FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

15441 MOUNT PLEASANT ROAD RESIDENTIAL DEVELOPMENT

TOWN OF CALEDON
REGION OF PEEL

PREPARED FOR:

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PREPARED BY:

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1.0 Introduction

C.F. Crozier & Associates Inc. (Crozier) was retained by 2818963 Ontario Inc. (Owner) to prepare a Functional Servicing and Stormwater Management Report in support of the Plan of Subdivision Application for the proposed residential development located at 15441 Mount Pleasant Road in the Town of Caledon. The purpose of this report is to demonstrate that the proposed development is feasible from a functional servicing and stormwater management perspective and conforms with the requirements of the Town of Caledon (Town), Region of Peel (Region), and the Toronto Region Conservation Authority (TRCA).

This report has been completed in accordance with the guidelines and Development Application Review Team meeting notes dated October 21, 2021. The relevant background studies and reports include:

- Region of Peel 2020 Water Master Plan
- Region of Peel Watermain Design Criteria (June 2010)
- Region of Peel Linear Wastewater Standards (March 2023)
- Town of Caledon As-Constructed Drawings (Drawing No. 50321-D, 50322-D, 50323-D & 50324-D) (May 2012)
- Geotechnical Report prepared by AllRock Consulting Ltd. (February 14, 2024)
- Hydrogeological Report (Crozier, July 5, 2024)
- Sustainable Technologies Evaluation Program (November 2022)
- Ministry of Environment Stormwater Management Planning and Design Manual (March 2003)
- CVC/TRCA Low Impact Development SWM Planning Design Guide (Version 1.0, 2010)

This report adheres to the applicable criteria, guidelines and site-specific information presented in the above-noted documents.

1.1 Site Description

The Site encompasses an area of 22.9 hectares with an ultimate developable area of approximately 2.90 hectares, due to a variety of environmental constraints and their respective setbacks. The Site currently consists of greenspace, natural heritage area, and open water. The Site is located in a rural neighbourhood in the Town of Caledon, bounded by Mount Pleasant Road to the west, residential estate properties to the north and south, and wetlands to the east (see Figure 1). The Site is currently zoned Environmental Policy Area 2 – Oak Ridges Moraine (ORM), Estate Residential – ORM, and Open Space – ORM.

According to the Concept Plan prepared by Design Plan Services Inc. (dated April 12, 2024, see Appendix A), it is understood that development plans for the Site will include:

- Five (5) single detached residential lots, serviced via individual onsite sewage systems.
- Internal 20.0 m municipal right-of-way, two cul-de-sacs and access to Mount Pleasant Road opposite Mulloy Court.
- Open Space associated with natural heritage, floodplain and respective buffers.

Figure 1: Site Location

2.0 Geotechnical and Hydrogeological Investigation

AllRock Consulting Ltd. (AllRock) was retained by the Client to complete a geotechnical investigation for the proposed development, which included the advancement of ten (10) boreholes to depths between 8.5 and 9.1 m below ground surface (bgs) in November 2023. Three (3) of the boreholes were instrumented as monitoring wells to support the hydrogeological investigation (completed by Crozier). According to AllRock, subsurface conditions generally consisted of a surficial layer of topsoil (approximately 100 mm thick), underlain by native deposits of silts with varying amounts of clay, sand, and gravel to the maximum depth of investigation. Refer to the Geotechnical Report (AllRock, 2024), provided under separate cover, for additional details. Based on the borehole logs, the predominant soil type is consistent with a "ML" soil per the Unified Soil Classification System (USCS). According to Supplementary Standard SB-6 of the Ontario Building Code (OBC), ML soils have a percolation time between 20 and 50 min/cm. Given the varying percentages of silt and clay, a percolation rate of 50 min/cm was conservatively considered of the onsite sewage system design.

As part of the hydrogeological investigation, Crozier has initiated the following field studies:

- Groundwater monitoring;
- Groundwater quality sampling;
- Hydraulic conductivity testing;
- Door-to-door survey.

Preliminary results are summarized in a stand-alone report referred to as Hydrogeological Investigation Report (Crozier, July 2024). Information from this report has been used to support the onsite sewage system design and determine the optimum locations for bioswale, described in the following sections.

3.0 Water Servicing

The Region of Peel is responsible for the operation and maintenance of the public watermain system surrounding the property. The existing and proposed water servicing are discussed in the following sections.

