

EXHIBIT A
Scope of Work
City of Longview
Beacon Hill Water and Sewer District
Hillside and Hillcrest Booster Pump Stations
Pump Selection, Hydraulic Analysis, and Design Support
May 2016

Background

The City of Longview (Longview) and the Beacon Hill Water and Sewer District (BHWSD) have requested that RH2 Engineering, Inc., (RH2) provide hydraulic modeling analysis, pump selection, geological exploration, geotechnical recommendations, electrical and telemetry design, and hydraulic model calibration, to support Longview's design of two proposed booster pump facilities. In addition, RH2 will assist with the suction piping design from the proposed tie-in location to the proposed booster pump stations (BPSs).

Longview and BHWSD are planning to demolish two existing 0.5 million gallon (MG) circular concrete reservoirs and two existing pump stations. The intent is to design two new pumping facilities to serve both distribution systems. The project location is known as the Main/Hillcrest Reservoir site. The two existing pumping stations share the same transmission main and source of supply, and this will remain unchanged. Currently, there are five reservoirs on the site: The two 0.5 MG concrete reservoirs, which will be removed, and three rectangular, partially-buried concrete reservoirs will remain as water storage facilities.

Longview and BHWSD are planning to construct a new facility to detain stormwater at the site. A 0.33-acre below-grade lined pond was constructed on Longview property immediately east of the 0.5 MG reservoirs in 2006 to detain stormwater from a nearby new subdivision. This detention pond likely does not have sufficient capacity to offset additional impervious surface area.

Assumptions:

- *Longview will be performing the site, structural, and mechanical design of the proposed BPSs and stormwater detention pond.*
- *Longview will prepare bid packages for both BPSs and the stormwater pond.*
- *The plans and specifications will be Professional Engineer (PE)-stamped by Longview.*
- *RH2 will PE-stamp the plans prepared by RH2.*
- *RH2 will rely on the accuracy and completeness of any data, materials, or information provided by Longview, BHWSD, or others in relation to the work.*

Task 1 – Project Management Services and Coordination

Objective: Provide project management services and coordinate data collection and related services required for project completion.

Approach:

- 1.1 Meet with Longview and BHWSD to establish goals, benchmarks, project expectations, data collection, and develop design criteria.
- 1.2 Coordinate with the RH2 project team to track and monitor work elements accomplished, work items planned for the next phase, man-hours, scope changes, time, and budget needed to complete the work. Prepare monthly progress reports to summarize work accomplished for the month, anticipate work for the following month, and identify potential problems or changes. Submit a monthly invoice summarizing costs and remaining budget.

RH2 Deliverables:

- Technical memo to identify design criteria.
- Monthly progress reports.

Task 2 – Booster Pump Station - Suction Piping Design

Objective: Assist Longview and BHWSD in determining the suction pipe configuration for the proposed BPSs. This will be from the proposed tie-in location to the BPS pump cans.

Approach:

- 2.1 Prepare a preliminary layout of the proposed suction header. Establish size, materials, and proposed alignment for optimal pump intake configuration. Develop preliminary suction header details.
- 2.2 Revise suction header layout based on feedback from Longview and BHWSD.
- 2.3 Finalize suction header design and details.

Provided by Longview and BHWSD:

- Site survey drawings and proposed BPS building layout.
- Record drawings of previous projects.
- Location and depth of existing site piping.

RH2 Deliverables:

- Suction header AutoCAD external reference (xref) drawing for the Longview and BHWSD to incorporate into the contract documents.
- Suction pipe and booster pump cans material recommendation in Word format.

Task 3 – Hydraulic Analysis

Objective: Model BPS service area demands to generate system head curves to be used for the proposed pump selection and document the proposed system improvements.

