



AGENDA ITEM FORM

SUBJECT: Request Authorization to Execute Amendment #2 to the Existing Nitrate Management Plan Agreement with CH2M Hill and add Nitrate Removal Engineered Wetlands Pilot/Demonstration Scope

SUMMARY:

- Des Moines Water Works (DMWW) entered into an agreement with CH2M Hill on May 5, 2015, for a Nitrate Management Plan.
- The original agreement included evaluation of raw water nitrate trends, projections on future nitrate treatment requirements, assessment of different nitrate removal technologies, and development of a strategy to handle increasing raw water nitrate concentrations.
- Preliminary results from the Nitrate Management Plan included a recommendation to evaluate the use of natural and intensified wetland treatment as pretreatment for nitrates.
- Because use of wetlands is not common for drinking water treatment, it is recommended that a one-acre pilot study be conducted for a two-year period to better understand the advantages and disadvantages prior to constructing a full scale wetland.
- Amendment #2 includes design of pilot, pilot testing plan, evaluation of results, and a basis of design report for the full scale wetland.
- The pilot wetland will be constructed and operated by staff.
- Amendment #2 increases the cost of the original agreement by \$155,942.
- The Amendment #2 to the Nitrate Management Plan Agreement has been reviewed by staff. A copy of the amendment is attached.
- It is recommended that the Board authorize the CEO and General Manager to execute Amendment #2 to the Nitrate Manage Plan with CH2M Hill and add the Nitrate Removal Engineered Wetlands Pilot and Demonstration Scope.

FISCAL IMPACT:

The estimated consultant fees for this Amendment are \$155,942. Funds for this amendment will come from other 2016 work plan budgets.

RECOMMENDED ACTION:

Approve and authorize the CEO and General Manager to execute Amendment #2 to the Existing Nitrate Management Plan Agreement with CH2M Hill and add Nitrate Removal Engineered Wetlands Pilot and Demonstration Scope.

BOARD REQUIRED ACTION:

Motion to approve and authorize the CEO and General Manager to execute Amendment #2 to the Nitrate Management Plan Agreement with CH2M Hill and add Nitrate Removal Engineered Wetlands Pilot/Demonstration Scope.

| | | |
|--|--|---|
| _____ / _____ Nathan W. Casey, P.E. (date) Project Manager | _____ / _____ Danny J. Klopfer, P.E. (date) Engineering Services Manager | _____ / _____ William G. Stowe (date) CEO and General Manager |
|--|--|---|

Attachments: Amendment #2 to the Existing Nitrate Management Plan Agreement



**STANDARD AGREEMENT FOR PROFESSIONAL SERVICES
Amendment No. 2**

CH2M'S OFFICE ADDRESS: 1295 Northland Drive, Suite 200, Mendota Heights, MN 55120

CH2M'S PROJECT NO.: 662766

PROJECT NAME: Nitrate Management Plan Project (Amendment No. 2)

CLIENT: Board of Water Works Trustees of the City of Des Moines ("Des Moines Water Works")

CLIENT'S ADDRESS: 2201 George Flagg Parkway, Des Moines, Iowa 50321

CLIENT requests and authorizes CH2M HILL Engineers, Inc. (hereinafter "CH2M ") to perform the following Services:

Scope of Services

This is Amendment 2 to the Standard Agreement for Professional Services, dated May 18, 2015.

CLIENT has requested that additional Nitrate Management Plan related activities be incorporated by Amendment. Specifically, the scope of work associated with the development of a Treatment Wetlands Pilot System and Preliminary Engineering Report for a full scale system. Attachment A – Scope of Work and Schedule – provides the details associated with Amendment No. 2 services.

The services associated with Amendment No. 2 will be maintained separately from the other project scope, and will be clearly identified on invoices.

Compensation

Compensation by CLIENT to CH2M will be on a time and materials basis in the amount of \$155,942.00. Attachment B provides a fee estimate by task for Amendment No. 2 services.

Schedule

Amendment No. 2 Services are to be delivered as defined in Attachment A – Scope of Work and Schedule.

Other Terms

Services covered by this Amendment 2 will be performed in accordance with the Provisions of the original Standard Agreement, dated May 18, 2015 and any attachments or schedules. This Amendment shall supplement the existing Agreement and understandings and shall be effective upon execution by both parties.

DES MOINES WATER WORKS:

Signature _____

Name (printed) William Stowe

Title DMWW CEO

Date _____

CH2M HILL Engineers, Inc.

