

CITY OF HIGH POINT

AGENDA ITEM



Title: Sanitary Sewer Master Plan

From: Terry Houk – Public Services Director
Derrick Boone – Public Services Asst. Director

Meeting Date: July 17, 2017

Public Hearing: N/A

Advertising Date: N/A
Advertised By: On-Call

Attachments: Bid Recommendation
Attachment A – Sanitary Sewer Master Plan Proposal

PURPOSE:

The Public Services Department has identified the need and budgeted for a sanitary sewer master plan for evaluating wastewater capacity for current conditions and for future development. The master plan will be beneficial for planning and prioritizing future capital improvement projects for the sanitary sewer collection and treatment system.

BACKGROUND:

The professional engineering services to be provided for this project involve work associated with flow monitoring and data collection, hydrologic and hydraulic model development, capacity analysis, improvement alternative analysis, and prioritization of capital improvement projects.

BUDGET IMPACT:

Funds for this project are available in the 2017-2018 Budget.

RECOMMENDATION / ACTION REQUESTED:

The Public Services Department recommends approval and asks for the Council to award the professional engineering services to CDM Smith in the amount of \$410,300.



**FORMAL BID RECOMMENDATION
REQUEST FOR COUNCIL APPROVAL**

DEPARTMENT: **Public Services**

COUNCIL AGENDA DATE: **July 17, 2017**

BID NO.: CONTRACT NO.: DATE OPENED:

DESCRIPTION:

The Public Services Department has identified the need and budgeted for a sanitary sewer master plan for evaluating wastewater capacity for current conditions and for future development.

PURPOSE:

The master plan will be beneficial for planning and prioritizing future capital improvement projects for the sanitary sewer collection and treatment system.

COMMENTS:

RECOMMEND AWARD TO: **CDM Smith** AMOUNT: **\$410,300**

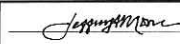
JUSTIFICATION:

ACCOUNTING UNIT	ACCOUNT	ACTIVITY	CATEGORY	BUDGETED AMOUNT
421779	527105	421151027205	40207	\$410,300
TOTAL BUDGETED AMOUNT				

DEPARTMENT HEAD: **Terry Houk** Digitally signed by Terry Houk
DN: cn=Terry Houk, o=City of High Point, ou=Public Services, email=terry.houk@highpointnc.gov, c=US
Date: 2017.06.29 10:43:37 -0400 DATE: **Jun 29, 2017**

The Purchasing Division concurs with recommendation submitted by the **Public Services** and recommends award to the lowest responsible, responsive bidder **CDM Smith** in the amount of \$ **410,300.00**.

PURCHASING MANAGER: **Erik Conti** Digitally signed by Erik Conti
DN: cn=Erik Conti, o=City of High Point, ou=Public Services, email=erik.conti@highpointnc.gov, c=US
Date: 2017.06.30 14:13:30 -0400 DATE: **Jun 30, 2017**

Approved for Submission to Council
FINANCIAL SERVICES DIRECTOR:  Digitally signed by Jeffrey A. Moore
DN: cn=Jeffrey A. Moore, o=City of High Point, NC, ou=Financial Services Director, email=jfmoore@highpointnc.gov, c=US
Date: 2017.07.06 17:18:11 -0400 DATE: **Jul 6, 2017**

CITY MANAGER: **Greg Demko** Digitally signed by Greg Demko
DN: cn=Greg Demko, o=High Point, ou=High Point, email=greg.demko@highpointnc.gov, c=US
Date: 2017.07.07 11:25:49 -0400 DATE: **Jul 7, 2017**



5400 Glenwood Avenue, Suite 400
Raleigh, North Carolina 27612
tel: 919-325-3500

June 12, 2017

Mr. Derrick Q. Boone
Assistant Public Services Director
City of High Point
211 S. Hamilton Street
High Point, North Carolina

Subject: City of High Point
 Sanitary Sewer Master Plan
 Proposal for Engineering Services

Dear Mr. Boone:

CDM Smith is pleased to submit this proposal for Engineering Services to the City of High Point for the Sanitary Sewer Master Plan project. Our proposed scope of services, schedule for completing the work and fee estimate are summarized further below.

