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April 15, 2022

Amy Gilson, Public Works Director
City of Charlotte
111 East Lawrence Avenue
Charlotte, MI 48813

Proposal for Professional Engineering Services
Water Treatment Facility Cost Estimates & Water Reliability Study

Dear Ms. Gilson:

Fishbeck is pleased to provide the City of Charlotte this proposal to provide engineering services for the City. The proposal includes two primary components: 1. Preparation of preliminary opinions of construction costs for drinking water treatment projects, and 2. Preparation of a Water System Reliability Study update.

Water Supply and Treatment Background

From the analytical data provided to us, and based on our prior experience with the City, a few characterizations about the water quality can be made. The water supply is classified as a groundwater supply source that is not under the influence of any surface water.

Hardness concentrations in the data provided varied from 367 to 471 milligrams per liter (mg/L) and averaged about 424 mg/L in the distribution system. This is considered a very hard water supply. Hardness causes scaling and interferes with the effectiveness of soaps and detergents.

Iron concentrations averaged about 0.08 to 0.09 mg/L. The U.S. EPA National Secondary Drinking Water Standard for iron is 0.30 mg/L, which is about 3.5 times higher than the data indicates for Charlotte's water supply. However, the automated analytical procedure often used in laboratories is believed to result in sample concentrations that are lower than the actual concentrations. This can be determined using a different analytical technique. Iron can cause staining of plumbing fixtures and discoloration of laundered items. It can also Impart a reddish color to water and result in a reddish precipitate in containers.

The concentration of manganese in the data varied from non-detectable to 0.52 mg/L and averaged about 0.13 mg/L. The U.S. EPA National Secondary Drinking Water Standard for manganese is 0.05 mg/L, which means that the Charlotte water supply has a manganese concentration that is about 2.6 times higher than the recommended standard. The data suggests that two of the wells may have higher concentrations than the third. However, there were only a limited number of analytical results provided for review. Although manganese is an essential element at low concentrations, it can have health effects at concentrations, generally higher than those indicated for Charlotte. In addition, manganese can also cause aesthetic issues such as metallic-tasting water and black stains on tubs/showers, toilets, plumbing fixtures, and laundry.

In summary, Charlotte's water supply can be characterized as being very hard, having an elevated manganese concentration, and having a relatively low iron concentration. It would typically be considered somewhat objectionable without having some form of treatment. As a result, most customers in the City likely utilize individual treatment systems, with the most systems being either ion exchange (salt) softeners or reverse osmosis treatment systems. As a result, the City wishes to explore the technologies and associated costs for a City owned and operated, centralized water treatment facility. This proposal is in response to that request from the City.

Water Reliability Study Background

The City last completed a water system reliability study in 2015 and has requested a proposal for preparation of an updated study.

The purpose of conducting a water system reliability study is to ensure that the water system will have adequate capacity and capability to provide a reliable supply of water to system users in the future. The study will evaluate current conditions, identify deficiencies, and needs, develop cost estimates for improvements, and prioritize the recommended improvements for use in capital planning. The study will include developing and updating the computerized hydraulic model of the water system, which will be used to analyze water system performance.

Fishbeck has extensive experience with hydraulic modeling and has performed water system reliability studies for many of the water systems in Michigan. We can provide a summary of project experience, resumes for key personnel, or other marketing materials if desired.

The Part 12 Rules of the Michigan Safe Drinking Water Act (Act 399, P.A. of 1976, as amended) requires that Type I water supplies conduct a water system reliability study and update the study every five years. At a minimum, the study must evaluate the present and future water demands and the ability of the existing system to reliably deliver the quantities of water needed, including periods when the normal power service is interrupted.

A reliability study should examine the water system under both current and projected future demand conditions. Current demands should be compiled and the future demand projections for 5- and 20-year periods be developed based primarily on historical water usage trends and any available population projections. The study should also fulfill the requirements for a general plan to comply with current regulations.

Project Approach

We propose to complete the treatment facility cost estimates and the water system reliability study as a single, combined project, with one summary report. By completing the two components of the study together, some efforts can be reduced where there is overlap. For example, water demand projections need to be completed for both components of the study and other efforts such as project meetings can also be combined and reduced.

