

City of Longview Mint Farm Regional Water Treatment Plant

Silica Removal Concept Design Report

Engineering Services Scope of Work, Fee and Schedule

Amendment No. 3 to the Executed Agreement of August 28th, 2014

City of Longview, WA

October, 2016



EXHIBIT A

Scope of Work

Understanding

The City of Longview and the Beacon Hill Water and Sewer District (BHWSD) (jointly referred to as City), developed a new water drinking water supply between 2011 and 2013, changing the source water from the Cowlitz River surface water supply to the Mint Farm Groundwater Source. In January 2013, construction was completed of the new groundwater source, and the change of source was initiated. Chemistry changes and directional flow changes from the new source caused spotting/scale and taste, odor, and color (T&O/Color) issues resulted in a significant number of complaints from the customers.

In September 2014, the City retained CH2M to assist with a community outreach and water supply evaluation process/study. Following this work, the City decided, based on community recommendation, to proceed with an evaluation to determine potential water quality and water supply yield by using a horizontal collector well(s) along the banks of the Cowlitz River with the intent to replace the Mint Farm water supply. After conducting this work, it was determined that the water quality was not superior to the existing Mint Farm Groundwater Source, and the City ceased further exploration and evaluation of this option.

At this time, the City desires to further evaluate the opportunities and costs for silica removal of the water supply from the Mint Farm Regional Water Treatment Plant. The work under this scope includes conducting bench test water quality testing to determine the appropriate treatment technology to employ, if silica removal was to be implemented.

City Staff Involvement

It is anticipated that the City will take the lead role in the following activities of the project:

- Collection and Delivery of water samples from the Mint Farm WTP to CH2M ASL Lab in Corvallis Oregon
- Review of the Silica Concept Design Report

Scope Elements

To deliver services for this water treatment concept design project, we propose the following tasks and work breakdown structure:

- **Task 13 – Silica Removal Concept Design Report**
 - Testing Plan
 - Bench Testing
 - Evaluation and Concept Design Report
 - Presentations
- **Task 14 – Project Management**

Task 13 – Silica Removal Concept Design Report

The consultant shall complete the following for this task:

1. Develop a testing plan and have it reviewed for approval by the City, and Washington Department of Health (DOH).
2. Conduct a Bench Scale-test study to demonstrate effective removal of silica at CH2M's Applied Science Laboratory (ASL).
3. Prepare an Evaluation of alternatives and Conceptual Design Report for the preferred Alternative for review and approval by the City and DOH.
4. Provide a Presentation of the results to the City and the District.

Each of the tasks is described in further detail below.

Task 13.1 Testing Plan

The test plan will include a description of the equipment to be used for testing, the expected duration of the testing, the type and frequency of water quality samples to be collected and analyzed. The consultant shall submit the plan to the City, and DOH for review and approval prior to testing.

Task 13.2 Conduct Bench Scale Testing at CH2Ms Applied Sciences Laboratory (ASL)

City will collect water samples from the City's Mint Farm WTP and transport them to ASL. It is expected that 20 gallons of water will be needed for the testing.

Bench testing will be performed for the treatment processes identified below:

Reverse Osmosis

- A low pressure Reverse Osmosis (RO) module test of Mint Farm Groundwater, primarily for silica removal, but also to characterize the water quality with respect to organic nitrogen, chlorine (F&T) demand, TDS, Calcium, Magnesium, Chloride, Sulfate, pH, TOC, Hardness, Total and Bicarbonate alkalinity. The module will be run to achieve a silica concentration in the permeate of less than 20 mg/L, and then the filtrate and concentrate streams will be tested to characterize the water quality.

Lime Softening

- Jar Testing replicating Lime softening with magnesium chloride addition (with input from Ken Martins) with the same water quality characterization listed for the RO test – including optimizing with a target of 75% silica removal.

Sodium Aluminate Dosing

- Jar testing with Sodium Aluminate doses ranging from 20 to 100 mg/L and analyzing for the same RO Test parameters, optimizing for silica removal with a target of 75% removal.

