



ASSOCIATION OF CONSULTING  
ENGINEERING COMPANIES | CANADA  
ASSOCIATION DES FIRMES  
DE GÉNIE-CONSEIL | CANADA

**wood.**

## 2020 Canadian Consulting Engineering Awards Project: Riverside Dam Class Environmental Assessment Category: Water Resources

**April 30, 2020  
5:00 pm EDT**

### **Submitted to:**

Canadian Consulting Engineer Magazine  
Attention: Peter Saunders, Editor  
111 Gordon Baker Road, Suite 400  
Toronto, On M2H 3R1

### **Submitted by:**

Ron Scheckenberger P.Eng.  
Principal Consultant, Senior Water Resources Engineer  
Phone: 905-335-2353  
Email: [ron.scheckenberger@woodplc.com](mailto:ron.scheckenberger@woodplc.com)  
Wood Environment & Infrastructure Solutions,  
a Division of Wood Canada Limited  
3450 Harvester Rd, Suite 100 Burlington, ON L7N 3W5





## Table of Contents

<b>1.0 Full Project Description .....</b>	<b>1</b>
<b>1.1 Innovation.....</b>	<b>1</b>
<b>1.1.1 Innovative approach to design.....</b>	<b>2</b>
<b>1.2 Complexity.....</b>	<b>2</b>
<b>1.2.1 Site problems.....</b>	<b>2</b>
<b>1.2.2 Scheduling difficulties.....</b>	<b>3</b>
<b>1.2.3 Key obstacles .....</b>	<b>3</b>
<b>1.3 Social and / or Economic Benefits.....</b>	<b>3</b>
<b>1.4 Environmental Benefits .....</b>	<b>4</b>
<b>1.5 Meeting Client’s Needs.....</b>	<b>4</b>
<b>Project Photos .....</b>	<b>5</b>





## 1.0 Full Project Description

### 1.1 Innovation

The Riverside Dam and associated mill race were constructed between 1860 and 1880. The mill became an economic hub in the Waterloo/Wellington region and the community developed around it. Once the mill race was no longer relied upon as a source of water and hydraulic power, the Riverside Dam ceased to provide a commercial function and served only social functions (i.e., recreation, culture, aesthetics). As Regular maintenance decreased or ceased, combined with the overall age of the structure, the dam's condition began to decline. The Riverside Dam and mill race have since exceeded their intended design life and have continued to deteriorate. The City of Cambridge as the proponent and overall project manager for the Riverside Dam Class Environmental Assessment, retained the Wood Consulting Team to establish a recommended solution for the dam and its local environs; the Team was comprised of the following:

- Wood Environment & Infrastructure Solutions:
  - Project management (study co-ordination/ ownership, QA/QC, regulatory adherence/ compliance)
  - Water resources engineering (hydrology/hydraulics, flood risk)
  - Structural engineering (stability assessments/ condition, alternative configuration)
  - Public communication (agencies/ regulations, stakeholder committees, Indigenous communities, council and public).
- Matrix Solutions Inc: Stream geomorphology and ecology
- Brook McIlroy: Landscape architects and public consultation
- Unterman McPhail Associates: Cultural heritage
- LURA Consulting – Public consultation and facilitation

The study defined the current environment (physical, social and natural) as a baseline condition and from this established a Long-List of management approaches for the Riverside Dam and related alternative solutions. The study systematically conducted an evaluation of each alternative using specific criteria leading to a short-list of alternatives. Further technical analyses were completed for the short-listed alternatives, including generation of conceptual designs which reflected public and agency input. Following public and agency consultation, and Indigenous community engagement, a preferred alternative was advanced and recommended for implementation by the City.

