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1.	SWM Facility Inlet Design			
	The proposed SWM Facility inlet design incorporates dual inlets, with lower flows directed to SWM pond forebays, and larger flows bypassing directly to the SWM Pond wet cell. This approach contradicts the MOE 2003 SWMPDM and the Guelph DEM. Per Section 4.6.2 (Wet Ponds) of the MOE 2003 SWMPDM, "*Wherever possible, all stormwater servicing should be conveyed to one inlet location at the pond*" and "*The stormwater conveyance system (sewers, grassed swales) should ideally have one discharge location into the wet pond*". Per Section 5.7.10 (Stormwater Management Pond Design Requirements) of the Guelph DEM: "*Minimize the number of inlets/forebays to one (1) where possible*". The proposed strategy increases the number of inlet structures from between 2 and 4 inlets to the Facilities (SWMF1 with 4 inlets, SWMF2 and SWMF3 with 2 inlets), which: • Increases the number of structures for the City to operate and maintain; and • Complicates sediment management and cleanout logistics. All inlet flows to the SWM Facilities should be directed through the forebay to the extent practical, with internal hydraulic controls (e.g., berms, as already proposed) managing large event bypassing within the Facility system, not externally, to reflect the Guelph DEM and MOE 2003 SWMPDM.	As presented in the MSP report and the meeting with the City on September 23rd, from our experience the splitter MH approach represents single inlet location and simplifies sediment management as the clean-out is restricted to the forebay area only and avoids disturbance of the main pond. We acknowledge the City's concern to minimize the number of structures requiring operation and maintenance; therefore, the splitter design has been removed from all SWM ponds. Revised layouts for all three SWM facilities have been appended to this letter.	Comment Addressed.	Acknowledged.

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2.	SWM Facility Forebay Design			

	The proposed SWM Facility forebay sediment cleanout frequencies range from 4.4 years to 11.8 years, indicating that the forebays are undersized. Typical sediment cleanout cycles are every 10 to 15 years. The City's maintenance capacity is approximately three SWM Facility cleanouts per year, out of approximately 125 SWM Facilities. Therefore, the City would prefer cleanout frequencies ranging from 20 to 25 years to balance maintenance feasibility and sediment management.
	The current design suggests more frequent cleanouts than what is achievable by the City. The forebay sizing should be revised to provide sufficient sediment storage and more reasonable cleanout frequencies. Please also note that per Figure 4 of the Guelph DEM, a maximum depth of 0.50 m can be used for sediment accumulation in the forebay.
	The following technical issues with the forebay sizing approach were also identified:
	• Forebay settling lengths were calculated using MOE SWMPDM 2003 Equation4.5 but incorrectly applied the inlet water quality design storm peak flow instead of the outlet flow.
	• Forebay settling lengths were calculated assuming a settling velocity of 0.0055 m/s, inconsistent with MOE SWMPDM 2003 Equation 4.5 which recommends 0.0003 m/s in most cases.
	• In all cases, the stated design length-to-width ratios in the appended calculations are not the same as the ratios applied in the calculation of settling length. For example:
	  ○ SWMF1 West Forebay Design Calculation (Appendix E)
	    ▪ length-to-width ratio in applied in calculation 1.a) is 0.86
	    ▪ design length-to-width ratio in 3. is 2.38
	• SWMF2 Forebay length-to-width ratio does not satisfy the minimum ratio of 2:1 per MOE 2003 SWMPDM.
	• The SWMF2 Forebay design may result in short-circuiting as runoff enters the west end of the forebay while the outlet to the wet cell is on the north side, reducing effective flow length and limiting sediment removal. Guidance in MOE SWMPDM 2003 recommends maximizing flow
		a) <u>Cleanout Frequency:</u>
		SWMF2 has been revised to meet at minimum the requested 20 year cleanout frequency under the 0.5m maximum sediment accumulation requirement of the City (22.8 years). As shown in the attached calculations, this is an extremely conservative approach, and cleanout frequencies calculated using MTE's typical 33% volume reduction calculation (30.4 years forebay and 121.7 years main pond), and the standard cleanout calculation from Section 4 of the MOE SWM Manual (57.6 years) are significantly reduced.
			The new cleanout frequency calculations provided appear to use varying assumptions regarding available forebay sediment storage volume and TSS removal efficiency which do not conform to City or MECP standards.
			The submitted calculation results and assumptions are as follows:
			(A) For the Cleanout frequency of 57.6 years, it appears you have assumed that the entire forebay volume (1.5 m depth) is full of sediment, and 80% TSS loading. But as we noted in our August comments, City standards permit a maximum of 0.5 m depth of sediment accumulation in the forebay. So this calculation does not meet City standards.
			(B) For the Cleanout frequency of 30.4 years, it appears you have assumed a 33% volume reduction and 50% TSS loading. As noted in our August comments, City standards permit a maximum of 0.5 m depth of sediment accumulation in the forebay. Furthermore, there is no explanation for the proposed reduction in TSS loading from the 80% in your previous submission to the new proposed 50% in your current submission. During discussion on Jan 8, it was stated that this reduction was due to the elimination of the proposed splitter manhole between the wet cell and forebay. However, this rationale is not supported by provincial guidance or the functional role of a forebay. Per MOE 2003, the forebay is intended to receive the full minor system inflow. The dispersion length calculation is explicitly based on the 5 year peak inlet flow, confirming that the forebay is expected to accommodate these flows without the need for upstream splitting. The elimination of a splitter manhole that is not required by design standards does not, on its own, justify a reduction in forebay TSS removal efficiency or sediment loading assumptions.
			(C) For the Cleanout frequency of 22.8 years, it appears you have assumed a 0.5m sediment depth and 50% TSS loading. See (B) comment for the 50% TSS.
			We also note the following from MOE 2003:
			"Alternatively, a conservative estimate of annual sediment accumulation in a SWMP may be obtained by multiplying the annual loading of suspended solids (m^3/yr) (see Table 6.3) by the initial removal efficiency for the particular SWMP. Using this method, a calculation is made to determine how long it takes to accumulate the difference in storage volumes between the initial storage and the target maintenance storage volume."
			As submitted, the calculations do not meet City standards.
				Response to A + B;
				Calculations noted in (A) and (B) were provided for comparison only and were only meant to meet the MOE and MTE typical standards respectively.
				
				Response to B;
				We agree that as per Page 4-57 of the MOE design guidelines (Attachment 1) that MOE guidance would be to conservatively assume the maximum removal efficiency of 80% would be completed in the forebay. However, it should be noted this conservative estimate is made in the MOE guidelines while targeting a 10-year cleanout frequency and also allowing sediment accumulation up to the full permanent pool volume. With the addition of more conservative City operational targets of a 20-year cleanout frequency and a maximum allowable accumulation of 0.5m, using the most conservative approach to estimating removal efficiency within the forebay is no longer reasonable as multiple conservative estimations are being compounded. Attachment 2 shows a comparison of the forebay volumes required to meet MOE standards, the proposed forebay volumes, and also additional volumes to meet City of Guelph requirements. The forebay volumes required to achieve 80% removal efficiency in the forebay while also meeting the City's requirements result in volumes ranging between 200-300% increase in size from those required to meet MOE standards. These forebay volumes would be close to equal to the required MOE permanent pool volumes.
				
				Response to C in reference to TSS loading;
				Assuming that the forebay completes all of the sediment removal over an extended period of time of 20 years is not representative of the expected sediment loading distribution within the facility in practice. The settling velocity (0.0003 m/s) used in the MOE calculations to design the forebays corresponds to a particle size of 150µm (Attachment 3). This particle size does not correspond to the smallest particle within the 80% enhanced mass removal. As per the MOE design standards the forebays are not being designed to settle the full sediment loading.

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	length while minimizing short circuiting to enhance sedimentation. • The SWMF2 estimated cleanout frequency calculation uses a forebay volume of 1,120 m3, but the stage storage relationship table for SWMF 2 lists the forebay volume as 785 m3.			This is confirmed within the *Storm Water Management Facility Sediment Maintenance Guide* which is referred to within the MOE manual. Section 3.2 of this document (Attachment 4) states in reference to the MOE forebay design criteria; *"The manual recommends a forebay design to remove particles 150μm and larger and a sufficient forebay storage to allow for ten years of sediment accumulation. From the particle size distribution table (SWMP manual p. 89) the proportion that will be retained in the forebay should store somewhere between 20 and 40% of the total mass influx."* With the understanding that the forebay will only be expected to store between 20 and 40% of the total mass influx, we have conservatively assumed 50% of total mass influx in these revised calculations.

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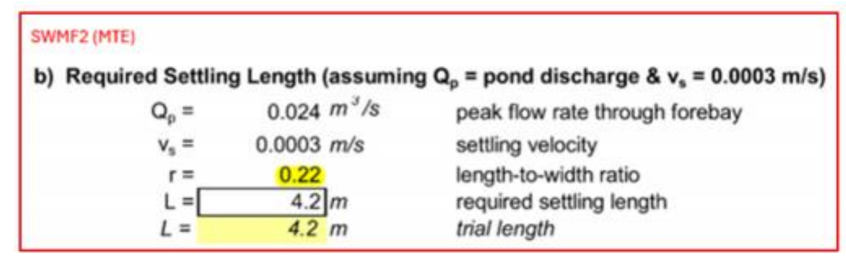
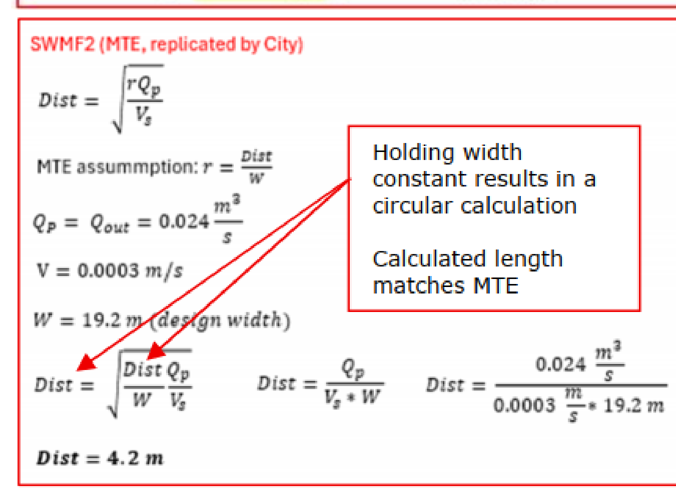
		b) Settling Length As stated within the MSP text of Section 5.5, the assumption has been made that flow into the forebay is equal to flow out of the forebay. Therefore, the storm peak inlet flow has been applied to this calculation.	The submitted settling length calculations do not meet MOE 2003 standards. As stated in the manual, the settling length equation assumes that flow out of the pond governs the velocity through the forebay and the remainder of the pond. Accordingly, the peak flow rate used in the equation represents pond outflow during the design quality storm, not inlet flow to the forebay. The Consultant has replaced the prescribed outflow term with the forebay inflow and further assumed that inflow and outflow are equivalent. This modifies the definition of the governing variable in the equation and is not consistent with the assumptions under which the equation was derived. Design equations cannot be selectively modified by redefining variables while retaining the same formulation. In a prior submission, the Consultant noted that applying the equation in such a manner resulted in “unachievable settling lengths” and subsequently further modified the equation by substituting a gross grit settling velocity of 0.0055 m/s, instead of the MOE 2003 recommended 0.0003 m/s. The Consultant has also indicated that the settling length was “goal-seeked” by holding the forebay width constant. This approach assumes that the required settling length and proposed forebay length are the same value, thereby creating a circular calculation, which is incorrect.   	The calculation for settling length that assumes the prescribed outflow term equal to the inflow to the forebay 1a) is made in addition to the required MOE calculation, not in place of it. The 1b) settling length calculation made for all of the facilities follows the requirements of the MOE manual, utilizing the 25mm pond outlet flow and a 0.0003 m/s target settling velocity. In all cases the additional 1a) settling length calculation is more conservative than the required MOE calculation, resulting in longer settling lengths. We are using a more conservative design procedure than is required by the MOE manual. While we understand the concern to ensure these calculations are correct, ultimately the results of the settling length calculations are not what is governing the size of any of the forebays, and will not have an impact of the overall SWM block size. We note that the City operational object to meet the required 20 year cleanout frequency is what governs the size of the all forebays, with the exception of SWMF1-West which is governed by dispersion length. For example, check calculations using the final forebay dimensions for SWMF2 result in the following settling lengths; 1a) Required Settling Length (assuming Qp = forebay through-flow & vs = 0.0055 m/s) = 18.7m 1b) Required Settling Length (assuming Qp = pond discharge & vs = 0.0003 m/s) = 12.6m While the final design length of the forebay is 38.4m. These calculations have been provided on the revised forebay design sheets (Attachments 5-8) for all three SWMF to confirm that adequate settling lengths have been provided.

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			Please see the MOE 2003 sample calculation below. Using this method, a reasonable settling length of 13.3 m was calculated for SWMF2 without any modifications to the equation. **As submitted, the calculations do not meet MOE 2003 standards.** $\text{Dist} = \sqrt{\frac{rQ_p}{V_s}}$ Equation 4.5: Forebay Settling Length where r = 2:1 (length-to-width ratio of forebay) Q_p = 0.1 m^3/s (peak flow rate from the pond during design quality storm) V_s = 0.0003 m/s (settling velocity for 0.15 mm diameter particles) Therefore, the forebay should be 26 m long to settle particles approximately 0.15 mm diameter in size. SWMF2 (MOE) $Dist = \sqrt{\frac{rQ_p}{V_s}}$ $Q_P = Q_{out} = 0.024 \frac{m^3}{s}$ r= 2.2 (*designed length:width ratio*) V= 0.0003 m/s $Dist = \sqrt{\frac{2.2 * 0.024 \frac{m^3}{s}}{0.0003 \frac{m}{s}}}$ $\mathbf{Dist = 13.3\ m}$	
		c) <u>Settling Velocity</u> The MOE SWMPDM Equation 4.5 recommends 0.0003 m/s to be used in most cases, dependant on desired particle size to settle. As stated within the MSP text of Section 5.5, it was determined that settling length should be based on two different scenarios. A 0.0055 m/s settling velocity is targeted in order to settle "Gross Grit" particle sizes, assuming the flow through the forebay equal to the forebay inflow of the quality storm event. And also a 0.0003 m/s is then targeted to settle finer particles assuming the flow through the forebay equal to the main pond outflow for the quality storm event. The second version b) on the forebay design sheets is utilizing the 0.0003 m/s target	See b)	

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		velocity matches the calculation recommended within the MOE SWMPDM.		
		d) SWMF2 Length-Width Ratio Due to re-alignment of Street G as a single loaded road under the most recent Block Plan, this forebay and SWM pond have been re-designed and are re-oriented such that short-circuiting is avoided.	Comment addressed.	
		e) SWMF2 Cleanout Frequency Calculation	Comment addressed.	
3.	Post Development SWMHYMO Model			
		This is the anticipated result, as the storm intensity during the 5 year storm at its peak is significantly more intense than the Regional storm peak intensity. On another project, the City provided and confirmed that their latest IDFs are to be used, as they were vetted and account for future climate change. The increased peaks of the new IDFs were discussed. Based on the new IDFs, these are the results that were anticipated. The City IDFs were "increased" to account for climate change, but the Regional storm assumptions remain the same (i.e. no future adjustments). This would explain why there may be some discrepancy in what typical results are expected in comparison between the two storms.	The provided explanation is noted; however, the magnitude of the post-development peak flows remains a concern. While the updated IDF parameters are more conservative, the resulting 5 Year peak flow being double that of the Regional is not considered reasonable. Furthermore, a variance was noted between 5 Year peak flows modelled by MTE with the Rational Method vs. SWMHYMO. For example, 5 Year peak flow to SWMF1 West Forebay was calculated by MTE as 6.4 m^3/s using the Rational Method, and 10.0 m^3/s using SWMHYMO (we note that these values are from the July 2025 MSP as the November submission did not include an updated storm sewer design sheet). While some variance between the two methods is anticipated, the discrepancy is significant and requires further investigation. We also request clarification on the following: • The submitted hydrologic model appears to assume that directly connected impervious area (XIMP) is equal to total impervious area (TIMP). While this assumption is not inherently incorrect, it implies that all impervious surfaces are directly connected to the storm sewer system, with no allowance for initial abstraction or attenuation (infiltration, ET, etc.). This assumption can impact the magnitude of peak flows. A runoff coefficient/percent impervious calculation was provided, but no assumptions for XIMP and TIMP were listed. Therefore, please confirm that it was intended to set XIMP = TIMP. Otherwise, please provide calculations for XIMP and TIMP.	Noted, we will continue to review. We will updae the SWMHYMO model to PCSWMM. At this moment, it should be noted that the SWM ponds are sized for the larger, more conservative peak flows. In the case of the GID site, we believe that most of the impervious areas will be directly connected, therefore, we have assumed XIMP is equal to TIMP in all cases as a conservative approach at this design stage. • XIMP: The ratio of directly connected impervious area. XIMP is entered as a ratio and should always be less or equal to TIMP. • TIMP: The ratio of the total impervious area. TIMP is entered as a ratio. Weighted curve number calculations are only applicable for drainage areas which utilize the NASHYD command in SWMHYMO (<20% impervious). For higher impervious areas the STANDHYD command was used, which models two parallel hydrographs each for the pervious and impervious portions of the catchment. As per the SWMHYMO user manual (page 7.32) the CN number entered into the model is to be the SCS Curve Number for the pervious surfaces. This is why the weighted value is not calculated on the parameters sheet and instead a 68.0 CN (matching the pervious CN) is shown for those catchments.

