



# EXECUTIVE SUMMARY

## BACKGROUND

The Bullfrog Creek/Wolf Branch Watershed lies entirely within the southern portion of Hillsborough County, nestled between the Alafia River to the north and the Little Manatee River to the south. Bullfrog Creek drains the northern and eastern portions of the watershed, discharging into Tampa Bay just south of the Alafia River. Wolf Branch drains the southwest portions of the watershed and discharges approximately 6 miles south of the Bullfrog Creek discharge point.

## PROJECT OBJECTIVES

The objective of this study is to develop a comprehensive Watershed Management Plan for the Bullfrog Creek/Wolf Branch Watershed that will be compatible for future updating. General objectives of the Watershed Management Plan include the following:

- Embracing the latest concepts of watershed planning outlined by the United States Environmental Protection Agency
- Comply with the requirements of the County's National Pollutant Discharge Elimination System (NPDES) permit, as well as the Tampa Bay Estuary Program (TBEP) agreement
- Address four areas of concern which include flood control, water quality, natural systems, and water supply
- Include specific regional and local recommendations dealing with issues that are specific to the watershed without being too complex or cumbersome to follow

## FLOOD CONTROL

The flood control element includes the development of hydrology and hydraulic models to simulate the response of the watershed to a variety of rainfall conditions. EPA's SWMM model was developed to evaluate hydraulic behavior of the watershed. A calibrated and verified model was used to assess channel flows and flooding conditions and subsequently define the level of service within the watershed. The 2.33-, 5-, 10-, 25-, 50- and 100-year design rainfall storm events were simulated using the SWMM model to estimate proposed peak flood elevations in channels and at structures. Water surface profiles were generated to show the maximum water level elevations for each event,

and the extent of the 100-year floodplain in the Bullfrog Creek/Wolf Branch Watershed.

### **Existing Flooding Conditions and Level of Service**

The existing conditions model of the watershed was developed as a tool to predict flow rates, flood and peak water surface elevations within the modeled portions of the watershed. The resulting existing conditions models provided the basis for assessing current flood control level of service (LOS), identification of problem areas that require improvements, and the assessment of potential benefits from proposed flood control projects.

The existing flooding conditions and corresponding LOS within the watershed are generally very good with 83% of the evaluated structures having a performance level of "A". Flooding was generally limited to approximately 35 locations, typically within the lower reaches of the coastal streams. Only 15% of the rated structures had an LOS of "C" or less for existing conditions. However, given the future land use pattern and development projected within the watershed, this performance level can reasonably be expected to significantly degrade without capital investment and enhanced maintenance.

### **Flood Control Alternatives**

A number of alternatives were developed to address each identified flooding problem in County-owned roadways, facilities and properties. Alternatives included enhanced maintenance, regulatory approaches and capital improvement projects designed to improve conveyance capacity and thereby reduce water levels and flooded areas. A standard 25-year, 24-hour design rainfall event was utilized to determine the effectiveness of each alternative for flood control, and to assess upstream and downstream impacts associated with these alternatives. The results of the alternatives modeling effort were used to prepare alternative concept designs, estimate construction costs, and evaluate benefit/cost ratios which, combined with other considerations, culminated in a list of "Preferred Alternatives". Preferred alternatives for each flood problem area were applied to the existing conditions design models to produce the "Proposed Conditions" models.

### **Future Flooding Conditions and Level of Service**

The 2.33-, 5-, 10-, 25-, 50- and 100-year design rainfall storm events were entered in the proposed conditions models, described above, for simulation of proposed peak flood elevations in channels and at structures. Water surface profiles were generated to show the maximum water level elevations for each event, represent the proposed flood control condition, and serve as a basis for defining flood control LOS within the Bullfrog Creek/Wolf Branch watershed.

Generally speaking, the future flooding conditions and corresponding LOS were improve with an LOS of "A" attained by 88% of the evaluated structures, and the elimination of identified flooding

on County-owned roadways, facilities and properties. Only 12% of the rated structures had an LOS of “C” or less for future conditions.

## **WATER QUALITY CONDITIONS**

The water quality and natural systems conditions element included an assessment of the existing water quality in the lakes, streams and groundwater within the watershed. Natural systems were evaluated, and water quality issues and environmental areas of concern were identified. An assessment of water supply was incorporated into this element of the Watershed Management Plan. A pollutant load model was developed to predict the gross annual pollutant loads generated in each identified catchment area. The model was subsequently used to develop and assess the water quality level of service for current conditions in the watershed.

