74 Berkeley Street, Toronto, ON M5A 2W7
Tel: 647-795-8153 | www.pecg.ca

Preliminary Hydrogeological Assessment-Draft

69 and 117 John Street, Mississauga, Ontario

Palmer Project #
2209001

Prepared For

13545130 Canada Inc.

.January 19, 2023

74 Berkeley Street, Toronto, ON M5A 2W7
Tel: 647-795-8153 | www.pecg.ca

January 19, 2023

Bashar Ghreiwati
13545130 Canada Inc.
Montreal, Quebec H3G 1Y7
c/o Scott Kruse
Weston Consulting

Re: Preliminary Hydrogeological Assessment – 69 and 117 John Street, Mississauga, Ontario
Project #: 2209001

Palmer is pleased to submit the attached report presenting the results of our preliminary hydrogeological assessment for the proposed development located at 69 and 117 John Street, Mississauga, Ontario. The preliminary hydrogeological assessment covers all the items provided in the proposal with adjustment based on site constraints, and includes the following three major components:

- Site hydrogeological characterization;
- Construction and long-term dewatering assessment; and
- Hydrogeological impact assessment.

Palmer conducted the required assessments and analysis completed in general accordance with the Water Taking User Guide for Environmental Activity and Sector Registry (EASR) and the Permit To Take Water (PTTW) Manual (2005) published by MECP as well as practices generally accepted in Ontario, and concluded that:

- The site is underlain by a multi aquifer-aquitard system comprising of a highly permeable fill/ sand fill aquifer, a low permeability till aquitard and a moderate permeability bedrock aquifer.
- Excavations below the groundwater table, which was measured as shallow as approximately 2.67 m below grade, will require significant dewatering to maintain a dry excavation for the building foundations and underground parking structure.
- If the shoring system allows groundwater to flow freely into foundation pit (i.e., non-watertight), the proposed development is expected to require temporary dewatering of up to a maximum of 1,844,100 L/day to maintain safe working conditions and stable cutting slopes. A typical daily rate under steady state conditions is estimated to be 1,018,285 L/day. As the maximum estimated dewatering rate is over 400,000 L/day, a Category 3 PTTW application with the MECP is required;
- If a rigid watertight shoring system is used and installed sufficiently into the competent bedrock, the proposed development is estimated to still require temporary dewatering of approximately 316,672 L/day to unwater the volume of water within the excavation. As this dewatering rate is less than 400,000 L/day it may be completed under an EASR registration with the MECP. It would also only be needed for approximately 60 days or until the volume of porewater is removed
- An additional 458,025 L/day of water should be accounted for in dewatering planning assuming direct precipitation from a 25 mm storm event.

- No impacts to groundwater quantity to neighboring groundwater users, the municipal water supply system, natural heritage system or storm sewers are not anticipated from the proposed development, if mitigation measures are implemented as recommended; and
- No impacts to groundwater quality are expected should appropriate mitigation measures and best management practices are implemented as recommended.

We trust that this report is completed within our terms of reference and suitable for your present requirements. If you have any questions or require further information, please do not hesitate to contact our office. This report is subject to the Statement of Limitations found at the end of the report.

Yours truly,
Palmer

_____DRAFT_____
Jason Cole, M.Sc., P.Geo.
VP, Principal Hydrogeologist

Table of Contents

List of Figures

List of Tables

List of Appendices

1. Introduction

Palmer was retained by Centracondos de la Montagne 1000 de la Montagne (13545130 Canada Inc.) (the "client") to complete a Preliminary Hydrogeological Assessment for the proposed development located at 69 and 117 John Street, Mississauga, ON L5A 1Y5 (the "site" or "property") (**Figure 1**). We understand that the client plans to submit Official Plan Amendment (OPA) and Zoning By-Law Amendment (ZBA) applications with the City of Mississauga for a proposed high density residential development. The site is approximately 1.6 ha in area and is located at the northeast quadrant of Hurontario Street and John Street, bordered to the north by the Canadian Pacific Railway (CPR). The site currently is vacant and was a former sand pit that has been backfilled.

The purpose of the preliminary hydrogeological assessment is to delineate site conditions and assess construction dewatering requirement, and based on which to assess the impacts of construction dewatering to natural environment, municipal water supply system and municipal sewer system.

It should be noted that the preliminary hydrogeological assessment was conducted in tandem with preliminary geotechnical investigation and environmental site assessment (ESA) all undertaken by Palmer.

1.1 Proposed Development

Based on design drawings and information provided by the client (provided in **Appendix A**), the proposed development includes the following features:

- Three (3) tower buildings of 33, 23 and 16 stories;
- A six (6) story podium that connects each tower;
- Three (3) levels of underground parking to a depth of 11 m below grade;
- An earth berm along the south flank of CPR alignment;
- Pavement and landscaping features;
- Underground utilities including storm sewer, sanitary sewer and water supply; and
- Shallow utilities including gas lines, hydro service and telecommunication lines.

1.2 Scope of Work

Based on the understanding of the proposed development, the preliminary knowledge of the site conditions as well as regulatory requirements of agencies, the scope of work for this hydrogeological assessment is proposed to include the following components:

- Characterizing regional physical and environmental settings through records review and Source Water Protection policies and background mapping;
- Characterizing site subsurface condition through drilling, hydraulic test and groundwater sampling, and data analysis and interpretation;
- Preliminary construction dewatering assessment;
- Permanent or long-term dewatering assessment;
- Impact assessment; and

- Completion of a Hydrogeological Report and effects assessment to provide design and permitting recommendations.

This study was completed in general accordance with the Water Taking User Guide for Environmental Activity and Sector Registry (EASR) and the Permit To Take Water (PTTW) Manual (2005) published by MECP as well as practices generally accepted in Ontario.

2. Methodology

The methodology employed to complete the hydrogeological assessment included records reviews, site reconnaissance, borehole drilling and monitoring well installation, groundwater monitoring, hydraulic tests, and groundwater sampling, and are described below.

2.1 Background Study and Record Review

Detailed background and record review was conducted for the area surrounding the site to delineate the regional setting of the site, including physical setting and environmental setting. The regional setting will help delineate site conditions, help with data interpretation, and help with impact assessment. The sources of records reviewed are listed in the References Section.

The sources of data and records reviewed included, but not limited to, Ontario Geological Survey database (physiography, geology and boreholes), MECP database (well record, natural heritage, hydrology, source protection and environmental instruments), data from Conservation Authorities (watershed plan, subwatershed studies, source protection plan, stormwater criteria and LID), and data from the municipalities (official plan, zoning plan, permit application, well head protection policies and sewer use bylaw).

Four (4) previous study reports had been identified for the property, including:

1. Phase I Environmental Site Assessment, by Chung and Vander Doelen Engineering LTD (2019);
2. Phase II Environmental Site Assessment, by Chung and Vander Doelen Engineering LTD (2019);
3. Supplemental Soil and Groundwater Testing by Peritus Environmental Consultants INC. in 2022; and
4. Soil Investigation by Soil-Eng Limited in 1988.

The following will present the parts from these studies that will contribute to the site characterization and data analysis for present study.

The Phase II ESA completed by Chung and Vander Doelen Engineering LTD (2019) was based on 12 boreholes (with four (4) monitoring wells) which were executed following general geotechnical protocols despite that they were drilled for the ESA. The borehole logs and well logs provided factual data that can be used for helping with characterizing site conditions. The four (4) monitoring wells were inspected during site reconnaissance and were found in good condition. These wells will be enlisted for the present study.

The study by Soil-Eng Ltd (1988) was based on five (5) boreholes with depths of 7 m, without monitoring wells installed. Considering the age of the study and the limited depth of boreholes, the value of this study is limited.

2.2 Borehole Drilling, Monitoring Well Installation and Existing Monitoring Wells

As mentioned above, Palmer's preliminary hydrogeological assessment was conducted in tandem with Palmer's preliminary geotechnical investigations and a Phase Two ESA. A total of sixteen (16) boreholes (BH22-1 to BH22-16) were drilled from November 3 to November 11, 2022. Borehole drilling was executed by specialized driller subcontractors supervised by Palmer staff. In general, the borehole drilling and soil sampling followed the guidelines of Professional Engineers of Ontario (PEO), ASTM D1586 as well as O.Reg. 153/04. Eight (8) boreholes were installed with monitoring wells following O.Reg. 903. The details of these monitoring wells are shown in **Table 1**, and well logs and borehole logs are attached as **Appendix B**.

The four (4) historical monitoring wells (BH1, 5, 9, 12) installed by Chung and Vander Doelen Engineering LTD. (2019) were identified at the site and are enlisted for the present study. Their details are shown in **Table 1**, and the well logs are attached as **Appendix B**.

Table 1. Monitoring Well Summary

Borehole ID	Surface Elevation (masl)	Stick-up (m)	Depth (mbgs)	Screened Interval (mbgs)	Screened Unit	Slug Test	Groundwater Quality Sampling
BH22-1	119.1	0.91	4.54	1.5-4.5	Sand fill and sand	Yes	-
BH22-2	119.0	1.0	4.51	1.5-4.5	Sand fill and silt till	Yes	-
BH22-3	119.7	1.0	4.56	1.5-4.5	Sand fill	-	-
BH22-7	118.7	1.08	5.93	2.9-5.9	Sand fill and silt till	Yes	-
BH22-8	117.9	1.17	4.45	1.5-4.5	-	Yes	-
BH22-9	119.4	1.07	5.86	2.9-5.9	Sand fill and silt till	Yes	-
BH22-11	117.7	1.02	12.25	9.2-12.2	Shale	Yes	Yes
BH22-16	119.2	0.86	20.55	16.8-18.3	Shale	Yes	-
BH1	119.6	0.96	13.64	6.1-10.5	Shale	Yes	-
BH5	118.8	1.0	13.58	7.5-10.5	Shale	Yes	-
BH9	117.6	1.01	10.68	7.6-10.6	Shale	Yes	-
BH12	119.5	0.68	5.4	2.4-5.4	Fine sand	Yes	-

2.3 Soil Classification

Soil samples were brought back to Palmer soil lab for detailed classification and analysis. Soil classification was conducted following the guidelines of ASTM D2487 and geological principles. The results are presented on the borehole logs in **Appendix B**. Grain size analysis was commissioned to Terrapex and was conducted for four (4) representative samples (BH22-4/SS6, BH22-12/SS7, BH22-13/SS5 and BH22-16/SS6) following the MTO standards and ASTM standards (LS-702, ASTM D421, ASTM D422). The

purposes of the grain size analysis were to gauge the soil classification and to estimate hydraulic conductivity (K-value) for the stratigraphy units that could not be covered by the slug tests. The grain size analysis results and K-value estimation results are attached as **Appendix C**.

2.4 In-Situ Hydraulic Test

Single well response tests (SWRT or slug test) were conducted on November 23,26, 2022 and January 5, 2023 in 11 monitoring wells to estimate hydraulic conductivity (K-value) of the screened interval. The slug test was executed in general accordance with ASTM D4044 (Standard Test Method for Field Procedure for Instantaneous Change in Head (Slug) Tests for Determining Hydraulic Properties of Aquifers) and the generally accepted practices in Ontario. All wells were developed by removing at least 3 well casing volumes of water from the well prior to completing hydraulic testing or sampling.

Based on site conditions, the methods of falling head and rising head with a solid 1 m long slug and falling head with water injection was used. The results of the slug tests are attached as **Appendix D**.

2.5 Groundwater Sampling

Groundwater sampling was conducted on November 18, 2022 in general accordance with provincial practices and Palmer's standard operating procedure (SOP). Chemical analysis was conducted by ALS Environmental Laboratory, which has been accredited Canadian Association for Laboratory Accreditation (CALA). The groundwater sampling involved taking one (1) sample from the BH22-11, and the sample was tested against the parameters of Limits for Sanitary Sewer Discharge and Limits for Storm Sewer Discharge in By-law 53-2010 of Peel Region. The test results are attached as **Appendix E**.

2.6 Groundwater Level Monitoring

Groundwater level monitoring was conducted through manual measurement of groundwater levels to delineate water level trends and fluctuation magnitude. As required by the hydrogeological assessment, Palmer completed more than four (4) rounds of site visits for groundwater level monitoring. Together with each round of groundwater level monitoring, maintenance for monitoring wells had been carried out. Depending upon the results, additional groundwater level monitoring may be required in the spring to confirm high groundwater level conditions.

2.7 WWIS Well Record and PGMN Well Inventory

Well records within 500 m from the site boundary were queried from the database of the Water Well Information System (WWIS) of MECP for fields of well ID, completion date, well depth, static groundwater levels, aquifer type (bedrock or overburden well) and water use. Total 62 wells were identified. The results of well survey were attached as **Appendix F** and **Table 2** lists the summary of well records. Most wells are monitoring wells installed after the year of 2000. Only two domestic wells and one industrial well that have potential to supply water were identified, and they were installed before 1968. No Provincial Groundwater Monitoring Network (PGMN) was identified within 10 km from the site.

Given the urban nature of this site, no active potable groundwater wells are expected within 500 m of the site.

Table 2. Summary of MECP Water Well Records

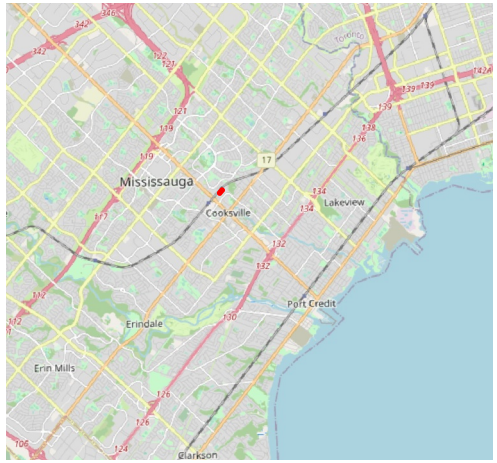
Classification		Record Number
Water Use	Domestic/livestock	2
	Commercial	-
	Industrial	1
	Municipal	-
	Monitoring	-
	Monitoring and Test Hole	43
	Irrigation	-
	Decommissioned	-
	Unknow/Not used	23
Water Quality	Fresh	-
	Salty	-
	Untested	-
	Unknown	-
Aquifer	Overburden	17
	Bedrock	26
	Unknown	19

LEGEND

Site Boundary

Monitoring Wells and Boreholes

- Borehole
- Monitoring Well



CLIENT
CentraCondos 1000 Rue de La Montagne

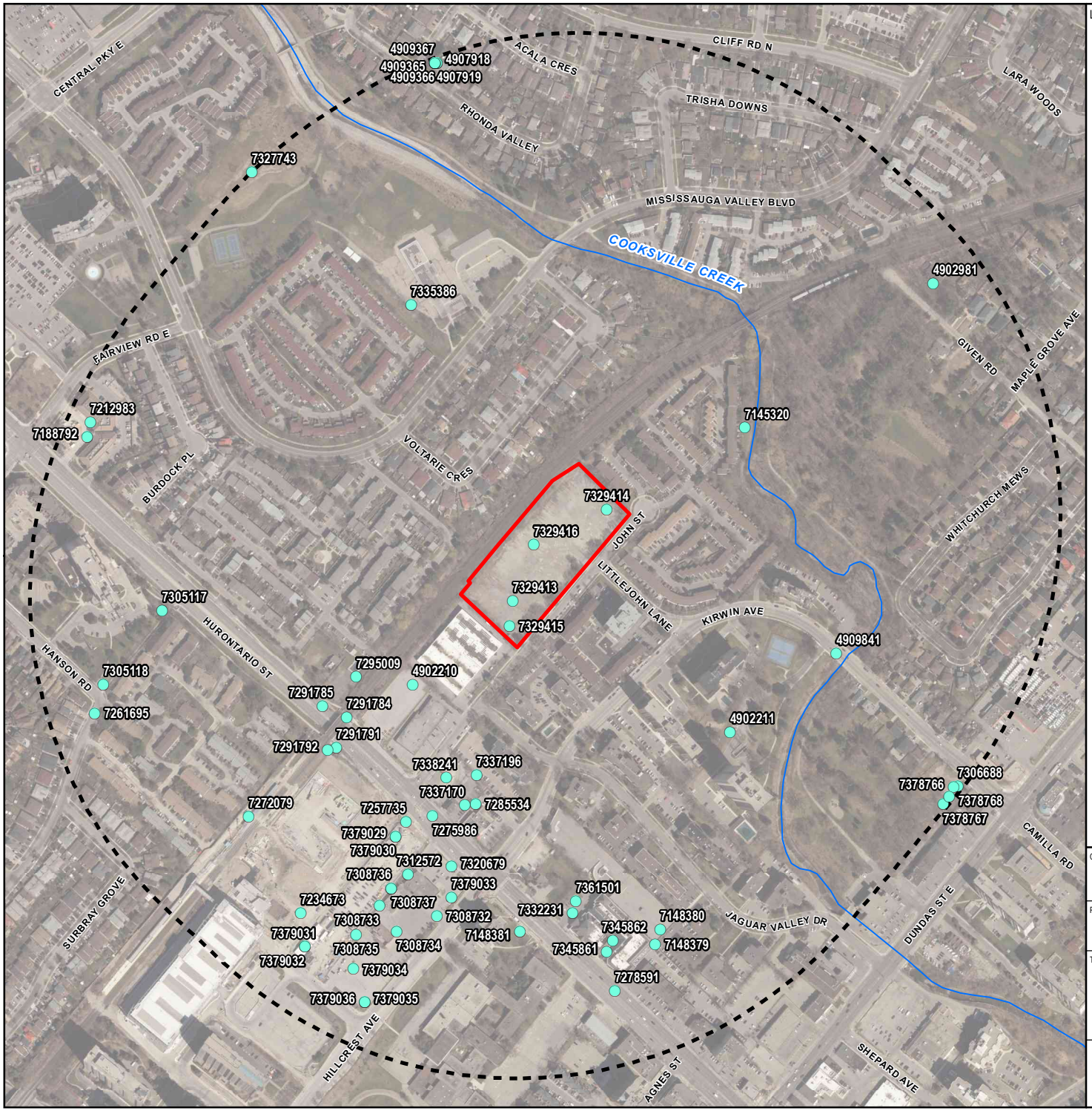
PROJECT
69 and 117 John Street, Mississauga

TITLE
Site Investigation Plan

Palmer™

REF. NO: 2209001

Figure 1



LEGEND

- Subject Site
- 500m Site Buffer
- Watercourse[1]
- Well Record within 500m[2]

1. LIO/MNRF
2. MECP

0 25 50 100 150 200
METRE SCALE

North American Datum 1983
Universal Transverse Mercator Projection Zone 17

Scale: 1:6,500
Page Size: Letter (8.5 x 11 inches)

Drawn: CV
Checked: FL
Date: Dec 11, 2022

NORTH

Source Notes:
Imagery (2020) provided by Peel Region map service.
Contains information licensed under the Open Government Licence – Ontario.

CLIENT
13545130 Canada Inc

PROJECT
69 & 117 John Street, Mississauga

TITLE
MECP Well Records within 500m of Site

Palmer™

REF. NO. 2209001-5-1

Figure 2

Document Path: G:\Shared drives\Projects 2022\22090 - 13545130 Canada Inc\2209001 - Canada Inc - 69 & 117 John St\GIS\1_Workspace\Task 2 - HydroG Figures\2209001-5-1-MECP Well Records.mxd

3. Regional Setting

Regional setting is referred to as regional conditions in physiography, geology and groundwater resources surrounding the site, which will help delineate the site conditions and interpret data and information collected about the site, as well as help with dewatering assessment, and impact assessment.

The physical setting was delineated through record review. Record review covered all publicly available sources of information and data, including provincial agencies, federal agencies, conservation authorities and local municipalities.

3.1 Physiography, Hydrology and Climate

The site sits on the south edge of a till plain unit (Chapman & Putnam, 1984 and OGS), which borders the Iroquois Lake beaches to the south (**Figure 3**). The site is located in Cooksville Creek watershed (or Subwatershed 22) under the jurisdiction of Credit Valley Conservation Authority. It should be noted that Cooksville Creek is not a tributary to Credit River, and discharges into Lake Ontario directly. The site is about 160 m away from Cooksville Creek. The site is also located in Oak Ridges Moraine Groundwater Program (ORMGP) area.

The site is in a continental climate region with a warm, humid summer and a cold winter as well as wet spring, dry summer and moderate rainfall in autumn. The region is generally affected by warm, moist air masses from the south and cold, dry air masses from the north and experiences a wide range of weather conditions through the course of an average year. The following table lists the average and daily values of major climate parameters collected at the closest climate station (Toronto Lester B. Pearson International Airport) for the period between1981 and 2010 (**Table 3**).

Table 3. Monthly Averaged Climate Data (1981 – 2010)

Monthly Averaged Value	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Daily Air T (°C)	-5.5	-4.5	0.1	7.1	13.1	18.6	21.5	20.6	16.2	9.5	3.7	-2.2
Rainfall (mm)	25.1	24.3	32.6	63	74.3	71.5	75.7	78.1	74.5	60.6	68	34
Snowfall (cm)	29.5	24	17.7	4.5	0	0	0	0	0	0.4	7.5	24.9
Precipitation (mm)	51.8	47.7	49.8	68.5	74.3	71.5	75.7	78.1	74.5	61.1	75.1	57.9
Extreme Daily Value	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Extreme Daily Rainfall (mm)	58.7	31.8	41.7	55.8	92.7	53.8	118.5	80.8	108	121.4	86.1	40.9
Extreme Daily Snowfall (cm)	36.8	39.9	32.3	26.7	2.3	0	0	0	0	7.4	33.5	28.2

3.2 Geology and Hydrogeology

Surficial geology surrounding the site was mapped by Ontario Geological Survey (OGS) as coarse-textured glaciolacustrine deposits of sand, gravel, minor silt and clay deposited in a littoral environment associated

with ancient glacial lake, Lake Iroquois (**Figure 4**). Coarse-textured glaciolacustrine deposits constitute local significant aquifer. The site is also known to be a former sand pit that has been in-filled.

Bedrock underlays the overburden and was mapped as Georgian Bay Formation of Late Ordovician (O3) age and consists of shale, limestone, dolostone, siltstone (**Figure 5**). Georgian Bay Formation serves as regional aquitard in the area based on regional hydrogeology of Ontario.

3.3 Groundwater Resources

Groundwater resources are delineated through groundwater levels, groundwater quality, and hydrostratigraphy or aquifer system. Five major sources of information about regional groundwater resources include ORMGP, municipal supply wells, WWIS and PGMN as introduced above.

Based on ORMGP mapping, there are no significant overburden or bedrock aquifers under the site and surrounding area. The contact aquifer, which is composed of weathered bedrock and lag gravel, may exist locally depending on elevations and thickness of the contact zone.

The water supply for the residential area surrounding the site was provided by South Peel Drinking Water System owned and operated by Peel Region, which is a lake-based water supply system including two water treatment plant (WTP) (Arthur P. Kennedy WTP and Lorne Park WTP).

3.4 Natural Heritage

Based on the provincial natural heritage mapping, the major natural heritage feature identified near the site is Cooksville Creek, located approximately 160 m to the east of the property boundary. No wetlands or other natural features were identified.

4. Source Water Protection

The site is located within the Credit Valley Source Protection Area under the Source Protection Plan of CTC Source Protection Region. The Source Protection Plan designated the following 10 types of vulnerable areas:

- Wellhead Protection Area-Quality
- Wellhead Protection Area E-(GUDI)
- Intake Protection Zone-Quality
- Intake Protection Zone-Quantity
- Issue Contributing Area
- Significant Groundwater Recharge Area
- Highly Vulnerable Aquifer
- Event Based Area
- Wellhead Protection Area Q1-Quantity
- Wellhead Protection Area Q2-Quantity

Based on the provincial source protection mapping and the above source protection plan (**Figure 6**), the east corner of the site is above a Highly Vulnerable Aquifer (HVA) with score of 6.0. An Intake Protection Zone (IPZ-2 with score of 2.5) is located about 400 m to the south of the site. Therefore, based on Source Water Protection policies, there are no restrictions to site development but steps should be taken to maintain groundwater quality to provincial requirements.

LEGEND

- Subject Site
- Watercourse[1]

Physiographic Region[2]

- 32: South Slope
- 41: Iroquois Plain

1. LIO/MNRF
2. Chapman, L.J. and Putnam, D.F. 2007. Physiography of southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 228.

0 0.5 1 2
KM

North American Datum 1983
Universal Transverse Mercator Projection Zone 17

Scale: 1:60,000
Page Size: Letter (8.5 x 11 inches)

Drawn: CV
Checked: FL
Date: Dec 11, 2022

NORTH

Source Notes:
Imagery provided by Esri basemap service.
Contains information licensed under the Open Government Licence – Ontario.

CLIENT
13545130 Canada Inc

PROJECT
69 & 117 John Street, Mississauga

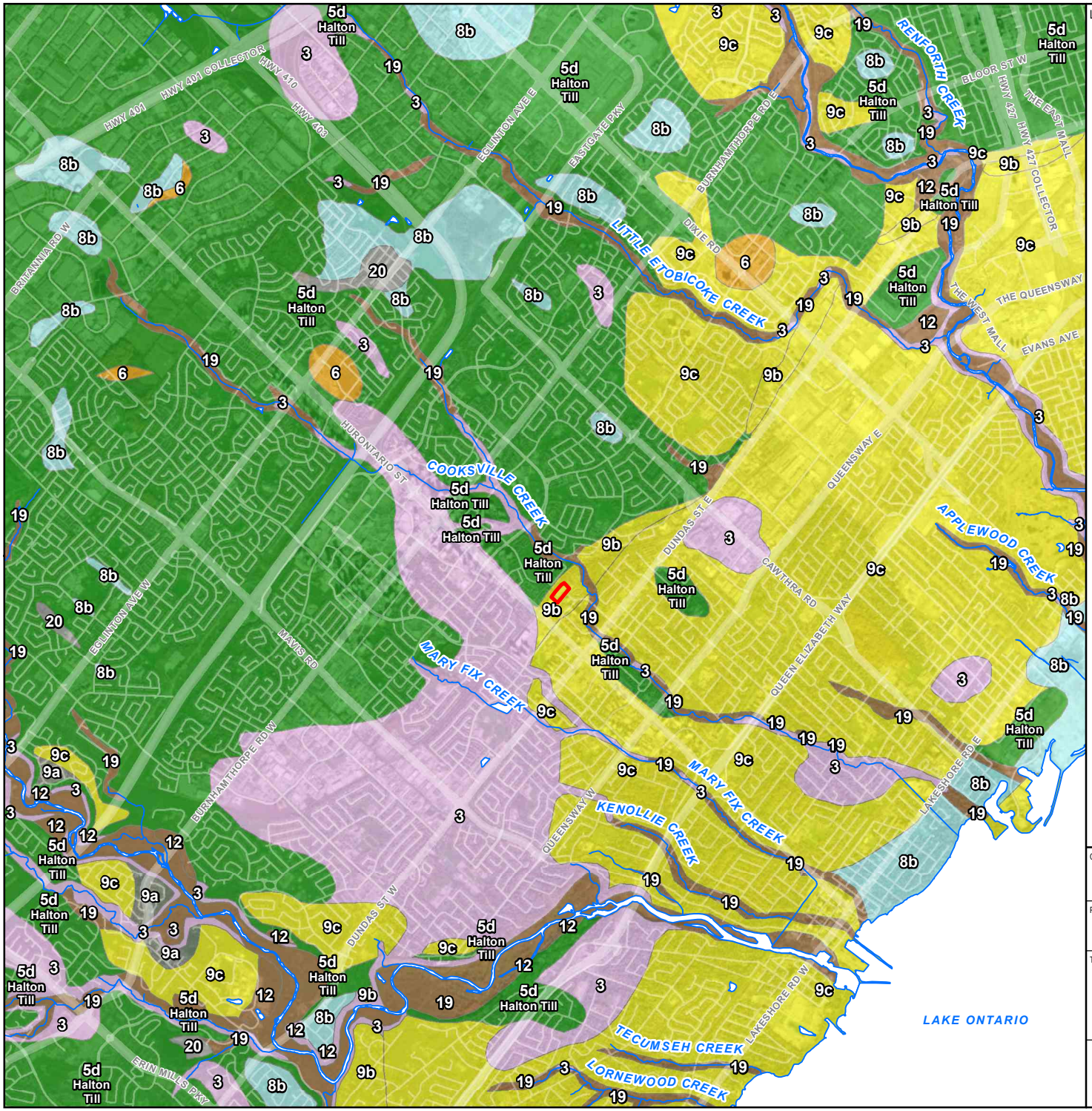
TITLE
Physiography

Palmer™

REF. NO. 2209001-1-1

Figure 3

Document Path: G:\Shared drives\Projects 2022\22090 - 13545130 Canada Inc\2209001 - Canada Inc - 69 & 117 John St\GIS\1_Workspace\Task 2 - HydroG Figures\2209001-1-1-Physiography.mxd



LEGEND

Subject Site

Watercourse[1]

Surficial Geology[2]

Phanerozoic / Cenozoic / Quaternary / Recent

20: Organic deposits *(peat, muck, marl)*

19: Modern alluvial deposits *(clay, silt, sand, gravel, may contain organic remains)*

Phanerozoic / Cenozoic / Quaternary / Pleistocene

12: Older alluvial deposits *(clay, silt, sand, gravel, may contain organic remains)*

9b: Coarse-textured glaciolacustrine deposits *(Littoral deposits)*

9c: Coarse-textured glaciolacustrine deposits *(Foreshore and basinal deposits)*

8b: Fine-textured glaciolacustrine deposits *(Interbedded silt and clay and gritty, pebbly flow till and rainout deposits)*

6: Ice-contact stratified deposits *(sand and gravel, minor silt, clay and till)*

5d: TillI *(Clay to silt-textured till [derived from glaciolacustrine deposits or shale])*

Phanerozoic / Paleozoic

3: Paleozoic bedrock

1. LIO/MNRF
2. Ontario Geological Survey 2010 (Mapped at 1:50,000). Surficial geology of southern Ontario; Ontario Geological Survey. Miscellaneous Release- Data

0 0.5 1 2
KM

North American Datum 1983
Universal Transverse Mercator Projection Zone 17

Scale: 1:60,000
Page Size: Letter (8.5 x 11 inches)

Drawn: CV
Checked: FL
Date: Dec 11, 2022

NORTH

Source Notes:
Imagery provided by Esri basemap service.
Contains information licensed under the Open Government Licence – Ontario.

CLIENT
13545130 Canada Inc

PROJECT
69 & 117 John Street, Mississauga

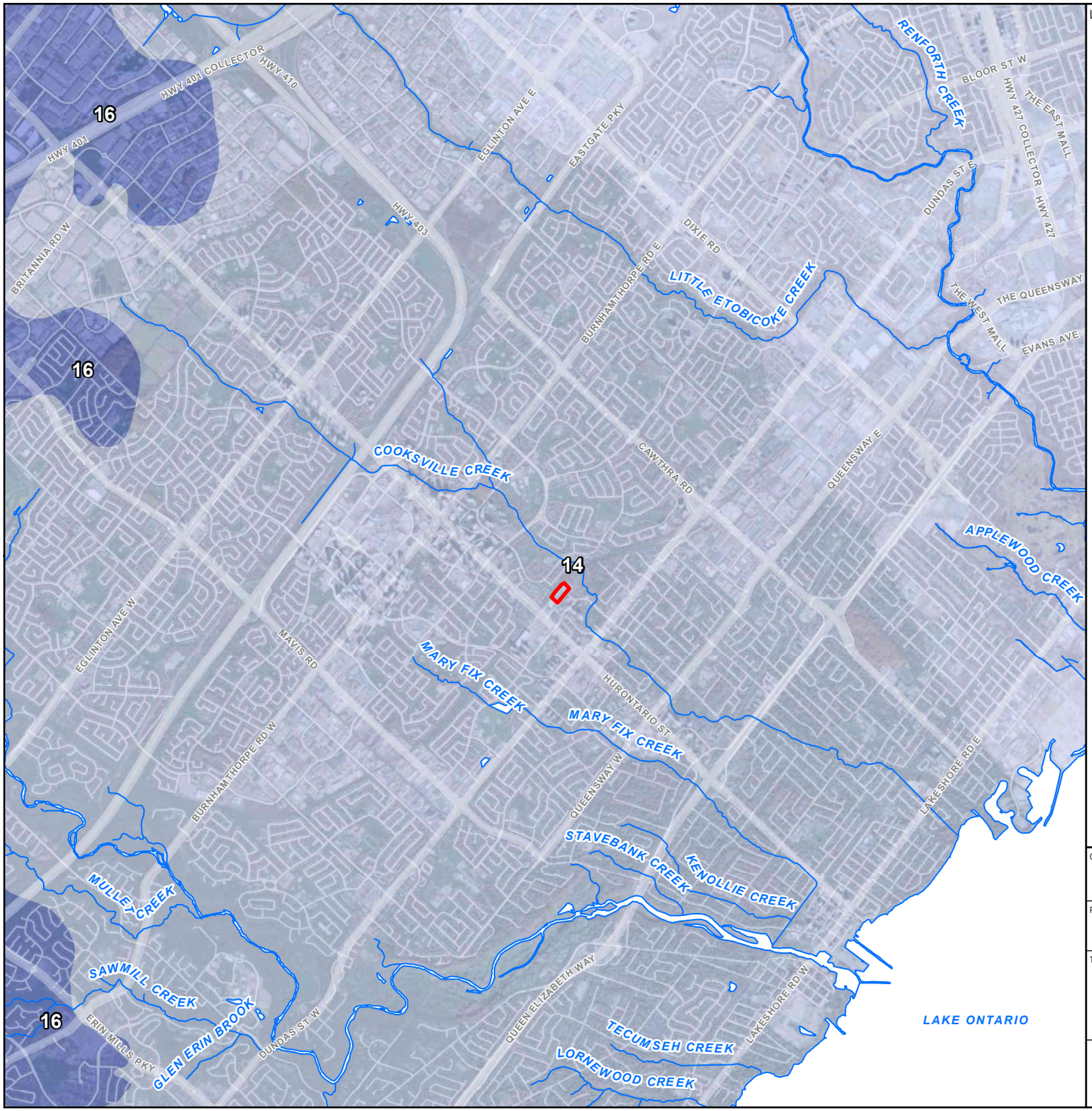
TITLE
Surficial Geology

Palmer

REF. NO. 2209001-2-1

Figure 4

Document Path: G:\Shared drives\Projects 2022\22090 - 13545130 Canada Inc\2209001 - Canada Inc - 69 & 117 John St\GIS\1_Workspace\Task 2 - HydroG Figures\2209001-2-1-Surficial Geology.mxd



LEGEND

- Subject Site
- Watercourse[1]

Paleozoic Bedrock Geology[2]

Upper Ordovician

- 16: Queenston *(shale, siltstone, minor limestone and sandstone)*
- 14: Georgian Bay *(shale and limestone)*

1. LIO/MNRF
2. Armstrong, D.K. and Dodge, J.E.P. Paleozoic Geology Map of Southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 219

0 0.5 1 2
KM

North American Datum 1983
Universal Transverse Mercator Projection Zone 17

Scale: 1:60,000
Page Size: Letter (8.5 x 11 inches)

Drawn: CV
Checked: FL
Date: Dec 11, 2022

NORTH

Source Notes:
Imagery provided by Esri basemap service.

CLIENT
13545130 Canada Inc

PROJECT
69 & 117 John Street, Mississauga

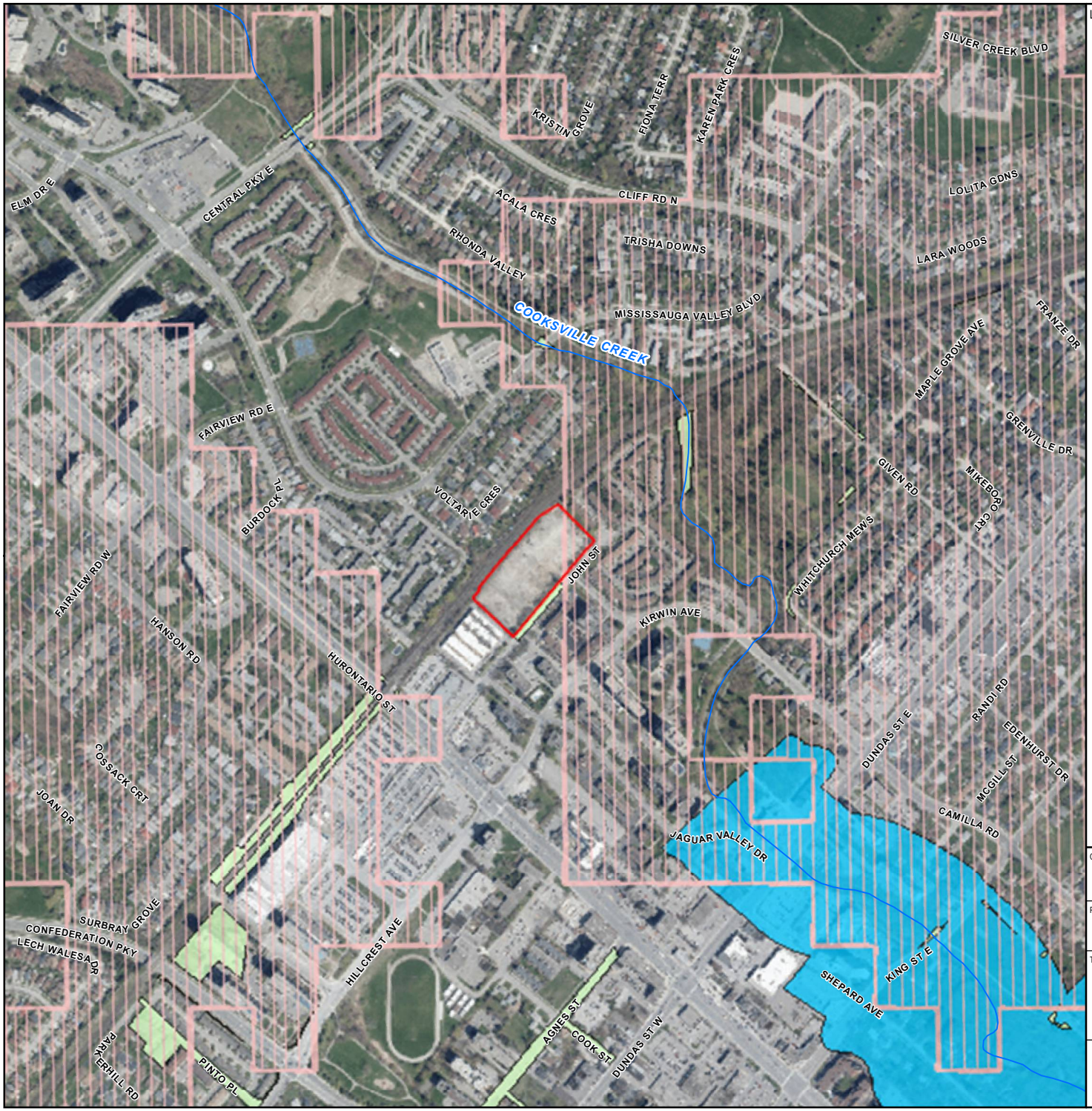
TITLE
Bedrock Geology

Palmer

REF. NO. 2209001-3-1

Figure 5

Document Path: G:\Shared drives\Projects 2022\22090 - 13545130 Canada Inc\2209001 - Canada Inc - 69 & 117 John St\GIS\1_Workspace\Task 2 - HydroG Figures\2209001-3-1-Bedrock Geology.mxd



LEGEND

Subject Site

Watercourse[1]

Source Water Protection[2]

Intake Protection Zone 2

Highly Vulnerable Aquifer

Significant Groundwater Recharge Area

Score 0

1. LIO/MNRF
2. *Source Protection Information Atlas*, MECP © King's Printer for Ontario 2022

0 25 50 100 150 200
METRE SCALE

North American Datum 1983
Universal Transverse Mercator Projection Zone 17

Scale: 1:9,000
Page Size: Letter (8.5 x 11 inches)

Drawn: CV
Checked: FL
Date: Dec 11, 2022

NORTH

Source Notes:
Imagery (2020) provided by Peel Region map service.
Contains information licensed under the Open Government Licence – Ontario.

CLIENT
13545130 Canada Inc

PROJECT
69 & 117 John Street, Mississauga

TITLE
Source Water Protection

Palmer™

REF. NO. 2209001-4-1

Figure 6

Document Path: G:\Shared drives\Projects 2022\22090 - 13545130 Canada Inc\2209001 - Canada Inc - 69 & 117 John St\GIS\1_Workspace\Task 2 - HydroG Figures\2209001-4-1-Source Water Protection.mxd

5. Site Geological and Hydrogeological Conditions

The site is a vacant former sand pit, and grown with sparse vegetation. The total area of the site is about 1.5 hectares (Ha). The ground surface undulates gently sloping from west to east with elevations ranging from approximately 120 to 118 meters above sea level (masl). Surface water drains to the east corner through overland sheet flow.

Subsurface conditions of the site have been delineated based on the information and data acquired through borehole drilling, groundwater monitoring, hydraulic testing, groundwater sampling and grain size analysis.

5.1 Stratigraphy

Site stratigraphy not only serves as medium to support proposed structures but also act as porous medium to store and transmit groundwater. Based on the information from the borehole logs (**Appendix B**) and topography, the site is divided into two parts in stratigraphy, west part and east part, and each part has its own stratigraphic characteristics. The stratigraphy of each part of the site is summarized in **Table 4**, which includes data from Palmer's Geotechnical Investigation (Palmer, 2022) for reference.

Table 4. Summary of Stratigraphy

Unit No	Unit Name	Lithology	Top Elev (masl)	Bottom Elev (masl)	Natural Water Content	N-Value
West Part (BH22-2, BH22-3, BH22-5, BH22-7, BH22-9, BH22-10, BH22-12, BH22-14, BH1, BH5, BH12)						
1	Fill	Gravelly sand, trace to some silt, brown to dark brown.	119.6-118.8	117.5-115.6	Damp to moist	5-29
2	Sand fill to sand	Fine sand, trace to some gravel and silt. Clayey silt lens to the east. Brown to grey.	117.5-115.6	114.7-113.2	Damp to saturated (wet)	5-29
3	Till	Clayey silt till to shaly till, grey.	114.7-113.2	112.3-113.7	Moist to wet	17-74
4	Bedrock	Grey shale, occasionally limestone seams	112.6-112.7	105.7-105.2		
East Part (BH22-1, BH22-4, BH22-6, BH9)						
1	Fill	Sand, gravel, some silt, dark brown to grey	119.1-117.4	115.2-113.9	Moist	21-22
2	Till	Clayey silt till to shaly till, grey.	115.2-113.9	110.3	Moist to wet	13-77
3	Bedrock	Grey shale, occasionally limestone seams	110.3	102.2		

As shown in **Table 3**, the difference in stratigraphy between the west part and east part of the site is the sandfill to sand unit, which covers about two thirds of the site extending from west to east and gradually thinning out in the eastern part of the site. The west part accounts for about 85% of the site.

5.2 Groundwater Levels, Flow Direction and Gradients

Twelve monitoring wells (as shown on **Figure 1**) were installed at the site as part of previous and current site investigations. Groundwater conditions in the open boreholes were observed during and upon completion of drilling. Moisture condition of soil was tracked in order to predict and delineate groundwater condition. The details of observation for groundwater conditions can be found in borehole logs in **Appendix B**.

Four (4) rounds of manual groundwater level measurement will ultimately be conducted for the eight monitoring wells installed by Palmer and the four monitoring wells enlisted. The representative manual measurement results of the first two (2) monitoring rounds completed to date are summarized in **Table 5**.

Table 5. Groundwater Levels

Well ID	Surface Elevation (masl)	Depth (mbgs)	Water Level (m)			
			Nov 18, 22		Dec 22, 22	
			mbgs	masl	mbgs	masl
BH22-1	119.1	4.54	3.35	115.75	3.21	115.89
BH22-2	119.0	4.51	3.01	115.99	3.05	115.95
BH22-3	119.7	4.56	4.28	115.42	4.30	115.40
BH22-7	118.7	5.93	3.84	114.86	3.83	115.27
BH22-8	117.9	4.45	2.77	115.13	2.67	115.23
BH22-9	119.4	5.86	4.09	115.31	4.10	115.30
BH22-11	117.7	12.25	2.92	114.78	3.00	114.70
BH22-16	119.2	20.55	5.32	113.88	6.21	112.99
BH1	119.6	13.64	4.70	114.90	4.93	114.67
BH5	118.8	13.58	3.62	115.18	3.59	115.21
BH9	117.6	10.68	3.13	114.47	3.12	114.48
BH12	119.5	5.40	3.79	115.71	4.07	115.43

Based on the elevation of groundwater levels, the groundwater table contours and flow direction were delineated and shown in **Figure 7**. The horizontal groundwater gradient is about 2.4% and the flow direction is from northwest to southeast, to Cooksville Creek.

It should be noted that no significant vertical gradient was anticipated in overburden in the area surrounding the site based on regional conditions and the well hydraulics for at the site, and therefore, the groundwater table elevation should not be significantly different from the groundwater levels measured from other depths, and the aquifer-aquitard system of the overburden should be treated as an unconfined system. Bedrock is separated from the upper porous fill sand by a till layer, and therefore, the bedrock should be treated as confined system.

