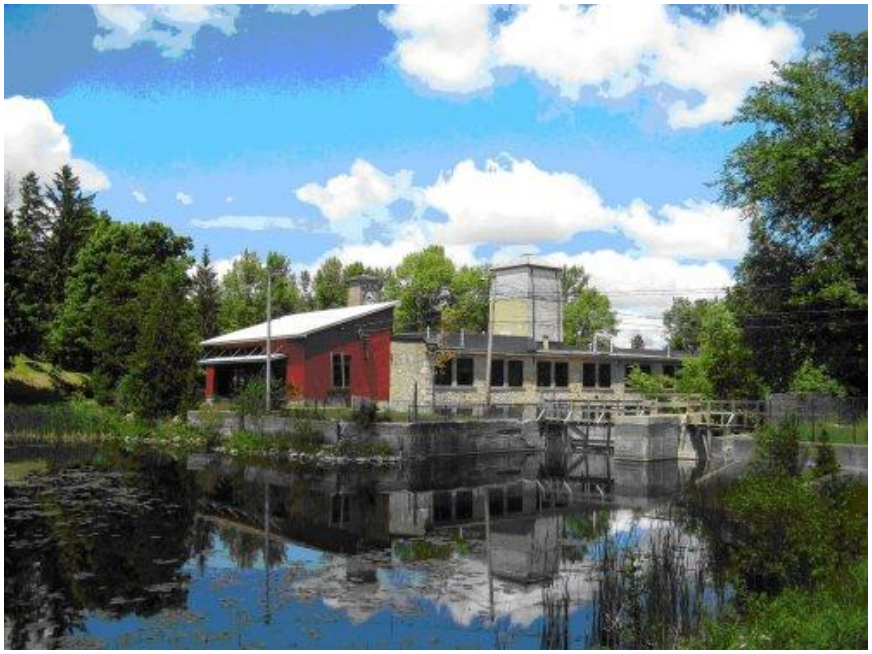
Terms of Reference
Alton Millpond Rehabilitation Project

Millpond Rehabilitation Master Plan and Design Report



Alton Millpond Rehabilitation Committee
www.altonmillpond.org

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1. Background

The Alton Millpond is part of the Alton Mill Arts Centre property and is an important feature of the Village of Alton from a cultural and environmental perspective within the Town of Caledon.

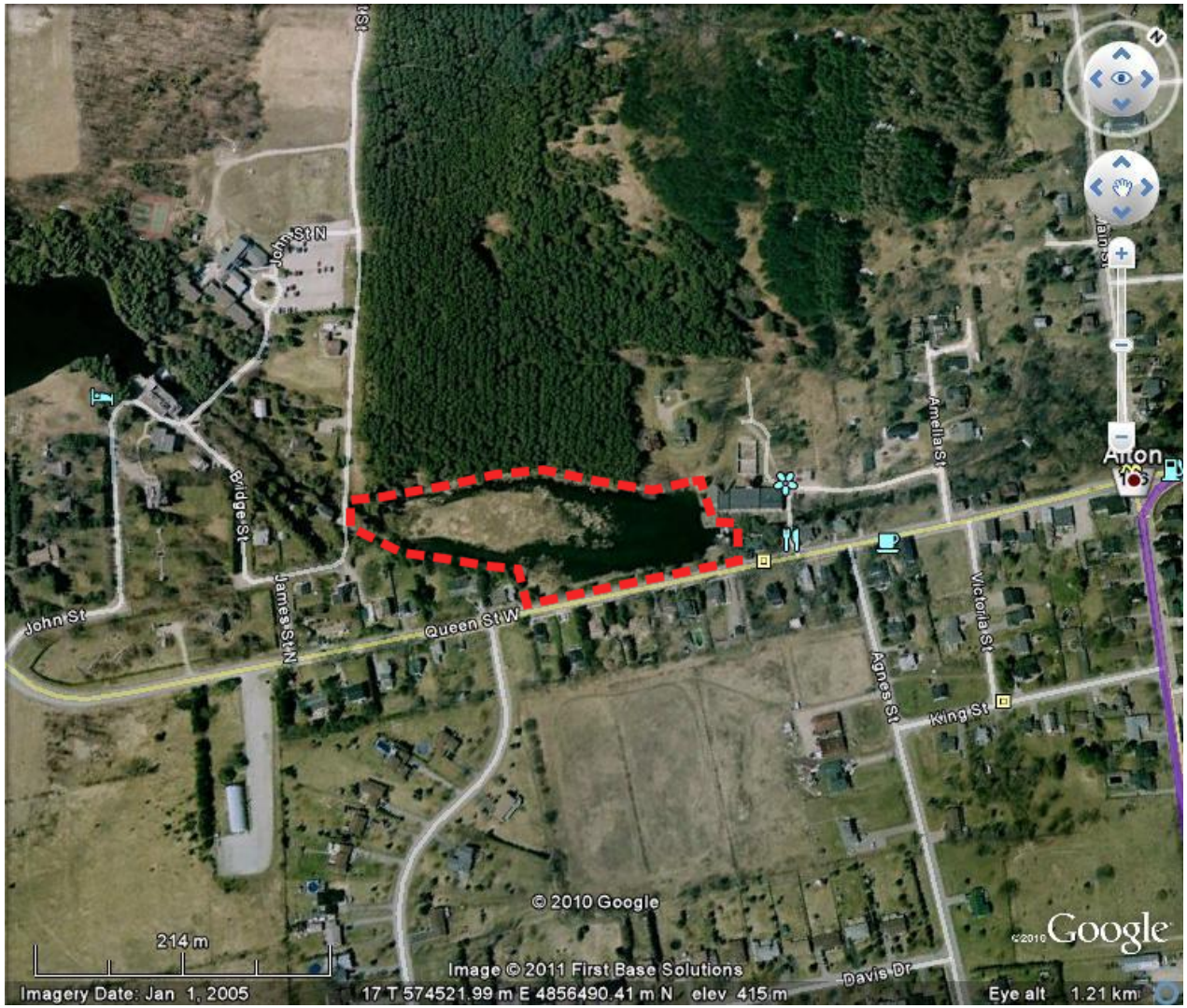
The 3 acre millpond was originally created in the 1880's to use the stored energy of Shaw's Creek to power the Alton Mill's woolen machinery and became an important visual and recreational feature of the main street. But its creation also caused some environmental problems. The pond has been slowly deteriorating, impairing both its cultural and green energy functions, and further impairing the health of Shaw's Creek, a tributary of the Credit River.

