



CHUNG & VANDER DOELEN
ENGINEERING LTD.

311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 5E1
519-742-8979

February 16, 2022
File No.: G19849

Urban Legend Developments Ltd.
22 King Street South, Suite 300
Waterloo, Ontario
N2J 1N8

Attention: Mr. Jason Malfara

Re: Geotechnical and Hydrogeological Investigation
Groundwater Condition, Proposed 6-Storey Apartment Building
310 - 316 Erb Street West, Waterloo, Ontario

CHUNG & VANDER DOELEN ENGINEERING LTD. (CVD) submitted our report dated March 31, 2020. Following submission, CVD learned that the following design elevations for the underground parking level (P1) have been proposed, as illustrated in the attached Drawing 2.1 by Edge Architects Ltd.

Design Elevations

The design elevations are summarized below:

- Elevator Lobby in P1: 337.85 m
- Parking Level (P1) Floor: 337.85 m
- Mechanical Room in P1: 337.65 m at southwest corner

Groundwater Condition

Monitoring wells were installed in Boreholes 1, 3 and 4 to determine the groundwater level/elevation and to provide hydrogeological information. Groundwater was measured within the monitoring wells on March 17, 2020 and the depths and corresponding elevations are shown in the following table.

Borehole logs and their locations are attached.

Borehole No.	Existing Ground Elevation (m)	Measured Groundwater Depth (m)	Groundwater Elevation (m)
1	339.95	2.70	337.25
3	338.29	0.00	338.29
4	337.84	1.24	336.60

Groundwater levels in monitoring wells at Boreholes 1, 3 and 4 were measured to depths between 0.00 (at ground surface) and 2.70 m below existing grades, corresponding to elevations between 336.60 and 338.29 m. The elevated groundwater level at Borehole 3 is likely due to being located in a “catchment” or “lower” topographical area and a “perched” groundwater condition in which the groundwater is sitting above the silt deposit containing clayey seams/layers.

Based on the observed/measured groundwater levels in the monitoring wells and boreholes during sampling and measured moisture contents, the groundwater table at the site exists at elevations between 337.25± and 336.60± m. It is anticipated that the groundwater table generally follows the existing surface grades and drops in both northerly and easterly directions.

It is noted that the observed groundwater table will fluctuate seasonally. The water levels were taken in mid-March at typical “high” season in spring.

Basement Floor Elevation

Based on the proposed basement floor elevation of 337.85 m, most of the eastern and northeastern portions of the P1 floor will be located above the March 2020 measured groundwater level (Borehole 4 at elevation 336.60 m). However, there is a higher groundwater table on the western portion of the site (Boreholes 1 and 3 at elevations 337.25 and 338.29 m respectively).

Due to the steep groundwater gradient and the apparent higher permeability of the sand and silt soil on the east end of the property, it is feasible to convey the groundwater from the higher western portion of the building to the lower eastern portion of the building using a combination of a coarse granular layer (Granular “B” Type II), under-floor drains and footing drains; **detailed design of such drainage system will be presented in due course.** With the installation of this type of passive drainage system, the groundwater table and its fluctuations can be controlled and the basement can be maintained in a “dry” condition.

It is important to note that the conveyance of groundwater in this way does not increase the quantity of groundwater moving through the property. It simply moves the groundwater more efficiently to the down-gradient area.



Under-floor Drains

Under-floor drains will be installed in the drainage layer to more efficiently convey collected water to the down-gradient area and to a sump pit. Pumping from the sump pit will be a secondary defence against groundwater table fluctuations. The high water level in the sump pit (in the mechanical room at the southwest corner of building) can be set to 300 mm below the floor elevation (i.e., at elevation 375.35 m).

Construction Groundwater Control

During footing excavations, proper groundwater control will be required for any footing excavations carried out below the water table, as the fine granular soils will become “quick” and lose its integrity to support loads. Since the predominant subgrade soil is silt to sand and silt with occasional to frequent clayey seams, the ingress of water into the excavation is expected to be relatively slow due to the low permeability (hydraulic conductivity). The following is advised to circumvent dewatering using well points or other more sophisticated methods.

It is noted that since the majority of the basement floor subgrade will be located above the groundwater table, conventional sump pumping technique together with intercept drains could be employed to control the groundwater ingress into the footing excavations. The following excavation and footing construction methodology is recommended:

1. General excavation for the basement should be carried out to at least 300 mm above the groundwater table. This will ensure trafficability on the soil subgrade.
2. Only excavate a small manageable length/section of footing area so that the quantity of groundwater ingress to be handled will be less than 50,000 liters/day.
3. Place lean mix concrete over the approved footing area to protect the soil subgrade from being disturbed by the construction traffic and the elements.
4. Continue to manage the groundwater ingress by pumping from filtered sump pits.
5. If there is evidence that the footing subgrade will become “quick” or too much water could enter the excavation, the footing can be constructed with “trench and pour” method.
6. Backfill the footing excavations with imported Granular “B” Type I immediately after the foundation walls or the piers are poured.

