

July 27, 2016

Ms. Jean Keely  
City Engineer  
Engineering Department, City of Blaine  
10801 Town Square Drive NE  
Blaine, MN 55449

Sent via e-mail to [JKeely@ci.blaine.mn.us](mailto:JKeely@ci.blaine.mn.us)

**Re: Proposal for WTP4 feasibility study and pilot testing; City of Blaine, Minnesota**

Dear Ms. Keely:

Barr Engineering Co. appreciates the opportunity to submit a proposal to provide continued engineering services for planning and design of the City of Blaine's future water supply and treatment system in the northeast part of the city. This proposal provides for continued technical development of Water Treatment Plant No. 4 (WTP4) through pilot testing and a feasibility study, and has been developed based on the recently completed Capital Improvements Plan (CIP) and associated WTP4 pre-feasibility study. We are submitting this proposal with a subcontractor, Bolton & Menk, Inc., a firm with whom we regularly team for services related to municipal water treatment plant planning, design, and construction.

Selecting the Barr team to assist Blaine with this work will provide several benefits, including:

- **Continuity.** Barr has been helping Blaine plan and design your water system for many years, and it is safe to say your system is working well. Furthermore, our approach has garnered support from state regulators. We will keep the same core team members involved in your project to maintain consistency and quality.
- **Collaborative service.** Barr's water supply and water treatment group has a proven track record of working *with* our clients—not just for them—as a high-functioning team.
- **Experience with municipal water.** From well siting to permitting through design and operation of municipal water systems, our team has worked on numerous municipal water supply and treatment systems. Our experience enables efficient design and permitting of your project.
- **Experience with water treatment.** As a team, Barr and Bolton & Menk have successfully delivered dozens of municipal water treatment plants to clients throughout the upper Midwest.

## Project understanding

### Background

The CIP and pre-feasibility study for the NE Well Field and WTP4 were recently completed and approved by the City of Blaine in April 2016. These documents describe the infrastructure needed to complete a

6,000-gpm well field and treatment plant for the NE Well Field. The pre-feasibility report described several treatment process alternatives and improvements of interest to City staff, including gravity filtration, filtration media options, disinfectant alternatives, and backwash recovery. At the conclusion of the pre-feasibility study, the City made a number of key decisions with respect to the design approach for WTP4:

- Employ gravity filtration.
- Use dual media—anthracite and greensand—reliable and well-established media for iron and manganese removal.
- Provide disinfection by using on-site hypochlorite generation to improve safety and ease of handling of the disinfectant.
- Use Lamella clarification to recovery backwash and reduce sewer fees for backwash disposal.

These decisions put the City well along the path for planning for WTP4. Typically, before municipal drinking water plant design and construction, full feasibility studies and pilot treatment studies are used to evaluate process alternatives and their associated economics. However, given the similarity in water quality to the City's existing wells and operating experience with WTPs 1-3, the pre-feasibility study and NE Well Field study have served much of that function. As such, a more targeted feasibility study is proposed for WTP4, which will build off the pre-feasibility study already completed.

The pre-feasibility report recommended the following activities for development of the treatment process for WTP4:

- Additional sampling and analyses of the water quality of the wells 18-21 that will feed WTP4 and review of resulting data for assessing/confirming treatment requirements.
- Pilot study of the selected media (anthracite/greensand) and filtration approach (gravity) to assess filter loading rates, chemical requirements, filter run time, and filtrate quality.
- A feasibility study to incorporate pilot test data into the design process and confirm prior decisions made for gravity filters with dual-media, high-service pumping, onsite chlorine generation, and the use of Lamella clarifiers for backwash.

These recommendations still hold and we propose to incorporate them into the targeted feasibility study.

## Objectives

The following objectives will guide our work on the feasibility study and pilot:

- Further define future feed water quality to WTP4 and incorporate that information into the preliminary design, based on water quality from the new wells.
- Pilot test the selected filtration process and media to verify performance and to inform the design of the future filtration system.
- Refine the preliminary plant and site layouts and update the construction cost estimate, considering potential cost-savings and design/construction efficiencies.

