



January 26, 2020  
Mr. Andy Harris  
WWTP Superintendent  
Page | 1

Mr. Andy Harris  
WWTP Superintendent  
City of Wheeling  
Water Pollution Control Division  
2516 Main Street, PO Box 6348  
Wheeling, West Virginia 26003-0613

Re: City of Wheeling – GC&P Sewer Capacity Analysis

Dear Mr. Harris:

The City is currently reviewing a request for connection for a new development on Bethany Pike just south of Greggsville Clinton and Potomac (GC&P) Road. The sanitary sewer along Bethany Pike is commonly referred to as the GC&P sewer. The proposed development information provided by The Thrasher Group, Inc. indicates a proposed increase in sanitary flow of approximately 0.177 MGD. The City has requested that CT Consultants provide a review of the existing sewer to determine if it has available capacity for new development.

#### Available Data

For the capacity review, the City has provided existing sewer drawings of the GC&P sewer, had CT install a temporary flow meter near the point of intended connection, and has a permanent meter installed at the downstream end of the system across from Hampton Inn. In addition, there are several permanent rain gauges located throughout the City.

#### Meters

The temporary meter is identified as the Yensen Landscape Meter and provides depth, velocity, and flow data from September 16, 2020 to February 19, 2020. It was located in the manhole on the property line of the Yensen Landscape business and the community park. The permanent meter is identified as the Hampton Inn Meter and has depth data available from January 1, 2014 to November 11, 2019 and depth, velocity and flow data available from November 16, 2019 to February 19, 2020. The Warwood Rain Gauge correlates the best to this location and has data available from January 1, 2014 to current.

#### Existing Sewer

The existing GC&P sanitary sewer downstream of the Yensen Landscape consists of approximately 4,700 ft of 24-inch sewer, 300 ft of 36-inch sewer, and 400 ft of 39-inch sewer. The slope of the various sections of 24-inch sewer range from flat to almost 3%. The 36 and 39-inch sewers have slopes from 0.04% to 1.5%.



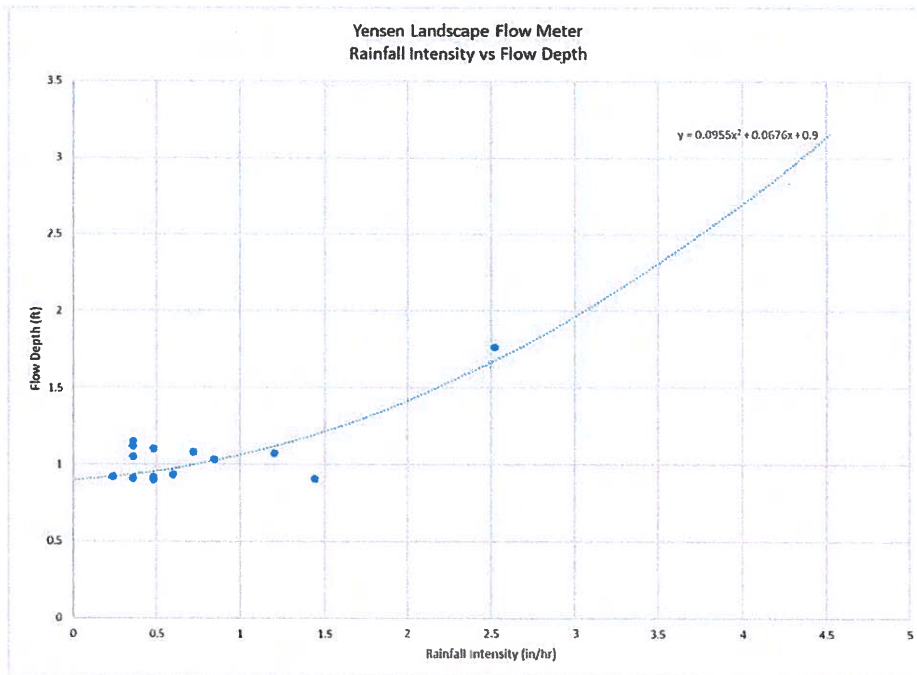
January 26, 2020  
Mr. Andy Harris  
WWTP Superintendent  
Page | 2

### Analysis

#### Yensen Landscape Flow Meter

The flow meter data is evaluated based upon the flow depth to sewer diameter comparison. The sewer capacity is considered to be questionable when the depth reaches 80% to 90% of the sewer diameter. During the flow metering period it was determined that 1 event occurred where the flow depth reached 85% of the sewer diameter. Further review of the data indicated that the sewer capacity is a function of the rainfall intensity (Figure 1) as opposed to total rainfall (Figure 2).

