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## **Council-In-Committee Meeting – November 09, 2021**

Subject: Gilbert Road Culvert - Budget Amendment  
Report Number: EIS 21-06  
Division: Environmental and Infrastructure Services  
Department: Engineering  
Purpose: For Decision

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### **Executive Summary:**

This report is to provide Council with an update on the Gilbert Road Culvert replacement project and to present potential options for consideration.

### **Discussion:**

In January 2020, Environmental and Infrastructure Services staff presented Report PW 20-13 Bridge Project Updates. The report provided an update on the current status of three bridge projects, which included the Gilbert Road Culvert. The Capital project for the Gilbert Road Culvert is still an active project and Environmental and Infrastructure Services staff is requesting that Council review this project, considering the options and provide direction to staff for completion of this project.

Gilbert Road is 570m in length and the culvert scheduled for replacement is located approximately 160m north of Woolley Road. See Attachment No. 1 – Location Map Gilbert Road Culvert.

At the time of the presentation of Report PW 20-13, Council requested that staff investigate if there was any funding available from the LPRCA for the removal of this culvert. Environmental and Infrastructure Services staff have been in contact with LPRCA to confirm if funding is available, however, this project would not be eligible for funding approval.

This culvert was scheduled for replacement in 2020, however, has been delayed as staff and the engineering consultant have been working with Long Point Regional Conservation Authority (LPRCA) to determine flow capacities and impacts to the upstream Hay Creek Dam risk and flooding assessment. The current approved capital budget is \$725,000 (\$98,000 Engineering, \$627,000 Construction). The replacement was required due to age and the deteriorated state of the structure.

The Hay Creek Dam which is owned by the LPRCA is upstream of the Gilbert Road Culvert. A Dam Safety Review completed by LPRCA identified the Hay Creek Dam as a high hazard classification which is directly related to the Gilbert Road Culvert. The high hazard classification is due to the dam's potential for failure, which may result in loss of life, inundation and property damage adjacent to the Gilbert Road Culvert. Potential inundation of the adjacent property is due to the limited capacity of the existing culvert. To reduce the classification of the Hay Creek Dam, capacity would need to be increased by completing one of the following:

- Installing a larger culvert or twin culverts
- Constructing a bridge structure
- Removing the culvert.

The first two points above will have significant cost increases which have not been factored into the existing approved budget. The option of constructing a bridge structure has not been considered further as this would require significant road reconstruction and the required increase in budget would not be feasible.

LPCRA has reviewed their flow modeling and have provided a culvert sizing of twin 3.96m x 3.05m box culverts that will adequately convey the flow and reduce the dam risk assessment to a low-risk classification. This size is increased from the existing size of one 2.36m x 2.64m box culvert. The preliminary estimate for the increased culvert size is \$830,000, which would require a budget increase to the Construction allotment of \$203,000. It is noted that due to the narrow right of way of Gilbert Road, any replacement of the existing culvert would require some land acquisition from the neighbouring property owner on the east side of Gilbert Road, which is also reflected in the cost estimate above. LPRCA has also reviewed the option for the existing culvert size to remain, however, if this was the case, there would need to be significant flow capacity increase upgrades at the dam structure itself, which would be in the amount of \$700,000, and would still be required to be funded through the special levy to Norfolk County.

The removal of this culvert is also supported by the LPRCA as this would eliminate the high hazard classification on the Hay Creek Dam and ultimately lower the design standards for future maintenance or replacement of the dam. The removal of the Gilbert Road Culvert would require the closure of the travelled portion of Gilbert Road between Radical Road and Woolley Road. This closure would result in an inconvenience to some residents on Woolley Road and Gilbert Road as it would require them to use Port Ryerse Road which is approximately 580m to the west of Gilbert Road. Any closure of Gilbert Road would require turn around areas with adequate turning radius for snow removal, garbage collection and maintenance. Due to the narrow right of way, the turnaround areas would require land acquisition from the neighbouring properties for buildup of the low-lying areas and to accommodate the required turning radius. Preliminary cost estimate associated with the removal of the culvert, stream and bank restoration, property acquisition, installation of turn around areas, dead end barricades and signage is estimated to be approximately \$450,000. Engineering staff

have contacted the neighbouring properties to discuss this option of closure, however, they have expressed nonsupport of this option as it would affect their farming operations and they would not be willing to sell a portion of their lands for the construction of turnarounds.