A. BACKGROUND

The City of High Point would like to develop a hydraulic model of their sanitary sewer collection system for use in evaluating capacity and options for capacity improvements both for potential existing capacity issues and for future development. Two critical pieces of information are required for the model that can be expensive to collect: physical data for the pipes (especially connectivity, diameter, slope, rim elevation, and invert elevation information) and flow data during dry and wet weather (peak, minimum, and average velocities, depths, and flow.) The City's GIS will provide diameter and connectivity information; however, slope, rim, and invert elevation information is not available. The City plans to hire a summer intern to go through their scanned As-Built data for large diameter modeled pipes (generally 20-inches and above with limited priority 15-inch added) and input this information into the GIS for use in the hydraulic model. The City has 12 pump stations with flow data and 8 permanent rain gages. Of those 12 pump stations, seven of those pump flow meters would be analyzed as they discharge to large diameter pipe. In addition, the City has three chart recorder meters measuring discharge from Archdale, Jamestown, and Sedgfield. Additional temporary flow monitors are required to augment the available flow information and provide the correct flow distribution in the upstream pipes and pipes with no pump stations. These additional temporary meters will be installed in the high groundwater time starting in December 2017 to capture representative wet weather peak flows.



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B. SCOPE OF SERVICES

This project consists of seven major tasks which are described in more detail in the following paragraphs.

Task 1 – Flow Monitoring and Data Collection

Task 2 – Flow Monitoring Data Analysis and Hydrologic Model Development

Task 3 – Flow Projections

Task 4 – Hydraulic Model Development and Calibration

Task 5 – Capacity Analysis

Task 6 – Improvement Alternatives Analysis

Task 7 – Prioritized CIP and Report

Task 1 – Kickoff Meeting and Data Collection

Task 1.1 - Project Kick-off Meeting - CDM Smith will conduct a kick-off meeting with City staff to clearly define the goals, objectives and priorities to help focus the work effort to be accomplished in this project. The meeting will identify the primary objectives of the City's collection system modeling so that the methodology developed under subsequent tasks may be tailored to achieve those objectives. Data collection and requirements will also be discussed as well as appropriate planning and design criteria for the various aspects of this study.

Task 1.2 – Review of Data – The City will provide and CDM Smith will review the following information which includes existing studies, pump station data, flow projection data, and other available documentation.

- Current GIS of the wastewater collection system
- Updated GIS information (or electronic file that can be linked to pipe and manhole asset ID) with slope, rim, and invert elevation information of all pipes 20-inches and larger and limited priority 15-inch pipes (see Task 4.1 below)
- Locations of recent pipe improvement projects if not already contained in the GIS
- Available population projections, existing land use, future land use, development information and planning studies other than TAZ data.
- Pump station information including number of pumps, pump capacities, pump curves, drawdown test results (if available), wet well dimensions/volume, pump on/off levels, other available operational data, and elevations of sewer entering pump stations
- Force main profiles, if available.

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- Information on downstream hydraulics (whether force mains coming out of the project area are free flow discharge or pumping against a full pipe, etc.)
- SSO information including location, volume, date, and reason, if known.
- Basement back-up information including location, date, and reason, if known.
- Information on unusual structures in the basin that may divert flow, transfer flow, or hold back flow (storage, siphons, weirs, etc.)
- Large customers/water users
- Flow data at the treatment facilities.
- Flow and rainfall data from pump stations with flow meters and/or rain gages and chart recorder flow data from the three wholesale discharger meters.
- Flow data from any outside areas (mergers, acquisitions) that convey flow into the project area either now or anticipated in the future.
- Planned capital improvements to the infrastructure in these service areas.

Task 1.3 – Flow Monitoring Data Collection – CDM Smith will develop a flow monitoring plan to collect pertinent flow and rainfall data for the City’s service area. CDM Smith will make recommendations regarding flow monitor locations, subbasin size, and duration of flow monitoring. This scope includes \$82,000 for a temporary flow monitoring program based on the estimated cost for installation and maintenance of 20 temporary flow monitors and 3 rain gauges installed for 60 days. CDM Smith intends to subcontract flow monitoring services to Hydromax USA. The scope also includes \$10,000 to purchase radar rainfall that has been correlated to the temporary rain gauges. Should flow monitoring need to be extended on a weekly basis for lack of adequate rainfall events, an amendment or change order would be required as noted in the compensation section below.