### **Existing Water Quality Conditions and Level of Service**

The County’s Pollutant Loading and Removal Model (PLRM) was used to assess all basins within the watershed. The parameters of particular interest in this watershed were total nitrogen (TN) and total suspended solids (TSS). Identification of areas with the highest potential for excessive TN loads is important to minimize eutrophication effects, and to assist in meeting the nitrogen load reduction goals of the Tampa Bay Estuary Program. TSS, in addition to signifying areas vulnerable to erosion and sedimentation, is often used as a surrogate indicator for other pollutants, because metals, organic compounds, and phosphorus often bind to suspended material in the water column.

The existing conditions Water Quality LOS was calculated and benchmarked using the County’s specified assessment procedure with the following results:

- Using TN as an indication of service level, 83% of the subbasins received a score of “F”. Distribution of these subbasins had no evident spatial trend within the watershed.
- Using TSS as an indicator of service level, more than 50% of the subbasins received a “C” or better LOS score.

The distribution of basins receiving a LOS score of “D” or “F” indicates widespread nonpoint source pollution potential, and suggests that there are potential benefits for stormwater BMPs placed almost anywhere within the watershed.

### **Future Water Quality Conditions and Level of Service**

Future conditions net loads were also computed by varying the land use specific model parameters, which were then benchmarked per the County’s procedures. Generally speaking, many of the watershed’s subbasins received an improved LOS score with respect to existing conditions, and these areas are projected to generate less nonpoint source pollution, due to the incorporation of additional BMPs.

- Using TN as an indication of LOS, a “C” score was received in 53% of all the subbasins in the study area, with no spatial trend evident. The majority of the subbasins under existing conditions received a score of “F”, while only 26% of the subbasins received a score of “F” under future conditions. Subbasins with a “F” score were mainly located in the central and west-central portion of the watershed.
- Using the TSS as an indicator of level of service, 17% of the subbasins received a “D” or “F” score. Similar to the TN level of service, these subbasins are mainly located in the central and west-central portion of the watershed. Greater than 70% of the subbasins received a score of “B” or better for the TSS LOS.

## ANALYSIS OF ALTERNATIVES

Multiple alternatives were developed to address the identified flooding and water quality problems. Each alternative solution included conceptual site layouts, hydraulic model assessment, preliminary facilities design, initial facilities sizing, and preliminary cost estimates. These alternatives were presented to interested stakeholders in a public meeting, and the resulting comments and public response was used to assist the County in the selection and identification of preferred alternatives.

## SELECTION AND DEVELOPMENT OF THE PREFERRED ALTERNATIVES

The 21 alternatives evaluated in this study alternatives were culled based upon the public input, preliminary costs, permitting issues, and County staff’s preferences. The resulting preferred alternatives were then refined to form the basis of the recommended Watershed Management Plan. Levels of service for flooding and water quality were defined for future conditions based upon the eventual construction of the preferred alternatives.

The Preferred Plan for the Bullfrog Creek/Wolf Branch Watershed consists of 10 new CIP projects for inclusion in the County Stormwater CIP program. Based on the results of the public meeting, the final list of recommended projects is summarized in the table on the following page. The total cost of these ten recommended projects is approximately \$1,000,000, distributed as follows:

Bullfrog Creek Basin	\$ 557,000
Wolf Branch Basin	<u>481,600</u>
Watershed Total	\$ 1,038,600

## PUBLIC INVOLVEMENT

One of the key components of the development of the Watershed Management Plan was continuing

citizen involvement. A web page was developed and maintained to provide information on the ongoing study efforts, enable citizen read-only access to the draft plan chapters, and provide a platform for receipt of public comment during the entire duration of the project. The public and other citizen groups were solicited at three different stages during this study:

- Following the collection of data on existing conditions
- At the beginning of the alternatives analysis
- At the development of recommendations

