

Tenblock
30 Soudan Avenue, Suite 200
Toronto, ON, M4S 1V6

File No. 21-195
July 10, 2023

Attention: Sue Chen

RE: HYDROGEOLOGICAL REVIEW REPORT
48 Grenoble Drive, Toronto, Ontario

Grounded Engineering Inc. ("Grounded") is pleased to provide you with this Hydrogeological Review for the site known as 48 Grenoble Drive, in Toronto, Ontario.

The following documents are provided as part of this package:

- City of Toronto Hydrogeological Review Summary Form
- City of Toronto Foundation Drainage Summary Form & Technical Brief
- Hydrogeological Review Report

As part of the development applications process, the City of Toronto requires that these documents are submitted together for review.

We trust that the information contained with this report is adequate for your present requirements. If we can be of further assistance, please do not hesitate to contact us.

A handwritten signature in black ink that reads "Shelby Plant".

Shelby Plant, BSCE, MSc, EIT
Project Manager

A handwritten signature in black ink that reads "Matthew Bielaski".

Matthew Bielaski, PEng, QP_{ESA-RA}
Principal

FOUNDATION DRAINAGE SUMMARY FORM



General Information	
Applicant Name:	
Development Address:	
Development Application #:	
Available Sewer Servicing: ☐ Storm Sewers ☐ Combined Sewers ☐ Sanitary Sewers	
Groundwater Level Assessment	
GW Monitoring Approach: ☐ 1. Flexible Year-Round ☐ 2. Peak Season ☐ 3. Alternate (Attach Justification)	
Monitoring Length [weeks]:	
Monitoring Months: ☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sept ☐ Oct ☐ Nov ☐ Dec	
# of Measurements:	
Peak Observed GWL [masl]:	
Estimated Maximum Anticipated GWL [masl]:	
Lowest Elevation of Proposed Structure [masl]:	
Proposed Condition and Measures (Complete all)	
On-site Management Provided? ☐ Yes (Describe) ☐ No (Provide Rationale)	
Infrastructure Required for Future Emergency Repair? ☐ Yes ☐ No	
Foundation Drainage Expected to Contain Only Infiltrated Stormwater? ☐ Yes ☐ No	
Site Condition: ☐ Non-Brownfield with no RSC ☐ Brownfield with RSC + Risk Management ☐ Other (Describe)	
Proposed Foundation Drainage Management (Select one)	
☐ On-site Management (no long-term discharge to sewers)	
☐ On-site Management with Infrastructure for Future Emergency Repair (in accordance with Policy 4.4)	
☐ Long-term Discharge to Storm or Combined Sewers (in accordance with Policy Statement 4.3)	
☐ Request for Exemption of Policy to apply for Long-Term Discharge Agreement (in accordance with Policy Sec 5.0)	
Description/Attachments in Foundation Drainage Technical Brief (Select all that apply)	
☐ On-site Management Description/Rationale for Technological Infeasibility	
☐ GWL Monitoring Well Plan, including Monitoring Methodology and Justification (where alternate is proposed)	
☐ GWL Monitoring and Peak Flow Estimation Results, Analysis & Interpretation	
☐ Building Elevation Plan	
☐ Site Condition Supporting Documentation (e.g., Brownfield/RSC Status, Soil Quality)	
☐ Exemption Rationale and Documentation for Technical Infeasibility and/or Extenuating Circumstances.	
Describe physical and design constraints to substantiate that a technical solution was not feasible; include documentation to substantiate that there are extenuating circumstances (e.g., application submission timeline and milestones) that may warrant an exemption, where applicable.	
☐ Other Documentation; Specify -	
Qualified Professional Sign-Off	
Name:	Designation:
Signature: 	Date:

Form to accompany *Foundation Drainage Technical Brief* document prepared in accordance with the *Foundation Drainage Policy and Guidelines*.

November 1, 2021

Tenblock
30 Soudan Avenue, Suite 200
Toronto, ON M4S 1V6

File No. 21-195
July 10, 2023

Attention: Sue Chen

**Subject: Foundation Drainage Summary Form Technical Brief
48 Grenoble Drive, Toronto, Ontario**

Grounded Engineering Inc. ("Grounded") is pleased to provide you with this Foundation Drainage Summary Form Technical Brief for the site known as 48 Grenoble Drive, in Toronto, Ontario.

The proposed project includes constructing two residential towers (West tower is 43-storeys and East tower is 39-storeys) and associated 6-storey podium with three levels of underground (P2 & partial P3). The lowest elevation of the proposed structure (Elev. 117.0 m) is below the Maximum Anticipated Groundwater Level (MAGWL) (Elev. 119.5 m). The proposed development will be below the MAGWL and as such, a drained foundation is not possible as per the Policy.

The subject site is not a Brownfield Property, per Foundation Drainage Policy Section 4.3.a(i). An RSC is not required for development, as there is no change to a more sensitive Land Use.

We trust that the information contained in this letter is sufficient for your present requirements. If we can be of any further assistance, please do not hesitate to contact us.

For and on behalf of our team,

A handwritten signature in black ink, appearing to read "Matthew Bielaski", written in a cursive style.

Matthew Bielaski, PEng, QP_{RA-ESA}
Principal

August 2018

HYDROLOGICAL REVIEW SUMMARY

The form is to be completed by the Professional that prepared the Hydrological Review.

Use of the form by the City of Toronto is not to be construed as verification of engineering/hydrological content.

Refer to the Terms of Reference, Hydrological Review:

[Link to Terms of Reference Hydrological Review](#)

For City Staff Use Only:

Name of ECS Case Manager (Please print)

Date Review Summary provided to TW, EM&P

IF ANY OF THE REQUIREMENTS LISTED BELOW HAVE NOT BEEN INCLUDED IN THE HYDROLOGICAL REVIEW, THE REVIEW WILL BE CONSIDERED INCOMPLETE.

THE GREY SHADED BOXES WILL REQUIRE A CONSISTANCY CHECK BY THE ECS CASE MANAGER.

Summary of Key Information:

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
Site Address	48 Grenoble Drive, Toronto, Ontario	Title, i (Exec Sum), 1 (Sec 1)	
Postal Code	M3C 1C8	1 (Sec 1)	
Property Owner (on request for comments memo)	Tenblock	Title, i (Exec Sum), 1 (Sec 1)	
Proposed description of the project (if applicable) (point towers, number of podiums)	Towers: West Tower (43-storeys) and East Tower (39-storeys), Townhomes, Podium: 6 storeys	i (Exec Sum), 1 (Sec 1)	
Land Use (ex. commercial, residential, mixed, institutional, industrial)	Current: Residential Proposed: Residential with Parkland Conveyance	1-2 (Sec 1)	
Number of below grade levels for the proposed structure	3 levels of underground parking (P1, P2, partial P3)	i (Exec Sum), 1 (Sec 1)	
HYDROLOGICAL REVIEW INFORMATION			
Date Hydrological Review was prepared:	2023-07-10	Title, 2 (Sec 1)	
Who Performed the Hydrological Review (Consulting Firm)	Grounded Engineering Inc.	Title, i (Exec Sum), 1 & 2 (Sec 1)	
Name of Author of Hydrological Review	Matthew Bielaski, PEng, QP _{ESA-RA}	2 (Sec 1), 16 (Sec 14)	

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
Check the directories on the website for Professional Geoscientists and/or Professional Engineers of Ontario been checked to ensure that the Hydrological Report has been prepared by a qualified person who is a licensed Professional Geoscientist as set out in the Professional Geoscientist Act of Ontario or a Professional Engineer? PEO: Professional Engineers of Ontario APGO: Association of Professional Geoscientists of Ontario	✓ Yes	N/A	
Has the Hydrological Review been prepared in accordance with all the following: - Ontario Water Resources Act - Ontario Regulation 387/04 - Toronto Municipal Code Chapter 681-Sewers	✓ Yes	2 (Sec 1)	
Total Volume (L/day) Short Term Discharge of groundwater (construction dewatering) with safety factor included	110,000 L/day What safety factor was used? 1.5	ii (Exec Sum), 10 (Sec 10) Appendix G	

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
Total Volume (L/day) Short Term Discharge of groundwater (construction dewatering) without safety factor included	70,171 L/day	Appendix G	
Total Volume (L/day) Long Term drainage of groundwater (from foundation drainage, weeping tiles, sub slab drainage) with safety factor included If the development is part of a multiple tower complex, include total volume for each separate tower	Drained Structure – 105,000 L/day Fully Watertight Structure – 0 L/day What safety factor was used? 1.5	ii (Exec Sum), 11 (Sec 10) Appendix G	
List the nearest surface water (river, creek, lake)	The nearest waterbody is Don River, located approximately 500 m East of the Property.	4 (Sec 3)	
Lowest basement elevation	120.0 masl – P2 Finished Floor Elevation 117.0 masl – P3 Finished Floor Elevation	i (Exec Sum), Appendix F	
Foundation elevation	118.5 masl – Base of Raft at P2 115.5 masl – Base of Raft at P3	i (Exec Sum)	
Ground elevation	127.5 masl	Appendix F	

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
STUDY AREA MAP			Review Includes this Information City Staff (Check)
Study area map(s) have been included in the report.	✓ Yes	Figures 1 & 2	N/A
Study area map(s) been prepared according to the Hydrological Review Terms of Reference.	✓ Yes	Figures 1 & 2 3 (Sec 2)	N/A
WATER LEVEL AND WELLS		Page # & Section # of every occurrence in the Review	Review Includes this Information (City Staff Initial)
The groundwater level has been monitored using all wells located on site (within property boundary).	✓ Yes	4 (Sec 4), 5 (Sec 5), Figures 2 & 3	
The static water level measurements have been monitored at all monitoring wells for a minimum of 3 months with samples taken every 2 weeks for a minimum of 6 samples. The intent is for the qualified professional to use professional judgement to estimate the seasonally high groundwater level.	✓ Yes The required 3-months of ground water level monitoring has been completed for the Property.	5 (Sec 5), Appendix A	

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
All water levels in the wells have been measured with respect to masl.	✓ Yes	5 (Sec 5), Appendix A	
A table of geology/soil stratigraphy for the property has been included.	✓ Yes	i (Exec Sum), 3 & 4 (Sec 3)	
GEOLOGY AND PHYSICAL HYDROLOGY		Page # & Section # of every occurrence in the Review	Review Includes this Information (City Staff Initial)
The review has made reference to the soil materials including thickness, composition and texture, and bedrock environments.	✓ Yes	3 & 4 (Sec 3)	
Key aquifers and the site's proximity to nearby surface water has been identified.	✓ Yes	3 (Sec 3)	N/A
PUMP TEST/SLUG TEST/DRAWDOWN ANALYSIS		Page # & Section # of every occurrence in the Review	Review Includes this Information City Staff (Check)
A summary of the pumping test data and analysis is included in the review.	A pumping test was not conducted.	6 (Sec 6.1)	
The pump test been carried out for at least 24 hours if possible. If not, has a slug test been conducted?	✓ Yes A pump test was not conducted. Slug tests were conducted.	6 (Sec 6.2)	

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
Have the monitoring well(s) have been monitored using digital devices? If yes how frequently?	✓ Yes Yes, water level measurements have been taken using a Solinst Oil/Water Interface Meter (Model 122) with a 60 m long tape. The frequency of the measurements was every two weeks over the course of a 3-month period.	5 (Sec 5)	
If a slug or pump test has been conducted has the static groundwater level been monitored at all monitoring well(s) multiple times to measure recovery? -prior to the slug or pumping test(s)? -post slug or pumping test(s)?	✓ Yes ✓ Yes ✓ Yes	5 (Sec 5), 6 (Sec 6.2)	N/A
The above noted slug or pump tests have been included in the report.	✓ Yes	6 (Sec 6.2), Appendix B	
WATER QUALITY		Page # & Section # of every occurrence in the Review	Review Includes this Information City Staff (Check)
The report includes baseline water quality samples from a laboratory. The water quality must be analyzed for all parameters listed in Tables 1 and 2 of Chapter 681 Sewers of the Toronto Municipal Code (found in Appendix A) and the samples must have to be taken unfiltered within 9 months of the date of submission.	✓ Yes One (1) unfiltered groundwater sample was collected and analyzed for all parameters listed in Tables 1 and 2 of Chapter 681 Sewers of the Toronto Municipal Code.	8 (Sec 7), Appendix E	

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
The water quality data templates in Appendix A have been completed for each sample taken for both sanitary/combined and storm sewer limits.	For sanitary discharge- See the sanitary/combined sewer parameter limit template For storm discharge- See the storm sewer parameter limit template	Pg. 11-14 of Hydrological Review Summary	
Qualified professional to list all sample parameters that have violated the Bylaw limits for each sample taken for the sanitary/combined Bylaw limits If there are any sample parameter Exceedances the groundwater can't be discharged as is.	The groundwater sample met the Limits for Sanitary and Combined Sewer Discharge for all parameters analyzed.	8 (Sec 7)	
Qualified professional to list all sample parameters that have violated the Bylaw limits for each sample taken for the storm Bylaw limits. If there are any sample parameter exceedances the groundwater can't be discharged as is.	Storm Sewer: - Total Suspended Solids (Result 246mg/L; Limit 15 mg/L; RDL 3 mg/L) - Total Cyanide (Result 0.0711 mg/L; Limit 0.02 mg/L; RDL 0.002 mg/L) - Total Manganese (Result 0.384 mg/L; Limit 0.05 mg/L; RDL 0.05 mg/L) - BOD (Result 40.5 mg/L; Limit 15 mg/L; RDL 2 mg/L)	8 (Sec 7)	
The water quality samples have been analyzed by a Canadian laboratory accredited and licensed by Standards Council of Canada and/or Canadian Association for Laboratory Accreditation. List of Canadian accredited laboratories: Standards Council of Canada	✓ Yes	Appendix E	N/A
A chain of custody record for the samples is included with the report.	✓ Yes	Appendix E	
Has the chain of custody reference any filtered sample? If yes, the report has to be amended and re-submitted to include only non-filtered samples.	⊗ No One (1) unfiltered groundwater sample was collected and analyzed for all parameters listed in Tables 1 and 2 of Chapter 681 Sewers of the Toronto Municipal Code.	Appendix E	

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
List any of the sample parameters that exceed the Bylaw limits with the reporting detection limit (RDL) included.	The groundwater sample met the Limits for Sanitary and Combined Sewer Discharge for all parameters analyzed. Storm Sewer: - Total Suspended Solids (Result 246mg/L; Limit 15 mg/L; RDL 3 mg/L) - Total Cyanide (Result 0.0711 mg/L; Limit 0.02 mg/L; RDL 0.002 mg/L) - Total Manganese (Result 0.384 mg/L; Limit 0.05 mg/L; RDL 0.05 mg/L) - BOD (Result 40.5 mg/L; Limit 15 mg/L; RDL 2 mg/L)	8 (Sec 7), Appendix E	
A true copy of the Certificate of Analysis report, is included with the report.	✓ Yes	Appendix E	
EVALUATION OF IMPACT		Page # & Section # of every occurrence in the Review	Review Includes this Information City Staff (Check)
Does the report recommend a back-up system or relief safety valve(s)?	✓ Yes	9 (Sec 9)	
Does the associated Geotechnical report recommend a back-up system or relief safety valve(s)?	✓ Yes	21 (Sec 3.5) of Geotech Report	
The taking and discharging of groundwater on site has been analyzed to ensure that no negative impacts will occur to: the City sewage works in terms of quality and quantity (including existing infrastructure), the natural environment, and settlement issues.	✓ Yes	12-14 (Sec 11)	N/A

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
Has it been determined that there will be a negative impact to the natural environment, City sewage works, or surrounding properties has the study identified the following: the extent of the negative impact, the detail of the precondition state of all the infrastructure, City sewage works, and natural environment within the effected zone and the proposed remediation and monitoring plan?	☒ No If yes, identify impact:	12-15 (Sec 11-12)	N/A

Summary of Additional Information and Key Items (if applicable):

August 2018

HYDROLOGICAL REVIEW SUMMARY

Appendix A:

SANITARY/COMBINED

Sample Location: BH2

Inorganics		Sample Result (mg/L)	Sample Result with upper RDL included (mg/L)	
<u>Parameter</u>	<u>mg/L</u>			<u>ug/L</u>
BOD	300	40.5	40.5 (2)	300,000
Fluoride	10	<1.0	<1.0 (1)	10,000
TKN	100	3.55	3.55 (0.05)	100,000
pH	6.0 - 11.5	7.48	7.48 (0.10)	6.0 - 11.5
Phenolics 4AAP	1	<0.0010	<0.0010 (0.001)	1,000
TSS	350	246	246 (3)	350,000
Total Cyanide	2	0.0711	0.0711 (0.002)	2,000
Metals				
Chromium Hexavalent	2	<0.00050	<0.00050 (0.0005)	2,000
Mercury	0.01	<0.0000050	<0.0000050 (0.000005)	10
Total Aluminum	50	1.82	1.82 (0.5)	50,000
Total Antimony	5	<0.010	<0.010 (0.01)	5,000
Total Arsenic	1	<0.010	<0.010 (0.01)	1,000
Total Cadmium	0.7	<0.00050	<0.00050 (0.0005)	700
Total Chromium	4	<0.050	<0.050 (0.05)	4,000
Total Cobalt	5	<0.010	<0.010 (0.01)	5,000
Total Copper	2	<0.050	<0.050 (0.05)	2,000
Total Lead	1	<0.0050	<0.0050 (0.005)	1,000
Total Manganese	5	0.384	0.384 (0.05)	5,000
Total Molybdenum	5	0.0257	0.0257 (0.00004)	5,000
Total Nickel	2	<0.050	<0.050 (0.0001)	2,000
Total Phosphorus	10	<0.30	<0.30 (0.3)	10,000
Total Selenium	1	<0.0050	<0.0050 (0.005)	1,000
Total Silver	5	<0.0050	<0.0050 (0.005)	5,000
Total Tin	5	<0.010	<0.010 (0.01)	5,000
Total Titanium	5	0.050	0.050 (0.03)	5,000
Total Zinc	2	<0.30	<0.30 (0.3)	2,000
Petroleum Hydrocarbons				
Animal/Vegetable Oil & Grease	150	<5.0	<5.0 (5)	150,000
Mineral/Synthetic Oil & Grease	15	<2.5	<2.5 (2.5)	15,000

August 2018

Volatile Organics		Sample Result (mg/L)	Sample Result with upper RDL included (mg/L)	
<u>Parameter</u>	<u>mg/L</u>			<u>ug/L</u>
Benzene	0.01	<0.50	<0.50 (0.5)	10
Chloroform	0.04	0.0011	0.0011 (0.001)	40
1,2-Dichlorobenzene	0.05	<0.50	<0.50 (0.5)	50
1,4-Dichlorobenzene	0.08	<0.50	<0.50 (0.5)	80
Cis-1,2-Dichloroethylene	4	<0.50	<0.50 (0.5)	4,000
Trans-1,3-Dichloropropylene	0.14	<0.50	<0.50 (0.5)	140
Ethyl Benzene	0.16	<0.50	<0.50 (0.5)	160
Methylene Chloride	2	<0.002	<0.002 (0.002)	2,000
1,1,2,2-Tetrachloroethane	1.4	<0.50	<0.50 (0.5)	1,400
Tetrachloroethylene	1	<0.50	<0.50 (0.5)	1,000
Toluene	0.016	0.56	0.56 (0.5)	16
Trichloroethylene	0.4	<0.50	<0.50 (0.5)	400
Total Xylenes	1.4	<1.1	<1.1 (1.1)	1,400
Semi-Volatile Organics				
Di-n-butyl Phthalate	0.08	<1.0	<1.0 (1.0)	80
Bis (2-ethylhexyl) Phthalate	0.012	<2.0	<2.0 (2.0)	12
3,3'-Dichlorobenzidine	0.002	<0.40	<0.40 (0.40)	2
Pentachlorophenol	0.005	<2.0	<2.0 (2.0)	5
Total PAHs	0.005	<1.7	<1.7 (1.7)	5
Misc Parameters				
Nonylphenols	0.02	<1.0	<1.0 (1.0)	20
Nonylphenol Ethoxylates	0.2	<2.0	<2.0 (2.0)	200

Sample Collected: February 18, 2022

Temperature: 1.9°C

August 2018

HYDROLOGICAL REVIEW SUMMARY

STORM

Sample Location:

Inorganics		Sample Result (mg/L)	Sample Result with upper RDL included (mg/L)	
Parameter	mg/L			ug/L
pH	6.0 - 9.5	7.48	7.48 (0.10)	
BOD	15	40.5	40.5 (2)	15,000
Phenolics 4AAP	0.008	<0.0010	<0.0010 (0.0010)	8
TSS	15	246	246 (3)	15,000
Total Cyanide	0.02	0.0711	0.0711 (0.002)	20
Metals				
Total Arsenic	0.02	<0.010	<0.010 (0.010)	20
Total Cadmium	0.008	<0.00050	<0.00050 (0.00050)	8
Total Chromium	0.08	<0.050	<0.050 (0.050)	80
Chromium Hexavalent	0.04	<0.00050	<0.00050 (0.00050)	40
Total Copper	0.04	<0.010	<0.010 (0.010)	40
Total Lead	0.12	<0.0050	<0.00050 (0.00050)	120
Total Manganese	0.05	0.384	0.384 (0.050)	50
Total Mercury	0.0004	<0.0000050	<0.0000050 (0.0000050)	0.4
Total Nickel	0.08	<0.050	<0.050 (0.050)	80
Total Phosphorus	0.4	<0.30	<0.30 (0.3)	400
Total Selenium	0.02	<0.0050	<0.0050 (0.0050)	20
Total Silver	0.12	<0.0050	<0.0050 (0.0050)	120
Total Zinc	0.04	<0.30	<0.30 (0.3)	40
Microbiology				
E.coli	200	0	0 (0)	200,000
Volatile Organics				
Parameter	mg/L			ug/L
Benzene	0.002	<0.50	<0.50 (0.5)	2
Chloroform	0.002	1.1	1.1 (1.0)	2
1,2-Dichlorobenzene	0.0056	<0.50	<0.50 (0.5)	6
1,4-Dichlorobenzene	0.0068	<0.50	<0.50 (0.5)	7
Cis-1,2-Dichloroethylene	0.0056	<0.50	<0.50 (0.5)	6
Trans-1,3-Dichloropropylene	0.0056	<0.50	<0.50 (0.5)	6
Ethyl Benzene	0.002	<0.50	<0.50 (0.5)	2
Methylene Chloride	0.0052			5
1,1,2,2-Tetrachloroethane	0.017	<0.50	<0.50 (0.5)	17
Tetrachloroethylene	0.0044	<0.50	<0.50 (0.5)	4
Toluene	0.002	0.56	0.56 (0.5)	2
Trichloroethylene	0.0076	<0.50	<0.50 (0.5)	8
Total Xylenes	0.0044	<1.1	<1.1 (1.1)	4

August 2018

HYDROLOGICAL REVIEW SUMMARY

Semi-Volatile Organics		Sample Result (mg/L)	Sample Result with upper RDL included (mg/L)	
Di-n-butyl Phthalate	0.015	<1.0	<1.0 (1.0)	5
Bis (2-ethylhexyl) Phthalate	0.0088	<2.0	<2.0 (2.0)	8.8
3,3'-Dichlorobenzidine	0.0008	<0.40	<0.40 (0.40)	0.8
Pentachlorophenol	0.002	<2.0	<2.0 (2.0)	2
Total PAHs	0.002	<1.7	<1.7 (1.7)	2
PCBs	0.0004	<0.040	<0.040 (0.040)	0.4
Misc Parameters				
Nonylphenols	0.001	<1.0	<1.0 (1.0)	1
Nonylphenol Ethoxylates	0.01	<2.0	<2.0 (2.0)	10

Sample Collected: February 18, 2022

Temperature: 1.9°C

Consulting Firm that prepared Hydrological Report: Grounded Engineering Inc.

Qualified Professional who completed the report summary: Matthew Bielaski, P.Eng., QP_{RA-ESA}
Print Name

Qualified Professional who completed the report summary: _____
Signature Date & Stamp



HYDROGEOLOGICAL REVIEW REPORT

PREPARED FOR:

Tenblock
30 Soudan Avenue, Suite 200
Toronto, ON M4S 1V6

ATTENTION:

Sue Chen

48 Grenoble Drive | Toronto, Ontario

Grounded Engineering Inc.

File No. 21-195

Issued March 10, 2022

Revised July 10, 2023



Executive Summary

Grounded Engineering Inc. (Grounded) was retained by Tenblock to conduct a Hydrogeological Review for the proposed redevelopment of 48 Grenoble Drive in Toronto, Ontario (site). The conclusions of the investigation are summarized as follows:

Development Information

Current Development					
Development Phase	Above Grade Levels	Below Grade Levels			
		Level #	Lowest Finished Floor		Approximate Base of Footings (masl)
			Depth (m)	Elevation (masl)	
1 Building	9	1	Unknown	Unknown	Unknown

Proposed Development					
Development Phase	Above Grade Levels	Below Grade Levels			
		Level #	Lowest Finished Floor		Approximate Base of Footings (masl)
			Depth (m)	Elevation (masl)	
1 Building (2 towers and associated podium)	Podium - 6	3	10.5	P2 – 120.0	P2 – 118.5*
	West Tower - 43			P3 – 117.0	P3 – 115.5*
	East Tower - 39				

*Underside of raft foundation

Site Conditions

Site Stratigraphy				
Stratum/Formation	Aquifer or Aquitard	Depth Range (mbgs)	Elevation Range (masl)	Hydraulic Conductivity (m/s)
Fill	Aquifer	0.0 – 3.1	127.5 – 124.4	$1.0 \times 10^{-5***}$
Upper Sands	Aquifer	3.1 – 6.9	124.4 – 120.6	$3.6 \times 10^{-6**}$
Upper Glacial Till	Aquifer	6.9 – 20.2	120.6 – 107.3	$5.5 \times 10^{-8*}$
Silts and Clays	Aquitard	20.2 – 26.3	107.3 – 101.2	$1.6 \times 10^{-8*}$
Lower Sands	Aquifer	26.3 – 36.7	101.2 – 90.8	$1.5 \times 10^{-6*}$
Lower Glacial Till	Aquifer	36.7 – 39.7	90.8 – 87.8	$1.0 \times 10^{-7***}$

*Indicates conductivity was calculated by Slug Test

**Indicates conductivity was estimated using grain size analysis

***Indicates conductivity was estimated using typical published values from Freeze and Cherry (1979)

Maximum Groundwater Elevation		
Monitoring Well ID	Depth Below Grade (m)	Elevation (masl)
BH1	13.1	114.2
BH2	15.2	111.9
BH3	16.2	115.5
BH4	14.8	113.1



Maximum Groundwater Elevation		
BH5	10.6	118.2
BH6	17.5	109.6
BH7	30.2	97.3
BH8	30.7	98.4
BH9	30.4	97.5
MAGWL Assessment Option		Option 1
Maximum Anticipated Groundwater Level (MAGWL)		119.5*

*Highest water level reading of Elev. 118.2± m was observed.

Groundwater Quality				
Sample ID	Sample Date	Sample Expiry Date	City of Toronto Storm Sewer Limits	City of Toronto Sanitary and Combined Sewer Limits
SW-UF-BH2	Feb 16, 2022	Nov 16, 2022	Exceeds	Meets

Groundwater Control

Stored Groundwater (pre-excavation/dewatering)					
Volume of Excavation (m³)	Volume of Excavation Below Water Table (m³)	Volume of Stored Groundwater		Volume of Available Groundwater	
		(m³)	(L)	(m³)	(L)
53,526	28,079	8,400	8,400,000	6,200	6,200,000

Short Term (Construction) Groundwater Quantity – Safety Factor of 1.5 Used					
Groundwater Seepage		Design Rainfall Event (25mm)		Total Daily Water Takings	
L/day	L/min	L/day	L/min	L/day	L/min
110,000	76.4	142,000	98.6	252,000	175.0

Long Term (Permanent) Groundwater Quantity – Safety Factor of 1.5 Used						
Scenario	Groundwater Seepage		Infiltration Design Rainfall Event (25mm)		Total Daily Water Takings	
	L/day	L/day	L/min	L/day	L/day	L/min
Drained Structure	105,000	72.9	22,000	15.3	127,000	88.2
Fully Watertight Structure	0	0	0	0	0	0

Maximum Zone of Influence (m)		
Site	Short Term (Construction)	Long Term (Permanent)
48 Grenoble Dr.	Soldier Pile & Lagging – 18±	Soldier Pile & Lagging – 15±



Fully Watertight Structure – 0±

Maximum Potential Settlement (mm)		
Site	Short Term (Construction)	Long Term (Permanent)
48 Grenoble Dr.	Solider Pile & Lagging – 11±	Solider Pile & Lagging – 3± Fully Watertight Structure – 0±

Regulatory Requirements	Drained Structure	Fully Watertight Structure
Environmental Activity and Sector Registry (EASR) Posting	Required	Required
Short Term Permit to Take Water (PTTW)	Not Required	Not Required
Long Term Permit to Take Water (PTTW)	Required	Not Required
Short Term Discharge Agreement City of Toronto	Required	Required
Long Term Discharge Agreement City of Toronto	Required	Not Required



TABLE OF CONTENTS

1	INTRODUCTION	1
2	STUDY AREA MAP	3
3	GEOLOGY AND PHYSICAL HYDROGEOLOGY	3
4	MONITORING WELL INFORMATION.....	4
5	GROUNDWATER ELEVATIONS.....	5
6	AQUIFER TESTING	6
6.1	PUMP TEST	6
6.2	SINGLE WELL RESPONSE TEST (SLUG TEST)	6
6.3	SOIL GRAIN SIZE DISTRIBUTION	6
6.4	LITERATURE.....	7
7	WATER QUALITY	8
8	PROPOSED CONSTRUCTION METHOD.....	8
9	PRIVATE WATER DRAINAGE SYSTEM (PWDS)	9
10	GROUNDWATER EXTRACTION AND DISCHARGE	10
11	EVALUATION OF IMPACT	12
11.1	ZONE OF INFLUENCE (ZOI).....	12
11.2	LAND STABILITY	12
11.3	CITY'S SEWAGE WORKS	13
11.4	NATURAL ENVIRONMENT	13
11.5	LOCAL DRINKING WATER WELLS	13
11.6	CONTAMINATION SOURCE	14
12	PROPOSED MITIGATION MEASURES AND MONITORING PLAN	14
13	LIMITATIONS	15
13.1	REPORT USE	15
14	CLOSURE	16



FIGURES

Figure 1 – Study Area Map

Figure 2 – Borehole and Monitoring Well Location Plan (Existing Condition)

Figure 3 – Borehole and Monitoring Well Location Plan (Proposed Condition)

Figure 4 – Subsurface Cross Section

APPENDICES

Appendix A – Borehole Logs

Appendix B – Aquifer Response Tests

Appendix C – Grain Size Analysis

Appendix D – HydrogeoSieveXL Data

Appendix E – Laboratory Certificate of Analysis

Appendix F – Finite Element Model

Appendix G – Dewatering Calculations



1 Introduction

Tenblock has retained Grounded Engineering Inc. ("Grounded") to provide hydrogeological engineering design advice for their proposed development at 48 Grenoble Drive, in Toronto, Ontario.

Property Information

Location of Property	48 Grenoble Drive, Toronto, Ontario, M3C 1C8
Ownership of Property	Tenblock
Property Dimensions (m)	Approximately 96 by 70 (irregular shape)
Property Area (m ²)	Approximately 6,749

Existing Development

Number of Building Structures	1 Building
Number of Above Grade Levels	9
Number of Underground Levels	1
Sub-Grade Depth of Development (m)	Unknown
Sub-Grade Area (m ²)	Approximately 1,200
Land Use Classification	Residential

Proposed Development

Number of Building Structures	1 Building (2 towers and associated podium)
Number of Above Grade Levels	Towers: West Tower – 43 & East Tower - 39 Podium: 6
Number of Underground Levels	3 (P1, P2, Partial P3)
Sub-Grade Depth of Development	P1/P2 – 7.5 mbgs Partial P3 – 10.5 mbgs
Sub-Grade Area (m ²)	P1/P2 - Approx. 5,655 (65 m x 87 m) Partial P3 = Approx. 877 (51.7 m x 17 m)



Land Use Classification

Residential with Parkland Conveyance

Qualified Person and Hydrogeological Review Information

Qualified Person	Matthew Bielaski, PEng, QP _{ESA-RA}
Consulting Firm	Grounded Engineering Inc.
Date of Hydrogeological Review	July 10, 2023
Scope of Work	- Review of MECP Water Well Records for the area - Review of geological information for the area - Review of topographic information for the area - Advancement of 3 environmental boreholes to a maximum depth of 1 m (BH10 to BH12) along the proposed parkland conveyance, with no monitoring wells. - Advancement of 6 boreholes to an approximate depth of 20 m, which were instrumented with monitoring wells (BH1 to BH6) - Advancement of 3 boreholes to an approximate depth of 45 m, which were instrumented with monitoring wells (BH7 to BH9) - Completion of a 24 hour pump test (if feasible) - Completion of slug tests in all available monitoring wells - Groundwater elevation monitoring for three (3) months - Groundwater sampling and analysis to the City of Toronto Sewer Use Limits - Assessment of groundwater controls and potential impacts - Report preparation in accordance with Ontario Water Resources Act, Ontario Regulation 387/04 and Toronto Municipal Code Chapter 681

General Hydrogeological Characterization

Property Topography	The site has an approximate ground surface elevation of 127.5 masl.
Local Physiographic Features	The site is composed of sandy silt till and clayey silt till deposits, as well as a clayey silt strata and lower sands.
Regional Physiographic Features	The West St Lawrence Lowland consists of a limestone plain (elevation 200–250 masl) that is separated by a broad, shale lowland from a broader dolomite and limestone plateau west of Lake Ontario. This plateau is bounded by the Niagara Escarpment. From the escarpment the plateau slopes gently southwest to lakes Huron and Erie (elevation 173 masl). Glaciation has mantled this region with several layers of glacial till (i.e., an unsorted mixture of clay, sand, etc.), the youngest forming extensive, undulating till plains, often enclosing rolling drumlin fields.