Signature 

Name (printed) Douglas R. Lubben

Title Vice President

Date 12/18/15

Amendment No. 2 Attachment A:

Nitrate Removal Engineered Wetlands Pilot/Demonstration Project Scope of Work and Schedule Des Moines Water Works (Contract No. tbd)

SOW VER. 3 DECEMBER 18, 2015

SOW Revision notes:

Version 1: Per Nitrate Management Plan Project meeting of October 30, 2015

Version 2: Per DMWW comments on November 23, 2015

Version 3: Schedule adjusted per DMWW discussions

Project Background & Objectives

The Des Moines Water Works (DMWW) has developed a comprehensive plan to increase the nitrate treatment capacity at the Fleur Drive Water Treatment Plant. This plan includes the construction of an 80-acre intensified treatment wetland. Prior to the construction of the wetland DMWW will construct and operate a pilot wetland, that will:

- Confirm the nitrate removal basis of design criteria
- Determine impacts to the drinking water treatment plant (i.e. DBP formation, ammonia levels, pesticide removal)
- Aid regulatory approval for full-scale system
- Optimize full scale treatment

Refer to DMWW's Nitrate Management Plan Task 4 meeting summary and draft implementation schedule recommendation for a 2 year engineered wetland pilot/demonstration project with the first year providing critical information used to define the full-scale system design basis and a second year of pilot to focus on operations optimization for the full-scale system once operational.

Scope of Work

The scope of services for this engineered wetland pilot/demonstration project includes the following tasks:

- Task 1—Pilot/Demonstration Testing Plan
- Task 2—Pilot/Demonstration Preliminary Design (Concept Drawings) and Final Design (Plans & Specifications)
- Task 3—Pilot/Demonstration Services During Construction
- Task 4—Pilot/Demonstration Services During Operation & Pilot/Demonstration Testing Report
- Task 5—Full-Scale System Basis of Design Report (BODR)
- Task 6 – Pilot/Demonstration Testing Report Addendum with an Operations Optimization Supplement

Each of these tasks are further defined in the respective sections below.

Tasks 5 & 6 are conditional on the outcome of Task 4 and will not be initiated until both the completion of Task 4 and DMWW authorization to proceed with Tasks 5 & 6.

Task 1—Pilot/Demonstration Testing Plan

This is an important critical path task in planning so that the pilot is operational in a timely manner and to takes full advantage of the 2016 growing season. Authorization of this task can be independent of the authorization for Tasks 2, 3, and 4. Year one pilot testing will be focused on answering the key design criteria (i.e. carbon addition rate, denitrification kinetic rate constants, temperature dependence, system background concentrations of key constituents). The plan includes two parallel half-acre wetlands to enable the full range of treatment approaches (with and without carbon addition, carbon addition with sulfate, etc., and different operational schemes). CH2M

will develop alternate planting approaches for DMWW to consider along with the associated costs and schedule impacts (alternatives include direct seeding of native emergent species, planting of native emergent species bare root, and established wetland harvesting of plants and muck).

In addition, the proximity of the proposed full-scale wetland to the Des Moines Airport will likely require Federal Aviation Authority (FAA) approval. CH2M will review the site to identify potential FAA requirements that may impact siting in the proposed location. .

Activities:

- CH2M, in collaboration with DMWW, will develop a detailed pilot/demonstration testing plan that includes operation and testing for 2 year, where the first year will support full-scale system design development and a second year will support operational optimization of the ultimate full-scale system. The testing plan will identify alternate treatment approaches, sample collection frequency, and sample analyses to be performed.
- Technical Working Session No. 1
- Perform FAA site review

Outcomes:

- A detailed plan developed for the timely execution of the engineered wetland pilot/demonstration testing.

Assumptions:

- DMWW provides relevant historical data in tabular format in a single excel workbook
- DMWW provides pilot demonstration location
- FAA evaluation is based on existing available information. No FAA meetings are planned.
- Geotechnical investigation of the pilot/demonstration location will not be required. It is assumed that existing available geotechnical information is.
- Pilot demonstration testing plan will be provided in PDF format. One draft and one final version will be provided.

