STORMWATER MANAGEMENT BRIEF

4011 Vaughan Side Road, Carp, ON

Prepared For:

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Prepared By:

Intelligent, Intuitive, Inspired
IN ENGINEERING + PLANNING
PLANNING
LAND DEVELOPMENT
ENGINEERING
BUILDING DESIGN

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Job No. 12486

August 11, 2026

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1.0 Introduction

IN Engineering + Planning ("IN Engineering") has been retained by Hidden Pond Winery to prepare this Stormwater Management ("SWM") Brief in support of a Site Plan Control application to the City of Ottawa for a proposed change of use at 4011 Vaughan Side Road in Carp, Ontario.

The subject property is approximately 16.39 hectares in area and currently contains an existing single-storey residential dwelling, single-storey winery building, and vineyard lands extending across the central and northern portions of the site. According to the owner, the new winery building was previously constructed under a separate permit. The owner is now proposing a change of use to permit grape processing, wine production, and a farmgate tasting area open to the public as an On-Farm Diversified Use.

To support this application, minor site modifications are proposed, including widening of the existing gravel driveway and expansion of a gravel parking area to accommodate the proposed use. This SWM Brief has been prepared to demonstrate that the proposed changes will not negatively impact stormwater quantity or quality and that the site will remain generally compliant with applicable municipal stormwater management criteria.

Refer to **Figure 1** below for the site location.

Figure 1: Aerial View of Site

1.1 Scope of Work and Objectives

The objectives of this SWM Brief are to:

- Evaluate existing site drainage conditions
- Assess the impact of the proposed development on stormwater runoff
- Demonstrate compliance with municipal SWM criteria
- Identify any required stormwater management controls

The following design criteria have been considered:

- Post-development peak flows (up to the 100-year event) are to be controlled to pre-development levels
- Stormwater quality control is to achieve 80% Total Suspended Solids (TSS) removal
- Grading and drainage design is to be consistent with the proposed Site Plan

2.0 References

The design and analysis presented in this brief are based on the following guidelines and reference materials:

[1] Ministry of the Environment, *Stormwater Management Planning and Design Manual*, Ontario, Canada, Mar. 2003.

[2] Ministry of Transportation Ontario, *Hydrotechnical Design Charts*, Jan. 2023.

[3] Ontario Ministry of Transportation, “IDF Curves Map Acquisition,” *IDF Curves*, n.d. [Online]. Available: https://idfcurves.mto.gov.on.ca/map_acquisition.shtml.

[4] City of Ottawa, Sewer Design Guideline SDG 004, Fourth Edition, December 2025, chapter 8.0 “Stormwater Management”.

3.0 Development Description & Study Area

The proposed development consists of the conversion of the new winery building to support wine production and a tasting area, together with minor modifications to the existing driveway and parking areas. The existing gravel driveway will be slightly widened from an existing width of 4.8 m to a width of 6 m, and the gravel parking area expanded (adding +/- 240 m²) to accommodate additional visitors to the farmgate winery.

For the purposes of the stormwater management analysis, a scoped study area of approximately 1.37 hectares has been defined in addition to the entire property. This scoped

study area includes the existing winery building, the expanded proposed driveway and parking area, and the existing residential dwelling. The remainder of the property, consisting primarily of vineyards and pasture lands, will remain unchanged and is not expected to experience any alteration in drainage characteristics.

The proposed grading and drainage design for the development is illustrated on the **Grading and Drainage Plan** prepared by IN Engineering (Drawing C-2), included in **Appendix A**.

4.0 Existing Drainage Conditions

Under existing conditions, the site generally drains from southwest to northeast via overland flow following the natural topography of the property. Runoff for scoped study area mostly flows away from Vaughan Side Road in a northeasterly direction, with roadside ditches along Vaughan Side Road conveying flows eastward toward Upper Dwyer Hill Road.

Almost the entire property (16.39 ha), with the exemption of the existing/new buildings (+/- 369 m²) is entirely permeable and consists of vineyard lands and pasture areas that naturally allows for runoff retention/infiltration limiting runoff off-site. Based on AgMaps soil classification information provided in **Appendix D**, the native soils in the study area are classified as a Hydrologic Soil Group B (well drained).

