

EXECUTIVE SUMMARY

Introduction

The Upper Thames River Conservation Authority (UTRCA) is responsible for the maintenance and operations of Embro Dam, situated in Zorra Township (**Figure 1-1**). Results of a 2007 (Acres) Dam Safety Assessment revealed concerns pertaining to insufficient spillway capacity, insufficient freeboard, embankment stability, and the conveyance of flood flows through the emergency spillway. A subsequent 2008 (Naylor/LVM) embankment stability analysis study concluded that the Embro Dam did not meet dam safety guidelines stability criteria and was not considered stable under existing conditions. The dam was classified as having a ‘Low Hazard’, based on MNR (2011) Dam Hazards due primarily to the rural area in which the dam is situated and the few low density of residential dwellings in the area.

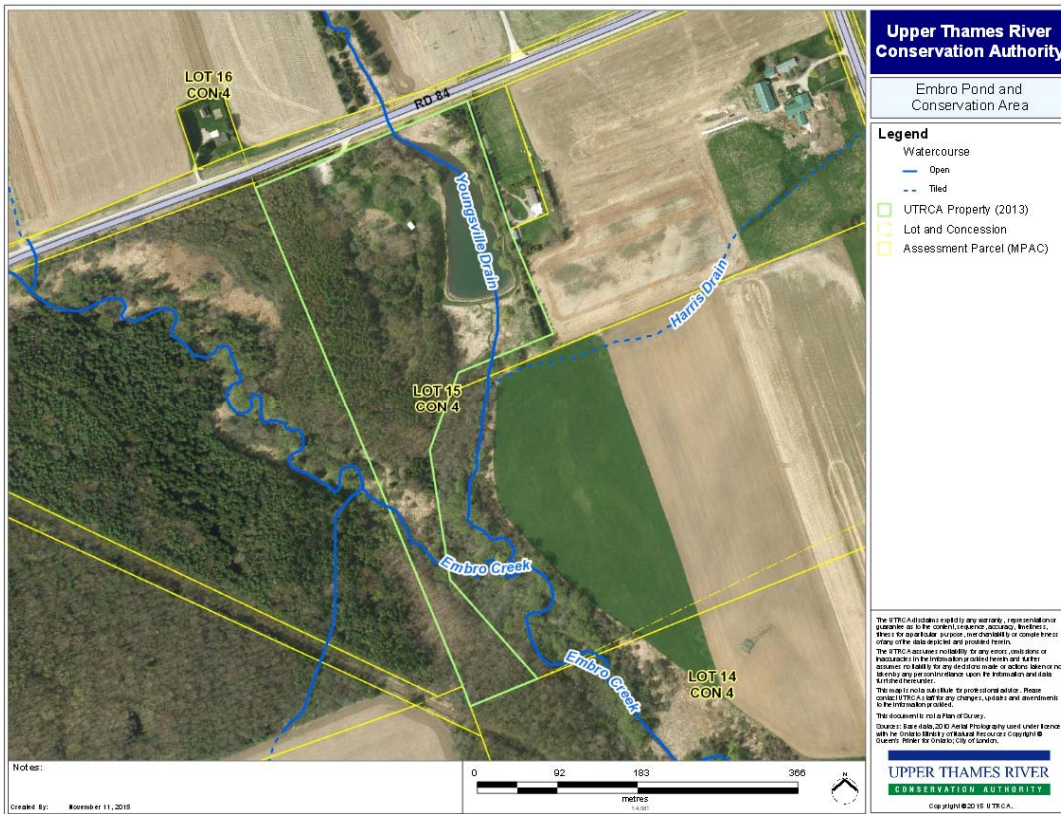


Figure 1-1. Embro Conservation Area (outlined in green, Source: UTRCA)

The UTRCA, in partnership with Zorra Township, initiated a Class Environmental Assessment due to the significant concerns related to the structural integrity and hydraulic capacity of the Embro Dam. The objective of this EA study was to identify, evaluate, and ultimately to recommend an alternative (including Do-Nothing) that will allow the Upper Thames River Conservation Authority (UTRCA) to move forward with resolution to the problem statement regarding the future of Embro Dam.