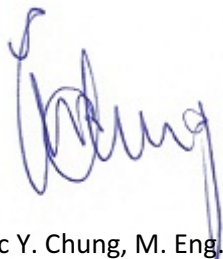


In the areas where the excavations are expected to be deeper into the groundwater table (such as the sump pits in the mechanical room and the elevator pit), excavation/soil support using a "slide rail" shoring support system, together with pouring the concrete base with "tremie" method can be considered.

If you have any questions, please do not hesitate to contact the undersigned.

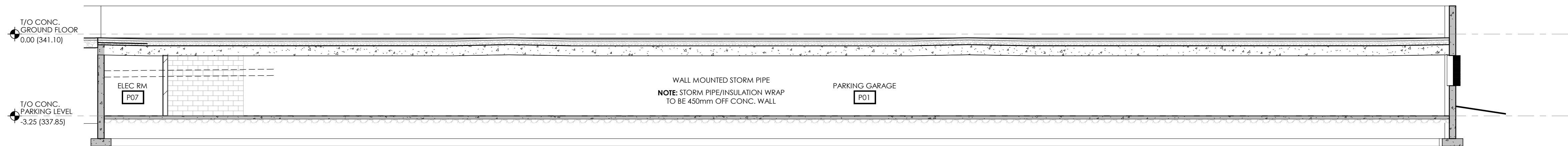
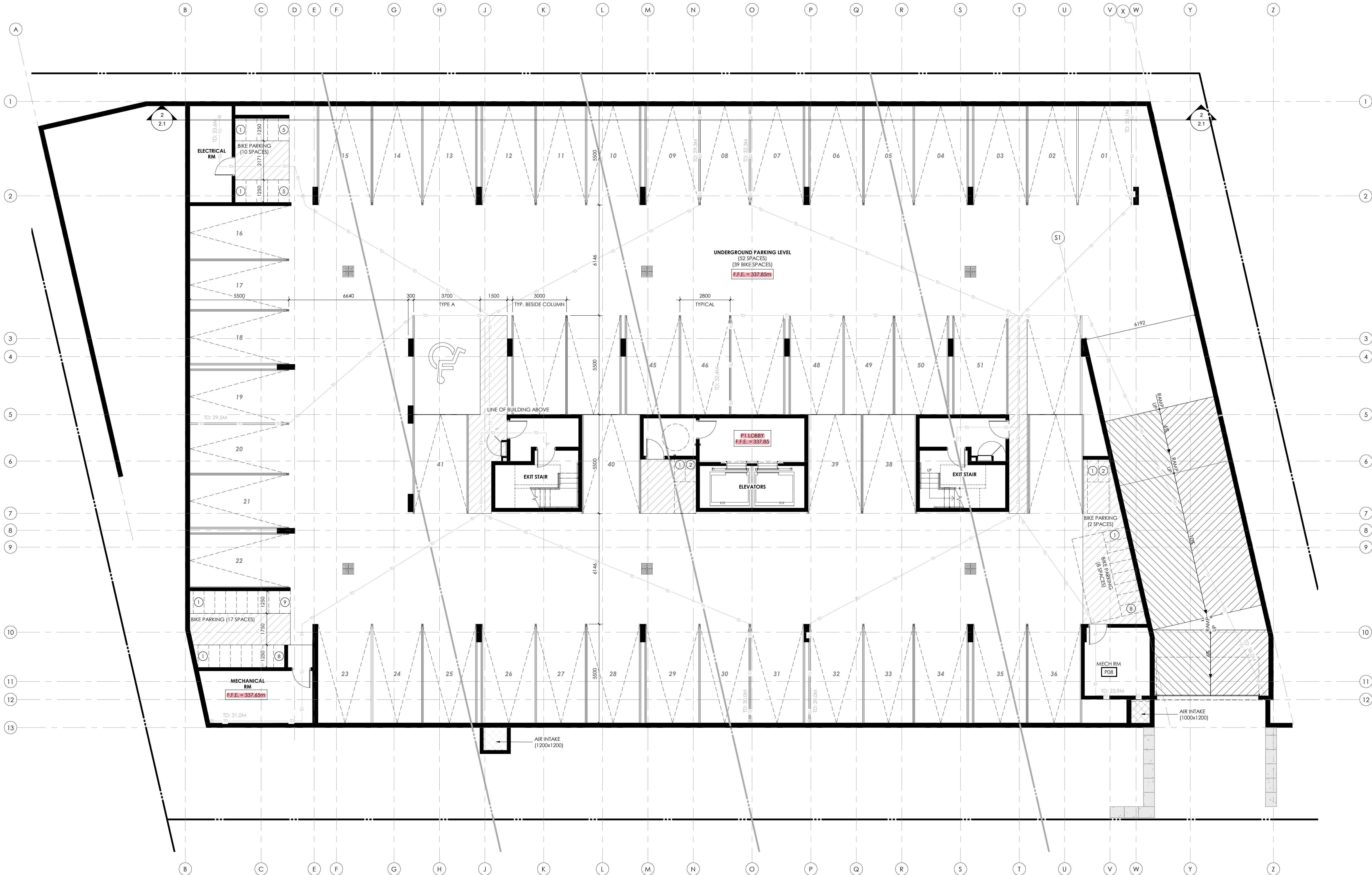
Respectfully yours,

