

**AGREEMENT FOR PROFESSIONAL SERVICES
BETWEEN
VANASSE HANGEN BRUSTLIN, INC.
AND
THE TOWN OF DURHAM, NEW HAMPSHIRE
VHB PROPOSAL NO. 82201.21
AMENDMENT #1
March 30, 2021**

To supplement the Mill Pond Dam (#D071003) Feasibility Study, the VHB team will conduct supplemental analysis of Alternative 3 (Dam Stabilization) without Option 1 (Pond Restoration Dredge). The goal of this supplemental analysis will be to determine whether the water quality impairments within the Mill Pond impoundment can be addressed through a series of watershed management strategies. The analysis will focus on answering the specific questions posed in an email from Town Councilors Welsh and Lawson to Councilor Marple dated February 24, 2021, as discussed at the March 1 Town Council meeting, as well as subsequent email communication on March 19, 2021.

VHB proposes to add DK Water Resource Consulting (Mr. Don Kretchmer, CLM) to the project team to assist with portions of this supplemental analysis.

A. SCOPE OF WORK

Task 13. Supplemental Water Quality Analysis - LLRM

To understand the benefits of increased watershed management activities on water quality in the Mill Pond impoundment, the consultant team will complete the following:

- Review the *2018 Mill Pond Nutrient Control Measures – Final Report* prepared by Waterstone Engineering, PLLC (WE) to assess assumptions and modeling results, as well as implications for phosphorous control.
- Use the nutrient Load-Lake Response Model (LLRM) developed and calibrated as a part of the *2014 Durham Ponds Assessment and Plan* prepared by DK Water Resource Consulting (DK) to evaluate the potential change in phosphorus and nitrogen concentrations in Mill Pond as a result of the predicted nitrogen load reductions associated with BMPs proposed by Waterstone Engineering as part of their MS4 evaluation. We will assume that the potential phosphorus reductions, although not presented in the WE report, mirror the estimated nitrogen reductions presented in the WE report on a percentage of total load basis.
- Work with the Client to identify up to two additional scenarios to model within the LLRM. These scenarios are expected to include incorporating additional watershed BMPs, revised hydrologic budget, etc.
- The results of the LLRM analysis will be used to predict the trophic status of the Mill Pond impoundment under the various scenarios, compared to the existing condition, expressed in

terms of total phosphorus concentrations, chlorophyll *a* concentrations, transparency and the probability of an algal bloom.

Task 14. Supplemental Water Quality Analysis – Additional In-Pond Measures

The consultant team will perform a screening level alternatives analysis for in-pond management of water quality in Mill Pond. Alternatives to be addressed will include mechanical or hydraulic aeration, alum, and copper sulfate or similar treatment. The analysis will describe the alternative, discuss its applicability to Mill Pond, and provide generalized costs, but will not provide a full feasibility assessment. Benefits and impacts will be discussed in qualitative terms.

Task 15. Supplemental Hydrological Analysis

To address questions related to the impact of withdrawals from the upstream Oyster Reservoir Dam (#D071007), the VHB team will develop a spreadsheet-based monthly mass balance model of the Oyster River Reservoir to evaluate how summertime releases from that impoundment might increase flow rates and reduce residence times (i.e., increase flushing) in the downstream Mill Pond impoundment. This task will include:

- Development of a stage-storage curve for the Oyster Reservoir Dam impoundment, interpolated from a 1-foot interval storage curve provided by the Client.
- Development of an analysis of withdrawals expressed as a percentage of pro-rated streamflow at the Oyster Reservoir Dam based on USGS gage data.
- Incorporation of a historical record of daily reservoir levels at the Oyster Reservoir Dam, which will be provided by the Client for the period 2015 through early 2020.
- Analysis of the influence of the Oyster River Reservoir on Mill Pond by assuming no further water supply withdrawals during annual low flow conditions. (This assumption is intended to reflect the scenario with the largest potential water quality benefit, and is understood to have major implications for the resiliency of the UNH/Durham Water System.)
- Development of a long-term monthly dataset of feasible downstream flows from the Oyster Reservoir Dam.
- Development of long-term monthly dataset of estimated streamflow and baseflow inputs from Hamel Brook, College Brook, and the rest of the Oyster River watershed between the Oyster Reservoir Dam and Mill Pond.
- Coordination with the Client to identify a range of notch elevations and dimensions (assume no more than two alternatives), and therefore a revised stage-storage-discharge curve for the Mill Pond impoundment.

- Calculation of potential improvements to monthly inflows and residence times in the Mill Pond impoundment.

Task 16. Supplemental Hydraulic Analysis

To further study the potential effects on the Oyster River and Hamel Brook, additional hydrological and hydraulic modeling will be conducted to define the minimum size of the river and Hamel Brook during the low-flow months of July, August and September under both Alternative 3 and Alternative 5. This supplemental study will identify the typical size of the tide-impacted pond area during high and low tide during these months. This effort will incorporate up to four additional low flow scenarios that take into account the impact of the Oyster Reservoir Dam into the existing HEC-RAS model, and will develop cross-sections and maps that present what the Mill Pond Dam impoundment would look like, hydraulically, under up to four additional “low flow” conditions under both high-tide and low-tide conditions.