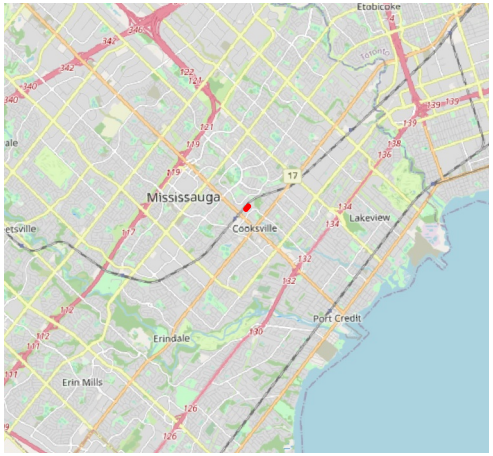
Additional groundwater level monitoring is planned for spring 2023 between the months of March to May.

LEGEND

- Site Boundary
- Groundwater Level Contours
- Groundwater Flow Direction

Monitoring Wells and Boreholes

- Borehole
- Monitoring Well



CLIENT
CentraCondos 1000 Rue de La Montagne

PROJECT
69 and 117 John Street, Mississauga

TITLE
Groundwater Level Contours and Flow Direction

Palmer

REF. NO: 2209001

Figure 7

5.3 Hydraulic Conductivity

Hydraulic conductivity (K-value) of saturated zones were estimated through single well response tests (SWRTs) or slug tests, which has been introduced above. The results of the slug tests are summarized by hydrostratigraphic unit (*sand and fill, and bedrock*) in **Table 6**.

Table 6. Hydraulic Conductivity Summary

Borehole ID	Surface Elevation (masl)	Depth (mbgs)	Screened Interval (mbgs)	Screened Unit	Method	K-value (m/s)	Geometric Mean K (m/s)	90th Percentile K (m/s)
BH22-1	119.1	4.54	1.5-4.5	Sand fill and sand	Falling head	$2.4x10^{-4}$	$1.0x10^{-4}$	$2.4x10^{-4}$
BH22-2	119.0	4.51	1.5-4.5	Sand fill and silt till	Falling head	$2.3x10^{-4}$		
					Falling head	$2.0x10^{-4}$		
					Rising head	$1.1x10^{-4}$		
					Rising head	$7.2x10^{-5}$		
BH22-3	119.7	4.56	1.5-4.5	Sand fill	Falling head	-		
BH22-7	118.7	5.93	3.0-6.0	Sand fill and silt till	Falling head	$1.1x10^{-4}$		
BH22-8	117.9	4.45	1.5-4.5	-	Falling head	$5.6x10^{-6}$		
BH22-9	119.4	5.86	3.0-6.0	Sand fill and silt till	Falling head	$2.5x10^{-4}$		
					Rising head	$1.9x10^{-4}$		
BH12	119.5	5.40	2.4-5.4	Fine sand	Falling head	$1.1x10^{-4}$		
					Rising Head	$6.6x10^{-5}$		
BH22-11	117.7	12.25	9.2-12.2	Shale	Falling head	$2.7x10^{-7}$	$9.6x10^{-7}$	$6.2x10^{-6}$
BH22-16	119.2	20.55	16.8-18.3	Shale	Falling head	$3.7x10^{-8}$		
BH1	119.6	13.64	6.1-10.5	Shale	Falling head	$6.7x10^{-6}$		
BH5	118.8	13.58	7.5-10.5	Shale	Falling head	$5.6x10^{-6}$		
BH9	117.6	10.68	7.6-10.6	Shale	Falling head	$2.2x10^{-6}$		

The K-values was also estimated with grain size analysis results. Four soil samples for grain size analysis were taken from four boreholes which represents shallow to middle saturated conditions (Table 7). The results of grain size analysis were used to get K-values through the following empirical equation.

$$K\ (Sauerbrei, 1932) = \frac{\rho g}{\mu}[(3.75 \times 10^{-5}) \times \tau]\left[\frac{n^3}{(1-n)^2}\right] d_{17}^2\ \frac{cm}{s}$$

Where K = hydraulic conductivity (cm/s)
ρ = $3.1x10^{-8}T^3 - 7.0x10^{-6}T^2 + 4.19x10^{-5}T + 0.99985$
g = 980 cms^{-2}
μ = $-7.0x10^{-8}T^3 + 1.002x10^{-5}T^2 – 5.7x10^{-4}T + 0.0178$
τ = $1.093x10^{-4}T^2 + 2.102x10^{-2}T + 0.5889$
n = porosity as a fraction of aquifer volume
T = water temperature (°C)

Table 7. Hydraulic Conductivity by Grain Size Analysis

Borehole ID	Sample No	Depth Range (mbgs)	Sampled Unit	K-value (m/s)
BH22-3	SS6	3.8-4.6	Sand fill	$1.8x10^{-9}$
BH22-12	SS7	6.0-6.7	Silt till	$1.7x10^{-8}$
BH22-13	SS5	3.0-3.8	Silty sand	$9.5x10^{-8}$
BH22-16	SS6	4.6-5.5	Silty sand	$2.6x10^{-5}$

The K-values derived from grain size analysis results are highly volatile due to reworking of sampled soils and destruction of sedimentological structures, and therefore, they are not factored into dewatering rate estimation. They have been used to assess the hydraulic properties of the till to confirm that its hydraulic conductivity is sufficiently low to be considered an aquitard.

5.4 Infiltration Rate

Infiltration rate was estimated through the following empirically equation between K-values and infiltration rate provided in the SG-6 Percolation Time and Soil Descriptions of the Supplementary Guidelines of Ontario Building Code 1997 (**Table 8**) for the formations in shallow depths The following empirical correlation presented in the Stormwater Management Criteria of TRCA:

$$K = (6 \times 10^{-11}) I^{3.7363}$$

Where:
K = hydraulic conductivity (cm/s)
I = infiltration rate (mm/hr)

Table 8. Infiltration Rate

Borehole ID	Surface Elevation (masl)	Depth (mbgs)	Screened Interval (mbgs)	K-value (m/s)	Infiltration Rate		Geometric Mean		90th Percentile	
					cm/min	T (min/cm)	cm/min	T (min/cm)	cm/min	T (min/cm)
BH22-1	119.1	4.54	1.5-4.5	$2.4x10^{-4}$	33.5	3	26.9	3.7	33.5	4.2
BH22-2	119.0	4.51	1.5-4.5	$2.3x10^{-4}$	33.0	3				

				$2.0x10^{-4}$	32.0	3				
				$1.1x10^{-4}$	27.3	4				
				$7.2x10^{-5}$	24.3	4				
TBH22-7	118.7	5.93	3.0-6.0	$1.1x10^{-4}$	26.9	4				
BH22-8	117.9	4.45	1.5-4.5	$5.6x10^{-6}$	12.2	8				
BH22-9	119.4	5.86	3.0-6.0	$2.5x10^{-4}$	33.8	3				
				$1.9x10^{-4}$	31.4	3				
BH12	119.5	5.40	2.4-5.4	$1.1x10^{-4}$	27.2	4				
				$6.6x10^{-5}$	23.6	4				

5.5 Groundwater Chemistry

One (1) groundwater sample was taken from BH22-11 on November 18, 2022 and tested against the parameters of Limits for Sanitary Sewer Discharge and Limits for Storm Sewer Discharge in By-law 53-2010 of Peel Region. The test results are attached in **Appendix E**, and **Table 9** lists the exceedances.

Table 9. Exceedance over Peel Sewer Discharge Limits

Analyte	Units	Storm Sewer Limits	Sanitary Sewer Limits	BH22-11
TSS	mg/L	15	350	276
TKN	mg/L	1	100	1.76
Total phosphorus	mg/L	0.4	10	0.55
Total manganese	mg/L	0.05	5	0.286

In addition, as part of the Palmer Phase Two ESA conducted in tandem with this preliminary hydrogeological assessment, groundwater samples were taken from monitoring wells BH22-1, BH22-2, BH22-3, BH22-7, Bh22-8, Bh22-9, BH12, BH1. The groundwater samples were tested for the parameters of metals, VOV, PHC and PAH. The test results were compared against Table 3 standards of O. Reg 153 and no groundwater exceedances were identified. Testing results can be found in the Palmer Phase Two ESA report.

Groundwater quality was observed during drilling and sampling. No visual and olfactory evidence of contamination such as visible petroleum hydrocarbon film or sheen as well as smell and odor were identified.

It should be noted that Palmer Phase Two ESA identified a number of exceedances for soil samples including PHC, arsenic, cadmium, lead, SAR and EC.

6. Construction Dewatering Assessment

Dewatering for construction is conducted to fulfil three purposes: provide a dry working condition, help maintain ground stability and help maintain healthy and safe working environment. Based on the above characterization of site conditions, the recorded groundwater levels (ranging from 2.6 to 6.2 mbgs) are higher than the bottom floor of the underground parking (11 m below grade), and therefore construction dewatering must be assessed.

6.1 Excavation Dimension and Targeted Groundwater Level

Excavation dimension is determined by structure footprint and over-excavation. Assuming trench boxes or shoring system will be used for all excavation, the excavation walls will be vertical, and it is reasonable to add 1.0 m over-excavation to excavation walls to account for excavation precision and the space required by the shoring system. As introduced in Section 1, the part of the proposed development that involves excavation is the 3-levels of underground parking. Based on design drawings provided by the client, the bottom floor of the underground parking has a depth of 11.0 m. Plus 0.5 m floor thickness and 0.5 m of over-excavation, the excavation floor depth is assumed to be 12.0 m.

Targeted groundwater level to be lowered to is assumed to be one meter below the bottom of the excavation floor to account for capillary rise, and suction caused by vibration.

Grading plan is not available. For the purpose of dewatering estimation, it is reasonable to use the existing grades at the west end of the proposed building as the reference, which is about 119 masl. **Table 10** summarizes the excavation parameters and values used for the dewatering assessment.

Table 10. Excavation Parameters and Targeted Groundwater Level

Structure	Underground Parking
Horizontal Dimension (m x m)	197 x 93
Building grade (masl)	119.0
Excavation Floor Depth (mbgs)	12.0
Excavation Floor Depth (masl)	107.0
Groundwater Level Target (masl)	106.0

6.2 Dewatering Rate Estimation

Dewatering rate (liters/day or L/day) is key parameter for implementing construction dewatering and impact assessment, and can cover three parts of water that have potential to flow or seep into an excavation trenches or pits, including (1) static groundwater seepage, (2) storage of groundwater that has to be depleted before groundwater flow attains a static state, and (3) storm water. Based on the form of the excavation pit, the excavation space will be treated as trench for estimating dewatering rate.

Static Groundwater Seepage and Influence Zone:

Based on the above delineation of excavation dimensions and stratigraphy, the excavation will penetrate all overburden units and extend into the shale bedrock. As the two penetrated hydrostratigraphic units have drastically different hydraulic properties, static groundwater seepage estimation was broken into the following two components:

- Upper Unit – saturated fill unit and sand unit; and
- Lower Unit – partially saturated till unit and bedrock unit.

The upper unit is in unconfined condition and the dewatering rate for the upper unit will be estimated with Dupuit-Thiem equation:

$$Q = K(H^2 – h_w^2) / [0.733 \log (R / r_w)]+xK(H^2-h^2)/L$$

The low unit is under confined condition and the dewatering rate for the lower unit will be estimated with Jacob's modified equition

$$Q = KB(H – h_w) / [0.733 \log (R / r_w)]+2xKB(H-h)/L$$

Q = pumping rate
K = hydraulic conductivity (m/s)
H = original water level (m) above lower aquitard
h_w = targeted level (m) above the lower aquitard
R = influence radius (combined) (m)
r_w = well radius or equivalent radius (m)
B=thickness of confined aquifer (m)
x=length of trench (m)
L=line source distance (m) which is the greater of $R_0/2$ or 10 m

Radius of influence zone is calculated with Sichart and Kryieleis formula:

$R_0 = C(H-h_w)K^{1/2}$
C =3000 for wells
$R = R_o+r_w$

The calculations provided in the section are based on the assumption that the shoring system allows free flow of groundwater into foundation pit (i.e., non-watertight). It should be noted that partially saturated till unit and bedrock unit are treated as saturated units and bedrock is treated porous medium, which is out of convenience and is considered more conservative.

Storage of Groundwater:
The storage of groundwater was assessed based on porosity of excavated soil, the volume of excavated saturated soil plus the volume of saturated soil enclosed by drawdown cone and influence zone column as well as the potential of free gravity flow of groundwater in saturated zone. The saturated zones which have potential to release free gravity flow groundwater include the saturated sand fill and sand, which have a combined saturated thickness of 2.0 to 2.5 m. The storage for these two units will have to be considered. Based on the nature of construction, a depletion period of 60 days is assumed. Two types of storage are provided, including storage with rigid shoring and storage in natural state.

The underlying till unit is usually moist in natural water content. Given its low hydraulic conductivity, free gravity groundwater flow is not anticipated during excavation period. The bedrock including weathered and unweathered shale has limited storage as secondary porosity is the major space within bedrock to store and transmit groundwater. Therefore, groundwater storge depletion will not be considered for till unit and bedrock.

Stormwater:
Based on Palmer's experience, it is reasonable to use 25 mm/day rainfall intensity to estimate potential stormwater that may accumulate in the foundation pit. Based on the above climate records (**Table 3**) 25 mm/day rainfall intensity corresponds to one quarter of the extreme daily rainfall.

Dewatering Summary:
Table 11 presents the input parameter values and output values for dewatering quantity estimation. The maximal required pumping rate without watertight shoring or with a shoring system allowing free groundwater seepage into the foundation pit is estimated to be 2,862,385L/day.

Based on the classification of soil encountered in the boreholes and the expected limited extent to the high permeability fill soils off site, it is likely that the volume of groundwater storage and the steady state dewatering rate will be less than predicted. Not withstanding this, the client and their contactor should be prepared to manage the dewatering rates predicted in **Table 11**. If rigid shoring system is applied, the groundwater seepage may be significantly reduced. This is further discussed in Section 6.5 below.

Table 11. Dewatering Analysis Results

Parameters	Upper Unit (sand and sandy fill)	Lower Stage (bedrock)	Combined Dewatering Rates
Horizontal Dimension (mxm)	197 x 93	197 x 93	-
Excavation Depth (masl)	113.6	107	-
Groundwater Level Target (masl)	113.6	106	-
Groundwater Level (masl)	116.0	113.6	-
K (m/s)	$2.4x10^{-4}$	$6.2x10^{-6}$	-
H (m)	2.4	9.0	-
h (m)	0	0	-
B	-	5	
x (m)	197	197	-
R_0 (m)	111	123	-
Q_{static} (L/day)	751,131	267,154	1,018,285
$Q_{StaticFOS=1.5}$ (L/day)	1,126,697	400,731	1,527,428
$Q_{storage}$ (L/day)**	316,672	0	316,672
$Q_{Groundwater}$ (L/day) with FOS			**1,844,100**
$Q_{Stormwater}$ (L/day)	458,025		
Total Q (L/day)	**2,302,125**		

** assumes 60 days to fully deplete the groundwater storage

6.3 Rigid Watertight Shoring System

Based on site subsurface conditions, high dewatering volumes, and the sensitivity of the building features surrounding the site, a rigid watertight shoring system, such as sheet pile wall or an interlocking caisson wall, should be considered for this project. Should the rigid watertight shoring system be adopted, the required temporary dewater rate will be the storage part of the above estimated dewatering rate, which is 316,672 L/day. As the dewatering rate is less than 400,000 L/day, PTTW application is not required, but it must be registered on the MECP EASR system.

Permanent groundwater seepage will also be avoided if the rigid watertight shoring system is incorporated into “bathtub” watertight foundation. A direct precipitation volume of 458,025 L/day should be accounted for in dewatering planning and discharge permit applications.

6.4 Location of Discharge and Dewatering Methods

MECP construction dewatering guides provided several options for discharging pumped water, including:

- Discharge to a sewage works that has the appropriate environmental compliance approval (ECA);
- Transfer to a waste management system that has the appropriate environmental compliance approval (ECA) or is registered under the non-hazardous waste transportation systems EASR;
- Discharge to a municipal sanitary sewer or storm sewer in accordance with any municipal requirements; and
- Discharge to surface land.

Based on the understanding of site conditions, the recommended discharge location is the storm sewers installed along John Street owned and operated by Peel Region. Treatment of dewatering discharge will be required to meet Peel Region Storm Sewer Discharge Standards.

Dewatering method should be selected based on site subsurface condition and shoring system to be employed. As discussed above, the upper overburden units including sand fill unit and sand unit are incohesive and show various relative densities. Cutting slope cannot sustain its form even being flattened due to incohesiveness of soil, internal erosion of groundwater seepage (piping) and vibration caused by train traffic. Based on the site condition, the following two combinations of shoring system and dewatering method may be considered:

1. Rigid shoring – sump pump;
2. Non-rigid shoring – pre-drainage though active dewatering methods; and
3. Rigid shoring on north edge along railway, non-rigid shoring along other sides – pre-drainage though active dewatering methods on the east, west and south sides.

Rigid shoring system is referred to as sheet pile wall, secant pile wall or other continuous piles that are installed into one to three meters below bottom of foundation wall into dense soil or bedrock prior to the start of excavation. Soil movement retained with rigid shoring system is limited and groundwater seepage is mostly or totally blocked. The storage of groundwater within foundation pit can be dealt with sump pumps, but it may be more easily completed with active dewatering methods such as well points or eductors.

Non-rigid shoring is referred to as soldier pile system (H pile and lagging), tie-back walls and etc. Non-rigid shoring is usually installed in parallel with excavation. Certain amount of movement of retained soil is allowed, and groundwater seepage and associated basal heave may occur if groundwater level is not lowered in advance of excavation. For non-rigid shoring, pre-drainage is recommended through active dewatering methods, which may include well-points, eductors or multiple deep wells. Sump pumps at the base of the excavation may also be required.

The third combination incorporates rigid shoring on north edge along railway to reduce the risk of settlement and deformation of railway foundation soil and non-rigid shoring along other sides of the foundation pit to reduce cost. Under this scenario, pre-drainage is still recommended on the east, west and south sides of the excavation through active dewatering methods, which may include well-points, eductors or multiple deep wells. Sump pumps at the base of the excavation may also be required.

A specialist dewatering contractor is recommended to be retained to confirm dewatering methods.

6.5 PTTW, EASR and Municipal Permits

Water taking in Ontario is governed with Section 34 of Ontario Water Resources Act and its Regulation 387/04. The act and regulation require that no person shall take more than 50,000 litres of water on any day by any means except in accordance with a permit.

Construction dewatering is governed with Part II. 2 of Environmental Protection Act and its Regulation 63/16. Based on the act and regulation, construction dewatering with rates between 50,000 and 400,000 L/day can go through Environmental Activity and Sector Registry (EASR) and do not have to apply for a PTTW if the impact to natural resource and environment is not significant and no sensitive features are involved. As provided in the regulation, this water taking limit is specific to the taking of groundwater and does not include storm water contribution。

Based on the above assessment and understanding of the water taking legislations, if non-watertight shoring methods are used (i.e., pile and lagging) construction dewatering for this project is expected to be above 400,000 L/day, and therefore applying for a PTTW is required. If watertight shoring methods are implemented and properly sealed into a confining unit, the construction dewatering rate is expected to be less than 400,000 L/day requiring a registration on the MECP EASR sytem.

As mentioned above, the pumped water is recommended to be discharged into storm sewers installed along road curbs. The storm sewers are owned and operated by Peel Region as part of its stormwater management system. A discharge permit from Peel Region will be required.

7. Permanent Groundwater Seepage

Based on the groundwater levels data collected up to date, groundwater levels are invariably higher than the finished floor elevation. There is potential that groundwater will migrate into basement causing either basement flooding or wet condition.

7.1 Permanent Groundwater Seepage Rate Estimation

Groundwater that seeps into underground space comes from the static groundwater seepage flow, and the seepage rate is estimated based on the same principle as the above construction dewatering assessment. The following table lists the results of estimation for permanent groundwater seepage rate assuming that groundwater seeps into underground space freely (i.e., non-watertight foundations). As this volume of passive drainage exceeds 50,000 L/day, a long-term PTTW with the MECP would be required.

Table 12. Permanent Groundwater Seepage Rate

Structure	Upper Stage	Lower Stage	Combined
Horizontal Dimension (mxm)	197 x 93	197 x 93	-
Floor Depth (masl)	113.6	108	-
Groundwater Level Target (masl)	113.6	107	-
Groundwater Level (masl)	116.0	113.6	-
K (m/s)	$1.0x10^{-4}$	$9.6x10^{-7}$	-
H (m)	2.4	6.6	-
h (m)	0	0	-
x (m)	197	197	-
Q_{static} (L/day)	453,325	46,878	500,203
$Q_{StaticFOS=1.5}$ (L/day)	679,988	70,317	750,305

7.2 Treatment of Permanent Groundwater Seepage

There are three methods to treat the permanent groundwater seepage: passive dewatering, positive dewatering and water-tight foundation design.

Passive dewatering can be employed where the storm sewers lower than basement floor exists close to the property. The groundwater supposed to seep into basement can be directed to the nearby storm sewer through foundation drainage and subfloor drainage system.

Positive dewatering is basically a sump pump system. The groundwater seepage is collected through foundation drainage and subfloor drainage system into a sump pit within or outside the basement, and the collected water is pumped to storm or sanitary sewers.

Bathtub Water-tight foundation is a type of raft foundation constructed with water proofing material and structures. Construction cost is high due to complicated construction procedure and expensive materials which are required to ensure permanent water proofing.

Based on the above analysis, the permanent ground seepage is approximately 15 milliliter/s per meter of foundation drainage. Well-designed foundation floor drainage and foundation wall drainage should be enough to deal with the groundwater seepage if the drainage system can be linked to storm sewer lower than the basement floor. If storm sewers near the site is higher than the basement floor, sump pump system or water-tight foundation will have to be considered.

As aforementioned, the permanent groundwater seepage issue can be avoided if “bathtub” watertight foundation is adopted.

8. Impact Assessment and Mitigation

The construction and operation of the proposed development both have the potential to cause quantity and quality impact of groundwater to natural heritage, municipal water sources, private water supply and discharge receiver. The following presents the assessment of impact to each major resource and environmental features and ways of mitigation if the impact is negative.

8.1 Natural Heritage Features

As presented in Section 4.1, the site is not located natural heritage system, and the major natural heritage feature identified is Cooksville Creek approximately 160 m to the east boundary of the property. The influence zone is 234 m if groundwater is allowed to flow into excavation pit freely. Based on Lake Ontario Integrated Shoreline Strategy Characterization Report (CVC, 2018), Cooksville does not receive significant amount of baseflow. Therefore, temporary construction dewatering will not have negative effect to the flow regime of Cooksville Creek.

If rigid or semi-rigid shoring systems are adopted, the required dewatering rate will be drastically reduced, and the influence zone will be negligible. No impacts to Cooksville Creek are expected.

8.2 Source Water Protection

As presented in Section 4.2, the east corner of the site is above a Highly Vulnerable Aquifer (HVA) with score of 6.0. An Intake Protection Zone (IPZ-2 with score of 2.5) is located about 400 m to the south of the site. Water quantity and quality impact of construction dewatering to the municipal water sources is not anticipated. However, other construction and operation activities have potentials to release contaminants into environment, which may migrate to HVA through infiltration and pathways. These potentials will be mitigated through spill management plan, salt management plan and other best management practices (BMPs) implemented by contractors and the property owner.

8.3 Private Water Wells

As presented above, the water supply for the residential area surrounding the site was provided through South Peel Drinking Water System owned and operated by Peel Region, which is a lake-based water supply system. As shown in the results of MECP well record inventory (Appendix F), only three wells have to the potential of still being used for water supply. However, they were completed before 1970s and far away from the dewatering influence zone. Consequently, impact of dewatering to private wells are not expected.

8.4 Discharge Receiver

As presented above, the pumped water for the purpose of conduction dewatering is recommended to be discharged into storm sewers along John Street. The potential impact of discharged water to the storm sewers includes quantity impact (flooding) and quality impact. Quantity impact will be addressed by scheduling excavation and dewatering activities during dry weather or dry seasons if the pumped water plus storm precipitation exceeds conveying capacity of the storm sewers.

As presented above, groundwater sampling program identified several exceedances over Limits for Storm Sewer Discharge in By-law 53-2010 of Peel Region. These exceedances may be associated with high turbidity of raw groundwater and can often be eliminated through filtering and settling. Therefore, quality impact of discharged groundwater to storm system will be insignificant if the pumped groundwater is treated through settling and filtering. Additional groundwater sampling is required prior to finalizing a discharge permit application or treatment system design.

8.5 Foundation Soils

Dewatering and decreased groundwater levels will reduce the pore pressure and increase effective stress between soil particles. Given that the upper overburden soils are unconsolidated sand and fill soils the increase effective stress between soil particles has the potential to cause settlement of foundation soils. Building features within or close to the influence zone include railway to the north, warehouse to the west, residential house to the east, asphalt pavement and storm and sanitary sewers systems to the south of the site. Construction dewatering will put these building features under risk. These building features have different degrees of sensitivity to settlement. For the purpose of controlling soil settlement, rigid shoring system as discussed above is recommended for whole foundation pit, or at least the north excavation wall should be braced with rigid shoring as the railway is the most sensitive to soil settlement.

A comprehensive settlement monitoring program should be implemented by the client or the contractors. A specialist geotechnical firm should be retained to make the settlement monitoring plan and to execute field monitoring. It should be noted that monitoring is the last and final guarantee to ensure and confirm the effectiveness of all preventive measures.

9. Summary of Findings and Recommendations

Based on record review and field investigations, the major findings of the hydrogeological assessment is summarized as follows:

- Surficial geology surrounding the site was mapped by Ontario Geological Survey (OGS) as coarse-textured glaciolacustrine deposits of sand, gravel, minor silt and clay deposited in a littoral environment associated with ancient glacial lake, Glacial Lake Iroquois;
- Four hydrostratigraphic units were identified within the site including shallow fill, fill sand, clayey till and shale. The excavation will extend into shale bedrock;
- The measured groundwater levels range from 2.7 to 6.2 mbgs or 115.2 to 113.0 masl. No apparent fluctuation was identified based monitoring data collected up to date;

- Hydraulic conductivity estimated from slug tests for screened units ranges from $5.6x10^{-6}$ to $2.4x10^{-4}$ m/s for overburden units and ranges from $3.7x10^{-8}$ to $6.7x10^{-6}$ m/s for bedrock units. The 90th percentile values were used to estimate construction dewatering rates and the geometric mean values were used to estimate permanent groundwater seepage;
- Infiltration rate were derived from hydraulic conductivity through empirically equation, and ranges from 12 to 33 cm/min. The infiltration rate will inform design of infiltration facilities on site;
- Groundwater chemical testing for the parameters of Peel Region sewer use by-law did not identify any exceedances;
- If the shoring system allows groundwater to flow freely into foundation pit (i.e., non-watertight), the proposed development is expected to require temporary dewatering of up to a maximum of 1,844,100 L/day to maintain safe working conditions and stable cutting slopes. A typical daily rate under steady state conditions is estimated to be 1,018,285 L/day. As the maximum estimated dewatering rate is over 400,000 L/day, a Category 3 PTTW application with the MECP is required;
- If a rigid watertight shoring system is used and installed sufficiently into the competent bedrock, the proposed development is estimated to still require temporary dewatering of approximately 316,672 L/day to unwater the volume of water within the excavation. As this dewatering rate is less than 400,000 L/day it may be completed under an EASR registration with the MECP. It would also only be needed for approximately 60 days or until the volume of porewater is removed;
- An additional 458,025 L/day of water should be accounted for in dewatering planning assuming direct precipitation from a 25 mm storm event;
- A discharge permit may be required by Peel Region and/or the City of Mississauga;
- No impacts to groundwater quantity to neighboring groundwater users, the municipal water supply system, natural heritage system or storm sewers are not anticipated from the proposed development, if mitigation measures are implemented as recommended; and
- No impacts to groundwater quality are expected should appropriate mitigation measures and best management practices are implemented as recommended.

The above hydrogeological assessment and conclusions are based on the assumptions that the client and the contractors will undertake the execution and construction of the project following all applicable codes, regulations, guidelines and BPMs, and these assumptions will end up being realized through actual construction activities. Considering the large dewatering quantity anticipated and ambient conditions of the proposed development, a water taking plan, discharge plan and monitoring plan may be required by agencies to ensure compliance of construction activities with all applicable codes, regulations, guidelines and BPMs.

This hydrogeological report should be considered preliminary until the final project design can assessed. Groundwater systems and other natural system are highly complex and can have significant uncertainties between borehole locations. Additional hydrogeological testing is expected to be required as the project moves towards a Site Plan Application (SPA).

In addition, to help address unexpected occurrences during construction, the following steps are recommended:

- The client should have enough pumping capacity in place to deal with unexpected seasonal perched groundwater and stormwater accumulation. The climate data was presented in the report for the reference of the client;

- The client should have hydrogeologists to conduct hydrogeological inspection as needed during excavation to confirm groundwater conditions and witness dewatering process; and
- While hiring excavation contractors, the client should ensure that the excavators have enough experiences and capacity in dewatering.

10. Signatures

This report was prepared, reviewed and approved by the undersigned:

Prepared By:

Lauren Bourke, M.Env.Sc.
Environmental Scientist

Prepared By:

Frank C. Liu, P.Eng.
Senior Hydrogeologist

Reviewed By:

Jason Cole, M.Sc., P.Geo.
VP, Principal Hydrogeologist

Limitations of Report

The extent of this study was limited to the specific scope of work for which we were retained and that is described in this report. Palmer has assumed that the information provided by the client or any secondary sources of information are factual and accurate. Palmer accepts no responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of omissions, misinterpretations or negligent acts from relied upon data. Judgment has been used by Palmer in the interpretation of the information provided but subsurface physical and chemical characteristics may differ from regional scale geology mapping and vary between or beyond well/borehole locations given the inherent variability in geological conditions.

Palmer is not a guarantor of the geological or groundwater conditions at the subject site, but warrants only that its work was undertaken and its report prepared in a manner consistent with the level of skill and diligence normally exercised by competent geoscience professionals practicing in the Province of Ontario. Our findings, conclusions and recommendations should be evaluated in light of the limited scope of our work.

The information and opinions expressed in the Report are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT PALMER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS PALMER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belongs to Palmer. Any use which a third party makes of the Report is the sole responsibility of such third party. Palmer accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Palmer's express written permission. Should the project design change following issuance of the Report, Palmer must be provided the opportunity to review and revise the Report in light of such alteration or variation.

References

Bedrock Geology, OGSEarth, Ministry of Energy, Northern Development and Mines, August 2019
https://www.mndm.gov.on.ca/en/mines-and-minerals/applications/ogsearth

Canadian Climate Normals 1981-2010 Station Data, Environmental and Climate Change Canada.
Geotechnical Boreholes, OGSEarth, Ministry of Energy, Northern Development and Mines, August 2019
https://www.mndm.gov.on.ca/en/mines-and-minerals/applications/ogsearth

Chapman, L.J. and Putnam, D.F.
The Physiography of Southern Ontario, 1984, Ontario Geological Survey.

Credit Valley Conservation Authority, 2018.
Lake Ontario Integrated Shoreline Strategy Characterization Report.

Geology of Ontario, Special Volume 4, Part 2, Ontario Geological Survey, 1992.

Intensity-Duration-Frequency (IDF) curves, Ontario Ministry of Transportation (MTO).

MECP. MAP Well Records of Ontario.

MECP. Ontario Source Protection Atlas.

MECP. Provincial Groundwater Monitoring Network.
Ontario Digital Terrain Model Ministry of Natural Resources and Forestry.

MNDM. Ontario Geology Survey, Central Database.

Surficial Geology, OGSEarth, Ministry of Energy, Northern Development and Mines, August 2019
https://www.mndm.gov.on.ca/en/mines-and-minerals/applications/ogsearth

Water Well Information System (WWIS) of Ontario.

Appendix A

Site Plan

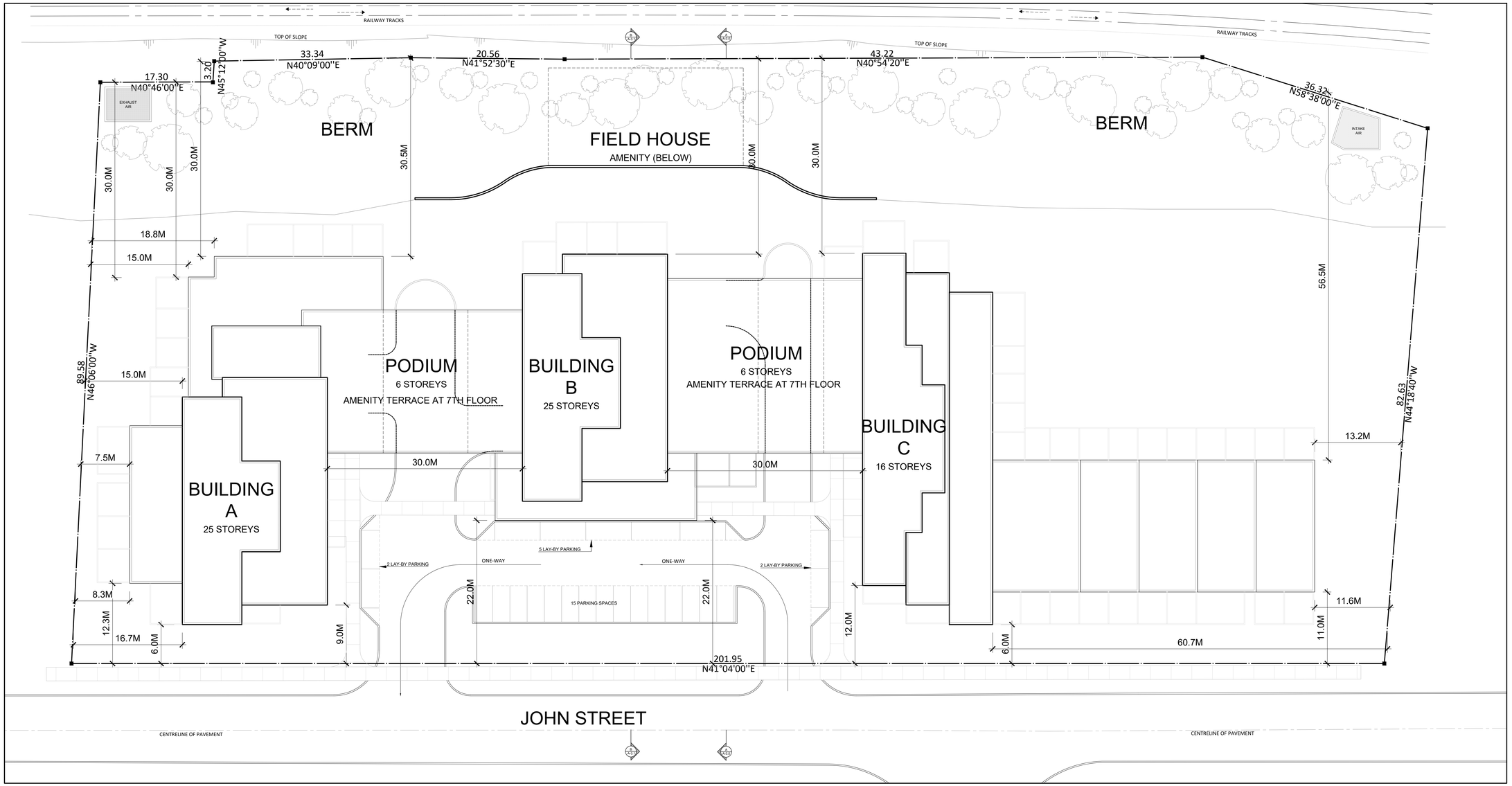
Tregebov Cogan Architect, 2022

FOR REVIEW

69 & 117 JOHN STREET, MISSISSAUGA, ON

PROPOSED DEVELOPMENT PLANS

PRINT DATE :DECEMBER 19, 2022



3 SITE PLAN

Scale: 1:300

2 CONTEXT PLAN

Scale: 1:5000

LEGAL DESCRIPTION

PART OF LOT 15 CONCESSION 1. NORTH OF DUNDAS STREET
(GEOGRAPHIC TOWNSHIP OF TORONTO)

CITY OF MISSISSAUGA
REGIONAL MUNICIPALITY OF PEEL

SITE DATA

LOT AREA	18,690 sq.m (1.87 hectare)
BUILDING AREA (GROUND FLOOR)	4,740 sq.m 25% of LOT AREA
GROSS FLOOR AREA	73,900 sq.m
FLOOR SPACE INDEX (F.S.I)	4.0

FLOOR AREAS AND SUITES

RES. ARES (m²)	1 BEDROOM	2 BEDROOM	3 BEDROOM	TOTAL UNITS
35,500	410	133	30	573
14,300	36	144	36	216
14,300	36	144	36	216
9,800	90	41	9	140
73,900	572	462	111	1,145

NOTES:
NO COMMERCIAL USES ARE PROPOSED
FLOOR AREAS REFLECT 750 sq.m FLOOR PLATES FOR TOWERS
FLOOR AREAS DO NOT EXCLUDE CIRCULATION SPACE

MIN. SUITE AREA	50 sq.m
AVERAGE AREA/SUITE (net)	65 sq.m
UNITS PER HECTARE (U.P.H)	590

LAND USE AT GRADE

PAVED AREA	2,805 m	15%
LANDSCAPED AREA	11,145 m	60%
AREA OF BLDG. AT GRADE	4,740 m	25%
	18,690 m	**100%**

SETBACKS

PROVIDED

SOUTH SIDE (JOHN STREET)	VARIES 6.0 m – 36.8 m
WEST SIDE	VARIES 15.2 m – 16.7 m
NORTH SIDE (C.P.R RAILWAY)	VARIES 30.0 m – 38.5 m
EAST SIDE	VARIES 13.4 m – 14.9 m

BUILDING HEIGHTS

TOWER 1 HEIGHT TO TOP OF FLAT ROOF (TAKEN FROM ESTABLISHED GRADE LINE)	80 m
TOWER 2 HEIGHT TO TOP OF FLAT ROOF (TAKEN FROM ESTABLISHED GRADE LINE)	80 m
TOWER 3 HEIGHT TO TOP OF FLAT ROOF (TAKEN FROM ESTABLISHED GRADE LINE)	53 m

PARKING

REQUIRED

TYPE OF UNIT	NO. OF UNITS	PARKING RATIO	PARKING REQUIRED
1 BEDROOM	572	0.8	457
2 BEDROOM	462	0.8	370
3 BEDROOM	111	0.8	89
TOTAL RESIDENTIAL PARKING			**916**
VISITOR PARKING	1,145	0.15	172
TOTAL PARKING REQUIRED			**1,088**

PROVIDED

PARKING LEVEL	NEW RATIO PARKING SPACES
SURFACE	23
P1 LEVEL	529
P2 LEVEL	565
TOTAL	**1117**

PARKING SPACE TYPICAL DIMENSIONS: 2.7 m X 5.7 m
BARRIER-FREE: 4.5 m X 5.7 m
DRIVEWAY: 7.00 m MIN. WIDTH

NOTES:
INCLUDES 2% BARRIER-FREE PARKING SPACES
SURFACE LEVEL PARKING ARE SHORT-TERM VISITOR PARKING SPACES
PARKING RATIOS ARE BASED ON NEW REQUIREMENTS OF MISSISSAUGA CITY COUNCIL

BICYCLE PARKING PROVIDED

SURFACE LEVEL	40 SPACES
BASEMENT LEVELS	1,000 SPACES
TOTAL ON SITE	**1,040 SPACES**

NOTES:
SURFACE LEVEL SPOTS ARE SHORT-TERM VISITOR SPACES

AMENITY SPACE

OUTDOOR REAR YARD (ON GRADE)	5,750 sq.m
PROVIDED SHARED OUTDOOR AMENITY (AT FLOOR 7)	1,380 sq.m
INDOOR AMENITY (TOTAL OF FLOORS 1 AND 7)	1,250 sq.m
INDOOR AMENITY (BERM FIELD HOUSE)	450 sq.m
TOTAL	**8,830 sq.m**

NOTES:
OUTDOOR REAR YARD AMENITY SPACE EXCLUDES PRIVATE PATIOS AND RAILWAY BERM AREAS

LANDSCAPE AREAS

LANDSCAPE AREA (ON GRADE)	5,750 sq.m
OUTDOOR AMENITY (AT FLOOR 7)	1,250 sq.m
TOTAL	**7,000 sq.m**

NOTES:
OUTDOOR REAR YARD AMENITY SPACE EXCLUDES PRIVATE PATIOS AND RAILWAY BERM AREAS

1 STATISTICS

CONSULTANTS:

DATE	No.	ISSUE
2022-12-19	02	FOR REVIEW
2022-04-22	01	PRELIMINARY COORDINATION

ARCHITECT:
TREGEBOV COGAN *ARCHITECT*
40 Saint Clair Avenue East, Suite 303
Toronto, ON M4T 1M9
PHONE: 647.352.3350

OWNER:

FOR REVIEW

PROJECT NAME:
69 & 117 JOHN ST.
MISSISSAUGA

DRAWING TITLE:
SITE STATISTICS, CONTEXT PLAN AND SITE PLAN

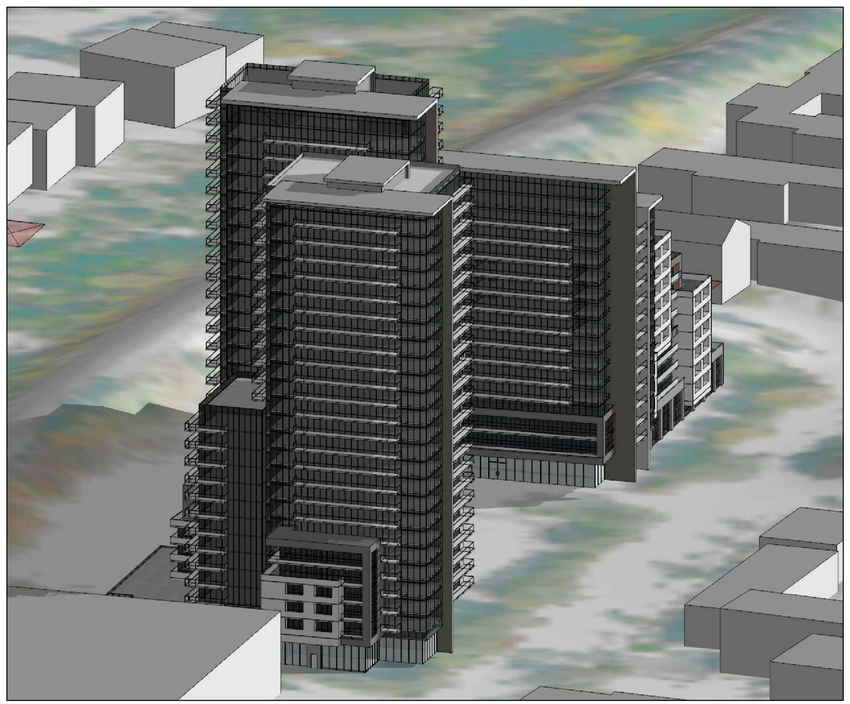
PRINT DATE: 19-DEC-2022

NORTH

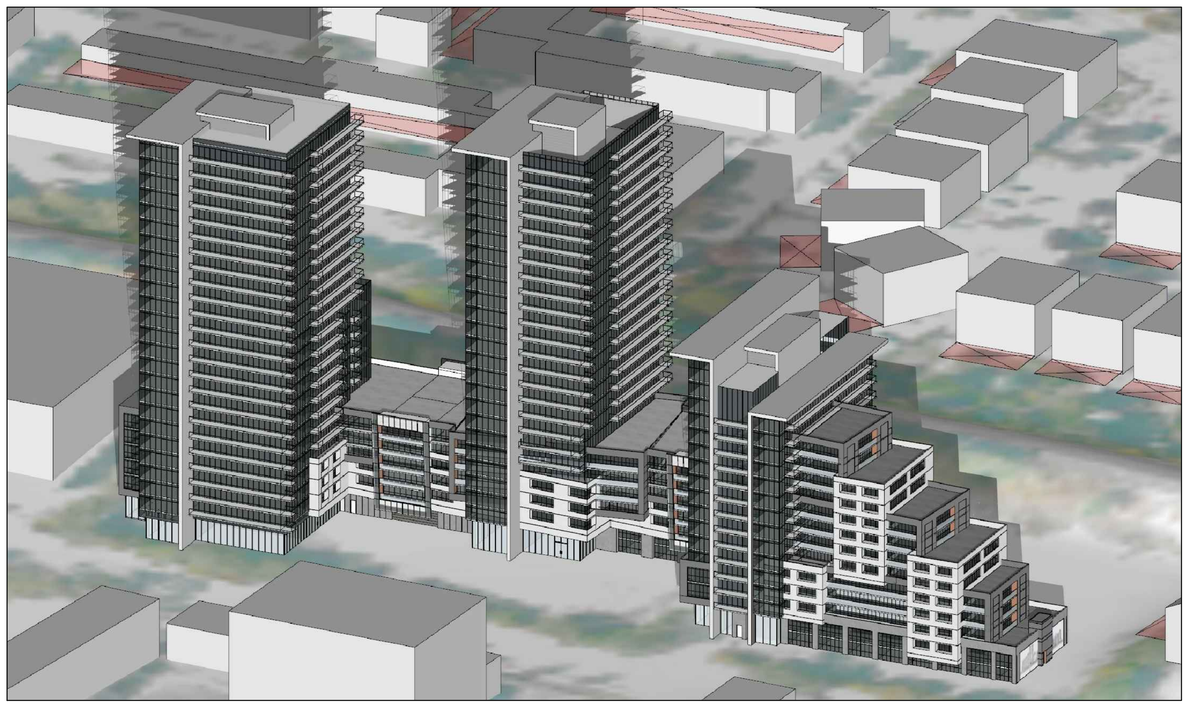
PROJ. No.: 1101
SCALE: AS NOTED
DRAWN BY: AJT
DEV APPLICATION NO:
DWG NO. **A1.0**

