



FINAL

Hydrogeology Assessment – Proposed Commercial Development

Southwest Corner of Yonge Street & Mapleview Drive East,
Barrie, Ontario

Prepared for:

Sobeys Capital Inc.
498 Tahoe Boulevard,
Mississauga, ON L4W 0C7

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1.0 INTRODUCTION AND BACKGROUND

Pinchin Ltd. (Pinchin) was retained by Sobeys Capital Inc. (Client) to complete a hydrogeological assessment of the properties located at the southwest corner of Yonge Street and Maplevue Drive East, Barrie (the Site) with regards to a proposed commercial re-development.

The Client owns the properties comprising a total area of 19.74 acres, which are identified with municipal addresses:

- 651, 659, 665, 669 and 673 Maplevue Drive East; and
- 892 and 900 Yonge Street.

It is Pinchin's understanding that the Client is proposing to develop the properties in phases.

The Site (Phase I area) is a portion of the Client properties located on the south side of Maplevue Drive East, and consists of an undeveloped forested land with an area of 35,267.34 m²). The first phase of the proposed development that will take place at the Site will consist of six slab-on-grade (i.e. no basement level) retail store buildings, complete with at-grade asphalt parking areas and access roadways and landscaping areas. The outline of the Site that is the subject of this Hydrogeological Assessment is shown on Figure 2.

1.1 Purpose

The purpose of the hydrogeological investigation was to characterize the soil and groundwater conditions at the Site, assess the pre- and post-construction water balances, identify the potential impacts of the proposed development on local groundwater and surface water resources, and provide a potential environmental impact assessment and mitigative options, if required.

1.2 Proposed Development Parameters

The conceptual site design plan dated March 17, 2022 is provided in Appendix I. It is understood that the proposed development at the Site consists of a total of six slab-on-grade commercial buildings with no underground levels, and will provide approximately 7,007 square metres (m²) of ground floor area with a total of 459 car parking spaces (including 14 barrier-free parking spaces).

The Site is currently vacant with no building structures. The existing site topography is provided in the survey plan included in Appendix I.



2.0 METHODOLOGY

As part of the concurrent geotechnical and hydrogeological investigations, a total of 12 boreholes were advanced at the Site, of which nine were completed as monitoring wells. The borehole/monitoring well locations are shown on Figures 2A (showing the existing conditions) and 2B (showing the conceptual development plan) and the well construction details are presented in Table 1. The borehole logs for the boreholes and monitoring wells are included in Appendix II.

The data and information obtained from the geotechnical field program was incorporated into this report. The nine monitoring wells were utilized in the groundwater monitoring, sampling and hydraulic conductivity testing during this hydrogeological assessment.

The scope of work for the dewatering estimates and groundwater quality evaluation included the following tasks:

- A review and preparation of a summary of the regional geology and hydrogeology, and its linkage to the site-specific geology and hydrogeology;
- Groundwater level monitoring after well completion;
- Rising head hydraulic conductivity tests and groundwater sampling of select monitoring wells. As the monitoring wells were found to be dry at the time of groundwater monitoring events, hydraulic conductivity tests or groundwater sampling were not conducted;
- A review of the conceptual design and available plans for the proposed development, and assessment of the need for dewatering during construction and operations phases of development;
- Conduct a preliminary water balance assessment and soil infiltration rate estimate;
- Conduct a potential impact assessment with mitigative measures, if required; and
- Preparation of a hydrogeological assessment report summarizing the findings of the investigation.

3.0 SITE DESCRIPTION AND GEOLOGICAL SETTING

3.1 Surface Water and Drainage

The Site is located in the Lovers Creek Subwatershed, close to the border with the Hewitt's Creek Subwatershed to the east, which is within the Lake Simcoe Watershed under the jurisdiction of the Lake Simcoe Region Conservation Authority (LSRCA). There is no surface watercourse or other open water body present at the Site. Lovers Creek is located approximately 2 km to the west of the Site and flows generally to the north and drains into Lake Simcoe. Hewitt's Creek is located approximately 820 m east of the Site, which also flows generally to the north and drains into Lake Simcoe.



The topographic survey plan for the Site (in Appendix A), shows a relatively higher elevation ridge in the middle of the Site with an alignment from northwest to southeast, which may divide the Site into two natural drainage areas: Lovers Creek to the west and Hewitt's Creek to the east. The elevations at the Site range from approximately 266.5 masl to 273.4 masl.

3.2 Physiography

The Site is located on the Peterborough Drumlin Field Physiographic Region, and the Drumlinized Till Plains Physiographic Landform (Chapman and Putnam, 2007).

3.3 Surficial Geology

The Site is located in an area covered by coarse-textured glaciolacustrine deposits consisting of sand, gravel, minor silt and clay, or foreshore and basinal deposits (Ontario Geological Survey (OGS), 2010).

3.4 Bedrock Geology

Based on the Ontario Geological Survey database, the Site is located in an area underlain by Middle Ordovician Simcoe Group Lindsay Formation consisting of nodular to black laminated limestone (Armstrong and Dodge, 2007).

3.5 MECP Water Wells

Water well records from within a 500 m radius of the Site were accessed from the Ontario Ministry of the Environment, Conservation and Parks (MECP) Water Well Information System (WWIS).

Based on a review of the water well database, a number of water supply wells and monitoring wells were found within a radius of 500 m from the Site. The area of interest is presented on Figure 3.

Among the water supply wells, three records are mapped as being located on the Site, including Well Nos. 5707053, 5701417 and 5701418, which are provided in Appendix II. A summary of the on-site water supply wells are presented below.

No.	Well ID	Soil Encountered and Depth (mbgs)	Screen Depth (mbgs)	Static Water Level (mbgs)	Recommended Pumping Rate (IGPM)
1	5707053	Unknown: 0 – 8.5 Sand: 8.5 – 18.9	17.7 ~ 18.9	11.6	5
2	5701417	Unknown: 0 – 10.7 Hardpan: 10.7 – 18.3 Sand: 18.3 – 21.9	20.1 ~ 21.3	12.2	3



No.	Well ID	Soil Encountered and Depth (mbgs)	Screen Depth (mbgs)	Static Water Level (mbgs)	Recommended Pumping Rate (IGPM)
3	5701418	Loam: 0 – 0.9 sand: 0.9 – 21.9	14.3 ~ 15.5	12.2	8

Note: IGPM = Imperial gallons per minute

All three of the water supply wells were completed in a sand layer at a depth below 14.3 mbgs, with recorded static water levels ranging from 11.6 mbgs to 12.2 mbgs. Bedrock was not encountered at these well locations to the maximum drilled depth of 21.9 mbgs.

4.0 SUBSURFACE CONDITIONS

4.1 Soil Stratigraphy

The following stratigraphy is based on the borehole findings. Detailed stratigraphic depths and elevations are provided in the following subsections and the borehole logs in Appendix III.

The soil stratigraphy at the Site generally consists of reworked soil/earth fill under topsoil, underlain by glacial till deposits and/or sand. No bedrock was encountered to the maximum explored depth of 6.6 mbgs.

Three (3) main stratigraphic units are presented as follows:

- Reworked soil / earth fill materials extending to approximately 0.8 to 2.6 mbgs (i.e. Elevation 265.3 to 269.1 masl), overlying;
- Stiff to hard / loose to compact glacial till deposits, extending to approximately 1.5 to 2.7 mbgs in Boreholes BH1, BH2, BH6 and BH7 (i.e. Elevation 267.4 to 268.1 masl); and
- Very loose to very dense (typically compact to very dense) sand, extending to the full depths of the borehole investigation.

Topsoil and Reworked Soil

A topsoil layer was encountered at the ground surface in each borehole. The topsoil ranged from 80 to 200 mm in thickness.

A layer of reworked soil, with trace amounts of organics was encountered beneath the topsoil layer in Boreholes BH4 to BH12 and extended to depths ranging from approximately 0.8 to 2.6 mbgs.

These reworked soils have been weathered by natural processes such as frost penetration and were likely disturbed by farming practices.



Earth Fill

Earth fill materials, consisting of gravelly sand and sandy silt, with trace amounts of clay, stone fragments and organics were encountered beneath the topsoil layer in Boreholes BH1 to BH3 and extended to depths ranging from approximately 0.8 to 1.5 mbgs.

The gravelly sand and sandy silt earth fill zones have a loose to compact relative density based on SPT 'N' values of 9 to 13 blows per 300 mm penetration of a split spoon sampler. The in-situ moisture contents of the earth fill samples were generally moist at the time of sampling.

Glacial Till

Sandy silt to silty sand till deposits, with trace to some amounts of clay, trace gravel and stone fragments were encountered beneath the reworked soil and earth fill zone in Boreholes BH1, BH2 and BH6, and extended to depths ranging from approximately 1.5 to 2.7 mbgs.

A clayey silt till deposit, with notable proportions of sand (sandy) and trace gravel, was encountered beneath the reworked soil in Borehole BH7 and extended to a depth of approximately 1.8 mbgs.

The clayey silt till deposit has a stiff to hard consistency based on SPT 'N' values of 11 and 31 blows per 300 mm penetration of a split spoon sampler.

The cohesionless glacial till deposits have a loose to very dense relative density based on SPT 'N' values of 9 to 52 blows per 300 mm penetration of a split spoon sampler. The in-situ moisture contents of the glacial till samples were generally moist at the time of sampling.

Sand

A sand deposit with varying amounts of silt (trace silt to silty), trace to some gravel and trace stone fragments was encountered beneath the reworked soil, earth fill zone and glacial till deposits in each borehole, and extended to the full depth of the investigation.

The sand deposit has a very loose to very dense (typically compact to very dense) relative density based on SPT 'N' values of 3 to more than 50 blows per 300 mm penetration of a split spoon sampler. The in-situ moisture contents of the sand samples were generally moist at the time of sampling.

The results of particle size distribution analysis completed on three soil samples (BH8 SS5, BH9 SS5 and BH10 SS6) indicate that the samples contain 0-22.4% gravel, 72.1-93.4% sand, 5.5-9.1% silt and clay.

Detailed soil descriptions and stratigraphy are presented in the Borehole Logs that are provided in Appendix III. Cross-sections showing the stratigraphy across the Site are presented in Figures 4A and 4B in this report.

4.2 Water Level Elevations

As mentioned, a total of nine monitoring wells were installed at the Site during the current investigations. The monitoring well construction details are presented in Table 1.

Groundwater level measurements were conducted on December 15, 2021 and January 19, February 24 and March 23, 2022 in all the monitoring wells. At the groundwater monitoring events, all of the monitoring wells were found to be dry, indicating that the groundwater levels were anticipated to be at the depths ranging from below 5.5 mbgs to below 6.6 mbgs or elevations ranging from below 260.4 masl to 263.8 masl.

4.3 Hydraulic Conductivity and Infiltration Rate

As the monitoring wells were found to be dry, rising head hydraulic conductivity tests cannot be conducted. The hydraulic conductivity (K-value) of the soils was estimated based on the results of grain size analysis of representative soil samples.

The hydraulic conductivity of three (3) soil samples was estimated using the Hazen empirical equation, which is based on the particle size gradation curves. Furthermore, based on the obtained hydraulic conductivity, the soil infiltration rates were estimated using the method described in TRCA's Stormwater Management Criteria ("SWMC"), Version 1.0, dated August 2012. The estimated hydraulic conductivity and soil infiltration rates are presented below.

Sample ID	Sample Depth Interval (mbgs)	Soil Composition	K (cm/sec)	Infiltrate Rate (mm/hour)
BH8 SS5	3.0 – 3.3	Gravelly Sand, trace silt and clay	2.6×10^{-2}	204
BH9 SS5	3.1 – 3.5	Sand, trace gravel, silt and clay	6.4×10^{-3}	141
BH10 SS6	4.6 – 4.9	Sand, trace silt and clay	8.1×10^{-3}	150

The estimated hydraulic conductivity of the sandy soil ranges from 6.4×10^{-3} cm/sec to 2.6×10^{-2} cm/sec, and the estimated soil infiltration rate ranges from 141 mm/hour to 204 mm/hour. The results are indicative of high permeability soils.

4.4 Groundwater Quality

All nine of the on-Site monitoring wells were found to be dry to the maximum explored depth of 6.6 mbgs. Therefore, the handling of groundwater is not expected for either the construction or operations phases of the proposed slab-on-grade development. An assessment of groundwater quality is not considered to be necessary, based on the proposed development parameters and the inferred presence of the water table at a depth at least below 5.5 mbgs over the period of record (December 2021 water levels).



5.0 DEWATERING ASSESSMENT

As stated above in Section 1.2, the proposed development includes six slab-on-grade buildings with no underground levels. It should be noted that the design details and invert elevations of the underground utilities were not available at the time of preparing this report.

The geotechnical investigation by Pinchin concluded that shallow foundations may be supported on the native sand and undisturbed glacial till deposits in potential cut areas, or on imported engineered fill where the Site grade may need to be raised for building construction. The finished floor level of the proposed slab-on-grade buildings will be constructed close to the existing grade, and it is expected that site services will be installed between 2 and 4 mbgs.

Based on the groundwater monitoring, the groundwater level will be below 5.5 mbgs at a minimum. Given the limited excavation for slab-on-grade buildings and the identified soil conditions, the potential excavation for footing and utility installation is anticipated to be above the water table. Therefore, there is not expected to be a requirement for short-term dewatering during the construction phase, nor is there expected to be long-term dewatering during operations phase of the development. An emergency perimeter subdrain system is required to handle potential infiltration into the subsurface from high-precipitation events.

Considering that dewatering will not be required for the proposed development, there is not expected to be an impact on groundwater resources or on-Site and off-Site natural features due to the proposed development.

Based on the depth to water table and the proposed slab-on-grade development, it is not considered necessary to conduct a door-to-door Private Well Survey of the Site vicinity.

6.0 PRELIMINARY WATER BALANCE

A preliminary water balance was conducted to estimate the water budgets of the runoff and infiltration at the Site prior to and after proposed site development for the purpose of supporting detailed design that will be incorporating the low-impact development strategies.

6.1 Site Condition

The Site (Phase I area) is currently vacant and undeveloped forested land with no building structures and covers an area of 35,267.34 m² (rounded to 35,267 m²). The proposed development at the Site consists of six slab-on grade commercial buildings with exterior above-ground parking spaces, driveways and landscaping areas.

Based on the site information provided, the site can be roughly categorized into two (2) types of ground surface characteristics: as a pervious area (for unpaved and landscaped areas) and an impervious area (for paved and building areas) for the purpose of the preliminary water balance assessment, which are summarized as follows.