Deliverable:

- Draft and final Pilot/Demonstration Testing Plan Technical Memorandum

Task 2—Pilot/Demonstration Preliminary Design (Concept Drawings) and Final Design (Plans & Specifications)

Based on the Task 1 Pilot/Demonstration testing plan, CH2M will develop the design for the pilot wetland in two phases, preliminary and final design. The preliminary design package will focus on system drawings to present the pilot concept and gain acceptance by DMWW. Once DMWW endorses the concept, CH2M will complete the final design that will include appropriate level of detail and specifications required for DMWW to construct the system. The design will focus on ease and cost effectiveness of construction, including full material balance of cut and fill to construct berms and avoid the need to import or export material, and a planting plan that results in minimum time of establishment and provides sufficient operational data to achieve the project goals. The pilot will include two cells to be operated in parallel with a wetted area of ½ acre each. Total wetland footprint is expected to be no more than 1.5 acres. A narrow inlet and outlet deep zone and a flat marsh zone will be included in each cell. This will allow the collection of the borrow material needed to construct the berms. Berm sharing between cells can minimize earth-moving requirements. The cells will be designed identically to include an average marsh zone depth of 1 foot and deep zone depth of 3 feet. Two feet of freeboard will be included to provide the ability to vary wetland operational depth and to capture any extreme storm events without overtopping the berms. Water levels will be controlled via a hydraulic control structure, such as an AgriDrain®, which allows for easy downstream control of water depths in the wetland cells.

Activities:

- Technical Working Sessions No. 2 and 3.
- Design Development

Outcomes:

- The pilot system design provided in a timely fashion

Assumptions:

- DMWW provides timely review of preliminary design
- Plans and technical specifications developed with assumption of construction being completed by DMWW staff. No front end documents will be prepared and there will be no bidding of work to outside contractors.
- Custom specifications will be incorporated onto the drawings
- DMWW will perform design for raw water pumps and chemical feed systems based on design criteria provided by CH2M.
- CH2M design scope does not include electrical or instrumentation and control design work.
- Preliminary Design and Final Design will be provided in PDF format. One draft and one final version of each will be provided.

Deliverable:

- Pilot/Demonstration system Preliminary Design
- Pilot/Demonstration system Final Design

Task 3—Pilot/Demonstration Services During Construction

This task provides a summary of CH2M’s involvement during the construction of the pilot/demonstration wetland by DMWW staff.

Activities:

- Support DMWW during construction

Outcomes:

- Timely construction of the pilot/demonstration wetlands to fully utilize the 2016 periods of elevated nitrate in the water supply

Assumptions:

- CH2M response to DMWW Requests for Information (RFI’s) during construction. 10 RFI’s are assumed
- One site visit by David Austin during the pilot/demonstration construction
- Construction is completed by DMWW resources.

Deliverable:

- Documentation of related meetings and conference calls

Task 4—Pilot/Demonstration Services During Operation & Testing Report

This is the primary task of this project, and captures the first year of pilot/demonstration testing.

Activities:

- Execute the Task 1 Pilot Testing Plan
- Monthly conference calls on pilot/demonstration performance
- Data Analysis and Presentation
- Technical Working Sessions No. 4 and 5A – one at the beginning of the year-one testing program and one at a mid-point of the year-one testing
- Technical Working Session No. 5B on the Development of integration of wetlands implications to existing and future WTP processes
- Prepare draft Pilot/Demonstration Testing Report and submit to DMWW for comment
- Draft report review meeting
- Incorporate DMWW comments, as appropriate, and finalize the Pilot/Demonstration Testing Report
- Submit the final Pilot/Demonstration Pilot Testing Report to DMWW

Outcome:

- Successful pilot/demonstration testing program that: a) quantifies performance for an engineered wetland for raw water nitrate removal b) identify any downstream impacts to the water treatment plant, c) enables regulatory approval, and d) allows for the development of the Task 5 Full-Scale BODR.

Assumptions:

- DMWW staff operate the treatment wetland, collect and analyze the samples, tabulate the cumulative data
- DMWW Water Quality Laboratory will be utilized for: Analysis of routine samples (i.e. nitrate, nitrite, TKN, ammonia, pH, temperature, TOC, etc.)
- CH2M's Applied Science Laboratory will be utilized for: coagulation jar testing, DBP formation testing, pesticides, and other contaminants of emerging concern. These costs are not included in the level of effort and will be determined after completion of Task 1.
- Testing Report will be provided in PDF format. One draft and one final version will be developed

Deliverable:

- Pilot/Demonstration Testing Report

Task 5—Full-Scale System Basis of Design Report (BODR)

This Task will not be initiated prior to the completion of Task 4 and DMWW authorization to proceed. This task includes the development of a BODR for the full scale system and includes a preliminary design, description of the facilities, description of codes used by each discipline, material of construction, utilities required, and geotechnical information. The BODR will outline the basic layout of the wetland system, access roads, and pipelines needed. Preliminary typical details will be provided. This document will provide the basis of design and a description of the facilities by discipline. An engineer's opinion of probable cost (Class 4 cost estimate based on the Cost Estimate Classification System as defined by ACE International) will be prepared. This cost will be based on the documents developed at that time and will be a mixture of actual takeoffs and cost factors. Takeoffs and measurements will be based on the actual drawings but will be limited at this stage.