CHUNG & VANDER DOLEN ENGINEERING LTD.



Eric Y. Chung, M. Eng., P.Eng.
Principal Engineer





2.1 INTERIOR ELEVATION - WALL MOUNTED STORM PIPE

1:100

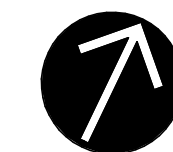
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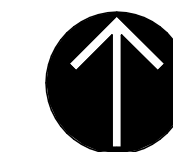
THE GENERAL CONSTRUCTOR SHALL VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE CONSULTANTS PRIOR TO PROCEEDING WITH THE WORK.

THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL OTHER RELATED DOCUMENTS AND SPECIFICATIONS.

THIS DRAWING SHALL NOT BE SCALED.



TRUE NORTH



PROJECT NORTH

ISSUED FOR:

SCHEMATIC DESIGN

DEVELOPED DESIGN

2021.03.12

SITE PLAN APPROVAL

BUILDING PERMIT

BIDDING/TENDER

NO.	REVISION DESCRIPTION	DATE
1	ISSUED FOR ZBA	2021.06.03
2	RE-ISSUED FOR SPA	2021.12.01
3	RE-ISSUED FOR SPA	2021.12.15
4	RE-ISSUED FOR SPA	2022.02.16

