



February 12, 2021

File: **0473**

Town of Pelham
20 Pelham Town Square
Fonthill, ON L0S 1E0

Attn: Jason Marr, P.Eng – Director of Public Works

Background Information

Village of East Fonthill SWM Facility (Rice and RR20), Town of Pelham

We are pleased to provide a summary of the function and design overview of the SWM facility constructed at the south-west corner of Rice Road and Regional Road 20.

Reduction in Flows (Quantity Controls)

- 1) The Region of Niagara reconstruction of Regional Road 20 resulted in a Part II order where the Ministry of the Environment required that the Region implement stormwater controls on their project. The Region contributed to the construction of the SWM facility to lower flows to the outlet to Twelve Mile Creek.
- 2) Prior to the pond construction the outlet sewer from the Regional Road was 900mm (36") in diameter which outlet to the existing box culvert. Once the pond was in place the largest outlet to the box culvert was reduced in size to a 675mm (27") diameter which is approximately 1.8 times smaller.
- 3) The Ministry of the Environment, Town of Pelham Design Standards, and NPCA regulations requires that the future stormwater flows from proposed development projects match the existing stormwater flows that occurred prior to development (where these lands were agricultural) to prevent increasing downstream flooding or erosion.

See Table 14 of the SWM Report (UCC, 2015) Outlet A (Twelve Mile Creek) for reductions.



Table 14. Peak Flow Values				
Design Storm (Return Period)	Peak Flow (m ³ /s)			
	Existing	Future without SWMP	Future with SWMP	Change
OUTLET A (TWELVE MILE CREEK)				
25mm Storm	0.831	1.836	0.079	-90.49%
5 Year Storm	1.796	3.815	0.602	-66.48%
100 Year Storm	2.875	5.644	1.089	-62.12%
OUTLET B (SINGER'S DRAIN)				
25mm Storm	1.455	1.612	1.172	-19.45%
5 Year Storm	3.051	3.943	2.487	-18.49%
100 Year Storm	4.969	6.869	4.713	-5.15%

The SWM facility was design recognizing that the downstream Twelve Mile Creek is experiencing erosion and was oversized to further reduce the peak flows by 90% in a rainfall event where 25mm (1") of rain occurs; and by 62% in the 100 year design storm event.

- 4) The Ministry of the Environment regulates flows that are most impactful to erosion (small low flows vs large flash floods) and require that the volume of stormwater water produced by a 25mm (1") rainfall be detained and released slowly over a minimum period of 24 hours.

The facility was constructed with both the typical orifice control where a small outlet is used to control these flows as well as a "geothermal bed" where flows from smaller 10mm (3/8") storm events are contained and forced through a series of perforated pipes and gravel (clear stone) beds which both slow the flow and reduce the temperature of the stormwater.

MOE Equation 4.10 Drawdown Coefficient 'C2' =	2,163
MOE Equation 4.10 Drawdown Coefficient 'C3' =	4,346
MOE Equation 4.10 Drawdown Time (h) =	24.8

The SWM facility retains the water for 24.8 hours which exceeds the Ministry requirements and industry best practices.

Temperature Concerns

- 5) There was recognition that Twelve Mile Creek supports cold water fishery and that the temperature increase normally associated with standing water (SWM facilities) should be reduced. The implementation of the geothermal bed, where low flows trickle through stone at the temperature of the earth to lower temperatures has been confirmed by WSP testing results to be functioning to reduce the temperature of water leaving the pond.
- 6) Plantings and aquatic vegetation play an important role in providing shade and reducing the increase in temperature associated with the exposed water surface. The pond block was heavily vegetated, far in excess of what would be typical for a subdivision or other municipal pond. Included were numerous trees as shown on the attached planning list.