Drawings to be included in the Preliminary Engineering Report are generally as follows:

- a) Layout of the wetland system
- b) Pipeline routing
- c) Electrical single line diagram
- d) P&IDs
- e) Control block diagram

Activities:

- Prepare draft BODR and submit to DMWW for comment.
- Incorporate DMWW comments, as appropriate, and finalize the BODR.
- Submit the final BODR to DMWW. Provide five (5) hard copies of the Final BODR. In addition, provide one (1) copy of an electronic version of the final BODR in PDF format. The BODR shall be signed and sealed by a professional engineer in the state of Iowa.

Assumptions:

- Development of one draft BODR and one final BODR.

Deliverable:

- Basis of Design Report for the Full Scale Nitrate Removal Engineered Wetland.

Task 6—Pilot/Demonstration Testing Report Addendum with an Operations Optimization Supplement

This Task will not be initiated prior to the completion of Task 4 and DMWW authorization to proceed. This task captures the year-two experimental operational schemes and results of the pilot/demonstration testing. The second year of pilot/demonstration testing will be dedicated to optimizing operation including loading, carbon dosing, and wetland operational depth, for application to a full-scale system. Refer to the milestone schedule, as the operations optimization phase of the pilot/demonstration will be completed well after the Full-Scale BODR.

Activities:

- Update pilot testing plan based on year 1 results
- Analyze Year 2 testing results
- Prepare draft and final supplement document/TM

Outcome:

- The operations optimization data analysis and recommendations for full-scale operations are documented in a stand-alone document that is attached by addendum to the pilot/demonstration testing report developed and finalized in Task 4.

Assumptions:

- DMWW staff operate the treatment wetland, collect and analyze the samples, tabulate the cumulative data.
- DMWW Water Quality Laboratory will be utilized for: Analysis of routine samples (i.e. nitrate, nitrite, TKN, ammonia, pH, temperature, TOC etc.).
- CH2M's Applied Science Laboratory will be utilized for: coagulation jar testing, DBP formation testing, pesticides, and other contaminants of emerging concern. These costs are not included in the level of effort and will be determined after updating the pilot testing plan.
- Development of one draft and one final of the supplement

Deliverables:

- Addendum Supplement to the Task 3 Pilot/Demonstration Testing Report

Project Administration

Includes services associated with the administration of this scope of work. Subtasks include project management, project control (budget & schedule), overall quality control, invoicing, progress reporting, and project communications throughout the duration of this contract. Project Administration activities are included within the respective tasks above.

Activities:

- Prepare a project schedule that meets project requirements
- Conduct & document a project initiation meeting between CH2M and DMWW
- Prepare written progress reports with each invoice. Each report should include Milestone dates; work completed within the invoice period; work to be completed in the next period; and report percent work complete versus percent budget spent.

Outcome:

- Orderly delivery of the project that is on schedule and within budget

Assumptions:

- Project duration of 24 months
- Electronic submittal of invoices and progress reports to DMWW PM
- Progress meetings will occur just prior to (or directly after) technical meetings and/or on-site work
- Project will utilize the same change management process as with other DMWW projects, and/or as acceptable to DMWW. A Scope Modification will be developed for changes incurred during the project,

should they occur, for DMWW review and acceptance. The changes incurred will be as directed by DMWW, and or as identified by CH2M as being beyond the original project scope. At the appropriate time during the project, approved Scope Modification(s) will be incorporated into the associated contract amendment and submitted for DMWW execution.

- DMWW provides notice of any requested changes to meeting documentation within 7 days of receipt.
- DMWW PM responsible for coordination and scheduling of DMWW participants for conference calls and meetings.