Based on the review of the 2 options noted above, Environmental and Infrastructure Services staff is recommending that Norfolk County proceed with the installation of the twin 3.96m x 3.05m box culverts at an estimated construction cost of \$830,000 and that the budget be increased to cover the additional costs.

**Financial Services Comments:**

The Approved 2019 Capital Budget included funds in the amount of \$725,000 for the Gilbert Road Culvert Replacement Project, which included \$98,000 for Engineering costs and \$627,000 for Construction costs.

Given that the LPRCA has identified that maintaining the existing culvert would result in an additional \$700,000 to update the dam, it is recommended that the installation of twin box culverts at an additional \$203,000 is in the long run the best financial decision in this situation.

Should council approve the installation of twin 3.96 x 3.05m box culverts as recommended by staff, an amendment of \$203,000 will be completed to accommodate the additional costs. If council decides to approve of the recommendation, Finance recommends that this increase be funded through the issuance of Debentures.

<b>Gilbert Road Culvert Replacement</b>	<b>Approved Budget \$</b>	<b>LTD Actual Costs \$</b>	<b>Proposed Revised Budget \$</b>	<b>Proposed Increase</b>
<b>Project Costs</b>				
Engineering	\$98,000	-	\$98,000	-
Construction	\$627,000	-	\$830,000	\$203,000
<b>Total Project Costs</b>	<b>\$725,000</b>	<b>-</b>	<b>\$928,000</b>	<b>\$203,000</b>
<b>Project Financing</b>				
Debenture Proceeds	\$750,000	-	\$928,000	\$203,000
<b>Total Project Financing</b>	<b>\$725,000</b>	<b>-</b>	<b>\$928,000</b>	<b>\$203,000</b>

Since this project will be financed through debentures, the *Municipal Act and Regulations* require that, prior to commencement of the capital project; Council is required to approve the issuance of long-term debentures. Further, the Treasurer is required to provide a Certificate of Treasurer, certifying that the issuance of the proposed debt will not exceed the financial obligation limit of the municipality. Attached to this report is a Certificate of Treasurer – CT 21-09 required under Regulations in the *Municipal Act*.

**Interdepartmental Implications:**

Not applicable

**Consultation(s):**

Roads and Environmental Services divisions have been consulted for turnaround requirements for snow removal, maintenance and garbage collection.

Preliminary discussions with adjacent landowners with respect to option for Gilbert Road closure.

**Strategic Plan Linkage:**

This report aligns with the 2019-2022 Council Strategic Priority "Build and Maintain Reliable, Quality Infrastructure".

**Explanation:**

Build a strategic approach to managing facilities, addressing deferred capital maintenance and divesting assets and buildings that are no longer strategic for this County's long-term needs.

**Conclusion:**

The Gilbert Road Culvert is a current project that was identified for replacement. Staff is recommending that the culvert be replaced with twin box culverts sized to adequately convey flow required to reduce the Hay Creek Dam risk classification to a low classification and that the budget be increased to cover the additional costs required for the culvert upsizing.

**Recommendation(s):**

THAT Staff Report EIS 21-06, Gilbert Road Culvert, be received as information;

AND THAT Engineering proceed with the replacement of the Gilbert Road Culvert with twin box culverts;

AND THAT the 2019 Approved Capital budget for the Gilbert Road Culvert Replacement be amended from \$725,000 to \$928,000 with funding to be provided by Debenture Proceeds;

AND FURTHER THAT the funding for the Gilbert Road Culvert project be provided by the issuance of debentures up to \$928,000 with a term not to exceed 20 years.

**Attachment(s):**

Attachment No. 1 – Location Map Gilbert Road Culvert

Attachment No. 2 – Letter of Advice – Gilbert Road Culvert Replacement and its Impact on Hay Creek Dam