The flow monitoring equipment will be capable of measuring the depth and velocity of wastewater flows in gravity sewers at preset, synchronized time intervals of 15 minutes. Pressure sensors will be installed with the capability of measuring depth of surcharging at the monitoring locations. Flow monitoring sites will be selected in conjunction with the City. Radar rainfall will be correlated to the temporary flow monitoring gauges. Flow and rainfall data will be provided to the City in spreadsheet format. The data shall include, date, time, depth, and average velocity and flow at 15-minute increments or less. Site installation will also be provided for each monitoring site.

CDM Smith will review the flow data and determine with City staff 3 appropriate storm events to analyze as well as a period of dry-weather flow to analyze. This data will serve as the basis for the hydrologic model developed in Task 2.

Task 2 – Flow Monitoring Data Analysis and Hydrologic Model Development

CDM Smith will analyze the temporary flow monitoring data collected as part of Task 1. CDM Smith will decompose wastewater flow meter data into base flow, groundwater infiltration, and rainfall dependent infiltration and inflow (RDI/I) components for up to 3 storm events. CDM Smith will then develop a hydrologic model using a unit hydrograph approach (RTK approach.) RDI/I hydrographs will be developed that are calibrated to actual flow monitoring data and used to project the system response from design storm events. The EPA SSO Analysis Package (SSOAP) will be used to develop the hydrologic model using the RTK approach. A meeting will be held with City staff to review the results of the flow analysis.

Task 3 – Flow Projections

Flow projections will be developed for the 2025, 2030, 2040 and buildout scenarios for the sub-basins. The flow projections will be based on TAZ planning data and other information provided by the City on land use and population projections. CDM Smith will review the basis for the water demand projections developed by Hazen and Sawyer and the City will provide any additional development information used in the water demand projections for use in the wastewater flow - projections. A meeting will be held with City staff to review the results of the flow projections analysis.

Task 4 – Hydraulic Model Development and Calibration

Task 4.1 – Hydraulic Model Development - CDM Smith will create a dynamic hydraulic model of the City's sanitary sewer system. The model will contain gravity sewer owned by the City 20-inches in diameter and larger as well as priority 15-inch sewers. Associated pump stations with inlet pipe diameters 15-inches or larger will also be included. The City will provide pump station data for pump stations as noted in Task 1.2 above. Only pump stations shown in Figure 1 will be analyzed and included in the model. The model set-up will be based on the City's updated GIS. It is anticipated that the City will provide updated information in GIS format that includes as-built information for manhole rim and inverts, as well as, pipe invert and slope information. Areas where no invert information is provided will be interpolated based on known inverts or minimum slope will be assumed. Existing dry-weather flows as determined in Task 2 will be input into the model at a "load point" based on subbasin delineation. Wet-weather flows will be calculated using the hydrologic model developed in Task 2. Model data files will be provided to the City at the conclusion of the project; however, the modeling software will not be provided.

Task 4.2 – Model Calibration - This task will include calibrating the hydraulic model to dry- and wet-weather flows. The model will be calibrated to average dry-weather flow, peak dry-weather flow, and depth captured by the flow monitors. Existing dry-weather wastewater flows generated in the sewershed will be input into the model at a "load point" based on the subbasin delineation. The model will be calibrated to one storm event from the flow monitoring period and verified using

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1-2 other storm events. A meeting will be held with City staff to review the results of the model calibration.

Task 5 – Capacity Analysis

CDM Smith will use rainfall-frequency analysis of historical rainfall records to develop design storm events (e.g. SCS type II, 2-yr and 5-yr storm events) and the resulting hydrographs input at each load point on the hydraulic model for the wet weather analysis.

For each model scenario, the calibrated hydraulic model from Task 5 will be used to determine available sewer capacity and potential lines needing additional capacity. Model scenarios will include existing and future dry- and wet-weather flows. The sewer capacity analysis will result in maps illustrating the percent of full pipe capacity that is used under existing and future conditions. These maps will guide development of the sewer system improvement alternatives that will be evaluated under Task 6. The sewer capacity analysis will also identify hydraulic restrictions in the system that may lead to capacity problems under wet-weather or future flow conditions. CDM Smith will meet with the City to discuss the results of the capacity analysis.