Background

The Embro Dam is situated 2 km north of the Village of Embro, in Embro Conservation Area (ECA). The dam is situated on Spring Creek which is also commonly referred to as Youngsville Drain situated in the Town of Embro, includes a dam and pond; both are under UTRCA ownership.

The Embro Conservation Area, in which the dam and pond are situated, supports a system of hiking and cross-country skiing trails. The Embro Pond Association entered into a lease agreement with UTRCA in 1999 for maintenance of Embro CA. excepting the dam. Various initiatives have been undertaken that have included planting of native trees and wildflowers. A hardwood forest regeneration project was also implemented in the conservation area.

Existing Conditions

Review of background materials and site conditions was completed to define and confirm the problem statement. Characterization of existing conditions was completed through review of background information; completion of field investigations, data collection, data analyses and monitoring. This included a general assessment of the study area and investigations of Youngsville Creek downstream and upstream of the dam, and within pond.

Youngsville Drain is a tributary of the North Branch Creek within the Mud Creek watershed. The drainage area to the dam and pond is approximately 7.0 km²; this is made up of mostly agricultural lands.

The wooded area of Embro Conservation Area (CA) is part of a larger significant natural heritage feature that includes the Oxford County Forest. Results of a three season botanical inventory revealed that 31% of the species within the 5.4 ha of Embro CA are non-native; no plant species at-risk, or rare or uncommon or sensitive species were found on the land or in the reservoir/pond. The reservoir has a dense growth of rooted aquatic waterweeds and pondweeds, but all three native species are common. There are very few rooted emergent wetland plants along the edges of the pond owing to the steep sides and constant water levels. The overall quality of the vegetation within Embro CA was rated as average or moderate.

During the three season bird survey, 40 species (common and mostly forest birds) were recorded. Only one species-at-risk bird (Barn Swallow) was observed although no evidence of nesting was found. The reservoir provides limited significance for a few resident waterfowl for raising broods (e.g., Wood Ducks, Canada Geese). These are common species. Migrating waterfowl make little use of the Embro Reservoir during spring migration, likely due to the isolation of this pond from other ponds or lakes in the area

Downstream of Embro Dam, Youngsville Drain Creek appeared to have been previously straightened and was considered to be stable. Through the aquatic assessment, twenty-one (21) different species were recorded downstream of the dam; the diverse community included cold water species and both permanent and seasonally present warm water species. The presence of Brook Trout below the dam indicates the presence of numerous seeps and the cooling effect of aquatic vegetation. Benthic analyses revealed pollution tolerant taxa in this section of the creek that were indicative of 'fairly poor' water quality. Measurements of water temperature revealed warmer water downstream than upstream of the pond; the pond appears to provide a warming effect.

Bathymetric surveys of Embro Pond showed that approximately 27-35% of the available pond volume has filled with sediment. Analysis of the accumulated sediment indicated that the sediment was not defined as hazardous waste according to Schedule 4 Leachate quality criteria (Ontario, 2015) but did exceed MOE (2011) Table 2 standards for Cyanide and Boron when considering sediment for agricultural, residential, or Industrial/commercial/community property reuse. The footprint of Embro Pond was determined to have no archaeological potential.

Youngsville Drain, upstream of the backwater effects due to the pond was considered to be geomorphologically 'in transition' and was considered to be aggradational. Results from the aquatic assessment suggested that this portion of Youngsville Drain provides good quality cold water habitat.

Only eight (8) species were recorded, including Brook Trout; the low species diversity likely reflects the barrier to fish migration due to the dam. Benthic analyses revealed that pollution sensitive taxa were observed in this portion of the creek that were indicative of 'fairly poor' water quality. Water temperature was cooler upstream than downstream of the dam.