There is no formal storm sewer system servicing the site. Existing drainage occurs via natural overland flow and roadside ditch conveyance, which will remain the case under post-development conditions.

5.0 Proposed Drainage & SWM Strategy

The proposed SWM approach is based on maintaining existing drainage patterns while providing practical runoff treatment, retention and detention measures to help mitigate the very slight increase to runoff generated from the minor expansion of the gravel driveway, gravel parking area, and winery building (concrete pad and wood framed landing).

Runoff from the winery roof and gravel surfaces will be conveyed via overland flow toward a proposed 2.75m wide enhanced swale that will include plantings for screening on the northern half along the center and will be underlaid by a sand filter layer and filter fabric (non-woven

geotextile). The enhanced swale will be located along the east side of the driveway and parking area to intersect runoff from the proposed site works. The maintained gravel and landscaped surfaces, together with proposed enhanced swale with plantings, topsoil, filter fabric and sand filter layer will provide adequate runoff treatment prior to conveying flows overland downstream through existing landscaped lands.

Flow from the enhanced swale will convey runoff to the north end of the parking area and will naturally overflow and drain northeast through existing landscaped areas that ultimately drain into Upper Dwyer Hill Road drainage ditch consistent with current site drainage patterns.

To match existing grading, portions of the swale are graded as steep as 5% (noting that most grass swales can typically accommodate slopes up to approximately 6% when appropriately vegetated and stabilized). The proposed planting will provide adequate stabilization and erosion protection. The swale and plantings will be maintained, monitored and repaired as required, particularly after periods of high rainfall.

Given the minor increase in site impervious, the proposed SWM approach will not include full stormwater detention analysis and measures as the increase is considered negligible. It is our opinion that the proposed enhanced swale with sand filter layer that has stormwater detention capacity will provide practical mitigation measures to address the minor increase in site imperviousness.

6.0 Stormwater Management Analysis

6.1 Hydrologic Methodology

Stormwater runoff from the property area was evaluated using the Rational Method. Runoff coefficients were assigned based on surface types including roof area, gravel surfaces, and landscaped areas, as suggested in *MTO Design Chart 1.07*. See **Table 1** for pre- vs post-development areas and runoff coefficients. A time of concentration of 10 minutes was assumed for the study area based on site characteristics and overland flow conditions. Rainfall intensities for return periods ranging from the 2-year to 100-year storm events were obtained from the Ministry of Transportation (MTO) *IDF Curve Lookup* **[3]** for the specific site location. The calculated pre-development and post-development peak flows are summarized in **Table 2**. Refer to **Appendix C** for detailed calculations.

Table 1: Pre- and Post-Development Runoff Coefficients

Surface Type	Area (ha)	Runoff Coefficient (C)
Pre-Development		
Grass/Landscaped	16.224	0.25
Gravel	0.124	0.40
Building/Roof	0.029	0.90
Concrete	0.005	0.90
TOTAL / Weighted	16.382	**0.2525**
Post-Development		
Grass/Landscaped	16.171	0.25
Gravel	0.173	0.40
Building/Roof	0.032	0.90
Concrete	0.006	0.90
TOTAL / Weighted	16.382	**0.2531**

As shown above, the increase in the site's total imperviousness by +0.23% can be considered negligible where the site remains primarily landscaped with a runoff coefficient of 0.25.

6.2 Stormwater Quantity Control

The City of Ottawa requires that post-development peak flows for all storm events up to the 100-year storm be controlled to pre-development rates; however, given the negligible increase in flows, the existing and continued agricultural land-use, and rural receiving system (road drainage ditch), stormwater detention to the full extent is not pursued, as the measured increase in flow would be within the accuracy of any hydrologic modeling analysis. Instead, the detention volumes provided by the enhanced swale may be considered an appropriate and practical mitigation measures to address the negligible increase.

The increased stormwater flows for the 2- to 100-year storm events are shown in **Table 2**.

