FUNCTIONAL SERVICING REPORT & STORMWATER MANAGEMENT REPORT

BOLTON VILLAGE, 13656-13668 EMIL KOLB PARKWAY

TOWN OF CALEDON

PROJECT 2024-5440 FEBRUARY 2025

DATE	DESCRIPTION	PREPARED	APPROVED
February 2025	ZBA & SPA Submission	C. D'Souza	H. Sarkissian

SCHAEFFERS
CONSULTING
ENGINEERS
6 Ronrose Drive
Concord, Ontario L4K 4R3

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Study Objectives and Location

Schaeffers Consulting Engineers (SCE) has been retained by CAMCOS Living to prepare a Functional Servicing Report and Stormwater Management Report in support of the proposed high-density residential development located north west of Harvest Moon Drive and Emil Kolb Parkway within the West Bolton Secondary Plan Area in the Town of Caledon.

The subject properties are approximately **0.83 ha** and are bound by Harvest Moon Drive to the south, Emil Kolb Parkway to the east, and residential properties to the west and north. The subject property can be legally defined as Part of Lot 9, Concession 5, Town of Caledon, Regional Municipality of Peel. The municipal address for the subject property to the north is 13656 Emil Kolb Parkway, Bolton, Ontario and the municipal address for the property to the south is 13668 Emil Kolb Parkway, Bolton Ontario. The location of the subject sites are illustrated in **Figure 1.1**.

The purpose of this report is to provide site-specific information for the Town, Region, and Toronto Region and Conservation Authority (TRCA) with respect to infrastructure required to support the proposed development regarding storm drainage, sanitary drainage, and water servicing. All of the proposed infrastructure shall be in accordance with the Town and Region's design requirements. Additionally, the report is to clearly demonstrate the impact the proposed development has on the capacity of the existing municipal services and to ensure the existing municipal infrastructure is capable of servicing the proposed site, and to address any impacts to the municipal services.

1.2 Existing Site Condition

The subject property consists of a single detached residential house with an associated driveway in the north, and a vacant commercial block in the southern half. In preparing this report, Schaeffers' staff secured and reviewed available Town of Caledon and Region of Peel drainage figures, plan and profile drawings for the roads and existing sewers adjacent to the site. Refer to **Appendix A** for all as-built information.

As per the information received from the Town and Region the existing site has storm flows discharging to an existing storm sewer on Emil Kolb Parkway and Harvest Moon Drive and ultimately discharging to the storm water management (SWM) pond located just south of the development across Harvest Moon Drive.

It should be noted per as-built drawings obtained from the Town & Region the existing southern parcel contains a Block connection to the Regional sanitary sewer on Emil Kolb Parkway, as well as a Block connection to the Regional watermain on Harvest Moon Drive. The northern parcel also has a sanitary connection to the Regional sanitary sewer on Emil Kolb Parkway.

1.3 Proposed Development Plan & Population

The proposed development will consist of two townhome blocks, consisting of three (3) storey units, and one eight (8) storey building with an associated parking lot. A total of 124 residential units are proposed for this development. The site plan associated site statistics, prepared by Q4 Architects Inc. have been included in **Appendix A**.

Detailed population estimate calculations for the proposed development are provided in **Table 1-1** below, utilizing townhouse and apartment population densities as per the Region of Peel Linear Wastewater Standards dated March 29, 2023 and the 2020 Development Charges Background Study.

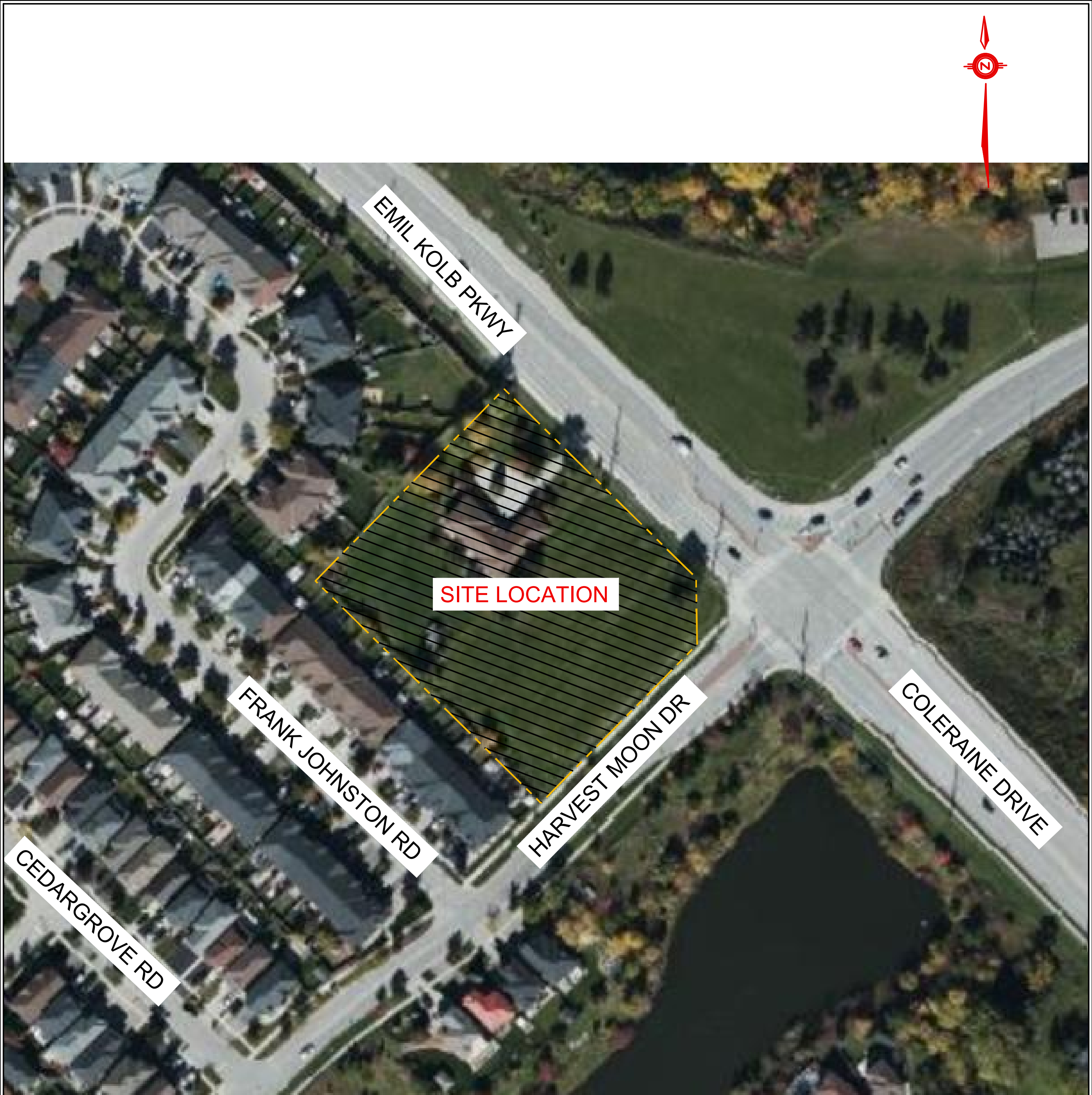
Table 1.1: Estimated Design Population

Housing Classification	Population Density	Units	Population
Multiples (Townhouses)	3.4 persons/unit (ppu)	22	75
Large Apartment (>1 bedroom)	3.1 persons/unit (ppu)	29	90
Small Apartment (≤ 1 bedroom)	1.7 persons/unit (ppu)	73	125
TOTAL	--	124	**290**

1.4 Emil Kolb Parkway Roundabout

In support of future growth to 2041 the Region of Peel completed a ‘Schedule C’ Municipal Class Environmental Assessment (Class EA) to consider a range of options for long term traffic improvements on Coleraine Drive and Emil Kolb Parkway. The study area included Coleraine Drive from Holland Drive to Emil Kolb Parkway at the Harvest Moon Drive/King Street West intersection. The Emil Kolb Parkway and Harvest Moon Drive / King Street West intersection was identified to be in need of improvement to accommodate future traffic needs. To facilitate improvements at the intersection, the Region of Peel will be converting the existing intersection to a roundabout.

In consultation with the Region of Peel, relevant information available at the time regarding the future roundabout was provided in October 2024 in order to ensure the ultimate condition of the roundabout is reflected in terms of property impacts / limits.



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SCHAEFFERS
CONSULTING ENGINEERS
6 Ronrose Drive, Concord, Ontario L4K 4R3
Tel: (905) 738-6100 Email: general@schaeffers.com
www.schaeffers.com

LEGEND
PROPERTY LINE

FIGURE 1.1
SITE LOCATION

5440	JUNE 2024	SCALE: N.T.S.

Vivian Huynh
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2.0 STORMWATER MANAGEMENT

2.1 Existing Services & Tributary Area

According to information provided by the Town of Caledon and Region of Peel, there is an existing 375 mm diameter storm sewer running south on Emil Kolb Parkway and a 300 mm diameter storm sewer from a double catch basin running south across Harvest Moon Drive. The existing storm sewers both discharge to SWM pond 5 located south west of Harvest Moon Drive and Emil Kolb Parkway and outlets to the Jaffary Creek.

As per the tributary drainage figure received from the Town of Caledon the tributary area for SWM Pond 5 is approximately 72 ha and the subject property is confirmed to be included in the tributary area for SWM Pond 5. Refer to **Appendix A** to review the SWM Pond 5 tributary drainage figure.

Site investigations and the topographic survey indicate that approximately **0.39 ha** (with runoff coefficient **C=0.39**) drains to the existing 375 mm diameter storm sewer running south on Emil Kolb Parkway. In addition, approximately **0.44 ha** (with runoff coefficient **C=0.46**) drains to the existing double catch basin located on Harvest Moon Drive. Ultimately both drainage areas discharge to the existing SWM Pond 5 south of Harvest Moon Drive.

As per the drainage figure provided by the Town of Caledon a portion of the rear lots of the existing residential development located to the west of the subject property on Frank Johnston Road drains south east into the subject lands. Under pre-development conditions the external drainage area totals approximately **0.09 ha** with a runoff coefficient **C=0.45**. Refer to **Figure 2.1** for the pre-development drainage patterns.

2.2 Design Criteria

The Town of Caledon and Toronto and Region Conservation Authority Design Standards require the following stormwater management (SWM) criteria for development:

- Quality control (80% long-term Total Suspended Solids removal);
- Quantity control is to be provided where the SWM system should provide adequate control to meeting pre-development flows for all design storm events from 2 to 100 year
- 5mm on site retention for Water Balance

2.3 Allowable Release Rate

As previously noted, the subject site consists of a single detached lot and commercial parcel. The area breakdown for the pre-development condition is included in **Appendix B.** The proposed stormwater management strategy is to ultimately discharge all post-development flows towards the existing 300mm diameter outlet of the double catch basin located on Harvest Moon Drive, which discharges to the existing SWM Pond 5 south of Harvest Moon Drive. The stormwater design criteria is to provide adequate control to meet pre-development flows for all design storm events from 2 to 100-year. But given that the subject property is constrained by out letting to an existing 300mm storm sewer within the Harvest Moon Drive right-of-way (ROW) we are proposing to control the subject site from post to pre-development flows for a 2-year storm and then to attenuate all storm events from 5-year to 100-year (inclusive) to 5-year peak flows. The allowable release rates are established in **Table 2-3** with supporting calculations in **Appendix B.**

Table 2-3: Allowable Release Rates

Design Storm event	Allowable Release Rate (L/s)
2 year	48.2
5year – 100 year	61.7

2.4 Proposed Servicing & Stormwater Management Plan

As previously noted, the proposed development consists of two townhome blocks, and a mid-rise building with associated parking. The weighted runoff coefficient for the proposed development is approximately **0.76**. The proposed area breakdown and weighted runoff coefficient and corresponding calculations are included in **Appendix B.**

All post-development flows will discharge to the existing double catch basin located on Harvest Moon Drive (with its 300mm dia. outlet to SWM Pond 5) where the existing double catch basin will be replaced with a 1500mm double catch basin manhole. The runoff from the 0.09 ha external area that is currently draining across the proposed development shall be fully collected (up to and including 100-year flows) at internal catch basins and conveyed through storm sewers within the site. Refer to **Figure 2.2** for the post-development drainage plan, **Figure 2.3** for the storm tributary plan, and **Figure 2.4** for the proposed stormwater servicing schematic.

2.5 Quantity Control

The post-development flows shall be controlled to the allowable release rates as defined in **Section 2.3** above. Stormwater runoff from the site will be captured and directed to an underground stormwater management tank via stormwater sewers such that the site is self-contained. The maximum required storage volume for the proposed development was calculated to be **81 m^3** for the 2-year storm event, and **307 m^3** for the (5-year to) 100-year storm event. The provided storage volume for the proposed development was calculated to be **83 m^3** and **318 m^3** by using a CULTEC chamber system, for the 2-year and (5 year to) 100-year storm events, respectively.

A control structure was sized to control the runoff for 2 year and 5-100-year peak flows to the allowable release rates. A **149 mm** diameter orifice plate will be provided and located upstream of the filtration unit, controlling flows to **48.1 L/s** and **61.5 L/s** for the 2-year and 5 to 100-year storm events, respectively. Both flow rates are less than the allowable release rates of **48.2 L/s** (2-year) and **61.7 L**/s (5 to 100-year) established in **Section 2.3** above. Refer to **Appendix B** for supporting calculations.

2.6 Quality Control

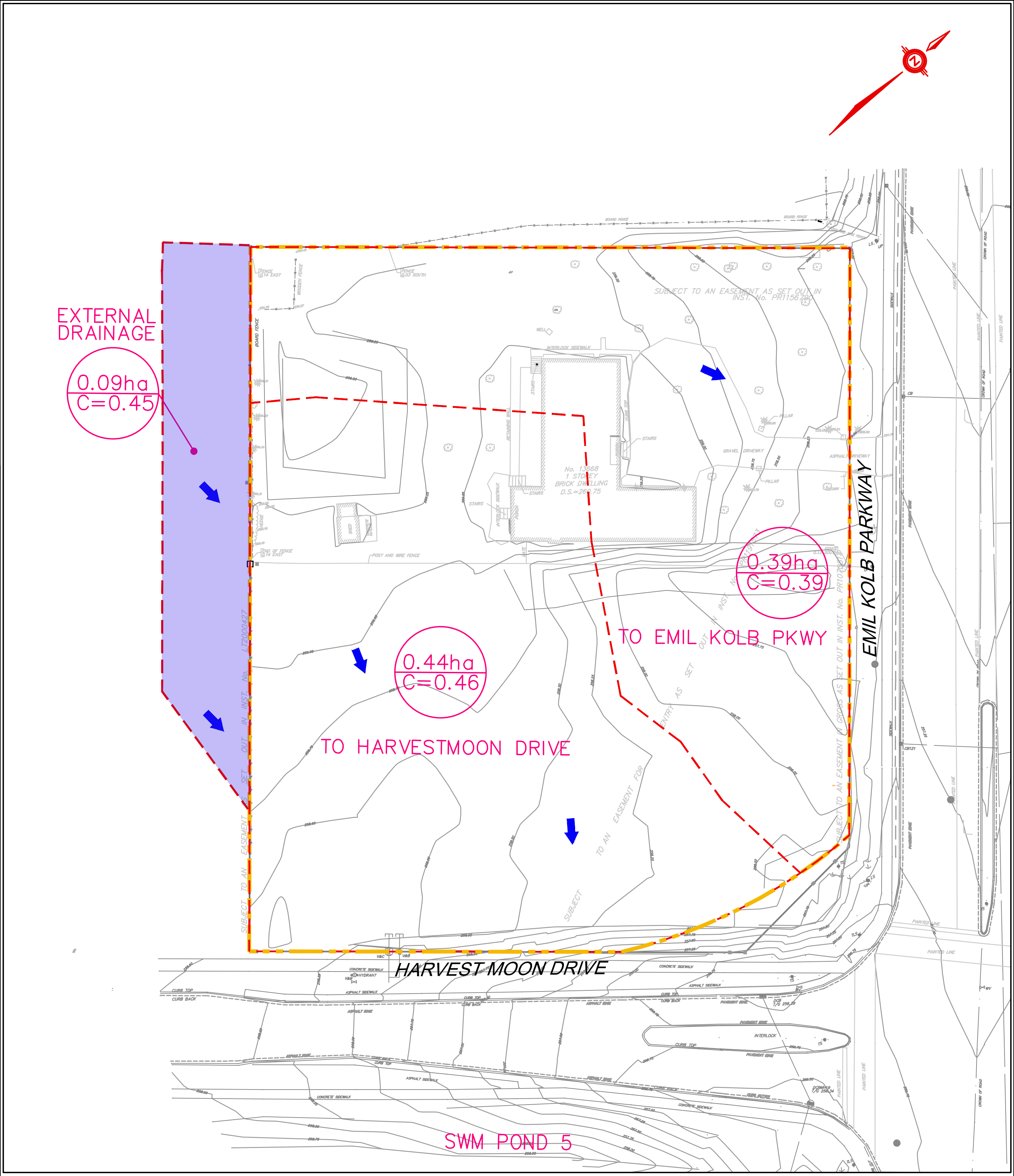
The water quality target, as set out in the MOE's Stormwater management Planning and Design Manual, is the long-term average removal of 80% of Total Suspended Solids (TSS).

A Jellyfish (Model JF6-5-1) by Imbrium Systems Inc. has been sized to provide a minimum TSS removal rate of 80% according to the manufacturer. The off-line filtration unit is proposed upstream of the site's control manhole, thus treating the entirety of the site's discharge. Refer to **Appendix B** for the sizing of the filtration unit.

2.7 Water Balance

TRCA stormwater management criteria require a minimum on-site retention of 5mm. The proposed strategy to address on-site retention will be through infiltration, evapotranspiration, and or re-use to reduce run-off volumes. Based on initial abstraction calculations, 1.64 mm will be captured on site. The remaining 3.4 mm translates to a volume of approximately **27.8 m^3**. The remaining volume of 27.8 m^3 will be infiltrated via an infiltration gallery 80 m by 1.25 m and a depth of 0.7 m.

Detailed on-site retention requirement calculations are provided in **Appendix B**. The groundwater conditions and proposed infiltration facility are being reviewed by the hydrogeologist. Should the soil and groundwater conditions not permit an infiltration gallery surfaced based low impact development (LID) features will be considered.



13656 EMIL KOLB PKWY

SCHAEFFERS CONSULTING ENGINEERS
6 Ronrose Drive, Concord, Ontario L4K 4R3
Tel: (905) 738-6100 Email: general@schaeffers.com
www.schaeffers.com

LEGEND
PROPERTY LINE
DRAINAGE AREA
OVERLAND FLOW ROUTE
0.11ha AREA IN HECTARES
C=0.50 RUN-OFF COEFFICIENT

FIGURE 2.1
EXISTING DRAINAGE PLAN

5440	JAN 2025	SCALE: N.T.S.

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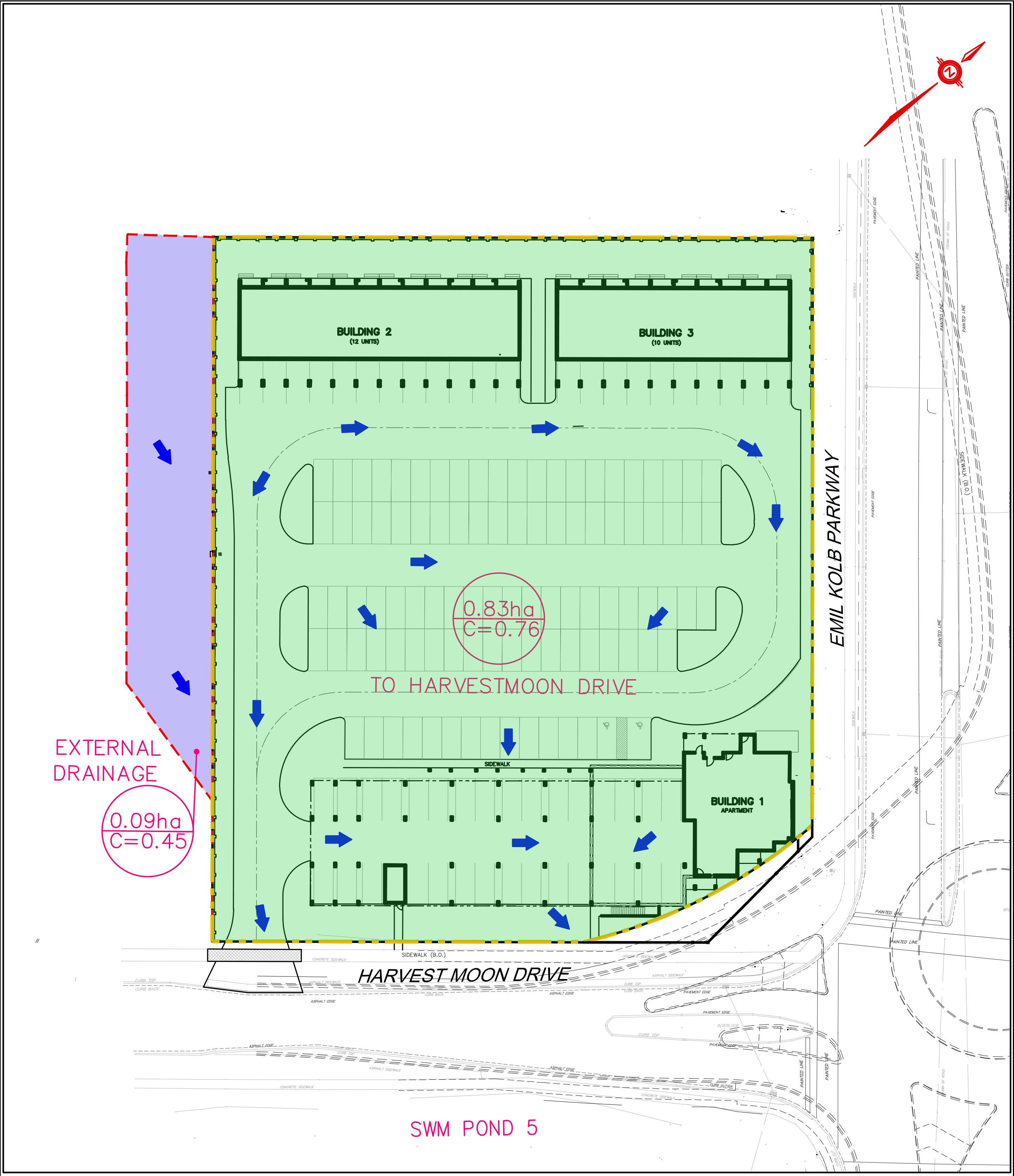
Christopher DSouza



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SCHAEFFERS
CONSULTING ENGINEERS
6 Ronrose Drive, Concord, Ontario L4K 4R3
Tel: (905) 738-6100 Email: general@schaeffers.com
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LEGEND
PROPERTY LINE
DRAINAGE AREA
OVERLAND FLOW ROUTE
0.11ha — AREA IN HECTARES
C=0.50 — RUN-OFF COEFFICIENT

FIGURE 2.2
POST-DEVELOPMENT
DRAINAGE PLAN

5440	JAN 2025	SCALE: N.T.S.

Christopher DSouza
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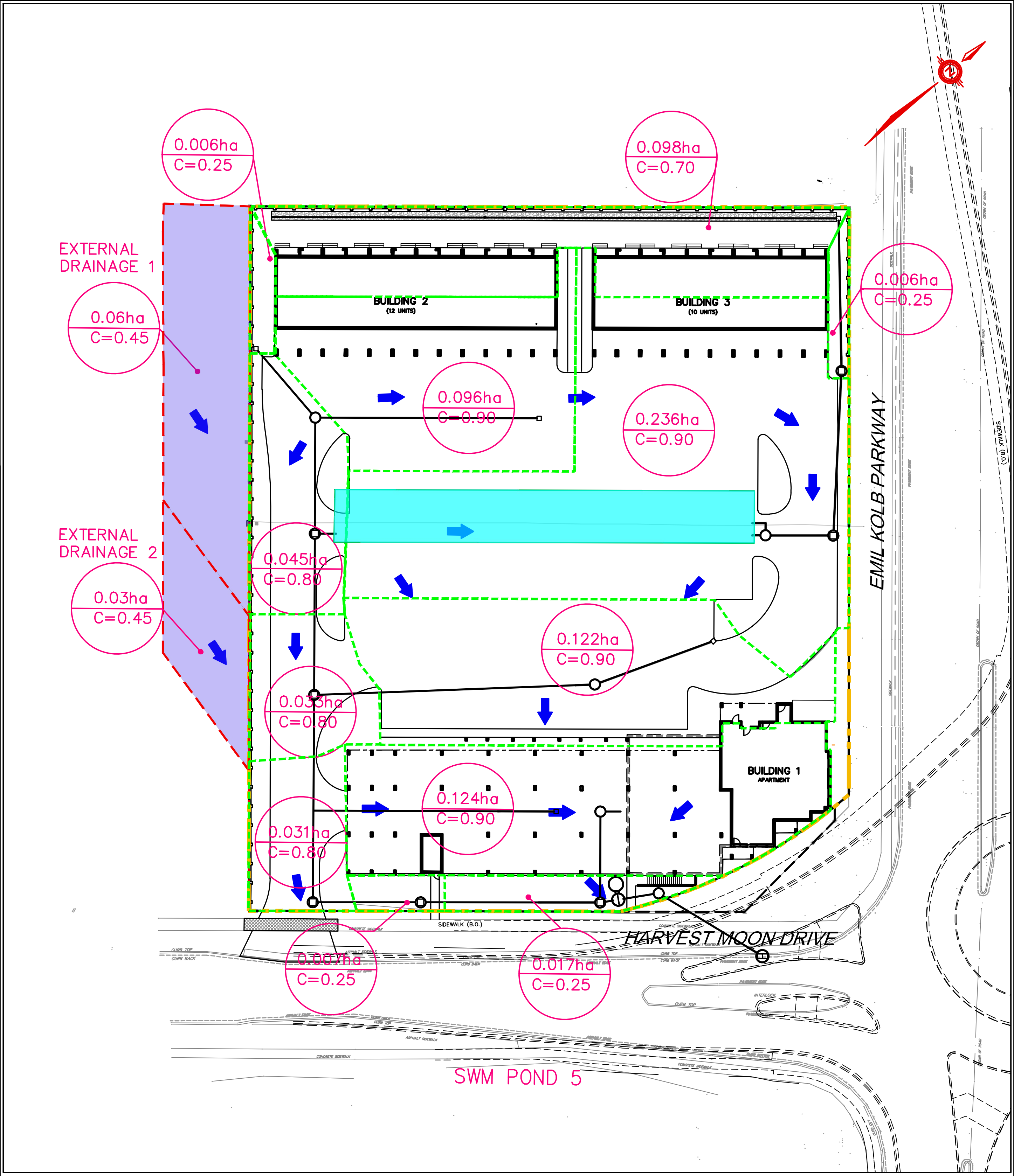

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SCHAEFFERS
CONSULTING ENGINEERS
6 Ronrose Drive, Concord, Ontario L4K 4R3
Tel: (905) 738-6100 Email: general@schaeffers.com
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LEGEND

PROPERTY LINE	
TRIBUTARY AREA	
OVERLAND FLOW ROUTE	
0.11ha	AREA IN HECTARES
C=0.50	RUN-OFF COEFFICIENT

FIGURE 2.3
STORM TRIBUTARY AREA

5440	JAN 2025	SCALE: N.T.S.

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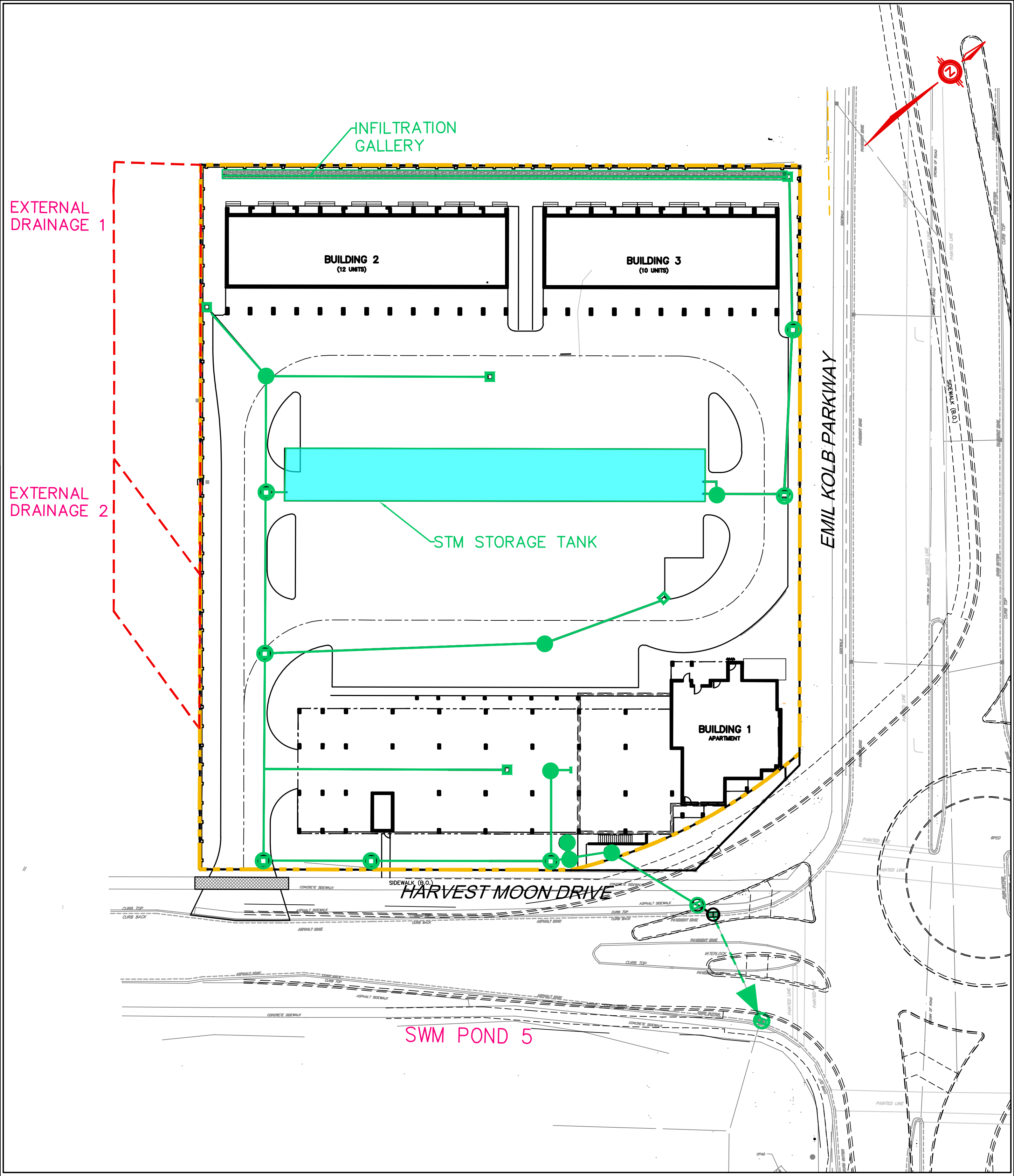

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LEGEND

PROPERTY LINE

EX. STORM SEWER AND MANHOLE

PROPOSED STORM SEWER AND MANHOLE

FIGURE 2.4
PROPOSED STORMWATER SERVICING

5440	FEB 2025	SCALE: N.T.S.

3.0 SANITARY SERVICING

3.1 Existing Servicing Infrastructure

According to information obtained from the Town of Caledon and Region of Peel, sanitary servicing in the vicinity of the subject site is provided by a 150 mm diameter sanitary service located on the southern parcel connecting to the 375 mm diameter sanitary sewer flowing south-westerly on Emil Kolb Parkway. North of the existing driveway there is an existing service connection that will be decommissioned as per Peel Region standards.

3.2 Design Criteria & Parameters

The following information from the *Region of Peel Sanitary Sewer Design Criteria and 2020 Development Charges Background Study* will be utilized to calculate estimated flows from the subject site:

Table 3.1: Region of Peel Sanitary Sewer Design Parameters

Design Criteria	Parameter
Region of Peel 2020 DC Background Study & Linear Wastewater Standards (March 29, 2023)	Avg. Daily Domestic Flow Q_D = 290 litres/person/day
	Infiltration Rate Q_I = 0.26 litres/second/hectare
	Population (Single Detached) P = 4.2 person/unit
	Population Townhomes P = 3.4 persons/unit Large Apartment (>1 bedroom) P = 3.1 persons/unit Small Apartment (<=1 bedroom) P = 1.7 persons/unit
	Harmon Peaking Factor $M = [1+(14/(4+P(total)^{1/2}))]$
	Peak Flow Rate $Q = (ADWF \times PF) + Q_{I\&I}$

3.3 Existing Conditions & Sanitary Flows

Based on the Region's design criteria, the pre-development peak flow from the site is estimated to be **0.27 L/s** as indicated in the calculations shown in **Appendix C**. The estimated flow is based on one (1) single family dwelling within the existing property.

3.4 Proposed Sanitary Servicing

The development is proposed to connect to the existing 375 mm diameter sanitary sewer on Emil Kolb Parkway by reutilizing the existing 150 mm connection for the southern parcel. Refer to **Figure 3.1** for the proposed sanitary servicing plan schematic. It should be noted, the existing sanitary connection's condition will be verified via CCTV inspection to ensure it is suitable.

As previously mentioned in **Section 1.3**, the proposed residential development consists of **124** residential units, which totals a population of **290** persons.

An estimate of the expected sanitary flow generation for the development, on the basis of the Region's criteria, has been included in **Appendix C** including the Region's water and wastewater modeling demand table. The sanitary flow estimate was based on the expected population using an average flow of **290 L/person/day**. The average sanitary flow was calculated to be **0.97 L/s**. Applying a peaking factor and allowance for infiltration results in an estimated sanitary design flow of **4.11 L/s**. Sanitary flows for the development are summarized below in **Table 3.2**.