The Millpond is in need of rehabilitation in order to improve water quality and enhance the cold water fish habitat of Shaw's Creek, to improve its appearance and provide recreational opportunities for residents and visitors.

The Millpond also provides an opportunity for locally generated green electricity to power the Alton Mill. A rehabilitated millpond and hydro-electric generating system could provide opportunities for local students to learn about ecology and renewable energy.

The Millpond project also presents an opportunity to integrate a unique artistic component with the fundamental environmental and engineering elements to achieve the project goals. This approach will connect the fact the Alton Mill Arts Centre is an arts-focused facility with an underlying respect for heritage preservation and environmental protection. It is anticipated that the art component will increase the project's value in terms of public attention and excitement and access to funding sources by more than its associated additional cost.

2. Site Location



Process to Date

The project was initiated in June 2009 with the formation of a committee including the owners of the millpond, local and regional government and agencies, environmental groups, corporate donors, community groups and private citizens from Alton. Between them, the committee members offer a good deal of expertise.

There is a core team of individuals from the committee providing overall management and guidance for the project. The core team includes two representatives of Credit Valley Conservation, a local citizen volunteer who is a senior ecologist at a major consulting firm, and representatives of the Alton Development Inc. and Headwaters Arts.

A summary of the work to date carried out by the committee is included in this document as **Attachment 1**. The primary document guiding the project is a Statement of Intent dated March 2010 and is attached as **Attachment 2**.

It was initially envisioned the project would be undertaken in collaboration with MNR as the lead proponent following the Class EA for Resource Stewardship process. In the fall of 2011, the committee undertook an exercise following the Environmental Assessment process by collecting and examining background information, project goals and constraints. A number of alternatives were evaluated, including ability to meet project goals, perceived environmental effects, estimated cost, the effectiveness of satisfying the watershed fisheries objectives and project purpose.

A funding application for the EA process was not successful and MNR subsequently advised its role in the project would need to be scaled back due to budget cuts. This has lead to the current position of the project being advanced as a private, permit-based undertaking instead of an EA-based project. Fundraising has been happening over the past four years and there are funds in a dedicated bank account now available to move forward to the next stage, which is to develop a master plan for the ultimate project.

A significant amount of discussion, planning and committee work has taken place over the past several years. Important background material is available and the overall thrust of the project has been agreed upon (see Section 4 below).