Table 2: 2- to 100-Year Storm Flows

Scoped Study Area (1.37 ha)				
Storm Event	**Post-Development Flow (m^3/s)**	**Pre-Development Flow (m^3/s)**	**Flow Increase (m^3/s)**	**Flow Increase (%)**
2-Year	0.077	0.075	0.002	2.67%
5-Year	0.102	0.100	0.003	3.00%
10-Year	0.119	0.116	0.003	2.59%
25-Year	0.154	0.150	0.004	2.67%
50-Year	0.187	0.182	0.005	2.75%
100-Year	0.214	0.208	0.005	2.40%
Entire Property (16.382 ha)				
Storm Event	**Post-Development Flow (m^3/s)**	**Pre-Development Flow (m^3/s)**	**Flow Increase (m^3/s)**	**Flow Increase (%)**
2-Year	0.810	0.808	0.002	0.25%
5-Year	1.076	1.073	0.003	0.28%
10-Year	1.253	1.250	0.003	0.24%
25-Year	1.623	1.619	0.004	0.25%
50-Year	1.964	1.959	0.005	0.25%
100-Year	2.246	2.240	0.005	0.22%

Based on the Rational Method analysis for the 1.37 ha scoped study area, the increase in flows range from 2.40% to 3.00%, while the entire property of 16.38 ha will experience an increase in flows ranging from 0.22% to 0.28%. As highlighted by these results, the increase in runoff is relatively minor.

The required storage volume for the 100-year storm event has been calculated as approximately 3.25 m^3 based on a time of concentration of 10 min. Considering the 150mm sand layer to have a conservative void ratio of 40%, the 61m long, 2.75m wide enhanced swale will provide approximately 10.1 m^3 of detention capacity.

6.3 Stormwater Quality Control

Stormwater quality control requirements for the site consist of achieving a minimum of 80% total suspended solids (TSS) removal, in accordance with City of Ottawa criteria. This requirement is achieved considering a treatment train approach. Pervious surface (landscape, gravel parking lot/driveway surface) are maintained that naturally provides pre-treatment, followed by filtration through the proposed (enhanced swale) and existing conveyance system (existing landscape areas) prior to discharging onto the municipal right-of-way.

Runoff from the subject area is directed to the enhanced swale, where it undergoes filtration through the proposed plantings, topsoil, filter fabric and sand filter later covering the native soils. This process provides effective removal of suspended solids and is consistent with low impact development best practices suitable for rural and agricultural settings. As noted in *Section 4.0*, the soils are classified as **Hydrologic Soil Group B** based on AgMaps mapping. Given the limited scale of development and the absence of direct discharge to a receiving watercourse, the proposed approach is considered appropriate and effective.

7.0 Conclusion

The proposed change of use for the Hidden Pond Winery represents a minor modification to an existing developed rural property and results in only a small increase in site imperviousness associated with the gravel driveway and parking expansion.

The stormwater management strategy for the site maintains existing drainage patterns and incorporates an enhanced swale to manage runoff from the developed area. Hydrologic analysis demonstrates that post-development peak flows are negligibly increased and that sufficient on-site storage is provided to generally meet City of Ottawa requirements.

Stormwater quality control is achieved through an integrated treatment train strategy comprising maintained pervious surfaces for pre-treatment and an enhanced swale for runoff capture and filtration. The enhanced swale provides effective total suspended solids (TSS) removal prior to discharge across existing landscaped areas, which offer supplementary filtration and infiltration benefits before runoff reaches off-site drainage pathways. The proposed drainage design maintains existing drainage patterns and is not anticipated to create adverse impacts to adjacent lands or downstream drainage systems.

Based on the analysis presented in this report, the proposed development satisfies the stormwater management requirements of the City of Ottawa Site Plan Control process.

IN ENGINEERING LTD.