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			• Weighted Curve Number calculations were completed for the post-development catchments; however, the calculated results are showing the pervious Curve Number 68.0 for several catchments (e.g., 201-1, 201-2, 201-5, 201-3, 201-4, 202-1, and 203), though the catchments do have impervious area, and were modelled as such. • Please note that SWMHYMO is not an approved model per the Guelph DEM.	We do note that catchments 201-3 and 201-4 were incorrectly modelled with NASHYD in the most recent submission, despite percent impervious of these catchments being above 20%. This will be corrected on future submission, however as these areas are both small uncontrolled catchments oustide of the SWMF catchment area there should not be any concern with this impacting the size of the facility. As noted above, we will update the SWMHYMO model to PCSWMM for future submissions.
4.	Brentwood Storm Tank Sizing			
		Please refer to the revised infiltration gallery calculations. Each gallery has been designed with the contact area represented by the bottom area of the gallery. There is no need to size the galleries for the full volume requirement, as each corresponding SWMF wet cell will account for the additional storage required beyond the size of each gallery. Each pond outlet elevation will be set such that the 27mm storm is fully stored within the pond, and is not allowed to outlet before entering the infiltration gallery.	Please demonstrate that the inflow to the infiltration galleries does not exceed the outflow (i.e., infiltration) from the infiltration galleries to native soil.	The bottom area of the galleries have been sized such that the inflow volume (5,581m^3) is equal to the outlfow volume over a 48 hour drawdown period using MOE SWMP&DM Eq. 4.3 A =1,000V/(PnDT). The outflow rate of the galleries is not required to be equal to or greater than the peak inflow rate, as there is storage capacity within the galleries themselves as well as the SWM facilities upstream. If it were, the drawdown time would be minimal and no storage capacity would be required. As noted during our Jan. 26th meeting, outlets will be designed (via invert elevations, or weir walls) such that no flows up to the required infiltration storm volume will be allowed to outlet and will instead be temporarily stored in the wet cells of the SWMF before entering the gallery to be infiltrated.
5.	SWM Facility 3			
		a) <u>Infiltration Rate</u> The redesign of SWMF3 incorporates a revised infiltration rate of 0.037m3/s, that has included a 2.5 factor of safety. The revised infiltration rate was calculated using the OBC method.	At draft plan, please provide a full calculation to show how the infiltration rate of 0.037 m^3/s was determined and include references to field data (e.g., geotechnical report, borehole ID) and background information.	Detailed calculations have been attached (Attachment 9) with these comments. In summary, the hydraulic conductivity was determined using the Kozeny-Carmen formula and information from borehole/monitoring well MW520-22. The CVC & TRCA (2010) (Building Code Method) Equation (Line of best fit) was then used to determine the unfactored percolation/infiltration rate.
		b) <u>Winter Bypass</u> Please refer to the revised SWM facility. The weir between the wetcell and the	While City staff acknowledge that the berm weir has been removed and the infiltration cell ponding depth has been capped at 0.60 m to address the original comment, we note several	Mounding calculations will be completed with draft plan submission, with in-situ testing.

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		infiltration gallery has been removed. All storms are contained within the forebay and wetcell. In addition, we have introduced a ditch-inlet at the elevation 0.6m above the bottom of the infiltration cell, which ensured that the 0.6m depth is respected.	items regarding system performance that have not been fully evaluated. Dewatering times: Based on the submitted incremental dewatering times, the total cumulative dewatering times for various storm events are as follows: ○ Extended Detention: 38.89 hours or 1.6 days ○ 25 mm: 82.45 hours or 3.4 days ○ 5 Year: 105.23 hours or 4.4 days ○ 25 Year: 122.54 hours or 5.1 days ○ 100 Year: 136.29 hours or 5.7 days These extended ponding durations indicate that the wet cell will retain a significant portion of the runoff for multiple days. This raises concerns regarding prolonged ponding within the system. Extended ponding of this duration introduces risks related groundwater mounding in the infiltration cell, and limits recovery capacity for back-to-back storm events. These risks must be evaluated. **Infiltration Cell Capacity**: The total 100 Year inflow to the infiltration cell is 0.056 m^3/s which is nearly double the cell's infiltration rate of 0.037 m^3/s, indicating that inflow is exceeding infiltration capacity. At Draft Plan, we are requesting a groundwater mounding analysis to evaluate any impact on the adjacent employment block, Victoria Road infrastructure, and the overall performance and feasibility of the infiltration cell.	Opportunities to reduce the dewatering times within the facility will continue to be reviewed through the Draft Plan approval process, once in-situ infiltration testing has been completed It is correct that the peak inflow rate to the infiltration cell is exceeding the infiltration rate, but this still meets the required maximum 0.6m ponding criteria within the cell. The attached hydrograph (Attachment 10) displays how the inflow and infiltration rate are related during the 100 year storm. Inflow reaches its peak flow early in the drawdown time, where ponding occurs up to the allowable 0.6m maximum level. Ultimately the inflow reduces over time, and drops well below the infiltration rate to allow the ponding level to draw down.
		c) <u>Max Ponding Depth</u> As per the above, the revised SWMF3 design allows for a maximum 0.6m storage depth within the infiltration cell, up to the 100-year storm.	See comment 5. b)	
		d) <u>Emergency Spill Elevation</u> Under the revised SWMF3 design the 100 year storm is designed to be fully infiltrated, and the DI spill elevation is set accordingly.	See comment 5. b)	
		e) <u>Overland Flow</u> While no overland flow calculations have been provided with the MSP, in preparation of Draft Plan submission overland flows routes have been modelled. The intention is for the access road to include modified barrier curb at a height appropriate to contain the overland flows as they are directed towards the wet cell.	Comment addressed.	

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6.	Existing Rail Culvert Capacity Analysis			
		Rail Culvert Analysis The lands to the east of these catchments remain undeveloped and as such the flows will remain the same as pre-development conditions. The intention of the analysis is not to analyze the actual capacity of the culvert, but rather the analysis has been completed to ensure that the flows from the developed area are limited to and do not exceed the existing peak flows. By limiting the SWMF2 outlet flows below the existing it ensures that peak flows to the existing culvert are not increased, and that the culvert can remain without a need to increase the size.	The existing rail culvert analysis only considers runoff from the portion of the site that is to be developed. Therefore, the analysis demonstrates that peak flows from the developed area alone are not increased. However, the culvert receives flows from both the developed and undeveloped catchments. Although the undeveloped catchments are not being altered, their hydrographs still contribute to the total peak flow leaving the site and interact with the timing of the development catchment hydrographs. Excluding the undeveloped catchments may not reflect the full pre and post development flows at the culvert. Please revise the analysis to include the undeveloped catchments.	The rail culvert analysis has been revised (Attachment 11) to confirm that the proposed design for SWMF2 limits total peak flows up to the 100 year storm, at or below the pre-development peak flows.

ATTACHMENT #1

The design flow rate in Equation 4.6 is the peak flowrate of the water quality storm. If this value is not known (e.g., the subwatershed plan specifies the pond sizing based on continuous simulation) it can be approximated using either standard design event modelling practices with a 4 hour Chicago distribution of a 25 mm storm, or using the Rational Method (Equation 4.8) with an intensity given by Equation 4.9.

$$Q = \frac{C\,i\,A}{360}$$ **Equation 4.8: Rational Method**

where Q = peak flow rate (m^3/s)
C = runoff coefficient
i = rainfall intensity (mm/h)
A = drainage area (ha)

$$i = 43\,C + 5.9$$ **Equation 4.9: 25 mm Storm Intensity**

where i = rainfall intensity (mm/h)
C = runoff coefficient

3) Clearout Frequency

A check on the permanent pool volume contained in the forebay can be made by estimating the accumulation of sediments in the forebay. A conservative estimate would be to assume the maximum facility removal efficiency in the forebay and to ensure that the forebay volume is equal to, or greater than, 10 years of sediment accumulation. Values of sediment loading/ accumulation per hectare of contributing drainage area are provided in Section 6.4 (Table 6.3) based on the upstream catchment imperviousness.

Forebay Berm

The forebay should be separated from the rest of the pond by an earthen berm. The berm can be submerged slightly below the permanent pool or it can extend into the extended detention portion of the pond. Pipes can be installed in the berm as either the primary conveyance system from the forebay to the pond, or as a secondary conveyance system to supplement flows over a submerged berm. In either case, flow calculations should be made to ensure that the berm does not provide a flow restriction which would cause the entire forebay (not just the berm) to overflow under design conditions. The calculations should account for the potential ice thickness over the berm.

The inverts of any conveyance pipes installed in the berm should be set at least 0.6 m above the bottom of the forebay. This will prevent the siphoning of settled material from the bottom of the forebay into the rest of the pond. A maintenance pipe should also be installed in the berm to draw down the forebay for maintenance purposes. If only the forebay is drawn down during maintenance (i.e., maintenance pipe connects to the outlet directly and/or the forebay will be pumped out) the forebay berm must be designed as a small dam since the rest of the pond will not be drained.

Given the results of Equations 4.5 and 4.6, the forebay length will be 45 m long and 20 m wide. The permanent pool volume of the forebay will be approximately 900 m^3.

3. Clean-out Frequency

Based on Table 7.3, the annual sediment loading for this site will be approximately 2,300 kg/ha or 1.9 m^3/ha. Therefore, based on the volume of the forebay (900 m^3) and a pond removal efficiency of 70% (Level 2 protection **[Editor's Note: now referred to as normal level of protection]**), the forebay will be required to be cleaned out every 13.5 years. This is acceptable to the municipality since it is greater than its 0 year minimum cleanout frequency.

Forebay Berm

The forebay will be separated from the rest of the pond by an earthen berm. The berm will be submerged slightly below the permanent pool. Low flow pipes will be installed in the berm to convey low flows from the forebay to the pond. The conveyance pipes will be installed in the berm at 0.6 m above the bottom of the forebay. A maintenance pipe will also be installed in the berm to drawdown the forebay for maintenance purposes.

H.2.4 Summary of Case II

According to Table 3.1, a wet pond for this site will require 3,500 m^3 for a permanent pool and 2,000 m^3 for active storage to provide water quality control. For erosion control, the required volume is 6,875 m^3 based on the 25 mm rainfall event. The following SWMPs have been designed to meet these criteria:

i) Soakaway pits will accommodate 10 mm of runoff from the roof area which will reduce the required end-of-pipe active storage requirements by 513 m^3; and

ii) A wet pond will provide the end-of-pipe stormwater management (water quality and erosion) control. The pond will provide 3,500 m^3 of permanent pool storage and 6,362 m^3 of active storage.

ATTACHMENT #2

Review of Forebay Sizing in Response to Tech Memo Comments

Current SWMF Design Characteristics

Pond	Catchment Area (ha)	SWMF Area (ha)	Percentage of the Catchment Area (%)	Imperviousness (%)	Total Storage Volume Required (m3)	Total Storage Volume Provided (m3)	Percentage Exceeding (%)	Minimum Required FB PP Volume (m3)	Proposed FB PP Volume (m3)	Forebay Increased	Proposed Wetpond PP Volume (m3)	SWMF Performance after 20 years			
SWMF1	55.16	3.323	6.02%	68.15	12,172	13,025	107.01%		4,027		8,998	81.0%	20 years	>75%	42 years
SWMF1 - East	*20.11*								*1,293*						
SWMF1 - West	*35.05*								*2,734*						
SWMF2	10.16	1.37	13.46%	66.00	2,191	2,877	131.30%	683	1,199	175.55%	1,677	86.8%	20 years	>75%	66 years
SWMF3	24.10	2.01	8.34%	72.00	5,503	7,829	142.27%	1,345	2,695	200.37%	5,134	89.3%	20 years	>75%	60+ years

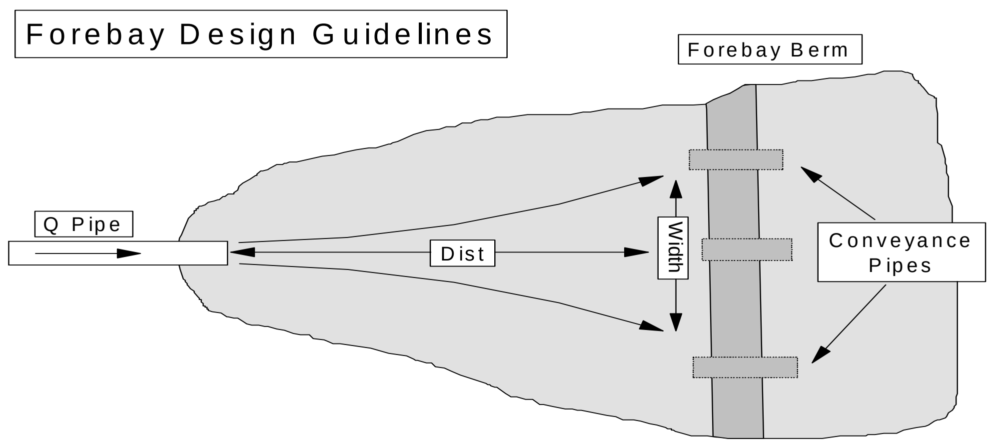
Pond	Catchment Area (ha)	SWMF Area (ha)	Percentage of the Catchment Area (%)	Imperviousness (%)	Total Storage Volume Required (m3)	Total Storage Volume Provided (m3)	Percentage Exceeding (%)	Minimum Required FB PP Volume (m3)	Proposed FB PP Volume (m3)	Forebay Increased	Proposed Wetpond PP Volume (m3)	SWMF Performance after 20 years			
SWMF1	55.16	3.323	6.02%	68.15	12,172	13,025	107.01%	4027	9,105	226.10%	8,998	89.1%	20 years	>75%	60+ years
SWMF1 - East	*20.11*							*1293*	*3,337*	*258.08%*					
SWMF1 - West	*35.05*							*2734*	*5,768*	*210.97%*					
SWMF2	10.16	1.37	13.46%	66.00	2,191	2,877	131.30%	683	1,691	247.58%	1,677	92.6%	20 years	>75%	60+ years
SWMF3	24.10	2.01	8.34%	72.00	5,503	7,829	142.27%	1,345	3,985	296.28%	5,134	95.3%	20 years	>75%	60+ years

ATTACHMENT #3

Sediment Forebay
A sediment forebay (Figure 4.18) facilitates maintenance and improves pollutant removal by trapping larger particles near the inlet of the pond. The forebay should be one of the deeper areas of the pond (at least 1 m) to minimize the potential for re-suspension and to prevent the conveyance of re-suspended material to the pond outlet.

The forebay sizing depends on the inlet configuration, and several calculations can be made to ensure that it is adequately sized.

Figure 4.18: Wet Pond Forebay



1) Settling Calculations
The primary method to calculate the forebay volume and length should be based on settling calculations that determine the distance to settle out a certain size of sediment. The methodology assumes that the flow out of the pond dictates the velocity through the forebay and the rest of the pond. Although this is not strictly correct, it is reasonable for the determination of an appropriate forebay length. Equation 4.5 defines the appropriate forebay length for a given settling velocity and hence, the particle size to be trapped in the forebay.

$$\text{Dist} = \sqrt{\frac{r\,Q_p}{V_s}}$$

Equation 4.5: Forebay Settling Length

where Dist = forebay length (m)
r = length-to-width ratio of forebay
Q_p = peak flow rate from the pond during design quality storm
V_s = settling velocity (dependent on desired particle size to settle). It is recommended that a value of 0.0003 m/s be used in most cases.

size distribution monitoring data by the U.S. EPA. Equation 4.5 defines the appropriate forebay length for a given settling velocity.

$$\text{Dist} = \sqrt{\frac{r\,Q_p}{V_s}} \qquad \text{Equation 4.5: Forebay Settling Length}$$

where r = 2:1 (length-to-width ratio of forebay)
Q_p = 0.1 m³/s (peak flow rate from the pond during design quality storm)
V_s = 0.0003 m/s (settling velocity for 0.15 mm diameter particles)

Therefore, the forebay should be 26 m long to settle particles approximately 0.15 mm diameter in size.

2. Dispersion Length

Equation 4.6 provides a simple guideline for the length of dispersion required to dissipate flows from the inlet pipe. It is recommended that the forebay length is such that a fluid jet will disperse to a velocity ≤ 0.5 metre/second at the forebay berm. The fluid jet should be based on the capacity of the inflow pipe (if the pipe is ≤ 10 year pipe). In this subdivision, the pipe will be designed to convey the 5 year storm flows. A flow splitter will not be implemented.

$$\text{Dist} = \frac{8Q}{d\,V_f} \qquad \text{Equation 4.6: Dispersion Length}$$

where Q = 5.1 m³/s (inlet flow rate)
d = 2 m (depth of the permanent pool in the forebay)
V_f = 0.5 m/s (desired velocity in the forebay)

Therefore, the forebay length should be 40.8 m for the peak flow during a 5 year storm.

A guideline for the minimum bottom width of this deep zone is given by:

$$\text{Width} = \frac{\text{Dist}}{8} \qquad \text{Equation 4.7: Minimum Forebay Bottom Width}$$

Therefore, the forebay deep zone should be at least 5.1 m wide.

Therefore, the forebay will be 45 m long and 20 m wide (based on an approximate 2:1 length-to-width ratio). The velocity of the flow as it moves through the forebay will be as follows:

$$\text{Velocity} = \frac{Q}{A}$$

where Q = 5.1 m³/s
A = 22 m² (cross-sectional area)

Therefore, the average velocity through the forebay will be 0.23 m/s. This velocity is acceptable since it is less than the 0.45 m/s permissible velocity to prevent erosion, as noted previously.

likely have different volume design criteria. As discussed before, if the current facility design criteria is accepted, it should be used as the basis for evaluating the need for maintenance. Under the present guidelines in Ontario, the operating conditions and available volumes of older facilities could be evaluated in light of the most recent MOE design criteria and/or local watershed specific requirements. If possible, additional volume could be provided during maintenance to approximate the latest treatment guidelines. If it is not possible to implement the latest criteria, the objective for maintenance could be based on restoring or maximizing the original storage volume.

Although there may be significant amounts of solids accumulation, there may still be sufficient volume available to provide the desired treatment, in some cases. Therefore the minimum storage volume should be clearly understood in light of:

1. The level of habitat protection sought;
2. The characteristics of the tributary area, and;
3. The type of facility being evaluated (wet pond, wetland, dry-pond, etc.).

3.2 Sediment Forebay Considerations

To this point, the methodology for evaluating the need for maintenance of SWMFs has focused on maintaining or restoring the overall treatment efficiency to an acceptable level, such as the minimum storage levels in ***Table 3.*** From a treatment performance viewpoint, no distinction has been made between sediment removal maintenance of the entire facility and the sediment forebay.

The sediment forebay is a feature that '*facilitates maintenance and improves pollutant removal by trapping larger particles near the inlet of the pond*' (MOEE 1994). It is not clear how the overall removal is significantly improved by trapping larger particles in the forebay, but a close examination of the design concept suggests that maintenance within the forebay can be facilitated due to its proximity to the access way. The forebay also enhances treatment in the main pond area by allowing the flow to disperse and become quiescent.

The manual recommends a forebay design to remove particles 150 μm and larger and a sufficient forebay storage to allow for ten years of sediment accumulation. From the particle size distribution table (SWMP manual p. 89), the proportion that will be retained in the forebay should store somewhere between 20 and 40% of the total mass influx. A cursory review of case studies of sediment depth distribution collected at six facilities does not provide significant evidence that a higher proportion of solids will accumulate in the vicinity of the inlet (Refer to ***Appendix D***). However, there is evidence that larger particle sizes (e.g. sand and gravel) will concentrate near the inlet, which, after drying, could facilitate movement of tracked loaders or excavators. These findings, although originating from sites designed and constructed prior to the 1994 SWMP manual, should not be unexpected given the turbulent conditions expected at SWMF inflow points. Therefore, in the absence of sufficient detailed field sampling data and due to the variability in treatment (and storage) characteristics of the SWMF, the need to remove accumulated sediment from the forebays

In order to facilitate maintenance, it is advisable to prepare an annual maintenance report. The report should provide the following information annually:

- Observations resulting from inspection:
  - hydraulic operation of the facility (detention time, evidence or occurrence of overflows);
  - condition of vegetation in and around facility;
  - occurrence of obstructions at the inlet and outlet;
  - evidence of spills and oil/grease contamination; and
  - frequency of trash build-up.
- Measured sediment depths (where appropriate);
- Monitoring results, if flow or quality monitoring was undertaken;
- Maintenance and operation activities; and
- Recommendations for inspection and maintenance program for the coming year.