Eight (8) alternatives were considered as part of the Long-List of alternative solutions to address the future management of the Riverside Dam and local environs including:

- |   |   |
|---|---|
| A. <b>Do nothing</b>                          | F. <b>Construct in-stream rock structures (remove dam)</b>      |
| B. Repair Riverside Dam                       | G. <b>Build offline dam and naturalize Speed River (hybrid)</b> |
| C. <b>Rebuild Riverside Dam</b>               | H. Incremental decommissioning of dam                           |
| D. Lower dam crest                            |   |
| E. <b>Naturalize Speed River (remove dam)</b> |   |

The bolded alternatives were "short-listed" and advanced for evaluation





Engineers are typically tasked with conducting environmental assessments for municipal (public) infrastructure. In Ontario, this study process is outlined in the Municipal Engineers Association (MEA), Municipal Class Environmental Assessment. The Municipal Class EA process defines mandatory principles, details of project consultation and technical requirements. It is the engineer's responsibility to use a balanced, systematic and transparent approach which reflects the natural, technical and economic environments, but also the social environment. For the Riverside Dam project, the Wood Team provided comprehensive well-documented details on the natural, technical and economic environment related to each of the short-listed alternatives. This information was brought forward to stakeholder committees, agencies, Indigenous communities, public and council on numerous occasions. Social input regarding the value of the dam, raised by area residents, park users, local businesses and others, become a strong factor in the decision-making process regarding the future of the dam. The Wood Team needed to expand and enhance its approach to engagement to allow for a more comprehensive consideration of social input including Council's direction. The forgoing at times put the various perspectives regarding the dam's future in conflict (i.e. rebuild vs. remove and naturalize). Regardless, through a process which embraced environmental principles, the Wood Team and City of Cambridge were able to establish a preferred solution which balances the engineering, natural and social environment.

### 1.1.1 Innovative approach to design

The Wood Team needed to develop approaches to communicating engineering principles which could be understood by broad audiences. To this end, the Wood Team used "visualization" techniques to illustrate what the various alternatives would look like (see Figures ES-3.1, 3.2, 3.3, 3.4). These images provided lay members of the public with a better understanding of the various alternatives in the existing setting.

In addition, the Wood Team developed an innovative and interactive assessment process for use in the stakeholder workshops. Attendees were provided a "Smart Spreadsheet" which allowed the stakeholders to weight criteria and personally evaluate the various alternatives. This interactive approach provided stakeholders with an appreciation of the various factors involved in establishing a preferred solution, and ultimately was highly useful in educating the various groups on key decision-making considerations, including City Councillors.

During the study, the following unique techniques were utilized:

- Digital visualizations
- Acoustic Doppler Imaging for bathymetry
- "Smart Spreadsheet" assessment tool
- Petrographic structural survey imaging

## 1.2 Complexity

### 1.2.1 Site problems

The Riverside Dam spans the Speed River immediately upstream of the Canadian Pacific Railway line and King St., both of which represent important transportation corridors for the City and region. Dam failure could potentially cut off these vital links. The head pond area has over the years, due largely to a lack of management, become filled with considerable contaminated sediment. The Speed River in this location is home to the Wavy ray Lamp mussel which is an endangered species reliant on host fish for migration. The head pond is also immediately adjacent to the Riverside Park, and seasonally floods this area disrupting



both programmed and non-programmed activities. The foregoing, along with uncertainty regarding the construction approach and material used in the legacy dam (1880's), all combined to make this a complex site.

### 1.2.2 Scheduling difficulties

This project had a very protracted timeline initially commencing late 2011 and ultimately being finalized in 2018 for public review and clearing MECP review in 2019. Due to tremendous public and political interest, the project had numerous points of public engagement (4 public meetings, 8 stakeholder meetings, 2 workshops, several committee meetings, etc.). Ultimately, the City of Cambridge leadership became involved in a series of senior level meetings (supported by the Wood Team) with the province and other agencies to develop a process to facilitate the interests of the stakeholders. This process significantly extended the project timeline resulting in several "start-stop" periods over the course of the study.

### 1.2.3 Key obstacles

The key obstacles associated with the Riverside Dam Class EA related to the need to find a balance/compromise between the natural environment and the social environment. The technical studies related to flood risk, ecology (species at risk) and life cycle economics all pointed to a preference towards the "Remove the Dam and Naturalize the River" alternative. At issue though was the potential loss of the area's cultural heritage, resulting from dam removal which many citizens considered to be the nexus of the original settlement, premised on the original millworks.

Resolving this impasse was difficult, and at times controversial, pitting parts of the community against each other, along with regulators and stakeholder groups. Ultimately the Wood Team and City of Cambridge collaborated on an approach that would preserve and restore the area's history while incorporating key elements into the rebuilt dam, which would modernize its operational components to off-set most of the key concerns related to a rebuilt dam, including: sediment and flood operational management, as well as public safety and fish passage.