August 11, 2026

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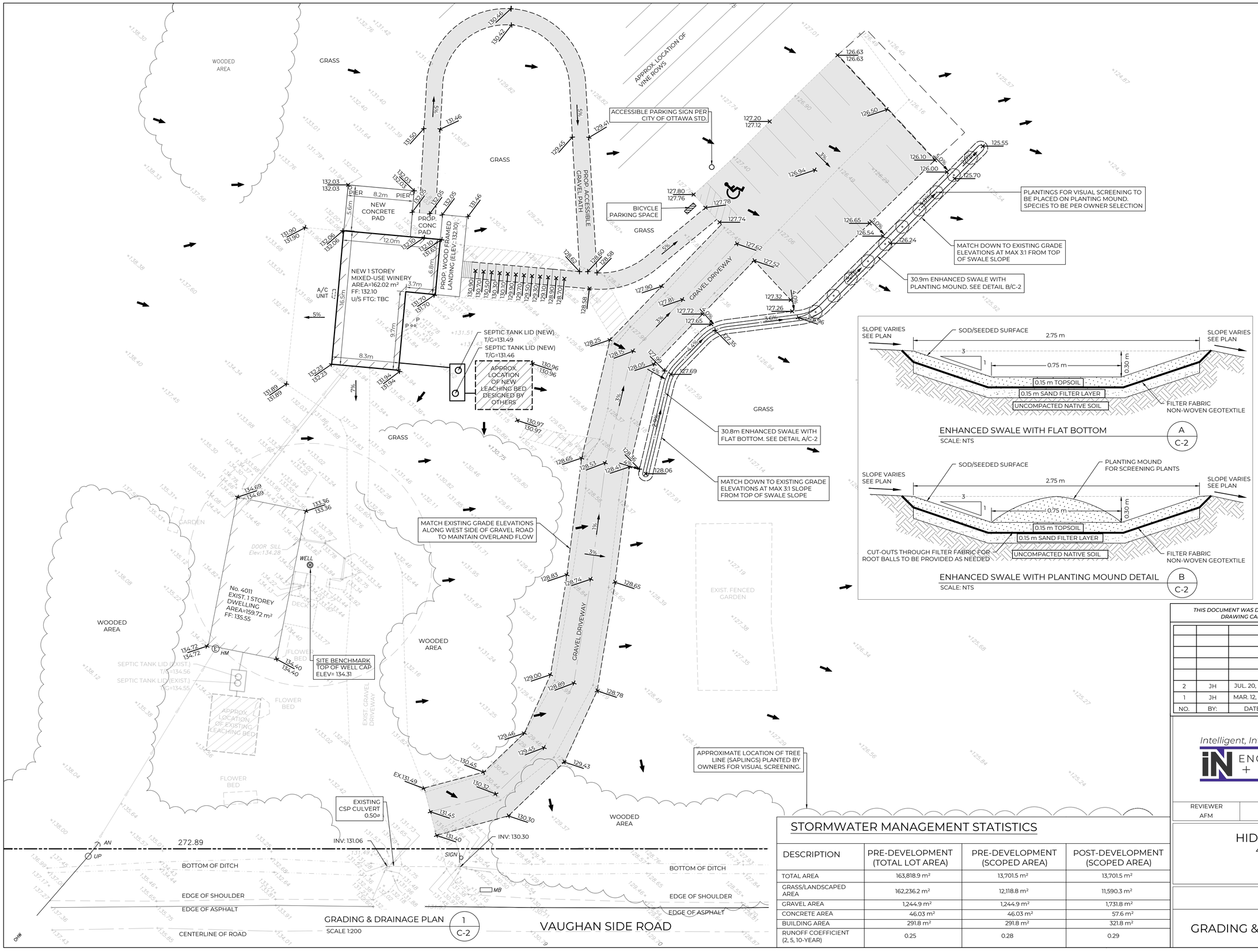
Appendix A