3.1 Existing Water Servicing

The existing water servicing infrastructure close to the Site include:

- A 300 mm diameter polyvinyl chloride (PVC) municipal watermain located on the south side of Mount Pleasant Road (Region of Peel As-Constructed Drawing (50323-D), December 2012).
- A 200 mm diameter PVC municipal watermain located on the west side of Mulloy Court (Region of Peel As-Constructed Drawing (50321-D), December 2012).
- The proposed development is located within the Water Pressure Zone 8 supply system.

The as-constructed drawings for the water servicing infrastructure are provided in Appendix A.

3.2 Domestic Water Demand Calculations

The domestic water demand for the proposed residential development was calculated with reference to the Region of Peel Linear Infrastructure Watermain Design Criteria (June 2010). The Region of Peel design criteria requires an average daily water demand of 280 L/capita/day for residential uses. A unit-based population density of six (6) persons per unit, based on similar developments in the Town of Caledon, was used along with the peaking factors outlined in the Region of Peel Watermain Design Criteria to obtain the estimated maximum daily demand and peak hourly demand for the proposed development.

Table 1 summarizes the overall domestic water demand for the Site. Appendix B contains the detailed domestic water demand calculations.

Table 1: Proposed Domestic Water Demand

Standard	Type	Average Daily Water Demand (L/s)	Maximum Daily Water Demand (L/s)	Peak Hourly Water Demand (L/s)
Region of Peel	Residential	0.10	0.19	0.29

Note: References to design guidelines are provided in the detailed domestic water demand calculations in Appendix B.

Using the Region of Peel design criteria for domestic water demand, the estimated average daily demand, maximum daily demand, and peak hourly demand for the proposed development are 0.10 L/s, 0.19 L/s, and 0.29 L/s, respectively.

3.3 Fire Flow Calculations

The Fire Underwriters Survey (FUS) method was used to estimate the preliminary fire flow requirements for the proposed residential development. This calculation is based on the building type assumption of wood frame construction. The estimated fire flow requirement is used to estimate the watermain size required to service the development.

Table 2 summarizes the estimated fire flow demand and duration necessary to meet fire protection for the proposed development. Appendix B contains the Fire Underwriters Survey calculations.

Table 2: Proposed Fire Flow Demand

Method	**Total Effective Floor Area** (m^2)	**Fire Flow** (L/s)	**Duration** (hrs)
Fire Underwriters Survey	720	133	2.00

Note: Proposed Fire Flow Demand is based on the building located in Lot 2 due to the building's proximity to adjacent lot structures.

Based on the fire flow calculations and total effective floor area of 720 m^2, the required fire flow for the development was calculated to be 133 L/s for a duration of 2.00 hours.

It should be noted that the fire flows determined from the FUS method is a conservative estimate for comparison purposes only. The Mechanical Engineer for the development will complete the required analysis for fire protection and the Architect will design fire separation methods per the determined fire flow rate to meet municipally available flows and pressures. Based on the estimated peak hourly domestic water demand (0.3 L/s) and fire flow demand (133 L/s) summarized in Table 1 and Table 2, the total design flow for the internal water distribution system is approximately 133 L/s.

A contractor has been retained to conduct a hydrant flow test to determine the existing available pressures and flows within the municipal watermain on Stinson Street. These results will be used to confirm that the existing system has the capacity to service the proposed development.

3.4 Proposed Water Servicing

A 150 mm diameter PVC watermain is proposed to service the Site with a 50 mm diameter copper watermain looped at the cul-de-sacs on Street A and Street B. The proposed watermain is located within the proposed municipal right-of-way and will connect to the existing 300 mm PVC watermain along Mount Pleasant Road, bounding the Site to the southwest. All residential lots will be serviced with domestic water services connecting to the proposed internal watermain. The Preliminary Servicing Plan (Drawing C102) illustrates the location and design of the proposed watermain.

Hydrants are proposed throughout the development with a maximum spacing of 150 m in accordance with Region of Peel Watermain Design Criteria (June 2010) and a maximum distance of 90 m to the perimeter of each building in accordance with the Ontario Building Code (OBC).

4.0 Sanitary Servicing

There are no municipal sanitary services in the vicinity of the Site and the surrounding properties are serviced via private onsite sewage systems. Similarly, private onsite sewage systems are proposed to provide sanitary servicing for this development as the Region of Peel does not have plans to provide sanitary servicing in this area in the near future.