Table 3.2: Estimated residential Sanitary Servicing Demands

Expected Population (1)	Development Area (ha)	Harmon's Peaking Factor (M)(2)	Average Sanitary Demand (L/s)(3)	Infiltration (L/s) (4)	Total Peak Flow (L/s)(5)
290	0.83	4.00	0.97	0.22	4.11

Note:

(1) Expected population from Table 1.1
(2) $M = 1 + (14/(4 + (\rho/1000)^{0.5})$
(3) Average day consumption rate of 290 L/cap/day as per 2020 DC Background Study
(4) Based on infiltration allowance of 0.26 L/s/ha
(5) Peak Flow = average demand * M + infiltration

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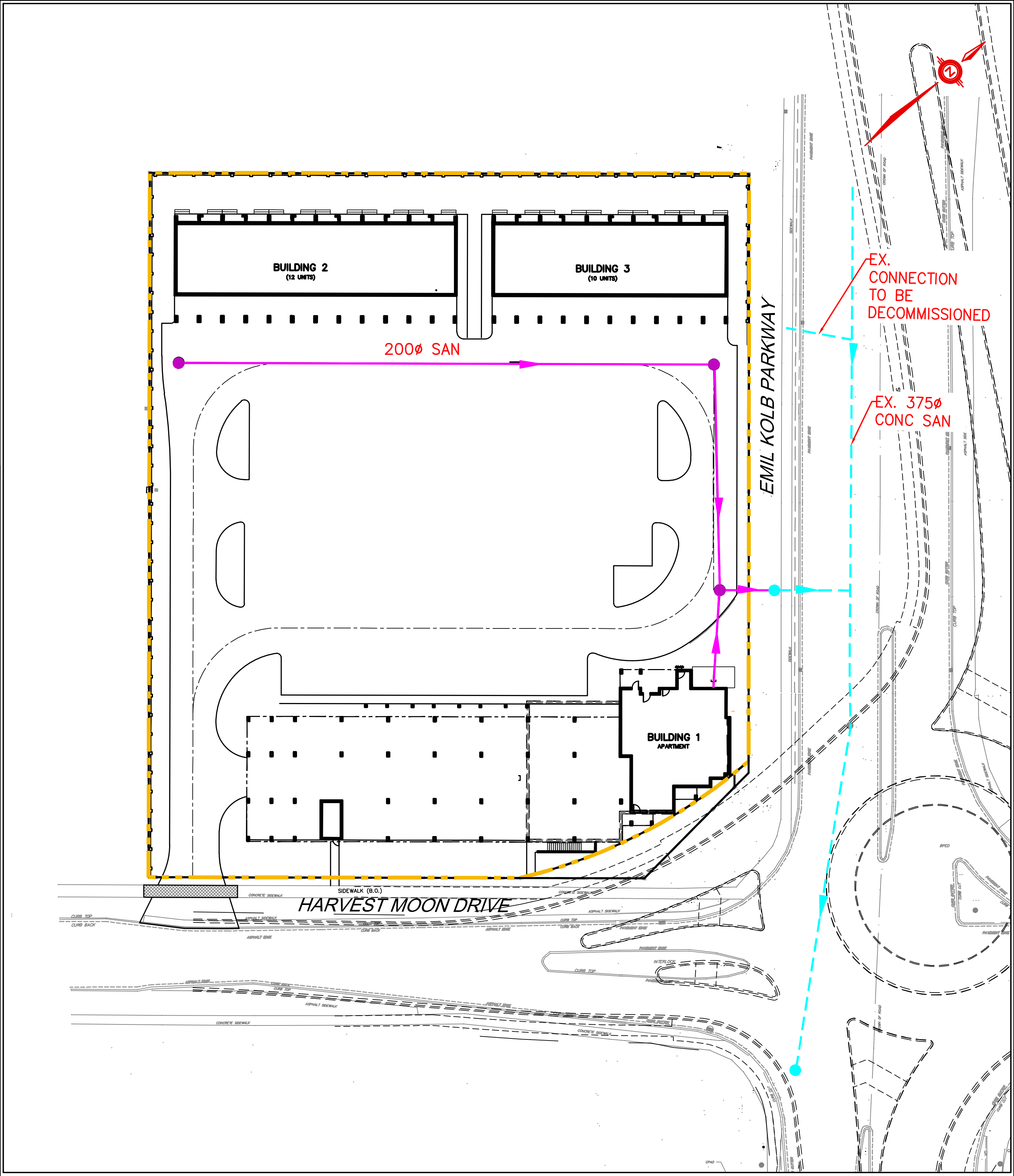

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6 Ronrose Drive, Concord, Ontario L4K 4R3
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LEGEND

- PROPERTY LINE
- PROPOSED SANITARY SEWER
- EX. SANITARY SEWER

FIGURE 3.1
PROPOSED SANITARY
SERVICING

5440	FEB.2025	SCALE: N.T.S.

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4.0 WATER SUPPLY SERVICING

4.1 Existing Servicing

The subject site is located in watermain pressure zone 6 and based on information received from Peel Region and the Town of Caledon, the following watermains exist in the vicinity of the site:

- 300 mm diameter PVC watermain on Harvest Moon Drive
- 300 mm diameter PVC watermain on Emil Kolb Parkway
- Existing Hydrant on Harvest Moon Drive
- Existing Hydrant on Emil Kolb Parkway

There is an existing water service connection located off of Harvest Moon Drive. The existing water supply infrastructure adjacent to the subject site can be seen schematically on **Figure 4.1**

4.2 Water Supply Design Criteria

In accordance with the Region of Peel's 2020 Development Charges Background Study, Ministry of Environment, conservation & Parks (MECP Design Guidelines for Drinking Water Systems (May 2019), and the Fire Underwriters Survey (2020) the following design criteria outlined in **Table 4.1** will be utilized

Table 4.1: Water Supply Design Criteria

Design Criteria	Parameters
Region of Peel 2020 Development Charges Background Study	Avg. Daily Domestic Flow (Residential) Q_D = 270 L/capita/day
	Maximum Hour Demand Peaking Factor Max. Hour PF = 3.0
	Maximum Day Demand Peaking Factor Max. Day PF = 1.8
Ministry of Environment, Conservation and Parks (MECP) Design Guidelines for Drinking Water Systems (May 2019)	Minimum Peak Hour Demand Pressure Min. $P_{PEAK\ HR}$ = 275 kPa (40 psi)
	Minimum Peak Day Demand Pressure Min. $P_{PEAK\ DAY}$ = 140 kPa (20 psi)
	Maximum Static Pressure Max. P_{STATIC} = 690 kPa (100 psi)
Fire Underwriters Survey (2020)	Refer to the Fire Underwriters Survey Calculations in **Appendix D** for the applicable guidelines

4.3 Proposed Water Servicing

The subject property will be serviced by a looped 200 mm PVC watermain service connection to the existing 300 mm watermain on Harvest Moon Drive in order to provide a redundant supply and improve circulation and water quality. The existing water service connection on Harvest Moon Drive will be decommissioned and capped at the property line as per Region of Peel guidelines. Within the subject site the 200mm watermain will provide domestic and fire flow for the two townhouse blocks. The eight-storey building will be serviced by the 200 mm diameter for a fire line and a 150 mm diameter domestic line. Two internal hydrants are proposed to ensure fire coverage for all three proposed buildings. Additionally, two detector check valves within two water chambers will be installed within the property line, water meters will be installed for each town house unit, and one water meter installed in the mechanical room of the eight-storey building all in accordance with Region of Peel standards. **Figure 4.1** illustrates the proposed water servicing strategy for the subject site.

As indicated above in Section 1.3 the proposed development has a population equivalency of **290** persons. The expected water supply demands have been summarized in **Table 4.2.**

Table 4.2: Water Supply Demands

Population	Average Day Demand (L/s) (2)	Maximum Day Demand (L/s) (3)	Peak Hour Demand (L/s) (4)	Fire Flow + Max Day Demand (L/s) (5)
290	0.91	1.63	2.72	284.96

The fire flow demand noted above was calculated using Fire Underwriters Survey (FUS). It is assumed that the construction type for the two town house blocks is categorized as “wood-frame” (C = 1.5). The eight-storey building it is assumed the construction type is categorized as “non-combustible” (C = 0.8) with an NFPA 13 sprinkler system (F = 30%). The fire flow required for the proposed development was found to be **17,000 L/min** resulting in a fire flow demand of **283 L/s.** Water supply demand and fire flow calculations are included in **Appendix D**.

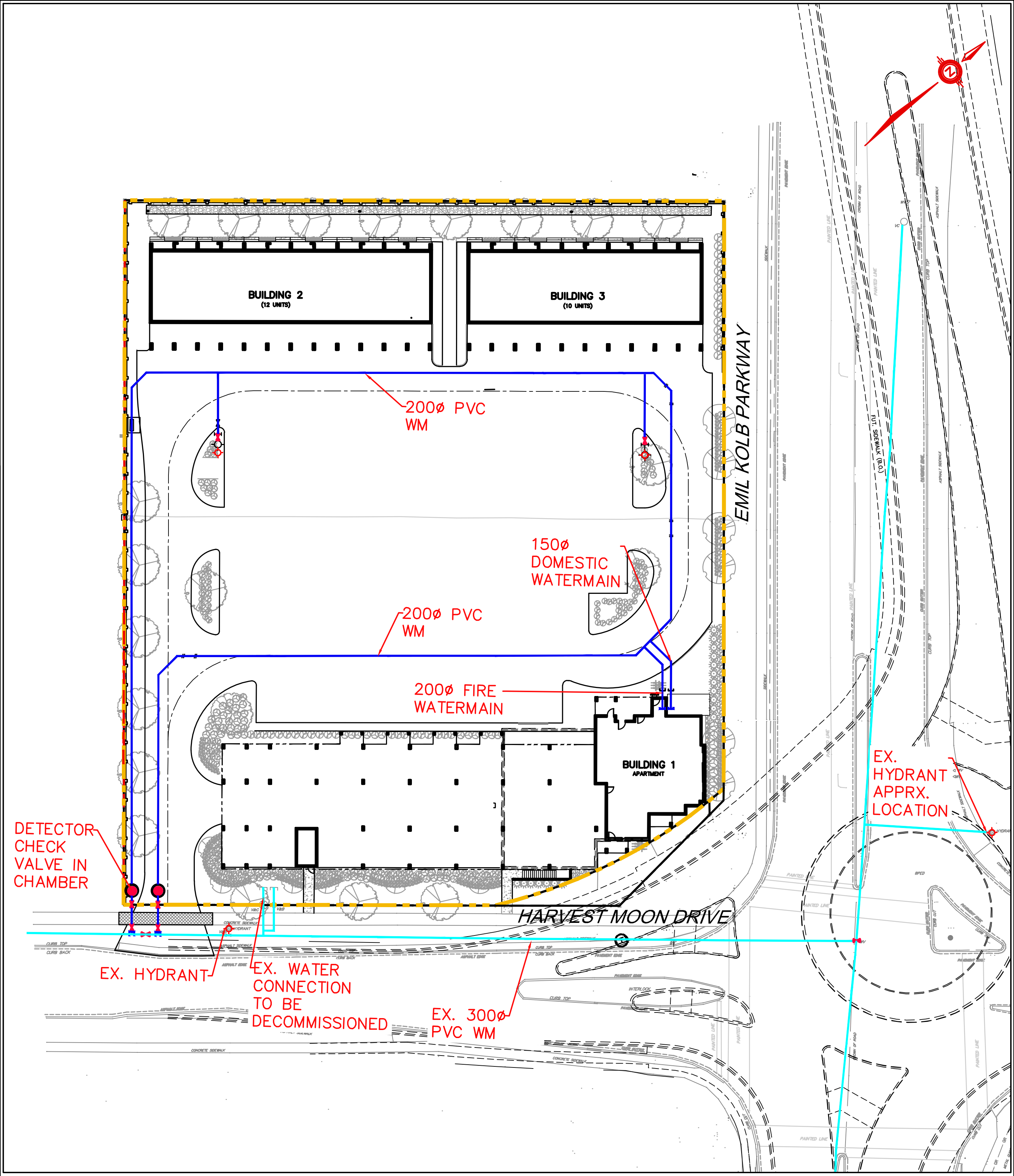
4.4 Existing System Analysis

A hydrant flow test was conducted by Tyco Integrated fire and Security Canada Inc. on June 20, 2024 on the existing 300 mm diameter watermain and hydrant on Harvest Moon Drive – refer to **Appendix D** for the test results.

The water supply test measured a static pressure of **49 psi (338 kPa)**, a pressure of **47 psi (324 kPa)** during a flow of **923 U.G.P.M. (58 L/s)**, and a pressure of **45 psi (311 kPa)** during a flow of **1686 U.G.P.M. (106 L/s)**.

Extrapolation of the hydrant flow test results indicate that the maximum day plus fire scenario of **17,098 L/min (284.96 L/s)** has an expected pressure of **166.78 kPa (24.2 psi)**, which is greater than the minimum required residual pressure of **140 kPa**. Additionally, at a pressure of **140 kPa (20 psi)**, the available flow in the system is **18,601 L/min (310.019 L/s)**, which is greater than the required peak flow.

To conclude, the analysis results suggest that the surrounding municipal watermain satisfied the required water demand for the proposed development. Detailed analysis calculations are presented in **Appendix D.**



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SCHAEFFERS
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6 Ronrose Drive, Concord, Ontario L4K 4R3
Tel: (905) 738-6100 Email: general@schaeffers.com
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LEGEND

PROPERTY LINE	PROPOSED HYDRANT
PROPOSED WATERMAIN	PROPOSED VALVE
EXISTING WATERMAIN	DECTECTOR CHECK VALVE

FIGURE 4.1
PROPOSED WATER SUPPLY SERVICING

5440	JAN 2025	SCALE: N.T.S.

Christopher DSouza

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5.0 GROUNDWATER CONDITIONS

A hydrogeological assessment of the subject site was undertaken by Hydrogeology Consulting Services (HCS) to assess the potential effects of groundwater on the proposed development. Refer to hydrogeological assessment report dated September 7, 2021 and May 30, 2023 included in **Appendix E**.

The detailed investigations have indicated that construction dewatering may be required and is estimated to be approximately 68,100 L/day. An Environmental Activity and Sector Registry (EASR) may be obtained in lieu of a Permit to Take Water (PTTW) for temporary construction dewatering rates between 50,000 and 400,000.

Any construction dewatering discharge that might be generated that is not collected for off-site treatment and disposal would need to be tested and treated to ensure it meets Region of Peel Sewer Use By-Law criteria prior to discharging to a Regional sewer.

6.0 SUMMARY

This document has provided detailed information on the functional servicing and stormwater management plan for the subject site, indicating the Town/Regional criteria are met:

- A stormwater management plan can be implemented to meet quantity, quality and water balance requirements. On-site controls are required to ensure a controlled release rates of **48.1 L/s** and **61.5 L/s** for the 2-year and 5-100-year storm events, respectively from the site to the existing 300 mm diameter storm sewer on Harvest Moon Drive. Water balance requirements will be met via the implementation of an infiltration gallery.

- Sanitary servicing for the proposed development will be provided by connecting to the existing sanitary manhole within the Emil Kolb Parkway ROW using a 200 mm PVC sanitary sewer.

- Water supply servicing will be provided from the existing 300 mm diameter watermain on Harvest Moon Drive. Within the subject site the 200m diameter watermain will provide domestic and fire flow for the two townhouse blocks, as well as the mid-rise building. A hydrant flow test was conducted to confirm sufficient pressure and flows are available to service the subject site.

We trust that you will find the contents of this report satisfactory. Should you have any questions or comments, please do not hesitate to contact the undersigned.

Respectfully Submitted,

SCHAEFFER & ASSOCIATES LTD.

Prepared by:

Christopher D'Souza
Intermediate Designer

Reviewed by:

Hagop Sarkissian, P.Eng.
Partner

APPENDIX A

Background Information

PROJECT INFORMATION

PROJECT NAME	BOLTON VILLAGE - ARPEGGIO
LEGAL DESCRIPTION	PART OF LOT 9, CONCESSION 5 TOWN OF CALEDON REGIONAL MUNICIPALITY OF PEEL PIN# 14326-1856 (LT)
MUNICIPAL ADDRESS	13656 EMIL KOLB PARKWAY , BOLTON, ON

SITE

SITE AREA	8,363.7m² / 0.83ha / 90,026.1SqFt
TOTAL LANDSCAPE AREA	1,730.6m²
SOFT LANDSCAPE AREA	1,267.1m²
HARD LANDSCAPE AREA	463.5m²
OUTDOOR PARKING AREA	4,387.4m²
SITE COVERAGE	23.3%

BUILDING AREAS

TOTAL BUILDING AREA	1,951m²
BLDG 1 AREA - HIGH BLDG	1,181m² (INCLD. 936m² OF OPEN PARKING AREA & 245m² FIRST FLOOR AMENITIES)
BLDG 2 AREA - 12 UNITS	~420m²
BLDG 3 AREA - 10 UNITS	~350m²

UNIT BREAKDOWN

BLDG 1 - HIGH BLDG	
No OF STOREYS	8
No OF UNITS	102
ACCESSIBLE UNITS	15
BLDG 2 - TOWNHOUSES	
No OF STOREYS	3
No OF UNITS	12
BLDG 3 - TOWNHOUSES	
No OF STOREYS	3
No OF UNITS	10
TOTAL # OF RESDIENTIAL UNITS	124

GFA

BLDG 1 - HIGH BLDG	7,996m²
BLDG 2 - TOWNHOUSES	18,220m²
BLDG 3 - TOWNHOUSES	15,130m²

FSI = 4.95

PARKING

PROVIDED	
TOTAL # OF PARKING SPACES	172
AT GRADE PARKING	
HIGH-RISE (RESIDENTS - Ratio 1:1)	102
HIGH-RISE (VISITORS - Ratio 1:0.2)	21
STACKS (RESIDENTS - Ration 1:2)	44(22 + 22 Tandem Spaces)
STACKS (VISITOR - Ration 1:0.2)	5
BARRIER-FREE PARKING (4%)	2 (Incld.)

INFORMATION TAKEN FROM

PLAN OF SURVEY AND TOPOGRAPHY
PART OF LOT 9,
CONCESSION 5
(GEOGRAPHIC TOWNSHIP OF ALBION)
TOWN OF CALEDON
REGIONAL MUNICIPALITY OF PEEL

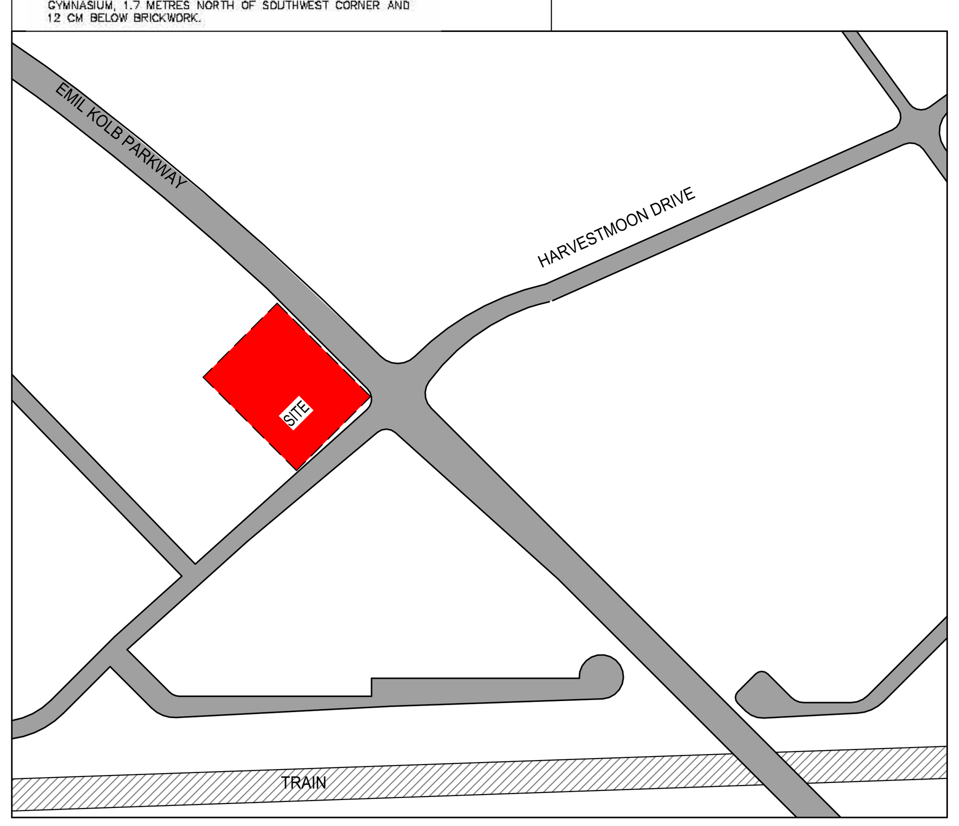
INTEGRATION NOTE

ROTATION NOTE

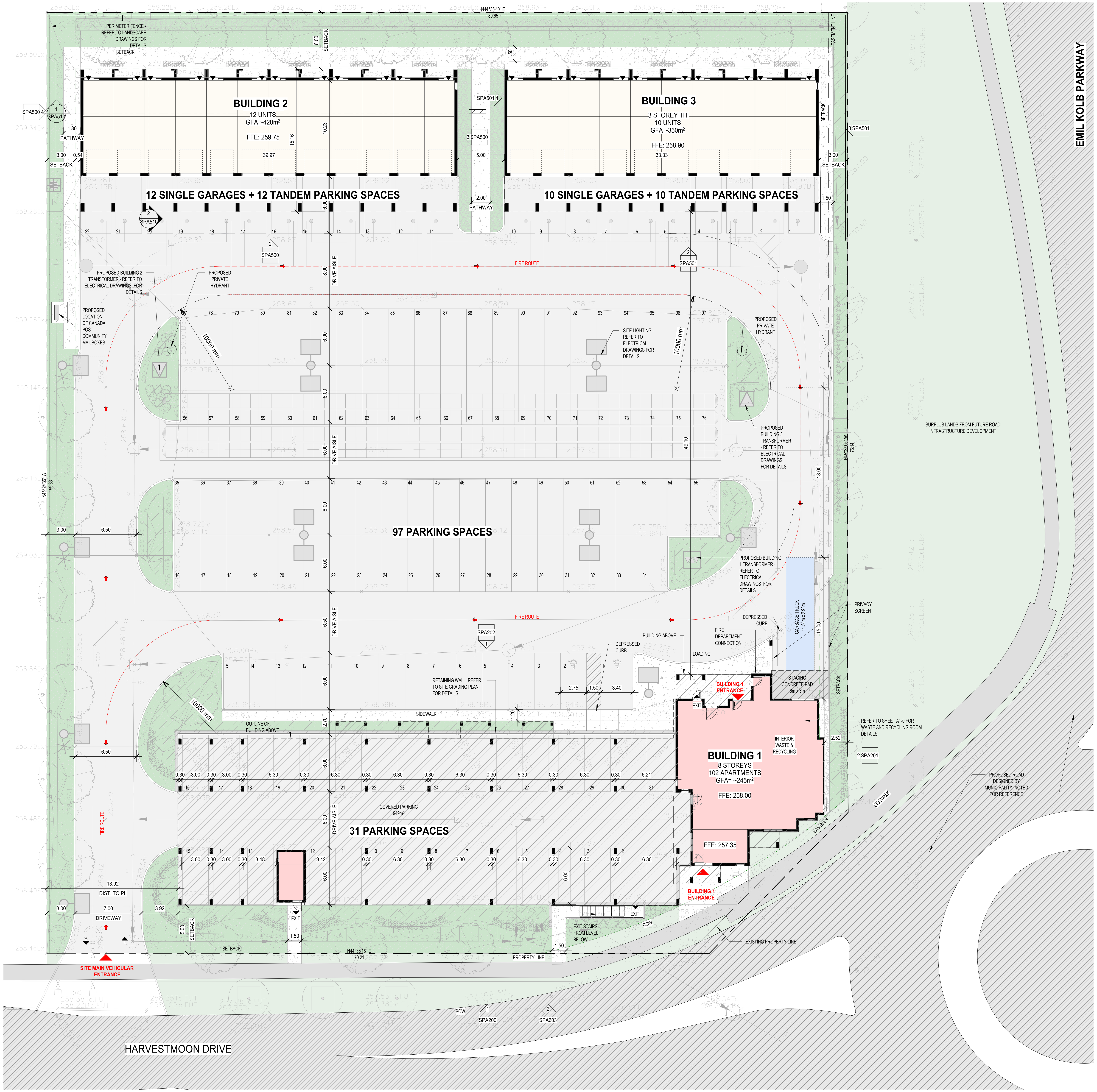
BENCHMARK NOTE

LEGEND

TRAVEL DISTANCE	
RESIDENTS PARKING	2.75 / 2.75 / 2.75 / 6.00
ACCESSIBLE PARKING	3.40 / 6.00
NO PARKING AREA	



KEY PLAN N.T.S.



Q4A ARCHITECTS

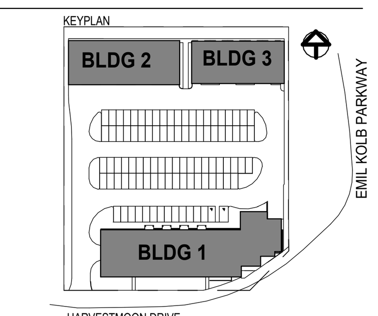
Q4 ARCHITECTS INC.
4110 Yonge Street
Suite 602,Toronto,ON.
M2P 2B7
T. 416.322.6334
F. 416.322.7294
E. info@q4architects.com

PN
TN
TN = TRUE NORTH
PN = PROJECT NORTH

ONTARIO ASSOCIATION OF ARCHITECTS
MARCELO JORGE GRACA
LICENCE
4263

The contractor / builder must verify all dimensions on the job and report any discrepancy to the designer before proceeding with the work.

Drawings are NOT to be scaled. All drawings and specifications are instruments of service and the copyright property of the designer and must be returned upon request.



Issued For:

01	Issue for SPA Coordination	2024-11-21
02	Issue for SPA Coordination #2	2025-01-07
03	Issued for Review - Stubbes	2025-01-22
04	Issued for Client Review	2025-01-23
06	Issued for SPA Coordination #3	2025-01-29
07	Issued for Client Review	2025-01-31
08	Issued for SPA Coordination #4	2025-02-20
09	Issued for Site Plan Application	2025-02-28
10	Issued for Rezoning Application	2025-02-28

No	Description	Date

Revision Schedule

Project Title

Project Description

BOLTON VILLAGE (ARPEGGIO)

13656, 13668 EMIL KOLB PARKWAY BOLTON, ON

CAMCOS LIVING

Project No.	23005
Scale	As indicated
Drawn By	Author
Checked By	Checker

MASTER SITE PLAN

BUILDING 1-2-3

SPA001 2

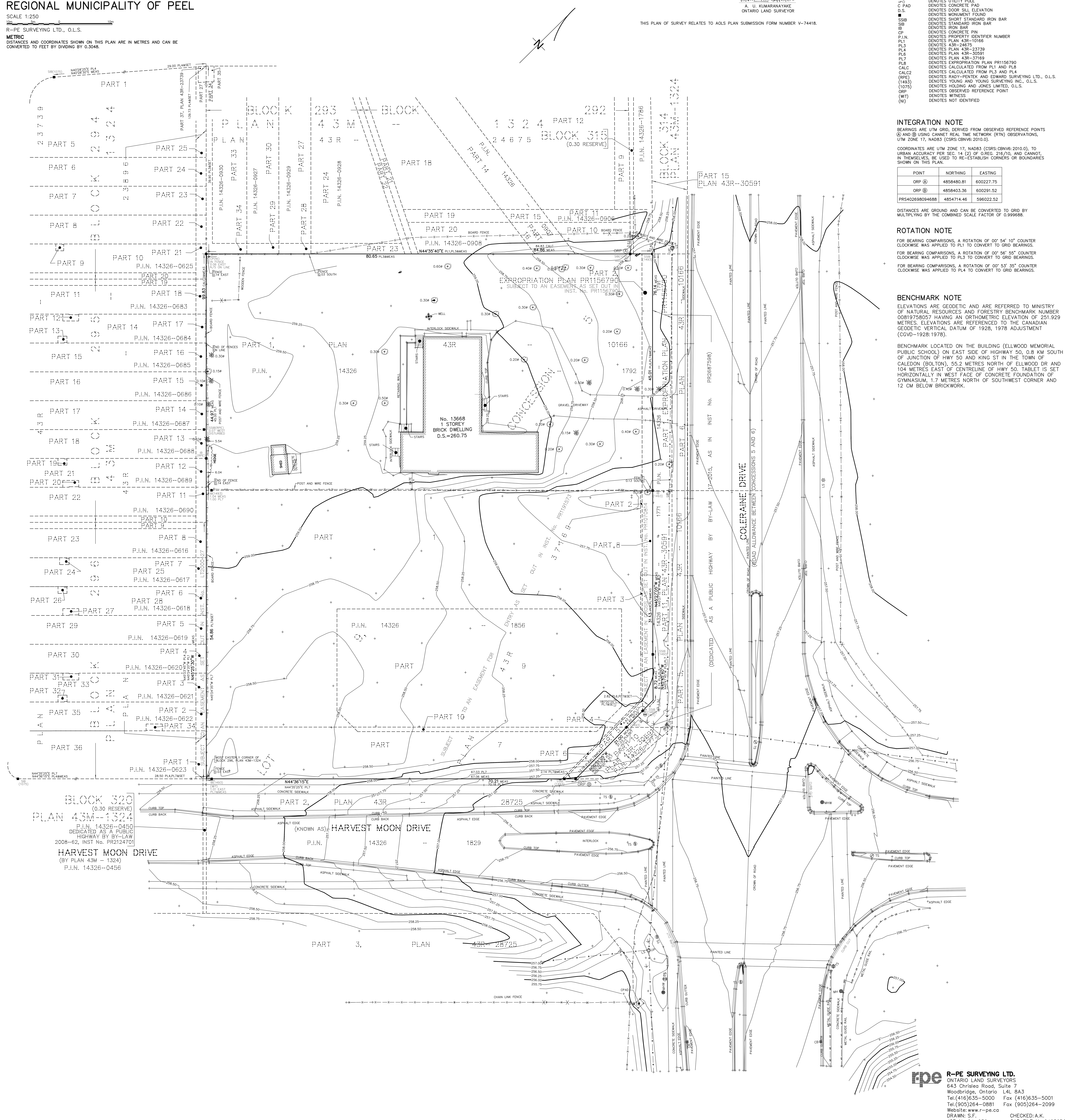
PLAN OF SURVEY AND TOPOGRAPHY
PART OF LOT 9,
CONCESSION 5
(GEOGRAPHIC TOWNSHIP OF ALBION)
TOWN OF CALEDON
REGIONAL MUNICIPALITY OF PEEL

SCALE 1:250

10m 5m 0 10m

R–PE SURVEYING LTD., O.L.S.

METRIC
DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.



SURVEYOR'S CERTIFICATE

I CERTIFY THAT:

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE 20th DAY OF MARCH 2024.

DATE APRIL 3rd, 2024

ALOKA KUMARANAYAKE

A. U. KUMARANAYAKE
ONTARIO LAND SURVEYOR

THIS PLAN OF SURVEY RELATES TO AOLS PLAN SUBMISSION FORM NUMBER V–74418.

NOTES

BXB	DENOTES COMMUNICATION BOX
CB	DENOTES CATCH BASIN
	DENOTES DECIDUOUS TREE
	DENOTES CONIFEROUS TREE
	DENOTES FENCE
LS	DENOTES LAMP STANDARD
MHW	DENOTES MANHOLE WATER
W	DENOTES OVERHEAD WIRE
	DENOTES GUY WIRE ANCHOR
TS	DENOTES TRAFFIC SIGNAL
UP	DENOTES UTILITY POLE
C PAD	DENOTES CONCRETE PAD
D.S.	DENOTES DOOR SILL ELEVATION
■	DENOTES MONUMENT FOUND
SSIB	DENOTES SHORT STANDARD IRON BAR
SIB	DENOTES STANDARD IRON BAR
IB	DENOTES IRON BAR
CP	DENOTES CONCRETE PIN
P.I.N.	DENOTES PROPERTY IDENTIFIER NUMBER
PL1	DENOTES PLAN 43R–10166
PL3	DENOTES 43R–24675
PL4	DENOTES PLAN 43R–23739
PL6	DENOTES PLAN 43R–30591
PL7	DENOTES PLAN 43R–37169
PL8	DENOTES EXPROPRIATION PLAN PR1156790
CALC	DENOTES CALCULATED FROM PL1 AND PL8
CALC2	DENOTES CALCULATED FROM PL3 AND PL4
(RPE)	DENOTES RADY–PENTEK AND EDWARD SURVEYING LTD., O.L.S.
(1493)	DENOTES YOUNG AND YOUNG SURVEYING INC., O.L.S.
(1075)	DENOTES HOLDING AND JONES LIMITED, O.L.S.
ORP	DENOTES OBSERVED REFERENCE POINT
(WIT)	DENOTES WITNESS
(NI)	DENOTES NOT IDENTIFIED

INTEGRATION NOTE

BEARINGS ARE UTM GRID, DERIVED FROM OBSERVED REFERENCE POINTS Ⓐ AND Ⓑ USING CANNET REAL TIME NETWORK (RTN) OBSERVATIONS, UTM ZONE 17, NAD83 (CSRS: CBNV6: 2010.0).

COORDINATES ARE UTM ZONE 17, NAD83 (CSRS: CBNV6: 2010.0), TO URBAN ACCURACY PER SEC. 14 (2) OF O.REG. 216/10, AND CANNOT, IN THEMSELVES, BE USED TO RE–ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

POINT	NORTHING	EASTING
ORP Ⓐ	4858480.81	600227.75
ORP Ⓑ	4858403.36	600291.52
PRS402698094688	4854714.46	596022.52

DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999688.

ROTATION NOTE

FOR BEARING COMPARISONS, A ROTATION OF 00° 54' 10" COUNTER CLOCKWISE WAS APPLIED TO PL1 TO CONVERT TO GRID BEARINGS.

FOR BEARING COMPARISONS, A ROTATION OF 00° 56' 55" COUNTER CLOCKWISE WAS APPLIED TO PL3 TO CONVERT TO GRID BEARINGS.

FOR BEARING COMPARISONS, A ROTATION OF 00° 53' 35" COUNTER CLOCKWISE WAS APPLIED TO PL4 TO CONVERT TO GRID BEARINGS.

