CITY OF HIGH POINT
AGENDA ITEM

Title: **Sanitary Sewer Hydraulic Modeling and Master Plan Update**

CDM-Smith

From: Robby Stone – Public Services Director
Derrick Boone – Public Services Asst. Director

Meeting Date: August 1, 2022

Public Hearing: N/A

Advertising Date: N/A

Advertised By: On-Call

Attachments: Attachment A –Proposal for Engineering Services

PURPOSE:
The Public Services Department has identified the need to update the sanitary sewer master plan (2018) for current conditions and for future development. The updated sewer 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 phase of the project include updating the existing sewer hydraulic model with revised alternatives and capital improvement projects. The project will include expansion of the model to include sewer lines 10-inch and greater and select 8-inch sewers. A future phase of the project will include the update of the Sewer Master Plan.

BUDGET IMPACT:
Funds for this project are available in the 2022-2023 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 $289,800.

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

July 15, 2022

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

Subject: Sewer Hydraulic Modeling and Master Plan Update
Proposal for Engineering Services

Dear Mr. Boone:

CDM Smith Inc. (CDM Smith) is pleased to submit this Proposal for Engineering Services to the City of High Point for Sewer System Hydraulic Modeling based on our phone conversations and the Background Section presented below.

A. BACKGROUND

CDM Smith developed a Sanitary Sewer Hydraulic Model for the City of High Point in 2018 generally for sewers greater than 18-inch in diameter and associated pump stations. CDM Smith also developed a Wastewater Master Plan (WWMP) including future flow projections and a capital improvements plan (CIP) in 2018 (final document completed in 2019.) The model calibration and design flows to the Westside plant (for which some uncertain assumptions were required in 2018) were verified to be reasonable in 2020 using additional flow monitoring data that captured a large design level storm event. This verification was documented in an April 6, 2020, letter report. Therefore, CDM Smith is comfortable with the current model flows. The City has indicated that there is no urgent need to re-do the previously estimated future flow projections (as there is little additional data available to justify updating these in FY23.)

However, there are three issues that do require an updated hydraulic model and corresponding CIP. First, several key improvements have been implemented or are under construction (including a new parallel Riverdale pump station (PS) force main, an upgrade to Registers Creek PS and new manifolded force main, and a new and re-routed Waterview PS force main). These improvements need to be added to the model along with several other updates related to additional data collection and improved data attributes performed over the last few years (including incorporating Upper Boulding, Shadybrook, Trinity, & Rich Fork basin model updates). Secondly, the current CIP was driven by the assumption that the City did not wish to upgrade the Riverdale PS beyond 30 mgd capacity. As a result, an option to pump flow coming into Waterview PS over to Westside Wastewater Treatment Plant (WWTP) (versus the current pumping configuration to Eastside

WWTP) was recommended to both alleviate flows to Riverdale PS and accommodate high peak flows to Waterview PS now and in the future. The City is now evaluating an option to upgrade Riverdale PS (potentially up to 45 mgd), which would significantly change the prior improvements alternatives analysis.

Lastly, the City has been receiving development requests in upstream portions of the system for which capacity is unclear. The City would like to add additional smaller diameter pipes to the hydraulic model, especially in locations where development is anticipated. One of the critical areas of development concern is the Northwest part of the City near Kernersville and upstream of the Waterview PS.

To address these issues, CDM Smith proposes a two-phased project approach:

Phase 1- Model Update with Revised Alternatives Evaluation and CIP and Model Expansion

Phase 1.1 Model Update with Revised Alternatives Evaluation and CIP

Phase 1.1 will provide a revised CIP by November 2022 to serve as valuable input for budget planning. No model expansion or re-calibration is included in this first task, but this evaluation is critical to understand the effects that the proposed upgraded Riverdale PS capacity has on prior recommended improvements (i.e., some improvements may not be needed or may be less extensive.) In addition, the opinion of probable construction costs will be updated from the 2018 estimates.

This task will also include delivery of a detailed spreadsheet and/or GIS files regarding the level of development assumed/included in the model. This spreadsheet will allow the City to make capacity determinations for development approvals based on evaluation of the larger diameter pipes and pump stations (and assumed CIP.)

Also included in Phase 1.1 is a preliminary model expansion assessment where CDM Smith will assist the City in identifying pipes for model expansion in key areas for Phase 1.2.