4.1 Design Sanitary Flow

Part 8 of the OBC was referenced to estimate the sanitary design flows generated by the proposed estate residential development. The development will consist of five (5) residential lots, which will each contain one (1) dwelling per the Concept Plan prepared by Design Plan Services Inc. (dated April 12, 2024). It is Crozier's understanding that each dwelling may be up to thirteen (13) bedrooms with approximately 720 m^2 of floor area. Preliminary sewage system design flows were calculated for a typical thirteen (13) bedroom dwelling with 720 m^2 of finished floor area, ten (10) bathroom groups and additional fixtures of a total of 93 fixture units. The preliminary sewage system design flow for each dwelling is summarized in Table 3.

Table 3: Preliminary Sewage System Design Flows

Unit Type	Number of Bedrooms	Floor Area (m^2)	Number of Fixture Units	Base Flow (L/day)	Additional Flow – Floor Area (L/day)	Additional Flow – Fixture Units (L/day)	Total Flow Per Unit (L/day)
720 m^2 Residential Dwelling	13	720	93	2,500	4,100	3,650	6,600

As shown, the preliminary sewage system design flow for a typical unit is 6,600 L/day.

These flows were calculated based on the information available at the time of this report. If details of the proposed dwellings change (e.g., number of bedrooms, fixtures, and floor area) during detailed design, the sewage system design flows might change, which may affect the size of the onsite sewage systems and the serviceability of the development.

The detailed design of the onsite sewage systems will be confirmed during the building permit stage and building permits will be required for each sewage system prior to construction. Properties with a total daily design sanitary sewage flow exceeding 10,000 L/day are subject to Section 53 of the Ontario Water Resources Act and require an Environmental Compliance Approval (ECA) issued by the Ministry of Environment, Conservation and Parks. Given the preliminary sewage system design flow is less than 10,000 L/day per individual lot, an ECA is not required.

4.2 Proposed Sanitary Servicing

Sanitary servicing for the development will be provided through individual Class 4 onsite sewage systems. Each onsite sewage system will consist of an advanced treatment system discharging to a leaching bed constructed as a Type 'A' Dispersal Bed, designed in accordance with the OBC.

The advanced treatment system will consist of a Level IV treatment unit meeting the CAN/BNQ 3680-600 standard, sized based on the sewage system design flow. The treatment unit proposed is a Waterloo Biofilter recirculating basket system. Sewage will flow from the dwelling to a Waterloo Biofilter anaerobic digester tank. Effluent from the digester tank is pumped to the Waterloo Biofilter basket tank, which is equipped with a patented foam media that effectively treats wastewater prior to discharge to the leaching bed. Note the Waterloo Biofilter configuration is shown for conceptual purposes only, any Level IV CAN/BNQ certified system may be considered.

Treated effluent will be directed to the leaching bed, which will be constructed as a Type 'A' dispersal bed for final polishing and dispersal. Table 4 summarizes the preliminary sizing of the Type 'A' Dispersal Bed, based on a T-time of 50 min/cm.

Table 4: Preliminary Type A Bed Sizing

Unit Type	Total Flow Per Unit (L/day)	Minimum Stone Area (m^2)	Minimum Sand Area (m^2)	Provided Footprint (m^2)
720 m^2 Residential Dwelling	6,600	132	825	840

Drawings OSS101 and OSS102 found in Appendix D, illustrate the proposed onsite sewage servicing for the development. A total of 840 m^2 has been allocated per lot. The details, size, and location of the onsite sewage systems will be confirmed once individual home designs and building permit applications are prepared.

5.0 Drainage Conditions

The drainage conditions for the Site in both pre-development and post-development conditions are outlined in the following sections.

5.1 Existing Drainage Conditions

According to the topographic survey (Guido Papa Surveying - J.D. Barnes Limited, May 13, 2022), the Site currently consists of greenspace, forested area, and open water.. The Site generally slopes from east to west and is separated into five (5) catchments as shown on the Pre-development Drainage Plan (Figure 2). The existing drainage catchments and their respective outlets may be described as follows:

- Catchment 101 consists of woodlots, vegetated areas, existing wetland (west wetland) and gravel driveway. Catchment 101 drains to the west wetland.
- Catchment 102 consists of woodlot, vegetated areas and a natural pond (west pond) and drains to the west pond. Should the pond fill, it will drain the wetland within Catchment 101.
- Catchment 103 consists of woodlot, vegetated areas and a natural pond (east pond) and drains to the east pond. The pond is hydraulically connected to the existing east wetland within Catchment 105.
- Catchment 104 consists of woodlot and vegetated areas and drains to an external pond west of the Site's property limits.
- Catchment 105 consists of woodlots, vegetated areas, existing wetland (east wetland) and drains to the east wetland.