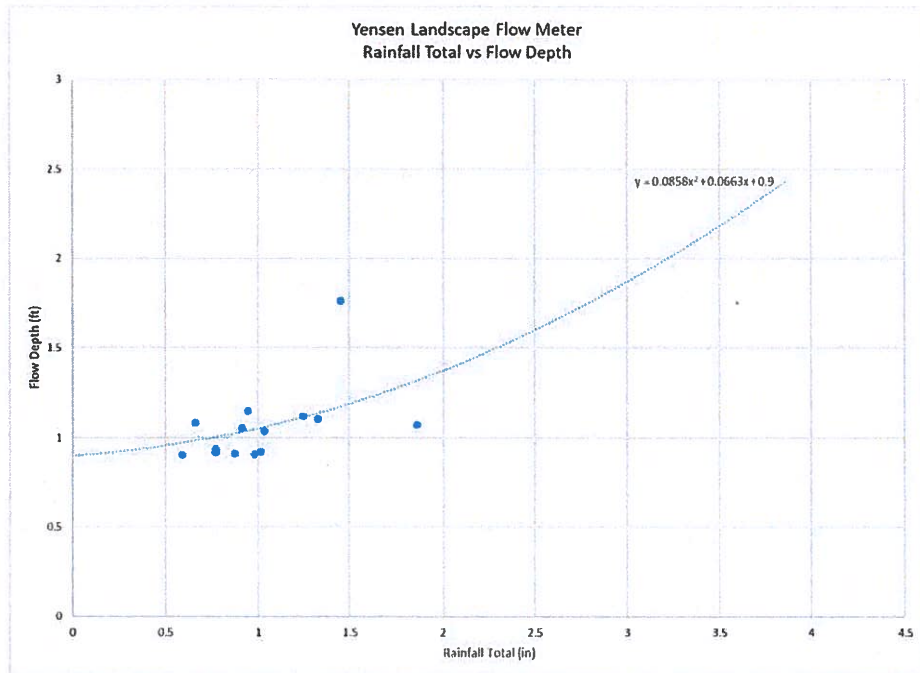
FIGURE 1





January 26, 2020  
Mr. Andy Harris  
WWTP Superintendent  
Page | 3

FIGURE 2



The flow meter data was also utilized to identify pipe conditions. The drawings indicated that the sewer pipe that was metered has a slope of 0.18%. The meter data indicated that the largest wet weather event created a peak flow of 5.89 MGD at a peak depth of 21.1 inches. Based upon Manning's equation, it can be determined that the sewer has a roughness coefficient of 0.014. This value is feasible based upon the sediment and fat/grease buildup observed during the flow meter installation.

#### Hampton Inn Flow Meter

This flow meter data was reviewed to identify how much the service area between the meters increased flows by during wet weather events. The review indicates that the service area between the meters doubles the flows. This is noted since there is not any Hampton Inn Meter flow data during the peak Yensen Landscape Meter peak event. The Hampton Inn flow meter was installed after the event occurred. It is estimated that the flows at the Hampton Inn Meter during that event were in the 11 to 12 MGD range.