Project Name	Project ID	Scope of Work	Overall Project Benefit Score	Planning Level Cost Estimate
<b>RECOMMENDED PROJECTS IN THE BULLFROG CREEK BASIN</b>				
The Headwaters Project	BF-1	Construct a new 42-inch RCP culverts through the CSX Railroad right-of-way to provide conveyance to the west	15	\$36,100
Lincoln Road Improvements	BF-5	Upgrade existing culverts under Lincoln Road with a 4' x 5' Box Culvert to provide adequate conveyance capacity	8	\$61,700
Beach Avenue Improvements	BF-6	Raise the roadbed a maximum of 6 inches and reconstruct 170 feet of roadway to elevate the driving surface out of the floodplain	2	\$30,000
Bill Tucker Road Improvements	BF-7	Upgrade existing culvert under Bill Tucker Road to 36-in RCP to provide adequate conveyance capacity	7	\$25,700
Old Big Bend Road Improvements	BF-9	Raise the bridge approaches a maximum of 1 foot and reconstruct 2,150 feet of roadway to elevate the approaches out of the floodplain	8	\$174,000
	BF-10	Raise the Bullfrog Creek roadbed a maximum of 9 inches and reconstruct 1,000 feet of roadway to elevate the driving surface out of the floodplain	8	\$131,900
Simmons Loop Road Improvements	BF-12	Upgrade existing culverts under Simmons Loop Road with twin 4' x 6' Box Culverts to provide adequate conveyance capacity	7	\$97,600
<b>RECOMMENDED PROJECTS IN THE WOLF BRANCH BASIN</b>				
Miller Mac Road Improvements	WB-2	Replace existing agricultural and driveway culverts with single 72-in RCP culverts to provide adequate conveyance capacity, raise the roadbed a maximum of 9 inches, and reconstruct 850 feet of roadway to elevate the driving surface out of the floodplain	9	\$196,800

Wolf Brach Culvert Replacements	WB-5	Replace existing culverts at 19 <sup>th</sup> Avenue with a 4'x 5' Box Culvert to provide adequate conveyance capacity	8	\$66,200
	WB-7	Replace existing culverts at 12 <sup>th</sup> Street with twin 5'x7' Box Culvert to provide adequate conveyance capacity, raise the roadbed a maximum of 3 inches, and reconstruct 1,300 feet of roadway to elevate the driving surface out of the floodplain	8	\$218,600

Dames & Moore conducted three formal public meetings in the watershed to secure public input and assistance in defining flooding and water quality problems, evaluating alternatives for resolving the existing problems. The input received was used in refining the alternative's proposed CIP projects, adding regulatory enhancements, and fine tuning recommendations for additional maintenance of the existing stormwater conveyance and treatment facilities.

## RECOMMENDATIONS

Recommendations for achieving cost effective flood control and water quality objectives were developed and presented to the public for stakeholder comment and input. Based on the results of the public meeting, a final list of recommended projects were developed for incorporation in Hillsborough County's integrated \$96,000,000 5-Year Capital Improvements Program for stormwater Management. The following recommendations have been organized into six functional areas to facilitate their consideration and implementation.

### CAPITAL INVESTMENT

1. Implement the 10 recommended Capital Investment Projects from the preferred alternatives discussed previously, subject to budgetary constraints and public support, to eliminate existing flooding problems and improve water quality.
2. Evaluate the potential benefits of implementing additional water quality based Capital Investment Projects within the Bullfrog Creek/Wolf Branch Watershed, where land is available and less expensive. This approach can be used to off-set pollutant loads generated in other watersheds where land may not be available without taking, or where the cost per pound removed for comparable water quality facilities is higher.
3. Invest in the development of accurate GIS-based mapping of the drainage system components in the watershed in order to
  - Clearly delineate the extent of jurisdictional wetlands in the ditches, creeks and channels that need to be maintained to provide flood control protection.

- Provide the basis for an efficient implementation of the Hansen 7 maintenance management system.
4. Acquire specialized maintenance equipment for the Southern Maintenance Unit
    - Purchase one new Menzi Muck excavator, a highly used and frequently depended on piece of equipment, to replace the existing unit, which was reported by Southern Maintenance Unit as being old and unreliable.
    - Purchase a second Menzi Muck excavator, when trained field staff become available, to expand the Unit's capability to maintain critical ditches and channel segments to maintain conveyance capacity in the system.

#### OPERATIONS AND MAINTENANCE

1. Immediately undertake efforts to fully staff the Southern Maintenance Unit, which is currently experiencing difficulty in filling open positions, which is limiting the ability of the field staff to perform both reactive and proactive maintenance activities.
2. Re-evaluate its funding of the Southern Maintenance Unit given that the Unit reports that approximately 80% of its operations are reactive, driven by citizen complaints and administrative referrals, rather than scheduled or planned maintenance. Increasing the annual maintenance resources for staffing and equipment should enable the Southern Maintenance Unit to undertake more proactive maintenance efforts, and gradually reduce the reactive work efforts.
3. Undertake a periodic re-training program for field crews that is focused on reducing the number of culverts damaged during the ditch cleaning process—by either partial end crimping and end crushing, or blocking. This action will avoid reducing the capacity of ditch culverts and cross-drains and subsequently causing localized flooding.
4. Southern Maintenance Unit supervisory staff should review the data input process being used with the Hansen 7 system and provide periodic QA/QC of monthly data to ensure the completeness, accuracy and integrity of the maintenance performance data.
5. The Southern Maintenance Unit should formally develop and implement a set of maintenance standards for the activities it performs in conjunction with the Hansen 7 system.
6. The Southern Maintenance Unit should keep and maintain an accurate inventory of equipment, including maintenance records and operating hours for each piece of equipment, to help identify failing equipment and justify the need for new/additional equipment.
7. The Southern Maintenance Unit staff should evaluate the maintenance frequency guidelines identified in the Maintenance Plan (Appendix G, Table G-5), revise them to fit the observed needs within the watershed, and then incorporate this information into the maintenance standards as they are developed. Evaluate maintenance methods and practices that minimize

erosion, sediment transport and related pollutant discharges to receiving waters.