Table 5 summarizes the pre-development catchment areas. Figure 2 illustrates their configuration and the overall drainage direction.

Table 5: Pre-Development Catchment Areas, Imperviousness and Drainage Outlet

Catchment ID	Land-Use Description	Impervious Area (ha)	Pervious Area (ha)	Percent Impervious (%)	Outlet
101	Existing gravel roadway, woodlot, wetland and meadow	0.09	2.57	3.4	West Wetland
102	Existing woodlot, wetland, and meadow	0.21	1.26	15	West Pond
103	Existing woodlot, wetland, and meadow	-	1.38	0	East Pond
104	Existing woodlot and meadow	-	1.15	0.0	External Pond
105	Existing woodlot, wetland, and meadow	-	14.61	0.0	East Wetland
	Total Area (ha) =	**21.27**			

5.2 Proposed Drainage Conditions

Based on the Concept Plan prepared by Design Plan Services Inc. (dated April 12, 2024), the proposed development will consist of five (5) single detached residential lots, a paved internal roadway, and open spaces (non-developable). Access to the Site will be via Mount Pleasant Road.

5.2.1 Grading Compliance with Town of Caledon Official Plan Policies 7.1.9.3 and 7.1.9.37

According to the Town of Caledon Official Plan Policies 7.1.9.3 and 7.1.9.37, the Site must be graded to accommodate proposed buildings, associated driveways, provide sufficient area for individual leaching beds, and amenity space. Lot Grading should be accommodated within the Structure Envelope but some grading outside of the envelope (e.g., along the lot line) may be permitted for stormwater management purposes. This grading will ensure that runoff from multiple lots is adequately conveyed to a proper outlet.

The Grading Plan included in this submission aims to satisfy the Official Plan policies referenced above.

5.2.2 Post-Development Drainage Catchment Areas

The proposed Site grading divides the Site into eleven (11) drainage catchment areas as shown on the Post-Development Drainage Plan (Figure 3):

- Catchment 201 (A = 2.51 ha) closely mimics the pre-development conditions of Catchment 101 with the drainage from the woodlot and vegetated areas being conveyed to the existing west wetland.

- Catchment 202 (A = 0.82 ha) drains into the existing west pond within the Catchment. A 600mm diameter CSP culvert is proposed under Street B to allow the pond to overflow to the west wetland within Catchment 101 if necessary. It is not expected that an overflow condition will occur very often.

- Catchment 203 (A = 1.81 ha) drains into the existing pond in the Catchment and is hydraulically connected to the wetland in Catchment 205.

- Catchment 204 (A = 1.74 ha) consists of Lot 5 and drains into the existing pond to the west of the Catchment.

- Catchment 205 (A = 13.64 ha) closely mimics the pre-development conditions of Catchment 105 with drainage from the woodlot and vegetated areas being conveyed to the existing east wetland.

- Catchment 206 (A = 1.04 ha) consists of drainage from Lots 1 and 2 and half of Street B. Runoff from this catchment will be subject to treatment through a series of bioswales/enhanced grass swales. The swales will convey the treated drainage to the existing west wetland within Catchment 201.

- Catchment 207 (A = 0.18 ha) drains along Street B and into the proposed bioswales/enhanced grass swales through a curb on the east side of the R.O.W. The swales then convey the drainage to the existing west pond within Catchment 202. If the west pond fills up, there will be a 600 mm diameter CSP culvert under Street B to allow for overflow.

- Catchment 208 (A = 0.13 ha) drains along Street A and into the proposed bioswales/enhanced grass swales through a curb on the west side of the R.O.W. The swales then convey the drainage to the existing west pond within Catchment 202. Similar to Catchment 207, the west pond can spill to the west wetland via a proposed 600 mm diameter CSP culvert within Street B.

- Catchment 209 (A = 0.12 ha) drains along Street A and into the proposed bioswales/enhanced grass swales through a curb on the west side of the R.O.W. The swales then convey the drainage to the existing west wetland within Catchment 201.

- Catchment 210 (A = 0.78 ha) consists of the front yard of Lot 4 and drains along Street A and into the proposed bioswales/enhanced grass swales through a curb on the east side of the R.O.W. The swales then convey the drainage to the existing ditch along Mount Pleasant Road and ultimately to the west wetland within Catchment 101.