EDGE
ARCHITECTS LTD

ARCHITECT'S SEAL



PROJECT NAME

310-316 ERB ST W
MULTI-RES DEVELOPMENT
310-316 ERB STREET WEST, WATERLOO, ON

CLIENT



URBAN LEGEND
DEVELOPMENTS

DRAWING TITLE

UNDERGROUND PARKING

PROJECT NUMBER

19099

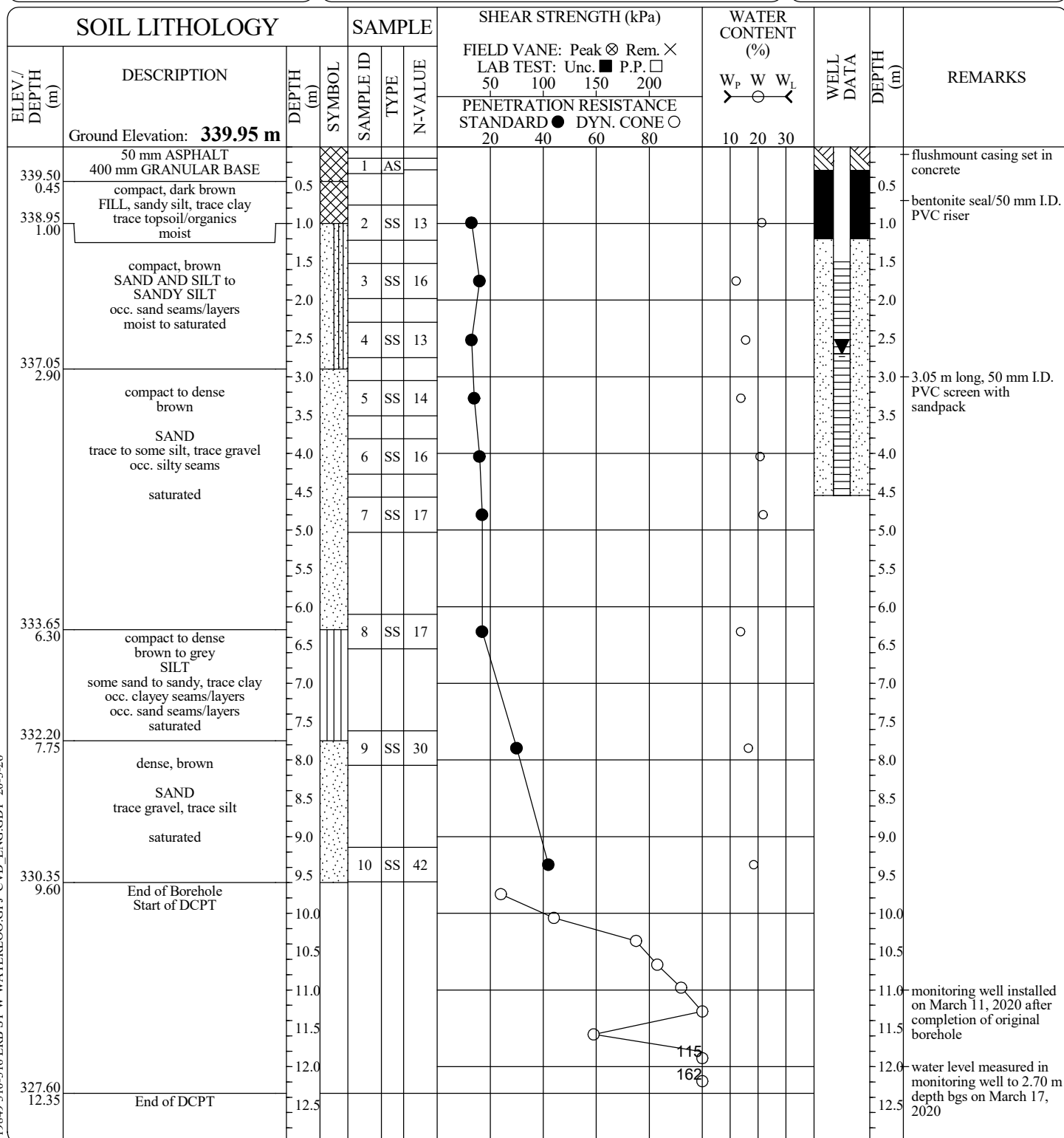
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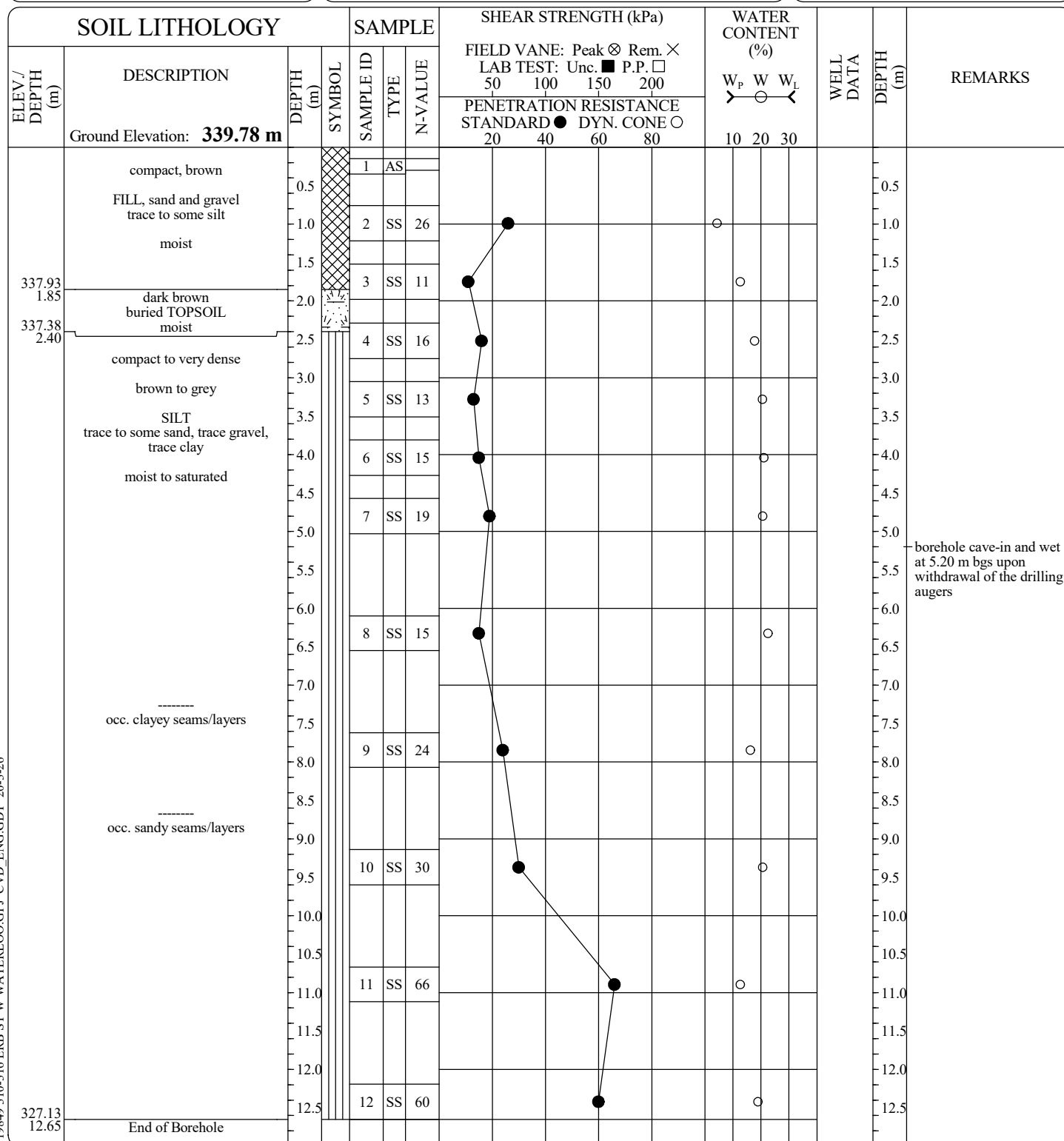
1 : 100

