Proposed 12-storey Mid-Rise Condominium Development
720 Granite Court, City of Pickering
1334281 Ontario Limited

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

August 2024

MAEL Reference 22-104

MASONGSONG ASSOCIATES ENGINEERING LIMITED
ENGINEERING SUSTAINABLE FUTURES

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

PROPOSED 12-storey Mid-Rise Condominium Development

720 Granite Court, Pickering

FOR

1334281 Ontario Limited

CITY OF PICKERING

August 2024

Prepared by:

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MAEL Project No. 22-104

1.0 INTRODUCTION

Masongsong Associates Engineering Limited has been retained by 1334281 Ontario Limited to prepare a *Functional Servicing and Stormwater Management Report* in support of a Rezoning Application for a proposed 12-storey Mid-Rise Condominium Development at 720 Granite Court, situated northwest of the Whites Road and Granite Court intersection in the City of Pickering.

This study provides an overview of the proposed development and examines servicing feasibility within the framework of existing infrastructure. Specifically, this report will address the Regional servicing jurisdiction of water distribution and sanitary sewerage, the City of Pickering criteria for storm drainage and grading as well as with Toronto and Region Conservation Authority (TRCA) for stormwater management.

1.1 Background

The subject development is located at the northwest corner of Granite Court and Whites Road, which is just south of the Highway 401 Whites Road interchange in the City of Pickering. The triangular shaped site of approximately 1.18 ha (2.91 ac) is presently vacant land with municipal road frontage onto both Granite Court and Whites Road.

A Metrolinx railway line runs along the westerly boundary of the site. The top of rail is approximately 6-7 m lower than the table-lands of the subject site, and therefore is grade-separated running under both Whites Road and Granite Court.

The development proposal will consist of the construction of a 12-storey condominium apartment building with associated on-grade and 2-levels of below-grade parking. Vehicular access will be from Granite Court, with numerous pedestrians at-grade accesses to both Granite Court and Whites Road.

The total GFA in the current plan is approximately 216,595 sq.ft. with a total of 262 units and 81m^2 of non-residential area.

A site statistic prepared by Onespace Architects is attached in Appendix A.

See Figure 1 for location plan.

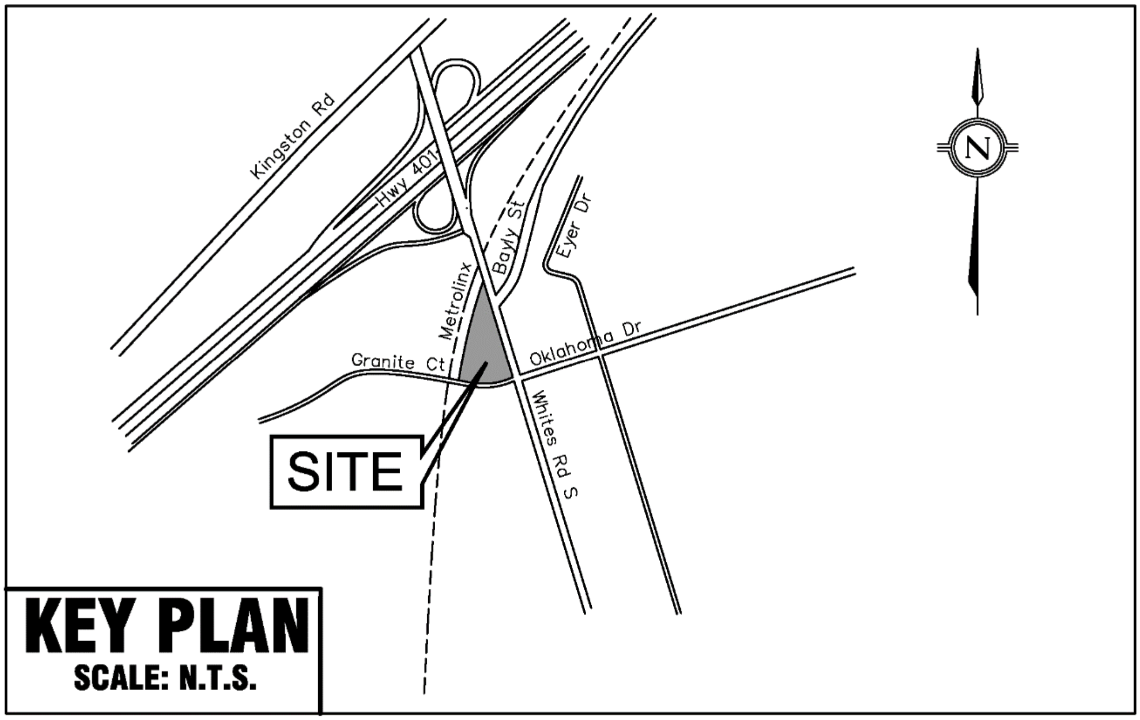


Figure 1 *Site Location Key Plan*

2.0 EXISTING INFRASTRUCTURE

There are existing municipal sewers and watermain in the vicinity of the subject site. A schematic of the existing services in the vicinity of the site is included in Appendix A as Figure 02. A discussion of the available existing infrastructure follows.

Watermain	A 300mm diameter CI watermain located on the north side of Granite Court.
Sanitary Sewerage	A 200mm diameter PVC sanitary sewer located at the southeast corner of Granite Court and Whites Road south intersection.
Storm Drainage	The majority of the subject site drainage sheet drains from north to south into a 450mm diameter culvert within the southwesterly of the site. This 450mm diameter culvert is connected to the double catchbasins on Granite Court and discharged into a 200m long V-ditch which runs parallel to the railway. The remainder of the site sheet drains into the north into an existing ditch at the north end of the site.

3.0 PROPOSED EQUIVALENT POPULATIONS

The equivalent population basis (for sanitary sewerage and water servicing demands) is derived from the Region of Durham's Design Standards.

The subject site comprises 262 apartment units (228 units of one-bedroom/bachelor and 34 units of two-bedrooms). Using the Region design criteria, the resulting equivalent population is therefore:

Apartment Units	= (1.5 ppu x 228) + (2.5 ppu x 34) = 427 persons
Commercial (GFA)	= 81 m^2

Therefore, the total residential population for this development is **427 persons plus 81 m^2 of commercial area.**

The population statistics are carried forward in the following sections on water demands and sanitary sewerage.

4.0 WATER DISTRIBUTION

The estimated total population is 427 persons. Using the MOE Guidelines for Drinking Water Systems (2008), the estimated water demand is summarized in Table 1 below.

Table 1 *Water Demands*

Site Description	**Populations / GFA**	**Avg Consumption Rate** (450 L/c/d) Res. 28 m^3/ha/day Comm.	**Max Day Factor** (2.75 Factor)	**Peak Hour Factor** (4.13 Factor)
Residential	**427 people**	**2.22 L/s**	**6.11 L/s**	**9.17 L/s**
Commercial	**81 m^2**	**0.00262 l/s**	**0.0072 L/s**	**0.011 L/s**
Total		**2.25 L/s**	**6.12 L/s**	**9.18 L/s**

4.1 Water Demand

Domestic:

The max-day domestic consumption rate of 6.12 L/s or 367 L/min is a fraction of the 300 mm diameter watermain; therefore, domestic water demand can be easily met.

Fire:

The critical demand on the local water system will be the fire demand, which is 2 orders to magnitude higher than the domestic demand requirements. Fire flow requirements are calculated in accordance with the Fire Underwriters Survey (FUS). An estimate of the required fire flow can be determined by the following formula:

Fire Flow (F) = 220 x C ($A^{0.50}$) L/min. where

F = Fire Flow (L/s)
C = coefficient in relation to the type of construction
A = Total Floor Area

1. The proposed building will be of reinforced concrete construction of fire resistive construction (C=0.60) where the vertical openings and exterior vertical communications are properly protected with at least one hour rating, the Area consideration can be limited to that of the largest floor plus 25 percent of each of the two immediately adjoining floors.

   The largest floor area is located on the ground floor having a total floor area of 2,365 m^2. The two immediately adjoining floors are the second (2,365 m^2) and third floor (2,365 m^2).

   Therefore, the total floor area can be estimated as:

   A = 2,365 m^2 + (2,365 x 25%) + (2,365 x 25%)
   = 3,548 m^2

   Solving for F = 220 x 0.60 x ($3{,}548^{0.50}$)
   = 6,800 L/min

2. In determining the Occupancy Factor for having low contents fire hazard, the F value may be reduced by 15%

   F = 6,800 + (6,800 x -15%)
   = 5,780 L/min.

3. The value in 2. above may be reduced by up to 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards.

F = 6,800 x -30%
= -2,040 L/min.

4. For the value in 2. Above, a percentage should be added for structures exposed within 45 m by the fire area under consideration. 5% should be added to the north property, 5% should be added to the south property. 5% should be added to the east property and 5% should be added to the west property for a combined 20%.

F = 6,800 x 20%
= 1,360 L/min.

5. The total required Fire Flow under FUS criteria is therefore:

F = 6,800 – 2,040 + 1,360
= 6,120 L/min
= 7,000 L/min (rounded)

Based on the above FUS calculations, the required fire flows is estimated at **7,000 L/min.**

A hydrant flow test, enclosed in Appendix B, was performed in November 03, 2022 to ascertain the available municipal supply on Granite Court. Detailed hydrant flows are calculated in Table F1 in Appendix B, confirming that the existing granite Court water system is capable of delivering a fire flow of **10,677 L/min. at the minimum pressure of 140 kPa**, which satisfies both FUS and ISO fire flows superimposed on the max-day domestic consumption rate of 389 L/min.

4.2 Proposed Water Connection

It is proposed to provide a new 200 mm diameter PVC water service connection and connect into the existing 300mm watermain in the north side (near-side) of Granite Court. The proposed 200 mm diameter connection will serve as the fire line, with a 150 mm diameter domestic cold-water supply branched off the main service in accordance with Region standards. Both the fire and domestic lines will enter at the southerly of the site where the meter room will be located on P1 parking level. Both fire and domestic lines will be provided with shut-off valves at the streetline and water meters in accordance with Region standards.

A Site Servicing Plan is attached in the Appendix drawings showing the location of the proposed watermain connection.

5.0 SANITARY SEWERAGE

5.1 Proposed Sanitary Flow Estimates

<u>Proposed Site Design Flow:</u>

Peak Flow Design Parameters

Total Population = 427 persons (as calculated in Section 3.0)
Res. Avg. Flow = 364 L/p/d
Peaking Factors = 1 + {14/(4+$(P/1000)^{0.50}$)} = 3.80 max.
Site Area = 1.19 ha
Infiltration rate = 0.026 L/s (long-term groundwater, see Section 8.0)
Commercial = 81 m^2 (0.0081 ha)
Design Flow = 180 m^3/gross ha/day, including peaking infiltration & peaking effect

Calculation of Peak Design Flows

Design flow, $Q_{SANITARY}$ = *average daily flow * peaking factor + infiltration flow + commercial*
=[{(427 p x 364 L/p/d / 86400 s/d) x 3.80} + 0.026 L/s] + (180 m^3/GFAha/day * 0.0081 ha)
= 6.86 L/s + 0.0169 L/s
<u>**= 6.88 L/s**</u>

Therefore, the peak sanitary flow from the development site has been calculated to be <u>**6.88 L/s.**</u>

Similar to the water network, the downstream sanitary capacity is maintained by the Region, and therefore a detailed downstream sanitary analysis is not included with this report. However, based on preliminary discussion with Region staffs, sanitary capacity appear to be available to serve this proposed development.

5.2 Proposed Sanitary Connection

The subject is provided with a 200 mm diameter PVC sanitary service connection at the southeast corner of the site of Granite Court and Whites Road south intersection. A new maintenance hole will be installed on the property line in accordance with Region standards.

A Site Servicing Plan is attached in the Appendix drawings showing the location of the proposed sanitary connection.

6.0 STORM SEWERAGE SYSTEM

6.1 Existing Storm Sewers and Drainage

The subject property is currently vacant with sodded areas. The majority of the site drainage sheet drains from north to south into an existing a 450mm diameter culvert located at the southwesterly of the site. This 450mm diameter culvert is connected to the double catchbasins on Granite Court and discharged into a 200m long V-ditch with runs parallel to the railway. The remainder site area sheet drains into the north into an existing ditch; ultimately captured by the existing catchbasin to the north. The existing storm sewers and drainage are illustrated on Figure 02 in Appendix C.

6.2 Allowable Discharge (South Area)

Quantity control for the subject site will be restricted to the City's 2-year storm event with a maximum runoff coefficient of R=0.25 as per the pre-development drainage plan (see Figure 02) in Appendix C. All run-offs in excess of the 2-year design storm event, up to and including the 100-year storm event must be detained on-site.

To simulate site hydrology, the allowable post-development peak discharge rate for the site during 2-years through 100-years events has been quantified using the Modified Rational Method.

The following City of Pickering Storm Rainfall intensity equations were used for calculating the allowable release rate from the subject site:

$I_{2year} = (715.076) / (t_c + 5.262)^{0.815}$

$i_{100year} = (2096.425) / (t_c + 6.485)^{0.863}$

2-year storm rainfall intensity and 100-year storm rainfall intensity, respectively.

Where:

i = rainfall intensity (mm/hr)
t_c= time of concentration (min)
*An initial time of concentration of (10 minutes) was used for determining peak pre and post-development flows.

$$\therefore i_2 = 77.57mm/hr \qquad \therefore i_{100} = 186.69mm/hr$$

The allowable release rate for the site is calculated as follows

Where:

$$Q_{allow} = \frac{A_t R i_{10} i_{10}}{360} (m^3 / s)$$

Q_{allow} = Peak Stormwater Flow (m^3/s)
R = Runoff coefficient = 0.25
I_5 = Rainfall intensity (mm/hr) = 77.57mm/hr
A_t = Total Pre Development Area (ha) = 0.8036 ha (only area into the south is accounted for allowable discharge)

$$\therefore Q_{allow} = \frac{0.8036 * 0.25 * 77.57}{360} = 43.3\ L/s$$

Therefore, the maximum release from the site into the 450mm CMP on Granite Court will be controlled to **43.3 L/s** as per the 2-year pre-development.

North Area:
The remaining portion of the north area drains will continue to sheet drain to the north as per pre-development conditions. As per Figure 02, the north drainage area is 0.3373 ha with a runoff coefficient 0.25. Therefore, the 2-yr and 100-yr pre-development flows are as follows:

$$Q_{2-YR} = \frac{0.3373*0.25*77.57}{360} = 18.1\ L/s$$

$$Q_{100-YR} = \frac{0.3373*0.25*186.69}{360} = 43.7\ L/s$$

As per Figure 03, the north drainage area is 0.2538 ha with a runoff coefficient 0.36. Therefore, the 2-yr and 100-yr post-development flows are as follows:

$$Q_{2-YR} = \frac{0.2538*0.35*77.57}{360} = 19.10\ L/s$$

$$Q_{100-YR} = \frac{0.2538*0.35*186.69}{360} = 46.1\ L/s$$

There is a slight increase in the post-development flows under the 2-yr (increase by 1 L/s or 5.5%) and 100-yr (increase by 2.4 L/s or 5.5%) compared to the pre-development levels. Since post-development flows slightly increase by 5.5%, quantity control is not required as the slight increase is considered an acceptable tolerance for hydraulic calculations. However, post-development drainage will be captured by the proposed bio-retention/infiltration area to meet the water balance target, which is discussed in Section 6.5.

6.3 Quantity Control

To meet the stormwater quantity objectives, the south of the subject site is proposed to provide on-site water quantity control up to the maximum allowable release rate of **43.3 L/s** into the existing 450mm CMP on Granite Court. A post-development drainage plan is attached in Appendix C as Figure 03.

The mass Rational Method was used to calculate the 100-year storage requirement for the site. Computation tables for the volumetric sizing are included in Appendix C. An infiltration storage tank is proposed to provide the volumetric attenuations. Due to the depth of the infiltration tank and the shallow municipal sewer system, the outflow must be pumped, and the discharge will be set at a maximum 43.3 L/s, with a high-level overflow for emergency spillover. In addition, control MH1 to MH2 is fitted with a 200mm diameter @ 1.75% which is sized to match the allowable release rate of 43.3 L/s. This section of piping will act aa a flow restrictor.

The proposed tanks and storm connection can be seen on the proposed Site Servicing Plan (SS-1) attached in the Appendix Drawings.

A summary of the storage required versus provided is shown below in Table 2.

Table 2 *Stormwater Management Quantity Control Summary*

Description	Total Area (ha.)	Avg. Runoff Coefficient "C"	Maximum Release Rate (L/S)	Required Storage (m^3)	Provided Storage (m^3)
Controlled Area	**0.9101**	**0.88**	**43.3**	**300.52**	**312.0**

In summary, total post development site discharge will be controlled to the 2-yr pre-development level; therefore, the existing storm sewers can accommodate the site without imposing any detrimental effects downstream.

6.4 Major Overland flow/External Drainage

The proposed grade within the subject site have been designed such that for storms greater than the 100-yr events or in the case of emergency overflow due to clogging in the storm system, safe overland flow route exist is established to convey flow away from the site and into the north-east as per pre-development drainage plan.

The overland flow routes will have no depth of ponding greater than 0.20m and will not result in flood damage to proposed and adjacent public and private properties.

6.5 Quality Control

TSS Removal

Spills control will be provided by oil-grit-separator (OGS stormceptor type or equivalent) for the at-grade impervious areas to improve upon the overall weighted TSS removal rate. The unit has been sized to treat the parking areas based on a minimum of 80% TSS removal rate. The following table summarizes the date used for sizing the OGS and the associated treatment values.

Table 4 OGS Sizing and Treatment Information

OGS ID	Contributing Area (ha.)	Runoff Coefficient '(C)	Percent Imperviousness	Oil-Grit Separator Model	TSS Removal Rate (%)
OGS #2	**0.3616**	0.90	100%	EFO4	88%

Note: The Stormceptor modeling outputs are included in Appendix C.
It is noted that OGS unit is credited up 50% TSS removal. However, with the implementation of infiltration for the 5mm water balance, the overall TSS removal can be vastly improved as infiltration is known to remove 70-90% TSS removal rate.

Stormceptor Inspection and Maintenance:

The primary purpose of the stormwater management stormceptor is to filter and prevent pollutants from entering the waterways. Routine inspection and maintenance tasks are key to restore the stormceptor to its full efficiency and effectiveness. Maintenance activities may be required in the event of a chemical spill or after a major storm events.

Routine inspection and maintenance activities as shown in the attached Appendix C "Stormceptor Owner's Manual" should be implemented for the continued operation of the stormceptor.

5mm Water Balance

South Area

As outlined in Figure 03, the site's impervious areas comprise a total of 6,365 m^2 of hard surface areas. The required 5mm volume is therefore:

Surface Area Component	Area	Target Water Retention	Required Water Retention
	(m^2)	(mm)	(m^3)
Rooftop	3,001	5	15.00
Asphalt / Conc.	3,364	5	16.82
Landscaped Area	2,736	0	0

To meet the 5mm water balance target, a combination of irrigation re-use and infiltration will be provided. A cistern is proposed to capture rainwater from the rooftop areas for landscaped irrigation with a minimum of 15.0 m^3. The retained rainwater will be empty within 72 hours (maximum permitted drawdown time). A site irrigation usage report has been provided by the irrigation consultant confirming that the required irrigation system will require a total of 134m^3 in 72 hours of portable water during the irrigation months through evapotranspiration and water usage within the site; and therefore, ensuring that the water balance target objective can be met entirely with the site irrigation within the private lands.

The remaining water balance target within the parking area (16.82 m^3) will be storage under the infiltration tanks; these volumes will pass through a crushed stone bottom and be allowed to dissipate back to the in-situ soils over at least 24-48 hours period to maximize on-site discharge. As the entire 5 mm volumes are being stored and retained for in-situ infiltration, there are no proposed piped outlets for the 5 mm storm event other than the controlled pump discharge which is above the 5 mm storage volume.

In-Situ testing will be provided by the geotechnical engineer at the detail design stage to ensure the subsoil is suitable for infiltration type LID to fully drain the 5mm design storm runoff within 24-48 hours as per MOE criteria.

North Area

As outlined in Figure 03, the north's impervious areas comprise a total of 445 m^2 of hard surface areas. The required 5mm volume is therefore:

$$V_{5mm\ Required} = 445\ m^2 \text{ X } 0.005\ m$$
$$= 2.3\ m^3$$

The required water balance will be stored under the bioretention/infiltration area for infiltration; these volumes will pass through a crushed stone bottom and be allowed to dissipate back to the in-situ soils over at least 24-48 hours period to maximize on-site discharge. As the entire 5 mm volumes are being stored and retained for in-situ infiltration, there are no proposed piped outlets for the 5 mm storm event.

7.0 EROSION AND SEDIMENT CONTROLS

An erosion and sediment control strategy should be implemented during the construction to mitigate the transportation of silt from the site.

To prevent construction generated sediments from entering the storm sewer or leaving the site by overland flow, the following measures should be implemented:

- Temporary silt fencing
- Temporary catch basin sediment control
- Temporary rock mud mats
- Seeding and mulching of disturbed undeveloped areas
- Erosion monitoring and sediment removal program throughout the construction period

An Erosion and Sediment Control Plan showing all of the measures is attached in the Appendix Drawings.

8.0 GROUNDWATER DISCHARGE CONSIDERATION

Soil Engineers Limited completed a hydrogeological assessment in regard to the groundwater needs for the site (excerpt of the report is attached in Appendix D).

Short Term Discharge (During Construction):

As indicated on page 13 of the hydrogeological assessment, the maximum short-term discharge rate for the site is 241,020.6 L/day or 2.79 L/s. An Environmental Activity Sector Registry (EASR) is required as the discharge rate is more than the allowable of 50,000 L/day.

The selection and design of the dewatering system should be prepared by a dewatering contractor. At the time of construction and prior to the discharge of groundwater into the municipal sewer system, the dewatering contractor will need to ensure all appropriate approvals are met.

Long Term Discharge (Post-Construction):

As indicated on page 16 of the hydrogeological assessment, the maximum long term groundwater discharge rate for the site is 2,249.82 L/day or 0.026 L/s. As the estimated drainage flow rates are below the EASR limit of 50,000 L/day, an EASR is not required.

Therefore, long-term ground discharge will be into the sanitary sewer system.

9.0 SUMMARY AND RECOMMENDATIONS

This functional servicing and stormwater management report demonstrates that the proposed condominium development can be accommodated by the existing local infrastructure. Specifically:

Water Service	will be provided by the existing 300 mm diameter municipal watermain located on Granite Court. A 200 mm service line will be tapped off the main to provide fire service with a 150 mm domestic branch at the streetline. Based on the hydrant testing results and analysis, there is adequate supply and pressures to meet the critical high-demand flow for fire-fighting plus the maximum-day domestic consumption rate.
Sanitary Sewerage	will be accommodated by the existing 200 mm diameter sanitary sewer on southeast corner of Granite Court and Whites Road. An equivalent population of 427 persons is calculated for this development which is an equivalent peak sanitary flow of 6.88 L/s. Preliminary discussion with Region staffs, sanitary capacity appear to be available to serve this proposed development.
Storm Drainage	will be collected on-site and discharged into the existing 450 CMP located on the southwest of the site off Granite Court. Post development release rate will be controlled to the 2-year pre-development discharge. The required volumes for the major storm events will be achieved in the proposed underground storage tanks.
TSS Removal	will be achieved by installing an OGS-Stormceptor model EF04 sized to provide quality control to 80% TSS removal and by the infiltration gallery.
Water Balance	will be achieved by collecting the entire rooftop areas and storing it in the proposed cistern for irrigation and and the remaiming area will be storage in the infiltration tank for infiltration.
Groundwater	Short term dewatering during construction is estimated to be 2.79 L/s. An Environmental Activity Sector Registry (EASR) is required as the discharge rate is more than the allowable of 50,000 L/day. Longt term dewatering after construction is estimated to be 0.026 L/s. An Environmental Activity Sector Registry (EASR) is not

required as the discharge rate is less than the allowable of 50,000 L/day. The proposed long term groundwater will be discharged into the sanitary sewer system.

Respectfully Submitted,

MASONGSONG ASSOCIATES ENGINEERING LIMITED

Limited Licensee
Name: K. K. LO
Number: 100209166
Category: CIVIL

W. C. IP
Aug 30, 2024

Ken Lo, LEL, C.E.T.
Project Manager

Andrew Ip, P.Eng
Principal

Appendix A

Site Statistics •

Fig. 02 – Pre-Development Conditions•

720 Granite Court Statistics

720 Granite Court, Pickering, Ontario

Site Description	Plan 40M-1334 City of Pickering Regional Municipality of Durham

Subject To Zoning By-Law 6358/04

FFE of Ground Floor	105.20
Established Grade	105.05
Lot Area (Gross)	11,932.94 m2
Lot Area (Net)	11,854.36 m2
Road Widening Area	78.58 m2

Condominium Tower

		Units						Gross Floor Area	
Floor No.	Storey	**Total Units**	BACH	1B	1B+D	2B	2B+D	**zoning GFA (m2)**	**zoning GFA (sq.ft.)**
-2	Parking Level 2	**0**	0	0	0	0	0	**0.00 m2**	**0.00 sq.ft.**
-1	Parking Level 1	**0**	0	0	0	0	0	**0.00 m2**	**0.00 sq.ft.**
1	Lobby/Amenity/Residential	**19**	0	5	14	0	0	**2,682.68 m2**	**28,876.37 sq.ft.**
2	Residential	**30**	1	8	17	2	2	**2,461.33 m2**	**26,493.76 sq.ft.**
3	Residential	**34**	1	12	15	0	6	**2,511.36 m2**	**27,032.28 sq.ft.**
4	Residential	**34**	1	12	15	0	6	**2,513.51 m2**	**27,055.42 sq.ft.**
5	Residential	**33**	1	17	11	1	3	**2,288.66 m2**	**24,635.14 sq.ft.**
6	Residential	**33**	1	17	11	1	3	**2,288.66 m2**	**24,635.14 sq.ft.**
7	Residential	**27**	1	22	3	1	0	**1,709.01 m2**	**18,395.78 sq.ft.**
8	Residential	**18**	0	18	0	0	0	**1,222.32 m2**	**13,157.05 sq.ft.**
9	Residential	**17**	0	11	0	4	2	**1,222.32 m2**	**13,157.05 sq.ft.**
10	Residential	**17**	0	11	2	2	2	**1,222.32 m2**	**13,157.05 sq.ft.**
	Mechanical	**0**	0	0	0	0	0	**0.00 m2**	**0.00 sq.ft.**
	Totals	**262**	6	133	88	11	24	**20,122.17 m2**	**216,595.04 sq.ft.**

81m2 of the GFA this is non-residential space at level 1

Minimum Condo Setbacks Provided

Front Yard (m) *	Side Yard (m)	Rear Yard (m)	Flankage Side Yard (m) *
Granite Court	NA	Rail Corridor	Whites Road
8.765	NA	29.497	4.119

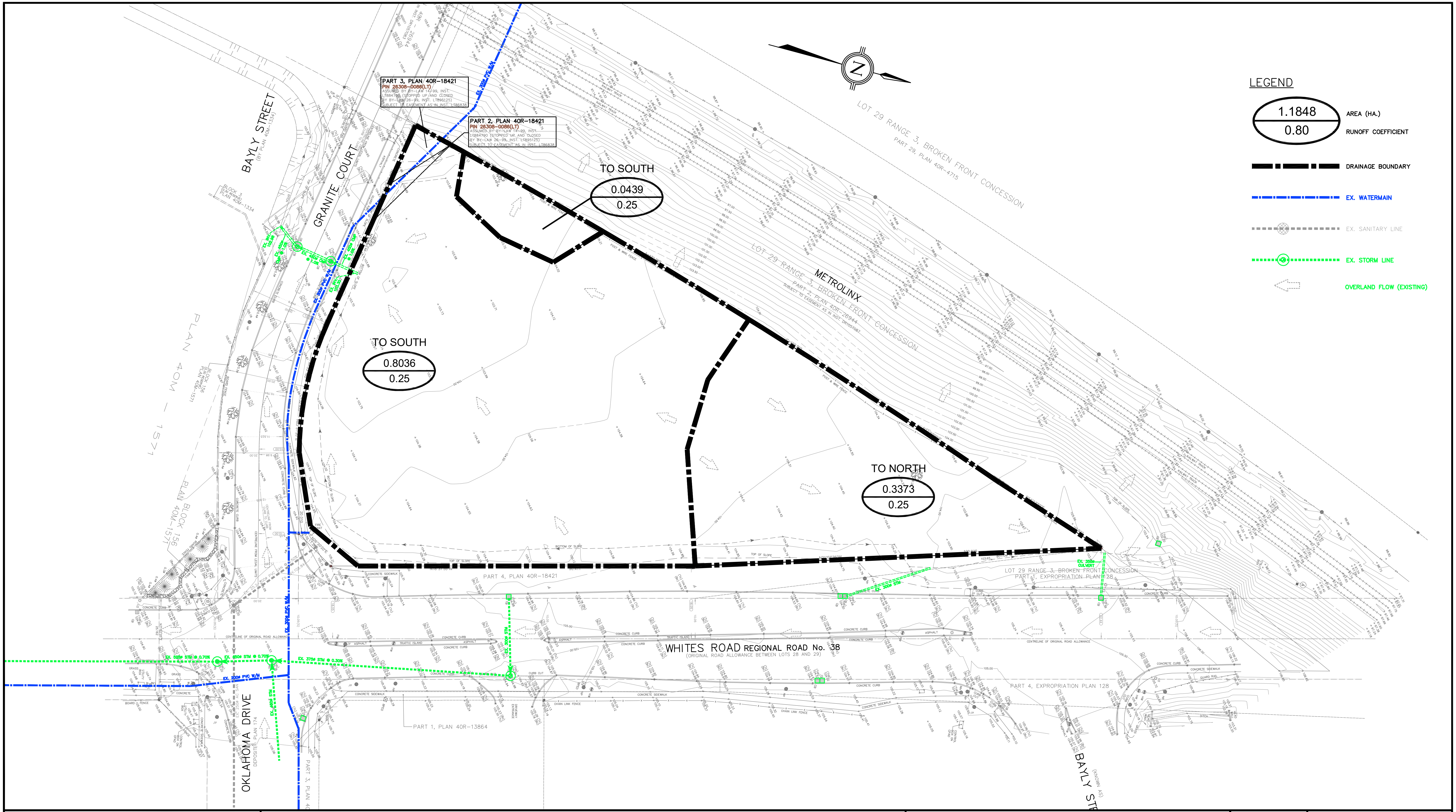
Required Condo Setbacks

Front Yard * (m)	Side Yard (m)	Rear Yard (m)	Flankage Side Yard * (m)
Granite Court	NA	Rail Corridor	Whites Road
3.000	NA	7.500	3.000

** Refer to A-030 for Build Within Limits*

Maximum as Per Zoning

Provided



MASONGSONG ASSOCIATES ENGINEERING LIMITED
Consulting Engineers • Planners • Project Managers

PROJECT:

PROPOSED 12-STOREY RESIDENTIAL DEVELOPMENT
720 GRANITE COURT, PICKERING

DWG. TITLE:

PRE-DEVELOPMENT CONDITIONS

DWG. No:	**02**
DATE:	**OCTOBER 2022**
PROJECT No.	**22-104**
SCALE:	**NTS**

FILE NAME: G:\projects\22\104\DESIGN\FIGURES\22104-SERVICING.dwg_PRE PRINTED ON: Wednesday 04/19/2023

Appendix B

Watermain Analysis:

Hydrant Flow Test •

FUS Fire Demand Calculation •

HYDRATEST

7-325 Nantucket Blvd, Scarborough ON M1P 4V5

JOB NO. ______________________ DATE NOVEMBER 3, 2022

LOCATION 720 GRANITE COURT, PICKERING

TEST DATA

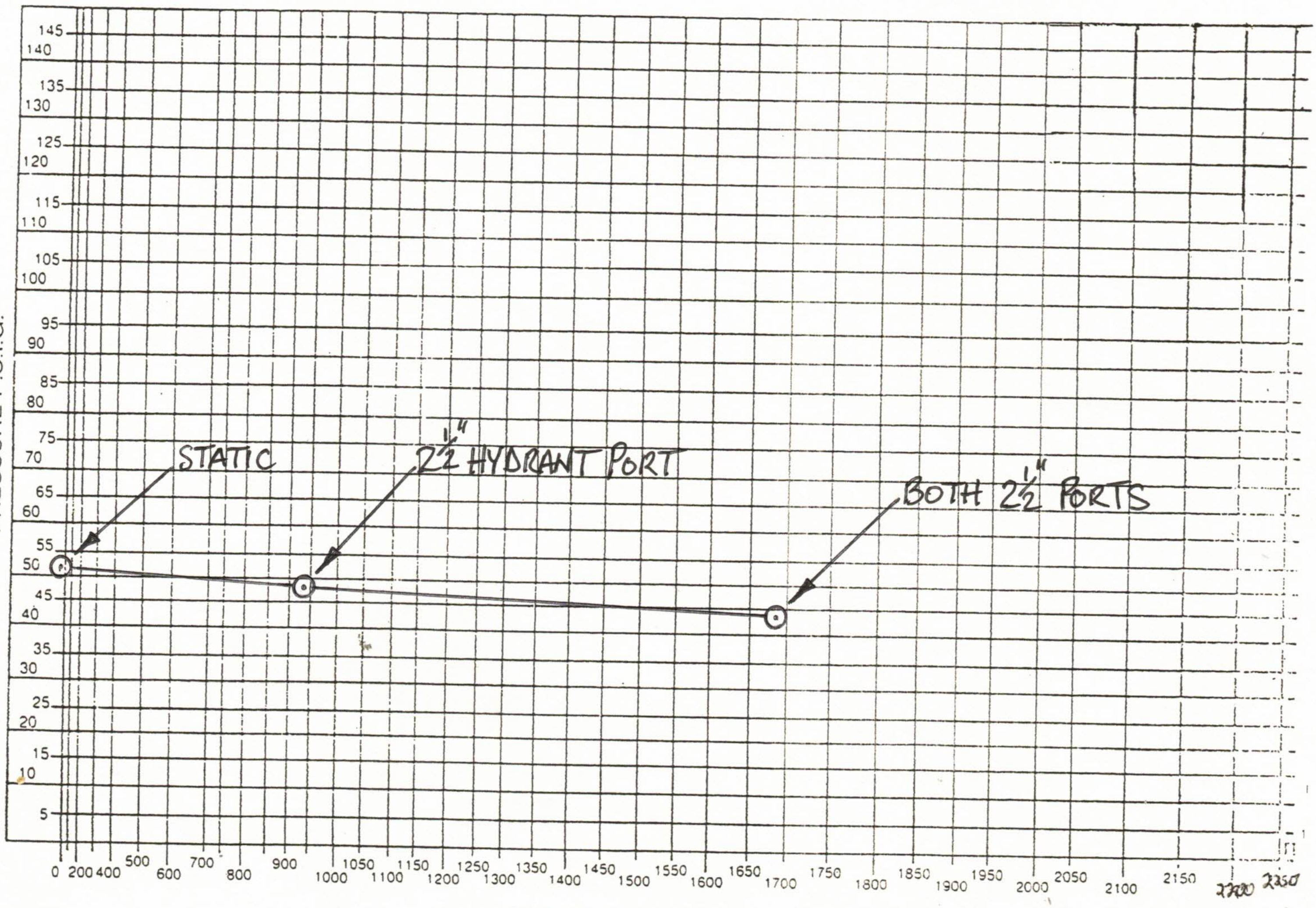
TIME OF TEST 11:10 A.M.