Type of Land Coverage		Pre-Development Area (m ²)	Post-Development Area (m ²)
Pervious Area (unpaved and landscaping landscaped areas)		35,267	9,645
Impervious Area	Building area	0	7,007
	Paved area	0	18,615
Total (m ²)		35,267	35,267

6.2 Site Level Water Balance

Based on the Thornthwaite and Mather methodology (1957), the water balance is an accounting of water in the hydrologic cycle. Precipitation (P) falls as rain and snow. It can run off towards lakes and streams (R), infiltrate to the groundwater table (I), or evaporate from ground and/or undergo evapotranspiration by vegetation (ET). When the long-term average values of P, R, I, and ET are utilized in the water balance equation, there is minimal to no net change to groundwater storage (ΔS).

The annual water budget, can be expressed as:

$$P = ET + R + I + \Delta S$$

Where:

P = Precipitation (mm/year);

ET = Evapotranspiration/Evaporation (mm/year);

R = Run-off (mm/year);

I = Infiltration (mm/year); and

ΔS = Change in groundwater storage (taken as zero) (mm/year).

6.3 Climatic Data

Monthly average temperature and precipitation data were obtained from Environment Canada for the Barrie WPCC weather station (Climate Identifier: 6110557), which is located approximately 6 km northwest from the Site in the City of Barrie, Ontario.



The climatic data obtained from Canadian Climatic Normals 1981 to 2010 for Barrie WPCC weather station are included in Appendix V.

6.4 Precipitation and Water Surplus

Based on the collected data from the weather station from 1981 to 2010, the average annual precipitation for the Site and vicinity is recorded to be approximately 932.9 mm/year.

In general, the difference between the recorded precipitation and the estimated evapotranspiration/evaporation is referred to as the water surplus. In a pervious area where evapotranspiration prevails, the evapotranspiration rate was calculated to be 594.8 mm/year based on the 1981 to 2010 Barrie WPCC weather station data, according to the Thornthwaite Method. As a result, there would be 338.1 mm/year of water surplus in the pervious area, of which some portion would travel across the Site as surface or overland runoff, and the rest may infiltrate into the subsurface.

In the impervious area where evaporation prevails, it is conventionally assumed that 20% of the precipitation (or 186.6 mm/year) will evaporate, and 80% of the precipitation (or 746.3 mm/year) will become surface runoff.

A summary of the calculations is provided in Appendix VI.

6.5 Infiltration and Runoff

As mentioned above, a water surplus will be generated every year due to precipitation, which can either infiltrate into subsurface and/or become surface run-off.

The rate of infiltration at a given site is expected to vary, based on several factors to be considered in any infiltration model. To partition the available water surpluses into infiltration and surface run-off, the Ministry of Environment, Conservation and Parks (MECP) infiltration factors were consulted and utilized. The MECP Storm Water Management Planning and Design Manual (2003) methodology for calculating total infiltration based on topography, soil type and land cover was used, and a corresponding run-off component was calculated for the soil moisture storage conditions.



The estimations of infiltration and runoff for the pre-development and post-development phases at the Site are provided in Appendix VI and summarized as follows.

Annual Pre-Development Water Balance/Budget

Land Use		Area (m ²)	Precipitation (m ³)	Water Surplus (m ³)	Infiltration (m ³)	Run-off (m ³)
Pervious Areas	Unpaved/Landscape Area	35,267	32,901	17,725	11,521	6,204
Impervious	Building Area	0	0	0	0	0
	Paved Area	0	0	0	0	0
Total Pre-development		35,267	32,901	17,725	11,521	6,204

Annual Post-Development Water Balance/Budget

Land Use		Area (m ²)	Precipitation (m ³)	Water Surplus (m ³)	Infiltration (m ³)	Run-off (m ³)
Pervious Areas	Unpaved/Landscape Area	9,645	8,998	4,847	3,151	1,697
Impervious	Building Area	7,007	6,537	5,229	0	5,229
	Paved Area	18,615	17,366	13,893	0	13,893
Total Post-development		35,267	32,901	23,970	3,151	20,819

Comparison of Pre- and Post Development Water Balance Components

	Precipitation (m ³)	Water Surplus (m ³)	Infiltration (m ³)	Run-off (m ³)
Pre-Development	32,901	17,725	11,521	6,204
Post-Development	32,901	23,970	3,151	20,819
Change in Volume (m ³)	0	6,245	-8,370	14,615
Change in %	0%	35%	-73%	236%



6.6 Summary

Based on the above calculations, a summary of water balance/budget is provided as follows:

- 1) An increase of water surplus by about 35% will be anticipated due to the proposed development, resulting from the reduced evapotranspiration post-development due to a decreased in vegetated area on-Site; and
- 2) Without implementation of mitigation measures, there will be a 236% increase in run-off and a 73% decrease in infiltration, due to the proposed development at the Site. These changes are a result of the development of the Site imposing a significant increase in the proportion of impervious areas compared to the pre-construction Site characteristics.

6.7 Low Impact Development Considerations

Based on the preliminary water balance assessment, an infiltration reduction of approximately 8,370 m³/year will occur due to the proposed development without any mitigative measures. Groundwater recharge would be anticipated to be impacted because of the deficit in the local infiltration. It is understood that both the City of Barrie and LSRCA are directing proponents to incorporate low-impact development (LID) concepts and instruments in their development plans and designs.

As discussed, the groundwater levels measured at the Site are expected to be at least below 5.5 mbgs. In addition, the soils at the Site are primarily comprised of sands some silt to sand, with relatively high infiltration rates, estimated to range from 141 mm/hour and 204 mm/hour. Both the soil and groundwater conditions are considered to be favorable for the design and installation of LID instruments.

7.0 CONCLUSIONS

Pinchin provides the following conclusions arising out of the Hydrogeology Assessment activities to date:

- The Site is located in the Lovers Creek Subwatershed, close to the border with the Hewitt's Creek Subwatershed to the east, within the Lake Simcoe Watershed under the jurisdiction of Lake Simcoe Region Conservation Authority (LSRCA);
- The Site is located on the Peterborough Drumlin Field Physiographic Region, and the Drumlinized Till Plains Physiographic Landform, comprising with coarse-textured glaciolacustrine deposits consisting of sand, gravel, minor silt and clay, or foreshore and basinal deposits. The Site is underlain by Middle Ordovician Simcoe Group Lindsay Formation bedrock consisting of nodular to black laminated limestone;
- The soil stratigraphy at the Site generally consists of reworked soil/earth fill under topsoil, underlain by glacial till deposits and/or sand. No bedrock was encountered to the maximum explored depth of 6.6 mbgs;



- The results of groundwater monitoring indicated that groundwater levels at the Site are anticipated to be at least below 5.5 mbgs or below an elevation of 263.8 masl;
- The estimated hydraulic conductivity of the sandy soil ranged from 6.4×10^{-3} cm/sec to 2.6×10^{-2} cm/sec, which is indicative of high permeability deposits. The estimated soil infiltration rate ranged from 141 mm/hour to 204 mm/hour.
- Given the relatively deep groundwater table and the proposed slab-on-grade building design, no dewatering will be required for the proposed development; and
- A preliminary water balance assessment indicated that there will be a post-development increase in run-off by 236%, and a decrease in infiltration by 73%, due to the increase in impervious surfaces for the proposed development of the Site.

Based on the depth to water table and the proposed slab-on-grade development, it is not considered necessary to conduct a door-to-door Private Well Survey of the Site vicinity.

8.0 RECOMMENDATIONS

It is understood that LID instruments will be expected to be implemented to maintain or enhance infiltration of precipitation into the subsurface at the Site. Therefore, it is recommended that in-situ infiltration tests be conducted at the proposed LID locations in support of the detailed design of LID stormwater management instruments. This would be conducted once the Civil Engineers have selected the preferred location for these instruments. Both the soil and groundwater conditions are considered to be favorable for the design and installation of LID instruments..

Despite the dry conditions of the monitoring wells in December 2021, water level monitoring should continue through the spring (June) of 2022 to confirm the depth to water table is below the maximum depth of investigation over the conventional period of high water levels.

9.0 REFERENCES

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10.0 TERMS AND LIMITATIONS

This Hydrogeology Assessment was performed for the exclusive use of Sobeys Capital Inc. (Client), the City of Barrie (City), and Lake Simcoe Region Conservation Authority (LSRCA) in order to evaluate the subsurface conditions at Southwest Corner of Yonge Street & Maplevue Drive East, Barrie, Ontario. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practises in the field of hydrogeology for the Site. Classification and identification of soil and geologic units have been based upon commonly accepted methods employed in professional geotechnical and geological engineering practice. No warranty or other conditions, expressed or implied, should be understood. Conclusions derived are specific to the immediate area of study and cannot be extrapolated extensively away from sample locations.

Performance of this Hydrogeological Assessment to the standards established by Pinchin is intended to reduce, but not eliminate, uncertainty regarding the subgrade soil and groundwater conditions at the Site and recognizes reasonable limits on time and cost.

Regardless of how exhaustive a geological/hydrogeological investigation is performed, the investigation cannot identify all of the subsurface conditions. In addition, this report is intended to be supplemented and updated with future, more extensive, investigations at the detailed design stage(s) of the Project. Therefore, no warranty is expressed or implied that the entire Site is representative of the subsurface information obtained at the specific locations of our investigation and previous investigations done by others. If, during construction, subsurface conditions differ from then what was encountered within our test locations and the additional subsurface information provided to us, Pinchin should be contacted to review our recommendations. This report does not alleviate the contractor, owner, or any other parties of their respective responsibilities.



This report has been prepared for the exclusive use of the Client, the City, and Client's authorized agents. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third parties. If additional parties require reliance on this report, written authorization from Pinchin will be required. Pinchin disclaims responsibility of consequential financial effects on transactions or property values, or requirements for follow-up actions and costs. No other warranties are implied or expressed. Furthermore, this report should not be construed as legal advice.

The liability of Pinchin or our officers, directors, shareholders or staff will be limited to the lesser of the fees paid or actual damages incurred by the Client. Pinchin will not be responsible for any consequential or indirect damages. Pinchin will only be liable for damages resulting from the negligence of Pinchin.

Pinchin will not be liable for any losses or damage if the Client has failed, within a period of two years following the date upon which the claim is discovered (Claim Period), to commence legal proceedings against Pinchin to recover such losses or damage unless the laws of the jurisdiction which governs the Claim Period which is applicable to such claim provides that the applicable Claim Period is greater than two years and cannot be abridged by the contract between the Client and Pinchin, in which case the Claim Period shall be deemed to be extended by the shortest additional period which results in this provision being legally enforceable.

Pinchin makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and these interpretations may change over time.

Specific limitations related to the legal and financial and limitations to the scope of the current work are outlined in our proposal and any subsequent Change Order documentation, the attached Methodology and the Authorization to Proceed, Limitation of Liability and Terms of Engagement which accompanied the proposal.

Information provided by Pinchin is intended for Client, the City, and Client's authorized agents' use only. Pinchin will not provide results or information to any party unless disclosure by Pinchin is required by law. Any use by a third party of reports or documents authored by Pinchin or any reliance by a third party on or decisions made by a third party based on the findings described in said documents, is the sole responsibility of such third parties. Pinchin accepts no responsibility for damages suffered by any third party as a result of decisions made or actions conducted. No other warranties are implied or expressed.

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Template: Master Geotechnical Investigation Report – Ontario, GEO, April 18, 2019

Tables



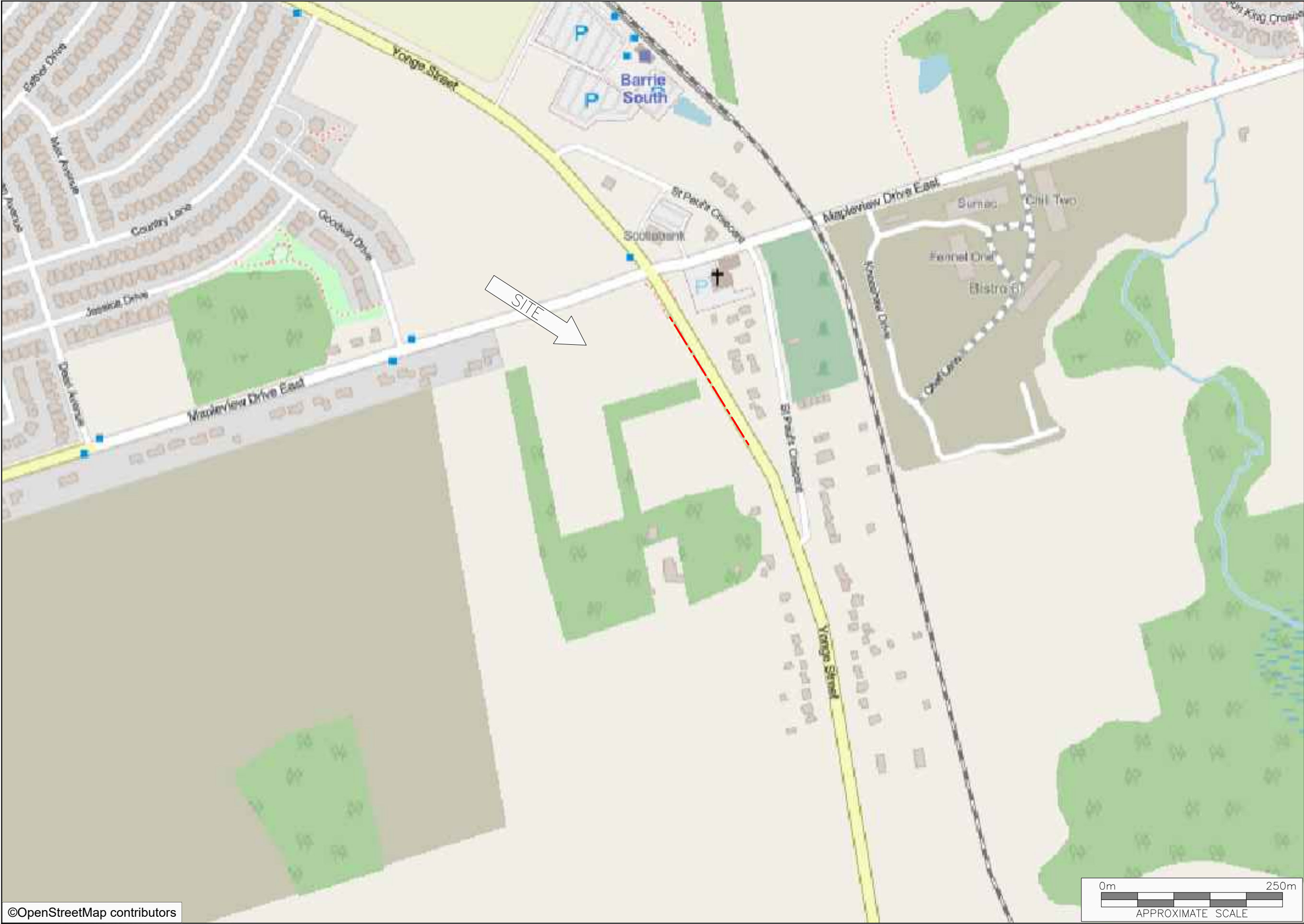
Table 1
MONITORING WELL CONSTRUCTION DETAILS AND
Sobeys Inc.
Yonge Street & Maplevue Drive East, Barrie, Ontario