## 1.3 Social and / or Economic Benefits

The Riverside Park is used frequently by local citizens, and the interrelationship of the Riverside Park and the Speed River, Riverside Dam and head pond is considered significant and highly influential on the social value of the park. Riverside Park is Cambridge's largest park [102 hectares (+/-)]. It is also one of the most popular, drawing visitors beyond the immediate community. The park offers visitors an interface with the Speed River, as well as other natural areas, active park programming, passive leisure, extensive trail/road networks and built heritage features, including Riverside Dam. The Dam is also a heritage structure under the Ontario Heritage Act.

Area businesses contacted over the course of the study, highlighted both direct and indirect economic value of the dam, citing area boating and fishing businesses, as well as other tourist-oriented businesses, reliant on the area's history.

Six Nations of the Grand River, the Haudenosaunee Development Institute and the Mississauga's of the New Credit First Nation were consulted throughout the Class EA by the Wood Team, and no concerns were raised by these communities. The communities requested to be involved during the archaeological assessments, and they will also be consulted during the detailed design phases and provided opportunity to participate in any future field studies.



Public safety and the potential for serious environmental impacts due to an unmanaged failure were also cited as important community considerations in the planning and design of the future system. As noted, the Riverside Dam is immediately upstream of the Canadian Pacific Railway Line which services numerous area industries including the Toyota plant. A dam failure was noted to have the potential to affect the railway bridge and disrupt rail services. Furthermore, the unmanaged release of legacy sediment resident in the dam's head pond was noted to have the potential for serious environmental impact on the Lower Speed River and Grand River, both highly valued sport fisheries.

## 1.4 Environmental Benefits

The Riverside Dam and head pond in its current degraded condition are unsafe and subject to failure. The "Rebuild" alternative will address long term public safety by adding contemporary design elements and features, particularly for the management of sediment. By introducing operative elements into a rebuilt dam, the City and regulators like the Grand River Conservation Authority, will be able to improve sediment transport and establish a more sustainable and balanced system. The rebuilt dam will also allow for important fish passage on a seasonal basis to address the need of the local species at risk (Wavy ray lamp mussel). Lastly, the fully operational gates will allow the City to manage and reduce flood risk to upstream/ adjacent users including Cambridge's largest park, Riverside Park.

## 1.5 Meeting Client's Needs

Wood was contractually engaged to the City of Cambridge and managed the services of its specialist firms through subconsultant agreements. Wood was the primary point of contact for the City, responsible for schedule, deliverable quality and budgets. Furthermore, in its capacity of Consultant Team Project Manager, Wood supported the City in all communications with Council, public, stakeholder committees and Indigenous communities.

The alternative to rebuild the dam aligns closely with the City of Cambridge's corporate strategic plan (2016), specific to many of the plan's goals and objectives as they apply to culture and heritage, and parks and recreation. The existence of a dam and mill pond in Preston is considered by many to be an asset of significant historical value and pride to the community that should be maintained. Council also considered Riverside Dam as essential to the enjoyment of Riverside Park and the identity of Preston.

Ultimately, the preferred solution will:

- Preserve / recreate important cultural heritage of the community of Preston in the City of Cambridge
- Provide the City with the ability to safely operate the dam, reducing risk to the public
- Enhance seasonal fish passage and reduce sediment build up

The engineer's role in projects like the Riverside Dam Class EA, is not to be an advocate but rather to provide professional advice in a systematic and transparent manner. The principles of the MEA Class EA process reflect this role, and in many ways facilitate the engagement of the engineer with public stakeholders. The Riverside Dam Class EA is an excellent example of how the engineer can provide technical insights using a balanced approach leading to meaningful engagement. While rarely perfect, these processes can work towards compromise in a respectful and valued manner, resulting in the "best possible" solution.



## Project Photos

Figure ES-3.1: Visualization of Alternative 'C' Rebuild Dam



**Figure ES-3.2: Visualization of Alternative 'E' Naturalize Speed River (Remove Dam)**



**Figure ES-3.3: Visualization of Alternative 'F' Construct In-Stream Rock Structures (Remove Dam)**



**Figure ES-3.4: Visualization of Alternative 'I' Build Offline Dam and Naturalize**