Alternative Selection and Evaluation

Through review of study findings, seven potential alternative solutions were identified to address the dam and embankment instability concerns that were identified in the Acres (2007) and Naylor (2008) studies. These included:

- 1) Do Nothing
- 2) Repair Dam
- 3) Remove Dam and Establish Natural Channel
- 4) Remove Dam and Construct One or More Offline Ponds/Wetlands with a Natural Channel
- 5) Partially Remove Dam, Lower Crest and Naturalize the Remaining Perimeter

Evaluation of the potential alternatives was completed for each of the technical, environmental, socio-cultural and economic categories as defined in MOE (2014). The specific criteria that were evaluated were selected based on study area characteristics and factors considered especially relevant by the study team and/or the community. Ranking of each criterion was undertaken to determine the preferred alternative considering an equal category weighting.

The preferred alternative, resulting from both the equal and the weighted evaluation processes, was Alternative 3 (**Figure 7-1**). In this alternative, the dam would be removed and a naturalized channel would be established. The alternative recognizes the benefit of removing the dam to improve fish migration opportunities into cold water habitat.

Subsequent to Public Information Centre 3, a member of the public proposed an additional alternative. This alternative was reviewed and considered by the study team. That alternative shows thoughtful consideration for the reduction of liability and cost associated with any works in the area. The alternative included elements that are similar to Alternatives 2, and 5 and was thus not advanced to an additional alternative for inclusion in the evaluation process. Instead, draining the pond and lowering the dam crest to accommodate a fish ladder could be considered as a variation on Alternative 5 that incorporates elements of Alternative 3 (i.e., naturalized channel in area of exposed pond bottom).

Prior to development of detailed design, additional study is required to further characterize Youngsville Drain hydrology, examine potential effects of pond removal on nearby groundwater wells, and undertake further archaeological assessment. Where possible, the detailed design should address and incorporate elements considered important by the community that include: walking trails and viewing areas for birds, habitat creation for brook trout.