LOCATION OF TEST (FLOW) HYD. @ NW CORNER WHITES RD./GRANITE CRT.

(RESIDUAL) HYD. @ 750 OKLAHOMA DR. (UNIT #3)

MAIN SIZE 12"-300mm STATIC PRESSURE 52 P.S.I.

NUMBER OF OUTLETS & ORIFICE SIZE	PITOT PRESSURE	FLOW (U.S.G.P.M.)	RESIDUAL PRESSURE
(#1) 2½" HYDRANT PORT	31	935	48
(#2) 2×2½" HYDRANT PORTS	25	1679	44



COMMENTS HYDRANT RATED CLASS AA - LIGHT BLUE

Authorized Signature ______________________ Hydratest Ltd. Signature

Table F1 Available Fire Flow Calculations

Project: **720 Granite Court**
Client: **1334281 Ontario Limited**

Outlet diameter: **2.5** in, one port
Static pressure: **52** psi
Resid. pressure: **48** psi, one port

Location: **720 Granite Court, Pickering**
Date of Test: **03-Nov-22**
Operator: **Hydratest**

- **Observed Flow** $Q_F = 29.83 \times C \times (d^2) \times (p^{0.5})$

where
$C =$ **0.90** Coefficient
$d =$ **2.50** in, Outlet diameter
$p =$ **31.00** psi, Pitot Pressure

⇨ $Q_F =$ **918** USGPM
3,474 L/min

- **Available Flow** $Q_R = Q_F \times (h_R^{0.54}) / (h_F^{0.54})$

where
$h_F =$ 4.00 psi, Pressure difference, static to measured residual
$h_R =$ 32.00 psi, Pressure difference, static to required residual
Required = **20.00** psi

⇨ $Q_F =$ **2,821** USGPM
10,677 L/min

Table F2 Required Fire Flow Calculations

Project: **720 Granite Court**
Client: **1334281 Ontario Limited**

- **Base Flow** F_B = 220 x C_C x $A^{0.5}$

where C_C = 0.60 from Table F3
A = 3547.5 m^2 from Table F3
⇨ F_B = 7,862 L/min
8,000 L/min rounded to nearest 1,000 L/min

- **Occupancy Factor** C_O = **-15%** from Table F3

F_O = F_B + (F_B x C_O)
= 6,800 L/min

- **Sprinkler Factor** C_S = **-30%** from Table F3

f_S = F_O x C_S
= -2,040 L/min

- **Exposure Factor** C_E = **20%** from Table F3

f_E = F_O x C_E
= 1,360 L/min

- **Total Required Flow**

F = F_O + f_S + f_E
= 6,120 L/min
= **7,000** L/min rounded to nearest 1,000 L/min

Table F3 Building Area and Coefficients

Project: **720 Granite Court**
Client: **1334281 Ontario Limited**

- **Area of Building** **3,548** m^2

The total floor area in square metres (including all storeys, but excluding basements at least 50 percent below grade) in the building being considered.

For fire-resistive buildings, consider the two largest adjoining floors plus 50 percent of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected.

If the vertical openings and exterior vertical communications are property protected (one hour rating), consider only the area of the largest floor plus 25 percent of each of the two immediately adjoining floors.

- **Construction Coefficient** floors. **0.60** ⇔

1.50	Wood Frame
1.00	Ordinary Construction
0.80	Non-Combustible
0.70	Fire Resistive (<2 hrs)
0.60	**Fire Resistive (>2 hrs)**

- **Occupancy Coefficient** C_O = **-15%** ⇔

-25%	Non-Combustible
-15%	**Limited Combustible**
0%	Combustible
15%	Free Burning
25%	Rapid Burning

- **Sprinkler Coefficient** C_S = **-30%** ⇔

-30%	**NFPA 13 standard**
-40%	+ fully supervised
-50%	+ std water supply

- **Exposure Coefficient** C_E = **20%** ⇔

N	> 30m	5%
S	> 30m	5%
E	> 30m	5%
W	> 30m	5%

25%	0 - 3m separation
20%	3.1- 10m separation
15%	10.1- 20m separation
10%	20.1- 30m separation
5%	> 30m separation
	percentages counted per side, max 75%

Appendix C

SWM Calculations:

Fig. 03 – Post Development Drainage Plan •

Table C1 - On-site Storage Calculator •

Irrigation Calculations •

Stormceptor EFO Sizing Reports •

LEGEND

0.7092 AREA (HA.)
0.80 RUNOFF COEFFICIENT

DRAINAGE BOUNDARY

EX. STORM LINE

PROPOSED STORM LINE

OVERLAND FLOW (EXISTING)

OVERLAND FLOW (PROPOSED)

🟦 ROOFTOP AREA R=0.90

🟫 ASPHALT/CONC AREA R=0.90

▨ RIP RAP AREA R=0.70

🟩 LANDSCAPE AREA

▨ UNCONTROLLED AREA R=0.25

SITE AREA (CONTROLLED AREA)		
DESCRIPTION	AREA (Ha.)	RUNOFF COEFF.
IMPERVIOUS ROOFTOP	0.3001	0.95
ASPHALT/CONC.	0.3364	0.95
GREEN ROOF AREAS	0.0000	0.50
LANDSCAPED AREA	0.2736	0.25
	0.9101	0.70
100 YR FACTOR (1.25) –		0.88

UNCONTROLLED #1		
DESCRIPTION	AREA (Ha.)	RUNOFF COEFF.
ASPHALT/CONC.	0.0323	0.90
RIP RAP	0.0122	0.70
LANDSCAPED AREA	0.2093	0.25
	0.2538	0.35

UNCONTROLLED #2		
DESCRIPTION	AREA (Ha.)	RUNOFF COEFF.
LANDSCAPED AREA	0.0209	0.25

MASONGSONG ASSOCIATES ENGINEERING LIMITED
Consulting Engineers • Planners • Project Managers

PROJECT:
PROPOSED 10-STOREY RESIDENTIAL DEVELOPMENT
720 GRANITE COURT, PICKERING

DWG. TITLE:
POST-DEVELOPMENT CONDITIONS

Figure No: **03**

DATE: **OCTOBER 2022**

PROJECT No. **22-104**

SCALE: **NTS**

FILE NAME: G:\projects\22\104\DESIGN\FIGURES\22104-POST.dwg_POST PRINTED ON: Tuesday 07/23/2024

Table C1

On-Site Storage Calculator

Pickering 2-Year

Project: 720 Granite Court
Project No.: 22-104
By: KL
Date: 19-Apr-23

Location: **720 Granite Court**

A = 0.9101 ha
Composite C = 0.88
$i\text{-}2y_{(Allowable)}$ = 715.08 mm/hr
$Q_{Allowable}$ = 0.0433 m^3/s
Q_{Actual} = 0.0433 m^3/s

$$i_{100} = 2096.425/(T + 6.485)^{0.863}$$

t_c (min)	i_{100} (mm/hr)	Q_{100} (m^3/s)	Q_{stored} (m^3/s)	Peak Volume (m^3)	
10	186.695	0.4153	0.372	223.222	
11	177.443	0.3948	0.351	231.961	
12	169.127	0.3763	0.333	239.728	
13	161.610	0.3595	0.316	246.661	
14	154.778	0.3443	0.301	252.868	
15	148.541	0.3305	0.287	258.442	
16	142.822	0.3177	0.274	263.458	
17	137.558	0.3060	0.263	267.979	
18	132.696	0.2952	0.252	272.060	
19	128.190	0.2852	0.242	275.748	
20	124.002	0.2759	0.233	279.080	
21	120.099	0.2672	0.224	282.093	
22	116.452	0.2591	0.216	284.815	
23	113.035	0.2515	0.208	287.272	
24	109.828	0.2443	0.201	289.488	
25	106.811	0.2376	0.194	291.482	
26	103.967	0.2313	0.188	293.272	
27	101.282	0.2253	0.182	294.875	
28	98.743	0.2197	0.176	296.304	
29	96.336	0.2143	0.171	297.572	
30	94.053	0.2092	0.166	298.691	
31	91.884	0.2044	0.161	299.671	
32	89.820	0.1998	0.157	300.521	
33	87.853	0.1954	0.152	301.250	
34	85.977	0.1913	0.148	301.865	
35	84.186	0.1873	0.144	302.374	
36	82.473	0.1835	0.140	302.782	
37	80.834	0.1798	0.137	303.096	
38	79.263	0.1763	0.133	303.321	
39	77.757	0.1730	0.130	303.463	
40	76.311	0.1698	0.126	303.525	***

41	74.922	0.1667	0.123	303.512
42	73.587	0.1637	0.120	303.428
43	72.302	0.1608	0.118	303.276
44	71.064	0.1581	0.115	303.060
45	69.871	0.1554	0.112	302.783
46	68.721	0.1529	0.110	302.448
47	67.611	0.1504	0.107	302.058
48	66.538	0.1480	0.105	301.614
49	65.502	0.1457	0.102	301.121
50	64.500	0.1435	0.100	300.579
51	63.531	0.1413	0.098	299.990
52	62.592	0.1392	0.096	299.358
53	61.683	0.1372	0.094	298.683
54	60.802	0.1353	0.092	297.968

Irrigation Requirements

General Information: All measures are in Metric

Refer to the 'Water Efficiency' section of the LEED Canada-NC 1.0 Document.

Using the chart below please note:
Species Factor (Ks), Plant water needs is determined as follows:
North and East of the site will be shaded so enter the 'Low'
South and West of the site will be sunny so enter the 'High or Avg' based on building/other shade
Density Factor (Kd), Plant grouping spacing is determined as follows: Sparsely planted enter 'Low'
Densely Planted enter 'High'
Microclimate Factor (Kmc), Plant grouping exposure to wind, heat, reflected light: NE are shaded so enter 'Low'
SW are hot and gets the summer wind so enter 'Ave or High'

Kl=KsxKdxKmc
Etl= KlxETo (for Toronto and region)
IE can either be Rotor or Spray Heads
TPWA (L)=Area (sqm) x (Etl/IE)

May

Landscape	Area	Species Factor	Density Factor	Microclimate	Kl	ETl	IE	$TPWA$
Type	M^2	Ks	Kd	Kmc			Spray (.450) Rotors (.550)	(LITERS)
Shrubs/Perennials	835	0.5	1	1.3	0.65	**66.04**	0.389	**141,757**
Trees	2515	0.5	1	1.4	0.70	**71.12**	0.389	**459,812**
Mixed	122	0.5	1.3	1.4	0.91	**92.46**	0.389	**28,996**
Turfgrass	2343	0.7	1	1.2	0.84	**85.34**	0.389	**514,039**
							Subtotal [L]	1,144,604

Water Required [L] from Design Case for May: 1,144,604

June

Landscape	Area	Species Factor	Density Factor	Microclimate	Kl	ETl	IE	$TPWA$
Type	M^2	Ks	Kd	Kmc			Spray (.450) Rotors (.550)	(LITERS)
Shrubs/Perennials	835	0.5	1	1.3	0.65	**81.19**	0.389	**174,266**
Trees	2515	0.5	1	1.4	0.70	**87.43**	0.389	**565,261**
Mixed	122	0.5	1.3	1.4	0.91	**113.66**	0.389	**35,646**
Turfgrass	2343	0.7	1	1.2	0.84	**104.92**	0.389	**631,923**
							Subtotal [L]	1,407,096

Water Required [L] from Design Case for June: 1,407,096

July

Landscape	Area	Species Factor	Density Factor	Microclimate	Kl	ETl	IE	$TPWA$
Type	M^2	Ks	Kd	Kmc			Spray (.450) Rotors (.550)	(LITERS)
Shrubs/Perennials	835	0.5	1	1.3	0.65	**89.83**	0.389	**192,823**
Trees	2515	0.5	1	1.4	0.70	**96.74**	0.389	**625,453**
Mixed	122	0.5	1.3	1.4	0.91	**125.76**	0.389	**39,442**
Turfgrass	2343	0.7	1	1.2	0.84	**116.09**	0.389	**699,214**
							Subtotal [L]	1,556,931

Water Required [L] from Design Case for July: 1,556,931

August

Landscape	Area	Species Factor	Density Factor	Microclimate	Kl	ETl	IE	$TPWA$
Type	M^2	Ks	Kd	Kmc			Spray (.450) Rotors (.550)	(LITERS)
Shrubs/Perennials	835	0.5	1	1.3	0.65	**71.76**	0.389	**154,035**
Trees	2515	0.5	1	1.4	0.70	**77.28**	0.389	**499,638**
Mixed	122	0.5	1.3	1.4	0.91	**100.46**	0.389	**31,508**
Turfgrass	2343	0.7	1	1.2	0.84	**92.74**	0.389	**558,562**
							Subtotal [L]	1,243,743

Water Required [L] from Design Case for August: 1,243,743

September

Landscape	Area	Species Factor	Density Factor	Microclimate	Kl	ETl	IE	$TPWA$
Type	M^2	Ks	Kd	Kmc			Spray (.450) Rotors (.550)	(LITERS)
Shrubs/Perennials	835	0.5	1	1.3	0.65	**46.54**	0.389	**99,899**
Trees	2515	0.5	1	1.4	0.70	**96.74**	0.389	**625,453**
Mixed	122	0.5	1.3	1.4	0.91	**125.76**	0.389	**39,442**
Turfgrass	2343	0.7	1	1.2	0.84	**116.09**	0.389	**699,214**
							Subtotal [L]	1,464,008

Water Required [L] from Design Case for September: 1,464,008

Total Water Required [L] from Design Case for Growing Season: 6,816,382

Average Daily Water Use [L] (60 Days) 44,552

72 Hour Requirement (m3) 134

Stormceptor® EF Sizing Report

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

07/04/2024

Province:	Ontario
City:	Pickering
Nearest Rainfall Station:	TORONTO INTL AP
Climate Station Id:	6158731
Years of Rainfall Data:	20

Site Name:	720 Granite Crt.

Drainage Area (ha):	0.3616
Runoff Coefficient 'c':	0.90

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0
Required Water Quality Runoff Volume Capture (%):	90.0
Estimated Water Quality Flow Rate (L/s):	10.08
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	

Project Name:	720 Granite Crt.
Project Number:	-
Designer Name:	Brandon O'Leary
Designer Company:	Rinker Pipe
Designer Email:	brandon.oleary@RinkerPipe.com
Designer Phone:	905-630-0359
EOR Name:	Ken Lo
EOR Company:	Masongsong Associates Engineering Ltd.
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	88
EFO6	95
EFO8	98
EFO10	99
EFO12	100

Recommended Stormceptor EFO Model: **EFO4**

Estimated Net Annual Sediment (TSS) Load Reduction (%): **88**

Water Quality Runoff Volume Capture (%): **> 90**

THIRD-PARTY TESTING AND VERIFICATION

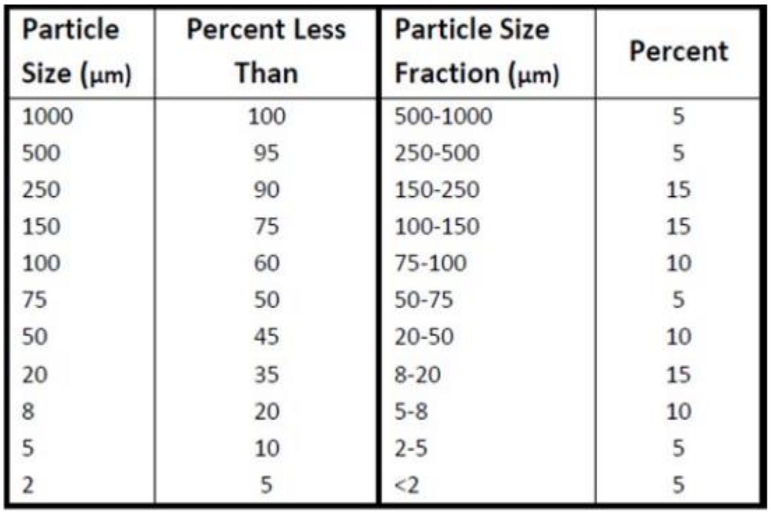
►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.



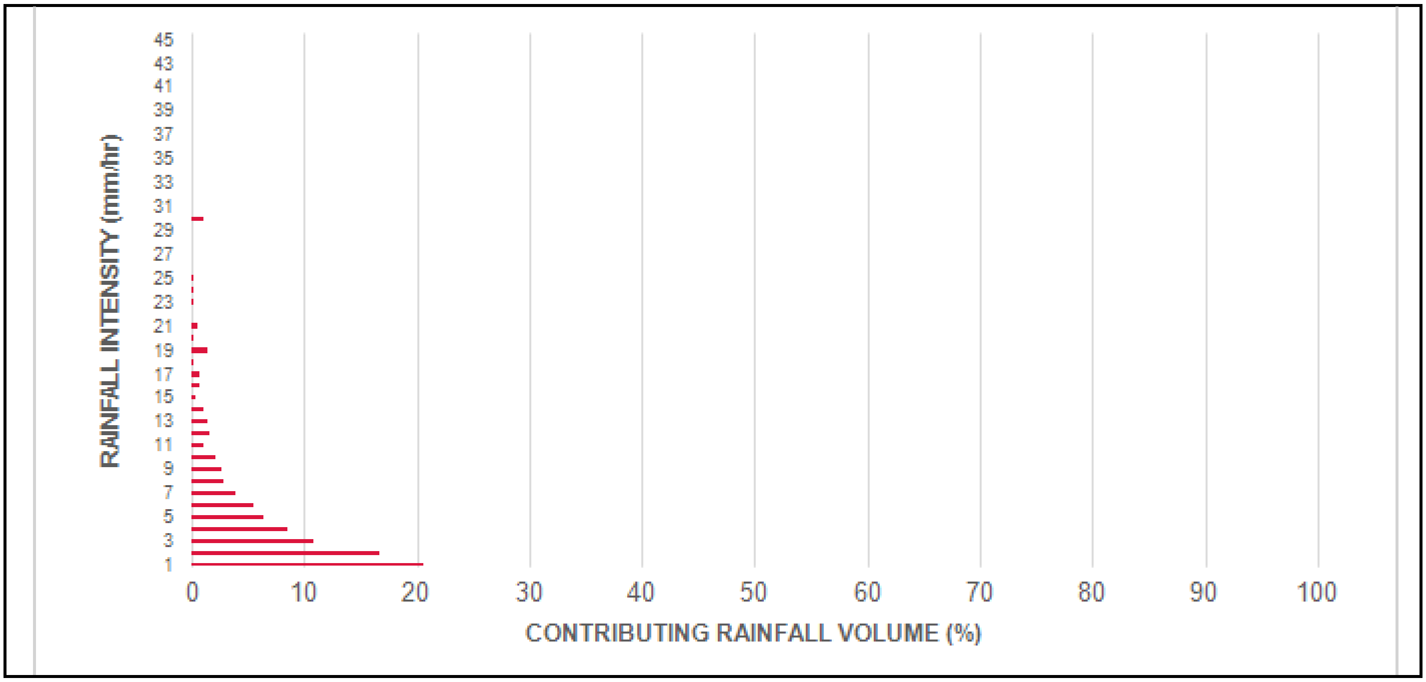
Particle Size (μm)	Percent Less Than	Particle Size Fraction (μm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Stormceptor® EF Sizing Report

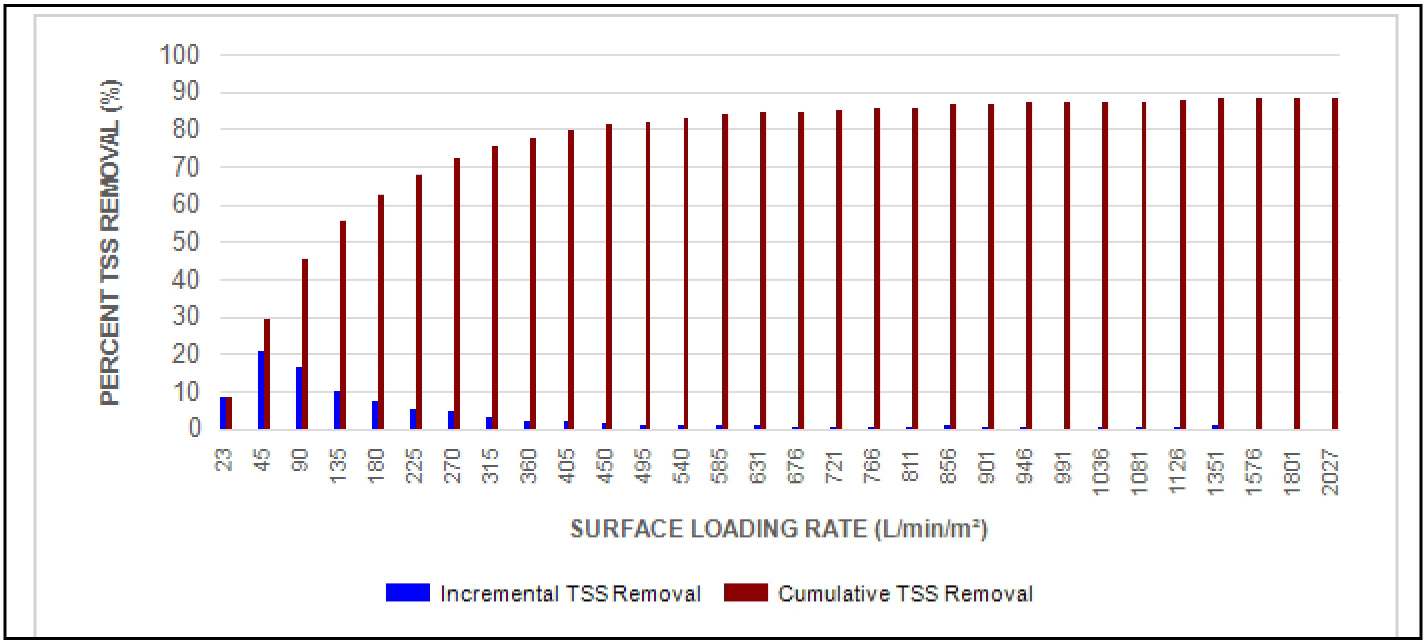
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.5	8.5	0.45	27.0	23.0	100	8.5	8.5
1.00	20.6	29.1	0.90	54.0	45.0	100	20.6	29.1
2.00	16.8	45.9	1.80	108.0	90.0	97	16.3	45.5
3.00	10.8	56.7	2.70	162.0	135.0	92	9.9	55.4
4.00	8.5	65.2	3.60	216.0	180.0	86	7.2	62.6
5.00	6.4	71.6	4.50	270.0	225.0	82	5.3	67.9
6.00	5.5	77.0	5.40	324.0	270.0	80	4.4	72.2
7.00	3.9	81.0	6.31	378.0	315.0	78	3.1	75.3
8.00	2.9	83.9	7.21	432.0	360.0	76	2.2	77.5
9.00	2.7	86.5	8.11	486.0	405.0	74	2.0	79.5
10.00	2.2	88.7	9.01	540.0	450.0	72	1.6	81.0
11.00	1.0	89.7	9.91	594.0	495.0	70	0.7	81.7
12.00	1.7	91.3	10.81	649.0	540.0	67	1.1	82.8
13.00	1.4	92.8	11.71	703.0	585.0	66	0.9	83.8
14.00	1.0	93.7	12.61	757.0	631.0	64	0.6	84.4
15.00	0.3	94.0	13.51	811.0	676.0	64	0.2	84.6
16.00	0.8	94.8	14.41	865.0	721.0	64	0.5	85.1
17.00	0.8	95.7	15.31	919.0	766.0	63	0.5	85.6
18.00	0.2	95.8	16.21	973.0	811.0	63	0.1	85.7
19.00	1.5	97.3	17.11	1027.0	856.0	63	0.9	86.7
20.00	0.2	97.5	18.01	1081.0	901.0	62	0.1	86.8
21.00	0.6	98.2	18.92	1135.0	946.0	62	0.4	87.2
22.00	0.0	98.2	19.82	1189.0	991.0	62	0.0	87.2
23.00	0.2	98.4	20.72	1243.0	1036.0	61	0.1	87.3
24.00	0.2	98.6	21.62	1297.0	1081.0	60	0.1	87.4
25.00	0.2	98.9	22.52	1351.0	1126.0	59	0.1	87.6
30.00	1.1	100.0	27.02	1621.0	1351.0	53	0.6	88.2
35.00	0.0	100.0	31.53	1892.0	1576.0	47	0.0	88.2
40.00	0.0	100.0	36.03	2162.0	1801.0	41	0.0	88.2
45.00	0.0	100.0	40.53	2432.0	2027.0	36	0.0	88.2
Estimated Net Annual Sediment (TSS) Load Reduction =								**88 %**

Climate Station ID: 6158731 *Years of Rainfall Data*: 20

RAINFALL DATA FROM TORONTO INTL AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

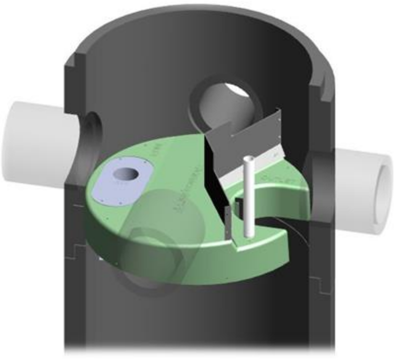
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

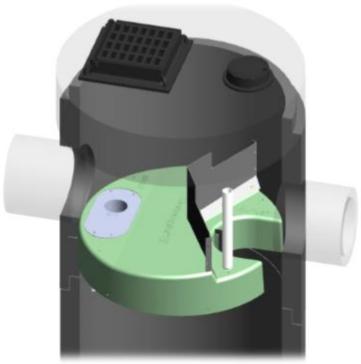
DESIGN FLEXIBILITY

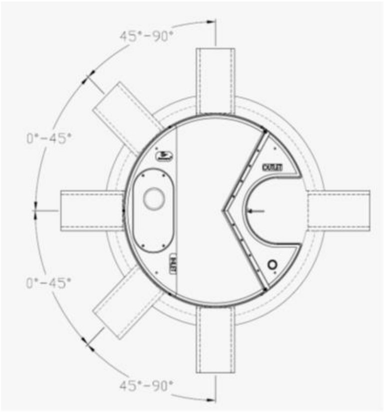
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft³)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD PERFORMANCE SPECIFICATION FOR “OIL GRIT SEPARATOR” (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program’s **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

◆ Verification Statement ◆ Verification Statement ◆ Verification Statement ◆

VERIFICATION STATEMENT

GLOBE Performance Solutions

Verifies the performance of

Stormceptor® EF and EFO Oil-Grit Separators

Developed by Imbrium Systems, Inc.,
Whitby, Ontario, Canada

Registration: GPS-ETV_VR2023-11-15_Imbrium-SC

In accordance with

ISO 14034:2016

**Environmental management —
Environmental technology verification (ETV)**

John D. Wiebe, PhD
Executive Chairman
GLOBE Performance Solutions

November 15, 2023
Vancouver, BC, Canada

GLOBE
PERFORMANCE
SOLUTIONS

Verification Body
GLOBE Performance Solutions
404 – 999 Canada Place | Vancouver, B.C | Canada |V6C 3E2

Technology description and application

The Stormceptor® EF and EFO are treatment devices designed to remove oil, sediment, trash, debris, and pollutants attached to particulates from Stormwater and snowmelt runoff. The device takes the place of a conventional manhole within a storm drain system and offers design flexibility that works with various site constraints. The EFO is designed with a shorter bypass weir height, which accepts lower surface loading rate into the sump, thereby reducing re-entrainment of captured free floating light liquids.

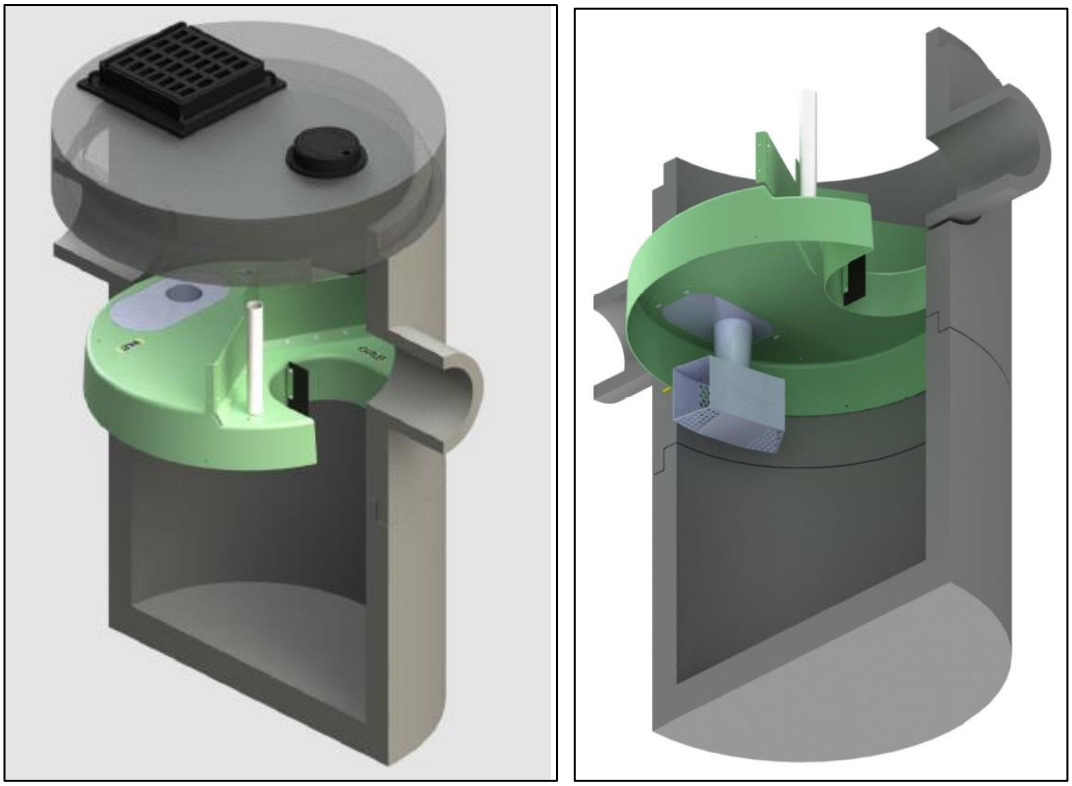


Figure 1. Graphic of typical inline Stormceptor® unit and core components.

Stormwater and snowmelt runoff enters the Stormceptor® EF/EFO's upper chamber through the inlet pipe(s) or a surface inlet grate. An insert divides the unit into lower and upper chambers and incorporates a weir to reduce influent velocity and separate influent (untreated) from effluent (treated) flows. Influent water ponds upstream of the insert's weir providing driving head for the water flowing downwards into the drop pipe where a vortex pulls the water into the lower chamber. The water diffuses at lower velocities in multiple directions through the drop pipe outlet openings. Oil and other floatables rise up and are trapped beneath the insert, while sediments undergo gravitational settling to the sump's bottom. Water from the sump can exit by flowing upward to the outlet riser onto the top side of the insert and downstream of the weir, where it discharges through the outlet pipe.

Maximum flow rate into the lower chamber is a function of weir height and drop pipe orifice diameter. The Stormceptor® EF and EFO are designed to allow a surface loading rate of 1135 L/min/m^2 (27.9 gal/min/ft^2) and 535 L/min/m^2 (13.1 gal/min/ft^2) into the lower chamber, respectively. When prescribed surface loading rates are exceeded, ponding water can overtop the weir height and bypass the lower treatment chamber, exiting directly through the outlet pipe. Hydraulic testing and scour testing demonstrate that the internal bypass effectively prevents scour at all bypass flow rates. Increasing the bypass flow rate does not increase the orifice-controlled flow rate into the lower treatment chamber where sediment is stored. This internal bypass feature allows for in-line installation, avoiding the cost of additional bypass structures. During bypass, treatment continues in the lower chamber at the maximum flow rate. The Stormceptor® EFO's lower design surface loading rate is favorable for minimizing re-entrainment and washout of captured light liquids. Inspection of Stormceptor® EF and EFO devices is performed from grade by inserting a sediment probe through the outlet riser and an oil dipstick through the oil inspection pipe. The unit can be maintained by using a vacuum hose through the outlet riser.

Performance conditions

The data and results published in this Technology Fact Sheet were obtained from the testing program conducted on the Imbrium Systems Inc.'s Stormceptor® EF4 and EFO4 Oil-Grit Separators, in accordance with the Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014). The Procedure was prepared by the Toronto and Region Conservation Authority (TRCA) for Environment Canada's Environmental Technology Verification (ETV) Program. A copy of the Procedure may be accessed on the Canadian ETV website at www.etvcanada.ca.

Performance claim(s)

Capture test [a]:

During the capture test, the Stormceptor® EF4 OGS device, with a false floor set to 50% of the manufacturer's recommended maximum sediment storage depth and a constant influent test sediment concentration of 200 mg/L, removes 70, 64, 54, 48, 46, 44, and 49 percent of influent sediment by mass at surface loading rates of 40, 80, 200, 400, 600, 1000, and 1400 L/min/m^2, respectively.

Stormceptor® EFO4, with a false floor set to 50% of the manufacturer's recommended maximum sediment storage depth and a constant influent test sediment concentration of 200 mg/L, removes 70, 64, 54, 48, 42, 40, and 34 percent of influent sediment by mass at surface loading rates of 40, 80, 200, 400, 600, 1000, and 1400 L/min/m^2, respectively.

Scour test [a]:

During the scour test, the Stormceptor® EF4 and Stormceptor® EFO4 OGS devices, with 10.2 cm (4 inches) of test sediment pre-loaded onto a false floor reaching 50% of the manufacturer's recommended maximum sediment storage depth, generate corrected effluent concentrations of 4.6, 0.7, 0, 0.2, and 0.4 mg/L at 5-minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2, respectively.

Light liquid re-entrainment test[a]:

During the light liquid re-entrainment test, the Stormceptor® EFO4 OGS device with surrogate low-density polyethylene beads preloaded within the lower chamber oil collection zone, representing a floating light liquid volume equal to a depth of 50.8 mm over the sedimentation area, retained 100, 99.5, 99.8, 99.8, and 99.9 percent of loaded beads by mass during the 5-minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2.

---

[a] The claim can be applied to other units smaller or larger than the tested unit as long as the untested units meet the scaling rule specified in the Procedure for Laboratory of Testing of Oil Grit Separators (Version 3.0, June 2014)

Performance results

The test sediment consisted of ground silica (1 – 1000 micron) with a specific gravity of 2.65, uniformly mixed to meet the particle size distribution specified in the testing procedure. The *Procedure for Laboratory Testing of Oil Grit Separators* requires that the three sample average of the test sediment particle size distribution (PSD) meet the specified PSD percent less than values within a boundary threshold of 6%. The comparison of the average test sediment PSD to the CETV specified PSD in Figure 2 indicates that the test sediment used for the capture and scour tests met this condition.