4 EAST VIEW

3 NORTH VIEW



2 WEST VIEW



1 SOUTH VIEW

CONSULTANTS:

DATE	No.	ISSUE
2022-12-19	02	FOR REVIEW
2022-04-22	01	PRELIMINARY COORDINATION

ARCHITECT:

TREGEBOV COGAN *ARCHITECT*

40 Saint Clair Avenue East, Suite 303
Toronto, ON M4T 1M9
PHONE: 647.352.3350

OWNER:

FOR REVIEW

PROJECT NAME:

69 & 117 JOHN ST.
MISSISSAUGA

DRAWING TITLE:

BUILDING MASSING VIEWS

PRINT DATE: 19-DEC-2022

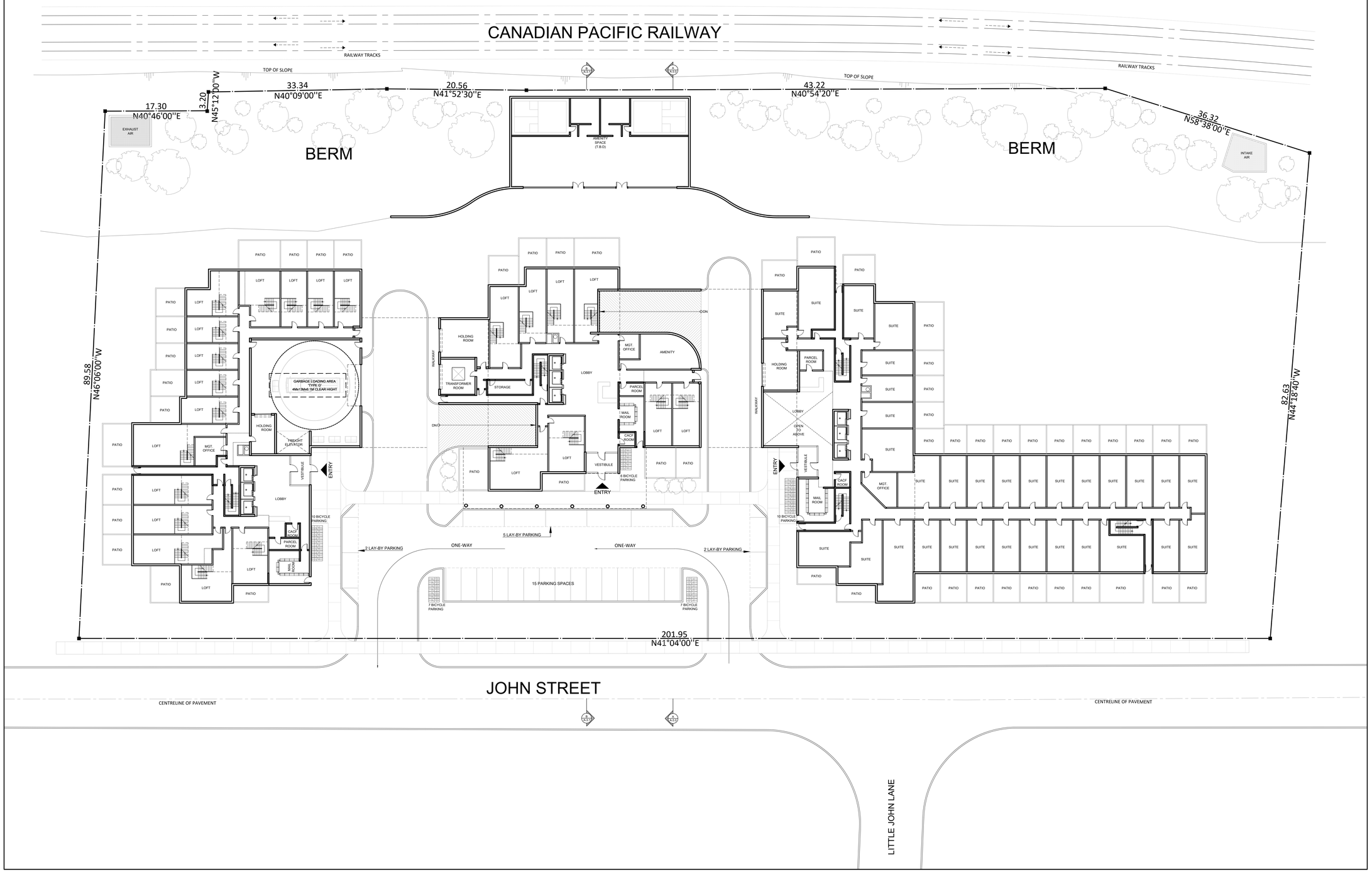
PROJ. No.: 1101

DEV APPLICATION NO:

SCALE: AS NOTED

DWG NO. **A1.1**

DRAWN BY: AJT



1 GROUND FLOOR PLAN

CONSULTANTS:

DATE	No.	ISSUE
2022-12-19	02	FOR REVIEW
2022-04-22	01	PRELIMINARY COORDINATION

ARCHITECT:

TREGEBOV COGAN *ARCHITECT*

40 Saint Clair Avenue East, Suite 303
Toronto, ON M4T 1M9
PHONE: 647.352.3350

OWNER:

FOR REVIEW

PROJECT NAME:

69 & 117 JOHN ST.
MISSISSAUGA

DRAWING TITLE:

GROUND FLOOR PLAN

PRINT DATE: 19-DEC-2022

NORTH

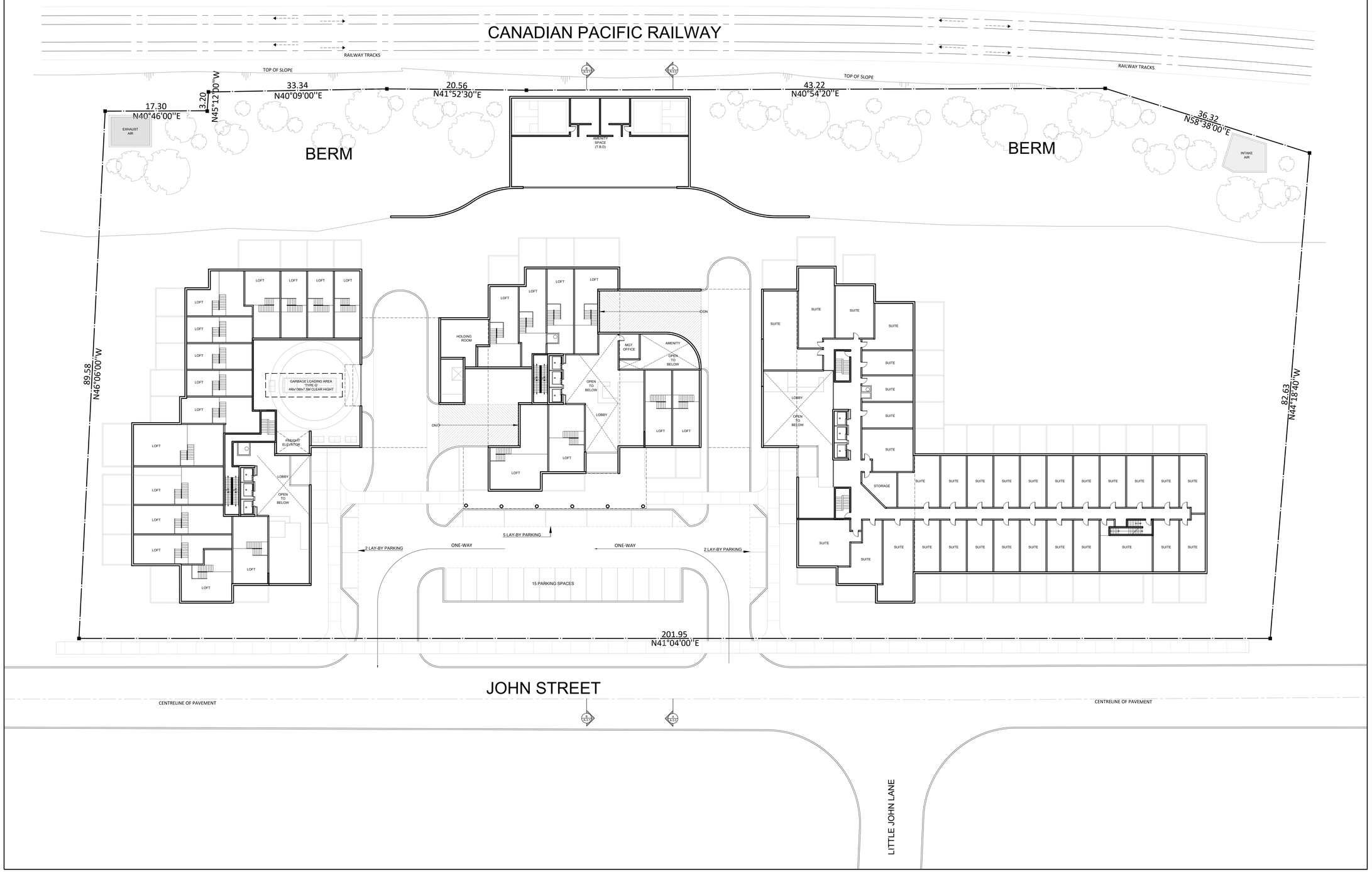
PROJ. No.: 1101

DEV APPLICATION NO:

SCALE: AS NOTED

DWG NO. **A2.0**

DRAWN BY: AJT



1 MID-F1 FLOOR PLAN

CONSULTANTS:

DATE	No.	ISSUE
2022-12-19	02	FOR REVIEW
2022-04-22	01	PRELIMINARY COORDINATION

ARCHITECT:

TREGEBOV COGAN *ARCHITECT*

40 Saint Clair Avenue East, Suite 303
Toronto, ON M4T 1M9
PHONE: 647.352.3350

OWNER:

FOR REVIEW

PROJECT NAME:

69 & 117 JOHN ST.
MISSISSAUGA

DRAWING TITLE:

MID-F1 FLOOR PLAN

PRINT DATE: 19-DEC-2022

NORTH

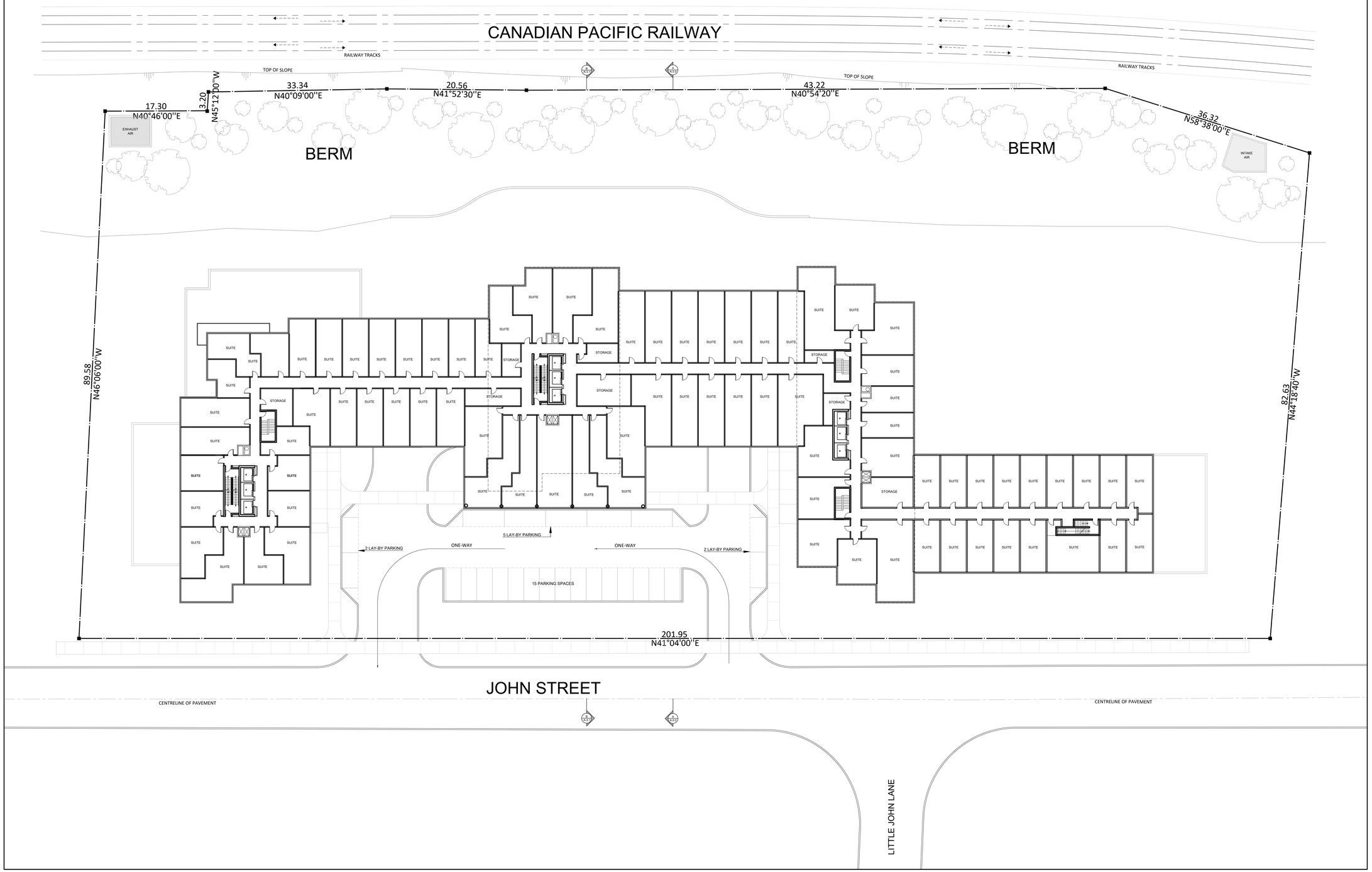
PROJ. No.: 1101

DEV APPLICATION NO:

SCALE: AS NOTED

DWG NO. **A2.1**

DRAWN BY: AJT



1 SECOND TO FOURTH FLOOR PLAN

CONSULTANTS:

DATE	No.	ISSUE
2022-12-19	02	FOR REVIEW
2022-04-22	01	PRELIMINARY COORDINATION

ARCHITECT:

TREGEBOV COGAN *ARCHITECT*

40 Saint Clair Avenue East, Suite 303
Toronto, ON M4T 1M9
PHONE: 647.352.3350

OWNER:

FOR REVIEW

PROJECT NAME:

69 & 117 JOHN ST.
MISSISSAUGA

DRAWING TITLE:

SECOND TO FOURTH FLOOR PLAN

PRINT DATE: 19-DEC-2022

NORTH

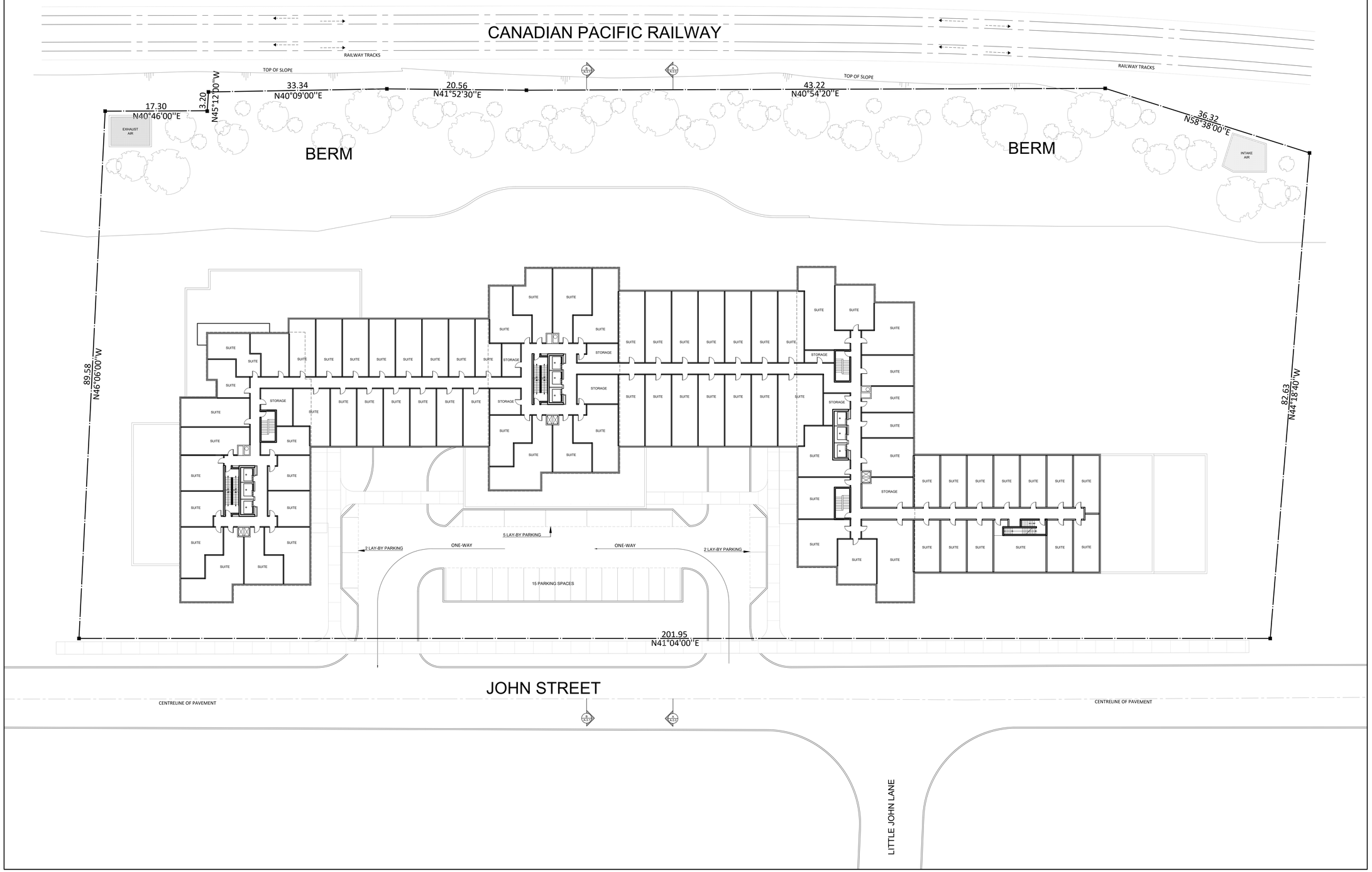
PROJ. No.: 1101

DEV APPLICATION NO:

SCALE: AS NOTED

DWG NO. **A2.2**

DRAWN BY: AJT



1 FIFTH TO SIXTH FLOOR PLAN

CONSULTANTS:

DATE	No.	ISSUE
2022-12-19	02	FOR REVIEW
2022-04-22	01	PRELIMINARY COORDINATION

ARCHITECT:
TREGEBOV COGAN *ARCHITECT*
40 Saint Clair Avenue East, Suite 303
Toronto, ON M4T 1M9
PHONE: 647.352.3350

OWNER:

FOR REVIEW

PROJECT NAME:
69 & 117 JOHN ST.
MISSISSAUGA

DRAWING TITLE:
FIFTH TO SIXTH FLOOR PLAN

PRINT DATE: 19-DEC-2022

NORTH

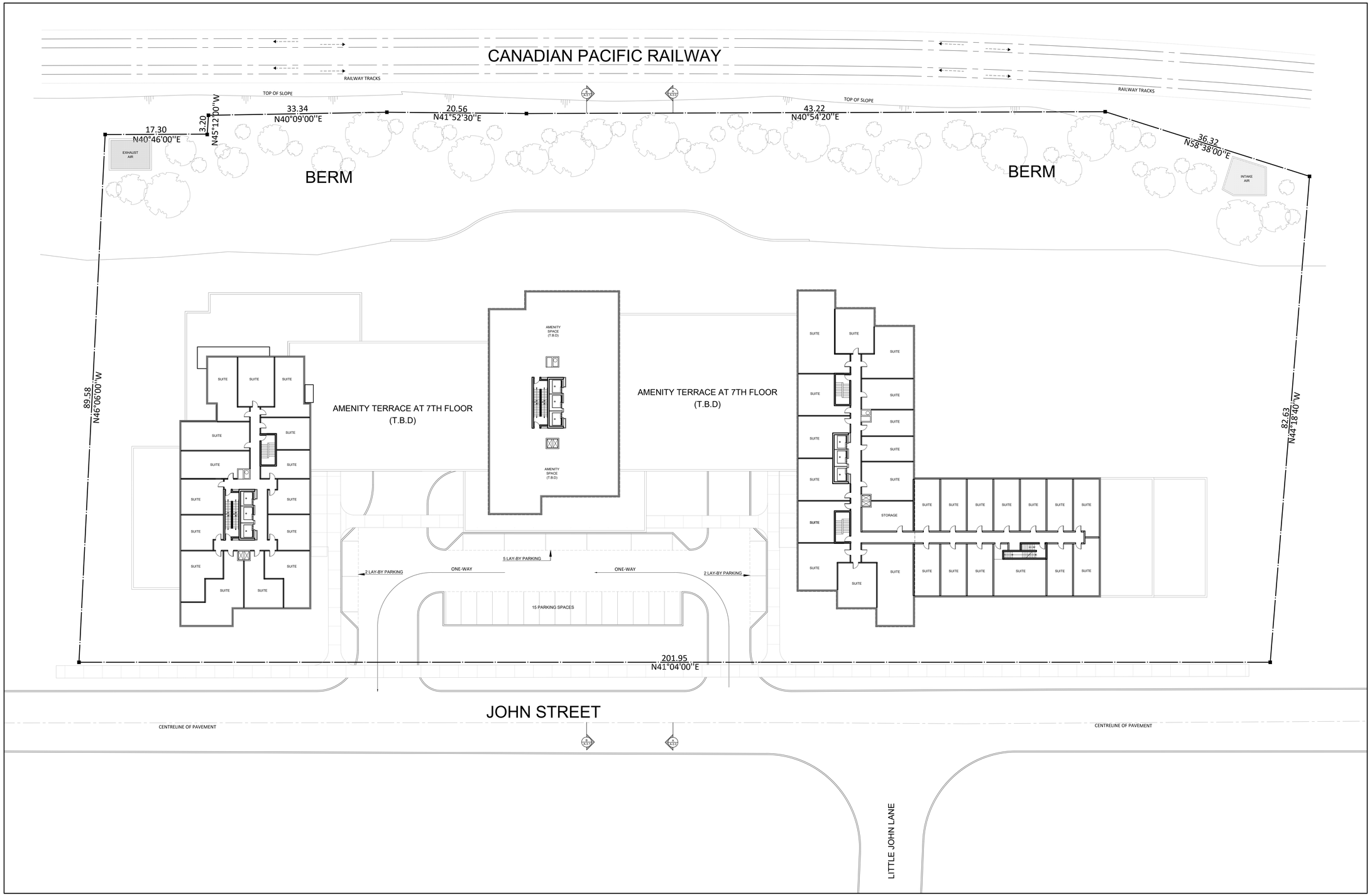
PROJ. No.: 1101

DEV APPLICATION NO:

SCALE: AS NOTED

DWG NO. **A2.3**

DRAWN BY: AJT



1 SEVENTH FLOOR PLAN

CONSULTANTS:

DATE	No.	ISSUE
2022-12-19	02	FOR REVIEW
2022-04-22	01	PRELIMINARY COORDINATION

ARCHITECT:

TREGEBOV COGAN *ARCHITECT*

40 Saint Clair Avenue East, Suite 303
Toronto, ON M4T 1M9
PHONE: 647.352.3350

OWNER:

FOR REVIEW

PROJECT NAME:

69 & 117 JOHN ST.
MISSISSAUGA

DRAWING TITLE:

SEVENTH FLOOR PLAN

PRINT DATE: 19-DEC-2022

NORTH

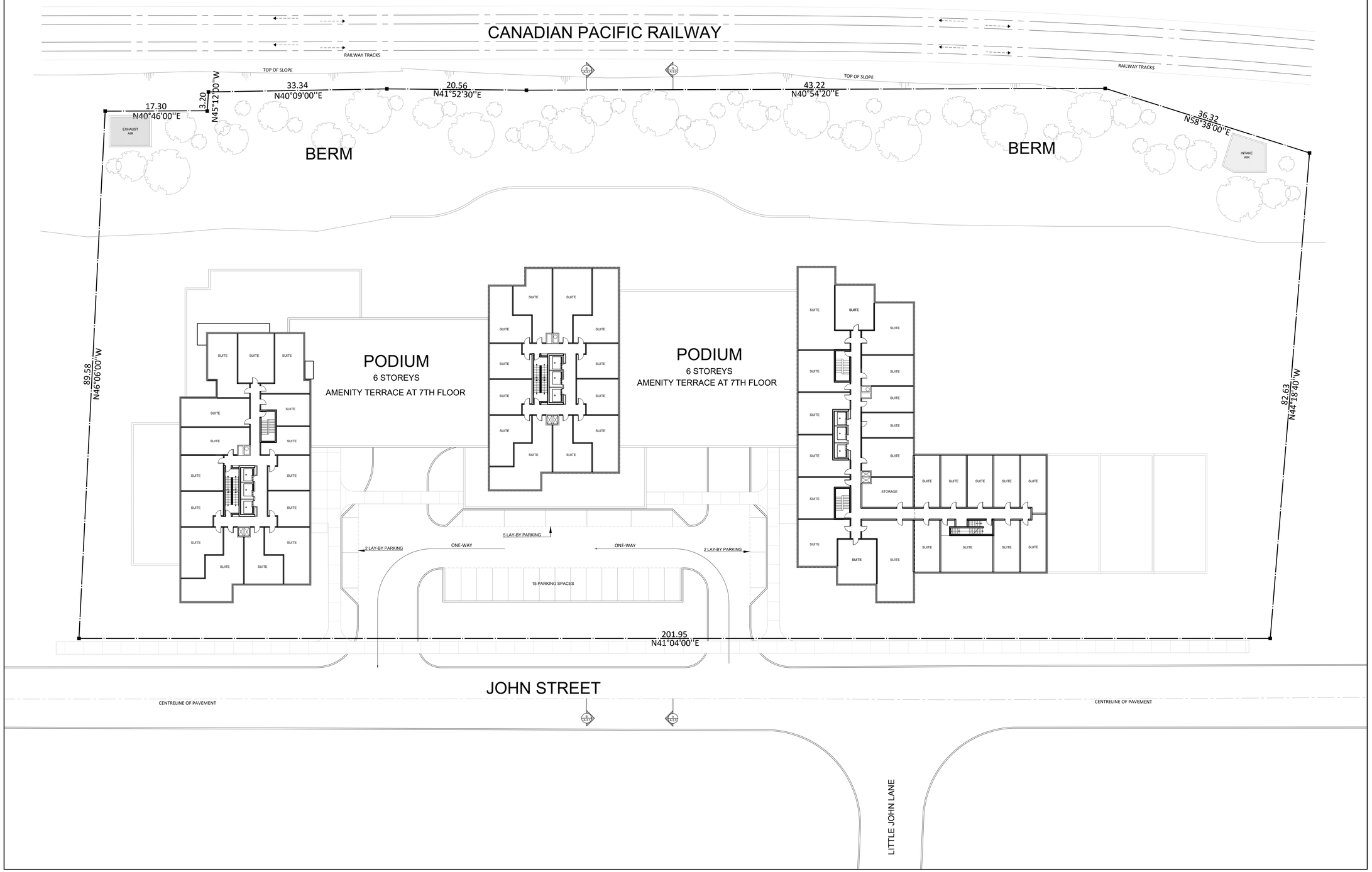
PROJ. No.: 1101

DEV APPLICATION NO:

SCALE: AS NOTED

DWG NO. **A2.4**

DRAWN BY: AJT



1 EIGHTH TO TENTH FLOOR PLAN

CONSULTANTS:

DATE	No.	ISSUE
2022-12-19	02	FOR REVIEW
2022-04-22	01	PRELIMINARY COORDINATION

ARCHITECT:

TREGEBOV COGAN *ARCHITECT*

40 Saint Clair Avenue East, Suite 303
Toronto, ON M4T 1M9
PHONE: 647.352.3350

OWNER:

FOR REVIEW

PROJECT NAME:

69 & 117 JOHN ST.
MISSISSAUGA

DRAWING TITLE:

EIGHTH TO TENTH FLOOR PLAN

PRINT DATE: 19-DEC-2022

NORTH

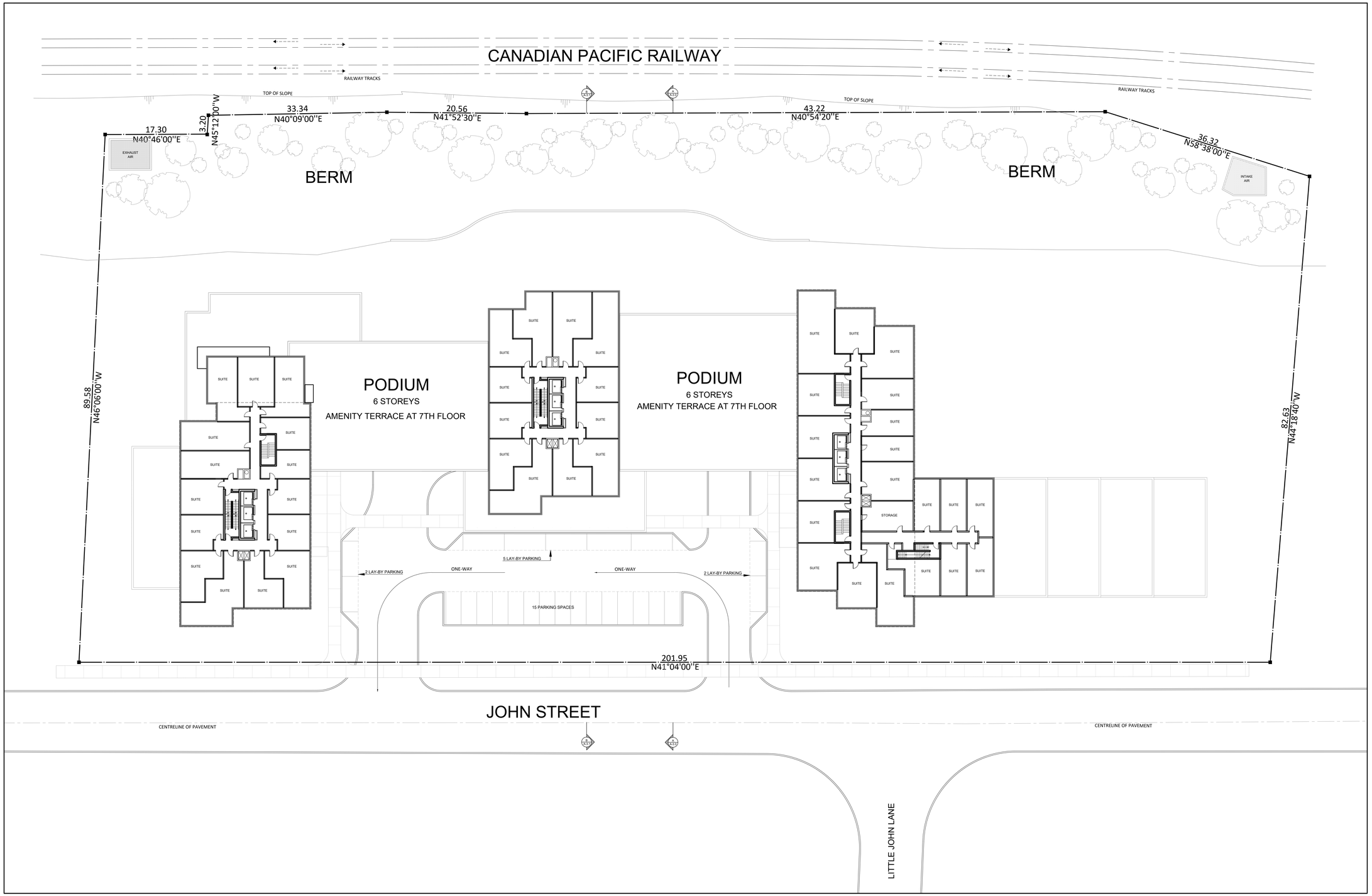
PROJ. No.: 1101

DEV APPLICATION NO:

SCALE: AS NOTED

DWG NO. **A2.5**

DRAWN BY: AJT



1 ELEVENTH TO TWELFTTH FLOOR PLAN

CONSULTANTS:

DATE	No.	ISSUE
2022-12-19	02	FOR REVIEW
2022-04-22	01	PRELIMINARY COORDINATION

ARCHITECT:

TREGEBOV COGAN *ARCHITECT*

40 Saint Clair Avenue East, Suite 303
Toronto, ON M4T 1M9
PHONE: 647.352.3350

OWNER:

FOR REVIEW

PROJECT NAME:

69 & 117 JOHN ST.
MISSISSAUGA

DRAWING TITLE:

ELEVENTH TO TWELFTH FLOOR PLAN

PRINT DATE: 19-DEC-2022

NORTH

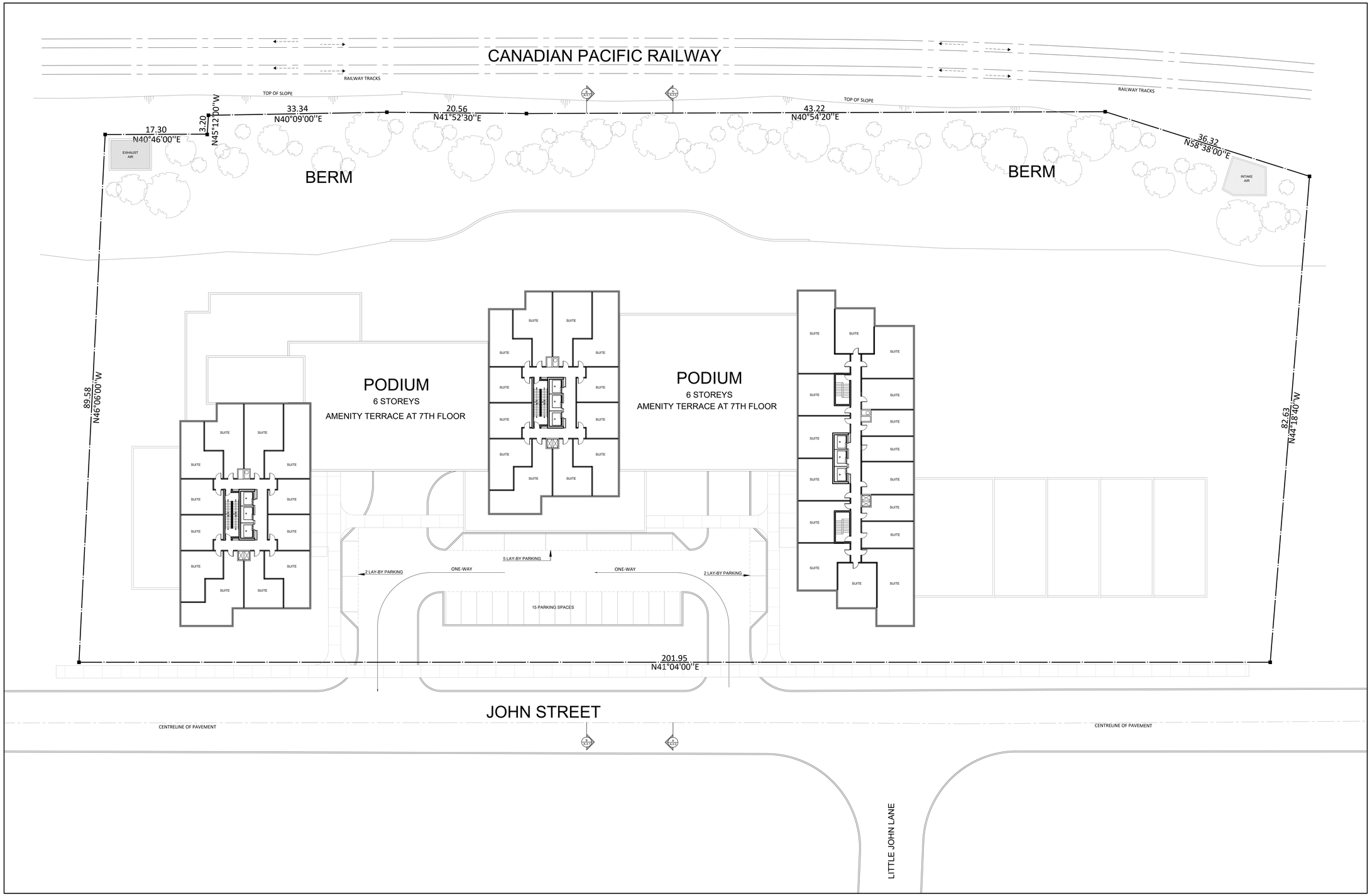
PROJ. No.: 1101

DEV APPLICATION NO:

SCALE: AS NOTED

DWG NO. **A2.6**

DRAWN BY: AJT



1 THIRTEENTH TO FOURTEENTH FLOOR PLAN

CONSULTANTS:

DATE	No.	ISSUE
2022-12-19	02	FOR REVIEW
2022-04-22	01	PRELIMINARY COORDINATION

ARCHITECT:
TREGEBOV COGAN *ARCHITECT*
40 Saint Clair Avenue East, Suite 303
Toronto, ON M4T 1M9
PHONE: 647.352.3350

OWNER:

FOR REVIEW

PROJECT NAME:
69 & 117 JOHN ST.
MISSISSAUGA

DRAWING TITLE:
THIRTEENTH TO FOURTEENTH FLOOR PLAN

PRINT DATE: 19-DEC-2022

NORTH

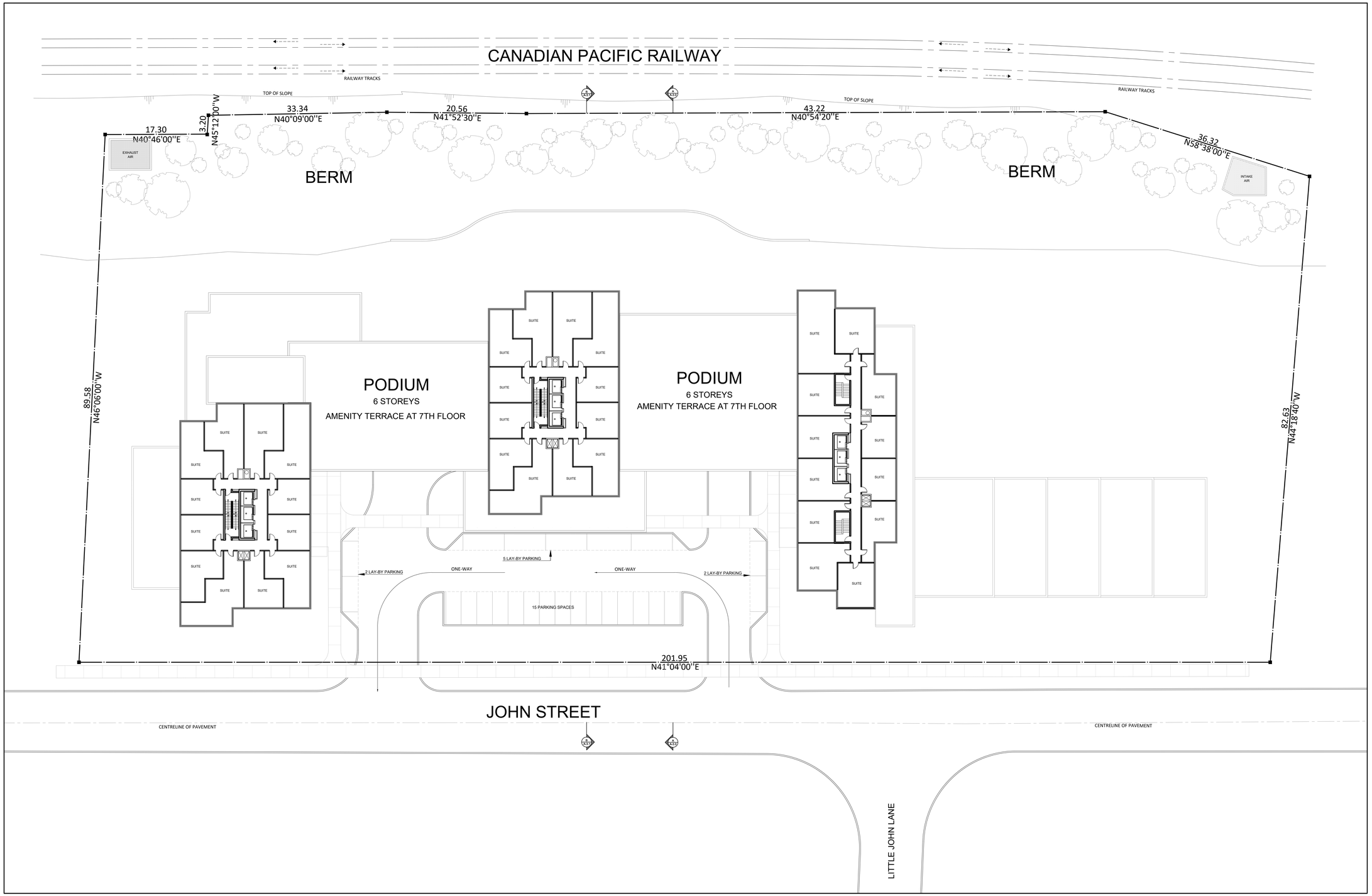
PROJ. No.: 1101

DEV APPLICATION NO:

SCALE: AS NOTED

DWG NO. **A2.7**

DRAWN BY: AJT



1 FIFTEENTH FLOOR PLAN

CONSULTANTS:

DATE	No.	ISSUE
2022-12-19	02	FOR REVIEW
2022-04-22	01	PRELIMINARY COORDINATION

ARCHITECT:

TREGEBOV COGAN *ARCHITECT*

40 Saint Clair Avenue East, Suite 303
Toronto, ON M4T 1M9
PHONE: 647.352.3350

OWNER:

FOR REVIEW

PROJECT NAME:

69 & 117 JOHN ST.
MISSISSAUGA

DRAWING TITLE:

FIFTEENTH FLOOR PLAN

PRINT DATE: 19-DEC-2022

NORTH

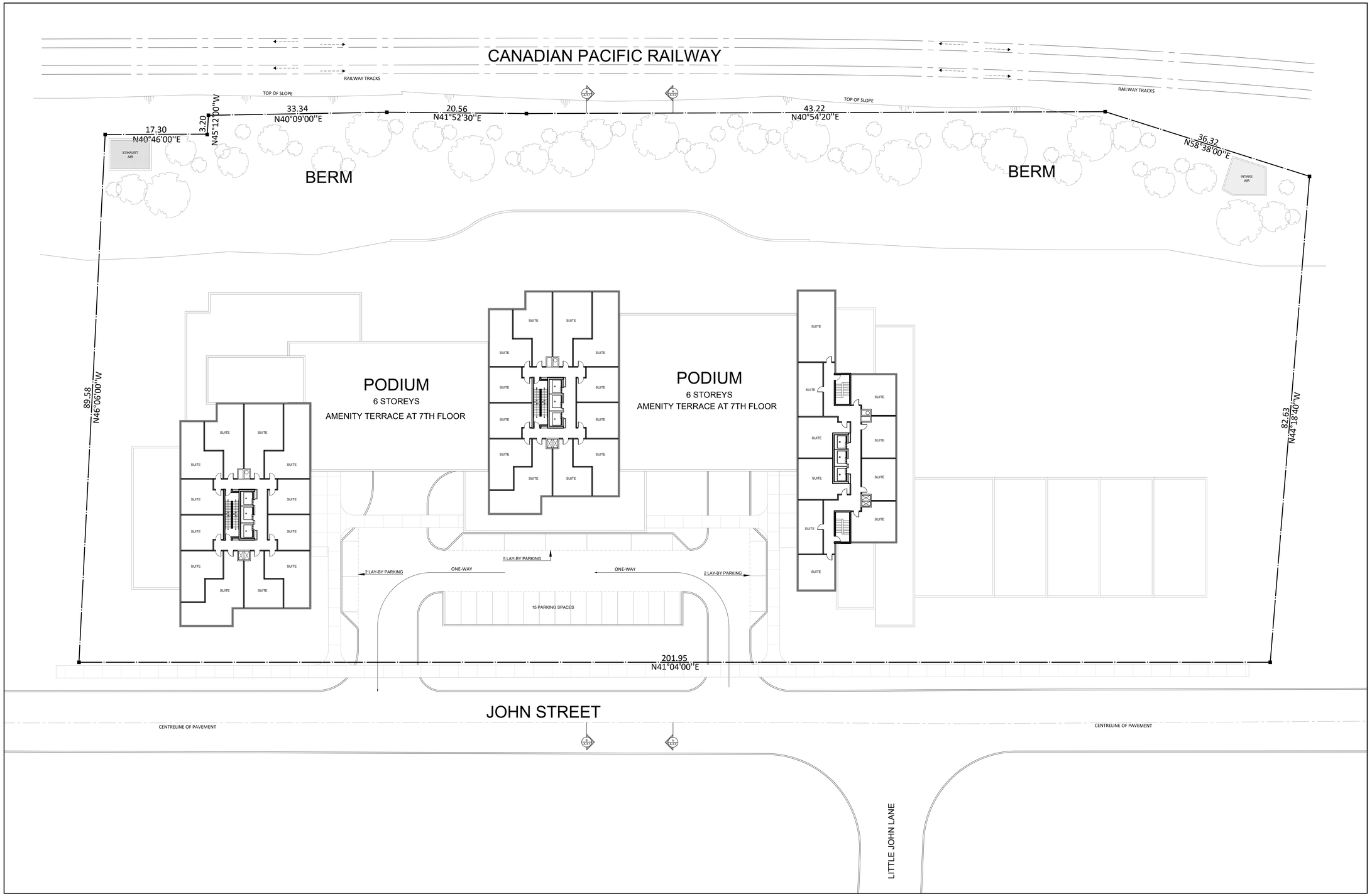
PROJ. No.: 1101

DEV APPLICATION NO:

