



CITY OF RAPID CITY

Engineering Services

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MEMORANDUM

TO: Mayor Alan Hanks and City Council Members

FROM: Stacey Titus, P.E.
Project Manager

SUBJECT: Pre-qualification of Membrane Vendors for the Rapid City Jackson Springs and Mountain View Water Treatment Plant Facilities

DATE: November 5, 2008

The implementation plan and Conceptual Design for Water Treatment Plant Upgrades Report approved by the City Council on July 7, 2008, for the design and construction of the City's water treatment plants included the methodology for the procurement of the membrane filters for both the Jackson Springs and Mountain View Treatment Plants. In keeping with the approved plan, staff is requesting authorization to pre-qualify Siemens Water Technology and GE-Zenon for the public bidding of the membrane pre-purchase for both facilities.

The pre-qualification process is further described in "Technical Memorandum 1 – Membrane Prepurchase Rapid City Jackson Springs and Mountain View WTP's", dated November 3, 2008, by Burns and McDonnell.



EQUAL OPPORTUNITY EMPLOYER

Memorandum



Date: November 3, 2008

To: Stacey Titus, P.E., City of Rapid City
Robert Ellis, P.E., City of Rapid City
Dale Tech, P.E., City of Rapid City
John Wagner, City of Rapid City

From: Mark Lichtwardt, P.E., Burns & McDonnell
Anthony Beeson, P.E., Burns & McDonnell
Melissa Halverson, E.I., Burns & McDonnell

Re: Technical Memorandum 1 – Membrane Prepurchase
Rapid City Jackson Springs and Mountain View WTPs
Burns & McDonnell Project No. 50328

INTRODUCTION

This memorandum summarizes the process Burns & McDonnell Engineering (BMcD) and the City of Rapid City are utilizing to select a membrane filtration system for both the Jackson Springs Water Treatment Plant (JSWTP) and the Mountain View Water Treatment Plant (MVWTP). For operation and maintenance purposes, both plants will utilize the same membrane filtration system. The JSWTP will have an eight million gallon per day (MGD) capacity, and will be designed and constructed first. The MVWTP will be designed and constructed following the JSWTP and have a 36 MGD initial capacity, with the potential to expand to 48 MGD in the future.

The membrane manufacturers are currently being evaluated by BMcD with input from City of Rapid City (City) staff. The evaluation will be split into prequalification and final evaluation processes. The prequalification process will include a general evaluation of all membrane manufacturers and the completion of a prequalification questionnaire. BMcD and the City will then prepare a procurement package for the prequalified manufacturers including purchase terms and technical specifications. Each prequalified manufacturer will have the opportunity to submit a single bid package for both plants. The bids will provide capital costs for the membrane systems and operational parameters necessary to complete a net present worth analysis. The final evaluation will take into account the 20-year, net present worth of all capital, operation, and maintenance costs.

The membrane filtration system will be purchased directly by the City. The membrane equipment may then be assigned to the successful general contractor for each project. Each general contractor will be responsible for the installation and start-up of the membrane filtration equipment. Delivery of the membrane equipment will be coordinated with each general contractor's construction schedule to minimize storage on site. Because construction of the MVWTP is scheduled for 2011-2012, a method for

adjusting the equipment cost for inflation will be agreed upon prior to issuing the prepurchase specifications.

BACKGROUND

BMcD and the City have worked together to determine the City's future potable water system needs. During the *Source Water Evaluation* (December 20, 2006), BMcD evaluated locations and treatment process alternatives for the City's raw water resources. Seven locations were evaluated based on criteria developed by BMcD and City staff. Based on the results of this process, treatment alternatives and capacity for each site were recommended. The City Council appointed the Water Advocacy Task Force (WATF) to review the project recommendations and advise the City Council on future water system work. The WATF recommended and the City Council accepted the following recommendations:

- Design and construction of an 8 MGD treatment plant at the Cleghorn Springs site to treat water from Jackson Springs Infiltration Gallery (JSG) and Rapid Creek
- Retrofit or design of a new treatment plant at the existing Mountain View WTP site. (*Conceptual Design Phase for Water Treatment Plant Upgrades, May 2008* concluded that a new treatment plant design would have substantial cost savings over a retrofit design.)
- The combined capacity of the two facilities shall meet the City's projected water demand through the year 2020. (Determined by the *Utility System Master Plan, April, 2008*, to be 42.5 MGD for maximum peak day demand.)
- Development of a Water Use Management Plan to ensure the optimal use of the City's ground water and surface water resources. (Source Water Utilization Tool developed as part of the *Conceptual Design Phase for Water Treatment Plant Upgrades, May 2008*.)