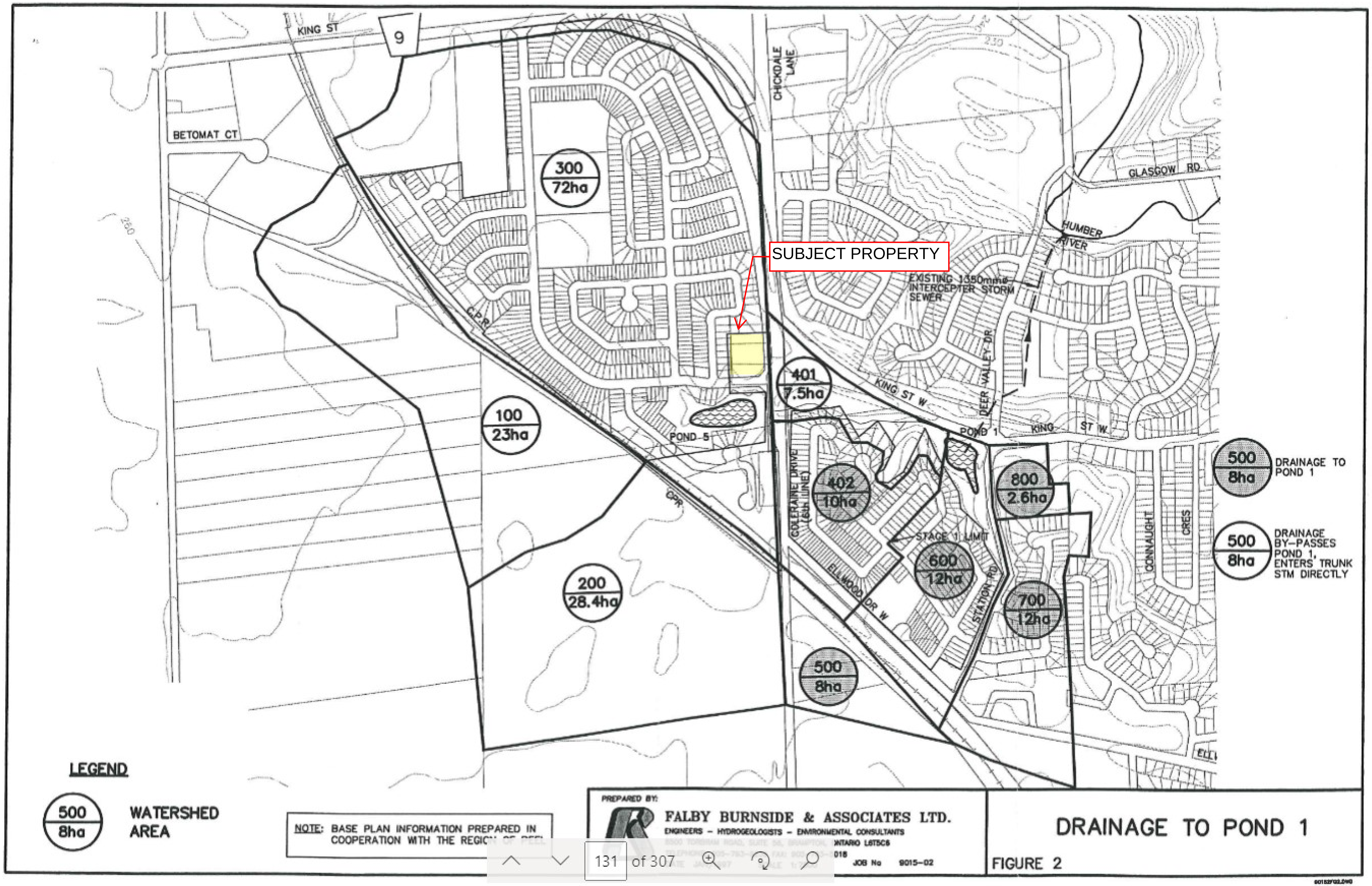
BENCHMARK NOTE

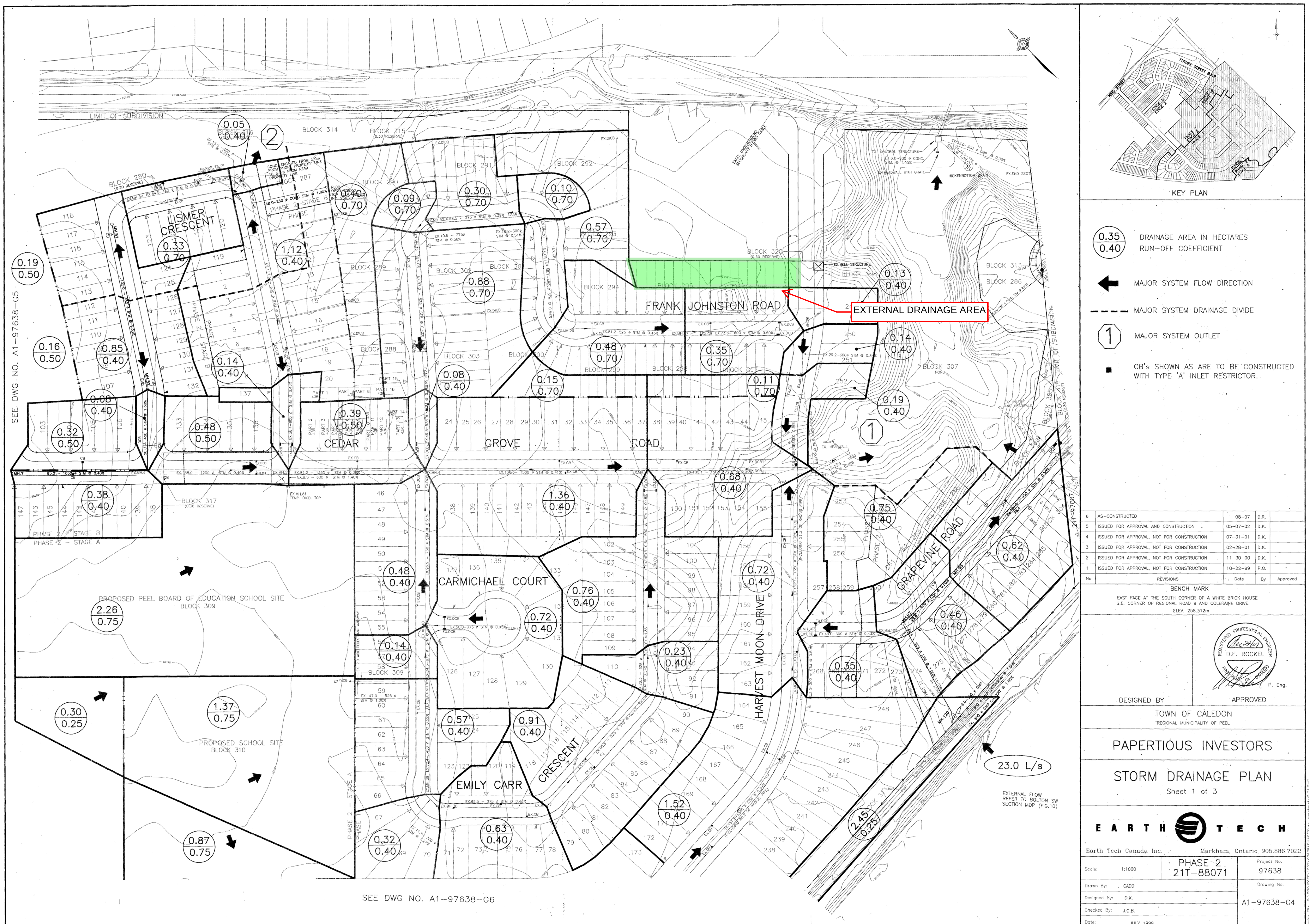
ELEVATIONS ARE GEODETIC AND ARE REFERRED TO MINISTRY OF NATURAL RESOURCES AND FORESTRY BENCHMARK NUMBER 00819758057 HAVING AN ORTHOMETRIC ELEVATION OF 251.929 METRES. ELEVATIONS ARE REFERENCED TO THE CANADIAN GEODETIC VERTICAL DATUM OF 1928, 1978 ADJUSTMENT (CGVD–1928:1978).

BENCHMARK LOCATED ON THE BUILDING (ELLWOOD MEMORIAL PUBLIC SCHOOL) ON EAST SIDE OF HIGHWAY 50, 0.8 KM SOUTH OF JUNCTION OF HWY 50 AND KING ST IN THE TOWN OF CALEDON (BOLTON), 55.2 METRES NORTH OF ELLWOOD DR AND 104 METRES EAST OF CENTRELINE OF HWY 50. TABLET IS SET HORIZONTALLY IN WEST FACE OF CONCRETE FOUNDATION OF GYMNASIUM, 1.7 METRES NORTH OF SOUTHWEST CORNER AND 12 CM BELOW BRICKWORK.

R–PE SURVEYING LTD.
ONTARIO LAND SURVEYORS
643 Chrislea Road, Suite 7
Woodbridge, Ontario L4L 8A3
Tel.(416)635–5000 Fax (416)635–5001
Tel.(905)264–0881 Fax (905)264–2099
Website: www.r–pe.ca

DRAWN: S.F. CHECKED: A.K.
JOB No. 24–056 CAD FILE No. 24056R01


KING ST
9
BETOMAT CT
CHICKDALE LANE
GLASGOW RD
HUMBER RIVER
SUBJECT PROPERTY
EXISTING 1350mmø INTERCEPTER STORM SEWER
300
72ha
100
23ha
200
28.4ha
401
7.5ha
402
10ha
600
12ha
700
12ha
800
2.6ha
500
8ha
C.P.R.
CPR
POND 5
POND 1
KING ST W
DEER VALLEY DR
COLERAINE DRIVE (6th LINE)
ELLWOOD DR W
STATION RD
STAGE 1 LIMIT
CONNAUGHT CRES
500
8ha
DRAINAGE TO POND 1
500
8ha
DRAINAGE BY-PASSES POND 1, ENTERS TRUNK STM DIRECTLY
LEGEND
500
8ha
WATERSHED AREA
NOTE: BASE PLAN INFORMATION PREPARED IN COOPERATION WITH THE REGION OF PEEL
PREPARED BY:
FALBY BURNSIDE & ASSOCIATES LTD.
ENGINEERS – HYDROGEOLOGISTS – ENVIRONMENTAL CONSULTANTS
JOB No 9015-02
DRAINAGE TO POND 1
FIGURE 2



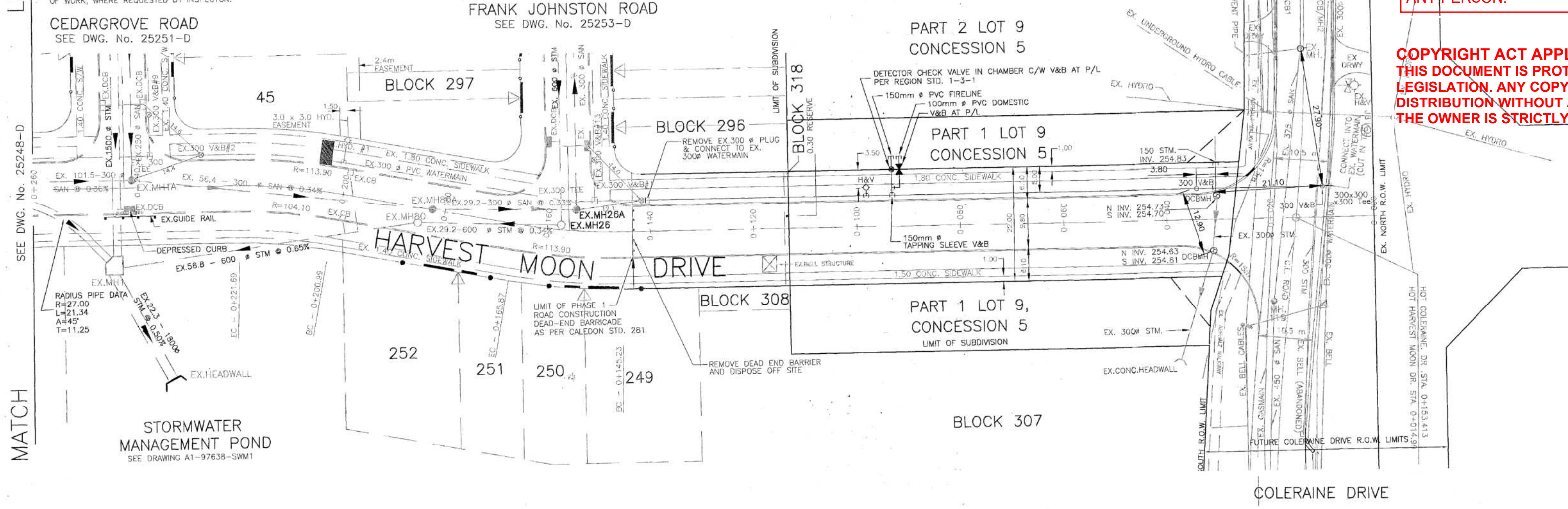
KEY PLAN
DRAINAGE AREA IN HECTARES
RUN-OFF COEFFICIENT
MAJOR SYSTEM FLOW DIRECTION
MAJOR SYSTEM DRAINAGE DIVIDE
MAJOR SYSTEM OUTLET
CB's SHOWN AS ARE TO BE CONSTRUCTED WITH TYPE 'A' INLET RESTRICTOR.
EXTERNAL DRAINAGE AREA
LIMIT OF SUBDIVISION
LISMER CRESCENT
FRANK JOHNSTON ROAD
CEDAR GROVE ROAD
CARMICHAEL COURT
EMILY CARR CRESCENT
HARVEST MOON DRIVE
GRAPEVINE ROAD
PROPOSED PEEL BOARD OF EDUCATION SCHOOL SITE
BLOCK 309
PROPOSED SCHOOL SITE
BLOCK 310
23.0 L/s
EXTERNAL FLOW REFER TO BOLTON SW SECTION MDP (FIG.10)
SEE DWG NO. A1-97638-G5
SEE DWG NO. A1-97638-G6
6 AS-CONSTRUCTED 08-07 D.R.
5 ISSUED FOR APPROVAL AND CONSTRUCTION 05-07-02 D.K.
4 ISSUED FOR APPROVAL, NOT FOR CONSTRUCTION 07-31-01 D.K.
3 ISSUED FOR APPROVAL, NOT FOR CONSTRUCTION 02-28-01 D.K.
2 ISSUED FOR APPROVAL, NOT FOR CONSTRUCTION 11-30-00 D.K.
1 ISSUED FOR APPROVAL, NOT FOR CONSTRUCTION 10-22-99 P.G.
No. REVISIONS Date By Approved
BENCH MARK
EAST FACE AT THE SOUTH CORNER OF A WHITE BRICK HOUSE S.E. CORNER OF REGIONAL ROAD 9 AND COLERAINE DRIVE.
ELEV. 258.312m
D.E. ROCKEL
P. Eng.
DESIGNED BY
APPROVED
TOWN OF CALEDON
REGIONAL MUNICIPALITY OF PEEL
PAPERTIOUS INVESTORS
STORM DRAINAGE PLAN
Sheet 1 of 3
EARTH TECH
Earth Tech Canada Inc.
Markham, Ontario 905.886.7022
Scale: 1:1000
PHASE 2
21T-88071
Project No. 97638
Drawn By: CADD
Designed By: D.K.
Checked By: J.C.B.
Date: JULY 1999
Drawing No.
A1-97638-G4

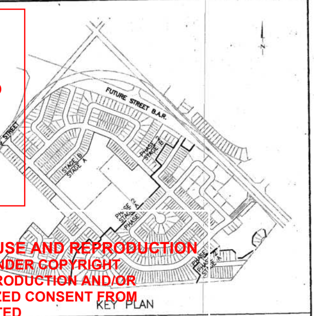
SANITARY SEWERS
1. PVC SANITARY SEWER PIPE SHALL CONFORM TO CSA STANDARD B182.2 & ASTM STANDARDS D-3034 AND F679.
2. ALL PVC SANITARY PIPE AND FITTINGS TO BE PVC SDR-35.
3. ALL SANITARY BEDDING AS PER REGION STANDARD DRAWING 2-3-1, CLASS 'B'.
4. ALL SANITARY SEWERS SHALL HAVE PREMIUM RUBBER GASKET JOINTS.
5. ALL SANITARY MANHOLES AS PER REGION OF PEEL STD. 2-1-1 AND ALL SANITARY DROP STRUCTURES AS PER PEEL STD. 2-1-5.
6. ALL SANITARY SERVICE CONNECTIONS SHALL CONFORM TO CSA STANDARD B182.2 & ASTM STANDARD D-3034 AND ALL RELATED PIPE & FITTINGS TO BE PVC SDR-28. PIPE TO BE ANY COLOUR EXCEPT WHITE.

WATERMAINS
1. WATERMAIN AND/OR WATER SERVICE MATERIALS 100mm(4") AND LARGER MUST BE PVC CLASS 150, MANUFACTURED TO AWWA C900-75 SPECIFICATIONS COMPLETE WITH TRACER WIRE.
2. HYDRANT AND VALVE SET TO REGION STANDARD 1-6-1.
3. ALL HYDRANTS ARE TO HAVE PUMPER NOZZLE OUTLET.
4. WATERMAINS TO BE INSTALLED TO GRADES AS SHOWN ON APPROVED PLANS. COPY OF GRADE SHEET MUST BE SUPPLIED TO INSPECTOR PRIOR TO COMMENCEMENT OF WORK, WHERE REQUESTED BY INSPECTOR.

REGION OF PEEL NOTES:
1. All materials and construction methods must correspond to the current Peel Public Works standards and specifications.
2. Watermains and/or water services are to have a minimum cover of 1.7m(5'6") with a minimum horizontal spacing of 1.2M(4') fromthemselves and all other utilities.
3. Provisions for flushing waterline prior to testing, etc., must be provided with at least a 50mm(2") outlet on 100mm(4") and larger lines. Copper lines are to have flushing points at the end, the same size as the line. They must also be hosed or piped to allow the water to drain onto a parking or down a drain. On fire lines, flushing outlet to be 100mm(4") diameter minimum on a hydrant.
4. All curb stops to be 3.0m(10') off the face of the building unless otherwise noted.
5. Watermains must have a minimum vertical clearance of 150mm(6") over/300mm(12") under sewers and all utilities when crossing.
6. All proposed water piping must be isolated from existing lines in order to allow independent pressure testing and chlorinating from existing systems.

NOTE: FUTURE COMMERCIAL SITE PLAN TO VERIFY EXISTING WATER SERVICE TO BE CAPPED AND ABANDONED AT THE WATERMAIN FOR THE EXISTING DWELLING.





GENERAL

NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. ALL PIPE SIZES ARE IN MILLIMETRES.
3. SEE INDEX SHEET FOR LIST OF DRAWINGS.
4. SEE INDEX SHEET FOR LISTS OF GENERAL NOTES.
5. CB's SHOWN AS ■ ARE TO BE CONSTRUCTED WITH IPEX TYPE 'A' INLET RESTRICTOR.
6. ALL SANITARY SEWER TO BE PVC AND ALL STORM SEWER TO BE CONCRETE UNLESS SHOWN OTHERWISE.

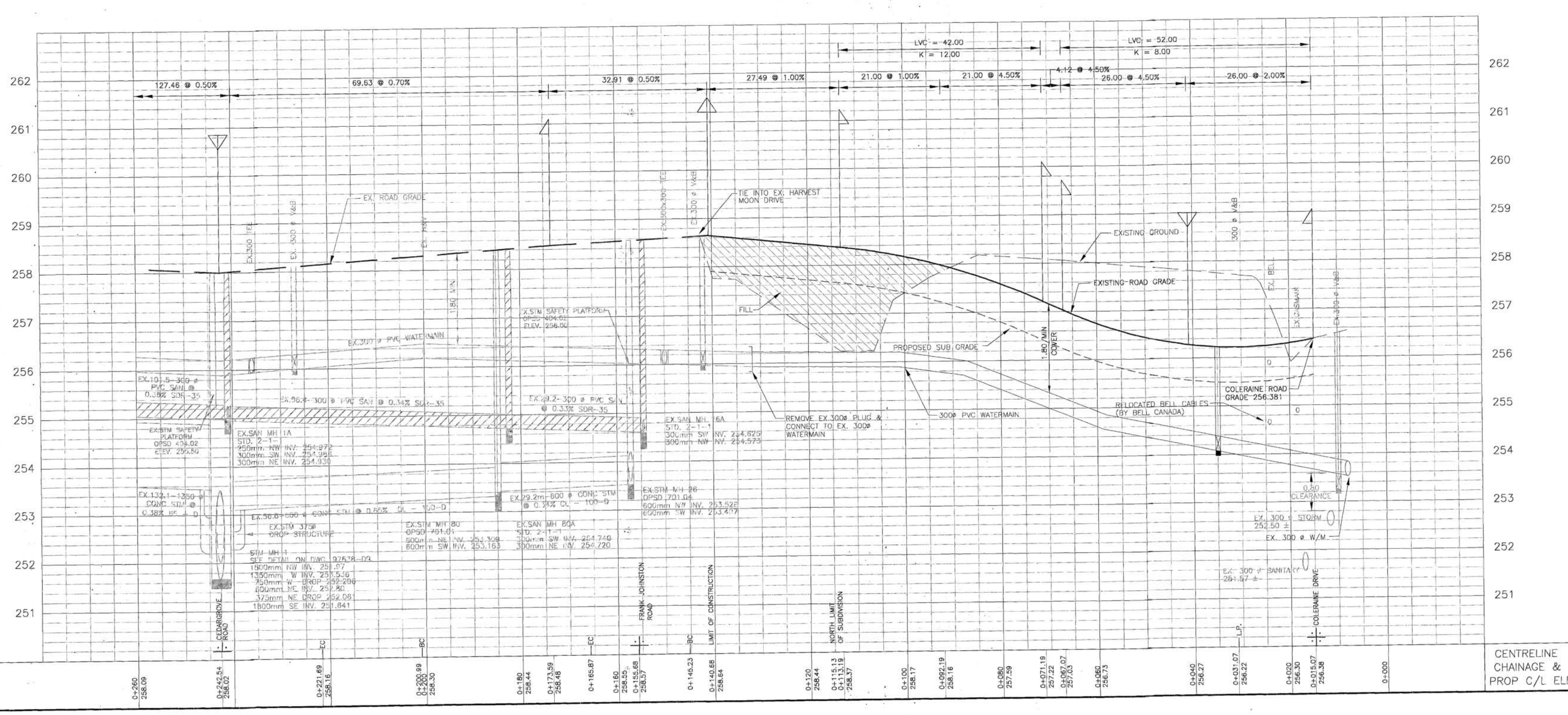
MINIMUM ROAD BASE REQUIREMENTS:
40 mm HL-3
90 mm HL-8
150 MM GRANULAR "A"
450 MM GRANULAR "B"

APPROVED AS NOTED

THIS APPROVAL CONSTITUTES A GENERAL REVIEW AND DOES NOT CERTIFY DIMENSIONAL ACCURACY.

THIS APPROVAL IS SUBJECT TO THE FURTHER CERTIFICATION OF THE "AS-CONSTRUCTED" WORKS BY A REGISTERED PROFESSIONAL ENGINEER OF THE PROVINCE OF ONTARIO.

DATE: ____________ APPROVED BY: ____________
H.MUNTZ, P.ENG.
TOWN ENGINEER



No.	REVISIONS	Date	By	Approved
9	RE-ISSUED FOR COMMERCIAL BLOCK SERVICES	07-06-05	B.G.	
8	AS-CONSTRUCTED	02-19-05	B.G.	
7	ISSUED FOR APPROVAL AND CONSTRUCTION	06-19-03	B.G.	
6	ISSUED FOR APPROVAL, NOT FOR CONSTRUCTION	01-29-03	B.G.	
5	ISSUED FOR APPROVAL AND CONSTRUCTION	05-07-02	D.K.	
4	ISSUED FOR APPROVAL, NOT FOR CONSTRUCTION	07-31-01	D.K.	
3	ISSUED FOR APPROVAL, NOT FOR CONSTRUCTION	02-28-01	D.K.	
2	ISSUED FOR APPROVAL, NOT FOR CONSTRUCTION	11-30-00	D.K.	
1	ISSUED FOR APPROVAL, NOT FOR CONSTRUCTION	10-22-99	P.C.	

BENCH MARK

EAST FACE AT THE SOUTH CORNER OF A WHITE BRICK HOUSE S.E. CORNER OF REGIONAL ROAD 9 AND COLERAINE DRIVE.
ELEV. 258.312m

REGISTERED PROFESSIONAL ENGINEER
Feb 12/09
D.E. ROCKEL
PROVINCE OF ONTARIO
P. Eng.

DESIGNED BY | APPROVED

TOWN OF CALEDON
REGIONAL MUNICIPALITY OF PEEL

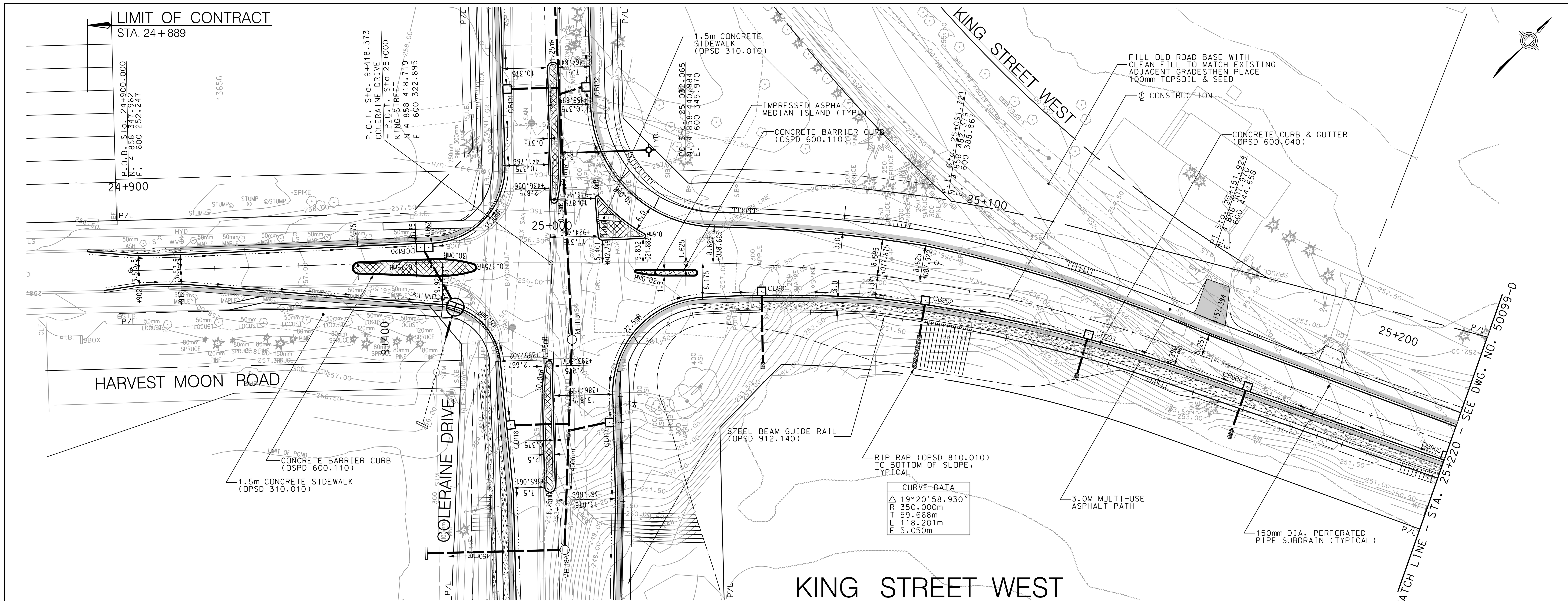
PAPERTIOUS INVESTORS

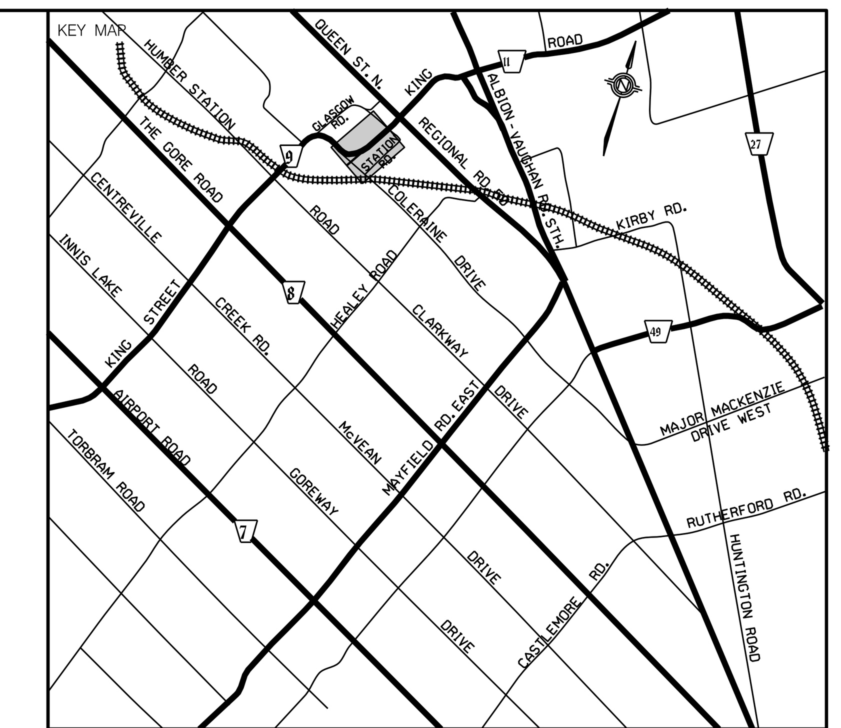
HARVEST MOON DRIVE
Sheet 1 of 5
From Sta. 0+000 to Sta. 0+260

EARTH TECH

Earth Tech Canada Inc. Markham, Ontario 905.886.7022

Scale: H. 1:500 / 1:500 / V. 1:50	PHASE 2 21T-88071'D'	Project No.: 97638
Drawn By: CADD		Drawing No.
Designed By: D.K.		32176-D
Checked By: J.C.B.		
Date: JUNE 1999		





GENERAL NOTES

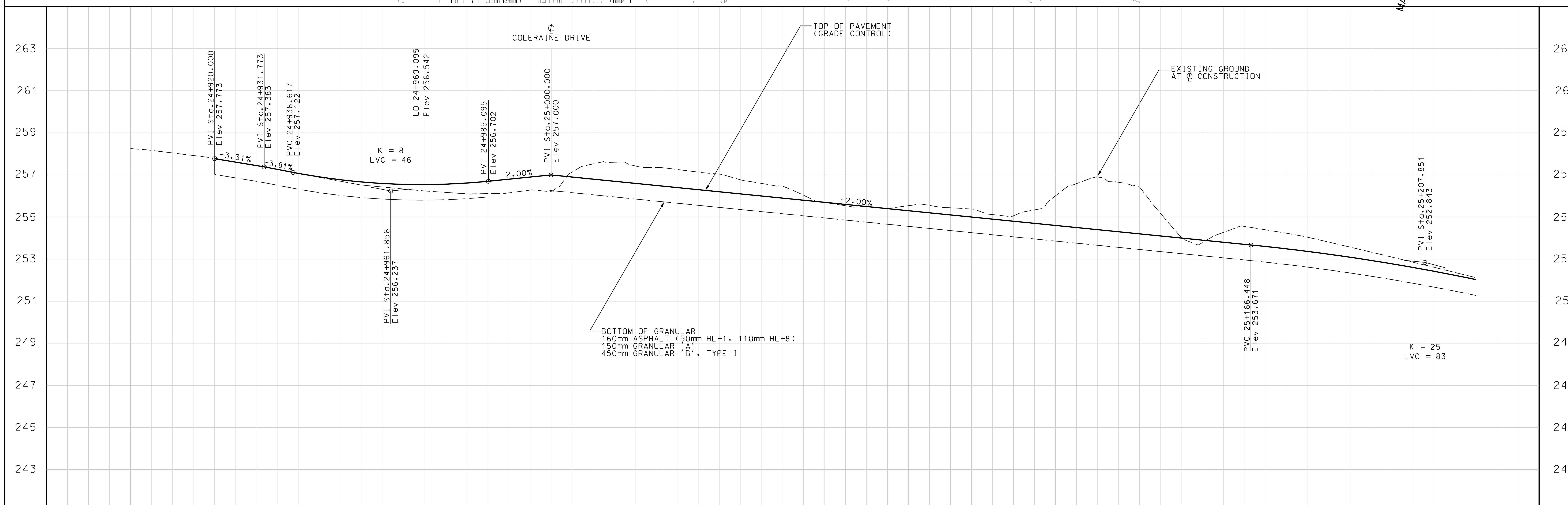
AS-BUILT DRAWING
CONTRACTOR: MARDAVE CONSTRUCTION (2007) LTD.
WORK COMMENCED: MAY, 2010
WORK COMPLETED: OCTOBER, 2012

These As-Built Drawings have been prepared based on inspections and observations undertaken by MRC staff during key stages of construction and on information submitted, in part, by others. While this information is believed to be reliable, MRC is not responsible for its accuracy, or for errors or omissions that may have been incorporated into this drawing as a result.

THESE DESIGN DOCUMENTS ARE PREPARED SOLELY FOR THE USE BY THE PARTY WITH WHOM THE DESIGN PROFESSIONAL HAS ENTERED INTO A CONTRACT AND THERE ARE NO REPRESENTATIONS OF ANY KIND MADE BY THE DESIGN PROFESSIONAL TO ANY PARTY WITH WHOM THE DESIGN PROFESSIONAL HAS NOT ENTERED INTO A CONTRACT.

THE LOCATION OF UTILITIES IS APPROXIMATE ONLY AND THE EXACT LOCATION SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES CONCERNED. THE CONTRACTOR SHALL PROVE THE LOCATION OF UTILITIES AND SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION FROM DAMAGE.

NO.	BY	DATE	REVISION	CONS. CHECKED	TOWN APPR'D
1.	R.I.R.	04/12/10	ISSUED FOR CONSTRUCTION		
2.	R.I.R.	03/06/13	CONSTRUCTION RECORD DRAWING		



℄ CHAINAGE	STORM INVERT	PROPOSED ℄ ROAD GRADES	EXISTING ℄ ROAD GRADES
24+900			
24+920		257.773	257.77
24+940		257.071	257.07
24+960		256.594	256.42
24+980		256.616	256.10
25+000		257.000	256.20
25+020		256.600	257.43
25+040		256.200	257.04
25+060		255.800	256.04
25+080		255.400	255.40
25+100		255.000	255.38
25+120		254.600	256.01
25+140		254.200	256.42
25+160		253.800	254.28
25+180		253.363	254.04
25+200		252.775	253.09
25+220		252.026	252.12

APPROVED FOR CONSTRUCTION

DATE : ______ APPROVED BY: ______
C.A. Campbell, C.E.T.
Director

BENCH MARK:

Designed by

PROJECT NAME
COLERAINE DRIVE WIDENING AND RECONSTRUCTION

CONSULTANT
McCORMICK RANKIN CORPORATION

IN THE REGION OF PEEL

TOWN OF CALEDON

KING STREET REALIGNMENT
GRADING, PAVEMENT AND DRAINAGE

STA. 24+900 TO STA. 25+220

AREA: C-02

SCALE: HORIZ. 1:500	VERT. 1:100	PROJECT No. 08-4280
DESIGNED BY: W.J.B.	DRAWN BY: A.K.S.	DRAWING No.
CHECKED BY: M.W.S.	DATE: FEBRUARY 2010	50101-D

FILE: $FILE$
DATE: 20/05/2014

APPENDIX B

Stormwater Management Calculations

PRE-DEVELOPMENT RUNOFF COEFFICIENT

SCHAEFFERS
CONSULTING ENGINEERS
SCHAEFFER & ASSOCIATES LTD.

Municipality:	Town of Caledon, Municipality of Peel
Project Address:	13656 Emil Kolb Parkway
Project No.	5440
Completed By:	C.D.
Checked By:	H.S.
Date:	2025-02-28

INTERNAL DRAINAGE AREA - DRAINING TO EMIL KOLB PKWY

Type of Area	Area (ha)	Runoff Coeff.*	A x C
Impervious	0.08	0.90	0.08
Pervious	0.30	0.25	0.08
Sub Total	**0.39**		**0.15**

Weighted Coefficient	**0.39**

INTERNAL DRAINAGE AREA TO HARVEST MOON DRIVE

Type of Area	Area (ha)	Runoff Coeff.*	A x C
Impervious	0.14	0.90	0.13
Pervious	0.30	0.25	0.08
Sub Total	**0.44**		**0.20**

Weighted Coefficient	**0.46**

POST-DEVELOPMENT RUNOFF COEFFICIENT

SCHAEFFERS CONSULTING ENGINEERS
SCHAEFFER & ASSOCIATES LTD.

Municipality: Town of Caledon, Municipality of Peel
Project Address: 13656 Emil Kolb Parkway
Project No. 5440
Completed By: C.D.
Checked By: H.S.
Date: 2025-02-28

Controlled Internal Drainage Area

Site Features	Area (ha)	Runoff Coeff.	A x C
Impervious	0.69	0.90	0.62
Pervious	0.13	0.25	0.03
Sub Total	**0.83**		**0.67**

Weighted Coefficient	0.81

Controlled External Drainage Area

Type of Area	Area (ha)	Runoff Coeff.*	A x C
Impervious	0.03	0.90	0.02
Pervious	0.06	0.25	0.02
Sub Total	**0.09**		**0.04**

Weighted Coefficient	0.45

COMBINED CONTROLLED DRAINAGE AREA TO HARVEST MOON DRIVE

Type of Area	Area (ha)	Runoff Coeff.*	A x C
Impervious	0.72	0.90	0.65
Pervious	0.19	0.25	0.05
Sub Total	**0.92**		**0.70**

Weighted Coefficient	0.76

PRE-DEVELOPMENT RELEASE RATE

Municipality:	Town of Caledon, Municipality of Peel
Project Address:	13656 Emil Kolb Parkway
Project No.	5440
Completed By:	C.D.
Checked By:	H.S.
Date:	2025-02-28

SCHAEFFERS CONSULTING ENGINEERS
SCHAEFFER & ASSOCIATES LTD.