- Catchment 211 (A = 0.09 ha) drains along Street B and into the proposed bioswales/enhanced grass swales through a curb outlet on the west side of the R.O.W. The swales then convey the drainage to the existing west wetland within Catchment 201 through a 600 mm diameter CSP culvert with Street B.

Table 6 summarizes the main attributes of the post-development catchment areas. Figure 3 illustrates their configuration and the overall drainage direction.

Table 6: Post-Development Catchment Areas' Imperviousness and Drainage Outlet

Catchment ID	Land-Use Description	Impervious Area (ha)	Pervious Area (ha)	Percent Impervious (%)	Outlet
201	Existing Woodlot and Meadow	0	1.60	0	West Wetland
202	Existing woodlot, wetland, and meadow	0.21	0.61	26	West Pond
203	Existing woodlot, wetland, and meadow	0.02	1.09	2	East Pond
204	Existing woodlot, meadow, and proposed lot rear yard	0.04	0.84	5	External Pond
205	Existing woodlot, wetland, meadow, and Lot 5	0.04	14.49	0	East Wetland
206	Lots 1 & 2 Front Yard and Street 'B' R.O.W.	0.24	0.80	23	West Wetland
207	Street 'B' R.O.W.	0.09	0.09	48	West Pond
208	Street 'A' R.O.W.	0.09	0.04	69	West Pond
209	Street 'A' R.O.W.	0.06	0.06	50	West Wetland
210	Lot 4 Front Yard and Street 'A' R.O.W.	0.21	0.57	27	West Wetland
211	Street 'B' R.O.W.	0.04	0.05	44	West Wetland
	Total Area (ha) =	**21.27**			

6.0 Stormwater Management

Stormwater management and Site drainage for the proposed development must adhere to the policies and standards of the Town of Caledon, Toronto and Region Conservation Authority (TRCA), and the Ministry of Environment, Conservation and Parks (MECP). It is important to note that efforts have been made to preserve and maintain the rural character of the property and passive stormwater management practices have been incorporated throughout the design.

The stormwater management criteria for the development is summarized below:

Water Quality Control

Provide at least 80% removal of Total Suspended Solids in accordance with "Enhanced Protection" in Table 3.2 (Ministry of the Environment, Planning, and Stormwater Management Manual, MOE 2003).

Water Balance and Erosion Control

The objective of the Water Balance is to maintain pre-development infiltration volumes. Having worked in Caledon, it is our understanding that capturing and infiltrating storm events up to 27 mm will ensure that infiltration volumes are preserved. This was the target for the infiltration design described in the following sections.

For Erosion Control, the minimum requirement is the retention of the first 5 mm of rainwater event over the area of the proposed development, according to CVC/TRCA Low Impact Development SWM Planning Design Guide (Version 1.0, 2010). Given that the Water Balance requirements are much more stringent, the focus of water retention will be detailed in the Water Balance and Water Quality sections.

Water Quantity Control

According to the Town of Caledon Development Standards Manual (2019), water quantity controls are required for the Site. The water quantity requirements include controlling the post-development peak flow event to the respective pre-development peak flow event for design storms up
to and including the 100-year event.

6.1 Visual OTTHYMO (VO) Model Set-up and Hydrologic Parameters

The TRCA, Town of Caledon, and Ministry of Transportation guidelines were referenced to determine the hydrologic parameters for the various catchment areas within the Site. The topographic survey (Guido Papa Surveying - J.D. Barnes Limited, May 13, 2022) for the Site was referenced to understand the land cover and drainage patterns under the existing Site conditions.
The Geotechnical Investigation prepared by AllRock (February 14, 2024) was reviewed to determine the on-site soil conditions.

Based on the above, the hydrologic parameters for the pre-development and post-development conditions were determined and are summarized in Tables 7 and 8 respectively. The detailed hydrologic parameter sheets for each catchment area are provided in Appendix C.

Table 7: Pre-Development Hydrologic Parameters

Catchment Characteristics	101	102	103	104	105
Drainage Area (ha), Total Area = 21.27 ha	2.66	1.47	1.38	1.15	14.61
Total Imperviousness (%)	3	15	0	0	0
Hydrologic Soil Type	Silt Loam - BC				
Composite Curve Number (CN)[1]	66.13	69.80	65.00	65.00	59.97
Initial Abstraction (mm)	8.56	7.81	8.32	8.31	11.66
Time to Peak (hrs)	0.23	0.11	0.14	0.23	0.18

1. Composite Curve Numbers (CN) have been adjusted using the Modified Curve Number (CN*) method in VO and the total 100-year precipitation volume.