## Proposed scope of work

Details of the scope of work we will perform to meet the objectives listed above are included below.

### Task 1: pilot testing

Under Task 1, Barr will work collaboratively with the City to execute a pilot testing study of the selected media and filtration process. The Barr scope of work under Task 1 includes:

- Develop a pilot testing plan to define pilot objectives, define key test parameters to be evaluated, and describe the data collection requirements to meet the pilot objectives.
- Plan for use of the Bolton & Menk pilot water treatment trailer, and recommend specific pilot test equipment needed.
- Coordinate site requirements and installation with the City.
- Run a one-week pilot onsite with three different media columns using water from Wells 18, which is a quaternary well, and one of the future Tunnel City - Wonewoc wells. The pilot trailer will be located near Water Tower 4. The flow rate will be approximately 3 gpm.
- Coordinate with a laboratory to obtain sample bottles for the pilot testing program, coolers and chain of custody forms, and cost of shipping the transportation of samples to the laboratory.
- Collect water samples from the new wells to be used in the pilot and submit for chemical analyses.
- Review and evaluate pilot study data.

#### *Task 1 meetings*

- After completion of the draft pilot testing plan, Barr will hold one meeting with City staff to review the testing plan and coordinate pilot unit installation details and site infrastructure needs.
- Meetings will be held on site with city staff and pilot operators as needed.

#### *Task 1 deliverables*

- Draft and final pilot testing plan
- Summary of pilot test results

#### *Task 1 work by City*

- City of Blaine will contract directly with a commercial analytical laboratory.
- City will provide access to the site for installation and operation of the pilot unit.
- City will provide installation assistance for pilot equipment in coordination with the Barr team.
- City will provide infrastructure to support the pilot unit, including:
  - Raw water supply to the unit from the wells, and/or supply tank if needed
  - Collection and disposal of wastewater from the pilot unit
  - Power and potable water connection
  - Security (degree to be determined by City)
  - Any permitting or permissions required for pilot

### ***Task 1 assumptions***

- Number of pilot units: one
- Pilot duration: one week
- Pilot operations: Barr team
- Pilot media: three column tests, anthracite and greensand, operated at 3 gpm/ft<sup>2</sup>, and two other based on city selection.
- Equipment included in the proposal: supply and operation of the pilot trailer, three filtration columns with backwash ability, column media, chemical feed equipment, water treatment chemicals and onsite testing instrumentation.
- Location of pilot unit: trailer near Water Tower #4
- Well sampling: conducted on a single day

### ***Task 1 Optional services***

We understand that the City has been installing alternative filter media for its other treatment plants. The City could pilot test this filter media which has a higher loading rate than anthracite/ greensand filter. This media could potentially reduce the filter area required for the facility or as a means to expand the capacity of the filter system in the future. This column would be run in parallel for comparison to the base design condition (3 gpm/ft<sup>2</sup>).

### **Task 2: feasibility study**

As mentioned previously, the pre-feasibility study evaluated a number of process alternatives and enabled the City to make several key decisions regarding the process design for WTP4. Under Task 2, we propose to further develop and refine these concepts in a targeted feasibility study. The pilot test results will be incorporated into the conceptual design of WTP4, and we will evaluate future expansion options.

We understand that WTP4 and its associated infrastructure represent a significant investment for the City of Blaine. As such, we also propose to include value engineering elements in the feasibility study to identify potential design and construction efficiencies and to provide potential costs savings for the City.

The Barr scope of work under Task 2 includes:

- Incorporate the pilot test results and feed water quality data into the design approach for WTP4, including:
  - Refine filter design criteria
  - Update plant and site layout
- Compare the projected finished water quality from WTP4 with finished water from City's other water treatment plants to proactively identify potential distribution system issues so they can be addressed in detailed design, if necessary.
- Review if aeration would be beneficial to the treatment process given the water quality.
- Specify and review soil borings for the plant site to assess impacts on civil and structural design requirements.
- Review design approach for potential cost savings and efficiencies.
- Update the construction cost estimate.