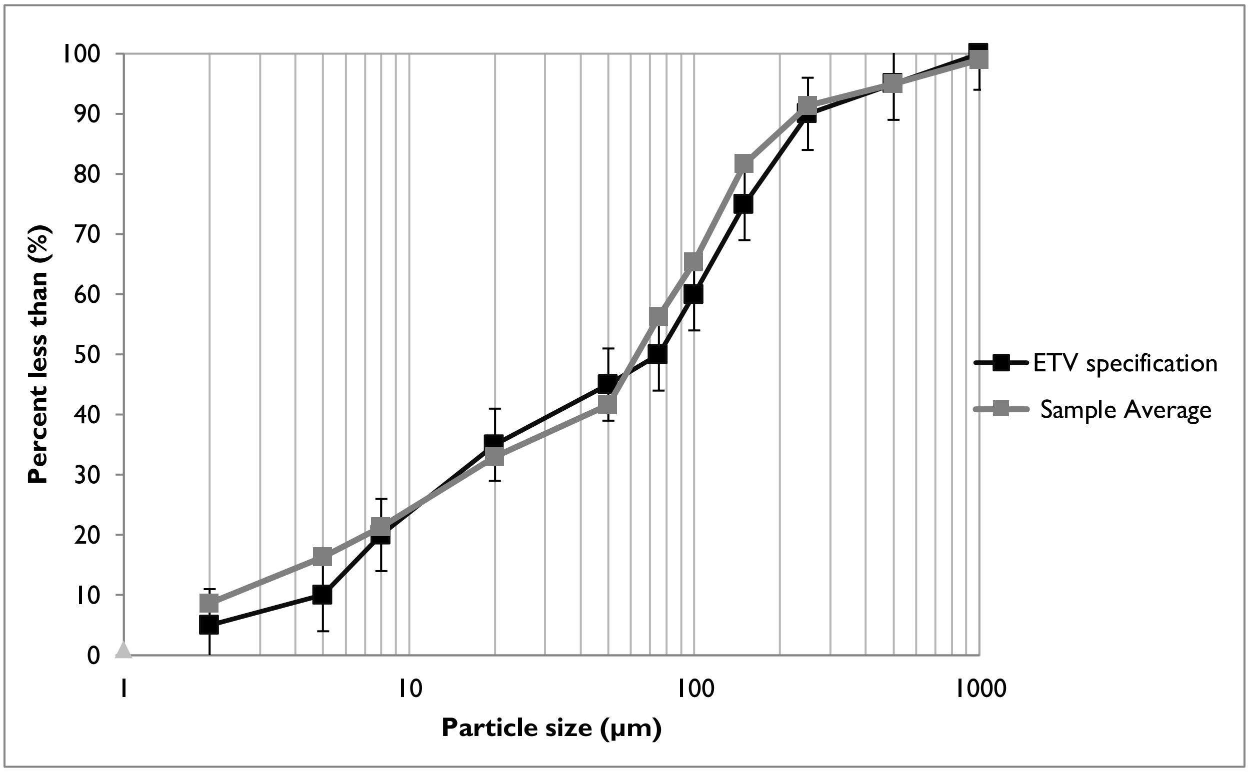


Figure 2. The three sample average particle size distribution (PSD) of the test sediment used for the capture and scour test compared to the specified PSD.

The capacity of the device to retain sediment was determined at seven surface loading rates using the modified mass balance method. This method involved measuring the mass and particle size distribution of the injected and retained sediment for each test run. Performance was evaluated with a false floor simulating the technology filled to 50% of the manufacturer's recommended maximum sediment storage depth. The test was carried out with clean water that maintained a sediment concentration below 20 mg/L. Based on these conditions, removal efficiencies for individual particle size classes and for the test sediment as a whole were determined for each of the tested surface loading rates (Table 1). Since the EF and EFO models are identical except for the weir height, which bypasses flows from the EFO model at a surface loading rate of 535 L/min/m^2 (13.1 gpm/ft^2), sediment capture tests at surface loading rates from 40 to 400 L/min/m^2 were only performed on the EF unit. Surface loading rates of 600, 1000, and 1400 L/min/m^2 were tested on both units separately. Results for the EFO model at these higher flow rates are presented in Table 2.

In some instances, the removal efficiencies were above 100% for certain particle size fractions. These discrepancies are not unique to any one test laboratory and may be attributed to errors relating to the blending of sediment, collection of representative samples for laboratory submission, and laboratory analysis of PSD. Due to these errors, caution should be exercised in applying the removal efficiencies by particle size fraction for the purposes of sizing the tested device (see Bulletin # CETV 2016-11-0001). The results for "all particle sizes by mass balance" (see Table 1 and 2) are based on measurements of the total injected and retained sediment mass, and are therefore not subject to blending, sampling or PSD analysis errors.

Table 1. Removal efficiencies (%) of the EF4 at specified surface loading rates

Particle size fraction (µm)	**Surface loading rate (L/min/m^2)**						
	40	80	200	400	600	1000	1400
>500	90	58	58	100*	86	72	100*
250 - 500	100*	100*	100	100*	100*	100*	100*
150 - 250	90	82	26	100*	100*	67	90
105 - 150	100*	100*	100*	100*	100*	100*	100
75 - 105	100*	92	74	82	77	68	76
53 - 75	Undefined [a]	56	100*	72	69	50	80
20 - 53	54	100*	54	33	36	40	31
8 - 20	67	52	25	21	17	20	20
5 – 8	33	29	11	12	9	7	19
<5	13	0	0	0	0	0	4
All particle sizes by mass balance	**70.4**	**63.8**	**53.9**	**47.5**	**46.0**	**43.7**	**49.0**

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[a] An outlier in the feed sample sieve data resulted in a negative removal efficiency for this size fraction.

* Removal efficiencies were calculated to be above 100%. Calculated values ranged between 101 and 171% (average 128%). See text and Bulletin # CETV 2016-11-0001 for more information.

Table 2. Removal efficiencies (%) of the EFO4 at surface loading rates above the bypass rate of 535 L/min/m^2

Particle size fraction (µm)	**Surface loading rate (L/min/m^2)**		
	600	1000	1400
>500	89	83	100*
250 - 500	90	100*	92
150 - 250	90	67	100*
105 - 150	85	92	77
75 - 105	80	71	65
53 - 75	60	31	36
20 - 53	33	43	23
8 - 20	17	23	15
5 – 8	10	3	3
<5	0	0	0
All particle sizes by mass balance	**41.7**	**39.7**	**34.2**

* Removal efficiencies were calculated to be above 100%. Calculated values ranged between 103 and 111% (average 107%). See text and Bulletin # CETV 2016-11-0001 for more information.

Figure 3 compares the particle size distribution (PSD) of the three sample average of the test sediment to the PSD of the sediment retained by the EF4 at each of the tested surface loading rates. Figure 4 shows the same graph for the EFO4 unit at surface loading rates above the bypass rate of 535 L/min/m^2.

As expected, the capture efficiency for fine particles in both units was generally found to decrease as surface loading rates increased.

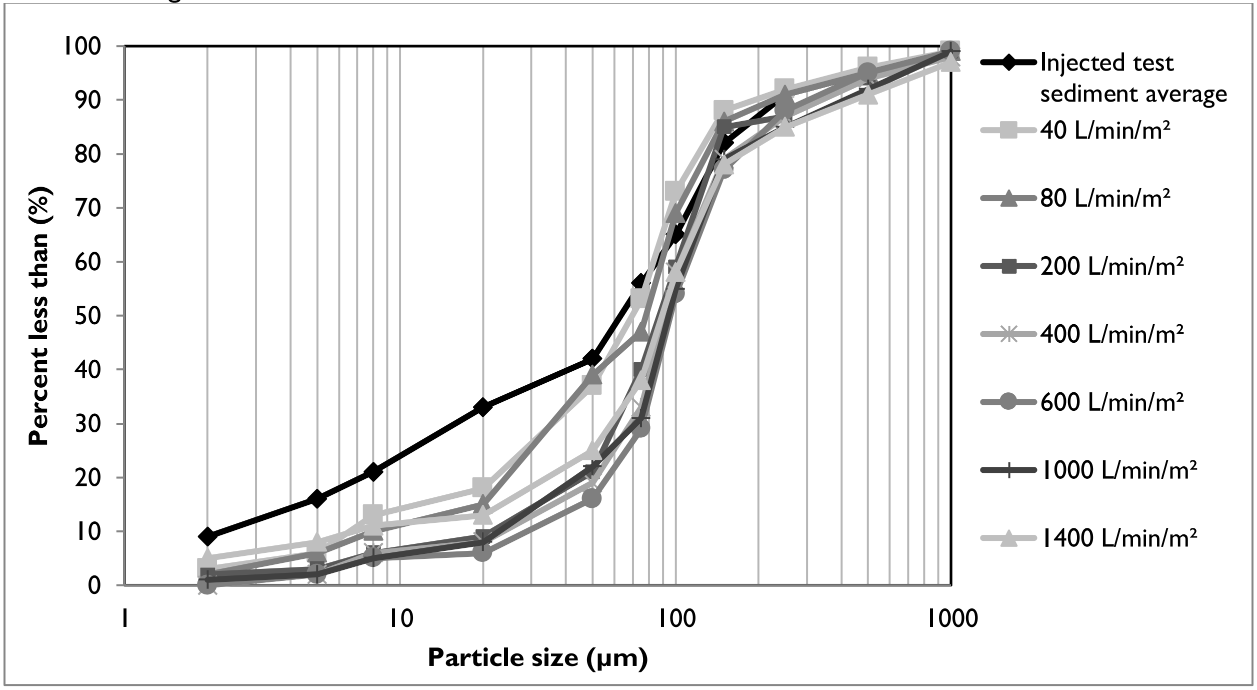

Figure 3. Particle size distribution of sediment retained in the EF4 in relation to the injected test sediment average.

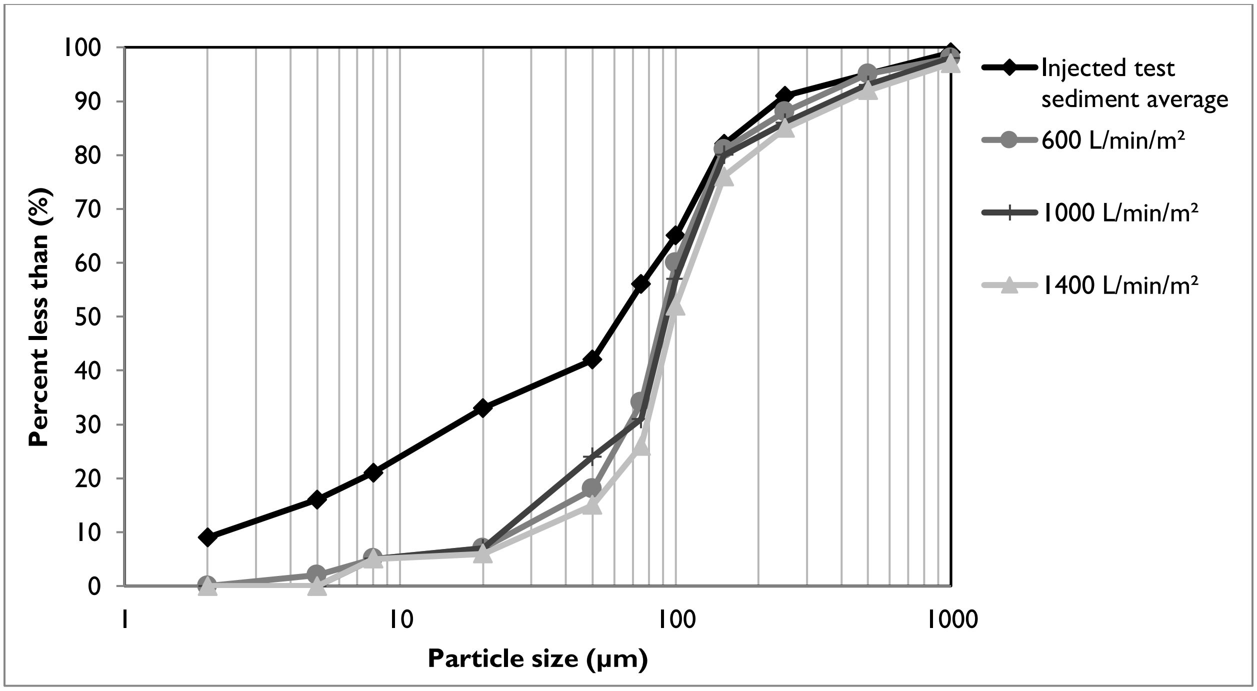

Figure 4. Particle size distribution of sediment retained in the EFO4 in relation to the injected test sediment average at surface loading rates above the bypass rate of 535 L/min/m²

Table 4 shows the results of the sediment scour and re-suspension test for the EF4 unit. The EFO4 was not tested as it was reasonably assumed that scour rates would be lower given that flow bypass occurs at a lower surface loading rate. The scour test involved preloading 10.2 cm of fresh test sediment into the sedimentation sump of the device. The sediment was placed on a false floor to mimic a device filled to 50% of the maximum recommended sediment storage depth. Clean water was run through the device at five surface loading rates over a 30 minute period. Each flow rate was maintained for 5 minutes with a one minute transition time between flow rates. Effluent samples were collected at one minute sampling intervals and analyzed for Suspended Sediment Concentration (SSC) and PSD by recognized methods. The effluent samples were subsequently adjusted based on the background concentration of the influent water. Typically, the smallest 5% of particles captured during the 40 L/min/m² sediment capture test is also used to adjust the concentration, as per the method described in Bulletin # CETV 2016-09-0001. However, since the composites of effluent concentrations were below the Reporting Detection Limit of the Laser Diffraction PSD methodology, this adjustment was not made. Results showed average adjusted effluent sediment concentrations below 5 mg/L at all tested surface loading rates.

It should be noted that the EF4 starts to internally bypass water at 1135 L/min/m², potentially resulting in the dilution of effluent concentrations, which would not normally occur under typical field conditions because the field influent concentration would contain a much higher sediment concentration than during the lab test. Recalculation of effluent concentrations to account for dilution at surface loading rates above the bypass rate showed sediment effluent concentrations to be below 1.6 mg/L.

Table 4. Scour test adjusted effluent sediment concentration.

Run	Surface loading rate (L/min/m²)	Run time (min)	Background sample concentration (mg/L)	Adjusted effluent suspended sediment concentration (mg/L) [a]	Average (mg/L)
1	200	1:00	<RDL	11.9	4.6
		2:00		7.0	
		3:00		4.4	
		4:00		2.2	
		5:00		1.0	
		6:00		1.2	
2	800	7:00	<RDL	1.1	0.7
		8:00		0.9	
		9:00		0.6	
		10:00		1.4	
		11:00		0.1	
		12:00		0	
3	1400	13:00	<RDL	0	0
		14:00		0.1	
		15:00		0	
		16:00		0	
		17:00		0	
		18:00		0	
4	2000	19:00	1.2	0.2	0.2
		20:00		0	
		21:00		0	
		22:00		0.7	
		23:00		0	
		24:00		0.4	

5	2600	25:00	1.6	0.3	0.4
		26:00		0.4	
		27:00		0.7	
		28:00		0.4	
		29:00		0.2	
		30:00		0.4	

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[a] The adjusted effluent suspended sediment concentration represents the actual measured effluent concentration minus the background concentration. For more information see Bulletin # CETV 2016-09-0001.

The results of the light liquid re-entrainment test used to evaluate the unit's capacity to prevent re-entrainment of light liquids are reported in Table 5. The test involved preloading 58.3 L (corresponding to a 5 cm depth over the collection sump area of 1.17m²) of surrogate low-density polyethylene beads within the oil collection skirt and running clean water through the device continuously at five surface loading rates (200, 800, 1400, 2000, and 2600 L/min/m²). Each flow rate was maintained for 5 minutes with approximately 1 minute transition time between flow rates. The effluent flow was screened to capture all re-entrained pellets throughout the test.

Table 5. Light liquid re-entrainment test results for the EFO4.

Surface Loading Rate (L/min/m2)	Time Stamp	Amount of Beads Re-entrained			
		Mass (g)	Volume (L)[a]	% of Pre-loaded Mass Re-entrained	% of Pre-loaded Mass Retained
200	62	0	0	0.00	100
800	247	168.45	0.3	0.52	99.48
1400	432	51.88	0.09	0.16	99.83
2000	617	55.54	0.1	0.17	99.84
2600	802	19.73	0.035	0.06	99.94
Total Re-entrained		295.60	0.525	0.91	--
Total Retained		32403	57.78	--	99.09
Total Loaded		32699	58.3	--	--

---

[a] Determined from bead bulk density of 0.56074 g/cm³

Variances from testing Procedure

The following minor deviations from the *Procedure for Laboratory Testing of Oil-Grit Separators* (Version 3.0, June 2014) have been noted:

1. During the capture test, the 40 L/min/m² and 80 L/min/m² surface loading rates were evaluated over 3 and 2 days respectively due to the long duration needed to feed the required minimum of 11.3 kg of test sediment into the unit at these lower flow rates. Pumps were shut down at the end of each intermediate day, and turned on again the following morning. The target flow rate was re-established within 30 seconds of switching on the pump. This procedure may have allowed sediments to be captured that otherwise may have exited the unit if the test was continuous. On the basis of practical considerations, this variance was approved by the verifier prior to testing.

2. During the scour test, the coefficient of variation (COV) for the lowest flow rate tested (200 L/min/m^2) was 0.07, which exceeded the specified limit of 0.04 target specified in the OGS Procedure. A pump capable of attaining the highest flow rate of 3036 L/min had difficulty maintaining the lowest flow of 234 L/min but still remained within +/- 10% of the target flow and is viewed as having very little impact on the observed results. Similarly, for the light liquid re-entrainment test the COV for the flow rate of the 200 L/min/m^2 run was 0.049, exceeding the limit of 0.04, but is believed to introduce negligible bias.

3. Due to pressure build up in the filters, the runs at 1000 L/min/m^2 for the Stormceptor® EF4 and 1000 and 1400 L/min/m^2 for the Stormceptor® EFO4 were slightly shorter than the target. The run times were 54, 59 and 43 minutes respectively, versus targets of 60 and 50 minutes. The final feed samples were timed to coincide with the end of the run. Since >25 lbs of sediment was fed, the shortened time did not invalidate the runs.

Verification

The verification was completed by the Verification Expert, Toronto and Region Conservation Authority, contracted by GLOBE Performance Solutions, using the International Standard ***ISO 14034:2016 Environmental management -- Environmental technology verification (ETV)***. Data and information provided by Imbrium Systems Inc. to support the performance claim included the following: Performance test report prepared by Good Harbour Laboratories, and dated September 8, 2017; the report is based on testing completed in accordance with the Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014).

What is ISO14034:2016 Environmental management – Environmental technology verification (ETV)?

ISO 14034:2016 specifies principles, procedures and requirements for environmental technology verification (ETV), and was developed and published by the *International Organization for Standardization (ISO)*. The objective of ETV is to provide credible, reliable and independent verification of the performance of environmental technologies. An environmental technology is a technology that either results in an environmental added value or measures parameters that indicate an environmental impact. Such technologies have an increasingly important role in addressing environmental challenges and achieving sustainable development.

For more information on the Stormceptor® EF and EFO OGS please contact:

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info@imbriumsystems.com

For more information on ISO 14034:2016 / ETV please contact:

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Tel: 604-695-5018 / Toll Free: 1-855-695-5018
etv@globeperformance.com

Limitation of verification - Registration: GPS-ETV_VR2023-11-15_Imbrium-SC
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Appendix D

Excerpts from Hydrological Assessment

Soil Engineers Ltd.
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FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 721-7864	FAX: (905) 542-2769

A REPORT TO
1334281 ONTARIO LIMITED

HYDROGEOLOGICAL ASSESSMENT FOR PROPOSED RESIDENTIAL DEVELOPMENT

720 GRANITE COURT

CITY OF PICKERING

REFERENCE NO. 2111-W043

SEPTEMBER 2024
(REVISION OF REPORT DATED MARCH 2022)

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1.0 EXECUTIVE SUMMARY

Soil Engineers Ltd. (SEL) has completed a Hydrogeological Assessment for a proposed residential development site, located at 720 Granite Court, in the City of Pickering.

Based on the updated architectural plans, dated February 14, 2023, project number 22035, prepared by Onespace Unlimited Inc., the proposed development is anticipated to be completed with 12-storey building over 2-levels of underground parking structure.

The subject site is located within the Physiographic Region of Southern Ontario known as the Iroquois plain, where the clay plain is the predominant physiographic feature for the area. The mapped surface geological unit consists of a Till Unit, consisting, predominantly of undifferentiated sandy silt to silt matrix, commonly rich in clasts and often high in total matrix calcium carbonate.

A review of the topography shows that the subject site is relatively flat, with the surrounding area exhibiting a gentle decline in elevation relief towards the west and southwest.

The proposed development site is located within the Petticoat Creek Watershed. Review of available mapping indicates that Petticoat Creek and its associated wooded areas and wetlands are located, approximately 550 m south of the subject site. In addition, the Rouge River and its associated wooded areas, Provincially Significant wetlands, water courses, water bodies and Areas of Natural and Scientific Interest (ANSI) are located, approximately 1,500 m southeast of the subject site.

This study has revealed that beneath a layer of topsoil, the native subsoils underlying the subject site consists of sandy silt till extending to the maximum investigated depth.

The groundwater monitoring program indicates that the measured groundwater levels ranged from 3.61 to 8.24 m below the prevailing ground surface, or at the elevations, ranging from 96.16 to 100.38 masl. The interpreted shallow groundwater flow pattern beneath the stie suggests that it flows in southerly and westerly directions.

The Single Well Response Tests (SWRT) estimates for hydraulic conductivity (K) for the underlying sandy silt till unit ranged from 1.4×10^{-8} to 1.9×10^{-7} m/sec. These results suggest that the hydraulic conductivity (K) estimates for the groundwater bearing sandy silt till unit are low, with correspondingly low to moderate anticipated groundwater seepage rates being anticipated into open excavations, below the groundwater table.

Based on the provided development plans, the estimated construction dewatering flow rate is anticipated to reach a daily rate of 80,340.2 L/day; by considering a 3 x safety factor, it could reach an approximate daily maximum of 241,020.6 L/day. The conceptual zone of influence may reach approximately 4.2 m away from construction dewatering array or well used or around for the excavation footprint for the construction of 2-levels underground parking structure. In accordance with the current policy of the Ministry of the Environment, Conservation and Parks (MECP), this dewatering flow rate for excavation, is above the groundwater taking threshold limit of 50,000 L/day, but is below Permit-To-Take-Water limit of 400,000 L/day, whereby a Environmental Activity and Sector Registry (EASR) would be required as an approval to facilitate the groundwater takings for a temporary construction dewatering program for groundwater control.

The conceptual zone of influence for any dewatering well or dewatering array used during installation of underground services is approximately 4.3 m away from the conceptual dewatering wells or array for the construction of the considered underground services. There are no natural features, such as; watercourses, bodies of water, wetlands or any groundwater receptors, including water supply wells on site, or within anticipated zones of influence for any temporary construction dewatering.

The long-term foundation drainage rates for the complete P2 underground structure from a mira drain for a conventionally shored exaction is 508.17 L/day and to the under-slab drainage network it is 241.77 L/day with the combined drainage rate being749.94 L/day by applying a safety factor of 3 it could reach a maximum rate of 2,249.82 L/day.

2.0 INTRODUCTION

2.1 Project Description

In accordance with authorization from Mr. Steve Margie of 1334281 Ontario Limited, we have carried out a hydrogeological study for a proposed development property, located at 720 Granite Court, which is located northwest of the intersection of Granite Court and Whites Road South in the City of Pickering. The location of the subject site is shown on Drawing No. 1.

The subject site currently comprises of vacant land that is covered in grass and weeds. The surrounding land uses consists of a highway the north, Whites Road South and existing residential and commercial properties to the east, Granite Court and residential properties to the south, along with a railway line and commercial/industrial properties to the west. Based on the updated architectural plan, dated February 14, 2023, project number 22035, prepared by Onespace Unlimited Inc., the proposed development is anticipated to be completed with 12-storey high building over 2-levels of underground parking structure. Based on the topographic plan, provided by the client, the finished floor elevation has been considered at an elevation of 105.20 masl.

This Hydrogeological Study summarizes findings of a field study and the associated groundwater monitoring and testing programs, and provides a description and characterization for the site's hydrogeological setting. The current study provides preliminary recommendations for any construction dewatering needs, and for any need to acquire an Environmental Activity and Sector Registry (EASR), or a Permit-To-Take Water (PTTW) as an approval to facilitate a temporary construction dewatering program in support of proposed earthworks.

2.2 Project Objectives

The major objectives of this Hydrogeological Study Report are as follows:

1. Establish the local and regional hydrogeological setting for the subject site and the local surrounding areas;
2. Interpret the site's shallow groundwater flow patterns;
3. Identify zones of higher groundwater yield as potential sources for on-going shallow groundwater seepage from the site's subsoil strata;
4. Characterizing the hydraulic conductivity (K) for groundwater-bearing subsoil strata;
5. Preparing an interpreted hydrogeostratigraphic cross-sections across the subject site;

6. Estimate the temporary dewatering flows that may be required to lower the groundwater table to facilitate earthworks and construction;
7. Estimate the anticipated zones of influence associated with any construction dewatering, if required, and to provide mitigation recommendations to safeguard nearby groundwater receptors from potential impacts, and;
8. Provide comments regarding any need to file an Environmental Activity and Sector Registry (EASR), or to acquire a Permit-To-Take Water (PTTW) as an approval to facilitate a construction dewatering program.

2.3 **Scope of Work**

The scope of work for the Hydrogeological Study is summarized below:

1. Clearance of underground services, drilling of four (4) boreholes, and installation of monitoring wells, one in each of three (3) selected boreholes, at the time of borehole drilling.
2. Monitoring well development, groundwater level monitoring and measurements at the three installed monitoring wells;
3. Monitoring well development and performance of Single Well Response Tests (SWRTs) at the monitoring wells to estimate the hydraulic conductivity (K) for shallow groundwater-bearing subsoil strata at the depths of the monitoring well screens;
4. Reviewing plotting and mapping of Ministry of the Environment, Conservation and Parks (MECP) water well records within 500 m of the subject site;
5. Describing the geological and hydrogeological setting for the subject site and the nearby surrounding areas;
6. Assessing the preliminary dewatering needs and estimating any anticipated temporary dewatering flows necessary to lower groundwater levels to facilitate earthworks and construction;
7. Review of groundwater receptors in the vicinity of the development site, and providing of preliminary recommendations for any monitoring, mitigation and discharge management plans to safeguard nearby groundwater receptors from potential adverse impacts associated with any construction dewatering, and;
8. Providing comments regarding any need to register an Environmental Activity and Sector Registry (EASR) approval, or to apply for and obtain a Permit-To-Take Water (PTTW) to facilitate a groundwater taking approval for any temporary construction dewatering or any long-term foundation drainage following construction.

3.0 METHODOLOGY

3.1 Borehole Advancement and Monitoring Well Installation

The field work for borehole drilling and monitoring well construction were performed on December 14, 16 and 17, 2021. It consisted of four (4) drilled boreholes (BH) and the installation of three (3) monitoring wells (MW), one (1) within each of three (3) selected boreholes drilled at the locations shown on Drawing No. 2. The boreholes were drilled using solid stem flight-augers. The drilling and monitoring well construction were completed by a licensed well contractor, DBW Drilling Limited, under the full-time supervision of a geotechnical technician from SEL, who also logged the subsoil strata encountered during borehole advancement and collected representative soil samples to confirm the subsoil textures. The Borehole and Monitoring Well Logs are enclosed as Figures 1 to 4.

The monitoring wells, consisting of 50 mm diameter PVC riser pipes and screen sections, which were installed in the boreholes in accordance with Ontario Regulation (O. Reg.) 903. All of the monitoring wells were equipped with above-ground, monument-type, steel protective casings. The monitoring well construction details are shown on the Borehole/Monitoring Well Logs and the details are summarized in Table 3-1.

The UTM coordinates and ground surface elevations at the borehole and monitoring well locations, together with the well construction details, are provided in Table 3-1.

Table 3-1 - Monitoring Well Installation Details

Well ID	Installation Date	East (m)	North (m)	Ground El. (masl)	Borehole Depth (mbgs)	Screen Interval (mbgs)	Casing Dia. (mm)
BH/MW 1	December 16, 2021	651771.5	4852735.8	104.50	12.3	6.0-9.0	50
BH/MW 2	December 16, 2021	651723.7	4852753.2	104.40	12.3	6.0-9.0	50
BH/MW 4	December 14, 2021	651735.7	4852844.0	103.99	12.3	6.0-9.0	50

Notes: mbgs -- metres below ground surface masl -- metres above sea level

3.2 Groundwater Monitoring

The groundwater levels in the monitoring wells were measured, manually by our representative on January 7, January 19, and February 1, 2022.

3.3 **Mapping of Ontario Water Well Records**

SEL reviewed the MECP Water Well Records (WWRs) for registered monitoring wells on the subject site, and within 500 m of the site boundaries (study area). The records indicate that fifteen (15) wells are located within the 500 m study area relative to the subject site boundaries. A summary of the Ontario WWRs reviewed for this study is provided in Appendix 'A' with the locations of the well records shown on Drawing No. 3.

3.4 **Monitoring Well Development and Single Well Response Tests**

All of the monitoring wells underwent development to prepare them for SWRTs to estimate the hydraulic conductivity (K) for the saturated aquifer subsoils at the monitoring well screen depths. The well development involved purging and removing several casing volumes of groundwater from each monitoring well to remove remnants of clay, silt and other debris introduced into the monitoring wells during construction, and to induce the flow of formation groundwater through the monitoring well screens, thereby improving the transmissivity of the groundwater bearing formation at the monitoring well screen depth intervals.

The K estimates provide an indication of the seepage yield capacity for the groundwater-bearing subsoil strata and can be used to estimate the flow of groundwater through the groundwater-bearing subsoil strata.

The SWRT involves the placement of a slug of known volume into the well, below the water table, to displace the groundwater level upward. The rate at which the groundwater level recovers to static conditions (falling head) is tracked using a data logger/ pressure transducer and/or manually using a water level tape, with this rate being used to estimate the K value for the groundwater-bearing subsoil formation at the well screen depths. All of the BH/MWs underwent a SWRT (Falling Head Tests) on February 1, 2022. The results for the tests are provided in Appendix 'B'.

3.5 **Review of Previous or Concurrent Reports**

The following report was reviewed for the preparation of this hydrogeological study:
A Report to 1334281 Ontario Limited, A Geotechnical Investigation for Proposed Mid-Rise Residential Development, 720 Granite Court, City of Pickering, SEL Reference No. 2111-S043 dated January 2022.

4.0 REGIONAL AND LOCAL SETTING

4.1 Regional Geology

The subject site lies within the Physiographic Region of Southern Ontario, known as the Iroquois Plain, on the clay plains physiographic feature. The Iroquois Plain occupies the north shore of Lake Ontario, where it extends from Scarborough to Trenton and is considered an area of considerable complexity, not easily divisible into well-marked geological units. The Highland Creek and the Rouge River deposited sand into a former glacial lake to build the present-day sand plain in the southeast corner of the City of Scarborough and within the adjacent portions of the Cities of Pickering, Ajax and Whitby. Across the Regional Municipality of Durham, the Iroquois plain has a fairly consistent pattern (Chapman and Putnam, 1984).

Based on a review of a surface Geological Map of Ontario, the subject site is located on the Till deposits, consisting predominantly of undifferentiated sandy silt to silt matrix, commonly rich in clasts and often high in total matrix calcium carbonate content. Drawing No. 4, reproduced from Ontario Geological Survey mapping, illustrates the Quaternary surface soil geology for the subject site and the surrounding local areas.

The top of bedrock beneath the subject site lies at an elevation of approximately 76 to 78 masl (Bedrock Topography of the Markham Area, Southern Ontario, 1992) and consists of Upper Ordovician aged shale, limestone, dolostone and siltstone of the Georgian Bay Formation, the Blue Mountain Formation, the Billings Formation, the Collingwood Member and the Eastview Member (Ontario Ministry of Northern Department and Mines, 1991).

4.2 Physical Topography

A review of the topographic map for the subject site and surrounding area shows that it is relatively flat, with the surrounding area exhibiting a gentle decline in elevation relief towards the west and southwest. Drawing No. 5 shows the mapped topographic contours for the subject site and the local surrounding areas.

4.3 Watershed Setting

The subject site is located within the Petticoat Creek Watershed, as shown, mapped, on Drawing No. 6. The Petticoat Creek river systems have a total length of about 49 km and drains an area of approximately 27 square km, with portions of the associated watershed being within the Cities of Pickering, Markham, and Toronto. In contrast with many of the watersheds in the Greater Toronto Area (GTA), Petticoat Creek does not originate on the Oak Ridges Moraine. Its headwaters, or upper reaches, are located south of the Oak Ridges Moraine, between the larger Rouge River and Duffin's Creek watersheds. Petticoat Creek flows south and empties into Lake Ontario at the Petticoat Creek Conservation Area (Toronto and Region Conservation Authority, 2012).

4.4 Local Surface Water and Natural Features

Records review shows that Petticoat Creek and its associated wooded areas and wetland are located, approximately 550 m south of the subject site. In addition, the Rouge River and its associated wooded areas, Provincially Significant wetlands, water courses, water bodies and Areas of Natural and Scientific Interest (ANSI) are located, approximately 1,500 m southeast of the subject site.

Drawing No. 7 shows the locations of the natural features around the subject site.

5.0 SOIL LITHOLOGY

This study has revealed that beneath a layer of topsoil, the native soils underlying the subject site consists of sandy silt till. A Key Plan and the interpreted geological cross-sections along north-to-south and west-to-east transects are presented on Drawing Nos. 8-1 and 8-2.

5.1 **Topsoil** (All BH and BH/MW locations)

Topsoil was found at the ground surface at all of the BH/MW locations. The thickness for the topsoil horizon ranges from 20 to 25 cm.

5.2 **Sandy Silt Till** (All BH/MW locations)

Sandy silt till was encountered beneath the topsoil horizon at all of the BH and BH/MW locations, where it extended to the maximum investigated depth of 12.3 m below grade. The sandy silt till unit is brown to grey in colour, is dense to very dense in consistency, and contains a trace of gravel with occasional silty clay layers and cobbles and boulders. The moisture contents for the retrieved subsoil samples ranged from to 11%, indicating damp to moist conditions. The estimated permeability for the sandy silt till ranges from about 10^{-7} cm/sec to 10^{-6} cm/sec. Grain size analyses were performed on three (3) subsoil samples, and the gradations are plotted on Figure 5.

6.0 GROUNDWATER STUDY

6.1 Review Summary of Previous Report

A review of the findings from the geotechnical soil investigation, prepared by SEL (Reference No. 2111-S043) has indicated that beneath the topsoil horizon, the underlying subsoils consist of sandy silt till. Upon completion of the boreholes, groundwater was recorded at depths of 8.1 to 10.4 m below the prevailing ground surface at BHs 1 and 2, while BHs 3 and 4 remained dry upon completion of the drilling.

6.2 Review of Ontario Water Well Records

The Ministry of the Environment, Conservation and Parks (MECP) water well records (WWRs) for the subject site and for the properties within a 500 m radius of the boundaries of the site were reviewed.

The records indicate that fifteen (15) wells are located within the 500 m study area relative to the site boundaries. The locations of these wells, based on the UTM coordinates provided by the records, are shown on Drawing No. 3. A detailed summary of the MECP WWRs is provided in Appendix ‘A’.

A review of the final status of the well records within the study area reveals that one (1) well is registered as an abandoned-supply well, four (4) are observation wells, four (4) are test hole wells, and six (6) are monitoring and test hole wells.

A review of the first status of the monitoring wells shows that eight (8) are registered as monitoring wells, five (5) are monitoring and test hole wells, one (1) well is not used and one (1) well has an unidentified status.

6.3 Groundwater Monitoring

Groundwater levels were measured within the monitoring wells to record the fluctuation of the groundwater table beneath the site over the monitoring period, covering the dates between January 7 and February 1, 2022. The groundwater level measurements and their corresponding elevations are summarized in Table 6-1.