Attachment No. 3 – CT 21-09 Gilbert Road Culvert

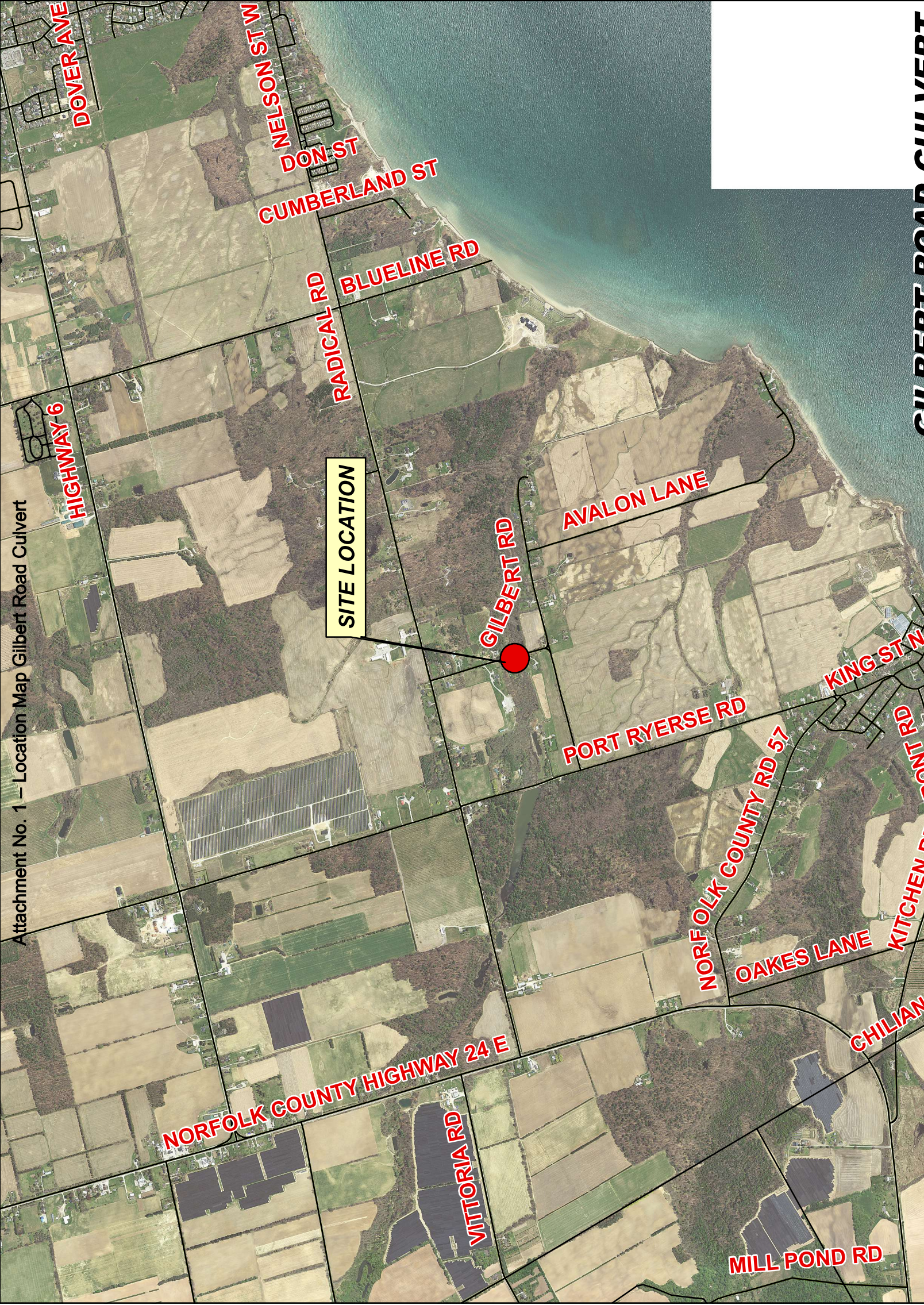
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Attachment No. 1 — Location Map Gilbert Road Culvert



GILBERT ROAD CULVERT



## Attachment No. 2 – Letter of Advice



### Long Point Region Conservation Authority

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4 Elm St., Tillsonburg, Ontario N4G 0C4  
519-842-4242 or 1-888-231-5408 • Fax 519-842-7123  
Email: conservation@lprca.on.ca • www.lprca.on.ca

August 25, 2021

G. Douglas Vallee Limited  
2 Talbot St North  
Simcoe, ON N3Y 3W4

ATTN: Ryan Elliott, P.Eng., BDS - Director of Structural Engineering

**Subject:        Gilbert Road Culvert Replacement and its Impact on Hay Creek Dam**

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It is our understanding that the culvert at Gilbert Road is scheduled to be replaced and preliminary design of the new replacement structure has begun. This letter outlines the impact that the Gilbert Road Hay Creek water crossing design has on future capital projects at the upstream Hay Creek Dam. In addition, Long Point Region Conservation Authority (LPRCA) has provided some culvert sizing details for your consideration.

