October 15, 2026

Ned Lathrop
St. Faustina Parish
2571 Highway 174, P.O. Box 174
Cumberland, Ontario
K4C 1E5

Re: Water Balance, 2835 Old Montreal Road, Cumberland, Ontario (Egis No. CCO-25-1892)

Egis Canada Ltd ('Egis') was retained by Ned Lathrop ('the Client') to complete a Water Balance in connection with the property located at 2835 Old Montreal Road, Cumberland, Ontario ('the Site'). It is our understanding that the Client is planning to construct the St Faustina New Parish, which includes a building, parking lot, and storage space.

The Client is requesting this non-feature specific Water Balance assessment on the existing pre-development and proposed post-development conditions. Egis has prepared the following Water Balance based on a review of hydrogeological and meteorological data, and references the latest Site Plan drawing. This Water Balance is completed for the area of development only.

The details of the scope of work are outlined below.

1.0 BACKGROUND

1.1.1 Proposed Construction

The details about the proposed construction used for the Water Balance were obtained from the Site Plan "St. Faustina New Prish" drawing A101 and dated September 22, 2026, and the "Servicing and Stormwater Management Report – St. Faustina – 2835 Old Montreal Road", dated September 23, 2026.

Based on the elevations provided in the Pre-Development Drainage Area Plan, dated September 23, 2026 and prepared by Egis, the average ground surface elevation ranged from 56.74 m asl (metres above sea level) in the northeast portion of the Site to 61.16 m asl.

2.0 WATER BALANCE

In order to assess the potential for impacts to the existing local groundwater regime, a detailed Water Balance has been carried out for the Site to determine the pre- and post-development infiltration volumes. The water balance calculations are discussed further in the following sections.

2.1 Water Balance Components

A water balance is used to quantify the availability of water resources within a given area. It is estimated based on the following analytical model:

$$P = S+ET+R+1$$

Where,

P = precipitation
S = change in groundwater storage
ET = evapotranspiration/evaporation
R = surface water runoff
I = infiltration

The components of the water balance vary in space and time and depend on climatic conditions, as well as the soil and land cover conditions (i.e. rainfall intensity, land slope, soil hydraulic conductivity, and vegetation). Runoff, for example, occurs particularly during periods of snowmelt when the groundwater is frozen, or during intense rainfall events. Precise measurement of the water balance components is difficult; this, approximations and simplifications are made to characterize the water balance of a study area. Field observations of the drainage conditions, land cover and soil types, groundwater levels, and local climatic records are important input considerations for the water balance calculations.

In the water balance equation, Precipitation (P) is typically a measured value. Evapotranspiration (ET) is calculated based on number of parameters including measured air temperatures, type of vegetation, and soil moisture. Infiltration (I) and Runoff (R) are calculated based on P and ET, where the difference between P and ET is the water surplus (WS) available for Infiltration (I) and Runoff (R) as follows:

$$WS = P – ET$$

Where,

WS is used to calculate I after applying an infiltration factor (IF), I = WS x IF; and
R is estimated by subtracting I from WS, R = WS – I.

The groundwater balance components for the Subject Property are discussed below.

Precipitation and Evapotranspiration

Based on weather station data from the Ottawa (City) (Climate ID: 6105976), the annual precipitation rate in the area is 938 mm/year and the annual evapotranspiration rate in the area is 616 mm. on this basis, there is a water surplus rate of 322 mm/annum. Depending on the site topography, subsurface soil conditions and land cover, the available water surplus translates proportionately into infiltration and surface runoff.

Infiltration and Runoff

According to the Ontario Stormwater Management Planning and Design Manual (March 2003), a series of infiltration factors can be applied to a site, based on its slope, soil type, and vegetation coverage. The cumulative value of these factors is termed the infiltration factor, with the values ranging from 0 to 1. The difference between the value 1 and the infiltration factor is referred to as the runoff factor.