SCALE: AS NOTED

DWG NO. **A2.8**

DRAWN BY: AJT



1 SIXTEENTH FLOOR PLAN

CONSULTANTS:

DATE	No.	ISSUE
2022-12-19	02	FOR REVIEW
2022-04-22	01	PRELIMINARY COORDINATION

ARCHITECT:

TREGEBOV COGAN *ARCHITECT*

40 Saint Clair Avenue East, Suite 303
Toronto, ON M4T 1M9
PHONE: 647.352.3350

OWNER:

FOR REVIEW

PROJECT NAME:

69 & 117 JOHN ST.
MISSISSAUGA

DRAWING TITLE:

SIXTEENTH FLOOR PLAN

PRINT DATE: 19-DEC-2022

NORTH

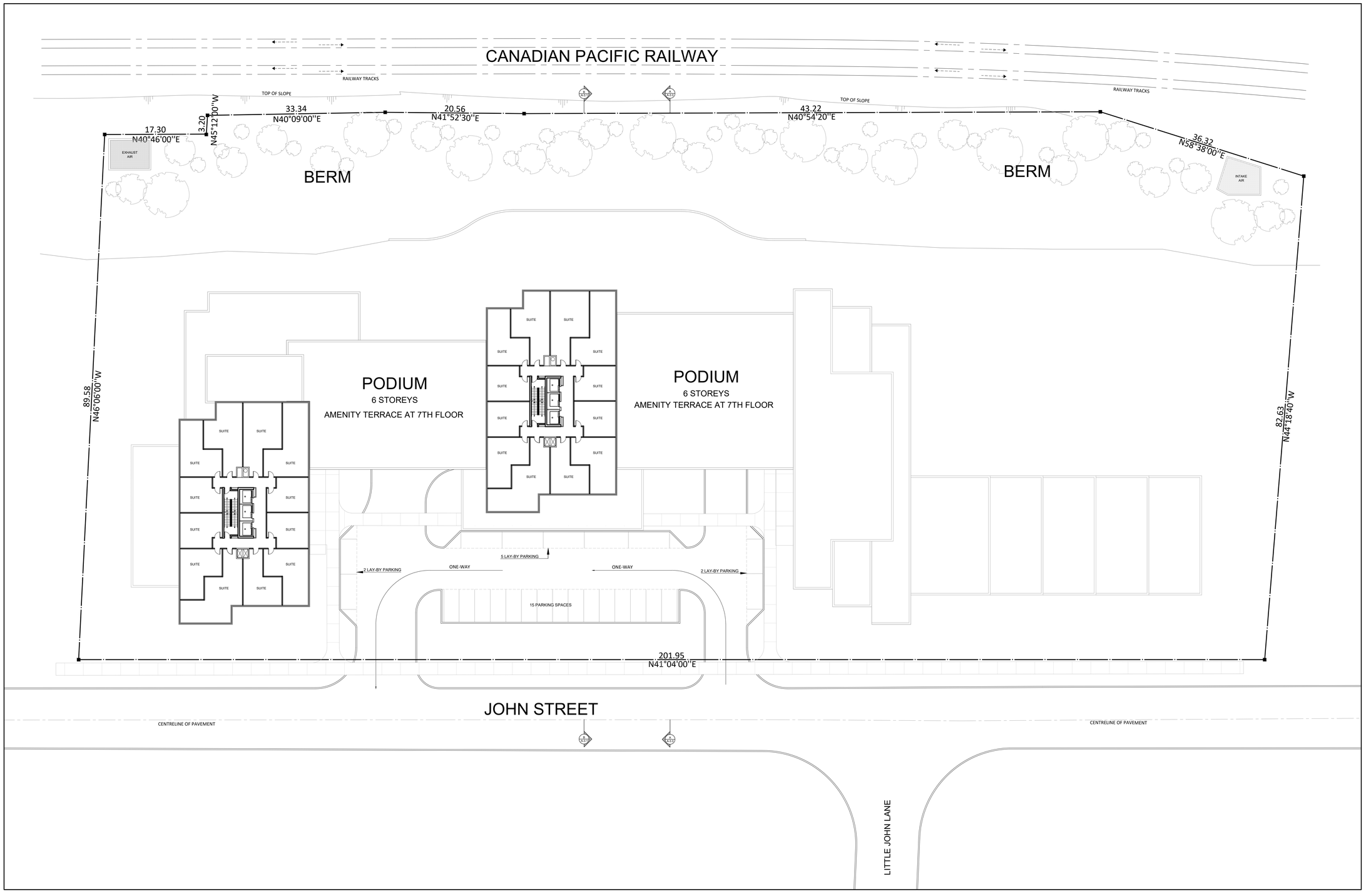
PROJ. No.: 1101

DEV APPLICATION NO:

SCALE: AS NOTED

DWG NO. **A2.9**

DRAWN BY: AJT



1 SEVENTEENTH TO TWENTY-FIFTH FLOOR PLAN

CONSULTANTS:

DATE	No.	ISSUE
2022-12-19	02	FOR REVIEW
2022-04-22	01	PRELIMINARY COORDINATION

ARCHITECT:

TREGEBOV COGAN *ARCHITECT*

40 Saint Clair Avenue East, Suite 303
Toronto, ON M4T 1M9
PHONE: 647.352.3350

OWNER:

FOR REVIEW

PROJECT NAME:

69 & 117 JOHN ST.
MISSISSAUGA

DRAWING TITLE:

SEVENTEENTH TO TWENTY-FIFTH FLOOR PLAN

PRINT DATE: 19-DEC-2022

NORTH

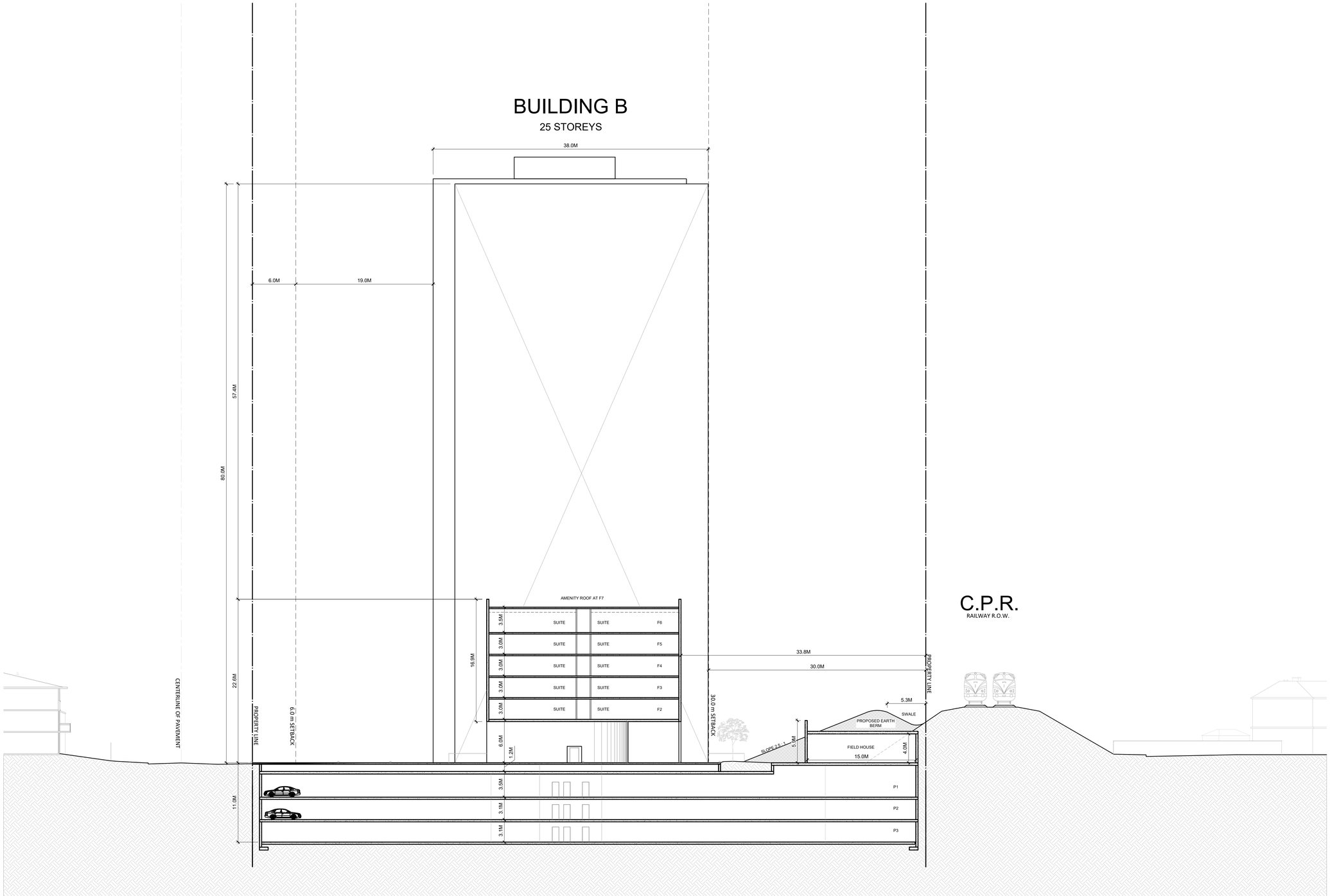
PROJ. No.: 1101

DEV APPLICATION NO:

SCALE: AS NOTED

DWG NO. **A2.10**

DRAWN BY: AJT



1 PODIUM SECTION

Scale: 1:250

CONSULTANTS:

DATE	No.	ISSUE
2022-12-19	02	FOR REVIEW
2022-04-22	01	PRELIMINARY COORDINATION

ARCHITECT:

TREGEBOV COGAN *ARCHITECT*

40 Saint Clair Avenue East, Suite 303
Toronto, ON M4T 1M9
PHONE: 647.352.3350

OWNER:

PROJECT NAME:

69 & 117 JOHN ST.
MISSISSAUGA

DRAWING TITLE:

SECTION A - PODIUM SECTION

PRINT DATE: 19-DEC-2022

PROJ. No.: 1101

DEV APPLICATION NO:

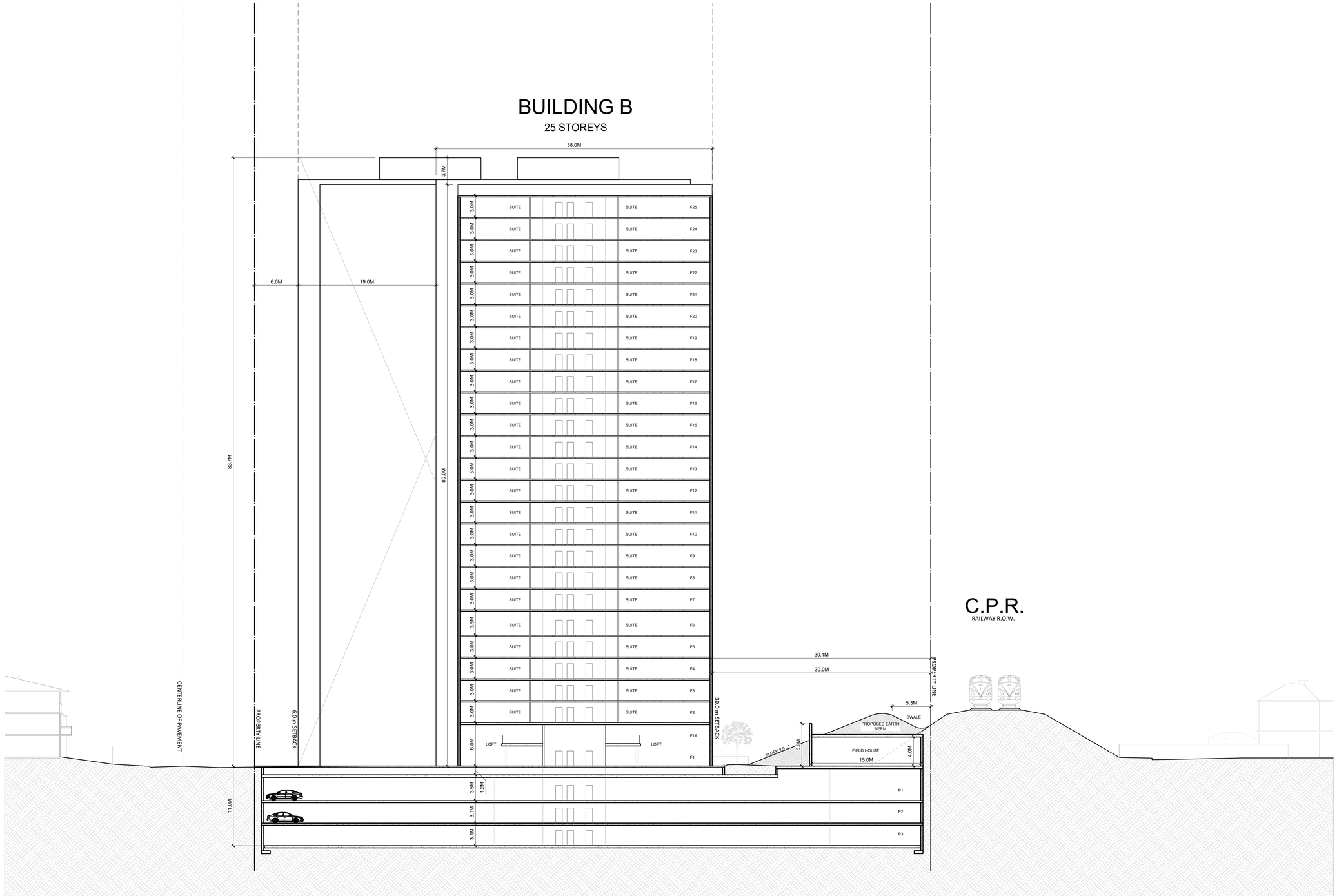
SCALE: AS NOTED

DWG NO. **A3.0**

DRAWN BY: AJT

BUILDING B

25 STOREYS



1 BUILDING B CROSS SECTION

Scale: 1:250

CONSULTANTS:

DATE	No.	ISSUE
2022-12-19	02	FOR REVIEW
2022-04-22	01	PRELIMINARY COORDINATION

ARCHITECT:

TREGEBOV COGAN *ARCHITECT*

40 Saint Clair Avenue East, Suite 303
Toronto, ON M4T 1M9
PHONE: 647.352.3350

OWNER:

PROJECT NAME:

69 & 117 JOHN ST.
MISSISSAUGA

DRAWING TITLE:

SECTION B - BUILDING SECTION

PRINT DATE: 19-DEC-2022

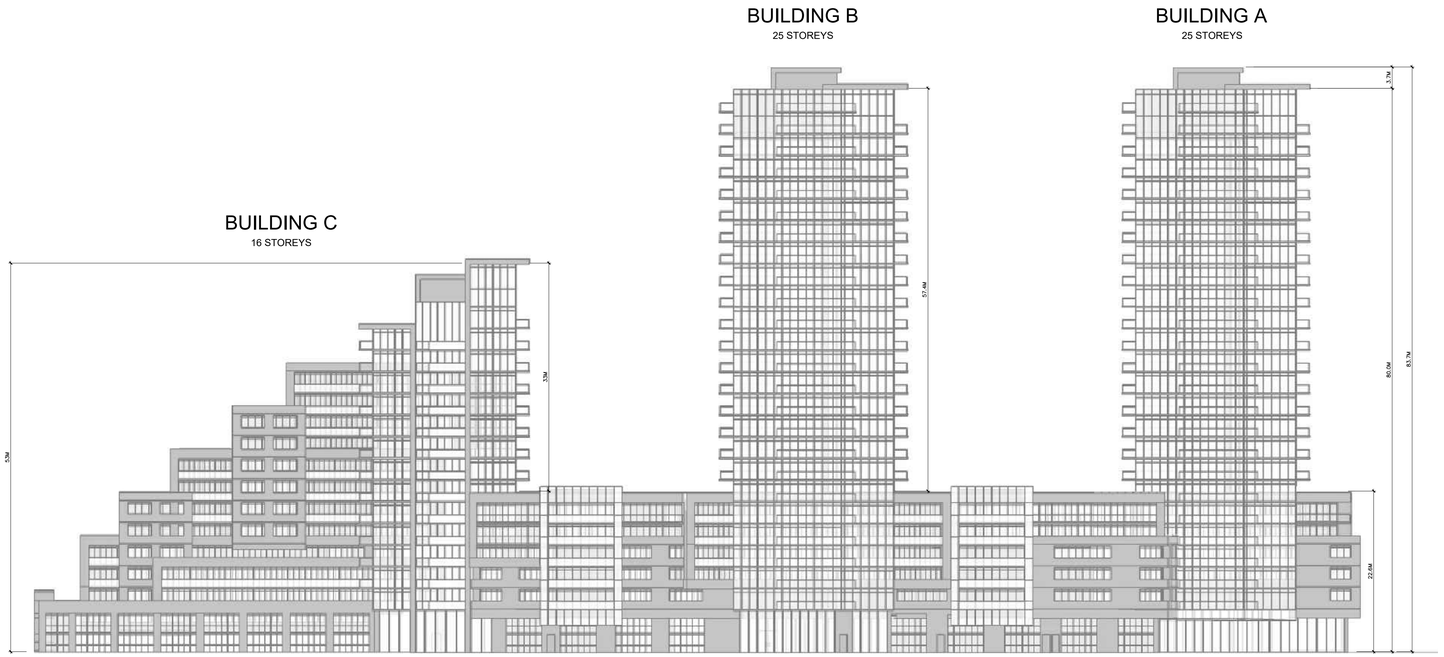
PROJ. No.: 1101

DEV APPLICATION NO:

SCALE: AS NOTED

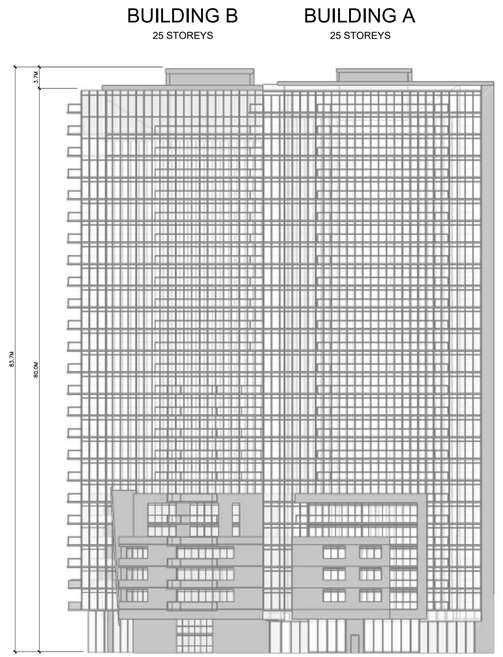
DWG NO. **A3.1**

DRAWN BY: AJT



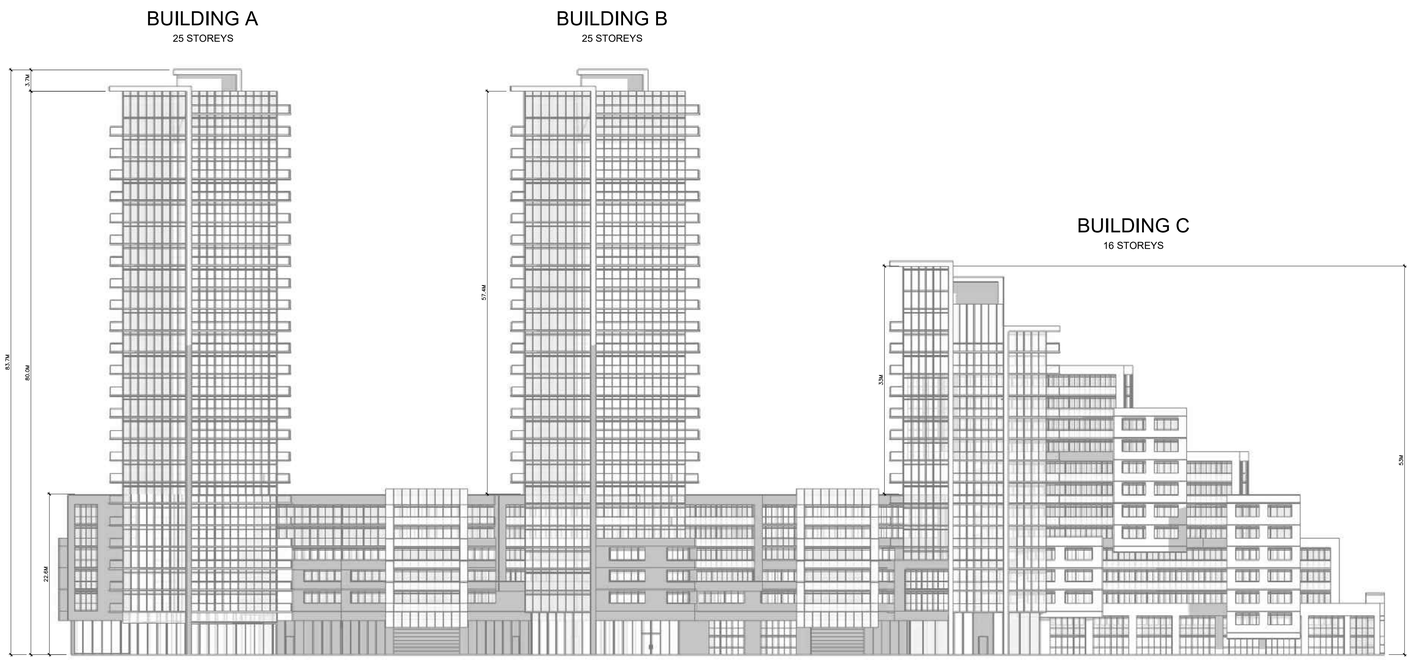
4 SOUTH ELEVATIONS

Scale: 1:400



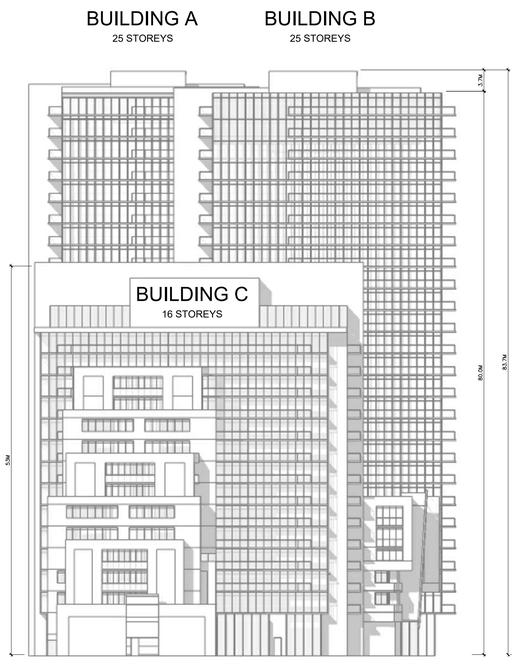
3 WEST ELEVATIONS

Scale: 1:400



2 NORTH ELEVATIONS

Scale: 1:400



1 EAST ELEVATIONS

Scale: 1:400

CONSULTANTS:

DATE	No.	ISSUE
2022-12-19	02	FOR REVIEW
2022-04-22	01	PRELIMINARY COORDINATION

ARCHITECT:
TREGEBOV COGAN *ARCHITECT*
40 Saint Clair Avenue East, Suite 303
Toronto, ON M4T 1M9
PHONE: 647.352.3350

OWNER:

PROJECT NAME:
69 & 117 JOHN ST.
MISSISSAUGA

DRAWING TITLE:
ELEVATIONS

PRINT DATE: 19-DEC-2022

PROJ. No.: 1101

DEV APPLICATION NO:

SCALE: AS NOTED

DRAWN BY: AJT

DWG NO. **A5.0**

PLAN OF TOPOGRAPHY OF

PART OF LOT 15
CONCESSION 1, North of Dundas Street

(GEOGRAPHIC TOWNSHIP OF TORONTO)

CITY OF MISSISSAUGA

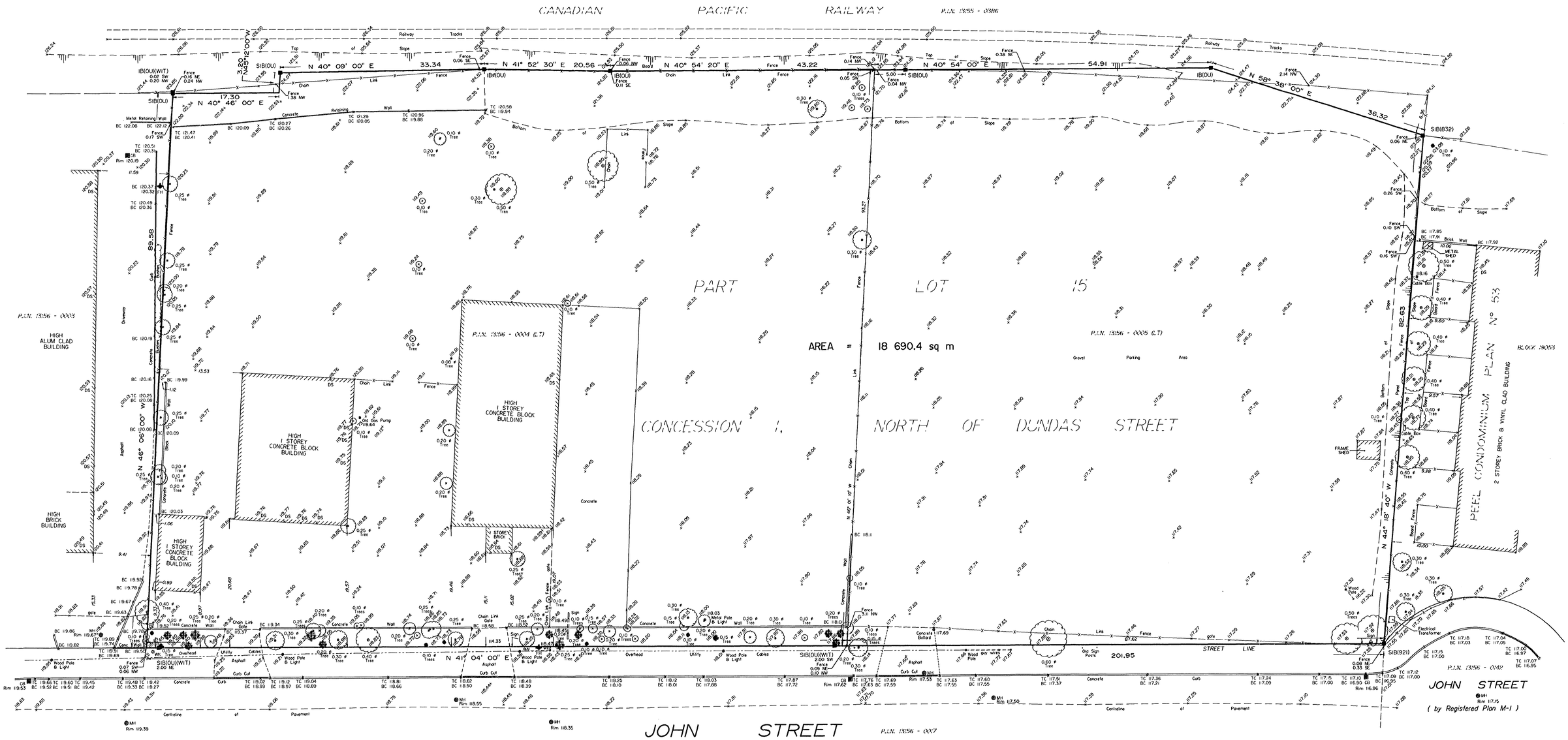
REGIONAL MUNICIPALITY OF PEEL

SCALE = 1 : 300

0 5 10 15 metres

NOTE

THIS PLAN AND REPORT WERE PREPARED FOR DUPONT VICTORIAN HOMES (MISSISSAUGA) LTD. AND THE UNDERSIGNED ACCEPTS NO RESPONSIBILITY FOR USE BY OTHER PARTIES.



LEGEND

□	DENOTES	MONUMENT PLANTED
■	DENOTES	MONUMENT FOUND
WT	DENOTES	WITNESS
SIB	DENOTES	STANDARD IRON BAR
IB	DENOTES	IRON BAR
IB#	DENOTES	ROUND IRON BAR
921	DENOTES	P. SALNA, O.L.S.
RL/832	DENOTES	R. P. LEEPER, O.L.S.
OU	DENOTES	ORIGIN UNKNOWN
P.I.N.	DENOTES	PROPERTY IDENTIFIER

LEGEND

TC	DENOTES	TOP OF CURB
BC	DENOTES	BOTTOM OF CURB
CB	DENOTES	CATCH BASIN
MH	DENOTES	MANHOLE
WK	DENOTES	WATER KEY
ø	DENOTES	DIAMETER
FH	DENOTES	FIRE HYDRANT
DS	DENOTES	DOORSILL ELEVATION

METRIC

DISTANCES SHOWN HEREON ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

ELEVATION NOTE

ELEVATIONS SHOWN HEREON IN METRES AND ARE RELATED TO CITY OF MISSISSAUGA DATUM. BENCH MARK N° 793 HAVING A PUBLISHED ELEVATION OF 110.955 METRES. TO OBTAIN GEODETIC ELEVATIONS (1978 G.S.C. RE-ADJUSTMENT), SUBTRACT 0.121 METRES FROM VALUES SHOWN HEREON.

BOUNDARY NOTE

BOUNDARY INFORMATION SHOWN HEREON IS TAKEN DIRECTLY FROM A PLAN OF SURVEY PREPARED BY D. H. BROWN, SURVEYING LTD., DATED MARCH 18TH, 2003 AND HAS NOT BEEN VERIFIED BY A FIELD SURVEY.

SURVEYOR'S CERTIFICATE

I CERTIFY THAT THE FIELDWORK REPRESENTED HEREON WAS COMPLETED FEBRUARY 2ND, 2004.

FEBRUARY 12th 2004
DATE

PETER J. HOMER
Ontario Land Surveyor

R&C RABIDEAU & CZERWINSKI
ONTARIO LAND SURVEYORS
777 THE QUEENSWAY, UNIT E, TORONTO, ONTARIO
M8Z 1N4 (416) 252-2511

DRAWN : J. H. MOHER | CHECKED BY : P.J.H | PLAN N° : RC6200

Appendix B

Borehole and Well Logs

Palmer, 2022 and Chung and Vander, 2019

Palmer

LOG OF BOREHOLE BH22-01

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

PROJECT LOCATION: City of Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826927.98 E 611489.09

Method: Hollow Stem Augers

Diameter: 200 mm

Date: Nov 3, 2022

REF. NO.: 2209001

ENCL NO.: 1

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION
119.1	Ground Surface						
0.0	**FILL:** silty sand, trace clay, trace to some gravel, brown, moist, compact to very dense contains rootlets concrete block/slab encountered		1	SS	15		Concrete Sand
1			2	SS	61/ initial 200mm		Bentonite 118 Sand
117.6							
1.5	**FILL:** silty sand, trace clay, trace gravel, trace wood pieces, brown, wet, loose to compact		3	SS	8		117
2			4	SS	22		
3							
116.0							Screen
3.1	**FILL:** gravelly sand, trace clay, trace silt, brown, moist to wet, loose		5	SS	9		W. L. 115.9 m Dec 22, 2022
115.4							
115.3	**FILL:** clayey silt, trace clay, trace gravel, brown, moist, loose						
3.8	**SILTY SAND:** trace silt, trace gravel, grey, moist to wet, compact		6	SS	11		115
4							
114.5							
4.6	**CLAYEY SILT TILL:** trace sand, trace gravel, grey, moist to wet, stiff		7	SS	11		Bentonite 114
5							
113.8							
5.3	**END OF BOREHOLE** 1. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (mBGS) Dec 22, 2022 3.21						

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ε_f=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-02

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

Method: Hollow Stem Augers

PROJECT LOCATION: City of Mississauga, ON

Diameter: 200 mm

REF. NO.: 2209001

DATUM: Geodetic

Date: Nov 3, 2022 to Nov 4, 2021

ENCL NO.: 2

BH LOCATION: See Borehole Location Plan N 4826875.93 E 611443.05

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION
119.0	Ground Surface						
0.0	**FILL:** gravelly sand, trace clay, trace silt, brown to grey, moist, compact		1	SS	16		Concrete / Sand
118.2							Bentonite
0.8	**FILL:** silty sand, some gravel, trace clay, brown, moist, compact to loose		2	SS	20		118 / Sand
1			3	SS	7		117
116.7	contains metal chain link fence garbage, moved location 1.5m						
2.3	**FILL:** gravelly sand, trace clay, trace silt, grey, moist, compact to loose		4	SS	21		
3			5	SS	10		Screen / W. L. 116.0 m Dec 22, 2022
115.4							
3.6	**FILL:** clayey silt, trace sand, trace gravel, grey, moist, loose						
115.2							
3.8	**SANDY SILT TILL:** trace gravel, trace clay, grey, moist to wet, compact to loose		6	SS	13		115
4							
5			7	SS	7		Bentonite / 114
113.7							
5.3	**END OF BOREHOLE** 1. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (mBGS) Dec 22, 2022 3.05						

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES

+3, ×3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-03

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

Method: Hollow Stem Augers

PROJECT LOCATION: City of Mississauga, ON

Diameter: 200 mm

REF. NO.: 2209001

DATUM: Geodetic

Date: Nov 4, 2021

ENCL NO.: 3

BH LOCATION: See Borehole Location Plan N 4826813.65 E 611391.18

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
119.7	Ground Surface											
0.0	**FILL:** silty sand, trace clay, trace gravel, contains cobbles, brown, moist, loose		1	SS	6		Concrete / Sand					
			2	SS	7		Bentonite / Sand					
118.2							118					
1.5	**FILL:** gravelly sand, trace silt, contains cobbles, brown to grey, moist to wet, very loose		3	SS	3							
	wet below 2.6m		4	SS	2		117 Screen					
116.6												
3.1	**FILL:** silty sand, trace clay, grey, moist, compact		5	SS	11		116					
			6	SS	26		W. L. 115.4 m Dec 22, 2022					
115.1							115					
4.6	**CLAYEY SILT TILL:** trace sand, trace gravel, grey, wet, very stiff		7	SS	25		Bentonite					
114.4												
5.3	**END OF BOREHOLE** 1. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (BGS) Dec 22, 2022 4.3m											

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ε_f=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-04

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

PROJECT LOCATION: City of Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826909.39 E 611517.39

Method: Hollow Stem Augers

Diameter: 200 mm

Date: Nov 3, 2022

REF. NO.: 2209001

ENCL NO.: 4

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
117.7	Ground Surface											
0.0	**FILL:** silty sand, trace to some clay, trace gravel, contains silty clay pockets, contains cobbles, brown, moist, compact to loose contains rootlets		1	SS	13		117					
1			2	SS	10							
116.2												
1.5	**FILL:** sand, some silty, trace clay, trace gravel, contains cobbles, brown, moist, compact		3	SS	22		116					
2												
115.5												
2.3	**FILL:** clayey silt, trace sand, trace gravel, some organics, brown, wet, very loose contains silty clay pocket		4	SS	4		115					
115.0												
2.7	**SILT:** some clay, trace sand, brown, wet, very loose											
3												
114.7												
3.1	**SILTY SAND TILL:** trace clay, some gravel, brown, wet, loose		5	SS	10		114					
113.9												
3.8	**CLAYEY SILT TILL:** some sand, trace gravel, contains cobbles, brown to grey, moist to wet, very stiff to very hard		6	SS	18							17 15 47 21
4												
5			7	SS	24		113					
6							112					
111.2			8	SS	67/ 275mm							
6.5	**END OF BOREHOLE**											

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

$+^3$, $\times^3$: Numbers refer to Sensitivity

$\circ^{\varepsilon_f=3\%}$ Strain at Failure

Palmer

LOG OF BOREHOLE BH22-05

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

Method: Hollow Stem Augers

PROJECT LOCATION: City of Mississauga, ON

Diameter: 200 mm

REF. NO.: 2209001

DATUM: Geodetic

Date: Nov 3, 2022

ENCL NO.: 5

BH LOCATION: See Borehole Location Plan N 4826872.93 E 611478.93

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS / 0.3 m	ELEVATION
118.0	Ground Surface				
0.0	**FILL:** sand, trace silt, some gravel, dark brown to brown, moist, compact	1	SS	17	
		2	SS	20	117
		3	SS	12	
115.7	silty clay layers				116
2.3	**FILL:** silt, some sand, trace clay, brown, moist to wet, very loose	4	SS	4	
114.9					115
3.1	**FILL:** sand, trace silt, brown, moist to wet, loose	5	SS	9	
113.9					114
4.1	**CLAYEY SILT TILL:** trace sand, trace gravel, brown to grey, moist, firm to very stiff	6	SS	8	
		7	SS	16	113
	grey below 6.1m				112
		8	SS	70	
111.1					
6.9	**END OF BOREHOLE**				

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
- ○ UNCONFINED
- ● QUICK TRIAXIAL
- + FIELD VANE & Sensitivity
- × LAB VANE

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L

WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

$+^3$, $\times^3$: Numbers refer to Sensitivity

ε_f=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-06

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

PROJECT LOCATION: City of Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826880.91 E 611535.11

Method: Solid Stem Augers

Diameter: 150 mm

Date: Nov 3, 2022

REF. NO.: 2209001

ENCL NO.: 6

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION
117.4	Ground Surface						
0.0	**FILL:** sand, trace silt, some gravel, contains rootlets, brown, moist to wet, compact		1	SS	17		117
			2	SS	20		
	contains clayey silt pockets		3	SS	12		116
115.1							
2.3	**FILL:** clayey silt, trace sand, trace gravel, brown, moist, very loose		4	SS	4		115
114.7							
2.7	**SILT:** some clay, trace sand, brown, wet, very loose						
114.4							
3.1	**SILTY CLAY:** trace to some sand, trace gravel, brown, moist, stiff		5	SS	9		114
113.6							
3.8	**CLAYEY SILT TILL:** trace sand, trace gravel, brown to grey, moist, firm to very stiff		6	SS	8		113
	grey below 4.6m		7	SS	16		
							112
			8	SS	70		
111.1							
6.4	**END OF BOREHOLE**						

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
$+^{3}$, $\times^{3}$: Numbers refer to Sensitivity
○ ^{6}=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-07

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

PROJECT LOCATION: City of Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826796.32 E 611439.19

Method: Hollow Stem Augers

Diameter: 200 mm

Date: Nov 4, 2022

REF. NO.: 2209001

ENCL NO.: 7

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
119.1	Ground Surface											
0.0	**FILL:** sand, some gravel, trace silt, contains clayey silt pocket, dark brown to brown, moist to wet, compact		1	SS	16		Concrete / Sand		○			
1			2	SS	12		118		○			
117.5												
1.5	**FILL:** silt, some sand, trace clay, brown, wet, loose		3	SS	6		Bentonite		○			
2							117					
116.8												
2.3	**FILL:** sand, some silt, trace clay, brown, moist to wet, loose to compact		4	SS	9				○			
3	contains silt layer and organic pockets		5	SS	19		Sand 116		○			
4			6	SS	18		W. L. 115.2 m Dec 22, 2022		○			
114.5							Screen					
4.6	**SILTY CLAY:** some sand, trace gravel, brown, moist to wet, very stiff		7	SS	18		114		○			
5												
113.7												
5.3	**CLAYEY SILT TILL:** trace sand, trace gravel, contains shale fragments, grey, moist, very hard											
6							113					
112.7			8	SS	84/ initial 225mm		Bentonite		○			
6.3	**END OF BOREHOLE** 1. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (BGS) Dec 22, 2022 3.83m											

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε_f=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-08

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

Method: Hollow Stem Augers

PROJECT LOCATION: City of Mississauga, ON

Diameter: 200 mm

REF. NO.: 2209001

DATUM: Geodetic

Date: Nov 4, 2022

ENCL NO.: 8

BH LOCATION: See Borehole Location Plan N 4826809.63 E 611477.31

SOIL PROFILE			SAMPLES												
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
117.9 Ground Surface												
0.0	Straight augered to 4.6m, no sample collected						Concrete Sand Bentonite 117 Sand 116 W. L. 115.3 m Dec 22, 2022 115 Screen 114					
113.4												
4.6	**END OF BOREHOLE** 1. Upon completion of drilling, a 50mm diameter monitoring wells was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (mBGS) Dec 22, 2022 2.67											

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε_f=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-09

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

PROJECT LOCATION: City of Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826775.85 E 611404.33

Method: Hollow Stem Augers

Diameter: 200 mm

Date: Nov 4, 2022

REF. NO.: 2209001

ENCL NO.: 9

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION
119.4	Ground Surface						
0.0	**FILL:** sand, trace to some silt, trace to some gravel, contains cobbles, contains rootlets, dark brown to brown, moist to wet, compact		1	SS	13	Concrete / Sand	119
			2	SS	20		118
			3	SS	23	Bentonite	
			4	SS	28	Sand	117
	wet below 3.8m		5	SS	18		116
			6	SS	14	W. L. 115.3 m Dec 22, 2022	115
114.8							
4.6	**CLAYEY SILT TILL:** some sand, trace gravel, contains cobbles, brown to grey, moist, stiff to very stiff		7	SS	11	Screen	114
	contains shale fragment, grey below 6.1m		8	SS	26	Bentonite	113
112.8							
6.6	**END OF BOREHOLE** 1. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (mBGS) Dec 22, 2022 4.1						

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-10

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

PROJECT LOCATION: City of Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826815.3 E 611421.09

Method: Hollow Stem Augers

Diameter: 200 mm

Date: Nov 4, 2022

REF. NO.: 2209001

ENCL NO.: 10

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION
119.1	Ground Surface						
0.0	**FILL:** sand, some gravel, trace silt, contains rootlets, contains brick pieces, brown, moist to wet, compact		1	SS	16		119
			2	SS	22		118
			3	SS	30		117
			4	SS	29		
	wet below 3.8m		5	SS	29		116
			6	SS	13		115
114.7							
4.4	**SILT:** trace clay, trace sand, contains sand layers, brown, wet, compact		7	SS	16		
114.1							114
5.0	**SILTY CLAY:** some sand, trace gravel, contains shale fragments, grey, wet, very stiff to very hard						
113.0			8	SS	50/ initial 50mm		113
6.2	**END OF BOREHOLE**						

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ε=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-11

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

Method: Hollow Stem Augers/Rock Coring

PROJECT LOCATION: City of Mississauga, ON

Diameter: 200 mm/96 mm

REF. NO.: 2209001

DATUM: Geodetic

Date: Nov 10, 2022 to Nov 11, 2022

ENCL NO.: 11

BH LOCATION: See Borehole Location Plan N 4826869.87 E 611504.27

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
117.7	Ground Surface											
117.6 0.1	**TOPSOIL:** 100mm						Concrete					
117.0 0.7	**FILL:** gravelly sand, some silt, trace clay, trace gravel, dark brown, moist, compact		1	SS	17		Sand					
1	**FILL:** sand to silty sand, some silt, trace clay, trace to some gravel, trace wood pieces, dark brown, moist, compact		2	SS	15		117					
2 115.5			3	SS	11		116					
2.2	**SILTY SAND:** some clay, trace gravel, contains clayey silt layer, contains silt layer, brown, moist, compact		4	SS	14		115					
3			5	SS	13	▽	W. L. 114.7 m Dec 22, 2022					
4 113.6							114					
4.1	**CLAYEY SILT TILL:** trace sand, trace gravel, brown to grey, moist, very stiff		6	SS	20		Bentonite					
5							113					
6			7	SS	39		112					
7 110.6							111					
7.1	**SHALE:** highly weathered, grey, wet											
109.9			8	SS	79/ initial 200mm		110					
8 7.8	**ROCK CORING STARTS, REFER TO ROCK CORE LOG**						109					
9							Sand					
10							108					
11							Screen					
12 105.4							106					
12.3	**END OF BOREHOLE**						Bentonite					

1. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole.
2. Water Level Readings:

Date	W. L. Depth (mBGS)
Dec 22, 2022	3.0

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε_f=3% Strain at Failure

Palmer

LOG OF ROCK CORE BH22-11

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc | Method: Hollow Stem Augers/Rock Coring | REF. NO.: 2209001

LOCATION: City of Mississauga, ON | Diameter: 200 mm/96 mm | ENCL NO.: 11

DATUM: Geodetic | Date: Nov-10-2022 to Nov-11-2022

BH LOCATION: See Borehole Location Plan N 4826869.87 E 611504.27

(m) ELEV / DEPTH	ROCK DESCRIPTION	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES	Weathering Index	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm^3) E (GPa)
109.9 0.0	Rock Surface															
109.8 0.1	**GEORGIAN BAY FORMATION:** highly weathered to moderately weathered, laminated to thinly bedded with fragmented layers, very weak to weak, grey **SHALE**		1	HQ	100	82	N/A	78	20 2 1 1 1	Soft Layer: 7.82m-8.03m Fracture: 8.13-8.15m (15°) Fragment Zone: 8.23m-8.28m	W4 - W3					
108.5 9.2	**GEORGIAN BAY FORMATION:** moderately to slightly weathered, laminated to thinly bedded with fragmented layers, weak to medium strong, grey **SHALE**		2	HQ	100	95	N/A	83	2 3 2 1 3	Soft Layer: 9.6m-9.63m Fragment Zone: 9.77m-9.79m, 10.11m-10.15m	W3 - W2				18.9	
107.0 10.7			3	HQ	100	100	N/A	60	2 5 4 3 3							
105.4 12.3	**END OF BOREHOLE** 1. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (mBGS) Dec 22, 2022 3.0															

Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered θ = angle to the core axis E = Modulus of Elasticity

*: UCS [Mpa]≈ 24 $I_{S(50)}$

Palmer

LOG OF BOREHOLE BH22-12

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

Method: Hollow Stem Augers/Rock Coring

PROJECT LOCATION: City of Mississauga, ON

Diameter: 200 mm/96 mm

REF. NO.: 2209001

DATUM: Geodetic

Date: Nov 10, 2022

ENCL NO.: 12

BH LOCATION: See Borehole Location Plan N 4826843.5 E 611504.4

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
117.8	Ground Surface											
117.7 / 0.1	**TOPSOIL:** 100mm		1	SS	66		117					
117.1 / 0.7	**FILL:** gravelly sand, trace silt, contains cobbles, contains rootlets, grey, moist, very dense											
1	**FILL:** sand, some silt, trace clay, trace rootlets, contains cobbles, brown, moist, compact to very loose		2	SS	13							
2			3	SS	3		116					
115.6 / 2.2	**FILL:** silty sand, some clay, some gravel, contains cobbles, contains pottery pieces, brown, moist to wet, compact		4	SS	25							
114.8 / 3.0	wet below 2.7m						115					
3	**SILTY SAND:** trace clay, trace gravel, brown, wet, compact		5	SS	11							
113.7 / 4.1	contains silt pockets						114					
4	**CLAYEY SILT TILL:** some sand, trace gravel, contains shale fragments, grey, moist to wet, very stiff to hard		6	SS	18		113					
5												
6			7	SS	34		112					19 21 48 12
110.7 / 7.2	**SHALE:** highly weathered, trace gravel, grey, wet						111					
110.1 / 7.8	**ROCK CORING STARTS, REFER TO ROCK CORE LOG**		8	SS	50/ initial 125mm		110					
8												
9							109					
10							108					
11							107					
12							106					
105.5 / 12.3	**END OF BOREHOLE** 1. Borehole was open upon completion of drilling.											