General Hydrogeological Characterization

Watershed	The site is located within the Don River Watershed. Locally, groundwater is anticipated to flow East towards a branch of the Don River.
Surface Drainage	Surface water is expected to flow towards municipal catch basins located on or adjacent to the site, via Grenoble Dr and Deauville Ln to the South and East.

2 Study Area Map

A map has been enclosed which shows the following information:

- All monitoring wells identified on site
- All monitoring wells identified off site within the study area
- All boreholes identified on site
- All buildings identified on site and within the study area
- The property boundaries of the site
- Any watercourses and drainage features within the study area.

3 Geology and Physical Hydrogeology

The site stratigraphy, including soil materials, composition and texture are presented in detail on the borehole logs in Appendix A. A summary of stratigraphic units that were encountered at the site are as follows:

Site Stratigraphy

Stratum/Formation	Aquifer or Aquitard	Depth Range (mbgs)	Elevation Range (masl)	Hydraulic Conductivity (m/s)
Fill	Aquifer	0.0 – 3.1	127.5 – 124.4	$1.0 \times 10^{-5***}$
Upper Sands	Aquifer	3.1 – 6.9	124.4 – 120.6	$3.6 \times 10^{-6**}$
Upper Glacial Till	Aquifer	6.9 – 20.2	120.6 – 107.3	$5.5 \times 10^{-8*}$
Silts and Clays	Aquitard	20.2 – 26.3	107.3 – 101.2	$1.6 \times 10^{-8*}$
Lower Sands	Aquifer	26.3 – 36.7	101.2 – 90.8	$1.5 \times 10^{-6*}$
Lower Glacial Till	Aquifer	36.7 – 39.7	90.8 – 87.8	$1.0 \times 10^{-7***}$

*Indicates conductivity was calculated by Slug Test

**Indicates conductivity was estimated using grain size analysis

***Indicates conductivity was estimated using typical published values from Freeze and Cherry (1979)



Bedrock			
Stratum	Depth Range (mbgs)	Elevation Range (masl)	Hydraulic Conductivity (m/s)
Weathered	39.6 – 41.6	87.9 – 85.8	1.0×10^{-6}
Sound	41.6 – 46.1	85.8 – 81.3	2.5×10^{-7}

Surface Water		
Surface Water Body	Distance from site (m)	Hydraulically Connected to Property (yes/no)
Don River	500 (East)	No

4 Monitoring Well Information

Well ID	Well Diameter (mm)	Ground Surface (masl)	Top of Screen (masl)	Bottom of Screen (masl)	Screened Geological Unit
BH1	51	126.9	114.7	111.7	Upper Glacial Till
BH2	51	127.1	111.2	108.2	Upper Glacial Till
BH3	51	127.7	112.4	109.4	Upper Glacial Till
BH4	51	127.6	110.9	107.8	Silts and Clays
BH5	51	127.6	113.9	110.9	Upper Glacial Till
BH6	51	125.2	110.0	106.9	Silts and Clays
BH7	51	127.1	87.3	84.2	Bedrock
BH8	51	127.5	97.0	94.0	Lower Sands
BH9	51	127.4	84.3	81.3	Bedrock



5 Groundwater Elevations

Well ID	Groundwater Elevation (masl)						
	Mar 14, 2022	Mar 25, 2022	Apr 18, 2022	May 6, 2022	May 20, 2022	Sept 23, 2022	June 27, 2023
BH1	113.9	114.0	114.2	114.2	114.1	113.9	-
BH2	111.7	111.6	111.6	111.7	-	111.9	-
BH3	111.8	112.2	113.2	113.2	114.1	114.8	115.5
BH4	112.8	112.9	112.9	112.9	112.9	113.1	112.5
BH5	117.7	118.0	118.0	118.1	118.2	118.2	117.5
BH6	107.8	108.1	108.5	108.6	109.0	109.6	109.5
BH7	97.0	97.0	97.3	97.2	97.2	97.1	97.3
BH8	96.5	96.7	96.5	96.6	96.7	98.4	96.7
BH9	-	97.4	97.3	97.4	97.4	97.3	97.3

The groundwater elevations were collected using a Solinst Oil/Water Interface Meter (model 122) with a 60 m long tape.

Based on local information, the design groundwater table for engineering purposes is Elev. 123 ±m.

Groundwater levels fluctuate with time depending on the amount of precipitation and surface runoff and may be influenced by known or unknown dewatering activities at nearby sites.

Per the City of Toronto, Toronto Water Infrastructure Management's Foundation Drainage Policy (November 1, 2021), long-term discharge of foundation drainage to the City's sanitary sewer system will not be permitted. A temporary, emergency foundation drainage connection to the City's sewer systems **may** be granted if the lowest elevation of any proposed structure is higher than the Maximum Anticipated Groundwater Level at the site. The MAGWL was determined based on the following equation:

$$\text{Maximum Anticipated GWL} = \text{Peak Static GWL Observed} + \text{Fluctuation Allowance}$$

The Peak Static GWL Observed was at Elev. 118.2 ±m in BH5 on May 20, 2022 and September 23, 2022. The Fluctuation Allowance based on the Option 1 - Table 1 approach, is 1.3 m. Therefore, the MAGWL for the site is estimated at Elev. 119.5 m.

As proposed foundations are above the observed maximum groundwater level at the Property, the elevation of the lowest structure will be above the MAGWL. As such, long term discharge of



groundwater to the City's sewer systems may be permitted. Pre-consultation with Toronto Water is encouraged to determine the feasibility for a Long-Term Storm/Sanitary Discharge Exemption.

6 Aquifer Testing

6.1 Pump Test

A pumping test was not completed at the site. Please note however that in-situ single well response tests were completed on each of the monitoring wells installed at the site.

6.2 Single Well Response Test (Slug Test)

The hydraulic conductivities from the monitoring wells were determined based on slug tests (single-well response tests). These tests involve rapid removal of water or addition of a "slug" which displaces a known volume of water from a single well, and then monitoring the water level in the well until it recovers. The results of the slug tests were analyzed using the Bouwer and Rice method (1976).

The hydraulic properties of the strata applicable to the site are as follows:

Well ID	Well Screen Elevation (masl)	Screened Geological Unit	Hydraulic Conductivity (m/s)
BH1	114.7 - 111.6	Upper Glacial Till	2.5×10^{-8}
BH2	111.2 - 108.2	Upper Glacial Till	2.7×10^{-7}
BH4	112.4 - 109.4	Silts and Clays	1.0×10^{-8}
BH5	110.9 - 107.8	Upper Glacial Till	2.5×10^{-8}
BH6	113.9 - 110.9	Silts and Clays	2.5×10^{-8}
BH7	110.0 - 106.9	Bedrock	2.5×10^{-7}
BH8	87.3 - 84.2	Lower Sands	1.5×10^{-6}
BH9	97.0 - 94.0	Bedrock	2.3×10^{-8}

6.3 Soil Grain Size Distribution

The hydraulic conductivities of various soil types can also be estimated from grain size analyses. An assessment of the grain sizes was conducted using the excel-based tool, HydrogeoSieve XL (*HydrogeoSieve XL ver.2.2, J.F. Devlin, University of Kansas, 2015*). HydrogeoSieve XL compares the results of the grain size analyses against fifteen (15) different analytical methods.

Given our experience in the area as well as published literature, some of the geometric means provided for the soil were biased low by one or more methods. In these instances, the values determined by these methods were excluded from the mean. The table below illustrates the



hydraulic conductivity values estimated from the mean of the analytical methods where the soil met the applicable analysis criteria.

Sample ID	Soil Description	Applicable Analysis Methods	Hydraulic Conductivity (m/s)
BH1 SS4	Upper Sands	Hazen, Slichter, Beyer, Sauerbrei, Kruger, Zunker, Zamarin, Barr, Alyamani and Sen, Krumbein and Monk	3.6×10^{-6}
BH2 SS8	Upper Glacial Till	Hazen, Slichter, Beyer, Sauerbrei, Kruger, Zunker, Zamarin, Barr, Alyamani and Sen, Krumbein and Monk	1.7×10^{-8}
BH3 SS12	Upper Glacial Till	Hazen, Slichter, Beyer, Sauerbrei, Kruger, Zunker, Zamarin, Barr, Alyamani and Sen, Krumbein and Monk	1.0×10^{-7}
BH4 SS15	Silts and Clays	Hazen, Slichter, Beyer, Sauerbrei, Kruger, Zunker, Zamarin, Barr, Alyamani and Sen, Krumbein and Monk	1.0×10^{-8}
BH7 SS17	Silts and Clays	Hazen, Slichter, Beyer, Sauerbrei, Kruger, Zunker, Zamarin, Barr, Alyamani and Sen, Krumbein and Monk	3.3×10^{-9}
BH7 SS22	Lower Sands	Hazen, Slichter, Beyer, Sauerbrei, Kruger, Zunker, Zamarin, Barr, Alyamani and Sen, Krumbein and Monk	4.6×10^{-9}
BH7 SS26	Lower Glacial Till	Hazen, Slichter, Beyer, Sauerbrei, Kruger, Zunker, Zamarin, Barr, Alyamani and Sen, Krumbein and Monk	3.6×10^{-8}

The results of the analyses are presented in Appendix D.

6.4 Literature

According to Freeze and Cherry (1979), the typical hydraulic conductivity of the strata investigated at the site are:

Stratum/Formation	Hydraulic Conductivity (m/s)
Earth Fill	10^{-2} to 10^{-6}
Upper Sands	10^{-2} to 10^{-7}
Upper Glacial Till	10^{-6} to 10^{-12}
Silts and Clays	10^{-6} to 10^{-12}
Lower Sands	10^{-2} to 10^{-7}
Lower Glacial Till	10^{-6} to 10^{-12}
Bedrock (Shale)	10^{-6} to 10^{-13}



7 Water Quality

One (1) unfiltered groundwater sample was collected and analyzed by a Canadian laboratory accredited and licensed by Standards Council of Canada and or Canadian Association for Laboratory Accreditation.

The sample was collected directly from monitoring well BH2 on February 16, 2022. The sample was analyzed for the following parameters:

- City of Toronto Municipal Code Chapter 681 Table 1 – Limits for Sanitary and Combined Sewers Discharge
- City of Toronto Municipal Code Chapter 681 Table 2 – Limits for Storm Sewer Discharge

The groundwater sample **exceeded** the **Limits for Storm Sewer Discharge** for the following parameters:

- Total Suspended Solids (Limit 15 mg/L, Result 246 mg/L)
- Total Cyanide (Limit 0.02 mg/L, Result 0.0711 mg/L)
- Total Manganese (Limit 0.05 mg/L, Result 0.384 mg/L)
- BOD (Limit 15 mg/L, Result 40.5 mg/L)

The groundwater sample **met** the **Limits for Sanitary and Combined Sewer Discharge** for all parameters analyzed.

A true copy of the analysis report, Certificate of Analysis and a chain of custody record for the sample are enclosed.

8 Proposed Construction Method

The proposed shoring methodology at the site is currently undetermined. For the purposes of this report, numerical analyses were conducted employing conventional soldier piling and lagging in order to determine a “worst-case scenario” with respect to dewatering volumes and groundwater seepage at the site.

For design purposes, the stabilized groundwater table is at about Elev. 123 ± m. The lowest (partial P3) FFE is at about Elev. 117.0 m. Therefore,

- Bulk excavation will extend below the elevation of the prevailing groundwater table;
- Foundation excavations will extend below the prevailing groundwater table; and
- Base of the P3 raft is estimated at 115.5 masl which is conservative for the present purposes. This depth may be revised once the final structural design becomes available for review.
- Foundation excavations are anticipated to extend to 115.5 masl, which will penetrate the upper glacial till and may yield moderate groundwater seepage.



Prior to excavation, positive dewatering to lower the groundwater table will be required to facilitate construction as well as to maintain the integrity of the subgrade for foundation and slab-on-grade support. The water level must be kept at least 1.2 m below the lowest excavation elevation during construction. Failure to dewater prior to excavation will result in unrecoverable disturbance of the subgrade, which will render advice provided for undisturbed subgrade conditions inapplicable.

Dewatering will take some time to accomplish prior to the start of excavation. Stored water within the excavation will need to be considered prior to excavation/dewatering.

It is recommended that a professional dewatering contractor be consulted to review the subsurface conditions and to design a site-specific dewatering system. It is the dewatering contractor's responsibility to assess the factual data and to provide recommendations on dewatering system requirements.

The proposed structures may consist of either drained foundations or a fully leak tight structure. Per the City of Toronto, Toronto Water Infrastructure Management's Foundation Drainage Policy (November 1, 2021), long-term discharge of groundwater to the City's sewer systems is unlikely to be permitted. Pre-consultation with Toronto Water is encouraged to determine the feasibility for a Long-Term Storm/Sanitary Discharge Exemption, as applicable.

The City of Toronto will require Discharge Agreements in the short and long terms, if any water is to be discharged to the storm or sanitary sewers. It should be noted that securing a permit to take water on a permanent basis may not be supported by regulatory agencies.

9 Private Water Drainage System (PWDS)

If the proposed development consists of drained foundations, then a private water drainage system will be required. The total sub floor drain area will be approximately 5,655 m² based on the drawings which have been provided.

If the development is designed with a private water drainage system, the drainage system is a critical structural element since it keeps water pressure from acting on the basement walls and floor slab. As such, the sump that ensures the performance of this system must have a duplexed pump arrangement for 100% pumping redundancy and these pumps must be on emergency power. The size of the sump should be adequate to accommodate the estimated groundwater seepage. It is anticipated that the groundwater seepage can be controlled with typical, widely available, commercial/residential sump pumps.

If the proposed development is designed as a watertight structure, then a private water drainage system will not be required. However, the structure must then be designed to resist hydrostatic pressure and uplift forces. A connection to the City's sewer for emergency repair services is recommended.



10 Groundwater Extraction and Discharge

Numerical analyses were conducted for both short term and long term dewatering scenarios. The modeling was conducted using computer software, which deploys the finite element modelling method. The Finite Element Model (FEM) for groundwater seepage indicates the short term (construction) and long term (permanent) dewatering requirements as provided below. The finite element model results are presented in Appendix E.

The groundwater seepage estimates, which have been provided, represent the steady state groundwater seepage. There will be an initial drawdown of the groundwater before a steady state condition is reached. The rate of the initial drawdown, and therefore discharge, is dependent on the dewatering contractor and how the groundwater is being dealt with at the site. An estimated initial volume of stored groundwater which will require removal before steady state is reached has been provided below.

Please note that if excavation is exposed to the elements, storm water will have to be managed. The short term control of groundwater should consider stormwater management from rainfall events. A dewatering system should be designed to consider the removal of rainfall from excavation. A design storm of 25 mm has been used in the quantity estimates.

As required by Ontario Regulation 63/16, a plan for discharge must consider the conveyance of storm water from a 100-year storm. The additional volume that will be generated in the occurrence of a 100-year storm event is approximately 532,000 L.

Stored Groundwater (pre-excavation/dewatering)

Volume of Excavation (m ³)	Volume of Excavation Below Water Table (m ³)	Volume of Stored Groundwater		Volume of Available Groundwater	
		(m ³)	(L)	(m ³)	(L)
53,526	28,079	8,400	8,400,000	6,200	6,200,000

Short Term (Construction) Groundwater Quantity – Safety Factor of 1.5 Used

Groundwater Seepage		Design Rainfall Event (25mm)		Total Daily Water Takings	
L/day	L/min	L/day	L/min	L/day	L/min
110,000	76.4	142,000	98.6	252,000	175.0



Long Term (Permanent) Groundwater Quantity – Safety Factor of 1.5 Used						
Scenario	Groundwater Seepage		Infiltration Design Rainfall Event (25mm)		Total Daily Water Takings	
	L/day	L/day	L/min	L/day	L/day	L/min
Drained Structure	105,000	72.9	22,000	15.3	127,000	88.2
Fully Watertight Structure	0	0	0	0	0	0

Regulatory Requirements	Drained Structure	Fully Watertight Structure
Environmental Activity and Sector Registry (EASR) Posting	Required	Required
Short Term Permit to Take Water (PTTW)	Not Required	Not Required
Long Term Permit to Take Water (PTTW)	Required	Not Required
Short Term Discharge Agreement City of Toronto	Required	Required
Long Term Discharge Agreement City of Toronto	Required	Not Required

Please note:

- The native soils must be dewatered a minimum of 1.2 m below the footing elevation prior to excavation to preserve the in-situ integrity of the native soils during construction dewatering activities. It is anticipated that the groundwater table will rise to the elevation of the subfloor drainage in the event of a drained structure or the waterproofing in the event of a leak tight structure.
- The proposed pump schedule for short term construction dewatering has not been completed. As such, the actual peak short term discharge rate is not available at the time of writing this report. The pump schedule must be specified by the dewatering contractor retained.
- The proposed pump schedule for long term permanent drainage has not been completed. As such the actual peak long term discharge rate is not available at the time writing of this report. The pump schedule must be specified by the mechanical consultant.
- A leak-tight structure (structure that has not included a private water drainage system) has been considered as part of the proposed development at this time.
- Per the City of Toronto, Toronto Water Infrastructure Management's Foundation Drainage Policy (November 1, 2021), long-term discharge of groundwater to the City's sewer systems is unlikely to be permitted. Pre-consultation with Toronto Water is encouraged to determine the feasibility for a Long-Term Storm/Sanitary Discharge Exemption, where applicable.



11 Evaluation of Impact

11.1 Zone of Influence (ZOI)

The Zone of Influence (ZOI) with respect to groundwater was calculated based on the estimated groundwater taking rate and the hydraulic conductivity of the unit which water will be taken at the Property.

The ZOI was calculated using the Sichardt equation below.

Equation: $R_0 = 3000 * dH * K^{0.5}$

Where:

dH is the dewatering thickness (m)

K is the hydraulic conductivity (m/s)

Calculation:

The ZOI with respect to groundwater seepage within the Upper Sands at the site is:

$$R_0 = 3000 * 2.4 \text{ m} * (3.58 \times 10^{-6})^{0.5} \text{ m/s}$$

$$R_0 = 14 \pm \text{m}$$

The ZOI with respect to groundwater seepage within the Upper Glacial Till at the site is:

$$R_0 = 3000 * 6.3 \text{ m} * (5.55 \times 10^{-8})^{0.5} \text{ m/s}$$

$$R_0 = 4 \pm \text{m}$$

The ZOI with respect to groundwater construction dewatering at the site is 18 m. This represents the maximum zone of influence with respect to groundwater at the site.

If all underground structures are constructed to be fully watertight, the ZOI with respect to groundwater seepage in the long term is 0 m.

11.2 Land Stability

The impacts to land stability of the proposed short term and long term dewatering at the site on adjacent structures are summarized as follows:

- The proposed dewatering at the subject site locally lowers the groundwater table within the ZOI by a maximum of 8.7 m. This drawdown would create an increase in effective stress of approximately 85 kPa in the native soils.



- Based on the change in effective stress and the compressibility of the soil subjected to that change, the proposed dewatering activities will induce a maximum 11 mm of additional settlement in the adjacent soils.
- The maximum induced settlement occurs directly adjacent to the proposed excavation and decreases in a nonlinear fashion with distance away from the excavation.
- For the structures within the public realm adjacent to the site, the dewatering-induced settlement is calculated to be 11 mm or less (depending on the depth of the structure).

On this basis, the impact of the proposed dewatering on the existing adjacent structures is considered by Grounded to be within acceptable limits.

11.3 City's Sewage Works

Negative impacts to City's sewage works may occur in terms of the quantity or quality of the groundwater discharged. This report provided the estimated quantity of the water discharge. However, this report does not speak to the sewer capacities. The sewer capacity analysis is provided under a separate cover by the civil consultant.

The quality of the proposed groundwater discharge is provided in Section 7. As noted in that section, the groundwater sample exceeded the Limits for Storm Sewer Discharge and met the Limits for Sanitary and Combined Sewer Discharge.

As such, additional treatment will be required before the water can be discharged to the Storm Sewer to avoid impacts to the City's sewage works caused by groundwater quality. Additional treatment will not be required before the water can be discharged to the Sanitary and Combined Sewer.

Per the City of Toronto, Toronto Water Infrastructure Management's Foundation Drainage Policy (November 1, 2021), long-term discharge of groundwater to the City's sewer systems is unlikely to be permitted. Discharge to the City's sewers may only be accomplished via a Long-Term Storm/Sanitary Discharge Exemption.

11.4 Natural Environment

There are no natural waterbodies within the ZOI that will be affected by the proposed construction dewatering or permanent drainage. Any groundwater which will be taken from the site will be discharged (if required) into the City's sewer systems and not into any natural water body. As such, there will be no impact to the natural environment caused by the water takings at the site.

11.5 Local Drinking Water Wells

The site is located within the municipal boundaries of the City of Toronto. The site and surrounding area are provided with municipal piped water and sewer supply. There is no use of



the groundwater for water supply in this area of Toronto. As such, there will be no impact to drinking water wells.

11.6 Contamination Source

The site and immediately surrounding area currently consist mostly of residential and commercial areas. These land uses are not anticipated to be a source of potential contamination and are not expected to provide an Area of Potential Environmental Concern for the site. As such, the pumping of groundwater at the site is not anticipated to facilitate the movement of potential contaminants onto the site. Evaluation of the environmental condition of the site will be completed under a separate cover.

12 Proposed Mitigation Measures and Monitoring Plan

The extent of the negative impact identified in previous sections will be limited to the ZOI caused by the groundwater taking at the site.

As a result of dewatering and draining the soil, changes in ground water level have the potential to cause settlement based on the change in the effective stresses within the ZOI. Per Section 11.2 of this report, the impact of the proposed dewatering on the existing adjacent structures is considered by Grounded to be within acceptable limits. Groundwater quality and quantity monitoring during dewatering activities will be conducted, as outlined below:

- Monitoring of groundwater quality on an ongoing basis per the requirements of the City of Toronto Discharge Agreement and also at the discretion of the Toronto Water Environmental Monitoring & Protection Unit (Toronto Water EM&P).
- Daily monitoring and metering of groundwater taking/discharge volumes per the City of Toronto Discharge Agreement.
- Groundwater will be discharged at the rate specified in the Discharge Agreement as approved by the City. This rate will not be exceeded.
- Any additional storm water accumulated on the Property will be managed on site and discharged in a controlled manner, not in excess of the agreed upon maximum daily volumes set out in the Discharge Agreement.
- Reporting of groundwater quality and quantity per the requirements of the applicable regulatory bodies (City of Toronto for the Discharge Agreement and MECP for the EASR Posting/Permit to Take Water requirements).
- The dewatering system including any applicable treatment system will be reviewed and inspected by Toronto Water – EM&P prior to connection to the City's municipal sewer system and after installation before discharge commences.
- Vibration and settlement monitoring during construction will be part of the shoring monitoring program at the site, as required by the Ontario Building Code and applicable City of Toronto By-Laws.



- If settlement outside of the acceptable limits is observed, dewatering at the site will be temporarily suspended.
- A Professional Engineer will be called to the Property to evaluate site conditions, determine cause of settlement, and provide remedial action.

Both the temporary construction dewatering system and the permanent building drainage system (if applicable) must be properly installed and screened to ensure sediments and fines will not be removed which would cause loss of ground. This is typically a primary cause of dewatering related settlement.

13 Limitations

Natural occurrences, the passage of time, local construction, and other human activity all have the potential to directly or indirectly alter the subsurface conditions at or near the project site. Contractual obligations related to groundwater or stormwater control must be considered with attention and care as they relate this potential site alteration.

The hydrogeological engineering advice provided in this report is based on the factual observations made from the site investigations as reported. It is intended for use by the owner and their retained design team. If there are changes to the features of the development or to the scope, the interpreted subsurface information, geotechnical engineering design parameters, advice, and discussion on construction considerations may not be relevant or complete for the project. Grounded should be retained to review the implications of such changes with respect to the contents of this report.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Grounded accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report, including consequential financial effects on transactions or property values, or requirements for follow-up actions and costs.

13.1 Report Use

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14 Closure

If there are any questions regarding the discussion and advice provided, please do not hesitate to contact our office. We trust that this report meets your requirements at present.

For and on behalf of our team,



Shelby Plant, BSCE, MES, EIT
Project Manager



Matthew Bielaski, PEng, QP_{RA-ESA}
Principal

FIGURES





1 BANIGAN DRIVE, TORONTO, ONT., M4H 1G3
www.groundedeng.ca

LEGEND

— APPROXIMATE PROPERTY BOUNDARY

Note

Reference

ArcGIS My Map 2021

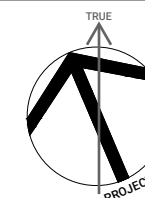
Project

48 GRENOBLE DRIVE,
TORONTO, ONTARIO

Figure Title

SITE LOCATION PLAN

North



Date _____

JUNE 2023

Scale

NTS

Job No

21-195

Figure No

FIGURE 1

LEGEND

APPROXIMATE PROPERTY BOUNDARY

MONITORING WELL/BOREHOLE
BY GROUND

Note

Reference

Survey Drawing no. 3487-OT.
Project no. 3487-0.
Dated August 4, 2021.
Prepared by RAVIS Surveying Inc.

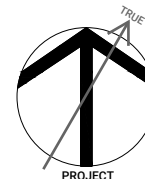
Project

48 GRENABLE DRIVE
TORONTO, ONTARIO

Figure Title

**BOREHOLE LOCATION
PLAN
(Existing Condition)**

North



Date

JUNE 2023

Scale

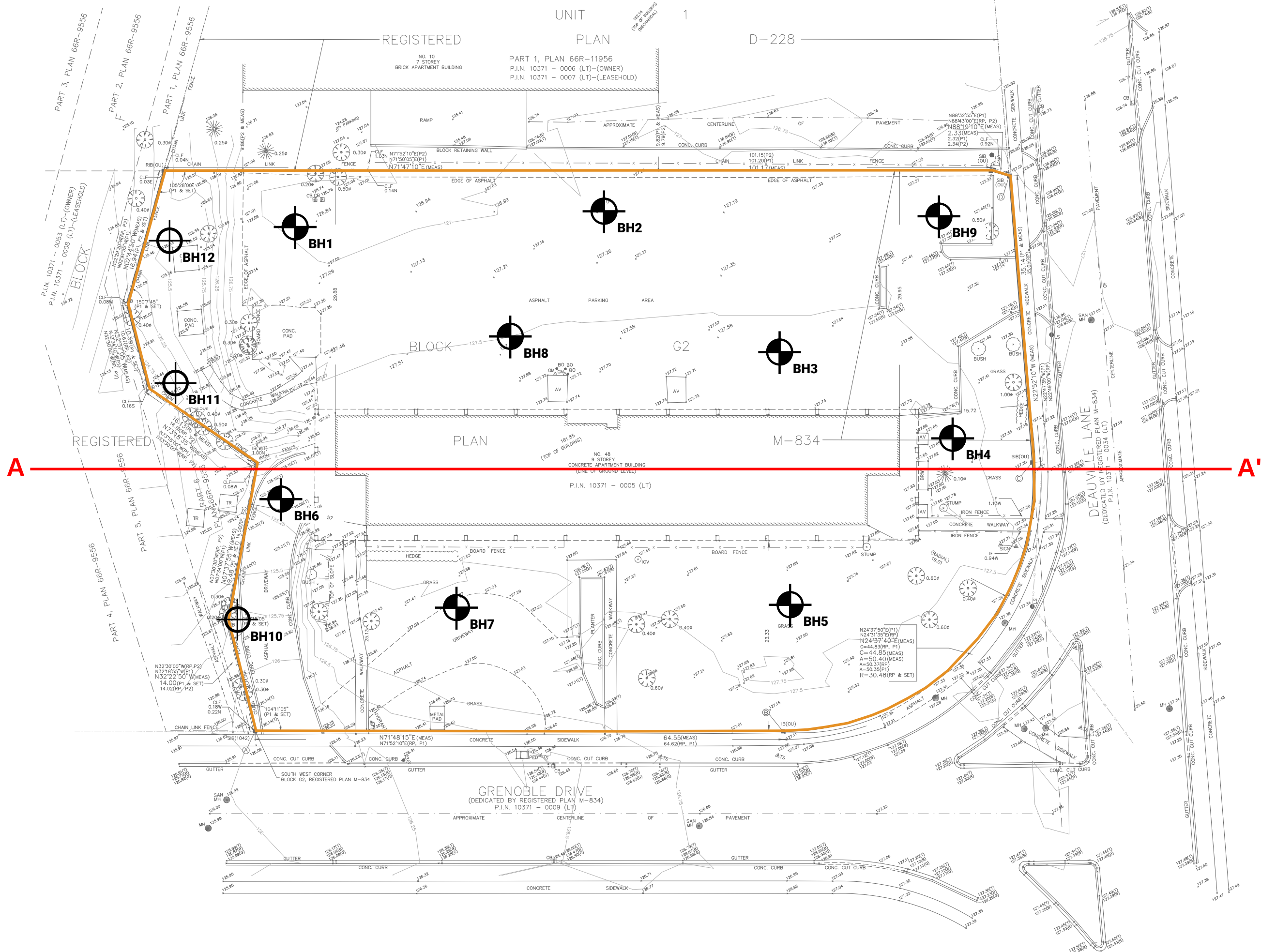
0m 5m 10m

Job No

21-195

Figure No

FIGURE 2





GROUND
ENGINEERING

1 BANIGAN DRIVE, TORONTO, ONT., M4H 1G3
www.groundedeng.ca

LEGEND

APPROXIMATE PROPERTY BOUNDARY

MONITORING WELL/BOREHOLE
BY GROUNDED

Note

Reference

Site Plan (A012)
Project no. 211033.
July 10, 2023
Prepared by Diamond Schmitt.