Slope has an influence upon the infiltration and runoff. Based on the Site Plan entitled "Pre-Development Drainage Area Plan", dated September 23, 2026 and prepared by Egis., the surface topography at the Site is varies from 56.74 m asl in the northeast portion of the Site to 61.16 m asl in the southwest portion. On this basis, there is approximately 4.42 m of relief across the Site with an approximate average interpolated slope of 27.6 m/km. Surficial soil and vegetation coverage and/or the cropping practice also contribute to infiltration and runoff factors. During the Site investigations, the surficial soil coverage for the Site was found to consist predominantly of silty clay with trace sand. Based on the Sites topography, the predominant surficial soil and vegetation cover, the cumulative infiltration factor and corresponding runoff factor have been selected as provided in Table 1, below.

Table 1 – Thornwaite and Mather Model Calculations

Land Characteristics	MECP infiltration Factors (1995)	Water Surplus Estimate (mm/year)	Infiltration Estimate (mm/year)	Runoff Estimate (mm/year)
Soil (Silty Clay, trace sand)	0.15	**322**	I = 0.35x 322	R = 322 – 113
Slope (average estimated slope of 27.6 m/km)	0.1			
Vegetation Cover	0.1			
Site Infiltration Factor	**0.35**		**113**	**209**

The water balance components estimated for the Site are summarized in Table 2 below.

Table 2 – Estimated Site Water Balance Parameters

Precipitation (mm/year)	Evapotranspiration (mm/year)	Runoff (mm/year)	Infiltration (mm/year)
938	616	209	113

2.1 Pre-Development Water Balance

The pervious and impervious areas for the pre-development and post-development condition at the Site have been estimated using the following:

- "Servicing and Stormwater Management Report – St. Faustina – 2835 Old Montreal Road", dated September 23, 2026 and prepared by Egis; and
- "Site Plan – St Faustina New Parish" dated September 22, 2026 and prepared by Cunliffe & Associates, Chorley + Bisset Consulting Engineers, and Egis.

Considering that the focus of this water balance assessment is to estimate the reduction in the average annual infiltration rates as a result of the proposed building additions, the pre-development volumetric average annual water balance parameters for the previous area were calculated by multiplying the existing pervious Site areas by the averaged annual estimates for precipitation, evapotranspiration, infiltration, and runoff.

For the purpose of assessing the worst-case scenario, the landscaped areas within the Site were considered as comprised of urban vegetation during the pre-development conditions.

The average volumetric annual estimates for the water balance components are shown in Table 3, below.

Table 3 – Summary of Pre-Development Water Balance Components

Pre-Development Site Areas	Area Coverage (m^2)	Precipitation (m^3/year)	Evapotranspiration (m^3/year)	Infiltration (m^3/year)	Runoff (m^3/year)
Hard Surface Areas	0	0	0	0	0
Building Coverage	0	0	0	0	0
Landscaped/Vegetated Area	24,512	22,992	15,099	2,763	5,130
Total Area/Volume	**24,512**	**22,992**	**15,099**	**2,763**	**5,130**

As shown in the above table, the average annual infiltration volumes for the pre-development site condition is 2,763 m^3/year.

2.2 Post-Development Water Balance

The pervious and impervious areas for the post-development condition at the Site have been estimated using the Site Plan and proposed site statistics provided in the report entitled "Servicing and Stormwater Management Report" prepared September 23, 2026 and prepared by Egis.

Generally, site development involves an increase in impervious/hard surfaces (i.e. paved surfaces, parking lots, roadways, rooftops), relative to vegetated/landscaped areas, which in turn reduces the volume of Site runoff.

Post-development volumetric annual water balance parameters for the pervious and impervious area are shown in Table 4, below.

Table 4 – Summary of Post-Development Water Balance Components

Pre-Development Site Areas	Area Coverage (m^2)	Precipitation (m^3/year)	Evapotranspiration (m^3/year)	Infiltration (m^3/year)	Runoff (m^3/year)
Paved Area	5,867	5,503	550	0	4,953
Building Coverage	1,125	1,055	106	0	950
Landscaped/Vegetated Area	17,520	16,434	10,792	1,975	3,667
Total Area/Volume	**24,512**	**22,992**	**11,448**	**1,975**	**9,570**

As shown in the Table above, the average annual infiltration volumes for the post-development site condition is 1,975 m^3/year.