Table 8: Post-Development Hydrologic Parameters

Catchment ID	Drainage Area (ha)	Total Imperviousness (%)	Hydrologic Soil Type	Composite Curve Number (CN)[1]	Initial Abstraction (mm)	Time to Peak (hrs)
201	1.60	0	Silt Loam - BC	65.69	8.38	0.21
202[2]	0.82	26		65.00	8.00	-
203	1.10	2		65.84	7.60	0.15
204	0.88	5		67.98	6.85	0.47
205	14.53	0		60.07	11.56	0.18
206[2]	1.04	23		68.00	5.00	-
207[2]	0.18	48		68.00	5.00	-
208[2]	0.13	69		68.00	5.00	-
209[2]	0.12	50		68.00	5.00	-
210[2]	0.78	27		68.00	5.00	-
211[2]	0.09	44		68.00	5.00	-

1. Composite Curve Numbers (CN) have been adjusted using the Modified Curve Number (CN*) method in VO and the total 100-year precipitation volume.
2. Catchments 202, 206-211 are considered STANDHYD and therefore will not have a time to peak (t_p) provided.

Visual OTTHYMO (VO) was used to simulate pre-development and post-development runoff conditions. The Town of Caledon's intensity-duration frequency (IDF) curves were used to derive the 4-hour Chicago design storm. The VO results from the 4-hour Chicago design storm is provided in Appendix C. While 6-hour and 12-hour AES Storms were considered, the 'storm duration is selected in relation to basin physical characteristics' according to Hydrology of Floods in Canada, a Guide to Planning and Design (Watt, 1989). The storm duration 'is taken as equal to or greater than the time of concentration'. Because the time of concentration for the site is very small (less than one hour), a Chicago distribution, which offers flexible storm durations more consistent with the time of concentration, was used for this investigation.

6.2 Stormwater Quality Control

Stormwater quality controls for the proposed development will be achieved by retaining, treating, and infiltrating runoff in roadside bioswale/enhanced grass swale systems. The treatment systems will capture runoff from the majority of hard surfaces. Runoff from the remainder of the Site consists of natural heritage and landscaped/pervious areas and is therefore not subject to water quality treatment requirements.

Table 9 summarizes the water quality storage requirements in accordance with Table 3.2 of the Stormwater Management Planning and Design manual (MOE, 2003) and the storage provided within the bioswale/enhanced grass swale systems on each side of the roadway.

Table 9: Provided Water Quality Storage to Achieve Enhanced Water Quality Protection

Catchment ID	Required Treatment Volume Per Table 3.2 (MOE, 2003) (m^3)	Provided Treatment Volume[2] (m^3)
201	N/A – Uncontrolled Landscaped Area	
202	N/A – Uncontrolled Landscaped Area	
203	N/A – Uncontrolled Landscaped Area	
204	N/A – Uncontrolled Landscaped Area	
205	N/A – Uncontrolled Landscaped Area	
206	23	45
207	5.1	27
208	4.5	21
209	3.5	N/A
210	17.9	35
211	2.5	N/A
Total	**57**	**128**

1. Catchments 208-210 consist of ditches along the Street 'A' R.O.W.
2. Catchments 206, 207 and 211 consist of ditches along Street 'B' R.O.W.
3. Catchments 209 and 211 will consist of enhanced grass swales and discharge to the West Wetland. The provided treatment volumes above are based on the treated volume from the bioswales.
4. The provided treatment volume is assumed to be equally distributed between the roadside ditches on either side of the proposed internal roadway.

At a minimum, a total of 57 m^3 of runoff is required to be treated and infiltrated to remove 80% of TSS and achieve "Enhanced Protection". The proposed bioswale system exceeds this requirement, having capacity to treat and infiltrate a total of approximately 128 m^3 of runoff.

Water quality controls are not provided for Catchments 201-205 as they remain relatively unchanged between pre-development and post-development conditions with no directly connected impervious areas.

6.3 Water Balance and Erosion Control

The purpose of a Water Balance is to ensure that existing infiltration volumes are maintained on an annual basis. The stormwater management design for the subject site incorporates linear bioswales to capture, treat and infiltrate runoff to achieve this goal.

