Comments regarding the choices for the Embro Dam site put forward in the third public meeting.

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[redacted]

This project to repair or remove the Embro dam is a study in liability and risk. Liability is a legal responsibility and risk is a measure of how that liability will affect the owner. It also ought to be a study in the best outcome for the money spent to reduce or control that liability. Because the cause of the liability in this project is not fixed but occurs on a graduated scale, the solutions ought to reflect that graduation.

There are three things that occur in nature that Mankind is not able to control very well, Wind, Water, and Seismic Vibrations that we call earthquakes. As a society, both in law and from a risk analysis in insurance assessments, we have recognized the events that involve these natural inputs at levels that exceed normal and that occur infrequently as outliers to the normal and call them “Acts of God”. While God is not defined, we do recognize that these events are beyond Man’s control, and those in the path of the event have to accept the consequences. However, there are analyses of risk, both in Law and in insurance protocols to evaluate these three natural factors, and that ought to be of some help in such a situation as the repair or removal of this dam. But in every case of such an event, the result is from an outlier to normal, and as such, the analysis of a project like this one ought to embrace outliers, not normalize data as we were told was done in this “mathematical “ approach in this case. The test done to suggest performing a normalized treatment of data is usually undertaken to confirm that the data at hand are an estimate of the true mean, and thus the data collected as a sample represents a sample of that mean, so that a statistical procedure will be relevant. No such statistical procedure was discussed in the presentation of this project, although normalized data was.

Because there are varying levels of damage that depend upon how much of an outlier the event might present, the only way to realistically analyse the problem is with an iterative approach, so that as the event becomes more abnormal and approaches a value that might be outside twice the standard deviation of a mean on a normal curve, both the risk and the damages increase. This has been done in the Acres report where they have been able to run their simulation model with a 50 year, 100 year and 250 year outlier to provide an estimate of possible water flow and associated damages for each event. No such analysis has been done in this EA, and as such no estimate of damage or risk or liability has been discussed for events beyond the 50 year event. No outside opinion, either legal or insurance related, was apparently sought out or considered in this report, even for the 50 year event.

There were five choices proposed in the third meeting and there were no changes among these proposals and the five put forward in the second public meeting. The only difference was that the matrix “mathematical” procedure for choosing the desired option was put forward at this time. I have indicated some very real concern over the term mathematical, because, from the discussion presented at the meetings, all of the inputs to the matrix appear to be subjective and not based on mathematics at all, which reduces the method to a numerical approach, but is not at all mathematical or objective in its results. It was also very obvious at the meeting that the method used was confusing for most of those that were there. At the PIC3, it was said that the

determination of the matrix numbers were done on an iterative process, which included going back to the CA for further input. If there were to be an iterative process, it ought to have been done on the choice among options because that might have offered some objective separation of the proposals and included more options with gradations, when unintended consequences arise, like further liability or cost issues that vary as the project changes occur. The logic and reasoning with the chosen method has been subject to the most subjective review and when the expert has asked for further input from the CA in mid process, he has abdicated his unbiased approach to all solutions. It makes him no expert at all. As expected from my comments after the second meeting, the criteria put forward as the evaluation parameters were such that only the removal of the dam and replacement by a reconstructed stream and flood plain were reasonable for consideration.

The relevance of these five proposals deserves some comment. The public has no information on the exact particulars of the terms of the hiring of Ecosystems for whatever job or expertise they have or bring to the problem. Because of that, the public has no way of determining how well these 5 approaches measure up to the requirements of the letter of transmittal. Ecosystems' presentation showed other work they have either designed or supervised some 2 to 5 months after construction. That is no time for evaluation. The time for evaluation is after the design maximum has been overstepped, and that was not considered. We were told the site would contain recreational opportunities, with the highlights to be trails. Most walkers use trails to walk, and usually some distance like 10 kilometers, which cannot be achieved here on the base of the reservoir. For these reasons, it means that the framing of the question is of major importance for determining the proposals.