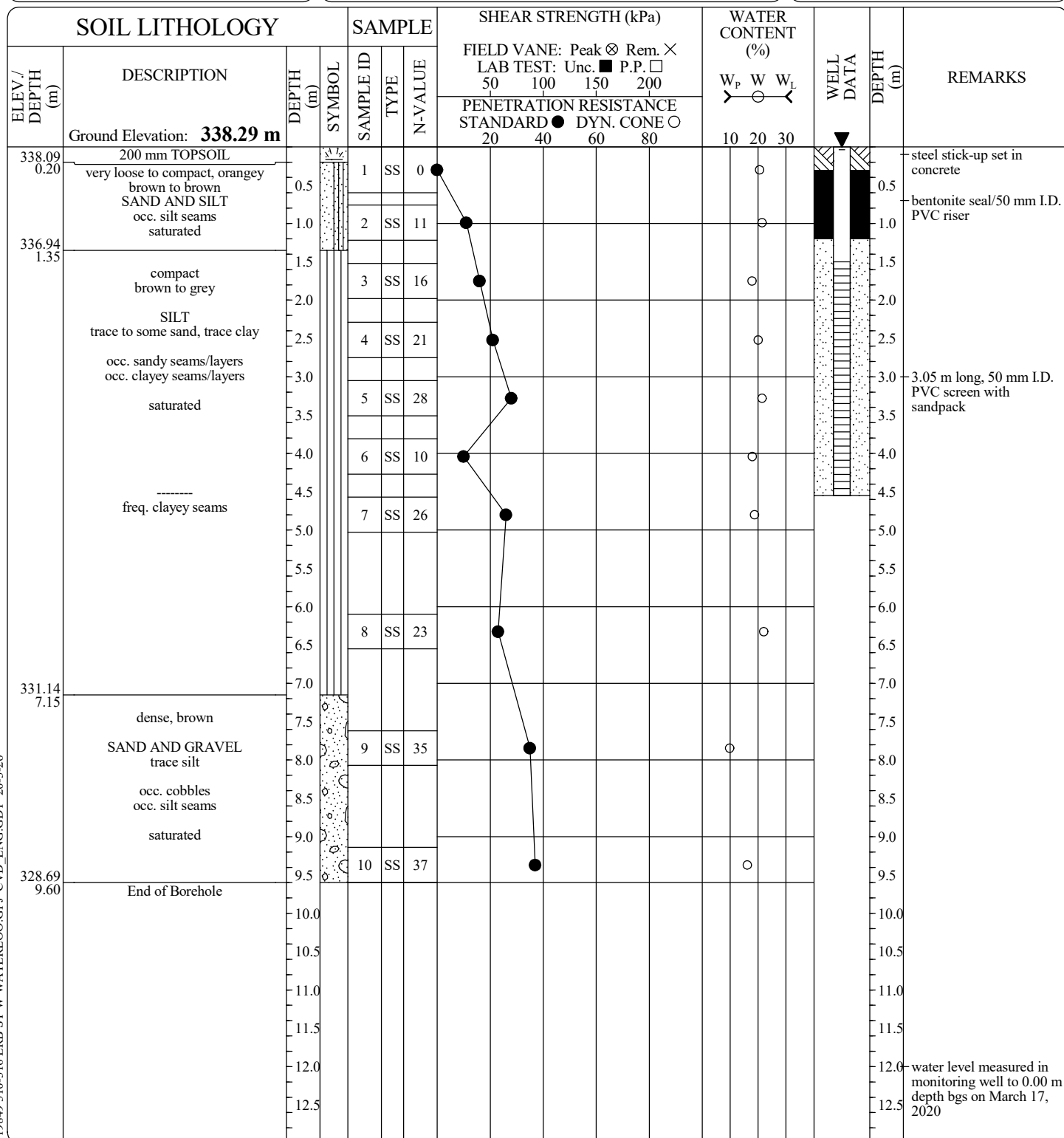
SHEET SIZE

24x36

2.1

FILE No: G19849**BOREHOLE No. 1**Client: **Urban Legend Development Ltd.**Project: **Proposed Residential Development**Location: **310-316 Erb Street West, Waterloo, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **107 mm I.D.**Date: **Dec 09 - 19 TO Dec 09 - 19**PROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