The bioswale/enhanced grass swale systems were sized based on the runoff generated by a 27 mm design storm. This design storm was used recently for a Water Balance study in the Palgrave area and provided favourable results.

The roadside bioswale/enhanced grass swale systems consist of four (4) main elements including:

- Curb gutter outlets;
- Roadside ditches;
- Rock check dams;
- Filter media and gravel storage;

The bioswale systems will accept road runoff via curb gutter outlets along Streets 'A' and 'B'. From each curb gutter outlet, the runoff will be directed to conveyance systems to be infiltrated.

To encourage the runoff to infiltrate, rock check dams will be placed strategically along the ditches or swales to reduce flow velocity. The ponded runoff will infiltrate into the high performance bioswale filter media, and the treated water will then be stored in the gravel layer below and allowed to infiltrate into the native soils. in

The bioswale systems' treatment capacity is governed by the surface ponding volume and the infiltration volume of the bioswales. The gravel storage layer has been conservatively sized to provide storage that is greater than, or equal to, the surface storage required for the 27 mm event. Design calculations for the bioswale and drawdown are provided in Appendix C. Additional details are provided on Drawing C103, and C104.

The bioswale design aims to maintain a minimum separation to groundwater of 1.0 m or more. According to preliminary results provided in the AllRock Geotechnical Report (February 14, 2024), bioswales can be accommodated within the proposed right-of-way and meet this separation requirement. In areas where 1.0 m of separation is not possible, enhanced grass swales are proposed.

Table 10 summarizes the water balance requirements on a catchment basis and the corresponding storage volumes provided. By capturing and infiltrating the runoff volume for a 27 mm rainfall, it is understood that the annual infiltration volumes can be maintained.

Table 10: 27 mm Runoff Volumes and Corresponding Storage Provided

Catchment ID	**Required Treatment Volume Per 27 mm Event** (m^3)	**Provided Treatment Volume[2]** (m^3)
201	N/A – Uncontrolled Landscaped Area	
202	N/A – Uncontrolled Landscaped Area	
203	N/A – Uncontrolled Landscaped Area	
204	N/A – Uncontrolled Landscaped Area	
205	N/A – Uncontrolled Landscaped Area	
206	45	45
207	11	27
208	12	21
209	7.8	N/A
210	35	35
211	5.3	N/A
Total	**117**	**128**

From Table 10, it is apparent that there is sufficient storage provided in the bioswale system to capture and infiltrate the runoff from the 27 mm rainfall event.

6.4 Stormwater Quantity Controls

The 4-hour Chicago storm distribution was simulated in Visual OTTHYMO (VO) to calculate the 2-Year through 100 Year flood event runoff rates for predevelopment and post development conditions.

The site drains to two existing wet areas, the West Pond and the West Wetland. While an overflow culvert has been included in the design to connect the two wet areas, it is unlikely that surface water would overflow from the West Pond into the West Wetland. Therefore, the VO modelling treats the two as different outlets.

The results of flow modelling for the predevelopment and post development conditions are presented in Table 11 and Table 12.

Table 11: 4-Hour Chicago Peak Flows (West Wetland Outlet)

4-Hour Chicago Storm Event	Pre-Dev. Peak Flow Rate[1] (L/s)	Post-Dev. Peak Flow Rate[2] (L/s)	% Change
2-year	31	26	-16.1%
5-year	72	67	-6.94%
10-year	110	109	-0.91%
25-year	166	181	9.04%
50-year	211	245	16.1%
100-year	262	309	17.9%

1. Includes runoff directed to West Wetland Outlet (Catchment 101) A = 2.66 ha.
2. Includes runoff from Catchments 201, 206, 209 and 210 directed to the West Wetland Outlet A = 3.54 ha.

Based on the results shown above, the West Wetland Outlet experiences a minimal change in peak flows from pre- to post-development conditions. This is due to the Site remaining mostly pervious in post development conditions (large residential lots). The minor change in peak flows will be naturally attenuated by the surrounding low-lying areas.

Table 12 below summarizes the changes in peak flow to the West Pond.

Table 12: 4-Hour Chicago Peak Flows (West Pond Outlet)

4-Hour Chicago Storm Event	Pre-Dev. Peak Flow Rate[1] (L/s)	Post-Dev. Peak Flow Rate[2] (L/s)	% Change
2-year	29	27	-6.90%
5-year	66	59	-10.6%
10-year	100	92	-8.00%
25-year	146	138	-5.48%
50-year	185	174	-5.95%
100-year	229	215	-6.11%

1. Includes runoff directed to West Pond Outlet (Catchment 102) A= 1.47 ha.
2. Includes runoff from Catchments 202, 207, 208 and 211 directed to the West Pond Outlet = 1.22 ha.