Monitoring Well	Ground Surface Elevation (masl)	Borehole Depth (mbgs)	Well Construction Details		15-Dec-21		19-Jan-22		24-Feb-22		23-Mar-22	
			Monitoring Well Screen Interval (mbgs)	Screened Soil	Depth to Water Level (mbgs)	Watre Level Elevation (masl)	Depth to Water Level (mbgs)	Watre Level Elevation (masl)	Depth to Water Level (mbgs)	Watre Level Elevation (masl)	Depth to Water Level (mbgs)	Watre Level Elevation (masl)
BH/MW1	270.10	6.6	3.5 - 6.6	sand	dry	< 263.5	dry	< 263.5	dry	< 263.5	dry	< 263.5
BH/MW3	269.60	6.6	3.5 - 6.6	sand	dry	< 263	dry	< 263	dry	< 263	dry	< 263
BH/MW4	268.80	6.4	3.3 - 6.4	sand	dry	< 262.4	dry	< 262.4	dry	< 262.4	dry	< 262.4
BH/MW6	269.60	6.6	2.7 - 5.8	sand	dry	< 263.8	dry	< 263.8	dry	< 263.8	dry	< 263.8
BH/MW7	269.90	6.4	3.3 - 6.4	sand	dry	< 263.5	dry	< 263.5	dry	< 263.5	dry	< 263.5
BH/MW9	269.10	6.4	2.4 - 5.5	fill; sand	dry	< 263.6	dry	< 263.6	dry	< 263.6	dry	< 263.6
BH/MW10	267.70	6.4	3.3 - 6.4	sand	dry	< 261.3	dry	< 261.3	dry	< 261.3	dry	< 261.3
BH/MW11	267.00	6.6	3.5 - 6.6	sand	dry	< 260.4	dry	< 260.4	dry	< 260.4	dry	< 260.4
BH/MW12	267.20	6.6	3.5 - 6.6	sand	dry	< 260.6	dry	< 260.6	dry	< 260.6	dry	< 260.6

Notes:

masl= metres above sea level
mbgs= metres below ground surface
NA

Figures



©OpenStreetMap contributors



LEGEND

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NON-COLOUR COPIES MAY ALTER
INTERPRETATION.



PROJECT NAME:
HYDROGEOLOGICAL
ASSESSMENT

CLIENT NAME:
SOBEYS CAPITAL INC.

PROJECT LOCATION:
SEVEN PARCELS OF LAND
SOUTHWEST CORNER OF YONGE STREET
AND MAPLEVIEW DRIVE EAST, BARRIE

FIGURE NAME:
KEY MAP

PROJECT NUMBER:
298298.003

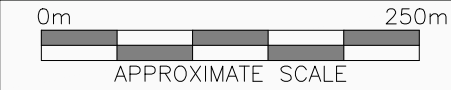
SCALE:
AS SHOWN

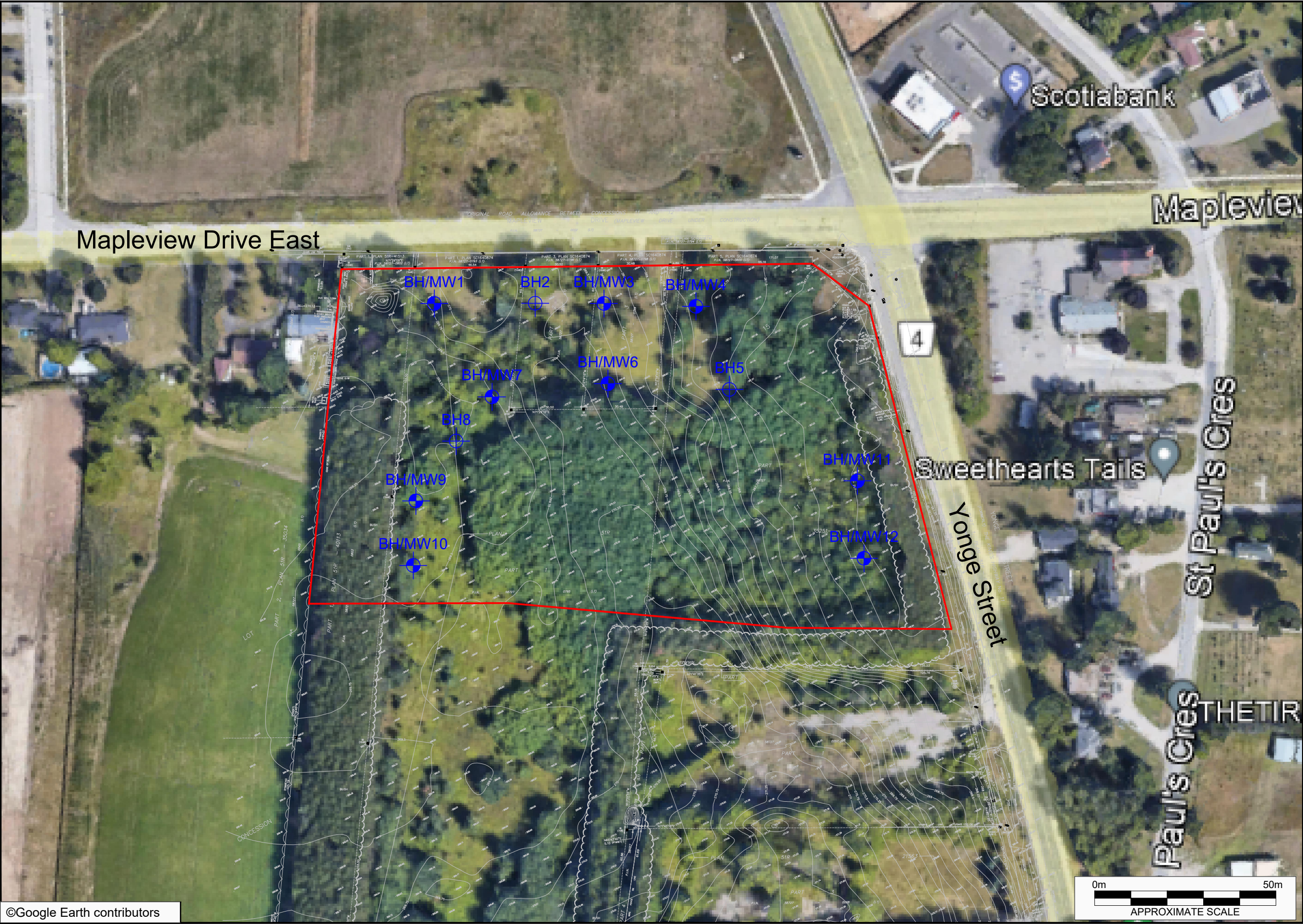
DRAWN BY:
SR

REVIEWED BY:
BG

DATE:
APRIL 2022

FIGURE NUMBER:
1





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LEGEND

- SITE BOUNDARY
- BOREHOLE
- MONITORING WELL

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INTERPRETATION.

PROJECT NAME:

HYDROGEOLOGICAL
ASSESSMENT

CLIENT NAME:

SOBEYS CAPITAL INC.

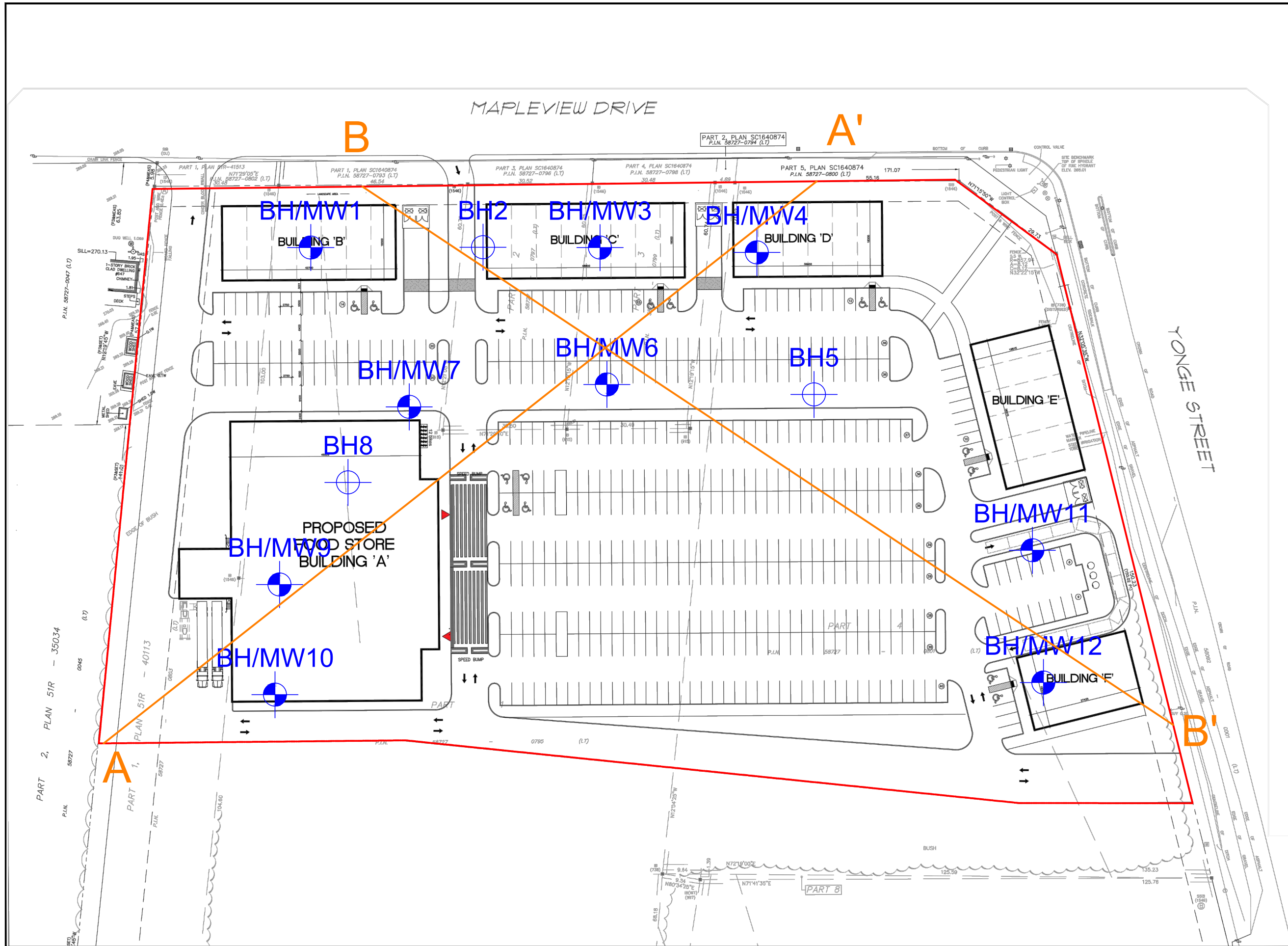
PROJECT LOCATION:

SEVEN PARCELS OF LAND SOUTHWEST
OF YONGE STREET AND MAPLEVIEW
DRIVE EAST, BARRIE, ONTARIO

FIGURE NAME:

BOREHOLE/MONITORING WELL
LOCATION PLAN
(EXISTING CONDITIONS)

PROJECT NUMBER: 298298.003	SCALE: AS SHOWN
DRAWN BY: MYB	REVIEWED BY: BG
DATE: APRIL 2022	FIGURE NUMBER: 2A



LEGEND

- SITE BOUNDARY
- BOREHOLE
- MONITORING WELL
- A-A' CROSS SECTION LINES

LEGEND IS COLOUR DEPENDENT.
NON-COLOUR COPIES MAY ALTER
INTERPRETATION.



PROJECT NAME:
HYDROGEOLOGICAL
ASSESSMENT

CLIENT NAME:
SOBEYS CAPITAL INC.

PROJECT LOCATION:
SEVEN PARCELS OF LAND SOUTHWEST
OF YONGE STREET AND MAPLEVIEW
DRIVE EAST, BARRIE, ONTARIO

FIGURE NAME:
BOREHOLE/MONITORING WELL
LOCATION PLAN
(PROPOSED CONDITIONS)

PROJECT NUMBER:
298298.003

SCALE:
AS SHOWN

DRAWN BY:
KP

REVIEWED BY:
BG

DATE:
APRIL 2022

FIGURE NUMBER:
2B



PROJECT NAME: Hydrogeological Assessment

CLIENT NAME: Sobeys Inc.

PROJECT LOCATION: 651, 659, 665, 669 and 673 Mapleview Drive East; and 892 and 900 Yonge Street, Barrie, Ontario

FIGURE NAME: Ontario Water Well Records (500 m Radius)

PROJECT NO. 298298.003

DATE: April 2022

SCALE: 1:6,000

FIGURE NO. 3

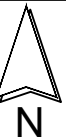
- LEGEND**
- Site Boundary (Geotechnical)
 - 500 m Radius
 - Park
 - Wetland (Unevaluated)
 - Wetland (Evaluated)
 - Roadway
 - Railway
 - Topography Contours (5 m)
 - Watercourse
 - Ontario Water Well Records**
 - Monitoring Well
 - Water Supply Well

0 60 120 240 Metres

Coordinate System: NAD 1983 CSRS UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983 CSRS

DRAWN BY: MH REVIEWED BY: BG REVISION: 0

Service Layer Credits: Ontario Ministry of Natural Resources, Geohub, 2021.
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User



LEGEND

- SITE BOUNDARY
- BOREHOLE
- MONITORING WELL
- CROSS SECTION LINES
- TOPSOIL
- FILL - REWORKED SOIL
- FILL
- CLAYEY SILT TILL
- SANDY SILT TILL
- SAND
- WELL CASING/ BENTONITE
- MEASURED GROUNDWATER ELEVATION
- WELL SCREEN

NOTE: ALL MONITORING WELLS WERE DRY DURING SAMPLING EVENT ON DEC. 15, 2021.

LEGEND IS COLOUR DEPENDENT. NON-COLOUR COPIES MAY ALTER INTERPRETATION.



PROJECT NAME:
HYDROGEOLOGICAL ASSESSMENT

CLIENT NAME:
SOBEYS CAPITAL INC.