In September 2013, the committee commissioned internationally-known artist Noel Harding, who happens to live in Caledon, to lead the integration of functional public art element(s) into the project. Harding has extensive experience in the design and construction of large-scale functional environmental art projects, including the Elevated Wetlands alongside the Don Valley Parkway, and Green Corridor Environmental Gateway to Canada in Windsor. He will be working initially on concept development and ultimately, in collaboration with the selected consultant(s), will prepare a detailed presentation of the public art components of the project. The public art aspect, and Harding's involvement, is expected to elevate the profile of the project such that it will attract national and international attention, thus enhancing the ability of the project as a whole to attract funding.

Information on Noel Harding, his public sculpture portfolio and past public art vision plans is available at www.noelharding.ca. An example of one of his major international projects is highlighted in this Canadian Art feature essay.

In December 2013, the committee retained BluMetric Environmental Inc. to be the lead environmental engineering consultant on the project. Stage One work was completed in July 2014 and lead to a number of important findings and recommendations, many of which are contained in this document.

4. Project Objectives

The Alton Millpond Rehabilitation project is an exciting and potentially noteworthy environmental undertaking that has multiple objectives and constraints. The principal objectives, in no particular order, are:

a) Improve Shaw's Creek ecosystem by restoring stream processes such as sediment transport and cold water flow-through, and providing for upstream fish passage.

b) Development of an aesthetically pleasing, publicly-accessible site including retention of a pond in some form, recreational amenities (eg. trails, boardwalks, paddle boats, ice skating), educational elements (about ecology and renewable energy), and incorporating public art

c) Work / collaborate with others to eliminate untreated storm water flow into the pond and creek from the surrounding village.

d) Micro-hydro generation if practical for consumption and/or demonstration purposes;

e) Address public safety, dam safety, and ownership/operational issues.

5. Design Criteria

As a result of the work carried out to date the following design criteria have been established. They have been split into two categories; Need to Have and Nice to Have.

Need to Have

Dam	● Whether the overall project is treated (for regulatory and permitting purposes) as a dam decommissioning, partial decommissioning, refurbishment or replacement, the site must be designed such that the regional flood (~112 m3/s) can be safely passed.
Pond	● The pond should be visible from Queen Street (specifics to be identified). ● The surface of the pond should be controllable within a relatively narrow range of elevations (except in severe drought or flood conditions) so that the pond elevation will be essentially stable under normal conditions, including winter.
Shaw's Creek:	● Water velocities and in-stream structures must allow upstream passage of brook trout at least and other local species to the extent possible. ● Water velocities should provide sediment transport through/past the site.
Flow Splitting (between the pond and the creek):	● A small weir somewhere in the creek-side flow path will be necessary to split the flows between creek and pond and support the water level in the pond. Such a weir: ◦ must not adversely affect flood levels, ◦ must not impede upstream fish passage, and ◦ must have adequate foundation for stability/longevity. ● Shaw's Creek (where it by-passes the pond) must have at least a minimum ecological flow at all

	times, likely ~0.2 m3/s minimum. ● Flow through the pond, discharging back to the creek at the downstream end of the pond, will be controlled via a micro-hydro generation system and/or an overflow weir or possibly a bottom draw.
Pond-Creek Separation stucture:	•Must resist ice (on the pond side) and erosion (caused by water flows on the Shaw's creek side). •Since there will be a water level difference between the pond and the creek downstream of the small weir, the separation structure must resist seepage from pond to creek through the structure, to the extent required to maintain pond levels under normal low inflow conditions.

Nice To Have Design Criteria

	● The project to be treated by regulatory authorities as a complete or partial decommissioning of the dam, with no new structure on the site being subject to the Dam Safety Regulations.
	● Pond water level should be as high as possible for both aesthetic and power generation "head" reasons.
	● The surface area of the pond should be large enough to accommodate two, half size hockey rinks side by side during winter months.
	● The in-line weir required to support the pond surface elevation should be as far downstream as practical.

Conflicting Criterion: Pond Level

High pond level pros	**High pond level cons**
● More aesthetically pleasing (?) ● More surface for hockey rinks	● Higher separation structure ● Additional fish ladder ?

• Larger pond perimeter (walkway, habitat) • More power for micro-hydro	• Higher capital and operating costs

6. Conceptual Design Variables

- Position of the "Flow Splitting Weir" and therefore the length and upstream extent of the Pond-Creek Separation Structure.
- Elevation of the surface of the Pond.
- Pond water depth (ie. elevation of bottom of pond - may vary)
- Location, length and materials of separation structure, including where it ends - at shore beside mill or at centre pier of existing dam? Where the pond and stream elevations are the same if may be permeable, whereas where they diverge, it must be impermeable.
- Area and profile of the water passage at the location of the existing dam.
- Timeframe for project realization.