Table 6-1 - Water Level Measurements

Well ID		January 7, 2022	January 19, 2022	February 1, 2022	Average	Fluctuation
BH/MW 1	mbgs	6.48	6.68	6.81	6.66	0.33
	masl	98.02	97.82	97.69	97.85	
BH/MW 2	mbgs	6.79	8.24	8.04	7.69	1.25
	masl	97.61	96.16	96.36	96.71	
BH/MW 4	mbgs	5.50	4.78	3.61	4.63	1.89
	masl	98.49	99.21	100.38	99.36	

Notes: mbgs -- metres below ground surface masl -- metres above sea level

As shown above, the groundwater levels generally decreased at BH/MWs 1 and 2, and increased at BH/MW 4 over the monitoring period, exhibiting small fluctuations in between. The highest shallow groundwater level fluctuation was recorded at BH/MW 2, which exhibited a 1.89 m difference in groundwater level over the monitoring period.

6.4 Single Well Response Test Analysis

All of the BH/MWs underwent Falling Head Tests (SWRT's) to assess the hydraulic conductivity (K) for saturated aquifer subsoils at the monitoring well screen depths. The results for the SWRT analysis are presented in Appendix 'B', with a summary of the findings shown in Table 6-2.

Table 6-2 - Summary of SWRT Results

Well ID	Ground El. (masl)	Monitoring Well Depth (mbgs)	Borehole Depth (mbgs)	Screen Interval (mbgs)	Screened Soil Strata	Hydraulic Conductivity (K) (m/sec)
BH/MW 1	104.50	9.0	12.3	6.0-9.0	Sandy silt till	1.9 x 10^{-7}
BH/MW 2	104.40	9.0	12.3	6.0-9.0	Sandy silt till	1.4 x 10^{-8}
BH/MW 4	103.99	9.0	12.3	6.0-9.0	Sandy silt till	6.1 x 10^{-8}

The SWRT results provide an indication of the yield capacity for the groundwater-bearing subsoil strata at the depths for the monitoring well screens. The results of the field investigation indicate low to moderate anticipated groundwater seepage rates are associated with the subsoils at the depths for the monitoring well screens.

6.5 Shallow Groundwater Flow Pattern

The average of groundwater levels, measured within the monitoring wells were used to interpret the shallow groundwater flow pattern across and beneath the subject site. Review of the groundwater table data indicates that shallow groundwater is interpreted to generally flow in south and westerly directions. The interpreted groundwater flow pattern beneath the subject site is illustrated on Drawing No. 9.

7.0 GROUNDWATER CONTROL DURING CONSTRUCTION

The hydraulic conductivity (K) estimates suggest that groundwater seepage rates into open excavations below the groundwater table, within the till subsoils will range from low to moderate. To provide safe, dry and stable conditions for excavation and construction for the proposed underground parking structure, and for the installation of the associated underground services, the shallow groundwater table may need to be lowered in advance of or during construction. The preliminary estimates for the temporary construction dewatering flows required to locally lower the groundwater table, based on the K test results are discussed in the following sections.

7.1 Groundwater Construction Dewatering Rates

Based on the updated architectural plan, dated February 14, 2023, project number 22035, prepared by Onespace Unlimited Inc., the proposed development is anticipated to be completed with 12-storeys high building over 2-levels of underground parking. Based on the topographic grading plan provided by the client, the finished floor elevation will be considered at an elevation of 105.20 masl, where the elevation for the P2 underground structure slab has been considered at elevation 98.2 masl which is about 7.0 m below the proposed finished grade level floor.

Dewatering Flow Rate Estimates for Construction of Proposed 2-Levels Underground Parking Structure

Based on the provided plans, the P2-slab elevation is considered at an elevation of 98.2 masl for this construction dewatering needs assessment. To facilitate excavation and construction in dry and stable subsoil conditions, it is proposed that the groundwater table be lowered to an elevation of 97.20 masl, which is about 1.0 m below the lowest proposed excavation depth. The highest, shallow groundwater level within the monitoring wells was measured at an elevation of. 100.38 masl. The subsoil profile consists of topsoil and sandy silt till, extending to the maximum anticipated excavation depth. Based on a review of the measured groundwater levels, the shallow groundwater levels are about 2.18 m above the considered elevations for the proposed underground parking structure. As such some limited construction dewatering is anticipated for the proposed development of the P2 underground structure. As a conservative approach, the highest estimated hydraulic conductivity values of 1.9×10^{-7} m/sec obtained from the installed monitoring wells on site was used for current dewatering needs assessments. The estimated construction dewatering flow rate is - anticipated to reach a daily rate of 80,340.2 L/day; by considering a 3=x safety factor, it could reach an approximate daily maximum of 241,020.6 L/day. It should be noted that the excavation footprints assumed for the dewatering needs flow rates are considered to be 140.0 m in length and 110.0 m in width, where the estimated perimeter for the construction footprints being considered at a length of 500.0 m. The conceptual zone of influence may reach approximately 4.2 m away from construction dewatering array or well used for dewatering purposed for the construction of 2-levels underground parking structure.

In accordance with the current policy of the Ministry of the Environment, Conservation and Parks (MECP), this dewatering flow rate for excavation, is above the groundwater taking threshold limit of 50,000 L/day, but is below Permit-To-Take-Water limit of 400,000 L/day, whereby a Environmental Activity and Sector Registry (EASR) would be required as an approval to facilitate the groundwater takings for a temporary construction dewatering program for groundwater control. This higher dewatering flow estimates may only occur at the beginning of the dewatering process, which includes; any rapid removal of collected runoff within the excavation area after a high intensity storm. It is anticipated that, following the lowering of the localized water table, groundwater seepage removed via dewatering from the open excavation will be a fraction of the above estimate, since much of the groundwater in the proposed excavation areas will have been removed from local storage. Furthermore, upon excavation for, any encountered, perched groundwater within the shallow fill horizons is expected to dissipate relatively quickly following commencement of earthworks.

It should be noted that shallow groundwater levels were monitored over the winter season and it is anticipated that they will increase over the high, precipitation, spring season. As such, it is recommended that shallow groundwater levels be monitored again, over the spring season, and that the dewatering estimates be updated if excavation and construction are planned for this season. It is also recommended that the construction dewatering needs assessment be revised if significant changes in the excavation depth and construction footprints are anticipated.

7.2 **Groundwater Control Methodology**

Low to moderate groundwater seepage rates which may be encountered in open excavations below the groundwater table can likely be controlled by occasional pumping from sumps. When and where needed during construction. Well points can be employed to lower water table if wet subsoil is unstable and seepage cannot be controlled via sump pumping. The final designs for the dewatering system will be the responsibility of the construction contractors.

7.3 **Mitigation of Potential Impacts Associated with Dewatering**

The conceptual zone of influence for any dewatering well or dewatering array is approximately 4.3 m away from the conceptual dewatering wells or array for the construction of 2-levels underground parking structure. There are no natural features, such as; watercourses, bodies of water, wetlands or any groundwater receptors, including water supply wells on site, or within anticipated zones of influence for any temporary construction dewatering.

7.4 Groundwater Function for the Subject Site

The zone of influence for any temporary construction dewatering array or wells could reach a maximum of 4.3 m away from the conceptual dewatering wells/array considered for the construction of 2-levels of underground parking structure. No private wells, bodies of water, watercourses, wetlands or any natural features are present within the conceptual zone of influence for any temporary construction dewatering array being considered for construction. In addition, the subject site is underlain by lower permeable subsoil, resulting in limited estimated zones of influence for temporary construction dewatering, resulting in minimal to negligible anticipated impacts to any nearby features from any temporary dewatering needs for construction. As such no long-term impacts to groundwater function of the subject site are anticipated.

7.5 Long-Term Permanent Foundation Drainage

Based on the updated architectural plan, dated February 14, 2023, project number 22035, prepared by Onespace Unlimited Inc., the proposed development is anticipated to be completed with 12-storey high building over 2-levels of underground parking. Based on the topographic grading plan provided by the client, the finished floor elevation is considered at an elevation of 105.20 masl, where the elevation of P2 slab is considered at 98.2 masl which is about 7.0 m below the finished floor.

Given the low seepage rate estimates for any long-term foundation drainage needs, a conventionally shored excavation, using pile and lagging methods can be designed and completed for the construction of the proposed 2-levels underground parking structures. A conventional, Mira drainage network can be included with the design for a conventionally shored excavation, along with a simple basement under-slab drainage network to address any long-term seepage needs to the excavation and the completed underground structure. These systems can be drained to separate sump pits, one for the shore wall, Mira drainage network, and the other for the under-basement floor slab drainage network. The drainage network should be designed by a qualified mechanical engineer, having experience with the designs for under-slab and Mira drainage networks.

In order to estimate the long-term foundation drainage needs for the shored excavations, the associated mira foundation drainage networks, and for the under-slab floor basement drainage networks at the subject site, Darcy's expression and equation was used. The base elevation for the 2-levels underground parking structure was considered to be at elevation of approximately 98.2 masl, which was used for the long-term foundation drainage needs estimation. Review of the measured groundwater levels indicates that the shallow groundwater levels are above the base elevations for the proposed P-2 underground parking structure. As such, it is anticipated that that some long-term foundation drainage needs may be required for the proposed underground parking structure. Darcy's Expression below, was used to assess the long-term foundation seepage flow estimates:

$$Q = KiA$$

Where:

Q = Estimated seepage drainage rate (m^3/day)

K = 1.90×10^{-7} m/sec (highest hydraulic conductivity (K) assessed for the silty clay till subsoil and shale bedrock aquifer encountered during the study)

A = 1,090.0 m^2 for the saturated Mira drain foundation walls and 967.61 m^2 for the under-slab floor drainage network which is the approximate area for weeper tiles comprising the under-basement floor slab drainage network (cross-sectional area of flow).

iv = 0.0152205 [unitless], Vertical Hydraulic Gradient for groundwater considered for the under-slab basement floor drainage system

ih = 0.0284 [unitless], Horizontal Hydraulic Gradient for groundwater considered for the perimeter, shore wall Mira drainage network system.

Based on review of the plans for the proposed 2-levels underground parking structure, the estimated long-term seepage drainage rate to the Mira drainage network is 508.17 L/day. The long-term drainage seepage drainage rate to the under-slab basement floor drainage networks 241.77 L/day. The combined long-term seepage rate from both the Mira shore wall foundation drainage network and from the under-slab basement floor drainage networks are estimated at 749.94 L/day. After applying a safety factor of three (3), the combined drainage flow rate is estimated at 2,249.82 L/day for the proposed 2-levels underground parking structure. As the estimated drainage flow rates are below the EASR limit of 50,000 L/day, the approval to facilitate the groundwater takings for a permanent foundation drainage program for the completed underground structure is not required to register with MECP with an EASR application.

Given that estimated drainage rates are low, the conventional pumping facility and sump system can be designed for the maximum expected seepage, drainage rates. The drainage piping should be properly constructed using weeper tiles surrounded by filter cloth, in turn, surrounded by bedding stone or concrete sand to minimize loss of fines and to prevent silt from clogging the weeper tiles. Over time, the foundation seepage drainage rates to the underground parking structures may diminish to a lower, or possibly negligible steady state rate. It is recommended that the long-term drainage system be design by a mechanical engineer with experience designing foundation drainage networks. It is recommended that the mira drain perimeter system be drained to a separate sump than the basement under-slab drainage network. Potential storm runoff could overwhelm the perimeter system if the shore wall gap between the building foundation and shore wall is not properly sealed against potential runoff accumulation.

The groundwater monitoring program was completed during the winter season when the shallow groundwater levels are typically lower than during the spring seasons.

7.6 **Ground Settlement**

The following report was reviewed in preparation for this hydrogeological assessment, "A Geotechnical Review for Potential Ground Settlement, Proposed Mid-Rise Residential Development, 720 Granite Court, City of Pickering, dated September 11, 2024". The report is presented in Appendix 'C'. The report indicates that:

- In order to provide a dry and stable subgrade for construction, the groundwater should be lowered to at least 1.0 m below the bottom of the excavation. Considering that the conceptual zone of influence is primarily within the property boundary and in areas extends to the existing sidewalk and boulevard, no structure will be affected from the construction dewatering. Furthermore, the ground settlement due to construction dewatering is estimated to be less than 1.0 mm for the sidewalk and is considered geotechnically acceptable. Once the dewatering system ceases operation, additional ground settlement due to construction dewatering is not anticipated.

- With the very dense sandy silt till in the subgrade below the lowest parkade level, long-term foundation drainage discharge will likely be water seepage captured in the perimeter foundation subdrains and underfloor subdrains, which can be considered minimal and would not significantly change the groundwater condition from the proposed development; thus, potential settlement due to long-term foundation drainage discharge is not anticipated.

8.0 CONCLUSIONS

Based on the findings of this Hydrogeological Study, the following conclusions and recommendations are provided:

1. The subject site is located within the Physiographic Region of Southern Ontario known as the Iroquois plain, where the clay plain is the predominant Physiographic feature for the area
2. A review of the topography information shows that the subject site is relatively flat, with the surrounding area exhibiting a gentle decline in elevation relief towards the west and southwest.
3. The proposed development site is located within the Petticoat Creek Watershed. Review of available mapping indicates that Petticoat Creek and its associated wooded areas and wetlands are located, approximately 550 m south of the subject site.
4. This study has revealed that beneath a layer of topsoil, the native subsoils underlying the subject site consists of sandy silt till, extending to the maximum investigated depth of 12.3 m below grade.
5. The groundwater monitoring program indicates that the measured groundwater levels ranged from the depths of 3.61 to 8.24 m below the prevailing ground surface, or at the elevations, ranging from 96.16 to 100.38 masl. The interpreted shallow groundwater flow pattern suggests that it flows in southerly and westerly directions.
6. The Single Well Response Tests (SWRT) estimates for hydraulic conductivity (K) for the underlying sandy silt till unit ranged from 1.4×10^{-8} to 1.9×10^{-7} m/sec. These results suggest that the hydraulic conductivity (K) estimates for the groundwater bearing sandy silt till unit is low, with correspondingly low anticipated groundwater seepage rates being anticipated into open excavations, below the groundwater table.
7. Based on the provided updated architectural plans, the estimated construction dewatering flow rate is anticipated to reach a daily rate of 80,340.2 L/day; by considering a 3 x safety factor, it could reach an approximate daily maximum of 241,020.6 L/day. The conceptual zone of influence may reach approximately 4.2 m away from construction dewatering array or well used for dewatering purposed for the construction of 2-levels underground parking structure. In accordance with the current policy of the Ministry of the Environment, Conservation and Parks (MECP), this dewatering flow rate for excavation, is above the groundwater taking threshold limit of 50,000 L/day, but is below Permit-To-Take-Water limit of 400,000 L/day, whereby a Environmental Activity and Sector Registry (EASR) would be required as an approval to facilitate the groundwater takings for a temporary construction dewatering program for groundwater control.
8. The conceptual zone of influence for any dewatering well or dewatering array used

during services installation is approximately 4.3 m away from the conceptual dewatering wells or array for the construction of 2-levels of underground parking. There are no natural features, such as; watercourses, bodies of water, wetlands or any groundwater receptors, including water supply wells on site, or within anticipated zones of influence for any temporary construction dewatering.

9. The long term foundation drainage rates for the complete P2 underground structure from a mira drain for a conventionally shored exaction is 508.17 L/day and to the under-slab drainage network it is 241.77 L/day with the combined drainage rate being749.94 L/day by applying a safety factor of 3 it could reach a maximum rate of 2249.82 L/day.

Yours Truly,
SOIL ENGINEERS LTD.

Harpreet Singh

Harpreet Singh, EIT, PMP, C.Tech.

Nar

Narjes Alijani, M.Sc., P.Geo.
HS/NA

PROFESSIONAL GEOSCIENTISTS ONTARIO
NA
NARJES ALIJANI
PRACTISING MEMBER
2386
Sep. 11, 2024

9.0 REFERENCES

1. The Physiography of Southern Ontario (Third Edition), L. J. Chapman and D. F. Putnam, 1984

2. Petticoat Creek Watershed Action Plan, 2012, Toronto and Region Conservation Authority

3. Bedrock Topography of the Markham Area, Southern Ontario, 1992, Open File Map 196, Mines and Minerals Division, Ontario Geological Survey

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FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

FIGURES 1 TO 5

BOREHOLE LOGS AND GRAIN SIZE DISTRIBUTION GRAPHS

REFERNCE NO. 2111-W043

LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

The abbreviations and terms commonly employed on the borehole logs and figures, and in the text of the report, are as follows:

SAMPLE TYPES

AS	Auger sample
CS	Chunk sample
DO	Drive open (split spoon)
DS	Denison type sample
FS	Foil sample
RC	Rock core (with size and percentage recovery)
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

PENETRATION RESISTANCE

Dynamic Cone Penetration Resistance:

A continuous profile showing the number of blows for each foot of penetration of a 2-inch diameter, 90° point cone driven by a 140-pound hammer falling 30 inches.

Plotted as '—●—'

Standard Penetration Resistance or 'N' Value:

The number of blows of a 140-pound hammer falling 30 inches required to advance a 2-inch O.D. drive open sampler one foot into undisturbed soil.

Plotted as '○'

WH	Sampler advanced by static weight
PH	Sampler advanced by hydraulic pressure
PM	Sampler advanced by manual pressure
NP	No penetration

SOIL DESCRIPTION

Cohesionless Soils:

'N' (blows/ft)	Relative Density
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
over 50	very dense

Cohesive Soils:

Undrained Shear Strength (ksf)	'N' (blows/ft)	Consistency
less than 0.25	0 to 2	very soft
0.25 to 0.50	2 to 4	soft
0.50 to 1.0	4 to 8	firm
1.0 to 2.0	8 to 16	stiff
2.0 to 4.0	16 to 32	very stiff
over 4.0	over 32	hard

Method of Determination of Undrained Shear Strength of Cohesive Soils:

x 0.0	Field vane test in borehole; the number denotes the sensitivity to remoulding
△	Laboratory vane test
□	Compression test in laboratory

For a saturated cohesive soil, the undrained shear strength is taken as one half of the undrained compressive strength

METRIC CONVERSION FACTORS

1 ft = 0.3048 metres

1lb = 0.454 kg

1 inch = 25.4 mm

1ksf = 47.88 kPa

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JOB NO.: 2111-W043

LOG OF BOREHOLE: BH/MW 1

FIGURE NO.: 1

PROJECT DESCRIPTION: Proposed Mid-Rise Residential Development

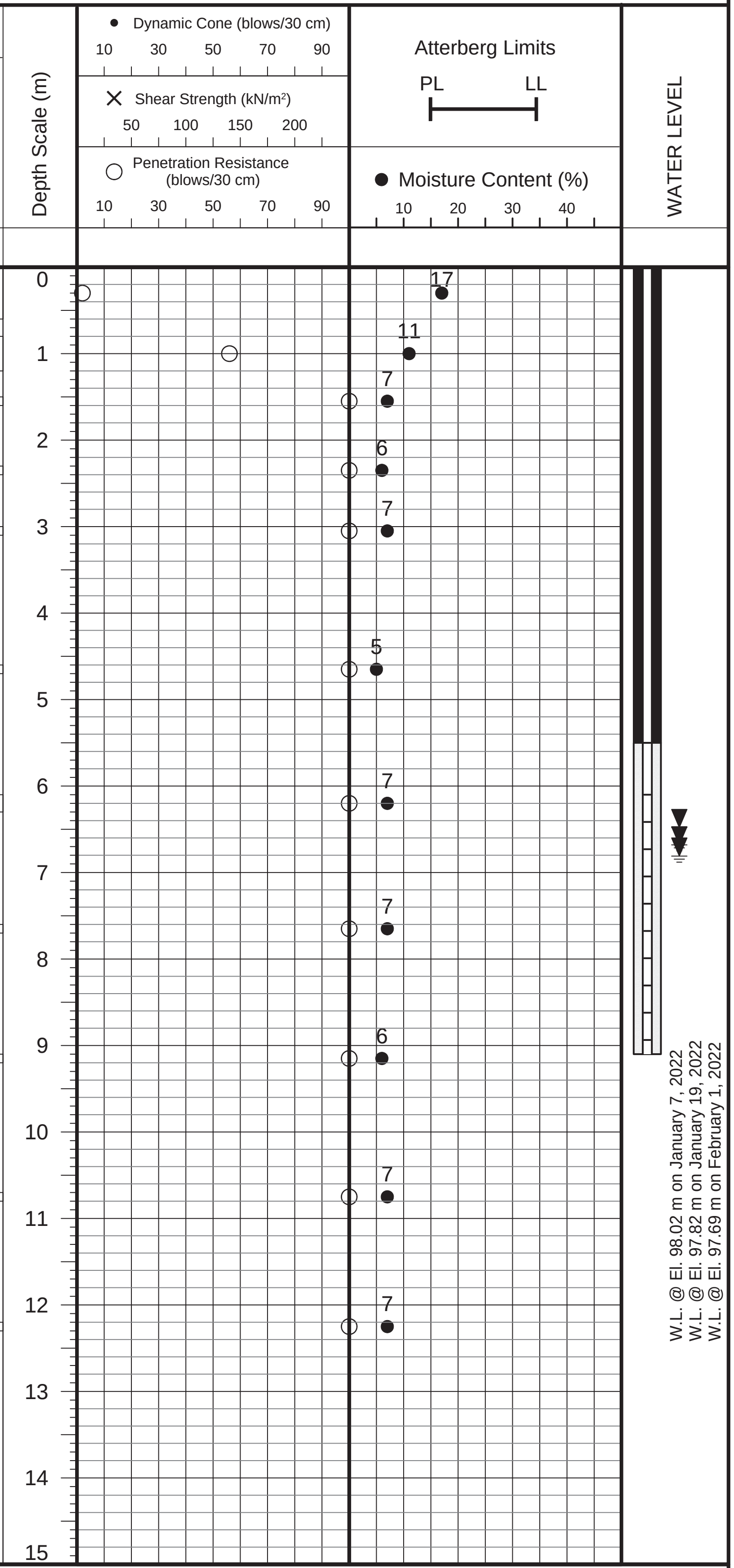
METHOD OF BORING: Flight Auger

PROJECT LOCATION: 720 Granite Court, City of Pickering

DRILLING DATE: December 16, 2021

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
104.5	Ground Surface			
0.2	23 cm TOPSOIL	1	DO	2
	Very dense SANDY SILT TILL a trace of gravel occ. silty clay layers, cobbles and boulders weathered	2	DO	56
		3	DO	50/4
		4	DO	50/4
		5	DO	50/4
	brown grey	6	DO	50/5
		7	DO	50/6
		8	DO	50/3
		9	DO	50/1
		10	DO	50/3
92.2 12.3	END OF BOREHOLE	11	DO	50/3

Installed 50 mm Ø monitoring well to 9.0 m
3.1 m slotted screen from 5.9 m to 9.0 m
Sand backfill from 5.5 to 9.0 m
Bentonite seal from 0.0 m to 5.5 m
Provided with a monument steel casing



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Page: 1 of 1

JOB NO.: 2111-W043

LOG OF BOREHOLE: BH/MW 2

FIGURE NO.: 2

PROJECT DESCRIPTION: Proposed Mid-Rise Residential Development

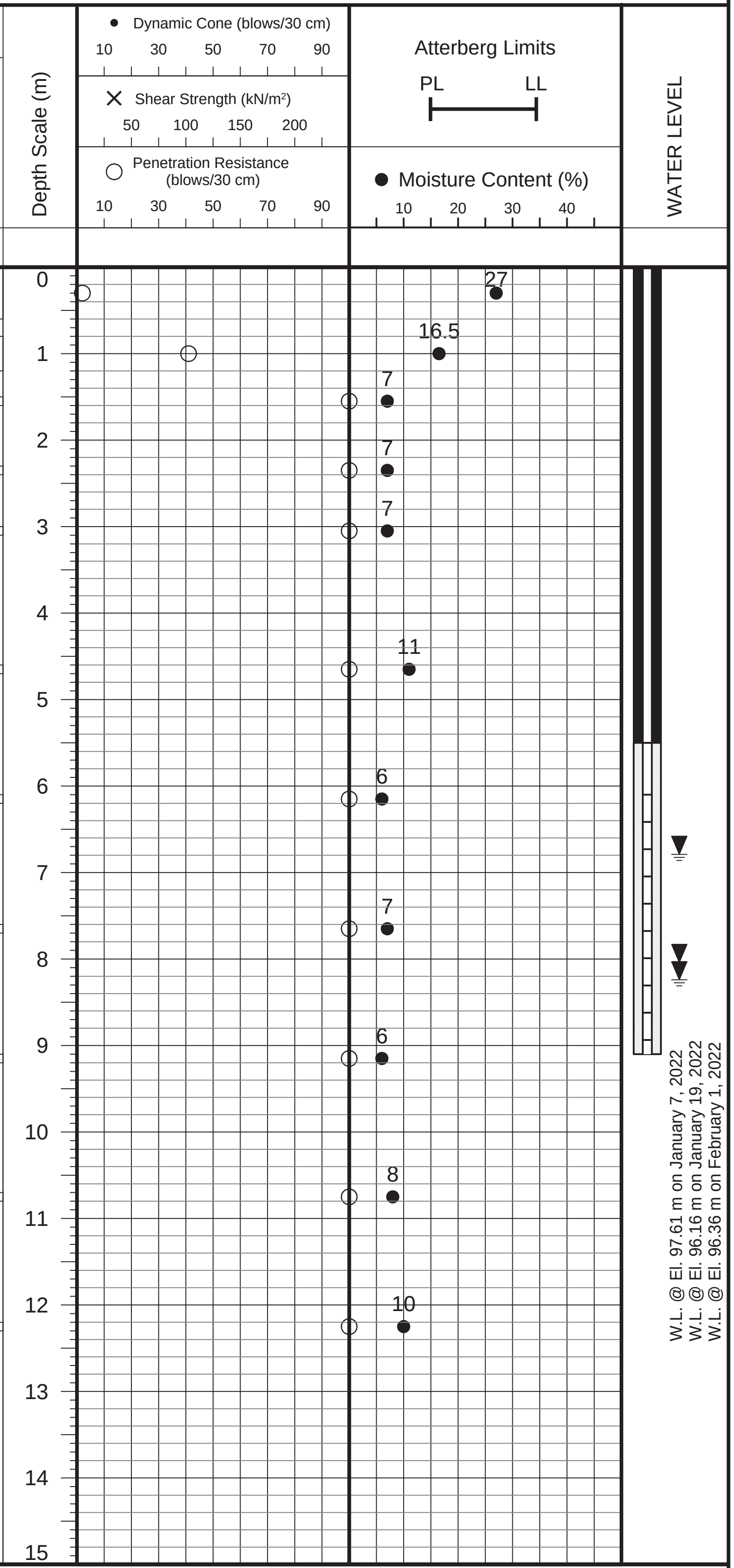
METHOD OF BORING: Flight Auger

PROJECT LOCATION: 720 Granite Court, City of Pickering

DRILLING DATE: December 16, 2021

El. (m) Depth (m)	SOIL DESCRIPTION
104.4	Ground Surface
0.2	23 cm TOPOSIL
	Dense to very dense SANDY SILT TILL a trace of gravel occ. silty clay layers, cobbles and boulders weathered (to approx. 0.9 m) brown / grey (at approx. 4.0 m)
92.1 12.3	END OF BOREHOLE Installed 50 mm Ø monitoring well to 9.0 m 3.1 m slotted screen from 5.9 m to 9.0 m Sand backfill from 5.5 to 9.0 m Bentonite seal from 0.0 m to 5.5 m Provided with a monument steel casing

SAMPLES Number	Type	N-Value
1	DO	2
2	DO	41
3	DO	50/3
4	DO	50/5
5	DO	50/6
6	DO	50/5
7	DO	50/5
8	DO	50/4
9	DO	90/11
10	DO	50/4
11	DO	50/2



W.L. @ El. 97.61 m on January 7, 2022
W.L. @ El. 96.16 m on January 19, 2022
W.L. @ El. 96.36 m on February 1, 2022

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JOB NO.: 2111-W043

LOG OF BOREHOLE: BH 3

FIGURE NO.: 3

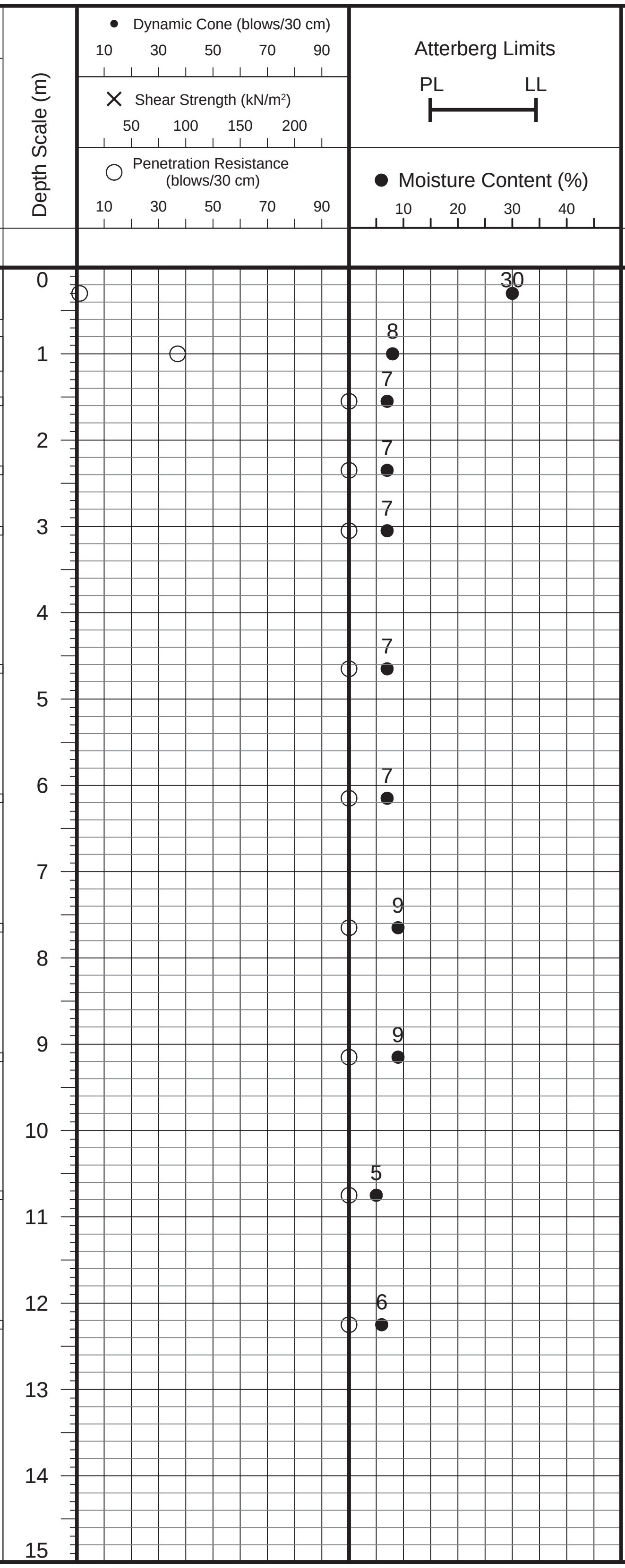
PROJECT DESCRIPTION: Proposed Mid-Rise Residential Development

METHOD OF BORING: Flight Auger

PROJECT LOCATION: 720 Granite Court, City of Pickering

DRILLING DATE: December 17, 2021

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	WATER LEVEL
104.9	Ground Surface				
0.2	20 cm TOPSOIL	1	DO	1	
	Dense to very dense SANDY SILT TILL a trace of gravel occ. silty clay layers, cobbles and boulders weathered	2	DO	37	
		3	DO	50/5	
		4	DO	50/5	
		5	DO	50/3	
	brown grey				
		6	DO	50/5	
		7	DO	50/6	
		8	DO	50/3	
		9	DO	50/4	
		10	DO	50/3	
92.6 12.3	END OF BOREHOLE	11	DO	50/3	Dry upon completion



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Page: 1 of 1

JOB NO.: 2111-W043

LOG OF BOREHOLE: BH/MW 4

FIGURE NO.: 4

PROJECT DESCRIPTION: Proposed Mid-Rise Residential Development

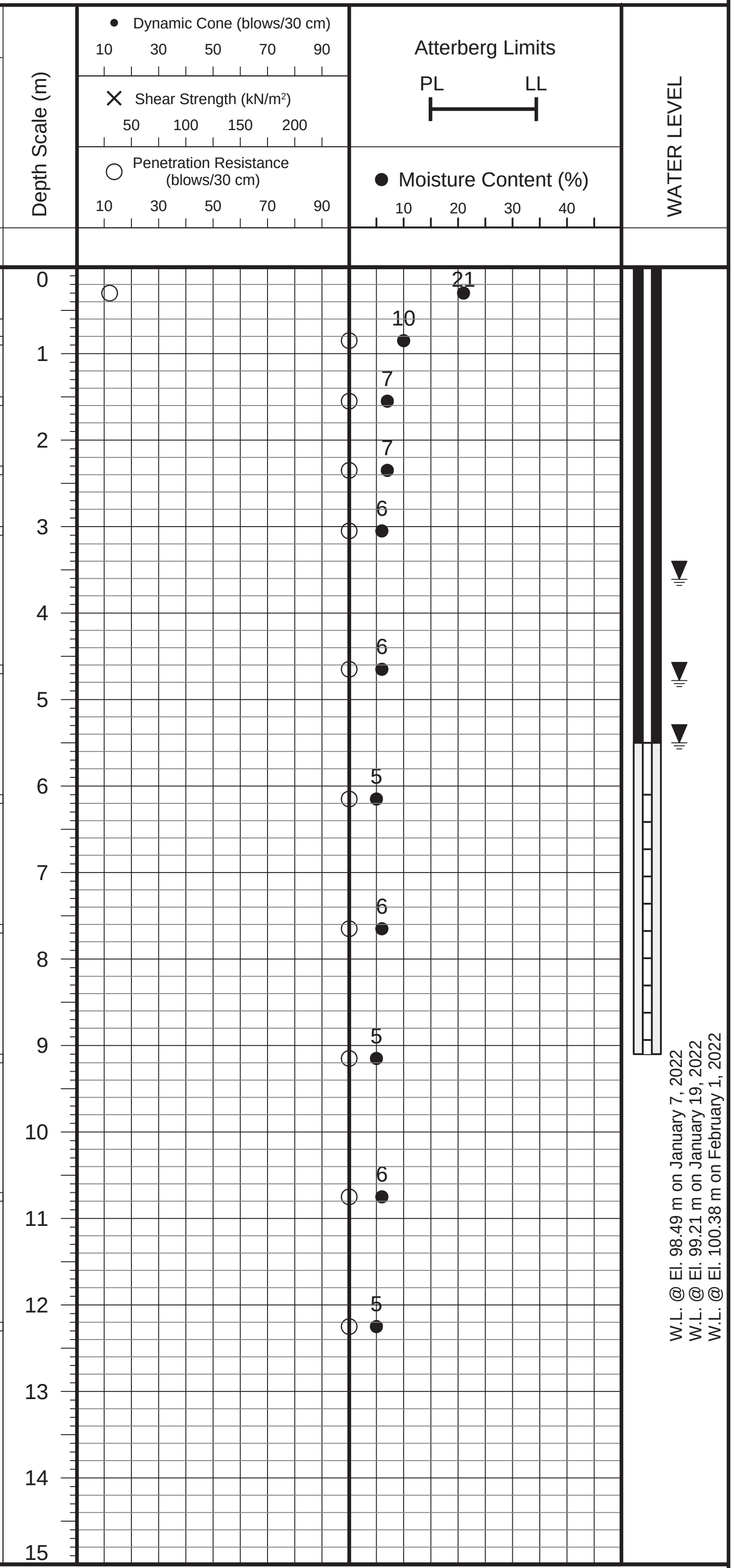
METHOD OF BORING: Flight Auger

PROJECT LOCATION: 720 Granite Court, City of Pickering

DRILLING DATE: December 14, 2021

El. (m) Depth (m)	SOIL DESCRIPTION
104.0	Ground Surface
0.3	25 cm TOPSOIL
	Very dense SANDY SILT TILL a trace of gravel occ. silty clay layers, cobbles and boulders weathered brown grey
91.7 12.3	END OF BOREHOEL Installed 50 mm Ø monitoring well to 9.0 m 3.1 m slotted screen from 5.9 m to 9.0 m Sand backfill from 5.5 to 9.0 m Bentonite seal from 0.0 m to 5.5 m Provided with a momument steel casing