#### **Culvert Impacts on Hay Creek Dam Capital Costs**

LPRCA completed a Dam Safety Review (DSR) study on Hay Creek Dam in 2018. This study identified several deficiencies in the dam's embankment stability and flow capacity. Through this study it was found that the resulting flood wave from a dam failure would inundate a dwelling upstream of the Gilbert Road culvert with flood depths greater than 0.8m. The flooding on this property is the result of backwater effects from the Gilbert Road culvert being unable to convey the dam breach flow. The Hay Creek DSR report noted that if the culvert capacity was increased to sufficient size, this property would not be impacted.

Flood depths in excess of 0.8m of dwelling are considered to pose a risk to life to the residents of the dwelling. Therefore, the dam has been designated to have a "High" Hazard Potential Classification (HPC) as per the Ministry of Natural Resources and Forestry (MNR) Dam Safety guidelines. A dam's HPC dictates the inflow design flood that the structure must be able to pass without overtopping the dam. The DSR study found that Hay Creek Dam is unable to pass its required 25 m<sup>3</sup>/s inflow design flood through the spillway without overtopping the dam. This necessitates the need to increase the flow capacity at the dam in order to meet provincial standards. Increasing the flow capacity at this dam would require either an emergency spillway in the form of an additional culvert through the road embankment, or widening the current abutments which would essentially result in a complete rebuild of the structure. An order of magnitude estimate of the cost of constructing an emergency spillway would be \$700,000, and widening of the abutments would cost \$2,000,000.



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*A Member of the Conservation Ontario Network*

Repair costs associated with LPRCA dams are funded through special levy to the municipality where the dam is located. Therefore, Norfolk County will be required to bear the full cost of all construction associated with increasing the flow capacity and improving the embankment stability to provincial standards. If the dam is to be kept in operation, improving the embankment stability to meet the required factor of safety at an estimated cost of \$500,000 is unavoidable. However, if the downstream dwelling is removed from the dam breach flood hazard then Hay Creek Dam would receive a “Low” HPC as there is no longer a risk to life to the dwelling and its residents. A Low HPC requires an inflow design flood of the 100 year flood (16.6 m<sup>3</sup>/s at this location) which the DSR notes the dam is capable of passing without overtopping. Therefore, the dam would not require flow capacity upgrades and represent a savings to Norfolk County of approximately \$700,000 with respect to dam costs.

## Culvert Sizing

### *Existing Conditions*

LPRCA received a HEC-RAS dam breach model from Riggs Engineering as part of the DSR that was completed in 2018. All elevations used are in vertical datum CGVD28.

The existing Culvert as modeled in the DSR had a 2.36m span x 2.64m and upstream and downstream inverts of 193.4 m and 193 m respectively. The results of the flood flow dam breach model with the existing culvert at Gilbert Road can be seen below in Figure 1. Note that flood depths around the dwelling on the north upstream side of the culvert are greater than 0.8m.

