b>FM-19</b>	\$125,000	\$125,000	\$125,000										
<b>FM-20</b>	\$77,770	\$77,770							\$77,770				
<b>TOTAL</b>	\$5,100,990	\$5,789,538	\$446,527	\$852,267	\$498,459	\$477,165	\$1,177,410	\$149,918	\$771,567	\$315,766	\$449,672	\$878,009	

Water Quality

The table below shows a potential schedule of implementation for projects addressing water quality improvements.

Similar to Flood Mitigation projects, some Water Quality projects are multi-year efforts that will incur annual costs, or additional costs over the 10-year period. Project WQ-15 is a project that involves an initial expenditure where floating wetland will be installed, followed by subsequent annual costs for maintenance of these wetlands. Project WQ-29, which aims to extend the reclaimed water system on a per-mile basis, is a project whose “Total Cost” will ultimately depend on the number of miles of additional piping to be completed.

The rest of the projects are single projects whose annual expenditures are minimal, negligible, or already accounted for, and are therefore all projects that could be executed in smaller timeframes.

*Table 83: Water Quality Project 10-year Schedule of Implementation.*

Project #	Project Cost	Total Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
<b>WQ-10</b>	\$1,216,663	\$1,216,663	\$1,216,663									
<b>WQ-11</b>	\$236,670	\$236,670	\$236,670									
<b>WQ-12</b>	\$549,643	\$549,643	\$549,643									
<b>WQ-15</b>	\$206,635	\$818,635	\$206,635	\$68,000	\$68,000	\$68,000	\$68,000	\$68,000	\$68,000	\$68,000	\$68,000	\$68,000
<b>WQ-16</b>	\$1,500,000	\$1,500,000		\$1,500,000								
<b>WQ-20</b>	\$282,900	\$282,900	\$282,900									
<b>WQ-28*</b>	\$4,338,360	\$4,338,360	\$500,000	\$3,838,360								
<b>WQ-29*</b>	\$1,264,006	\$2,528,012			\$1,264,006		\$1,264,006					
<b>TOTAL**</b>	\$3,992,511	4,604,511	\$2,492,511	\$1,568,000	\$68,000	\$68,000	\$68,000	\$68,000	\$68,000	\$68,000	\$68,000	\$68,000

\* Projects are anticipated to be funded and conducted by other Departments, i.e. SOIRL/Public Utilities

**Section 6**  
**Schedule of Implementation**

\*\* Total cost not including projects to be funded by other Departments.

**Major Equipment**

The table below shows a potential schedule for when Major Equipment purchases need to be made.

*Table 84: Major Equipment Purchases 10-Year Schedule of Implementation.*

Equipment #	Year	Equipment Name	Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
131	2008	ISUZU FVR TYMCO 500X	\$338,592	\$338,592									
137	2009	FORD F150	\$25,989			\$25,989							
146	1999	FORD 350SD	\$74,991			\$74,991							
158	2014	International TYMCO 600X	\$395,953					\$395,953					
167	2006	Sterling Acterra	\$178,459							\$178,459			
91	1995	FORD VAC-CON	\$599,999									\$599,999	
<b>TOTAL</b>			\$1,613,983	\$338,592		\$100,980		\$395,953		\$178,459		\$599,999	

**Overall**

The following Table provides a breakdown of the three project categories spread out over the 10-year program with the total annual project budget as outlined above.

*Table 85: Overall annual Costs of 10-year Program.*

Category	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
<b>FM Projects</b>	\$446,527	\$852,267	\$498,459	\$477,165	\$1,177,410	\$149,918	\$771,567	\$315,766	\$449,672	\$878,009
<b>WQ Projects</b>	\$2,492,511	\$1,568,000	\$68,000	\$68,000	\$68,000	\$68,000	\$68,000	\$68,000	\$68,000	\$68,000
<b>Major Equip.</b>	\$338,592		\$100,980		\$395,953		\$178,459		\$599,999	
<b>TOTAL</b>	\$3,277,630	\$2,420,267	\$667,439	\$545,165	\$1,641,363	\$217,918	\$1,018,026	\$383,766	\$1,117,671	\$946,009

**A. Amendments to Schedule**

The schedules for implementation of Flood Mitigation and Water Quality projects described above serve as suggestions for the order in which the City should consider execution of each project. The actual timeline of implementation will vary as the City may need to make amendments to the order based on input from other officials or the City Council.

Each project present in this final selection is self-supporting and will not present any conflicts with any of the other independent projects in this final list, should the implementation order change.

## **7. Funding**

Alongside the development of this 10-year SCWP, City officials worked with Stantec Inc. to establish a different stormwater rate structure in order to ensure the future economic sustainability of the Stormwater Utility. Alongside the required investments to address existing flooding issues, the City faces mandatory expenditures to ensure the TMDL requirements of the IRL BMAP are met, as well as numerous expenses for general maintenance tasks associated with the stormwater system.

### **A. Sources**

Among the various funding sources available for the implementation of the projects discussed below include direct budgeting from the Stormwater Utility funding source directly. Additionally, various grant and loan programs are available to fund portions of projects depending on their particular requirements. These include:

- Save Our Indian River Lagoon (SOIRL) grants for water quality improvements and nutrient reduction.
- St Johns River Water Management District (SJRWMD) cost share grants.
- Programs offered by the Florida Department of Environmental Protection include; State Water-quality Assistance Grant (SWAG),
- Federal Clean Water Act Section 319(h) Grants, and
- Clean Water State Revolving Fund (SRF) Loan Program.

Funds from these programs can often be utilized in intricate schemes that are beyond the scope of this report. Going forward, as the projects are developed and the Stormwater Utility revenue stream are defined and delineated, a careful look will need to be taken with respect to re-prioritizing along this line. Programs gain or lose support from one year to the next, or one administration to the next, and careful and consistent monitoring is required to implement them for best advantage.

### **B. Possible SOIRL Funding**

SOIRL funding may be possibilities for most of the Water Quality projects. Currently, SOIRL funding pays projects a set dollars per pound removal for Nitrogen and Phosphorous. The estimated pounds of nutrient reduction are calculated utilizing established, State recognized removal efficiencies, such as those generated by the BMPTRAINS model, or as listed in the IRL BMAP.

## **8. References**

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