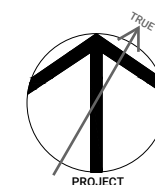
Project

48 GRENABLE DRIVE
TORONTO, ONTARIO

Figure Title

BOREHOLE LOCATION PLAN (Proposed Condition)

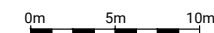
North



Date

JUNE 2023

Scale



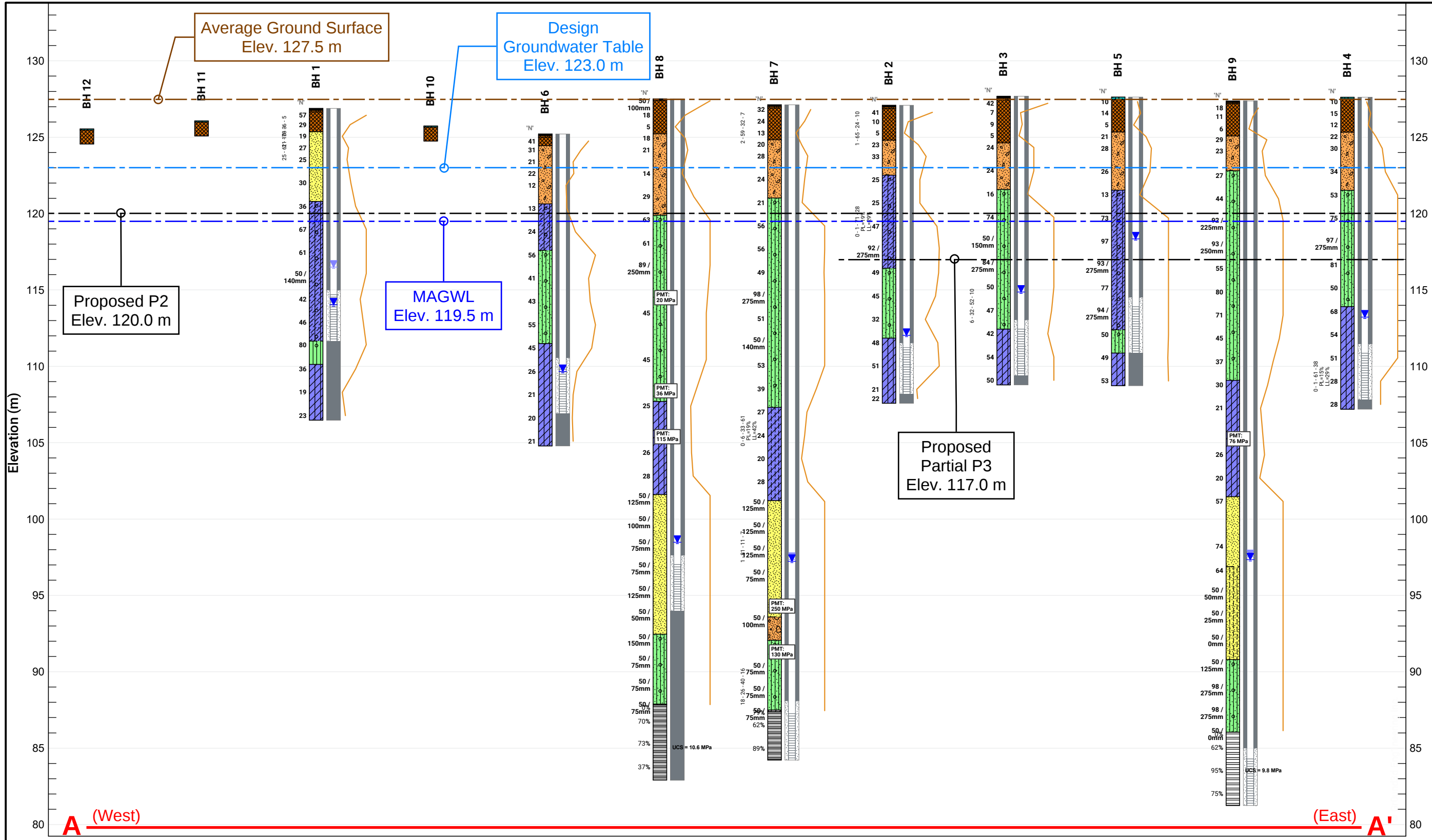
Job No

21-195

Figure No

FIGURE 3





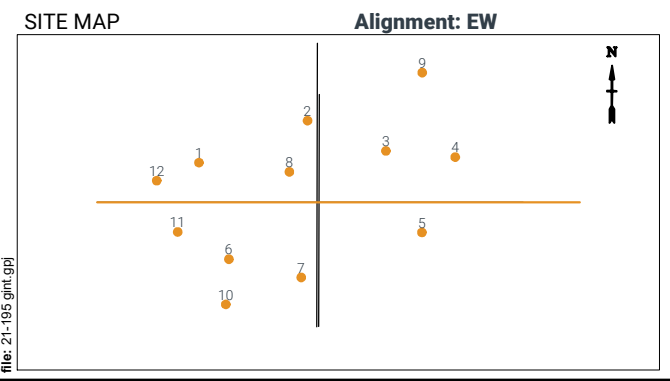
LEGEND

- FILL
- GRAVELS (gravel to gravelly sand)
- SILT TO SAND (not till)
- COHESIONLESS TILLS
- COHESIVE SOILS (clayey silt to clay, incl. tills)
- DISTURBED/REWORKED/ORGANIC

▽ water level, unstabilized
▽ water level, stabilized (latest)
▽ water level, stabilized (highest)

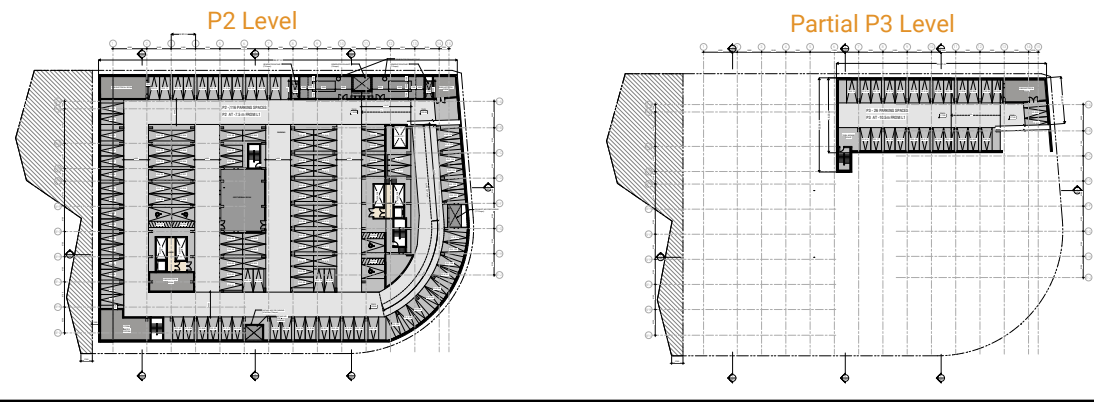
Project
**48 GRENOBLE DRIVE
TORONTO, ON**

Figure Title
**SUBSURFACE
CROSS SECTION**



BOREHOLE STRATIGRAPHY LEGEND

Asphalt	Clayey Silt Till	Sandy Silt Till	Bedrock (inferred)
Aggregate	Silty Till	Topsoil	Bedrock (cored)
Fill	Silt and Clay	Silty Clay	Silty Sand
Sand	Gravelly Sand	Sand and Gravel	Shale



APPENDIX A



SAMPLING/TESTING METHODS

SS: split spoon sample
 AS: auger sample
 GS: grab sample
 FV: shear vane
 DP: direct push
 PMT: pressuremeter test
 ST: shelby tube
 CORE: soil coring
 RUN: rock coring

SYMBOLS & ABBREVIATIONS

MC: moisture content
 LL: liquid limit
 PL: plastic limit
 PI: plasticity index
 γ : soil unit weight (bulk)
 G_s : specific gravity
 S_u : undrained shear strength
 unstabalized water level
 1st water level measurement
 2nd water level measurement most recent
 water level measurement

ENVIRONMENTAL SAMPLES

M&I: metals and inorganic parameters
 PAH: polycyclic aromatic hydrocarbon
 PCB: polychlorinated biphenyl
 VOC: volatile organic compound
 PHC: petroleum hydrocarbon
 BTEX: benzene, toluene, ethylbenzene and xylene
 PPM: parts per million

FIELD MOISTURE (based on tactile inspection)

DRY: no observable pore water
MOIST: inferred pore water, not observable (i.e. grey, cool, etc.)
WET: visible pore water

COMPOSITION

Term	% by weight
trace silt	<10
some silt	10 - 20
silty	20 - 35
sand and silt	>35

COHESIONLESS

Relative Density	N-Value
Very Loose	<4
Loose	4 - 10
Compact	10 - 30
Dense	30 - 50
Very Dense	>50

COHESIVE

Consistency	N-Value	Su (kPa)
Very Soft	<2	<12
Soft	2 - 4	12 - 25
Firm	4 - 8	25 - 50
Stiff	8 - 15	50 - 100
Very Stiff	15 - 30	100 - 200
Hard	>30	>200

ASTM STANDARDS**ASTM D1586 Standard Penetration Test (SPT)**

Driving a 51 mm O.D. split-barrel sampler ("split spoon") into soil with a 63.5 kg weight free falling 760 mm. The blows required to drive the split spoon 300 mm ("bpf") after an initial penetration of 150 mm is referred to as the N-Value.

ASTM D3441 Cone Penetration Test (CPT)

Pushing an internal still rod with a outer hollow rod ("sleeve") tipped with a cone with an apex angle of 60° and a cross-sectional area of 1000 mm² into soil. The resistance is measured in the sleeve and at the tip to determine the skin friction and the tip resistance.

ASTM D2573 Field Vane Test (FVT)

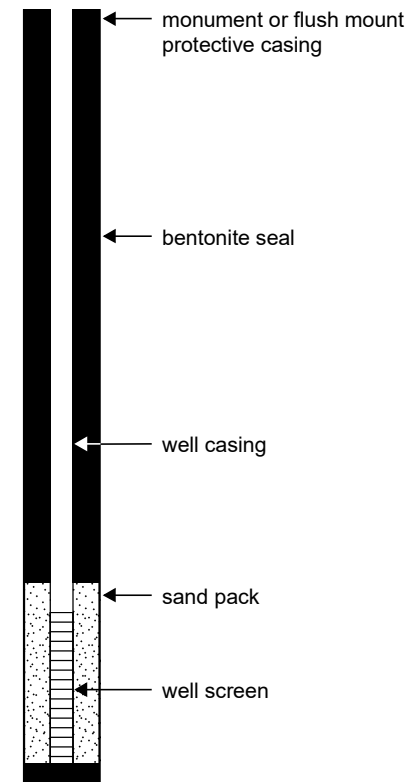
Pushing a four blade vane into soil and rotating it from the surface to determine the torque required to shear a cylindrical surface with the vane. The torque is converted to the shear strength of the soil using a limit equilibrium analysis.

ASTM D1587 Shelby Tubes (ST)

Pushing a thin-walled metal tube into the in-situ soil at the bottom of a borehole, removing the tube and sealing the ends to prevent soil movement or changes in moisture content for the purposes of extracting a relatively undisturbed sample.

ASTM D4719 Pressuremeter Test (PMT)

Place an inflatable cylindrical probe into a pre-drilled hole and expanding it while measuring the change in volume and pressure in the probe. It is inflated under either equal pressure increments or equal volume increments. This provides the stress-strain response of the soil.

WELL LEGEND

TCR **Total Core Recovery** the total length of recovery (soil or rock) per run, as a percentage of the drilled length
SCR **Solid Core Recovery** the total length of sound full-diameter rock core pieces per run, as a percentage of the drilled length
RQD **Rock Quality Designation** the sum of all pieces of sound rock core in a run which are 10 cm or greater in length, as a percentage of the drilled length

Natural Fracture Frequency (typically per 0.3 m) The number of natural discontinuities (joints, faults, etc.) which are present per 0.3m. Ignores mechanical or drill-induced breaks, and closed discontinuities (e.g. bedding planes).

LOGGING DISCONTINUITIES

Discontinuity Type	Roughness (Barton et al.)	Spacing in Discontinuity Sets (ISRM 1981)
BP bedding parting		VC very close < 60 mm
CL cleavage		C close 60 – 200 mm
CS crushed seam		M mod. close 0.2 to 0.6 m
FZ fracture zone		W wide 0.6 to 2 m
MB mechanical break		VW very wide > 2 m
IS infilled seam		
JT Joint		
SS shear surface		
SZ shear zone		
VN vein		
VO void		
Coating		Aperture Size
CN Clean		T closed / tight < 0.5 mm
SN Stained		GA gapped 0.5 to 10 mm
OX Oxidized		OP open > 10 mm
VN Veneer		
CT Coating (>1 mm)		
		Planarity
		PR Planar
		UN Undulating
		ST Stepped
		IR Irregular
		DIS Discontinuous
		CU Curved

GENERAL

Degree of Weathering (after MTO, RR229 Evaluation of Shales for Construction Projects)

Zone	Degree	Description
Z1	unweathered	shale, regular jointing
Z2	partially weathered	angular blocks of unweathered shale, no matrix, with chemically weathered but intact shale
Z3		soil-like matrix with frequent angular shale fragments < 25mm diameter
Z4a		soil-like matrix with occasional shale fragments < 3mm diameter
Z4b	fully weathered	soil-like matrix only

Strength classification (after Marinos and Hoek, 2001; ISRM 1981b)

Grade		UCS (MPa)	Field Estimate (Description)
R6	extremely strong	> 250	can only be chipped by geological hammer
R5	very strong	100 - 250	requires many blows from geological hammer
R4	strong	50 - 100	requires more than one blow from geological hammer
R3	medium strong	25 - 50	can't be scraped, breaks under one blow from geological hammer
R2	weak	5 - 25	can be peeled / scraped with knife with difficulty
R1	very weak	1 - 5	easily scraped / peeled, crumbles under firm blow of geo. hammer
R0	extremely weak	< 1	indented by thumbnail

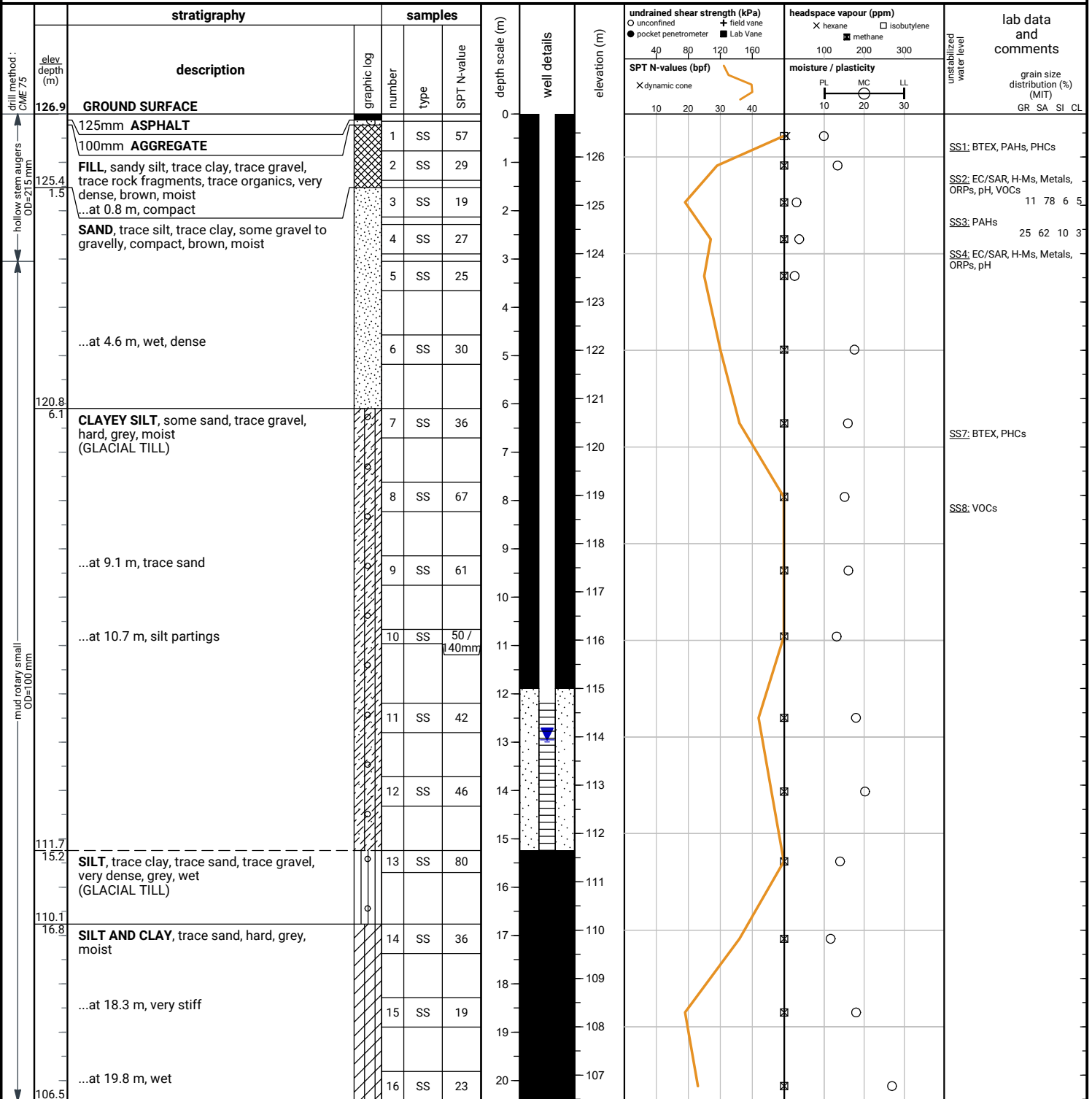
Bedding Thickness (Q. J. Eng. Geology, Vol 3, 1970)

Very thickly bedded	> 2 m
Thickly bedded	0.6 – 2m
Medium bedded	200 – 600mm
Thinly bedded	60 – 200mm
Very thinly bedded	20 – 60mm
Laminated	6 – 20mm
Thinly Laminated	< 6mm

File No. : 21-195

Project : 48 Grenoble Drive, Toronto, ON

Client : Tenblock



END OF BOREHOLE

Borehole was filled with drill water upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

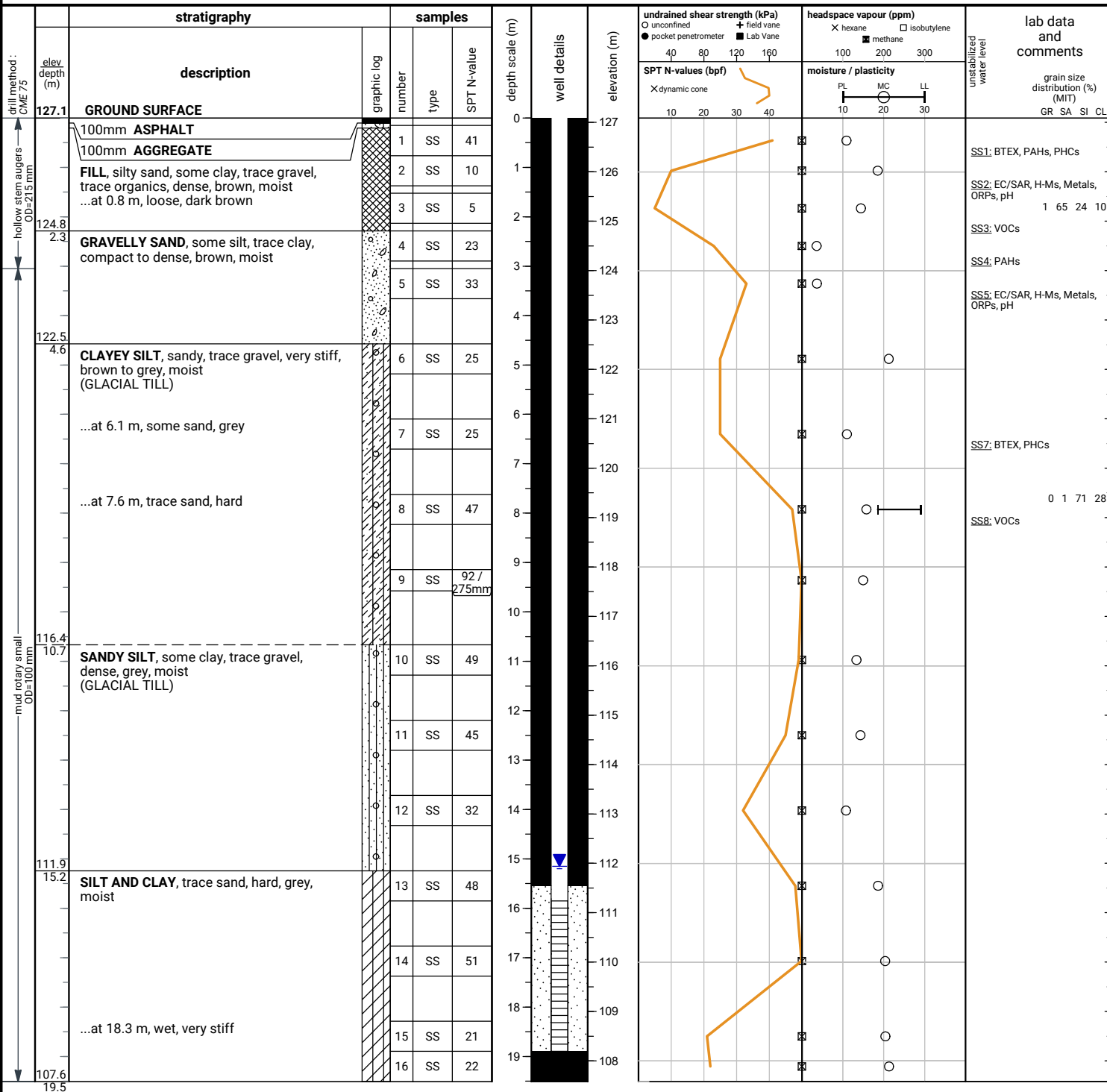
date	depth (m)	elevation (m)
Mar 25, 2022	12.9	114.0
Mar 31, 2022	12.9	114.0
Apr 18, 2022	12.8	114.1
May 6, 2022	12.7	114.2
May 20, 2022	12.8	114.1
Sep 23, 2022	13.0	113.9

*latest 6 measurements shown

File No. : 21-195

Project : 48 Grenoble Drive, Toronto, ON

Client : Tenblock



END OF BOREHOLE

Borehole was filled with drill water upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

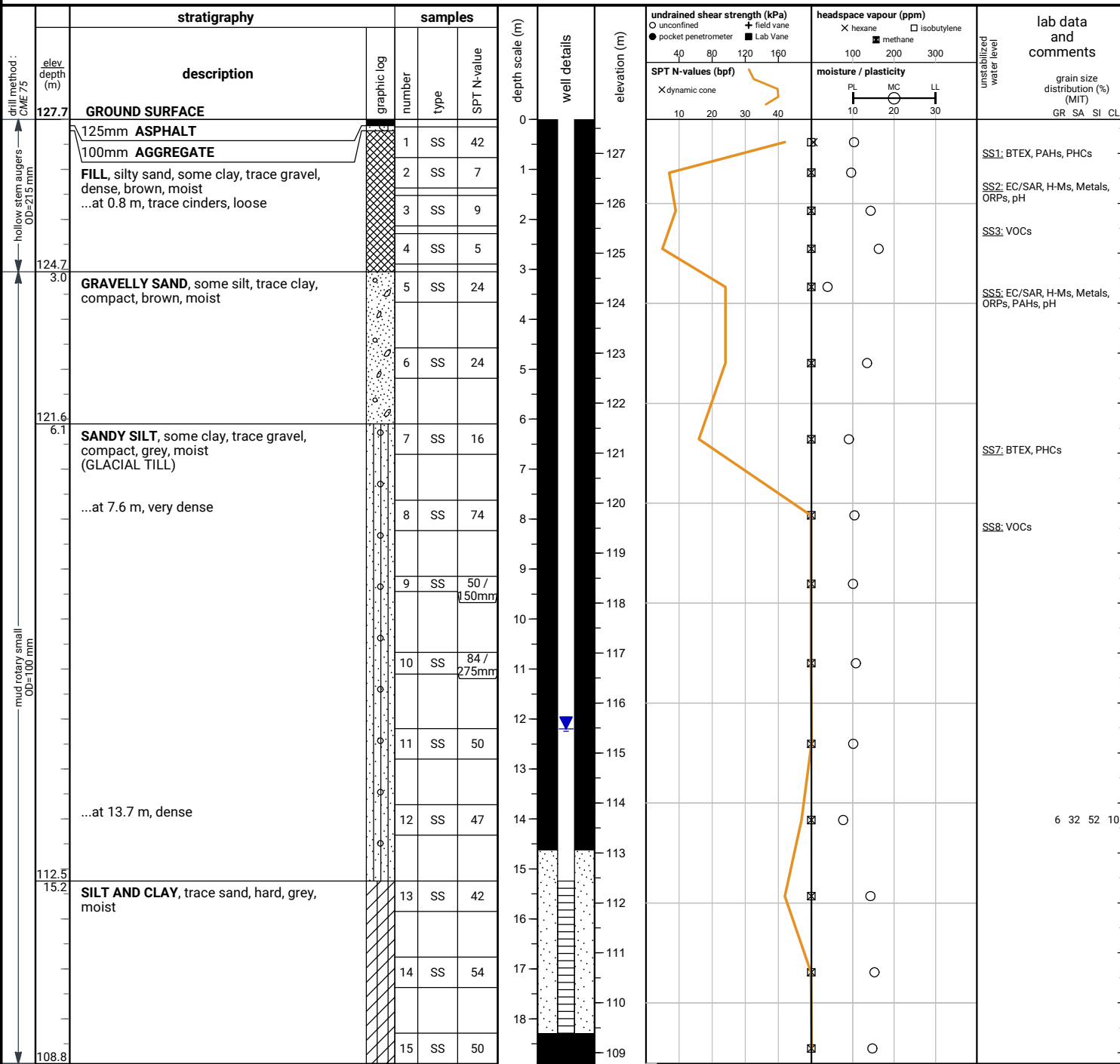
date	depth (m)	elevation (m)
Mar 14, 2022	15.4	111.7
Mar 25, 2022	15.5	111.6
Mar 31, 2022	15.5	111.6
Apr 18, 2022	15.5	111.6
May 6, 2022	15.4	111.7
Sep 23, 2022	15.2	111.9

*latest 6 measurements shown

File No. : 21-195

Project : 48 Grenoble Drive, Toronto, ON

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END OF BOREHOLE

Borehole was filled with drill water upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

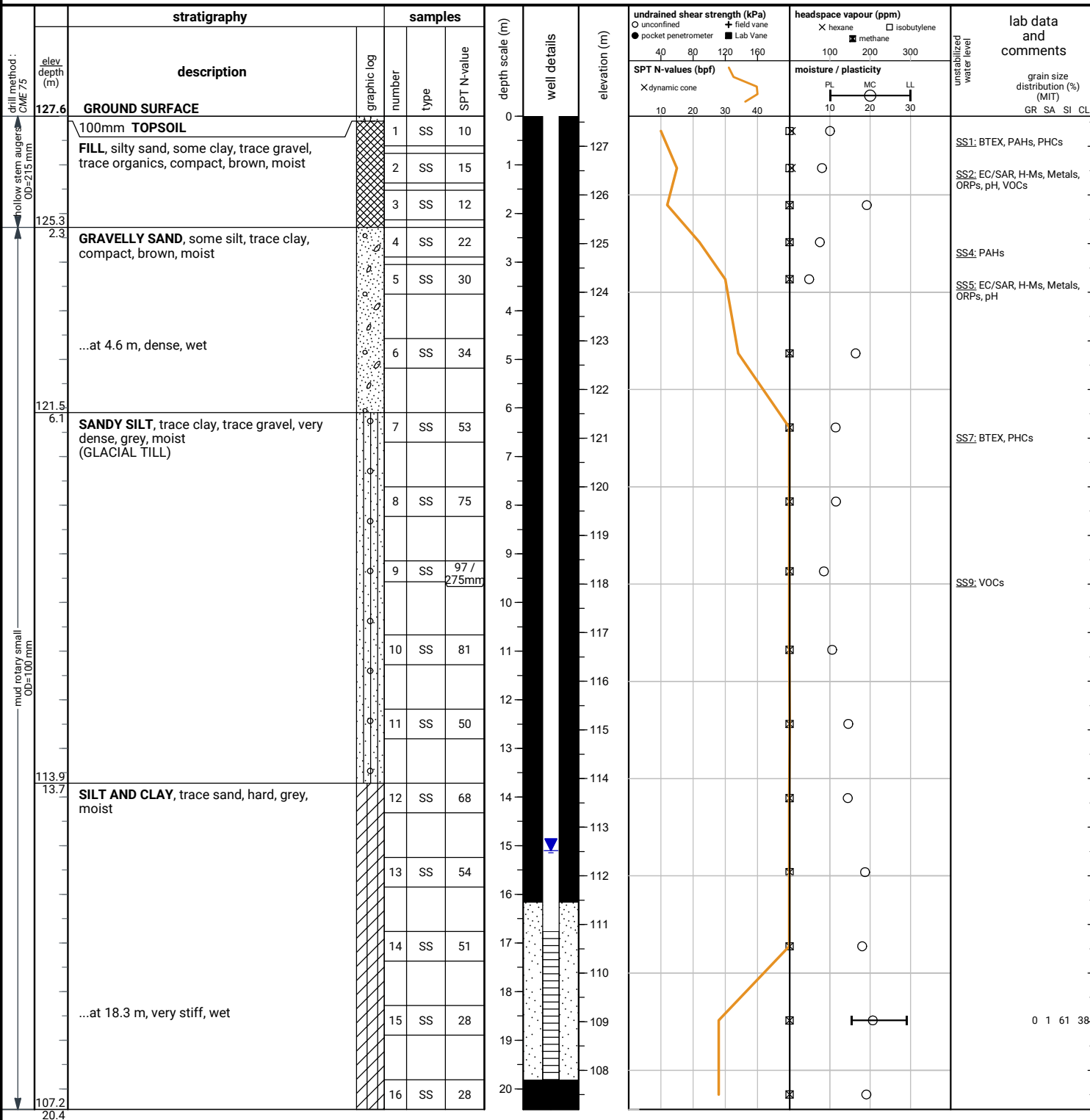
date	depth (m)	elevation (m)
Mar 31, 2022	15.5	112.2
Apr 18, 2022	14.5	113.2
May 6, 2022	14.5	113.2
May 20, 2022	13.6	114.1
Sep 23, 2022	12.9	114.8
Jun 27, 2023	12.2	115.5

*latest 6 measurements shown

File No. : 21-195

Project : 48 Grenoble Drive, Toronto, ON

Client : Tenblock



END OF BOREHOLE

Borehole was filled with drill water upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

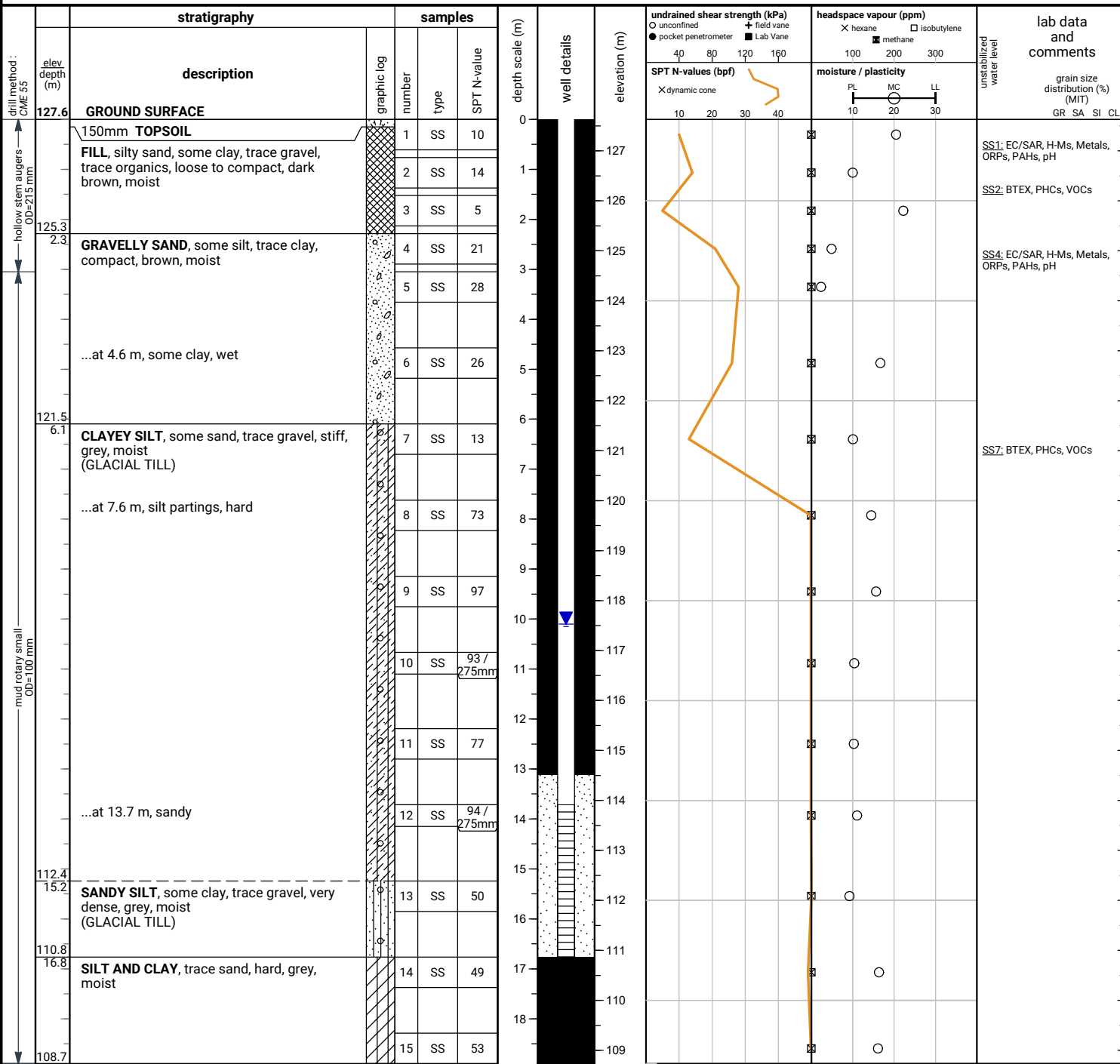
date	depth (m)	elevation (m)
Mar 31, 2022	14.7	112.9
Apr 18, 2022	14.7	112.9
May 6, 2022	14.7	112.9
May 20, 2022	14.7	112.9
Sep 23, 2022	14.5	113.1
Jun 27, 2023	15.1	112.5

*latest 6 measurements shown

File No. : 21-195

Project : 48 Grenoble Drive, Toronto, ON

Client : Tenblock



END OF BOREHOLE

Borehole was filled with drill water upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