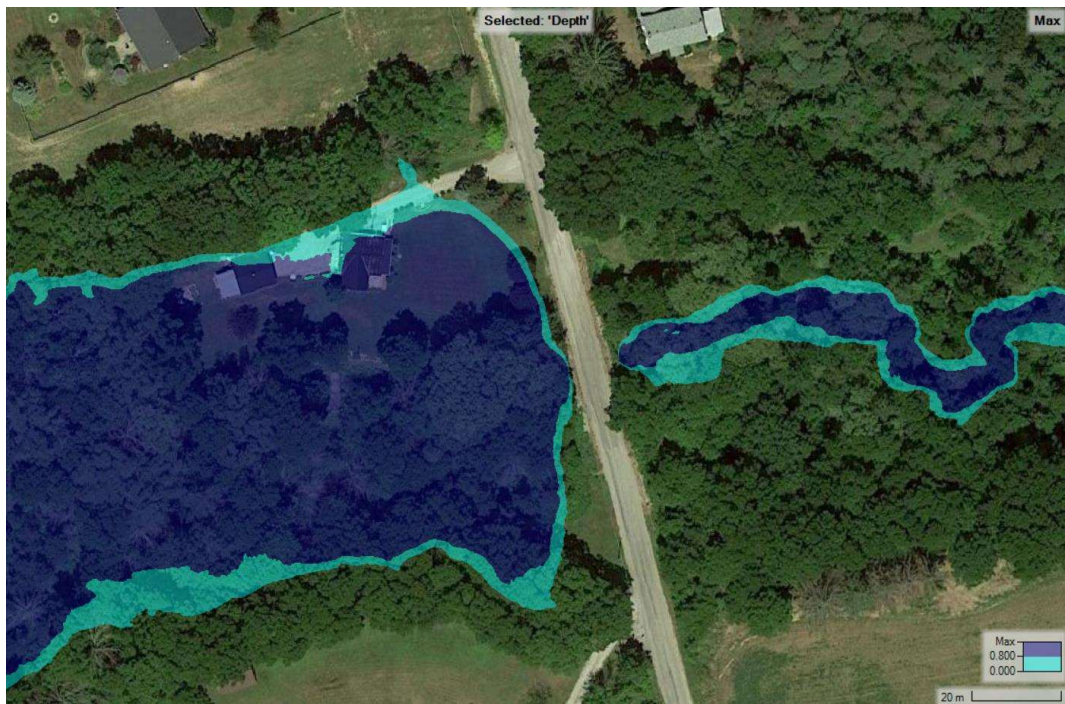


Figure 1 - Existing Culvert on Gilbert Road as Modeled in DSR - 2.36m Span x 2.64m Rise Flood Depth



*Proposed Conditions*

LPRCA staff ran several iterations of possible culvert configurations through a HEC-RAS dam breach model to determine the minimum culvert size that would remove the dwelling from the flood hazard and therefore lower the HPC of the dam from “High” to “Low”.

LPRCA staff found that two 3.96 m x 3.05 m box culverts using upstream and downstream inverts of 193.29 m and 192.89 m respectively were the smallest culvert configuration that completely removed the building from the floodplain. The results of the flood flow dam breach model with two 3.96 m x 3.05 m box culverts at Gilbert Road can be seen below in Figure 2. Note that there is no longer backwater at the culvert and the dwelling is completely removed from the floodplain.