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

Palmer

LOG OF ROCK CORE BH22-12

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

LOCATION: City of Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826843.5 E 611504.4

Method: Hollow Stem Augers/Rock Coring

Diameter: 200 mm/96 mm

Date: Nov-10-2022

REF. NO.: 2209001

ENCL NO.: 12

(m) ELEV / DEPTH	ROCK DESCRIPTION	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES	Weathering Index	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm^3) E (GPa)
110.2	Rock Surface															
7.6 / 110.2	**GEORGIAN BAY FORMATION:** Moderately weathered to slightly weathered, laminated to thinly bedded, grey, weak **SHALE** (92~96%), Moderately weathered, light grey, weak to medium strong **LIMESTONE** (4~8%)		1	HQ	100	93	0	47	5 3 2 2 6	Fragmented Zone: 7.62m-7.67m, 8.84m-8.89m	W3-W2					
9.2 / 108.1			2	HQ	100	100	39	62	4 1 4 3 1	Hard Layer: 9.82m-10.31m Fracture: 9.47m-9.50m (90°), 9.82m-9.93m (90°)					18	
9.7 / 107.1	**GEORGIAN BAY FORMATION:** **SHALE** (80~90%), Moderately weathered to slightly weathered, laminated to thinly bedded, grey, weak to medium strong, **LIMESTONE** (10~20%), Slightly weathered, light grey, weak to medium strong		3	HQ	100	96	18	66	5 1 2 1 4	Soft Layer: 10.84m-10.88m 10.85m ~ 10.88m Hard Layer: 11.46m-11.58m, 12.09m-12.24m Broken Zone: 12.07m-12.09m						
10.7 / 105.5																
12.3	**END OF BOREHOLE** 1. Borehole was open on completion of drilling.															

Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered

θ = angle to the core axis

E = Modulus of Elasticity

*: UCS [Mpa]≈ 24 $I_{S(50)}$

Palmer

LOG OF BOREHOLE BH22-13

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

Method: Hollow Stem Augers/Rock Coring

PROJECT LOCATION: City of Mississauga, ON

Diameter: 200 mm/96 mm

REF. NO.: 2209001

DATUM: Geodetic

Date: Nov 8, 2022 to Nov 9, 2022

ENCL NO.: 13

BH LOCATION: See Borehole Location Plan N 4826834.89 E 611436.88

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
118.7	Ground Surface							
118.6 0.1	**TOPSOIL:** 100mm							
	FILL: silty sand to sand, trace clay, trace gravel, contains cobbles and limestone pieces, brown, moist, compact		1	SS	13		118	
117.2			2	SS	65			
1.5	**FILL:** clayey silt, some sand to sandy, trace gravel, trace brick fragments, brown, moist to wet, very stiff		3	SS	29		117	
116.4 2.3	wet below 2m		4	SS	12		116	
	SILTY SAND: trace clay, trace gravel, contains cobbles, contains clayey silt pocket, brown, wet, compact		5	SS	14		115	6 64 22 8
114.5								
4.2	**SANDY SILT:** some clay, grey, wet, loose		6	SS	8		114	
113.0							113	
5.7	**CLAYEY SILT TILL/SHALE COMPLEX:** trace sand, trace gravel, grey, wet, very dense		7	SS	50/ initial 125mm		112	
111.0							111	
7.7	**ROCK CORING STARTS, REFER TO ROCK CORE LOG**		8	SS	50/ initial 100mm		110	
							109	
							108	
							107	
							106	
							105	
							104	
103.4								
15.2	**END OF BOREHOLE** 1. Borehole was open upon completion of drilling.							

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES

$+^3$, $\times^3$: Numbers refer to Sensitivity

○ $^{\varepsilon_f}$=3% Strain at Failure

Palmer

LOG OF ROCK CORE BH22-13

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc | Method: Hollow Stem Augers/Rock Coring | REF. NO.: 2209001

LOCATION: City of Mississauga, ON | Diameter: 200 mm/96 mm | ENCL NO.: 13

DATUM: Geodetic | Date: Nov-08-2022 to Nov-09-2022

BH LOCATION: See Borehole Location Plan N 4826834.89 E 611436.88

(m) ELEV / DEPTH	ROCK DESCRIPTION	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES	Weathering Index	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm^3) E (GPa)
111.0	Rock Surface															
8	**GEORGIAN BAY FORMATION:** Highly weathered to slightly weathered, laminated to thinly bedded, grey, weak to medium strong **SHALE** (60~95%), Moderately weathered, light grey, weak to medium strong **LIMESTONE** (5~40%)		1	HQ	100	75	N/A	25	25 25 2 3 2	Soft Layer: 10.84m-10.88m Hard Layer: 11.46m-11.58m, 12.09m-12.24m Broken Zone: 12.07m-12.09m	W4					
9 109.5																
9.2			2	HQ	100	97	N/A	67	3 3 2 2 5	Fragmented Zone: 10.72m-10.77m Fractures: 9.75m-9.83m (90°)	W3-W2					
10 108.0																
10.8	**GEORGIAN BAY FORMATION:** Highly weathered to moderately weathered, laminated to thinly bedded, grey, very weak to weak **SHALE** (70~90%), Moderately weathered, light grey, medium strong **LIMESTONE** (10~30%)		3	HQ	100	95	5	70	3 12 1 1 2 2	Hard Layer: 10.85m-10.92m Fragmented Zone: 10.77m-10.85m	W4-W3 W3					
11 12 106.4																
12.3 105.9	Lost core zone, residual soil/silty washed away during coring		4	HQ	98	95	20	23	5 10 5 3 2	Hard Layers: 12.42m-12.52m, 13.07m-13.21m, 13.68m-13.74m Soft Layer: 12.70m-12.78m Fractures: 12.34m-12.37m (90°), 12.53m (15°), 13.07m-13.21m (90°)	W6 W3-W2					
13 12.8	**GEORGIAN BAY FORMATION:** Moderately weathered to slightly weathered, laminated to thinly bedded, grey, weak to medium strong **SHALE** (55~80%), Moderately to slightly weathered, light grey, medium strong to strong **LIMESTONE** (20~45%)									12.7m ~ 12.78m						
104.9																
14 13.8			5	HQ	100	96	23	64	10 2 3 0 1	Hard Layers: 14.30m-14.38m, 14.99m-15.24m Fragmented Zone: 13.82m-13.87m Fractures: 13.87m-13.89m (90°), 13.94m-13.97m (90°), 15.06m (15°)	W2				46.1	
15 103.4																
15.2	**END OF BOREHOLE** 1. Borehole was open on completion of drilling.															

Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered

θ = angle to the core axis

E = Modulus of Elasticity

*: UCS [Mpa]≈ 24 $I_{S(50)}$

Palmer

LOG OF BOREHOLE BH22-14

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

PROJECT LOCATION: City of Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826815.94 E 611464.25

Method: Hollow Stem Augers/Rock Coring

Diameter: 200 mm/96 mm

Date: Nov 9, 2022 to Nov 10, 2022

REF. NO.: 2209001

ENCL NO.: 14

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION
118.1	Ground Surface						
118.0 / 0.1	**TOPSOIL:** 100mm		1	SS	14		
117.4 / 0.7	**FILL:** gravelly sand, some silt, contains cobbles, contains rootlets, contains concrete pieces, grey to brown, moist, compact		2	SS	16		117
	FILL: sand, some silt, trace to some gravel, contains cobbles, brown, moist, compact		3	SS	12		
115.9 / 2.2	**FILL:** silty sand, trace gravel, some clay, contains cobbles, brown to grey, moist to wet, loose to very loose		4	SS	4		116
			5	SS	3		115
114.0 / 4.1	**SILTY CLAY TO CLAYEY SILT:** some sand to sandy, trace gravel, trace rootlets, grey, moist to wet, soft		6	SS	4		114
112.4 / 5.6	**CLAYEY SILT TILL/SHALE COMPLEX:** trace sand, trace gravel, grey, moist, very hard		7	SS	69/ initial 250mm		113
110.4 / 7.7	**ROCK CORING STARTS, REFER TO ROCK CORE LOG**		8	SS	50/ initial 75mm		112
							111
							110
							109
							108
							107
							106
							105
							104
102.8 / 15.2	**END OF BOREHOLE** 1. Borehole was open upon completion of drilling.						103

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

Palmer

LOG OF ROCK CORE BH22-14

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc | Method: Hollow Stem Augers/Rock Coring | REF. NO.: 2209001

LOCATION: City of Mississauga, ON | Diameter: 200 mm/96 mm | ENCL NO.: 14

DATUM: Geodetic | Date: Nov-09-2022 to Nov-10-2022

BH LOCATION: See Borehole Location Plan N 4826815.94 E 611464.25

(m) ELEV / DEPTH	ROCK DESCRIPTION	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES	Weathering Index	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm^3) E (GPa)
110.4	Rock Surface															
110.4 / 0.0	**GEORGIAN BAY FORMATION:** Highly weathered to moderately weathered, laminated to thinly bedded, grey, weak **SHALE**		1	HQ	100	72	4	16	16 22 7 3 4	Hard Layer: 14.30m-14.38m, 14.99m-15.24m Fragmented Zone: 13.82m - 13.87m Fractures: 13.87m-13.89m (90°), 13.94m-13.97m (90°), 15.06m (15°)	W4-W3 W2					
108.9 / 9.2	Lost core zone, residual soil/silt washed away during coring		2	HQ	58	20	N/A	0	18 25 14 25 25	Lost Zone: 9.42m-9.75m, 10.36m-10.67m Fragmented Zones: 9.14m-9.19m, 9.32m-9.42m, 9.87m-9.94m, 10.01m-10.36m	W4-W3				128.7	
107.4 / 10.7	**GEORGIAN BAY FORMATION** Slightly weathered, laminated to thinly bedded, grey, medium strong **SHALE** (50~60%), Slightly weathered, light grey, strong to very strong **LIMESTONE** (40~50%)		3	HQ	96	94	26	32	10 5 1 5 3	Lost Zone: 10.67m-10.73m Hard Layer: 11.40m-11.73m, 12.04m-12.10m Fragmented Zone: 10.77m-10.80m	W3-W2					
105.9 / 12.2			4	HQ	100	80	N/A	48	7 19 5 5 0	Fractures: 12.55m-12.57m (90°), 13.13m-13.17m (90°) Fragmented Zone: 12.34m-12.40m, 12.37m-12.42m, 12.55m-12.60m, 12.65m-12.80m	W4-W3					
105.4 / 12.7	**GEORGIAN BAY FORMATION: LIMESTONE/SHALE:** Highly weathered to slightly weathered, laminated to thinly bedded, grey, weak to medium strong **SHALE** (80~96%) Slightly weathered to moderately weathered, light grey, medium strong to very strong **LIMESTONE** (4~20%)		5	HQ	100	95	N/A	83	0 0 9 0 0	Fragmented Zone: 14.48m-14.55m	W3-W2					
104.4 / 13.7																
102.8 / 15.2	**END OF BOREHOLE** 1. Borehole was open upon completion of drilling.															

Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered

θ = angle to the core axis

E = Modulus of Elasticity

*: UCS [Mpa]≈ 24 $I_{S(50)}$

Palmer

LOG OF BOREHOLE BH22-15

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

Method: Hollow Stem Augers/Rock Coring

PROJECT LOCATION: City of Mississauga, ON

Diameter: 200 mm/96 mm

REF. NO.: 2209001

DATUM: Geodetic

Date: Nov 7, 2022 to Nov 8, 2022

ENCL NO.: 15

BH LOCATION: See Borehole Location Plan N 4826788.27 E 611428.09

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION
119.3	Ground Surface						
119.2 / 0.1	**TOPSOIL:** 100mm						
	FILL: gravelly sand, trace clay, trace silt, contains cobbles, dark brown to brown, moist, compact to loose		1	SS	16		119
			2	SS	6		118
117.0 / 2.3			3	SS	5		
	SILTY SAND: some clay, trace gravel, contains cobbles, contains clayey silt layer, contains shale fragments, brown to grey, moist, compact to very dense		4	SS	13		117
			5	SS	20		116
							115
			6	SS	21		
							114
112.3 / 7.0			7	SS	94/ initial 250mm		113
	CLAYEY SILT TILL/SHALE COMPLEX: trace sand, trace gravel, grey, moist to wet, very hard						112
111.6 / 7.7	**ROCK CORING STARTS, REFER TO ROCK CORE LOG**		8	SS	50/ initial 100mm		111
							110
							109
							108
							107
							106
							105
103.5 / 15.8	**END OF BOREHOLE** 1. 1. Borehole was open upon completion of drilling.						104

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

Palmer

LOG OF ROCK CORE BH22-15

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

LOCATION: City of Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826788.27 E 611428.09

Method: Hollow Stem Augers/Rock Coring

Diameter: 200 mm/96 mm

Date: Nov-07-2022 to Nov-08-2022

REF. NO.: 2209001

ENCL NO.: 15

(m) ELEV / DEPTH	ROCK DESCRIPTION	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES	Weathering Index	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm^3) E (GPa)
111.7	Rock Surface															
111.6 7.6	**GEORGIAN BAY FORMATION:** moderately weathered to slightly weathered, laminated to thinly bedded, light grey to grey, weak to strong **SHALE** (81~100%). thinly laminated to medium bedded with slightly weathered to fesh, light grey to grey, medium strong to strong **LIMESTONE** (0~19%)		1	HQ	100	61	7	22	>25 >25 12 8 4	Fracture: 8.64m-8.69m (90°), 8.81m-8.84m (15°) Fragment Zone: 7.62m-7.86m, 7.98m-8.05m, 8.2m-8.28m	W3					
110.1 9.1			2	HQ	100	85	N/A	13	8 17 8 5 5	Fragment Zone: 9.45m-9.6m						
108.6 10.7			3	HQ	83	72	N/A	25	8 11 >25 8 3	Soft Layer: 11.19m-11.51m Fracture: 10.95m-10.96m (15°) Fragment Zone: 10.81m-10.86m, 11.58m - 11.63m	W3-W2					
107.1 12.2			4	HQ	85	62	17	28	3 2 5 20 >25	Soft Layer: 13.21m-13.72m Fracture: 12.83m-12.85m (90°)						
105.6 13.7			5	HQ	100	78	32	17	16 6 6 3 4	Soft Layer: 14.12m-14.15m Fragment Zone: 13.72m-13.86m					137.5	
104.0 15.2			6	HQ	100	81	N/A	43	13 0	Fracture: 15.51m (15°) Fragment Zone: 15.24m-15.32m						
103.5 15.8	**END OF BOREHOLE** 1. Borehole was open upon completion of drilling.															

Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered

θ = angle to the core axis

E = Modulus of Elasticity

*: UCS [Mpa]≈ 24 $I_{S(50)}$

LOG OF BOREHOLE BH22-16

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

PROJECT LOCATION: City of Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826769.25 E 611440.73

Method: Hollow Stem Augers/Rock Coring

Diameter: 200 mm/96 mm

Date: Nov 7, 2022 to Nov 8, 2022

REF. NO.: 2209001

ENCL NO.: 16

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
119.2	Ground Surface											
119.0 / 0.1	**TOPSOIL:** 100mm						Concrete					
	FILL: silty sand, trace clay, trace gravel, contains cobbles, dark rown to brown, moist, compact		1	SS	16		Sand					
			2	SS	18		118					
			3	SS	13		117					
	contains clayey silt pockets		4	SS	6							
			5	SS	54		116					
	contains limestones and cobble fragments											
115.1 / 4.1	**SILTY SAND:** trace clay, contains silt layer, contains shale complex fragments, grey, wet, compact to very dense		6	SS	18		115					4 81 12 3
							114					
			7	SS	67/ 225mm		113					
							112					
111.5 / 7.7	**ROCK CORING STARTS, REFER TO ROCK CORE LOG**		8	SS	50/ initial 100mm		111					
							Bentonite					
							110					
							109					
							108					
							107					
							106					
							105					
							104					
							103					
							Sand					

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

LOG OF BOREHOLE BH22-16

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

PROJECT LOCATION: City of Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826769.25 E 611440.73

Method: Hollow Stem Augers/Rock Coring

Diameter: 200 mm/96 mm

Date: Nov 7, 2022 to Nov 8, 2022

REF. NO.: 2209001

ENCL NO.: 16

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa): ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE & Sensitivity, × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued										
	ROCK CORING STARTS, REFER TO ROCK CORE LOG(Continued)						102				
							Screen				
18							101				
19							100				
							Bentonite				
20							99				
98.7											
20.5	**END OF BOREHOLE** 1. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (mBGS) Dec 22, 2022 6.21										

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ $^{\varepsilon}$=3% Strain at Failure

Palmer

LOG OF ROCK CORE BH22-16

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

LOCATION: City of Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826769.25 E 611440.73

Method: Hollow Stem Augers/Rock Coring

Diameter: 200 mm/96 mm

Date: Nov-07-2022 to Nov-08-2022

REF. NO.: 2209001

ENCL NO.: 16

(m) ELEV / DEPTH	ROCK DESCRIPTION	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES	Weathering Index	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm^3) E (GPa)
111.5	Rock Surface															
111.5 / 1.7	**GEORGIAN BAY FORMATION:** moderately weathered, laminated to thinly bedded with fragment layers, weak, reddish brown to grey **SHALE**		1	HQ	100	43	N/A	0	>25 >25 22 9 12	Fracture: 8.17m-8.23m (90°), 8.66m-8.7m (75°), 9.02m - 9.07m (90°) Fragment Zone: 7.7m-8.15m, 8.31m-8.41m, 8.48m-8.56m	W3					
110.0																
9.2	**GEORGIAN BAY FORMATION:** slightly weathered, laminated to thinly bedded with fragment layers, grey, weak to medium strong **SHALE** (80~90%) slightly weathered, thinly to medium bedded, light grey to grey, medium strong to strong **LIMESTONE** (10~20%)		2	HQ	100	93	N/A	0	17 9 5 7 9	Fracture: 10.13m-10.16m (15°), 10.67m-10.69m (90°) Fragment Zone: 9.22m-9.32m						
108.4																
10.8			3	HQ	100	100	N/A	0	6 7 7 6 5	Fracture: 11.35m-11.4m (90°), 11.71m-1.81m (90°)						
106.9																
12.3			4	HQ	100	98	N/A	20	6 5 9 7 3	Fragment Zone: 13.08m-13.1m						
105.4																
13.8			5	HQ	100	60	N/A	0	19 >25 >25 15 8	Soft Layer: 14.15m-14.63m Fracture: 14.9m-14.92m (90°) Fragment Zone: 14.63m-14.78m	W2					
103.8																
15.4			6	HQ	100	100	N/A	9	5 1 18 2 2						31	
102.5																
16.7			7	HQ	100	90	N/A	38	3 3 2 16 5	Fracture: 18.15m - 18.23m (90°) Fragment Zone: 17.75m-17.91m						
100.9																
18.3			8	HQ	100	100	N/A	41	2 2 3 6 4	Fracture: 19.18m-19.2m (45°)						
99.5																
19.8			9	HQ	100	100	N/A	72	3 1							
98.7																
20.5	**END OF BOREHOLE** 1. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (mBGS) Dec 22, 2022 6.21															

Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered

θ = angle to the core axis

E = Modulus of Elasticity

*: UCS [Mpa]≈ 24 $I_{S(50)}$

FILE No: G19726

BOREHOLE No. 1

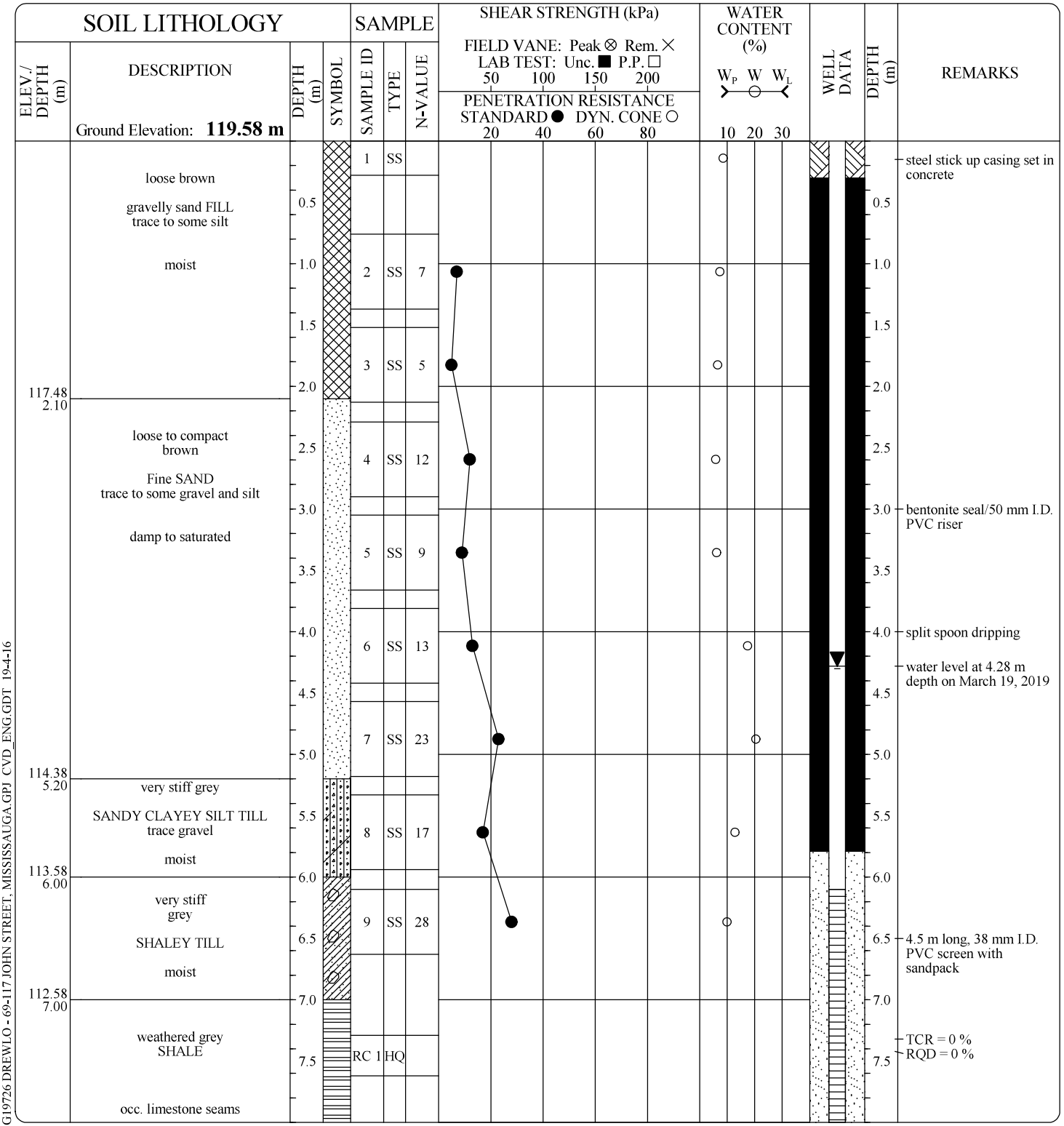
Client: **Drewlo Holdings Inc.**

Project: **Proposed 25-Storey Apartment Complex**

Location: **69-117 John Street, Mississauga**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **HSA & DC**
Size: **108 mm I.D. & HQ**
Date: **Feb 14 - 19** TO **Feb 14 - 19**



PROJECT MANAGER: **RVD**

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: G19726

BOREHOLE No. 1

Client: **Drewlo Holdings Inc.**

Project: **Proposed 25-Storey Apartment Complex**

Location: **69-117 John Street, Mississauga**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **HSA & DC**
Size: **108 mm I.D. & HQ**
Date: **Feb 14 - 19** TO **Feb 14 - 19**

SOIL LITHOLOGY | SAMPLE | SHEAR STRENGTH (kPa) | WATER CONTENT (%) | WELL DATA | DEPTH (m) | REMARKS

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80
WATER CONTENT (%): W_P W W_L ; 10 20 30

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	REMARKS
	(continued)	8.5		RC 2	HQ		TCR = 100 % RQD = 18.3 %
		9.0					
		9.5		RC 3	HQ		TCR = 98.3 % RQD = 33.3 %
		10.0					
		10.5					
		11.0		RC 4	HQ		TCR = 98.3 % RDQ = 78.3 %
		11.5					
		12.0					Bentonite seal
		12.5		RC 5	HQ		TCR = 80.0 % RQD = 71.7 %
		13.0					
		13.5					
105.86 13.72	End of Borehole	14.0					
		14.5					
		15.0					
		15.5					

PROJECT MANAGER: **RVD**

CHUNG & VANDER DOELEN
ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: G19726

BOREHOLE No. 12

Client: **Drewlo Holdings Inc.**

Project: **Proposed 25-Storey Apartment Complex**

Location: **69-117 John Street, Mississauga**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **108 mm I.D.**
Date: **Feb 11 - 19** TO **Feb 11 - 19**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	REMARKS
	Ground Elevation: **119.49 m**						
	brown sand and gravel FILL some silt	0.5		1	SS		stick up casing set in concrete
118.69 0.80	compact brown Fine SAND trace gravel and silt moist to saturated	1.0		2	SS	18	bentonite seal/50 mm I.D. PVC riser
		1.5		3	SS	26	
		2.0					
		2.5		4	SS	15	
		3.0		5	SS	10	3.0 m long, 50 mm I.D. PVC screen with sandpack
		3.5					water level at 3.8 m depth on March 19, 2019
		4.0		6	SS	23	
		4.5		7	SS	29	
114.29 5.20	hard grey SHALEY TILL moist	5.0					
		5.5		8	SS	74	
113.80 5.69	End of Borehole	6.0					
		6.5					
		7.0					
		7.5					

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

PROJECT MANAGER: **RVD**

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: G19726

BOREHOLE No. 5

Client: **Drewlo Holdings Inc.**

Project: **Proposed 25-Storey Apartment Complex**

Location: **69-117 John Street, Mississauga**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **HSA & DC**
Size: **108 mm I.D. & HQ**
Date: **Feb 21 - 19** TO **Feb 21 - 19**

Ground Elevation: **118.79 m**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SAMPLE ID	TYPE	N-VALUE	REMARKS
	compact dark brown to grey sand, silt, clay and shale FILL damp	0.5	1	SS		steel stick up casing set in concrete
		1.0	2	SS	29	
117.49 1.30	compact brown Fine SAND trace to some silt occ. gravelly pockets/lenseas moist to saturated	1.5	3	SS	25	
		2.0				
		2.5	4	SS	20	split spoon dripping
115.59 3.20	firm grey CLAYEY SILT wet	3.0	5	SS	5	water levelat 3.27 m depth on March 19, 2019
115.19 3.60	compact grey interbedded SAND AND SILT occ. clayey lenses/pockets saturated	3.5				
		4.0	6	SS	15	bentonite seal/50 mm I.D. PVC riser
		4.5				
		5.0	7	SS	16	
113.59 5.20	very stiff grey SANDY CLAYEY SILT TILL trace gravel moist	5.5	8	SS	21	
112.69 6.10	weathered grey SHALE occ. limestone seams	6.0	9	SS	50/ 100 mm	
		6.5				
		7.0	10	SS	64/ 150 mm	
		7.5	RC 1	HQ		TCR = 71.4 % RQD = 0 %

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

PROJECT MANAGER: **RVD**

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: G19726

BOREHOLE No. 5

Client: **Drewlo Holdings Inc.**

Project: **Proposed 25-Storey Apartment Complex**

Location: **69-117 John Street, Mississauga**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **HSA & DC**
Size: **108 mm I.D. & HQ**
Date: **Feb 21 - 19** TO **Feb 21 - 19**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	SAMPLE TYPE	N-VALUE	SHEAR STRENGTH (kPa) FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200 / PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80	WATER CONTENT (%) W_P W W_L 10 20 30	WELL DATA	DEPTH (m)	REMARKS
	(continued)	8.5		RC 2	HQ					8.5	TCR = 91.7 % RQD = 23.3 %
		9.0								9.0	3.0 m long, 38 mm I.D. PVC screen with sandpack
		9.5		RC 3	HQ					9.5	TCR = 41.7 % RQD = 8.3 %
		10.0								10.0	
		10.5								10.5	
		11.0		RC 4	HQ					11.0	TCR = 100 % RQD = 71.7 %
		11.5								11.5	
		12.0								12.0	Bentonite seal
		12.5								12.5	
		13.0		RC 5	HQ					13.0	TCR = 98.3 % RQD = 76.7 %
105.18		13.5								13.5	
13.61	End of Borehole	14.0								14.0	
		14.5								14.5	
		15.0								15.0	
		15.5								15.5	

PROJECT MANAGER: **RVD**

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: G19726

BOREHOLE No. 9

Client: **Drewlo Holdings Inc.**

Project: **Proposed 25-Storey Apartment Complex**

Location: **69-117 John Street, Mississauga**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **HSA & DC**
Size: **108 mm I.D. & HQ**
Date: **Feb 19 - 19** TO **Feb 20 - 19**

Ground Elevation: **117.55 m**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SAMPLE ID	TYPE	N-VALUE	REMARKS
	compact dark brown to brown sand and gravel FILL some silt to silty moist to wet	0.5	1	SS		steel stick up casing set in concrete
		1.0	2	SS	22	
		1.5	3	SS	21	
115.15		2.0				
2.40	very stiff grey SANDY CLAYEY SILT TILL trace gravel moist	2.5	4	SS	13	water level at 2.75 m depth on March 19, 2019
		3.0	5	SS	18	
		3.5				bentonite seal/50 mm I.D. PVC riser
		4.0	6	SS	28	
		4.5				
		5.0	7	SS	28	
112.35						
5.20	hard grey SHALEY TILL moist	5.5	8	SS	47	
		6.0				
		6.5	9	SS	77	
		7.0				
110.25						
7.30	weathered grey SHALE and	7.5	RC 1	HQ		TCR = 25.0 % RQD = 0 %

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

PROJECT MANAGER: **RVD**

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: G19726

BOREHOLE No. 9

Client: **Drewlo Holdings Inc.**

Project: **Proposed 25-Storey Apartment Complex**

Location: **69-117 John Street, Mississauga**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **HSA & DC**
Size: **108 mm I.D. & HQ**
Date: **Feb 19 - 19** TO **Feb 20 - 19**

SOIL LITHOLOGY

ELEV./ DEPTH (m)	DESCRIPTION (continued)	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE
	??SHALEY TILL??	8.5		RC 2	HQ	
	---	9.0				
	occ. to frequent cobbles from 9.2 to 11.1 m depth	9.5		RC 3	HQ	
		10.0				
		10.5		RC 4	HQ	
		11.0				
		11.5		RC 5	HQ	
		12.0				
		12.5		RC 6	HQ	
		13.0				
		13.5		10	SS	100/ 115 mm
		14.0				
		14.5				
		15.0				
102.18 15.37	End of Borehole	15.5		11	SS	100/ 125 mm

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

DEPTH (m)	REMARKS
8.5	TCR = 66.7 % RQD = 43.3 %
9.0	3.0 m long, 38 mm I.D. PVC screen with sandpack
9.5	TCR = 25.0 % RQD = 0 %
10.0	
10.5	
11.0	TCR = 47.6 % RQD = 13.1 %
11.5	TCR = 0 % RQD = 0 %
12.0	Bentonite seal
12.5	TCR = 0 % RQD = 0 %
13.0	
13.5	
14.0	
14.5	
15.0	
15.5	

PROJECT MANAGER: **RVD**

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

Appendix C

Grain Size Distributions and K-Value Estimation

Terrapex, 2022

GRAIN SIZE DISTRIBUTION TEST DATA

2022-12-07

Client: Palmer Environmental Consulting Group Inc. (PECG)
Project: PECG PRJ# 2209001
Project Number: CA19009
Sample Number: BH 22-4, SS6
Material Description: CLAYEY SILT some gravel some sand
Testing Remarks: HYDROMETER DETAILS: Spec. Grav. 2.75(assumed);Vb=53cm^3; L2=13.8cm; L1=10.7cm; hs= 0.16cm/Div; A=30.2cm^2; Mass of Disp. Agent=40g/1 Test Date: Nov.29 2022
Tested by: AM/CM

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
297.62	0.00	6"				
		3"				
		2"				
		1.5"				
		1"	0.00	0.00	100	0
		0.75"	17.88	0.00	94	6
		0.625"	0.00	0.00	94	6
		0.53"	0.00	0.00	94	6
		0.375"	10.91	0.00	90	10
		0.265"	1.60	0.00	90	10
		#4	4.91	0.00	88	12
		#10	14.60	0.00	83	17
50.00	0.00	#20	1.98	0.00	80	20
		#40	1.60	0.00	77	23
		#60	1.53	0.00	75	25
		#140	3.14	0.00	70	30
		#200	1.02	0.00	68	32

Hydrometer Test Data

Hydrometer test uses material passing #10
Percent passing #10 based upon complete sample = 83
Weight of hydrometer sample =50.0
Hygroscopic moisture correction:
Moist weight and tare = 66.72
Dry weight and tare = 66.53
Tare weight = 34.76
Hygroscopic moisture = 0.6%
Automatic temperature correction
Composite correction (fluid density and meniscus height) at 20 deg. C = -3.5
Meniscus correction only = 1.0
Specific gravity of solids = 2.75
Hydrometer type = 152H
Hydrometer effective depth equation: L = 16.7225166 **-** 0.16 **x Rm**

Hydrometer Test Data (continued)

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	22.2	40.0	37.0	0.0129	41.0	10.2	0.0411	61	39
2.00	22.2	37.7	34.7	0.0129	38.7	10.5	0.0296	57	43
5.00	22.2	35.0	32.0	0.0129	36.0	11.0	0.0191	52	48
16.25	22.2	30.7	27.7	0.0129	31.7	11.7	0.0109	45	55
31.00	22.2	28.0	25.0	0.0129	29.0	12.1	0.0081	41	59
60.00	22.1	25.0	21.9	0.0129	26.0	12.6	0.0059	36	64
90.00	22.1	23.2	20.1	0.0129	24.2	12.9	0.0049	33	67
120.00	22.2	22.1	19.1	0.0129	23.1	13.0	0.0042	31	69
251.00	22.4	18.8	15.8	0.0129	19.8	13.6	0.0030	26	74
1440.00	23.0	14.1	11.3	0.0128	15.1	14.3	0.0013	18	82

Fractional Components

Cobbles	Gravel	Sand			Fines		
		Coarse	Fine	Total	Silt	Clay	Total
0	17	6	9	15	47	21	68

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
			0.0016	0.0039	0.0076	0.0156	0.0393	0.8649	2.8234	7.7137	20.6217

Fineness Modulus
1.37

GRAIN SIZE DISTRIBUTION TEST DATA

2022-12-07

Client: Palmer Environmental Consulting Group Inc. (PECG)
Project: PECG PRJ# 2209001
Project Number: CA19009
Sample Number: BH 22-12, SS7
Material Description: SANDY SILT some gravel some clay
Testing Remarks: HYDROMETER DETAILS: Spec. Grav. 2.75(assumed);Vb=53cm^3; L2=13.8cm; L1=10.7cm; hs= 0.16cm/Div; A=30.2cm^2; Mass of Disp. Agent=40g/1 Test Date: Nov.30 2022
Tested by: AM/CM

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
263.58	0.00	6"				
		3"				
		2"				
		1.5"				
		1"				
		0.75"				
		0.625"	0.00	0.00	100	0
		0.53"	7.27	0.00	97	3
		0.375"	5.71	0.00	95	5
		0.265"	5.38	0.00	93	7
		#4	8.23	0.00	90	10
		#10	22.20	0.00	81	19
50.00	0.00	#20	2.85	0.00	77	23
		#40	2.18	0.00	73	27
		#60	1.89	0.00	70	30
		#140	4.48	0.00	63	37
		#200	1.77	0.00	60	40

Hydrometer Test Data

Hydrometer test uses material passing #10
Percent passing #10 based upon complete sample = 81
Weight of hydrometer sample =50.0
Hygroscopic moisture correction:
Moist weight and tare = 77.98
Dry weight and tare = 77.81
Tare weight = 35.29
Hygroscopic moisture = 0.4%
Automatic temperature correction
Composite correction (fluid density and meniscus height) at 20 deg. C = -3.5
Meniscus correction only = 1.0
Specific gravity of solids = 2.75
Hydrometer type = 152H
Hydrometer effective depth equation: L = 16.7225166 **-** 0.16 **x Rm**

Hydrometer Test Data (continued)

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	22.2	33.7	30.7	0.0129	34.7	11.2	0.0431	49	51
2.00	22.1	30.5	27.4	0.0129	31.5	11.7	0.0312	44	56
5.00	22.2	27.0	24.0	0.0129	28.0	12.2	0.0202	38	62
15.00	22.0	22.0	18.9	0.0129	23.0	13.0	0.0121	30	70
30.25	22.1	19.7	16.6	0.0129	20.7	13.4	0.0086	27	73
60.00	22.1	17.0	13.9	0.0129	18.0	13.8	0.0062	22	78
90.00	22.1	15.5	12.4	0.0129	16.5	14.1	0.0051	20	80
120.00	22.2	14.7	11.7	0.0129	15.7	14.2	0.0044	19	81
250.00	22.5	12.2	9.2	0.0128	13.2	14.6	0.0031	15	85
1440.00	22.9	9.5	6.6	0.0128	10.5	15.0	0.0013	11	89

Fractional Components

Cobbles	Gravel	Sand			Fines		
		Coarse	Fine	Total	Silt	Clay	Total
0	19	8	13	21	48	12	60

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
		0.0032	0.0052	0.0118	0.0228	0.0451	0.0749	1.6072	2.9460	4.7923	9.3479

Fineness Modulus
1.42

GRAIN SIZE DISTRIBUTION TEST DATA

2022-12-07

Client: Palmer Environmental Consulting Group Inc. (PECG)
Project: PECG PRJ# 2209001
Project Number: CA19009
Sample Number: BH 22-13, SS5
Material Description: SILTY SAND trace clay trace gravel
Testing Remarks: HYDROMETER DETAILS: Spec. Grav. 2.75(assumed);Vb=53cm^3; L2=13.8cm; L1=10.7cm; hs= 0.16cm/Div; A=30.2cm^2; Mass of Disp. Agent=40g/1 Test Date: Nov.30 2022
Tested by: AM/CM

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
364.02	0.00	6"				
		3"				
		2"				
		1.5"				
		1"				
		0.75"				
		0.625"				
		0.53"	0.00	0.00	100	0
		0.375"	2.81	0.00	99	1
		0.265"	2.05	0.00	99	1
		#4	5.06	0.00	97	3
		#10	10.54	0.00	94	6
50.00	0.00	#20	2.09	0.00	90	10
		#40	3.33	0.00	84	16
		#60	15.25	0.00	55	45
		#140	12.03	0.00	33	67
		#200	1.36	0.00	30	70

Hydrometer Test Data

Hydrometer test uses material passing #10
Percent passing #10 based upon complete sample = 94
Weight of hydrometer sample =50.0
Hygroscopic moisture correction:
Moist weight and tare = 48.68
Dry weight and tare = 48.57
Tare weight = 20.77
Hygroscopic moisture = 0.4%
Automatic temperature correction
Composite correction (fluid density and meniscus height) at 20 deg. C = -3.5
Meniscus correction only = 1.0
Specific gravity of solids = 2.75
Hydrometer type = 152H
Hydrometer effective depth equation: L = 16.7225166 **-** 0.16 **x Rm**

Hydrometer Test Data (continued)

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	22.2	17.5	14.5	0.0129	18.5	13.8	0.0478	27	73
2.00	22.2	16.0	13.0	0.0129	17.0	14.0	0.0341	24	76
5.00	22.2	14.7	11.7	0.0129	15.7	14.2	0.0217	22	78
16.00	22.2	12.8	9.8	0.0129	13.8	14.5	0.0123	18	82
30.00	22.3	12.0	9.0	0.0129	13.0	14.6	0.0090	17	83
60.50	22.2	10.8	7.8	0.0129	11.8	14.8	0.0064	14	86
90.00	22.4	10.0	7.0	0.0129	11.0	15.0	0.0052	13	87
120.00	22.4	9.3	6.3	0.0129	10.3	15.1	0.0046	12	88
250.00	22.5	7.5	4.5	0.0128	8.5	15.4	0.0032	8	92
1442.00	22.8	6.8	3.9	0.0128	7.8	15.5	0.0013	7	93

Fractional Components

Cobbles	Gravel	Sand			Fines		
		Coarse	Fine	Total	Silt	Clay	Total
0	6	10	54	64	22	8	30

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
	0.0038	0.0070	0.0168	0.0740	0.1664	0.2234	0.2720	0.3862	0.4597	0.8005	2.2887

Fineness Modulus	C_u	C_c
1.25	70.79	5.24

GRAIN SIZE DISTRIBUTION TEST DATA

2022-12-07

Client: Palmer Environmental Consulting Group Inc. (PECG)
Project: PECG PRJ# 2209001
Project Number: CA19009
Sample Number: BH 22-16, SS6
Material Description: SAND some silt trace gravel trace clay
Testing Remarks: HYDROMETER DETAILS: Spec. Grav. 2.75(assumed);Vb=53cm^3; L2=13.8cm; L1=10.7cm; hs= 0.16cm/Div; A=30.2cm^2; Mass of Disp. Agent=24g/1 Test Date: Nov.29 2022
Tested by: CM

