

March 12, 2020, 2020

Ms. Jana Stewart, P.E.
City of Greensboro Water Resources
Via Email

**Re: Proposal for Engineering Services
Sanitary Sewer Assessment Services
City of Greensboro, NC**

Dear Ms. Stewart

Hydrostructures, P.A. is pleased to provide this proposal to sanitary sewer assessment services for the City of Greensboro. We understand that approximately 20 meters and 4 rain gauges will be deployed for a minimum duration of 3 months, with an option to extend depending on the number and quality of rain events that are captured. Separate deployments will be made for pre-rehabilitation and post-rehabilitation monitoring. We also understand that the City of Greensboro desires to perform smoke testing on selected basins within its sewer collection system as part of its Inflow and Infiltration reduction program. The priority areas include a total of approximately 150,000 linear feet of pipe.

Scope of Services

Gravity Sewer Flow Monitoring: We propose to install the temporary electronic flow meters at points selected by the City of Greensboro. The flow monitoring period will be a minimum of three (3) months. Four (4) tipping bucket rain gauges will be installed in conjunction with the flow monitors.

We will install Hach FL900 series flow monitors with submerged level-velocity sensors. The meters will continuously monitor the level and velocity within the pipe and calculate the corresponding rate of flow; a data point for level, flow, and velocity will be stored every fifteen (15) minutes. Combined with the Data Delivery System (DDS), the meters will continuously submit real-time data via a wireless cellular modem to a dedicated server where it can be viewed through an internet-connected web browser. The system will also include alarms to submit event notifications via SMS texts and emails in the event any

problems occur with the meters. A username and password will be provided to the City for read-only data access and review. Rain gauges are standard tipping buckets with data loggers. Rain gauges will be manually downloaded during site visits.

Hydrostructures will provide a two-man, confined space entry certified crew to assess the proposed meter sites, install the meters, and calibrate them to match the existing conditions encountered in the field. A Flow Meter Installation Log will be provided containing the manhole ID number, approximate location (address if available), groundcover photo of manhole, photo looking down into the manhole after sensor is installed, pipe diameter, pipe material, sediment level, initial level reading, and initial velocity reading.

Hydrostructures' Data Technicians will monitor meter operation and data via DDS on a daily basis. Any equipment malfunctions, sensor fouling, or other problems will be immediately apparent from the data. Field crews will be dispatched as soon as possible to troubleshoot and resolve the problems. Flow monitor and rain gauge sites will be visited a minimum of once a month to conduct manual level and velocity readings and calibrations. A Maintenance Log will be compiled during each visit and contain notes for any replacement or adjustment.

At the end of the first month of flow monitoring, the data will be processed and reconstructed (as needed) and both raw and edited final data will be provided for review. All data will be provided in digital Microsoft Excel .csv format. Hydrographs will be provided showing depth of flow, velocity, and flow rate. Scatter plots will be provided displaying level versus velocity. Rain data will be provided in Microsoft Excel in 15-minute intervals.

Smoke Testing: Smoke testing enables field inspection staff to quickly identify direct sources of inflow and rainfall dependent infiltration entering the sanitary sewer system. Using a mechanical blower, smoke is forced into the sewer collection system through a manhole. The smoke exits the system through the same points where I&I enters the system. For each defect located, the following information shall be collected:

- Unique smoke test identification number
- Test date
- Basin and sub-basin names
- Physical location (street address)
- GPS coordinates of defect (map grade accuracy – within +/- 1.0 feet)
- Source description
- Smoke intensity
- I/I Rating
- General comments

A photograph shall be taken of each positive smoke observation, close enough to show the exact location of the defect but far enough back to show the general location of the defect relative to adjacent structures or landmarks.

Door hangers will be distributed at least 24 hours but no more than 7 days in advance of any smoke testing activities to notify the public of the upcoming work. Each day of smoke testing and prior to starting work for the day; the local fire and police departments, as well as any hospitals, schools or other sensitive businesses within the area to be tested will be informed of the locations where work will be occurring.

To allow our Project Manager to track the progress of the field work and the client to know when and where crews are working in real time, we utilize the Fulcrum mobile data collection app to collect all data. Fields will be pre-populated with commonly used information to allow for quicker data entry and prevent data entry errors. The app also allows our data specialists to access and download the field data for analysis at any time. We will provide access to the website hosting the data to key staff at the City by assigning a "guest" username and password.

Fee Estimate

Our proposed fees include all labor, materials, equipment, leasing fees, software and other incidental costs needed to complete the scope of services discussed above.

Pre-Rehabilitation Flow Metering

15 Gravity Flow Meters/ 4 Rain Gauges for a 3 Month Metering Period

- | | |
|--|--------------|
| 1. Flow Monitoring (15 Meters @ \$2,600/meter/month) | \$117,000.00 |
| 2. Rain Gauge (4 Gauges @ \$500/gauge/month) | \$6,000.00 |

Total Pre-Rehabilitation Metering Cost **\$123,000.00**

Post-Rehabilitation Flow Metering

15 Gravity Flow Meters/ 4 Rain Gauges for a 3 Month Metering Period

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|--|--------------|
| 3. Flow Monitoring (15 Meters @ \$2,600/meter/month) | \$117,000.00 |
| 4. Rain Gauge (4 Gauges @ \$500/gauge/month) | \$6,000.00 |

Total Post-Rehabilitation Metering Cost **\$123,000.00**

Smoke Testing

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| 5. Smoke Testing (150,000 LF @ \$0.40/LF) | \$ 60,000.00 |
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Total Smoke Testing Cost **\$ 60,000.00**

TOTAL PROJECT COST **\$306,000.00**

Additional/Optional Services

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|--|-----------------------|
| 1A. Extend Flow Monitoring (Including Data Processing) | \$2,400.00/Meter/Week |
| 1B. Utilize Equipment Provided by City (Deduct) | -\$600.00/Meter/Month |
| 2A. Extend Rain Monitoring (Including Data Processing) | \$400.00/Gauge/Month |



Project Schedule: We will begin installing the meters with 15 days receipt of a written notice to proceed from the City. All final data will be delivered within 21 days from the date the meters are removed. We will begin smoke testing field services with 15 days receipt of a written notice to proceed from the City for that work. Field work shall be completed within 60 days, and final data will be delivered within 30 days from completion of field work.

We appreciate the opportunity to assist you with this project. If you have any questions or need any additional information, please give me a call at (919) 542-5002, Ext. 222#.

Sincerely,
HYDROSTRUCTURES, P.A.

Michael S. Koonce

Michael S. Koonce, PE
President



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