The selected treatment processes include rapid mix, flocculation, sedimentation, membrane filtration and disinfection. The use of the same processes at both plants will allow the City to train staff to operate both plants, store necessary spare parts and utilize chemicals that will treat both water supplies. Jackson Springs Infiltration Gallery (JSG) and Rapid Creek will provide raw water to the JSWTP. Rapid Creek will supply raw water for the MVWTP.

Utilizing the membrane prepurchase process will allow BMcD to optimize the design of both plants for the selected membrane system. Prepurchasing the membranes can also create substantial savings for the City. By using this process, each prequalified

manufacturer will spend time developing and refining their equipment design with BMcD and City staff. The time invested in their design should result in a reduced capital cost for the equipment. The process will reduce the potential for change orders and/or redesign that could otherwise result from a general contractor's procurement of the membrane systems.

This process has been utilized previously on several projects with good success. For example, the City of Thornton, Colorado saved over \$8 million (initial budgetary pricing vs. final bid pricing) by using this process for their membrane system at the 50-MGD Wes Brown Water Treatment Plant Expansion.

PREQUALIFICATION PROCESS

To begin the prequalification process, BMcD compiled a list of all potential membrane manufacturers, included as Attachment A. A general evaluation of each potential membrane manufacturer was conducted. For the general evaluation, BMcD reviewed websites, standard literature, and product promotional materials from each manufacturer. BMcD gathered information on type of membrane systems offered (submerged or pressure), process applications (drinking water, wastewater or industrial service), footprint (surface area required for membranes and ancillary equipment) and capacity of current installations. The City and BMcD determined that the general evaluation should eliminate membrane manufacturers and/or systems for the following reasons:

- Membrane systems not designed for potable water or with limited potable water experience were eliminated.
- Ceramic membranes were eliminated because of their high initial capital cost, additional spatial requirements, and limited experience in potable water applications.
- Membrane systems without three installations greater than 6 MGD and one installation greater than 20 MGD were eliminated.
- Membrane systems that did not meet the spatial constraints previously developed (*Conceptual Design Phase for Water Treatment Plant Upgrades, May 2008*) were eliminated.

The results of the general evaluation indicated that Siemens Water Technology (Siemens), GE-Zenon (GE) and Pall Corporation (Pall) were suitable membrane manufacturers and have been prequalified.

BMcD then sent prequalification questionnaires to Siemens and GE for their submerged membrane systems and Pall for its pressure membrane system. A copy of the prequalification questionnaire is included as Attachment B. The questionnaire included questions regarding the manufacturer's experience, standard equipment offerings, references for prior projects and information about on-site services.

The questionnaire responses included basic system operating information, such as the type and number of membranes proposed. The standard equipment offerings for pumps, blowers, compressors, valves, etc. provided by Siemens, GE and Pall will be reviewed by the City and BMcD staff. The equipment will then be compared to equipment already used by the City to maintain continuity throughout the potable water system and will be modified to reflect the preferences of both the City and BMcD.

Submerged membrane systems typically have a smaller footprint than pressure systems. BMcD was unable to determine with sufficient certainty whether or not Pall's pressure system would fit within the space provided at the JSWTP. Therefore, BMcD requested that Pall provide a layout drawing of the system that would best fit the application. The layout did not meet the space requirements of the JSWTP. Subsequent discussions with Pall resulted in their decision to withdraw from consideration.

FINAL EVALUATION PROCESS

The final evaluation process will include individual proprietary meetings between BMcD, the City, and each prequalified manufacturer. These meetings serve several purposes, which collectively will result in a more competitive procurement process and a better overall value to the City. They provide an opportunity to discuss many critical aspects of the project prior to developing the final prepurchase specifications. Items discussed at the proprietary meetings will include design criteria, operational requirements, conceptual layouts, instrumentation and control requirements, and the City's equipment and operational preferences (and/or BMcD's recommended preferences).

These meetings will allow BMcD and City staff to provide input to the manufacturers during the bid development process. They also provide each manufacturer an opportunity to better understand the net present worth evaluation and the associated assumptions and penalties that will be used. By working with each manufacturer throughout this process, they are able to minimize uncertainties and develop a better understanding of the project. In turn, it allows the City and Burns & McDonnell to develop a more competitive specification with 'buy-in' from each manufacturer. City staff involvement will allow them to gain additional knowledge of the design, construction and operation of membrane filtration systems.