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
314.37	0.00	6"				
		3"				
		2"				
		1.5"				
		1"				
		0.75"				
		0.625"				
		0.53"	0.00	0.00	100	0
		0.375"	2.26	0.00	99	1
		0.265"	1.98	0.00	99	1
		#4	1.09	0.00	98	2
		#10	7.10	0.00	96	4
100.00	0.00	#20	3.04	0.00	93	7
		#40	3.31	0.00	90	10
		#60	30.56	0.00	61	39
		#140	44.51	0.00	18	82
		#200	3.10	0.00	15	85

Hydrometer Test Data

Hydrometer test uses material passing #10
Percent passing #10 based upon complete sample = 96
Weight of hydrometer sample =100.0
Hygroscopic moisture correction:
Moist weight and tare = 50.93
Dry weight and tare = 50.86
Tare weight = 19.93
Hygroscopic moisture = 0.2%
Automatic temperature correction
Composite correction (fluid density and meniscus height) at 20 deg. C = -1.8
Meniscus correction only = 1.0
Specific gravity of solids = 2.75
Hydrometer type = 152H
Hydrometer effective depth equation: L = 16.7225166 **-** 0.16 **x Rm**

Hydrometer Test Data (continued)

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	22.4	13.0	11.7	0.0129	14.0	14.5	0.0490	11	89
2.00	22.4	12.0	10.7	0.0129	13.0	14.6	0.0348	10	90
5.00	22.4	10.0	8.7	0.0129	11.0	15.0	0.0223	8	92
15.25	22.3	8.7	7.4	0.0129	9.7	15.2	0.0128	7	93
30.00	22.3	7.8	6.5	0.0129	8.8	15.3	0.0092	6	94
60.00	22.2	6.9	5.6	0.0129	7.9	15.5	0.0065	5	95
90.00	22.4	6.7	5.4	0.0129	7.7	15.5	0.0053	5	95
120.25	22.5	6.2	4.9	0.0128	7.2	15.6	0.0046	5	95
250.00	22.6	4.8	3.6	0.0128	5.8	15.8	0.0032	3	97
1440.00	22.9	4.0	2.8	0.0128	5.0	15.9	0.0013	3	97

Fractional Components

Cobbles	Gravel	Sand			Fines		
		Coarse	Fine	Total	Silt	Clay	Total
0	4	6	75	81	12	3	15

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.0051	0.0338	0.0762	0.1206	0.1637	0.1955	0.2231	0.2485	0.3070	0.3368	0.4273	1.5045

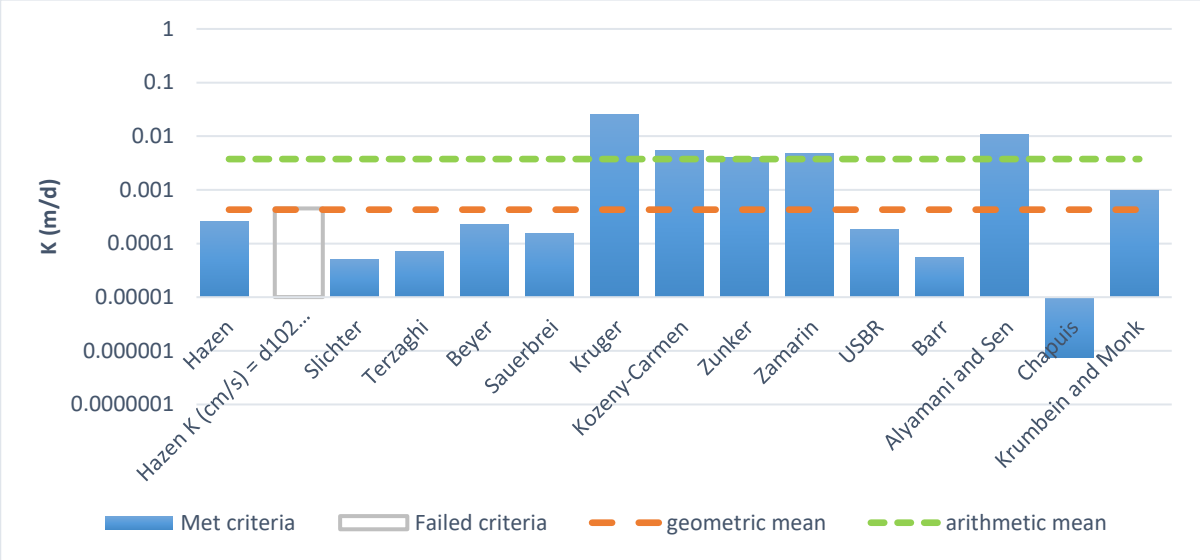
Fineness Modulus	C_u	C_c
1.15	7.36	3.19

Hydraulic Conductivity Report

Sample ID: BH22-4/SS6 Date: Dec 2022

Sample Mass (g): T (oC): 20

Poorly sorted silt low in fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d
Hazen	.295E-06	.295E-08	0.00
Hazen K (cm/s) = d_{10} (mm)	.522E-06	.522E-08	0.00
Slichter	.580E-07	.580E-09	0.00
Terzaghi	.828E-07	.828E-09	0.00
Beyer	.263E-06	.263E-08	0.00
Sauerbrei	.177E-06	.177E-08	0.00
Kruger	.294E-04	.294E-06	0.03
Kozeny-Carmen	.626E-05	.626E-07	0.01
Zunker	.472E-05	.472E-07	0.00
Zamarin	.551E-05	.551E-07	0.00
USBR	.210E-06	.210E-08	0.00
Barr	.622E-07	.622E-09	0.00
Alyamani and Sen	.125E-04	.125E-06	0.01
Chapuis	.887E-09	.887E-11	0.00
Krumbein and Monk	.115E-05	.115E-07	0.00
geometric mean	.495E-06	.495E-08	0.00
arithmetic mean	.434E-05	.434E-07	0.00

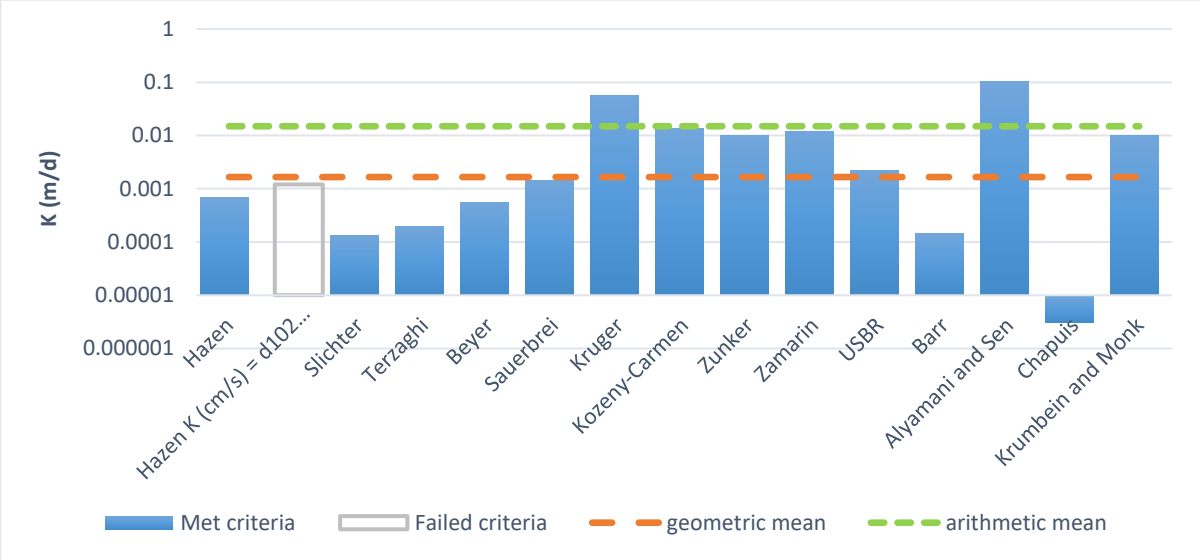
74 Berkeley Street, Toronto, ON M5A 2W7 Tel: 647-795-8153

Hydraulic Conductivity Report

Sample ID: BH22-12/SS7 Date: Dec 2022

Sample Mass (g): T (oC): 20

Poorly sorted silt low in fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d
Hazen	.791E-06	.791E-08	0.00
Hazen K (cm/s) = d_{10} (mm)	.140E-05	.140E-07	0.00
Slichter	.155E-06	.155E-08	0.00
Terzaghi	.222E-06	.222E-08	0.00
Beyer	.647E-06	.647E-08	0.00
Sauerbrei	.165E-05	.165E-07	0.00
Kruger	.642E-04	.642E-06	0.06
Kozeny-Carmen	.154E-04	.154E-06	0.01
Zunker	.116E-04	.116E-06	0.01
Zamarin	.135E-04	.135E-06	0.01
USBR	.255E-05	.255E-07	0.00
Barr	.167E-06	.167E-08	0.00
Alyamani and Sen	.119E-03	.119E-05	0.10
Chapuis	.355E-08	.355E-10	0.00
Krumbein and Monk	.114E-04	.114E-06	0.01
geometric mean	.192E-05	.192E-07	0.00
arithmetic mean	.173E-04	.173E-06	0.01

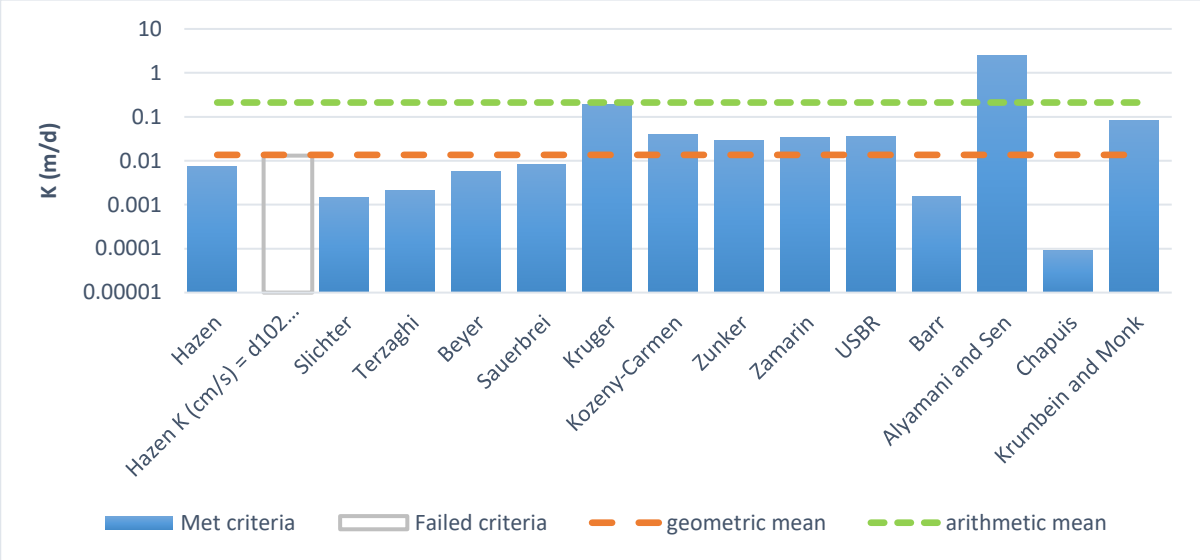
74 Berkeley Street, Toronto, ON M5A 2W7 Tel: 647-795-8153

Hydraulic Conductivity Report

Sample ID: BH22-13/SS5 Date: Dec 2022

Sample Mass (g): T (oC): 20

Poorly sorted sand low in fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d
Hazen	.861E-05	.861E-07	0.01
Hazen K (cm/s) = d_{10} (mm)	.152E-04	.152E-06	0.01
Slichter	.169E-05	.169E-07	0.00
Terzaghi	.241E-05	.241E-07	0.00
Beyer	.662E-05	.662E-07	0.01
Sauerbrei	.949E-05	.949E-07	0.01
Kruger	.218E-03	.218E-05	0.19
Kozeny-Carmen	.447E-04	.447E-06	0.04
Zunker	.334E-04	.334E-06	0.03
Zamarin	.386E-04	.386E-06	0.03
USBR	.406E-04	.406E-06	0.04
Barr	.181E-05	.181E-07	0.00
Alyamani and Sen	.293E-02	.293E-04	2.53
Chapuis	.103E-06	.103E-08	0.00
Krumbein and Monk	.947E-04	.947E-06	0.08
geometric mean	.158E-04	.158E-06	0.01
arithmetic mean	.245E-03	.245E-05	0.21

74 Berkeley Street, Toronto, ON M5A 2W7 Tel: 647-795-8153

Hydraulic Conductivity Report

Sample ID: BH22-16/SS6 Date: Dec 2022

Sample Mass (g): T (oC): 20

Poorly sorted sand low in fines

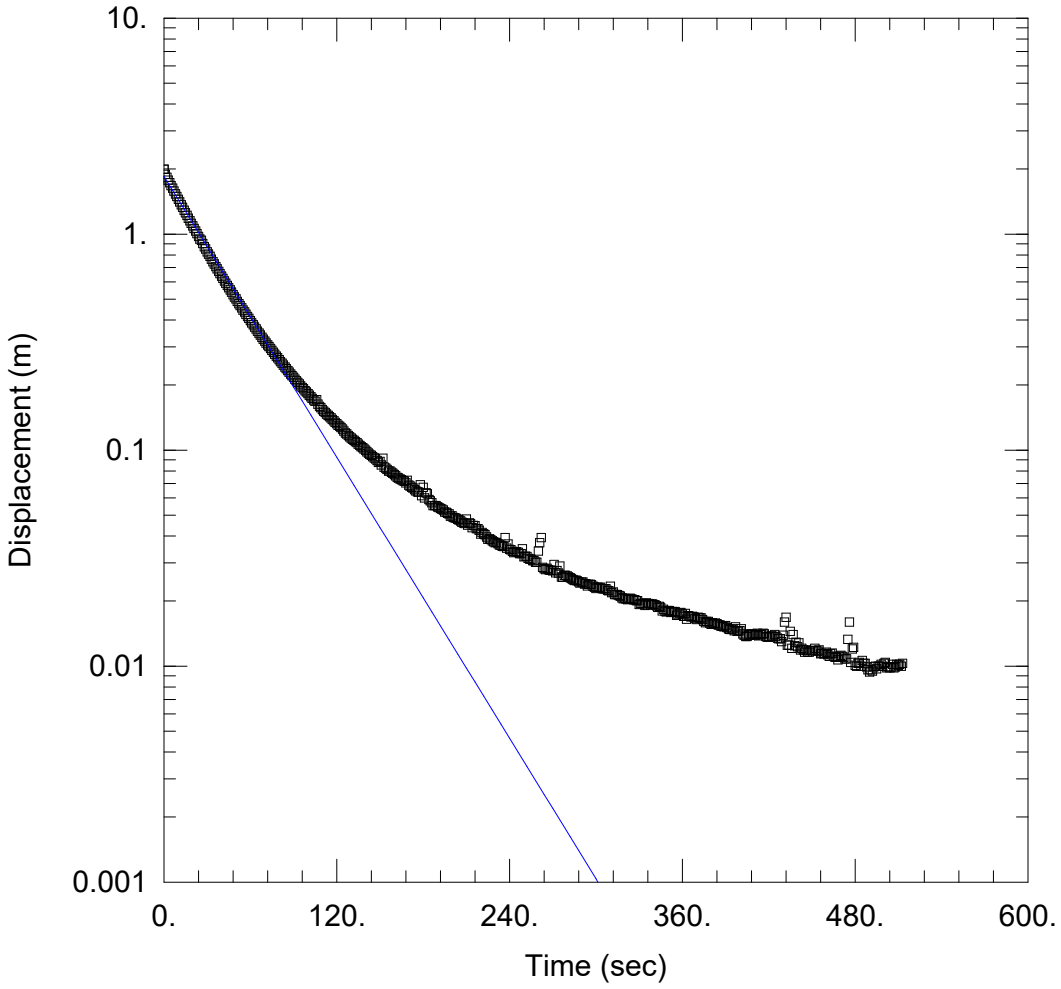
Estimation of Hydraulic Conductivity	cm/s	m/s	m/d
Hazen	.118E-02	.118E-04	1.02
Hazen K (cm/s) = d_{10} (mm)	.121E-02	.121E-04	1.05
Slichter	.293E-03	.293E-05	0.25
Terzaghi	.489E-03	.489E-05	0.42
Beyer	.116E-02	.116E-04	1.00
Sauerbrei	.264E-02	.264E-04	2.28
Kruger	.176E-02	.176E-04	1.52
Kozeny-Carmen	.590E-03	.590E-05	0.51
Zunker	.348E-03	.348E-05	0.30
Zamarin	.400E-03	.400E-05	0.35
USBR	.315E-02	.315E-04	2.72
Barr	.356E-03	.356E-05	0.31
Alyamani and Sen	.428E-04	.428E-06	0.04
Chapuis	.167E-03	.167E-05	0.14
Krumbein and Monk	.250E-02	.250E-04	2.16
geometric mean	.628E-03	.628E-05	0.54
arithmetic mean	.108E-02	.108E-04	0.93

74 Berkeley Street, Toronto, ON M5A 2W7 Tel: 647-795-8153

Appendix D

Single Well Response Tests

Palmer, 2022



WELL TEST ANALYSIS

Data Set: G:\...\BH1_SelfConfining.aqt
Date: 01/03/23 Time: 16:04:21

PROJECT INFORMATION

Company: Palmer
Client: Canada Inc
Project: 2209001
Location: Mississauga, On
Test Date: Nov 26, 2022

AQUIFER DATA

Saturated Thickness: 8.95 m Anisotropy Ratio (Kz/Kr): 0.1

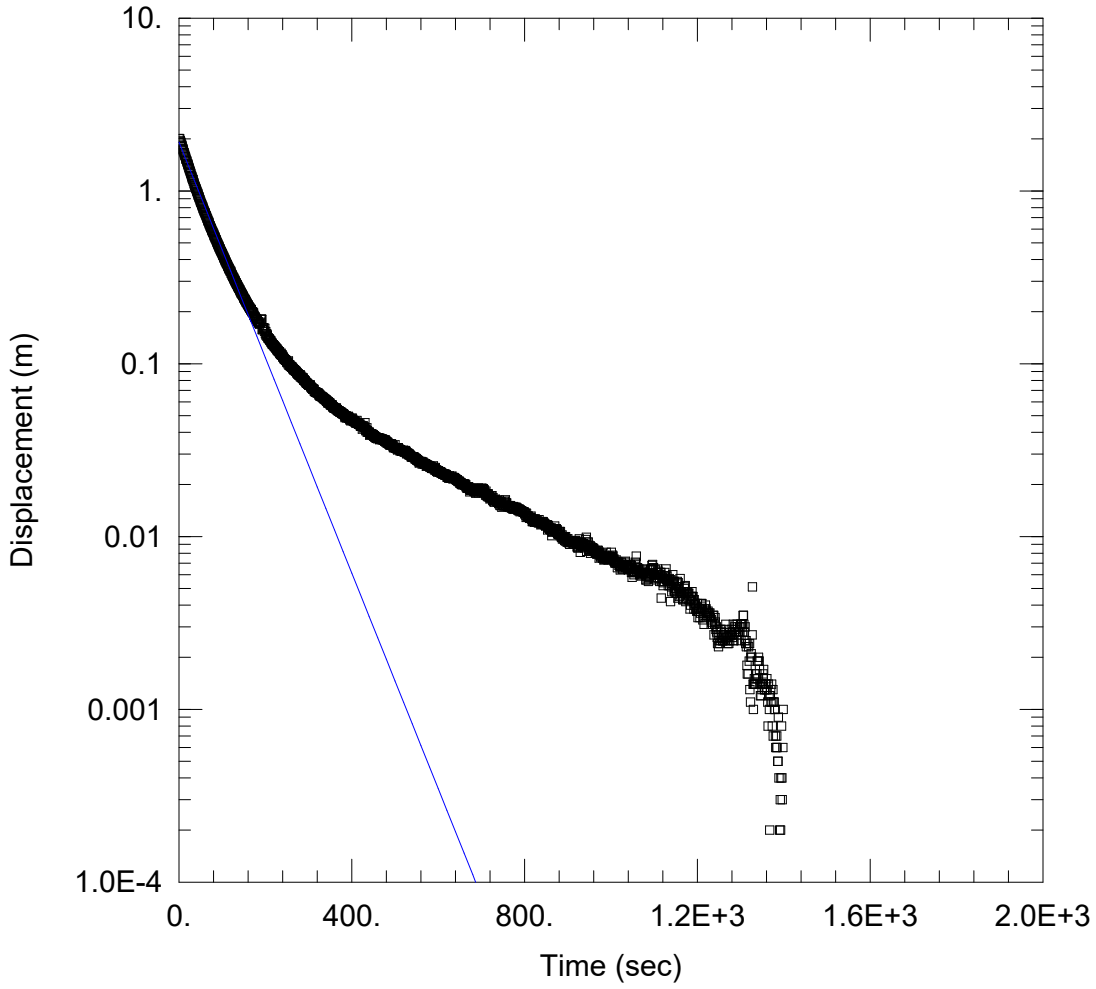
WELL DATA (BH1)

Initial Displacement: 1.992 m
Total Well Penetration Depth: 8.87 m
Casing Radius: 0.01905 m
Static Water Column Height: 8.95 m
Screen Length: 4.5 m
Well Radius: 0.01905 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Confined Solution Method: Hvorslev

K = 6.658E-6 m/sec y0 = 1.85 m



WELL TEST ANALYSIS

Data Set: G:\...\BH5.aqt
Date: 01/03/23 Time: 16:03:06

PROJECT INFORMATION

Company: Palmer
Client: Canada Inc
Project: 2209001
Location: Mississauga, On
Test Date: Nov 26, 2022

AQUIFER DATA

Saturated Thickness: 7.5 m Anisotropy Ratio (Kz/Kr): 0.1

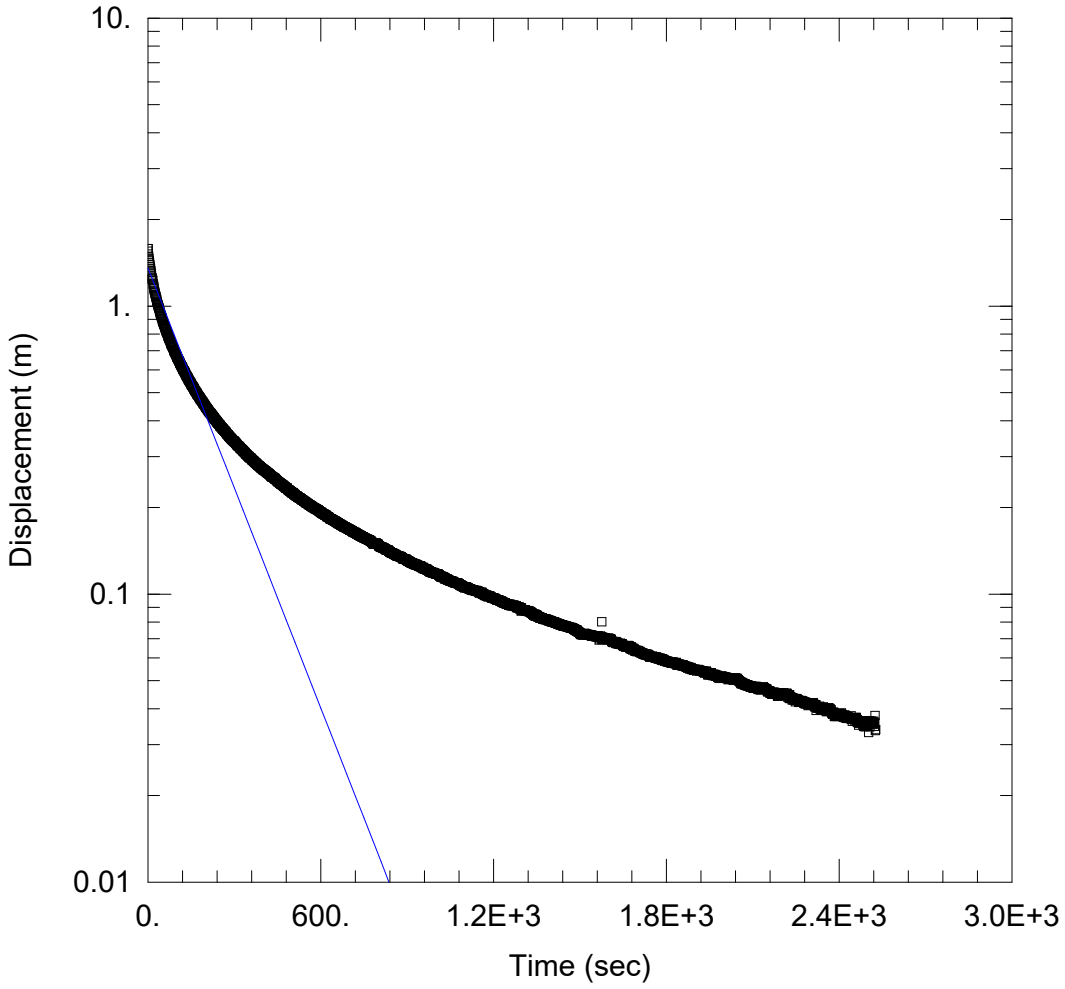
WELL DATA (BH5)

Initial Displacement: 2.004 m
Total Well Penetration Depth: 7.48 m
Casing Radius: 0.0194 m
Static Water Column Height: 10.01 m
Screen Length: 3. m
Well Radius: 0.0194 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Confined Solution Method: Hvorslev

K = 5.575E-6 m/sec y0 = 1.912 m



WELL TEST ANALYSIS

Data Set: G:\...\BH9.aqt
Date: 01/03/23 Time: 16:11:51

PROJECT INFORMATION

Company: Palmer
Client: Canada Inc
Project: 2209001
Location: Mississauga, On
Test Date: Nov 26, 2022

AQUIFER DATA

Saturated Thickness: 12.27 m Anisotropy Ratio (Kz/Kr): 0.1

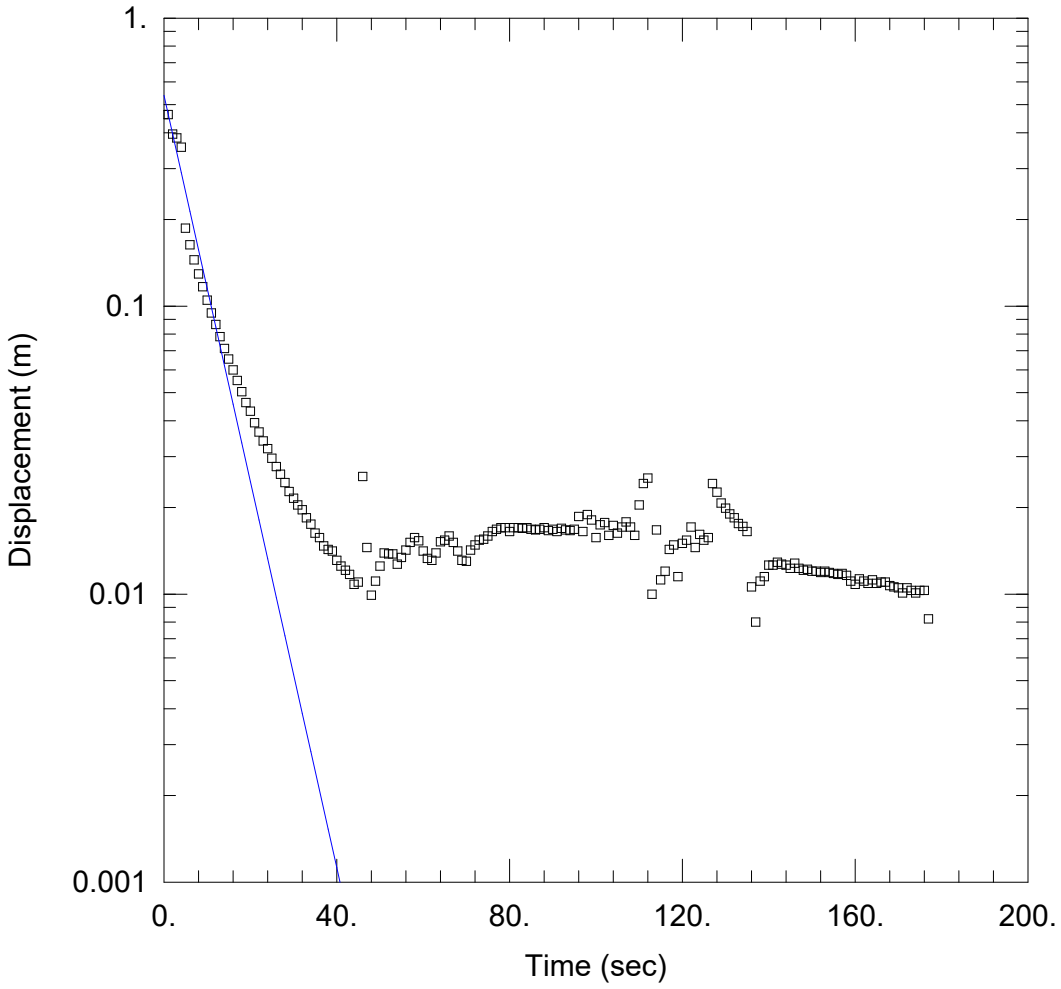
WELL DATA (BH9)

Initial Displacement: 1.583 m
Total Well Penetration Depth: 7.58 m
Casing Radius: 0.01905 m
Static Water Column Height: 12.27 m
Screen Length: 3. m
Well Radius: 0.01905 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Confined Solution Method: Hvorslev

K = 2.202E-6 m/sec y0 = 1.355 m



WELL TEST ANALYSIS

Data Set: G:\...\BH12.aqt
Date: 01/03/23 Time: 16:25:37

PROJECT INFORMATION

Company: Palmer
Client: Canada Inc
Project: 2209001
Location: Mississauga, On
Test Date: Nov 26, 2022

AQUIFER DATA

Saturated Thickness: 1.61 m Anisotropy Ratio (Kz/Kr): 0.1

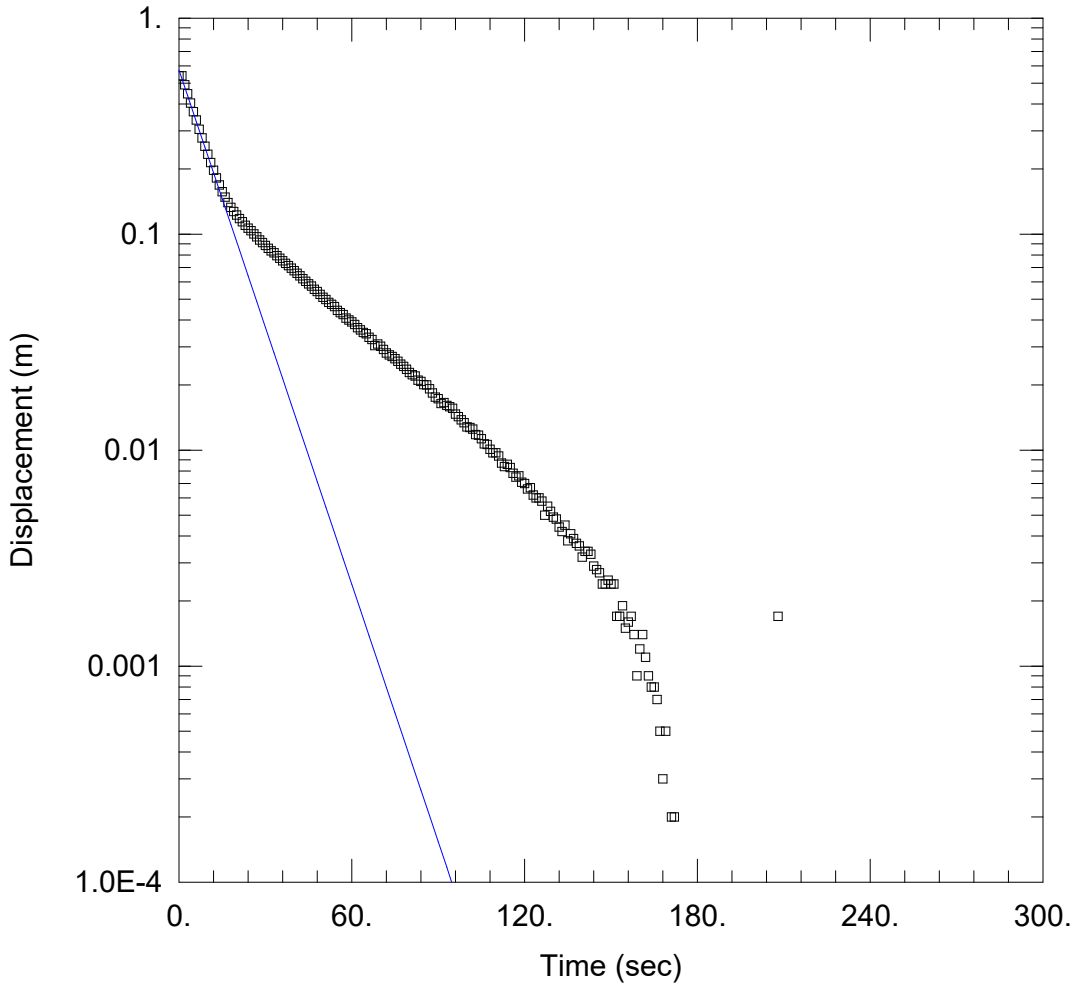
WELL DATA (BH12)

Initial Displacement: 0.4625 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 1.61 m
Screen Length: 3. m
Well Radius: 0.0254 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.0001106 m/sec y0 = 0.539 m



WELL TEST ANALYSIS

Data Set: G:\...\BH12_2.aqt
Date: 01/03/23 Time: 16:28:47

PROJECT INFORMATION

Company: Palmer
Client: Canada Inc
Project: 2209001
Location: Mississauga, On
Test Date: Nov 26, 2022

AQUIFER DATA

Saturated Thickness: 1.61 m Anisotropy Ratio (Kz/Kr): 0.1

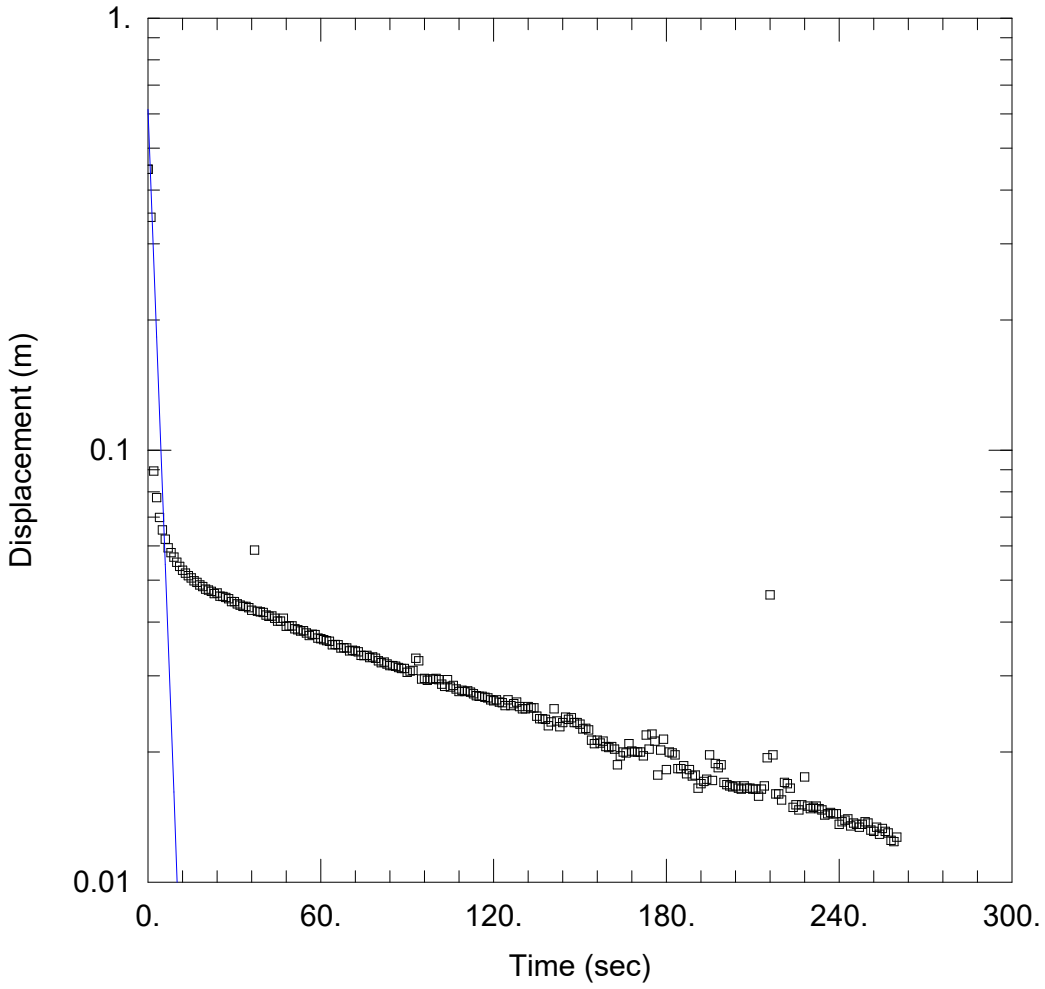
WELL DATA (BH12)

Initial Displacement: 0.5406 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 1.61 m
Screen Length: 3. m
Well Radius: 0.0254 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 6.549E-5 m/sec y0 = 0.5745 m



WELL TEST ANALYSIS

Data Set: G:\...\BH22-1_Beginning.aqt
Date: 01/03/23 Time: 10:22:36

PROJECT INFORMATION

Company: Palmer
Client: Canada Inc
Project: 2209001
Location: Mississauga, On
Test Date: Nov 23, 2022

AQUIFER DATA

Saturated Thickness: 1.94 m Anisotropy Ratio (Kz/Kr): 0.1

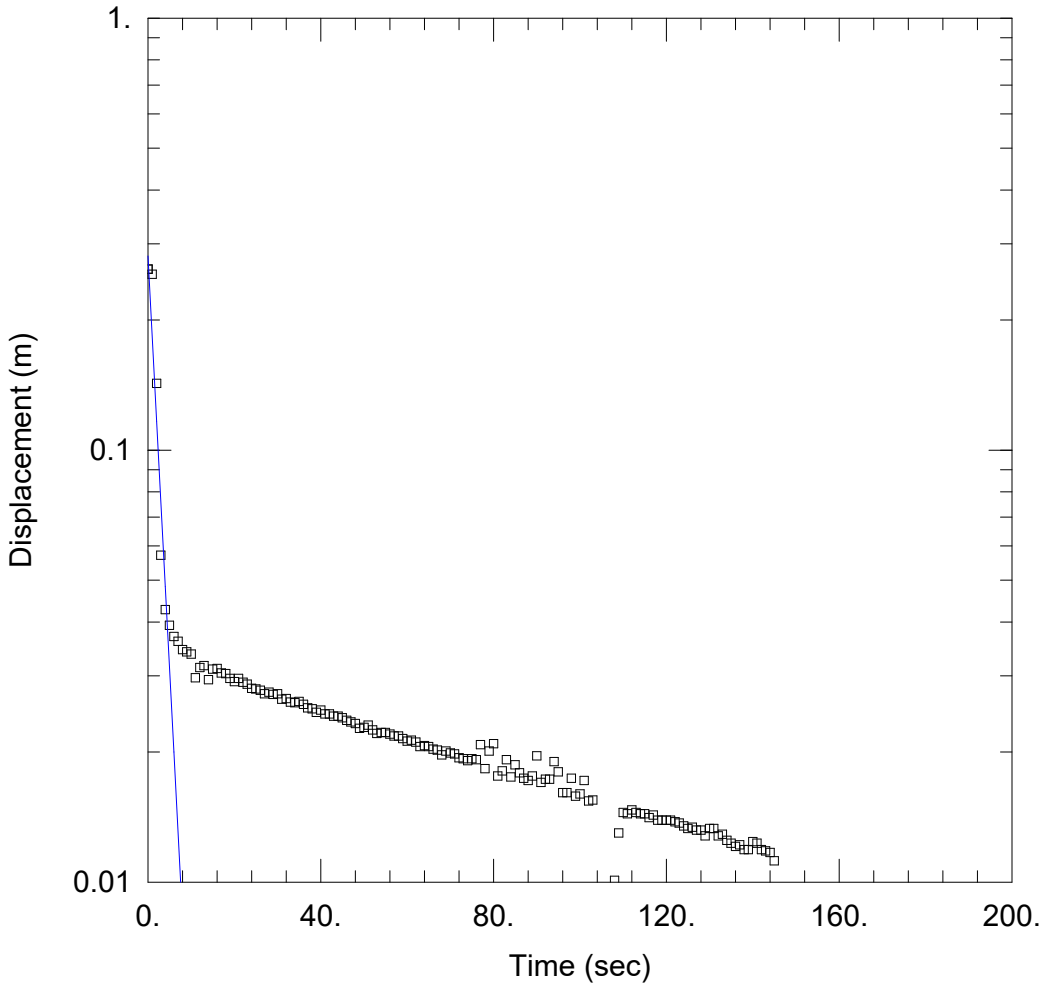
WELL DATA (BH22-1)

Initial Displacement: 0.4467 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 1.27 m
Screen Length: 3. m
Well Radius: 0.0254 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.0002426 m/sec y0 = 0.6146 m



WELL TEST ANALYSIS

Data Set: G:\...\BH22-2_FH1_unconfined_beginning.aqt
Date: 01/03/23 Time: 10:31:26

PROJECT INFORMATION

Company: Palmer
Client: Canada Inc
Project: 2209001
Location: Mississauga, On
Test Date: Nov 23, 2022

AQUIFER DATA

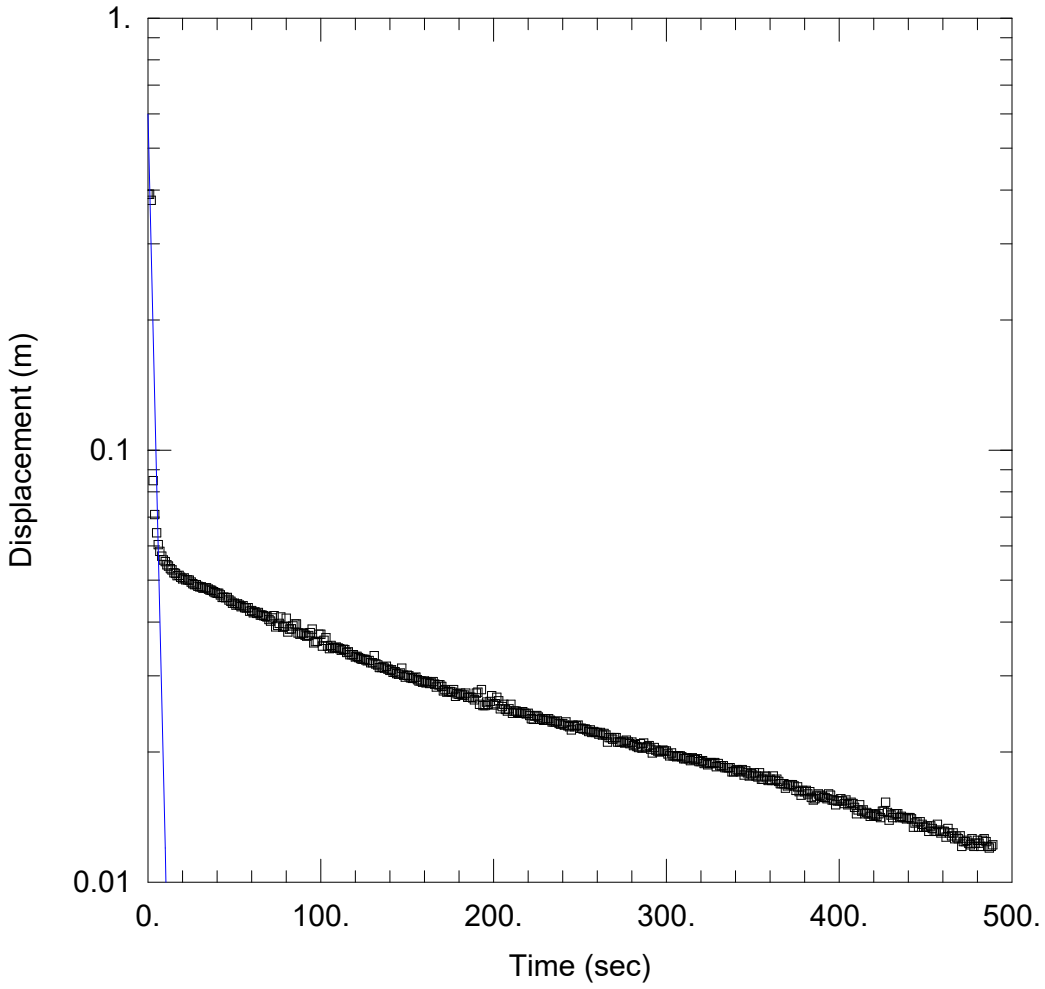
Saturated Thickness: 2.25 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (BH22-2)