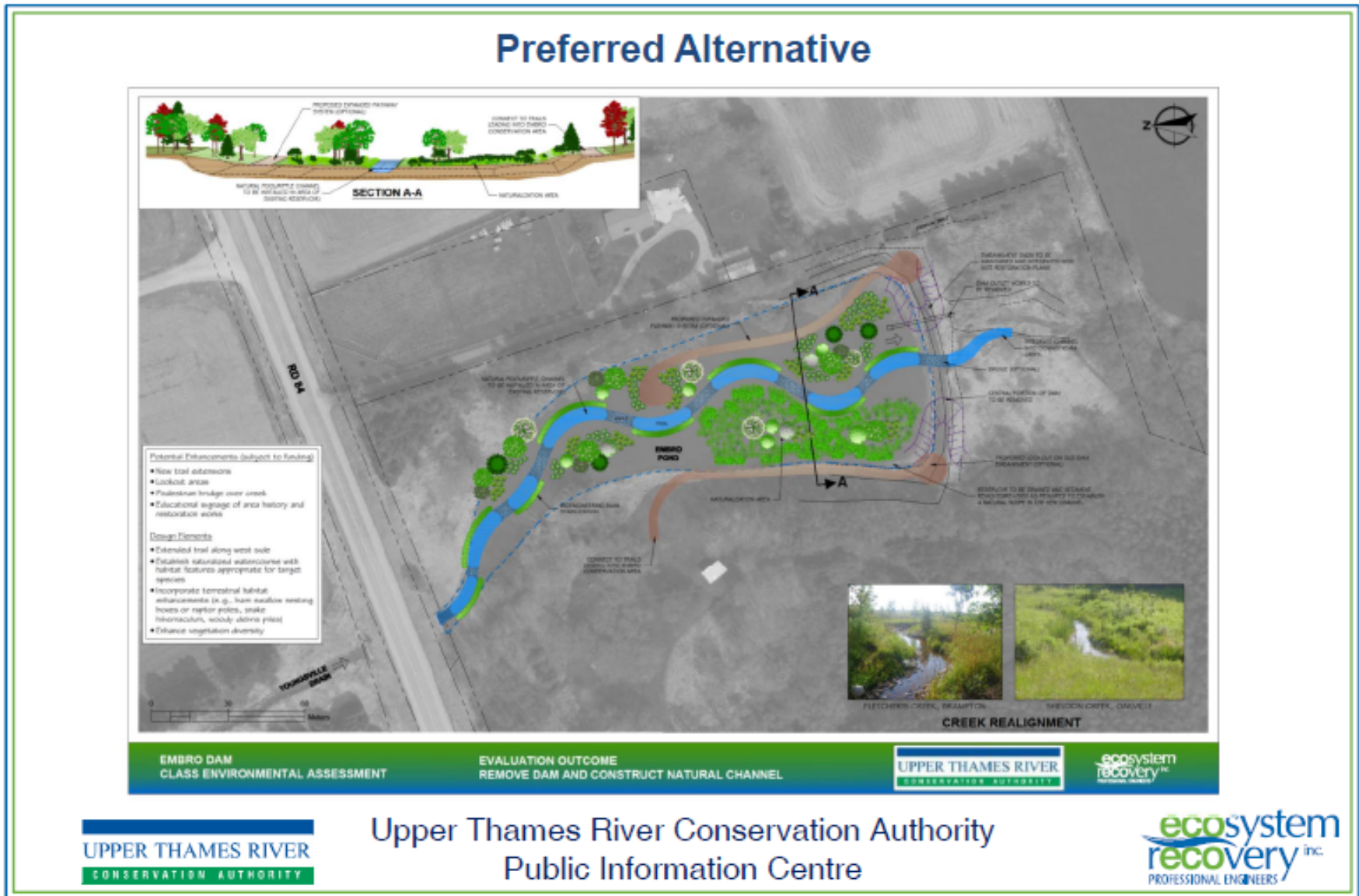


Figure 7-1. Preferred Alternative

Public Consultation

Public Consultation was undertaken throughout the study process which included not only the immediate community, but also First Nations, and organizations that may be interested in the project and/or agencies that must be consulted during the Class EA process. Public meetings were held to communicate study findings and study process to the community and to obtain public feedback to consider and incorporate into the study. In addition to three (3) public information centres (PIC), UTRCA also participated in additional communication with a community member who was actively engaged in the study process. All public notices, PIC presentation materials and draft reports were posted on the UTRCA website to provide public access.

Public comment and feedback received during the PICs and subsequent questionnaires were reviewed and used to inform the alternative evaluation process and refinement of the preferred alternative. While the preferred alternative is generally accepted by the community; a variation of Alternative 5 was felt, by a community member, to provide a more cost effective approach that would also reduce UTRCA liability for failure. This variation provides limited environmental benefits and could, in fact, contribute to adverse environmental conditions.

Conclusion

An Environmental Assessment study was initiated by UTRCA with the intent of identifying the preferred alternative for addressing the failure of Embro dam to meet dam safety guidelines with respect to its spillway and embankment. Review of existing conditions through background review and field studies demonstrated environmental impacts of the pond on water quality, fish species diversity, and channel function. No constraints were identified that would limit works associated with any of the potential alternatives. Through the evaluation process, Alternative 3 (remove dam and naturalize channel) was determined to be preferred. Preparation of design drawings for the preferred alternative should consider design elements that would support existing community use of the Embro Conservation Area and provide habitat creation and/or enhancement opportunities. Consideration should be given to initiating a Dam Safety Review if implementation of the preferred alternative is delayed. MNR (2011) recommends that Dam Safety Reviews be completed on a maximum 10 year cycle; the last reviews were completed in 2017 and 2018.