Town of Caledon IDF Curves

RAINFALL INTENSITY

Design Storm Event	A	B	C	I (mm/hr)
2-Year	1070	0.8759	7.85	85.718
5-Year	1593	0.8789	11	109.677
10-Year	2221	0.9080	12	134.162
25-Year	3158	0.9335	15	156.471
50-Year	3886	0.9495	16	176.192
100-Year	4688	0.9624	17	196.536

I=A/(T+C)^B

Time of Concetration (min) = 10

EXISTING PEAK DISCHARGE RATE TO EMIL KOLB PKWY

Weighted Runoff Coefficient, C	0.39	
Drainage Area	0.39	ha
2-Year Peak Flow, Q_2	36.3	L/s
5-Year Peak Flow, Q_5	46.4	L/s
10-Year Peak Flow, Q_{10}	56.8	L/s
25-Year Peak Flow, Q_{25}	66.2	L/s
50-Year Peak Flow, Q_{50}	74.5	L/s
100-Year Peak Flow, Q_{100}	83.2	L/s

EXISTING PEAK DISCHARGE RATE TO HARVEST MOON DRIVE

Weighted Runoff Coefficient, C	0.46	
Drainage Area	0.44	ha
2-Year Peak Flow, Q_2	48.2	L/s
5-Year Peak Flow, Q_5	61.7	L/s
10-Year Peak Flow, Q_{10}	75.5	L/s
25-Year Peak Flow, Q_{25}	88.1	L/s
50-Year Peak Flow, Q_{50}	99.2	L/s
100-Year Peak Flow, Q_{100}	110.6	L/s

ALLOWABLE RELEASE RATES TO HARVEST MOON DRIVE

2-Year Peak Flow, Q_2	**48.2**	**L/s**
5 to 100-Year Peak Flow, $Q_{5\text{-}100}$	**61.7**	**L/s**

Town of Caledon

Control Orifice Sizing - 5-100 year

Project: 13656 Emil Kolb Parkway
5440

Allowable Release Rate = 61.7 l/sec

Control Manhole Orifice(s) =

	Orifice
DIA (mm)=	**149**
AREA m^2=	0.017
COEFF =	**0.62**
GRAVITY =	9.81
K =	1.0
D/S HGL (m)=	N/A
Orifice Inv. (m)=	255.43

Effective Head (m)	Depth of Water (m)	Orifice Qp m^3/s	TOTAL FLOW Qp m^3/s	Elevation of Water (m)
0.00	0.075	0.0000	0.0000	255.50
1.000	1.075	0.0479	0.0479	256.50
1.200	1.274	0.0525	0.0525	256.70
1.500	1.575	0.0586	0.0586	257.00
1.650	**1.724**	**0.0615**	**0.0615**	**257.15**
1.700	1.774	0.0624	0.0624	257.20
1.900	1.974	0.0660	0.0660	257.40

ORIFICE FLOW	$Q(m^3/s)$=	COEF*AREA*(2*GRAVITY*HEAD/K)^0.5	
WEIR FLOW	$Q(m^3/s)$=	CLH^1.5	C=1.5

Town of Caledon

Control Orifice Sizing - 2-year

Project: 13656 Emil Kolb Parkway

5440

Allowable Release Rate = 48.2 l/sec

Control Manhole Orifice(s) =

	Orifice
DIA (mm)=	**149**
AREA m^2=	0.017
COEFF =	**0.62**
GRAVITY =	9.81
K =	1.0
D/S HGL (m)=	N/A
Orifice Inv. (m)=	255.43

Effective Head (m)	Depth of Water (m)	Orifice Qp m^3/s	TOTAL FLOW Qp m^3/s	Elevation of Water (m)
0.00	0.075	0.0000	0.0000	255.50
0.800	0.875	0.0428	0.0428	256.30
0.900	0.974	0.0454	0.0454	256.40
1.000	1.075	0.0479	0.0479	256.50
1.010	**1.084**	**0.0481**	**0.0481**	**256.51**
1.700	1.774	0.0624	0.0624	257.20
1.900	1.974	0.0660	0.0660	257.40

ORIFICE FLOW $Q(m^3/s)$= COEF*AREA*(2*GRAVITY*HEAD/K)^0.5

WEIR FLOW $Q(m^3/s)$= CLH^1.5 C=1.5

ORIFICE DESIGN AND STAGE STORAGE - 5 year - 100 year Events

SCHAEFFERS CONSULTING ENGINEERS
SCHAEFFER & ASSOCIATES LTD.

Municipality: Town of Caledon, Municipality of Peel
Project Address: 13656 Emil Kolb Parkway
Project No. 5440
Completed By: C.D.
Checked By: H.S.
Date: 2025-02-28

MODIFIED RATIONAL METHOD

Area (ha)	0.92
C	0.76
Allowable Release Rate (L/s)	61.7
Actual Release Rate (L/s)	61.5

Controlled Roof Flow (L/s)	0.0
Groundwater Allowance (L/s)	2.0

Town of Caledon: 100-Year Storm Event	
A	4688
B	0.9624
C	17

Time (min)	100-YEAR RAINFALL EVENT Intensity 100-Year (mm/yr)	Surface Runoff (L/s)	Allowable G.W. (L/s)	Total Runoff (L/s)	Total Runoff Volume (m^3)	Max. Release Volume (m^3)	Req'd Storage Volume (m^3)
10	196.54	384.17	2.00	386.17	231.70	36.91	194.79
15	166.89	326.22	2.00	328.22	295.40	55.36	240.04
20	145.13	283.68	2.00	285.68	342.81	73.81	269.00
25	128.46	251.10	2.00	253.10	379.65	92.26	287.39
30	115.28	225.34	2.00	227.34	409.21	110.72	298.49
35	104.59	204.45	2.00	206.45	433.54	129.17	304.37
40	95.75	187.16	2.00	189.16	453.98	147.62	306.36
45	88.31	172.61	2.00	174.61	471.45	166.08	305.37
50	81.95	160.19	2.00	162.19	486.58	184.53	302.05
55	76.47	149.47	2.00	151.47	499.87	202.98	296.88
60	71.69	140.12	2.00	142.12	511.64	221.44	290.20
65	67.47	131.89	2.00	133.89	522.17	239.89	282.28
70	63.74	124.59	2.00	126.59	531.66	258.34	273.32
75	60.40	118.06	2.00	120.06	540.28	276.79	263.49
80	57.40	112.20	2.00	114.20	548.16	295.25	252.91
85	54.69	106.90	2.00	108.90	555.40	313.70	241.70
90	52.23	102.09	2.00	104.09	562.09	332.15	229.93
95	49.98	97.70	2.00	99.70	568.29	350.61	217.68
100	47.93	93.68	2.00	95.68	574.07	369.06	205.01
105	46.03	89.98	2.00	91.98	579.48	387.51	191.97
110	44.29	86.57	2.00	88.57	584.56	405.97	178.59
115	42.67	83.41	2.00	85.41	589.34	424.42	164.92
120	41.17	80.48	2.00	82.48	593.85	442.87	150.98
125	39.78	77.75	2.00	79.75	598.13	461.32	136.80

I=A/(T+C)^B

Required Storage (m^3):	307.0
Provided Storage (m^3):	318.0

ORIFICE DESIGN AND STAGE STORAGE - 2 year Event

Municipality: Town of Caledon, Municipality of Peel
Project Address: 13656 Emil Kolb Parkway
Project No. 5440
Completed By: C.D.
Checked By: H.S.
Date: 2025-02-28

SCHAEFFERS CONSULTING ENGINEERS
SCHAEFFER & ASSOCIATES LTD.

MODIFIED RATIONAL METHOD

Area (ha)	0.92
C	0.76
Allowable Release Rate (L/s)	48.2
Actual Release Rate (L/s)	48.1

Controlled Roof Flow (L/s)	0.0
Groundwater Allowance (L/s)	2.0

Town of Caledon: 2-Year Storm Event	
A	1070
B	0.8759
C	7.85

Time (min)	100-YEAR RAINFALL EVENT				Total Runoff Volume (m^3)	Max. Release Volume (m^3)	Req'd Storage Volume (m^3)
	Intensity 100-Year (mm/yr)	Surface Runoff (L/s)	Allowable G.W. (L/s)	Total Runoff (L/s)			
10	85.72	167.55	2.00	169.55	101.73	28.87	72.86
15	69.05	134.96	2.00	136.96	123.27	43.31	79.95
20	58.06	113.48	2.00	115.48	138.58	57.75	80.83
25	50.24	98.20	2.00	100.20	150.30	72.19	78.12
30	44.38	86.74	2.00	88.74	159.74	86.62	73.11
35	39.81	77.81	2.00	79.81	167.60	101.06	66.54
40	36.14	70.64	2.00	72.64	174.34	115.50	58.84
45	33.13	64.75	2.00	66.75	180.23	129.94	50.29
50	30.60	59.82	2.00	61.82	185.46	144.37	41.09
55	28.46	55.63	2.00	57.63	190.19	158.81	31.38
60	26.62	52.02	2.00	54.02	194.49	173.25	21.24
65	25.01	48.88	2.00	50.88	198.44	187.68	10.76
70	23.60	46.12	2.00	48.12	202.11	202.12	0.00
75	22.34	43.67	2.00	45.67	205.53	216.56	0.00
80	21.23	41.49	2.00	43.49	208.75	231.00	0.00
85	20.22	39.53	2.00	41.53	211.78	245.43	0.00
90	19.31	37.75	2.00	39.75	214.65	259.87	0.00
95	18.49	36.14	2.00	38.14	217.39	274.31	0.00
100	17.74	34.67	2.00	36.67	220.00	288.75	0.00
105	17.05	33.32	2.00	35.32	222.50	303.18	0.00
110	16.41	32.08	2.00	34.08	224.90	317.62	0.00
115	15.82	30.93	2.00	32.93	227.21	332.06	0.00
120	15.28	29.87	2.00	31.87	229.45	346.49	0.00
125	14.78	28.88	2.00	30.88	231.60	360.93	0.00

I=A/(T+C)^B

Required Storage (m^3):	**81.0**
Provided Storage (m^3):	**318.0**

13656 EMIL KOLB PKWY TOWNHOUSES

13656 EMIL KOLB PARKWAY
BOLTON, ON

DRAWING INDEX

PROJECT INFORMATION

PROJECT NO:	25-0122
CULTEC SALES REP:	DOMINIC TURNER 438-266-4033 DOMINIC.TURNER@CULTEC.COM
CULTEC TECHNICAL SALES ENGINEER:	
CULTEC PROJECT COORDINATOR:	TYLER BRUSH 475-289-7120 TYLER.BRUSH@CULTEC.COM
ENGINEER OF RECORD	SCHAEFFERS CONSULTING ENGINEERS

REVISIONS:

ITERATION	DATE	BY	COMMENTS	EOR SHEET REFERENCE	DATE
00	2/3/2025	SRA	INITIAL SUBMITTAL DRAWINGS	SITE SERVICING PLAN	06/2024

BEFORE YOU BEGIN - REQUIRED MATERIALS AND EQUIPMENT

1. PROPER GEOTECHNICAL SOIL EVALUATION BY A QUALIFIED ENGINEER OR SOIL SCIENTIST TO DETERMINE SUITABILITY OF STRUCTURAL INSTALLATION
2. OSHA COMPLIANCE
3. CULTEC WARNING TAPE, OR EQUIVALENT
4. ASSURANCES FROM LOCAL UTILITIES THAT NO UNDERGROUND GAS, ELECTRICAL OR OTHER POTENTIALLY DANGEROUS PIPELINES OR CONDUITS ARE ALREADY BURIED AT THE SITE
5. ACCEPTABLE 1- 2 INCH (25 - 51 mm) WASHED, CRUSHED STONE AS DETAILED IN CULTEC'S INSTALLATION INSTRUCTIONS. CLEANLINESS OF STONE TO BE VERIFIED BY ENGINEER.
6. ACCEPTABLE FILL MATERIAL AS SHOWN IN CULTEC'S INSTALLATION INSTRUCTIONS.
7. ALL CULTEC CHAMBERS AND ACCESSORIES AS SPECIFIED IN THE ENGINEER'S PLANS INCLUDING CULTEC NO. 410 NON-WOVEN GEOTEXTILE, CULTEC STORMFILTER AND CULTEC NO. 4800 WOVEN GEOTEXTILE, WHERE APPLICABLE.
8. RECIPROCATING SAW OR ROUTER
9. STONE BUCKET
10. STONE CONVEYOR AND/OR TRACKED EXCAVATOR
11. TRANSIT OR LASER LEVEL MEASURING DEVICE
12. COMPACTION EQUIPMENT WITH MAXIMUM GROSS VEHICLE WEIGHT OF 12,000 LBS (5,440 KGS). VIBRATORY ROLLERS MAY ONLY BE USED ON THE STONE BASE PRIOR TO THE INSTALLATION OF CHAMBERS.
13. CHECK CULTEC CHAMBERS FOR DAMAGE PRIOR TO INSTALLATION. DO NOT USE DAMAGED CULTEC CHAMBERS, CONTACT YOUR SUPPLIER IMMEDIATELY TO REPORT DAMAGE OR PACKING-LIST DISCREPANCIES.

REQUIREMENTS FOR CULTEC CHAMBER SYSTEM INSTALLATIONS

1. INSTALLING CONTRACTORS ARE EXPECTED TO COMPREHEND AND USE THE MOST CURRENT INSTALLATION INSTRUCTIONS PRIOR TO BEGINNING A SYSTEM INSTALLATION. IF THERE IS ANY QUESTION AS TO WHETHER YOU POSSESS THE MOST CURRENT INSTRUCTIONS, CONTACT CULTEC AT (203) 775-4416 OR VISIT WWW.CULTEC.COM.
2. CONTACT CULTEC AT LEAST THIRTY DAYS PRIOR TO SYSTEM INSTALLATION TO ARRANGE FOR A PRE-CONSTRUCTION MEETING.
3. ALL CULTEC SYSTEM DESIGNS MUST BE CERTIFIED BY A REGISTERED PROFESSIONAL ENGINEER.
4. USE CULTEC INSTALLATION INSTRUCTIONS AS A GUIDELINE ONLY FOR MINIMUM/MAXIMUM REQUIREMENTS. ACTUAL DESIGN MAY VARY. REFER TO APPROVED CONSTRUCTION DRAWINGS FOR JOB-SPECIFIC DETAILS. BE SURE TO FOLLOW THE ENGINEER'S DRAWINGS AS YOUR PRIMARY GUIDE.
5. THE FOUNDATION STONE SHALL BE LEVEL AND COMPACTED PRIOR TO CHAMBER INSTALLATION.
6. OVERLAPPING RIB CONNECTIONS OF CHAMBERS SHALL BE FULLY SHOULDERED PRIOR TO STONE PLACEMENT.
7. CENTER-TO-CENTER SPACING SHALL BE CHECKED AND MAINTAINED THROUGHOUT INSTALLATION PROCESS.
8. ANY DISCREPANCIES WITH THE SYSTEM SUB-GRADE SOIL'S BEARING CAPACITY MUST BE REPORTED TO THE DESIGN ENGINEER.
9. NON-WOVEN GEOTEXTILE MUST BE USED AS SPECIFIED IN THE ENGINEER'S DRAWINGS.
10. CULTEC REQUIRES THE CONTRACTOR TO REFER TO CULTEC'S INSTALLATION INSTRUCTIONS CONCERNING VEHICULAR TRAFFIC. RESPONSIBILITY FOR PREVENTING VEHICLES THAT EXCEED CULTEC'S REQUIREMENTS FROM TRAVELING ACROSS OR PARKING OVER THE CHAMBER SYSTEM LIES SOLELY WITH THE CONTRACTOR THROUGHOUT THE ENTIRE SITE CONSTRUCTION PROCESS. THE PLACEMENT OF WARNING TAPE, TEMPORARY FENCING, AND/OR APPROPRIATELY LOCATED SIGNS IS HIGHLY RECOMMENDED. IMPRINTED WARNING TAPE IS AVAILABLE FROM CULTEC. FOR ACCEPTABLE VEHICLE LOAD INFORMATION, REFER TO CULTEC INSTALLATION INSTRUCTIONS.
11. TRAFFIC OF INSTALLATION EQUIPMENT OR OTHER VEHICULAR TRAFFIC OVER TOP OF THE CULTEC STORMWATER SYSTEM IS STRICTLY RESTRICTED AND PROHIBITED UNTIL SATISFACTORY COVER AND COMPACTION IS ACHIEVED ACCORDING TO CULTEC'S MANUFACTURER INSTALLATION INSTRUCTIONS.
12. EROSION AND SEDIMENT-CONTROL MEASURES MUST MEET LOCAL CODES AND THE DESIGN ENGINEER'S SPECIFICATIONS THROUGHOUT THE ENTIRE SITE CONSTRUCTION PROCESS.
13. CULTEC SYSTEMS MUST BE DESIGNED AND INSTALLED IN ACCORDANCE WITH CULTEC'S MINIMUM REQUIREMENTS. FAILURE TO DO SO WILL VOID THE LIMITED WARRANTY.
14. CONTACT CULTEC, INC. AT 203-775-4416 WITH ANY QUESTIONS OR FURTHER CLARIFICATION OF REQUIREMENTS.
15. PLACEMENT OF EMBEDMENT STONE MUST BE IN ACCORDANCE WITH CULTEC'S INSTALLATION INSTRUCTIONS. STONE COLUMN HEIGHT DEFERENTIAL MUST NEVER EXCEED 12" (305 mm) BETWEEN CHAMBER ROWS, ADJACENT CHAMBERS OR STONE PERIMETER. STONE MUST BE PLACED OVER THE CROWN OF THE CHAMBERS TO ANCHOR THE CHAMBERS IN PLACE AND MAINTAIN ROW SPACING.
16. EMBEDMENT STONE MUST ONLY BE PLACED BY EXCAVATOR OR TELESCOPING CONVEYOR BOOM. PLACEMENT OF EMBEDMENT STONE WITH BULLDOZER IS NOT AN ACCEPTABLE METHOD OF INSTALLATION AND MAY CAUSE DAMAGE TO THE CHAMBERS. ANY CHAMBERS DAMAGED USING AN UNACCEPTABLE METHOD OF BACKFILL ARE NOT COVERED UNDER THE CULTEC LIMITED WARRANTY.

CULTEC

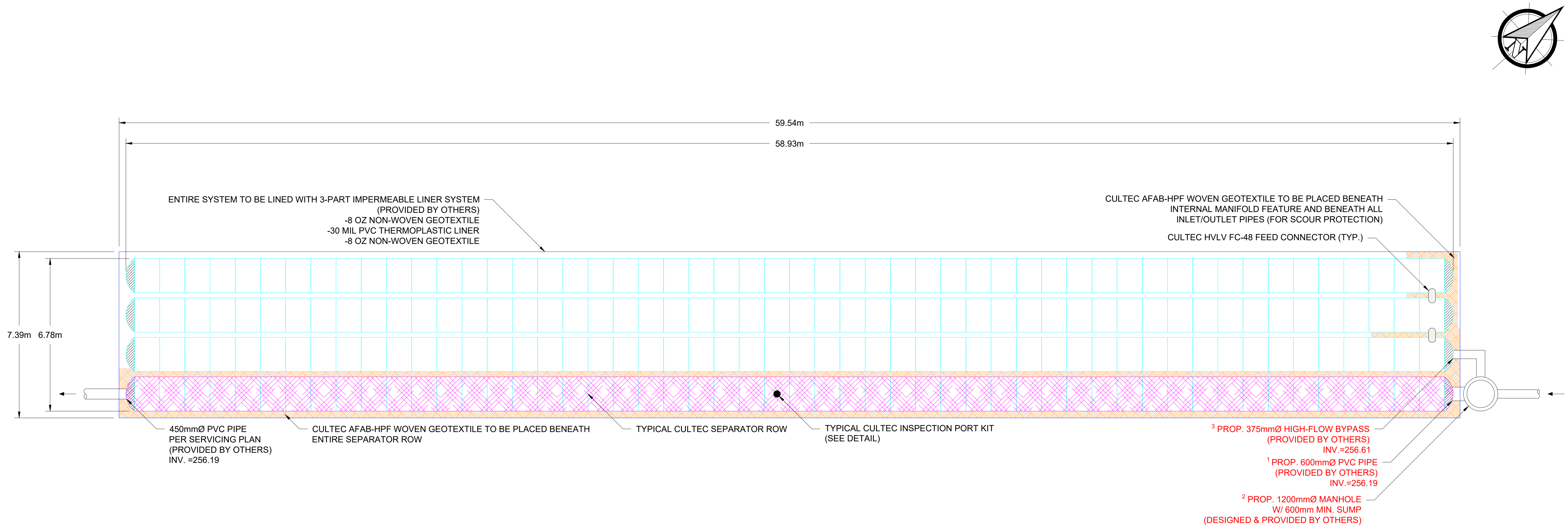
Subsurface Stormwater Management Systems

878 Federal Road
Brookfield, CT 06804
www.cultec.com

PH: 1(203) 775-4416
PH: 1(800) 4-CULTEC
CT-tech@cultec.com

NOTE: THESE SHOP DRAWINGS MAY CONTAIN COMPONENTS INCLUDING BUT NOT LIMITED TO MANHOLES, CATCH BASINS, STORM PIPES AND FITTINGS, MANIFOLDS, CASTINGS AND OTHER NECESSARY APPURTENANCES THAT MAY NOT BE SUPPLIED BY CULTEC, INC. IT IS THE RESPONSIBILITY OF THE CONTRACTOR AND/OR SUPPLIER TO CONFIRM WITH CULTEC THE MATERIALS PROVIDED.

THIS DRAWING HAS BEEN PREPARED TO SUPPORT THE PROJECT ENGINEER OF RECORD FOR THE PROPOSED SYSTEM. THIS DRAWING HAS BEEN PREPARED BASED ON INFORMATION PROVIDED TO CULTEC UNDER THE DIRECTION OF THE PROJECT ENGINEER OF RECORD OR OTHER PROJECT REPRESENTATIVE. IT IS ULTIMATE RESPONSIBILITY OF THE PROJECT ENGINEER OF RECORD TO ENSURE THAT THE CULTEC SYSTEM'S DESIGN IS IN FULL COMPLIANCE WITH ALL APPLICABLE LAWS, REGULATIONS AND MANUFACTURER REQUIREMENTS.



1 SYSTEM LAYOUT DETAIL
NTS

NOTE: ALL EXTERNAL SYSTEM STRUCTURES, INLET/OUTLET PIPES AND PROPOSED ELEVATIONS MUST BE DESIGNED AND APPROVED BY THE ENGINEER OF RECORD. ALL PROPOSED SYSTEM ELEVATIONS PROVIDED MUST BE VERIFIED BY THE ENGINEER OF RECORD AND THE ENGINEER OF RECORD MUST ENSURE CHAMBER BURIAL REQUIREMENTS ARE MET

MATERIALS LIST SUPPLIED BY CULTEC

PRODUCT DESCRIPTION	SKU	QUANTITY	UNIT OF MEASURE
CULTEC RECHARGER 360HD CHAMBER	360HD	208	PIECES
CULTEC RECHARGER 360HD END CAP	360HD EC	8	PIECES
CULTEC HVLV FEED CONNECTORS	FC-48	2	PIECES
CULTEC NO. 410 NON-WOVEN GEOTEXTILE	75NWG410	16	SQ. METERS
CULTEC AFAB-HPF WOVEN GEOTEXTILE	75WGHPF	73	METERS
CULTEC INSPECTION PORT KIT	1299CGC	1	PIECES
MATERIALS LIST NOT SUPPLIED BY CULTEC			
1-2 INCH WASHED, CRUSHED STONE	---	319	CUBIC METERS
8 OZ. NON-WOVEN GEOTEXTILE	---	2502	SQ. METERS
30 MIL. PVC THERMOPLASTIC LINER	---	1251	SQ. METERS

CULTEC RECHARGER® 360HD LEGEND

- RECHARGER 360HD CHAMBER
- RECHARGER 360HD END CAP
- FEED CONNECTORS
- SEPARATOR ROW
- WOVEN GEOTEXTILE
- STONE BORDER

PROPOSED SYSTEM ALTERATION TABLE

1	PROPOSED SEPARATOR ROW ACCESS PIPE
2	PROPOSED SEPARATOR ROW ACCESS MANHOLE
3	PROPOSED SEPARATOR ROW HIGH-FLOW BYPASS PIPE

PROPOSED STORMWATER MANAGEMENT SYSTEM ELEVATIONS

(TO BE APPROVED BY ENGINEER OF RECORD)
*ENGINEER OF RECORD TO CONFIRM MINIMUM AND MAXIMUM BURIAL REQUIREMENTS ARE MET)

MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT OR UNPAVED)	260.76
MINIMUM ALLOWABLE GRADE (UNPAVED TRAFFIC)	257.70
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT)	257.55
MINIMUM ALLOWABLE GRADE (TOP OF RIGID PAVEMENT)	257.55
TOP OF STONE ELEVATION	257.26
TOP OF CHAMBER ELEVATION	257.10
375mm HIGH-FLOW BYPASS PIPE INVERT	256.61
450mm OUTLET PIPE INVERT	256.19
600mm INLET PIPE INVERT	256.19
BOTTOM OF CHAMBER ELEVATION	256.19
BOTTOM OF STONE ELEVATION	256.04

CULTEC STORMWATER MANAGEMENT SYSTEM SUMMARY

TOTAL STORAGE REQUIRED (m^3)	317
TOTAL STORAGE PROVIDED (m^3)	318
BEDDING STONE DISCOUNTED FROM TOTAL STORAGE PROVIDED	
% STONE POROSITY	40
SYSTEM AREA (m^2)	439.68
DEPTH OF EMBEDMENT STONE (mm)	152
DEPTH OF BEDDING STONE (mm)	152
STONE PERIMETER (mm)	305
SPACING BETWEEN CHAMBER ROWS (mm)	229

CULTEC STORMWATER CHAMBER

PROJECT NO:	25-0122.00
DATE:	2/3/2025
DESIGNED BY:	SRA
CHECKED BY:	TNB
SCALE:	N.T.S
SHEET NO:	2 OF 5

13656 EMIL KOLB PKWY TOWNHOUSES
13656 EMIL KOLB PARKWAY
BOLTON, ON
SYSTEM LAYOUT SHEET

CULTEC
Subsurface Stormwater Management Systems
878 Federal Road
Brookfield, CT 06804
www.cultec.com
PH: 1(203) 775-4416
PH: 1(800) 4-CULTEC
CT-tech@cultec.com

1.02

CULTEC Recharger 360HD Stormwater System Calculations

CULTEC

Consulting Engineer:
Schaeffers Consulting Engineers
Concord, ON

Project Information:
13656 Emil Kolb Pkwy Townhouses
13656 Emil Kolb Parkway
Bolton, ON

Calculations Performed By:
Steve Almendarez
CULTEC
878 Federal Rd.
Brookfield, CT 06804
PH: 203-775-4416
FX: 203-775-5887

Date: 2/3/25

Project Number: 25-0122.00

System Information

Rectangular Bed Inputs — **No. of Rows** 4 — **No. of Chambers/Row** 52

Given:

Storage required		CF	317.00 m^3	
CULTEC AFAB-HPF For Internal Manifolds	12	feet		
Number of Inlet/Outlet Pipes (Do Not Include Separator Rows)	1			
Stone **Base**	6	inches	152 mm	☑ Discount stone base from Total storage provided (If Applicable)
Stone **Above**	6	inches	152 mm	☐ Discount stone above from Total storage provided (If Applicable)
Spacing **Between** Rows	9	inches	229 mm	
No. of HVLV FC-48 Feed Connectors	2	units		
12" PVC Universal Inline Drain Body Only - Kit	1	units		
12" Ductile Iron Square Solid Drain Base Cover	1	units		
Stone Porosity	40	%		
Stone Border Width	12	inches	305 mm	

Other Parameters:

Length of Separator Row	193.34	feet	58.930 m
Type of Lining	All Sides		
☐ Sand Filter Depth (If Applicable)		feet	0.000 m
☐ Sloped Sides (1:1) (If Applicable)			

Assumptions

Model Name		Chamber Height (inches / mm)	Design Unit Height (feet / m)	Chamber Width (inches / mm)	Chamber Spacing (inches / mm)	Design Unit Width (feet / m)	Chamber Volume per Linear Foot (cu. ft/ft / cu. m/m)	Design Unit Volume (cu. ft/ft / cu. m/m)	Installed Chamber Length (feet / m)
Recharger® 360HD Chamber	English	36	4.000	60	9	5.75	10.00	15.199	3.667
	Metric	914	1.219	1524	229	1.75	0.929	1.412	1.118
Recharger® 360HD End Cap	English	36.5	4.000	60	9	5.75	5.168	12.301	1.250
	Metric	927	1.219	1524	229	1.75	0.480	1.143	0.381
HVLV™ FC-48 Feed Connectors	English	12	n/a	16	n/a	n/a	0.913	n/a	0.750
	Metric	305	n/a	406	n/a	n/a	0.085	n/a	0.229

Storage Provided within CULTEC Recharger 360HD Stormwater Chamber, End Caps and HVLV FC-48 Feed Connector Internal Manifold System - *not including stone*

Number of Recharger 360HD chambers by design			=	208 pcs		
208	pcs x	3.667	=	762.67 feet	232.46 m	
Number of Recharger 360HD end caps			=	8 pcs		
8	pcs x	1.250	=	10.00 feet	3.05 m	
Number of HVLV FC-48 Feed Connectors			=	2 pcs		
2	pcs x	0.750	=	1.50 feet	0.46 m	
Total footage of Recharger 360HD chambers			=	762.67 feet	232.46 m	
Total footage of Recharger 360HD end caps			=	10.00 feet		
Total footage of HVLV FC-48 Feed Connectors			=	1.50 feet	0.46 m	
Storage provided within Recharger 360HD chambers			=	7624.76 CF	215.93 m^3	
Storage provided within Recharger 360HD end caps				51.68 CF	1.46 m^3	
Storage provided within HVLV FC-48 Feed Connectors			=	1.37 CF	0.04 m^3	
Total Storage within chambers and feed connectors			=	**7677.81 CF**	**217.44 m^3**	

Storage Provided within Entire CULTEC Stormwater System - *including stone*

Bed width	24.25 feet	7.39 m	
Bed length	195.17 feet	59.49 m	
Bed Depth	4.00 feet	1.22 m	
Total Area	4732.79 sq. ft.	439.68 m^2	
Volume of Effective Excavation *(not including additional cover)*	18931.17 CF	536.13 m^3	
Perimeter of Bed	438.83 feet	133.76 m	
Total Storage within CULTEC Recharger 360HD chambers, end caps and feed connectors	7677.81 CF	217.44 m^3	
Total Stone Required	11253.36 CF	318.70 m^3	
	417 CY		
	584 tons		
Storage provided within stone	3554.78 CF	100.67 m^3	
Total Storage within CULTEC Stormwater System =	**11233 CF**	**318.08 m^3**	*Req. storage attained.*

CULTEC MATERIALS LIST

Model	Model #	Quantity	Unit of Measure	Quantity	Unit of Measure
Recharger 360HD Heavy Duty Chamber	360HD	208	pcs		
Recharger 360HD End Cap	360HD EC	8	pcs		
HVLV FC-48 Feed Connectors	FC-48	2	pcs		
CULTEC No. 410 Non-Woven Geotextile	NWG410	19	Sq. Yards	16	m2
CULTEC AFAB-HPF Woven Geotextile 7.5' x 100'	75WGHPF	239	feet	73	m
12" PVC Universal Inline Drain Body Only - Kit	2712AGSB	1	pcs		
12" Ductile Iron Square Solid Drain Base Cover	1299CGC	1	pcs		
Total Stone		417	cubic yards	319	m^3
8 oz. Non-Woven Geotextile (Not provided by Cultec)		2992	Sq. Yards	2502	m2
30 mil. PVC Thermoplastic Liner (Not provided by Cultec)		1496	Sq. Yards	1251	m2

☐ DISCLAIMER: If this is a value-engineered project based on a competitor's design.
The following inputs and calculations are based upon limited design information provided to CULTEC by a third-party. An engineer should review the inputs to confirm accuracy of the assumptions.