Phase 1.2 –Model Expansion

Phase 1.2 includes an initial data collection effort to add additional As-Built data to the GIS for model expansion for sewers 10-inch and greater and select 8-inch sewers. Once this information is collected the model can be expanded. Expansion will include subdividing sub-catchments to facilitate re-allocation of existing and future flows to the newly added upstream pipes. Additional flow monitoring on expanded model pipes is recommended in the future but not required for this task. The more-detailed model will be verified against the Task 1 modeled flow loadings to ensure the integrity of the WWMP calibration is maintained. Once this phase is complete, the model will be more useful to the City in terms of assessing smaller diameter pipe capacities as part of

development reviews. An initial capacity analysis of the newly added pipes will be performed, but improvements will not yet be recommended and costed until Phase 2. The intent of this task is to provide the City with an expanded model to use in development reviews and assist with identifying additional flow monitoring locations. (i.e., based on the capacity analysis of expanded model sewers, additional flow monitoring will likely be prioritized for pipes showing capacity issues to verify flow distribution assumptions.)

Phase 2 – Master Plan Update

CDM Smith recommends additional flow monitoring analysis and model re-calibration to refine the additional model expansion conducted as part of Phase 1.2 (i.e., additional pipe 10-inches and larger added to the model as well as critical 8-inch diameter lines). Once the model expansion areas are refined with flow monitoring data, then the capacity analysis, alternatives analysis, and CIP will be updated with projects required to address deficiencies identified in the newly added sewers. Phase 2 could also include updates to future flow projections in Fiscal Year 2024.

B. SCOPE OF SERVICES

The proposed scope of services for each phase are described in more detail below. A budget estimate is provided for Phase 1, but not yet for Phase 2 as actual costs will depend greatly on the number of flow monitors and associated analysis (to be determined as part of Phase 1.)

Phase 1 - Model Update and Revised Alternatives Evaluation and CIP and Model Expansion

Phase 1 includes the following 8 tasks.

Task 1 – Model Update & Future Flow Projections Detail

CDM Smith will update the hydraulic model with the following new or revised information: Upgrades and re-routed Waterview PS force main, upgrades to Registers Creek PS and new manifolded force main, addition and use of parallel force main at Riverdale PS, planned potential upgrades to Riverdale PS capacity and operation, updates to the model based on additional modeling analyses and data collection since 2018 in the Rich Fork, Upper Boulding, Trinity, and Shadybrook basins. In addition, CDM Smith will develop and provide a detailed spreadsheet and/or GIS files regarding the level of development assumed/included in the model (and therefore planned/accounted for by the City as part of the CIP).

Task 2 – Revise Alternatives Evaluation, Opinions of Probable Cost, and CIP

CDM Smith will revise the alternatives evaluation, conceptual opinions of probable construction cost, and CIP per the updates in Task 1. This will include a closer review of improvement options for Waterview PS, whether a pump around to Westside WWTP is still required, flows to the treatment plants for various alternatives, and options for addressing Upper Boulding basin capacity

deficiencies. This will also include revised cost estimates for new or revised improvements (excluding any planned improvements being studied separately such as the Riverdale PS Capacity Upgrade.)

Task 3 –Master Plan Addendum

CDM Smith will prepare a Draft Master Plan Addendum and finalize the Master Plan Addendum after receipt of City comments.

Task 4 – Data Collection for Model Expansion

CDM Smith will assist the City with identifying sewers for model expansion. Initial identification efforts suggest approximately 245,000 lf of sewer and 1,300 manholes have rim and invert elevation in the GIS. These assets can be added to the model assuming this data is correct. Approximately 125,000 lf of 10-18-inch sewers, 600 manholes, and approximately 13,500 lf of 8-inch sewers in development areas will require As-Built data conversion. The City will provide CDM Smith with an existing GIS database (to include the full wastewater GIS model), VPN access to "The Point" GIS web application, and Laserfiche document repository for As-builts as well as any digitally stored As-built upon request. CDM Smith will use these data sources to locate and download all As-builts needed for GIS updates. If As-built data cannot be found the City could use survey crews where needed or assumptions could be made depending on the extent of the missing data. CDM Smith will convert the sewer attribute data (rim elevations, invert elevations, pipe diameter) and make spatial adjustments as needed from the As-Built drawings to an Esri File Geodatabase format that can be used to update both the City's existing GIS and the hydraulic model. CDM Smith will review profiles of the model expansion sewers and compile any issues or questions regarding the updated data for the City to address.