6.3 Operation and Maintenance Activities

There are many factors which influence sedimentation rates and maintenance requirements including: type of SWMP, land use, upstream development, and wildlife. Table 6.1 outlines operation and maintenance activities associated with different types of SWMPs.

Most SWMP monitoring has focussed on determining pollutant removal efficiency rather than maintenance/operations requirements of the facility. Since monitoring for maintenance is not common, the required frequency of maintenance activities is not well defined and activities tend to be performed on an “as required” basis.

One of the most important maintenance requirements for effective SWMP function is the removal of accumulated sediment which is discussed in Section 6.4. “The Storm Water Management Facility Sediment Maintenance Guide” (Greenland International Consulting Inc., 1999) provides additional information on sediment removal maintenance requirements.

Guidance on determining other maintenance requirements and frequency schedules is outlined in the following sections.

6.3.1 Inspections

SWM system inspections determine required maintenance activities. During the first two years of operation, inspections should be made after every significant storm to ensure proper functioning (average is about four inspections per year).

ATTACHMENT #5

GID
STORMWATER MANAGEMENT
Guelph, Ontario

Project Number: 46927-104
Date: January 30, 2026
Design By: MPW
File: Q:\46927\104\SWM\SWMF 3\46927-104_SWMF 3 Master Design Sheet.xlsx

FOREBAY DESIGN CALCULATIONS: Forebay-East — SWMF-1 (East)

Reference: Section 4.6.2 Wet Ponds, MOE Stormwater Management Planning and Design Manual, March 2003

Forebay Design Flows

Flow into forebay during 1:5yr Storm Event	2.710 m^3/s	**From MTE STM Sewer Design Spreadsheet using Rational Flow*
Estimated pipe flow capacity for inlet pipe into forebay designed for the 1:5yr Storm Event	3.721 m^3/s	**Pipe designed for 90% Capcity*
Flow into forebay during the 25 mm - 4 hour design storm event	1.730 m^3/s	**From MTE STM SWMHYMO*
Peak flow from main pond outlet for the 25mm design storm	0.012 m^3/s	**From MTE STM SWMHYMO*

Forebay Characteristics

b =	15.3 *m*	bottom width
y =	1.5 *m*	depth
z =	3.8 :1	side slope
w =	21.0 *m*	average width
R =	1.16 *m*	hydraulic radius
A =	31.5 m^2	cross-sectional area

1. Length Calculation Based on Settling Velocity

Reference: MOE SWM P&D Manual, Equation 4.5: Forebay Settling Length

L = forebay flow length *(m)*
r = length-to-width ratio
Q_p = peak flow rate through forebay *(m^3/s)*
v_s = settling velocity *(m/s)*

Table 1: Average settling velocities

	Mass Removed	Particle Size Range	Average Settling Velocity
	%	*μm*	*m/s*
	80 - 100	x ≤ 20	0.00000254
Enhanced:	70 - 80	20 < x ≤ 40	0.00001300
Normal:	60 - 70	40 < x ≤ 60	0.00002540
Basic:	40 - 60	60 < x ≤ 130	0.00012700
Medium Sand:	20 - 40	130 < x ≤ 400	0.00059267
Gross Grit:	0 - 20	400 < x ≤ 4000	0.00550333

a) Required Settling Length (assuming Q_p = forebay through-flow & v_s = 0.0055 m/s)

Q_p =	1.730 m^3/s	peak flow rate through forebay
v_s =	0.0055 *m/s*	settling velocity
r =	0.71	length-to-width ratio
L =	15.0 *m*	required settling length
L =	*15.0 m*	*trial length*

Check Calculation with Design Forebay

Q_p =	1.730 m^3/s
v_s =	0.0055 m/s
r =	2.22
Dist. =	26.4 m
L_{design} =	46.7 m

CONFIRMED - DESIGN LENGTH IS GREATER THAN SETTLING LENGTH

b) Required Settling Length (assuming Q_p = pond discharge & v_s = 0.0003 m/s)

Q_p =	0.012 m^3/s	peak flow rate through forebay
v_s =	0.0003 *m/s*	settling velocity
r =	0.10	length-to-width ratio
L =	2.0 *m*	required settling length
L =	*2 m*	*trial length*

Check Calculation with Design Forebay

Q_p =	0.012 m^3/s
v_s =	0.0003 m/s
r =	2.22
Dist. =	9.4 m
L_{design} =	46.7 m

CONFIRMED - DESIGN LENGTH IS GREATER THAN SETTLING LENGTH

2. Length Calculation Based on Flow Dispersion Length

Reference: MOE SWM P&D Manual, Equation 4.6: Dispersion Length

Q =	3.72 m^3/s	inlet flow rate
d =	1.5 *m*	depth of permanent pool in forebay
V_f =	0.50 *m/s*	desired velocity in forebay (typical value ≤ 0.50 *m/s*)
L =	39.7 m	required length of dispersion

3. Required Forebay Length

L_{min} =	39.7 *m*	Minimum required design length
L_{design} =	**46.7 *m***	**Proposed design length**
r =	2.22	design length-to-width ratio (typical minimum of 2.0)

4. Scour Velocity

Reference: MOE SWM P&D Manual, Sect. 4 Pg 56

v_s =	0.15 *m/s*	scour velocity (typical value = 0.15 *m/s*)	
v =	**0.118 *m/s***	**actual velocity**	OK The actual velocity through the forebay is less than the scour velocity.

5. Weir Flow From Forebay

Reference: MOE SWM P&D Manual, Equation 4.4: Weir Flow

L =	14 *m*	length of crest of weir	
α =	1.65	coefficient	
H =	0.3 *m*	head	
Q =	**3.80 m^3/s**	**discharge**	OK The weir flow from the forebay exceeds the flow entering the forebay

6. Estimated Cleanout Frequencies

A) MOE Clean-Out Frequency Estimate (For Reference Only)
(Reference: 2003 MOE SWM P&D Manual, Sect. 4 Pg. 57 & App. H Pg. 12)

Total Forebay Design Volume =	1293 m^3
Selected TSS Removal Efficiency =	80%
Estimated Catchment Impervious level =	66.00 %
Estimated annual sediment loading =	2.6 m^3/ha
Catchment Contributing area =	20.11 ha
Calculated Annual sediment volume =	41 m^3/yr
MOE Clean-out Frequency Estimate =	**31.4 *years***

Estimated clean-out frequency meets MOE recommended minimum of 10yrs (Ref. 2003 MOE SWM P&D Manual, Sect. 4 Pg. 57)

Table 2: Annual sediment loading

Impervious Level	Annual Loading
%	m^3/ha
35	0.6
55	1.9
70	2.8
85	3.8

B) MTE Recommended Clean-out Frequency Estimate (For Reference Only)

(Note: Forebay and Pond Sized to meet MOE Requirements)

Forebay

Total Forebay Design Volume =	1293	m^3
33% Volume Reduction =	427	
Estimated Forebay TSS Removal Efficiency =	50%	
Estimated Catchment Impervious level =	66	%
Estimated annual sediment loading =	2.6	m^3/ha
Catchment Contributing area =	20.11	ha
Calculated Annual sediment volume =	26	m^3/yr
Cleanout frequency for 33% volume reduction =	**16.6**	***years***

Estimated clean-out frequency meets MOE recommended minimum of 10yrs (Ref. 2003 MOE SWM P&D Manual, Sect. 4 Pg. 57)

Wet Cell

Total Wet Cell Design Volume =	8998	m^3 *(Note: Wet Cell Design Volume does not include forebay volume)*
Estimated Wet Cell TSS Removal Efficiency =	30%	
Estimated Catchment Impervious level =	68.15	%
Estimated annual sediment loading =	2.7	m^3/ha
Catchment Contributing area =	57.55	ha
Calculated Annual sediment volume =	46	m^3/yr
Cleanout frequency for 33% volume reduction =	**64.0**	***years***

C) City of Guelph Development Manual and Operational Objective

(Reference: 2023 CoG Development Engineering Manual, Figure 4)

Total Forebay Volume at 0.5m above bottom =	319	m^3
Estimated Forebay TSS Removal Efficiency =	50%	
Estimated Catchment Impervious level =	66.00	%
Estimated annual sediment loading =	2.6	m^3/ha
Catchment Contributing area =	20.11	ha
Calculated Annual sediment volume =	26	m^3/yr
Cleanout frequency for 0.5m sediment accumulation =	**12.4**	***years***

D) MOE Clean-Out Frequency Estimate for Oversized Permanent Pool (For Reference Only)

(Reference: 2003 MOE SWM P&D Manual, Sect. 6.4 Pg. 6-9)

Total Provided Permanent Pool Volume =	13025	m^3
Total Provided Permanent Pool Storage Volume =	226.3	m^3/ha
Selected TSS Removal Efficiency =	80%	
Target Maintenance Removal Efficiency =	75%	
Target Maintenance Removal Storage Volume =	146.4	m^3/ha
Estimated Design Removal Efficiency =	84.4%	
Estimated Catchment Impervious level =	68.15	%
Estimated annual sediment loading =	2.7	m^3/ha
Catchment Contributing area =	57.55	ha

Year	Initial MOE Perm. Pool Vol.	Est. Removal Efficiency	MOE Wet Cell Volume	MOE Forebay Vol.	Removal Efficiency: Wet Cell	Removal Efficiency: Forebay	Annual Sediment Removal	Accum. Sediment Vol: Total	Accum. Sediment Vol: MOE Wet Cell	Accum. Sediment Vol: MOE Forebay	Year End Perm. Pool Vol.	Remaining Perm. Pool Storage	
	m^3	%	m^3	m^3	%	%	m^3/ha	m^3	m^3	m^3	m^3	m^3/ha	
1	13025	84.4%	8998	4027	34.4%	50.0%	2.27	130.6	45.0	65.3	12894	224.05	
2	12894	84.2%	8953	3962	34.3%	49.9%	2.26	130.2	89.6	130.3	12764	221.79	
3	12764	83.9%	8908	3897	34.2%	49.7%	2.26	129.8	134.0	194.8	12634	219.53	
4	12634	83.6%	8864	3832	34.0%	49.6%	2.25	129.4	178.0	259.0	12505	217.29	
5	12505	83.3%	8820	3768	33.9%	49.5%	2.24	129.0	221.7	322.7	12376	215.05	
6	12376	83.1%	8776	3704	33.8%	49.3%	2.23	128.5	265.1	386.1	12247	212.81	
7	12247	82.8%	8733	3641	33.6%	49.2%	2.23	128.1	308.2	449.2	12119	210.59	
8	12119	82.5%	8690	3578	33.5%	49.1%	2.22	127.7	350.9	511.8	11992	208.37	
9	11992	82.3%	8647	3515	33.3%	48.9%	2.21	127.3	393.4	574.1	11864	206.15	
10	11864	82.0%	8604	3453	33.2%	48.8%	2.20	126.9	435.5	636.0	11737	203.95	
11	11737	81.7%	8562	3391	33.1%	48.7%	2.20	126.5	477.4	697.5	11611	201.75	
12	11611	81.5%	8520	3330	33.0%	48.5%	2.19	126.1	518.9	758.7	11485	199.56	
13	11485	81.2%	8479	3269	32.8%	48.4%	2.18	125.7	560.2	819.5	11359	197.38	*0.5m Sediment Accumulation in MOE Forebay*
14	11359	80.9%	8438	3208	32.7%	48.3%	2.18	125.3	601.1	879.9	11234	195.20	
15	11234	80.7%	8397	3147	32.6%	48.1%	2.17	124.8	641.7	940.0	11109	193.03	
16	11109	80.4%	8356	3087	32.4%	48.0%	2.16	124.4	682.1	999.7	10985	190.87	
17	10985	80.2%	8316	3027	32.3%	47.9%	2.16	124.0	722.2	1059.1	10861	188.71	
18	10861	79.9%	8276	2968	32.2%	47.7%	2.15	123.6	761.9	1118.1	10737	186.57	
19	10737	79.6%	8236	2909	32.0%	47.6%	2.14	123.2	801.4	1176.8	10614	184.43	
20	10614	79.4%	8196	2850	31.9%	47.5%	2.13	122.8	840.6	1235.1	10491	182.29	
21	10491	79.1%	8157	2792	31.8%	47.3%	2.13	122.4	879.5	1293.1	10368	180.16	
22	10368	78.9%	8118	2734	31.7%	47.2%	2.12	122.0	918.1	1350.7	10246	178.04	
23	10246	78.6%	8080	2676	31.5%	47.1%	2.11	121.6	956.5	1408.0	10125	175.93	
24	10125	78.4%	8041	2619	31.4%	47.0%	2.11	121.3	994.5	1464.9	10003	173.82	
25	10003	78.1%	8003	2562	31.3%	46.8%	2.10	120.9	1032.3	1521.5	9883	171.72	
26	9883	77.9%	7965	2506	31.1%	46.7%	2.09	120.5	1069.9	1577.8	9762	169.63	
27	9762	77.6%	7928	2449	31.0%	46.6%	2.09	120.1	1107.1	1633.8	9642	167.54	
28	9642	77.4%	7891	2393	30.9%	46.5%	2.08	119.7	1144.1	1689.4	9522	165.46	
29	9522	77.1%	7854	2338	30.8%	46.3%	2.07	119.3	1180.8	1744.6	9403	163.39	
30	9403	76.9%	7817	2283	30.6%	46.2%	2.07	118.9	1217.2	1799.6	9284	161.32	
31	9284	76.6%	7780	2228	30.5%	46.1%	2.06	118.5	1253.4	1854.2	9166	159.26	
32	9166	76.4%	7744	2173	30.4%	46.0%	2.05	118.1	1289.3	1908.5	9047	157.21	
33	9047	76.1%	7708	2119	30.3%	45.8%	2.05	117.8	1324.9	1962.5	8930	155.16	
34	8930	75.9%	7673	2065	30.1%	45.7%	2.04	117.4	1360.3	2016.2	8812	153.12	
35	8812	75.6%	7637	2011	30.0%	45.6%	2.03	117.0	1395.5	2069.5	8695	151.09	
36	8695	75.4%	7602	1958	29.9%	45.5%	2.03	116.6	1430.3	2122.5	8579	149.07	
37	8579	75.1%	7567	1905	29.8%	45.3%	2.02	116.2	1464.9	2175.2	8462	147.05	
38	8462	74.9%	7533	1852	29.7%	45.2%	2.01	115.9	1499.3	2227.6	8347	145.03	*Target Maintenance Removal Efficiency*

ATTACHMENT #6

GID
STORMWATER MANAGEMENT
Guelph, Ontario

Project Number: 46927-104
Date: January 30, 2026
Design By: MPW
File: Q:\46927\104\SWM\SWMF 3\46927-104_SWMF 3 Master Design Sheet.xlsx

FOREBAY DESIGN CALCULATIONS: Forebay-West — SWMF-1 (West)

Reference: Section 4.6.2 Wet Ponds, MOE Stormwater Management Planning and Design Manual, March 2003

Forebay Design Flows

Flow into forebay during 1:5yr Storm Event	5.432	m^3/s	**From MTE STM Sewer Design Spreadsheet using Rational Flow*
Estimated pipe flow capacity for inlet pipe into forebay designed for the 1:5yr Storm Event	6.120	m^3/s	**Pipe designed for 90% Capcity*
Flow into forebay during the 25 mm - 4 hour design storm event	2.937	m^3/s	**From MTE STM SWMHYMO*
Peak flow from main pond outlet for the 25mm design storm	0.021	m^3/s	**From MTE STM SWMHYMO*

Forebay Characteristics

b =	21.5	*m*	bottom width
y =	1.5	*m*	depth
z =	3.8	:1	side slope
w =	27.2	*m*	average width
R =	1.23	*m*	hydraulic radius
A =	40.8	m^2	cross-sectional area

1. Length Calculation Based on Settling Velocity

Reference: MOE SWM P&D Manual, Equation 4.5: Forebay Settling Length

L = forebay flow length *(m)*
r = length-to-width ratio
Q_p = peak flow rate through forebay *(m^3/s)*
v_s = settling velocity *(m/s)*

Table 1: Average settling velocities

	Mass Removed	Particle Size Range	Average Settling Velocity
	%	*µm*	*m/s*
	80 - 100	x ≤ 20	0.00000254
Enhanced:	70 - 80	20 < x ≤ 40	0.00001300
Normal:	60 - 70	40 < x ≤ 60	0.00002540
Basic:	40 - 60	60 < x ≤ 130	0.00012700
Medium Sand:	20 - 40	130 < x ≤ 400	0.00059267
Gross Grit:	0 - 20	400 < x ≤ 4000	0.00550333

a) Required Settling Length (assuming Q_p = forebay through-flow & v_s = 0.0055 m/s)

Q_p =	2.937	m^3/s	peak flow rate through forebay
v_s =	0.0055	*m/s*	settling velocity
r =	0.72		length-to-width ratio
L =	19.6	m	required settling length
L =	*19.6*	*m*	*trial length*

Check Calculation with Design Forebay

Q_p =	2.937	m^3/s
v_s =	0.0055	m/s
r =	2.40	
Dist. =	35.8	m
L_{design} =	65.3	m

CONFIRMED - DESIGN LENGTH IS GREATER THAN SETTLING LENGTH

b) Required Settling Length (assuming Q_p = pond discharge & v_s = 0.0003 m/s)

Q_p =	0.021	m^3/s	peak flow rate through forebay
v_s =	0.0003	*m/s*	settling velocity
r =	0.09		length-to-width ratio
L =	2.5	m	required settling length
L =	*2.5*	*m*	*trial length*

Check Calculation with Design Forebay

Q_p =	0.021	m^3/s
v_s =	0.0003	m/s
r =	2.40	
Dist. =	13.0	m
L_{design} =	65.3	m

CONFIRMED - DESIGN LENGTH IS GREATER THAN SETTLING LENGTH

2. Length Calculation Based on Flow Dispersion Length

Reference: MOE SWM P&D Manual, Equation 4.6: Dispersion Length

Q =	6.12	m^3/s	inlet flow rate
d =	1.5	*m*	depth of permanent pool in forebay
V_f =	0.50	*m/s*	desired velocity in forebay (typical value ≤ 0.50 *m/s*)
L =	65.3	m	required length of dispersion

3. Required Forebay Length

L_{min} =	65.3	*m*	Minimum required design length
L_{design} =	**65.3**	***m***	**Proposed design length**
r =	2.40		design length-to-width ratio (typical minimum of 2.0)

4. Scour Velocity

Reference: MOE SWM P&D Manual, Sect. 4 Pg 56

v_s =	0.15	*m/s*	scour velocity (typical value = 0.15 *m/s*)
v =	**0.150**	***m/s***	**actual velocity**

OK The actual velocity through the forebay is less than the scour velocity.