Within the West Pond Outlet, the peak flows are lower in post-development conditions than pre-development conditions. This can be attributed to a smaller catchment area outletting to the West Pond and a minimal change in imperviousness.

It is noted that flood flows were not routed through the bioretention system in the VO model, and this would further reduce post development flows. Therefore, no specific flood control measures are proposed for the five (5) lot development.

7.0 Erosion and Sediment Controls During Construction

Erosion and sediment controls will be implemented prior to the commencement of any site servicing works for the development and will be maintained throughout construction until the Site is stabilized or as directed by the Site Engineer and/or Town of Caledon.

Controls will be inspected after each significant rainfall event and maintained in proper working condition. A Preliminary Erosion and Sediment Control Plan (Drawing C101) has been prepared for the development outlining the site-specific erosion and sediment controls. This plan includes silt fencing, a mud mat, and more robust measures, such as check dams, in areas of concentrated flow.

Further details on the erosion and control measures have been summarized below:

<u>Sediment Control Silt Fence</u>

Sediment Control Silt Fence will be installed on the perimeter of the Site to intercept sheet flow. Additional Sediment Control Silt Fence may be added based on field decisions by the Site Engineer and Owner prior to, during, and following construction.

Mud Mat

A rock mud mat will be installed at the entrance to the Site off Mount Pleasant Road. The rock mud mat will help to prevent mud tracking. All construction traffic will be restricted to the construction entrance as indicated on the Preliminary Erosion and Sediment Control Plan (Drawing C101).

Rock Check Dams

Rock check dams installed according to OPSD 219.210 should be installed in the proposed swale to protect from erosion conveyance during construction.

8.0 Conclusions & Recommendations

This report was prepared in support of the Zoning By-Law Amendment Application for the property located at 15441 Mount Pleasant Road, in the Town of Caledon. The proposed development can be serviced for water, sanitary, and stormwater management in accordance with the Town of Caledon, Region of Peel, and Toronto and Region Conservation Authority requirements and standards. Our conclusions and recommendations include:

Proposed Water Services

1. The domestic peak hourly water demand for the proposed development is 0.29 L/s. The design fire flow is 133 L/s for 2.00 hours.

2. Water servicing for the proposed development will be met by installing and connecting a 150 mm diameter PVC watermain to the existing 300 mm diameter PVC watermain on Mount Pleasant Road. The proposed 150 mm diameter PVC watermain will be looped throughout the development at the respective Street A and Street B cul-de-sac bulbs and provide municipal water servicing to each residential lot.

Proposed Sanitary Services

1. Sanitary servicing for the proposed development will consist of private individual lot on-site sewage systems.

2. The preliminary sewage system design flows for each lot is 6,600 L/day. Given that the design flows are less than 10,000 L/day, an ECA with the MECP is not required. Building permits be required to permit construction of each sewage system.

3. Each onsite sewage system will consist of an advanced treatment system discharging to a leaching bed constructed as a Type A dispersal bed. Each leaching bed footprint is approximately 840 m^2.

Stormwater Management

1. A passive stormwater management approach is proposed to preserve and maintain the rural character of the property using bioswale systems.

2. Water quality controls, erosion protection, and water balance for the proposed development will be provided by roadside bioswale and enhanced grass swale systems. The roadside bioswale systems will provide water quality treatment that exceeds the "Enhanced Protection" criteria by retaining, treating, and infiltrating runoff volume equal to, or greater than, the runoff volume recommended in the Stormwater Management Planning and Design manual (MOE 2003).

3. The bioswale system is designed to capture and infiltrate all rainfall events up to 27 mm, therefore maintaining predevelopment infiltration volumes,

4. VO modelling of flood events suggests only minor increases in peak flows, so no specific flood storage facilities are proposed. The nature of the development (low imperviousness), the distributed runoff and the presence of abundant low lying areas will ensure that any changes will be naturally assimilated.

Respectfully submitted,

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APPENDIX A

As-Constructed Drawings & Background Material

APPENDIX B

Water and Sanitary Servicing Calculations

APPENDIX C

Stormwater Servicing Calculation

DRAWINGS

FIGURES