SYSTEM STORAGE CALCULATION

CULTEC Recharger 360HD Stormwater Incremental Storage

CULTEC

Date: February 3, 2025

Project Information
13656 Emil Kolb Pkwy Townhouses
13656 Emil Kolb Parkway
Bolton, ON

Project Number 25-0122.00

Base of Stone Elevation- 256.04

Recharger 360HD Incremental Storage Volumes

Height of System (in)	Height of System (mm)	End Cap Volume (ft^3)	End Cap Volume (m^3)	Chamber Volume (ft^3)	Chamber Volume (m^3)	HVLV FC-48 Feed Connector Volume (ft^3)	HVLV FC-48 Feed Connector Volume (m^3)	Stone Volume (ft^3)	Stone Volume (m^3)	Cumulative Storage Volume (ft^3)	Cumulative Storage Volume (m^3)	Total Cumulative Storage Volume (ft^3)	Total Cumulative Storage Volume (m^3)	Stage/Area (ft^2)	Stage/Area (m^2)	Elevation (ft)	Elevation (m)	
48.00	1219	0.00	0.00	0.00	0.00	0.00	0.00	157.76	4.47	157.76	4.47	11232.61	318.07	1893.12	175.87	260.04	257.26	**Top of Stone Elevation**
47.00	1194	0.00	0.00	0.00	0.00	0.00	0.00	157.76	4.47	157.76	4.47	11074.85	313.60	1893.12	175.87	259.96	257.23	
46.00	1168	0.00	0.00	0.00	0.00	0.00	0.00	157.76	4.47	157.76	4.47	10917.09	309.14	1893.12	175.87	259.87	257.21	
45.00	1143	0.00	0.00	0.00	0.00	0.00	0.00	157.76	4.47	157.76	4.47	10759.33	304.67	1893.12	175.87	259.79	257.18	
44.00	1118	0.00	0.00	0.00	0.00	0.00	0.00	157.76	4.47	157.76	4.47	10601.57	300.20	1893.12	175.87	259.71	257.16	
43.00	1092	0.00	0.00	0.00	0.00	0.00	0.00	157.76	4.47	157.76	4.47	10443.81	295.74	1893.12	175.87	259.62	257.13	
42.00	1067	0.08	0.00	16.68	0.47	0.00	0.00	151.06	4.28	167.82	4.75	10286.05	291.27	2013.80	187.08	259.54	257.11	**Top of Chamber Elevation**
41.00	1041	0.16	0.00	35.38	1.00	0.00	0.00	143.54	4.06	179.08	5.07	10118.23	286.52	2149.01	199.64	259.46	257.08	
40.00	1016	0.24	0.01	52.60	1.49	0.00	0.00	136.62	3.87	189.47	5.37	9939.15	281.44	2273.59	211.22	259.37	257.06	
39.00	991	0.32	0.01	89.11	2.52	0.00	0.00	121.99	3.45	211.42	5.99	9749.68	276.08	2536.99	235.69	259.29	257.03	
38.00	965	0.40	0.01	112.53	3.19	0.00	0.00	112.59	3.19	225.52	6.39	9538.27	270.09	2706.20	251.41	259.21	257.01	
37.00	940	0.48	0.01	130.08	3.68	0.00	0.00	105.53	2.99	236.10	6.69	9312.75	263.71	2833.17	263.20	259.12	256.98	
36.00	914	0.56	0.02	144.66	4.10	0.00	0.00	99.67	2.82	244.89	6.93	9076.65	257.02	2938.73	273.01	259.04	256.95	
35.00	889	0.64	0.02	157.27	4.45	0.00	0.00	94.60	2.68	252.51	7.15	8831.76	250.09	3030.06	281.49	258.96	256.93	
34.00	864	0.72	0.02	168.42	4.77	0.00	0.00	90.10	2.55	259.24	7.34	8579.25	242.94	3110.91	289.00	258.87	256.90	
33.00	838	0.80	0.02	178.42	5.05	0.00	0.00	86.07	2.44	265.29	7.51	8320.01	235.60	3183.52	295.75	258.79	256.88	
32.00	813	0.88	0.02	187.51	5.31	0.00	0.00	82.40	2.33	270.79	7.67	8054.72	228.08	3249.54	301.88	258.71	256.85	
31.00	787	0.96	0.03	195.79	5.54	0.00	0.00	79.06	2.24	275.81	7.81	7783.92	220.42	3309.72	307.47	258.62	256.83	
30.00	762	1.12	0.03	203.40	5.76	0.00	0.00	75.95	2.15	280.47	7.94	7508.11	212.61	3365.68	312.67	258.54	256.80	
29.00	737	1.20	0.03	210.43	5.96	0.00	0.00	73.11	2.07	284.74	8.06	7227.64	204.66	3416.88	317.43	258.46	256.78	
28.00	711	1.28	0.04	216.92	6.14	0.00	0.00	70.48	2.00	288.68	8.17	6942.90	196.60	3464.18	321.82	258.37	256.75	
27.00	686	1.36	0.04	222.98	6.31	0.00	0.00	68.03	1.93	292.36	8.28	6654.22	188.43	3508.34	325.92	258.29	256.73	
26.00	660	1.44	0.04	228.63	6.47	0.00	0.00	65.73	1.86	295.80	8.38	6361.86	180.15	3549.65	329.76	258.21	256.70	
25.00	635	1.52	0.04	233.94	6.62	0.00	0.00	63.58	1.80	299.03	8.47	6066.05	171.77	3588.41	333.36	258.12	256.68	
24.00	610	1.60	0.05	238.91	6.77	0.00	0.00	61.56	1.74	302.07	8.55	5767.02	163.30	3624.78	336.74	258.04	256.65	
23.00	584	1.60	0.05	243.61	6.90	0.00	0.00	59.68	1.69	304.89	8.63	5464.95	154.75	3658.63	339.89	257.96	256.62	
22.00	559	1.68	0.05	248.02	7.02	0.00	0.00	57.88	1.64	307.58	8.71	5160.07	146.12	3690.95	342.89	257.87	256.60	
21.00	533	1.76	0.05	252.20	7.14	0.00	0.00	56.18	1.59	310.14	8.78	4852.49	137.41	3721.63	345.74	257.79	256.57	
20.00	508	1.84	0.05	256.13	7.25	0.00	0.00	54.57	1.55	312.54	8.85	4542.35	128.62	3750.51	348.42	257.71	256.55	
19.00	483	1.92	0.05	259.83	7.36	0.00	0.00	53.06	1.50	314.81	8.91	4229.81	119.77	3777.74	350.95	257.62	256.52	
18.00	457	1.92	0.05	263.33	7.46	0.01	0.00	51.66	1.46	316.91	8.97	3915.00	110.86	3802.95	353.29	257.54	256.50	
17.00	432	2.00	0.06	266.64	7.55	0.05	0.00	50.29	1.42	318.97	9.03	3598.09	101.89	3827.62	355.59	257.46	256.47	
16.00	406	2.08	0.06	269.76	7.64	0.09	0.00	48.99	1.39	320.91	9.09	3279.12	92.85	3850.98	357.76	257.37	256.45	
15.00	381	2.08	0.06	272.71	7.72	0.11	0.00	47.80	1.35	322.70	9.14	2958.20	83.77	3872.38	359.74	257.29	256.42	
14.00	356	2.16	0.06	275.48	7.80	0.12	0.00	46.66	1.32	324.41	9.19	2635.50	74.63	3892.96	361.66	257.21	256.40	
13.00	330	2.24	0.06	278.10	7.87	0.13	0.00	45.57	1.29	326.04	9.23	2311.09	65.44	3912.45	363.47	257.12	256.37	
12.00	305	2.32	0.07	280.55	7.94	0.13	0.00	44.56	1.26	327.56	9.28	1985.05	56.21	3930.74	365.17	257.04	256.34	
11.00	279	2.32	0.07	282.88	8.01	0.14	0.00	43.62	1.24	328.96	9.32	1657.49	46.93	3947.56	366.73	256.96	256.32	
10.00	254	2.40	0.07	285.04	8.07	0.14	0.00	42.73	1.21	330.31	9.35	1328.53	37.62	3963.73	368.23	256.87	256.29	
9.00	229	2.40	0.07	287.08	8.13	0.15	0.00	41.91	1.19	331.54	9.39	998.21	28.27	3978.43	369.60	256.79	256.27	
8.00	203	2.48	0.07	289.02	8.18	0.15	0.00	41.10	1.16	332.75	9.42	666.68	18.88	3992.96	370.95	256.71	256.24	
7.00	178	2.72	0.08	290.74	8.23	0.16	0.00	40.31	1.14	333.93	9.46	333.93	9.46	4007.19	372.27	256.62	256.22	
6.00	152	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	256.54	256.19	**Bottom of Chamber Elevation**
5.00	127	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	256.46	256.17	
4.00	102	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	256.37	256.14	
3.00	76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	256.29	256.12	
2.00	51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	256.21	256.09	
1.00	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	256.12	256.07	
0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	256.04	256.04	**Bottom of Stone Elevation**

SYSTEM STAGE-STORAGE TABLE

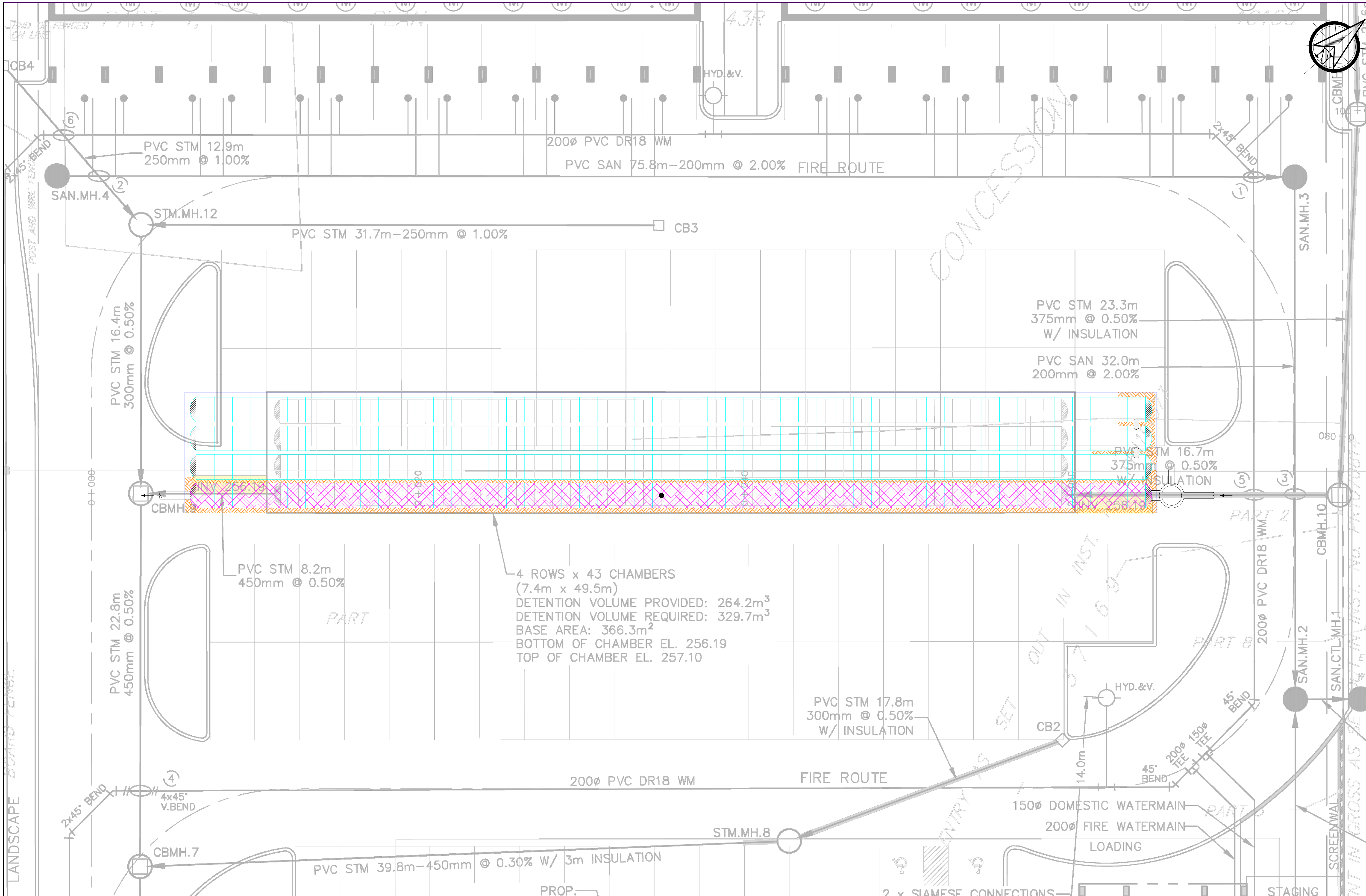
CULTEC STORMWATER CHAMBER

PROJECT NO:	25-0122.00	DATE:	2/3/2025
DESIGNED BY:	SRA	CHECKED BY:	TNB
SCALE:	N.T.S	SHEET NO:	3 OF 5

13656 EMIL KOLB PKWY TOWNHOUSES
13656 EMIL KOLB PARKWAY
BOLTON, ON
SYSTEM CALCULATION SHEET

CULTEC
Subsurface Stormwater Management Systems
878 Federal Road
Brookfield, CT 06804
www.cultec.com
PH: 1(203) 775-4416
PH: 1(800) 4-CULTEC
CT-tech@cultec.com

1.02



CULTEC STORMWATER CHAMBER

PROJECT NO:	25-0122.00
DATE:	2/3/2025
DESIGNED BY:	SRA
CHECKED BY:	TNB
SCALE:	N.T.S
SHEET NO:	4 OF 5

13656 EMIL KOLB PKWY TOWNHOUSES

13656 EMIL KOLB PARKWAY

BOLTON, ON

SYSTEM OVERLAY SHEET

CULTEC
Subsurface Stormwater Management Systems
878 Federal Road
Brookfield, CT 06804
www.cultec.com
PH: 1(203) 775-4416
PH: 1(800) 4-CULTEC
CT-tech@cultec.com

CULTEC RECHARGER® 360HD PRODUCT SPECIFICATIONS

GENERAL

CULTEC RECHARGER® 360HD CHAMBERS ARE DESIGNED FOR UNDERGROUND STORMWATER MANAGEMENT. THE CHAMBERS MAY BE USED FOR RETENTION, RECHARGING, DETENTION OR CONTROLLING THE FLOW OF ON-SITE STORMWATER RUNOFF.

CHAMBER PARAMETERS

1. THE CHAMBERS SHALL BE MANUFACTURED IN THE U.S.A. OR CANADA BY CULTEC, INC. OF BROOKFIELD, CT. (203-775-4416 OR 1-800-428-5832)
2. THE CHAMBERS SHALL BE DESIGNED AND TESTED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS.
3. THE CHAMBER SHALL BE DESIGNED TO WITHSTAND THE AASHTO DESIGN TRUCK LOAD AND LIVE AND DEAD LOAD FACTORS AS DEFINED BY AASHTO LRFD SECTION 12.12 WHEN INSTALLED ACCORDING TO CULTEC'S RECOMMENDED INSTALLATION INSTRUCTIONS.
4. THE CHAMBER SHALL BE STRUCTURAL FOAM INJECTION MOLDED OF BLUE VIRGIN HIGH MOLECULAR WEIGHT IMPACT-MODIFIED POLYPROPYLENE.
5. THE CHAMBER SHALL BE ARCHED IN SHAPE.
6. THE CHAMBER SHALL BE OPEN-BOTTOMED.
7. THE CHAMBER SHALL BE JOINED USING AN INTERLOCKING OVERLAPPING RIB METHOD. CONNECTIONS MUST BE FULLY SHOULDERED OVERLAPPING RIBS, HAVING NO SEPARATE COUPLINGS.
8. THE NOMINAL CHAMBER DIMENSIONS OF THE CULTEC RECHARGER® 360HD SHALL BE 36 INCHES (915 mm) TALL, 60 INCHES (1525 mm) WIDE AND 50 INCHES (1275 mm) LONG. THE INSTALLED LENGTH OF A JOINED RECHARGER® 360HD SHALL BE 3.67 FEET (1.12 m).
9. MULTIPLE CHAMBERS MAY BE CONNECTED TO FORM DIFFERENT LENGTH ROWS. EACH ROW SHALL BEGIN AND END WITH A SEPARATELY FORMED CULTEC RECHARGER® 360HD END CAP. MAXIMUM INLET OPENING ON THE END CAP IS 24 INCH (600 mm) HDPE OR 30 INCH (750mm) PVC.
10. THE CHAMBER SHALL HAVE TWO SIDE PORTALS TO ACCEPT CULTEC HVLV™ FC-48 FEED CONNECTORS TO CREATE AN INTERNAL MANIFOLD. MAXIMUM ALLOWABLE PIPE SIZE IN THE SIDE PORTAL IS 10 INCH (250mm) HDPE OR 12 INCH (300mm) PVC.
11. THE NOMINAL CHAMBER DIMENSIONS OF THE CULTEC HVLV™ FC-48 FEED CONNECTOR SHALL BE 12 INCHES (305 mm) TALL, 16 INCHES (406 mm) WIDE AND 49 INCHES (1245 mm) LONG.
12. THE NOMINAL STORAGE VOLUME OF THE RECHARGER® 360HD CHAMBER SHALL BE 10.0 FT^3 / FT (.928 m^3 / m) - WITHOUT STONE. THE NOMINAL STORAGE VOLUME OF A JOINED RECHARGER® 360HD SHALL BE 36.66 FT^3 / UNIT (1.038 m^3 / UNIT) - WITHOUT STONE.
13. THE NOMINAL STORAGE VOLUME OF THE HVLV™ FC-48 FEED CONNECTOR SHALL BE 0.913 FT^3 / FT (0.085 m^3 / m) - WITHOUT STONE.
14. THE RECHARGER® 360HD CHAMBER SHALL HAVE 7 CORRUGATIONS.
15. THE CHAMBER SHALL BE MANUFACTURED IN A FACILITY EMPLOYING CULTEC'S QUALITY CONTROL AND ASSURANCE PROCEDURES.
16. MAXIMUM ALLOWABLE COVER OVER THE TOP OF THE CHAMBER SHALL BE 12.0 FEET (3.66 m).

END CAP PARAMETERS

1. THE CULTEC RECHARGER® 360HD END CAP (REFERRED TO AS 'END CAP') SHALL BE MANUFACTURED IN THE U.S.A. OR CANADA BY CULTEC, INC. OF BROOKFIELD, CT. (203-775-4416 OR 1-800-428-5832)
4. THE END CAP SHALL BE STRUCTURAL FOAM INJECTION MOLDED OF BLUE VIRGIN HIGH MOLECULAR WEIGHT IMPACT-MODIFIED POLYPROPYLENE.
5. THE END CAP SHALL BE ARCHED IN SHAPE.
6. THE END CAP SHALL BE OPEN-BOTTOMED.
7. THE END CAP SHALL BE JOINED AT THE BEGINNING AND END OF EACH ROW OF CHAMBERS USING AN INTERLOCKING OVERLAPPING RIB METHOD. CONNECTIONS MUST BE FULLY SHOULDERED OVERLAPPING RIBS, HAVING NO SEPARATE COUPLINGS.
8. THE END CAP SHALL HAVE 5 CORRUGATIONS.
9. THE NOMINAL DIMENSIONS OF THE END CAP SHALL BE 36.5 INCHES (927 mm) TALL, 60 INCHES (1525 mm) WIDE AND 18 INCHES (458 mm) LONG. WHEN JOINED WITH A RECHARGER 360HD CHAMBER, THE INSTALLED LENGTH OF THE END CAP SHALL BE 15 INCHES (381 mm).
10. THE NOMINAL STORAGE VOLUME OF THE END CAP SHALL BE 5.17 FT^3 / FT (0.48 m^3 / m) - WITHOUT STONE. THE NOMINAL STORAGE VOLUME OF AN INTERLOCKED END CAP SHALL BE 6.46 FT^3 / UNIT (0.183 m^3 / UNIT) - WITHOUT STONE.
11. MAXIMUM INLET OPENING ON THE END CAP IS 24 INCH (600 mm) HDPE OR 30 INCH (750 mm) SMOOTH-WALL PVC.
12. THE CHAMBER SHALL BE MANUFACTURED IN A FACILITY EMPLOYING CULTEC'S QUALITY CONTROL AND ASSURANCE PROCEDURES
13. THE END CAP SHALL PROVIDE RESISTANCE TO THE LOADS AND LOAD FACTORS AS DEFINED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 12.12.

CULTEC HVLV FC-48 FEED CONNECTOR PRODUCT SPECIFICATIONS

GENERAL

CULTEC HVLV FC-48 FEED CONNECTORS ARE DESIGNED TO CREATE AN INTERNAL MANIFOLD FOR CULTEC RECHARGER MODEL 360HD STORMWATER CHAMBERS.

FEED CONNECTOR PARAMETERS

1. THE FEED CONNECTOR SHALL BE MANUFACTURED BY CULTEC, INC. OF BROOKFIELD, CT. (203-775-4416 OR 1-800-428-5832)
2. THE FEED CONNECTOR SHALL BE VACUUM THERMOFORMED OF BLACK HIGH MOLECULAR WEIGHT HIGH DENSITY POLYETHYLENE (HMWHDPE).
3. THE FEED CONNECTOR SHALL BE ARCHED IN SHAPE.
4. THE FEED CONNECTOR SHALL BE OPEN-BOTTOMED.
5. THE NOMINAL DIMENSIONS OF THE CULTEC HVLV FC-48 FEED CONNECTOR SHALL BE 12 INCHES (305 mm) TALL, 16 INCHES (406 mm) WIDE AND 49 INCHES (1245 mm) LONG.
6. THE NOMINAL STORAGE VOLUME OF THE HVLV FC-48 FEED CONNECTOR SHALL BE 0.913 FT^3 / FT (0.085 m^3 / m) - WITHOUT STONE.
7. THE HVLV FC-48 FEED CONNECTOR SHALL HAVE 4 CORRUGATIONS.
8. THE HVLV FC-48 FEED CONNECTOR MUST BE FORMED AS A WHOLE UNIT HAVING TWO OPEN END WALLS AND HAVING NO SEPARATE END PLATES OR SEPARATE END WALLS. THE UNIT SHALL FIT INTO THE SIDE PORTALS OF THE CULTEC RECHARGER STORMWATER CHAMBER AND ACT AS CROSS FEED CONNECTIONS CREATING AN INTERNAL MANIFOLD.
9. THE FEED CONNECTOR SHALL BE DESIGNED TO WITHSTAND AASHTO HS-25 DEFINED LOADS WHEN INSTALLED ACCORDING TO CULTEC'S RECOMMENDED INSTALLATION INSTRUCTIONS.
10. THE FEED CONNECTOR SHALL BE MANUFACTURED IN AN ISO 9001:2008 CERTIFIED FACILITY.

CULTEC NO. 410™ NON-WOVEN GEOTEXTILE

CULTEC NO. 410™ NON-WOVEN GEOTEXTILE MAY BE USED WITH CULTEC CONTACTOR® AND RECHARGER® STORMWATER INSTALLATIONS TO PROVIDE A BARRIER THAT PREVENTS SOIL INTRUSION INTO THE STONE.

GEOTEXTILE PARAMETERS

1. THE GEOTEXTILE SHALL BE PROVIDED BY CULTEC, INC. OF BROOKFIELD, CT. (203-775-4416 OR 1-800-428-5832)
2. THE GEOTEXTILE SHALL BE BLACK AND WHITE IN APPEARANCE.
3. THE GEOTEXTILE SHALL HAVE A TYPICAL WEIGHT OF 4.5 OZ/SY (142 G/M).
4. THE GEOTEXTILE SHALL HAVE A TENSILE STRENGTH VALUE OF 120 LBS (533 N) PER ASTM D4632 TESTING METHOD.
5. THE GEOTEXTILE SHALL HAVE AN ELONGATION @ BREAK VALUE OF 50% PER ASTM D4632 TESTING METHOD.
6. THE GEOTEXTILE SHALL HAVE A MULLEN BURST VALUE OF 225 PSI (1551 KPA) PER ASTM D3786 TESTING METHOD.
7. THE GEOTEXTILE SHALL HAVE A PUNCTURE STRENGTH VALUE OF 65 LBS (289 N) PER ASTM D4833 TESTING METHOD.
8. THE GEOTEXTILE SHALL HAVE A CBR PUNCTURE VALUE OF 340 LBS (1513 N) PER ASTM D6241 TESTING METHOD.
9. THE GEOTEXTILE SHALL HAVE A TRAPEZOID TEAR VALUE OF 50 LBS (222 N) PER ASTM D4533 TESTING METHOD.
10. THE GEOTEXTILE SHALL HAVE A AOS VALUE OF 70 U.S. SIEVE (0.212 MM) PER ASTM D4751 TESTING METHOD.
11. THE GEOTEXTILE SHALL HAVE A PERMITTIVITY VALUE OF 1.7 SEC-1 PER ASTM D4491 TESTING METHOD.
12. THE GEOTEXTILE SHALL HAVE A WATER FLOW RATE VALUE OF 135 GAL/MIN/SF (5500 L/MIN/SM) PER ASTM D4491 TESTING METHOD.
13. THE GEOTEXTILE SHALL HAVE A UV STABILITY @ 500 HOURS VALUE OF 70% PER ASTM D4355 TESTING METHOD.

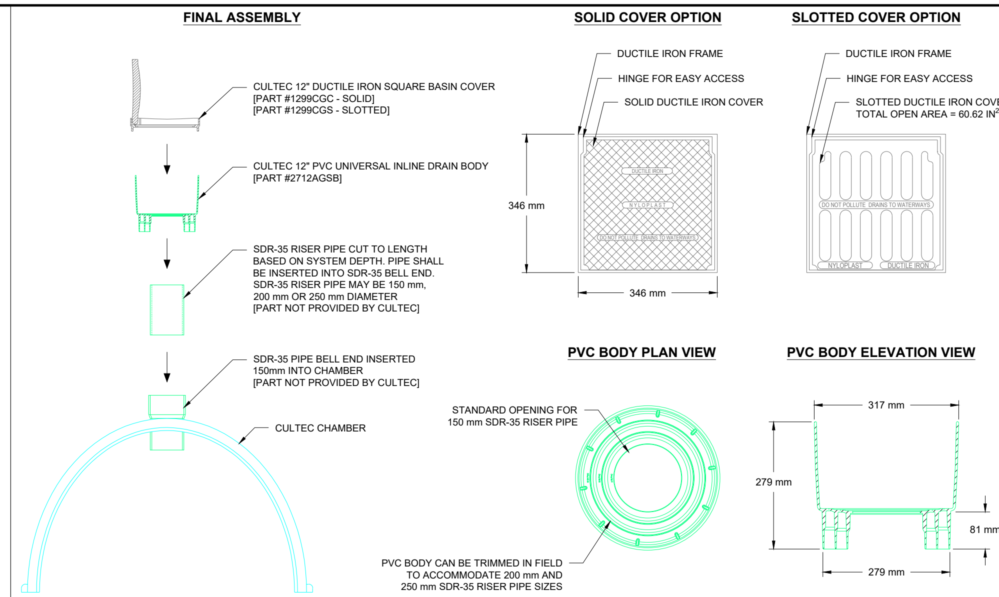
CULTEC AFAB-HPF™ WOVEN GEOTEXTILE

CULTEC AFAB-HPF WOVEN GEOTEXTILE IS DESIGNED AS A UNDERLAYMENT TO PREVENT SCOURING CAUSED BY WATER MOVEMENT WITHIN THE CULTEC CHAMBERS AND FEED CONNECTORS UTILIZING THE CULTEC MANIFOLD FEATURE. IT MAY ALSO BE USED AS A COMPONENT OF THE CULTEC SEPARATOR ROW TO ACT AS A BARRIER TO PREVENT SOIL/CONTAMINANT INTRUSION INTO THE STONE WHILE ALLOWING FOR MAINTENANCE.

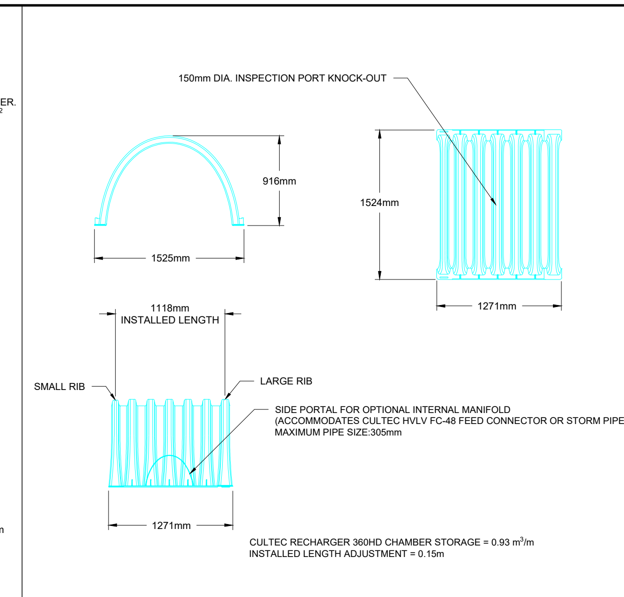
GEOTEXTILE PARAMETERS

1. THE GEOTEXTILE SHALL BE PROVIDED BY CULTEC OF BROOKFIELD, CT. (203-775-4416 OR 1-800-428-5832)
2. THE GEOTEXTILE SHALL BE BLACK IN APPEARANCE.
3. THE GEOTEXTILE SHALL HAVE A TENSILE STRENGTH OF 320 X 320 LBS (1,420 X 1,420 N) PER ASTM D4632 TESTING METHOD.
4. THE GEOTEXTILE SHALL HAVE A ELONGATION @ BREAK RESISTANCE OF 15 X 15% PER ASTM D4632 TESTING METHOD.
5. THE GEOTEXTILE SHALL HAVE A WIDE WIDTH TENSILE RESISTANCE OF 3,563 X 3,563 LBS/FT (52 X 52 KN/M) PER ASTM D4595 TESTING METHOD.
6. THE GEOTEXTILE SHALL HAVE A CBR PUNCTURE RESISTANCE OF 1,500 LBS (6,670 N) PER ASTM D6241 TESTING METHOD.
7. THE GEOTEXTILE SHALL HAVE A TRAPEZOIDAL TEAR RESISTANCE OF 120 X 120 LBS (540 X 540 N) PER ASTM D4533 TESTING METHOD.
8. THE GEOTEXTILE SHALL HAVE AN APPARENT OPENING SIZE OF 30 US STD. SIEVE (0.60 MM) PER ASTM D4751 TESTING METHOD.
9. THE GEOTEXTILE SHALL HAVE A PERMITTIVITY RATING OF 0.2 SEC-1 PER ASTM D4491 TESTING METHOD.
10. THE GEOTEXTILE SHALL HAVE A WATER FLOW RATING OF 22 GPM/FT2 (900 LPM/M2) PER ASTM D4491 TESTING METHOD.
11. THE GEOTEXTILE SHALL HAVE A UV RESISTANCE OF 70% @ 500 HRS. PER ASTM D4355 TESTING METHOD.

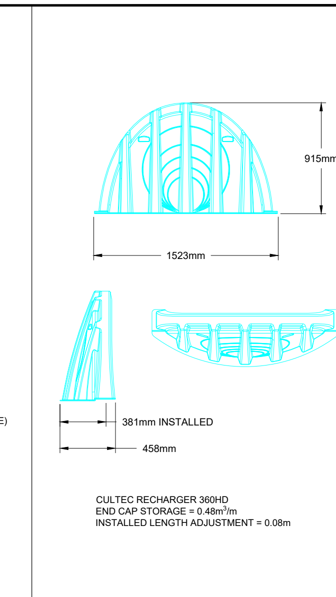
360HD 1.0 **GENERAL NOTES**



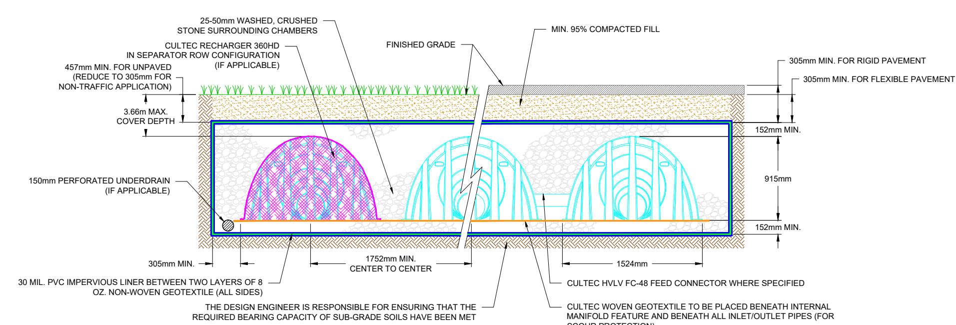
360HD 2.0 **CULTEC UNIVERSAL INSPECTION PORT KIT DETAIL**



360HD 3.0 **CULTEC RECHARGER 360HD HEAVY DUTY THREE VIEW**



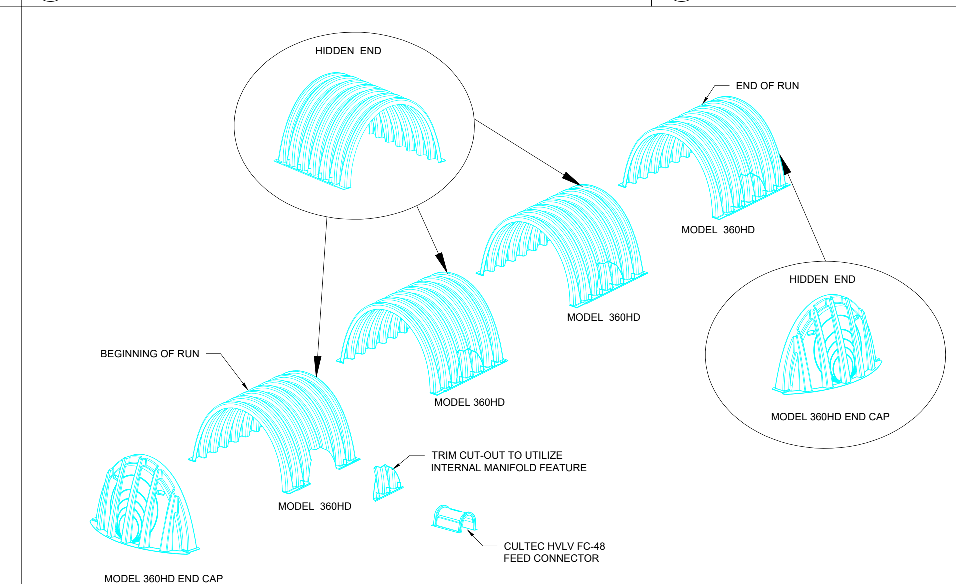
360HD 4.0 **CULTEC RECHARGER 360HD HEAVY DUTY END CAP THREE VIEW**



NOTES:

1. THE CHAMBERS SHALL BE DESIGNED AND TESTED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS." THE LOAD CONFIGURATION SHALL INCLUDE:
   - 1.a. INSTANTANEOUS AASHTO DESIGN TRUCK LIVE LOAD AT MINIMUM COVER
   - 1.b. MAXIMUM PERMANENT (50-YEAR) COVER LOAD
   - 1.c. 1-WEEK PARKED AASHTO DESIGN TRUCK LOAD
2. THE CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F3430-20 "STANDARD SPECIFICATION FOR CELLULAR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS"
3. THE INSTALLED CHAMBER SYSTEM SHALL PROVIDE RESISTANCE TO THE LOADS AND LOAD FACTORS AS DEFINED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 12.12, WHEN INSTALLED ACCORDING TO CULTEC'S RECOMMENDED INSTALLATION INSTRUCTIONS. THE STRUCTURAL DESIGN OF THE CHAMBERS SHALL INCLUDE THE FOLLOWING:
   - 3.a. THE CREEP MODULUS SHALL BE 50-YEAR AS SPECIFIED IN ASTM F3430
   - 3.b. THE MINIMUM SAFETY FACTOR FOR LIVE LOADS SHALL BE 1.75
   - 3.c. THE MINIMUM SAFETY FACTOR FOR DEAD LOADS SHALL BE 1.95

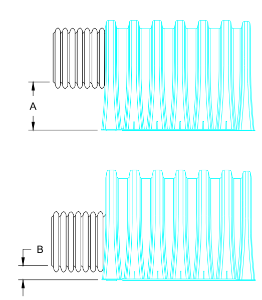
360HD 5.0 **CULTEC RECHARGER 360HD HEAVY DUTY CROSS SECTION**



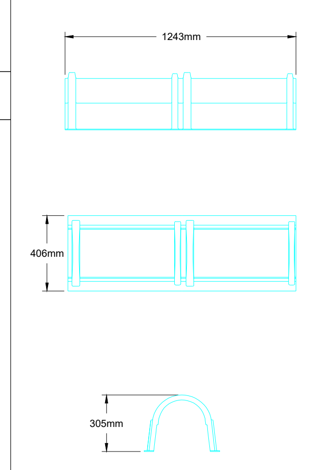
360HD 6.0 **CULTEC RECHARGER 360HD HEAVY DUTY TYPICAL INTERLOCK**

PIPE	A	B
6" [150 mm]	26.00" [660 mm]	0.75" [20 mm]
8" [200 mm]	24.00" [600 mm]	1.00" [25 mm]
10" [250 mm]	21.00" [525 mm]	1.25" [32 mm]
12" [300 mm]	18.00" [450 mm]	1.75" [45 mm]
15" [375 mm]	15.00" [375 mm]	2.00" [50 mm]
18" [450 mm]	12.00" [300 mm]	2.25" [58 mm]
24" [600 mm]	6.00" [150 mm]	2.50" [64 mm]

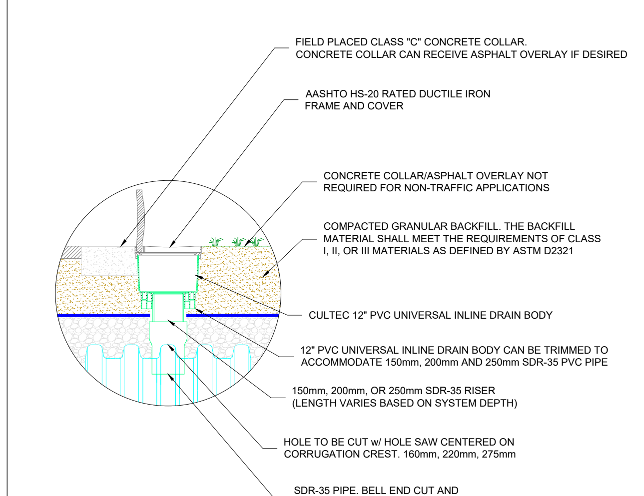
*THE TYPICAL INVERT TABLE ABOVE IS BASED ON THE INSIDE DIAMETER OF STANDARD CORRUGATED PLASTIC PIPE. THE HEAVY DUTY END CAP HAS PRE-MARKED TRIM LINES FOR PIPE DIAMETERS 12" (300mm), 15" (375mm), 18" (450mm) AND 24" (600mm). PIPES OF ANY SIZE AND MATERIAL UP TO 24" (600mm) MAY BE PLACED AT CUSTOM LOCATIONS AND CUSTOM INVERTS. 30" (750 mm) SMOOTH-WALL SDR-35 PVC PIPE MAY BE USED AT THE BOTTOM OF THE END CAP. THE CROWN OF THE PIPE MUST REMAIN A MINIMUM OF 3" (75mm) FROM THE EDGE OF THE HEAVY DUTY END CAP.



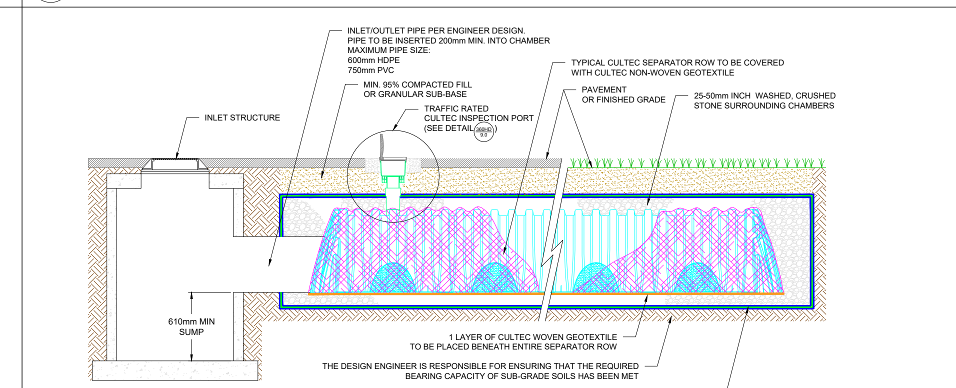
360HD 7.0 **CULTEC RECHARGER 360HD TYPICAL PIPE INVERTS**



360HD 8.0 **CULTEC HVLV FC-48 FEED CONNECTOR THREE VIEW**



360HD 9.0 **CULTEC INSPECTION PORT - ZOOM DETAIL**



NOTES:

1. THE CHAMBERS SHALL BE DESIGNED AND TESTED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS." THE LOAD CONFIGURATION SHALL INCLUDE:
   - 1.a. INSTANTANEOUS AASHTO DESIGN TRUCK LIVE LOAD AT MINIMUM COVER
   - 1.b. MAXIMUM PERMANENT (50-YEAR) COVER LOAD
   - 1.c. 1-WEEK PARKED AASHTO DESIGN TRUCK LOAD
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3. THE INSTALLED CHAMBER SYSTEM SHALL PROVIDE RESISTANCE TO THE LOADS AND LOAD FACTORS AS DEFINED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 12.12, WHEN INSTALLED ACCORDING TO CULTEC'S RECOMMENDED INSTALLATION INSTRUCTIONS. THE STRUCTURAL DESIGN OF THE CHAMBERS SHALL INCLUDE THE FOLLOWING:
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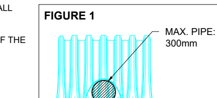
   - 3.c. THE MINIMUM SAFETY FACTOR FOR DEAD LOADS SHALL BE 1.95

FIGURE 1



ZOOM OF SIDE PORTAL SHOWING MAX. PIPE O.D.