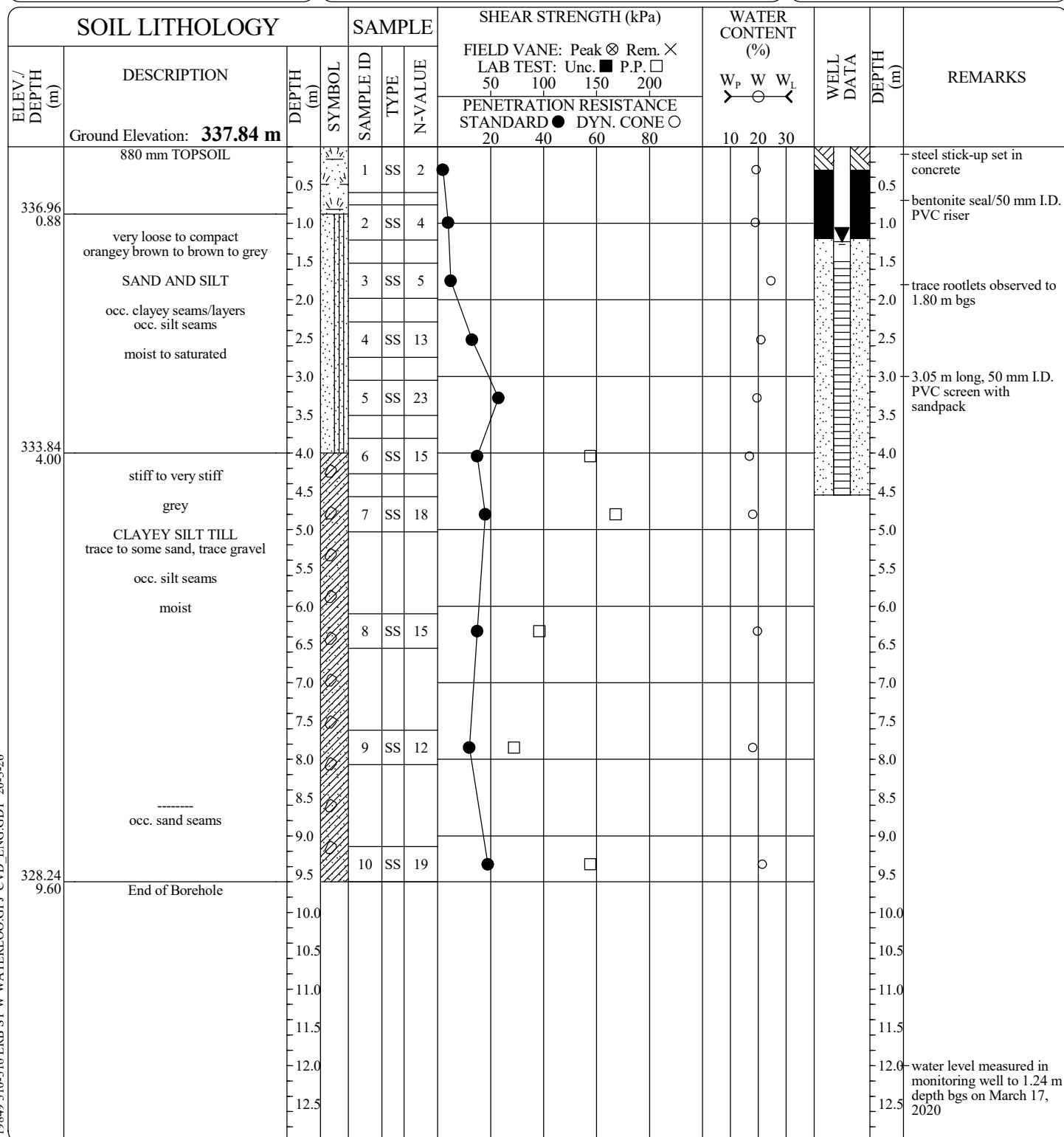
FILE No: G19849**BOREHOLE No. 2**Client: **Urban Legend Development Ltd.**Project: **Proposed Residential Development**Location: **310-316 Erb Street West, Waterloo, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **107 mm I.D.**Date: **Dec 10 - 19 TO Dec 10 - 19**PROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
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FILE No: G19849**BOREHOLE No. 3**Client: **Urban Legend Development Ltd.**Project: **Proposed Residential Development**Location: **310-316 Erb Street West, Waterloo, Ontario****EQUIPMENT DATA**Machine: **Mobile B57**Method: **Hollow Stem Auger**Size: **107 mm I.D.**Date: **Mar 11 - 20 TO Mar 11 - 20**