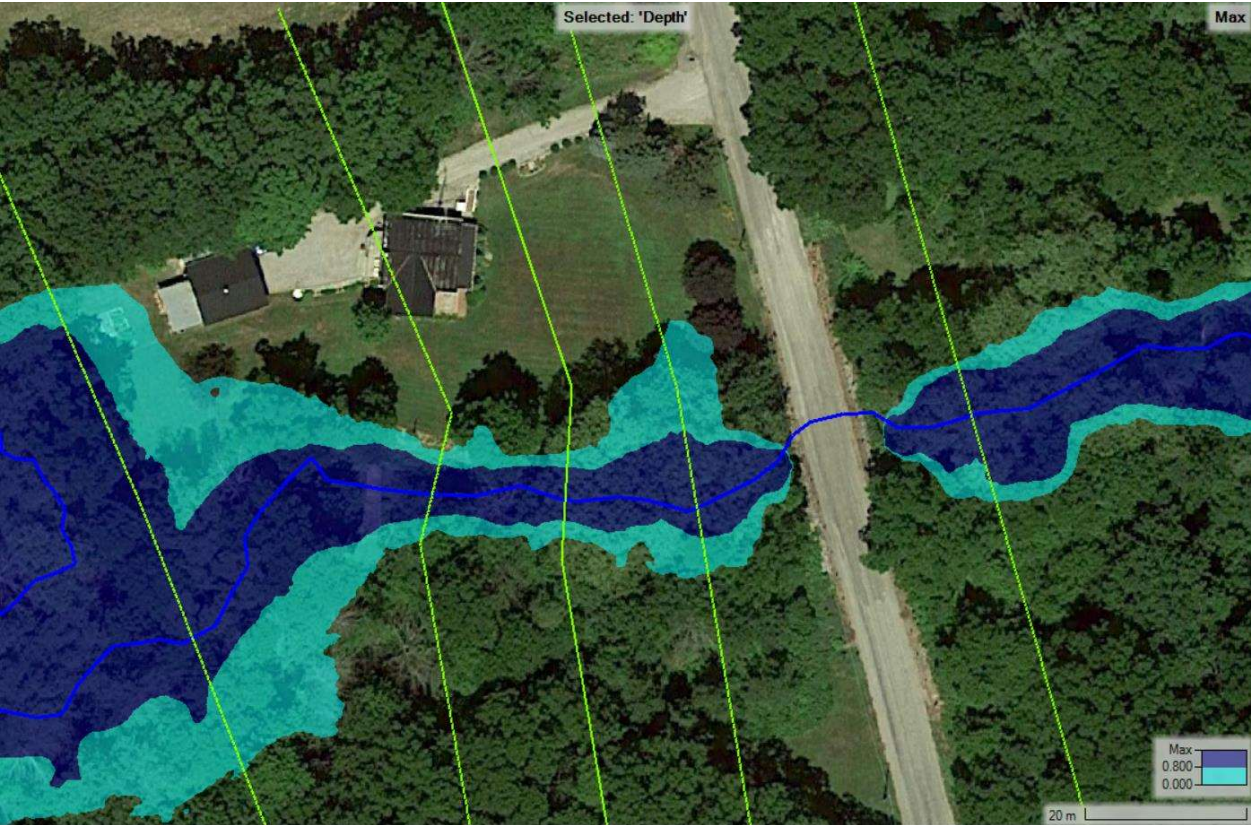


Figure 2 - Two 3.96 m Span x 3.05 m Rise Box Culvert

LPRCA staff ran several iterations of possible culvert configurations through the HEC-RAS dam breach model to determine the minimum culvert size that would cause the dwelling to flood, but not meet the risk to life thresholds outlined in the MNRG guidelines of greater than 0.8m flood depth, 2x2 rule greater than 0.37 m<sup>2</sup>/s, or velocities greater than 1.7 m/s. This would cause the HPC of the dam to be reduced from “High” to “Moderate”.

LPRCA staff’s analysis found that twin 3.65 m x 3.05 m box culverts using upstream and downstream inverts of 193.29 m and 192.89 m respectively would lower the HPC to “Moderate”. The results of the flood flow dam breach model with twin 3.65 m x 3.05 m box



culverts at Gilbert Road can be seen below in Figure 3. Note that there is still backwater at the culvert and the dwelling is still inundated; however flood depths do not exceed 0.8 m around the dwelling. The flow velocities also fall below the 2x2 rule and velocity thresholds for risk to life with this culvert configuration.

After review of the requirements of a “Moderate” inflow design flood in the MNRF Dam guidelines, LPRCA staff would expect that this would still trigger the need for a capacity upgrade at the dam. Therefore, there would be negligible cost savings going from a “High” HPC to a “Moderate” HPC.