360HD 10.0 **CULTEC SEPARATOR ROW - CULTEC INSPECTION PORT DETAIL (IF APPLICABLE)**

CULTEC STORMWATER CHAMBER

PROJECT NO:	25-0122.00	DATE:	2/3/2025
DESIGNED BY:	SRA	CHECKED BY:	TNB
SCALE:	N.T.S	SHEET NO:	5 OF 5

13656 EMIL KOLB PKWY TOWNHOUSES
13656 EMIL KOLB PARKWAY
BOLTON, ON
SYSTEM DETAIL SHEET

CULTEC
Subsurface Stormwater Management Systems
878 Federal Road
Brookfield, CT 06804
www.cultec.com
PH: 1(203) 775-4416
PH: 1(800) 4-CULTEC
CT-tech@cultec.com

1.02

POST DEVELOPMENT WATER BALANCE

Municipality:	Town of Caledon, Municipality of Peel
Project Address:	13656 Emil Kolb Parkway
Project No.	5440
Completed By:	C.D.
Checked By:	H.S.
Date:	2025-02-28

SCHAEFFERS
CONSULTING ENGINEERS
SCHAEFFER & ASSOCIATES LTD.

A = REQUIRED AVG. ANNUAL PRECIPITATION TO BE RETAINED ON SITE 5 mm

B = INITIAL ABSTRACTION

Site Features	Area (ha)	% of Site Area	Initial Abstraction	Overall Site Capture (mm)
Impervious	0.69	84.0%	1	0.84
Pervious	0.13	16.0%	5	0.80
Total	**0.83**	**100.0%**		**1.64**

Total

Deficit = A - B =	**3.4**	**mm**
Total Capture Over Entire Site Through the Surface = B x Area =	**13.5**	**m^3**
Total Required Retention = A x Area =	**41.3**	**m^3**
Total Required Volume for Rain Harvesting	**27.8**	**m^3**

STANDARD OFFLINE
Jellyfish Filter Sizing Report

Project Information

Date	Saturday, January 25, 2025
Project Name	13656 Emil Kolb Pkwy.
Project Number	5440
Location	Caledon

Jellyfish Filter Design Overview

This report provides information for the sizing and specification of the Jellyfish Filter. When designed properly in accordance to the guidelines detailed in the Jellyfish Filter Technical Manual, the Jellyfish Filter will exceed the performance and longevity of conventional horizontal bed and granular media filters.

Please see ***www.ImbriumSystems.com*** *for more information.*

Jellyfish Filter System Recommendation

The Jellyfish Filter model JF6-5-1 is recommended to meet the water quality objective by treating a flow of 27.8 L/s, which meets or exceeds 90% of the average annual rainfall runoff volume based on 18 years of TORONTO CENTRAL rainfall data for this site. This model has a sediment capacity of 313 kg, which meets or exceeds the estimated average annual sediment load.

Jellyfish Model	Number of High-Flo Cartridges	Number of Draindown Cartridges	Manhole Diameter (m)	Treatment Flow Rate (L/s)	Sediment Capacity (kg)
JF6-5-1	5	1	1.8	27.8	313

The Jellyfish Filter System

The patented Jellyfish Filter is an engineered stormwater quality treatment technology featuring unique membrane filtration in a compact stand-alone treatment system that removes a high level and wide variety of stormwater pollutants. Exceptional pollutant removal is achieved at high treatment flow rates with minimal head loss and low maintenance costs. Each lightweight Jellyfish Filter cartridge contains an extraordinarily large amount of membrane surface area, resulting in superior flow capacity and pollutant removal capacity.

Maintenance

Regular scheduled inspections and maintenance is necessary to assure proper functioning of the Jellyfish Filter. The maintenance interval is designed to be a minimum of 12 months, but this will vary depending on site loading conditions and upstream pretreatment measures. Quarterly inspections and inspections after all storms beyond the 5-year event are recommended until enough historical performance data has been logged to comfortably initiate an alternative inspection interval.

Please see ***www.ImbriumSystems.com*** *for more information.*

Thank you for the opportunity to present this information to you and your client.

Performance

Jellyfish efficiently captures a high level of Stormwater pollutants, including:

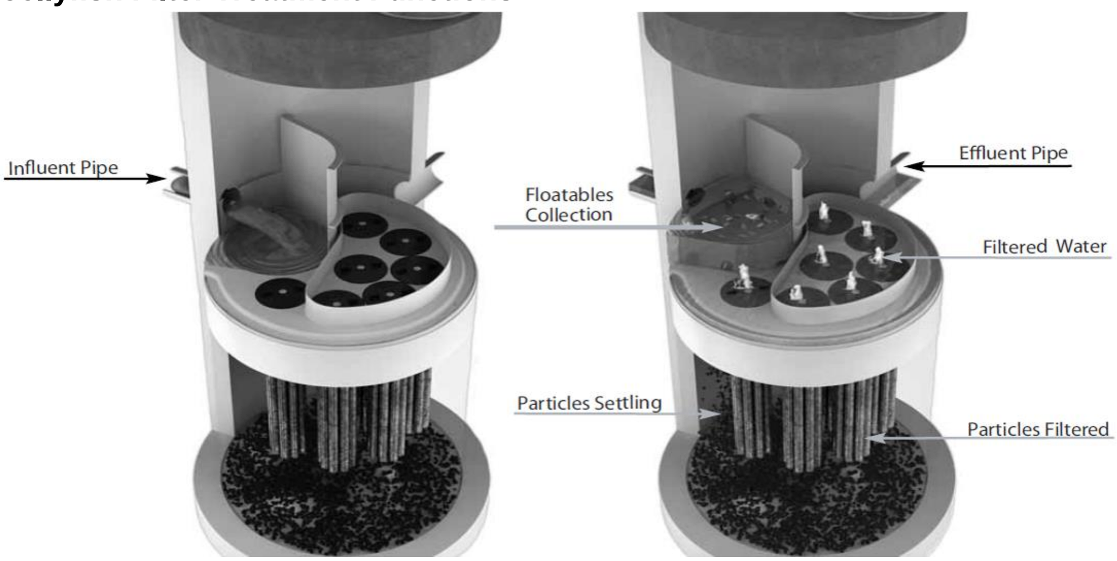
- ☑ 89% of the total suspended solids (TSS) load, including particles less than 5 microns
- ☑ 77% TP removal & 51% TN removal
- ☑ 90% Total Copper, 81% Total Lead, 70% Total Zinc
- ☑ Particulate-bound pollutants such as nutrients, toxic metals, hydrocarbons and bacteria
- ☑ Free oil, Floatable trash and debris

Field Proven Peformance

The Jellyfish filter has been field-tested on an urban site with 25 TAPE qualifying rain events and field monitored according to the TAPE field test protocol, demonstrating:

- A median TSS removal efficiency of 90%, and a median SSC removal of 99%;
- The ability to capture fine particles as indicated by an effluent d50 median of 3 microns for all monitotred storm events, and a median effluent turbidity of 5 NTUs;
- A median Total Phosphorus removal of 77%, and a median Total Nitrogen removal of 51%.

Jellyfish Filter Treatment Functions



Pre-treatment and Membrane Filtration

Jellyfish® Filter

Project Information

Date:	Saturday, January 25, 2025
Project Name:	13656 Emil Kolb Pkwy.
Project Number:	5440
Location:	Caledon

Designer Information

Company:	Schaeffers Consulting Engineers
Contact:	Debbie Wong
Phone #:	

Notes

Rainfall

Name:	TORONTO CENTRAL
State:	ON
ID:	100
Record:	1982 to 1999
Co-ords:	45°30'N, 90°30'W

Drainage Area

Total Area:	0.92 ha
Runoff Coefficient:	0.76

Upstream Detention

Peak Release Rate:	n/a
Pretreatment Credit:	n/a

Design System Requirements

Flow Loading	90% of the Average Annual Runoff based on 18 years of TORONTO CENTRAL rainfall data:	**20.6 L/s**
Sediment Loading	Treating 90% of the average annual runoff volume, 4398 m³, with a suspended sediment concentration of 60 mg/L.	**264 kg***

* Indicates that sediment loading is the limiting parameter in the sizing of this Jellyfish system

Recommendation

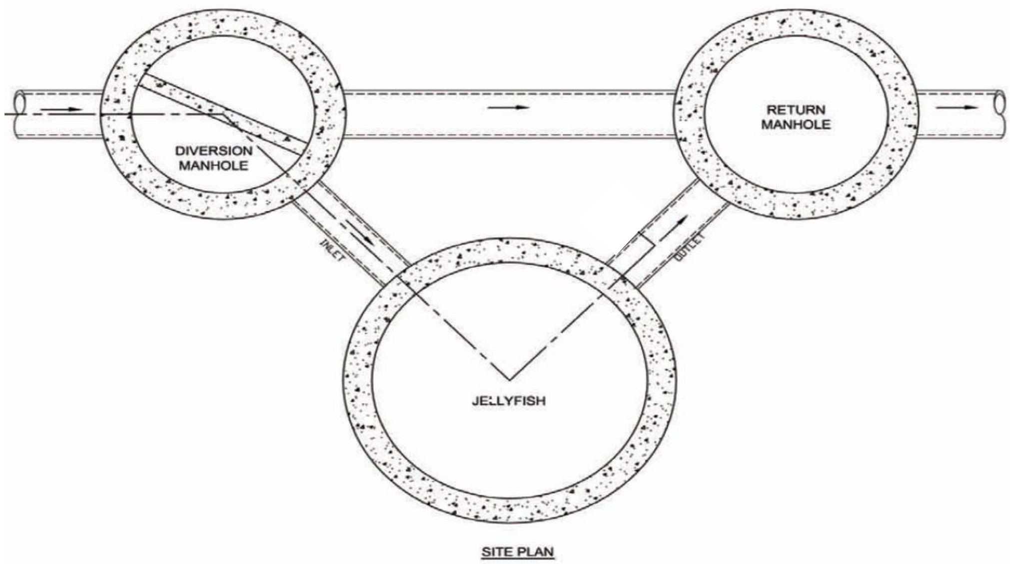
The Jellyfish Filter model JF6-5-1 is recommended to meet the water quality objective by treating a flow of 27.8 L/s, which meets or exceeds 90% of the average annual rainfall runoff volume based on 18 years of TORONTO CENTRAL rainfall data for this site. This model has a sediment capacity of 313 kg, which meets or exceeds the estimated average annual sediment load.

Jellyfish Model	Number of High-Flo Cartridges	Number of Draindown Cartridges	Manhole Diameter (m)	Wet Vol Below Deck (L)	Sump Storage (m³)	Oil Capacity (L)	Treatment Flow Rate (L/s)	Sediment Capacity (kg)
JF4-1-1	1	1	1.2	2313	0.34	379	7.6	85
JF4-2-1	2	1	1.2	2313	0.34	379	12.6	142
JF6-3-1	3	1	1.8	5205	0.79	848	17.7	199
JF6-4-1	4	1	1.8	5205	0.79	848	22.7	256
JF6-5-1	**5**	**1**	**1.8**	**5205**	**0.79**	**848**	**27.8**	**313**
JF6-6-1	6	1	1.8	5205	0.79	848	28.6	370
JF8-6-2	6	2	2.4	9252	1.42	1469	35.3	398
JF8-7-2	7	2	2.4	9252	1.42	1469	40.4	455
JF8-8-2	8	2	2.4	9252	1.42	1469	45.4	512
JF8-9-2	9	2	2.4	9252	1.42	1469	50.5	569
JF8-10-2	10	2	2.4	9252	1.42	1469	50.5	626
JF10-11-3	11	3	3.0	14456	2.21	2302	63.1	711
JF10-12-3	12	3	3.0	14456	2.21	2302	68.2	768
JF10-12-4	12	4	3.0	14456	2.21	2302	70.7	796
JF10-13-4	13	4	3.0	14456	2.21	2302	75.7	853
JF10-14-4	14	4	3.0	14456	2.21	2302	78.9	910
JF10-15-4	15	4	3.0	14456	2.21	2302	78.9	967
JF10-16-4	16	4	3.0	14456	2.21	2302	78.9	1024
JF10-17-4	17	4	3.0	14456	2.21	2302	78.9	1081
JF10-18-4	18	4	3.0	14456	2.21	2302	78.9	1138
JF10-19-4	19	4	3.0	14456	2.21	2302	78.9	1195
JF12-20-5	20	5	3.6	20820	3.2	2771	113.6	1280
JF12-21-5	21	5	3.6	20820	3.2	2771	113.7	1337
JF12-22-5	22	5	3.6	20820	3.2	2771	113.7	1394
JF12-23-5	23	5	3.6	20820	3.2	2771	113.7	1451
JF12-24-5	24	5	3.6	20820	3.2	2771	113.7	1508
JF12-25-5	25	5	3.6	20820	3.2	2771	113.7	1565
JF12-26-5	26	5	3.6	20820	3.2	2771	113.7	1622
JF12-27-5	27	5	3.6	20820	3.2	2771	113.7	1679

Jellyfish® Filter

Jellyfish Filter Design Notes

- Typically the Jellyfish Filter is designed in an offline configuration, as all stormwater filter systems will perform for a longer duration between required maintenance services when designed and applied in off-line configurations. Depending on the design parameters, an optional internal bypass may be incorporated into the Jellyfish Filter, however note the inspection and maintenance frequency should be expected to increase above that of an off-line system. Speak to your local representative for more information.



Jellyfish Filter Typical Layout

- Typically, 18 inches (457 mm) of driving head is designed into the system, calculated as the difference in elevation between the top of the diversion structure weir and the invert of the Jellyfish Filter outlet pipe. Alternative driving head values can be designed as 12 to 24 inches (305 to 610mm) depending on specific site requirements, requiring additional sizing and design assistance.
- Typically, the Jellyfish Filter is designed with the inlet pipe configured 6 inches (150 mm) above the outlet invert elevation. However, depending on site parameters this can vary to an optional configuration of the inlet pipe entering the unit below the outlet invert elevation.
- The Jellyfish Filter can accommodate multiple inlet pipes within certain restrictions.
- While the optional inlet below deck configuration offers 0 to 360 degree flexibility between the inlet and outlet pipe, typical systems conform to the following:

Model Diameter (m)	Minimum Angle Inlet / Outlet Pipes	Minimum Inlet Pipe Diameter (mm)	Minimum Outlet Pipe Diameter (mm)
1.2	62º	150	200
1.8	**59º**	**200**	**250**
2.4	52º	250	300
3.0	48º	300	450
3.6	40º	300	450

- The Jellyfish Filter can be built at all depths of cover generally associated with conventional stormwater conveyance systems. For sites that require minimal depth of cover for the stormwater infrastructure, the Jellyfish Filter can be applied in a shallow application using a hatch cover. The general minimum depth of cover is 36 inches (915 mm) from top of the underslab to outlet invert.
- If driving head caclulations account for water elevation during submerged conditions the Jellyfish Filter will function effectively under submerged condtions.
- Jellyfish Filter systems may incorporate grated inlets depending on system configuration.
- For sites with water quality treatment flow rates or mass loadings that exceed the design flow rate of the largest standard Jellyfish Filter manhole models, systems can be designed that hydraulically connect multiple Jellyfish Filters in series or alternatively Jellyfish Vault units can be designed.

STANDARD SPECIFICATION
STORMWATER QUALITY – MEMBRANE FILTRATION TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

Specifies requirements for construction and performance of an underground stormwater quality membrane filtration treatment device that removes pollutants from stormwater runoff through the unit operations of sedimentation, floatation, and membrane filtration.

1.2 REFERENCE STANDARDS

ASTM C 891: Specification for Installation of Underground Precast Concrete Utility Structures
ASTM C 478: Specification for Precast Reinforced Concrete Manhole Sections
ASTM C 443: Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM D 4101: Specification for Copolymer steps construction

CAN/CSA-A257.4-M92
Joints for Circular Concrete Sewer and Culvert Pipe, Manhole Sections and Fittings Using Rubber Gaskets

CAN/CSA-A257.4-M92
Precast Reinforced Circular Concrete Manhole Sections, Catch Basins and Fittings

Canadian Highway Bridge Design Code

1.3 SHOP DRAWINGS

Shop drawings for the structure and performance are to be submitted with each order to the contractor. Contractor shall forward shop drawing submittal to the consulting engineer for approval. Shop drawings are to detail the structure's precast concrete and call out or note the fiberglass (FRP) internals/components.

1.4 PRODUCT SUBSTITUTIONS

No product substitutions shall be accepted unless submitted 10 days prior to project bid date, or as directed by the engineer of record. Submissions for substitutions require review and approval by the Engineer of Record, for hydraulic performance, impact to project designs, equivalent treatment performance, and any required project plan and report (hydrology/hydraulic, water quality, stormwater pollution) modifications that would be required by the approving jurisdictions/agencies. Contractor to coordinate with the Engineer of Record any applicable modifications to the project estimates of cost, bonding amount determinations, plan check fees for changes to approved documents, and/or any other regulatory requirements resulting from the product substitution.

1.5 HANDLING AND STORAGE

Prevent damage to materials during storage and handling.

PART 2 – PRODUCTS

2.1 GENERAL

2.1.1 The device shall be a cylindrical or rectangular, all concrete structure (including risers), constructed from precast concrete riser and slab components or monolithic precast structure(s), installed to conform to ASTM C 891 and to any required state highway, municipal or local specifications; whichever is more stringent. The device shall be watertight.

2.1.2 Cartridge Deck The cylindrical concrete device shall include a fiberglass deck. The rectangular concrete device shall include a coated aluminum deck. In either instance, the insert shall be bolted and sealed watertight inside the precast concrete chamber. The deck shall serve as: (a) a horizontal divider between the lower treatment zone and the upper treated effluent zone; (b) a deck for attachment of filter cartridges such that the membrane filter elements of each cartridge extend into the lower treatment zone; (c) a platform for maintenance workers to service the filter cartridges (maximum manned weight = 450 pounds (204 kg)); (d) a conduit for conveyance of treated water to the effluent pipe.

2.1.3 Membrane Filter Cartridges Filter cartridges shall be comprised of reusable cylindrical membrane filter elements connected to a perforated head plate. The number of membrane filter elements per cartridge shall be a minimum of eleven 2.75-inch (70-mm) diameter elements. The length of each filter element shall be a minimum 15 inches (381 mm). Each cartridge shall be fitted into the cartridge deck by insertion into a cartridge receptacle that is permanently mounted into the cartridge deck. Each cartridge shall be secured by a cartridge lid that is threaded onto the receptacle, or similar mechanism to secure the cartridge into the deck. The maximum treatment flow rate of a filter cartridge shall be controlled by an orifice in the cartridge lid, or on the individual cartridge itself, and based on a design flux rate (surface loading rate) determined by the maximum treatment flow rate per unit of filtration membrane surface area. The maximum design flux rate shall be 0.21 gpm/ft^2 (0.142 lps/m^2).

Each membrane filter cartridge shall allow for manual installation and removal. Each filter cartridge shall have filtration membrane surface area and dry installation weight as follows (if length of filter cartridge is between those listed below, the surface area and weight shall be proportionate to the next length shorter and next length longer as shown below):

Filter Cartridge Length (in / mm)	Minimum Filtration Membrane Surface Area (ft2 / m2)	Maximum Filter Cartridge Dry Weight (lbs / kg)
15	106 / 9.8	10.5 / 4.8
27	190 / 17.7	15.0 / 6.8
40	282 / 26.2	20.5 / 9.3
54	381 / 35.4	25.5 / 11.6

2.1.4 Backwashing Cartridges The filter device shall have a weir extending above the cartridge deck, or other mechanism, that encloses the high flow rate filter cartridges when placed in their respective cartridge receptacles within the cartridge deck. The weir, or other mechanism, shall collect a pool of filtered water during inflow events that backwashes the high flow rate cartridges when the inflow event subsides. All filter cartridges and membranes shall be reusable and allow for the use of filtration membrane rinsing procedures to restore flow capacity and sediment capacity; extending cartridge service life.

2.1.5 Maintenance Access to Captured Pollutants The filter device shall contain an opening(s) that provides maintenance access for removal of accumulated floatable pollutants and sediment, removal of and replacement of filter cartridges, cleaning of the sump, and rinsing of the deck. Access shall have a minimum clear vertical clear space over all of the filter cartridges. Filter cartridges shall be able to be lifted straight vertically out of the receptacles and deck for the entire length of the cartridge.

2.1.6 Bend Structure The device shall be able to be used as a bend structure with minimum angles between inlet and outlet pipes of 90-degrees or less in the stormwater conveyance system.

2.1.7 Double-Wall Containment of Hydrocarbons The cylindrical precast concrete device shall provide double-wall containment for hydrocarbon spill capture by a combined means of an inner wall of fiberglass, to a minimum depth of 12 inches (305 mm) below the cartridge deck, and the precast vessel wall.

2.1.8 Baffle The filter device shall provide a baffle that extends from the underside of the cartridge deck to a minimum length equal to the length of the membrane filter elements. The baffle shall serve to protect the membrane filter elements from contamination by floatables and coarse sediment. The baffle shall be flexible and continuous in cylindrical configurations, and shall be a straight concrete or aluminum wall in rectangular configurations.

2.1.9 Sump The device shall include a minimum 24 inches (610 mm) of sump below the bottom of the cartridges for sediment accumulation, unless otherwise specified by the design engineer. Depths less than 24 inches may have an impact on the total performance and/or longevity between cartridge maintenance/replacement of the device.

2.2 PRECAST CONCRETE SECTIONS

All precast concrete components shall be manufactured to a minimum live load of HS-20 truck loading or greater based on local regulatory specifications, unless otherwise modified or specified by the design engineer, and shall be watertight.

2.3 JOINTS All precast concrete manhole configuration joints shall use nitrile rubber gaskets and shall meet the requirements of ASTM C443, Specification C1619, Class D or engineer approved equal to ensure oil resistance. Mastic sealants or butyl tape are not an acceptable alternative.

2.4 GASKETS Only profile neoprene or nitrile rubber gaskets in accordance to CSA A257.3-M92 will be accepted. Mastic sealants, butyl tape or Conseal CS-101 are not acceptable gasket materials.

2.5 FRAME AND COVER Frame and covers must be manufactured from cast-iron or other composite material tested to withstand H-20 or greater design loads, and as approved by the local regulatory body. Frames and covers must be embossed with the name of the device manufacturer or the device brand name.

2.6 DOORS AND HATCHES If provided shall meet designated loading requirements or at a minimum for incidental vehicular traffic.

2.7 CONCRETE All concrete components shall be manufactured according to local specifications and shall meet the requirements of ASTM C 478.

2.8 FIBERGLASS The fiberglass portion of the filter device shall be constructed in accordance with the following standard: ASTM D-4097: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks.

2.9 STEPS Steps shall be constructed according to ASTM D4101 of copolymer polypropylene, and be driven into preformed or pre-drilled holes after the concrete has cured, installed to conform to applicable sections of state, provincial and municipal building codes, highway, municipal or local specifications for the construction of such devices.

2.10 INSPECTION All precast concrete sections shall be inspected to ensure that dimensions, appearance and quality of the product meet local municipal specifications and ASTM C 478.

PART 3 – PERFORMANCE

3.1 GENERAL

3.1.1 Verification – The stormwater quality filter must be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV).

3.1.2 Function - The stormwater quality filter treatment device shall function to remove pollutants by the following unit treatment processes; sedimentation, floatation, and membrane filtration.

3.1.3 Pollutants - The stormwater quality filter treatment device shall remove oil, debris, trash, coarse and fine particulates, particulate-bound pollutants, metals and nutrients from stormwater during runoff events.

3.1.4 Bypass - The stormwater quality filter treatment device shall typically utilize an external bypass to divert excessive flows. Internal bypass systems shall be equipped with a floatables baffle, and must avoid passage through the sump and/or cartridge filtration zone.

3.1.5 Treatment Flux Rate (Surface Loading Rate) – The stormwater quality filter treatment device shall treat 100% of the required water quality treatment flow based on a maximum design treatment flux rate (surface loading rate) across the membrane filter cartridges of 0.21 gpm/ft² (0.142 lps/m²).

3.2 FIELD TEST PERFORMANCE

At a minimum, the stormwater quality filter device shall have been field tested and verified with a minimum 25 TARP qualifying storm events and field monitoring shall have been conducted according to the TARP 2009 NJDEP TARP field test protocol, and have received NJCAT verification.

3.2.1 Suspended Solids Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median TSS removal efficiency of 85% and a minimum median SSC removal efficiency of 95%.

3.2.2 Runoff Volume – The stormwater quality filter treatment device shall be engineered, designed, and sized to treat a minimum of 90 percent of the annual runoff volume determined from use of a minimum 15-year rainfall data set.

3.2.3 Fine Particle Removal - The stormwater quality filter treatment device shall have demonstrated the ability to capture fine particles as indicated by a minimum median removal efficiency of 75% for the particle fraction less than 25 microns, an effluent d_{50} of 15 microns or lower for all monitored storm events.

3.2.4 Turbidity Reduction - The stormwater quality filter treatment device shall have demonstrated the ability to reduce the turbidity from influent from a range of 5 to 171 NTU to an effluent turbidity of 15 NTU or lower.

3.2.5 Nutrient (Total Phosphorus & Total Nitrogen) Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median Total Phosphorus removal of 55%, and a minimum median Total Nitrogen removal of 50%.

3.2.6 Metals (Total Zinc & Total Copper) Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median Total Zinc removal of 55%, and a minimum median Total Copper removal of 85%.

3.3 INSPECTION and MAINTENANCE

The stormwater quality filter device shall have the following features:

3.3.1 Durability of membranes are subject to good handling practices during inspection and maintenance (removal, rinsing, and reinsertion) events, and site specific conditions that may have heavier or lighter loading onto the cartridges, and pollutant variability that may impact the membrane structural integrity. Membrane maintenance and replacement shall be in accordance with manufacturer's recommendations.

3.3.2 Inspection which includes trash and floatables collection, sediment depth determination, and visible determination of backwash pool depth shall be easily conducted from grade (outside the structure).

3.3.3 Manual rinsing of the reusable filter cartridges shall promote restoration of the flow capacity and sediment capacity of the filter cartridges, extending cartridge service life.

3.3.4 The filter device shall have a minimum 12 inches (305 mm) of sediment storage depth, and a minimum of 12 inches between the top of the sediment storage and bottom of the filter cartridge tentacles, unless otherwise specified by the design engineer. Variances may have an impact on the total performance and/or longevity between cartridge maintenance/replacement of the device.

3.3.5 Sediment removal from the filter treatment device shall be able to be conducted using a standard maintenance truck and vacuum apparatus, and a minimum one point of entry to the sump that is unobstructed by filter cartridges.

3.3.6 Maintenance access shall have a minimum clear height that provides suitable vertical clear space over all of the filter cartridges. Filter cartridges shall be able to be lifted straight vertically out of the receptacles and deck for the entire length of the cartridge.

3.3.7 Filter cartridges shall be able to be maintained without the requirement of additional lifting equipment.

PART 4 – EXECUTION

4.1 INSTALLATION

4.1.1 PRECAST DEVICE CONSTRUCTION SEQUENCE

The installation of a watertight precast concrete device should conform to ASTM C 891 and to any state highway, municipal or local specifications for the construction of manholes, whichever is more stringent. Selected sections of a general specification that are applicable are summarized below.

4.1.1.1 The watertight precast concrete device is installed in sections in the following sequence:

- aggregate base
- base slab
- treatment chamber and cartridge deck riser section(s)
- bypass section
- connect inlet and outlet pipes
- concrete riser section(s) and/or transition slab (if required)
- maintenance riser section(s) (if required)
- frame and access cover

4.1.2 The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

4.1.3 Adjustment of the stormwater quality treatment device can be performed by lifting the upper sections free of the excavated area, re-leveling the base, and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary to restore original condition and watertight seals. Once the stormwater quality treatment device has been constructed, any/all lift holes must be plugged watertight with mortar or non-shrink grout.

4.1.4 Inlet and Outlet Pipes Inlet and outlet pipes should be securely set into the device using approved pipe seals (flexible boot connections, where applicable) so that the structure is watertight, and such that any pipe intrusion into the device does not impact the device functionality.

4.1.5 Frame and Cover Installation Adjustment units (e.g. grade rings) should be installed to set the frame and cover at the required elevation. The adjustment units should be laid in a full bed of mortar with successive units being joined using sealant recommended by the manufacturer. Frames for the cover should be set in a full bed of mortar at the elevation specified.

4.2 MAINTENANCE ACCESS WALL
In some instances the Maintenance Access Wall, if provided, shall require an extension attachment and sealing to the precast wall and cartridge deck at the job site, rather than at the precast facility. In this instance, installation of these components shall be performed according to instructions provided by the manufacturer.

4.3 FILTER CARTRIDGE INSTALLATION Filter cartridges shall be installed in the cartridge deck only after the construction site is fully stabilized and in accordance with the manufacturer's guidelines and recommendations. Contractor to contact the manufacturer to schedule cartridge delivery and review procedures/requirements to be completed to the device prior to installation of the cartridges and activation of the system.

PART 5 – QUALITY ASSURANCE

5.1 FILTER CARTRIDGE INSTALLATION Manufacturer shall coordinate delivery of filter cartridges and other internal components with contractor. Filter cartridges shall be delivered and installed complete after site is stabilized and unit is ready to accept cartridges. Unit is ready to accept cartridges after is has been cleaned out and any standing water, debris, and other materials have been removed. Contractor shall take appropriate action to protect the filter cartridge receptacles and filter cartridges from damage during construction, and in accordance with the manufacturer's recommendations and guidance. For systems with cartridges installed prior to full site stabilization and prior to system activation, the contractor can plug inlet and outlet pipes to prevent stormwater and other influent from entering the device. Plugs must be removed during the activation process.

5.2 INSPECTION AND MAINTENANCE

5.2.1 The manufacturer shall provide an Owner's Manual upon request.

5.2.2 After construction and installation, and during operation, the device shall be inspected and cleaned as necessary based on the manufacturer's recommended inspection and maintenance guidelines and the local regulatory agency/body.

5.3 REPLACEMENT FILTER CARTRIDGES When replacement membrane filter elements and/or other parts are required, only membrane filter elements and parts approved by the manufacturer for use with the stormwater quality filter device shall be installed.

END OF SECTION

APPENDIX C

Sanitary Servicing Calculations

EXISTING SANITARY DEMAND

Municipality:	Town of Caledon, Municipality of Peel
Project Address:	13656 Emil Kolb Parkway
Project No.	5440
Completed By:	C.D.
Checked By:	H.S.
Date:	2025-02-28

SCHAEFFERS CONSULTING ENGINEERS
SCHAEFFER & ASSOCIATES LTD.

Average Demand Calculation

Tenure Type	Unit	Area (ha)	Pop. Density (persons/unit)	Population (persons)	Sanitary Demand (L/cap/d)	Average Demand (L/s)
Single Detached	1	0.83	4.2	4	290	0.01

Peak Demand Calculation

Average Sanitary Demand (L/s)	Total Population	M	Site Area (ha)	*Infiltration (L/s)	Total Peak Flow (L/s)
0.01	4	4.0	0.83	0.22	**0.27**

*Based on 0.20 L/s/ha of gross area

$M = 1 + 14/(4 + (P/1000)^{0.5})$

PROPOSED SANITARY DEMAND

Municipality: Town of Caledon, Municipality of Peel
Project Address: 13656 Emil Kolb Parkway

Project No. 5440
Completed By: C.D.
Checked By: H.S.
Date: 2025-02-28

SCHAEFFERS CONSULTING ENGINEERS
SCHAEFFER & ASSOCIATES LTD.

Average Demand Calculation

Tenure Type	Units	Unit Density (ppu)	Population (Persons)	Sanitary Demand (L/cap/d)	Average Demand (L/s)
Townhouse	22	3.4	75	290.00	0.25
Large Apartment (>1 bedroom)	29	3.1	90	290.00	0.30
Small Apartment (<=1 bedroom)	73	1.7	125	290.00	0.42

Peak Demand Calculation

Average Sanitary Demand (L/s)	Total Population	M	Site Area (ha)	*Infiltration (L/s)	Total Peak Flow (L/s)
0.97	290	4.0	0.83	0.22	**4.11**

*Based on 0.26 L/s/ha of gross area

$M = 1 + 14/(4 + (P/1000)^{0.5})$

Region of Peel
working with you

Water and Wastewater Modelling Demand Table

Site Plan Applications

Version	Date	Description of Revision
1.0	January 10 2023	Posted to Peel Website
2.0	August 30 2024	Reflects 2023 Linear Wastewater Standards and ICI population estimates as per Peel 2020 DC background study

Introduction

Water and wastewater modelling may be required as a condition of the development approval process or prior to regional site servicing connection approval where intensification is proposed, where a possible increase in water demand or wastewater discharge is identified or where deemed necessary by Regional staff.

A completed table includes the Professional Engineer's signature and stamp as well as a site servicing concept. The table will be deemed complete once all the information below is submitted and/or included. Modelling will commence once the information is deemed complete. All required calculations must be submitted with the completed demand table. The calculations shall be based on the specific development proposal.

Application Information

Application Number:	
Address:	13656 Emil Kolb Parkway
Consulting Engineer:	Schaeffers Consulting Engineers
Date Prepared:	February 7, 2025

Population

Existing

		Units	Persons
1	Residential [8)]		4
2	Institutional/Employment [8)]		
3	Total		4

Proposed

			Units	Persons
4	Residential [1]	singles/semis (4.2 ppu)		
5		Townhomes (3.4 ppu)	22	75
6		Large apartments (>1 bedroom – 3.1 ppu)	29	90
7		Small apartments (<=1 bedroom – 1.7 ppu)	73	125
8		Total proposed residential	124	290
9	Proposed Institutional[2]			
10	Proposed employment [3]			
11	Total Proposed			290

Other

12	Existing gross floor area for commercial and/or retail (sqm)	
13	Proposed gross floor area for commercial and/or retail (sqm)	
14	Land area (ha)	0.83

Water Connection

Hydrant flow test [4]

15	Location 1	Harvest Moon Drive west of Frank west of Frank Johnstone Rd. (Residual)
16	Location 2	Harvest Moon Drive east of Frank west of Frank Johnstone Rd. (Flow Hydrant)

		Pressure (kPa)	Flow (L/s)	Time
17	Minimum water pressure	310.26	6382	2:30 pm
18	Maximum water pressure	324.05	3494	2:30 pm

Water Demands (L/s)

		Use 1 6)	Use 2 6)	Use 3 6)	Total
19	Existing fire flow 5) 8)				
20	Proposed average day flow	0.91 L/s			
21	Proposed maximum day flow	1.63 L/s			
22	Proposed peak hour flow	2.72 L/s			
23	Proposed fire flow 5)				17,000 L/min

Water calculations

Please use the following updated typical water demand criteria as per Peel's 2020 Development Charges background study.