SAMPLES		
Number	Type	N-Value
1	DO	12
2	DO	79/8
3	DO	50/4
4	DO	50/4
5	DO	50/4
6	DO	50/3
7	DO	50/3
8	DO	50/2
9	DO	50/2
10	DO	50/4
11	DO	50/4



W.L. @ El. 98.49 m on January 7, 2022
W.L. @ El. 99.21 m on January 19, 2022
W.L. @ El. 100.38 m on February 1, 2022

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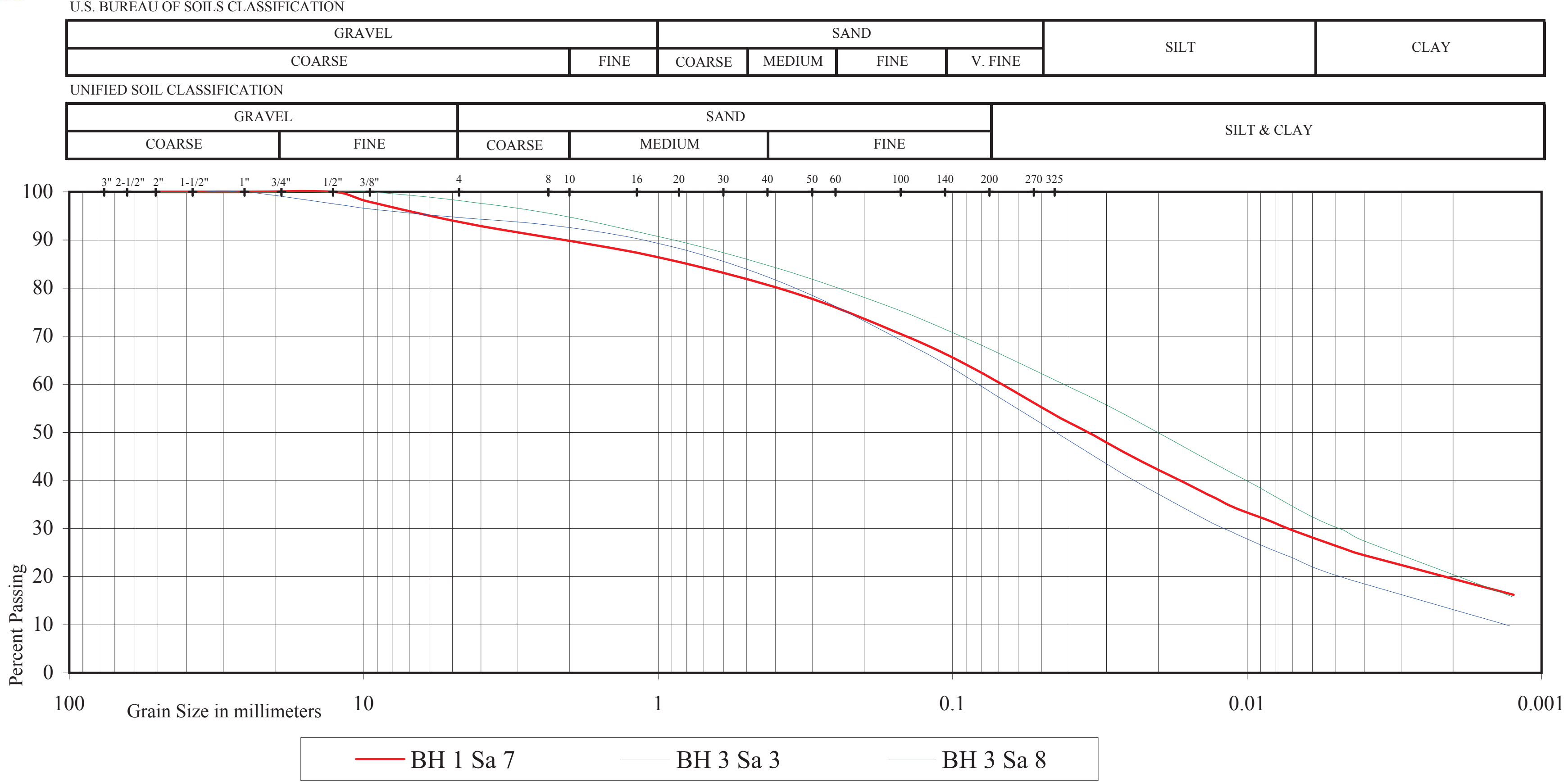
GRAIN SIZE DISTRIBUTION

Reference No: 2111-W043



Project: Proposed Residential Development

Location: 720 Granite Court, City of Pickering

Borehole No:	1	3	3
Sample No:	7	3	8
Depth (m):	6.1	1.5	7.6
Elevation (m):	98.4	103.4	97.3

BH 1 Sa. 7 Estimated Permeability (cm./sec.) = 10^{-7}

BH 3 Sa. 3 Estimated Permeability (cm./sec.) = 10^{-6}

BH 3 Sa. 8 Estimated Permeability (cm./sec.) = 10^{-7}

Classification of Sample [& Group Symbol]: SANDY SILT TILL

some clay, a trace of gravel

Figure: 5

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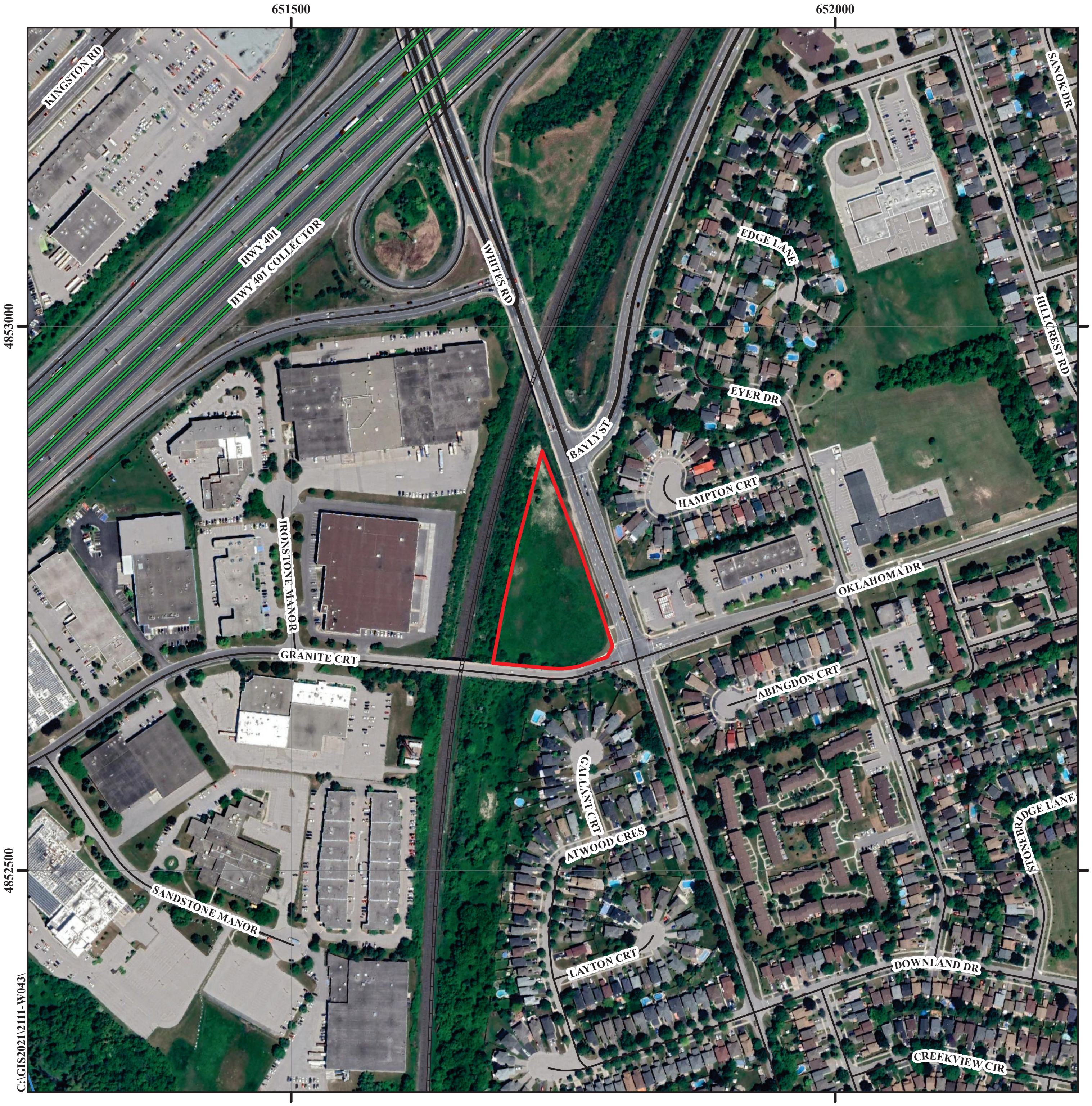
DRAWINGS 1 TO 9

REFERNCE NO. 2111-W043



N

🟥	Approximate Boundary of Subject Site
→	Watercourse
🟩	Expressway/Freeway
━	Major Road
─	Local Road
┼	Railway

Soil Engineers Ltd.

Title: Site Location Plan

Project:
Hydrogeological Assessment
Proposed Mid-Rise Residential Development
720 Granite Court
City of Pickering

Reference No. 2111-W043

Date: January 19, 2022

Scale:
0 25 50 100 150 200 250
Metres

Drawing No. 1

Source: Ontario Ministry of Natural Resources and Forestry

🟥 Approximate Boundary of Subject Site

⊕ Borehole

⊕ Borehole with Monitoring Well

━ Major Road

─ Local Road

┅ Railway

Soil Engineers Ltd.

Title: Borehole and Monitoring Well Location Plan

Project:

Hydrogeological Assessment
Proposed Mid-Rise Residential Development
720 Granite Court
City of Pickering

Reference No. 2111-W043

Date: January 19, 2022

Scale:
0 5 10 20 30 40 50
Metres

Drawing No. 2

Source: Ontario Ministry of Natural Resources and Forestry

N

🟥	Approximate Boundary of Subject Site
▭	500 metres from Subject Site Boundary
● 1	Well Location from MECP Well Records (see Appendix 'A')
▶	Watercourse
🟩	Expressway/Freeway
━	Major Road
─	Local Road
═	Railway

Soil Engineers Ltd.

Title: MECP Well Location Plan

Project:
Hydrogeological Assessment
Proposed Mid-Rise Residential Development
720 Granite Court
City of Pickering

Reference No. 2111-W043

Date: January 19, 2022

Scale:
0 25 50 100 150 200 250
Metres

Drawing No. 3

Source: Ontario Ministry of Natural Resources and Forestry
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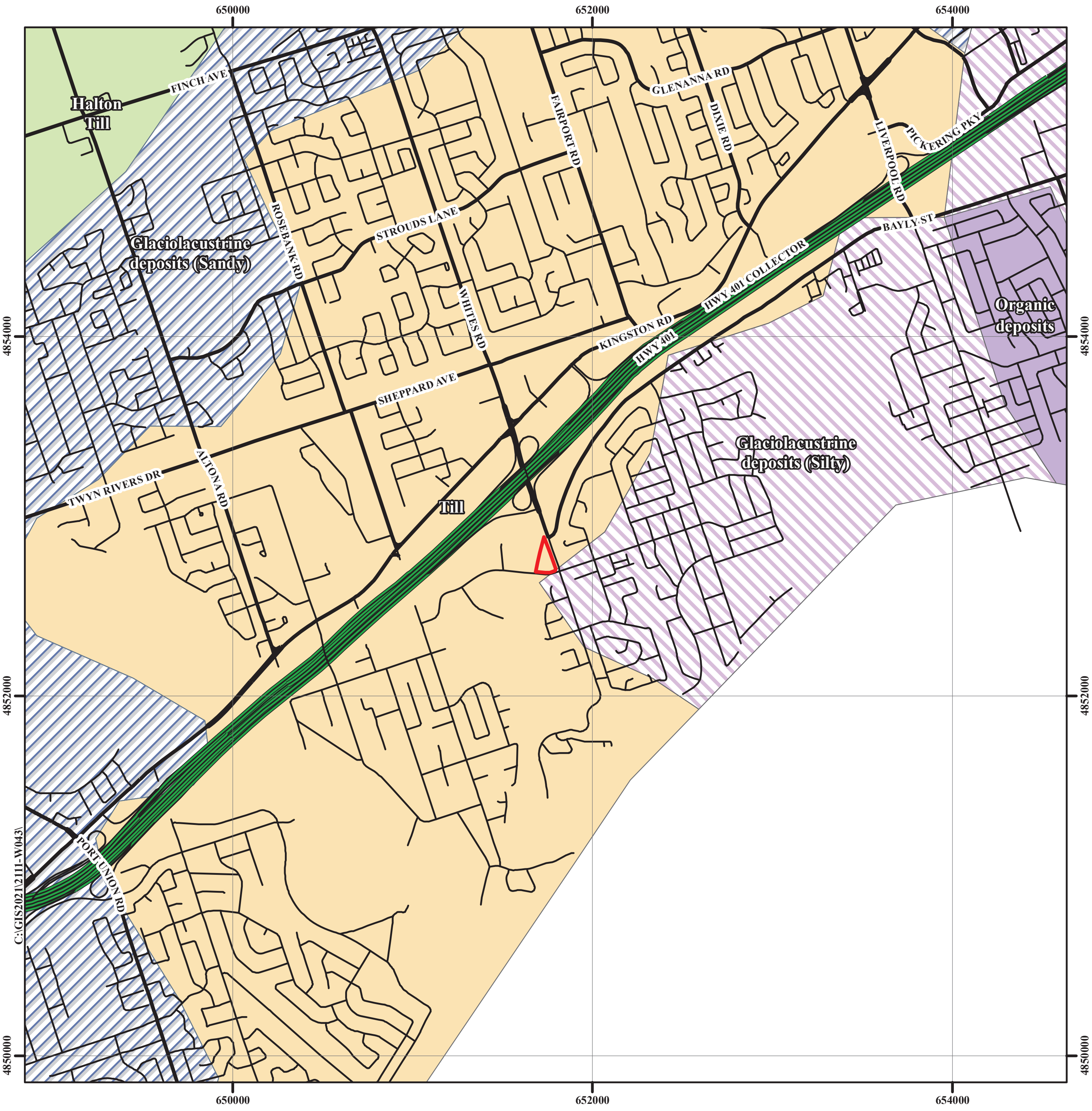


N

🟥 Approximate Boundary of Subject Site

▨ Glaciolacustrine deposits (Sandy)
Material: sand, gravelly sand
and gravel, nearshore and
beach deposits

▨ Glaciolacustrine deposits (Silty)
Material: silt and clay, minor sand,
basin and quiet water deposits

🟩 Halton Till
Material: predominantly silt to
silty clay matrix, high in matrix
carbonate content and clast poor

🟪 Organic deposits
material: peat, muck and marl

🟧 Till
Material: undifferentiated,
predominantly sandy silt to silt
matrix, commonly rich in
clasts, often high in total
matrix carbonate content

━ Expressway/Freeway

━ Major Road

─ Local Road

Soil Engineers Ltd.

Title: Quarternary and Surface
Geology Map

Project:

Hydrogeological Assessment
Proposed Mid-Rise Residential Development
720 Granite Court
City of Pickering

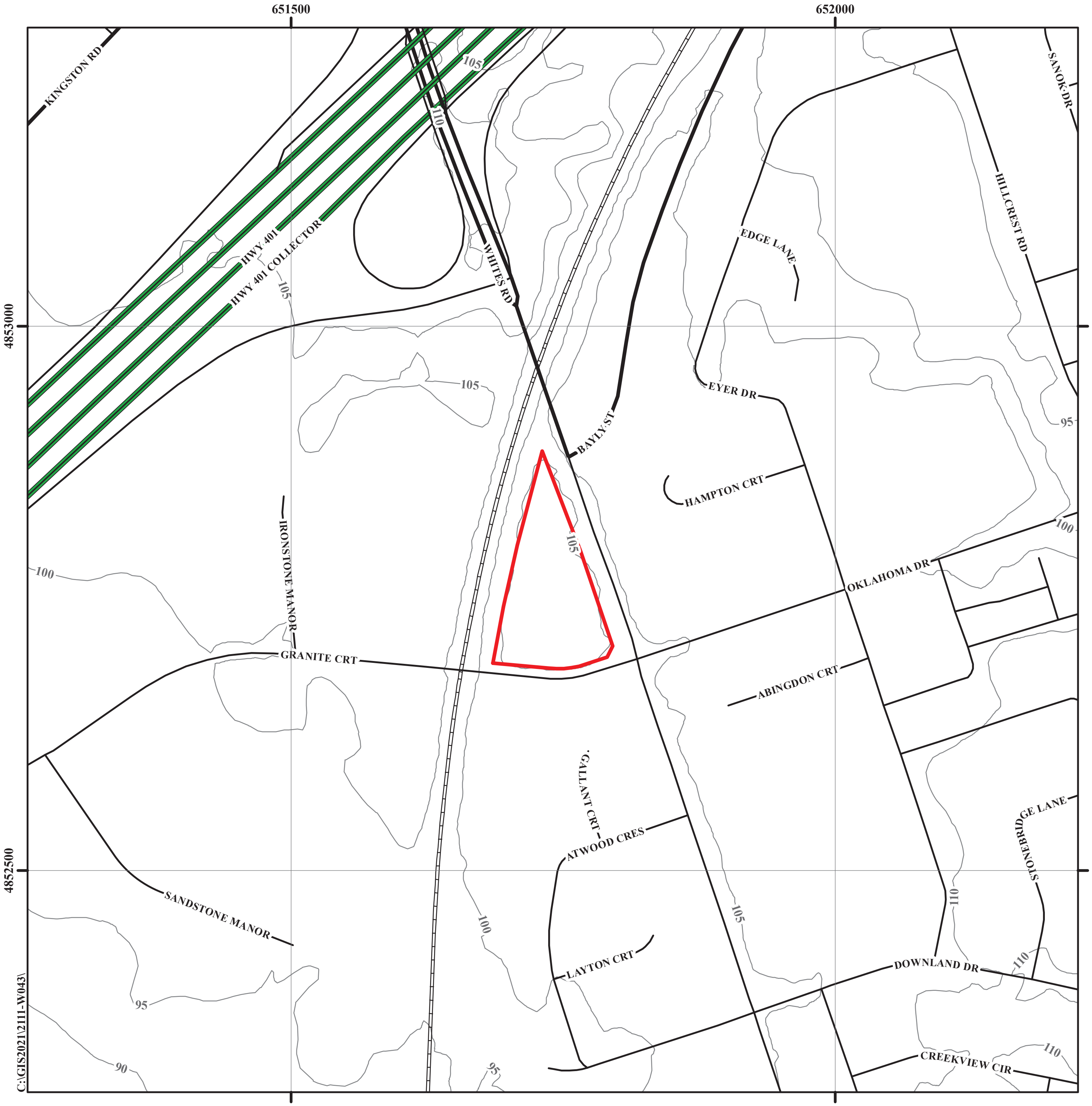
Reference No. 2111-W043

Date: January 19, 2022

Scale:
0 200 400 600 800 1,000
Metres

Drawing No. 4

Source: Ontario Geological Survey, 1997,
Surface Geology of Ontario; Ontario Geological Survey,
Miscellaneous Released-Data 0014



N

🟥 Approximate Boundary of Subject Site

🟩 Expressway/Freeway

━ Major Road

─ Local Road

┼┼┼ Railway

—100— Topographic Contour (masl)

Soil Engineers Ltd.

Title: Topographic Map

Project:
Hydrogeological Assessment
Proposed Mid-Rise Residential Development
720 Granite Court
City of Pickering

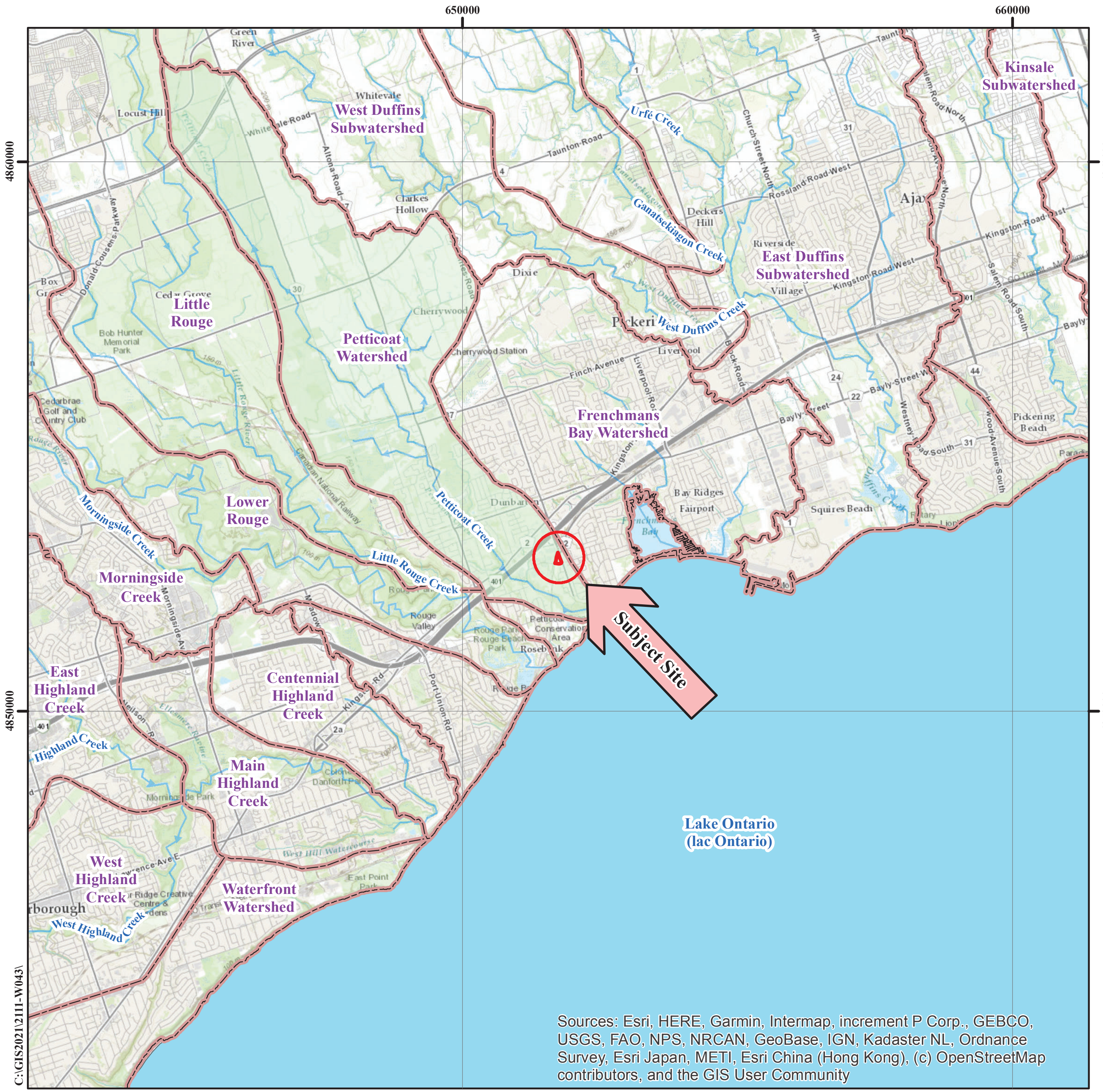
Reference No. 2111-W043

Date: January 19, 2022

Scale:
0 25 50 100 150 200 250
Metres

Drawing No. 5

Source: Ontario Ministry of Natural Resources and Forestry



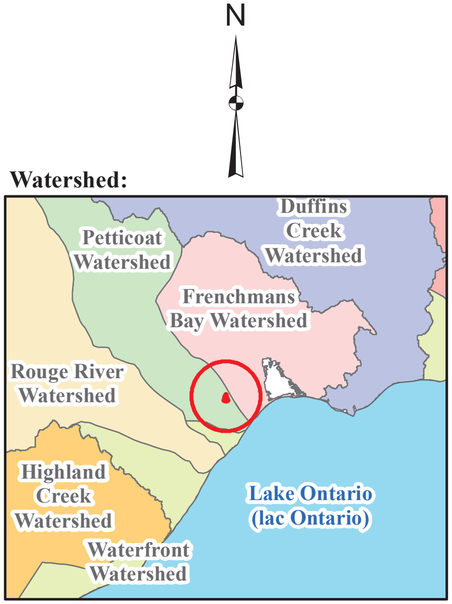
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

C:\GIS2021\2111-W043\

This mapping was produced by SEL and should be used for information purposes only.
Data sources used in its production are of varying quality and accuracy and all boundaries should be considered approximate.

N

Watershed:



🟥	Approximate Boundary of the Subject Site
▨	Watershed Boundaries
🟦	Waterbody
—	Watercourse
—	Expressway/Major Road

Soil Engineers Ltd.

Title: Watershed and Subwatershed Map

Project:

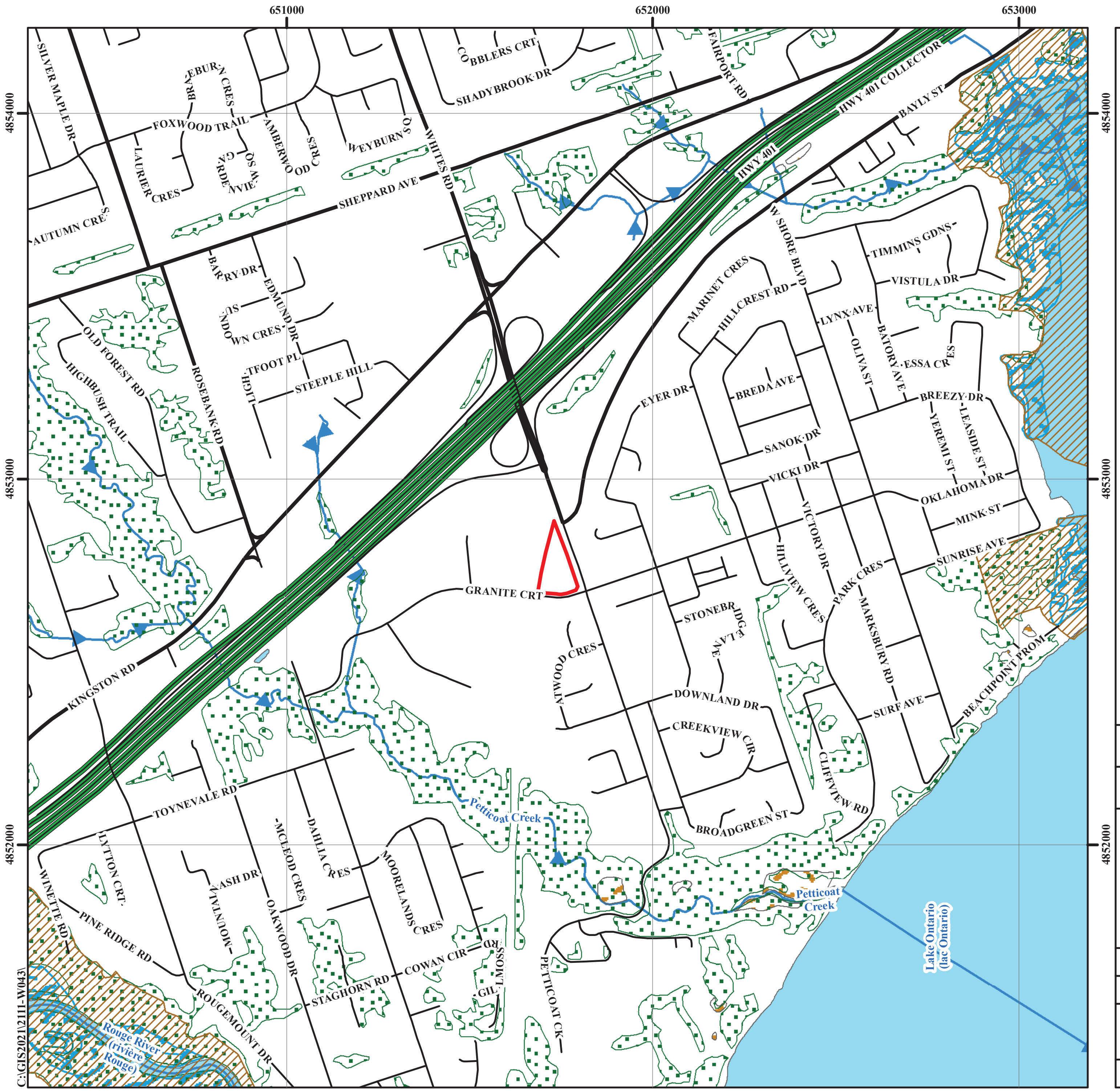
Hydrogeological Assessment
Proposed Mid-Rise Residential Development
720 Granite Court
City of Pickering

Reference No. 2111-W043

Date: January 19, 2022

Scale:
0 1,000 2,000 3,000 4,000 5,000
Metres

Drawing No. 6



🟥	Approximate Boundary of Subject Site
▨	Area of Natural and Scientific Interest (ANSI)
▨	Wetland (classified as Provincial)
▨	Wetland (Not evaluated per OWES)
▨	Wooded Area
🟦	Waterbody
➤	Watercourse
🟩	Expressway/Freeway
━	Major Road
─	Local Road

Soil Engineers Ltd.

Title: Natural Features and Protection Area Plan

Project:
Hydrogeological Assessment
Proposed Mid-Rise Residential Development
720 Granite Court
City of Pickering

Reference No. 2111-W043

Date: January 19, 2022

Scale:
0 100 200 300 400 500
Metres

Drawing No. 7

Contains information licensed under the Open Government Licence – Ontario, 2021.
Includes information: Provincial Park, Conservation Reserve, Area of Natural and Scientific Interest, Wetland, Niagara Escarpment Protection Area, Oak Ridges Moraine Conservation and Wilderness Areas

Source: Ontario Ministry of Natural Resources and Forestry
Ⓒ Queen's Printer for Ontario, 2021
OWES: Ontario Wetland Evaluation System

N

🟥 Approximate Boundary of Subject Site

⊕ Borehole

⊕ Borehole with Monitoring Well

— Major Road

— Local Road

Railway

A — A' Cross-Section Direction

—100— Topographic Contour (masl)

Soil Engineers Ltd.