PROJECT LOCATION:
SEVEN PARCELS OF LAND SOUTHWEST OF YONGE STREET AND MAPLEVIEW DRIVE EAST, BARRIE, ONTARIO

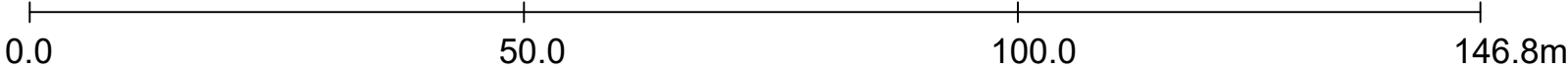
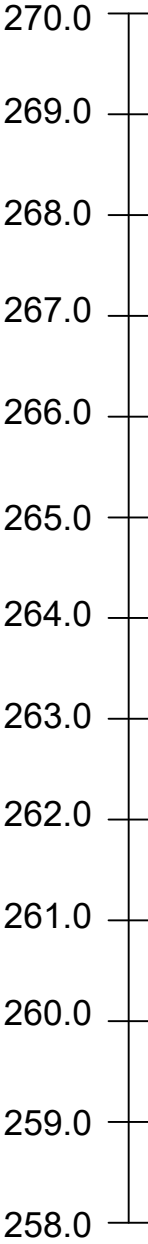
FIGURE NAME:
CROSS SECTION DETAILS A-A'

PROJECT NUMBER: 298298.003	SCALE: AS SHOWN
DRAWN BY: KP	REVIEWED BY: BG
DATE: APRIL 2022	FIGURE NUMBER: 4A

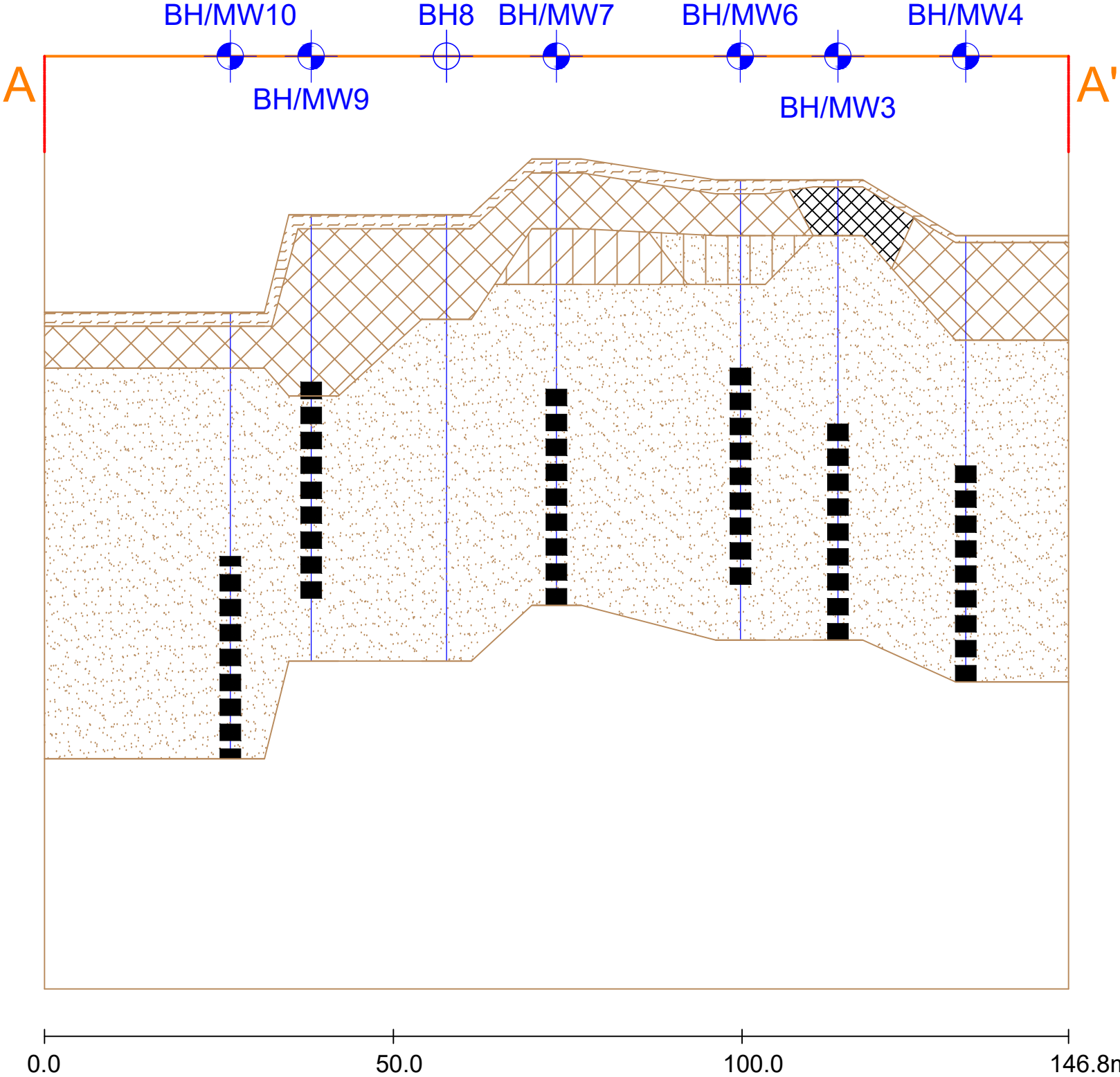
SOUTHWEST

NORTHEAST

GROUND ELEVATION (mbgs)



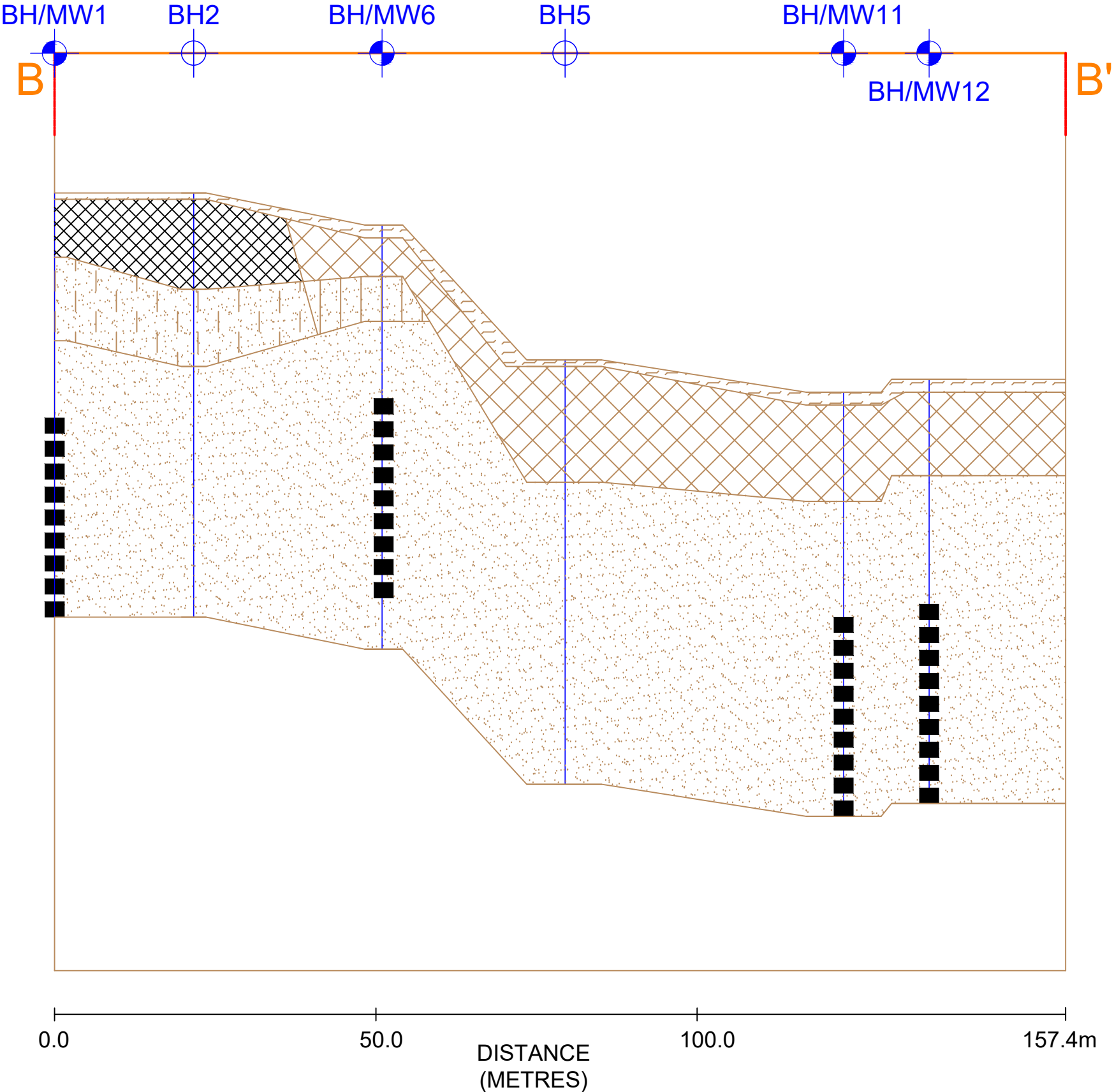
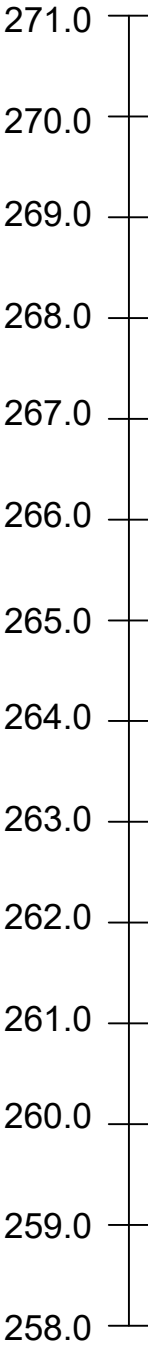
DISTANCE (METRES)



NORTHWEST

SOUTHEAST

GROUND
ELEVATION
(mbgs)



LEGEND

- SITE BOUNDARY
- BOREHOLE
- MONITORING WELL
- CROSS SECTION LINES
- TOPSOIL
- FILL - REWORKED SOIL
- FILL
- CLAYEY SILT TILL
- SANDY SILT TILL
- SAND
- SILTY SAND TILL/SAND AND SILT TILL
- WELL CASING/ BENTONITE
- MEASURED GROUNDWATER ELEVATION
- WELL SCREEN

NOTE: ALL MONITORING WELLS WERE DRY DURING SAMPLING EVENT ON DEC. 15, 2021.

LEGEND IS COLOUR DEPENDENT.
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INTERPRETATION.

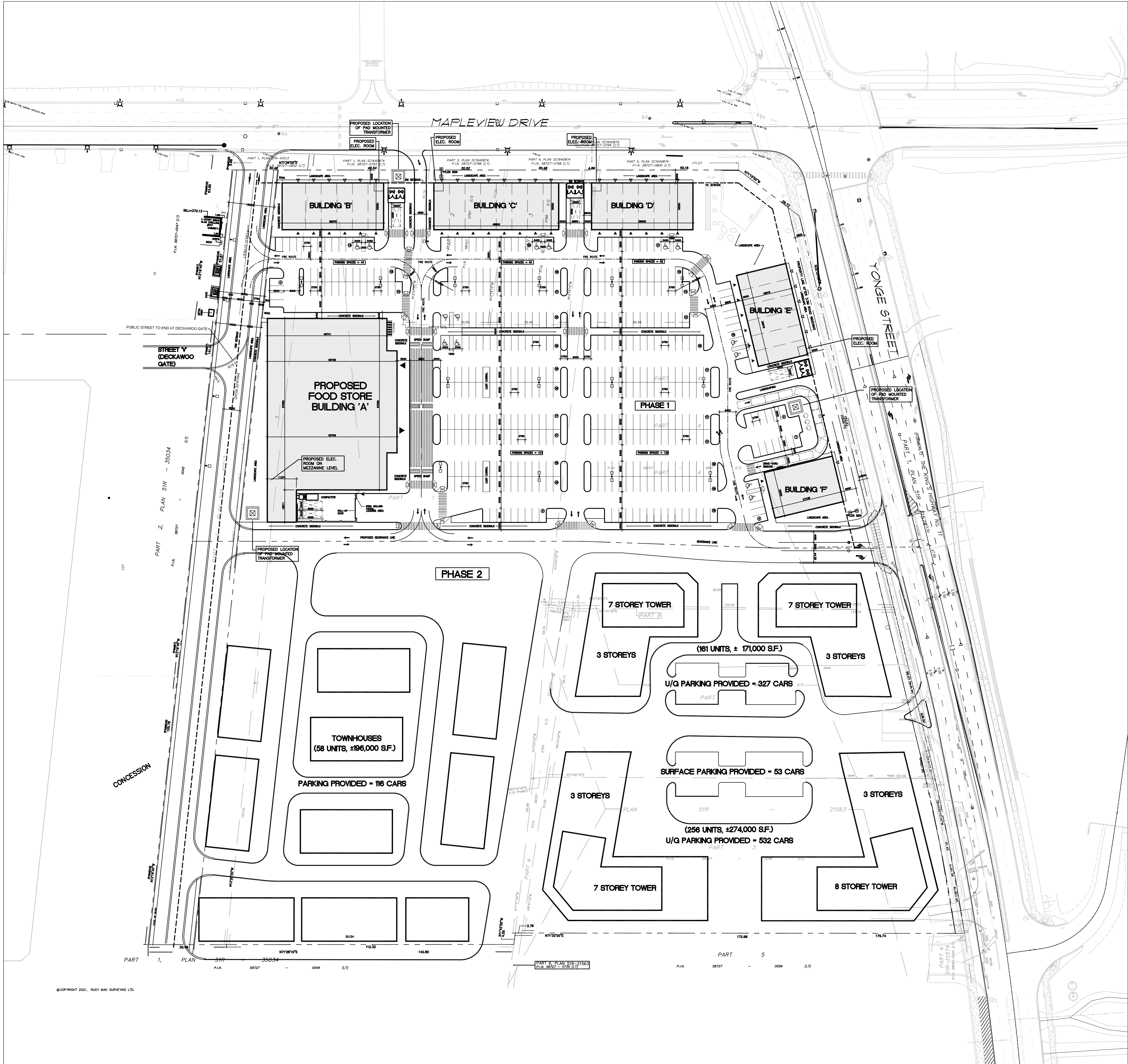
PROJECT NAME: HYDROGEOLOGICAL ASSESSMENT	
CLIENT NAME: SOBEYS CAPITAL INC.	
PROJECT LOCATION: SEVEN PARCELS OF LAND SOUTHWEST OF YONGE STREET AND MAPLEVIEW DRIVE EAST, BARRIE, ONTARIO	
FIGURE NAME: CROSS SECTION DETAILS B-B'	
PROJECT NUMBER: 298298.003	SCALE: AS SHOWN
DRAWN BY: KP	REVIEWED BY: BG
DATE: APRIL 2022	FIGURE NUMBER: 4B

APPENDIX I
Site Plans

IMAGES: S:\2021 Projects\21A130 - Cornbliss RET Food Store - Yonge St & Mapleview Dr. E. Barrie Design Dwg\location plan.jpg
S:\2021 Projects\21A130 - Cornbliss RET Food Store - Yonge St & Mapleview Dr. E. Barrie Design Dwg\location plan.jpg

XREFS: HATCH-MAPLEVIEW YONGE-60% (.\\Street Improvement Drawings\Reference\HATCH-MAPLEVIEW YONGE-60%.dwg)
Mapleview plan 1 (.\\Dog Submittals\SPA\Mapleview plan.dwg)
Yonge Street Plan (.\\Street Improvement Drawings\Yonge Street Plan.dwg)

FILE NAME: S:\2021 Projects\21A130 - Cornbliss RET Food Store - Yonge St & Mapleview Dr. E. Barrie Design Dwg\SPA\Plans & Elev's_Mar 09_22\21A130 - Site Plan_Mar 15_22.dwg



KEY PLAN

SITE STATISTICS

SITE AREA (PHASE 1 LANDS) (+/- 35,267.34 S.M.) (+/- 8.71 acres)
SITE AREA (PHASE 2 LANDS) (+/- 45,557.40 S.M.) (+/- 11.26 acres)
TOTAL SITE AREA (+/- 80,824.74 S.M.) (+/- 19.97 acres)

PROPOSED BUILDING STATISTICS
PHASE 1

BUILDING 'A' (FOOD STORE)	3,436.05 S.M.	36,985.33 S.F.
BUILDING 'B'	725.96 S.M.	7814.17 S.F.
BUILDING 'C'	893.04 S.M.	9612.60 S.F.
BUILDING 'D'	725.23 S.M.	7806.31 S.F.
BUILDING 'E'	724.73 S.M.	7800.92 S.F.
BUILDING 'F'	502.06 S.M.	5404.12 S.F.