In the first meeting, the consideration of liability was paramount and the liability lay with the lack of stability of the dam. There are two engineering reports, by Acres and Naylor, two engineering firms, defining the terms of the problem and there are two main factors that determine the Atterberg limits for stability: Soil Type including particle size, and Water Content of that soil. As the water content approaches the limit of plasticity, the stability decreases and the greater the force on the unstable soil from water pressure in the reservoir, the more likely a failure. In the third meeting another main factor was revealed, and that was financial support from sources other than the Upper Thames River Conservation Authority, (CA), and the Municipality, Zorra Township.

The proposed costs were also introduced in this presentation, with the proviso that the five proposals were all subjective, and so costs could only be guessed at without final designs. It was highly intimated that the cost of final designs for more than one proposal were out of the question financially. This limitation is justification for using an iterative process with reasonable costs and proposals so that the choice is as carefully reasoned as possible, and less biased than this report has been. Since it was said that input on the numerical evaluation process included further information and iteration by members of the CA, it is clear that the results presented were not at arm's length and were biased to the desires of the CA. In any event, the proposal for the dam removal and reconstruction of a stream has been the choice and it was obvious from the beginning that this was the preferred choice of the CA before the EA process was undertaken. Thus the EA process appears to be a sham, and a fairly expensive one at that.

At this third meeting, there were no supporting facts or updates on the work done over the past year that might have been an addition to the work presented at the second meeting, and from

personal communication with Mr. Goldtof the CA, there were changes to some of that information that did occur over the past summer.

The option of choice is not just the apparent reduction of the liability issue or the applicability of costs supported by other funding sources. We were told Provincial monies are only available for dam removal or flood control systems. This preferred option includes far more than just the reduction of liability, and the preliminary costing was so vague that it was impossible to tell what portion of the $250,000 to $325,000 were for reduction of liability and what was considered for the esthetic stream reconstruction which would morph into Brook Trout habitat.

I have said in prior comments that there were only two options for consideration if liability were the criteria for decision making: repair the dam and spillway as suggested by the engineering reports of Acres and Naylor, or remove parts of the dam so there is no impediment to water flow. I still maintain that those are the only two options, but at a reasonable cost, especially to taxpayers who have very little say in how the CA levies assessments for water control within its jurisdiction. There is a very clear duty of care from a legal sense when the CA is as powerful in its ability to assess costs as it sees fit. I think that the CA has forsaken some of that Duty to care with the process of this EA.

The estimate for costs for the proposal to remove the dam and build a watercourse and flood plain were $250,000 to $320,000. The estimate for the proposal to repair the dam and overflow, was $150,000 to $200,000. Maintenance costs were also estimated for these two choices at $1,500 to 3000 for the watercourse and $1,500 to $20,000 for the repair with an additional $80,000 for dam removal at 75 years. The estimates for maintenance were far greater for the repair than for the stream. While the author of the report may have seen the billing history for maintenance at the Embro pond area, it was not evident to the public that there has been much maintenance on the actual dam or pond itself. In fact, the pond maintenance has been reduced. As an example, the pond used to be drained every year before winter, but has not been since about 2000. This has, in effect, increased the liability of the owner, because water has been allowed to remain in the berm over the winter, rather than recede when the reservoir drained and the effect of internal and external water forces and gravity work away over the fall and winter to lower the water levels within the berm. Thus the history of maintenance costs would appear to be on tree management and grass cutting, which is not going to change with a change from pond to stream. The report boards for the PIC3 indicate that the township pays all of the operating costs for the dam and the Embro Pond Association maintains the Conservation Area. The owner has abdicated his responsibility for his liability with a lack of overseeing the changing conditions of the dam on a regular basis.

Up to now, there has been no report made public from the risk assessment officer within the CA so there is no quantified risk for liability, nor any measure of how well the liability is defined or whether any option satisfies such a risk analysis. There have been no reports from outside sources, either legal or insurance based, brought forward either. There may also be a liability problem that is not well defined among the Municipality, the CA, and the Embro Pond Association, and that would rest with the legal agreements among these three parties. However, in law, the landowner has the responsibility of the liability and it is his responsibility to do maintenance if the Municipality or Pond Association is not doing the agreed upon work, or the liability is beyond the agreements among those three identities. <u>The worst case is that the Municipality and the Pond Association have liability but don't know they have, so can take no action to mitigate their risk!</u> It is unlikely the owner would ask either the Municipality or the Pond

Association to remove the logs for draining the reservoir, as that is a specialized task that they have done in the past, so know the system, its dangers, and have the tools to do that task.