### *Task 2 meetings*

- One meeting with City staff to review the draft feasibility study

### *Task 2 deliverables*

- Soil boring specification and recommended locations
- Draft and final feasibility report, including pilot study results

### *Task 2 work by City*

- City of Blaine will contract directly for soil borings.

### *Task 2 optional services*

- Value based design (VBD) workshop. Barr could conduct a 2-to-4-hour workshop with Barr staff, Bolton & Menk, Inc. staff, and city staff to help optimize the WTP4 design for cost savings and operations efficiency. These studies are best timed when the client is trying to choose a path forward (i.e., when there are decisions on the table and they are trying to determine which is best) or when the client is trying to minimize costs and risks. The city would be provided with a memo documenting the workshop's findings for use in detailed design. These workshops typically provide a cost savings by reducing future design decisions and shortening the duration of detailed design. Capital costs may also be reduced by optimized equipment selection, site design, and building layout.
- Evaluate options for future expansion of WTP4's treatment capacity to 8,000 gpm. The expansion alternatives may include the physical expansion of the filters and building but could also include increasing the hydraulic loading to the filters.
- Life cycle assessment (LCA) of pressure filters versus gravity filters.

## Project management

Project management will involve project updates and correspondence with City staff and the project team, at frequency requested by City staff.

### *Project Management optional services*

- City council workshop presentation

## Personnel availability

The Barr team committed to this project consists of staff with whom you are familiar, including:

- **Brian LeMon**—principal in charge and QA/QC
- **Michelle Stockness**—project manager
- **Dan Nesler**—senior process/civil engineer (site design and coordination)
- **Lisa Andrews**—process engineer (pilot testing oversight and feasibility study)
- **Stuart Stephens**—electrical engineer

With an eye towards cost-effective implementation of WTP4, we also have engaged key staff from Bolton & Menk, Inc., a well-respected local design firm. Bolton & Menk, Inc. designed the 4.8-MGD iron/manganese gravity filtration plant for the City of Big Lake, Minnesota, and the 8.0-MGD filtration plant for the City of Andover, Minnesota, which City of Blaine staff toured in the spring of 2016. Bolton & Menk, Inc. will assist with the pilot study and will provide QA/QC review and value engineering services in the feasibility study.

The Bolton & Menk, Inc. staff who will assist with the project include:

- **Seth Peterson**—project manager
- **Hermann Dharmarajah**—water quality engineer
- **Brian Guldán**—operations engineer

## Project schedule

The proposed project schedule for the pilot testing and feasibility study is provided in the following table.

| Work task                | Deliverable date |
|--------------------------|------------------|
| Draft pilot testing plan | August 2016      |
| Final pilot testing plan | September 2016   |
| Draft feasibility study  | September 2016   |
| Operate pilot test       | October 2016*    |
| Final feasibility study  | November 2016*   |

*\*Dependent on final completion date of well construction projects*

## Fee estimate

Fee estimates for each work task (described above) are provided in the table below. These fees are estimated as not-to-exceed time and materials fees. The fee for each task can also be negotiated based on the final work scope.

| Work task                 | Fee estimate     |
|---------------------------|------------------|
| Task 1: Pilot Testing     | \$ 14,200        |
| Task 2: Feasibility Study | \$ 27,700        |
| <b>Total</b>              | <b>\$ 41,900</b> |

If the City is interested in any of the optional services identified in this letter, please contact either Brian or Michelle and we can work with you to develop a scope and budget to provide them.

## In conclusion

Thank you for the opportunity to propose on this project. If you have questions about our team's proposal scope or budget, feel free contact Michelle Stockness (952-832-2754 or mstockness@barr.com) or Brian LeMon (952-832-2774 or blemon@barr.com).

If the terms of this subagreement are acceptable to the City of Blaine, please date and sign in the space provided below. Keep one copy for your records and return the other to Barr Engineering Co.

Sincerely,

By: Brian LeMon, PE  
Its: Vice President, Principal in Charge

Michelle Stockness, PE  
Project Manager

Accepted this \_\_\_\_ day of \_\_\_\_\_, 2016

CITY OF BLAINE

By\_\_\_\_\_

Its\_\_\_\_\_