Task 6 – Improvement Alternatives Analysis

The hydraulic model will be used to evaluate planning level alternatives needed to meet existing and future sewer requirements. The improvements will focus on addressing sewer system capacity concerns identified in Task 5. This analysis includes a comparison of peak flows to pump station capacities and maximum velocity checks in force mains. Improvements may consist of increased system capacity (upsized sewers and/or pump stations), I/I reduction through sewer rehabilitation, or various combinations of these improvements. Planning level conceptual cost estimates will be developed as a means of comparing alternatives.

CDM Smith will identify potential implementation problems or other non-cost related factors for improvement alternatives. A meeting will be held with the City to review the results of the alternatives analysis. With City input, CDM Smith will select and recommend appropriate improvement alternatives to meet overall planning objectives.

Task 7 – Develop Draft and Final Reports

CDM Smith will prepare a report that includes the methodologies, results, and conclusions of the above tasks. The report will identify and describe the location, size, and costs of all recommended improvements. Sewer system maps showing the location of existing sewers and recommended phased improvements will be developed by CDM Smith and provided to the City.

Comments from the draft report will be incorporated into a final report. The report will be electronically submitted in PDF format. In addition to a thumb drive of the report, 4 hard copies of



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the draft and 4 hard copies of the final report will be given to the City. A thumb drive with the hydraulic model and all other relevant data will also be delivered.

C. SCHEDULE

Task 1 kickoff meeting is anticipated in September 2017. Pending City approval of the flow monitoring plan by October 15, 2017, temporary flow monitors and rain gauges are anticipated to be in place no later than December 1, 2017. It is anticipated that final flow metering data will be received within 4 weeks of the completion of the flow metering period. CDM Smith will complete Task 2 (Flow Monitoring Data Analysis and Hydrologic Model Development) within 8 weeks of receipt of the data. Task 3 (Flow Projections) will be completed within 12 weeks of receipt of the flow data assuming that the flow projections developed as part of the water master plan are available by January 2018. Task 4 (Hydraulic Model Development and Calibration) will be completed within 8 weeks after the completion of Task 3 assuming that the City has entered as-built information into the GIS by October 2017. Tasks 5 and 6 (Capacity Analysis and Improvement Alternatives Analysis) will be completed 16 weeks after completion of Task 4. The draft report will be completed within 4 weeks of completion of workshop to review the CIP. The final report will be completed within 2 weeks from receiving comments from the City.

D. COMPENSATION

For the Basic Services performed by ENGINEER under Section B of this Task Order, OWNER agrees to pay the Engineer a lump sum fee of \$410,300 for the services included in Tasks 1 through 7. In addition to this compensation, the City reserves the right to amend this Contract so that the Engineer may furnish additional services as may be needed (such as additional flow monitoring services, if required, as noted in Task 1 above).

Payments shall be made on a monthly basis in proportion to satisfactory services performed.





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A breakdown of costs by task for is provided below for information purposes only:

Task	Description	CDM Smith Labor Cost	Outside Professionals	Other Direct Costs	Total Task Budget
1	Flow Monitoring and Data Collection	\$17,500	\$92,000	\$ 700	\$110,200
2	Flow Monitoring Data Analysis and Hydrologic Model Development	\$60,900	\$ -	\$ 2,400	\$ 63,300
3	Flow Projections	\$24,400	\$ -	\$1,000	\$ 25,400
4	Hydraulic Model Development and Calibration	\$60,900	\$ -	\$2,400	\$63,300
5	Capacity Analysis	\$27,400	\$ -	\$ 1,100	\$ 28,500
6	Improvement Alternatives Analysis	\$49,700	\$ -	\$ 2,000	\$51,700
7	Prioritized CIP, Report, and Project Management	\$ 65,300	\$ -	\$ 2,600	\$ 67,900
	TOTAL Tasks 1-7	\$306,100	\$92,000	\$ 12,200	\$ 410,300

Thank you for the opportunity for CDM Smith to serve the City of High Point and your customers. We look forward to working with you on this important project. If you have any questions or need any additional information please let me know.

Sincerely,

Christine Nesbit, P.E.

Vice President

CDM Smith Inc.