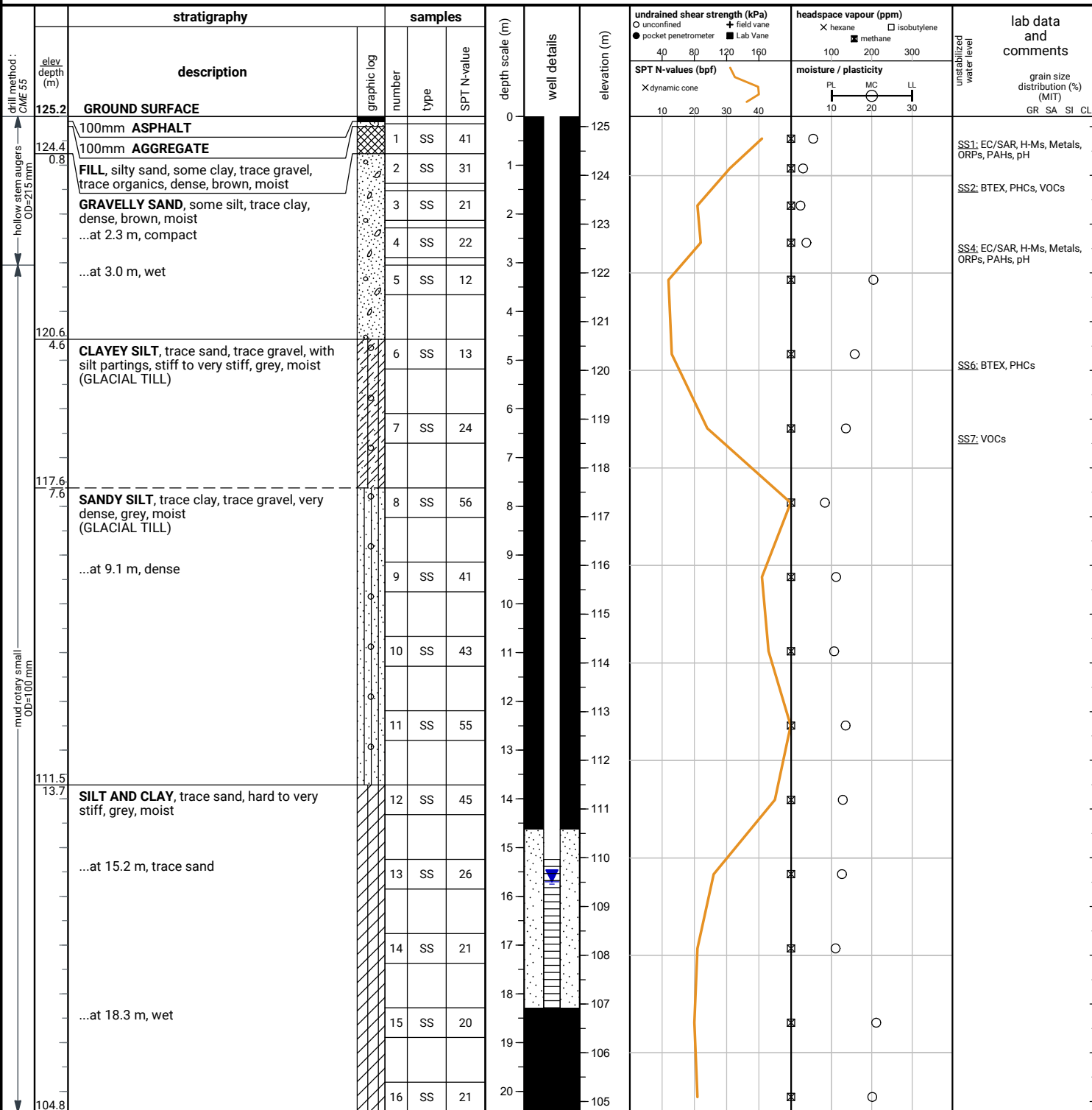
date	depth (m)	elevation (m)
Mar 31, 2022	9.7	117.9
Apr 18, 2022	9.6	118.0
May 6, 2022	9.5	118.1
May 20, 2022	9.4	118.2
Sep 23, 2022	9.4	118.2
Jun 27, 2023	10.1	117.5

*latest 6 measurements shown

File No. : 21-195

Project : 48 Grenoble Drive, Toronto, ON

Client : Tenblock



END OF BOREHOLE

Borehole was filled with drill water upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

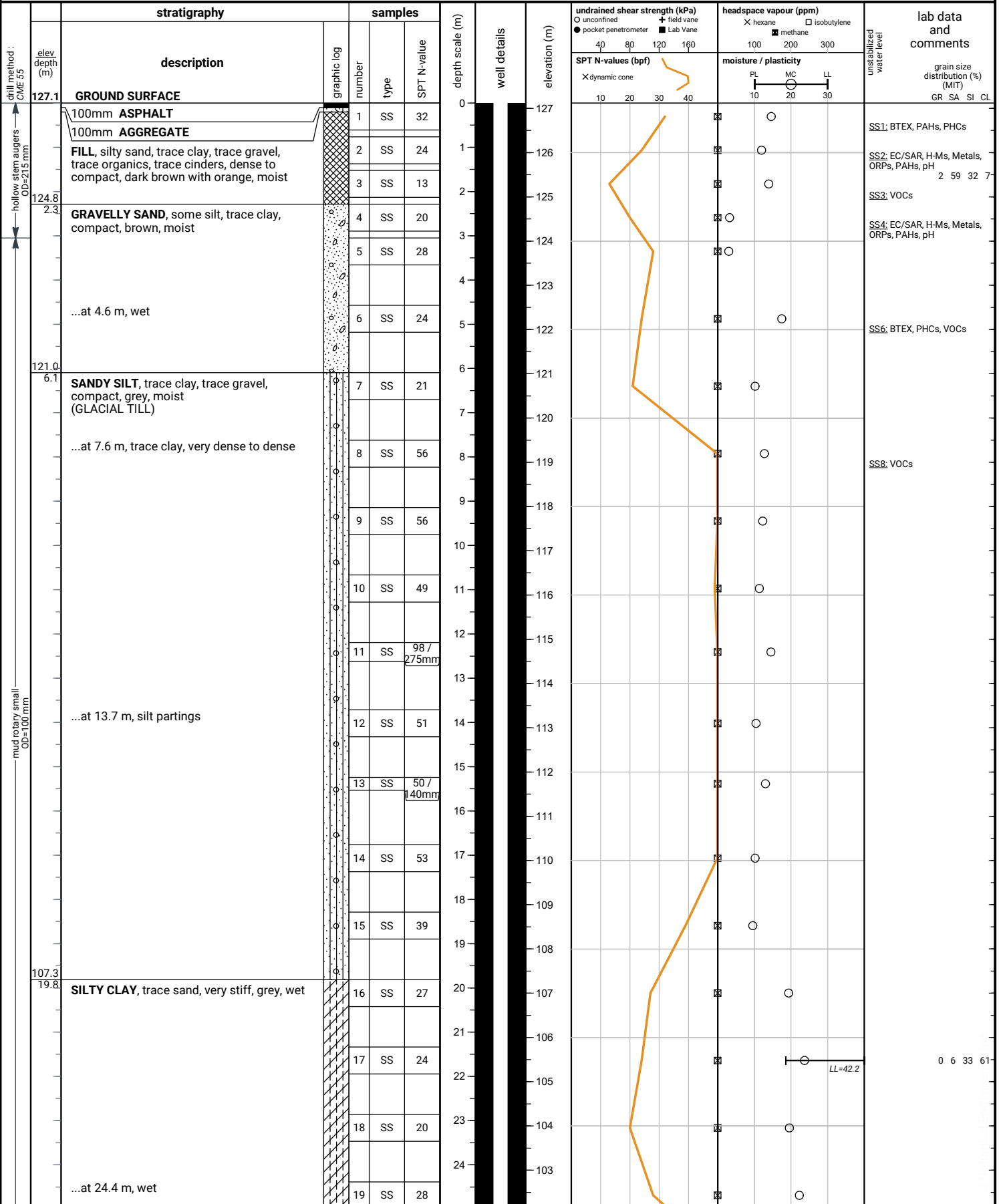
date	depth (m)	elevation (m)
Mar 31, 2022	17.1	108.1
Apr 18, 2022	16.7	108.5
May 6, 2022	16.6	108.6
May 20, 2022	16.2	109.0
Sep 23, 2022	15.6	109.6
Jun 27, 2023	15.7	109.5

*latest 6 measurements shown

File No. : 21-195

Project : 48 Grenoble Drive, Toronto, ON

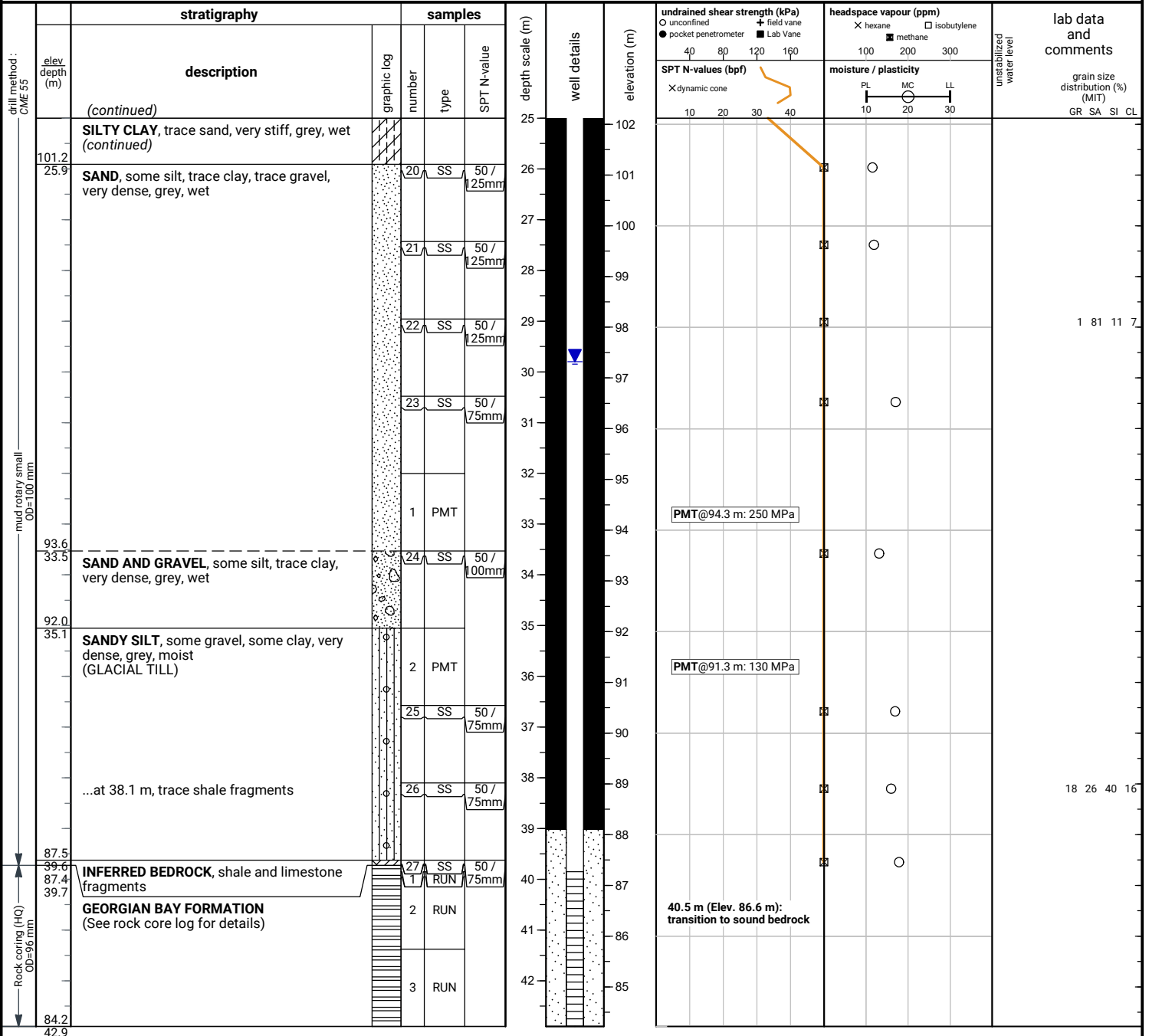
Client : Tenblock



File No. : 21-195

Project : 48 Grenoble Drive, Toronto, ON

Client : Tenblock



END OF BOREHOLE

Borehole was filled with drill water upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Mar 25, 2022	30.1	97.0
Apr 18, 2022	29.9	97.2
May 6, 2022	29.9	97.2
May 20, 2022	29.9	97.2
Sep 23, 2022	30.0	97.1
Jun 27, 2023	29.8	97.3

*latest 6 measurements shown

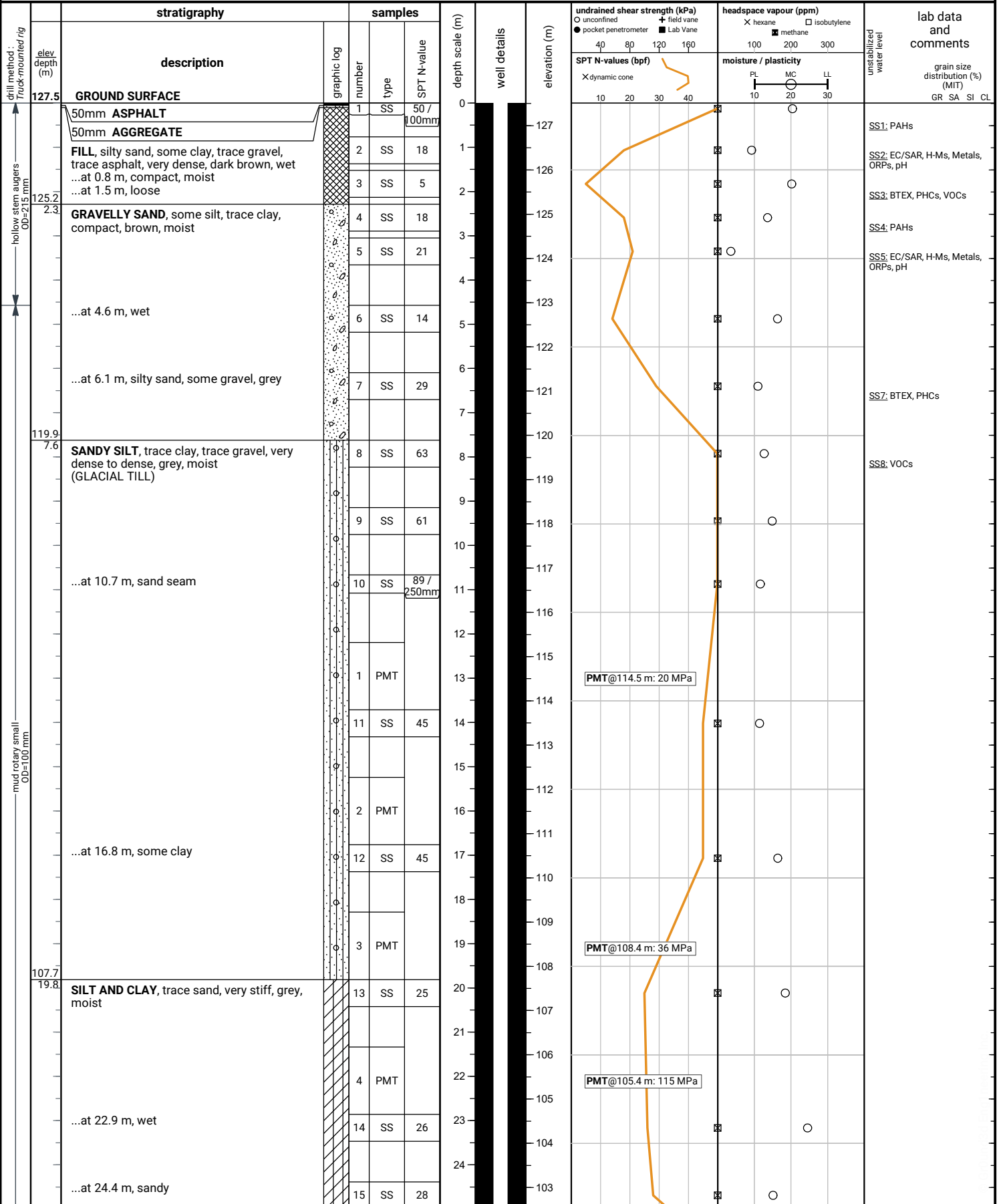
Project : 48 Grenoble Drive, Toronto, ON **Client :** Tenblock

END OF COREHOLE

File No. : 21-195

Project : 48 Grenoble Drive, Toronto, ON

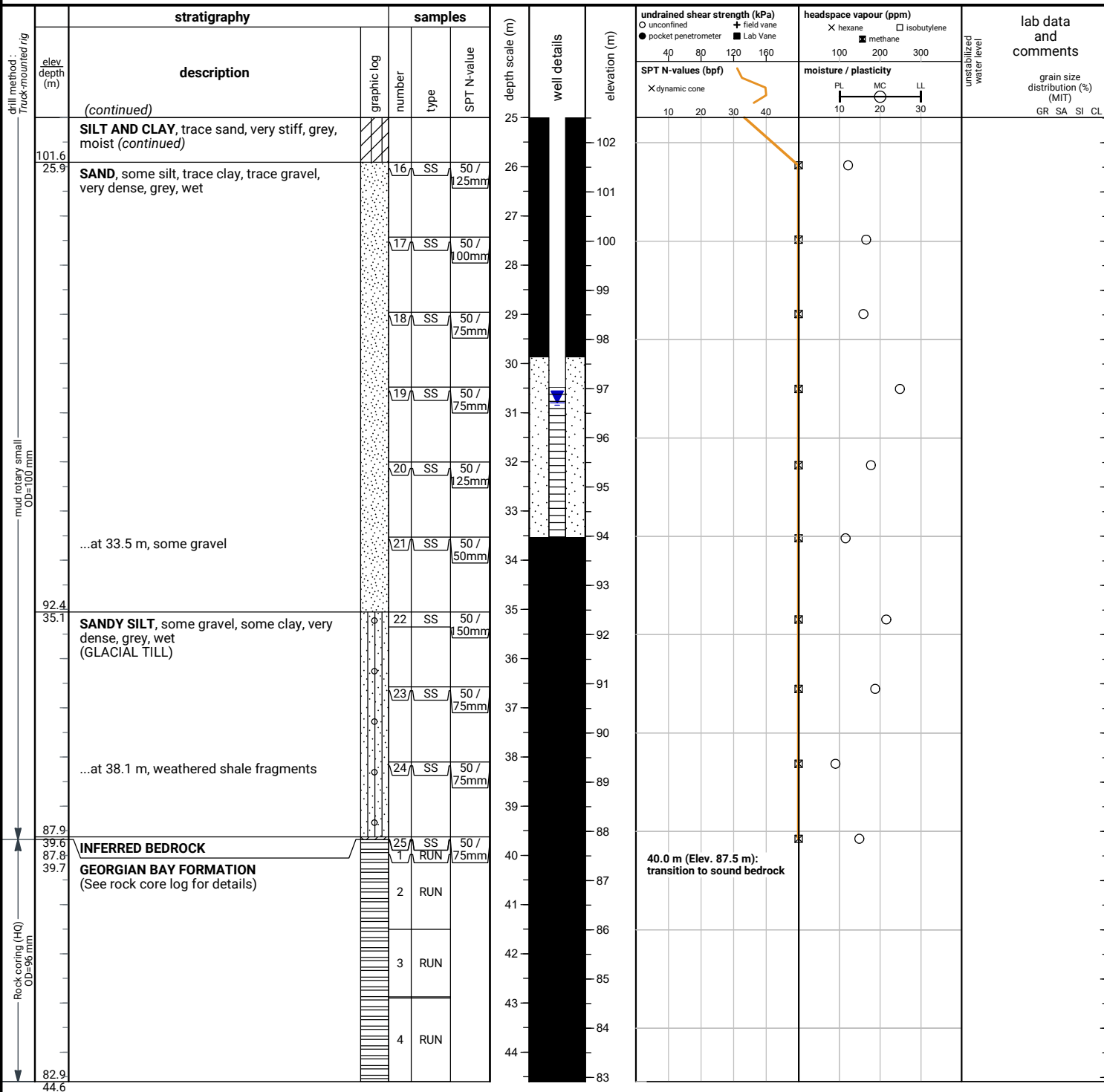
Client : Tenblock



File No. : 21-195

Project : 48 Grenoble Drive, Toronto, ON

Client : Tenblock



END OF BOREHOLE

Borehole was filled with drill water upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Mar 25, 2022	30.8	96.7
Apr 18, 2022	31.1	96.4
May 6, 2022	30.9	96.6
May 20, 2022	30.8	96.7
Sep 23, 2022	29.1	98.4
Jun 27, 2023	30.8	96.7

*latest 6 measurements shown

Project : 48 Grenoble Drive, Toronto, ON **Client :** Tenblock

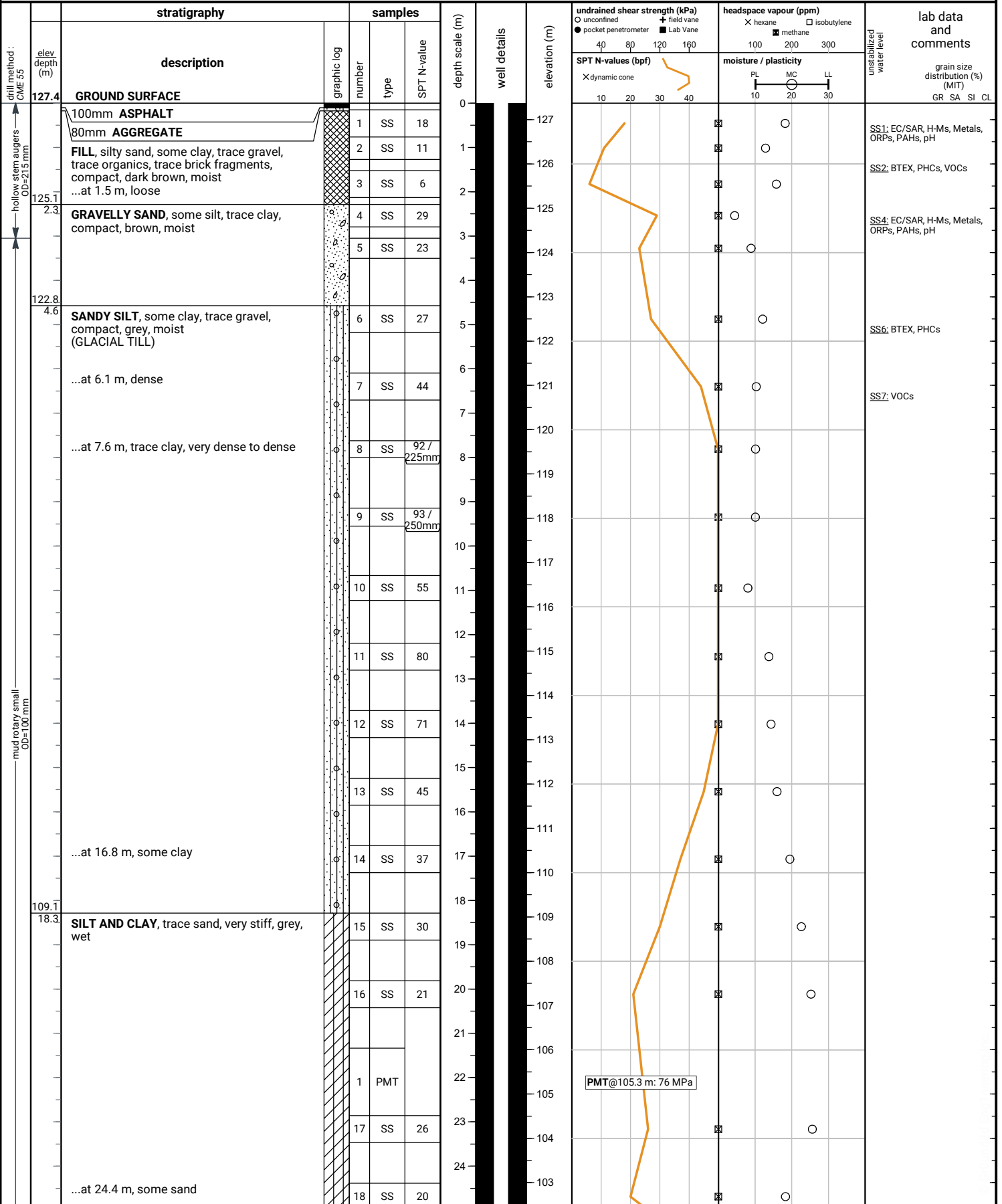
depth (m)	graphic log	stratigraphy	Run elev depth (m)	recovery	elevation (m)	shale weathering zones	UCS (MPa)	natural fracture frequency	laboratory testing	notes and comments	elevation (m)
						Z1 Z2 Z3 Z4	● 5 25 50 100 250				
							estimated strength				
		Rock coring started at 39.7m below grade	87.8								
40		GEORGIAN BAY FORMATION Shale, grey, thinly bedded, weak; joints are horizontal, gapped, clean, planar; interbedded with limestone , light grey, very thinly bedded, medium strong <i>Overall shale: 86%, limestone: 14% ... at 40.0 m (Elev. 87.5 m), transition to sound rock</i>	39.7 R1 40.0	TCR = 0% SCR = 0% RQD = 0%				N/A		R1 not recovered	
				TCR = 97% SCR = 87% RQD = 70%	87			2			
			R2					1		40.9 / 86.6m: clay coated joint	
								1			
			86.0 41.5		86			2			
								1			
42		Run 2 : 17% limestone 83% shale						0			
			R3	TCR = 89% SCR = 87% RQD = 73%				1			
								0			
		Run 3 : 15% limestone 85% shale						0		El. 85.0m: UCS = 10.6 MPa	
			84.6 42.9					0			
43								2			
								0			
			R4	TCR = 99% SCR = 61% RQD = 37%	84			1		43.9 / 83.6m: FC SV	
								2			
44		Run 4 : 13% limestone 87% shale						1		44.5 / 83.0m: FC SV	
			82.9		83						

END OF COREHOLE

File No. : 21-195

Project : 48 Grenoble Drive, Toronto, ON

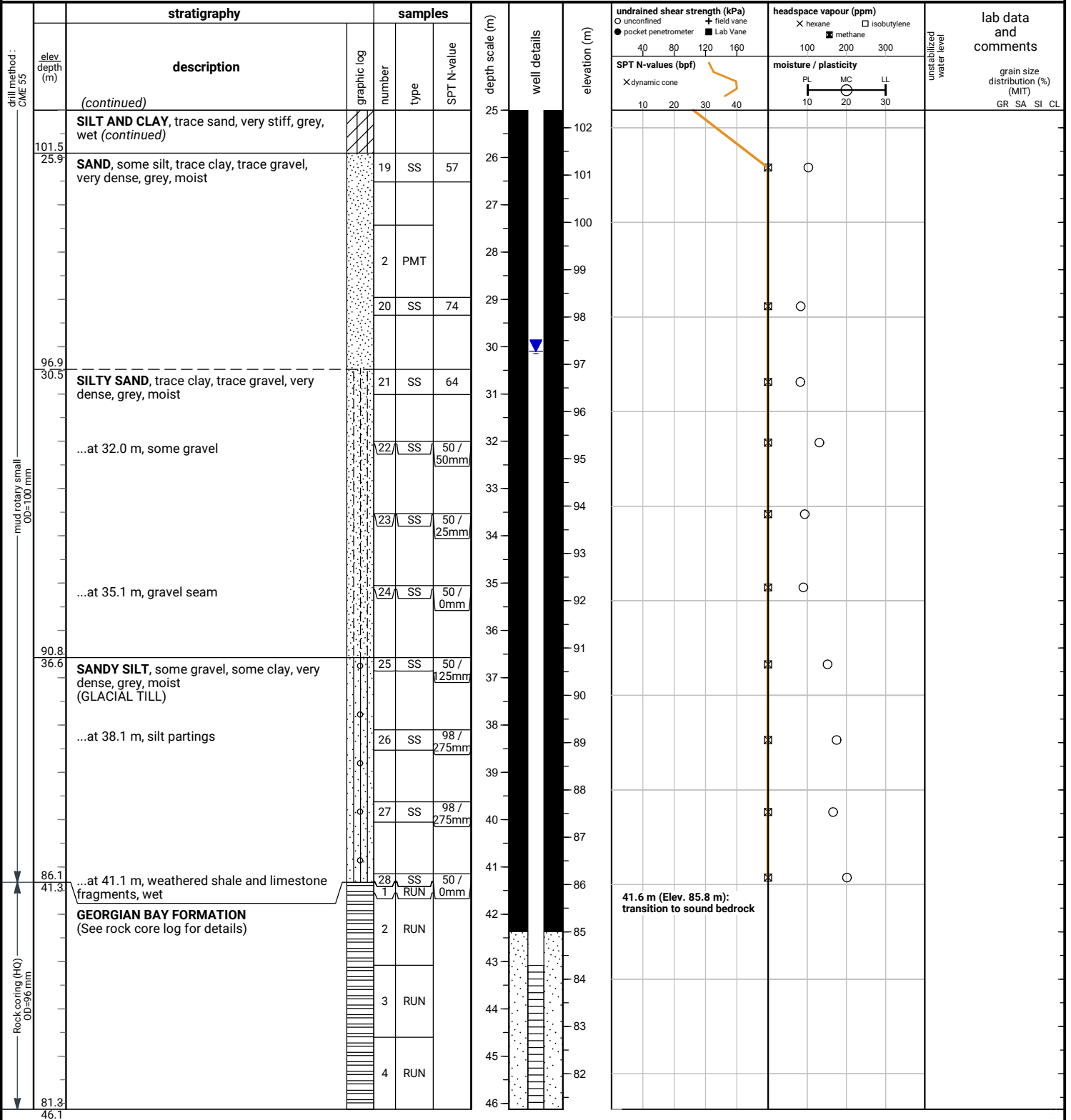
Client : Tenblock



File No. : 21-195

Project : 48 Grenoble Drive, Toronto, ON

Client : Tenblock



END OF BOREHOLE

Borehole was filled with drill water upon completion of drilling.

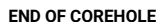
50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Mar 31, 2022	29.9	97.5
Apr 18, 2022	30.1	97.3
May 6, 2022	30.0	97.4
May 20, 2022	30.0	97.4
Sep 23, 2022	30.1	97.3
Jun 27, 2023	30.1	97.3

*latest 6 measurements shown

Project : 48 Grenoble Drive, Toronto, ON **Client :** Tenblock



File No. : 21-195

Project : 48 Grenoble Drive, Toronto, ON

Client : Tenblock

drill method : Manual methods	stratigraphy		samples			depth scale (m)	well details	elevation (m)	undrained shear strength (kPa)	headspace vapour (ppm)	lab data and comments
	elev. depth (m)	description	graphic log	number	type				O unconfined ● pocket penetrometer X dynamic cone	+ field vane ■ Lab Vane X hexane □ isobutylene ■ methane	
hand augers	125.7	GROUND SURFACE				0.0					grain size distribution (%) (MIT) GR SA SI CL GS1: BTEX, EC/SAR, H-Ms, Metals, ORPs, PCBs, pH, PHCs GS2: PCBs
		75mm TOPSOIL									
		FILL , silty sand, some clay, trace gravel, trace organics, brown, moist		1	GS						
				2	GS						
	124.7										
	1.0										

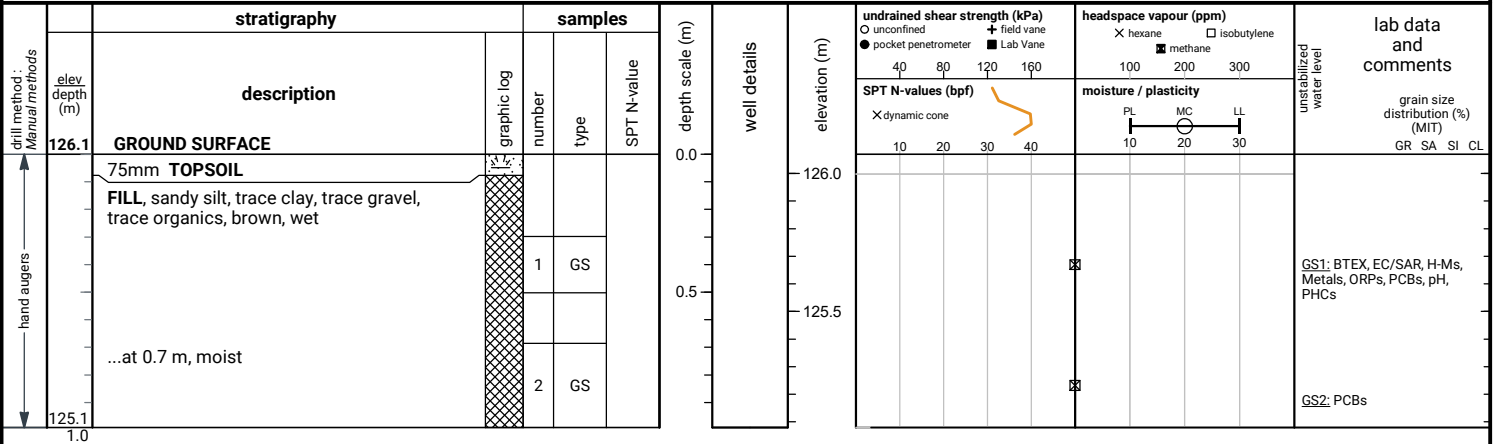
END OF BOREHOLE

Dry and open upon completion of drilling.

File No. : 21-195

Project : 48 Grenoble Drive, Toronto, ON

Client : Tenblock



END OF BOREHOLE

Dry and open upon completion of drilling.



File No. : 21-195

Project : 48 Grenoble Drive, Toronto, ON

Client : Tenblock

drill method : Manual methods	stratigraphy		samples			depth scale (m)	well details	elevation (m)	undrained shear strength (kPa)	headspace vapour (ppm)	lab data and comments
	elev. depth (m)	description	graphic log	number	type				O unconfined ● pocket penetrometer X dynamic cone	+ field vane ■ Lab Vane X hexane □ isobutylene ■ methane	
hand augers	125.6	GROUND SURFACE				0.0		125.5			grain size distribution (%) (MIT) GR SA SI CL GS1: BTEX, EC/SAR, H-Ms, Metals, ORPs, PCBs, pH, PHCs GS2: PCBs
		75mm TOPSOIL		1	GS						
		FILL , sandy silt, trace clay, trace gravel, trace organics, brown, moist		2	GS						
	124.6					1.0					

END OF BOREHOLE

Dry and open upon completion of drilling.