5. Weir Flow From Forebay

Reference: MOE SWM P&D Manual, Equation 4.4: Weir Flow

L =	24	*m*	length of crest of weir
α =	1.65		coefficient
H =	0.3	*m*	head
Q =	**6.51**	**m^3/s**	**discharge**

OK The weir flow from the forebay exceeds the flow entering the forebay

6. Estimated Cleanout Frequencies

A) MOE Clean-Out Frequency Estimate (For Reference Only)
(Reference: 2003 MOE SWM P&D Manual, Sect. 4 Pg. 57 & App. H Pg. 12)

Total Forebay Design Volume =	2734	m^3
Selected TSS Removal Efficiency =	80%	
Estimated Catchment Impervious level =	70.00	%
Estimated annual sediment loading =	2.8	m^3/ha
Catchment Contributing area =	35.05	*ha*
Calculated Annual sediment volume =	79	m^3/yr
MOE Clean-out Frequency Estimate =	**34.8**	***years***

Table 2: Annual sediment loading

Impervious Level	Annual Loading
%	m^3/ha
35	0.6
55	1.9
70	2.8
85	3.8

Estimated clean-out frequency meets MOE recommended minimum of 10yrs (Ref. 2003 MOE SWM P&D Manual, Sect. 4 Pg. 57)

B) MTE Recommended Clean-out Frequency Estimate (For Reference Only)

(Note: Forebay and Pond Sized to meet MOE Requirements)

Forebay

Total Forebay Design Volume =	2734	m^3
33% Volume Reduction =	902	
Estimated Forebay TSS Removal Efficiency =	50%	
Estimated Catchment Impervious level =	70	%
Estimated annual sediment loading =	2.8	m^3/ha
Catchment Contributing area =	35.05	ha
Calculated Annual sediment volume =	49	m^3/yr
Cleanout frequency for 33% volume reduction =	**18.4**	***years***

Estimated clean-out frequency meets MOE recommended minimum of 10yrs (Ref. 2003 MOE SWM P&D Manual, Sect. 4 Pg. 57)

Wet Cell

Total Wet Cell Design Volume =	8998	m^3 *(Note: Wet Cell Design Volume does not include forebay volume)*
Estimated Wet Cell TSS Removal Efficiency =	30%	
Estimated Catchment Impervious level =	68.15	%
Estimated annual sediment loading =	2.7	m^3/ha
Catchment Contributing area =	57.55	ha
Calculated Annual sediment volume =	46	m^3/yr
Cleanout frequency for 33% volume reduction =	**64.0**	***years***

C) City of Guelph Development Manual and Operational Objective

(Reference: 2023 CoG Development Engineering Manual, Figure 4)

Total Forebay Volume at 0.5m above bottom =	742	m^3
Estimated Forebay TSS Removal Efficiency =	50%	
Estimated Catchment Impervious level =	70.00	%
Estimated annual sediment loading =	2.8	m^3/ha
Catchment Contributing area =	35.05	ha
Calculated Annual sediment volume =	49	m^3/yr
Cleanout frequency for 0.5m sediment accumulation =	**15.1**	***years***

D) MOE Clean-Out Frequency Estimate for Oversized Permanent Pool (For Reference Only)

(Reference: 2003 MOE SWM P&D Manual, Sect. 6.4 Pg. 6-9)

Total Provided Permanent Pool Volume =	13025	m^3
Total Provided Permanent Pool Storage Volume =	226.3	m^3/ha
Selected TSS Removal Efficiency =	80%	
Target Maintenance Removal Efficiency =	75%	
Target Maintenance Removal Storage Volume =	146.4	m^3/ha
Estimated Design Removal Efficiency =	84.4%	
Estimated Catchment Impervious level =	68.15	%
Estimated annual sediment loading =	2.7	m^3/ha
Catchment Contributing area =	57.55	ha

Year	Initial MOE Perm. Pool Vol.	Est. Removal Efficiency	MOE Wet Cell Volume	MOE Forebay Vol.	Removal Efficiency		Annual Sediment Removal	Accum. Sediment Vol			Year End Perm. Pool Vol.	Remaining Perm. Pool Storage	
					Wet Cell	Forebay		Total	MOE Wet Cell	MOE Forebay			
	m^3	%	m^3	m^3	%	%	m^3/ha	m^3	m^3	m^3	m^3	m^3/ha	
1	13025	84.4%	8998	4027	34.4%	50.0%	2.27	130.6	45.0	65.3	12894	224.05	
2	12894	84.2%	8953	3962	34.3%	49.9%	2.26	130.2	89.6	130.3	12764	221.79	
3	12764	83.9%	8908	3897	34.2%	49.7%	2.26	129.8	134.0	194.8	12634	219.53	
4	12634	83.6%	8864	3832	34.0%	49.6%	2.25	129.4	178.0	259.0	12505	217.29	
5	12505	83.3%	8820	3768	33.9%	49.5%	2.24	129.0	221.7	322.7	12376	215.05	
6	12376	83.1%	8776	3704	33.8%	49.3%	2.23	128.5	265.1	386.1	12247	212.81	
7	12247	82.8%	8733	3641	33.6%	49.2%	2.23	128.1	308.2	449.2	12119	210.59	
8	12119	82.5%	8690	3578	33.5%	49.1%	2.22	127.7	350.9	511.8	11992	208.37	
9	11992	82.3%	8647	3515	33.3%	48.9%	2.21	127.3	393.4	574.1	11864	206.15	
10	11864	82.0%	8604	3453	33.2%	48.8%	2.20	126.9	435.5	636.0	11737	203.95	
11	11737	81.7%	8562	3391	33.1%	48.7%	2.20	126.5	477.4	697.5	11611	201.75	
12	11611	81.5%	8520	3330	33.0%	48.5%	2.19	126.1	518.9	758.7	11485	199.56	
13	11485	81.2%	8479	3269	32.8%	48.4%	2.18	125.7	560.2	819.5	11359	197.38	0.5m Sediment Accumulation in MOE Forebay
14	11359	80.9%	8438	3208	32.7%	48.3%	2.18	125.3	601.1	879.9	11234	195.20	
15	11234	80.7%	8397	3147	32.6%	48.1%	2.17	124.8	641.7	940.0	11109	193.03	
16	11109	80.4%	8356	3087	32.4%	48.0%	2.16	124.4	682.1	999.7	10985	190.87	
17	10985	80.2%	8316	3027	32.3%	47.9%	2.16	124.0	722.2	1059.1	10861	188.71	
18	10861	79.9%	8276	2968	32.2%	47.7%	2.15	123.6	761.9	1118.1	10737	186.57	
19	10737	79.6%	8236	2909	32.0%	47.6%	2.14	123.2	801.4	1176.8	10614	184.43	
20	10614	79.4%	8196	2850	31.9%	47.5%	2.13	122.8	840.6	1235.1	10491	182.29	
21	10491	79.1%	8157	2792	31.8%	47.3%	2.13	122.4	879.5	1293.1	10368	180.16	
22	10368	78.9%	8118	2734	31.7%	47.2%	2.12	122.0	918.1	1350.7	10246	178.04	
23	10246	78.6%	8080	2676	31.5%	47.1%	2.11	121.6	956.5	1408.0	10125	175.93	
24	10125	78.4%	8041	2619	31.4%	47.0%	2.11	121.3	994.5	1464.9	10003	173.82	
25	10003	78.1%	8003	2562	31.3%	46.8%	2.10	120.9	1032.3	1521.5	9883	171.72	
26	9883	77.9%	7965	2506	31.1%	46.7%	2.09	120.5	1069.9	1577.8	9762	169.63	
27	9762	77.6%	7928	2449	31.0%	46.6%	2.09	120.1	1107.1	1633.8	9642	167.54	
28	9642	77.4%	7891	2393	30.9%	46.5%	2.08	119.7	1144.1	1689.4	9522	165.46	
29	9522	77.1%	7854	2338	30.8%	46.3%	2.07	119.3	1180.8	1744.6	9403	163.39	
30	9403	76.9%	7817	2283	30.6%	46.2%	2.07	118.9	1217.2	1799.6	9284	161.32	
31	9284	76.6%	7780	2228	30.5%	46.1%	2.06	118.5	1253.4	1854.2	9166	159.26	
32	9166	76.4%	7744	2173	30.4%	46.0%	2.05	118.1	1289.3	1908.5	9047	157.21	
33	9047	76.1%	7708	2119	30.3%	45.8%	2.05	117.8	1324.9	1962.5	8930	155.16	
34	8930	75.9%	7673	2065	30.1%	45.7%	2.04	117.4	1360.3	2016.2	8812	153.12	
35	8812	75.6%	7637	2011	30.0%	45.6%	2.03	117.0	1395.5	2069.5	8695	151.09	
36	8695	75.4%	7602	1958	29.9%	45.5%	2.03	116.6	1430.3	2122.5	8579	149.07	
37	8579	75.1%	7567	1905	29.8%	45.3%	2.02	116.2	1464.9	2175.2	8462	147.05	
38	8462	74.9%	7533	1852	29.7%	45.2%	2.01	115.9	1499.3	2227.6	8347	145.03	Target Maintenance Removal Efficiency

ATTACHMENT #7

MTE

GID
STORMWATER MANAGEMENT
Guelph, Ontario

Project Number: 46927-104
Date: January 30, 2026
Design By: MPW
File: Q:\46927\104\SWM\SWMF 2\46927-104_SWMF 2 Master Design Sheet - Modified Forebay Sheet.xlsx

FOREBAY DESIGN CALCULATIONS: 20yr Cleanout Forebay — SWMF-2

Reference: Section 4.6.2 Wet Ponds, MOE Stormwater Management Planning and Design Manual, March 2003

Forebay Design Flows

Flow into forebay during 1:5yr Storm Event	1.447	m^3/s	*From MTE STM Sewer Design Spreadsheet using Rational Flow
Estimated pipe flow capacity for inlet pipe into forebay designed for the 1:5yr Storm Event	1.454	m^3/s	*Pipe designed for 90% Capcity
Flow into forebay during the 25 mm - 4 hour design storm event	0.962	m^3/s	*From MTE STM SWMHYMO
Peak flow from main pond outlet for the 25mm design storm	0.024	m^3/s	*From MTE STM SWMHYMO

Forebay Characteristics

b =	13.5	m	bottom width
y =	1.5	m	depth
z =	3.8	:1	side slope
w =	19.2	m	average width
R =	1.14	m	hydraulic radius
A =	28.8	m^2	cross-sectional area

1. Length Calculation Based on Settling Velocity

Reference: MOE SWM P&D Manual, Equation 4.5: Forebay Settling Length

L = forebay flow length *(m)*
r = length-to-width ratio
Q_p = peak flow rate through forebay *(m^3/s)*
v_s = settling velocity *(m/s)*

Table 1: Average settling velocities

	Mass Removed	Particle Size Range	Average Settling Velocity
	%	μm	m/s
	80 - 100	x ≤ 20	0.00000254
Enhanced:	70 - 80	20 < x ≤ 40	0.00001300
Normal:	60 - 70	40 < x ≤ 60	0.00002540
Basic:	40 - 60	60 < x ≤ 130	0.00012700
Medium Sand:	20 - 40	130 < x ≤ 400	0.00059267
Gross Grit:	0 - 20	400 < x ≤ 4000	0.00550333

a) Required Settling Length (assuming Q_p = forebay through-flow & v_s = 0.0055 m/s)

Q_p =	0.962	m^3/s	peak flow rate through forebay
v_s =	0.0055	m/s	settling velocity
r =	0.47		length-to-width ratio
L =	9.1	m	required settling length
L =	*9.1*	*m*	*trial length*

Check Calculation with Design Forebay

Q_p =	0.962	m^3/s
v_s =	0.0055	m/s
r =	2.00	
Dist. =	18.7	m
L_{design} =	38.4	m

CONFIRMED - DESIGN LENGTH IS GREATER THAN SETTLING LENGTH

b) Required Settling Length (assuming Q_p = pond discharge & v_s = 0.0003 m/s)

Q_p =	0.024	m^3/s	peak flow rate through forebay
v_s =	0.0003	m/s	settling velocity
r =	0.22		length-to-width ratio
L =	4.2	m	required settling length
L =	*4.2*	*m*	*trial length*

Check Calculation with Design Forebay

Q_p =	0.024	m^3/s
v_s =	0.0003	m/s
r =	2.00	
Dist. =	12.6	m
L_{design} =	38.4	m

CONFIRMED - DESIGN LENGTH IS GREATER THAN SETTLING LENGTH

2. Length Calculation Based on Flow Dispersion Length

Reference: MOE SWM P&D Manual, Equation 4.6: Dispersion Length

Q =	1.45	m^3/s	inlet flow rate
d =	1.5	m	depth of permanent pool in forebay
V_f =	0.50	m/s	desired velocity in forebay (typical value ≤ 0.50 *m/s*)
L =	15.5	m	required length of dispersion

3. Required Forebay Length

L_{min} =	15.5	m	Minimum required design length
L_{design} =	**38.4**	**m**	**Proposed design length**
r =	2.00		design length-to-width ratio (typical minimum of 2.0)

4. Scour Velocity

Reference: MOE SWM P&D Manual, Sect. 4 Pg 56

v_s =	0.15	m/s	scour velocity (typical value = 0.15 *m/s*)
v =	**0.050**	**m/s**	**actual velocity**

OK The actual velocity through the forebay is less than the scour velocity.

5. Weir Flow From Forebay

Reference: MOE SWM P&D Manual, Equation 4.4: Weir Flow

L =	7.5	m	length of crest of weir
α =	1.65		coefficient
H =	0.3	m	head
Q =	**2.03**	**m^3/s**	**discharge**

OK The weir flow from the forebay exceeds the flow entering the forebay

6. Estimated Cleanout Frequencies

A) MOE Clean-Out Frequency Estimate (For Reference Only)
(Reference: 2003 MOE SWM P&D Manual, Sect. 4 Pg. 57 & App. H Pg. 12)

Total Forebay Design Volume =	1199	m^3
Selected TSS Removal Efficiency =	80%	
Estimated Catchment Impervious level =	66.00	%
Estimated annual sediment loading =	2.6	m^3/ha
Catchment Contributing area =	10.16	ha
Calculated Annual sediment volume =	21	m^3/yr
MOE Clean-out Frequency Estimate =	**57.6**	***years***

Table 2: Annual sediment loading

Impervious Level	Annual Loading
%	m^3/ha
35	0.6
55	1.9
70	2.8
85	3.8

Estimated clean-out frequency meets MOE recommended minimum of 10yrs (Ref. 2003 MOE SWM P&D Manual, Sect. 4 Pg. 57)

B) MTE Recommended Clean-out Frequency Estimate (For Reference Only)

(Note: Forebay and Pond Sized to meet MOE Requirements)

Forebay

Total Forebay Design Volume =	1199	m^3
33% Volume Reduction =	396	
Estimated Forebay TSS Removal Efficiency =	50%	
Estimated Catchment Impervious level =	66	%
Estimated annual sediment loading =	2.6	m^3/ha
Catchment Contributing area =	10.16	ha
Calculated Annual sediment volume =	13	m^3/yr
Cleanout frequency for 33% volume reduction =	**30.4**	***years***

Estimated clean-out frequency meets MOE recommended minimum of 10yrs (Ref. 2003 MOE SWM P&D Manual, Sect. 4 Pg. 57)

Wet Cell

Total Wet Cell Design Volume =	1677	m^3 *(Note: Wet Cell Design Volume does not include forebay volume)*
Estimated Wet Cell TSS Removal Efficiency =	30%	
Estimated Catchment Impervious level =	66.00	%
Estimated annual sediment loading =	2.6	m^3/ha
Catchment Contributing area =	10.16	ha
Calculated Annual sediment volume =	8	m^3/yr
Cleanout frequency for 33% volume reduction =	**70.9**	***years***

C) City of Guelph Development Manual and Operational Objective

(Reference: 2023 CoG Development Engineering Manual, Figure 4)

Total Forebay Volume at 0.5m above bottom =	296	m^3
Estimated Forebay TSS Removal Efficiency =	50%	
Estimated Catchment Impervious level =	66.00	%
Estimated annual sediment loading =	2.6	m^3/ha
Catchment Contributing area =	10.16	ha
Calculated Annual sediment volume =	13	m^3/yr
Cleanout frequency for 0.5m sediment accumulation =	**22.8**	***years***

D) MOE Clean-Out Frequency Estimate for Oversized Permanent Pool (For Reference Only)

(Reference: 2003 MOE SWM P&D Manual, Sect. 6.4 Pg. 6-9)

Total Provided Permanent Pool Volume =	2877	m^3
Total Provided Permanent Pool Storage Volume =	283.1	m^3/ha
Selected TSS Removal Efficiency =	80%	
Target Maintenance Removal Efficiency =	75%	
Target Maintenance Removal Storage Volume =	142.3	m^3/ha
Estimated Design Removal Efficiency =	92.2%	
Estimated Catchment Impervious level =	66.00	%
Estimated annual sediment loading =	2.6	m^3/ha
Catchment Contributing area =	10.16	ha