A more detailed description of the two project components is provided in the following paragraphs.

Treatment Facility Cost Estimate

This approach is suggested to provide enough information to present to the City, technologies and associated opinions of cost that would be deemed reliable for the purpose of making decisions relative to moving forward with a plan of action that may differ from the status quo. The cost opinions developed at this point would be preliminary and would need to be refined prior to moving forward with project funding steps.

1. Data Collection and Review:
    a. Obtain from the City the following information:
        1) Copies of all analytical data available on the wells and distribution system for the following parameters: Hardness, Alkalinity, pH, Calcium, Magnesium, Sodium, Iron, Manganese, Chloride, Sulfate, Total Dissolved Solids/Conductivity, Phosphate, Lead, and Copper.
        2) Historical data related to average day, maximum day, peak hour, and peak instantaneous flows for the water supply system. Also determine the respective volumes produced by each of the wells.
        3) Most recent Water System Reliability Study and Sanitary Survey.
    b. Organize the analytical data, into data from certified laboratories, and data from others.
    c. Advise the City if the data is insufficient and additional sampling and analyses are required.

d. Tabulate and summarize the analytical data to determine the average, maximum and minimum concentrations. If there is sufficient data, determine standard deviation values.
e. Compare the analytical data to generally accepted values for a water supply that is generally considered non-objectionable. Determine the recommended targeted values.
f. Organize the flow data to project the future (10- and 20-year) average daily, maximum day, peak hourly, and peak momentary flows.
g. Establish flow and concentration projections to be used for sizing of the facility. Review and confirm with the City Public Works Director.

2. Technology Review:
   a. Review and screen technologies as applicable to the City's needs. The City has indicated that manganese has frequently been a problem, often manifesting in the occurrence of black water. The control of manganese will certainly be evaluated as one main option. Treatment alternatives to be considered include the following:
      1) Manganese (or Iron and Manganese) Oxidation and Filtration.
      2) Membrane Softening.
      3) Lime Softening.

      It should be noted that with oxidation/filtration removal of manganese, most customers would continue to utilize their existing at-home treatment systems for hardness removal. The softening processes would reduce the need for customer treatment systems.

      Various configurations and variations of the technologies mentioned will be screened and evaluated as applicable to the water quality in Charlotte.
   b. Review and confirm the final technology selections with the City Public Works Director.
   c. Develop preliminary quantification of the configurations, process unit quantities, and sizes for the various alternatives.

3. Cost Estimating:
   a. Project cost estimate opinions would be prepared for the various treatment scenarios. Sources for developing cost estimates would include: Fishbeck project experience; research on other project costs; EPA Water Treatment Cost Curves; cost estimating manual and spreadsheet software (by S. Kawamura); RS Means Construction Cost publications; and our in-house engineering and cost estimating judgment.
   b. Appropriate adjustments would be made for project complexities and for prior year costs using various construction cost indices.
   c. Operating cost estimate opinions would also be developed.
   d. A cost summary would be prepared which would include the capital costs, operational costs, and present worth costs for each alternative.

4. Presentation:
   a. A slide-based presentation would be prepared for presentation to the City Council.
   b. The draft presentation would be presented for review by the City Public Works Director and/or the City Manager prior to the actual presentation being made.
   c. Fishbeck would attend the presentation and entertain any questions by the City Council or City Staff.

Water System Reliability Study

Fishbeck will complete the following as part of the study:

1. Obtain and review information from the City required for the study, including:
   a. The water model files from the 2015 study.
   b. GIS shapefile of current water system, including pipe and valve size, materials, and age data.

c. GIS shapefile of the system's water service meter connections, including meter number/ID, size, and service categories.
d. As-built drawings or files showing the pipe locations of any system improvements that are not in the GIS files.
e. As-built drawings of the existing wells and elevated storage tanks.
f. Water production data from the existing wells.
g. City billing data for each meter in the system, including meter number/ID and water consumption information.
h. A list of the current ten largest water users in the City and their annual water usage.
i. A copy of the most recent Michigan Department of Environment, Great Lakes, and Energy (EGLE) Water System Review (also known as a Sanitary Survey) for the water system.
j. Any available current population data and population projection data for the service area.
k. Any information on proposed expansion areas or potential new water customers that may be added to the system in the future.
l. Fire flow requirements and Insurance Services Office reports, if available. This information will be used in the fire flow analysis portion of the modeling study.
m. Records or reports of current problem areas (frequent repairs, pressure, or quality complaints, etc.), if any.
n. Most recent Water Asset Management Plan Report and Capital Improvements Plan.