8. Develop updated maintenance practices that stabilize exposed surfaces during new infrastructure construction, and rehabilitation and repair of existing infrastructure. This action provides erosion and sediment control thereby reducing annual pollutant discharges.

#### MONITORING

1. The Southern Maintenance Unit should identify those privately owned drainage system components that are critical to the proper operation of the stormwater conveyance systems within the watershed. This includes FDOT roadways and drainage systems, CSX Railroad and its bridges and drainage features, and private property owners. The identified critical facilities should be included in SMU's GIS-based mapping of the watershed's stormwater management systems. The owner of each of these critical facilities should be identified along with an emergency contact name and telephone number.
2. Southern Maintenance Unit staff should regularly inspect/monitor the maintenance condition of the critical, privately owned drainage system components that are critical for proper operation of the stormwater conveyance systems within the watershed. If these components are not being properly maintained, the County should formally notify the responsible entities of the need to perform timely maintenance.
3. Evaluate the problems identified in the Maintenance Plan of the Watershed Management Plan should be with subsequent budgeting and scheduling of remedial maintenance, repairs and replacements as appropriate.
4. Southern Maintenance Unit staff should observe and record the structural condition and any occurrence of failing infrastructure (culverts, headwalls, ditches). Remedial maintenance, repairs and replacements should be scheduled and budgeted as part of the ongoing proactive maintenance operations.
5. No new ambient water quality monitoring programs, or changes to existing programs, are recommended as the data currently being generated is generally adequate to provide sufficient information about the watershed.
6. If additional septage spreading/disposal facilities are sited within the watershed, Hillsborough County should consider requiring the facility operator to conduct a continuing monitoring program—focused on both stormwater runoff and groundwater infiltration—at their septage sites to provide additional information as to the significance of these areas as non-point pollution sources.

#### FUTURE STUDIES AND PLANNING

1. Periodically update the Watershed Management Plan to reflect changes in the development

of the watershed. New data (structural, topographic, etc.), and new regulations will necessitate periodic Plan updates.

2. Update the SWMM model developed for the watershed as and more information becomes available on the watershed and existing structures are modified/replaced. This will provide valuable information regarding changes in hydraulic performance and potential flooding caused by new projects, replacement of existing structures and similar engineering and regulatory issues.
3. Revise the SWMM model developed for the watershed to assess the potential impacts to the primary conveyance channels that will occur when the farm crossings—typically undersized and retarding flow thus providing flow attenuation volume—are removed by subsequent land development activities. The potential exists that roadway flooding and LOS degradation will occur once the farm crossings are removed, even if the County implements all of the recommended structural improvements.

4. Modify the SWMM model developed for the watershed to include the projected future land use, including estimates of future hydrologic and hydraulic conditions and simulation of private stormwater management facilities. This effort is needed to verify the assumption in the County's methodology that existing stormwater management regulations will provide adequate attenuation of future flows to prevent new flooding problems and degradation of LOS.
5. Given the extent of agricultural land uses in the watershed, the County should evaluate the potential benefits of conducting a limited monitoring program and assessment of the impacts of agricultural irrigation return flows. This analysis is needed to address the comments, received during Public Meeting Number 3, that return flows are the cause of observed increased base flow in Bullfrog Creek which may be altering the aquatic ecosystem. The results of this investigation, if conducted, should be shared with DACS and NRCS to assist them with developing BMPs to reduce pollutant loads to receiving waters and more efficiently use the region's water resources.
6. Evaluate the potential benefits to be derived from conducting a limited investigation to characterize fish farm discharges, and assess their impacts on downstream waters. This investigation would serve to verify the Southern Maintenance Unit's allegation that fish farm discharges cause accelerated, excessive aquatic growth in County ditches and could help quantify the significance of these facilities to annual nutrient loadings to the creeks and Tampa Bay. In addition, coordination with owner/operators may result in identifying simple, cost-effective remedial measures for water quality impacts, if any are observed.
7. Conduct a study to monitor existing septic systems and further evaluate their nutrient and pathogen discharge characteristics, as a means of better identifying their water pollution problems, if the current water quality sampling for bacteria and other pathogens by the University of South Florida suggests that septic tanks are a significant contributor to bacteria contamination.
8. Periodically update the Watershed Management Plan to reflect changes in the development of the watershed that impact water quality, new monitoring data, findings from assessments and special studies, and new regulations that impact discharges to receiving waters and private stormwater management system discharges.