Deliverables:

- Project Work Plan
- Project Invoices and Progress Reports
- Communication, meeting agenda and meeting summary documentation

Schedule Milestone Summary

| | |
|-------------------|--|
| December 23, 2015 | Email Notice to Proceed with Task 1 |
| January 15, 2016 | Project kickoff meeting |
| January 26, 2016 | Pilot/Demonstration Testing Plan Complete (Task 1) |
| January 26, 2016 | DMWW Board Meeting and Notice to Proceed with Tasks 2, 3, and 4 |
| March 8, 2016 | Pilot/Demonstration System Design Complete (Task 2) |
| May 1, 2016 | Pilot/Demonstration System Construction Completed (Task 3) & Operations Begin (Task 4) |
| December 6, 2016 | Year-One Pilot Operations Cut-off (Task 4) for use in BODR (start of year two pilot) |
| December 6, 2016 | Notice to Proceed with Tasks 5 and 6 |
| January 17, 2017 | Pilot/Demonstration Testing Report is complete (Task 4) |
| February 14, 2017 | Full-Scale BODR complete (Task 5) |
| December 1, 2017 | Pilot/Demonstration Testing Report Supplement Complete (Task 6) |

Amendment No. 2 - Attachment B
DMWW Engineered Treatment Wetlands Pilot/Demonstration Project: Fee Estimate
Version 1 December 4, 2015

| | | | | | | | | | | | Labor Summary | | | | | | Expense Summary | Total Fee Summary | |
|---|--------------|--------------------------|--------------|-----------------------|---------------|-------------|--|-----------|-----------------|-------------|----------------------|-------|------|-------|---------------|---------|------------------------|--------------------------------------|-------------------|
| | Roger Scharf | Paul Swaim (Myers/Odell) | Daivd Austin | Rafael Vázquez-Burney | Chris Pomeroy | Doug Lubben | Discipline Engineers (civil, structural, electrical) | Drafting | Accounting & AA | Total Hours | Total Labor | Misc | Lab | Repo | Lodging/Meals | Travel | Total Expense | | |
| Task 1 Pilot/Demonstration Testing Plan | 30 | 0 | 20 | 14 | 20 | 3 | 4 | 2 | 4 | 97 | \$ 17,119 | \$ - | \$ - | \$ - | \$ 100 | \$ 300 | \$ 400 | \$ 17,519 | |
| Task 2 Pilot/Demonstration Preliminary & Final Design | 50 | 0 | 38 | 52 | 0 | 10 | 20 | 12 | 6 | 188 | \$ 31,586 | \$100 | \$ - | \$ 50 | \$ 100 | \$ 600 | \$ 850 | \$ 32,436 | |
| Task 3 Pilot/Demonstration Services During Construction | 11 | 0 | 17 | 10 | 0 | 2 | 2 | 0 | 2 | 44 | \$ 8,329 | \$ 25 | \$ - | \$ - | \$ 25 | \$ 300 | \$ 350 | \$ 8,679 | |
| Task 4 Pilot/Demonstration Services During Operations & Pilot/Demonstration Testing Report | 80 | 23 | 46 | 81 | 0 | 12 | 0 | 2 | 8 | 252 | \$ 46,211 | \$ 75 | \$ 1 | \$ - | \$ 150 | \$1,100 | \$ 1,326 | \$ 47,537 | |
| Task 5 Full-Scale System Basis of Design Report | 52 | 4 | 18 | 60 | 0 | 8 | 58 | 16 | 6 | 222 | \$ 36,180 | \$ - | \$ - | \$ - | \$ 50 | \$ 300 | \$ 350 | \$ 36,530 | |
| Task 6 Pilot/Demonstration Testing Report Addendum & Operations Optimization Supplement | 23 | 2 | 8 | 40 | 0 | 3 | 0 | 0 | 3 | 79 | \$ 13,215 | \$ 25 | \$ - | \$ - | \$ - | \$ - | \$ 25 | \$ 13,240 | |
| Total Hours: | 246 | 29 | 147 | 257 | 20 | 38 | 84 | 32 | 29 | 882 | \$ 152,641 | | | | | | \$ 3,301 | \$ 155,942 | |
| | | | | | | | | | | | | | | | | | | Tasks 1-4 Subtotal: | \$ 106,171 |
| | | | | | | | | | | | | | | | | | | Tasks 5&6 Subtotal: | \$ 49,770 |
| | | | | | | | | | | | | | | | | | | External Lab Estimate Year 1: | \$ 15,000 |
| | | | | | | | | | | | | | | | | | | External Lab Estimate Year 2: | \$ 5,000 |