Title: Cross-Section Key Plan

Project:
Hydrogeological Assessment
Proposed Mid-Rise Residential Development
720 Granite Court
City of Pickering

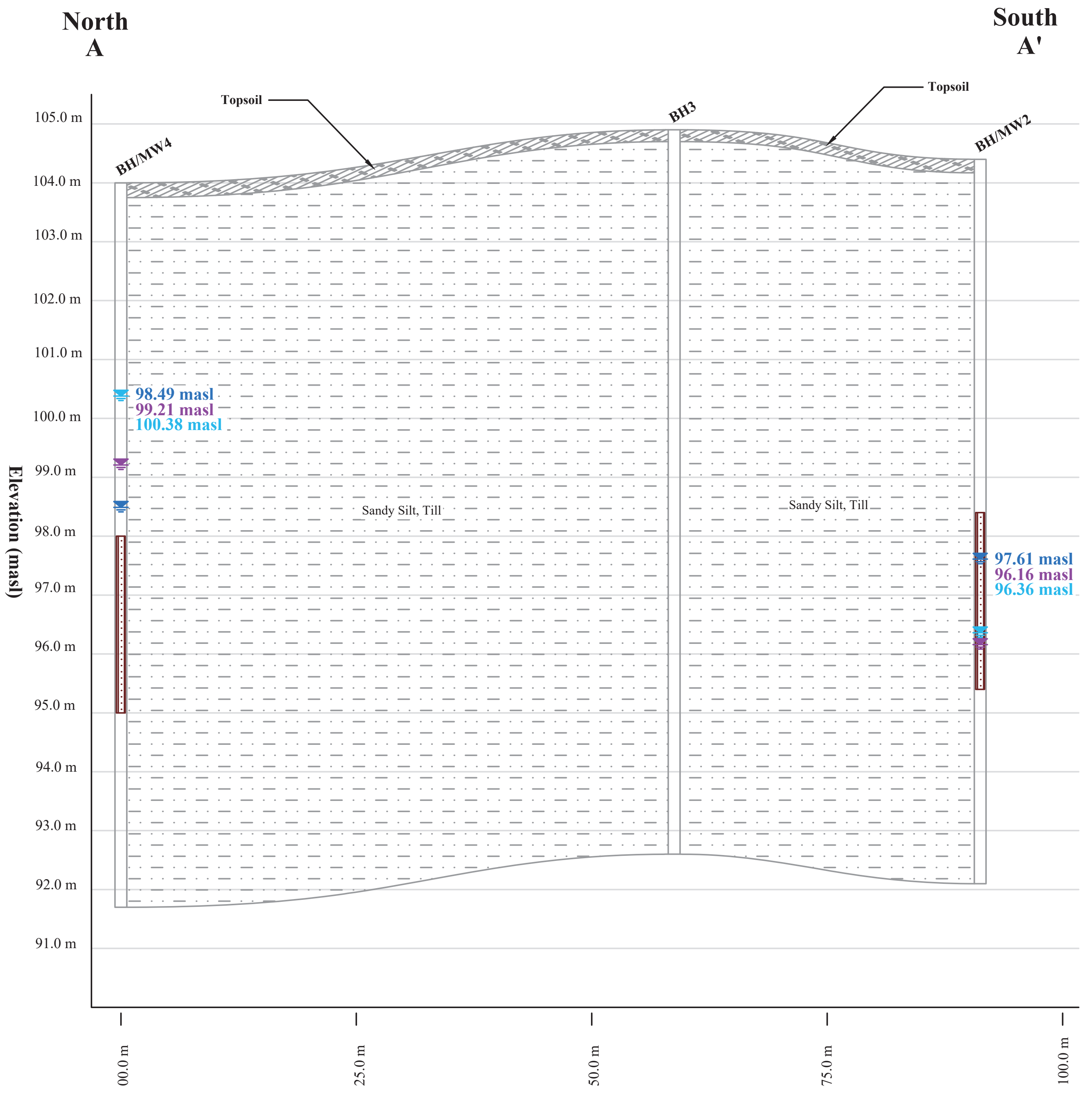
Reference No. 2111-W043

Date: March 1, 2022

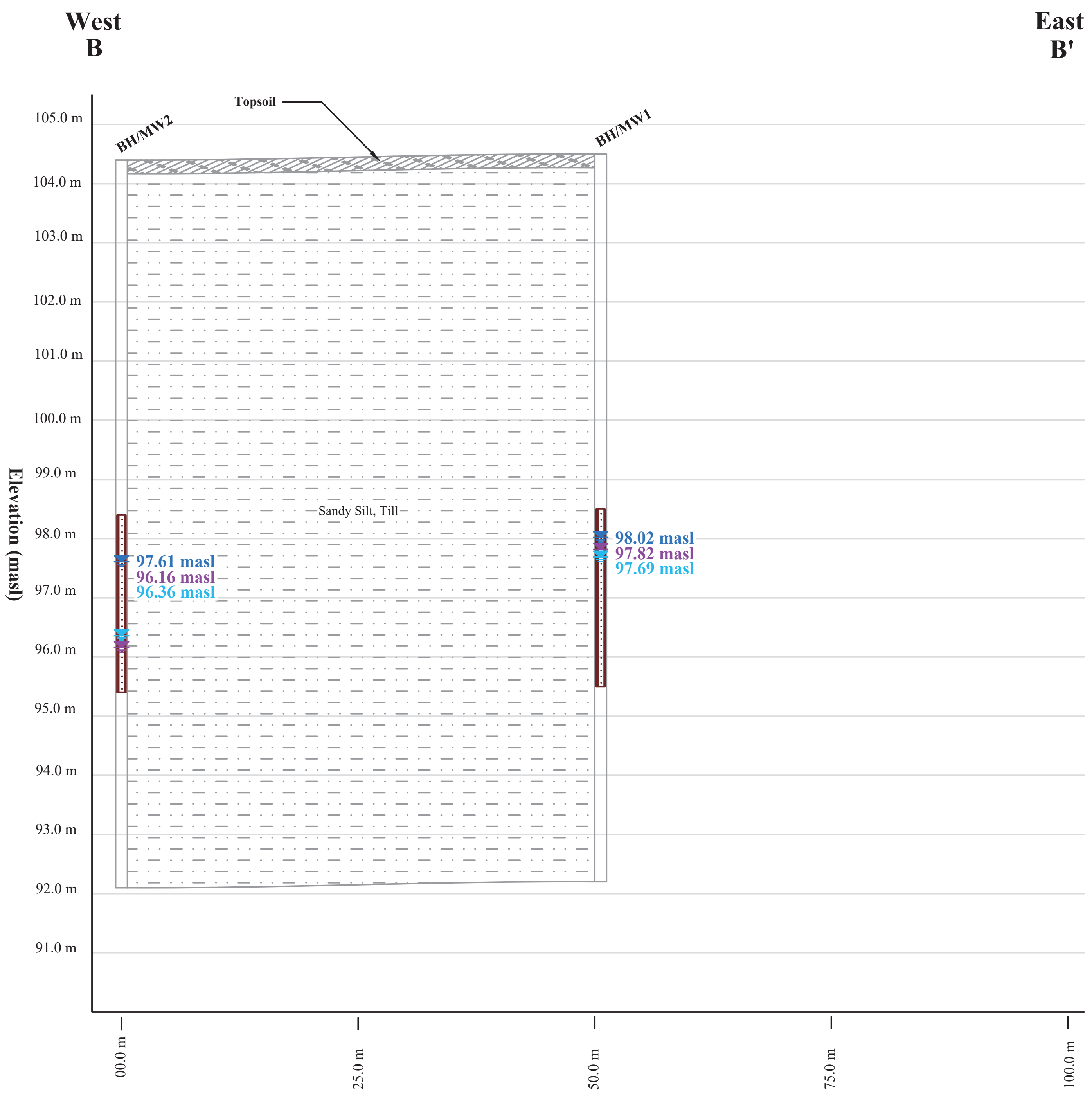
Scale:
0 5 10 20 30 40 50
Metres

Drawing No. 8-1

Source: Ontario Ministry of Natural Resources and Forestry



Section A-A'



Section B-B'

▨ **Topsoil**

Sandy Silt, Till

3.0 m Screen

Water Table on January 7, 2022

Water Table on January 19, 2022

Water Table on February 1, 2022

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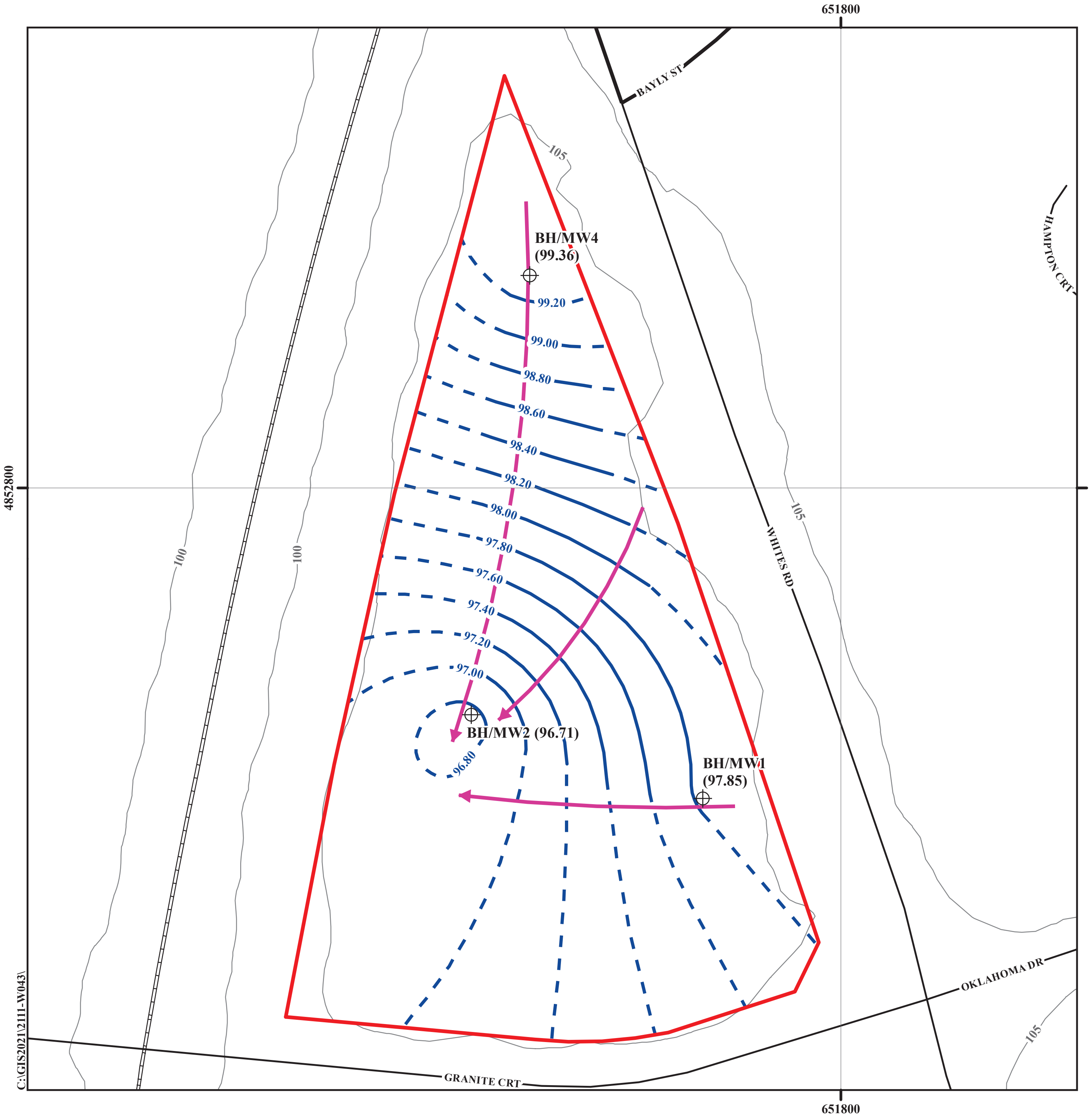
Title: Geological Cross-Section (A-A' and B-B')

Project: Hydrogeological Assessment
Proposed Mid-Rise Residential Development
720 Granite Court, City of Pickering

Reference No:	Date:	Scale: V	Scale: H	Drawing No.
2111-W043	March, 2022	1:100	1:2500	8-2



N

🟥	Approximate Boundary of Subject Site
⊕	Borehole with Monitoring Well
→	Interpreted Shallow Groundwater Flow Direction
──	Interpreted Shallow Groundwater Level Elevation (masl)
- - -	Inferred Shallow Groundwater Level Elevation (masl)
━━	Major Road
──	Local Road
┼┼┼	Railway
—100—	Topographic Contour (masl)
(97.85)	Average Shallow Groundwater Level Elevation (masl)

Soil Engineers Ltd.

Title: Shallow Groundwater
Flow Pattern Plan

Project:
Hydrogeological Assessment
Proposed Mid-Rise Residential Development
720 Granite Court
City of Pickering

Reference No. 2111-W043

Date: March 1, 2022

Scale:
0 5 10 20 30 40 50
Metres

Drawing No. 9

Source: Ontario Ministry of Natural Resources and Forestry
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FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

APPENDIX ‘A’

MECP WATER WELL RECORDS SURVEY

REFERNCE NO. 2111-W043

Ontario Water Well Records

WELL ID	MECP WWR ID	Construction Method	Well Depth (m)**	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
				Final Status	First Use				
1	4601906	Rotary (Convent.)	37.49	Abandoned-Supply	-	28.35	19.20	-	-
2	7041862	Boring	6.00	Observation Wells	Not Used	-	-	1.50	6.00
3	7125150	Boring	3.90	Test Hole	Monitoring	-	-	0.90	3.90
4	7125150	Boring	3.90	Test Hole	Monitoring	-	-	0.90	3.90
5	7125150	Boring	3.90	Test Hole	Monitoring	-	-	0.90	3.90
6	7125150	Boring	3.90	Test Hole	Monitoring	-	-	0.90	3.90
7	7183708	Direct Push	6.10	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.10	6.10
8	7183709	Direct Push	6.10	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.10	6.10
9	7253328	Auger	4.57	Monitoring and Test Hole	Monitoring and Test Hole	-	-	1.52	4.57
10	7253330	Auger	4.57	Monitoring and Test Hole	Monitoring and Test Hole	-	-	1.52	4.57
11	7253329	Auger	6.10	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.10	6.10
12	7335757	Auger	9.14	Observation Wells	Monitoring	-	-	6.10	9.14
13	7335758	Auger	19.81	Observation Wells	Monitoring	15.24	-	16.76	19.81
14	7335759	Auger	9.14	Monitoring and Test Hole	Monitoring	7.32	-	6.10	9.14
15	7335763	Auger	4.27	Observation Wells	Monitoring	-	-	2.74	4.27

*MECP WWID: Ministry of Environment, Conservation, and Parks Water Well Records Identification

**metres below ground surface

Soil Engineers Ltd.
CONSULTING ENGINEERS
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90 WEST BEAVER CREEK ROAD, SUITE 100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	MUSKOKA	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

APPENDIX ‘B’

SINGLE WELL RESPONSE TEST RESULTS

REFERNCE NO. 2111-W043

Falling Head Test (Slug Test)

Test Date:		1-Feb-22	
Piezometer/Well No.:		BH/MW 1	
Ground level:		104.50	m
Screen top level:		98.40	m
Screen bottom level:		95.40	m
Test El. (at midpoint of screen):		96.90	m
Test depth (at midpoint of screen):		7.6	m
Screen length	L=	3.0	m
Diameter of undisturbed portion of aquifer	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.2057	m
Initial water depth		6.81	m
Aquifer material:		**Sandy Silt Till**	

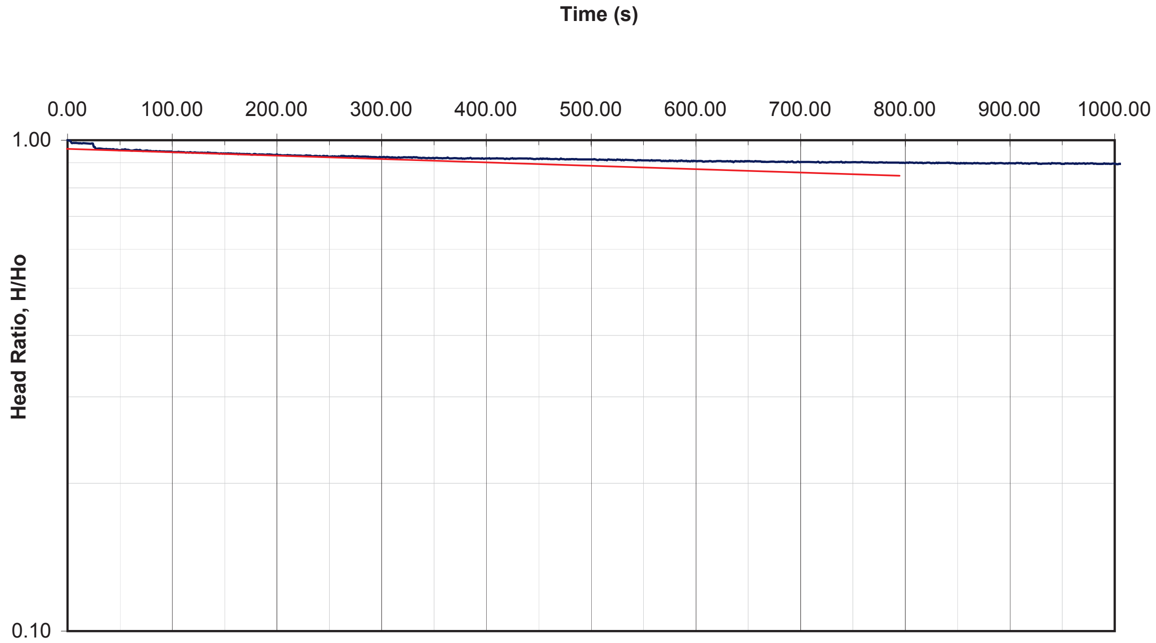
Shape factor $F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.701815$ m

Permeability $K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$$\frac{\ln(H1/H2)}{(t2 - t1)} = 0.000549589$$

K= **1.9E-05** cm/s

1.9E-07 m/s



Falling Head Test (Slug Test)

Test Date:		1-Feb-22	
Piezometer/Well No.:		BH/MW 2	
Ground level:		104.40	m
Screen top level:		98.10	m
Screen bottom level:		95.10	m
Test El. (at midpoint of screen):		96.60	m
Test depth (at midpoint of screen):		7.8	m
Screen length	L=	3.0	m
Diameter of undisturbed portion of aquifer	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.5609	m
Initial water depth		8.04	m
Aquifer material:		**Sandy Silt Till**	

Shape factor

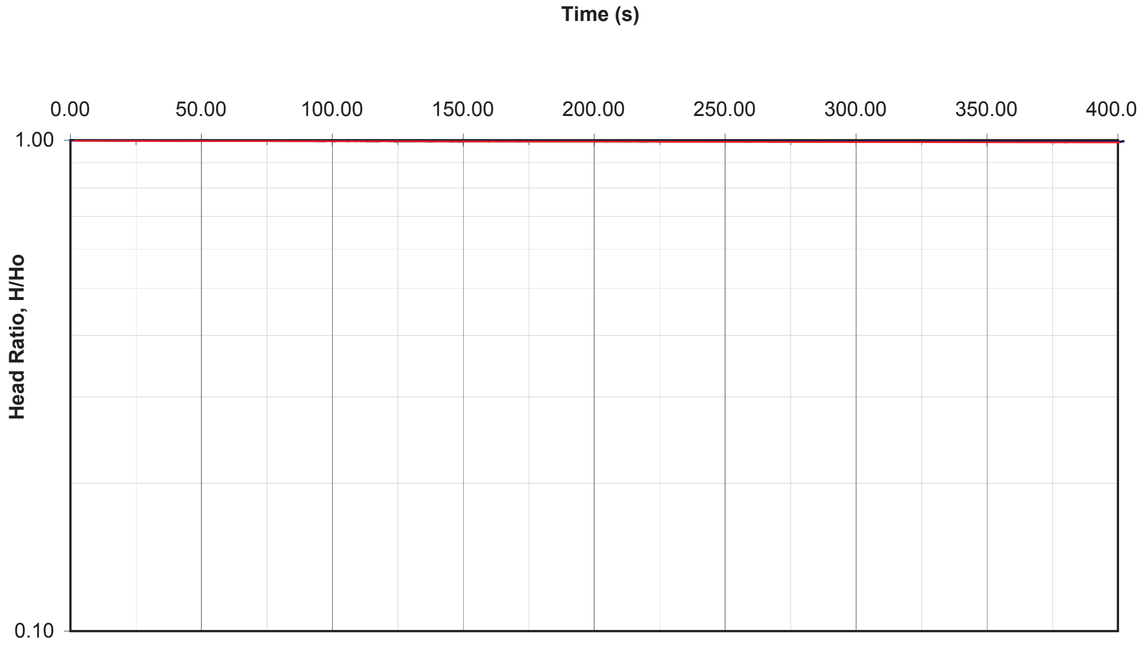
$$F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.701815 \text{ m}$$

Permeability

$$K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2) \quad \text{(Bouwer and Rice Method)}$$

$$\frac{\ln(H1/H2)}{(t2 - t1)} = 4.10898E-05$$

K= **1.4E-06** cm/s
1.4E-08 m/s



Falling Head Test (Slug Test)

Test Date:		1-Feb-22	
Piezometer/Well No.:		BH/MW 4	
Ground level:		103.99	m
Screen top level:		97.69	m
Screen bottom level:		94.69	m
Test El. (at midpoint of screen):		96.19	m
Test depth (at midpoint of screen):		7.8	m
Screen length	L=	3.0	m
Diameter of undisturbed portion of aquifer	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.4395	m
Initial water depth		3.61	m
Aquifer material:		**Sandy Silt Till**	

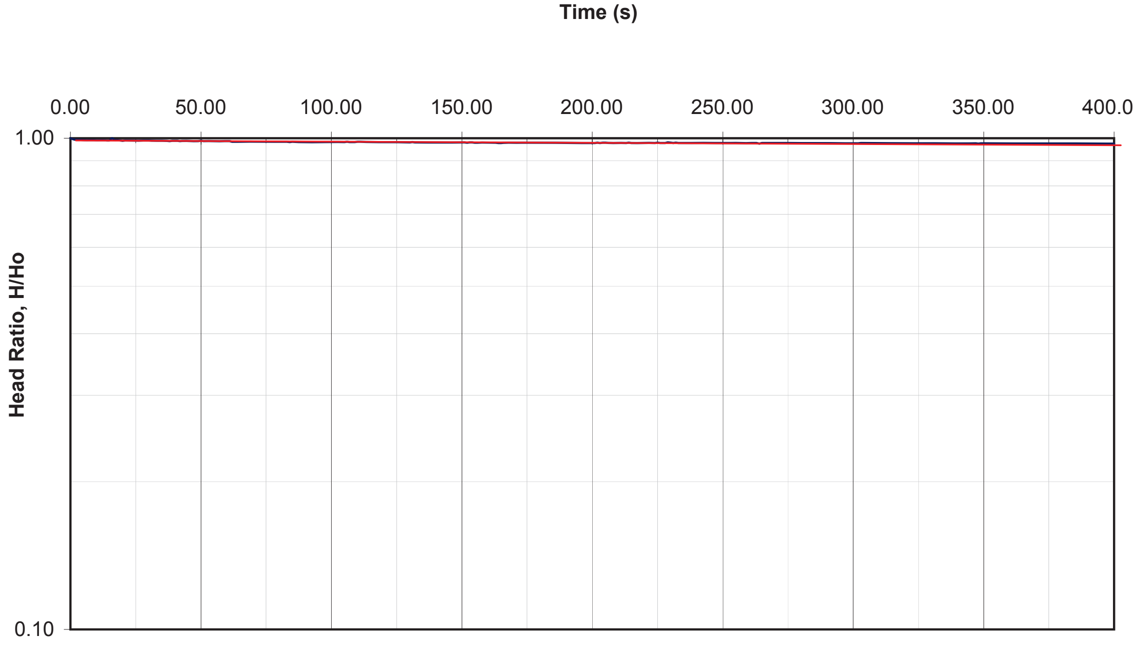
Shape factor F= $\frac{2 \times 3.14 \times L}{\ln(L/R)}$ = 5.701815 m

Permeability K= $\frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$\frac{\ln(H1/H2)}{(t2 - t1)}$ = 0.000176752

K= **6.1E-06** cm/s

6.1E-08 m/s



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APPENDIX ‘C’

A GEOTECHNICAL REVIEW FOR POTENTIAL GROUND SETTLEMENT

REFERNCE NO. 2111-W043

Soil Engineers Ltd.
CONSULTING ENGINEERS
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FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 721-7864	FAX: (905) 542-2769

September 11, 2024

Reference No. 2111-S043

1334281 Ontario Limited
720 Granite Court
Pickering, Ontario
L1W 4A3

Attention: Mr. Domenic Grossi

Re: A Geotechnical Review for Potential Ground Settlement
Proposed Mid-Rise Residential Development
720 Granite Court
City of Pickering

Dear Sir:

As requested, Soil Engineers Ltd. (SEL) has performed a geotechnical review for potential settlement to the existing structures surrounding the captioned site due to short-term construction dewatering and long-term foundation drainage discharge within the subject site.

The following documents, drawings and reports are reviewed for the assessment:

- *Geotechnical Investigation Report, prepared by SEL, dated March 2023.*
- *Hydrogeological Assessment Report, prepared by SEL, dated September 2024.*
- *Architectural Drawings, prepared by onespace unlimited Inc., dated August 28, 2024*

Subsurface Conditions

Based on the borehole findings in the geotechnical report, beneath a veneer of topsoil, the site is underlain by a stratum of sandy silt till throughout the site.

The recorded groundwater elevations within the building envelope as reported in the hydrogeological assessment ranges from El. 96.16 to 98.02 m.

Estimation of Settlement Due to Dewatering

Based on the architectural drawings, it is estimated that the bottom of excavation for the proposed development is at El. 98.2 m and the base of elevator pit is at El. 97.2 m. Given the bottom of excavation and the base of elevator pit are lower than the recorded groundwater level, construction dewatering is anticipated during construction.

A review of the aerial image and drawings shows that the site is bounded by a municipal street to the south, a regional road to the east and northeast, and a railway line to the west and northwest. According to the hydrogeological report, the Zone of Influence (ZOI) due to construction dewatering is estimated to be 4.2 m. The dewatering array will likely be installed along the extent of underground structure. The extent of the ZOI is estimated and is illustrated on Drawing No. 1, enclosed.

In order to provide a dry and stable subgrade for construction, the groundwater should be lowered to at least 1.0 m below the bottom of the excavation. As such, the maximum drawdown of the groundwater is estimated to be 1.0 m. Considering that the ZOI is primarily within the property boundary and in areas extends to the existing sidewalk and boulevard, no structure will be affected from the construction dewatering. Furthermore, the ground settlement due to construction dewatering is estimated to be less than 1.0 mm for the sidewalk and is considered geotechnically acceptable. Once the dewatering system ceases operation, additional ground settlement due to construction dewatering is not anticipated.

Long Term Foundation Drainage Discharge

With the very dense sandy silt till in the subgrade below the lowest parkade level, long-term foundation drainage discharge will likely be water seepage captured in the perimeter foundation subdrains and underfloor subdrains, which can be considered minimal and would not significantly change the groundwater condition from the proposed development; thus, potential settlement due to long-term foundation drainage discharge is not anticipated.

We trust the above satisfies your requirements. Should you have any further queries, please feel free to contact this office.

Yours truly,
SOIL ENGINEERS LTD.

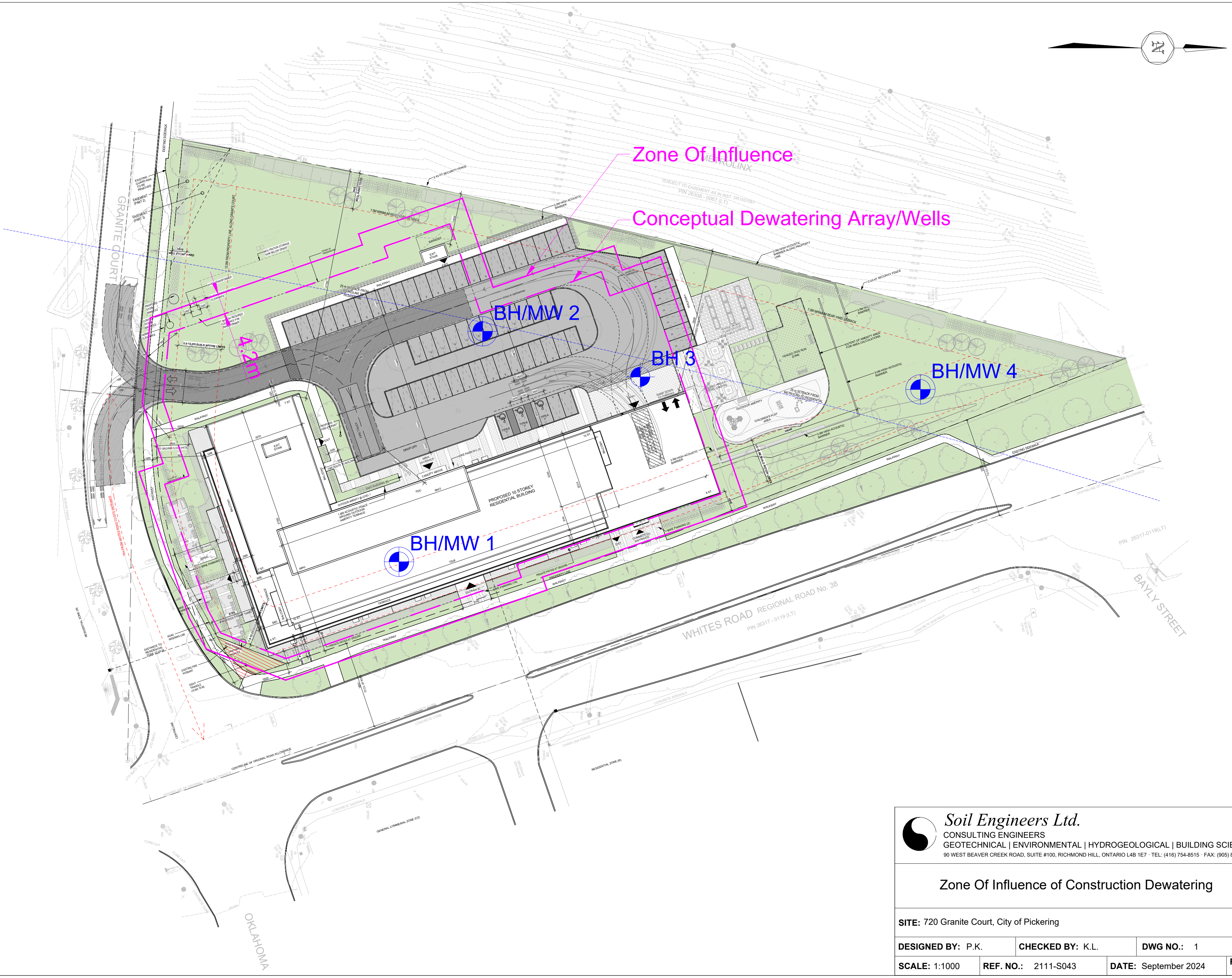
Poh Fung Kwok, M.Sc.

Kin Fung Li, P.Eng.
PK/KL:dd

LICENSED PROFESSIONAL ENGINEER
Sept 11, 2024
K. F. LI
100169280
PROVINCE OF ONTARIO

ENCLOSURE

Borehole Location Plan with ZOI of Construction Dewatering........................Drawing No. 1



Soil Engineers Ltd.
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90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

Zone Of Influence of Construction Dewatering

SITE: 720 Granite Court, City of Pickering

DESIGNED BY: P.K. **CHECKED BY:** K.L. **DWG NO.:** 1

SCALE: 1:1000 **REF. NO.:** 2111-S043 **DATE:** September 2024 **REV** -

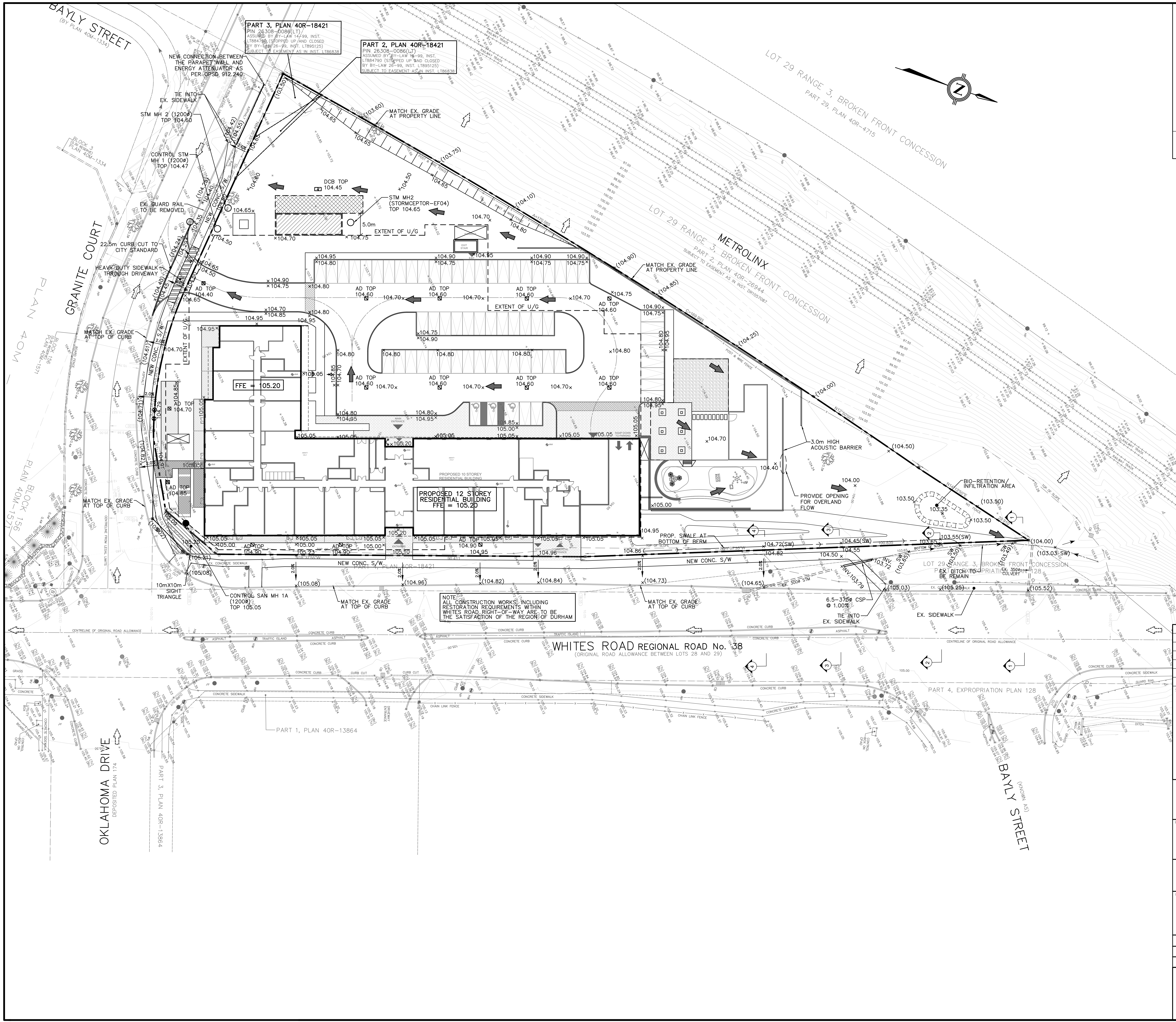
Appendix Drawings

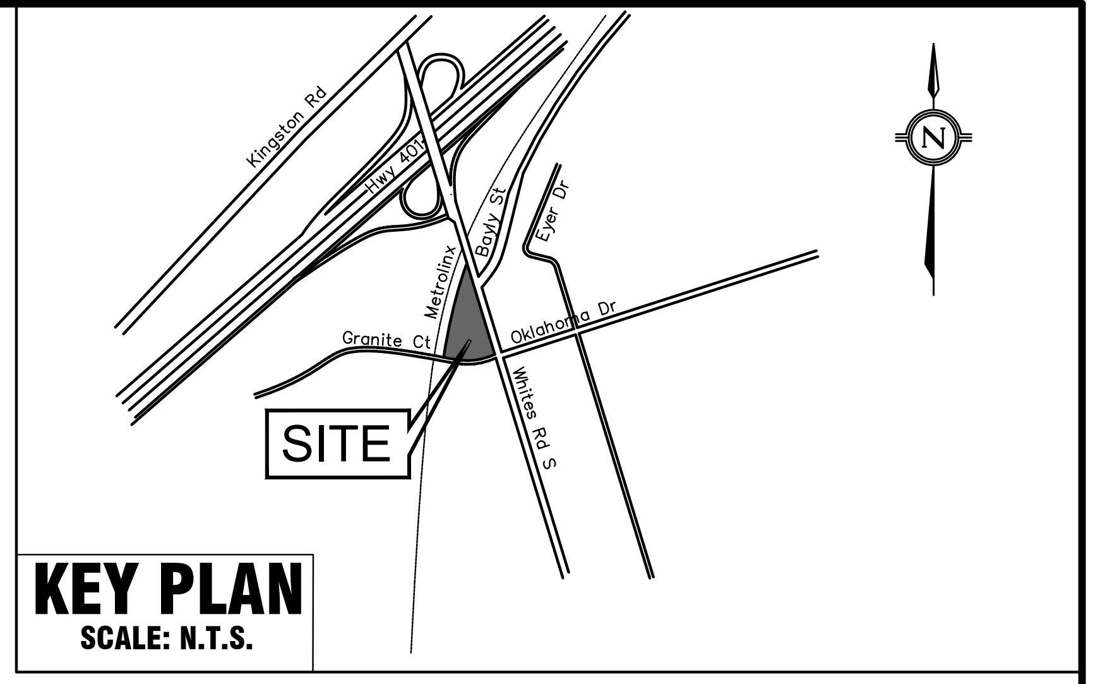
SS-1 – Site Servicing Plan •

GR-1 – Site Grading Plan •

GEN-1 – General Notes Plan •

ESC-1 – Erosion and Sediment Control Plan •





KEY PLAN
SCALE: N.T.S.

BENCHMARK:

ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE REFERRED TO CITY OF PICKERING BENCHMARK No. R-055 HAVING A PUBLISHED ELEVATION OF 107.485 METRES.

TOPO INFORMATION TAKEN FROM PLAN OF SURVEY OF PART OF BAYLY STREET, PLAN 40M-1334, CITY OF PICKERING IN THE REGIONAL MUNICIPALITY OF DURHAM. PLAN OF SURVEY PREPARED BY KRCMAR SURVEYORS LTD, OLS; DATED DECEMBER 7, 2021.