The information exchanged at these proprietary meetings will allow BMcD to create a bid package for the membrane filtration systems that is fair and equitable to all of the prequalified manufacturers. The bid package will contain conceptual drawings, the terms and conditions of purchase, and technical specifications. Each manufacturer will be provided an individualized package using the design criteria provided during the proprietary meetings. The bid package will require each manufacturer to provide all

system parameters necessary to project operation and maintenance (O&M) costs, in addition to capital costs.

The information required in the bid package will be used to create a net present worth analysis based on the capital and O&M costs for each manufacturer. The O&M analysis will include membrane replacement, chemical usage, labor requirements, power consumption, adjustments and penalties. BMcD will obtain current chemical pricing from Hawkins, Inc. (Black Hawk, South Dakota) for the evaluation. Labor requirements will take into account the time necessary for City staff to operate and maintain the system including membrane replacement. Adjustments and penalties will be determined by BMcD with input from the City and manufacturers. Penalties can be assessed for excessive chemical consumption, power consumption, disposal of residuals, or other operational parameters that are determined to be affected by the design of a membrane system. Adjustments are applied when one manufacturer includes materials in their proposal that the other manufacturer does not include. Adjustments may include additional screening requirements, piping fabrication, or additional construction.

The final evaluation process will be based on a 20-year net present worth calculation of the capital cost and projected O&M costs. After this process it is anticipated that the City will enter into a procurement contract with the prequalified manufacturer having the lowest cost net present worth for the purchase of membrane filtration systems at both MVWTP and JSWTP. Contract terms for the future purchase of equipment at MVWTP would likely be agreed upon by the City and the manufacturer during the bid package development.

MEMBRANE MANUFACTURERS

The following is a table of membrane manufacturers considered for the general evaluation conducted by Burns & McDonnell. The table includes the evaluation criteria (process type, experience/capacity, and spatial constraints) used to determine which manufacturers were sent a prequalification questionnaire.

Manufacturer System	Parameters		
	Drinking Water Process	Three Plants greater than 6 MGD⁽¹⁾	One Plant greater than 20 MGD⁽¹⁾
Atec Systems Associates, Inc Pressure System	No - Industrial		
Filtronic, Inc Pressure System	Yes	No	No
H2O Innovation (2000) Inc. Pressure System	Yes	No	No
Hydranautics Pressure System	Yes	No	No
Hydropro Inc. Pressure System	Yes	No	No
Koch Membrane Systems Pressure System Submerged System under redesign	Yes	No	
WesTech Pressure System	Yes	No	
Norit⁽²⁾ Pressure System (Inside-Out)	Yes	(2)	(2)
Infilco Degremont Inc.⁽²⁾ Pressure System (Inside-Out)	Yes	(2)	(2)
Veolia Water/CeraMem⁽²⁾ Ceramic Membrane/Pressure System	Yes	No	No
Pall Corporation⁽²⁾ Pressure System	Yes	Yes	Yes
Siemens Water Technologies Submerged System Pressure System ⁽²⁾	Yes	Yes	Yes
GE Water & Process Technologies Submerged System	Yes	Yes	Yes

Notes:

1. Drinking water facilities within the United States.
2. Not prequalified due to spatial requirements.

SUBMERGED MEMBRANE MANUFACTURER'S PREQUALIFICATION QUESTIONNAIRE

The Undersigned certifies under oath the truth and correctness of all statements and/or all answers to questions made hereinafter.

Project Name: **Jackson Springs and Mountain View Water Treatment Plant
Membrane Prepurchase**

Owner: **City of Rapid City, South Dakota**

Submitted to: Mr. Mark Lichtwardt, P.E.
Project Manager
Burns & McDonnell Engineering Company, Inc.
9785 Maroon Circle, Suite 400
Centennial, CO 80112
303-721-9292

Manufacturer Contact:

Name: _____
Address: _____

Phone: _____
Fax: _____
Mobile: _____
Email: _____

Check One: ☐ Corporation ☐ Partnership ☐ Joint Venture
 ☐ Other _____

1. If a Corporation, answer the following:

Date of Incorporation _____
State of Incorporation _____
President _____
Vice-President(s) _____

Secretary _____
Treasurer _____

2. How many years has your organization been in business under the present firm's name? Indicate any previous company names and the time frame during which it was utilized.

3. How many years has your company been a manufacturer of submerged membrane systems?

4. Is your company solely responsible for the manufacture of the submerged membranes used in your system? If not, which company supplies the membranes for your submerged membrane system?

5. If your company is a North American licensee of the membrane technology, please indicate how long this contractual arrangement has been in place in the United States.

6. Provide (or attach) a detailed description of the equipment proposed.

7. Pretreatment with rapid mix, flocculation and sedimentation will be provided at both WTPs. If additional screening/straining is required upstream of the submerged membranes, state size requirements.