#### INSTITUTIONAL CONSIDERATIONS

1. Continue coordination activities with FDOT to resolve flooding on US-41. Citizen input at the public meetings indicated that portions of US-41 have been closed to traffic during periods of heavy rainfall. While modeling does not indicate a flow-induced flooding problem, examination of SWFWMD aerial topographic mapping found the presence of low points on US-41 that may be periodically flooded by a combination of high flows and a high tide condition in Tampa Bay. US-41 is not a County road and remedial repairs were not

addressed in this study's recommendations. US-41 is a State highway and FDOT should undertake the necessary remedial actions.

2. Continue coordination with CSX to remedy problems of debris accumulating on CSX bridge and restricting flow by:
  - Redesigning the existing railroad bridge
  - Clearing debris during flood events

The railroad and bridge are not owned by the County and cannot be maintained by the County. However, debris that accumulates on the bridge restricts the movement of water and creates upstream flooding problems. The County should therefore request that CSX rectify the problem.

3. Coordinate with the Federal Emergency Management Agency to determine the availability and qualification requirements for assistance and/or buyout for landowners within the watershed that have experienced repetitive flooding losses.
4. Develop and implement a public education program, pertaining to the maintenance zones and the scheduling of maintenance, to educate the public about scheduled maintenance activities, procedures and schedules, in order to reduce the number of citizen complaints.
5. Enhance current coordination activities with the Florida Department of Agriculture and Consumer Services (DACS) in their ongoing programs of working with farmers to develop Farm Management Plans. These plans focus on improving irrigation practices and chemical management programs in order to further reduce nutrient and pesticide loadings to the watershed's receiving waters from agricultural land uses.
6. Enhance current coordination activities with DACS—the State agency charged with developing a suite of agricultural BMPs for use in various agricultural activities—in order to help determine the efficiency of these BMPs.
7. Cooperate with IFAS, NRCS, FFWCC, and other agencies to monitor and assess undesirable plant species in agricultural, coastal, disturbed, and fringe areas, in order to protect the remaining habitat areas within the watershed.
8. Develop a public-private partnership to monitor the spread of undesirable plant species and reduce nuisance vegetation in non-County habitat restoration areas.
9. Coordinate with the EPCHC, SWFWMD, FDEP and ACOE to develop delineation of those components of the County's primary drainage systems that have become jurisdictional wetlands through lack of maintenance over the past 20 years.

10. Coordinate with the EPCHC, SWFWMD, FDEP and ACOE to develop maintenance permits that will allow SMU personnel to provide the maintenance necessary to re-establish conveyance capacity within the drainage system that has been lost due to excessive aquatic and herbaceous growth in the absence of adequate periodic maintenance over the past 20 years.

## REGULATORY

1. Investigate the public allegation (Public Meeting Number 3) that current stormwater regulations are not being enforced in the watershed. If the allegation is true, then the County and/or relevant agencies should undertake programmatic enhancements designed to improve enforcement of existing regulations.
2. Improve their efforts at inspection and regulation of fish farm discharges, reportedly a frequent source of illicit discharges to the County's MS4 system. These discharges are reported by the SMU Staff to accelerate growth in County ditches and channels downstream of the discharges, which reduces channel conveyance capacity and may cause flooding of roadways and adjacent properties.
3. Aggressively enforce the requirements of its MS4 Permit regarding illicit discharges, such as those suspected from the fish farms in the south service area, in order to reduce annual pollutant loads discharged to receiving waters. Public education, combined with an effective tracing program can help to reduce the frequency of these discharges.
4. Increase their current level of inspection and regulation of non-County owned stormwater management facilities. Inspection of these facilities indicates that many are not being sufficiently maintained by the responsible entities. This effort should increase the levels of on-site treatment provided by private systems, generally work toward improvement of system-wide water quality LOS, and serve to reduce annual pollutant loads discharged to receiving waters.
5. Investigate the long-term benefits of implementing development regulations that require new development over a given size threshold to institute water quality monitoring at the development site to demonstrate that no degradation to water quality has occurred as a result of the land use change. The County could allow the developer, as an alternative, to pay into a fund that would allow the County to monitor site discharges.