#### Existing Sewer System

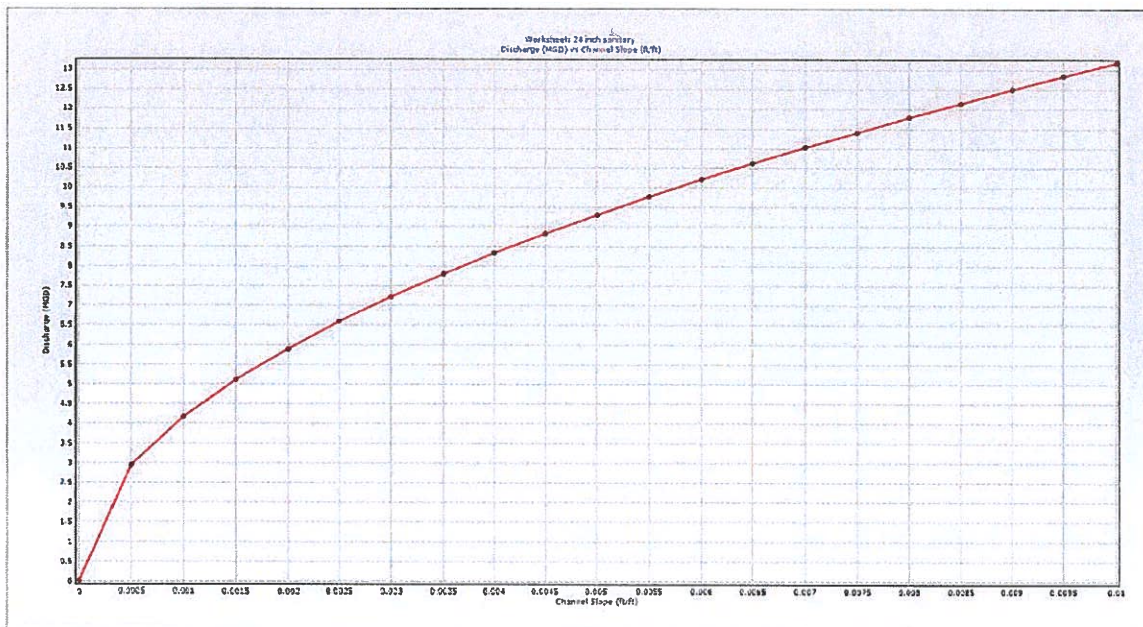
The existing GC&P sanitary sewer is primarily (87%) 24-inch sewer, the flows are doubling from upstream to downstream, and the upper end of the system almost reached capacity based on flow metering results. A 24-Inch full pipe capacity curve versus slope is provided below in Figure 3.





January 26, 2020  
Mr. Andy Harris  
WWTP Superintendent  
Page | 4

FIGURE 3



During the largest metered event, it is estimated sewer sections with a slope of less than 0.2% would have capacity issues at the upper end of the system. Sections of sewer where this is of concern are as follows:

- The sanitary sewer at Yenson Landscape north to GC&P Road.
- The sanitary sewers at the Long Run crossing and south to Howgait Court. The sewer is flat south of the crossing.

During the largest metered event, it is estimated sewer sections with a slope of less than 0.85% would have capacity issues at the lower end of the system. Sections of sewer where this is of concern are as follows:

- Various sections of sewer between Bethany Pike and Edgewood Street to the first downstream section from Park Road and Homestead Lane (approximately 465 ft in total).

#### Capacity Occurrences

Since sewer capacity issues appear to be related to rainfall intensity rather than the total rainfall. A historical review of rainfall data from 2014 to current was performed. It is assumed that rainfall events with intensities of 2.5 in/hr will create capacity issues within the system. A total of 38 events have occurred over the past 4 years. The number of occurrences have ranged from 4 to 9 per year with an



January 26, 2020  
Mr. Andy Harris  
WWTP Superintendent  
Page | 5

average of 6.3 per year. The primary months in which these events occur are the summer months of June through August. The occurrences included peak intensities from 2.5 to 6.2 inches/hour for storm events with total rainfall ranging from 0.21 to 2.84 inches

### Conclusion

It is CT's opinion that the existing GC&P sewer does not have any available capacity for future growth due to the wet weather impacts of higher intensity storms that occur on a regular basis each year.

If the City determines that further development is to occur on the GC&P sewer system, further investigation is necessary to determine the proper sewer improvements needed to allow future development. CT recommends that this analysis include the following:

- Additional longer term flow metering to identify rainfall intensity/flow impacts on the sewer system.
- Modeling of the GC&P sewer system with calibration to flow metering data to review sanitary sewer improvements needed for future development.

If you have any questions, please do not hesitate to contact me.

Respectfully,

CT Consultants, Inc.

Christopher Rybak, P.E.  
Project Manager

CPR/saa

Enclosures

cc: Jay Shutt, P.E., CT Consultants, Inc.

H:\2020\200326\REPORTS\2002 (Analysis Letter) CPR.Docx