Other ways of using the resources that do exist at this site ought to have been considered. Because the availability of funds from sources other than the CA and Municipality were not mentioned until the third meeting, no opportunity for the input of this factor by the public existed until now. If the goal is to reduce liability, it can be done in more ways than by removing the dam. There is a third proposal that ought to merit consideration, given that funding is available for flood control as well as dam removal, and that is to drain the pond, repair only the overflow and perhaps consider a small fish ladder from the current outflow pipe to the creek level above. I am not an engineer but from the Acres report, with an inflow design of 9.4 m^3 per second for a flood situation, which the current consultant refuses to consider because he says the design for creeks is different than for dammed ponds, there is a standpipe that with three logs removed will allow for a flow of 3 $m.^3$ maximum at full dam capacity, and the pond basin would act as some flood control provided the overflow is repaired. Having the pond drained as the normal course of events will reduce the wetness factors and the seepage factors in the berm, so influence the stability factors and make the repairs suggested by Naylor unnecessary. Adding a way to make the system so that fish can travel through the system ought to be possible even if a small concrete pad needs to be added at the base of the standpipe and a small pool exist there. The cost for the overflow repair in the Acres Report is $8,000.00. The current consultant has chosen to double the values of this report in his current cost estimates. Thus to repair the overflow would be $16, 000.00 and that included moving 420 m^3 of materials.

At this third meeting, the question was asked about the age of this dam. No answer was given, except to say the CA ‘s involvement began in 1958. I have consulted the historical atlas of Oxford County for 1876 and there is a grist mill located on this creek at that time, and so there would have been some dam in place then. The building of the first dam would have preceded that date. Therefore whatever flaws are in the current dam, some part of the foundation of this dam has withstood the weather and storms from 1875 to now, in spite of the concerns of today’s requirements and standards. In all probability, there is a good chance that this dam was originally constructed with horses and slush scrapers as the only means available to bring soil to the site. Compaction and consolidation of materials would not have been a high item on the list of necessary conditions to be met. It has been sufficient until now. If there have been failures of the dam, there is not much record of damage from that failure, probably because it was not major, and our society was much more tolerant and less litigious than it seems to be at present, in spite of the fact that Rylands and Fletcher, the standard for Strict Liability is a law case from 1868 (most of the life of this dam). It also needs to be said that the estimates of sedimentation were 161 m^3 per year. This number was determined without consideration of the fact that there had been a clean out of the pond bottom in the 1980’s that the CA cannot document, but at least three people at the PIC3 meeting could remember. Thus this value is probably underestimating the rate of sediment deposition.

Further on the subject of sediment, while it is a natural process and streams need some sediment flow to stay healthy, there will be increased pressure on landowners to reduce sediment loading to comply with phosphorus run-off into watercourses within the Great Lakes basin, and the possible loss of a settling pond for phosphorus management has been completely disregarded in this process. The area of 7 $kms.^2$ ought to be a reasonable test watershed for research on phosphorus loading within all of the Thames River watershed, and if

this dam is removed, then the settling pond will be removed for research options. The soil in this water shed is part of Oxford County , the only county in Canada with a rating of 95% class 1 soils for agricultural production and because it is soil of relatively large particle size, very subject to erosion. The high productivity of this soil increases the chances for heavy use of fertilizers and so this resource is one that would be most sought after for research purposes. As well, our highways seem to include catchment ponds in the current construction methods, so there is a lack of co-ordination with overall water policy here. This option of a research study area has been overlooked.