Year	Initial Perm. Pool	Est. Removal	Wet Cell Volume	Forebay Vol.	Removal Efficiency Wet Cell	Removal Efficiency Forebay	Annual Sediment	Accum. Sediment Vol Total	Accum. Sediment Vol Wet Cell	Accum. Sediment Vol Forebay	Year End Perm. Pool	Remaining Perm. Pool	
	m^3	%	m^3	m^3	%	%	m^3/ha	m^3	m^3	m^3	m^3	m^3/ha	
1	2877	92.2%	1677	1199	42.2%	50.0%	2.36	24.0	10.1	12.0	2853	280.77	
2	2853	91.9%	1667	1187	42.0%	49.9%	2.35	23.9	20.2	23.9	2829	278.41	
3	2829	91.6%	1657	1175	41.9%	49.7%	2.35	23.8	30.1	35.7	2805	276.07	
4	2805	91.3%	1647	1164	41.7%	49.6%	2.34	23.8	40.1	47.5	2781	273.73	
5	2781	91.0%	1637	1152	41.6%	49.4%	2.33	23.7	49.9	59.2	2757	271.40	
6	2757	90.7%	1627	1140	41.5%	49.3%	2.32	23.6	59.7	70.8	2734	269.08	
7	2734	90.5%	1618	1128	41.3%	49.1%	2.32	23.5	69.4	82.4	2710	266.76	
8	2710	90.2%	1608	1117	41.2%	49.0%	2.31	23.5	79.1	93.9	2687	264.46	
9	2687	89.9%	1598	1105	41.0%	48.8%	2.30	23.4	88.7	105.3	2663	262.15	
10	2663	89.6%	1589	1094	40.9%	48.7%	2.29	23.3	98.2	116.7	2640	259.86	
11	2640	89.3%	1579	1083	40.7%	48.6%	2.29	23.2	107.7	127.9	2617	257.57	
12	2617	89.0%	1570	1071	40.6%	48.4%	2.28	23.2	117.1	139.2	2594	255.30	
13	2594	88.7%	1560	1060	40.5%	48.3%	2.27	23.1	126.4	150.3	2571	253.02	
14	2571	88.5%	1551	1049	40.3%	48.1%	2.26	23.0	135.7	161.4	2548	250.76	
15	2548	88.2%	1542	1038	40.2%	48.0%	2.26	22.9	144.9	172.4	2525	248.50	
16	2525	87.9%	1532	1027	40.0%	47.9%	2.25	22.9	154.1	183.3	2502	246.25	
17	2502	87.6%	1523	1016	39.9%	47.7%	2.24	22.8	163.2	194.2	2479	244.01	
18	2479	87.4%	1514	1005	39.8%	47.6%	2.24	22.7	172.2	205.0	2456	241.77	
19	2456	87.1%	1505	994	39.6%	47.4%	2.23	22.6	181.2	215.8	2434	239.54	
20	2434	86.8%	1496	984	39.5%	47.3%	2.22	22.6	190.1	226.5	2411	237.32	
21	2411	86.5%	1487	973	39.4%	47.2%	2.22	22.5	198.9	237.1	2389	235.10	
22	2389	86.3%	1478	962	39.2%	47.0%	2.21	22.4	207.7	247.6	2366	232.90	
23	2366	86.0%	1470	952	39.1%	46.9%	2.20	22.4	216.5	258.1	2344	230.69	
24	2344	85.7%	1461	941	38.9%	46.8%	2.19	22.3	225.2	268.5	2322	228.50	
25	2322	85.4%	1452	931	38.8%	46.6%	2.19	22.2	233.8	278.9	2299	226.31	
26	2299	85.2%	1443	920	38.7%	46.5%	2.18	22.2	242.4	289.2	2277	224.13	*0.5m Sediment Accumulation in MOE Forebay*
27	2277	84.9%	1435	910	38.5%	46.4%	2.17	22.1	250.9	299.4	2255	221.96	
28	2255	84.6%	1426	900	38.4%	46.2%	2.17	22.0	259.3	309.6	2233	219.79	
29	2233	84.4%	1418	890	38.3%	46.1%	2.16	21.9	267.7	319.7	2211	217.63	
30	2211	84.1%	1410	880	38.1%	46.0%	2.15	21.9	276.1	329.8	2189	215.48	
31	2189	83.8%	1401	870	38.0%	45.8%	2.15	21.8	284.4	339.8	2167	213.33	
32	2167	83.6%	1393	860	37.9%	45.7%	2.14	21.7	292.6	349.7	2146	211.19	
33	2146	83.3%	1385	850	37.7%	45.6%	2.13	21.7	300.8	359.6	2124	209.06	
34	2124	83.0%	1377	840	37.6%	45.4%	2.13	21.6	308.9	369.4	2102	206.94	
35	2102	82.8%	1368	830	37.5%	45.3%	2.12	21.5	317.0	379.1	2081	204.82	
36	2081	82.5%	1360	820	37.4%	45.2%	2.11	21.5	325.0	388.8	2059	202.70	
37	2059	82.3%	1352	810	37.2%	45.0%	2.11	21.4	332.9	398.5	2038	200.60	
38	2038	82.0%	1344	801	37.1%	44.9%	2.10	21.3	340.9	408.1	2017	198.50	
39	2017	81.7%	1336	791	37.0%	44.8%	2.09	21.3	348.7	417.6	1995	196.41	
40	1995	81.5%	1329	782	36.8%	44.6%	2.09	21.2	356.5	427.0	1974	194.32	
41	1974	81.2%	1321	772	36.7%	44.5%	2.08	21.1	364.3	436.4	1953	192.24	
42	1953	81.0%	1313	763	36.6%	44.4%	2.07	21.1	372.0	445.8	1932	190.17	
43	1932	80.7%	1305	754	36.4%	44.3%	2.07	21.0	379.6	455.1	1911	188.10	
44	1911	80.5%	1298	744	36.3%	44.1%	2.06	20.9	387.2	464.3	1890	186.04	
45	1890	80.2%	1290	735	36.2%	44.0%	2.05	20.9	394.8	473.5	1869	183.99	
46	1869	79.9%	1283	726	36.1%	43.9%	2.05	20.8	402.3	482.6	1849	181.94	
47	1849	79.7%	1275	717	35.9%	43.8%	2.04	20.7	409.7	491.7	1828	179.90	
48	1828	79.4%	1268	708	35.8%	43.6%	2.03	20.7	417.1	500.7	1807	177.87	
49	1807	79.2%	1260	699	35.7%	43.5%	2.03	20.6	424.5	509.7	1787	175.84	
50	1787	78.9%	1253	690	35.6%	43.4%	2.02	20.5	431.8	518.6	1766	173.82	
51	1766	78.7%	1246	681	35.4%	43.3%	2.01	20.5	439.0	527.4	1746	171.81	
52	1746	78.4%	1238	672	35.3%	43.1%	2.01	20.4	446.2	536.2	1725	169.80	
53	1725	78.2%	1231	663	35.2%	43.0%	2.00	20.3	453.4	545.0	1705	167.80	
54	1705	78.0%	1224	654	35.1%	42.9%	2.00	20.3	460.5	553.7	1685	165.80	
55	1685	77.7%	1217	646	34.9%	42.8%	1.99	20.2	467.6	562.3	1664	163.81	
56	1664	77.5%	1210	637	34.8%	42.6%	1.98	20.1	474.6	570.9	1644	161.83	
57	1644	77.2%	1203	628	34.7%	42.5%	1.98	20.1	481.5	579.4	1624	159.85	

MTE

Year	Initial MOE Perm. Pool Vol.	Est. Removal Efficiency	MOE Wet Cell Volume	MOE Forebay Vol.	Removal Efficiency		Annual Sediment Removal	Accum. Sediment Vol			Year End Perm. Pool Vol.	Remaining Perm. Pool Storage	
					Wet Cell	Forebay		Total	MOE Wet Cell	MOE Forebay			
	m^3	%	m^3	m^3	%	%	m^3/ha	m^3	m^3	m^3	m^3	m^3/ha	
58	1624	77.0%	1196	620	34.6%	42.4%	1.97	20.0	488.5	587.9	1604	157.88	
59	1604	76.7%	1189	611	34.5%	42.3%	1.96	20.0	495.3	596.4	1584	155.92	
60	1584	76.5%	1182	603	34.3%	42.2%	1.96	19.9	502.2	604.7	1564	153.96	
61	1564	76.2%	1175	595	34.2%	42.0%	1.95	19.8	509.0	613.1	1544	152.01	
62	1544	76.0%	1168	586	34.1%	41.9%	1.95	19.8	515.7	621.4	1525	150.06	
63	1525	75.8%	1162	578	34.0%	41.8%	1.94	19.7	522.4	629.6	1505	148.12	
64	1505	75.5%	1155	570	33.9%	41.7%	1.93	19.6	529.0	637.8	1485	146.19	
65	1485	75.3%	1148	562	33.7%	41.5%	1.93	19.6	535.7	645.9	1466	144.26	
66	1466	75.0%	1142	553	33.6%	41.4%	1.92	19.5	542.2	654.0	1446	142.34	*Target Maintenance Removal Efficiency*

ATTACHMENT #8

MTE

GID

STORMWATER MANAGEMENT

Guelph, Ontario

Project Number:	46927-104
Date:	January 30, 2026
Design By:	MPW
File:	Q:\46927\104\SWM\SWMF 3\46927-104_SWMF 3 Master Design Sheet.xlsx

FOREBAY DESIGN CALCULATIONS: 20yr Cleanout Forebay — SWMF-3

Reference: Section 4.6.2 Wet Ponds, MOE Stormwater Management Planning and Design Manual, March 2003

Forebay Design Flows

Flow into forebay during 1:5yr Storm Event	2.693	m^3/s	**From MTE STM Sewer Design Spreadsheet using Rational Flow*
Estimated pipe flow capacity for inlet pipe into forebay designed for the 1:5yr Storm Event	3.139	m^3/s	**Pipe designed for 90% Capcity*
Flow into forebay during the 25 mm - 4 hour design storm event	2.564	m^3/s	**From MTE STM SWMHYMO*
Peak flow from main pond outlet for the 25mm design storm	0.035	m^3/s	**From MTE STM SWMHYMO*

Forebay Characteristics

b =	**23.2**	*m*	bottom width
y =	1.5	*m*	depth
z =	3.8	:1	side slope
w =	28.9	*m*	average width
R =	1.24	*m*	hydraulic radius
A =	43.3	m^2	cross-sectional area

1. Length Calculation Based on Settling Velocity

Reference: MOE SWM P&D Manual, Equation 4.5: Forebay Settling Length

L = forebay flow length *(m)*
r = length-to-width ratio
Q_p = peak flow rate through forebay *(m^3/s)*
v_s = settling velocity *(m/s)*

a) Required Settling Length (assuming Q_p = forebay through-flow & v_s = 0.0055 m/s)

Q_p =	2.564	m^3/s	peak flow rate through forebay
v_s =	0.0055	*m/s*	settling velocity
r =	0.56		length-to-width ratio
L =	16.1	*m*	required settling length
L =	*16.1*	*m*	*trial length*

Check Calculation with Design Forebay

Q_p =	2.564	m^3/s
v_s =	0.0055	m/s
r =	2.00	
Dist. =	30.5	m
L_{design} =	57.7	m

CONFIRMED - DESIGN LENGTH IS GREATER THAN SETTLING LENGTH

Table 1: Average settling velocities

	Mass Removed	Particle Size Range	Average Settling Velocity
	%	*μm*	*m/s*
	80 - 100	x ≤ 20	0.00000254
Enhanced:	70 - 80	20 < x ≤ 40	0.00001300
Normal:	60 - 70	40 < x ≤ 60	0.00002540
Basic:	40 - 60	60 < x ≤ 130	0.00012700
Medium Sand:	20 - 40	130 < x ≤ 400	0.00059267
Gross Grit:	0 - 20	400 < x ≤ 4000	0.00550333

b) Required Settling Length (assuming Q_p = pond discharge & v_s = 0.0003 m/s)

Q_p =	0.035	m^3/s	peak flow rate through forebay
v_s =	0.0003	*m/s*	settling velocity
r =	0.14		length-to-width ratio
L =	4.0	*m*	required settling length
L =	*4*	*m*	*trial length*

Check Calculation with Design Forebay

Q_p =	0.035	m^3/s
v_s =	0.0003	m/s
r =	2.00	
Dist. =	15.3	m
L_{design} =	57.7	m

CONFIRMED - DESIGN LENGTH IS GREATER THAN SETTLING LENGTH

2. Length Calculation Based on Flow Dispersion Length

Reference: MOE SWM P&D Manual, Equation 4.6: Dispersion Length

Q =	3.14	m^3/s	inlet flow rate
d =	1.5	*m*	depth of permanent pool in forebay
V_f =	0.50	*m/s*	desired velocity in forebay (typical value ≤ 0.50 *m/s*)
L =	33.5	m	required length of dispersion

3. Required Forebay Length

L_{min} =	33.5	*m*	Minimum required design length
L_{design} =	**57.7**	***m***	**Proposed design length**
r =	2.00		design length-to-width ratio (typical minimum of 2.0)

4. Scour Velocity

Reference: MOE SWM P&D Manual, Sect. 4 Pg 56

v_s =	0.15	*m/s*	scour velocity (typical value = 0.15 *m/s*)	
v =	**0.073**	***m/s***	**actual velocity**	**OK** The actual velocity through the forebay is less than the scour velocity.

5. Weir Flow From Forebay

Reference: MOE SWM P&D Manual, Equation 4.4: Weir Flow

L =	13	*m*	length of crest of weir	
α =	1.65		coefficient	
H =	0.4	*m*	head	
Q =	**5.43**	m^3/s	**discharge**	**OK** The weir flow from the forebay exceeds the flow entering the forebay

6. Estimated Cleanout Frequencies

A) MOE Clean-Out Frequency Estimate (For Reference Only)

(Reference: 2003 MOE SWM P&D Manual, Sect. 4 Pg. 57 & App. H Pg. 12)

Total Forebay Design Volume =	2695	m^3
Selected TSS Removal Efficiency =	80%	
Estimated Catchment Impervious level =	72.00	%
Estimated annual sediment loading =	2.9	m^3/ha
Catchment Contributing area =	24.10	ha
Calculated Annual sediment volume =	57	m^3/yr
MOE Clean-out Frequency Estimate =	**47.6**	***years***

Estimated clean-out frequency meets MOE recommended minimum of 10yrs (Ref. 2003 MOE SWM P&D Manual, Sect. 4 Pg. 57)

Table 2: Annual sediment loading

Impervious Level	Annual Loading
%	m^3/ha
35	0.6
55	1.9
70	2.8
85	3.8

B) MTE Recommended Clean-out Frequency Estimate (For Reference Only)

(Note: Forebay and Pond Sized to meet MOE Requirements)

Forebay

Total Forebay Design Volume =	2695	m^3
33% Volume Reduction =	889	
Estimated Forebay TSS Removal Efficiency =	50%	
Estimated Catchment Impervious level =	72.00	%
Estimated annual sediment loading =	2.9	m^3/ha
Catchment Contributing area =	24.10	*ha*
Calculated Annual sediment volume =	35	m^3/yr
Cleanout frequency for 33% volume reduction =	**25.2**	***years***

Estimated clean-out frequency meets MOE recommended minimum of 10yrs (Ref. 2003 MOE SWM P&D Manual, Sect. 4 Pg. 57)

Wet Cell

Total Wet Cell Design Volume =	5134	m^3 *(Note: Wet Cell Design Volume does not include forebay volume)*
Estimated Wet Cell TSS Removal Efficiency =	30%	
Estimated Catchment Impervious level =	72.00	%
Estimated annual sediment loading =	2.9	m^3/ha
Catchment Contributing area =	24.10	*ha*
Calculated Annual sediment volume =	21	m^3/yr
Cleanout frequency for 33% volume reduction =	**79.9**	***years***

C) City of Guelph Development Manual and Operational Objective

(Reference: 2023 CoG Development Engineering Manual, Figure 4)

Total Forebay Volume at 0.5m above bottom =	745	m^3
Estimated Forebay TSS Removal Efficiency =	50%	
Estimated Catchment Impervious level =	72.00	%
Estimated annual sediment loading =	2.9	m^3/ha
Catchment Contributing area =	24.10	*ha*
Calculated Annual sediment volume =	35	m^3/yr
Cleanout frequency for 0.5m sediment accumulation =	**21.1**	***years***

D) MOE Clean-Out Frequency Estimate for Oversized Permanent Pool (For Reference Only)

(Reference: 2003 MOE SWM P&D Manual, Sect. 6.4 Pg. 6-9)

Total Provided Permanent Pool Volume =	7829	m^3
Total Provided Permanent Pool Storage Volume =	324.9	m^3/ha
Selected TSS Removal Efficiency =	80%	
Target Maintenance Removal Efficiency =	75%	
Target Maintenance Removal Storage Volume =	152.8	m^3/ha
Estimated Design Removal Efficiency =	94.9%	
Estimated Catchment Impervious level =	72.00	%
Estimated annual sediment loading =	2.9	m^3/ha
Catchment Contributing area =	24.10	*ha*