TOTAL GFA (7,007.07 S.M.) 75,423.47 S.F.

SITE COVERAGE 19.8 %

PARKING REQUIRED (1SPACE / 30 S.M.)

TOTAL PARKING REQUIRED 234 SPACES

PARKING PROVIDED 445 SPACES

BARRIER-FREE PARKING REQ'D 9 SPACES

BARIER FREE SPACES PROVIDED 14 SPACES

BICYCLE PARKING PROVIDED 12 SPACES
EACH BICYCLE SPACE mm X mm

PAVED AREA

PAVED AREA 18,615 S.M.

LANDSCAPE AREA

LANDSCAPE AREA 9,645.27 S.M.

LOADING SPACES

LOADING SPACES 5 LOADING SPACES
PROVIDED (3.0m X 9.0m)

PROPOSED BUILDING STATISTICS
PHASE 2

RESIDENTIAL BUILDINGS	445,000.00 S.F.
TOWNHOUSES	196,000.00 S.F.
TOTAL GFA	641,000.00 S.F.

PARKING PROVIDED
RESIDENTIAL BUILDINGS 912 SPACES
TOWNHOUSES 116 SPACES

ALL DRAWINGS ARE THE PROPERTY OF THE ARCHITECT AND MUST BE RETURNED ON REQUEST.
THE CONTRACTOR SHALL CHECK ALL DIMENSIONS AND REPORT DISCREPANCIES TO THE ARCHITECT.
ALL DIMENSIONS ARE GIVEN IN MILLIMETRES UNLESS OTHERWISE INDICATED.
DO NOT SCALE DRAWINGS.

REVISIONS AND DISTRIBUTION LOG

No.	Date	Note

LEGAL DESCRIPTION

SURVEY INFORMATION SHOWN ON THIS PLAN
TAKEN FROM
PLAN SHOWING TOPOGRAPHICAL SURVEY OF
PART OF LOT 15
CONCESSION 11
CITY OF BARRIE
COUNTY OF SIMCOE

AS PREPARED BY
RUDY MAK SURVEYING LTD.
TEL: (705) 722-3846



CMV GROUP
Architects

Seal:

247 Spadina Avenue, 4th Floor
Toronto, Ontario
M5T 3A8
www.cmvarch.com

T 416.506.1600 F 416.506.0956

Project:
**PROPOSED RETAIL
DEVELOPMENT**

YONGE STREET & MAPLEVIEW DRIVE

BARRIE ONTARIO

Drawing Title:
OVERALL SITE PLAN

Drawn By: Checked By: Date Checked: Project No.

Date Plotted:
Mar 17, 2022 - 3:59pm

Scale:

Drawing No.: Revision No.:

A101a

1 SITE PLAN — PHASE 1 AND PHASE 2
A101 SCALE: 1:750



APPENDIX II
MECP Water Supply Well Record

pm
UTM 17 2 6 0 9 3 5 2 E
5 R 4 9 1 1 1 6 5 N



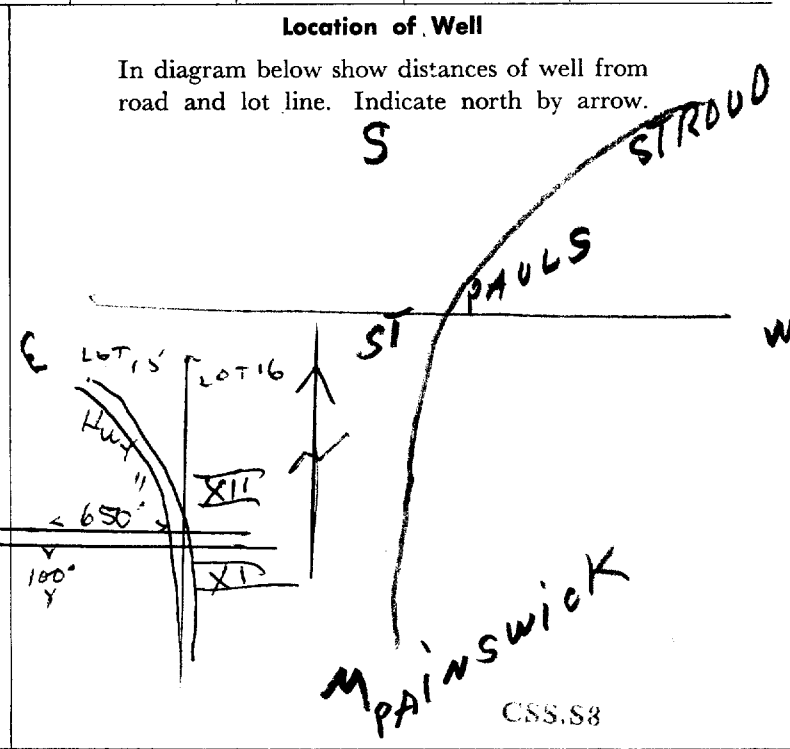
WATER RESOURCES
DIVISION
57 APR 1 1966 1417
ONTARIO WATER
RESOURCES COMMISSION

Elev. 5 R 0 8 7 5
Basin 22 SIMCOE
County or District
Con. 11 Lot 15
Township, Village, Town or City *Midhurst*
Date completed 23 3 66
(day month year)
Address *RRI STROUD*

Casing and Screen Record	Pumping Test
Inside diameter of casing <i>4"</i>	Static level <i>40</i>
Total length of casing <i>66</i>	Test-pumping rate <i>3</i> G.P.M.
Type of screen <i>coarse #8</i>	Pumping level <i>58'</i>
Length of screen <i>4'</i>	Duration of test pumping <i>1 hr</i>
Depth to top of screen <i>66</i>	Water clear or cloudy at end of test <i>clear</i>
Diameter of finished hole <i>4"</i>	Recommended pumping rate <i>3</i> G.P.M.
	with pump setting of <i>60</i> feet below ground surface

Well Log		Water Record		
Overburden and Bedrock Record		From ft.	To ft.	Depth(s) at which water(s) found
<i>dry well</i>		<i>0</i>	<i>35</i>	<i>70</i>
<i>Hard pan</i>		<i>35</i>	<i>60</i>	
<i>fine sand</i>		<i>60</i>	<i>72</i>	

For what purpose(s) is the water to be used? *Home*
Is well on upland, in valley, or on hillside? *valley*
Drilling or Boring Firm
Address
Licence Number *2126*
Name of Driller or Borer *Alex Cameron*
Address *RRI Midhurst*
Date *Mar 26 / 66*
Alex Cameron
(Signature of Licensed Drilling or Boring Contractor)



pmw
UTM 17z 609347E



WATER RESOURCES
DIVISION
57 No 1 1956
APR 1 1956
ONTARIO WATER
RESOURCES COMMISSION

5R 4911175N

The Ontario Water Resources Commission Act

Elev. 5R 0880

WATER WELL RECORD

Basin 22 SIMCOE
County or District

Township, Village, Town or City ~~Simcoe~~ ST. PAULS

Con. 11 Lot 15

Date completed 30 3 66
(day month year)

Address RA/ST ROAD

Casing and Screen Record

Inside diameter of casing 4"
Total length of casing 67'
Type of screen coop TE 14
Length of screen 4'
Depth to top of screen 67'
Diameter of finished hole 4"

Pumping Test

Static level 40
Test-pumping rate 10 G.P.M.
Pumping level 50
Duration of test pumping 2 Hrs
Water clear or cloudy at end of test clear
Recommended pumping rate 5-10 G.P.M.
with pump setting of 60 feet below ground surface

Well Log

Overburden and Bedrock Record

sandy loam
gravelly sand
Coarse sand

From
ft.

To
ft.

Depth(s) at
which water(s)
found

Kind of water
(fresh, salty,
sulphur)

0

3

3

47

47

72

72

fresh

For what purpose(s) is the water to be used? Home

Is well on upland, in valley, or on hillside?

Drilling or Boring Firm Valley

Address

Licence Number 2126

Name of Driller or Borer

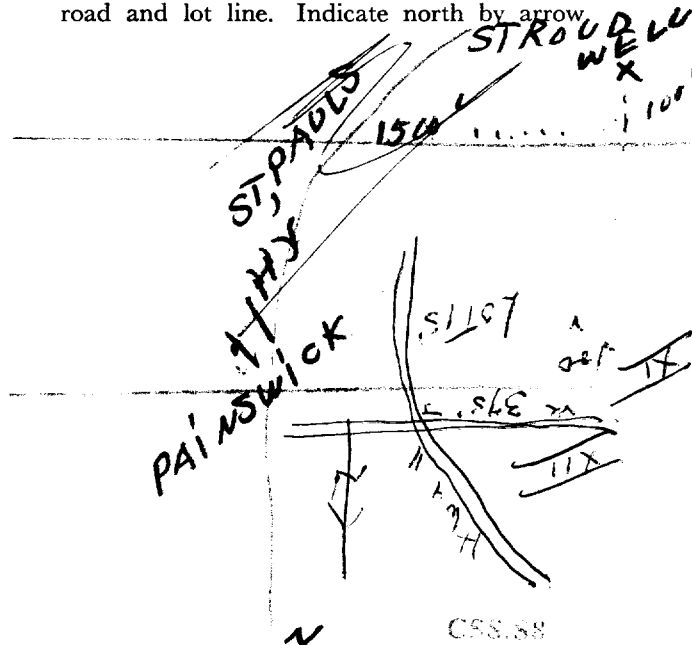
Address Alex Cameron

Date 4/4/66

(Signature of Licensed Drilling or Boring Contractor)

Location of Well S

In diagram below show distances of well from road and lot line. Indicate north by arrow.



APPENDIX III
Borehole Logs



Log of Borehole: BH1 (MW)

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Mapleview Drive East, Barrie, Ontario

Drill Date: November 22, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE						
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value □ 20 40 60 □	Water Content % ○	Laboratory Analysis and Comments
0		Ground Surface	270.1								
		Topsoil Approximately 100 mm	0.0								
		Fill Brown gravelly sand, trace silt, loose to compact, moist			SS	1	30	11			
1		Silty Sand Till Brown silty sand till, trace to some clay, trace gravel, trace stone fragments, loose to compact, moist	269.1 1.0		SS	2	25	9			
2					SS	3	70	22			
		Sand Brown sand, trace to some silt, trace to some gravel, compact to dense, moist	267.8 2.3		SS	4	60	21			
3					SS	5	55	33			
4											
		Very dense	265.5 4.6		SS	6	50	>50			
5											

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 270.1 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: 51 mm

Sheet: 1 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH1 (MW)

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Maplevue Drive East, Barrie, Ontario

Drill Date: November 22, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE									
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value			Water Content		Laboratory Analysis and Comments
									20	40	60	%		
6			263.5		SS	7	80	>50						
7		End of Borehole Borehole was terminated at approximately 6.6 mbgs. Borehole was dry and open upon completion of drilling. Water Level Reading Date Water Depth (mbgs) Dec 15, 2021 dry	6.6											
8														
9														
10														

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 270.1 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: 51 mm

Sheet: 2 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH2

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Maplevue Drive East, Barrie, Ontario

Drill Date: November 22, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE							
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value □ 20 40 60 □	Water Content ○ % ○	Laboratory Analysis and Comments	
0		Ground Surface	270.1	No Monitoring Well Installed								
		Topsoil Approximately 125 mm	0.0		SS	1	20	13				
		Fill Brown sandy silt, trace to some gravel, trace clay, trace stone fragments, trace organics, compact, moist	269.3									
1		Brown gravelly sand, trace silt, compact, moist	0.8		SS	2	25	13				
			268.6									
2		Sand and Silt Till Brown sand and silt till, trace to some clay, trace gravel, trace stone fragments, compact, moist	1.5		SS	3	60	18				
			267.8									
		Very dense	2.3		SS	4	75	52				
3		Sand Brown sand, trace to some silt, trace gravel, dense to very dense, moist	267.4									
			2.7		SS	5	70	35				
4												
5												

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 270.1 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: N/A

Sheet: 1 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH2

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Maplevue Drive East, Barrie, Ontario

Drill Date: November 22, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE									
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value			Water Content		Laboratory Analysis and Comments
									20	40	60	%		
6			263.5	↓	SS	7	100	>50						
7		End of Borehole Borehole was terminated at approximately 6.6 mbgs. Borehole was dry and open upon completion of drilling.	6.6											
8														
9														
10														

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 270.1 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: N/A

Sheet: 2 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH3 (MW)

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Mapleview Drive East, Barrie, Ontario

Drill Date: November 23, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE						
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value	Water Content %	Laboratory Analysis and Comments
0		Ground Surface	269.6								
		Topsoil Approximately 100 mm	0.0								
		Fill Dark brown gravelly sand, trace to some silt, trace organics, trace stone fragments, compact, moist	268.8		SS	1	25	12			
1		Sand Brown sand, trace silt to silty, trace gravel, trace stone fragments, compact to dense, moist	0.8		SS	2	40	15			
2					SS	3	70	32			
		Very dense	267.3		SS	4	70	51			
3					SS	5	60	53			
4											
5					SS	6	100	56			

