EXECUTIVE SUMMARY

Introduction

In September 2003, Hillsborough County retained Ayres Associates Inc to update the Watershed Management Plan (WMP) for the Brooker Creek watershed, which was originally prepared in 2001. The main objective of this project is to perform water resources, natural systems assessment, Total Maximum Daily Load (TMDL), and water quality modeling for the watershed and prepare its supporting documents.

This study does not include the task of updating hydrological and hydraulic models for the watershed. As a result, Chapters 1 through 6 of this report remain for the most part, similar to the original version prepared in 2001. Throughout the report, where water quantity is discussed, this was generally left unchanged. Chapters 7 through 15 have been added to the report to reflect recent watershed conditions and studies performed during this study.

Based on the information collected and the analysis performed, a series of alternatives were developed to address water quality issues within the watershed. Chapter 15 presents the recommended projects for water quality improvement. In addition, a cost estimate for each recommended project was prepared. Since no hydraulic analysis could be performed, the accurate project sizing was not known. Therefore, project costs presented in this report may be subject to adjustments, depending on their actual size and detailed designs.

Condition of the Watershed

The Brooker Creek Area (BCA) watershed drains approximately 22 square miles of land located in northwest Hillsborough County, Florida. Brooker Creek is located in the northern half of the watershed and outfalls to Lake Tarpon in Pinellas County. The southern part of the watershed is comprised of a lake chain and wetland system that outfalls under Patterson Road into a drainage ditch and ultimately outfalls to Pinellas County. The southern system is also partially interconnected to the northern system via small diameter pipes that were most likely installed for agricultural purposes. Currently the project area consists of both agricultural and single family land uses. Some of the residential areas located in the BCA watershed include: Cheval, Canterberry, Van Dyke Farms, Keystone Terrace, and the Sand Dollar Resort.

The purpose of the study was to develop a computer simulation model of the BCA watershed. The model was used to develop this Storm Water Management Master Plan (SMMP) for the BCA watershed. The objective of the SMMP is to determine levels-of-service (LOS) for existing stormwater infrastructure and to develop alternatives and recommendations for improving those systems that are deficient.

In August of 2000, the existing conditions portions (Chapters 1 – 6) of the SMMP was updated to include calibration of the model using the September and December 1997 storms (El Nino) and adaptation of the model to Hillsborough Counties latest SWMM model.

The update also included adding in any significant development that occurred from 1995 – 2000 within the basin.

The U.S. Environmental Protection Agency's Storm Water Management Model (SWMM) was used to model the Brooker Creek watershed. The SWMM model utilizes a RUNOFF Block for hydrologic simulation and the EXTRAN Block for detailed hydraulic simulation. The RUNOFF Block, was modified by Hillsborough County to use the SCS runoff method, incorporating the required SCS shape factor of 256 which is dictated by the flat terrain of Florida.

The model study included field reconnaissance and collection of available survey and other relative data (e.g. SWFWMD aerials etc.). The model developed for the BCA basin includes the simulation of 107 subbasins and numerous open and closed conduit reaches. Numerous storage elements were also included to simulate the significant storage capacity of the existing lakes and wetland systems. Available rainfall data from two SWFWMD rain gages and stage data for eighteen lakes located within the basin were used for calibration of the model.

Historically, the BCA has had minimal flooding problems that are directly related to Brooker Creek. Per Hillsborough County's Northwest Maintenance Unit those areas where there have been significant problems in the past, such as the overtopping of Patterson Road in the southern part of BCA basin have been corrected. Other ongoing problems are localized and are typically a result of depressional areas or undersized driveway culverts or lack thereof.

The results of the model suggest that the LOS at three roadway crossings may not meet the County's requirements. The County's level of service requirements for road crossings state flooding of the roadways may not occur for either a 5, 10 or 25-year storm event. These include crossings at Spencer, Echo View, and Boy Scout Roads. Potential alternatives were developed and modeled for all the crossings as part of the original 1988 Brooker Creek SMMP. All of the alternatives were to increase the existing pipe sizes from as small as 18 in. to as large as double 30 in. pipes. Based on an initial estimate the cost for these improvements would range from $5,400 to $77,600. Additionally, it has also been verified that these improvements would not reduce the level of service of the downstream basins. Other possibilities to consider may include the impoundment of runoff at various locations in the watershed to enhance existing wetlands through supplemental hydration.

Recent County Improvements: Of the alternatives mentioned above, only Boy Scout Road had both historical evidence and model predicted flooding. Therefore, it was the only alternative recommended for implementation as part of the original Master Plan study. This project was recently completed by the County as part of the Capital Improvements Program (CIP 47129, Boy Scout Road Culvert Upgrade) and was added to the existing conditions model. The improvements have resulted in an improved LOS of "A" for the roadway crossing in this area. The two other locations are still only being recommended for monitoring.