Initial Displacement: 0.2622 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 1.46 m
Screen Length: 3. m
Well Radius: 0.0254 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0002295 m/sec
y0 = 0.2812 m



WELL TEST ANALYSIS

Data Set: G:\...\BH22-2_FH2_unconfined_beginning.aqt
Date: 01/03/23 Time: 10:36:18

PROJECT INFORMATION

Company: Palmer
Client: Canada Inc
Project: 2209001
Location: Mississauga, On
Test Date: Nov 23, 2022

AQUIFER DATA

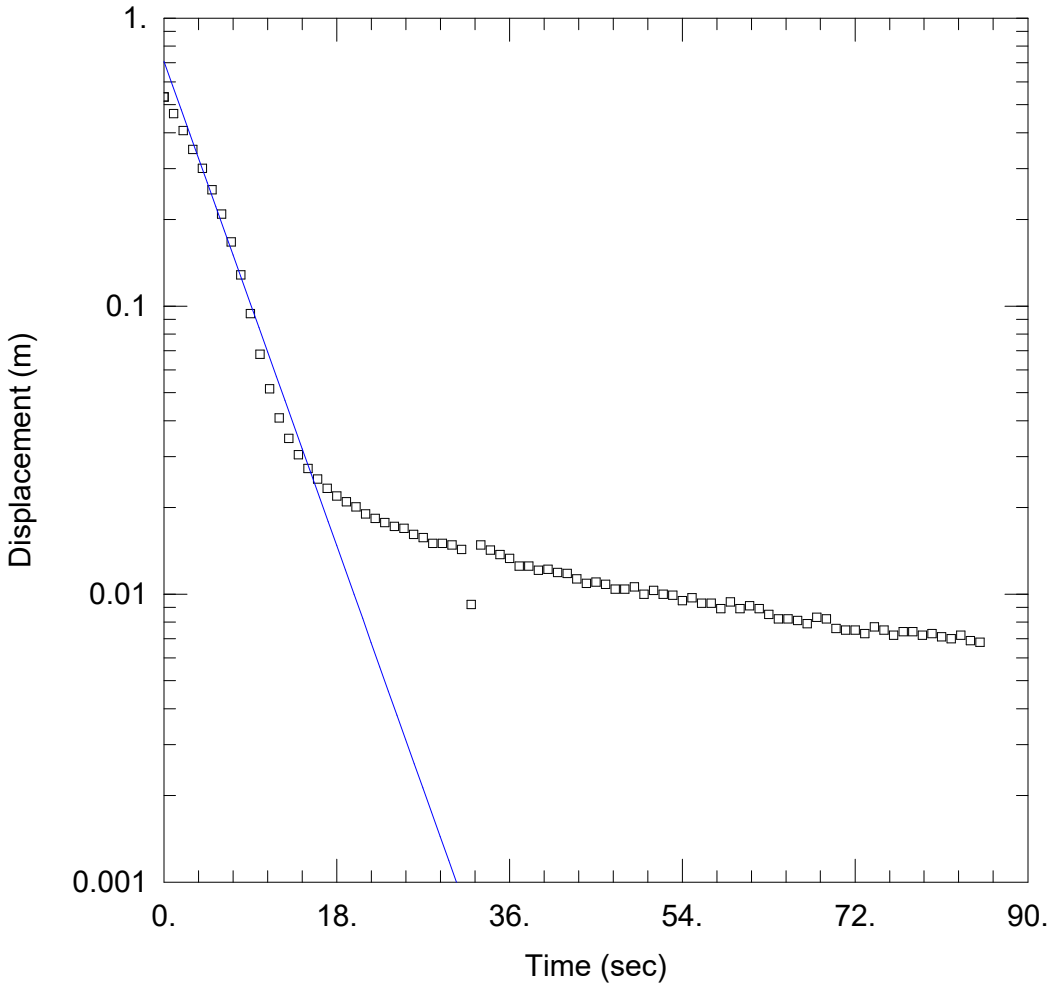
Saturated Thickness: 2.25 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (BH22-2)

Initial Displacement: 0.3909 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 1.46 m
Screen Length: 3. m
Well Radius: 0.0254 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0002037 m/sec
y0 = 0.5987 m



WELL TEST ANALYSIS

Data Set: G:\...\BH22-2_RH1_unconfined_beginning.aqt
Date: 01/03/23 Time: 10:41:13

PROJECT INFORMATION

Company: Palmer
Client: Canada Inc
Project: 2209001
Location: Mississauga, On
Test Date: Nov 23, 2022

AQUIFER DATA

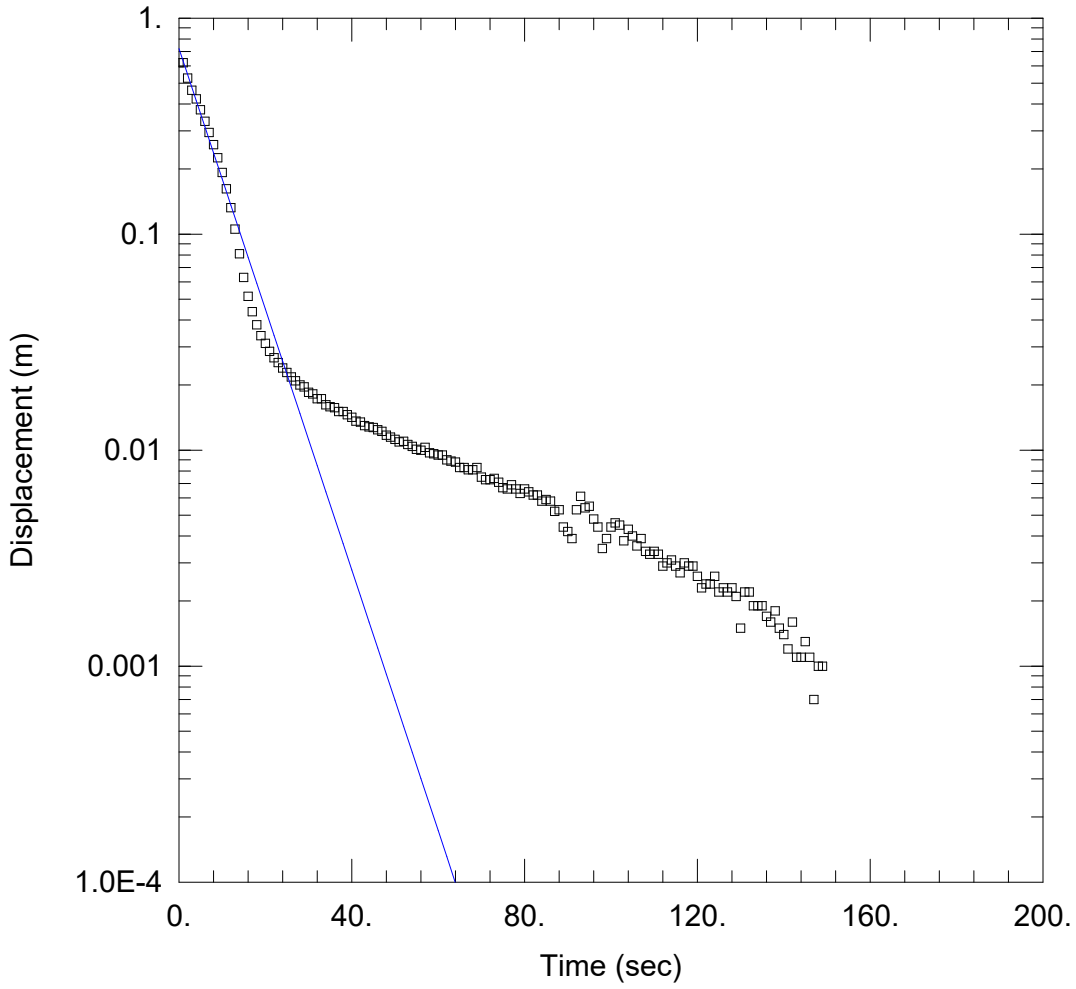
Saturated Thickness: 2.25 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (BH22-2)

Initial Displacement: 0.5322 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 1.46 m
Screen Length: 3. m
Well Radius: 0.0254 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.000112 m/sec
y0 = 0.7072 m



WELL TEST ANALYSIS

Data Set: G:\...\BH22-2_RH2.aqt
Date: 01/03/23 Time: 10:51:29

PROJECT INFORMATION

Company: Palmer
Client: Canada Inc
Project: 2209001
Location: Mississauga, On
Test Date: Nov 23, 2022

AQUIFER DATA

Saturated Thickness: 2.25 m Anisotropy Ratio (Kz/Kr): 0.1

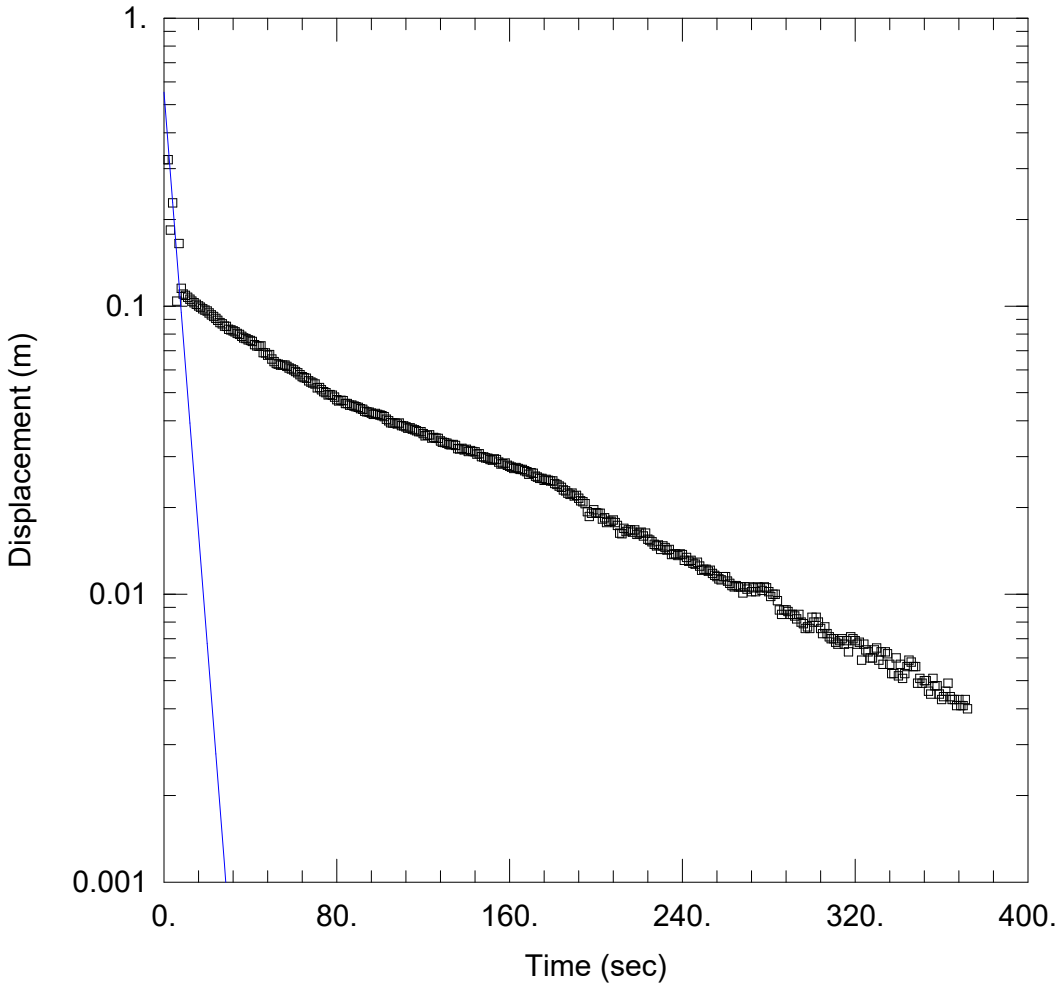
WELL DATA (BH22-2)

Initial Displacement: 0.6222 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 1.46 m
Screen Length: 3. m
Well Radius: 0.0254 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 7.236E-5 m/sec y0 = 0.7222 m



WELL TEST ANALYSIS

Data Set: G:\...\BH22_7_start.aqt
Date: 01/03/23 Time: 14:14:19

PROJECT INFORMATION

Company: Palmer
Client: Canada Inc
Project: 2209001
Location: Mississauga, On
Test Date: Nov 26, 2022

AQUIFER DATA

Saturated Thickness: 2.45 m Anisotropy Ratio (Kz/Kr): 0.1

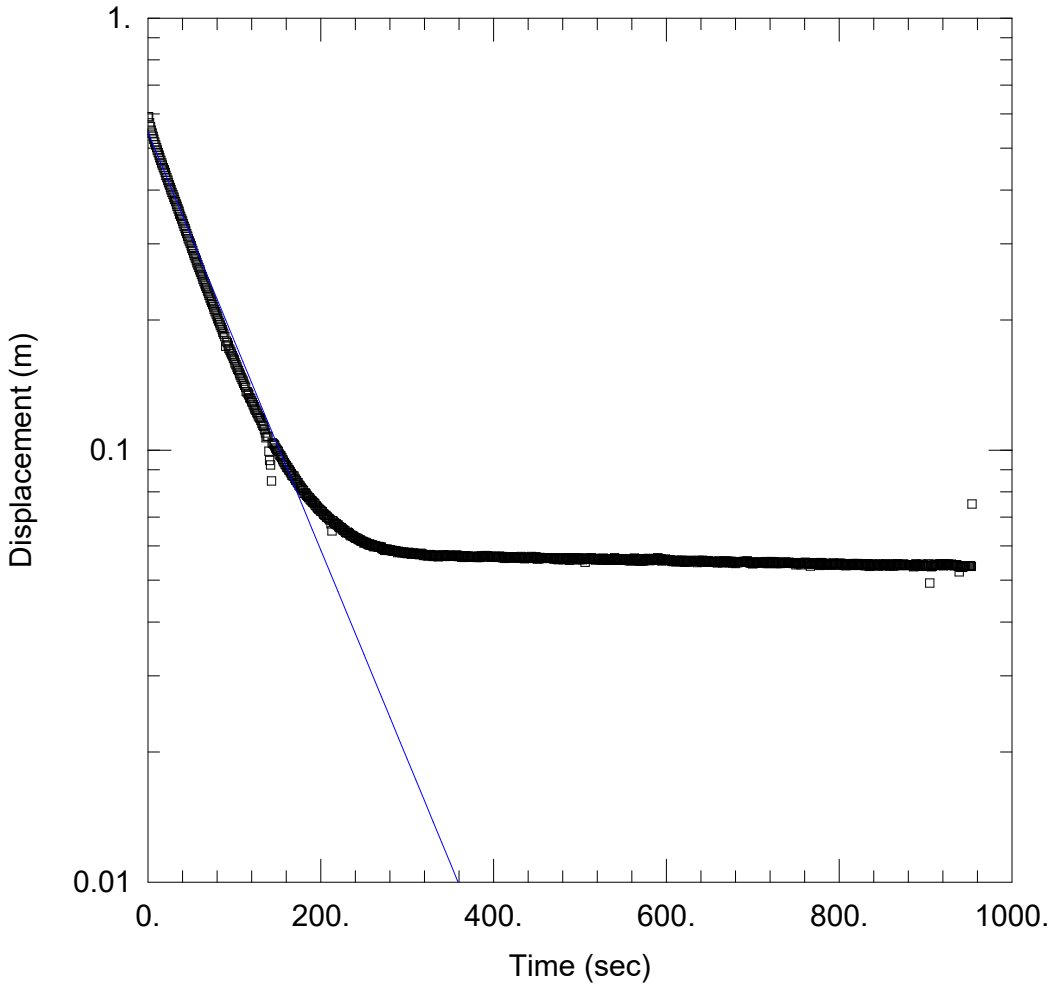
WELL DATA (BH22-7)

Initial Displacement: 0.3223 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 2.08 m
Screen Length: 3. m
Well Radius: 0.0254 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.0001059 m/sec y0 = 0.5534 m



WELL TEST ANALYSIS

Data Set: G:\...\BH22-8_A.aqt
Date: 01/04/23 Time: 12:07:42

PROJECT INFORMATION

Company: Palmer
Client: Canada Inc
Project: 2209001
Location: Mississauga, On
Test Date: Nov 23, 2022

AQUIFER DATA

Saturated Thickness: 2.34 m Anisotropy Ratio (Kz/Kr): 0.1

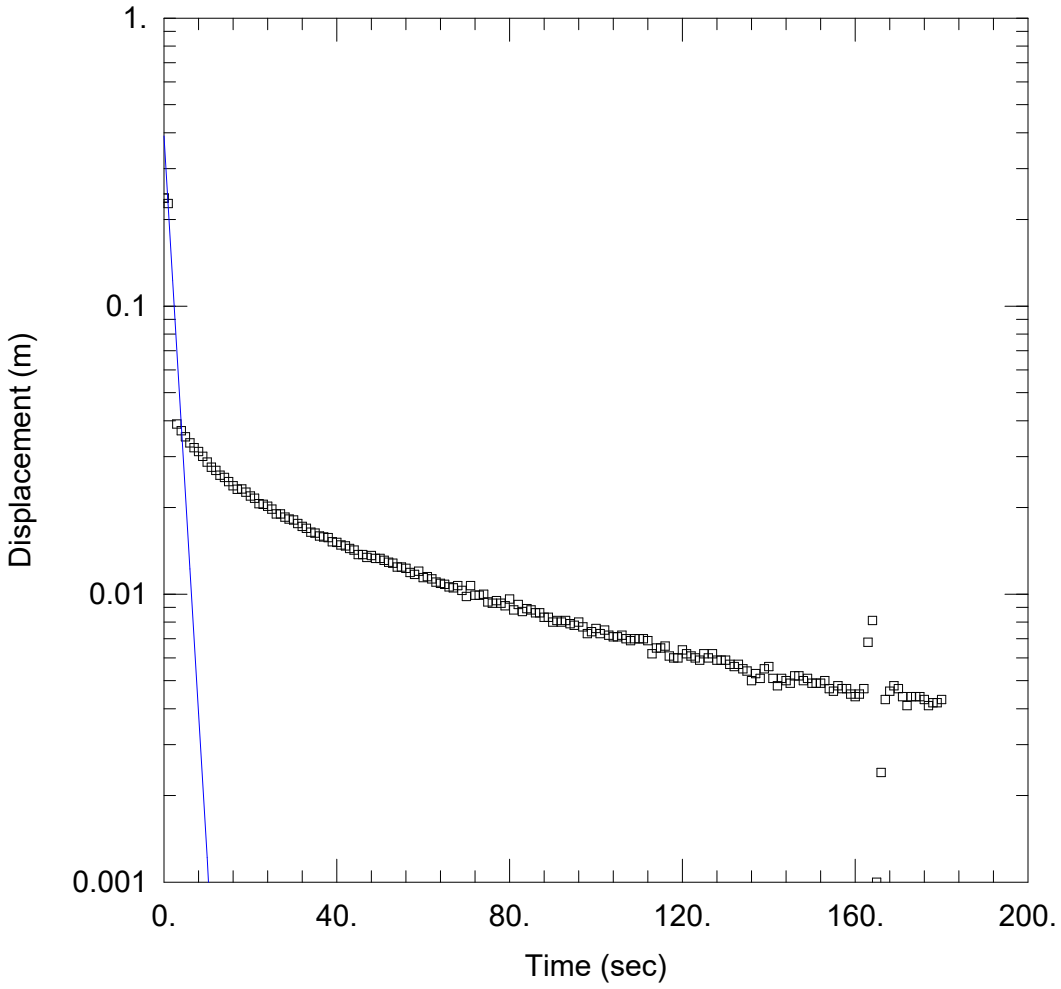
WELL DATA (BH22-8)

Initial Displacement: 0.5904 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 1.69 m
Screen Length: 3. m
Well Radius: 0.0254 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 5.588E-6 m/sec y0 = 0.5446 m



WELL TEST ANALYSIS

Data Set: G:\...\BH22-9_beginning..aqt
Date: 12/23/22 Time: 14:36:43

PROJECT INFORMATION

Company: Palmer
Client: Canada Inc
Project: 2209001
Location: Mississauga, On
Test Date: Nov 26, 2022

AQUIFER DATA

Saturated Thickness: 2.72 m Anisotropy Ratio (Kz/Kr): 0.1

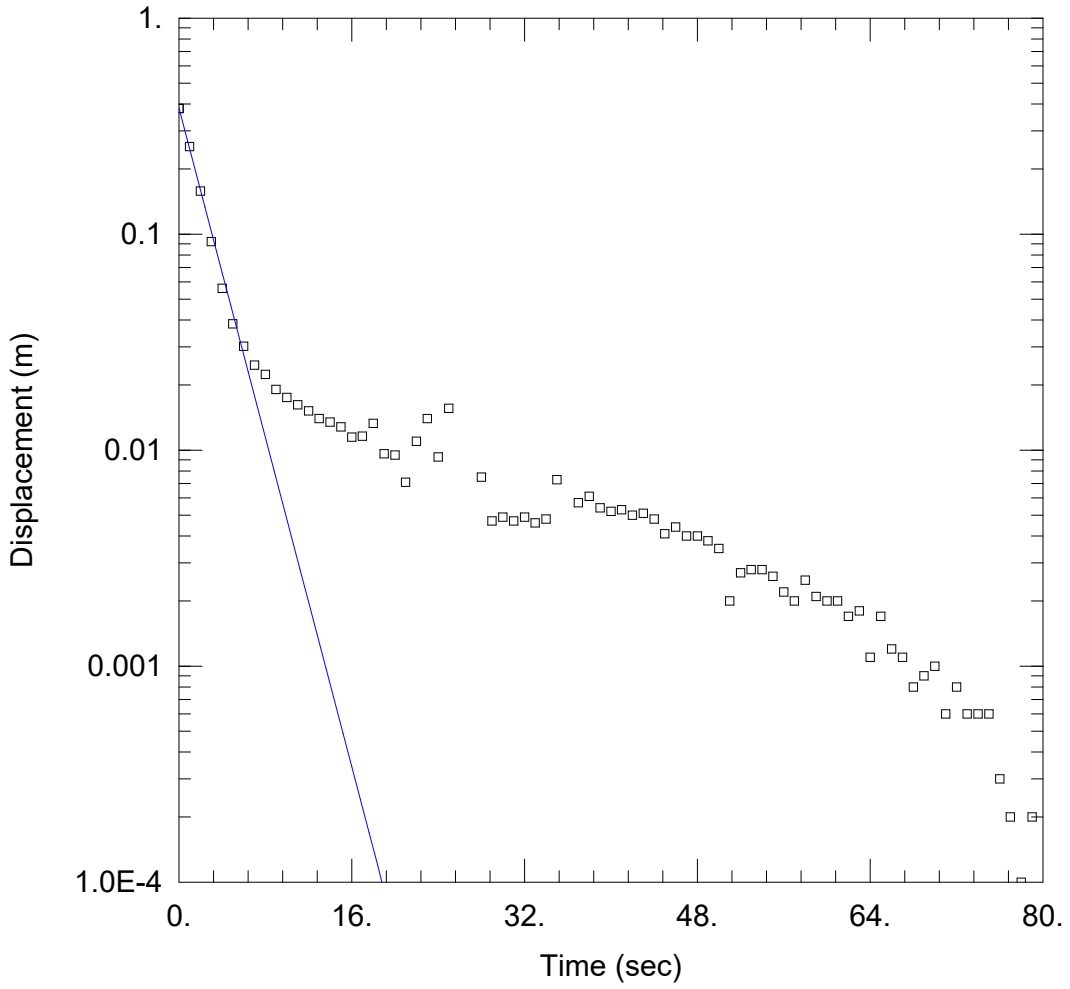
WELL DATA (BH22-9)

Initial Displacement: 0.2372 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 1.78 m
Screen Length: 3. m
Well Radius: 0.0254 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.0002506 m/sec y0 = 0.3893 m



WELL TEST ANALYSIS

Data Set: G:\...\BH22-9RH_beginning..aqt
Date: 12/23/22 Time: 14:42:05

PROJECT INFORMATION

Company: Palmer
Client: Canada Inc
Project: 2209001
Location: Mississauga, On
Test Date: Nov 26, 2022

AQUIFER DATA

Saturated Thickness: 2.72 m Anisotropy Ratio (Kz/Kr): 0.1

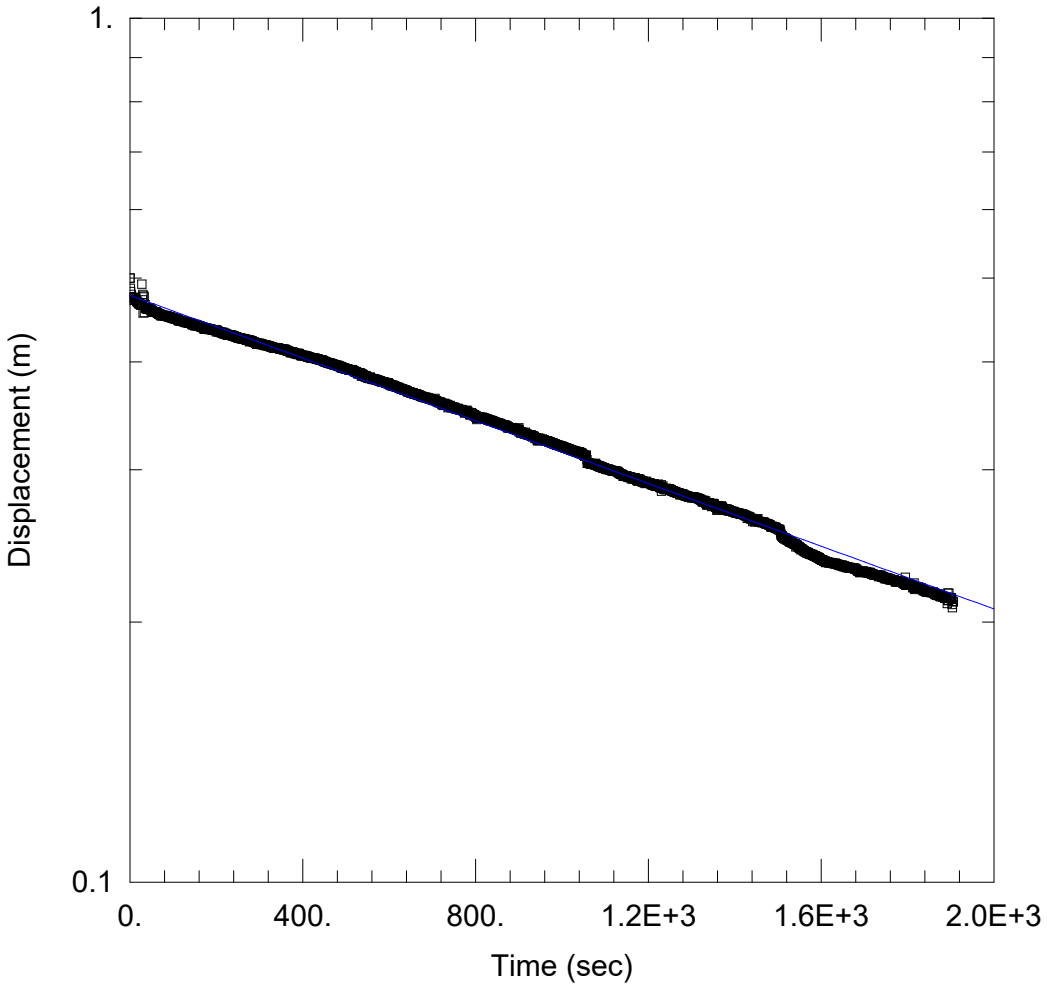
WELL DATA (BH22-9)

Initial Displacement: 0.3813 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 1.78 m
Screen Length: 3. m
Well Radius: 0.0254 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.0001906 m/sec y0 = 0.3826 m



WELL TEST ANALYSIS

Data Set: G:\...\BH22-11_SelfConfining.aqt
Date: 01/04/23 Time: 13:33:10

PROJECT INFORMATION

Company: Palmer
Client: Canada Inc
Project: 2209001
Location: Mississauga, On
Test Date: Nov 26, 2022

AQUIFER DATA

Saturated Thickness: 9.52 m Anisotropy Ratio (Kz/Kr): 0.1

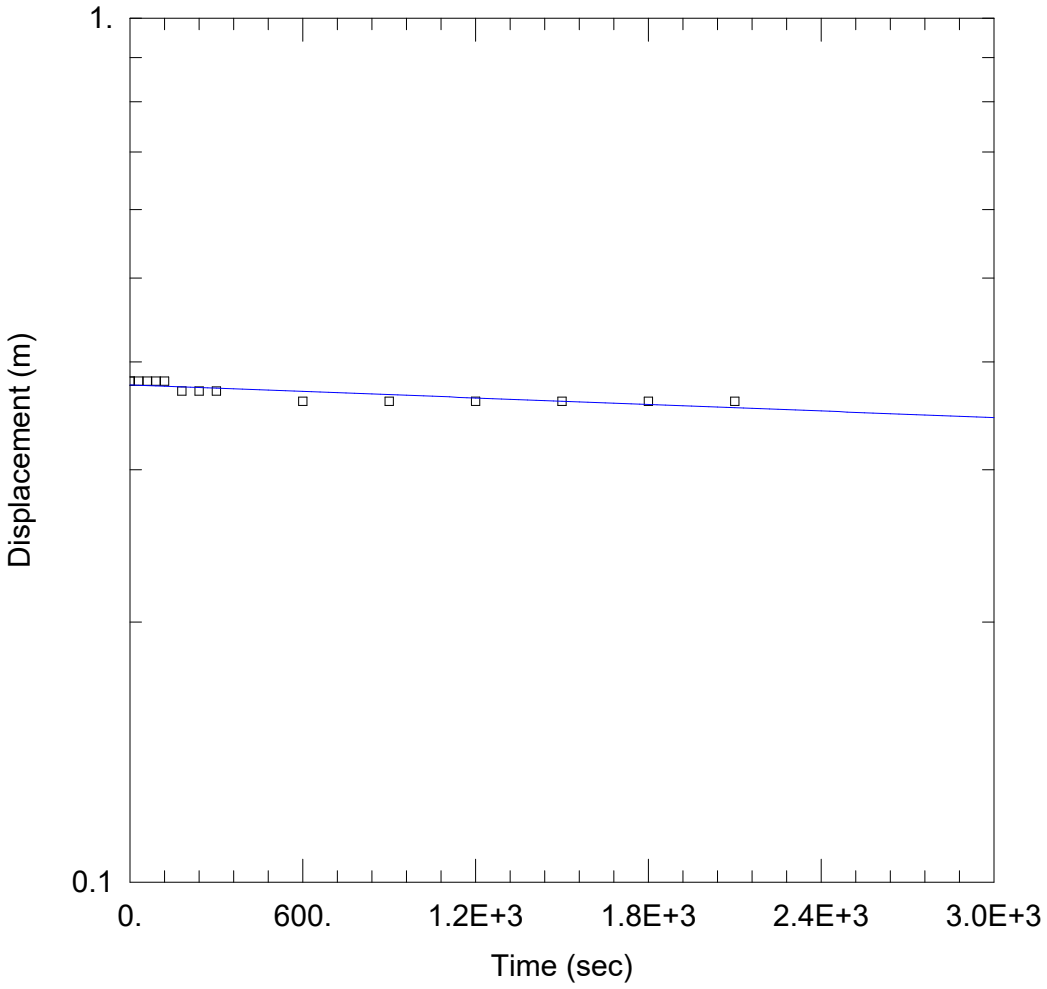
WELL DATA (BH22-11)

Initial Displacement: 0.5 m
Total Well Penetration Depth: 9.27 m
Casing Radius: 0.0254 m
Static Water Column Height: 9.52 m
Screen Length: 3. m
Well Radius: 0.0254 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Confined Solution Method: Hvorslev

K = 2.661E-7 m/sec y0 = 0.4776 m



WELL TEST ANALYSIS

Data Set: G:\...\BH22-16-Jan5.aqt
Date: 01/09/23 Time: 10:17:20

PROJECT INFORMATION

Company: Palmer
Client: Canada Inc
Project: 2209001
Location: Mississauga, On
Test Date: Jan 5, 2023

AQUIFER DATA

Saturated Thickness: 14.34 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (BH22-16)

Initial Displacement: 0.38 m
Total Well Penetration Depth: 14.38 m
Casing Radius: 0.0254 m
Static Water Column Height: 14.38 m
Screen Length: 1.5 m
Well Radius: 0.0254 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Confined Solution Method: Hvorslev

K = 3.701E-8 m/sec y0 = 0.3763 m

Appendix E

Groundwater Chemistry Analyses

ALS, 2022

ALS Canada Ltd.

right solutions.
right partner.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2222346**	Page	: 1 of 11
Client	: **Palmer Environmental Consulting Group Inc.**	Laboratory	: Waterloo - Environmental
Contact	: Frank Liu	Account Manager	: Andrew Martin
Address	: 74 Berkeley Street Toronto ON Canada M5V 1E3	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: ----	Telephone	: +1 519 886 6910
Project	: 2209001	Date Samples Received	: 18-Nov-2022 13:37
PO	: ----	Issue Date	: 30-Nov-2022 13:35
C-O-C number	: 20-999595		
Sampler	: CLIENT		
Site	: ----		
Quote number	: (Q88296) PALMER 2022 STANDING OFFER		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Matrix Spike outliers occur.
- Laboratory Control Sample (LCS) outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers occur - please see following pages for full details.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Laboratory Control Sample (LCS) Recoveries								
Volatile Organic Compounds	QC-752840-002	----	methyl ethyl ketone [MEK]	78-93-3	E611D	144 % LCS-H	70.0-130%	Recovery greater than upper control limit
Volatile Organic Compounds	QC-752840-002	----	tetrachloroethane, 1,1,2,2-	79-34-5	E611D	153 % LCS-H	70.0-130%	Recovery greater than upper control limit

Result Qualifiers

Qualifier	*Description*
LCS-H	*Lab Control Sample recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.*

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Aggregate Organics : Biochemical Oxygen Demand (Carbonaceous) - 5 day										
HDPE [BOD HT-4d]										
BH22- 11	E555	18-Nov-2022	----	----	----		21-Nov-2022	4 days	3 days	✓
Aggregate Organics : Mineral Oil & Grease by Gravimetry										
Amber glass (hydrochloric acid)										
BH22- 11	E567SG	18-Nov-2022	22-Nov-2022	28 days	5 days	✓	22-Nov-2022	40 days	0 days	✓
Aggregate Organics : Oil & Grease by Gravimetry										
Amber glass (hydrochloric acid)										
BH22- 11	E567	18-Nov-2022	22-Nov-2022	28 days	5 days	✓	22-Nov-2022	40 days	0 days	✓
Aggregate Organics : Phenols (4AAP) in Water by Colorimetry										
Amber glass total (sulfuric acid) [ON MECP]										
BH22- 11	E562	18-Nov-2022	22-Nov-2022	----	----		23-Nov-2022	28 days	6 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP]										
BH22- 11	E235.F	18-Nov-2022	22-Nov-2022	----	----		23-Nov-2022	28 days	6 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP]										
BH22- 11	E235.SO4	18-Nov-2022	22-Nov-2022	----	----		23-Nov-2022	28 days	6 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) [ON MECP]										
BH22- 11	E318	18-Nov-2022	23-Nov-2022	----	----		23-Nov-2022	28 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) [ON MECP]										
BH22- 11	E372-U	18-Nov-2022	23-Nov-2022	----	----		24-Nov-2022	28 days	7 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
BH22- 11	E333	18-Nov-2022	25-Nov-2022	----	----		25-Nov-2022	14 days	8 days	✓
Microbiological Tests : E. coli (MF-mFC-BCIG)										
Sterile HDPE (Sodium thiosulphate) [ON MECP]										
BH22- 11	E012A.EC	18-Nov-2022	----	----	----		19-Nov-2022	48 hrs	35 hrs	✓
Nonylphenols : Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode										
Amber glass/Teflon lined cap - LCMS										
BH22- 11	E749B	18-Nov-2022	24-Nov-2022	7 days	7 days	✓	29-Nov-2022	7 days	5 days	✓
Nonylphenols : Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode										
Amber glass/Teflon lined cap - LCMS										
BH22- 11	E749A	18-Nov-2022	24-Nov-2022	7 days	7 days	✓	29-Nov-2022	7 days	5 days	✓
Phthalate Esters : BNA (Ontario Sanitary Sewer SVOC Target List) by GC-MS										
Amber glass/Teflon lined cap [ON MECP]										
BH22- 11	E655F	18-Nov-2022	23-Nov-2022	14 days	6 days	✓	24-Nov-2022	40 days	1 days	✓
Physical Tests : pH by Meter										
HDPE [ON MECP]										
BH22- 11	E108	18-Nov-2022	22-Nov-2022	----	----		23-Nov-2022	14 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE [ON MECP]										
BH22- 11	E160	18-Nov-2022	----	----	----		24-Nov-2022	7 days	7 days	✓
Polychlorinated Biphenyls : PCB Aroclors by GC-MS										
Amber glass/Teflon lined cap										
BH22- 11	E687	18-Nov-2022	21-Nov-2022	14 days	4 days	✓	22-Nov-2022	40 days	1 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid)										
BH22- 11	E508	18-Nov-2022	21-Nov-2022	----	----		21-Nov-2022	28 days	3 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
BH22- 11	E420	18-Nov-2022	21-Nov-2022	----	----		22-Nov-2022	180 days	5 days	✓
Volatile Organic Compounds : VOCs (Eastern Canada List) by Headspace GC-MS										
Glass vial (sodium bisulfate)										
BH22- 11	E611D	18-Nov-2022	22-Nov-2022	----	----		22-Nov-2022	14 days	5 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: ✗ = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555	751178	1	20	5.0	5.0	✓
E. coli (MF-mFC-BCIG)	E012A.EC	749981	1	7	14.2	5.0	✓
Fluoride in Water by IC	E235.F	753246	1	4	25.0	5.0	✓
Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode	E749B	761880	1	20	5.0	5.0	✓
Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode	E749A	761879	1	20	5.0	5.0	✓
pH by Meter	E108	753250	1	6	16.6	5.0	✓
Phenols (4AAP) in Water by Colorimetry	E562	753517	1	10	10.0	5.0	✓
Sulfate in Water by IC	E235.SO4	753247	1	18	5.5	5.0	✓
Total Cyanide	E333	757482	1	19	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	753515	1	17	5.8	5.0	✓
Total Mercury in Water by CVAAS	E508	751079	1	12	8.3	5.0	✓
Total metals in Water by CRC ICPMS	E420	752020	1	10	10.0	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	753516	1	19	5.2	5.0	✓
TSS by Gravimetry	E160	754190	1	19	5.2	4.7	✓
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	752840	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555	751178	1	20	5.0	5.0	✓
BNA (Ontario Sanitary Sewer SVOC Target List) by GC-MS	E655F	755346	1	2	50.0	5.0	✓
Fluoride in Water by IC	E235.F	753246	1	4	25.0	5.0	✓
Mineral Oil & Grease by Gravimetry	E567SG	750814	1	13	7.6	5.0	✓
Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode	E749B	761880	1	20	5.0	5.0	✓
Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode	E749A	761879	1	20	5.0	5.0	✓
Oil & Grease by Gravimetry	E567	750813	1	13	7.6	5.0	✓
PCB Aroclors by GC-MS	E687	750866	1	6	16.6	4.7	✓
pH by Meter	E108	753250	1	6	16.6	5.0	✓
Phenols (4AAP) in Water by Colorimetry	E562	753517	1	10	10.0	5.0	✓
Sulfate in Water by IC	E235.SO4	753247	1	18	5.5	5.0	✓
Total Cyanide	E333	757482	0	19	0.0	5.0	✗
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	753515	1	17	5.8	5.0	✓
Total Mercury in Water by CVAAS	E508	751079	1	12	8.3	5.0	✓
Total metals in Water by CRC ICPMS	E420	752020	1	10	10.0	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	753516	1	19	5.2	5.0	✓
TSS by Gravimetry	E160	754190	1	19	5.2	4.7	✓
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	752840	1	20	5.0	5.0	✓
Method Blanks (MB)							

Matrix: **Water**

Evaluation: ✗ = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB) - Continued							
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555	751178	1	20	5.0	5.0	✓
BNA (Ontario Sanitary Sewer SVOC Target List) by GC-MS	E655F	755346	1	2	50.0	5.0	✓
E. coli (MF-mFC-BCIG)	E012A.EC	749981	1	7	14.2	5.0	✓
Fluoride in Water by IC	E235.F	753246	1	4	25.0	5.0	✓
Mineral Oil & Grease by Gravimetry	E567SG	750814	1	13	7.6	5.0	✓
Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode	E749B	761880	1	20	5.0	5.0	✓
Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode	E749A	761879	1	20	5.0	5.0	✓
Oil & Grease by Gravimetry	E567	750813	1	13	7.6	5.0	✓
PCB Aroclors by GC-MS	E687	750866	1	6	16.6	4.7	✓
Phenols (4AAP) in Water by Colorimetry	E562	753517	1	10	10.0	5.0	✓
Sulfate in Water by IC	E235.SO4	753247	1	18	5.5	5.0	✓
Total Cyanide	E333	757482	0	19	0.0	5.0	✗
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	753515	1	17	5.8	5.0	✓
Total Mercury in Water by CVAAS	E508	751079	1	12	8.3	5.0	✓
Total metals in Water by CRC ICPMS	E420	752020	1	10	10.0	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	753516	1	19	5.2	5.0	✓
TSS by Gravimetry	E160	754190	1	19	5.2	4.7	✓
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	752840	1	20	5.0	5.0	✓
Matrix Spikes (MS)							
Fluoride in Water by IC	E235.F	753246	1	4	25.0	5.0	✓
Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode	E749B	761880	1	20	5.0	5.0	✓
Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode	E749A	761879	1	20	5.0	5.0	✓
Phenols (4AAP) in Water by Colorimetry	E562	753517	1	10	10.0	5.0	✓
Sulfate in Water by IC	E235.SO4	753247	1	18	5.5	5.0	✓
Total Cyanide	E333	757482	1	19	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	753515	1	17	5.8	5.0	✓
Total Mercury in Water by CVAAS	E508	751079	1	12	8.3	5.0	✓
Total metals in Water by CRC ICPMS	E420	752020	1	10	10.0	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	753516	1	19	5.2	5.0	✓
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	752840	1	20	5.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
E. coli (MF-mFC-BCIG)	E012A.EC Waterloo - Environmental	Water	ON E3433 (mod)	Following filtration (0.45 µm), and incubation at 44.5±0.2°C for 24 hours, colonies exhibiting characteristic morphology of the target organism are enumerated.
pH by Meter	E108 Waterloo - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160 Waterloo - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Fluoride in Water by IC	E235.F Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Waterloo - Environmental	Water	Method Fialab 100, 2018	TKN in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021).
Total Cyanide	E333 Waterloo - Environmental	Water	ISO 14403 (mod)	Total or Strong Acid Dissociable (SAD) Cyanide is determined by Continuous Flow Analyzer (CFA) with in-line UV digestion followed by colourmetric analysis. Method Limitation: High levels of thiocyanate (SCN) may cause positive interference (up to 0.5% of SCN concentration).
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U Waterloo - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Total metals in Water by CRC ICPMS	E420 Waterloo - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Mercury in Water by CVAAS	E508 Waterloo - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555 Waterloo - Environmental	Water	APHA 5210 B (mod)	Samples are diluted and incubated for a specified time period, after which the oxygen depletion is measured using a dissolved oxygen meter. Nitrification inhibitor is added to samples to prevent nitrogenous compounds from consuming oxygen resulting in only carbonaceous oxygen demand being reported by this method. Free chlorine is a negative interference in the BOD method; please advise ALS when free chlorine is present in samples.
Phenols (4AAP) in Water by Colorimetry	E562 Waterloo - Environmental	Water	EPA 9066	This automated method is based on the distillation of phenol and subsequent reaction of the distillate with alkaline ferricyanide (K3Fe(CN)6) and 4-amino-antipyrine (4-AAP) to form a red complex which is measured colorimetrically.
Oil & Grease by Gravimetry	E567 Waterloo - Environmental	Water	BC MOE Lab Manual (Oil & Grease) (mod)	The entire water sample is extracted with hexane and the extract is evaporated to dryness. The residue is then weighed to determine Oil and Grease.
Mineral Oil & Grease by Gravimetry	E567SG Waterloo - Environmental	Water	BC MOE Lab Manual (Oil & Grease) (mod)	The entire water sample is extracted with hexane, followed by silica gel treatment after which the extract is evaporated to dryness. The residue is then weighed to determine Mineral Oil and Grease.
VOCs (Eastern Canada List) by Headspace GC-MS	E611D Waterloo - Environmental	Water	EPA 8260D (mod)	Volatile Organic Compounds (VOCs) are analyzed by static headspace GC-MS. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
BNA (Ontario Sanitary Sewer SVOC Target List) by GC-MS	E655F Waterloo - Environmental	Water	EPA 8270E (mod)	BNA are analyzed by GC-MS.
PCB Aroclors by GC-MS	E687 Waterloo - Environmental	Water	EPA 8270E (mod)	PCB Aroclors are analyzed by GC-MS
Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode	E749A Waterloo - Environmental	Water	J. Chrom A849 (1999) p.467-482	An aliquot of 5.0 ± 0.10 mL of filtered sample is spiked with Nonylphenol-D4, Nonylphenol Diethoxylate 13C6, and Bisphenol A 13C12 internal standards and analyzed by LC-MS/MS.
Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode	E749B Waterloo - Environmental	Water	J. Chrom A849 (1999) p.467-482	Water samples are filtered and analyzed on LCMS/MS by direct injection.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Animal & Vegetable Oil & Grease by Gravimetry	EC567A.SG Waterloo - Environmental	Water	APHA 5520 (mod)	Animal & vegetable oil and grease is calculated as follows: Oil & Grease (gravimetric) minus Mineral Oil & Grease (gravimetric)

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Digestion for TKN in water	EP318 Waterloo - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low.
Digestion for Total Phosphorus in water	EP372 Waterloo - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Oil & Grease Extraction for Gravimetry	EP567 Waterloo - Environmental	Water	BC MOE Lab Manual (Oil & Grease) (mod)	The entire water sample is extracted with hexane by liquid-liquid extraction.
VOCs Preparation for Headspace Analysis	EP581 Waterloo - Environmental	Water	EPA 5021A (mod)	Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler. An aliquot of the headspace is then injected into the GC/MS-FID system.
BNA Extraction	EP655 Waterloo - Environmental	Water	EPA 3510C (mod)	SVOCs are extracted from aqueous sample using DCM liquid-liquid extraction.
Pesticides, PCB, and Neutral Extractable Chlorinated Hydrocarbons Extraction	EP660 Waterloo - Environmental	Water	EPA 3511 (mod)	Samples are extracted from aqueous sample using an organic solvent liquid-liquid extraction.
Preparation of Nonylphenol and Nonylphenol Ethoxylates	EP749 Waterloo - Environmental	Water	J. Chrom A849 (1999) p.467-482	An aliquot of 5.0 ± 0.10 mL of filtered sample is spiked with Nonylphenol-D4, Nonylphenol Diethoxylate 13C6, and Bisphenol A 13C12 internal standards and analyzed by LC-MS/MS.