Population Type	Unit	Average Consumption Rate	Max Day Factor	Peak Hour Factor
Residential	L/cap/d	270	1.8	3.0
Institutional/Commercial/ Industrial	L/emp/d	250	1.4	3.0

Wastewater Connection

Wastewater Effluent (L/s)

		Discharge location [7)]	Flow
24	Existing effluent [8)]		
25	Proposed effluent	4.11 L/s peak flow discharging to Emil Kolb Parkway 375mm sanitary sewer	
26	Proposed effluent		
27	Proposed effluent		
28	Proposed additional effluent [8)]		
29	Other proposed effluent*		
30	Total proposed effluent		4.11 L/s

*Please specify other proposed effluent (ex. occasional tank purges, off peak discharge, pool drainage)

N/A

Wastewater calculations

Please use the following updated daily per capita as per 2023 Peel Linear Wastewater Standards

Population Type	Unit	Average Day Demand	Min Peaking Factor	Max Peaking Factor	Inflow and Infiltration**
Residential	L/cap/d	290	2	4	0.26L/s/Ha
Non-residential	L/emp/d	270	2	4	0.26L/s/Ha

**For maintenance holes that are flood prone or located in low lying areas, an extra 0.28 L/s per maintenance hole may be added to the I&I calculation.

Notes

1) In accordance with Peel Linear Wastewater Standards and Region of Peel 2020 DC background Study
2) refer to Peel Linear Wastewater Standards
3) For the commercial and industrial design flow calculations, please refer to Schedule 8b on page A-9 of the Region of Peel 2020 DC background Study to determine population.
4) Please include the graphs associated with the hydrant flow test data. Hydrant flow tests should be performed within 2 years of submission to the Region. The Region will not permit hydrant flow tests during the winter, please contact Region Water Operations for scheduling. The Region reserves the right to request an updated hydrant flow test as required at any time.
5) Please reference the Fire Underwriters Survey Document
6) Please identify the flows for each use type, **if applicable**
7) Please include drainage plan for multiple discharge locations
8) For Intensification, sites with additions to buildings or additional buildings please provide existing flow for existing buildings and the added flows for the new proposal, **if applicable**

APPENDIX D

Water Supply Calculations

WATER DEMAND

SCHAEFFERS CONSULTING ENGINEERS
SCHAEFFER & ASSOCIATES LTD.

Municipality:	Town of Caledon, Municipality of Peel
Project Address:	13656 Emil Kolb Parkway
Project No.	5440
Completed By:	C.D
Checked By:	H.S.
Date:	2025-02-28

FUS Fire Flow:	17,000	L/minute
FUS Fire Flow:	283.33	L/s
Generation Rate:	270	L/capita/day

Population	Unit Average Day Demand (L/capita/day)	Average Day Demand (L/s)
290	270	**0.91**

TOTAL DEMANDS

	Average Day Demand (L/s)	Max Hour Demand Peaking Factor †	Max Hour Demand (L/s)	Max Day Demand Peaking Factor †	Max Day Demand (L/s)	Max Day Demand + Fire Flow (L/s)
TOTAL	**0.91**	3.0	**2.72**	1.8	**1.63**	**284.96**

	Demand (L/s)
Average Day Demand	0.91
Maximum Day Demand	1.63
Peak Hourly Demand	2.72
Fire Flow	283.33
Total Demand	284.96

FIRE UNDERWRITERS SURVEY CALCULATION

Municipality:	Town of Caledon, Municipality of Peel
Project Address:	13656 Emil Kolb Parkway - Building 1
Project No.	5440
Completed By:	C.D.
Checked By:	H.S.
Date:	2025-02-28

A = Type of Construction

Type of Construction:	C	Description
Wood Frame	1.5	(essentially all combustible)
Ordinary	1	(brick/masonry walls, combustible interior)
Non-Combustible	0.8	(unprotected metal structure, masonry/metal walls)
Fire-Resistive	0.6	(fully protected frame, roof, floors)

Construction Coefficient:	0.8	

D = Fire Flow (000's)

GFA*	5025	**square metres**
Construction Type	0.8	
Fire Flow	**12,476**	**L/min**

*GFA of Building B

Fire Flow	**12,000**	**L/min**

E = Occupancy Factor

Fire Hazard of Contents	Charge
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Burning	25%

Occupancy Factor	-15%	
Fire Flow	**10,200**	**L/min**

F = Sprinkler Factor

Sprinkler System	Charge
n/a	0%
NFPA 13 System	-30%
Fully Supervised System	-50%

Sprinkler Factor:	-30%

G = Exposure Factor

Separation	Charge	
0 to 3 m	25%	North: 52m (0%)
3.1 to 10 m	20%	West: 13.9m +3.4m = 17.3m (15%)
10.1 to 20 m	15%	South: 45+ (0%)
20.1 to 30 m	10%	East: 45m+ (0%)
30.1 to 45 m	5%	

Exposure Factor	15%	(no more than 75%)

H - Net Fire Flow Required

F + G Factors	**-15%**

Calculated Fire Flow:	**8670**	**L/min**
Fire Flow:	**9000**	**L/min** (round to the nearest 1000th)
Fire Flow:	**150**	**L/s**

FIRE UNDERWRITERS SURVEY CALCULATION

Municipality:	Town of Caledon, Municipality of Peel
Project Address:	13656 Emil Kolb Parkway - Building 2
Project No.	5440
Completed By:	C.D.
Checked By:	H.S.
Date:	2025-02-28

A = Type of Construction

Type of Construction:	C	Description
Wood Frame	1.5	(essentially all combustible)
Ordinary	1	(brick/masonry walls, combustible interior)
Non-Combustible	0.8	(unprotected metal structure, masonry/metal walls)
Fire-Resistive	0.6	(fully protected frame, roof, floors)

Construction Coefficient:	1.5

D = Fire Flow (000's)

GFA*	1768	**square metres**
Construction Type	1.5	
Fire Flow	**13,876**	**L/min**

*GFA of Building B

Fire Flow	**14,000**	**L/min**

E = Occupancy Factor

Fire Hazard of Contents	Charge
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Burning	25%

Occupancy Factor	-15%	
Fire Flow	**11,900**	**L/min**

F = Sprinkler Factor

Sprinkler System	Charge
n/a	0%
NFPA 13 System	-30%
Fully Supervised System	-50%

Sprinkler Factor:	0%

G = Exposure Factor

Separation	Charge	
0 to 3 m	25%	North: 6.9 + 15.1 = 22m (10%)
3.1 to 10 m	20%	West: 4.0 + 10.5 = 14.5 (15%)
10.1 to 20 m	15%	South: 59.8 (0%)
20.1 to 30 m	10%	East: 5.3m (20%)
30.1 to 45 m	5%	

Exposure Factor	45%	(no more than 75%)

H - Net Fire Flow Required

F + G Factors	**45%**

Calculated Fire Flow:	**17255**	**L/min**
Fire Flow:	**17000**	**L/min** (round to the nearest 1000th)
Fire Flow:	**283**	**L/s**

FIRE UNDERWRITERS SURVEY CALCULATION

Municipality:	Town of Caledon, Municipality of Peel
Project Address:	13656 Emil Kolb Parkway - Building 3
Project No.	5440
Completed By:	C.D.
Checked By:	H.S.
Date:	2025-02-28

A = Type of Construction

Type of Construction:	C	Description
Wood Frame	1.5	(essentially all combustible)
Ordinary	1	(brick/masonry walls, combustible interior)
Non-Combustible	0.8	(unprotected metal structure, masonry/metal walls)
Fire-Resistive	0.6	(fully protected frame, roof, floors)

Construction Coefficient:	1.5

D = Fire Flow (000's)

GFA*	1480	**square metres**
Construction Type	1.5	
Fire Flow	**12,695**	**L/min**

*GFA of Building B

Fire Flow	**13,000**	**L/min**

E = Occupancy Factor

Fire Hazard of Contents	Charge
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Burning	25%

Occupancy Factor	-15%	
Fire Flow	**11,050**	**L/min**

F = Sprinkler Factor

Sprinkler System	Charge
n/a	0%
NFPA 13 System	-30%
Fully Supervised System	-50%

Sprinkler Factor:	0%

G = Exposure Factor

Separation	Charge	
0 to 3 m	25%	North: 7.2 + 21.3 = 28.5m (10%)
3.1 to 10 m	20%	West: 5.3m (20%)
10.1 to 20 m	15%	South: 59.6 (0%)
20.1 to 30 m	10%	East: 45m+ (0%)
30.1 to 45 m	5%	

Exposure Factor	30%	(no more than 75%)

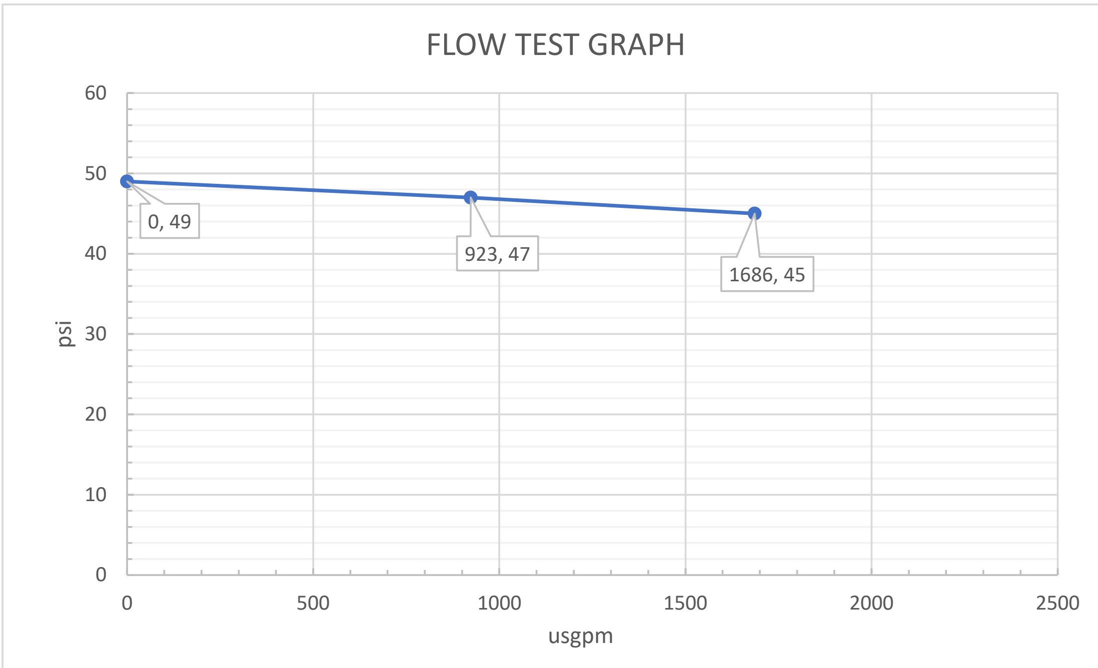
H - Net Fire Flow Required

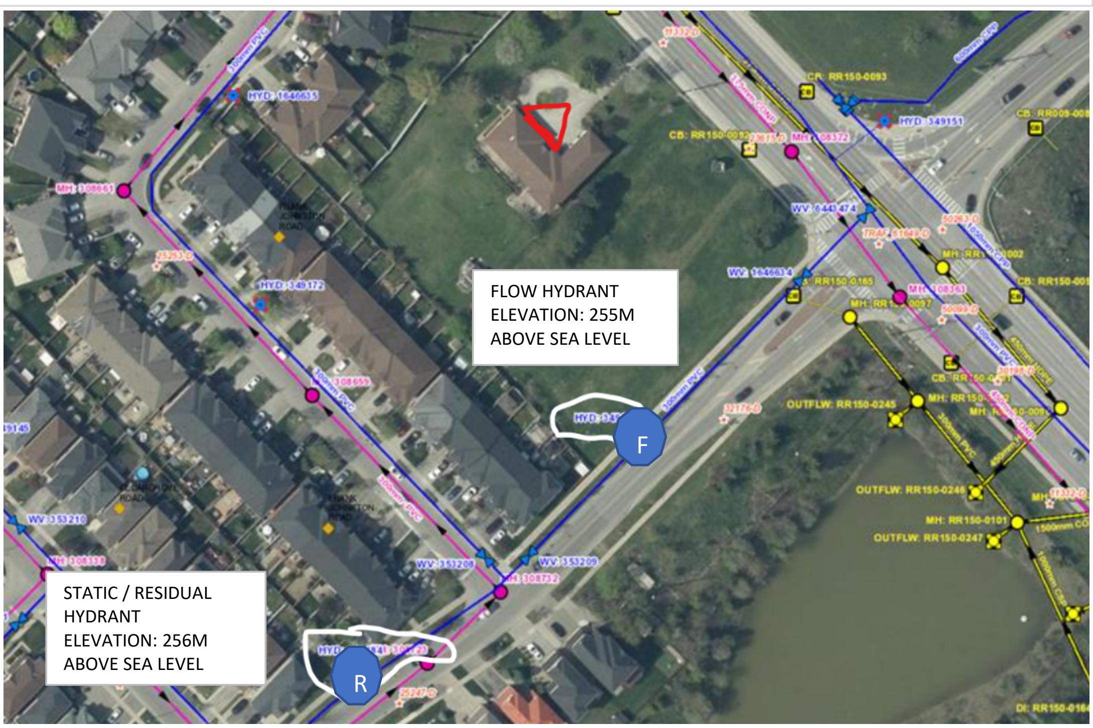
F + G Factors	**30%**

Calculated Fire Flow:	**14365**	**L/min**
Fire Flow:	**14000**	**L/min** (round to the nearest 1000th)
Fire Flow:	**233**	**L/s**

FLOW TEST REPORT

Project No.	24-F020								
Address	Harvest Moon Drive & Emil Kolb Pkwy - Bolton								
Date:	2024-06-20			Time	2:30pm		Size of Main		12"PVC
Static	Pitot. 1 (2.5")	Flow 1	Res. Pres. 1	Pitot 2a (2.5")	Flow 2a	Pitot 2b (2.5")	Flow 2b	Flow 2a+2b	Res. pres. 2
49	30	**923**	**47**	25	843	25	843	**1686**	**45**





Note: Flow Test was performed as per NFPA 291.

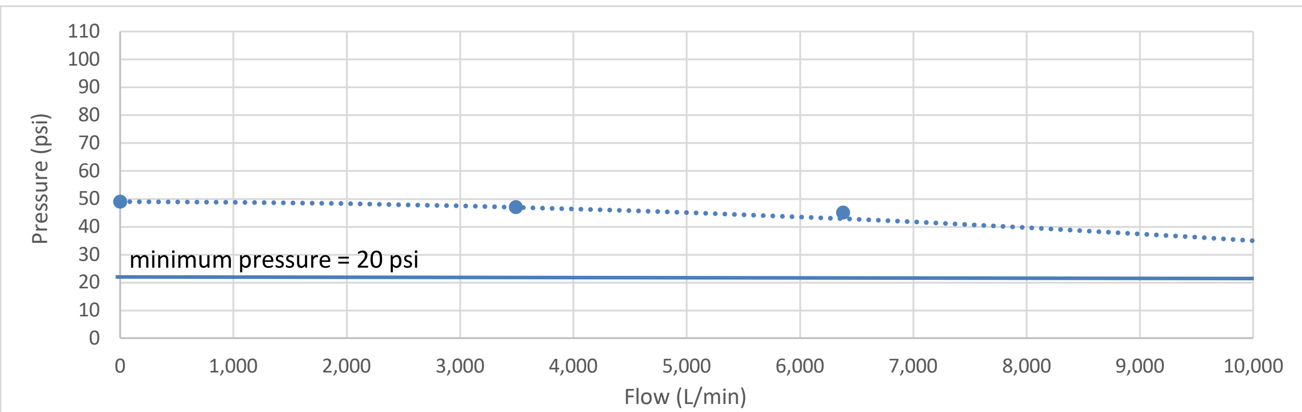
Note: Hydrant's elevation is obtained from Google Earth.

Water System Pressure Calculation Worksheet

Hydrant Flow Test Results

Flow Test Location: 13656 Emil Kolb Parkway
Residual Test Location: 13656 Emil Kolb Parkway
Main Size: 300
Test Date: 2024-06-20
Tested By: Hydrant Testing Ontario

Number of Outlets & Orifice Size	Pilot Pressure (psi)	Flow (US GPM)	Flow (L/min)	Residual Pressure (psi)
0	0	0	0	49
1 x 2.5"	30	923	3494	47
2 x 2.5"	25	1686	6382	45



$$Q_R = Q_T\left(\frac{P_S - Pr}{P_S - Pt}\right)\hat{}0.54$$

Where,

Q_r = Projected Flow Rate
Q_t = Flow Rate from Flow Test = 6382 L/min
P_s = Static Pressure = 49 psi
P_r = Desired System Pressure
P_t = Residual Presure inTest = 45 psi

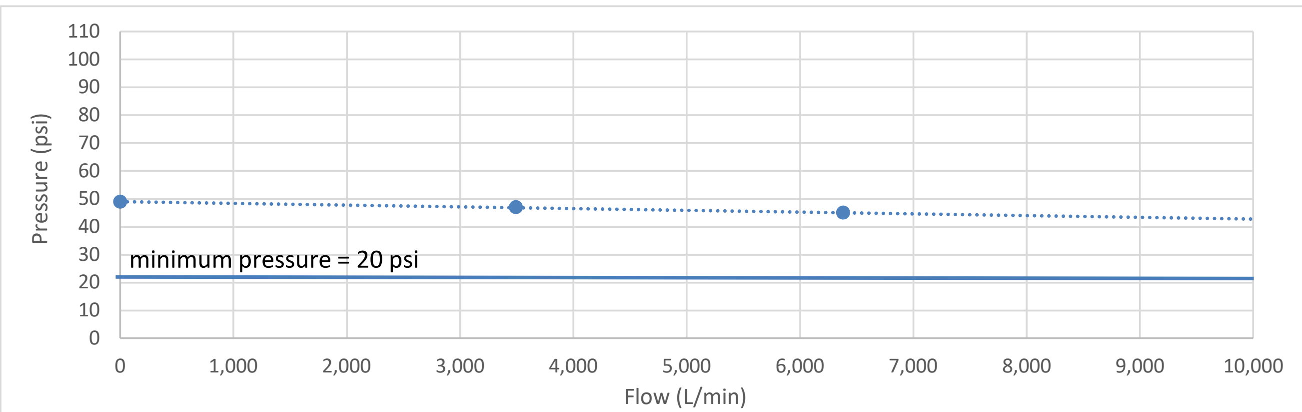
Pressure Under Fire Suppression (P_{r1}) =	20.0	psi
Calculated Flow Rate (Q_{r1}) =	18,601	L/min
Pressure Under Normal Operation (P_{r2}) =	40.0	psi
Calculated Flow Rate (Q_{r2}) =	9,889	L/min

Water System Pressure Calculation Worksheet

Hydrant Flow Test Results

Flow Test Location: 13656 Emil Kolb Parkway
Residual Test Location: 13656 Emil Kolb Parkway
Main Size: 300
Test Date: 2024-06-20
Tested By: Hydrant Testing Ontario

Number of Outlets & Orifice Size	Pilot Pressure (psi)	Flow (US GPM)	Flow (L/min)	Residual Pressure (psi)
0	0	0	0	49
1 x 2.5"	30	923	3494	47
2 x 2.5"	25	1686	6382	45



$$P_r = P_s - (Ps - Pt)^{0.54}\sqrt{Q_r/Q_t}$$

Where,

Q_r = Projected Flow Rate at the Desired Pressure
Q_t = Flow Rate from Flow Test = 6382 L/min
P_s = Static Pressure = 49 psi
P_r = Calculated Pressure
P_t = Residual Presure inTest = 45 psi

Fire Flow + Max Day (Q_{r1}) =	17,098	L/min
Calculated Pressure(P_{r1}) =	24.2	psi
Peak Flow (Q_{r2}) =	163.2	L/min
Calculated Pressure(P_{r2}) =	49.0	psi

APPENDIX E

Excerpts from Hydrogeological Reports

Scoped Hydrogeological Assessment

13656 Emil Kolb Parkway
Colerain Drive and Harvest Moon Drive
Town of Bolton (Caledon), Ontario

Project 10083

1. INTRODUCTION

Hydrogeology Consulting Services (HCS) was retained by Harvestone Centre Inc. to conduct a scoped hydrogeological assessment for the proposed development at Colerain Drive and Harvest Moon Drive in the Town of Bolton (Caledon), Ontario. The location of the subject property is shown on Drawing 1 in Appendix A. Proposed development of the 0.45 hectare property includes a three block residential development of 45 units as shown on the Site Plan (Soscia Professional Engineers Inc., December 2020) included in Appendix A. The property is currently vacant and is serviced by municipal water supply and sewage effluent disposal.

This assessment has been prepared to respond to requirements from the Town of Caledon and the Region of Peel.

1.1 Previous and Concurrent Studies

HCS has not been made aware of previous studies of the subject property. Concurrently with the hydrogeological assessment a geotechnical investigation is being completed by CMT Engineering Inc. The Geotechnical Engineering Report (CMT Engineering Inc., Project No. 21-242, June 2021) provides a description of the subsurface soil stratigraphy and geotechnical conditions beneath the property, along with evaluations of geotechnical parameters and requirements for the proposed redevelopment. The geotechnical investigation report should be read in conjunction with this report.

A Phase I Environmental Site Assessment is also being completed concurrently with this assessment (Peritus Environmental Consultants Inc., September 2021).

1.2 Scope of Work

Field investigation for this scoped hydrogeological assessment comprised a site visit to assess the property and the proposed site plan layout. Six boreholes were drilled on the property by CMT Engineering Inc., with four boreholes completed as 38 mm diameter monitoring wells to investigate the presence of shallow groundwater. Soil samples were obtained from the boreholes for the purposes of particle size distribution (grain size) analysis, and monitoring wells were assessed via slug tests to estimate saturated soil hydraulic conductivity. Water chemistry samples were also obtained from selected wells for analysis of general chemistry parameters per the Region of Peel’s Storm Sewer Use By-Law regulations.

1.2.1 Borehole Drilling and Monitoring Well Installation

On June 2, 2021 CMT Engineering Inc. observed and performed drilling of six boreholes (BH 01 to BH 06) to depths between 3.88 and 6.10 metres below ground surface (mBGS) via direct push using a Geoprobe 7822DT drill rig.

Split spoon samples obtained at 0.76 and 1.52 m intervals within the first 3 m of drilling, with continuous soil core samples obtained at 1.52 m intervals below 3 m. Selected soil samples were submitted to CMT Engineering Inc. for particle size distribution (grain size) analysis.

Well locations and ground surface elevations were surveyed by CMT Engineering Inc., and the locations are shown on the appended Drawing 2 (CMT, 2021). The boreholes were located to a local datum.

Boreholes BH 01, 04, and 05 were completed as 38-mm diameter monitoring wells using 3.05 m slotted Schedule 40 PVC well screens and PVC riser pipes, with well sand installed around the well screens and the borehole annular spaces sealed with bentonite. All wells were constructed with flush mounted protective steel casings, and lockable vented protective caps. Monitoring well construction followed Ontario Regulation 903 (as amended). Borehole logs are included in Appendix C for reference.

The wells were developed (purged) using a Waterra inertial valve and tubing to remove fine-grained material from the well screen sand pack and mitigate smearing on the borehole walls during drilling.

Stabilized groundwater elevations were measured using a manual electronic water level tape on June 6, 2021. Well construction information and water level measurements are summarized in Table 1 in Appendix B.

2. STUDY AREA PHYSIOGRAPHY AND HYDROGEOLOGY

2.1 Site Description

The subject property is located within a predominantly residential area, within the Town of Bolton (Caledon). The property is bounded by existing residential properties to the north, and west as well as Coleraine Drive to the east and Harvest Moon Drive to the south.

As shown on the appended Drawing 2, the subject property is currently vacant. There are a few coniferous trees near the corner of the intersection and along the north property line. The surface topography of the subject property is relatively level with an elevation of approximately 259 metres above sea level (mASL), and a change in elevation of less than 1.5 m across the property. The topography is relatively level with a slight slope to the east.

2.2 Physiography

The subject property is located within the South Slope physiographic region, and is within the Drumlinized Till Plains physiographic landform which is mainly comprised of drumlinized glacial till overlain by thin aeolian sand deposits (Chapman and Putnam, 2007). Within the Town of Bolton urban limits the Drumlinized Till Plains surface topography has generally been graded.

2.3 Geology

Quaternary Geology mapping (Ontario Geological Survey, 2000) indicates the subject property is underlain by clay to silt-textured till with interbedded deposits of silt and sand (Halton Till) derived from glaciolacustrine deposits or shale.

Overburden soil stratigraphy observed in the six boreholes drilled on the subject property generally consists of topsoil underlain by clayey silt with some sand and trace gravel (till) to the borehole completion depths of up to 6.1 mBGS. The borehole logs are included in Appendix C for reference.

Paleozoic Geology mapping of Ontario (Anderson and Dodge, 2007) indicates underlying the overburden deposits is Georgian Bay Formation shale and limestone bedrock. Water well records from adjacent properties show that shale bedrock was encountered at depths between 45.4 and 77.7 mBGS.

2.4 Hydrogeology and Groundwater

Perched groundwater was encountered in the fine-grained overburden till deposits at depths of 2.83 to 5.10 mBGS corresponding to elevations of 253.37 to 255.69 mASL on June 6, 2021. It is noted that seasonal fluctuations in groundwater elevations would be expected, with the June measurements expected to be somewhat lower than typical spring high water levels.

Groundwater encountered in the silt and clay till soils is considered perched water trapped within seams of more permeable material within the low permeability deposits, or within the deposits themselves, rather than a local or regional groundwater aquifer.

As shown on the groundwater contour map on the appended Drawing 3, shallow groundwater perched within the low permeability soils beneath the property is generally flowing south-eastwards generally following the flow direction of nearby creeks.

Locally, shallow overburden groundwater is expected to flow generally eastwards/north-eastwards following the tributary creeks and surface water features that flow towards the Humber River. As the site is located within the Black Creek Humber River Outlet subwatershed of the Main Humber River watershed; regionally, groundwater is expected to flow generally eastwards/south-eastwards following the general watershed topography and flow routes of the creeks within the Humber River subwatershed. It is noted that the boundary of the Bolton Dam - Humber River subwatershed is located approximately 200m north of the subject property.

Percolation of precipitation into the shallow subsurface is governed by near-surface soil types, in addition to factors such as topography, evapotranspiration, and the degree of soil saturation. Small volumes of precipitation infiltrating into the near-surface native low-permeability deposits would be expected to become perched on top of and within low permeability deposits of clayey silt till. Over time small volumes of perched water could gradually percolate vertically downwards or flow laterally following ground surface topography. The lack of hummocky terrain within the South Slope region means that ponding of precipitation and depression-focused infiltration are unlikely.

Based on subsurface stratigraphy consisting of deposits of low permeability till, no shallow overburden aquifer is present beneath the property. As discussed previously, small amounts of perched water exist in overburden soils, which generally acts as an aquitard beneath the subject property. As no monitoring wells were screened/completed in deeper overburden aquifer units an evaluation of deep overburden groundwater was not performed.

More regional hydrostratigraphy would be expected to consist of the Halton Till Aquitard overlying the Oak Ridges Aquifer, which in turn overlies sequences of aquifers and aquitards such as the Newmarket Aquitard, the Thorncliffe Aquifer, and older overburden deposits. The silt till encountered in the boreholes could represent the Halton Till; however, without deeper boreholes on site it is difficult to conclusively determine whether the soils encountered represent a vertically extensive aquitard, or whether they are simply minor variations of more regional near surface stratigraphy.

2.5 Surface Water Features

Based on the site visit completed June 6, 2021, there are no visible surface water features on the subject property. A stormwater management pond is located across the road, south of Harvest Moon Drive. There is a tributary of Jaffary's Creek located east of the property leading to Jaffary's pond. TRCA mapping indicates that the creek and surrounding area are regulated by the TRCA; however, the subject property is not within a regulated area.

2.6 Soil Hydraulic Conductivity

Hydraulic conductivity estimates for the site soils were determined using single response hydraulic (slug) tests of the soil deposits screened by the monitoring wells. Estimates of hydraulic conductivity were also made using soil sample grain size analyses and the Kaubisch, Breyer, Kozeny-Carman, and Hazen formulae where appropriate.

2.6.1 Slug Test Results

Prior to conducting slug testing of the monitoring wells, each well was developed (purged) to mitigate smearing during drilling and remove fine-grained material from the sand pack around the well screen and the screened interval.

The slug test methodology followed the procedures developed by Hvorslev (1951), as described in Freeze and Cherry (1979). The slug tests were conducted as falling head tests by introducing a volume (slug) of potable water into the well to cause a temporary rise in the water table; or, as rising head tests by purging a well dry and allowing water to flow naturally back into the well. The displacement and gradual re-equilibration of the water level in the wells was recorded using electronic pressure transducers (dataloggers).

Hvorslev's method is expressed by the following equation:

$$K = \frac{r^2 \ln (L/R)}{2LT_{0.37}}$$

where:

- K = hydraulic conductivity of the tested material (m/sec)
- r = inner radius of the well riser pipe (m)
- R = outer radius of the well riser pipe (m)
- L = length of screen and sand pack (m)
- $T_{0.37}$ = time lag (sec), where $(H-h)/(H-H_0) = 0.37$
- h = water level at each time of measurement (m)
- H_0 = initial water level (m, start of test)
- H = stabilized water level prior to slug testing (m)

The time lag, $T_{0.37}$, represents the time required for the water level to recover to the stabilized level if the initial flow rate from the surrounding aquifer into the well is maintained. This time lag is determined graphically as the time where (H-h) divided by ($H-H_0$) is equal to 0.37.

Graphical analyses of the slug tests are included in Appendix E, and the hydraulic conductivity estimates are listed in the appended Table 2. As none of the three slug tests achieved $T_{0.37}$, an estimated hydraulic conductivity values of $<1 \times 10^{-7}$ m/sec suggests very low permeability for the clayey silt till soils.

2.6.2 Grain Size Analysis Results

Samples of soil collected from Boreholes BH 03 and 05 during drilling were submitted to the CMT Engineering Inc. laboratory facility in St. Clements, Ontario for analysis of particle size distribution (grain size). As shown on the grain size analysis graphs included in Appendix F, the near-surface soils predominantly consist of clay and silt with trace amounts of sand and gravel. The grain size analysis results were used to estimate soil hydraulic conductivity (K) values by applying the Kaubisch, Breyer, Hazen, and Kozeny-Carman formulae where appropriate based on the limitations of each formula. The hydraulic conductivity estimates are summarized in the appended Table 2.

It is noted that for both soil samples a high percentage of fine-grained material was present in a sample, requiring the D_{10} value of the sample to be approximated; therefore, calculated values are considered estimates.

Hydraulic conductivity values of <1 x 10^{-9} and 1.4 x 10^{-9} m/sec correlate well with the slug test calculated values and indicate a very low permeability for the soils underlying the property.

The hydraulic conductivity estimates from both slug test and grain size analyses correlate reasonably well with published ranges for the major soil types (Freeze and Cherry, 1979).

2.7 Groundwater Chemistry

On June 6, 2021 one water chemistry sample was obtained from on-site monitoring well BH 01. The samples were collected in the appropriate laboratory-supplied containers, stored in a cooler, and delivered to ALS Environmental Laboratories in Waterloo, Ontario for analysis of the Region of Peel's Storm Sewer and Sanitary Sewer Use By-Law chemistry parameters. The laboratory Certificate of Analysis (COA) is included in Appendix G for reference, and the appended Table 3 summarizes parameters of interest.

It is important to consider the water chemistry samples were obtained using an inertial valve (Waterra Valve) and tubing. The method of water collection inherently results in the inclusion of sediments into the water sample which can increase concentrations of parameters such as colour, turbidity, total suspended solids, total dissolved solids, and total metals where metals are adsorbed onto soil particles.

The sample from BH 01 exhibited exceedances of the Region of Peel's Storm Sewer By-Law limits for the following parameters:

- Total Suspended Solids (TSS)
- Total Manganese
- Total Zinc

The sample from BH 01 exhibited exceedances of the Region of Peel's Sanitary Sewer By-Law limits for the following parameters:

- Total Suspended Solids (TSS)

It is understood proposed development on the site includes slab-on-grade construction which will not require excavation below the level of perched groundwater. It is important to note that if any dewatering is required and discharge is not collected using a hydrovac truck for off-site treatment and disposal, discharge to municipal storm sewers would require discharge chemistry testing to ensure all Storm Sewer Use By-Law criteria are met, and permission to discharge to municipal sewers from the municipality or Region of Peel. Treatment of discharge to resolve potential exceedances of total manganese would likely be necessary.

3. WATER USERS

Well Records from the Ministry of the Environment, Conservation, and Parks (MECP) Water Well Record (WWR) Database (2020) were reviewed to determine the number of supply wells present. According to the MECP WWR Database sixteen wells are located within an approximate radius of 500 m from the subject property.

Of these wells, six are identified as test holes or monitoring wells, with one additional well having a diameter of 50 mm or less assumed to be a monitoring well not used for water supply. Five well records pertain to abandoned wells, and two additional wells are identified as not in use. These records have been excluded from further consideration.

The two remaining domestic use wells are completed in overburden soils at depths of 15.24 and 75.28 mBGS, respectively. A copy of the MECP well records is included in Appendix D, and the two wells are plotted on the appended Drawing 4.

It is noted that some wells plotted on the appended Drawing 4 are located in areas where the actual existence of a well is unlikely (they may be associated with nearby properties), and that some properties shown on the aerial imagery do not have a well associated with them; however, the MECP WWR coordinate data has been used in the absence of more reliable information.

The Region of Peel Department of Public Works was consulted to determine where municipal watermains existed within a 500 m radius of the property. Watermains were identified along Colerain Drive, Harvest Moon Drive, King Street (Emil Kolb Parkway), and 6th Line. It is anticipated that MECP WWRs which may plot along these roadways could represent wells which have been previously decommissioned, or wells which are not used for drinking water supply.

3.1 Door-to-Door Well Survey

On June 11, 2021 a survey of properties where a private water supply well might exist within a 500 m radius of the subject property was conducted to determine the locations and construction details of private water supply wells in the area. It is noted due to COVID-19 protocol the door-to-door survey was completed by leaving a copy of the survey along with a self-addressed stamped envelope at each residence.

Two homes were canvassed. Zero surveys were filled out and received by mail prior to the preparation of this report.

3.2 Municipal Wellhead Protection Areas

Ontario Source Protection Information Atlas (OSPIA) mapping shows that the property is not located within a Wellhead Protection Area (WHPA). There are no WHPAs is more than 6 km southeast of the subject property.

3.3 Sensitive Features

Ontario Source Protection Information Atlas mapping indicates that the subject property does not fall within a highly vulnerable aquifer zone, or a significant groundwater recharge area.

Based on the presence of low permeability clayey silt till overburden soils from ground surface to the a depth of more than 6 mBGS there is no shallow overburden aquifer beneath the subject property, and any deeper overburden aquifer would be sufficiently isolated by the overburden aquitard to be protected from any potential ground surface contaminants. Since all pavement stormwater runoff will be directed to municipal storm sewers, it is reasonable to conclude that no potential surface contaminants that might be accidentally released at the site would be able to migrate vertically downwards to a deep overburden or bedrock aquifer, or laterally to surface water features.

Natural Heritage Area maps from the Ministry of Natural Resources and Forestry (MNRF; 2020) reveal no Areas of Natural and Scientific Interest (ANSIs) within the subject property or surrounding area. As discussed in Section 2.5, TRCA mapping (2019) indicates that Jaffary's Creek and surrounding area southeast of the site are regulated by the TRCA.

Minimum buffer requirements must be satisfied for all sensitive features.

4. CONSTRUCTION DEWATERING ASSESSMENT

Table I below summarizes the construction excavation parameters based on information provided on the engineering drawings for the project (Soscia Professional Engineers, Inc. 2020).

Table I: Construction Excavation Parameters

Task	Excavation Dimensions (approximate) (m)	Excavation Depth (mBGS)	Estimated Seasonally High Groundwater Elevation (mBGS)*
Building Footings	40 x 16 m (3 buildings)	0.5 mBGS	1.58 mBGS

*- Estimated seasonally high groundwater elevation is the highest measured groundwater elevation from June 2021, increased by 1.25 m.