Task 5 – Model Expansion & Additional Capacity Analysis Mapping

CDM Smith will update the hydraulic model with the new sewer pipe data from Task 4. As new sewers are added to the model, existing model sub-catchments will be subdivided to better reflect assignment of new flow loading locations. The new sub-catchments will have flow loadings re-allocated in proportion to the sewered area. Once flows are re-allocated, the model will be verified against the Task 1 model to ensure integrity of flow loadings is consistent with prior calibration and future flow projection allocations. The model will be run with the existing design storm flows and capacity results documented for the expanded model sewers. Further analysis and potential improvements to address capacity issues in the upstream expanded model sewers will be performed in Phase 2, after flow monitoring is performed to verify flow assumptions and re-allocation based on sewered area.

Task 6 – Additional Flow Monitoring Plan Development

Using the results of Task 1 capacity analysis, CDM Smith will develop a flow monitoring plan for the expanded model sewers to verify flows, especially where potential capacity issues are identified. The flow monitoring data collection effort will be performed in Phase 2.

Task 7 – Letter Report

CDM Smith will prepare a letter report that includes documentation of the capacity analysis of the expanded model pipes and the proposed flow monitoring plan to check flow assumptions in the expanded model. Comments from the City will be addressed, and a final letter report issued.

Task 8 – Project Management & QAQC

CDM Smith will perform monthly invoicing and quality management procedures including quality assurance (QA) and Quality Control (QC) of the model, results, and deliverables.

Phase 2 - Master Plan Update

Phase 2 may include the following five tasks (details still to be determined):

Task 1 – Flow Monitoring Data Collection

CDM Smith will install flow monitors to check the hydrologic model and to distribute flows in upstream pipes as well as calibrate flows in downstream pipes and at the plants.

Task 2 – Re-calibrate Hydraulic Model

CDM Smith will re-calibrate the hydraulic model based on the additional flow monitoring data collected.

Task 2a – Update Future Flow Projections

CDM Smith will update the future flow projections in FY2024 based on additional information provided by the City and updated TAZ data, if available.

Task 3 – Update Capacity Analysis and Alternatives Analysis

CDM Smith will update the capacity analysis mapping and alternatives analysis mapping from Phase 1 (current model with pipes over 18-inches) with the expanded model pipes.

Task 4 – Update CIP and Master Plan Report

CDM Smith will update the CIP with additional projects required on smaller diameter pipes (as determined from the model expansion). CDM Smith will provide a Master Plan Update Report that includes the methodology, results, conclusions, and recommendations of the above tasks. Comments from the City will be addressed and a final report issued.

Task 5 – Project Management and QAQC

CDM Smith will perform monthly invoicing and quality management procedures including QA/QC of the model, results, and deliverables.

C. SCHEDULE

Tasks 1-3 will begin within 2 weeks of notice to proceed and receipt of information on upgraded Riverdale PS capacity. The intent is to complete these tasks by November 2022 to provide the City with defensible CIP improvement projects for planning purposes. Riverdale PS information must be received by July 30, 2022, to meet this schedule.

Task 4 will begin upon notice to proceed with a final determination of which sewers to include in the model expansion. The data collection effort Task 5 is expected to take approximately 4 months, but the schedule could vary based on data receipt and potential need for survey. The model expansion and capacity analysis (Task 5) will be completed within 3 months of the completion of Task 4. Task 6 will be completed 1 month after the completion of Task 5. Task 7 (Letter Report) will be completed 2 months after the completion of Task 6.

D. COMPENSATION

For the Phase 1 Basic Services performed by CDM Smith under Section B of this Task Order, the City of High Point agrees to pay a lump sum fee of $289,800. For the Phase 2 Basic Services performed by CDM Smith, the City will amend this contract adding additional compensation for these tasks once the final scope, fee, and schedule are negotiated. In addition to this compensation, the City reserves the right to amend this Contract, so that CDM Smith may furnish additional services as needed. Payments shall be made by the City on a monthly basis in proportion to the percentage of work completed, with the balance of payment made when the work is complete.

Thank you for the opportunity for CDM Smith to serve the City of High Point and your customers. We look forward to further discussing this proposal with you. If you have any questions or need any additional information, please let us know.

Sincerely,

Christine Nesbit, P.E.
Vice President
CDM Smith Inc.

Cc: Robby Stone, Public Services Director, City of High Point
Glendon Fetterolf, CDM Smith Inc.