7. Core Elements

To meet the design criteria, the following core elements and optional or variable elements have been identified:

Core Elements of Plan	**Reason / Result**
• Create a by-pass channel, separation structure and diversion weir to direct the water into a through-stream and an off-line pond	• Allow base flow of cold water to by-pass the pond and avoid its warming effect, improve water quality, allow for natural stream function and sediment transport
• at least partially decommission the dam and create a fish ladder or other structures allowing for fish passage	• potentially increases Regional flood passage • Eliminates fish barrier • allows natural sediment transfer

• create a length (TBD) of impermeable barrier between pond and portion of through-stream where surface water elevations diverge • repair any portion of the dam that is retained • repair existing shore-line retaining walls as required	• allow water level to be raised back to pre-1990 height to restore "head" for power generation while preventing water seepage into mill basement. • Accommodate water pressure from differential water surface levels • address downstream safety concerns
• Make remainder of berm between the future pond and stream more naturalized - explore alternate methods of implementing over time	• minimize cost • potential for trees to be planted, providing shade over pond and stream • provides opportunities for trails and education.
• Create public art features as an integral and preferably functional part of the rehabilitation project	• Attract international attention and broader funding sources for project.
• Create silt trap for existing municipal storm-sewer outfall adjacent to Queen Street prior to release into pond	• Minimize migration of road salts and contaminants from existing and future development into Shaw's Creek and re-silting of pond
• Develop ownership, maintenance and public access protocol • install boardwalks, trails and interpretative signage	• Make the project an amenity for the general public, and a model of how multiple competing objectives can be achieved with creative thinking. • if micro-hydro is installed, need to determine if this is a separately-funded component of project or whether cost is included in overall and revenue stream becomes income for long-term maintenance and operation of entire project
Optional/Variable Elements of Plan	**Reason / Result**

• Install micro-hydro turbine using water from bottom draw siphon (Feasibility would need to be determined through detailed design and study.)	• Capture perpetual source of energy from Shaw's Creek without greenhouse gas or other emissions. • Bottom draw mitigates transport of warmer water from surface of pond
• gradually dredge or siphon silt from off-stream portion of pond, dewater silt (likely most cost effective way is using geo-textile bags)	• Positive: reduce ratio of surface area to pond volume, thereby reducing the relative solar heating effect, better water quality • Negative: increased depth increases water pressure on impermeable berm and likelihood that berm is considered a "dam"

8. Work Program for Consultants

In summary, the Work Program for the consultant includes:

a) discussions with MNR
b) geotechnical and other detailed surveys to provide up to date base information
c) develop updated master plan and accompanying design report

The details of the work program includes:

Task	**Consultant & Role**	**Deliverables**
a) Consultations with Ontario MNR to develop conservation strategies, land use guidelines/regulations design	**Lead** BluMetric & sub-consultant (dam specialist	a. meet with MNR to lay the groundwork for the project to be considered a full or partial decomissioning of the dam as opposed to having the new berm considered a dam.

guidelines and best management practices for the proposed design elements	Quazi Alam)	b. prepare memo/letter report summarizing discussions c. obtain letter from MNR confirming design criteria, and core elements will be acceptable
b) geotechnical investigation to confirm topography of site (land and under pond) and nature, extent & depth of soil and underlying bedrock conditions	**Lead** BluMetric - & sub-consultant (dam specialist Quazi Alam)	a. coordinate and manage geotechnical investigation and other survey work b. interpret data and ensure input same into the master plan design process
	Geotechnical Consultant	a. evaluate pond & creek bottom: probes either by drill rig or other means, in sufficient quantities and locations to provide data for design decisions relating to up stream weir, pond-creek separation structure, and retaining walls b. letter report summarizing the above including recommendations (if any) for detailed design stage in context of the overall project
c) Development of an updated master plan and rendering of the overall project. To be produced by design team including engineering consultant, biologist, environmental artist. Coordinated by the landscape architect with oversight by the Project Core Team. The overriding goal of this task is to meet as many of the project Objectives as outlined in Section 4 above as possible.		
Coordination and Production of Master Plan Landscape Architect Environmental Design	a. coordinate team in the design and production of master plan b. master plan to be detailed enough to illustrate the concept clearly, including structural, public art, landscape (hard and soft), micro-hydro elements. Plan must reflect to the maximum extent possible the design criteria outlined above and incorporate the findings of Tasks 1 and 2 above.	