Temporary dewatering requirements are dependent on factors such as excavation parameters (excavation dimensions, infrastructure invert elevations, the number of concurrent excavations, etc.), hydrogeological conditions at the site (groundwater levels, soil/bedrock hydrogeological parameters, etc.), construction and dewatering methodologies (open cuts, dewatering pits, sumps, wellpoints, etc.), and the amount of groundwater drawdown required to achieve and maintain dry working conditions and stable excavations.

Additionally, factors such as the use of shoring would be expected to influence the rate of groundwater inflow into an excavation. The calculations provided below assume an open excavation as a conservative factor of safety.

Based on preliminary excavation locations, dimensions, and depths provided for this report, construction of the slab on grade buildings will not require excavation below the elevation of perched water at the site. As a result, no construction dewatering requirements are anticipated for construction of the building. Additionally, it is noted the measured water level from June 6 has been increased by 1.25 m to account for seasonal groundwater fluctuation.

With no construction dewatering anticipated, there is no anticipated requirement for an Environmental Activity and Sector Registry (EASR), or Permit to Take Water (PTTW); however, the possibility for dewatering after a significant precipitation event should be considered by the client. Ontario Regulation 387/04 (as amended) requires authorization from the Ministry of the Environment, Conservation, and Parks (MECP) for all water takings over 50,000 L/day. Ontario Regulation 63/16 specifies that for temporary construction dewatering at rates between 50,000 and 400,000 L/day an Environmental Activity and Sector Registry (EASR) may be obtained in lieu of a Permit to Take Water (PTTW). Obtaining an EASR as an “insurance policy” for potential dewatering after a precipitation event can be completed by HCS should it be desired.

Discharge of any construction dewatering effluent (in the event dewatering is required) to a municipal sewer would require permission from the Town of Bolton/Region of Peel; however, based on the low daily dewatering rates that might realistically be encountered it is expected that collection of discharge using a hydrovac truck or similar equipment for off-site treatment and disposal will be sufficient for control of inflow into the excavation.

As discussed in Section 2.6 and its subsections groundwater chemistry samples exhibited measured exceedances of the Region of Peel Storm Sewer Use By-Law criteria limits for TSS, total manganese, and total zinc. The groundwater chemistry samples exhibited measured exceedances of the Region of Peer Sanitary Sewer Use By-Law criteria limits for TSS.

In the event construction dewatering for precipitation management is necessary, a cost-benefit analysis should be undertaken to evaluate the potential to discharge to municipal sewers vs. collection of water using a hydrovac truck or similar equipment for off-site disposal.

5. CLOSURE

Subsurface stratigraphy beneath the subject property consists of fill underlain by more than 6 m of clay/silt till deposits. Perched water was encountered at a depth of 2.83 to 5.10 mBGS, flowing generally south-eastwards in the general flow direction of nearby creeks. These perched water conditions do not represent a local or regional shallow aquifer.

Soil hydraulic conductivity estimates from grain size analyses and slug tests indicate the clayey silt till deposits have a low hydraulic conductivity ranging from $<1 \times 10^{-9}$ to $<1 \times 10^{-7}$ m/sec.

There are no visible surface water features on the property and a stormwater management pond is located south of the subject site.

TRCA mapping indicates that Jaffary's Creek and surrounding area are regulated by the TRCA; however, the subject property does not lie within a regulated area. Mapping indicates the subject property is not within a highly vulnerable aquifer zone, significant groundwater recharge area, or wellhead protection area.

The construction dewatering assessment performed for the site demonstrates that the proposed slab on grade construction will not require excavation below the measured perched water levels beneath the property. Any construction dewatering discharge that might be generated (e.g. during precipitation management) that is not collected for off-site treatment and disposal would need to be tested and treated to ensure it meets Region of Peel Sewer Use By-Law criteria prior to discharge to a municipal sewer. Additionally, any discharge to a municipal sewer would require permission from the Town of Bolton/Region of Peel.

We trust that this report satisfies your present requirements, and we thank you for this opportunity to be of service. If you have any questions, or require further hydrogeological consulting services, please feel free to contact the undersigned directly.

Respectfully submitted,

PROFESSIONAL GEOSCIENTIST
07-Sept-2021
CHRIS HELMER
PRACTISING MEMBER
2285
ONTARIO

Chris Helmer, B.Sc., P.Geo.
Senior Hydrogeologist
www.hydrog.ca

6. LIMITATIONS AND USE

This report has been prepared for the exclusive use of the Client indicated in Section 1. Chris F Helmer hereby disclaims any liability or responsibility to any person or party for any loss, damage, expense, fines, or penalties which may arise from the use of any information or recommendations contained in this report by anyone other than the Client.

The conclusions and recommendations provided in this report are not intended as specifications or instructions to contractors. Any use contractors may make of this report, or decisions made based on it, are the responsibility of the contractors. Contractors must accept responsibility for means and methods of construction they select, seek additional information if required, and draw their own conclusions as to how the subsurface conditions may affect them.

In preparing this report Chris F Helmer has relied in good faith on information provided by individuals and companies noted in this report, and assumes that the information provided is factual and accurate. No responsibility is accepted for any deficiencies, misstatements, or inaccuracies contained in this report as a result of errors, omissions, misinterpretations, or fraudulent acts in the resources referenced, or of persons interviewed or consulted during the preparation of this report.

The report and its complete contents are based on data and information collected during investigations conducted by Chris F Helmer, and pertains solely to the conditions of the site at the time of the investigation, supplemented by historical information and data as described in this report. It is important to note that the investigation involves sampling of the site at specific locations, and the conclusions in this report are based on the information gathered. Limitations of the data and information include the fact that conditions between and beyond the sampling locations may vary; that the assessment is dependent upon the accuracy of the analytical data generated through sample analysis; and that conditions or contaminants may exist for which no analyses have been conducted. Furthermore, no assurance is made regarding potential changes in site conditions and/or the regulatory regime (standards, guidelines, etc.), subsequent to the time of investigation.

The professional services provided for this project include only the hydrogeological aspects of the subsurface conditions at the site, unless otherwise stated specifically in the report. No other warranty or representation is either expressed or implied, as to the accuracy of the information or recommendations included or intended in this report.

7. REFERENCES

Armstrong, D.K. and Dodge, J.E.P. 2007. *Paleozoic Geology of Southern Ontario, Ontario Geological Survey*. Miscellaneous Release – Data 219.

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Scoped Hydrogeological Assessment

13668 Emil Kolb Parkway
Colerain Drive and Harvest Moon Drive
Town of Bolton (Caledon), Ontario

Project 10224

APPENDIX A: DRAWINGS

APPENDIX B: TABLES

APPENDIX C: BOREHOLE LOGS

APPENDIX D: MECP WATER WELL RECORDS AND WELL SURVEY FORMS

APPENDIX E: SLUG TEST ANALYSIS GRAPHS

APPENDIX F: GRAIN SIZE ANALYSIS GRAPHS

APPENDIX G: LABORATORY CERTIFICATE OF ANALYSIS

1. INTRODUCTION

Hydrogeology Consulting Services Inc. (HCS) was retained by Camcos (Bolton Village) Inc. to conduct a scoped hydrogeological assessment for the proposed development at 13668 Emily Kolb Parkway in the Town of Bolton (Caledon), Ontario. The location of the subject property is shown on Drawing 1 in Appendix A. Proposed development of the 0.40-hectare property includes stacked townhouses with one level of underground parking. The property is currently occupied by a residential property and is serviced by municipal water supply and sewage effluent disposal.

This assessment has been prepared to respond to requirements from the Town of Caledon and the Region of Peel.

1.1 Previous and Concurrent Studies

Concurrently with the hydrogeological assessment a geotechnical investigation is being completed by CMT Engineering Inc. The Geotechnical Engineering report (CMT Engineering Inc., Project No. 23-089, May, 2023) provides a description of the subsurface soil stratigraphy and geotechnical conditions beneath the property, along with evaluations of geotechnical parameters and requirements for the proposed redevelopment. The geotechnical investigation report should be read in conjunction with this report.

Additionally, a Phase I Environmental Site Assessment (ESA) is being completed concurrently by Peritus Environmental Consultants Inc. The Phase I ESA report (Peritus Environmental Consultants Inc., Project No. 22-21-231878, May, 2023) provides a description of the historical usage of the property and adjacent properties along with an evaluation of the potential for contaminating activities and areas of potential environmental concerns. The Phase I ESA report should be read in conjunction with this report.

1.2 Scope of Work

Field investigation for this scoped hydrogeological assessment comprised a site visit to assess the property and the proposed site plan layout. Five boreholes were drilled on the property by CMT Engineering Inc., with three boreholes completed as 38 mm diameter monitoring wells to investigate the presence of shallow groundwater. Soil samples were obtained from the boreholes for the purposes of particle size distribution (grain size) analysis, and monitoring wells were assessed via slug tests to estimate saturated soil hydraulic conductivity. Water chemistry samples were also obtained from selected wells for analysis of general chemistry parameters per the Region of Peel’s Storm Sewer Use By-Law regulations.

1.2.1 Borehole Drilling and Monitoring Well Installation

On March 24, 2023 CMT Engineering Inc. observed and performed drilling of five boreholes (BH1 to BH5) to depths between 5.18 and 6.10 metres below ground surface (mBGS) via direct push using a Geoprobe 7822DT drill rig.

Split spoon samples were obtained at 0.76 and 1.52 m intervals within the first 3 m of drilling, with continuous soil core samples obtained below 3 m. Selected soil samples were submitted to CMT Engineering Inc. for particle size distribution (grain size) analysis.

Well locations and ground surface elevations were surveyed by CMT Engineering Inc., and the locations are shown on the appended Drawing 2 (CMT, 2023). The boreholes were located to a local datum.

Boreholes BH1 – BH3 were completed as 38-mm diameter monitoring wells using 3.05 m slotted Schedule 40 PVC well screens and PVC riser pipes, with well sand installed around the well screens and the borehole annular spaces sealed with bentonite. All wells were constructed with flush mounted protective steel casings, and lockable vented protective caps. Monitoring well construction followed Ontario Regulation 903 (as amended). Borehole logs are included in Appendix C for reference.

The wells were developed (purged) using a Waterra inertial valve and tubing to remove fine-grained material from the well screen sand pack and mitigate smearing on the borehole walls during drilling.

Stabilized groundwater elevations were measured using a manual electronic water level tape on March 28th 2023. Well construction information and water level measurements are summarized in Table 1 in Appendix B.

2. STUDY AREA PHYSIOGRAPHY AND HYDROGEOLOGY

2.1 Site Description

The subject property is located within a predominantly residential area within the Town of Bolton (Caledon). The property is bounded by existing residential properties to the north and west, Coleraine Drive to the east, and Harvest Moon Drive to the south.

As shown on the appended Drawing 2, the subject property is currently occupied by a residential property. There are a few coniferous trees near the corner of the intersection and along the north property line. The surface topography of the subject property is relatively level with a slight slope to the east, varying from approximately 259-258 metres above sea level (mASL).

2.2 Physiography

The subject property is located within the South Slope physiographic region, and is within the Drumlinized Till Plains physiographic landform which is mainly comprised of drumlinized glacial till overlain by thin aeolian sand deposits (Chapman and Putnam, 2007). Within the Town of Bolton urban limits the Drumlinized Till Plains surface topography has generally been graded.

2.3 Geology

Quaternary Geology mapping (Ontario Geological Survey, 2000) indicates the subject property is underlain by clay to silt-textured till with interbedded deposits of silt and sand (Halton Till) derived from glaciolacustrine deposits or shale.

Overburden soil stratigraphy observed in the five boreholes drilled on the subject property generally consists of topsoil underlain by clayey silt with some sand and trace gravel (till) to the borehole completion depths of up to 6.1 mBGS. The borehole logs are included in Appendix C for reference.

Paleozoic Geology mapping of Ontario (Anderson and Dodge, 2007) indicates underlying the overburden deposits is Georgian Bay Formation shale and limestone bedrock. Water well records from adjacent properties show that shale bedrock was encountered at depths between 45.4 and 77.7 mBGS.

2.4 Hydrogeology and Groundwater

Perched groundwater was encountered in the fine-grained overburden till deposits at depths of 4.65 to 5.48 mBGS corresponding to elevations of 254.63 to 252.74 mASL on March 28, 2023. It is noted that seasonal fluctuations in groundwater elevations would be expected, with the March measurements expected to be somewhat lower than typical spring high water levels.

Groundwater encountered in the silt and clay till soils is considered perched water trapped within seams of more permeable material within the low permeability deposits, or within the deposits themselves, rather than a local or regional groundwater aquifer.

While one of the on-site monitoring wells was dry at the time measurements were collected, HCS measured the shallow groundwater perched within the low permeability soils beneath the property flowing on the neighbouring property to the south generally south-eastwards following the flow direction of nearby creeks. It is therefore anticipated shallow perched groundwater beneath the subject property also flows generally south-eastwards.

Locally, shallow overburden groundwater is expected to flow generally eastwards following the tributary creeks and surface water features that flow towards the Humber River. As the site is located within the Black Creek Humber River Outlet subwatershed of the Main Humber River watershed; regionally, groundwater is expected to flow generally eastwards/south-eastwards following the general watershed topography and flow routes of the creeks within the Humber River subwatershed. It is noted that the boundary of the Bolton Dam - Humber River subwatershed is located approximately 210 m north of the subject property.

Percolation of precipitation into the shallow subsurface is governed by near-surface soil types, in addition to factors such as topography, evapotranspiration, and the degree of soil saturation. Small volumes of precipitation infiltrating into the near-surface native low-permeability deposits would be expected to become perched on top of and within low permeability deposits of clayey silt till. Over time small volumes of perched water could gradually percolate vertically downwards or flow laterally following ground surface topography. The lack of hummocky terrain within the South Slope region means that ponding of precipitation and depression-focused infiltration are unlikely.

Based on subsurface stratigraphy consisting of deposits of low permeability till, no shallow overburden aquifer is present beneath the property at depths of 6.1 mBGS or less. As discussed previously, small amounts of perched water exist in overburden soils, which generally acts as an aquitard beneath the subject property. As no monitoring wells were screened/completed in deeper overburden aquifer units an evaluation of deep overburden groundwater was not performed.

More regional hydrostratigraphy would be expected to consist of the Halton Till Aquitard overlying the Oak Ridges Aquifer, which in turn overlies sequences of aquifers and aquitards such as the Newmarket Aquitard, the Thorncliffe Aquifer, and older overburden deposits. The silt till encountered in the boreholes could represent the Halton Till; however, without deeper boreholes on site it is difficult to conclusively determine whether the soils encountered represent a vertically extensive aquitard, or whether they are simply minor variations of more regional near surface stratigraphy.

2.5 Surface Water Features

Based on the site visit completed March 28, 2023, there are no visible surface water features on the subject property. A stormwater management pond is located south of Harvest Moon Drive to the south of the subject property. There is a tributary of Jaffary's Creek located east of the property leading to Jaffary's pond. TRCA mapping indicates that the creek and surrounding area are regulated by the TRCA; however, the subject property is not within a regulated area.

2.6 Soil Hydraulic Conductivity

Hydraulic conductivity estimates for the site soils were determined using single response hydraulic (slug) tests of the soil deposits screened by the monitoring wells. Estimates of hydraulic conductivity were also made using soil sample grain size analyses and the Kaubisch, Breyer, Kozeny-Carman, and Hazen formulae where appropriate.

2.6.1 Slug Test Results

Prior to conducting slug testing of the monitoring wells, each well was developed (purged) to mitigate smearing during drilling and remove fine-grained material from the sand pack around the well screen and the screened interval.

The slug test methodology followed the procedures developed by Hvorslev (1951), as described in Freeze and Cherry (1979). The slug tests were conducted as falling head tests by introducing a volume (slug) of potable water into the well to cause a temporary rise in the water table; or, as rising head tests by purging a well dry and allowing water to flow naturally back into the well. The displacement and gradual re-equilibration of the water level in the wells was recorded using electronic pressure transducers (dataloggers).

Hvorslev's method is expressed by the following equation:

$$K = \frac{r^2 \ln (L/R)}{2LT_{0.37}}$$

where:

- K = hydraulic conductivity of the tested material (m/sec)
- r = inner radius of the well riser pipe (m)
- R = outer radius of the well riser pipe (m)
- L = length of screen and sand pack (m)
- $T_{0.37}$ = time lag (sec), where $(H-h)/(H-H_0) = 0.37$
- h = water level at each time of measurement (m)
- H_0 = initial water level (m, start of test)
- H = stabilized water level prior to slug testing (m)

The time lag, $T_{0.37}$, represents the time required for the water level to recover to the stabilized level if the initial flow rate from the surrounding aquifer into the well is maintained. This time lag is determined graphically as the time where (H-h) divided by ($H-H_0$) is equal to 0.37.

Graphical analyses of the slug tests are included in Appendix E, and the hydraulic conductivity estimates are listed in the appended Table 2. As neither of the two slug tests achieved $T_{0.37}$, an estimated hydraulic conductivity value of $<1 \times 10^{-7}$ m/sec suggests very low permeability for the clayey silt till soils.

2.6.2 Grain Size Analysis Results

Samples of soil collected from Boreholes BH1 – BH3 during drilling were submitted to the CMT Engineering Inc. laboratory facility in St. Clements, Ontario for analysis of particle size distribution (grain size). As shown on the grain size analysis graphs included in Appendix F, the near-surface soils predominantly consist of clay and silt with trace amounts of sand and gravel (i.e. till). The grain size analysis results were used to estimate soil hydraulic conductivity (K) values by applying the Kaubisch, Breyer, Hazen, and Kozeny-Carman formulae where appropriate based on the limitations of each formula. The hydraulic conductivity estimates are summarized in the appended Table 2.

It is noted for all soil samples a high percentage of fine-grained material was present in each sample, requiring the D_{10} values of the samples to be approximated; therefore, calculated values are considered estimates.

Hydraulic conductivity values of 6.83 x 10^{-10} to 1.36 x 10^{-9} m/sec correlate well with the slug test calculated values and indicate a very low permeability for the soils underlying the property.

The hydraulic conductivity estimates from both slug tests and grain size analyses correlate reasonably well with published ranges for the major soil types (Freeze and Cherry, 1979).

2.7 Groundwater Chemistry

On March 28, 2023 one water chemistry sample was obtained from on-site monitoring well BH1. The sample was collected in the appropriate laboratory-supplied containers, stored in a cooler, and delivered to ALS Environmental Laboratories in Waterloo, Ontario for analysis of the Region of Peel's Storm Sewer and Sanitary Sewer Use By-Law chemistry parameters. The laboratory Certificate of Analysis (COA) is included in Appendix G for reference, and the appended Table 3 summarizes parameters of interest.

It is important to consider the water chemistry sample was obtained using an inertial valve (Waterra Valve) and tubing. The method of water collection inherently results in the inclusion of sediments into the water sample which can increase concentrations of parameters such as colour, turbidity, total suspended solids, total dissolved solids, and total metals where metals are adsorbed onto soil particles.

The sample from BH1 exhibited exceedances of the Region of Peel's Storm Sewer By-Law limits for the following parameters:

- Total Suspended Solids (TSS)
- Total Manganese
- Total Zinc

The sample from BH1 exhibited no exceedances of the Region of Peel's Sanitary Sewer By-Law limits.

It is understood proposed development on the site includes construction of one underground parking level which will likely not require excavation below the level of perched groundwater. It is important to note that if any dewatering is required and discharge is not collected using a hydrovac truck for off-site treatment and disposal, discharge to municipal storm sewers would require discharge chemistry testing to ensure all Storm Sewer Use By-Law criteria are met, and permission to discharge to municipal sewers from the municipality or Region of Peel. Treatment of discharge to resolve potential exceedances of total manganese would likely be necessary.

3. WATER USERS

Well Records from the Ministry of the Environment, Conservation, and Parks (MECP) Water Well Record (WWR) Database (2020) were reviewed to determine the number of supply wells present. According to the MECP WWR Database nineteen wells are located within an approximate radius of 500 m from the subject property.

Of these wells, eight are identified as test holes or monitoring wells. Five well records pertain to abandoned wells, two well records have partial or no data, and one additional well is identified as not in use. These records have been excluded from further consideration.

The three remaining domestic use wells are completed in overburden soils at depths of 15.24 and 77.72 mBGS, respectively. A copy of the MECP well records is included in Appendix D, and the two wells are plotted on the appended Drawing 3.

It is noted that some wells plotted on the appended Drawing 3 are located in areas where the actual existence of a well is unlikely (they may be associated with nearby properties), and that some properties shown on the aerial imagery do not have a well associated with them; however, the MECP WWR coordinate data has been used in the absence of more reliable information.

The Region of Peel Department of Public Works was consulted to determine where municipal watermains existed within a 500 m radius of the property. Watermains were identified along Colerain Drive, Harvest Moon Drive, King Street (Emil Kolb Parkway), and 6th Line. It is anticipated that MECP WWRs which may plot along these roadways could represent wells which have been previously decommissioned, or wells which are not used for drinking water supply.

3.1 Door-to-Door Well Survey

On March 28, 2023 a survey of properties where a private water supply well might exist within a 500 m radius of the subject property was conducted to determine the locations and construction details of private water supply wells in the area.

Seven homes and one commercial property were canvassed. Zero surveys were received prior to the preparation of this report.

3.2 Municipal Wellhead Protection Areas

Ontario Source Protection Information Atlas (OSPIA) mapping shows that the property is not located within a Wellhead Protection Area (WHPA). There are no WHPAs is more than 6 km southeast of the subject property.

3.3 Sensitive Features

OSPIA mapping indicates that the subject property does not fall within a highly vulnerable aquifer (HVA) zone, or a significant groundwater recharge area (SGRA).

Based on the presence of low permeability clayey silt till overburden soils from ground surface to a depth of more than 6 mBGS there is no shallow overburden aquifer beneath the subject property, and any deeper overburden aquifer would be sufficiently isolated by the overburden aquitard to be protected from any potential ground surface contaminants. Since all pavement stormwater runoff will be directed to municipal storm sewers, it is reasonable to conclude that no potential surface contaminants that might be accidentally released at the site would be able to migrate vertically downwards to a deep overburden or bedrock aquifer, or laterally to surface water features.

Natural Heritage Area maps from the Ministry of Natural Resources and Forestry (MNRF; 2023) reveal no Areas of Natural and Scientific Interest (ANSIs) within the subject property or surrounding area. As discussed in Section 2.5, TRCA mapping (2023) indicates that Jaffary's Creek and surrounding area southeast of the site are regulated by the TRCA.

Minimum buffer requirements must be satisfied for all sensitive features.

4. PRELIMINARY CONSTRUCTION DEWATERING ASSESSMENT

Table I below summarizes the preliminary construction excavation parameters based on information provided on preliminary engineering drawings for the project (Q4 Architects Inc., May 2023). It is important to note these calculations are preliminary, and based on limited site data. Construction dewatering calculations will need to be updated once additional site investigation and detailed design of the project have been completed.

Table I: Preliminary Construction Excavation Parameters

Task	Excavation Dimensions (approximate) (m)	Excavation Depth (mBGS)	Estimated Seasonally High Groundwater Elevation (mBGS)*
1-Level Underground Parking	85 x 78 m	3.5-4.5 mBGS	4.15 mBGS

*- Estimated seasonally high groundwater elevation is the highest measured groundwater elevation from March 2023, increased by 0.5 m.

Based on preliminary excavation locations, dimensions, and depths provided for this report, construction of the proposed one-level of underground parking may require excavation below the elevation of perched groundwater. As a result, construction dewatering may be required for construction of the building.

Temporary dewatering requirements are dependent on factors such as excavation parameters (excavation dimensions, infrastructure invert elevations, the number of concurrent excavations, etc.), hydrogeological conditions at the site (groundwater levels, soil/bedrock hydrogeological parameters, etc.), construction and dewatering methodologies (open cuts, dewatering pits, sumps, wellpoints, etc.), and the amount of groundwater drawdown required to achieve and maintain dry working conditions and stable excavations.

Additionally, factors such as the use of shoring would be expected to influence the rate of groundwater inflow into an excavation. The calculations provided below assume an open excavation as a conservative factor of safety.

It is important to note that the dewatering contractor retained to perform construction dewatering is solely responsible for achieving and maintaining dry working conditions at the site at all times. The calculations and dewatering rates/volumes provided below are not directives for a dewatering contractor, and the dewatering contractor must review the information, calculations, and recommendations provided as part of their own assessment of dewatering requirements to determine appropriate methodologies and designs for their construction dewatering project.

4.1 Preliminary Excavation Requirements and Temporary Construction Dewatering Assumptions

During the construction project dewatering operations are expected to take place twenty-four hours per day to maintain dry excavations. Dewatering calculations include a number of variables such as the static groundwater level, soil hydraulic conductivity, aquifer thickness, confined aquifer conditions, etc. that can be adjusted to provide conservative buffers to account for conditions beyond those encountered in the available monitoring wells.

It is noted all excavations will be completed in overburden deposits.

Table II below summarizes the preliminary excavation requirements. Additionally, Table II includes the following buffers as factors of safety:

- A buffer of 2 m for all excavation widths and lengths to account for an excavation large enough to accommodate working around the perimeter;
- A buffer of 1 m for the excavation invert elevation to ensure groundwater is drawn down 1 m below the base of the excavation to maintain a dry work surface;
- A “squared off” excavation shape to account for excavation dimension adjustments during the construction process;

- A buffer of 0.5 m for the groundwater elevation (the highest measured elevation from on-site monitoring wells) to account for seasonal fluctuations.

Table II: Preliminary Excavation Requirements

Excavation	Excavation Length (m) (+2 m)	Excavation Width (m) (+2 m)	Excavation Elevation (mBGS) (-1m)	GW Elevation (mBGS) (+0.5 m)
1-Level Underground Parking	87	80	5.5	4.15

It is very important to consider that all construction dewatering calculations provided in this report are based on the preliminary excavation requirements and dimensions listed above. If design changes or other site plan modifications result in changes to the information listed above, the dewatering calculations below will need to be revised accordingly.

4.1.1 Concurrent Excavations

It is understood the following concurrent tasks should be contemplated for construction dewatering:

- Concurrent excavation of the entire multi-building footprint for construction of one-level of underground parking.

It is very important to consider that if modifications to the concurrent construction tasks are desired, the calculated dewatering requirements would need to be reassessed.

4.1.2 Dewatering Assumptions

Dewatering calculations have been prepared for the anticipated concurrent tasks noted above based on the following assumptions to account for variability in soil, surface water, and groundwater conditions:

- Aquifer hydraulic conductivity of 5.0×10^{-7} m/sec (the highest hydraulic conductivity measured in the on-site well slug tests and grain size samples, increased as a conservative factor of safety).
- An unconfined aquifer thickness of 8 m.
- An initial groundwater elevation corresponding to the highest measured groundwater elevation from the on-site monitoring wells (4.65 mBGS), increased by 0.5 m (to 4.15 mBGS) to account for seasonal variation.

4.2 Preliminary Dewatering Calculations

To estimate the steady-state dewatering flow rate needed to maintain dry conditions in the excavation for the underground parking structure, the following equation (for radial flow to an unconfined aquifer) from Powers (2007)[1] was used:

$$Q = \frac{\pi K\left(H^2 - {h_w}^2\right)}{\ln\left(\frac{R_o}{r_e}\right)}$$

Where:

Q = Flow Rate (m^3/sec)

H = Initial Saturated Thickness (Piezometric Head) of Aquifer (m)

h_w = Dewatered Saturated Thickness (Piezometric Head) of Aquifer (m)

K = Soil Hydraulic Conductivity (m/sec)

r_e = Effective radius, $r_e = \sqrt{(excavation\ area/\pi)}$ (m)

$R_o = 3000*(H-h_w)*\sqrt{K}$ (m)

Where R_o is very close to r_e or less than r_e, to avoid $\ln\left(\frac{R_o}{r_e}\right)$ resulting in a very small or negative number R_o can be replaced with ($R_o + r_e$) in the formula above, which gives a reasonable estimate of the dewatering requirements. Using the assumptions described in Section 4.1 and its subsections the steady-state inflow rate and radius of influence listed in Table III below are estimated.

Table III: Preliminary Steady-State Dewatering Requirements

Excavation	Daily Dewatering Rate (L/day)	Radius of Influence (m)
1-Level Underground Parking	45,400	2.9

4.2.1 Preliminary Calculated Dewatering Rates, With Factors of Safety

It is important to consider that dewatering requirements will be highest at the start of the dewatering process when the volume of water stored within the pore spaces of the soil matrix

[1] Powers, P.J. et al. 2007. Construction Dewatering and Groundwater Control: New Methods and Applications. Wiley.

must be extracted. This overburden storage must be accounted for to allow for rapid achievement of drawdown targets.

Initial drawdown of the shallow overburden aquifer within a short period of time would be expected to require additional pumping capacity. An initial drawdown requirement has been calculated assuming a surcharge of 50% of the estimated steady state dewatering rate.

Additionally, it is important to consider that during and after precipitation events significantly higher dewatering flow rates may be required to account for direct precipitation and surficial runoff falling into an excavation.

While it is important to consider that during and after precipitation events significantly higher dewatering flow rates may be required to account for direct precipitation and surficial runoff falling into an excavation; recent changes to Ontario Regulation 63/16 mandate that stormwater does not need to be counted as part of the daily dewatering limit..

Table IV below provides a summary of the calculated dewatering rates and factors of safety for the underground parking excavation.

Table IV –Preliminary Calculated Maximum Total Dewatering Rate including Factors of Safety

	Steady State Dewatering (L/day)	**Initial Drawdown Surcharge (L/day)**	**Total Dewatering Requirement (L/day)**
1-Level Underground Parking	45,400	22,700	68,100

The preliminary totals shown in Table IV indicate a potential maximum dewatering requirement of 68,100 L/day for the multi-building underground parking structure. An Environmental Activity and Sector Registry (EASR) would be required to authorize pumping at this rate. Additionally, a Sewer Discharge Permit from the Region of Peel would be required to discharge to municipal sewers.

While the conservative assumptions and factors of safety discussed in the preceding sections combine to create conservative dewatering calculations, it is important to consider the potentially variable nature of the overburden stratigraphy on groundwater flow.

The potential maximum dewatering requirements outlined above are reasonable based on the information available; however, performing one or several pumping tests of the shallow overburden aquifer in advance of designing and installing dewatering systems would provide empirical data that could be used to refine maximum daily pumping requirements. The client, the construction contractor, and the dewatering contractor shall review the dewatering calculations provided above and make their own determinations regarding the potential benefits of performing pumping tests as part of the construction dewatering design strategy.

As noted previously these calculations are preliminary, and based on limited site data. Construction dewatering calculations will need to be updated once additional project design has been completed.

5. PRELIMINARY PERMIT REQUIREMENTS AND DEWATERING DISCHARGE

Ontario Regulation 387/04 requires authorization from the Ministry of the Environment, Conservation, and Parks (MECP) for all water takings over 50,000 L/day. Ontario Regulation 63/16 specifies that for temporary construction dewatering at rates between 50,000 and 400,000 L/day an Environmental Activity and Sector Registry (EASR) may be obtained in lieu of a Permit to Take Water (PTTW). Dewatering at rates of more than 400,000 L/day require a PTTW to authorize groundwater withdrawal.

As shown in Section 4.1 and its subsections, construction dewatering will likely require daily dewatering rates below 400,000 L/day; therefore, an EASR submission for the project should be considered a requirement to permit pumping from the excavation.

Discharge to a municipal sewer would require a Sewer Discharge Permit from the Region of Peel.

5.1 Dewatering Discharge

It is expected that dewatering discharge will be directed to municipal sewers.

As discussed in Section 2.7, groundwater chemistry samples exhibited exceedances of Region of Peel Storm Sewer Use By-Law criteria limits for TSS and several metals. Discharge treatment and mitigation measures will need to be developed and implemented to permit discharging to municipal storm sewers.

Groundwater chemistry samples exhibited no exceedances of Region of Peel Sanitary Sewer Use By-Law criteria limits; therefore, discharge treatment and mitigation measures are not anticipated to be required to permit discharging to municipal sanitary sewers.

As a suggestion for consideration, a cost-benefit analysis should be undertaken to evaluate the potential to discharge to municipal sewers vs. collection of water using a hydrovac truck or similar equipment for off-site disposal.

6. CLOSURE

Subsurface stratigraphy beneath the subject property consists of fill underlain by more than 6 m of clay/silt till deposits. Perched water was encountered at a depth of 4.65 to 5.48 mBGS, anticipated to be flowing generally south-eastwards in the general flow direction of nearby creeks. The perched groundwater conditions encountered in the low permeability till overburden do not represent a local or regional shallow aquifer.

Soil hydraulic conductivity estimates from grain size analyses and slug tests indicate the clayey silt till deposits have a low hydraulic conductivity ranging from <1 x 10^{-9} to <1 x 10^{-7} m/sec.

There are no visible surface water features on the property. A stormwater management pond is located south of the subject site.

TRCA mapping indicates that Jaffary's Creek and the surrounding area are regulated by the TRCA; however, the subject property does not lie within a regulated area. Mapping indicates the subject property is not within a highly vulnerable aquifer zone, significant groundwater recharge area, or a municipal wellhead protection area.

The preliminary construction dewatering assessment performed for the site demonstrates the proposed one-level underground parking structure may require dewatering at rates below the 400,000 L/day Permit to Take Water (PTTW) threshold; therefore, an EASR submission for the project should be considered a requirement to permit pumping from the excavation.

Any construction dewatering discharge that will be generated would need to be tested and treated to ensure it meets Region of Peel Sewer Use By-Law criteria prior to discharge to a municipal sewer. Additionally, any discharge to a municipal sewer would require a Sewer Discharge Permit from the Region of Peel.

We trust that this report satisfies your present requirements, and we thank you for this opportunity to be of service. If you have any questions, or require further hydrogeological consulting services, please feel free to contact the undersigned directly.

Respectfully submitted,

PROFESSIONAL GEOSCIENTIST
30-May-2023
CHRIS HELMER
PRACTISING MEMBER
2285
ONTARIO

Chris Helmer, B.Sc., P.Geo.
Senior Hydrogeologist
MECP Licensed Well Contractor and Class 5 Well Technician
www.hydrog.ca

7. LIMITATIONS AND USE

This report has been prepared for the exclusive use of the Client indicated in Section 1. Hydrogeology Consulting Services Inc. (HCS) and Chris F Helmer hereby disclaim any liability or responsibility to any person or party for any loss, damage, expense, fines, or penalties which may arise from the use of any information or recommendations contained in this report by anyone other than the Client.

The conclusions and recommendations provided in this report are not intended as specifications or instructions to contractors. Any use contractors may make of this report, or decisions made based on it, are the responsibility of the contractors.

In preparing this report HCS and Chris F Helmer have relied in good faith on information provided by individuals and companies noted in this report, and assumes that the information provided is factual and accurate. No responsibility is accepted for any deficiencies, misstatements, or inaccuracies contained in this report as a result of errors, omissions, misinterpretations, or fraudulent acts in the resources referenced, or of persons interviewed or consulted during the preparation of this report.

The report and its complete contents are based on data and information collected during investigations conducted by HCS and Chris F Helmer, or others where noted, and pertains solely to the conditions of the site at the time of the investigation, supplemented by historical information and data as described in this report. It is important to note that the investigation involves testing and sampling of the site at specific locations, and the conclusions in this report are based on the information gathered. Limitations of the data and information include the fact that conditions between and beyond the sampling locations may vary; that the assessment is dependent upon the accuracy of the analytical data generated through sample analysis; and that conditions or contaminants may exist for which no analyses have been conducted. Furthermore, no assurance is made regarding potential changes in site conditions and/or the regulatory regime (standards, guidelines, etc.), subsequent to the time of investigation.

The professional services provided for this project include only the hydrogeological aspects of the subsurface conditions at the site, unless otherwise stated specifically in the report. No other warranty or representation is either expressed or implied, as to the accuracy of the information or recommendations included or intended in this report.

8. REFERENCES

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