MIAMIBEACH

OFFICE OF THE CITY MANAGER
NO. LTC # 132-2008

LETTER TO COMMISSION

TO: Mayor Matti H. Bower and Members of the City Commission

FROM: Jorge M. Gonzalez, City Manager

DATE: May 5, 2008

SUBJECT: Stormwater System Overview

This Letter to Commission (LTC) is intended to provide you with an overview of the City's stormwater system and its current improvement program. At a later date, an LTC with a map will be sent providing locations where flooding concerns have been observed by City staff and/or complaints have been received from residents.

The Stormwater Utility is responsible for protecting the waterways from pollution and removal of stormwater from the roadways. It is also responsible for maintaining the stormwater conveyance system, relieving flooding conditions, and complying with National Pollutant Discharge Elimination System (NPDES) permit.

Most of the City's stormwater system was built between 40 and 50 years ago. Although the system has been relatively well maintained, intense development in recent years and changes in stormwater regulations have shown the system needs to be upgraded to provide the required level of service. The management of stormwater in the City is a difficult task because of its unique features: low ground elevation, high ground water table, poor soil percolation rates, and the environmentally sensitive nature of Biscayne Bay.

The City's stormwater system has two (2) primary objectives; the first is flood protection or the removal of stormwater and the second is water quality improvement or pollutant removal. Arguably the most important objective is flood prevention.

To successfully accomplish the flood prevention goal, the stormwater management system is required to prevent flooding of homes and businesses, maintain safe passage on roadways, and remove standing water within a reasonable amount of time. The City meets this objective by the following methods: permitting construction of new buildings and improvements only at elevations above the anticipated flood elevation; and by the construction of stormwater collection and conveyance systems to remove stormwater from the land surface and discharge it into the surrounding waterways or into groundwater.

Current building codes require all new construction to be completed with a finished floor elevation (FFE) above the 100-year flood stage elevation. Although this is successful in protecting the new structures, significant portions of the existing structures within the City are substandard with the FFE's at or below the necessary levels. The condition is exacerbated as new structures are built near older, substandard structures. The new structures shed stormwater and the resulting flow pools around or within the older, substandard buildings. Another problem associated with increasing land elevations is that it accelerates the rate at which stormwater runs off of the property and into the stormwater collection system. The accelerated stormwater runoff may overload the collection system and create pools of standing water at the point of collection.

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A canal network is also utilized as part of the City's stormwater management program. The canals are designed in conjunction with the stormwater system and reportedly were sized to handle a 25-year storm having a 24-hour duration. Although the canals provide discharge points for the City's outfalls, they do little to lower groundwater elevations. Because the elevation of the island is so low, groundwater elevations virtually mirror surface water elevations.

The final method of stormwater management is through the use of stormwater and other stormwater collection and conveyance devices. A stormwater system serves to collect and dispose of excess water after a rainfall event through containment and/ or rapid disposal by gravity driven outlets. A stormwater system is comprised of a collection of devices; typically catch basins, pipes and outfalls that historically have collected, conveyed and discharged stormwater runoff directly into surface water bodies. Seasonal and tidal influences can result in higher than usual water levels in the receiving waters, which will limit efficient operations of the stormwater system. These influences can cause localized flooding that usually abates after a short period of time, depending on the percolation rates and tidal fluctuation. The City's low elevation and location present a condition under which the capacity of even the most conservatively designed and well-maintained stormwater system can be temporarily exceeded by runoff from severe storms.

Since new direct outfall systems are not permitted under County guidelines, on-site retention systems are typically used. Various types of on-site retention systems, either alone or in combination are used by the City to achieve an appropriate and acceptable drainage system configuration. These systems include surface infiltration through grassed swales, underground seepage disposal, and drainage wells. The use of swales is a relatively easy and inexpensive method of stormwater management that tends to mitigate pollutant levels better than the others systems.

Underground seepage disposal systems, which disperse stormwater directly into the groundwater, can be used as drainage facilities. An example of these seepage systems are French drains. French drains are trenches filled with pea gravel and ballast rock that filter stormwater runoff before it enters the groundwater. This type of drainage is most commonly used for spot treatment of flooding areas.

The third type of on-site retention system is a drainage well. A drainage well typically consists of several collection basins fitted with pollution control boxes that are connected to an open-ended, vertical, cased well that discharges stormwater into the saltwater portion of the aquifer.