Grading & Drainage Plan



GRADING & DRAINAGE PLAN 1 C-2
SCALE 1:200

ENHANCED SWALE WITH FLAT BOTTOM

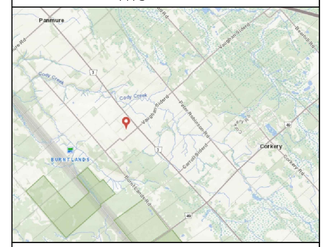
SCALE: NTS — A C-2

ENHANCED SWALE WITH PLANTING MOUND DETAIL

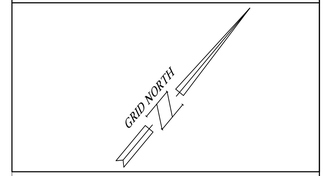
SCALE: NTS — B C-2

KEY PLAN

NTS



ORIENTATION



SITE SYMBOL LEGEND

WELL (W)	EXISTING WELL
(E) HM	EXISTING HYDRO METER
×125.52	EXISTING ELEVATION
	MAJOR FLOW DIRECTION
X%	SLOPE
PROP. EXIST.	PROPOSED ELEVATION CHANGE
	EXISTING FENCE
	PROPERTY LINE
	BOTTOM OF DITCH
	C/L OF ROAD
	EXISTING EDGE OF GRAVEL
	PROPOSED C/L SWALE
	PROPOSED PLANTING
	NEW BUILDING
	EXISTING BUILDING
	PROPOSED GRAVEL

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm

LICENSED PROFESSIONAL ENGINEER
A. N. PALAGANAS
100187445
JULY 20, 2026
PROVINCE OF ONTARIO

THIS DOCUMENT WAS DIGITALLY SEALED. CONTACT US TO VERIFY AUTHENTICITY. THIS DRAWING CANNOT BE RELIED UPON UNLESS SEALED AND SIGNED.

NO.	BY:	DATE:	REVISION:
2	JH	JUL. 20, 2026	REVISED PER CITY COMMENTS & ISSUED FOR SPC
1	JH	MAR. 12, 2026	ISSUED FOR SITE PLAN CONTROL

STORMWATER MANAGEMENT STATISTICS

DESCRIPTION	PRE-DEVELOPMENT (TOTAL LOT AREA)	PRE-DEVELOPMENT (SCOPED AREA)	POST-DEVELOPMENT (SCOPED AREA)
TOTAL AREA	163,818.9 m²	13,701.5 m²	13,701.5 m²
GRASS/LANDSCAPED AREA	162,236.2 m²	12,118.8 m²	11,590.3 m²
GRAVEL AREA	1,244.9 m²	1,244.9 m²	1,731.8 m²
CONCRETE AREA	46.03 m²	46.03 m²	57.6 m²
BUILDING AREA	291.8 m²	291.8 m²	321.8 m²
RUNOFF COEFFICIENT (2, 5, 10-YEAR)	0.25	0.28	0.29

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Land Development
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REVIEWER	DESIGNER	DRAFTER	FILE NO.
AFM	JH	JH	12486

HIDDEN POND WINERY

4011 VAUGHAN SIDE RD.
CARP, ONTARIO
K0A 1L0

CIVIL

GRADING & DRAINAGE PLAN — C-2

FILE PLOTTED BY Alan P @ 7/20/2026 12:42 PM

Appendix B

IDF Data (MTO)

Ontario IDF CURVE LOOKUP

Active coordinate

45° 17' 15" N, 76° 9' 15" W (45.287500,-76.154167)

