



**HYDRAULIC ANALYSIS
OF
WASTEWATER TRANSMISSION SYSTEM
FOR
THE CITY OF FELLSMERE, FLORIDA
OCTOBER, 2005**

**I hereby certify that the information
contained herein is true and accurate
to the best of my knowledge and belief**

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EXECUTIVE SUMMARY

As recently as late 2001, all developments within the City of Fellsmere, except for the Elementary School and City Hall, have been serviced with “on-site” wastewater treatment and disposal (septic tank) systems. Through the Community Development Block Grant Program, the City was able to procure funding for construction of a wastewater transmission system which pumps into Indian River County’s Regional system for ultimate treatment and disposal. The initial system was limited in size and scope to initiate commercial growth along the County Road 512 corridor. At start-up of the City’s new wastewater transmission system in November of 2001, the system consisted of 6 and 8-inch diameter force main pipe from downtown Fellsmere along C.R. 512 to I-95. Originally, three pump stations were constructed, consisting of a downtown repump station, a grinder pump station located at Bruno’s Restaurant, and a system wide repump station at the Southwest corner of I-95 and C.R. 512.

During the past four years, new and currently approved developments as well as the connection of some existing commercial developments have substantially increased the extent of the original system. There are now eleven operating pump stations connected to the original force main with a twelfth station approved for the Willow Lake Estates subdivision. Additionally, wastewater flow from the Elementary School and City Hall pump directly into the wet well of the downtown repump station. The most recently approved pump stations have been associated with large residential developments and their corresponding large wastewater flows. The pressure of additional development and more wastewater flow has dictated the need for this Hydraulic Study not only to study the existing system, but also as a planning tool to be used with future development in the City.

The existing manifold pumping system is depicted on the aerial maps in Chapter 1. The pump stations and buried force main pipes are located near their actual location in the field according to observation and “record” construction drawings. The force main pipe to Willow Lake Estates (pump station no. 12) is depicted as a dashed line. The infrastructure for this development has been approved by City Council, but has yet to be installed. The Elementary School and City Hall pump stations are not indicated on the aerials since their direct discharge into the downtown repump station does not affect pressures and flows in the manifold system. Before inputting data into the hydraulic model, each individual lift station was visited by the Engineer and manufacturer’s pump curves were procured for each pump station. In many cases, the pump station start-up report was available. This information is provided in Chapter 4 for any future reference.

At the inception of this project, it was determined that free software developed by the U.S. E.P.A. could be used to accurately and easily model the Fellsmere Wastewater Transmission system. By using this “freeware”, no aspects of the project would be subject to proprietary information, thereby allowing unfettered distribution of the model and analysis software to all who are in the position to utilize the information. After gathering the system information, a hydraulic model was created using the digital program “EPANET 2” as released by the E.P.A. in September 2000. The model was subsequently run for each pump station, examined and corrected for any data input errors and calibrated to confirm the output data for pump station operation reasonably matched points on the manufacturer’s pump curve. Although the model results represent a good picture of how the existing system operates, its significant impact is that it can be utilized to predict

changes to the existing system as additional pump stations are added. As a pressurized, manifold system, it is important to realize that the operation of all other connected pump stations are affected by the addition of any other pressure source. Thus, it is highly recommended that the model be continuously updated as pump stations are added to the system.

As a system with independent variables at each pump station (varying levels in wet wells resulting in varying pump out rates) it is important to understand there an infinite number of operating conditions for the manifold wastewater system. In this report, the operating criteria used to judge the acceptability and effectiveness of each pump station and force main section is simple and straightforward. If the following three criteria were met, the existing system component was deemed to be operating at an acceptable level.

1. The velocity in force main pipes must obtain self cleaning velocity (2 fps) during at least one of the operating conditions examined.
2. When examined at the extreme low pressure condition (pump station operating alone in the manifold) the pump station must pump in excess of its peak design flow.
3. When examined at the extreme high pressure condition (all pump stations operating in the manifold) the pump station must pump at or near its average daily flow.

While the low pressure pump station condition will occur often in a system of this size, it is realized the high pressure condition will occur infrequently, usually only after a prolonged power outage. However, by utilizing these two lift station criteria, it is known the pump stations will operate between the two resulting pumping rates unless the manifold system is changed.

The hydraulic modeling results of the existing Fellsmere Wastewater Transmission system are presented in Chapter 3. The results indicate that each of the pump stations and force main sections currently in the system and that of the approved Willow Lake Estates subdivision meet the above criteria for an acceptable level of operation.

The modeling results together with the high pump flow rates for the Fellsmere Repump Station (pump station no. 3) indicate the Wastewater Transmission system is well “balanced” with adequate capacity. We strongly recommend the model be used for designing future additions to the system to maintain the current “balance”. The Fellsmere Repump Station should be monitored for run times and pump rates to determine the ultimate system capacity.

Table of Contents

1	EXISTING WASTEWATER TRANSMISSION SYSTEM
2	HYDRAULIC MODEL OF EXISTING WASTEWATER TRANSMISSION SYSTEM
3	RESULTS OF HYDRAULIC MODELING
4	PUMP STATION MANUFACTURER'S PUMP CURVE
5	EPANET 2 USERS MANUAL AND PROGRAM CD