Approach:

- 3.1 Run hydraulic model to review operation, demand allocations, and proposed future improvements.
- 3.2 Establish the capacity of the proposed BPSs.
- 3.3 Run the model to identify potential water system deficiencies.
- 3.4 Run the model in steady-state mode under current and future scenarios to develop system head curves.
- 3.5 Pump Selection for Longview:
 - 3.5.1 Perform hydraulic analysis using the provided model to select a pump that is best suited for the expected situation for Longview.
- 3.6 Pump Selection for BHWSO:
 - 3.6.1 Perform hydraulic analysis using the provided model to select a pump for the expected situation for BHWSO.
- 3.7 Meet with Longview and BHWSO to discuss the results of the analyses, planned design criteria, and the proposed size and pump configuration to be used as the basis for the design of the new system.
- 3.8 Develop technical specifications for pumps and other specialty mechanical equipment, such as surge anticipatory, pressure relief, or back pressure sustaining valve.

RH2 Deliverables:

- Pump selection technical memo and specifications for both Longview and BHWSO.
- Recommendations to be incorporated into the design for system improvements (such as surge anticipator valves, etc.) in Word format.

Task 4 – Electrical and Telemetry Design

Objective: Prepare bid-ready design plans and specifications for the proposed electrical and control system work for two (2) BPSs. Final plans and specifications are to be included in a bid set that will be prepared by Longview for competitive bidding.

Approach:

- 4.1 Kickoff meeting with Longview and BHWSO to discuss electrical and control design criteria.
- 4.2 Develop electrical plans for the proposed BPSs. Electrical plans will include a one-line diagram showing equipment layout, a power distribution plan, and a signal plan showing conduit routing and equipment locations, electrical schedules, and electrical details.

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- 4.3 Provide instrumentation equipment selection and design, and prepare instrumentation installation details.
- 4.4 Prepare automatic control and telemetry system diagrams. *The telemetry system diagrams will show the telemetry system input and output signals and the power supply and communication requirements for the telemetry system.*
- 4.5 Project manager will meet one (1) time with Longview and BHWSO staff for a general design meeting to discuss and review the plans and specifications.
- 4.6 Prepare electrical, instrumentation, and automatic control/telemetry system technical specifications in RH2's standard specification format to be included with the overall specification documents prepared by Longview and BHWSO.
- 4.7 Prepare an electrical and control system construction cost estimate for Longview and BHWSO review purposes.
- 4.8 Provide quality assurance/quality control (QA/QC) services as part of this Scope of Work. Services will include an internal QA/QC process, which provides qualified professional engineering review of the completeness, accuracy, and constructability of the project design and final deliverables.
- 4.9 Provide an electrical load summary for each of the facilities for Longview to coordinate with the Cowlitz PUD for electrical service requirements.

Provided by Longview and/or BHWSO:

- BPS design requirements.
- Cut sheets and information for all equipment included as part of Longview's design.
- Site plans and site briefs in AutoCAD DWG format.
- Mechanical plans and model in AutoCAD DWG format.
- Final plans in PDF.
- Final specifications in PDF.

RH2 Deliverables:

- Bid-ready electrical, instrumentation, and control/telemetry design documents (drawings and specifications) in electronic PDF to be included in a bid set prepared by Longview.
- Final electrical, instrumentation, and control/telemetry construction cost estimate.
- One (1) electronic copy of the final plans in AutoCAD DWG format on a CD.
- One (1) electronic copy of the final plans in PDF on a CD.
- One electronic copy of the final specifications in PDF and Word format on a CD.

Task 5 – Geological Exploration and Geotechnical Report

Objective: Acquire geotechnical information of the soil and groundwater conditions at the existing reservoir site. Evaluate geotechnical soil and groundwater conditions to support design during construction, and prepare recommendations/specifications for shoring, groundwater control, and backfill of the excavations for the BPSs and the stormwater detention pond.