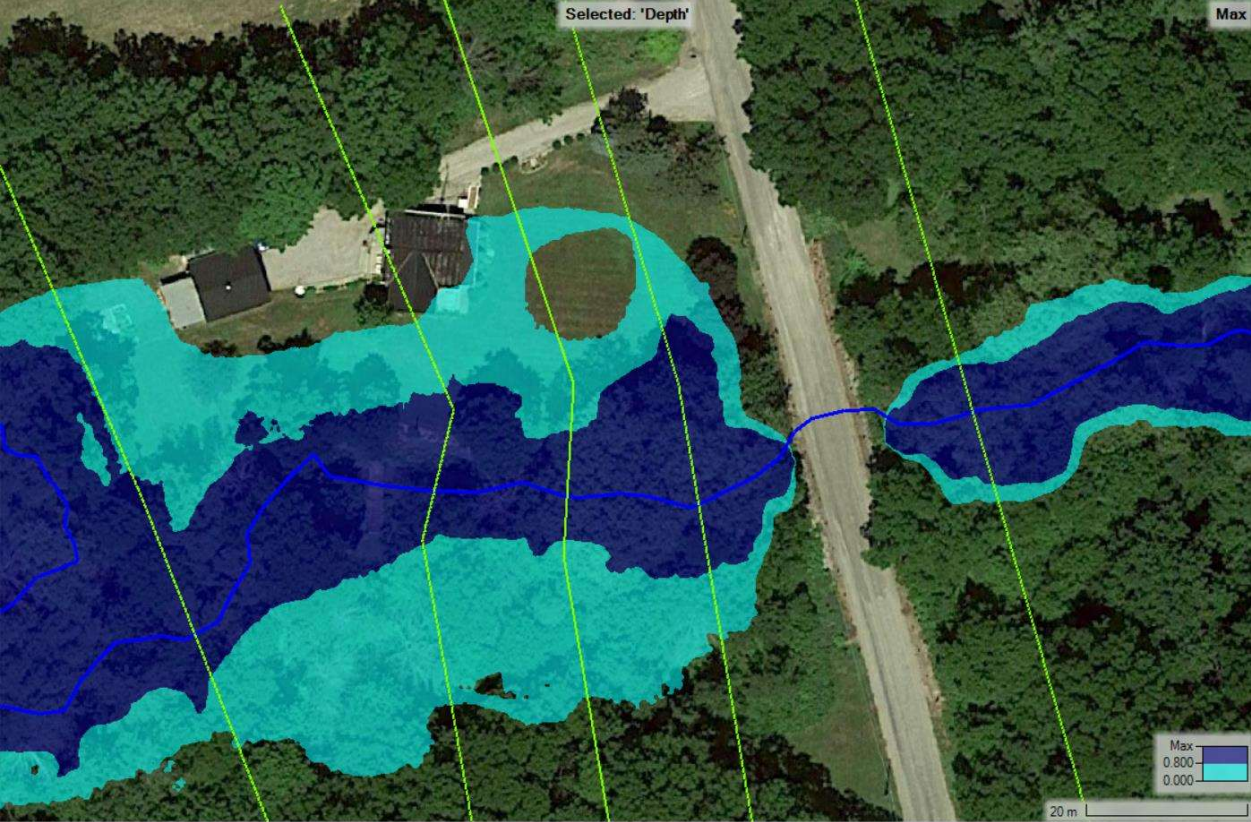


Figure 3 - Two 3.65 m Span x 3.05 m Rise Box Culvert Flood Depth

*An alternative method for lowering the HPC from “High” to “Low” would be to remove the culvert and road embankments over the creek completely and provide enough conveyance to pass the dam breach flood wave.*

**Recommendations**

It is LPRCA’s opinion that removal of culvert and road embankments or upgrading the existing culvert to a twin 3.96 m x 3.05 m box culvert configuration will lower Hay Creek Dam’s HPC from “High” to “Low” resulting in approximately \$700,000 in cost savings to Norfolk County from required dam upgrades.

We recommend that G. Douglas Vallee Limited and Norfolk County review the information contained in this letter, and use it to inform the design direction for the Gilbert Road Culvert.



If you wish, LPRCA can provide the HEC-RAS dam breach model to you so that you can undertake your own hydraulic analysis to support culvert design.

Sincerely,



Matt Churly, EIT,  
Water Resource Analyst,  
Long Point Region Conservation Authority



Lorrie Minshall, P.Eng.,  
Project Manager,  
Long Point Region Conservation Authority

cc: Jeff Demeulemeester – Project Manager, Norfolk County  
Jason Godby – General Manager, Environmental and Infrastructure Services, Norfolk County  
Shelly Darlington – Acting CAO, General Manager, Corporate Services, Norfolk County  
Judy Maxwell, CGA, CPA – General Manager, Long Point Region Conservation Authority



**CERTIFICATE OF TREASURER  
CT 21-09**

Required by Ontario Regulation 403/02  
Made under the *Municipal Act, 2001*

TO: The Council of Norfolk County

RE: Certificate of Treasurer CT 21-09 for the Gilbert Road Culvert Replacement, for the amended budget as stated in report EIS 21-06, at a maximum cost of \$928,000 to Norfolk County to be financed entirely by debentures over a term not exceeding 20 years

I hereby certify that I have calculated an updated annual debt and financial obligation limit using the most recent annual debt and financial obligation limit determined by the Ministry of Municipal Affairs in accordance with Ontario Regulation 403/02 as amended;

That I have calculated the estimated annual amount payable by Norfolk County in respect of the subject work and the calculation is based on current interest rates and amortization periods which do not exceed the lifetime of the project, all in accordance with generally accepted accounting principles; and

That the issuance of debt for the subject project will not cause Norfolk County to exceed its updated and financial obligation limit.

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Treasurer/Director, Financial Management and Planning

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Date