Retrieved: Mon, 02 Mar 2026 14:38:44 GMT

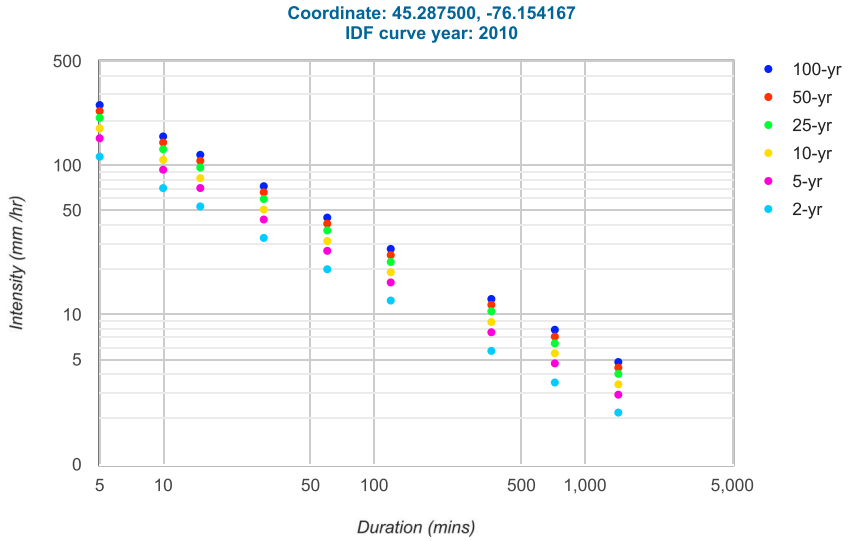
Location summary

These are the locations in the selection.

IDF Curve: 45° 17' 15" N, 76° 9' 15" W (45.287500,-76.154167)

Results

An IDF curve was found.



Coefficient summary

IDF Curve: 45° 17' 15" N, 76° 9' 15" W (45.287500,-76.154167)

Retrieved: Mon, 02 Mar 2026 14:38:44 GMT

Data year: 2010
IDF curve year: 2010

Return period	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
A	20.1	26.7	31.1	36.6	40.6	44.6
B	-0.699	-0.699	-0.699	-0.699	-0.699	-0.699

Statistics

Rainfall intensity (mm hr^{-1})

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	114.2	70.3	53.0	32.6	20.1	12.4	5.7	3.5	2.2
5-yr	151.7	93.4	70.4	43.3	26.7	16.4	7.6	4.7	2.9
10-yr	176.6	108.8	82.0	50.5	31.1	19.2	8.9	5.5	3.4
25-yr	207.9	128.1	96.5	59.4	36.6	22.5	10.5	6.4	4.0
50-yr	230.6	142.1	107.0	65.9	40.6	25.0	11.6	7.1	4.4
100-yr	253.3	156.0	117.5	72.4	44.6	27.5	12.7	7.9	4.8

Rainfall depth (mm)

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	9.5	11.7	13.2	16.3	20.1	24.8	34.5	42.5	52.3
5-yr	12.6	15.6	17.6	21.7	26.7	32.9	45.8	56.4	69.5
10-yr	14.7	18.1	20.5	25.2	31.1	38.3	53.3	65.7	80.9
25-yr	17.3	21.3	24.1	29.7	36.6	45.1	62.8	77.3	95.3
50-yr	19.2	23.7	26.7	33.0	40.6	50.0	69.6	85.8	105.7
100-yr	21.1	26.0	29.4	36.2	44.6	54.9	76.5	94.2	116.1

Terms of Use

Appendix C

Hydrologic Calculations

Rainfall Intensities

Time of Concentration (Tc)

Site area consists of small sub-catchments, Therefore
The Time of Concentration is assumed as 10 minutes

Rainfall Intensities Based on MTO Online IDF Curve Look-up (See Appendix B)

Return Period	Intensity, I mm/hr
2 year	70.30
5 year	93.40
10 year	108.80
25 year	128.10
50 year	142.10
100 year	156.00

Pre-Development Condition

Predevelopment Flows are Computed by utilizing Rational Formula

Q (m^3/s)= C I A/360

Where

C = Runoff Coefficient

I = Rainfall Intensity in mm/hr

A = Drainage Area in ha

Total Area	16.38 ha
Study Area	1.37 ha

Total Lot Area

Catchment ID	Area (m^2)	Area (ha)	C
Grass/Landscaped	162236.2	16.2236	0.25
Gravel	1244.9	0.1245	0.4
Building/Roof	291.8	0.0292	0.9
Concrete	46.03	0.0046	0.9
Total / Weighted	**163818.93**	**16.38**	**0.25**

Scoped Study Area

Catchment ID	Area (m^2)	Area (ha)	C
Grass/Landscaped	12118.8	1.2119	0.25
Gravel	1244.9	0.1245	0.4
Building/Roof	291.8	0.0292	0.9
Concrete	46.03	0.0046	0.9
Total / Weighted	**13701.5**	**1.37**	**0.28**

