

BLACK & VEATCH CORPORATION

TECHNICAL MEMORANDUM

**Fountain Sanitation District
Master Plan Enhancement Study
Task 600 – Lift Station Analysis**

**B&V Project 137033
November 22, 2004**

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Introduction

This task was to perform an analysis to determine the possibility of replacing the Race Street Pump Station (RSPS) with an all gravity sanitary sewer and to remove the hydraulic bottleneck under the railroad crossing at Illinois Avenue just west of Race Street.

There were a total of five options analyzed to provide alternatives with varying estimated costs to remove the RSPS and the hydraulic bottleneck. All five options are gravity sewers. Only one of the options will allow the removal of RSPS, however, some options are arranged to pass by RSPS in an effort to reduce the length of the force main associated with the pump station.

Data Used for Analyses

Invert elevations, ground elevations, and pipe lengths are taken from the file “Sewer Inv at RSPS Service Area.xls,” provided by GMS, Inc on February 8, 2004 and data supplied for the 2003 Fountain Sanitation District Wastewater Master Plan. Manning’s formula is used to calculate the capacity of pipes. A Manning’s “n” of 0.013 is used in the calculations. Unit construction costs are taken from Table 6-2 of the 2003 Master Plan. Excess flow was determined by finding the lowest capacity pipe segment in the stretch of overloaded pipe. This was the segment from OF-007 to OF-006. For proposed sewers 18-inch and smaller, the design flow to capacity ratio was 0.65. For proposed sewers larger than 18-inch, the design flow to capacity ratio was 0.78.

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Analyses Results

The options are summarized in the paragraphs below and shown in Figure 4-1. More detailed information is shown in Table 4-1.

The first analysis involved reviewing the pipe invert elevations at the RSPS and determining which parts of the collection system was lower than these elevations to allow a gravity sewer to replace the RSPS. The most feasible option is to tie the relief sewer into the proposed CIP project JC1-A at Old Pueblo Road south of Jimmy Camp Creek. The estimated capital cost for this first option relief pipe is \$439,600. This option assumes a constant pipe slope from OF-008 to RSPS and a second constant slope from RSPS to CIP JC1-A. This option also assumes the pipe will be buried under Jimmy Camp Creek. This may not be the case once more detailed information on the area is collected and the proposed CIP project JC1-A is constructed. Due to the elevation of the pipe inverts at RSPS compared to the rest of the collection system, there appears to be no other reasonable relief pipe alternatives to eliminate RSPS.

The second analysis involved the next two options to estimate the cost for shortening the RSPS force main and relieving the hydraulic bottleneck.

The second option is to divert all excess flow from MH OF-008 along Race Street to the RSPS, divert all flow from the RSPS, then route this flow west to MH SF-018 along Kentucky Avenue. The estimated capital cost for this option is \$170,800. This option has a constant pipe slope from OF-008 to SF-018. This option brings the gravity sewer to within a foot of the ground elevation at the RSPS. Due to the shallow pipe at RSPS this option is not feasible.

The third option is to divert all excess flow from OF-008 south on Race St to Indiana Avenue, then west on Indiana Avenue to Santa Fe, and then south on Santa Fe to MH SF-018. The estimated capital cost for this option is \$179,200. There appears to be no pipe

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depth problems near OF-088 or OF-002 with this option. This option will allow the RSPS force main to be shortened by approximately 460 feet.

The third analysis involved the next two options to estimate the cost for relieving the hydraulic bottleneck by using the route of the existing gravity pipe. These two options will have not effect on eliminating the RSPS or shortening its force main.

The fourth option is to replace the existing pipe from OF-008 to SF-019 with a constant slope pipe. The estimated capital cost for this option is \$218,400. The pipe slope of this option allows for all flow that was directed into the old pipe to be routed through the new pipe.

The fifth option is to replace the existing line from OF-008 to SF-019 with a line matching the existing slopes. The estimated capital cost for this option is \$232,400. Due to the changes in slope, the minimum necessary pipe diameter increases and decreases several times along the route.

Pump Station Inspection

An inspection of the RSPS was performed to determine the condition of its components. The information collected during the inspection and the information provided by the District shows that the RSPS is in fair condition. The pumps in the pump station are standard pumps that are sold by a local retailer and easy to acquire. Typically the pumps in the pump station have to be replaced once every three years.

Recommendations

It is recommended that the District keep the RSPS in service and maintained until it becomes cost effective to replace the pump station by serving the area with a gravity sewer.