PLANTING LIST

Key	Botanical Name	Common Name	Qty.	Size	Spacing
DECIDUOUS TREES / LARGE SHRUBS					
AR	<i>Acer rubrum</i>	Red Maple	3	70MM B+B	AS INDICATED
AR	<i>Acer rubrum</i>	Red Maple	3	45MM W.B.	AS INDICATED
AS	<i>Acer saccharinum</i>	Silver Maple	1	70MM B+B	AS INDICATED
CO	<i>Celtis occidentalis</i>	Common Hackberry	15	70MM B+B	AS INDICATED
LT	<i>Liriodendron tulipifera</i>	Tulip Tree	14	70MM B+B	AS INDICATED
LT	<i>Liriodendron tulipifera</i>	Tulip Tree	5	45MM W.B.	AS INDICATED
MCO	<i>Malus coronaria</i>	Wild Crabapple	16	70MM B+B	AS INDICATED
NS	<i>Nyssa sylvatica</i>	Black Gum	18	70MM B+B	AS INDICATED
PT	<i>Populus tremuloides</i>	Trembling Aspen	13	70MM B+B	AS INDICATED
PT	<i>Populus tremuloides</i>	Trembling Aspen	12	45MM W.B.	AS INDICATED
PSE	<i>Prunus serotina</i>	Black Cherry	5	70MM B+B	AS INDICATED
QA	<i>Quercus alba</i>	White Oak	3	70MM B+B	AS INDICATED
QP	<i>Quercus palustris</i>	Pin Oak	2	70MM B+B	AS INDICATED
QS	<i>Quercus shumardii</i>	Shumard Oak	1	70MM B+B	AS INDICATED
QS	<i>Quercus shumardii</i>	Shumard Oak	3	50MM W.B.	AS INDICATED
QV	<i>Quercus velutina</i>	Black Oak	12	70MM B+B	AS INDICATED
RG	<i>Rhus glabra</i>	Smooth Sumac	6	70MM B+B	AS INDICATED
RT	<i>Rhus typhina</i>	Staghorn Sumac	14	70MM B+B	AS INDICATED
VE	<i>Viburnum lentago</i>	Nannyberry	14	70MM B+B	AS INDICATED
Coniferous Trees					
JV	<i>Juniperus virginiana</i>	Red Cedar	3	125cm W.B.	AS INDICATED
TO	<i>Thuja occidentalis</i>	White Cedar	7	125cm W.B.	AS INDICATED
TCA	<i>Tsuga canadensis</i>	Eastern Hemlock	3	125cm W.B.	AS INDICATED

- 7) These trees were 70mm (2.5") diameter in size when installed and they will continue to grow, increasing the shading provided. Additional large tree plantings cannot be installed without negatively impacting the function of the thermal remediation bed which is regulated as part of the Ministry of Environment ECA (Environmental Compliance Approval) certificate, issued to the Town of Pelham that governs the operation of this SWM facility. The only remaining bank area with tree is immediately above this bed and installation would risk damage.



Sediment Reduction (Quality Improvements)

- 8) The stormwater management pond also functions to reduce sediment contained within stormwater flows, being transported to the facility. The MECP requires that 80% of total suspended solids be removed by the SWM facility to protect the most critical of aquatic environments such as Twelve Mile Creek. This SWM facility is therefore designed to an Enhanced level (80% TSS Removal) which is a higher standard than a typical stormwater management facility, such as others found within Niagara.

The Town's sampling program carried out by WSP indicate that the SWM facility is operating as designed to reduce the sediment carried downstream.

This sediment accumulates within the first area of the stormwater facility known as the Sediment Forebay, this area, immediately beyond the pipe inlet to the pond and adjacent to the access route was sized to provide a location where the majority of sediment is accumulated and can be cleaned out when full.

Sizing follows MECP guidelines, but should require cleaning approximately every 12.5 years as shown below from Table 8 of the SWMP (UCC, 2015).

e) Cleanout Frequency		
	L= 40.0 m	(Proposed bottom length)
	ASL= 3.8	(Annual sediment loading) - m ³ /ha
	A= 20.69	(Drainage area) - ha
	FRC= 80%	(Facility removal efficiency)
	FV= 792	(Forebay volume) - m ³
	Cleanout Frequency= 12.59	(Minimum 10 Years)
	Is this Acceptable? Yes	

Approvals and Monitoring

- 9) The design and operation of the SWM facility is regulated by the MECP under the ECA held by the Town of Pelham and monitoring is a requirement of the approval. The Town's consultant WSP has undertaken testing and determined that the SWM facility is operating to provide controls as required.

If there are any further questions or concerns please do not hesitate to contact the undersigned.

Sincerely,

Adam Keane, P.Eng.
Engineering Manager
Upper Canada Consultants