There was one proposed option to add an off watercourse pond to the design. It was more expensive than preferred proposal. It also did not give any regard to possible mosquito breeding and the four big mosquito borne diseases have not been considered: Malaria, Zika virus, West Nile virus and Dengue fever. The species that carries Zika has been found at Windsor, Ontario in 2016, so the mosquito can survive in this climate, at least in the summer. No virus was found on or in these insects but the ominous sign is there that transmission is possible. Malaria was a major killer in the 1820's in Ontario when the feeder canal was being built for the Welland Canal, particularly in the area of Stromness and the marshes of the Grand River delta, so we have records of this disease in Ontario. West Nile virus is now an annual event in Ontario. Such ponds as the one proposed ought to be avoided completely if liability is a concern for the CA. This design ought to be considered off the matrix grid, because a negative score of 1 to 5 for one social factor is not damaging enough to the proposal, given the gravity of the liability not thus far considered.

The fifth proposal was to lower the dam height and landscape the surrounding area to fit the lower level. The cost estimates were in the neighbourhood of $500,000 to $600,000. This is a highly exaggerated cost because the lowering of the water surface and hence the effective top of the dam would merely require the overflow to be lowered and the logs to be removed from the standpipe. This would lower the top of the water curve in the dam as well. The estimated costs in Acres for the overflow were $8,000, and the bare soil remaining by lowering the water level would be less than the bare soil remaining if the whole reservoir were drained, so less remedial work needs be done, especially on the length of the stream. Such over estimations reflect poorly on the expert and more so because of the over-exaggeration compared with the practical ways to lower the reservoir height, repair the overflow and change the standpipe. There is no need to take the top off the berm for relocation, it is only necessary to make it redundant and leave it in place.

It makes no sense to me that there is no design flow in these proposals. It would seem that if the run-off from a storm event is projected at 9.4 m^3 per second, (based on calibrated simulation data from the Acres report), the flow will be the same entering the proposed constructed stream, and that this ought to be the design flow for the creek and flood plain. Since there has been a mill on this creek since the 1870's, the site and design was chosen by a miller who needed power and his estimate was that the required power could be supplied by the flow, and the fall at this site which is about 3.1 m. in the length of the reservoir of 200 m. from the road culvert at road 84 to the current dam. Acres suggests the total fall in the creek is about 15 m. and so the fall here is 20 % of the total. This will mean that the water coming in will accelerate for this 200 m distance with this much fall and no dam. Nowhere in this report has an energy balance been estimated or undertaken, and unless energy is considered, there will be mistakes from unintended consequences within the final design. I suspect that the actual final design for a

creek to take this much flow without liability for erosion or added maintenance to rebuild the stream after a 50 year event will not resemble the meandering course shown in the presentation materials but will more nearly be the concrete blocks cabled together that Acres has suggested for the overflow of 60 m. length rather than the 200 m of the reservoir bottom.

A further comment about the considered costs of the current five proposal is warranted. In the dam repair proposal, suggested annual maintenance costs are estimated to be as high as $20,000 and include a further $80,000.00 (2016 dollars) for dam removal at the end of the projected life of 75 years. It is not obvious how these costs are arrived at. Even if costs are incurred on an irregular basis, maintenance of the dam, including clean out of sediments (which, so far, has been once in the time the CA has owned the dam), ought not be this great. To remove the dam with a profile that allows for the flow in the Acres report means that a stream bed of some 5 to 6.5 m, (from Acres) or 10 m at the most, needs to be dug into the current embankment. Since there is a requirement to remove considerably more fill from the west side of the current outlet, because there is more fill there, much of the fill will be removed from the side east of the outlet. It was inconceivable to many who were at the PIC3 meeting that the costs could be as projected and that would include that the dam removal will be $80,000, because good operators on a dozer and hydraulic shovel ought to be able to move enough to vacate the dam, accommodate the required flow and place it to the east of the creek in a few days. One member of the public thought biological design was far superior to the geomorphological one suggested by the consultant because of superior results at less cost. In any event, higher estimated costs at this stage means that if the actual design comes in at less, then things appear better than they were. This is merely presentation of false information to bias the results and embellish the reputation of the consultant when final designs are not as expensive as first thought.