LEGEND:

176.40	PROPOSED ELEVATION
176.44 TW	PROP. TOP OF WALL
176.31 BW	PROP. BOTTOM OF WALL
(175.93)	EXISTING ELEVATION TO REMAIN
●	PROPOSED SANITARY MANHOLE
○	PROPOSED STORM MANHOLE
□	PROPOSED CATCHBASIN
▨	PROPOSED AREA DRAIN
⊗	PROPOSED WATER VALVE & BOX
	PROPOSED HYDRANT
Ⓜ	WATER METER LOCATION
← 2.0%	DRAINAGE FLOW
⬅	OVERLAND FLOW DIRECTION (GREATER THAN 100 YEAR)
Ⓢ	PROPOSED STORMCEPTOR MANHOLE
	PROPERTY LINE
176.00	EXISTING ELEVATION
⇦	EXTERNAL OVERLAND FLOW DIRECTION
▤	EXISTING CATCHBASIN
	EXISTING SANITARY MANHOLE
	EXISTING STORM MANHOLE
	EXISTING HYDRANT
	EXISTING VALVE & BOX
●	EXISTING UTILITY POLE
	3:1 SLOPE (MAX)
D.C.	DEPRESSED CURB

6			
5			
4			
3			
2	RE-ISSUED FOR REZONING	AUG. 29/24	K.L.
1	ISSUED FOR REZONING	.	K.L.
	DESCRIPTION	DATE	BY

STAMP: REVISIONS

STAMP:
LICENSED PROFESSIONAL ENGINEER
W. C. IP
AUG. 29/24
PROVINCE OF ONTARIO

CITY OF PICKERING
ENGINEERING SERVICES DEPARTMENT

PROJECT:
PROPOSED 12-STOREY RESIDENTIAL BUILDING
720 GRANITE COURT, PICKERING

SITE GRADING PLAN

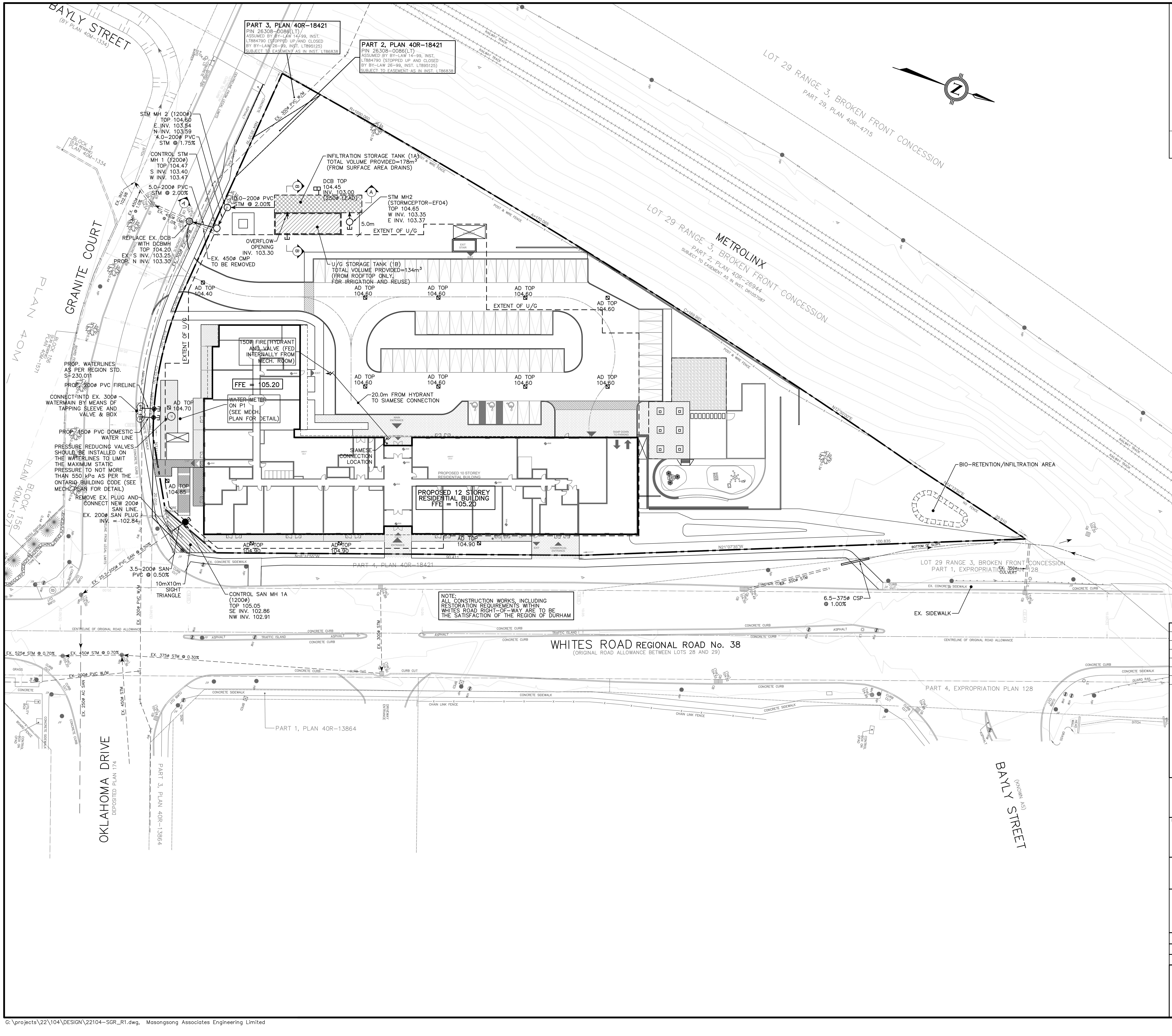
CONSULTANT:
MASONGSONG ASSOCIATES
7800 KENNEDY ROAD
SUITE 201
MARKHAM, ONTARIO
L3R 2C7
T: (905) 944-0162
www.maeng.ca

DESIGN BY:	K.L.	CHECKED BY:	K.L.	PROJECT No.
DRAWN BY:	MAEL-CAD	CHECKED BY:	A.I.	22-104
SCALE:	1:400	DATE:	OCTOBER 2022	

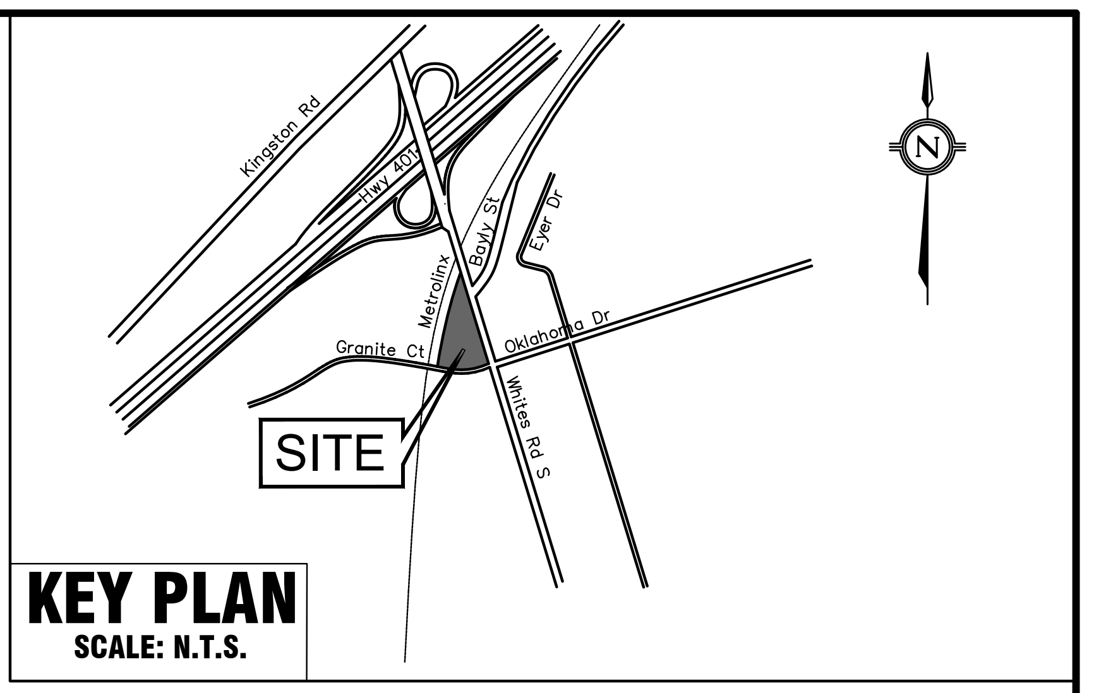
Approved as to form in reliance upon the professional skill and ability of Masongsong Associates, Consulting Engineers, as to design and specification.

Director of Engineering　　Date

DRAWING No.
GR-1



NOTE:
ALL CONSTRUCTION WORKS, INCLUDING
RESTORATION REQUIREMENTS WITHIN
WHITES ROAD RIGHT-OF-WAY ARE TO BE
THE SATISFACTION OF THE REGION OF DURHAM



KEY PLAN
SCALE: N.T.S.

BENCHMARK:

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LEGEND:

●	PROPOSED SANITARY MANHOLE
○	PROPOSED STORM MANHOLE
□	PROPOSED CATCHBASIN
⧄	PROPOSED AREA DRAIN
⊗	PROPOSED WATER VALVE & BOX
⚲	PROPOSED HYDRANT
Ⓜ	WATER METER LOCATION
Ⓢ	PROPOSED STORMCEPTOR MANHOLE
━ ▪ ━	PROPERTY LINE
▤	EXISTING CATCHBASIN
▩	EXISTING SANITARY MANHOLE
◎	EXISTING STORM MANHOLE
⚲	EXISTING HYDRANT
⚲	EXISTING VALVE & BOX
● UP/L	EXISTING UTILITY POLE
D.C.	DEPRESSED CURB

	DESCRIPTION	DATE	BY
6			
5			
4			
3			
2	RE-ISSUED FOR REZONING	AUG. 29/24	K.L.
1	ISSUED FOR REZONING	.	K.L.

REVISIONS

STAMP:

STAMP:

LICENSED PROFESSIONAL ENGINEER
W. C. IP
AUG. 29/24
PROVINCE OF ONTARIO

CITY OF PICKERING
ENGINEERING SERVICES DEPARTMENT

PROJECT:
PROPOSED 12-STOREY
RESIDENTIAL BUILDING
720 GRANITE COURT, PICKERING

SITE SERVICING PLAN

CONSULTANT:

MASONGSONG ASSOCIATES
7800 KENNEDY ROAD
SUITE 201
MARKHAM, ONTARIO
L3R 2C7
T: (905) 944-0162
www.maeng.ca

DESIGN BY: K.L.	CHECKED BY: K.L.	PROJECT No. 22-104
DRAWN BY: MAEL-CAD	CHECKED BY: A.I.	
SCALE: 1:400	DATE: OCTOBER 2022	

Approved as to form in reliance upon the professional skill and ability of Masongsong Associates, Consulting Engineers, as to design and specification.

Director of Engineering ____________ Date ____________

DRAWING No.
SS-1

G:\projects\22\104\DESIGN\22104-SGR_R1.dwg, Masongsong Associates Engineering Limited

GENERAL NOTES

1. ALL WORK TO CONFORM WITH THE APPLICABLE STANDARDS OF THE REGIONAL MUNICIPALITY OF DURHAM, CITY OF PICKERING, AND ONTARIO PROVINCIAL STANDARD DRAWINGS AND SPECIFICATIONS.
2. FOR ALL CONSTRUCTION DETAILS NOT SHOWN ON PLANS, REFERENCE SHALL BE MADE TO THE ENGINEERING DESIGN CRITERIA AND STANDARD DRAWINGS OF THE CITY OF PICKERING AND REGIONAL MUNICIPALITY OF DURHAM.
3. 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 VERIFY THE LOCATION OF ALL UTILITIES AND SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION FROM DAMAGE DURING CONSTRUCTION.
4. ALL DISTURBED AREA WITHIN MUNICIPAL RIGHT OF WAY SHALL BE RESTORED TO THE SATISFACTION OF THE CITY/MUNICIPAL ENGINEER.
5. ALL RESTORATIONS AND RELOCATIONS WITHIN THE REGIONAL RIGHT–OF–WAY TO BE COMPLETED TO THE SATISFACTION OF THE DIRECTOR OF ENGINEERING AND THE REGION OF DURHAM.
6. ROAD CURB AND PARKING LOT CURBS TO BE OPSD–600.11.

SEWER PIPE MATERIAL

1. ALL POLYVINYL CHLORIDE (PVC) SANITARY AND STORM SEWER PIPES SHALL MEET CURRENT M.O.E.E. SPECIFICATIONS.
2. ALL CONCRETE SEWER PIPES AND FITTING UP TO AND INCLUDING 450 mm IN DIAMETER SHALL BE FABRICATED IN ACCORDANCE WITH CSA–A257.1–M92 CLASS 3 OR LATEST AMENDMENT UNLESS OTHERWISE NOTED.
3. ALL CONCRETE SEWER PIPES AND FITTINGS 525 mm DIAMETER AND LARGER SHALL BE FABRICATED IN ACCORDANCE WITH CSA SPECIFICATIONS CSA–A257–2–M92 REINFORCED CLASSES AS SPECIFIED, OR LATEST AMENDMENT UNLESS OTHERWISE NOTED.
4. WHERE WATER BEARING SAND AND SILT OCCUR, THE SERVER JOINTS SHOULD BE LEAK–PROOF, OR WRAPPED WITH A WATER PROOF MEMBRANE TO PREVENT SUBGRADE MIGRATION THROUGH LEAKY JOINTS RESULTING FROM INADVERTENT FAULTY INSTALLATION. THE NECESSITY OF IMPLEMENTING THESE MEASURES CAN BEST BE DETERMINED DURING SEWER CONNECTION.

SEWER BEDDING

1. STORM, SANITARY AND FDC SEWER BEDDING TO BE AS OPSD 802.010 CLASS 'B' FOR FLEXIBLE PIPE AND OPSD 802.030 CLASS 'B' FOR RIGID PIPES, OR AS SPECIFIED.
2. ALL SERVICES AND STRUCTURES LOCATED IN TRENCH CUT TO BE SUPPORTED BY COMPACTED GRANULAR TO UNDISTURBED OR STRUCTURALLY COMPACTED GROUND.

MANHOLES

1. ALL STORM AND SANITARY MANHOLES SHALL BE AS PER OPSD 701.010, 701.011, 701.012 AND 701.013 WITH FRAME AND COVER AS PER OPSD 401.010.
2. 'MODULOC' OR APPROVED MANHOLE ADJUSTERS TO BE USED IN LIEU OF BRICKING.

BACK FILL

1. ALL STORM MANHOLES AND CATCHBASIN EXCAVATIONS TO BE BACKFILLED WITH GRANULAR 'B' COMPACTED TO 95% PROCTOR DENSITY.

ESC AND CONSTRUCTION TIMING NOTES

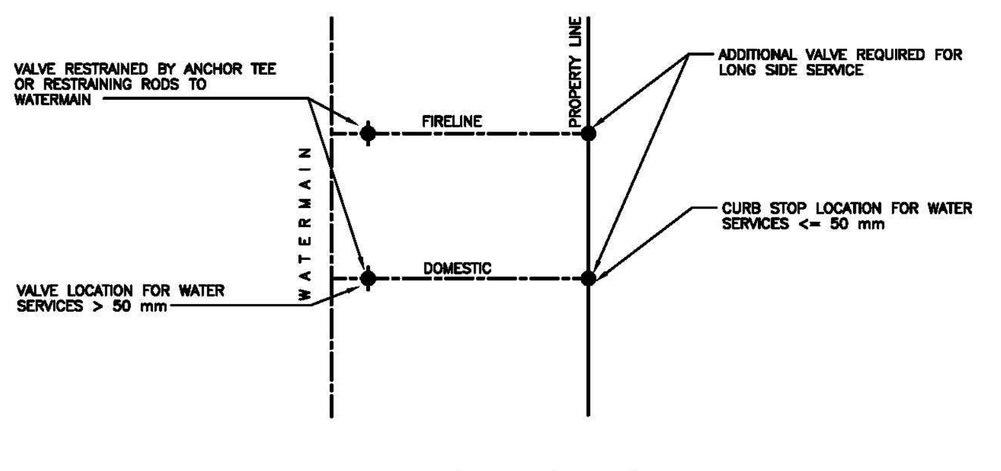
1. ALL EROSION AND SEDIMENT CONTROL MEASURES TO BE INSTALLED PRIOR TO ANY SITE ALTERATION OR BUILDING ACTIVITIES, IN ACCORDANCE WITH DRAWING ES1, AND AS DIRECTED ON–SITE BY THE CONSULTING ENGINEER.
2. ALL EROSION AND SEDIMENT CONTROL MEASURES TO BE INSPECTED AT LEAST ONCE A WEEK AND IMMEDIATELY AFTER EVERY RAINFALL. ANY DEFICIENCIES IN THE ESC MEASURES TO BE RECTIFIED IMMEDIATELY, AND AS DIRECTED BY THE ENGINEER.
3. THE INFILTRATION TRENCH AND PRE–TREATMENT FILTER STRIP ARE TO BE INSTALLED AS THE FINAL STAGE OF CONSTRUCTION, AND NO EARLIER THAN AFTER COMPLETION OF ASPHALT PAVING OPERATIONS.
4. ESC MEASURES ARE TO REMAIN IN PLACE UNTIL THE COMPLETION OF ALL CONSTRUCTION ACTIVITIES, ALL DISTURBED AREAS ARE COMPLETELY RE–ESTABLISHED AND STABILIZED, AND AS DIRECTED BY THE ENGINEER AFTER FINAL INSPECTION.

CATCHBASINS

1. ALL CATCHBASINS AND DOUBLE CATCHBASINS SHALL BE PRECAST AS PER OPSD 705.010 AND 705.020 RESPECTIVELY.
2. ALL CATCHBASIN FRAME AND COVER SHALL BE AS PER OPSD 400.020.

WATERMAINS

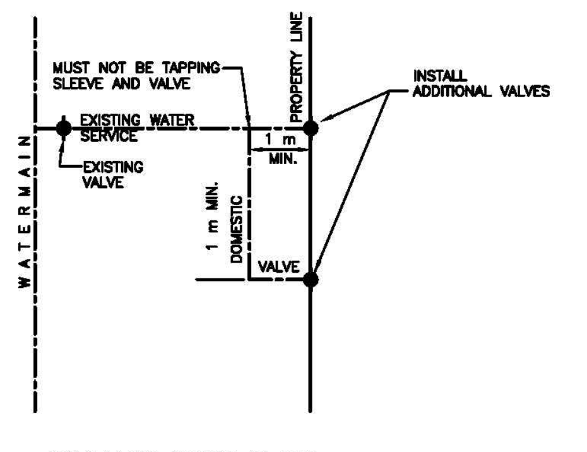
1. WATERMAINS AND APPURTENANCES SHALL BE AS PER REGION OF DURHAM SPECIFICATIONS.
2. WATERMAIN SHALL BE POLYVINYL CHLORIDE (PVC) CLASS 150, DR18 CONFORMING TO AWWA C–900, CLASS 'P' BEDDING. 19mm SERVICE CONNECTIONS TO BE TYPE K COPPER (REGION OF DURHAM STANDARD S–410).
3. ALL WATERMAIN AND SERVICE CONNECTIONS SHALL HAVE A MINIMUM COVER OF 1.80 m.



SHORT SIDE OR LONG SIDE CONNECTION

NOTES

1. VALVE LOCATION SHALL BE DETERMINED BY REGION OF DURHAM.
2. CONNECTION LAYOUT SHALL BE DETERMINED BY THE REGION OF DURHAM.
3. BLOWOFFS SHALL BE PROVIDED AS PER S–210.060.
4. 19 mm DIA. TEST POINTS SHALL BE PROVIDED ON CONNECTIONS LARGER THAN 50 mm, AND 6 METRES IN LENGTH OR MORE.
5. LONG SIDE WATER SERVICES REQUIRE AN ADDITIONAL PROPERTY LINE VALVE.



DOMESTIC CONNECTION TO EXISTING WATER SERVICE (LONG SIDE ONLY)

ALL DIMENSIONS IN MILLIMETRES EXCEPT WHERE NOTED.

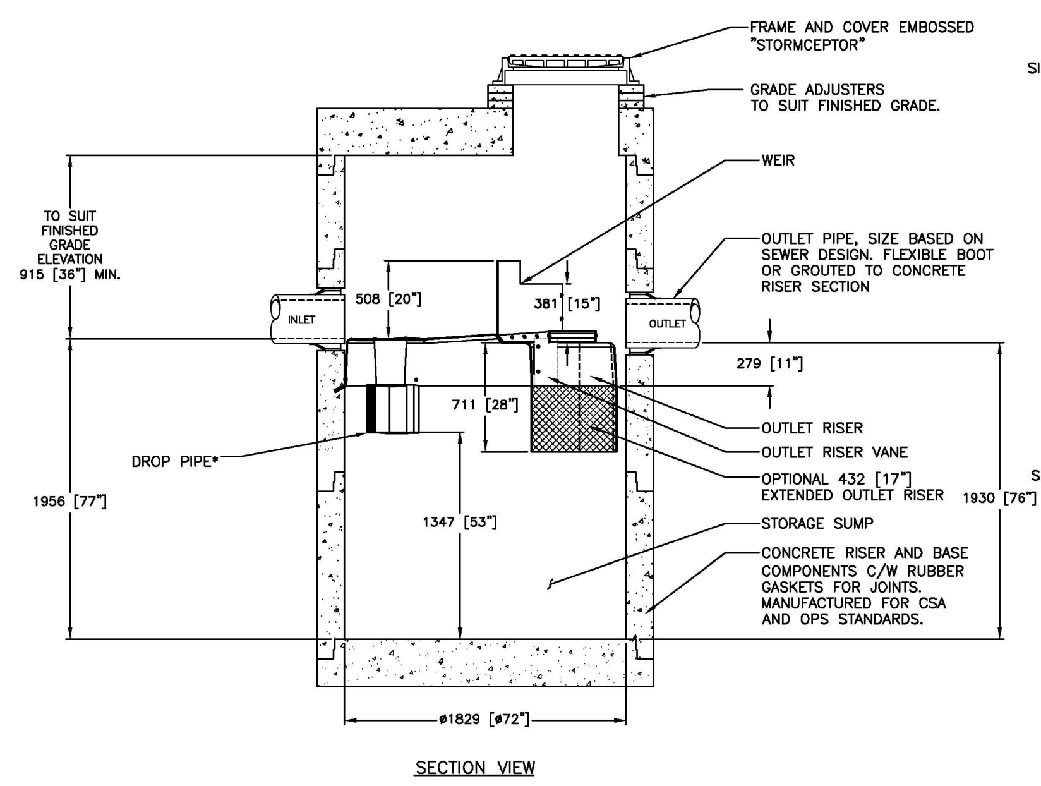
DURHAM REGION
WORKS DEPARTMENT

PIPING & FITTINGS FOR COMMERCIAL, INDUSTRIAL & MULTI–RESIDENTIAL CONNECTIONS (DOMESTIC & FIRELINE)

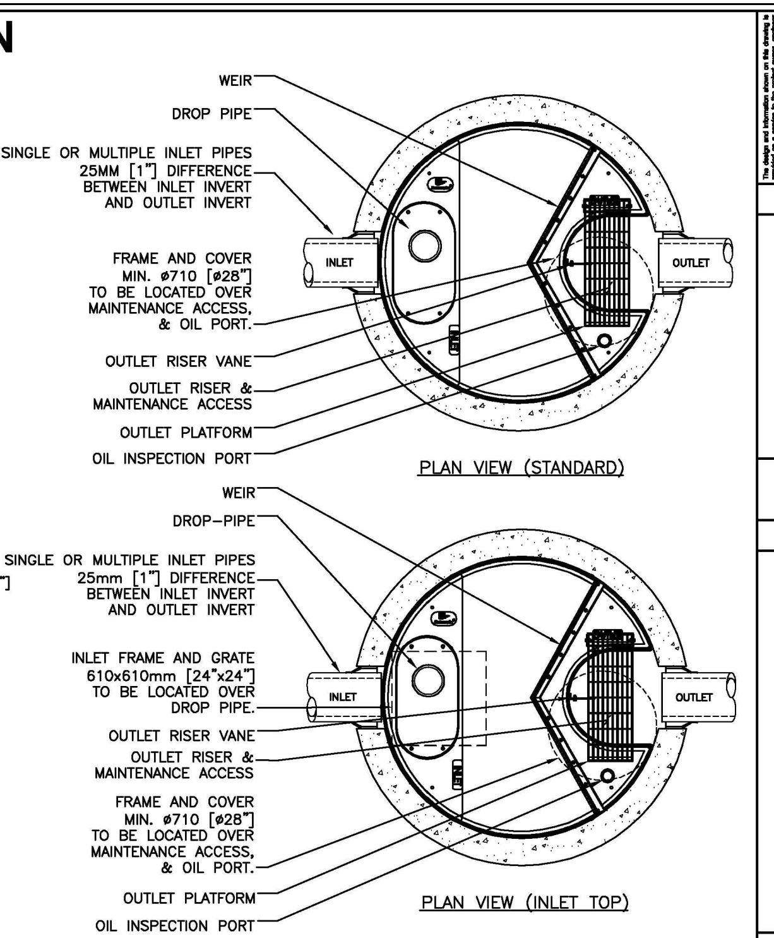
DWG. DATE: 1988 09
REVISION NO.: 9
REV. DATE: 2020 04
SCALE: N.T.S.

S-230.011

DRAWING NOT TO BE USED FOR CONSTRUCTION



SECTION VIEW



GENERAL NOTES:

- * MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m^2 (27.9 gpm/ft^2) FOR STORMCEPTOR EF6 AND 535 L/min/m^2 (13.1 gpm/ft^2) FOR STORMCEPTOR EFO6 (OIL CAPTURE CONFIGURATION).

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
2. STORMCEPTOR STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. UNLESS OTHERWISE NOTED, BYPASS INFRASTRUCTURE, SUCH AS ALL UPSTREAM DIVERSION STRUCTURES, CONNECTING STRUCTURES, OR PIPE CONDUITS CONNECTING TO COMPLETE THE STORMCEPTOR SYSTEM SHALL BE PROVIDED AND ADDRESSED SEPARATELY.
4. DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEER'S SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
5. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL STORMCEPTOR REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS. ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE (IF REQUIRED).

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING CLUTCHES PROVIDED)
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT THE DEVICE FROM CONSTRUCTION-RELATED EROSION RUNOFF.
E. DEVICE ACTIVATION, BY CONTRACTOR, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE STORMCEPTOR UNIT IS CLEAN AND FREE OF DEBRIS.

STANDARD DETAIL
NOT FOR CONSTRUCTION

SITE SPECIFIC DATA REQUIREMENTS

STORMCEPTOR MODEL	EFO6				
STRUCTURE ID	*				
HYDROCARBON STORAGE REQ'D (L)	*				
WATER QUALITY FLOW RATE (L/s)	*				
PEAK FLOW RATE (L/s)	*				
RETURN PERIOD OF PEAK FLOW (yrs)	*				
DRAINAGE AREA (HA)	*				
DRAINAGE AREA IMPERVIOUSNESS (%)	*				
PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

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If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Imbrium immediately for re-evaluation of the design. Imbrium accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

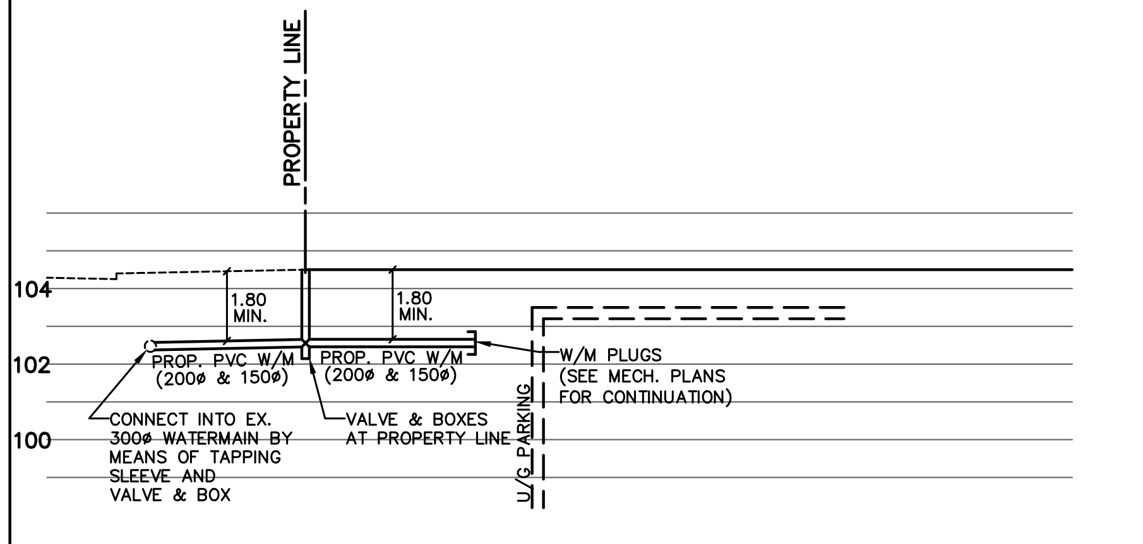
MARK	DATE	REVISION DESCRIPTION	BY
####	####	####	####
####	####	####	####
####	####	####	####
1	6/8/18	OUTLET PLATFORM	JSK
0	05/26/17	INITIAL RELEASE	JSK

Stormceptor® EF

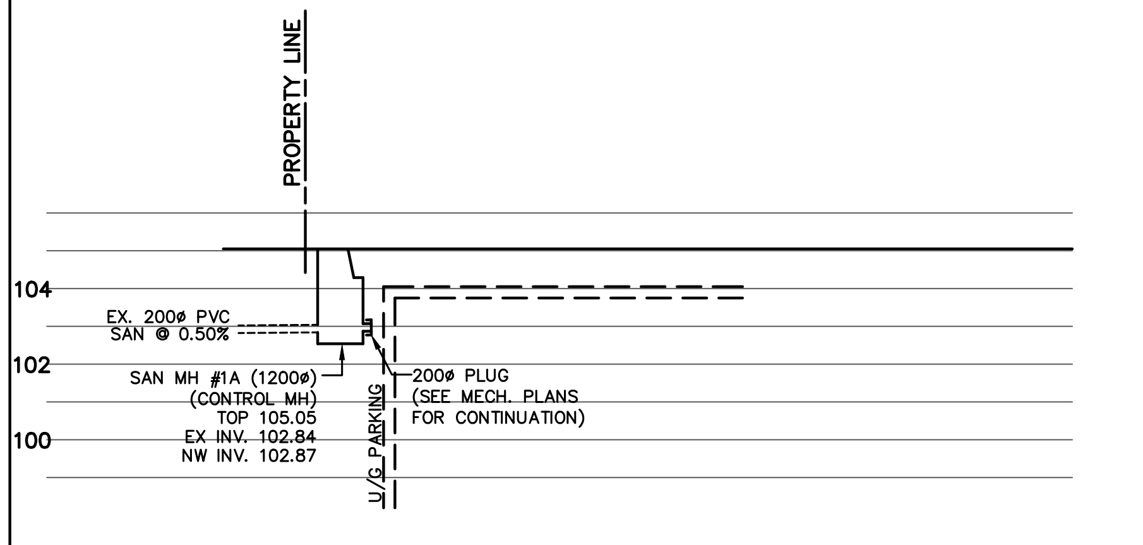
SCALE = NTS

imbrium®
407 FAIRVIEW DRIVE, WHITBY, ON L1N 3A9
TF 800-565-4801 CA 416-960-9900 INTL +1-416-960-9900

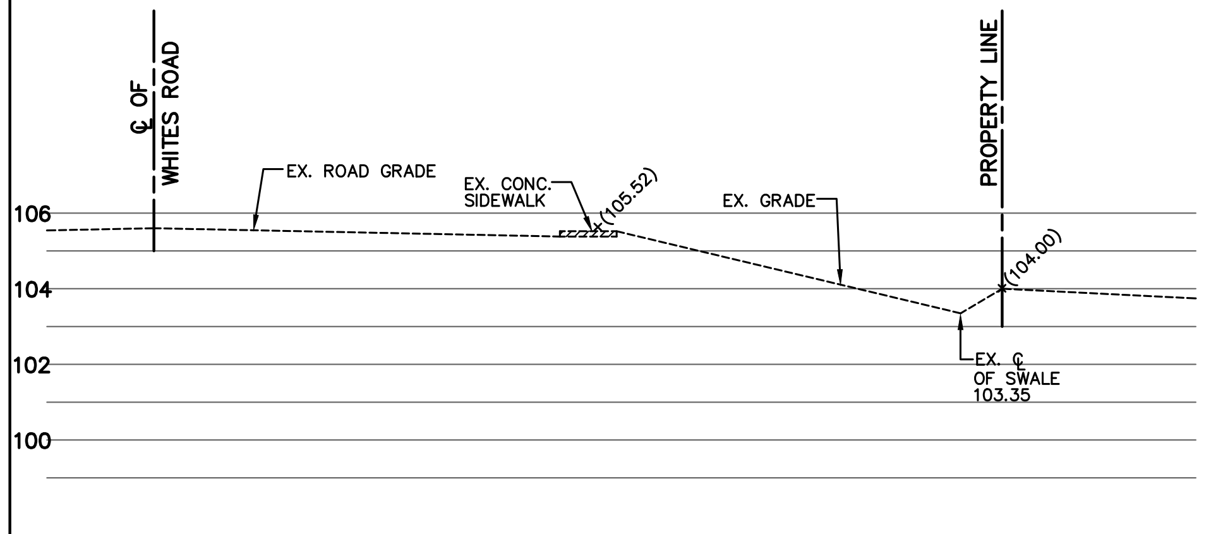
DATE: 10/13/2017
DESIGNED: JSK
DRAWN: JSK
CHECKED: BSF
APPROVED: SP
PROJECT No.: EFO6
SEQUENCE No.: *
SHEET: 1 OF 1