APPENDIX B





Slug Test Analysis Report

Project: 48 Grenoble Drive, Toronto

Number: 21-195

Client: Tenblock Management LP

Location: 48 Grenoble Drive, Toronto

Slug Test: MW1

Test Well: MW1

Test Conducted by: FR

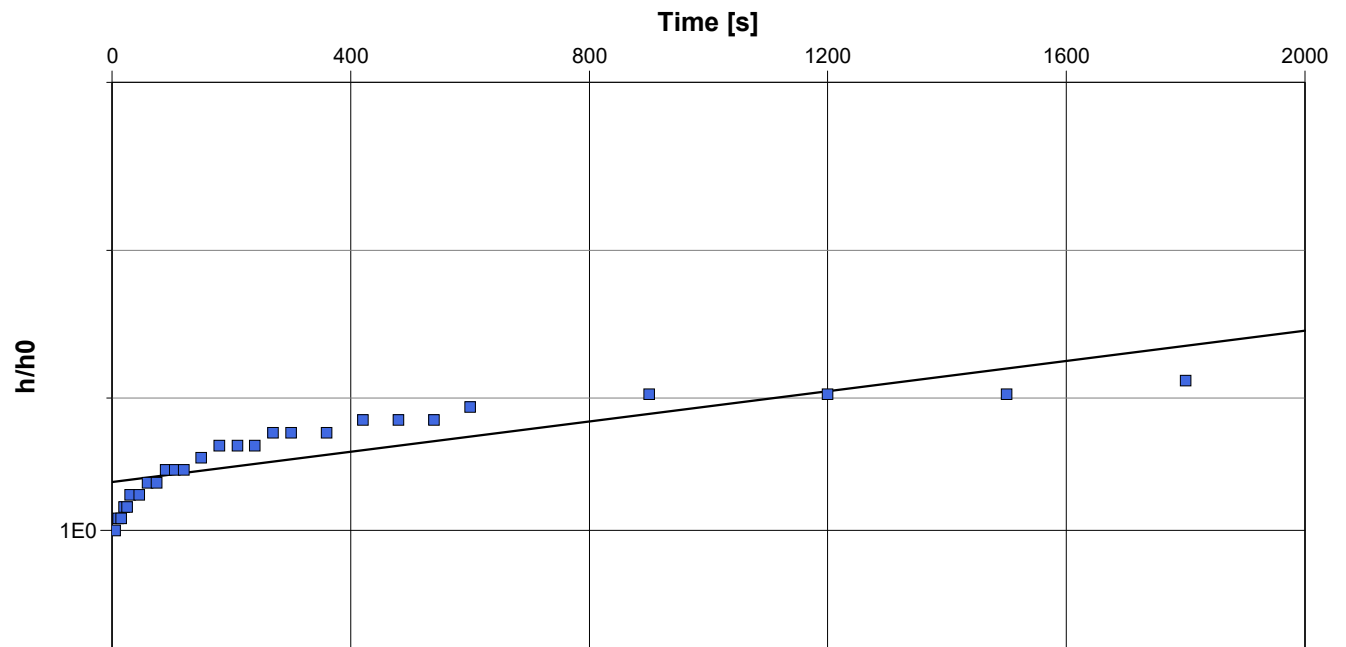
Test Date: 2022-02-09

Analysis Performed by: KM/JAW

Bouwer & Rice

Analysis Date: 2022-02-25

Aquifer Thickness: 16.80 m



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]
------------------	---------------------------------

MW1	2.54×10^{-8}
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Slug Test Analysis Report

Project: 48 Grenoble Drive, Toronto

Number: 21-195

Client:

Location: 48 Grenoble Drive, Toronto

Slug Test: MW2

Test Well: MW2

Test Conducted by: FR

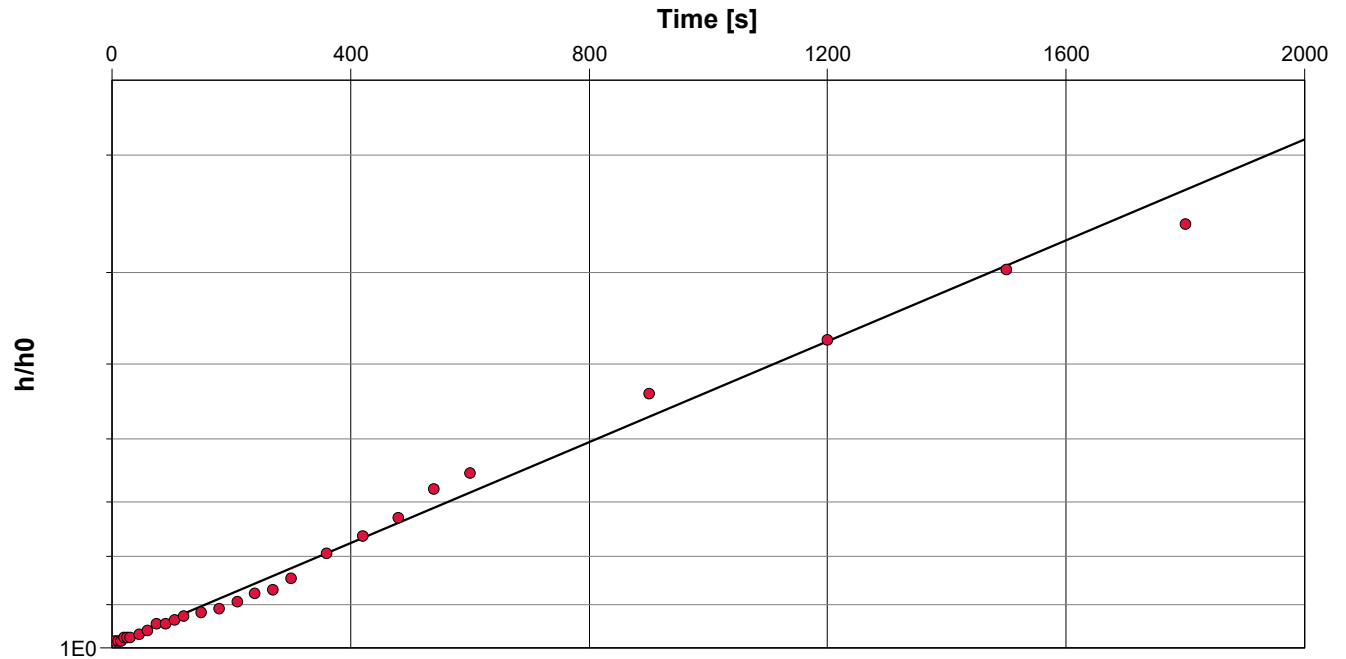
Test Date: 2022-02-09

Analysis Performed by: KM/JAW

Bouwer & Rice

Analysis Date: 2022-02-25

Aquifer Thickness: 19.50 m



Calculation using Bouwer & Rice

Observation Well

Hydraulic Conductivity
[m/s]

MW2

2.53×10^{-7}



Slug Test Analysis Report

Project: 48 Grenoble Drive, Toronto

Number: 21-195

Client:

Location: 48 Grenoble Drive, Toronto

Slug Test: MW4

Test Well: MW4

Test Conducted by: FR

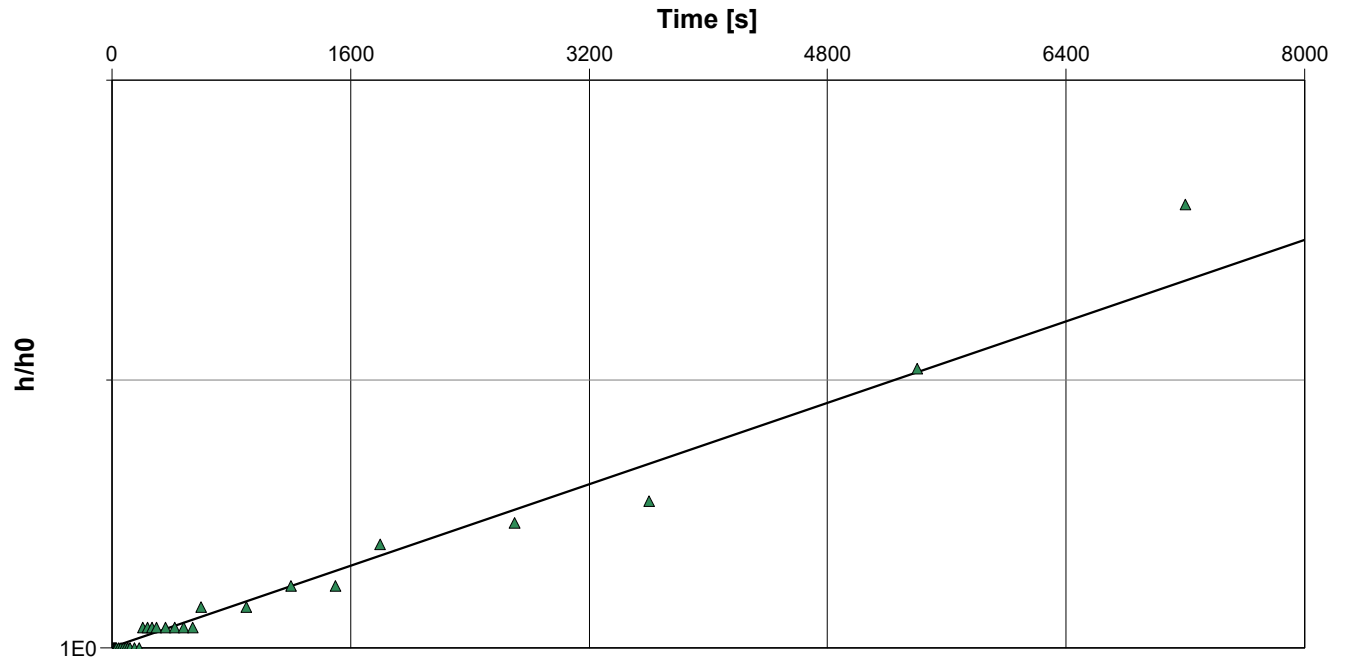
Test Date: 2022-02-09

Analysis Performed by:

Bouwer & Rice

Analysis Date: 2022-02-25

Aquifer Thickness: 20.40 m



Calculation using Bouwer & Rice

Observation Well

Hydraulic Conductivity
[m/s]

MW4

8.93×10^{-9}



Slug Test Analysis Report

Project: 48 Grenoble Drive, Toronto

Number: 21-195

Client: Tenblock Management LP

Location: 48 Grenoble Drive, Toronto

Slug Test: MW5

Test Well: MW5

Test Conducted by: FR

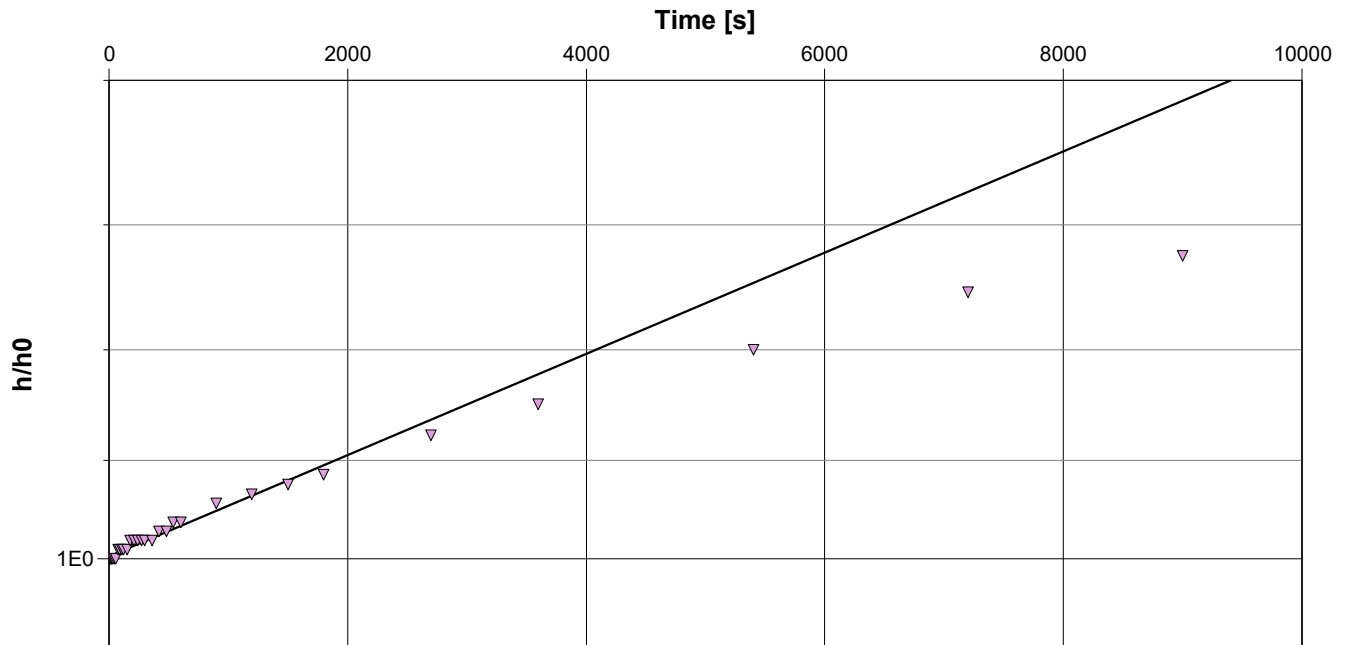
Test Date: 2022-02-17

Analysis Performed by: KM/JAW

Bouwer & Rice

Analysis Date: 2022-02-25

Aquifer Thickness: 16.80 m



Calculation using Bouwer & Rice

Observation Well

Hydraulic Conductivity
[m/s]

MW5

2.49×10^{-8}



Slug Test Analysis Report

Project: 48 Grenoble Drive, Toronto

Number: 21-195

Client: Tenblock Management LP

Location: 48 Grenoble Drive, Toronto

Slug Test: MW6

Test Well: MW6

Test Conducted by: FR

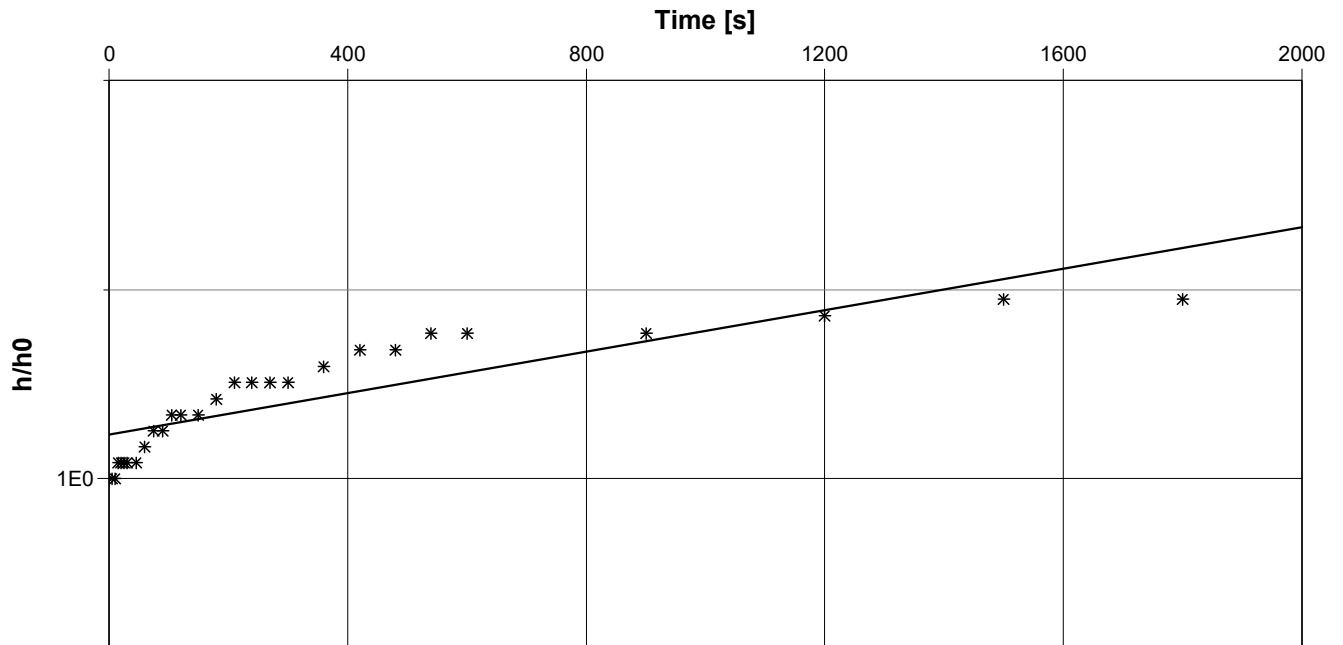
Test Date: 2022-02-17

Analysis Performed by: KM/JAW

Bouwer & Rice

Analysis Date: 2022-02-25

Aquifer Thickness: 20.40 m



Calculation using Bouwer & Rice

Observation Well

Hydraulic Conductivity
[m/s]

MW6

2.48×10^{-8}



Slug Test Analysis Report

Project: 48 Grenoble Drive, Toronto

Number: 21-195

Client:

Location: 48 Grenoble Drive, Toronto

Slug Test: MW7

Test Well: MW7

Test Conducted by: FR

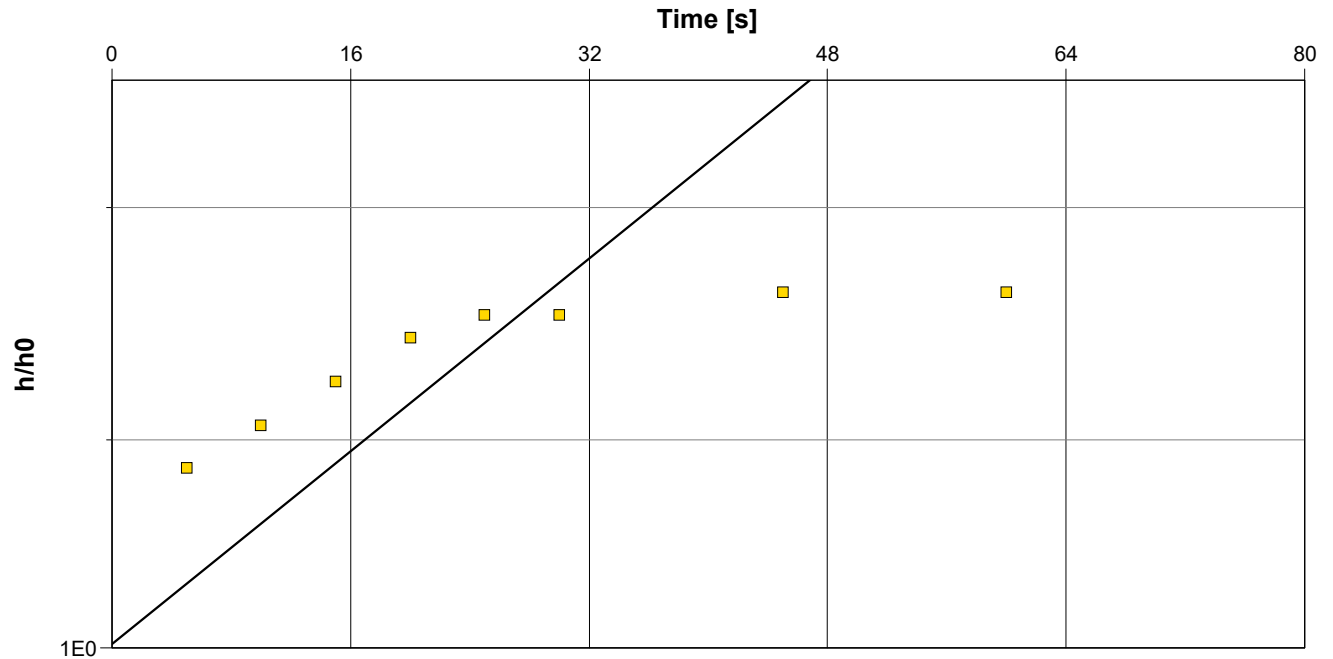
Test Date: 2022-02-22

Analysis Performed by: KM/JAW

Bouwer & Rice

Analysis Date: 2022-02-25

Aquifer Thickness: 42.90 m



Calculation using Bouwer & Rice

Observation Well

Hydraulic Conductivity
[m/s]

MW7

2.45×10^{-6}



Slug Test Analysis Report

Project: 48 Grenoble Drive, Toronto

Number: 21-195

Client:

Location: 48 Grenoble Drive, Toronto

Slug Test: MW8

Test Well: MW8

Test Conducted by: FR

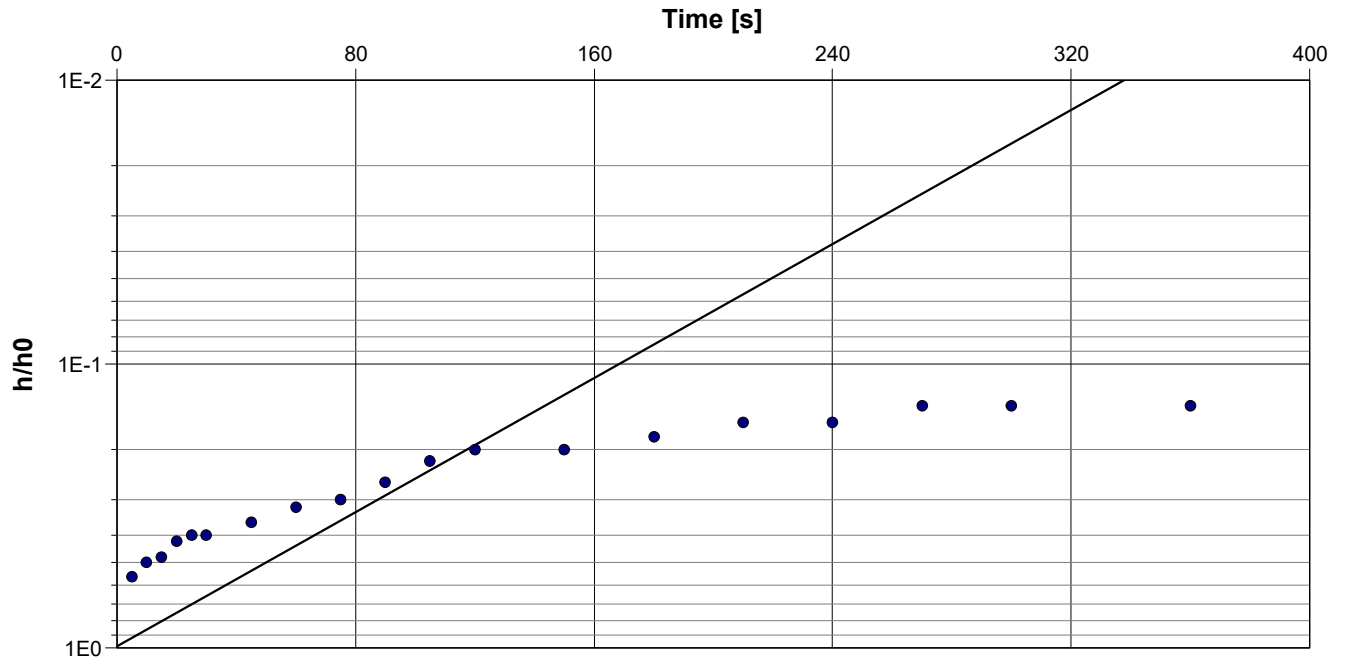
Test Date: 2022-02-22

Analysis Performed by: KM/JAW

Bouwer & Rice

Analysis Date: 2022-02-25

Aquifer Thickness: 36.60 m



Calculation using Bouwer & Rice

Observation Well

Hydraulic Conductivity
[m/s]

MW8

5.46×10^{-6}



Slug Test Analysis Report

Project: 48 Grenoble Drive, Toronto

Number: 21-195

Client:

Location: 48 Grenoble Drive, Toronto

Slug Test: MW9

Test Well: MW9

Test Conducted by: FR

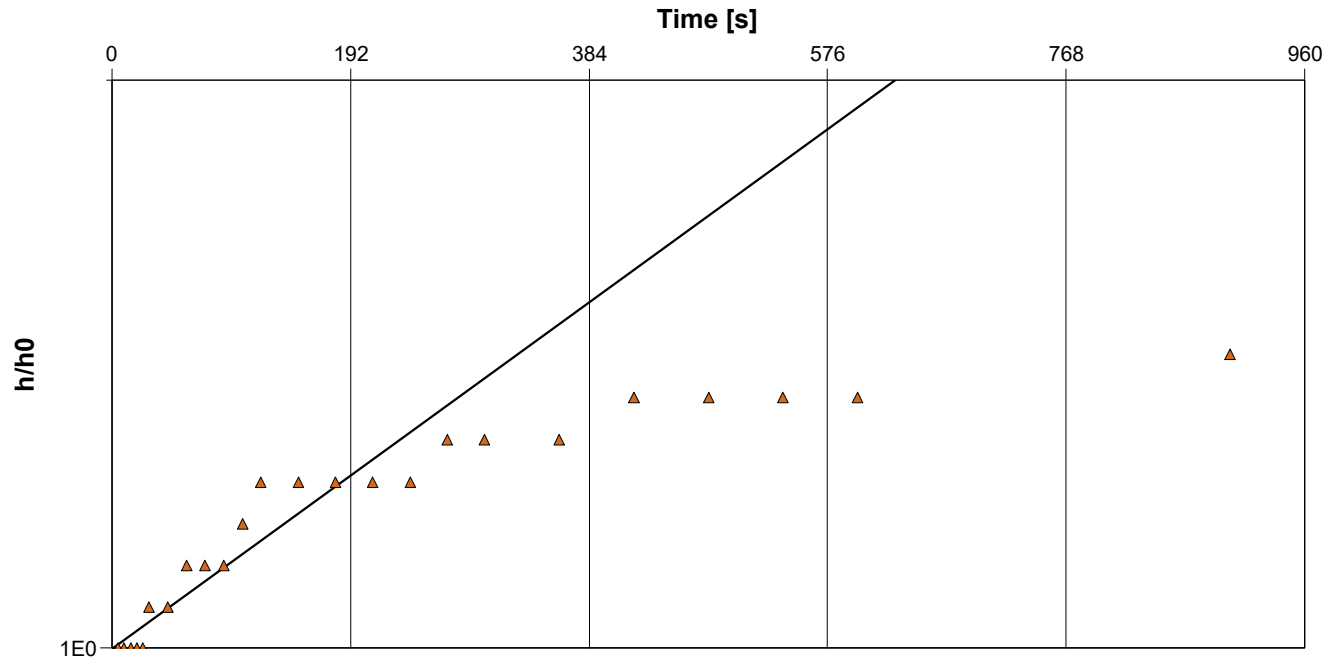
Test Date: 2022-02-22

Analysis Performed by: KM/JAW

Bouwer & Rice

Analysis Date: 2022-02-25

Aquifer Thickness: 46.10 m



Calculation using Bouwer & Rice

Observation Well

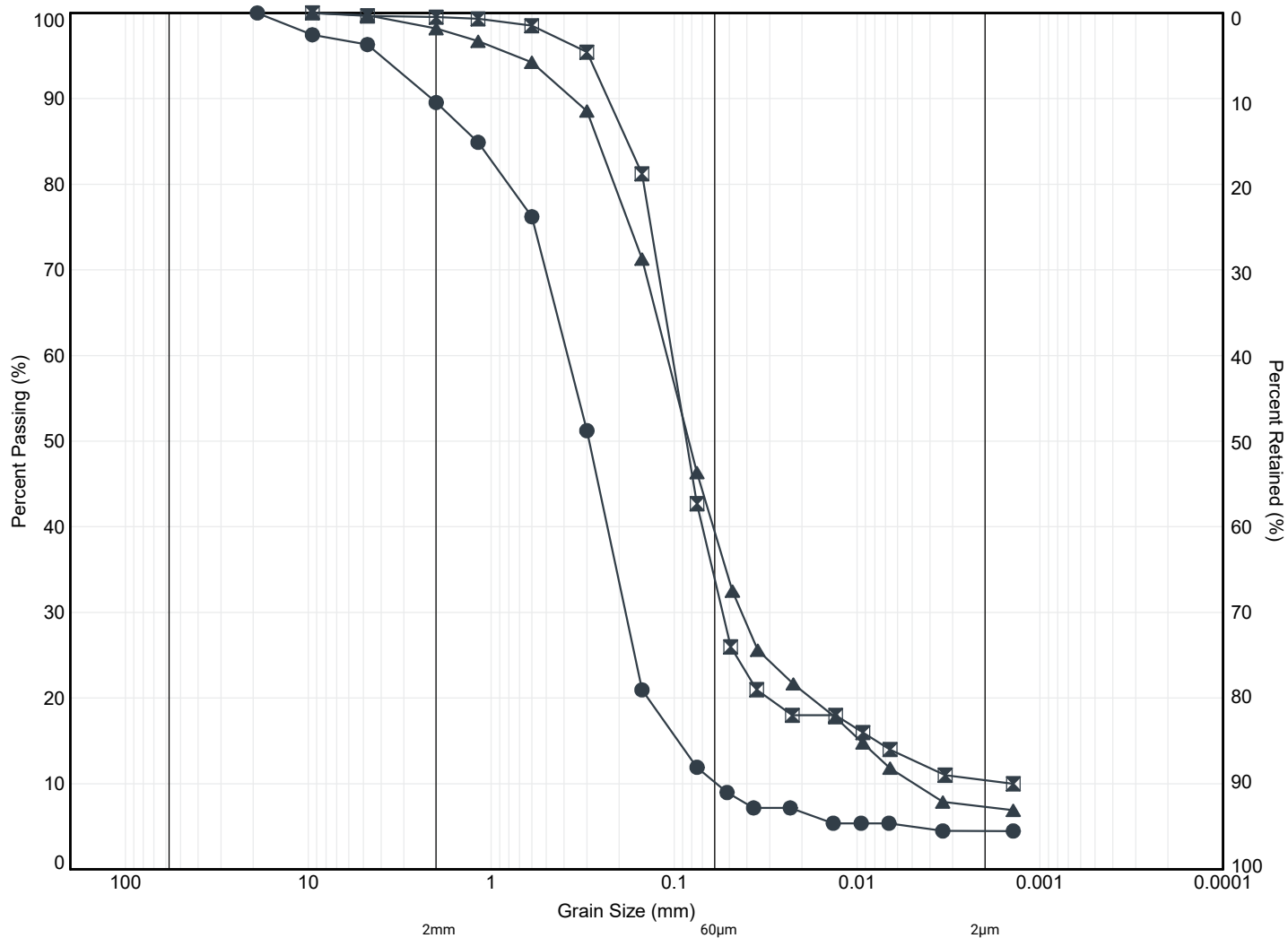
Hydraulic Conductivity
[m/s]