2.3 Pre- and Post-Development Water Balance Comparison

A summary of the findings from the pre- and post-development water balance assessment is provided in Table 5, below.

Table 5 – Pre- and Post-Development Water Balance Summary

Area	Pre Development	
	Infiltration (m^3/year)	Runoff (m^3/year)
Pre-Development	2,763	5,130
Post-Development	1,975	9,570
Change in Rate	-788	+4,440

As indicated in Table 5, the proposed plans for development will result in an overall decrease in the Site infiltration and an overall increase in the Site surface runoff. In the absence of any mitigative measures, it is estimated that there will be a 788 m^3/year reduction in the infiltration rates following the construction of the building at the Site.

4.0 CONCLUSIONS

We trust that this information is satisfactory for your present requirements. Should you have any questions or require additional information, please do not hesitate to contact the undersigned.

Sincerely,

Egis,

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Attachments:
Water Balance Calculation Spreadsheet

Water Balance

To be used in combination with the infiltration memo provided.

Egis

Hydrogeological Assessment

2835 Old Montreal Road, Cumberland, Ontario

Climate Data	
Precipitation (m/annum)	0.938
Evapotranspiration (m/annum)	0.616
Surplus Rate (m/annum)	0.322

Table 2: Infiltration Factors (MOEE, 1995)	
Soil (Silty Clay tr sand)	0.15
*Slope (>27.6m/km) hilly	0.1
Vegetation Cover (cultivated equivalent)	0.1
Infiltration Factor	**0.35**
Runoff Factor	**0.65**
Infiltration Rate (m^3/annum)	**0.113**
Runoff Rate (m^3/annum)	**0.209**

Site Statistics - Pre-Development	
Area Covered by Hard Surfaces (m^2)	0
Area Covered by Buildings (m^2)	0
Area Covered by Landscaped/Vegetation (m^2)	24,512
Total Site Area (m^2)	***24,512***

Site Statistics - Post-Development	
Area Covered by Hard Surfaces (m^2)	5,867
Area Covered by Buildings (m^2)	1,125
Area Covered by Landscaped/Vegetation (m^2)	17,520
Total Site Area (m^2)	***24,512***

Pre-Development Water Balance

Land Use Type	Land Use Area	Precipitation (m^3/a)	Evapotranspiration (m^3/a)	Infiltration (m^3/a)	Runoff (m^3/a)
Area Covered by Hard Surfaces (m^2)	0	0	0	0	0
Area Covered by Buildings (m^2)	0	0	0	0	0
Area Covered by Landscaped/Vegetation (m^2)	24,512	22,992	15,099	2,763	5,130
Total	***24,512***	***22,992***	***15,099***	***2,763***	***5,130***

Post-Development Water Balance

Land Use Type	Land Use Area	Precipitation (m^3/a)	Evapotranspiration (m^3/a)	Infiltration (m^3/a)	Runoff (m^3/a)
Area Covered by Paved Surfaces (m^2)	5,867	5,503	550	0	4,953
Area Covered by Buildings (m^2)	1,125	1,055	106	0	950
Area Covered by Landscaped/Vegetation (m^2)	17,520	16,434	10,792	1,975	3,667
Total	***24,512***	***22,992***	***11,448***	***1,975***	***9,570***

Impact Assessment & Mitigation	
Pre-Development Infiltration (m^3/a)	2,763
Post-Development Infiltration (m^3/a)	1,975
Change in Infiltration Volume, Post Development (m^3/a)	***-788***
Available Post-Development Roof Runoff (m^3/a)	***950***
Post-Development Roof Runoff Required for Mitigation	***83%***

AREA Data

"Servicing and Stormwater Management Report – St. Faustina – 2835 Old Montreal Road", dated September 23, 2026 and prepared by Egis; and

"Site Plan – St Faustina New Parish" dated September 22, 2026 and prepared by Cunliffe & Associates, Chorley + Bisset Consulting Engineers, and Egis.