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 269.6 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: 51 mm

Sheet: 1 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH3 (MW)

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Maplevue Drive East, Barrie, Ontario

Drill Date: November 23, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE									
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value			Water Content		Laboratory Analysis and Comments
									20	40	60	%		
6			263.0		SS	7	100	66						
7		End of Borehole Borehole was terminated at approximately 6.6 mbgs. Borehole was dry and open upon completion of drilling. Water Level Reading Date Water Depth (mbgs) Dec 15, 2021 dry	6.6											
8														
9														
10														

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 269.6 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: 51 mm

Sheet: 2 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH4 (MW)

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Maplevue Drive East, Barrie, Ontario

Drill Date: November 24, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE						
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value	Water Content %	Laboratory Analysis and Comments
0		Ground Surface	268.8								
		Topsoil Approximately 80 mm	0.0								
		Reworked Soil Dark brown sand, trace to some silt, trace gravel, trace organics, pockets of clayey silt, loose, moist			SS	1	50	7			
1					SS	2	60	7			
			267.3								
		Sand Brown sand, some silt, trace gravel, trace stone fragments, compact to dense, moist	1.5		SS	3	80	13			
2					SS	4	90	29			
3					SS	5	90	49			
4											
			264.2								
		Very dense	4.6		SS	6	95	>50			
5											

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 268.8 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: 51 mm

Sheet: 1 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH4 (MW)

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Maplevue Drive East, Barrie, Ontario

Drill Date: November 24, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE									
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value			Water Content		Laboratory Analysis and Comments
									20	40	60	%		
6			262.4		SS	7	100	>50						
7		End of Borehole Borehole was terminated at approximately 6.4 mbgs. Borehole was dry and open upon completion of drilling. Water Level Reading Date Water Depth (mbgs) Dec 15, 2021 dry	6.4											
8														
9														
10														

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 268.8 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: 51 mm

Sheet: 2 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH5

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Maplevue Drive East, Barrie, Ontario

Drill Date: November 25, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE						
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value	Water Content %	Laboratory Analysis and Comments
0		Ground Surface	267.5	No Monitoring Well Installed							
		Topsoil Approximately 100 mm	0.0		SS	1	50	4			
		Reworked Soil Dark brown sand, some silt to silty, trace gravel, trace organics, very loose to loose, moist									
1					SS	2	20	6			
					SS	3	100	3			
2		Sand Brown sand, trace silt to silty, trace gravel, trace stone fragments, very loose, moist Compact to very dense	265.6 1.9 265.2 2.3		SS	4	100	15			
3					SS	5	100	>50			
4											
5					SS	6	100	66			

Rig Type: Compact Equipment

Grade Elevation: 267.5 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: N/A

Sheet: 1 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH5

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Mapleview Drive East, Barrie, Ontario

Drill Date: November 25, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE									
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value			Water Content		Laboratory Analysis and Comments
									20	40	60	%		
6			260.9	↓	SS	7	100	>50						
7		End of Borehole Borehole was terminated at approximately 6.6 mbgs. Borehole was dry and open upon completion of drilling.	6.6											
8														
9														
10														

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 267.5 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: N/A

Sheet: 2 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH6 (MW)

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Maplevue Drive East, Barrie, Ontario

Drill Date: November 24, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE						
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value □ 20 40 60 □	Water Content ○ % ○	Laboratory Analysis and Comments
0		Ground Surface	269.6								
		Topsoil Approximately 150 mm	0.0								
		Reworked Soil Dark brown silty sand, some gravel, trace organics, loose, moist	268.8		SS	1	30	7			
1		Sandy Silt Till Brown sandy silt till, some clay, trace gravel, loose, moist	0.8		SS	2	80	9			
		Sand Brown sand, trace to some silt, trace gravel, dense, moist	268.1		SS	3	65	38			
2			1.5		SS	4	50	49			
3		Very dense	266.6		SS	5	95	>50			
4			3.0								
5					SS	6	100	>50			

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 269.6 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: 51 mm

Sheet: 1 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH6 (MW)

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Maplevue Drive East, Barrie, Ontario

Drill Date: November 24, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE									
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value			Water Content		Laboratory Analysis and Comments
									20	40	60	%		
6			263.0		SS	7	100	>50						
7		End of Borehole Borehole was terminated at approximately 6.6 mbgs; Borehole caved at approximately 4.6 mbgs; Borehole was dry upon completion of drilling.	6.6											
8		Water Level Reading Date Water Depth (mbgs) Dec 15, 2021 dry												
9														
10														

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 269.6 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: 51 mm

Sheet: 2 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH7 (MW)

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Mapleview Drive East, Barrie, Ontario

Drill Date: November 23, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE						
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value	Water Content %	Laboratory Analysis and Comments
0		Ground Surface	269.9								
		Topsoil Approximately 200 mm	0.0 269.7								
		Reworked Soil Dark brown silty sand, trace gravel, trace organics, trace stone fragments, loose to compact, moist	0.2		SS	1	50	9			
1		Clayey Silt Till Brown clayey silt till, sandy, trace gravel, stiff to hard, moist	268.9 1.0		SS	2	70	11			
2		Sand Brown sand, some silt to silty, trace gravel, dense to very dense, moist	268.1 1.8		SS	3	60	31			
3					SS	4	80	36			
4					SS	5	40	>50			
5					SS	6	60	65			

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 269.9 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: 51 mm

Sheet: 1 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH7 (MW)

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Maplevue Drive East, Barrie, Ontario

Drill Date: November 23, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE									
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value			Water Content		Laboratory Analysis and Comments
									20	40	60	%		
6			263.5		SS	7	90	>50						
		End of Borehole	6.4											
7		Borehole was terminated at approximately 6.4 mbgs. Borehole was dry and open upon completion of drilling.												
		Water Level Reading												
		Date Water Depth (mbgs)												
		Dec 15, 2021 dry												
8														
9														
10														

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 269.9 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: 51 mm

Sheet: 2 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH8

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Maplevue Drive East, Barrie, Ontario

Drill Date: December 9, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE						
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value □ 20 40 60 □	Water Content ○ % ○	Laboratory Analysis and Comments
0		Ground Surface	269.1	No Monitoring Well Installed							
		Topsoil Approximately 200 mm	0.0 268.9								
		Reworked Soil Dark brown sand, some silt to silty, trace gravel, trace organics, very loose, moist	0.2		SS	1	60	2			
1					SS	2	50	3			
2		Sand Brown sand, trace to some silt, trace to some gravel, trace stone fragments, dense to very dense, moist	267.6 1.5		SS	3	80	31			
					SS	4	100	65			
3					SS	5	100	>50			
4											
5					SS	6	100	>50			

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 269.1 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: N/A

Sheet: 1 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH8

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Mapleview Drive East, Barrie, Ontario

Drill Date: December 9, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE									
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value			Water Content		Laboratory Analysis and Comments
									20	40	60	%		
6			262.5	↓	SS	7	100	>50						
7		End of Borehole Borehole was terminated at approximately 6.6 mbgs. Borehole was dry and open upon completion of drilling.	6.6											
8														
9														
10														

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 269.1 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: N/A

Sheet: 2 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH9 (MW)

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Maplevue Drive East, Barrie, Ontario

Drill Date: December 9, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE						
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value □ 20 40 60 □	Water Content % ○	Laboratory Analysis and Comments
0		Ground Surface	269.1								
		Topsoil Approximately 200 mm	0.0 268.9								
		Reworked Soil Dark brown to brown sand, trace to some silt, trace to some gravel, trace organics, very loose to compact, moist	0.2		SS	1	40	4			
1					SS	2	50	2			
2					SS	3	70	6			
					SS	4	80	11			
3		Sand Brown sand, trace to some silt, trace gravel, trace stone fragments, compact to very dense, moist	266.5 2.6		SS	5	100	>50			
4					SS	6	100	>50			
5											

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 269.1 masl

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: 51 mm

Sheet: 1 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH9 (MW)

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Mapleview Drive East, Barrie, Ontario

Drill Date: December 9, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE									
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value			Water Content		Laboratory Analysis and Comments
									20	40	60	%		
6			262.7		SS	7	100	>50						
7		End of Borehole Borehole was terminated at approximately 6.4 mbgs. Borehole was dry and open upon completion of drilling. Water Level Reading Date Water Depth (mbgs) Dec 15, 2021 dry	6.4											
8														
9														
10														

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 269.1 masl

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: 51 mm

Sheet: 2 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH10 (MW)

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Maplevue Drive East, Barrie, Ontario

Drill Date: December 8, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE						
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value 20 40 60	Water Content %	Laboratory Analysis and Comments
0		Ground Surface	267.7								
		Topsoil Approximately 200 mm	0.0 267.5								
		Reworked Soil Dark brown sandy silt, trace gravel, trace organics, loose, moist	0.2		SS	1	50	5			
1		Sand Brown sand, trace to some silt, trace to some gravel, compact to dense, moist	266.9 0.8		SS	2	80	18			
2					SS	3	100	41			
		Very dense	265.4 2.3		SS	4	100	58			
3					SS	5	70	>50			
4					SS	6	100	>50			
5											

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 267.7 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: 51 mm

Sheet: 1 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH10 (MW)

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Maplevue Drive East, Barrie, Ontario

Drill Date: December 8, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE										
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value			Water Content			Laboratory Analysis and Comments
									20	40	60	%			
6			261.3		SS	7	NR	>50							
7		End of Borehole Borehole was terminated at approximately 6.4 mbgs. Borehole was dry and open upon completion of drilling.	6.4												
		Water Level Reading Date Water Depth (mbgs) Dec 15, 2021 dry													
8															
9															
10															

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 267.7 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: 51 mm

Sheet: 2 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH11 (MW)

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Maplevue Drive East, Barrie, Ontario

Drill Date: November 25, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE						
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value □ 20 40 60 □	Water Content ○ % ○	Laboratory Analysis and Comments
0		Ground Surface	267.0								
		Topsoil Approximately 180 mm	0.0		SS	1	40	4			
		Reworked Soil Dark brown to brown sand, trace to some silt, trace gravel, trace organics, loose to compact, moist									
1					SS	2	80	4			
			265.3		SS	3	80	23			
2		Sand Brown sand, trace to some silt, trace gravel, trace stone fragments, compact to very dense, moist	1.7								
					SS	4	85	56			
3											
					SS	5	100	42			
4											
5					SS	6	75	62			

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 267.0 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: 51 mm

Sheet: 1 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH11 (MW)

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Mapleview Drive East, Barrie, Ontario

Drill Date: November 25, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE						
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value □ 20 40 60 □	Water Content % ○	Laboratory Analysis and Comments
6											
			260.4 6.6		SS	7	100	69			
7		End of Borehole Borehole was terminated at approximately 6.6 mbgs. Borehole was dry and open upon completion of drilling.									
		Water Level Reading Date Water Depth (mbgs) Dec 15, 2021 dry									
8											
9											
10											

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 267.0 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: 51 mm

Sheet: 2 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH12 (MW)

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Maplevue Drive East, Barrie, Ontario

Drill Date: November 26, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE						
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value □ 20 40 60 □	Water Content ○ % ○	Laboratory Analysis and Comments
0		Ground Surface	267.2								
		Topsoil Approximately 180 mm	0.0								
		Reworked Soil Dark brown sand, trace to some silt, trace gravel, trace organics, very loose to loose, moist			SS	1	50	2			
1					SS	2	80	7			
			265.7								
		Sand Brown sand, trace to some silt, trace gravel, trace stone fragments, compact to very dense, moist	1.5		SS	3	100	16			
2					SS	4	80	40			
3					SS	5	95	70			
4											
5					SS	6	100	68			

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 267.2 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

Well Diameter: 51 mm

Sheet: 1 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level



Log of Borehole: BH12 (MW)

Project #: 298298.002

Logged By: HE

Project: Geotechnical Investigation for Proposed Commercial Development

Client: Sobeys Inc.

Location: Yonge Street and Maplevue Drive East, Barrie, Ontario

Drill Date: November 26, 2021

Project Manager: MYB

SUBSURFACE PROFILE					SAMPLE									
Depth (mbgs)	Graphic Log	Description	Elevation (masl) / Depth (mbgs)	Monitoring Well Details	Sample Type	Sampler Number	Recovery (%)	SPT N-Value	Standard Penetration N-Value			Water Content		Laboratory Analysis and Comments
									20	40	60	%		
6			260.6		SS	7	100	>50						
7		End of Borehole Borehole was terminated at approximately 6.6 mbgs. Borehole was dry and open upon completion of drilling.	6.6											
		Water Level Reading Date Water Depth (mbgs) Dec 15, 2021 dry												
8														
9														
10														

Rig Type: Big Beaver/Ram Sounder

Grade Elevation: 267.2 masl.