Year	Initial Perm. Pool	Est. Removal	Wet Cell Volume	Forebay Vol.	Removal Efficiency		Annual Sediment	Accum. Sediment Vol			Year End Perm. Pool	Remaining Perm. Pool	
					Wet Cell	Forebay		Total	Wet Cell	Forebay			
	m^3	%	m^3	m^3	%	%	m^3/ha	m^3	m^3	m^3	m^3	m^3/ha	
1	7829	94.9%	5134	2695	44.9%	50.0%	2.78	67.1	30.2	33.6	7762	322.08	
2	7762	94.6%	5104	2661	44.8%	49.8%	2.78	66.9	60.1	66.9	7695	319.30	
3	7695	94.3%	5074	2628	44.6%	49.7%	2.77	66.7	89.8	100.0	7629	316.54	
4	7629	94.0%	5045	2595	44.4%	49.5%	2.76	66.4	119.4	132.9	7562	313.78	
5	7562	93.6%	5015	2562	44.3%	49.4%	2.75	66.2	148.7	165.6	7496	311.03	
6	7496	93.3%	4986	2529	44.1%	49.2%	2.74	66.0	177.8	198.0	7430	308.30	
7	7430	93.0%	4957	2497	44.0%	49.0%	2.73	65.7	206.7	230.2	7364	305.57	
8	7364	92.7%	4928	2465	43.8%	48.9%	2.72	65.5	235.4	262.3	7299	302.85	
9	7299	92.4%	4899	2433	43.6%	48.7%	2.71	65.3	263.9	294.1	7233	300.14	
10	7233	92.0%	4871	2401	43.5%	48.6%	2.70	65.1	292.2	325.7	7168	297.44	
11	7168	91.7%	4842	2369	43.3%	48.4%	2.69	64.8	320.3	357.0	7104	294.75	
12	7104	91.4%	4814	2338	43.2%	48.2%	2.68	64.6	348.2	388.2	7039	292.07	
13	7039	91.1%	4786	2307	43.0%	48.1%	2.67	64.4	375.9	419.2	6974	289.40	
14	6974	90.8%	4759	2276	42.9%	47.9%	2.66	64.2	403.4	449.9	6910	286.73	
15	6910	90.5%	4731	2245	42.7%	47.8%	2.65	64.0	430.7	480.5	6846	284.08	
16	6846	90.2%	4704	2214	42.5%	47.6%	2.64	63.7	457.8	510.8	6783	281.44	
17	6783	89.9%	4677	2184	42.4%	47.5%	2.64	63.5	484.7	541.0	6719	278.80	
18	6719	89.5%	4650	2154	42.2%	47.3%	2.63	63.3	511.5	570.9	6656	276.17	
19	6656	89.2%	4623	2124	42.1%	47.2%	2.62	63.1	538.0	600.7	6593	273.56	
20	6593	88.9%	4596	2094	41.9%	47.0%	2.61	62.9	564.4	630.2	6530	270.95	
21	6530	88.6%	4570	2065	41.8%	46.8%	2.60	62.7	590.6	659.6	6467	268.35	
22	6467	88.3%	4544	2035	41.6%	46.7%	2.59	62.4	616.5	688.7	6405	265.76	
23	6405	88.0%	4518	2006	41.5%	46.5%	2.58	62.2	642.4	717.7	6343	263.18	
24	6343	87.7%	4492	1977	41.3%	46.4%	2.57	62.0	668.0	746.5	6281	260.60	*0.5m Sediment Accumulation in MOE Forebay*
25	6281	87.4%	4466	1948	41.2%	46.2%	2.56	61.8	693.4	775.0	6219	258.04	
26	6219	87.1%	4441	1920	41.0%	46.1%	2.56	61.6	718.7	803.4	6157	255.48	
27	6157	86.8%	4416	1891	40.9%	45.9%	2.55	61.4	743.8	831.6	6096	252.94	
28	6096	86.5%	4391	1863	40.7%	45.8%	2.54	61.2	768.7	859.6	6035	250.40	
29	6035	86.2%	4366	1835	40.6%	45.6%	2.53	61.0	793.4	887.5	5974	247.87	
30	5974	85.9%	4341	1807	40.4%	45.5%	2.52	60.7	818.0	915.1	5913	245.35	
31	5913	85.6%	4316	1780	40.3%	45.4%	2.51	60.5	842.4	942.5	5852	242.84	
32	5852	85.3%	4292	1752	40.1%	45.2%	2.50	60.3	866.6	969.8	5792	240.33	
33	5792	85.0%	4268	1725	40.0%	45.1%	2.49	60.1	890.6	996.9	5732	237.84	
34	5732	84.8%	4244	1698	39.8%	44.9%	2.49	59.9	914.5	1023.8	5672	235.35	
35	5672	84.5%	4220	1671	39.7%	44.8%	2.48	59.7	938.2	1050.5	5612	232.87	
36	5612	84.2%	4196	1644	39.6%	44.6%	2.47	59.5	961.7	1077.1	5553	230.41	
37	5553	83.9%	4173	1618	39.4%	44.5%	2.46	59.3	985.1	1103.5	5493	227.94	
38	5493	83.6%	4149	1591	39.3%	44.3%	2.45	59.1	1008.3	1129.7	5434	225.49	
39	5434	83.3%	4126	1565	39.1%	44.2%	2.44	58.9	1031.4	1155.7	5375	223.05	
40	5375	83.0%	4103	1539	39.0%	44.0%	2.44	58.7	1054.2	1181.5	5317	220.61	
41	5317	82.7%	4080	1513	38.8%	43.9%	2.43	58.5	1077.0	1207.2	5258	218.19	
42	5258	82.5%	4057	1488	38.7%	43.8%	2.42	58.3	1099.5	1232.7	5200	215.77	
43	5200	82.2%	4035	1462	38.6%	43.6%	2.41	58.1	1121.9	1258.1	5142	213.36	
44	5142	81.9%	4012	1437	38.4%	43.5%	2.40	57.9	1144.1	1283.2	5084	210.95	
45	5084	81.6%	3990	1412	38.3%	43.3%	2.39	57.7	1166.2	1308.3	5026	208.56	
46	5026	81.3%	3968	1387	38.1%	43.2%	2.39	57.5	1188.1	1333.1	4969	206.18	
47	4969	81.1%	3946	1362	38.0%	43.1%	2.38	57.3	1209.9	1357.8	4912	203.80	
48	4912	80.8%	3924	1337	37.9%	42.9%	2.37	57.1	1231.5	1382.3	4854	201.43	
49	4854	80.5%	3903	1313	37.7%	42.8%	2.36	56.9	1253.0	1406.6	4798	199.07	
50	4798	80.2%	3881	1288	37.6%	42.6%	2.35	56.7	1274.3	1430.8	4741	196.71	
51	4741	79.9%	3860	1264	37.4%	42.5%	2.35	56.5	1295.5	1454.8	4684	194.37	
52	4684	79.7%	3839	1240	37.3%	42.4%	2.34	56.3	1316.5	1478.7	4628	192.03	
53	4628	79.4%	3818	1216	37.2%	42.2%	2.33	56.1	1337.3	1502.4	4572	189.70	
54	4572	79.1%	3797	1192	37.0%	42.1%	2.32	55.9	1358.0	1525.9	4516	187.38	
55	4516	78.9%	3776	1169	36.9%	42.0%	2.31	55.7	1378.6	1549.3	4460	185.07	
56	4460	78.6%	3756	1145	36.8%	41.8%	2.31	55.6	1399.0	1572.6	4405	182.76	
57	4405	78.3%	3735	1122	36.6%	41.7%	2.30	55.4	1419.3	1595.6	4349	180.47	

Year	Initial MOE Perm. Pool Vol.	Est. Removal Efficiency	MOE Wet Cell Volume	MOE Forebay Vol.	Removal Efficiency		Annual Sediment Removal	Accum. Sediment Vol			Year End Perm. Pool Vol.	Remaining Perm. Pool Storage	
					Wet Cell	Forebay		Total	MOE Wet Cell	MOE Forebay			
	m^3	%	m^3	m^3	%	%	m^3/ha	m^3	m^3	m^3	m^3	m^3/ha	
58	4349	78.0%	3715	1099	36.5%	41.6%	2.29	55.2	1439.4	1618.6	4294	178.18	
59	4294	77.8%	3695	1076	36.4%	41.4%	2.28	55.0	1459.4	1641.3	4239	175.90	
60	4239	77.5%	3675	1053	36.2%	41.3%	2.27	54.8	1479.3	1664.0	4184	173.62	
61	4184	77.2%	3655	1031	36.1%	41.2%	2.27	54.6	1499.0	1686.4	4130	171.36	
62	4130	77.0%	3635	1008	36.0%	41.0%	2.26	54.4	1518.5	1708.8	4075	169.10	
63	4075	76.7%	3616	986	35.8%	40.9%	2.25	54.2	1538.0	1730.9	4021	166.85	
64	4021	76.5%	3596	964	35.7%	40.8%	2.24	54.0	1557.3	1753.0	3967	164.61	
65	3967	76.2%	3577	942	35.6%	40.6%	2.23	53.9	1576.4	1774.9	3913	162.37	
66	3913	75.9%	3558	920	35.4%	40.5%	2.23	53.7	1595.4	1796.6	3859	160.14	*Target Maintenance Removal Efficiency*

ATTACHMENT #9

GID
STORMWATER MANAGEMENT
Guelph, Ontario

Project Number: 46927-104
Date: January 16, 2026
Design By: MPW
File: Q:\46927\104\SWM\SWMF 3\46927-104_SWMF 3 Master Design Sheet.xlsx

INFILTRATION RATE CALCULATION — SWMF-3

Soil Characteristics

Well ID =	MW520-22		
Material Layer =	Sand and Gravel		
Depth Top =	2.30	*m*	
Depth Bottom =	2.90	*m*	
d_{10} =	0.16	*mm*	grain size at which 10% is finer
d_{60} =	14.00	*mm*	grain size at which 60% is finer
P_1 =	3.00	%	% passing.02mm sieve
P_2 =	5.00	%	% passing.06mm sieve
C =	100		Hazen Coefficient
C_u =	87.5		Uniformity Index $C_u = d_{60}/d_{10}$
n =	0.255	m^2	Porosity $n=0.255(1+0.83^{Cu})$

Calculation of Hydraulic Conductivity

Kozeny-Carmen Formula:

$$K = \frac{1}{180}\frac{g}{v}\left(\frac{n^3}{(1-n)^2}\right){d_{10}}^2$$

K= 3.470E-05 m/s

Where:

K Hydraulic conductivity (m/sec)
g Gravitational acceleration (9.8 m/s2)
v Kinematic viscosity of water(1.2 x 10-6 m2/s)
d_{10} Grain size at which 10% is finer (m)

Applicability: silts, sands, gravelly sands

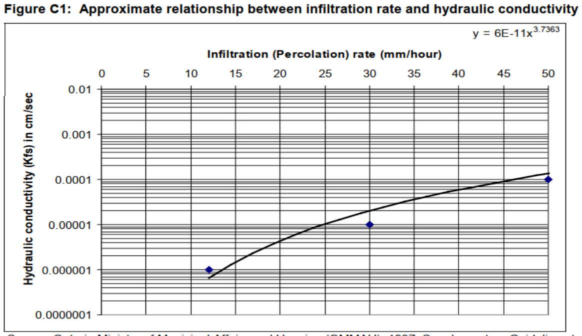
The Hazen formula, Beyer formula, Wang et al formula, and Kaubisch formula for hydraulic conductivity were all considered, and determined to be not applicable based on the properties of the soil.

Hazen Formula: *Applicable where 0.1<d10<3.0 mm AND C_u<5*
Beyer Formula: *Applicable where 0.06<d10<0.6 mm AND Cu<=20*
Wang Et Al. Formula: *Applicable where 0.05< d10<0.83 mm, 0.09<d60<4.29mm, AND 1.3<CU<18.3%*
Kaubisch Formula: *Applicable where 5<Cu<400 AND 10%<P2>60%*

Calculation of Infiltration Rate

CVC & TRCA (2010) (Building Code Method) Equation (Line of best fit)

Figure C1: Approximate relationship between infiltration rate and hydraulic conductivity



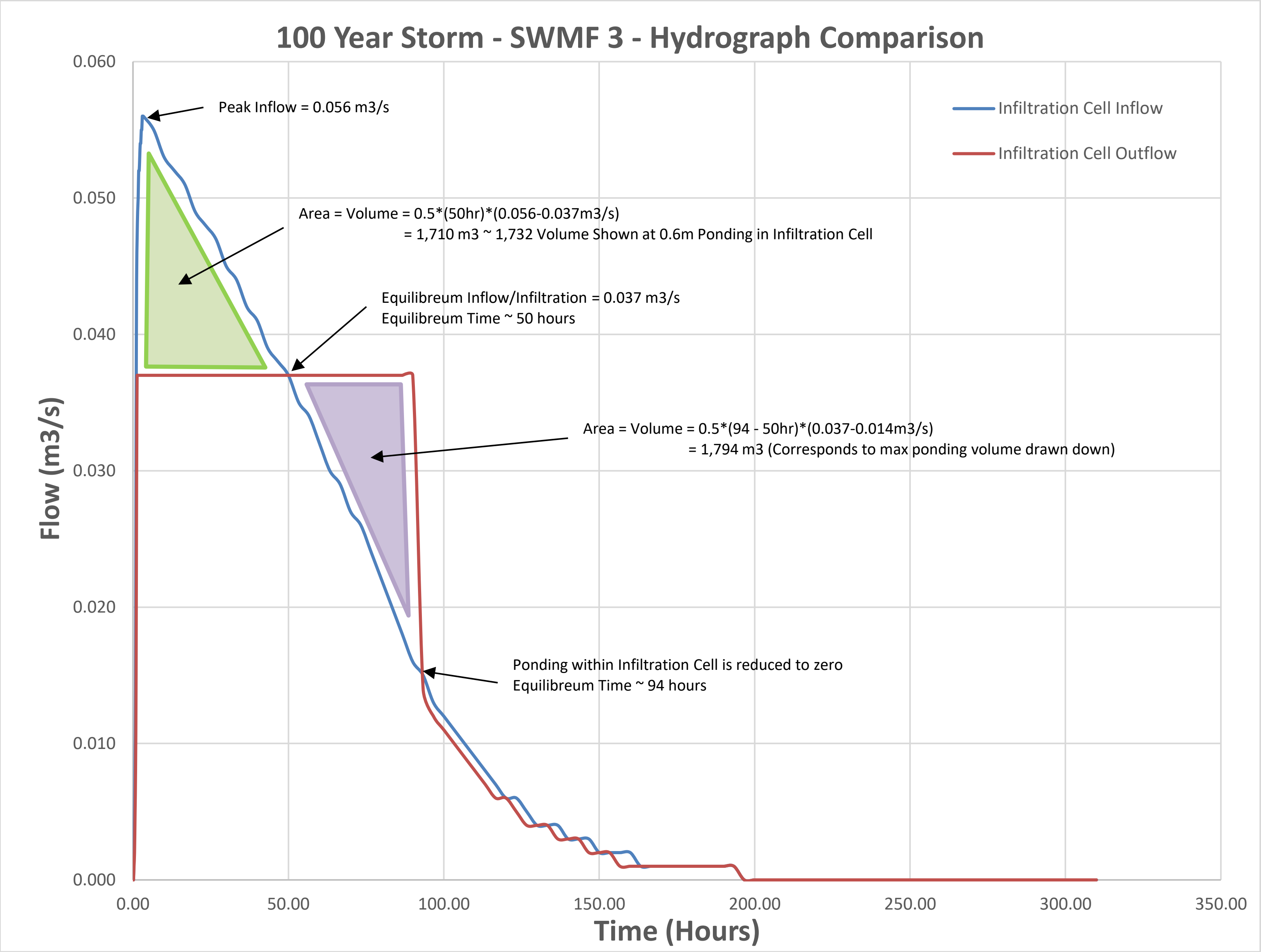
Source: Ontario Ministry of Municipal Affairs and Housing (OMMAH). 1997. Supplementary Guidelines to the Ontario Building Code 1997. SG-6 Percolation Time and Soil Descriptions. Toronto, Ontario.

$$K = \frac{1}{180}\frac{g}{v}\left(\frac{n^3}{(1-n)^2}\right){d_{10}}^2$$

**OMMAH (1997) Supplementary Guidelines to the OBC 1997 (SG-6 Percolation Time and Soil Descriptions. Toronto, Ontario)*

Unfactored Infiltration Rate = 120 mm/hr

ATTACHMENT #10



ATTACHMENT #11

Guelph Innovation District
Stormwater Mangement - Culvert #2 Water Balance Analysis
City of Guelph

Project Number: 46927-104
Date: January 16, 2026
Design By: MPW
File: Q:\46927\104\SWM\SWMF 2\Wetland #3 Balance\01-16-26 - Address City Comments\46927-104_SWMF 2 - Culvert #2.xlsx

HYDROLOGIC PARAMETERS

Sub-Catchment Number	Area	Overland Slope	Overland Length	SCS Curve Number *MTO Drainage Management Manual Table 1.09 (MTO, 1997)			Percent Impervious	Weighted Curve Number	Runoff Coefficient		Weighted Runoff Coefficient	Time of Concentration	Time to Peak	Land Use	Design Command	Comment
				Hydrologic Soil Group	Pervious (AMC II)	Impervious		CN	Pervious	Impervious	RC	ToC	Tp			
	(ha)	(%)	(m)				(%)					(hr)	(hr)			
Pre-Development Conditions																
102-1	14.75	3.0	350	B	65.0	98.0	0.5	65.2	0.20	0.90	0.20	0.63	0.38	Agricultural	NASHYD	Existing drainage east to Eramosa River via Culvert #1
102-2	11.93	4.0	350	B	65.0	98.0	1.5	65.5	0.20	0.90	0.21	0.57	0.34	Agricultural	NASHYD	Existing drainage east to Eramosa River via Culvert #2
102-3	1.48	4.0	300	B	65.0	98.0	0.0	65.0	0.20	0.90	0.20	0.54	0.32	Agricultural	NASHYD	Existing drainage to Wetland #6
102-4	0.33	4.0	100	B	65.0	98.0	0.0	65.0	0.20	0.90	0.20	0.31	0.19	Agricultural	NASHYD	Existing drainage east to Eramosa River via Culvert #3
105-1	5.60	18.0	110	B	58.0	98.0	0.0	58.0	0.20	0.90	0.20	0.20	0.12	Woodlot	NASHYD	Existing drainage east to Eramosa River via Culvert #1
105-2	8.96	11.0	200	B	58.0	98.0	0.0	58.0	0.20	0.90	0.20	0.31	0.19	Woodlot	NASHYD	Existing drainage east to Eramosa River via Culvert #2
105-3	0.70	14.0	60	B	58.0	98.0	0.0	58.0	0.20	0.90	0.20	0.16	0.10	Woodlot	NASHYD	Existing drainage to Wetland #6
Total	**43.75**															
Post-Development Conditions																
202-1	10.16	1.5	550	B	68.0	98.0	66.0	68.0	0.20	0.90	0.66	0.38	0.23	Mix of residential and 'mixed land use'	STANDHYD	Proposed drainage to SWMF2
202-2	2.68	7.5	75	B	68.0	98.0	7.0	70.1	0.20	0.90	0.25	0.21	0.12	Park and open space	NASHYD	Uncontrolled drainage to Eramosa River via Culvert #1
202-3-1	0.68	33.0	50	B	68.0	98.0	5.0	69.5	0.20	0.90	0.24	0.10	0.06	Embankment and open space	NASHYD	Uncontrolled drainage to Eramosa River via Culvert #1
202-3-2	1.77	33.0	35	B	68.0	98.0	5.0	69.5	0.20	0.90	0.24	0.09	0.05	Embankment and open space	NASHYD	Uncontrolled drainage to Eramosa River via Culvert #2
202-3-3	0.23	33.0	35	B	68.0	98.0	5.0	69.5	0.20	0.90	0.24	0.09	0.05	Embankment and open space	NASHYD	Uncontrolled drainage to Wetland #6
205-1	5.60	18.0	110	B	58.0	98.0	0.0	58.0	0.20	0.90	0.20	0.20	0.12	Woodlot	NASHYD	Existing drainage east to Eramosa River via Culvert #1
205-2	8.96	11.0	200	B	58.0	98.0	0.0	58.0	0.20	0.90	0.20	0.31	0.19	Woodlot	NASHYD	Existing drainage east to Eramosa River via Culvert #2
205-3	0.70	14.0	60	B	58.0	98.0	0.0	58.0	0.20	0.90	0.20	0.16	0.10	Woodlot	NASHYD	Existing drainage to Wetland #6
Total	**30.78**															

SWMHYMO OUTPUTS

Pre-Development Conditions

Storm Event	Peak Flow per Catchment							Total Peak Flow Eramosa River	Total Peak Flow to Culvert #2
	102-1	102-2	102-3	102-4	105-1	105-2	105-3		
	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)
5-year	0.281	0.248	0.032	0.010	0.185	0.215	0.026	0.829	0.428
25-year	0.518	0.457	0.058	0.019	0.342	0.400	0.048	1.537	0.794
100-year	0.748	0.660	0.084	0.027	0.494	0.580	0.070	2.227	1.149

Post-Development Conditions

Storm Event	Peak Flow per Catchment								Total Peak Flow Eramosa River	Total Peak Flow to Culvert #2
	202-1	202-2	202-3-1	202-3-2	202-3-3	205-1	205-2	205-3		
	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)
5-year	0.149	0.138	0.055	0.160	0.021	0.185	0.215	0.026	0.678	0.310
25-year	0.357	0.249	0.098	0.285	0.037	0.342	0.400	0.048	1.355	0.732
100-year	0.580	0.352	0.137	0.400	0.052	0.494	0.580	0.070	2.070	1.173