water level measured in monitoring well to 0.00 m depth bgs on March 17, 2020

PROJECT MANAGER: **EYC**
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FILE No: G19849**BOREHOLE No. 4**Client: **Urban Legend Development Ltd.**Project: **Proposed Residential Development**Location: **310-316 Erb Street West, Waterloo, Ontario****EQUIPMENT DATA**Machine: **Mobile B57**Method: **Hollow Stem Auger**Size: **107 mm I.D.**Date: **Mar 11 - 20 TO Mar 11 - 20**PROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
Kitchener, Ontario N2H 5E1
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FILE No: G19849**BOREHOLE No. 5**Client: **Urban Legend Development Ltd.**Project: **Proposed Residential Development**Location: **310-316 Erb Street West, Waterloo, Ontario****EQUIPMENT DATA**Machine: **Mobile B57**Method: **Hollow Stem Auger**Size: **107 mm I.D.**Date: **Mar 11 - 20 TO Mar 11 - 20**

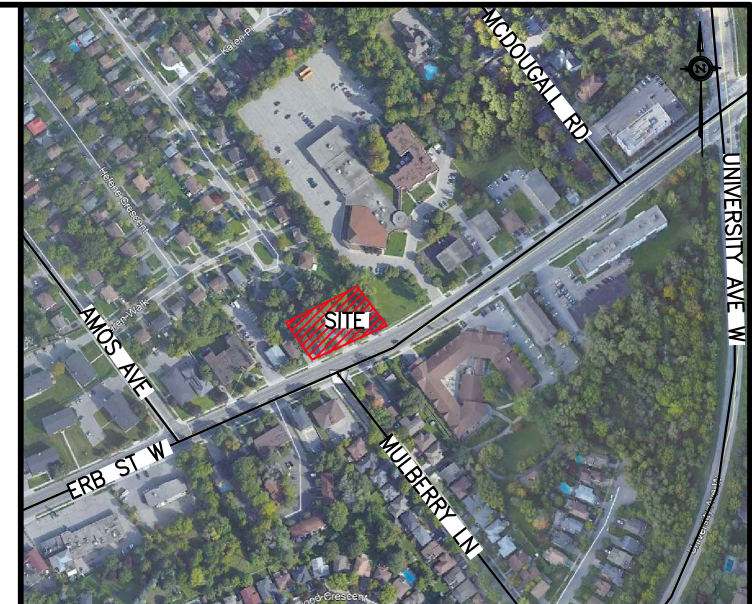
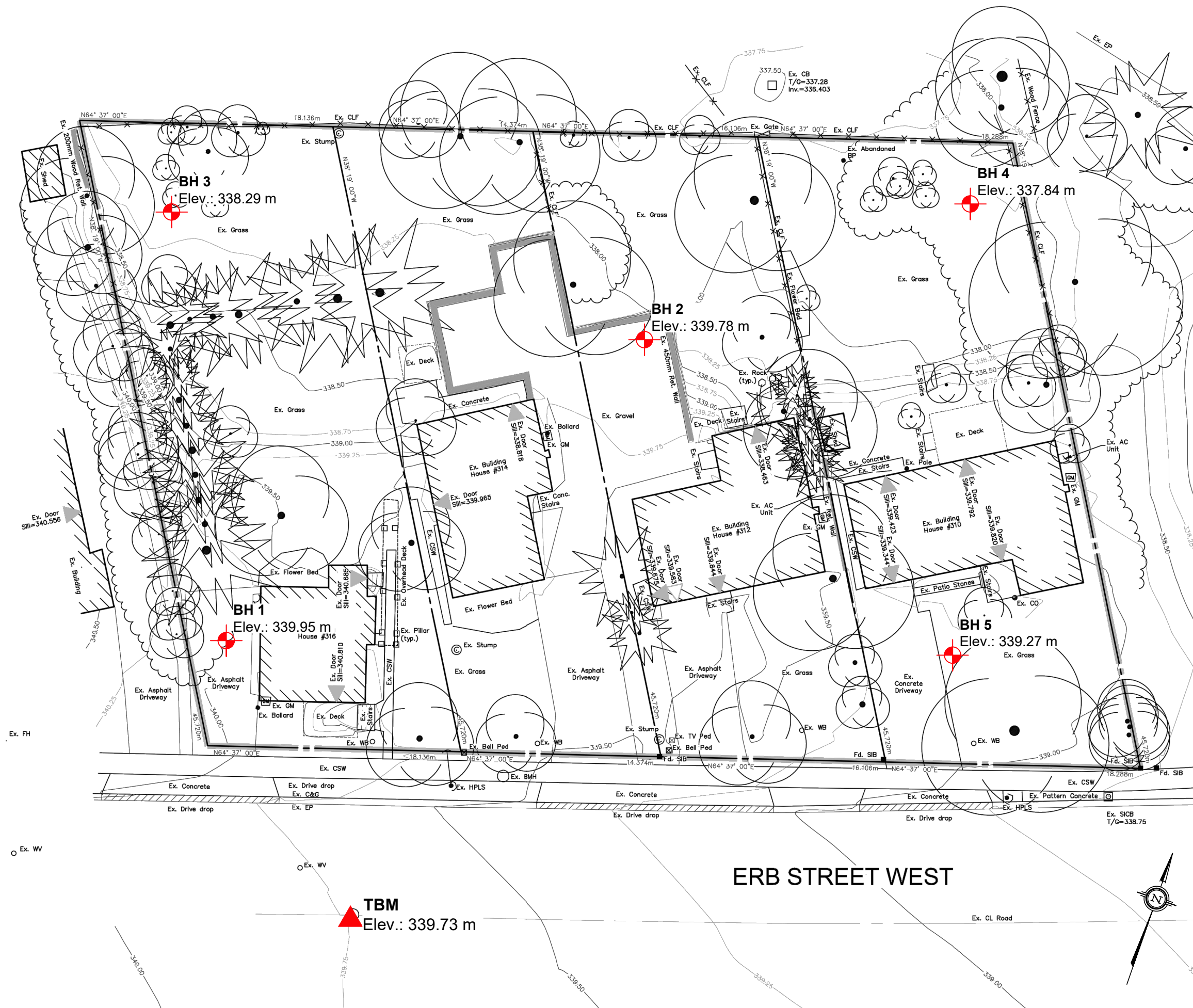
SOIL LITHOLOGY			SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS	
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W _P W W _L ↔ ○ ↔					
Ground Elevation: 339.27 m							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○				10 20 30					
339.07 0.20	200 mm TOPSOIL			1	SS	6	●						○			
	loose to compact dark brown to brown FILL, silty sand trace gravel, trace clay trace topsoil/organics occ. silt pockets moist	0.5														
		1.0		2	SS	10	●						○			
		1.5														
337.47 1.80	dark brown buried TOPSOIL	2.0		3	SS	6	●						○			
336.92 2.35	moist															
	compact, brown SAND	2.5		4	SS	16	●						○			
	some silt moist to saturated	3.0														