8. What chemicals are typically used with the submerged membrane system? In what concentrations?

9. List all proprietary equipment or technologies used in the membrane system.

10. Provide a description of the manufacturer's standard warranty; length, full, partial, or pro-rated components, and warranty options available.

11. List (or attach) your standard equipment manufacturers and/or materials for the proposed submerged membrane system.

Equipment

Supplier

Blowers

Process Pumps (indicate type and application)

Process Pumps (indicate type and application)

Process Pumps (indicate type and application)

Process Pumps (indicate type and application)

Motors

Air removal system

Air removal equipment

Chemical Pumps (indicate type and chemical)

Chemical Pumps (indicate type and chemical)

Chemical Pumps (indicate type and chemical)

Chemical Pumps (indicate type and chemical)

Air Compressors & ancillary equip

Pre-Screening/Strainers (of required)

Process Valves (indicate type and application)

Process Valves (indicate type and application)

Process Valves (indicate type and application)

Control Valves (indicate type and application)

Valve Actuators (indicate type and application)

Valve Actuators (indicate type and application)

Valve Actuators (indicate type and application)

Control System

Pressure Monitors

Flow Monitors

12. List your company's five most recent constructed potable water projects utilizing the submerged membrane system proposed for this project greater than 6 MGD capacity.

Project Name _____
Owner _____ Phone Number _____
Contract Amount _____ Contract Date _____
Maximum Rated Plant Flow _____ Completion Date _____

Project Name _____
Owner _____ Phone Number _____
Contract Amount _____ Contract Date _____
Maximum Rated Plant Flow _____ Completion Date _____

Project Name _____
Owner _____ Phone Number _____
Contract Amount _____ Contract Date _____
Maximum Rated Plant Flow _____ Completion Date _____

Project Name _____
Owner _____ Phone Number _____
Contract Amount _____ Contract Date _____
Maximum Rated Plant Flow _____ Completion Date _____

Project Name _____
Owner _____ Phone Number _____
Contract Amount _____ Contract Date _____
Maximum Rated Plant Flow _____ Completion Date _____

13. List all of you company's constructed potable water projects utilizing the submerged membrane system proposed for this project greater than 20 MGD capacity.

Project Name _____
Owner _____ Phone Number _____
Contract Amount _____ Contract Date _____
Maximum Rated Plant Flow _____ Completion Date _____

Project Name _____
Owner _____ Phone Number _____
Contract Amount _____ Contract Date _____
Maximum Rated Plant Flow _____ Completion Date _____

Project Name _____
Owner _____ Phone Number _____
Contract Amount _____ Contract Date _____
Maximum Rated Plant Flow _____ Completion Date _____

Project Name _____
Owner _____ Phone Number _____
Contract Amount _____ Contract Date _____
Maximum Rated Plant Flow _____ Completion Date _____

Project Name _____
Owner _____ Phone Number _____
Contract Amount _____ Contract Date _____
Maximum Rated Plant Flow _____ Completion Date _____

14. Indicate your company's two submerged membrane systems installations, regardless of size, in closest proximity to Rapid City, South Dakota

Project Name _____
Owner _____ Phone Number _____
Contract Amount _____ Contract Date _____
Maximum Rated Plant Flow _____ Completion Date _____

Project Name _____
Owner _____ Phone Number _____
Contract Amount _____ Contract Date _____
Maximum Rated Plant Flow _____ Completion Date _____

15. Please attach information listing the addresses for all of your company's existing supply, service and repair offices within the North America. Indicate the number of full-time employees at each location in the following categories:

- Field service
- Engineering
- Sales/customer service
- Spare parts

Also indicate each location's estimated response time to Rapid City, South Dakota.

16. Indicate the recommended support services duration and personnel for the construction start-up period.

17. Identify standard costs for on-site services.

18. Has your company ever not been awarded a project on which they were the lowest cost system?
If so, when, where, and why?

19. Has your company ever failed to complete a membrane system project that was awarded to it, or defaulted on a contract? If so, indicate when, where, and why.

20. Liquidated Damages and/or disputes: List all government or agency projects in the last three years where Liquidated Damages were, or may be assessed, where substantial disputes or lawsuits on projects occurred or are currently occurring. Attach a detailed explanation.

21. Please attach any additional information related to your company, or its experience, that you feel is pertinent to the evaluation of this qualifications statement.

The submerged membrane system manufacturer hereby represents and warrants that all statements set forth herein are true and correct.