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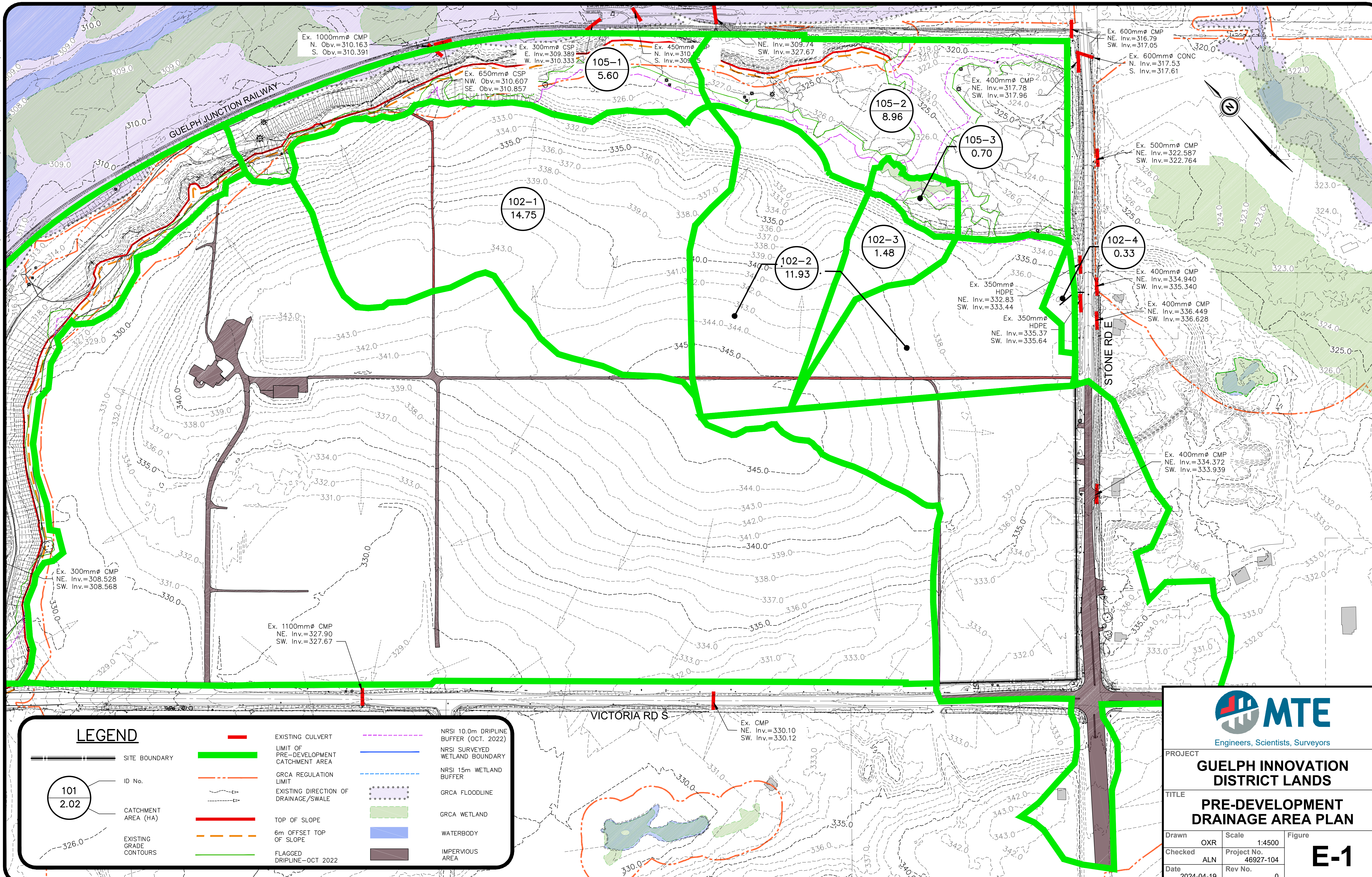
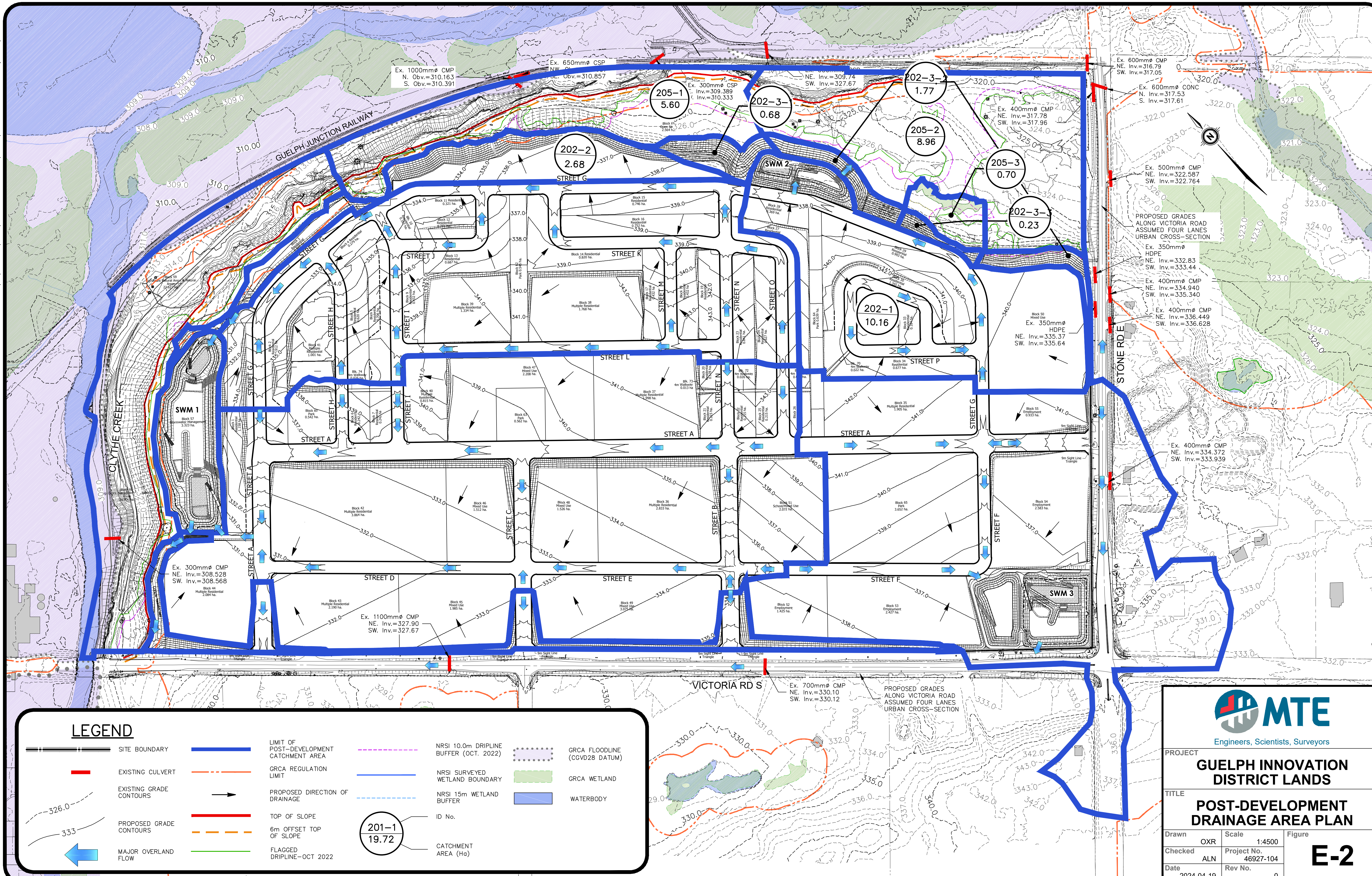


Plot Date: January 16, 2026 - 3:09 PM

January 14, 2025 — 4:05 p.m. — Plotted By: ORahmaty

P:\P\46927\104\TEMP DRAWINGS\MPW\46927-104-F2.1 (PRE).dwg



March 7, 2025 — 2:07 p.m. — Plotted By: ALee

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  S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
      S   W W   M   M  H   H    Y    M   M  O   O       9999   9999    Sept 2011
  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9    =========
                                                       9   9  9   9    # 3053466
       StormWater Management HYdrologic Model           999    999     =========

 *******************************************************************************
 ***************************** SWMHYMO Ver/4.05  *****************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                 OTTHYMO-83 and OTTHYMO-89.                  *********
 *******************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                  Ottawa,  Ontario: (613) 836-3884           *********
 *********                  Gatineau, Quebec: (819) 243-6858           *********
 *********                  E-Mail: swmhymo@jfsa.Com                   *********
 *******************************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: MTE Consultants Inc.                         +++++++++
 +++++++++                Burlington            SERIAL#:3053466        +++++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 *******************************************************************************
 *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
 *********           Maximum value for ID numbers  :     10            *********
 *********           Max. number of rainfall points: 105408            *********
 *********           Max. number of flow points    : 105408            *********
 *******************************************************************************

 ***** DESCRIPTION SUMMARY TABLE HEADERS (units depend on METOUT in START) *****
 *****-------------------------------------------------------------------*****
 *****    ID:  Hydrograph IDentification numbers, (1-10).                *****
 *****  NHYD:  Hydrograph reference numbers, (6 digits or characters).   *****
 *****  AREA:  Drainage area associated with hydrograph, (ac.) or (ha.). *****
 ***** QPEAK:  Peak flow of simulated hydrograph, (ft^3/s) or (m^3/s).   *****
 ***** TpeakDate_hh:mm is the date and time of the peak flow.            *****
 *****  R.V.:  Runoff Volume of simulated hydrograph, (in) or (mm).      *****
 *****  R.C.:  Runoff Coefficient of simulated hydrograph, (ratio).      *****
 *****     *:  see WARNING or NOTE message printed at end of run.        *****
 *****    **:  see  ERROR  message printed at end of run.                *****
 *******************************************************************************
 *******************************************************************************

::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

 *******************************************************************************

 ***********************   S U M M A R Y   O U T P U T   ***********************
 *******************************************************************************
 *         DATE: 2026-01-16     TIME: 14:30:57     RUN COUNTER: 000212          *
 *******************************************************************************
 * Input   filename: C:\SWMHYMO\Projects\SWMHYMO\pre.dat                        *
 * Output  filename: C:\SWMHYMO\Projects\SWMHYMO\pre.out                        *
 * Summary filename: C:\SWMHYMO\Projects\SWMHYMO\pre.sum                        *
 * User comments:                                                               *
 * 1:___________________________________________________________________________*
 * 2:___________________________________________________________________________*
 * 3:___________________________________________________________________________*
 *******************************************************************************
```

```
#******************************************************************************
#  Project Name: [Guelph Innovation District]    Project Number: [46927-104]
#  Date        : 01-16-2026
#  Modeller    : [MPW]
#  Company     : MTE Consultants Ltd.
#  License #   : 3057174
#******************************************************************************
# EXISTING CONDITIONS ANALYSIS
#******************************************************************************
 RUN:COMMAND#
 001:0001---------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   1 ]
 001:0002---------------------------------------------------------------------------
     READ STORM
      Filename = STORM.001
      Comment  =
      [SDT= 5.00:SDUR=   3.00:PTOT=  40.47]
#******************************************************************************
# Existing Catchment 102-1 - Existing drainage east to Eramosa River via Culver
#******************************************************************************
 001:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      01:102-1         14.75     .281 No_date    1:27    8.70 .215
      [CN= 65.2: N= 3.00]
      [Tp=  .38:DT= 1.00]
#******************************************************************************
# Existing Catchment 102-2 - Existing drainage east to Eramosa River via Culver
#******************************************************************************
 001:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      02:102-2         11.93     .248 No_date    1:24    8.79 .217
      [CN= 65.5: N= 3.00]
      [Tp=  .34:DT= 1.00]
#******************************************************************************
# Existing Catchment 102-3 - Existing drainage to Wetland #6
#******************************************************************************
 001:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      03:102-3          1.48     .032 No_date    1:22    8.64 .214
      [CN= 65.0: N= 3.00]
      [Tp=  .32:DT= 1.00]
#******************************************************************************
# Existing Catchment 102-4 - Existing drainage east to Eramosa River via Culver
#******************************************************************************
 001:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      04:102-4           .33     .010 No_date    1:12    8.64 .214
      [CN= 65.0: N= 3.00]
      [Tp=  .19:DT= 1.00]
#******************************************************************************
# Existing Catchment 105-1 - Existing drainage east to Eramosa River via Culver
#******************************************************************************
 001:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      05:105-1          5.60     .185 No_date    1:06    6.81 .168
      [CN= 58.0: N= 3.00]
      [Tp=  .12:DT= 1.00]
#******************************************************************************
# Existing Catchment 105-2 - Existing drainage east to Eramosa River via Culver
#******************************************************************************
 001:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      06:105-2          8.96     .215 No_date    1:12    6.81 .168
      [CN= 58.0: N= 3.00]
      [Tp=  .19:DT= 1.00]
```

```
#******************************************************************************
# Existing Catchment 105-3 - Existing drainage to Wetland #6
#******************************************************************************
 001:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      07:105-3           .70     .026 No_date    1:05    6.81 .168
      [CN= 58.0: N= 3.00]
      [Tp=  .10:DT= 1.00]
#******************************************************************************
# Total Flow Off-Site to Eramosa River
#******************************************************************************
 001:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            01:102-1         14.75     .281 No_date    1:27    8.70  n/a
                    +  02:102-2         11.93     .248 No_date    1:24    8.79  n/a
                    +  03:102-3          1.48     .032 No_date    1:22    8.64  n/a
                    +  04:102-4           .33     .010 No_date    1:12    8.64  n/a
                    +  05:105-1          5.60     .185 No_date    1:06    6.81  n/a
                    +  06:105-2          8.96     .215 No_date    1:12    6.81  n/a
                    +  07:105-3           .70     .026 No_date    1:05    6.81  n/a
      [DT= 1.00]  SUM=  08:Total         43.75     .829 No_date    1:17    8.06  n/a
#******************************************************************************
# Total Flow Off-Site to Wetland #3 / Culvert #2
#******************************************************************************
 001:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            02:102-2         11.93     .248 No_date    1:24    8.79  n/a
                    +  06:105-2          8.96     .215 No_date    1:12    6.81  n/a
      [DT= 1.00]  SUM=  09:Total         20.89     .428 No_date    1:17    7.94  n/a
#******************************************************************************
  ** END OF RUN :   1
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 RUN:COMMAND#
 002:0001-----------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   2 ]
#******************************************************************************
#  Project Name: [Guelph Innovation District]    Project Number: [46927-104]
#  Date        : 01-16-2026
#  Modeller    : [MPW]
#  Company     : MTE Consultants Ltd.
#  License #   : 3057174
#******************************************************************************
# EXISTING CONDITIONS ANALYSIS
#******************************************************************************
 002:0002-----------------------------------------------------------------------------
     READ STORM
      Filename = STORM.001
      Comment  =
      [SDT= 5.00:SDUR=   3.00:PTOT=  57.18]
#******************************************************************************
# Existing Catchment 102-1 - Existing drainage east to Eramosa River via Culver
#******************************************************************************
 002:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      01:102-1         14.75     .518 No_date    1:27   16.21 .283
      [CN= 65.2: N= 3.00]
      [Tp=  .38:DT= 1.00]
#******************************************************************************
# Existing Catchment 102-2 - Existing drainage east to Eramosa River via Culver
#******************************************************************************
 002:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      02:102-2         11.93     .457 No_date    1:24   16.36 .286
      [CN= 65.5: N= 3.00]
      [Tp=  .34:DT= 1.00]
#******************************************************************************
# Existing Catchment 102-3 - Existing drainage to Wetland #6
#******************************************************************************
 002:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      03:102-3          1.48     .058 No_date    1:22   16.11 .282
      [CN= 65.0: N= 3.00]
      [Tp=  .32:DT= 1.00]
#******************************************************************************
# Existing Catchment 102-4 - Existing drainage east to Eramosa River via Culver
#******************************************************************************
 002:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      04:102-4           .33     .019 No_date    1:12   16.11 .282
      [CN= 65.0: N= 3.00]
      [Tp=  .19:DT= 1.00]
#******************************************************************************
# Existing Catchment 105-1 - Existing drainage east to Eramosa River via Culver
#******************************************************************************
 002:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      05:105-1          5.60     .342 No_date    1:06   12.94 .226
      [CN= 58.0: N= 3.00]
      [Tp=  .12:DT= 1.00]
#******************************************************************************
# Existing Catchment 105-2 - Existing drainage east to Eramosa River via Culver
#******************************************************************************
 002:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      06:105-2          8.96     .400 No_date    1:12   12.94 .226
      [CN= 58.0: N= 3.00]
      [Tp=  .19:DT= 1.00]
#******************************************************************************
# Existing Catchment 105-3 - Existing drainage to Wetland #6
#******************************************************************************
 002:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      07:105-3           .70     .048 No_date    1:05   12.94 .226
      [CN= 58.0: N= 3.00]
      [Tp=  .10:DT= 1.00]
#******************************************************************************
# Total Flow Off-Site to Eramosa River
#******************************************************************************
 002:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            01:102-1         14.75     .518 No_date    1:27   16.21  n/a
                    +  02:102-2         11.93     .457 No_date    1:24   16.36  n/a
                    +  03:102-3          1.48     .058 No_date    1:22   16.11  n/a
                    +  04:102-4           .33     .019 No_date    1:12   16.11  n/a
                    +  05:105-1          5.60     .342 No_date    1:06   12.94  n/a
                    +  06:105-2          8.96     .400 No_date    1:12   12.94  n/a
                    +  07:105-3           .70     .048 No_date    1:05   12.94  n/a
      [DT= 1.00]  SUM=  08:Total         43.75    1.537 No_date    1:17   15.11  n/a
#******************************************************************************
# Total Flow Off-Site to Wetland #3 / Culvert #2
#******************************************************************************
 002:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            02:102-2         11.93     .457 No_date    1:24   16.36  n/a
                    +  06:105-2          8.96     .400 No_date    1:12   12.94  n/a
      [DT= 1.00]  SUM=  09:Total         20.89     .794 No_date    1:17   14.89  n/a
#******************************************************************************
  ** END OF RUN :   2
*******************************************************************************
```