2. Analyze the information provided by the City. The following will be included in the report:
   a. Summary of current population, service connections, and equivalent residential data.
   b. Summary of monthly and annual water production totals.
   c. Summary of water usage for the overall system and customer class.
   d. Estimate unaccounted for water that may exist due to unmetered water uses, system leaks, hydrant flushing, etc.
   e. Update future water use demand projections for average day, maximum day, and peak hour demands for 5- and 20-year planning periods.
   f. Verify fire flow goals with the City for use in the fire flow modeling and summarize results.
   g. Review the adequacy of the water supply to meet current and future demands and identify needs.
   h. Summarize water storage facilities and assess for additional needed capacity.

3. Update the hydraulic model to reflect any changes in the system since it was last updated in 2015.

4. Calibrate the hydraulic model:
   a. Run the model and review output to determine optimal locations for calibration flow tests.
   b. Submit a map showing proposed flow test locations to the City in advance of flow testing date, for City input. Meet with the City to review comments and adjust the proposed locations as needed.
   c. Collect field data using hydrant flow tests and calibrate the model. We have assumed one day of field calibration, which would include 6 to 7 flow tests involving 30 to 35 fire hydrants in total. Fishbeck will provide the flow diffusers and gauges needed to complete the calibration. We will use our digital data loggers attached to fire hydrants to monitor and record system pressures during calibration. Tank levels and flow from the wells will be obtained from the City's SCADA system.
   d. Calibrate the model using field data to adjust model input parameters, such as pipe friction C-factors.
   e. Compare and summarize calibration results in a chart or graphical format.

5. Complete hydraulic analysis of the distribution system using the updated hydraulic model.
   a. Complete model runs for the following scenarios:
      1) Current system under existing demands.
      2) Current system under future demands (5- and 20-year).

3) 5-year improvements under 5-year demands.
4) 20-year improvements under 20-year demands.

b. Prepare drawings to graphically represent model results.
1) Pressure contours at peak hour demands.
2) Available fire flow at maximum day demands.

c. Evaluate model runs and identify deficiencies relative to pressure and fire flows.
d. Evaluate system improvements needed to reduce or eliminate deficiencies.
e. Develop a prioritized list of recommended improvements in a 5- and 20-year capital improvements plan with cost estimates. Work with the City to develop and prioritize the recommendations.

6. Develop/update the water system general plan drawing. Include symbols and labels for all main line valves and fire hydrants.

7. Develop a pipe inventory to satisfy the requirements for the General Plan in conjunction with input from the City on pipe materials and age, using owner provided information.

8. Summarize the study in a report format. Meet with the City to review comments. After integrating City comments, submit the study to EGLE for review. Help the City obtain approval from the EGLE by incorporating applicable EGLE comments into the final report.

9. Provide two hard copies and one electronic copy of the final report to the Owner and one hard copy to EGLE.

10. Attend meetings with the City as part of this project. The following (virtual) meetings are assumed:
a. Project Kickoff Meeting: Meet to review the work plan, clarify the City's goals, and obtain required information on the system. If desired, a representative from EGLE could be included in the kickoff meeting to ensure their expectations will be met.
b. Meet to review calibration plan.
c. Progress Meeting: Review the draft report comments with the City.

Assumptions

- It is assumed that the required amount of park property can be made available without cost to any treatment project.
- We are assuming that the City will provide Fishbeck with a per-acre cost and a distance to be used for any additional property acquisition.
- We have assumed a 2-week period for the return of the background analytical data and flow information requested by Fishbeck at the beginning of the project. If it is necessary to obtain additional data, then the project schedule will be delayed for the time it takes to obtain such information.
- It is assumed that if additional water quality data is required, the coordination and costs for such sampling and analyses will be the City's responsibilities.
- A Fishbeck engineer will lead the fieldwork for hydrant flow testing. We assume that the City can provide 2-3 staff to assist with fieldwork, operate hydrants, etc. Fishbeck staff will collect and record the flow and pressure data.
- We have assumed a 2-week period for review and comments of the draft presentation and report by the City.