MW9

6.72×10^{-8}

APPENDIX C

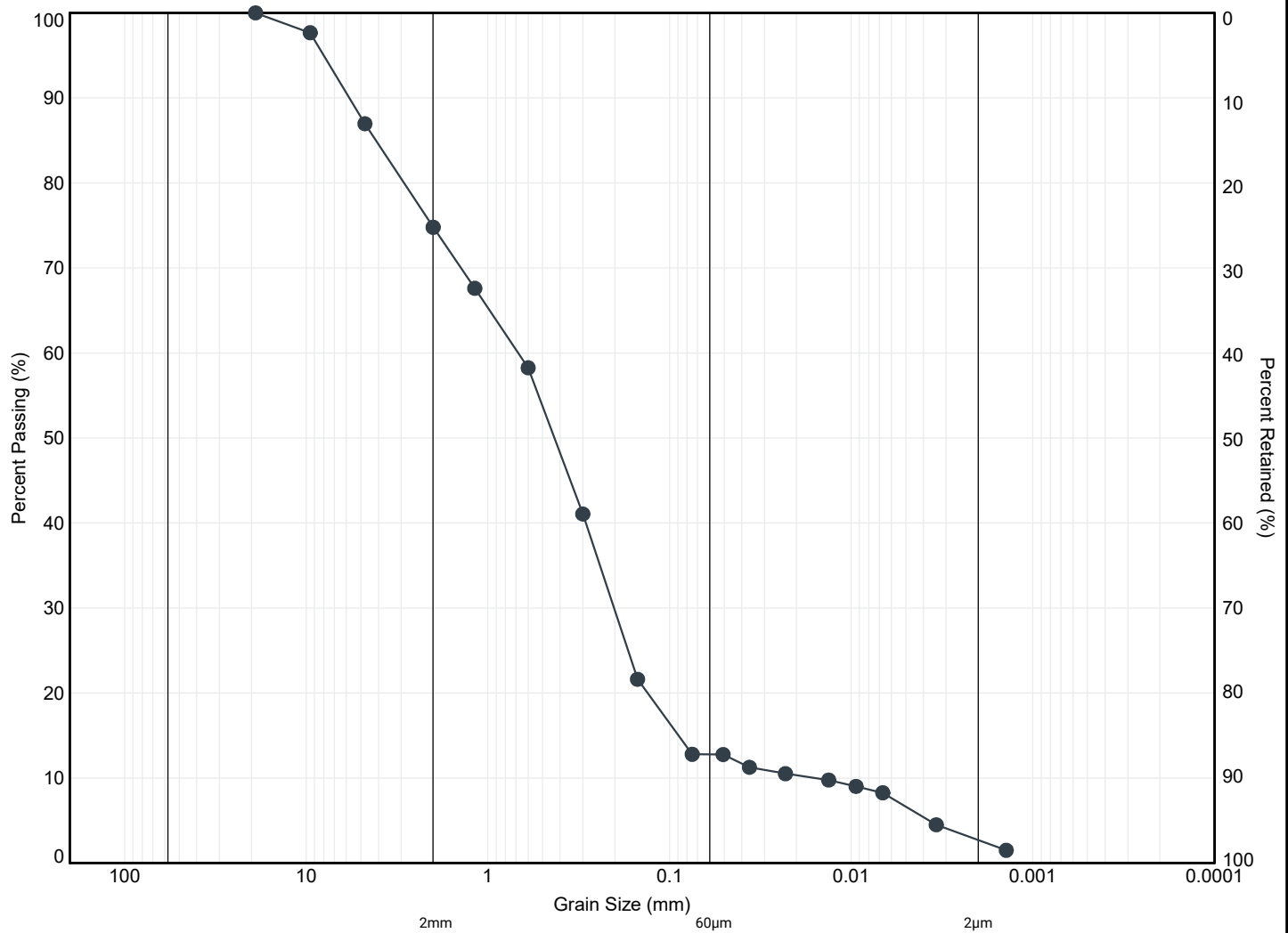




MIT SYSTEM	COBBLES	GRAVEL			SAND			SILT	CLAY
		COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE		

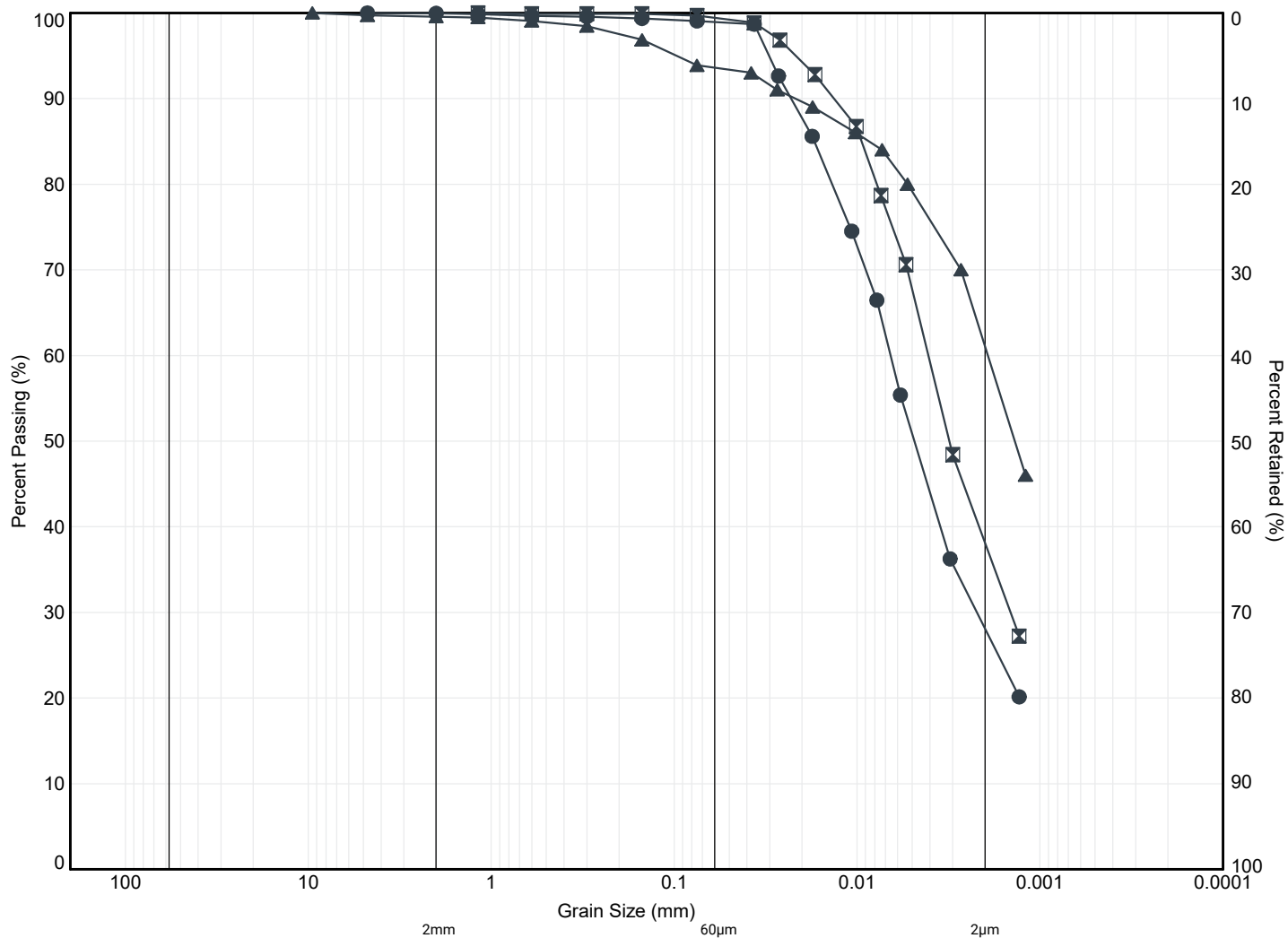
MIT SYSTEM

Borehole	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
● 1	SS3	1.8	125.1	11	78	6	5
⊠ 2	SS3	1.8	125.3	1	65	24	10
▲ 7	SS3	1.8	125.3	2	59	32	7



MIT SYSTEM	COBBLES	GRAVEL			SAND			SILT	CLAY
		COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE		

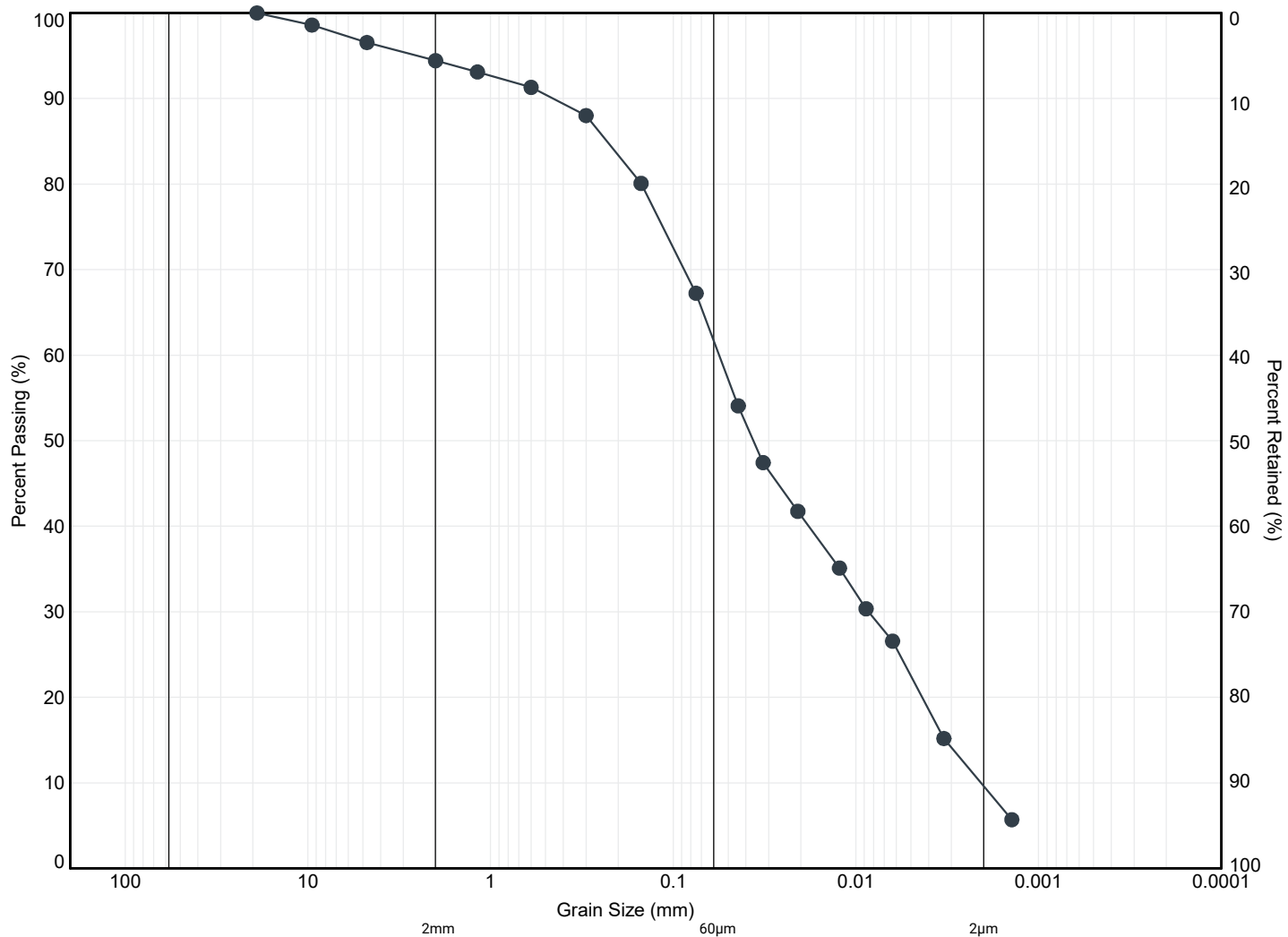
MIT SYSTEM								
Borehole	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	
● 1	SS4	2.6	124.3	25	62	10	3	



MIT SYSTEM	COBBLES	GRAVEL			SAND			SILT	CLAY
		COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE		

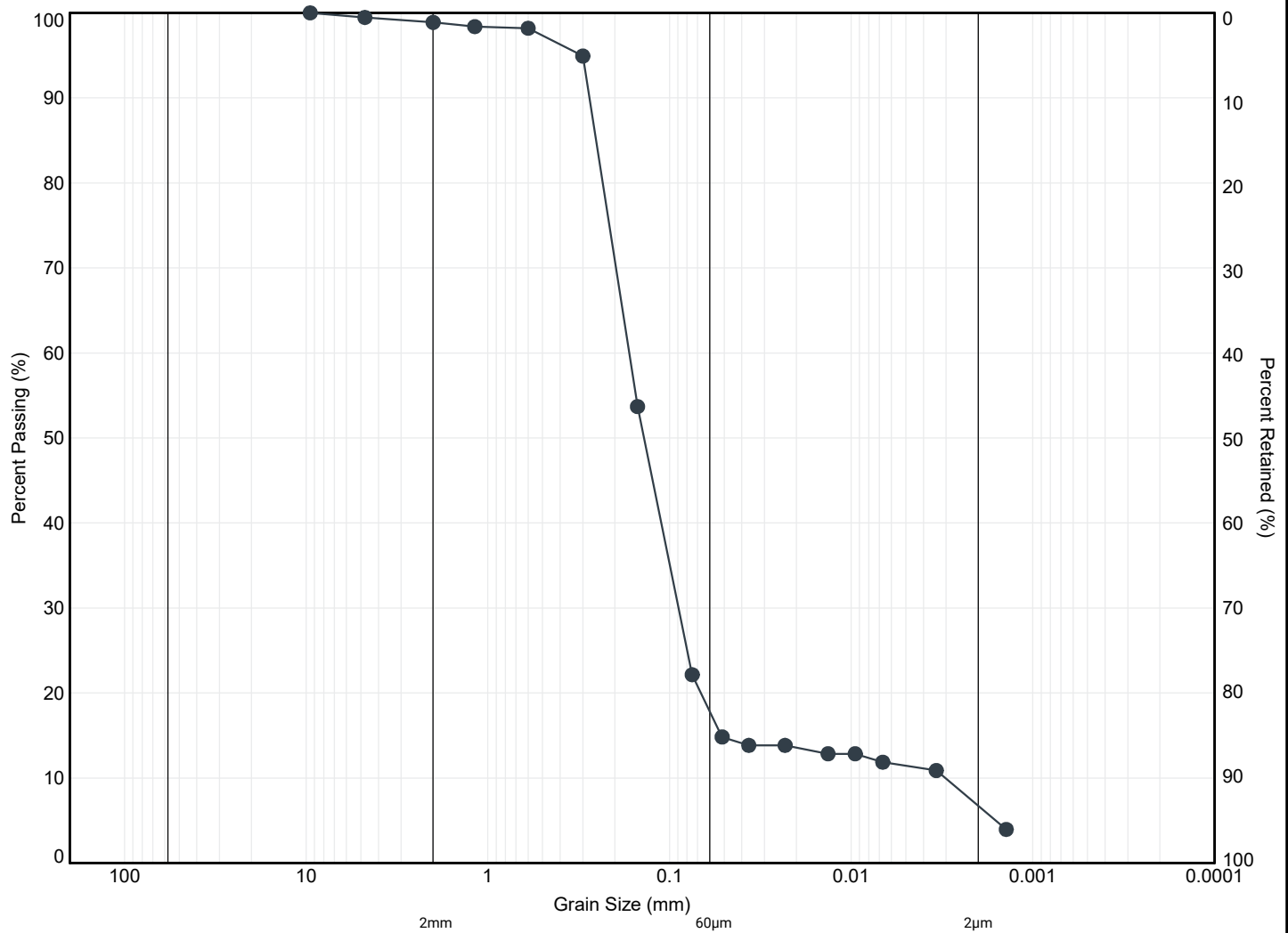
MIT SYSTEM

Borehole	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
● 2	SS8	7.9	119.2	0	1	71	28
☒ 4	SS15	18.6	109.0	0	1	61	38
▲ 7	SS17	21.6	105.5	0	6	33	61



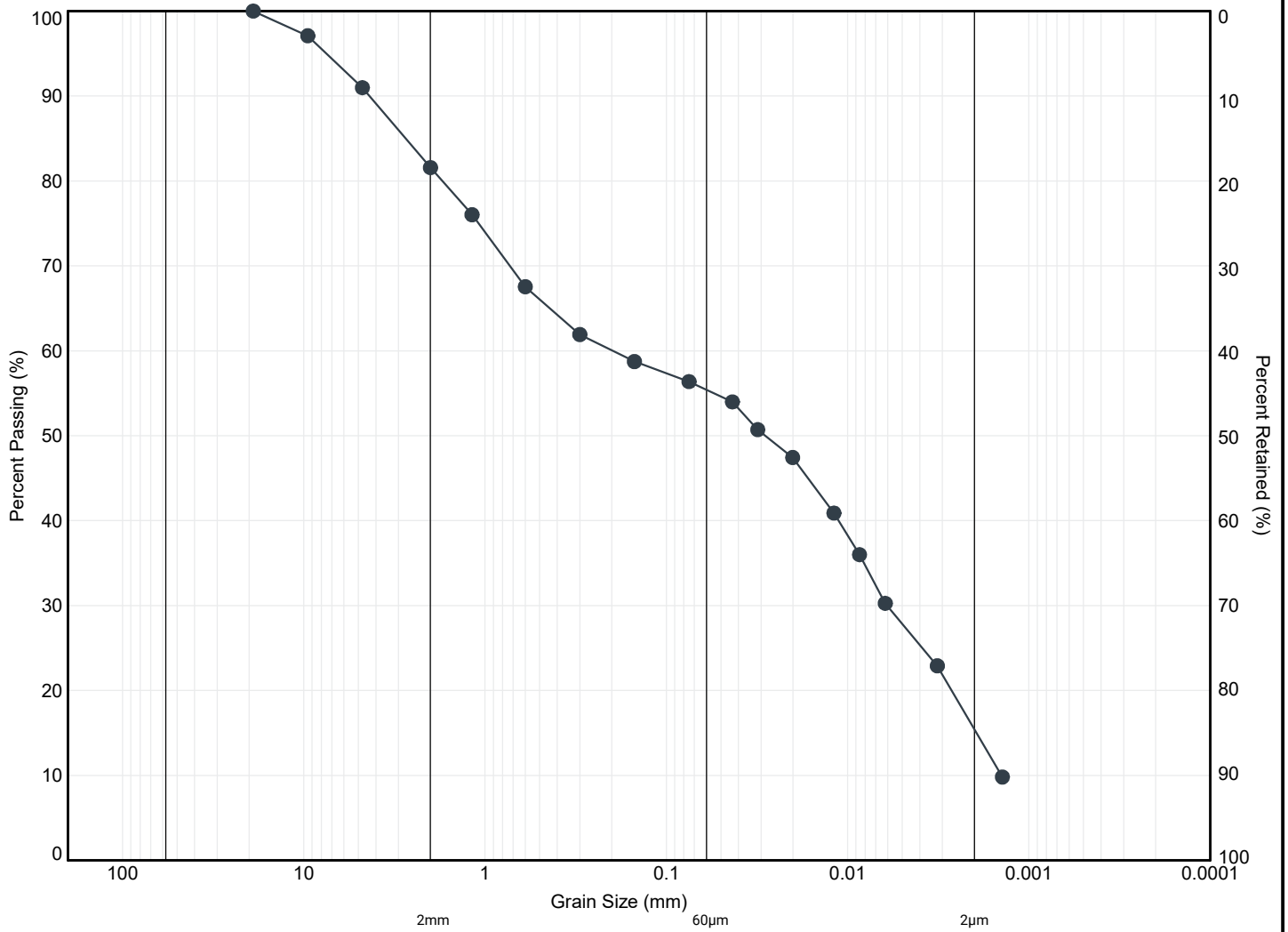
MIT SYSTEM	COBBLES	GRAVEL			SAND			SILT	CLAY
		COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE		

MIT SYSTEM								
Borehole	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	
● 3	SS12	14.0	113.7	6	32	52	10	



MIT SYSTEM	COBBLES	GRAVEL			SAND			SILT	CLAY
		COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE		

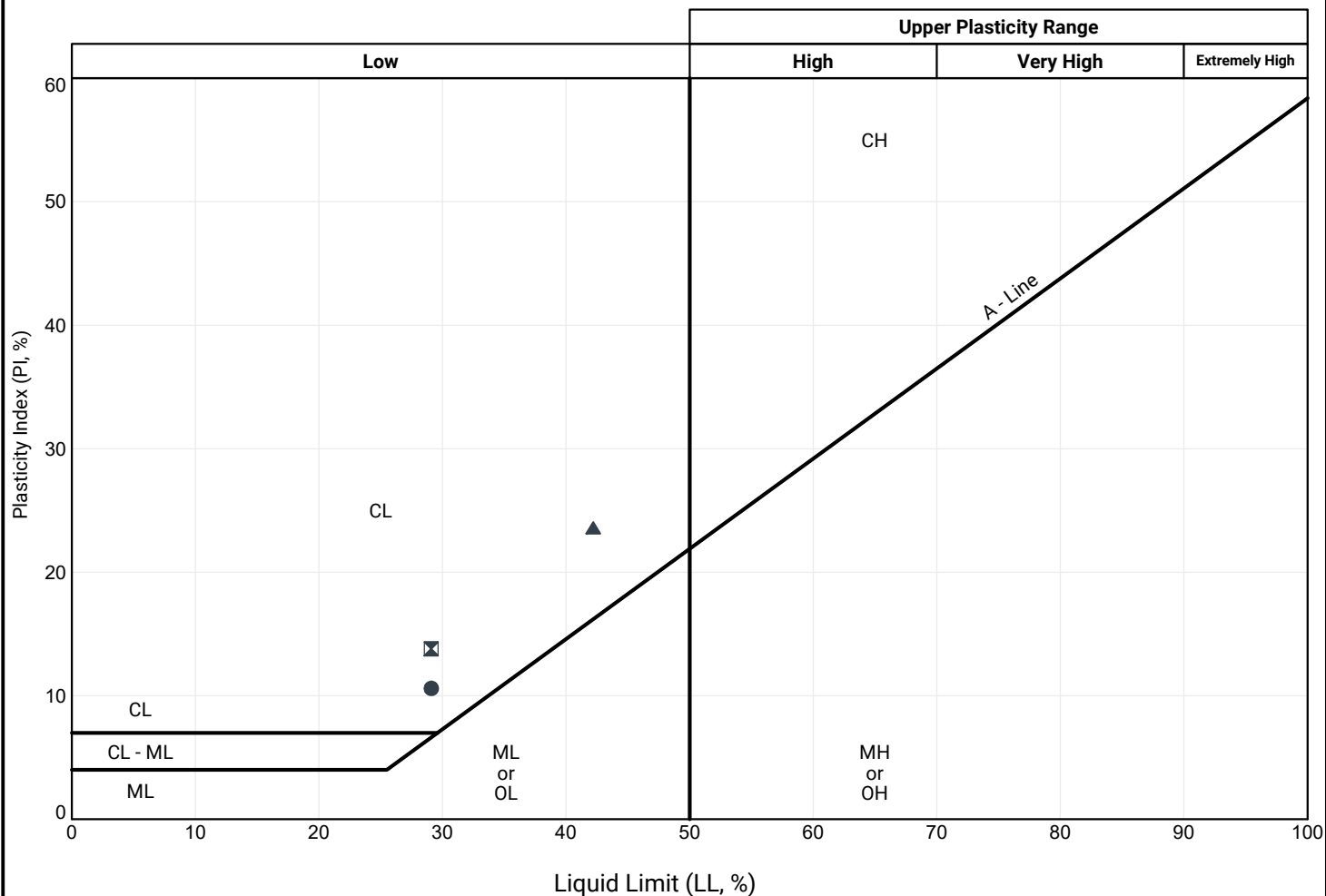
MIT SYSTEM								
Borehole	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	
● 7	SS22	29.0	98.1	1	81	11	7	



MIT SYSTEM	COBBLES	GRAVEL			SAND			SILT	CLAY
		COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE		

MIT SYSTEM

Borehole	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
● 7	SS26	38.2	88.9	18	26	40	16



Borehole	Sample	Depth (m)	Elev. (m)	LL (%)	PL (%)	PI (%)
● 2	SS8	7.9	119.2	29	19	11
⊠ 4	SS15	18.6	109.0	29	15	14
▲ 7	SS17	21.6	105.5	42	19	23

APPENDIX D





K from Grain Size Analysis Report

Date: 01-Mar-22

Sample Name: BH1 SS4

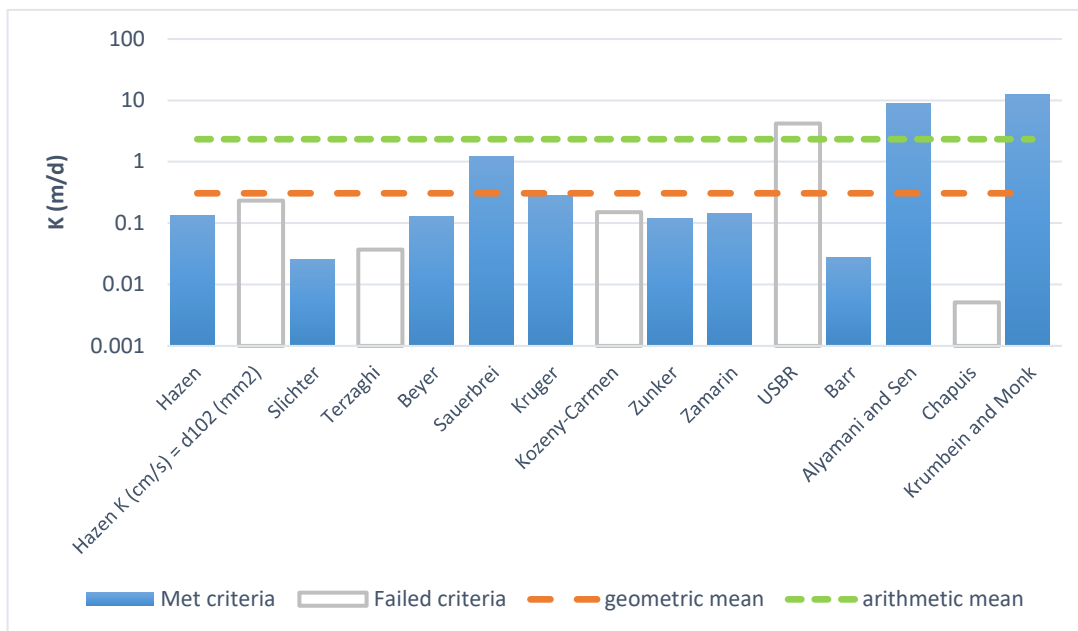
Mass Sample (g):

100

T (oC)

20

Poorly sorted sand low in fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	1.5E-04	1.5E-06	0.13	
Hazen K (cm/s) = d ₁₀ (mm)	2.7E-04	2.7E-06	0.23	
Slichter	3.0E-05	3.0E-07	0.03	
Terzaghi	4.3E-05	4.3E-07	0.04	
Beyer	1.5E-04	1.5E-06	0.13	
Sauerbrei	1.4E-03	1.4E-05	1.24	
Kruger	3.2E-04	3.2E-06	0.28	
Kozeny-Carmen	1.7E-04	1.7E-06	0.15	
Zunker	1.4E-04	1.4E-06	0.12	
Zamarin	1.7E-04	1.7E-06	0.14	
USBR	4.9E-03	4.9E-05	4.21	
Barr	3.2E-05	3.2E-07	0.03	
Alyamani and Sen	1.0E-02	1.0E-04	8.85	
Chapuis	5.9E-06	5.9E-08	0.01	
Krumbein and Monk	1.4E-02	1.4E-04	12.50	
geometric mean	3.6E-04	3.6E-06	0.31	
arithmetic mean	2.7E-03	2.7E-05	2.34	



K from Grain Size Analysis Report

Date: 01-Mar-22

Sample Name: BH2 SS8

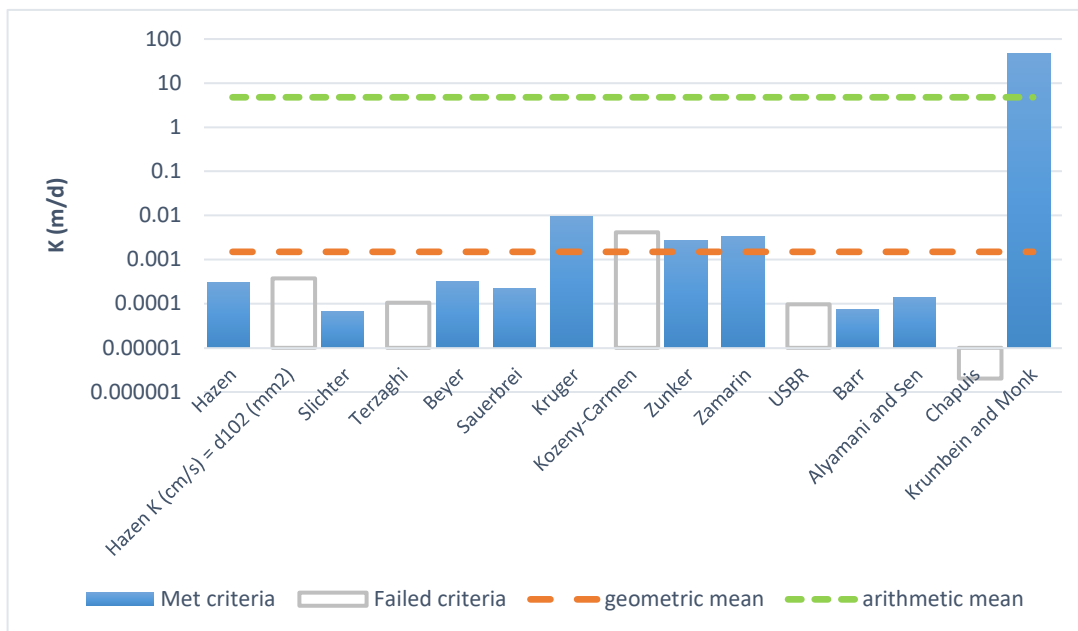
Mass Sample (g):

100

T (oC)

20

Poorly sorted clay low in fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	3.5E-07	3.5E-09	0.00	
Hazen K (cm/s) = d ₁₀ (mm)	4.3E-07	4.3E-09	0.00	
Slichter	7.7E-08	7.7E-10	0.00	
Terzaghi	1.2E-07	1.2E-09	0.00	
Beyer	3.8E-07	3.8E-09	0.00	
Sauerbrei	2.5E-07	2.5E-09	0.00	
Kruger	1.1E-05	1.1E-07	0.01	
Kozeny-Carmen	4.8E-06	4.8E-08	0.00	
Zunker	3.2E-06	3.2E-08	0.00	
Zamarin	3.9E-06	3.9E-08	0.00	
USBR	1.1E-07	1.1E-09	0.00	
Barr	8.8E-08	8.8E-10	0.00	
Alyamani and Sen	1.6E-07	1.6E-09	0.00	
Chapuis	2.3E-09	2.3E-11	0.00	
Krumbein and Monk	5.5E-02	5.5E-04	47.68	
geometric mean	1.7E-06	1.7E-08	0.00	
arithmetic mean	5.5E-03	5.5E-05	4.77	



K from Grain Size Analysis Report

Date: 01-Mar-22

Sample Name:

BH3 SS12

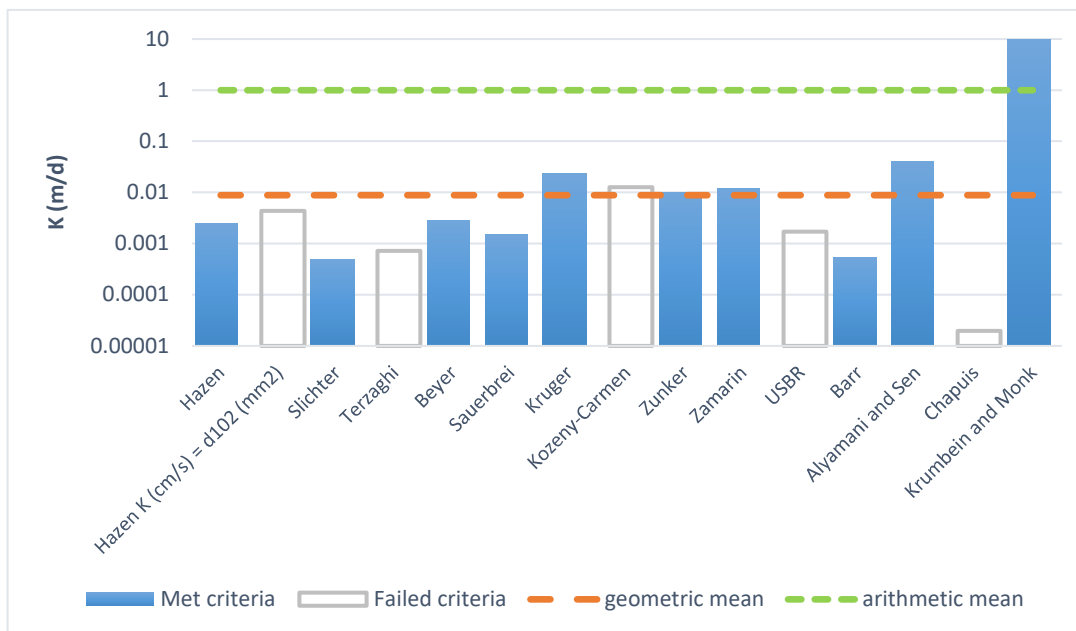
Mass Sample (g):

100

T (oC)

20

Poorly sorted silt low in fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	2.9E-06	2.9E-08	0.00	
Hazen K (cm/s) = d_{10} (mm)	5.0E-06	5.0E-08	0.00	
Slichter	5.8E-07	5.8E-09	0.00	
Terzaghi	8.3E-07	8.3E-09	0.00	
Beyer	3.3E-06	3.3E-08	0.00	
Sauerbrei	1.7E-06	1.7E-08	0.00	
Kruger	2.7E-05	2.7E-07	0.02	
Kozeny-Carmen	1.5E-05	1.5E-07	0.01	
Zunker	1.1E-05	1.1E-07	0.01	
Zamarin	1.4E-05	1.4E-07	0.01	
USBR	2.0E-06	2.0E-08	0.00	
Barr	6.2E-07	6.2E-09	0.00	
Alyamani and Sen	4.6E-05	4.6E-07	0.04	
Chapuis	2.3E-08	2.3E-10	0.00	
Krumbein and Monk	1.1E-02	1.1E-04	9.86	
geometric mean	1.0E-05	1.0E-07	0.01	
arithmetic mean	1.2E-03	1.2E-05	1.00	



K from Grain Size Analysis Report

Date: 01-Mar-22

Sample Name: BH4 SS15

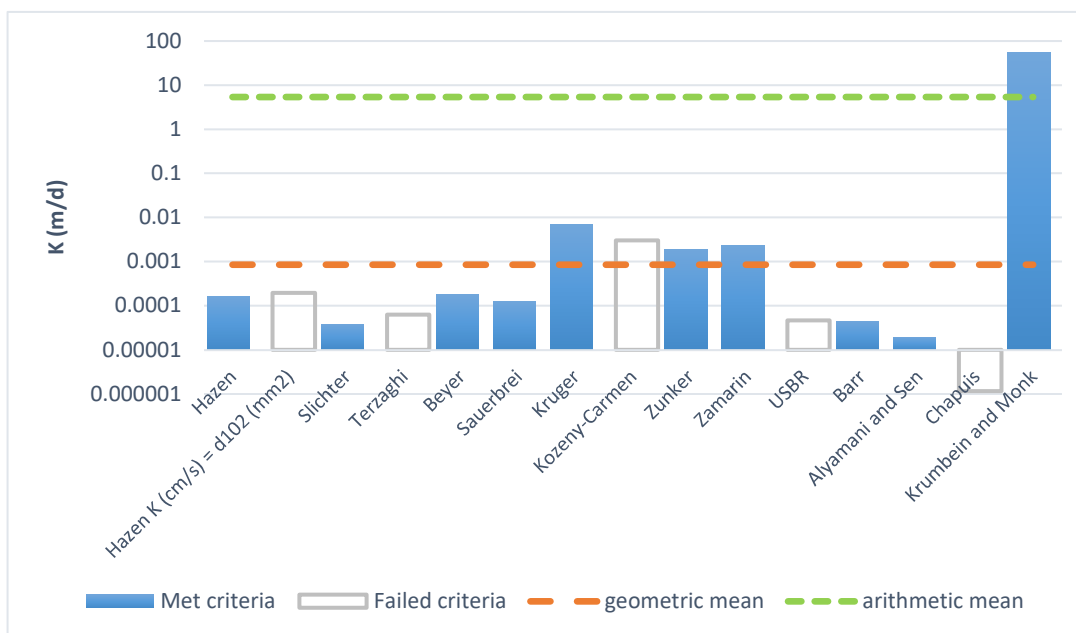
Mass Sample (g):