```
 RUN:COMMAND#
 003:0001------------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   3 ]
#*******************************************************************************
#  Project Name: [Guelph Innovation District]    Project Number: [46927-104]
#  Date        : 01-16-2026
#  Modeller    : [MPW]
#  Company     : MTE Consultants Ltd.
#  License #   : 3057174
#*******************************************************************************
# EXISTING CONDITIONS ANALYSIS
#*******************************************************************************
 003:0002------------------------------------------------------------------------------
     READ STORM
      Filename = STORM.001
      Comment  =
      [SDT= 5.00:SDUR=   3.00:PTOT=  71.25]
#*******************************************************************************
# Existing Catchment 102-1 - Existing drainage east to Eramosa River via Culver
#*******************************************************************************
 003:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      01:102-1         14.75     .748 No_date    1:27   23.69 .333
      [CN= 65.2: N= 3.00]
      [Tp=  .38:DT= 1.00]
#*******************************************************************************
# Existing Catchment 102-2 - Existing drainage east to Eramosa River via Culver
#*******************************************************************************
 003:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      02:102-2         11.93     .660 No_date    1:24   23.90 .335
      [CN= 65.5: N= 3.00]
      [Tp=  .34:DT= 1.00]
#*******************************************************************************
# Existing Catchment 102-3 - Existing drainage to Wetland #6
#*******************************************************************************
 003:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      03:102-3          1.48     .084 No_date    1:22   23.56 .331
      [CN= 65.0: N= 3.00]
      [Tp=  .32:DT= 1.00]
#*******************************************************************************
# Existing Catchment 102-4 - Existing drainage east to Eramosa River via Culver
#*******************************************************************************
 003:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      04:102-4           .33     .027 No_date    1:12   23.56 .331
      [CN= 65.0: N= 3.00]
      [Tp=  .19:DT= 1.00]
#*******************************************************************************
# Existing Catchment 105-1 - Existing drainage east to Eramosa River via Culver
#*******************************************************************************
 003:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      05:105-1          5.60     .494 No_date    1:06   19.18 .269
      [CN= 58.0: N= 3.00]
      [Tp=  .12:DT= 1.00]
#*******************************************************************************
# Existing Catchment 105-2 - Existing drainage east to Eramosa River via Culver
#*******************************************************************************
 003:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      06:105-2          8.96     .580 No_date    1:12   19.18 .269
      [CN= 58.0: N= 3.00]
      [Tp=  .19:DT= 1.00]
#*******************************************************************************
# Existing Catchment 105-3 - Existing drainage to Wetland #6
#*******************************************************************************
 003:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      07:105-3           .70     .070 No_date    1:05   19.18 .269
      [CN= 58.0: N= 3.00]
      [Tp=  .10:DT= 1.00]
#*******************************************************************************
# Total Flow Off-Site to Eramosa River
#*******************************************************************************
 003:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            01:102-1         14.75     .748 No_date    1:27   23.69  n/a
                      + 02:102-2         11.93     .660 No_date    1:24   23.90  n/a
                      + 03:102-3          1.48     .084 No_date    1:22   23.56  n/a
                      + 04:102-4           .33     .027 No_date    1:12   23.56  n/a
                      + 05:105-1          5.60     .494 No_date    1:06   19.18  n/a
                      + 06:105-2          8.96     .580 No_date    1:12   19.18  n/a
                      + 07:105-3           .70     .070 No_date    1:05   19.18  n/a
      [DT= 1.00]  SUM=  08:Total         43.75    2.227 No_date    1:17   22.17  n/a
#*******************************************************************************
# Total Flow Off-Site to Wetland #3 / Culvert #2
#*******************************************************************************
 003:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            02:102-2         11.93     .660 No_date    1:24   23.90  n/a
                      + 06:105-2          8.96     .580 No_date    1:12   19.18  n/a
      [DT= 1.00]  SUM=  09:Total         20.89    1.149 No_date    1:17   21.88  n/a
#*******************************************************************************
 003:0002------------------------------------------------------------------------------
      FINISH
--------------------------------------------------------------------------------------
**************************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2026-01-16     at 14:30:58
======================================================================================
```

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================================================================================

  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
  S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
      S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                       9   9  9   9   # 3053466
       StormWater Management HYdrologic Model           999    999    =========

 ******************************************************************************
 ***************************** SWMHYMO Ver/4.05  *****************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                 OTTHYMO-83 and OTTHYMO-89.                  *********
 ******************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                  Ottawa,  Ontario: (613) 836-3884           *********
 *********                  Gatineau, Quebec: (819) 243-6858           *********
 *********                  E-Mail: swmhymo@jfsa.Com                   *********
 ******************************************************************************

 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: MTE Consultants Inc.                        +++++++++
 +++++++++                Burlington           SERIAL#:3053466        +++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ******************************************************************************
 *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++           *********
 *********           Maximum value for ID numbers  :     10           *********
 *********           Max. number of rainfall points: 105408           *********
 *********           Max. number of flow points    : 105408           *********
 ******************************************************************************

 ***** DESCRIPTION SUMMARY TABLE HEADERS (units depend on METOUT in START) *****
 *****-------------------------------------------------------------------*****
 *****    ID:  Hydrograph IDentification numbers, (1-10).                 *****
 *****  NHYD:  Hydrograph reference numbers, (6 digits or characters).    *****
 *****  AREA:  Drainage area associated with hydrograph, (ac.) or (ha.).  *****
 ***** QPEAK:  Peak flow of simulated hydrograph, (ft^3/s) or (m^3/s).    *****
 ***** TpeakDate_hh:mm is the date and time of the peak flow.             *****
 *****  R.V.:  Runoff Volume of simulated hydrograph, (in) or (mm).       *****
 *****  R.C.:  Runoff Coefficient of simulated hydrograph, (ratio).       *****
 *****     *:  see WARNING or NOTE message printed at end of run.         *****
 *****    **:  see  ERROR  message printed at end of run.                 *****
 ******************************************************************************
 ******************************************************************************

:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

 ******************************************************************************

 ***********************   S U M M A R Y   O U T P U T   **********************
 ******************************************************************************
 *         DATE: 2026-01-16     TIME: 15:27:09     RUN COUNTER: 000217         *
 ******************************************************************************
 * Input   filename: C:\SWMHYMO\Projects\SWMHYMO\post.dat                     *
 * Output  filename: C:\SWMHYMO\Projects\SWMHYMO\post.out                     *
 * Summary filename: C:\SWMHYMO\Projects\SWMHYMO\post.sum                     *
 * User comments:                                                             *
 * 1:_________________________________________________________________________*
 * 2:_________________________________________________________________________*
 * 3:_________________________________________________________________________*
 ******************************************************************************
```

```
#******************************************************************************
#  Project Name: [Guelph Innovation District]    Project Number: [46927-104]
#  Date        : 01-16-2026
#  Modeller    : [MPW]
#  Company     : MTE Consultants Ltd.
#  License #   : 3057174
#******************************************************************************
# PROPOSED CONDITIONS ANALYSIS
#******************************************************************************
 RUN:COMMAND#
 001:0001--------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   1 ]
 001:0002--------------------------------------------------------------------------
     READ STORM
      Filename = STORM.001
      Comment  =
      [SDT= 5.00:SDUR=   3.00:PTOT=  40.47]
#******************************************************************************
# Proposed Catchment 202-1 - Proposed drainage to SWMF2
#******************************************************************************
 001:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN STANDHYD     01:202-1         10.16    2.711 No_date    1:01   29.44 .727
      [XIMP=.66:TIMP=.66]
      [SLP=1.50:DT= 1.00]
      [LOSS= 2 :CN= 68.0]
#******************************************************************************
#******************************************************************************
# Preliminary SWMF 2 Design
#******************************************************************************
 001:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE RESERVOIR -> 01:202-1         10.16    2.711 No_date    1:01   29.44  n/a
      [RDT= 1.00] out<- 02:SWMF-2        10.16     .149 No_date    2:00   29.44  n/a
            overflow <= 03:ovflw-2         .00     .000 No_date    0:00     .00  n/a
     {MxStoUsed=.2169E+00, TotOvfVol=.0000E+00, N-Ovf=    0, TotDurOvf=    0.hrs}
#******************************************************************************
# Uncontrolled Flow East to Eramosa River
#******************************************************************************
 001:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      04:202-2          2.68     .138 No_date    1:06   10.31 .255
      [CN= 70.1: N= 3.00]
      [Tp=  .12:DT= 1.00]
 001:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      05:202-3-1         .68     .055 No_date    1:02   10.09 .249
      [CN= 69.5: N= 3.00]
      [Tp=  .06:DT= 1.00]
 001:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      06:202-3-2        1.77     .160 No_date    1:01   10.09 .249
      [CN= 69.5: N= 3.00]
      [Tp=  .05:DT= 1.00]
 001:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      07:202-3-3         .23     .021 No_date    1:01   10.09 .249
      [CN= 69.5: N= 3.00]
      [Tp=  .05:DT= 1.00]
 001:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      08:205-1          5.60     .185 No_date    1:06    6.81 .168
      [CN= 58.0: N= 3.00]
      [Tp=  .12:DT= 1.00]
 001:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      09:205-2          8.96     .215 No_date    1:12    6.81 .168
      [CN= 58.0: N= 3.00]
      [Tp=  .19:DT= 1.00]
```

```
 001:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      10:205-3           .70     .026 No_date    1:05    6.81 .168
      [CN= 58.0: N= 3.00]
      [Tp=  .10:DT= 1.00]
#******************************************************************************
# Total Flow Off-Site to Eramosa River
#******************************************************************************
 001:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            02:SWMF-2        10.16     .149 No_date    2:00   29.44  n/a
                     +  03:ovflw-2         .00     .000 No_date    0:00     .00  n/a
                     +  04:202-2          2.68     .138 No_date    1:06   10.31  n/a
                     +  05:202-3-1         .68     .055 No_date    1:02   10.09  n/a
                     +  06:202-3-2        1.77     .160 No_date    1:01   10.09  n/a
                     +  07:202-3-3         .23     .021 No_date    1:01   10.09  n/a
                     +  08:205-1          5.60     .185 No_date    1:06    6.81  n/a
                     +  09:205-2          8.96     .215 No_date    1:12    6.81  n/a
                     +  10:205-3           .70     .026 No_date    1:05    6.81  n/a
      [DT= 1.00]  SUM=  01:Total         30.78     .678 No_date    1:06   14.87  n/a
#******************************************************************************
# Total Flow Off-Site to Wetland #3 / Culvert #2
#******************************************************************************
 001:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            02:SWMF-2        10.16     .149 No_date    2:00   29.44  n/a
                     +  03:ovflw-2         .00     .000 No_date    0:00     .00  n/a
                     +  06:202-3-2        1.77     .160 No_date    1:01   10.09  n/a
                     +  09:205-2          8.96     .215 No_date    1:12    6.81  n/a
      [DT= 1.00]  SUM=  04:Total         20.89     .310 No_date    1:13   18.10  n/a
#******************************************************************************
  ** END OF RUN :   1
*******************************************************************************
 RUN:COMMAND#
 002:0001-----------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   2 ]
#******************************************************************************
#  Project Name: [Guelph Innovation District]    Project Number: [46927-104]
#  Date        : 01-16-2026
#  Modeller    : [MPW]
#  Company     : MTE Consultants Ltd.
#  License #   : 3057174
#******************************************************************************
# PROPOSED CONDITIONS ANALYSIS
#******************************************************************************
 002:0002-----------------------------------------------------------------------------
     READ STORM
      Filename = STORM.001
      Comment  =
      [SDT= 5.00:SDUR=   3.00:PTOT=  57.18]
#******************************************************************************
# Proposed Catchment 202-1 - Proposed drainage to SWMF2
#******************************************************************************
 002:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN STANDHYD    01:202-1         10.16    3.786 No_date    1:01   43.23 .756
      [XIMP=.66:TIMP=.66]
      [SLP=1.50:DT= 1.00]
      [LOSS= 2 :CN= 68.0]
#******************************************************************************
```

```
#******************************************************************************
# Preliminary SWMF 2 Design
#******************************************************************************
 002:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE RESERVOIR -> 01:202-1         10.16    3.786 No_date    1:01   43.23  n/a
      [RDT= 1.00] out<- 02:SWMF-2        10.16     .357 No_date    1:34   43.23  n/a
            overflow <= 03:ovflw-2         .00     .000 No_date    0:00     .00  n/a
     {MxStoUsed=.2748E+00, TotOvfVol=.0000E+00, N-Ovf=    0, TotDurOvf=    0.hrs}
#******************************************************************************
# Uncontrolled Flow East to Eramosa River
#******************************************************************************
 002:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      04:202-2          2.68     .249 No_date    1:06   18.90 .331
      [CN= 70.1: N= 3.00]
      [Tp=  .12:DT= 1.00]
 002:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      05:202-3-1         .68     .098 No_date    1:02   18.55 .324
      [CN= 69.5: N= 3.00]
      [Tp=  .06:DT= 1.00]
 002:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      06:202-3-2        1.77     .285 No_date    1:01   18.55 .324
      [CN= 69.5: N= 3.00]
      [Tp=  .05:DT= 1.00]
 002:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      07:202-3-3         .23     .037 No_date    1:01   18.55 .324
      [CN= 69.5: N= 3.00]
      [Tp=  .05:DT= 1.00]
 002:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      08:205-1          5.60     .342 No_date    1:06   12.94 .226
      [CN= 58.0: N= 3.00]
      [Tp=  .12:DT= 1.00]
 002:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      09:205-2          8.96     .400 No_date    1:12   12.94 .226
      [CN= 58.0: N= 3.00]
      [Tp=  .19:DT= 1.00]
 002:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      10:205-3           .70     .048 No_date    1:05   12.94 .226
      [CN= 58.0: N= 3.00]
      [Tp=  .10:DT= 1.00]
#******************************************************************************
# Total Flow Off-Site to Eramosa River
#******************************************************************************
 002:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            02:SWMF-2        10.16     .357 No_date    1:34   43.23  n/a
                     +  03:ovflw-2         .00     .000 No_date    0:00     .00  n/a
                     +  04:202-2          2.68     .249 No_date    1:06   18.90  n/a
                     +  05:202-3-1         .68     .098 No_date    1:02   18.55  n/a
                     +  06:202-3-2        1.77     .285 No_date    1:01   18.55  n/a
                     +  07:202-3-3         .23     .037 No_date    1:01   18.55  n/a
                     +  08:205-1          5.60     .342 No_date    1:06   12.94  n/a
                     +  09:205-2          8.96     .400 No_date    1:12   12.94  n/a
                     +  10:205-3           .70     .048 No_date    1:05   12.94  n/a
      [DT= 1.00]  SUM=  01:Total         30.78    1.355 No_date    1:07   23.94  n/a
#******************************************************************************
# Total Flow Off-Site to Wetland #3 / Culvert #2
#******************************************************************************
 002:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            02:SWMF-2        10.16     .357 No_date    1:34   43.23  n/a
                     +  03:ovflw-2         .00     .000 No_date    0:00     .00  n/a
                     +  06:202-3-2        1.77     .285 No_date    1:01   18.55  n/a
                     +  09:205-2          8.96     .400 No_date    1:12   12.94  n/a
      [DT= 1.00]  SUM=  04:Total         20.89     .732 No_date    1:14   28.14  n/a
#******************************************************************************
  ** END OF RUN :   2
*******************************************************************************
```

```
 RUN:COMMAND#
 003:0001------------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   3 ]
#*******************************************************************************
#  Project Name: [Guelph Innovation District]    Project Number: [46927-104]
#  Date        : 01-16-2026
#  Modeller    : [MPW]
#  Company     : MTE Consultants Ltd.
#  License #   : 3057174
#*******************************************************************************
# PROPOSED CONDITIONS ANALYSIS
#*******************************************************************************
 003:0002------------------------------------------------------------------------------
     READ STORM
      Filename = STORM.001
      Comment  =
      [SDT= 5.00:SDUR=   3.00:PTOT=  71.25]
#*******************************************************************************
# Proposed Catchment 202-1 - Proposed drainage to SWMF2
#*******************************************************************************
 003:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN STANDHYD    01:202-1         10.16    4.629 No_date    1:01   55.24 .775
      [XIMP=.66:TIMP=.66]
      [SLP=1.50:DT= 1.00]
      [LOSS= 2 :CN= 68.0]
#*******************************************************************************
#*******************************************************************************
# Preliminary SWMF 2 Design
#*******************************************************************************
 003:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE RESERVOIR -> 01:202-1         10.16    4.629 No_date    1:01   55.24  n/a
      [RDT= 1.00] out<- 02:SWMF-2        10.16     .580 No_date    1:26   55.23  n/a
            overflow <= 03:ovflw-2         .00     .000 No_date    0:00     .00  n/a
     {MxStoUsed=.3233E+00, TotOvfVol=.0000E+00, N-Ovf=    0, TotDurOvf=    0.hrs}
#*******************************************************************************
# Uncontrolled Flow East to Eramosa River
#*******************************************************************************
 003:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      04:202-2          2.68     .352 No_date    1:06   27.32 .383
      [CN= 70.1: N= 3.00]
      [Tp=  .12:DT= 1.00]
 003:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      05:202-3-1         .68     .137 No_date    1:02   26.85 .377
      [CN= 69.5: N= 3.00]
      [Tp=  .06:DT= 1.00]
 003:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      06:202-3-2        1.77     .400 No_date    1:01   26.85 .377
      [CN= 69.5: N= 3.00]
      [Tp=  .05:DT= 1.00]
 003:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      07:202-3-3         .23     .052 No_date    1:01   26.85 .377
      [CN= 69.5: N= 3.00]
      [Tp=  .05:DT= 1.00]
 003:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      08:205-1          5.60     .494 No_date    1:06   19.18 .269
      [CN= 58.0: N= 3.00]
      [Tp=  .12:DT= 1.00]
 003:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      09:205-2          8.96     .580 No_date    1:12   19.18 .269
      [CN= 58.0: N= 3.00]
      [Tp=  .19:DT= 1.00]
 003:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     DESIGN NASHYD      10:205-3           .70     .070 No_date    1:05   19.18 .269
      [CN= 58.0: N= 3.00]
      [Tp=  .10:DT= 1.00]
#*******************************************************************************
# Total Flow Off-Site to Eramosa River
#*******************************************************************************
 003:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            02:SWMF-2        10.16     .580 No_date    1:26   55.23  n/a
                    +  03:ovflw-2         .00     .000 No_date    0:00     .00  n/a
                    +  04:202-2          2.68     .352 No_date    1:06   27.32  n/a
                    +  05:202-3-1         .68     .137 No_date    1:02   26.85  n/a
                    +  06:202-3-2        1.77     .400 No_date    1:01   26.85  n/a
                    +  07:202-3-3         .23     .052 No_date    1:01   26.85  n/a
                    +  08:205-1          5.60     .494 No_date    1:06   19.18  n/a
                    +  09:205-2          8.96     .580 No_date    1:12   19.18  n/a
                    +  10:205-3           .70     .070 No_date    1:05   19.18  n/a
      [DT= 1.00]  SUM=  01:Total         30.78    2.070 No_date    1:07   32.46  n/a
#*******************************************************************************
# Total Flow Off-Site to Wetland #3 / Culvert #2
#*******************************************************************************
 003:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            02:SWMF-2        10.16     .580 No_date    1:26   55.23  n/a
                    +  03:ovflw-2         .00     .000 No_date    0:00     .00  n/a
                    +  06:202-3-2        1.77     .400 No_date    1:01   26.85  n/a
                    +  09:205-2          8.96     .580 No_date    1:12   19.18  n/a
      [DT= 1.00]  SUM=  04:Total         20.89    1.173 No_date    1:14   37.36  n/a
#*******************************************************************************
 003:0002------------------------------------------------------------------------------
      FINISH
-------------------------------------------------------------------------------------
*************************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2026-01-16     at 15:27:11
=====================================================================================
```