Drainage wells as previously described can operate under the influence of gravity or by a pressurized system. As surface water ponds, the elevation difference (head differential) between the ponded water and the groundwater table drives the stormwater into the pervious formations at the base of the well. Drainage well operation is dependent upon a multitude of variables. To minimize the influence of these variables and to improve well performance, the City is using pumps to pressurize drainage wells (injection wells).The use of injection wells has the ability to provide an increased flood level of service, and also to reduce residual standing water. The use of injection wells provides increased drainage capacity; however, it also greatly increases the cost and annual maintenance expenses of the City's drainage system.

In 1997 the City published a Comprehensive Stormwater Management Program Master Plan (Master Plan). The purpose of the Master Plan was to comply with the requirements of the federally mandated National Pollutant Discharge Elimination System (NPDES) program and the resultant Interlocal Agreement entered between the City and the County. The Master Plan evaluated over 160 stormwater basins; a stormwater basin is a defined surface area that drains to a common discharge point. Factors used to evaluate each basin were: pollutant loading, pollutant concentration, flooding potential, citizen complaint and City staff ranking. 34 of the 160 plus stormwater basins were identified as "priority drainage basins". The Master Plan was presented to the City Commission, and ultimately adopted by the City Commission. The Master Plan's 5-year Capital Improvement Program (CIP) recommendations were updated in 1999 and a Stormwater Revenue Bond was issued in 2000 to fund stormwater improvements to these 34 priority drainage basins.

The Master Plan originally identified proposed projects for the 34 stormwater priority drainage basins. During the development of the Stormwater Revenue Bond, Series 2000, capital improvements were grouped together and reclassified by the neighborhood in which they are located. The improvements were to meet the Miami-Dade drainage system design criteria which specify a 5-year storm level of service for collector and local streets in residential and commercial areas. Under the 5-year storm criteria roads must be passable allowing flooding to the crown of the street or within fifteen (15) feet of occupied buildings, whichever is lower. The original cost estimates generally were based on upsizing the conveyance pipes in the system with assumptions made that the existing outfall system of disposal would essentially be maintained. In actual design and construction, these cost estimates have been shown to be insufficient to address the adopted level of service. The need for additional facilities and capacity to address the 5-year storm standard and construction cost increases over the years has caused the overall program to increase from the original $50 million bond budget to an estimated amount of $163 million. The bond interest through March 2008 provided approximately $18.8 million, leaving an approximate shortfall of $94 million.

The Master Plan recommended improvements were generally incorporated without alteration into each of the neighborhood Basis of Design Reports. There were few exceptions where significant stormwater problems were identified by residents during the planning process for each neighborhood and then confirmed by CIP staff, the consulting engineer, and Public Works staff. In these few instances (such as Stillwater) stormwater funding was added to address the flooding issue, both CIP and Public Works agreed that it was appropriate to do so.

Post Basis of Design Report, the project moved into the design phase. As part of the design process, there is regular interaction between CIP and Public Works. At the 60% and 100% levels, the construction documents are sent to Public Works for review and permitting. Public Works staff regularly brings known problems that are not addressed by the BODRs to the attention of the CIP staff. If there is some flexibility in the budget and in the project design to address the issue, depending upon the severity, then it is usually added to the project.

Reports of flooding problems are reported to both to Public Works and CIP in a number of different ways. These include Better Place, direct resident inquiries, indirect resident inquiries via the City Commission's or City Manager's Offices, Public Works and CIP staff observation, and observation by the consulting engineers. The standard process for addressing these inputs is that these are typically routed to CIP to determine if one of the neighborhood projects is addressing the problem, if not, then the input is routed back to Public Works. In some instances, the flooding problem may be due to a clogged catch basin or conveyance pipe or some similar occurrence. In other cases, the problem is being caused by a third party and Public Works is able to have the third party address the issue. In some instances, the problem requires a minor modification, such as installing a short-run larger conveyance pipe, or maybe a small French drain or a well. On occasion, Public Works has funded Stormwater improvements from Operating Funds.

In addition, the Public Works Department has greatly expanded and funded the systematic maintenance of all of the stormwater systems via contractors and/ or City staff. The smaller pipe system (less than 18 inches), including catch basins and manholes were and continue to be cleaned every year and a half by City staff. Starting in 2003, the larger pipe system (larger than 18 inches), including catch basins and manholes, is cleaned on a five (5) year cycle.

Public Works and CIP are currently preparing a consolidated summary of known stormwater drainage issues that are not located in the priority basins. This is being mapped and will serve as graphic tool to illustrate potential future stormwater needs.

Should you have any questions, please do not hesitate to call me.

JMG/RCM/FHB/amj

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