Drilling Method: Split Spoon / Solid Stem Auger

Top of Casing Elevation: N/A

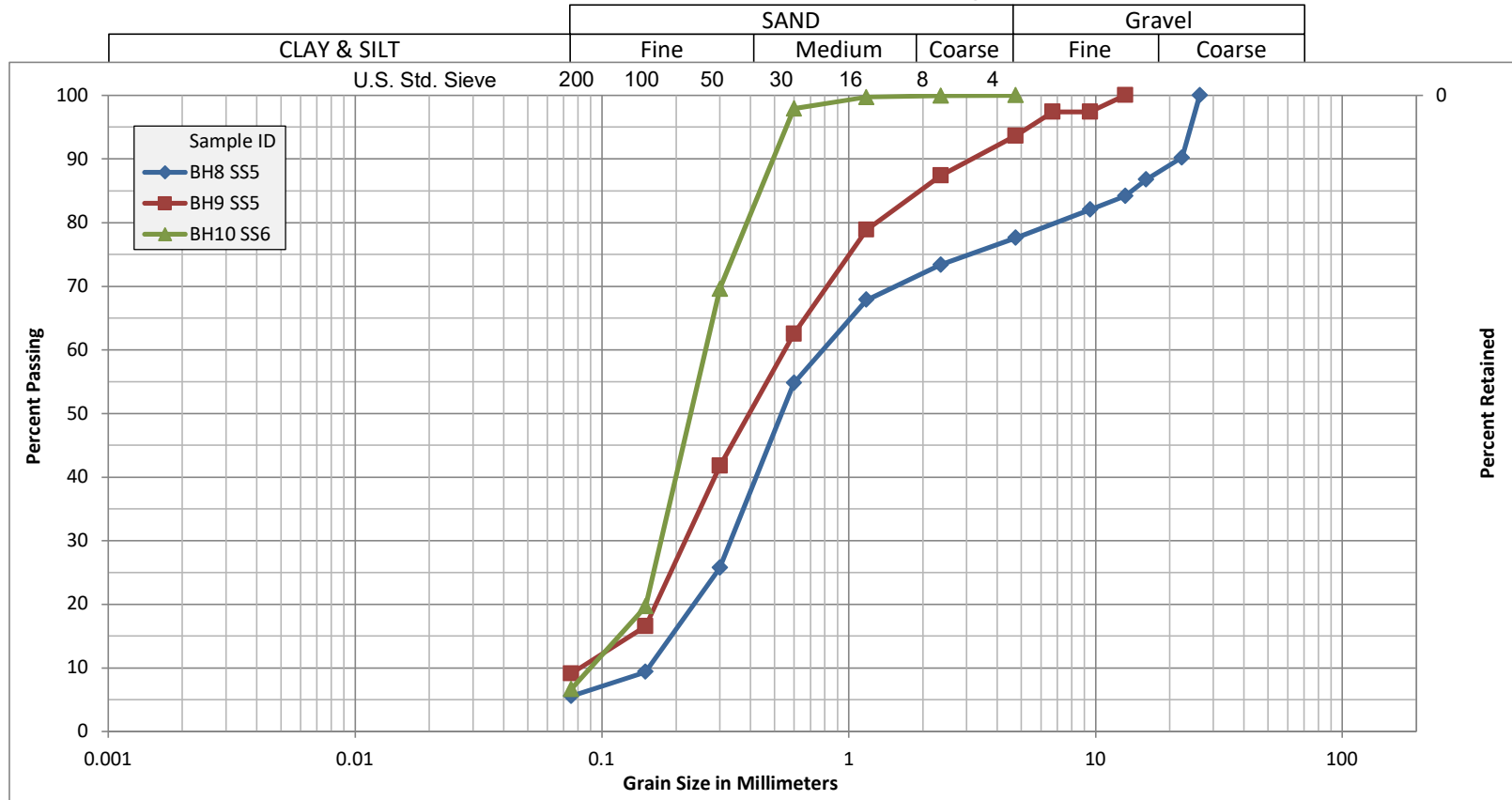
Well Diameter: 51 mm

Sheet: 2 of 2

mbgs - meters below ground surface
mbfs - meters below basement floor slab
masl - meters above sea level

APPENDIX IV
Particle Size Distribution Analyses

Unified Soil Classification System



Sample ID	Depth (ft)	% Gravel	% Sand	% Silt and Clay
BH8 SS5	10.0-12.0	22.4	72.1	5.5
BH9 SS5	10.0-12.0	6.4	84.5	9.1
BH10 SS6	15.0-16.5	0.0	93.4	6.6



Pinchin Waterloo - 225 Labrador Drive,
Unit 1, Waterloo, Ontario N2K 4M8

PARTICLE SIZE DISTRIBUTION ANALYSIS

Geotechnical Investigation - Yonge & Mapleview Barrie, ON
Sobeys Inc.

Figure No. 1

298298.002

Reviewed By :

More information available upon request

APPENDIX V

1981 to 2010 Canadian Climatic Normals (Barrie WPCC)

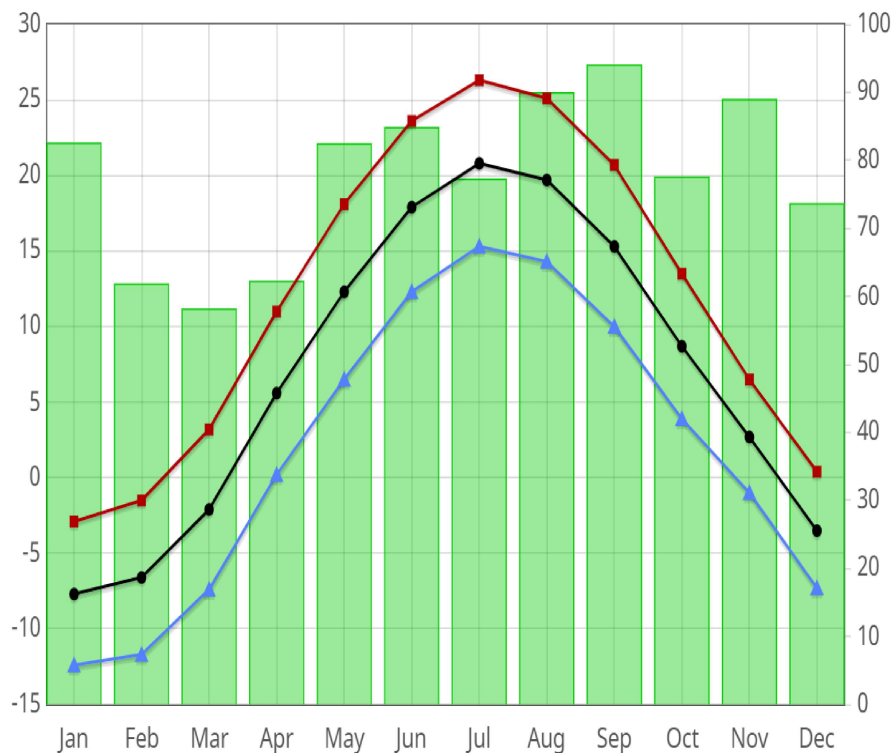


► Notices

Canadian Climate Normals 1981-2010 Station Data

▼ Temperature and Precipitation Graph

Temperature and Precipitation Graph for 1981 to 2010 Canadian Climate Normals
BARRIE WPCC



	Daily Maximum Temperature (°C)
	Daily Average Temperature (°C)
	Daily Minimum Temperature (°C)
	Precipitation (mm)

▼ Normals Data

The minimum number of years used to calculate these Normals is indicated by a [code](#) for each element. A "+" beside an extreme date indicates that this date is the first occurrence of the extreme value. Values and dates in bold indicate all-time extremes for the location.

Data used in the calculation of these Normals may be subject to further quality assurance checks. This may result in minor changes to some values presented here.

BARRIE WPCC ONTARIO

Latitude: 44°22'33.012" N **Longitude:** 79°41'23.010" W **Elevation:** 221.00 m
Climate ID: 6110557 **WMO ID:** **TC ID:**

▼ Temperature

<u>Temperature</u>														
	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Year</u>	<u>Code</u>
Daily Average (°C)	-7.7	-6.6	-2.1	5.6	12.3	17.9	20.8	19.7	15.3	8.7	2.7	-3.5	6.9	<u>C</u>
Standard Deviation	3.4	2.6	2.2	1.6	1.9	1.4	1.3	1.5	1.4	1.2	1.6	3.0	1.4	<u>C</u>
Daily Maximum (°C)	-2.9	-1.5	3.2	11.0	18.1	23.6	26.3	25.1	20.7	13.5	6.5	0.4	12.0	<u>C</u>
Daily Minimum (°C)	-12.4	-11.7	-7.4	0.2	6.5	12.3	15.3	14.3	10.0	3.9	-1.0	-7.3	1.9	<u>C</u>
Extreme Maximum (°C)	14.0	14.0	24.0	30.5	35.0	35.0	36.0	36.5	34.5	30.0	21.5	19.5		
Date (yyyy/dd)	1995/ 14	1984/ 23	1998/ 30	2002/ 16	2006/ 30	1994/ 17	1988/ 06	2006/ 01	2002/ 09	2005/ 05	1978/ 05	1982/ 03		
Extreme Minimum (°C)	-35.0	-33.0	-30.5	-15.0	-4.0	1.0	6.0	0.0	-1.5	-6.5	-19.5	-33.0		
Date (yyyy/dd)	1981/ 04	1979/ 18	1984/ 08	2003/ 07	2006/ 07	1980/ 09	1984/ 08	2004/ 22	1993/ 30	1988/ 31	1989/ 29	2004/ 20		

▼ Precipitation

<u>Precipitation</u>														
	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Year</u>	<u>Code</u>
Rainfall (mm)	16.6	16.0	29.2	56.6	82.3	84.8	77.2	89.9	94.0	75.2	66.0	22.2	709.9	C
Snowfall (cm)	65.9	45.9	29.0	5.7	0.1	0.0	0.0	0.0	0.0	2.3	22.8	51.4	223.0	C
Precipitation (mm)	82.5	61.8	58.1	62.2	82.4	84.8	77.2	89.9	94.0	77.5	88.9	73.6	932.9	C
Average Snow Depth (cm)	16	17	8	1	0	0	0	0	0	0	2	9	4	D
Median Snow Depth (cm)	17	17	8	0	0	0	0	0	0	0	1	8	4	D
Snow Depth at Month-end (cm)	17	15	1	0	0	0	0	0	0	0	4	11	4	C
Extreme Daily Rainfall (mm)	27.0	35.0	43.0	40.0	54.4	96.0	75.0	79.0	80.0	48.8	50.0	28.6		
Date (yyyy/dd)	1998/05	1997/21	1990/11	1995/21	2004/23	1995/02	1980/20	1995/31	1986/11	1995/05	1999/02	1979/24		
Extreme Daily Snowfall (cm)	65.0	32.4	22.0	17.0	2.0	0.0	0.0	0.0	0.0	12.0	27.0	44.0		
Date (yyyy/dd)	1978/09	1984/29	1984/10	1979/04	1989/07	1978/01	1978/01	1978/01	1977/01	1997/26	2000/21	1995/10		
Extreme Daily Precipitation (mm)	65.0	35.0	43.0	40.0	54.4	96.0	75.0	79.0	80.0	48.8	52.0	44.0		
Date (yyyy/dd)	1978/09	1997/21	1990/11	1995/21	2004/23	1995/02	1980/20	1995/31	1986/11	1995/05	1999/02	1995/10		
Extreme Snow Depth (cm)	57	59	50	21	0	0	0	0	0	8	29	54		
Date (yyyy/dd)	1981/07	2001/09	2003/05	1987/01	1981/01	1981/01	1981/01	1981/01	1981/01	1997/27	1995/28	1995/11		

▼ Days with Maximum Temperature

Days with Maximum Temperature														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
<= 0 °C	21.0	16.6	10.0	0.92	0.0	0.0	0.0	0.0	0.0	0.0	3.5	14.6	66.6	☐
> 0 °C	10.0	11.6	21.0	29.1	31.0	30.0	31.0	31.0	30.0	31.0	26.5	16.4	298.6	☐
> 10 °C	0.36	0.48	3.8	14.9	28.2	29.9	31.0	31.0	29.5	21.8	6.4	1.0	198.2	☐
> 20 °C	0.0	0.0	0.54	3.1	10.6	22.6	29.1	27.3	15.6	3.6	0.08	0.0	112.5	☐
> 30 °C	0.0	0.0	0.0	0.04	0.40	2.5	4.4	2.4	0.63	0.0	0.0	0.0	10.4	☐
> 35 °C	0.0	0.0	0.0	0.0	0.0	0.0	0.04	0.04	0.0	0.0	0.0	0.0	0.08	☐

▼ Days with Minimum Temperature

Days with Minimum Temperature														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
> 0 °C	0.84	1.0	2.9	13.9	29.0	30.0	31.0	31.0	29.8	24.8	10.6	3.0	207.8	☐
<= 2 °C	30.9	28.1	30.2	21.7	5.2	0.12	0.0	0.09	0.96	12.3	23.7	29.9	183.0	☐
<= 0 °C	30.2	27.2	28.1	16.1	2.0	0.0	0.0	0.04	0.21	6.3	19.4	28.0	157.5	☐
< -2 °C	27.0	24.6	22.9	7.1	0.12	0.0	0.0	0.0	0.0	0.92	10.6	22.6	115.8	☐
< -10 °C	17.0	15.6	9.1	0.52	0.0	0.0	0.0	0.0	0.0	0.0	0.79	9.6	52.6	☐
< -20 °C	6.0	3.9	0.96	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	12.2	☐
< -30 °C	0.56	0.13	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.04	0.77	☐

▼ Days with Rainfall

Days with Rainfall														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
>= 0.2 mm	2.8	3.0	5.4	11.3	12.9	11.4	11.1	11.8	13.3	15.5	11.3	4.6	114.4	☐
>= 5 mm	1.0	1.2	2.2	3.9	5.8	4.4	4.7	5.1	5.4	5.5	4.6	1.9	45.5	☐
>= 10 mm	0.64	0.58	0.88	1.6	2.7	2.9	2.5	3.4	3.0	1.9	2.2	0.46	22.8	☐
>= 25 mm	0.04	0.08	0.04	0.27	0.36	0.73	0.62	0.81	0.73	0.15	0.28	0.04	4.2	☐

▼ Days With Snowfall

Days With Snowfall														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
>= 0.2 cm	12.4	10.0	6.8	1.5	0.04	0.0	0.0	0.0	0.0	0.54	4.5	9.6	45.5	☐
>= 5 cm	5.0	3.4	2.2	0.35	0.0	0.0	0.0	0.0	0.0	0.19	1.6	3.8	16.5	☐
>= 10 cm	1.8	1.0	0.64	0.12	0.0	0.0	0.0	0.0	0.0	0.04	0.46	1.6	5.7	☐
>= 25 cm	0.08	0.15	0.0	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.08	0.08	0.43	☐

▼ Days with Precipitation

Days with Precipitation														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
>= 0.2 mm	14.9	12.3	11.6	12.2	12.9	11.4	11.1	11.8	13.3	15.6	15.4	13.8	156.1	☐

<u>Days with Precipitation</u>														
	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Year</u>	<u>Code</u>
>= 5 mm	6.0	4.5	4.3	4.2	5.8	4.4	4.7	5.1	5.4	5.7	6.2	5.8	62.0	☐
>= 10 mm	2.4	1.8	1.6	1.7	2.7	2.9	2.5	3.4	3.0	2.0	2.7	2.1	28.9	☐
>= 25 mm	0.12	0.23	0.04	0.31	0.36	0.73	0.62	0.81	0.73	0.19	0.44	0.13	4.7	☐

▼ Degree Days

<u>Degree Days</u>														
	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Year</u>	<u>Code</u>
Above 24 °C	0	0	0	0	0.1	2.5	8.3	4.2	0.4	0	0	0	15.5	☐
Above 18 °C	0	0	0	0.8	8	45.5	95.8	71.4	19.6	1	0	0	242	☐
Above 15 °C	0	0	0	3.4	25.6	103.1	180.5	149.2	56.1	5.1	0	0	523	☐
Above 10 °C	0	0	1.5	16.8	97.6	239.8	334.6	301.4	165.9	36.1	2.2	0.3	1196.3	☐
Above 5 °C	0.4	0.5	10.1	66.1	227.7	389.2	489.6	456.3	310.6	126.9	26.1	3.9	2107.4	☐
Above 0 °C	7.7	10.1	44.4	176.1	381.7	539.2	644.6	611.3	460.5	272.9	101.1	25.4	3274.9	☐
Below 0 °C	245.7	194.9	110	7.9	0	0	0	0	0	0	21.7	132.5	712.8	☐
Below 5 °C	393.4	326.4	230.8	47.9	1.1	0	0	0	0.1	9.1	96.6	266	1371.3	☐
Below 10 °C	548	466.9	377.1	148.6	25.9	0.6	0	0.1	5.4	73.2	222.8	417.4	2286.2	☐
Below 15 °C	703	608	530.7	285.3	108.9	14	0.9	2.8	45.6	197.2	370.6	572.1	3439.1	☐
Below 18 °C	796	692.6	623.7	372.6	184.3	46.3	9.1	18	99	286.2	460.6	665.1	4253.7	☐

▼ Frost-Free

1981 to 2010 Canadian Climate Normals station data

<u>Frost-Free</u>		
	<u>Date/Days</u>	<u>Code</u>
Average Date of Last Spring Frost	May 07	☐
Average Date of First Fall Frost	Oct 09	☐
Average Length of Frost-Free Period	153 Days	☐

1981 to 2010 Canadian Climate Normals station data

<u>Frost-Free</u>							
Probability of last temperature in spring of 0 °C or lower on or after indicated dates	10%	25%	33%	50%	66%	75%	90%
Date	May 19	May 16	May 12	May 05	May 03	Apr 30	Apr 27
Probability of first temperature in fall of 0 °C or lower on or before indicated dates	10%	25%	33%	50%	66%	75%	90%
Date	Sep 20	Oct 02	Oct 07	Oct 10	Oct 14	Oct 18	Oct 23
Probability of frost-free period equal to or less than indicated period (Days)	10%	25%	33%	50%	66%	75%	90%
Days	126	147	154	156	159	161	169

Legend

- A = WMO "3 and 5 rule" (i.e. no more than 3 consecutive and no
- B = At least 25 years more than 5 total missing for **either** temperature **or**
- C = At least 20 years
- D = At least 15 years

precipitation)

▼ Station / Element Metadata

Statistics listed below are provided as a guide to determine the validity of Normals and Extremes calculations. For example, a station with 30 years of record between 1981 and 2010 with no missing years would be a more reliable normal than a station with 15 years of record and 2 missing years. Less than 100% possible observations indicates that out of the total number of observations used, some records were missing.