firm TBD	c. prepare drawings of the site and immediate surrounding lands, utilizing the inputs from the other team members, including: - plan view colour CAD rendering - minimum of two perspective CAD renderings and ideally live 3D model of site and plan - illustrative visual materials (i.e. digital projections/presentations; display boards etc.) d. collaborate with Noel Harding to produce a summary graphic piece that is to be used for communication to the overall committee, the general public and in future funding applications. e. produce a Millpond Rehabilitation Design Report (to accompany the Master Plan outlined above) that will describe the rationale behind the proposed design and how it fits the federal HSP program objectives with respect to Brook Trout. The report will also guide detailed design and support ultimate application(s) for necessary permits to implement the project. Such document should include a summary of the known/predicted project planning process going forward and should include order of magnitude costs to carry out the project.
BluMetric Environmental, Civil, Water Resources Engineering	a. interpret Sarafinchen data to determine underlying design parameters for dam, berm and weir b. preliminary conceptual engineering of all core elements sufficient to provide inputs into master plan design (ie. the separation structure, fish ladder, upstream weir and whatever is left of the dam) including ensuring we meet flood requirements c. provision of text about functional elements for inclusion into design report d. assist in project management pulling all the pieces together - primarily liasing between project team and HydroSys people
Noel Harding	a. create concepts, sketches, illustrations, photographs and text for public art

Public Art and Environmental Design	to be integrated throughout the site including but not limited to: fish passage, water feature/art element, silt removal, oxygenation b. integrate concepts into master plan design - act as a sounding board to test ideas and ensure creative opportunities are given substantive weight c. collaborate with landscape architect to produce and edit a summary graphic piece that is to be used for communication to the overall committee, the general public and future funding applications d. provide text about creative/artistic approach to the project
Biologist firm TBD	a. provide expert input into habitat requirements for Brook Trout (and other potential species identified in the federal HSP funding application) b. mitigate negative impacts to fish habitat and wildlife habitat, while ensuring no negative impacts to existing function c. provide written text to be incorporated into the Design Report summarizing recommendations related to such things as optimal stream bed profile/grade, water temperature, creek edge design and plantings, optimal time of year for physical work and timing or other restrictions
Project meetings & site visits - all team members	a. meet with the Alton Mill Rehabilitation core team at least three times during the work period (start up meeting and at least two working/progress meetings - may be "virtual" meetings) b. ensure they are familiar with the site

9. Deliverables

Reports, charts, tables and other documents are to be provided in Microsoft Word format and in Adobe Acrobat (pdf) format. Spreadsheets shall be provided in Excel format.

All photographs documenting the field investigations shall be taken using a digital camera with a minimum 10 mega-pixel resolution. All photos to be provided on a CD-ROM appended to the final Millpond Rehabilitation Design Report, both in an original unedited form and annotated (JPG images). The reports shall contain colour

copies of the annotated photographs.

The summary graphic piece may be produced in the design software of the team's choice. All other drawings submitted are to be prepared in AutoCad and all are to be provided in hard copy bound with the report and electronically in the design software's native format and/or AutoCad as the case may be, plus Adobe Acrobat on CD-ROM or uploaded via a secure uploading site.

Hydrologic, hydraulic, routing and dam break models used in the study are to be provided on CD-ROM, including executable code, input data and output. User manuals for the models are to be provided in hard copy and in electronic form (if practical) on CD-ROM.

A single executive summary report for the Millpond Rehabilitation Design Report containing findings, conclusions and recommendations shall be provided. Ten (10) copies of the executive summary will be provided. The electronic versions of the executive summary shall be appended to the CD-ROMs contained in the both reports.

Three (3) hard copies of the full reports will be provided. The electronic versions of the reports shall be appended to the CD-ROMs contained in the both reports.

10. Proposed Schedule

Target time frame (2015)	Task	Description
Dec 22 to January 30		finalize consulting team selection (geotech, landscape architect, biologist), Terms of Reference and related fees
January 1 to March 1	1	commence and carry on discussions with MNR
January 1 to Jan 30	2	geotechnical field work
Feb 1 to Feb 15	2	geotech report writing
Dec 29 to Jan 15	3	compile base material for Master Plan
Feb 5 to March 1	3	working meeting(s) to craft Master Plan - consultant team & “core team” (Steering committee)
March 1 to 15	3	finalize Master Plan and draft/edit Design report - including Millpond

		Stakeholder Committee input/feedback on draft plan
March 15	3	submit draft Design report & Master Plan to EC
April 30	3	submit final Design report and Master Plan to EC

Attachment 1

Summary of Work to Date

Attachment 2

Project Statement of Intent
March, 2010

tdah

Attachment 3

Data Collection Summary

Attachment 4

BluMetric work to date:

summary letter June 23, 2014

PowerPoint presentation July 26, 2014