In addition, water quality information will be provided to an Activated Alumina Vendor and an Ion Exchange Vendor, for their internal assessment and equipment recommendations.

The City will also conduct a separate bench testing evaluation of electrocoagulation, and have the information provided to CH2M for the results.

Under this task, an evaluation of utilizing water from Weyerhaeuser's Columbia River intake system to supplement and mix with Mint Farm Groundwater for blending will also be reviewed.

Task 13.3 Evaluation and Conceptual Design Report

Consultant will use the results from Task 13.2, and the information received from:

- The Electrocoagulation Vendor
- The Ion Exchange Vendor
- The Activated Alumina Vendor

to prepare an evaluation of silica removal alternatives. It is expected the evaluation will include removal effectiveness, capital and O&M costs, ease or difficulty of operation, residuals handling and disposal, number of systems of similar size in operation, and safety to the operators and the community. A preferred alternative will be selected based on the evaluation and the preferred alternative will be the basis for development of a Conceptual Design Report (CDR).

CH2M will prepare the CDR for review and approval by the City and DOH. The CDR will include the following information:

- Project Goals and Objectives
- Existing Wells Descriptions and Water Quality
- Site Constraints
- Regulatory Requirements for Treatment and Residuals
- Treatment Objectives
- Operation and Management of the Facilities
- Testing Methodology
- Testing Results
- Evaluation of Alternatives
- Evaluation Criteria
- Preferred Alternative
- Recommendation for Further Pilot Testing
- Cost estimates including capital, annual O&M and a 20-year life-cycle cost
- For the preferred alternative:
 - Recommended Design and Operation Criteria for full-scale Treatment
 - Conceptual Design of the Treatment Facility including basic equipment, layouts, chemicals, electrical requirements, operations and maintenance requirements and building requirements.

The CDR submittals will consist of the following:

- Draft CDR - one electronic (pdf) file
- Final CDR - one electronic (pdf) file
- A hard copy and electronic (pdf) file of the Final CDR will be submitted to the City.

Task 13.4 Presentation

The consultant shall provide a presentation at a joint meeting of the City and the District when a draft of the conceptual design report is completed. The presentation shall include all elements of the conceptual design report.

Task 14 —Project Management

Project management will be ongoing throughout the duration of the project as we work closely with the City to ensure the project meets schedule, budget, and technical requirements.

We will provide a summary report of work completed for each monthly invoice.

Overall project management of the consultant team will be the responsibility of CH2M which includes coordinating and communicating to ensure the project team is meeting scope, schedule, and budget. The project manager will be supported by a multi-person team including an overall quality assurance manager, senior advisors, and support staff.

Ongoing monthly status reports will be provided by the consultant for the consultant team's work efforts. These monthly updates will provide a summary of the progress completed in the preceding month and identify unresolved or changed issues that need to be addressed. This report will be provided with the monthly invoice and tracking schedule.

Periodic project manager meetings (in-face or telecon as mutually agreed) will be held between the client and consultant project manager through the project.

EXHIBIT B

Schedule

Project Schedule

The draft Silica removal concept design report is anticipated to be delivered by spring, 2017, assuming a late fall 2016 start.

EXHIBIT C

Fee Proposal

Basis for Compensation

The basis of compensation is shown as per the original contract terms dated August 28th, 2014 as updated in Table 1. The fee estimate for the project is presented in Table 2. The fee is based on a time and materials basis for the work defined in the above scope for project Tasks 13 and 14.

As mutually agreed, the Consultant and City may adjust budgets between tasks as needed to address changes in the work requested or performed.

Table 1
CH2M 2016 Rate Schedule

Cost Type	Basis of Compensation
Labor Rates	
Labor Costs	Raw Salary Labor times 3.15 Adjustments (ranging from 3% to 6%) to employee raw salary labor rates occur in April of each year.
Expenses	
Personal Automobile Mileage Reimbursement	Federally Accepted Rate
Mark-up on Direct Expenses	Cost
Mark-up on Outside Services	10%

Total Fee	\$ 67,296
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