There was no mention of timing on the aging of the dam. If the age were to be taken from the initial date of CA ownership of 1958, then much of the 75 years has passed. If the 75 years were to begin after the Acres and Naylor repairs were made, then there is no understanding today of the wear on the dam by that date and no necessity to include those sorts of unknown factors and costs in a decision making process to-day. This sort of biased view not only clouds clear thinking, but also makes for an impression that dam repair is not effective to reduce liability. Thus far, that dam has weathered for 145 years and still holds water! At the same time, if the costs for dam removal in the preferred case do not include removal costs of the same $80,000.00, and we were not told that they were that, then the costs have been estimated differently for different proposals and that is not a fair test of objectivity for the choice of options. The presented cost data was so gross that this sort of detail was not available. However, it allows for the implication of faulty logic and faulty science, neither of which is a good base on which to build any project.

Within this whole process, there is no method to evaluate how well money has been suggested to be spent. This was questioned at the meeting and the response was that all the proposals were subjective and as such the consultant was unable to be specifically quantify either costing, (capital costs and maintenance costs) or effectiveness. However, careful spending of funds to give value for money spent, to achieve specified purposes, is still a requirement for taxpayers who really want to see the value received. The feedback thus far from the public is such a small sample (with only 4 comments on removal or repair after the second meeting and only a very small turn out for PIC3) that the decision must fall on the shoulders of the CA and Municipal

Council to evaluate money well spent ONLY TO REDUCE THE OWNER'S LIABILITY WITH AN OPTION FOR OUTSIDE FUNDING. Any further expenditure of funds is unwarranted to achieve the goals of reduced liability and financial support. "While we are at it, we might as well do _____ (Fill in the blank with "a trout creek") is only an attempt to seek funds for projects not covered by the purpose of the Acres and Naylor reports or current outside funding and as such ought **not** to be undertaken as part of this project. There is nothing wrong with a trout creek but not as a solution for the liability problem. While Brook Trout habitat was being looked forward to by some few individuals, the costs for this are not reasonable as proposed, at a $100,000.00. difference between dam removal and stream construction estimates. Better use of funds needs to be made and decisions made only with non-biased, objective processes, and they are not evident within this process here.

The other parameter that has not been considered is the standard to which things are measured. The Acres report states that the CA uses a 250 year storm in their own simulation model and the standard here is only a 50 year, 8 day snowmelt (from the first two meetings). No estimate is given for the repairs on any of these options if conditions exceed this weather event, and it is a given that they will be exceeded. The process of this EA has failed such testing for examining the reasonableness of any of the five options put forward in this study.

In conclusion, the recommendation by the consultant for the option to remove the dam and reconstruct a creek has been chosen with a very problematic processes that cannot be evaluated for effectiveness because of lack of disclosure of the terms of the hiring and their stating that the CA has had input on the iterations of the matrix numbers as the process was evaluated. Such a process only allows for errors in logic to determine a valid option, whether the errors are from clouded, misapplied or ill-defined purpose, biased inputs from the CA, lack of disclosure of the importance of funding from outside sources, or grossly distorted estimates of probable costs. All of these failures do exist in this presentation this far. They skew the results for choosing an unbiased selection of an option that ought to be based on science and good cost estimates. The result is that the choice of the best option at the best cost is not possible. This process as it has occurred here only offers the pubic a sham of what is reasonable, at a very high cost, given the CA's desire to remove the dam before the EA was undertaken. That the CA and the Ausable Bayfield Conservation Authority have 15 dams between them to have to undergo this process is a tremendous financial stress across both watersheds when the results are determined with such low quality workmanship.

If there were any question on the reasonableness of the report thus far, one might ask and answer two questions: The first is what will the project look like five days after the 100 year storm, or the 250 year storm, and were the maintenance costs estimated reasonably for the aftereffects of those events? The second question to ask is would this expert and his technique stand up to a rigourous cross-examination in a court to provide the explanation of the preferred choice by an unbiased expert providing advice based on science, and reasonable, uniform costing to come up with the results proposed at this time. I am sure the answer to both questions is negative.

My feeling is that the money for this EA has not been spent well, that there is little value for the monies expended thus far, and that the choices are not well fit to only the liability reduction

requirements. This sort of low value, high volume spending ought not continue into the final design process.

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