335.92 3.35		3.5		5	SS	26		●					○			
	compact brown to grey	4.0		6	SS	21		●					○			
	SILT trace to some, trace clay	4.5														
	occ. sandy seams/layers occ. clayey seams/layers	5.0		7	SS	24		●					○			
	saturated	5.5														
		6.0														
		6.5		8	SS	24		●					○			
		7.0														
	----- freq. clayey seams	7.5														
		8.0		9	SS	26		●					○			
330.92 8.35		8.5														
	very stiff, grey CLAYEY SILT TILL trace gravel, trace sand occ. silt seams moist	9.0														
329.67 9.60	End of Borehole	9.5		10	SS	26		●				□	○			
		10.0														
		10.5														
		11.0														
		11.5														
		12.0														
		12.5														

water level at 5.35 m bgs upon withdrawal of the drilling augers
borehole cave-in to 5.50 m bgs upon withdrawal of the drilling augers

water level at 5.35 m bgs upon withdrawal of the drilling augers
borehole cave-in to 5.50 m bgs upon withdrawal of the drilling augers

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KEY PLAN SOURCE: Google Earth

LEGEND

- TBM: Top of manhole in centrline of Erb Street West at intersection with Mulberry Lane Elev.: 339.73 m (Geodetic)
- Borehole Location

Dwg/Elev. Ref.: MTE; Urban Legend Developments Ltd.; "Exisiting Conditions Plan"; 310-316 Erb Street West, Proj. No. 46981-100; Dwg No.: C1.1; November 29, 2019

BOREHOLE LOCATION PLAN

Geotechnical Investigation
Proposed Residential Development

310-316 Erb Street West
Waterloo, Ontario



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Drawn By: JV	Date: March, 2020	File No.: G19849
Checked By: EYC	Scale: N.T.S.	Drawing No.: 1