Fee Proposal and Schedule

Fishbeck proposes to provide the services as outlined for a lump sum fee of Forty-Four Thousand Six Hundred Fifty Dollars ($44,650). This is inclusive of all labor and expenses for the services outlined in this proposal. The table below provides an approximate breakdown of the fee by task.

Item	Fee	Task Breakdown
Water Treatment Study	$14,850	
Water Reliability Study	$29,800	
Model Updates and Modeling		$11,100
Calibration		$4,900
Report, Meetings, Presentation		$13,800
Total	$44,650	

It is estimated that the project will be completed approximately 5 to 6 months following authorization to proceed.

Attached is our Professional Services Agreement. If you concur with our scope of services, please sign in the space provided and return the executed contract to the attention of Darcy McWilliams (dmcwilliams@fishbeck.com). This proposal is made subject to the attached Terms and Conditions for Professional Services. Invoices will be submitted every four weeks and payment is due upon receipt.

We look forward to serving the City of Charlotte on this effort. If you have any questions or require additional information, please contact me at 616.464.3809 or djbaar@fishbeck.com.

Sincerely,

David J. Baar, PE
Vice President/Senior Water & Wastewater Engineer

By email
Copy: Jeff Brown – Fishbeck

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Engineers | Architects | Scientists | Constructors

1515 Arboretum Drive, SE
Grand Rapids, Michigan 49546

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Professional Services Agreement

PROJECT NAME	City of Charlotte Water Treatment Facility Cost Estimates & Water Reliability Study
FISHBECK CONTACT	David J. Baar, PE
CLIENT	City of Charlotte
CLIENT CONTACT	Amy Gilson
ADDRESS	111 East Lawrence Avenue, Charlotte, MI 48813

Client hereby requests and authorizes Fishbeck to perform the following:

SCOPE OF SERVICES: Provide professional engineering services in accordance with Fishbeck letter proposal dated April 15, 2022.

AGREEMENT. The Agreement consists of this page and the documents that are checked:

☒ Terms and Conditions for Professional Services, attached.
☒ Proposal dated April 15, 2022.
☐ Other:

METHOD OF COMPENSATION:

☒ Lump Sum for Defined Scope of Services
☐ Hourly Billing Rates plus Reimbursable Expenses
☐ Other:

Budget for Above Scope of Services: Forty-Four Thousand Six Hundred Fifty Dollars ($44,650)

ADDITIONAL PROVISIONS (IF ANY): None.

APPROVED FOR:		ACCEPTED FOR:	
City of Charlotte		Fishbeck	
BY:	_____	BY:	_____
TITLE:	_____	TITLE:	Vice President
DATE:	_____	DATE:	April 15, 2022