Total Lot Area

Storm Event	Adjusted C	Intensity, I mm/hr	Flow m^3/s
2 year	0.25	70.30	0.808
5 year	0.25	93.40	1.073
10 year	0.25	108.80	1.250
25 year	0.28	128.10	1.619
50 year	0.30	142.10	1.959
100 year	0.32	156.00	2.240

Scoped Study Area

Storm Event	Adjusted C	Intensity, I mm/hr	Flow m^3/s
2 year	0.28	70.30	0.075
5 year	0.28	93.40	0.099
10 year	0.28	108.80	0.116
25 year	0.31	128.10	0.150
50 year	0.34	142.10	0.181
100 year	0.35	156.00	**0.208**

Post-Development Condition

Post Development Flows are Computed by utilizing Rational Formula

Q (m^3/s)= C I A/360

Where

C = Runoff Coefficient

I = Rainfall Intensity in mm/hr

A = Drainage Area in ha

Total Area	16.38	ha
Study Area	1.37	ha

Total Lot Area

Catchment ID	Area (m^2)	Area (ha)	C
Grass/Landscaped	161707.72	16.171	0.2500
Gravel	1731.8	0.173	0.4000
Building/Roof	321.8	0.032	0.9000
Concrete	57.61	0.006	0.9000
Total / Weighted	**163818.93**	**16.382**	**0.2531**

Scoped Study Area

Catchment ID	Area (m^2)	Area (ha)	C
Grass/Landscaped	11590.3	1.1590	0.25
Gravel	1731.8	0.1732	0.4
Building/Roof	321.8	0.0322	0.9
Concrete	57.61	0.006	0.9
Total / Weighted	**13701.5**	**1.37**	**0.29**

Total Lot Area

Storm Event	Adjusted C	Intensity, I mm/hr	Flow (Q) m^3/s
2 year	0.25	70.30	0.810
5 year	0.25	93.40	1.076
10 year	0.25	108.80	1.253
25 year	0.28	128.10	1.623
50 year	0.30	142.10	1.964
100 year	0.32	156.00	2.246

Scoped Study Area

Storm Event	Adjusted C	Intensity, I mm/hr	Flow (Q) m^3/s
2 year	0.29	70.30	0.077
5 year	0.29	93.40	0.102
10 year	0.29	108.80	0.119
25 year	0.32	128.10	0.154
50 year	0.34	142.10	0.186
100 year	0.36	156.00	**0.213**

Total Lot Area

Storm Event	Post Dev Flow (m^3/s)	Pre Dev Flow (m^3/s)	Flow (Q) Increase (m^3/s)
2 year	0.810	0.808	0.002
5 year	1.076	1.073	0.003
10 year	1.253	1.250	0.003
25 year	1.623	1.619	0.004
50 year	1.964	1.959	0.005
100 year	2.246	2.240	0.005

Scoped Study Area

Storm Event	Post Dev Flow (m^3/s)	Pre Dev Flow (m^3/s)	Flow (Q) Increase (m^3/s)
2 year	0.077	0.075	0.002
5 year	0.102	0.099	0.003
10 year	0.119	0.116	0.003
25 year	0.154	0.150	0.004
50 year	0.186	0.181	0.005
100 year	0.213	0.208	0.005