QUALITY CONTROL REPORT

Work Order	: **WT2222346**	Page	: 1 of 12
Client	: Palmer Environmental Consulting Group Inc.	Laboratory	: Waterloo - Environmental
Contact	: Frank Liu	Account Manager	: Andrew Martin
Address	: 74 Berkeley Street Toronto ON Canada M5V 1E3	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	:	Telephone	: +1 519 886 6910
Project	: 2209001	Date Samples Received	: 18-Nov-2022 13:37
PO	: ----	Date Analysis Commenced	: 19-Nov-2022
C-O-C number	: 20-999595	Issue Date	: 30-Nov-2022 13:35
Sampler	: CLIENT ----		
Site	: ----		
Quote number	: (Q88296) PALMER 2022 STANDING OFFER		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Waterloo Microbiology, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Waterloo Inorganics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Waterloo Metals, Waterloo, Ontario
Jocelyn Kennedy	Department Manager - Semi-Volatile Organics	Waterloo Organics, Waterloo, Ontario
Rachel Cameron	Supervisor - Semi-Volatile Extractions	Waterloo Organics, Waterloo, Ontario
Sanja Risticevic	Department Manager - LCMS	Waterloo LCMS, Waterloo, Ontario
Sarah Birch	VOC Section Supervisor	Waterloo Organics, Waterloo, Ontario

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 753250)											
WT2222429-001	Anonymous	pH	----	E108	0.10	pH units	8.13	8.12	0.123%	4%	----
Physical Tests (QC Lot: 754190)											
WT2222336-002	Anonymous	solids, total suspended [TSS]	----	E160	5.0	mg/L	84.7	86.7	2.33%	20%	----
Anions and Nutrients (QC Lot: 753246)											
WT2222423-001	Anonymous	fluoride	16984-48-8	E235.F	0.200	mg/L	0.610	0.616	0.006	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 753247)											
WT2222423-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	3.00	mg/L	41.9	41.7	0.508%	20%	----
Anions and Nutrients (QC Lot: 753515)											
WT2222363-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	5.00	mg/L	61.9	58.2	6.16%	20%	----
Anions and Nutrients (QC Lot: 753516)											
WT2222346-001	BH22- 11	phosphorus, total	7723-14-0	E372-U	0.0200	mg/L	0.550	0.542	1.58%	20%	----
Cyanides (QC Lot: 757482)											
WT2222062-001	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.0020	mg/L	<0.0020	<0.0020	0	Diff <2x LOR	----
Microbiological Tests (QC Lot: 749981)											
WT2222414-001	Anonymous	coliforms, Escherichia coli [E. coli]	----	E012A.EC	1	CFU/100mL	160	100	46.2%	65%	----
Total Metals (QC Lot: 751079)											
TY2204129-001	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Total Metals (QC Lot: 752020)											
TY2204000-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.221	0.220	0.631%	20%	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00026	0.00028	0.000010	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00080	0.00077	0.00002	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0000071	0.0000062	0.0000009	Diff <2x LOR	----
		chromium, total	7440-47-3	E420	0.00050	mg/L	0.00075	0.00074	0.00001	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	0.00056	0.00053	0.00002	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.00223	0.00225	0.00001	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.000149	0.000149	0.0000004	Diff <2x LOR	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.0512	0.0511	0.148%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00113	0.00104	8.09%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00096	0.00098	0.00002	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 752020) - continued											
TY2204000-001	Anonymous	selenium, total	7782-49-2	E420	0.000050	mg/L	0.000098	0.000133	0.000035	Diff <2x LOR	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	0.00696	0.00711	2.05%	20%	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.0034	0.0035	0.00005	Diff <2x LOR	----
Aggregate Organics (QC Lot: 751178)											
WT2222418-002	Anonymous	carbonaceous biochemical oxygen demand [CBOD]	----	E555	3.0	mg/L	<3.0	<3.0	0.0%	30%	----
Aggregate Organics (QC Lot: 753517)											
WT2222371-001	Anonymous	phenols, total (4AAP)	----	E562	0.0010	mg/L	<0.0050	0.0015	0.0035	Diff <2x LOR	----
Volatile Organic Compounds (QC Lot: 752840)											
WT2222321-001	Anonymous	benzene	71-43-2	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		chloroform	67-66-3	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichlorobenzene, 1,2-	95-50-1	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichlorobenzene, 1,4-	106-46-7	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichloroethylene, cis-1,2-	156-59-2	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichloromethane	75-09-2	E611D	1.0	µg/L	<1.0	<1.0	0	Diff <2x LOR	----
		dichloropropylene, trans-1,3-	10061-02-6	E611D	0.30	µg/L	<0.30	<0.30	0	Diff <2x LOR	----
		ethylbenzene	100-41-4	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		methyl ethyl ketone [MEK]	78-93-3	E611D	20	µg/L	<20	<20	0	Diff <2x LOR	----
		styrene	100-42-5	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		tetrachloroethane, 1,1,2,2-	79-34-5	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		tetrachloroethylene	127-18-4	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		toluene	108-88-3	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		trichloroethylene	79-01-6	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		xylene, m+p-	179601-23-1	E611D	0.40	µg/L	<0.40	<0.40	0	Diff <2x LOR	----
		xylene, o-	95-47-6	E611D	0.30	µg/L	<0.30	<0.30	0	Diff <2x LOR	----
Nonylphenols (QC Lot: 761879)											
WT2222374-001	Anonymous	nonylphenols [NP]	84852-15-3	E749A	1.0	µg/L	<1.0	<1.0	0	Diff <2x LOR	----
Nonylphenols (QC Lot: 761880)											
WT2222374-001	Anonymous	nonylphenol diethoxylates [NP2EO]	n/a	E749B	0.10	µg/L	<0.10	<0.10	0	Diff <2x LOR	----
		nonylphenol monoethoxylates [NP1EO]	n/a	E749B	2.0	µg/L	<2.0	<2.0	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 754190)						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 753246)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 753247)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 753515)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 753516)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Microbiological Tests (QCLot: 749981)						
coliforms, Escherichia coli [E. coli]	----	E012A.EC	1	CFU/100mL	<1	----
Total Metals (QCLot: 751079)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Total Metals (QCLot: 752020)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Aggregate Organics (QCLot: 750813)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Aggregate Organics (QCLot: 750813) - continued						
oil & grease (gravimetric)	----	E567	5	mg/L	<5.0	----
Aggregate Organics (QCLot: 750814)						
oil & grease, mineral (gravimetric)	----	E567SG	5	mg/L	<5.0	----
Aggregate Organics (QCLot: 751178)						
carbonaceous biochemical oxygen demand [CBOD]	----	E555	2	mg/L	<2.0	----
Aggregate Organics (QCLot: 753517)						
phenols, total (4AAP)	----	E562	0.001	mg/L	<0.0010	----
Volatile Organic Compounds (QCLot: 752840)						
benzene	71-43-2	E611D	0.5	µg/L	<0.50	----
chloroform	67-66-3	E611D	0.5	µg/L	<0.50	----
dichlorobenzene, 1,2-	95-50-1	E611D	0.5	µg/L	<0.50	----
dichlorobenzene, 1,4-	106-46-7	E611D	0.5	µg/L	<0.50	----
dichloroethylene, cis-1,2-	156-59-2	E611D	0.5	µg/L	<0.50	----
dichloromethane	75-09-2	E611D	1	µg/L	<1.0	----
dichloropropylene, trans-1,3-	10061-02-6	E611D	0.3	µg/L	<0.30	----
ethylbenzene	100-41-4	E611D	0.5	µg/L	<0.50	----
methyl ethyl ketone [MEK]	78-93-3	E611D	20	µg/L	<20	----
styrene	100-42-5	E611D	0.5	µg/L	<0.50	----
tetrachloroethane, 1,1,2,2-	79-34-5	E611D	0.5	µg/L	<0.50	----
tetrachloroethylene	127-18-4	E611D	0.5	µg/L	<0.50	----
toluene	108-88-3	E611D	0.5	µg/L	<0.50	----
trichloroethylene	79-01-6	E611D	0.5	µg/L	<0.50	----
xylene, m+p-	179601-23-1	E611D	0.4	µg/L	<0.40	----
xylene, o-	95-47-6	E611D	0.3	µg/L	<0.30	----
Phthalate Esters (QCLot: 755346)						
bis(2-ethylhexyl) phthalate [DEHP]	117-81-7	E655F	2	µg/L	<2.0	----
di-n-butyl phthalate	84-74-2	E655F	1	µg/L	<1.0	----
Nonylphenols (QCLot: 761879)						
nonylphenols [NP]	84852-15-3	E749A	1	µg/L	<1.0	----
Nonylphenols (QCLot: 761880)						
nonylphenol diethoxylates [NP2EO]	n/a	E749B	0.1	µg/L	<0.10	----
nonylphenol monoethoxylates [NP1EO]	n/a	E749B	2	µg/L	<2.0	----
Polychlorinated Biphenyls (QCLot: 750866)						
Aroclor 1016	12674-11-2	E687	0.02	µg/L	<0.020	----
Aroclor 1221	11104-28-2	E687	0.02	µg/L	<0.020	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Polychlorinated Biphenyls (QCLot: 750866) - continued						
Aroclor 1232	11141-16-5	E687	0.02	µg/L	<0.020	----
Aroclor 1242	53469-21-9	E687	0.02	µg/L	<0.020	----
Aroclor 1248	12672-29-6	E687	0.02	µg/L	<0.020	----
Aroclor 1254	11097-69-1	E687	0.02	µg/L	<0.020	----
Aroclor 1260	11096-82-5	E687	0.02	µg/L	<0.020	----
Aroclor 1262	37324-23-5	E687	0.02	µg/L	<0.020	----
Aroclor 1268	11100-14-4	E687	0.02	µg/L	<0.020	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 753250)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 754190)									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	100	85.0	115	----
Anions and Nutrients (QCLot: 753246)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 753247)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	99.5	90.0	110	----
Anions and Nutrients (QCLot: 753515)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	95.3	75.0	125	----
Anions and Nutrients (QCLot: 753516)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.53 mg/L	104	80.0	120	----
Total Metals (QCLot: 751079)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	103	80.0	120	----
Total Metals (QCLot: 752020)									
aluminum, total	7429-90-5	E420	0.003	mg/L	0.1 mg/L	101	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	0.05 mg/L	102	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	0.05 mg/L	103	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.005 mg/L	102	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.0125 mg/L	100	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.0125 mg/L	101	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.0125 mg/L	99.6	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.025 mg/L	105	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.0125 mg/L	101	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.0125 mg/L	96.9	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.025 mg/L	99.9	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	0.05 mg/L	97.2	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.005 mg/L	89.8	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.025 mg/L	97.2	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.0125 mg/L	98.2	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.025 mg/L	93.9	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report: Spike Concentration	Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High	Qualifier
Aggregate Organics (QCLot: 750813)									
oil & grease (gravimetric)	----	E567	5	mg/L	200 mg/L	86.7	70.0	130	----
Aggregate Organics (QCLot: 750814)									
oil & grease, mineral (gravimetric)	----	E567SG	5	mg/L	100 mg/L	80.6	70.0	130	----
Aggregate Organics (QCLot: 751178)									
carbonaceous biochemical oxygen demand [CBOD]	----	E555	2	mg/L	198 mg/L	103	85.0	115	----
Aggregate Organics (QCLot: 753517)									
phenols, total (4AAP)	----	E562	0.001	mg/L	0.02 mg/L	92.8	85.0	115	----
Volatile Organic Compounds (QCLot: 752840)									
benzene	71-43-2	E611D	0.5	µg/L	100 µg/L	112	70.0	130	----
chloroform	67-66-3	E611D	0.5	µg/L	100 µg/L	108	70.0	130	----
dichlorobenzene, 1,2-	95-50-1	E611D	0.5	µg/L	100 µg/L	110	70.0	130	----
dichlorobenzene, 1,4-	106-46-7	E611D	0.5	µg/L	100 µg/L	88.9	70.0	130	----
dichloroethylene, cis-1,2-	156-59-2	E611D	0.5	µg/L	100 µg/L	107	70.0	130	----
dichloromethane	75-09-2	E611D	1	µg/L	100 µg/L	103	70.0	130	----
dichloropropylene, trans-1,3-	10061-02-6	E611D	0.3	µg/L	100 µg/L	119	70.0	130	----
ethylbenzene	100-41-4	E611D	0.5	µg/L	100 µg/L	110	70.0	130	----
methyl ethyl ketone [MEK]	78-93-3	E611D	20	µg/L	100 µg/L	# 144	70.0	130	LCS-H
styrene	100-42-5	E611D	0.5	µg/L	100 µg/L	120	70.0	130	----
tetrachloroethane, 1,1,2,2-	79-34-5	E611D	0.5	µg/L	100 µg/L	# 153	70.0	130	LCS-H
tetrachloroethylene	127-18-4	E611D	0.5	µg/L	100 µg/L	103	70.0	130	----
toluene	108-88-3	E611D	0.5	µg/L	100 µg/L	118	70.0	130	----
trichloroethylene	79-01-6	E611D	0.5	µg/L	100 µg/L	92.5	70.0	130	----
xylene, m+p-	179601-23-1	E611D	0.4	µg/L	200 µg/L	111	70.0	130	----
xylene, o-	95-47-6	E611D	0.3	µg/L	100 µg/L	111	70.0	130	----
Phthalate Esters (QCLot: 755346)									
bis(2-ethylhexyl) phthalate [DEHP]	117-81-7	E655F	2	µg/L	6.4 µg/L	106	50.0	140	----
di-n-butyl phthalate	84-74-2	E655F	1	µg/L	6.4 µg/L	108	50.0	140	----
Nonylphenols (QCLot: 761879)									
nonylphenols [NP]	84852-15-3	E749A	1	µg/L	10 µg/L	86.6	75.0	125	----
Nonylphenols (QCLot: 761880)									
nonylphenol diethoxylates [NP2EO]	n/a	E749B	0.1	µg/L	1 µg/L	101	75.0	125	----
nonylphenol monoethoxylates [NP1EO]	n/a	E749B	2	µg/L	20 µg/L	107	75.0	125	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Polychlorinated Biphenyls (QCLot: 750866)									
Aroclor 1016	12674-11-2	E687	0.02	µg/L	0.2 µg/L	123	60.0	140	----
Aroclor 1221	11104-28-2	E687	0.02	µg/L	0.2 µg/L	123	60.0	140	----
Aroclor 1232	11141-16-5	E687	0.02	µg/L	0.2 µg/L	123	60.0	140	----
Aroclor 1242	53469-21-9	E687	0.02	µg/L	0.2 µg/L	123	60.0	140	----
Aroclor 1248	12672-29-6	E687	0.02	µg/L	0.2 µg/L	93.0	60.0	140	----
Aroclor 1254	11097-69-1	E687	0.02	µg/L	0.2 µg/L	114	60.0	140	----
Aroclor 1260	11096-82-5	E687	0.02	µg/L	0.2 µg/L	112	60.0	140	----
Aroclor 1262	37324-23-5	E687	0.02	µg/L	0.2 µg/L	112	60.0	140	----
Aroclor 1268	11100-14-4	E687	0.02	µg/L	0.2 µg/L	112	60.0	140	----

Qualifiers

Qualifier	Description
LCS-H	Lab Control Sample recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 753246)										
WT2222423-001	Anonymous	fluoride	16984-48-8	E235.F	9.86 mg/L	10 mg/L	98.6	75.0	125	----
Anions and Nutrients (QCLot: 753247)										
WT2222423-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	952 mg/L	1000 mg/L	95.2	75.0	125	----
Anions and Nutrients (QCLot: 753515)										
WT2222363-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	312 mg/L	2.5 mg/L	125	70.0	130	----
Anions and Nutrients (QCLot: 753516)										
WT2222346-001	BH22- 11	phosphorus, total	7723-14-0	E372-U	ND mg/L	0.1 mg/L	ND	70.0	130	----
Cyanides (QCLot: 757482)										
WT2222062-001	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.229 mg/L	0.25 mg/L	91.8	75.0	125	----
Total Metals (QCLot: 751079)										
TY2204129-002	Anonymous	mercury, total	7439-97-6	E508	0.0000930 mg/L	0.0001 mg/L	93.0	70.0	130	----
Total Metals (QCLot: 752020)										
TY2204223-001	Anonymous	aluminum, total	7429-90-5	E420	0.0981 mg/L	0.1 mg/L	98.1	70.0	130	----
		antimony, total	7440-36-0	E420	0.0511 mg/L	0.05 mg/L	102	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0526 mg/L	0.05 mg/L	105	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00532 mg/L	0.005 mg/L	106	70.0	130	----
		chromium, total	7440-47-3	E420	0.0128 mg/L	0.0125 mg/L	103	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0128 mg/L	0.0125 mg/L	102	70.0	130	----
		copper, total	7440-50-8	E420	0.0129 mg/L	0.0125 mg/L	103	70.0	130	----
		lead, total	7439-92-1	E420	0.0257 mg/L	0.025 mg/L	103	70.0	130	----
		manganese, total	7439-96-5	E420	0.0119 mg/L	0.0125 mg/L	95.4	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0124 mg/L	0.0125 mg/L	99.4	70.0	130	----
		nickel, total	7440-02-0	E420	0.0254 mg/L	0.025 mg/L	102	70.0	130	----
		selenium, total	7782-49-2	E420	0.0521 mg/L	0.05 mg/L	104	70.0	130	----
		silver, total	7440-22-4	E420	0.00464 mg/L	0.005 mg/L	92.8	70.0	130	----
		tin, total	7440-31-5	E420	0.0250 mg/L	0.025 mg/L	99.9	70.0	130	----
		titanium, total	7440-32-6	E420	0.0123 mg/L	0.0125 mg/L	98.4	70.0	130	----
		zinc, total	7440-66-6	E420	0.0242 mg/L	0.025 mg/L	96.8	70.0	130	----
Aggregate Organics (QCLot: 753517)										

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Aggregate Organics (QCLot: 753517) - continued										
WT2222371-001	Anonymous	phenols, total (4AAP)	----	E562	0.0166 mg/L	0.02 mg/L	82.9	75.0	125	----
Volatile Organic Compounds (QCLot: 752840)										
WT2222321-001	Anonymous	benzene	71-43-2	E611D	86.5 µg/L	100 µg/L	86.5	60.0	140	----
		chloroform	67-66-3	E611D	92.6 µg/L	100 µg/L	92.6	60.0	140	----
		dichlorobenzene, 1,2-	95-50-1	E611D	96.9 µg/L	100 µg/L	96.9	60.0	140	----
		dichlorobenzene, 1,4-	106-46-7	E611D	93.8 µg/L	100 µg/L	93.8	60.0	140	----
		dichloroethylene, cis-1,2-	156-59-2	E611D	94.3 µg/L	100 µg/L	94.3	60.0	140	----
		dichloromethane	75-09-2	E611D	82.1 µg/L	100 µg/L	82.1	60.0	140	----
		dichloropropylene, trans-1,3-	10061-02-6	E611D	101 µg/L	100 µg/L	101	60.0	140	----
		ethylbenzene	100-41-4	E611D	90.2 µg/L	100 µg/L	90.2	60.0	140	----
		methyl ethyl ketone [MEK]	78-93-3	E611D	118 µg/L	100 µg/L	118	60.0	140	----
		styrene	100-42-5	E611D	98.5 µg/L	100 µg/L	98.5	60.0	140	----
		tetrachloroethane, 1,1,2,2-	79-34-5	E611D	89.2 µg/L	100 µg/L	89.2	60.0	140	----
		tetrachloroethylene	127-18-4	E611D	74.1 µg/L	100 µg/L	74.1	60.0	140	----
		toluene	108-88-3	E611D	88.5 µg/L	100 µg/L	88.5	60.0	140	----
		trichloroethylene	79-01-6	E611D	85.6 µg/L	100 µg/L	85.6	60.0	140	----
		xylene, m+p-	179601-23-1	E611D	194 µg/L	200 µg/L	96.8	60.0	140	----
		xylene, o-	95-47-6	E611D	98.4 µg/L	100 µg/L	98.4	60.0	140	----
Nonylphenols (QCLot: 761879)										
WT2222374-001	Anonymous	nonylphenols [NP]	84852-15-3	E749A	11.7 µg/L	10 µg/L	117	60.0	140	----
Nonylphenols (QCLot: 761880)										
WT2222374-001	Anonymous	nonylphenol diethoxylates [NP2EO]	n/a	E749B	1.07 µg/L	1 µg/L	107	60.0	140	----
		nonylphenol monoethoxylates [NP1EO]	n/a	E749B	24.6 µg/L	20 µg/L	123	60.0	140	----

Chain of Custody (COC) / Analytical Request Form

COC Number: 20- [illegible]

Environmental Division Waterloo

Work Order Reference WT2222346

Telephone : +1 519 886 6910

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Page

Report To	Contact and company name below will appear on the final report
Company:	palmer
Contact:	Frank Liu
Phone:	647-972-0433
	Company address below will appear on the final report
Street:	74 Berkeley st
City/Province:	Toronto, ON
Postal Code:	M5A 2W7

Invoice To		
	Same as Report To	☑ YES ☐ NO
	Copy of Invoice with Report	☑ YES ☐ NO
Company:		
Contact:		

Project Information

ALS Account # / Quote #:	24400
Job #:	2209001
PO / AFE:	
LSD:	mel

ALS Lab Work Order # (ALS use only): WT2222346

Reports / Recipients

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)

Merge QC/QCI Reports with COA ☐ YES ☐ NO ☐ N/A

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: frank.liu@PECG.ca

Email 2:

Email 3:

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: accounting@PECG.ca

Email 2:

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler:

Turnaround Time (TAT) Requested

☑ Routine [R] if received by 3pm M-F - no surcharges apply

☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum

☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum

☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum

☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum

☐ Same day [E2] if received by 10am M-S - 200% rush surcharge. Additinal fe may apply to rush requests on weekends, statutory holidays and non-routine te

Date and Time Required for all E&P TATs:

For all tests with rush TATs requested, please contact your AM to confirm availability.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Peel Sanitary storm package	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	BH22-11	18-NOV-22		Water	16	✓			

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human consumption/ use? ☐ YES ☑ NO

Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)

Peel Region Sanitary Sewer and storm Sewer Discharg limits.

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☐ NONE ☐ ICE ☑ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C					FINAL COOLER TEMPERATURES °C				
10.0					5.7				

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:
Frank Liu	Nov 18. 2022	

INITIAL SHIPMENT RECEPTION (ALS use only)

Received by:	Date:	Time:
Fahad M	18 NOV, 2022	13:37

FINAL SHIPMENT RECEPTION (ALS use only)

Received by:	Date:	Time:
MA	2022-11-18	17:30

AUG 2020 FRONT

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

GC-166 B-294 L-249, MM-438, N-425, CN-243
MA VW-108, OS-561, OR-064, OGG-258

ALS Canada Ltd.

right solutions.
right partner.

CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

Work Order	: **WT2222346**	Page	: 1 of 6
Client	: **Palmer Environmental Consulting Group Inc.**	Laboratory	: Waterloo - Environmental
Contact	: Frank Liu	Account Manager	: Andrew Martin
Address	: 74 Berkeley Street Toronto ON Canada M5V 1E3	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: ----	Telephone	: +1 519 886 6910
Project	: 2209001	Date Samples Received	: 18-Nov-2022 13:37
PO	: ----	Date Analysis Commenced	: 19-Nov-2022
C-O-C number	: 20-999595	Issue Date	: 30-Nov-2022 13:36
Sampler	: CLIENT		
Site	: ----		
Quote number	: (Q88296) PALMER 2022 STANDING OFFER		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Guideline Comparison

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Microbiology, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Metals, Waterloo, Ontario
Jocelyn Kennedy	Department Manager - Semi-Volatile Organics	Organics, Waterloo, Ontario
Rachel Cameron	Supervisor - Semi-Volatile Extractions	Organics, Waterloo, Ontario
Sanja Risticevic	Department Manager - LCMS	LCMS, Waterloo, Ontario
Sarah Birch	VOC Section Supervisor	Organics, Waterloo, Ontario

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.
Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guidelines are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Key : LOR: Limit of Reporting (detection limit).

Unit	*Description*
µg/L	micrograms per litre
CFU/100mL	colony forming units per hundred millilitres
mg/L	milligrams per litre
pH units	pH units

>: greater than.
<: less than.
Red shading is applied where the result is greater than the Guideline Upper Limit or the result is lower than the Guideline Lower Limit.
For drinking water samples, Red shading is applied where the result for E.coli, fecal or total coliforms is greater than or equal to the Guideline Upper Limit .

Workorder Comments

Matrix spike recovery was above ALS DQO non detect sample results were considered reliable.

Qualifiers

Qualifier	*Description*
BODL	*Limit of Reporting for BOD was increased to account for the largest volume of sample tested.*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
DLHC	*Detection Limit Raised: Dilution required due to high concentration of test analyte(s).*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	Method	LOR	Unit	Client sample ID: BH22- 11 Sampling date/time: 18-Nov-2022 00:00 WT2222346-001		RMPSUB SAN	RMPSUB STM				
Physical Tests											
pH	E108	0.10	pH units	7.99		5.5 - 10 pH units	6 - 9 pH units	--	--	--	--
solids, total suspended [TSS]	E160	3.0	mg/L	276	DLHC	350 mg/L	15 mg/L	--	--	--	--
Anions and Nutrients											
fluoride	E235.F	0.020	mg/L	0.744	DLDS	10 mg/L	--	--	--	--	--
Kjeldahl nitrogen, total [TKN]	E318	0.050	mg/L	1.76	DLM	100 mg/L	1 mg/L	--	--	--	--
phosphorus, total	E372-U	0.0020	mg/L	0.550	DLM	10 mg/L	0.4 mg/L	--	--	--	--
sulfate (as SO4)	E235.SO4	0.30	mg/L	42.3	DLDS	--	--	--	--	--	--
Cyanides											
cyanide, strong acid dissociable (total)	E333	0.0020	mg/L	<0.0020		2 mg/L	0.02 mg/L	--	--	--	--
Microbiological Tests											
coliforms, Escherichia coli [E. coli]	E012A.EC	1	CFU/100mL	<1		--	200 CFU/100mL	--	--	--	--
Total Metals											
aluminum, total	E420	0.0030	mg/L	8.08	DLHC	50 mg/L	--	--	--	--	--
antimony, total	E420	0.00010	mg/L	<0.00100	DLHC	5 mg/L	--	--	--	--	--
arsenic, total	E420	0.00010	mg/L	0.00420	DLHC	1 mg/L	0.02 mg/L	--	--	--	--
cadmium, total	E420	0.0000050	mg/L	<0.0000500	DLHC	0.7 mg/L	0.008 mg/L	--	--	--	--
chromium, total	E420	0.00050	mg/L	0.0122	DLHC	5 mg/L	0.08 mg/L	--	--	--	--
cobalt, total	E420	0.00010	mg/L	0.00715	DLHC	5 mg/L	--	--	--	--	--
copper, total	E420	0.00050	mg/L	0.0116	DLHC	3 mg/L	0.05 mg/L	--	--	--	--
lead, total	E420	0.000050	mg/L	0.00312	DLHC	3 mg/L	0.12 mg/L	--	--	--	--
manganese, total	E420	0.00010	mg/L	0.286	DLHC	5 mg/L	0.05 mg/L	--	--	--	--
mercury, total	E508	0.0000050	mg/L	0.0000055		0.01 mg/L	0.0004 mg/L	--	--	--	--
molybdenum, total	E420	0.000050	mg/L	0.000513	DLHC	5 mg/L	--	--	--	--	--
nickel, total	E420	0.00050	mg/L	0.0150	DLHC	3 mg/L	0.08 mg/L	--	--	--	--
selenium, total	E420	0.000050	mg/L	<0.000500	DLHC	1 mg/L	0.02 mg/L	--	--	--	--
silver, total	E420	0.000010	mg/L	<0.000100	DLHC	5 mg/L	0.12 mg/L	--	--	--	--
tin, total	E420	0.00010	mg/L	<0.00100	DLHC	5 mg/L	--	--	--	--	--
titanium, total	E420	0.00030	mg/L	0.0557	DLHC	5 mg/L	--	--	--	--	--
zinc, total	E420	0.0030	mg/L	<0.0300	DLHC	3 mg/L	0.04 mg/L	--	--	--	--

Analyte	Method	LOR	Unit	WT2222346-001 (Continued)	RMPSUB SAN	RMPSUB STM				
Aggregate Organics										
carbonaceous biochemical oxygen demand [CBOD]	E555	2.0	mg/L	<3.0 BODL	300 mg/L	15 mg/L	--	--	--	--
oil & grease (gravimetric)	E567	5.0	mg/L	<5.0	--	--	--	--	--	--
oil & grease, animal/vegetable (gravimetric)	EC567A.SG	5.0	mg/L	<5.0	150 mg/L	--	--	--	--	--
oil & grease, mineral (gravimetric)	E567SG	5.0	mg/L	<5.0	15 mg/L	--	--	--	--	--
phenols, total (4AAP)	E562	0.0010	mg/L	0.0014	1 mg/L	0.008 mg/L	--	--	--	--
Volatile Organic Compounds										
benzene	E611D	0.50	µg/L	<0.50	10 µg/L	2 µg/L	--	--	--	--
chloroform	E611D	0.50	µg/L	<0.50	40 µg/L	2 µg/L	--	--	--	--
dichlorobenzene, 1,2-	E611D	0.50	µg/L	<0.50	50 µg/L	5.6 µg/L	--	--	--	--
dichlorobenzene, 1,4-	E611D	0.50	µg/L	<0.50	80 µg/L	6.8 µg/L	--	--	--	--
dichloroethylene, cis-1,2-	E611D	0.50	µg/L	<0.50	4000 µg/L	5.6 µg/L	--	--	--	--
dichloromethane	E611D	1.0	µg/L	<1.0	2000 µg/L	5.2 µg/L	--	--	--	--
dichloropropylene, trans-1,3-	E611D	0.30	µg/L	<0.30	140 µg/L	5.6 µg/L	--	--	--	--
ethylbenzene	E611D	0.50	µg/L	<0.50	160 µg/L	2 µg/L	--	--	--	--
methyl ethyl ketone [MEK]	E611D	20	µg/L	<20	8000 µg/L	--	--	--	--	--
styrene	E611D	0.50	µg/L	<0.50	200 µg/L	--	--	--	--	--
tetrachloroethane, 1,1,2,2-	E611D	0.50	µg/L	<0.50	1400 µg/L	17 µg/L	--	--	--	--
tetrachloroethylene	E611D	0.50	µg/L	<0.50	1000 µg/L	4.4 µg/L	--	--	--	--
toluene	E611D	0.50	µg/L	<0.50	270 µg/L	2 µg/L	--	--	--	--
trichloroethylene	E611D	0.50	µg/L	<0.50	400 µg/L	8 µg/L	--	--	--	--
xylene, m+p-	E611D	0.40	µg/L	<0.40	--	--	--	--	--	--
xylene, o-	E611D	0.30	µg/L	<0.30	--	--	--	--	--	--
xylenes, total	E611D	0.50	µg/L	<0.50	1400 µg/L	4.4 µg/L	--	--	--	--
Volatile Organic Compounds Surrogates										
bromofluorobenzene, 4-	E611D	1.0	%	88.8	--	--	--	--	--	--
difluorobenzene, 1,4-	E611D	1.0	%	107	--	--	--	--	--	--
Phthalate Esters										
bis(2-ethylhexyl) phthalate [DEHP]	E655F	2.0	µg/L	3.1	12 µg/L	8.8 µg/L	--	--	--	--
di-n-butyl phthalate	E655F	1.0	µg/L	<1.0	80 µg/L	15 µg/L	--	--	--	--
Semi-Volatile Organics Surrogates										
fluorobiphenyl, 2-	E655F	1.0	%	80.0	--	--	--	--	--	--
terphenyl-d14, p-	E655F	1.0	%	96.7	--	--	--	--	--	--

Analyte	Method	LOR	Unit	WT2222346-001 (Continued)	RMPSUB SAN	RMPSUB STM				
Phenolics Surrogates										
tribromophenol, 2,4,6-	E655F	0.20	%	96.7	--	--	--	--	--	--
Nonylphenols										
nonylphenol diethoxylates [NP2EO]	E749B	0.10	µg/L	<0.10	--	--	--	--	--	--
nonylphenol ethoxylates, total	E749B	2.0	µg/L	<2.0	200 µg/L	--	--	--	--	--
nonylphenol monoethoxylates [NP1EO]	E749B	2.0	µg/L	<2.0	--	--	--	--	--	--
nonylphenols [NP]	E749A	1.0	µg/L	<1.0	20 µg/L	--	--	--	--	--
Polychlorinated Biphenyls										
Aroclor 1016	E687	0.020	µg/L	<0.020	--	--	--	--	--	--
Aroclor 1221	E687	0.020	µg/L	<0.020	--	--	--	--	--	--
Aroclor 1232	E687	0.020	µg/L	<0.020	--	--	--	--	--	--
Aroclor 1242	E687	0.020	µg/L	<0.020	--	--	--	--	--	--
Aroclor 1248	E687	0.020	µg/L	<0.020	--	--	--	--	--	--
Aroclor 1254	E687	0.020	µg/L	<0.020	--	--	--	--	--	--
Aroclor 1260	E687	0.020	µg/L	<0.020	--	--	--	--	--	--
Aroclor 1262	E687	0.020	µg/L	<0.020	--	--	--	--	--	--
Aroclor 1268	E687	0.020	µg/L	<0.020	--	--	--	--	--	--
polychlorinated biphenyls [PCBs], total	E687	0.060	µg/L	<0.060	1 µg/L	0.4 µg/L	--	--	--	--
decachlorobiphenyl	E687	0.1	%	71.3	--	--	--	--	--	--
tetrachloro-m-xylene	E687	0.1	%	104	--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any qualifiers detected.

Summary of Guideline Breaches by Sample

SampleID/Client ID	Matrix	Analyte	Analyte Summary	Guideline	Category	Result	Limit
BH22- 11	Water	solids, total suspended [TSS]		RMPSUB	STM	276 mg/L	15 mg/L
	Water	Kjeldahl nitrogen, total [TKN]		RMPSUB	STM	1.76 mg/L	1 mg/L
	Water	phosphorus, total		RMPSUB	STM	0.550 mg/L	0.4 mg/L
	Water	manganese, total		RMPSUB	STM	0.286 mg/L	0.05 mg/L

Key:

RMPSUB	Ontario Reg.Mun. of Peel Sewer Bylaw #53-2010 (APR, 2019)
SAN	Peel Sanitary Sewer (53-2010)
STM	Peel Storm Sewer (53-2010)

Appendix F

Well Records (WWIS)

WELL_ID	COMPLETED	DEPTH	DP_BEDROCK	STATIC_LEV	WELL_USE	WATER	FORMATION
4902210	1964-01-11	8.2	0.0	4.6	IN		BRWN CLAY MSND 0009 BRWN MSND 0026 BLUE CLAY MSND 0027
4902211	1958-11-12	15.5	5.2	3.0	DO		BRWN MSND GRVL 0017 BLUE SHLE 0051
4902981	1968-09-09	8.8	0.0	3.7	DO		LOAM 0001 GRVL 0018 BLUE CLAY 0029
4907918	1994-10-11	4.3	0.0	0.0	NU		BRWN FILL SAND LOOS 0010 GREY TILL SILT HARD 0014
4907919	1994-10-11	4.3	0.0	0.0	NU		BRWN FILL SAND LOOS 0010 GREY TILL SILT HARD 0014
4909365	2004-02-17	4.3	0.0	0.0	NU		BRWN CLAY TILL FILL 0014
4909366	2004-02-17	4.3	0.0	0.0	NU		BRWN CLAY TILL FILL 0014
4909367	2004-02-17	4.9	0.0	0.0	NU		BRWN CLAY TILL FILL 0016
4909841	2005-06-30	7.6	0.0	0.0	NU		GREY SILT CLAY SHLE 0025
7145320	2010-04-28	4.8	0.0	0.0	MT		BLCK ---- SOFT 0000 BRWN SAND SOFT 0009 GREY SHLE SILT HARD 0016
7148379	2010-06-21	3.1	0.0	0.0	TH		BRWN SAND GRVL LOOS 0006 BRWN CLAY SILT DNSE 0010
7148380	2010-06-21	3.4	0.0	0.0			BRWN SAND GRVL LOOS 0006 GREY CLAY SILT DNSE 0011
7148381	2010-06-21	0.0	0.0	0.0	MO		
7188792	2012-03-22	0.0	0.0	0.0			
7212983	2013-09-27	0.0	0.0	0.0			
7234673	2014-11-27	0.0	0.0	0.0			
7257735	2015-12-14	0.0	0.0	0.0			
7261695	2016-02-03	7.9	0.0	0.0	MO		GREY SILT SAND HARD 0005 BLCK SHLE HARD 0026
7272079	2016-08-24	0.0	0.0	0.0	MT		
7275986	2016-10-18	5.3	0.0	0.0	MO		BRWN SAND FILL PCKD 0003 BRWN SILT CLAY SOFT 0012 GREY SHLE LMSN LYRD
7278591	2016-11-25	5.3	0.0	0.0	MO		BRWN SILT CLAY HARD 0009 GREY SHLE ROCK 0017
7285534		0.0	0.0	0.0			
7291784	2017-06-28	2.2	0.0	0.0	MO		BRWN SAND GRVL FILL 0001 GREY SHLE LMSN LYRD 0007
7291785	2017-06-27	5.8	0.0	0.0	MO		BRWN SAND GRVL FILL 0004 GREY SHLE LMSN LYRD 0019
7291791	2017-06-22	7.4	0.0	0.0	MO		GREY SAND SLTY FILL 0007 GREY SHLE LMSN LYRD 0024
7291792	2017-06-23	7.6	0.0	0.0	MO		BRWN SAND GRVL FILL 0001 GREY SILT CLAY DNSE 0007 BRWN SAND LOOS 0009 GREY SILT CLAY DNSE 0012 GREY SHLE LMSN LYRD 0025
7295009	2017-09-06	6.0	0.0	0.0	MO		BRWN LOAM SAND SOFT 0003 BRWN SAND CLAY SOFT 0012 GREY SILT CLAY DNSE
7305117	2018-01-05	7.9	0.0	0.0	MO		BRWN LOAM LOOS 0001 BRWN SILT SAND PCKD 0015 GREY SHLE HARD 0026
7305118	2018-01-05	8.5	0.0	0.0	MO		BRWN LOAM LOOS 0001 BRWN SILT SAND PCKD 0025 GREY SHLE HARD 0028
7306688	2017-09-13	7.6	0.0	0.0	TH MO		BRWN LOAM FILL SILT 0012 BRWN FSND SILT GRVL 0015 GREY SILT CLAY TILL 0025
7308732	2018-03-14	6.1	0.0	0.0	MO		FILL 0005 SAND 0010 SHLE 0020
7308733	2018-03-14	6.1	0.0	0.0	MO		FILL 0005 SAND 0010 SHLE 0020
7308734	2018-03-14	3.8	0.0	0.0	MO		FILL 0005 SAND 0010 SHLE 0012
7308735	2018-03-14	6.1	0.0	0.0	MO		FILL 0005 SAND 0010 SHLE 0020
7308736	2018-03-23	2.4	0.0	0.0	MO		BRWN LOAM 0002 BRWN FILL CLAY 0008
7308737	2018-03-23	6.1	0.0	0.0	MO		BRWN LOAM 0012 BRWN FILL CLAY 0020 GREY SHLE
7312572	2018-04-13	0.0	0.0	0.0			
7320679	2017-07-13	5.7	0.0	0.0	MO		BRWN SAND GRVL FILL 0002 BRWN SAND SILT SOFT 0009 GREY SILT CLAY DNSE
7327743	2018-11-16	0.0	0.0	0.0			
7332231	2019-04-08	4.5	0.0	0.0	MT		BLCK 0000 GREY GRVL 0001 BRWN SAND 0005 BRWN SILT CLAY 0007 GREY SHLE
7329413	2019-02-11	5.3	0.0	0.0	MT		BRWN SAND GRVL PCKD 0002 BRWN SILT FILL CLAY 0005 BRWN SAND SILT SOFT
7329414	2019-02-20	15.2	0.0	0.0	MT		BRWN SAND GRVL PCKD 0003 BRWN CLAY SILT SOFT 0008 BRWN SAND SILT SOFT
7329415	2019-02-14	13.7	0.0	0.0	MT		BRWN SAND GRVL PCKD 0002 BRWN CLAY SILT SOFT 0006 BRWN SAND SILT SOFT 0012 GREY SILT TILL SAND 0017 GREY SHLE SILT WTHD 0045
7329416	2019-02-21	13.7	0.0	0.0	MT		BRWN SILT FILL HARD 0002 BRWN SAND GRVL HARD 0007 BRWN SAND SILT SOFT 0012 GREY SILT TILL HARD 0019 GREY SHLE SILT CLAY 0045
7335386	2019-06-01	6.1	0.0	0.0	MO		BLCK ---- 0003 BRWN FILL 0012 GREY CLAY SLTY 0020
7337170	2019-05-28	6.1	0.0	0.0	MT		BRWN SAND GRVL PCKD 0011 GREY CLAY SILT DNSE 0012 GREY SHLE LMSN ROCK

7337196	2019-05-27	6.1	0.0	0.0	TH		BRWN SAND GRVL PCKD 0012 GREY CLAY SAND DNSE 0013 GREY SHLE LMSN ROCK
7338241	2019-07-10	6.0	0.0	0.0	MT		BRWN SAND GRVL FILL 0010 BRWN CLAY SILT HARD 0016 GREY SHLE ROCK 0020
7345861	2019-07-03	3.7	0.0	0.0	MT		BRWN FILL GRVL ---- 0002 BRWN SAND SILT DRY 0008 BRWN SAND SILT WBRG 0012
7345862	2019-07-03	3.7	0.0	0.0	MT		GREY ---- GRVL ---- 0000 BRWN FILL GRVL SAND 0002 BRWN SAND SILT DRY 0008
7361501	2020-03-12	0.0	0.0	0.0			
7378766	2020-12-09	6.7	0.0	0.0	MO	18	BRWN GRVL SAND 0015 BLUE SHLE WTHD 0022
7378767	2020-12-09	5.8	0.0	0.0	MO		BRWN GRVL SAND 0015 BLUE SHLE WTHD 0019
7378768	2020-12-09	6.7	0.0	0.0	MO		BRWN GRVL SAND 0015 BLUE SHLE WTHD 0022
7379029	2020-12-04	0.0	0.0	0.0			
7379030	2020-12-04	0.0	0.0	0.0			
7379031	2020-12-04	0.0	0.0	0.0			
7379032	2020-12-04	0.0	0.0	0.0			
7379033	2020-12-04	0.0	0.0	0.0			
7379034	2020-12-04	0.0	0.0	0.0			
7379035	2020-12-04	0.0	0.0	0.0			
7379036	2020-12-04	0.0	0.0	0.0			