Terms and Conditions for Professional Services

1. **METHOD OF AUTHORIZATION.** Client may authorize Fishbeck to proceed with work either by signing a Professional Services Agreement or by issuance of an acknowledgment, confirmation, purchase order, or other communication. Regardless of the method used, these Terms and Conditions shall prevail as the basis of Client's authorization to Fishbeck. Any Client document or communication in addition to or in conflict with these Terms and Conditions is rejected.
2. **CLIENT RESPONSIBILITIES.** Client shall provide all criteria and full information as to requirements for the Project and designate in writing a person with authority to act on Client's behalf on all matters concerning the Project. If Fishbeck's services under this Agreement do not include full-time construction observation or review of Contractor's performance, Client shall assume responsibility for interpretation of contract documents and for construction observation, and shall waive all claims against Fishbeck that may be in any way connected thereto.
3. **HOURLY BILLING RATES.** Unless stipulated otherwise, Client shall compensate Fishbeck at hourly billing rates in effect when services are provided by Fishbeck employees of various classifications.
4. **REIMBURSABLE EXPENSES.** Those costs incurred on or directly for Client's Project. Reimbursement shall be at Fishbeck's current rate for mileage for service vehicles and automobiles, special equipment, and copying, printing, and binding. Reimbursement for commercial transportation, meals, lodging, special fees, licenses, permits, insurances, etc., and outside technical or professional services shall be on the basis of actual charges plus 10 percent.
5. **OPINIONS OF COST.** Any opinions of probable construction cost and/or total project cost provided by Fishbeck will be on a basis of experience and judgment, but since it has no control over market conditions or bidding procedures, Fishbeck cannot warrant that bids or ultimate construction or total project costs will not vary from such estimates.
6. **PROFESSIONAL STANDARDS; WARRANTY.** The standard of care for services performed or furnished by Fishbeck will be the care and skill ordinarily used by members of Fishbeck's profession practicing under similar circumstances at the same time and in the same locality. Fishbeck makes no warranties, express or implied, under this Agreement or otherwise, in connection with Fishbeck's services.
7. **TERMINATION.** Either Client or Fishbeck may terminate this Agreement by giving ten days' written notice to the other party. In such event, Client shall pay Fishbeck in full for all work previously authorized and performed prior to the effective date of termination, plus (at the discretion of Fishbeck) a termination charge to cover finalization work necessary to bring ongoing work to a logical conclusion. Such charge shall not exceed 30 percent of all charges previously incurred. Upon receipt of such payment, Fishbeck will return to Client all documents and information which are the property of Client.
8. **SUBCONTRACTORS.** Fishbeck may engage subcontractors on behalf of Client to perform any portion of the services to be provided by Fishbeck hereunder.
9. **PAYMENT TO FISHBECK.** Invoices will be issued every four weeks, payable upon receipt, unless otherwise agreed. Interest of 1 percent per four-week period will be payable on all amounts not paid within 28 days from date of invoice, payment thereafter to be applied first to accrued interest and then to the principal unpaid amount. Any attorney's fees or other costs incurred in collecting any delinquent amount shall be paid by Client.

   Client agrees to pay on a current basis, in addition to any proposal or contract fee understandings, all taxes including, but not limited to, sales taxes on services or related expenses which may be imposed on Fishbeck by any governmental entity.

   If Client directs Fishbeck to invoice another, Fishbeck will do so, but Client agrees to be ultimately responsible for Fishbeck's compensation until Client provides Fishbeck with that third party's written acceptance of all terms of this Agreement and until Fishbeck agrees to the substitution.

   In addition to any other remedies Fishbeck may have, Fishbeck shall have the absolute right to cease performing any basic or additional services in the event payment has not been made on a current basis.
10. **HAZARDOUS WASTE.** Fishbeck has neither created nor contributed to the creation or existence of any hazardous, radioactive, toxic, irritant, pollutant, or otherwise dangerous substance or condition at any site, and its compensation hereunder is in no way commensurate with the potential risk of injury or loss that may be caused by exposure to such substances or conditions. Fishbeck shall not be responsible for any alleged contamination, whether such contamination occurred in the past, is occurring presently, or will occur in the future, and the performance of services hereunder does not imply risk-sharing on the part of Fishbeck.
11. **LIMITATION OF LIABILITY.** To the fullest extent permitted by law, Fishbeck's total liability to Client for any cause or combination of causes, which arise out of claims based upon professional liability errors or omissions, whether based upon contract, warranty, negligence, strict liability, or otherwise is, in the aggregate, limited to the greater of $250,000 or the amount of the fee earned under this Agreement.

    To the fullest extent permitted by law, Fishbeck's total liability to Client for any cause or combination of causes, which arise out of claims for which Fishbeck is covered by insurance other than professional liability errors and omissions, whether based upon contract, warranty, negligence, strict liability, or otherwise is, in the aggregate, limited to the total insurance proceeds paid on behalf of or to Fishbeck by Fishbeck's insurers in settlement or satisfaction of Client's claims under the terms and conditions of Fishbeck's insurance policies applicable thereto.

    Higher limits of liability may be considered upon Client's written request, prior to commencement of services, and agreement to pay an additional fee.

12. **DELEGATED DESIGN.** Client recognizes and holds Fishbeck harmless for the performance of certain components of the Project which are traditionally specified to be designed by the Contractor.