Tc= 10 min

StorageVolume Req'd= Flow Increase x Tc x 60

3.25 m3

Sand Layer Detention

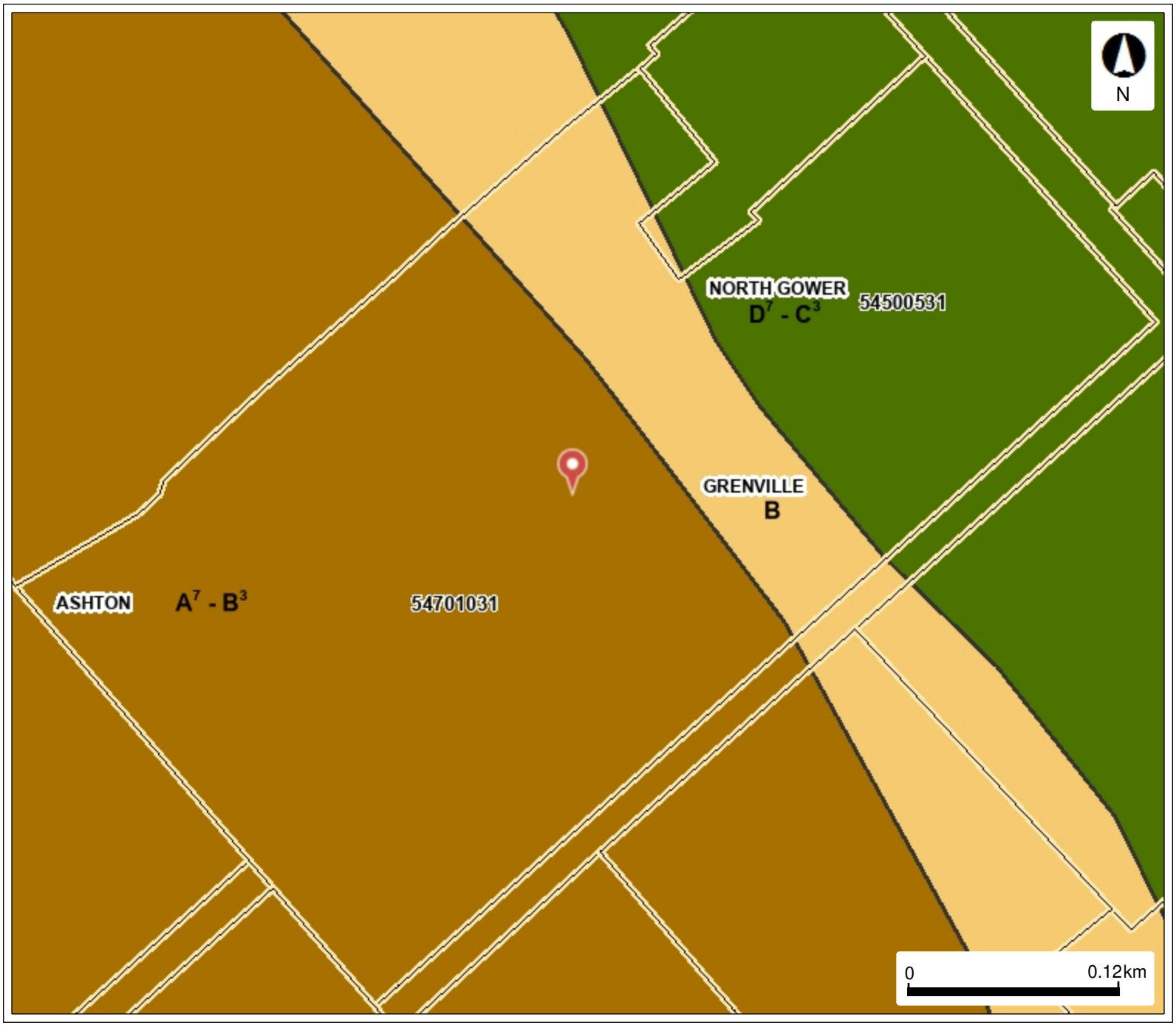
Length	61.0	m
Width	2.75	m
Depth	0.15	m
Vol.	25.2	m^3
Sand Void Ratio	0.40	
Total Storage Cap.	**10.1**	**m^3**

Capacity (%) at 100 yr Storm 32%

Appendix D

Soil Classification Map (AgMaps)

Soil Classification Map



Legend

- Assessment Parcel
- Soil Name Label
- Hydrologic Soil Group
  - A - High
  - B - Moderate
  - C - Slow
  - D - Very Slow
- Soil Landscapes - Soil Order

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Ontario Ministry of Agriculture, Food and Agribusiness (OMAFA) shall not be liable in any way for the use or any information on this map. of, or reliance upon, this map.

Map Created: 3/12/2026
Map Center: 45.28718 N, -76.15758 W