Further model refinements can be made through the collection and verification of additional data (e.g., survey, field reconnaissance, additional interviews with local residents, etc.). This particularly applies in cases where there is a lack of historical data related to the "model identified" problem areas.

The SWMM model created for the BCA produces reasonable results for the simulation of hydrology and hydraulics of the basin. Model results suggest that the basin is neither peak nor volume sensitive and normal development criteria should apply. Additionally future development within the basin can continue to be incorporated into the model as well as other potential alternatives.

Water Quality, Natural Systems, and TMDL Requirements

The assessment of existing water quality and natural systems for the watershed is presented in Chapters 7 and 8, respectively, while water supply issues are discussed in Chapter 9. The existing information was used to perform pollutant loading and removal modeling (Chapter 10). The modeling results were used to develop water quality level of service (LOS) that is discussed in Chapter 11. Public involvement process and survey of potential contaminant sources are described in Chapters 12 and 13, respectively. Subsequently, best management practices (BMPs) were developed to address existing water quality issues that are presented in Chapter 14. In selecting the location for final structural BMPs, attempts were made to identify and use available publicly owned properties. Additional exploratory site visits were also performed to examine the suitability of the sites for specific projects. Final recommendations along with individual preliminary cost estimates are presented in Chapter 15.

To meet water quality standards both the Federal (Clean Water Act [CWA]) and state (Chapter 62-302, Florida Administrative Code [F.A.C.]) rules apply, and certain actions must be taken to protect, restore, and maintain water quality. In addition, for the area of this project, discharges to surface waters are also regulated by the Florida Department of Environmental Protection (FDEP), Southwest Florida Water Management District (SWFWMD), Hillsborough County Environmental Protection Commission (HCEPC), and/or the US EPA, depending on types and magnitude of the discharge. Water quality assessment of the BCA and TMDL evaluations were conducted taken into considerations all the applicable regulations by collecting water quality data and using a water quality model described in Chapter 7. A brief summary is described below.

Overall Water Quality Level of Service (LOS)

Using an average score for all water quality parameters combined, the overall LOS score for the entire watershed is a D. The greatest concentration of D and F scores for total nitrogen, total phosphorus, and TSS, was located in the central region of the watershed primarily surrounding the Keystone Lake, as well as nearby residential areas. These areas are predominantly comprised of various density residential and agricultural uses. These land uses contribute large quantities of various pollutants into surface waterbodies.

The overall low LOS score for the entire watershed (D) indicates that many subbasins surrounding large areas of contiguous remnant natural systems have been developed to some degree, resulting in low LOS scores for seemingly large undeveloped subwatershed.

Unless effective treatment measures are implemented, continued loading to surface waters in the watershed, and eventually into Old Tampa Bay, may result in significant water quality degradation. Efforts to reduce loading of pollutants to the Brooker Creek, channels, lakes, sinkholes, and groundwater should be incorporated into future management activities for the watershed. Reduction of pollutant loading should include implementation of local and regional stormwater best management practices (BMPs) to reduce or eliminate pollutant loading to receiving waters. To achieve this goal, a variety of BMPs, such as wet detention ponds, baffle boxes, alum treatment, improved wastewater treatment systems, and restoration of natural ecosystems may be used.

Natural System Conditions

The Brooker Creek watershed area encompasses 14,272 acres in Hillsborough County. The watershed contains plant communities, both terrestrial and aquatic, that provide a variety of important environmental functions, including habitat for listed species and other wildlife, stability for stream banks and lake shores, improvement of water and air quality, and moderation of water and air temperatures. However, plant communities have undergone several periods of significant alteration since the 1830's as land use in the watershed changed from original conditions to agriculture to the current suburban/urban uses. Land use shifts have left the watershed with substantially less acreage in native plant communities, impaired water quality in streams, degradation of all plant communities by non-native invasive plants, and highly disturbed stream banks and lake shores. Most populations of native wildlife have been reduced and/or eliminated. The changes to the natural system impact ecosystem behavior in ways that may alter water quality and viability of habitats. In order to remedy the adverse impacts to water quality, maintain healthy habitats, and meet the regulatory requirements, appropriate BMPs are recommended. Such recommendations are made based on the survey of existing natural conditions and water quality improvement goals.

Regulatory Background/TMDL

The Total Maximum Daily Load (TMDL) was originally promulgated as a part of the Federal Water Pollution Control Act and was later expanded by the Clean Water Act (CWA). The law requires states to define state-specific water quality standards for various designated uses and to identify water bodies that do not meet established water quality standards. Water bodies that do not meet such water quality standards as a result of human-induced conditions, are to be considered impaired.