13. **INSURANCE.** Client shall cause Fishbeck and Fishbeck's consultants, employees, and agents to be listed as additional insureds on all commercial general liability and property insurance policies carried by Client which are applicable to the Project. Client shall also provide workers' compensation insurance for Client's employees. Client agrees to have their insurers endorse these insurance policies to reflect that, in the event of payment of any loss or damages, subrogation rights under this Agreement are hereby waived by the insurer with respect to claims against Fishbeck.

    Upon request, Client and Fishbeck shall each deliver to the other certificates of insurance evidencing their coverages.

    Client shall require Contractor to purchase and maintain commercial general liability and other insurance as specified in the contract documents and to cause Fishbeck and Fishbeck's consultants, employees, and agents to be listed as additional insureds with respect to such liability and other insurance purchased and maintained by Contractor for the Project. Contractor must agree to have their insurers endorse these insurance policies to reflect that, in the event of payment of any loss or damages, subrogation rights under this Agreement are hereby waived by the insurer with respect to claims against Fishbeck.

14. **INDEMNIFICATION.** Fishbeck will defend, indemnify, and hold Client harmless from any claim, liability, or defense cost for injury or loss sustained by any party from exposures to the extent caused by Fishbeck's negligence or willful misconduct. Client agrees to defend, indemnify, and hold Fishbeck harmless from any claim, liability, or defense cost for injury or loss sustained by any party from exposures allegedly caused by Fishbeck's performance of services hereunder, except for injury or loss to the extent caused by the negligence or willful misconduct of Fishbeck. These indemnities are subject to specific limitations provided for in this Agreement.

15. **CONSEQUENTIAL DAMAGES.** Client and Fishbeck waive consequential damages for claims, disputes, or other matters in question relating to this Agreement including, but not limited to, loss of business.

16. **LEGAL EXPENSES.** If either Client or Fishbeck makes a claim against the other as to issues arising out of the performance of this Agreement, the prevailing party will be entitled to recover its reasonable expenses of litigation, including reasonable attorney's fees. If Fishbeck brings a lawsuit against Client to collect invoiced fees and expenses, Client agrees to pay Fishbeck's reasonable collection expenses including attorney fees.

17. **OWNERSHIP OF WORK PRODUCT.** Fishbeck shall remain the owner of all drawings, reports, and other material provided to Client, whether in hard copy or electronic media form. Client shall be authorized to use the copies provided by Fishbeck only in connection with the Project. Any other use or reuse by Client or others for any purpose whatsoever shall be at Client's risk and full legal responsibility, without liability to Fishbeck. Client shall defend, indemnify, and hold harmless Fishbeck from all claims, damages, losses, and expenses, including attorney's fees arising out of or resulting therefrom.

18. **ELECTRONIC MEDIA.** Data, reports, drawings, specifications, and other material and deliverables may be transmitted to Client in either hard copy, digital, or both formats. If transmitted electronically, and a discrepancy or conflict with the electronically transmitted version occurs, the hard copy in Fishbeck's files used to create the digital version shall govern. If a hard copy does not exist, the version of the material or document residing on Fishbeck's computer network shall govern. Fishbeck cannot guarantee the longevity of any material transmitted electronically nor can Fishbeck guarantee the ability of the Client to open and use the digital versions of the documents in the future.

19. **GENERAL CONSIDERATIONS.** Client and Fishbeck each are hereby bound and the partners, successors, executors, administrators, and legal representatives of Client and Fishbeck are hereby bound to the other party to this Agreement and to the partners, successors, executors, administrators, and legal representatives (and said assigns) of such other party, in respect of all covenants, agreements, and obligations of this Agreement.

    Neither Client nor Fishbeck shall assign this Agreement without the written consent of the other.

    Neither Client nor Fishbeck will have any liability for nonperformance caused in whole or in part by causes beyond Fishbeck's reasonable control. Such causes include, but are not limited to, Acts of God, civil unrest and war, labor unrest and strikes, acts of authorities, and events that could not be reasonably anticipated.

    This Agreement shall be governed by the law of the principal place of business of Fishbeck.

    This Agreement constitutes the entire agreement between Client and Fishbeck and supersedes all prior written or oral understandings. This Agreement may only be amended, supplemented, modified, or canceled by a duly executed written instrument.

End of Terms and Conditions for Professional Services