BARRIE WPCC

Province/Territory	ON
<u>Latitude (dd mm):</u>	44 22 <u>N</u>
Country	CAN
<u>Longitude (ddd mm):</u>	79 41 <u>W</u>
Time Zone	EST
<u>Latitude (decimal degrees):</u>	44.38 <u>N</u>
<u>Climate ID:</u>	6110557
<u>Longitude (decimal degrees):</u>	79.69 <u>W</u>
<u>WMO ID:</u>	
<u>Elevation (m):</u>	221
<u>TC ID:</u>	

▼ Temperature

<u>Temperature</u>						
	Begin Year	End Year	Total Number of Years	Missing Years	Total Count of Observations	% of Possible Observations
Daily Average (°C)	1981	2006	26	1	9142	98.8
Standard Deviation	1981	2006	26	1	9142	98.8
Daily Maximum (°C)	1981	2006	26	1	9148	98.9
Daily Minimum (°C)	1981	2006	26	1	9149	98.9
Extreme Maximum (°C)	1977	2006			10419	99.5
Extreme Minimum (°C)	1977	2006			10372	99.1

▼ Precipitation

<u>Precipitation</u>						
	Begin Year	End Year	Total Number of Years	Missing Years	Total Count of Observations	% of Possible Observations
Rainfall (mm)	1981	2006	26	1	9280	97.8
Snowfall (cm)	1981	2006	26	1	9280	97.8
Precipitation (mm)	1981	2006	26	1	9280	97.8
Average Snow Depth (cm)	1981	2006	25	7	7474	88.9
Median Snow Depth (cm)	1981	2006	25	7	7474	88.9

<u>Precipitation</u>						
	Begin Year	End Year	Total Number of Years	Missing Years	Total Count of Observations	% of Possible Observations
Snow Depth at Month-end (cm)	1981	2006	26	5	270	97.3
Extreme Daily Rainfall (mm)	1968	2006			10717	99.7
Extreme Daily Snowfall (cm)	1968	2006			10730	99.9
Extreme Daily Precipitation (mm)	1968	2006			10705	99.6
Extreme Snow Depth (cm)	1980	2006			7897	93

► Days with Maximum Temperature

► Days with Minimum Temperature

► Days with Rainfall

► Days With Snowfall

► Days with Precipitation

► Degree Days

► Frost-Free

Date modified:
2021-11-25

APPENDIX VI
Water Balance Calculations

WATER BALANCE TABLE 1 - CLIMATIC DATA

Barrie WPCC Weather Station (Class "C")

Latitude: 44°22'33.012" N Longitude: 79°41'23.010" W Elevation: 221.00 m

Temperature:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Daily Average (°C)	-7.7	-6.6	-2.1	5.6	12.3	17.9	20.8	19.7	15.3	8.7	2.7	-3.5	6.9
Precipitation													
Rainfall (mm)	16.6	16.0	29.2	56.6	82.3	84.8	77.2	89.9	94.0	75.2	66.0	22.2	709.9
Snowfall (cm)	65.9	45.9	29.0	5.7	0.1	0.0	0.0	0.0	0.0	2.3	22.8	51.4	223.0
Precipitation (mm)	82.5	61.8	58.1	62.2	82.4	84.8	77.2	89.9	94.0	77.5	88.9	73.6	932.9

Note:

WMO Standards for "CLIMATE NORMALS" - Class "C": No more than 3 consecutive or 5 total missing years between 1981 to 2010 for at least 20 years.

This station meets WMO standards for temperature and precipitation

WATER BALANCE TABLE 2 - PRE-DEVELOPMENT

Pre-Development Water Balance Components
Based on Thornthwaite's Soil Moisture Balance Approach
Climate data from Woodbridge (Vaughan, Ontario) Weather Station (1981 - 2010)

Potential Evapotranspiration Calculation	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
Average Temperature (Degree C)	-7.7	-6.6	-2.1	5.6	12.3	17.9	20.8	19.7	15.3	8.7	2.7	-3.5	7.6
Heat index: $i = (t/5)^{1.514}$	0.00	0.00	0.00	1.19	3.91	6.90	8.66	7.97	5.44	2.31	0.39	0.00	36.8
$a = 0.000000675 * TI^3 - 0.0000771 * TI^2 + 0.01792 * TI + 0.49239$	1.08												
Unadjusted Daily Potential Evapotranspiration U (mm)	0.00	0.00	0.00	25.21	59.00	88.49	104.08	98.15	74.69	40.58	11.46	0.00	501.7
Adjusting Factor for U (Latitude 44°N)*	0.81	0.81	1.02	1.13	1.27	1.28	1.3	1.2	1.04	0.94	0.8	0.76	
Adjusted Potential Evapotranspiration PET (mm)	0.0	0.0	0.0	28.5	74.9	113.3	135.3	117.8	77.7	38.1	9.2	0.0	594.8
PRE-DEVELOPMENT WATER BALANCE (PERVIOUS AREA)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
Precipitation (P)	82.5	61.8	58.1	62.2	82.4	84.8	77.2	89.9	94.0	77.5	88.9	73.6	932.9
Potential Evapotranspiration (PET)	0.0	0.0	0.0	28.5	74.9	113.3	135.3	117.8	77.7	38.1	9.2	0.0	594.8
P - PET	82.5	61.8	58.1	33.7	7.5	-28.5	-58.1	-27.9	16.3	39.4	79.7	73.6	338.1
Soil Moisture Storage Max (determined from MOE SWMM manual Table 3.1)**	175.0	175.0	175.0	175.0	175.0	146.5	88.4	60.5	76.9	116.2	175.0	175.0	
Actual Evapotranspiration (AET)	0.0	0.0	0.0	28.5	74.9	113.3	102.2	70.2	77.7	38.1	9.2	0.0	514.1
P - AET	82.5	61.8	58.1	33.7	7.5	-28.5	-25.0	19.7	16.3	39.4	79.7	73.6	418.8
Surplus - available for infiltration or runoff	82.5	61.8	58.1	33.7	7.5	0.0	0.0	50.0	16.3	39.4	79.7	73.6	502.6
Potential Infiltration (based on MOE methodology; independent of temperature)	53.6	40.2	37.8	21.9	4.9	0.0	0.0	32.5	10.6	25.6	51.8	47.8	326.7
Potential Surface Water Runoff (independent of temperature)	28.9	21.6	20.3	11.8	2.6	0.0	0.0	17.5	5.7	13.8	27.9	25.8	175.9
PRE- DEVELOPMENT WATER BALANCE (IMPERVIOUS AREA)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
Precipitation (P)	82.5	61.8	58.1	62.2	82.4	84.8	77.2	89.9	94.0	77.5	88.9	73.6	932.9
Potential Evaporation (PE) from impervious areas (20%)	16.5	12.4	11.6	12.4	16.5	17.0	15.4	18.0	18.8	15.5	17.8	14.7	186.6
P-PE (surplus available for runoff from impervious areas)	66.0	49.4	46.5	49.8	65.9	67.8	61.8	71.9	75.2	62.0	71.1	58.9	746.3

* the Site is at Latitude of 43°49'31" N.

**Soil Moisture Storage (from Table 3.1 MOE SWM manual)

175 mm

Site Condition

fine sand soil; between pasture/shrubs and Mature Forests

Pre-development

average slope > 28 m/km
clayey silt to silty clay soil
agricultural land

*MOE SWM infiltration factor calculation

topography - Hilly Land	0.1
soils - Open sandy loam	0.4
cover - cultivated land to woodland	0.15
Infiltration Factor	0.65

WATER BALANCE TABLE 3 - POST-DEVELOPMENT									
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[illegible]

Based on Thornthwaite's Soil Moisture Balance Approach

Climate data from Woodbridge (Vaughan, Ontario) Weather Station (1981 - 2010)

POTENTIAL EVAPOTRANSPIRATION CALCULATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
Average Temperature (Degree C)	-7.7	-6.6	-2.1	5.6	12.3	17.9	20.8	19.7	15.3	8.7	2.7	-3.5	6.9
Heat index: $i = (t/5)^{1.514}$	0.00	0.00	0.00	1.19	3.91	6.90	8.66	7.97	5.44	2.31	0.39	0.00	36.8
$a = 0.000000675 * TI^3 - 0.0000771 * TI^2 + 0.01792 * TI + 0.49239$	1.08												
Unadjusted Daily Potential Evapotranspiration U (mm)	0.00	0.00	0.00	25.21	59.00	88.49	104.08	98.15	74.69	40.58	11.46	0.00	501.7
Adjusting Factor for U (Latitude 44°N)*	0.81	0.81	1.02	1.13	1.27	1.28	1.3	1.2	1.04	0.94	0.8	0.76	
Adjusted Potential Evapotranspiration PET (mm)	0.0	0.0	0.0	28.5	74.9	113.3	135.3	117.8	77.7	38.1	9.2	0.0	594.8
POST- DEVELOPMENT WATER BALANCE (PERVIOUS AREA)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
Precipitation (P)	82.5	61.8	58.1	62.2	82.4	84.8	77.2	89.9	94.0	77.5	88.9	73.6	932.9
Potential Evapotranspiration (PET)	0.0	0.0	0.0	28.5	74.9	113.3	135.3	117.8	77.7	38.1	9.2	0.0	594.8
P - PET	82.5	61.8	58.1	33.7	7.5	-28.5	-58.1	-27.9	16.3	39.4	79.7	73.6	338.1
Soil Moisture Storage Max (determined from MOE SWMM manual Table 3.1)**	50.0	50.0	50.0	50.0	50.0	21.5	-36.6	-64.5	-48.1	-8.8	50.0	50.0	
Actual Evapotranspiration (AET)	0.0	0.0	0.0	28.5	74.9	77.1	-65.2	-122.4	77.7	38.1	9.2	0.0	118.0
P - AET	82.5	61.8	58.1	33.7	7.5	7.7	142.4	212.3	16.3	39.4	79.7	73.6	814.9
Surplus - available for infiltration or runoff	82.5	61.8	58.1	33.7	7.5	7.7	0.0	50.0	16.3	39.4	79.7	73.6	510.3
Estimate of I and R													
Potential Infiltration (based on soil conditions; independent of temperature)	53.6	40.2	37.8	21.9	4.9	5.0	0.0	32.5	10.6	25.6	51.8	47.8	331.7
Potential Surface Water Runoff (independent of temperature)	28.9	21.6	20.3	11.8	2.6	2.7	0.0	17.5	5.7	13.8	27.9	25.8	178.6
POST- DEVELOPMENT WATER BALANCE (IMPERVIOUS AREA)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
Precipitation (P)	82.5	61.8	58.1	62.2	82.4	84.8	77.2	89.9	94.0	77.5	88.9	73.6	932.9
Potential Evaporation (PE) from impervious areas (20%)	16.5	12.4	11.6	12.4	16.5	17.0	15.4	18.0	18.8	15.5	17.8	14.7	186.6
P-PE (surplus available for runoff from impervious areas)	66.0	49.4	46.5	49.8	65.9	67.8	61.8	71.9	75.2	62.0	71.1	58.9	746.3

* the Site is at Latitude of 43°50'39.24" N.

**assuming soil moisture reaches maximum in January (from Table 3.1 MOE SWM manual) 50

*MOE SWM infiltration factor calculation

topography -Rolling to Hilly Land	0.15
soils - Open sandy loam	0.4
cover - cultivated land	0.1
Infiltration Factor	0.65

Post-developmet Site Condition

fine sand

re-grading anticipated

primarily fine sand, trace to some silt

urban lawn

WATER BALANCE TABLE 4 Pre-/Post-Development Water Balance Without Mitigations/LID Strategies						
Land Use Description		Land Area (m ²)	Total Precipitation (m ³ /year)	Water Surplus (m ³ /year)	Infiltration Volume (m ³ /year)	Runoff Volume (m ³ /year)
Pre-Development Analysis (Existing Conditions)						
Pervious	Unpaved/Landscape Area	35267	32901	17725	11521	6204
Impervious	Building Area	0	0	0	0	0
	Paved Area	0	0	0	0	0
TOTAL PRE-DEVELOPMENT		35267	32901	17725	11521	6204
Post-Development Analysis (No Mitigation)						
Pervious	Unpaved/Landscape Area	9645	8998	4847	3151	1697
Impervious	Building Area	7007	6537	5229	0	5229
	Paved Area	18615	17366	13893	0	13893
TOTAL POST-DEVELOPMENT		35267	32901	23970	3151	20819
Change in Volume Due to development (m ³ /year)		0	0	6245	-8370	14615
Change in % Due to development (m ³ /year)		0%	0%	35%	-73%	236%
The required infiltration volume to balance pre- to post development conditions (m ³ /year)					8,370	