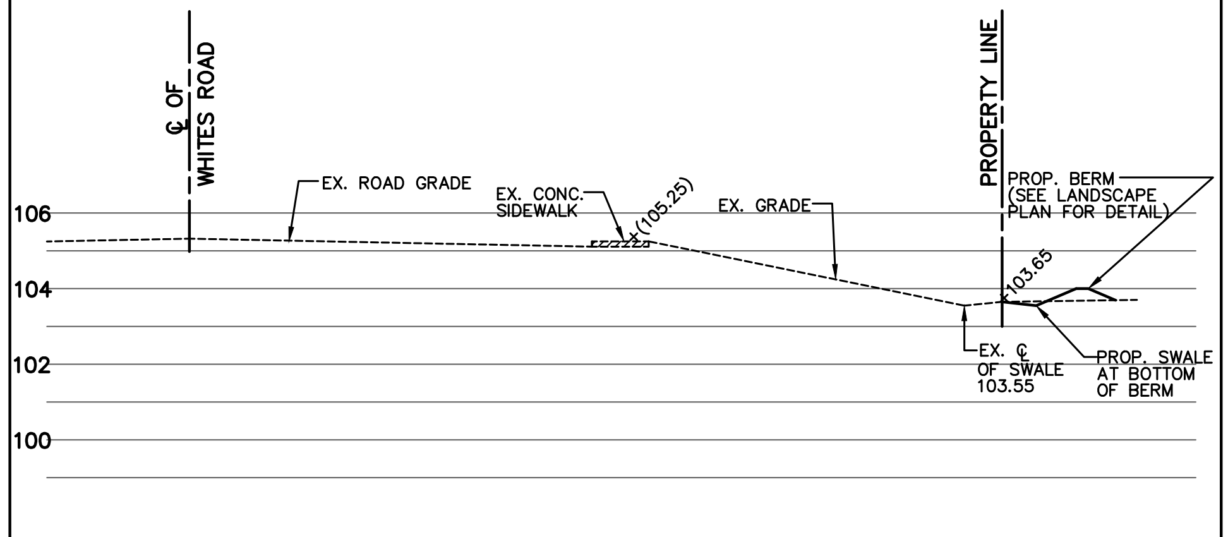
PROPOSED WATERMAIN CONNECTION



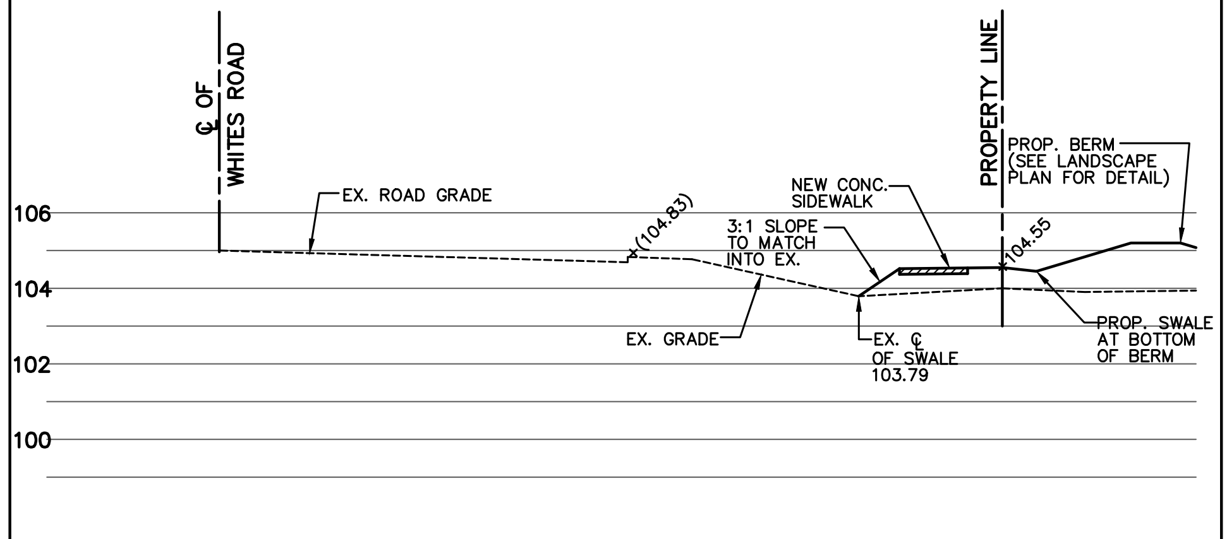
PROPOSED SANITARY CONNECTION



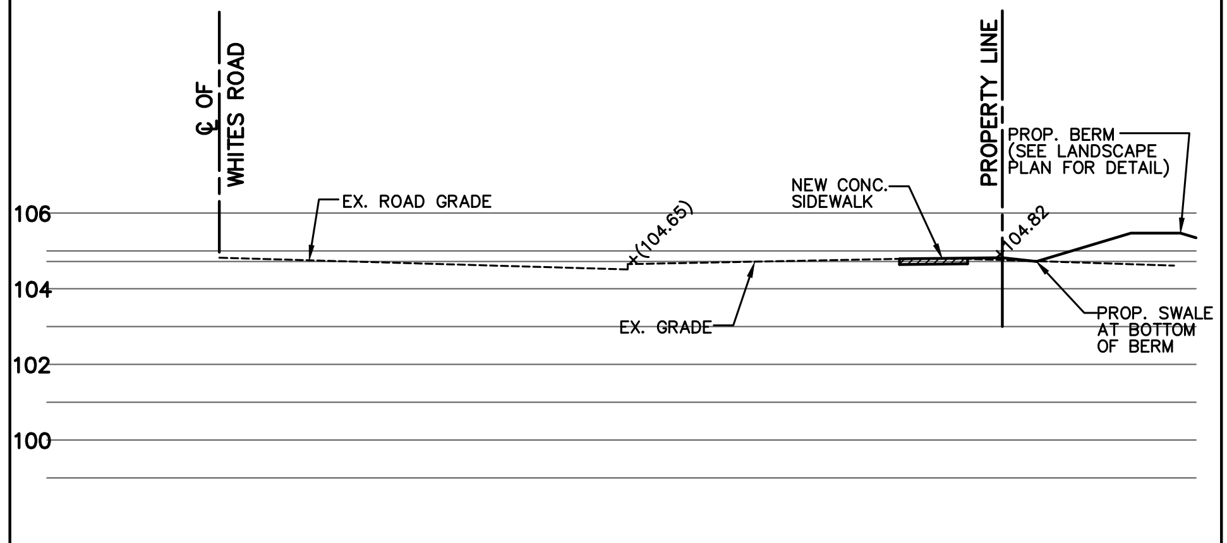
SECTION 1–1



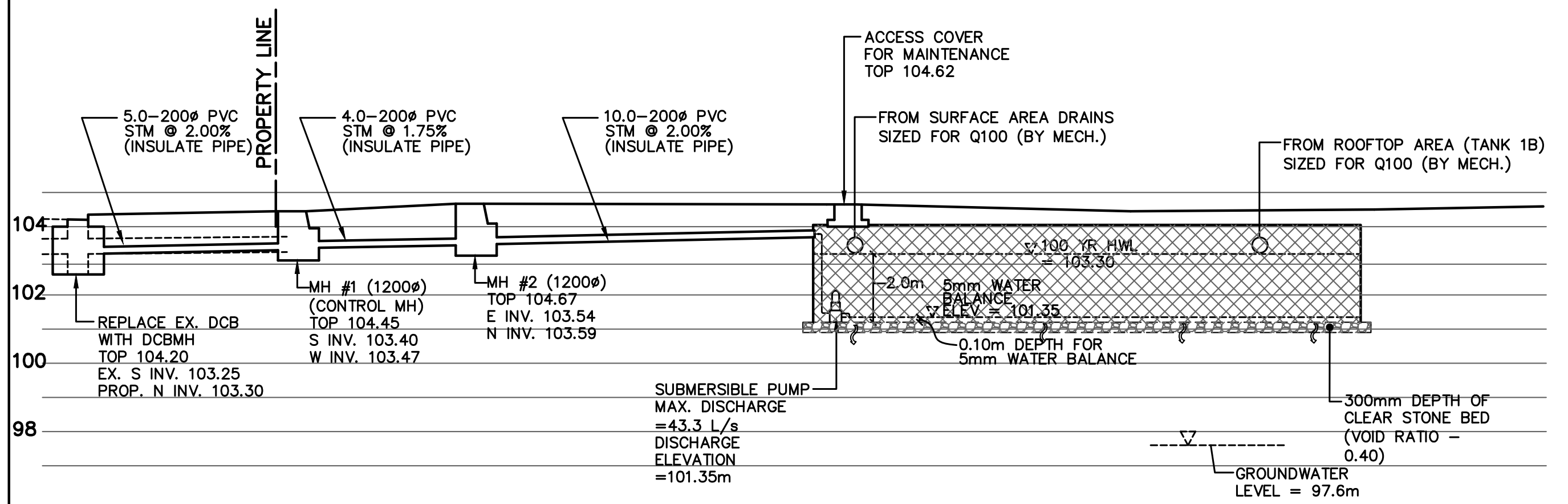
SECTION 2–2



SECTION 3–3



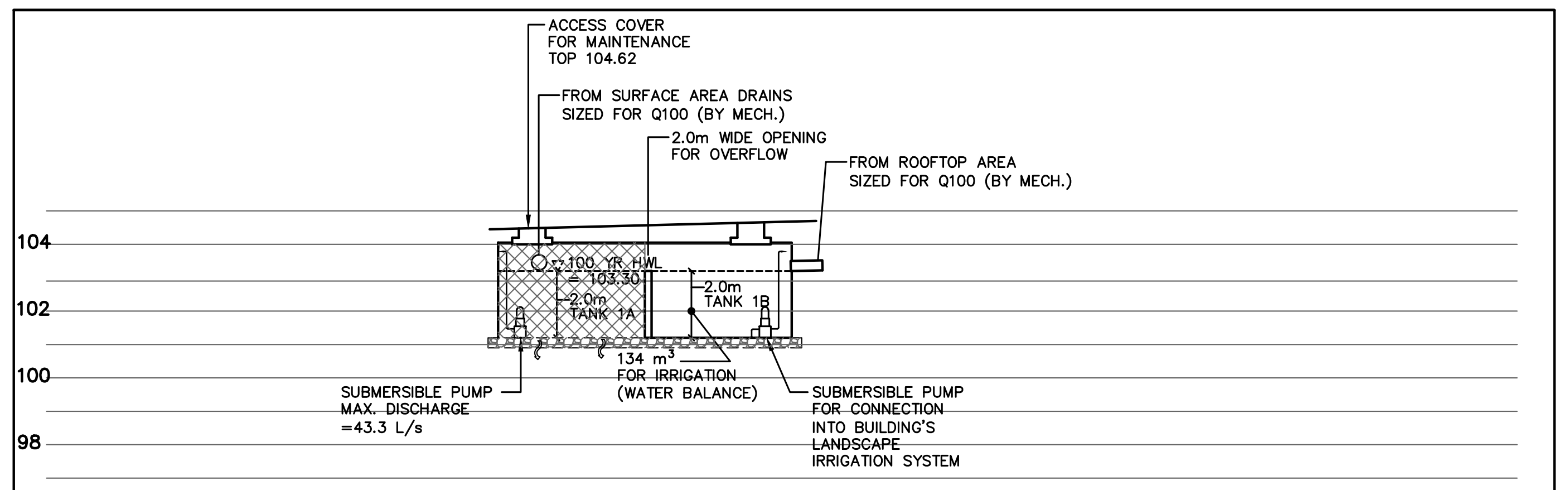
SECTION 4–4



WATER BALANCE STORAGE
=AREA x HEIGHT (BELOW OUTLET) + (VOLUME IN THE STONE)
=(80m^2 X 0.10m) + (80m^2 x 0.30m x 0.40 VOID)
=17.6m^3 (PROVIDED) > 16.2m^3 (REQUIRED)

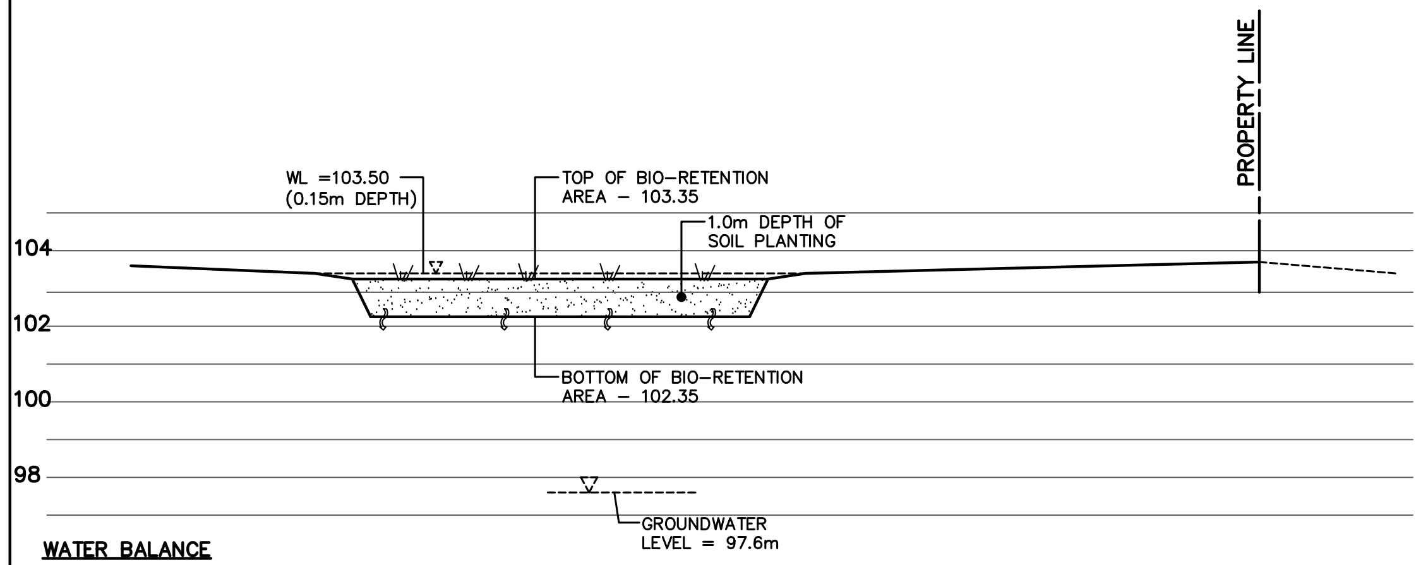
100–YR STORAGE
=AREA x HEIGHT (HWL) + (STORAGE IN STONE) + (STORAGE IN TANK 1B)
=(80m^2 x 2.0m) + (17.6m^3) + (134.0m^3)
=312m^3 (PROVIDED) > 300.5m^3 (REQUIRED)

PROPOSED INFILTRATION STORAGE TANK (1A)
SECTION A–A



STORAGE FOR IRRIGATION
=AREA x HEIGHT (HWL)
=(67m^2 x 2.0m)
=134m^3 (PROVIDED FOR IRRAGATION)

PROPOSED U/G STORAGE TANK (1B)
SECTION B–B



WATER BALANCE
=AREA x HEIGHT (BELOW OUTLET) + (VOLUME IN THE STONE)
=(40.0m^2 x 1.00m x 0.10 VOID)
=4.0m^3 (PROVIDED) > 2.3m^3 (REQUIRED)

PROPOSED BIO–RETENTION/INFILTRATION AREA
TOTAL VOLUME PROVIDED = 4.0m3

	DESCRIPTION	DATE	BY
6			
5			
4			
3			
2	RE–ISSUED FOR REZONING	AUG. 29/24	K.L.
1	ISSUED FOR REZONING	.	K.L.

REVISIONS

STAMP:

STAMP:
W. C. IP
AUG. 29/24

CITY OF PICKERING
ENGINEERING SERVICES DEPARTMENT

PROJECT:

PROPOSED 12–STOREY RESIDENTIAL BUILDING
720 GRANITE COURT, PICKERING

DETAIL PLAN

CONSULTANT:

MASONGSONG ASSOCIATES
7800 KENNEDY ROAD
SUITE 201
MARKHAM, ONTARIO
L3R 2C7
T: (905) 944-0162
www.maeng.ca

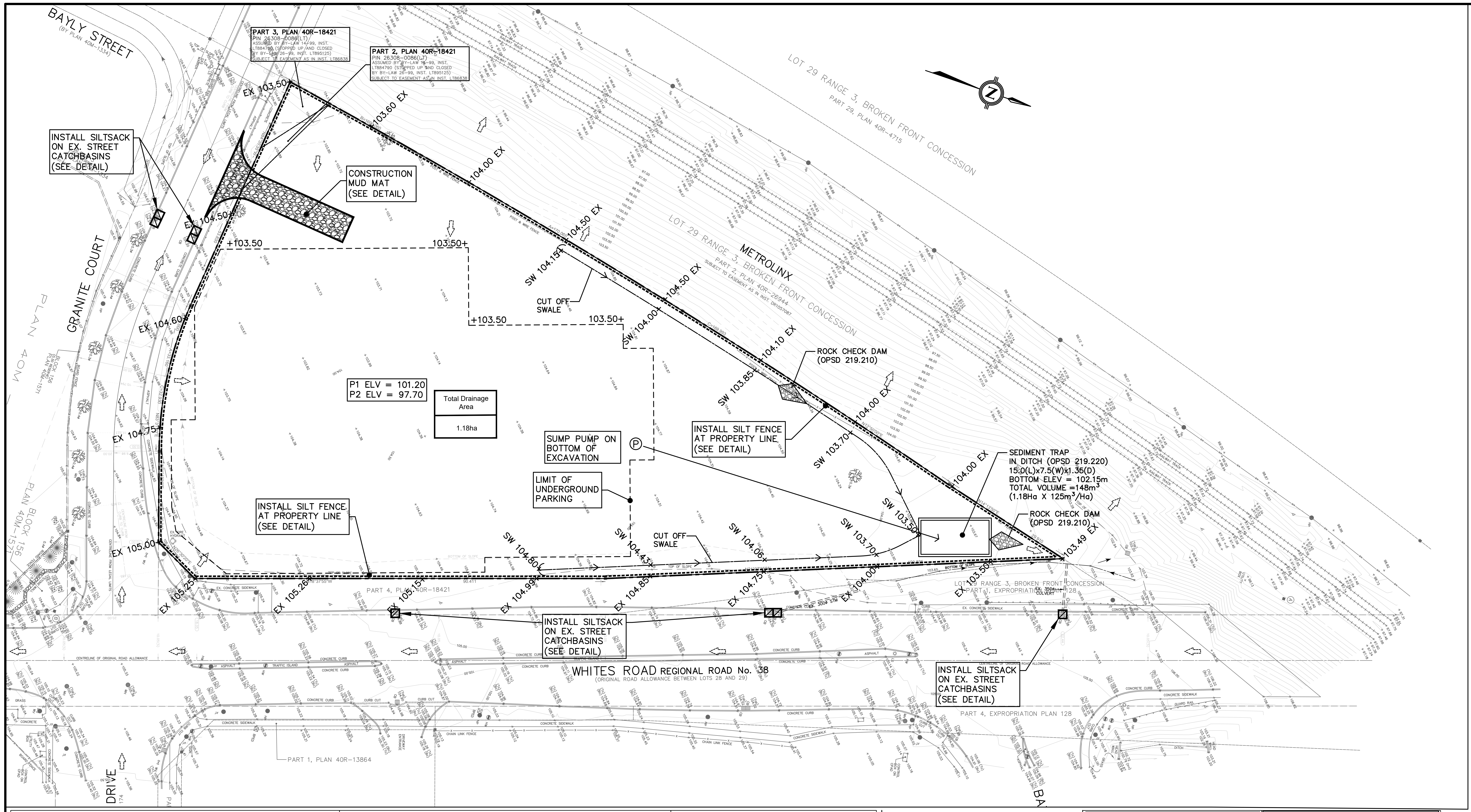
DESIGN BY: K.L.
CHECKED BY: K.L.
DRAWN BY: MAEL–CAD
CHECKED BY: A.I.
SCALE:
DATE: OCTOBER 2022
PROJECT No. 22–104

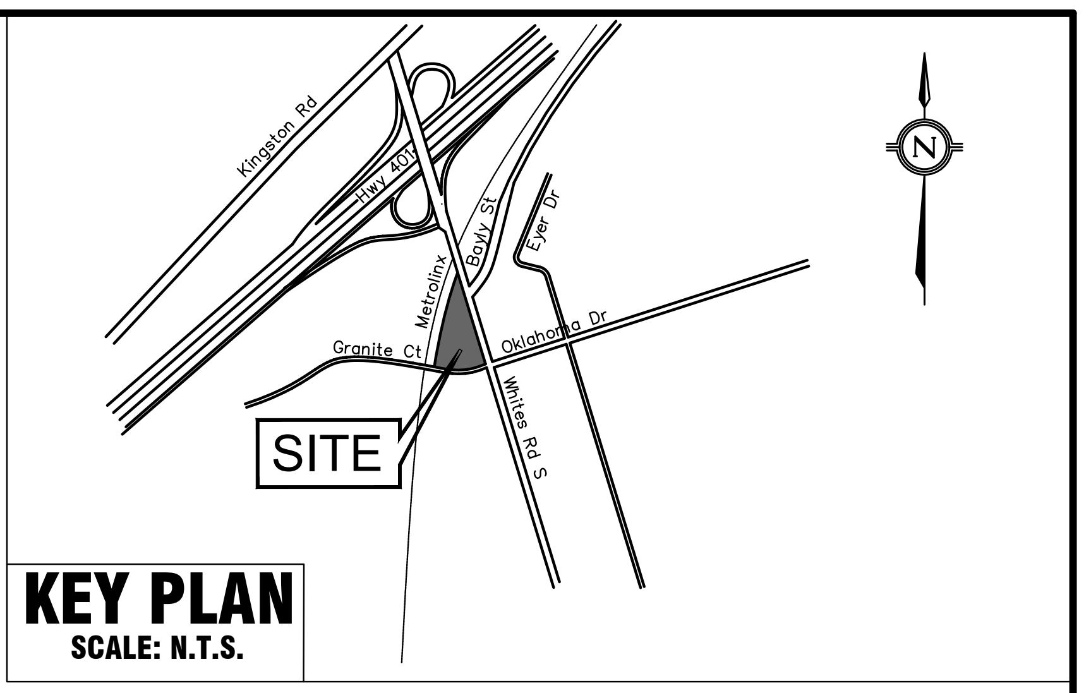
Approved as to form in reliance upon the professional skill and ability of Masongsong Associates, Consulting Engineers, as to design and specification.

Director of Engineering
Date

DRAWING No.
DET–1

G:\projects\22\104\DESIGN\22104-DET.dwg, Masongsong Associates Engineering Limited





KEY PLAN

SCALE: N.T.S.

BENCHMARK:

ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE REFERRED TO CITY OF PICKERING BENCHMARK No. R-055 HAVING A PUBLISHED ELEVATION OF 107.485 METRES.

TOPO INFORMATION TAKEN FROM PLAN OF SURVEY OF PART OF BAYLY STREET, PLAN 40M-1334, CITY OF PICKERING IN THE REGIONAL MUNICIPALITY OF DURHAM. PLAN OF SURVEY PREPARED BY KRCMAR SURVEYORS LTD, OLS; DATED DECEMBER 7, 2021.

LEGEND:

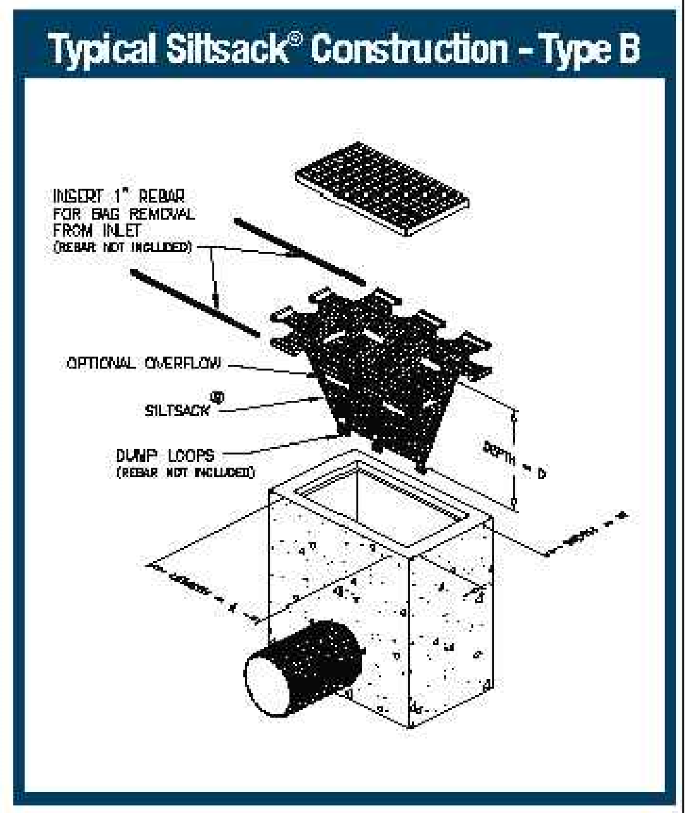
⇦	EXTERNAL OVERLAND FLOW DIRECTION
— - —	PROPERTY LINE
- - - - -	SEDIMENT CONTROL FENCE
☐	PROPOSED CATCHBASIN & AREA DRAIN
☐	EXISTING CATCHBASIN

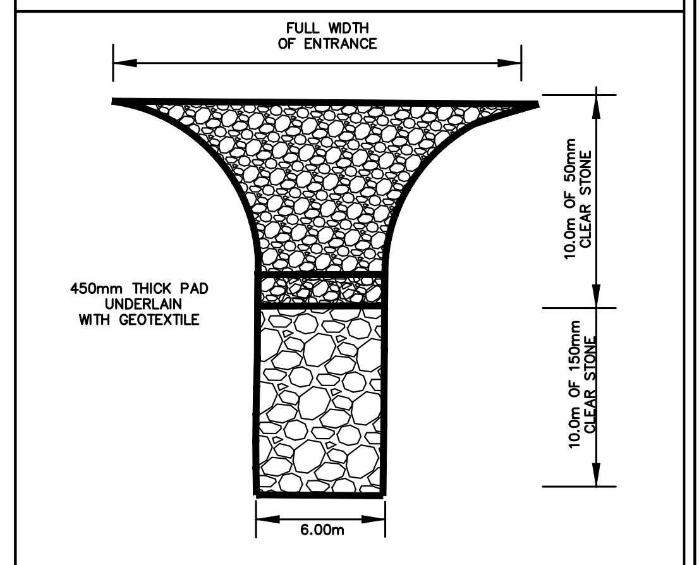
City of PICKERING

Erosion and Sediment Control General Notes

1. Prior to commencement of any on-site work/topsoil stripping, erosion and sediment control (ESC) measures, as per approved Erosion & Sediment Control Plan, must be installed to prevent surface runoff from leaving the site "untreated". All ESC measures are to be maintained until the site has been stabilized.
2. The contractor shall be responsible for the proper installation, maintenance and removal of all temporary erosion and sediment control measures during construction, as directed by the Engineer or the City of Pickering.
3. Sediment control fence to use geotextile with weave density of 270R terrafix or equivalent.
4. All exposed soils shall be immediately stabilized as directed by the Engineer or City of Pickering.
5. Check dams are to be used in any temporary drainage swales required during the construction period.
6. Additional erosion and sediment control measures may be required and shall be determined by the Engineer or the City of Pickering.
7. All swales are to be stabilized prior to use.
8. Inspection of the proposed erosion and sediment control measures will occur on a weekly basis, after rainfall events exceeding 10mm or after rapid snow melt events and daily during extended rain or snow melt periods. The silt control fence must be inspected for rips or tears, broken stakes, blow outs and accumulation of sediment. The silt control fence must be fixed and/or replaced immediately when damaged. Accumulated sediment must be removed from the silt control fence when accumulation reaches 50% of the height of the fence.
9. Rock check dams are to be cleaned of all accumulated sediment as soon as sediment has accumulated to a depth greater than 50% of all the upstream check dams.
10. Cleaning and repair of mud mats and any other temporary sediment control measures shall be done as necessary through regular inspection or as directed by the Engineer or City of Pickering. All damaged ESC measures shall be repaired and/or replaced within 48 hours of the inspection.
11. Materials to repair damaged ESC measures must be kept on-site at all times.
12. The ESC strategies on these plans are not static and may need to be upgraded/amended as site conditions change to prevent sediment releases. Failed ESC measures must be repaired immediately.
13. No construction activity or machinery shall intrude beyond the silt control fence or limit of development. All construction vehicles shall leave the site at designated locations as shown on the plans. All materials and equipment shall be stored on site in a designated area. No materials or equipment shall be stored on the Municipal right of way. No construction vehicles will park on Municipal roads.
14. Servicing of construction equipment on site is prohibited.
15. The contractor must clean adjacent roads on a regular basis. The road shall be, at a minimum scraped daily and flushed (if necessary) on Friday evenings or Saturday mornings.
16. Dust control to be reviewed daily. Water truck or calcium chloride is to be provided on-site and haul roads/working areas are to be treated as required to ensure that dust is controlled on-site.
17. At the end of construction period, accumulated sediment is to be removed off site prior to the removal of the silt fence.
18. All litter and debris shall be monitored and disposed of daily or as necessary through regular inspection.
19. All topsoil stockpiles shall be surrounded with sediment control fence and stabilized with seed mix as per this drawing.
20. Disturbed areas are to be minimized to the extent possible and stabilized as the work progresses. Any area exposed for more than 30 days will be stabilized.

Typical Siltsack® Construction - Type B

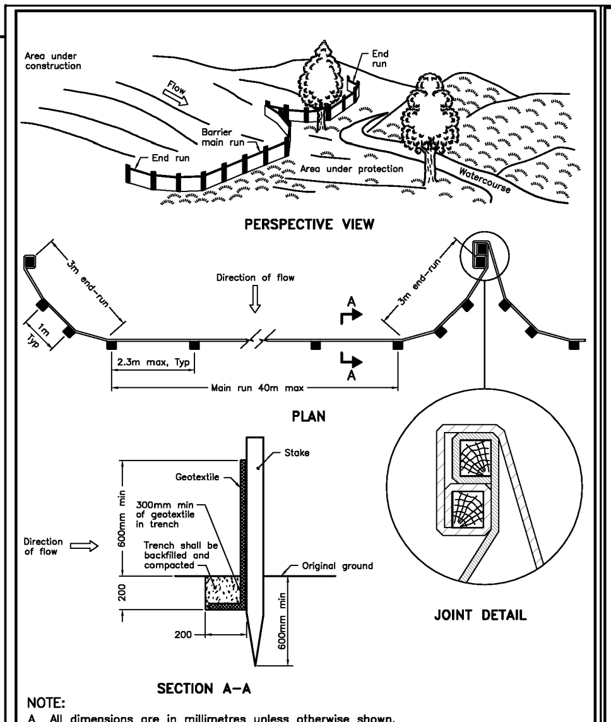




NOTES:

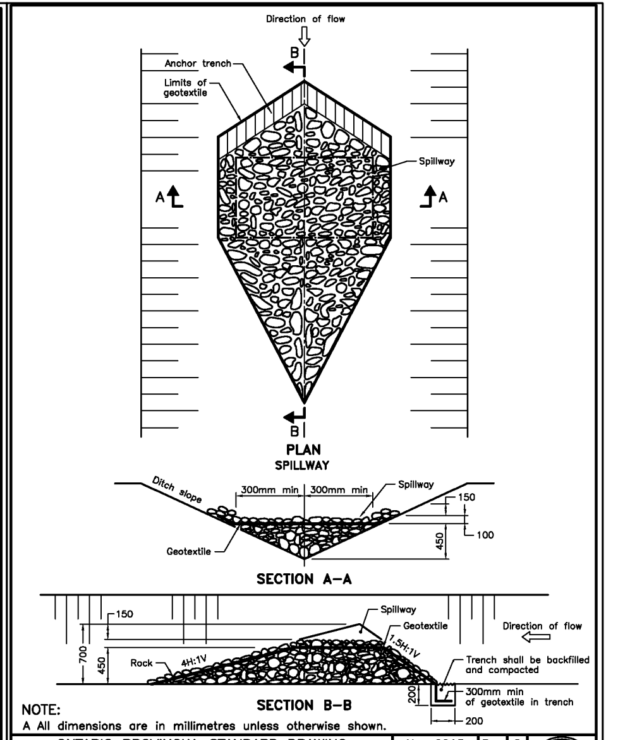
1. GRANULAR MATERIAL IS TO BE CLEAN APPROVED MATERIAL AND PLACED AT NOTED DIMENSION PRIOR TO LAND DISTURBANCE.
2. GEOTEXTILE IS TO BE PLACED OVER THE ENTIRE AREA PRIOR TO STONE PLACEMENT.
3. MAINTENANCE – THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL REDUCE TRACKING OR FLOWING OF SEDIMENT ONTO THE R.O.W. AND GRANULAR MATERIAL IS TO BE REPLACED AS DIRECTED BY THE TRANSPORTATION AND WORKS DEPARTMENT OF THE CITY OF TORONTO.

CONSTRUCTION MUD-MAT DETAIL



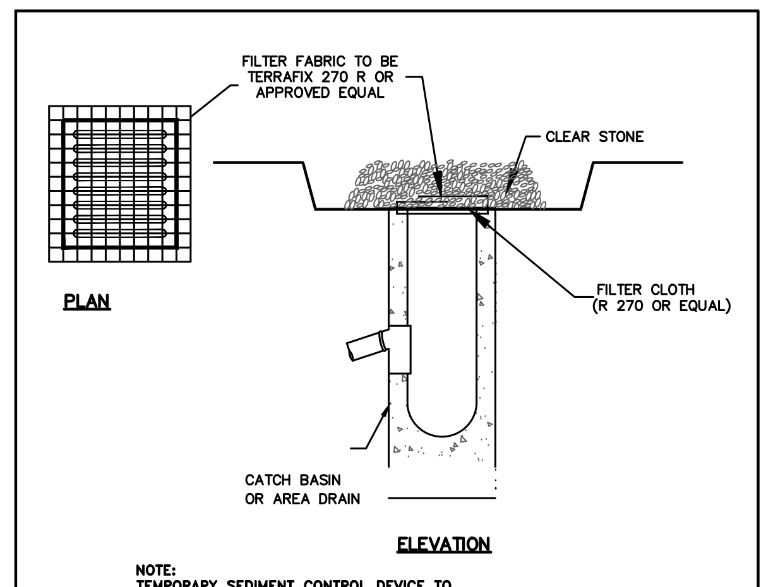
NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
LIGHT-DUTY SILT FENCE BARRIER	OPSD 219.110	



NOTE:
A All dimensions are in millimetres unless otherwise shown.

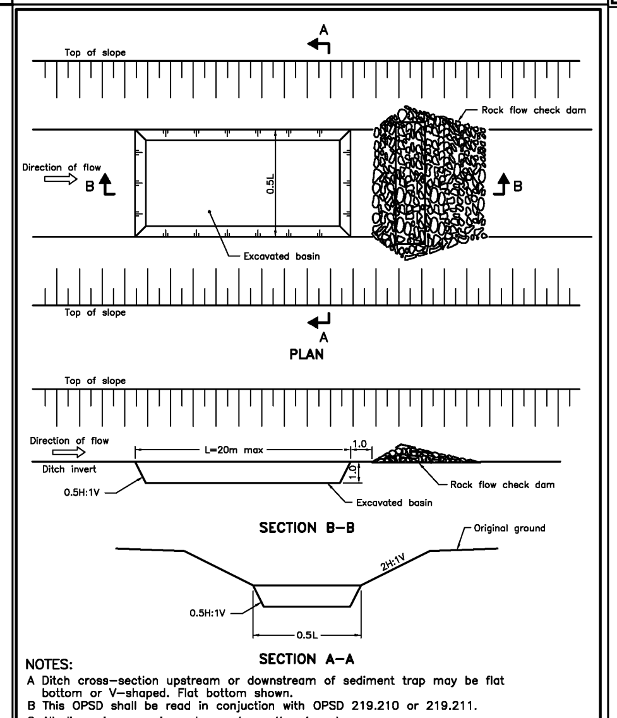
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
TEMPORARY ROCK FLOW CHECK DAM V-DITCH	OPSD 219.210	



NOTE:
TEMPORARY SEDIMENT CONTROL DEVICE TO BE INSTALLED AND MAINTAINED ON ALL ONSITE CB AND AD DURING CONSTRUCTION UNTIL ENTIRE SITE AREA HAS BEEN PAVED AND OR SODDED.

TEMPORARY SEDIMENT TRAP

N.T.S.



NOTES:
A Ditch cross-section upstream or downstream of sediment trap may be flat bottom or V-shaped. Flat bottom shown.
B This OPSD shall be read in conjuction with OPSD 219.210 or 219.211.
C All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
SEDIMENT TRAP IN DITCH	OPSD 219.220	

6			
5			
4			
3			
2	RE-ISSUED FOR REZONING	AUG. 29/24	K.L.
1	ISSUED FOR REZONING	.	K.L.
	DESCRIPTION	DATE	BY

REVISIONS

STAMP:

STAMP:

W. C. IP
AUG. 29/24

CITY OF PICKERING
ENGINEERING SERVICES DEPARTMENT

PROJECT:

PROPOSED 12-STOREY
RESIDENTIAL BUILDING
720 GRANITE COURT, PICKERING

EROSION AND SEDIMENT CONTROL PLAN

CONSULTANT:

MASONGSONG ASSOCIATES

7800 KENNEDY ROAD
SUITE 201
MARKHAM, ONTARIO
L3R 2C7
T: (905) 944-0162
www.maeng.ca

DESIGN BY:	K.L.	CHECKED BY:	K.L.	PROJECT No. 22-104
DRAWN BY:	MAEL-CAD	CHECKED BY:	A.I.	
SCALE:	1:500	DATE:	OCTOBER 2022	

Approved as to form in reliance upon the professional skill and ability of Masongsong Associates, Consulting Engineers, as to design and specification.

Director of Engineering

Date

DRAWING No.

ESC-1

Municipal and Development Engineering

Water Resources Engineering

Planning

Project Manag

MASONGSONG ASSOCIATES ENGINEERING LIMITED
Consulting Engineers • Planners • Project Managers

Markham Head Office

7800 Kennedy Road, Suite 201
Markham, Ontario
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