Approach:

- 5.1 Review available geologic, groundwater, and geotechnical information for the proposed BPSs. Subcontract with a boring contractor to support field investigations, and obtain geologic and groundwater information at the reservoir site. Investigate deep soil and groundwater conditions at the site by drilling up to three (3) 6-inch outside-diameter (OD) soil borings up to 30 feet deep. Complete one (1) of the borings as a 2-inch OD monitoring well. Investigate soil conditions using a backhoe to excavate up to five (5) exploration test pits at the proposed BPSs and stormwater detention pond. *The test pits will be excavated by the Longview crew. Longview will coordinate with RH2 regarding the timing of the test pits' excavation to be at the same time when the crew is potholing to locate the existing water main.*
- 5.2 Prepare a geotechnical investigation report for the proposed BPSs and stormwater detention pond site; describe subgrade conditions, bearing capacities and earth pressures, geological hazards, and groundwater conditions describing any necessary shoring and/or dewatering requirements; prepare recommendations for subgrade preparation and backfilling for the excavations around the BPSs; conduct a pond overflow analysis and a pond seepage analysis to support the design of the detention pond, and other pertinent information required for the design and construction of the proposed below- and above-grade structures.

Assumptions:

- *The reservoirs will be operational at the time of the geologic exploration.*
- *The detention pond will be designed by Longview, and per the Washington 2014 Stormwater Manual.*
- *Longview will perform the test pits excavation.*

RH2 Deliverables:

- Geological/geotechnical report detailing the findings of the geological exploration and recommendations.
- Specifications for shoring and groundwater control and structural backfill.
- Hydraulic and seepage analyses to support stormwater pond design.

Task 6 – Hydraulic Model Calibration (Optional Task)

Objective: Collect field data to calibrate Longview and BHWSD's hydraulic models.

Approach:

- 6.1 Meet with Longview and BHSWD one (1) time to discuss the project objectives and goals, and to request data pertinent to the execution of the work. Review system operational issues, and discuss conditions, system demands, and scenarios to be evaluated.
- 6.2 Conduct one (1) conference call with Longview and BHWSD to establish field calibration strategy and methodology. Establish flow-testing parameters and areas to be studied.
- 6.3 Conduct field calibration. *Anticipate one (1) field day to perform hydrant testing with two (2) RH2 staff members at eight (8) hours each. It is assumed that RH2 will provide flow equipment and pressure data loggers. Longview and BHWSD staff will operate the valves.*
- 6.4 Create calibration scenarios and calibrate model. *Field measurements versus hydraulic modeling output inconsistencies may be the result of different factors, including, but not limited to, unknown closed valves in the system or incorrect diameter of water main shown on system mapping or as-builts. Since this item is highly variable in nature, an initial allocation of six (6) hours of a water modeling specialist's time has been included for this subtask. If generally accepted industry standards for hydraulic model accuracy cannot be achieved within this initial allocation, RH2 will coordinate with Longview and BHSWD to determine the next steps. This may include a scope amendment to assist Longview and BHSWD in performing additional field flow tests and model calibration analyses.*
- 6.5 Meet with Longview and BHWSD one (1) time to discuss the results of calibration.
- 6.6 Perform a surge analysis on the BHWSD system to determine that the system will function as designed once new pumps are installed.

Assumptions:

- The hydraulic water model is current, contains all recent water system improvements, and runs without error.
- Only one (1) pressure zone at each system will be calibrated under these efforts. The pressure zones to be calibrated will be the 481 Zone for Longview and the 540 Zone for BHWSD (discharge zones for proposed station).

Provided by Longview and BHWSD:

- Field calibration assistance
- Telemetry information and meter reading records.

RH2 Deliverables:

- Calibration methodology and equipment.
- Calibrated hydraulic model based on calibration goals.

Task 7 – Services During Construction

Objective: Provide technical assistance during construction, as requested.

Approach:

- 7.1 Provide construction engineering services related to the project to assist Longview in review of submittals, product substitutions, issue interpretations, and requests for information (RFI) response and clarification, and on-site observation. *RH2 will provide services up to the fee estimate provided in this Scope of Work.*