100

T (oC)

20

Poorly sorted clay low in fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	1.9E-07	1.9E-09	0.00	
Hazen K (cm/s) = d ₁₀ (mm)	2.3E-07	2.3E-09	0.00	
Slichter	4.5E-08	4.5E-10	0.00	
Terzaghi	7.2E-08	7.2E-10	0.00	
Beyer	2.0E-07	2.0E-09	0.00	
Sauerbrei	1.5E-07	1.5E-09	0.00	
Kruger	8.2E-06	8.2E-08	0.01	
Kozeny-Carmen	3.5E-06	3.5E-08	0.00	
Zunker	2.2E-06	2.2E-08	0.00	
Zamarin	2.7E-06	2.7E-08	0.00	
USBR	5.4E-08	5.4E-10	0.00	
Barr	5.2E-08	5.2E-10	0.00	
Alyamani and Sen	2.3E-08	2.3E-10	0.00	
Chapuis	1.3E-09	1.3E-11	0.00	
Krumbein and Monk	6.3E-02	6.3E-04	54.17	
geometric mean	1.0E-06	1.0E-08	0.00	
arithmetic mean	6.3E-03	6.3E-05	5.42	



K from Grain Size Analysis Report

Date: 01-Mar-22

Sample Name: BH7 SS17

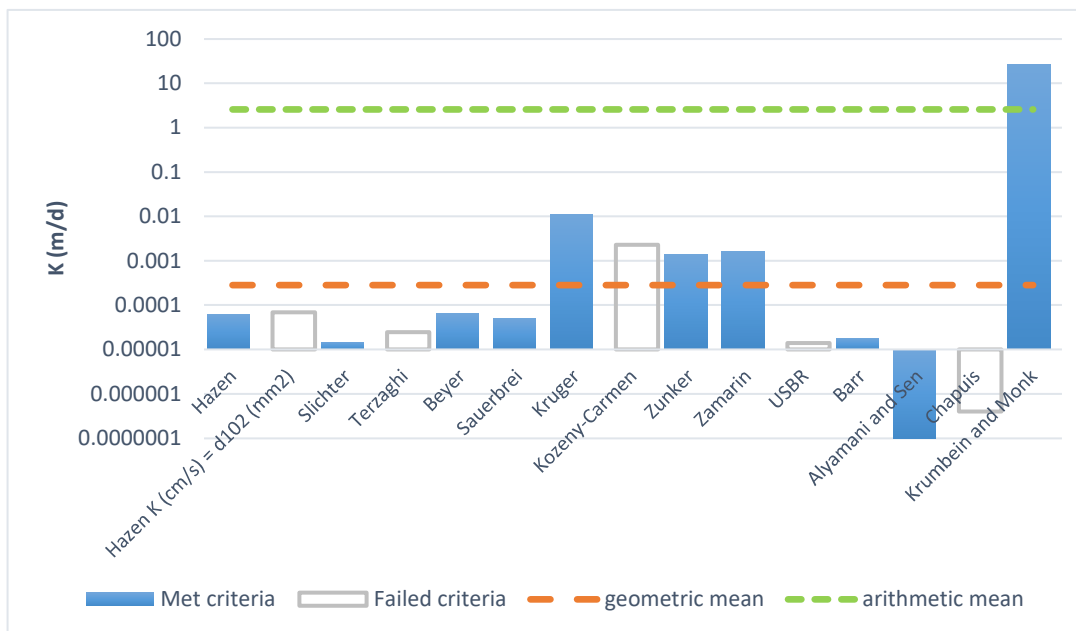
Mass Sample (g):

100

T (oC)

20

Poorly sorted clay low in fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	7.2E-08	7.2E-10	0.00	
Hazen K (cm/s) = d_{10} (mm)	7.9E-08	7.9E-10	0.00	
Slichter	1.7E-08	1.7E-10	0.00	
Terzaghi	2.8E-08	2.8E-10	0.00	
Beyer	7.4E-08	7.4E-10	0.00	
Sauerbrei	5.8E-08	5.8E-10	0.00	
Kruger	1.3E-05	1.3E-07	0.01	
Kozeny-Carmen	2.6E-06	2.6E-08	0.00	
Zunker	1.6E-06	1.6E-08	0.00	
Zamarin	1.9E-06	1.9E-08	0.00	
USBR	1.6E-08	1.6E-10	0.00	
Barr	2.0E-08	2.0E-10	0.00	
Alyamani and Sen	1.2E-10	1.2E-12	0.00	
Chapuis	4.6E-10	4.6E-12	0.00	
Krumbein and Monk	3.0E-02	3.0E-04	25.93	
geometric mean	3.3E-07	3.3E-09	0.00	
arithmetic mean	3.0E-03	3.0E-05	2.59	



K from Grain Size Analysis Report

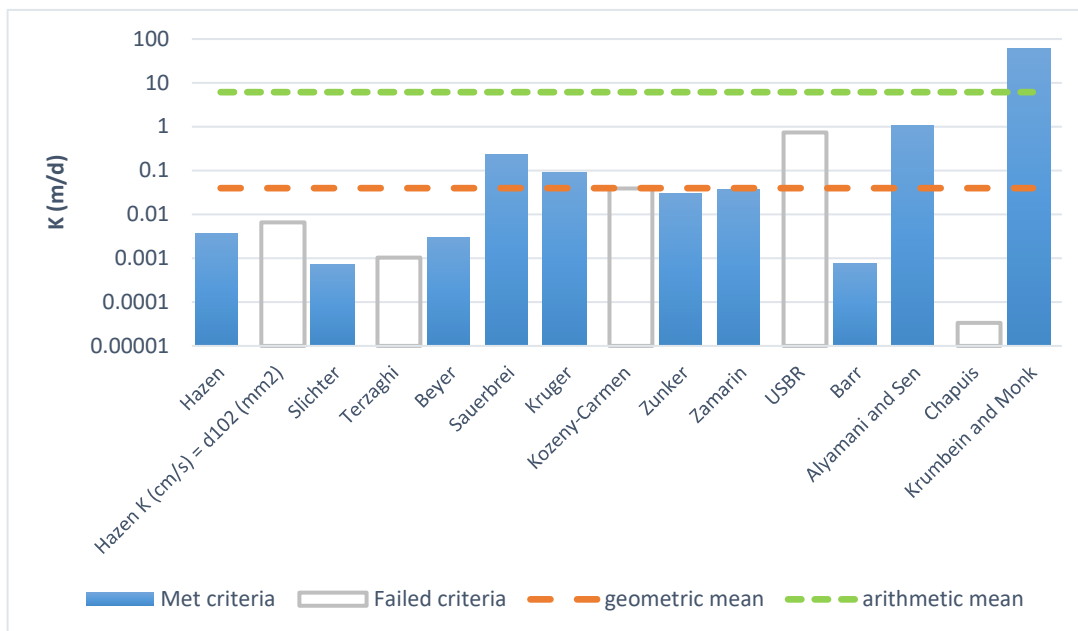
Date: 01-Mar-22

Sample Name: BH7 SS22

Mass Sample (g): 100

T (oC) 20

Poorly sorted sand low in fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	4.3E-06	4.3E-08	0.00	
Hazen K (cm/s) = d ₁₀ (mm)	7.6E-06	7.6E-08	0.01	
Slichter	8.4E-07	8.4E-09	0.00	
Terzaghi	1.2E-06	1.2E-08	0.00	
Beyer	3.5E-06	3.5E-08	0.00	
Sauerbrei	2.7E-04	2.7E-06	0.23	
Kruger	1.1E-04	1.1E-06	0.09	
Kozeny-Carmen	4.5E-05	4.5E-07	0.04	
Zunker	3.5E-05	3.5E-07	0.03	
Zamarin	4.3E-05	4.3E-07	0.04	
USBR	8.5E-04	8.5E-06	0.73	
Barr	9.0E-07	9.0E-09	0.00	
Alyamani and Sen	1.2E-03	1.2E-05	1.05	
Chapuis	3.8E-08	3.8E-10	0.00	
Krumbein and Monk	7.0E-02	7.0E-04	60.20	
geometric mean	4.6E-05	4.6E-07	0.04	
arithmetic mean	7.1E-03	7.1E-05	6.16	



K from Grain Size Analysis Report

Date: 01-Mar-22

Sample Name: BH7 SS26

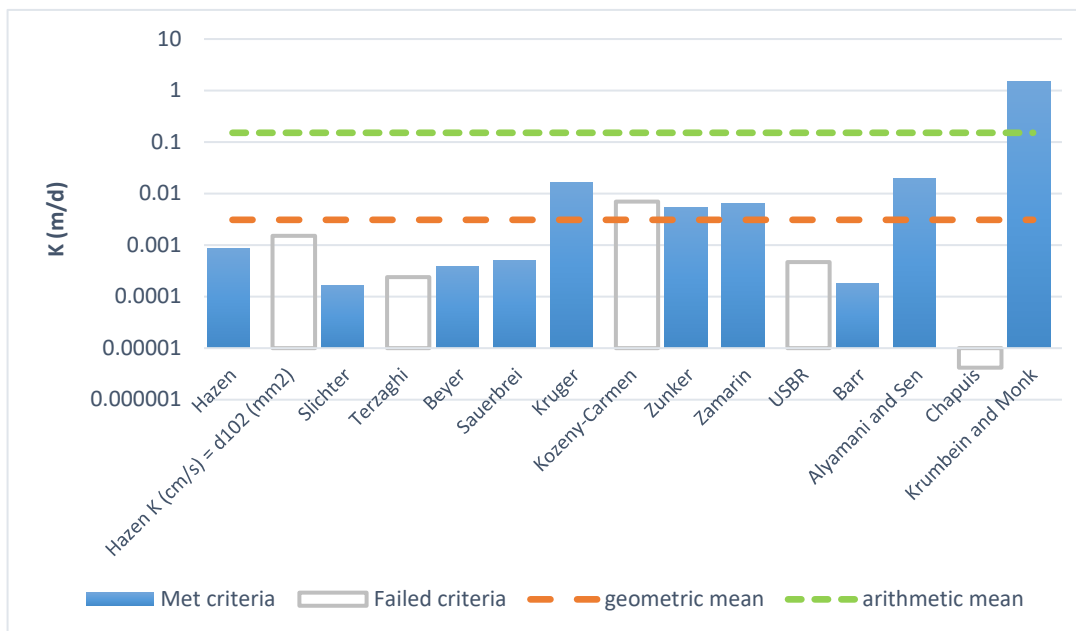
Mass Sample (g):

100

T (oC)

20

Poorly sorted silt low in fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	9.9E-07	9.9E-09	0.00	
Hazen K (cm/s) = d ₁₀ (mm)	1.7E-06	1.7E-08	0.00	
Slichter	1.9E-07	1.9E-09	0.00	
Terzaghi	2.8E-07	2.8E-09	0.00	
Beyer	4.5E-07	4.5E-09	0.00	
Sauerbrei	5.7E-07	5.7E-09	0.00	
Kruger	1.9E-05	1.9E-07	0.02	
Kozeny-Carmen	8.1E-06	8.1E-08	0.01	
Zunker	6.3E-06	6.3E-08	0.01	
Zamarin	7.5E-06	7.5E-08	0.01	
USBR	5.4E-07	5.4E-09	0.00	
Barr	2.1E-07	2.1E-09	0.00	
Alyamani and Sen	2.2E-05	2.2E-07	0.02	
Chapuis	4.9E-09	4.9E-11	0.00	
Krumbein and Monk	1.7E-03	1.7E-05	1.48	
geometric mean	3.6E-06	3.6E-08	0.00	
arithmetic mean	1.8E-04	1.8E-06	0.15	

Adopting the equation form presented in Vukovic and Soro (1992),

$$K = \frac{\rho g}{\mu} N \varphi(n) d_e^2$$

the following values and equations are substituted into the appropriate terms to evaluate the models listed in the table below. The values of d_e to be entered should be in cm units. The values of K calculated have the units cm/s, except for the Alyamani and Sen model (see footnote).

Source	N	$\varphi(n)$	d_e	Applicable Conditions
Hazen simplified (Freeze and Cherry, 1979)	$10 \frac{\mu}{\rho g}$	1	d_{10}	uniformly graded sand, $n = 0.375$ $T = 10^\circ\text{C}$
Hazen (1892) ^a	6×10^{-4}	$[1 + 10(n - 0.26)]$	d_{10}	$0.01 \text{ cm} < d_{10} < 0.3 \text{ cm}$ $U < 5$
Slichter (1898) ^a	1×10^{-2}	$n^{3.287}$	d_{10}	$0.01 \text{ cm} < d_{10} < 0.5 \text{ cm}$
Terzaghi (1925) ^a	10.7×10^{-3} smooth grains 6.1×10^{-3} coarse grains	$\left(\frac{n - 0.13}{\sqrt[3]{1 - n}}\right)^2$	d_{10}	sandy soil, coarse sand
Beyer (1964) ^a	$5.2 \times 10^{-4} \log \frac{500}{U}$	1	d_{10}	$0.006 \text{ cm} < d_{10} < 0.06 \text{ cm}$ $1 < U < 20$
Sauerbrey (1932) ^a (Vuković and Soro, 1992)	$(3.75 \times 10^{-5}) \times \tau$ $\tau \cong 1.093 \times 10^{-4} T^2 + 2.102 \times 10^{-2} T + 0.5889$	$\frac{n^3}{(1 - n)^2}$	d_{17}	sand and sandy clay $d_{17} < 0.05 \text{ cm}$
Krüger (1919) ^a	4.35×10^{-4}	$\frac{n}{(1 - n)^2}$	$\frac{1}{\sum_{i=1}^n \frac{\Delta w_i}{d_i}}$	medium sand $U > 5$ $T = 0^\circ\text{C}$
Kozeny-Carmen (1953) ^a	8.3×10^{-3}	$\frac{n^3}{(1 - n)^2}$	$\frac{d_{10}}{\text{or } 1}$ $\frac{3 \Delta w_1}{2 d_1} + \sum_{i=2}^n \Delta g_i \frac{d_i^8 + d_i^d}{2 d_i^8 d_i^d}$ $d_1 = \frac{1}{2} \left(\frac{1}{d_i^8} + \frac{1}{d_i^d} \right)$	Coarse sand
Zunker (1930) ^a	0.7×10^{-3} for nonuniform, clayey, angular grains 1.2×10^{-3} for nonuniform 1.4×10^{-3} for uniform, coarse grains 2.4×10^{-3} for uniform sand, well rounded grains	$\frac{n}{(1 - n)}$	$\frac{1}{\sum_{i=1}^n \Delta g_i \frac{d_i^8 - d_i^d}{d_i^8 d_i^d \ln \left(\frac{d_i^8}{d_i^d} \right)}}$	no fractions finer than $d = 0.0025 \text{ mm}$
Zamarin (1928) ^a	8.65×10^{-3}	$\frac{n^3}{(1 - n)^2} C_n$ $C_n = (1.275 - 1.5n)^2$	$\frac{1}{\sum_{i=1}^n \Delta g_i \frac{d_i^8}{d_i^8 - d_i^d}}$	Large grained sands with no fractions having $d < 0.00025 \text{ mm}$
USBR (United States Bureau of Reclamation) (Bialas, 1966) ^a	$(4.8 \times 10^{-4})(10^{0.3})$	1.0	$d_{20}^{1.15}$	Medium grained sands with $U < 5$; derived for $T = 15^\circ\text{C}$
Barr (2001)	$\frac{1}{(36)5C_s^2}$ $C_s^2 = 1$ for spherical grains $C_s^2 = 1.35$ for angular grains	$\frac{n^3}{(1 - n)^2}$	d_{10}	unspecified
Alyamani and Sen (1993)	1300	1.0	$[I_0 + 0.025(d_{50} - d_{10})]$	unspecified
Chapuis (2004)	$\frac{\mu}{\rho g}$	$10^{1.291\xi - 0.6435}$ $\xi = \frac{n}{1 - n}$	$d_{10} \left(\frac{10^{(0.5304 - 0.2997\xi)}}{2} \right)$	$0.3 < n < 0.7$ $0.10 < d_{10} < 2.0 \text{ mm}$ $2 < U < 12$ $d_{10}/d_5 < 1.4$
Krumbein and Monk (1942)	7.501×10^{-6}	$e^{(-1.31 \times \sigma_\phi)}$ $\sigma_\phi = \frac{d_{84\phi} - d_{15\phi}}{\frac{d_{25\phi} - d_{5\phi}}{6.6}}$	$2 \left(\frac{d_{15\phi} + d_{50\phi} + d_{84\phi}}{3} \right)$	natural sands with lognormal grain size distribution

^a indicates formulas were taken from Vuković and Soro, (1992)

N = constant dependent on characteristics of the porous medium

$\varphi(n)$ = function of porosity

T = water temp. ($^\circ\text{C}$)

$g = 980 \text{ cm s}^{-2}$

$\rho = 3.1 \times 10^{-8} T^3 - 7.0 \times 10^{-6} T^2 + 4.19 \times 10^{-5} T + 0.99985$

$\mu = -7.0 \times 10^{-8} T^3 + 1.002 \times 10^{-3} T^2 - 5.7 \times 10^{-4} T + 0.0178$

$\tau = 1.093 \times 10^{-4} T^2 + 2.102 \times 10^{-2} T + 0.5889$

n = porosity as fraction of aquifer volume

d^8 = the maximum grain diameter in fraction i

d^d = the minimum grain diameter in fraction i

d_{10} = grain size (cm) corresponding to 10% by weight passing through the sieves

d_{20} = grain size (cm) corresponding to 20% by weight passing through the sieves

d_{50} = grain size (cm) corresponding to 50% by weight passing through the sieves

d_{60} = grain size (cm) corresponding to 60% by weight passing through the sieves

$U = d_{60}/d_{10}$

Δg_i = the fraction of mass that passes between sieves i and $i+1$ where i is the smaller sieve

Δw_i = fraction of total weight of sample with fraction identifier ' i '

d_i = mean grain diameter of the fraction i

$d_{i\phi}$ = mean grain diameter of the fraction i in phi units ($\phi = \log_2 (d_o/d_o)$, d_e in mm, $d_o = 1 \text{ mm}$)

I_0 = x-intercept (grain size) of a percent grain retention curve plotted on arithmetic axes and focussing on data below 50% retained

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APPENDIX E





Grounded Engineering Inc
ATTN: Shelby Plant
1 Banigan Drive
TORONTO ON M4H 1G3

Date Received: 16-FEB-22
Report Date: 28-FEB-22 09:15 (MT)
Version: FINAL

Client Phone: 647-264-7928

Certificate of Analysis

Lab Work Order #: L2686534
Project P.O. #: NOT SUBMITTED
Job Reference: 21-195
C of C Numbers:
Legal Site Desc: 48 GRENOBLE DR.

Amanda Overholster
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 5730 Coopers Avenue, Unit #26, Mississauga, ON L4Z 2E9 Canada | Phone: +1 905 507 6910 | Fax: +1 905 507 6927
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ANALYTICAL REPORT

Summary of Guideline Exceedances

Guideline		Grouping	Analyte	Result	Guideline Limit	Unit
ALS ID	Client ID					
Ontario Toronto Sanitary Discharge Sewer By-Law 100-2016 (FEB 4,2016) - Ontario Toronto Sanitary Discharge Sewer By-Law						
(No parameter exceedances)						
Ontario Toronto Sanitary Discharge Sewer By-Law 100-2016 (FEB 4,2016) - Ontario Toronto Storm Sewer By-Law						
L2686534-1	SW-UF-BH2	Physical Tests	Total Suspended Solids	246	15	mg/L
		Cyanides	Cyanide, Total	0.0711	0.02	mg/L
		Total Metals	Copper (Cu)-Total	<0.050	0.04	mg/L
			Manganese (Mn)-Total	0.384	0.05	mg/L
			Zinc (Zn)-Total	<0.30	0.04	mg/L
		Aggregate Organics	BOD	40.5	15	mg/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.



ANALYTICAL REPORT

Physical Tests - WATER

					Lab ID	L2686534-1
					Sample Date	16-FEB-22
					Sample ID	SW-UF-BH2
					Guide Limits	
Analyte	Unit	#1	#2			
pH	pH units	6.00-11.5	6.0-9.5	7.48		
Total Suspended Solids	mg/L	350	15	246		

Guide Limit #1: Ontario Toronto Sanitary Discharge Sewer By-Law

Guide Limit #2: Ontario Toronto Storm Sewer By-Law

 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.



ANALYTICAL REPORT

Anions and Nutrients - WATER

					Lab ID	L2686534-1
					Sample Date	16-FEB-22
					Sample ID	SW-UF-BH2
					Guide Limits	
Analyte	Unit	#1	#2			
Fluoride (F)	mg/L	10	-	<1.0	DLDS	
Total Kjeldahl Nitrogen	mg/L	100	-	3.55		
Phosphorus, Total	mg/L	10	0.4	<0.30	DLM	

Guide Limit #1: Ontario Toronto Sanitary Discharge Sewer By-Law

Guide Limit #2: Ontario Toronto Storm Sewer By-Law

 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.



ANALYTICAL REPORT

Cyanides - WATER

Lab ID L2686534-1
Sample Date 16-FEB-22
Sample ID SW-UF-BH2

Guide Limits
#1 #2

Analyte

Unit

Analyte	Unit	#1	#2	
Cyanide, Total	mg/L	2	0.02	0.0711

Guide Limit #1: Ontario Toronto Sanitary Discharge Sewer By-Law

Guide Limit #2: Ontario Toronto Storm Sewer By-Law

 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.



ANALYTICAL REPORT

Bacteriological Tests - WATER

Lab ID L2686534-1
Sample Date 16-FEB-22
Sample ID SW-UF-BH2

Analyte	Unit	Guide Limits		
		#1	#2	
E. Coli	CFU/100m L	-	200	0

Guide Limit #1: Ontario Toronto Sanitary Discharge Sewer By-Law

Guide Limit #2: Ontario Toronto Storm Sewer By-Law

 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.



ANALYTICAL REPORT

Total Metals - WATER

		Lab ID	L2686534-1	
		Sample Date	16-FEB-22	
		Sample ID	SW-UF-BH2	
		Guide Limits		
Analyte	Unit	#1	#2	
Aluminum (Al)-Total	mg/L	50	-	1.82 ^{DLHC}
Antimony (Sb)-Total	mg/L	5	-	<0.010 ^{DLHC}
Arsenic (As)-Total	mg/L	1	0.02	<0.010 ^{DLHC}
Cadmium (Cd)-Total	mg/L	0.7	0.008	<0.00050 ^{DLHC}
Chromium (Cr)-Total	mg/L	4	0.08	<0.050 ^{DLHC}
Cobalt (Co)-Total	mg/L	5	-	<0.010 ^{DLHC}
Copper (Cu)-Total	mg/L	2	0.04	<0.050 ^{DLHC}
Lead (Pb)-Total	mg/L	1	0.12	<0.0050 ^{DLHC}
Manganese (Mn)-Total	mg/L	5	0.05	0.384 ^{DLHC}
Mercury (Hg)-Total	mg/L	0.01	0.0004	<0.0000050
Molybdenum (Mo)-Total	mg/L	5	-	0.0257 ^{DLHC}
Nickel (Ni)-Total	mg/L	2	0.08	<0.050 ^{DLHC}
Selenium (Se)-Total	mg/L	1	0.02	<0.0050 ^{DLHC}
Silver (Ag)-Total	mg/L	5	0.12	<0.0050 ^{DLHC}
Tin (Sn)-Total	mg/L	5	-	<0.010 ^{DLHC}
Titanium (Ti)-Total	mg/L	5	-	0.050 ^{DLHC}
Zinc (Zn)-Total	mg/L	2	0.04	<0.30 ^{DLHC}

Guide Limit #1: Ontario Toronto Sanitary Discharge Sewer By-Law

Guide Limit #2: Ontario Toronto Storm Sewer By-Law

 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.



ANALYTICAL REPORT

Speciated Metals - WATER

Lab ID L2686534-1
Sample Date 16-FEB-22
Sample ID SW-UF-BH2

Guide Limits

Analyte	Unit	#1	#2	
Chromium, Hexavalent	mg/L	2	0.04	<0.00050

Guide Limit #1: Ontario Toronto Sanitary Discharge Sewer By-Law

Guide Limit #2: Ontario Toronto Storm Sewer By-Law

 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Aggregate Organics - WATER

		Lab ID	L2686534-1	
		Sample Date	16-FEB-22	
		Sample ID	SW-UF-BH2	
		Guide Limits		
Analyte	Unit	#1	#2	
BOD	mg/L	300	15	40.5
Oil and Grease, Total	mg/L	-	-	<5.0
Animal/Veg Oil & Grease	mg/L	150	-	<5.0
Mineral Oil and Grease	mg/L	15	-	<2.5
Phenols (4AAP)	mg/L	1.0	0.008	<0.0010

Guide Limit #1: Ontario Toronto Sanitary Discharge Sewer By-Law

Guide Limit #2: Ontario Toronto Storm Sewer By-Law

- Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
- Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.



ANALYTICAL REPORT

L2686534 CONT'D....

Job Reference: 21-195

PAGE 10 of 18

28-FEB-22 09:15 (MT)

Volatile Organic Compounds - WATER

		Lab ID	L2686534-1	
		Sample Date	16-FEB-22	
		Sample ID	SW-UF-BH2	
		Guide Limits		
Analyte	Unit	#1	#2	
Benzene	ug/L	10	2	<0.50
Chloroform	ug/L	40	2	1.1
1,2-Dichlorobenzene	ug/L	50	5.6	<0.50
1,4-Dichlorobenzene	ug/L	80	6.8	<0.50
cis-1,2-Dichloroethylene	ug/L	4000	5.6	<0.50
Dichloromethane	ug/L	2000	5.2	<2.0
trans-1,3-Dichloropropene	ug/L	140	-	<0.50
Ethylbenzene	ug/L	160	2	<0.50
1,1,1,2,2-Tetrachloroethane	ug/L	1400	17	<0.50
Tetrachloroethylene	ug/L	1000	4.4	<0.50
Toluene	ug/L	16	2	0.56
Trichloroethylene	ug/L	400	7.6	<0.50
o-Xylene	ug/L	-	-	<0.50
m+p-Xylenes	ug/L	-	-	<1.0
Xylenes (Total)	ug/L	1400	4.4	<1.1
Surrogate: 4-Bromofluorobenzene	%	-	-	97.0
Surrogate: 1,4-Difluorobenzene	%	-	-	100.0

Guide Limit #1: Ontario Toronto Sanitary Discharge Sewer By-Law

Guide Limit #2: Ontario Toronto Storm Sewer By-Law

 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.



L2686534 CONT'D....

Job Reference: 21-195

PAGE 11 of 18

28-FEB-22 09:15 (MT)

Polycyclic Aromatic Hydrocarbons - WATER

Guide Limit #1: Ontario Toronto Sanitary Discharge Sewer By-Law
Guide Limit #2: Ontario Toronto Storm Sewer By-Law

	Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
	Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Semi-Volatile Organics - WATER

		Lab ID	L2686534-1	
		Sample Date	16-FEB-22	
		Sample ID	SW-UF-BH2	
Analyte	Unit	Guide Limits		
		#1	#2	
3,3-Dichlorobenzidine	ug/L	2	0.8	<0.40
Di-n-butylphthalate	ug/L	80	15	<1.0
Bis(2-ethylhexyl)phthalate	ug/L	12	8.8	<2.0
Pentachlorophenol	ug/L	5	2	<2.0 ^{RRR}
Surrogate: 2-Fluorobiphenyl	%	-	-	54.9
Surrogate: p-Terphenyl d14	%	-	-	60.0
Surrogate: 2,4,6-Tribromophenol	%	-	-	105.8

Guide Limit #1: Ontario Toronto Sanitary Discharge Sewer By-Law

Guide Limit #2: Ontario Toronto Storm Sewer By-Law

 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.



L2686534 CONT'D...
Job Reference: 21-195
PAGE 13 of 18
28-FEB-22 09:15 (MT)

Polychlorinated Biphenyls - WATER

		Lab ID	L2686534-1	
		Sample Date	16-FEB-22	
		Sample ID	SW-UF-BH2	
Analyte	Unit	Guide Limits		
		#1	#2	
Aroclor 1242	ug/L	-	-	<0.020
Aroclor 1248	ug/L	-	-	<0.020
Aroclor 1254	ug/L	-	-	<0.020
Aroclor 1260	ug/L	-	-	<0.020
Surrogate: Decachlorobiphenyl	%	-	-	50.5
Total PCBs	ug/L	1	0.4	<0.040
Surrogate: Tetrachloro-m-xylene	%	-	-	82.1

Guide Limit #1: Ontario Toronto Sanitary Discharge Sewer By-Law

Guide Limit #2: Ontario Toronto Storm Sewer By-Law

 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.



ANALYTICAL REPORT

Organic Parameters - WATER

Lab ID L2686534-1
Sample Date 16-FEB-22
Sample ID SW-UF-BH2

Analyte	Unit	Guide Limits		
		#1	#2	
Nonylphenol	ug/L	20	1	<1.0
Nonylphenol Diethoxylates	ug/L	-	-	<0.10
Total Nonylphenol Ethoxylates	ug/L	200	10	<2.0
Nonylphenol Monoethoxylates	ug/L	-	-	<2.0

Guide Limit #1: Ontario Toronto Sanitary Discharge Sewer By-Law

Guide Limit #2: Ontario Toronto Storm Sewer By-Law

 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Reference Information

L2686534 CONT'D....
Job Reference: 21-195
PAGE 15 of 18
28-FEB-22 09:15 (MT)

Additional Comments for Sample Listed:

Samplenum	Matrix	Report Remarks	Sample Comment:
L2686534-1	Water	Note: RRR; The Reporting Limit has been raised due to possible instrument background interference.	
L2686534-1	Water	Note: RRR: Detection limit raised due to bias low analyte response in continuing calibration standard.	

Qualifiers for Individual Parameters Listed:

Qualifier	Description
R	The ion abundance ratio(s) did not meet the acceptance criteria. Value is an estimated maximum.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLQ	Detection Limit raised due to co-eluting interference. GCMS qualifier ion ratio did not meet acceptance criteria.
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
RRR	Refer to Report Remarks for issues regarding this analysis

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
625-PAH-LOW-WT	Water	EPA 8270 PAH (Low Level)	SW846 8270
Aqueous samples are extracted and extracts are analyzed on GC/MSD. Depending on the analytical GC/MS column used benzo(j)fluoranthene may chromatographically co-elute with benzo(b)fluoranthene or benzo(k)fluoranthene.			
625-SAN-WT	Water	Ontario Sanitary Sewer SVOC Target List	SW-846 8270
Samples are extracted with solvent and then analyzed by GC/MS.			
BOD-WT	Water	BOD	APHA 5210 B
This analysis is carried out using procedures adapted from APHA Method 5210B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.			
CN-TOT-WT	Water	Cyanide, Total	ISO 14403-2
Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.			
When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference			
CR-CR6-IC-WT	Water	Chromium +6	EPA 7199
This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution. Chromium (III) is calculated as the difference between the total chromium and the chromium (VI) results.			
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).			
EC-SCREEN-WT	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Reference Information

L2686534 CONT'D....
 Job Reference: 21-195
 PAGE 16 of 18
 28-FEB-22 09:15 (MT)

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
EC-WW-MF-WT	Water	E. Coli	SM 9222D
A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200			
F-IC-N-WT	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.			
MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).			
NP,NPE-LCMS-WT	Water	Nonylphenols and Ethoxylates by LC/MS-MS	J. Chrom A849 (1999) p.467-482
Water samples are filtered and analyzed on LCMS/MS by direct injection.			
OGG-SPEC-CALC-WT	Water	Speciated Oil and Grease A/V Calc	CALCULATION
Sample is extracted with hexane, sample speciation into mineral and animal/vegetable fractions is achieved via silica gel separation and is then determined gravimetrically.			
OGG-SPEC-WT	Water	Speciated Oil and Grease-Gravimetric	APHA 5520 B
The procedure involves an extraction of the entire water sample with hexane. Sample speciation into mineral and animal/vegetable fractions is achieved via silica gel separation and is then determined gravimetrically.			
P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.			
PAH-EXTRA-WT	Water	Sanitary Sewer Use By-Law Additional PAH	SW 846 8270
PAH-SUM-CALC-WT	Water	TOTAL PAH's	CALCULATION
Total PAH represents the sum of all PAH analytes reported for a given sample. Note that regulatory agencies and criteria differ in their definitions of Total PAH in terms of the individual PAH analytes to be included.			
PCB-WT	Water	Polychlorinated Biphenyls	EPA 8082
PCBs are extracted from an aqueous sample at neutral pH with aliquots of dichloromethane using a modified separatory funnel technique. The extracts are analyzed by GC/MSD.			