Date _____, 2008

Name of Organization:

By: _____

Title: _____

(If Manufacturer is a corporation, the corporate name shall be signed, followed by the signature of a duly-authorized officer and with the corporate seal affixed).

MINUTES
Water Advocacy Task Force
June 18, 2008

Members Present: Chairperson JP Duniphan, Mayor Alan Hanks, Pete Cappa, Malcom Chapman, Karen Gundersen-Olson, Deb Hadcock, Tom Johnson, Hani Shafai, Dale Tech (for Robert Ellis,) John Wagner

Support Staff Present: Stacey Titus, Toni Broom

Others Present: Mark Lichtwardt and Anthony Beeson; Burns and McDonnell, and other members of the community

Meeting was called to order by Chairperson Duniphan at 5:03 p.m. with a quorum present.

The "Conceptual Designs for Water Treatment Plant Upgrades" report was presented by Anthony Beeson and Mark Lichtwardt, of Burns & McDonnell. A question and answer period along with discussion followed the presentation.

Discussion

In response to committee members' questions, the following information was provided. Staff recommended proceeding with the procurement of the membrane filter system for both the Jackson Springs and Mt. View Plants. It was further recommended to then proceed with construction of the Jackson Springs Plant first and immediately follow it with the construction of the Mt. View Plant. The Jackson Springs Plant is a smaller plant and will be inexpensive to operate due to the good source water. By bringing it on first, and using the existing Mt. View Plant as a peaking plant, there will actually be more capacity than is currently realized. If Mt. View is constructed first, there is a longer construction period and a longer time before additional capacity is realized. Once completed, the Jackson Springs Plant along with other City water supplies will support average water needs while the Mt. View Plant is being constructed. The Mt. View Plant could still be used as a back up if there were any kind of failure at the Jackson Springs Plant or for peak times. It was noted Mt. View is very redundant and plant parts could be borrowed from one component to service another, so the plant could continue to operate if any operational problems develop.

It was recommended to construct a new plant at Mt. View rather than do a retrofit. The total cost is considerably less for a new plant. It will be modular in design and allow for additional expansion and replacement of modules without putting the entire plant at risk. The existing Mt. View Plant will also be able to remain operational longer during the construction of the new plant.

Both plants will be bid as two projects, which will allow the opportunity to get the same general contractor for both. A general contractor will be utilized along with local sub-contractors. It was advised by staff to not bid both projects at the same time as construction will not begin immediately on the Mt. View Plant. Some of the reasons provided for this recommendation included: higher costs at construction time; doing both at the same time would create a larger burden on city staff and funding appropriations; a single large project limits the ability of some good general contractors to bid on the project; and efficiencies with the consultant would be realized with staged bidding and construction.

It was, however, recommended to pre-purchase membranes for both plants upfront to guarantee pricing. A recommended timeline is included in the Power Point presentation.

Funding options were evaluated by the consultant, however, the presentation only briefly addressed the funding. Generally, it was noted to pursue federal funding grants and supplement short falls utilizing other sources. Mayor Hanks reported all three members of our federal congressional delegation are interested in helping with this project. They indicated we should not count on large appropriations in any given year. Smaller funding requests over several years is likely a better approach than requesting a single large grant. The Mayor is cautiously optimistic help would be received by the federal government.

Discussion was held on the impact of delaying construction on either plant. With prices and inflation increasing, it is likely interest rates will also increase. It was generally noted that locking in prices as quickly as possible would be best.

Motions

Motion was made by Johnson, seconded by Shafai that the Water Advocacy Task Force recommends the City of Rapid City approve the "*Conceptual Design for Water Treatment Plant Upgrades Report*," dated May 23, 2008, by Burns & McDonnell. Motion carried unanimously.

Motion was made by Johnson, seconded by Chapman that the Water Advocacy Task Force recommends the City of Rapid City approve the proposed implementation plan for design and construction of the City water treatment plants as presented by City staff, including procurement of the membrane filters and construction of Jackson Springs first, followed by Mt. View. Motion carried unanimously.

Other Discussion

Discussion was held on the future role of the Water Advocacy Task Force. The committee agreed that there was no need to have any future meetings and that their intended purposes have been completed.

Chairperson Duniphan thanked the audience members for attending and asked for any further input or comments from them. Dr. Perry Rahn asked the committee to consider a paper he wrote and mailed to them on future water supplies for Rapid City.

Adjourn

There being no further business to come before the Committee, motion was made by Chapman, seconded by Hadcock to adjourn the Water Advocacy Task Force meeting at 6:06 p.m. Motion carried unanimously.

Respectfully submitted,

Toni Broom
Administrative Assistant
Public Works