In Florida, the TMDL process is multi-phased and includes identification, verification, and listing of impaired waterbodies, followed by the development and implementation of constituent-specific TMDL for different water quality parameters.

The Brooker Creek watershed has been delisted by FDEP for coliforms and nutrients, but US EPA proposed a TMDL for DO and has approved a TMDL for Fecal Coliforms. Public water supply requirements have impacted water levels/quality in both the surface water system and aquifers in the Tampa Bay region and TMDL development for receiving waters will be required in the near future.

Pollutant Loading and Water Quality Level of Service (LOS)

The gross pollutant loading within the watershed was estimated based on the 2004 land use and soils characteristics. The 2004 land use map indicated 10 different land uses categories that were evaluated for the pollutant loading model. Water quality evaluations were performed by assessing 12 water quality constituents in receiving waters. Gross pollutant loading was estimated by assuming no treatment of stormwater runoff. This parameter indicates the potential of each land use in yielding contaminants into the environment. To approximate the net pollutant loading within the watershed, the loading reduction due to the existing BMPs, was subtracted from the gross loading value for that watershed. Analyses were conducted at both watershed and subbasin levels. The details of these analyses are discussed in Chapter 10 of this report.

Based on these results, a water quality treatment level of service was determined at the subbasin and watershed levels within the Brooker Creek watershed. This type of analysis facilitates prioritization of water quality improvement alternatives for the watershed. Water quality treatment levels-of-service criteria were used as part of this study to allow comparisons of existing and proposed stormwater treatment conditions to pollutant loading goals and to help prioritize alternative BMPs throughout the watershed.

Three water quality constituents were identified and analyzed in greater detail due to their importance in local water quality management programs. These parameters included total suspended solids, total phosphorus, and total nitrogen. In addition, based on specific concerns, some subbasins required assessment of other parameters, including heavy metals and bacteria. Excess nitrogen can stimulate algal growth resulting in reduced light penetration through the water column, resulting in loss of seagrass. Other factors that affect light availability in the Bay are also of concern, including excess total suspended solids. Excess phosphorous can promote eutrophication and algal blooms, leading to degradation of water quality. Results from the pollutant loading model were used to develop LOS for each water quality constituents that are fully described in Chapter 11 of this report.

Structural BMP Alternatives

Analyses were performed using GIS to strategically locate structural BMP sites for water quality and natural systems improvements. Various methods were used to identify feasible alternative projects for implementation that are described extensively in Chapter 14. Water quality conditions were evaluated using the County's Water Quality Treatment Level of Service criteria and pollutant loading model. The proposed alternatives are developed to improve water quality and natural

systems consistent with the overall goals of the County.

Recent aerial photos were used to identify the most suitable and cost-effective sites for implementation of structural BMPs. The main criteria for site selection included proximity to streams/rivers (500-meter buffer zone), open areas, and publicly owned properties that are readily available for stormwater treatment in the form of retention or detention facilities. Initially a total of four locations for potential siting of structural BMPs are identified. Of the 4 potential sites, all fall within the 500-meter buffer of major streams. GIS analyses were performed to verify that the identified sites had no existing construction and were open areas suitable for construction of a stormwater treatment facility. The analysis showed that all four sites met this criterion. Further GIS analyses were performed to identify the parcels that were publicly owned. A field survey was conducted to examine the feasibility of placing BMPs at these four facilities. The survey indicated that only two of the four sites are feasible and are recommended as potential structural BMPs locations based on the established criteria in this study, except that these sites are privately owned. Site location, photos, maps and detailed preliminary cost estimates are described in Chapter 15. A brief summary of each site and total costs are presented below:

1. Binder

This site is located at the corner of Cosme Road and Gunn Highway and is under private ownership. The site is located to the west of an orange grove. The parcel also contains a private residence; however, the area located to the south of Cosme Road may provide and opportunity for water retention. This area of land is open with a few large trees. No wetland feature is visible and a tree nursery is located across the street of Cosme Road. This location is suitable for a structural alternative. The estimated cost of implementing such facility is $1,077, 700.

2. Rainbow Terrace

This site is located at the intersection of Crawley Road and Roberts Road, along Rainbow Terrace. The size and location of the parcel make it an acceptable location for a small treatment pond. This location is adjacent to an agricultural property and a horse farm. In addition, there is a possibility of a small wetland located in the back of the parcel. This location is fenced off due to its private ownership; land acquisition costs will be considered during the final cost analysis. This location may not only provide an opportunity for a wetland improvement/expansion project, but also become a home to a new treatment pond. The estimated cost of implementing this facility is $869,432.

In addition to the structural BMPs enumerated above, there are various state and local agencies that provide educational and outreach materials for the public at large and academic institutions. The specifics of these educational programs are presented in Chapter 15.