Reference Information

L2686534 CONT'D....
 Job Reference: 21-195
 PAGE 17 of 18
 28-FEB-22 09:15 (MT)

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
PH-WT	Water	pH	APHA 4500 H-Electrode
Water samples are analyzed directly by a calibrated pH meter.			
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days			
PHENOLS-4AAP-ED	Water	Phenols (4AAP)	EPA 9066 AUTO-DISTILL-COLORIMETRIC
This automated method is based on the distillation of phenol and subsequent reaction of the distillate with an oxidizing agent (alkaline potassium ferricyanide), and 4-aminoantipyrine to form a red complex which is measured at 505 nm. The method will include ortho and meta-substituted phenols, and is collectively named 4AAP phenols.			
SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric
A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.			
TKN-F-WT	Water	TKN in Water by Fluorescence	J. ENVIRON. MONIT., 2005,7,37-42,RSC
Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection			
VOC-ROU-HS-WT	Water	Volatile Organic Compounds	SW846 8260
Aqueous samples are analyzed by headspace-GC/MS.			
XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION
Total xylenes represents the sum of o-xylene and m&p-xylene.			

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA

Reference Information

L2686534 CONT'D....
Job Reference: 21-195
PAGE 18 of 18
28-FEB-22 09:15 (MT)

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg ww - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

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. Guideline limits 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.



Quality Control Report

Workorder: L2686534

Report Date: 28-FEB-22

Page 1 of 11

Client: Grounded Engineering Inc
1 Banigan Drive
TORONTO ON M4H 1G3
Contact: Shelby Plant

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
625-PAH-LOW-WT		Water						
Batch	R5728371							
WG3697929-2	LCS							
Acenaphthene			85.3		%		50-130	23-FEB-22
Anthracene			91.5		%		60-130	23-FEB-22
Benzo(a)anthracene			99.3		%		60-140	23-FEB-22
Benzo(a)pyrene			87.2		%		60-130	23-FEB-22
Benzo(b&j)fluoranthene			93.5		%		60-130	23-FEB-22
Benzo(ghi)perylene			86.0		%		50-140	23-FEB-22
Benzo(k)fluoranthene			81.4		%		60-130	23-FEB-22
Chrysene			88.9		%		60-140	23-FEB-22
Dibenz(a,h)anthracene			89.0		%		60-130	23-FEB-22
Fluoranthene			93.8		%		60-130	23-FEB-22
Fluorene			89.9		%		60-130	23-FEB-22
Indeno(1,2,3-cd)pyrene			97.2		%		60-140	23-FEB-22
Naphthalene			89.4		%		50-130	23-FEB-22
Perylene			84.0		%		60-130	23-FEB-22
Phenanthrene			86.1		%		60-130	23-FEB-22
Pyrene			94.5		%		60-130	23-FEB-22
WG3697929-1	MB							
Acenaphthene			<0.010		ug/L		0.01	23-FEB-22
Anthracene			<0.010		ug/L		0.01	23-FEB-22
Benzo(a)anthracene			<0.010		ug/L		0.01	23-FEB-22
Benzo(a)pyrene			<0.010		ug/L		0.01	23-FEB-22
Benzo(b&j)fluoranthene			<0.010		ug/L		0.01	23-FEB-22
Benzo(ghi)perylene			<0.010		ug/L		0.01	23-FEB-22
Benzo(k)fluoranthene			<0.010		ug/L		0.01	23-FEB-22
Chrysene			<0.010		ug/L		0.01	23-FEB-22
Dibenz(a,h)anthracene			0.013	MB-LOR	ug/L		0.01	23-FEB-22
Fluoranthene			<0.010		ug/L		0.01	23-FEB-22
Fluorene			<0.010		ug/L		0.01	23-FEB-22
Indeno(1,2,3-cd)pyrene			<0.010		ug/L		0.01	23-FEB-22
Naphthalene			0.020	MB-LOR	ug/L		0.01	23-FEB-22
Perylene			<0.010		ug/L		0.01	23-FEB-22
Phenanthrene			<0.010		ug/L		0.01	23-FEB-22
Pyrene			<0.010		ug/L		0.01	23-FEB-22
Surrogate: 2-Fluorobiphenyl			86.6		%		40-130	23-FEB-22



Quality Control Report

Workorder: L2686534

Report Date: 28-FEB-22

Page 2 of 11

Client: Grounded Engineering Inc
1 Banigan Drive
TORONTO ON M4H 1G3

Contact: Shelby Plant

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
625-PAH-LOW-WT	Water							
Batch	R5728371							
WG3697929-1 MB								
Surrogate: D14-Terphenyl			88.3		%		40-130	23-FEB-22
625-SAN-WT	Water							
Batch	R5728527							
WG3697929-2 LCS								
3,3-Dichlorobenzidine			64.6		%		50-140	23-FEB-22
Bis(2-ethylhexyl)phthalate			99.1		%		50-140	23-FEB-22
Di-n-butylphthalate			86.1		%		50-140	23-FEB-22
Pentachlorophenol			58.2		%		50-140	23-FEB-22
WG3697929-1 MB								
3,3-Dichlorobenzidine			<1.0	RRQC	ug/L		0.4	23-FEB-22
Bis(2-ethylhexyl)phthalate			<2.0		ug/L		2	23-FEB-22
Di-n-butylphthalate			<1.0		ug/L		1	23-FEB-22
Pentachlorophenol			<1.0	RRQC	ug/L		0.5	23-FEB-22
Surrogate: 2-Fluorobiphenyl			89.3		%		40-130	23-FEB-22
Surrogate: 2,4,6-Tribromophenol			107.4		%		40-130	23-FEB-22
Surrogate: p-Terphenyl d14			113.7		%		40-130	23-FEB-22
COMMENTS: RRQC: Detection limit raised due to bias low analyte response in continuing calibration standard.								
BOD-WT	Water							
Batch	R5728545							
WG3697448-2 DUP		L2686580-1						
BOD		<2.0	<2.0	RPD-NA	mg/L	N/A	30	17-FEB-22
WG3697448-3 LCS								
BOD			99.0		%		85-115	17-FEB-22
WG3697448-1 MB								
BOD			<2.0		mg/L		2	17-FEB-22
CN-TOT-WT	Water							
Batch	R5727301							
WG3697252-9 DUP		WG3697252-8						
Cyanide, Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	17-FEB-22
WG3697252-7 LCS								
Cyanide, Total			94.6		%		80-120	17-FEB-22
WG3697252-6 MB								
Cyanide, Total			<0.0020		mg/L		0.002	17-FEB-22
WG3697252-10 MS		WG3697252-8						
Cyanide, Total			91.3		%		70-130	17-FEB-22



Quality Control Report

Workorder: L2686534

Report Date: 28-FEB-22

Page 4 of 11

Client: Grounded Engineering Inc
1 Banigan Drive
TORONTO ON M4H 1G3

Contact: Shelby Plant

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT		Water						
Batch	R5727599							
WG3697677-4	DUP	WG3697677-3						
Aluminum (Al)-Total		0.0158	0.0152		mg/L	4.0	20	18-FEB-22
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	18-FEB-22
Arsenic (As)-Total		0.00019	0.00021		mg/L	11	20	18-FEB-22
Cadmium (Cd)-Total		0.0000240	0.0000227		mg/L	5.6	20	18-FEB-22
Chromium (Cr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	18-FEB-22
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	18-FEB-22
Copper (Cu)-Total		0.00087	0.00087		mg/L	0.0	20	18-FEB-22
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	18-FEB-22
Manganese (Mn)-Total		0.00384	0.00382		mg/L	0.3	20	18-FEB-22
Molybdenum (Mo)-Total		0.000574	0.000556		mg/L	3.3	20	18-FEB-22
Nickel (Ni)-Total		0.00106	0.00100		mg/L	5.6	20	18-FEB-22
Selenium (Se)-Total		0.000131	0.000146		mg/L	11	20	18-FEB-22
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	18-FEB-22
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	18-FEB-22
Titanium (Ti)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	18-FEB-22
Zinc (Zn)-Total		0.0187	0.0185		mg/L	1.1	20	18-FEB-22
WG3697677-2	LCS							
Aluminum (Al)-Total			103.2		%		80-120	18-FEB-22
Antimony (Sb)-Total			100.0		%		80-120	18-FEB-22
Arsenic (As)-Total			98.4		%		80-120	18-FEB-22
Cadmium (Cd)-Total			97.0		%		80-120	18-FEB-22
Chromium (Cr)-Total			95.8		%		80-120	18-FEB-22
Cobalt (Co)-Total			93.2		%		80-120	18-FEB-22
Copper (Cu)-Total			94.6		%		80-120	18-FEB-22
Lead (Pb)-Total			100.7		%		80-120	18-FEB-22
Manganese (Mn)-Total			97.1		%		80-120	18-FEB-22
Molybdenum (Mo)-Total			94.8		%		80-120	18-FEB-22
Nickel (Ni)-Total			95.8		%		80-120	18-FEB-22
Selenium (Se)-Total			95.5		%		80-120	18-FEB-22
Silver (Ag)-Total			90.4		%		80-120	18-FEB-22
Tin (Sn)-Total			97.2		%		80-120	18-FEB-22
Titanium (Ti)-Total			96.0		%		80-120	18-FEB-22
Zinc (Zn)-Total			96.0		%		80-120	18-FEB-22



Quality Control Report

Workorder: L2686534

Report Date: 28-FEB-22

Page 8 of 11

Client: Grounded Engineering Inc
1 Banigan Drive
TORONTO ON M4H 1G3

Contact: Shelby Plant

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-WT		Water						
Batch	R5727769							
WG3697878-4	DUP	WG3697878-3						
pH		6.79	6.84	J	pH units	0.05	0.2	18-FEB-22
WG3697878-2	LCS							
pH			6.93		pH units		6.9-7.1	18-FEB-22
PHENOLS-4AAP-ED		Water						
Batch	R5729634							
WG3700152-3	DUP	L2686854-1						
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	25-FEB-22
WG3700152-2	LCS							
Phenols (4AAP)			90.0		%		85-115	25-FEB-22
WG3700152-1	MB							
Phenols (4AAP)			<0.0010		mg/L		0.001	25-FEB-22
WG3700152-4	MS	L2686977-1						
Phenols (4AAP)			98.1		%		75-125	25-FEB-22
SOLIDS-TSS-WT		Water						
Batch	R5727924							
WG3698179-3	DUP	L2687125-1						
Total Suspended Solids		88.6	87.6		mg/L	1.1	20	21-FEB-22
WG3698179-2	LCS							
Total Suspended Solids			95.3		%		85-115	21-FEB-22
WG3698179-1	MB							
Total Suspended Solids			<3.0		mg/L		3	21-FEB-22
TKN-F-WT		Water						
Batch	R5728298							
WG3697655-3	DUP	L2686904-1						
Total Kjeldahl Nitrogen		0.071	0.089	J	mg/L	0.019	0.1	23-FEB-22
WG3697655-2	LCS							
Total Kjeldahl Nitrogen			105.2		%		75-125	23-FEB-22
WG3697655-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	23-FEB-22
WG3697655-4	MS	L2686904-1						
Total Kjeldahl Nitrogen			125.3		%		70-130	23-FEB-22
VOC-ROU-HS-WT		Water						
Batch	R5726998							
WG3697184-4	DUP	WG3697184-3						
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-FEB-22
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-FEB-22



Quality Control Report

Workorder: L2686534

Report Date: 28-FEB-22

Page 9 of 11

Client: Grounded Engineering Inc
1 Banigan Drive
TORONTO ON M4H 1G3

Contact: Shelby Plant

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT		Water						
Batch	R5726998							
WG3697184-4 DUP		WG3697184-3						
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-FEB-22
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-FEB-22
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	18-FEB-22
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-FEB-22
Dichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	18-FEB-22
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-FEB-22
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	18-FEB-22
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	18-FEB-22
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-FEB-22
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	18-FEB-22
Trichloroethylene		7.86	8.72		ug/L	10	30	18-FEB-22
WG3697184-1 LCS								
1,1,2,2-Tetrachloroethane			113.1		%		70-130	17-FEB-22
1,2-Dichlorobenzene			102.0		%		70-130	17-FEB-22
1,4-Dichlorobenzene			99.8		%		70-130	17-FEB-22
Benzene			96.9		%		70-130	17-FEB-22
Chloroform			99.1		%		70-130	17-FEB-22
cis-1,2-Dichloroethylene			98.1		%		70-130	17-FEB-22
Dichloromethane			104.1		%		70-130	17-FEB-22
Ethylbenzene			95.4		%		70-130	17-FEB-22
m+p-Xylenes			96.5		%		70-130	17-FEB-22
o-Xylene			95.3		%		70-130	17-FEB-22
Tetrachloroethylene			98.4		%		70-130	17-FEB-22
trans-1,3-Dichloropropene			106.6		%		70-130	17-FEB-22
Trichloroethylene			98.3		%		70-130	17-FEB-22
WG3697184-2 MB								
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	17-FEB-22
1,2-Dichlorobenzene			<0.50		ug/L		0.5	17-FEB-22
1,4-Dichlorobenzene			<0.50		ug/L		0.5	17-FEB-22
Benzene			<0.50		ug/L		0.5	17-FEB-22
Chloroform			<1.0		ug/L		1	17-FEB-22
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	17-FEB-22
Dichloromethane			<2.0		ug/L		2	17-FEB-22
Ethylbenzene			<0.50		ug/L		0.5	17-FEB-22



Quality Control Report

Workorder: L2686534

Report Date: 28-FEB-22

Page 10 of 11

Client: Grounded Engineering Inc
1 Banigan Drive
TORONTO ON M4H 1G3

Contact: Shelby Plant

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT		Water						
Batch	R5726998							
WG3697184-2	MB							
Ethylbenzene			<0.50		ug/L		0.5	17-FEB-22
m+p-Xylenes			<0.40		ug/L		0.4	17-FEB-22
o-Xylene			<0.30		ug/L		0.3	17-FEB-22
Tetrachloroethylene			<0.50		ug/L		0.5	17-FEB-22
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	17-FEB-22
Trichloroethylene			<0.50		ug/L		0.5	17-FEB-22
Surrogate: 1,4-Difluorobenzene			100.1		%		70-130	17-FEB-22
Surrogate: 4-Bromofluorobenzene			99.0		%		70-130	17-FEB-22
WG3697184-5	MS	WG3697184-3						
1,1,2,2-Tetrachloroethane			87.3		%		50-150	18-FEB-22
1,2-Dichlorobenzene			101.1		%		50-150	18-FEB-22
1,4-Dichlorobenzene			101.4		%		50-150	18-FEB-22
Benzene			95.0		%		50-150	18-FEB-22
Chloroform			97.1		%		50-150	18-FEB-22
cis-1,2-Dichloroethylene			95.4		%		50-150	18-FEB-22
Dichloromethane			97.5		%		50-150	18-FEB-22
Ethylbenzene			96.5		%		50-150	18-FEB-22
m+p-Xylenes			96.6		%		50-150	18-FEB-22
o-Xylene			95.3		%		50-150	18-FEB-22
Tetrachloroethylene			97.4		%		50-150	18-FEB-22
trans-1,3-Dichloropropene			97.6		%		50-150	18-FEB-22
Trichloroethylene			97.7		%		50-150	18-FEB-22
Batch	R5728209							
WG3698280-4	DUP	WG3698280-3						
Toluene		<0.40	<0.40	RPD-NA	ug/L	N/A	30	23-FEB-22
WG3698280-1	LCS		99.5		%		70-130	22-FEB-22
WG3698280-2	MB		<0.40		ug/L		0.4	22-FEB-22
WG3698280-5	MS	WG3698280-3	95.2		%		50-150	23-FEB-22

Quality Control Report

Workorder: L2686534

Report Date: 28-FEB-22

Client: Grounded Engineering Inc
1 Banigan Drive
TORONTO ON M4H 1G3
Contact: Shelby Plant

Page 11 of 11

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
K	Matrix Spike recovery outside ALS DQO due to sample matrix effects.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.
RRQC	Refer to report remarks for information regarding this QC result.

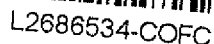
Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes 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 pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



COC Number: 20 - 954787

Page 1 of 1

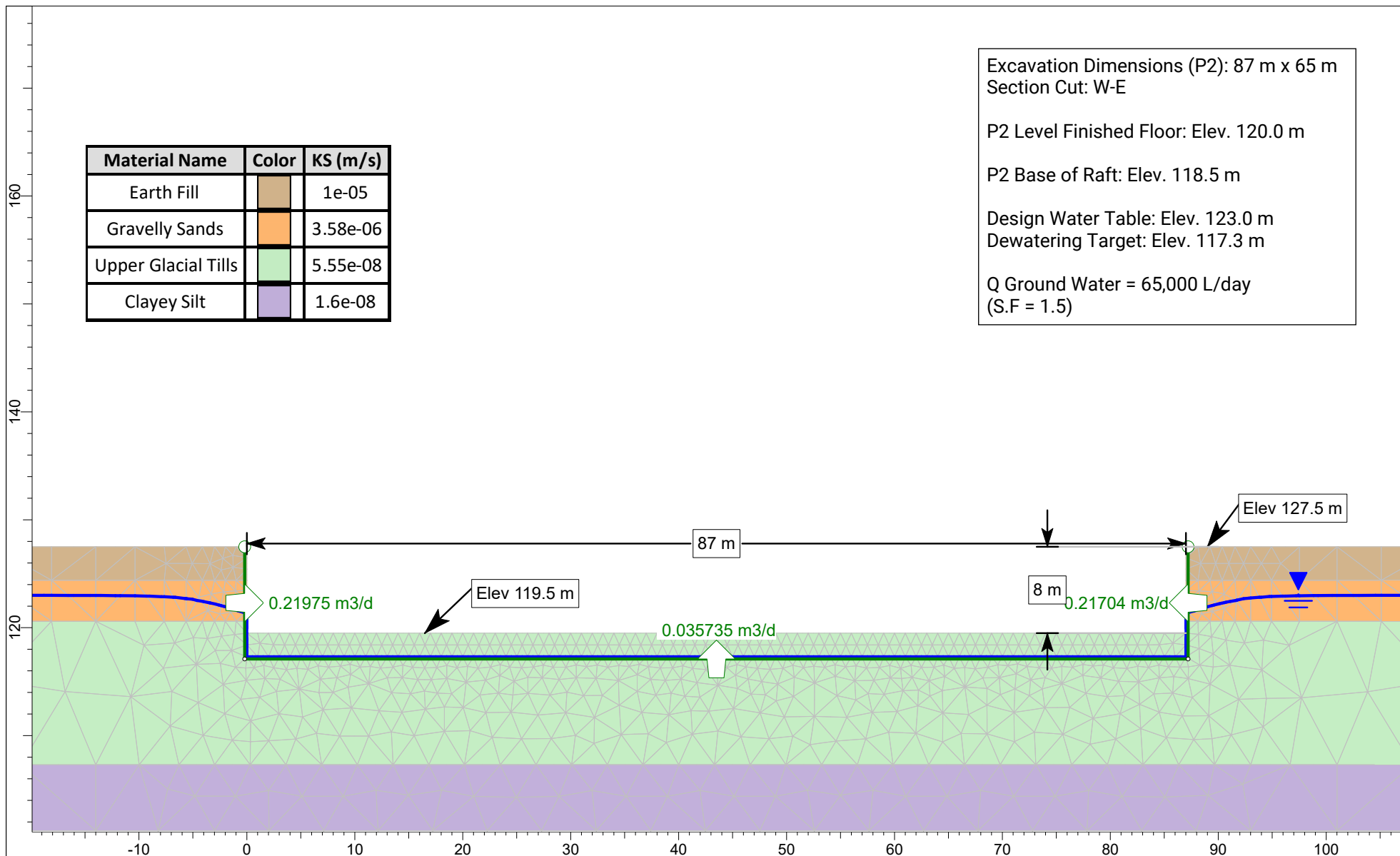
AUG 31/SEP 1

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.

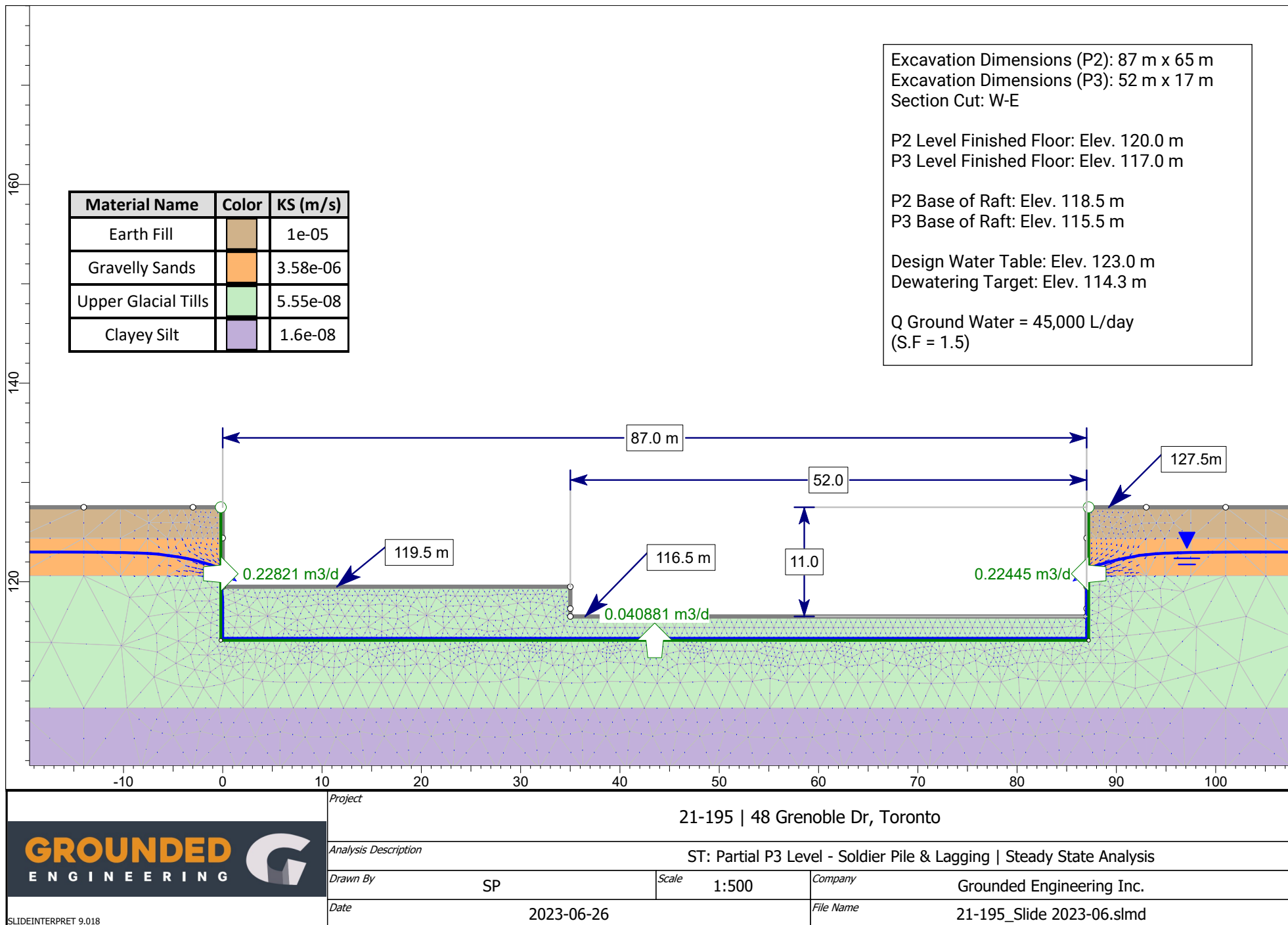
1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

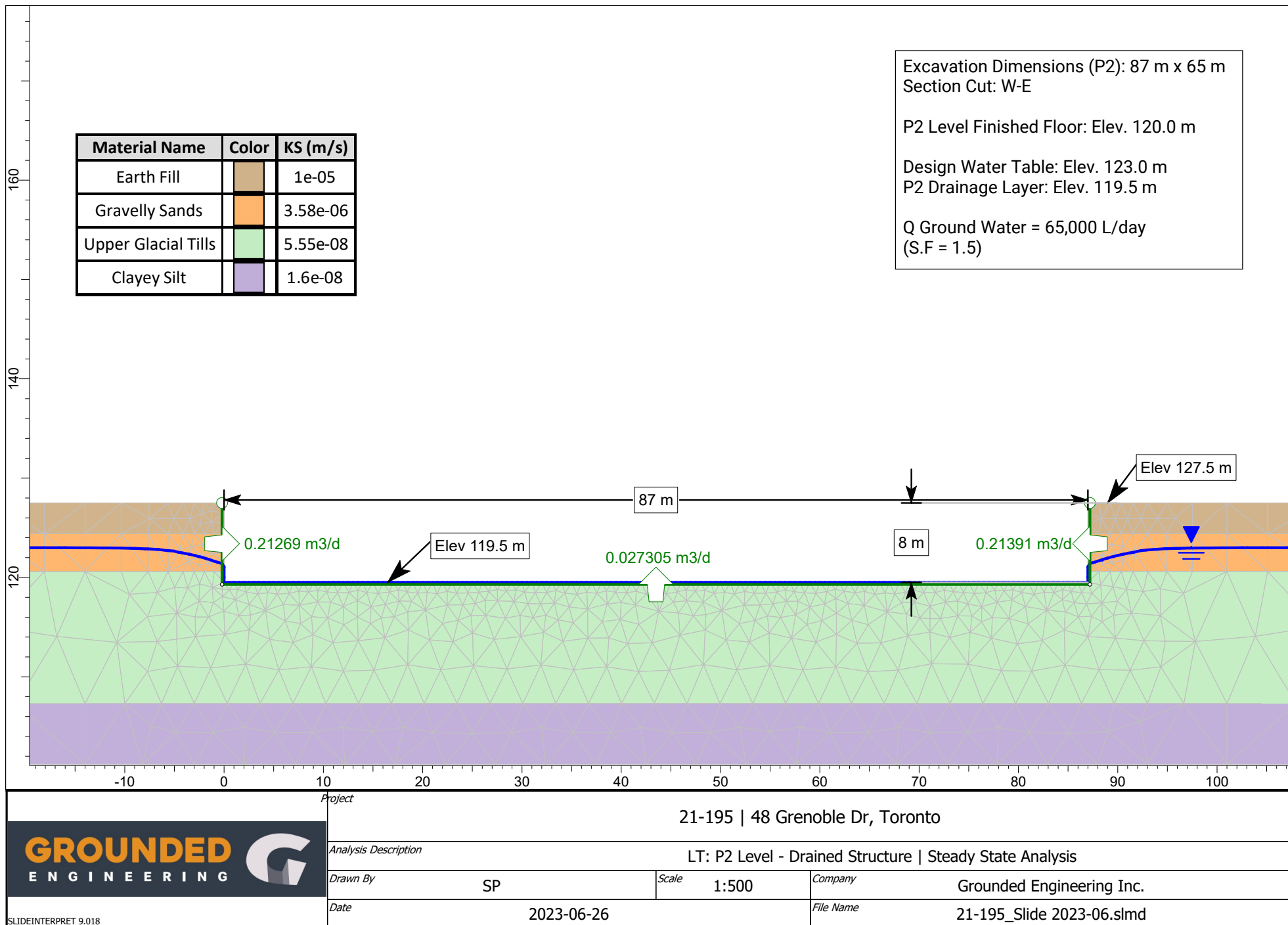
APPENDIX F

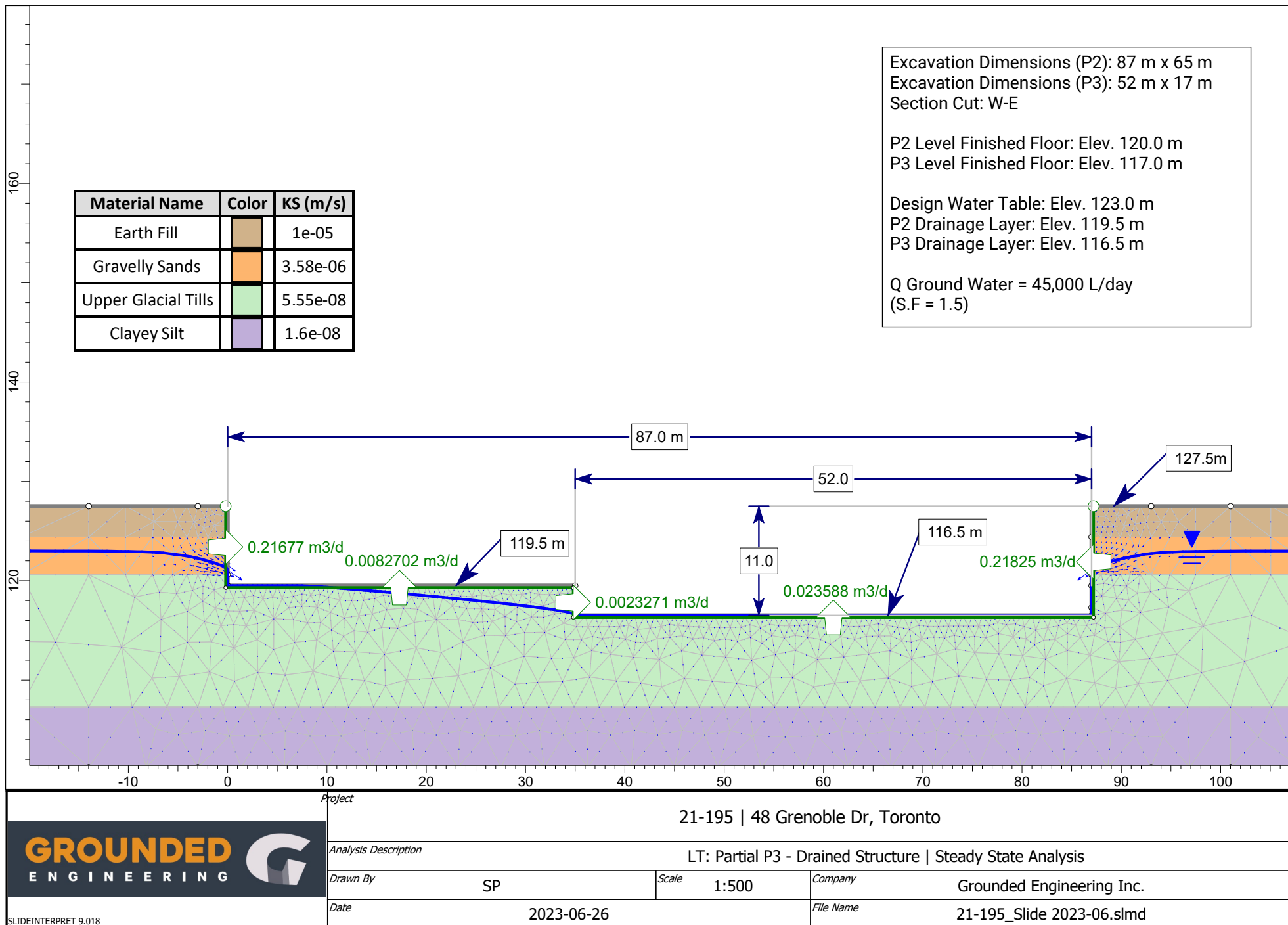




GROUND ENGINEERING	Project			21-195 48 Grenoble Dr, Toronto	
	Analysis Description			ST: P2 Level - Soldier Pile & Lagging Steady State Analysis	
	Drawn By	SP	Scale	1:500	Company
	Date	2023-06-26	File Name	21-195_Slide 2023-06.slmld	







APPENDIX G



SHORT TERM - TOTAL - Soldier Pile and Lagging						
Excavation Dimensions [m]		Rainfall Data				
N-S	65	Year	2	100		
E-W	87	Hour	3	12		
Area (m2)	5655	Depth (mm)	25	94		
Perimeter (m)	295.3	Depth (m)	0.025	0.094		
Section		Flow [m3/day]	Length [m]	Volume [L/day]		
Base - Partial P3		0.040881	17	689		
Sides - Partial P3		0.22821	121	27,552		
Base - P1/P2		0.035735	48	1,715		
Sides - P1/P2		0.21975	183	40,214		
Total				70,171		
Factor of Safety		1.5		105,256		
Storm Events		Summary		L/day		L/min
2 Year [L/day]	100 Year [L/day]	Groundwater		110,000		76.4
141,375	532,000	Rainfall		142,000		98.6
		Total		252,000		175.0

LONG TERM - TOTAL - Drained Structure						
Excavation Dimensions [m]		Rainfall Data				
N-S	17	Year	2	100		
E-W	87	Hour	3	12		
Area (m2)	1467	Depth (mm)	25	94		
Perimeter (m)	295.3	Depth (m)	0.025	0.094		
Section		Flow [m3/day]	Length [m]	Volume [L/day]		
Base - Partial P3		0.0318582	17	537		
Sides - Partial P3		0.2190971	121	26,452		
Base - P1/P2		0.027305	48	1,311		
Sides - P1/P2		0.21391	183	39,146		
Total				67,445		
Factor of Safety		1.5		101,168		
Infiltration [L/day]		Summary	L/day	L/min		
21,040		Groundwater	105,000	72.9		
		Infiltration	22,000	15.3		
		Total	127,000	88.2		