Task 17. Supplemental Dam Structural Analysis

To evaluate the feasibility of modifying the dam to provide a control section to accommodate flow adjustments for water quality and fish migration purposes, the VHB team will:

- Review information on the design and operation of the migration notch at the Wiswall Dam on the Lamprey River (which has been cited as a possible model for the Mill Pond system).
- Coordinate with the Client to determine an appropriate size (width and depth) and location for the proposed notch; review and determine control approach (gate, stoplogs, etc.).
- Review documentation of 1974 restoration work to assess location of structural connections/cold joints; determine impact of jointing on approach. This may require field review of the conditions if location is not apparent in existing records.
- Develop concept drawings documenting preferred approach, and coordinate with the hydrology and water quality teams to assist with Tasks 13-17.

Task 18. Invasive Species Analysis

VHB will develop a conceptual plan for the monitoring and control of invasive species. The intent of this task is to develop a conceptual plan with enough detail to estimate reasonable likely costs for implementation of an invasive species program including actions prior to, during, and following construction (five year monitoring and implementation phase). The analysis will focus on Alternative 5, but recommended actions under Alternative 3 will also be considered. VHB will review data provided by the Durham Land Stewardship Commission and will consult with the NH Department of Agriculture as well as other local experts in developing the plan.

Task 19. Supplemental Fisheries Management

The supplemental analysis will attempt to identify what additional actions could be included in Alternative 3 to improve fish passage and habitat quality. These could include modifications to the

existing fish ladder or its operation, the installation of additional upstream or downstream passage facilities, or the net benefits derived from watershed management strategies discussed in Tasks 13-15. This task will not include habitat modeling, but will rely on review of the supplemental analysis results discussed above as well as consultation with experts at the NH Fish and Game Department, the National Marine Fisheries Service, and the US Fish and Wildlife Service.

Task 20. Technical Memorandum

VHB will compile the results of the analyses described above into a comprehensive but understandable technical memorandum addressed to the Town Council. This technical memorandum will be focused on providing a discussion of the resulting water quality/habitat within the Mill Pond impoundment if a suite of watershed management improvements are implemented, but without removing the dam or dredging Mill Pond. Additional questions related to dam removal will be addressed as discussed above. We expect this report would be 15-25 pages, exclusive of appendices, with 5-10 figures/exhibits. Additionally, VHB will prepare a two-page reader-friendly summary of the main questions and supplemental analysis findings. A draft memo will be prepared for review by the DPW prior to its distribution to the Town Council.

Task 21. Additional Outreach and Coordination Meetings

The VHB team will continue to support the project by conducting regular client coordination activities. Additionally, the VHB team will attend up to two additional meetings with the Town Council (assumed virtual). Typically, no more than three VHB Team members would attend any public informational meeting.

B. COMPENSATION

The CONSULTANT will complete the Amended Scope of Services on a TIME and MATERIALS BASIS with an upset limit for labor and expenses of \$43,920, to be billed on a PERCENT COMPLETE basis. Invoices will be provided monthly. The CONSULTANT shall be reimbursed for expenditures made specifically for the project such as: Subconsultant charges; printing and reprographics; travel and subsistence; computer charges; telephone charges; shipping, postage, and courier service charges; purchase of maps and similar documents; etc. These direct expenses will be billed at cost.

C. CLIENT-FURNISHED INFORMATION

The CLIENT shall provide the CONSULTANT with the following:

- All records related to flows, withdrawals, and discharges from the Oyster Reservoir Dam and operation of the water system;
- Stage-Storage curve for the Oyster Reservoir dam or data needed to develop one;
- Data related to Wiswall Dam notch;
- Landowner permission to enter private property to conduct inspections, field studies, *etc.* including temporary construction access agreements; and


- All plans and surveys related to infrastructure in the dam vicinity, including the dam itself and any utilities.

D. SCHEDULE

The CONSULTANT is prepared to begin the tasks outlined in this proposal immediately following written authorization of the CLIENT. CONSULTANT will endeavor to complete a draft analysis for CLIENT review within 8-10 weeks. The schedule is subject to timely delivery of information provided by the CLIENT and is subject to timely review of interim products by the CLIENT and other stakeholders. If the CLIENT requests that work under this Agreement be stopped, the schedule is subject to renegotiations when written authorization to proceed is received. Unforeseen site conditions or project delays beyond the control of CONSULTANT, and without CONSULTANT’S fault or neglect, may result in an adjustment to the indicated schedule. Should such conditions arise, CONSULTANT will notify the CLIENT as soon as possible.

If this amended Agreement is satisfactory, please sign under client authorization and send us back an original for our files.

VANASSE HANGEN BRUSTLIN, INC. AUTHORIZATION

By: 

Title: Managing Director

Date: 3/30/21

CLIENT AUTHORIZATION

THE TOWN OF DURHAM, NEW HAMPSHIRE agrees with this amended scope of services, schedule and fee and authorizes commencement of project work. Together with the previously adopted terms and conditions executed on September 18, 2019, they constitute the entire amended Agreement.

By: _____
Title: _____
Date: _____